E. A. Tuttle,

Wind Wheel

No. 16,616. Patented Feb. 10, 1857.

Fig. 1.

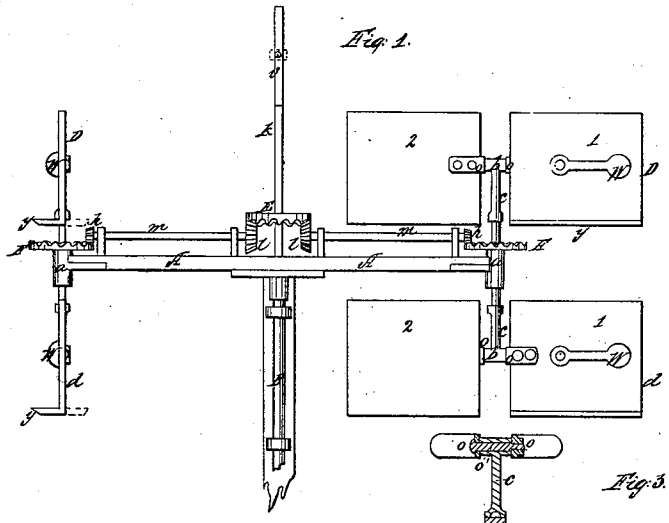


Fig. 3.

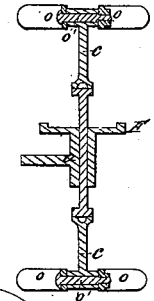
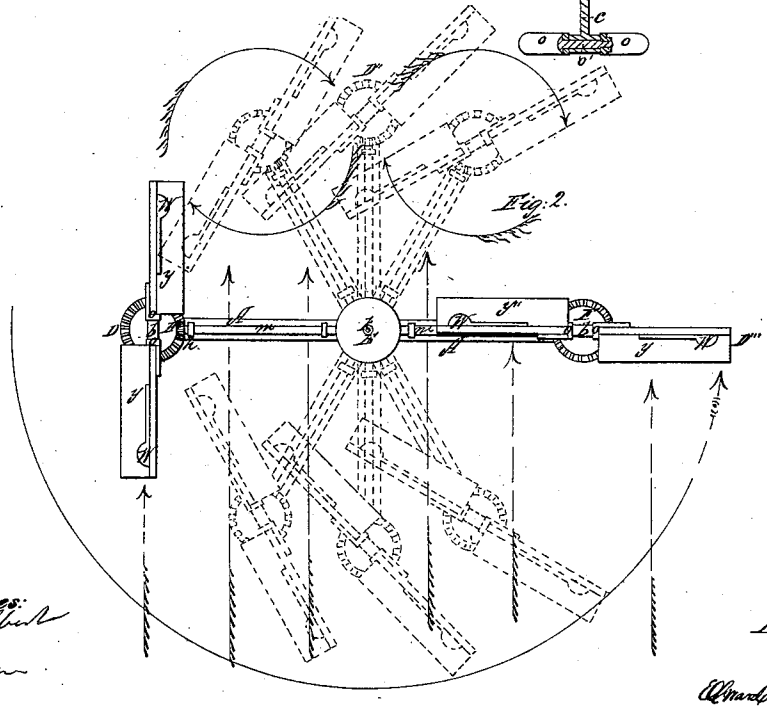


Fig. 2.



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UNITED STATES PATENT OFFICE.

EDWARD A. TUTTLE, OF BROOKLYN, NEW YORK.

IMPROVED SELF-ADJUSTING WIND-WHEEL.

Specification forming part of Letters Patent No. **16,616**, dated February 10, 1857.

To all whom it may concern:

Be it known that I, EDWARD A. TUTTLE, of Brooklyn, Kings county, New York, have invented a new and useful Improvement in Wind and Tide Wheels; and I do hereby declare the following to be a full and exact description of the same, reference being had to the annexed drawings, making a part of this specification, in which—

Figure 1 is a side elevation. Fig. 2 is a top view with the vane removed. Fig. 3 is a section through the center of one of the sails.

The same letters indicate like parts in all the figures.

The nature of my invention consists in first placing a number of horizontally-revolving sails at certain angles before the wind, as hereinafter shown, upon a horizontally-revolving wheel or shaft, and then causing the revolutions of such wheel to impart to the sails a second horizontal continuous motion in an opposite direction at the rate of one rotation of the sails upon their axes to two revolutions of the windmill, by which positive rotations the sails are retained in the best possible position before the wind to impart force to the wheel from every available part of the circle.

It also consists in attaching a vane to the apparatus, by which the sails are rotated in such manner that the shifting of the wind shall cause the sails to accelerate or retard their rotary motion, so as to maintain the same angle to the wind, however the latter may change.

It also consists in suspending the sails upon a vibratory shaft, allowing them to incline from the perpendicular in either direction at the same time they are rotating upon their axes and around with the wind-wheel, being weighted and balanced by adjustable bars in a peculiar manner, so as to turn edgewise by a greater or less force of wind, as desired.

It also consists in attaching to the bottom edge of the sails offsets or projecting rims in such manner that they serve the double purpose of weighting the sails and also of assisting them to perform the rotations around their axes by offering to the wind a greater resisting-surface upon the receding side of the sail when they are anywise inclined from the perpendicular by the force of the wind.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

My invention will operate either as a wind or tide wheel, and is not limited to any number of sails that may not interfere with each other; but the wheel will readily turn with but two placed upon opposite sides of the center or axis.

In order to embody my invention in the simplest form, I have therefore represented but two sails. These are placed in the position above stated upon the two arms A A, which latter are supported upon a vertical main shaft B, allowing the arms to revolve freely in a horizontal direction. Affixed to the ends of each arm are the journals or sockets *a a*, through which turn the smaller vertical shafts *c c*, to which latter are attached the sails D D. Each sail is divided into two parts D *d*, one part turning above the arms A and the other underneath, thus balancing the pressure upon the journals *a a*. Each of these parts is again subdivided into two pieces 1 2 and 1′ 2′, and is suspended upon a horizontal shaft *o o′*, upon which they can vibrate in either direction from the perpendicular. While I do not wish to confine myself to thus constructing each sail of four separate pieces, there is an advantage in so doing in thereby equalizing the pressure upon the journals in which they turn, and also in allowing the sails to be made from smaller and lighter pieces of wood or other material than if made in one piece.

Immediately over the center or main shaft B is a smaller vertical shaft K, resting upon but detached from or turning independently of it. Upon this shaft K is fastened a central or crown cog-wheel E, and also upon each of the sail-shafts a similar-sized cog-wheel F F. These latter wheels are connected at half-speed with the crown-wheel E by means of the pinion-wheels *h h* and *l l* upon the shafts *m m*. The pinions *l l* have just twice the number of cogs that have the pinions *h h*. The crown-wheel E gears into the top side of the pinions *l l* and the wheels F F into the under side of the pinions *h h*. Hence it will be seen that by causing the crown-wheel to remain stationary and turning the wind-wheel or arms A A the revolutions of the latter will cause the sails to perform rotations upon

their axes *c c* at the same time they are revolving around the axis B of the windmill, and both the sails and the windmill turn upon their respective axes in parallel planes, but in reverse directions from each other. The motion which is imparted to the sails being continuous and positive in every part of the circle in which they move, it is essential that the sails should first be set or placed in their proper position before the wind.

Fig. 2 represents the sails D D so placed and also in dotted lines the angle they sustain to the wind in different parts of the circle, which is also the angle of as many different sails in the several positions shown. The wind being in the direction of the straight arrows in blue ink and a sail being placed face to the wind at the point D‴, Fig. 2, it will turn upon its axis in the direction of the small arrows in black ink, while at the same time the windmill turns in the direction of the large arrows in black ink. When the wind-wheel has turned one-quarter of a circle, the sail will have turned upon its axis one-eighth of a circle and will stand at an angle to the wind of forty-five degrees, which is the position shown by the red dotted lines at D″. When the windmill has turned through one-half a circle, the sail will have turned one-quarter of a circle upon its axis and will stand edge to the wind, as shown at D′. When the windmill has passed through three-quarters of a circle, the sail will have turned upon its axis three-eighths of a circle, and will again stand at an angle to the direction of the wind of forty-five degrees, as shown by the red dotted lines at D⁗, but at right angles to its former position at D″. When the windmill shall have completed one revolution, the sail will have performed one-half a rotation upon its axis and will again stand face to the wind at D‴, but presenting to the wind the reverse side. When the windmill shall have completed two revolutions, the sail will have completed one rotation upon its axis and will stand the second time at the point D‴, but with the same side to the wind as before starting. Both or all the sails placed face to the wind at the point D‴ will present the same angle to the wind as they arrive at the different parts of the circle, as indicated in Fig. 2, and will so continue to revolve upon their axis during every succeeding revolution of the wind-wheel, thus presenting to the wind the best possible angle at every part of the circle to impart force to the wind-wheel. By thus setting the sails and causing them to rotate, as described, is secured the result above stated not only, but also the changes constantly occurring in the direction of the wind are provided for in a very simple manner. Upon the shaft K of the crown-wheel E is fastened a vane V, the front edge of which is shown in Fig. 1. It is secured to said shaft so that in turning in either direction it carries the crown-wheel with it, and is so placed that its indication of the direction of the wind and the relative position of the sails to the wind, as indicated by Fig. 2, shall correspond with each other.

The vane of course points in a reverse direction from that of the straight arrows, the latter showing the direction in which the wind is moving and the former the direction from whence the wind is coming. The force of the wind upon the vane holds the crown-wheel stationary so long as the direction of the wind remains unchanged, the sails continuing to drive the wind-wheel, as described; but if the wind shifts in either direction the vane will turn the crown-wheel in a corresponding manner, which will be found to accelerate or retard the motion of the sails upon their axes sufficiently to bring them to precisely the same angle to the wind as before.

The wind will reverse the revolutions of the wind-wheel if the position of the vane be reversed upon its shaft K, while the other parts are retained in the same position.

In order to regulate the varying force of the wind upon the windmill to any given amount of power desired within the capacity or power of the wind-wheel, and also to equalize it approximately to such rate of power, the parts of the sails 1 2 and 1′ 2′ are suspended so as to vibrate upon the horizontal shafts *o′ o′* (better understood from Fig. 3) near their centers, but with an area of surface slightly larger below the line of said shaft *o′* than above it. They are also slightly weighted at their bottom edges, and adjustable bars *w w*—one for each part—attached to their flat sides, which, by sliding toward the upper edge, serve approximately to balance them so that a small force of wind will turn them edgewise, or by moving the bars toward the lower edge increase the weight below the shaft *o′*, and consequently also increase the resisting power of the sail to the wind before turning edgewise; also, the adjustable bars remaining set at any point, the sails will turn more or less from the perpendicular, or toward the edgewise, as the force of the wind is greater or less at different times, thus equalizing the velocity of the wind-wheel to a great degree, notwithstanding the varying force of the wind.

Upon the bottom edges of each part 1 2 and 1′ 2′ of the sails are affixed offsets or projecting rims *y y″*, the offset *y″* upon the inner side of the vertical shaft *c* (when the sail is face to the wind) projecting toward the windward, and the offset *y* upon the outside of the shaft *c* projecting upon the opposite side or from the windward. It must be particularly observed, however, that to understand correctly the operation of these offsets by the drawings as made the wind must be supposed to be blowing from precisely the opposite direction to that shown by the arrows in blue ink, which consequently reverses the direction of all the arrows and causes the

wind-wheel to turn in the reverse direction from that indicated. These offsets effect the double purpose of weighting the sails and also of assisting them to turn upon their vertical shaft or axis *c*. Thus, although they allow their respective sides of the sails to present the same area of resisting-surface to the wind when hanging perfectly perpendicularly, yet when the force of the wind causes them to vibrate from the perpendicular, with the bottom part receding from and the top inclining toward the windward, the offset *y''* projects downward, and thereby causes the sail to present to the wind a larger resisting-surface upon that side of the vertical shaft, thus assisting to carry the sail forward in its rotations upon said shaft and relieve almost or quite the side pressure upon the vane. There are other methods by which the sails may be connected with the crown cog-wheel E to produce the motion described—viz., by means of a second wheel geared into the crown-wheel at half-speed and then connecting the sails (say four in number) with said second wheel by rods and cranks attached to the shafts of the sails, or belts or chains may be used to connect the sails to the crown-wheel; but they are defective in many respects.

Having thus described my invention, I do not claim a horizontally-revolving wind-wheel as such, or suspending them upon a second horizontal shaft simply.

What I claim as new, and desire to secure by Letters Patent, is—

1. Placing the sails D D or a greater number in a position before the wind, as shown, and then causing them to perform complete rotations upon their axes *c c* in the time relatively with those of the wind-wheel and in the direction as specified by connecting them with the crown-wheel E in any manner producing the same result, for the purpose set forth.

2. The particular mechanism shown and described—viz., the crown-wheel E and vane V, connected with the sails D D by means of the pinion-wheels *h h* and *l l* and wheels F F, arranged in the manner substantially as shown, for the purpose set forth.

3. Combining with the horizontal rotary motion of the sails upon their axes *c c* the perpendicular adjustable vibratory motion described, by which they are rendered self-regulating in most simple manner, although presenting reverse sides to the wind at each succeeding revolution of the wind-wheel.

4. The method of assisting the sails to perform their rotations upon their axes *c c* by means of the reverse projecting rims *y y''* upon the bottom edges, and operating in the manner described.

EDWARD A. TUTTLE.

Witnesses:

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