

The distance to Mirzapore from Calcutta is 460 miles by Dawk, and at the same rate, the cost of conveyance may be taken on the maund of $\frac{1}{30}$ th of a ton at ten annas, a sum that many persons would prefer paying, to avoid the risks of river navigation, as at present conducted.

GILLANDERS, ARBUTHNOT, & Co.

[$\frac{1}{30}$ th of a ton for 10 annas is 1 ton for 300 annas, or 450*d.*, and the distance of Mirzapore from Calcutta in the line the railway would follow being 450, instead of 460 miles, the cost of conveyance at the rate stated is 1*d.* per ton per mile.]

Cost per ton
per mile.

Present cost
of transport.

1*d.*

The expense of carrying goods from Calcutta to Mirzapore by river is not less than from $3\frac{1}{2}$ to 4 per cent. on the invoice price.

R. J. CHAMBERS.

[4 per cent. on goods of £40 a ton is 32*s.*, or 382*d.* for conveying a ton 450 miles, which is equivalent to 0.85 of a penny per ton per mile. It would appear from comparing this result with Mr. Ashburner's statement, that the insurance upon goods and the interest, are together more than the freight.]

0.85*d.*

The cost of conveying coals from the collieries at Raneegunge to Calcutta is 10 rps. per 100 maunds.

DWARKANAUTH TAGORE.

[The Raneegunge collieries are about 100 miles from Calcutta, which gives $\frac{1}{10}$ th of a rupee for conveying 100 maunds 1 mile, or 2.4*d.* for carrying 3.66 tons 1 mile, or 0.66 of 1*d.* per ton per mile.]

0.66*d.*

Present cost
of transport.

The expense of conveying piece goods from Calcutta to Mirzapore by water is 150 rps. for 250 maunds, and the time required is from six weeks to two months.

M. RUSTOMJEE.

Cost per ton
per mile.

0.88*d.*

[250 maunds of 82 lbs. are 9.1 tons, which are carried 450 miles for 3,600 pence, or 1 mile for 8*d.*, which is 0.88 of a penny per ton per mile.]

The expense of conveyance down the river from Mirzapore to Calcutta for cotton and other produce is from 1 rupee 4 annas to 1 rupee 8 annas per bale of four Calcutta maunds.

M. RUSTOMJEE.

0.54*d.*

[1 rupee 8 annas for 4 maunds is 36 pence for 321 lbs. carried 450 miles, or since 328 lbs. is contained 6.8 times in a ton, it is 6.8 times 36 pence, or 224.8 pence for carrying a ton 450 miles, which is 0.54 of a penny per ton per mile.]

The present cost of carriage down the river from Mirzapore to Calcutta, inclusive of insurance, is one shilling per maund, and the time occupied is nearly three months.

J. B. HIGGINSON.

0.72*d.*

[This is 27 shillings a ton for 450 miles or, 0.72 of a penny per ton per mile.]

The whole of these quantities are not directly comparable, as the expense of conveying merchandise down the river with the stream is not so great as that of carrying it up against the stream; and in the price of carrying goods down the river given by Mr. Higginson insurance is included, which

does not appear to be the case in the second statement of M. Rustomjee, in which the goods are also supposed to be carried downward. Taking the second, third, and fifth statements, in which the goods are supposed to be carried upwards, and which exclude the considerations of interest and insurance, it appears that the cost of carrying goods up the Ganges from Calcutta to Mirzapore is $0.91d.$ or very nearly $1d.$ per ton per mile; while the cost of carrying the goods downwards is $0.54d.$, or little more than $\frac{1}{2}d.$ per ton per mile: or with insurance it is $0.72d.$, or nearly $\frac{3}{4}d.$ per ton per mile. Taking the cost of transport at $\frac{1}{2}d.$, and the insurance at $\frac{1}{4}d.$ per ton per mile, and reckoning that the interest of money is 10 per cent., the value of the goods £40 per ton, and the length of time occupied in the transport between two and three months, we shall have to add $0.43d.$ per ton per mile for interest, which makes the cost of the carriage downwards $1.15d.$, or rather more than $1d.$; the cost of the carriage upwards $1.59d.$, and the average $1.37d.$, or very nearly $1\frac{1}{2}d.$ per ton per mile.

Present cost
of transport.

We have excluded from this comparison the statement of Dwarkanauth Tagore, as the coal he refers to is carried, not down the Ganges, but down the Damooda by a circuitous route, which adds to the expense; and this datum, therefore, if admitted, would make the cost of water transport appear to be greater than it really is. It is clear from the tenor of our remarks, that, in estimating the cost per ton per mile, we have not reckoned the

Present cost
of transport.

distance by following the sinuosities of the river, but by taking the actual distance between the termini in the direction a railway would follow, as it is by this course alone that the cost of river and railway transport become measurable by one another.

Ganges traffic by native boats.

Cost per ton
per mile.

Average cost per ton per mile *upwards*, including interest and insurance. } 1.59d.

Average cost per ton per mile *downwards*, including interest and insurance } 1.15d.

Cost of Transport by the River in Steam Vessels.

The average rate of freight charged by steamer from Calcutta to Allahabad is 2 rps. 10 annas 10 pp. per cubic foot, or for heavy articles 1 anna per lb. weight; freight brought downwards is charged 8 annas per cubic foot, and 1 anna per 3 lbs. weight—a cubic foot weighing 30 lb. on the average. Treasure to Dinapore pays 6 annas per cent., to Benares 8, to Mirzapore 10, and to Allahabad 12 annas. Native merchants are the principal shippers; they fully appreciate the saving of time and insurance, &c. The average voyage to Allahabad is 25 days.

Average
upwards
4d. per
ton per
mile;
average
down-
wards 1d.
per ton
per mile.

Capt. JOHNSTONE, Comptroller of Steam Vessels.

[2 rps. 10 annas 10 pice, or say 43 annas or 64d. for carrying 30 lbs. 500 miles; or 15,000 lbs., or 6.7 tons 1 mile is 9½d. per ton per mile. 1 anna per lb. weight is 2,240 annas, or 3,360d. per ton for 500 miles, or 6.7d. per ton per mile. The freight downwards is 1.78d. per ton per mile, or only about ⅓th of that upwards on the measurement goods, and ⅓rd of that upwards on the heavy goods, or 2.2d. per ton

per mile. Average *upwards* 8*d.* per ton per mile; average *downwards* 2*d.* per ton per mile. Since the time Capt. Johnstone's information was given, however, the cost of transport has been reduced about one-half; so that 4*d.* per ton per mile for the upward, and 1*d.* per ton per mile for the downward voyage will now be about the right proportions.]

Cost per ton
per mile.

Average
upwards
4*d.* per
ton per
mile;
average
down-
wards 1*d.*
per ton
per mile.

Present cost
of transport.

Passengers.

Cost of each Pas-
senger per mile

1st Class.—The expense of the journey by land from Calcutta to Benares with 12 bearers, is from 150 to 200 rps.; a palanquin will cost 125 rps., besides 25 rps. for a banghy to carry provisions. By water the cost is 180 to 200 rps.

M. RUSTOMJEE.

8*d.*

[Taking the cost at 150 rps. and the distance at 450 miles, though in reality it is but 428 miles by the road, the cost per mile will be 8*d.*]

2nd Class.—By buying a horse and selling him at the end of the journey, the cost of proceeding from Calcutta to Benares on horseback will be 23 rps. The hire of an eka that will carry two persons is 30 rps. and the hire of a rutha that will carry 4 persons is 60 rps., or 15 rps. each person; but the charge for crossing rivers, &c. amounts to 8 rps. in addition.

RAM COOMUL SIN.

1.12*d.*

[23 rps. or 554 pence spent in 450 miles is 1.23 of a penny per mile. 19 rps., which is the half of 38, or 456 pence spent in 450 miles is about one penny a mile. The average is 1.12 of a penny per mile for each passenger.]

Passengers.

Cost of each Passenger per mile.

Present cost of transport.

3rd Class.—A boat of six oars capable of taking from 6 to 10 persons, costs for the passage from Calcutta to Benares, 60 rps. The toll is 3 rupees and the sums paid to Chokeydars to prevent detention, &c. is about 12 rps., or 75 rps. in all exclusive of provisions for 6 to 10 persons. The expenses of a journey on foot are not so easily determinable, but the allowance for the journey among the natives, when a messenger is sent on foot, is 10 rps., which includes wages, food, and all charges.

RAM COOMUL SIN.

[75 rps. for 10 persons is $7\frac{1}{2}$ rps. for each, or 180 pence for 450 miles, which is 0.4 of a penny for each person per mile. 10 rps. or 240 pence for 450 miles is 0.533 of a penny per mile. The voyage by boats occupies from 30 to 45 days, say 38 days, and the most parsimonious Hindo cannot subsist himself for less than $1\frac{1}{2}$ anna per day for fuel, flour, or rice, ghee and salt, this is 85 pence for 36 days, or 0.2 per mile ; so that the cost of conveyance by water including subsistence, appears to be 0.6 of a penny per mile for each person.]

By boat .6 of a penny including subsistence. By foot 0.533 of a penny including time and subsistence.

CHAPTER III.

PROFITS OF THE EAST INDIAN LINE.

HAVING now ascertained the amount of traffic *at present existing* in the districts traversed by the East Indian line, and the average cost of transport by the existing modes of conveyance, it only remains that we should determine what amount of dividend this traffic, if secured to the railway by moderate charges, would return upon the capital invested. Before proceeding to this determination we may, for the sake of distinctness, briefly recapitulate the chief facts at which we have arrived.

Recapitulation of extent and cost of traffic.

On the line between Calcutta and Mirzapore the total quantity of goods carried is 1,166,048 tons per annum, and the total number of passengers per annum is 569,684. On the line between Mirzapore and Delhi the goods traffic is 897,190 tons per annum, and the number of passengers per annum is 446,851. The average cost of carrying goods by the road is $3\frac{1}{2}d.$ per ton per mile. By the river the average cost upwards in native boats is, including interest and insurance, $1.59d.$ per ton per mile : and downwards, $1.15d.$ per ton per mile, making an average of $1.37d.$; the charges by the steamers are so much above this—being $4d.$ per ton

Rate of
charge ob-
tainable by
the railway.

per mile upwards, and $1d.$ per ton per mile downwards, exclusive of interest or insurance, or on the average of $2\frac{1}{2}d.$ per ton per mile, exclusive of interest and insurance, that they need hardly be considered. The average cost of travelling is, to 1st class passengers, $8d.$ per mile each; to 2nd class, $1.12d.$ per mile each; and to 3rd class, $0.6d.$ per mile each, including food if proceeding by water, and $0.533d.$ per mile each, including time and food if travelling by foot.

With these rates of charge for the present unsatisfactory modes of conveyance, it may be supposed that an average charge of $1d.$ per ton per mile for goods carried by the railway, and $\frac{1}{2}d.$ per mile each for passengers, would be sufficient to attract to it the whole of the existing traffic. These rates, moreover, would make a large dividend permissible, provided it could be realized. The average rates of charge on the London and Birmingham Railway for goods is $1.8d.$ per ton per mile, and for passengers $1\frac{1}{2}d.$ each per mile; these rates are about twice greater than those proposed for the East Indian line, so that, by the terms of the suggested arrangement with the government, a dividend of from 24 to 30 per cent. on the capital invested in the East Indian line would become permissible. Let us see how far a dividend, approaching to this amount, could be obtained.

The cost of locomotive power varies on different railways, with the price of coke, the quality of the gradients, and other circumstances. On the

Great Western Railway, the cost, Mr. Gooch states, is 0.06 of a penny per ton per mile ; on the Grand Junction, 0.13*d.* ; on the Birmingham and Gloucester, 0.09*d.* ; on the South Western, 0.1*d.* ; and on the London and Birmingham 0.12 of a penny per ton per mile. In this return the economy of the Great Western locomotives appears to be exaggerated, but in other respects it may be taken as a tolerably near approximation to the truth, and 0.12*d.* or $\frac{1}{8}$ th of a penny per ton per mile, may be taken as about the probable cost on the East Indian line. On the Glasgow and Greenock Railway, with a heavy passenger traffic, and coke 18*s.* per ton, the cost of maintaining a locomotive is 8*d.* per mile run ; while on the Bristol and Gloucester Railway, with cheaper coke and a lighter traffic, it is 10*d.* per mile run. On the Norfolk Railway the offer has been made to supply, maintain, and work locomotives at 1*s.* per mile run : we may, therefore, reckon that the locomotives of the East Indian Railway can be worked and maintained, *without* being supplied, for 1*s.* per mile run—the increased amount of engine drivers and engine menders' wages in India being taken as equal to the interest of the money invested in the locomotives. Goods' waggons weigh about 2½ tons each on the narrow guage, and 4 tons on the broad guage, and it is reckoned injurious to the rails to put more than 6 tons of merchandise in each waggon. On the Liverpool and Manchester Railway the average load of a merchandise train, drawn by one engine, is 100 tons, and of a passen-

Cost of
locomotive
power.

Number of
trains neces-
sary per day.

ger train 35 tons ; but these loads are often much exceeded on other lines ; and on a line 5ft. 6in. between the rails, as the East Indian line is proposed to be, the merchandise engines could easily be made sufficiently powerful to draw 200 tons of merchandise each, in addition to the weight of the trucks. If 1,166,048 tons of goods were carried yearly, 3,194 tons would have to be carried daily, which it would require 16 engines to do—8 starting from each end. If these engines were all to start from each end together at six o'clock in the evening, and were to travel at the rate of 15 miles an hour, they would meet at the central station, where the trains would pass one another at nine o'clock in the morning. A passenger train started from each end at six o'clock in the morning, and travelling at the rate of 37 miles an hour, would reach the central station at twelve o'clock in the day, and the goods trains could be detained at the central station until the passenger trains had passed on. The passenger trains would perform the distance from Calcutta to Mirzapore in 12 hours, and the goods trains in 36 hours. 569,684 passengers per annum are 1,561 passengers per day, or 780 passengers per day from each end ; and 4 trains per day from each end would be sufficient to carry this number.

On lines ten years old, and where, therefore, the locomotives are not all new, a locomotive performs, on the average, about 20,000 miles per annum, or only 54.8 miles per day ; if on the East

Indian line 8 luggage trains and 4 passenger trains start from each end in the day, the total number of miles travelled will be 13,080 per day; and the number of times 54.8 is contained in 13,080, or 238, will be the number of locomotives necessary. In round numbers, 250 locomotives may be set down as the number that would be required; and 250 locomotives, at £2,500 each, would cost £625,000, which is £1,146 per mile.

Number of
locomotives
requisite for
the line.

On the London and Birmingham Railway the total cost of the carrying stock has been 1.5 more than that of the locomotives. On the East Indian line the cost of the carrying stock would not be so great in proportion, as there are comparatively few passenger carriages; but supposing the same proportion to apply, the cost of carrying stock, independent of locomotives, on the East Indian line, would be £937,500, making in all £1,562,500 for the cost of locomotives and carrying stock. If, then, the cost be estimated at £3,000 per mile,—which makes the total expense £1,635,000—the cost will be within the estimate, and at this sum we shall reckon it. On the London and Birmingham Railway the maintenance of way and stations, coaching and merchandise charges, and general charges, which together comprise all the expenses, except that of locomotive power, are equal in amount to about $\frac{1}{4}$ th of the receipts: on the East Indian line these expenses would probably be less, as there would be fewer stations in proportion, and

Total re-
ceipts of the
railway.

cheaper wages ; but we shall reckon them at the same amount.

We exclude from this comparison the cost of the locomotive power, for the obvious reason, that it will be much larger on the East Indian line in proportion to the receipts, in consequence of the cheapness of the transport. Reckoning, then, the income by the direct distance—though the expenditure must be reckoned by the actual distance travelled,—and taking the average tariff of the goods traffic at $1d.$ per ton per mile, and of the passenger traffic at $\frac{1}{2}d.$ each per mile, we shall have of receipts on the line between Calcutta and Mirzapore, for 1,166,048 tons of goods carried 448 miles at $1d.$ per ton per mile, £2,176,622 ; and for 569,684 passengers carried 448 miles at $\frac{1}{2}d.$ per mile each, £531,705, making a total of £2,708,327 per annum. The distance between Mirzapore and Delhi is about 452 miles, and on this length of line we shall have of receipts, for 897,190 tons of goods carried 452 miles at $1d.$ per ton per mile, £1,689,707 ; and for 446,851 passengers carried 452 miles at $\frac{1}{2}d.$ per mile each, £420,783, making a total of £2,110,490 per annum. This traffic has all been taken as through traffic, for the obvious reason, that it represents the traffic as ascertained at different points, and is, therefore, to be reckoned as the average traffic along the whole line ; and, although but a small proportion of the goods and passengers may pass through the whole distance,

yet that circumstance cannot affect the result so long as every loss is made up by a corresponding addition ; or, in other words, it signifies nothing whether the whole traffic is a through traffic, or is composed of a short traffic, reckoned in successive lengths through the whole length of the line—the only essential condition being that the traffic at the several points, however composed, is of the amount represented.

Total ex-
penses of the
railway.

There is no need for discriminating between the branch and the trunk traffic ; for if the tariff of charge to the several places to which branches lead is to be reckoned by the direct distance, each of those places is virtually brought upon the trunk line—the only difference indeed being, that the expense of working the branches has to be added to the expense of working the trunk. There will no doubt be a local traffic on the branches which will diminish this expense, and probably extinguish it altogether ; but it will be the safer way to reckon the expense per mile of working the branches at the same rate as the expense per mile of working the trunk, which will be accomplished by reckoning the expense of working the line, as if the total traffic passed through its total length including trunk and branches. The expenses of working the Calcutta and Mirzapore line, which, including its branches, is 545 miles long, will then be as follows :—Locomotive power for carrying 1,166,048 tons, 545 miles, $\frac{1}{8}$ th of a penny per ton per mile, £330,987 ; traction of 8 passenger trains per

Excess of
receipts over
expenses.

day for 545 miles, at 1s. per mile, £77,568; maintenance of way and stations, coaching and merchandise, charges and general charges, say $\frac{1}{4}$ th of the receipts £386,903; and haulage of empty waggons, £9,696, making a total of £805,154 per annum. On the Mirzapore and Delhi section, which, including its branches, but exclusive of the continuation to Meerut, is 524 miles long, the expenses will be:—locomotive power for hauling, 897,170 tons, 524 miles, £224,858; 6 passenger trains, drawn 524 miles per day, at 1s. per mile for each £57,378; maintenance of way and stations, coaching and merchandise charges and general charges $\frac{1}{4}$ th of receipts, £301,498; and haulage of empty waggons, £9,563; being a total of £593,297 per annum. On the Calcutta and Mirzapore section, the receipts per mile will be £4,969, and the expenses per mile £1,495, leaving £3,474 per mile, which, after deducting the charge due to depreciation, will be available as dividend. On the Mirzapore and Delhi sections, the receipts per mile will be £4,021, and the expenses £1,113, leaving £2,908 per mile, available for depreciation and dividend, or a mean of £3,191 per mile upon the whole line, including all the branches.

These results are sufficiently encouraging; but before the profits of the undertaking can be determined, it is necessary to fix the cost; and here some complications have been needlessly introduced by the government, or its subordinates, which it becomes necessary to disentangle. Mr. Stephen-

son appears originally to have contemplated a cheap description of railway for connecting Calcutta with Mirzapore and Delhi; but this view of the matter did not satisfy Mr. Simms, who, in a letter to Mr. Stephenson, dated January, 1846, says, "The character of the works I may deem it my duty to recommend the government to require, may perhaps be of a better kind than you originally contemplated—such as a double line of rails to a great, if not the whole extent; but this difficulty, if it prove such, you state your company is prepared to meet by increasing their capital." The capital could no doubt have been increased, if the government had extended the guarantee, but the government refuses to give a guarantee upon a larger sum than three millions, which would not be sufficient, even for a single line from Calcutta to Mirzapore. It appears that it was a single line Mr. Stephenson originally contemplated: Mr. Simms says, "The construction of the line between Calcutta and Mirzapore will probably cost more than a casual observer might from the appearances of the country suppose; for, although the earth works, will, with few exceptions, be light, the masonry works to cross the rivers will be heavy. I do not think with you, that the adoption of a double line at once will very materially increase the cost as compared with the total outlay, because I should at all events advise that the bridges should be constructed of sufficient breadth to admit hereafter of a second line of rails; and the masonry works will be found, as

Quality of
railway to be
preferred.

Expensive
stone struc-
tures, need-
less and in-
expedient

before stated, the great item of expenditure." But wherefore should masonry works be adopted to such an extent, as to become the 'great item of expenditure?' Is the prosperity of a railway company to be endangered, or the utility of its project curtailed, by imposing upon it the performance of needless feats in architecture? No doubt the railway should be constructed in a durable and substantial manner, so as to be capable of withstanding a large traffic and a high rate of speed, without involving the necessity of continual repairs; but these conditions can be attained without making stone work the great item of expenditure, and the experience in English railways latterly acquired shows that timber bridges and viaducts are for the most part preferable to those constructed of stone. By kyanizing the wood, or otherwise suitably preparing it, a great durability is attainable, and the timber viaducts have in every case proved themselves to be substantial and satisfactory—and have, in no one instance, like the Barentin Viaduct, or the stone bridges on the Aberdeen, North British, and various other railways, suddenly tumbled down. In the American railways, timber has always been largely employed, and in the English railways its use has of late years been rapidly extending—not merely because it is cheaper than stone, but because it is in most respects better. There does not appear to be any good reason in the case of Indian railways, for resorting to the exploded practice upon European lines, of squandering money on gi-

gantic works in stone, for the white ants have been raised into a bugbear only by those orientals, who construct impossibilities out of fancies, or impediments such as the most moderate capacity may surmount. And if timber viaducts be for the most part employed, the stone work can no longer be the great item of expenditure; and the question again arises, whether it would not be advisable to commence all the railways as single lines? A single can be constructed as substantially as a double line; and if timber viaducts be chiefly used, there is no necessity for making them wider at first than is sufficient to accommodate the single track; for such structures can be widened at any time when provision has been made for that purpose. Under these conditions, a single line would not cost much more than half the sum that a double line would cost; and with the same expenditure, it would open up nearly twice the area of country, and render available for its support nearly twice the extent of infiltrating surface. A single line connecting Mirzapore with Calcutta would suffice for the transmission of all the traffic, even if it were increased fourfold; and the same remarks applies still more emphatically to the other Indian lines.

A single line
sufficient,
and most
wise.

In the present position of the money market, only a limited capital is obtainable, even for the construction of the best railways; that capital will be more easily got if expended upon the construction of single lines, than if spent upon double ones, inasmuch as a larger return may thus be expected from the single lines, and the expendi-

Requisition
of double
lines presses
upon the
Company
without
benefit to
the Govern-
ment.

ture of any given amount of capital upon such railways, will be of nearly twice the utility to the public, as nearly twice the extent of country will participate in the advantage of the amelioration. Upon what plea, then, can the formation of double lines be justified? No doubt, if the money were obtainable for double lines, on the conditions offered by the government, it would be natural enough that it should prefer all the main trunks to be made at once with a double track and be exclusively formed of such imperishable materials that they might last to the day of doom; but the question is more properly a financial than an engineering one; and the circumstances of the money market have so much changed since Mr. Simms' views were propounded, that his stringent conditions are no longer maintainable. Companies cannot be coerced by a hard bargain, where no corresponding benefit is accorded and the fever of speculation has passed away; and if the present companies, which had their origin in some measure in the recent railway excitement, are broken up, who can say when others will be constructed? The course of procedure prescribed to the railway companies should be identical with that followed, if the government was itself making the railways, as Mr. Simms indeed himself elsewhere maintains; and it is hard to believe that the formation of a double line could then be advantageous to the government in any case in which a single line would serve the turn.

In the first dispatch from the Court of Directors to the Bengal Government on the subject of

Indian railways, it is stated, that one of the functions of the railway commission would be "to suggest some feasible line of moderate length, as an experiment for railroad communication in India;" and two pieces of the trunk line, one extending from Calcutta to Barrackpore, and the other from Allahabad to Cawnpore, were accordingly recommended. But what, it may be asked, is the proposed experiment to discover? It is clear that an experimental railway can establish no general conclusions respecting cost or traffic, inasmuch as those elements depend more upon the population, wealth, and physical conformation of the district selected, than upon any such accidents as its latitude and longitude. It may indeed teach something as to the comparative durability of different modes of construction; but are all the other Indian lines to remain in abeyance for some half a century, until it is seen how the experimental line withstands the ravages of time? The truth is, new tests of durability are not needed; for the materials entering into the composition of railways, have been tested for ages in other combinations, and an experimental line as a test of durability, is no more required in India than it is in England. The works of the Indian railways, in common with those of every other country, must consist of masonry, timber, and earthwork; and a new railway, or any number of them, could add nothing to the evidence of the durability of those materials, always accessible. The bounds or embankments

Inutility and
futility of an
experimental
line.

Question of
peculiar at-
mospheric
influences
already an-
swered.

in the Deccan, constructed to shut up in narrow valleys the waters descending from the hills, are certainly in some cases more than 800 years old; yet these embankments have withstood all the unfavourable influences of the climate, though pressed upon by a large volume of water; many of the stone structures are of a still more remote antiquity; and timber is too familiar an article, and the durability of the different kinds is too well known, to need new experiments to determine it. Some of the embankments of the road leading from Chittagong to Comillah, constructed by Mr. Elliot, about 1795, are from 20 to 30 feet high; and the road, which in most of its works much resembles a railway, passes through a country much exposed to inundation; nevertheless, every part of the work has been exempt from disaster; and such a result tells far more than anything the brief experience of an experimental railway could unfold.

The climate of the southern portion of the United States very much resembles India; yet in America no impediment has been experienced from atmospheric causes; and does any one doubt, that if India had been in the hands of the Americans, it would not long before this time have been intersected by railways? Cuba even has its railway, which has been open to the public for 9 years; and a short line, the Red River Railway, has been for some years in existence at Madras, which might be appealed to touching any question of durability, that an experimental railway might be

thought competent to determine ; but any new line, as a criterion of durability, is obviously superfluous, and a *piece* of railway could not even determine the probable traffic of the district through which it extended. Pilgrims in India would not use a short line, nor would merchandise be committed to it, to be exposed to the risks, expense, and damage of transshipment. Such a work would be like a river shorn of its branches ; or, to use a more artificial simile, it would resemble an aqueduct, of which the fountains were dried up or diverted. It would signify but little that such a conduit existed, if the waters, instead of being led into it, were dissipated by evaporation, or passed off through their ancient channels ; and a railway, to be the aqueduct of commerce, must be formed to collect, as well as to transmit the stream—an end obviously promoted by making one half of the railway a tributary of the other. A piece of the East Indian line, extending 150 miles, or even 300 miles towards Mirzapore from Calcutta, could not attract to itself the Ganges trade, without which it could not be successful ; and the result of constructing such a segment as a beginning, would be to damn the whole of the Indian lines in the public estimation, by holding up as a specimen of their success, a result which would most probably be a failure.

An isolated
railway a
monitory
scarecrow.

In most of the other Indian lines a few miles more or less in the length is a question of no moment, and to the upper portion of the East In-

More risk
upon the
proposed
pieces of
double line
than by a
single line to
Mirzapore.

dian line the same remark might be applied, for whether the line goes on to Delhi or only to Agra, could not signify much ; but in the lower portion of the line it is an indispensable condition that the railway after leaving Calcutta should not stop until it reaches Mirzapore, as on no other condition can the Ganges trade be commanded. To stop short at Raneegunge or Shahurgatee, would be very much like the Birmingham railway stopping at Tring, and between the construction of the whole line to Mirzapore, or none of it, there appears to be no judicious alternative. There will be far more risk to the government in giving a guarantee upon the 3 millions understood to have been offered for the formation of the *pieces*, than in giving a guarantee even upon a considerably larger sum for the formation of a single line to Mirzapore, with the Patna and Benares branches ; for whatever opinion may be formed as to the prospects of the segments it cannot be doubted, that a single line of economical construction, connecting Calcutta with the great marts upon the Ganges, would return a large profit, and lay the foundation of a prosperity which might aspire higher when it had been rendered secure.

In planning railways for the service of India reference must always be had to the high value of money in that country, and a different adjustment of the law must there obtain, which regulates the investment of capital in works of art, to purchase either a great durability, or a diminution of the current expenses. We have already recommended

that the lines should at the outset be single ones, and that timber should be largely employed in the viaducts and bridges; and the principle we have just indicated shows that less fastidious gradients than those usual in this country, may be adopted. The question of gradients is merely a question of load, or of the expense of tractive power; and in consequence of the difference in the rate of interest in the two countries, an outlay on gradients that was judicious in England might in India be altogether indefensible. Fortunately, upon most of the Indian lines there are but few gradients of any difficulty to encounter, but it is most important to keep down the cost to the lowest possible point, consistent with strength and firmness of construction. Larger scantlings than are common on the English lines should be adopted, for on none other than substantial railways are high speeds attainable with safety, and no saving should be tolerated which compromised the efficiency of the line; but the whole may be saved that has been dissipated in the case of the English lines on works of ostentation, in creating a superfluous railway power by putting a double track where a single one was sufficient, and in purchasing by a large increase of the cost a slight diminution of the current expenses.

Operation of
a high rate
of interest
upon the
gradients to
be selected.

The average cost of railways in this country has been about £35,000 per mile, inclusive of carrying stock and stations. In America there are railways which have cost only £1,600 per mile, but the usual cost is from £3,000 to £4,000 per mile. The cost

Cost of
American
lines.

of the the Utica and Syracuse railway, which is a well finished line, and regularly traversed by locomotives maintaining a good speed, was £3,600 per mile; the cost of the Auburn and Rochester was £2,900 per mile; of the Richmond and Potomac, £3,600; of the South Carolina, £2,600; and of the Alabama Florida and Georgia, £3,200 per mile. Most of the American lines are formed with a single track and there has never been a case of collision, or other accident upon them—the rule of the road being that the train first reaching the station goes into a siding to allow the other to pass, and there are thus never two trains upon the same section of the line at the same time. The construction of the American lines is not sufficiently substantial for the high speeds India ought to possess, but the cost would not be doubled if they were made twice as strong: and with such prices in America, where although some of the materials are cheap, labour and iron are expensive, it is impossible to doubt, that an excellent and substantial single line could be constructed in India, inclusive of the few hundred pounds per mile required for the electrical telegraph, for £7,000 per mile; for in India the labour is cheap, the land is to be had for nothing, the timber for the trouble of felling it, and all the other articles free of duty. £7,000 per mile for the railway, and £3,000 per mile for locomotives and carrying stock, makes a total of £10,000 per mile, to which sum it appears expedient that the cost should be restricted. This would make the

capital requisite for the formation of the line from Calcutta to Mirzapore, with its branches, £5,450,000.

Mode of
bridging the
Saone.

We have already stated that the country generally between Calcutta and Mirzapore is favourable to the construction of a railway, the only exception to this remark being the bridge across the Saone, which requires to be upwards of two miles long; while the river rises in floods to a height of 30 to 40 feet, and the foundations are nothing but sand so far as has yet been discovered. There is nothing of difficulty, however, in this work, which skill and capital may not overcome; and as the chief impediment is the expense, it is proper to form some estimate of the expense, which in its turn involves the consideration of the mode of procedure to be adopted. In summer there is very little water in the river, and if a foundation cannot be found at a moderate depth, it can easily be made by driving two rows of sheet piles into the sand—extending across the river and at a distance from one another, equal to the breadth of the viaduct—and then attaching to these piles a platform which will confine the sand, as in a gigantic box, and give the necessary support to the structure to be reared upon it. Before the application of the platform the whole of the sand between the walls of sheet piling could be turned into rock by pouring upon it a ferruginous water—in the manner the plum-pudding-stone rocks are formed in the Thames, by the agglutinating action of ferruginous springs upon the banks of gravel—

Cost of timber bridge.

the small quantity of water in the river being first diverted to the one bank and then to the other, to permit this operation. The foundation being obtained the bridge becomes a mere timber viaduct, the expense of which per yard forward can easily be estimated by comparing it with similar structures.

The expense of the Yarrow Viaduct, on the North Union Railway, which consists of trussed beams with timber piers, was £23 per yard forward, the height being 73 feet. The West Brandywine and Valley Creek Viaducts in America, which are formed with timber arches resting on stone piers, are 72 feet, and 56 feet high above the water respectively; the former cost £42 per yard forward, and the latter £25. The Sherburn Viaduct, on the Newcastle and Darlington Railway which is altogether of timber cost £30 15s. per yard forward. It is from 60 to 70 feet high at the highest place, and rests upon piles driven 35 feet into the ground. The piles are of American rock elm, 12 inches square, and upon the tops of the piles, blocks of masonry, 3 feet deep and 4 feet square are placed, upon which the balks rest. These upright timbers are from 12 to 13 inches square, and there are two piles to every upright: the distance between the uprights is 20 feet in the direction of the bridge, and athwartships 7 feet at the roadway, and 11 feet at the ground—the timbers spreading laterally at the bottom for the sake of greater stability. The whole of the timber, except that used for the

piles, is of Memel. In some respects a bridge over the Saone would be more expensive than this viaduct; but looking to the cheapness of timber in India, which may be had for the use of the railway for the mere cost of cutting it, the expense per yard forward, would probably be moderate.

Probable
cost of the
Saone
bridge.

As the bridge will require to be 2 miles and 3 furlongs, or 4,180 yards in length, the cost, if taken at same rate per yard forward as that of the Yarrow Viaduct, will be £96,240. This is a less cost than that of the Congleton Viaduct, on the Manchester and Birmingham Railway, which amounted to £113,000; so that the cost of the Saone Viaduct, though large, will certainly not be unprecedented. The Yarrow, as well as the Sherburn Viaduct, is designed for a double line; and it would probably be found expedient to make the Saone bridge double also, as the unoccupied portion might be used intermediately for the accommodation of travellers by the road, a toll being of course charged upon all persons or vehicles passing over it. It might also be expedient to make provision for carrying a carriage road and foot way above the railway, so as to have the power of perpetuating the accommodation to the road, even after the second line of railway has been opened to the public. These, however, are details which we need not here consider; but it is important to understand that there is no impediment presented by the bridging of the Saone that will necessarily cause the cost of the railway to exceed £10,000 per mile, even

Methods of
preserving
timber.

though that structure were to be several times more expensive than it will probably prove.

It appears to be indispensable that the whole of the timber employed in railway works in India, whether for sleepers or viaducts, should be so prepared as to prevent decay, and to be capable of resisting the attacks of the white ants. There are several known means by which both of these ends may be attained; but it is important to ascertain how the required immunity may be reached with the least expense. Payne's and Kyan's processes for preventing rot of every kind in timber, are largely employed in this country, and are known to be effectual; and in India kyanized timber has been found to be exempt from the attacks of the white ants, if it has been thoroughly penetrated by the preservative solution. A curious illustration of the efficacy of Kyan's process is recounted in Mr. Stephenson's report. Some pieces of prepared wood, which had been received several years previously by one of the builders in Calcutta, were found, after long exposure, to be entirely eaten out in the inside by the white ants, while the exterior, so far as the preparation had penetrated, remained perfectly sound and untouched. By the use of hydraulic pressure the wood is now penetrated throughout; but the apparatus is cumbersome and costly, as it requires to be very strong to withstand the pressure.

The cost of preparing timber in this country, according to Payne's process, is 14s. per load, or up-

wards of 3*d.* per cubic foot; and although in India the cost might be less, yet it is to be apprehended that the cost of Payne's or Kyan's process would amount to a very large sum where the preparation of so large a quantity of timber was necessary. It is worthy of consideration whether Boucherie's method of preparing timber, which has been much used in France, would not be preferable for Indian purposes to any of those processes which involve the use of hydraulic pressure. By Boucherie's plan the preservative liquid is introduced into the trunk of the live tree, which, by the action of its capillary vessels, sucks the liquid up, and diffuses it throughout the entire substance of the timber. If this plan were adopted, it would only be necessary, after selecting the trees in the forest, to bore through the trunk of such as are to be cut down as near the ground as convenient, and to run a wide saw cut from the hole towards each side, leaving timber enough uncut to maintain the tree in the perpendicular position. In this cut the preservative liquid is to be kept for a few days by any suitable arrangement; but if kept too long it will penetrate to the twigs and leaves, and thereby occasion a waste of the preservative material.

Methods of
preserving
timber.

Pyrolignite of iron prevents every kind of rot, but coal tar appears to answer the same purpose; and it is both a cheaper material and one to which the white ants appear to have a great antipathy. The white ants will not touch the iron wood of Moulmien, they do little or no damage to teak, and there

Methods of
preserving
timber.

are various other woods which resist their attacks. The *Englishman*, of March 1st, 1845, says—"It is an utter mistake to suppose that timber cannot be found to resist white ants; there is abundance in this country that will, for a period as long, if not longer, than the common pine timber used in England, resist the weather of that climate." There is no doubt that the difficulty presented by the white ants has been much exaggerated; it is found that they do not attack timber over which there is any traffic, and the vibration of a railway train, it has been alleged, would deter them from committing ravages upon the timber employed in railway constructions; but nothing must be left to chance in so momentous a question, and it appears desirable that the whole of the timber should either be kyanized, or be impregnated with tar by Bouche-rie's process, both as an antidote against the white ants, and as a preservative against decay. It may, perhaps, be found expedient to construct the piers of the bridges, over the Nuddea rivers, of iron or stone, instead of timber, to obviate the attacks of worms which some rivers contain; but this course would not be necessary in the case of the Saone bridge, except, perhaps, in one or two of the central piers, as the whole of the other piers would rest on dry land, except during the winter floods.

Taking then, the cost of a single line between Calcutta and Mirzapore at £10,000 per mile as the price which must not be exceeded, and to which the plans of the engineer must conform; and sup-

posing the whole of this line, with the branches to Patna and Benares, were completed at once at a total cost of £5,450,000, the profits of the undertaking may be ascertained from the following comparison of the receipts and expenses :—

Profits on
East Indian
Line.

Line between Mirzapore and Calcutta.

<i>Receipts.</i>		<i>Expenses.</i>	
1,166,048 tons carried 448 miles at 1d. per ton per mile	£2,176,622	Locomotive power for carrying 1,166,048 tons 545 miles at $\frac{1}{4}$ th of 1d. per ton per mile	£330,987
569,684 passengers carried 448 miles at $\frac{1}{4}$ d. per mile each	531,705	Drawing 8 passenger trains per day 545 miles at 1s. per mile.	77,568
Mails, treasure, parcels, troops and military stores	Not reckoned.	Maintenance of way and stations, coaching and merchandise charges, and general charges,—say $\frac{1}{4}$ th of the receipts	386,903
		Haulage of empty waggons	9,696
		Depreciation 10 per cent. on £5,450,000	545,000
		Balance available for dividend being £24 2s. per cent.	1,358,173
	<u>£ 2,708,327</u>		<u>£ 2,708,327</u>

This shows a clear profit of 24 per cent. On the Mirzapore and Delhi section of the East Indian line, which, including the branches, is 524 miles long, and which, at £10,000 per mile, would cost £5,240,000, the return would be as follows :—

Line between Mirzapore and Delhi.

<i>Receipts.</i>		<i>Expenses.</i>				
Profits of East Indian Line.	897,190 tons carried 452 miles at 1d. per ton per mile	} £1,689,707	Locomotive power for carrying 897,190 tons 524 miles at $\frac{1}{4}$ th of a penny per ton per mile	} £224,858		
	446,851 passengers carried 452 miles at $\frac{1}{4}$ d. per mile each		} 420,783		Drawing 6 passen- ger trains 524 miles per day at 1s. per mile	} 57,378
	Mails, treasure, par- cels, troops, and mili- tary stores				} Not reckoned.	
			Haulage of empty waggons	} 9,563		
			Depreciation 10 per cent on £5,240,000		} 524,000	
			Balance applicable to dividend being £18 19s. 1d. per cent.	} 993,193		
		£ 2,110,490	£ 2,110,490			

It may be useful to contrast with these results the returns of a *piece* of the main trunk, extending from Calcutta 150 miles in the direction of Mirzapore. Taking the cost as before at £10,000 per mile, inclusive of carrying stock and stations, a capital of £1,500,000 would be necessary for a length of 150 miles; though, if made with a double track, and with stone bridges, in the manner contemplated by Mr. Simms, the cost would probably be £18,000 per mile. The returns of this experimental line would be as follows :—

Experimental line.

<i>Receipts.</i>		<i>Expenses.</i>		Result of Experi- mental Line.
106,754 tons carried 150 miles at 1d. per ton per mile	£66,721	Locomotive power for carrying 106,754 tons 150 miles at $\frac{1}{4}$ th of a penny per ton per mile	£8,340	
569,684 passengers carried 150 miles at $\frac{1}{4}$ d. per mile each	178,026	Drawing 8 passen- ger trains per day 150 miles at 1s. per mile	21,900	
		Maintenance of way and stations, coach- ing and merchandise charges, and general charges, $\frac{1}{4}$ th of receipts	34,964	
		Haulage of empty waggons	2,737	
		Depreciation 10 per cent. on £1,500,000	150,000	
		Balance applicable to dividend being £1 15s. 9d. per cent	26,806	
	<u>£ 244,747</u>		<u>£ 244,747</u>	

Thus it appears that the returns upon the experimental line, computed *on the same data*, which exhibit a profit of 24 per cent. upon the line connecting Calcutta with Mirzapore, show only a profit of £1 15s. 9d. per cent. upon the capital invested, supposing the line to be a single one; while, if made with a double track, so as to cost £18,000 per mile, there would not only be no profit, but a *loss* of £98,194 per annum, or about $3\frac{1}{2}$ per cent. This, of course, is only an extreme case; and supposing the railway to be confined to this piece of a line, without any intention to extend it. The objection is in a great measure removed, if

Losses of
experimen-
tal line.

it is regarded as only the first portion of the longer line which is to be afterwards constructed ; and this is the light in which it is most probably regarded by the railway company. The question, however, is not before us for immediate decision, as the government of India will no doubt weigh the relative advantages before finally determining this point. As regards the traffic, though we have reckoned the same number of passengers to travel by the experimental line as by the through line, it is very questionable whether this anticipation would be verified by the result. Pilgrims passing to Benares would rather provide themselves with suitable conveyances at Calcutta than be carried by the railway a third of the distance, to be set down in a region where conveyances could not be got ; and many of them would no doubt still continue to journey by the road and the Ganges. The conveyance of such merchandise alone could be reckoned upon by the experimental line as now proceeds by the road and Damooda, and the quantity thus transported is insufficient to warrant the construction of a double-track railway for its special accommodation.

It may be satisfactory to compare the prospects of the East Indian line with the original estimates of profit, and the actual results upon some of the English lines which it the most nearly resembles. On the Liverpool and Manchester Railway the original estimate of passenger traffic was £666 per mile per annum ; on the Calcutta and Mirzapore line the passenger traffic, which forms but a small proportion of the receipts, amounts to £975 per

mile per annum. On the Liverpool and Manchester line the passenger traffic at the end of four years, was found to be nearly four times greater than the estimate ; on the Calcutta and Mirzapore line, though a similar increase is probable, no addition to the present traffic is reckoned upon. In the prospectus of the Grand Junction Railway the total annual receipts for passengers and goods is estimated at £1,480 per mile per annum. On the Calcutta and Mirzapore line the annual receipts from passengers and goods is estimated at £4,969 per mile per annum. On the London and Birmingham Railway, the number of passengers during the first year was 608,564, carried on the average 65 miles, equal to 353,184 passengers carried the whole length of the line. The quantity of goods carried was about 65,000 tons, and these were the quantities *after* the increase due to the formation of the railway. On the Calcutta and Mirzapore line, *before* the realization of any such increase, the passenger traffic is found to be 569,684 passengers per annum, and 1,166,000 tons of goods ; being about twice the number of passengers, and 18 times the quantity of goods. On the London and Birmingham Railway, the passenger traffic increased 110 per cent. in 5 years, and the goods traffic 85 per cent. The cost of the London and Birmingham Railway was upwards of £50,000 per mile ; the cost of the Calcutta and Mirzapore railway will be £10,000 per mile. Single lines of railway have been constructed in this country for less than £10,000 per mile. The cost of the Aylesbury railway was £7,000 per mile,

Comparison
of the East
Indian with
London and
Birmingham
line.

Cost of Eng-
lish single
lines.

including carrying stock, and the purchase of land. This was also the estimated cost per mile of the Yarmouth and Norwich line, as computed by the Company's engineer ; the actual cost, inclusive of the electric telegraph, has been about £8,000 per mile, though between a fourth and a fifth of the capital was expended in law charges, and compensation for land.

Such, then, are the prospects of the East Indian Railway ; and if the course recommended be followed of making a continuous single line, with as much double line at the termini as the restricted expenditure will permit, it certainly promises to be the most profitable railway project ever undertaken. Nor can there be any doubt as to the extent of the traffic, which has been derived from official documents, cited in Mr. Stephenson's Reports, and which leave nothing to conjecture. There cannot be a doubt, that the traffic of the Ganges is a million tons a year, and it is equally certain that the charges at which the revenue of the railway is computed, are less than those incidental to any of the existing modes of transport. Whether a railway which carries more cheaply than a barge or a wagon, as well as more expeditiously, will obtain a preference in the market it is superfluous to enquire, for those who dissent from this conclusion are beyond the reach of argument ; and that it will obtain a preference, is indeed the initial postulate on which our whole investigation proceeds : but those who admit that in locomotion as in other things, the best and cheapest article will be the

one selected, will find themselves constrained to acquiesce in the whole of the subsequent deductions. A section of the line formed after a careful survey, shows that, for three-fourths of the distance between Calcutta and Delhi, the ground is almost level, rising only 1 in 1,500; and the worst gradient which extends but for a very short distance, is 1 in 61. There are only two short tunnels on the whole length of the line, and scarce any heavy earth works, so that, as Mr. Simms remarks, the chief expense as regards engineering structures will be the bridges, the cost of which, per yard forward has been already considered. There are only three bridges—those over the Hoogly, the Saone, and the Jumna, likely to be formidable from their expense; the worst, which is that over the Saone, we have already reckoned as likely to cost £100,000; but, taking the cost of each of the three at double that amount, there is still nothing in such an expenditure sufficient to prevent the line from being made with a single track for £10,000 per mile, and which sum it must not be left optional with the engineer to exceed. The extent and cost of the present traffic, being established facts which cannot be controverted, and this traffic being secured to the railway, by a diminution in the charges, a revenue will result of which the amount may be ascertained by the simplest arithmetical operations, and which, with the same cost and the same current expenditure, will be found to accord with the estimate of profits we have given.

Cost and profits of East Indian line.

CHAPTER IV.

GENERAL REFLECTIONS RESPECTING INDIAN LINES.

Great Indian
Peninsula
and Madras
Railways.

THE only railways in the Bombay and Madras presidencies which appear likely to be carried into practical operation, are the lines projected by the Great Indian Peninsula Railway Company, and the Madras Railway Company; both of which are undertakings of promise, and are promoted by men of known means and commercial standing, whose names give confidence to the public. The Great Indian Peninsula Company proposes to run a line from Bombay across the peninsula of India to Coringa, at the mouth of the Godavery, sending out occasional branches, of which no very distinct scheme appears yet to have been formed; but in the first instance the line is only to be carried from Bombay to Alleh, 109 miles distant, with branches or extensions to the Pera river, 31 miles, and to Mhuse, 36 miles, making 176 as the total length of railway at first to be undertaken. Mr. Chapman, the managing director of the Great Indian Peninsula Company, who has investigated the probable

profits of the line with great patience and ability, reckons that he will be able to form a double line of railway for £10,000 a mile; and that the existing traffic, if secured to the railway by moderate charges, will pay a dividend of 11 per cent.: but it does not appear at all probable that a double line could be formed across the Ghauts, inclusive of carrying stock and stations, for £10,000 per mile, though a single line might perhaps be made for that amount.

Cost of Indian Peninsula underrated if double.

The Madras Railway is intended to be a single line, and will extend in the first instance from Madras to Wallajahnuggur, a distance of 70 miles; but should the result be such as to encourage the further prosecution of the enterprise, it will be carried on to Arcot, Vellore, and Bangalore, and eventually, perhaps, to Seringapatam and Calicut. The facilities of construction consequent on the level nature of the country through which the line passes, are such as to make it probable that it can be made at a cost of about £7,000 per mile, inclusive of carrying stock and stations. Mr. Simms says that he considers the annual expense of working the line, and maintaining both it and the plant in perfect repair, will not be less than 20,000*l.*; and with 30,000 tons of goods at 2*d.* per ton per mile, and 150,000 passengers at $\frac{1}{2}$ *d.* per mile each annually carried along the line, he estimates the receipts at 50,312*l.*, leaving 30,312 divisible as profits, or 6 per cent. on the capital. It does not

Direction of
Madras and
Indian Pe-
ninsular lines.

appear probable, however, that more than $\frac{1}{2}d.$ per mile each could be got for the passengers, but $2\frac{1}{2}d.$ per ton per mile could be got for the goods.

The line leading from Bombay to Alleh, passes over the Malsej Ghaut at Koobee, about 86 miles from Bombay, by means of an inclined plane 6 miles long, and rising on the average 1 in 18, but in some places 1 in 15. This plane is to be worked by means of three pair of engines giving motion to endless ropes. Near the Ghauts the earthworks are heavy, and there are a great number of tunnels; the collective length of the tunnels upon and above the Ghauts is 3780 yards, and below them 6,000 yards, making a total length of 6 miles of tunnels through rock. It does not appear probable that the line from Bombay to Alleh can be constructed at as small a cost per mile as the line connecting Calcutta with Mirzapore; but the cost of the carrying stock will be less, as there will be a smaller traffic upon it, and the extensions also will be less costly than the main trunk: so that it is not improbable that a single line 179 miles long if the tunnels be kept single also—as upon the South-Western line, where it pierces the Dover cliffs—could be formed at a cost of £1,863,053, which is the cost as estimated by Mr. Chapman, of the portion of the Indian Peninsula line at present proposed to be undertaken. The following is Mr. Chapman's estimate of the receipts and expenditure:—

Great Indian Peninsula Railway.

<i>Receipts.</i>		<i>Expenses.</i>		Estimate of profits of Indian Peninsula.
180,000 tons carried between Bombay and Alleh, 109 miles, at 2½ <i>d.</i> per ton per mile	£224,812	Annual cost of working the line from Bombay to Alleh, with 180,000 tons of goods	£74,021	
90,000 tons carried between Alleh and the Pera river, 31 miles, at 2½ <i>d.</i> per ton per mile	31,969	Annual cost of working the line from Alleh to the Pera river, and from Alleh to Mhuse	22,357	
90,000 tons carried between Alleh and Mhuse (12 miles from Seroor) 36 miles, at 2½ <i>d.</i> per ton per mile	37,125	Balance applicable to dividend, being £11 0 <i>s.</i> 11 <i>d.</i> per cent. on £1,863,053, the cost of construction	205,778	
Additional revenue for 120,000 tons carried up the Malsej Ghaut, double mileage, being 2½ <i>d.</i> per ton per mile for 6 miles	8,250			
£ 302,156		£ 302,156		

This estimate though deficient in data showing how the working expenses have been derived, appears to be tolerably near the truth; and if there are errors in it, they must about balance one another, as the result nearly accords with that arrived at by other methods of determination. The amount of traffic at present subsisting in the districts traversed by the railway, has been investigated by Mr. Chapman with great care and industry, and the quantities at which he arrives are probably nearly correct, though the method he pursues in fixing the traffic in salt, by taking the average population

Indian Peninsula
should be a
single line.

and the average consumption of each individual is liable to material error in a country like India, where the people are too poor to be able to afford a consumption of 16 lbs. of salt each per annum ; salt in India being a costly article on account of the high duty imposed upon it. There can be no doubt, however, from the facts Mr. Chapman adduces, that the traffic he anticipates will be fully realized, and the only risk is that the cost of the line may exceed the estimate, which will certainly be the case if £10,000 per mile is set down as sufficient for the construction of a double line, and which should not therefore be attempted.

On both the Bombay and Madras Railways the amount of traffic is very much smaller than on the East Indian line, but a higher price is obtainable for transport on account of the absence of river competition, so that a smaller traffic will enable them to pay ; and as with *the present traffic* they are capable of returning a profit considerably exceeding the guarantee, it appears expedient that the guarantee should be extended to them. The effect of the formation of a good road in India has invariably been to increase the traffic ; and in countries in which good roads already exist the formation of a railway has the same operation. By the improvement of the Allahabad and Cawnpore road the traffic *quintupled* itself in seven years ; and by the improvement of the road leading from Kamptee to Bellary, the exports from Kamptee so increased that the customs rose from

£4,622 to £18,015 in three years. The immediate effect of opening the Liverpool and Manchester Railway was to increase the number of passengers three-fold; and the invariable effect of the formation of a railway has been greatly to increase the traffic. If then this be the effect of the facilities successively afforded by roads and railways, what increase may not be expected where these successive steps are taken simultaneously? The facility of locomotion attained by other countries in successive stages, appears likely to be realized by India by a single giant stride; and the grandeur of the results must be correspondent with the vastness of the innovation. In dealing with the question of profits however, it is necessary to put a rein upon the imagination, and to cast out every element of a hypothetical nature, for it is facts and not hopes which justify the investment of capital; but the safety of the investment once demonstrated the contemplation of additional benefits becomes permissible. A railway is sure to be a sound undertaking which is profitable, without the increase of traffic it will certainly create, and which rests its pretensions rather upon established facts than upon vague and brilliant anticipations.

Ratio of increase of traffic on Indian lines.

In giving a guarantee then of $3\frac{1}{2}$ or 4 per cent. upon the $5\frac{1}{2}$ millions required for the formation of the line between Calcutta and Mirzapore, upon the 1 million requisite for opening the line connecting Bombay with Alleh, and upon the $\frac{1}{2}$ million re-

A guarantee
on 7 millions
for lines in
the three
presidencies
to be recom-
mended.

quired for the formation of the line between Madras and Wallajahnuggur, the government appears to subject itself to no risk which might not be insured at a moderate premium, and its concession of a guarantee would at once enable the lines in the three Presidencies to proceed. The total sum on which the guarantee is necessary is seven millions; which at 4 per cent. amounts to £280,000 per annum, as the sum the government would have to pay if the railways produced nothing: and such are the benefits the government would derive from the introduction of railways, that they would be cheaply purchased even at that amount. But if single lines be adopted, the risk to the government will become so trifling that it may be insured for a very small amount—perhaps 1 or 2 per cent.; but at 5 per cent. the maximum expense to the government arising out of the guarantee is only £14,000 per annum. The objection is an obvious one, that if the risk to the government be small, it will be equally so to individuals, and that therefore a guarantee is superfluous; but although this argument is conclusive in the case of English projects, it is by no means so in the case of undertakings projected in a country so far away as India, and so full of mystery to the bulk of the English people.

The claim for a guarantee upon Indian railways does not rest on the same basis as that upon Irish railways which was recently disallowed; for in India the government is the first recipient of the

benefits the railways will confer—the inevitable operation of the railways being to increase the public revenue to an extent greatly exceeding any possible expenditure under the guarantee, provided the railways be made in the manner recommended, and be opened at the first as single lines. The risk involved by the guarantee upon 3 millions expended upon the formation of pieces of double line could not be insured for the same sum, as the risk upon the 7 millions expended upon single lines in the three presidencies as already suggested; neither would the benefits to the public or the government be so extended or decisive; and it appears to be injudicious therefore to limit the guarantee to the smaller sum, when there is in reality less risk attaching to the larger. The proposed limitation, moreover, would probably have the effect of breaking up the Bombay and Madras Companies, which would occasion much dissatisfaction in those Presidencies, and would indeed be a great public misfortune; for each of those companies, if kept in existence by a small concession, would become the nucleus of more extended undertakings, and would in time be able to accomplish the formation of lines overrunning the whole peninsula of India without further government assistance. If this be so, the government will certainly incur a grave responsibility if, to evade a nominal risk, they shut out India from the benefits of railway communication; and that by granting a guarantee upon 7 millions, the railway

More gain to the government by the railways than it can lose by the guarantee.

Method of
completing
subsequent
lines without
a guarantee.

companies would be enabled to complete their grandest designs, will appear from the following considerations :—

The capital required to carry the railway from Calcutta to Mirzapore is $5\frac{1}{2}$ millions ; and that sum, under the government guarantee, could easily be collected. About 2 millions more could be raised by way of debenture, which would carry the line at least as far as Cawnpore ; and this is the utmost that could be undertaken until the railway was opened to the public. So soon as the railway was opened, however, and its traffic ascertained, the company should be authorised to issue railway notes or tokens to an extent proportionate to the traffic, which notes would be receivable in payment of railway transport, in the same manner as the penny stamps in this country are received in payment of postage. The depreciation of the railway notes would thus be as effectually prevented as if they were exchangeable for gold, provided the issue be kept proportionate to the traffic ; and reference must always be had in regulating the issue (which is to be done under government direction), to the amount of the government guarantee, and the interest upon the debentures, which must be returned by the railway in money. By the application of these railway notes to the accomplishment of railway extensions, the East Indian line would probably in a few years be carried on to Lahore : the Great Indian Peninsula would be carried on to Coringa, from whence arms would

extend to Madras and Calcutta, and the Madras railway would send its branches over the whole southern portion of the Indian Peninsula. These grand results are all accomplishable by a risk to the government, amounting to fourteen thousand a year ; and should the government remain recusant, in spite of the smallness of their adventure, it would be better that the promoters of the several railway companies should unite to insure the guarantee for a fixed sum, than that their respective projects should remain unaccomplished.

Companies
might unite
to insure the
government
risk.

The whole of the Indian lines will of course be of a uniform guage, and it appears very important that the branches and extensions of each line should as far as possible be in the hands of the original company. No doubt in time there will be points at which branches of different lines will meet one another ; but the complications arising out of the tenure by different companies of different parts of the same line, are as much as possible to be avoided. In conformity with this principle, it appears to be expedient, that the line extending from Mirzapore down the valley of the Nerbudda to Bombay, should be undertaken by the East Indian railway company, that the extensions of the Indian Peninsula line to Madras and by Coringa to Calcutta should be accomplished by the Peninsula company, and that the Madras Company should execute any lines undertaken to the southward of Madras. The fields to be occupied by the respective companies should be defined at the outset, so

Districts
should be
allotted to
each com-
pany.

as to obviate subsequent conflicts by which the interests of the public might be endangered ; and the only intelligible principle on which the adjudication can proceed, is that of giving to each company the precedence in working out all the developments of its own line. Of course, if these developments are not carried into effect within a reasonable time by the original company, they should be handed over to any other party willing to undertake them ; but it is better for the public interests that the management of every part of a line, and of the whole of its branches, should be vested in the same hands.

Upon the duration of the guarantee and the tenure by which the railways are to be held many opposite opinions have been propounded ; but perhaps it is on the whole the most equitable arrangement, that the government should have the power of assuming possession of such railways as have a guarantee in 25 years from the time they are opened, upon repayment of the original capital ; and further, that it should have the power of buying up such railways as are not guaranteed, at 25 years' purchase, but not before 5 years after they are opened. Lord Dalhousie, who investigated with much care, the conditions upon which English railways might be purchased with equity by the government, came to the conclusion that 25 years' purchase would be a fair award ; and to these views the railway act appears to conform, but it is only in guaranteed lines that it would be equitable. If these views should appear to be applicable to the

Indian railways, and if such terms could be obtained from the Indian Railway Companies—it being considered sufficient for the guarantee to last as long as the lease—the grant of the guarantee would be the means of saving to the government the difference between the first cost and the market value of those lines over which it extended, when they came to be purchased. Mr. Simms proposes that the period of the lease should remain undetermined for some years, so that its duration may be made inversely proportional to the traffic ; but such transcendental modes of determination though they might answer in dealing with an individual, would not be satisfactory to a public company, where it is necessary to be able to lay before the shareholders information of a more tangible and definite nature, than can be extracted from the vagaries of a sliding scale. It is clear, moreover, that the proposed arrangement offers a premium upon mismanagement and speculation ; for if by good management and economy the profits are increased, the period of the lease will be diminished in the same proportion ; and it is only necessary to mismanage the railways sufficiently, to earn a claim to a lease for ever.

Duration of
the guarantee
and of the
lease.

Before sanctioning the investment of 7 millions in Indian railways, it is right that the government should estimate the probable effect of the measure upon the financial operations of this country. It may indeed be expected, that most of the money invested in railway works in India will

Method of
obviating
inconve-
nience from
an abstrac-
tion of bul-
lion.

eventually find its way back to this country for the purchase of manufactures ; but it is not so obvious that any sudden abstraction of a large sum of money would not, in the present prostrate condition of the money market, give rise to serious embarrassment. Fortunately, however, the peculiar conditions involved in the formation of Indian lines are such, that the exportation of any large quantity of bullion may be dispensed with. As far as regards the iron and the engines, it is clear that no export of bullion is involved in the purchase of them : and the only other large expenditure against which it is necessary to provide, is the labour of the natives employed in the formation of the railways. Now it appears very clear from the peculiar habits of the Indian people, that the whole of these native labourers must be supplied with food and clothing by the railway companies. The natives of the country villages would not sell their corn on any terms, as they would thereby be reduced to starvation themselves ; for such are the difficulties of transport in India from the badness of the roads, the heat of the climate, the absence of bridges over the rivers, and other impediments, that there may be, and often has been, a famine in one part of the country—when mothers even for a mouthful of food, have been driven to sell their children—and unbounded plenty not many miles distant. It will be necessary, therefore, for the railway companies to collect grain and other articles of consumption in

depôts along the line of country the railways traverse; and it does not appear impossible so to arrange that this grain shall for the most part be paid for in manufactures. If then this be done, and the labourers are paid in part upon the truck system—under such precautions, however, as would prevent it from becoming a grievance—it does not appear probable that any considerable export of bullion from this country would be necessary. The railway labourers would be paid partly in food and partly in clothing—the former having been previously purchased with British manufactures, and the operation of the measure would be to retrieve to some extent the disasters now coming upon the manufacturing districts in consequence of the late deficient harvests. The necessity for providing manufactures, moreover, would facilitate the collection of the capital; for subscriptions in merchandize might be got where it would be impossible to get subscriptions in money; and it would signify nothing in what species of coin the instalments were paid, provided they were all equally effectual in accomplishing the formation of the railways. The Indian railway companies indeed would become large consumers of British manufactures at a time the markets are failing in other quarters; and by the time the consumption ceased from the completion of the railways, new fields would have been opened up, by the accessibility of which a still larger consumption would be occasioned.

Necessity of
the Truck
system on
Indian lines.

Opinions of
the Indian
government
on Indian
railways.

Since the foregoing pages were written the reports received from Calcutta by the India House, relative to Indian railways have been published. Sir J. H. Maddock and Messrs. Millett and Cameron, the members of the legislative department of the Indian government, all concur in the opinion that railways ought to be encouraged; but they consider that this encouragement may be more conveniently given by the concession of the land to the railway companies free of cost, than by a guarantee, which they consider open to objection. The governor-general however, thinks that the encouragement should not be restricted to the gift of land—which may cost perhaps £200 per mile, while the railway may cost £14,000 per mile; he calculates that the saving in the expense of the army, consequent on the formation of the line which connects Calcutta with Delhi, will be £50,000 a year on the lowest scale, and he recommends this sum to be annually given in encouragement of the railway. The members of the legislative department object to a guarantee, on the ground that a bad railway does not deserve a guarantee, and a good railway does not need one: but both of these assumptions are true only under certain limitations and become wholly untenable when extended to the case of Indian lines. The governor-general shows that whether the East Indian line is profitable or not to the projectors, it will save in the military establishments alone an expense of £50,000 a year to the government, and although the developments into which

we have entered, prove that the East Indian line must be a profitable one if judiciously carried into execution ; yet the *theory* that it will in consequence finds abundant support cannot weigh against the *fact* that it is only by the concession of a guarantee that the capital is to be collected. Dividend is not the only element necessary to attract capital ; there must also be confidence, and confidence in Indian projects is likely to spring up in the minds only of that small circle conversant with Indian affairs. As a sailor does not invest his capital in mines, nor a miner in ships, merely because each has confidence only in the things he understands, so the middle classes in this country who are the chief holders of railway property may be expected to exhibit a corresponding repugnance to Indian projects, as for the most part they know as much of India as of paradise. A government guarantee, however, is a thing all can understand, and such an assurance in the present case, is necessary not to obviate risk—for doubtful projects need not be encouraged—but to satisfy persons who from deficient information are unable to form an opinion for themselves upon Indian projects. The members of the legislative department repudiate Mr. Simms' doctrine that the railways should be given up free to the government after a period of years ; but they think that in 25 years they should have the option of purchasing the railways. To this there can be no objection provided the purchase money is ascertained by a reference to the profits during the three last years,

Fallacies of the doctrine that no promising enterprise can require a guarantee.

Duration of
the lease and
terms of pur-
chase.

as prescribed by the statute 7 and 8 Vic. c. 85 ; but there can be no option given of purchasing the railway in 25 years by the redemption of the original capital, unless the offer be accepted now, and the purchase at the end of that time be made not optional but imperative. There is no fairness in the demand that a company shall make a railway to the end that if profitable the government may purchase it at cost price in 25 years, and if unprofitable, reject it : if the railway company has to sustain the risk, the line if purchased at all must be purchased at the value and not at the cost, and must be paid for, not in stock as the legislative department suggests, but in money. With the means of purchase possessed by the government the railway company has no concern, and it is rather a novel doctrine that the price of an article must conform to the necessities of the purchaser.

The legislative department does not think it possible that any agreement can be made for the conveyance of mails, troops and government stores until the railways are completed ; but expresses a hope that railway companies may not be therefore discouraged from proceeding with their works, as the government will be disposed to act liberally, having an interest at stake ; but it is for the security of the *government* and not for the satisfaction of companies, that the terms should be defined at the outset upon which the government service shall be performed, as without some such compact the government will be left quite too much in the power

of the companies. When the railways are made the government *must* use them, however exorbitant the charges may be, and the government would certainly be in a safer position if it were to stipulate now that soldiers shall be carried at the lowest passenger fares, letters at the highest rate for goods, and government stores at the lowest rate for goods, than if it left all these questions undetermined. By devoting an annual grant of money to the encouragement of Indian railways, as recommended by the governor-general, which may be most beneficially expended in the insurance of the guarantee, there is every probability that the whole of the undertakings deserving of encouragement, would immediately proceed, whereas, without such a concession the benefits certain to result from the measure must be indefinitely protracted, and a deep discontent will be created by its miscarriage which it will be found difficult to allay.

Necessary to the safety of the government that terms for conveying mails and troops should be defined.

APPENDIX.

INDIAN RAILWAYS.

(From the Artizan.)

THE momentous subject of Indian Railways is at present attracting much attention both in India and in this country; and public expectation is raised to a high pitch by the anticipated introduction of this new system of locomotion into so magnificent a field. Of all countries in the world, India is probably the one in which the railway system may be expected to work out the grandest results; for in none are the existing means of internal communication more defective, and in none is there such an accumulation of the *materials* of wealth, which need only the addition of facility of transport to bring them into profitable combination. With a density of population in the lower provinces exceeding that of any country in Europe, profound tranquillity, an industrious people, and a soil which yields in rich abundance all the precious productions of a tropical sun, there co-exists such a difficulty of locomotion as to turn these high gifts into barrenness, and to reduce commerce to the lowest ebb. The cotton of Nagpoor and Amrowty which is brought for sale to Mirzapore, a distance of 500 miles, is transported the greater part of the distance upon oxen, which carry 160 lbs. each, and travel, on the average, 7 miles a day. The cost of conveying 160 lbs. 100 miles in this manner is about 5s., and should rain occur during the interval, the cotton is saturated with wet, and becomes too heavy for the oxen to carry; the men and cattle sink in the soft earth of the unmetalled tracks which

stand in the place of roads, and both merchant and carrier are ruined. The general character of the roads throughout the country is of this impracticable description ; and products yielded by the soil in rich luxuriance, and for which, if facility of transport existed, a profitable market could readily be found, are suffered to go to waste and to lie neglected.

The same impediments, too, which prevent the products of central India from reaching our shores, prevent our productions from being carried thither ; and the formation of Indian railways must, as a collateral benefit, add largely to the consumption of British manufactures, by opening up districts that are at present inaccessible to them. But these views are poor and feeble. If it be a benefit to give a security to our Indian empire, such as it could never otherwise acquire — endowing it, as in the living anatomy, with electric nerves, to telegraph every throb throughout the system to the governing head, and enabling military force to be concentrated upon any point with inconceivable rapidity and effect—if it be a beneficent thing to awaken to a new existence 150,000,000 people on whom the sleep of ages has fallen, by overturning their conceptions of time and space, unfettering their energies, and rousing them to exertion by new incentives—if it be a benefit to draw European settlers into India, who will expend capital on land the railways will make productive, thus furnishing an example to the native population, and leading onward to that course of subsidiary improvement which facility of intercourse will create—then are Indian railways a benefit, and every moment they remain unestablished occasions a loss of wealth and happiness, of which it would be hard to exaggerate the amount.

As a commercial enterprise, the more important of the Indian railways present attractions such as are rarely surpassed in such undertakings, and which we propose to

examine in some detail; but even on the supposition that the railways did not return their expenses, and that the deficiency had to be made up by the Indian government, their formation would nevertheless be expedient, as a greater gain would be realised by such diminutions of the army as the railways would render possible, the superior health of the European troops—which is immediately referrible to a money standard—and the greater ability on the part of the people to bear taxation, than would suffice to balance any loss the working of a railway could occasion. Fortunately there is little need of dealing with any such hypothetical case, as there is very little doubt that whatever railways in India are likely to be made, will return a large profit. But if it would have been a benefit to work Indian railways even at a loss, what must the benefit be when they enrich all concerned?

There are three lines of railway at present projected in India which divide the suffrages of the public. The first runs from Calcutta in the general direction of the Ganges, through Mirzapore and Allahabad, on to Delhi, and it is intended eventually to continue this line to Ferozepore upon the Sutlej, the scene of the late conflicts with the Sikhs: the second extends from Calcutta to a town on the Ganges, 180 miles distant, called Rajmahal: and the third runs from Bombay to Alleh, with extensions to Mhuse and the Pera river, and branches to Sholapoor, Hyderabad, and Indore. The last two are chiefly to be regarded as commercial projects, but the first, in addition to its commercial merits, puts forth the claim of being a great political engine, by which the north-west frontier, which is the most vulnerable part of India, may be secured against future irruptions. Had this railway been constructed at the time of the late wars with the Sikhs, a prodigious waste of life and money would have been averted. Troops that were three months in reaching their destination, and which arrived at the end

of that time worn with sickness and fatigue, could have been transported through the same distance, if a railway had been available, in three days, and with unimpaired health and vigour. The resources of Fort William, moreover, which is the chief magazine in India for military stores, as well as the resources of Allahabad, Cawnpore, Agra and Delhi, would all have been made available for the immediate uses of the army; and a force could have been thrown at any moment on any point of the frontier, in such strength as to overwhelm the enemy and disconcert all his operations. And not only is railway transport the most rapid and effectual for such a purpose, but it is by far the cheapest, even if we do not reckon the saving of time or health it achieves; the cost of transporting troops by railway being actually less than when they are suffered to proceed on foot. Nor is there any danger of this powerful adjunct of military operations, being wrested from us and turned against ourselves, for railways are altogether instruments of defence, and, even though taken possession of by an enemy, they could render him but little assistance. In all probability he would be without carriages or locomotives, and even if he possessed those essentials, the removal of a few rails from the line at intervals, or the demolition of a few of the viaducts, would render the railways useless to an invader. The services rendered by a railway in enabling a small standing army to quell wide-spread insurrection were experienced in this country in 1842, and in India these benefits would be still more extended and conspicuous. They give ubiquity to the ruling power, and concentrate the strength of the empire into a focus—thus turning doubt into security, and making small means great.

The political fruits of the line leading from Calcutta to the north-west frontier are of so important a nature that the Indian government may naturally be supposed to be

impatient for its formation. Its commercial prospects, however, are equally alluring, and it may be doubted whether they do not transcend those of any other railway in any other country. Mirzapore, one of the points through which this line passes, is the great mart for the productions of Central India, while the value of the exports and imports of Calcutta is about £16,000,000 a year, of which, probably, the greater part passes in the direction the proposed railway will follow. Above Mirzapore again, on the road between Allahabad and Cawnpore, an immense traffic exists, the amount of which is given in Mr. Macdonald Stephenson's Report upon Indian railways, from which we gave some citations in a former number; and on the road leading to Burdwan, which is about 80 miles from Calcutta by the track the railway would follow, there is a very great trade in salt, coal which is mined there, goor, and other articles of large consumption. Mirzapore is about 448 miles from Calcutta, and the journey thither and back by Dawk occupies at the least 10 days, and involves an expense of £60. By the steam vessels on the Ganges, which proceed from Calcutta to Mirzapore, the expense is not less, and the time occupied is four times greater, while the length of the journey by railway would not exceed 15 or 16 hours. Goods are transported by land from Mirzapore to Calcutta only with great difficulty and at immense expense: much merchandise is lost or damaged in crossing the rivers, especially the Saone, a large river which runs into the Ganges, and which presents many engineering difficulties to the construction of a bridge. The rate of freight charged by the steamers on the Ganges between Mirzapore and Calcutta is about £2 10s. per ton; the speed does not exceed 50 miles a day; and, as the vessels have to stop by night, the voyage is very tedious. The ledges and shallows in the Ganges above Allahabad prevent the steamers from proceeding farther up than that place, and the sharp rocks in the bed

of the Jumna present a barrier in that river equally insurmountable. The navigation of the lower part of the Ganges, again, is beset with serious difficulties. The head of the delta is situated at Rajmahal, about 180 miles north of Calcutta, and at this point the Bhaugirruttee and Jellinghi branches break off from the main stream, and uniting their waters at Nuddeya constitute the Hooghly, which flows past Calcutta into the Bay of Bengal. The navigation of these offshoot streams is always difficult, and during a considerable part of the year impossible; and the steamers are compelled to make a circuit through the perilous labyrinths of the Sunderbunds, and to pass through a distance of 528 miles to reach a place only 180 miles distant. These impediments to the navigation of the Ganges constitute a limit to the competition that river can offer to a railway, as well as a reason for the formation of one, and although the navigation of the Ganges could no doubt be improved, yet the amelioration would involve a large expenditure, and it does not appear probable, from the examinations which have been made, that the improvement could be extended to the Bhaugirruttee channel, which, even if deepened and opened up, would, it is said, soon become choked again with alluvial deposit, though this doctrine we think requires confirmation. But there is no measure of improvement the navigation of the Ganges could receive, that is capable of realizing for the country the political and social benefits the institution of the proposed railway would confer; and the necessity for its formation, therefore, any such improvements, even if accomplished, could not supersede.

We have already mentioned that one of the Indian railway projects is the formation of a line between Rajmahal and Calcutta; and in Calcutta this line is, we believe, popular, especially among the persons interested in the success of the steamers on the Ganges. The author of a small work upon Indian railways, who writes under

the patronymic of "An Old Indian Postmaster," displays much zeal in the advocacy of this project, on the ground that the navigable part of the Ganges affords sufficient locomotive facilities to the regions through which it passes, and that it is more judicious by tacking railways to the end of this navigable portion extending from Rajmahal to Allahabad to supplement the defects of the Ganges, than to construct a railway with which the Ganges must compete. It reveals, however, we fear, a rather Indian conception of what constitutes sufficient locomotive facilities for a great country, when those facilities are supposed to be afforded by a speed of 50 miles a day, or about 2 miles an hour; and we hardly think the achievement of such a result will, in the estimation of unbiassed persons, be regarded as superseding the necessity for Indian railways, or that railways need apprehend the consequences of such a competition. No doubt the Ganges, even if a railway is opened from Calcutta to Delhi, will still be used for the purposes of internal transport; many heavy articles for which speed is no great consideration, instead of being carried by the railway, will be carried by the river. But it appears very doubtful to us whether those articles, or, indeed, any of the articles then transported by the river, would be unladen at Rajmahal, even if a railway were conducted thither; and we humbly conceive that, so far as the Ganges trade is concerned, it would be much more benefitted by the formation of the Rajmahal canal, projected by Col. Forbes, on such a scale of magnitude as to enable the vessels navigating the Ganges to pass through it without the necessity of transshipment, than by any railway that could here be made. A railway from Rajmahal can never become a substitute for a railway to the north-west frontier, and we have yet to learn what effect the formation of the latter line will produce upon the trade of the Ganges, as it bears upon a railway to Rajmahal. Will

not the railway to Delhi and the north-west frontier, or, as we believe it is called, the East Indian Railway, take from the vessels on the Ganges the great bulk of the passengers, and the finest articles of merchandise, for which alone speed is of importance? And if nothing is left for the Ganges trade but coarse and heavy cargo which does not require speed—is it likely that such cargo would be unloaded at Rajmahal, subject to all the expense and risk by transshipment and loss by speculation, to be conveyed from thence to Calcutta by railway?

The distance of Mirzapore from Calcutta we have already stated as 448 miles. Delhi is 452 miles from Mirzapore, and the north-west frontier is about 260 miles from Delhi. Taking the distance of Rajmahal from Calcutta at 180 miles, though 200 miles would probably be a nearer approximation, it appears that by adopting the route by Rajmahal to the north-west provinces, and taking the Ganges between Rajmahal and Allahabad, as the Old Indian postmaster suggests, as part of the connecting chain we save only about one-third of the length of railway in proceeding to the north-west frontier, while for the sake of saving this third we increase the distance and extend the time so much, that a good mail coach running on a turnpike road, would be more expeditious than such a hybrid system of communication. It is clear, therefore, that even if the commercial aspect of the question be alone regarded, it is impossible that the Indian government can adopt the 'Old Indian Postmaster's' suggestion of making the Rajmahal the initiatory line. It is very doubtful whether the formation of that line at all is expedient, and what magic is there in the Rajmahal line to compensate the government for the loss of all those political benefits the postponement of the East Indian line would occasion? How could an army be precipitated upon the frontier with a rapidity to confound all machinations, if the patchwork

line of the 'Old Indian Postmaster,' with all its drags and complications were to be the only dependence? If an army were to be brought to Rajmahal, how could it be sent forward? It is clear the steamers on the Ganges could not convey such a multitude, and what would be the time occupied if they were carried only in successive voyages? It is question whether, with *such* means of acceleration, time would not be saved by marching by the road, and the result would be, if the 'Old Indian Postmaster's' plan were adopted, that after the loss of much valuable time in a vain experiment, the benefits due to railways would remain unrealised until a continuous line was constructed—which moreover might render valueless the line first made. The establishment of the electric telegraph, which we understand the East Indian railway company proposes to carry to the frontier, appears to be scarcely possible except upon a direct line; and such an instrument appears to us calculated to render important services to the government, by binding remote parts of the empire into close proximity. It is at present contemplated, we believe, to complete only parts of the East Indian line—one portion leading from Calcutta to Burdwan, and another portion through the Doab, between Allahabad and Cawnpore. But we think the Indian government should require the railway company to open up the whole line to Delhi without delay, as there is a serious loss in any postponement of such a measure if the benefits are as great as are asserted. The political ends of the line cannot be compassed unless it be unbroken; and in the present unsettled aspect of affairs in Lahore, it would be most unwise, we conceive, for the government to shut out the aids an unbroken railway communication is able to afford.

It is unnecessary to dwell upon the physical features of the proposed East Indian Railway, as they are fully set forth

in the report of Mr. Simms and his coadjutors, which we published in a late number. The district through which the railway runs is upon the whole wonderfully free from engineering difficulties of every kind, the only one of any prominence being the bridging of the Soane, a large river flowing over a bed of sand ; but even here the question is one only of expense. The ravages committed by the white ants in India upon ordinary timber, involves the necessity of using some preparative process such as Kyan's ; and it is found that when timber is thoroughly impregnated with such a preparation by hydrostatic pressure, or by introducing the preservative liquid into the live tree, it may henceforth be reckoned safe against the ravages of the white ants as well as against the dry rot. It is doubtful, indeed, whether the white ants would attack timber subject to such violent vibrations or concussions as railway sleepers have to withstand ; but nothing should be risked in a matter of so much importance ; and unless stone blocks be employed, or sleepers of Moulmein iron-wood, or cast-iron attachments, such as are used on some of the American lines, sleepers that have been prepared by some effectual curative process should be adopted throughout the line. The last alternative is the one of which we approve, inasmuch as timber has been found preferable to stone for railway foundations, and the preparation of wood by Kyanizing or some equivalent process, is the method of which we have most experience for securing it against dry rot or the ravages of insects. No doubt this preparation of the timber will add to the expense ; but on many of the English lines this method of preparing the timber is adopted, and it does not appear probable that the cost of the line between Calcutta and Delhi, though formed with a double line of rails, and constructed in the most substantial manner, will exceed £15,000 a mile. It is false economy in the case of a great

trunk line, such as the East Indian Railway, to be content with any but the most complete and substantial modes of construction. The gradients too should be good, and the line direct, without turning to the right or left to pass through neighbouring towns, which may be adequately accommodated by branches ; for in all human probability this line will not stop at the frontier, but will pass on into Persia, and perhaps eventually into Turkey, until it at length reaches Constantinople ; and then we shall be able to pass from London to Calcutta in little more than a week. We know that to most persons this will appear a very visionary expectation ; but in every thing relating to the achievements of steam, the visionary people have been far oftener right than those who plume themselves so much upon their practical sagacity. It was *visionary* not twenty years ago, to talk of a speed exceeding ten miles an hour on a railway ; it was *visionary* to expect that steam vessels should navigate the open ocean ; it was *visionary* to maintain a regular steam communication with India by the way of the Red Sea and the Egyptian desert ; it was *visionary* to connect Ostend by railway with Constantinople, which is now doing or done ; and until the other day it was *visionary* to project a railway from Calcutta to Delhi. Every great step in the world's progress has at the first been visionary ; but the rapidity with which steam works its enchantments, confounds the arithmetic of practical stolidity. Practical men, it appears, have yet to learn, that in such anticipations "to doubt is to rebel," and that in resolving the question of the probabilities of human progress, rashness lies in scepticism rather than in faith.

We fear these remarks have drawn out to too great a length to enable us to say much respecting the third scheme to which we have referred, which has its terminus at Bombay, and of which the Great Indian Peninsula Company are the promoters. Nor are we sure that any discussion

of its merits would not be premature, as we scarcely think it probable that the Indian Government, after having secured to itself the benefits of the Political line, will, until after it has been tested, offer sufficient encouragement to any other railway to induce its construction. Such a delay is nevertheless to be regretted, especially as, if Bombay were to be connected with Calcutta by railway, the length of the voyage to England would be considerably abridged. As regards the Bengal lines, the political grounds will necessarily determine the decision of government to adopt the trunk line at once, and if they can profit by the experience of the past, they will place all the branches under one company's management.

There are many benefits arising from such concentration ; but we have considerable doubts whether there is any benefit to be derived, and, indeed, whether there is not a very material detriment in distributing the construction of segments of railway among different companies who may have conflicting interests, and among whom it may be difficult to preserve the concord necessary for the public service. In England the inconveniences of the system have been found to be so great, that the different companies have spontaneously proceeded to redress them by amalgamation, and wherefore should a system be introduced into India that has in England well nigh wrought its own extirpation ? If amalgamation be beneficial, it would surely have been *more* beneficial if there had been no separation ; economy is promoted by one management, strength consolidated, and unanimity secured ; and we therefore do think that it behoves the Indian Government, in introducing railways into India, to deal in each district only with one party, from whom conditions more favourable to the public service may then be exacted. Against this there would of course be the outcry of monopoly, but there would be no reason in such a cry ; for, so long as the lines

do not compete with one another, there is no more monopoly in the possession of the lines by one company than in their possession by any number. The monopoly of the London and Birmingham Railway Company is not diminished by the formation, by a different company, of a railway from Perth to Aberdeen; and wherein, then, could the monopoly of a railway from Mirzapore to Calcutta be diminished by the formation, by a different company, of a railway from Delhi to Mirzapore? Monopoly is not diminished in amount by being broken into fragments, but as it becomes more impalpable, it becomes more obnoxious in its exactions. To any kind of monopoly in locomotion we have always been opposed, and with the example of the intolerable oppression of the railway monopolies in this country, we trust the Indian government will take effectual precautions against the introduction of such a system into India. But these precautions are afforded, not by a multiplication of companies, but by restricting the profits of each; by providing that the government shall have access to the books, and shall possess the power of reducing the fares when the dividends become very high, and insisting on the condition that whatever lines may be constructed shall be formed under government supervision, conducted under government sanction, and be hereafter purchaseable by the government at a fair valuation. It is not difficult we are aware, to evade any condition respecting the restriction of profits, and it is therefore worthy of consideration, whether instead of providing that all above a certain rate per cent. went to the government, it would not be preferable to award only a portion of the sum in a ratio increasing with the dividend, so that the company would still have an interest in making the profits as large as possible. The rates charged for the conveyance of passengers and merchandize, should be gradually diminished until the railway attracted to itself the conveyance of the agricultural pro-

duce, whereby a larger revenue is to be realized with greater advantage to the country than if a high rate of charge were to shut it out. With these concessions we think it only reasonable that the Indian government should guarantee to the railway company the moderate interest upon their money of 4 per cent ; for the money necessary for the construction of Indian railways must be raised in England, and we should suppose that it would be difficult without such a guarantee, to collect the capital necessary for the purpose. A difficulty might perhaps be supposed to be presented by the uncertain tenure of the East India Company's charter ; but in an affair of so much importance the English government would be singularly remiss or perverse if it failed to delegate the powers necessary for the accomplishment of such an object ; for such interventions in reality constitute the most important of the functions a government has to perform.

The constitution of the East Indian Railway Company is, we think, a favourable one for introducing railways into India with success. The governing directory will be located in England, and efficient paid servants will be chosen in India for carrying its instructions into effect. This arrangement—independent of its obvious sequency from the almost exclusive use of English capital—is rendered expedient by the fact, that joint stock companies have never been known to succeed in Calcutta, but have, in every case, become the theatre of jobbery and intrigue. Oriental morality appears to be of too lax a quality to render possible the success of the undertakings entrusted to its guardianship ; and it appears indispensable therefore that the management of the proposed company should be undertaken by English merchants, who have already given proofs of their eligibility for such a trust. The value of money in India is much too great to encourage the expectation that much of the capital for railways will be subscribed

there—though indeed the effect of the introduction of railways will be to double or quadruple the capital of the country, by enabling the interchanges of commerce to be effected three or four times more rapidly than before. But this effect cannot be antecedent to the institution of railways, and on the resources of English capital their formation must depend. With these cursory remarks we must at present dismiss this important subject ; but we trust on an early occasion to be able to turn to it again, and to acquit ourselves of the duties of the investigation, with greater patience and success.

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THE EAST INDIA
GOVERNMENT GUARANTEE
ON
RAILWAYS,
WITH
LORD CANNING'S SPEECH ON THE OPENING
OF THE RAILWAY FROM CALCUTTA TO
THE GANGES, &c., &c., &c.

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CONTENTS.

	Page
Indian, Colonial and Foreign Guarantees	3
India Government Guarantee on Railway Stocks and Shares	4
India Government Guarantee on Railway Debentures . .	9
Sir Charles Wood on Indian Finance	13
Lord Canning's Speech at the recent Opening of the Railway from Calcutta to the Ganges	18
Scinde Railway—Indus Steam Flotilla—Punjaub Railway	24
Opening throughout of Scinde Railway from Kurrahee to Hydrabad	24
Punjaub Railway (Mooltan to Lahore and Umritsir) . .	29

INDIAN, COLONIAL, AND FOREIGN GUARANTEES.

"There was no similarity whatever," said Mr. Andrew, the chairman of the Scinde Railway Company, "between the Indian railway guarantees and the guarantees by Foreign and Colonial Governments, except that all of them had one character in common, namely, that they were in the nature of assistance and contribution by the State to private enterprise. In all essential particulars these guarantees were dissimilar. The guarantee of the East India Government was not on any particular sum, but on any sum which the railway might cost; nor was there any condition attached limiting the time for the completion of the line. Now the case was the very reverse with all foreign and colonial guarantees in which a limit to the cost was placed, and a limit to the period of completion. These were very important points of difference in the terms.

"Foreign and Colonial Governments exercised only a very general control over the construction of the Railway, and took no responsibility in the expenditure or in the execution of the engineering works; so that disputes often arose after a long period upon points which might affect very seriously the interests of the company. But the control which the East India Government exercised in these matters was very stringent, and not a step could be taken, or a shilling expended without their special sanction.

“Another important peculiarity of the Indian guarantee was this,—that the companies might have all their moneys returned if they found, after the line was constructed, that the dividends did not equal their expectations.”—*Money Market Review*.

INDIA GOVERNMENT GUARANTEE ON RAILWAY STOCKS AND SHARES.

At the Special Meeting of the Scinde Railway Company, held on the 29th of August, (1860) the able and energetic Chairman, Mr. W. P. Andrew, (as reported in the *Money Market Review* of the 1st of September) proffered some interesting remarks upon several points bearing upon the conditions of Indian Railway Guarantees, respecting which misconception prevails in many quarters. Mr. Andrew mentioned that he had been specially requested to say a few words upon the subject. His remarks related more particularly to an essential point wherein Indian Railway Guarantees differ from those accorded by other Governments, whether foreign or colonial. In the case of all other guarantees, a limit is fixed to the amount of capital, and there is always some degree of uncertainty as to whether that amount will be sufficient for the pur-

poses of the undertaking. Should it be exceeded, the government that has granted the guarantee is under no responsibility in respect to the capital expended in excess of the original agreement. It stipulated to pay a certain rate of interest upon a certain sum, and the limitation was accepted as an essential condition of the enterprise by the capitalists or association who took it in hand. Should the original estimates prove erroneous, and the capital be exceeded—and in the majority of railways, both at home and abroad, this has been the case—the guarantee becomes delusive, for its amount will be reduced. This is the main reason why the public have always refused to attach the same value to a Railway Guarantee as to a State Bond. The conditions of the latter are certain, and clearly defined, whilst those of the former are not so. Various plans have been resorted to in order to obviate the uncertainty. A guarantee has, in some cases, been granted upon an amount of capital largely in excess of the estimates, and yet the actual cost has exceeded, or bids fair to exceed, the enlarged sum fixed. In other instances “responsible contractors,” as the phrase runs, have been bound down in large penalties to complete the work for a sum within the capital guaranteed. An arrangement of this character has usually been attended with one or other of the following unsatisfactory results:—

1. The railway and other works have been constructed within the estimate, it is true, but in an

unsubstantial manner. By this means the obligation entered into by every party to the bargain is nominally fulfilled, but the shareholders find themselves subjected to a large annual expenditure for repairs and renewals, which materially affects the remunerative capacity of the enterprise, for in nearly every instance the terms of the guarantee do not do more than oblige the Government to pay a *maximum* sum, sufficient for the stipulated rate of interest upon the fixed amount of capital. Should heavy repairs and renewals become necessary hereafter, the position of the shareholders may be seriously imperilled.

2. The second of the unsatisfactory results to which we have alluded is, either a quarrel and lawsuit between the Company and the contractor who has been bound down, or his insolvency. This explains the numerous cases that have arisen of late years, wherein railway companies and contractors prolong a wearying litigation, frequently carrying the struggle from court to court.

From uncertainties of the character above described, Indian railways are completely exempt, and in this important particular they enjoy an advantage over every other class of railway undertakings. The guarantee of the Indian Government is not limited to a particular sum, but applies to *any sum that the railway may cost*. In this instance, therefore, the guarantee is a real one, and exempt from risk.

Another very important point in favour of the

Indian railways was alluded to with equal clearness by Mr. Andrew. He pointed out that foreign and colonial governments exercise only a very general control over the construction of their railways, and take no responsibility in respect of the expenditure or the execution of the engineering works, the result being that disputes often arise after a long period upon points which may seriously affect the interests of the Company. But the control which the Indian Government exercises in these matters, Mr. Andrew remarked, "is very stringent, and not a step can be taken, or a shilling expended, without its special sanction." This precludes the possibility of dispute, and defines the position of Indian railway investments with the greatest possible degree of clearness. In the same way, there is a decisive assurance that no danger can arise to the interests of the companies from any possible delay in the progress of the works, originating, perhaps, in causes over which the directors have no control. There is, in fact, no arbitrary period whatever fixed for the completion of the Indian railways. The Government is represented by one of its own officers, an *ex-officio* director, at the board of each of the companies, and thus may be said to stamp with official sanction each step in their progress. We know how different is the position of other railways—colonial and foreign. Their completion is imperative, within a specified time, under severe penalties, which even provide, in some instances, for

the entire forfeiture of the whole undertaking by its proprietors.

Finally, Mr. Andrew remarked, "Another important peculiarity of the Indian guarantee was this—the companies might have all their money returned if they found, after the line was constructed, that the dividends did not equal their expectations." This stipulation is of so extraordinarily favourable a character that an investor might well be excused for demanding the strictest evidence of its accuracy. There is, however, not the slightest doubt upon the point. Mr. Andrew's assurance needs no corroboration; but we may cite here a paragraph from Mr. Juland Danvers's Official Report on the Indian Railways, addressed to the Secretary of State for India (to which reference was made in the *Money Market Review* of the 16th of June), describing the conditions of the Government guarantee. Mr. Danvers observes: "The railway companies have the power of surrendering the works at any time after any portion of the line has been opened for a period of three months, upon giving six months' notice to the Government, who would have to repay the whole amount that has been expended, with their sanction, on the undertaking."

We know of no other railway undertakings which present such signal advantages. The shareholders have to deal with a perfectly solvent Government—with, in fact, the servants of the British Crown—which guarantees to them a hand-

some minimum rate of interest upon the capital employed, fixes no limit to the amount of capital, or to the period for the accomplishment of the undertaking, identifies itself with the management at every step, and, finally, binds itself to take the railway and works into its own hands, and to repay the capital expended in the event of the Company finding, at any time during the period of the concession (ninety-nine years), that the return does not equal their expectations.—*Money Market Review*.

INDIA GOVERNMENT GUARANTEE ON RAILWAY DEBENTURES.

It is curious to observe how large a part mere fancy plays in the choice of an investment, not only in the preference shown for one class of stocks over another, but in assigning the most capricious values to descriptions resting upon the same security. A disinterested individual might reasonably infer that in a question entirely confined to pounds, shillings and pence, the exact price of any single issue from the same government could, *ceteris paribus*, be arithmetically determined to a fraction by a comparison with another. It seems, however, that

investors, like other people, have their little likings and dislikings, and will submit to a pecuniary disadvantage to obtain a favourite security. At the moment at which we write, reduced and new three per cents., although identical in value with consols, are yet, from the operation of this feeling, some three-quarters per cent. cheaper, the public prejudice in favour of the latter being even sufficient to more than counterbalance the operations of bankers exchanging their securities at a profit. Many other differences may be pointed out in the relative prices of foreign stocks, railway shares, &c. The confusion in Indian finance appears especially favourable to such a discrepancy, and perhaps the greatest diversities may be found in the issues of the Indian Exchequer.

Until a comparatively recent period, the issue of fresh capital by an Indian railway company could always be effected with ease, as the new shares at once commanded a premium. Even as late as the latter part of 1857, the mutiny did not prevent the placing by a well-known company of a large sum in new shares, which almost immediately rose to 5 per cent. above their nominal value. But from the quantity of fresh stocks that came upon the market, it soon became necessary to give capitalists some additional advantage, and the plan of raising money on debentures was adopted. It is to these securities that we wish to direct attention.

Indian Railway Debentures possess a double

security, such as belongs to scarcely any other similar investments in the world. They have, first, a claim upon the assets of the company by whom they are issued. They have, secondly, the guarantee for principal and interest of the Secretary of State for India secured by the revenues of India. As possessing this double security, they are of superior value to the Indian Five per Cent. Loan of 1859, which stands at about 103. They have a third advantage, by which they are entitled to rank above home debentures, and that is, the privilege attaching to most of them of being converted into stock at any time within a fixed period. Indian railways are constructed very cheaply; they run through fertile and thickly populated districts; they stand little or no chance of competition, and, according to all experienced observers, they will enjoy a very large and steadily increasing traffic. It is fully anticipated that nearly every one of the Indian railways will pay more than 5 per cent. guarantee, and already the certainty that a much higher dividend will be earned has been demonstrated in the case of several of the great trunk lines by the receipts on the disjointed portions now open. Let 8 or 9 per cent. be distributed, and the debenture holder, by converting his securities into stock, will come in for a considerable addition to his principal. Taking, however, the worst possible—indeed, an almost impossible—view, namely, that the railway not only does

not pay its proprietors, but that it does not pay the working expenses, and yet the debenture-holder has always the Government to fall back upon. In fact, he enjoys the advantage of receiving a good rate of interest for his money while the loan lasts, of possessing a favourable chance of making a large additional profit, and of being certain, in any event, of never making a loss.

It may be said that like advantages are possessed by the ordinary stock of an Indian railway, since it is also secured the payment of a guaranteed rate of interest, and at a stipulated time the proprietors may claim to be reimbursed their capital from the Government. But during the interval, from various causes, the price may be reduced in the market, and holders compelled to realise may have to do so at a disadvantage. With a debenture, however, having only a few years to run, this can rarely or never be the case to any important extent. Again, although debentures may be converted into ordinary stock, ordinary stock cannot be converted into debentures; thus the proprietors of the latter enjoy the privilege of electing which security they may prefer to retain. It seems necessary to say a few words respecting the real value of these very eligible investments, since by the general public they appear to be little understood.—*Money Market Review*.

SIR CHARLES WOOD ON INDIAN FINANCE.

It would be well if all the questions of the session could be explained as promptly and as satisfactorily as that of Indian finance. Scarcely had Lord Derby's misgivings been uttered when a brief statement from Sir Charles Wood dispelled our visions of gloom and difficulty, and indulged us with such a prospect as could hardly have been anticipated a few months since. It is quite true that at this moment the Government of India is about to contract a new loan, but that loan is not required to supply the deficiency in the Indian revenue; it does not represent any political embarrassment, nor is it in any way calculated to depress the credit or curtail the resources of our empire in the East. On the contrary, the question asked by Mr. Crawford on this subject drew forth from the Indian Secretary such a report of Eastern finance as will hardly seem credible after the impressions which have recently been entertained.

The new loan represents merely a transaction on account of Indian Railways. It is simply the application of a power already provided against a contingency of the very kind which has occurred. Ever since the construction of Indian Railways commenced there has been a natural flow of money from this country to India, while the disbursements

annually effected in this country on behalf of the Indian Government created a return current from India to England. It happened that the remittances expected in each country as nearly as possible balanced each other, and it was, of course, a simple expedient to set one debt against the other debt, and thus save the delay and expense which the actual remittance of money to so great a distance would necessarily entail. So the home expenditure of India was defrayed out of the subscriptions paid into the home Treasury by the railway shareholders, and the charges of railway construction in the East were paid from the funds which would otherwise have been sent home. This year, however, the balance has been upset. The railway companies have not paid in so much as was expected, and the Indian Government, having pushed on certain railway works with unusual vigour, requires a greater supply than had been provided for in the estimate. Sir Charles Wood ought to have received £7,000,000 in the whole by the end of next April, whereas he cannot reckon, he thinks, on more than £5,500,000. There is a deficiency, therefore, on this side, coinciding with an excess on the other, and the consequence is that money is wanted. Under the powers given by statute it was competent to the authorities to raise the required sum by way of loan, and, as this method promised the greatest economy, it was judiciously adopted. The whole transaction is purely a matter of railway account,

and is not connected in any way with the political administration of India.

These, however, are points of little significance compared with the statement incidentally made by Sir Charles Wood on Wednesday. From that statement we learn that the financial position of the Indian Government had been marvellously improved. The receipts and expenses were actually approaching to a balance. The Government of Calcutta had encountered its difficulties by two natural resolutions. It had resolved to spend less and to raise more. How far the latter attempt may have been successful is still uncertain, for the operation of new taxes can be discerned only after the lapse of time, but there is no such obscurity, we are happy to say, about the effects of retrenchment. Mr. Wilson had calculated, in framing his budget, that a reduction of expenditure could be accomplished to the extent of £1,700,000. At a later period he raised this estimate to £2,500,000, and the justice of his views has been remarkably confirmed by the results now ascertained. The reduction actually declared, instead of £2,500,000, is no less than £3,300,000, showing how truly extensive was the margin on which Mr. Wilson had speculated. We are now told by the Indian Secretary himself that one more such year as the last will bring the finances of India to an equilibrium. If the taxes only produce as much and Government retrenches as largely in 1861 as in

1860, the days of deficits will be over. We see no reason why these pleasant anticipations should not be verified; for, although the work of reduction may possibly become more difficult as it proceeds, the military expenditure of India was so enormous that the opportunities of saving must be almost inexhaustible. We economized £3,500,000 in 1859, and £3,300,000 more in 1860. In ordinary cases such precedents might make us rather distrustful of the scope left for 1861, but in India we believe the process may still be continued. The fact is that our military establishments in the East were doubled. We were maintaining European troops there in strength enough to garrison the country, while we had not relieved ourselves of the native establishments which the Europeans were intended to supersede. The Sepoys were gone, but Sikhs and Irregulars had taken their place, till, in the end, the force of native soldiers actually on foot was not less than it had been before the mutinies began. This was burning the candle at both ends. We shall doubtless require native troops as well as Europeans, but it cannot be necessary that both establishments should be kept at such a height as would be requisite if only one of them existed.

Apart, therefore, from the problem of Eastern taxation, we are disposed to look with confidence on the financial prospects of India if the Government will but do its duty boldly, and there is certainly no reason to regret that the expenditure upon

Indian Railways has been liberally encouraged. It sounded ill the other day when the Governor-General stated in his financial minute that public works, even of a productive character, must be suspended in consequence of the difficulties of the Exchequer, for such a resolution bespoke not only very serious straits, but a very tardy recovery. We are rejoiced to find that railways are an exception to the rule. If the resources of India are to be successfully developed, it must be principally through railways. What may be the staple produce of that wonderful country we cannot pretend to conjecture. We know that India can produce tea, silk, wool, or cotton, and that whenever any crop fails or threatens to fail us in any other quarter we turn by some instinctive impulse to India as our best resource ; but, whether its exports are to be of one kind or another, it is certain that railways alone can bring such commerce to pass. So long as the money raised for these railways is judiciously applied the outlay is sure to be advantageous. All the forebodings of difficulty in these respects have long since disappeared. There is no insuperable obstacle to railway enterprise in the nature of the country,—none in the prejudices of the people. On the contrary, it has been found that Hindoos are extremely fond of railway travelling, and that they actually save their pice for the pleasure of a journey. We are still, however, at the commencement of these undertakings. Not until the great

centres of population are connected, and the great agricultural districts united to the coast, shall we see the results of railways in India. Even the military departments will be gainers. The facilities of immediate concentration will enable a small number of troops to garrison a large district, and the reductions which are so earnestly desired may be found to be very intimately connected with the expenses which are now announced. More money for railways and less money for troops will be a good maxim for Indian administrators, and Indian loans will cease to be regarded as ominous transactions when they represent nothing but remunerative works and national progress.—*Times*.

LORD CANNING'S SPEECH AT THE RECENT OPENING
OF THE RAILWAY FROM CALCUTTA TO THE
GANGES.

“ We began this day's journey at a spot washed by the tides of the Bay of Bengal, and within a stone's throw of the anchorage of some of the noblest ships which, to the furtherance of commerce and all its attendant blessings, the skill and enterprise of our fellow-countrymen have launched upon the ocean. We have ended it in an inland district

200 miles off, where not only are the uses of the great highway of nations uncared for and unknown, but where the very name of the 'black water' is a word of mystery and terror. We began our journey at the chief seat of Western trade and civilization on this side of the globe, the head quarters of England's power in Asia ; and we have closed it almost under the walls of the ancient capital of Bengal and Behar—the city of Gour—which, little more than two centuries ago, was not surpassed by any in India for its busy population and magnificence, but which now lies a mass of tangled ruins and rank forest, tenanted by wild beasts, reeking with fever, and void not only of human industry, but of human life. In travelling between these two points,—points of such striking contrast—we have passed through a country teeming with population and covered thick with all that is necessary to the sustenance of man. We have skirted a district abounding in mineral wealth, and already eagerly seizing the opportunity, as yet imperfectly afforded to it, of pouring this wealth into the great centre of activity in Calcutta. We have been carried through the wild country of the Sonthals, one of the rudest and wildest races of India, but a race not insensible to kindly government, and who, if their hills and jungles had been as accessible five years ago as they are now, would have been at once checked in a purposeless rebellion. Lastly, we find ourselves standing on the bank of the great Ganges,

at that point at which it is in the interests of commerce that the tedious and uncertain navigation of its lower waters should be exchanged for a short and secure land carriage.

“ If, then, Gentlemen, it be destined, as without presumption we may believe it to be, that to British science and British enterprise shall be committed in India the noble task of bringing security, comfort, and comparative wealth within the reach of races as yet ignorant of these ; of extending the field of profitable industry to them ; of supplying the wants of some by the superfluities of others ; of enhancing prosperity where it exists, and of reviving it where it has drooped and decayed ; of promoting fellowship between men, and of bringing light into dark places ;—if these, I say, be the functions allotted to the science and enterprise of our fellow countrymen in India, then I declare that I do not know where in the map, not of India only, but of the world, a spot could be found presenting, within the short compass of one day’s journey, so complete an epitome of all the opportunities for usefulness and good which attend on well directed enterprise, as does the country through which we have this day passed.

“ I have said that I would not trouble you with figures ; but that you should know that the old portion of the line over which you have this day travelled is *the* one in India the proceeds of which already more than cover the Government’s guar-

antee * of five per cent. And though this may appear an unimportant vulgar fact to those who are not concerned by it, it is one full of hope for the future. It is by tempting the capital as well as the skill and experience of England into India, by showing that there is remunerative employment for it, that India must be advanced. This can be done only by showing an example of the practical success of such undertakings as this ; and that the East India Railway, to do honour to which we are met, is not only full of future promise, but actually in great part remunerative, and that of its well-working there need be no apprehension, we may now safely assert. I am sure, gentlemen, that many of you must have been struck, as certainly I was, by the sight of a train such as we saw to-day, carrying 200 first class passengers, all in brand-new carriages of Indian make, and with new engines, issuing from its starting place, so perfect in all its parts, and so well appointed, that Paddington station itself might have been proud of it, accomplishing within nine hours a journey of more than 200 miles, 85 of which have only this day been opened, and arriving at its journey's end, not only easily, smoothly, and without an accident, but without a screw loosened. I have known something of similar ceremonies in England, but never have I heard of any that was

* The Great Indian Peninsula Railway also earns more than the amount of the guarantee.

more thoroughly successful than that which we have this day witnessed.

“I believe, gentlemen, that if it had been prophesied to any one of you a few years ago on getting into the comfortable carriage of an express train at Euston square, that you would one day be carried in a like conveyance and very nearly at a like speed through such a country as this, you would have treated it as a joke. Yet the thing has come to pass this day;—and, let me say that the extravagant contrasts which have thus been presented to our eyes are not merely a subject for idle wonderment, but a solid ground of hope for the future of British India.”—*Bengal Hurkaru*.

The opening of the line of the East Indian Railway Company to Rajmahal, was inaugurated lately with great solemnity by the authorities, and was honoured by the presence of Lord Canning, the Commander-in-Chief, and other distinguished functionaries, with much splendour, and with no small amount of speech-making. It is, however, to be remarked that none of the speakers on the occasion thought it proper to mention the fact, which, by the by, would have amounted to nothing but a graceful acknowledgment, that the line of the East Indian Railway Company was carried to Rajmahal in opposition to their own original intentions and plans, and solely in consequence of its being urged by Mr W. P. Andrew, in one of his earliest publi-

cations in England,* under the soubriquet of an "Old Indian Postmaster," that that was the best and most judicious direction of the line. It is always as well to keep such facts before the public; and it would, we repeat, have been more graceful on the part of the Company to have saved us the trouble of reminding them of the obligations the Company owe to the "Old Postmaster!"—*Railway Record*.

"Our opinion," observed Mr. Andrew, in 1846, "remains unchanged, notwithstanding that the Railway Commissioners have enunciated propositions and proposed projects in exact accordance with the views entertained by the East Indian or Mirzapore Railway Company."

"A railroad from Calcutta to deep water in the Ganges at Rajmahal; from this point, river steamers to Allahabad at the confluence of the Jumna and Ganges, where deep water ceases, and a railway from Allahabad to Delhi and the Sutlej."

"An extension of the Rajamahall line up the Gangetic valley to Mirzapore and Allahabad, would have many advantages over the direct route indicated by the East Indian or Mirzapore Railway Company."—*Indian Railways, by an Old Indian Postmaster*. 2nd edition: 1846.

"The line (in Bengal) seems to have been adopted which was originally recommended by Mr. W. P. Andrew."—*Times*, 19th Nov., 1851

* *Indian Railways and their Probable Results: By an Old Indian Postmaster, &c., dedicated to the Court of Directors of the Honourable East India Company*. Second Edition, 1846.

SCINDE RAILWAY—INDUS STEAM FLOTILLA—PUN- JAUB RAILWAY.

The great object contemplated in these combined undertakings is the establishment of a sure and speedy means of communication between the port of Kurrachee in Scinde, and the Punjaub ; as well as the connexion of Lahore and the North-West frontier of India, with Calcutta on the one side, and the Western Coast on the other.—*Report of Secretary Rail. Dept., India Office.*

OPENING THROUGHOUT OF SCINDE RAILWAY.

The agent of this Company at Kurrachee reports that “the last arch of the Bahrūn viaduct, the principal engineering work on the line, had been finally keyed in on Christmas eve ; that the roadway was to have been completed before the night of December 31st ; and that by the middle of March, they would be in a position to commence traffic.” It is understood that the bridges and other engineering works have been highly approved by the officers appointed by Government to inspect the line.—*Daily News.*

It appears that this railway is to be opened from Kurrachee to Kotree for traffic in the early part of 1861, and it is understood that Sir G. Clerk, the Governor of Bombay, will preside at the formal opening of the line for public traffic.—*Times*.

The agent of the Scinde Railway Company at Kurrachee, after adverting to the expected early opening of the line reports that "the amount of real business now going on in connexion with Kurrachee is, this year, at least five times what it was last year. Our trade and traffic prospects are of the best possible kind."

There appears every prospect of it (the Scinde Railway) being the first completed line, having its capital account closed, and one of the first railways in India, likely to pay a dividend on the capital expended on its construction.—*Directors' Report*.

INDUS STEAM FLOTILLA.

The fleet sanctioned for this undertaking consists of fifty-three vessels, viz. :—

7 Passenger Steamers,
 6 Towing „
 33 Cargo Barges,
 and 7 Accommodation Flats.

The boat recommended by a Commission appointed in 1857, to consider the best description of vessel suited to the navigation of shallow Indian rivers, has been adopted, with slight modifications, to meet the requirements of the service. The dimensions of the passenger steamers are :—

Length, 200 feet.

Breadth, 38 „

Depth, 6 „

Draught, 2 „

The whole of these vessels have been built under contract. One steamer of each class was built and tested, to the satisfaction of the directors in England, before contracts for the remainder were entered into.

The capital authorised for the undertaking, and upon which five per cent. interest has been guaranteed, is £250,000. The whole of this had been subscribed for, and £249,140 lodged in the Government treasury on the 31st December, leaving £860 still to be paid up.—*Report of Secretary Rail. Dept., India Office.*

All the vessels above alluded to have left this country, and a large proportion of them are in course of re-erection in India. The ‘Stanley,’ model steamer, which was publicly tried on the Thames, with such satisfactory results, has recently arrived at Mooltan, in the Punjaub, after a success-

ful trial trip from Kotree, occupying little more than half the time taken by the large Government passenger steamers. The 'Stanley' went through the Sukkur pass, where the current of the Indus is the strongest, with ease and steadiness. The arrangements for passengers have been highly approved of. It is expected that the 'Stanley' and the other passenger steamers of the Flotilla, plying between Mooltan and Kotree, will, with the assistance of the Scinde Railway, which will be opened in March, make Kurrachee accessible to the Punjaub in little more than a week, instead of a month, the time now occupied. By the last advices from Mr. Neville Warren, the agent of the Indus Steam Flotilla, and Major Malcolm, the Consulting Engineer to Government, had proceeded to Lahore, on the invitation of the honourable the Lieutenant-Governor of the Punjaub, to confer regarding the results obtained by the 'Stanley,' and to concert future arrangements, so as to take advantage of the new facilities offered for the commerce of the country.—*Official Papers.*

The following communication dated Kotree, January 19, 1861, has been received by the Chairman from the agent of the Indus Steam Flotilla.

"You will have learnt by my last letter that the trial of the *Stanley* steamer up river, had been a successful one. I have now the honour to report that the down trip was remarkably successful also. The assertion comes from so many sources, and on

so many different accounts, that the river has not been known to be so low for at least seventeen years as it is this year, that I feel able to report it as fact, certainly the channels were very small and shallow in many places. There is no doubt that we have had as severe a test of the fitness of the *Stanley* for duty on this river, both as to draught and speed, as could be desired, and I have the greatest gratification in assuring you that you may be entirely satisfied with her performances.

“On the journey down river, we had an excellent comparative test for the *Stanley*, in the fact that a large steamer with flat in tow, the *Outram*, had left the day before us, and the *Indus*, a small or short steamer, with passengers, had left two days before us. We passed the *Outram* at the end of the first day, and sighted the *Indus*, on the second day, passing her on the fourth day, and reaching Kotree one and a-half days before her.

“I decided on the necessity of this trial trip over the whole ground, under great anxiety as to what the *Stanley* would do under the various conditions to which she would be exposed.

“The result of the journey has fully convinced me that it was properly undertaken, and that no less trial of the steamer would have enabled me to be at all confident in my report as to her capabilities. In addition to this, I have been able to obtain information as to the traffic on the rivers which I never could have obtained so fully otherwise.”—*Agent's Letter*.

PUNJAB RAILWAY (FROM MOOLTAN TO LAHORE AND UMRITSIR.)

The line selected, in accordance with the terms of the contract of March 1859, viz., from Mooltan to Lahore and Umritsir, is 250 miles in length. It is carried by the low-water shed of the Dooab (between the Ravee and the Sutlej), and presents very favourable gradients. For sections of 30, 40, and 100 miles respectively, the line keeps a straight course. There are several watercourses to be crossed, but, with the exception of a few near Mooltan, the necessary works are mere culverts.

It is estimated that the railway will be completed within a period of four years from the commencement. Some earthwork had been done previous to the formal commencement of operations by Sir John Lawrence on the 8th February, 1859, and much progress has since been made on the line between Lahore and Umritsir.—*Report of Secretary Rail. Dept., India Office.*

The Punjab may well be considered the most important portion of Asia, south of the Himalaya, not only in its political, but also in its commercial relations. From its position, it has ever exercised an important influence on the military affairs of India; this is at once apparent when regard is had to its geographical situation, communicating on the east with the Valley of the Ganges, commanding on the west the passes into Persia and Affghanistan.

The physical features of the country adapt it for military operations; the natural richness of the soil and variety of its own productions, render it independent of external resources, and hence we find that from the earliest times the Punjaub has been to India what the Netherlands have been to Europe.

The Chief Commissioner for the Punjaub, in his report for the years 1854-56, estimates the surplus production of cereals at nearly half a million of tons annually, and the quantity of unreclaimed land capable of cultivation at six millions of acres.

"Let means of export" (observes Sir John Lawrence), "the grand desideratum, be once supplied, everything will follow. There is a population, prolific to increase, hardy and industrious to labour. There are vast supplies of water in the rivers, and facilities for excavating canals. Then money will be abundant, prices will recover their standard, and the land revenue will flourish."

The selection of this route (from Mooltan to Lahore and Umritsir) for a railway is unquestionably advantageous, giving a first-class communication where it was most required, and where a cheaper mode to enter into competition with it is not practicable.

The remarkably favourable nature of the country over which this line is to run, and its low cost as compared with other lines in India,

will enable it to carry at much lower rates than elsewhere.

So great is the passenger traffic over this line of country, it will probably be found as much as the railway can deal with.—*Report to Secretary of State for India, by Mr. W. Purdon, Government Executive Engineer, Punjaub.*

Mr. Macleod, the Financial Commissioner of the Punjaub, stated at the last Annual General Meeting of the Scinde and Punjaub Proprietors, that:—"Besides wool, cotton, and flax, there were many other articles of small bulk and great commercial value, which could be grown in the Punjaub with great advantage. One of these was tea, which grew admirably on the skirts of the Himalayas. There was a fertility in the soil, and a power of production which amounted to an absolute surfeit, and cereals had been produced until they had ceased to be remunerative. Let the Railway be established, and the whole trade of the country would be attracted by it."

According to Sir John Lawrence, "few railroads in India will have been undertaken under happier auspices; Umritsir and Lahore are situated in the middle of the flower of the Sikh people. The one city contains a population of 120,000 souls; the other not less than 94,000. The first is the emporium of the commerce of the Punjaub, and the religious capital of the lately dominant race. The latter is the seat of the local Government, and the

place of residence of many of the chiefs. For these reasons the influx of travellers, traders, and visitors is great and continuous. The surrounding country is fertile and well cultivated, and the population dense." The Baree Doab Canal, which has recently been opened, will render the land still more productive.

When it is considered that 250 carriages ply for hire daily between Lahore and Umritsir, that 3,500 travellers, on foot, or mounted on camels, elephants and horses, with about 4,000 carts and animals, laden and unladen, pass daily along the route, it is believed that the opening of this section will impart a powerful impetus to the extension of railways in India.—*Directors' Report.*

By recent advices the engineering works along the whole course of the line were progressing towards completion; the embankments were also in a forward state, the cost of which ready for the reception of the permanent way continues to average under £200 per mile. Large quantities of rails, chairs, and other materials have been deposited along the line at a moderate rate of charge. The rolling stock is also in course of delivery; about 36,000 tons of permanent way material and rolling stock have left this country, while about 5,000 tons remain to be forwarded for the completion and stocking of the line.

No rise has taken place in the price of labour in the Punjab, and there appears good reason to believe that this line will cost less per mile than any railway constructed in India.—*Daily News.*

RAILWAY COMMUNICATION WITH INDIA.

A continental statesman not long ago observed that "in British India the construction of railroads has made considerable progress, and after the final pacification of these valuable possessions, it may be presumed that Her Britannic Majesty's Government will find it advisable to urge with energetic means the prosecution of what remains to be done for the completion of the principal lines. Supposing therefore that the principal Indian lines will be achieved, and that the roads across the continent of Europe to Constantinople will be executed in nearly the same space of time, the connection of these two great systems will then be appreciated in all its importance. Their junction in the direction of Iskenderun* is that which appears to me to deserve a decided preference, as it would pass through very rich and populous countries, and connect them with that Mediterranean Port."

In June, 1857, Mr. Andrew, with a deputation of 120 influential gentlemen, M.P.'s and others, waited on Lord Palmerston, who stated "that the Government had supported, and would continue to support, the project" (the Euphrates Valley Railway). *Engineer*.

According to Sir Bartle Frere, "The Euphrates Valley Railway would give them the command of the sea-board of the Persian Gulf, the completion

* General Chesney and Sir John MacNeil prefer, after survey, Seleucia, the ancient port of Antioch and Aleppo as the Mediterranean terminus of the Euphrates Railway.

of that railway would practically make Chatham nearer to any point of action in the Persian territory, than any military force which could be brought to bear upon it from Central Asia. If the triumphs of Great Britain are to be permanent, they must be rendered so by a mutuality of interests, by the material and civilising influences of expanding commerce. The great battle of the country for the tranquility of Central Asia must be fought at Manchester and Liverpool. If we would command Central Asia, that dominion must be established by opening up a ready market for their raw produce, and subjecting them by the force of their own material interests.”—*Sir Bartle Frere*.

“In 1857, a concession was obtained from the Porte, and the British Government avowedly approved the plan, which would have saved a thousand miles in distance, and fourteen days in time, in communicating with India, and ‘supported, and promised to continue to support, the route;’ but just as its necessity was more than ever demonstrated, by the breaking out of the mutiny in India, our very good friend, the Emperor of the French, for reasons best known to himself, put his veto upon it; but being a magnanimous ally, no doubt the British Government will be able some of these days to induce him to consent to grant us permission to make a road to our own dominions without giving umbrage to his Imperial Majesty.”—*Weekly Paper*.

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“Sir George Clerk is on his way from Gogo to Kurachee. It is expected that the railway from the latter port to Kotree will be opened while his Excellency is in Scinde, and thus the difficult navigation at the mouth of the Indus will be avoided, and a ready outlet provided for the vast commerce of Upper India.—“*Times*, *March 9th*, 1861.”

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the convulsion cannot fail to be general against this mirror of truth.' *Saint-Simon*, tom. xx. p. 92.)

Were it not for his passionate sympathy with the good and his assionate hatred of the evil, Saint-Simon would not be one of the greatest of satirists; but it must be confessed that the charity which throws a veil over the follies and weaknesses of others was not among his virtues—nay, he disdained even to conceal his own. His work therefore remains not altogether free from inaccuracies, though these are marvellously infrequent—not coherent in form, or correct in style; but representing with masterly fidelity a large epoch of human history, illuminated by the power of genius and the love of truth. In the variety and force of his characters Saint-Simon is Shakespearean; and no drama can surpass in turbid grandeur the mingled scenes of comedy and grief which he drew from life. But of all the characters he has delineated none exceeds in interest his own; for it is that of a consummate gentleman, who remained pure when most men were corrupt, and erect when all men were prostrate.

ART. IV.—1. *Tea Cultivation, Cotton, and other Agricultural Experiments in India.* A Review by W. NASSAU LEES, LL.D.

2. *Report to the Secretary of State for India in Council on Railways in India for the year 1862–63.* By JULAND DANVERS, Esq.
3. *The Cauvery, Kistnah, and Godavery; being a Report of the Works constructed on these Rivers for the Irrigation of the Provinces of Tanjore, Gunttoor, Masulipatam, and Rajahmundry, in the Presidency of Madras.* By R. BAIRD SMITH, Lieut.-Col. Bengal Engineers. London: 1856.
4. *Reports on the direct and indirect Effects of the Godavery and Krishna Annicuts in Rajahmundry, Masulipatam, Gunttoor, &c., and the Colesoon Annicuts in Tanjore and South Arcot.* Madras: 1858.
5. *Major-General Sir Arthur Cotton (late Chief Engineer in Madras) on Irrigation and Navigation, in connexion with the Finances of India.* Address delivered to the Calcutta Chamber of Commerce, May 7th, 1863. London.

THE subject which we have undertaken to treat is so large and various, extending over so vast a territorial area, and embracing within its scope the condition and prospects of so

many millions of people, divided into numerous races and nations, differing widely from each other in language, in religion, and in all that constitutes character, that we cannot but despair of doing justice to it within the limits of a single article. But it is essential that England should know how fast her great dependency is growing, and how large a field is opened in that noble country, not, indeed, for colonisation in the ordinary sense of the term, but for the highly profitable employment of capital, and, in combination with such investments, for British intelligence and enterprise, in the forms especially of civil engineering, and in the direction and superintendence of skilled labour. Although room may be wanting in the following pages for even a sketch in outline of the whole of this immense field, we hope to be able to bring together such an amount of information in respect to the state of British India, as may not only be useful to those who are in a position to benefit both India and themselves by taking an active part in her progress, but will also be acceptable to the larger class who feel an unselfish interest in the civilisation and enlightenment of distant countries committed to the guardianship of England.

We rejoice in the persuasion, that agencies—moral and physical—already actively at work, are propelling India in its progress at a rate rapid almost beyond precedent. And this progress is natural and healthy; not like that of Russia, at the opening of the eighteenth century, dragged along, struggling and recalcitrant, in the strong grasp of Peter the Great; but the effect of causes which, ‘like rain upon the mown grass,’ are acting gently and almost imperceptibly, as well as equably, upon the whole breadth of society. The onward march of civilisation is not more plainly denoted by the improved education and diminished prejudices of the wealthier classes, than it is by the larger profits of the ryot and the higher wages of the artisan, with the natural sequences of more wants and of greater efforts to gratify them. Colonel Baird Smith has borne unquestionable testimony to the energy and resources displayed by the agricultural classes of the North-western provinces in meeting the famine of 1859, as contrasted with the helplessness with which they succumbed to a like calamity in 1837. The extent to which the facilities for travelling afforded by the railways are taken advantage of by every class of the community, in all parts of India, must satisfy all who knew the people in former days, that the deep torpor of centuries is fast giving way before the quickening influences of science applied to the practical purposes of life. At last, the great driving-wheel of

progress has been fairly set in motion, and it demands but scanty powers of observation to see that society is moving onward at a pace almost Anglo-Saxon in its rapidity.

Holding these views, we shall endeavour to show what has been done and is doing by the instrumentality of the Government, of joint-stock companies, or of individuals, to bring into light and use the vast dormant wealth of India; to stimulate its agriculture, and enlarge its sphere; to infuse both energy and capital into the operations of its productive classes; and to open and increase, in a somewhat better proportion to the wants of the people, the means of intercommunication both by land and by water. Whatever may have been the condition of the country when the Mahomedan Empire was at its zenith under Akbar, it is certain that it rapidly declined during the long and miserable interval between the death of Aurungzebe and the establishment of British ascendancy, which may be dated from the defeat and death of Tippoo Sultan and the first great check given to the power of the Mahrattas, under the administration of Lord Wellesley. And even since that period, down to the close of the last Sikh war and the annexation of the Punjab, the rulers of British India have had but little time and thought to spare from the struggles of ambition or of self-defence and the constantly recurring anxieties of an exhausted exchequer, for the appreciation and supply of the material wants of their subjects and the cultivation of the useful arts.

Still something—however inadequate—was done during the second quarter of the century; and the marvellous energy of Lord Dalhousie, grasping and controlling every branch of the administration, and mastering the details of every department, was able, at the same time, to carry into execution two great and novel schemes of material improvement,—a system of trunk railways, connecting the three Presidencies with each other and with the principal centres of production and commerce, and the first exhibition in Asia of the magic powers of the Electric Telegraph. Then came the terrible catastrophe of the Sepoy mutiny, which, however great its sorrows and its bitterness, has done more, beyond all question, to dispel illusion, to quicken perception; to lift men's minds out of the wheel-ruts of custom, and to set them to work with fresh vigour upon new subject-matter, than could have been effected by any number of years of sleepy acquiescence in traditional modes of thought and action. It did for India, by a shorter and less widely painful process of awakening, what the Revolution of 1793 did for France.

This golden opportunity is the inheritance of the present

generation of Englishmen. Whatever the conquerors or administrators of India in earlier times may have to answer for, we are satisfied that the Mutiny of 1857 was in no manner or degree the consequence and retribution of civil misgovernment. It was the ferocious outbreak of a pampered and blindly trusted soldiery, not the insurrection of an oppressed and indignant people. As, then, this great moral thunderstorm has cleared the atmosphere, and done so much to render progress and improvement both easy and safe, let us press forward, without misgivings as to the past, in the path from which so many obstacles have happily—may we not say—Providentially—been removed for us; and take advantage of the freedom from enemies without, as well as from domestic troubles, which India is now enjoying, to win for her people—so entirely dependent upon us for good or evil—every trophy which we can secure by the victories of peace.

Happily, all that India needs beyond the essential elements of wise legislation and general good government, for the prompt and complete development of her vast natural resources,—namely, English capital, enterprise, and energy,—can be supplied with equal benefit to both countries. There is room in the wide regions of our great dependency for many men of capital, even for men of small capital, if its possession be combined with the qualities of mind and body essential to the successful fighting of the battle of life in a new land. And although we shrink from encouraging those who are not possessed of moderate means of independent support, or of friends in a position to receive them on their first arrival, to risk a voyage to India, in the mere hope of meeting with employment there, it is certain that there is a great and increasing demand for the services of young men of character and intelligence, as managers or superintendents of the many hundreds of plantations, works, and factories, which are growing in number and importance in every part of the country.

India is now thrown absolutely open to English enterprise. There is no obstacle, in law or practice, to as free an acquisition and tenure of land by all British subjects as are enjoyed by the natives of the country. It will be seen, when we come to treat upon the several articles of agricultural produce to which English industry and skill are especially directed, how easily and largely our adventurous fellow-countrymen can obtain possession of whatever land they stand in need of. As regards all land now waste, or which has been reclaimed from that condition within the last thirty or forty years, under leases from the Government, an absolute right of property in fee-simple may

be acquired on very moderate terms. We have recently learnt, on the first authority, that the land suited for tea, which is advertised for sale by auction in Assam (where there is great competition), during this winter, is not expected to sell at a higher price than 2*l.* per acre. The revenue assessed upon lands which are borne on the regular rentrolls of the several districts cannot, indeed, be redeemed, so as to give the proprietor an absolute fee-simple tenure of such an estate; but if the landholder thinks fit, he may deposit with the collector bonds of the Government yielding an interest equal in amount to the assessment upon such estate, and can thus relieve himself from all trouble and anxiety with respect to the payment of the revenue. It is not easy to see how a landowner taking advantage of this privilege is in a worse position than if he had sold the bonds, and had been allowed to redeem the revenue with the proceeds. Indeed, in one respect his condition is better, seeing that he may recall the bonds, at will, in the event of his finding a better use for his capital. On the other hand, the Government would not be damaged to the amount of a rupee by conceding the right to redeem in regard to all estates the revenue of which has been or may be fixed in perpetuity,—assuming, of course, that the price paid is sufficient to redeem an equivalent amount of the public debt. Therefore, believing that the high rate of interest normally ruling in India would effectually prevent any such excessive exercise of the privilege as might prove embarrassing to the Government, by filling its coffers with capital, to the diminution of its annual revenue, we are clearly of opinion that the right of redemption, alleged to be so much coveted, might—within the limits above specified—be safely and advantageously conceded.

The first essential to national prosperity and progress is a solvent exchequer. But the keen and somewhat angry controversies on questions of finance, which have recently inspired the public mind with a more than usual interest in Indian affairs, have relieved us from the necessity of dwelling at any length on this primary branch of our subject. After long years of chronic deficit,—a state of things, however, which is attributable in great measure to the practice, unknown elsewhere, of constructing important public works, and paying interest upon the hitherto unremunerative capital of great joint-stock companies out of current revenue,—India at last exhibits an undeniable and substantial surplus. This, amounting to 1,280,596*l.* in 1862–3, is estimated at 480,775*l.* in 1863–4, after the remission of 1 per cent. of the income tax, and a reduction of other taxes to a considerable extent. But

the real significance of such a result cannot be properly appreciated unless it be borne in mind that this sum of nearly half a million is the favourable balance of an account to which 4,700,500*l.* has been debited on account of Public Works, and 1,912,425*l.* on account of interest, &c., upon railway capital, in excess of receipts from traffic, or 6,612,915*l.* in the aggregate. And, if only the opium revenue do not fail, there seems to be a reasonable certainty that this state of national solvency may be established for years to come as the normal state of things, and that the income tax may be altogether removed at the close of the period for which it was originally imposed. Of course, these bright hopes are entirely dependent upon continued peace, and no less upon persistent economy. But the mention of that essential condition of financial prosperity compels us to add, that the happy state of things which now exists, and to which we look forward, is very far from being corroborative of the opinions of those who, when the finances of India were in the lowest abyss of deficiency, preached with so much warmth the doctrine that economy alone would be amply sufficient to restore the desired equilibrium between receipt and expenditure, and that new taxes of any sort, as conducing to discontent, and even to the probable renewal of disturbance, would be more likely to add to our expenditure than to increase our income. No less than 5,108,059*l.* of the revenue of 1863-4 is derived from taxes newly imposed, or from the additions made to old taxes; so that if the advice rashly tendered in 1860, by those not responsible for the consequences, had unhappily been followed, India would either have been compelled to abandon all her public works, or would still be labouring under the crushing effects of a deficiency so large, that any attempt to get rid of it by mere reduction of expenditure must have led directly to a mischievous crippling of the administration, if not—had danger threatened—to a perilous weakness in the sinews alike of war and of good government.

From revenue the transition to commerce is natural, and the broad view of the subject is highly satisfactory. During late years the exports from India of merchandise to all parts have gone on increasing, as the following statement shows, in a rapidly accelerating ratio:—

1841-42	1851-52	1861-62
£	£	£
13,885,218	19,879,254	34,894,767

We very much doubt whether the commercial annals of any other country, at any period of history, could exhibit so great an increase in the amount and value of exports, from a starting

point little short of fourteen millions, within the space of twenty years. It is easy, of course, to double small figures, but it is a very different thing to raise fourteen millions to thirty-five.

It has been said that the large value of the exports from India in 1861-62 is due rather to the very high price of cotton, than to any general growth of trade. There is a measure of truth, no doubt, in this inference; but the great misapprehension entertained as to the influence of the price of cotton upon general results, would seem to be due to the remarkable entry in the Returns published by the Board of Trade of 34,149,597*l.*, as the value of imports into the United Kingdom from India in the year 1862. We call these figures remarkable, because the Returns from India for the year 1861-2 exhibit only 34,894,766*l.*, as the value of the gross exports from that country to all parts of the world, of which no more than 17,388,146*l.* is stated to have been sent to the United Kingdom. We are well aware, of course, that the two periods do not tally, but we see no reason to believe that if the Indian Returns had, like those of the Board of Trade, embraced the whole of the year 1862, instead of stopping short at the 30th of April, the aggregate results would have differed very materially from those now exhibited. The only way in which we can account for the enormous difference between the two Returns is, that the Board of Trade must have estimated the cotton at double the value, at least, that was put upon it in India. If so, the fairness of the Indian Return is unquestionable. At any rate, this much is clear, that if our own imports from India in 1862 exceeded 34,000,000*l.*, the exports from India to all parts of the world, during that year (including some seven or eight millions sent to China in opium), must have approached, or even exceeded, fifty millions. So that, in either case, the argument against the correctness of Sir Charles Wood's statement, in his speech on the Indian budget, founded upon the Return of the Board of Trade, falls to the ground.

Within the last twenty-five years several articles of great commercial value have been added to the exports from India. Of these the chief are oil seeds, jute, wool, coffee, and tea; and the table annexed will show from how small a beginning the trade in these products has rapidly grown into importance.

VALUE OF EXPORTS.

	1842	1852	1862
	£	£	£
Oil seeds . . .	2,377	501,420	1,197,469
Jute . . .	24,941	180,976	537,610
Wool . . .	77,591	100,612	400,342
Coffee . . .	74,957	84,306	462,380
Tea . . .	17,244	59,220	192,242

The case of oil seeds is peculiar. Up to the time of the Russian war, which shut out England from her accustomed source of supply, the increase of exportation, although large, appeared to have reached its limit, since during the three years ending with 1854 the value of the shipments had been stationary. In 1854 it was only 471,797*l.*, or somewhat less than in 1852. But the demand resulting from the exclusion of the supply from Russia raised the value in 1855 to 812,799*l.*, and in 1856 to 1,273,457*l.*, showing how capable India is of responding effectually even to a sudden call, backed by a sufficient price. The value of the export in 1862 is considerably below the average of the last seven years, which is 1,480,470.

Jute is exported only from Bengal; wool, principally from Bombay. The quantity exported in 1860 was somewhat greater than in 1862. But the most remarkable, as it promises to be the most valuable, of all the new articles of export from India, is tea. The circumstances under which the cultivation of this plant, and the manipulation of its leaves, were first brought about, in modern times at least, are very interesting, and well worthy of being placed upon record.

For several years after our acquisition of Assam, at the close of the first Burmese war, reports were rife that the tea-plant was to be found in that province, either of indigenous growth, or as the relic of a long-forgotten cultivation, at a period when the valley of the Brahmapootra was comparatively populous and civilised:—a state of things of which other traces remain in the shape of massive embankments, manifestly lines of high-road, but now overgrown with forest trees of the largest size.* In consequence of these reports, Lord William Bentinck appointed, in 1834, a committee (of which we believe that Sir Charles Trevelyan and Mr. Ross Mangles are the only survivors), to investigate the subject; and this committee reported, in December of that year, ‘that the tea-shrub was, beyond all doubts, indigenous in Upper Assam; and that they were perfectly confident that the tea-plant which has been brought to light will be found capable, under proper management, of being cultivated with complete success for commercial purposes.’

This discovery was followed up, both by a mission to China to procure plants, seeds, and skilled cultivators and manufacturers, and by the deputation of three scientific officers to

* When a plantation was being formed by the Company, adjacent to one of these raised roads, several brass guns of large calibre, and bearing very ancient dates, were dug up.

Assam, to examine not the tea-plants only, but also the soil and climate of the province. This was deemed essential, notwithstanding the certainty that the plants were already growing there, because an opinion was, at that time, strongly entertained (on the ground, it would seem, of some erroneous impressions regarding the climate of the tea-producing provinces of China), 'that a decided winter climate, of six weeks' or two 'months' duration, with frost as well as snow, was essential to 'ensure final success with really good sorts of tea.' Both expeditions were, on the whole, successful, although most of the Chinese plants and seeds (some of which were forwarded to Madras and the Himalayas, as well as to Assam), appear to have perished; for the cultivation by the skilled Chinese of the native shrubs, some of which were found of a size entitling them to be called trees, was prosecuted with considerable vigour at the cost of the Government; and the excitement produced by the appearance in London of the first batch of eight chests of Assam tea, in the year 1839, was such that the whole of it sold at prices varying from 16s. to 34s. per lb. Indeed, only one lot sold as low as 16s., the average of the whole being 24s. 6d. per lb.

These, of course, were 'fancy' prices, consequent upon the strangeness of the appearance in the English market of tea from any other quarter than China. But the real and practical result of the novel importation was the formation of a company, under the title of 'the Assam Company,' having for its object the production of tea in that province. Among the first directors of this Company were several gentlemen of varied experience in the matter, and of great sagacity in business, such as Sir William Baynes, formerly chief of the East India Company's Factory at Canton, Mr. Thomas Weeding, and the late Mr. John Travers, so well known both in the political and the commercial circles of London.

This was the starting point of the present cultivation of tea in India. The Government transferred its gardens and establishments to the Tea Company on very liberal terms. But the management of its affairs in India was intrusted to reckless hands, its paid-up capital of 200,000*l.* was exhausted, and the directors in London were on the point of abandoning the concern in despair. At this crisis, after the shares of 20*l.* each had been sold in Calcutta for less than one rupee, and one hundred and fifty of them had been offered in London as a free gift to any one willing to take them with their responsibilities, a change greatly for the better took place in the administration of the concern in India; and

after a long and arduous struggle, the first dividend upon capital, the investment of which had commenced in 1839, was paid in 1852, and then at the rate of no more than $2\frac{1}{2}$ per cent. per annum. Since that date, the progress of the Company, though very gradual in the first years of the series, has been uninterrupted; and the dividend paid this year was 12 per cent. The shares are now quoted in Calcutta, where their real value is best understood, at 58*l.* to 59*l.*

The crop of 1861 amounted to 933,850 lbs., and was sold for 86,080*l.*, 'after deducting the cost of lead, freight, marine 'and fire insurances, and sale charges.' The crop of 1862 is estimated at 1,031,717 lbs., and that of the current year at 1,050,241 lbs. The Company's new plantations in Cachar, the whole cost of forming which was defrayed out of the surplus profits of the gardens in Assam, yielded 49,008 lbs. of tea in 1862, and have since been sold for 60,000*l.* Seed was also sold in 1862 to the value of 14,000*l.*; and the proceeds from the same source this year are estimated at nearly 20,000*l.*

It will be readily believed that the Company had not many followers in the field of enterprise during the long years of poverty and disaster from 1839 to 1852. But when it emerged from that condition, or rather when it began, at a later period, to yield, at last, a somewhat adequate return for the capital invested, paying 8, 9, and 10 per cent., as it did in 1857, 1858, and 1859 respectively, with prospects of still better dividends,

'Applications for grants of land,' says Dr. Lees, 'now poured in, and were complied with by Government on the most liberal terms.' He proceeds:—'there are now in Assam 160 plantations, owned by sixty companies and individuals. The quantity of land appropriated to the cultivation of tea by the latest returns (July 1862), had reached the sum of 71,218 acres, 13,222 of which are actually under cultivation, bearing an estimated crop of 1,788,787 lbs. of tea.'

Nor has the adventure been confined to Assam. In the adjacent province of Cachar, where also the tea-plant has been found growing wild—

'Upwards of 68,149 acres have been leased to tea-planters; there are thirty-one working concerns; and though the experiment has a development of only six years, 6,077 acres have been brought under culture, the estimated crop of which for the year is 336,800 lbs. of manufactured tea.'

The tea of Cachar has been pronounced by London brokers to be 'quite equal in every respect to the best Assam.' At Darjeeling again—a hill station on the lowest range of the Himalayas, looking down on the northernmost point of the plains of

Bengal—8,762 acres have been brought under tea cultivation with seed from Assam; and the crop of 1862 was estimated at 78,244 lbs. Successful experiments have also been tried at Chittagong, in the extreme south-east of Bengal, and upon a larger scale in Sylhet, a district bordering on Cachar, where the prospects of planting are said to be very favourable.

Almost simultaneously with the commencement of operations in Assam, experimental gardens were laid out, by the direction of Government, on the skirts of the Himalayas in the North-western Provinces. Some of the plants and seeds brought from China by Mr. Gordon, during the administration of Lord William Bentinck, were despatched to that quarter. It is stated, however, that 'not a single seed germinated, and of the 20,000 seedlings, but 2,000 reached their destination alive.' But this small stock was so carefully nursed by Dr. Falconer, that with but little addition from China (we believe that no Assam seed has been tried in the North-west), he succeeded in making an effectual start in the cultivation; and nine Chinamen having been sent up from Assam to Kumaon in 1842, a small quantity of tea was manufactured in the autumn of that year, and was taken by Dr. Falconer himself to England.

This and other specimens of the same year's crop were reported by one eminent broker, as 'equal to the superior black tea generally sent as presents, and better, for the most part, than the China tea imported for mercantile purposes;' and by another, as being of 'a delicate fine flavour, and such as would command a ready sale here.' Indeed, the tea of the North-western Provinces, raised entirely, as we have stated, from Chinese seed, appears to have retained its character to this day, as being finer and more delicate in flavour than the produce of Assam.

'Having taken,' as they stated in a despatch to India, on the occasion of further consignments of small quantities of highly-approved tea from the same quarter, 'a deep interest in this subject, to which they attached great importance,' the Court of Directors deputed to China Mr. Fortune, a botanist of reputation, and specially acquainted with that country, to collect plants and seeds. That gentleman proceeded twice on this errand, bringing back with him not only a large stock of seeds and seedlings, all of which, we believe, were despatched to the North-west (the planters in Assam preferring to rely on the acclimated plant of that province), but a valuable fund of information regarding the culture and manufacture of tea in China. But the chief merit of the success that eventually crowned the experiment in the North-west, is due to Dr. Jameson, the

successor of Dr. Falconer as Superintendent of the Botanical Garden of the Government in that quarter, who devoted himself to the task, under great and repeated discouragement from various causes, with very rare intelligence, energy, and perseverance. Great credit appears to be due to the Government also, for the care that they have taken to prevent their experimental gardens from falling into the possession of a few monopolising speculators, and thus preserving in their own hands the means of supplying all cultivators alike with plants and seeds. The result of these measures is thus stated by Dr. Lees:—

‘By a late return, I find that there were established at the end of last year in Kumuon 18, in the Deyrah Dhoon 25, in Gurhwal 3, at Simla 3, in the Kangra Valley 26, and at Kooloo 3, or a grand total of 78 *bonâ fide* tea-plantations. Of this number 37 are in the hands of European companies and individuals, and the remainder are worked by natives.’

This last is not the least encouraging and satisfactory feature of the case.

‘Last year, 89 tons of tea-seed, and 2,400,000 seedlings, were distributed gratis to private planters from the government factories, and yet, though so immense the supply, it fell far short of the demand. Many indents sent in could not be complied with.’

So rapid are the strides with which this particular industry is advancing, that even since the preceding pages have been in type, the figures which we have quoted from Dr. Lees’ volume have been outstripped by further progress. Instead of the area of tea-plantations in Assam being ‘71,218 acres, 13,222 of ‘which are actually under cultivation,’ it appears from later accounts that ‘the aggregate area of all tea grants in Assam ‘is close on 123,000 acres, of which upwards of 20,000 are ‘under cultivation, the clearing last year amounting to 6,000 ‘acres.’ Several pages in recent Calcutta Gazettes are filled with notices by the Government of lots of waste land to be put up for sale to the highest bidder above the upset price of 2 rupees 8 annas (5s.) per acre. The number of lots advertised in three of the divisions of Assam amount in the aggregate to 66, with an area of 54,371 acres; the size of the lots varying from 200 acres (with a single lot of 60 acres), to 3,000 acres.

There has been a like increase of cultivation and production both in Cachar and at Darjeeling. But it is in the North-western Provinces, and in the Punjab, that the rate of progress appears to be most remarkable. We wish that the space at our command would permit us to publish *in extenso* Dr. Jameson’s

Report of the 8th of May last, in which, after stating and proving by statistics which may well be called marvellous, that the 'move is already a national one, and the part which it was necessary for a great and powerful Government to play, is completed,' he recommends that the tea-plantations belonging to the Government in Kumaon and the Dehra Dhoon should be sold, in fee-simple, for the highest tender above the upset price which may be received before the 1st of April next, advertisements to this effect being issued in England as well as in India.* We understand that this proposal has been sanctioned, and that the same course will probably be followed in regard to the Government plantations in the Punjab. That at Paoree in Gurhwal has already been sold for 10,000*l*. Dr. Jameson proceeds:—

'In the home markets, teas, the produce of the Government factories in the North-western Provinces and the Punjab, are well known, but seldom seen. The sample about to be transmitted, consisting of 300 40-lb. chests, will show to London capitalists the kinds of tea capable of being produced, and will thus assist, along with advertisements, to attract attention to the plantations which are shortly to be thrown into the market.'

The assistance rendered by Dr. Jameson, acting under the liberal orders of the Government, to private planters, has by no means been confined to the free grant of seeds and seedlings. 'To many planters, both English and natives,' he states, 'experienced tea cultivators and tea manipulators have been given, and in every tea factory from Kumaon to Kangra, men educated in the Government factories are to be found.' In consequence, he adds, 'already many estates, raised entirely from plants and seeds supplied gratis from the Government plantations, have changed hands for large sums of money, as the Harbunswallah estate in the Dehra Dhoon for 50,000*l*.' It is stated also that four experienced men have been sent to Madras, for the instruction of planters in the Neilgherries.

The tea of India will not compete with the produce of China in the English market alone. Dr. Jameson tells us that a Cashmerian trader has recently bought 1,300 lbs. for transportation to Bokhara; and we understand that the manufacture of 'brick-tea,' for sale in Tartary, has been commenced. But all that has been done and is doing, is only a feeble foreshadowing of an enormous cultivation and trade. We are told that the

* The day of sale has since been postponed to the 1st of October 1864, in order to allow full time for capitalists in England to communicate with India, and to receive replies before they send in their tenders.

tea-plants are now thriving over 4.30 degrees of latitude and 80 degrees of longitude, a tract containing upwards of 35,000 square miles. Were all this area planted, and yielding only 100 lbs. per acre, the produce would amount to 930,000,000 lbs. ; and Dr. Jameson tells us, that ' with high cultivation the figures ' might easily be doubled.' When moderately good tea can be sold at a low price, the consumption in India alone will be very great. And it is satisfactory to know that ' many fine plantations have been formed by wealthy and intelligent natives.'

The value of the exports of tea from India has risen in the last twenty years in the following proportion :—

1842	1852	1862
£	£	£
17,244	59,220	192,242

But this statement by no means exhibits the full amount of production. The produce of the North-western Provinces commands so high a price upon the spot, that a very small proportion of the whole is exported, and the Assam Company sold last year 20,000 lbs. to the commissariat at Calcutta. But even thus, the exportation to England is increasing so fast, that ' the trade ' have recently found it necessary to appoint distinct days for the public sales of Indian teas.

These are highly gratifying reports of progress in an industry novel to India, of great interest and importance ; and after reading such statements we find it very difficult to believe that a Government which gave away twenty years ago its nursery plantations in Assam, to the first Company that presented itself with a capital sufficient to develop the experiment ; which has granted so freely, year by year, tens of thousands of acres of land to tea-planters in Assam, Cachar, Darjeeling, and the North-western Provinces ; and which distributed last year, gratuitously, seeds by the ton and seedlings by the million, can have been so persistently hostile to the prosecution by Englishmen of industrial enterprises in India, as it has been the fashion in some quarters to represent it. This much, at any rate, is evident, that there was no insuperable difficulty in obtaining large grants of waste land, in many parts of India at least, not only before the date of Lord Canning's celebrated resolution, but even in the days of the Court of Directors.

Whilst the valley of the Brahmapootra and the slopes of the lowest range of the Himalayas, from Darjeeling round to Kangra, are being clothed with tea-plantations, the cultivation of coffee has advanced with rapid strides in the highlands of

Southern India. The introduction of the plant is ascribed by tradition to a Mahomedan pilgrim, who brought seven berries of coffee from Mocha about two centuries ago, and planted them near his hermitage in the wild hills of Mysore. Whatever the origin of the culture, however, it is only of late years that the produce has become considerable. Up to 1837 the revenue was farmed out. In that year a new system was introduced, and an export duty of 2s. per maund of 28 lbs. was imposed. Under a gradual reduction of this duty to 6d. per maund, the produce has increased from an annual average of 15,238 maunds, to an average, during the twelve years ending with 1861, of 346,683 maunds. 'Together with the reduction of duties, regulations for taking up and holding coffee lands were adopted.' Colonel Onslow (to whose memorandum in Dr. Forbes Watson's catalogue of the Indian contributions to the International Exhibition of 1862 we are indebted for our information), proceeds—

'The plant is now extending over tens of thousands of acres in Coorg, the Wynaad district, the Neilgherry hills, and along the western Ghats, north and south. In Mysore, the number of European coffee-planters has, within the last ten years, increased to twenty or thirty. The number of native planters is estimated between three and four thousand, and these numbers are fast increasing.' 'This elevation' (from 3,500 to 4,000 feet above the sea) 'gives a pleasant climate, well suited to Europeans. During the south-west monsoon, the planter may be in his gardens all day long without oppression in the hottest weather; the thermometer in the house in these plantations rises no higher than 81° or 82° Fahrenheit. The whole of the coffee district, with here and there an exception of feverish spots, possesses a climate in which the European can live and work with comfort, and, with moderate care and prudence, throughout the whole year.

'Planting has of late years been carried to such an extent in Mysore, that but little available land remains. Those mountain and forest wastes have been turned into rich productive gardens. From being the most wild and desolate parts of Mysore, these districts have become very prosperous; and the people have been raised from poverty to comfort, and in many instances to wealth. The natives are benefiting largely by the capital and example of European planters, and are learning the science of planting.

'Mysore generally, especially the coffee districts, affords the most promising field for European capital and enterprise.'

If there be any truth in these statements, written by a gentleman of long practical experience—for Colonel Onslow held high office in Mysore for many years, and has been, since his retirement from the service, a joint owner of the principal and most prosperous coffee-plantation in that province—we must

say again that it is impossible to believe that waste land cannot be freely obtained in India for any purpose of agricultural enterprise. In a very recent despatch, the Commissioner (Mr. L. Bowring) states: 'The coffee grants may be numbered by ' thousands, and a very large number among these have been ' given to Europeans.'

The sites of the principal tea and coffee plantations are designated in the Map prefixed to this article.

There is another plant—compared with the growth of which, in India, even our tea-plantations are of ancient date—which promises to take a high place, in point of interest and value, among the products of that country. We refer to the Chin-chona; but the narrative which we gave in our last Number of the means by which the seeds and seedlings of this health-giving tree have been transferred from its natural habitat on the slopes of the Andes to the Neilgherries and other sites in the hilly regions of India, and of the signal success of the experiment, renders it unnecessary that we should enlarge upon the subject.

From tea and coffee—from products which have sprung into existence in India within the second quarter of the present century, which have already outstripped the most sanguine expectations of the first adventurers, and which are yearly assuming larger proportions,—we turn to cotton, a plant indigenous to India, the original culture and manufacture of which are lost in the remotest antiquity, and with which she, at one time, supplied the world. After the paper on this subject published in our Number for April 1862, it cannot be necessary that we should again enter at length upon the vexed question of the supply of cotton from India. From the lips of men, not mere disciples, but very teachers in the school of the sternest political economy, have proceeded, under the stress of the cotton famine, sentiments and suggestions as wild and heterodox as any uttered during the heat of the corn-law controversy by the most violent and illogical of the farmer's friends. Reviewing in November last the prospects of the trade, in a letter to a newspaper, Mr. Cheetham wrote:—'Of India, ' I regret I cannot take so hopeful a view' (as of Egypt, Turkey, and Italy). 'As long as high prices prevail, she may ' furnish us with a considerable quantity of cotton; but when ' this stimulus is withdrawn, and the day of competition returns, ' as return it will, then will she descend, I fear, to her former ' subordinate position in the cotton markets of the world. This ' result will be owing to the inferiority of her staple, the imperfection of her agriculture, the ignorance of her ryots, the

'frauds of her middlemen, and the indifference of her rulers.' Mr. Cheetham may depend upon it that the ryots of India, ignorant as they may be, will continue to grow cotton as long as it is as profitable, at least, as other crops, and no longer. Would he have the Government, which he charges with indifference, interfere to compel the ryot to cultivate the less profitable crop? We entreat the keen men of Lancashire to bear in mind that India is not like the Southern States of America, a huge cotton farm, with a sparse population, fed principally, under normal circumstances, with imported food; but a country largely, and in some parts, very densely peopled, and raising not only cereals for its own consumption, but many other articles in demand both for use and enjoyment at home, and for exportation to all parts of the world, most of which pay both the grower and the merchant at least as well as cotton can be expected to pay, under ordinary circumstances, in years to come.

Already the intensity of the demand has induced strange devices to meet it, and has inflicted distress upon more than one class of the native community. Not only have the warehouses at Mirzapore and other marts of trade been emptied of their old and probably damaged stock, but all the rubbish that could be got together and screwed into bales, including even, it is said, the wadding of furniture, quilts, and cloaks, has been shipped to England: circumstances which will account, in some measure, for the complaints of the inferior quality of recent importations. The native spinners and weavers have thus been deprived of a sufficient quantity of the raw material for their own use, and are reduced in some parts of the country to extreme distress. But for a happy demand for labour upon railways and other public works, their sufferings would have been still more severe. The people of the northern and other more elevated parts of the country, whose dress and coverlets in the cold season are mainly composed of cotton fabrics quilted with cotton wool, have been put to very great inconvenience, to say the least, by the extremely high price to which an article of such prime necessity has risen. Thus the distress of Lancashire has reacted in more ways than one upon India. On the other hand, the profits made by those who have immediately furnished the supply to England have been enormous. We have been assured on the highest authority, that at Bombay alone these profits, added to what has been gained by the rise in the price of piece goods, have amounted, within the last year or eighteen months, to the almost incredible sum of from twenty to twenty-five millions sterling. In these gains the Parsee and Hindoo

merchants of that city have largely participated, and so, no doubt, have the various grades of middlemen in the interior. We trust that some drops from this full cup of profit have trickled down to the ryots.

For the future, we believe that if, as seems highly probable, an effective demand for Indian cotton is maintained for a moderate further period, the supply will not only be rapidly and largely increased, but—if the reaction of price be not very sudden and severe—will be permanently maintained. Earnest endeavours have been made both to improve the general quality of the produce, and to prevent the adulteration of that which is good. Legislation has been put in action for the last-mentioned end. Last season the crop failed in many parts of the country. By the latest account it appears that the prospects of the present year are much more favourable. Mr. Cheetham stated in his letter above quoted that the actual importation of 1862 had amounted to 1,072,000 bales; and he estimated the supplies of 1863 and 1864 at 1,200,000 bales, and 1,500,000 bales respectively. To the latter estimate, Mr. Ashworth added 50,000 bales. Although Mr. Cheetham desponds, we believe that even the larger expectation will be exceeded. In some of the districts of Madras, the cultivation, though not yet upon a very large scale, appears to have greatly increased; the number of acres under cotton being officially reported as 82,230, against 29,658 acres in 1862. As respects the Punjab, the Lieutenant-Governor, Sir Robert Montgomery, after speaking of the hopeful prospects of flax*, adds, ‘could some of our European capitalists connected with the cotton trade be induced, after the example set by the Belfast Association in regard to flax, to send out agents to this country capable of instructing the people, and authorised to give prices varying with the excellence and cleanness of the cotton produced, two or three years would see a vast change effected.’

Upon one point a few words are necessary to disabuse the minds of those who have not given any special attention to the subject. Not Mr. Cheetham alone, but the spokesmen of the manufacturers in Parliament and elsewhere, have accused the Government of India of indifference to the wants of our great manufacture, or worse. The simple answer is, that while, with a single excep-

* We have lately seen an interesting memorandum in MS. on the ‘*Dæmia Extensa*,’ described as ‘a perennial creeper growing in every hedge of the Dekhan and south of India,’ and as yielding a fibre apparently equal in beauty and strength to flax. It is inferred from the imperfect experiments that were made, that the yield per acre of the plant, when carefully cultivated, would be very large.

tion, the Government has not found it necessary to advance a step beyond the bounds of its legitimate functions to promote any other industry, or to stimulate any other sort of production, it has spent far more thought, more time, and more money in the attempt to increase the growth and improve the quality of cotton, than has served to create the production of tea, and to launch that industry upon a career of unprecedented success. Even now, after the tea-planters of Assam have been left for more than twenty years to their own resources, and after that novel cultivation has spread spontaneously from that province to Cachar, Sylhet, and Darjeeling,—the Government is employing Dr. Forbes to manufacture gins in Dharwar to clean the American cotton, which has thriven greatly in that part of the country. According to the last accounts he was turning out these gins at the rate of eight a day, selling them at prime cost, for 30*l.* each, whilst he had upwards of 1,000 applications for them on the books of the factory, and fresh applications were being daily registered. And so eager was the demand for the article, that a body of native workmen had combined to supply an imitation of the machine, getting as much as 60*l.* or 70*l.* for immediate delivery. Both the American cotton and Dr. Forbes' gins are extending themselves into Mysore, beyond what was, till recently, supposed to be the extreme limit of the climate adapted to the New Orleans' seed; but gins are yet to be invented fitted to clean the native cotton, and we are told that a different gin will be required for each variety. We shall show presently what sums have been expended in roads during the two last years, mainly to facilitate the transport of cotton to the ports of shipment.

The cultivation of indigo was the first to which English enterprise was attracted in India. The plant is indigenous, as the name (corrupted from *Indicum*) implies; it is mentioned by both Pliny and Arrian; and 'in the seventeenth century,' says Dr. Royle, 'the consumption of indigo in Europe was so considerable, that the sale of woad was much diminished, and the use of indigo was prohibited by an Imperial edict, published in 1654.' The East India Company imported it largely during the first century of their existence. But soon after that period the superior industry and skill in the manufacture of the Europeans settled in the West Indies and the low latitudes of the American continent, drove the East Indian drug almost altogether out of the market, in spite of the superior fitness of soil, or climate, or both, for its production, which subsequent experience has proved Bengal to possess. It was not

until about 1780 that the growth and manufacture of indigo were systematically undertaken in that province by English settlers, acting under the encouragement of the East India Company. On the 30th of May 1792, the Directors wrote, 'It affords us much pleasure to remark that the article, as to quality, is still increasing in reputation. It has already surpassed the American and French, and there is no doubt that, by perseverance and attention on the part of the planters, it will effectually rival the Spanish.' From that time the Bengal drug rapidly obtained the command—almost, indeed, the monopoly—of the trade, which has of late years been shared, in a minor degree, by the produce of other provinces of India; and although the manufacture has recently sustained a very serious, and to individuals, we fear, a ruinous check, in the districts where the plant has been longest and most profitably cultivated, we have no apprehension that India will lose the vantage ground which she recovered more than half a century ago.

Unhappily, however, the mischief resulting from the differences between the indigo-planters and the ryots, occasioning the check to which we have referred, has not been pecuniary alone. Much bad blood has been generated, and much irritating recrimination has ensued between classes whose kindly feelings each to the other are essential to the smooth working of so anomalous a state of things as the settlement of a handful of Englishmen among millions of natives; one half of the former class being the delegated rulers of the country, bound to administer even-handed justice between man and man, without respect of persons, and the other half keen and energetic traders and planters, proud of their Anglo-Saxon blood, and but ill-inclined to recognise in practice that equality with their native fellow-subjects in the eye of the law, which is the unquestionable theory of their position. In the quarrel between the planters and the ryots, there were great faults on both sides, faults congenial to their respective characters—high-handed assumption, and sometimes violence and oppression on the one side, and fraud and trickery on the other. Not that all the planters were wilful wrongdoers, far from it; many of them were eminently honest and benevolent men, kind and helpful in a hundred ways to the people about them. But among a large number of Englishmen, not a few of them very indifferently educated, living much alone, or with persons of the same pursuits and interests, impressed with an over-weening sense of their superiority to the natives, and out of the reach of any public opinion competent to control them, it cannot surprise us that

some, at least, should conduct themselves towards the inferior race with whom they had to deal as—to our shame be it confessed—so many Anglo-Saxons similarly situated, have behaved and are behaving in all quarters of the globe. And all the planters, good and bad alike, had, of necessity, to employ unscrupulous and extortionate native agents and accountants. These men ground and cheated the ryots without moderation or mercy. An Irishman, who knew his own country well, said in the House of Commons, that ‘if you put one Irishman on a spit, you will never want another Irishman to turn him.’ And this is emphatically true of Bengal. There the orders of the most reckless Englishman determined on taking the law into his own hands, would assuredly be overstepped by the outrages of his native servants. If the command were given to pull down a single recusant’s hut, the execution might be expected to involve the wrecking, if not the burning, of a whole village.

On the other hand, there is no doubt that the honest fair-dealing planter suffered great provocation. He made contracts, and advanced money for their execution, and then often saw the quasi-mortgaged fields planted with rice, or the indigo which he had paid for cut, carried away, and sold to a rival factory. But even this gross fraud on the part of the ryot was not without palliation. Unless under the constraint of the strongest moral principle, it is not in human nature to stand, as the losing party, to a one-sided bargain. In some parts of the country advantage was systematically taken of the ryots’ necessities to tempt them to receive advances to grow indigo on terms which all the parties concerned well knew to be inadequate. Can we wonder that men with habits of thought and action, the growth of centuries of misrule and oppression, and of the worst of false religions, should have felt the obligation of such engagements a very light one; and having long since spent the advance, should be ready and happy to sell their mortgaged crop a second time for ready money?

The vital point at issue between the planters and the ryots was, in fact, conceded in favour of the latter, when Mr. W. F. Fergusson, the nominee and representative of the planters in the Indigo Commission, wrote in his minute dissenting from the report of the majority of that body, that ‘the recent crisis, though accelerated by an unfounded belief on the part of the ryots that the Government was opposed to the cultivation of indigo, must have sooner or later occurred, owing to the disturbance which has taken place on the relative returns to the ryot from indigo, as compared with cereals and other

‘cultivation; and the planters would have done well had they paid earlier attention to the above facts, and met the ryots with a more proportionate remuneration.’

It cannot surprise us that men paid less, year after year, for growing indigo than they could make by growing rice or any of twenty other crops—paid too, what they ostensibly got, through the itching palms of the native harpies whom we have described, and feeling conscious that they had long been thus wronged and defrauded—should have struggled passionately and often unscrupulously to get themselves quit of their trammels. Unhappily, the best and the worst among the planters suffered equally in this rural revolution. In some large tracts of country, the very name of indigo was hateful to the people. The planters, on the other hand, were not the men to succumb tamely to what, in some cases, was little less than ruin.*

Meanwhile nothing could be more violent and ill-judged than the tone for months together—when large districts of Lower Bengal were in imminent danger of being devastated by a jacquerie—of that portion of the press of Calcutta which assumed to be the organ of the whole non-official British community. They clamoured, at the same time, for a contract law, the gist of which was to render the ryot who failed to fulfil an engagement to deliver agricultural produce liable to punishment as a criminal; and they were so ignorant of the state of public opinion in England as to believe that the press, or Parliament, or both, would compel the Home Government to consent to deliver over the ryot, bound hand and foot, to grow indigo, on the planter's own terms. At the same time they charged the public servants of the Government holding office in the district where the contest was raging with the same bitter hostility against the independent planters as ‘interlopers,’ which had marked the earlier rule of the East India Company.

The charges against the Government and its servants that they regarded British settlers as ‘interlopers,’ to be discouraged and thwarted in all their pursuits, but especially in the ac-

* The dispute has, of late, passed into a new phase. As long as the ryots were willing to grow indigo, the planters—who were generally, in one form or other, their landlords—allowed them to hold their lands at rates of rents very low in relation to the value of the produce, and with much laxity as to the quantity of land held. Now, according to the old adage of ‘malt and meal,’ the planter, who cannot get the indigo, claims a higher rent for the actual number of acres in the possession of the ryot, and the High Court of Bengal has sanctioned the claim; but the contest upon the point in the Courts of Law threatens to be very long and obstinate.

quisition of land, by every process of vexatious interference, denial of justice, and partial favour shown to the natives, are, we are satisfied, utterly unfounded. Even before the close of the last century, whilst the Company still enjoyed a monopoly of trade with India, they liberally fostered the revival of the growth and manufacture of indigo by independent English planters. At a recent date the Government, both at home and abroad, has manifested the same spirit in regard to tea and coffee. As regards their servants, for the last fifty years every man of mark—every man, from Lord Metcalfe downwards, whose opinions were likely to have the least weight with his brethren—has earnestly desired, for the sake of the people of India, that Englishmen should be induced to settle in that country in the largest possible numbers. More than thirty years ago, before the law permitted Englishmen to hold land in India, we strongly urged the policy of throwing the door unreservedly open to all British subjects. That paper (in our Number for June, 1831) was written by a gentleman then, and for many years afterwards, a member of the Indian Civil Service. It is a mere figment—a cry got up for factious purposes, in order to sow jealousy and ill-will between classes whose cordial co-operation, as we have said, is essential to the well-being and progress of India—to represent the servants of the Government as opposed to the freest access of their fellow-countrymen to that land, and to their enjoyment of the fullest means and opportunities for the development of its resources, which it is in their power and within their province to afford. It is because they have refused to go beyond legitimate limits, and to show partial favour to Englishmen, to the injury of the natives whose property and rights they are bound to protect, that they have been charged with a wilful and malevolent leaning against their own countrymen. The natural bias is, assuredly, the other way; and those who know the terms of friendly intercourse and reciprocal hospitality on which the public officers in the interior of the country live with the planters of their respective districts, would be rather inclined to fear that the genial host, or pleasant fellow-sportsman, might obtain more than justice from the judge or the collector.

The great physical want of India is roads, using that term in a generic sense, as including all means of transit and communication, whether by land or by water. Roads are more needful even than irrigation, because increased production is comparatively of little value unless there be means of conveying the surplus to market. From the want of these means it has often happened that while grain was superabundant in one part of the

country, food has been at a famine price, and the people have been dying of hunger by hundreds or thousands in another district, within a few miles of the scene of plenty.

To supply this great want railways have been introduced, and the steamboats of joint-stock companies are plying, in place of vessels belonging to the Government, on some of the larger rivers. But we would now speak of railways, the lines of which, as planned by Lord Dalhousie, are shown by the accompanying Map. It has been asserted by some of those who labour under the strange hallucination that the Government of India, if it do not exert itself to thwart all enterprise, is, at all events, careful not to render the slightest assistance to British merchants or manufacturers, that the lines of these railways were determined with exclusive reference to political and military objects, and that the general wants of the people and the interests of commerce have been alike disregarded. The truth is, that while considerations of policy and strategy have not of course been overlooked, these trunk lines of railway have been studiously devised to link together all the capitals and all the principal sites of production, marts, and seaports in British India. One line obviates the chief difficulties of the navigation of the Lower Indus; another stretches from Calcutta to the Punjab, serving in its course all the great mercantile cities of Bengal and the North-western Provinces, including Agra and Delhi, while a branch brings the best coal of Bengal to Calcutta; a third connects the great cotton field of Central India and the coal measures of the Nerbudda (a river hopelessly unnavigable) with Bombay on the one hand, and with Mirzapore, the Ganges, and Calcutta on the other. A fourth will convey the coffee-planter to the foot of the Neilgherry hills. A fifth will render almost as much assistance to the tea-planter of Assam or Cachar. A sixth will place the enterprising adventurer from England within a moderate distance of all the most promising sites for settlement in the skirts of the Himalayas. A seventh runs from one of the best ports on the coast of Coromandel into the heart of the magnificently-watered plains of Tanjore, and of the best cotton field of Southern India. An eighth connects Calcutta with the Mutlah, a river much more easily and more safely navigable than the Hooghly. It would be impossible, indeed, to lay down a system of main trunk lines—for that was all that was attempted or was feasible—better adapted to subserve all the wants of the community. It was not probable, indeed, *à priori*, that a statesman with the experience of Lord Dalhousie should have anything

to learn in such a matter from those who have impugned his judgment.

The aggregate length of the ten lines, in respect to each of which the Government has engaged to pay a certain amount of interest upon the sums expended on its construction, is upwards of 4,700 miles. Of these, 2,560 miles are open for traffic. The line from Madras across the peninsula to Beypore, on the coast of Malabar, a length of 405 miles, is in operation throughout. On the East Indian Railway, which will connect Calcutta with Delhi, the still greater distance from the former city to Mirzapore (580 miles), may be traversed without a break. It was so traversed a few months ago by the late Governor-General, who stopped to examine and admire the bridge over the Saone (close to Arrah, so gallantly defended in the mutiny), 'almost twice the length of the railway bridge over the Thames at Charing Cross, consisting of twenty-seven iron girders of 150 feet each.' The works by which the Great Indian Peninsula line (now open from Bombay to Sholapore, a length of 295 miles) is carried up the Bhore Ghat, appear to be still more remarkable. 'In a distance of fifteen miles the railway climbs a height of 1,831 feet, the difficulties in its course being overcome by such a series of cuttings, tunnels, viaducts, and embankments, as is hardly to be found within the same space in any other work in the world.' The two greatest mountain works in Europe—the Giovi incline on the Turin and Genoa Railway, and the Simmering incline on the line from Vienna to Trieste—rise only 889 feet and 1,325 feet respectively. Besides the Saone, many rivers, such as from their breadth and from the volume and velocity of their waters in the rainy season, present far greater difficulties to the engineer than any of our quiet streams, have been successfully bridged. Within a few months the East Indian line will be finished to Delhi (1,144 miles), the only break being the bridge over the Jumna at Allahabad. In the same period, the railway from Bombay to Ahmedabad will be completed. The whole extent of railways opened in India will then amount to about 3,000 miles.

The aggregate capital of all the lines upon which the Government have guaranteed interest will amount to upwards of 60,000,000*l.*, of which nearly fifty millions have already been expended, besides about 1,500,000*l.* in the purchase of land by the Government. The interest—almost all at 5 per cent.—upon this large sum, coupled with what is termed the 'loss by exchange' (namely, the difference between the real value of the rupee at the present time, 2*s.*, and the 1*s.* 10*d.* at which the Government contracted to supply it in India for the

operations of the several companies, in exchange for monies paid into their home treasury), constitute, taken together, a very heavy present burden upon the finances of India. The weight of this burden will, however, be gradually reduced as the lines are opened, the traffic developed, and the net earnings approach the 5 per cent. on the capital guaranteed to the shareholders. It may be hoped, indeed, with regard to some of the lines at least, that the day is not very distant when they will not only pay the dividends of the current year, but will begin to repay to the Government, as stipulated, the interest advanced by it to the shareholders during the period of construction. When that time arrives, there will also be a gain by exchange to compensate for the present loss. Mr. Danvers calculates that 'the gross receipts necessary to earn the guaranteed interest, supposing that 50 per cent. is sufficient for maintenance and working, would be 6,000,000*l.*, or about 1,300*l.* a mile a year, or 25*l.* per mile per week. Take, for example, the East Indian and the Great Indian Peninsula lines. The gross receipts of the East Indian, when the line is completed, should be about 36*l.*; the Great Indian Peninsula, about 25*l.* per mile per week, to yield 5 per cent. They are now both earning upwards of 22*l.*, and are gradually increasing their receipts every month.' In the year ending on the 30th of June, 1862, the East Indian Railway carried, in the aggregate, on its two unconnected sections, 2,280,035, and the Great Indian Peninsula line 2,509,962 passengers. On all the lines in India, none of which were at that time completed, the number of passengers carried during the same year amounted to 6,484,338. And the numbers appear to be steadily and continuously increasing.

But, after all, the question whether the development of the traffic shall be rapid and decisive, or slow and unsatisfactory, must depend in a great measure upon the promptitude, sufficiency, and good judgment with which feeders shall be supplied to the trunk railways. For it is manifest, that ten lines—some of them though useful, very short—traversing a country comprising no less than 1,125,000 square miles, can serve immediately but a small portion of that vast area; and that as to goods especially, the means of bringing them to the lines at a moderate cost is an indispensable condition of their being brought there at all. Good roads are wanting in all parts of India; in that respect, and in works of irrigation, all that has been done by our Government (for the people do nothing), is still greatly out of proportion to the area and the population. But now, at last, roads converging on the stations

of the several railways must be made, if we would not render futile all the labour and all the vast sums of money which we have expended on those grand works. The best feeders, unquestionably, will be light and cheap railroads, where the amount of traffic to be served, added to the 'subvention' in land and money by which the Government is prepared to encourage such undertakings, are sufficient to warrant the necessary outlay. Our Map exhibits, marked in yellow, several important feeders of this character to the East Indian Railway, to which the Government have already granted liberal concessions. One of these projects of light railways is calculated to render such great local service, by transporting independently, and for long distances, the traffic of so large a tract of country, and of so many millions of people, that it can hardly be properly called a feeder. Yet it will, no doubt, very materially promote the interests of the East Indian line. It is intended to leave that railway at Meerut, and to join it again at Benares, passing through Moradabad, Bareilly, Shahjehanpore, Lucknow (with a branch from thence to Cawnpore), Fyzabad and Juanpore; thus affording accommodation to the agriculture and trade of what are, perhaps, the two finest and most productive provinces in India—Rohilcund and Oude. Similar works are in contemplation both in Madras and Bombay. Tramways, to be worked by animal power, come next in value; then metalled roads, fit for traffic at all seasons of the year, and sufficiently bridged; and, lastly, what are called in India 'fair weather roads,' which can be used by carts only in the season when the tracks are dry and the streams low. Very many roads of both descriptions have been laid out of late. It is difficult to distinguish in the memorandum before us, as published by the Government of India in the Gazette, 'showing what has been done during the last two years by the Public Works Department to facilitate the transit of cotton to the ports of shipment,' those roads which are intended to act as feeders to the several railways, from those which run directly from the interior to the coast, at Sedashcoghur, or elsewhere. The list manifestly comprises roads of both kinds. It appears from this statement, that in Madras 70,000*l.*, and in Bombay 170,000*l.*, have been expended on 1,400 and 1,000 miles of road respectively, of which, in the first case, 700 miles, and in the latter, 500 miles, were open for traffic in June last. In Bengal, and the several provinces subject to the Supreme Government (not including Burmah), 191,000*l.* had, in the same period, been expended upon 2,420 miles of road. Of Bengal, it is stated in the memorandum, 'there has been a

‘considerable development of branch roads generally in this province, irrespective of those mentioned here.’

Before we enter upon the large subject of the progress made or making in works of inland navigation or irrigation, or intended to serve both purposes, it is necessary to clear away some misapprehensions, which appear to have taken considerable hold upon the public mind. Not satisfied with habitually contrasting our brief era with the many centuries of Hindoo and Mahomedan domination, it has been asserted by those who have found a strange delight in depreciating the labours of their fellow-countrymen in India, that the British Government has not only failed to execute new works, in which respect we are put to shame by the public spirit and benevolence of the ancient rulers of the land, but has allowed the canals and reservoirs dedicated to the public benefit by our predecessors, to be choked up or dilapidated by neglect. And it is assumed, for the purposes of disparagement, that all the ruin which has fallen in many parts of India on these prolific sources of agricultural prosperity, has been consummated, at least, if not altogether inflicted, during the comparatively brief period of British dominion.

Although so great a man as Burke set the example of using language of this sort, the charge is not, on that account, a whit the more true. But he had, at any rate, far more plausible ground for his denunciation, than those who have echoed his complaints in this generation. In his time, no doubt, the banks of the thousand tanks of the Carnatic were all broken down, the rains of the monsoon were running waste into the sea, and the English had neither repaired the breaches, nor inaugurated any great works of irrigation in their stead. Indeed, they had not had breathing time from their struggles for life or death, with the French and with Hyder Ali, to attend to any such matters. But though they had not restored the blessing, they as certainly had not inflicted the curse. The long agony of the breaking up of the great Mahomedan Empire, and the rise of the Mahrattas, who ‘loved to have their hands in every man’s dish,’ and who swept the whole face of the land periodically with fire and sword, had effaced almost every vestige of the works of peace and comparative civilisation, long before the Company began to wield even delegated power. Hyder Ali and his more ruthless son completed in the South of India the ruin which the Mahrattas had begun. The British Government of Madras inherited only desolation. How matters stood in the North, the following facts will show.

The first Indian canal, made by Feroze Shah in 1358 to

water his favourite hunting-ground of Hissar, and improved by Akbar in 1597, had ceased to flow in 1707, and Hissar had relapsed into its original sterility. The Delhi Canal of Shah Jehan, constructed in 1626 by that eminent engineer and architect, Ali Murdan Khan, and which had been a blessing to the land for more than a century, had ceased to ward off famine from the ryot, and to afford a palatable beverage to the people of the imperial city (for the adjacent waters of the Jumna are impregnated with natron), in 1753. Bishop Heber tells us, in his delightful journal, how the inhabitants of Delhi went forth in crowds, when the good work of restoration was completed, to meet and crown with garlands the returning waters. What is now called the Eastern Jumna Canal, also constructed by Shah Jehan, if ever opened at all in his lifetime, or during the reigns of his Mahomedan successors, had run but for a very brief period. By the middle of the last century all the canals of the Mogul sovereigns had practically been destroyed. In every province of India, therefore, the English had to begin the work afresh; and the worst blame that can justly be imputed to them is, that engrossed by diplomacy and war, and by the ten thousand details of internal administration, they were unwisely tardy in turning their attention to a course of material improvement fraught with blessings to the people, and with an increase of willingly paid revenue to the State.

The first great work of irrigation undertaken by the British Government, and completed between the years 1808 and 1822, was the restoration of the Mogul canals mentioned above. Of these, the Eastern Jumna Canal, with 150 miles of main line and 500 miles of distributing channels, waters 160,000 acres. The Western Jumna Canal has a main channel of the far greater length of 445 miles, exclusive of distributing channels. The pastoral villages of Hissar depend entirely upon it for the means of watering their cattle, and it has given life and fertility to what was by nature a great sterile waste, the chief towns of which were found in 1807 to be literally without an inhabitant—depopulated by the combination of drought with chronic war, rapine, and misgovernment. In the terrible famine of 1837–38, the value of the crops saved by this canal was estimated at 1,462,000*l.*, giving food to the inhabitants of 500 villages. It irrigated at that time 212,241 acres.

To restore, extend, and improve these canals was a considerable operation, but it was the work of pigmies when compared with the Ganges Canal, a purely British design, the main channels of which extend to a length of 898½ miles, which receives at its head no less than 6,750 cubic feet of water per second, and

which had attached to it in May, 1862, 1,852 miles of distributing watercourses, besides many hundred miles of minor channels. A great authority from Lancashire, a member of the House of Commons, said that he was 'sick of hearing of' the Ganges Canal, which, after all, was only a local work,—its length being about the distance from John o'Groat's House to the Straits of Dover. We believe that no work of irrigation, in any country or in any age, will bear comparison with it, either in magnitude or in the extent of the benefits which it will bestow upon immense bodies of mankind. Sir Arthur Cotton may well call it 'a work of prodigious value and importance,' for it is calculated to irrigate an area of 1,471,500 acres, and its beneficent waters will protect from the risk of famine a tract of country containing a population of no less than 6,500,000. It is estimated that, in the famine of 1860–61, 339,243,840 lbs. of grain were grown by means of the irrigation which it afforded; and a vast quantity of this produce was sent in boats by the canal towards distant famine-stricken districts. The number of villages supplied with water for irrigation is 3,483.

We shall return to speak of the Ganges Canal, with reference to Sir Arthur Cotton's criticisms on its plan and execution, after we have passed under review the great works in the Presidency of Madras, of which that distinguished officer is so justly proud. We omit—partly from want of space, and partly lest we should weary our readers with long details, filled with strange names—many and important works of irrigation, completed or under construction, in the Dehra Dhoon (fast becoming a sheet of tea-plantations), Rohilcund, Bundelcund, and in several parts of the Punjab. Speaking of these canals, the late lamented Colonel Baird Smith remarked:—'The works of irrigation are more likely, from their relation to the material prosperity of the country, and from their permanent nature, to perpetuate the memory of English dominion in India, than any others hitherto executed.' We trust that the iron roads which we are constructing, with the hundreds or thousands of ancillary means of transport with which they will assuredly be united, will be as useful and enduring monuments of British wisdom and beneficence as those works of irrigation towards which, as we rejoice to observe, the Government of India is directing its efforts, both immediately and through independent agency, with greatly increased energy.

The three old British provinces of Bengal, Behar, and Orissa have had less attention paid to their means of irrigation, either by the British Government or by its predecessors, than any

other part of India, on account, probably, of the greater amount and certainty of rain-fall which they enjoy, and of their consequent comparative independence of artificial sources of supply. No such works were found, even in ruin, when we became masters of the country; and we did no more during the first century after Plassy than open two or three short canals, for purposes solely of navigation, in the immediate neighbourhood of Calcutta.

At last, however, public attention has been seriously directed towards the wants and the capabilities of the provinces above named in respect to works of irrigation. The Government, mistrusting its own power to do justice to all the countless calls upon its energies, has committed to the East Indian Irrigation Company, virtually the same as that similarly engaged at Madras, the difficult and important task of so effectually bridling, by an annicut or dam, the headlong current of the Mahanuddee, rushing into the Bay of Bengal at Cuttack, as at once to protect that town and the adjacent country from inundations which have heretofore proved most destructive, and to render the diverted waters available both for extensive irrigation and for connecting, by a navigable canal, the whole province of Orissa (of which Cuttack is the capital) with the Hooghly and Calcutta. It is still further contemplated to substitute a canal for a part of the course of the Mahanuddee which may at present be termed unnavigable, so as to open up the fine cotton-producing plateau of Chutteesghur, which is now almost inaccessible. These are grand and bold projects, all the more so because undertaken without any guarantee of interest from the Government; and we heartily wish the Company such a measure of success as shall be abundantly remunerative to itself, and shall confer, at the same time, the greatest practicable amount of benefit upon the people, to whom the Mahanuddee has hitherto been a terror and a curse. We hope that the undertaking may be highly profitable, not only because we know that it cannot prove so without adding far more largely to the prosperity of the great tract of country within its scope, but also that other capitalists may be thereby encouraged to engage in the construction of public works in India. At the same time, we consider it to be most desirable that, on account of their intimate connexion with the Land Revenue, works of irrigation should, as a general rule, be executed and managed by the officers of the Government. But anything is better than the old dog-in-the-manger system, which neither carried out such measures itself, nor allowed any one else to carry them out.

Another scheme has been broached, having for its object the irrigation of the large part of the province of Behar which lies south of the Ganges, by constructing a dam across the bed of the Saone, and otherwise storing the superabundant rainfall in the upper basins of that and of adjacent rivers, the execution of which, we understand, will probably be committed to the same Company. In this case, also, there are to be navigable channels, extending on the one side to Patna, if not to Calcutta, and on the other 'on a dead level for 170 miles to Allahabad.' This also is a scheme upon a very grand scale, so grand, indeed, that Colonel Dickens, who originally projected and very ably recommended it to the Government, calculated the total cost, if it were carried out in its integrity, at no less than 2,690,000*l*. Still, so large, fertile, and well-peopled is the tract of country which this scheme will benefit, that we have no doubt of financial success; and our only regret is, that it has not been undertaken directly by the Government.

We turn now to those noble works by which almost all the great rivers that water the Presidency of Madras have been compelled to stay their downward course into the Bay of Bengal, and to pay tribute at once, though by a different process, to the skill of the engineer and to the wants of the ryot. Although it is stated that, so long ago as 1792, Major Beatson laid before the Government of Madras a plan for constructing a weir, or annicut, across the river Krishna, in the district of Guntoor, with the view of 'providing means for 'raising two crops of rice where only one was raised before, 'and for the production of several important articles, such as 'sugar and indigo,' it was not until 1836 that the first project of that nature was actually carried out, and that not altogether by a new work, but by the restoration and improvement of a very ancient Hindoo scheme for retaining the bulk of the water of the Cauvery in that branch of the river which continues to bear the same name. The other branch is called the Coleroon. 'For many years,' it is stated, 'the bed of the Cauvery was 'found to be silting up, while that of the Coleroon was 'deepening, so that most of the water which was required for 'the irrigation of Tanjore escaped uselessly to the sea by the 'latter river.' It was to remedy this evil that Captain Cotton was employed, and learnt, we believe, his first lesson in the construction of great works of irrigation; and the success of the operation has been so complete that, mainly from that cause, the condition of the people of Tanjore, and, with that, the public revenue, have progressively and very greatly improved. When the district first fell into our hands, it yielded

no more than 300,000*l.*, while the revenue now amounts to 657,000*l.* per annum. We will not embroil ourselves with Sir Arthur Cotton by any attempt to determine what deductions should be made from this total increase of revenue, before the remainder can justly be set down to the exclusive credit of the water-works, for we believe that he lays claim to almost, if not quite, the sum total. But there can be no doubt that the great facilities of irrigation which Tanjore enjoys have converted the province into one great garden — Colonel Baird Smith called it ‘literally the Lombardy of Southern India’ — and have given a largely enhanced value to the landed tenures of the owners or occupiers of the soil. In what estimation the annicut is held by the people in general may best, perhaps, be told in the language of Mr. Kindersley, who was the Collector at the period of its construction. He says, ‘There is not an individual in the province who does not consider it the greatest blessing that has ever been conferred upon it, and I have not the smallest doubt that the name of its projector will, in Tanjore, survive those of all Europeans who have ever been connected with it.’ Colonel Baird Smith bears testimony to the same effect, saying, ‘that here at least we have stamped our mark for good, deep on the face of the land, and the condition of the people.’

If Sir Arthur Cotton, like other great men, has suffered from detraction, we can bear witness, founded on the many authorities to which it has been our duty to refer, that, on the other hand, no contributions to the public weal have been more highly appreciated than his. He must forgive us when we say that if he had been more moderate in his claims on behalf of water, as the sole source of private wealth and of public revenue, critics of his works and writings would not, we believe, have been induced to make such large deductions from its universally acknowledged potency. Extreme demands generate extreme resistance to them. Water, combined with the sun of the tropics, is a mighty agent of production; but, after all, moderation in fiscal demands, a generally improved administration, and a great rise in the price of all produce, have something to do with agricultural prosperity. As regards the rise in prices, for example, whilst the water, no doubt, has acted largely to increase the amount of production, it is absurd to ignore such facts as that, while in 1846 the cost of a bag of oil-seeds in the districts watered by the Godavery and the Krishna was from Rs. 2½ to 3, and there was scarcely any export, the price of late years, owing to a great demand from France (where much of the oil called *colza* is expressed from these seeds), has risen to an

average of about Rs. 8, and many hundred thousand bags are annually exported. In like manner, the new demand in England for rice from the same quarter for the manufacture of starch, cannot be attributed to the annicuts, though, no doubt, the abundant and certain supply of water has enabled the ryot to grow much more rice than heretofore. The simple truth is that several causes have combined to produce the happy effects which Sir Arthur Cotton, with the fondness of parental affection, ascribes exclusively to his darling child. But he must be satisfied, on consideration, that if the oil-seeds and surplus rice could not have been produced without the water, they must have rotted where they grew but for that external demand which the water had certainly no share in creating. For the rest, the services of Sir Arthur Cotton to the Government and people of Madras—services which he is now extending to Bengal—have been so great, that he can well afford to assume higher ground than he has taken in his pamphlets and in much of his official correspondence; to acknowledge that concurrent circumstances have added something considerable to the value of his water to the agriculturist; and to rest satisfied with the almost universal testimony borne by all competent and impartial judges to the benefits and blessings which he has conferred upon millions of his fellow-creatures.

The Krishna Annicut was begun in 1853, and is intended to serve 350,000 acres. In 1862, 133,212 acres were actually irrigated by means of this work, of which 101,868 acres had been converted from dry into watered land. This great work was planned, we believe, by Colonel A. Lake, of Kars, under the immediate supervision of Sir Arthur Cotton; and there appears to be no reason to doubt that it will amply fulfil all reasonable expectations of its efficiency for good; though we cannot raise our hopes in respect to revenue so high as Colonel Lake's estimate of August 1847, namely, an increase of 400,000*l.* per annum, in the two districts of Guntoor and Masalipatam, between which the works distribute the waters of the Krishna. It will certainly effectually prevent the recurrence of such fearful calamities as those which followed the drought of 1833, when, according to Colonel Baird Smith, 'not fewer than 200,000 people perished, either from hunger or under the virulent fever that followed in the train of the 'famine;' and the joint loss of the community and the Government amounted to no less than 2,500,000*l.*

We now come to the last and greatest work of Sir Arthur Cotton in Madras, the annicut which controls the waters of the river Godavery; the work, too, regarding which the con-

troversies have been most frequent and most bitter, owing, as we believe, mainly, if not entirely, first, to the unduly high estimate formed by that officer of the effects of irrigation from the new works, without considering that a great part of the delta was already enjoying great benefit, though uncertainly, from the natural supply of water; and, secondly, to his uncompromising ascription of all improvement to the one great cause—the annicut.

Still, enough of the purest glory redounds to Sir Arthur Cotton, from this great achievement, to satisfy any inordinate ambition, even if he had done nothing else, and would do nothing more. This is the language in which, at a period before the construction of the annicut, the state of Rajahmundry, the district principally served by that work, is spoken of by the Public Works Commissioners; and the passage is quoted, without a hint of dissent, by Mr. Goldingham, a member of the Board of Revenue, with whom Sir Arthur Cotton had some of his fiercest passages of arms. ‘While Tanjore, under the beneficial effects of the lately constructed annicuts, was paying with ease a revenue of 45 lacs (450,000*l.*), and annually increasing in wealth, Rajahmundry, of similar extent, with a far more fertile soil, and inferior in no one natural advantage, was paying with extreme difficulty a revenue of 19 lacs (190,000*l.*), and its people were in the lowest state of poverty.’ We find now, that while the districts watered by the annicuts on the Krishna and the Godavery yielded, in 1846, an aggregate revenue of 470,000*l.*, they paid to the exchequer in 1861–2 no less than 820,500*l.* And there is every indication that the condition of the people is improving in at least a corresponding ratio.

But it must not be supposed that the increase of production and the flourishing condition of the revenue in ordinary years are the sole fruits of these magnificent waterworks. Magnificent they may well be called, for the length of the weir that bridles the Godavery is 4,200 yards. They may be said to be absolute preventives of famine, heretofore the most frightful scourge of India, in those seasons, of not unfrequent occurrence, when the rain-fall in the plains is greatly below the average. They are, at the same time, an almost equally effective safeguard against inundations, which in former times too often devastated the deltas of the great rivers of Madras. Mr. G. H. Taylor, the able sub-collector of Rajahmundry, whose large and liberal views do him great credit, after speaking of two very disastrous floods of former years, adds, ‘With the effects of previous floods before us, it is not too much to

'say that the inundation of the past year, which exceeded both the previous ones in volume, if not in duration, would have reduced the revenue 10 or 15 per cent., and caused an amount of damage which would have completely dispirited the people, and from the effects of which it would have taken long years to recover.' This immunity from loss he attributes entirely to the annicuts, and thus these works not merely increase the revenue, but render it stable and certain. Again, the main channels afford great facilities for navigation, and for the transport of the increased produce to the ports of shipment. To this, also, Mr. Taylor bears testimony, at an early period after the completion of the weir itself, stating, 'the importance of the navigation is attested by the eagerness with which the people already avail themselves of the water-carriage within their reach.' General Cotton assures us that the boats on the principal canal have increased from 750 in 1851, to 15,000 in 1860, and adds that, 'the latter boats were of more than double the tonnage of the first ones.' Lastly, Mr. Taylor writes: 'I have not yet alluded to the new and abundant supply of river-water for men and cattle, which is now conveyed to villages where the want of it was before severely felt, and which has contributed so largely to the comfort and happiness of thousands of the people. This blessing can only be properly estimated by those who have benefited by the change, and I can testify that by them, at all events, it is fully and gratefully appreciated.'

As in the case of the North-western Provinces and the Punjab, we pass over without special notice many minor works of great local utility; amongst others, the West Coast Canal (of navigation), the primary object of which is to connect the port of Cochin with the western terminus of the Madras Railway, at Beypore; it will also assist the general traffic of a long line of coast.

We wish that we could speak with satisfaction of the progress that has been made in opening the navigation of the Godavery, in order to fit it to carry down to the sea the produce, and especially the cotton, of Central India. We should be still better pleased if we could feel satisfied that the advantages of the work, when achieved, would be commensurate with the labour and cost of its execution. For although the upper waters of the river flow through well-peopled and fertile districts, the greater part of its course lies through regions of a very different character; and it seems very doubtful whether the railway from Bombay to Nagpore, now in course of construction, will not prove a better outlet than the Godavery for

the produce of Berar. Still, no doubt, the opening of the river is an important object, if it can be effected at a moderate expense.

A joint-stock association, under the title of 'The Madras Irrigation and Canal Company,' appears to be making satisfactory progress with its works. The original scheme, undertaken with the concurrence of the Government, which guarantees interest at five per cent. upon one million of the capital, was to make a canal from the Toombudra River, which is an affluent of the Krishna, by Kurnoul and Cuddapah, to the East Coast Canal near Nellore, for purposes both of irrigation and navigation. The length of the main line, from a point twelve miles above Kurnoul to the coast, was to be about 300 miles. It is now, however, intended to place the head of the works in the district of Bellary, higher up the river, adding by this and other extensions to the plan a second million to the estimated cost of its execution, which has been subscribed, in reliance mainly upon the great ability and experience of Sir Arthur Cotton as an hydraulic engineer, without any guarantee. We believe that part of Kurnoul is already irrigated from this canal, which is a work calculated to be very greatly useful throughout its long course. The only misgiving that we have upon that point is, whether the supply of water will be found sufficient to answer both the contemplated purposes of the undertaking. Indeed, *pace* Sir Arthur Cotton—we venture to express an opinion, with reference both to this scheme and to the Ganges Canal, that the practicability of combining efficient irrigation with facile and perennial navigation on canals of great length, carried through a country of any but the easiest slopes, is a problem yet to be solved. We apprehend that in dry seasons at least, when the demand for irrigation will be at its maximum, the boats will be very liable to be stopped for want of water to float them; and that it will be only when water is not needed in the fields, that it will be found in sufficient quantity in the canal.

We now return, as we proposed, to notice the remarks of Sir Arthur Cotton, at pages 23—27. of his pamphlet, upon the plan and execution of the Ganges Canal; and as we have not failed to state how highly we estimate the signal services rendered to the State and people of India by that very eminent engineer, we shall not shrink, on the other hand, from pointing out with equal frankness the injustice of some of his criticisms upon the great work of a fellow-labourer in the same field of public usefulness, as zealous and as well-deserving as himself. Let us not, however, be misunderstood. We have not the

faintest suspicion that General Cotton's injustice is wilful, nor that he has been actuated in any of his remarks by a feeling of jealousy towards Sir Proby Cautley, unworthy of his high character. On the contrary, we are persuaded that the errors into which he has fallen in his estimate of the fitness of the Ganges Canal for the purposes which it was intended to fulfil, have resulted solely from his long and exclusive acquaintance with water-works constructed under essentially different natural conditions; so that his very experience has misled him to look at the great work of the North-west from a purely Madras point of view, and to make no sufficient allowance for difficulties with which he has never had to contend. He has, in fact, failed, throughout his strictures on the Ganges Canal, to bear in mind that while the engineer operating at Madras has to deal with the deltas of rivers, and, however large the volume of water, with moderate slopes, his brother officer in the North-western Provinces has to handle the great rivers at points where they debouch from the Himalayas, not with large bodies of water only, but with the impetuosity of mountain torrents, and with very severe slopes in their further downward course. In the North-west, the contest is with the heads, and at Madras with the tails, of some of the largest rivers of India.

At page 24. General Cotton remarks:—‘There has been, ‘undoubtedly, a far greater expenditure upon it (the Ganges Canal) than there needed to have been;’ and at page 26., ‘The current is too strong.’ Now, seeing that the rapid slope of the country down which the canal had to be carried was a condition precedent of the undertaking, from which it was impossible to escape, it must be evident, even to those who are not engineers, that the strength of the current could be reduced only by artificial means—by giving the canal greater width, and more weirs and locks—and that these additional works must necessarily have enhanced the cost of construction, complained of as already excessive.

In truth, Sir Arthur Cotton appears to have forgotten that the canals in the North-west are, in fact, artificial rivers, carrying large bodies of water, and not canals in the sense understood in England, and we apprehend also in Madras, where, in one instance, at least (that of the Godavery), according to Colonel Baird Smith, ‘the effective fall of the bed, taking the entire ‘length of the river channel into account, is not more than ‘from four to five inches per mile.’

General Cotton goes on to remark—

‘One grand mistake was the excavating the whole section of the water-way, so as to carry all the water below the surface. This was

entirely owing to the medical men. Had only so much earth been excavated as would have made the embankments, and the principal part of the water been carried above the level of the ground, about two-thirds of the cost of excavation would have been saved.

Here Sir Arthur Cotton labours under a misapprehension of fact. The whole section was not excavated below the surface. Nor did the excavation as it exists depend altogether on the medical men. The experience of the Bengal engineers, derived principally from what they had seen in the Eastern Jumna Canal, had shown them that a running stream demands a certain hold on the soil; and that the water cannot be run in the main canal on high levels, and within raised embankments, without great liability to accidents of a very serious nature. It should be remembered also, that the Ganges Canal is a work extending from $29^{\circ} 37'$ to $26^{\circ} 29'$ north latitude, in a line of 370 miles, exclusive of branches. The country which it traverses is subject to extraordinary drought during the months preceding the rains, which commence at the end of June. It is subject, also, to very heavy rain-falls during the rainy months; and, as may be expected in so many degrees of latitude, the falls of rain are at times exceedingly capricious, leading to sudden overwhelming accumulations of water in the channel, at this or that point of its course, both from the rain-fall itself, and from a cessation of irrigation in those districts which the rain has sufficiently supplied. The Ganges, which is the only source of supply to the canal, is frequently, during the early months of the year, after the snow melts in the Himalayas, and again during the rains (when the volume of water pouring out of the mountains becomes a vast cataract), very uncertain in the rises and falls of its floods. As before stated, the supply of water required for the canal is 6,750 cubic feet per second; and this normal amount of supply is liable to be greatly augmented, at any point, by such heavy falls of rain as we have described, and that, too, without an hour's notice. Even when the head of the canal can be rapidly communicated with, and the influx stopped, the enormous quantity of water already in the channel must often cause most serious disasters before a breach in the embankments can be stopped.

Thus it is liable to be with the water carried at the present level, to which General Cotton objects, on the score of expense, as too far below the surface. It requires neither scientific knowledge nor experience to estimate in how terrible a ratio the risk would be increased by every foot of height added to the body of the stream. It is frightful to contemplate the

loss of life and the ruin to crops, buildings, and even to the soil itself, which would be the certain consequence of the sudden breaking away of such a volume of water as fills the Ganges Canal, from the elevation at which Sir Arthur Cotton would have it carried, to wit, in his own words, if 'the principal part of the water had been carried above the level of the ground.'

We pass over some minor points, in regard to which Sir Arthur Cotton has done less than justice to the genius—the term is not too strong—that planned and executed the Ganges Canal. It would have been well, if, when commenting upon that gigantic work, he had borne in mind the generous terms in which Colonel Baird Smith wound up his remarks, from the exactly opposite point of view, upon the hydraulic operations of the Madras engineers:—

'My own experience has been gained in a part of India presenting characteristics in its surface and hydrography very different to those found in the Peninsula; and among works which have but a general resemblance to those described, agreeing with them in their ultimate object, but differing greatly in the manner whereby this is attained. I have tried to bear this fact always in mind, in the expression of my opinions on the works, and to give their due weight to the more minute knowledge and larger experience of those who have spent their professional lives in daily familiarity with the localities.'

Of the electric telegraph within the limits of British India, including the Ultra-Gangetic provinces of Pegu and Burmah, it is not necessary to say more than that it has already linked together all the principal cities and stations, civil and military. The marvellous fluid, giving voice to the dumb wires, was of the greatest service to the Government during the mutiny, most especially in conveying the tidings of the outbreak at Meerut to Lahore, and thus enabling Sir Robert Montgomery and the commanding officer of the troops, now Sir Stuart Corbett, to take the decisive step of disarming the three regiments of sepoys quartered there, several days before an invitation from their brethren to follow their example of outrage and murder could reach them by the post.

At present, the Government is earnestly engaged in the great work of connecting England with India through Constantinople and Bagdad. The line is completed as far as the latter place, and English engineers are actively employed in carrying it on to Bussorah and the mouth of the Shât-el-Arab. From thence the submarine cable will run, in four stages, to Bushire, to Cape Missendon, on the Arabian coast, to Gwadir in Beloochistan, and to Kurrachee. An alternative aërial line has already been carried from Kurrachee, which is in communication with the

whole of India, to Gwadir; but the Belooches not being the steadiest of all possible allies, it is thought prudent to possess ourselves of the safeguard of a duplicate submarine line. For the same reason, because the line from Bagdad to the head of the Persian Gulf will run through districts belonging to or haunted by some of the wildest of the sons of Ishmael, an alternative line will be constructed, in connexion with the Persian Government, from Bagdad to Khanakaim on the Turkish frontier, and thence by Teheran and Shiraz to join the submarine cable at Bushire. The whole work is in the hands of Lieutenant-Colonel Patrick Stewart, R. E. (Bengal), an officer of well-tryed ability, and he is supported by the high professional skill and experience of Sir Charles Bright and Mr. Latimer Clark, the latter of whom has gone out to superintend the laying of the cable. It is believed that the work will be completed in February, and the whole line from London to Calcutta open in March next. It cannot be necessary that we should add a word to this simple narrative to impress upon all who read it the extreme interest and importance of the fulfilment of this grand scheme. No pains appear to have been spared to secure its success.

The subject has grown so much under our hands, that we are very reluctantly compelled to stop short when we have completed only half of our original plan; leaving the religious, social, and intellectual progress of India altogether unnoticed. As regards material improvement, we trust that we have demonstrated in the foregoing pages that the Government of India is fully and earnestly doing its part towards the physical well-being of its subjects. The one great object to be desired is, that they should themselves co-operate to that end. If that single condition be granted, even in a moderate degree—and after the changes we have witnessed in much that was once considered immutable, we are most hopeful of its attainment,—we are convinced that the material advancement of India during the present generation will be such as the world has never yet seen in the instance of any ancient and long-settled people.

These pages were scarcely written when the country was startled by the intelligence that the Governor-General, stricken by a mortal disease in a journey through the Himalayas, was lying at the point of death. The personal sorrow felt at the sudden termination of so useful a life, and of a career of which Scotland especially was justly proud, is increased by the singular infelicity which has attended the three last rulers of India, united alike by early friendship, by equal years, by the same exalted duties, and by the same untimely end. By Lord

Elgin's demise India has lost a ruler of rare sagacity, earnest and laborious, of varied experience in political affairs, and familiar with the interests and passions of men widely differing in race and character. Had his life been spared, he would, doubtless, have pushed on to a successful issue the great works—under execution or contemplated—of which we have treated in this paper; and would have afforded all the encouragement which it is wise for a Government to render to the various industries which are beginning to give new life to the agriculture and commerce of India. These duties, as well as a thousand other important tasks, have now devolved upon a successor, whose selection for an office so honourable, because so arduous, reflects the highest credit upon Her Majesty's Government. In appointing Sir John Lawrence to the Viceroyalty of India the Crown has been influenced by no claims of party, and has paid no homage to hereditary rank. His patent of precedence bears the seal of no earthly power. His past services—services of which it is scarcely possible to over-estimate the value—are the guarantee of his future success. As certainly as he held the Punjab in his iron grasp during the terrible crisis of 1857—a feat which his previous firm, just, and beneficent administration alone rendered possible—so certain is it that he thus saved the Upper Provinces, and probably, through them, Central and Southern India. Upon the conduct of the Sikhs under his government depended at that moment, humanly speaking, the British power in India; and the conduct of the Sikhs, friendly to British rule, rested mainly on the ascendancy acquired by Lawrence over them. Such priceless services have now received their most appropriate reward.

He takes with him to the office he is about to fill a knowledge of India, of her peoples, of her languages, and of her interests, which no Governor-General ever before possessed, even on leaving the country: and already no name is more revered by the native chiefs and tribes from the Himalayas to the sea than that of Lawrence. The authority of his experience and his services in the past equals, at least, the authority conferred upon him by his present rank. He brings to this Imperial charge a power of mastering detail which is the true characteristic of the greatest men, when it is combined, as it is in him, with a comprehensive intellect and a resolute will. To apply the knowledge and the power of England to such a country as India, for their mutual benefit, is at this moment the noblest task under the sun; and of Lawrence it may be said that no living man is equally fit to undertake it. God grant him life and strength to advance the work!

ART. V.—1. *The History of the Jews from the earliest Period down to modern Times.* By HENRY HART MILMAN, D.D., Dean of St. Paul's. 3rd edition, thoroughly revised and extended. Three volumes. London: 1863.

2. *Lectures on the History of the Jewish Church* (Part I. Abraham to Samuel). By ARTHUR PENRHYN STANLEY, D.D., Regius Professor of Ecclesiastical History in the University of Oxford, and Canon of Christ Church. London: 1863.

MORE than thirty years ago the first appearance of Dr. Milman's History of the Jews in the 'Family Library' drew forth a clamour of alarm and intolerance, as loud and as unreasonable as that which has been raised on a more recent occasion. We still remember the horror which was then expressed in religious circles, whether of the Evangelical School or of the High Church of that day, at the attempt (as it was considered) of the learned author to explain away the supernatural element in sacred history, and to bring the annals of the chosen people into profane contact with this every-day world. Had those been days of episcopal manifestos, of Convocational committees, of prosecutions in the ecclesiastical courts, the obnoxious Vicar of St. Mary's Reading would hardly have escaped some formal censure, even if he had fared no worse. But such methods of assailing theological innovators or literary heretics were not then in fashion. The outcry against Mr. Milman gradually died away, partly from exhaustion, and partly out of very shame, when he pointed in self-vindication to the uncensored opinions of high theological authorities, English as well as foreign, and even produced whole passages from the 'Family Bible of the Society for the Promotion of Christian Knowledge' (no other than the 'D'Oyley and Manby Bible' of our childhood), in which the very same conjectures which had been furiously denounced in his own book, were presented without offence, and accepted without hesitation, as suitable instruction for Christian households. These extracts may be read in the Appendix to his second edition (1830), ranged in parallel columns with his own words; and they supply an instructive example of the injustice and precipitation of religious panic.

But Mr. Milman's greatest crime (as Dr. Stanley has observed), without which perhaps his other offences would scarcely have been noticed, was that he ventured to let in the light of common day upon ground which was popularly considered too sacred for the sun to shine on. It was thought an

unpardonable familiarity with holy things, a dangerous and profane liberty, to speak of Abraham as a Sheikh or a Bedouin chieftain, of the Israelites after their occupation of Canaan as an 'independent yeomanry, residing on their hereditary farms,' of the Levites as a 'learned nobility,' of Israel itself as a 'confederacy of separate republics' or of 'scattered cantons.' In this respect, still more than the other, it has been the fortune of Dean Milman to witness a complete revolution of public opinion, inaugurated in England principally by himself. All sections of the Christian Church amongst us (for the exceptions are rare, and avowedly singular) unite now in agreeing that nothing is lost, and very much is gained, by letting in the light of criticism and analogy upon the sacred annals; by allowing the local features, the customs, the modes of feeling which still prevail in the slowly changing East to impart appropriate colour and picturesqueness to the Biblical narratives; by adducing the lessons of universal experience and historical parallels, wherever found, for the better illustration of those examples and incidents which the Bible itself declares 'were written for our learning.' Meanwhile he himself has passed with general approval to the place of dignity he now occupies in the Church; and from the valuable contributions he has since made to ecclesiastical literature, is justly regarded as second to none who adorn with their learning and character the chief seats of the English Cathedrals.

Under these circumstances we hail the republication of his earlier work with peculiar pleasure; and in reviewing it now for the first time, we are only paying off a debt, which ought to have been gratefully discharged by the last generation. But the work has gained, like its author, dignity by age. Its own intrinsic merits deserve a prolonged term of life; and the Dean has done much to render it more worthy of the place which it has attained in our literature. The title-page describes this edition as 'thoroughly revised and extended;' and this it will be found to be—extended to embrace the remarkable development of Judaism which the last half century has witnessed—revised to meet in some degree the discoveries of recent times, and to express the author's maturer thoughts on the Biblical records and the annals they contain; while it is furnished besides with notes, references, and citations, which, if they cannot transform a work originally popular in its form and limited in its size into one of great value to the learned reader, yet considerably enhance its literary calibre, and will make it often of real service to the student.*

* While commending the general correctness, as well as remarkable beauty of the typography of these volumes, we are forced to

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