beds when very fine ashlar joints are required. This may cause the edges to spall off when the stone is fixed owing to the pressure not being distributed over the whole area of the bed but concentrated at the edges. A portion of a hollow bed is shown at X, Fig. 27, where the bed surface of the upper stone only is concave. The shaded triangular portion is likely to be splintered off, especially if the joint is not completely filled with mortar. There is little likelihood of the beds being worked hollow when the stone is sawn by machinery.

The mortar specified for jointing masonry depends a good deal upon the character of the stone. Mortar joints for ashlar should be as inconspicuous as possible, and it is often necessary to experiment with various compositions of mortar until the desired colour (which should conform with that of the stone) is obtained.

That used for walling built of sandstone is sometimes composed of 1 part Portland cement and 4 parts sand, and occasionally a little lime is added.

The mortar recommended for certain limestones, *e.g.*, Portland stone, consists of 1 part Portland cement, 2½ parts *lime putty* (well slaked lime mixed with water to a consistency of a paste) and 3½ parts stone dust (powder obtained by the crushing of waste pieces of the limestone). *Neat* cement should *never* be used for grouting Portland stone blocks, as this may cause staining of the face of the work; only liquid mortar of the above composition should be used for this purpose.

Rubble walling (especially if of sandstone) should be built with cement mortar composed of 1 part cement to 3 parts sand, as the strength of the work depends very largely upon that of the mortar.

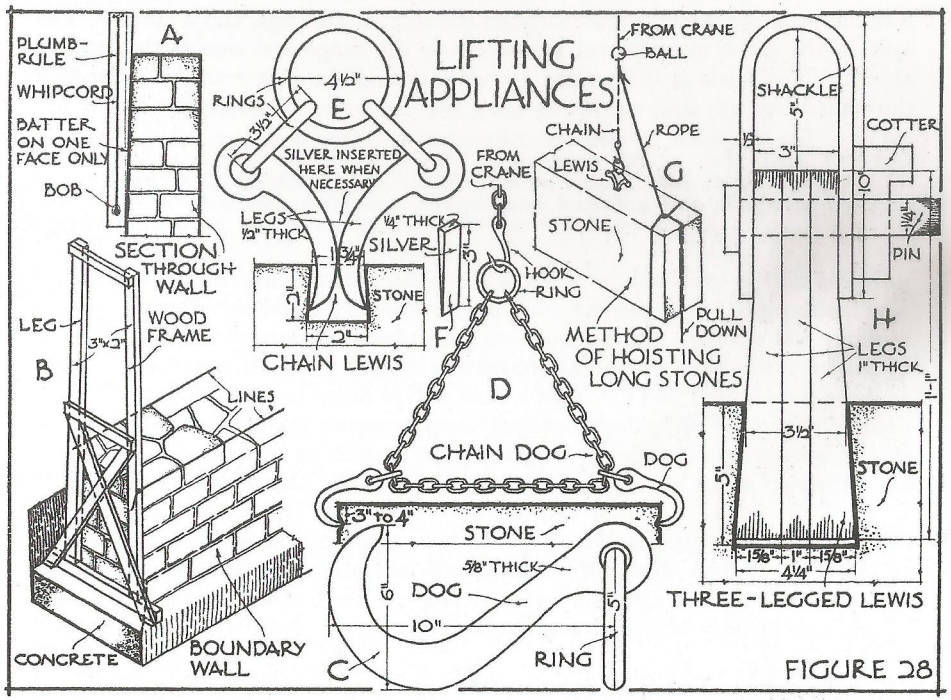
CONSTRUCTION OF MASONRY WALLS.—Much of the description on p. 31 referring to the construction of brickwork is applicable to stone walls. The batter which is sometimes given to walls may be maintained by the use of the plumb-rule which has one edge shaped to the required batter (see A, Fig. 28). Where a wall is to receive a batter on both faces (as at B, Fig. 20), the batter is preserved by the use of frames built of wood.

One form of such a frame is shown at B, Fig. 28. The frame is shaped to that of the section of the wall, and the outside edge of each inclined leg coincides with each wall face. During the construction of the wall a frame is fixed temporarily at each end. The correct alignment and the batter of each face are maintained by two lines, the ends of which are wound round nails driven into both legs of each frame at the required height.

LIFTING APPLIANCES

Blocks of dressed stone which are too large to be lifted by hand are raised by means of a crane or other hoisting apparatus and lowered gently into the correct position in the wall. Various appliances, such as Chain Dogs and Lewises, are used for this purpose.

Chain Dogs.—Dogs, which are of various sizes, are made of steel and are shaped as shown at C, Fig. 28. The stone to be lifted has a hole (about ¾-in. deep) punched in the centre of each end and from 3 to 4-in. down. A steel chain is passed through the ring of each dog and is hooked on to the chain from the crane (as shown at D) and the points of the dog are placed in the holes of the stone. When the chain from the crane is wound up taut, the dogs bite into the stone, which is hoisted and lowered to the required position. Chain dogs are particularly suited for lifting heavy stones and long stones with narrow beds. They grip the stone very securely and are used when special safety precautions have to be taken.



Chain Lewis.—This comprises three steel rings and two curved steel legs (see E, Fig. 28). The legs vary in size. The hole which is formed in the centre of the top bed of the stone is *slightly* dovetailed. If it is excessively dovetailed there is a tendency for the lewis to be pulled out owing to the legs bursting the stone during the lifting operation. The size of the hole varies from 2 to 3-in. deep; the 2-in. deep hole shown is about ¾-in. wide.

The lewis is placed carefully into the hole, one leg at a time. If the hole is found to be too large, a narrow wedge shaped piece of steel, called a *silver* (see F), is driven down between the legs. When the crane chain or that from a pulley block (which is hooked through the large ring) is wound up, the two smaller rings pull the upper ends of the legs together and thus cause the lower ends to grip the stone. For stones which are more than 3-ft. long, additional control is obtained if a length of rope is secured to the sling from the crane, as shown at G. The rope is generally secured by two half-hitches just below the "ball," it is then passed round the stone at one end, when a man pulling on the rope can assist in directing the stone as required as it is being lifted.