April 8, 1924.

1,489,683

F. B. ALLEN

STRUCTURAL MATERIAL

Filed Sept. 12, 1921

2 Sheets-Sheet 1

Fig. 1.

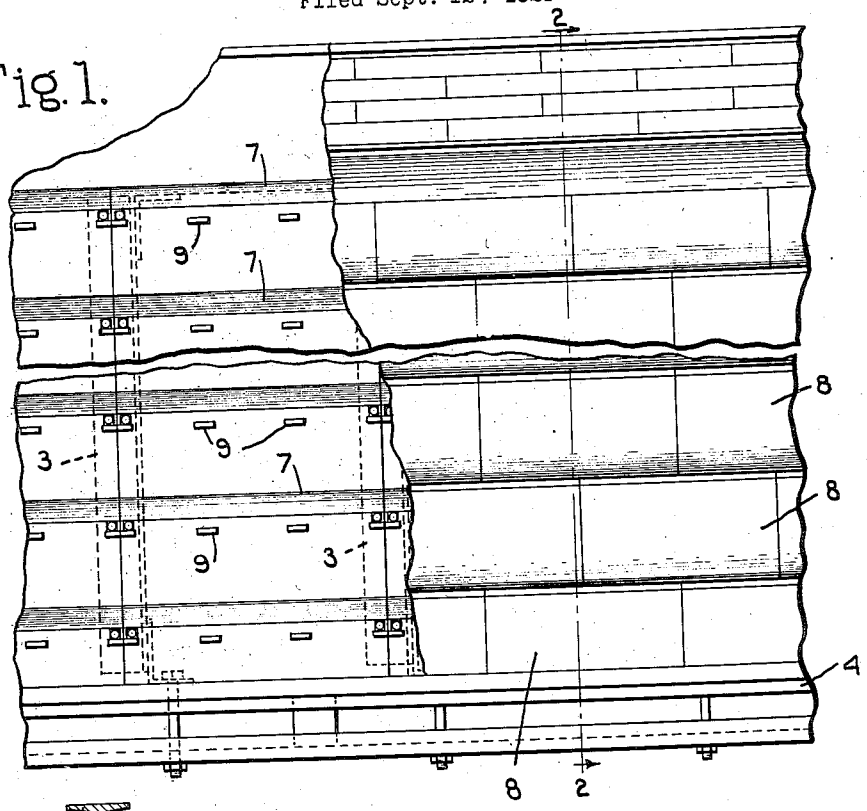


Fig. 2.

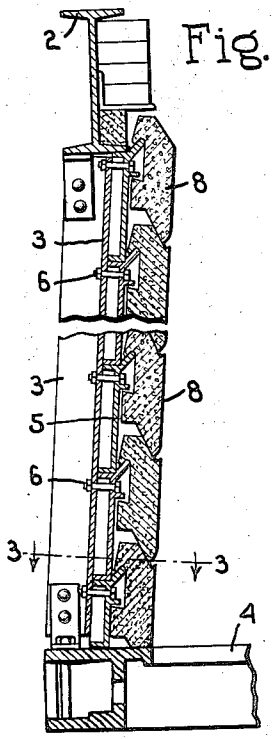
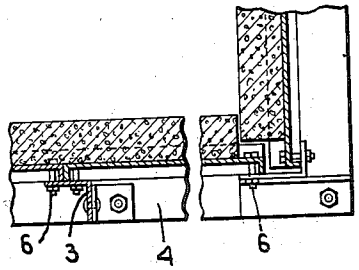


Fig. 3.



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Fig. 4.

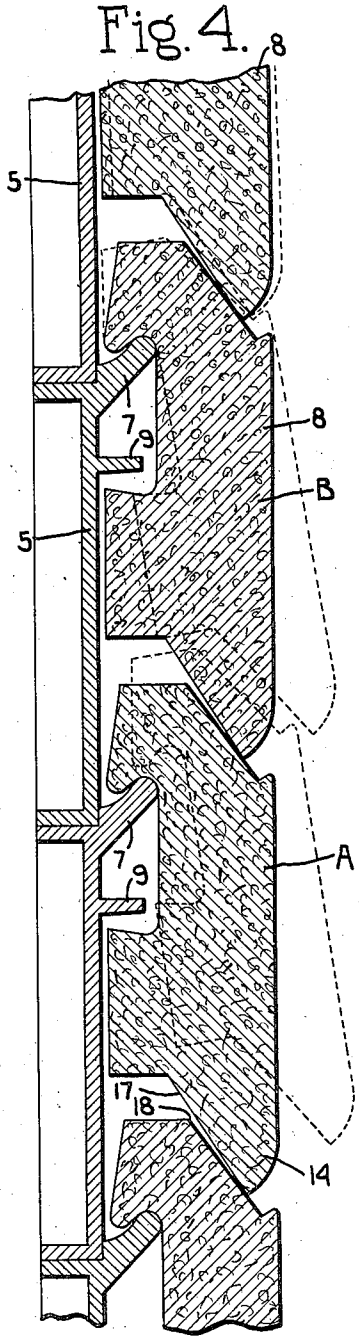
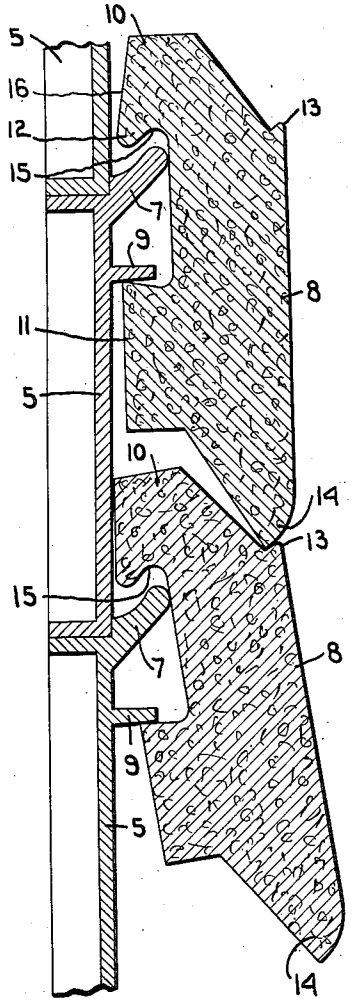


Fig. 5.



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UNITED STATES PATENT OFFICE.

FRANK B. ALLEN, OF CLEVELAND, OHIO.

STRUCTURAL MATERIAL.

Application filed September 12, 1921. Serial No. 499,883.

To all whom it may concern:

Be it known that I, FRANK B. ALLEN, a citizen of the United States, residing in Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Structural Material; and I do hereby declare the following to be a full, clear, concise, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to structural devices and material. More particularly it relates to improved structural elements and supports therefor.

Among the objects of my invention are the following:—

To provide a structural unit for use in construction of walls, furnace linings, and the like, and readily removable, one unit at a time;

To provide units of the above character which are held in position by gravity;

To provide units of the above character which may be hung in place;

To provide units of the above character which are interlocked in position without the use of bolts, cement, or the like;

To provide an improved supporting frame for units of the above character and serving as a foundation of a wall;

To provide units of the above character made of terra cotta, refractory or other suitable material;

To provide units of the above character with the center of gravity to one side of the point of support;

To provide units of the above character interlocked with each other and with projections on the wall frame any one of which may be removed by rotating the same about its support and raising it therefrom;

To provide units of the above character and interlocked to insure against any unit being removed by a simple lifting operation;

To provide a wall of the above character in which the units are so locked in position by adjoining units as to necessitate the swinging of a unit before an adjoining unit can be removed;

To provide other details of improvement tending to increase the efficiency and serviceability of structural material of the above character and frames for supporting the same.

To accomplish the foregoing and other useful ends, my invention comprises means hereinafter more fully set forth and claimed.

Referring to the accompanying drawings.

Fig. 1 is a fragmentary elevation of a wall structure using the units and frame of my invention, the right-hand section showing the units in position, and the left-hand section showing the units removed and exposing the frame work.

Fig. 2 is a cross-section on line 2—2, of Fig. 1.

Fig. 3 is a cross-section on line 3—3, Fig. 2, extended to include and show a cross-sectional view of the corner construction of the structure.

Fig. 4 is an enlargement of a section of the drawing Fig. 2, and showing the units hung in position and overlapping, the dotted lines indicating the positions of the upper and lower units when the lower unit is unlocked and ready to be removed from its support.

Fig. 5 is a similar enlarged drawing showing how the lower unit is prevented from being lifted out of position or rotated out of position by stops on the frame and by the upper unit.

Referring more in detail to the drawings, the wall shown in Figs. 1, 2, and 3, may be considered as the wall of an ash chute in which and through which the ash of a large furnace, for example, is accumulated and discharged.

Referring to Fig. 2, it will be seen that the wall need not be perpendicular but it may be sloping to form either a flaring or a contracting chute. Assuming that the structure shown in Figs. 1, 2, and 3, is an ash chute, this structure may be supported from an overhead cross girder, 2, from which girder a series of steel angle ribs, 3, depend. The lower terminals of these angle ribs may terminate in a suitable gate frame, 4, to which the ribs may be suitably secured. As shown in Fig. 2, these ribs may be made to slope if a downwardly flaring chute is desired. Secured to these ribs, I provide a series of crosswise plates, 5, which are suitably bolted to the ribs by bolts, 6. Referring to Fig. 5, each of these plates is provided with a toe-like shelf, 7, from which the structural units, 8, are hung. Below these shelves, 7, are a series of heels or lugs, 9. These toe shelves and heel lugs are clearly shown in front view in Fig. 1. It will be understood, of course, that the heel lugs, 9, instead of being a series of unit lugs as shown in Fig. 1, may be a con-

tinuous member. Likewise, it will be understood that the shelf, 7, instead of being a continuous toe, may be a series of unit projections.

In cross-section the unit, 8, has the appearance of a shoe with the point of the toe section, 10, cut off. The heel section, 11, of the unit normally rests below the heel lug, 9. It will thus be seen that among the functions performed by the heel lugs and heels, 9 and 11, is to prevent the unit, 8, being disengaged from the frame by a lifting operation inasmuch as the heel, 11, striking the lug, 9, prevents the point, 12, from clearing the toe, 7. Still using the shoe simile for the unit, it will be seen that in the arch section, I provide a notch or ratchet tooth, 13, which engages the tip or rim of the rearwardly projecting heel section, 14, of the upper part of the shoe. In other words, the rim section, 14, serves as a dog for engaging the tooth or notch, 13, to prevent the lower unit being rotated about the supporting toe shelf, 7.

As shown, on the under side of the toe section of the shoe, 8, I provide a curvature, 15, serving as a notch section in which the point of the toe, 7, plays, forming in a general fashion a sort of a ball and socket pivoted engagement. It will be seen that between the point of the toe shelf, 7, and the frame plate, 5, the toe section of the unit forms a sort of a heel, 12, which serves to prevent the unit from slipping off of the supporting member, 7. It will also be seen that normally the surface, 16, of the toe section of the unit slopes with respect to the face of the plate 5, in order to allow the unit, 8, being rotated about its pivotal support to a position such as indicated by the dotted lines in Fig. 4. It will also be seen that between the pivotal notch, 15, and the heel, 11, of the unit, 8, a sort of mortise cavity is formed in which the members, 7 and 9 project. It will be seen, therefore, that the unit, 8, is locked against being raised far enough to be unlocked from the frame by the heel and lug, 9, and the same unit is also prevented from being rotated far enough to become unlocked from the frame by the adjoining unit, 8, immediately above. This as has been already suggested, is caused by the engagement of the sections, 13 and 14, see Fig. 5.

Although I may variously shape the wall units and frame to prevent the unlocking of the unit from the frame I have shown my invention in its preferred form with the lugs, 9, and heels 11. The object in providing these two elements is to prevent the unlocking of the unit, 8, by merely lifting the same in the event that the dog, 14, is broken or in the event that the unit, 8, is forced upwardly with sufficient force to raise not only the unit, 8, but the overlapping unit immediately above from off its support a short distance until the upper unit, 8, in turn strikes the dog of the third unit immediately above. In other words, by providing the heels, 9 and 11, I make the locking of each unit independent of the condition of the unit immediately above as far as the unlatching of the same by a simple raising operation is concerned.

In the construction of the frame, I have been careful to place the bolt, 6, between the heel lug, 9, and the toe support, 7, so that the heel, 9, would serve to prevent the head of the bolt, 6, from rotating in order that the nut on the bolt, 6, may be tightened without any danger of the bolt rotating.

In my preferred construction, I also provide a slope between the lower surface, 17, of the dog, 14, and the upper surface, 18, of the toe section of the lower unit, in order to insure satisfactory contact connection between the upper unit and the lower unit and to insure proper operation between the tip of the dog 14, and the tooth, 13.

With the construction of unit that I have devised, it will be seen, of course, that the center of gravity is located to the right of the point of support on the toe, 7. This enables me to construct a sloping wall such as shown in Fig. 2, and yet insure gravity, retaining units, 8, in an interlocked normal position of contact as shown in Fig. 2.

In Fig. 2 I have shown the dog of the lowermost unit blunted off and resting against the lower surface of the gate frame, 4, but it will be understood that I may instead have the surface of the heel, 11, resting against the plate, 5, or I also may use a construction in which the lowermost unit rests against the frame, 4, as shown in Fig. 2, and in which at the same time the heel, 11, rests against the plate of the wall frame.

It will be seen that the nose of the dog, 14, in the units is rounded off, and that the inner surfaces of the units form a substantially smooth and continuous wall. These units, by the construction disclosed, fit so intimately together as to insure against any one, who may be standing below the gate frame, 4, and using a crow bar or other tool for removing any clinkers or other obstructions that may have attached themselves to the wall, from possibly prying under the points of any of these units and in any possible way disengage such unit and cause it to fall.

By referring to the figures, it will be observed that the structural unit 8 is substantially rectangular and flat, that is, with the rectangular side surfaces substantially parallel. One side surface is provided with a dovetailed recess 15, the surface of the unit being beveled at its upper edge above the recess. The outer surface of the unit is beveled at its upper edge and undercut at its lower edge to form respectively the ratchet 13 and the dog 14.

It will thus be seen that I have an im-

proved form of structural unit in which each unit serves as a latch for the unit below it both as to rotary motion of the lower unit about its pivotal point and as to a raising motion along the frame of the wall. It will also be seen that each unit is provided with individual means other than the adjoining units for preventing its being raised out of socket. It will further be seen that the units may be removed one at a time, for example, if a particular unit is to be removed such as the unit A, Fig. 4, the unit, B, is rotated about its support to clear the unit, A, whereupon the unit A, is rotated in turn about its support and then lifted out.

Although I have disclosed my invention as embodied in the wall of an ash hopper, I do not wish to be limited to the particular details shown and described. The scope of my invention is defined in what I claim as my invention.

What I claim as my invention is:—

1. In a structural device a wall frame, a support member projecting therefrom, a structural unit having a curvature on one side thereof from which the unit is pivotally hung on the said support, a notch in said unit and a stop for engaging said notch to prevent the unit being lifted from or rotated about its support.

2. In a structural device, a wall frame, a structural unit, a mortise in said unit, a tenon on said frame, said mortise and tenon operating as a hinge joint, and the said tenon serving as a support for the unit, the center of gravity of the unit located outside of the point of support, said unit having a heel below the mortise, a lug on said frame overlapping said heel to prevent the unit being lifted from over the support, the surface of which normally rests against the frame.

3. In a structural device, a wall frame, a structural unit, a mortise in said unit, a tenon on said frame, said mortise and tenon operating as a hinge joint, the said tenon serving also as a support for the unit, the center of gravity of the unit located outside of the point of support, said unit having a heel below the mortise, the surface of which normally rests against the frame, a second similar unit, similarly supported below said first unit, said first unit having a projecting section in the heel region overlapping the toe region of the second unit and serving as a dog to prevent the lower unit from being rotated about the rest support, said second unit having a ratchet tooth in the arch region serving as a stop for the dog to prevent said rotation.

4. In a structural device, a wall frame, a structural unit, a mortise in said unit, a tenon on said frame, said mortise and tenon operating as a hinge joint, the said tenon serving also as a support for the unit, the center of gravity of the unit located outside of the point of support, said unit having a heel below the mortise, the surface of which normally rests against the frame, a second similar unit, similarly supported below said first unit, said first unit having a projecting section in the heel region overlapping the toe region of the second unit and serving as a ratchet bar to prevent the lower unit from being rotated about the rest support, said second unit having a ratchet projection in the arch region serving as a stop against said bar to prevent said rotation, said units having each an outer surface, said surfaces serving to form a substantially continuous wall front.

5. In a structural device, a wall frame, a structural unit, a mortise in said unit, a tenon on said frame, said mortise and tenon operating as a hinge joint, the said tenon serving also as a support for the unit, the center of gravity of the unit located outside of the point of support, said unit having a heel below the mortise, the surface of which normally rests against the frame, a second similar unit, similarly supported below said first unit, said first unit having a projecting section in the heel region overlapping the toe region of the second unit and serving as a ratchet bar to prevent the lower unit from being rotated about the rest support, said second unit having a ratchet tooth in the arch region serving as a stop against the outer surface of the projecting section in the heel region of each unit being curved inwardly at its lower end and terminating below the plane of the outer surface of the unit.

6. In a structural device, in combination, a wall frame, a unit of structural material of a general shoe shape in cross-section, with a socket in the sole region and with a ratchet projection in the arch region, a rest secured to said frame engaging said socket to support said unit; a second similar unit similarly supported, the heel region of the first unit overlapping the toe region of the second unit and serving as a dog to the ratchet projection in the second unit to prevent the latter being rotated about its rest support.

7. In a structural device, in combination, a wall frame, a unit of structural material of a general shoe shape in cross-section, with a socket in the sole region and with a ratchet projection in the arch region, a rest secured to said frame engaging said socket to support said unit; a second similar unit similarly supported, the heel region of the first unit overlapping the toe region of the second unit and serving as a bar to the ratchet projection in the second unit to prevent the latter being rotated about its rest support, the center of gravity of each unit standing outside the support whereby gravity holds the unit in position.

8. In a structural device, a wall frame, said frame having a series of metal plates secured to a series of steel ribs extending across said plates, a series of supporting members projecting from said plates, a series of structural units each having a curvature on one side thereof, said units pivotally mounted on said supports, a notch in each one of said units, a series of stops on said plates for engaging said notches to prevent the units from being lifted.

9. In a structural device, a wall frame, said frame having a series of metal plates secured to a series of steel ribs extending across said plates, a series of supporting members projecting from said plates, a series of structural units each having a curvature on one side thereof, said units pivotally mounted on said supports, a notch in each one of said units, a series of stops on said plates for engaging said notches to prevent the units from being rotated about their supports.

10. In a structural device, a wall frame, said frame having a series of metal plates secured to a series of steel ribs extending across said plates, a series of supporting members projecting from said plates, a series of structural units each having a curvature on one side thereof, said units pivotally mounted on said supports, said units each having an outer surface, said surfaces forming a substantially continuous wall, said frame tilted to slope with respect to a vertical line to cause said surface to slope likewise.

11. In a structural device, a wall frame, said frame having a series of metal plates secured to a series of steel ribs extending across said plates, a series of supporting members projecting from said plates, a series of structural units each having a curvature on one side thereof, said units pivotally mounted on said supports, a notch in each one of said units, a series of stops on said plates for engaging said notches to prevent the units from being lifted, said units having each an outer surface, said surfaces forming a substantially continuous wall, said frame tilted to slope with respect to a vertical line to cause said surface to slope likewise.

12. In a structural device, a wall frame, said frame having a series of metal plates secured to a series of steel ribs extending across said plates, a series of supporting members projecting from said plates, a series of structural units each having a curvature on one side thereof, said units pivotally mounted on said supports, a notch in each one of said units, a series of stops on said plates for engaging said notches to prevent the units from being rotated about their supports, said units having each an outer surface, said surfaces forming a substantially continuous wall, said frame tilted to slope with respect to a vertical line to cause said surface to slope likewise.

13. In a structural device, a wall frame, said frame having a series of metal plates secured to a series of steel ribs extending across said plates, a series of supporting members projecting from said plates, a series of structural units each having a curvature on one side thereof, said units pivotally mounted on said supports, said units having each an outer surface, said surfaces forming a substantially continuous wall, said frame tilted to slope with respect to a vertical line to cause said surface to slope likewise.

14. A wall comprising a metal frame having projections on one side thereof, and independently removable lining units recessed to engage with the said projections and pivotally supported on the said projections in overlapped relation.

15. A wall comprising an upright frame having upwardly and outwardly extending projections on one side thereof, and independently removable overlapping lining units recessed to engage with the said projections and pivotally supported on the said projections.

16. A wall for an ash hopper comprising an upright metal frame having projections on one side thereof, and lining units recessed to engage with the said projections and pivotally supported in overlapping relation by certain of the said projections, the lining units being independently removable but locked against accidental removal.

17. A rectangular, wall lining unit having an outer surface beveled at its upper edge and undercut at its lower edge, and an inner surface provided with a dovetailed recess to engage removably a unit supporting member.

18. A rectangular, flat structural unit having an inner surface provided with a dovetailed recess, the upper edge of which is rounded to engage slidably a unit supporting member, the inner surface of the unit being beveled above the said recess.

19. A rectangular, flat wall lining unit having an inner surface provided with a dovetailed recess having a rounded upper corner and a rounded upper edge, the inner surface being beveled above the said recess, the said unit having an outer surface beveled at the upper edge and undercut at the lower edge and provided at the lower edge of the beveled surface with an upwardly extending projection.

In witness whereof, I have hereunto signed my name this 2nd day of September, 1921.

FRANK B. ALLEN.