

(No Model.)

J. McKNIGHT.
WINDMILL.

No. 466,756.

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Fig. 1.

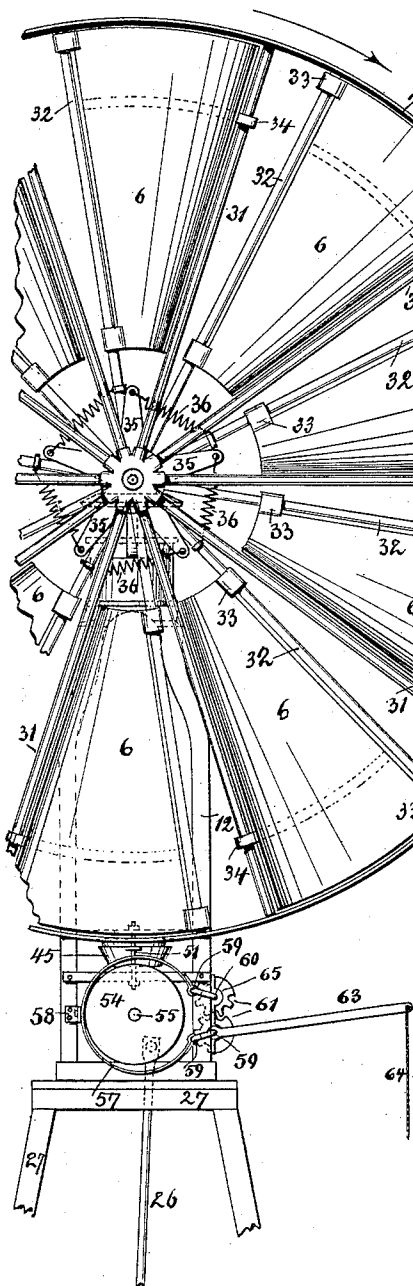
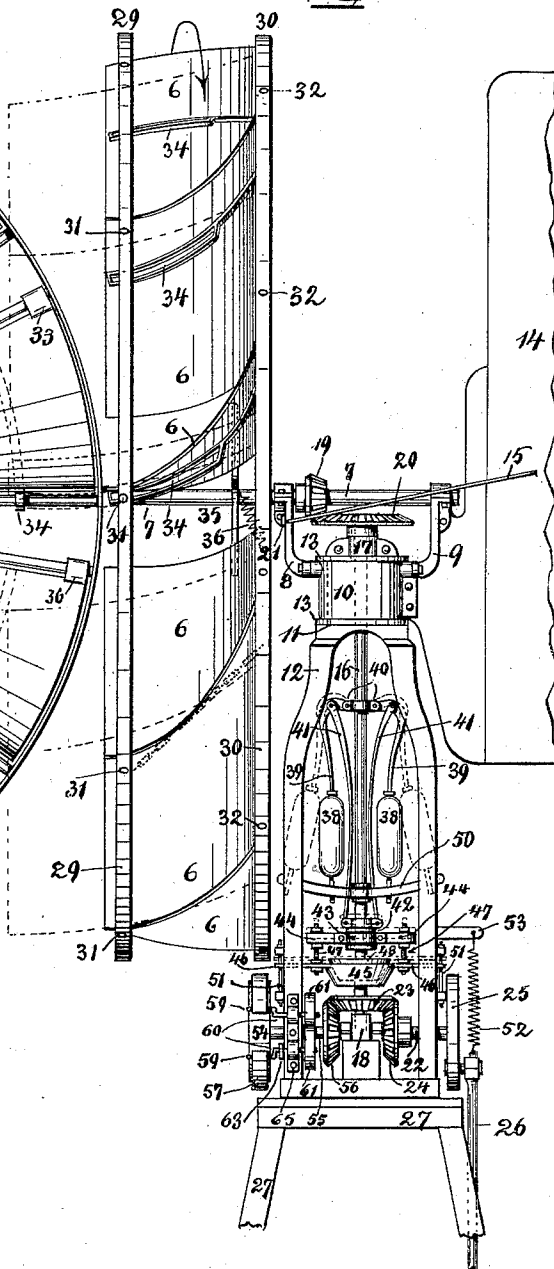


Fig. 2.



Attest
Samuel M. Levine
Edgar Wilson.

Inventor
Joseph McKnight
by Carl Spengel Atty

UNITED STATES PATENT OFFICE.

JOSEPH MCKNIGHT, OF MIDDLEPORT, OHIO.

WINDMILL.

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Application filed January 5, 1891. Serial No. 376,733. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH MCKNIGHT, a citizen of the United States, residing at Middleport, in the county of Meigs and State of Ohio, have invented certain new and useful Improvements in Wind-Wheels; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

This invention relates to an improved construction of wind-wheels by which the direct action of the wind against the blades, without the intervention of any governors or similar devices, regulates the amount of their surface to be safely exposed, causing this latter to be decreased as the force of the wind increases, so that in case of a strong gale, which, if acting on a fully-exposed wheel, would increase the speed to a ratio which would ultimately wreck the structure, the blades are nearly turned edgewise to the wind, preventing possible injury to the wheel from this source. In extreme cases this direct adjustment is aided by the provision of a friction-brake, which is operated automatically by a governor. Further, an additional brake has been provided whereby the wheel may be stopped from below, all of which will be fully explained in the following specification and illustrated in the accompanying drawings, in which—

Figure 1 is a partial front view of a wind-wheel. Fig. 2 is a side view of the same, part of the vane being omitted.

6 are the blades of the wheel, which latter is secured to a shaft 7, revolving in two bearings 8 and 9, extending out and up from a sleeve 10. This sleeve revolves about a central bearing 11, superposed upon a frame 12, and is vertically confined between two flanges 13 13, extending out from said bearings. Near the other end of shaft 7 is a vane 14, secured to sleeve 10 and bearing 9, serving as a means to keep the wheel always in the wind. Braces 15, secured to arms 21, extending out laterally from bearing 8, run back to this vane to stiffen it.

16 is an upright shaft revolving in bearings 17 and 18, receiving motion from shaft 7 by means of two bevel-wheels 19 and 20. Near its lower end a short horizontal shaft 22 is located and actuated by shaft 16 through the intervention of a pair of miter-wheels 23 and 24, having on its outer end a crank-wheel 25, from whence a connecting-rod 26 runs to the object to be operated by the wheel. These objects are usually pumps; but of course other devices may be operated equally as well.

Frame 12, which is preferably of iron, rests on a suitable wooden structure 27, which reaches to the ground.

Thus far the parts described comprise the general construction of an ordinary windmill.

The variation of the amount of blade-surface exposed to the wind is attained by the following construction: The wheel consists of two circular frames 29 and 30, each having the same number of arms 31 and 32, (ten in this case,) running toward the center. To the arms 32 of frame 30 the blades 6 are pivotally secured by hinges 33, while arms 31 of frame 29 pass through loops 34, secured to the backs of blades 6. These loops retain the hinged blades in the proper position and prevent them from flopping over during the revolution of the wheel. The first frame 29 is rigidly secured to shaft 7, while frame 30 sits loosely thereon. Secured to shaft 7 between the two frames there are a number of arms 35, from which springs 36 connect to the loose frame 30. The position of these arms 35 and the length and tension of the springs 36 are so arranged that the second frame 30 is held in about a position with reference to frame 29, as shown in the drawings. This position is considered to be about the normal one for ordinary purposes. In place of the form of springs shown a spiral spring secured with its inner end to the shaft and its outer end to some point on frame 30 might be substituted. Should the power of the wind striking the blades increase to such a strength as to overcome the tension of the springs 36, the blades will be depressed, sliding along in loops 34, and less of their surface will be acted upon. In extreme cases when gales are blowing this depression may be increased so much that

hardly more than the edges of the blades will be presented to the wind. (See dotted lines in Fig. 2.) In this manner the increasing velocity of the wind after overrunning its proper and useful working limits decreases the resistance offered it, and thus prevents the mill from attaining a ruinous speed, leading to injury and ultimate destruction.

In extreme cases the adjustment of the blades directly by the wind may be assisted by means of a friction-brake operated automatically by a governor in a manner which will be presently explained.

38 are two weights secured to two bent levers 39, which latter are hinged at 40 to upright shaft 16.

41 are two rods pivotally connected to levers 39 at their upper horizontal portion and reach down to a flanged sleeve 42, surrounding shaft 16. Vertically confined between its two horizontally-extending flanges this sleeve 42 is loosely surrounded by another sleeve 43, which has two arms 44 extending at either side from it.

45 is a frustum-shaped friction-brake having, also, two arms 46 extending out from it. By means of rods 47 passing from arms 44 to arms 46 this friction-brake is connected to sleeve 43.

48 is a friction-cone rigidly secured to upright shaft 16. If the speed of the wheel overruns the safe limits, centrifugal force will swing weights 38 outwardly and raise by means of rods 41 sleeves 42 43 and friction-brake 45. This latter impinges against friction-cone 48, and thus retards the movement of shafts 16 and 7. Frame 29 of the wheel being rigid on shaft 7 is also retarded, and falling behind frame 30 causes the front edge of blades 6 to slip up in their loops which confine them on the former's arms. The rear edges of the blades move with frame 30, which is independent from shaft 7, and to the arms of which blades 6 are hinged. (See dotted lines in Fig. 2.) In this way the surface of the wheel available to the action of the wind is lessened and as a consequence its speed decreased.

50 is a guide revolving with shaft 16 and having a slot in which the lower ends of the rods 39 are confined, and whereby the swinging movement of the weights is limited to one in a radial direction only. To prevent the friction-brake from revolving while engaged with the friction-cone, two guides 51 are provided, which pass through arms 46 of said brake and permit the same to move in a vertical direction only. Rods 47 are screw-threaded and provided with nuts, so as to permit the proper regulation of the distance between friction-brake and cone. In case this mill is used in operating a single-acting pump I provide a spiral spring 52, connected to an arm 53, extending out from the frame and reaching to the connecting-rod 26. It is put under tension by the downward stroke, and on the upward stroke compensates by its

contracting pressure for the weight of the lifted water.

54 is a friction-wheel secured to a shaft 55 and receives motion from upright shaft 16 by means of miter-wheels 56 and 23. It is surrounded by a steel band 57, which is secured at 58 and has its two free ends fastened to the crank-shaped terminations 59 of shafts 60. These shafts revolve in bearings 65 and have pinions 61 meshing into each other, which cause, when lever 63 is operated from below by means of a rope 64, a simultaneous contraction of the ends of band 57, which closely hugs friction-wheel 54, and thereby retards and arrests the motion of the wheel.

If operations are to be stopped for some time, it is desirable that the blades be turned so as to present no resistance to the wind and prevent unnecessary strain on the structure. This is best accomplished by turning frame 30 back until blades 6 are turned flat (see dotted lines in Fig. 2) and then locking it in this position. This locking may be done by a hooked chain running over to frame 29 or by any other suitable means.

Having described my invention, I claim as new—

1. In a wind-wheel of the kind where the blades are supported on their longitudinal edges by radial arms, the construction and combination of two sets of radial arms, each reaching out from a hub and supported on a common shaft, one of these hubs being loose on the latter, a number of blades hinged at their longitudinal edges to one set of these radial arms and having loops through which the arms of the other set pass, and a number of springs securing the loose set of arms to an intermediate set of arms rigidly secured to the shaft, all substantially as shown and described.

2. In a wind-wheel of the kind where the blades are supported on their longitudinal edges by radial arms, the construction and combination of two sets of arms, each radiating from a central hub, the two sets placed one behind the other on a common shaft, one of the hubs being loose, the other rigidly secured to said shaft, a number of blades situated between these arms and provided at their longitudinal edges with hinges and having loops attached to them reaching across their surface, the former engaging with the arms on the loose hub, while the arms of the hub, fast with the shaft, pass through the latter, and springs connecting to and holding the loose set of arms up against the wind, all substantially as shown and described.

3. In a wind-wheel of the kind where the blades are supported on their longitudinal edges by radial arms, the combination, with these blades hinged and supported longitudinally between a loose and tight set of arms, of a friction-brake automatically operated by a governor, which, by excessive speed, retards the movement of the wheel and with it the tight set of arms, causing thereby this

latter to fall behind the loose set of arms and tilting the blades, all substantially as shown and described.

4. In a windmill, the combination, with the
5 drive-wheel and shafting actuated by it, of a friction-wheel 54, revolved by said shafting, a band 57, surrounding loosely this friction-wheel, two crank-shafts 59 60, connecting to the free ends of bands 57, pinions 61 on said
10 crank-shafts, meshing into each other, and an

operating-lever secured to one of the crank-shafts, all substantially as shown and described.

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

JOSEPH McKNIGHT.

Witnesses:

WM. H. GRANT,
M. W. ALLEN.