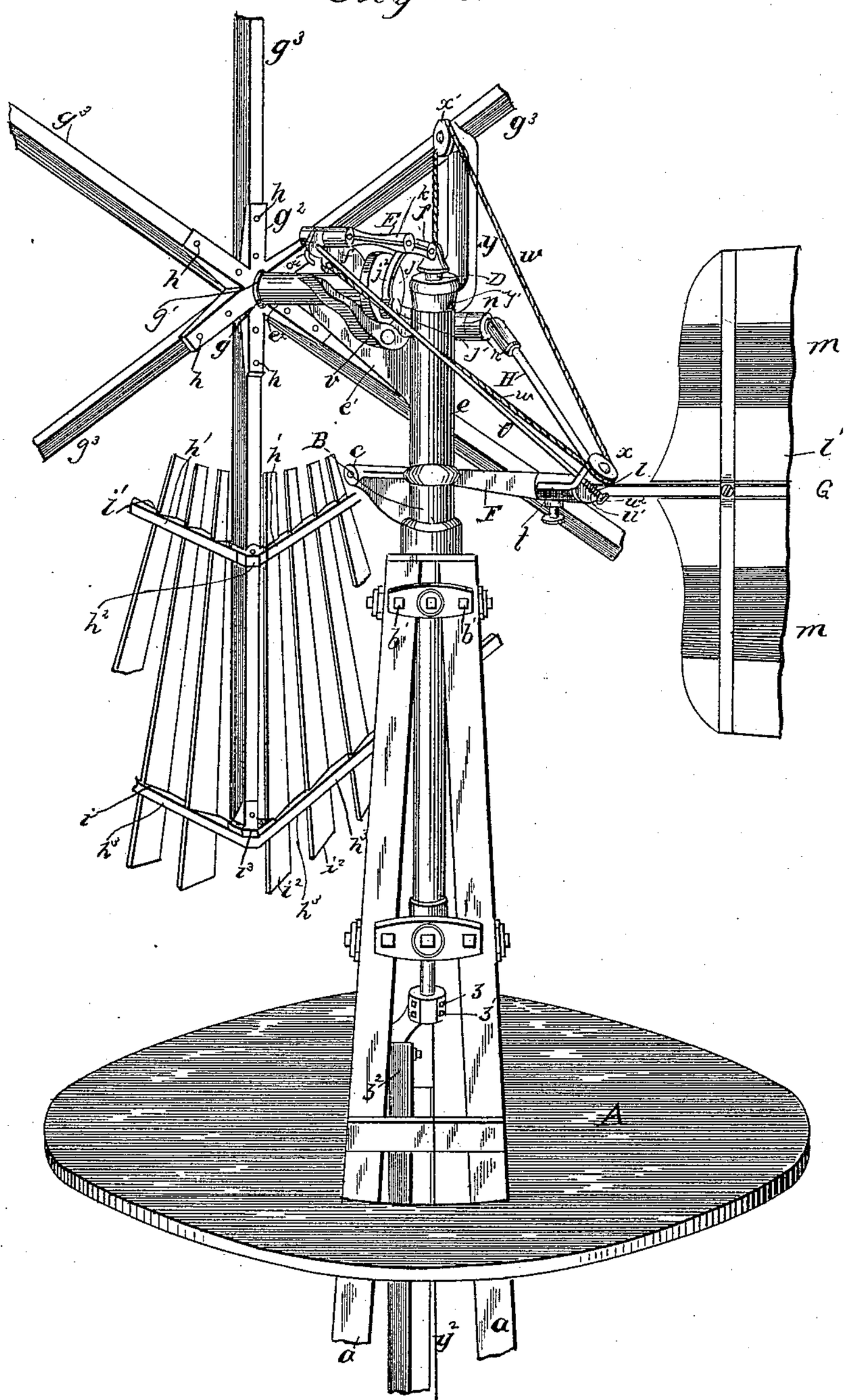
(No Model.) 2 Sheets—Sheet 1.

A. S. BAKER.

WINDMILL.

No. 441,631. Patented Dec. 2, 1890.

Fig. 1.



Witnesses
Arthur A. Erb.
Arthur Middleton

Inventor
Allen S. Baker
By his Attorney
Frank L. Dyer

(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

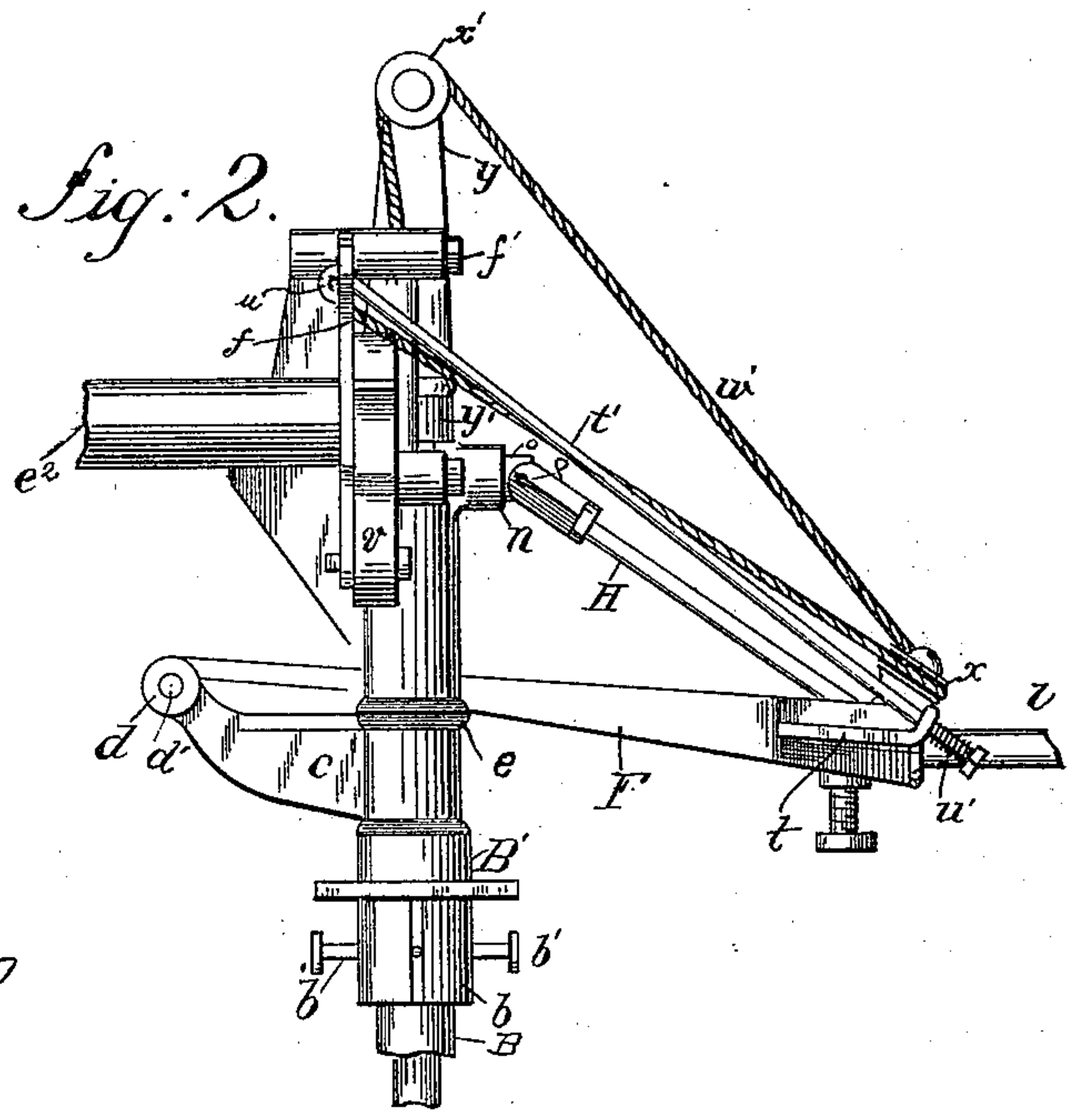


Fig. 4.

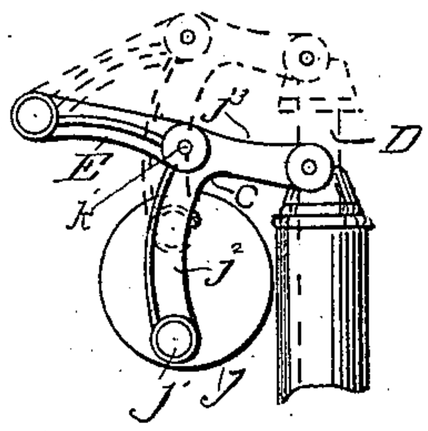
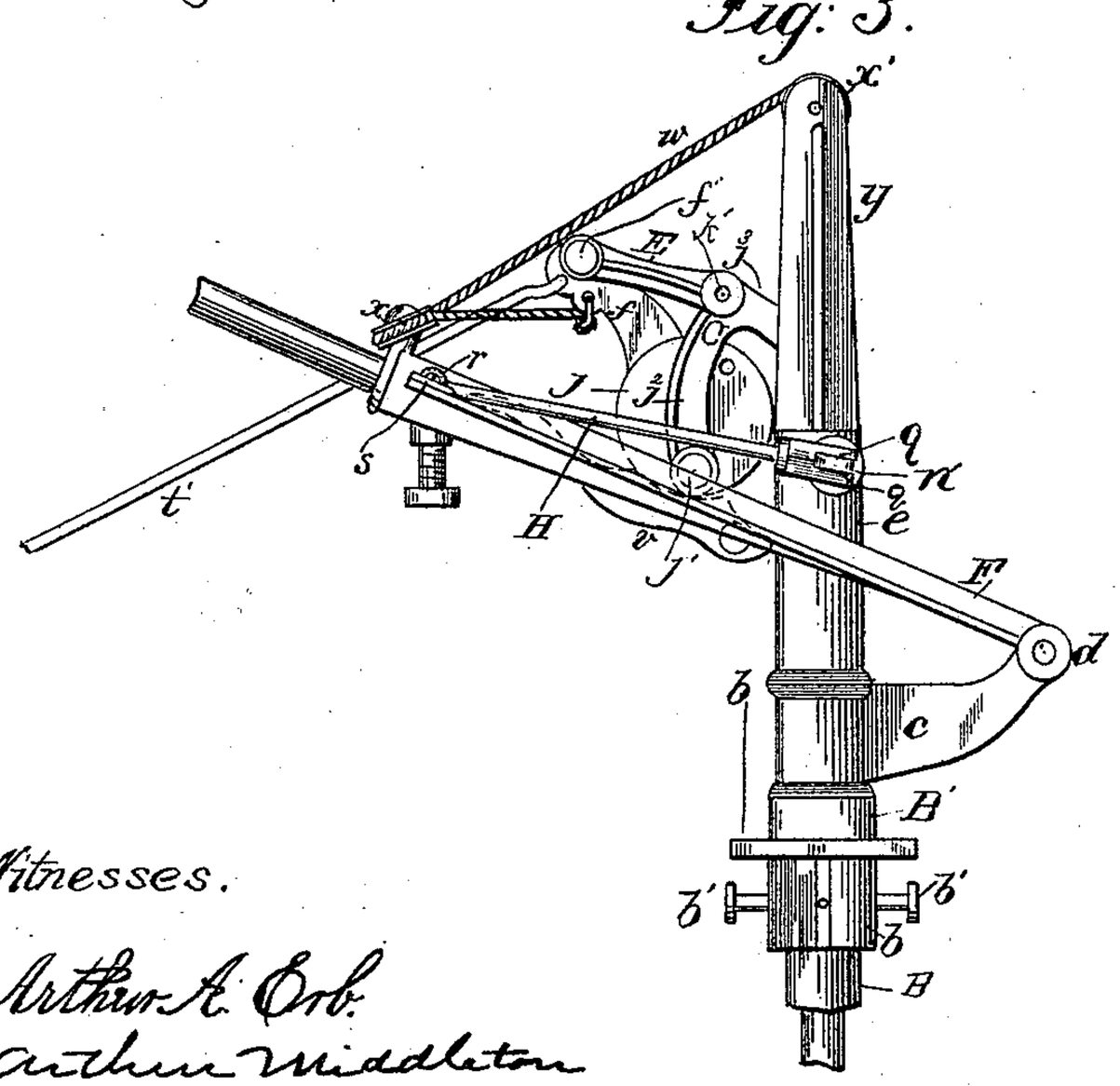


Fig. 3.



Witnesses.

Arthur A. Orb.

Arthur Middleton

Inventor:

Allen S. Baker

by Francis L. Dyer

his Attorney

UNITED STATES PATENT OFFICE.

ALLEN S. BAKER, OF EVANSVILLE, WISCONSIN.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 441,631, dated December 2, 1890.

Application filed November 3, 1888. Serial No. 289,897. (No model.)

To all whom it may concern:

Be it known that I, ALLEN S. BAKER, a citizen of the United States, residing at Evansville, in the county of Rock and State of Wisconsin, 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 invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to various new and useful improvements in those varieties of windmills known to the trade as "solid-wheel windmills," and by the use of my invention the speed of the wind-wheel will be automatically regulated with certainty, and the upstroke of the drive-rod will be much more powerful than the downstroke, making the windmill particularly desirable for pumping purposes.

The objects of my invention are to provide a windmill that will be powerful and positive in operation, durable in use, comparatively simple in construction, and one that can be easily controlled (either stopped or started) from the ground or platform, and will adjust itself to winds of varying velocities, so that the speed of the windmill will be always uniform, or approximately so.

The principal novelties in the construction and operation of my invention consist in a peculiarly-constructed wind-wheel pivoted at one side of the main supporting-shaft in such a manner that the wheel under certain conditions will be forced out of its normal plane by the action of the wind and will present a working-surface to the plane of the wind inversely proportionate to the increase in the velocity of the wind. When the wheel is thus thrown out of plane perpendicular with the direction of the wind, it causes the fan or vane to be elevated by means of intermediate mechanism, and a resisting force is imposed on the wheel, which increases as the wheel is forced farther and farther away from the plane of the wind. After the wheel is thus forced out of its normal plane and the velocity of the wind decreases, the weight of the fan causes the wheel to approach its normal plane. By this means I am enabled to regulate the speed of the wind-wheel automatically and with precision, and the wheel is thereby enabled to operate in winds of both high and low velocities.

My invention relates, further, to other but less important details of construction, which will be fully hereinafter described, and embodied in the claims, and which are illustrated in the accompanying drawings, wherein similar parts are designated by identical letters of reference, and in which—

Figure 1 is a rear perspective view of my improved windmill with a portion of the blades of the wheel removed; Fig. 2, a side elevation of the same; Fig. 3, a rear elevation of the same; Fig. 4, a diagrammatic view of the disk, link, lever, and connecting-rod, showing the position of the different parts at the top and bottom of the stroke.

The mill is mounted upon the usual uprights *a a a a*, converging toward each other at their upper ends, and near the top of which is secured the platform A, for the use of repairers or for other purposes. Rigidly fastened to the extreme upper ends of these uprights is a metallic bearing-box *b*, secured in position by means of bolts *b' b'*, passing through between each pair of uprights *a*. Extending down inside of this bearing-box is a hollow shaft B, provided with a collar B', bearing on the upper portion of the bearing-box *b*. The shaft B is capable of easy rotation inside of this bearing-box.

A horizontal arm *c* extends out from the shaft B, and is provided on its extreme outer end with an enlarged cylindrical head *d*, provided with a hole extending entirely through the same. This arm *c* is preferably made integral either with the shaft B or the collar B', although it will be evident that this is not an indispensable requisite. Encircling that portion of the shaft B directly above the collar B' is the cylindrical supporting-collar *e* of the main casing, with its lower portion bearing on the collar B'. The collar *e* is capable of easy rotary movement on the shaft B. A horizontally-curved arm *e'*, made integral with the collar *e*, extends out, and on the end of this arm is formed the bearing e^2 for the main axle. Extending obliquely upward

from the bearing e^2 is an arm f, provided on its upper end with a pivoting-pin j'. All of the parts last enumerated—to wit, the collar e, arm e', bearing e^2, and oblique arm f—are preferably cast in one piece and are suitably braced and strengthened in any suitable manner.

The wind-wheel is constructed as follows: To the main axle g is rigidly secured the hub g', provided with the integral radiating spokes g'' g'', the spokes g'' g'' g'' are made preferably channel shape in cross-section, and into each of these spokes is secured a wooden extension g''' g''' g''' g''', fastened in position in these spokes by means of bolts h h h h h h. Connecting the centers of these extensions are the braces h' h' h' h', secured in position by means of the staples h'' h'' h'' h''. Connecting the outer ends of the extension g''' g''' g''' g''' are the braces h''' h''' h''' h''', secured in position by means of the clamping-jaws i''' i'''. The braces h' h' h' and h''' h''' h''' are slotted at regular intervals i' i', and securely fastened within these slots are the usual inclined blades i'' i'' i'' i''. By means of this construction of wheel I am enabled to make a much lighter and stronger wheel than heretofore, and am also enabled to replace any broken blades by fresh ones without affecting the other parts of the wheel.

On the rear of the main axle g, directly back of the bearing e'', is rigidly secured a flat metallic disk j, provided with an integral wrist-pin j', projecting from its outer face. Engaging with this wrist-pin is the lower portion of the arm j'' of the right-angled lever C. The outer end of the horizontal arm j''' of the lever C is provided with an integral stirrup, and each arm of this stirrup engages with a pin formed on the upper end of the main driving-rod D, so as to be capable of pivotal movement on the same.

A connecting-rod E is provided with a similar stirrup k, engaging with a pin k', passing through the lever C at its angle. The other end of this connecting-rod is fitted over the pin f' and is capable of pivotal movement on said pin. From an inspection of the drawings of the parts just described it will be evident that the following action will occur when the wind-wheel is rotated in the usual manner by reason of the wind striking against the inclined blades i'' i''. This motion of the wind-wheel will rotate the main axle g and the disk j and will cause the lower end of the arm j'' to travel around with the wrist-pin j', and it will be apparent that the other end of the arm j''' will be moved upward and downward, carrying the main driving-rod D with it, and thereby actuating the pump or whatever other device is to be operated. By means of the connecting-rod E the movements of the outer end of the arm j''' will be approximately vertical, and the usual guides can therefore be disposed of; also, by means of the connecting-rod the movement of the driving-rod D will be slower on the upstroke, and consequently more powerful than on the downstroke, for this reason: When the wrist-pin j' is in position shown in Fig. 1—to wit, about two-thirds of the distance from the top of a vertical diametrical line drawn through the disk j to the bottom of the same—the connecting-rod E will be approximately horizontal, and the outer end of the arm j''' and the driving-rod D will have reached the bottom of their stroke. Further movement of the wrist-pin j' will cause the arm j'' to approach the vertical diameter, and thereby elevate the rod j''' a short distance, and of course the driving-rod D. It is true that as the arm j'' moves toward the vertical diameter of the disk it partakes also of the downward stroke; but the horizontal motion predominates. Therefore the rod D will begin to slowly ascend while the wrist-pin j' is making part of its downward movement. As the pin j' begins to ascend, the connecting-rod E, arm j'', and driving-rod D also ascend and continue to ascend until the wrist-pin reaches its extreme limit of upward movement. When the pin j' begins to descend, the connecting-rod E and arm j'' are forced downward very rapidly for two reasons, viz: the outward motion of the lower end of the arm j''', which would of course depress the arm j''', and the downward motion of the arm j'', which would exert a similar movement of the connecting-rod E, arm j''', and driving-rod D. It will therefore be seen that the upward movement of the driving-rod D is accomplished by more than a half-rotation of the wind-wheel, while an opposite movement of the same driving-rod is accomplished by less than a half-rotation of the wind-wheel, and since the revolutions of the wind-wheels are practically uniform it follows that more power is obtained on the upstroke than on the downstroke.

Pivoted on a pin passing through a hole d' in the cylindrical head d of the arm c is the stirrup portion of the arm F. This arm F is above the arm c and is provided at its rear portion with an annular chamber therein. Inserted and secured inside of this chamber is the cylindrical arm l of the central portion l' of the fan or vane G. On each side of this central section l' are other sections m m m m, forming the completed fan or vane G for keeping the wind-wheel directly in the path of the wind.

At the upper portion of the collar e is formed a hollow projection n, through the front wall n' of which extends the cylindrical body portion o of a pivoting-pin p. The rear portion of the body o of this pivoting-pin is provided with a nut or other device on the inside of the projection n, by means of which the pivoting-pin is prevented from becoming disengaged from the projection n, but is not deprived of rotary motion therein. This pivoting-pin p is pivoted between the two ears q q,

formed in the upper end of the connecting-rod H, and on the lower end of this connecting-rod H is formed a ball *r*. This ball is secured to the arm F by means of a socket *s*, thereby forming an ordinary ball-and-socket joint. Cast integrally with the rear portion of the arm F is a lug *t*, provided with an inclined top portion.

Extending downward from the upper portion of the arm *f* and passing through an opening in the lug *t* is a rod *t'*. This rod is preferably secured to the arm *f* by means of an ordinary hook *u*, and encircling the lower portion of the said rod is a coiled spring *u'*, held in position by a nut *u''*. This spring also forms a flexible stop and prevents the wind-wheel from swinging beyond a position at right angles with the vane G when thrown into the wind, and also prevents any jars or jolting that might arise when the mill is started—*i. e.*, when the fan or vane is lowered.

By the means above described the wheel regulates its speed as follows: When the wind acquires too great a velocity, it causes the wheel to be forced backwardly by reason of the manner of mounting it on one side of the pivoting-point—*i. e.*, the shaft B. This movement of the wheel will cause the collar *e* to partake of a vertical rotation, which will exert a strain on the rod H and will elevate the fan or vane G. A still greater increase in the velocity of the wind will cause a greater deflection of the wind-wheel and collar and a higher elevation of the fan or vane. As the wheel is forced farther out of the normal plane, the leverage will be increased by reason of the length of the bearing *e''*; but this is compensated by reason of the decrease in the leverage of the arm H as the fan or vane approaches nearer to the plane of the pivoting-pin *p*. It will be of course evident that as the wheel is forced more and more away from its normal plane a smaller surface is presented to the action of the wind, and the speed of the wheel is less rapid than it would be if the wheel had not been thrown out of its normal plane; but, nevertheless, this speed is identical to that which would result if the wind were just sufficient to counterpoise the wheel. Now, should the velocity decrease, the weight of the fan or vane will cause the collar *e* to make a partial rotation, and the wheel will present a greater surface to the action of the wind, and the wheel will continue to maintain its acquired average velocity. As the fan or vane is elevated, the rod *t* remains immovable, and the lug *u* slides up over the same.

Pivoted directly beneath the disk *j* is a lever *v*, provided with a curved bearing portion corresponding with the curve of the disk *j*.

Securely fastened to the oblique arm *f* is a chain or rope *w*, passing down and under the pulley-wheel *x* on the upper portion of the arm F and up over the pulley-wheel *x'*, situated directly above the main driving-shaft. The pulley-wheel *x'* is pivotally mounted on the upper end of a vertical arm *y*, provided at its lower end with an integral collar *y'*, encircling and fixed to the hollow shaft B. From the pulley-wheel *x* the chain *w* passes down inside of the main driving-shaft and is there connected with a wire *y''*, extending down to the platform at the base of the uprights *a a*. By exerting a downward pressure on this wire it will be apparent that the vane or fan will be elevated and will approach the arm *f*, as shown in Figs. 2 and 3. As the fan is elevated, it causes the collar *e* to be forced partly around by means of the rod H, and the wheel is drawn out of the wind, only to a greater extent, precisely similar to the manner of regulation. When the fan or vane reaches the extent of the upward movement, the inclined upper portion of the lug *t*, pressing against the lever *v*, will cause the said lever to bear against the disk *j*, and the friction resulting therefrom will immediately arrest any rotation of the wind-wheel and will prevent any possible motion of the same. If it is desired to start the mill, (it being the supposition that the parts are in the position shown in Figs. 2 and 3,) the wire *y''* is unfastened at its lower end, and the fan by its own weight will drop (any jars or shocks being prevented by means of the spring *u'*) and the wind-wheel will be forced into the wind by means of the connecting-rod H. At the extreme lower end of the driving-shaft D is securely fastened a split collar *z*, held in position on said driving-shaft by means of bolt *z'*, and extending downward from one section of said split collar and preferably made integral with the same is a short arm *z''*. Fastened securely to this arm is the usual rod I for actuating the pump or device. However,

Having now described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. The combination of a hollow vertical shaft B, a hollow casing *e*, surrounding the same, a wind-wheel mounted to one side of said casing, a fan hinged at the other side of said casing to an arm *c*, connected with said casing, a disk *j*, operated by said wind-wheel, connections between said disk and the drive-rod D, and a brake-lever pivoted beneath the disk, all combined and arranged so that when the wind-wheel is thrown out of its normal plane by the action of the wind the said fan or vane will be elevated so as to engage with the brake-lever and throw the same into engagement with the said disk, whereby the motion of the same is arrested, substantially as set forth.

2. In a windmill, the combination of a vertical hollow shaft B, a fan or vane hinged to and connected with said shaft, a casing *e*, movably mounted on said hollow shaft, a wind-wheel horizontally mounted on said casing, a disk connected with and operated by

the axle of said wind-wheel, a right-angled lever connecting said disk with the driving-rod D, a link connecting said right-angled lever to the casing *e*, a connecting-rod H, connecting said casing with the fan or vane, and a connecting-rod *t'*, having a spring-buffer *w'* at its lower end, for the purposes mentioned.

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

ALLEN S. BAKER.

Witnesses:
R. M. ANTES,
J. H. HOSKINS.