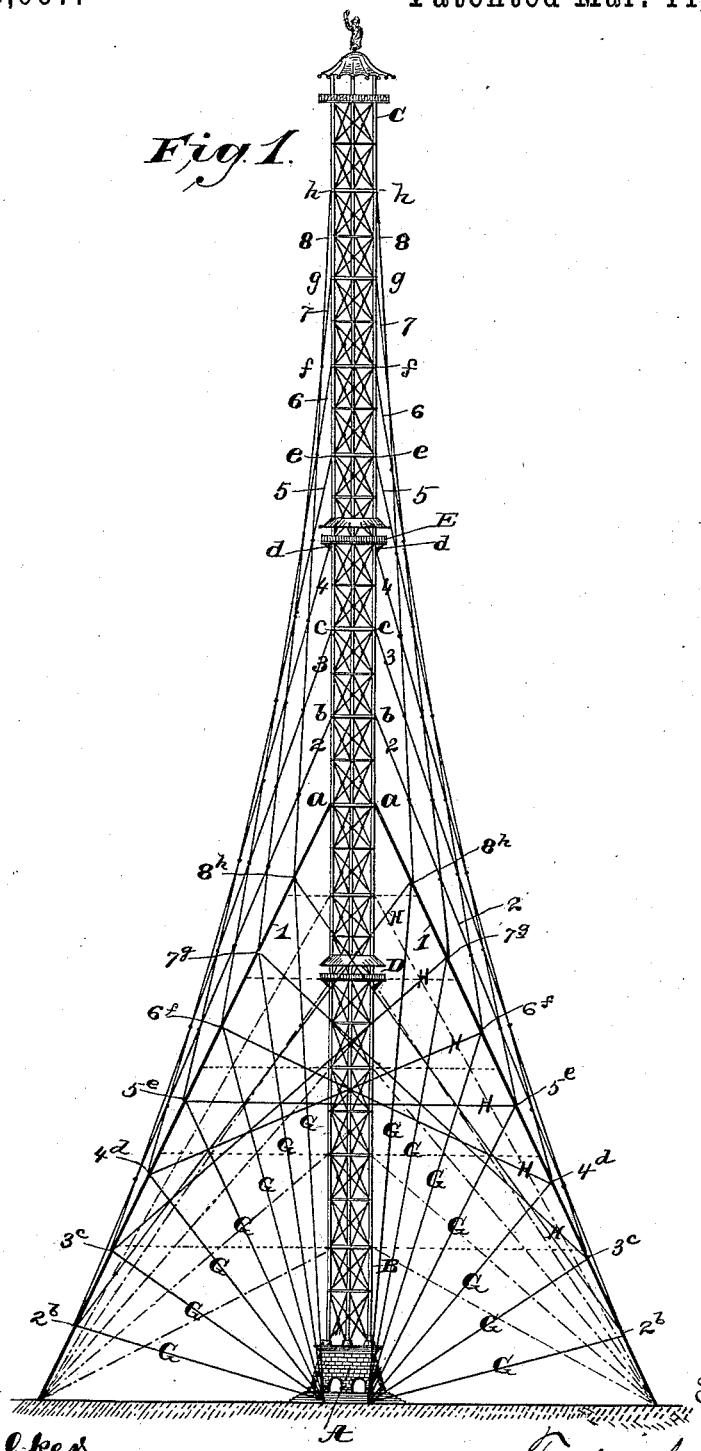
(No Model.) 2 Sheets—Sheet 1.

F. MELBER.

CONSTRUCTION OF TOWERS OR BRIDGES.

No. 423,067. Patented Mar. 11, 1890.

Fig 1.



Witnesses
E. Walker
F. R. Cornwall.

Inventor
Frederick Melber
by F. H. Ritter Jr
atty

(No Model.) 2 Sheets—Sheet 2.

F. MELBER.

CONSTRUCTION OF TOWERS OR BRIDGES.

No. 423,067. Patented Mar. 11, 1890.

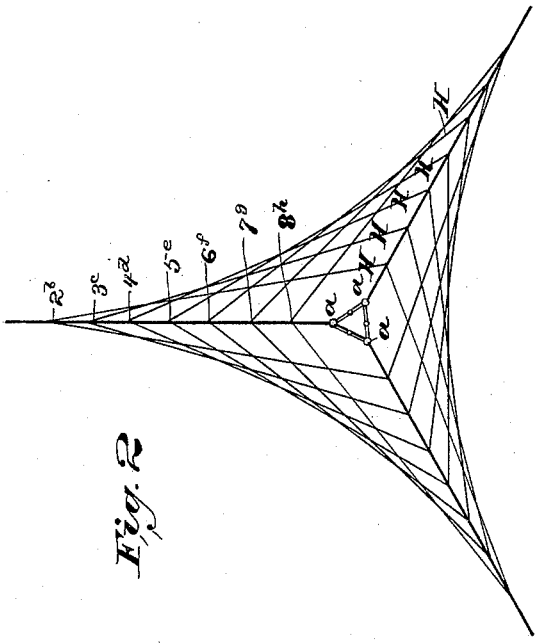


Fig. 2.

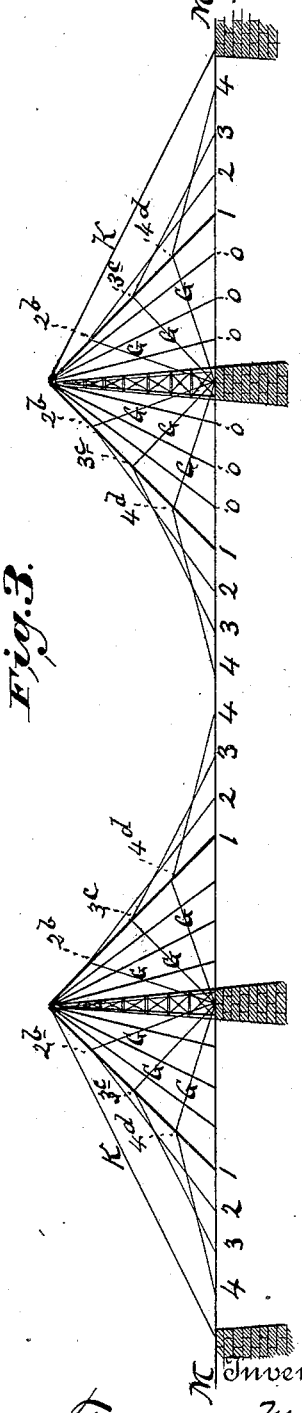


Fig. 3.

Witnesses

E. T. Walker

Jas. W. Graham

Inventor

Frederick Melber

By his Attorney F. P. Ritter

UNITED STATES PATENT OFFICE.

FREDERICK MELBER, OF ROSS, ALLEGHENY COUNTY, PENNSYLVANIA.

CONSTRUCTION OF TOWERS OR BRIDGES.

SPECIFICATION forming part of Letters Patent No. 423,067, dated March 11, 1890.

Application filed November 11, 1889. Serial No. 329,913. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK MELBER, a citizen of the United States, residing in Ross township, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in the Construction of Towers and Bridges, whether the same be single structures for purposes of observation, for signal, meteorological, or light towers, or parts of other structures, such as bridges, viaducts, &c.; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is an elevation of a single shaft or high tower embodying my invention. Fig. 2 is a plan view of said tower. Fig. 3 is an elevation of a bridge, the part between the towers thereof constructed in accordance with my invention.

Like symbols refer to like parts wherever they occur.

The object of the present invention is to secure such a construction of high towers, used for observation, meteorological purposes, and electric lighting, or for bridge or viaduct structures, as shall insure the maximum of strength and safety combined with the minimum of cost and labor in erecting the same.

To this end my invention, generally stated, consists, first, in so combining a series of guys or tension-rods with a tower, bridge, or like structure as to divide the same into a series of sections, each of which sections is tied down so as to independently resist the force of the wind or equivalent strains; and, second, in combining with the guys or tension-rods which directly brace the tower or bridge a second series of guys, which tie down or fix the tension-points of the first set of guys, whereby but a limited or proportionately small base is required for the tower or similar structure.

There are other minor points of novelty which relate especially to the arrangement of the guys, where only a limited spread of the guys is permissible.

In a tower as at present commonly constructed the whole or an extended portion of the structure has to resist the force of the wind, which it does by deflection or bending, and this consequently requires great solidity of structure and a broad base or foundation proportionate to the height of the tower, and where guys or tension-rods are used to brace such structures a greatly-increased ground-space is required for the spread of the guys as they are now commonly applied and secured.

I will now proceed to describe my invention more specifically, so that others may apply the same.

The cross-sectional form of the tower or its general construction is immaterial, and, as it forms no part of the present invention, may be in accordance with the views of the constructer or the requirements of its use or position.

For purposes of illustration only, I have chosen a triangular form as one of the best to obtain lightness and strength with limited material and labor.

In the drawings, A indicates the foundation-base of the tower, and B C the shaft, which will be of any required height. The shaft B C, which is usually a skeleton shaft, is commonly constructed in sections and of iron or steel columns, struts, and rods of sufficient strength and solidity to sustain the crushing weight of the proposed height of tower, properly connected and trussed in ways well known to those skilled in the art, and, if desired, may be provided in its length and at suitable distances above its base with covered platforms, as indicated at D and E. For a certain height above the base the tower may be self-sustaining and capable of resisting wind force, and this height will be measurably determined by the cross-section of the tower and its base or foundation. From such a point on the tower (indicated in the drawings by *a*) I drop or extend main guys or tension-rods 1, preferably wire cables, anchoring the same at a suitable distance from the base of the tower. The tower above said point *a* is divided up into sections in number proportionate to its height, as indicated by *b c d e f*, &c., and from each of said points guys or tension-rods 2 3 4 5 6, &c., are dropped or carried down and secured to the main guys 1, as at the points 2^b 3^c 4^d 5^e, &c., by which arrangement of guys or tension-rods it will be noted that the tower is divided up into sections without extending the anchorage of the

guys beyond the restricted limit required by the first series of guys 1. In order to fix the points 2^b, 3^c, 4^d, and 5^e in place, a third set or series of guys G or ground-lines may be dropped from said points 2^b, &c., and anchored at any suitable point between the anchor of main guy 1 and the foundation, but preferably are carried to and anchored on the foundation, as shown in the drawings.

Where it may be deemed desirable to apply sectional support to the tower below the point *a* or attachment of the main guys 1 I accomplish this by means of a series of guys running from the shaft B C to suitable anchors, and also by guys running from the shaft to the main guy 1. In order to avoid confusion, the two sets of guys last named have been shown in dotted lines in Fig. 1. They correspond with the guys *o o* in Fig. 3 or the bridge figure of the drawings.

H H indicate guys which connect the several main guys 1, and which hold the system of guys against torsion.

The advantages of the combination, with a tower, of the system of guys or tension-rods hereinbefore specified are, first, that the tower opposes independently-supported sections to the wind force, which lessens the strain on the structure as a whole and obviates the usual bending, deflection, or vibration of the tower, and the wind force will produce only direct tension on the guys and compression in the shaft; second, but a small or limited base is needed for very high towers, the space decreasing proportionately to the increase of the points of hold on the shaft within reasonable limitations; third, the points of anchorage of the guys may be chosen anywhere, and as a rule the rise of the main guys 1 may be very steep, as indicated, so that a tower three thousand feet in height will only require about twenty square feet of surface for its erection at points of anchorage of line 1.

The system of guys hereinbefore pointed out is equally applicable to bridges, as indicated in Fig. 3 of the drawings, wherein the roadway of the bridge corresponds to the tower, and the system of guys 1 2 3, &c., is disposed with relation to the roadway of the bridge the same as they are disposed with relation to the tower in Fig. 1. In bridge structures I also prefer to add guys K, extending from the tops of the bridge-piers (which in bridges are in reality the anchorage of guys 1) to the abutments M of the bridge. The towers of the bridge may also be supported by the same system of guys shown in Fig. 1; but this has not been shown on the drawings, because it can be readily understood by an examination of Figs. 1 and 2, and to add said guys to Fig. 3 would tend to confuse the drawings.

As hereinbefore stated, the system of guys is the same and operates in like manner, whether it be applied to the vertical tower shown in Fig. 1 or to the horizontal roadway and wind-bracing of the bridge shown in Fig. 3; and as the invention, broadly considered, consists in a system of guys for sustaining structures, I wish it distinctly understood that wherever in the claims hereinafter made the word "tower" is used it is intended to cover the roadway of a bridge as its equivalent element or structure.

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

1. The combination, with a tower, of a set of main guys properly anchored, and one or more sets of secondary guys attached to the shaft above the main guys and anchored on or connected with the main guys, substantially as and for the purposes specified.

2. The combination, with a tower, of a set of main guys properly anchored, one or more sets of secondary guys attached to the shaft above the main guys and to the main guys, and a third set of guys attached to the main guys and anchored to the foundation or at points between the foundation and anchors of the main guys, substantially as and for the purposes specified.

3. The combination, with a tower, of a set of main guys, a set of cross guys or cables which connect the main guys and the tower, and a series or set of ground-guys arranged between the foundation of the tower and anchors of the main guys, and which are connected with the main guys, substantially as and for the purposes specified.

In testimony whereof I affix my signature, in presence of two witnesses, this 21st day of October, 1889.

FREDERICK MELBER.

Witnesses:
SAML. DIESCHER,
ARTHUR L. DIXON.