(No Model.) 2 Sheets—Sheet 1.

# T. O. PERRY.

## TILTING TOWER FOR WINDMILLS.

No. 485,883. Patented Nov. 8, 1892.

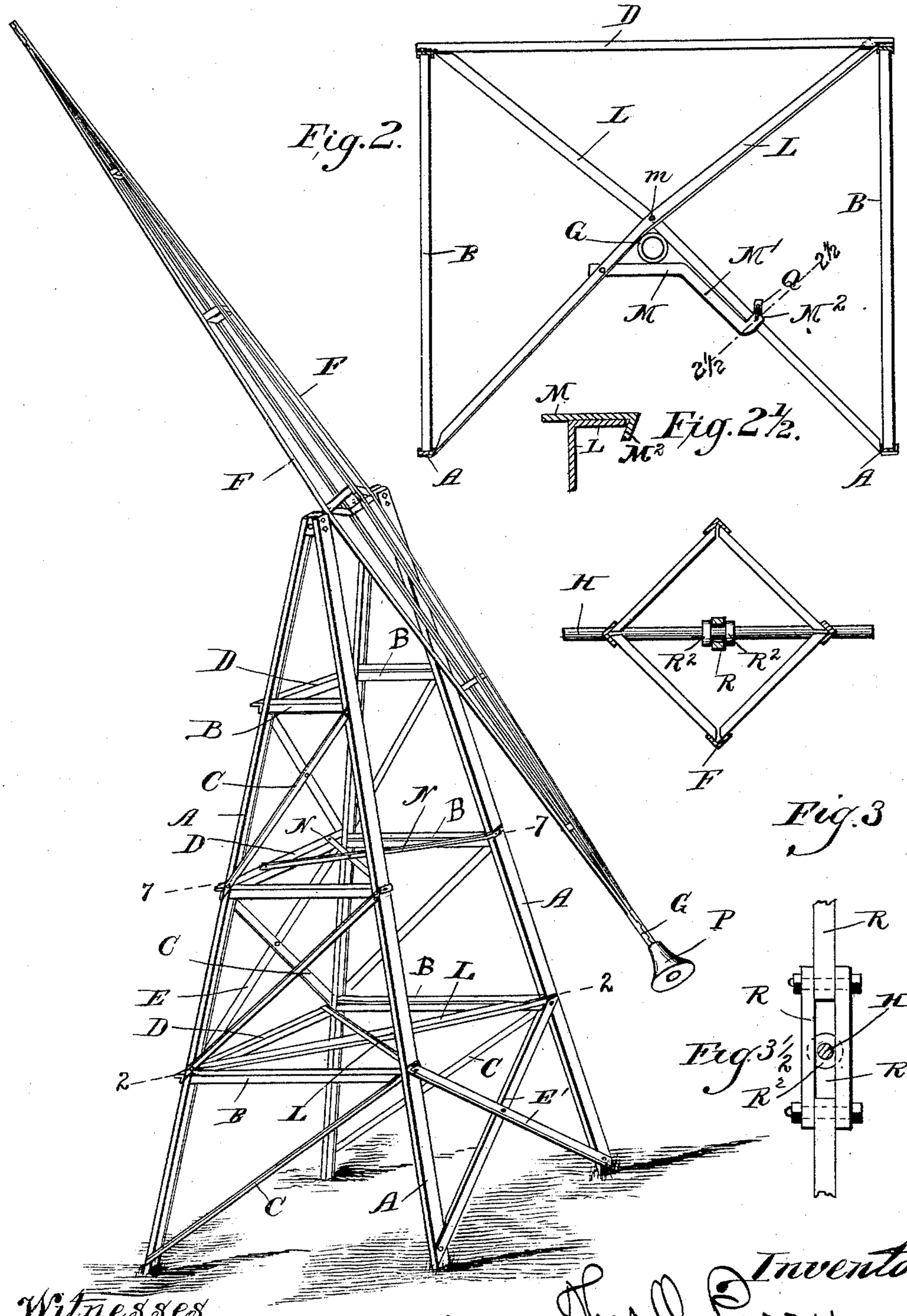


Fig. 1




Fig. 2.




Fig. 2½.




Fig. 3




Fig. 3½

Witnesses.
J. L. Tunison.
Jean Elliott.

Inventor:
Thos. O. Perry
By Burton & Burton
his Attys.

(No Model.) 2 Sheets—Sheet 2.

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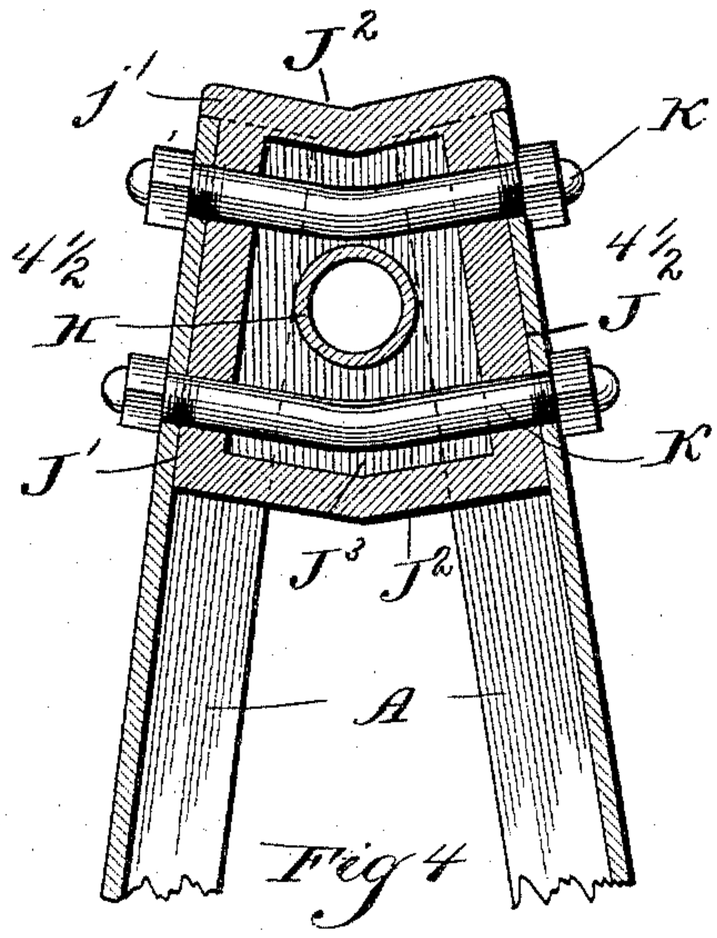



Fig 4

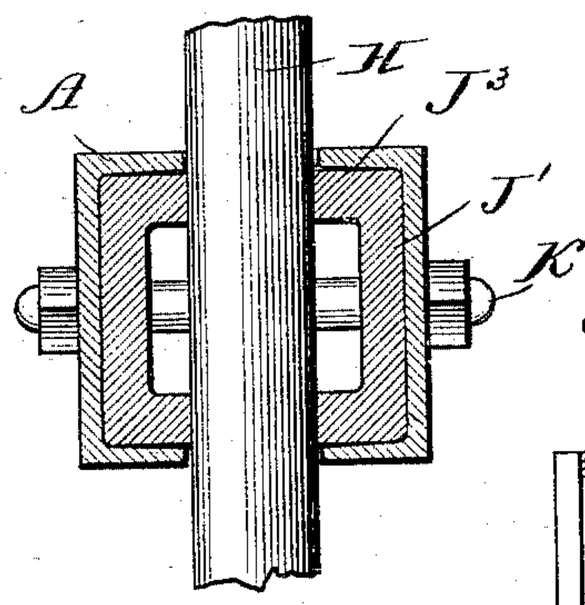
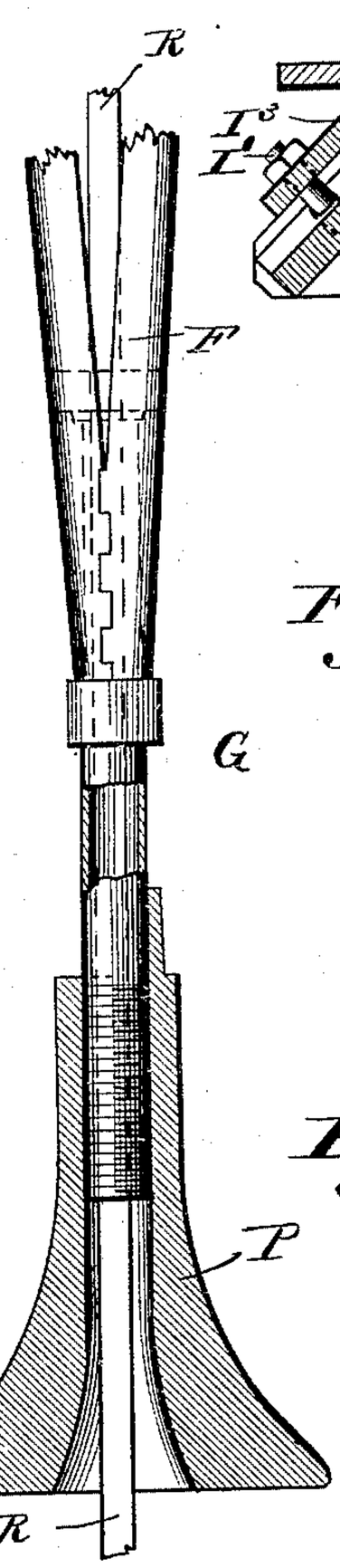



Fig. 4½



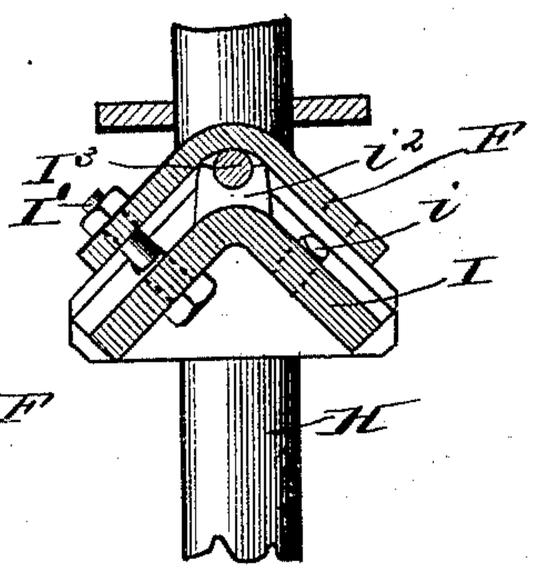




Fig. 5 Fig. 5½.

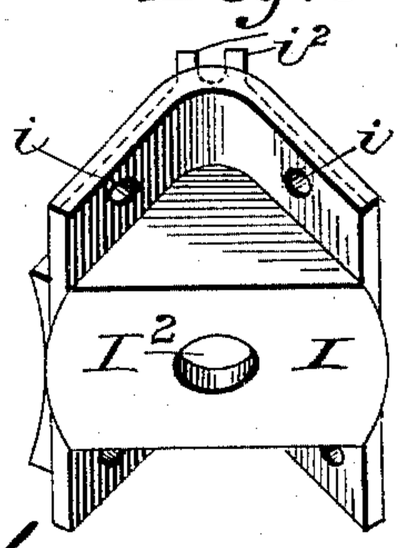



Fig 6

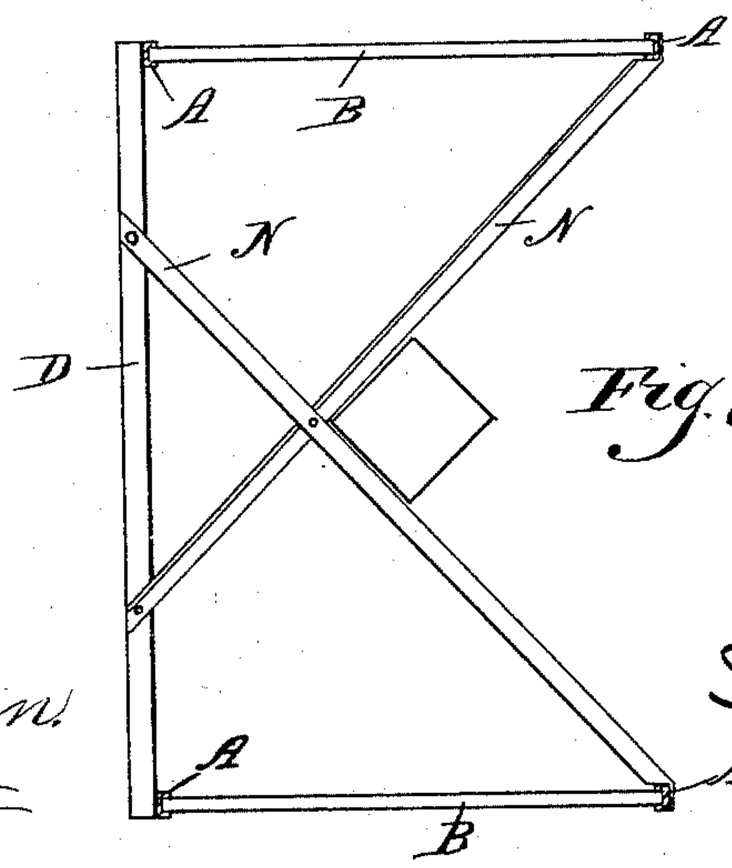



Fig. 7

Witnesses.
J. L. Tunison.
Jean Elliott

Inventor:
Thos O. Perry
By Burton & Burton
his attys.

# UNITED STATES PATENT OFFICE.

THOMAS O. PERRY, OF CHICAGO, ILLINOIS.

## TILTING-TOWER FOR WINDMILLS.

SPECIFICATION forming part of Letters Patent No. 485,883, dated November 8, 1892.

Application filed April 5, 1892. Serial No. 427,817. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS O. PERRY, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in a Tilting-Tower for Windmills, which is fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

The invention relates to the construction of a tower for a windmill which comprises a mast fulcrumed upon a tower carrying the windmill at the end which is uppermost when the mast is tilted upright.

In the drawings, Figure 1 is a perspective of the fixed base or tower and the mast fulcrumed, thereon partly tilted. Fig. 2 is a horizontal section through the base-tower of the plane indicated by the lines 2 2 on Fig. 1. Fig. $2\frac{1}{2}$ is a detail section at the line $2\frac{1}{2}$ $2\frac{1}{2}$ on Fig. 2. Fig. 3 is a horizontal section of the mast at the plane of its fulcrum. Fig. $3\frac{1}{2}$ is a detail section at $3\frac{1}{2}$ $3\frac{1}{2}$ on Fig. 3. Fig. 4 is a detail of the bearing of the mast in the tower. Fig. $4\frac{1}{2}$ is a section at $4\frac{1}{2}$ $4\frac{1}{2}$ on Fig. 4. Fig. 5 is a sectional detail of one of the two similar corners of the mast, through which the shaft or axle protrudes and at which it is secured, showing the casting by means of which it is secured. Fig. $5\frac{1}{2}$ is a perspective of the corner-casting shown in Fig. 5. Fig. 6 is an axial detail section of the lower end of the mast, showing the counterbalance attached thereto and the pump-rod extending through it. Fig. 7 is a section at the plane indicated by the line 7 7 on Fig. 1, showing, also, the mast as it would be cut by said plane if it were in vertical position.

The base-tower comprises two triangular supports of equal size, whose sides A A, which constitute the corner-posts of the tower, are made of channel-iron, the channels of the two sides of each triangular support facing each other, and the two triangles being set up inclined toward each other and with their base-lines parallel, their apices being in horizontal line at right angles to their said parallel base-lines, and the said triangles being provided at their apices with fulcrum-bearings for the tilting-tower. Each triangle is braced by horizontal cross-ties B B B and diagonal ties C C C, all of which are made of angle-iron to afford stiffness in two directions. The two triangles, set up inclined toward each other, as described, are connected and bound together at one side by cross-ties D D D and diagonal ties E E E, connecting the ends of the cross-ties, and themselves bolted together at the intersections, all of said ties, both diagonal and horizontal, being preferably made of angle-iron. At the other side the tower-base is open, except for two diagonal ties E′ E′ at the lowest section—that is, below the plane of the lowest cross-tie D. This permits the tilting mast to swing in and out through that open side, the lower end of said tilting mast being high enough to swing over the intersection of the two oblique ties E′ E′. The mast is made of four corner-bars F F F F, of angle-iron, facing a common center, spread at the middle point of their length to the corners of a square and joined at their ends and connected by cross-ties, each bar to its adjacent bar, at any desired number of points between the middle point at which the spread is the greatest and the ends at which the corner-irons meet, so that the mast is trussed by four trusses in two directions at right angles to each other. The ends of the corner-irons are securely locked together, the flanges of the angle-irons being correspondingly notched and interlocked about a tubular terminal piece G, the construction in this respect being the same at both ends. The windmill turn-table is designed to pivot upon one of these terminals and the counterbalance is secured to the other. At two diagonally-opposite corners of the mast, at the middle and widest point of its length, are provided means for securing the shaft H to the mast, said shaft protruding beyond the two corners and constituting trunnions by which the mast is fulcrumed on the tower. These means consist of angle-castings I I, adapted to fit within the corner angle-irons of the mast and provided with bolt-holes *i*, by which bolts I′ may secure it to the flanges of the angle-iron. An aperture $I^2$ is made through the middle of the angle-casting at the corner to admit the shaft H, which is preferably a pipe, as shown, and the corner angle-iron of the mast is likewise apertured at the corner, so that the shaft H penetrates it. To prevent the shaft turning in the angle-iron and

to cause it instead to turn with the mast, as well as to prevent longitudinal movement on the pipe, a pin $I^3$ is put through the shaft H within the angle of the corner angle-iron of the mast, and the angle-casting I is provided with concave seats between the lugs $i^2$ for the pin $I^3$, the pin projecting beyond the shaft at both ends and lodging in said seats. The bearings for the trunnions which the protruding ends of the shaft H constitute are afforded by castings J J, which are secured at the apices of the triangular sides, respectively, of the base-tower. These castings serve, also, to secure the junction between the two side posts of the triangular sides. I will describe one of them, both being alike. Said casting is a shell having two diverging sides J′, adapted to fit within the channel of the channel-bar posts and having at the upper end the flanges $j'$ $j'$, projecting enough to lodge upon the upper end of the post between the flanges, the diverging sides J′ J′ being connected by the approximately-horizontal webs $J^2$ $J^2$ at the top and bottom, respectively, and by the vertical webs $J^3$ $J^3$ at the opposite sides between the planes of the flanges of the channel-iron, and in said vertical webs is formed the bearing of the shaft H in a horizontal direction. The bolts K K, which secure the castings J between the channel-iron posts A A, are bent at their middle point, so that both ends protrude at right angles to the web of the channel-irons from which they protrude, respectively, and nuts on said protruding ends thereby are made to bind laterally against the surface of the channel-irons and clamp them tightly to the casting J.

By making the mast in the form described, trussed in four planes, and pivoting it diagonally, as described, so that it rocks in a plane diagonal to said planes in which it is trussed and over an axis having the other diagonal direction with respect to said planes, the benefit of all of said trusses is at all times obtained to resist any strain which results from the rocking movement or from the fact that it is pivotally supported.

One side of the tower is necessarily open, as above described, far enough down to permit the mast to swing in and out; but this does not prevent the use of two diagonal ties at the other end on that side, as above described, since the lower end of the mast, as stated, does not reach to the intersection of those ties. In fact, I provide the stop and lock for the lower end of the mast at the plane of the lowest direct cross-tie D, that cross-tie being, however, omitted on the side through which the mast swings in to the tower; but the four corners of the tower are connected by horizontally-diagonal ties L L, which are made of angle-iron reversed in position, so that their horizontal flanges are laterally in contact at their intersection. This intersection would be a vertical center of the tower if the cross-ties were straight; but they are both bent slightly out of a straight line, so that intersection falls aside from the vertical center sufficiently to permit the lower terminal of the mast to occupy that central position, as seen in Fig. 2. The deviations of the ties L from straight lines sufficiently to make their intersection slightly aside from the vertical center, as stated, is scarcely perceptible to the eye. The said lower terminal of the mast when the latter is upright is lodged in the angle between the ties L toward the open side of the tower, and in order to lock the mast in such position I provide the latch M, of flat-metal bar, pivotally connected to the horizontal flange of the uppermost of the two ties L and having a bend at the point *m*, the pivot being at such distance from the intersection of the ties that when the latch is being swung around to position at which said portion between the pivot and the bend is substantially parallel to the open side of the tower the terminal G of the mast is locked in the triangle formed between the two ties and said latch, and the remainder M′ of the latch from the bend outward stands alongside the other tie—that is, the one to which the latch is not pivoted—and I bend the end portion of the latch at right angles to the direction of said end portion M′ and at the extremity turn down the lip $M^2$ in a slightly-oblique direction trending inward—that is, back toward the portion M′—so that when the latch is swung to the position shown in Fig. 2, this lip constitutes a hook which engages beyond and projects obliquely under the edge of the horizontal flange of the lower of the ties L. Both the latch and the tie will spring sufficiently to permit such engagement to be effected, and the reaction will hold the latch securely engaged, but so that it may be disengaged by a slight blow upward.

In order to stiffen the tower as much as possible, notwithstanding the fact that one side must be left open so that the mast may swing within it, I provide at as many points as may be desirable, depending upon the height of the tower, braces N N, extending from the corner-posts of the open side obliquely to a horizontal cross-tie D at the opposite side, securing said ties N to the cross-tie D at such points on the latter that the open angle between said ties N toward the open side is far enough over toward the closed side, at which the cross-tie D is secured, to permit the mast when at its proper vertical position to lodge in said angle, as seen in Fig. 7. The cross-ties N are bolted together at their intersection, and thereby measurably serve to stiffen the tower as if they were diagonal from corner to corner.

P is a counterbalancing-weight, which I secure upon one of the terminals of the mast. It is a casting with an axial aperture adapted to receive the end of the terminal G, and to be secured thereto and permit the pump-rod to extend and reciprocate through it. It will be understood that the counterbalance is below the latch when the tower is locked in up-

right position. To prevent tampering with the tower, the latch and the horizontal flange of the tie M may be provided with corresponding apertures, which register when the latch is engaged with the tie to lock the mast upright, and a padlock Q may be inserted through said registering apertures.

R is the pump-rod. It is guided on the shaft of the tilting tower, as seen in Figs. 3 and $3\frac{1}{2}$, being longitudinally slotted or provided with a longitudinal eye R′ for that purpose. Stops, as the collars $R^2$ $R^2$, may be secured on either side of the pump-rod on the shaft to retain the rod laterally. In attaching the several braces and ties to the channel-bar corner parts, in order to avoid weakening the said parts I lap and bolt the brace or tie onto the web and never onto the flange of the channel-bar, so that the bolt-holes necessary to be made to secure the parts are made through the center of the broad web at the neutral line as respects its resistance to edgewise-bending strain. This is illustrated in the drawings at the corners of the tower in Figs. 2 and 7.

I claim—

1. In a windmill-tower, a mast comprising four corner-bars converged from the middle toward both ends and suitably braced apart between the ends and fulcrumed at an axis diagonal to the square defined by the corner-bars, substantially as set forth.

2. In a windmill, a mast comprising four angle-iron corner-bars set with their angles at the corners of a square and their flanges coinciding with the sides of such square, said bars being converged from the middle of their length toward both ends and joined at their ends and braced apart between the ends and fulcrumed on an axis diagonal to the square defined by the corner-bars, substantially as set forth.

3. A windmill-tower consisting of corner-posts of channel-bar set in pairs, the individuals of each pair having their channels facing each other, substantially as set forth.

4. A windmill-tower consisting of triangular sides set on parallel base-lines and inclined toward each other, said triangular sides being tied together above a certain horizontal plane by braces connecting a side post of each triangle on one side of the pyramidal space defined by said triangular sides and being tied together at the opposite side of said pyramidal space below said horizontal plane, whereby the tower is open at one side above and at the other side below said plane, substantially as set forth.

5. A windmill-tower consisting of triangular sides set on parallel base-lines and inclined toward each other, said triangular sides being tied together above a certain horizontal plane by braces connecting a corner side post of each triangle on one side of the pyramidal space defined by said triangular sides and being tied together at the opposite side of said pyramidal space below said horizontal plane, whereby the tower is open at one side above and at the other side below said plane, combined with a mast fulcrumed at the apices of said triangular sides and tilting in a vertical plane between them, whereby such mast swings within the tower through the side open above said horizontal plane and is accessible at its lower end through the side open below said plane, substantially as set forth.

6. A windmill-tower having corner-posts and the tilting mast fulcrumed at the upper ends of such posts, horizontal ties connecting diagonally-opposite corner-posts near the lower end, said ties being deflected from straight lines to bring their intersection aside from the center of the rectangle defined by the corner-posts sufficiently to permit the lower end of the tilting mast to lodge in the angle between said ties when the axis of the mast is vertical and bolted together at such intersection, and suitable means for locking the said lower end of the mast at such lodgment, substantially as set forth.

7. A windmill-tower consisting of triangular sides set on parallel base-lines and inclined toward each other and tied together above a certain horizontal plane at one side of the pyramidal space defined by the triangles, the side bars of said triangles, which constitute the corner-posts of the tower, being tied together by horizontal bars connecting diagonally-opposite corner-posts at said horizontal plane, said diagonal ties being deflected from straight lines to carry their point of intersection away from the center of the rectangle defined by the corner-posts toward the side at which said triangles are tied together above said plane, and a tilting mast fulcrumed at the apices of said triangular sides and adapted to swing through the open side of the tower, substantially as set forth.

8. In combination with the diagonal ties L L and the tilting mast, whose lower end is adapted to lodge in the angle between them, the latch M, pivotally connected to one of said ties and bent at a distance from said pivot to permit the free end to lie alongside the other tie and provided with a hooked terminal adapted to engage the other tie, substantially as set forth.

9. In combination with the ties L of angle-iron oppositely placed, so that the horizontal flange of one lies upon the horizontal flange of the other at their intersection, the latch M, pivotally connected to the horizontal flange of one of said ties and having its free end hooked to engage the horizontal flange of the other, substantially as set forth.

10. A windmill-tower comprising two pairs of corner-posts, the individuals of each pair being rigidly joined together and forming side frames of the tower, set on parallel base-lines and provided each with a fulcrum for a tilting mast, such mast of double pyramidal shape, fulcrumed on the two side-frames and adapted to swing in a vertical plane between

the side frames, the side frames being tied together by a cross-tie B, connecting adjacent posts, and oblique braces N N from the other two posts to the cross-tie B, said braces intersecting within the tower and bolted together at their intersection, substantially as set forth.

11. A windmill-tower consisting of triangular sides set on parallel base-lines and inclined toward each other, each of such sides being made of side posts of channel-bar whose webs are transverse to the planes of the triangles, and ties and braces bolted to the webs of the channel-bars, substantially as set forth.

12. A windmill-tower composed of triangular sides consisting each of channel-bars set with their channels facing each other and secured together at their upper ends by means of the fitting J, said fitting having the fulcrum-bearing for the tilting tower, in combination with the corner-irons having an aperture at the angle to admit a shaft and the fitting having a corresponding aperture $I^2$, and the seat formed by the lugs $i^2$ for the pin $I^3$ at right angles to the axis of the shaft-aperture, and the shaft H, inserted diagonally through the mast and protruding at the corners through said apertures and pinned fast to the mast by the pins $I^3$, seated between the lugs $i^2$, substantially as set forth.

13. In combination with the tower, the mast fulcrumed thereon and having the axially-hollow terminal G, and a counterbalance-weight P, having an axial aperture to receive the terminal G and permit the pump-rod to protrude through it, substantially as set forth.

14. A windmill-tower consisting of opposite triangular sides, each made of side posts of channel-bar rigidly connected by cross-ties, the webs of the channel-bar being transverse to the planes of the triangles, substantially as set forth.

15. A windmill-tower comprising four corner-posts arranged in two pairs, a post of each pair having the web of the channel-bar in the plane of the web of the adjacent post of the other pair, substantially as set forth.

16. In a windmill-tower, in combination, substantially as set forth, the four corner-posts, and ties which rigidly unite said posts on three sides of the tower, the fourth side being left open to permit the mast to swing through it, the post which bounds such open side being made of channel-bar set with the web in the plane of such side.

In testimony whereof I have hereunto set my hand, at Chicago, Illinois, in the presence of two witnesses, this 24th day of March, 1892.

THOMAS O. PERRY.

Witnesses:
CHAS. S. BURTON,
JEAN ELLIOTT.