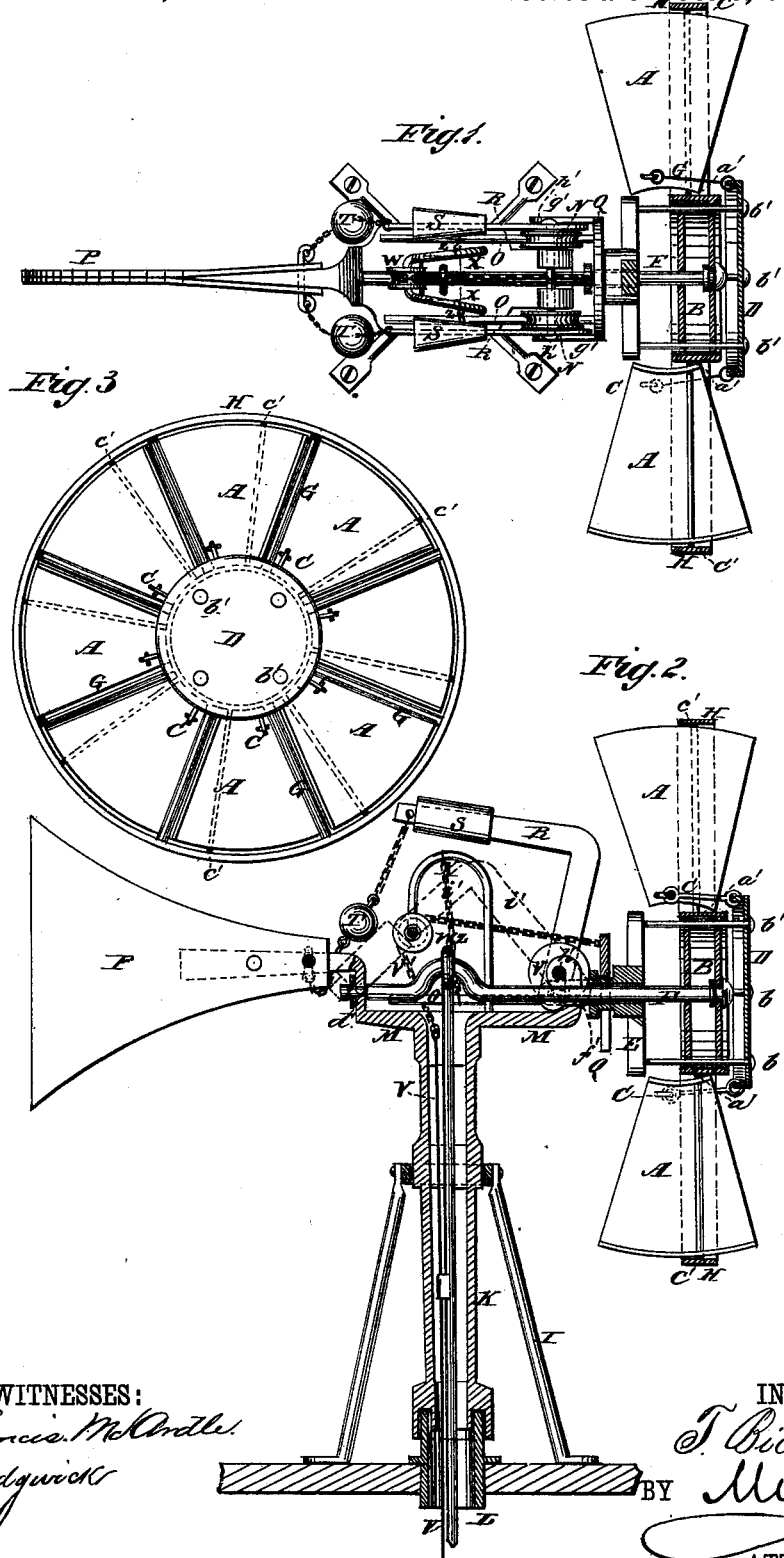


T. BICKERMAN.  
Windmill.

No. 213,801.

Patented April 1, 1879.



WITNESSES:  
*Francis McMillan*  
*C. Sedgwick*

INVENTOR:  
*T. Bickerman*  
BY *Mum Ho*  
ATTORNEYS.

# UNITED STATES PATENT OFFICE.

THEODORE BICKERMAN, OF HENRY, ILLINOIS.

## IMPROVEMENT IN WINDMILLS.

Specification forming part of Letters Patent No. **213,801**, dated April 1, 1879; application filed January 15, 1879.

*To all whom it may concern:*

Be it known that I, THEODORE BICKERMAN, of Henry, in the county of Marshall and State of Illinois, have invented a new and Improved Windmill, of which the following is a specification:

Figure 1 is a plan of the mill. Fig. 2 is a side elevation, partially in section. Fig. 3 is an end view of the wheel.

Similar letters of reference indicate corresponding parts.

The sails A A are pivoted at *a'* in hub B of sail-frame, and are connected or linked, by rods or links C C, to circular plate D, which is supported by rods *b' b'*, which pass through the hub of the wheel and attach firmly to the arms of the loose sleeve E, which slides on the crank-shaft F. Spokes G G, radiating from the hub, hold the wheel-rim H, to which the convex ends of the sails are pivoted at *c' c'*. These pivots of the sails are rods extending from hub to rim, to which the sails are firmly attached, as shown.

The hub of the wheel is, for strength, preferably made of cast-iron, and the rim, spokes, and rods of gas-pipe, for lightness; the sails, of sheet-iron or other metal or of wood.

The standard I supports a hollow post, K, which revolves on a thimble, L. The horizontal arm M of this post affords bearings for the crank-shaft at *d'* and *f'*, and, turning upward at one end, forms two ears or lugs, which afford bearings for the shaft of the friction-wheels N N, in the grooves of which run the rods O O, which form guides for the sliding head, and at the same time serve to relieve it of friction, and thereby cause it to move more easily. The outer ends of these arms are supported on the horizontal arm of the vertical post, while to the other end the vane P is secured.

A collar, Q, is shown fitted around the loose sleeve E. Attached to this collar are two lugs, *g' g'*, to which the angle-pieces R R are pivoted, and these pieces carry on their ends weights S S and chains and balls T T. Through the arms of these pieces R R, and affording them a fulcrum, the shaft of the friction-wheels passes at *h' h'*.

The apparatus works as follows, *i. e.*: When the weights and angle-pieces are in the posi-

tion indicated by the dotted lines *i' i'*, the circular plate D is at its greatest distance from the hub B, and the sails are as full to the wind as it is possible for them to be. As the wind increases in force its pressure against the circular plate D forces it inward toward the hub B. This inward motion of the plate D causes, by means of the links or rods C C, a corresponding "feathering" of the sails A A, and at the same time, through the medium of the rods *b' b'*, the loose sleeve E, with its attachments, is pushed along the crank-shaft, and in a corresponding degree the angle-pieces, with their weights, are raised, and if to the degree shown in the drawings, the sails will present only their edges to the wind. As the force of the wind decreases the weights gradually fall, and by so doing cause the plate D to move outward and adjust the sails to suit the conditions.

It will be seen that these weights and balls are arranged to counterbalance the sails and keep them full in moderate-working winds, and that they can be reduced or increased, so that with a given pressure of wind the sails may be held in the desired adjustment, and be self-regulating under all changes of pressure, so that the speed of revolution will remain nearly or quite the same under all working conditions.

V and V' are a rod and chain, respectively, which are attached to the collar Q, and run over pulley W, which is supported by the curved upright X, which not only supports the pulley, but also serves as a guide to the arms O, to which the said arms are attached by chains, by means of which their movement may be limited. This rod V is led down the hollow post by the side of the crank-rod, and by pulling upon it the plate D is drawn inward, the sails feathered, and the movement of the mill stopped.

By constructing the wheel, as shown, with spokes, pivot-rods, and rim, I secure great advantages over all other windmills with which I am acquainted in strength and durability, and also in the ability to use larger sails.

The chains Z Z, hanging from the curved uprights X, hold up the ends of the rods O O—a necessary precaution in a large mill, or when running at high speed, or when there are sud-

den and great changes in the pressure of the wind.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The collar Q, provided with lugs *g g'*, and the angle-pieces R R, provided with weights S and chains and balls T, in combination with the sliding head composed of a plate, D, the rods *b'*, and the sleeve E, the links C, and sails A, substantially as and for the purpose described.

2. The chain V', rod V, and pulley W, supported by the curved upright X, in combination with the sleeve E, substantially as and for the purpose set forth.

3. The friction-pulleys N, secured to the lugs of the horizontal arm M, in combination with the rods O of the sleeve E, substantially as and for the purpose described.

THEODORE BICKERMAN.

Witnesses:

HERBERT M. ROLLINS,

WILHELEM KLEIN.