Dec. 16, 1952 A. P. BUQUOR ET AL 2,621,763

WALL STUD AND FIRE WALL CONSTRUCTION

Filed Feb. 14, 1949 2 SHEETS--SHEET 1

Fig. 1.

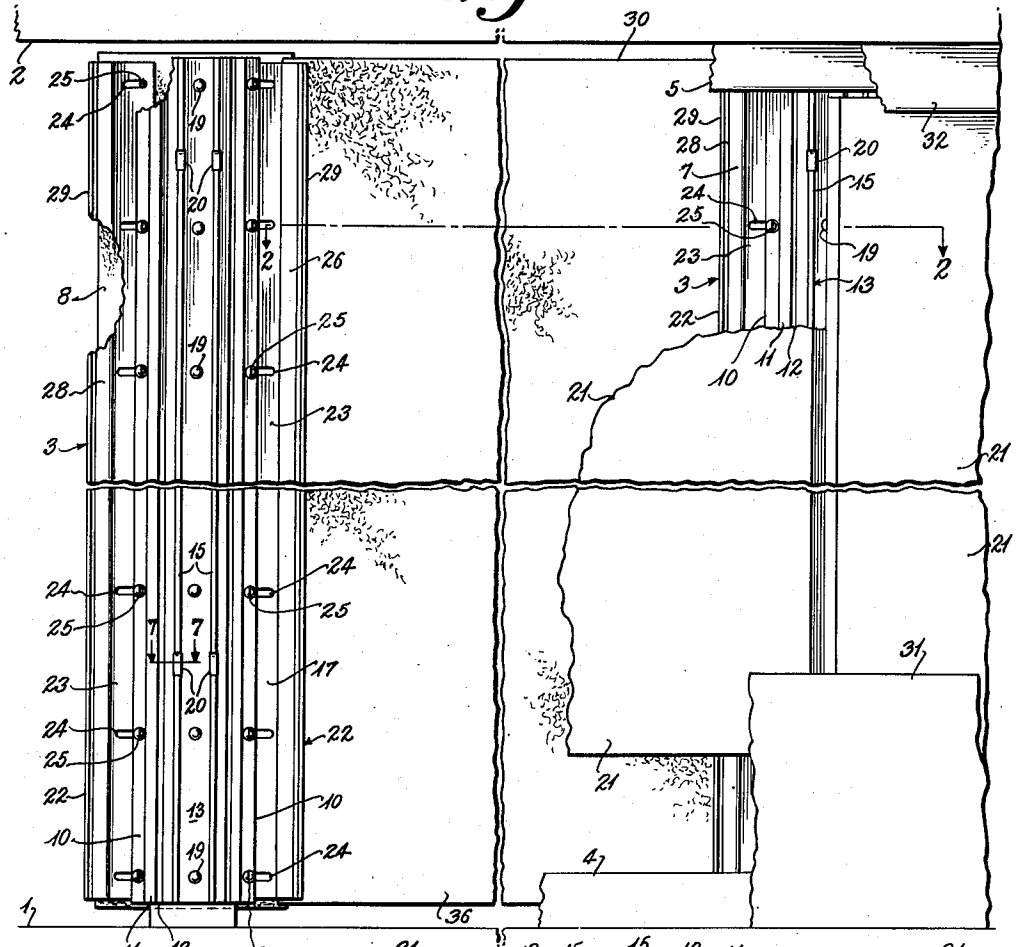


Fig. 2.

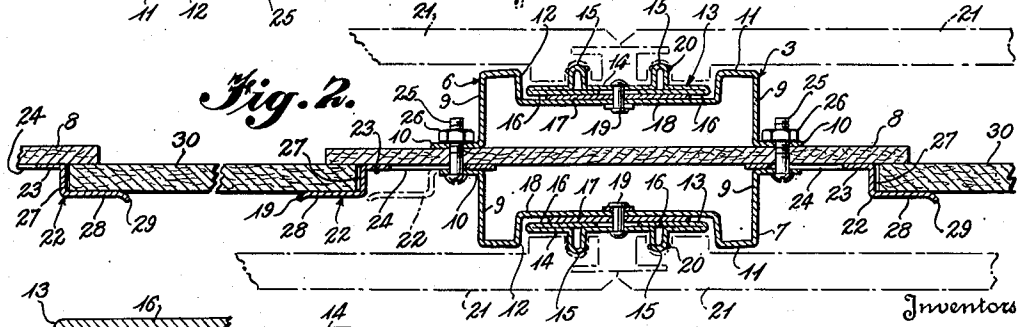
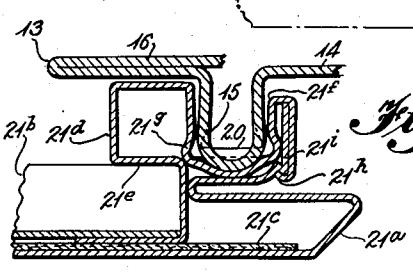


Fig. 7.



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WALL STUD AND FIRE WALL CONSTRUCTION

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Fig. 3.

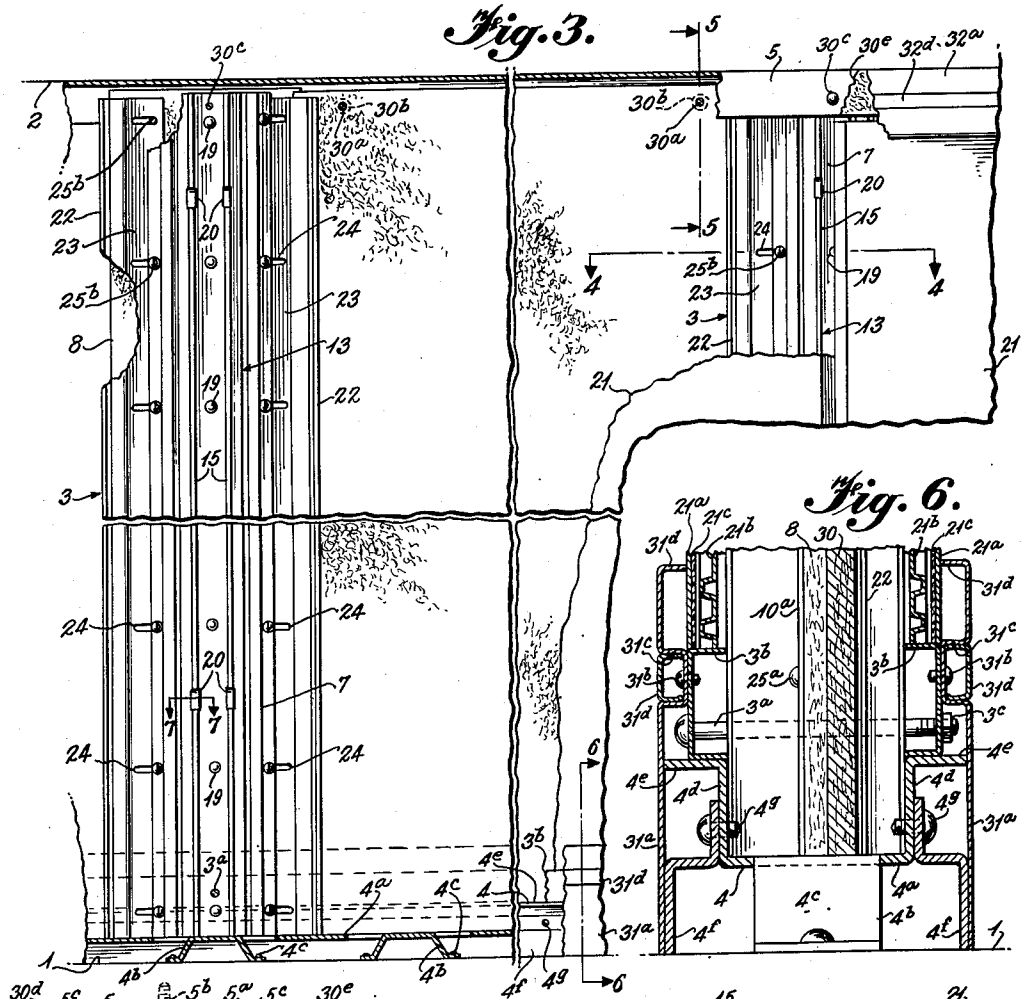


Fig. 6.



Fig. 4.

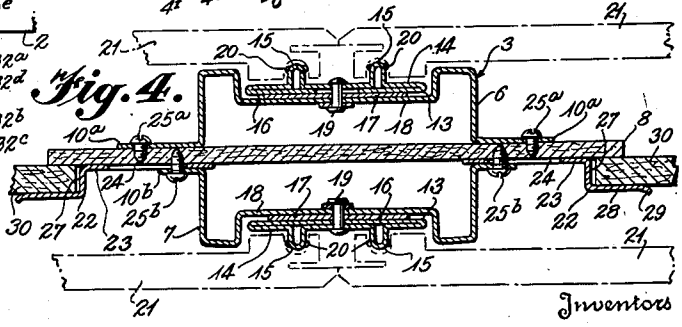
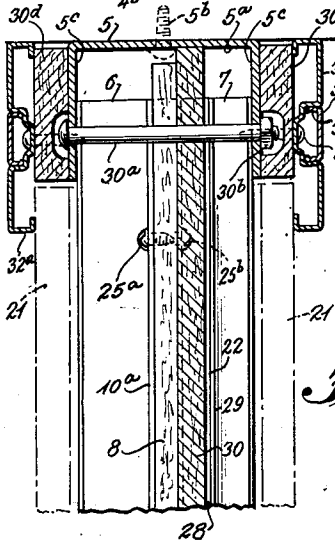


Fig. 5.



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2,621,763

## WALL STUD AND FIRE WALL CONSTRUCTION

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Application February 14, 1949, Serial No. 76,282

12 Claims. (Cl. 189—34)

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This invention relates to a prefabricated wall construction, and more particularly to a prefabricated fire-resistant wall including novel fire-resistant studs, adapted for use in constructing interior walls of offices, factories, stores, etc., and particularly bulkheads in ships.

This application is a continuation-in-part of co-pending application Serial No. 41,274, filed July 29, 1948, now abandoned.

The studs of the present fire wall are each preferably constructed of a plurality of sheet metal sections serving as furring strips and having a narrow or elongated sheet of asbestos millboard or compressed asbestos, or the like, disposed between and separating the furring strips, and adjustable, flanged clamping strips arranged between one of the furring strips and one side of the asbestos sheet and adapted to serve as clamping elements or fasteners for securing fire-resistant asbestos millboard panels to the studding; the furring strips, clamping strips and asbestos sheet all being adapted to be preassembled as a unit and secured together by a plurality of bolts or screws. The clamping strips are adjustably mounted on the studs to facilitate the erection of the fire-resistant panels between adjacent studs. In addition, each of the metal furring strips carries panel mounting strips for securing plain or decorative metal wall panels thereto to conceal the furring strips and the asbestos sheets and panels, so that the finished wall or bulkhead comprises outer metal wall panels with a continuous asbestos partition therebetween.

While aluminum alloy studs and aluminum alloy wall panels are highly desirable for use in constructing partitions in buildings and bulkheads in ships (because of their light weight), their use for such purposes has been somewhat limited due to the low melting point (about 1100° F. to 1210° F.) of such alloys, which affects their ability to meet certain prescribed heat endurance tests without collapsing.

The present invention combines the use of asbestos millboard sheets and panels with aluminum alloy studding and outer aluminum alloy wall panels in such a way that a continuous partition of fire-resistant material is provided to prevent the passage of flame, in the event that the heat of the fire reaches such intensity as to melt the outer wall panels and studding. Thus, the present invention makes it practicable to extend the use of aluminum alloy to fields where its use has heretofore been limited.

The principal object of the invention is to

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provide a fire-resistant wall that will withstand extreme heat and flame without failure, and thereby prevent the damage usually resulting therefrom in case of fire.

Another object of the invention is to provide a fire-resistant wall which lends itself to prefabrication and which is adapted for erection anywhere that a fire wall is desired or required.

A more specific object of the invention is to provide a light-weight fire wall construction especially adapted for bulkhead use in ships.

A further object of the invention is to provide a metal stud adapted to have prefabricated metal wall panels erected on either side thereof to provide a wall, and which stud is so constructed and associated with fire-resistant material as to provide a fire-proof partition to prevent flame passage or the transfer of heat from the metal wall panel on one side thereof to the metal wall panel on the other side thereof.

A still further object of the invention is to provide a fire-resistant stud with means for readily securing fire-proof panels thereto.

Another object of the invention is to provide a fire wall construction that makes it possible and practicable to employ a light-weight metal, such as aluminum, for use in prefabricated partition and studs in all types of buildings, and especially in constructing bulkheads for use in ships, and which at the same time meets established specifications for fire endurance tests for buildings and merchant vessels.

Other objects and advantages of the invention will be apparent from the following description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is an elevational view of a fire wall construction embodying the principles of the present invention, with certain parts shown broken away in the interest of clarity;

Fig. 2 is an enlarged horizontal sectional view through one of the studs and panels associated therewith, taken on the line 2—2 of Fig. 1;

Fig. 3 is an elevational view of another form of fire wall construction embodying the principles of the present invention, with certain parts shown broken away;

Fig. 4 is an enlarged horizontal sectional view through one of the studs and panels associated therewith taken on the line 4—4 of Fig. 3;

Fig. 5 is an enlarged vertical sectional view taken on the line 5—5 of Fig. 3 and particularly illustrating the manner in which the fire-resistant asbestos panel is suspended from a top

channel by bolts disposed between adjacent studs;

Fig. 6 is an enlarged vertical sectional view through the base portion of the wall, taken on the line 6—6 of Fig. 3; and

Fig. 7 is an enlarged fragmentary sectional view taken on the line 7—7 of Figs. 1 and 3, respectively, and illustrating the manner in which the mounting clips secure the outer wall panels to the studs.

Referring now to the drawings, the numeral 1 indicates the floor, and the numeral 2 the ceiling of a space or room in which the new fire wall is disposed. A plurality of upright studs of substantially room height are each generally identified by the numeral 3 and are adapted to be secured at their opposite ends in any suitable or convenient manner to a floor channel 4 and a ceiling channel 5.

The floor channel 4 may be made of steel but is preferably made from a .102" thick section of rolled aluminum alloy (type 3–S–½ H) and may have a cross-section such as indicated in Fig. 6. Thus, the channel 4 includes a bottom wall $4^a$ having tongues $4^b$ struck therefrom (see Fig. 3) and the ends thereof flattened so that they can be attached to the floor 1 by ferrous metal screws $4^c$. The floor channel 4 further includes vertical side walls $4^d$ which extend upwardly from the bottom wall $4^a$ and terminate in outwardly extending horizontal flanges $4^e$. Strips $4^f$, of the same material and thickness as the channel 4, have offset vertical flanges and are respectively secured to the channel side walls $4^d$ by screws $4^g$. On the other hand, the ceiling channel 5 may be made of aluminum alloy similar to that of the base channel 4, but is preferably made from 16 gauge sheet steel with the cross-section shown in Fig. 5. The ceiling channel 5 is arranged so that it is inverted with its bottom wall $5^a$ secured to the ceiling 2 by a plurality of screws $5^b$. The side walls $5^c$ extend downwardly from the bottom wall $5^a$ and serve a purpose which will be described in greater detail later.

Each of the studs 3 comprises a pair of identical sheet metal, aluminum alloy (52–S–½ H), furring strips 6 and 7, .051" thick, located upon opposite sides of a narrow or elongated sheet of compressed asbestos fibers (millboard) or other suitable non-metallic fire-resistant material 8. The sheet 8 is about $\frac{3}{16}$" thick and is wider than the furring strips 6 and 7 and includes longitudinal edge portions projecting outwardly beyond the sides of the furring strips 6 and 7. The furring strips 6 and 7 are generally channel-shaped, or U-shaped, in cross-section and include legs or side walls 9 having flanges 10 extending outwardly from the free ends thereof, and a bottom wall 11 provided with a depression 12 intermediate said side walls. A wall panel mounting strip 13 is disposed in each of the depressions 12 and preferably comprises a steel strip or ferrous metal sheet, .035" thick, having a wall portion 14 rolled to provide spaced, outwardly extending longitudinal ridges 15 projecting outwardly therefrom on one side thereof and having end portions 16 bent and folded back against the other side of the wall portion 14 and extending inwardly beyond the channels formed by the ridges 15. A steel strip 17 may be interposed between the outer face of a wall 18 defining the bottom of the depression 12 and the inwardly bent portions 16, and a plurality of steel rivets 19 secures the mounting strip 13 and the strip 17 to the bottom wall 18 of the depression 12. The ridges 15 extend outwardly beyond the plane of the bottom wall portion 11 and the rounded crests thereof are flattened at spaced intervals 20 along the length thereof to provide bulged portions extending laterally from the ridges 15 and adapted to serve as locking elements to secure sheet metal wall panels 21 thereto. As shown in dot-and-dash lines in Figs. 2 and 4, the panels 21 are arranged upon both sides of the studs 3 and form an enclosure for concealing said studs, the sheets 8, etc., as will appear more fully hereinafter.

As is best shown in Figs. 6 and 7, each of the panels 21 comprises an aluminum alloy (type 3–S–½ H) facing sheet $21^a$ .025" thick, and an aluminum alloy corrugated backing sheet $21^b$ .028" thick, the two sheets having a layer of asbestos paper $21^c$ .025" thick therebetween. A steel locking clip $21^d$, .018" thick, includes a channel portion $21^e$ adapted to receive the upright edge of the corrugated sheet $21^b$. The locking clip $21^d$ is also provided with a channel $21^f$ adapted to receive one of the longitudinal ridges 15 of the mounting strip 13. The flattened portions 20 of the ridge 15 cooperate with the inner portions $21^g$ of the channel $21^b$ to detachably lock the panels 21 on the mounting strips 13. A portion of the locking clip $21^d$, disposed beyond the channel $21^f$ is bent into substantial parallelism with said channel and is interlocked as indicated at $21^h$ with a flange $21^i$ on the facing sheet $21^a$. The outer wall panels 21 are thus securely mounted along each of their vertical edges on the studs 3. Inasmuch as the mounting strip 13 and the locking clip $21^d$ are made of steel, they will withstand higher temperatures without melting or buckling than the aluminum alloy material comprising the panels 21 and the furring strips 6 and 7.

A pair of ferrous metal fastening or clamping strips 22 is associated with each stud 3. Each metal clamping strip 22 includes a mounting flange 23 provided with a plurality of horizontal, elongated slots 24 of substantial length, spaced at intervals of about 4½" from each other. The flanges 10 of the furring strips 6 and 7, and the asbestos sheet 8, are provided with aligned holes, Figs. 1 and 2, spaced the same distance apart as the elongated slots 24, and iron bolts 25 extend through said holes and slots, and each bolt 25 has a nut 26 threaded thereon to maintain the stud parts in preassembled relation ready for mounting in the floor and ceiling channels 4 and 5, respectively.

It will be noted from Fig. 2 that the flanges 23 of the clamping strips 22 are disposed between the flanges 10 of the furring strip 7 and the adjacent side of the asbestos sheet 8. The slots 24 being horizontal, they provide for adjustment, or bodily shifting of the clamping strips 22 toward and away from the sides of the furring strip 7. Thus, the clamping strip 22 shown at the left side of the furring strip 7 may be moved back from its full line position to the position shown in dot-and-dash lines. Each of the clamping strips 22 includes an offset portion 27 bent at right angles to the plane of the flange 23, and each offset portion 27 carries a laterally extending flange 28 arranged generally parallel with the flange 23, but extending in the opposite direction. The free end of the flange portion 28 is curved or bent outwardly, as indicated at 29, in order to more readily receive one edge of an asbestos fiber (millboard) or other non-metallic fire-resistant sheet or panel 30 thereunder, the

height of the offset portion 27 being approximately equal to the thickness ($\frac{3}{16}$'' or more) of the sheet or panel 30 so that one side of each of the sheets or panels 30 contacts one side of the projecting edge portions of the asbestos sheet 8 and is tightly clamped thereagainst.

Figs. 3 and 4 illustrate a different manner of securing the furring strips 6 and 7 and the clamping strips 22 to the asbestos sheet 8, wherein no metal fastening elements extend from one side of the sheet 8 to the other to conduct heat therethrough. Thus, as shown, short ferrous metal screws 25a are threaded into the sheet 8 and secure the flanges 10a of the furring strip 6 to one side of said sheet, without extending completely through said sheet. Other similar screws 25b extend through flanges 10b of the furring strip 7 and through the slots 24 in the clamping strips 22 and are threaded into, but do not extend through, the sheet 8 and secure said furring strip and said clamping strips to the other side of said sheet. The screws 25a and 25b are relatively offset, as best shown in Fig. 4, and can be disposed in the same horizontal plane, if desired.

As is illustrated in Figs. 2 and 4, the longitudinal edges of the asbestos panel 30 underlie the flanges 28 of the clamping strips 22 carried by adjacent studs, and the asbestos panels 30 are disposed in overlapping relation with the projecting edge portions of the asbestos sheets 8 of two adjacent of said studs and fill the gap between said studs and between the floor channel 4 and the ceiling channel 5. Thus, a continuous, fireproof, partition of asbestos material 8—30 is disposed between the wall panels 21 on the opposite sides of the studs 3.

It will be understood that the adjustability of the clamping strips 22 facilitates the assembly of the asbestos panels 30 with the studs 3. In effecting such assembly, one or both of the clamping strips 22 will be slid inwardly toward its associated stud 3, so that one edge of the asbestos panel 30 can be inserted between a flange 28 of one of said clamping strips and the adjacent side of the asbestos sheet 8. The other longitudinal edge of the panel 30 is then engaged with the asbestos sheet 8 of the adjacent stud 3 and the clamping strip 22 of said adjacent stud is then moved outwardly so that its flange 28 overlies said other longitudinal edge of the panel 30. The clamping strips 22 may then be adjusted to center the panel 30 between the studs, if necessary, and the bolts 25 or screws 25b tightened to securely hold the panels 30 in place. After all of the necessary studs 3 and panels 30 shown in Fig. 1 have been erected to provide a fireproof partition, the wall panels 21 are mounted upon the furring strips 6 and 7 by engagement of the mounting clips 21d thereof with the mounting strips 13 on the outer face of said furring strips.

After the wall panels 21 of Fig. 1 have been erected, a conventional demountable base 31 is secured to the floor channel 4 in any suitable manner, and a conventional cornice strip 32 is suitably secured to the ceiling channel 5 to complete the trim.

Figs. 3 and 5 show the upper end of the asbestos millboard sheet 8 and the asbestos millboard panel 30 disposed between the side walls 5c of the ceiling channel 5. A plurality of bolts 30a extend through the channel side walls 5c and through the panel 30 and serve to suspend the panel 30 from the upper end thereof, more or less like a curtain. A nut 30b is threaded onto each of the bolts 30a and maintains the same in assembled relation with the ceiling channel 5. A similar bolt 30c (Fig. 3) extends through the mounting strips 13, the strips 17, the furring strips 6 and 7 and through the asbestos sheet 8, to hold the upper end of the studs 3 in fixed relation to the ceiling channel 5. The heads of the bolts 30a and 30c are protected by a strip of asbestos cement board 30d which is arranged to be disposed at the upper end of the side panels 21. The ends of the bolts 30a and 30c, having the nuts 30b mounted thereon, are protected by a similar asbestos cement strip 30e arranged to be disposed above the wall panel 21 on the opposite side of the wall structure.

The lower end of each of the studs 3 rests upon the bottom wall 4a of the base channel 4. A bolt 3a extends through the lower end of the stud 3 and through a pair of panel supporting strips 3b respectively supported by the horizontal flanges 4e of the base channel 4. A nut 3c is threaded on each of the bolts 3a to maintain the parts in fixed assembled relation.

The lower ends of the wall panels 21 at the respective sides of the partition rest upon the strips 3b and are held in place by a base molding 31a which is fastened to the strips 3b by screws 31b disposed in a channel 31c formed in the base molding 31a. A resilient channel member 31d is adapted to be received in the groove 31c to conceal the heads of the screws 31b. Each of the base molding strips 31 includes a portion below the screws 31b which engages the flanges 4e of the base channel 4 and the lower flange of the strips 4f, and a portion 31d above the screws 31b which engages the lower portion of the panels 21.

The upper end portions of the panels 21 are retained in place by an aluminum alloy (type 3–S–½ H) top molding strip 32a which is provided with a groove 32b adapted to receive screws 32c for fastening the molding strip in place on the ceiling channel side walls 5c. The cement board strips 30d and 30e may be held in place by the molding strips 32a, or by any other suitable means. A resilient channel member 32d is adapted to be received in the groove 32b to conceal the heads of the screws 32c.

Fire walls constructed in accordance with the principles of the present invention have withstood extremely severe tests and have met with all maritime requirements for use in constructing class B ship bulkheads. However, the invention is not limited to use on ships, and the wall can be erected anywhere that a good fire wall is desired.

It will be understood that changes in materials and in the details of construction and in the arrangement of the parts of the stud per se and the fire wall constructions disclosed herein can be made without departing from the spirit of the invention or the scope of the annexed claims.

We claim:

1. A wall stud for forming a wall having outer panels and a continuous partition of fire-resistant material therebetween, comprising: a pair of metal furring strips for supporting said outer panels in parallel relationship, each of said furring strips being generally channel-shaped in cross-section and having the legs thereof extending toward each other; an elongated strip of insulating fire-resistant material disposed between the ends of the legs of said furring strips separating said furring strips; and means for securing at least one element of said continuous par-

tition to said stud intermediate said outer panels and substantially parallel thereto; and fastening means maintaining said furring strips, said elongated strip, and said means for securing said element of said continuous partition in assembled relation.

2. A wall stud for forming a wall having outer panels and a continuous partition of fire-resistant material therebetween, comprising: an elongated strip of insulating fire-resistant material; a pair of metal furring strips for supporting said outer panels in parallel relation arranged one on each side of said elongated strip, said elongated strips being wider than said furring strips and having longitudinal edge portions projecting beyond the sides of said furring strips; clamping means for securing an element of said continuous partition intermediate said outer panels and substantially parallel thereto to a projecting edge portion of said elongated strip; and common means securing one of said furring strips and said clamping means to said elongated strip.

3. A wall stud for forming a wall having outer panels and a continuous partition of fire-resistant material therebetween, comprising: an elongated strip of insulating fire-resistant material; a pair of metal furring strips for supporting said outer panels in parallel relationship arranged one on each side of said elongated strip, said elongated strip being wider than said furring strips and having at least one longitudinal edge portion projecting beyond one side of said furring strips; means for securing an element of said continuous partition to said stud intermediate said panels and in overlapping relation to one side of said elongated strip; and fastening means maintaining said furring strips, said elongated strip and said means for securing said element of said continuous partition in assembled relation.

4. A wall stud for forming a wall having outer panels and a continuous partition of fire-resistant material therebetween, comprising: an elongated strip of insulating fire-resistant material; a pair of metal furring strips arranged one on each side of said elongated strip, said elongated strip being wider than said furring strips and having longitudinal edge portions projecting beyond the sides of said furring strips; a laterally adjustable flanged clamping means arranged on at least one side of said stud for securing an element of said continuous partition against said elongated strip in overlapping relation to a projecting longitudinal edge portion thereof, and means securing said clamping means on said stud in adjusted position.

5. A wall stud for forming a wall having outer panels and a continuous partition of fire-resistant material therebetween, comprising: a pair of metal furring strips for supporting said outer panels in parallel relation; an elongated strip of insulating fire-resistant material disposed between said furring strips, said elongated strip being greater in width than said furring strips and having longitudinal edge portions projecting beyond the sides thereof; a plurality of clamping strips secured to said stud for securing elements of said continuous partition to said stud intermediate said outer panels in overlapping relation to the projecting longitudinal edge portions of said elongated strip, said clamping strips having elongated slots for effecting lateral adjustment thereof with respect to said stud; and means extending through said slots for securing said clamping strips in adjusted position relative to said stud.

6. A wall stud for forming a wall having outer panels and a continuous partition of fire-resistant material therebetween, comprising: a pair of sheet metal furring strips for supporting said outer panels in parallel relationship, each of said furring strips being generally U-shaped in cross-section and having flanges extending laterally outwardly from the free ends of the legs of said U, said furring strips being arranged with their flanges opposing each other; an elongated strip of insulating fire-resistant material disposed between and separating said furring strips, said elongated strip being greater in width than said furring strips and having longitudinal edge portions projecting outwardly beyond the flanges thereof, the flanges of one of said furring strips engaging one side of said elongated strips; a pair of clamping strips secured to said stud and arranged upon the opposite side of said elongated strip, each clamping strip including a flange disposed between said opposite face of said elongated strip and one of the flanges of the other furring strip; and fastening means extending through the flanges of said furring strips and clamping strips, and through said strip of fire-resistant material for securing the same together in assembled relation.

7. A wall stud for forming a wall having outer panels and a continuous partition of fire-resistant material therebetween, comprising: a pair of sheet metal furring strips for supporting said outer panels in parallel relation, each furring strip being generally U-shaped in cross-section and having flanges extending laterally from the free ends of the legs of said U, said furring strips being arranged with their flanges opposing each other; an elongated strip of insulating fire-resistant material disposed between said furring strips, said elongated strip being greater in width than said furring strips and having longitudinal edge portions projecting outwardly beyond the flanges thereof, the flanges of one of said furring strips engaging one side of said elongated strip; a plurality of clamping strips secured to said stud for securing elements of said continuous partition to said stud and arranged upon the opposite side of said elongated strip, each clamping strip including a flange disposed between said opposite side of said elongated strip and one of the flanges of the other furring strip, the flanges of said clamping strips being provided with elongated slots; and fastening means extending through the flanges of said furring strips, the slots in the flanges of said clamping strips, and through said elongated strip for securing the same together in assembled relation, said elongated slots in said clamping strips permitting lateral adjustment of said clamping strips relative to said elongated strip.

8. A wall stud for forming a wall having outer panels and a continuous partition of fire-resistant material therebetween, comprising: a pair of sheet metal furring strips for supporting said outer panels in parallel relation, each furring strip being generally U-shaped in cross-section and having flanges extending laterally from the free ends of the legs of said U, said furring strips being arranged with their flanges opposing each other; an elongated strip of compressed asbestos fibers disposed between and separating said furring strips, said elongated strip being greater in width than said furring strips and having longitudinal edge portions projecting outwardly

beyond the flanges of said furring strips, the flanges of one of said furring strips engaging one side of said elongated strip; a plurality of clamping strips secured to said stud for securing elements of said continuous partition to said stud and arranged upon the opposite side of said elongated strip, each clamping strip including a mounting flange disposed between said opposite side of said elongated strip and one of the flanges of the other furring strip, the mounting flanges of said clamping strips being provided with elongated slots, each of said clamping strips also including an offset portion extending in a plane substantially normal to its mounting flange and carrying a flange extending therefrom in a direction opposite to that of said mounting flange; and fastening means extending through the flanges of said furring strips, the slots of the mounting flanges of said clamping strips and through said elongated strip for securing the same together in assembled relation, said elongated slots in said mounting flanges of said clamping strips permitting lateral adjustment of said clamping strips relative to said stud assembly.

9. A wall stud for forming a wall having outer panels and a continuous partition of fire-resistant material therebetween, comprising: an elongated strip of insulating fire-resistant material; a pair of metal furring strips for supporting said outer panels in parallel relation arranged one on each side of said elongated strip, said elongated strip being wider than said furring strips and having longitudinal edge portions projecting beyond the sides of said furring strips; clamping means arranged on one side of said elongated strip for securing elements of said continuous partition to said stud in overlapping relation to the projecting longitudinal edge portions of said elongated strip; fastening means securing one of said furring strips to, and adjustably mounting said clamping means on, one side of said elongated strip; and fastening means offset with respect to said first-mentioned fastening means securing the other furring strip to the other side of said elongated strip.

10. A wall stud for forming a wall having outer panels and a continuous partition of fire-resistant material therebetween, comprising: a pair of aluminum alloy furring strips for supporting said outer panel in parallel relation each furring strip being generally U-shaped in transverse cross-section and having flanges extending laterally outwardly from the free ends of the legs of said U, said furring strips being arranged with their flanges opposing each other; an elongated strip of asbestos millboard disposed between and separating said furring strips, said elongated strip being greater in width than said furring strips and having longitudinal edge portions projecting outwardly beyond the flanges of said furring strips, the flanges on one of said furring strips engaging one side of said elongated strip; a pair



of clamping strips for securing elements of said continuous partition to said stud arranged upon the opposite side of said elongated strip, each clamping strip including a flange disposed between said opposite side of said elongated strip and one of the flanges of the other of said furring strips; and fastening elements extending through the flanges of said furring strips and clamping strips and into but not completely through said strip of asbestos mill board and securing the same together in assembled relation.

11. A wall stud assembly for forming a wall having an outer panel and an inner continuous partition of fire-resistant material, comprising: a metal furring strip for supporting said outer panel; an elongated strip of insulating fire-resistant material of greater width than said furring strip engaged with said furring strip; a clamping strip disposed substantially parallel with said furring strip and having a flange for securing an element of said continuous partition in engagement with said elongated strip; and fastening elements securing said furring strip and said clamping strip to said elongated strip.

12. A wall stud for forming a wall having outer panels and a continuous partition of fire-resistant material therebetween comprising: a pair of metal furring strips for supporting said outer panels in parallel relation; an elongated strip of insulating fire-resistant material disposed between said metal furring strips and separating the same, said elongated strip being greater in width than said furring strips and having longitudinal edge portions projecting outwardly beyond the sides of said furring strips; securing means for fastening elements of said continuous partition to said stud in overlapping relation to said elongated strip; and fastening means maintaining said furring strips, said elongated strip and said securing means in assembled relation.

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