length of side, with two of their opposite diagonal corners cut off or shouldered. They are laid to a diagonal pattern, with the uncut corners or points at the head and tail. The slates in each course butt against each other at the shoulders only. Each is secured with two nails fixed just above the shoulders and by a copper disc rivet at the tail corner. The recommended minimum laps are $2\frac{3}{4}$, 3, $3\frac{1}{2}$ and 4-in. for 40°, 35°, 30° and 25° pitches respectively. The fussy appearance of roofs covered with these units has, apparently, a limited appeal.

(c) *Honeycomb Slates*.—With exception that their tail corners are removed, they are similar to (*b*).

Asbestos-cement Pantiles.—Whilst these resemble clay pantiles in appearance, there are several differences between the two. Thus: (1) asbestos-cement pantiles are thinner—only $\frac{5}{16}$-in. thick, (2) their opposite diagonal corners are not splayed, but instead each tile has its two opposite edges removed for a length of 4-in. (equal to the lap) and for a depth equal to the thickness, (3) they are nibless, (4) they are twice holed, and (5) they are made in one colour only, that of russet-brown. They are in two sizes, namely, $15\frac{3}{4}$-in. by $13\frac{1}{4}$-in. and $15\frac{3}{4}$-in. by $9\frac{7}{16}$-in. As the recommended head lap is 4-in., the gauge equals $15\frac{3}{4}$-in. $-$ 4-in. $= 11\frac{3}{4}$-in. The side lap is $1\frac{7}{8}$-in. A sketch of a tile is shown at E, Fig. 47, a plan showing the head lap is given at D, and the cross-section at C shows the side lap.

The method recommended for fixing these tiles is to partly fix a 2-in. nail through the right-hand hole (which is about $1\frac{1}{2}$-in. from the head), followed by a $1\frac{1}{2}$-in. nail driven home in the second hole (1-in. from the head) and, finally, the first nail is carefully driven further until the roll just binds on the tile below.

The groundwork is as described for clay pantiling.

Purpose-made eaves pantiles are available in the large size, the tail being stop-ended by a vertical portion shaped at its upper edge to the roll. The necessity for pointing and infilling with pieces of tile, as in clay pantiling, is thereby avoided. These stop-ended eaves tiles are laid upon a $5\frac{1}{2}$-in. wide strip of asbestos-cement, nailed to the batten, and overhanging the eaves gutter.

As stop-ended pantiles are not made in the small size, the eaves of a roof covered with these smaller units are formed in the following manner: Narrow under-eaves strips (see above) are nailed to the fascia or batten, and the eaves pantiles are bedded on them and the ends pointed in cement mortar. To provide a key for the latter, it is recommended that a strip of expanded metal be secured and used to cover the under-eaves strips.

Two forms of rounded hip tiles are used. Both are $15\frac{3}{4}$-in. long, but one is $10\frac{1}{4}$-in. wide and 5-in. high, whilst the other is $12\frac{1}{2}$-in. wide and 4-in. high. These are roughly lined with fine concrete to afford a key for the necessary cement mortar bedding. The flatter type is used for hips of low pitches.

Special double roll pantiles are used for left-hand verges to give a symmetrical appearance. Undercloaks are provided by using plain narrow strips (similar to those for eaves) covered with expanded metal to receive the cement mortar upon which the verge pantiles are bedded.

Purpose-made *twin* pantiles are used at hips and valleys, as ordinary pantiles used in these positions are sometimes difficult to secure after they have been cut to shape and only small triangular pieces remain. These purpose-mades are made in both large and small sizes. Thus, the larger size is $15\frac{3}{4}$-in. long by $24\frac{3}{4}$-in. wide; it has the appearance of two tiles when fixed, the left and right curved portions being $13\frac{1}{4}$ and $11\frac{1}{2}$-in. wide respectively. These can be securely fixed after they have been cut to the required splay.

This is a cheap, durable, fire-resisting and effective covering.

"Turnall" Trafford Tiles[1] (see S, Fig. 47).—These large tiles are of 3-ft. 8-in. standard width, 4 to 10-ft. long with 6-in. increments, and $\frac{1}{4}$-in. thick. Each sheet has four 2-in. deep corrugations alternating with flat portions. They are fixed to steel purlins by $\frac{5}{16}$-in. diameter *hook bolts* (see F, Fig. 47) and to wood purlins by $4\frac{1}{2}$-in. long *driving screws* (see J). The maximum distance apart of the purlins is 4-ft. 6-in.; the head lap is 6-in., and the side lap is approximately one corrugation of $3\frac{1}{2}$ to 4-in. (see S). The tiles are laid right to left, commencing at the eaves and working upwards. With exception of the first tile, those in the bottom course have their top right-hand corners mitred. In general, the remaining tiles have their top right-hand and bottom left-hand corners splayed. Eaves, filler pieces, ridges, etc., and the method of fixing are similar to those described below in connection with corrugated sheets. They are obtainable in standard colours of natural grey, red and russet-brown.

These tiles provide an excellent covering, especially for large spanned roofs of the industrial type.

These sheets are also reinforced with meshed wire, and because of their additional strength the purlin spacing can be increased to a maximum of 5-ft. 6-in.

Corrugated Sheets.—Two examples of corrugated sheeting are illustrated in Fig. 47, namely, "Everite Bigsix" Corrugated Sheets[1] and Standard Corrugated Sheets.

"*Everite Bigsix*" *Corrugated Sheets*.—These are $41\frac{1}{2}$-in. wide, 3 to 10-ft. long in 6-in. rises, and $\frac{1}{4}$ to $\frac{9}{32}$-in. thick. There are $7\frac{1}{2}$ corrugations per sheet at a pitch of $5\frac{3}{4}$-in. and their overall depth is $2\frac{1}{8}$-in. A part cross-section is shown at Q, and the boldness of the design may be gauged by comparing it with the standard corrugated sheets shown at R and having an average depth of corrugation of 1-in. only. The head lap is 6-in. (see L) and the side lap is $1\frac{1}{2}$ to 2-in. (see Q).

These sheets are fixed direct, with the smooth surface uppermost, to either wood or steel purlins. The detail at L shows the method of fixing to timber purlins. The latter are secured to the principal rafters of the mild steel trusses by angle cleats, as described in Chapter Four, Vol. II. The maximum spacing of the purlins is 4-ft. 6-in., and, because of the light weight of this covering material, the 8-in. by 3-in. wood purlin shown will be adequate for trusses spaced up to 14-ft. centres. The sheets are always fixed through the crowns of the corruga-

[1] These and the aforementioned slates and tiles are manufactured by Messrs Turner's Asbestos Company.