JAMALPUR TUNNEL –THE FIRST TUNNEL OF EIR

--P.K.MISHRA

Now, when the place is in the heart of a peaceful province, a fair view may be obtained from its roof of poppy fields, fields of pulse, the teeming bazaar, the mighty Ganges, and meandering round the Monghyr fort and through the cultivation, may be noticed the railway, winding its subtle course in the midst of old world prejudices, and destined, ere long, let us hope, to correct them.

Synopsis: After connecting Rajmahal and Bhagalpur with Railway, EIR decided to connect Monghyr, another important town of historic note in the region, with Railways by 31st January 1862 to provide 303 miles of uninterrupted rail connectivity between Howrah and Monghyr.
Major challenge in connecting Monghyr was construction of a 900 feet long tunnel, a critical bottleneck in rapid expansion of EIR network, across Jamalpur hills of Rajmahal mountain range. Hiuen Tsiang had described these mountains as Hiranyaparvat which belched masses of smoke and vapour *that obscured the light of the sun and the moon*.

Construction of the solitary tunnel of EIR had commenced in March 1856, but the contractors, Messrs Ward and Co., who were assigned the work of constructing 80 miles of Railway between Bhagalpur and Patna, soon gave it up in utter frustration, *owing to the exceeding hardness of the quartz* and difficulties faced during 1857 war of independence, and the tunnel boring work was continued by the Railway company's engineers.

Dr, Samuel Lilly, United States Consul-General to India, in a letter dated 14th Mach 1862 had reported:"The East India Railway is now open to Monghyr, 304 miles. I went to that place. ..
I did not learn the cost of making the tunnel, but I did learn that two or three sets of contractors were ruined by it, and the Company finished it themselves."

Governor General would inspect the tunnel work site twice in 1860 and again in1861 to personally ascertain the progress of work. In his despatch to Secretary of state England, He would report, *"But while all praise is due to those concerned in the execution of the work, it is very doubtful whether it was at all necessary to undertake it."* It would elicit a very interesting reply from London.

Originally it was thought worthwhile to construct the tunnel in order to save three miles of distance between Calcutta and Delhi as it was not intended to connect the railway with the Ganges by Munger branch line. But some engineer thought a stretch of more than a thousand miles of railway without one tunnel to be a sheer anomaly in civil engineering; and so the tunnel was made. Papers would report -"*In India, as elsewhere, engineers appear to have been more studious of their own fame than of the profits of the shareholders"*

Governor General reported that since the branch line of 5-1/2 miles to the Ganges had been undertaken, there was no saving in length of line to be constructed, and the expense and delay occasioned by this tunnel were clearly not at all commensurate

with the small advantage of a reduction of three miles in the distance to be run by through trains.

Blasting and quarrying were done night and day without any intermission. Work was being carried out from both ends and both headings met on the 27th March 1860. Cost of construction of tunnel was more than 6 lakhs of Rupees and it took five years to complete the construction.

The construction of tunnel was supervised by Resident Engineer E.B. Harris, an archaeologist par excellence, credited with discovery of important relics,artefacts including world famous statue of the Sooltangunge Budhha currently displayed in Birmingham and discovery of iron the region.

EIR would not only construct the first tunnel in its network but would also revive lost art of stone working in the region apart from introducing modern bricklaying technique in country. Brick arched roof would be constructed first time in Jamalpur to be adopted all over the country by EIR. The construction of tunnel has been immortalised in various folk songs of the era celebrating indomitable resolve of the workmen who would carve a path through the mountains.

Jamalpur tunnel was planned for double line but ultimately it remained 2' too narrow for laying double line; 468 feet portion of tunnel is lined in soft slate rock portion and 432feet portion in hard quartzite rock is unlined.

Finally the tunnel work was completed and the railroad was opened on 10th February, 1862, and the landmark tunnel had been working satisfactorily since then without any major problem & repair/maintenance works except for minor spalling and seepage at some locations.

The robustness of construction would be severely tested in various earthquakes and regular blasting in adjoining stone quarry. It would take another 160 years to construct second tunnel to provide double line rail connectivity in Sahebganj loop line.

History: After connecting Rajmahal, the ancient capital of Bengal, and Bhagalpur, next major centre of trade & commerce with Railway, on 15th October 1860 & 1st November 1861, respectively; EIR decided to connect Monghyr, another important town of historic note in the region, with Railways by 31st January 1862 to provide 303 miles of uninterrupted rail connectivity between Howrah and Monghyr. It would connect three important towns situated at the bank of Ganges with single stretch of 297 miles of Railway, longest in EIR, and would reduce journey time from to fourteen days to less than 14 hours.

The distance between Calcutta to Monghyr by riverine route from was 435 miles and passengers were charged 163 Rs, 136 Rs and 109 Rs for first class cabin, second class cabin and third class cabin respectively along with table charges of Rs 42 additionally. Steamers on an average would take 14 days to complete the journey.- **Bradshaw's railway &c. through route and overland guide to India, Egypt, China and Australia -By George Bradshaw**

Colonel Kennedy the consulting engineer of EIR, in his deposition before parliamentary committee had said it was expected that the Gangetic train would

answer every purpose; that every hackery load of produce now travelling along the road would necessarily drop into the company's trucks.

"I venture with the utmost confidence and earnestness to recommend the extension of the East India Company's railway by the route of the Ganges, and not by the desert hill route. If the Government should agree to my recommendation of adopting the Ganges line, I believe that the East
India Railway with its extension into the North, Western Provinces will, when completed, form the most perfect work of the kind in the world."

Edward Lockwood, late Magistrate of Monghyr had described Monghyr Town as picturesquely situated on a rocky soil, round which the waters of the Ganges fret and chafe in vain, where, one could refresh himself with an occasional glimpse of the snow-capped Himalayas on a clear day, especially at the close of the rainy season.

The town was for some time the headquarters of Akbar's officers in their expeditions against the rebels when the great Bengal military revolts started. It was in this year that Raja Todarmal took possession of Munger and tried to deal with refractory powerful semi-independent Zamindars of area. – **Bihar and Orissa District Gazetteer Munger- L.S.S.O'malley**

Even Clive and Hastings had stayed in magistrate's house, a celebrated house of immense historical importance, from where commanding view of fort could be seen, when Monghyr was a frontier station.- The Travels of a Hindoo to various parts of Bengal- BholanauthChunder 1869

The old fort mentioned by Orme and early historians still exists, though its ramparts are mere pleasure grounds, and the only traces of the military element are a few veterans and pensioners. The gates and drawbridges, if we remember aright, still remain, with the ditch, and of late years Monghyr has been connected by a branch of some six miles in extent with the main line of the East Indian Railway.- **Natural History of Sport and Travel. Tiy Edward Lockwood, Bengal Civil Service, late Magistrate of Monghyr. London: Allen & Co**

It required construction of 33 miles of rail lines between Bhagalpur and Jamalpur and six miles of branch line between Jamalpur to Monghyr. Major challenge in connecting Monghyr was construction of a 900 feet long tunnel, a critical bottleneck in rapid expansion of EIR network, across Jamalpur hills of Rajmahal mountain range. These mountains were known in earlier days as Hiranyaparvat which belched masses of smoke and vapour.

Hiuen Tsiang, who had visited "I-lan-ha-po-fa-to" country, identified as this area, towards the close of the first half of the seventh century A.D, had to pass through thick forest and strange mountains into the country of Hiranayaparvat. The capital Hiranayaparvat, lay, on the southern bank of Ganga, and close to it stood mount Hiranya*", which belched masses of smoke and vapour that obscured the light of the sun and the moon*".

Construction of the solitary tunnel of EIR had commenced in March 1856, but the contractors, Messrs Ward and Co., who were assigned the work of constructing 80

miles of Railway between Bhagalpur and Patna, soon gave it up in utter frustration, due to arduous nature of work and difficulties faced during 1857 war of independence and the tunnel boring work was continued by the railway company's engineers. *The work was not one of difficulty, such as to call forth the exercise of skill on the part of the engineers, but one of extreme laboriousness, owing to the exceeding hardness of the quartz*.

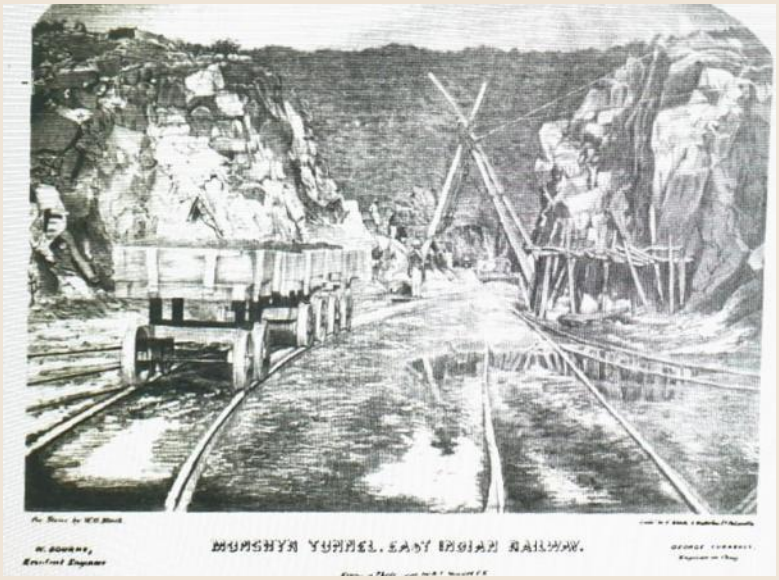
Dr, Samuel Lilly, United States Consul-General to India, in a letter dated 14th Mach 1862 had reported about EIR mines, construction of railways and his visit to Monghyr:

"The East India Railway is now open to Monghyr, 304 miles. I went to that place. The country through which it passes is a vast plain, traversed by some streams which are from one-half to one and one-half mile wide in the rains. The most of the masonry and the ballast of the road is formed of bricks. *Near Monghyr there is an upheave of nearly pure flint rocks which crosses the plain; it is some 300 feet in height, and, as it is very abrupt in its margins, the road traverses it by a tunnel 900 feet in length.*

I did not learn the cost of making the tunnel, but I did learn that two or three sets of contractors were ruined by it, and the Company finished it themselves. The engines and carriages are all in the English style, the former being built in England; all the material for the track is imported from there, to even the cross-ties and chairs." --- **The Merchants' Magazine and Commercial Review, Volume 47**

The contracts made by these firms extended to the bank and smaller bridges of the railroad merely, but did not include the large and difficult viaducts, nor the laying of the permanent way. In some instances, the laying of the permanent way was at first contemplated by the contract, but it was not carried out by the contractor; and in every instance all the larger engineering works on the East Indian Railway calling for unusual skill and energy were executed directly by the engineers of the *Railway Company, without the intervention of any contractors*.

The total length of the tunnel was 900 feet only;—the material to be pierced was for 600 feet clay slate, which was worked with ordinary ease and rapidity; but the remaining 300 feet were found to consist of quartz rock of excessive hardness, in which for a considerable time progress at the rate of four feet only per month could be effected, even after every care had been taken in the organization of the labour and in training the native miners.



George Turnbull, Chief Engineer EIR would also express his concerns over delay and expenses in making the tunnel-"*The unexpected delay and expense in making this tunnel was the more provoking, as the tunnel had been at first designed for the purpose of saving 3 miles of railway to Monghyr, which, after all had to be made."*

In 1860, a branch line to the river Ganges, 5-1/2 miles, had to be laid down, as Monghyr proved to be the only spot where there was deep water throughout the year. The primary objective of this branch was to facilitate the conveyance of permanent way materials, iron-work for the Hullohur and Keeul bridges, and the heavy machinery, &c., for the large workshops at Monghyr. "*For this purpose a temporary branch would certainly have sufficed, but Chief Engineer was of opinion that the branch would afford ready and cheap means of communication with the Ganges for country produce and for passengers; that, in fact, it would be wanted for general traffic*.''
This branch was estimated to cost 3,10,125 rupees, exclusive of the value of the land. *''Monghyr is in itself an important place of ancient note and considerable influence, having very considerable local traffic, and there is little doubt the branch line will benefit trade and bring traffic to the main line.''*-- **Statement exhibiting the Moral and Material progress and Condition of India during the Year 1859-60. Part. 1**

Governor General had inspected three principal works on the EIR; Monghyr Tunnel, Soane Bridge and the Karmanasa bridge in 1860 and in a letter dated 18th December 1860 addressed to Sir Charles Wood, Secretary of State for India, had expressed his concern over the slow progress of tunnelling and questioned the rationale of constructing the tunnel.

"*I forward an interesting section, showing the progress of the work from the beginning. It will be observed that the hill pierced consists, for two thirds of the length of the tunnel, of clay slate, and for the remaining one third of hard quartz rock; and that the effect of the latter in retarding the work is apparent in the very small progress through it during each month, as shown by the tinting on the section, both in the head drifts and in the main tunnel. The portion of this hard quartz rock remaining, though less than 250 feet in length, will, it is expected, take yet eight months to remove.*

At first it was not intended to connect the railway with the Ganges by a branch line; and under such circumstances, and while the arduous nature of the work had not been ascertained by experience, it was thought worthwhile to construct the tunnel in order to save three miles of distance between Calcutta and Delhi.

Governor general reported that since the branch line of 5-1/2 miles to the Ganges had been undertaken, there was no saving in length of line to be constructed, and the expense and delay occasioned by this tunnel were clearly not at all commensurate with the small advantage of a reduction of three miles in the distance to be run by through trains.

"*But while all praise is due to those concerned in the execution of the work, it is very doubtful whether it was at all necessary to undertake it.*"-- **Letter (No. 12), dated 18th December 1860, from the Right Honourable the Governor General to the Right Honourable Sir Charles Wood, Bart., G.C.B., Secretary of State for India,**

The report of Governor General elicited a very interesting reply from Her Majesty's Government.

" In reference to your remarks on the conduct of the Railway Officers engaged in these and other works on the line, I have to express the gratification which Her Majesty's Government has derived from the testimony which you bear to the creditable manner in which they have managed the large number of native labourers employed, and to the skill which they have displayed in conducting the operations."- **letter N0. 15, dated 16th February 1861. Selections from Despatches Addressed to the Several Governments in India**

Cost of construction of tunnel was more than 6 lakhs of Rupees and it took five years to complete the construction, while three miles of track detour would have been easily laid at total cost of 2.25 lakhs of Rupees.

EIR engineers found construction of more than thousand miles of Railway without any tunnel quite strange and at the first available opportunity decided to construct a tunnel near Jamalpur which would later be the headquarters of loco, traffic and electric departments of EIR due to its central location and workshop.

"Not far from the station a place called Jumalpore, like Wolverton on the London and Northwestern, has swollen from a mere village to a gigantic workshop; and near it is to be seen the only tunnel between Calcutta and Delhi.

The history of this unnecessary perforation is curious. A chain of hills intercepted the line marked out for the East Indian Railway, and it was suggested that, by a deflection towards Monghyr, which lay on the river-bank and beyond the line of hills, all blasting of rock might be avoided.

But some engineer thought a stretch of more than a thousand miles of railway without one tunnel to be a sheer anomaly in civil engineering; and so the tunnel was made, although this project entailed the subsequent construction of a separate branch line to Monghyr."- **Natural History of Sport and Travel. Tiy Edward Lockwood, Bengal Civil Service, late Magistrate of Monghyr. London: Allen & Co.**

Mr. E.B. Harris, the resident engineer, had carefully organized deployment of labour for construction of tunnel and his close supervision had ensured accident free operation despite round the clock blasting and quarrying earning the appreciation of Governor General.

"*The careful organization of the labour, the skill which the miners have acquired from long experience and the almost total freedom from accident during the long continued blasting operations, attests the ability with which the work has been superintended by Mr. Harris, the resident engineer.*"- **Letter (No. 12), dated 18th December 1860, from the Right Honourable the Governor General Lord Canning to the Right Honourable Sir Charles Wood, Bart., G.C.B., Secretary of State for India,**

Monghyr division had the highest deployment of labour amongst all divisions of EIR. 13,821 labourers were working everyday in Monghyr division for Railway construction.- **Chief Engineer's Office, Calcutta, 8 th February, 1859.**

Resident engineer E.B. Harris is credited with discovery of many artefacts of historical importance including the famed statue of The Sultanganj Buddha, the largest metal figure of its kind in the world and discovery of iron ores in Monghyr.

The house of resident engineer of Jungeerah in Sultanganj was an old Buddhist monastery and Mr. Harris supervised excavation of the area and discovered various chambers, bricks, terra-cotta figures and world famous statute of Buddha, currently displayed in Birmingham museum, underneath.

The Sultanganj Buddha , the largest substantially complete copper Buddha figure known from the time, dated to between 500 and 700 AD, is 2.3 m high and 1 m wide and weighs over 500 kg. A reminder of the extraordinary talents of the sculptors and metal craftsmen in ancient India, it is currently housed in Birmingham Museum and Art Gallery since 1867.

Buried for safe-keeping some 700 years after it was made, the exquisitely crafted statue was discovered and excavated by E B Harris, a railway engineer, during railway construction in 1862. It was visited by 30,000 local people in the first week, but its excavation was reported around the world and Samuel Thornton, a Birmingham MP lobbied for it to come to the city. Thornton funded its removal and transport.

The Sultanganj Buddha , cast in pure, unrefined copper by the cire perdue, or lost wax, technique, is one of the largest complete pieces of Buddhist metalwork in the world. Inside there is a clay body, mixed with rice husks that allowed radiocarbon dating. The figure stands in the "Fearless Posture", with his right hand raised in Abhayamudra (a gesture of reassurance or protection), and his left hand is held downwards with palm outwards, said to indicate granting a favour. The end of the monastic robe is held between the thumb and forefinger of this hand in the manner that is still practised by Theravadin monks.

Two smaller standing Buddhas in stone were also excavated by Harris; one is now in the British Museum and the other is exhibited in the Asian Art Museum of San Francisco.

EB Harris with the Sultanganj Buddha. 1861/1862 Sultanganj Buddha- Birmingham Museum & Art Gallery

Mr. Harris in his book, "Description of Buddhist remains discovered at Sooltangunge on the river Ganges 1862-63", wrote--

"On the other mound the Railway Company built their engineer's house, which is now standing, at the foot of which in February, 1863, I excavated the cells, block of brickwork and floors...

The two small figures in stone, which have inscriptions on them, were found shortly after I commenced the excavations, they were found very close together, about 6-7 feet under the surface and very near the spot the copper image was discovered...."

Stone statue of Buddha from Sultanganj in the British Museum. Ye Dharma Hetu inscribed on the lotus base

On the evening of the 6th December 1862, the right foot of the image was met at 10 feet under the surface. The news spread rapidly and by the next morning several thousands of the natives had arrived.- "**Description of Buddhist remains discovered at Sooltangunge on the river Ganges 1862-63 by E.B. Harris, C.E.**

View of the excavation- Mr. Harris could be seen in the foreground

Journal of the Asiatic Society had reported that –*"Of the relics which have been collected by Mr. Harris in course of his excavations at this place, the most important appears to be a colossal figure of Buddha which was found lying on a side of the hall described above. It had evidently been knocked down by some iconoclast before the destruction of the hall, and removed several feet away from its pedestal. The latter too had been tilted over, but not much removed from the centre of the hall which was its original position.*

It was formed of a slab of granite 6'—11" x 3–9" the thickness being 9 inches. The statue was secured to this stone by two bolts, the remains of which are still visible. The statue is of copper and seems to have suffered no injury from the hands of the destroyer, except the mutilation of the left foot across the ankle - **Journal of the Asiatic Society of Bengal, Volume 33**

'Close to the Sultanganj Railway station there is a large brick mound, from 10 to 30 feet in height, which furnished brick ballast for many miles of the line. On the highest point Mr. Harris, the Railway Engineer, built a house, and as the excavations for ballast disclosed several walls, a great part of the mound was carefully explored by him, of which a portion still remains open.'- **Archaeological Survey of India: Reports 1862-1884**

Resident engineer E.B. Harris had also discovered iron ores in Monghyr.
"Iron ore is found in the immediate vicinity of Monghyr, in the Kurruckpore Hills, and smelted by natives for local use. The report of the Geological Survey of the hills will put the Committee in possession of the comparative value of the ore. The specimen sent was furnished by E. B. Harris, Esq., the Resident Engineer, and found in excavating the Monghyr tunnel."—**H. H. Henderson, Collector of Monghyr.**

George Turnbull in his half yearly report 18th February 1859 addressed to agent of EIR Mr. Palmer had mentioned that Tunnel work was proceeding steadily but slowly and boring of 666 feet of boring out of 900 feet had been completed ; *"The large heading at the east end is driven 436 feet. The same from the west end is advanced 230 feet. There seems good reason to assume that this work will be done at the time the rest of the division is completed."*

Regarding further work in Munger division it was reported that brick-making on an extensive scale was being carried on, and use of rough stone of the hills for common walling was introduced.

"*Also a beginning has been made in quarrying and using the rough stone of the hills for common walling; for this some of it is well adapted but the workmen are still to be taught the art of working and*
setting it. It is not generally of first rate quality but platforms of bridges may everywhere be built with it ; the stone from Oorain is fit for any work.

Deputy consulting engineer captain Charles J. Hodgson, Bengal Engineers, had mentioned in his report that *chief engineer had been always urging, the Engineer of the Monghyr Division, to use this stone, but that gentleman has always objected that it would be more expensive than brick, owing to the want of skilled labor to work the stone ; a very short sighted objection I think ; besides an old bridge built in Mughal times on the Monghyr and Bhaugulpore road, some tombs, and a Seraie were constructed entirely of it.*-**The Engineer's Journal May 18,1859**

Progress of tunnelling work and cost details were reported in accounts and papers submitted in House of Commons in 1861.

"*The portion of the hard quartz rock remaining to be pierced in December 1860, though less than 250 feet in length, will, it is expected, take yet eight months to remove; and the entire cost of the tunnel and its approaches when finished will, it is believed, be not less than six lakhs of rupees.*"-- **East India (progress and Condition): Statement Exhibiting the Moral ..., Part 2 Accounts and Papers of the House of Commons, Volume 39, by Great Britain Parliament. House of Commons**

The possession of hills, through which tunnel was passing ,was with Mr. Fitzpatrick, a considerable Zemindar and Indigo producer and a Resident of Jehangeera, where he had an Indigo concern. EIR wanted to advantageously use the ballast from these hills and an offer of Rs 6 and 8 annas per 100 cubic feet delivered on line was made but Mr. Fitzpatrick demanded Rupees 7 and 8 annas.

Assistant Engineer at the upper end of the Bhaugulpore Division ascertained that he could work the quarries himself and cart the ballast even to his works for Rs. 3 and 8 annas per 100 cubic feet, thus EIR's offer would put a clear profit into Mr. Fitzpatrick's hands of Rs. 3 per 100 cubic feet, or of Rs 5,000 per mile of Railway. Subsequently Railway would establish its stone quarry in Jamalpur to meet its ballast requirements "*The Chief Engineer was annoyed that the offer had been made, burnt ballast might be supplied even at a less cost, and the Chief Engineer supposes that if reasonable terms are not acceded to by Mr. Fitzpatrick, Government will take up the land containing the quarries and pay Mr. Fitzpatrick some reasonable amount of compensation*."- **The Engineer's Journal May 18, 1859**

George Turnbull in his half yearly report 12th February 1861 addressed to agent of EIR Mr. Palmer had sent status report of construction activities: "*There remain only about 70,000 cube feet of rock-cutting in the tunnel; this will be cleared out, and Permanent Way laid through before the end of June next. The brick lining of the part where the roof is of clay slate, and the entrances, will be finished before the end of the year."*

Construction of brick arched roofs was tried first time in Jamalpur by EIR and chief engineer Mr. Turnbull recommended brick arched roofs to be adopted in subsequent construction of buildings in view of economy of construction and durability.

Of seven separate dwelling-houses for European workmen, some are finished and ready for occupation, and the rest will soon be in the same condition. These dwelling-houses, which contain three rooms each, with bath-rooms and out-houses, are all built with vaulted roofs and brick- work; no timber is used, except in the doors and windows.
The adoption of brick arched roofs, in place of flat terraced or sloping roofs, has in this case been most successful. Timber is so expensive, that the brick vaults are cheaper than the timber roofing ; there is no question as to their superiority in point of durability, and the houses are comfortable and well ventilated and have, on the whole, rather a pleasing appearance.-

I am inclined to recommend an extended use of brick arching, not only for dwelling houses, but also for other buildings, where ever it can be done with economy. There is no novelty in this construction in India, where many well-known buildings, public and private, ancient and modern, afford permanent examples of the advantages of arched roofing. - **May 1, 1861. THE ENGINEER'S JOURNAL**

The extravagant expenditure and delay in construction would invite derisive comments from media and Government. It would be called a show piece tunnel, a tunnel for sake of making tunnel!

"*In India, as elsewhere, engineers appear to have been more studious of their own fame than of the profits of the shareholders. In order to save the trifling distance of three miles, the sum of £600,000 will have been expended in boring through the 900 feet of the Monghyr Tunnel. This arduous operation was commenced in March, 1856, and is not yet finished, as one-third of the entire length is through an extremely hard quartz rock*.- **Allen's Indian mail and register of intelligence for British and foreign India, 1861,1/6**

In his subsequent report of 9th August 1861, Mr. Turnbull reported that the rock cutting in the Tunnel was completed, and the permanent way laid throughout. The brick lining of the clay slate portion of roof would be finished about the end of the present year. He had stated that it was extremely arduous work and huge labour was required before it could be driven. Blasting and quarrying were done night and day without any intermission. Work was being carried out from both ends and both headings had met on the 27th March 1860.

EIR engineers had to constantly battle onslaughts of diseases and hostile working condition -"*This division is most unfortunately losing District Engineer who is compelled by ill health to take 12 months' furlough; he was able to accompany us to the station ground but not to the lines. Resident engineer in charge of seven miles including the tunnel was also ill and unable to leave his house, but merely with an attack of fever and ague*."

Progress of rail construction and tunnelling works in June 1861, during running of first train to Bhagalpur was reported in local journals:" *We were really agreeably surprised to see the forward state of the works in most places: the bridges, embankments, cuttings, &c, having a perfectly finished appearance. There is every prospect also of the opening of the fine to Monghyr being anticipated. This is not promised till January next, but there is every possibility of an engine being able to run over this length in October.*

The last shot in the tunnel was fired yesterday, the last day of the month (June 1861). We trust that the dates fixed for the further openings of the Railway beyond Monghyr will be anticipated in the same manner, and, judging from the unparalelled energy and exertions the Railway Engineers have always shown, when put to the test, there is every ground for believing that such anticipations will be realized."- **July 1.1861 The Engineer's Journal**

Death of a native miner in Monghyr tunnel on 22nd march 1861 by an explosion was reported by EIR. The fuze had hung fire, was the cause of explosion.-

Lord Canning, the viceroy of India visited Munger and Jamalpur on 24th November 1861 to inspect progress of ongoing Railway works, which were on final stage of completion. Lord Canning accompanied by Mr. E.B.Harris Resident engineer, Mr. Yule, the commissioner, Assistant Engineer Monghyr W. J. Galway, Assistant Engineer G. Smith, Junior and other EIR officials inspected recently laid Munger – Saffiasari-Jamalpur branch line in a specially decorated trolley.

"Arm chairs were placed on the scarlet covering of the trolley, which, with its pretty monogram in a wreath of leaves, was tastefully arranged. Coolies ran behind, pushing the conveyance merrily over the iron road, which soon arrived at Jumalpore, the site of one of the central stations of the railway. During the journey, plenty of time was afforded for admiration of the beautiful scenery and close cultivation. "

At Jamalpur, the trucks were taken through the station, which was making quite an imposing appearance, with its engine-shed, passenger-station, and other buildings.

"All sorts of devices in the way of triumphal arches were passed under, and the railway people seemed determined to show all the honour they could to Lord Canning, as a friend of railway

enterprise, however much others might criticise his policy. The general burden of the decorations was the word "Welcome," differently arranged." -Englishman.

After inspecting station and workshop, Viceroy was taken to Jamalpur tunnel. Mr. Harris, the resident engineer, who had from the first superintended the work, had decorated the rugged rocks outside his gloomy cavern, and inside, where the visitors had, with the assistance of a rope, clambered up the face of the rock and entered the long gallery which had been excavated throughout, a fairy scene was disclosed. Innumerable lamps attached to the roof showed in a long vista, and their light was reflected in the water which had percolated through the joints of the rock over head creating a beautiful surrealistic effect.

A dry path had been formed for the ladies; and, guided by torch-bearers, the Viceregal party walked through the tunnel. After a short journey on the eastern side, they returned.

"At the western face a pause was made, sketch-books were produced and the scientific part of the visitors examined the effect of the gunpowder on the quartz rock. A rumbling sound only was heard when the blasts were fired in the body of the tunnel, but the reports from the shots in the face were very startling."

Lord Canning seemed greatly interested in all that was going on, and having satisfied his curiosity, again took his seat in his trolley, and the whole party returned to the Jumalpore station, where his Lordship walked through the workshops and looked over a series of beautiful drawings prepared by Mr. Galway, the engineer in charge.

"By this time night was coming on, and Lord and Lady Canning were conducted quickly down the incline to SuffiaSerai, and thence in carriages to the river side, where they embarked for the barge. The visit seemed to gratify all, and at an early hour this morning the steamer left for Patna."—Englishman.

Brick lining under most of the clay slate portion was completed by the hot season of 1861 to ensure perfect safety to trains. The stone found in this area did not prove quite suitable for masonry, and brickwork had to be largely used. Brick lining was done 113 meter in Howrah end and 29 meter in Delhi end of tunnel. Width at the bottom of this fully naturally ventilated tunnel was 7m and height was 6.44 m.

"The tunnel passed through two different categories of rocks, viz. quartzites and slates. The quartzites are hard and strong in the tunnel stretches towards the Jamalpur portal whereas the stretches of tunnel towards the Ratanpur portal consist of slates which are comparatively weak and also charged with water. The 113.39m portion of existing tunnel in slates from Ratanpur end, therefore, has been fully lined by brick masonry to protect the tunnel roof and sidewalls.

The tunnel in the quartzites, on the other hand, is partly lined at the western side from Jamalpur portal to 32.30m inside the tunnel and the balance 129.61m is unlined." **International Society for Rock Mechanics and Rock Engineering ISRM International Symposium - 5th Asian Rock Mechanics**

Jamalpur tunnel was planned for double line but ultimately it remained 2' too narrow for laying double line ; 468 feet portion of tunnel is lined and 432 feet portion is unlined.—**Railway administration report 1903, appendix 37**

Finally the tunnel work was completed and the railroad was opened on 10th February, 1862, up to Jamalpur and Monghyr was connected on 29th April 1862 .The landmark tunnel had been working satisfactorily since then without any major problem and repair/maintenance works except for minor spalling and seepage at some locations. The robustness of construction would be severely tested in various earthquakes and regular blasting in adjoining stone quarry. The construction of tunnel has been immortalised in various folk songs of the era celebrating indomitable resolve of the workmen who would carve a path through the mountains.

It would take another160 years to construct second tunnel to provide double line rail connectivity in Sahebganj loop line.

"The heavy works requiring the special ability of selected engineers; the ordinary works on the great
*length of embankment; the millions of bricks which had to be burnt in places far removed, not merely from marts of trade or commerce, but even from human habitation; were severe tests of the perseverance and exertion of all the engineers employed on this line ; employed as they were on duties so professedly novel to them as those of the actual construction of a railroad***."---Railways of India by Edward Davidson**

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