(No Model.) 2 Sheets—Sheet 1.

E. A. DANA.

WINDMILL.

No. 346,468. Patented Aug. 3, 1886.

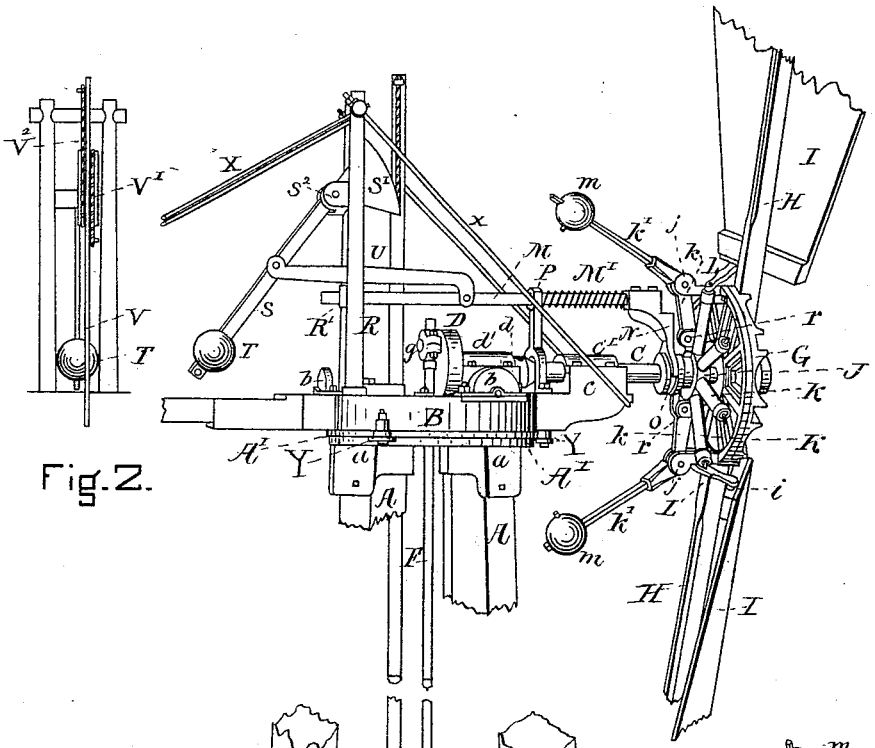

Fig. 2.

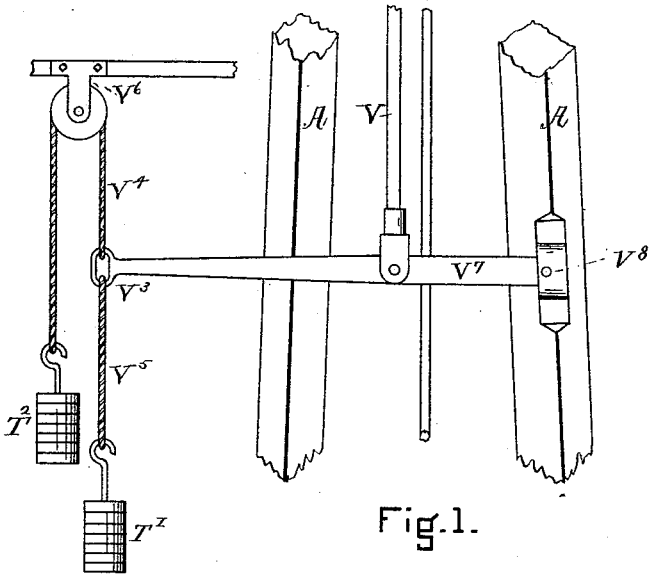

Fig. 1.

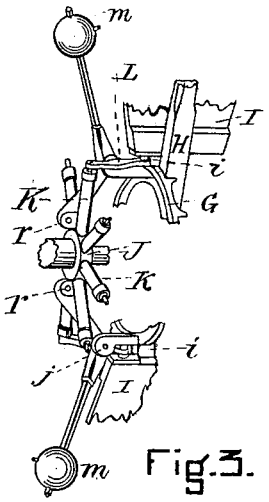

Fig. 3.

WITNESSES

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(No Model.)

2 Sheets—Sheet 2.

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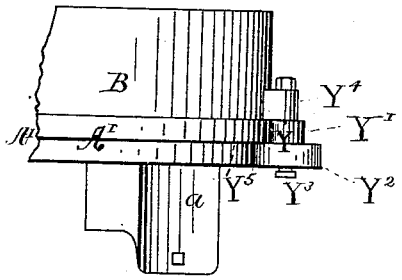

Fig. 4.

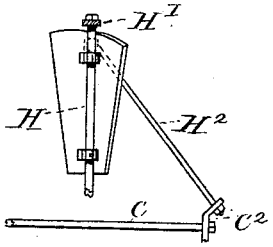

Fig. 5.

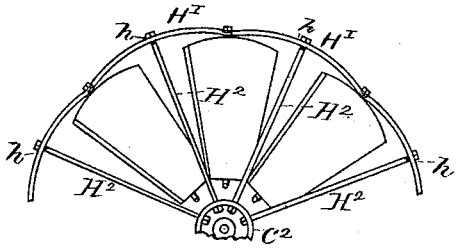

Fig. 6.

WITNESSES

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UNITED STATES PATENT OFFICE.

EDWARD A. DANA, OF FAIRHAVEN, MASSACHUSETTS.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 346,463, dated August 3, 1886.

Application filed April 8, 1881. Serial No. 30,281. (No model.)

To all whom it may concern:

Be it known that I, EDWARD A. DANA, a citizen of the United States, residing at Fairhaven, in the county of Bristol and State of Massachusetts, have invented a new and useful Improvement in Windmills, of which the following is a specification.

My invention relates to that class of windmills that are known as self-regulating.

The improvements consist in the construction and arrangement of the sails and their operating mechanism, substantially as hereinafter particularly set forth and claimed.

In the drawings, Figure 1 is a perspective view of my invention, showing all of the operating parts. Fig. 2 is an elevation of a part. Fig. 3 is a perspective view showing the devices for connecting the regulator-arms to the sails. Fig. 4 is a detail in elevation showing the method of attaching the turning table to the bed-plate. Figs. 5 and 6 are side view and elevation to illustrate the means for staying arms.

As my present invention relates to improvements on the windmill secured to me by Letters Patent of the United States Nos. 187,256 and 188,236, and dated, respectively, February 13, 1877, and March 13, 1877, it is not necessary to describe all of the parts in detail, and I will therefore confine myself to description necessary for an understanding of the improvements.

Let A A A, Fig. 1, represent the supporting-beams of the windmill, and A′ the bed-plate, which is attached to the beams by the housings *a a*. The bed-plate A′ is round and has a rabbeted edge, as shown in Figs. 1 and 4.

B is the turning table or moving bed-plate, upon which all of the operating parts of the windmill are supported. This turning table revolves on a hollow center, (not shown,) and is provided with friction-wheels *b b*, Fig. 1, to facilitate its turning.

The side wheels Y, Figs. 1 and 4, consisting of the two cylindrical parts Y′ Y^2, as shown in Fig. 4, are firmly held to the turning table B by bolts Y^3, upon which they revolve, which bolts pass through the bosses Y^4 on the sides of the turning table. The cylindrical part Y^2, entering below the rabbeted edge of the bed-plate A′, presents its upper surface toward the under side of the undercut on the bed-plate A′, and its outer edge toward the cylindrical surface below the undercut on the bed-plate A, and thus serves to take up and restrain both the lifting and the sidewise movements, and to facilitate the rotary motion of the turning table.

C, Fig. 1, is the main shaft of the windmill, and is secured to the turning table B by the housings *c c′* and *d d′*.

D is a crank-plate attached to the end of the shaft C, and provided with a crank-pin, *g*, which serves to operate the pitman F.

G is a circular frame attached rigidly to the main shaft C. This frame G serves to support the arms H of the windmill, and may be made in any suitable style and of any desirable metal. The arms H may be of wood or of iron. In case iron is used I prefer a tubular form. The sails I are hinged to the arms H in any desired manner, being so attached that they may be turned full up to the wind, or be so reefed as to present an edge only to the wind.

J, Figs. 1 and 3, is a sliding collar or hub, which may move back and forth on the shaft C. This collar J is provided with an annular groove, *o*, into which the forked end of the shoulder-piece N rests. This shoulder-piece N has attached to it a rod, M, Fig. 1, and is subject to the outward strain of the spring M′, which rests against the standard P as a buttress. The collar J has a number of ears, *r*, in pairs, each pair having a pin upon which the forked end of the bent lever *k* works. This bent lever *k* terminates in an arm, *k′*, and ball *m*. The lever-arms *k k′* are attached by a pivot, *j*, to the frame G, so that any motion of these lever-arms *k k′* will cause the collar J to move back or forward on the shaft C, and of necessity give a corresponding motion to the rod M.

K K are spokes extending from the collar J, which serve to connect the collar J, by means of the links L, to the sails I, each sail having a small pin, *i*, extending from its lower edge, for the purpose of connection with the links L. The number of the spokes K and links L agree with the number of sails, although in the drawings I have shown but two.

The balls *m* of the lever-arms *k k′* act as centrifugal regulators. It being seen by inspec-

tion, as the wind-wheel revolves, the balls will have a tendency to fly outward. The more rapid the motion the greater the tendency, and as these balls move outwardly they, acting through the lever-arms *k k'*, will cause the collar J and spokes K K to move away from the frame G. This action will be communicated by the links L to the sails I, and cause them to turn from the wind.

The sliding rod M is supported by the upright P and a housing, R', attached to the uprights R. U is a link which serves to connect the rod M with the swinging arm S. This arm S is a part of the segment-piece S', and swings in common with it on the journal S^2. (See Figs. 1 and 2.)

T is a weight attached to the arm S. The action of the arm S is to throw the shoulder N and the collar J toward the frame G—that is, acting through the spokes K and links L to bring the sails I up to the wind. In this respect it coacts with the spring M'. The centrifugal weights *m* and the counter-weight T are adjustable on their respective arms by means of set-screws for regulating the action of the governor.

V, Figs. 1 and 2, is a vertical rod, which is connected by two cords or chains or links, V' V^2, to the segment S', one of the chains, V', leading downward, while the other leads upward, so that a vertical movement of the rod V will cause an angular movement of the segment S', and of the arm S, which in turn, acting through the link U, will slide the rod M, and acting through the other parts, as above described, will operate finally on the sails.

From the above it will be readily understood that any motion of the sail will be communicated back to the rod V, and vice versa.

The rod V has suitable connections to allow of the motion of the turn-table, and passes down to a convenient point, and may there terminate in a handle or lever, V^7. The lever V^7 is pivoted at a fixed pivot, V^8, and has at its end V^3 two weighted cords, V^4 V^5, the cord V^4 passing over a pulley, V^6, affixed to any convenient cross-beam, and terminating in the weight T^2, the cord V^5 passing directly to the weight T'.

As the lever V^7 is connected to the rod V, it is evident that the whole sail-governing mechanism as above described—namely, the segment S', lever-arm S, link U, rod M, shoulder N, collar J, spokes K, and links L—must move in unison with it, and that by varying the amount of the weights T' T^2 any desired force may be exerted to counteract the force of the wind on the sails. In other words, I can regulate or set my governing device so that it shall be very sensitive to the velocity of the wind and to the resultant of the wind and work to be done.

I have shown in Figs. 5 and 6 a new device for staying the sails. This consists in extending the main shaft C for some distance in front of the plane of the sails, as shown in Figs. 5 and 6, and in uniting the arms H H at the outer extremities by spanners H' H'. (See Fig. 6.) Each of these spanners H' is secured at its center *h* by a stay-rod, H^2, which runs to the disk C^2 on the end of the shaft C. By arching each spanner H', as shown in Fig. 6, I am enabled to so place the stay-rods H^2 that they will not interfere in the least with the motion of the sails, and also increase the sustaining-power.

Having thus described my invention, what I desire to secure by Letters Patent is—

1. In a windmill-governing device, the rod M, supported to slide longitudinally in bearings on the turn-table, the lever-arm S, pivoted to an upright on said table and having the segmental end S', and connected with the rod M by link U, and the rod V, connected by flexible members V' V^2 with the segmental end of the aforesaid lever-arm, combined with the sails and intermediate connecting mechanism for adjusting the position of the sails, substantially as and for the purpose set forth.

2. The combination, with the sails and means, substantially as set forth, for automatically keeping them in the wind to the best advantage, of auxiliary means for controlling by hand the position of such sails or the operation of their adjusting means above named, the same comprising the rod V, lever V^3, changeable weights T' T^2, connections V^4 V^5 between said lever, and weights and pulley V^6, substantially as described.

EDWARD A. DANA.

Witnesses:
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HELEN M. FEEGAN.