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HOME OFFICE

# AIR RAID PRECAUTIONS

DIRECTIONS  
FOR THE ERECTION AND SINKING  
OF THE GALVANISED CORRUGATED  
STEEL SHELTER

February 1939

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## DIRECTIONS FOR THE ERECTION AND SINKING OF THE GALVANISED CORRUGATED STEEL SHELTER.

### Description of the Shelters

The shelters described here consist of a steel form (about 6 ft. 6 in. long  $\times$  4 ft. 6 in. wide  $\times$  6 ft. high, internal dimensions), over which it is intended to pile earth. This size shelter is the unit and variations on it will be dealt with in a separate leaflet.

The following are the parts provided for each standard unit shelter:—

- Two steel channels, each 6 ft. 6 in. long.
- Two steel tee sections, each 5 ft.  $1\frac{1}{2}$  in. long.
- Two steel angle sections, each 5 ft. long.
- Four steel rivets,  $\frac{3}{4}$  in. diameter, 4 in. long.
- Six curved corrugated steel sheets, 6 ft. high and 2 ft. 4 in. wide.
- Two flat corrugated steel sheets 6 ft. long, and 2 ft. 4 in. wide.
- Two flat corrugated steel sheets 7 ft. long and 2 ft. 4 in. wide, each having one corner cut off (one left- and one right-hand sheet).
- Two flat corrugated steel sheets 3 ft. long and 2 ft. 4 in. wide.
- One flat corrugated steel sheet, 3 ft.  $3\frac{1}{2}$  in. long and 2 ft. 4 in. wide.
- One flat corrugated steel sheet 1 ft. 3 in. long and 2 ft. 4 in. wide.
- Twenty-six bolts and nuts  $1\frac{1}{2}$  in. long and  $\frac{1}{2}$  in. diameter.
- Fifty-two curved diamond washers.
- Two flat steel clips  $8\frac{1}{2}$  in. long and 2 in. wide with a hook at one end.
- One spanner-tommy bar combined.

The parts will be found illustrated in Figure 3.

The construction of a shelter involves the following operations:—

- A. Choosing the proper location for it.
- B. Excavating a hole of the proper size to receive it.
- C. Erection of the metal portion of the shelter.
- D. Covering the whole with earth.

### (A) Location of the Shelter

The shelter, for convenience, should be placed near the house, although, of course, not against it. The nearest portion of the hole should not be closer than 6 ft. to the house, and preferably rather farther away, but, if the distance exceeds 15 ft. it is advisable to

erect an earthen or other wall to provide splinter-proof protection for the shelter entrance. In order that the services may not be disturbed, the Local Authority must plainly mark the site on which the shelter is to be erected. If the Local Authority does not also erect and sink the shelter, it should advise the householder as to storing the material to the best advantage. If the sheets are stored in the open they should be arranged to throw off rainwater and particularly to prevent water collecting between them.

Shelters may be sited singly or, if the householders agree, may be grouped in various ways. Grouping offers obvious advantages, e.g. there will be a greater amount of earth available for covering for the same amount of digging; and if two shelters are faced towards one another they will offer mutual protection for their entrances.

Figures 1 and 2 show some arrangements.

### **(B) The Excavation**

An excavation is required to receive the shelter. It has been shown by tests that if a hole 7 ft. 6 in. long by 6 ft. wide be dug to a depth of 4 ft., sufficient space will be allowed for erecting the steelwork, and sufficient earth will be excavated to provide satisfactory protection. Where the water-level in the garden prevents excavation to this depth, it will be necessary to call upon other soil for the protection, but, as the efficiency of the protection depends upon the depth to which the shelter is sunk in and covered by the earth the minimum depth should be 2 ft.

Stages 1 and 2 of Figure 4 illustrate this point.

Stage 3 shows the corner treatment of the excavation, the recesses being necessary to receive the edges of the steel work of the front and rear of the shelter.

### **(C) Erection of the Shelter**

Some guide to the method of assembly is provided in Figure 3.

The first step in the erection of the metal portion of the shelter is the placing of the ground framework in the bottom of the excavation. The framework consists of two tee sections and two channel sections. The tee sections are the ends, and the channels the sides.

*The following order should be useful in placing them:—*

1. The tees, leg upwards, should be located near the ends of the excavation.
2. The channels, also legs upward, should then be located so that the rivet holes in the tees and channels coincide at the corners.
3. The rivets should then be pushed into place, the framework squared, and the rivets driven home.

This is shown as stage 4 in Figure 4.

If the paint of the steel framework be chipped, it may be desirable to give these pieces a further coat of a preservative paint or tar before they are put in place.



The erection of the steel arches to form the sides and roof comes next. These consist of the six curved, corrugated steel sheets having slots at the top through which they are to be bolted together. The curved sheets are interchangeable, but their erection is a two-man job.

With one man standing inside the excavation, and the other outside, erection proceeds as follows:—

- (1) Two of the six curved sheets are located at one end of the excavation, in the channels. The tops of the sheets overlap to form an arch, and using the tommy-bar end of the spanner as a lever, the slots can be brought into line to receive the bolts. These are inserted from the underside, the two inner pairs of slots being left empty to receive the central arch later. Curved washers are supplied one for the inside and one for the outside. These should be carefully "nested" and a dab of paint applied to the threads of the bolts and to the punched edges of the holes in the sheets before bolting up. This is shown as stage 5 in Figure 4.
- (2) The arch at the opposite end is erected in the same way, and is shown in stage 6 in the Figure.
- (3) The central arch is placed much in the same way as the two end arches, the outer corrugations of the centre arch overlapping the inner corrugations of the end arches. The whole is then bolted and tightened.

Stage 7 in Figure 4 shows the order in which the bolting can be conveniently carried out.

The next step in the erection of the shelter is the fitting of the back end. This is shown as stages 8 and 9 in the Figure. First, one of the angle sections is bolted to one of the 3-ft. sheets, the bolts also serving to affix the two clips in the inside. Then the two 6-ft. corrugated sheets are placed one on either side of the central sheet (overlapping *one* corrugation) just previously fixed, and the end is completed by the sheet 3 ft. 3½ in. long which is pushed up from the inside until it just projects above the arch and rests upon the clips. When the clips are turned upward the sheet will be firmly held in place.

This last sheet forms an emergency exit. It can be removed at any time by turning the clips downward, and pulling the sheet in, and should the main entrance to the shelter be blocked by debris, the householder can dig his way out through this secondary opening.

**N.B.—AFTER ERECTION, THE SPANNER SHOULD BE KEPT IN THE SHELTER (PREFERABLY TIED TO ONE OF THE CLIPS), AS IT MAY BE NEEDED FOR LOOSENING THE CLIP-BOLTS BEFORE THE EMERGENCY EXIT CAN BE RELEASED.**

The front of the shelter is constructed in much the same way as the back. The remaining angle section is bolted to the last of the 3-ft. sheets and put in place as it was at the back. Then the two 7-ft. sheets are located one on either side, cut-off corners outward. The small 1-ft. 3-in. corrugated sheet is finally placed over the entrance, bolted to each of the outside sheets, and the erection of the metal work has been completed, as shown in stages 10 and 11 of the Figure.

#### **(D) Covering the Shelter**

The fill between the metal and the sides of the excavation should be thoroughly well tamped, for this earth serves to hold the front and back of the shelter in place. Covering should then proceed until a minimum of 15 in. thickness of earth is provided over the arch. There should be a slight slope away from the entrance to drain off rainwater.

Stages 12 and 13 of the Figure illustrate the completion of the shelter.

#### **Finishing Off**

The householder may afterwards cover the floor with clinker or duckboards, and furnish the shelter with whatever further accessories he considers necessary, including a strong box on which to step down from the entrance.

The shelters will safely support 3 ft. of earth should the householder desire to provide more than the minimum protection.



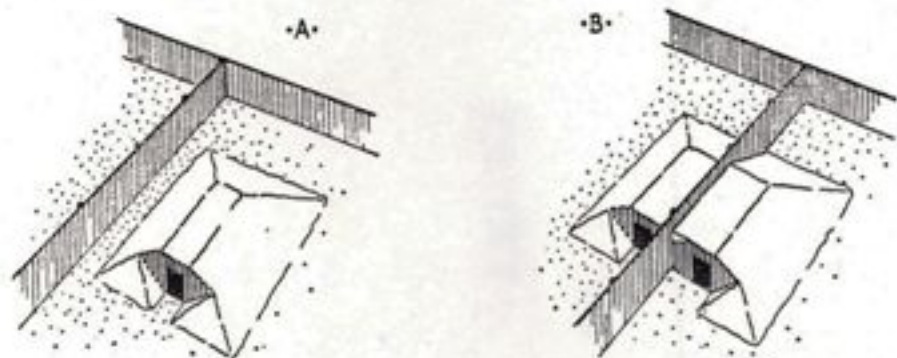
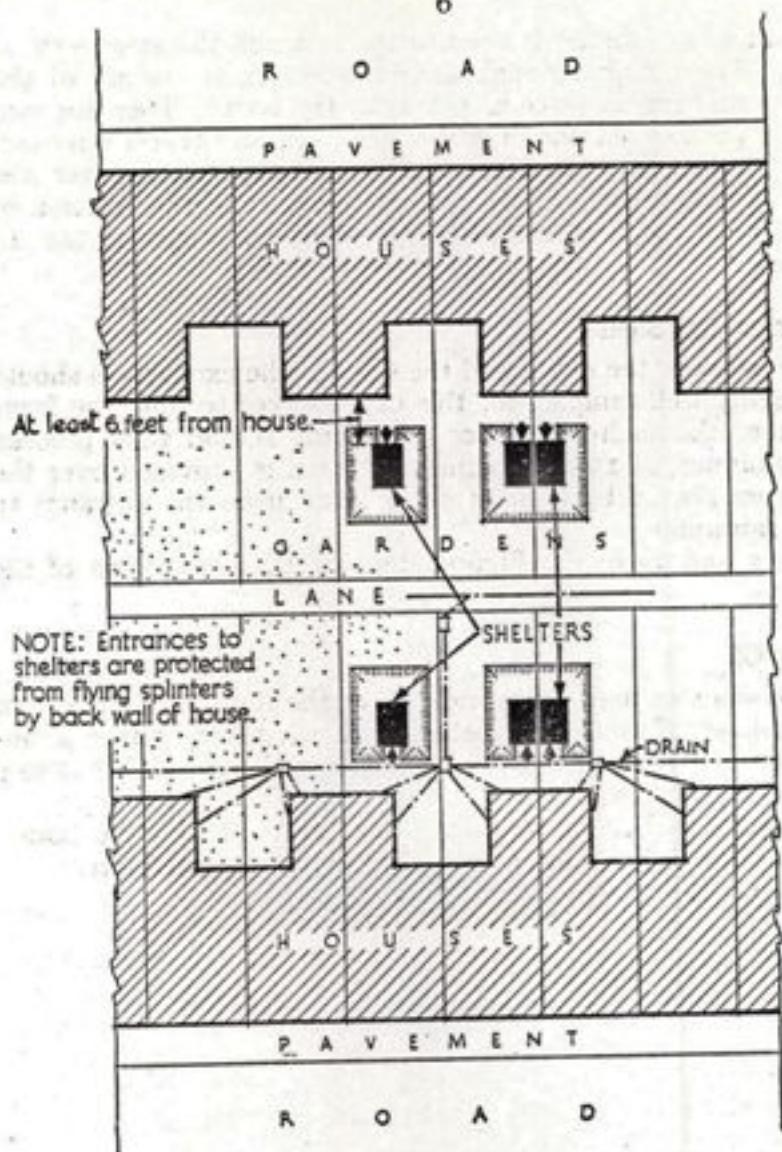
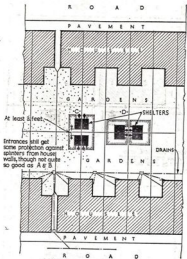


FIG. 1.—SOME ARRANGEMENTS OF SHELTERS FOR GARDENS  
METHODS OF DRAINAGE. THERE ARE OTHER METHODS



OF TERRACED HOUSES SHOWING SOME CONSIDERATION OF DRAINAGE TOO NUMEROUS TO BE SHOWN HERE.

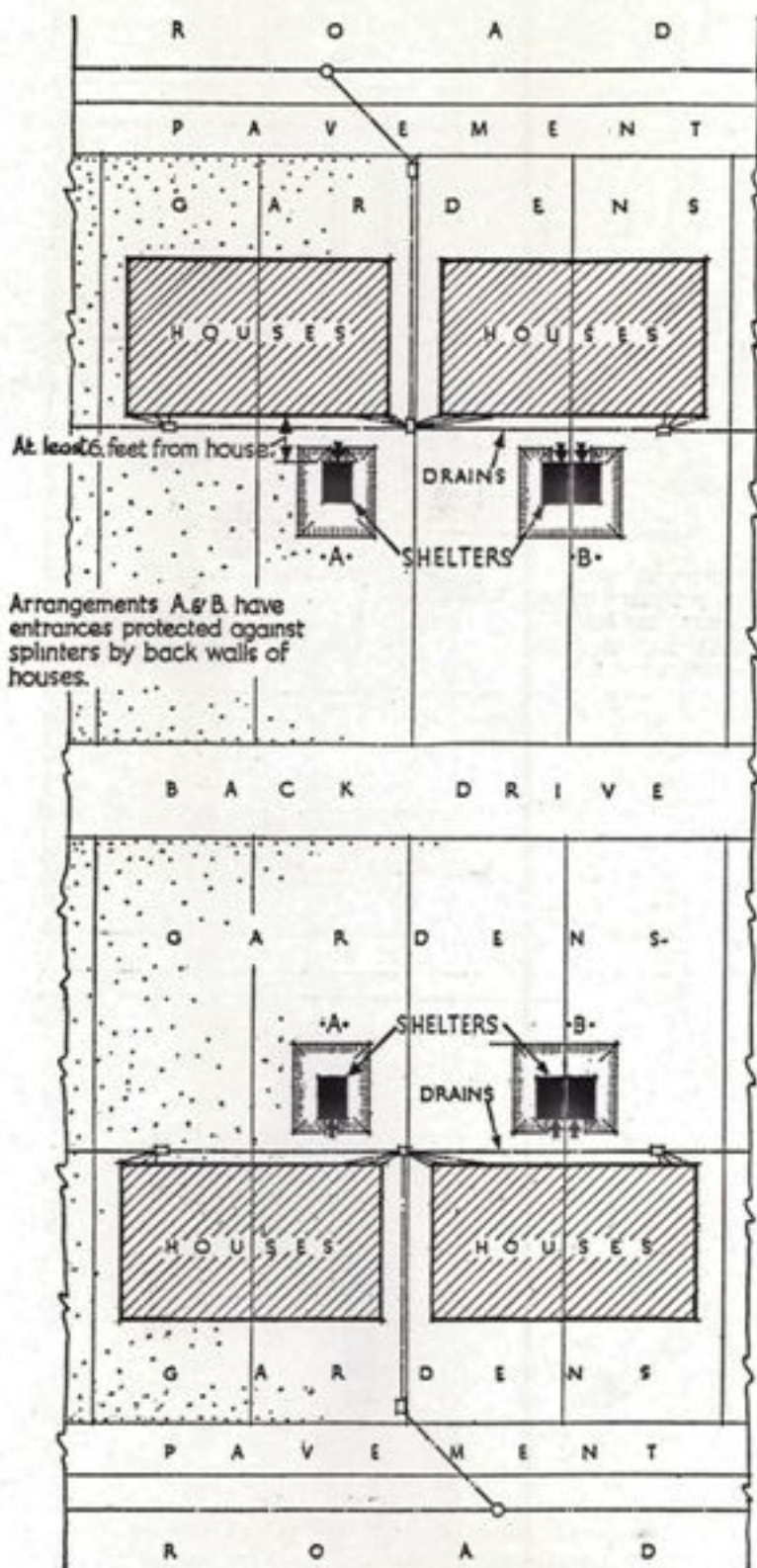
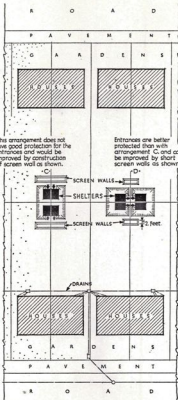


FIG. 2.—SOME ARRANGEMENTS OF SHELTERS FOR SEMI-  
OF DRAINAGE. THERE ARE OTHER METHODS OF





DETACHED HOUSES SHOWING SOME COMMON METEORIC DRAINAGE TOO NUMEROUS TO BE SHOWN HERE.

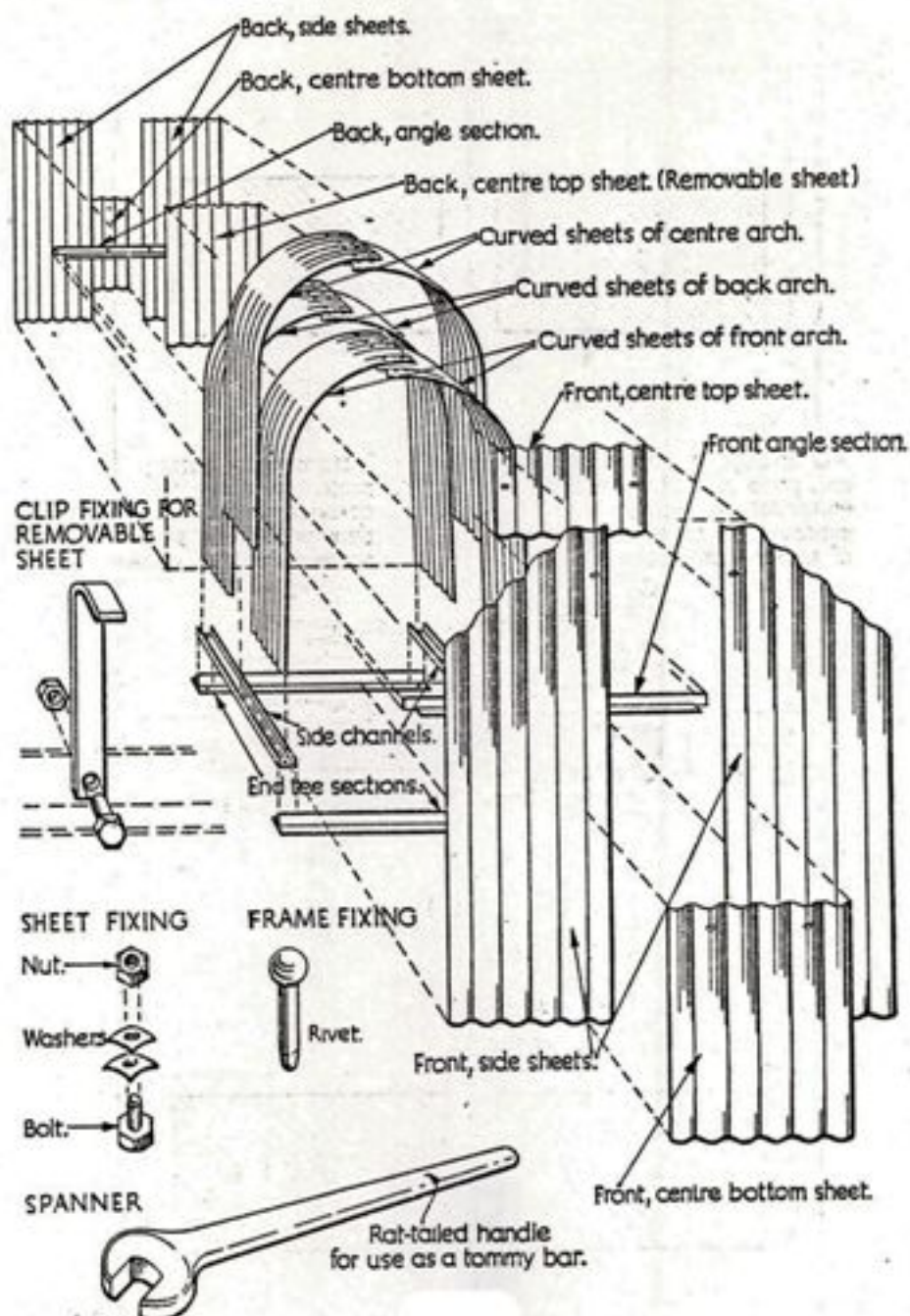


FIG. 3.—THE INDIVIDUAL PARTS.

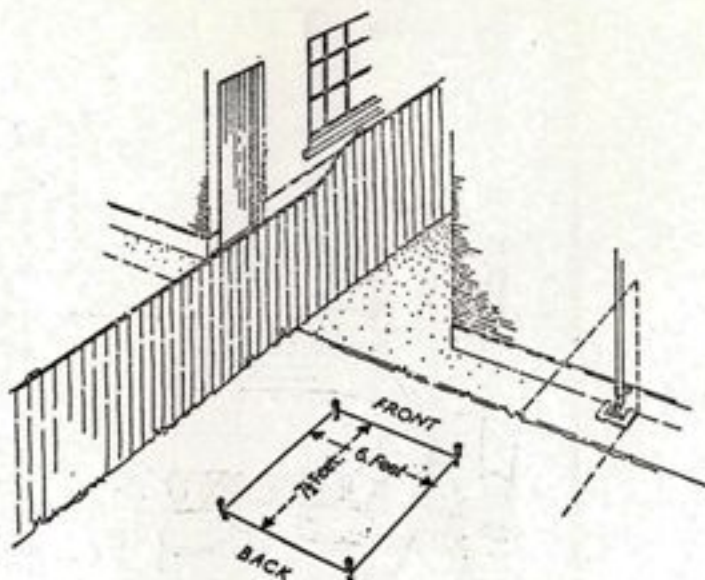


FIG. 4.—STAGE 1. POSITION OF HOLE PEGGED OUT.

NOTE: Keep earth away from edge of hole and do not pile in front of entrance.

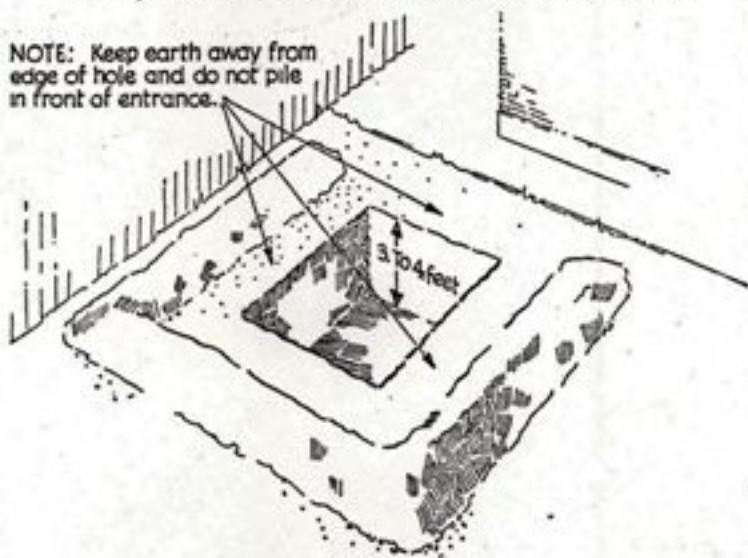


FIG. 4.—STAGE 2. HOLE DUG TO FINAL DEPTH.

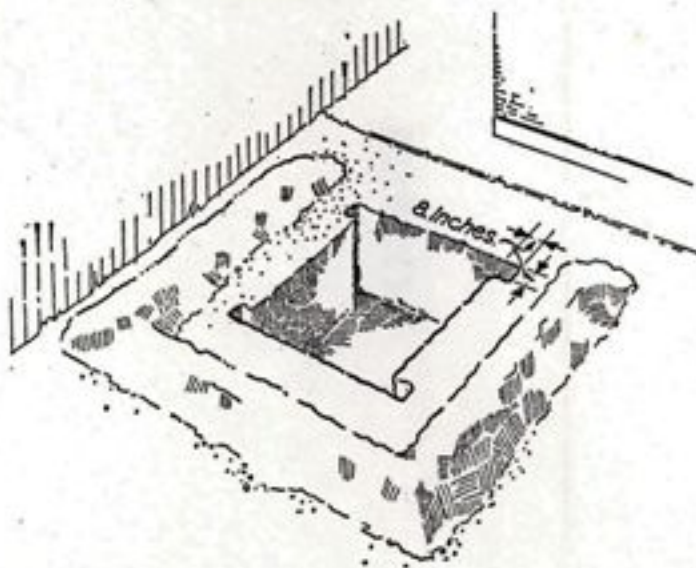


FIG. 4.—STAGE 3. HOLE WIDENED AT ENDS READY FOR ERECTION OF STEEL.



DETAIL SHOWING HOW  
CORNERS ARE CONNECTED;  
TEE UNDERNEATH AND  
CHANNEL ON TOP

When frame is square  
the rivet is driven into  
the ground.

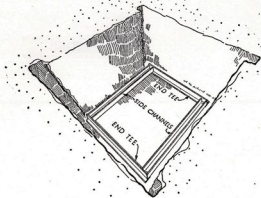
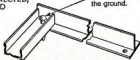


FIG. 4.—STAGE 4. THE FRAME ARRANGED IN THE BOTTOM  
OF THE HOLE.

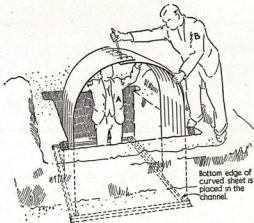


FIG. 4.—STAGE 5. ERECTING THE BACK ARCH.  
A. Supports curved sheets. B. Levers slots into line with bar.

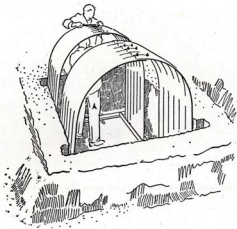


FIG. 4.—STAGE 6. ERECTING THE FRONT ARCH.  
A. Pushes bolts through from underneath.  
B. Puts on nuts and tightens up.

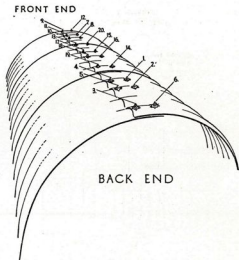


FIG. 4.—STAGE 7. VIEW OF TOP OF SHELTER WITH ALL THREE ARCHES IN POSITION SHOWING THE ORDER IN WHICH THEY ARE BOLTED TOGETHER. BOLTS NUMBERED 13, 14, 19 AND 20 GO THROUGH FOUR SHEETS.

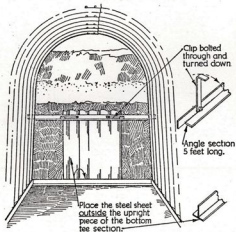


FIG. 4.—STAGE 8. VIEW FROM INSIDE THE SHELTER.  
LOOKING TOWARDS BACK END.

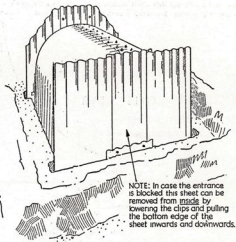


FIG. 4.—STAGE 9. VIEW OF BACK END OF SHELTER  
COMPLETE.



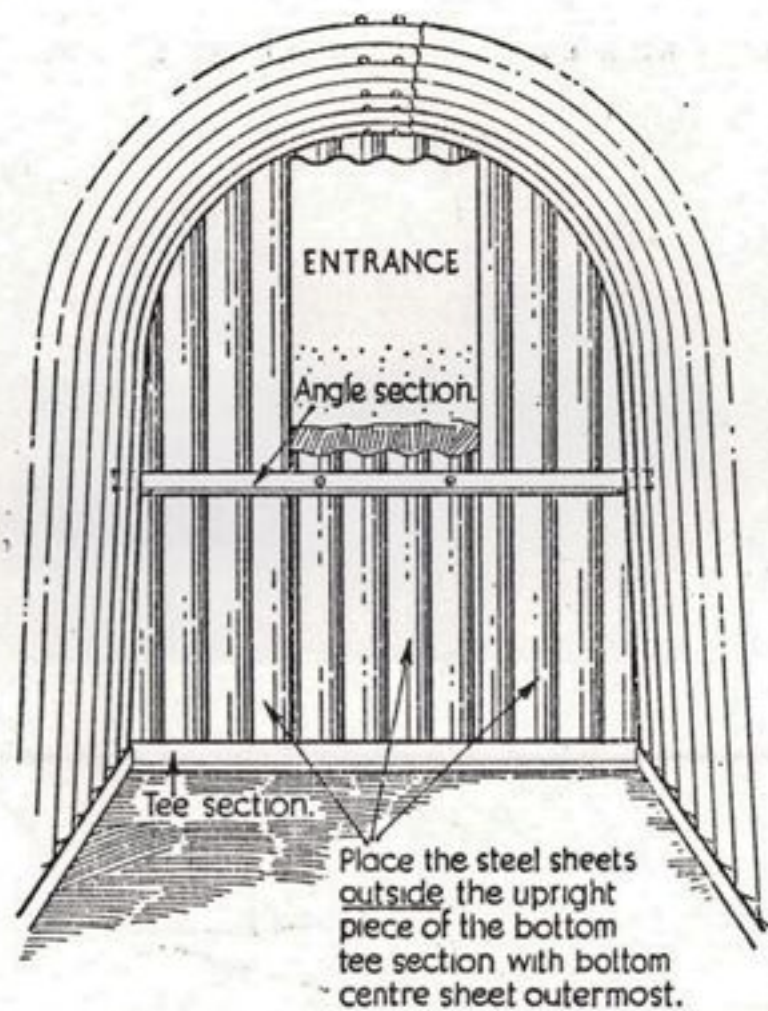


FIG. 4.—STAGE 10. VIEW FROM INSIDE THE SHELTER  
LOOKING TOWARDS ENTRANCE.

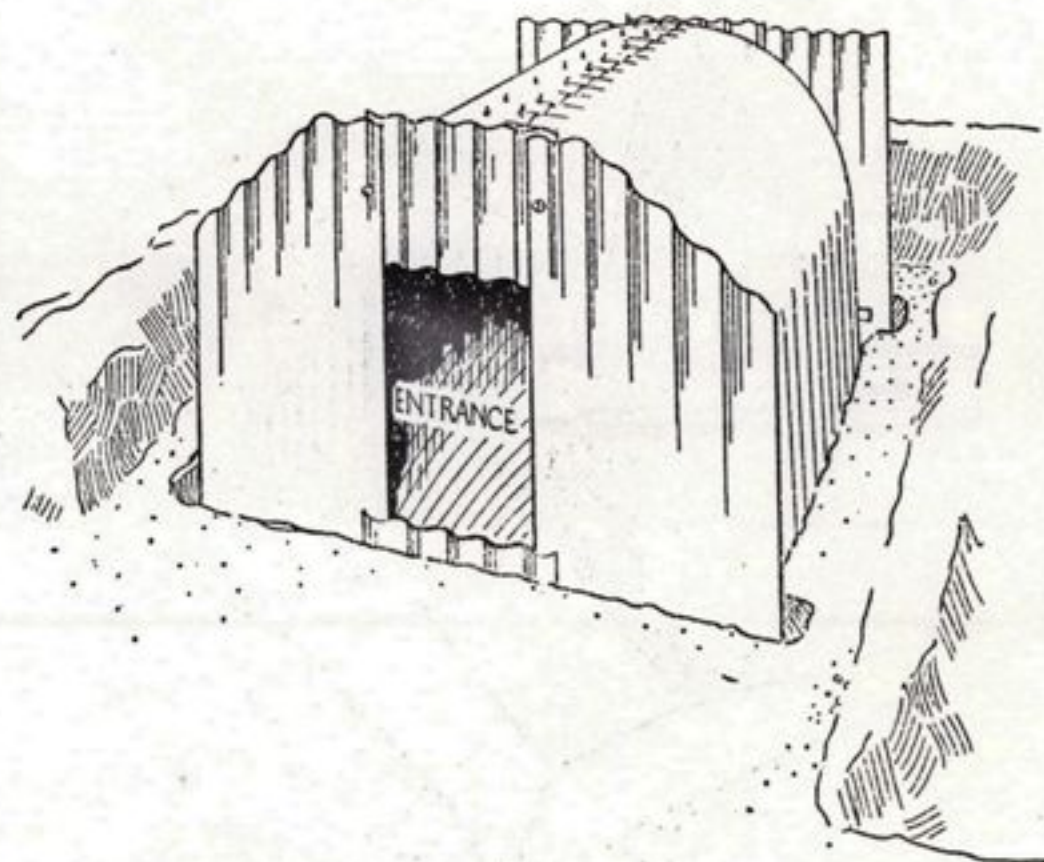


FIG. 4.—STAGE 11. VIEW OF FRONT END OF SHELTER  
COMPLETE.



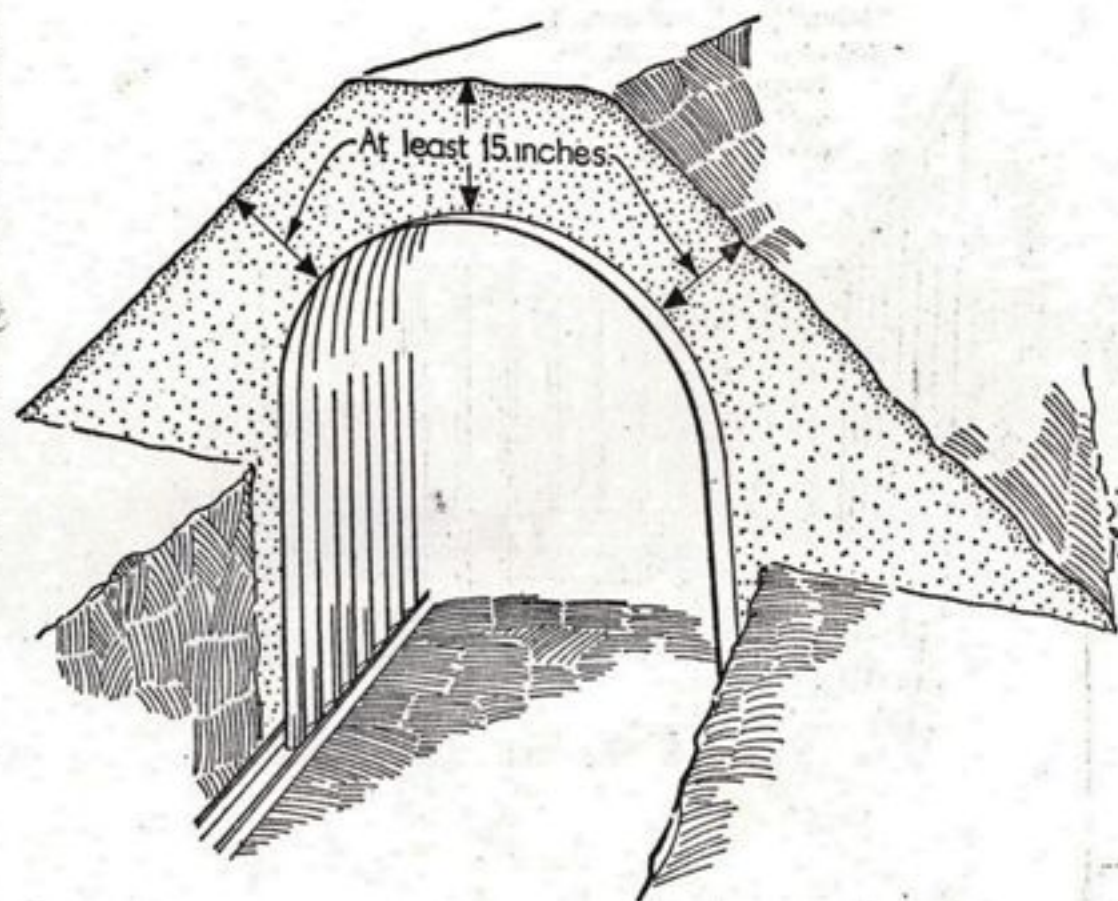


FIG. 4.—STAGE 12. COVERING THE SHELTER WITH EARTH.

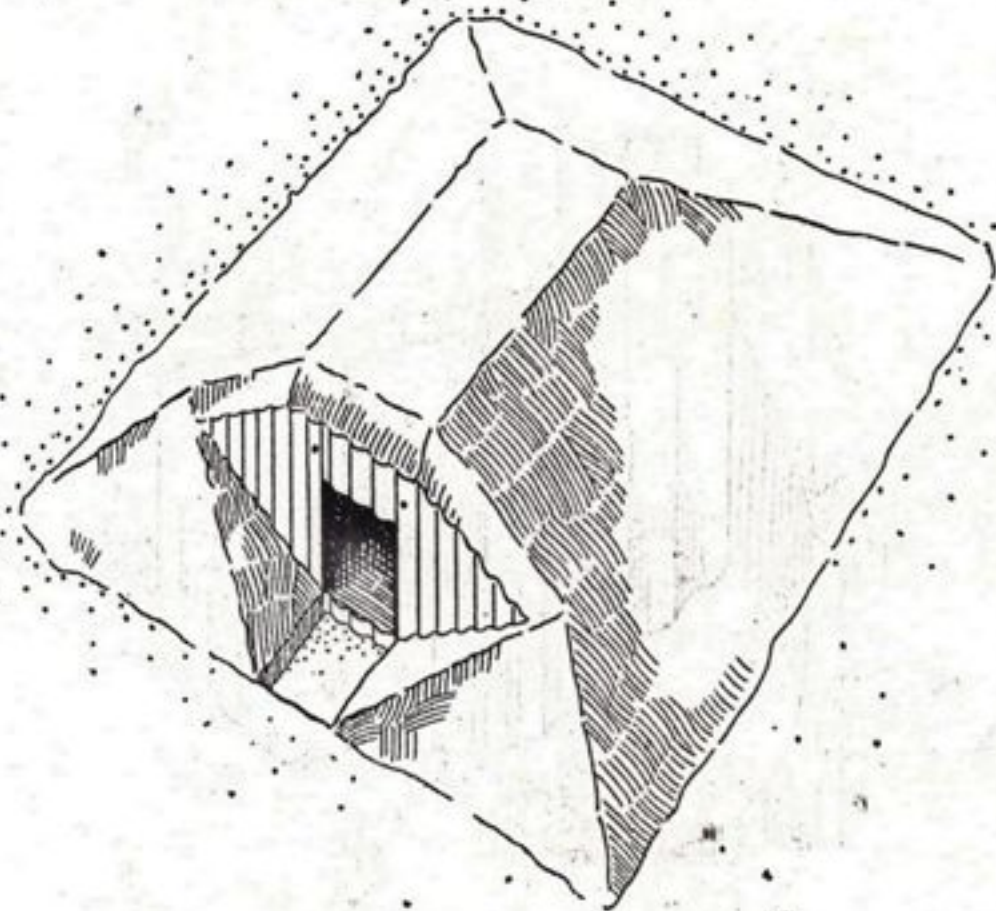


FIG. 4.—STAGE 13. THE SHELTER COMPLETE WITH EARTH COVER.