

SHAFT-LININGS.*

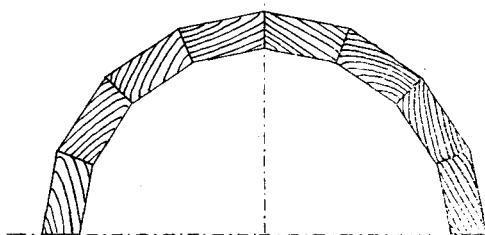
The subject of shaft-linings is one which has received little attention from the authors of papers, &c., the only references to it being, with a few exceptions, short paragraphs incorporated in papers dealing with the sinking of shafts, which are scattered throughout many volumes, and cannot be referred to without enormous labour. For this reason it is hoped that the following article, in which an attempt has been made to collect together some account of the different types of lining which have been employed, may be of use to those interested in the subject.

Shafts may be lined with timber, masonry, iron, or concrete, and, in addition to these used alone, combinations of timber and iron, masonry and iron, and iron and concrete have been employed. The selection of the material with which to line a shaft depends to a great extent on its cost, but in considering this it must be remembered that a small initial outlay does not necessarily result in saving, for the questions of repairs, safety, &c., affect the subject, and must be carefully considered before making a final decision. Timber is perhaps the cheapest material as regards first cost, but it has the serious disadvantage that maintenance charges are liable to be high owing to the wood decaying, and it is further subject to grave danger from fire, while it is not altogether satisfactory in water-bearing ground. For a shaft which constitutes the main highway to a mine—which therefore by its failure would not only stop the whole work of the mine, but might also cause great loss of life—timber should not be employed unless its use is absolutely unavoidable, for the greater safety and permanency of other materials will justify considerable additional first cost. Up to the present time—in this country, at any rate—masonry has been most often employed under ordinary circumstances, its safety and the small cost of maintenance, combined with the fact that it is much cheaper than iron, having led to its use even where considerable quantities of water have been encountered. Where, however, water is met with in excessive quantities, cast-iron tubbing is almost the only form of lining which it has so far been possible to use with advantage. Concrete lining has not hitherto been employed to any great extent, but the recent introduction of several fresh methods of applying it may be expected to lead to a wider utilisation of this material.

Timber shafts are generally rectangular in plan, and the commonest form of timbering consists of a number of rectangular frames of square timber spaced at equal distances apart vertically by means of distance-pieces, the earth being held up by close planking placed behind these frames. The frames or "sets" are formed of four beams, the two longer ones known as wall-plates and the shorter ones as end-pieces, and are joined either by halving the timber at each end or by some more complex joint. The distance-pieces, known as studdles, are placed perpendicularly between the different frames. The end-pieces are some of them made long enough to project beyond the wall-plates, the ends being imbedded in the ground and serving to support the lining, or the same effect is sometimes obtained by putting in bearers considerably longer than the end-pieces at regular intervals, the end-pieces being supported by these bearers. The distance between the frames must be regulated by the nature of the ground—in fact, if the ground is very bad they are placed quite close together, the studdles being done away with, while in good ground they may be 4 ft. or 5 ft. apart. During excavation the bottom unsupported frames are held in position by strong iron clamps until a length of 10 ft. or 12 ft. is completed, when vertical planks, which stretch over several frames and so bind them firmly together, are nailed on the inside. Partitions for separating the hoisting, pumping, and other compartments of the shaft are formed by putting timbers across the shaft parallel to the end-pieces. These timbers also serve the useful purpose of strengthening the framing considerably. Some of the shafts of the Comstock lode provide good examples of this form of timber lining.

In some districts round timber is used for shaft-lining, the general method being very similar to that described above, but the end-pieces and wall-plates are not halved together. In order to resist heavy pressure some additional timbering is put in within the frames. This consists of frameworks of round timber placed at the ends and in the centre of the shaft, each frame being formed of two vertical pieces about 20 ft. long, held apart by diagonal struts. Timber lining may take various other forms according as the shafts vary in shape; thus circular shafts are sometimes lined with timber, and at Clausthal there is an instance of a decagonal timbered shaft; but, whatever the shape of the shaft, the principle of lining is always the same under ordinary circumstances—that is to say, the lining always consists of planking to support the earth, the planking being held in place by strong frames placed at intervals in the shaft.

In watery strata it becomes necessary to make the shaft-lining as nearly watertight as possible



—Fig 1.—

Timber Tubbing.

* From the *Colliery Guardian* (London).