and Mr. Hughes promised to give, during the next session, a report of the method of using them, and of the result of their application in several wet cuttings.

April 2, 1844.

The PRESIDENT in the Chair.

The following candidates were balloted for and elected :—Alfred Stanistreet Jee, as a Member ; Adolphe du Bois de Ferrières, James Hunter Tasker, Bernard Snow, Arthur Collinge, and Thomas Hughes, as Associates.

The discussion of Mr. Gregory's paper, (No. 668,) "On Cuttings and Embankments of Railways" was renewed, and was extended to such a length as to preclude the reading of any paper during the meeting.

April 16, 1844.

WILLIAM CUBITT, V.P., in the Chair.

No. 661. "Account of the Railway from Amsterdam to Rotterdam, and of the principal works upon it." By the Chevalier Frederick Willem Conrad, M. Inst. C. E. ; translated from the French by Charles Manby, Assoc. Inst. C. E. Secretary.

This railway, the first that has been constructed in Holland, is due to the enterprize of a public company, called "The Railway Company of Holland ;" whose affairs are managed by a council of administration, consisting of five commissaries and the engineer. The difficulties of construction, arising from the peculiar physical character of the locality, were amongst the least that the company had to contend against ; the directors were however satisfied, that the utility of the undertaking would be finally understood in the country, and that by perseverance, all obstacles would be overcome.

The company was formed on the 8th August, 1837, at Amsterdam, and within a short period, the statutes received the royal sanction ; but no sooner had the contract been made, for the execution of the first division, from Amsterdam to Haarlem, than numerous law-suits arose, owing to the hostility of the proprietors of the land, over which

it was intended the railway should pass; the consequent difficulty of expropriation, and serious discussions with the engineer, to whom, at that period, the execution of the line was entrusted, and which terminated in his resignation, caused great delays, which were prejudicial to the undertaking.

At length, the Government, at the request of the council of administration, appointed the author of this paper 'Engineer Director,' and he entered on his duties in March 1839. After a minute inspection of the line, he found it necessary to complete the first division, between Amsterdam and Haarlem, according to the designs of the former engineer, but to adopt different and more eligible plans for all the other divisions. This first part was opened on the 20th September, 1839, and the dispatch that had been used, enabled the council to announce, at the general meeting held in April 1840, their intention to continue the execution of the remainder of the line, without delay.* The assent of the government being granted, the greater part of the year 1840 was occupied, in gaining the concurrence of the regencies of the different towns and the 'polders,'† through which the railway would pass, and in effecting the expropriations.

In the beginning of the year 1841, the first contract for works was made, including the bridge over the river Spaarne at Haarlem. This bridge, which is of iron, has six openings, the piers are of brick-work, faced with cut stone. The two middle openings have an iron swing bridge, of a very simple and solid construction, which opens and shuts both openings, at the same time, to render the passage of the vessels as rapid as possible, as between fourteen and fifteen thousand pass through annually. The principal beams of this swing bridge are each upwards of 23 metres long (= 75 feet 6 inches), and were cast in a single piece; the whole bridge weighs upwards of 110 tons, and the machinery for moving it is so perfect, that one man turns it easily in two minutes. There is also a method of holding the bridge firmly shut, during the passage of the train, at which times

* The divisions of the line are—

	Metres.	English Yards.
1 ^o From Amsterdam to Haarlem . . .	16817·40	= 18381·4
2 ^o „ Haarlem to Leyden . . .	28270·30	= 30891·1
3 ^o „ Leyden to the Hague . . .	15303·80	= 16726·2
4 ^o „ the Hague to Rotterdam . . .	24000	= 26232·0
Total . . .	84391·50	= 92230·7

or about $52\frac{1}{2}$ English miles; with fifty-eight bridges in the three first divisions.

† The "polders" are the spots of land which have been drained and are now cultivated: their level is usually below that of the sea.

alone it is closed, and a self-acting signal is attached to it. During the construction of this bridge, the channel of the river was diverted, that the navigation might not be interrupted, and the whole was completed in one season.

There are also five fixed bridges, of the same style of architecture, over the canals within the town of Haarlem, the station at which place is neat and simple.

After much difficulty in obtaining possession of the land for the railway, a contract for the cuttings and embankments, at a given price per cubic metre was made, to be executed as fast as each individual portion should be obtained, either by private purchase or otherwise; by this means, much time was saved, and the line was completed to Hellegom, during the season of 1841.

At Vogelenzang, near Bennebroek, the canal of Leyden, and the high road, are both crossed by a trellis bridge of 54 metres in length (= 177 feet,) at an angle of 30° with the canal. This bridge is built entirely of red deal, excepting the roadway beams, which are of oak, and is formed by three series of planks, crossing each other in the form of trellis-work; there are three openings, of which, those on either side are each 9.85 metres (= 32 feet 4 inches) span, and the centre one is 34 metres (= 111 feet 6 inches) span; the trains pass without causing any vibration.

The next step, was to make a contract for the trussed timber bridge, to cross the canal and the towing-path, at an angle of 60° , near Leyden, for which the span was required to be 17.20 metres (= 56 feet 5 inches.)

Near this spot is the 'Warmonder Leede' one of the navigable canals, which at the same time act as drains, for conveying water from the interior of the country, into and out of the Lake of Haarlem, by the dykes of Katwyk, as well as serving for commercial and agricultural purposes. The regency of Rhynland, insisted that the bridge to cross this canal, should have five openings, each of 6.30 metres (= 20 feet 10 inches), of which, the centre one should have a swing bridge, for the facility of the navigation of the canal.

This is of a novel construction, on the system of a sliding bridge; it is built of timber, and the platform is easily moved by one man.

The nature of the soil, from the 'Warmonder Leede' to the town of Leyden, was such as to render it necessary, to form the railway on fascines or faggots. This plan was also necessary, on all the first part of the line; and even at the Leyden station, the whole of the buildings were erected upon a similar foundation, which appears to answer very well.

Beyond Leyden, the railway crosses the Rhine at an angle of

82°, by a trussed timber bridge with five openings; the three centre ones have each a span of 10 metres (= 32 feet 10 inches), and the two side ones are each 6 metres (= 19 feet 8 inches) span. One of these latter, is for the navigation of the river, and is furnished with sliding platforms, opening both ways; they are easily managed by one man.

It was not until the end of the year 1841, that the Company obtained possession of part of the line of railway, at 'Sloterdijk,' in the first division, after a law-suit of four years' duration, relative to the expropriation, and after being obliged to pay a large sum to the proprietor, for the permission to pass temporarily during the law-suit; without which, the first division, between Amsterdam and Haarlem, could not have been opened.

These difficulties were encountered throughout the whole line, to such an extent, that at a short distance from Leyden, the obstinacy of a single landowner entirely stopped the progress of the works, and obliged the Company to build a temporary station for that town; without this step, the opening of that part of the line would have been retarded for three or four years, there being no legal means of accelerating the process of expropriation. The line was then opened from Haarlem to the immediate neighbourhood of Leyden.

In the course of the year 1842, the whole of the second division, and great part of the third, were completed. Several aqueducts, five large bridges, and a number of small ones were built; the latter being all over navigable canals, were made to swing on simple brackets; the permanent station at Haarlem was completed; the foundations were laid of those at Leyden and Amsterdam; and the workshops for the repairs of the engines, &c., were finished.

These circumstances are only mentioned to show, that considering the delays occasioned by the defective jurisprudence in the matter of expropriation, more than common diligence had been used to enable the line to be thus far opened.

After the opening of the second division, several of Stephenson's new patent locomotive engines were added to the stock of the Company, and after ample trial of their qualities, they were considered to be the best engines in the service.

A part of the third division was opened as far as Voorschoten, in the month of May, 1843, and thus, with the aid of omnibuses and diligences, the line was completed as far as the Hague, although, owing to the legal difficulties already named, the swing-bridge to cross the Hague and Delft canal, could not be constructed, nor the permanent station at the Hague be built. These latter works have only been completed in this present year (1844).

Such were the difficulties, the Company had to contend with, from the delay caused by the defective state of the law of expropriation, and the rapacity and prejudice of the proprietors, over whose land the line had to pass, that it was only on the 6th December 1843, that the railway was completely opened for public use, all the works, as well as the different stations being completed, and a simple and effective system of management established.

The opening of the railway took place, with much ceremony, on the day above named, being the anniversary of the birth of the King, in the presence of his excellency, the Minister of the Interior, who was conveyed by it from the Hague to Amsterdam, where, on the same day, he was present at the opening of the Rhenish Railway, from Amsterdam to Utrecht.

The stock of the company, now consists of thirteen locomotive engines, with their tenders complete, and one hundred and three carriages of three different classes, which number will be considerably increased.

From the opening of the different divisions, up to the 1st December 1843, the locomotive engines have traversed a distance of 386,124 kilometres (= 239,786 English miles), and 1,513,935 passengers have been conveyed.

In consequence of the difficulties experienced through the defective law of expropriation, a petition for its revision was presented to the States General, and, from its favourable reception, it is presumed, that such a law will be passed, as will facilitate the formation of railways throughout the kingdom, and will cause the speedy extension of the present one as far as Rotterdam, thus uniting two cities so long celebrated in the annals of commercial enterprise.

In an Appendix, copious extracts are given, from the schedule of general conditions for the public tenders, for the various works.

The metrical system of measures and weights is used ; the Flemish ell (el) = the French mètre = 3 feet 3 inches English ; and the Flemish pound = the French kilogramme = 2.2 lbs. avoirdupoise.

The proportions of stone-lime (steen kalk) from Liège, shell-lime (schulpkalk) burnt on the coast, and tarras (tras) from Andernach or Dordrecht, which were used in the constructions, are given for every kind of mortar.

The conditions to be observed by the contractors, in their attention to the works, the choice of workmen, the provision for breaking the contracts, in case of neglect, or of improper delay in completing the works ; the cases of applying to the schedule of prices for the valuation of the extra works ; the rates of payment upon the measured work, 5 per cent. being retained for one year after the completion of

the contract, and all other clauses, are given in detail, with the schedule of prices for all kinds of work and materials on the line and in the constructions.

The rails used in the permanent way (Figs. 1, 2, and 3) are of a

Fig. 1.

Plan of rail, longitudinal timbers, sleepers, and wedges.

Fig. 2.

Section of sleepers, showing the joint-plates, and mode of fastening the rails.

Fig. 3.

Section of longitudinal timbers, wedges, and rails.

bridge form, weighing 30 kilogrammes per metre (≈ 60 lbs. per yard); they are fixed by screws, upon longitudinal timber bearings, of Riga red deal, with sleepers of the same timber, halved into them, and secured by oak wedges. The ends of the rails are fastened by nuts and screws, through the longitudinal bearings, with joint plates and cramps. This method of fastening is stated to be very complete, and the motion of the carriages over the joints is without shock. The gauge is 2 metres (≈ 6 feet 6 inches English) from centre to centre of the rails; and the cost of each kilometre (≈ 0.616 of an English mile) of single line of railway laid, is 17700 florins ($\approx \pounds 1475$, or $\pounds 2394$. 10s. per mile). The dimensions of the various pieces, their number, weight, and price are given in minute detail.

The general width of the top of the earth-work for the rails (Fig. 4), is 9 metres (= 29 feet 6 inches English). The inclination of the

Fig. 4.

slopes of the embankment, is twice its vertical height. The side benches vary in width between 1 metre and 2 metres (= 3 feet 3 ins. and 6 feet 6 ins. English). The ditches are 4 metres (= 13 feet 1 in. English) in width, and the ballasting is composed of sea-shells (schulpen).

In marshy spots all the earth-works are laid upon beds of fascines (Fig. 4), more or less extensive, according to the nature of the ground. In those situations where the railway traverses pools of water, the fascines alternate with beds of rubble (Fig. 5), and are held together

Fig. 5.

by stakes and wattles, until the weight of the earth is laid upon them and the mass is consolidated. The earth-work is chiefly composed of sand from the sea beach, and is covered with turf.

The station at the Amsterdam terminus, is a semi-circular building of brick and cut stone, with projecting wings, and sheds on iron columns, founded on piles in the usual Dutch manner.

The station at the Haarlem terminus, is also of brick and stone, but is not founded on piles, as the ground was sufficiently solid to bear a building.

The Leyden station, which is of the same construction as the others, stands on such bad ground, that it was necessary to construct a raft, placed upon oak piles, to receive the foundation of the building (Fig. 6.)

Fig. 6.

Section of the foundation for the walls of the Leyden station.

The station at the Hague resembles the others, but being constructed on good ground, piles were not necessary.

The dimensions, arrangements, and cost of construction of all these stations are given.

The bridge over the Spaarne at Haarlem (Figs. 7, 8, 9, 10, 11, 12, and 13) consists of six arches of 8 metres (= 26 feet 3 inches English) span each; four of them are fixed, and the other two are occupied by a cast iron swing-bridge, which generally remains open for the convenience of the navigation, and is only closed at the times of the passage of the trains. The machinery for turning this bridge (Figs. 8, 11, 12, and 13), and for simultaneously opening or shutting both arches, is situated on the centre pier, which is constructed, like the others, of brick and cut stone, upon piles of pine. A self-acting signal is attached to this, and to all the other swing bridges, in order to show their position.

The bridge-keepers reside in two small wooden lodges, built in the river, opposite to each end of the centre pier. The bridge being equally balanced upon the pivot, the labour of working it is small, as compared with that required for working a half-arch swivel-bridge; and it possesses the far more important advantage, of perfect stability and freedom from vibration, when once fixed between its bearings—an indispensable condition for a railway bridge.

Fig. 7 is a side elevation of the bridge, showing the two centre openings, and the piers of brickwork with stone facings. The foundation piles of the piers, are from 8 inches to 11 inches square, and 26 feet 3 inches long. On these piles, are laid the longitudinal beams of a timber apron, which traverses the whole of the openings,

Fig. 7.

Bridge over the Spaarne, at Haarlem. Elevation of the centre pier, and part of the arches.

and extends above and below the bridge, to the extremities of the cut-waters, and on these are placed the tranverse bearers of the piers. The whole of the foundation is of white deal. All above the dotted line in the figure is iron-work.

Fig. 8 is a plan of the iron framing of the swivel-bridge, consist-

ing of five long girders, connected by transverse and diagonal pieces, supported by six rollers, working on a circular rail or bearing-plate; concentric with the latter, is a fixed circular rack for a travelling pinion, shown on a larger scale in Figs. 11, 12, and 13.

Fig. 9 is an elevation of one of the piers, and a section through

Fig. 9.

Section of one of the end arches.

the roadway, showing the brickwork and stone quoins of the side face of the pier. The brickwork on the facing is $1\frac{1}{2}$ and 2 bricks thick, of bricks of the best quality (clinkers) set in strong tarras cement: and the inside is of bricks of inferior quality, in bastard tarras cement.

Fig. 10 is a tranverse section of the swivel-bridge, at the middle

Fig. 10.

Section of the swing-bridge at the centre pier.

pier, with the trussing of the girders and the working machinery, the details of which are shown on a larger scale in Fig. 11.

Fig. 11 is a tranverse section of the swivel-bridge, showing the

Fig. 11.

Section of the swing bridge, showing the machinery for opening and closing it.

transverse pieces bolted, through their flanches, to the girders. The operation of working the bridge will be at once understood, by an examination of this figure, in connexion with Figs. 12 and 13. The action of the hand-wheel, is transmitted by bevelled gear to the shaft of the travelling pinion, and the bridge is thus made to revolve on its centre, supported by the six rollers. The bushes of all the roller axles are adjustable, by an apparatus shown in Figs. 11 and 12, by means of which they may be screwed down to a point, at which each roller carries its due share of the weight.

Figs. 12 and 13 show the machinery for securing the bridge, when closed. The pinion on the axle of the hand-wheel (Fig. 12,) works the sector rack. A long connecting rod is jointed at one end on an arm of the rack, and at the other on the arm of an axle, which carries three eccentric or cranked rollers. The hollow in the section of each roller, corresponds to the convex section of a bearing-block, upon which it is brought down, by an alteration in the position of the crank which carries it. When the bridge is secured in this position, the effect of which is to give it a firm bearing at each end, by distributing the weight over the two ends and the centre, it is evident, that it can have no lateral motion, and still greater security is given to it by the bolts, which are shot into their mortices, by means of a projecting arm on the connecting rod.

Fig. 12.

Elevation of half of the swing bridge, showing its machinery.

Fig. 13.

Plan of half of the swing bridge, showing its machinery.

The following are the principal dimensions:—

	Ft.	In.	
Thickness of the centre pier	21	10	English.
„ piers nearest to the centre on } each side	7	4	„
„ piers nearest to the abutments	6	6	„
Length of the iron swivel-bridge	77	6	„
Width of ditto	20	10	„
Length of the middle girder	77	6	„
„ intermediate pair	76	6	„
„ outside pair	74	9	„
Depth of the girders at the centre	4	0	„
„ at the ends	1	0	„
Thickness of the three middle girders	0	2 $\frac{3}{4}$	„
„ outside pair	0	1 $\frac{1}{2}$	„
„ oak planking of the platform	0	3	„

The castings were made at the foundry of Messrs. Dixon & Co., at Amsterdam.

The cost of this bridge was 83,000 florins (= £6,916. 13s. 4d.) All the details of dimensions and cost are given.

The timber bridge at Vogelenzang (Figs. 14, 15, and 16) is built on the American trellis-work system;* it is 54 metres (= 177 feet 2 inches English) long by 9.92 metres (= 32 feet 6 inches English) wide, and spans the high road and the canal, with its towing-path, at an angle of 30° with the latter. The piers are of masonry upon piles.

The timber-work consists of three ribs of lattice-work, one on each outer side of the platform and one in the centre, between the two lines of rails. Each series consists of battens of red Riga deal, 3 inches thick and 12 inches wide, crossed at an angle of 45° with the horizon, and therefore at right angles with each other, as shown in the elevation (Fig. 14), and well fastened, at each crossing, with oak trenails. More than one-third of the depth of the lattices is below the platform; and its general stability is very much increased, and lateral vibration is prevented, by the diagonal trussing shown in the transverse section and plan (Figs. 15 and 16) of the platform. The transverse oak bearers, 10 inches square, on which the planking of the platform is laid, are placed at intervals of about 3 feet, every alternate one being trussed, as shown in the section (Fig. 16), and the truss bound together by a pair of iron screw-bolts, 4 feet long, placed between the longitudinal bearers of the rails. The planking of the platform is of white deal, 3 inches thick and 20 inches wide; and, excepting this and the oak bearers of the platform, the whole of the timber-work is of red Riga deal.

* Vide also Stevenson's 'Civil Engineering in North America;' 8vo. 1838; page 231.

Fig. 14.

Lattice bridge at Vogelenzang. Elevation.

Fig. 16.

Transverse section.

Fig. 15.

Plan of the platform, showing the trussing.

The following are the principal dimensions of the parts :—

	Feet.	In.	
Length of the bridge	177	0	English.
Total width of ditto	32	6	„
Width of side openings	29	0	„
„ middle opening	111	6	„
Height of the platform	15	9	„
„ lattice above ditto	7	10	„
Depth of the lattice below ditto	5	2	„
Total height of the lattice ribs	13	0	„
Clear width of each roadway	13	0	„

This construction is stated to be very satisfactory, and to have cost only 46,000 florins (= £3833 6s. 8d.)

The trussed timber bridge over the Warmonder Leede crosses the river at an angle of 50°. It has five openings of 6·30 metres (= 20 feet 8 inches English) each; through one of these, the navigation is carried on, and it is closed when the trains pass, by a sliding platform moving diagonally upon rollers, which is worked by one man, and by very simple mechanism, like that of the double platform bridge at Vink (Figs. 20, 21, 22, 23, and 24.)

The heads of the piles for this bridge, required to be cut off, and a tenon to be worked upon each, below the water line; this was done by a simple apparatus, consisting of a deal box (Figs. 17, 18, and 19) well put together and caulked, so as to be water tight; it was two metres (= 6 feet 6 inches English) long, 1·30 metre (= 4 feet 3 inches English) wide, and 1 metre (= 3 feet 3 inches English) deep. Through the centre of the bottom there was a hole, large enough to

Fig. 17.

Plan.

Fig. 18.

Longitudinal section.

Fig. 19.

Transverse section.

admit the head of a pile (A.) Around this hole was nailed the open bottom of a sack (B), of stout canvas, strengthened with leather. Two cords (C C) were made fast, by one end of each, to the box, and the others were passed through pulleys in the sides.

When a pile was required to be cut off, the box was put over it, and by weights within, it was caused to descend as low as was requisite; by means of the two cords, the lower end of the sack was then drawn round the pile (A), so as to form a water-tight joint; by a small pump, the water was then emptied from the box, into which a workman descended, turned back the canvas sack (B), and after sawing off the pile, cut the head into any desired form.

This system is stated to have been used, wherever the piles were required to be cut off under water, and to have been very successful.

The cost of the bridge over the Warmonder Leede was 44,600 florins ($\approx$ £3716 13s. 4d.)

The trussed timber bridge, which crosses the canal and the towing path near Leyden, at an angle of 60° , is fixed, and has a span of

Fig. 20.

Trussed timber bridge over the Rhine at Vink. Elevation.

17·20 metres (= 56 feet 5 inches English). Its cost, with some accessory works, was 34,800 florins (= £2900.)

The trussed timber bridge over the Rhine, near Vink, beyond Leyden, is at an angle of 82° with the stream; it has five arches, three of which have openings of 10 metres (= 32 feet 10 inches English) each, and the two side arches are 6 metres (= 19 feet 8 inches English) each; one of these latter, which is intended for the navigation, is closed by two parallel platforms, which slide diagonally in opposite directions (Figs. 20, 21, 22, 23, and 24); when opening they are moved simultaneously by one man, with very simple machinery. The cost of this bridge was 41,200 florins (= £3433 6s. 8d.)

Fig. 21.

Plan showing the sliding platforms.

Fig. 22.

Section of the sliding platform.

Fig. 23.

Eccentrics for fastening the platforms in their situations.

The single swivel bridge over the Delft canal, at the Hague, is of cast iron, and spans the canal at an angle of 72° , with only one opening of 8 metres (= 26 feet 3 inches English). The piers are of masonry founded on piles. Its cost was 31,000 florins (= £2583.)

The railway necessarily passes over numerous canals, whose traffic must be provided for ; it was consequently requisite to provide a cheap and simple mode of crossing them ; the author therefore devised the form of bridge shown in Figs. 24 and 25, and has called it "the Turn-rail bridge."

Fig. 24.

Elevation of turn-rail bridge.

Fig. 25.

Plan.

Four timber bearers, 12 inches deep by 6 inches wide, carry the two lines of rails ; they are jointed on to heel-posts of oak, shod with iron,

which turn upon centres, on plates set in the masonry of the abutment. The bearers are further supported by brackets of cast iron (Fig. 24), and each pair is connected by two bars, turning on joints, to preserve the parallelism of the rails. Each pair opens outwards, for the passage of the boats, and when they are closed, the ends of the bearers rest in recesses, prepared in the masonry for their reception, (Fig 25), in order that the ends of the moveable rails, shall coincide with those of the fixed ones. This form of bridge is very cheap, and is found to answer well, for a span not exceeding 16 feet.

The population of the towns, through which the railway passes, is stated thus :—

Amsterdam	211,349 inhabitants.
Haarlem	24,012 „
Leyden	37,464 „
The Hague	63,556 „
Delft	17,037 „
Scheidam	12,051 „
Rotterdam	78,098 „
Total	<u>443,567</u> „

The relative proportions of the fares, per traveller, per kilometre, are,—

1st Class, 6 cents ($= 1\frac{1}{2}d.$) per kilometre ($= 0.616$ of an English mile, $= 2d.$ per mile.)

2nd Class, 4 cents ($= \frac{2}{3}d.$) $= 1.33d.$ per mile.

3rd Class, $2\frac{1}{2}$ „ ($= \frac{1}{2}d.$) $= 0.83$ ditto.

A tabular statement is given of the number of travellers, and the amount of the receipts since the opening of the railway.

Years.	Travellers.	Receipts.					
		Florins	Cts.	£.	s.	d.	
1839	77,763	41,765	19 =	3,480	8	$7\frac{1}{2}$	1st division opened Sept. 20, 1839.
1840	349,994	168,833	30 =	14,069	8	10	1st division alone worked.
1841	292,556	136,698	61 =	11,399	17	8	Ditto ditto
1842	364,081	210,574	34 =	16,714	10	$6\frac{3}{4}$	2nd division opened to Veenenberg June 20, and to Leyden Aug. 17.
1843	466,498	335,898	90 =	27,991	10	6	3rd division opened to Voorschoten May 1, and to the Hague Dec. 7.
	1,550,892	893,770	34 =	73,655	16	$2\frac{1}{2}$	

There is also a statement of the number of locomotives employed, their power, sizes, and number of wheels, the makers' names, the number of miles run over, with many other particulars.

A detailed statement is also given of the lengths, and height, above the datum line (AP)* of every portion of the three divisions of the railway which are opened, with particulars of all the bridges and other constructions.

This communication is illustrated by a section and plan of the line of railway (No. 3612), a map of part of Holland (No. 3613), and one of the city of Amsterdam (No. 3614); also a series of lithograph drawings of the bridges and other works on the line (Nos. 3596 to 3611), and a model of the Turn-rail bridges.

In a letter to the Secretary Inst. C. E., dated May 4, 1844, Mr. Conrad says, "At the last meeting of the shareholders, on the 26th April, we were authorized to borrow 2,500,000 florins (= £211,750) for finishing the fourth division of the railway, or that part between the Hague and Rotterdam. I shall therefore commence immediately the execution of the works, the plans for which I have already laid down. We expect that a new law of expropriation will be passed, and when the States General have conferred upon us that benefit, we shall see the works carried on with increased vigour.

"Since the opening of the railway, as far as the Hague, the improvement in the value of the shares, has been very great; the price in December, 1843, was 56 florins, and is now from 98 florins to 99 florins; and the shares will speedily be at a premium.

"The comparison of the number of travellers and of the amount of receipts in similar months of 1843 and 1844, is curious.

	1843		1844	
	Travellers.	Florins.	Travellers.	Florins.
January. .	17,439	12,929	35,213	30,968
February .	18,912	14,276	34,203	29,345
March . .	21,965	16,589	39,498	36,040
April . .	27,329	20,503	51,698	47,651

"The tariff of fares is also altered to the following rate :—

First class .	5 cents per kilometre per passenger	^{d.} = 1.66 per mile.
Second ,, .	4 ,, ,,	= 1.33 ,,
Third ,, .	2½ ,, ,,	= 0.83 ,,

This alteration has been found very profitable, as a greater number of passengers now travel in the first-class carriages."

* AP. (Amsterdam File), a fixed water level adopted by the Government as a datum line in all the hydraulic works in Holland.