

At 31 inches, 100° will require a length of	96°,7
30	100,
29	103,5
28	107,1
27	111,1
26	115,4

In the same manner, if the barometric scale be supposed to be adapted to the standard temperature 60°, then above and below that degree, the length of the *whole scale* (as it is not a scale of *equal division*, it is better to use this expression) must vary in the following proportions.

At 30°— the length will be	,9376
40	,9584
50	,9792
60	1,0000
70	1,0208
80	1,0416
90	1,0624
100	1,0832
110	1,1040
120	1,1248

After this explanation, it is easy to discover the cause of discrepancy in the two instruments mentioned before:—the first appears to have been experimentally divided at a temperature of 50°, and the other at a temperature below the freezing point, or in the depth of winter!

The most convenient method of obviating these sources of error, is to describe the lines which mark the divisions of inches and degrees, as parts of rays conveying to a distant point, instead of drawing them parallel to one another in the ordinary manner: perpendicular lines may then be drawn parallel to the line of *standard divisions*, at such distances on either side as to intersect new scales of divisions adapted to given variations of the bulk of air from pressure or temperature as above described.

Such scales might be printed and attached to common sliding rules, and it would be only necessary to have on the Sympiesometer a single scale of temperature, and indeed any air thermometer might then at once be converted to the purpose of a barometer on the same principle.

Q.

### V.—On the Firs of the Cásiya Range, and the possibility of transporting them into the Brahmáputra.

We have much pleasure in publishing the following account of the firs in the Cásiya Range, drawn up by Captain Jones of the Quarter Master General's Department.

I shall commence by stating that there are only two places, where in my opinion the fir timbers could possibly be floated. These are the Sórípáni four miles N. W. of Nancláo, and the Bar-pani, 37 miles east of the former, on the Jáintia road.

The Sórípáni is just 2000 feet below Nancláo, and 2400 feet above the level of the Brahmáputra, as measured with a barometer, and the same result nearly was obtained by using a theodolite: the point measured from, was the bridge of fir timbers and planks 60 yards long. The trees here are larger than those above or below this altitude. Many may be procured of 2 feet in diameter (bark included); the general breadth is between 14 and 18 inches in diameter, in the rough state, tapering very slightly to the top; the lengths vary a good deal, from 30 to 90 feet in timbers of the same thickness. The species appears to be that resembling the Scotch fir, having a long grain and containing a considerable quantity of turpentine, the knots being 2 or 3 or more feet distant from one another: the colour of some of the planks when dry is yellow, and in these I think there are fewer knots, and farther apart, whilst in other timbers the wood is nearly white and much softer.

A little lower down the Sórípáni, after several considerable falls, the fir trees are very numerous, and any number from 10 to 13 inches may be found, the wood of the same description. These firs do not thrive well after leaving the immense stratum of sparkling granite which extends to 40 miles, (known) east of Nancláo,

and 8 and 10 miles north and south of it. Beyond this to the eastward, in this latitude ( $25^{\circ} 40' 00''$ ), the country has not been explored, being inhabited by the tribes of Nágos, who are not inclined to let travellers into their country; but N. and S. of Nancláó where the granite rock terminates, the fir trees get dwarfish and are soon lost altogether. With regard to the transport of the timbers I cannot speak so positively, yet I should imagine the smaller ones below the Sóri-páni Bridge might be got down in the floods, and it is not impossible but what the large ones might also. The river has several falls from the bridge for 8 or 10 miles. The whole distance in a straight line to where the Sóri-páni river falls into the Brahmapútra being about 36 miles; the general course of the river being nearly N. W. The lower extremity near the Brahmapútra is known to be navigable for 10 miles or more, which shortens the distance a good deal. The current in the floods is very rapid, and the general breadth in the hills is 60 yards, the depth of water varying to extremes, like all hill torrents; but in the floods the depth is 12 to 14 feet; and its velocity may be conceived when it is stated, that the fall of water is 2400 feet in 26 miles, where it enters the plains, and 10 miles further falls into the Brahmapútra.

It would be perhaps worth while to have 2 or 3 specimens brought down, and if on examination, they should be found of the proper description for the purpose required, the attempt to bring them down into the Brahmapútra might then be made; and I have no doubt, it would partially succeed if made at the proper season. The best months would be July, August, and September.

I shall now refer back to the river to the East of Nancláó, the Barpáni. The fir timbers here are, I think, larger than on the Sóri-páni, by 5 or 6 inches on an average. The wood is the same in appearance in all respects. I shall therefore proceed to the nature of the river; and the probability of transporting the timbers. The river in the hills is from 80 to 90 yards broad, sounding through a gully formed by two high ranges clothed with the firs from about the middle of the descent to the water's edge: this river has always two feet of water, and has a very navigable appearance. The natives say, there are several falls lower down the stream, and also assert that the river becomes subterraneous for upwards of a mile, and then emerges again. The distance in a straight line into the plains is about 50 miles in a direction N. E. where it enters the Copelli river, and a few miles further falls into the Callang opposite Círhór Chóki: the river is navigable a short distance before it falls into the Capelli and downwards into the Callang, and from thence into the Brahmapútra, 12 miles above Gáohatti at all seasons of the year. Notwithstanding the tale of the inhabitants about the river running through a hill of granite rock, which I take to be an idle one, I think there would be a better chance of succeeding with the timbers in this river, than the Sóri-páni near Nancláó, but nothing for certain can be known until the experiment is tried.

It may not be unnecessary to state, that there would be little chance of getting assistance from the Jántia people near the Barpáni, or the Nancláó inhabitants near the Sóri-páni: the wood-cutters must be sent from the Assam side, at Nancláó. Mr. Scott, the Governor General's agent, has generally found it necessary to purchase the trees before cutting them to prevent dispute, but the sum was quite trifling that they asked.

I shall conclude by mentioning, that several fir timbers are washed down the Callang in the rains.

We have also been favoured with the following extract of a letter from a gentleman in the Cásiya Hills on the above subject.

I send you a specimen of Cásiya fir. The specific gravity will probably be found to vary considerably in different specimens, according to the quantity of resin contained in the wood, which is sometimes so great as to render it very heavy. If care were taken of the trees, by putting a stop to the annual conflagration of the grass that grows under them, they would evidently attain a much greater size than those seen by Captain Jones, as they are to be found in the sacred groves, which are carefully preserved, full 90 if not 100 feet in height. I cannot yet speak positively as to the question whether it is possible to get them floated down any of the rivers. The difficulty is occasioned by the beds being blocked up by immense granite boulders, under which the water in some places flows, and all the best trees are produced where the boulders most abound. I fear, however, that if it were found practicable to get them into the Brahmapútra, the expense of transport to Calcutta would prove too heavy; for as it would be necessary to go a part of the way against the stream, they must either be loaded on boats at Jaffer-ganj, or sent by sea

from Narnain ganj; and on this account, I should doubt whether the Bareilly fir might not be brought to market cheaper, although grown further off. They were, I believe, tried, and not found to answer.

REMARKS BY THE EDITOR.

By the Bareilly fir, we conclude the writer of the foregoing means the fir growing on the low sandstone range opposite Bareilly, and distant about 70 miles. From the character and relations of the Cásiya Hills, we conclude them to be a continuation of the former, and the two firs to be one and the same. That of the north-western mountain provinces is known to botanists as the *P. longifolia*: it bears three very long (sometimes 18 inches) leaves in a sheath. The fruit is a perfect cone, and the seeds are winged. With regard to the quality of the wood, it is generally considered good: noother is used at Almorah for the purposes of roofing, chowkuts, paanel doors, &c. The question, however, of transport is probably, as in the Cásiya Hills, a doubtful one. We shall be happy if any of our readers in that quarter will favour us with some information on the subject. As to the statement of its having been tried in Calcutta, and not found to answer, we rather think this refers to another pine, the *Deodar*—which is so different a wood, that though highly valuable also, it would never be used for the same purposes, and might consequently be pronounced, if tried with that view, not worth the trouble of transport. This latter too must have been in the case of the *Deodar* many times greater than in that of the fir.

The specific gravity of one of the specimens sent with the above letter was 595. Captain Baker had the kindness to try the strength, and found that a piece with a breadth of, 8 inch and depth, 9 inch bearing 15 inches, required 271 lbs.; a second 255; a third 247; mean 258. But he observes, that in such small specimens no fair conclusion can be drawn.

The above, such as it is, is a *higher* result than Mr. Barlow obtained with firs at home in the proportion of nearly one-fourth.

## VI. Comparative Value of different Methods of Raising Water.

The annexed Table exhibits a statement of the comparative performance in three different methods of raising water, and the expense of each method, or the number of hogsheads raised in different periods of half a day, or in six hours, to a whole day of twelve hours.

The labour of baling being a very hard work, the men are supposed to work no more than six hours at the rate of 20 deliveries in each minute of time; and when it is considered, that the actual delivery of a load is  $\frac{1}{4}$  of a cubic foot, or 21 pounds of water, and that the basket (wet) and rope must weigh at least 11 or 12 lbs. more, and are at the extremity of a lever at least 3 feet long, the exertion of each man is considerably more than 16 lbs. it is perhaps equal to 22 or 24 lbs.; and that this exertion could not be kept up for a whole day, is a circumstance known to every one acquainted in the least with ordinary labour.

In estimating the performance of bullocks in drawing water, the greatest advantage is derived from the greater height to which the load is raised, since the difference between drawing water 11 or 12 feet, and 40 to 45 feet, has not been observed to give more than about  $\frac{1}{3}$ ths more delivery for the shorter draught; so that in such moderate height baling is  $\frac{1}{4}$  dearer according to the table, and the men's labour applied on the walking beam, would seem to be  $\frac{3}{4}$  times as cheap as that of bullock labour with their necessary attendants, for small heights.

For heights of from 30 to 45 feet:

1st, baling gives from 40 to 50 hogsheads for each rupee expended;

2d, bullock labour from 135 to 150 hogsheads;

3d, and the walking beam about 500 hogsheads.

Or the 3d method is to the 1st as 10 : 1

the 3d to the 2d is as 10 : 3

and the 2d to the 1st as 3 : 1

or, the 2d method has as much advantage over the first for heights exceeding 30 feet, as the 3d method has over the 2d under such circumstances.