(No Model.) 2 Sheets—Sheet 1.

E. B. & O. E. WINGER.

WINDMILL.

No. 263,376. Patented Aug. 29, 1882.

Fig. 3.

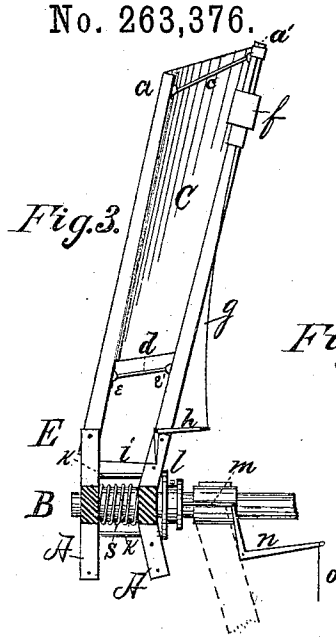


Fig. 1

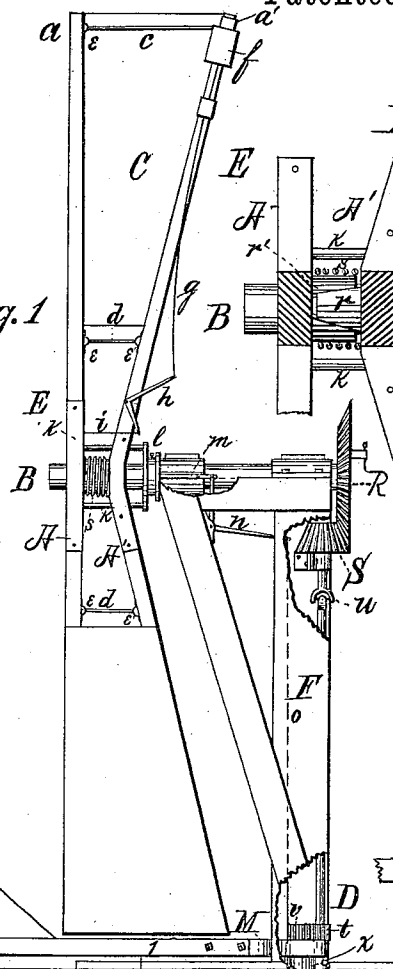


Fig. 4.

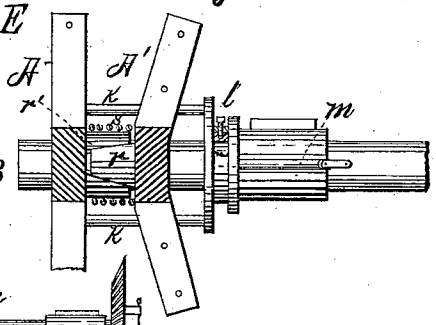


Fig. 5.

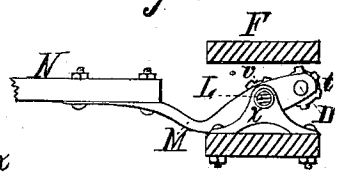
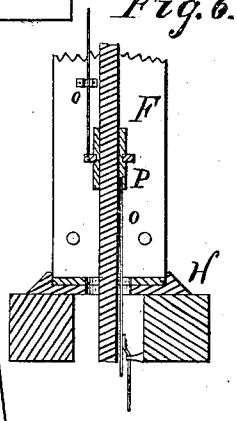


Fig. 6.



Witnesses.
R. H. Wiles
J. H. Stearns

Inventors.
Elam B. Winger
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(No Model.) 2 Sheets—Sheet 2.

E. B. & O. E. WINGER.

WINDMILL.

No. 263,376. Patented Aug. 29, 1882.

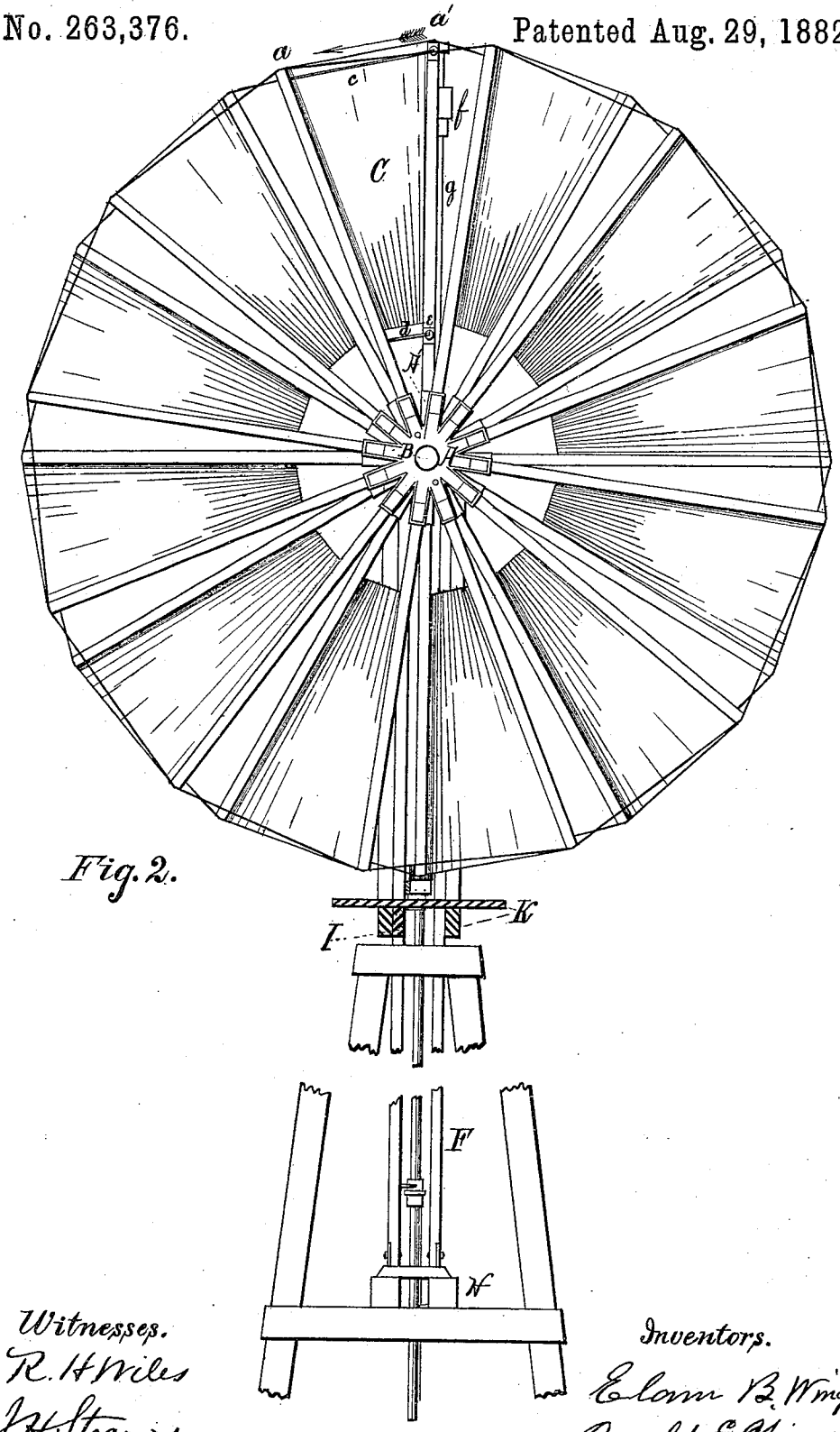

Fig. 2.

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UNITED STATES PATENT OFFICE.

ELAM B. WINGER AND OSWALD E. WINGER, OF FREEPORT, ILLINOIS.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 263,376, dated August 29, 1882.

Application filed March 6, 1882. (No model.)

To all whom it may concern:

Be it known that we, ELAM B. WINGER and OSWALD E. WINGER, citizens of the United States, both residing at Freeport, in the county of Stephenson and State of Illinois, have invented a new and useful Improvement in Windmills, of which the following is a specification.

Our invention relates to the construction of that class of mills in which the wind-wheel is vertical, and especially to the form of mill in which the revolution of the vertical wheel is applied to the rotation of a vertical shaft—in other words, to what are known as "power-mills" as distinguished from pumping-mills.

The nature of the invention is explained in detail in the specification and fully shown in the drawings, in which—

Sheet 1 contains Figures 1, 3, 4, 5, and 6, and Sheet 2 contains Fig. 2. Fig. 1 is a side view of the mill with all the arms of the wheel removed except those vertically above and below the axis, the arms shown being in the relative positions which they assume when the sails are out of the wind. Fig. 2 is a vertical projection of the mill, seen from the side opposite the supporting-pillar, the sails being in the wind, the tower being cut away at its middle and top and bottom brought together, and the platform and vanes being cut away by a vertical plane passing through the line 1 2, Fig. 1. Fig. 3 is a side view of one sail of the wind-wheel when in the wind. Fig. 4 is a side view of the shaft of the wind-wheel and the two spiders which carry the arms of the wheel, the arms of the spiders, except the vertical ones, being removed, and the spiders being in the position they assume when the sails are out of the wind. Fig. 5 is a horizontal section, seen from below, of the pillar which supports the wind-wheel, the section being made through the line 3 4, Fig. 1. Fig. 6 is a vertical section of the lower part of the supporting-pillar of the mill, showing the socket in which the pillar rests, the vertical shaft of the mill, the regulating-rod for throwing the sails out of the wind, and the swivel connecting the upper and lower parts of said rod.

Similar letters indicate the same parts in all the figures.

The construction of the wind-wheel is as follows:

Two spiders, A A′, having an equal number of similarly-arranged arms, which may be either radial or tangential, have a common shaft, B, to which the spider A′ is rigidly attached, but about which the spider A has both rotary and longitudinal motion. (See Figs. 1, 2, 3, 4.) The arms of the spider A are at right angles to the line of the shaft B, and the arms of the spider A′ at an oblique angle thereto. To each arm of the spider A′ is rigidly fastened a wooden arm extending in the same line as the arm of the spider, and to each arm of the spider A is pivoted, as at E, Figs. 1, 3, 4, a wooden arm, which, when the sail is out of the wind, extends in the same line as the arm of the spider to which it is attached and at right angles to the line of the shaft B. For convenience but one of the arms attached to each spider is lettered. These are marked *a a′* in Figs. 1, 2, 3, and in the description of the wheel. Whatever is said of these arms respectively applies equally to the other arms of the respective sets to which they belong. Each of the arms attached to the spider A, as *a*, is connected with a corresponding arm on the spider A′, as *a′*, by two rods, *c d*, Figs. 1, 2, 3, the ends of said rods being secured to said arms by ball-and-socket joints *e e*. To each pair of rods so connected is attached canvas or other suitable material, forming a sail, *c*, Figs. 1, 2, 3. When the sail is out of the wind—*i. e.*, when its surface lies in the line of the wind, so that the force of the wind does not tend to revolve it about the shaft B—the arm *a* stands at right angles to the line of the shaft and the sail shows, as in Fig. 1; but if the spider A be revolved about the shaft B to the position shown in Fig. 2, while the spider A′ is held stationary, the sail is thrown into the wind or placed at an angle to the line of the wind, so that the force of the wind tends to revolve the wheel. As the sail is thrown into the wind the outer end of the pivoted arm *a* approaches the inner surface of the wheel, or that formed by the arms attached to the spider A′, while the inner end of said arm *a* recedes from said inner surface and the spider A recedes from the spider A′, and, conversely, if the spider A be moved from the position shown in Fig. 1 to that shown in Fig. 3, the outer end of the arm *a* will approach the inner surface or front of the wheel, and, since the

length of the rod *c* remains the same, the arm *a*, and with it the spider A, will revolve about the shaft B, and the sail will be thrown into the wind and show, as in Figs. 2 and 3.

To the inner surfaces of the spiders A A′ are attached two sets of lugs, *r r′*, tapered from their bases outward, forming a partial shell about the shaft B, and so arranged as to engage and hold the spider A firmly in position when the sail is out of the wind, (see Fig. 4;) and immediately outside of these lugs, and between the spiders, is coiled a spiral spring, *s*, Figs. 1, 3, 4, which tends to push them apart and keep the sails in the wind. To counteract the force exerted by this spring there is always the force of the wind, which tends directly to push the sail into the line of its direction, and so to decrease the speed of revolution of the wheel both by decreasing the area of surface exposed to its direct action and also by lessening the angle of the surface to the line of the wind.

In addition to the tendency of the wind to throw the sail out of gear, two devices for the same purpose are shown, one being automatic and one operated from the foot of the tower, but both devices being used in the same mill, and both being necessary to its complete construction. The automatic device consists of a weight, *f*, attached to a rod, *g*, which slides in suitable bearings on an arm, *a′*, of the spider A′. The inner end of the rod is attached to the outer end of a bell-crank lever, *h*, which is pivoted to the arm *a′* and connected by a link, *i*, to the spider A. As the mill revolves the centrifugal force throws the weight toward the circumference of the wheel, and this tendency increases with the speed. The weight, as it moves toward the end of the arm, draws with it the outer end of the bell-crank, which, acting through the link *i*, draws the spider A toward the spider A′, and so moves the sail out of the wind. The other device, which is essentially the same in principle, consists of two rods, *k k*, attached to the spider A, passing through large openings in the spider A′, and attached to the swivel *l*, (shown in Figs. 1 and 3 and in detail in Fig. 4.) To the swivel *l* are also attached the rod *m* and a corresponding rod on the other side of the shaft B, and these rods are connected with a forked bell-crank, *n*, Figs. 1 and 3. To the outer end of this bell-crank is attached a rod, *o*, which passes down through the tower to the ground. To prevent twisting, this rod is divided near the base of the pillar which supports the wheel, the parts being fastened to the two parts of a swivel, *p*, respectively. The operation of this device is evident. Drawing down the rod *o* actuates the bell-crank, draws the swivel *l* away from the spider A′, and by means of the rods *k k* draws the spider A nearer to the spider A′, and so throws the sail out of the wind.

The shaft B of the wind-wheel revolves in suitable bearings supported by a hollow pillar, F, so constructed and arranged as to rotate freely in a bearing, G, at the top of the main tower, and a socket, H, below, also attached to the tower. The platform K is bolted to the pillar F and rotates with it, and to the platform-timbers is rigidly attached a vane, I, on the same side of the pillar as the wind-wheel. When the wind-wheel is in motion the revolution of the horizontal shaft B is communicated by means of the bevel-gears R S, Fig. 1, to the vertical shaft D, which is in two parts connected by universal joint *w*. A pinion, *t*, is rigidly secured to lower end of shaft D and engages another pinion, *v*, rigidly attached to lower vertical shaft, L, and by means of these pinions the motion of shaft D is transmitted to shaft L, which passes down through the tower and is the working-shaft of the mill. Near its upper end the shaft L is held in a bearing, *x*, Figs. 1 and 5, attached to the inner surface of the pillar F.

Pivoted on the shaft L, immediately above the bearing *x*, is an arm, M, to which is bolted a horizontal vane, N, Figs. 1 and 5, and in the outer end of the arm M is the bearing of the lower end of the shaft D. As the wind-wheel revolves and rotates the shaft D there is a tendency for the shaft D to move around the shaft L, instead of rotating it, or, in other words, a tendency to throw the entire mill out of the wind, and this tendency increases with the increase of the amount of work which the mill is required to perform. To counteract this tendency the vane N is arranged as above described. The revolution of the shaft D about the shaft L throws the arm M and vane N out of their normal position in the line of direction of the wind, and the force of the wind is thus brought to bear directly toward forcing the vane back into its normal position, and thus bringing the wheel into the wind.

We do not limit ourselves to the particular connection between the shaft D and vane N shown in the drawings, as the form of gearing might be varied infinitely, or the shaft and vane might be connected by a system of levers or by belts and pulleys. Nor do we confine the application of the vane N and suitable attachments to the particular form of mill described in this specification, as it may be applied to any power-mill. Neither do we limit the use of the form of wheel shown to the class of power-mills alone, as it may be readily converted into a pumping-mill. The bevel-gear R of the shaft B is provided with a wrist-pin, to which a pitman can be pivoted, and by removing the vertical shafting shown in the drawings and substituting a pitman the mill becomes a pumping-mill.

Instead of placing the main vane I on the same side of the pillar with the wind-wheel, if the wheel be reversed on its shaft, so as to bring the spider A next the pillar, the vane may be placed opposite the wheel, or the wheel may be left in its present position and the vane omitted entirely.

Having described my invention, what I claim

as new, and desire to secure by Letters Patent, is—

1. In a windmill, a wind-wheel consisting of two spiders having an equal number of arms and mounted upon a common shaft, one of said spiders being rigidly attached thereto and the other having rotary and longitudinal play thereon, to each arm of one of said spiders an arm of wood or other suitable material being rigidly fastened, and to each arm of the other spider an arm of wood or other suitable material being pivoted, each of said wooden arms of one spider being connected with a corresponding arm attached to the other spider, each pair of arms so connected being covered with canvas or other material, forming a sail, and said spiders being arranged, as described, so that the rotation of the loose spider about the shaft throws said sails out of the line of direction of the wind and increases the distance between the spiders upon the shaft, or that the separation of the spiders upon the shaft rotates the loose spider about the shaft and throws the sails out of the line of the wind.

2. In a windmill, a wind-wheel consisting of two spiders having the same number of arms, and mounted, one rigidly and the other loosely, upon a common shaft, the rigidly-mounted spider having bolted to each of its arms a wooden arm extending in the same line as the line of the spider-arm, the loose spider having pivoted to each of its arms a wooden arm whose normal position is in the line of the arm of the spider to which it is attached, each arm of one spider being connected by rods with the corresponding arm of the other spider, each pair of arms so connected being covered with canvas or other material, forming a sail, and the spiders and arms thereto attached being arranged, as described, so that the rotation of the loose spider throws the sails out of the line of the wind and increases the distance between the spiders upon the shaft, while the increasing of the distance between the spiders rotates the loose spider and throws the sails out of the line of direction of the wind.

3. In a windmill, a wind-wheel consisting of two spiders, one rigidly and one loosely attached to the same shaft, the rigid spider having rigidly attached wooden arms and the loose spider an equal number of pivoted wooden arms, the corresponding arms attached to the two spiders being connected by rods attached as shown, each pair of arms so connected being covered with suitable material, forming a sail, said spiders being pressed apart by a spring placed between them upon the shaft, or by other suitable means, and the whole being arranged, as described, so that the separation of said spiders by said spring or other equivalent device throws the sails out of the line of the wind, substantially as shown and described.

4. In a windmill, the combination, with a wind-wheel, constructed as shown, of the regulating device, consisting of the rods *k k*, attached to the spider A, the swivel *l*, the forked bell-crank *n*, rods *m*, wire *o*, and swivel P, all constructed and operating substantially as shown.

5. In a windmill of which the power is applied to the rotation of a vertical shaft, the combination of an auxiliary vane, with suitable means, substantially as set forth, whereby the resistance to the rotation of the vertical shaft throws said vane out of the line of the wind with a force increasing with such resistance.

6. In a windmill whose power is applied to the rotation of a vertical shaft, the combination of a vertical shaft, divided as shown, and having its parts connected by suitable gearing, with an auxiliary vane connected with said parts of said vertical shaft, so that the tendency of the upper portion of said shaft to move around the other acts with equal force to throw said auxiliary vane out of the line of the wind.

7. In a windmill, the combination of the wind-wheel, constructed as shown, the regulating devices connected therewith, the rotating supporting pillar and platform and main vane attached thereto, the vertical shafting, and the auxiliary vane, all constructed and operating substantially as described.

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