

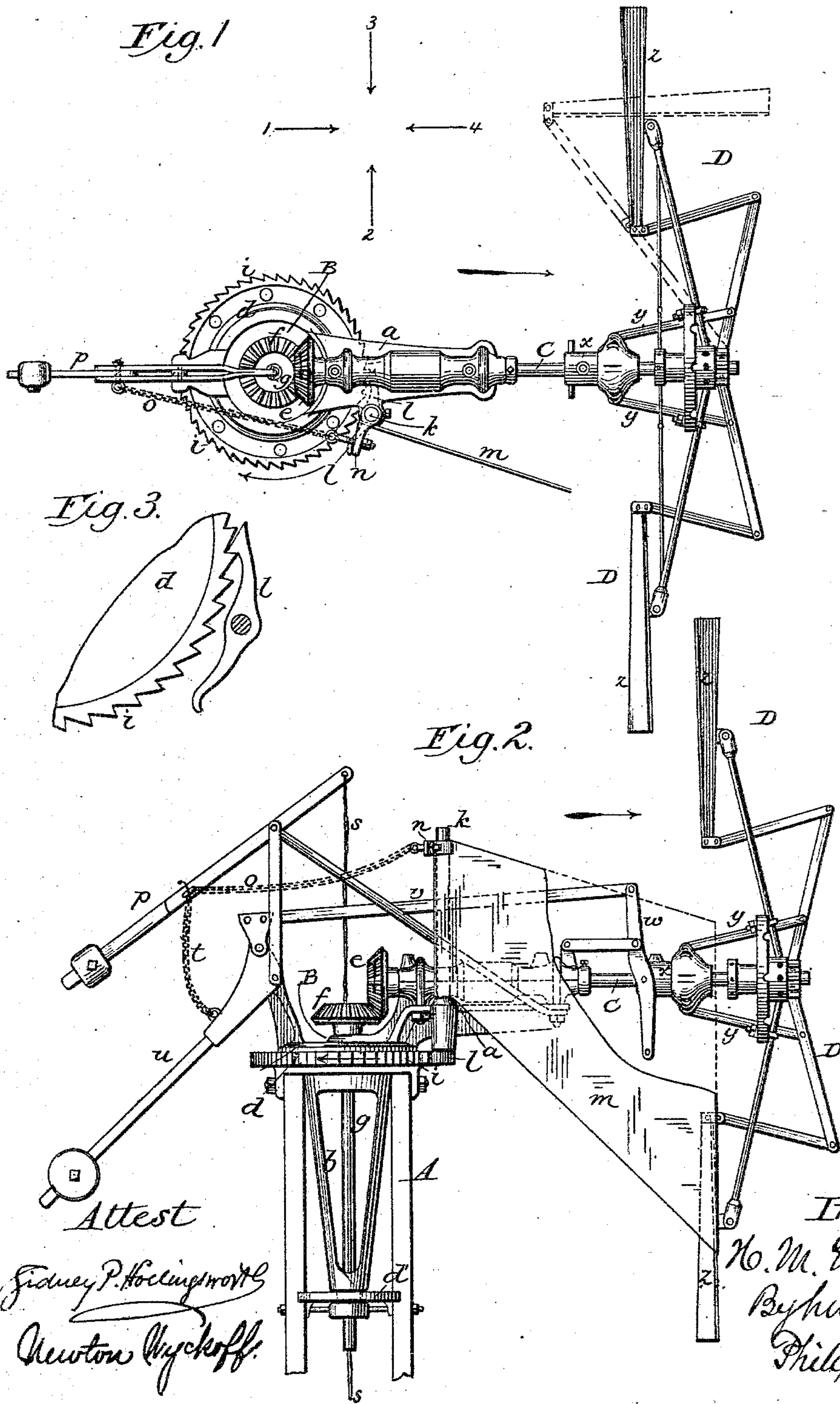
(No Model.)

H. M. UNDERWOOD.

WINDMILL.

No. 295,084.

Patented Mar. 11, 1884.





# UNITED STATES PATENT OFFICE.

HENRY M. UNDERWOOD, OF WAUKEGAN, ILLINOIS, ASSIGNOR OF ONE-HALF  
TO JOHN F. POWELL AND R. JOHN DOUGLAS, OF SAME PLACE.

## WINDMILL.

SPECIFICATION forming part of Letters Patent No. 295,084, dated March 11, 1884.

Application filed May 28, 1883. (No model.)

*To all whom it may concern:*

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

This invention relates to that class of vertical windmills which are sustained on a rotary head or turn-table, in order that they may  
10 swing horizontally to maintain a position facing the wind, and more particularly to that type of wheels which are arranged in rear of the turn-table, facing forward toward the same, so as to be operated without the employment of  
15 vanes for holding them in the wind. It has particular reference to that class of wheels in which motion is transmitted from a gear-wheel on the end of the horizontal wheel-shaft to a corresponding gear on the upper end of a  
20 vertical shaft.

The improvement relates to means whereby the resistance of the gear is prevented from causing the wheel to turn laterally in a position oblique to the wind, or, as it is technically  
25 known, "out of the wind."

In the operation of this class of mills the resistance offered by the machine or other device which is driven by the rotation of the vertical shaft and its gear has a tendency to  
30 cause the gear upon the wheel-shaft to revolve around the other, and thus swing the wheel laterally or horizontally into a position in which the wind will fail to act with the best effect thereon. To remedy this difficulty,  
35 locking devices have been heretofore devised for holding the mill-head against rotation in one direction, and combined with a small vane, by means of which the locking devices were caused to disengage when the wind shifted or  
40 changed its direction. Difficulty has been, however, experienced in securing the release of these locking devices with certainty in the event of the wind shifting suddenly and violently to one side, so as to subject the locking  
45 devices to excessive strain. It is to avoid this difficulty, as well as to simplify the mechanism, that the improvements are designed.

To this end they consist in a peculiar construction and arrangement of the locking-dog  
50 and vane, to their combination with a special

weighted lever to be operated by hand, and to the combination of this weighted lever with the ordinary weighted governing-lever by which the vanes of the wheel are held in an operative position.

It is preferred to apply the improvements to a mill of the class represented in the drawings, commonly known as a "rosette-wheel;" but they may be applied with equal facility to any and all wheels, whether of the same or  
60 different construction, which are arranged to swing horizontally to follow the course of the wind.

Referring to the accompanying drawings, Figure 1 represents a top plan view of a rosette-wheel provided with my improvements.  
Fig. 2 is a side elevation of the same. Fig. 3 is a plan view, on an enlarged scale, of the locking-dog and the wheel with which it en-  
70 gages.

Referring to the drawings, A represents the upper part of a tower or other stationary support designed to sustain the head or turn-table B, in which the horizontal shaft C of the vertical wind-wheel D has its bearings. The turn-  
75 table B, which is of substantially the usual form, is constructed with a horizontal arm, *a*, provided with bearings for the shaft, and with a vertical tubular journal, *b*, the upper end of which is seated in a cap or plate, *d*, on the top  
80 of the tower, while the lower end is seated in a bearing-plate, *d'*. This arrangement gives to the turn-table a firm support, but admits of its revolving horizontally, in order that the face of the wheel may be opposed directly to  
85 the course of the wind, as in other wheels of this class. It will be observed that the wheel is located behind or in rear of the turn-table, with its face toward the same, so that the wheel is caused to maintain a position facing the  
90 wind without the employment of a vane. The inner end of the wheel-shaft C is provided with a beveled pinion, *e*, which engages with a corresponding pinion, *f*, on the upper end of a vertical shaft, *g*, which passes centrally and loosely  
95 downward through bearings formed in the turn-table. This arrangement serves to transmit motion from the wheel to the vertical shaft and permit the turn-table to revolve horizontally without disconnecting the gear.  
100



The above features, being of substantially ordinary construction, constitute no part of my invention.

To prevent the resistance of the pinion *f* 5 from causing the pinion *e* to travel around the same as it is revolved, and thus causing the turn-table to revolve horizontally and throw the wheel out of the wind, I provide the bearing-plate at the top of the tower with a series 10 of ratchet-teeth, *i*, in its outer edge, as plainly represented in Figs. 1, 2, and 3, and provide the turn-table with a vertical rock-shaft, *k*, the lower end of which is provided with a 15 hooked dog, *l*, to engage the ratchet-teeth, which are faced in such direction that the engagement of the dog therewith will prevent the rotation of the turn-table in the direction in which it is urged through the resistance of 20 the gear, but will permit the table to turn freely in the opposite direction. To the upper end of the shaft by which the locking-dog is carried I secure rigidly a vane or blade, *m*, extended backward toward the wheel in a direction oblique to and away from the shaft of 25 the wheel. The shaft of the dog is also provided at the upper end with a backwardly and outwardly extending arm, *n*, connected by a chain, *o*, or equivalent device to a weighted lever, *p*, mounted in a standard on the forward 30 side of the turn-table. The vane tends, through its connections, to hold the dog in engagement with the teeth of the stationary plate, and thus prevent the turn-table and wheel from being carried by the pinion *d* out 35 of the wind. The parts remain in this their normal position (represented in Fig. 1) as long as the wind continues to blow squarely against the face of the wheel. When the wind shifts 40 toward the direction indicated by the arrow numbered 2 in Fig. 1, the wheel will swing to the left without resistance on the part of the dog, which will pass freely over the ratchet-teeth. If, however, the wind shifts in the opposite direction toward the course represented 45 by the arrow numbered 3 in Fig. 1, it will act upon the face of the vane *m*, and, overcoming the resistance of the weighted lever, will cause the dog to disengage, thereby permitting the wheel to swing in the direction of 50 the arrow numbered 3 until the wheel can face the breeze, whereupon, as the blade *m* at such time presents its face obliquely to the course of the wind, the dog will be caused to fall into engagement by the pressure of wind 55 upon the oblique face of the vane. In this manner, it will be perceived, the wheel is permitted to follow the varying course of the wind in either direction, but is held securely against movement so long as the course of the wind 60 remains unchanged. For the purpose of enabling the operator to unlock the dog at will, the weighted lever *p* is extended backward over the center of the turn-table and provided with a cord or chain, *s*, extending therefrom 65 downward through the turn-table in such manner that it may be operated by the attendant below. By pulling downward upon the

cord, the rear end of the lever *p* is elevated and caused, through the connecting-chain *o*, 70 to turn the shaft which carries the dog, and thereby disengage the latter. When the blades of the wheel are furled or thrown out of the wind, as hereinafter more fully explained, they present an extended surface to the wind, which may blow laterally against 75 them, in consequence of which the dog may engage with great firmness upon the teeth; but by means of the cord or chain *s* disengagement of the dog may be secured in such case by hand. In the event of the failure of 80 the vane *m* to effect the same, the cord or chain *s*, which is fastened or secured at its end, will also serve as a means for holding the dog permanently out of action when the same is not in use, if desired. To limit the 85 swinging movement of the dog and vane, the rear end of the dog is extended backward beyond its pivot, as represented in Fig. 3, in such manner that when its forward end is disengaged its rear end will bear against the 90 ratchet-teeth or the adjacent surface of the head, without, however, engaging therewith.

For the purpose of giving still better control of the wheel than would be afforded by the above devices alone, I connect the weighted 95 lever *p*, which controls the locking-dog, with a second weighted lever, *u*, by a chain, *t*. This second lever—commonly known as the “governing-lever”—is mounted, as usual in this class of mills, upon the forward portion 100 of the turn-table, and is connected by a rod, *v*, and lever *w* with a sliding collar, *x*, mounted on the wheel-shaft, which is in turn connected, through intermediate arms, *y*, with the feathering blades or sections *z* of the wheel, 105 these sections being pivoted to the arms of the wheel by pivots lying at right angles to radial lines, in a manner common to what are known as “rosette-wheels,” and familiar to all persons skilled in the art. The rangement of 110 the blades and connections is, as usual, such that as the speed of the wheel increases beyond the desired limit the centrifugal action of the blades, combined with the action of the wind thereon, will cause them to tip backward, 115 (indicated in dotted lines,) overcoming the resistance of the weighted lever *u* and presenting their ends or edges to the wind, whereby the action of the wind upon them is diminished and the speed of the wheel is brought 120 within proper limits. By connecting the governing-lever by the chain with the dog-operating lever, the action of the cord *s* is caused in one movement to disengage the dog, and also to effect in a positive manner the furling 125 of the sails. The connection, therefore, of the furling devices with the locking devices, so that both may be controlled by hand, permits the frame of the wheel to swing horizontally whenever it is thrown out of action by 130 hand, but does not cause the dog to be released when the wheel is at work in a high wind, for although the locking-lever *p* serves to operate the governing-lever *u*, the govern-



ing-lever has no effect upon the locking-lever and its connection. The connection of the governing-lever directly with the dog or its operating devices in such manner as to control them would be fatal to the proper operation of the mill, for the reason that it would cause the wheel to be frequently unlocked at the time when the locking action was most needed.

Regarding the combination of the locking devices and the devices controlling the speed of the wheel, the essence of the invention is in so arranging them that while their automatic actions are independent they may be simultaneously operated by hand, and while it is preferred to employ devices such as shown, it will be manifest to the skilled mechanic that the details may be modified in many respects without changing the general action or the result.

I am aware that a pawl has been employed to lock a mill-head against rotation in one direction, the only means for its disengagement being a hand-lever, so that constant attention on the part of the operator was necessary; and I am also aware that a dog connected with a vane by which it is thrown both into and out of action has been arranged to lock into square notches or teeth to hold a turn-table against rotation in either direction, the result being a violent, noisy, and dangerous action of the parts in suddenly arresting the motion of the wheel and attendant parts of great weight. I believe myself to be the first to operate a dog which locks in one direction only with a vane to cause its action, and an independent lever to effect its disengagement by hand, and also the first to combine the locking and governing mechanisms with a manual device by which both are controlled at the same time.

Having thus described my invention, what I claim is—

1. A vertical wind-wheel and a turn-table to sustain the same and permit it to swing horizontally with the wind, in combination with a pawl-and-ratchet mechanism to lock the table against rotation in one direction, a vane to cause the engagement of the pawl, a weighted lever provided with manual devices whereby it may be elevated, and connecting devices between said lever and the pawl for the purpose of disengaging the latter, said connections constructed as described, to remain inoperative when the lever is depressed.

2. In combination with the fixed toothed plate, the turn-table having the wheel thereon, the vertical shaft provided with the dog and vane, and the weighted lever *p*, connected therewith.

3. In combination with the rosette-wheel and its turn-table, the pawl-and-ratchet devices to lock the turn-table, the rock-shaft connected to the pawl, the vane and arm attached to the

rock-shaft, the weighted lever connected with said arm, and the cord or chain *s*, connected with the lever.

4. In combination with the horizontally-turning turn-table, the toothed disk and the locking-dog having its forward end adapted to engage the teeth, and the rear end adapted to serve as a stop to limit its movement.

5. The vertical horizontally-swinging wind-wheel with feathering blades, combined with automatic mechanism, substantially as described, to govern the position of the blades, automatic locking mechanism, combined with a vane to control the swinging action of the wheel, and a manual device, *s*, connected, substantially as described, with the governing and also with the locking mechanism, whereby the operation of the manual device is caused to serve the double purpose of adjusting the blades to an inoperative position and of unlocking the wheel, that it may swing freely in either direction.

6. A vertical wheel sustained by a turn-table and arranged to swing horizontally to follow the course of the wind, in combination with an automatic device to lock the head against rotation in one direction, a chain or equivalent manual device to disengage the locking device, an automatic governing mechanism to control the speed of the wheel, and a connection, substantially as described, between the locking and governing devices, whereby the two are permitted to operate independently, but their simultaneous operation by hand permitted.

7. In combination with the vertical rosette-wheel and its turn-table, the wheel-governing collar *x*, and the weighted lever *u*, connected therewith, the pawl-and-ratchet mechanism to control the rotation of the turn-table in one direction, the vane *m*, and the opposing lever *p*, weighted out of action, both connected with the pawl, the connection *t* between the two levers, and the rod or chain *s*, connected with lever *p*, whereby, raising the upper lever by hand, the lower one may be raised simultaneously therewith.

8. In combination with the wheel and its turn-table, the stationary toothed plate, the vane upon the turn-table, and the pawl attached directly to the vane-shaft.

9. The combination, in a wind-wheel, of the device to lock the turn-table against rotation, the lever connected therewith and provided with a manual device, the lever to govern the speed of the wheel, and a connection between the two levers, whereby the governing devices are permitted to operate independently of the locking devices, but the manual action of the two simultaneously permitted.

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Witnesses:

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PERRY L. SHAW.