applied under floor boards, between studs of partitions, etc. The slabs have a ½-in. thick facing of plaster and a backing of slag wool which is at least 1-in. thick; these are nailed direct to studs, the underside of joists, etc. *Wall boards* form another class of insulating material. These are sheets of wood fibre (shavings) cemented together under pressure, ½ to 1-in. thick, 3 to 4-ft. wide and 6 to 14-ft. long *Celotex*, *Insulite*, *Lloyd Board* and *Tentest* are examples of this material. Wall board composed of asbestos-cement (see pp. 120-121) and supplied in 8-ft. by 8-ft. by ¼-in. sheets is used for sound-proofing; this is an excellent fire-resisting material. As stated on p. 48, insulating material is also sold in quilt or blanket form; *Cabot's Quilt*, consisting of cured eel-grass stitched between strong kraft (brown) paper is one of the best known and is obtainable in 3-ft. wide rolls of ⅜-in. (single-ply), ½-in. (double-ply) and ¾-in. (triple-ply) thickness; this is applied like the quilted form of slag wool. *Hair felt* is another good insulating material, but this is not vermin-proof. An additional type of sound insulator is the wood-wool cement slab described on p. 47. Application of some of these is described below.

When used normally, these materials only offer partial insulation. Complete insulation can only be obtained at a cost which is almost prohibitive. As nails provide paths along which sound is conducted, it follows that the nailing of wall boards to joists, studs, battens, etc., should be reduced to a minimum.

A partition formed of two leaves with a cavity between has approximately double the insulation of a non-cavity partition of equal thickness to the combined leaves, *provided the leaves are not connected together by ties.* The wider the cavity the greater the insulation. Whilst wall ties are essential to ensure the stability of external cavity walls (see pp. 40-44, Vol. II), it will be appreciated that sound is transmitted through the ties from one leaf to the other and the good sound-resisting quality of this class of wall is accordingly somewhat reduced.

An independent ceiling and a suspended ceiling (*i.e.*, one supported by light metal hangers fixed to the wood floor joists or in the concrete floor) are effective in preventing the transmission of sound (see L, Fig. 14). Floating floors (*i.e.*, those consisting of light reinforced concrete slabs supported on rubber insulating pads fixed to structural concrete sub-floors) provide further examples of efficient insulating construction.

Rubber, cork and thick carpet coverings (see pp. 40 and 41) are effective in reducing the amount of sound transmitted through floors.

Fig. 14 illustrates typical sound-proof details which incorporate some of the features and materials described above. Certain of these cannot be adopted generally because of their expense. The need for insulating materials will be reduced in a well-planned building in which rooms used as offices (where type-writers are employed), or those accommodating machinery or in which noisy operations are carried out, are arranged in a group and isolated from rooms where quiet conditions are essential. Careful siting of lifts, selection of noiseless fittings (such as flushing cisterns), etc., will also effect a reduction in the amount of insulating material required.

A key plan and section of a portion of a building are shown at A and B, Fig. 14.

The detail at H is typical of the construction which has been employed for many years. The insulating material consists of 2 to 3-in. thickness of slag wool on thin plywood or rough boarding supported on fillets nailed to the joists. The thick arrows show the inadequacy of this treatment, sound being transmitted to adjacent rooms through the thin brick wall, at each joist, and at the gap between the wall and wall joist.

The insulation is rendered more effective if, as shown at J, narrow strips of insulating board are placed between the floor boards and joists. In lieu of the wood fillets, narrow ½-in. thick strips of the insulating material may be nailed to the joists and used to support the light insulating boards.

The detail at K shows an expensive but more efficient method of reducing the transmission of sound. Three insulating layers are used. Quilt, such as that shown at P, may be used instead of the top layer of insulating boards. Plastering applied to the lower layer increases the efficiency. Impact sound is isolated from the wall if, as shown, the skirting is kept clear of the floor and bedded on a rubber, asbestos or felt insulating strip. Alternatively, the bottom edge of the skirting may be bevelled, as indicated at L, in order that contact between it and the floor is reduced to a minimum: in practice this precaution is of no avail if the skirting shrinks and the resulting gap is subsequently covered with a quadrant, etc., fillet to exclude draughts.

The separate ceiling at L, although costly, is most effective. The floor is strutted (although the value of this is overrated) as described in Vol. I, and the insulating layer above it is continued up the wall and secured to grounds or vertical battens plugged to the wall.

A portion of a stoothing (see Fig. 11) is shown at N. Both sides of it are covered with slabs of Thermacoust (see p. 47) which are plastered.

Detail O shows a modified form of stud partition. The discontinuity produced by the staggered studs is partially effective even if the insulating boards shown are not used and the studs are simply lathed and plastered.

An efficient sound insulated partition is shown at P. The quilt is nailed to the studs. A saving in cost, with little reduction in efficiency, results if two instead of three layers of quilt are applied. Hair felt is also used instead of the quilt, and whilst this is a very good insulating material (provided it is sufficiently thick—preferably 1-in.), felt harbours vermin.

An effective but expensive type of partition, incorporating four layers of insulating material is shown at Q. Floors may be also constructed on this principle. Quilts may be used in lieu of the two inner layers (for partitions) or the three upper layers (for floors) of boards. Another good class of partition is shown at W; *loose* insulating boards may be used instead of the central layers of quilt.

The open grained material (see p. 47) of the thick slabs shown at V, together with the wide cavity (which must not be bridged by metal ties) produces an efficient insulated partition.

Typical details at the head and sill of stud partitions are shown at R, S, T