

THE POPPET HEAD AT THE MOUNT BOPPY MINE.

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The interesting feature of this structure is the use of wrought iron tension members. These offer less surface to the wind and also give a lighter design than is possible with wood alone, but the cost is greater. The general appearance is shown by the photograph.

Its height is 62 ft., and the load which it has to lift (without rope) is roughly $2\frac{1}{2}$ tons.

The compression members are of Oregon pine and the decking is of local pine.

The legs are 14 in. square at the bottom and taper to 10 in. square at the top. The slope of the legs is 80° to the horizontal and the spread at the bottom is 34 ft. between centres.

FOUNDATION.—The foundation for each leg consists of a block of concrete 2 ft. 6 in. deep, and 2 ft. 6 in. square at the top, but widening out slightly towards the bottom.

A cast iron shoe (Fig. 1) is fixed on top of the block by four 1 in. bolts grouted into the cement. The sole of the shoe is horizontal, but its sides are inclined so as to conform to the slope of the legs.

When this arrangement is used, the foundations rest normally upon the solid sandstone or other ground below, but an alternative method is to have the foundation blocks inclined, and the sides of the shoe perpendicular to its base. This gives a simpler form of casting.

When stepping the legs into position, the shoes are first filled with tar so as to preserve the timber.

TOP JOINTS.—At the top, the back and front legs are held together by stringers 10 in. square into which the legs are morticed. Across these lie two 12 in. by 10 in. cap-pieces, which are joggled to fit the stringers and overlap them by about 6 in. Each of these joints is strengthened by a 1 in. strap bolt running through the cap piece as shown in Fig. 2, and fastened to the leg by two half-inch bolts.

DISTANCE PIECES.—The brace is 30 ft. from the ground, and the distance pieces here are 14 in. by 10 in. Additional distance pieces

(14 in. by 10 in.) are placed half way between the brace and the ground and also another set (12 in. by 10 in.) at 13 ft. above the brace. The framework is further stiffened by 8 in. by 14 in. posts running between each distance piece at the brace and the one below it. These posts are morticed into the distance pieces.

The joint between the distance pieces, and the legs is a morticed one, strengthened by a strap bolt. See Fig 3. This is similar to the joint at the top of the legs. The bolt is 1 in. in diameter and is fixed on to the distance piece by two half-inch bolts. This form of joint is unusual, the distance pieces being generally goined on to the legs.

TENSION RODS.—The structure is braced diagonally by $1\frac{1}{4}$ in. wrought iron tie-rods, as shown in Fig. 8, in which provision is shown for a truckway. The centre ring is of cast iron and is 8 in. inside diameter, 2 in. thick, and 3 in. wide. Four rods meet at each ring, and the nuts bear on the round surface of the ring.

This is bad, as the vibration of the structure causes the nuts to work loose. Flat surfaces should have been cast on the ring to seat the nuts. The end of each rod runs through the leg diagonally; as shown in Fig. 5. The hole being a little on one side so as not to interfere with the strap bolts.

The seat for the nut has to be cut out as shown.

Lock nuts are not used at either end of the rods.

The tie rods are a nuisance in summer time if the nuts work loose and require a good deal of attention. Lock nuts might improve matters.

BRACE PLATFORM.—This rests upon 12 in. by 3 in. joists placed at intervals of 2 ft., and resting upon the distance pieces.

The flooring or decking is of local pine $2\frac{1}{4}$ in. thick.

In providing space for the cageway, the joists which have been cut have their ends supported by two additional bearers 12 in. by 3 in. These bearers also serve as supports for the corner posts of the cageway. See Fig. 4.

The railing is about 3 ft. 6 in. above the flooring, and is let into the legs at each end. The posts and rails are of 4 in. by 3 in. scantling.

LADDERWAY PLATFORM.—A small staging for the ladderway is provided at the distance pieces above the brace. It measures 5 ft. by $6\frac{1}{4}$ ft. and is fixed to the distance piece on one side and to the cageway on the other. It has a railing similar to the brace platform.

TOP PLATFORM.—The platform round the pulleys is $13\frac{1}{2}$ ft. by 14 ft. over all, and has an opening about $2\frac{1}{2}$ ft. by 2 ft. for the ladderway. The railing is $3\frac{1}{2}$ ft. from the floor. The corner posts are 6 in. by 4 in., and the rails and inside posts 2 in. by 4 in.

This platform rests on six beams, the two outer ones being 12 in. by 3 in., and carry the decking alone, while the inner four are 12 in. by $7\frac{1}{2}$ in., and carry the weight of the pulleys, cages, etc. They are fixed on to the cap pieces by $1\frac{1}{2}$ in. bolts, and are $22\frac{1}{2}$ in. apart between centres. Bearing blocks 12 in. deep by $7\frac{1}{2}$ in. wide by 5 ft. long, are

bolted on to these bearers, and upon them rest the bearing blocks for the pulleys.

THE CAGEWAY.—The cageway is $6\frac{1}{2}$ ft. by 4 ft. over all, and has two compartments. The corner and centre posts are $5\frac{1}{2}$ in. by $5\frac{1}{2}$ in., joined about every 10 ft. by $5\frac{1}{2}$ in. by 3 in., distance pieces morticed into them, and having a tie rod running just below.

The corresponding distance pieces on the longer sides of the cageway are gained into the posts.

The cage guides are $3\frac{1}{2}$ in. by 3 in., the broader sides facing the cage runner. They are supported by the distance pieces, and Fig. 6 shows the method of supporting the two inside runners to the one central distance piece.

PROVISION FOR HOISTING THE PUMP COLUMNS.—A hole was cut in the decking of the brace platform to allow of raising the pump columns. This necessitated strengthening the framework, which was done by two struts between the cross piece and distance piece below, as shown in Fig. 7.

WIND SCREEN.—The weather side of the poppet head is partly covered with a galvanized iron wind screen nailed on to a wooden framework. There is a lightning conductor provided at the top.

