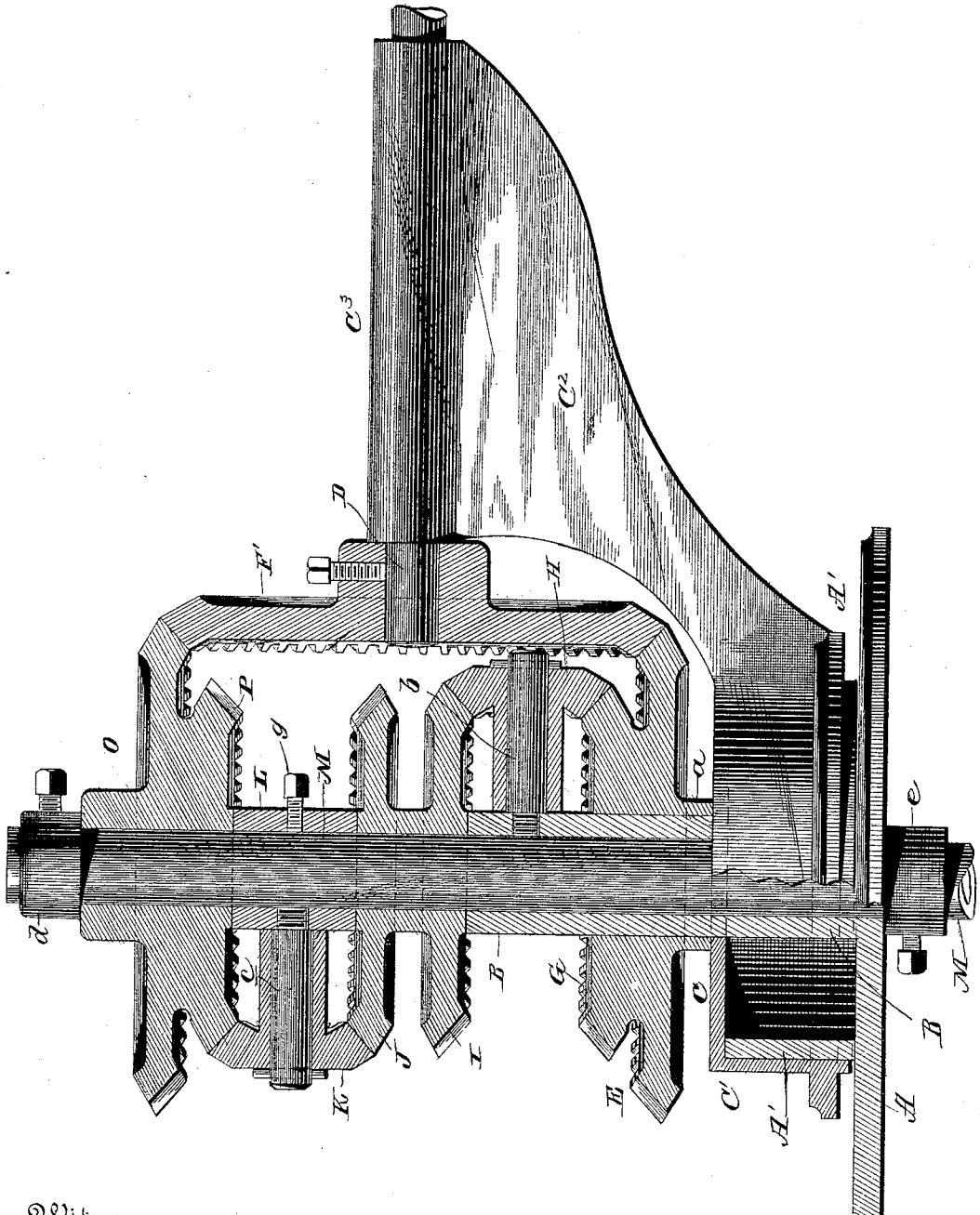
(Model.)

W. & C. H. TUCKWOOD.

BALANCE GEARING FOR WINDMILLS.

No. 389,342. Patented Sept. 11, 1888.



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BALANCE-GEARING FOR WINDMILLS.

SPECIFICATION forming part of Letters Patent No. 389,342, dated September 11, 1888.

Application filed June 18, 1887. Serial No. 241,727. (Model.)

To all whom it may concern:

Be it known that we, WILLIAM TUCKWOOD and CHARLES H. TUCKWOOD, of Janesville, in the county of Rock and State of Wisconsin, have invented certain new and useful Improvements in Balanced Gearing for Windmills; and we do hereby 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.

Our invention relates to an improvement in balanced gearing for windmills, the object being to provide a combination of gearing that will balance the whipping and lifting action of the wind-wheel when it is operated by varying wind-currents, and at the same time permit the wind-wheel to be moved in a horizontal plane, together with its supporting shaft and bracket, to hold the face of the wheel against the wind-current, and thus insure a continuous rotative motion of the shaft without regard to changes in direction of this current.

With these objects in view our invention consists in certain features of construction and combinations of parts that will be hereinafter described, and pointed out in the claims.

In the drawing is represented a side elevation in section through the vertical and horizontal gear-shafts and attached gearing.

A is a metallic base-plate, upon which the gear mechanism is located and supported. A vertical circular flange, A′, formed integral with the base-plate A, extends upwardly a proper distance above its upper face. The perforated "stump" or hollow shaft B also projects from the base-plate A concentric with the flange A′ and in the same direction.

The integral circular flange A′ is made true on its cylindrical outer surface and top or free edge to receive the bracket C, which has a recessed cylindrical turret-plate, C′, adapted to fit upon the flange A′ and rotate freely upon it as a supporting-bearing. From the side of the turret-plate C′ an arm, C^2, is projected laterally and curved upwardly to give support to the horizontal wind-wheel shaft D, an elongated journal-box, C^3, affixed to the extended horizontal upper edge of the arm C^2, being provided to receive the shaft and permit it to revolve.

Upon the true cylindrical outer surface of the stump B the miter-wheel E is placed, the turned end surface of its hub *a* resting to revolve upon the top surface of the turret-plate C′. The miter-wheel F′ is mounted upon the end of the wind-wheel shaft D and is made to mesh its teeth with the horizontal miter-wheel E, the diameters of these wheels E and F′ being the same and they having an equal number of teeth of the same pitch.

Integral with the upper face of the horizontal miter-wheel E a bevel gear-wheel, G, is formed, it being of less diameter than the wheel E.

Upon the side of the stump B, at a proper distance above the bevel-wheel G, the stud *b* is extended to form a bearing for the small bevel-pinion H, which is intended to act as an intermediate gear between the bevel-wheel G and a wheel, I, of the same diameter and number of teeth as the wheel G.

The bevel-wheel I has a mated or similar wheel, J, secured to it, the bevel-faces of these wheels inclining oppositely, so that while the wheel I has geared contact with the small intermediate bevel-pinion, H, the wheel J is adapted to mesh with a duplicate spur bevel-pinion, K, which is supported on a stud or fixed bracket-arm, *c*, that projects at right angles to the sleeve L, which latter loosely bears upon the upper surface of the twin bevel-wheels I J.

The wheels I J are supported in position by the vertical shaft M, which is inserted through the hollow stump B, that extends above the base-plate A a sufficient distance to form a seat for the wheels I and J, the wheel I resting upon its free true upper edge, so that the height of the stump B limits the depth of meshing contact of the teeth of the wheel I and intermediate pinion, H.

The sleeve L is firmly secured by the set-screw *g* to the shaft M, and upon its upper true edge the connected miter-wheels P O are seated. The lower and smaller wheel, P, that is of the same diametrical size as the wheels I J, is in proper relative position to have its teeth mesh with the bevel-pinion K at its upper edge.

The miter-wheel O, that is secured by its lower surface to the top surface of the wheel P, is of the same diameter as the lower hori-

zontal miter-wheel E, and, like it, is made to mesh with the miter-wheel F, secured to the wind-wheel shaft D.

The shaft M is secured in revoluble position by the adjustable collars *d e*, which are affixed in place by set-screws, the collar *e* loosely bearing against the lower surface of the base-plate A, while the collar *d* rests against the top face of the hub of the wheel O to prevent it from lifting out of gear.

The wind-wheel that gives rotative motion to the gearing just described may be of any approved form. This wheel is secured to the outer end of the shaft D, and a vane to keep this wheel facing the wind-current may be secured at any convenient point to the bracket-arm C, and this vane may be made to be elevated or lowered, and thus cause the wind-wheel to rotate or cease movement, as may be desired. The vane and wheel are not herein shown, as they are well-known parts of a windmill and are not the subject of the present invention.

The operation of the gearing is as follows: The shaft D is driven by the wind-wheel, which causes the bevel-wheel F′ to turn in the same direction. This latter wheel, F′, being meshed at diametrically-opposite points with the loosely-mounted wheels O and E, drives them in opposite directions, and, the axis of the bevel-pinion H being fixed to the stump B, of course the engagement of the wheel G, formed integral with the wheel E, with this pinion will rotate it upon its axis. This pinion communicates motion to the integral wheels I J, which wheels, it is evident, rotate in an opposite direction from the wheels E G. Now, as the integral gear-wheels O P and I J all four rotate in an opposite direction from wheels G E, hence, other things being equal, said wheels must rotate together. Evidently an equal pressure is now exerted on the teeth of the pinion K at diametrically-opposite points, so that no rotation of this pinion is possible. This impossibility of rotation of the pinion upon its axis, however, does not prevent a rotation of the pinion and shaft M about the axis of the latter. So far as communicating motion to the main shaft M, it is plain the pinion K might be entirely dispensed with; but the primary function of said pinion K is of utility when the bracket-arm C^2 shifts its position. At such times it is frequently expedient that the gear-wheels P and J should momentarily rotate in opposite directions or that the extreme gear-wheels O and E should turn together. At such periods it is desirable for the bevel-pinion K to turn on its axis. As a result of this arrangement, only one of the pinions, H or K, rotates, except periodically or at such times when the wind-wheel changes its position relative to the points of compass, due to the change in direction of the wind; but as long as the rotation of the shaft D continues without shifting to another point of compass one pinion rotates, as previously stated, while the other travels around with the main shaft M without revolving, so that in short but one of the pinions, H or K, revolves ordinarily, or when the wind-wheel remains in one position, and, on the other hand, one or both of these pinions revolve when the turret C revolves.

The advantages attained consist in effectually balancing or compensating the unsteady unequal lifting and whipping action of the wind, so that a constant and continual rotation of the main shaft is always insured, while the wheel is geared for motion and to always prevent a tendency to go out of the wind, no matter what the direction or velocity of the wind may be or however much its direction may be varied.

Having fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a base-plate, a hollow stump, and a bracket-arm loosely mounted on the base-plate, said arm having a wind-wheel shaft journaled therein, this shaft having a gear-wheel on one end, of a main shaft adapted to turn in the stump, gear-wheels loosely mounted on the main shaft and hollow stump, and bevel-pinions between said gear-wheels, the axis of one being secured to the hollow stump and the axis of the other to the main shaft, substantially as set forth.

2. The combination, with a base-plate, a hollow stump formed integral therewith, and a bracket-arm loosely mounted on the base-plate, said bracket-arm having a wind-wheel shaft journaled therein, this shaft carrying a gear-wheel, of a main shaft adapted to rotate in the hollow stump, gear-wheels loosely mounted on the stump and on the shaft in position for their teeth to mesh with the teeth on the wind-wheel-shaft gear-wheel, intermediate gear-wheel, also loosely mounted on the main shaft, and bevel-pinions between said intermediate wheels and the gear-wheels on the main shaft, the axis of one of said wheels being secured to the hollow stump and the axis of the other to the main shaft, substantially as set forth.

3. The combination, with a base-plate, circular supporting-flange projecting therefrom, a hollow stump formed integral with the base-plate, and a bracket-arm mounted on the flange, of a horizontal wind-wheel shaft journaled in the bracket-arm and provided with a gear-wheel, a vertical shaft journaled in the stump, bevel gear-wheels loosely mounted on the vertical shaft, meshing with the gear-wheel on the horizontal shaft, intermediate bevel gear-wheels, and the intermediate bevel-pinions, one secured to the vertical shaft and the other to the hollow stump, for the purpose substantially as set forth.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

WILLIAM TUCKWOOD.
CHARLES H. TUCKWOOD.

Witnesses:
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