No. 641,143. Patented Jan. 9, 1900.

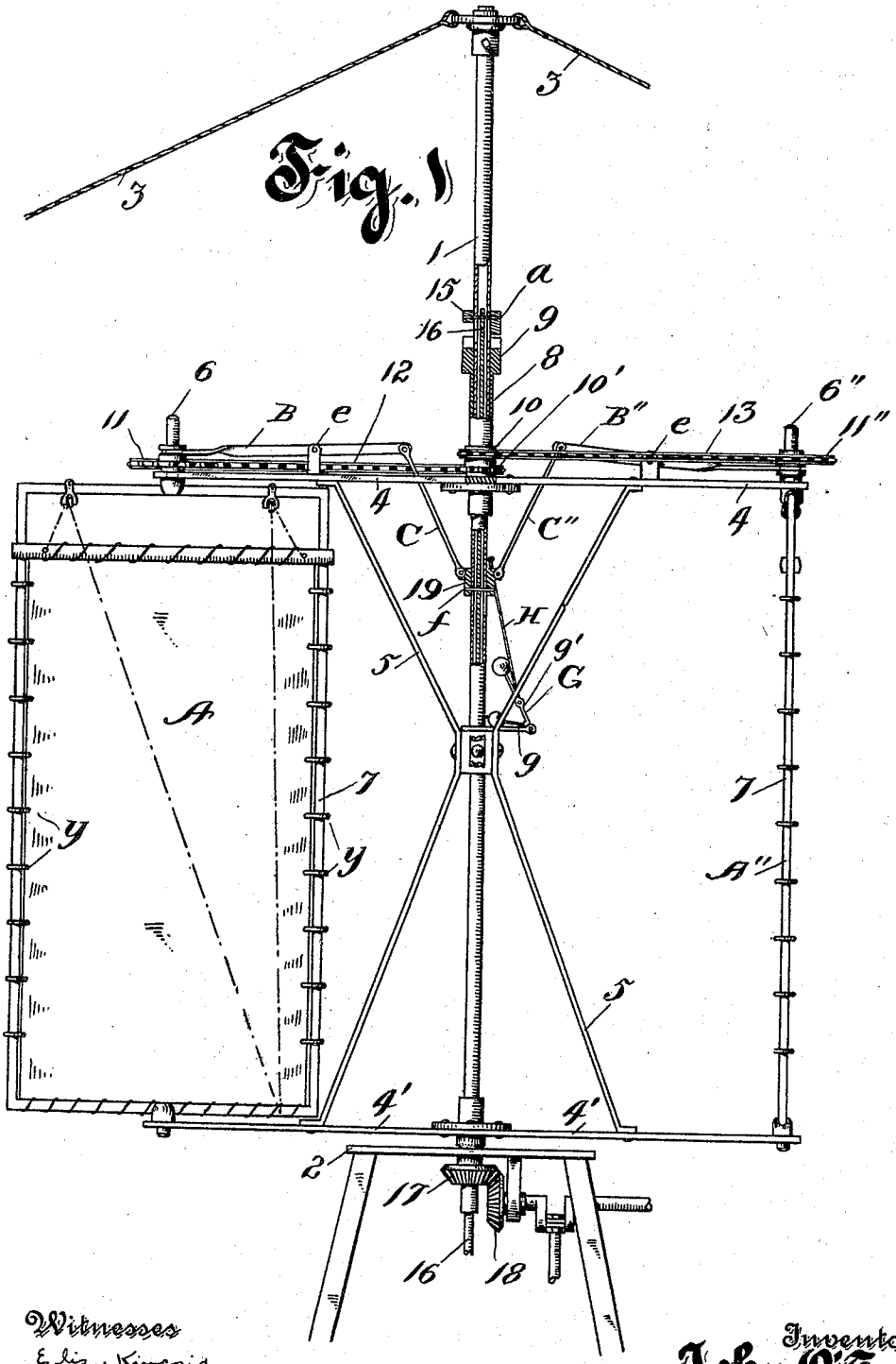
J. O'TOOLE.

WINDMILL.

(Application filed Apr. 10, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



Witnesses
Eliz. Kincaid
L. A. Goldbeck.

Inventor
John O'Toole.
By his Attorneys
Kincaid & Co.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 641,143. Patented Jan. 9, 1900.

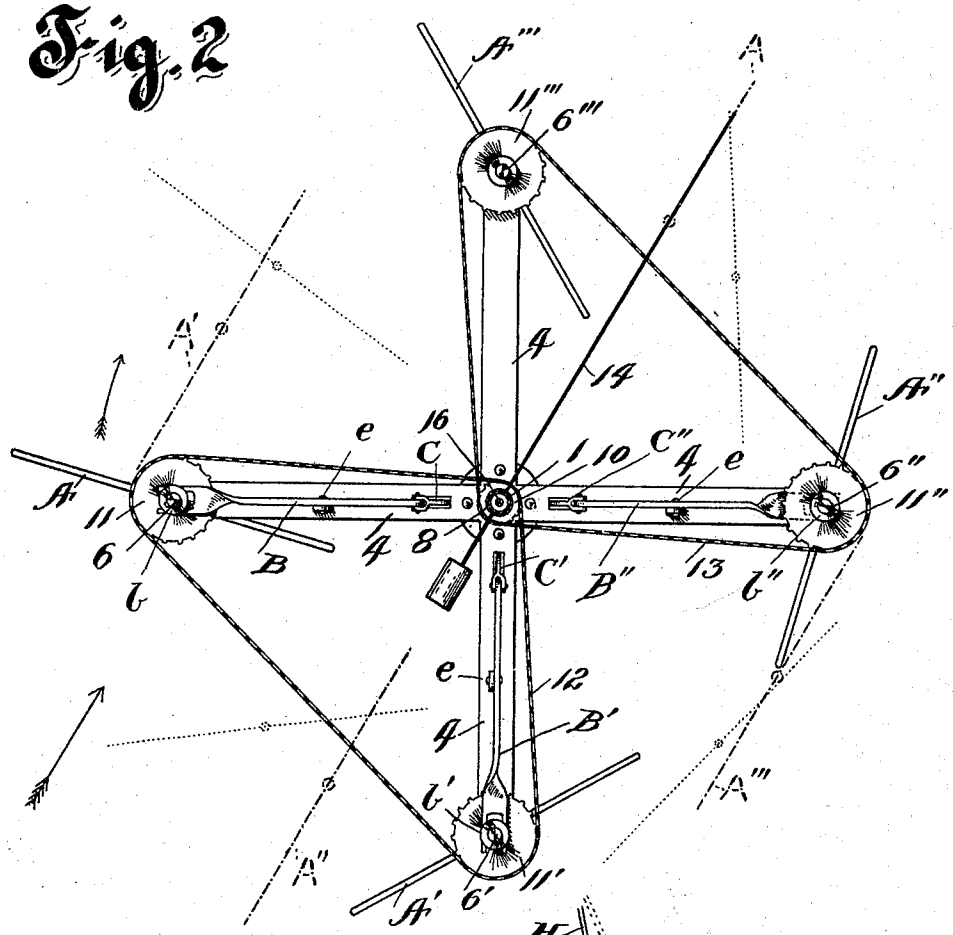
J. O'TOOLE.

WINDMILL.

(Application filed Apr. 10, 1899.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 2



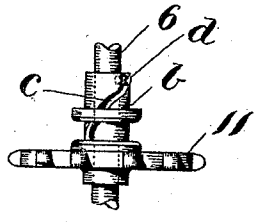


Fig. 3

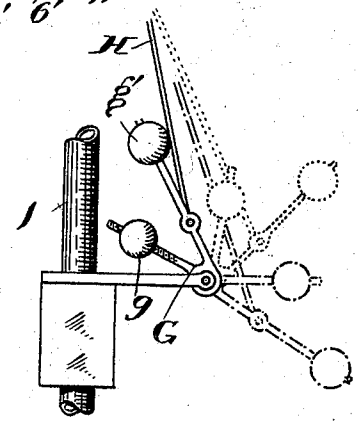


Fig. 4

Witnesses
Eliz. Kincaid.
L. A. Goldbeck.

Inventor
John O'Toole.
By his Attorneys
Kincaid & Co.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN O'TOOLE, OF SAN FRANCISCO, CALIFORNIA.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 641,143, dated January 9, 1900.

Application filed April 10, 1899. Serial No. 712,521. (No model.)

To all whom it may concern:

Be it known that I, JOHN O'TOOLE, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Windmills; and I do hereby declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates in a general way to that class of devices known in the art as "wind-wheels," but, to be more specific, to the subclass designated "horizontal feathering-blade wind-wheels;" and it has for one object to produce a wheel which will possess, besides the requisites of strength and durability, the property of utilizing the maximum wind-surface area in aiding its revolution, while at a certain point in its rotation where the wind cannot be used for this purpose, but its direction would retard the wheel, then to present a minimum wind-surface area.

A further object of my invention resides in the ability to shift in unison the positions of the blades into a line parallel to the direction of the wind-vane, thereby throwing the wheel out of any action other than revolution with the vane.

In carrying out the above prime objects I have resorted to certain combinations of parts, some of which are novel and tend additionally to increase the general efficiency of the mill.

Other minor objects will be gone into in the following specification and the novel features particularly pointed out in the appended claims.

In the accompanying drawings, in which similar letters and numerals of reference designate corresponding parts, Figure 1 is a side elevation of the mill, the front arm and connecting parts being removed to give a clearer view of the remaining portions. Fig. 2 is a top view of the main portion of the mill. Fig. 3 is an enlarged view of a detail, showing the manner of connecting the sprocket-wheels with the vertical shafts. Fig. 4 is a view of the governor.

Referring now to the above views by letters and numerals, 1 indicates a vertical hollow shaft mounted on a suitable framework 2, its upper extremity being revolubly held in position by suitable guide braces or rods 3. Rigidly secured to this shaft 1 are the upper and lower radiating arms 4 4', respectively, which are braced to the central shaft to form a rigid structure by means of the diagonal braces 5.

At equidistances from and parallel to the central shaft 1 and revolubly mounted between the outer extremities of the upper and lower arms 4 4', respectively, are the four shafts 6 6' 6'' 6''', each provided with rectangular frames 7, over which are stretched, in a manner to be hereinafter described, suitable coverings forming blades A A' A'' A'''.

Loosely mounted on the shaft 1 and immediately above the upper arms 4 is the thimble or hub 8, the upper extremity of which terminates in an integrally-formed clutch-jaw 9, while the lower end bears two small sprocket-wheels 10 and 10'.

Positioned above the arms 4 and mounted on the shafts 6, &c., in a manner to be hereinafter described, are the large sprocket-wheels 11 11' 11'' 11''', the two former being connected to the lower sprocket-wheel 10' by the continuous chain 12, while the two latter are connected to wheel 10 by a similar chain 13. I have formed the large sprocket-wheels twice the size of the smaller wheels.

Rigidly secured to the thimble 8 is the vane 14, which manifestly controls the position of the wheels 10 and 10'.

Adapted to engage with the jaw 9 and held to shaft 1 by means of pin *a* in such a manner as to be capable of assuming a short vertical play thereon is the opposite clutch-jaw 15, which is connected to rod 16, as shown, the latter being encircled by hollow shaft 1 and protruding from the lower extremity thereof.

The extremity of the shaft 1 below the framework 2 is connected to suitable pumping or other devices by means of bevel-gears, as shown at 17 and 18, or by any other usual means.

Assuming that the wind is blowing in the direction of the large arrow in Fig. 2 and that the blade leaving the wind is coincident with its supporting-arm when the latter is at right angles with the direction of the wind, then the several blades will be in the relative positions shown when the wheel reaches that

point. It is manifest that as the wheel revolves in the direction of the smaller arrow the blades will gradually turn to receive the full benefit of the wind. At another point in the revolution of the wheel I have shown the relative positions of the blades by means of small dotted lines.

Now from the above description, taken with the position of parts shown in Fig. 2, it will be seen that the blades A and A''', which are moving away from the wind, present a larger surface than blades A'' and A', which are advancing toward the wind; but, on the other hand, it must be considered that in order to calculate the true force of the wind against the retreating blades the velocity of the wheel must be subtracted from the velocity of the wind, while the same amount must be added when the advancing blades are to be considered, which fact makes apparent the efficiency of the advancing blades. It is further manifest that the only point in the revolution of the wheel in which every blade is not aiding the revolution is when a line through the axis of revolution of an advancing blade and the axis of the wheel is at right angles to the direction of the wind. In such a position I have shown the blade A''' in broken lines to the right-hand of Fig. 2.

I will now explain the construction of the parts immediately concerned in throwing the mill out of action.

The sprocket-wheels 11 11' 11'' are integrally formed with hubs *b b' b''*, respectively, which loosely encircle the shafts 6 6' 6'', and are provided with a worm-shaped diagonal roadway *c*. Projecting from each of the shafts 6 6' 6'' is a pin *d*, which is adapted to enter the roadway in the hub. Straddling the hubs *b b' b''* and engaging with a circumferential groove therein are the forked ends of the levers B B' B'', which are pivoted at points *e* to suitable bearings on the arms 4. At a short distance below the arms 4 and secured for vertical movement on shaft 1 by means of pin *f* is the thimble 19, which is connected to the inner ends of the levers B B' B'' by means of the pitman-rods C C' C'', respectively. The pin *f*, above referred to, also passes through the rod 16.

It is evident that as the thimble 19 is drawn downward by means of the rod 16 the motion communicated through the pitman-rods and levers just described will force the sprocket-wheels A A' A'' upward on the shafts 6, 6', and 6''. Now as these sprocket-wheels are elevated they are prevented from revolving by means of the sprocket-chains connecting them with the central small wheels; but, on the other hand, the shafts 6 6' 6'' are caused to revolve as the diagonal roadways in the hubs engage with the pins *d*. I have so arranged the length and pitch of these roadways that the blades will turn the desired amount. It is further manifest that before this drawing down of the thimble can be accomplished the jaws 9 and 15 of the clutch must be in the desired positions relative to each other, or, in other words, the blade A''' must occupy the position shown in broken lines in Fig. 2. When this position of the blades is reached, the jaw 15 and thimble 19 move downward simultaneously as the rod 16 is drawn down, and consequently the blades A A' A'' will turn into a position to cut the wind—that is, in the position shown in broken lines in Fig. 2. It will be seen that blade A''' as it reaches the above position has not shifted from its normal direction, and therefore does not require any operative mechanism to change it, as in the case of the other blades. In this shifted position the wheel, vane, and blades are locked together and turn, as the wind shifts, in unison with the shaft 1.

In order to make this throwing out of gear automatic as the wheel reaches a certain high velocity, I have provided the mechanism shown in Fig. 4. It consists of the two-armed member G, formed with weights *g* and *g'* and pivoted to a rigid projection on shaft 1, while leading upward from this member and passing loosely through the thimble 19 is the headed rod H. It is manifest that as the mill revolves with a velocity sufficient to cause the weights to fly outward by centrifugal force into the position shown in dotted lines in Fig. 4 then the force of gravity will cause them to fall and assume the position shown in broken lines and draw down the thimble 19, as above, thereby shifting the blades to cut the wind. I have further made the weight *g* adjustable on the member G, thereby making it possible to throw the mill out of action when any predetermined velocity is reached.

The manner of covering the blades is readily seen from Fig. 1. The canvas, which is secured to the side rings *y*, can be reefed to present the desired surface area and drawn taut by means of the ropes shown in broken lines.

From the above description it is manifest that I have attained all the objects set forth in a practical, durable, and comparatively inexpensive manner.

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

1. A windmill having a main vertical revoluble shaft provided with fixed bearings, a series of arms radiating from said shaft and secured thereto, wind-blades revolubly carried by said arms, a tail-vane loosely mounted on said shaft and connected to said blades by a speed-changing connection, and adjustable means for locking said vane to said shaft substantially as set forth.

2. A windmill having a main hollow shaft, a series of arms radiating from and rigidly secured to said shaft, a series of vertical wind-blades revolubly mounted on said arms, a tail-vane mounted to turn loosely about said shaft, said vane being connected to said blades in such a manner that the revolution of said shaft independent of said vane produces a movement of said blades on their

axes, and means for locking said vane to said shaft, substantially as set forth.

3. A windmill having a main vertical revoluble shaft provided with fixed bearings, a series of arms radiating from and secured to said shaft, wind-blades revolubly carried by said arms, a tail-vane loosely mounted on said shaft and connected to said vane by a speed-changing connection, and automatic means for locking said vane to said shaft as the mill reaches a predetermined velocity substantially as set forth.

4. In an apparatus of the character described, a horizontal wheel mounted upon a vertical rotary shaft having independently-journaled vertical vanes at its outer ends, a tail-vane loosely mounted upon the main shaft and connected to said vertical vanes by suitable gearing, a mechanism for moving said vanes to throw them out of action, and means for locking said tail-vane to said shaft, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN O'TOOLE.

Witnesses:
LEE D. CRAIG,
M. L. REILEY.