2 Sheets—Sheet 1.

E. A. DANA.

WIND-MILL.

No. 188,236. Patented March 13, 1877.

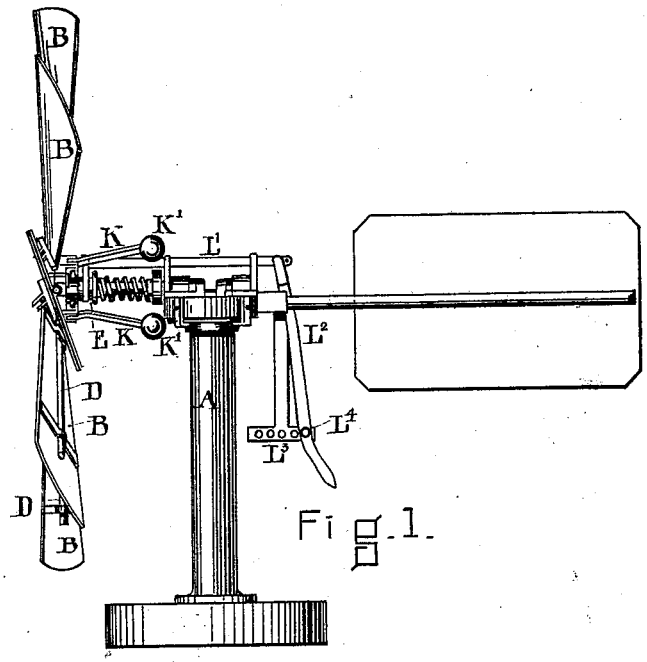

Fig. 1.

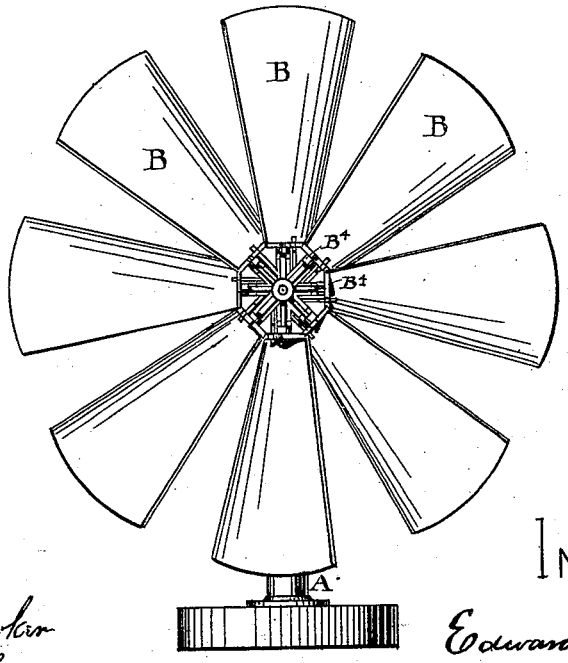

Fig. 2.

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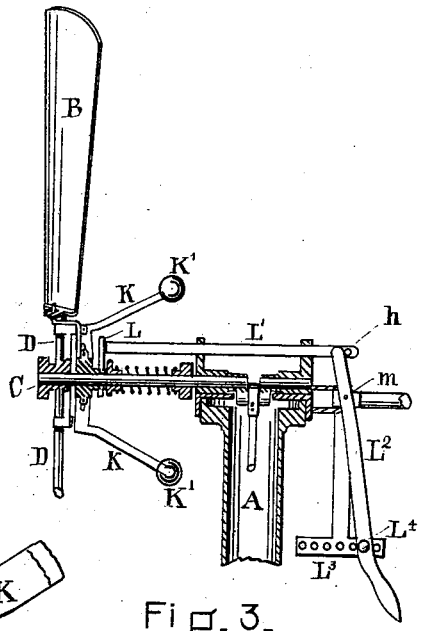

Fig. 3.

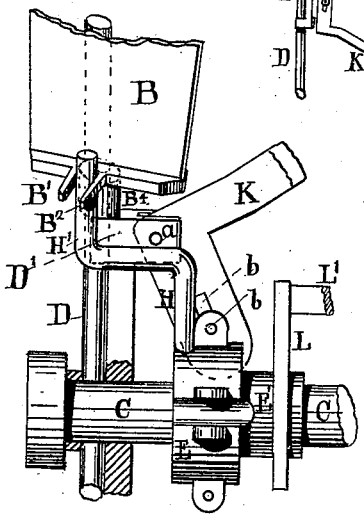

Fig. 4.

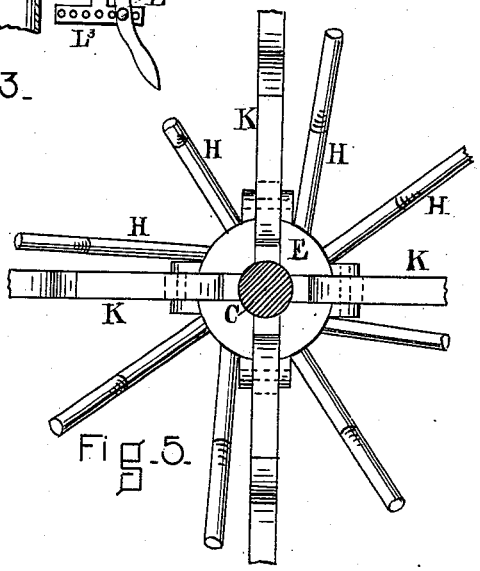

Fig. 5.

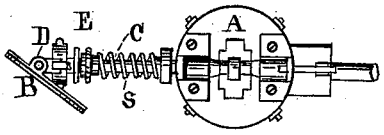

Fig. 6.

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UNITED STATES PATENT OFFICE.

EDWARD A. DANA, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN WINDMILLS.

Specification forming part of Letters Patent No. **188,236**, dated March 13, 1877; application filed February 20, 1877.

To all whom it may concern:

Be it known that I, EDWARD A. DANA, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Windmills, of which the following is a specification:

The nature of my invention consists in combining with a wind-wheel, first, a new device for automatically "weathering" the sails by means of a sliding spider on the main shaft, operated by governor-balls and counterbalanced by a spring; second, in limiting the action of this automatical regulator by means of a slide-bar and hand-lever, which limit the minimum angle of the sails to the plane of motion, the exact construction of which may be best understood by reference to the specification and drawings.

Figure 1 is a side elevation of my invention. Fig. 2 is a front elevation of the same. Fig. 3 is a vertical section, showing a part of the regulating device and one sail. Fig. 4 is an enlarged view of the regulating device. Fig. 5 is an end elevation of the spider of the regulating device. Fig. 6 is a plan of a part, showing a section of one of the sails, &c.

A is the support of the windmill, and may be made in any desired style. C is the shaft, which is hung in proper housings, and may be provided with a crank or wheel for transmitting its motion. I affix to the front end of this shaft the radial arms D, Figs. 1, 3, 4, and 6. Upon these arms the sails B are hung in such a manner as to be perfectly free to swing, so that they may be set at any desired angle to the plane of motion.

The sails may be adjusted longitudinally on the arms D by means of the collars B^4, Fig. 4, placed on the arms D, between the shoulder, near the hub and the inner end of the sail. By taking off this collar B^4, and placing it at the other end of the arm, thus causing the sail to be nearer the center, the whole wheel becomes smaller in diameter.

To adjust the sail to the wind, or, as it is called, "weathering it," I have the following device: Each sail has at its inner end a forked projection, B^1 B^2, which receives the end H of a bent arm, H H′, Fig. 4. These bent arms H H′ are affixed radially to the sliding collar E E′, and with it constitute what I call a spider. As this spider moves longitudinally on the shaft C, the arms H H′ will, acting through the forks B^1 B^2, cause the sail B to turn to or from the plane of motion.

This spider is operated upon by the automatic action of the governor-balls K′ K′ K′ K′, and the bent levers K. (See Figs. 1, 3, 4, and 5.) Each of the levers K is pivoted at *a*, Fig. 4, to an extension, D′, of the fixed radial arm D, so that the balls K′ may be free to fly outward as the velocity of the wheel increases, and to cause the spider E E′, to which the arms, by means of a slot, *b*, and pin *b′*, Fig. 4, are connected, to move longitudinally on the shaft C, and thus, acting through the arms H H′, change the angles of the sails B.

S, Figs. 3 and 6, is a spring which presses against the spider E E′, and acts as a counter-balance for the action of governor-balls K′ K′ K′ K′.

L, Figs. 1, 3, and 4, is a sliding rod attached by the forked part L, Fig. 4, to the collar E′ of the spider, so that any movement of the rod will cause a corresponding movement of the spider, and a consequent movement of the sails.

The rod L^1 is operated by a lever, L^2, pivoted at *m*, Fig. 3, and held in any desired position by the holding-pin L^4 and the pin-rack L^3.

The pin *h* in the rod L^1 is placed, as shown, behind the lever L^2, so that the movement of the lever serves to draw the rod and spider back, but does not prevent either from being forced back by the action of the governor-balls, the lever L^2 only serving to limit the forward motion of the rod and spider, and the minimum angle of the sail to the plane of motion.

Having now described the construction and operation of my invention, what I desire to secure by Letters Patent is as follows:

1. The combination of the sliding spider E E′, H H′, &c., with the sails B B and the governor-levers K K′, operating substantially as described, and for the purpose set forth.

2. The combination of the spider E E′, H H′, &c., with the rod L L^1 and lever L^2, operating substantially as described, and for the purpose set forth.

EDWARD A. DANA.

Witnesses:
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NATHL. EVANS.