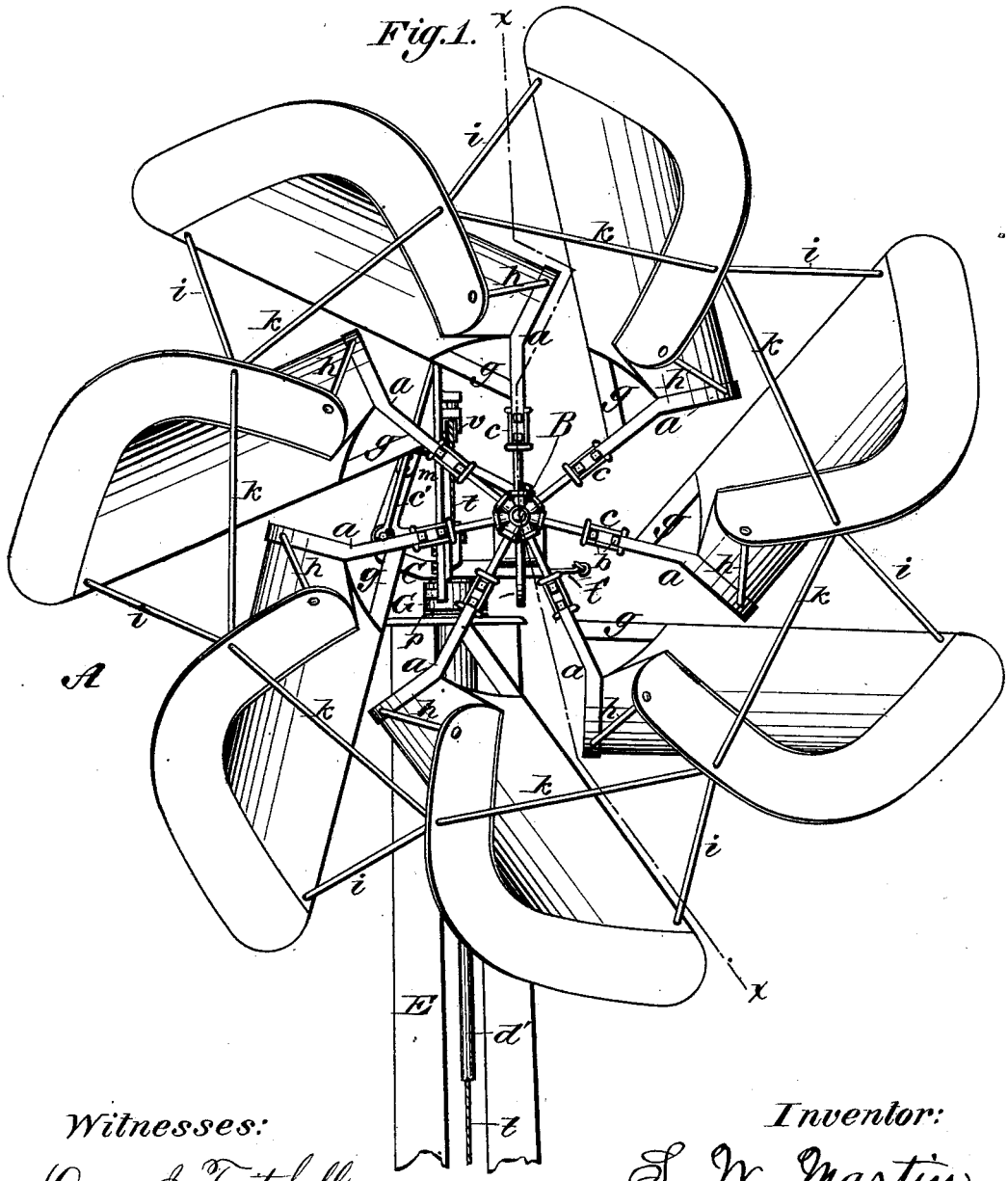
4 Sheets—Sheet 1.

S. W. MARTIN.

Windmill.

No. 220,083. Patented Sept. 30, 1879.

Fig. 1.



Witnesses:

Donn P. Twitchell.

William W. Dodge.

Inventor:

S. W. Martin

By Dodge & Dodge

Attys.

S. W. MARTIN.

Windmill.

No. 220,083. Patented Sept. 30, 1879.

Fig. 2.

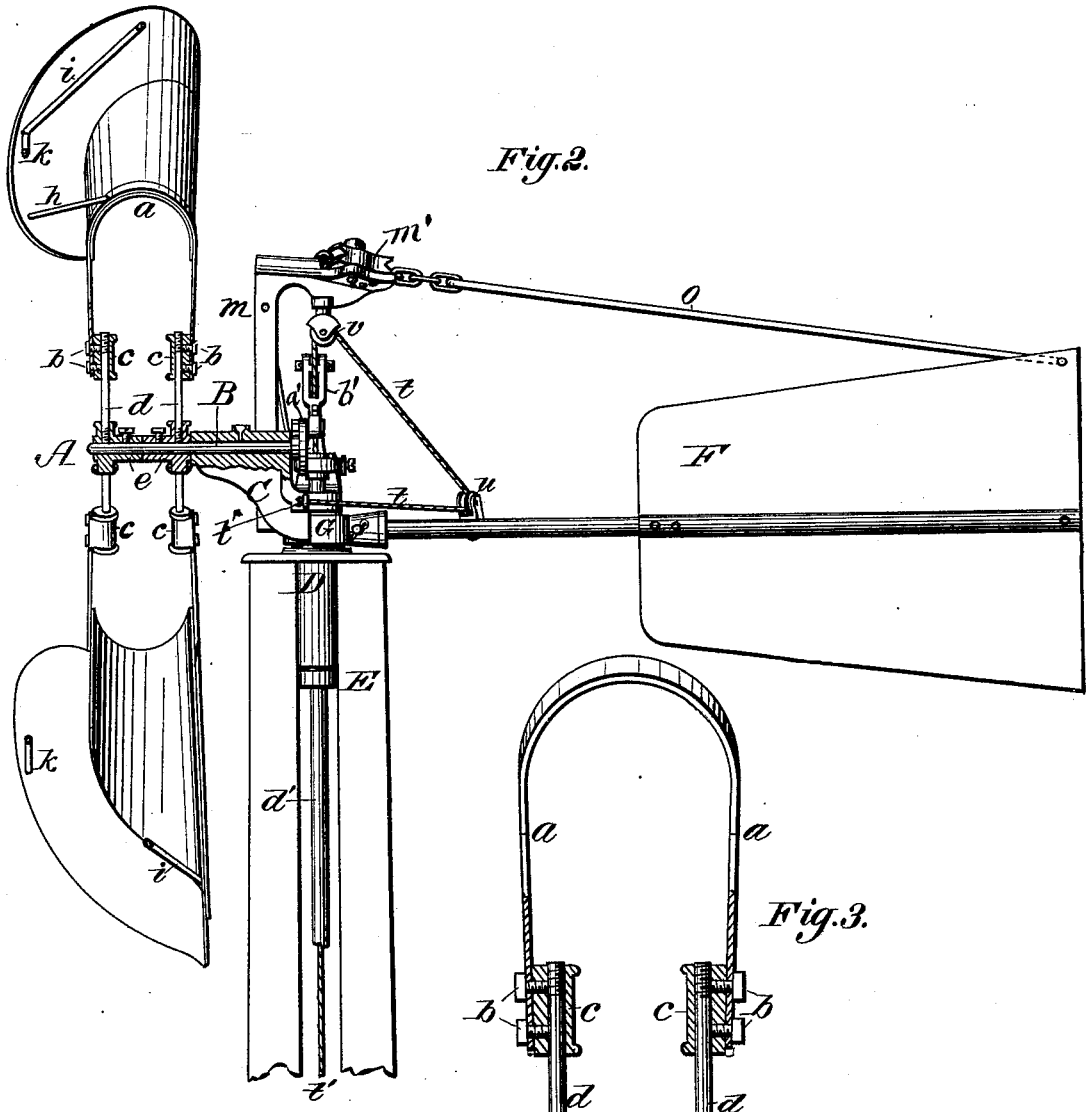
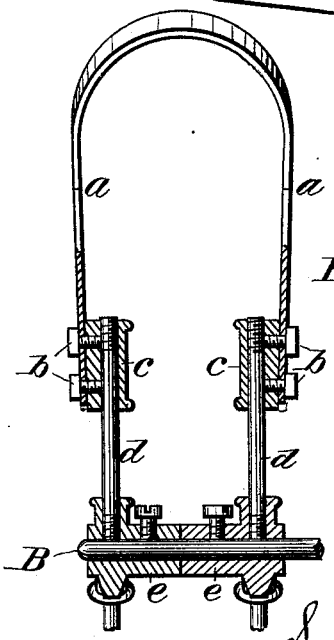


Fig. 3.



Witnesses:
Donn S. Twitchell.
William N. Dodge.

Inventor:
S. W. Martin
By Dodge & Son
Attys.

S. W. MARTIN.

Windmill.

No. 220,083. Patented Sept. 30, 1879.

Fig. 4.

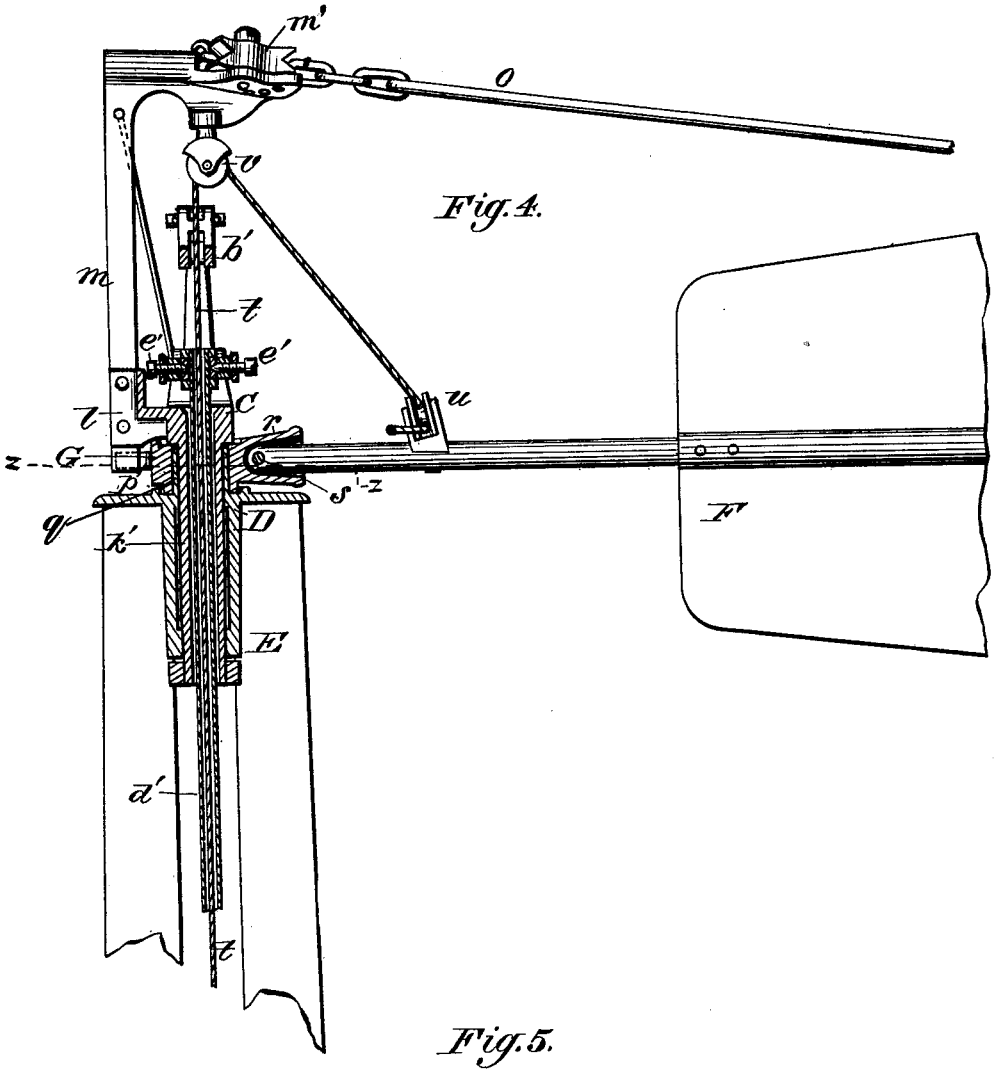
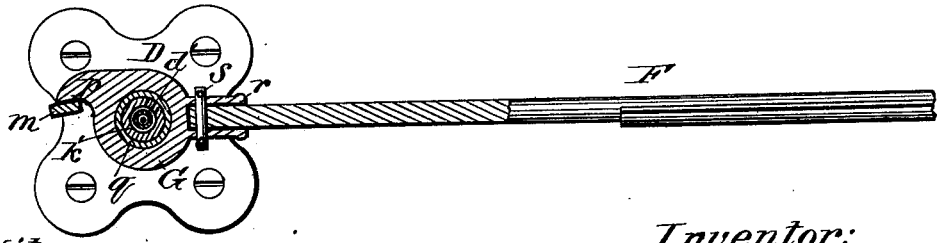


Fig. 5.



Witnesses:

Donn J. Twitchell.

William W. Dodge.

Inventor:

S. W. Martin

By Dodge & Son

attys.

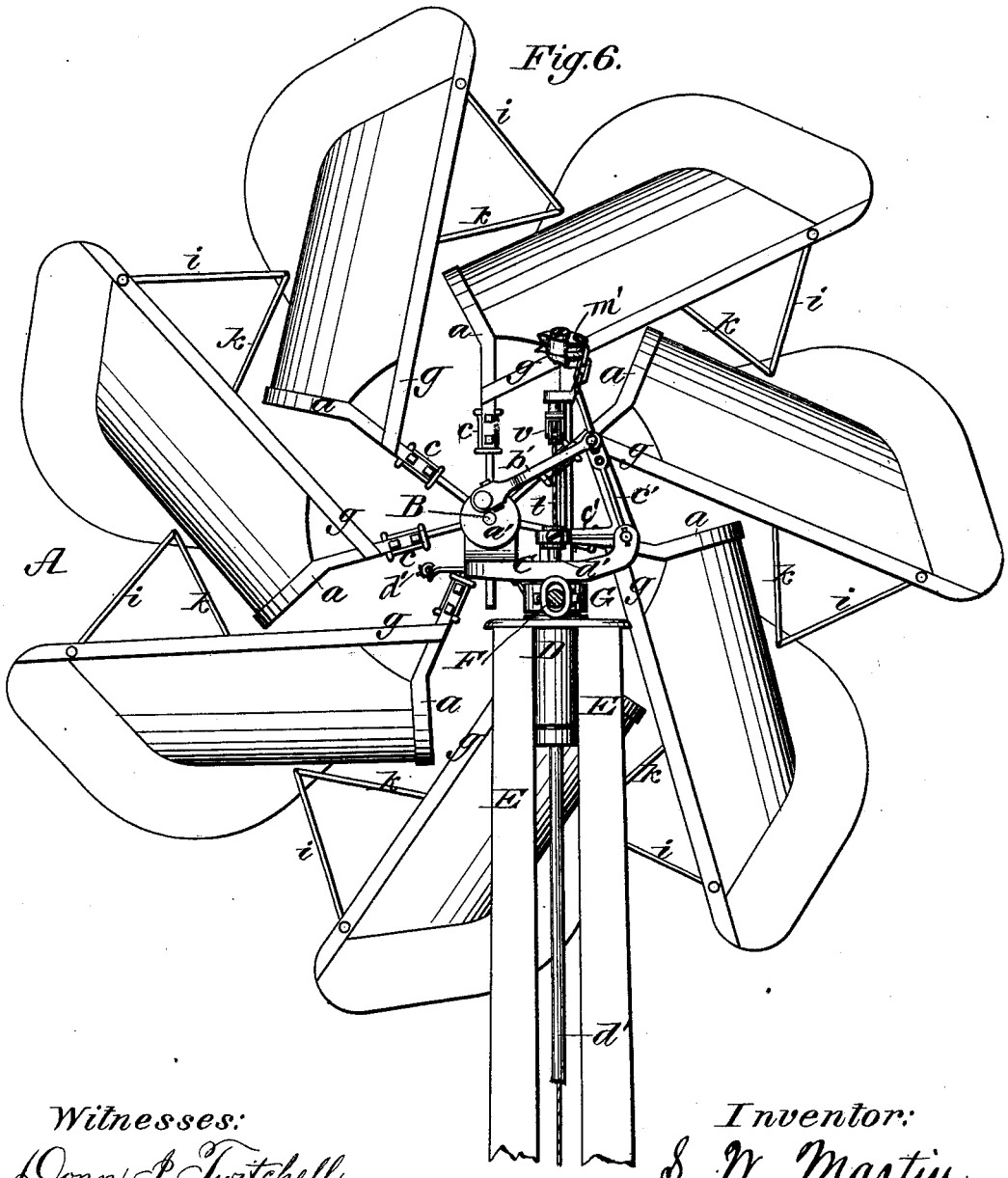
4 Sheets—Sheet 4.

S. W. MARTIN.

Windmill.

No. 220,083. **Patented Sept. 30, 1879.**

Fig. 6.



Witnesses:

Donn J. Twitchell.

William W. Dodge.

Inventor:

S. W. Martin

By Dodge & Son

Attys.

UNITED STATES PATENT OFFICE

SAMUEL W. MARTIN, OF SPRINGFIELD, OHIO, ASSIGNOR OF ONE-HALF HIS RIGHT TO P. P. MAST, OF SAME PLACE.

IMPROVEMENT IN WINDMILLS.

Specification forming part of Letters Patent No. **220,083**, dated September 30, 1879; application filed June 30, 1879.

To all whom it may concern:

Be it known that I, SAMUEL W. MARTIN, of Springfield, in the county of Clarke and State of Ohio, have invented certain Improvements in Windmills, of which the following is a specification.

This invention relates to that class of wheels which have metal sails, and which are commonly known in the art as "wind-turbines," and to wheels which are arranged to govern automatically by swinging bodily to one side against the strain and weight of an independently-swinging tail-vane; and the invention consists in the peculiar manner of constructing and bracing the wheel, and in the construction of the vane-supporting devices and attendant parts.

The invention is designed mainly as an improvement on a wheel made under a combination of the patents of D. Nysewander, April 3, 1877, No. 189,132, and S. W. Martin, August 20, 1878, No. 207,189.

Figure 1 represents a front elevation of my wheel; Fig. 2, a vertical section of the same on the line *x x;* Fig. 3, an enlarged view on the same line, showing the central hub and one of the sail-supports; Fig. 4, a vertical central section through the turn-table and vane-support; Fig. 5, a horizontal section on the line *z z*, Fig. 4. Fig. 6 is a rear elevation of the wheel with the tail-vane removed.

A represents the wheel proper, having a horizontal shaft, B, mounted in a horizontally-rotating head or turn-table, C, which is sustained in a step or bearing, D, on the upper end of a frame or mast, E; and F represents the tail-vane connected by a transverse hinge-pin to a ring or collar, G, which encircles the turn-table.

The wheel is composed of a series of sheet-metal sails, each curved lengthwise and provided with an inclined flange on the outer edge, as in the wheel described in the patent granted to Nysewander, as above mentioned. Unlike the Nysewander wheel, however, which had but four sails, and those attached directly to the central shaft, my wheel has a greater number of sails, each sustained at the inner end by means of an iron strap or bar, *a*, secured to the inner end of the sail, and connected at its ends by bolts *b* to two metal hubs, *c*, which are mounted on the outer ends of two radial arms, *d*, seated in hubs *e* on the main shaft. There are two of the hubs *e*, each provided with a series of sockets to receive the radial arms. Each arm is ordinarily made of iron tubing, although solid iron may be used, and has its end threaded and screwed into the hub to a point beyond the screw-thread, as shown in Fig. 3, the hub-sockets being bored out to admit the arms in this manner, so that the latter receive a solid support at a point where they are not reduced and weakened by the thread.

In this way the full strength of the arm is realized, and the usual danger of fracture through the thread at the periphery of the hub is avoided.

The outer ends of the arms *d* are threaded and seated in the hubs *c* in the same manner as in the central hub, so that they are inclosed and surrounded beyond the screw-thread, as shown.

The hubs or heads *c* are preferably enlarged at their ends, and are cast with recesses in their outer sides to receive and fit closely around the ends of the straps *a*, in order to relieve the bolts *b* from lateral strain.

In order to give the wheel the required stiffness, arms *g* are secured from the inner rear corners of the sails to the respective arms *a*, a tie-rod, *h*, passed from the flange of each sail backward to its body, and two tie-rods, *i* and *k*, passed from the rear side of the flange of each sail to the ends of the next sail in the rear, as clearly represented in Figs. 1, 2, and 6. These rods may be changed in location, provided they serve to tie the sails rigidly to one another, as shown.

While it is preferred to have the two supporting-arms *a* of each sail made in one piece, curved around and secured to the edge or end of the sail, as shown, two separated arms may be used, if desired. The single piece is pref-

erable, in that it is more readily attached, and in that it stiffens the end of the sail and keeps the same in shape.

The turn-table or head C is made with the usual vertical tubular axis or neck k' to enter the step or bearing, and also with the neck or bearing at one side of the center to receive the shaft of the wheel. On one side the turn-table has an arm, l, to which is bolted an upright crank-arm, m, the upper end of which connects with the vane-sustaining rod o, somewhat as in the patent of Martin, hereinbefore mentioned.

The lower end of arm m is arranged to encounter a shoulder, p, on the vane-supporting collar, as shown in Figs. 4 and 5, in order to serve as a stop to limit the rotation of the collar and turn-table in one direction with reference to each other, and keep the vane in line behind the wheel.

The collar G, which encircles an upright neck, q, on the turn-table and bears upon the latter, has at the rear side a hollow neck, r, having a vertically-extended slot or opening therein, and in this neck there is secured by a horizontal pivot or hinge-pin, s, the stem or arm of the tail-vane, which is sustained by a rod extending from its rear end to the elevated crank-arm, as shown.

In the original patent the rod o was connected by an eye-bolt directly to the crank-arm m; but as it is desirable that the vane shall offer a rapidly-increasing resistance as the wheel swings out of the wind, I now secure rigidly to the end of arm m an eccentric pulley, m'—that is to say, a pulley the periphery of which is eccentric to the vertical axis of the turn-table or tail-vane—to which the rod is connected by a chain, as shown, so that as the wheel swings around the chain winds around the pulley outward from the center, and thus the increasing resistance from the vane is secured.

In order that the ecccentricity of the pulley, and thereby the resistance of the wheel, may be varied, according as it is desired to have the wheel run at high or low speeds, the pulley is secured to the arm by screws or bolts, and the arm provided with a series of holes, to admit of the eccentric being given a rotary adjustment thereon.

The strain of the rod and chain upon the eccentric and crank-arm tends to hold the vane behind the wheel, and thus keep the latter facing the wind, as in the Martin patent, above named; but my present construction is advantageous in being more simple, easier in action, and less expensive.

The weight of the turn-table may be received, as shown in the drawings, upon the top of the collar G, or upon the upper end of the sleeve.

By arranging the collar to turn upon the sleeve instead of upon the neck of the turn-table, as in my former patent, above mentioned, I lessen the wear and friction, and permit the wheel and vane to change their relative positions with greater ease.

As a means of throwing the wheel out of the wind by hand a cord, t, is attached to an arm, t', on one side of the turn-table, and passed thence through a pulley, u, on the vane, and a swiveled pulley, v, suspended from the upright crank-arm, and down through the turn-table.

As shown in Fig. 6, the rear end of the shaft is provided with a crank-wheel, a', connected by a pitman, b', to one end of an angular lever, c', which latter has its fulcrum located on an arm overhanging the side of the turn-table, and its lower end connected to the tubular rod d' by the joint shown in Fig. 4. This joint consists of a ring or collar secured to and turning loosely around the end of the rod d', and suspended by two pivot-screws, e', seated in the end of the lever c', which is made in a ring-form to encircle the collar.

Having thus described my invention, what I claim is—

1. The wind-wheel consisting of the sheet-metal sails of the form shown and described, each connected with and held at a distance from the central support by means of rigid arms at both the front and rear sides, as described.

2. In combination with the sheet-metal sails, such as shown, the iron bars a, hubs c, arms d, and hubs e.

3. In combination with sheet-metal sails, such as described, curved supporting-arms a attached to the edge of the sail and extended inward therefrom at front and rear to a central support, as shown, whereby the wheel is given an open center, the sails firmly sustained, and the application of an increased number of sails permitted.

4. The combination of a windmill-sail having metal sockets secured thereto both in front and rear, a shaft provided with corresponding sockets, and arms d, connecting the two pair of sockets, as shown.

5. In combination with the sheet-metal sails, of the peculiar form shown, the series of braces k, extending in a continuous line around the wheel, and connecting the flanges of the sails with each other, and the braces i, extending from the outer ends of the sails inward to meet the braces k, as shown.

6. In combination with the turn-table having the shoulder thereon, the rotary vane-supporting collar, and the upright arm m, secured to the collar, and serving the double purpose of a stop to limit the rotation of the collar and a support for the vane lifting or supporting rod.

7. The rotary collar having the socket thereon, in combination with the vane-arm seated therein and secured by a horizontal pivot-pin.

8. The combination of the rod d', the rotary collar thereon, the actuating-lever, and the two-pointed adjustable pivot-screws in-

serted in the lever and bearing in opposite sides of the collar, as shown.

9. In combination with the turn-table and the independently-swinging tail-vane, the eccentric pulley and the vane-sustaining rod connected therewith.

10. The combination of the mill-head, the tail-vane, the tail-vane support *o*, and the eccentric-pulley, having said support connected thereto, adapted and arranged to receive a rotary adjustment by means substantially as described.

SAMUEL WEBB MARTIN.

Witnesses:

W. C. DOWNEY,

A. E. FOLGER.