P. H. JACKSON.

Improvement in Girders.

No. 126,396. Patented May 7, 1872.

Fig. 1.

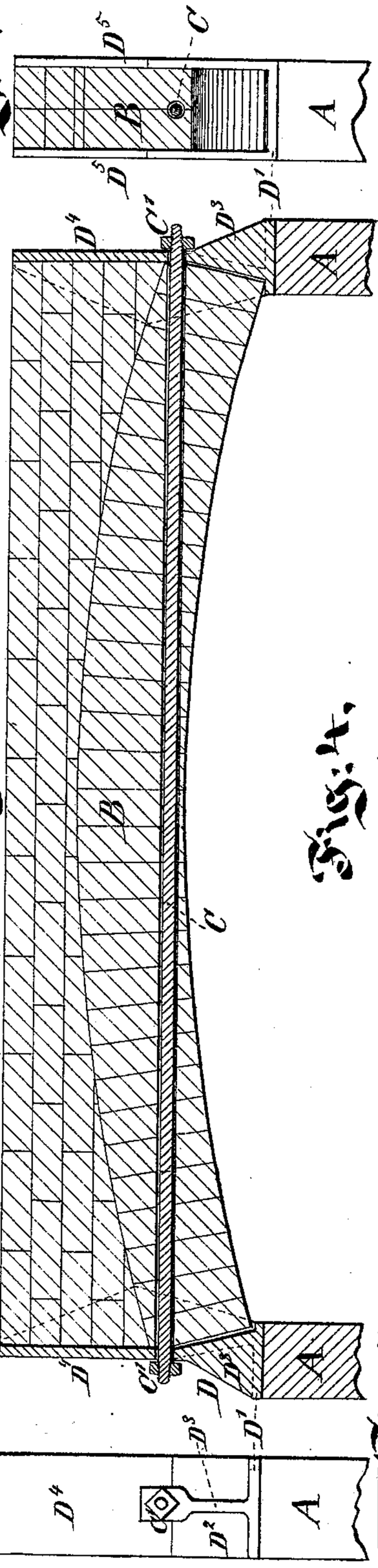

Fig. 2.

Fig. 3.

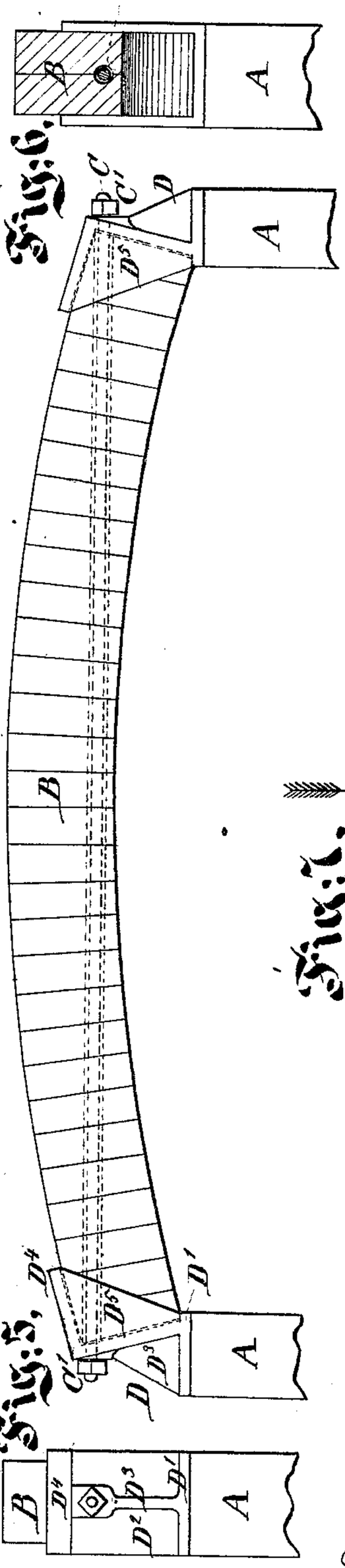

Fig. 4.

Fig. 5.

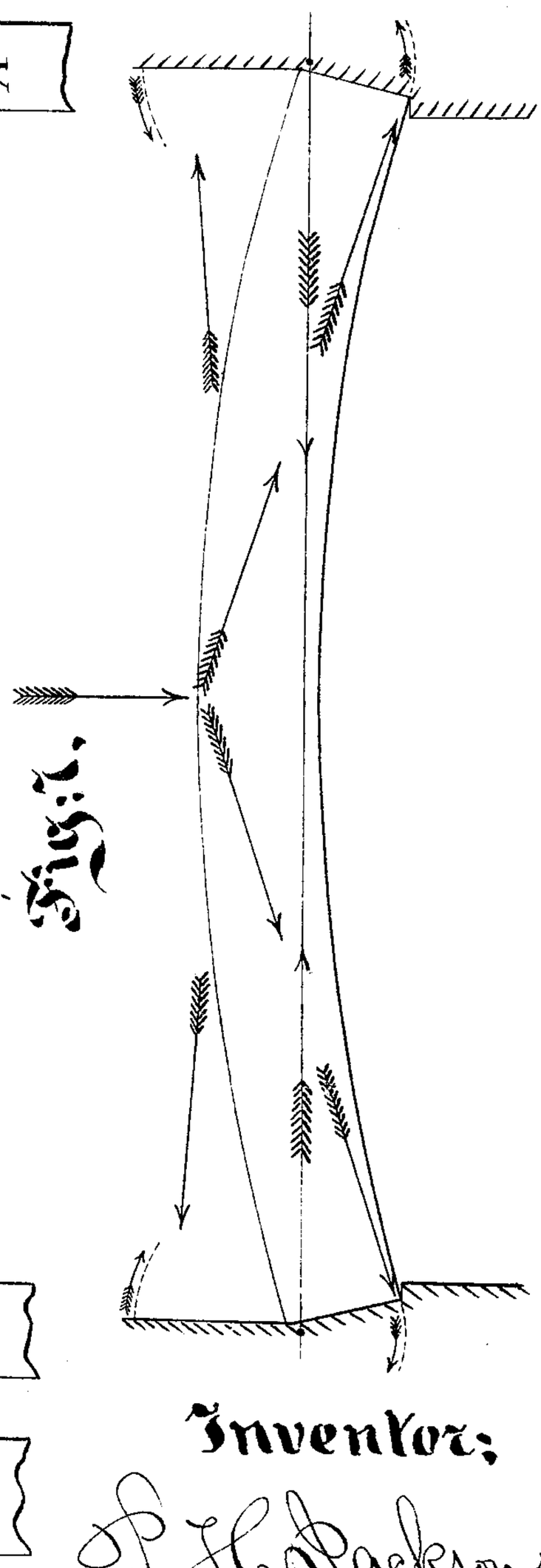

Fig. 6.

Witnesses;

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126,396

UNITED STATES PATENT OFFICE.

PETER H. JACKSON, OF NEW YORK, N. Y.

IMPROVEMENT IN GIRDERS.

Specification forming part of Letters Patent No. 126,396, dated May 7, 1872.

Specification describing an Improvement in Girders, invented by PETER H. JACKSON, of the firm of J. L. Jackson & Brothers, in New York city, in the State of New York.

My invention is intended more particularly for the fronts and rears of city buildings, but it may be used with advantage in any place where girders are required. I esteem it of more particular advantage in buildings requiring girders which are liable to be exposed to intense heat for a brief period in case of fire.

The effect of the heating of the exposed iron girders in buildings is very destructive. The current of flame pouring out from a lower story, destroying the window-frames and any ordinary casing which protects the iron, heats the lower surface of the iron to such a temperature as to materially weaken it. I use the bricks or stone of the masonry in a form to inclose one or more strong ties to resist the thrust of the arch, dispensing with any soffit-flange or other direct supporting metal. I turn a low arch, constructing it on centers of ordinary or any suitable construction, like ordinary arch-work, and provide peculiar skew-backs to receive the thrust, and connect them by ties which are completely embedded in the masonry. These ties, concealed from view, and protected from fire within the masonry, form the only metallic connections between the two sides of the arch. The thrust of the arch is felt most powerfully at its lower edge, and, consequently, on the lower portion of the abutment-castings. The tendency of the latter to turn around under this strain is resisted by the ties at a little higher level, and by the extension of the abutment-castings upward above the ties, and the spreading out of the same so as to obtain a large and fair bearing against the adjoining masonry. The form of the abutment-castings, their sizes, and the number of the ties may be varied.

The following is a description of what I consider the best means of carrying out my invention.

The accompanying drawing forms a part of this specification.

Figure 1 is a longitudinal vertical section. Fig. 2 is an end elevation; and Fig. 3 is a cross-section through the center. Figs. 4, 5, and 6 are representations of a modification involving the same general features, though in a less perfect form. Fig. 4 is a side elevation. Fig. 5 is an end elevation; and Fig. 6 is a cross-section through the center. Fig. 7 is a diagram, showing the direction of the several pressures or strains. It is drawn with reference more particularly to the form shown in Figs. 1, 2, and 3, where the portion of the abutment-casting which resists its turning is extended upward directly, and is pressed outward by the masonry sufficiently to resist the rotatory tendency.

Similar letters of reference indicate correing parts in all the figures.

A is the supporting masonry at the sides of the arch, and B is the arch-masonry itself. The masonry B is formed on a corresponding centering, not represented. C is a tie, embedded in the masonry, and extending in a right line from one side to the other of the arch. D D are the abutment-castings. Some of the parts of the abutment-castings receive strains differently, and perform different functions from the other parts. I will distinguish some of the parts by D^1, D^2, &c., while continuing to use the simple letter D to indicate the entire abutment-casting. D^1 is a broad base-flange, which rests upon the masonry A. D^2 is a broad inclined surface, which receives directly the thrust of the arch B. D^3 is a vertical web, which stiffens the connection of the part D^2 and the part D^1. D^4 is an extension of the casting above the part D^2. It is broadly extended, and takes a firm hold of the masonry at a considerable elevation above the line of junction of the tie C. D^5 D^5 are stiffening-webs, connecting the abutment-bearing D^2 to the extended top-bearing D^4. The function of these parts D^5 is to simply strengthen the abutment-pieces.

To apply my invention in a building the abutment-pieces D are placed in position on the side supports A, and, the centering being properly placed, the ties C are inserted, and, if they are liable to be much depressed by gravity, are held up at a few points by wires or cords attached to any convenient staging above. In this condition of the metal-work the masonry of the important part B is well and carefully laid with good bricks and mortar or other suitable materials adapted to withstand a large amount of crushing force. Care is taken in this work not only to lay the bricks

well embedded in the mortar against each other, and against the abutment-surfaces proper, marked D^2, but also to fill out tightly against the top extension of the abutment-castings, which extensions are marked D^4. Fig. 1 represents one form and position of these latter portions D^4, and Fig. 4 represents another modification thereof. In either case I fill out the masonry strongly up to and against the surfaces D^4. When the masonry has set, and the centering is ready to be struck, I commence by tightening the tie C. This, in the form represented, is done by nuts C′ C′; but keys or various other devices may be substituted, if preferred. I prefer, however, to adopt strong nuts, turning on well-formed threads. When the tie is tightened sufficiently, the centering is struck and taken away, and the arch, with any superincumbent weight which may be imposed, is self-supporting.

Lines drawn in the ordinary manner to show the effect of resolution of forces should abut against the abutment-pieces near their bases. I have shown in the outline diagram appended below the figures an exhibit of the direction of the strains. There is little or no thrust, properly so called, felt at and above the points where the ties C are connected to the abutment-pieces. The thrusting force of the arch, the resistance to which holds up the structure, is felt at and near the lower edges of the voussoirs. A heavy load on the arch tends to thrust with great force at these points, and, unless the casting is strongly fortified against a turning motion, it will move at the base and let the arch be deflected. But this movement is resisted by the tie and by the portion D^4 of the abutment-casting which extends above the plane of the tie. Any turning of the abutment-casting by yielding to a spreading force at the base must draw the upper portions D^4 together, and this is sufficiently extended to take hold of a large surface of the masonry, and effectually resist this tendency. I prefer to extend the portion D^4 upward, as shown in Fig. 1; but it may be extended nearly horizontal or adjacent to the outer edges of the voussoirs, as shown in Fig. 4, if preferred. In either form of the construction the casting will be stiffly held in position by the masonry s, long as the tie or ties can be depended on to afford the proper tensile strength. I make my work with a proper surplus of strength in these parts.

In order to give the greatest possible effect, I propose, in some instances, to make the arch of fire-brick, and to inclose the tie or ties with a thickness of one inch, more or less, of melted alum and clay, or analogous extraordinary fire-resisting material. Alum, in such a position, retains its water of crystallization under all ordinary conditions, but yields it up slowly when the heat, gradually entering through the masonry, exceeds the ordinary boiling point. A small quantity of alum, lying along the line of the girder, will suffice to absorb and carry away, in the form of vapor, all the heat which will enter through the thick masonry for a long time.

I propose, under some circumstances, to make what I have here termed the masonry-arch of blocks of hollow castings, either empty or filled with brick or other masonry or strong and non-conducting material. This affords facilities for making junctions with cross-arches and the like by appropriately forming the castings, and, under other conditions, for producing highly ornamental effects; but I esteem it unnecessary to more than merely mention these obvious modifications.

I claim as my invention—

The abutment-castings or skew-backs D^2 D^4, adapted to take a firm hold on the masonry to prevent their turning, the low arch B of masonry, and the tie or ties C, combined and arranged as shown, so that the metal connecting across shall be protected from heat, and shall serve its function as a tie perfectly under all conditions, as herein specified.

PETER H. JACKSON.

Witnesses:
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