D. HALLADAY.

WIND-MILL.

No. 190,430. Patented May 8, 1877.

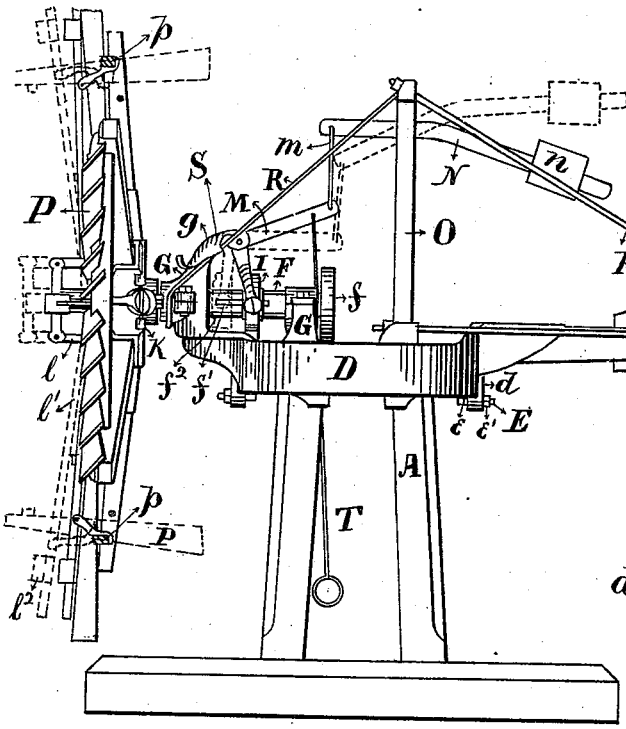

Fig.1.

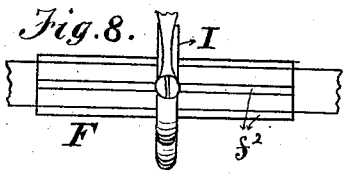

Fig.8.

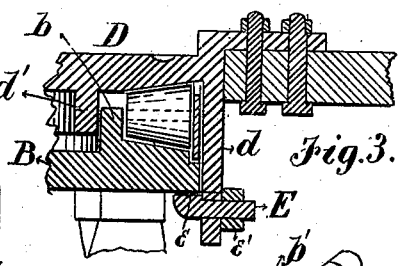

Fig.3.

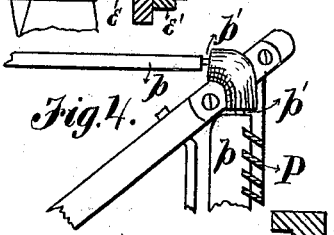

Fig.4.

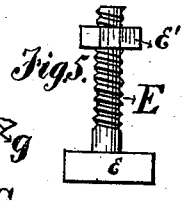

Fig.5.

Fig.2.

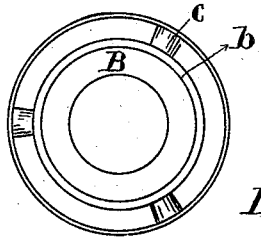

Fig7

Fig.6.

Attest.

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DANIEL HALLADAY, OF BATAVIA, ILLINOIS.

IMPROVEMENT IN WINDMILLS.

Specification forming part of Letters Patent No. **190,430**, dated May 8, 1877; application filed March 6, 1877.

To all whom it may concern:

Be it known that I, DANIEL HALLADAY, of Batavia, in the county of Kane and State of Illinois, have invented a new and useful Improvement in Windmills, which is fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents a side elevation of a windmill embodying my improvements; Fig. 2, a longitudinal section, showing the main shaft, its bearings and connections; Fig. 3, a detailed sectional view of the edge of the turn-table and support; Fig. 4, a detailed view, showing the method of attaching the sails to the arms; Fig. 5, a detached view of the broad-headed bolt for holding the turn-table to its support; Fig. 6, a detailed sectional view of the turn-table support; Fig 7, a plan view of said support, and Fig. 8 a side view of the main shaft.

My invention consists in a sliding rod supported within the main shaft, which is made tubular for this purpose, and connected at its outer end to the mechanism for throwing the sails into and out of the wind, and provided with a cap fitting over the outer end of the shaft for protection.

It also consists in constructing the central portion of the main shaft with a fluted surface, and combining therewith an external sliding collar, attached to the inner end of the sliding rod, and also connected to devices for reciprocating the latter, either automatically or otherwise.

It also consists in the peculiar method of hinging the sails so that the pivots will be eccentric to the central line of the rock-bars of the sails.

It also consists in the peculiar construction of the turn-table with double flanges, fitting on both sides of the supporting-bed, for the purpose of protection; and it further consists in various devices and combinations of devices, all of which will hereinafter be more fully set forth.

In the drawings, A represents the tower, upon which is mounted the supporting bed piece or plate B, secured to the tower in any ordinary way. This bed-piece is annular in form, and has an upright flange, *b*, rising from its upper side, near the outer edge thereof. Outside of this flange the bed-plate is beveled slightly, to form a track for the conical friction-rollers *c*, which are mounted upon a loose ring, C, supported upon the outer edge of the bed-piece, the latter being provided with a rabbet or shoulder for this purpose, as shown in Fig. 6 of the drawings.

The turn-table D is constructed with two flanges, *d* and *d'*, projecting from its lower surface, the outer one of which, *d*, fits down over the outside of the bed-piece and projects slightly below the latter, while the inner one, *d'*, is placed at such a distance from the other as to fit just inside of the flange *b*, as shown in Fig. 3.

It will be seen that this construction affords a perfect protection to the bearing-surface of the turn-table, and friction-rollers upon which it is mounted, the whole mechanism being inclosed within the flanges above described, so that rain or snow cannot possibly enter the inclosed space to obstruct the movements of the table by freezing.

The turn-table is secured to its supporting-beds by bolts E, which are passed through holes in the portion of the flange *d* extending below the bed-piece, and are provided on the inside with wide heads *e*, flattened on one side, to form a bearing-surface on the under side of the bed-plate, as shown in Fig. 3 of the drawings.

The bolts are passed through from the inside of the flange, and are secured in place by nuts *e'*, which are turned up against the flange.

The main shaft F is mounted in suitable bearings G upon one side of the turn-table, and is provided at its inner end with the usual crank-wheel *f*. The outer end of this shaft is made tubular for nearly two-thirds of the length of the shaft, and on each side of the shaft, between the bearings thereof, longitudinal slots f^1 are cut, which open into the free space within.

That portion of the shaft which is between its bearings is also constructed with a fluted surface, so that ribs f^2 will be formed upon its exterior. A rod, H, is placed within the tubular portion of the shaft F, and is fitted in a close bearing in the outer end of the latter, as

shown in Fig. 2 of the drawings, but at the same time is free to slide back and forth within the shaft.

This bearing is formed by making the extreme outer end of the main shaft a little thicker upon the inside surface, so that the rod H will have a bearing-surface only at this one point in the shaft, a free space being left between it and the latter elsewhere throughout its entire length.

A collar, I, is mounted upon the shaft F between its bearings, and is attached to the inner end of the rod H by means of pins *i*, which pass through the slots f^1 in the shaft, and are rigidly connected to both the collar and the rod. The collar fits the shaft closely, but so as to slide freely thereon, and the sliding rod is arranged so that it will be held from contact with the inner surface of the shaft by the supporting-pins.

As the surface of the main shaft along which the collar is to slide is ribbed, there will be contact only at a few points, thereby reducing the friction occasioned by the reciprocation of the collar.

On the outer end of the rod H, just outside of the tubular shaft F, is fixed a hub, J, which is held in place thereon by a nut, *h*, and turns with the shaft. This hub has a long inwardly-projecting flange, *j*, which extends back some distance over the end of the main shaft, the latter being turned down slightly, so that there will be no contact between it and the sleeve *j*. The bearing at the end of the shaft is protected by this sleeve from the effects of storms, so that there is no danger of the entrance of water, which might freeze and prevent the sliding of the rod H.

The hub K of the wind-wheel is secured to the main shaft inside of the sleeve on the hub J, and is brought close up to the outer bearing of the main shaft, as shown in Fig. 2 of the drawings.

The hub J is connected to bell-crank levers L by means of link-bars *l*. The bell-crank levers are pivoted to the spider of the wheel, and are connected by rods l^1 to the usual arms on the pivoted sails, this being the ordinary mechanism for turning the sails upon their pivots.

On the outer ends of the arms l^1 are governing-weights l^2, which are made adjustable back and forth on the arms. On the outer bearing G of the main shaft is an extension, *g*, which projects upward and inward, and carries upon its upper end a bell-crank lever, M, pivoted thereto. The lower arm of this lever is provided with a yoke, which embraces and is pivoted to the sliding collar I; and the other arm is connected by a link-rod, *m*, to the counterpoise-lever N, which is supported by an upright frame, O, on the turn-table, by a pivotal bearing, and carries upon its outer end a counterpoise-weight, *n*. The outer end of the lever N is bent downward, as shown in Fig. 1 of the drawings, and the weight *n* is adjustable thereon.

The sails P are of ordinary construction; but the cross-bars *p*, instead of being pivoted to the spokes of the wheel in line with their actual centers, have their pivot-pins *p'* arranged as near as possible to the edge of the cross-bar next to the slats of the sail, as shown in Fig. 4 of the drawings.

By this arrangement of the pivots the center of motion is brought nearer to the actual center of gravity of the sail, and therefore the latter is less sensitive to the influence of the regulating devices.

On the side of the turn-table opposite the wheel is the usual directing vane or tail Q, rigidly attached to the turn-table; and the machine is strengthened and supported by brace-rods R, extending from the top of the frame-work O to the turn table on one side and the vane on the other, thus forming, with the frame O, a kind of truss.

Upon the upper portion of the outer bearing G is mounted a wide shield, S, which extends over the main shaft below, and protects it from the effects of storms, so that water is prevented from entering the slots therein.

As the wheel always stands to the wind, this inclined shield on one side only affords all the protection necessary to the ribbed and slotted portion of the shaft below. A rod, T, is connected to the upper arm of the lever M, and is carried down to the foot of the tower, by means of which the sails may be thrown out of wind whenever desired, and secured in this position.

The operation of the regulating devices above described will be readily understood, as in the main features of their construction and operation there is no novelty.

By making the main shaft tubular, however, and placing therein a sliding rod connected to both the counterpoise and governing levers, I am enabled to secure several desirable results. The reciprocating collar or hub connected directly to the governing devices may be arranged outside of the wheel, and the hub of the latter brought in close to its bearing, thereby relieving the strain upon the main shaft. The bearings are also so arranged that there is very little friction, and are protected in such a way that there is scarcely any possibility of obstruction from ice.

The sails, when pivoted as described, are also less sensitive to the operation of the automatic regulating devices, so that a higher rate of speed can be obtained before they will be thrown out of the wind, and they will also be prevented from swinging out and in as the wheel revolves, producing rattling and wear if there is any lost motion.

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

1. The bed-piece B, constructed with an upright flange, *b*, in combination with the turn-table D, provided with outside and inside flanges *d d'*, substantially as and for the purpose set forth.

2. The turn-table D, provided with an outer flange, *d*, extending below the bed-piece, in combination with the bed-piece B and bolt E, having an elongated flattened head, *e*, substantially as described.

3. The tubular main shaft F, slotted as described, in combination with the sliding rod H, arranged within the shaft, and sliding collar I, arranged upon the main shaft between its bearings, and rigidly connected with the sliding rod, substantially as described.

4. The shaft F, constructed with ribs upon its surface, over which the collar I is to slide, substantially as and for the purpose set forth.

5. The shaft F, in combination with the hub J at its outer end, provided with a flange or sleeve, *j*, extending back over the end of the shaft, substantially as and for the purpose set forth.

6. The tubular main shaft F, mounted on the turn-table, in combination with the wheel-hub K, sliding rod H, provided with hub J on its outer end, bell-crank levers L, connecting-rods *l l'*, and pivoted sails P, all arranged and operating substantially as described.

7. The sails P, constructed with the pivot-pins *p'*, arranged on the rocking bars *p*, forward of the center of said bars, and nearly in line with the center of gravity of the sail, substantially as and for the purpose set forth.

8. The guard or cap S, arranged on the outer bearing G, for the protection of the shaft and collar between the bearings of the former, substantially as described.

9. The sliding rod H, arranged within the tubular main shaft F, and provided with a hub, J, upon its outer end, in combination with the bell-crank levers L, connecting-rods *l l'*, pivoted sails P, collar I, bell-crank lever M, connecting-rod *m*, and counterpoise-lever N, substantially as described.

DANIEL HALLADAY.

Witnesses:
I. R. WOOD,
HENRY NAYER WADE.