No. 650,011. Patented May 22, 1900.

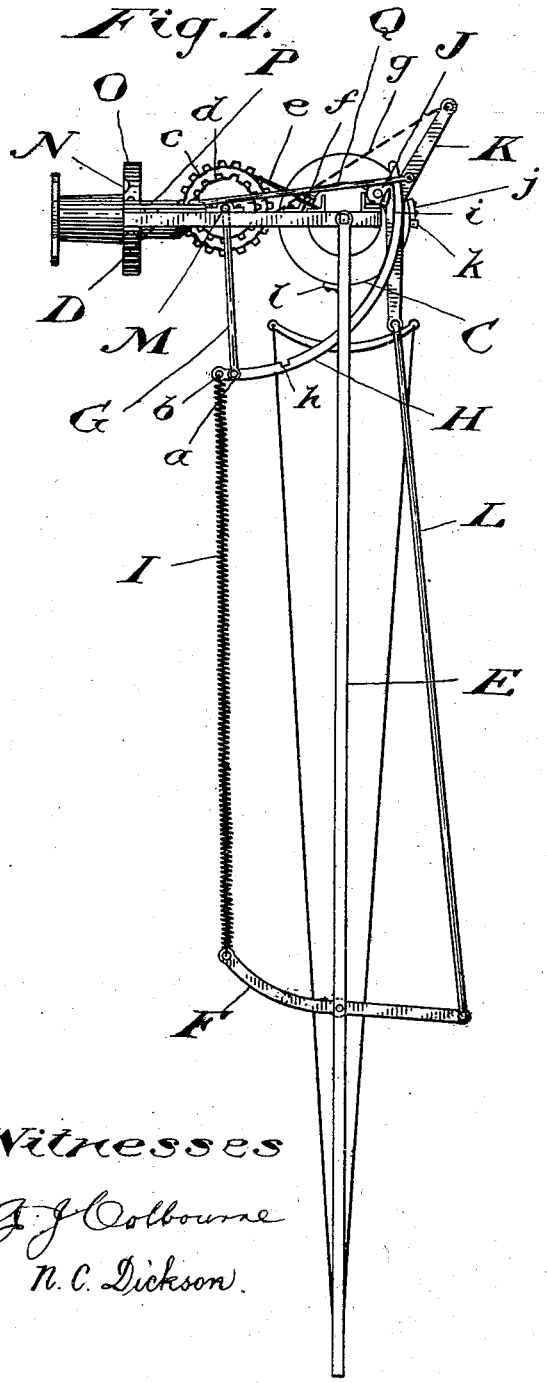
C. H. HEROD.

WINDMILL.

(Application filed May 3, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



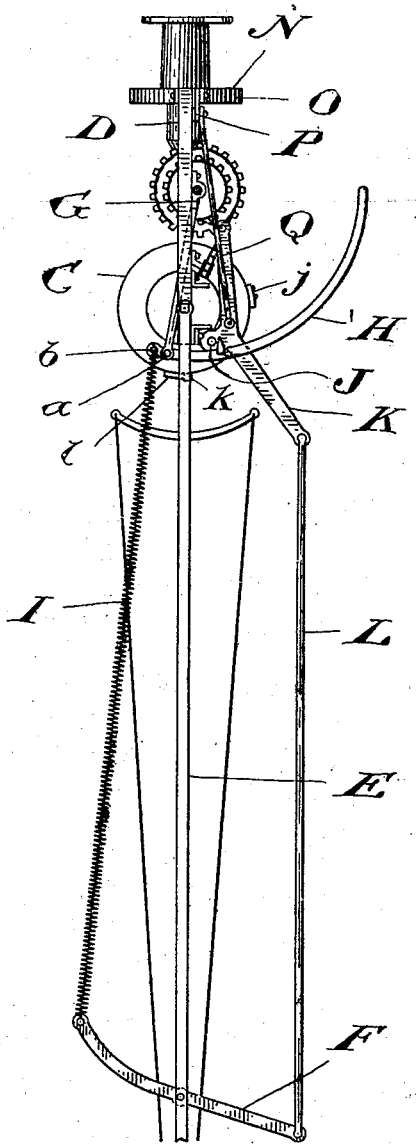


Fig. 2.

Witnesses

G. J. Colbourne

N. C. Dickson.

Inventor

Charles H. Herod

by Pidout & Maybee

Attys.

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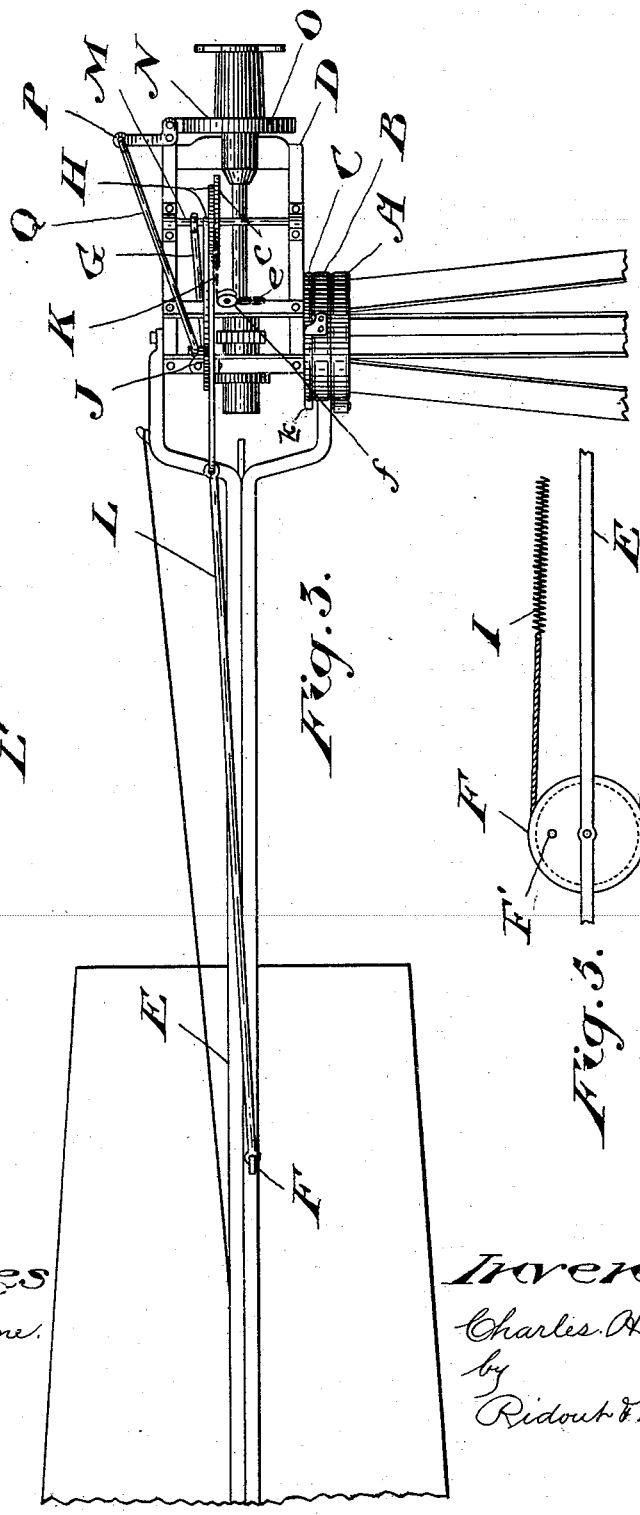

Fig. 3.

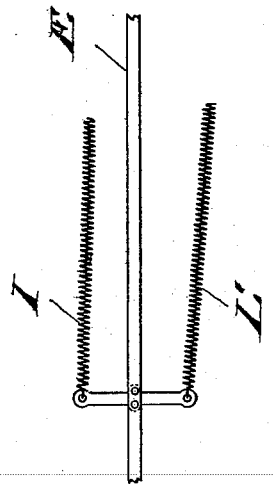

Fig. 4.

Fig. 5.

Witnesses
A. J. Colbourne.
N. C. Dickson

Inventor
Charles A. Herod.
by
Ridout & Maybee
attys

UNITED STATES PATENT OFFICE.

CHARLES H. HEROD, OF BRANTFORD, CANADA.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 650,011, dated May 22, 1900.

Application filed May 3, 1899. Serial No. 715,419. (No model.)

To all whom it may concern:

Be it known that I, CHARLES HENRY HEROD, pattern-maker, of the city of Brantford, in the county of Brant and Province of Ontario, Canada, have invented certain new and useful Improvements in Windmills, (for which I have obtained Canadian Letters Patent No. 63,467, dated July 17, 1899,) of which the following is a specification.

The object of my invention is to devise simple and effective means for governing a windmill and for holding it out of the wind; and it consists, essentially, in connecting the vane and the engine by tension-spring connections, means being provided whereby the relative positions of the lines of draft of the said connections may be shifted with regard to the pivot point or points of the engine and vane, so that the latter may be held in line by spring tension or similarly held out of line, substantially as hereinafter more specifically described and then definitely claimed.

Figure 1 is a plan view of the upper portion of the windmill provided with my improvements, the engine being turned out of the wind. Fig. 2 is a similar view, partly broken away, the engine being shown in the wind. Fig. 3 is a side elevation of the upper portion of the windmill provided with my improvements with the engine in the wind. Figs. 4 and 5 are details illustrating alternative forms of spring connections to the vane.

In the drawings like letters of reference indicate corresponding parts in the different figures.

A is the turn-table support at the top of the windmill. (See Fig. 3.) Upon this turn-table support revolves, preferably with roller or ball bearings, the ring B, to which the vane E is connected. Upon this ring revolves, preferably with roller or ball bearings, the ring C, to which the engine D is connected. As shown, the vane E is forked and the lower branch of the fork connected to the ring B, while the upper branch is pivotally connected with the engine D above the center of the turn-table A. It will thus be seen that the engine and the vane are so supported upon the tower as to swing independently of one another. Upon the vane E is pivoted the equalizer F, which may be either a lever, as shown in Figs. 1 and 2, or a pulley, as shown in Fig. 5.

G is a link pivoted upon the engine. The outer end of this link is pivotally connected at *a* with the notched quadrant H, to which is also connected at *b* the coil-spring I, the other end of which is connected at one end to the equalizer F. As the point *b* is just outside the pivot-point *a*, the spring when under tension will tend normally to keep the curved surface of the quadrant in contact with the fixed dog J, secured to the bell-crank lever K, which is pivoted upon the engine below the quadrant H. One end of this lever is at the opposite side of the vane from the spring I and is connected by the link L to the other end of the equalizer F. This link may be flexible, if desired, as shown at L′ in Fig. 4 and at L^2 in Fig. 5, as it undergoes a tensional strain only. If a pulley-equalizer is used, as shown in Fig. 5, at least a portion of the link must be flexible close to the pulley and wrapped around or otherwise secured to it. The spring is also preferably provided at its end with a flexible cord or chain wrapped around or otherwise secured to the pulley, the motion of which is preferably limited by a stop F′.

Journaled upon the engine is the vertical spindle M, upon which are secured pulleys or sprocket-wheels *c* and *d*. Wrapped around the sprocket-wheel *c* is a sprocket-chain *e*, which has one end secured to the said sprocket-wheel *c*, and which chain passes over an idler-pulley *f* and thence down to the ground, where it may be fastened in any suitable manner. Wrapped around the sprocket-wheel *d* is a sprocket-chain *g*, one end of which is connected to said wheel *d* and the other to the end of the bell-crank lever K. It is evident that by drawing upon the sprocket-chain *e* and fastening it the end of the lever to which the chain *g* is attached and the engine may be drawn toward one another and held there or allowed to move apart when the chain is released, so as to occupy either the position shown in Fig. 1 or that in Fig. 2.

When the chain *e* is drawn upon and the end of the lever K and the engine brought close together, the notch *h* in quadrant H is brought into engagement with the fixed dog

J and the quadrant thus held from moving in either direction until it is suitably released. When the parts are in this position, the tension of the spring I tends to maintain the engine in the position shown with regard to the vane—that is, with the wheel facing the wind.

In practice the wheel will be slightly inclined toward the left of the drawings, so that extra-strong puffs of wind will tend to swing it in that direction, and thus enable it to spill the wind. This motion is resisted by the tension of the spring I, which immediately returns the engine to its original position when the wind abates in force. By releasing the chain *e* the lever K will be allowed to swing. When this lever swings, it lifts the dog J out of engagement with the quadrant H. The tension of the spring I now causes the parts to assume the position shown in Fig. 1.

Upon the ring B is fixed a stop *j*, with which engages a stop *k* on the ring C. When the engine and vane are in the position shown in Fig. 1, these stops are engaged with one another, and thus prevent the engine swinging farther than is necessary to bring its wheel parallel with the vane. A stop *l* may also be connected to the ring B to prevent the engine when it is drawn into the wind being pulled past the point at which its wheel is at right angles to the vane, save for the slight inclination previously described.

It will be observed that the principle of my invention is substantially as follows: If three bodies—such as the vane, the engine, and the bell-crank lever—be pivoted together substantially at or near the same point and two of them, such as the lever and the engine, be connected by spring connections with opposite sides of the third, such as the vane, the position of the two with regard to the third may be altered by altering the relative position toward one another of the first two. By moving the first two with regard to one another and holding them as moved the relative position of the lines of draft of the said spring connections may be altered with regard to the pivot-point of the third body, and the two will shift themselves with regard to the third body until the tension of the spring connections at each side is the same. Any attempt to move the third body to one side or the other is resisted by the spring connections. In other words, if three bodies be pivoted and connected as described and the first two have their relative positions toward one another changed then the equilibrium of the system is disturbed and the relative position of the two toward the third changes until the spring tension is again equal on the opposite sides of the third. In any position an attempt to swing the third body to either side meets with a spring resistance.

An examination of Figs. 1 and 2 will show that the lines of draft of the connections between the vane and the engine and lever are shifted from left to right when bringing the engine into the wind and from right to left when taking it out of the wind.

The object in holding the end of the link close in toward the pivot-point of the vane by means of the quadrant H is that if the link were permitted to swing freely from its pivot-point on the engine the swinging of the engine to the left by a strong blast of wind would gradually shift the line of draft of the spring I out from the pivot-point, giving it greater leverage, and the tendency of the engine to fly back to its original position would be considerably reduced.

The object in using the equalizer is to enable one spring to take the place of two, though, of course, two springs might be readily used, as shown in Fig. 4.

N is a disk forming a portion of the hub of the wheel. Around this disk is a brake-band O. One end of this band is secured to a stationary portion of the engine, as shown, and the other end pivoted to the short end of the lever P, which itself is journaled upon a stationary portion of the engine. The longer end of the lever P is connected by the pivoted link Q with the lever K close to its pivot-point. From this it will be seen that when the parts assume the position shown in Fig. 1 the lever P is drawn upon to tighten the brake-band about the disk N and that this is one of the first effects produced by releasing the sprocket-chain *e*. At the same time as soon as the lever is drawn upon to bring the engine into the wind one of the first effects is to shift the lever P and release the brake-band O, so that the wheel is free to revolve as the air-pressure comes upon it.

What I claim as my invention is—

1. In a windmill, an engine and a vane so supported as to swing independently, in combination with mechanism which will give elastic tensional draft between the vane and engine on opposite sides of the pivot point or points of the engine and vane, and means whereby the relative position of the lines of draft of the mechanism may be shifted with regard to the said pivot point or points, so that the engine and vane may be held in line by spring tension, or similarly held out of line, substantially as and for the purpose specified.

2. In a windmill, an engine and vane so supported as to swing independently; and a lever pivoted on the said engine in combination with mechanism which will give elastic tensional draft between the vane and engine on one side of the vane and between the vane and the lever on the other; and means for swinging the said lever to move its end so as to alter the relative position of the lines of draft of the mechanism giving the said connections, substantially as and for the purpose specified.

3. In a windmill, an engine and vane so supported as to swing independently; and a lever pivoted on the said engine in combination

with mechanism which will give elastic tensional draft between the vane and engine on one side of the vane and between the vane and one end of the lever on the other; a wheel or pulley journaled upon the engine; a cord or chain wound on the said pulley and connected with the other end of the lever (which is centrally pivoted); and means for rotating the said wheel, substantially as and for the purpose specified.

4. In a windmill, an engine and vane so supported as to swing independently, in combination with a link pivoted upon the engine; a notched quadrant to which the other end of the said link is pivoted; a lever of the first order pivoted upon the engine; a stationary dog secured to the lever with which the notch in the quadrant is adapted to engage; mechanism which will give elastic tensional draft between the vane and quadrant just outside the point of connection of the link and quadrant, and between the vane and the end of the lever; and means connected with the engine and the other end of the lever whereby it may be swung to cause the notched quadrant to engage the fixed dog, or released to cause the fixed dog upon it to release the said quadrant and to shift the lines of draft of the said mechanism, substantially as and for the purpose specified.

5. In a windmill, an engine and vane so supported as to swing independently in combination with a link pivoted upon the engine; a lever pivoted upon the engine; mechanism which will give elastic tensional draft between the link and the vane and between the end of the lever and the vane on opposite sides of the pivot point or points of the engine and vane; means for swinging the lever to shift the lines of draft of the said mechanism; and means for holding the mechanism giving the said draft between the vane and the link close in to the pivot-point of the vane when the engine and vane are in line and for releasing it when the engine is to be swung out of line with the vane, substantially as and for the purpose specified.

6. In a windmill an engine and vane so supported as to swing independently, an equalizer pivoted upon the vane; a tension-spring connection between the engine and one side of the equalizer; a link connecting with the opposite side of the equalizer and the engine and means for shifting the line of draft of the link between the equalizer and engine, substantially as and for the purpose specified.

7. In a windmill an engine and vane so supported as to swing independently, in combination with an equalizer pivoted on the vane; a tension-spring connection between the engine and one side of the equalizer at one side of the pivot-point of the vane; a lever pivoted on the engine one end of which is at the other side of the said pivot-point; a link between the lever and the other side of the equalizer and means for swinging the said lever to move its end so as to alter the relative position of the lines of draft, substantially as and for the purpose specified.

8. In a windmill the engine D, and the vane E, so supported as to swing independently, in combination with the equalizer F, pivoted upon the vane; the link G, pivoted upon the engine; the notched quadrant H, to which the other end of the said link is pivoted at *a;* the coil-spring I, connected to one side of the equalizer and to the quadrant H, at *b;* the lever K, pivoted upon the engine; the link L, connecting the other side of the equalizer with the said lever; the fixed dog J, upon the lever with which the notch in the quadrant H, is adapted to engage; and means connected with the engine for swinging the said lever, substantially as and for the purpose specified.

9. In a windmill the engine D, and the vane E, so supported as to swing independently, in combination with the equalizer F, pivoted upon the vane; the link G, pivoted upon the engine; the notched quadrant H, to which the other end of the said link is pivoted at *a;* the coil-spring I, connected to one side of the equalizer and to the quadrant H, at *b;* the lever K, pivoted upon the engine; the link L, connecting the other side of the equalizer with the said lever; the fixed dog J, upon the lever with which the notch in the quadrant H, is adapted to engage; means connected with the engine for swinging the said lever; the brake-disk N, fast on the shaft of the engine; the brake-band O, encircling the said disk and having one end fast to a stationary part; the lever P, fulcrumed upon the engine and pivoted to the other end of the brake-band; and the pivoted link Q, connecting the levers P and K, substantially as and for the purpose specified.

Brantford, Canada, April 18, 1899.

C. H. HEROD.

In presence of—
J. B. DETWILER,
THO. WOODYATT.