(No Model.) 2 Sheets—Sheet 1.

LA VERNE W. NOYES.

TOWER.

No. 457,819. Patented Aug. 18, 1891.

Fig. 1.

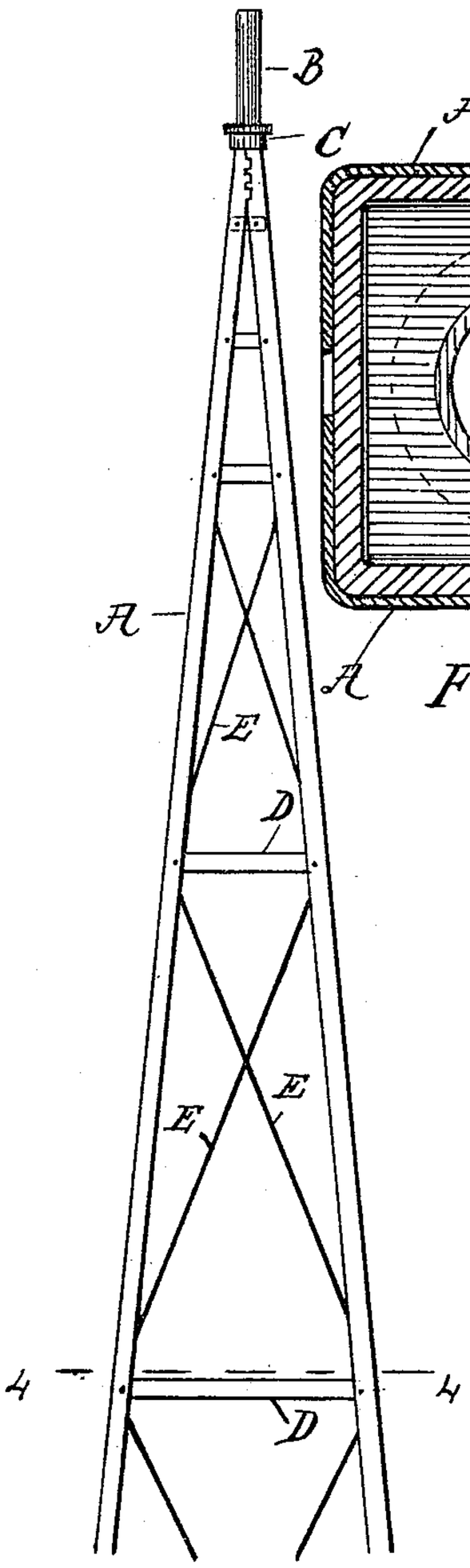
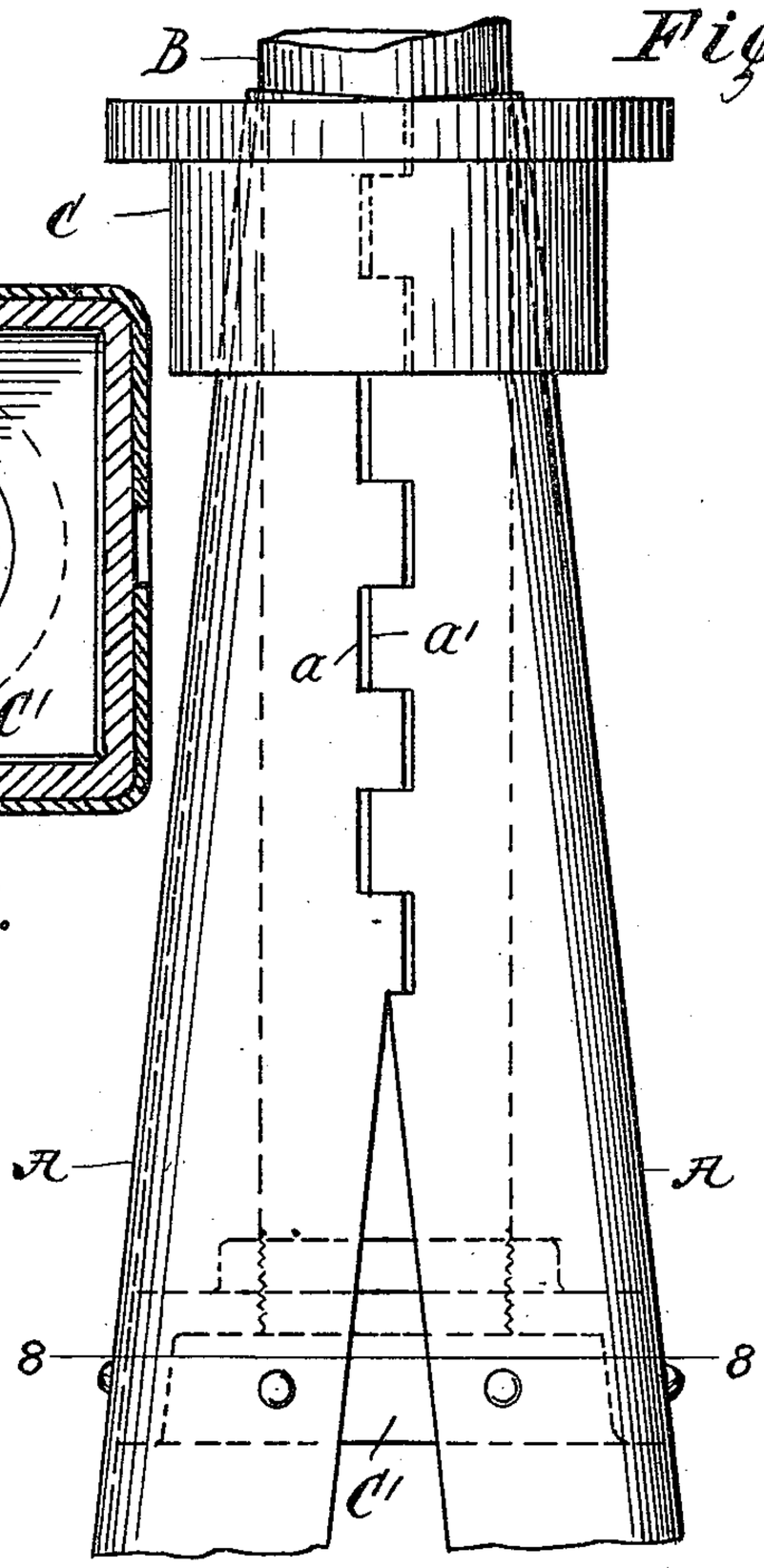


Fig. 2.



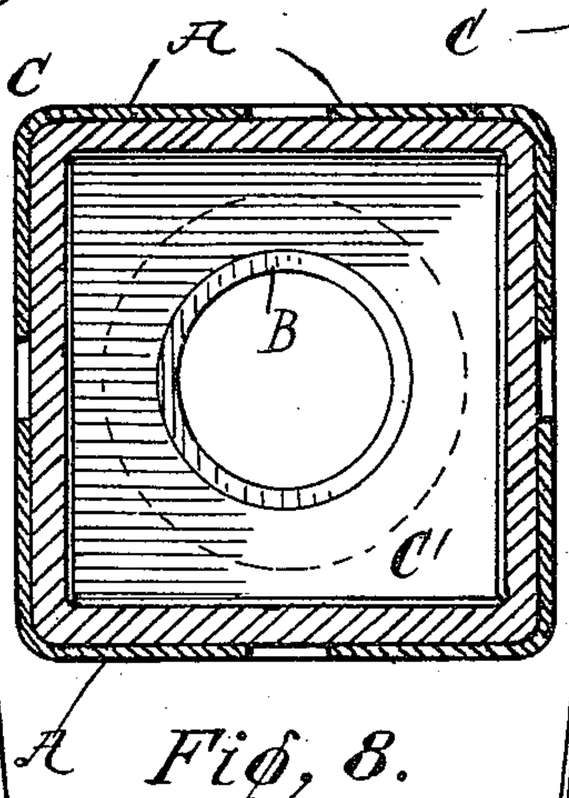
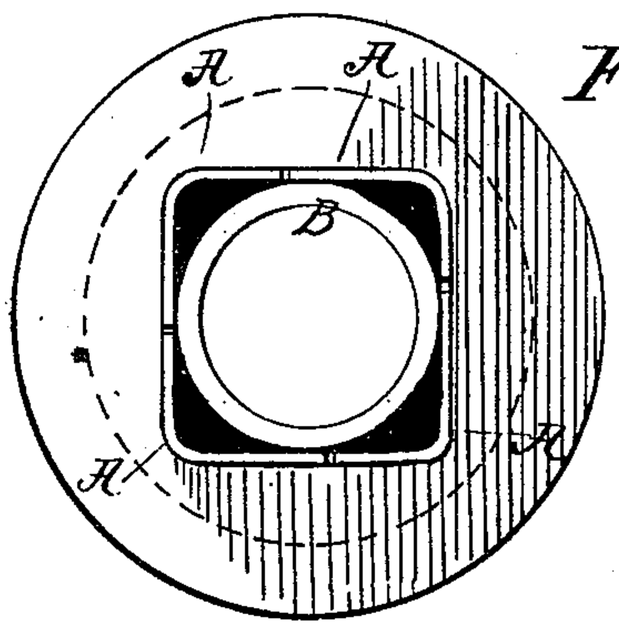


Fig. 8.

Fig. 3.



Witnesses
Jean Elliott.
Julia Usler.

La Verne W. Noyes Inventor
By his Attorneys
Burton and Burton.

(No Model.) 2 Sheets—Sheet 2.

LA VERNE W. NOYES.

TOWER.

No. 457,819. Patented Aug. 18, 1891.

Fig. 4.

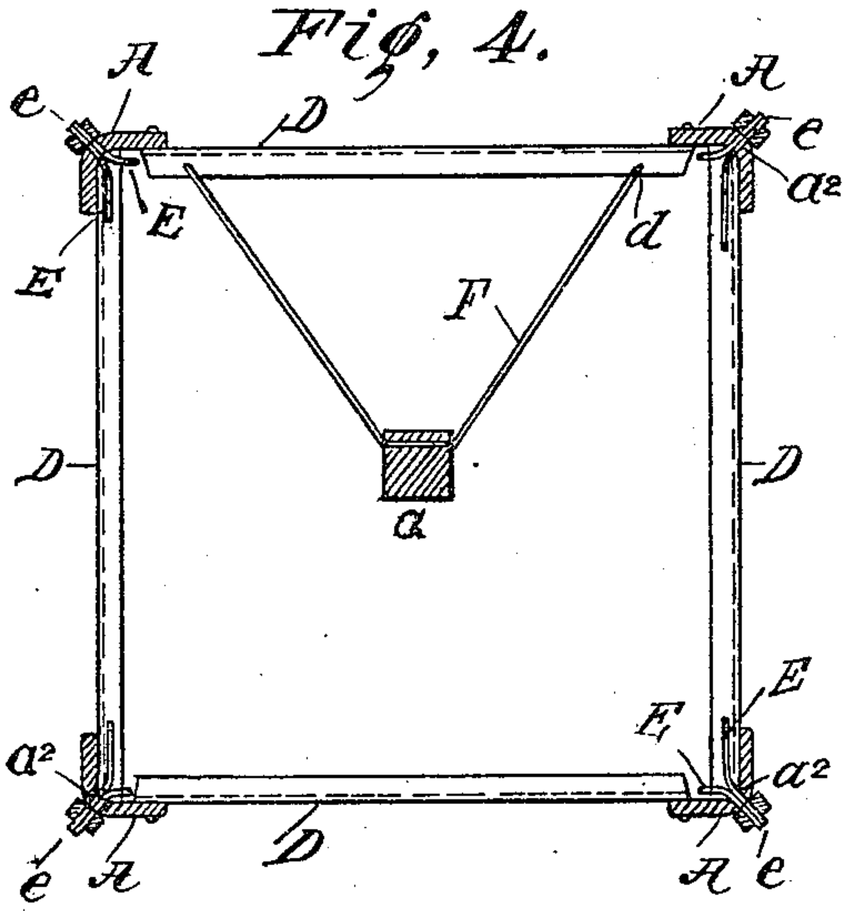


Fig. 5.

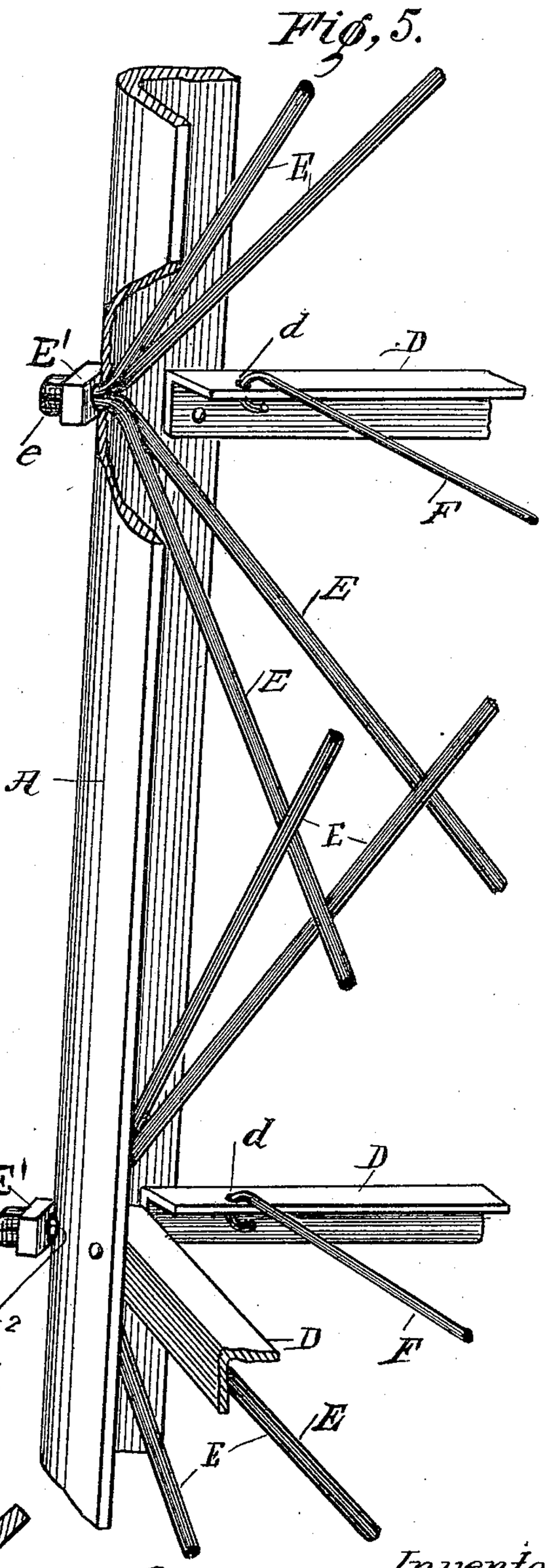


Fig. 6.

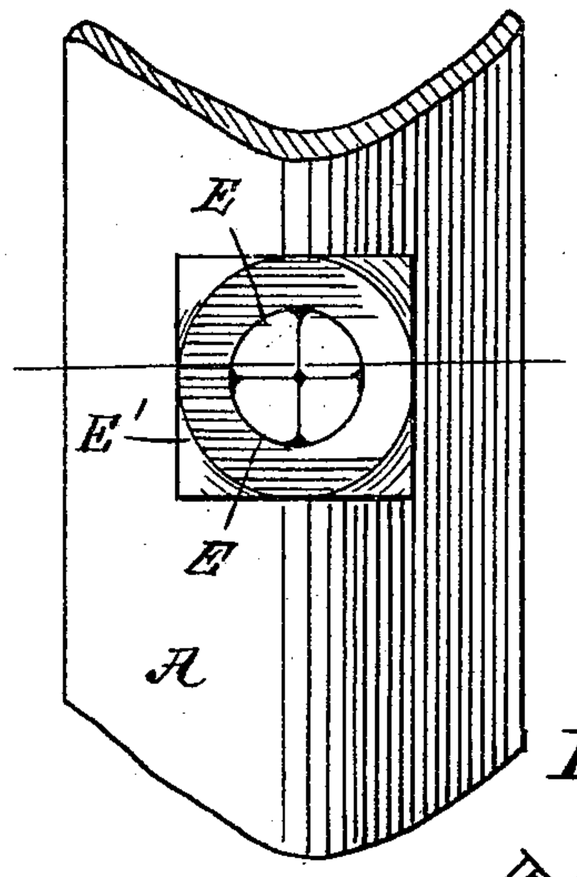
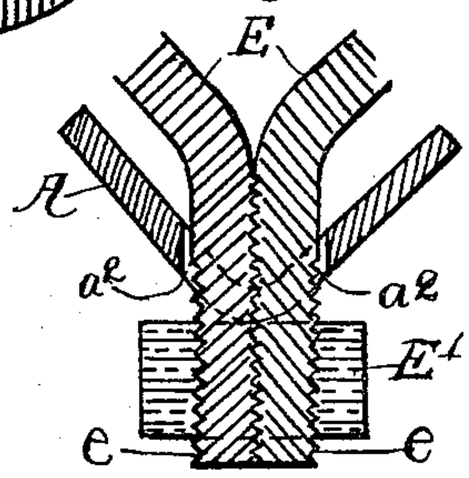


Fig. 7.



Witnesses
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Julia Usler.

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UNITED STATES PATENT OFFICE.

LA VERNE W. NOYES, OF CHICAGO, ILLINOIS.

TOWER.

SPECIFICATION forming part of Letters Patent No. 457,819, dated August 18, 1891.

Application filed April 27, 1891. Serial No. 390,615. (No model.)

To all whom it may concern:

Be it known that I, LA VERNE W. NOYES, 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 Tower, which are fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide a tower suitable for windmills, but not limited to such, which may be cheaply and strongly constructed out of structural iron, lightness and simplicity being also especially sought.

In the drawings, Figure 1 is a side elevation of my improved tower. Fig. 2 is a detail side elevation, on an enlarged scale, of the upper end portion of the tower, showing the joint which is formed between adjacent corner-irons where they meet at the top. Fig. 3 is a plan of the top end. Fig. 4 is an enlarged section at the line 4 4 on Fig. 1. Fig. 5 is a perspective of a portion of one corner-post and parts attached thereto, detail perspective showing the manner of securing the truss-ties to the corner-posts. Fig. 6 shows an elevation of a portion of an upright at the point where the ties are secured. Fig. 7 is a section at 7 7 on Fig. 6. Fig. 8 is a horizontal section at 8 8 on Fig. 2.

A A A A are four corner standards or uprights of the tower. They are made of angle-iron, and are set with their flanges each in the plane of the approximate flange of the adjacent upright A, their angles coinciding, therefore, with the angles of a rectangle, with whose sides the flanges coincide, as seen in the plan and horizontal sectional views in the drawings. These corner-uprights are inclined toward the vertical axis of the tower, and at their upper ends the edges of their proximate flanges are notched into each other, as shown in Figs. 1 and 2, being provided with corresponding projections and recesses—that is, with recesses between which the original metal stands as a projection. The uprights are even at their upper ends, so that at each of the joints thus formed between the abutting flanges, one upright has its flange ending with a recess, as *a*, while the other one has its flange ending in a tooth or projection *a'*. The upright, which has one flange ending in a recess, however, has the other flange, which makes the joint on the side of the tower adjacent to the side first considered, ending in a tooth, and all the uprights A are thereby rendered just alike—the right-hand flange, for instance, of each ending in a recess to match the tooth which terminates the left-hand flange of the adjacent upright at the right, while the left-hand flange terminates in a tooth to match the notch which terminates the right-hand flange of the adjacent upright at the left. The depth of the recesses *a* and the length therefore of the projections or teeth *a'* diminishes from the top end of the uprights down, according to the obvious requirements of the case, and the direction of the notches and teeth is at such angle to the length of the uprights as necessary in view of the inclination of the uprights to make the teeth and notches horizontal when engaged.

The size of the angle-iron corners A A A A is such as to adapt them when their flanges are engaged, as described, to admit within the square which their flanges inclose the sleeve B, through which the operating-rods from the mill may extend, and outside the said uprights A there is an inclosing and retaining thimble or ferrule C, which is vertically tapered interiorly to correspond with the inclinations of the uprights A, and, when placed about them, binds them firmly together, forcing their respective teeth and notches into close engagement as it is driven down on the tower. The sleeve B and ferrule C may be specifically adapted for purposes which relate to the operation of the windmill or other mechanism which the tower supports; but their specific features for such purposes need not be here explained.

Within the corner-posts at a short distance below their top there is the rigid frame or plate C', which fits the space defined by the flanges of the corner-posts at the level at which such plate is secured, and is bolted fast to them by bolts through the flanges which contact its four sides, respectively. This plate or frame is apertured at the center, and the lower end of the sleeve B is screwed onto such aperture, whereby the sleeve is upheld.

The two corner-uprights A A bounding each side of the tower are joined by the angle-iron horizontal bars D D at intervals in the height of the tower, such horizontal bars being struts for the truss structure formed by

the ties hereinafter described. They are secured to the corner-uprights by bolts through the flanges of the uprights which are in the plane of that side of the tower to which the bars D respectively pertain and through the vertical flanges of the said horizontal bars or struts D. The uprights of each side of the tower are further joined by the oblique rods or ties E E, which are braces or trusses of which the horizontal bars D are the struts. These ties E are made of iron or steel rod and are bent at the ends at an obtuse angle to the length, and the out-bent ends *e* are protruded from within the corner-uprights out through the holes a^2 made in said uprights at the angles or corners thereof. Since each upright A is the boundary for two sides of the tower, each of them receives the ends of the truss rods or ties E pertaining to the two sides. In order to afford proper trussing of each side of the tower, two ties must extend from each point of fastening of such ties to the corner-upright, one obliquely upward and one obliquely downward. I prefer to connect the truss-ties E for adjacent sides of the tower at the same point of the corner-upright which bounds said two sides, since to connect them at different points would cause them, when tightened, to tend to bend the corner-uprights by pulling in different directions at different points. There are therefore the ends of four of the ties E at each point of fastening of any of them to the uprights. I prefer to fasten all four in one and the same hole a^2 through the angle of the upright, and I secure the ends thus protruded through the upright by one nut E′, encircling them all, as seen in the drawings. The ends *e* may be adapted to be secured by running a tap around them after they are protruded through the hole; but it is much preferable to prepare them for such fastening before they are actually assembled in the tower, and I have found it of advantage, also, to cause the tie ends to become mutually engaged as well as to be engaged by the nut, and for both these reasons I prefer to prepare the ends *e* for the nut by pressing on them a suitable thread, and in the same process I press them into the approximately quadrantal shape shown in Fig. 6 and serrate their flat faces, so that they become mutually engaged at those faces when assembled in the hole a^2 and nut.

In order to conveniently make the connection of the braces at the tower corners in the manner above described, it is evident that the hole through which the end of the braces extend, in order to be bound together on the outside by a single nut, must be made through the corner of the angle-iron corner-posts of the tower. In the process of manufacture, the holes in question are most economically made by being punched in the iron, and they cannot be made in a clean or workman like manner either thus or by drilling if the angle is a sharp one, or if, in fact, the two flanges of the angle-iron form a perfect angle at the corner, because the tool, whether a punch or a drill, would have to enter from the inner side of the angle and would emerge through surfaces to which it would be so oblique as to make it almost impossible to cut a clean hole. Furthermore, the nut binding on the outside of such angle or angular corner would not seat securely and could not be set up readily. It is of considerable importance, therefore, that the so-called "angle-iron corner-posts" employed shall not have a sharp angle, but shall be blunted to the extent at least of the diameter of the hole by being rounded at the corner or angle, as shown in the drawings. The rounded construction is desirable, but generically, and for the purpose indicated it is to be considered simply as blunted. It is especially important that the exterior corner should not be angular.

This tower, being especially intended to support a windmill from which a pitman or other vertically-reciprocating rod shall extend down within the tower to operate a pump or other mechanism, I have adopted the form of the horizontal bars D to serve a specific purpose in connection with such reciprocating rod G, which will be hereinafter referred to as the "pump-rod." I make holes *d* in the horizontal flanges of some of the bars D, which are far enough down from the top of the tower, so that the width of the tower at that level is large relatively to the stroke of the pump-rod, and hook into these holes the ends of wire guide or stay links F, the other ends of which are connected to the pump-rod at a point which at the middle position of the rod is in the horizontal plane of the bar D, to which it is thus connected. A most convenient mode of making the connection to the pump-rod, which is usually of hard wood about one inch or one and one-fourth inches square, is to bore a hole through the pump-rod G at the proper point and insert the wire through it to the middle and then bend the wire on both sides of the rod toward the side of the tower and bend a suitable hook on each end and hook the ends into the holes in the bars D. Preferably the two ends or the ends of the two links, when they are not made of one piece, are connected as far apart as possible on the bar D, so that they will brace the pump-rod in the vertical plane parallel to the said bar, as well as in the vertical plane at right angles to it. These stay-links are designed to stay the pump-rod and prevent it from bending in its down or pushing stroke, and such links may be employed at several points in the length of a long pitman or pump rod, thus practically limiting the lateral bending of the rod to that amount which can occur between the consecutive points of connection of such stays or between the ends, respectively, of the rod and the nearest such stay.

I claim—

1. In a tower, corner-uprights made of angle-iron set inclined toward each other and

having their flanges correspondingly notched and toothed and mutually engaged thereby, whereby endwise displacement of the corners relatively to each other is prevented, substantially as set forth.

2. A tower having its corner-uprights made of angle-iron inclined toward each other and having their flanges correspondingly notched and toothed and mutually engaged thereby at their approximate edges, in combination with an encircling band or ferrule by which they are retained in engagement, substantially as set forth.

3. A tower having its corner-uprights made of angle-iron inclined toward each other and having their flanges correspondingly notched and toothed and mutually engaged thereby at their proximate edges, in combination with an interior sleeve or stop-ring to which the flanges of the angle-iron corners are tangent, whereby the joints formed between the engaged flanges are prevented from buckling inward, substantially as set forth.

4. In a tower, four corner-uprights made of right-angle irons, set with their angles at the corners of a square pyramid and their flanges in the planes of the slant sides of a pyramid, the edges of the flanges at the upper ends being correspondingly notched and toothed and mutually engaged thereby, and a hollow pyramidal ferrule embracing the upper ends of the angle-iron corners to hold them in engagement, substantially as set forth.

5. In combination with the angle-iron corner-uprights having their flanges respectively correspondingly toothed and notched and mutually engaged thereby, the interior sleeve to which the flanges are tangent and the exterior ferrule binding the angles, substantially as set forth.

6. In combination with the angle-iron corner-uprights having their flanges respectively correspondingly toothed and notched and mutually engaged thereby, the rigid frame or plate C′ interior to the corner-posts and contacting their flanges and bolted thereto, whereby they are kept from spreading, substantially as set forth.

7. In combination with the angle-iron corner-uprights having their flanges respectively correspondingly toothed and notched and mutually engaged thereby, the interior sleeve to which the flanges are tangent, and the rigid frame or plate C′ interior to the corner-posts and extending onto their angles, respectively, and bolted thereto, substantially as set forth.

8. In a tower, the angle-iron corner-uprights, and the ties by which the uprights of each side are trussed together, such ties being secured to the uprights by having their ends bent out and inserted outward through the uprights at the corner and secured outside such corner by a nut, said angle-iron uprights having their angles rounded or blunted, substantially as and for the purpose set forth.

9. In a tower, in combination with corner-uprights, the ties or struts by which the uprights of each side are trussed together, the ties pertaining to adjacent sides diverging from the same points of the intervening corner-uprights, all four of the ties at each such point having their ends protruded together through the upright and secured by a nut encircling them all, substantially as set forth.

10. In a tower, in combination with corner-uprights, the ties and struts by which the uprights of each side are trussed together, the ties pertaining to adjacent sides diverging from the same points of intervening corner-uprights, said corner-uprights being made of angle-iron having the angle rounded or blunted, all four of the ties at the point from which the same diverge having their ends protruded together through the upright and secured by a nut encircling them all and adapted to be jammed against the exter blunt angle of the corner-upright, substantially as set forth.

11. In a tower, in combination with corner-uprights, the ties and struts by which the uprights of each side are trussed together, the ties pertaining to adjacent sides diverging from the same points of the intervening corner-uprights, all four of the ties at each such point having their ends protruded together through the upright and serrated on their contacting surfaces, whereby they are adapted to be mutually engaged, substantially as set forth.

12. In a tower, in combination with corner-uprights, the ties and struts by which the uprights of each side are trussed together, the ties pertaining to adjacent sides diverging from the same points of the intervening corner-uprights, all four of the ties at each such point having their ends protruded together through the upright and flattened at their contacting surfaces, whereby they are approximately quadrantal in cross-section, substantially as set forth.

13. In combination with the tower-frame and the pitman arranged to be reciprocated vertically within the same, the horizontal guide-links pivotally connected at one end to the pitman and at the other end to the tower-frame, substantially as set forth.

14. In combination with the tower-frame having horizontal bars of angle-iron, the pitman arranged to be reciprocated vertically within the tower, and horizontal guide or stay links pivotally connected at one end to the pitman and at the other end hooked through holes in one flange of the angle-iron bars, substantially as set forth.

In testimony whereof I have hereunto set my hand, at Chicago, Illinois, in the presence of two witnesses, this 22d day of April, A. D. 1891.

LA VERNE W. NOYES.

Witnesses:

THOMAS O. PERRY,

R. R. BAILEY.