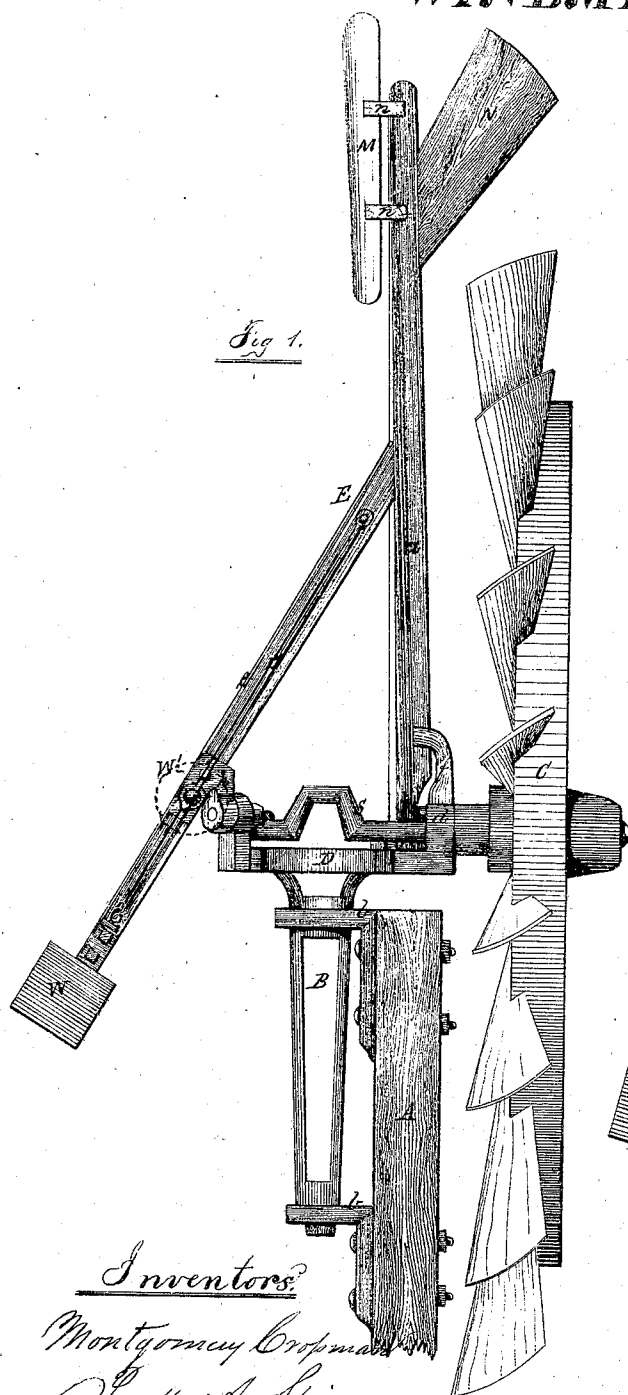
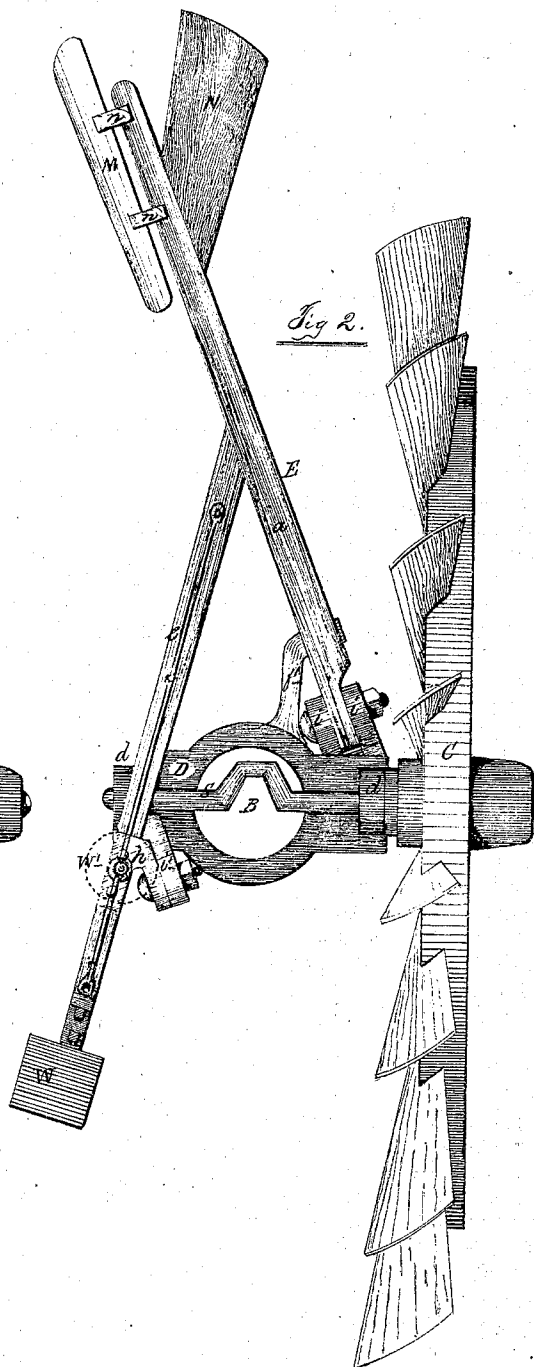


*Crossman & Spicer's Improvement in*  
 No. 119,972. **WINDMILLS.** Patented Oct. 17, 1871.



*Fig 1.*



*Fig 2.*

Inventors:

Montgomery Crossman  
 Pratt A. Spicer  
 by their Atty in fact.  
 George Johnson

Witnesses:

Otto Johnson.  
 Will H. Cole

# UNITED STATES PATENT OFFICE.

MONTGOMERY CROSSMAN AND PRATT A. SPICER, OF MARSHALL, MICHIGAN.

## IMPROVEMENT IN WINDMILLS.

Specification forming part of Letters Patent No. 119,972, dated October 17, 1871.

*To all whom it may concern:*

Be it known that we, MONTGOMERY CROSSMAN and PRATT A. SPICER, both of the city of Marshall, in the county of Calhoun and State of Michigan, have invented certain Improvements in Windmills, of which the following is a specification:

Our invention relates to the combination, with a wind-wheel having fixed wind-wings and with the appurtenances upon which said wheel rotates to face the wind, of a winged and weighted lever to be operated by the wind, and also, by gravity, to oscillate back and forth in a plane which is more or less oblique with the face of the wind-wheel, our object being to regulate and govern the wind-wheel, as regards its proper presentation before the wind, by means of this lever alone, and without the use and aid of a vane or tail on the wheel-shaft.

Figure 1 is a side elevation, showing the position of the obliquely-moving lever when the wind-wheel faces the wind squarely. Fig. 2 is a top view, showing the position of the lever when the wheel is carried partially around so as to present its feathered edge to the wind.

A is the post or mast of the mill, broken off. B is the hollow and open vertical pivot, secured and hung to the post in bearings in the brackets *b b*. D is the turn-table, carrying the pivot centrally at B. The turn-table has a raised bearing, *d*, at each end, in which bearings the wind-wheel shaft S is hung, and, in addition to such bearings, has projecting ears, as shown, at two opposite corners—at *i* and *i'*—to form joints for the pivoting thereto of the oblique governor-lever to be presently described. The wind-wheel shown at C and secured to an overhang of the shaft S may be of any of the ordinary constructions having fast wings or sails. E is the obliquely-moving governor-lever, which, although treated as a unit, is yet provided with several necessary attachments, viz.: the wind-wing arm *a*, that usually reaches beyond the periphery of the wind-wheel, is provided at its free end with either one very large or several smaller wind-wings, M, let in and secured to two cross-bars, *n*, at a suitable angle to catch the wind and cause the lever-arm to oscillate from the vertical equilibrium, either with or contrary to the wheel's working motion. One of the outer wings is shown at M, and we did not deem it necessary to further exhibit them,

as they would simply exhibit in front elevation a short section of the winged rim of the wind-wheel. *e* is the balancing-arm, framed or otherwise connected with the wind-wing arm *a*, at a suitable angle with it, and is hung by the hinge *h* to the ear *i'* of the turn-table. The wind-wing arm is also hung to the turn-table, but at the opposite side and end. The arm *e* projects sufficiently beyond the center of oscillation, and is furnished with a weight, W, and usually, also, with a lateral weight, W', at the end of a projecting stud, over which stud angle-braces pass to stiffen the arm when in a horizontal position. This weight is shown in dotted lines to avoid obscuring the hinge. The governor-lever should be hung at such two points on the turn-table that, when the lever is oscillated downward to a horizontal line, the winged head will have diverged from the wheel enough past the vertical center at B to counterbalance and neutralize the action of the wind on the feathered wheel; or, in other words, the resistance to the wind will be equal on each side of the wheel's center of horizontal rotation, and the wheel will be steadily held, feathering the wind as long as its force prevents the weights W and W' from overbalancing the resistance against the back wing N and other top surfaces. When this equilibrium of pressure is destroyed by the wind abating the lever-weights will cause the lever to oscillate back in the same oblique plane, and the winged head will swing back gradually nearer the wheel as the head approaches its vertical position, as shown in Fig. 1, thus enabling the wind to act with a proportionate increase of power on the wheel to impel it around to face the wind and to resume its regular motion without the aid of any vane whatever on the wheel-shaft. The preponderancy of weights on the bracing and balancing-arm will hold the governor-lever vertical, or nearly so, against the wind-pressure on the angular wings or sails M so long as the wind-wheel is not running too fast; but should an excessive motion be threatened the increased pressure of the wind acting on the wings M, &c., will overcome that gravity in the exact ratio of such increase of pressure, and, by oscillating the governor-lever, will so act upon the turn-table as to cause the face of the wheel to be carried more or less from the wind. It is evident that, were no provision made, the decreasing and increasing impact sur-

face of the lever-wings, as the wheel is thus swung around, would seriously affect the governing power; but this is compensated for by the projecting side weight  $W'$ , which loses and gains preponderancy during the respective ascent and descent of the weight  $W$ , and thus prevents spasmodic action. As the governor-lever is only designed to be oscillated about a quarter of a circle, suitable stops, as, for instance, shown at  $f$  and  $f'$ , should be attached to the turn-table; and a rope (not shown) leading from the arm and passing through the pivot  $B$  to the ground may be used to lash the lever to a horizontal position and keep the wind-wheel out of gear with the wind, whenever necessary.

Our obliquely-oscillating governor-lever not only renders the windmill self-regulating as to

speed, but makes it, in a much higher degree than is common, self-protective against sudden wind-storms, dispenses with the vane, and permits of a simple, compact, and economical construction.

We claim as our invention—

In a windmill, the winged and weighted governor-lever  $E$ , so hung to the turn-table as to oscillate, by the power of wind and gravity, in a plane more or less oblique with the face of the wind-wheel, substantially as and for the purposes set forth.

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Witnesses:

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