(No Model.) 3 Sheets—Sheet 1.

T. O. PERRY.

WINDMILL TOWER AND TURN TABLE.

No. 538,742. Patented May 7, 1895.

Fig. 1.

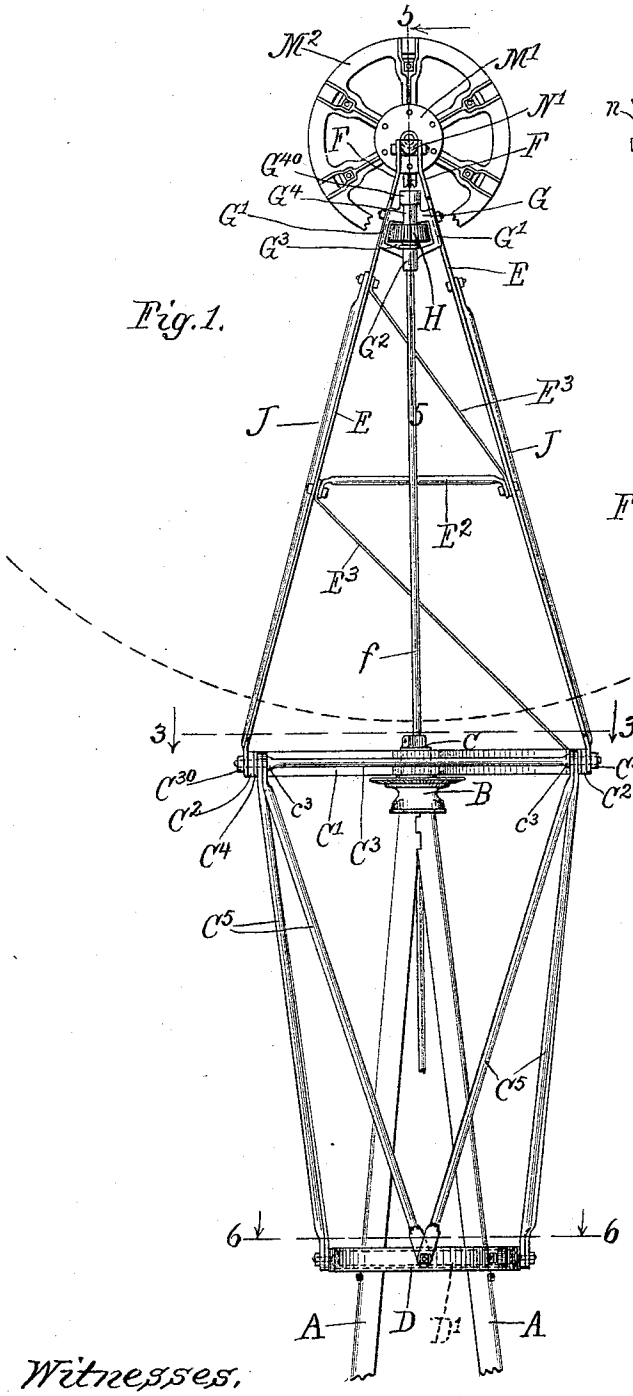
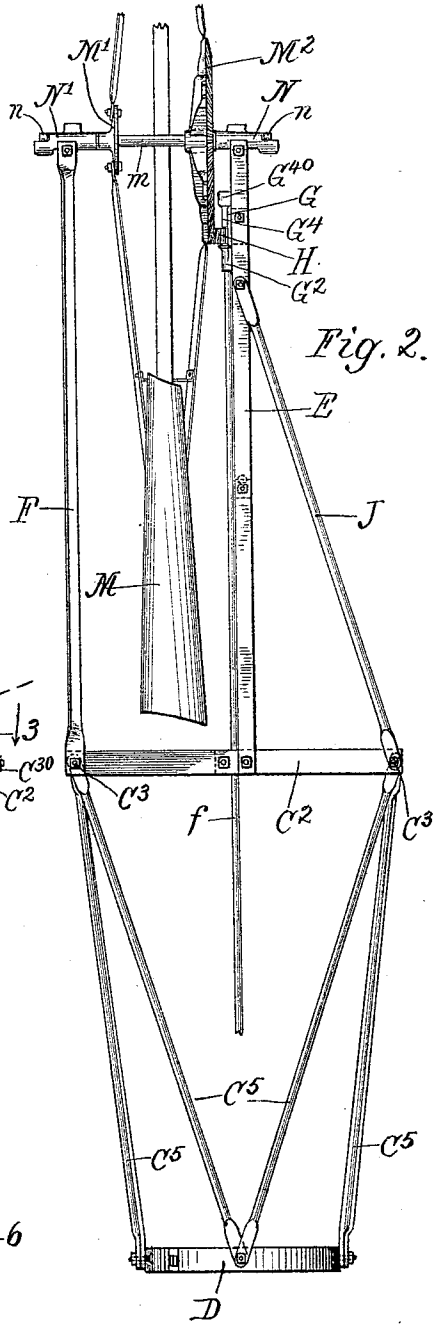


Fig. 2.



Witnesses,
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Jean Elliott

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(No Model.) 3 Sheets—Sheet 2.

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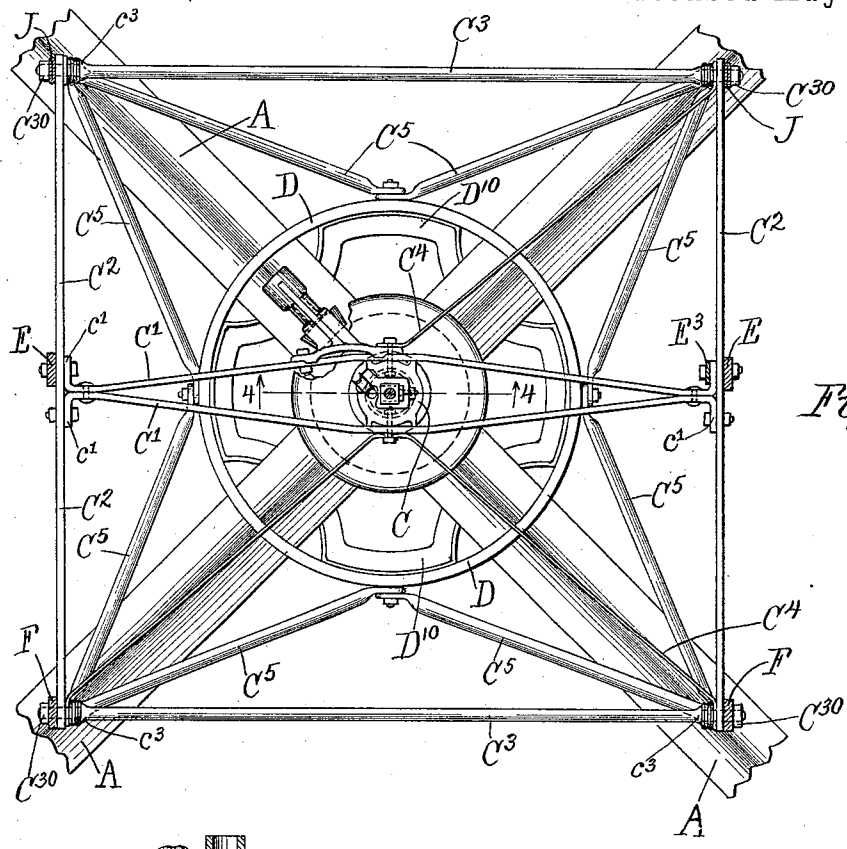

Fig. 3.

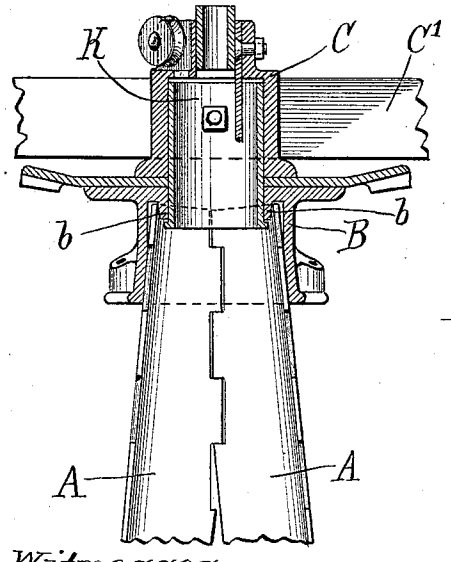

Fig. 4.

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(No Model.) 3 Sheets—Sheet 3.

T. O. PERRY.

WINDMILL TOWER AND TURN TABLE.

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Fig. 5.

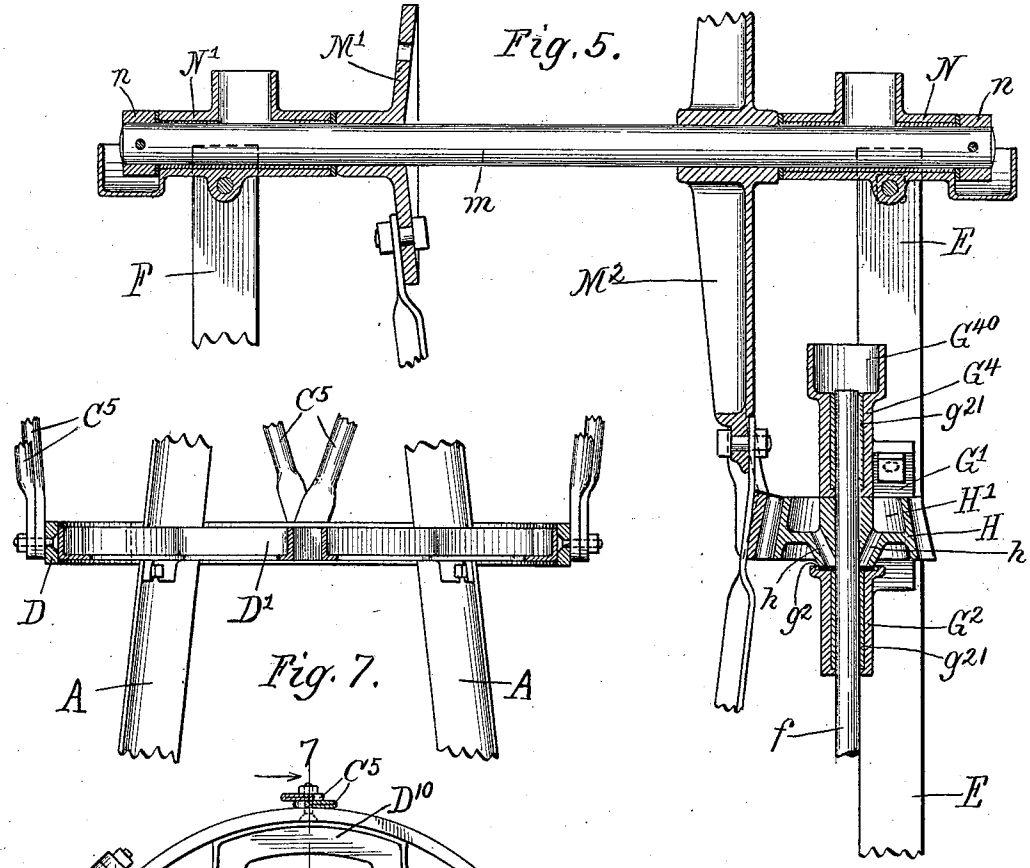

Fig. 7.

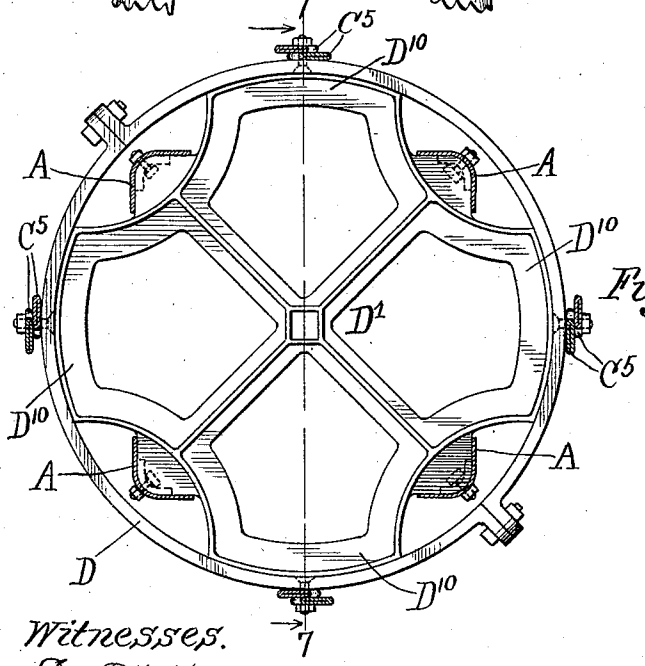

Fig. 6.

Witnesses.
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UNITED STATES PATENT OFFICE.

THOMAS O. PERRY, OF CHICAGO, ILLINOIS.

WINDMILL TOWER AND TURN-TABLE.

SPECIFICATION forming part of Letters Patent No. 538,742, dated May 7, 1895.

Application filed December 5, 1892. Serial No. 454,162. (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 Windmill Tower and Turn-Table, which are fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

This invention relates to the construction of windmills particularly in respect to means which facilitate the location of the wheel above the supporting timbers or other frame-work of the tower, so that the effective force of the wind upon the wheel may not be diminished by the resistance of the tower itself, and so that the wheel may be located closer to the vertical axis of the tower and turn-table, and the tendency of the wind to deflect the wheel thereby diminished.

In the drawings, Figure 1 is a front elevation of the turn-table employed in my invention and the upper end of the tower upon which it is mounted, showing the hub and main gear of the wind-wheel. Fig. 2 is a side elevation of the same, showing also one sail of the wheel. Fig. 3 is a section at the line 3 3 on Fig. 1, on an enlarged scale. Fig. 4 is a detail section at the line 4 4 on Fig. 3. Fig. 5 is a section at the line 5 5 on Fig. 1, on an enlarged scale. Fig. 6 is a section at the line 6 6 on Fig. 1, on an enlarged scale. Fig. 7 is a section at the line 7 7 on Fig. 6.

The details of the structure illustrated are such as pertain to a mill arranged to drive a vertical shaft at the center of the tower by beveled gears on the wheel shaft and said vertical shaft; but the invention is not limited to such a mill, but is equally adapted to the class of mills arranged to operate a reciprocating rod instead of the shaft. It has been generally customary to mount upon the top of the tower a turn-table having the bearings for the wheel shaft located very little, if any, above the top of the tower. Since the tower supports are necessarily inclined divergently from the top downward, the wheel, having its center thus near the apex of the tower and extending down from that point to the extent of its radius, must be set off from the apex enough to make it clear the diverging supports; that is to say, must be set off as much at least as the divergence of the supports from a vertical support in a distance equal to the radius of the wheel. As towers are commonly constructed, and as is necessary to construct them for safety, this compels the setting off of the wheel often as much as from eighteen to twenty-four inches from the axial line or center of the tower, which creates a very strong tendency of the wheel to swing sidewise or swerve from the wind while in operation, and this tendency must be counteracted by an increase of the tail surface or other equivalent means, the increased strain of which sideward tendency and resistance comes upon the tower and the mill-bearings, and, in a high wind, very materially strains the entire structure, diminishing its durability besides making it more difficult of management. I aim to avoid this defect by locating the wheel entirely above the tower, so that it may be placed as close to the vertical axis as is consistent with communicating motion from it to a rod or shaft extending down in the line of that axis. Theoretically, this might be done by mere elongation of the spindle or center-bearing of the turn-table, which is commonly a pipe, but practically, such a support would be totally inadequate, and would not solve the difficulty. I therefore construct, as a part of the turntable, at the very top of, or just above the top of the tower, a horizontal frame-work which may be called, for convenience, a platform frame, which I make rigid with respect to the vertical axis of the turn-table by means which is hereinafter described; and from this platform frame, thus made rigid with respect to its axis, I erect trussed supports for the wheel bearings, which, since they need be but very little greater in height than the radius of the wheel, can be made very light, as compared with the tower supports, and which offer, therefore, correspondingly less obstruction to the wind, and in an equally lessened degree than the tower supports, reduce the effectiveness of the wind upon the wheel.

A A represent converging corner posts of the tower.

B represents the thimble or tower-top, which binds the corner posts and affords the immediate support for the turn-table.

C may be termed the "hub" of the turn-

table, the latter comprising all that I have above designated as a platform frame.

K is a sleeve or coupling, which serves as a means of securing the turn-table on the tower-top, constituting the journal bearing of the turn-table in the tower top or thimble B. This coupling is a simple cylinder with a flange at the lower end, its diameter being equal to that of the central aperture through the tower top and through the hub of the turn-table, and it is designed to be inserted up through the tower top until its flange stops against the shoulder *b* around the margin of the central opening of the latter, and bolted to the hub of the turn-table into which it extends, fitting the aperture thereof as stated, the bolts which secure it being inserted from the outer side and nuts applied within the coupling. To opposite sides of the hub C, I bolt two flat bars C′ C′, which are brought together and riveted near their ends which are bent apart to form foot flanges *c′ c′*, at right angles to the line through the axis of the tower and the contacting surface of the two bars where they are brought together and riveted as stated. To the flanges *c′* of these bars I bolt fast the side-bars C^2 C^2, which are thus secured at the middle point of their length, so that their opposite ends mark four corners of a parallelogram, which, as I prefer to construct it, is a square, the length of the bars being equal to the distance between them, as measured by the trussed center bar formed by the bars C′ C′, spread by the hub C. The other two sides of this square I form by the round bars C^3 C^3, forged with shoulders c^3 c^3 near their ends, and threaded at the ends to receive the binding nuts C^{30} C^{30}. The shoulders c^3, however, are far enough back from the ends to admit between said shoulders and the side-bars C^2, respectively, certain braces; first, C^4 C^4, formed of a flat iron bar vertically edgewise bolted at the middle point to the hub at the same point at which the bars C′ C′ are secured, and at either side of the point of fastening bent obliquely and extending to the corners of the square where they are again bent to rest flat against the side-bar C^2 C^2, being penetrated at that point by the round bars C^3 C^3. In addition to the braces C^4 C^4, I secure between the shoulders c^3 and the side-bars C^2, the ends of certain other braces C^5 C^5, &c., which are made of pipe flattened at the ends where they are thus secured. From each corner I extend two of these braces obliquely to four points ninety degrees apart upon a collar or ring D, which encircles the four corner posts of the tower at a distance below the top of the latter approximately equal to the radius of the wheel which is to be mounted. This distance, however, is a matter of good mechanical judgment and is not obligatory. The purpose for which the structure is adopted will guide any mechanic in determining the distance.

The ring D is preferably centered at the axis of the tower by a special bearing provided for it hereinafter described simply to insure its position being accurately that which is desired notwithstanding possible inaccuracies in the tower, but so far as its function and operation are concerned, it may be considered as guided and having its position defined by the tower itself, and as being, as stated, centered at the tower axis.

From each corner of the turn-table, as stated, two of the braces C^5 extend to each of the four points of the ring D and are there made fast to the ring, being flattened and lapped upon each other and bolted to the ring. For the purpose of the precautionary bearing of this ring upon the tower, I provide the cast spider D′, adapted to be inserted within the tower corner posts and secured to them, and having the portions D^{10} D^{10} projecting between the tower posts and bounded by the arc of a circle within which the square defined by the corner posts at that level may be inscribed, and on these curved margins of the projections D^{10}, the ring D obtains its seat and accurate guidance, as described.

I make the spider D′, as shown, adapted to be inserted within the four corner posts, and protrude the bearing surface D^{10}, on which the ring D is seated, between posts, rather than construct it in a manner which will require it to encompass the posts or either of them, because, when it is thus constructed,—that is, so as to be inserted within the posts,—it can be easily removed and put in place by being merely dropped downward between the converging posts; whereas, if it encompassed them, or embraced any one of them, it could only be removed by being broken up or taken off over the tower top, and for that purpose, the mill would have to be dismantled, the platform and all the parts connected with it being removed from the tower before the spider could be removed. I am thus able to make the spider in one piece and remove it at any time without disturbing anything else.

It will be seen that the entire structure of the turn-table thus far described constitutes a horizontal platform frame trussed and triangularly braced from below in such manner as to be practically rigid and adapted, without twisting or yielding unequally, to support a very great weight, and to endure, therefore, very great strain of the nature which may be put upon the structure by the force of the wind operating against a wind-wheel which may be journaled upon it. From the horizontal platform thus obtained, as upon a foundation, I build up two triangular supports for the wheel, between which the wheel M revolves. One of these supports is located immediately back of the vertical plane through the center of the middle truss of the platform formed of the bar C′ C′ and the hub C, and is in a plane parallel with this vertical plane. The two side-bars E E of this triangular support are bolted to the outer sides of the side-bars C^2 C^2, respectively, of the turn-table platform, the same bolts which secure the flanges

of the bars C′ at the side serving to secure also these side-bars E. These side-bars are made rigid at their upper ends by being secured upon opposite sides of the wheel shaft rear bearing N. They are further braced and the stiffness of the triangular support increased by a cross-bar E^2, which I prefer to make of pipe flattened at the ends where it is secured by the slide-bars and by any necessary number of oblique bars E^3 E^3. This triangular support is braced at the back by two braces J J, preferably made of pipe flattened at the ends, as, in the case of the other pipe braces herein described, and bolted to the side bars E E, respectively of the triangular frame near the upper end thereof, and at their lower ends fastened to the side-bars C^2 C^2, at the rear corners of the platform by being pierced by the ends of the round iron bars C^3 C^3 and bound under the nuts C^{30} which secure the latter. The forward triangular support for the wheel is made of two flat bars F F, similar to those which form the rear triangular support, said bars being secured at their lower ends outside the bars C^2 C^2 respectively on the protruding ends of the round iron bar C^3, and bound by the nuts C^{30} against the bars C^2. They are also made rigid at their upper ends by being bolted to the opposite sides of the forward bearing N′ of the wheel shaft *m*. All the bars of the rear triangular support are set edgewise toward the plane of the wheel (except the short horizontal brace pipe E^2, whose extent is so slight that its resistance to the wind is not appreciable). The front triangular support is without braces, because it is desirable to diminish to the utmost the surface exposed to the wind in front of the wheel, as I have ascertained by experiment that the loss due to such surface in front is double that due to the same surface at an equal distance behind the wheel. Further to compensate for the slight loss which will be caused even by the thin edgewise bars of this front support, I twist the bars between their ends to an angle of about forty-five degrees in the direction which will deflect the wind striking against them to the most effective angle for action upon the wheel. The wheel M is mounted between the two triangular supports described, and by means of the beveled gear M^2 on the shaft *m* communicates motion to the vertical shaft *f* which passes down immediately in front of the rear support coaxial with the tower and turn-table. It is thus possible to locate the wheel as near the center or axis of the tower as consistent with causing the beveled wheel on the tower shaft to mesh with the beveled pinion on the vertical shaft. The wind-wheel has the spider M′ and the beveled gear M^2, preferably fast on its shaft *m*, which is adapted to revolve in the bearings N and N′, but whether the wheel revolves on the shaft or the shaft revolves in the bearings, the shaft is made a means of tying the two triangular supports together at the top, collars *n* being pinned fast on the shaft outside the bearings N N′, respectively, and the said bearings at their proximate ends abutting against the spider M′ and gear M^2, respectively.

I make a bearing for the vertical shaft *f* and its gear pinion H serves as a further means of securing rigidly together the two slant side-bars of the rear triangular support. This part is shown in Figs. 1, 2 and 5, being a yoke G having two inclined seats G′ G′ for the two side-bars E E, said seats being connected by transverse webs enlarged at their middle point to form the two bearings G^2 G^4 at opposite sides of the opening G^3, in which the pinion is located and guarded or stopped by the proximate ends of the two bearings respectively. On the upper wheel end of the lower bearing G^2, the lower end of the hub of the pinion H is seated, and the pinion has the oil ducts *h h*, leading through its web from the upper side convergingly, and emerging at the lower face of the hub, so that the oil is thus conducted to said seat g^2. The upper bearing G^4 has a cup enlargment G^{40} at the upper end serving as an oil-cup.

g^{21} in both bearings represents packing or Babbitt metal.

The pinion has an annular cavity H′ in its upper end around the hub and above the web from which the ducts *h* lead to the bearing below as stated. Any oil which escapes from the upper bearing at the lower end thereof will be received in the cavity and fed to the lower bearing, and said cavity H′ may be primarily provided with oil for the lower bearing.

One advantage of the construction herein described, which embodies the platform as a part of the turn-table, is that such platform serves as a place on which an attendant may stand while oiling or repairing the mill without being in danger of being struck or cut by the mill when the wind veers, as is the case in the more customary construction, wherein the means of access to the mill for such purpose is by a platform on the tower. Both the danger and cost of such platform is thereby dispensed with in my invention.

I claim—

1. In combination with the tower composed of supports converging to the top, the turn-table thereon comprising a platform extended horizontally about the apex of the tower supports, and overhanging the same on all sides; a ring or collar encircling said tower supports below the apex, and braces extended down from the apex converging toward the tower axis to such ring or collar and secured to the latter: substantially as set forth.

2. In combination with the tower composed of supports converging to the top, a turn-table thereon comprising a platform extended horizontally about the top of the supports and overhanging said supports upon all sides; a ring or collar encircling the tower supports below the top, and braces extended down from the platform converging toward the tower axis to such ring or collar and secured thereto,

and wheel-bearing supports projecting from the platform and the wheel journaled thereon located above the platform: substantially as set forth.

3. In combination with the tower and the turntable comprising a horizontal platform, the tower having the corner posts converging toward the top, and a spider inserted within the corner posts and secured thereto, and having projecting segments protruding between the posts with peripheral surfaces in a circle concentric with the axis of the turn-table; and a collar encircling the corner posts and seated upon the projecting segments of the spider, and braces extending from such collar to the platform: substantially as set forth.

In testimony whereof I have hereunto set my hand, in the presence of two witnesses, at Chicago, Illinois, this 19th day of November, 1892.

THOMAS O. PERRY.

Witnesses:
CHAS. S. BURTON,
JEAN ELLIOTT.