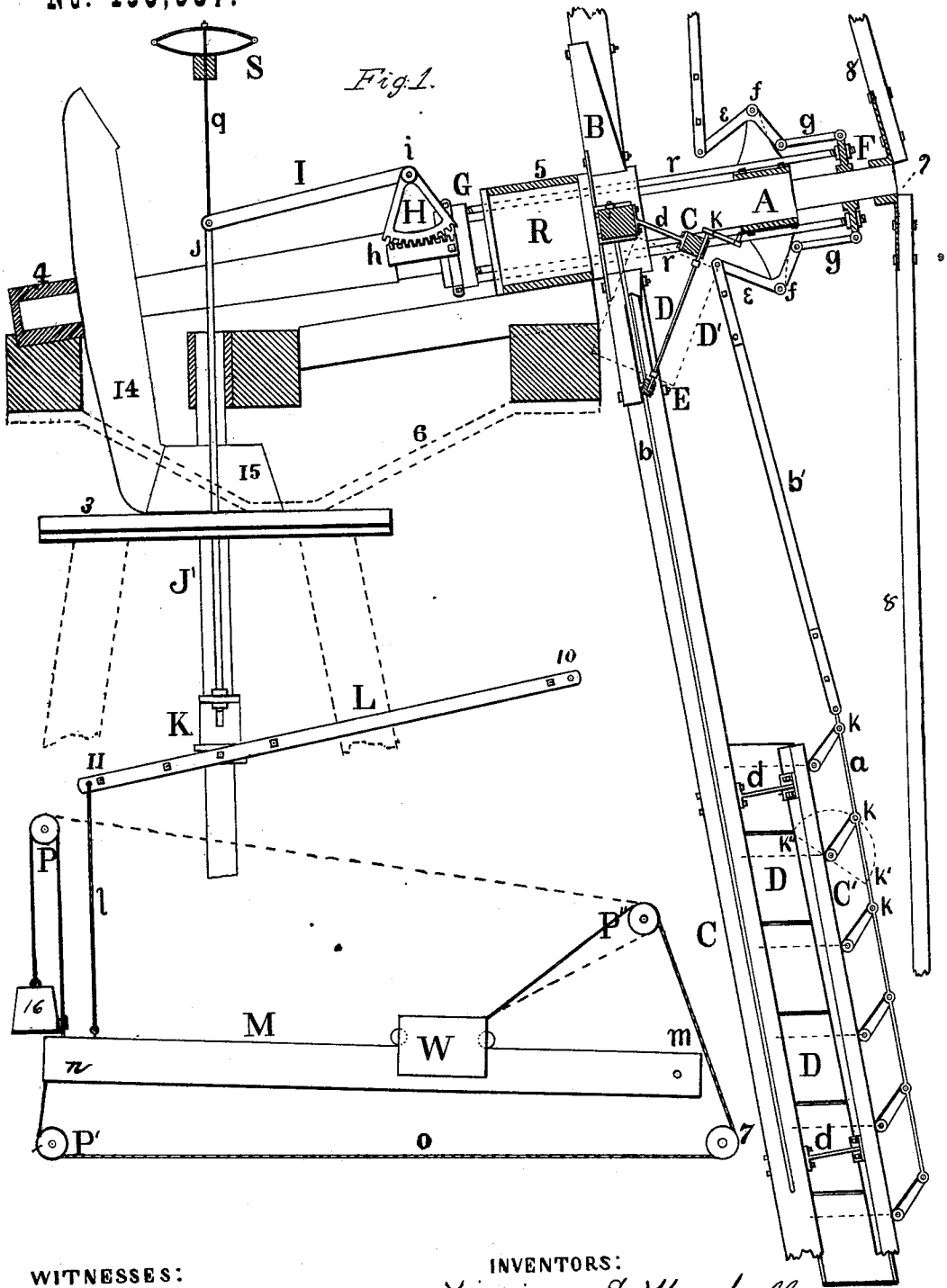
2 Sheets—Sheet 1.

J. WARWICK & W. S. MARSHALL.

WIND-MILL.

No. 190,937. Patented May 15, 1877.

Fig. 1.



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2 Sheets—Sheet 2.

J. WARWICK & W. S. MARSHALL.

WIND-MILL.

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FIG. 2.

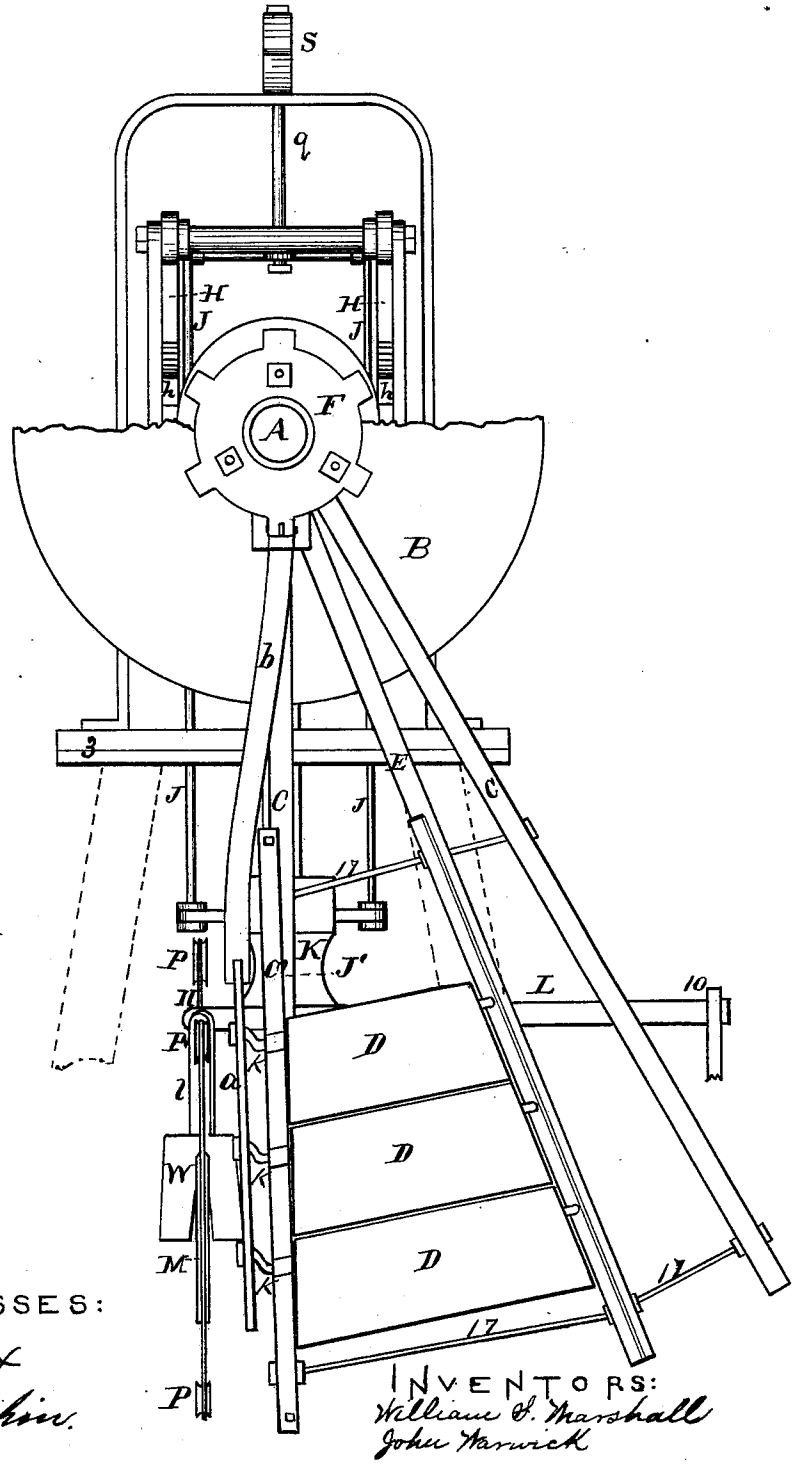
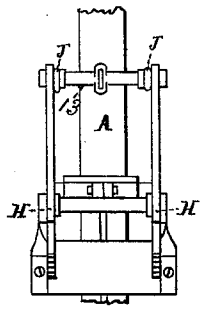


FIG. 3.



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UNITED STATES PATENT OFFICE.

JOHN WARWICK, OF MEDO, MINNESOTA, AND WILLIAM S. MARSHALL, OF BATAVIA, ILLINOIS.

IMPROVEMENT IN WINDMILLS.

Specification forming part of Letters Patent No. **190,937**, dated May 15, 1877; application filed April 2, 1877.

To all whom it may concern:

Be it known that we, JOHN WARWICK, of Medo, Blue Earth county, Minnesota, and WILLIAM S. MARSHALL, of Batavia, Kane county, Illinois, have invented a new and useful Improvement in Windmills, of which the following is a specification:

The object of the present invention is—

First, in the sails of windmills, to prevent their breakage by backlashing, in consequence of wind-pressure on their rear surfaces. This we accomplish by constructing the sails to reverse and present either of their edges to the front or face of the wind-wheel, and by reversible cranks operated by means of connecting-rods.

Second, in combining with reversible sails intermediate radial arms and auxiliary arms, whereby the sails are hinged wholly to the front of the main radial arms, and have a proper inclination to the wind, and permit the cranks to turn back of the pivoted line of the sails, to permit the sails to be reversed.

Third, in the combination of two sliding collars on the main shaft with an enlarged journal, connecting-rods, double rack, and segment-levers, as an intermediate means between the rear controlling-weight and the sails, to act in conjunction with the sails under wind-pressure, to give the sails the proper obliquity to the wind.

Fourth, in a rear controlling-weight arranged to travel on an adjustable inclined lever, so as to graduate the resistance to wind-pressure to coincide with the varying sail-surface presented to the wind.

Fifth, the combination of a traveling weight on an adjustable inclined lever with a controlling-weight, to hold the sails edge to the wind, to stop the rotation of the wind-wheel.

In drawings, Figure 1, Sheet 1, is a longitudinal sectional elevation of our improvement in windmills. Fig. 2, Sheet 2, shows a front elevation of the windmill. Fig. 3, Sheet 2, shows a top detached view of the segment-levers. Dotted lines 2 show the top of an ordinary tower to support the windmill, and 3 shows the position of the turn-table of ordinary construction.

A represents the horizontal shaft, which supports the spider B, to which the main radial arms C are to be bolted, in the usual manner. This shaft is supported in suitable bearings, 4 5, on the ends of the bridge 6, which is supported by the turn-table 3, and it is enlarged at R to permit the rods *r r* to pass through it and connect the collars G and F, so as to rotate with the shaft. C are the principal radial arms, and E show intermediate radial arms placed between arms C, and, in practice, generally placed in front of them, to support the pivots of the ends of the sails, and are firmly secured in place. C′ represents auxiliary arms, firmly attached to every main arm C by means of studs *d d*, of such length as to hold the arm C′ at a sufficient distance from the arm C to give to the sails the proper angle relative to the direction of the wind. The cranks are attached to the sails, and are pivoted to connecting-rods *a*, and have bearings in boxes secured to the arm C′. The rods *a* are jointed to rods *b*′, which, by means of elbow-levers E, are pivoted at *f* to studs projecting out from the shaft A, and connecting-rods *g* are connected to the outer collar F, which is connected by rods *r r* to the inner collar G, so that when the sails are turned by the wind the collars will slide on the shaft A and carry the racks *h* back, (the racks being attached to the inner collars G,) so as to turn the segments H and raise the levers I attached thereto, and consequently, by means of connecting-rods J J, raise the end *n* of lever M high enough to slide the weight W thereon toward the end *m* by means of cords *o* and pulleys P″ P′ P 7. This arrangement is such that, as the wind turns the sails D obliquely to the wind, the weight W, being drawn back on the lever M, exerts less power to keep the sails in the wind, and consequently allows the wind-wheel to run slower.

In the drawing only one set of sails is shown, but in a complete windmill, as we build it, there is to be any desired number of sails to fill the wind-wheel, supported by a duplication of arms, E C C′, elbow-levers E, and connecting-rods *g r*, shown to operate the one set of sails; also, there is to be employed a set of connecting-rods, *a b*′, for each set of sails; and to stay the wind-wheel ordinary braces

8 8 may be secured to a collar, 9, on the shaft A, and be attached to the outer ends of the arms C. Nothing, however, is claimed to be new in these braces. By this means all the sails on the wind-wheel have simultaneously the same movement, whether face to the wind, edge or obliquely to the wind, or are reversed, as when the wind strikes the sails on their back sides with force, and the wind-wheel will run with safety in all winds not so strong as to blow the mill down, and have practically a uniform motion.

To complete the connection with the vertical rods J J and the lever M, a sliding collar, K, is placed on the power-shaft J′, and the rods J J are fast to it; and to this collar is pivoted a lever, L, which has a pivoted support at 10, and at the other end it is connected to the lever M by a cord or metal strap, *l*, whereby, when the levers I and segments H are raised, as when the wind opens the sails, the end 11 of the lever is also raised, bringing the end *n* of the lever M up with it, and in this movement the lever M draws up on the rope or cord *o*, and moves the weight W farther toward its fulcrum *m*, and lessens the resistance which the weight W has to resist wind-pressure; and as the pressure of wind is lessened on the sails, the weight will run down the incline on lever M, when its position is as shown in Fig. 2, Sheet 2. By these means the controlling-weight W has its greatest resistance to wind-pressure when the sails are face to the wind, and the least resistance when the sails are edge to the wind; and the force exerted by the weight W when the sails have any intermediate position between those stated coincides with the obliquity of the sails.

To give an easy movement to the levers I I and stop them in position, a cross-head, 13, is pivoted to their rear ends, and there is fixed loosely to it a rod, *q*, extending through a spring, S, and fastening to its top.

The dotted line K″ shows the position of a crank, K, when the sail is reversed, and K′ shows the position of the crank when a sail is partly open. D shows the sails closed. 14 and 15 show the position of the gear for rotating the shaft J′. To hold the sails out of the wind and stop the mill, a weight, 16, is suspended from a pulley, P, by a cord fastened to the end *n* of the lever M. Said weight elevates the lever and holds the sails D edgewise to the wind, the weight being removed when the mill is to run.

17, Fig. 2, Sheet 2, represents binder-rods, connecting the arms C E, and it is in front of these rods that the sails D are pivoted, so as to bring them in front of the wind-wheel. Only one set of sails is shown between the main arms C; but two or more sets may be employed to make a large mill of great power, for grinding and other purposes.

We are aware a controlling-weight for keeping the sails to the wind is old, and that auxiliary arms have been used in the rear of wind-wheels; but we are not aware that any construction in windmills has been employed for the purpose herein stated.

We claim and desire to secure by Letters Patent—

1. The combination of the connecting-rods *b′*, reversing-rods and cranks *a k*, with reversible sails D, as and for the purpose set forth.

2. The combination of the arms C, intermediate arms E, auxiliary arms C′, and reversible sails D, as described and shown.

3. The combination of the sliding heads F G, connecting-rods *r r*, racks *h h*, segment-levers H I, elbow-levers E, connecting-rods *g b′ a*, sail D, and enlarged journal R, as described and shown.

4. The traveling controlling-weight W, in combination with the lever M, with its operative cord and pulleys, collar K, lever L, and shaft J′, and segment-levers H I, as described.

5. The combination of the traveling weight W, lever M, and weight 16, for stopping the rotating of the wind-wheel, as set forth.

6. The auxiliary arm C′, in combination with the intermediate arm E, for supporting sails in front of planes of radial arms C, as described and shown.

JOHN WARWICK.
W. S. MARSHALL.

Witnesses:
E. S. SMITH,
W. Z. HAIGHT.