4 Sheets—Sheet 1.

R. H. GILBERT.

Elevated Railway.

No. 228,055. **Patented May 25, 1880.**

FIG. 1.

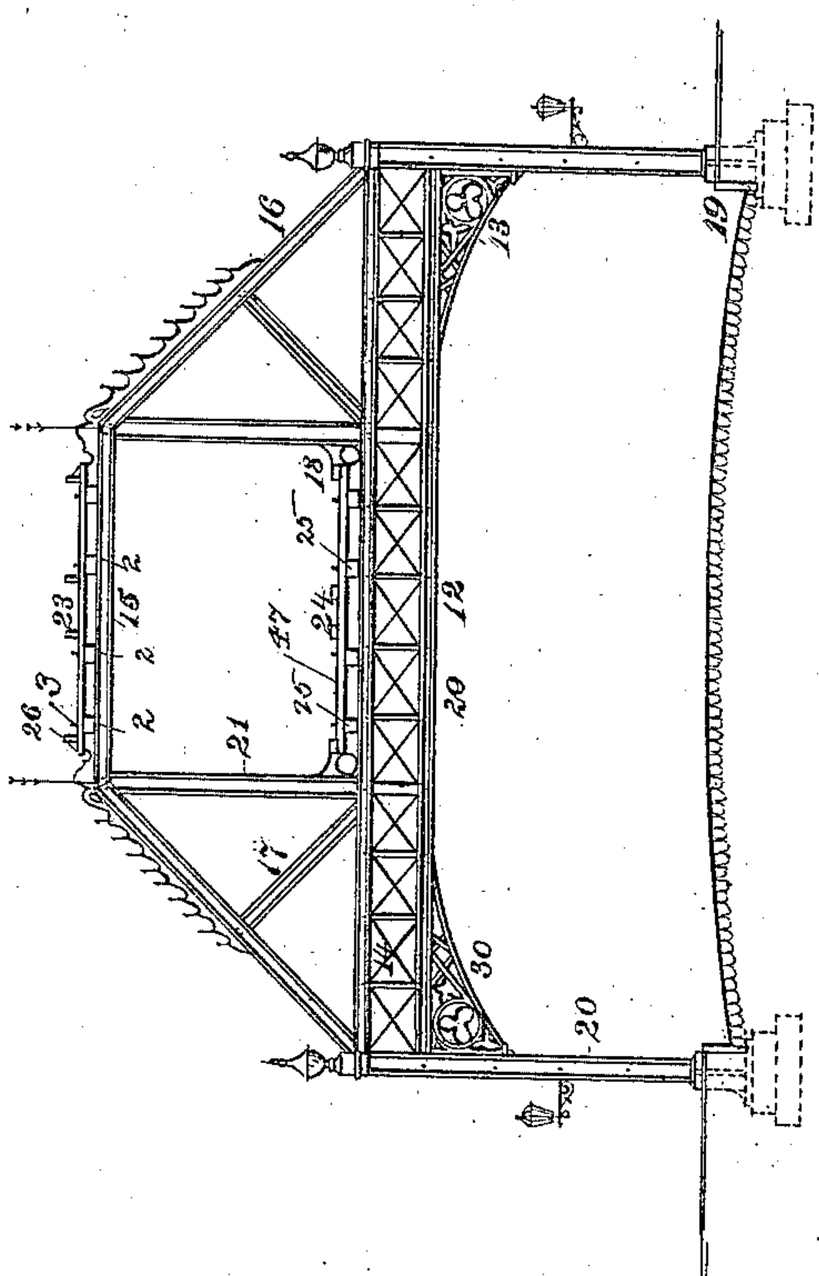
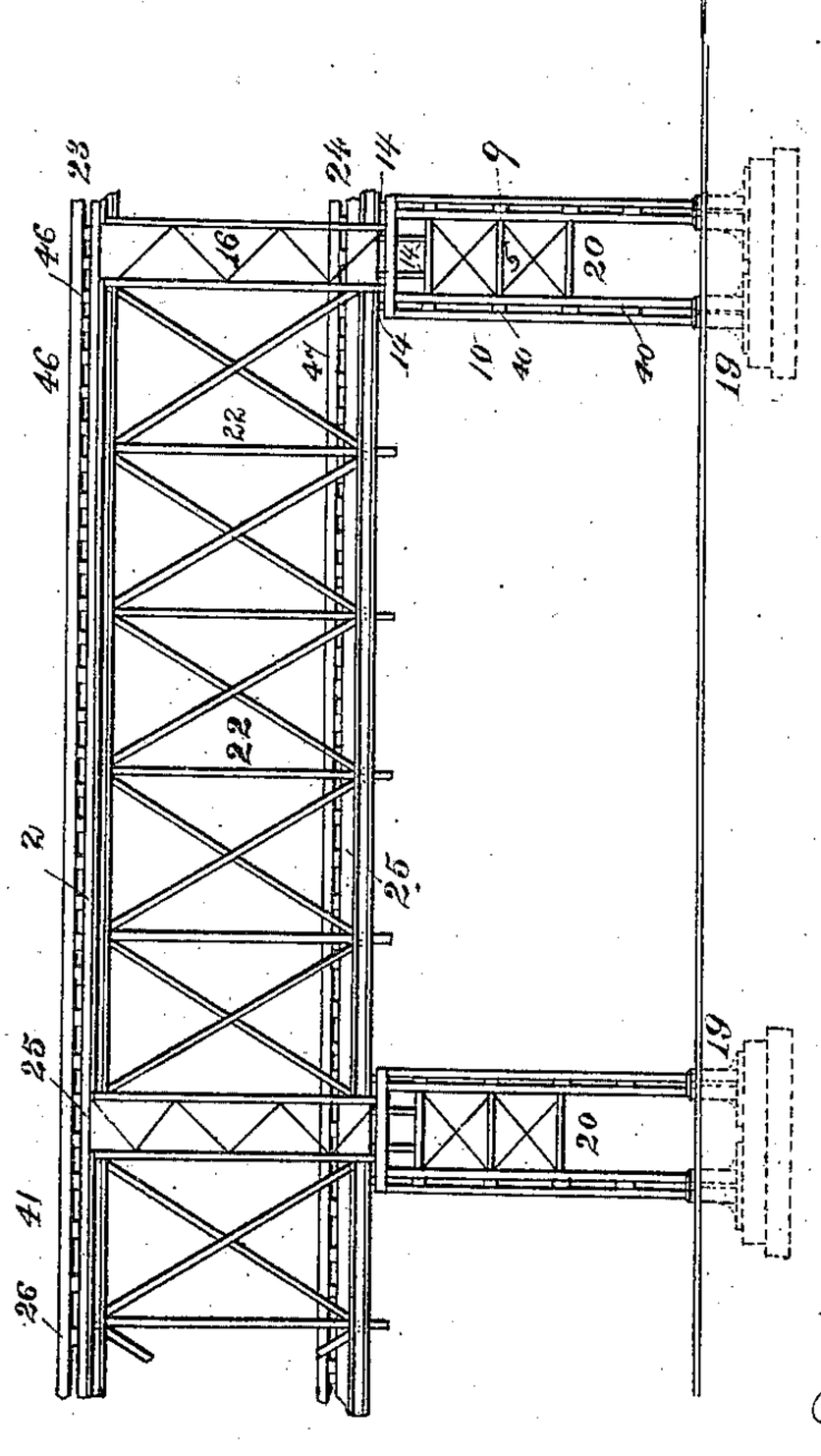


FIG. 2.



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4 Sheets—Sheet 2.

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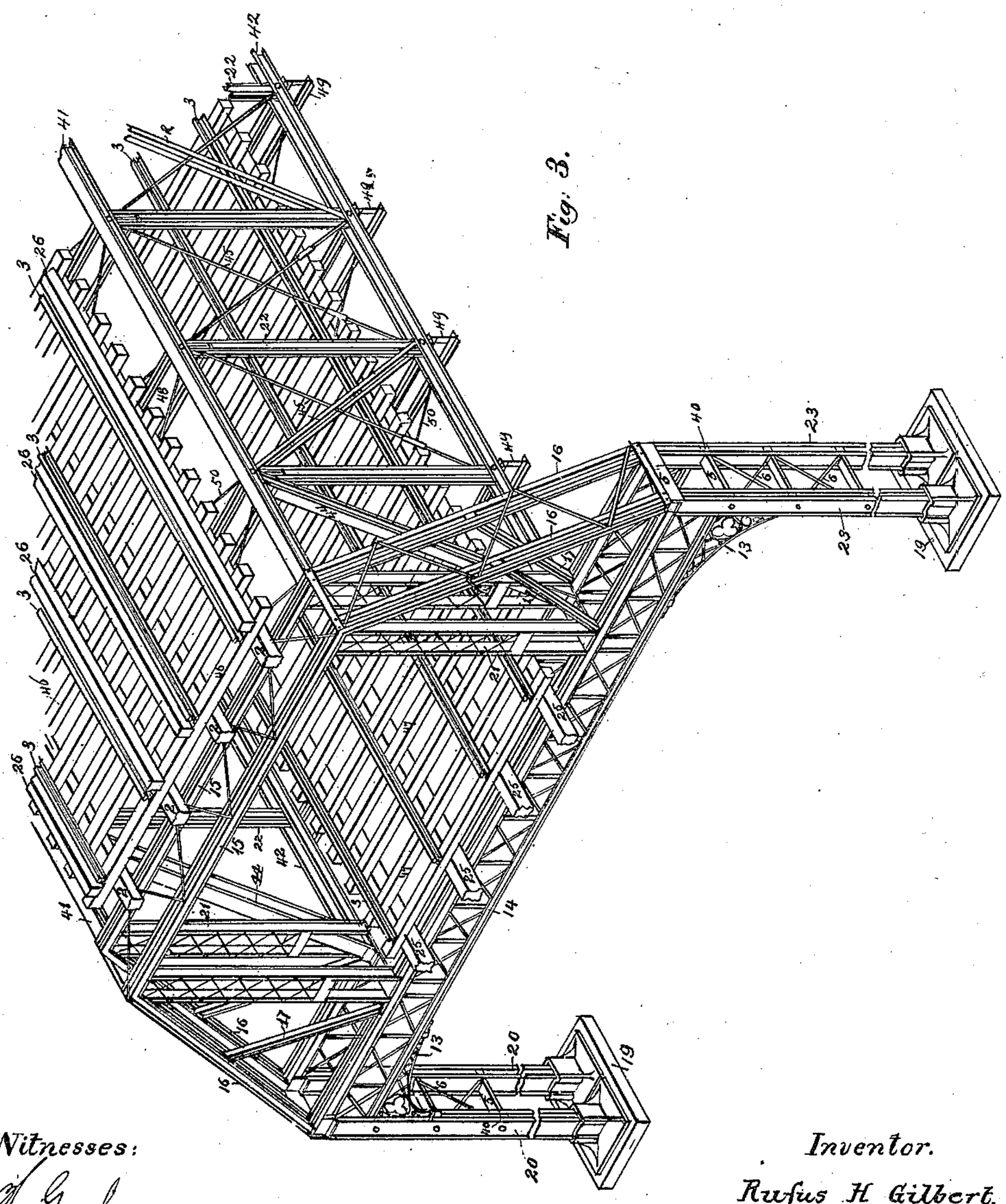

Fig. 3.

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4 Sheets—Sheet 3.

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FIG. 4.

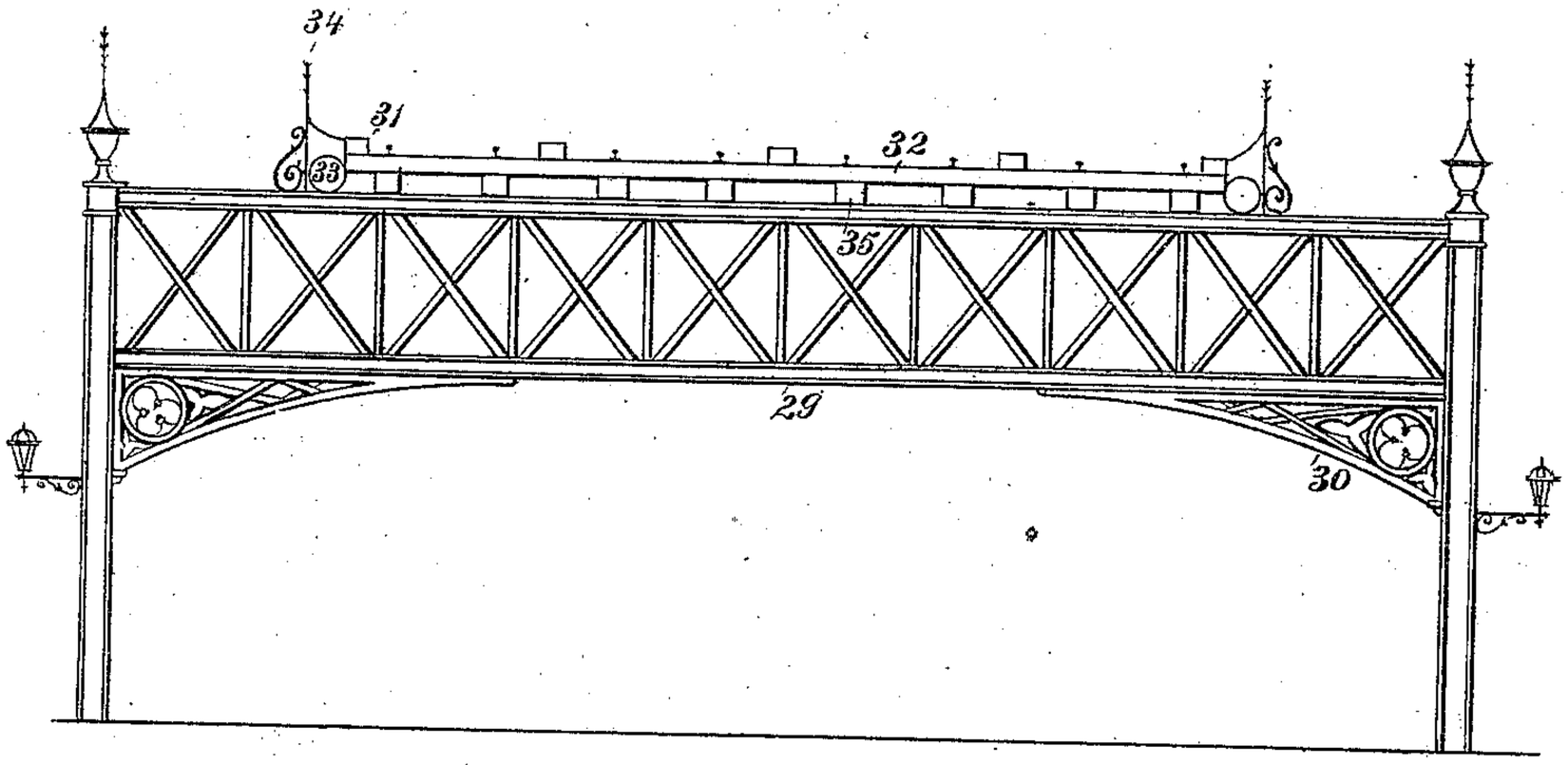
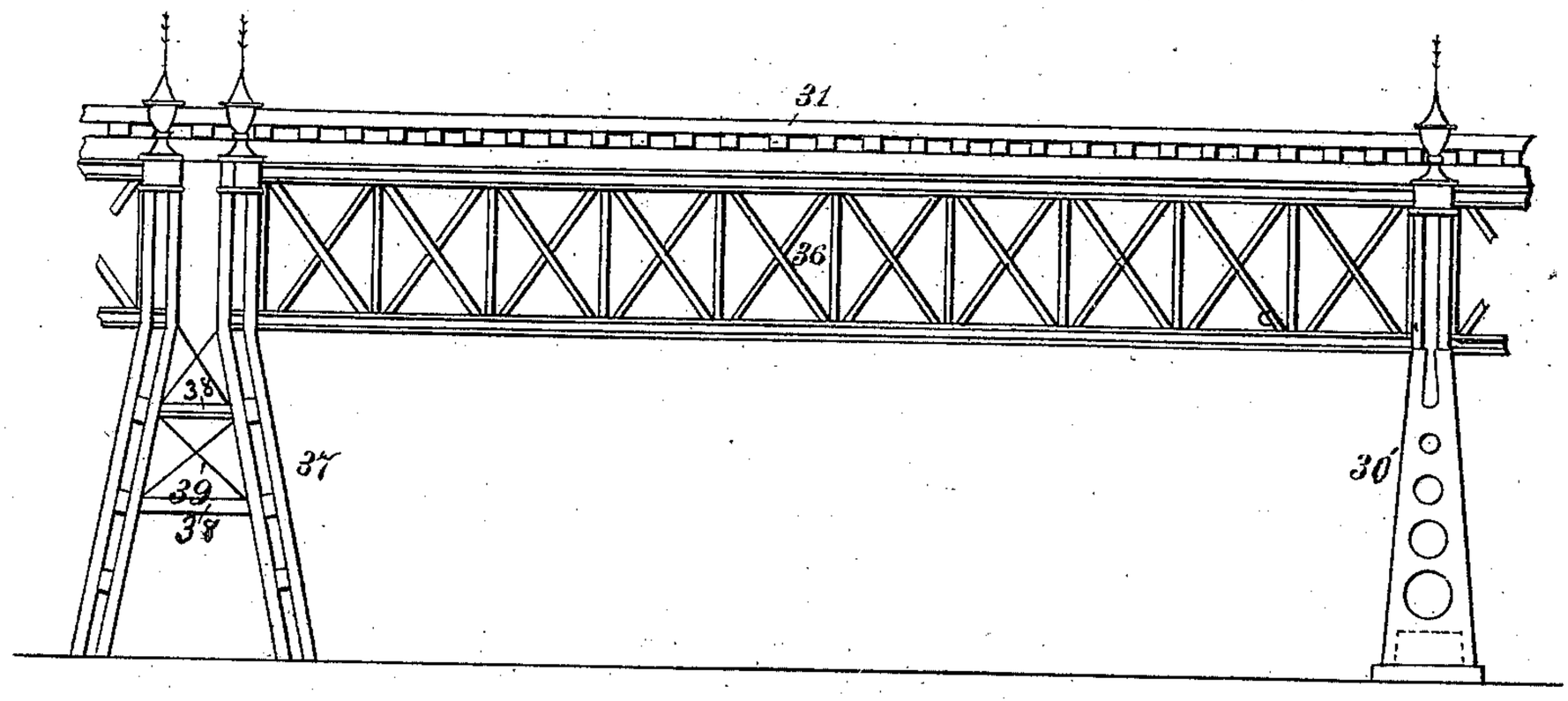


FIG. 5.



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4 Sheets—Sheet 4.

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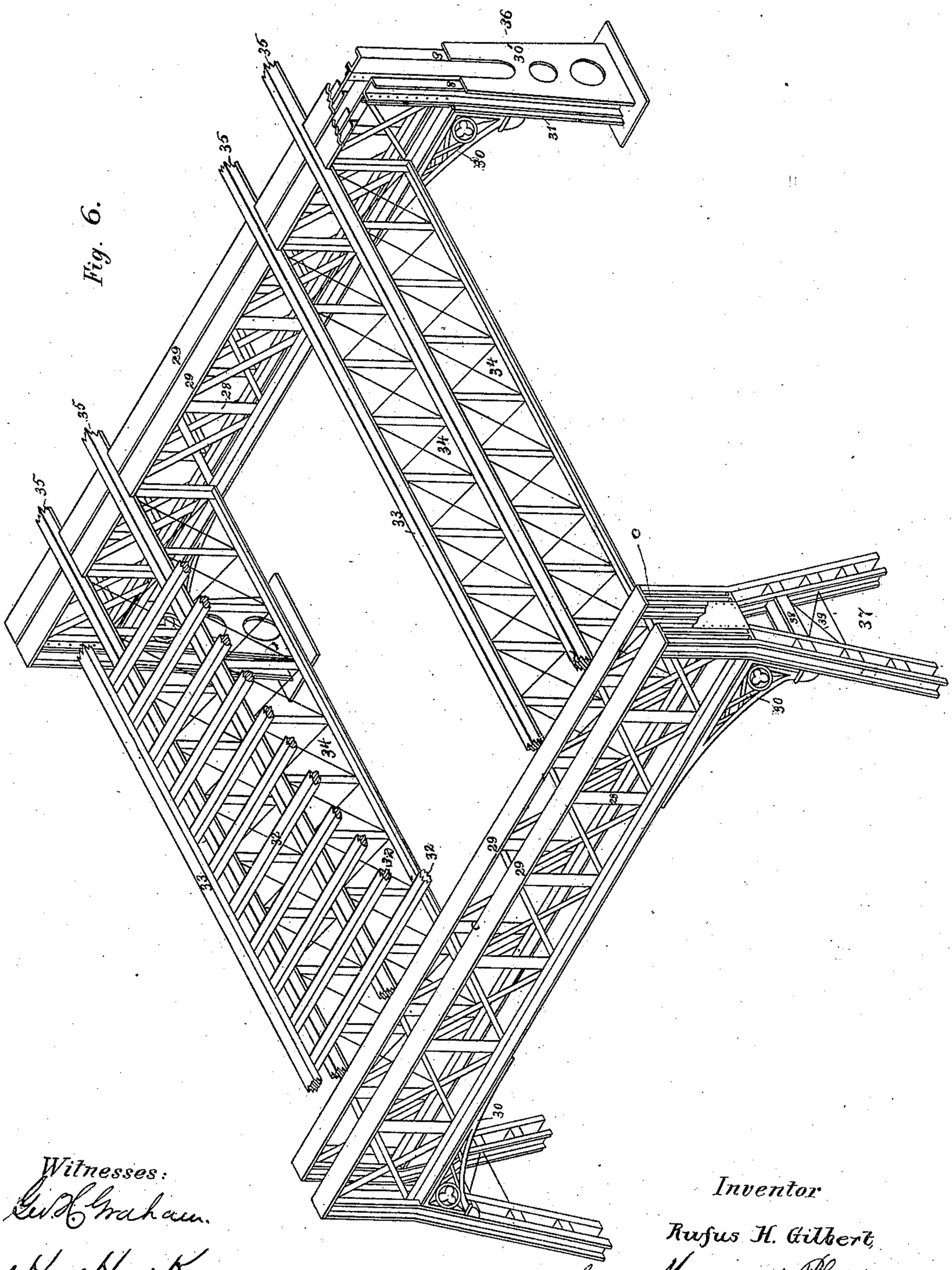
Fig. 6.



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UNITED STATES PATENT OFFICE.

RUFUS H. GILBERT, OF NEW YORK, N. Y.

ELEVATED RAILWAY.

SPECIFICATION forming part of Letters Patent No. 228,055, dated May 25, 1880.

Application filed May 15, 1876.

To all whom it may concern:

Be it known that I, RUFUS H. GILBERT, of the city, county, and State of New York, have invented certain new and useful Improvements in Elevated Railways, of which the following specification, in connection with the accompanying drawings, is a full, clear, and exact description.

In said drawings, Figure 1 is a transverse section of an elevated railway adapted for four tracks, one set of tracks being above the other. Fig. 2 is a side elevation of the same. Fig. 3 is an isometrical projection thereof, in which the plan of construction is more fully shown. Fig. 4 is a transverse section of an elevated railway with four tracks side by side in the same horizontal plane. Fig. 5 is a side elevation of the same. Fig. 6 is an isometrical projection thereof, in which the plan of construction is more fully shown, though a portion of the tracks and other parts are omitted for perspicuity.

The object of my invention is to so improve the construction of elevated railways that their capacity, stability, safety, and durability are increased.

The general features of the railway are, that it is elevated above the street or sidewalk, and its tracks carried by longitudinal girders or beams, which are supported by transverse girders resting upon columns placed at suitable distances apart along the streets or on the curb-line.

The present invention consists in supporting transverse and longitudinal trusses independently upon an improved column, which is at its base broader in the direction of the road than transversely, and is adapted to receive part of the longitudinal thrust of the structure, and also resist the same in an effective manner.

In the structure shown in Figs. 1 to 3 the transverse support for the railway consists of trapezoidal girders, which may rest upon such columns at points where the elevation is great, or upon vertical members where the elevation is less, said columns being placed at proper points along the street and carrying the longitudinal girders which support the track-structure. Each transverse or trapezoidal girder is composed of a bottom chord, 14, and a top chord, 15. This top chord is united with and sustained in its relation to the bottom chord by vertical posts 21 and inclined end posts, 16, formed of I-beams or channel-bars, which posts might be latticed, if desired, while braces 17 connect the centers of said end posts to the bases of said vertical posts and to the bottom chord, 14.

In order to provide the structure with a strength adequate to the support of the load imposed by quadruple tracks, as well as to provide for the independent contraction and expansion of its several sections, two or more of these transverse girders are placed upon each pair of columns, and a duplex construction of said columns is therefore desirable.

The bottom chords of the transverse girders rest or are supported upon the columns, and are secured thereto by any common means. The transverse girders, supported by the same columns, are preferably connected together by diagonal bracing, as in Fig. 3, which holds the said girders in position.

The longitudinal girders are composed of upper and lower chords, 41 42, Fig. 3, formed of suitably-shaped iron, connected together by vertical and inclined posts 2244, and strengthened by diagonal braces and tension-rods 45, though they might be trussed upon any other plan or system. These longitudinal girders rest upon and are suitably secured at each end to the transverse girders, and thus form, with said transverse girders, independent sections, constituting a structure of indefinite length.

The longitudinal stringers 2 and 25 rest upon the transverse girders, and form, respectively, the supports for the cross-ties 46 47, upon which the tracks 3 are laid.

Transverse floor-beams 48 49 are connected to the upper and lower chords, 41 42, of the longitudinal girders, and form intermediate supports for the track ties and stringers, said beams being held in place by diagonal ties or rods 50, and longitudinal guard-rails 26 18, Fig. 1, are placed outside or inside of the tracks, or both.

The increased strength required by the

double load imposed by the trains on the two sets of tracks is provided for by the great depth of the longitudinal girders and of the lower chord of the transverse girder, both being latticed girders.

The inclined end posts also form an important part of the transverse girder, as they serve, in addition to aiding in sustaining the imposed weight, to maintain the longitudinal girders in a vertical position, and also aid in preventing side motion or swaying of the structure.

By this construction of railway its capacity is increased by the provision made for independent sets of trains, such as local accommodation trains and through express trains, in streets not wide enough for four tracks placed side by side, which would necessarily encroach upon the buildings along the line. Moreover, by such construction the danger of crossing tracks to gain access to the trains is avoided.

A structure adapted to carry many tracks side by side in the same plane is shown in Figs. 4 to 6. It consists of transverse latticed girders 29, which rest upon and extend from opposite supporting-columns. These transverse girders support the several longitudinal girders which extend from one to another of said transverse girders, to which they are secured in any suitable manner.

In the structure hereinbefore described it is obvious that the supporting-columns must be of great capacity to resist not only vertical pressure, but also deflection from the perpendicular in the direction of the line of track, to which there is great liability in elevated railroads by passage of trains generally, and by trains braking-up especially. For this purpose my improved column consists of two members, each composed of pairs of I-beams or channel-bars properly secured together, and having blocks or stops interposed between them. These members are vertical to a length equal to the height or depth of the transverse girders, and then stand at an inclination. They are properly stiffened and united by cross-beams 38 and diagonal braces 39, and so form a column of great strength.

Instead of using the cross-beams and diagonal braces, perforated plates 30′ and 31, Fig. 6, may be used. These plates extend high enough to give support to the cross-girders. By using perforated plates instead of full solid plates material is saved, and the inside of the columns can conveniently be painted.

By bending the beams or channel-bars of the columns outward, or giving them an inclination, a greater bearing-surface in the direction of the length of the structure is obtained, and the column much more adapted to receive and resist part of the horizontal thrust imparted to the structure by the trains than if the base were as long as it is wide.

The transverse girders 29 have their chords made up of angle, cross, or channel bars and plates, which chords are connected together by suitable truss-work. The trusses are thus adapted to enter between the I-beams or channel-bars composing the members of the columns 37 and have their top chord supported thereon, or to have their bottom chords seated upon the upper edge of the inner plates, 31, Fig. 6, of the column 36, and their top chords supported on the upper ends of the channel-bars or angle-irons 8 9, composing in part said column, to which they are secured by angle-irons riveted to said columns and to one of their vertical posts. These transverse girders may also have braces 30 connecting them to the said columns.

The longitudinal girders 34, Fig. 6, have a construction similar to that of the transverse girders 29. The free upwardly-projecting ends of the bars or angle-irons 8 9 of the column 36 also allow for the slight movement of contraction and expansion of the sections.

The transverse girders, whether of the forms shown in Fig. 3 or Fig. 6, may be two or more in number, according to the weight they are to sustain; but if only two in number, as in Fig. 3, they must be of great depth, whereby the head-room beneath them will be decreased, while if three or more are used, as in Fig. 2, their depth may be decreased and their elevation above the street may be diminished.

The advantages arising from the provision of independent transverse girders to support the longitudinal girders of an elevated railway are many.

Where two tracks are to be supported over a street, and the span from column to column placed at the curb-line is great, it is obvious that if one girder is used it must be of great depth in order to sustain its own weight and that of the load it is to bear. This necessitates a costly structure, since, in addition to the increased depth of the girder, that construction requires a great elevation in order to afford beneath it proper head-room. When, however, two girders are placed side by side, they may each be made much shallower than one, and at the same time provide independent supports for the longitudinal girders. This same result is produced where the span is less wide, but the load is greater, as when more than two sets of tracks are placed side by side, as in Fig. 4.

This mode of independently supporting the longitudinal girders is an important element in the structure of elevated railways, as it permits one section to contract and expand without affecting another, and thus enables the parts of each section to be firmly riveted together and the general structure to be built very solidly.

Having thus described my invention, what I claim is—

The combination, with an elevated-railway structure, of a supporting-column composed of

I-beams or channel-bars, vertical at their top, adapted to receive transverse trusses and support the same with longitudinal trusses independent of each other and inclined outwardly below said trusses in the direction of the length of the structure, and having longitudinal and diagonal braces or perforated plates so placed that the direction of their length will be parallel to the general direction of the length of the structure, all as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

Witnesses: RUFUS H. GILBERT.
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