H. M. UNDERWOOD.

Wind-Mills.

No. 211,606. Patented Jan. 21, 1879.

Fig. 1.

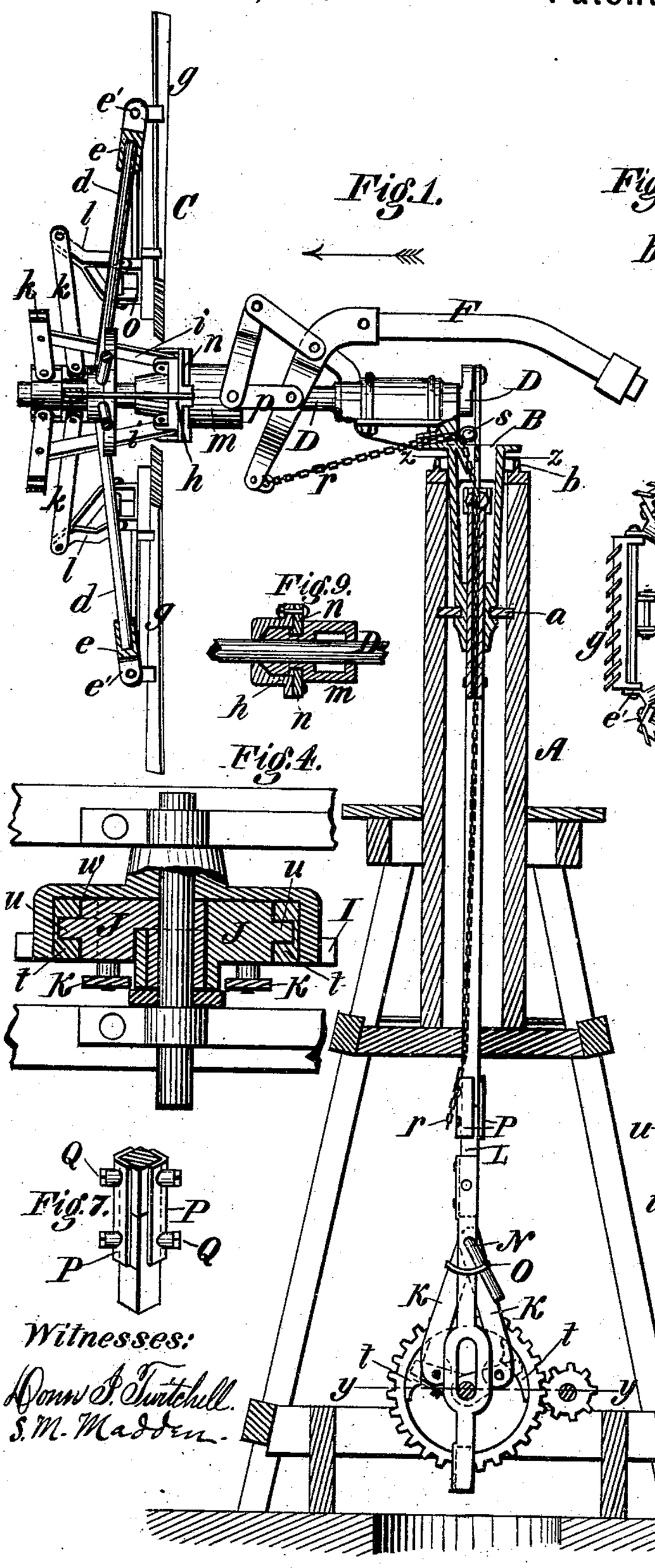

Fig. 9.

Fig. 4.

Fig. 7.

Witnesses:

Donn S. Turtchell.

S. M. Madden.

Fig. 3.

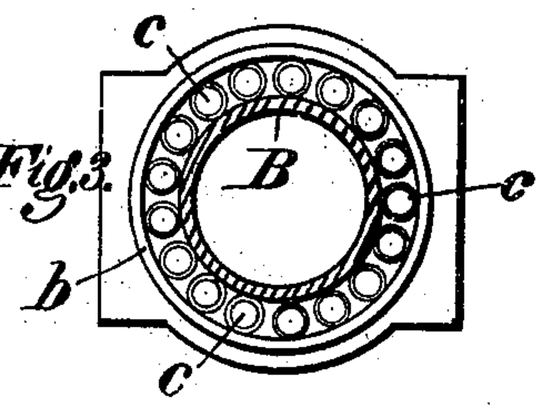

Fig. 6.

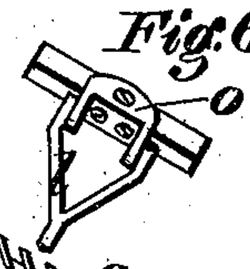

Fig. 2.

Fig. 8.

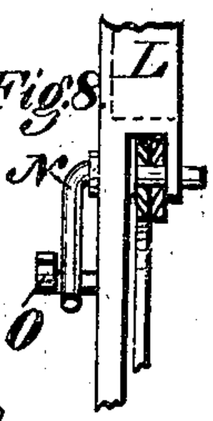

Fig. 5.

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UNITED STATES PATENT OFFICE.

HENRY M. UNDERWOOD, OF KENOSHA, WISCONSIN.

IMPROVEMENT IN WINDMILLS.

Specification forming part of Letters Patent No. **211,606,** dated January 21, 1879; application filed May 14, 1878.

To all whom it may concern:

Be it known that I, HENRY M. UNDERWOOD, of Kenosha, in the county of Kenosha and State of Wisconsin, have invented certain Improvements in Wind-Wheels, of which the following is a specification:

This invention relates to various improvements intended more especially for application to a wind-wheel for which Letters Patent of the United States were granted to me on the 1st day of August, 1876, No. 180,678, the improvements consisting, mainly, in certain peculiarities in the wheel proper, in the turn-table by which the wheel is supported, and in other details, hereinafter described.

Figure 1 represents an elevation of my wheel, showing portions of the wheel proper and the turn-table in section, the former being on the line *x x* of Fig. 2. Fig. 2 represents a rear face view of the wheel open or thrown out to the wind; Fig. 3, a cross-section on the line *z z* of Fig. 1; Fig. 4, a cross-section on the line *y y* of Fig. 1; Fig. 5, a face view of the mechanism for converting the reciprocating into a rotary motion; Figs. 6, 7, 8, and 9, details, which will be hereinafter described.

The wheel represented is of the class known as "rosette-wheels," consisting of a series of blades or sails arranged to rock inward and outward from the center, and is of the type which are used without a tail-vane by locating them behind and facing the turn-table or center upon which they swing.

A represents a mast or tower; B, a turn-table mounted thereon to support the wheel, and C the wheel proper. The turn-table, which is made of a vertical tubular form, and provided at the top with boxes to receive the shaft of the wheel, as usual, is supported at its lower end by a step or boxing, *a*, mounted in the mast A, and arranged to encircle the turn-table, which is provided with a circumferential groove, into which the boxing fits, as represented in Fig. 1. At its upper end the turn-table is surrounded by a fixed track or flange, *b*, between which and the turn-table there is mounted a series of small vertical rollers, *c*, which serve to support the turn-table against the lateral force exerted by the weight of and pressure against the wheel.

I am aware that rollers have been placed beneath the upper end of the turn-table to support the weight of the same, and this I do not claim; but by supporting the turn-table in the step at its lower end, and using the vertical rollers at the upper end to receive the lateral pressure, I am enabled to secure an easy and free operation of the turn-table at all times.

D represents the horizontal shaft of the wheel, having its inner end mounted in a bearing on the turn-table, and its outer or rear end provided with the wheel. The wheel consists, essentially, of a series of rigid arms, *d*, extending outward from a central hub, and provided at their outer ends with sockets *e*, having forked arms *e'*, supporting rods *f*, on which a series of sails, *g*, are mounted in substantially the ordinary manner. The sockets *e* are slipped upon the outer ends of the arms or spokes *d*, and are held thereon by the strain of the rods *f*.

It will be seen that the series of rods *f* form a continuous connection around the outer ends of the arms *d*, so that when tightened up by means of nuts applied to their ends, or in any other suitable manner, they hold the sockets *e* securely upon the ends of the arms *d*, and at the same time brace and strengthen the latter in such manner as to give the wheel great strength and rigidity.

For the purpose of controlling the tipping or governing action of the sails, I mount on the main shaft behind the wheel a sliding hub, *h*, and pivot thereto a series of arms, *i*, extending forward from the center wheel, and connecting at their forward ends with radial arms *k*, which latter are pivoted at their inner ends to heads fixed on the main shaft, and connected at their outer ends to arms *l*, which latter have their forward ends forked and connected to the inner ends of the sails *g*, so that the backward movement of the hub *h* tips the sails inward with their faces to the wind, and vice versa.

In order to give the sliding hub *h* additional wearing-surface and keep it more squarely to its work, it is, as shown in Fig. 9, provided on the front side with a central recess, to receive an elongated neck formed on the sliding non-rotating block *m*, and has riveted or bolted to it two segmental plates, *n*, which enter a groove in the neck of the block *h*, as shown,

the block serving to connect the parts *h* and *m* to each other in such manner that the former may rotate freely, while the two are compelled to slide endwise together. By introducing the neck of the slide *m* into the hub *h*, and combining therewith the plates *n*, in the manner shown, the rotating head is provided with a very large wearing-surface, and is supported firmly to its work without rendering the sliding parts objectionably long or reducing the wearing-surface of the slide *m*.

In order that the pivots or bolts securing the rods *i* to the sliding hub *h* may be the more readily inserted without increasing the size of said hub, I arrange ears to receïve said pivots, first on one side and then upon the other of the hub, as shown in Fig. 1. By thus arranging the ears in different planes I accomplish the results named without in the least increasing the cost of construction. For the same reason that the ears of the hub *h* are arranged in different planes, I arrange the ears of the hub, to which the arms *k* are pivoted, in like manner—that is to say, in two different planes, as represented in Fig. 1.

Compensation is made for the variation in the position of the ears and pivots by appropriately changing the point of connection of the different links *i* to the levers *k*.

The advantage resulting from the use of the links *l*, constructed with forked forward ends, so as to have two points of connection to the sail, is that the levers are thereby supported securely against lateral movement, and enabled to sustain the arms or levers in their proper position, whereby the wheel is caused to run without the rattling and noisy action which follows the use of links having only a single connection to the sails.

In practice much difficulty is experienced in maintaining the proper connection between the links and the sails of the wheel on account of the tendency of the screws or bolts by which the pivot-supporting ears are held to work loose. This difficulty I overcome by providing the sail with pivot-supporting plates *o*, having two flanges at right angles to each other, adapted to fit upon two sides of the sail-bar to which they are secured. These plates, being adapted to receive fastening-screws in two sides at right angles to each other, are, I find in practice, free from any liability to work loose.

For the purpose of holding the sails up to the wind, I employ, as usual, on the turn-table, a weighted lever, F, connected by links *p* to the sliding block *m*. For the purpose of throwing the sails out of the wind by hand, I connect with the lower end of the lever F a chain, *r*, extending through a tube or opening at one side of the turn-table B, and thence downward through the latter, as shown in Fig. 1.

In order to limit the motion of the sliding head and collar *h* and *m*, I insert a ring, *s*, or other enlargement, in the chain *r*, within the turn-table, this ring being made too large to pass through the tube or opening with the chain. This stop, limiting the motion of the chain and sliding head, limits the tipping motion of the sails, and also relieves the sliding head from the pressure of the weighted lever when the wheel is running in light winds.

Referring next to the devices for converting the reciprocating motion, it will be seen, on reference to Figs. 1 and 5, that in the general construction and mode of operation they are similar to those in my original patent, there being various minor improvements shown, which form no part of the present invention, but which will be made the subject of separate Letters Patent.

For the purpose of connecting the pitman or pump-rod of the windmill with the pump, I employ a pin, N, having its outer end bent downward at a right angle, and on the rod I locate a T-shaped plate, O, under one end of which the bent end of the pin N is engaged, as shown in Figs. 1, 5, and 8, whereby the withdrawal of the pin is prevented. When the pin is to be removed its end needs only to be turned upward from under the end of the plate O, when it may be readily withdrawn. The end of the pin is held in position under the plate O by gravity. The object of making the plate of the T form is to insure the locking of the pin automatically, whether its end falls to the right or left. The same arrangement of the pin and locking devices may be employed for connecting different sections of the pump-rod to each other.

For the purpose of connecting the lengths or sections of the pump-rod permanently to each other, I employ two angle irons or plates, P, as shown in Figs. 1 and 7, these plates being adapted to fit on the diagonally-opposite corners of the rod, and being provided with holes or sockets, through which transverse bolts Q are passed, as shown. These plates and bolts form a very cheap and secure coupling, which does not materially weaken the rod, and which insures a perfect alignment of the two sections.

I am aware that a turn-table has been sustained at its upper end by means of conical and upright cylindrical rolls mounted in a ring at the top, and hence I do not claim vertical rolls alone.

Having thus described my invention, what I claim is—

1. In a wind-wheel, the combination of a vertically-elongated mill-head or turn-table, a bearing or step, *a*, arranged at the lower end of the head, and sustaining its weight, a plate or ring, *b*, encircling the upper end of the head, and series of loose upright rollers mounted therein in such manner as to receive the lateral strain of the wheel.

2. In a wind-wheel, the combination of rigid radial arms, metal caps or sockets *e*, fitted over the outer ends of the arms, and provided with arms *e'*, rigid rods *f*, extending through and secured to said arms, and the tipping sails hung upon said rods, as shown.

3. In an automatic wind-wheel, a hub or slide having the series of sail-controlling arms or links connected thereto in two different planes, as and for the purpose described.

4. In an automatic wind-wheel, a series of sail-controlling arms or links, in which the alternate arms are pivoted in one plane, and the remaining arms in a different plane, to a hub or slide.

5. In a rosette-wheel, the combination of levers *k* and links or arms *l*, having their inner ends forked and attached to the sail at two points, as and for the purpose shown and described.

6. In combination with the transverse bar or cleat on the sail of a wind-wheel, the metal plate *o*, applied to the middle of said bar, and provided with two nail or screw receiving flanges, fitting upon two different faces of said bar, as and for the purposes described and shown.

7. In combination with the hub or collar *h*, having the hub or sleeve, the sliding block *m*, having a neck extended within the collar *h*, and secured thereto by the groove and plates, as shown and described.

8. In combination with the pitman or pump-rod of a windmill, the bent pin N and plate O, as a means of connecting the same with a pump or other device.

9. In a windmill, the combination of an angular rod or pitman with the two angular plates P P and bolts Q, as shown.

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Witnesses:
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