the former casting there is a lever which is pivoted at one end and has a solid knob at the other. When the lever is rotated, the pivoted end bears against the free end of a strong and highly tempered steel spring which is riveted to a recessed vertical portion of the casting, and the dovetailed notch on the lever engages in the solid curved lug which is riveted to the second fitting. This brings both meeting rails closely together and secures the window.

Sash Lift (see Q, Fig. 61).—This is the *hook lift* type, other forms being ring lifts, flush recessed lifts, knob lifts and hinged lifts. One pair of lifts is screwed to the inside of the bottom rail of the lower sash and at about 6-in. from each end. They are of course used to raise the bottom sash and are obtainable in brass and bronze.

Sash Handle (see P, Fig. 61).—When a sash is large (and especially when there are no glazing bars to grip when drawing down the sash) a pair of these may be fixed on the underside of the top sash meeting rail near to the stiles. They are not very convenient, as the lower sash has to be raised before the handles are accessible from the inside.

> The following simple expedient is effective: A pulley is fixed to the soffit lining of the frame immediately over each stile of the upper sash, and an *eye* or ring is screwed into the inner face and near to the end of each stile of this sash; a piece of cord of a length equal to about one and a half times the height of the window is passed through each eye and over each pulley; each cord is knotted immediately above and below the eye; the ends of each double cord are equal and a handle is fixed to each. To open the top sash, one end of each cord is pulled to draw the sash downwards with the top knot bearing upon the eye. The sash is closed by pulling on the other ends of the cords which brings the lower knots against the eyes to lift the sash.

As mentioned on p. 113, in order to conveniently slide the sashes and maintain them in any desired position when open, it is necessary to fix to them sash cords which are fastened to weights situated in the casings after being passed over pulleys fixed to the frame.

Sash Axle Pulleys (see A, B, D and N, Fig. 61).—This type consists of a $2\frac{1}{4}$-in. diameter round grooved brass pulley (or *sheave*) having $\frac{1}{2}$-in. diameter steel axles which revolve in brass or gunmetal *bushes* ($\frac{1}{4}$-in. thick annular bearings) mounted on a metal (iron, gunmetal or rustless steel) case which is flanged and covered with a brass or bronze plate; the pulleys may be $1\frac{3}{4}$, 2, $2\frac{1}{4}$, $2\frac{1}{2}$ and 3-in. in diameter. This hollow-rounded grooved type of pulley is suitable for flax cords, copper cords and metal chains of the form shown at W′. Square grooved pulleys are adopted for certain heavy chains. The cog wheel type of axle pulley (having a fixed axle with a toothed portion which bears the chain and which revolves on ball bearings) may be selected for extra heavy sashes.

The 5-in. by $1\frac{1}{8}$-in. face plate of the pulley is screwed flush with the outer face of a pulley stile with the top of the plate from $1\frac{1}{2}$ to $2\frac{1}{2}$-in. down from the head (see A and B); the mortice for the pulley case and the housing for the flange and face plate are shown at D. The pulleys project about $\frac{1}{8}$-in. beyond the outer external face of the pulley stile (see A), and the size of the pulley must be sufficient to allow the weight to hang clear of the casing. Two pulleys per sash are required.

Weights (see N and S, Fig. 60, and A, B and C, Fig. 61).—These are cylindrical cast iron weights, $1\frac{1}{2}$-in. in diameter and of varying length in accordance with their weight; thus, a 5-lb. weight is about 12-in. long, whilst a $6\frac{1}{2}$-lb. weight is 15-in. long. The object of these weights is to counterbalance the weight of the sashes. The top of each weight is holed to receive the end of the cord. Lead sash weights, square in section, are sometimes used for very heavy sashes, but these must be specially made, whereas the ordinary sizes of cast iron weights can be obtained from stock varying from 2 to 40-lb.

> Opinions differ as to the weight required per sash, but satisfactory results are obtained if *each* of the two weights for the *top* sash is from $\frac{1}{2}$ *to* 1-*lb. heavier* than *half* the weight of the sash, and if *each* of the two *bottom* sash weights is from $\frac{1}{2}$ *to* 1-*lb. lighter* than *half* the weight of this sash. The weight of each sash is determined by means of a spring balance, and due allowance should be made for the weight of the glass to be used and that of the paint.

Sash Cords and Chains.—The weights are secured by either cords or chains which are passed over the pulleys and attached to the sashes.

Best quality stout twisted or braided cotton cord is usually specified for ordinary work. It is obtainable in knots of "100-ft." or "60-yds." in length; its thickness varies from $\frac{3}{16}$ to $\frac{5}{8}$-in., the former being suitable for weights of less than 5-lb., and the latter for weights up to 50-lb. The cheaper cord stretches and, therefore, each length should be well stretched before being fixed, otherwise it may elongate to such an extent as to limit the movement of the sashes, *i.e.*, the weights of the bottom sash may reach the bottom of the casing before the sash has travelled to its full height. Certain brands of the best quality are greased and are guaranteed to be stretch proof and damp proof.

The defect of flax cord is that in course of time it frays and ultimately breaks. A stronger and more durable cord is that known as *copper wire cord*. It is sold by the 100-ft. and the size is specified according to the number; thus, a "No. 3" cord is $\frac{1}{4}$-in. in diameter and consists of thirty-six strands of copper wire which are subdivided into six segments; the strands in each segment are intertwined and the segments in turn are intertwisted together.

Another form of sash cord consists of a steel wire centre which is covered with cotton yarn; the covering prevents the wire from coming into contact with the metal pulley and thereby reduces the noise when the sashes are moved.

One form of sash chain is shown at W′, Fig. 61. This is called the *three-and-two link copper chain*, as it comprises a series of three links or plates (each $\frac{1}{24}$-in. thick) which alternate with a pair of links; the overall thickness of the five links is $\frac{1}{4}$-in. Each link has two holes and loose fitting pins or rivets pass through the five links at each connection. The chain can be used in conjunction with the ordinary axle pulley shown at N as it readily accommodates itself to the sharpest curve. Special fittings are used for connecting the chain to the weights and sashes. One form of connector to the weight consists of a hook