

everywhere, and are generally employed when natural reproduction has to be supplemented by planting.

Fellings. Fellings are conducted from an easterly direction towards the west, as the prevailing winds come from the latter direction.

Thinnings generally become necessary about the thirtieth year, after which they have to be repeated every tenth year, until the gradual felling of the largest trees commences. These fellings are regulated by the requirements of the young seedlings, and are carried out very gradually and only sufficient to admit as much light as is absolutely necessary for the young plants, leaving as many of the old trees to grow as large as they can. It also happens that some of the best trees are left standing, or are held over for the next rotation, to obtain exceptionally large timber. This can, however, only be done in somewhat sheltered positions, and on rocky ground, where the storms are less liable to overthrow them.

Use of the wood. Some damage is always done to the young plants by the removal of the old trees, but the silver fir seems to repair them almost faster than any other coniferous tree. It is also remarkable for its high and more cylindrical stem than other conifers, and the comparatively large amount of timber it produces, which is much used for masts in ships, axletrees of windmills, buildings, and other purposes; and although it is admitted to be somewhat inferior to spruce, it fetches in the Black Forest mountains the same price as spruce.

The long and barked logs of conifers here are valued according to their length and their diameter at the smaller end.

Transport of wood. Whilst small wood is moved on sledges in winter, timber is transported either by dragging with horses, let down the hill sides by means of ropes, sent down timber slips, and floated on the mountain streams, all of which methods are very instructive, and it is hoped will prove of use to me in India, where I have felt the want of it already, previous to this.

Dragging by horses. The dragging by horses is simple; it is done on comparatively level ground, by means of a rope fastened to a wedge (Fig. 3) driven into the end of the logs, and needs no further description.

Fig. 3, facing page 45. The wedge used is 6 inches long by $1\frac{1}{2}$ inches broad, whilst the ring is about $2\frac{1}{2}$ to 3 inches in diameter.

Lowering by ropes. The lowering of logs by ropes is employed for letting them down steep hill sides, and is sometimes connected with danger to life and limb to those who have to carry it out, if they lose control over the rope on the descending log. The rope in this, as in the previous case, is either fastened on to the log by means of the wedge already mentioned, or, if the log is too heavy, by means of a very strong and peculiarly shaped hook (Fig. 4), which is sufficient for the heaviest and largest timber.

Fig. 4, facing page 45. This hook is 18 inches long, and the ring attached to it about 6 inches in diameter. To be able to regulate the rate at which the log travels, and to have the power of checking it when required, the rope is wound several times round a tree or strong post before the log is started.

Fig. 5, facing page 45. For the setting in motion or otherwise moving these long and heavy logs the men use a kind of pick (Fig. 5), which, by a strong and long handle, gives them great power of leverage when the point is placed under the log and the handle drawn towards them. The wooden handle of this pick is 4 to $4\frac{1}{2}$ feet long, and at the thinnest end 1 to 2 inches thick. The iron is about 13 to 14 inches long, $1\frac{1}{2}$ inches broad, and $\frac{1}{2}$ inch thick, the head of it being $2\frac{1}{2}$ inches high by 2 inches broad.

Timber slips. The timber slips are constructed very simply, but are, for all that, very efficient for the transport of the timber out of the hills to a point where the streams can be used for floating timber. They are simple bridle paths cut out of the hill side, and winding around them with a gradient varying between 2 and 40 feet in 100, according to circumstances. So, for instance, on such slips as are used in winter, when snow and ice cover them, 2 to 3 feet in a hundred is found sufficient for the timber to travel quickly and safely down on them; whilst for smaller wood with such a gradient, it becomes necessary to place wood at intervals in the ground across the slip, as railway sleepers are put across a railway line, to give more impetus to it.

Ordinarily slips have a gradient of 10 feet, whilst the steepest have one of 35 to 40 feet in 100, which latter can only be used, however, in very dry weather, and dare not be exceeded; but the lowering of the logs by ropes must be resorted to if steeper descents are to be got over.

If the momentum of the travelling log is to be lessened, this is sometimes effected by throwing dry earth, charcoal dust, and in winter even loose snow, on the slip, which, however, only answers for a short time, and has to be repeated.

Sudden and great changes in the gradient are provided for in the case of an increase, which might cause the logs to shoot off the slip, by a covering in of the slip at such points as far as the change extends.

In the case of a decrease, which might stop, damage, or also cause the logs to bound off the slip, the change is made more gradual through building up such points by laying logs crossways over each other, and laying a floor of the slip out of logs. Where such a floor of the slip made of logs placed close alongside of each other is required further than the length of one log, they have to be placed, as a matter of course, so as to let the upper ones overlap the lower, or to rest with their lower end against the upper end of the following log, so as not to have any projection against which the logs might strike in their descent.

In the case of having to cross a public road which must not be closed, on the upper or higher side of the road the slip is built up close to the road, and in the same way as those places in which the gradient suddenly decreases, to a height of six feet or more, according to the width of the road, so as to enable the log to shoot across it through the air on to the lower continuation of the slip (Fig. 6). This construction has also to be resorted to where such a road leads along the bottom of a valley, and there is not a sufficient space between the road and the hill side for either storing the timber or letting it run out on the same side of the road.

To keep the logs on the slip in their descent, one or more logs are placed on the outer, or on both sides of it, leaving a space of 3 to 4 feet between the sides, for the timber to travel on. These logs on the sides are fastened firmly into the ground with wooden stakes 4 to 5 inches in diameter, and 4 to 5 feet in length, of which one is driven through the so-called shear (Fig. 7) at the end of the log, keeping it