2 Sheets—Sheet 1.

G. MABIE.

WIND-MILL.

No. 172,755. Patented Jan. 25, 1876.

Fig. 6.

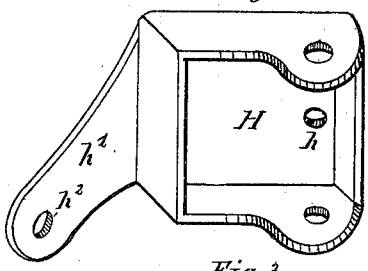

Fig. 7.

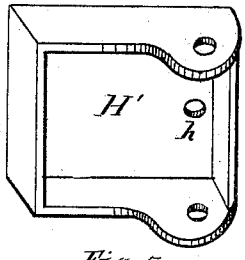

Fig. 3.

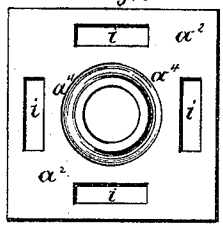

Fig. 5.

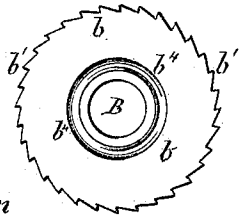

Fig. 2.

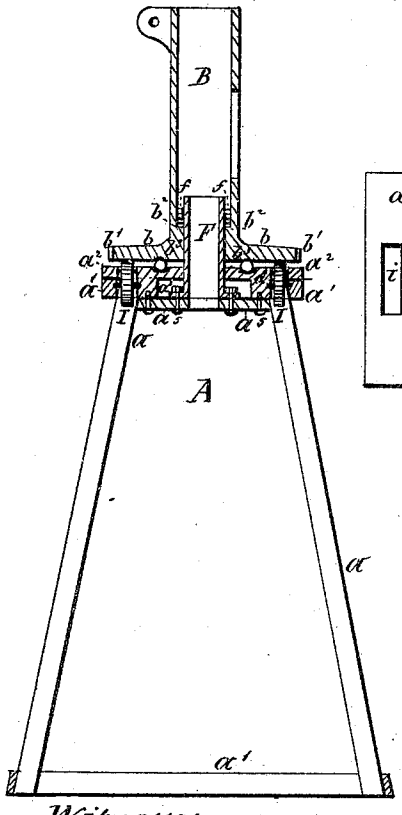

Fig. 4.

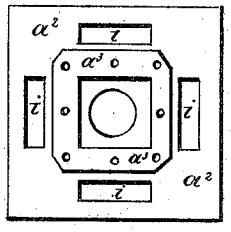

Fig. 1.

Witnesses
Henri Guillaume
Chas Jacobsen

Inventor
Giles Mabie
per Henry Orth
atty.

2 Sheets—Sheet 2.

G. MABIE.

WIND-MILL.

No. 172,755. Patented Jan. 25, 1876.

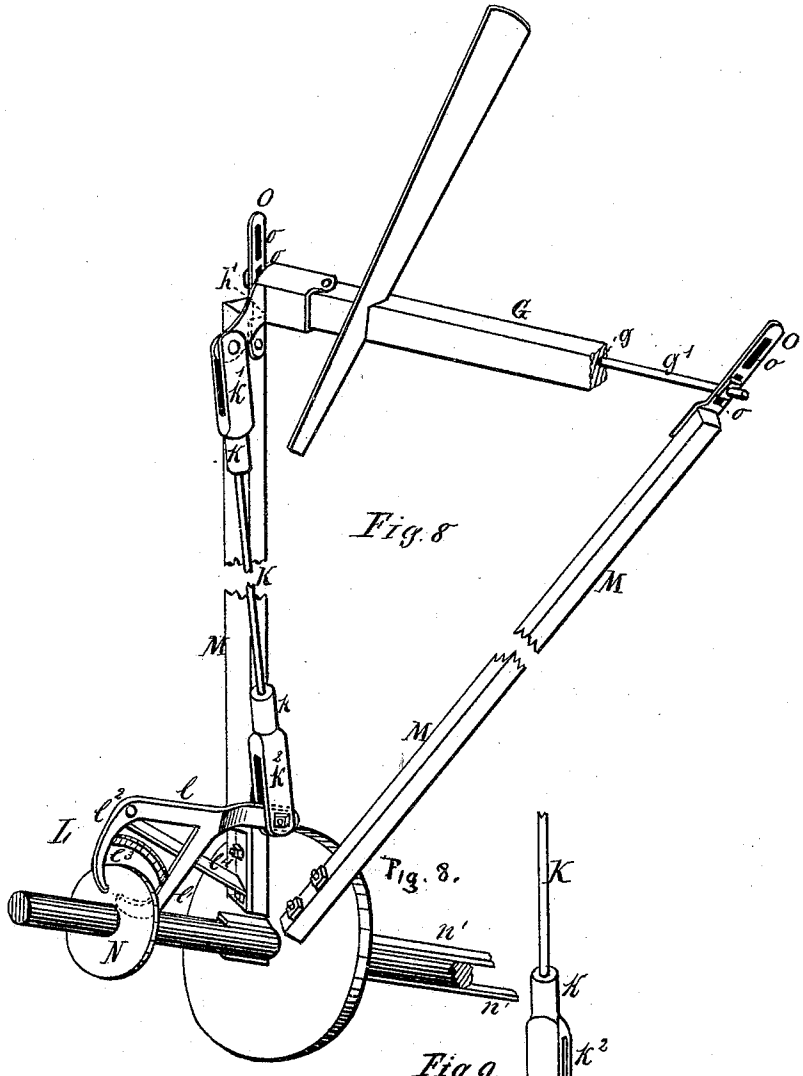

Fig. 8

Fig. 8.

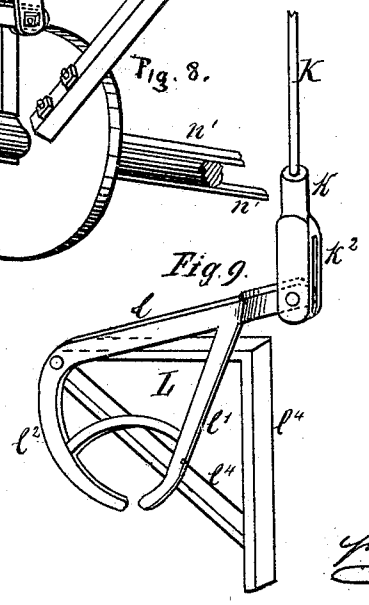

Fig. 9.

Witnesses
Henri Guillaume
Chas Jacobsen.

Inventor
Giles Mabie
by Henry Orth
atty.

UNITED STATES PATENT OFFICE.

GILES MABIE, OF MOLINE, ILLINOIS.

IMPROVEMENT IN WINDMILLS.

Specification forming part of Letters Patent No. **172,755**, dated January 25, 1876; application filed November 20, 1875.

To all whom it may concern:

Be it known that I, GILES MABIE, of Moline, in the county of Rock Island and State of Illinois, have invented certain new and useful Improvements in Windmills, of which the following is a specification:

My invention relates, first, to means for holding the mill to the wind when it is used as a power-mill for doing heavy work, such as the grinding of grain, &c., and to devices for facilitating the rotation of the vertical standard on the tower-platform; secondly, my invention relates to a peculiar construction of the hollow cylinder, in combination with a short cylinder connected to the tower-platform, whereby "the jumping" of the hollow vertical standard, when the mill is doing heavy work or the wind is very high, is prevented; thirdly, to novel devices for adjusting the fan-bars, and, consequently, setting the fans in their proper position before the wind and to novel means for shifting the fan-bars and fans, and adjusting them in any desired position to "catch" the wind or throw them out of the wind, as required.

But that my invention may be fully understood I will proceed to describe the same in detail by aid of the accompanying drawings, in which—

Figure 1 is a vertical elevation, and Fig. 2 a vertical transverse section, of a mill, constructed according to my invention. Fig. 3 is a top plan view of the tower, the vertical standard removed. Fig. 4 is an under-side view of the top plate of the tower. Fig. 5 is a similar view of the vertical hollow standard, and Figs. 6, 7, 8, and 9 are detached views of the adjusting and shifting devices and the end caps of the fan-bars.

Similar letters of reference are employed to represent corresponding parts wherever they may occur in the drawings.

A is the tower, consisting of the uprights *a*, base and top braces a^1, and the top plate a^2, secured together in any substantial and usual or preferred manner. B is the vertical cylinder or standard inclosing the working and shifting rods. This cylinder B is provided at its lower extremity with a broad rim or flange, *b*, covering nearly the top of the tower, the upper face of which has a slight inclination, so as to readily shed the water during rain storms. The periphery of this flange *b* is provided with a series of ratchet-teeth, b^1, formed thereon, or a ratcheted rim may be affixed to said flange, if preferred, in the teeth of which a dog or pawl, C, is made to catch or engage by means of a coiled or other spring; or a spring-pawl, constructed and arranged as shown, may be employed.

By means of the ratcheted flange or rim *b*, and the dog or pawl C, the wind-wheel is kept in any desired position before the wind, as it is obvious that when the dog or pawl C is engaged with one or the other of the ratchet-teeth b^1 the cylinder B is securely locked in position, thus effectually preventing the wheel from being turned out of the wind by the action of the stones or other mechanism when the mill is used as a power-mill and doing heavy work.

It is well known that when windmills are geared to mechanism for doing heavy work—such, for example, as the grinding of grain—the action of the stones, or more properly their resistance to the action of the wind-wheel, will cause the latter to be turned one-quarter more or less out of the wind. Various means have been employed to counteract this action, such as the employment of smaller wheels or vanes connected with the main driving-wheel by a a series of gearing, which vanes or smaller wheels are made to catch the wind as the main wheel is turned out of it, and bring the latter back to its required position, and other similar complicated devices have been used, whereby the defect mentioned has only been partially remedied, as the main wind-wheel is thrown considerably out of the wind before the auxiliary wheels are brought to face it, and through their action bring back the main wind-wheel to its required position before the wind.

When it is desired to shift the position of the wind-wheel upon a change of direction of the wind the dog is released from the ratchet-teeth by means of a lever, D, pivoted near the ground to one of the uprights *a*. To this lever one end of a cord or chain, *d*, is connected. This cord or chain *d* runs over a pulley, E, which has its bearings in the bracket *e* affixed to the top braces a^1 of the tower A, as shown

in Fig. 1. The other end of said cord or chain is connected to the dog or pawl C at or near the extremity thereof. It will thus be seen that upon bearing down the lever D the dog or pawl C may be readily disengaged from the ratchet-teeth of the rim or flange *b* through the medium of the cord or chain *d* running over pulley E.

The inner circumference of the lower part of the hollow standard B forms an inwardly-projecting concentric flange or shoulder, b^2, which, when the cylinder is in position, revolves with said cylinder B around a smaller cylinder or tube, F, which is rigidly mounted in the platform a^2 of the tower.

The cylinder F projects some distance above the shoulder or flange b^2 of the standard B, and is provided with a stop or set-screw, *f*, immediately above the concentric flange or shoulder b^2, holding the vertical standard B in position on the platform of the tower; and while said standard is allowed to revolve around the projecting stud or tube F on said platform, it is at the same time prevented from jumping, or, what is called in windmill parlance, "blowing away," when the wind is very high, or when the mill is doing heavy work, occasioned by the resistance of the stones or other mechanism to the action of the main wind-wheel.

In order to facilitate the rotation of the vertical standard B on the platform a^2 of the tower, I employ a series of pulleys or rollers, I, one on each side of the standard B. These pulleys have their bearings in the top braces a^1 and in the frame a^3, with which the under side of the top plate or platform a^2 is provided; and the pulleys project through slots or holes *i* formed in said plate a^2 just sufficiently to prevent the rim or flange *b* from resting on the platform or plate a^2, and thus form a movable bearing for said rim or flange *b* and the standard B.

To further facilitate this revolution of the standard, the top of the platform is provided with a circular groove, a^4, between the projecting tube F and the arc of the circle intersecting the axes of the pulleys I, as shown in Fig. 3, a similar groove, b^4, being formed on the under side of the rim or flange *b* of the standard B. A number of balls, b^3, are placed in the groove a^4, projecting above the level of the rollers or pulleys I, and enter the groove b^4 of the flange *b*, thus forming an additional movable bearing for the flange and cylinder B, and greatly facilitating its rotation, owing to the limited frictional contact of said flange with the pulleys and balls.

The principal bearing-points of the cylinder B being on a line eccentric to the axis of said standard prevents it from sagging, and tends to hold it in its proper position on the platform of the tower.

Various means, more or less effectual, have been employed to steady the vertical standard B on its base or platform, such as counterweights, or by allowing the standard to project downward through the platform of the tower, and holding it there in position on a step, as shown by my patent of April 2, 1872; but in this construction an increased length of standard, and consequent increase of weight of metal, is required, without completely overcoming the sagging and jumping of the standard, while in the arrangement of the enlarged flange or rim *b*, covering nearly the whole of the platform of the tower, the increase of metal and the weight is distributed evenly outside and around the line or axis of the vertical standard, forming a broad and solid base, while combining with it the projecting tube F, with its stopping-pin or set-screw, not only the sagging but the jumping of the standard B are effectually prevented, and the pulleys and balls at the same time are protected from rain, snow, or ice by the flange *b*, projecting some distance beyond the circle described by intersecting the axes of the pulleys.

In practice, with a view to economy and solidity, the hollow vertical standard B, with its flaring rim or collar *b* and the shoulder or concentric inner flange b^2, are cast in one piece; and the top plate a^2, with its projecting frame a^3, is also cast in one piece.

G, Figs. 1 and 8, is the fan-bar, provided in its rear face with a longitudinal groove, *g*, extending the whole length of the fan-bar, which has end caps H H^1, both caps having holes *h* *h* near their rear edges, coinciding with the grooves *g* in the fan-bars G, for a purpose hereinafter fully described. The end cap H has also a projecting lug or ear, h^1, provided with a hole, h^2, formed thereon. Said ear or lug h^1, when the cap is in position on the end of the fan-bar, projects forward or in front of the wind-wheel. To this lug or ear h^1 is pivoted a connecting or tilting rod, K, consisting of the rod itself, which is screw-threaded at both ends, and the two forks k^1 k^2, provided with threaded sleeves *k* *k*, into which the rod K is screwed, for the purpose of adjusting the position of the fans on the fan-bars G.

The fork K^1 is pivoted to the lug or ear h^1 by means of a bolt and nut or other equivalent device, and to the fork K^2 is pivoted the horizontal arm or elbow *l* of the shifting-fork L, consisting of a casting having a main or horizontal arm, *l*, and two projecting arms, l^1 l^2, and a transverse arm or brace, l^3. The lower arm l^1 is slightly curved upward, while the upper arm l^2 projects downward at an angle to the horizontal arm *l*, its end being slightly curved, thus forming a fork, between the two prongs of which is held or clasped the flange or rim N, which is connected to the flange *n* by means of connecting-rods *n'*, the two sliding on the horizontal shaft of the wind-wheel, and constitute the shifting devices. The forked-elbow casting L is further pivoted to a bracket, l^4, bolted to the radial arms M, in any convenient manner, though I prefer in practice to bolt both the bracket and radial arms together with the same bolts to the spider, thus avoiding additional bolts, as well as expense and labor.

In the groove g is located a transverse rod or journal, g^1, which passes through the holes h in the end caps H H′, and is rigidly affixed to the slotted supports O, bolted to the radial arms M by means of a tightening-nut, one end of the rod g' being screw-threaded for the purpose, and the other end is provided with a rivet or bolt head.

The supports O are provided with two vertical slots, o o, in which the rod g' is secured, and by means of this arrangement and construction an eccentric pivotal axis or truss is provided for the fan-bars G, the caps H H′ of which form their pivotal points, on which they are readily tilted forward or backward, and set to any desired angle to or out of the wind, and by means of the slots o in the supports O the fan-bars G, and consequently the fans, may be readily adjusted vertically in their relative position with each other—an improvement which will be readily appreciated by windmill-constructors.

The difficulty in regulating the position of the fan-bars in mills as heretofore constructed consists in the fact that in adjusting them vertically on the radial arms one end of two sections was moved at the same time, while by the construction and arrangement shown and described each fan-bar may be adjusted vertically at either or both ends without affecting the position of the fan-bars adjacent thereto.

The operation of the shifting devices is as follows: The shifting-rod proper and connecting forked levers clamping the flange or boss n, and the connections of said flange n with the flange or boss N on the shaft of the wind-wheel, are substantially the same as those shown and described in Letters Patent granted to me July 1, 1873. Pressure upon the hand-lever actuating the shifting-rod proper, will, through the forked levers and flanges n N, cause the shifting device or fork L to move backward, describing an arc of a circle, the center of which is the pivotal connection of said fork L with the bracket l^4. By this movement the horizontal arm or elbow l is moved upward, and consequently the connecting or tilting rod K is also moved upward, tilting the fan-bars G more or less, according to the pressure exerted on the hand-lever of the shifting-rod proper, causing the fan-bars and fans to turn around their axis or truss-journal g'.

By this construction a simple and effective device is provided for setting the fan-bars in any desired position before the wind, or tilting them over into a horizontal position completely out of the wind.

I will now proceed to describe the construction of the tower-platform, which, owing to its simplicity and great strength, I prefer to employ, and have adopted in constructing my mills, which consists of the ordinary frame-work hereinbefore described, and the top plate a^2, also constructed as shown and described. Instead, however, of rigidly affixing the inner smaller stud or tube F to the top plate a^2, I bolt the same to a secondary plate, a^5, which, in its turn, is bolted to the frame-work or transverse braces a^1 of the tower, as well as to the pendent frame a^3 of the top plate a^2, and by this construction a more solid basis is obtained for the hollow tube F, as well as a complete casing in which the rollers or pulleys are mounted, sheltering them completely and effectually from dust or rain, ice or snow. The platform of the tower is also rendered more solid and compact.

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

1. A hollow vertical standard of a wind-mill, having an enlarged flaring rim or flange, provided on its periphery with a series of ratchet-teeth, substantially as and for the purposes set forth.

2. The ratcheted flange b of the vertical standard B, in combination with the locking pawl or dog, substantially as and for the purposes specified.

3. The release mechanism of the locking dog or pawl, consisting of the cord or chain d, the lever D, and pulley E, in combination with said dog or pawl, the ratcheted flange b, and the vertical standard B, all constructed to operate substantially as specified.

4. The combination of the top plate or platform a^2, having a series of openings formed therein for the purpose described, and provided with a concentric groove, a^4, the depending frame a^3, with the lower plate a^5, and the short cylindrical hollow standard or stud F, substantially as and for the purposes specified.

5. The combination with the ratcheted flange b, having concentric groove b^4, and the cylinder B of the top plate a^2, constructed as described, the pulleys I, and balls b^3, all arranged and constructed to operate substantially as shown and described.

6. The top and lower plates a^2 a^5 of the platform, and the short hollow vertical cylinder or stud F, and set-screw f, or its equivalent, with the vertical hollow standard B, having an inner concentric flange or shoulder, b^2, when constructed and combined to operate substantially as and for the purposes set forth.

7. A wind-wheel, having its fan-bars journaled eccentrically to the radial arms, and moving independently of each other, substantially as and for the purposes set forth.

8. A wind-wheel having its fan-bars journaled to the radial arms independently of each other, in combination with said radial arms and the slotted bearings or supports O, whereby each fan-bar may be adjusted vertically at either end, or both, without affecting the position of the adjacent fan-bars, as described.

9. The combination, with the fan-bar G, provided with a grove eccentric to the axis of said fan-bar, of the truss-rod or journal g', the end caps H H′, the radial arms M, and the slotted supports O, constructed and ar-

ranged to operate substantially as shown and described.

10. The shifting-fork L, in combination with the connecting or tilting rod K, and the projecting lug or ear h^1 of the fan-bar cap H, constructed and arranged to operate substantially as specified.

11. The combination, with the shifting fork L, constructed as described, and the connecting or tilting rod K, having both of its extremities screw-threaded, and the fan-bar cap H, having projecting lug or ear h^1, of the forks k^1 k^2, provided with threaded sleeves k, whereby the relative position of the shifting-fork L and fan-bars G is adjusted, substantially as described.

12. The combination, with the arms l l^2 of the fork L, of the bracket l^4, radial arms M, and the spider of a windmill, substantially as described, and for the purposes specified.

In witness that I claim the foregoing I have hereunto set my hand.

GILES MABIE.

Witnesses:

AUG. SANDSTEDT,

W. J. WELLS.