

THE COCHIN FOREST RAILWAY

BY EDWARD HARRAN

The Cochin Forest Tramway is an interesting little line of tramway on the meter gage in the semi-independent State of Cochin in South India. It runs slightly to the north of the 10th parallel of latitude and to the east of the 75th parallel of longitude, and owes its origin to the fact that the forests of Cochin form one of the most valuable assets of the State, their approximate area being 505 square miles, or nearly one-half of its entire extent. Their commercial importance, it is stated, was vaguely realized as far back as the beginning of last century, but the earlier attempts to work them were of the usual spasmodic and unsystematic nature which characterized original efforts in forestry throughout the Indian peninsula. In the year 1835, however, a regular forest department, under the control of a European officer, was formed and worked for some sixty years on old fashioned lines. Though the department throughout this period brought in a certain amount of revenue to the

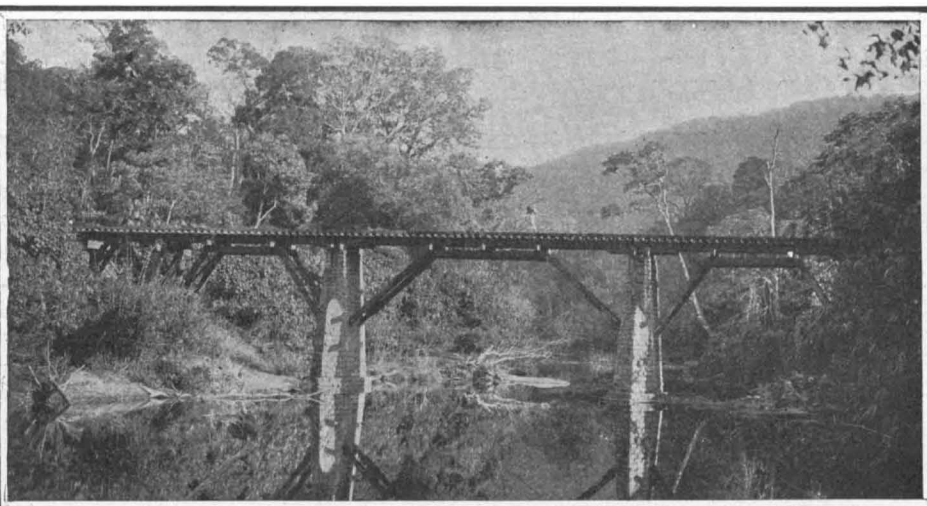
fact that a land route, provided means of transportation over it were available, would tap a far richer forest area than a proposed river route alone, while, of course, it would be open all the year round. So it came about that the idea of a tramway in three sections arose, was recommended to and sanctioned by the Durbar. The first section was to cover a distance of 8 miles in the valley, to be followed by a self-acting inclined tramway 5,000 feet long. The second section, $4\frac{1}{2}$ miles long, was to be followed by a slide 7,000 feet long, whence the third section, also $4\frac{1}{2}$ miles long, was to extend to the Kurumali River, from which point timber could be floated to the railway station at Trichur during the monsoonal period and carted to the Chalakudi Station in the dry weather. According to this first propounded scheme, timber from the hitherto unworked Parambikolam Forest was to have been floated by the Parambikolam River to the tramway terminus in the valley. A visit paid by his

logs both at the head and floor of the slide proved expensive. To remedy this latter, the conversion of the slide into another self-acting incline was decided upon. To remedy the first, Mr. Alwar Chetty recommended, and the Durbar sanctioned, another extension of the tramway, one of 15 miles to Chalakudi, to meet the Shoranut-Cochin Railway at that station, a connection, with the acquiescence of the Madras Railway authorities, being made between the railway and tramway there.

To-day the total length of the line as it stands completed at the time of writing is $49\frac{1}{2}$ miles divided into three sections. The first section extends from mile 1 to 21, the second from mile $22\frac{1}{2}$ to 27, and the third from mile 28 to $49\frac{1}{2}$. The first and second sections are connected by a self-acting wire rope manipulated double way of $1\frac{1}{2}$ miles, while the second and third sections are similarly connected by another incline a mile in length.



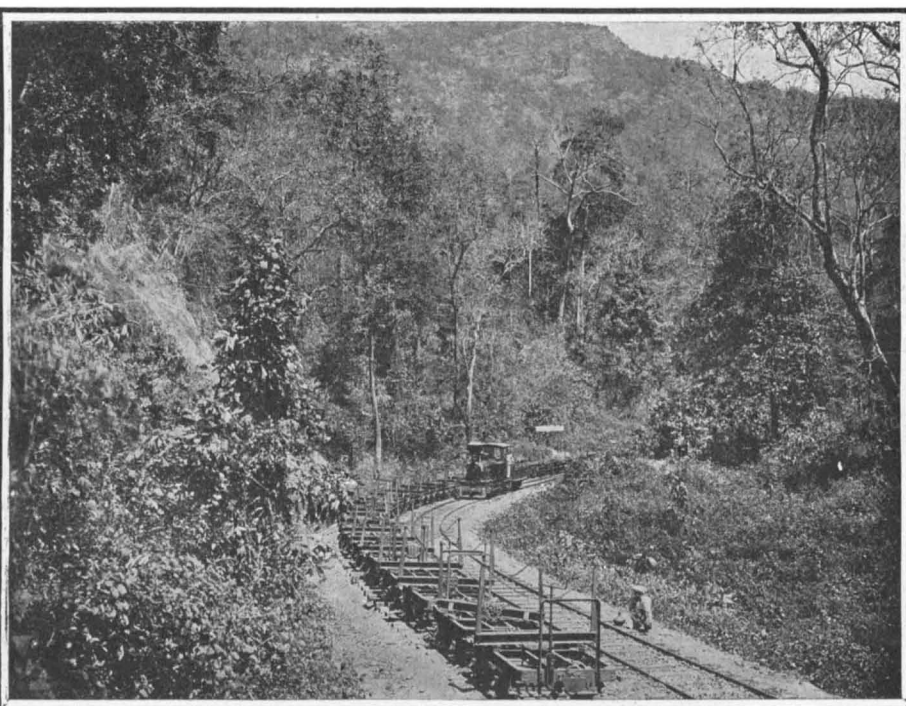
The logging locomotive, truck, and caboose.



Stone-and-timber bridge on the line of the Cochin Forest Railway.



Elephants moving logs for shipment.



A train of timber cars. Note the density of the forest growth.

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State, there was little or no pretense made of administering the forests on scientific principles, with the more or less natural result that while the interior of the forest area (from which there were no facilities for transporting the cut timber) remained practically untouched, work being confined to the more accessible portions and those from which transport was easy. It was not until the year 1895 that a move for the better was made, when suggestions were made by the Resident, Sir James Thomson, which culminated, early in 1897, in the Madras government placing at the disposal of the Cochin State a British forest officer, Mr. Foulkes, for the purpose of inspecting the forests and formulating proposals for their better and more profitable administration. This gentleman's report included the recommendation that the services of a trained and experienced forest officer be obtained, and, acting in accordance with this suggestion, the Cochin Durbar obtained from the Madras government the loan of Mr. V. Alwar Chetty, T.F.S., for a period of seven years. His first care was to inaugurate a period of rest for the overworked area of timber and to set about securing a suitable outlet for the prospective output of the then virgin forests. Surveys disclosed the

Highness the Maharaja of Cochin to the Parambikolam and Nelliampatty forests in October, 1903, suggested a revision of this scheme which provided for the extension of the proposed tramway to Parambikolam, an additional $12\frac{1}{2}$ miles, the experience gained during the preceding year or two having shown conclusively that the Parambikolam River could not be relied upon to carry every year anything like a year's full yield of timber. A survey of this extension was made by Mr. Haldwell, a specially engaged engineer, in 1904.

According to the original scheme, the traction of the timber trucks was to have been by manual labor, but when the length of the proposed line amounted to 31 miles, it was recognized that manual labor would prove both too expensive and too laborious, and in September, 1904, locomotive engine traction was finally decided upon. The modifications of the original scheme already alluded to necessitated a full reconsideration of other portions of it, chiefly the proposed combined river and road transport which it was anticipated would not clear the accumulations of timber. Also in practical working it was found that a timber slide, especially in the case of lengthy and heavy logs, was unsatisfactory, and the handling of

Throughout its whole length the Cochin Forest State Railway is excellently constructed. The gage is 1 meter; the average gradient of the line 1 in 80 and the maximum gradient 1 in 25, which gradient occurs on the third of the five inclines which have been embodied in the construction.

The inclined ways are so constructed as to be self-acting, and three of them are situated in series between 21 and 23 miles and the other two between $26\frac{1}{2}$ and $28\frac{1}{2}$ miles. They are worked by means of wire cables controlled from brake houses by gear brakes independent of each other, and consisting of horizontal wheels round which the cables pass two or three times. The inclines are double railed with suitable cross-over points at the up-hill side of each brake house. The points are so arranged that a descending load, which travels down by force of gravity, requires practically no up-hill shunting, the locomotive places the truck, which on being uncoupled is then ready for the descent. In some cases, however, empty trucks going up have to be hand-shunted after being placed, in order to place them on the side of the upper incline on which the traction rope lies. The ropes are flexible and are of $1\frac{1}{2}$ inch plow steel wire. The cable

passes over a grooved pulley 6 feet diameter, after which it forms a figure 8 over a loose pulley, back again over another 6-foot pulley mounted on the same shaft as the first and thence to the other line.

On the vertical shaft on which these two pulleys are, and on which the rope binds, are mounted two horizontal drum pulleys each 6 feet diameter, $3\frac{1}{2}$ inches broad, with $\frac{1}{4}$ -inch flanges. Steel hand brakes $3/16$ inch thick and 3 inches broad, studded with hard wood brake-blocks 6 inches long, can be applied to these drums by powerful linked levers controlled by hand wheels and screws, to control the speed of the load descending the incline. The grooved pulleys round which the rope binds are filled in with leather sections on end-grain, to give a good grip. The cast-iron portion of these wheels is suitably dovetailed out to contain the leather packing.

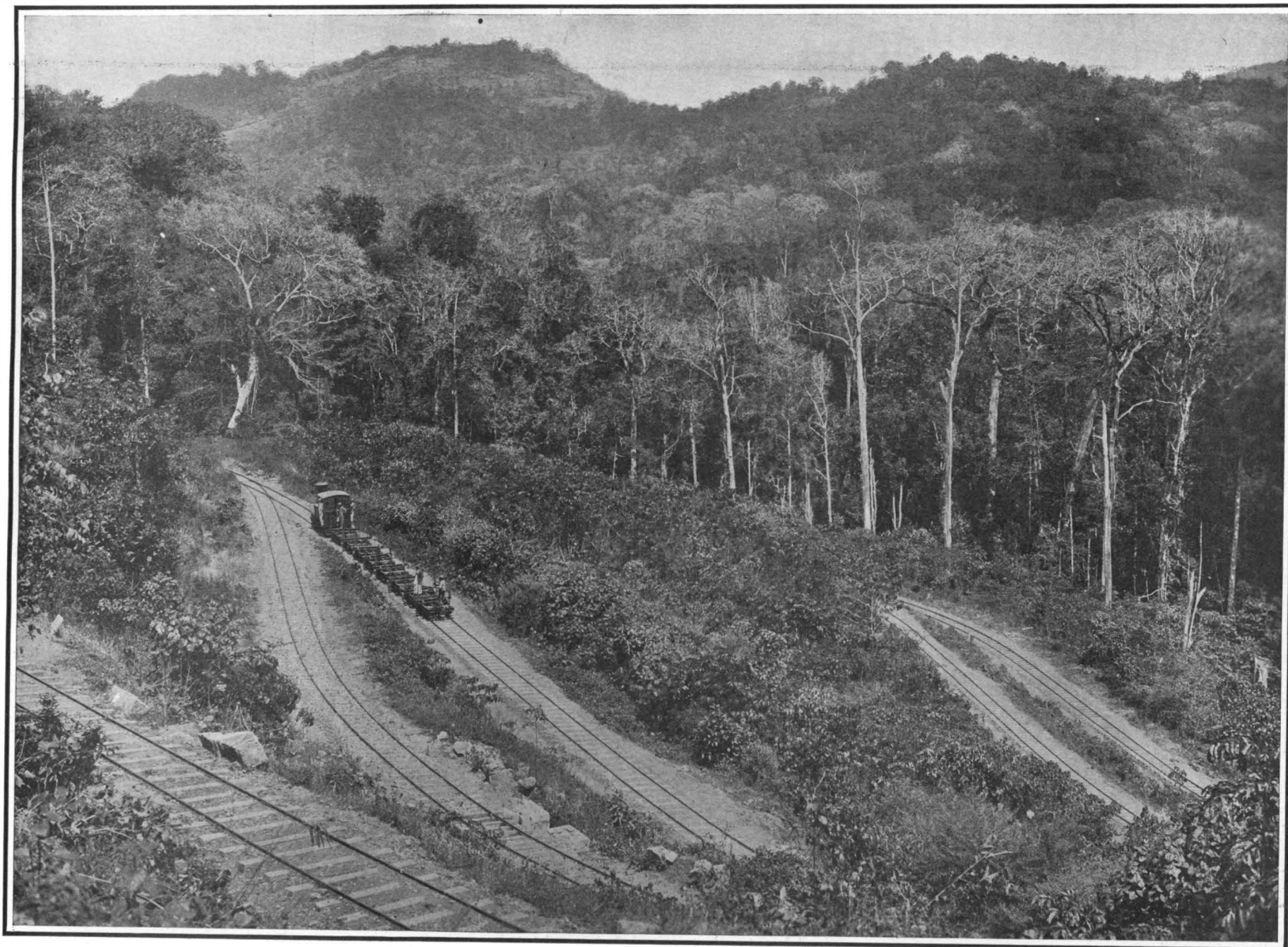
The first, second, and fourth of the five inclined ways are on curves, round which curves the wire ropes are guided by vertical rollers. On the straight portion of the inclines the cable is supported by horizontal rollers placed 30 feet apart. Illustrations of one of

sistent examination Prof. Moser has yet made. In this cave were found four such layers of clay separated by layers of ashes. While relics of the new stone-age were found in the first and second layer of ashes, in the third and fourth layers were discovered remains of the painter's mussel, land-snails, the bony scales of the swamp-turtle, and a mammal-fauna, such as the otter, beaver, goat, stag and wild bear, which manifestly point to the fact that the first cave-dwellers resorted to the fresh-water districts for their sustenance, while the later cave-dwellers found a much more generous source of nourishment along the coast. An important fact is the presence, in these oldest layers, of frequent tools, and to the same layers belong the especially interesting art objects, engravings on animal bone, described pictorially, many of them, in the Professor's report. On a polished piece of stag's horn, for instance, may be seen the rudely made drawing of a human figure that stands between two tree-trunks showing many branches. As in the set drawings of children the head is represented by a round depression, and hands and feet by slits slightly curved.

Moser cave; and very recently the Professor found a well-preserved human lower jawbone in the so-called Cave of the Bears. Sandstones, marked with grooves made by whetting the bone tools on them, prove that the caves were also the workshops of the cave-dwellers. A high degree of development is shown by the pottery; the vessels formed by a free hand are manifold not only in their form and material, but also in their decoration; one piece being marked with a broad spiral band, immediately on either side of which the depressions of the vessels are filled with white color, in which are the ears of corn and leaves of palm which ornament the band. This piece almost reminds one of the decoration of Mycenaean pottery.

Have Fishes Memory?

Studies as to the mental powers of animals have already been made on several occasions, but only recently have inquiries been made as to whether fishes have a memory or not. Results have shown traces of a memory both in coral zoophytes and other denizens of the deep. Experiments have been made with sev-



Part of the main line with empty train on a grade.
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these inclines are here reproduced. The rolling stock of the Cochin Forest Railway consists solely of open trucks, specially designed for carrying timber, with swiveled bolsters and chilled cast-iron wheels.

The Art of the Cave-Dweller.

A very noteworthy discovery of caves, which has brought to light a number of art objects of the oldest inhabitants, is reported by Prof. Moser in a late number of *Umschau*. In a depression, which has the appearance of a trough, of the valley extending from the Karst (Austrian) plateau, Trieste, Nabressina, Duino, to the Volnik Mountains, are found numerous caves to which leads a gate of rock under the projecting wall of the cliff. Their interiors are rooms small or spacious, which were first only places of sojourn for the Karst cave-dwellers who, originally nomads, later settled down to habitual residence in them. That the caves have served a long time as abodes is proven by the fact that in them are found frequent very thick layers of clay interstratified twice, thrice, four times, with ashes. In the latter are relics of the household. Among the caves visited the Rothgart cave, situated near the viaduct of the Southern Railway, near Nabressina, was subjected to the most per-

On a second engraved piece of bone, a jawbone, that was found in the third layer of ashes, is pictured, with a contour of almost straight lines, a wild boar of which the head is almost triangular, the tusks being clearly drawn, the eyes and ears being faintly indicated, the bristles on its back appearing with perfect distinctness, and the curl in its tail being rather indistinct. That the artist of the cave sought to reproduce the aspect of nature in which he had often seen and slain the wild boar, is shown by the high grass in which the animal stands, and which is represented by strong incisions. On a thigh-bone is easily recognized the head of a sea-turtle with eye and deeply cleft mouth; the scales and folds of the skin are indicated by easy strokes, and above the head is a sufficient hint of a fluttering dragon-fly and not far from it are tufts of reed. The two last engraved pieces of bone the Professor attributes to an early settlement in the new stone-age, while the awkward portrayal of the man may be considered as derived from the old stone-age.

While the layers of ashes contained a generous number of finely worked tools of bone and pieces of ornament, the occurrence of relics of man himself is restricted to two skeletons with additions from the

eral fishes, but the most striking results have been obtained with the gray perch, which lives chiefly on a small silvery-hued sardine. Some of these were taken and colored red, and were then put into the tank where the perch was with several other silver-colored sardines. Of course, the normal ones were at once attacked and eaten, but it was not till hungry that the perch made a tentative meal of one of the red-colored victims; on recognizing the sardine flavor, however, he promptly demolished the remainder. Subsequently the specimens in the tank devoured the sardines, irrespective of color, thus showing not only traces of a memory but also the power to differentiate color. Subsequently, sardines colored red and blue were placed in the tank together with the silver ones; the same scene was repeated, the blue ones not being attacked till the others were eaten, and hunger compelled investigation of the new comers. After this "introduction" the perch ate the sardines of all three types without any difficulty. Some spines of the sea nettle (*actinia*) were then fastened to the blue sardines; these were at once avoided by the perch, who promptly got out of the way of the new comers. This showed traces of memory, as the results of contact with the sea nettle were clearly shown and recognized.