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BOX-SHAPED SHELTER

Filed Oct. 26, 1962

Fig. 1

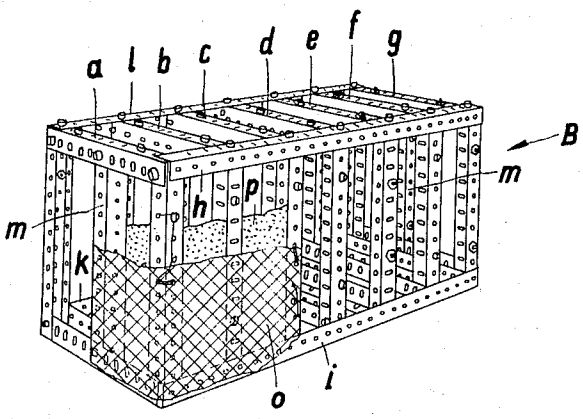
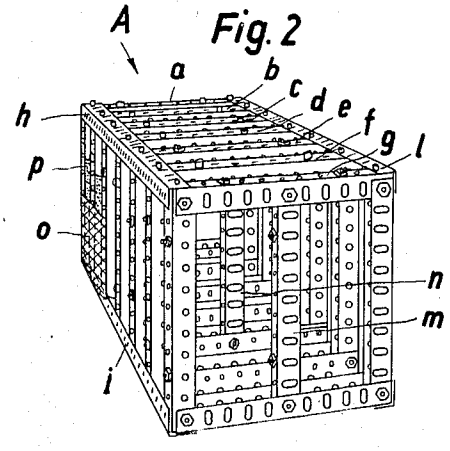


Fig. 2



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BOX-SHAPED SHELTER

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The invention relates to a box-shaped shelter of non-bending construction, which is adapted primarily for air-raid protection, but would also offer protection in the event of a natural disaster, for example in the case of earthquakes or typhoons. The protective action of such a shelter is manifold. In the first instance, because of its resistance to bending, the shelter offers those seeking protection a living room which is secure against burial and collapse. In the case of a natural disaster such protection will generally be sufficient. Apart from this, however, the construction of the shelter may be such that it offers protection against the penetration of gases or other noxious substances. Finally, the construction may be perfected by providing the shelter with a casing which offers protection against compressive action of all kinds. In connection with this, the radiation protection of a shelter may be of importance. An objective of the invention is to provide a shelter which, in the first place, has a high bending resistance but which, in addition, can also be constructed for any greater protective requirements, without great expenditure of material and costs and which can be assembled by the people themselves.

Box-shaped shelters are already known which are composed of rectangular, enclosed frame panels which stand upright.

In contrast thereto, the invention consists in that the posts and ties of the frame panels are made from angle members which are provided with rows of holes and/or slots and one leg of the angle pointing towards the interior of the box, and which are arranged close together in a row or at any desired distance apart and are joined together either directly or by means of like angle members. If a particularly high bending resistance is required or if light angle members which are correspondingly simple to machine are to be used, then it is advisable to compose each of the posts of the box-frame panels of two angle members in such a manner that U-sections are formed facing towards the interior of the box.

If the panels form a continuous row, then naturally, it is perfectly simple to bolt or rivet the adjacent angle legs of the successive panels directly to one another. If the panels are arranged in spaced apart rows, then the invention recommends either introducing in the spaces between the panels appropriate connecting panels made of the same angle members, or joining the panels together by means of angle members which form the edges of the box and which have the same rows of holes and/or slots as the angle members of the panels.

The perfection of the protective action of such a shelter so that it offers protection against the penetration of gases or noxious substances, may be effected in various ways. It proves particularly effective, however, if the box is surrounded on all sides by a concrete casing which is secured to and between the panels by means of steel fabric. In order that such a concrete casing may have adequate strength even under relatively sever compressive action, it is advisable to provide steel fabric both on the inside and on the outside of the box walls and to fill the gap between the two layers of fabric with concrete. Should such a concrete casing still not offer adequate protection against radiation, the shelter may be surrounded with a suitable packing, for example in the form of layers of stone or sandbags.

Because of its construction from angle members, the shelter according to the invention can be produced in any desired size, and the rows of holes and/or slots in the angle members permit an easy and cheap assembly of the panels and their connection. In particular, the independence of any specific dimensions offers the possibility of erecting the box-shaped shelters inside given localities and of adapting the shelter to the particular dimensions of the existing receiving room. This possibility is of particular significance when the shelter is used for air-raid protection. For example, the shelter may be assembled on the open cellar floor of a new building which is being erected and then walled in as the cellar walls are made, or may subsequently be installed in suitable existing cellar spaces.

Further frame panels can be installed subsequently between the existing panels, without the capacity of the shelter being reduced or otherwise adversely altered so that the protection afforded by the shelter can increase further according to the means or material.

Furthermore, two or more bending-resistant shelters may be connected together side by side or one above the other so that, although the capacity of the shelter increases, the costs thereof do not increase at the same rate as a result of the absence of the concreting of the contact walls. The resulting sets of shelters can be assembled like the individual type of shelter without any additional effort.

The construction of the shelter from angle members also offers the possibility of providing partition walls and, for example, air locks at the entrance and exit ends of the shelter. The construction of the chamber from angle members is also important for the installation of closing means because the possibility for adaptation which is afforded permits the use of closing means of a pre-determined size, as well as the installation of a main gravel filter and of valves and wall passages for a ventilating system.

The subject of the invention will be explained in more detail with reference to the drawing which illustrates an example of a box in the form of two perspective views. FIG. 1 is a view in the direction of the arrow A shown in FIG. 2 and FIG. 2 is a view in the direction of the arrow B shown in FIG. 1.

The box consists of the vertical frame panels *a, b, c, d, e, f, g,* arranged one behind the other, and the four angle bars *h, i, k* and *l* which form the lateral edges of the box and join the frame panels *a* to *g* together.

The frame panels are composed of angle irons each post of a panel consisting of two angle irons which are placed together in such a manner that a U-section is formed facing towards the interior of the box.

The foremost panel *a* and likewise the last panel *g* are equipped with central upright struts *m* which, like the posts of the frames, are composed of two angle members and serve as part of a door-frame. In the same manner, the panel *e* is equipped with an upright strut *n* which consists of an angle member and may be used to form as air-lock compartment which is separate from the actual shelter.

At the corner of the shelter facing the viewer as seen in the drawing there is shown a partial covering of steel fabric *o* which renders possible the application of a gas-tight casing particularly a concrete casing *p*. The reinforcing steel fabric may be provided both on the outside and on the inside of the shelter walls if it is desired to provide a thick-walled protective casing which is held to and between the panels *a* to *g* by means of the steel fabric. In addition, further reinforcement may be effected by means of bar material which can be passed through the holes or slots in the inner legs of the angle members of the frame

panels. Non-combustible asbestos-cement plates of corrugated shape or the like may be used as blind shuttering both inside and outside.

From the illustration it can be seen that the angle members which form the frame panels and the connecting rails comprise on one of their legs a row of holes and on the other leg a row of slots. As a result, the connection of the angle members forming the frame panels and the connection between the longitudinal members and the frame panels is rendered possible by means of bolts *c* or rivets. These connections may be supplemented, if desired, by welding, particularly at points of the box which may be subjected to comparatively high loading.

What I claim is:

1. A box-shaped shelter adapted to be positioned within a room comprising a plurality of rectangular vertically extending frame panels, each panel comprising vertical posts and horizontal ties, each said post and tie comprising an angle member having a right angle cross-section, each leg of each said angle member having longitudinally spaced openings throughout the length thereof, and horizontal bars joining the corners of said frame panels, said horizontal bars having longitudinally spaced openings through their lengths, at least some of said posts comprising a pair of angle members assembled with one leg of one angle member overlapping one leg of the other angle member, and the other legs of said angle members extending inwardly of the respective panel.

2. A box-shaped shelter adapted to be positioned within a room comprising a plurality of rectangular vertically extending frame panels, each panel comprising vertical posts and horizontal ties, each said post and tie comprising an angle member having a right angle cross-section, each leg of each said angle member having longitudinally spaced openings throughout the length thereof, and horizontal bars joining the corners of said frame panels, said horizontal bars having longitudinally spaced openings throughout their lengths, the space between the posts of adjacent frame panels being filled with concrete.

3. The combination set forth in claim **2** wherein one leg of each said angle member extends inwardly toward the center of each respective frame panel.

4. The combination set forth in claim **2** wherein each said horizontal bar comprises an angle member having a right angle cross section.

5. The combination set forth in claim **2** wherein at least one layer of steel fabric overlies the interior and exterior faces of said concrete.

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