

MADRAS RECORD OFFICE.

Government of Madras.

Pennine DEPARTMENT.

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Not to be folded or roughly handled

*Proceedings of the Madras Government, Revenue Department,
30th March 1865.*

No. 494. Read the following Circular from the Under Secretary to the Government of India,
Public Works Department (Revenue Forests), dated Fort William, 4th March 1865,
No. 3:—

Preservation of Timber and renewal of Railway Sleepers.

The following letter from the Secretary of the East Indian Railway Board, to the Agent at Calcutta, No. 35, dated the 19th July 1864, together with a Minute by the Committee assembled at London, dated the 17th May 1864, to report on the question of the renewal of sleepers, are circulated to the Local Governments and Administrations marginally noted, for information in the Forest Department.

Governments of Madras, Bombay, Bengal, North-Western Provinces and Punjab.
Governor of the Straits Settlement.
Chief Commissioners of Oudh, Central Provinces, and British Burmah.
Commissioner of Mysore.
Resident at Hyderabad.
Governor General's Agent Central India and Rajpootana.

(Signed) E. C. S. WILLIAMS, Captain, R. E.,
Under Secretary to the Government of India.

From Secretary Board of Directors, to Agent East Indian Railway Company, dated 19th July 1864, No. 35.

I beg to forward herewith a specification* for the Creosoting Apparatus required under Indent No. 87, and which is intended for the preservation of sleepers cut out of Cheer wood, a species of Pine lately discovered by Mr. Sibley in large quantities in British Gurhwal.

* Sent to Board with Agent's No. 13, dated 22nd February 1864.

This machine, if kept constantly at work, would require an annual supply of about 500,000 gallons of creosote, the whole of which must be imported from this country, until the use of gas becomes common in the great cities of India, an event which is probably not near at hand.

Mr. Sibley seems to expect that the petroleum found in Burmah may be used successfully in place of creosote; but expensive as the latter is, I doubt if the former would not prove much dearer, and we have no reason to suppose that it will have the same effect, at all events, in the same degree.

The price of creosote delivered in this country, including all charges except casks, may be taken at 4d. per gallon.

Assuming the most favorable circumstances for carriage, namely, that ordinary ships would take out the creosote in wood casks, or that, if a demand were to arise, tank ships, such as petroleum is sometimes brought over in from America, could be obtained, we could scarcely hope to carry the creosote to Calcutta for less than 3d. per gallon.

A considerable expenditure must then be incurred in providing tank and tank waggons for the carriage of the oil up-country, to some convenient point near that at which the sleepers would be landed, which may be assumed to be in the neighbourhood of Cawnpoor, or say 750 miles from Calcutta.

The cost of carriage to Cawnpoor at the bare rate of one-third of a penny per ton per mile, would be nearly 1½d. per gallon, bringing up the cost of the creosote delivered at Cawnpoor to about 8½d. per gallon, to which must be added something for insurance and general expenses; so that 9d. per gallon would seem to be about the minimum at which the creosote could be valued by the time it was ready for injection into the sleeper, and I doubt if the creosote hitherto sent out has not cost more.

The minimum quantity of creosote which should be injected into Pine timber is 10lbs., or one gallon to the cubic foot. At this rate, the cost of the creosote absorbed by sleepers 10 feet long would be 2s. 3d. if their section was 10 inch by 5 inch, and 3s. 2d. if their section was 12 inch by 6 inch.

Sleepers cut in India have hitherto been usually of the larger, that is, the 12 inch by 6 inch section.

The cost of the operation exclusive of the creosote, would probably be not less, including all charges, than 3d. per sleeper for smaller size, or say 6d. for the larger, so that the minimum total cost of creosoting a 10 inch by 5 inch sleeper in Cawnpoor would not be less than 2s. 6d. or of a 12 inch by 6 inch sleeper than 1s. 3d.

If, by the use of creosote, the durability of Cheer wood sleepers could be ensured for a period of, say, 20 years, and if there were no known method of obtaining an equally good result for a smaller sum, the advantage gained would not perhaps be bought too dear at either of these rates; but, unfortunately, it is as yet by no means clear that creosote will be effectual for so long a period in a climate like that of India.

It has been found in the south of France, that creosote vaporizes under a hot sun, and that it does not on this account materially increase the durability of wood, and sulphate of copper has almost entirely taken its place.

I am sorry also to say that, according to published accounts, experience on the Scinde Railway is rather against creosote, and that I have received unfavorable accounts of it in Bengal from one of our own Engineers.

But neither the present state of science nor actual recorded experiment and experience are yet sufficient to decide this question: coupled, however, with the undoubted cost of creosote, they are sufficient to make it desirable that the machinery which is now to be sent out should be suited to the use, not only of creosote, but of sulphate of copper, and of what is known of Burnett's fluid that is, chloride of zinc, both of which are far cheaper as preservatives than creosote.

To adapt the machinery to the use of sulphate of copper, it is necessary that certain portions of it which may be of iron when creosote is employed, should be of copper or gunmetal, and the cylinder itself must be coated with paint or asphalt. But, so far as I can judge, without making detail drawings, these modifications would not add to the cost of the machinery as much as £200: no special construction is necessary for chloride of zinc.

The cost of the sulphate of copper, delivered in Cawnpoor, would probably be about 4d. per lb. At the most, 1½ lbs., worth (say) 6d., would be sufficient for each sleeper of the 10 inch by 5 inch section; or 2½ lbs., worth (say) 10d., for the 12 inch by 6 inch size; and the total cost of the operation would be in the former case not more than 10d., or in the latter than 1s. 4d. The sulphate is injected in the form of a watery solution, containing about 2½ per cent. of the sulphate, under a pressure of about 150 lbs. to the inch.

Some years ago, 1,000 sleepers prepared with chloride of zinc, were sent out to India by the Board, but no reliable record exists in the country of the result. Such reports as we did receive were favorable, and I believe it has been found to answer well in the Scinde Railway. It was for a long while in vogue in this country, but owing to the difficulty of ascertaining if the injection had actually been performed, it ultimately gave place to creosote. This difficulty is now said to be overcome by the use of a coloring matter; but, whether it be so or not, if the operation be carried on by the Company's own Engineers, there will be no risk of dishonesty, and the efficacy of the coloring matter is comparatively unimportant.

The cost of the chloride of zinc process will be much less than even that of the sulphate of copper.

The quantity of the concentrated colored chloride requisite to prepare a load of timber, or 50 cubic feet, is 6 pints. This is mixed with about 30 gallons of water, and forced like creosote or sulphate of copper into the wood under heavy pressure. The chloride is delivered here in metallic drums fit for a sea voyage, each containing 10 gallons, weighing about 180 lbs., and costing £2 10s.; delivered at Cawnpoor, it may be reckoned to cost £3 for the 10 gallons, or 9d. per pint. At this rate the value of the quantity consumed by the 10 inches by 5 inches sleeper would be about 3½d., and by the 12 inches by 6 inches sleeper about 5½d.

The cost of performing the operation would be less than that of either creosoting or copperising, and the total cost, including the fluid, would probably not exceed 6d. for the small-sized sleeper, or 9d. for the large.

The chloride of zinc has therefore the advantage in point of cost over the sulphate of copper, and still more so over the creosote.

It is also cleaner than creosote, and would not require, like sulphate of copper, that the shikes and chairs should be turned where they come in contact with the sleeper; and it is therefore much to be wished, as there is good reason to believe it will, that it may be found successful.

Looking, therefore, to the importance of the sleeper question, to the economical working of the line, and to the figures which I have above given, I beg to recommend that the machinery to be ordered for creosoting be also adapted to the use of either chloride of zinc or sulphate of copper, and that a sufficient quantity of both these substances be sent out to allow of 20,000 sleepers being prepared with each of them. The supplies of creosote will, I presume, form the subject of indents in the usual manner.

To save time I have prepared the specification for the machinery, on the supposition that the Board will adopt these views; and I beg to recommend that tenders for it be obtained by public advertisement.

London, 17th May 1864.

The Committee submit to the Board the following observations on the important question of the renewal of sleepers. They are based on the following documents, viz. :—

- 1st.—A valuable Memorandum by Dr. Brandis, on the comparative merits of certain kinds of Railway sleepers for Bengal and the North Western Provinces, with special reference to the East Indian Railway.
- 2nd.—A Memorandum from Mr. Rendel on the subject.
- 3rd.—Report from Mr. Sibley on the Himalayan Pine Forest, and more especially on the Cheer trees found in them, and the extent to which sleepers may be obtained from them.
- 4th.—Letter from Mr. Rendel to the Board, on the subject of the creosoting apparatus indented for by Mr. Sibley, and sanctioned by the Government of India.
- 5th.—Letter from the Agent regarding the supply of iron-wood sleepers from Queensland.

If the Company is required to provide a double line from Calcutta to Futwah the length of line requiring sleepers will stand thus :—

Number of sleepers on the line.		From Calcutta <i>via</i> Rajmahal to Delhi, including all	
		branches, single line	1,131 miles of way.
		Jubbulpoor line, single line	221 "
		Second line from Howrah to Assensole when line to	
		Futwah, commences	133 "
		Loop line from Assensole to Futwah, distance 166	
		miles, double line	332 "
		In all	1,817
		Add 20 per cent. for siding	363
		Total miles of permanent way	2,180, or say 2,200

Mr. Rendel remarks that we must take 1,760 sleepers to the mile.

It is true that Mr. Turnbull some years ago tried 6 to the 20 feet rail, or say 1,600 per mile; but as a rule, there are at least one to the yard, or say 1,760 to the mile; the number of sleepers therefore on this 2,200 miles would be 3,872,000. These sleepers would in England cost about 4s. The expense of 3,872,000 sleepers would therefore be £774,000. Taking them at 10s. in India, the cost would be £1,936,000, and the difference would be £1,162,000.

Comparative cost of different Sleepers in India.

Dr. Brandis gives the following table of the comparative cost of the different kinds of sleepers in India.

- 1st.—Greaves's Cast-iron Pot or Bowl sleepers, per mile £1,500, number of sleepers about 3,600.
- 2nd.—Creosoted Fir from England per mile, £1,372, number of sleepers, 1,600, at Rupees 5 per sleeper in Calcutta.
- 3rd.—Creosoted Indian woods, per mile £1,101, number of sleepers, 1,600, at Rupees 4 per sleeper.
- 4th.—Sal-wood sleepers, per mile £1,085, number of sleepers, 1,600, at 4s. 4d.
- 5th.—Iron-wood from Burmah, per mile, £1,532, number of sleepers, 1,600, at Rupees 6 per sleeper.
- 6th.—Teak from Burmah, per mile £1,532, number of sleepers 1,600, at Rupees 6 each.
- 7th.—Jarrah Wood from Australia, per mile £1,372, number of sleepers 1,600, at Rupees 6 each.

Durability of sleepers.

Mr. Power estimates the duration of a sleeper at 10 years.

From Dr. Brandis's Report, the Committee draw the following data on the subject:—

1. Regarding Greaves's Patent Iron sleepers, he remarks that the opinion of Engineers differ as to their durability and fitness. In Bengal they are pronounced to be inapplicable. Mr. Rendel thinks that high speeds when used

will not so much be injurious to the sleepers as to the rolling stock which would suffer from want of elasticity in the road. Mr. Power states that the cost of maintaining a line of these sleepers would at least be equal to that of maintaining wooden sleepers, and that, from experience gained on five miles and a half of the Singharoon line, they would require renewal in 8 years.

The point on which the applicability of Greaves's Patent Iron sleepers appears to turn is that of ballast and perhaps climate. They may be suitable for Egypt and the Punjab, and yet unfit for Bengal, where the fall of rain is heavy and fine sand for ballast scarce.

They have answered admirably at Madras, and effected a great saving; but Madras enjoys a great advantage over Bengal in the matter of ballast.

2. The creosoted Fir from England is generally admitted to form the most elastic road.

Creosoted Fir From England

As to its durability, it is recorded that, on the Manchester and Crowe Railway, creosoted

American Fir sleepers were found to be perfectly sound after 17 years. On the Eastern Counties 800 out of 1,000 of the common Scotch Fir creosoted sleepers were perfectly sound after the lapse of 18 years.

On the East Indian line, near Bally, Dr. Brandis examined a number which had been down ten years and a half, they were perfectly sound, and the edges were still sharp, and there was no reason to conclude from their appearance that they would not last 10 years longer. At the present time, there is no ground for assuming that the average life of a good creosoted Fir sleeper will be less than 15 years. But this must necessarily depend on the care with which the timber is dried and seasoned before creosoting, and the absorption of a sufficient quantity of the preserving substance.

With regard to the durability and general fitness of Indian woods, and the prospect of a sufficient supply, Dr. Brandis states that, at the date of his report (17th January 1863), the question rested on analogy and speculation. It was one of experiment, and the sooner the experiment was made on a large scale the better.

Indian woods.

4. Sal-wood Sleepers, when cut of sound heart wood, from trees of full growth, provided they were carefully seasoned, may be expected to last 15 years if not longer. They are not, as

Sal sleepers.

a rule, liable to be attacked by white-ants, and their decay arises from dry rot. Mr. Turnbull believes that a perfectly sound Sal sleeper, consisting of heart wood only, would last 20 years. But unfortunately, very few sleepers of this kind were available for Bengal Division, and consequently, the average durations of the sleepers which have been laid down cannot be estimated at more than 7 years. But the Upper Division has been supplied with a large quantity of the best quality from the Government Forest, and the greater durability of the sleepers there appears thus far to confirm Mr. Turnbull's original opinion. Colonel Ramsay, who is in charge of the Gurhwal Forests, is confident that a good Sal sleeper will last as long as a creosote Fir sleeper, whereas one of white wood will decay in three or four years, even if it escapes the white-ants.

But Dr. Brandis remarks, in regard to the forests within British territory, which are under the control of Government, that the cutting of Sal must, for a number of years to come, be restricted to a small amount.

The greatest supply of large trees is to be found in the Nepaul Forests, which the Government of India made over to the Rajah after the mutiny, and he has established a royalty of Rupees 7 per ton, or 8 Annas a sleeper.

5. With regard to iron-wood, and other heavy Indian woods, Captain Hopkinson, late Commissioner in the Burmese Provinces, places the Burmese iron-wood first in the list of durable timber.

Iron-wood sleepers.

The principal objection to this wood is said to be its weight, and as the weight of the different kinds of wood available for sleepers is an element of great importance, the Committee record, for the information of the Board, the result of their investigation:—

Iron-wood, per cubic foot	...	...	...	...	...	60—66 lb.
Sal-wood	"	...	...	...	...	<i>idem.</i>
Teak	"	...	...	...	...	40—50 lb.
Creosoted Fir	"	...	...	...	...	42 lb.

6. Regarding Teak-wood sleepers from Burmah, Mr. Turnbull states that this timber

Teak-wood sleepers.

which has been tried in small quantities is better adapted for sleepers than any he is acquainted with. It is durable, and the sun has no effect on it. It is lighter than Sal, and more easily handled, lifted, and packed, and the white-ants do not touch it. Captain Hopkinson says it is liable to wet and dry rot, and he does not reckon its durability above 15 years, whereas he gives the iron-wood of Burmah a duration of 50 years. But Dr. Brandis is of opinion that the teak alluded to by Captain Hopkinson must have been cut up and employed before it was sufficiently seasoned, as it was formerly the practice of private parties in the Tenasserim Provinces to fell timber green without previous girdling. He is confident that it will last much longer; perhaps quite as long as iron-wood. Old teak beams in Calcutta, he remarks, are considered imperishable. And it may be mentioned, in corroboration of this fact, that the teak beams brought from Java by the Dutch, for the erection of Fort Cornelius at Ch'n-surah in 1693 were found to be as perfect and sound when the fort was taken down in 1826, as the day they were erected.

7. The Jarrah-wood from Australia has been found liable to split from exposure to the sun

Jarrah-wood.

easier than other woods. It has also been attacked by white-ants and the sea-worm, but not to any extent. The reports on its durability, however, are based only on the experience of two years, and with this imperfect data before us, the merits of Jarrah must be considered as yet doubtful.

From these facts it would appear that the duration of good creosoted Fir, and also of Sal, if selected with the greatest care, may be taken at an average of 15 years, while the Burmah iron-wood is estimated by Captain Hopkinson, and the teak by Dr. Brandis, to last 50 years; but

giving each of the latter, for the sake of comparison, a period of only 30 years, the account will stand thus :—

Number of sleepers on the whole line...	3,872,000
Annual renewal of Fir and Sāl once in 15 years ...	258,134
Cost of these sleepers if taken at Rupees 4-8...	Rs. 11,63,603
Annual renewal of teak and iron-wood once in 30 years, Sleepers	129,067
Cost of these sleepers if taken at Rupees 6 ...	Rs. 774,402

Mr. Sibley writes, on the 1st October last, that in September of the previous year he
Creosoting Apparatus for the N. W. Division. indented for a creosoting apparatus for impregnating Himalayan Pine and other porous woods,

stating that it would be available for petroleum as well as creosote. He had no actual experience of petroleum as applied to sleepers ; but, when in Bengal, he had applied it to timber for centring door frames, &c., not by injection under pressure, but by simple immersion, and the result was completely satisfactory, and he is anxious to try the application to sleepers, provided the article can be obtained as cheap as creosote.

Mr. Sibley now reports that, in October last, he visited the Himalayan Pine forests, in company with Major Hovenden, and was so happy as to discover that the Pine called Cheer

Cheer-wood.

was admirably adapted for sleepers, and procurable in great abundance. He traversed the forest in every direction, and from a careful survey of large tracts, came to the conclusion that each square mile might be considered as containing on an average 10,000 trees, of which *one-tenth* at least was first class, with a girth of from 6 to 10 feet. He is of opinion that, in British Gurhwal, the quantity of timber within four miles of water-carriage would be sufficient to furnish 100,000 sleepers. Assuming, he says, that our requirements for maintenance would average 100,000 a year, he is confident that British and Nepal Gurhwal would supply all these wants. First class sleepers, according to his calculation, may be delivered at Allygurh, on our line,

* Mr. Rendel, in his report on the creosoting apparatus, which is annexed to these Minutes, has furnished the Board with very minute information regarding the various processes of preserving timber, and comes to the conclusion that Mr. Sibley has under-rated the cost of creosoting when he assumes it at Rupee 1, or 2s. the sleeper. Mr. Rendel has shewn, with reference to the price of creosote, and the cost of conveyance, that the expense of creosoting a 12' X 6" sleeper in the N. W. P. Division will not fall short of 4s. 3d., while the cost of using sulphate of copper would be 1s. 4d., and of chloride of zinc only 9d. each.

for Rupees 3 each, and if the cost of impregnation be assumed at Rupee 1, the expense of each sleeper will not exceed Rupees 4. His request for a creosoting apparatus was postponed at the time, because the supply of wood from the Himalayan forests was uncertain. But as this fact has now been placed beyond doubt, the Government has sanctioned the indent, and Mr. Sibley has renewed his request for it.*

The letter from the Agent of 22nd February 1864, No. 13, states that iron-wood sleepers from Queensland may be conveyed as ballast to Calcutta, at 3-6-0 a piece (but whether this

Iron-wood from Queensland.

figure represents Shillings or Rupees it is not stated.)

It is possible that this wood will be found as durable as the iron-wood of Burmah.

No. 495.

ORDER THEREON, 30th March 1865, No. 691.

Forests, No. 13.

Communicated to the Financial Railway and Public Works Departments, the Board of Revenue, and Conservator of Forests.

(True Extract.)

(Signed) J. D. SIM,

Secretary to Government.

To the Financial Railway Department.
„ the Public Works Department.
„ the Board of Revenue.
„ the Conservator of Forests.

Exd. S. T. Augustin.

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Creosoting Apparatus for the N. W. Division.

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Cheer-wood.

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Iron-wood from Queensland.

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To
The Secretary to Govt.
Revenue Department.
Madras.

Pen 1865 (D) 1865
No. of 500 for each
of 1865

Revenue
Circular No. 3.

To
The Hon. Secy. of Int.
Revenue
Secy. to Govt. of India
in the Public Works Dept.

Dated 14th March, 1865.

Respectfully

1865

1865

Preservation of timber and renewal of railway
sleepers.

1865

To the Hon. Secy. of Int.
Revenue
Secy. to Govt. of India
in the Public Works Dept.

30th March 1865

Communicated to the
Hon. Secy. of Int.
Revenue and Secy.
of Public Works Dept.