No. 674,042. Patented May 14, 1901.

A. M. SPRINGER.

WINDMILL.

(Application filed May 12, 1900.)

(No Model.) 3 Sheets—Sheet 1.

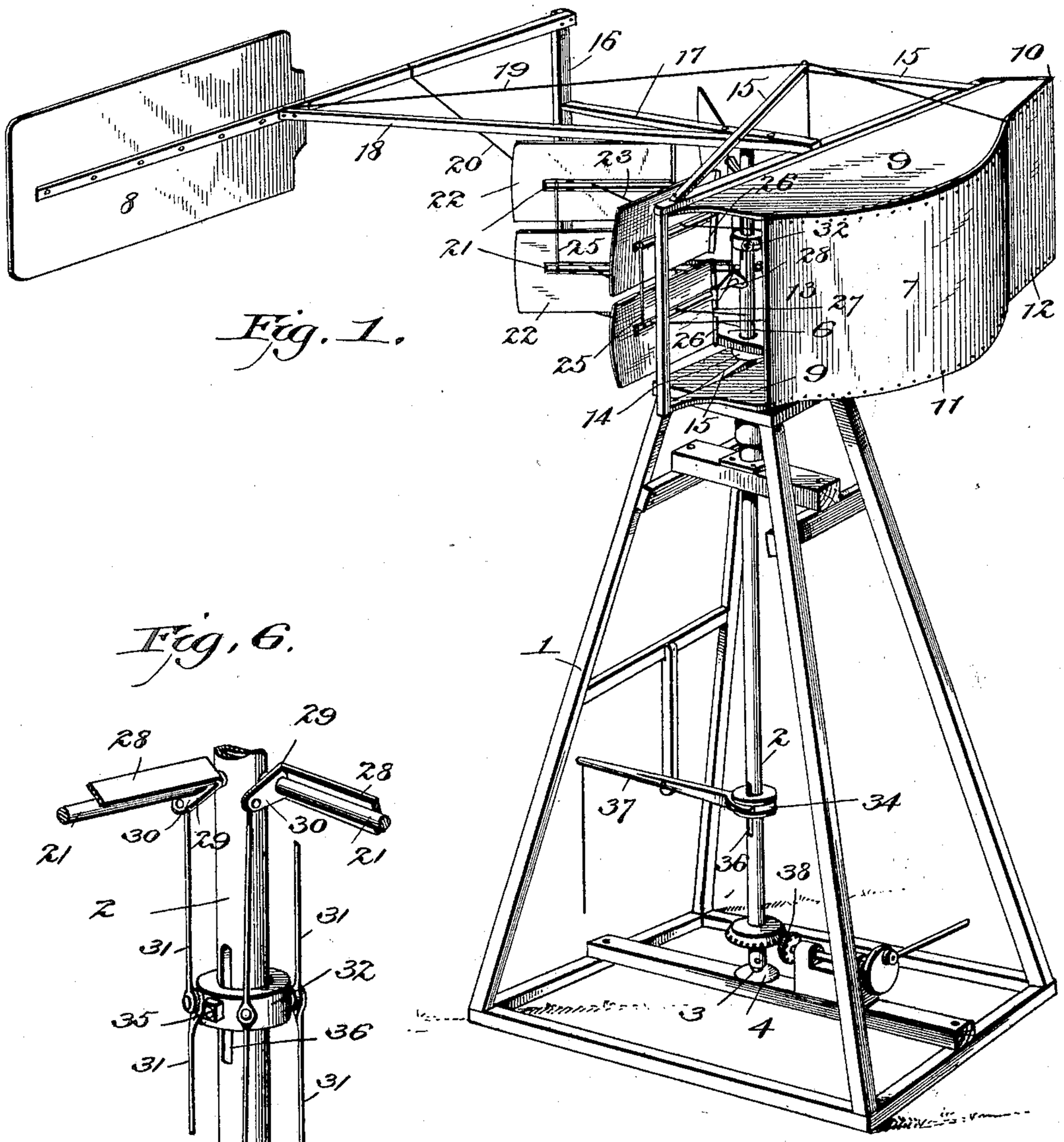


Fig. 1.

Fig. 6.

Witnesses
Wm. J. Linden.
Clarence Shaw

Inventor:
Aaron M. Springer,
Dinsmore & Co
By Attorneys

No. 674,042. Patented May 14, 1901.

A. M. SPRINGER.

WINDMILL.

(Application filed May 12, 1900.)

(No Model.) 3 Sheets—Sheet 2.

Fig. 2.

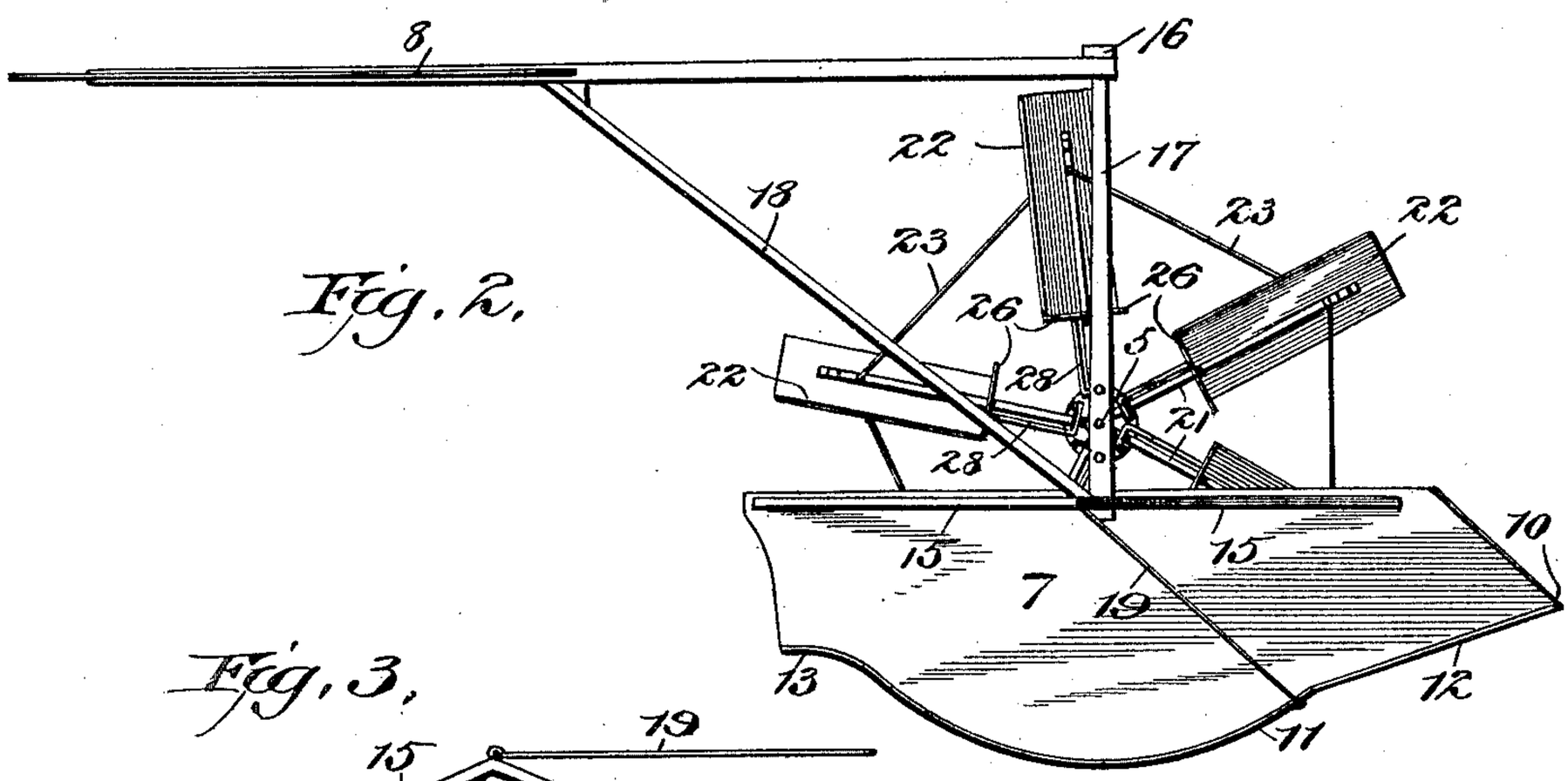


Fig. 3.

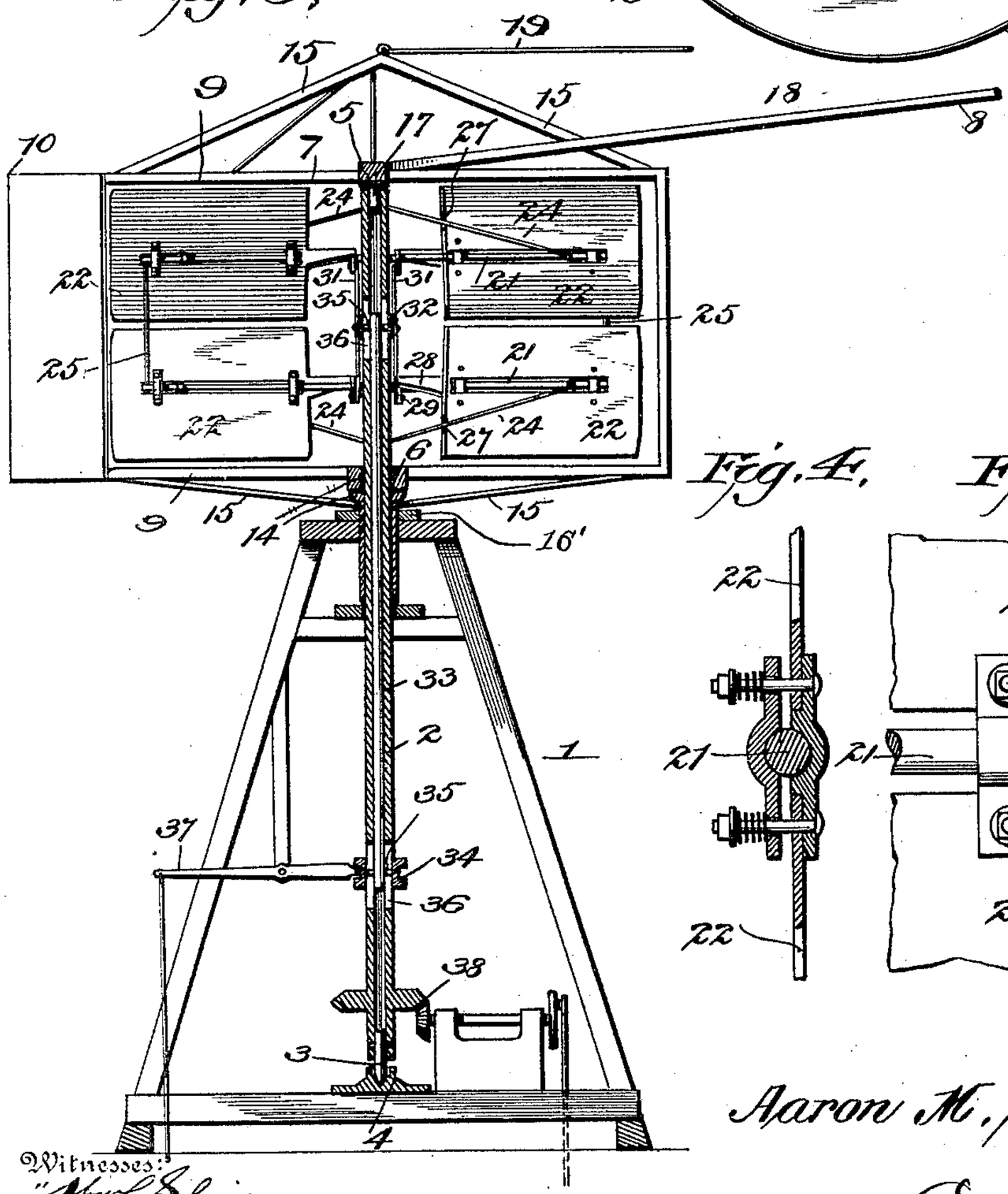
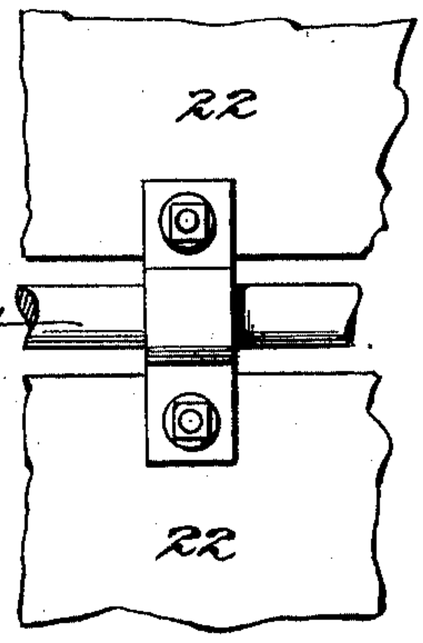


Fig. 4.

Fig. 5.



Witnesses:
W. L. Sheiden
Clarence Shaw

Inventor:
Aaron M. Springer,
By Munn & Co
Attorneys

No. 674,042. Patented May 14, 1901.

A. M. SPRINGER.

WINDMILL.

(Application filed May 12, 1900.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 7.

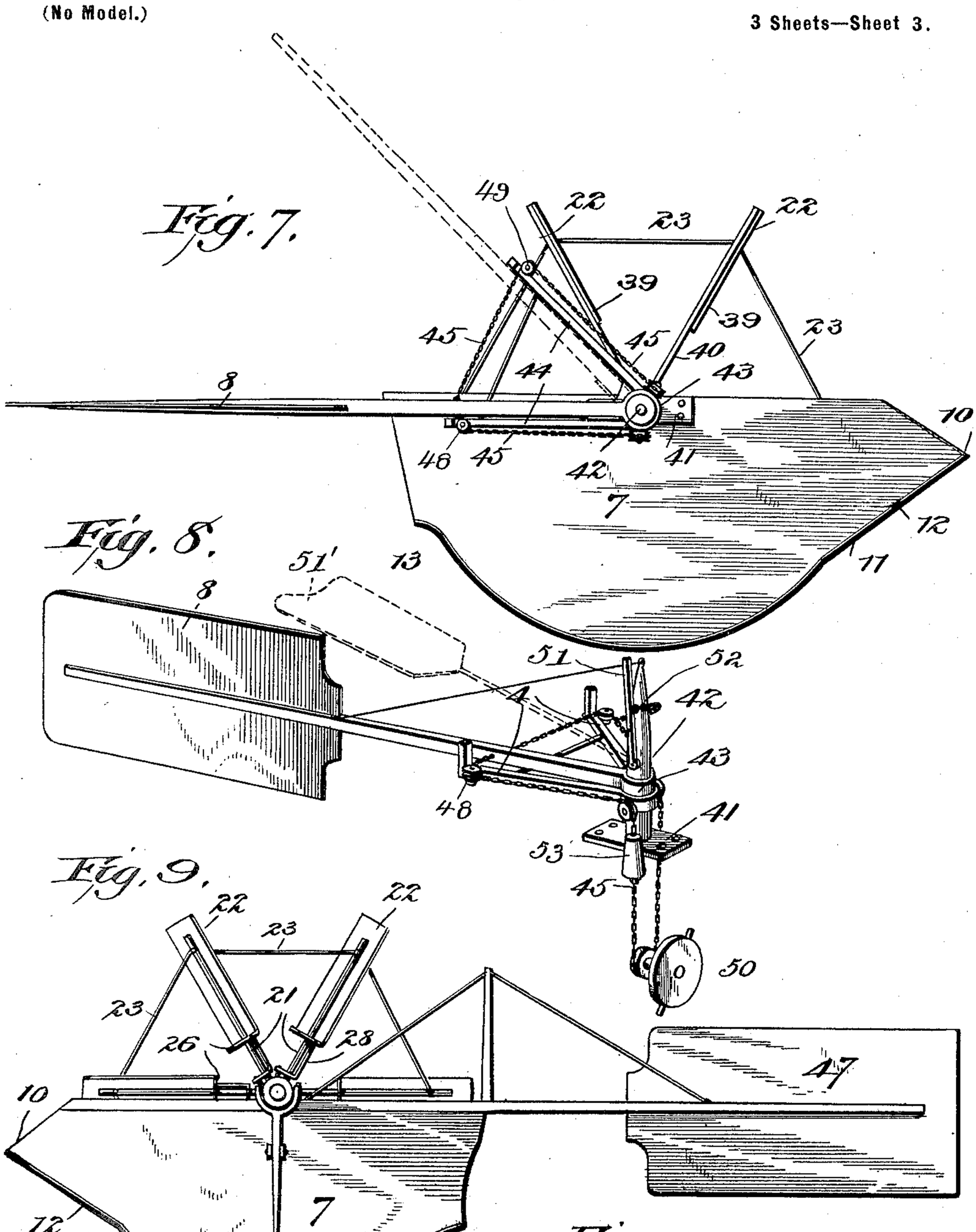
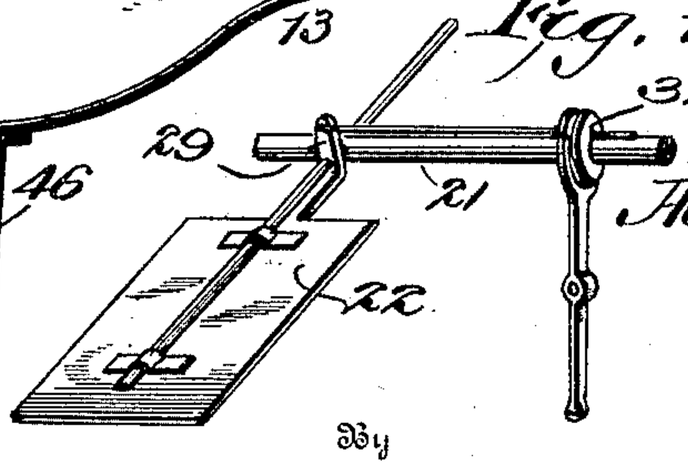


Fig. 8.

Fig. 9.

Fig. 10.



Witnesses:
Wm. L. Spencer
Clarence Shaw

Inventor:
Aaron M. Springer,
By Orwig & Co.
Attorneys

UNITED STATES PATENT OFFICE.

AARON M. SPRINGER, OF PORTLAND, OREGON, ASSIGNOR OF ONE-HALF TO FRANK G. COLES, OF SAME PLACE.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 674,042, dated May 14, 1901.

Application filed May 12, 1900. Serial No. 16,467. (No model.)

To all whom it may concern:

Be it known that I, AARON M. SPRINGER, a citizen of the United States, residing at Portland, in the county of Multnomah and State of Oregon, have invented a new and useful Windmill, of which the following is a specification.

My invention relates to wind-wheels; and it has for one object to produce a mill of this kind which is adapted for use upon towers or buildings or can be placed upon the ground and which will utilize the force of the wind in either of said locations.

Another object is to provide a movable casing or shield within which the vanes revolve or move in the direction toward the wind and beyond which they move with the wind.

Another object is to provide means for rotating the casing in accordance with the varying directions of the wind and in a vertical mill in providing means for counterbalancing the weight of the casing.

Another object is to so construct the vanes that they may be readily adjusted or regulated to suit conditions.

With these objects in view my invention consists in the improved construction and novel arrangement of parts of a mill, as will be hereinafter more fully set forth.

In the accompanying drawings, in which the same reference-numerals indicate corresponding parts in each of the views in which they occur, Sheet 1, Figure 1, is a perspective view of a windmill constructed in accordance with my invention. Sheet 2, Fig. 2, is a top plan view of the same. Sheet 2, Fig. 3, is a vertical sectional view. Sheet 1, Figs. 4, 5, and 6, are detail views. Sheet 3, Fig. 7, is a top plan view of a modification. Sheet 3, Fig. 8, is a detail view of the same. Sheet 3, Fig. 9, is a side elevation showing my invention embodied in a horizontal mill. Sheet 3, Fig. 10, is a detail of the same.

Referring more particularly to the drawings, 1 indicates the frame or support for my improved windmill, which may be of any suitable style and construction and which may be located upon a building or upon the ground, or it may be in the form of the ordinary tower. Journaled vertically within the support is a shaft 2, which is preferably hollow and provided at its lower end with a plug or gudgeon 3, which is supported in a suitable step or seat 4 and journaled in a suitable bearing 5 at the top of the support. Each of the bearings is preferably provided or formed with an oil-chamber, within which a sufficient quantity of oil may placed to supply the mill for some length of time, thereby avoiding the necessity of constant attention. Any ordinary means may be provided for emptying the cups or bearings of waste oil and supplying its place with fresh oil.

Journaled loosely upon the shaft at the top of the support is a cross-arm 6, upon one end of which is rigidly secured a drum or casing 7 and upon the other end the vane 8 for controlling the movements of the casing and holding it in the proper relation to the wind. The casing comprises a top and bottom piece 9, each of which is somewhat semicircular and has its forward end sharpened to a point, as at 10. The side 11 is preferably formed from metal and is secured at its edges to said top and bottom pieces to form a wedge or inclined portion 12 and having its opposite end terminating at a short distance from the straight edges of the side piece and bent slightly to the rear, as shown at 13, thereby forming an opening or exit for the escape of the wind after it has acted upon the wheel. The cross-piece 6 is preferably formed with a suitable casting 14, which rests upon the ordinary wearing-plate 16′ at the top of the support and steadies the mill in its operation. Support or brace rods 15 extend from the ends of the casing at the top and bottom to give greater strength and rigidity to the structure, those at the bottom preferably bearing with their inner ends against the sides of the casting 14.

The regulating-vane 8 is preferably bolted to the top of a standard 16, which is secured at its lower end to the outer end of the arm 6 and is braced near its upper end with a brace-arm 17, which extends outwardly from the top of the casing directly in line with the upper end of the shaft 2, which is journaled therein. A diagonal brace-arm 18 extends from the top of the casing, near the inner end of the arm 17, outward to the main arm of the vane 8. Two brace-rods 19 and 20 extend

from the vane to the casing and to the lower end of the standard 16, respectively, the rod 19 passing over the top or apex of the supports 15 at the top of the casing. By arranging the casing and the vane in this manner they will virtually counterbalance each other upon the shaft, and thereby prevent all lateral strain upon the latter and permit of the casing being moved into the wind very readily by the pressure upon the vane.

Projecting radially from the shaft 2 are a series of rods or arms 21, upon each of which is journaled a vane or blade 22 of the windwheel. These arms are preferably braced against movement by rods 23, which extend from one arm to the other, and rods 24, which extend diagonally from the arms near their outer ends to the shaft at a suitable distance from the point of attachment of the arm. These arms are preferably arranged in pairs, and the outer end of the corresponding arms of each set or pair is braced by means of a vertical stay-rod 25.

The vane upon each arm is preferably journaled so as to be rotated axially thereon for the purpose of regulating the action of the wheel. If desired, the bearings for the vanes upon the arms may be formed of two members, which are yieldingly secured together to permit of the easy rotation of the vanes, yet at the same time all noise and play of the parts is avoided. One form of constructing this bearing is to form the two faces of the bearing of sufficient size to engage with the rod or arm and to make the bolts for securing them together of a sufficient length to extend to a distance beyond one of them and place a spring between the nut at its outer end and the other half of the bearing, whereby the tension of the spring will always hold the bearings together with a sufficient force to prevent any noise or racket. The inner end of each of these vanes is provided with a lip or flange 26, which extends entirely across it and is provided with a notch or recess 27 to prevent its engaging with the brace-rods 24 when rotated so as to stand substantially vertical with each other and with the shaft 2. The lips or flanges of the vanes are bent so as to extend to the rear as the wheel revolves, so that when the point of the vane passes the inner or rear edge of the wedge 12 the current of air will pass in under the vane and be caught by the flange and retarded, thereby causing the wind to crowd or force the vanes around until they can be caught more fully by the current of air and carried forward. The flanges of the two vanes on each set of rods are preferably arranged at an angle to each other, so as to deflect the impounded air slightly to the sides of the casing and permit it to escape before its pressure becomes great enough to retard the forward progress of the succeeding vanes.

Extending inward from each vane to the shaft of the mill is a sleeve or arm 28, which is provided at its inner end with a head 29, which is journaled upon the inner end of the arm 21. Each of the heads is provided with a perforated projection 30, within which is pivotally secured the end of a rod 31. Each of the rods 31 is connected with a sleeve 32, which slides freely upon the shaft 2 and by means of which the vanes may be thrown into or out of operative position by feathering them to a greater or less extent. In the form of mill shown in the drawings the blades are arranged to be feathered or rotated in opposite directions—that is, those upon the upper set of arms being rotated in one direction and those upon the lower being rotated in the opposite direction. In this manner when the blades are being feathered or thrown out of the wind the current of air is divided and the force is diminished correspondingly, whereas if the vanes were feathered toward each other the current of air would be thrown to the adjacent edges of the blades and the power would not be decreased to such an extent as by deflecting it in the opposite direction.

By increasing the vertical capacity of the casing it is evident that any desirable number of sets of blades or vanes may be arranged within the casing one above the other, thereby increasing the capacity of the mill to suit circumstances. By increasing the number to a sufficient extent the support or standard may be located directly upon the ground, thereby avoiding the costly tower, as the support may be braced or rigidly secured in its vertical position by the ordinary guy-rods. The sleeve 32 is moved upon the shaft by means of a rod 33, which extends longitudinally of the shaft, preferably upon the inside, and is connected at its lower end with a sleeve or collar 34. The sleeves are connected with the rod by means of bolts 35, which pass through slots 36 in the shaft 2. A suitable lever 37 is pivotally secured to the frame in position for its inner end to engage with the sleeve or collar 34 and move the shaft and collars as the lever is swung upon its pivot, thereby adjusting the position of the blades of the mill to suit the condition of the wind and the work to be performed. If desired, a suitable weight may be placed upon the lever to assist the governor in regulating the speed of the mill. As the rotation of the mill in this position would probably not be so great as when placed at a higher elevation, the gearing 38 at the bottom of the shaft could be varied to suit circumstances and transmit the entire power of the mill to a different point, as desirable. Where the shaft is provided with a series of wheels in this manner, it must be slotted longitudinally for each wheel or set of wheels and provided with a separate regulating-collar, which is secured thereto by means of a bolt in the same manner as where there is only the one wheel.

In the form of mill shown in Fig. 7 the blades or vanes of the wheel are not adjustable, but are formed rigid—as, for instance, by securing boards 39 vertically to suitable cross-arms

40, which project from the operating-shaft of the mill—thereby rendering the construction of the mill cheaper and not so liable to be broken or thrown out of order as where the blades are movable. In this form of mill the drum is preferably provided with a plate 41, from which projects vertically a stem 42, which extends up from the top of the drum or through the support and upon which the vane 8 is pivotally mounted by means of a suitable sleeve or collar 43. Two arms 44 extend radially from the sleeve, between which the arm of the vane can be moved back and forth by means of a chain or regulator 45, which runs over pulleys 48 and 49 at the outer ends of the arms, and are connected with the vane upon opposite sides. The chain extends down to the bottom of the mill to any suitable point and is provided with means, as a hand-wheel 50, by which it may be moved longitudinally. By moving the chain in this manner the vane may be moved from the position in which it is substantially parallel with the straight side of the drum, which will cause the wedge or pointed end of the drum to project into the wind to a position at a greater or less angle thereto, which will cause the point of the drum to be brought to one side, which will throw a greater portion of the wheel out of the current of air, and thereby decrease its power.

If desired, an automatic governor or regulator can be connected with the vane 8 through the chain 45, as by pivotally securing an auxiliary vane 51 to the stem 42 and connecting it with the chain 45 by means of a chain 52, which passes around the stem. When the wind becomes too strong, as in a sudden gust or breeze, the auxiliary vane is swung back, as shown in dotted lines in Fig. 8, which will pull the vane 8 around toward the position shown in dotted lines in Fig. 7. A weight 53 may be connected with the chain 45 at any desired point to counterbalance the vane 51 to return the parts to their normal position as soon as the excessive wind has passed and the wind has assumed its normal velocity.

In the form of mill shown in Fig. 9 the drum or casing is arranged horizontally—that is, with the sides in a vertical position—and the shaft arranged horizontally. In this construction the bottom or rounding portion of the drum is provided with a suitable stem or projection 46, which is suitably journaled in the standard and upon which the drum may revolve to correspond with the direction of the wind. The regulating-vane 47 is preferably secured directly to the rear of the drum and is arranged vertically relatively thereto, so as to be acted upon by the wind and shifted to one side or the other in the same manner as where it controls the operation of the vertical mill.

The construction and operation of the blades of the wheel and their position relative to the drum or casing are substantially the same as with the vertical mill and need no further description. However, instead of the governor mechanism passing up through the vertical rod it is preferably passed up at one side or the other of the drum and is connected with a sleeve which will slide back and forth upon the shaft in the same manner as described for the collars or sleeves 32 upon the vertical mill.

From the foregoing description it will be seen that a mill constructed in accordance with my invention will possess great power, as the current of air in striking the point or nose of the drum will be divided, part of it being deflected around the smooth semicylindrical surface of the drum and the remaining portion being deflected up the inclined wedge-like portion of the drum until it engages with the tip of the blades of the wheel and rapidly carries them forward until they stand at a greater or less angle to the straight side of the drum, when they receive the full force and power of the wind and transmit it through the shaft and gearing to the place desired. With the least variation in the direction of the wind the drum or casing is automatically swung around to correspond therewith by the action of the regulating-vane upon the side of the shaft opposite from the casing. The speed of the mill is automatically regulated by the governor, and in case of a sudden gust of wind the mill is automatically thrown out of gear by having the blades of the wheel feathered or turned edgewise to the force of the wind.

By constructing the mill in accordance with the modifications I have shown it can be adapted for different positions and purposes, and I reserve to myself the right to make such other changes and variations in the construction of the mill as will come within the scope of my invention.

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

1. In a windmill, the combination, with a support, of a drum or casing mounted thereon, one side of which is straight and open and the other side is curved and closed and one end is substantially wedge-shaped and the other end is open, of a shaft journaled transversely across the open side of the drum, of vanes secured to the shaft, the inner end of each of which is bent at an angle and extends to the rear in the line of travel of the wheel, substantially as described.

2. In a windmill, the combination, with a support, of a drum or casing mounted thereon, one side of which is open and the forward end is provided with an inclined portion, of a shaft journaled transversely across the open side of the casing, and a series of radially-arranged rotatable blades arranged in pairs upon the shaft, the rear end of each of said blades being bent at an angle and projecting to the rear, the flat portions of the blades of each pair being adapted to be placed at an angle to each other, substantially as described.

3. In a windmill, the combination, with a support, of a drum mounted thereon, one side of which is open and the forward end is inclined, of a shaft journaled transversely across the open side of the drum, of radially-extending arms secured to said shaft, said arms being arranged in pairs, of a blade rotatably mounted upon each arm, a collar upon the shaft, a rod from each blade to said collar, and means for moving the collar upon the shaft and rotating the blades upon the arms, substantially as described.

4. In a windmill, the combination, with a support, of a casing mounted thereon, one side of which is open and the front end is inclined, of a hollow, longitudinally-slotted shaft journaled transversely across the open side of the casing, of arms projecting radially from the shaft at each side of the slot, blades rotatably mounted upon said arms, each of which is provided with an extension the head of which is adjacent to the shaft and provided with a crank-arm, of a collar upon the shaft intermediate said arms, a rod from each crank-arm to said collar, a rod within the shaft, a bolt extending through the collar and through the slot and the rod within the shaft, and means for moving said rod longitudinally, substantially as described.

5. In a windmill, the combination, with a support, of a shaft journaled vertically therein, of a cross-arm at the top of the support, a drum at one end of the arm and a standard at the other, a cross-piece extending from the top of the drum to the standard, braces at the top and bottom of the drum, a vane secured to the upper end of the standard, a brace extending over the top of the drum to the vane, and brace-rods extending from the vane to the drum and to the bottom of the standard respectively, the rod to the drum passing over the top of the braces on top of the drum, substantially as described.

AARON M. SPRINGER.

Witnesses:
C. W. ROOT,
A. H. WITHINGTON.