(No Model.) 2 Sheets—Sheet 1.

P. M. BRUNER.

METHOD OF LAYING HOLLOW CONCRETE FIRE PROOF FLOORS.

No. 356,704. Patented Jan. 25, 1887.

Fig. 1.

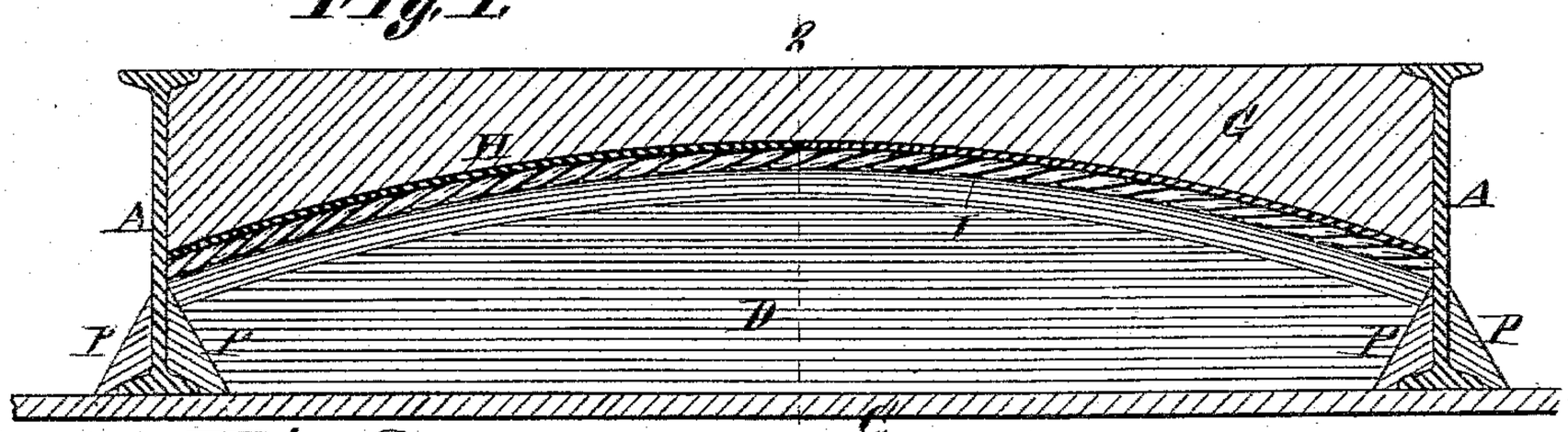


Fig. 2.

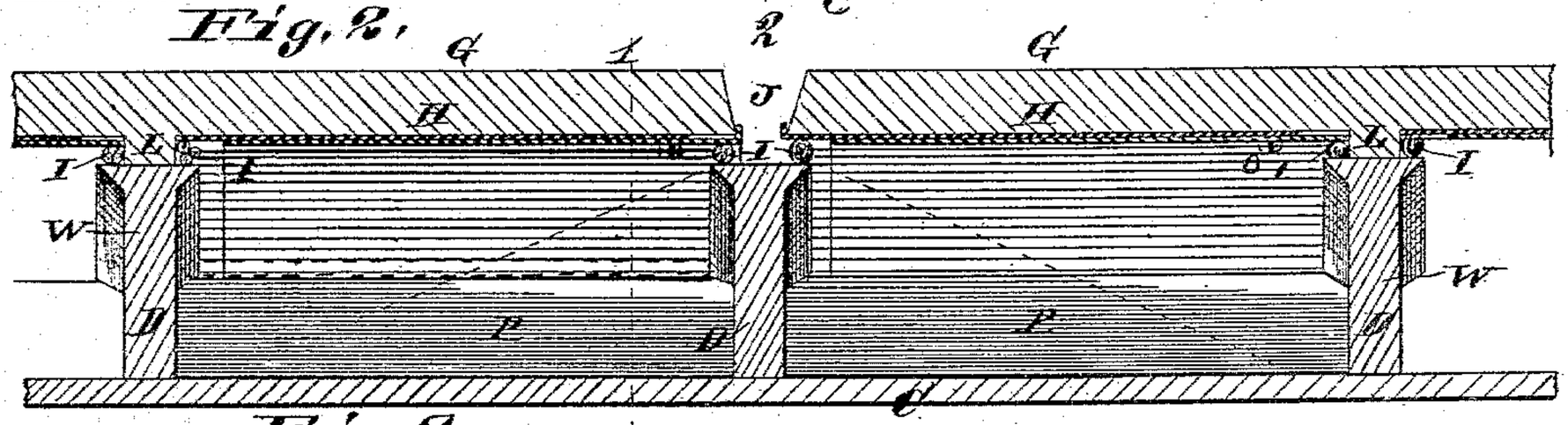
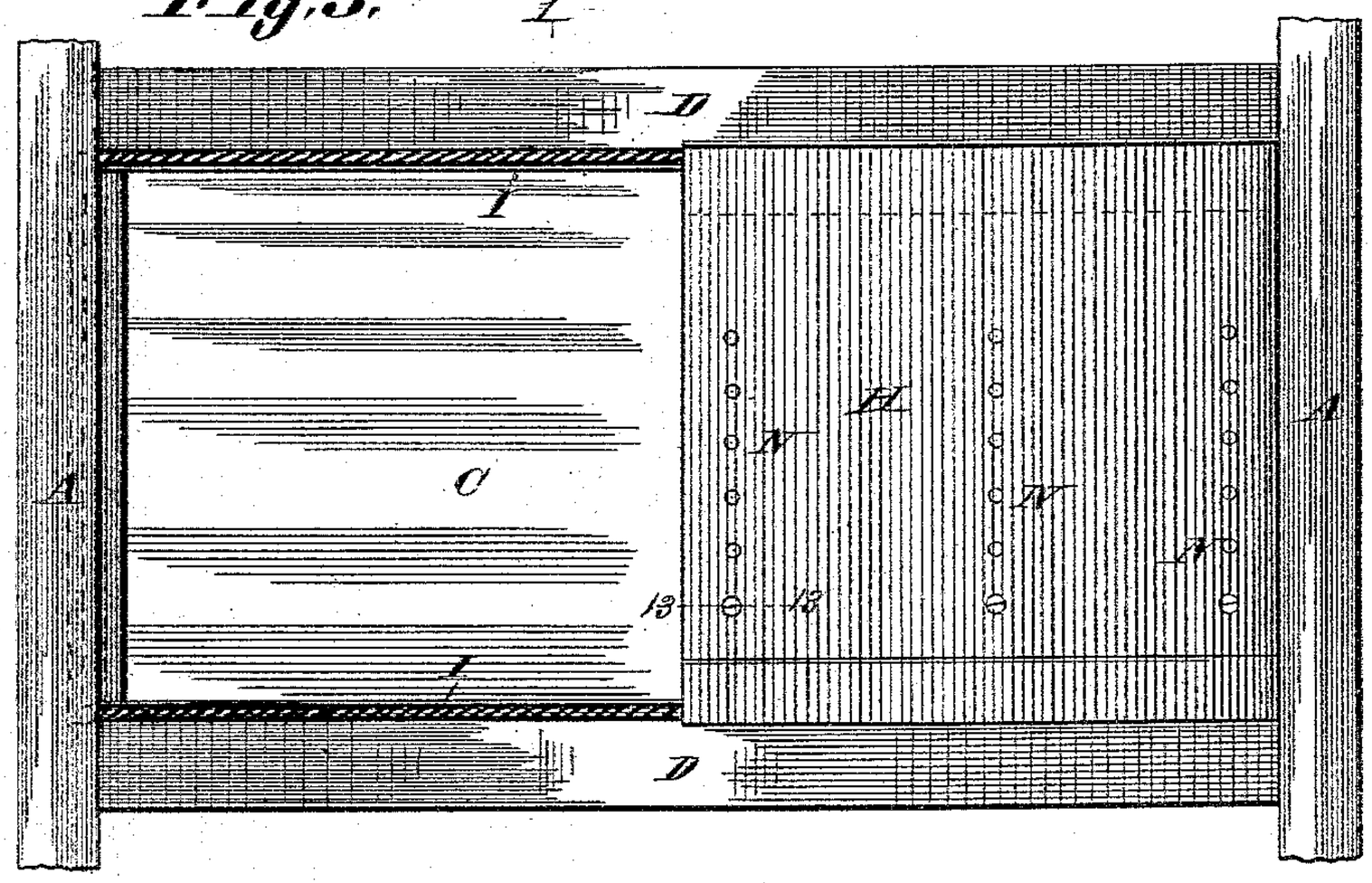


Fig. 3.



Witnesses
F. A. Hopkins,
Edward Stern,

Inventor
Preston M. Bruner
By his Attorney
Knight Bros

(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

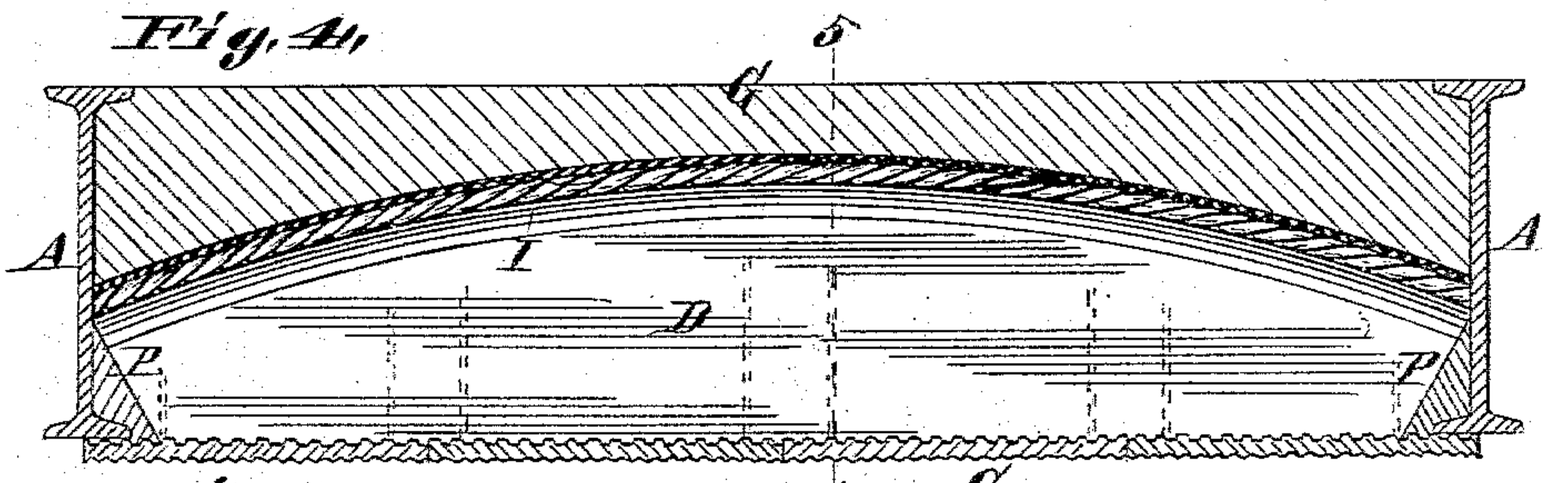


Fig. 5

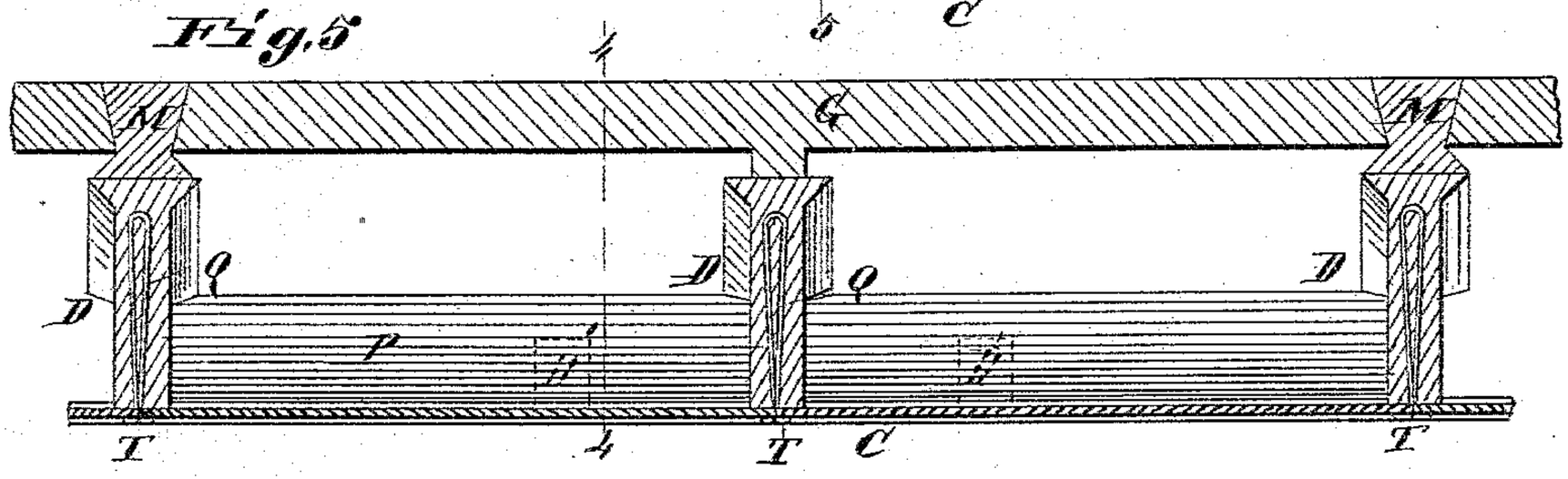


Fig. 6. Fig. 7. Fig. 8. Fig. 9.

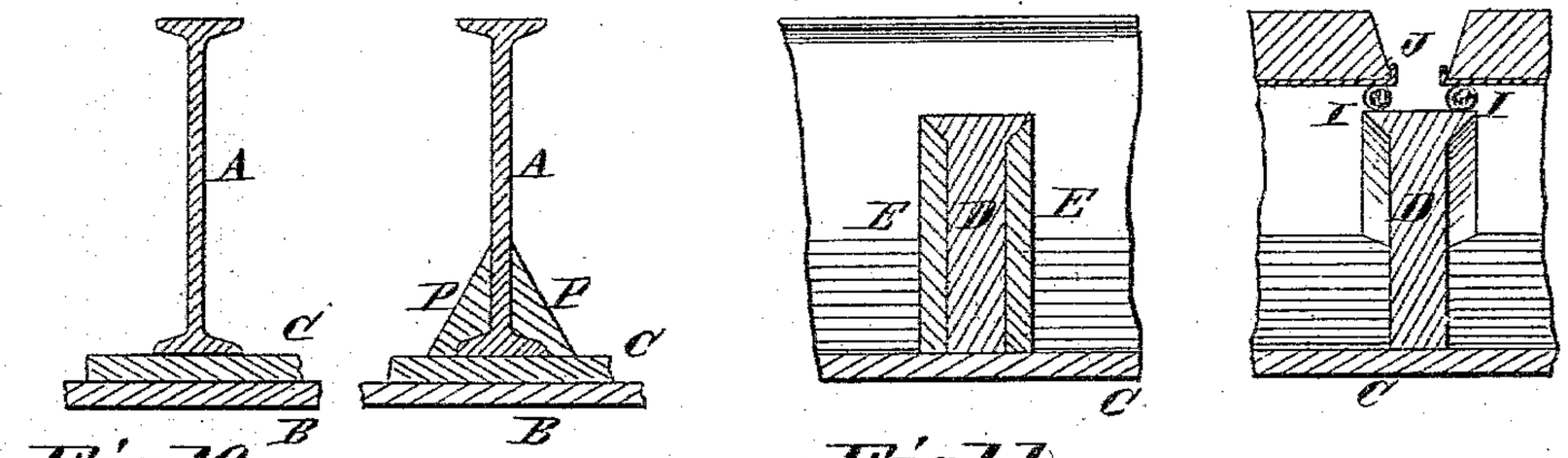


Fig. 10. Fig. 11.

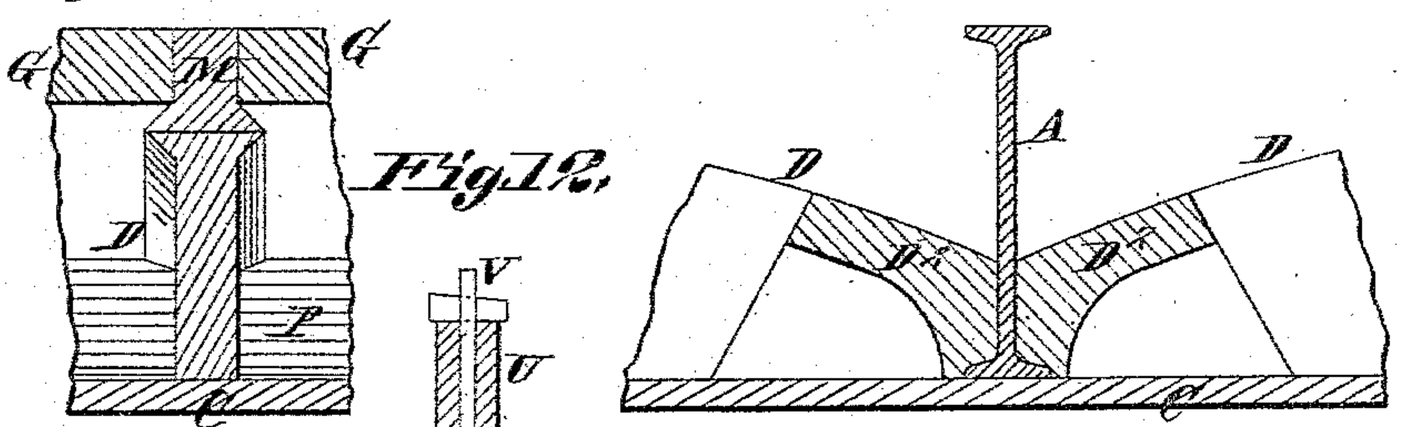


Fig. 12.

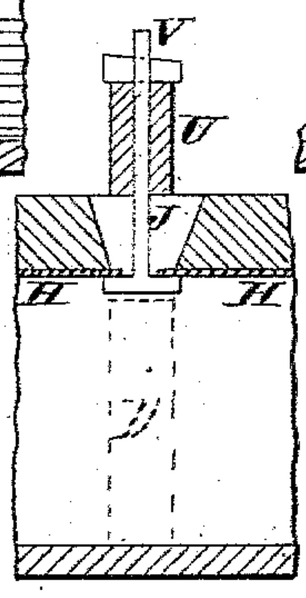
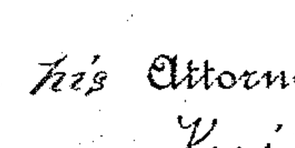


Fig. 13.



Witnesses
F. A. Hopkins
Edward Stein

Inventor
Preston M. Bruner
By his Attorney
Knight Bros

UNITED STATES PATENT OFFICE.

PRESTON M. BRUNER, OF ST. LOUIS, MISSOURI.

METHOD OF LAYING HOLLOW CONCRETE FIRE-PROOF FLOORS.

SPECIFICATION forming part of Letters Patent No. 356,704, dated January 25, 1887.

Application filed June 7, 1886. Serial No. 204,375. (No model.)

To all whom it may concern:

Be it known that I, PRESTON M. BRUNER, of the city of St. Louis, in the State of Missouri, have invented a certain new and useful Improvement in the Method of Laying Hollow Concrete Fire-Proof Floors, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, and in which—

Figure 1 is a detail vertical section through a floor, illustrating my improved method, the section being taken crosswise of the beams and lengthwise of the ribs or centers, and being taken on line 1 1, Fig. 2. Fig. 2 is a similar view taken lengthwise of the beams and crosswise of the ribs or centers, and taken on line 2 2, Fig. 1. Fig. 3 is a detail view of the beams, showing two ribs and one of the plates upon which the concrete to form the arches is placed. Fig. 4 is a view similar to Fig. 1, differing only in the manner of forming the ceiling. This section is taken on line 4 4, Fig. 5. Fig. 5 is a view similar to Fig. 2, except that the plates upon which the concrete is placed are removed and the joints between the concrete closed, and this figure also shows the plates of the ceiling shown in Fig. 4. Fig. 6 is an enlarged view taken through one of the beams, showing the manner of laying the ceiling. Fig. 7 is a similar view showing the abutments of the ribs or centers. Fig. 8 is a detail view illustrating the manner of making the ribs or centers. Fig. 9 is a detail view illustrating the manner of supporting the removable plates upon which the concrete is placed to form the arches. Fig. 10 is a detail view illustrating the manner of closing the joints between the sections of the arches. Fig. 11 is a detail view illustrating the abutments between the beams and the ribs or centers, this form being a modification of that shown in Figs. 1 and 7. Fig. 12 illustrates a modification of the manner of supporting the plates shown in Fig. 9. Fig. 13 is a detail view illustrating the manner of connecting the sectional supporting-plates.

My invention relates to an improved method of laying or putting down hollow concrete fire-proof floors of buildings, (the concrete being put down in plastic form;) and it consists in features of novelty hereinafter fully described, and pointed out in the claims.

Referring to the drawings, A represents the beams usually employed in the structure of floors of buildings, being I form and made of iron. Beneath these beams is secured a plank or other temporary support, B, as shown in Figs. 6 and 7. Upon this support, extending beneath the beams, is placed a permanent cement facing, C, that forms the ceiling, and which (when it becomes hardened) will admit of the support B being removed. Upon this ceiling C, thus formed, is laid a number of concrete centers or ribs, D, which span the spaces between the beams A, which are preferably made of arch form, and which are placed transverse to the line of the beams. These ribs are preferably made, as shown in Fig. 8, by placing planks or supports E each side of where they are to be formed, and pouring the concrete in between them. As soon as the concrete has become hardened, the supports E are removed, leaving these ribs or centers, which are preferably formed with T-heads, as shown in the drawings. When the ribs have thus been formed, I lay over them a concrete arch or covering, G.

To support the concrete of the arch while it is soft, I place plates or strips H between the ribs D, and in order that these plates may be removed after the concrete of the arch hardens I place between them and the ribs supports I, which preferably consist of ropes. It will be seen that the plates do not meet at the ribs, but a space is left between them and also in the arch, as shown at J, Figs. 2, 9, and 12. After the concrete hardens, the ropes I are removed through these openings J, and the plates are then allowed to drop down from the arch into the position shown by dotted lines in Fig. 2, and may be drawn out through the openings J for further use. Instead of having an opening, J, at each rib, I prefer and have thus shown an opening at each alternate rib, as the plates may be drawn from both directions through this one opening. I can, however, leave a space at each rib, if desired.

At the ribs where there are no spaces left the concrete passes down between the ends of

the plates onto the ribs, as shown at L, Fig. 2, and after the plates are removed the openings J are closed by pouring concrete into them, as shown at M, Fig. 5, which comes against and is supported by the ribs at these openings. Thus after the plates are removed the arch between each two beams is made in one continuous piece. The ropes I, away from the openings J or at the ribs where there are no openings, may be drawn out by being formed in one piece with the ropes at the openings, as shown by dotted lines in Figs. 2 and 3.

I am thus enabled to make a hollow concrete ceiling with no more material than is necessary, a space being left between the ceiling and arch and the various ribs.

As the spaces between the ribs sometimes vary, I prefer to make the plates H adjustable by forming holes N therein and connecting them by bolts O, as shown in Figs. 2, 3, and 13, the bolts being countersunk into the upper plates, and having nuts on their lower ends, as shown. The plates can thus be lengthened out or shortened up to correspond with the space between the ribs, and may be made adjustable in either direction. They are preferably made of metal, so as to be thin and not occupy unnecessary room between the ribs and the arches, and for the reason that they can be better drawn out through the openings J, as they will bend in case the openings are not large enough to permit of their being drawn out without bending.

As shown in Figs. 1 and 7, I prefer to place at the bottom of the beams, upon the ceiling C, abutment-pieces P, against which the ends of the ribs bear and are braced, as shown in Fig. 1. These abutments are made of concrete, and are made when the ceiling is laid, so as to be hard and set when the ribs or centers are made.

In Figs. 4 and 5 I have shown the ceiling secured to the ribs by means of metal rods or strips Q, which are embedded in the ribs, as shown, and which are turned outward at their lower ends at T to engage the ceiling. In this case the ceiling is composed of sections of concrete or fire-clay put in place in solid form, or after they are hardened, and they are preferably ribbed or corrugated, as shown in Fig. 4, so that the cement of the ribs will adhere to them.

In the modification shown in Fig. 12 a cross-strip, U, is placed on the I-beam A, and a headed plate, V, is secured thereto. The plates H are placed on the heads of these plates V, and are supported by them, and when the concrete hardens the plates V are removed, permitting the removal of the plates H. This will be particularly advantageous where there are no ribs to support the inner ends of the plates, as shown at W, Fig. 2; or, in other words, it is sometimes desirable to have only one-half the number of ribs D, and by this means the ends of the plates can be supported at these points where there are no ribs, and after the plates are removed the openings can be filled up, and, if desired, the concrete may pass down or fill the space between the openings and the ceiling, as shown by dotted lines, Fig. 12, the ribs being made in this case after the top has been formed.

If desired, the ribs D may be interspersed by low ribs D′, as shown by dotted lines, Fig. 5, that do not extend to the top G, the object being to cheapen and lighten the structure.

In the modification of the abutments shown in Fig. 11 the different ribs are united at the beams by continuous pieces, D^2, of concrete.

I claim as my invention—

1. The improved method of laying hollow concrete floors herein shown and described, consisting in making ribs between the beams, then placing plates or strips over the ribs, then placing concrete upon the plates to form the arch, and finally, after the arch has hardened, removing the plates through openings left for that purpose, substantially as shown and described.

2. The improved method of laying hollow concrete floors, consisting in making ribs between the beams, then placing a support over the ribs, then forming the arch on said support, and finally withdrawing the support after the arch hardens, substantially as set forth.

3. The improved method of laying hollow concrete floors, consisting in first placing the beams, then making a ceiling beneath them, placing ribs between said beams, and forming arches extending from rib to rib and resting upon the same, substantially as set forth.

4. An improved method of laying hollow concrete floors, consisting in laying a ceiling beneath the beams, then laying ribs on the ceiling, then placing plates upon the ribs, then laying an arch upon the plates, and finally, after the arch has hardened, withdrawing the plates through openings left for that purpose, substantially as set forth.

5. An improved method of laying hollow concrete floors, consisting in laying a ceiling, then laying ribs on the ceiling between the beams, then placing plates on the ribs with removable strips beneath them, then laying the arch upon the plates, and finally withdrawing the strips and plates from beneath the hardened arch through openings left for that purpose, substantially as set forth.

6. An improved method of laying hollow concrete floors, consisting in making ribs between the beams, then placing removable supports over the ribs, then laying the arch over the ribs on the plates, then withdrawing the plates from beneath the hardened arch through openings left for the purpose, and finally closing the openings with cement, substantially as shown and described.

7. An improvement in the method of laying hollow concrete floors, consisting in laying the ceiling on a temporary support with abutments against the beams, then laying ribs upon

the ceiling between the beams, then placing removable supports over the beams, then laying the arch on the supports, and finally, after the parts have hardened, withdrawing the supports from beneath the arch through openings left for the purpose, substantially as shown and described.

8. The improved method of forming concrete structures, which consists in first providing suitable supports, laying thereon a shell or covering of concrete material while in a plastic condition, leaving openings through said shell or covering through which the supports are withdrawn after the concrete hardens, and subsequently closing said openings, substantially as set forth.

9. The improved method of forming concrete structures, which consists in first forming a ceiling, placing thereon suitable supports, and finally laying thereon a shell or covering of concrete material while in a plastic condition, leaving openings through said shell or covering through which the supports are withdrawn after the concrete hardens, substantially as set forth.

PRESTON M. BRUNER.

In presence of—
GEO. H. KNIGHT,
JOE WAHLE.