2 Sheets--Sheet 1.

# J. B. CHURCH.

## Elevated-Railway.

No. 162,220. Patented April 20, 1875.

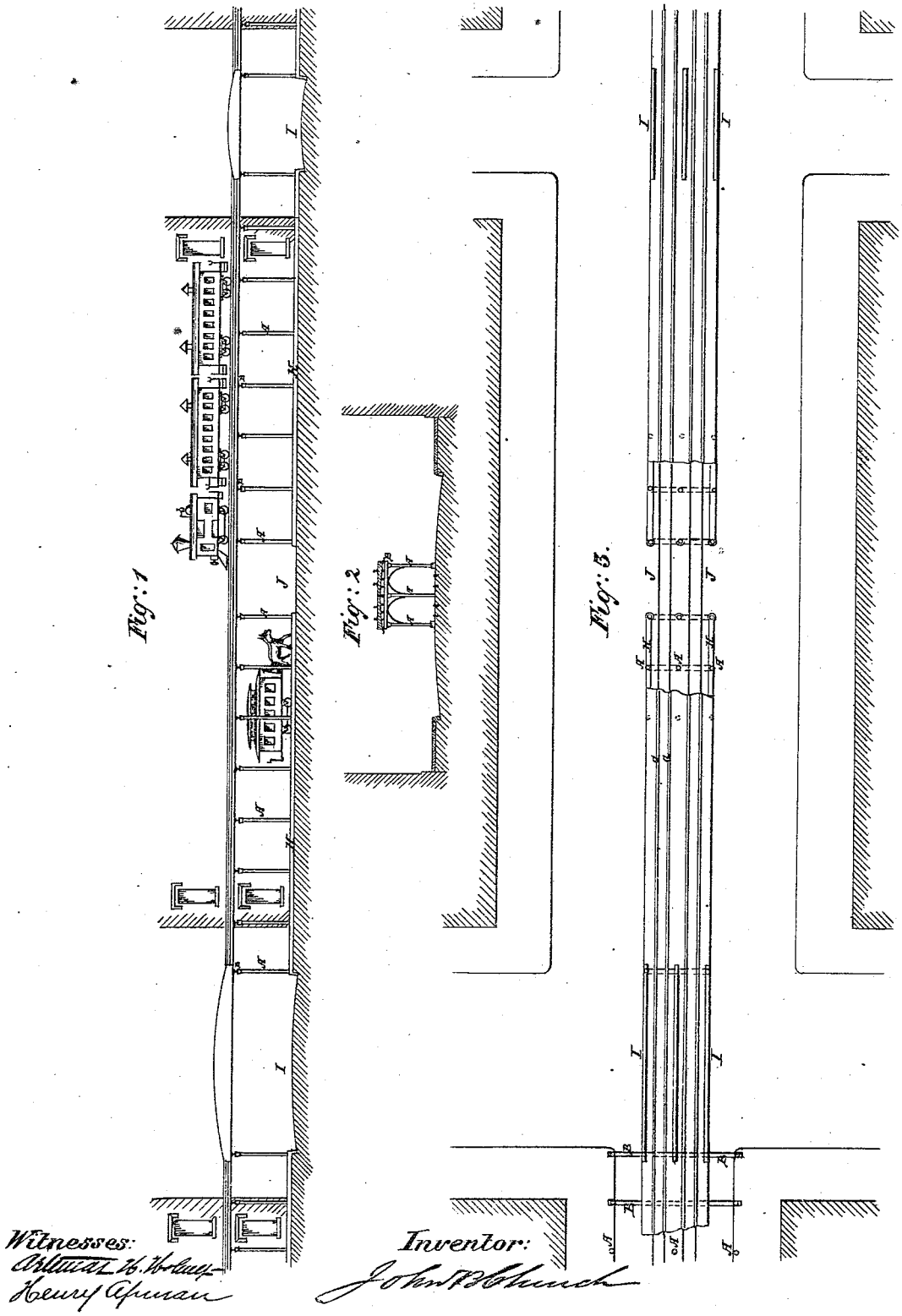

Fig: 1

Fig: 2

Fig: 3.

Witnesses:
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2 Sheets--Sheet 2.

# J. B. CHURCH.

## Elevated-Railway.

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*Fig: 4.*

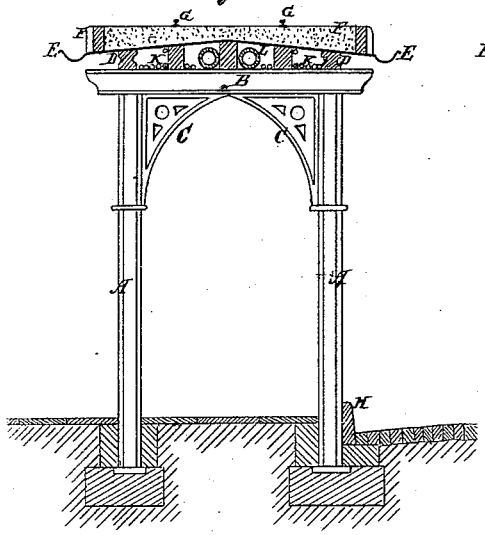



*Fig: 5.*

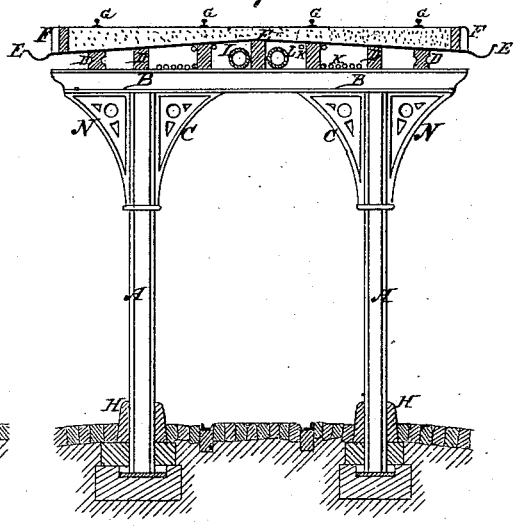
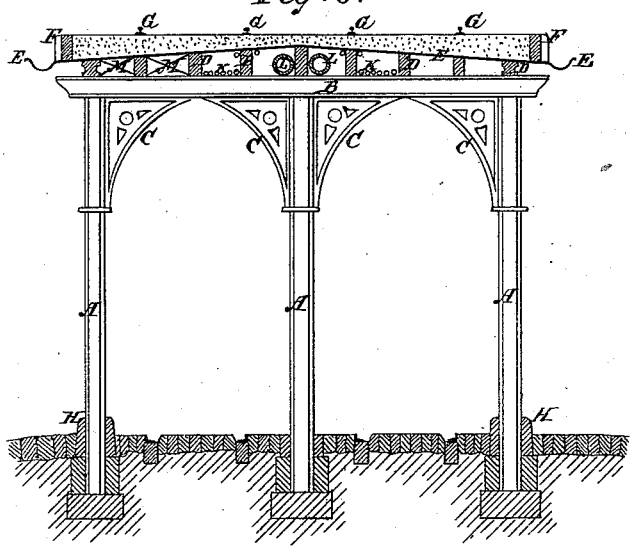



*Fig: 6.*




Witnesses:
Arthur H. Woodward
Henry Ayman

Inventor:
John B. Church

# UNITED STATES PATENT OFFICE.

JOHN B. CHURCH, OF SCARBOROUGH, NEW YORK.

## IMPROVEMENT IN ELEVATED RAILWAYS.

Specification forming part of Letters Patent No. **162,220**, dated April 20, 1875; application filed February 23, 1875.

*To all whom it may concern:*

Be it known that I, JOHN B. CHURCH, of Scarborough, in the county of Westchester and State of New York, have invented an Improvement in the Construction of Railways, of which the following is a specification:

The general object of my invention is to combine a street-railway, the cars upon which are drawn by horses or other power, with an elevated railway track or tracks of a novel form of construction, upon which cars may be propelled by steam or other power, the whole structure occupying about the same space in the street-surface as an ordinary street-railway, and possessing certain other advantages, hereinafter described, whereby greater economy of space in streets or avenues, greater safety and speed in the transportation of passengers, a more complete separation of the railway from the street-traffic, and greater economy of space and structure, will be secured; and my invention is intended to be especially applicable to the streets and avenues of towns and cities in which the necessity exists for greater rapidity of transit than by ordinary street-railways.

The form in which my improved railway is constructed is shown by the accompanying drawings, Figs. 1, 2, 3, 4, 5, and 6.

Figure 1 is a side elevation of said railroad structure. Figs. 2, 5, and 6 are cross-sections of the same when placed in the middle of a street or avenue. Fig. 4 is a like cross-section when the elevated portion thereof is placed at the side of the street or above the sidewalk. Fig. 3 is a ground plan of a wide avenue, with the railways placed in the middle thereof, and showing also the street-crossings.

My method of constructing said structure is as follows: When the avenue has a sufficient width—say, of about one hundred feet—for two railway-tracks, side by side, and for the accommodation of the traffic a space of, say, eighteen feet in width along the center is set apart exclusively for railway purposes, within this space on the surface the ordinary street-railroad with a double track is placed, and directly over the latter the elevated railroad is carried. The superstructure of the elevated railroad is supported by three parallel tiers of columns, of iron or other suitable material, marked A in Figs. 1, 5, and 6. These columns should be anchored upon stone placed far enough below the surface to be unaffected by the influence of the frost. Across each set of these columns, from side to side, is placed an iron cross-beam, marked B, Figs. 2, 5, and 6, and these columns are braced in the manner shown in said figures, by the lateral braces, marked C, and so fastened as to form a firm and rigid support for the superstructure. It is obvious that these sets of columns may be repeated, and placed as near together as may be necessary to support the superstructure. Upon these cross-beams, resting upon the columns, are placed longitudinal girders, marked D in Fig. 6. The two exterior girders should be made of iron or other metal. The remaining girders, being thoroughly protected from the weather, may be of wood. It is obvious that they should be of such number and strength as fully to support the upper track, and should be properly fastened to the cross-beams. The central of these longitudinal girders should be of somewhat greater height, and the intervening girders between them and those outside should gradually diminish in height, so as to give the gradual slope to the roof, as shown in Fig. 6. Over these longitudinal girders is placed a metallic roof, marked E in Fig. 6, which may project beyond the cross-beams, so as to form a gutter on each side, as shown in said Fig. 6. Above this roof, and resting upon it, supported by the girders, I place the cross-ties, marked F in Fig. 6. These may be of wood, and so shaped as to fit the slope of the roof on their lower sides, and to present a level upper surface, as shown in said Fig. 6. Upon said cross-ties the iron tracks, marked G in Fig. 6, are placed, as shown in said Fig. 6. Between the cross-ties ballast may be placed to deaden the sound from the cars and locomotives, and to give firmness to the structure. It is obvious that the girders may be either of wood or metal, or both combined, and that they should be so placed as to break joints with each other. Along the base of the outer tiers of columns I place a line of curb or cut stone masonry, H, in Figs. 1 and 6. This masonry is continuous, except at the crossings,

and should extend far enough above the street-level to effectually separate the street from the railway traffic; it also affords a support for the base of the columns, and renders it practicable to increase the number of those columns at pleasure; and it also protects the columns from collision or injury by street vehicles. Crossings may be left, as shown at I in Fig. 1, at the intersection of cross-streets, and, when the length of the block requires, at other intermediate points. As shown at J in Fig. 1, the curb masonry at the base should extend around the columns at each crossing, and conical protections should be placed at the base of each isolated column. It is obvious that wherever the span at the street-crossings is too great to be supported by the columns described, the structure may be supported by bridge-trusses, or in any other of the methods known to engineers. The spaces between the longitudinal girders, being protected from the weather, may be utilized for carrying telegraph-wires, as shown at K, Fig. 6, or for carrying pneumatic tubes, as shown at L in said Fig. 6. And the longitudinal girders may be braced from each other laterally, as shown at M in said Fig. 6.

The same parts in all the figures are represented by the same letters.

When the street is not of sufficient width to admit of more than one surface-track below the elevated tracks I modify my structure, as shown in Fig. 5, supporting it upon only two columns, and thus dispense with the central line of columns. In this case the cross-beams may extend laterally beyond the line of columns, and be sustained by lateral braces, as shown at N, Fig 5; and the elevated tracks should be so placed that the larger portion of the weight of the train shall bear on the inner side of the columns. It is obvious that the same structure may be modified and applied in other forms—for example, as shown in Fig. 4, where a single elevated track is represented as supported above the sidewalk upon only two tiers of columns, one of which is placed at the outer edge of the sidewalk and the other at or near the inner edge of the same. And where the street is not adapted to the kind of structure shown in Figs. 5 and 6, an elevated track may be supported by placing the outer tiers of columns on the outer edge of the sidewalks, and the third tier in the center of the street, and extending the cross-beams over the entire street. In that case the only obstruction to the street would be the central line of columns. By lengthening or shortening the columns, the superstructure may be elevated or depressed, so as to counterbalance the irregularities upon the surface, and diminish the grade. An important advantage arising from the separation of the street from the railway traffic, by means of the masonry along the base of the columns, as described, will be the material separation of the street-traffic into two parts, one of which, going in one direction, will pass on one side of the track, and the other, going in the opposite direction, will pass on the other side of the track; and the capacity of the street for public travel will be increased rather than diminished by this arrangement of structure. While any one of these modes of structure may be applied, regulated only by the public necessity, the principal value of my invention consists in the application of that form of it specially shown in Figs. 1 and 6 to the streets and avenues of large cities, in which more rapid means of transit than now exist have become a public necessity. That form of structure practically combines a street-railway having a double track with an elevated railway, having also a double track, upon which trains may be moved by steam or other motive power, the practical utility of the street is not seriously interfered with, safety is promoted by the simple form of an amply-sustained structure, and a great public want is thereby supplied.

I claim as my invention—

1. The curb or stone masonry along and around the base of the columns, in combination with the columns supporting an elevated railway, substantially as described.

2. In combination, the tiers of parallel columns A A, the cross-beams B B, the longitudinal girders D D, the roof E E, and the cross-ties F F, forming a support for the tracks of elevated railways, constructed substantially as described.

3. The cross-tie F F, fitted to the slope of the roof E E, supported by the longitudinal girders D D in an elevated railway, substantially as described.

JOHN B. CHURCH.

Witnesses:
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