(No Model.)

J. S. SMALL.

TUBULAR FRAMEWORK FOR CONCRETE-IRON CONSTRUCTION.

No. 590,690. Patented Sept. 28, 1897.

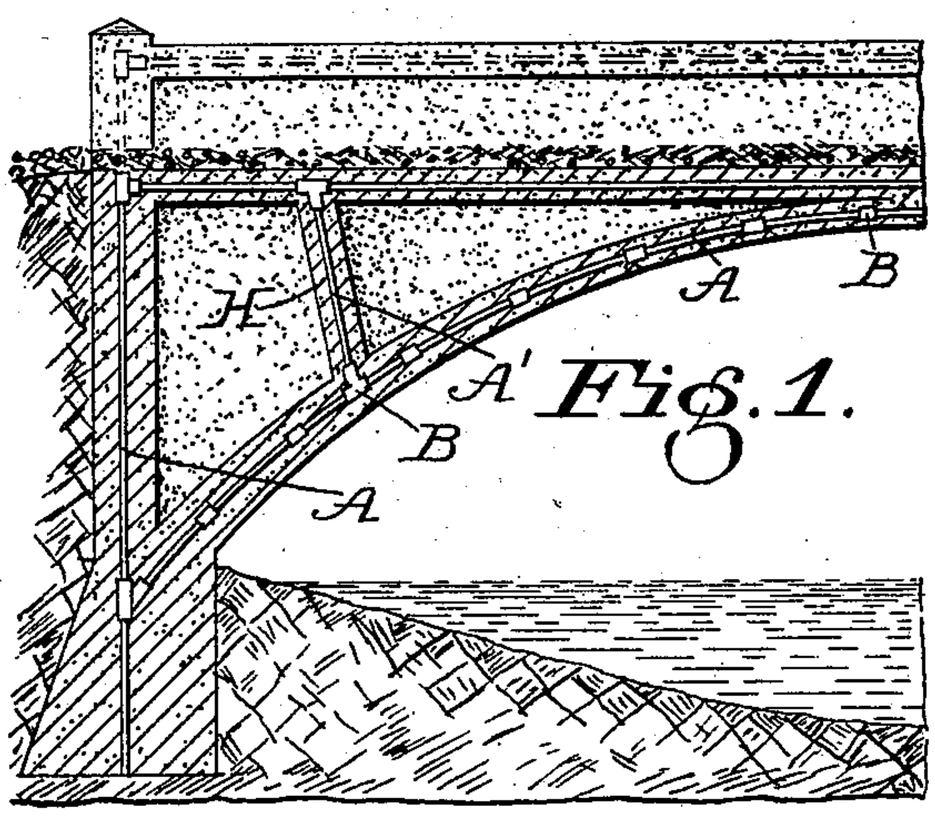

Fig. 1.

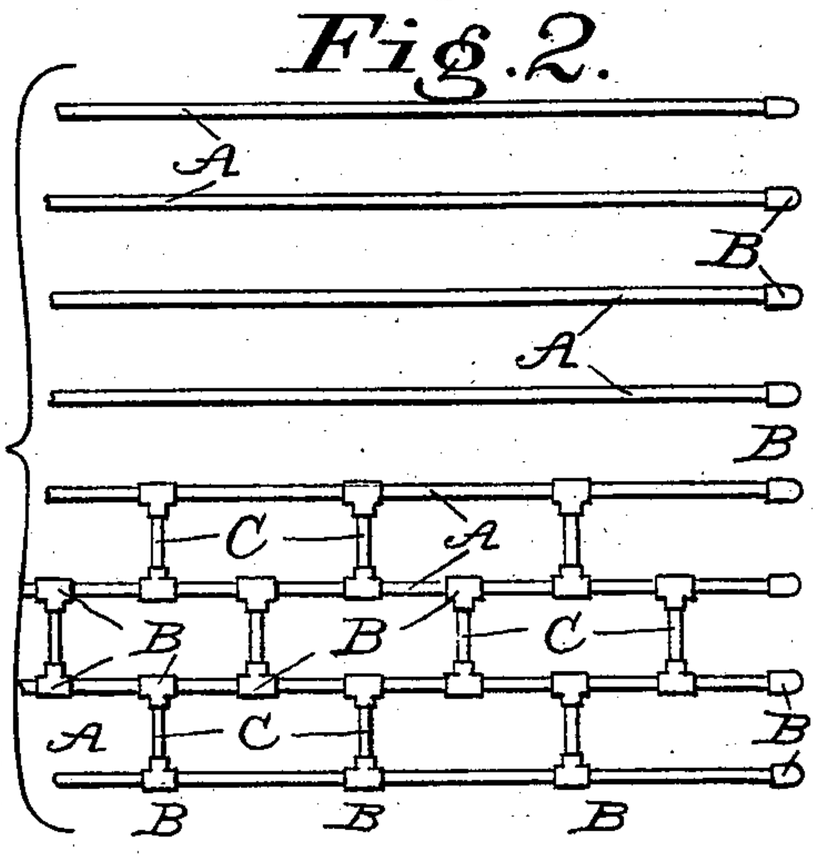

Fig. 2.

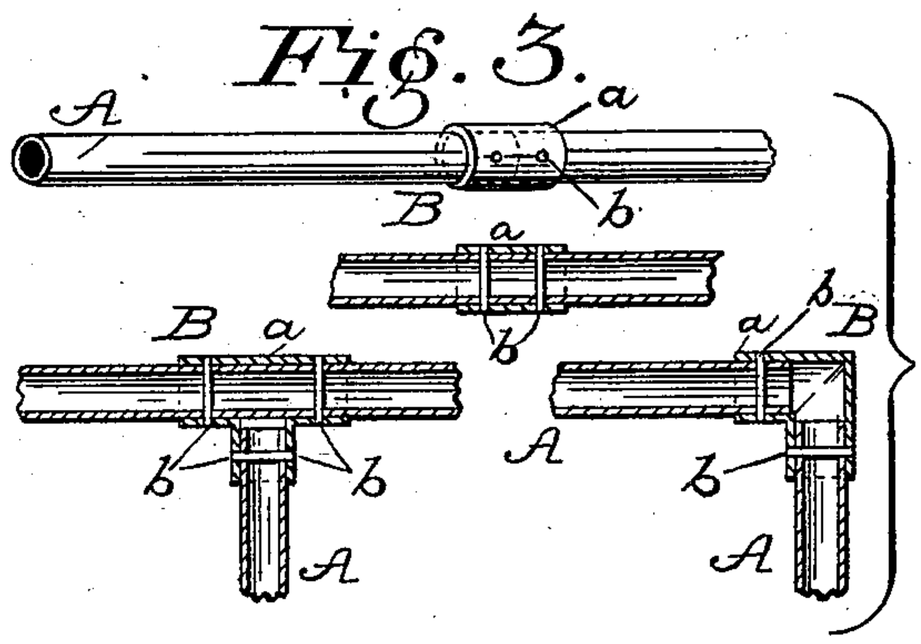

Fig. 3.

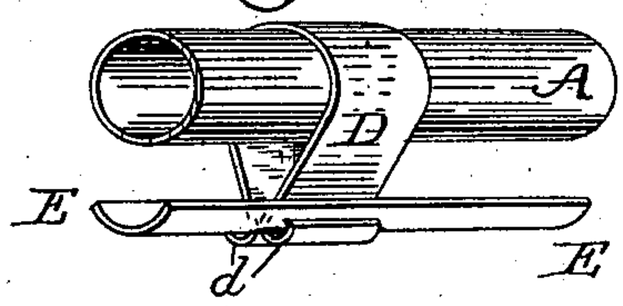

Fig. 4.

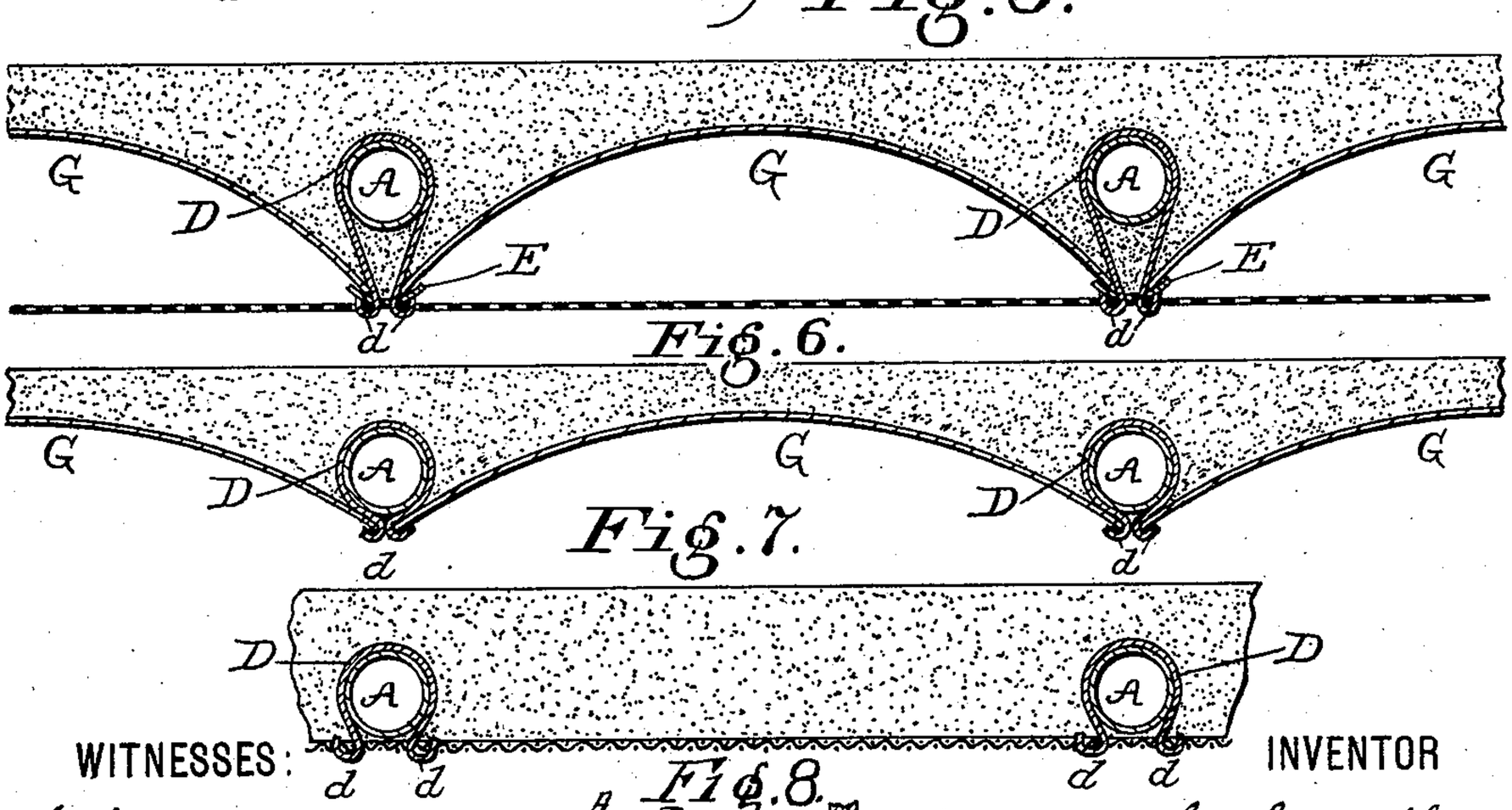

Fig. 6.

Fig. 7.

Fig. 5.

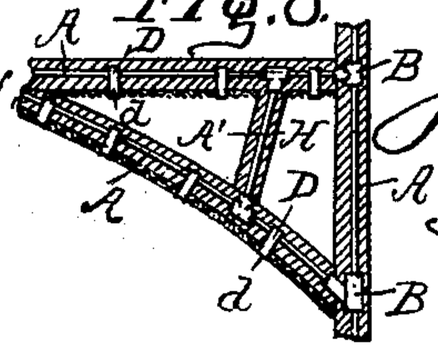

Fig. 8.

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TUBULAR FRAMEWORK FOR CONCRETE-IRON CONSTRUCTION.

SPECIFICATION forming part of Letters Patent No. 590,690, dated September 28, 1897.

Application filed September 23, 1896. Serial No. 606,696. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH STILWELL SMALL, a citizen of the United States, residing at the city of Piqua, in the county of Miami and State of Ohio, have invented certain new and useful Improvements in Tubular Framework for Concrete-Iron Construction; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

This invention relates to improvements in concrete-iron construction whereby the greatest strength of the concrete is more advantageously utilized by the combined strength of a metallic frame; but heretofore all frames have been so constructed as to be either too light and frivolous or so heavy and combersome that the objects sought have not been attained, but on the contrary the structure has been weakened and made unsafe, and to obviate these defects is the ultimate object of my present invention, and to this end this invention relates more directly to tubular framework for concrete bridges, buildings, floors, arches, &c.; and it consists in the peculiar construction and novel combination of parts, as hereinafter described, and pointed out in the claims.

The advantages of my form of frame is obvious, and it consists in the fact that tubes allow an air-space which makes a lighter and stronger frame, at the same time reinforcing and utilizing to greater advantage the strength of the concrete or other plastic substance after it sets, being simple in construction, more durable and lasting, and making the whole building, bridge, arch, floor, or other structure stronger, lighter, and more durable than heretofore, and being far superior to I-beams, T-bars, twisted iron, or other forms of frame in present use.

In the accompanying drawings illustrating my invention, and in which similar letters of reference indicate like parts in all the several views, Figure 1 is a vertical longitudinal sectional view of a portion of a bridge embodying the features of my invention. Fig. 2 is a plan view of two different styles of tubular frame used in floors or arches. Fig. 3 are detail views of the coupler. Fig. 4 is a detail perspective view of a hanger and support for supporting the steel arches and laths or netting properly adjusted on a tube. Figs. 5, 6, and 7 are vertical cross-sectional views of floors of different forms of construction and modifications of the hanger. Fig. 8 is a view of a portion of a building in section, showing concrete brace and brace-tube connecting arch with floor of structure.

The tubes A are left perfectly hollow and are placed in suitable numbers and distance apart to compose the frame, which is of any desired form, according to the structure to be built, and where necessary to lengthen said tubes or to connect the horizontal tubes with the vertical or upright tubes I use a coupler B, preferably as shown in Fig. 3, consisting of a sleeve *a*, said sleeve being straight, T or elbow shaped, or any form according to the connection, and coupling-pins *b*, although any form of coupler may be used—for instance, the old style of screw-threaded coupler—but these are not as readily adjusted or as strong as my present coupler here shown and described.

In Fig. 2 I have shown a number of parallel tubes A as laid more especially in the floors of buildings and other structures, they being connected at the ends at right angles to the upright or vertical tubes A by means of the couplers B. I have also shown in Fig. 2 another form of constructing the frame of floors more especially adapted in arching sewers, or bridges, as shown in Fig. 1, where the parallel tubes A throughout the whole floor are all connected at suitable distances apart by means of short supplemental cross or brace tubes C at a right-angle plan to tubes A and connected thereto by couplers B, each row being so laid as to break joints with those of the next row, thus forming a very strong powerful frame which will support the heaviest weight and strain. In bridges or other structures (see Figs. 1 and 8) where it is necessary to do any arching I strengthen the arch by a brace H, composed of concrete or the same composition as the entire structure, having embedded its entire length, through its center, a longitudinal brace-tube

A', passing through an air-chamber between the floor and arch, thus connecting the arch, by means of the couplers B and the parallel tubes A, with the floor or other portion of the structure.

The hangers D rest over and around and are supported by the tubes A, the ends *d* of said hangers D passing through slots or elongated openings in the metallic gutter or semicircular-shaped supports E, said ends *d* then passing downwardly through openings in the perforated metal laths or wire-netting, as preferred, are then bent or turned up, so that they again pass through openings in said perforated laths or wire-netting and rest against the bottoms of said semicircular supports E and in connection with the laths or netting help to support the semicircular support E, said semicircular support E thus firmly supporting and holding in position the metallic arches G, as in the style illustrated in Fig. 5, and in Fig. 6 I have shown another style in which the ends *d* of the hangers D are quite short and stiff and fit tight up to the tubes A, so that in this style they take the place of supports E, as shown in Figs. 4 and 5, and thus support the metallic arches G.

In Fig. 7 I have shown yet another style of flooring and hangers. There here being no arches, the wire-netting or perforated laths rest directly against the concrete, and the ends *d* of hangers D come almost straight down and are bent downwardly, then upwardly through openings in the netting or lath.

It will be readily seen that this entire structure will be perfectly fireproof, as the tubular frame and all connections are entirely covered and embedded in the concrete. The outside surface of the building or structure may be of imitation stone or other ornamental design. In constructing the rooms in a building the entire tubular framework, composed of the tubes A and other parts, is put together and set up like a cage, and then the concrete or other plastic substance is properly worked around it. The ceiling is of course plastered against the wire-netting or perforated laths which help to support it.

I am well aware that metallic tubes have been used in the construction of girders and beams and that an open frame or trestle work composed of thin steel tubes have been used for bridges and bodies of railway-cars, and I therefore do not claim the idea of using tubes, broadly; but,

Having thus described my invention, what I do claim as new and useful, and desire to secure by Letters Patent, is—

1. In a building or other structure constructed of concrete or like hard plastic material, the combination therewith of the floor portion having the internal longitudinal tube A, pillars having an internal longitudinal tube A, the arch having an internal longitudinal tube A, the concrete brace H, provided with an internal longitudinal tube A' passing through an air-chamber between the floor and arch, the anchoring of the arch-tube to the vertical tube of the pillar, as well as connections of all the tubes, by means of a coupler B, comprising a sleeve and pins, substantially as shown and described.

2. The combination therewith in a building or any structure, constructed of concrete or like hard plastic material; of a frame formed of tubes A, carrying hangers D formed with ends *d* to support wire-netting or laths: semicircular-shaped supports E having elongated openings to receive ends *d*, so as to support metallic arches G; substantially as and for the purposes shown and described.

3. In a building or other structure constructed of concrete or other like hard plastic substance; the combination therewith of a tubular frame, carrying hangers to support the perforated laths or netting; said hangers provided also with supports for supporting the metallic arches, all substantially as described.

4. In a building or other structure constructed of concrete or like hard plastic substance, of pillars provided with an internal longitudinal tube, an arch having an internal longitudinal tube, a brace constructed of concrete, or equivalent material, said brace having an internal tubular brace, the latter passing through an air-chamber between the floor and the arch, and connecting the arch with the floor or other portions of the structure, substantially as shown and described.

5. In a structure composed of hard plastic material, the combination therewith of a tubular frame; carrying hangers supporting perforated laths or netting; supports to support the arches; an arch provided with a tubular brace extending longitudinally throughout its center and connecting said arch with the floor or other part of the structure: the couplers of the tubes instead of screw-threaded ends: consisting of a sleeve and pins; substantially as shown and described.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH STILWELL SMALL.

Witnesses:

BLANCHE RUSSELL,

C. G. PIERY.