(Model.)

H. B. SPRAGUE.

Windmill.

No. 243,169. **Patented June 21, 1881.**

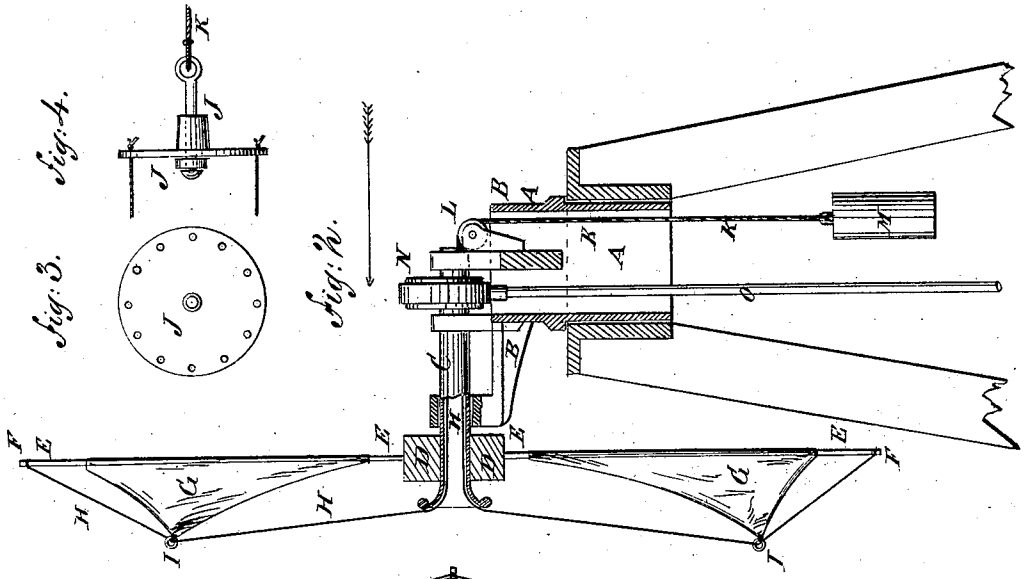


Fig. 4.

Fig. 3.

Fig. 2.

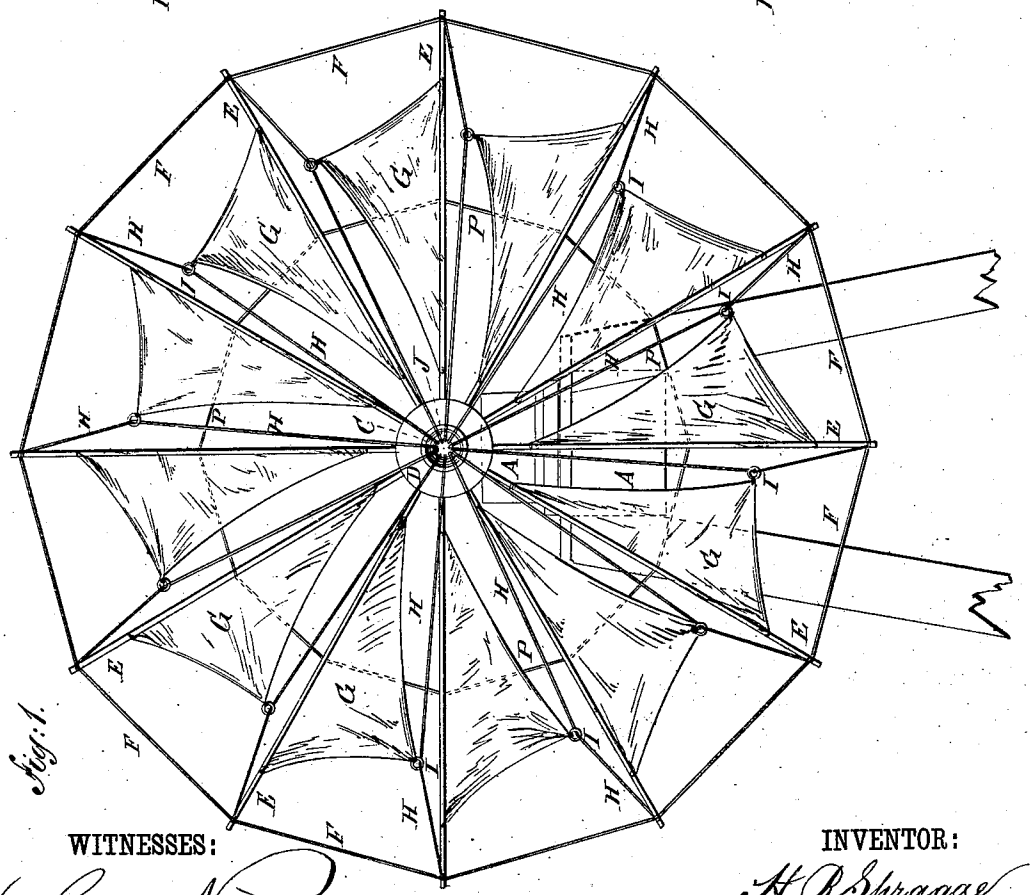


Fig. 1.

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UNITED STATES PATENT OFFICE.

HOMER B. SPRAGUE, OF GRANTVILLE, MASSACHUSETTS.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 243,169, dated June 21, 1881.

Application filed March 16, 1881. (Model.)

To all whom it may concern:

Be it known that I, HOMER B. SPRAGUE, of Grantville, in the town of Needham, county of Norfolk, and State of Massachusetts, have invented a new and useful Improvement in Windmills, of which the following is a specification.

Figure 1 is a rear elevation of the improvement. Fig. 2 is a sectional side elevation. Fig. 3 is a rear view of the swivel, enlarged. Fig. 4 is a side view of the swivel, enlarged.

The object of this invention is to furnish self-regulating windmills so constructed that the sails or vanes will adjust themselves to the varying force of the wind, so that the driving-wheel will rotate at a nearly uniform velocity and with more or less power up to the limit permitted by the wind and according to the gravity of the weight or force of the pulling power applied to the cord that draws the sails or vanes into position to catch the wind, as hereinafter stated, which windmills shall at the same time be simple in construction, inexpensive in manufacture, strong and durable, and capable of being easily set up and of being packed in small compass for storage and transportation.

Similar letters of reference indicate corresponding parts.

A represents the support for the windmill. This may ordinarily be a hollow iron pipe or tube standing upright, and which may turn on its lower end or upon a flange or collar when the wind changes its direction. To the top of the support A are attached one or two projecting arms, upon which arm or arms B are attached the bearing or bearings on which rests the horizontal shaft C. If there is but one arm the other bearing may rest on the top of the vertical tube or pipe A, which constitutes the support above named. The said arm or arms B either rotate freely horizontally upon this upright support, according to the veering of the wind, or are firmly fastened to the upright support, in which latter case they turn with it when there is a change in the direction of the wind.

To the shaft C, at or near its rear end, is attached a hub or collar, D, to which are firmly fastened the inner ends of radial arms or spokes E.

To the outer ends or any other parts of the spokes E may be attached a cord, rim, or chain, F, to hold said spokes firmly in proper relative positions.

G are the sails or vanes, which are made in triangular, oblong, or other convenient form, and are attached at their sides or at top and bottom directly or by cords or otherwise to the spokes E or to the outer rim, cord, or chain, F, the other side or edge being unattached, as shown in Figs. 1 and 2. These sails or vanes G can be made of canvas or other suitable flexible material, which construction I prefer, or they may be made of wood or iron or other suitable rigid material. In the latter case the sails or vanes G should be hinged to the spokes E or a rim by metal straps or other suitable hinges.

To the outer end of each spoke E is attached a pulley or one end of a short cord or chain, to the other end of which cord or chain is attached a pulley, over which pulley passes a longer cord, H, which is attached to the free corner or side of the sail G, which sail is attached by hinges or otherwise, as before described, to the next adjacent radial spoke or to the rim, cord, or chain that connects firmly said spokes. After passing over the pulley before mentioned the said longer cord H, one end of which is attached to the free side or corner of said sail, extends down and passes either directly or over a pulley, to reduce friction, into the rear end of the shaft C. Or, instead of this arrangement, several of said longer cords may, at some few inches outside the said shaft, be united in one or tied to one cord or chain which enters the rear end of the shaft C.

Inside the shaft C, which is made hollow to receive the cords so attached to the sails, is a swivel, J, to the rear end of which swivel J the ends of the cords are fastened, so that when the swivel J is drawn toward the other end of the horizontal shaft C the cords are drawn with it, and thereby the sails or vanes are drawn into a position suitable to catch the wind.

The pulleys at the rear end of the shaft C may be dispensed with, in which case the end of the shaft C should be made flaring or trumpet-shaped, to form a smooth surface for the cords H to work upon. The short cords and pulleys near the outer ends of the radial spokes or near the

rim or chain connecting said spokes may also be dispensed with, in which case the longer cords H may be attached to or near the ends of the radial spokes, each to each, or to the proper portion of said rim or chain, and then each of said cords H may pass through an eyelet or ring, I, or over a pulley in the free corner or side of the adjacent sail, and thence down toward the rear end of the horizontal shaft C, as before stated and as shown in the drawings. With this construction the cords H and the rear part of the swivel J are carried around by and with the wheel D E F and the shaft C in their revolutions.

To the forward or stationary part of the swivel J is attached the end of a cord or chain, K, which may pass over a guide-pulley, L, attached to the turn-table, or to the upright support A, or to one of the projecting arms B, and when the windmill is to be put in motion the cord has a weight, M, suspended from its lower end; or the lower end may be drawn down and made fast to the upright support A or to a spiral spring, so as to give the proper tension. When the mill is to be at rest the cord may be released by removing the weight or otherwise, so that the sails will be relaxed and not catch the wind. When a slight force is required of the driving-wheel a light weight is suspended at the lower end of said cord, and a heavier weight for a greater force. The cord K may pass down through the cavity of the turn-table and the support A, or it may pass along on the outside of the upright pipe or tube A, so that the rotation horizontally of the turn-table or the revolution of the upright tube or pipe A round its own axis, according to the changes in the direction of the wind, will not unfavorably affect the cord K and the weight M, but will carry both around in the same relative position. The weight M should be of such gravity and should operate with so little friction as to hold the cords H more or less taut and the sails G at a suitable angle with the plane of the spokes E when there is a wind and it is desired to have the mill working. As the force of the wind increases the pressure of the wind carries the free angle or side of the sails leeward, raising the weight M, so that the sails present less surface to the wind, until in a gale the sails take a position nearly or quite at right angles with the plane of the spokes, which arrangement, acting automatically, keeps up the revolution of the wheel with a force and velocity uniformly proportioned to the amount of the weight attached. Then, as the velocity of the wind decreases, the weight M draws the sails G forward to catch the wind, and the wheel continues to revolve as before as long as a fair amount of wind is blowing upon the sails. The position of the sails being thus adjusted to the wind by the weight M, the wind-wheel will revolve at a uniform rate and power however much the wind may vary, and by using a heavier or lighter weight, M, the sails may be adjusted at will to resist a greater or less force of wind and develop a greater or less power in the mill.

If desired, the shaft C may be made double, consisting of two or more solid parallel shafts with a sliding swivel partly between the parallel parts and partly outside, the cord from the forward end of the swivel passing, as before, through a hollow space in the line of the axis of rotation. In this case the cords attached to the other or rear end of the swivel need not pass through the shaft or any part of it, but extend directly from the swivel to the pulleys near the outer ends of the radial spokes, and thence to the free corners or sides of the sails; or, after leaving the swivel, they may pass directly through the eyelets or rings at the free corners or sides of the sails, and thence to or near the outer ends of the radial spokes, and be made fast there; or, dispensing altogether with said pulleys, eyelets, and rings, the said sail-cords may pass directly from the rear end of the sliding swivel to the free angles or sides of the sails and be fastened thereto.

Instead of either of the foregoing arrangements, a single solid horizontal shaft may be employed, with a slide moving freely upon it, to which slide the longer sail-cords may be attached directly, the other ends of said cords passing to the pulleys near the ends of the radial spokes, or through the eyelets or rings, or to the free sides or angles of the sails, to be attached there, as aforesaid. In this case the swivel may be dispensed with and a lever working against the forward part of the slide in a groove and moving the slide back and forth may be attached, a cord being made fast to the free end of the lever and a weight suspended by said cord, as may be desired, to operate the lever and the slide and the sails. In this case, too, stiff rods, instead of sail-cords, may pass directly from the slide to the corners or edges of the sails, to adjust the latter to the wind.

The shaft C is designed to be provided with an eccentric, N, or with a circular wheel with driving-belt or gearing-cogs. With the eccentric N may be connected the upper end of a pitman, O, or similar device passing down through the cavity of the turn-table, if a turn-table is used, and through the support A or passing down alongside the support A and connecting with the pump or other machinery to be driven.

To the middle or any other part of the spokes E may be attached a cord, P, or a chain or other device, which may pass around upon the windward side of the sails G, to prevent the sails from flapping forward or becoming entangled when the wind suddenly shifts.

With this construction the wind-wheel acts as its own vane to keep itself turned to receive properly the wind, either the upright support A with all that it sustains turning with the veering of the wind or the turn-table or the supporting arm or arms turning upon

the top of the upright support A, so that no separate steering-vane is required. Such vane, however, may be attached, if desired, to the turn-table or to the upright support A, as the case may be, on the leeward side of the whole apparatus.

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

In a windmill, the combination, with spokes E and triangular sails G, of the cords H, shaft C, carrying swivel J, and the rings I, as described.

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Witnesses:
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