No. 712,683. Patented Nov. 4, 1902.

H. R. KEITHLEY.

FIREPROOF BUILDING.

(Application filed Mar. 19, 1900. Renewed Apr. 17, 1902.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.

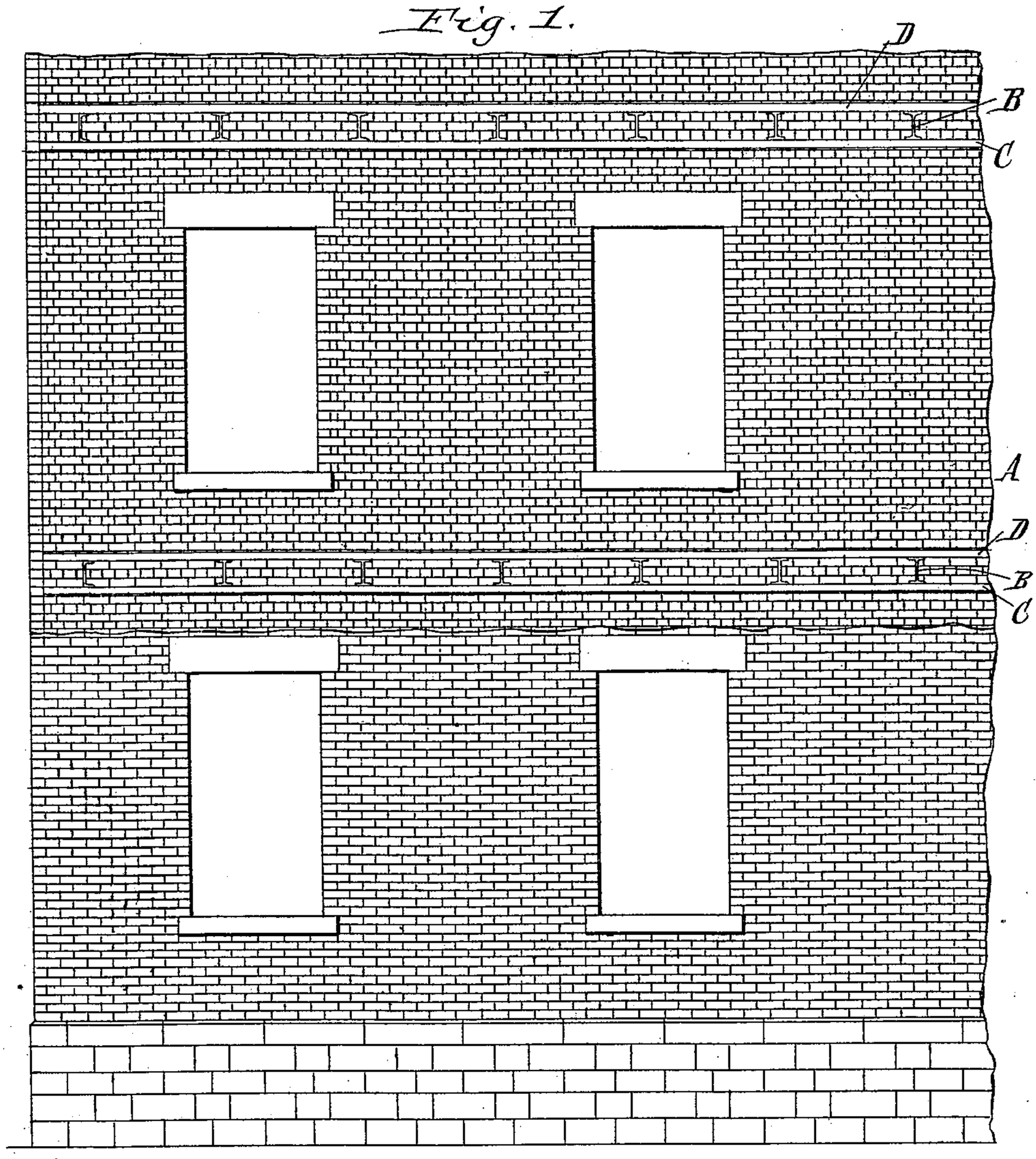
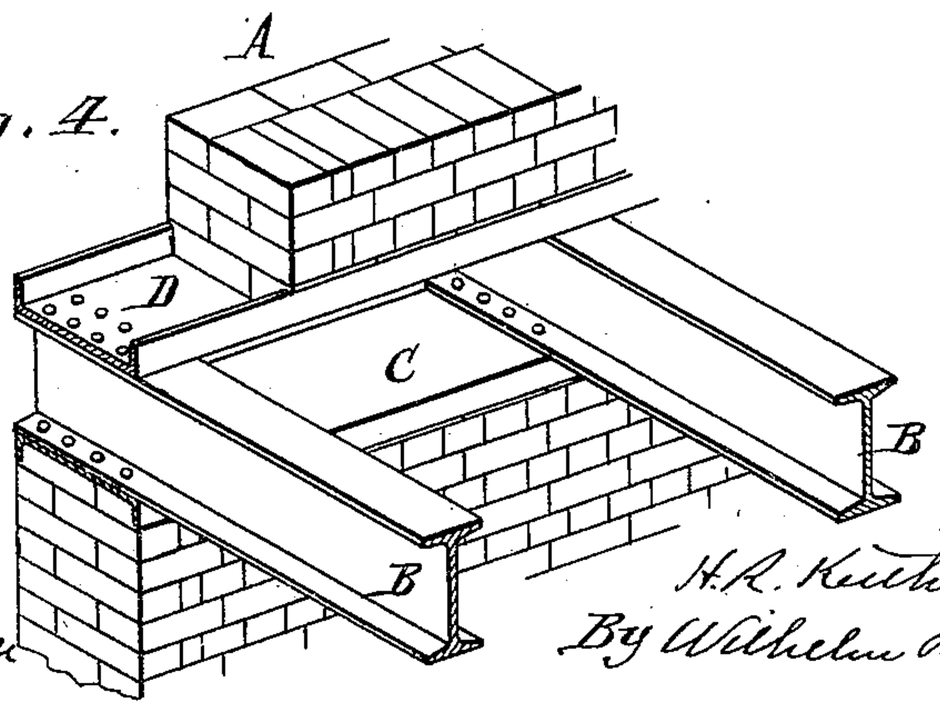


Fig. 4.



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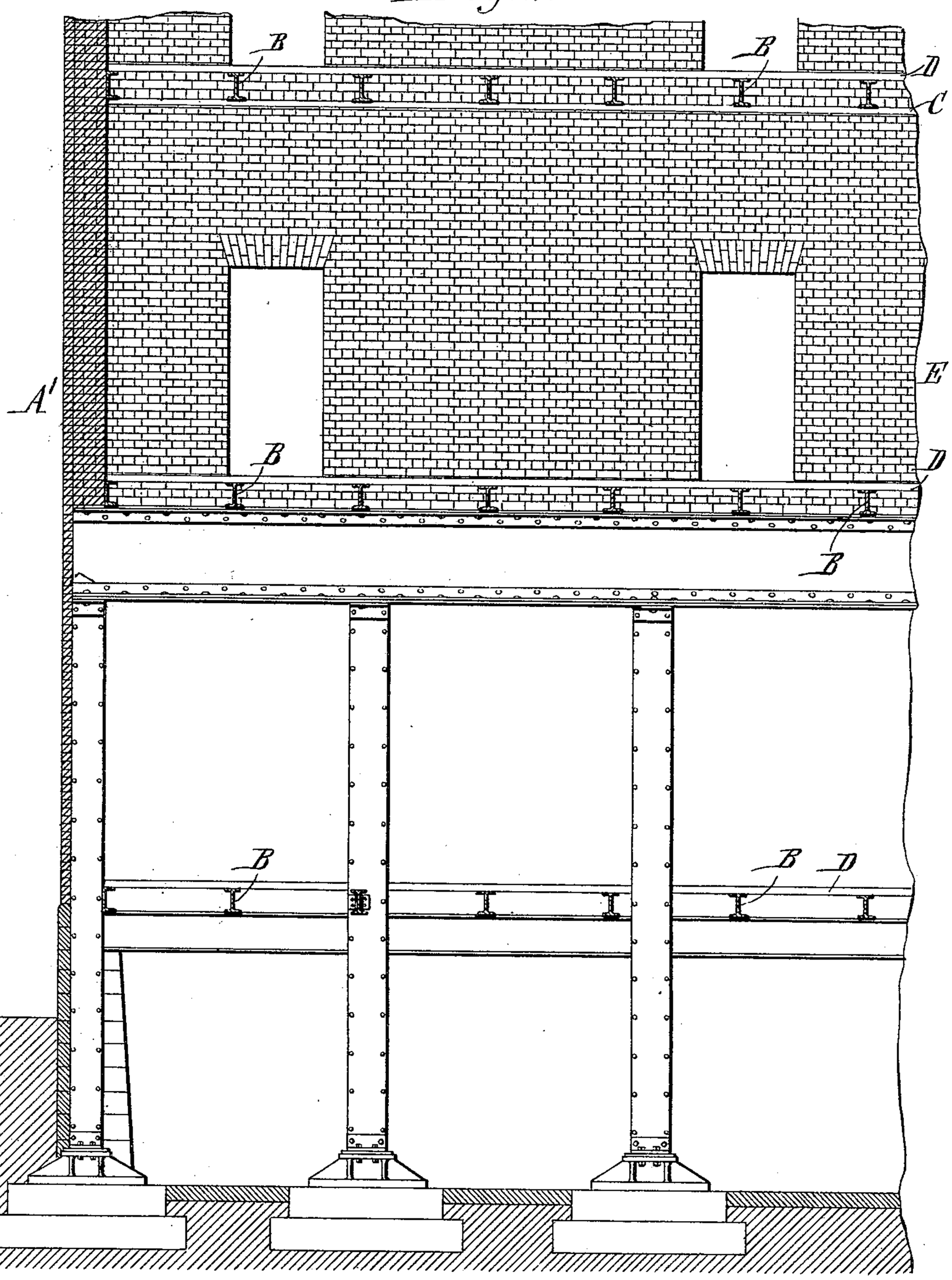
(No Model.) 4 Sheets—Sheet 2.

Fig. 2.



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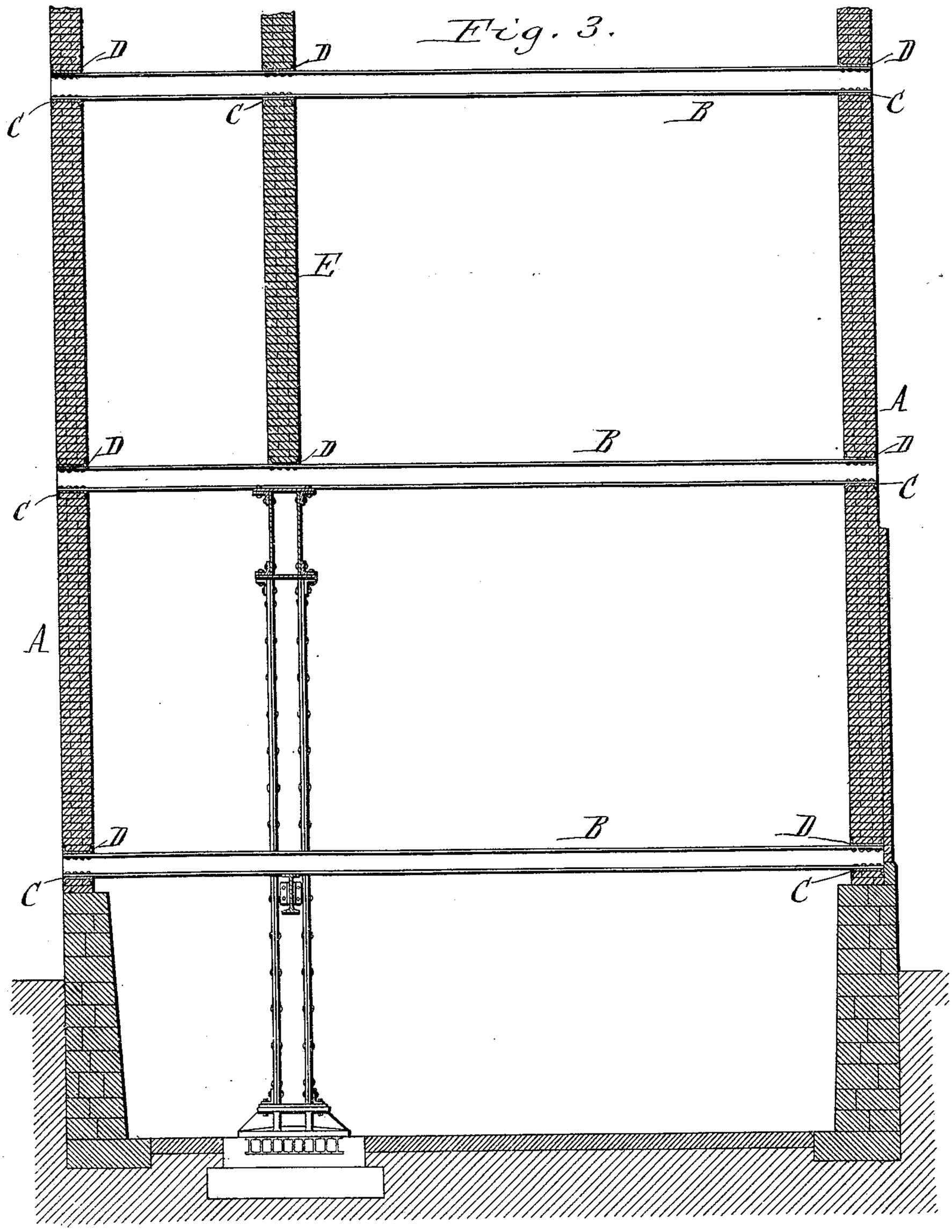
(No Model.) 4 Sheets—Sheet 3.

Fig. 3.



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(Application filed Mar. 19, 1900. Renewed Apr. 17, 1902.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 5.

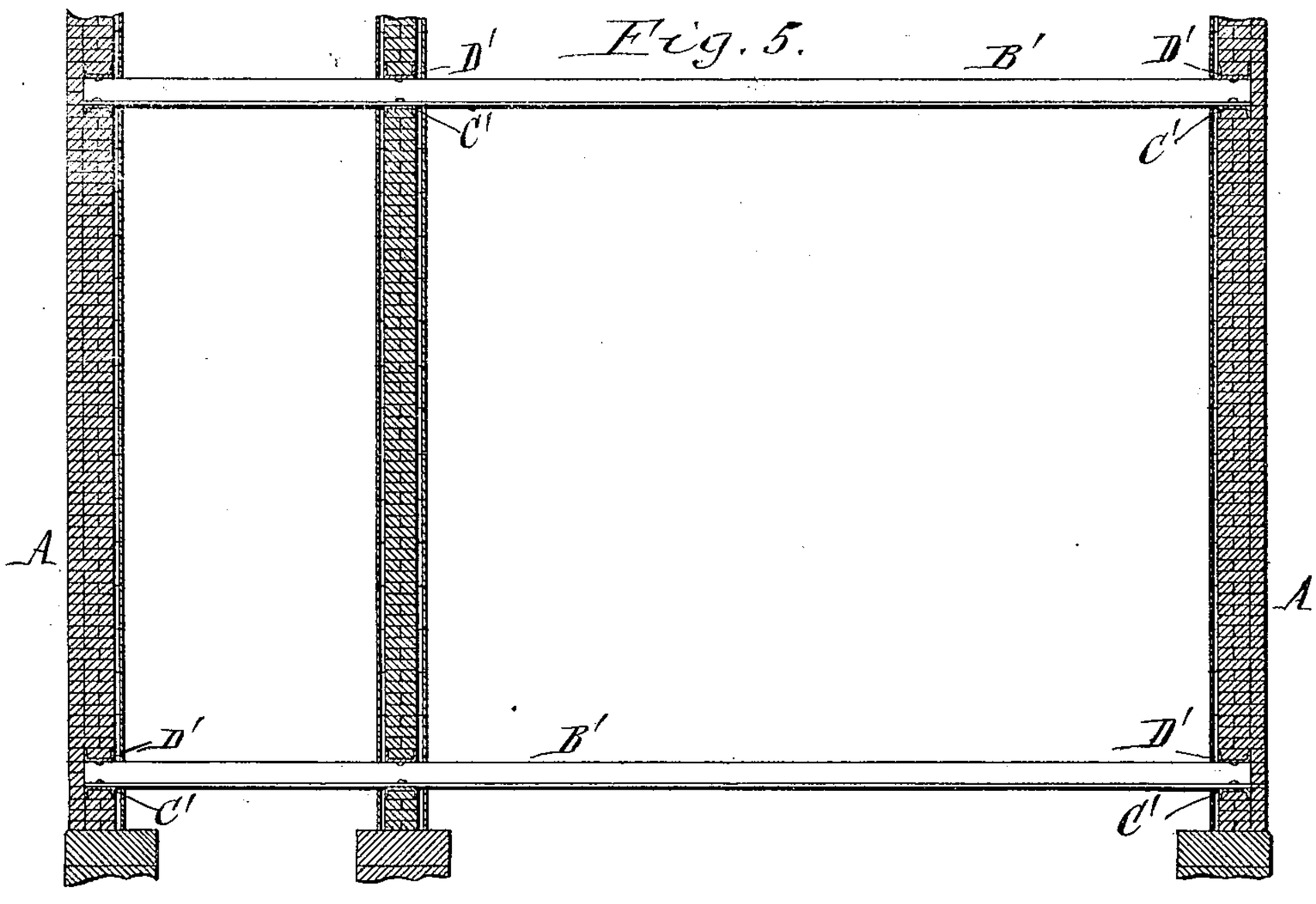


Fig. 6.

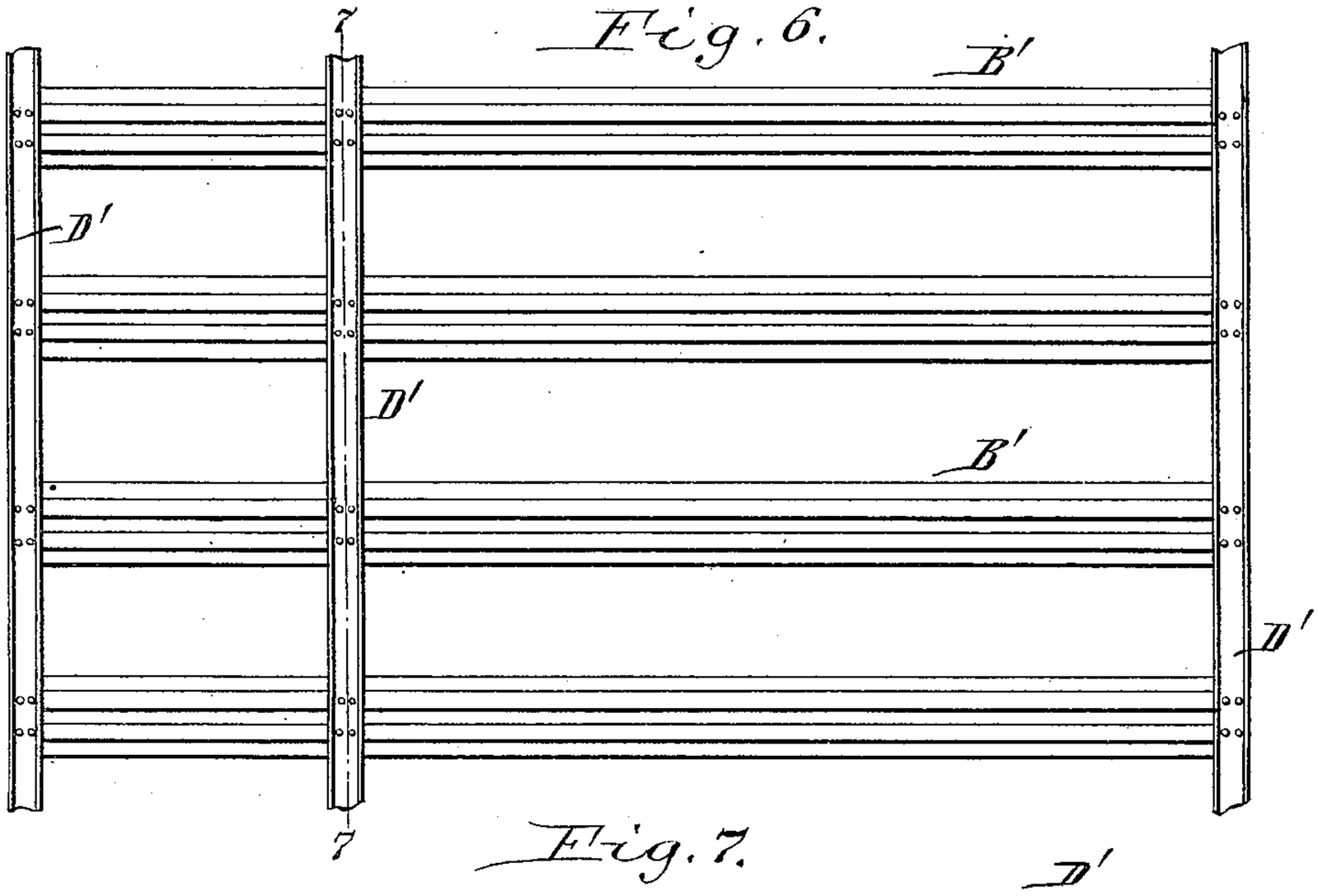
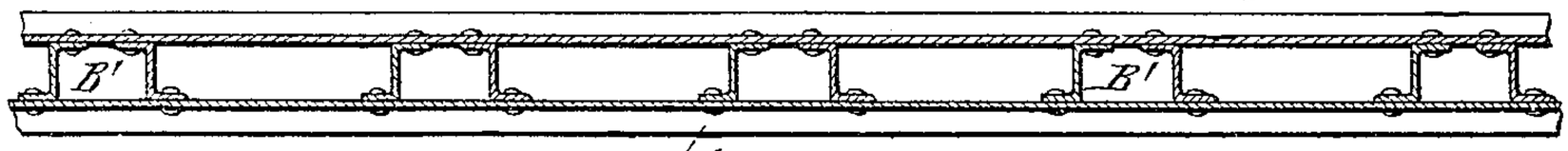


Fig. 7.



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UNITED STATES PATENT OFFICE.

HERBERT R. KEITHLEY, OF BUFFALO, NEW YORK.

FIREPROOF BUILDING.

SPECIFICATION forming part of Letters Patent No. 712,683, dated November 4, 1902.

Application filed March 19, 1900. Renewed April 17, 1902. Serial No. 103,432. (No model.)

To all whom it may concern:

Be it known that I, HERBERT R. KEITHLEY, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Fireproof Buildings, of which the following is a specification.

This invention relates to an improvement in the construction of ordinary masonry buildings which depend for their strength and stability upon their heavy masonry walls which carry the floors and all loads borne by the same as distinguished from the so-called "steel-skeleton" type of buildings in which the frame of structural steel possesses sufficient strength to carry the loads and afford the requisite rigidity and transverse strength of the structure.

Masonry buildings of the ordinary type are seldom made fireproof, and in a building of this kind of moderate height and dimensions the wooden floor-joists alone contain from ten to fifty thousand feet of lumber. In case of fire this mass of combustible material usually causes the total destruction of the building, including the walls of masonry, which crumble and fall from the combined effects of intense heat and the water thrown upon the fire. It has been attempted to render such ordinary masonry buildings fireproof by substituting metallic I-beams for the wooden floor-joists ordinarily employed and interposing fireproof material between these beams, the ends of the I-beams being built into the walls and anchored to the brickwork by light "anchor-straps."

The object of my invention is to combine with the walls of an ordinary masonry building improved metallic floor-supporting frames which render the building fireproof and at the same time increase the strength and stability of its walls to such a degree as to permit the employment of lighter walls.

My invention consists to that end of a series of metallic floor-beams built in and supported by the masonry walls and horizontal anchor plates or beams extending across the top of the ends of the beams and also built in the walls, whereby the weight of the walls resting upon said anchor-beams is exerted upon and distributed over the ends of said floor-beams.

In the accompanying drawings, consisting of four sheets, Figure 1 is a fragmentary side elevation of a building embodying my invention, the facing-brick being broken away above the first story to expose the ends of the floor-beams. Fig. 2 is a fragmentary longitudinal section of the building. Fig. 3 is a fragmentary transverse section of the same. Fig. 4 is a sectional perspective view of a portion of the building, showing the arrangement of the floor-beams and anchor-beams. Fig. 5 is a transverse section showing a modified construction of the steel floor-supporting frames. Fig. 6 is a detached fragmentary top plan view of one of said frames. Fig. 7 is a longitudinal section in line 7 7, Fig. 6.

Like letters of reference refer to like parts in the several figures.

A represents the side walls, and A′ the front wall, of a building, which walls are constructed of masonry in any ordinary or well-known manner.

Referring to Figs. 1 to 4, B represents the transverse metallic beams which carry the floors of the building and which preferably consist of I-beams. The ends of the I-beams of each floor extend into or through the masonry walls and rest upon metallic supporting-plates C, consisting, preferably, of horizontal channel-bars which extend lengthwise of the side walls A. The flanges of these channel-bars extend downwardly and embrace the inner and outer sides of the portion of the walls below the floor-beams, as most clearly shown in Fig. 4. D represents horizontal anchor bars, plates, or beams which are built lengthwise into the masonry of the side walls and which bear flat upon the upper flanges of each of the floor beams or members B, as shown, so as to transmit to or exert upon the end portions of said beams the weight or pressure of the portion of the walls above said anchor-beams. These anchor-beams may be just long enough to span two adjacent floor-beams, or they may be made of sufficient length to span three or more of said beams and may be spliced or otherwise secured together end to end, so as to extend practically continuously throughout the length of the side walls. The anchor-beams preferably consist of horizontal channel-bars which are so arranged that their flanges project upwardly

and embrace the portions of the walls which rest upon the flat webs of the bars. The outer faces of the flanges of the upper and lower channel-bars C and D are flush with the inner and outer faces of the walls, as shown. The webs of the upper and lower channel-bars C D are preferably riveted or otherwise secured to the flanges of the floor-beams. By this construction the transverse floor-beams and the longitudinal anchor-beams D of each floor form a practically integral supporting-frame of great stiffness and rigidity having its end portions securely fixed or anchored in the masonry side walls of the building. As the weight of the several floors and the portions of the walls above each floor-frame is exerted upon the ends of the I-beams through the anchor-beams D, said I-beams are permanently and rigidly fixed in the masonry walls, thereby preventing the fixed and embedded end portions of these beams from sharing in the bending or deflection of the intermediate body portions of the beams under a superimposed load. The pressure thus exerted upon the ends of the floor-beams is not only the weight of those portions of the walls directly over the beams, but also those portions resting upon the anchor-beams between the I-beams, which additional weight is distributed over the ends of the adjacent I-beams by the anchor-beams bridging the same. This construction has been estimated to increase the strength and resistance of the floor-beams fifty per cent. and to reduce their deflection at the middle of the span under a load to one-fifth of that of beams supported at their ends by ordinary angle connections. An important advantage gained by this large increase in the strength of the beams and this large reduction in their deflection is that correspondingly-greater spans can be safely bridged with comparatively light floor-beams than by the steel-frame constructions now commonly employed. These same advantages are secured in continuous floor-beams extending through an intermediate wall or partition, as shown at E in the upper portion of Fig. 3.

My improved building construction is especially adapted to buildings of moderate height—say from two to five stories. In a building of five stories or less twelve-inch masonry walls of common brick and mortar will safely carry their own weight and that of the four floors above the foundation and the roof. Such twelve-inch walls, combined with my improved steel binding-frames, produce a building of much greater rigidity and transverse strength than the old type of building having comparatively thick walls and wooden floor-joists, partitions, and framework. By the use of good paving-brick and Portland cement or natural cement for the walls in all stories below the fifth from the top of the building this construction can be used with safety for buildings up to ten stories in height with only twelve-inch walls.

In the old construction employing wooden joists the strength of the walls is greatly reduced along every line of connection with the joists, and to compensate for this deficiency in strength it is necessary to correspondingly increase the thickness of the walls. In my improved construction the bearings for the loads at each floor are distributed across the entire thickness of the walls, and the latter are strongest at their lines of connection with the steel floor-supporting frames. This increased strength of the walls at each story will compensate for and permit a reduction in the thickness of the walls to a sectional area which will safely bear the loads to be carried by the same.

If desired, angle-bars or other flanged bars may be used in place of the channel-bars D.

Figs. 5, 6, and 7 show a modified construction of the steel floor-supporting frames which is suitable for dwellings, flats, apartment-houses, hotels, and similar buildings. In this modified construction, which is lighter than that first described, the floor-beams consist of Z-bars B′ instead of I-beams. These beams are connected together at their ends by upper and lower channel-bars D′ C′, which are built into the masonry walls as in the construction first described. The Z-beams are arranged in pairs, with their upper flanges facing each other, as shown in Fig. 7, and their flanges are riveted or bolted to the horizontal webs of the channel-bars.

I am aware that changes may be made in my improved building construction which come within the scope of my invention, and I do not, therefore, wish to be limited to the particular construction herein shown and described.

I claim as my invention—

1. The combination with opposing walls of a building, of metallic floor-beams having their end portions embedded in said walls, and horizontal anchor members built lengthwise into said walls and extending across the top of said floor-beams, whereby said anchor members transmit the pressure of the superposed walls to the end portions of the floor-beams, substantially as set forth.

2. The combination with opposing masonry walls of a building, of flanged metallic floor-beams having their end portions embedded in said walls, and horizontal metallic anchor members built into said walls and bearing upon the upper flanges of said floor-beams, substantially as set forth.

3. The combination with opposing masonry walls of a building, of a metallic floor-supporting frame composed of transverse metallic beams provided at their top with horizontal flanges and having their ends supported in said walls, and horizontal anchor members embedded in said walls and extending across the top of said floor-beams and secured to the flanges thereof, substantially as set forth.

4. The combination with opposing walls of

a building, of metallic floor-beams having their end portions embedded in said walls, and flanged horizontal anchor members built into said walls and bearing flat upon the end portions of said floor-beams, substantially as set forth.

5. The combination with opposing walls of a building, of metallic floor-beams having their end portions embedded in said walls, and horizontal channel-bars built into said walls and bearing flat upon the end portions of said floor-beams, the flanges of said channel-bars being arranged to extend upwardly and embracing the superimposed walls, substantially as set forth.

6. The combination with opposing walls of a building, of metallic floor-beams having their end portions embedded in said walls, horizontal anchor members built into said walls and secured across the top of said floor-beams, and horizontal supporting members built lengthwise into said walls and secured across the under side of said floor-beams, substantially as set forth.

7. The combination with opposing walls of a building, of metallic floor-beams having their end portions embedded in said walls, and upper and lower horizontal channel-bars built into said walls and secured across the top and the bottom of said floor-beams, respectively, the flanges of said upper channel-bars extending upwardly and embracing the portion of the walls above the floor-beams, and the flanges of said lower channel-bars extending downwardly and embracing the portion of the walls below the floor-beams, substantially as set forth.

Witness my hand this 17th day of February, 1900.

HERBERT R. KEITHLEY.

Witnesses:
CARL F. GEYER,
JNO. J. BONNER.