No. 842,054. PATENTED JAN. 22, 1907.

J. BARKER.

WINDMILL.

APPLICATION FILED NOV. 15, 1905.

2 SHEETS—SHEET 1.

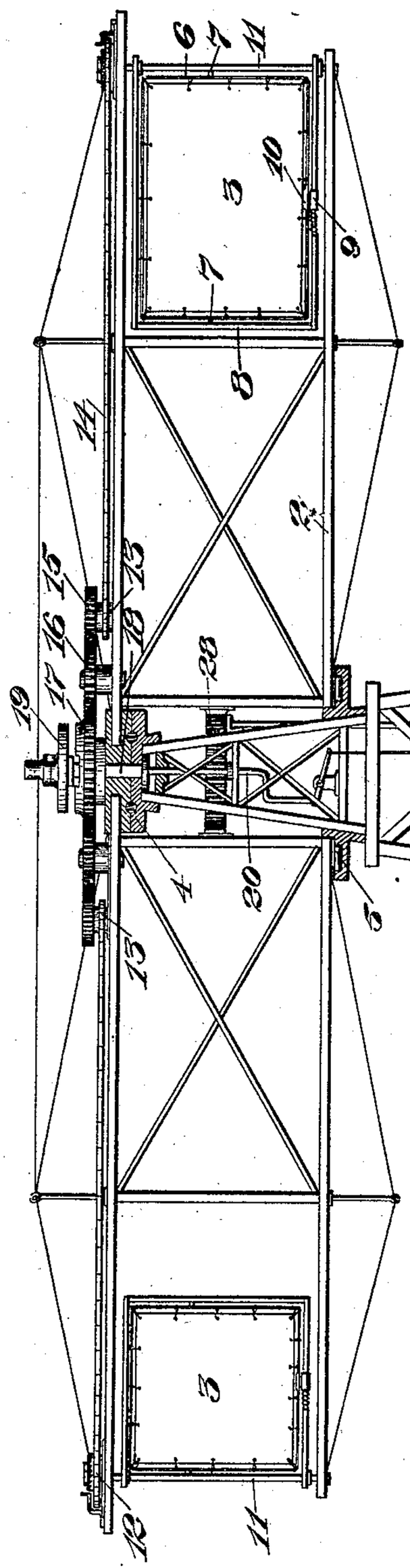

Fig. 1.

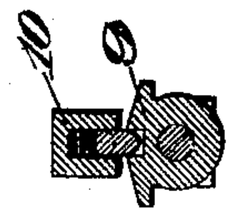

Fig. 3.

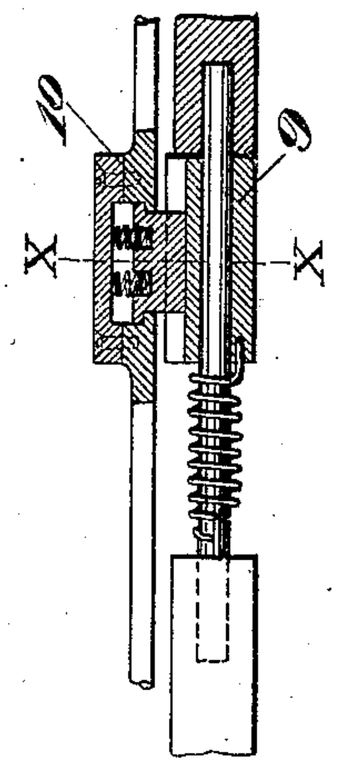

Fig. 2.

Witnesses.
F. Eastberg.
J. L. Morse

Inventor:
Joseph Barker
By Geo. H. Strong. Atty

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2 SHEETS—SHEET 2.

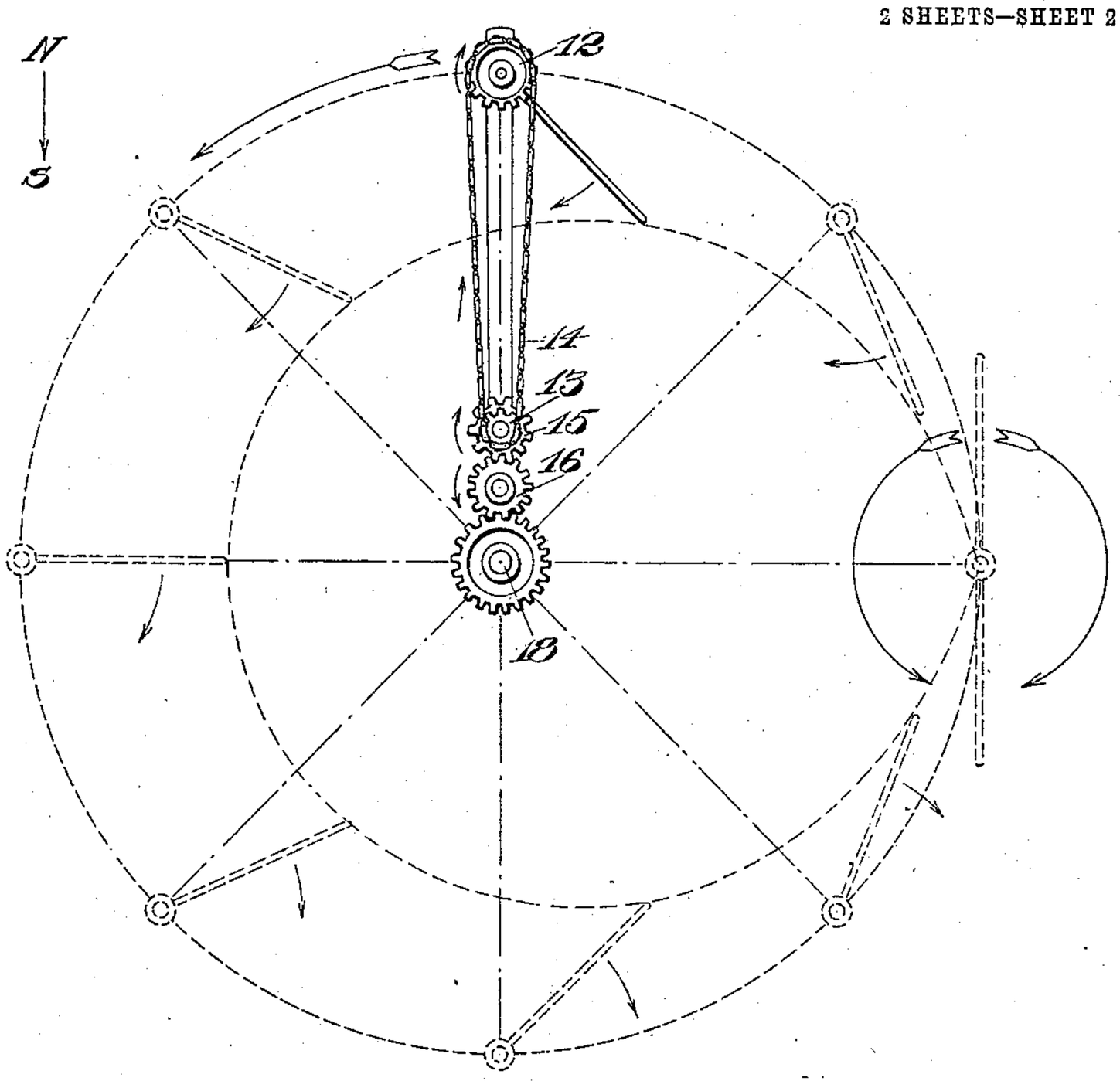
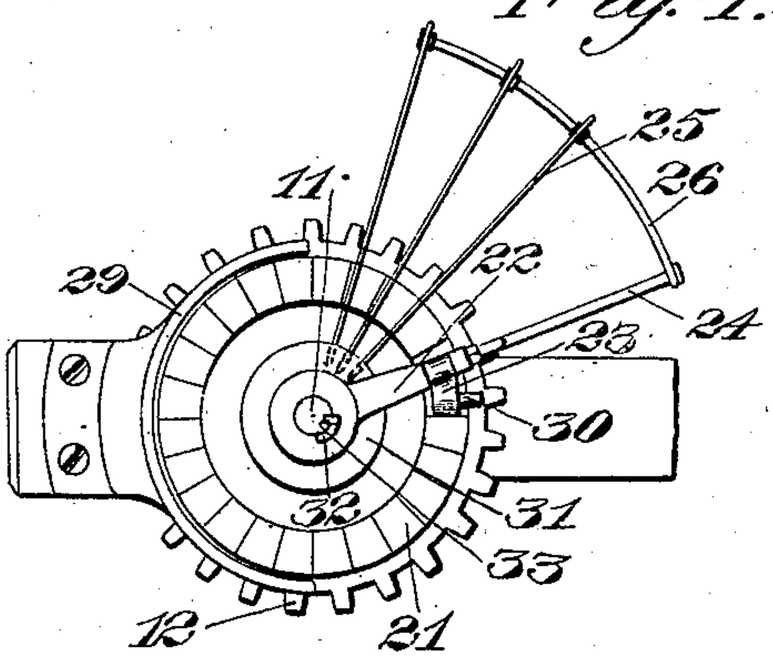


Fig. 4.



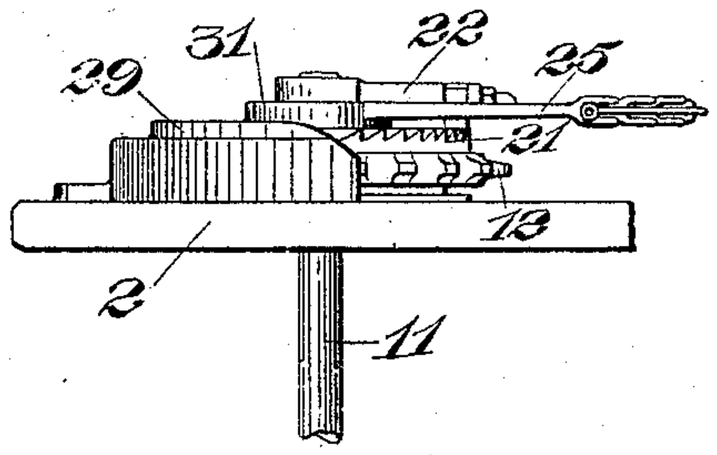


Fig. 5.

Fig. 6.

Witnesses.
E. Eastberg.
J. Dorse

Inventor.
Joseph Barker
By Geo. H. Strong. Atty

UNITED STATES PATENT OFFICE.

JOSEPH BARKER, OF CARSON CITY, NEVADA.

WINDMILL.

No. 842,054. Specification of Letters Patent. Patented Jan. 22, 1907.

Application filed November 15, 1905. Serial No. 287,423.

To all whom it may concern:

Be it known that I, JOSEPH BARKER, a citizen of the United States, residing at Carson City, in the county of Ormsby and State of Nevada, have invented new and useful Improvements in Windmills, of which the following is a specification.

My invention relates to windmills.

It consists of the parts and the construction and combination of parts, as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a side elevation, in partial section, of my invention. Fig. 2 is a detail and partial section of a sail-frame-locking device. Fig. 3 is a cross-section on line X X, Fig. 2. Fig. 4 is a plan view representing diagrammatically the several positions assumed by a vane at different periods during a single revolution of a vane-supporting arm. Fig. 5 is a plan view of the ratchet mechanism. Fig. 6 is a side elevation of the same.

A represents a framework or tower of any suitable size, construction, and material. Suitably mounted on this tower to rotate about a vertical axis is a frame 2, having a central hollow hub portion and radial arms at the ends of which are pivotally mounted on vertical axes the sails 3. There may be any number of arms carried by this horizontal rotatable frame, and the arms may be of any desired length and width. A machine which I have built and operated successfully has a frame forty feet in diameter. The frame is constructed of suitable material, and the arms are trussed and braced, so as to withstand the heavy strains to which the apparatus may be subjected by the force of the wind. The frame 2 is preferably supported at the top and bottom on antifrictional bearings 4 5.

The sails are made of canvas or other suitable fabric, stretched and secured to a frame 6, which latter is fulcrumed, as at 7, and a little to one side of the center of its ends to a second frame 8. The frames 6 and 8 are maintained normally in the same vertical plane by means of a suitable spring-latch mechanism carried by the frames. As here shown, the bottom bar of frame 8 has a keeper part 9, while the lower bar of the inner frame 6 carries a corresponding spring-actuated latch member 10. The stiffness of the latch member 10 is suitably proportioned to the differences in area of the two portions of the sail on opposite sides of the pivot 7, so that when the pressure on the sail reaches a point as to endanger the structure the latch 10 will give and the sail will swing out into a horizontal plane and offer no further resistance to the wind. Of course the sail could be attached directly to the frame 8, the object of the inner frame 6 being simply as a matter of precaution against the destructive force of very high winds.

The sail, with its frames 6 and 8, constitutes what I shall hereinafter term a "vane." Each radial arm of the rotatable frame 2 is provided with a vane, and these several vanes are suitably mounted to turn on vertical axes and to have a certain rotative movement independent of the frame 2. By this independent rotative movement of the vanes the frame 2 is made to revolve and the resulting power transmitted to a main power-shaft.

In the embodiment of my invention I have shown each frame 8 as fixed to a vertical shaft 11, which is suitably supported to rotate in the top and bottom bars of a radial arm of the frame 2. The upper end of the shaft 11 carries a loose sprocket 12. The inner end of the arm carries a corresponding sprocket 13, but of only half the diameter of the sprocket 12. An endless chain 14 passes around these two sprockets. The shaft of the inner sprocket 13 carries a gear 15, meshing an idle gear 16, carried by the frame 2. This idle gear 16 meshes with a large gear 17, which is loose on a central stationary support 18. This gear 17, however, is adapted to be locked against rotation by suitable means, as the clutch 19, which is here shown as comprising a disk with a lug on its under side mounted on the non-rotatable reciprocating shaft or rod 20, which extends centrally through gear 17 and is suitably supported in a fixed part 18 of the frame. Normally with the clutch member 19 lifted, as shown in Fig. 1, the gear 17 is free to turn and the mill is in inoperative position.

The sprocket 12, which, as before stated, is mounted loose on the vane-shaft 11, has a ratchet portion 21, fixed rigid to its upper surface, so that the ratchet always turns with the spocket. The shaft 11 carries a radially-extending arm 22, to which is pivoted a pawl 23, engageable with the ratchet 21, in order to revolve this sprocket in unison with the shaft 11 when the vane is turned in one direction. Any force acting on the

vane in an opposite direction leaves the pawl 23 free to ride over the teeth of the ratchet 21. As will be more fully explained hereinafter, certain provisions is made by means of the extension 24 of the arm 22 and the springs 25 and connecting-rod 26, whereby the apparatus is protected against shock and possible breakage when a vane is veered around suddenly to bring the pawl into engagement with the ratchet.

Referring to Fig. 4, the operation of the device is substantially as follows: Assuming that clutch 19 is engaged with gear 17 to lock the latter against rotation and with the wind blowing from the north and with an arm of the frame and its vane to be in position indicated in full lines, the frame will move to the left in the direction of the arrow, while the vane moves in the direction of the hands of a watch. Since the sprocket 13 is one-half the size of sprocket 12, the latter and its vane will move forty-five degrees for each ninety degrees described by or quarter-revolution of the frame. The rotative motion imparted to the vane by the force of the wind is transmitted through the connections shown with the stationary gear 17 to propel the frame and to transmit the power to the driveshaft 27.

Any suitable form of connections may be employed between the frame and driveshaft. In the present instance I have shown the shaft 27 as having a gear meshing the internal gear 28 on the frame 2.

At that point in the revolution of the frame where the vane is brought into neutral position with the wind, so that no force is exerted on the vane to propel the frame, the pawl will be lifted by appropriate means to disengage it from the ratchet, so that the vane can swing freely back into position behind its radial support, relock itself, and again present itself at the proper moment and at the proper angle to the wind to assist in propelling the frame 2 always in the same direction. For this purpose I have shown the radial support 2 as having a segmental guide 29 on its outer end arranged in the path of the pawl. Whenever the vane is brought so that its plane lies in the line of the direction of the wind, a pin 30, which projects laterally from the pawl 23, will encounter the stationary guide 29, lift the pawl, and free the ratchet. When the pawl is disengaged from the ratchet and held out of interference therewith, the vane is free to swing in the same direction in which it has been applying power to rotate the ratchet and sprocket 12. Since the pawl is always free to slide backward over the teeth of the ratchet, it is seen that by the employment of the guide or stop 29 under certain conditions the vane is capable of a rotative movement in either direction independently of its sprocket and ratchet.

Since there are always employed a plurality of radially-supported vanes with their individual driving connections, it is understood that a constant rotative motion in the same direction would be imparted to the frame 2, so that although a vane is capable of the independent rotative motion mentioned the ratchet and sprocket of each vane continues its rotation, although always in the direction opposite to that of the frame 2.

When the pawl 23 is lifted by the guide 29, the wind will swing the vane around in one direction or the other to trail out behind its radial support. Eventually the pawl rides off the guide 29 and engages again with the ratchet, so that the propulsion of the frame is gradually resumed by this vane.

In case of a high wind where the veering of the vanes may be sudden and frequent, it is desirable to provide a means of absorbing the shock that might otherwise result by the sudden stoppage of the pawl against a tooth of the ratchet. Accordingly the shaft 11 has a collar or hub 31, to which the radial spring members 25, previously referred to, are secured. These spring members and the hub 31 always revolve in unison with the shaft and are quite independent of the ratchet and sprocket 12. The pawl-carrying arm 22, also carried by the shaft 11, is capable of a limited rotative movement on the shaft 11 independently of the rotative movement of the latter.

The arm 22 has its hub provided with an internal groove 32 and a radial stop 33 on shaft 11 engages the end wall of its groove to limit the movement of the arm 22 on the shaft. The rod 26 is rigid and is locked to the springs 25 and also to the extension 24 of the arm 22. The springs 25 and stops 32 33 are so positioned relative to each other that the springs always act on the extension 24 to hold the stop 33 against one end of the slot 32.

The tension of the springs 25 is such that the stops 33 will always be maintained against the end of the slot 32 in the position shown in Fig. 5, except in cases of extraordinary pressure being brought to bear on the vane in the same direction in which the projection 33 is pressing on the arm. The springs will then give to absorb the shock, which would otherwise be transmitted to the ratchet and sprocket.

By throwing the clutch 19 out of engagement with the gear 17 the latter is left free to revolve, which results in the stoppage of the frame 2. In the event of very high winds the sails 3 are capable of being thrown into a horizontal innocuous position by reason of the disengagement of the latch members 10, previously described.

To illustrate the operation of a vane in case the wind should suddenly veer from north to northeast, reference is made to Fig. 4. With a vane in the successive positions

shown the only effect would be that the vane would swing back earlier on its pivot, as on its coming into line with wind, than when the wind was from the north. Thus with the wind from the north the vane is shown as swinging free when it reaches its farthermost position to the right of Fig. 4. With the wind veering to the northeast the vane would reverse when it was about the lowest point on the drawing, the reversing of the vane taking place according to variations in pressure on the two sides of the vane. When the pressure is on the side which carries the pawl to engage with or "push" on the ratchet, the vane operates to propel the frame. Changing the pressure to the opposite side of the vane naturally reverses the vane, and the pawl slips free over the ratchet or over the guide 29 until the opposite side comes into the wind again. When the guide 29 does not interfere, the pawl catches again in the ratchet. Of course in a very high or variable wind the apparatus would be placed in inoperative position, so that neither the vanes nor the frame would revolve. It is understood that the apparatus would generally be worked under favorable conditions with the wind continuing for a moderate length of time at least in the same direction. Under such circumstances the vanes are operative as propellers during a major part of their three hundred and sixty degrees of travel. A change of the wind to another direction does not alter the principle of operation of the vanes, but merely the time of their operation.

It is possible that various modifications in my invention may be made without departing from the principle thereof, and I do not wish to be understood as limiting myself to my specific construction beyond what is required by a reasonable interpretation of my claims.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A power-windmill comprising a frame mounted to rotate on a vertical axis, vertical shafts carried by said frames, vanes fixed to said shafts, coacting clutch members on the shafts and frame, a rotatable part mounted on the fixed support, means for locking said rotatable part against turning, and connections between said shafts and said rotatable part to govern the rotative movements of the vanes on their axes.

2. A power-windmill comprising a frame suitably supported to rotate on a vertical axis, pivotally-supported vanes carried by the frame, means including a pawl-and-ratchet mechanism for holding the vanes in operative position relative to the wind, and drive connections between the vanes and a stationary part of the apparatus to rotate the vanes.

3. A power-windmill comprising a suitably-supported rotatable frame, pivotally-supported vanes on the frame, drive connections between the vanes and a stationary part of the apparatus, to rotate the vanes on their pivots and means including a pawl-and-ratchet mechanism for causing the vanes to present themselves in operative position to the wind.

4. In a windmill, the combination of a rotary support, a vane mounted to rotate on a vertical axis on said support, pawl-and-ratchet mechanism permitting a rotative movement of the vane independent of the support and means acting through said pawl-and-ratchet mechanism to rotate the vane on the rotation of the support.

5. In a windmill, the combination of a rotary frame, a vane pivoted thereon, a pawl carried by the vane, a ratchet on the frame engageable by said pawl, a guide to lift the pawl, and disengage the latter from the ratchet and chain, and sprocket connections between the vane and a fixedly-supported part of the apparatus.

6. In a windmill, the combination of a main frame mounted to rotate on a vertical axis, vertical pivot-shafts on said frame, sail-frames fixed to said shafts, sails pivoted in said sail-frames to turn on horizontal pivots, means for maintaining the sails in operative position in said sail-frames, pawl-and-ratchet connections between the shafts and main frame to permit the shafts to turn freely in one direction, and means connected with the shafts to rotate the latter in a direction opposite to the rotation of the main frame.

7. In a windmill, the combination of a rotary support, a series of vertical shafts pivotally mounted on said support, vanes fixed to said shafts, sprockets loose on the shafts, ratchets rigid with the sprockets, pawls suitably supported to rotate with the shafts and engageable with the ratchets, other sprockets arranged centrally of the support, chains passing around the first-named sprockets and around corresponding of said inner sprockets, and means actuating the inner sprockets to rotate the vanes in a direction opposite to the direction of rotation of the frame on the engagement of said pawls with said ratchets.

8. In a windmill, the combination of a rotary support, a series of vertical shafts pivotally mounted on said support, vanes fixed to said shafts, sprockets loose on the shafts, ratchets rigid with the sprockets, pawls suitably supported to rotate with the shafts and engageable with the ratchets, other sprockets arranged central of the support, chains passing around the first-named sprockets and around corresponding of said inner sprockets, means actuating the inner sprockets to rotate the vanes in a direction opposite to the direction of rotation of the frame on the engagement of said pawls with said ratchets,

and means in the path of the pawls to disengage the latter from their respective sprockets and permit the vanes to swing freely on their pivots.

9. In a windmill, the combination of a rotary support, a series of vertical shafts pivotally mounted on said support, vanes fixed to said shafts, sprockets loose on the shafts, ratchets rigid with the sprockets, pawls suitably supported to rotate with the shafts and engageable with the ratchets, other sprockets arranged central of the support, chains passing around the first-named sprockets and around corresponding of said inner sprockets, means actuating the inner sprockets to rotate the vanes in a direction opposite to the direction of rotation of the frame on the engagement of said pawls with said ratchets, means in the path of the pawls to disengage the latter from their respective sprockets to permit the vanes to swing freely on their pivots, and means acting through the pivots of the vanes to absorb shock on the sudden turning of the vanes on their pivots.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOSEPH BARKER.

Witnesses:
S. H. NOURSE,
HENRY P. TRICOU.