

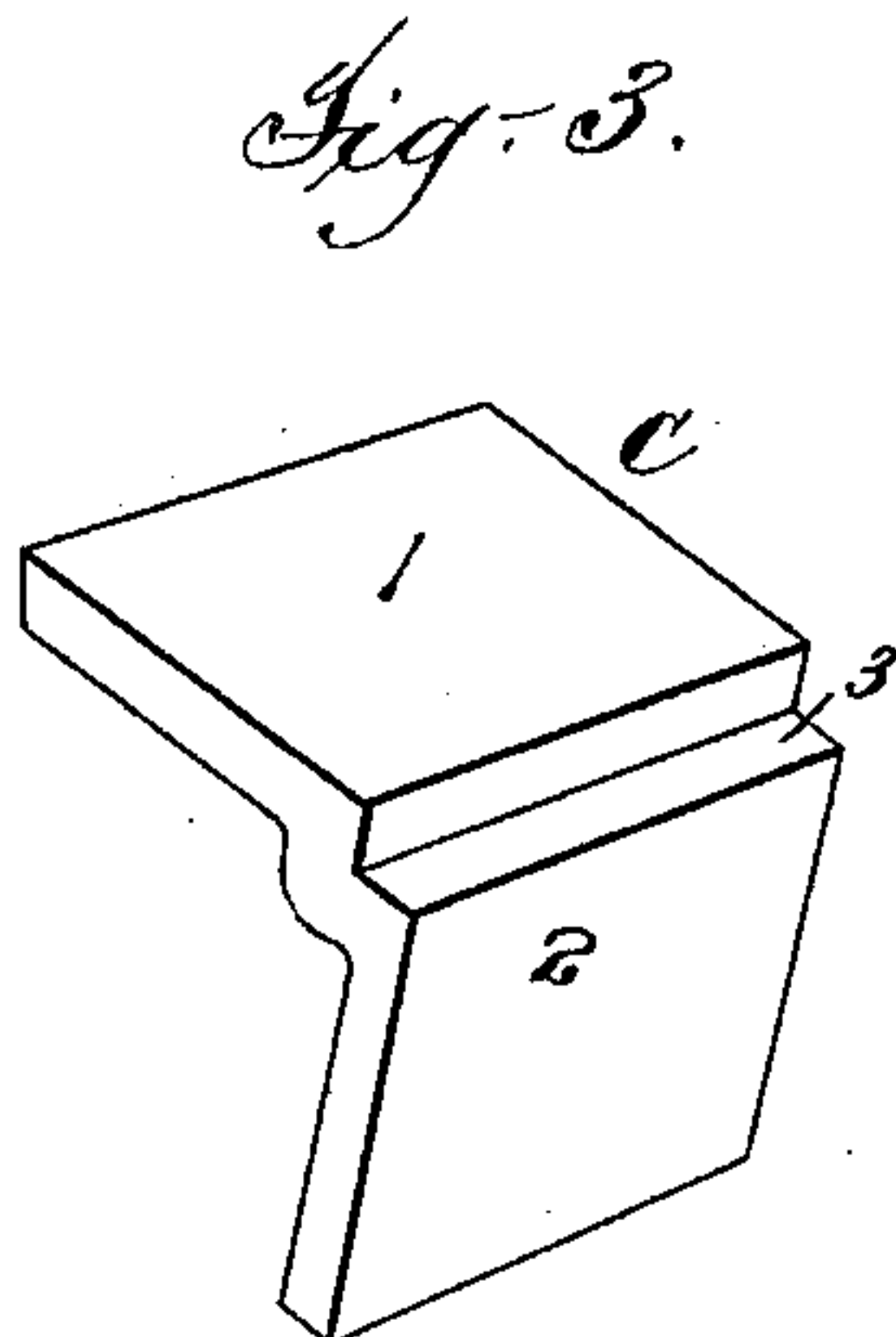
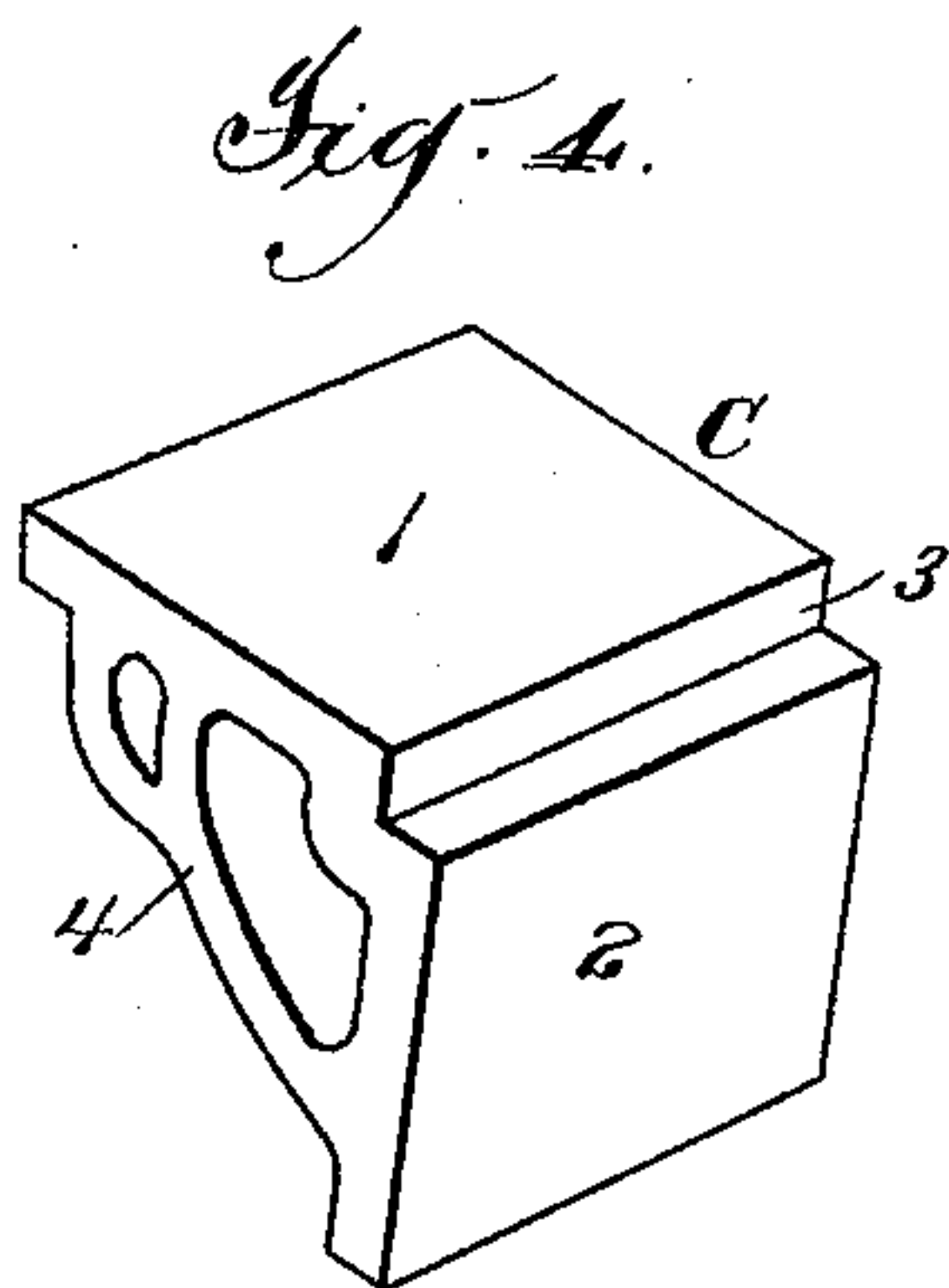
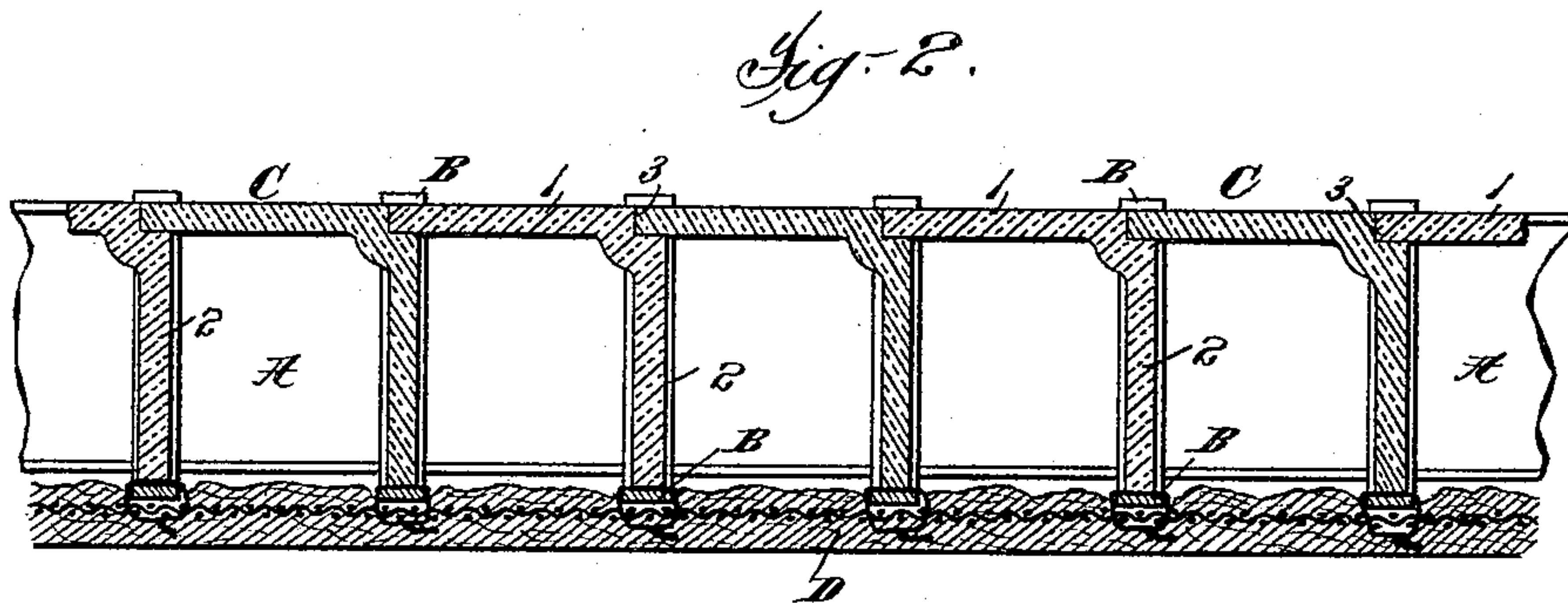
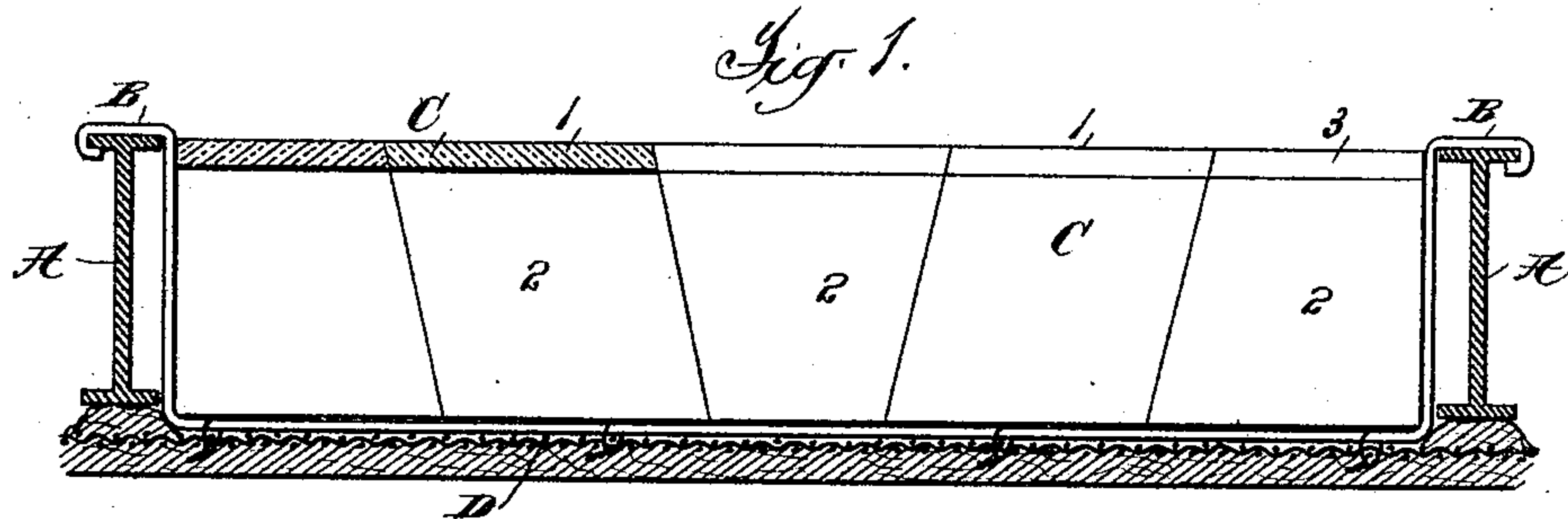
(No Model.)

4 Sheets—Sheet 1.

W. ORR.  
FIREPROOF FLOOR CONSTRUCTION.

No. 481,243.

Patented Aug. 23, 1892.



Attest:  
Geo. H. Bots  
S. Gruthal.

Inventor  
William Orr  
by Philip Munson  
& Phelps  
Attys

(No Model.)

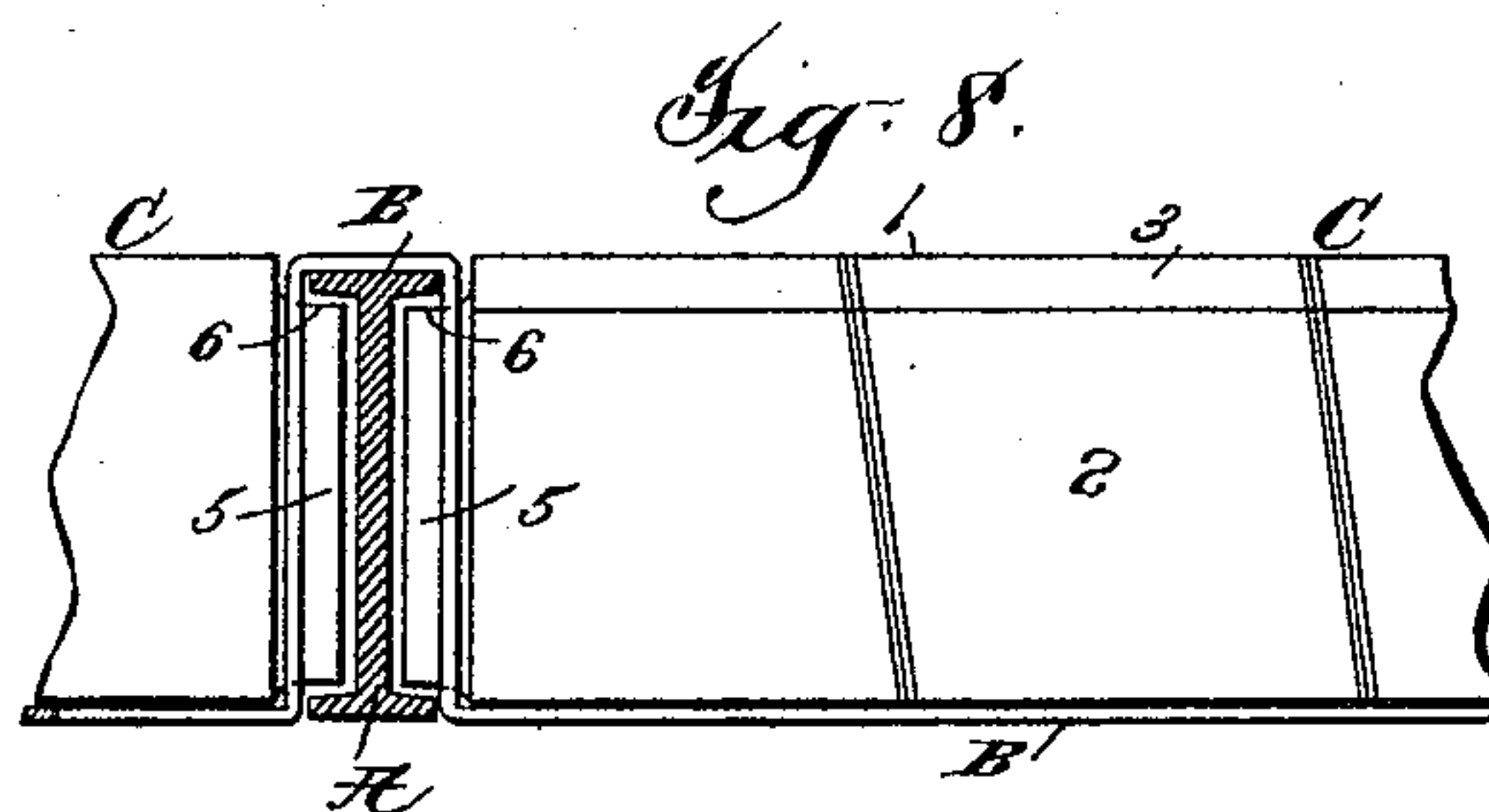
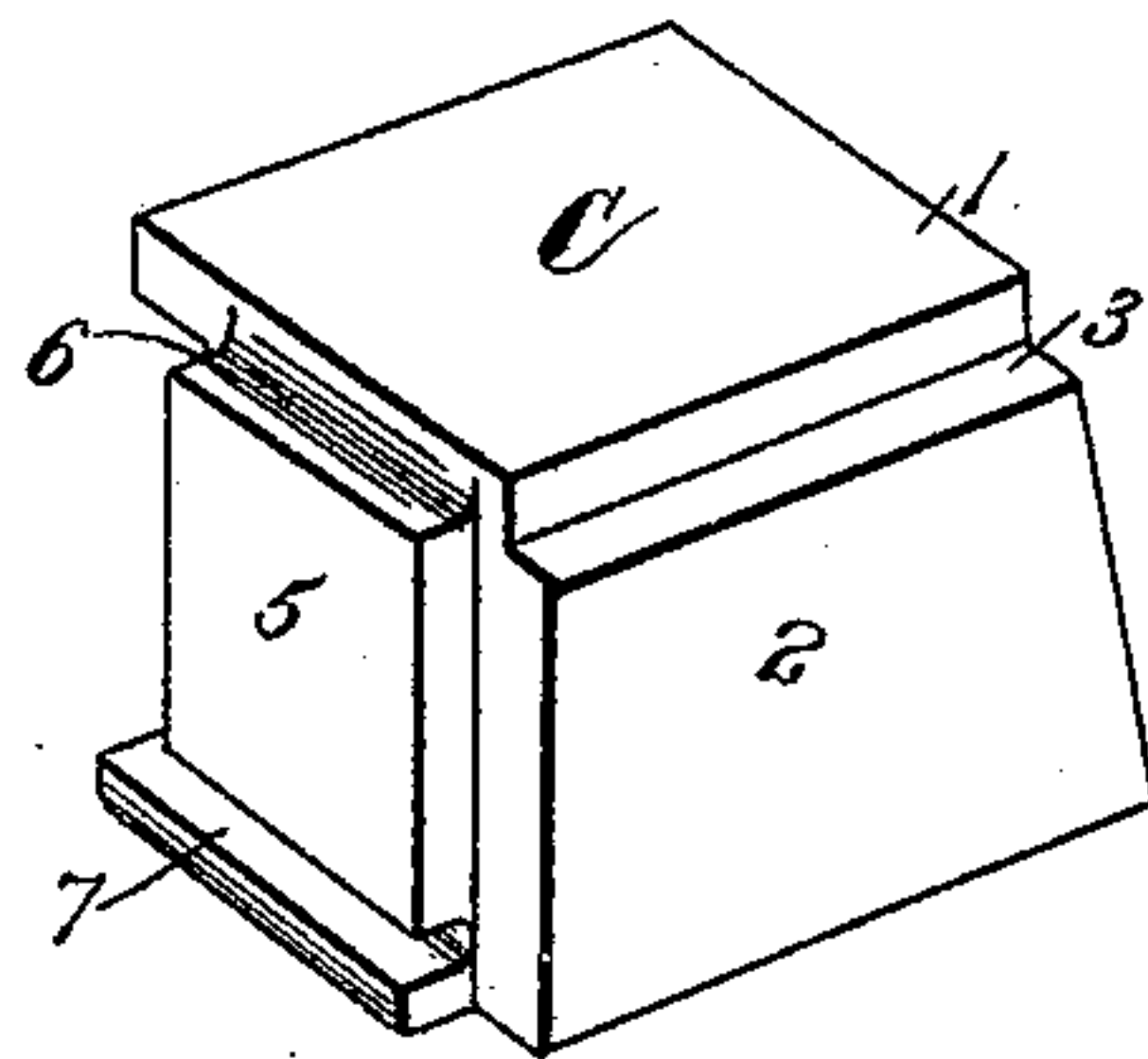
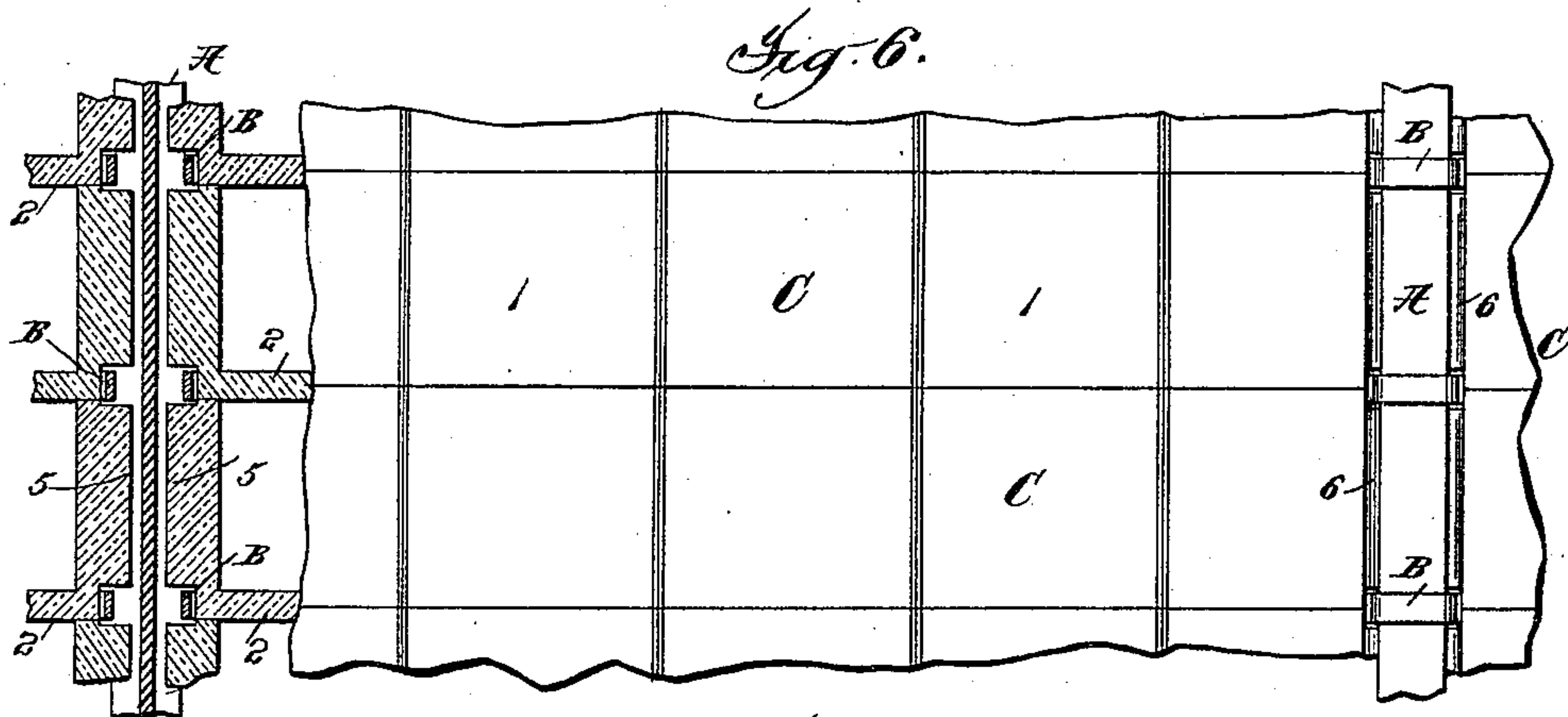
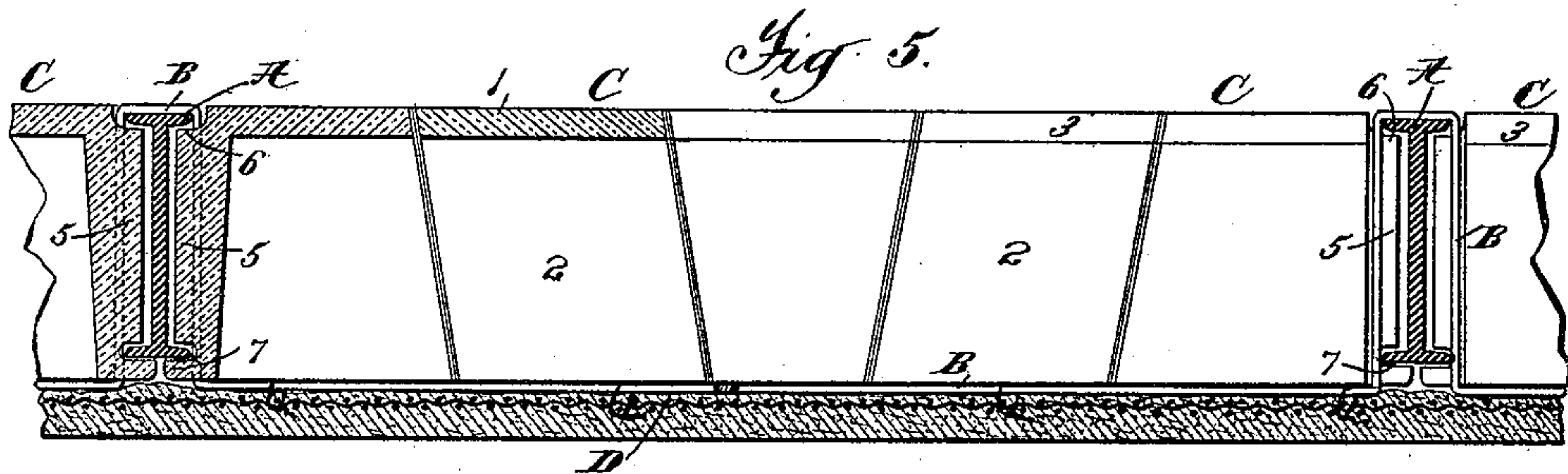
4 Sheets—Sheet 2.

W. ORR.

FIREPROOF FLOOR CONSTRUCTION.

No. 481,243.

Patented Aug. 23, 1892.



Attest:  
Geo H. Botts.  
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(No Model.)

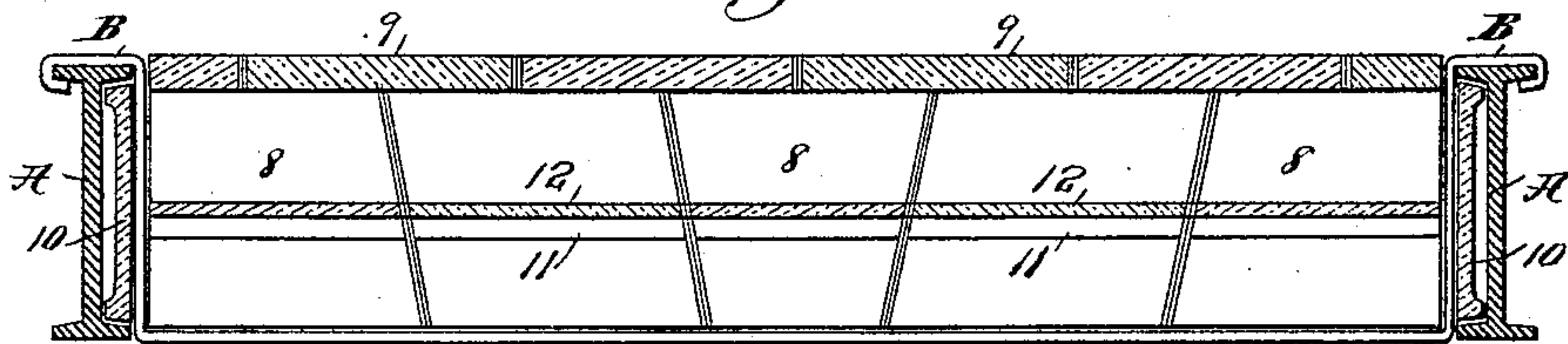
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W. ORR.  
FIREPROOF FLOOR CONSTRUCTION.

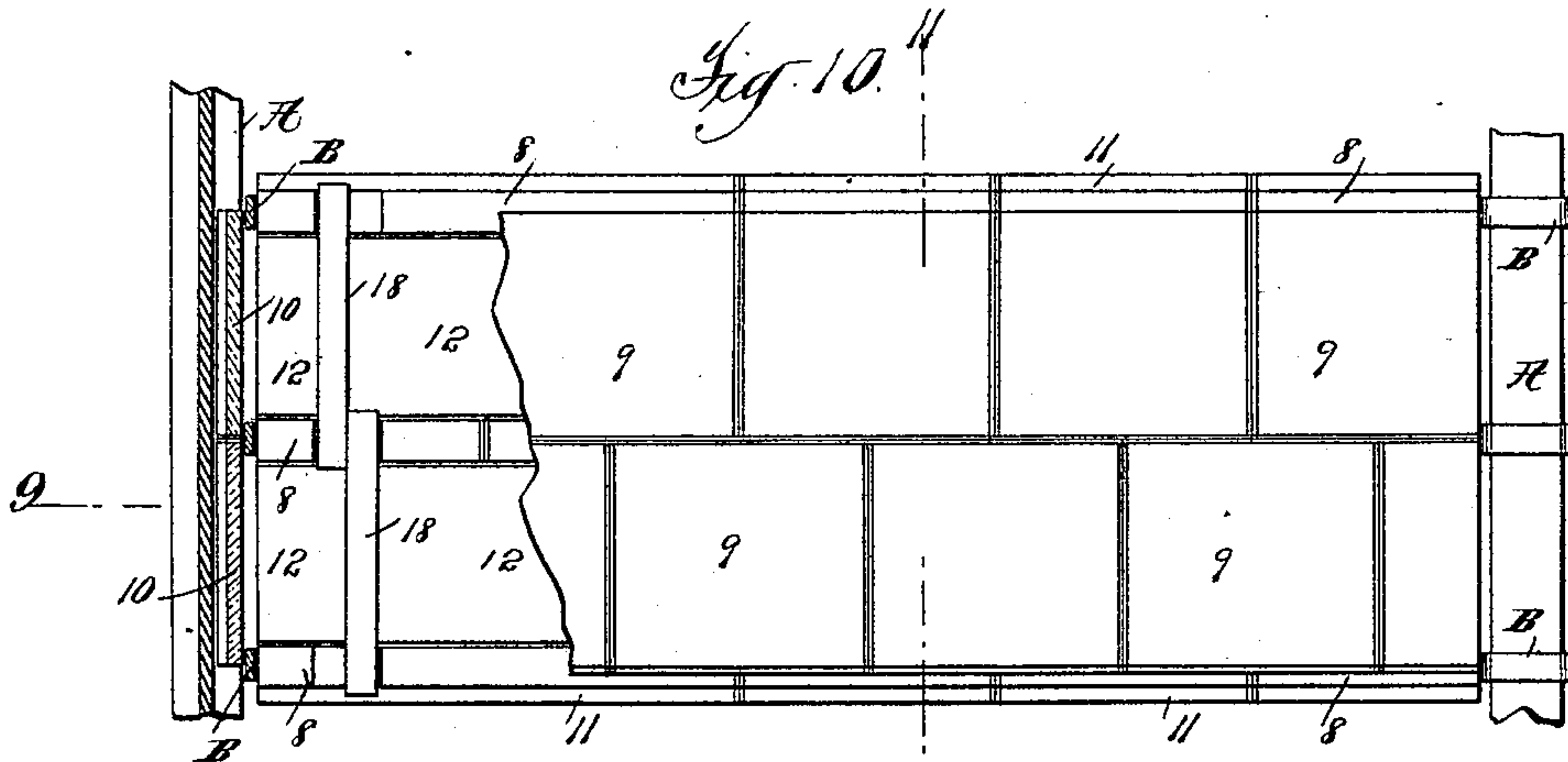
No. 481,243.

Patented Aug. 23, 1892.

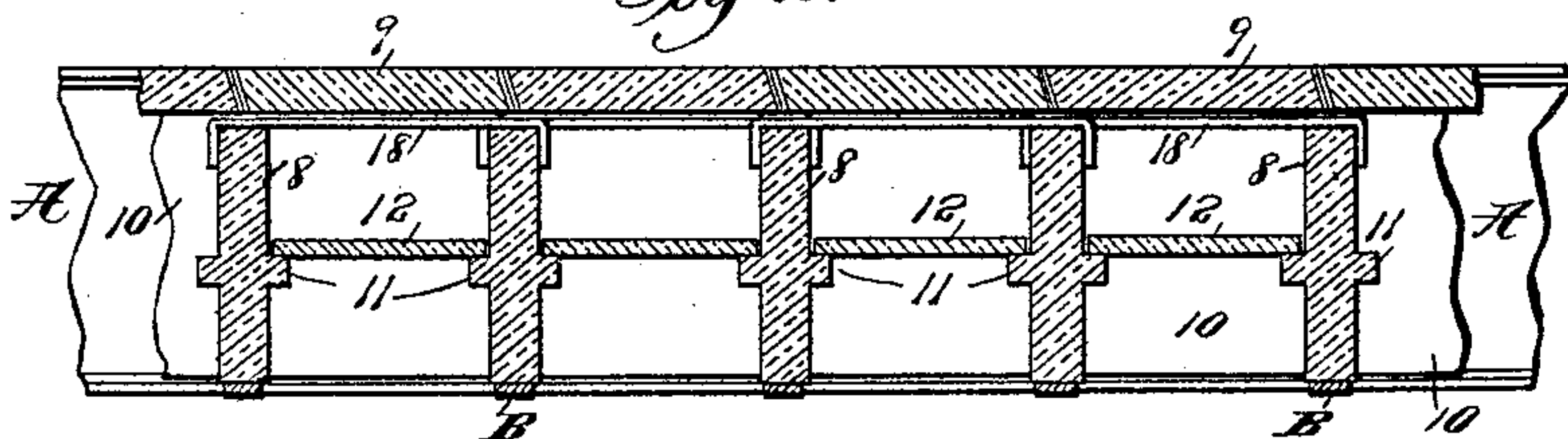
*Fig. 9.*



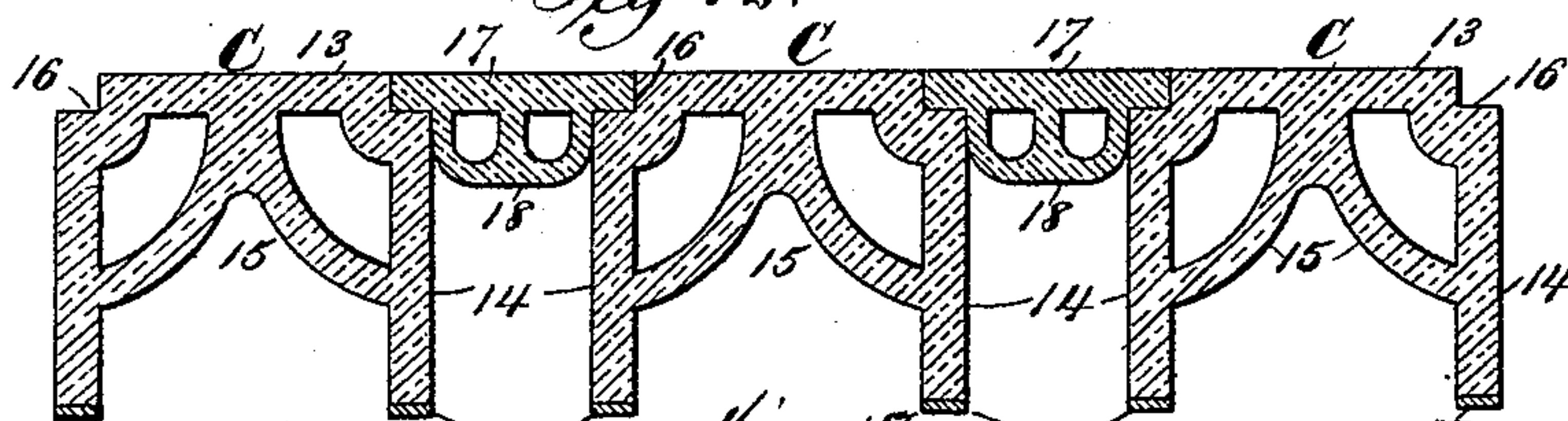
*Fig. 10.*



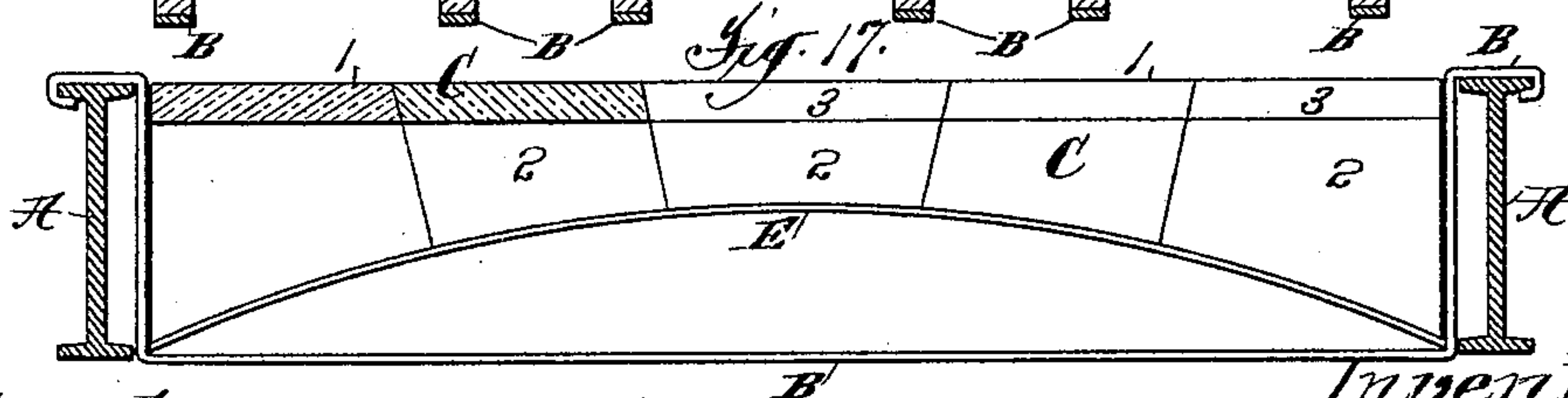
*Fig. 11.*



*Fig. 12.*



*Fig. 17.*



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(No Model.)

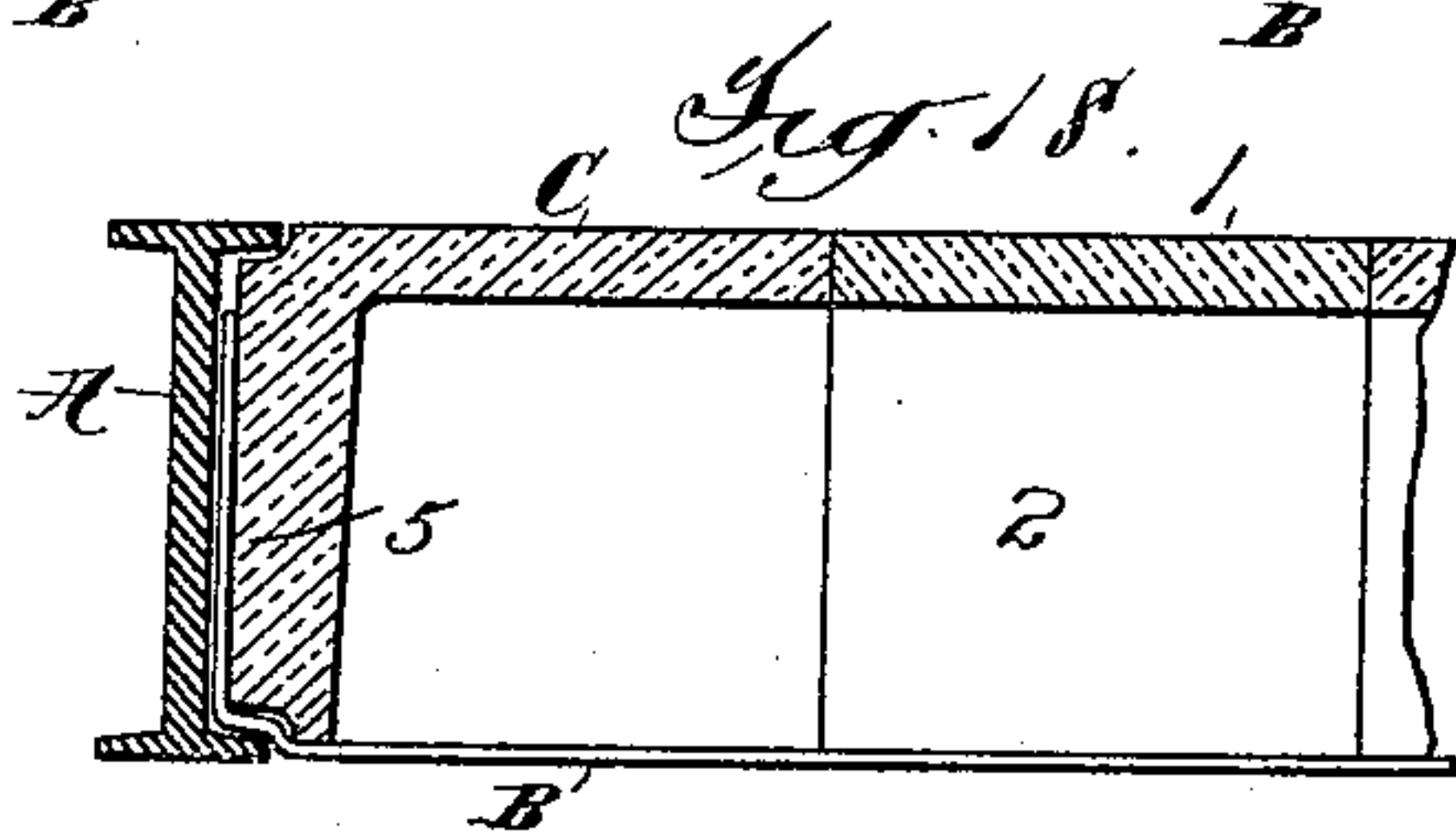
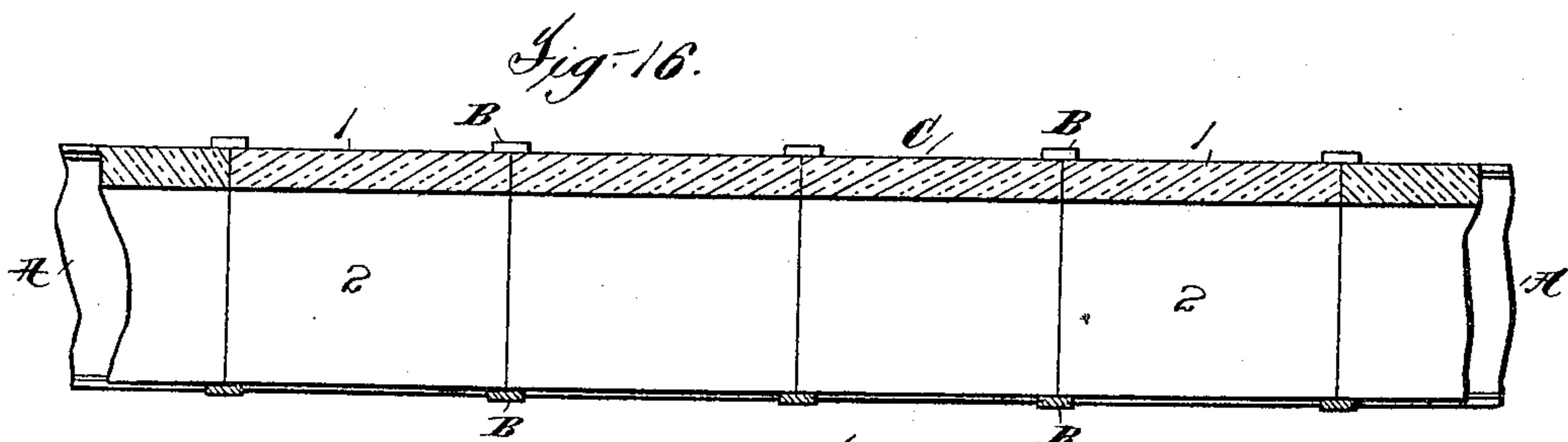
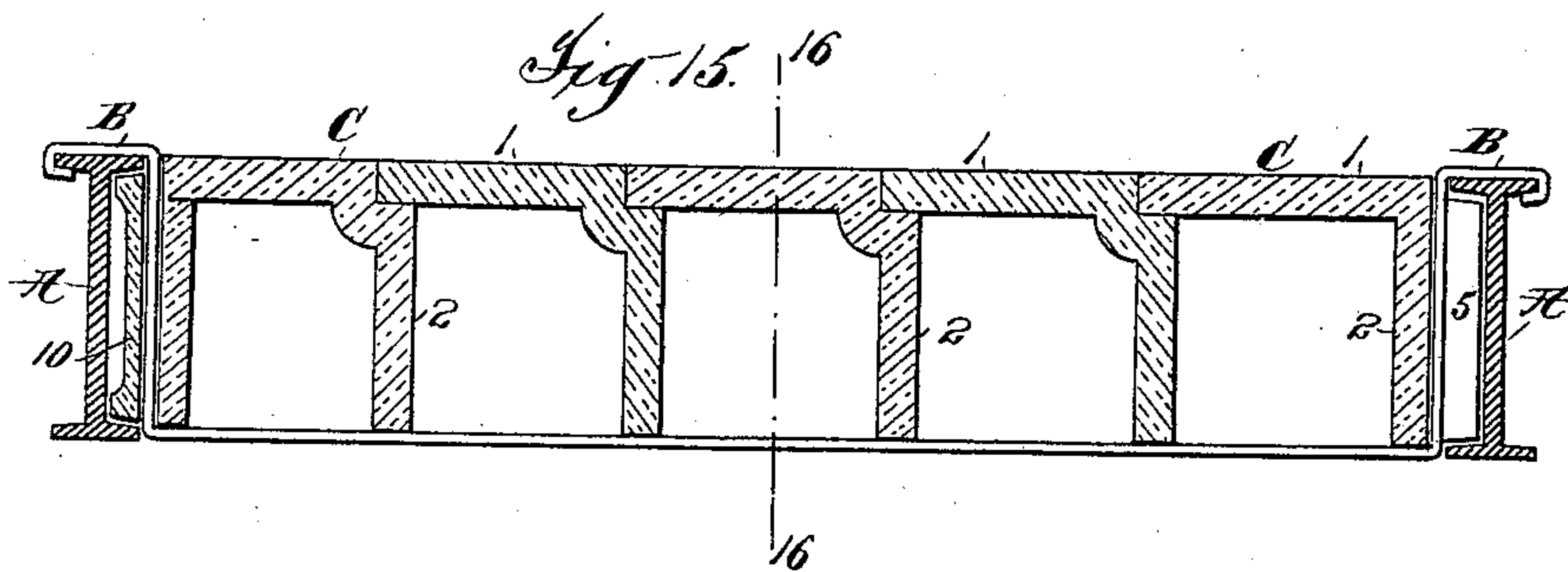
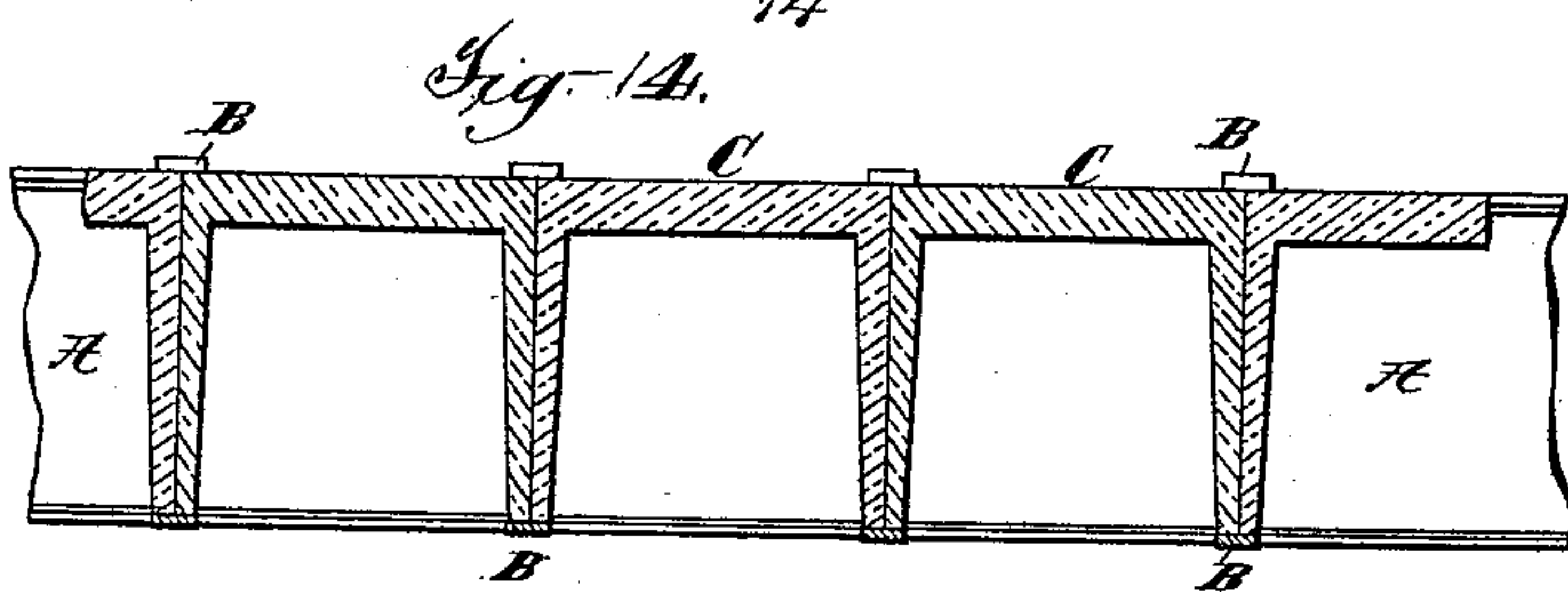
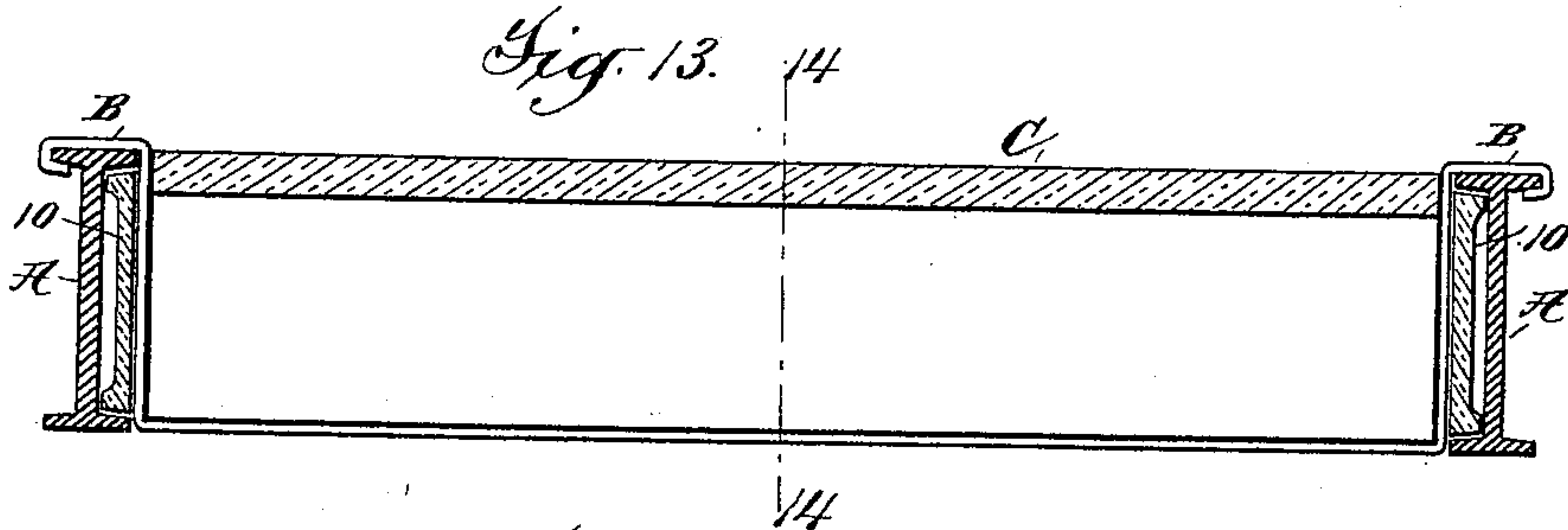
4 Sheets—Sheet 4.

W. ORR.

FIREPROOF FLOOR CONSTRUCTION.

No. 481,243.

Patented Aug. 23, 1892.



Attest:  
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# UNITED STATES PATENT OFFICE.

WILLIAM ORR, OF TRENTON, NEW JERSEY.

## FIREPROOF-FLOOR CONSTRUCTION.

SPECIFICATION forming part of Letters Patent No. 481,243, dated August 23, 1892.

Application filed December 21, 1891. Serial No. 415,710. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM ORR, a citizen of the United States, residing at Trenton, county of Mercer, and State of New Jersey, have invented certain new and useful Improvements in Fireproof Constructions, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to fireproof constructions, the object of the invention being to provide a tile fireproof floor, ceiling, or roof construction which shall be cheap and easily laid and which shall be of sufficient strength to carry heavy loads without the use of the heavy tile heretofore employed in such constructions. I attain this object, according to the present invention, by the use of suspenders extending from beam to beam and supported thereby, upon which the tile forming the floor, ceiling, or roof are supported. Upon these suspenders I lay the tile, which are formed and laid so as to provide air-spaces, and preferably so that the tile and continuous air-spaces extend transversely to the beams. These tile are preferably made and laid so as to form a construction open upon the lower side, and in the preferred form a floor construction consists of ribs supported upon the suspenders and a web extending across the top to form the flooring or a level surface for the flooring, and the ceiling, if the latter is to be used, may be formed of common wire or sheet-metal lathing supported from the suspenders and embedded, as usual, in plastic material so as to close the bottom of the tile.

The tile or brick used in carrying out my invention may be varied in form while retaining many of the advantages of the construction, and common hollow brick may be used supported upon the suspenders, and may be of any suitable size, the direct support afforded by the suspenders enabling light tile of large size to be used, so that single tile extending the full depth of the filling and with comparatively thin walls may be used even with beams of the greatest depth. These tile are preferably laid transversely to the beams, so that the crushing-pressure may be exerted edgewise on the walls of the tile, and while the tile may be of such a length that a single tile extends from beam to beam, I preferably

form the tile in sections transversely to the beams, so as to be readily handled in transportation and laying, and I have devised certain improved forms of tiles especially adapted for use in my construction. Thus the tile which I preferably use may be formed of one side and a top, and the latter overlap upon the side of the next tile when they are laid, so as to be supported thereby, or the sides and top may be of separate pieces, the sides being placed in position upon the suspenders and the tops laid thereon, the sides in either case forming vertical tile-blocks by which the flooring is supported. The tile also may be in the form of hollow bricks, open below and open or closed at the ends, the sides being supported upon adjacent suspenders, in which case the tile may be recessed at the upper corners to receive the ends of a block bridging the space between two suspenders.

My invention therefore consists in a fireproof structure having, in combination with the beams, a series of suspenders extending from beam to beam and supported thereby, and a hollow tile-filling laid on and supported by said suspenders and forming a flooring or floor-support, and in various constructions of fire-proof structures and an improved tile for use therein, all of which will be fully described in the following specification, and pointed out in the claims.

For a full understanding of my invention, a detailed description of constructions embodying the same will now be given, reference being had to the accompanying drawings, in which—

Figure 1 is a section of a floor construction embodying my invention in a simple form, the section being taken transversely to the beams and to show the tile partly in elevation. Fig. 2 is a section of the same, taken longitudinally of the beams. Fig. 3 is a perspective view of one of the tile of Figs. 1 and 2. Fig. 4 is a similar view of a slightly-modified form of tile. Fig. 5 is a view similar to Fig. 1, showing a construction in which the end blocks are constructed to fireproof the beams. Fig. 6 is a sectional plan of the same. Fig. 7 is a perspective view of one of the end tile of Figs. 5 and 6. Fig. 8 shows a slightly-modified construction, in which the end tile do not extend below the beam-flanges. Fig. 9 is a section transversely to the beams, showing a construc-



tion in which the sides and top of the tile are formed of separate pieces. Fig. 10 is a sectional plan of the same. Fig. 11 is a section on the line 11 of Fig. 10. Fig. 12 is a section longitudinally of the beams, showing a modified construction employing tiles formed of two sides and a top, and in which spaces between adjacent suspenders are bridged by separate tile. Fig. 13 shows a modification in which single tile extend from beam to beam. Fig. 14 is a section on the line 14 of Fig. 13. Fig. 15 is a section transversely to the beams, showing a construction in which the tile are laid longitudinally of the beams. Fig. 16 is a section on the line 16 of Fig. 15. Figs. 17 and 18 show constructions employing modified forms of suspender.

Referring now especially to Figs. 1 to 3, A are the usual I-beams of a floor, and B the suspenders which in the form shown in these figures consist of bars hooked over the top flanges of the beams and depressed sharply to the base of the beams, so as to form, practically, a straight bar extending from beam to beam and preferably level or approximately level with the lower flanges. The suspenders are shown as continuous throughout; but it will be understood that the hooks and horizontal bar may be in separate pieces, if desired. The suspenders are placed at suitable distances apart to support the tile, this depending somewhat upon the nature of the structure to be made and the weight to be supported thereby, and upon these suspenders are placed the tile C, forming the hollow filling between the beams. The suspenders may be of any suitable form to support the tile. In the form shown they consist of flat bars of considerable size, placed wide apart; but each suspender may consist of two or more bars or strands, or they may be of less size and placed nearer together. The suspenders shown in Figs. 1 to 3 are especially well adapted for use with the tile of these figures, the side wall of each tile being supported longitudinally upon the flat suspender. If desired, the suspenders may be tied together by wire or metal bands before or after laying to stiffen the structure; but this will usually be found unnecessary, and this result is attained by the sheet-metal or woven-wire ceiling, as described hereinafter.

The tile C may be of any suitable material, such as is in common use for this purpose, and of any suitable form, so as to be quickly laid and form a strong structure. I prefer, however, to make the tile open on one or more sides, and in the preferred form in these figures each tile consists of a block 1, forming the top of the tile, and a block 2 at right angles thereto, which forms one vertical side of the tile and by which the tile is supported upon the suspender. Each tile thus formed is cut away at the upper corner, so as to form a recess of a depth equal to the thickness of the top 1 of the tile, these recesses receiving the free end of the top 1 of the adjacent tile when

the tile are laid so as to form a level top surface. These tile may be square or of other form with vertical edges; but I prefer to form the tile as shown in Fig. 1, so that the middle tile of the floor-arch forms a key by which the tile are firmly held in position. In forming this structure the suspenders are placed in position by being hooked over the top flanges of the beams at the required distances apart, in accordance with the tile to be used, and the tile are then laid directly upon the suspenders in the position shown in Figs. 1 and 2, a base of cement being previously formed on the suspenders to hold the foot of the tile in position, and the joints between the tile also being formed in cement. It is evident that the tile may be laid very rapidly and without the use of the supports required in laying floors of plastic material or employing a plastic base, while the structure formed thereby is of great strength, even with tile having thin walls, the crushing-pressure being sustained by the abutting edges of the tile and transmitted to the suspenders, so as to be sustained by the tops of the beams, no outward pressure on the beams being produced. The displacement of the beams in the common floor constructions, due to the outward pressure of the load, is thus avoided, and, moreover, the support of the tile by the suspenders and beams is such that any slight displacement of the beams will not disrupt the floor and allow it to collapse, as in previous constructions.

If a ceiling is to be added, this may be formed, as shown, by sheet-metal or wire lathing D, supported from the suspenders by lacing, as shown, or in any other suitable manner, and embedded in plastic material, as usual. This lathing serves, also, to tie together the suspenders B and stiffen the structure, and may be made integral with the suspenders, so as to be laid therewith, if desired.

It will be found that tile of the form shown in these figures are cheap in manufacture, pack closely in shipment, and are conveniently handled and rapidly laid. These tile may be strengthened and the number of independent air-spaces increased, if desired, by the construction shown in Fig. 4, in which the blocks 1 and 2 are connected by ribs 4, extending between the two and forming two or more separated air-spaces.

In the modified construction shown in Figs. 5 to 7, the suspenders are extended over the upper flanges of the beams and then from beam to beam on each side, a single continuous suspender thereby being used for the entire width of the floor structure, the pressure still being borne by the beams, so as to avoid outward pressure thereon. The suspenders, also, are shown as extended below the lower flanges of the beams A, and the end tile C so constructed as to fill the space between the flanges and to extend below the flanges, so as to fireproof the webs and lower flanges of the



beams. The end tile in this construction are formed, as shown in Fig. 7, similar to those previously described in connection with Fig. 3, except that they are provided with an end wall 5 between the vertical arms of the suspenders, which has a recess on the top at 6 to allow the end to extend inward against the web of the beam beneath the upper flange of the latter, and a groove 7 at its base, into which extends the lower flange of the beam, the two tile on opposite sides of a beam thereby filling the space below the beam-flange, as shown in Fig. 5. It will be understood that the intermediate tile, also, may be provided with end walls, if desired, so that the air-space extending transversely to the beams is divided; but this increases the weight of the structure, and I prefer a continuous air-space extending from beam to beam, as shown.

In Fig. 8 is shown a construction similar to that of Figs. 5 to 7, except that the suspenders are level with the lower flanges of the beams, and the ends 5 of the end tile C fill only the space between the flanges and opposite the webs.

It is evident that the tile may be made of separate side and top blocks, if desired, and in Figs. 9 to 11 I have shown such a construction. In this construction the blocks 8 are first placed in position vertically upon the suspenders B in cement, as before described, and then the blocks 9 are laid upon them, bedded in cement or similar material, the joints between the blocks 9 also being similarly formed. The vertical side blocks may be tied together by metal bands or wires 18, extending between and lapped over the tops of adjacent tile, to aid in holding the sides in place till the tops are laid, and the top blocks 9 are preferably so laid as to break joint with the vertical blocks 8 and with each other, all as shown in Figs. 9 and 10. The webs of the beams are protected in this construction by independent blocks 10, supported vertically between the suspenders and beams. If it be desired to divide the air-space horizontally, this may readily be done by the construction shown in these figures, in which the vertical blocks 8 are provided with ribs 11 upon each side, on which are supported the blocks 12, so as to form two horizontally-divided air-spaces extending from beam to beam.

In Fig. 12 is shown a construction in which the tile C consist of the top 13 and the two sides 14, which are supported directly upon the suspenders, ribs 15 being preferably provided, connecting the top and sides, so as to strengthen the construction and form independent air-spaces. Tile of this form may be laid so that the sides of two tile are supported upon the same suspender; but it is evident that the weight of the structure will be increased over that of a construction employing the tile previously described and without appreciable increase in strength. The construction shown will be found preferable, in which the tile are recessed at the upper corners, as

shown at 16, and in these recesses are supported separate blocks 17, bridging the space between two suspenders. If desired, these blocks 17 may be provided with downwardly-extending ribs 18, forming independent air-spaces, as shown.

While I prefer to make the tile of comparatively small size, so as to be handled conveniently in transportation and laying, they may be made larger, and single tile extending from beam to beam may be used, which tile may be similar in form to those previously described. Such a construction is shown in Figs. 13 and 14, with tile C of a modified form, consisting of a top and two sides of sufficient length to fill the space between the end pieces of the suspenders. In this construction the webs of the beams may be fireproofed by separate blocks 10, as shown and as previously described in connection with the construction shown in Fig. 9. The tile are shown in this construction as laid side by side with the side walls of adjacent tile on the same suspenders. It will be seen, however, that the sides of each tile must be quite thin and of less strength, or this construction involves the use of more material than those previously described, so that the latter are preferred as lighter for equal strengths.

I prefer to form and lay the tile so that the continuous walls of the tile extend transversely to the beams, as above stated, and as in the construction thus far described; but the construction may be varied by laying the tile parallel with the beams. Such a construction is shown in Figs. 15 and 16, the tile C being of the form shown in Figs. 1 to 3, but being laid on the suspenders with their sides transverse to the suspenders or parallel with the beams. It will be understood, also, that tile of any of the other constructions shown may be thus laid. With the tile thus laid, however, it is evident that the crushing-pressure is exerted sidewise against the side walls of the tile and the strength of the construction greatly reduced.

The general form of the suspenders may be varied, and in some cases it may be desirable to use what may be called an "arch-suspender," as shown in Fig. 17. In this construction a supporting-bar E is sprung in between the vertical arms of the suspender, with its ends held in the lower angles of the suspender, when they may be secured by lacing or otherwise, if desired. The tile C are laid upon the bars E to form an arch, as shown, and the ceiling supported by the horizontal part of the suspenders, as in the other constructions.

While I prefer to extend the suspenders over the tops of the beams, so that the weight is borne by the top flanges, I may support the suspenders on the lower flanges. Such a construction is shown in Fig. 18, in which the suspender B rests upon the top of the lower flange, and is curved so as to extend between the beams level with the bottoms of the flanges,



and is provided with arms extending upward along the webs of the beams. The end tile are provided with ends 5, formed to fit the space between the flanges, these ends resting 5 against the upwardly-extending arms of the suspenders, so that the weight is sustained thereby.

Various other modifications may be made in the constructions shown without departing 10 from my invention, and the constructions shown are selected only as the preferable forms of many in which my invention may be embodied.

What I claim is--

15 1. The combination, with the beams, of a series of suspenders supported by said beams and extending from beam to beam and a hollow tile-filling laid on and supported by said suspenders and forming a flooring or floor- 20 support, substantially as described.

2. The combination, with the beams, of a series of suspenders supported by the tops of the beams and extending downward near the beams and then from beam to beam and a 25 hollow tile-filling laid on and supported by said suspenders and forming a flooring or floor-support, substantially as described.

3. The combination, with the beams, of a series of suspenders supported by said beams 30 and extending from beam to beam, a hollow tile-filling laid on and supported by said suspenders and forming a flooring or floor-support, and a ceiling of fireproof material supported by said suspenders and closing the 35 bases of said tile, substantially as described.

4. The combination, with the beams, of a series of suspenders supported by said beams and extending from beam to beam and a hollow tile-filling forming a top web extending 40 from beam to beam and forming a flooring or floor-support and supporting-ribs extending downward from the web and resting on said suspenders, substantially as described.

5. The combination, with the beams, of a series of suspenders supported by the beams 45 and extending from beam to beam, a hollow tile-filling forming a top web extending from beam to beam and forming a flooring or floor-support, and supporting-ribs extending downward from the web and resting on said suspenders and a ceiling of fireproof material 50 supported by said suspenders, substantially as described.

6. The combination, with the beams, of a series of suspenders supported by the beams 55 and extending from beam to beam and a hollow tile-filling forming a top web extending from beam to beam and forming a flooring or floor-support and a series of supporting-ribs 60 extending downward from the web and from beam to beam and resting on said suspenders, substantially as described.

7. The combination, with the beams, of a series of suspenders supported by the tops of 65 the beams and extending downward and then from beam to beam and a hollow tile-filling supported by said suspenders and filling the

space between the webs of the beams, substantially as described.

8. The combination, with the beams, of a series of suspenders supported by the tops of 70 the beams and extending downward and then from beam to beam and a hollow tile-filling supported by the suspenders and filling the space between the webs of the beams, the tile 75 being grooved to receive and fireproof the lower flanges of the beams, substantially as described.

9. The combination, with the beams, of a series of suspenders supported by said beams 80 and extending from beam to beam and a tile-filling consisting of a series of tile supported by said suspenders and having their tops constructed to receive and support the free edge of the next tile, so as to form a level surface, 85 substantially as described.

10. The combination, with the beams, of a series of suspenders supported by said beams and extending from beam to beam and a tile- 90 filling consisting of a series of tile, each extending the full depth of the filling and having one side supported on the suspenders and the free edge of the top block supported on the next tile, so as to form a level surface, 95 substantially as described.

11. The combination, with the beams, of a series of suspenders supported by said beams and extending from beam to beam and a tile- 100 filling consisting of a series of tile, each extending the full depth of the filling and having one side supported on the suspenders and extending transversely to the beams, and the free edge of the top block supported in a recess on the next tile, so as to form a level surface, 105 substantially as described.

12. The combination, with the beams, of a series of suspenders supported by said beams and extending from beam to beam and a tile- 110 filling supported by said suspenders, consisting of a series of tile, each extending the full depth of the filling and forming a flooring or floor-support, substantially as described.

13. The combination, with the beams A and suspenders B, supported thereby and extend- 115 ing from beam to beam, of vertical tile-blocks resting on said suspenders and forming a support for the flooring, substantially as described.

14. The combination, with the beams A, of suspenders B, supported by said beams and 120 extending from beam to beam, and vertical tile-blocks resting on said suspenders and forming a support for the floor and having horizontally-projecting ribs 11 and blocks 12, supported on said ribs, substantially as de- 125 scribed.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WM. ORR.

Witnesses:

H. N. CORNING,  
JAMES J. WILSON.