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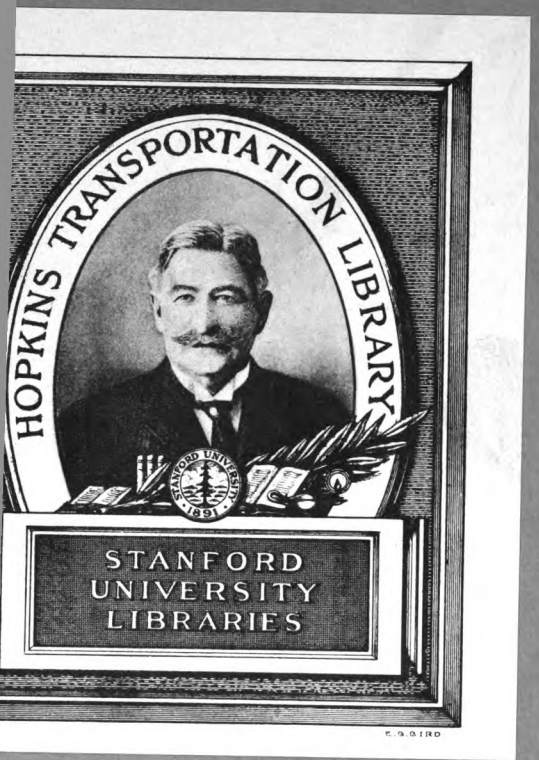

SAMBRE AND MEUSE RAILWAY.

CENTRAL LIN[illegible]

SAMBRE AND MEUSE RAILWAY.

CENTRAL LINE.

MEMOIR

BY AUG. DELAVELEYE,
CIVIL ENGINEER.

TRANSLATED FROM THE FRENCH.

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SAMBRE AND MEUSE RAILWAY.

It is in no degree my intention to blame the labours of the Engineers who projected the lines preceding that of Mr. Taylor, although this latter appears to me to be the preferable. Regard must be had to the time and circumstances in which each was laid out.

The project of constructing a Railway in the country situated between the rivers Sambre and Meuse, for the transport of ponderous matters, had its rise at a period somewhat remote. The first idea of it is due to Mr. Depuydt and his partners, who made their surveys in 1834. At this epoch, regular and very gentle gradients were considered as of the highest importance, and, in order to obtain them, it was deemed advisable, however otherwise inconvenient, to make long circuits and prolongations of the way. Since this epoch, experience, and particularly the improvements which have been made in locomotives, have greatly modified opinions; and this ideal perfection of the line, to which engineers had attached so high a value, has lost a great part of its illusion. At present, the preference is given to the most direct lines, when they remain within the limit of the gradient, which experience has shown can be used without danger; and this limit is extended every day.

The line of Mr. Depuydt and partners, created under the empire of these ideas, has been thrown too far to the westward, in order to take the advantage of the valley of the *Eaux-d'Heure,* which offered the possibility of establishing gentle gradients during a part of its course, but which has the fault of leaving at a distance from the line the centre

of the iron-ore district and the metallurgic establishments, which are there formed.

This line had begun to be formed when particular circumstances caused it to be abandoned; but a Railway in the Sambre and Meuse promises so great advantages to the country, that the idea of constructing it has always been preserved.

The Belgian government directed the Engineer *Magis* to verify the preceding line, and if need were, to improve it, but not to substitute for it another line.

His mission had specially for its object to investigate if the Government could without danger grant a *minimum* of interest to the capitalists who should devote their funds to this enterprise.

Messrs. Cubit and Sopwith found a line already laid out; they had only to examine if it would be serviceable to the capitalists who should embark in it. These distinguished Engineers had no authority to enquire, and ought not to have enquired if it were possible to find a better line.

In consequence of the reports of these Engineers, a company has been formed for the execution of this line, under the guarantee of a *minimum* of interest by Government.

The Chamber is about to discuss the principle of this guarantee.

Mr. Taylor, impressed with other ideas, sought out a line, which, although containing greater gradients, would be, according to him, more useful to the country, without injuring the capitalists, who would consecrate their funds to it. The object of this Memoir is to examine how far he has succeeded.

We shall make no mention of other lines which have been proposed at former periods, and particularly that of *Mr. Splingart;* not that we think them without merit, but because as those lines are not to be examined by the legislature, it would be to enter unnecessarily into superfluous details.

It will be sufficient to compare the line by the valley of

the *Eaux-d'Heure*, which is formed on the notions heretofore entertained, with the new propositions submitted by Mr. Taylor.

The different lines of Railway in the Sambre and Meuse country originate from the view of forwarding the national interests, in promoting the manufacture of iron, by bringing together, or near each other, the combustible and the ore, at present disjoined, and separated at a distance by the expense of burdensome transport, in such a manner as to paralyse the extension of this industry.

This first and principal object must not be lost out of view;—it is what should principally serve to decide on the relative merit of different competing lines.

The exportation of coal to France is equally of the highest importance, and ought also to be the ground on which the advantages of rival projects should be estimated.

The other branches of trade which are to be served, are important without doubt, but are less so than those we have indicated. Besides, they are common to all the projects, and cannot, in consequence, exercise any marked influence for the adoption of one preferably to another.

This object which we have announced is besides perfectly established, in a very important Report which the Inspector *De Moor* has just published by the order of Government. He there says, p. xvii.:—

" The industry of coal, and that of iron, these two " powerful elements of national prosperity, will owe to it " (the Railway), the one, a considerable extension in the " production; the other, the benefit of a much more eco- " nomical manufacture, in consequence of the reduction in " price of the primary matters, the ore, the coal, and the " wood charcoal; this economy, joined to that which will " be realised on the transport of the cast and malleable " iron, towards the interior of the country or towards " France, can alone offer to the metallurgic establishments " the means of striving with advantage against a formid- " able rivalry, and of emerging from the state of suffering

" to which this industry has been reduced for several " years.

" Such results constitute, in the end, a large increase of " the capital of national wealth, exhibited by a corres- " ponding increase in the revenue."

At the end of the memoir of the inspector *De Moor*, is to be found printed the report of the Engineer, *Magis*, charged by the government with the examination comparatively of the different projects presented. He also points out the importance of the direction of the Railway, in these words, p. iii.

" To promote the interests of the metallurgic establish- " ments in the neighbourhood of *Charleroi*, the system of " communication should, at the same time, be directed by " the shortest way, towards the mines of strong iron ore, " which the centre of the country between the Sambre and " Meuse contains, in order to allow the proprietors of the " blast furnaces of the Sambre to reduce the price of the " transport of the ore, and consequently, that of the manu- " facture of their cast iron, to a degree that would enable " them to oppose successfully, in the home market, the " rivalry which there exists between their products and " those of England, which latter carry their competition " even as far as the centre of our manufacture, since, at " Charleroi itself, English cast iron is used in several " foundries."

Further, in the same Report, Mr. Magis, who has studied conscientiously the different lines which have been presented, decides for that by the valley of the *Eaux-d'Heure*, for want of a better, but not without pointing out all the inconveniencies of it. The following are his words, p. viii.

" Does the project of *Depuydt* and partners completely " satisfy all the wants of the country between the Sambre " and Meuse? We are far from thinking so; in fact, on " casting our eyes on the map, it is at once seen that the " point of departure of the principal artery directed by the " valley of the Heure, is too far removed to the west, from " the central point of the establishments for the manufac-

" ture of iron of the Sambre, which may be taken to be " at Charleroi, and that its general direction is equally too " remote towards the west, from the centre of the country " between the Sambre and Meuse, which contains, in the " neighbourhood of *Fraire* and *Morialmé*, the mines of " strong iron ore, the transport of which towards the estab- " lishments of the Sambre, ought to be particularly encou- " raged. The project of the two branches towards *Fraire* " and *Morialmé* has, for object, to remedy specially this " imperfection of the principal trunk; but has this object " been attained in the same degree for all the establish- " ments of the Sambre?—Undoubtedly not; for the group " at *Marchiennes-au-Pont* alone profits by the adoption of " the principal direction, to the disadvantage of the estab- " lishments to the east of Charleroi, and particularly of " those of *Couillet*, *Chatelineau*, and *Acoz*, which, notwith- " standing, are situated nearer the mines. Are we then to " sacrifice to the first group, this last, the more important " of the two? Would it not be to abdicate the principle, " which has presided over all projects of Railways, for the " country between the Sambre and Meuse, that of restoring " to each locality the advantages to which it had a right " by its topographical position?"

Mr. Magis is so struck with the imperfection of the Line by the valley of the *Heure*, that he even proposes as a remedy the execution of one of the branches of the line projected by *Splingart*, that is, to make two railways instead of one.

In order to facilitate reasoning, and the comparison which we shall draw with the line of Mr. Taylor, we shall call the line by the valley of the Heure, the Western Line.

After having thus exposed the faults of the project presented by the Society of the Western Line, *Mr. Magis* does not characterize with less lucidity the conditions which a suitable project ought to fulfil.

" It is then to the search after the principal trunk of the " system, capable of satisfying all these wants, that the " surveys have been directed; now, the central position of

" the blast furnaces and collieries of the Sambre being at " Charleroi; that of the mines of strong iron ore in the " neighbourhood of Fraire and Morialme; and that of the " establishments for the manufacture of iron in the interior, " at Couvin, it is evident that the Railway which united by " the shortest roads these different centres of industry, " would be preferable, if gradients could be obtained which " would admit of the use of locomotive power for the trac- " tion."

Now, this such preferable direction, which, departing from Charleroi, would pass through the centre of the strong iron ore district at Morialmé, *St. Aubin, Florenne, Stave,* Oret, &c., and should arrive by the shortest way at *Vireux* on the Meuse, and at *Couviu,* is precisely that which Mr. Taylor presents.

Since, departing from the station at Charleroi, which is the central point of the coal district, it proceeds by a direct line to Morialmé, the centre of the iron ore district, and arrives at *Vireux* by a way shorter, by six miles on 36, than that of its rival.

The line proposed by Mr. Taylor, passing through the centres of the coal and iron district, may, with good right, claim the denomination of *Central Line.*

The advantages of the Central Line are then already recognized and brought out to light, in the investigation of the Government engineers.

There remains a not less important question. Is it possible to form a Railway in this direction? We answer, in a not less victorious manner, Yes, it is possible; and we furnish in support of this assertion, not only a plan, vertical section, and estimate, but the undertaking of a well known and eminent contractor, who charges himself with the execution at his risk and peril.

This will become still more evident by the comparison which we are about to draw of the two competing lines, submitted, or to be submitted to, and decided upon by the chamber.

The Western Line, the first in date, has its *terminus* of

departure at *Marchiennes-au-pont*, where it joins the state railway, ascends the valley of *Eaux-d'Heure* as far as the summit, and then descends the valley of the *Virouin* to Vireux, which is its *terminus* of arrival.

The Central Line has its terminus of departure at Charleroi, the central point of the Collieries, blast furnaces, and other establishments for the manufacture of iron, ascends a gradient of 1 in 43½ to gain the table-land, along which, in passing through the centre of the iron ore district, it proceeds, without engineering difficulties of any kind, as far as Surice, where it descends by a gradient similar to that on which it had ascended. It has its terminus of arrival, like the preceding, at Vireux, but after a course shorter by more than six miles.

Charleroi and Vireux are nearly on a level; the difference of absolute height is not above 48 feet, but to arrive at the one point from the other the summit must be crossed, which is situated between 500 and 600 feet above these extreme points.

The two lines take different modes of reaching and crossing this summit, and hence comes the excess of the expence of the one line above that of the other.

The Western Line gains the summit gradually in ascending a sinuous valley, in which runs a river which must be crossed at every instant by works of art; this valley, winding in every direction, presents at every bend, obstacles which must be overcome, either by making tunnels, or by cutting the projecting rocks; in short, it is a second edition of the valley of the *Vesdre*, which has been so rich a source of profit to contractors, and has given room to so many errors in the calculations of engineers.

The Central Line, on the contrary, ascends at once by an inclined plane to the table-land, along which it runs without any difficulty, meeting only little rivulets, which only require trifling works of art, as to the cost of which it is difficult to make a mistake.

The Western Line is in a continual course of difficulties for upwards of 62 miles. The Central Line experiences

none except for about three miles. Hence the difference of cost, which cannot be estimated at less than £120,000.

The State Railway affords an example which is strikingly analagous. Setting out from *Liege*, and ascending the course of the *Vesdre*, we have an image of the Western Line; if, on the contrary, we set out from Liege, on the road to Brussels, we ascend at first by an inclined plane; then we proceed along a level road: this is an image of the Central Line. Accordingly there is an enormous difference between the cost of the mile from Liege to the Prussian Frontier, and of that from Liege to Brussels. If I have drawn these imaginary comparisons, it is in order to make, if I may use the expression, palpable, even to persons unacquainted with engineering, the difference between the two Lines.

Are we to be told, now, that in the case of a Railway intended for the transport of merchandize, an inclined plane, (even though less inclined than that of Liege,) must be avoided? We are not of that opinion. We agree, besides, on this subject with two engineers of great merit, *Mr. Stephenson* and *Mr. Teisserenc*, who, in their writings, have described and ascertained what really is the value of that ideal perfection of almost a pure level, for which so many thousands have been sacrificed, which, according to them, have been uselessly expended, even in the cases where the conveyance of passengers was the main business, and, of course, much more so in Lines intended principally for the transport of goods.

To say that steep inclinations would cause an increase of working cost would be equally erroneous. *Mr. Teisserenc* has shown in his report, that both theoretically and practically, as proved by experience, it is not more advantageous to ascend from a given point to a given height by gentle than by steep slopes.

It will be sufficient, then, to shew that the Central Line contains no gradients which exceed the limits which have been employed for a long time, and which experience has shewn are unattended with danger. To do that, we shall again employ official documents.

Among the papers laid before the Belgian legislature, on the 2nd June, 1842, by the Minister of Public Works, there is the report of a commission of engineers, who were instructed to examine the different Railways in England, with reference to their gradients. We find there, under the head of Birmingham and Gloucester Railway.—"This "Railway has a very steep gradient, the traction along "which is effected by locomotive power. The slope is 1 in "37, on a length of 3660 yards. The descent takes place "without difficulty, in shutting the moderator of the "machine, and in pressing the brake of the tender, and if "necessary those of the train."

Then, it is possible to work, and in reality are worked, gradients of 1 in 37, by locomotive power. Now the steepest gradient on the Central Line is only 1 in 43½; it can then be worked by locomotive power. Besides, the traction might there be effected by fixed engines, and the inclined plane at Liege demonstrates that this may be done with security.

We have only alluded to fixed power, from respect to the prejudices which still exist as to the use of locomotive power on steep gradients. We ourselves are convinced that the latter is preferable. We shall quote, in favour of this opinion, a fact which is greatly in support of it. We read in the Railway Chronicle of 27th April, 1844.—

"There were on the Glasgow Railway two fixed engines, "each of 80 horse power; they drew the trains on a slope "of 1 in 42, (that of the Central Line is only 1 in 43½,) "and a mile long. The fixed engines have been abandoned, "and the traction is now effected by a locomotive, which "draws after the tender 104 tons, at a velocity of nine miles per hour."

We could multiply examples, but those which precede appear amply sufficient to elucidate this branch of the question.

We have said that the construction of the Central Line would cost less by £120,000 than that of the Western Line; but that would be of little consequence, if its advantages

were limited to that economy, for the cost of a Line fades away before an increase in traffic, and it is particularly, in this latter respect, that the Central Line gains upon its rival.

All projects of Railways in the country, situated between the Sambre and Meuse, being formed on the expectation of a great trade in goods, having Charleroi for its principal centre of passage, it is essential that there be a station at this town, in order to avoid the incumbrance which would arise, if it branched only with another Railway, which itself was occupied with an active trade.

The Central Line satisfies completely this condition, for its station is at Charleroi itself, and contiguous to that of the State Railway.

The Western Line has its station to the westward at Marchiennes-au-Pont, more than a mile and a half from Charleroi, and only gets to this town by making use of the State Railway; this mile and a half doing the service at the same time of the State Railway, and that of the Western Line, there would arise incumbrance, or, at least, difficulty in regulating two services of opposite natures.

The only remedy for this inconvenience would be to prolong the Line by Marchiennes-au-Pont a mile and a half further, parallel to the State Railway; but that would increase the length of the Line already much larger than the Central Line.

The country between the Sambre and Meuse contains two important towns, Dinant and Philippeville. The Central Line crosses the road which unites them, by establishing there a station. These two towns may be connected with the State Railway by means of the Central Line. The Western Line deprives these towns of such communication.

It appears to us that this circumstance demands the attention of the legislature, always desirous that every part of the territory should partake of the benefits of Railway transport.

Dinant, Philippeville, and all the rich and populous country which seperates these two towns, would contribute

to the income of the Central Line, which would allow of the tariff being lowered, without diminishing the dividends of the Shareholders.

But the most important consideration of all, that, with a view to which all the projects of Railways in the Sambre and Meuse country have been formed, is to lower the cost of manufacture of iron, in facilitating the union of the ore with the coal, the beds of which are separated, and at a distance from each other. The expence of transport is at present burdensome, and makes it difficult to compete with the English iron.

The Western Line fails entirely in attaining this object, while the Central Line, on the contrary, succeeds in its attainment. We shall see, in examining the tariff and the distance travelled over of the respective lines, that there is an enormous difference in the price paid for the transport by the two lines. This difference is so great, that in the principal centres of manufacture, it amounts to, at least, six per cent on the cost of manufacture of the cast iron. Moreover, it can be demonstrated that taking into consideration the joint effect of the tariff and the distance of the Western Line, the transport by it would be no improvement on the actual carriage by waggons on the ordinary roads.

The advantage which the Central Line presents is equally conspicuous, when the transport of the coal is considered, whether for home consumption or for exportation.

Before entering into the calculations which will make all that evident, let us say a word as to the motives which have induced the Central Line Company to establish a tariff different from that of the Western Line.

The great variety of produce of the country between the Sambre and Meuse, arises from its geological constitution, which, in a space of 36 miles long, presents three distinct formations; the primitive schistus, or slate formation; the carboniferous limestone; and the coal formation. Hence there are few parts of the globe, where there are united in the same locality so many treasures as in the Sambre and Meuse country: coal, iron, marble, metalliferous veins,

slate, immense forests, containing trees of the age of centuries, and two navigable rivers which circumscribe it; such is a general view of its wealth.

Any one of these products, singly considered, would warrant the construction of a Railway, adapted for the carriage of goods; of course, jointly taken, they necessarily offer the ground for a very advantageous speculation.

But all these ponderous products have little intrinsic value, and they imperiously reclaim a transport at a low rate; it is on the quantity of transport that we must speculate, and not on the high rate of tariff. To act otherwise, would be to deprive the country of a great part of the riches which nature has so liberally bestowed on it.

What has hitherto prevented a large production and consumption of this immense wealth, is no other than the difficulty of transport by the common roads, which are few in number, bad even in the summer, and for the most part altogether impracticable in the winter. The lower the price at which the transport is made, the greater will be the service rendered to the country.

In 1837, the tariff on the Western Line would have been favourable, considering the expence of carriage at that time by waggons on the common roads and by water; but what would have been useful at that period, would at this present day be exorbitant and useless.

It is under the conviction of these principles that we have proposed the tariff hereafter mentioned, which, to make comparison more easy, we have placed in juxtaposition with that of the Western Line.

COMPARISON OF THE TARIFF PROPOSED BY THE TWO COMPANIES.

WESTERN LINE. CENTRAL LINE.

Note.—The Lines in entire lengths indicate the dispositions common to the two Companies.

§. 1.

The Merchandise is divided into two classes, viz.:

First class.—Merchandise of every kind other than that designated as of the second class.

Second class.—Merchandise of cumbersome bulk, or difficult or dangerous to carry, or what is of a fragile nature, liquids, wool, cotton, glass, stone-ware, drugs, &c.

The rates are payable by complete loads (of 4 tons), and by incomplete loads (of less than 4 tons), as follow:

By complete loads—by the mile—and by the ton.

MERCHANDISE OF THE FIRST CLASS.

1. When the transport is effected along the whole line, from the Sambre to the Meuse, and *vice versâ*, or from one or another of these rivers, to a point beyond the summit-line, which divides their respective basins . .	$1\frac{5}{10}d.$	For every distance, and in every direction . .	$1\frac{1}{10}d.$
2. When the transport takes place from either river to a point within the summit-line, and, consequently, without crossing it .	$1\frac{7}{10}d.$	In place of . . .	$1\frac{1}{10}d.$
3. When the transport takes place, in ascending as far as the summit-line . .	$1\frac{8}{10}d.$	In place of . . .	$1\frac{1}{10}d.$
4. When the transport takes place only in descending from the summit-line to one or basin . .	$1\frac{3}{10}d.$	In place of . . .	$1\frac{1}{10}d.$
Note. The mean of rate of the Western Company is for the first class . .	$1\frac{6}{10}d.$	*Note.* The rate of the ~~Western~~ Company being uniform, the mean is . .	$1\frac{1}{10}d.$

Central

MERCHANDISE BY THE SECOND CLASS.

The rate of the first class augmented 5 per cent.		The rate is uniformly . .	$1\frac{3}{10}d.$
Note.—The mean is . .	$1\frac{7}{10}d.$	In place of . . .	$1\frac{3}{10}d.$

By incomplete loads—by the mile—and by 2 cwt.

MERCHANDISE OF ALL KINDS WITHOUT DISTINCTION OF CLASS.

From 11½ lbs. to 1 cwt. . $0\frac{6}{10}d.$	From 11½ lbs. to 1 cwt. . $0\frac{5}{10}d.$
Minimum of the rate . 6*d.*	
From 1 cwt. to 10 cwt. . $0\frac{4}{10}d.$	From 1 cwt. to 10 cwt. . $0\frac{3}{10}d.$
Minimum of the rate . 12*d.*	
From 10 cwt. to 4 tons and beyond . . . $0\frac{3}{10}d.$	From 10 cwt. to 4 tons . $0\frac{2}{10}d.$
Note.—The mean for incomplete loads is	*Note.*—The mean for incomplete loads is
Or by the ton . . . $4\frac{5}{10}d.$	Or by the ton . . . $3\frac{2}{10}d.$

Parcels of 11½lbs. weight and under, pay for every distance.

§ 2.

When the transport takes place for a distance less than 9 miles, the rate for complete loads is increased 5 per cent.

Note.—The mean price will be consequently raised to $1\frac{7}{10}d.$

The minimum of the rate will be what is payable for the distance of 2 leagues, (somewhat more than 6 miles).

§ 3.

The rate will be levied by the kilometer (upwards of $\frac{6}{10}$ of a mile), in this sense, that a kilometer commenced will be considered as run over.

§ 4.

For all the transports heretofore described, the loading and unloading of the waggons is at the charge of the party sending the merchandise.

§ 5.

The loading and unloading must take place within 3 hours after the waggons arrive at their destination. A penny per waggon per hour is payable for all time exceeding the 3 hours. The hour begun will be considered as completed.

§ 6

On the transport by the self-acting planes of the branches there is payable, over and above what is stipulated in the five preceding sections, by the league (of somewhat more than 3 miles), and by ton	$0\frac{4}{10}d.$	The transport takes place on the branches at the same rate as on the principal trunk . . .	$1\frac{1}{10}d.$
Note.—This will raise the mean rate per mile to	2*d.*	Instead of	$1\frac{1}{10}d.$

§ 7.

The transport of dangerous objects, of indivisible masses, or whose specific gravity is more than 2*, or less than 0·5 is not obligatory on the grantees. The conditions of such transport may be regulated by special contract; all transport requiring, by the dimensions of the article, the employment of a waggon, will pay for an entire waggon, whatever the weight may be.	The transport of dangerous objects, or of great dimensions, or requiring the employment of carriages of an extraordinary structure is not obligatory.

PASSENGERS.

The maximum of the rate for the transport of passengers is,

1. In first-class carriages, 1s. 6d. by the league of somewhat more than three miles.
2. In second-class ditto, 1s. 1d. ditto
3. In third-class ditto, 0s. 8d. ditto

The minimum of the rate is the price payable for the distance of six miles. A league begun will be considered as travelled over.

* *Note*—The carriage of cast or malleable iron is not then obligatory on the Western Company.

BAGGAGE.

Passengers may transport gratis articles of a weight less than 22 lb., and of a volume less than 1½ cubic feet, and which can be placed under the seats, without inconvenience to other travellers; such articles are at their own risk and peril.

All baggage exceeding the weight and bulk mentioned, and all other confided to the administration, pay at the rate of 3d. by the league (of somewhat more than three miles), and by 2 cwt.

The rate is calculated from 22 to 22 lb. The minimum of the rate is 5d.

MONIES AND VALUABLES.

For all distances, monies and valuables declared as such, there is payable

For sums below £4 . . .	½ per cent.
From £40 to £200 . . .	$\frac{1}{20}$ per cent.
For every £40 above £200 .	$\frac{1}{40}$ per cent.

This transport is only from station to station.

CARRIAGES AND HORSES.

For a 4-wheeled carriage .	$9d\frac{6}{10}$	per league.
2 ditto ditto .	$6\frac{4}{10}d.$	do.
For 3 horses . . .	$9\frac{6}{10}d.$	do.
2 ditto . . .	$6\frac{4}{10}d.$	do.
1 ditto . . .	$6\frac{4}{10}d.$	do.

CATTLE.

By waggon	8*d.* by league.
For 2 or 4 oxen or cows .	$6\frac{4}{10}d.$
5 to 10 pigs or calves . .	$6\frac{4}{10}d.$
11 to 20 sheep . . .	$6\frac{4}{10}d.$
1 or 2 oxen or cows . .	4*d.*
1 to 5 pigs or calves . .	$4\frac{8}{10}d.$
1 to 10 sheep . . .	$5\frac{5}{10}d.$

It follows from this comparison of the two tariffs, that for ponderous merchandize, the tariff of the Central Line is lower by 30 per cent.

We may observe, that when Mr. Magis makes his calculations for the object of establishing the utility of the Railway, he makes use of a tariff quite different from that which precedes, and in which the rates specified are much lower.

It is essential to make this remark, for Mr. Magis, calculating at a low tariff, and the Government making the concession to the Western Company at a high tariff, the reader is led into an error, which, in the future, it may be too late to deplore. It is in order to avoid this inconvenience, that we have restored in the comparative calculations, which we are about to make, the rates specified in the request of grant of the Western Company.

We may remark, by the way, that the tariff proposed by the engineer Magis, divides the merchandize into three classes, while the tariff proposed by the Western Company divides it only into two. The proposition of Mr. Magis is not fortunate, since it introduces complication where simplicity is desirable; besides, it is inconsistent with reason, since it charges the same for the transport of bricks, tiles, stone for building, &c. as of woollen and cotton stuffs, and these latter pay less than carved stone for building.

But, as this tariff, incidentally introduced, is not destined to undergo discussion, it is useless to dwell on its details. It suffices to say, that it has been the base of calculations, which are not conformable to the propositions made by the Western Company, and that we must have recourse to a true base, in order to draw a comparison between the two Lines.

IRON ORE.

The country which produces the strong, or rich iron ore, is situated on the table-land, of which Morialmé occupies nearly the central point. Around this are Oret, Bois des

Minières, Stave, Florennes, Fraire, St. Aubin, Gerpinnes, Hansinne, Hansinelle, &c. This country, the most productive of ore of the first quality, which forms the base of all mixtures, is traversed by the Central Railway, which unites it by the shortest road to Charleroi, the centre of the coal district, and the centre of the siderurgic establishments.

Let us see, then, what would be the price of transport of the ore by the two Lines, between Morialmé and Charleroi, that is, between the two centres of production.

Comparative price of transport of a ton of iron ore from the centre of the iron ore mines to Charleroi by

WESTERN LINE.		CENTRAL LINE.	
There is on the Line, and its Branches, a distance of 23½ miles to be travelled over (Report of Mr. Magis, p. 23). A ton will then cost at the tariff proposed by the Company .	2*s.* 4*d.*	There are 11½ miles to be travelled over . .	1*s.* 0*d.*
Upwards of six miles of Branch, which cost additionally	2½*d.*		
A mile and a half on the State Railway . .	2½*d.*		
Total cost of a ton .	2*s.* 9*d*		
Thus a ton of iron-ore, the transport of which from the mines to Charleroi by the Western Line would cost	2*s.* 9*d.*		
By the Central Line .	1*s.*		
Difference .	1*s.* 9*d.*		

If we recollect that Railways in the country between the Sambre and Meuse, have had for their main object to bring together the combustible and the ore, we shall be struck with the importance of this result.

In fact, a blast furnace consumes at an average 10,000 tons of ore yearly. There would then be an annual economy of about £865 for each furnace, which the proprietors of the Central Line will present over those of the Western.

We have taken for an example the two principal centres, where are situated the mines of iron ore, and the furnaces which consume it, because they are the most important; but if even we were to take the secondary group of Marchiennes-au-Pont, the terminus of the Western Line, and consequently the most favourable which it could invoke in its support, we shall find that this would not be in its favour, for the cost of transport would be :

Comparative price of the transport of a ton of iron ore from the centre of the mining district to Marchiennes-au-Pont by

THE WESTERN LINE.		THE CENTRAL LINE.	
21¼ miles . . .	2*s.* 4*d.*	11¼ miles . . .	1*s.* 0*d.*
Supplement for six miles of Branch	2½*d.*	1½ miles on State Railway	2½*d.*
Together .	2*s.* 6½*d.*	Together .	1*s.* 2½*d.*

The price of the transport of the ore would be still more than double, even for Marchiennes-au-Pont, which is the point the most favoured by the Western Line; accordingly, there would result even for this group an annual economy of £665 for furnace, by the adoption of the Central Line over that of the Western.

The Western Line, with its tariff, presents, relatively to the transport of the ore, so unfortunate a combination, that it offers no amelioration of the present state of matters.

Comparative view of the cost of carriage by waggon on the common roads, and that by the Western and Central Lines.

WESTERN LINE.		CENTRAL LINE.	
21¼ miles on the Western Line . . .	2*s.* 4*d.*	11 ½ miles on the Central Line . . .	1*s.* 0*d.*
6 miles supplemental by the Branch . . .	2½*d.*		

5½ miles on the State Railway . . . . . 9*d.*	4½ miles on the State Railway . . . . . 7*d.*
Cost at Chatelineau 3*s.* 3½*d.*	Cost at Chatelineau . . 1*s* 7*d.*
According to Mr. Magis, the cost of carriage of a ton of ore from Morialmé to Chatelineau (p. 23 of his Report) is by the common road . . 3*s.* 1*d.*	Cost by the waggon on the common road . . 3*s.* 1*d.*
Then the cost of carriage by the Western Line would be *more* than by the common road by . 1½*d.*	The cost of carriage by the Central Line would be *less* than by the common road by . . . . . 1*s.* 6*d.*

Thus, the carriage of the ton of ore would cost nearly 3d. more by the Western Line, than by the common road.

It is evident that the ore would continue to be carried by the common road, rather than pay 3d. more by the Western Line, while by the Central Line it would pay 17d. less, a reduction really important.

If there were nothing else in favour of the Central project, it would be sufficient to give it the preference; but we shall see that the comparison is equally favourable to it, relatively to other branches of traffic.

TRAFFIC OF COAL AND COKE.

The ore and combustible being separated, part of the blast furnaces have been established near the ore, and part near the combustible. It is the last we have hitherto considered; we shall now pass to the former, and shew that they are still worse used by the Western project than the others.

In fact for these furnaces a ton of coal will pay by

THE WESTERN LINE.		THE CENTRAL LINE.	
State Railway, 1½ miles .	2½*d.*	11½ miles	1*s.*
21¾ miles by the Western Line, in ascending to the Summit Line . .	3*s.* 4*d.*		
6 miles supplemental on Branch	2½*d.*		
Total for the Western Line	3*s.* 9*d.*		

That is to say, the blast furnaces of this description would pay for the transport of their coal and coke by the Western Line more than triple they would pay by the Central Line.

That is to say, these furnaces would cease to exist, if, in adopting the Western project, the common roads were suppressed, which alone afford them the means of vegetating.

In short, for the object of favouring the metallurgic industry, in bringing near each other the ore and the combustible, the conception of the Western Line is radically a nullity, while the Central Line favours it in a high degree; this latter ought, then, to have for it the national sympathy, when it should be carefully examined; and it will irrevocably destroy the rivalry of the English cast iron in this locality, while the Western Line allows the continuance of this deplorable competition.

TRANSPORT FROM THE SAMBRE TO THE MEUSE.

Let us pursue our comparative examination in regard to what would take place for the exports at Vireux, and we shall see that the Central Line maintains its advantage.

Comparison of the cost of transport of a ton carried along the whole Line from Charleroi to Vireux, by

THE WESTERN LINE.		THE CENTRAL LINE.	
The Line from Marchiennes-au-pont as far as Vireux, 39¾ miles . .	4*s.* 10*d.*	The distance by the Central Line is 32 miles, and the cost of carriage .	3*s.*
Add, on State Railway .	2*d.*		
Together . . .	5*s.*		
According to Mr. Magis, the transport by water costs	8*s.*	According to Mr. Magis, the transport by water costs	8*s.*
Economy by the Western Line	3*s.*	Economy by the Central Line	5*s.*

The economy by the Central Line will be almost double of what it would be by the Western Line.

But so great a difference in the price of transport must necessarily cause an enormous increase in the consumption which will take place in France of our coal, both in augmenting the quantity consumed, where it is already in use, and in extending the sphere of consumption; for a diminution of five shillings in the price of a ton of coals, allows it to be carried by water a much more considerable distance before it again attains that elevated price which arrests its consumption.

Mr. Sauvage, a French engineer, estimates that under the influence which the reduction offered by the Western Company would effect, the quantity exported will not be less than 150,000 tons annually. What then would be its amount, if a double reduction enabled the Belgian coal to extend to a much greater distance the sphere of its consumption?

Mr. Sauvage also estimates that the diminution in price would, in addition, substitute the Belgian for the Sarrebruck coal, which now enters France to the amount of 175,000 tons annually.

In the actual state of transport, the coal of the Charleroi district has reached the Paris market and has not been unfavourably received there. What would be the case, after this reduction, which amounts to five shillings per ton?

In limiting this exportation to 200,000 tons, we shall certainly be within the reality; but 200,000 tons presenting 2s. 4d. procured by the Central Line above that procured by the Western Line, there arises for the district of Charleroi an increase of annual economy in the transport of £22,800.

HOME TRADE.

The project of the Western Line and its tariff is burdensome on the home trade, since it demands (§ 1) of the tariff.

When the transport takes place from the Sambre or Meuse to a point within the Summit Line.	1·7d.
When the transport takes place from either river as far as the Summit Line. . . .	1·8
Mean . .	1·75

Now, these two cases comprise the greater part of the home trade, particularly of that in coal, an article of the very highest importance. The Central Line demands only 1·1d. per ton per mile, whatever is the direction. There will then arise under this head an economy for the trade of nearly 0·7d. per ton per mile; taking the average distance travelled over at 15 miles, there would then be an economy of 10d. on every ton of merchandise, to the advantage of the consumer.

If we suppose that the collective amount of the home trade of the Sambre and Meuse country is limited to 100,000 tons annually, there would be, on this head, an annual economy of £4,000, which the adoption of the propositions of the Central Line would effect.

To estimate at only 100,000 tons, the whole trade in timber, prop wood, bark, marble, building stone, coal for house use, or for burning lime, kelp, &c., &c.; certainly that is carrying moderation to its extreme limits.

If we recapitulate the different branches of economy, which the propositions of the Central Line present over those of the Western, we shall find—

On the metallurgy industry, in supposing blast furnaces fed with coke in activity, an economy of £800 yearly on each, for the transport of coke and ore. . . .	£6,400
On the export trade, principally in coal and cast iron.	22,800
On the home trade.	4,000
Together . . .	£33,200

Thus the country, between the Sambre and Meuse, is interested annually for the enormous sum of £33,200 of tax, which it would pay if the Western Line were adopted instead of the Central.

We have then good reason for saying that the difference of cost of construction fades away before an extensive traffic on it: we are so convinced of this truth, that even if the Central Line were to cost more than the Eastern, we should not have hesitated to have adjudged to it the preference, on account of its advantageous direction.

SECOND PART.

Now that we have proved to demonstration that the project of the Central Line promotes the interests of the country, let us see how far those of the shareholders are attended to.

PRICE OF THE TRANSPORT.

When we are going to examine the working cost of a Railway, the first question which presents itself is,— What is the cost in Belgium per ton per mile?

We may in vain search all the Belgian documents for an answer to this question. We shall not find any. In the absence of an official answer, let us seek out one ourselves, by deducing it, in a manner sufficiently approximative for the use we want to make of it, from the last result published by the minister relative to the year 1844.

On opening the first page of this formation, we find—

The whole expences of the State Railway, during the year 1844, amounted to £230,617.

The number of miles travelled over by the locomotives was 1,436,691.

Dividing one of these sums by the other, we find that the expence per mile per train was 3s. 2½d.

The statistical tables which this document contains, allow us to give the subordinate details of this 3s. 2½d., and we shall deduce from it the following results.

Detail of cost per mile per train on the Belgian Railways, in the year 1844.

§ 1.—TRANSPORT PROPERLY CALLED SUCH.

Combustible, coke, coal, premium to engine-men	5·32*d.*
Greasing, cleaning, lighting	1·54
Clerks, engine-men, stokers, conductors of trains, men for weighing baggage, and merchandise, labourers	8·20
Carriage from the Railway Stations to the place of destination in the towns, and *vice versa*, indemnities and loss by injury done to goods, several little expences	0·01
Together	1*s.* 4*d.*

§ 2.—KEEPING UP THE WAY, LOCOMOTIVES, CARRIAGES, &c.

Keeping up the way and stations, salaries and indemnities of functionaries, and clerks	0·77*d.*
Clerks and others employed on the lines	0·45
Paid to workmen for keeping up the lines	7·14
Salaries and payments made to the clerks and workmen at workshops at Malines and elsewhere	4·61
Renewal of sleepers and rails, building of waggons, pieces of mechanism, and a variety of articles necessary for keeping up stock	5·68
Together	1*s.* 6·65*d.*

§ 3.—ADMINISTRATION.

Salary and indemnities paid to functionaries	1·44*d.*
Office expences, printing	0·86
Cost of receipt of the rates	1·31
Rent and other expences	0·16
Together	3·77*d.*
Total general	3*s.* 2·4*d.*

We may resume, as follows, the preceding detail in adopting another subdivision.

COST PER MILE PER TRAIN IN THE STATE RAILWAY IN 1844.

Combustible	5·32*d.*
Salaries, wages, indemnities . . .	1*s.* 11·70
Primary materials, wood, iron, utensils, grease, &c.	8 35
Carriage from station and *vice versa* . .	0·53
Divers expences, rents, printing . .	0·26
Total in like manner . .	3*s.* 2·46*d.*

If we would deduce from these official documents, containing the cost per mile per train, on the State Railway, what would approximatively be the cost per mile per train, on the Sambre and Meuse Railway, (Central Line,) we may make the following remarks.—

Undoubtedly the keeping up will appear very considerable, since it exceeds the transport properly called such, and in this respect we may feel surprise, for it is much greater than what exists in other countries; it is probable that the stock is completed under the head of keeping up; we may therefore reasonably expect a considerable economy on this head, in the administration of the Sambre and Meuse Railway.

If we had not been furnished with the detail above mentioned, we might have thought that the combustible formed the principal part of the expence; yet, this is by no means the case; on the contrary, it is inconsiderable. It is only about $\frac{1}{7}$th of the whole, since it is $5\frac{1}{2}d.$ upon $3s.\ 2d\frac{1}{2}$.

The coal will be cheaper at Charleroi than what it costs at an average on the State Railway. *Mr. Magis* estimates the difference at 50 per cent; but we shall not count on so great a reduction.

The most considerable expence on the State Railway is that of salaries and wages, since it is more than half of the whole, namely, 1*s.* 11*d.* out of 3*s.* 2*d.* This circumstance leads us to believe that the establishment of salaried persons is too numerous, and therefore on the Central Line it is probable there will be a great reduction on this head.

The primary materials made use of for keeping in repair on the State Railway, seem to cost very high, since the amount of their price exceeds, by one half, that of the combustible; on the Central Line there will necessarily be a reduction.

The expence of carriage from the stations and *vice versa*, will not exist at all, since the loading and unloading are at the charge of the parties sending the goods.

The head, of rents, printing, and divers expences, will also suffer a material diminution since the State Railway pays above £4,000 for printing and paper alone.

The trains move with great velocity on the State Railway, because it is specially destined for the conveyance of passengers. On the Sambre and Meuse Railway, the velocity will be moderate, because its principal service will be the transport of goods.—Hence a new source of economy.

On the State Railway, there are proportionally a great number of carriages of a luxurious character. On the Sambre and Meuse Railway, the stock of carriages will be composed principally of those calculated for the transport of goods, whose original cost and repair is much less expensive.

All these sources of economy would make a large total, if we were to examine them minutely and accurately; but to abridge, we shall estimate them in mass, at sixpence per mile, which will reduce to 2*s.* 8*d.* the cost per mile per train on the Sambre and Meuse Railway, and we admit the repartition of them as follows.

COST PER MILE PER TRAIN ON THE SAMBRE AND MEUSE RAILWAY.

1. Transport properly called . . .	1*s.* 2·4*d.*
2. Keeping up way and stock . . .	1 2·4
3. Administration	3·2
Together . .	2*s.* 8*d.*

The Sambre and Meuse Railway being principally destined for the transport of ponderous goods, nothing will be more easy than to complete the trains; we can then reckon them each at 100 tons of goods, or of useful weight. The expence per ton per mile will then come to 0·33*d.* (one third of a penny.)

This 2*s.* 8*d.* per train, or one third of a penny per ton, forms the whole expense of every description, in the same way that on the StateRailway the 3*s.* 2·46*d.* forms the whole expense per mile per train, which we have seen is evident, for we arrive at that by dividing the whole of the expense by the number of miles travelled over.

Having determined the cost of the unity of transport, that is to say, the expense occasioned by a ton of heavy goods travelling over a mile on the Sambre and Meuse Railway, we shall now determine the number of ton—miles which shall circulate on the road.

When, in a country, abounding in ponderous productions, and unprovided with means of transport, a way of great communication is opened at a cheap rate, the increase of transport will then be immense. It is a principle which the experience of all ages has confirmed.

In order to judge soundly of the future increase which will be the result of the establishment of a new way of great communication, we shall avail ourselves of the analogies which experience can furnish.

Now, in the present case, and without going out of the locality, we shall find a case quite analogous, in the canal which reaches between Charleroi and Brussels.

Since the establishment of this canal, the transports have increased to such an extent, that the dimensions are become insufficient. The actual tonnage has risen, by the official reports, beyond 600,000 tons, by average mile of way; that is, the same quantity and distance as if 600,000 tons had been carried along the whole way from Charleroi to Brussels.

Let us see the analogy which may exist between this example, which we cite, and the proposed project.

The terminus of the canal and the Railway is the same; it is the centre of the Charleroi coal district.

The canal transports almost exclusively coal to Brussels. The returns are insignificant.

The Railway transports coal to France, and to the numerous manufacturing establishments which it passes near in its course.

The returns, in place of being insignificant, will be on the contrary numerous, for the country traversed is eminently productive in ponderous matters. They are—

Iron ore.
Timber for building.
Prop-wood for the coal mines.
Staves.
Bark.
Marble.
Building stone.
Slate.
Iron;

and many other ponderous articles, which not only will afford returns to Charleroi, but will flow into France.

To say, that at equal rates of transport, the direction from Charleroi towards France, in traversing the rich metallurgic country of the Sambre and Meuse, would be inferior in its productiveness to the direction from Charleroi to Brussels, in regard to the transport of ponderous goods, would be to advance a proposition, which could not be supported, and which no person conversant with the locality would admit.

It cannot, then, be reasonably supposed that the tonnage on the Sambre and Meuse Railway, with regard to ponderous goods, would be inferior to that on the canal from Charleroi to Brussels; that is evident as to the main trunk.

Let us, however, only admit of 300,000 tons by average mile of way; because the branches towards the mines of iron ore and the blast furnaces, as well as towards Couvin, will not produce so high an amount, at least until the proposed Railway in France is constructed in the direction of this latter branch.

As to the movement of passengers, parcels, &c., to estimate it, we shall have recourse to the Report which the engineer Magis has just published by order of the Government. He there estimates that the proposed Railway of the Western Line, and which only passes near villages, and the little town of Marienbourg, will produce annually a total sum of £11,688 by the transport of passengers, carriages, horses, and cattle.

In admitting the accuracy of these calculations, it may be conceived that the amount ought to be increased for the Central Line, which passes between Philippeville, where five important roads join, and Dinant, a town which has a population of 5000 souls, which would communicate with the station by a good road; yet we shall only admit of a receipt, on this head, of £12,000 in round numbers, because the Central Line relies much less on the receipts from passengers, than on those from ponderous goods.

From the preceding *data* we shall deduce the following account:—

EXPENSES

Length of the principal trunk . .	30 miles.
Ditto of the branches . . .	21 ditto.
Total	51 miles.

Fifty-one miles of way, at 300,000 tons per mile, will give a product of 15,000,000 tons—miles.

The trains of ponderous goods, being supposed at an average to carry 100 tons of useful weight, the number of trains necessary will be	153,000
A train at a great velocity per day in each direction, 51 × 365 × 2 . . .	37,230
Extraordinary trains 100 × 51 . . .	5,100
Total of miles travelled over by locomotives	195,300
A train on the Sambre and Meuse Railway, costing 2s. 8d. per mile, all expense of every kind included, the expense will amount to a total sum of	£26,044

RECEIPTS.

15,300,000 ton-miles of heavy goods, at 1s. 1d. by ton-mile, will produce . . .	£71,400
Passengers, parcels, cattle, &c. . . .	12,000
Total receipts	83,400
Deduct expenses	26,044
Excess	£57,356

which, upon a capital of £480,000, is 11¾ per cent.

The interests of the Shareholders will then be attended to, as well as those of the country, and that in spite of the extreme moderation we have shown in the estimate of the traffic.

In fact, we have only supposed a movement of 300,000 tons, by average mile of way; that is, a movement the same as of 300,000 tons passed along the whole of the trunk and the branches, which makes only 150,000 tons in each direction, and we have seen that the exports of coal alone will, in all probability, amount to 200,000 tons.

As to the 150,000 tons in return, they will probably be surpassed, for the cheap transport will cause the ponderous matters to spring up, as it were, in a country whose surface is in a manner composed of them.

We may then repose in entire security as to the fate of the enterprise, and the country and the Government may, without any apprehension for the capitalists, take the advantage of the cheap transport which is offered them.

SUMMARY.

Having proved that the project originally formed by Mr. Taylor, which we have called the project of the Central Line, is at once highly useful to the country and lucrative to capitalists who would embark their funds in it, we think it would not be altogether useless to give, in the form of a summary, a comparative view of the two projects submitted to the discussion of the Chambers.

LINE OF THE WAY.

The Central Line is simple, does not present any difficulty of execution, having no tunnels, and the works of art being insignificant, the whole being capable of being appreciated and calculated with precision.

An analogous case exists in the State Railway, in setting out from Liege to go to Brussels, only the inclined plane is less rapid, and the traction in it may be effected by locomotive power.

The Western Line marches amid tortuous vallies, requires tunnels and considerable works of art, the cost of which it is difficult to appreciate.

There is an analogous case on the State Railway, in setting out from Liege to go to the Prussian frontier, along the valley of the Vesdre.

The Western Line will have but a single way and will cost	£600,000
The Central Line will have a double way, and will cost	£480,000
The distance from Charleroi to Vireux, by the Western Line, will be more than .	38 miles.
The distance from Charleroi to Vireux, by the Central Line, will be less than . .	32 miles.

TARIFF.

The average price of the transport of a ton of goods over a mile will be by the Western Line	1*d.* $\frac{6}{10}$
By the Central Line	1*d.* $\frac{1}{10}$

SERVICE RENDERED.

The Central Line advances powerfully the siderurgic interests, in diminishing in a high degree the expense of manufacturing the iron.

The propositions of the Western Company do not effect any amelioration of the present state of matters.

With regard to the export of coal, the economy of transport is nearly double by the propositions of the Central Line.

As a general result, the excess of service rendered by the Central Line, over that rendered by the Western Line, will not amount to less than an annual sum of £32,000.

LEGISLATIVE PROPOSITIONS.

The Company of the Western Line demands the guarantee of a minimum of interest for its Shareholders.

Without entering into the general discussion, whether it is politic for a state to guarantee private speculations, we think that the Legislature will see with satisfaction that the Central Line will demand the concession simply, without subvention or minimum of interest.

The surveys of the Central Line, which were only commenced a few months ago, have been pushed on with such activity, that they have been already entirely completed, and a contract has been entered into with a responsible contractor for the construction of the Railway.

The plans and vertical sections are finished. A Com-

pany is now forming and will shortly lodge the deposit requisite to guarantee its solidity.

If this latter formality has not yet been complied with, it is owing to the judicious reserve of the capitalists, who wish to assure themselves of the superior merit of the new project over the old.

Let us hope that the Legislature will afford to the author of such useful projects the reasonable time for completing and uniting the capital requisite for the enterprise; and that, at all events, it will not decide by its vote, without having bestowed serious attention on the new project, which tends so eminently to promote the national industry.

[*Signed*] AUG. DELAVELEYE.
CIVIL ENGINEER.

BRUSSELS, 12*th December*, 1844.

W. Lewis and Son, Printers, 21, Finch-lane, Cornhill.