Sept. 24, 1935. G. D. KELLOGG 2,015,114

BUILDING STRUCTURE

Filed Dec. 26, 1931

Fig. 1.

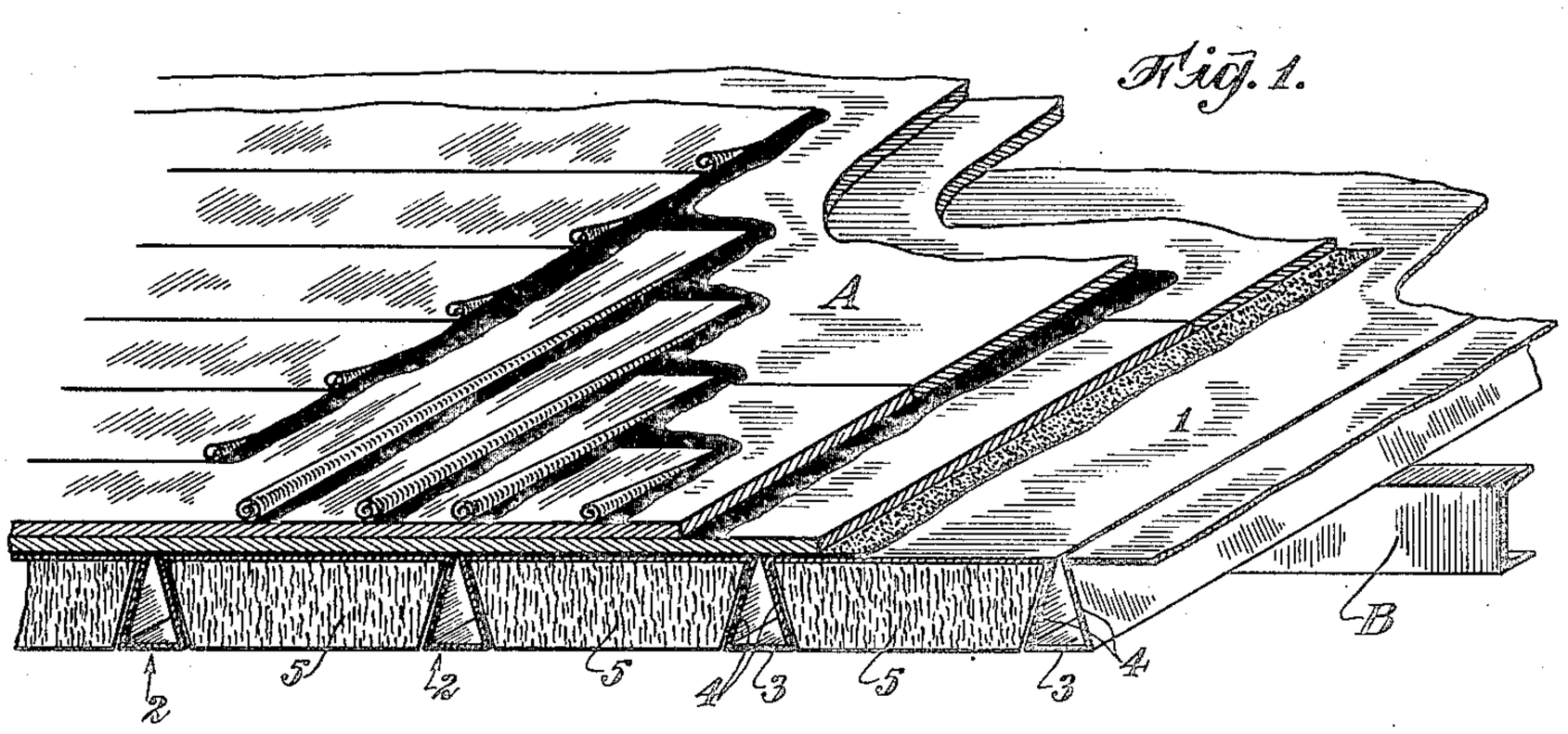


Fig. 2.

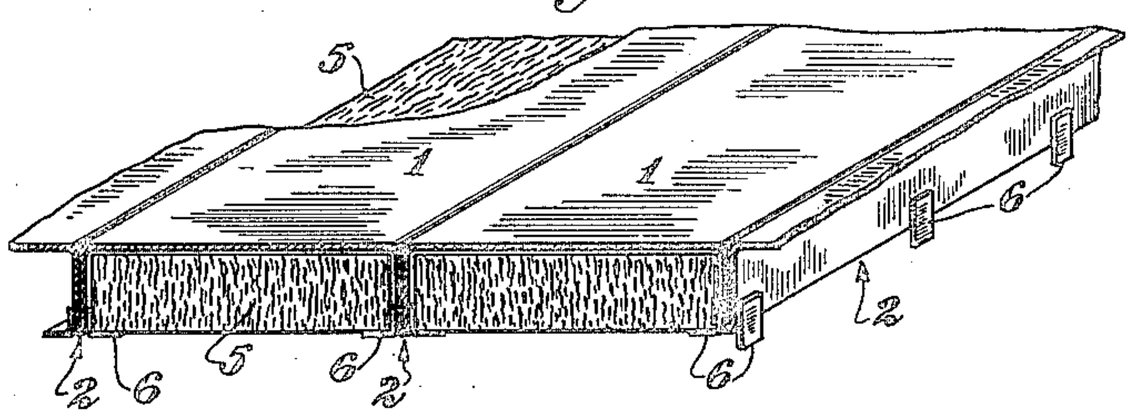


Fig. 3.

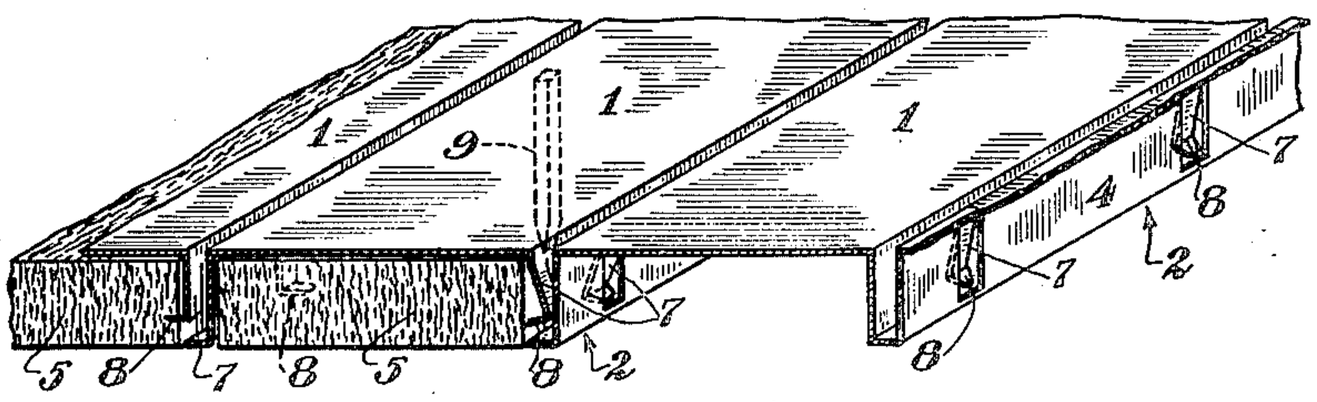
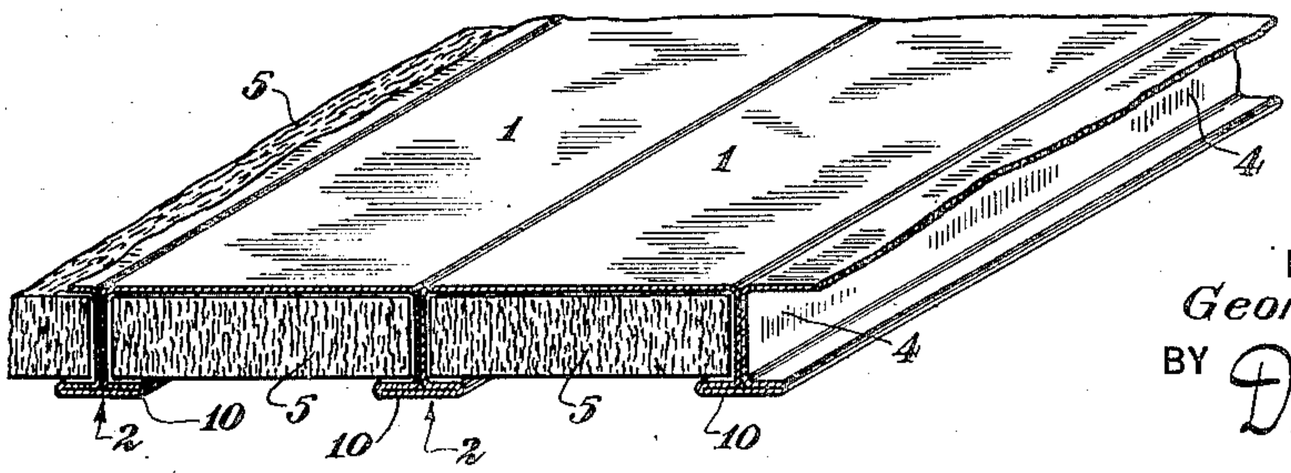


Fig. 4.



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BUILDING STRUCTURE

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2 Claims. (Cl. 108—13)

This invention relates to a structure suitable for use in buildings, and particularly to one comprising metal sheeting with reenforcing ribs and light-weight porous material maintained in position between said reenforcing ribs. A preferred embodiment is a roof comprising a metal roof deck with a plurality of downwardly extending reenforcing ribs and panels of sound deadening material maintained in position between the ribs.

An object of the invention is to provide a construction, suitable for a roof or side wall of a building, that is relatively light in weight, fire-resistant, and inexpensive. Another object is to provide such a wall or roofing that is thermal insulating and preferably also sound deadening. A further object is to provide such a structure that, although formed from relatively large units, is relatively rigid and can support a considerable load. Another object is to provide means of protecting the sound deadening material in the structural assembly from the condensation of vapor in the form of dew. Additional objects and advantages will appear from the detailed description that follows.

The use of metal sheets or sheeting in the construction of roof decks is well known. Such metal roof decking is frequently provided with a plurality of reenforcing ribs, spaced apart and extending approximately parallel to each other. Such metal roof deck material has been used in association with thermal insulation applied on the outside of the roof deck and protected from the weather by waterproof layers of so-called built-up roofing, as, for example, by asphalt-impregnated asbestos paper applied with a hot asphalt binder to the substructure.

The present invention is illustrated in the drawing, all of the figures of which show perspective views of embodiments of the invention.

Fig. 1 shows a view of a roof assembly comprising a thermal insulating and waterproofing exterior, a metal roof deck with downwardly extending hollow ribs, and panels of light-weight porous material engaged between the sides of the hollow ribs, the whole being supported on a substructure of which only one purlin is shown. The roof deck is attached to the purlin by any usual means.

Fig. 2 shows a metal roof deck structure in which the ribs are straight and have clips that may be bent over in such manner as to maintain in position panels of light-weight porous material inserted between the sides of the ribs.

Fig. 3 shows a similar construction in which are provided spring members with the ends turned laterally, at approximately a right angle, and adapted to engage the edges of panels of light-weight porous material inserted between the sides of the ribs.

Fig. 4 shows a view of a similar construction in which the ribs have flanges extending approximately at right angles from the lower edge of the rib, said flanges supporting the panels of light-weight porous material.

The outer roof structure or superstructure, indicated generally at A (see Fig. 1) consists suitably of one or more layers of thermal insulating board applied with hot asphalt directly above the upper or outer surface of the sheet metal and made water-tight by superposed layers of rag felt impregnated with tar, asphalt-impregnated asbestos paper, or the equivalent, applied suitably with hot asphalt, above the insulating board. This construction may be used with the sub-combinations illustrated in Figs. 2–4. Or, the superstructure A may be either omitted or replaced, for some purposes, by a coating of paint, a layer of hydraulic cementitious material, such as Portland cement, or by other finishing material that may be desired. However, a thermal insulating and water-tight superstructure is particularly suitable for the purposes of the present invention, as will appear later.

In the various figures like reference characters indicate like parts.

1 represents the metal roof deck with approximately parallel reenforcing ribs 2. In some cases the ribs have a remote portion 3 or 10 that is wider than the portion of the rib adjoining or adjacent to the flat metal sheet. The ribs have side walls 4, between which are placed and, in some cases, maintained the preformed shape-retaining panels 5. The whole is supported, as on purlins constituting a part of the supporting substructure and indicated generally at B, and covered by an outer protecting superstructure, such as A (Fig. 1).

The ribs may have attached thereto metal bands or clips 6, as illustrated in Fig. 2, adapted to be engaged below an edge of the panels, as by being turned over the inserted panel in such manner as to maintain the panel in position, particularly in cases where the rib has a straight side wall without other means of maintaining the panel in position. These metal bands or clips may be made, if desired, in the form of a continuous angle.

Or, the rib may have a tongue or spring member 7, with the point 8 of the tongue turned more or less at a right angle to the rest of the tongue. By means of a punch or chisel indicated at 9, the tongue may be projected beyond the side of the

rib, in the direction of and against the edge of an inserted panel, and the point of the tongue forced into the panel, as illustrated at the left of Fig. 3.

The ribs may have flanges 10 extending from the lower edge of the rib, approximately at right angles thereto. In this construction, as illustrated in Fig. 4, the panels may be inserted between the top face of the flanges and the lower face of the flat metal sheeting of the roof deck.

It will be noted that the structures illustrated have the metal sheeting continuous with the ribs. If desired, the ribs may be separately constructed elements attached to the plain sheeting, as by welding thereto, or otherwise secured to the sheets, as by removable engagement.

The units comprising the flat area of sheet metal and reenforcing ribs may be any of several sizes desired; for example, the units are frequently made 18½ inches wide by 5½ to 6½ feet long in the 20 gauge copper-bearing steel sheeting, and 18½ inches wide by 7¼ to 8½ feet long in the 18 gauge metal. The ribs may be of any of several sizes or proportions. Thus, the hollow rib illustrated in Fig. 1 may be 1½ inches deep by 1 inch wide.

While different shapes of ribs may be used, there have been employed with particular satisfaction ribs of the hollow shape illustrated in Fig. 1 or those with the flanges illustrated in Fig. 4.

The ribs are spaced apart as illustrated, suitably on six inch centers. The sections of usual width and also wider sections have a plurality of such spaced-apart approximately parallel reenforcing ribs. In a roofing construction these ribs extend downwardly. In a side wall construction they extend inwardly.

The material of which the metal roof deck is constructed may be varied. The material may be a copper-bearing steel, as stated, or some other material of high tensile strength in proportion to its weight. Thus, chrome-steel, "Allegheny metal", or aluminum may be used.

The material of which the sheeting is composed should be rigid even when used in relatively large units as described. Thus, the units when supported only at the side and end edges should withstand considerable loading.

The insertion of panels of light-weight porous material between the sides of the reenforcing ribs may be made by slipping the panels in between the adjacent ribs at the end of the metal section and then pushing the panel along to the position desired. For this method of insertion it is desirable that the panels should have chamfered edges which may be dove-tailed with sloping side walls of the reenforcing ribs, as illustrated particularly in Fig. 1. Or, the edges of the panels may be straight, to give a rectangular cross section, particularly when the panel is to be inserted between ribs with sides extending approximately at a right angle from the plane surface of the metal deck. A preferred method of insertion of the panel is to introduce it from a forward position between two adjacent ribs and then secure it by adhesive to the flat portion of the metal. The method of maintaining the panel between ribs with clips which are bent over the inserted panel has been described in connection with Fig. 2. Likewise, the insertion between ribs provided with engaging prongs on tongues has been described in connection with Fig. 3.

The light-weight porous material used in the structures of the present invention may be of any suitable composition such as a sound-absorbing preformed composition of mineral wool and a stiffening binder such as asphalt or starch.

The preferred structures of the present invention are suitable for use as a roof or other outer member of a building and to be distinguished from the more expensive construction in which a metal deck is used in a ceiling, as of an auditorium, and has above it an air space and then a roof.

The phrase "imperforate metal sheets" excludes sheeting with a multiplicity of perforations adapted to admit sound but does not exclude sheeting that contains a relatively small number of holes such as those used for rivets or other means of assembly.

It will be understood that a supporting substructure, such as one comprising purlins or studdings, is implied in the various claims covering specifically roof or side wall constructions.

The details that have been given are for the purpose of illustration, not restriction. It is intended that variations within the spirit of the invention should be included within the scope of the appended claims.

What I claim is:

1. A structure suitable for use as an outer member of a building comprising large, rigid imperforate metal sheets, each with a plurality of spaced apart approximately parallel inwardly extending reenforcing ribs provided on their sides with fastening means adapted to be projected beyond the said sides, in the direction of the panels and to engage the edges of panels, and panels of thermal insulating material maintained in position between the said ribs and engaged by said fastening means.

2. A structure comprising a metal roof deck with downwardly extending reenforcing ribs, panels of light-weight porous material maintained in position between the ribs, clips secured to the said ribs, and portions of the said clips adapted to be bent in such manner as to maintain in position panels between the ribs.

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