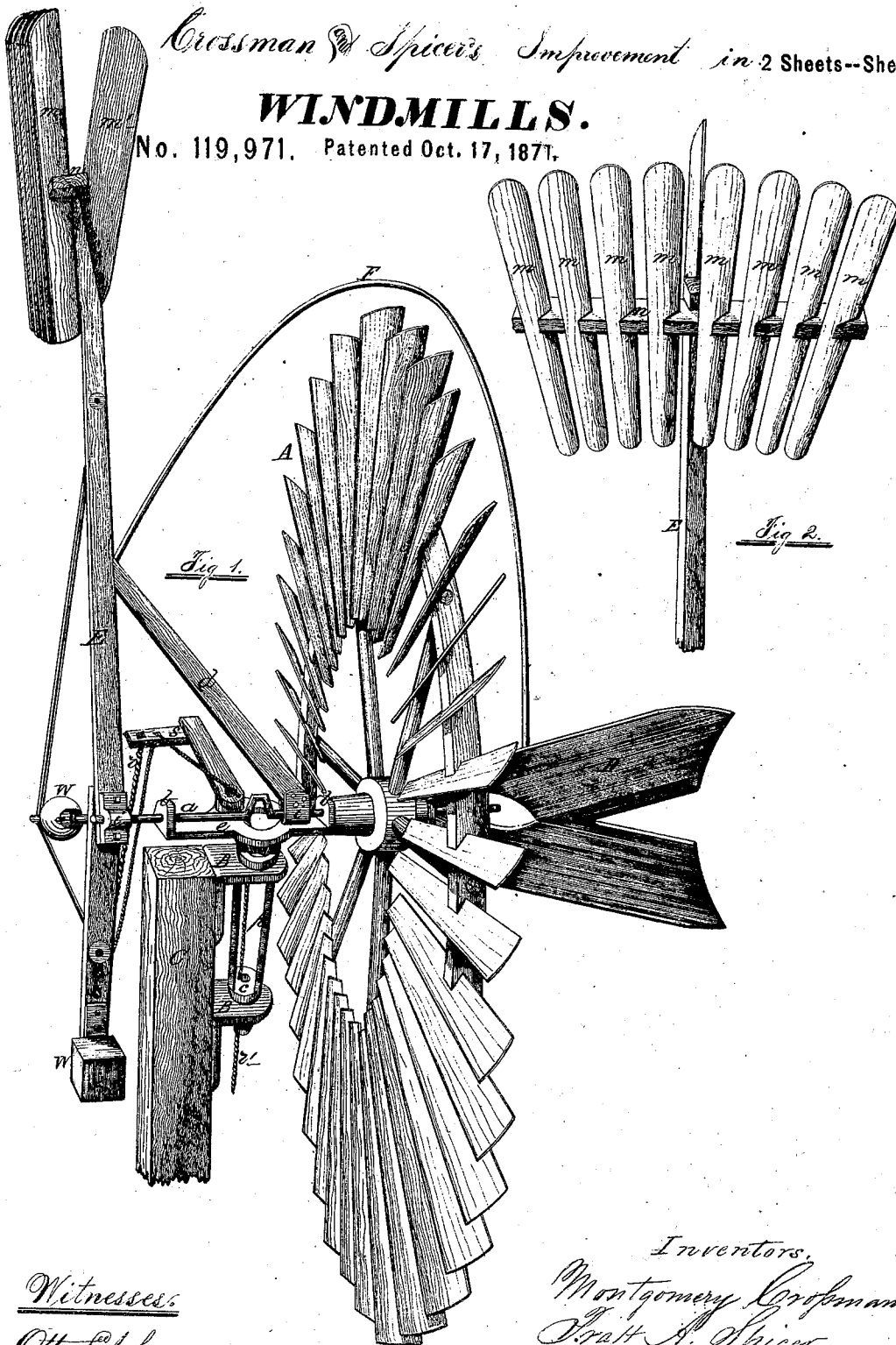


Crossman & Spicer's Improvement in 2 Sheets--Sheet 1.

WINDMILLS.

No. 119,971. Patented Oct. 17, 1871.



Witnesses:

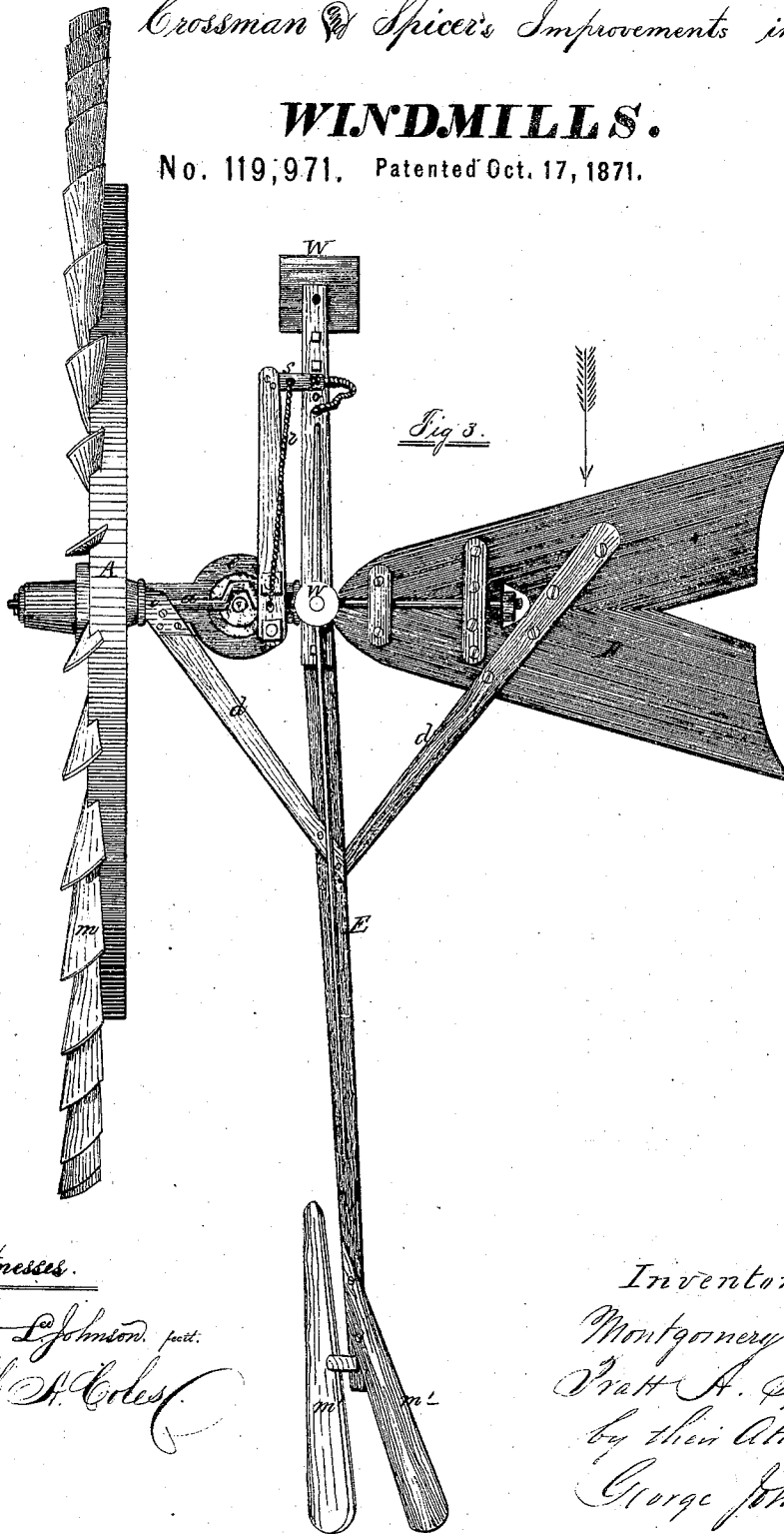
Otto L. Johnson.
Will A. Carter.

Inventors.
Montgomery Crossman.
Walt A. Spicer.
by their Attorney in fact
George Johnson.

Crossman & Spicer's Improvements in

WINDMILLS.

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by their Attorney in fact
George Johnson.

UNITED STATES PATENT OFFICE.

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

IMPROVEMENT IN WINDMILLS.

Specification forming part of Letters Patent No. 119,971, 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 employment, in a windmill, of a governor-lever, caused to oscillate back and forth, by the combined influence of the wind and gravitation, in a plane parallel with the plane in which the wind-wheel revolves, and operating, in connection and combination with a revolving vane, to govern and control the presentation of the wind-wheel to the wind, for the purpose of regulating the velocity of the wheel's motion, and more effectually providing for the safety of the mill in sudden gusts and windstorms. Our invention further consists in arranging the wind-wheel and vane in such relation with each other on the shaft that the said wheel will be impelled to face the wind in a position behind its vertical axis of rotation around the post, instead of being impelled by the vane to face the wind in front of such axis, as in the usual arrangement; our object being to greatly reduce the size of the vane by calling into action the natural tendency of such a wheel, when unrestrained, to adjust itself in the former-named position, and also to render it more sensitive to the governing devices.

Figure 1, sheet 1, is a perspective view of the mill embodying our invention, the governing lever being hung in front as a counterpoise to the wind-wheel and small vane behind. Fig. 2 is a front view or elevation of a broken-off section of the wind-wing end of the lever. Fig. 3, sheet 2, is a plane or top view, exhibiting the position of the governor-lever, when so far oscillated as to hold the vane and wheel feathering the wind.

A is the wind-wheel, having fixed angular set wind-wings or sails. *a* is the wheel crank-shaft hung in raised bearings *b b* on a turn-table, *e*, said shaft overhanging at one end to receive the governor-lever, exhibited at E, and also at the other end to receive the wind-wheel, which is keyed fast, and the vane D, which, like the lever, turns freely on the shaft. F is a bent rod, passing over the wheel, and connecting the governor-lever with the vane, in coincident lines, so that they will all oscillate simultaneously. The

turn-table *e* is provided with a long open pivot, *p*, within and through which the pump-rod works, and which pivot forms the vertical axis on which the wheel turns from or into the wind; but as this arrangement is already well-known and in use, no detailed description is necessary. This pivot is usually stepped and hung in brackets B bolted to the post C. The long arm of the governor-lever marked E is furnished at its extremity with one or two cross-bars, *n*, in which several wind-wings, *m m*, &c., are inserted, and permanently secured at a proper angle to catch the wind and cause the arm to oscillate; and it is unimportant whether the parts are arranged to have this arm swing to the right or left, and irrespective of the wind-wheel's motion.

The lever-stem is hung loosely on the wheel-shaft at or about the points *i i*, one of the bearings being attached to the end of an angle-brace, *d*, as shown. The short arm of the lever extending below the point *i* may be a separate piece, as seen, or form a continuation of the main arm, and it is provided with an adjustable balance-weight, W, and a side counter-balance, W', to be adjusted usually by screwing it on the projecting stud, over which a straining-brace may pass to stiffen the lever when horizontal. The gravity and precise positions of the weights W W' can only be determined by the relation existing between the winged end of the governor and the wind-wheel, as will be more fully explained in describing the mode of operation, as follows: The wind surface of the wings *m* and the bottom gravity should be so proportioned that the wind will not have the power on said wings to overbalance the weights and oscillate from the vertical until the wind-wheel begins to be driven beyond its maximum velocity, and then the governor-lever, acting through its connection with the shaft *a* on the turn-table *e*, will, if the wind still increases, carry the wheel still further on its vertical axis, and present a diminished impact surface, at an angle more or less obtuse with the wind's path, and thus preserve a proper uniform velocity. This rotation of the wheel is aided by the side wing *m'* being gradually brought round to face the wind at the same time that the resistance of the vane is diminishing, being partially turned on the shaft *a* by the oscillation of the lever.

Before the wind can increase so as to endanger the mill, the governor-lever will have been oscil-

lated to a horizontal position and arrested by the arm-stop *s*, attached to the turn-table, the edge of the wheel and vane both feathering the wind, and will be held there as long as the wind blows too strong, because the impact surfaces of the oscillated lever at one end of the shaft, or rather on one side of the vertical axis, presents just as much resistance to the wind as the feathered edges of the wheel and vane present on the opposite side.

The wind-wheel will not come into gear with the wind, and resume its motion, until there is a lull, so that the wind's downward pressure upon the side wing *m'* is so far reduced that the loaded end of the lever will overbalance it, and cause the lever to oscillate gradually back to such an angle as to turn the vane enough to bring the wheel back sufficiently into the wind, and when brought back fully, the lever will hang vertical again, its further motion being arrested by the rope *r* or other equivalent device.

The function of the projecting counter-balance *W'* is to gradually lessen the gravity as the weight *W* ascends, and similarly diminish it when descending, in order to steady oscillation.

A rope, *r'*, passing from the lever to the arm-stop, thence through the pivot toward the ground will, on being hauled taut and belayed, maintains the wheel out of gear by arresting the back oscillation of the lever.

Our governor-lever is equally efficient and applicable in mills having large vanes to impel the wheel to stand in front of its vertical axis, as shown in the arrangement on Sheet 2, Fig. 3; but in such case the angle of the hanger-brace *d* would be reversed, and the vane may be connected with the lever by another arm-brace, *d*².

We claim as our invention—

1. In a windmill, the winged and weighted governor-lever *E*, so hung to the shaft or turn-table as to oscillate in a plane parallel with that in which the wind-wheel revolves, substantially as and for the purposes specified.

2. The arrangement of a wind-wheel *A* on its shaft in such relation with the vane *D* so that said wheel will be impelled to face the wind behind its vertical axis or pivot *p*, substantially as and for the uses described.

3. The winged and weighted governor-lever *E*, in combination with the shaft *A*, turn-table *e*, bent rod *F*, and small vane *D*, all constructed and arranged relatively with each other and with the wind-wheel *A*, substantially in the manner and for the purpose set forth.

MONTGOMERY CROSSMAN.
PRATT A. SPICER.

Witnesses:

G. CRANSTON,
OTTO LEE JOHNSON.

(118)