J. M. ARMOUR.

Wind-Mill.

No. 161,318. Patented March 30, 1875.

Fig. 1.

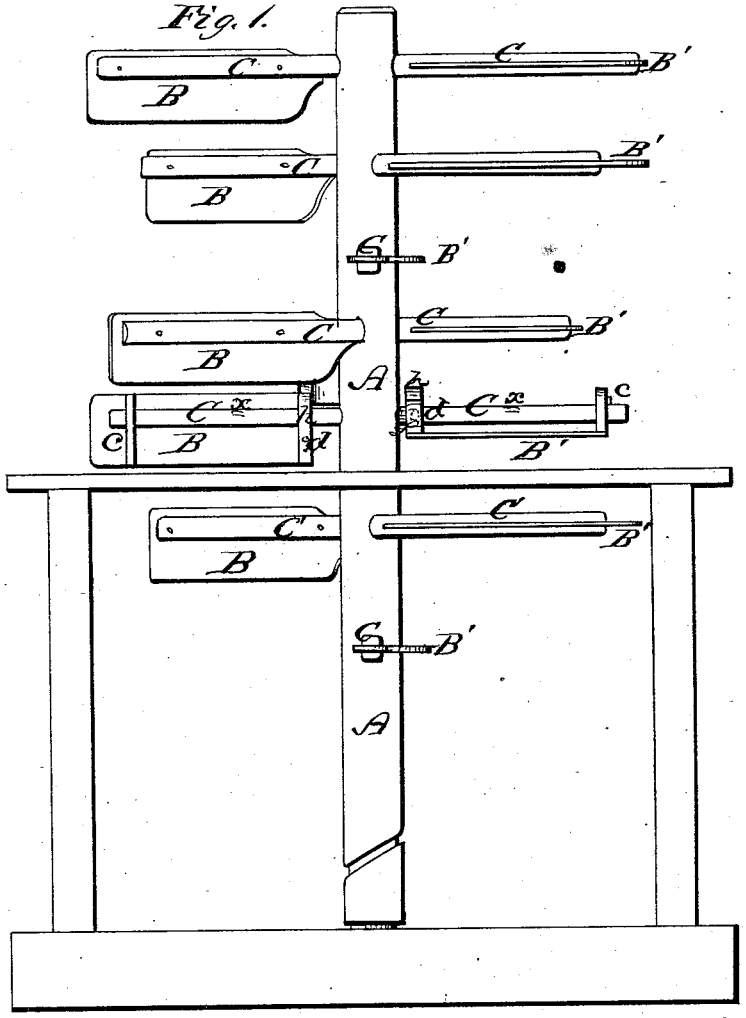


Fig. 2.

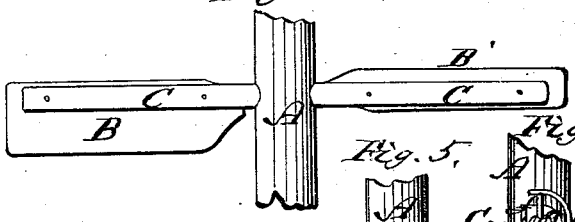


Fig. 3.

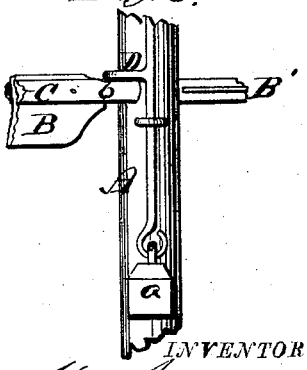
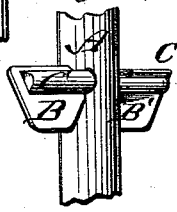


Fig. 4.

Fig. 5.



WITNESSES

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By

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UNITED STATES PATENT OFFICE.

JOHN M. ARMOUR, OF NORTHWOOD, OHIO.

IMPROVEMENT IN WINDMILLS.

Specification forming part of Letters Patent No. **161,318**, dated March 30, 1875; application filed October 28, 1874.

To all whom it may concern:

Be it known that I, JOHN M. ARMOUR, of Northwood, in the county of Logan and State of Ohio, have invented certain Improvements in Windmills; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings making part of this specification—

Figure 1 being a side elevation of the essential parts of a windmill provided with my improvements; Fig. 2, a side view of a portion of the driving-shaft, with a pair of the improved vanes used in this machine shown in the position they assume under a heavy pressure of wind; Fig. 3, a side view of a portion of the driving-shaft with a pair of the vanes, and a device for regulating the amount of pressure which the vanes will withstand before they will be forced from their vertical and counter horizontal planes of action; Fig. 4, a view of a portion of the driving-shaft with one of the vanes, and a device applied thereto to allow both counter-vanes to be forced into one plane, edge to the wind, under the pressure of a violent wind; Fig. 5, a view of a portion of the driving-shaft, with a pair of the vanes in the position where one of the vanes is brought into action by the wind.

Like letters designate corresponding parts in all of the figures.

The main feature of my invention consists in a device for employing wind-power to drive machinery, composed essentially of a vertical driving-shaft provided with sets or pairs of counterbalancing-vanes attached to shafts extending through the driving-shaft horizontally, and journaled therein, the several vane-shafts radiating regularly at different angles all around from the periphery of the driving-shaft, and the vanes at the opposite ends thereof being so constructed and arranged that they co-operate in adjusting themselves alternately to the wind, coming from whatever quarter, and also in adjusting themselves to the varying force of the wind, all substantially as hereinafter specified.

In the drawings, A represents the vertical driving-shaft; B B B and B′ B′ B′, the several pairs of vanes, and C C C their rocking shafts, journaled horizontally in the driving-shaft. The vanes B B B represent the vanes taking the wind, and turning the driving-shaft thereby, and the vanes B′ B′ B′ represent the counter-vanes returning against the wind, and having their edges turned thereto.

The driving shaft A may be a single beam of timber, with horizontal bearings for the vane-shafts; or it may be preferably made of frame-work, to increase its diameter, and thereby furnish longer bearings for the vane-shafts.

The rocking-shafts C C C of the vanes turn freely in their bearings; and the vanes B B′ on each shaft are secured thereon at right angles to each other, but both in line with the axis of the shaft, as shown. The vanes project from one side of the shaft, mostly or entirely, so that the tendency of each vane is to turn or swing down into a vertical position, suspended under the shaft; but, since the two counter-vanes on each shaft tend each to sink into its lowest position, they counterbalance each other, and when no wind is acting on them they assume positions at angles of forty-five degrees from the vertical, as shown in Fig. 5. Each shaft and pair of vanes assume this position when the wind leaves one vane and before it strikes against the counter-vane. Then, as soon as the vane B turns round, so as to take the wind, the pressure of the wind turns it into a vertical position, or more or less nearly approximating thereto, according to the force of the wind, the weight of the counter-vane B′ acting against the wind-pressure. If the vane B assumes a precisely vertical position, and the counter-vane B′ a horizontal position, as seen in Fig. 1, the former presents the greatest surface to the wind, and the latter the least, thus acting most effectively to turn the driving-shaft. The action of the wind itself tends to keep the two vanes of each shaft in this position by assisting to keep the counter-vane B′ horizontal; and this action of the wind on the vanes is irrespective of the direction or sudden changes of the wind, which only vary the position in the circle around the driving-shaft, where the wind leaves one vane and takes the opposite vane on the shaft. As the several vane-shafts are arranged at regular intervals around the driving-shaft, one vane takes the wind successively after another, so that there is no irregularity

of action, nor sudden jerking produced thereby.

The vanes B B′ on the several shafts C C C are of such weight and surface that they are adapted to a given average pressure of wind, a certain pressure being required to bring the active vane B into a vertical position, and the counter or returning vane B′ into a horizontal position. This standard or limit of pressure may be made as great or as little as desired, and may be varied at will.

Fig. 3 represents a device for thus regulating the limit of pressure which may be given to the vanes. It consists of a brake, D, pressing down upon the shaft C of each pair of vanes, and provided with a weight, *a*, or a spring to produce the pressure of the required degree, this weight or spring being increased or diminished in force by the attendant.

The brake D may be simply a friction-brake pressing upon a flattened part, *b*, of the vane-shaft when the vane B is in a vertical position, and upon another flattened part when the counter-vane B′ comes into a vertical position and becomes the active vane; or the brake may encounter a resisting stop on the shaft when either vane comes into a vertical position, the friction-brake, however, being preferable. By this means the active vanes will not be forced from a vertical position till the resistance of the brake is overcome, and that resistance is variable and adjustable at pleasure.

The narrow edges of the vanes may be increased in width if desired, in order to increase the pressure required to turn the vanes.

When the violence of the wind becomes excessive the vanes are self-regulating, and automatically counteract the excess of pressure, so that neither is the machinery driven at too great speed, nor is there danger of breaking the vanes or any part of the mill thereby.

The action of the vanes under excess of pressure is illustrated in Fig. 2, which indicates the positions which the vanes assume at such times. The excess of pressure raises the counter-vane B′ somewhat above a horizontal position, as shown, and the active vane B beyond its hanging vertical position until the diminished surface of the latter presented to the wind, and the resistance of the former produced by the counter-pressure action of the wind, hold the vanes at precise counter-balance, the resultant effect on the driving-shaft A remaining the same, or nearly the same, as when the limit of normal pressure is reached. Hence there is no injurious increase of speed imparted to the machinery from the violence of the wind, and the vanes are driven into such positions that the least aggregate resistance is offered to the wind, as a safeguard against injury thereto or any part of the mill.

In Fig. 1, upon the vane-shaft marked C *x*, and in Fig. 4, is shown a device for allowing the vanes B B to turn upon the shaft into one plane, edge to the wind, in certain cases when there is exposure to very violent winds or tornadoes, the turning of the vanes being regulated to take place at a certain pressure, beyond which it might not be safe to expose them in working position. One or each of the vanes is pivoted upon the vane-shaft by means of bearings *c d*. In one bearing, *d*, Fig. 4, enters a latch or pin, *f*, the inner end of which enters a notch or cavity, *g*, in the vane-shaft. A spring, *h*, bears upon the outer end of the latch or pin, and the pressure of this spring is adjusted so that when the limit of wind-pressure which is calculated to be safe is reached, the latch or pin will be forced from the notch, and the vane will be turned around its shaft till it ceases to offer resistance to the wind, and this position will be maintained till the storm is over, when the vanes can be readjusted in working position. Ordinarily the device will not be necessary, sufficient strength being readily given to the mill to withstand the winds in ordinary situations.

The number of vanes B B′ may be as many as desired, there being no special limit to the length of the driving-shaft A.

I disclaim counter-vanes on opposite ends of rocking shafts for windmills, when the movements of the vanes are limited within horizontal and vertical positions; but

What I claim as my invention, and desire to secure by Letters Patent, is—

1. Counter-vanes B B′ B B′, secured to horizontal rocking shafts C C, arranged in bearings of a vertical driving-shaft, A, the said vanes being arranged to have a free self-limiting movement beyond the horizontal and vertical lines, respectively, and constructed to turn automatically upon their shafts when a certain predetermined pressure of wind thereon shall have been reached, substantially as herein specified.

2. Regulating-brakes D D, in combination with the vane-shafts C C, substantially as and for the purpose herein specified.

3. Safety latches or pins *f f*, in combination with the vanes B B′ and shaft C, substantially as and for the purpose herein specified.

Specification signed by me this 29th day of September, 1874.

JOHN M. ARMOUR.

Witnesses:

V. O. ARMOUR,

JERRY WELSH.