

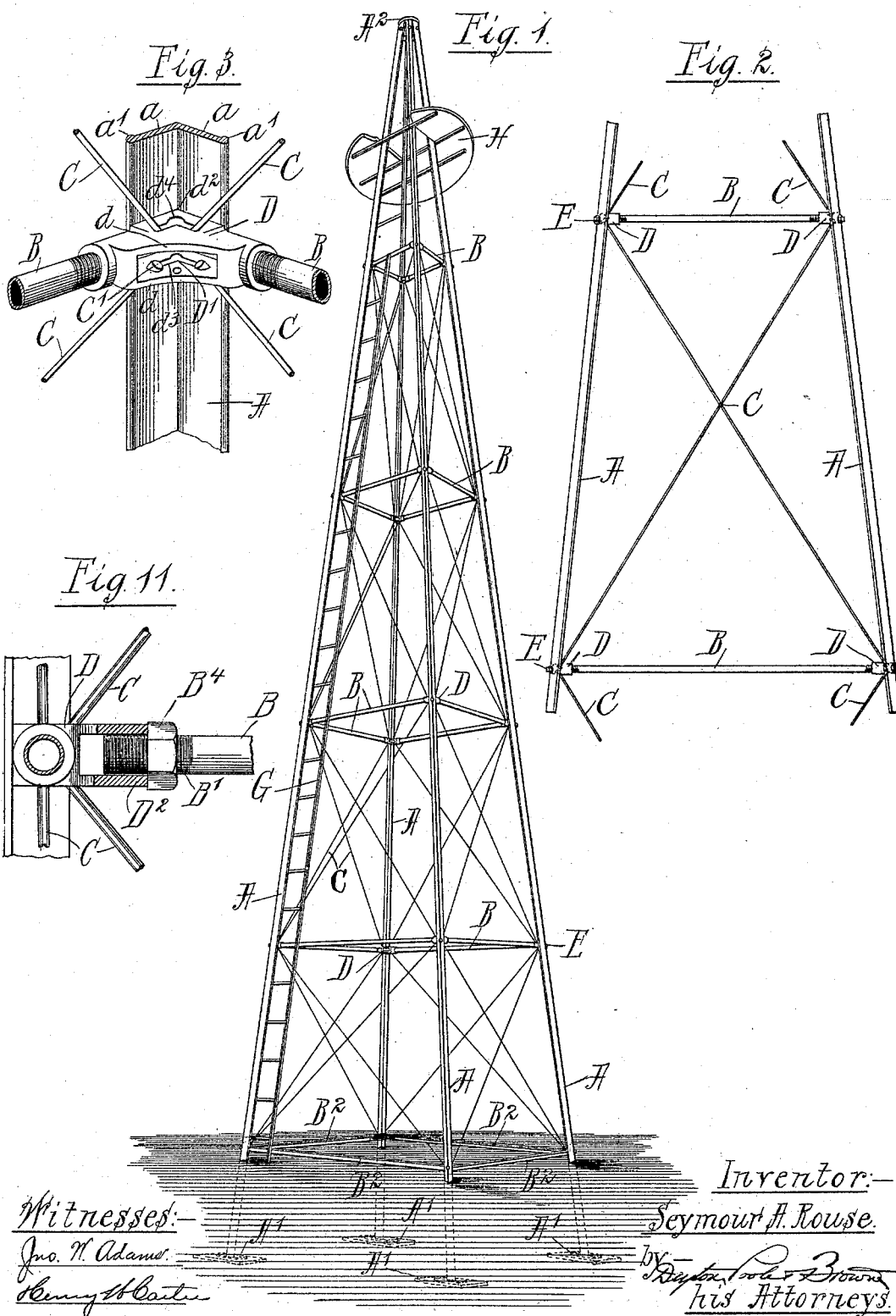
(No Model.)

2 Sheets—Sheet 1.

S. A. ROUSE.  
TOWER FOR WINDMILLS.

No. 526,793.

Patented Oct. 2, 1894.



Witnesses:—

Jno. W. Adams.  
Henry H. Carter

Inventor:—

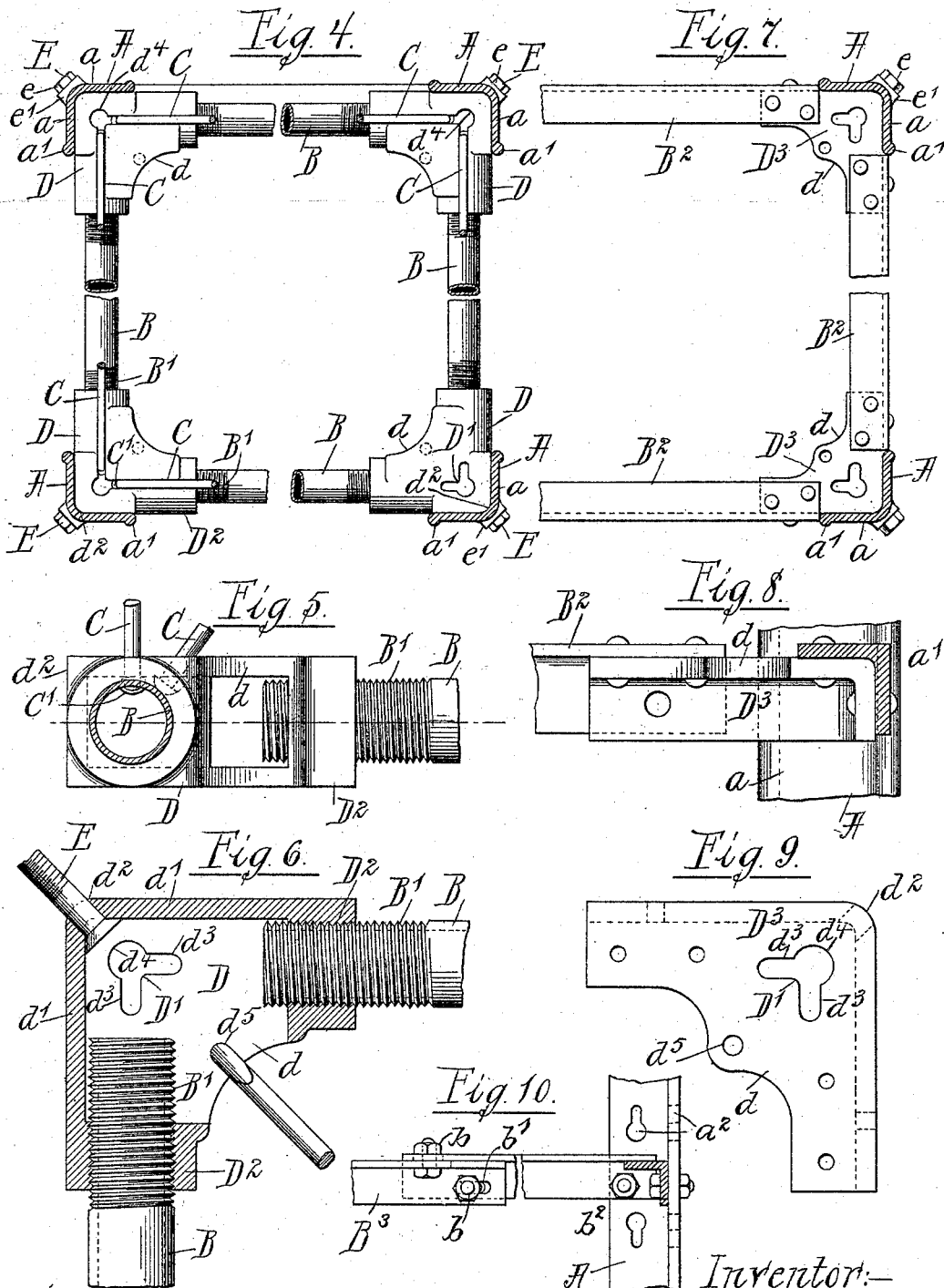
Seymour H. Rouse.

by *Richard P. Brown*  
his Attorneys.

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by: Dayton, Coker & Browne  
his Attorneys.

# UNITED STATES PATENT OFFICE.

SEYMOUR A. ROUSE, OF CHICAGO, ILLINOIS.

## TOWER FOR WINDMILLS.

SPECIFICATION forming part of Letters Patent No. 526,793, dated October 2, 1894.

Application filed April 26, 1894. Serial No. 509,143. (No model.)

*To all whom it may concern:*

Be it known that I, SEYMOUR A. ROUSE, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Towers for Windmills, &c.; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in steel or similar metallic towers for windmills, and has particular reference to the structural features whereby such towers are trussed or braced against the strains to which they are subjected in use.

The object of the invention is to provide an improved construction in towers of the character referred to; and it consists in the matters hereinafter set forth, and particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a perspective view of a tower constructed in accordance with my invention. Fig. 2 is an enlarged detail of one of the panels of the truss work. Fig. 3 is a perspective detail, showing the manner of connecting the corner posts, struts and tie rods. Fig. 4 is a horizontal sectional detail of the tower. Figs. 5 and 6 are detail views of a corner casting. Fig. 7 is a horizontal sectional view of a form of strut or brace and connections, somewhat modified from that previously shown. Figs. 8 and 9 are details of the corner casting shown in Fig. 7. Figs. 10 and 11 show forms of struts embodying my invention, somewhat modified from those previously illustrated.

A A designate the corner posts or supporting standards of the tower, said posts being formed of angle bars having two integral flanges *a a* arranged at right angles to each other, and herein shown as provided along their edges with an exterior beading *a'* which adds greatly to the strength of the posts without materially increasing their weight. In low towers each of the corner posts A will ordinarily be made of a single integral piece or length of angle bar. In high towers, they may be composed of two or more lengths of bars spliced together by any suitable means.

Not shown. The lower ends of the posts A are spread widely apart, and usually designed to be embedded in the ground and anchored in place by any suitable anchor plates A'. Obviously, however, they may be bolted to the top of any secure foundation designed to receive them. The posts converge upwardly almost to a point, and are bolted at their tops to a collar A<sup>2</sup> through the open center of which the pump rod or actuating shaft from the well is adapted to pass.

The trussing or bracing of the tower is principally effected by struts or girts B, tie rods C and corner pieces or castings D which form connections between the girts and tie rods, and the corner posts A. The struts or girts B are provided, as usual, in sets of four, arranged in different longitudinal planes at suitable distances apart, the members of each set being made of proper length to extend between the corner posts at that level. Each side of the tower is thus divided by the girts B into a plurality of panels, each of which is crossed diagonally by two of the tie rods C, each extending from the lower corner piece D on one side to the upper corner piece on the other.

The corner castings D, as herein shown, are made hollow, with top and bottom plates or flanges *d*, and side walls *d'* arranged at right angles to each other to form a corner *d*<sup>2</sup> adapted to fit within the angle of the corner posts. In the approved construction shown, each of the corner castings D is secured to the corner post with which it is engaged by a single bolt E passing through corresponding apertures in the extreme corners of the casting and post, the bolt being, in this instance, headed at its inner end and provided at its outer end with a nut *e*, and a washer *e'* shaped to fit on the exterior angle of the corner post. This construction obviates the natural weakening of the posts which occurs when several holes are required to be provided for the attachment of each corner casting.

The tie rods C are each made of a single piece, without turnbuckles or other devices for adjusting their tension, and are formed at their ends with enlarged heads C' which are adapted to engage button hole slots D' in

the top and bottom plates of the corner castings D, and which thus provide a simple and secure, but detachable connection between said tie rods and corner pieces. As a further improvement, and for the purpose of enabling the truss rods to be properly tightened up, notwithstanding the omission of turnbuckles in the ties C, the struts B are adjustably connected with the castings D by being provided at their opposite ends with right and left hand screw threads B' engaging correspondingly screw threaded apertures in the ends D<sup>2</sup> of the corner castings D. The screw threaded portions B' of the struts B are made long enough to screw into the castings D considerably beyond the point at which they are designed to stand when finally adjusted, in order that when they are screwed a considerable distance into the corner castings D the latter will be brought sufficiently near together to permit the insertion of the beaded ends of the ties C in the button hole slots D', while when afterward partially unscrewed said castings will be sufficiently separated to bring the necessary tension on the ties. When the bolts E which secure the corner pieces D to the corner posts A are tightened up, any turning of the girts B will obviously bend said corner posts, but the movement will ordinarily be well within the limit of elasticity of the posts, and if necessary, may be lessened or obviated by loosening the bolts E. The struts or girts and tie rods will normally be made the exact length necessary to hold the posts A perfectly straight when the parts are finally adjusted.

As herein shown, the button hole slots D' in the top and bottom plates of the corner castings are each formed with two reduced or slot portions d<sup>3</sup> extending parallel with the two sides of the corner casting and opening into a common enlargement d<sup>4</sup>. In this way a single aperture in each flange d' serves for the connection of both the tie rods C which engage that flange; the headed ends of the two tie rods being inserted one at a time in the common enlargement d<sup>4</sup> and each moved laterally into its proper slot d<sup>3</sup>.

Preferably, and as herein shown, the girts B are made hollow, and may be conveniently formed of ordinary wrought iron piping cut to the proper lengths, and screw threaded at their ends, in the manner described. The corner pieces D may be conveniently made of cast iron, and afterward made malleable, if desired, by the usual process. The button hole slots D', and the apertures for the bolt E may be cored out, so that the only machine work required will be the boring and tapping of ends D<sup>2</sup>. An aperture d<sup>5</sup>, into which the end of a usual swinging guide bar F for the pump rod may be hooked, (see Fig. 6) is also herein shown cored in the lower flange d of the casting near the inner edge thereof.

In some cases, and particularly in the lowermost set of girts, which will usually be located but a short distance above the ground,

the non-adjustable angle bar B<sup>2</sup>, shown in Figs. 7 and 8, is conveniently used in place of the tubular girts B. Such angle bar is designed to be bolted securely over the upper lateral corners of the corner castings D<sup>3</sup>, made generally similar to the castings D, but with the apertured ends D<sup>2</sup> omitted. The planks of the usual bottom platform of the tower may be arranged to extend beneath the upper flange of such angle bar girts B<sup>2</sup>, so that the latter will form a permanent edging to protect the platform.

Where the corner piece D<sup>3</sup> is used with the lowermost set of girts, there will ordinarily be no tie rods leading off from its under side, and the hollow flange of the casting may thus be omitted, as shown in Fig. 8; the hole d<sup>5</sup> for the pump rod guide being in this case provided, if desired, in the top flange d.

The provision of non-adjustable girts at the bottoms of the corner posts, and the limitation of the adjustment of the uppermost girts, due to the rigid connection of the tops of the corner posts by the collar A<sup>2</sup>, will obviously necessitate, in order to permit the insertion of the tie rods of the top and bottom panels, a greater adjustment of the intermediate struts than would suffice for the insertion of the intermediate tie rods, and the screw threaded connections will, accordingly, be proportioned to permit such excess of movement.

In the erection of the tower thus formed, the four girts comprising each set are usually connected to their proper corner pieces, and the corner posts A are secured to the rectangular frames thus formed by means of the bolts E. The tubular girts B being screwed well into the castings D, the tie rods C are placed in proper positions with their headed ends engaging the upper button hole slots, after which said tubular girts are unscrewed until the tie rods are drawn taut, and the truss work brought under the desired tension. When all of the tie rods are in place and adjusted, the tower will evidently be completely fully braced in all directions.

A suitable ladder G of any desired type is herein shown secured to one side of the tower, and the latter is also provided at its top with a platform H. These features, however, constitute no part of my invention, and may be altered or omitted without affecting the same. Obviously, while herein shown embodied in a four cornered tower, my invention is applicable to towers having but three sides, or even to towers having more than four sides, and also applicable to towers which do not converge toward the top, but are of the same cross sectional area throughout. Furthermore, although herein referred to and particularly designed for carrying wind mills, towers embodying my invention may be used for any other purpose to which they may be found adapted.

From a consideration of the underlying principles involved in the construction of the

tower hereinbefore described, as embodying my invention in one form, it will be understood that in its broad aspect said invention embraces as a fundamental feature the adjustment of the truss work of a tower in which tie rods of a fixed length are employed, by means of any form of adjustable girts or struts under the action of which the corner posts may be spread bodily to bring proper tension on said tie rod without the necessity of threading the same or providing them with turn buckles or any other form of adjusting device. Consequently, while the struts hereinbefore illustrated and made adjustable by right and left screw threaded connections with corner pieces which are secured to the corner posts, form an approved construction which I deem the most desirable for the purpose, various other forms of adjustable struts capable of securing the same general result may obviously be devised.

For example, in Fig. 10, I have shown a strut B<sup>3</sup> made of angle iron and divided between its ends into two parts which are adjustably connected with each other by means of bolts *b* engaging elongated slots *b'* in one or both parts of the strut. A strut of this form may be connected with the corner posts by means of a corner bracket similar to the bracket D<sup>8</sup> shown in Figs. 7, 8 and 9, or may be secured directly to the flange of the corner post itself by means of bolts *b*<sup>2</sup>, as in Fig. 10, and in case the latter construction is used and a separate corner piece omitted, the button-hole slots or other fastenings for the ends of the tie rods may be provided at the point of juncture of the girts with the corner posts in any of the members, as may be found most convenient. Such slots *a*<sup>2</sup> are in this instance shown provided in the flanges of the corner posts, though when so located, they have the obvious disadvantage of weakening said posts to a slight extent. When an adjustable strut of the type shown in Fig. 10 is employed, the parts may be forced apart to bring the requisite strain on the tie rods by means of a lever or other convenient device, until in their desired relative position, whereupon the bolts *b*<sup>2</sup> will be tightened up to clamp the parts together and secure them in such position. It will also be understood that even where the screw threaded girts B of the type previously described are employed, the adjustable connection between them and the corner pieces D may be variously provided in other forms than that above shown. As for instance, in Fig. 11, the interior diameter of the apertured ends D<sup>2</sup> of the corner piece D is made greater than the exterior diameter of the screw threaded ends B' of the struts, said apertures merely having sliding engagement with the ends of the strut instead of the screw threaded engagement therewith, as before described. The adjustment in this case is secured by means of ordinary nuts B<sup>4</sup> provided on the screw threaded ends B' of the struts and engaging the ends

of the corner pieces. By turning said nuts the corner pieces may obviously be forced outward in the same manner as in the case of a direct screw threaded engagement between the strut and corner piece, and in this instance it will be obvious that the ends B' of the struts need not necessarily be oppositely screw threaded, since said nuts B<sup>4</sup> may be turned independently of each other. The form of strut shown in Fig. 11, however, has the obvious disadvantage of affording no resistance whatever to the spreading of the corner posts in case the tie rods should break or become insufficient to withstand the strain upon them. While, however, the modifications thus shown serve to illustrate some of the various other forms in which my broad invention may be practically embodied, the features of construction more particularly set forth possess many practical advantages, and are accordingly specifically claimed.

I claim as my invention—

1. The combination with the corner posts of a tower, of means for bracing the latter comprising tie rods, and adjustable struts or girts by means of which the corner posts may be spread bodily to bring the tie rods under tension, substantially as described.
2. The combination with the corner posts of a tower, of corner pieces secured to said posts, tie rods connected at their ends to the corner pieces, and adjustable struts or girts engaging the corner pieces, substantially as described.
3. The combination with the corner posts of a tower, of corner pieces secured to said posts, tie rods of fixed lengths connected at their ends to the corner pieces, and struts or girts adjustably engaging the corner pieces, substantially as described.
4. The combination with the corner posts of a tower, of corner pieces secured to said posts and provided with button hole slots, tie rods having headed ends engaging said slots, and struts or girts adjustably engaging the corner pieces, substantially as described.
5. The combination with the corner posts of a tower, of corner pieces secured to said posts, tie rods connected at their ends to the corner pieces, and struts or girts provided at their opposite ends with right and left screw threaded portions adjustably engaging corresponding screw threaded apertures in the corner pieces, substantially as described.
6. The combination with the corner posts of a tower, of corner pieces secured to said posts, and provided with button hole slots, tie rods headed at their ends to engage said slots, and struts or girts having right and left screw threaded engagement with the corner pieces, substantially as described.
7. The combination with the angle bar corner posts of a tower, of corner pieces bolted to said posts comprising upper and lower flanges and side walls forming a corner adapted to fit within the angle of the corner posts, and having button hole slots in said

flanges, tie rods having headed ends to engage said slots, and struts having right and left screw threaded engagement with said corner pieces, substantially as described.

5 8. The combination with the angle bar corner posts of a tower, of corner castings comprising side walls forming a corner adapted to fit within the angle of the corner posts, a  
10 bolt passing through the angle of each corner post and corner piece to secure the latter in place, substantially as described.

9. The combination with the corner posts of a wind mill tower, of corner pieces secured to said posts, tie rods connected at their ends  
15 with said corner pieces, struts adjustably engaging the latter, and apertures in said cor-

ner pieces for engaging swinging guides for the pump rod, substantially as described.

10. The combination with the corner posts of a tower, and corner pieces secured to the 20 posts, of a lower set of angle bar struts rigidly secured to the lower corner pieces, upper sets of struts adjustably engaging the upper corner pieces, and tie rods connecting the corner pieces, substantially as described. 25

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

SEYMOUR A. ROUSE.

Witnesses:

HENRY W. CARTER,

ALBERT H. GRAVES.