

(No Model.)

3 Sheets—Sheet 1.

E. C. BOMGARDNER.  
WINDMILL.

No. 533,781.

Patented Feb. 5, 1895.

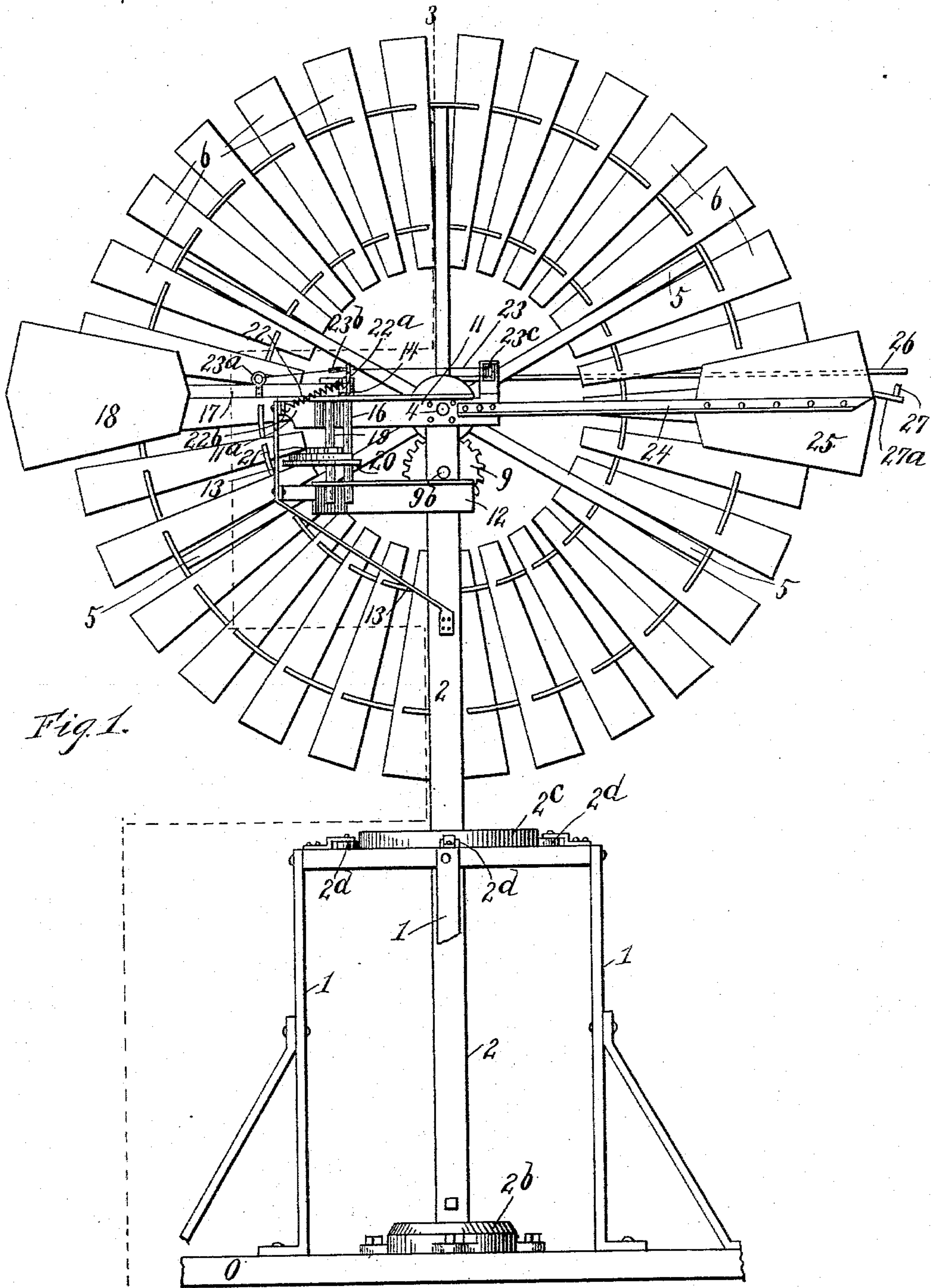


Fig. 1.

Witnesses:

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Jno. A. Christianson

Inventor:  
Edwin C. Bomgardner  
By Louis K. Gillson  
Attorney.

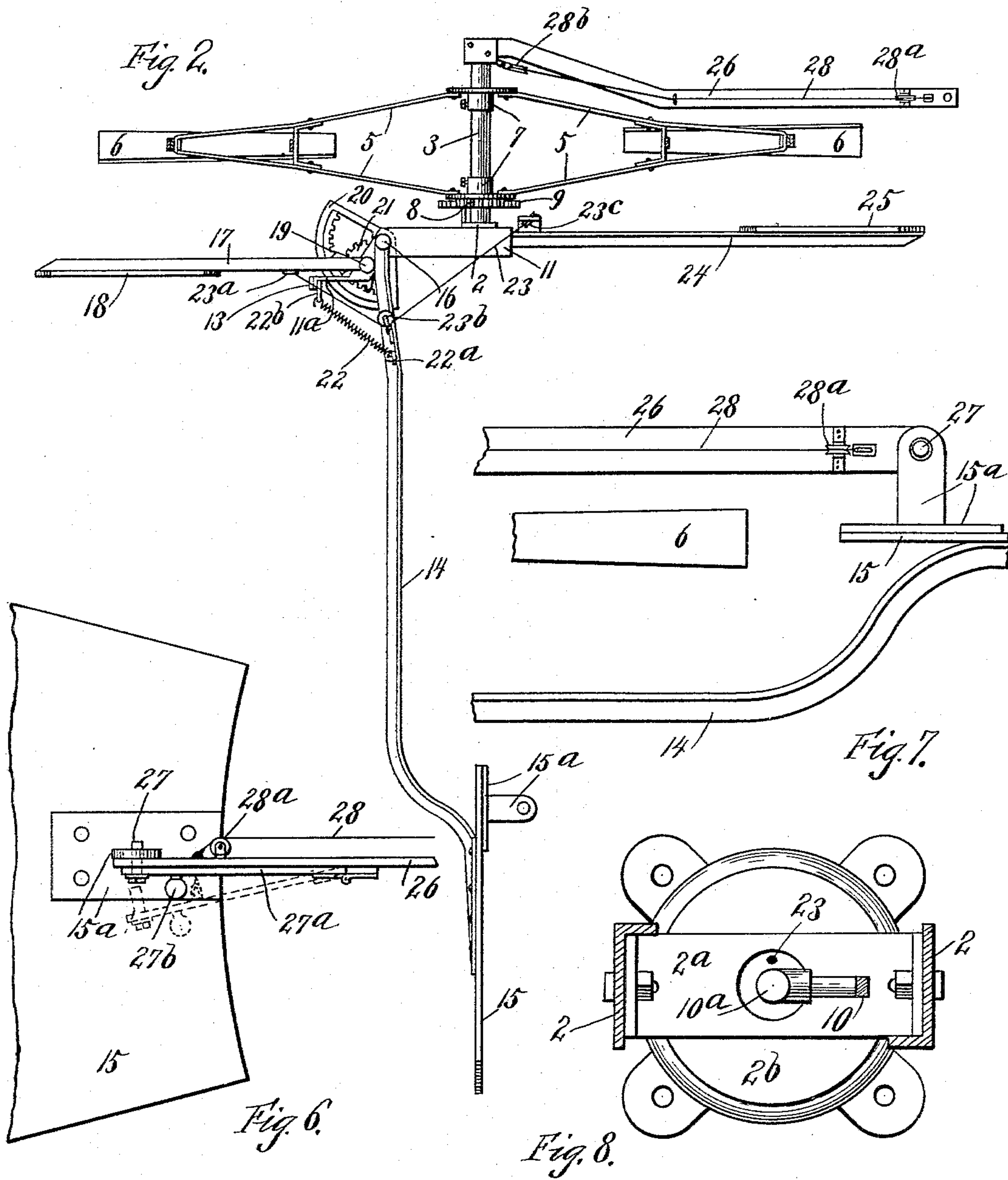
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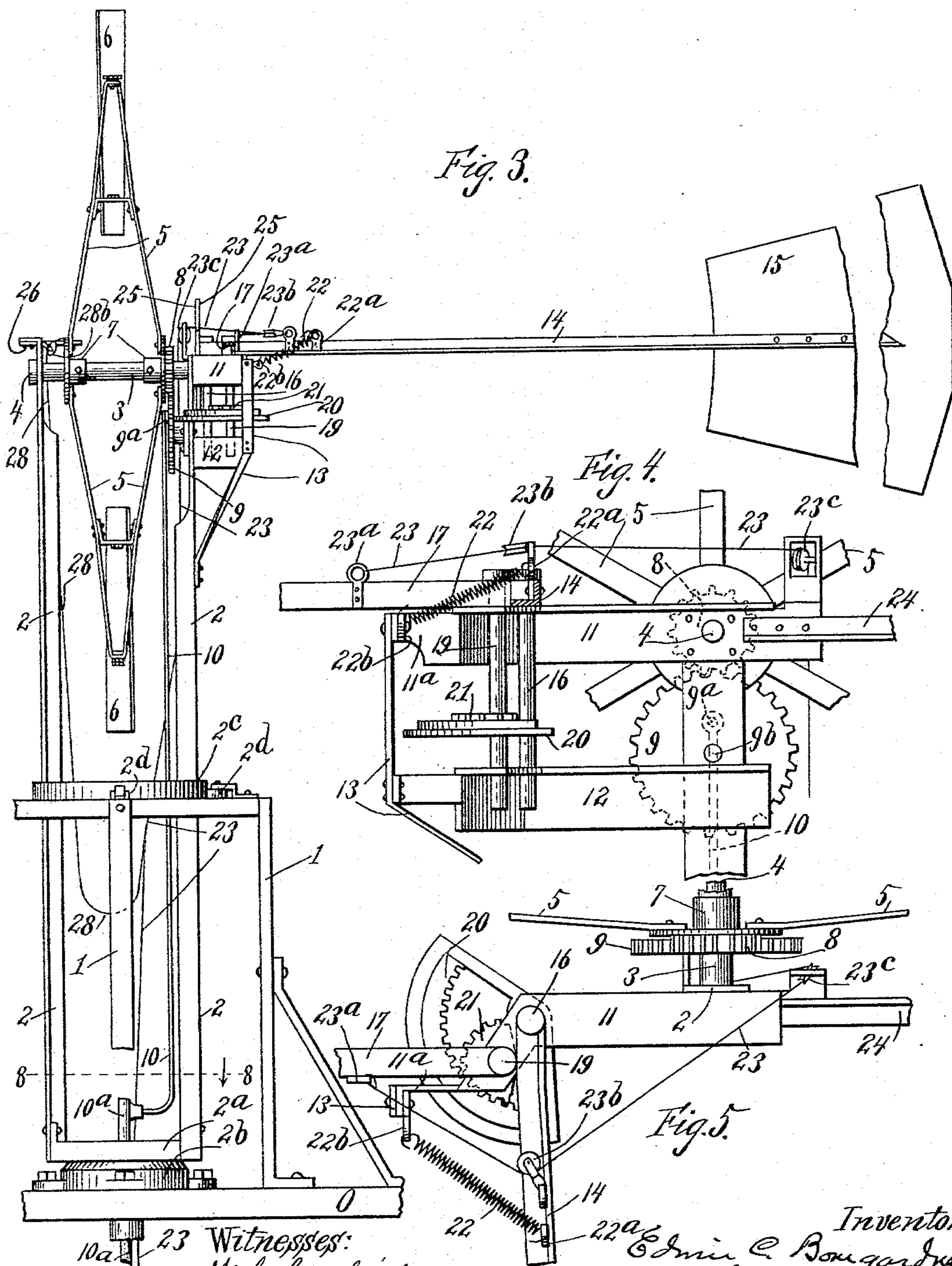
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# UNITED STATES PATENT OFFICE.

EDWIN C. BOMGARDNER, OF IOWA FALLS, IOWA.

## WINDMILL.

SPECIFICATION forming part of Letters Patent No. 533,781, dated February 5, 1895.

Application filed March 16, 1894. Serial No. 503,860. (No model.)

*To all whom it may concern:*

Be it known that I, EDWIN C. BOMGARDNER, a citizen of the United States, residing at Iowa Falls, in the county of Hardin and State of Iowa, have invented certain new and useful Improvements in Windmills; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to wind mills and has for its object the perfect balancing of the wheel upon the mast and such an arrangement of rudder and guide vanes as to hold the wheel true to the wind, or completely out of the wind.

The invention consists in a two armed mast, the wheel being journaled between the arms and its axle serving to strengthen them; of a rudder vane so pivoted to the mast and having a supporting arm of such shape that the vane will be exactly in line with the axis of the wheel when the latter is to the wind and exactly in the central longitudinal plane of the wheel when the latter is out of the wind.

It consists further in double guide vanes, one of which is rigidly attached to the mast, the other being pivotally attached thereto, and so attached to the arm of the rudder vane that it swings through one hundred and eighty degrees while the rudder vane moves through ninety degrees.

It consists further of a locking device for holding the wheel out of the wind and of such other parts and arrangement of parts as are hereinafter described.

In the accompanying drawings, Figure 1, is a rear elevation of the wheel with the rudder vane removed. Fig. 2, is a plan section of the wheel. Fig. 3, is a vertical section on the line 3—3, of Fig. 1. Figs. 4 and 5, are details showing the attachment of the vanes. Figs. 6 and 7, are details of the locking device. Fig. 8, is a plan section on the line 8—8 of Fig. 3.

I show at 1, 1, the head of the wind mill tower; at 2, 2, the two arms of the mast which are joined together at the bottom by a plate,

2<sup>a</sup>, which rests upon a plate, or turn table, 2<sup>b</sup>, carried by the beams, O, O, secured to the tower.

At 2<sup>c</sup>, is shown a metal ring inclosing the arms, 2, 2 of the mast and at 2<sup>d</sup>, 2<sup>d</sup>, are shown guide rollers mounted upon the top of the tower so as to have their faces bear against the face of the ring, 2<sup>c</sup>. A rod, 4, unites the upper ends of the two arms of the mast and serves as the axle for the wind wheel whose frame is shown at 5 and blades at 6. The rod, 4, is rigidly fixed into the arms 2, 2 of the mast thereby firmly uniting them.

The hub of the wind wheel consists of the sleeve, 3.

The frame, 5, is in diamond form, in transverse section, and its two sides are held apart by the collars, 7, fitting upon the sleeve, 3, and secured thereto by any suitable means. A gear wheel, 8, is mounted upon the sleeve, 3, and fixed to the frame, 5, of the wind wheel so as to rotate with it. The pinion, 8, meshes with a pinion, 9, carried by a stud shaft, 9<sup>b</sup>, projecting inwardly from one of the arms, 2, of the mast. The pinion, 9, is provided with a crank pin, 9<sup>a</sup>, to which is attached the pitman, 10, of the pump rod, 10<sup>a</sup>. The pump rod, 10<sup>a</sup>, extends through an aperture in the plate, 2<sup>a</sup>, midway between the arms, 2, 2, of the mast and through a central aperture of the plate, 2<sup>b</sup>.

At the upper end of one of the arms, 2, of the mast are rigidly secured two brackets, 11, 12, at different altitudes, and through the soles of these brackets extend the pivot pins 16, of the rudder vane and 19, of the swinging guide vane. The arm of the rudder vane is shown at 14. Its pivot pin, 16, is set out of line with the axis of the wind wheel, the distance between this pin and the axis of the wheel being the same as the distance between the pin and the central longitudinal plane of the wheel. The arm, 14, is offset so as to bring the rudder vane, 15, exactly in line with the axis of the wheel when the latter is to the wind, and so as to bring it into alignment with the central longitudinal plane of the wheel when the latter is out of the wind.

The arm of the swinging guide vane is shown at 17, the vane being shown at 18. Rigidly fixed to the pivot pin, 19, of the rudder vane is a sector, 20, provided with in-



ternal gear teeth and extending beyond and inclosing the pivot pin 19, of the vane, 18. The pivot pin 19, carries a pinion, 21, adapted to mesh with the internal gear, 20. The radii of the pinion, 21, and the sector, 20, are so relatively proportioned that in making a half revolution the former turns the latter a quarter revolution, so that when by the action of the guide vane, 18, the wind wheel is thrown entirely out of the wind the said vane moves, relatively to the wheel through one hundred and eighty degrees and the rudder vane, 15, moves through ninety degrees, the several parts being folded together.

An arm, 11<sup>a</sup>, of the bracket, 11, extends laterally beyond the pivotal point of the vane, 15. A spiral spring 22, connects the rudder arm, 14, with the arm, 11<sup>a</sup>, being attached to an eye, 22<sup>a</sup>, carried by the former, and eye, 22<sup>b</sup>, carried by the latter. The office of this spring, 22, is to bring the vane, 15, and the wind wheel perpendicular each to the other. The tendency of the guide vanes is to bring the planes of the rudder vane and the wind wheel into alignment and the tension of the spring, 22, must be sufficient to overcome this tendency until the strength of the wind is such that it is desirable to stop the action of the wheel.

A guide vane, 25, mounted upon an arm, 24, rigidly fixed to the upper end of the arm, 2, of the mast, which carries the vanes already described, is permanently parallel with the plane of the wind wheel. The length of the arms, 17, and 24, is such that the vanes, 18, and 25, extend to an equal distance beyond the periphery of the wind wheel, and the parts are so disposed that when the latter is to the wind the two guide vanes extend in opposite directions. In conjunction with a sixteen-foot wind wheel the guide vanes, 18, 25, should extend three feet beyond its periphery.

While the guide vanes, 18, and 25, both tend to throw the wheel out of the wind they serve to balance each other so long as the spring, 22, overcomes this tendency. When a single guide vane is used the wind wheel necessarily stands at an oblique angle to the wind the size of the angle being proportioned to the relative sizes of the guide and rudder vanes, and the efficiency of the wheel is thereby lessened.

I show at 23, a cable, running from a point of attachment, 23<sup>a</sup>, on the arm, 17, around a horizontal sheave, 23<sup>b</sup>, on the arm, 14, and down over a sheave, 23<sup>c</sup>, on the arm, 24. The cable, 23, extends to the ground and serves as a means for drawing the wheel out of action from below.

An arm, 26, rigidly secured to one of the arms, 2, of the mast, extends horizontally along the face of the wheel to and beyond its periphery. A vertical latch, 27, plays through an aperture in the outer end of the arm, 26, and is supported by a lever, 27<sup>a</sup>, pivotally at-

tached to the under side of the arm, 26, and carrying at its outer end a weight 27<sup>b</sup>, and controlled by a cord, 28, running upwardly and turned over a sheave, 28<sup>a</sup>, carried by the arm, 26, and downwardly over a sheave, 28<sup>b</sup>, carried by the same arm. A loop 15<sup>a</sup>, extends laterally from the face of the vane, 15, in such manner that when the latter is brought into the plane of the wind wheel the loop is adapted to be engaged by the latch, 27. The lower end of the cable, 28, is attached to the cable, 23, in such manner that when the latter cable has been drawn down for the purpose of throwing the wind wheel out of action strain is communicated to the cable, 28, in time to throw up the latch, 27, into engagement with the loop, 15<sup>a</sup>.

At 13, is shown a brace for strengthening the brackets, 11, 12.

I claim as my invention—

1. In a wind-mill the combination with a power wheel, a rotatable mast for carrying the wheel, and a rudder vane so mounted upon the mast that it is in alignment with the axis of the wheel, when the face of the wheel is transverse to the wind, and with the central plane of the wheel when the face of the latter is parallel with the wind, substantially as described and for the purpose specified.

2. In a wind-mill the combination with a power wheel and a rotatable mast for carrying the wheel, of a rudder vane pivotally connected with the wheel and for controlling its angular position with reference to the wind, an internally geared sector, mounted rigidly with the rudder vane, a swinging guide vane, adapted to be parallel with the plane of the wheel when the latter is perpendicular to the direction of the wind, a pinion mounted rigidly upon the pivot pin of the guide vane and being one-half the diametric size of the sector and adapted to mesh therewith, and a spring adapted to normally hold the rudder vane perpendicular to the plane of the wheel, substantially as described and for the purpose specified.

3. In a wind mill the combination with a rotatable mast, a power wheel carried by the mast, a rudder vane pivotally mounted upon the mast, and a spring adapted to hold the wheel and rudder vane in perpendicular relation, of a pair of guide vanes carried by the mast normally parallel with the plane of the wheel, and projecting in opposite directions, and adapted to resist the spring, substantially as described and for the purpose specified.

4. In a wind-mill the combination with a rotatable mast, a power wheel, a rudder vane pivotally mounted upon the mast, and a spring for normally holding the rudder vane and wheel in perpendicular relation, of a guide vane pivotally mounted upon the mast, normally parallel with the plane of the wheel and adapted to resist the spring, and a second guide vane rigidly fixed to the mast, parallel with the plane of the wheel and projecting



oppositely from the normal direction of the pivoted guide vane, substantially as described and for the purpose specified.

5 In a wind-mill the combination with a rotatable, bifurcated mast, a power wheel mounted between the arms of the mast and having its central plane in alignment with the axis of the mast, a rudder vane pivotally carried by the mast, and a spring adapted to nor-  
10 mally hold the rudder vane and wheel in perpendicular relation, of a guide vane rigidly mounted upon the mast, and parallel with the plane of the wheel, a guide vane, 18, pivotally mounted upon the mast, and adapted to  
15 be parallel with the plane of the wheel and projecting oppositely from the fixed vane when the wheel and rudder vane are in perpendicular relation, an internally geared sector carried by the rudder vane and having its  
20 center at the pivotal point thereof, and a pinion one-half the diametric size of the sector and adapted to mesh therewith and being rigidly mounted upon the pivot pin of the guide vane, 18, substantially as described and for  
25 the purpose specified.

6. In a wind-mill the combination with a bifurcated rotatable mast, a power wheel

mounted between the arms of the mast and having its central plane in alignment with the axis of the mast, a rudder vane pivoted 30 upon the mast in such manner as to be in alignment with the axis of the wheel when the wheel is perpendicular to the wind, and with the central plane of the wheel, when the latter is parallel with the wind, of an arm rig- 35 idly fixed to the mast, and means for locking the rudder vane to said arm when the wheel is parallel with the wind, substantially as described and for the purpose specified.

7. In a wind mill the combination with a 40 power wheel, of a rudder-vane so mounted relatively to the wheel that it is in alignment with the axis thereof when the wheel is transverse to the direction of the wind, and with the central plane of the wheel when the face 45 of the latter is parallel with the direction of the wind, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

EDWIN C. BOMGARDNER.

Witnesses:

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LOUIS K. GILLSON.