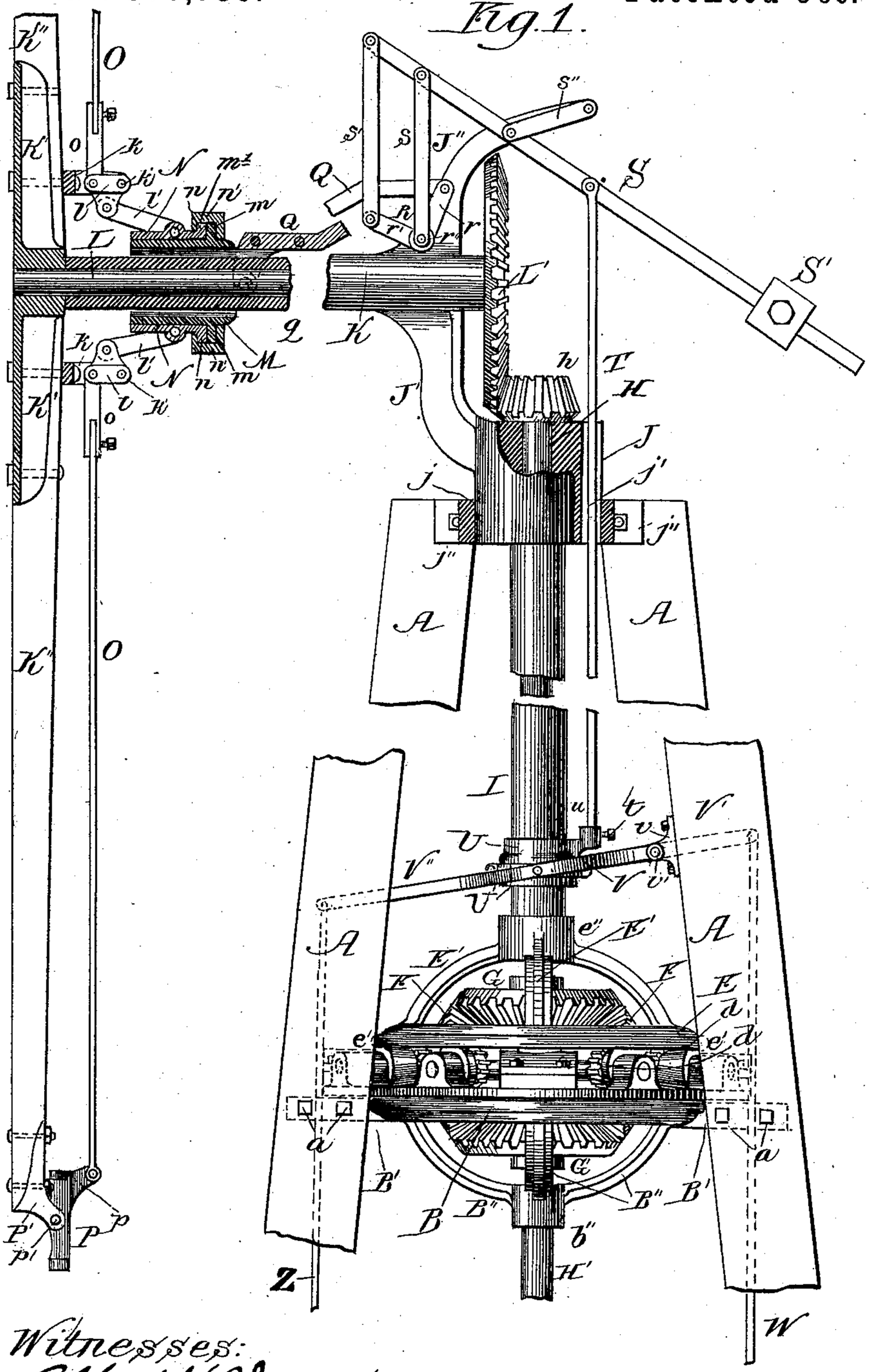
(No Model.) 2 Sheets—Sheet 1.

A. S. BAKER.

WINDMILL.

No. 370,756. Patented Oct. 4, 1887.

Fig. 1.



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Inventor:
Allen S Baker

(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

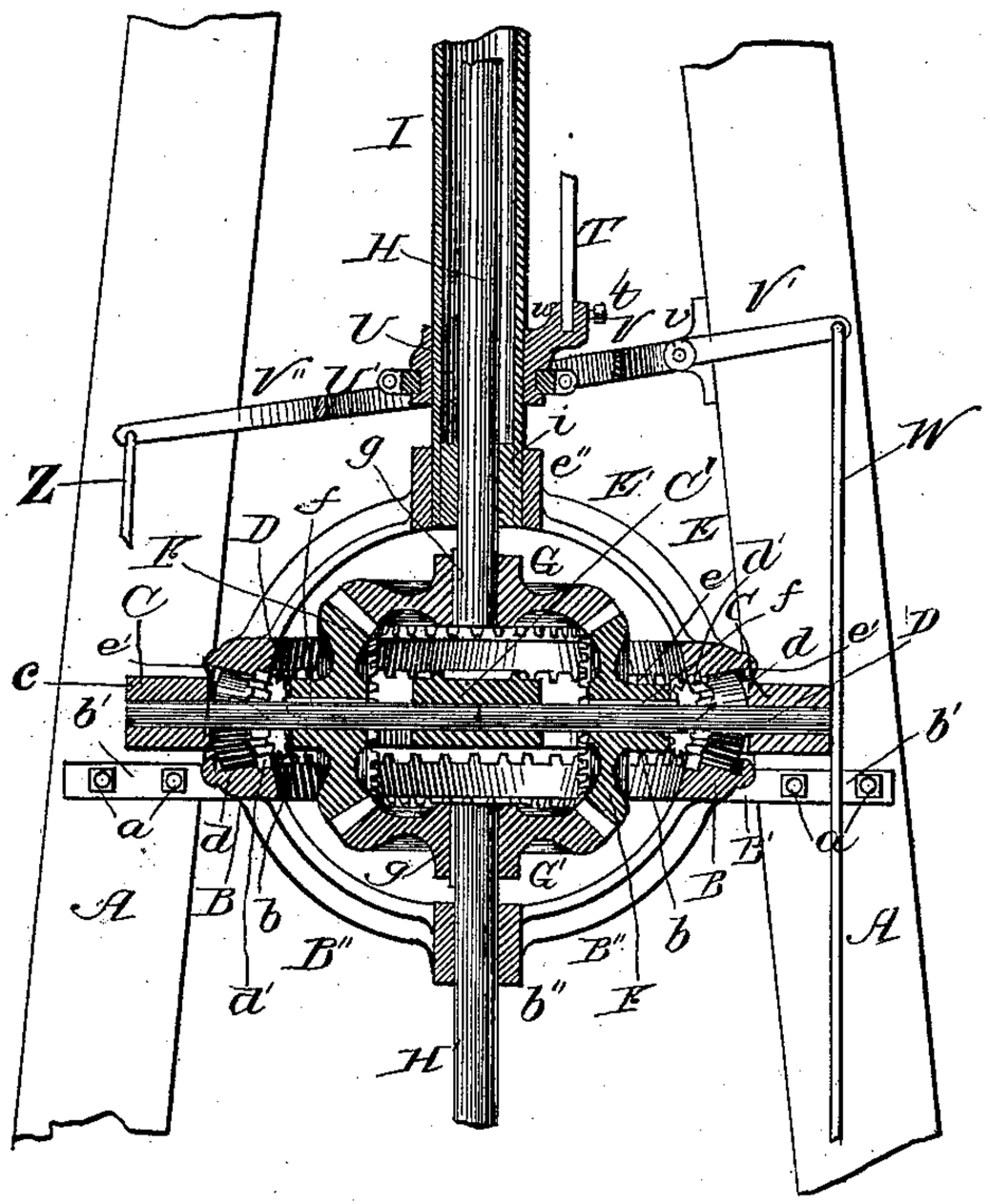
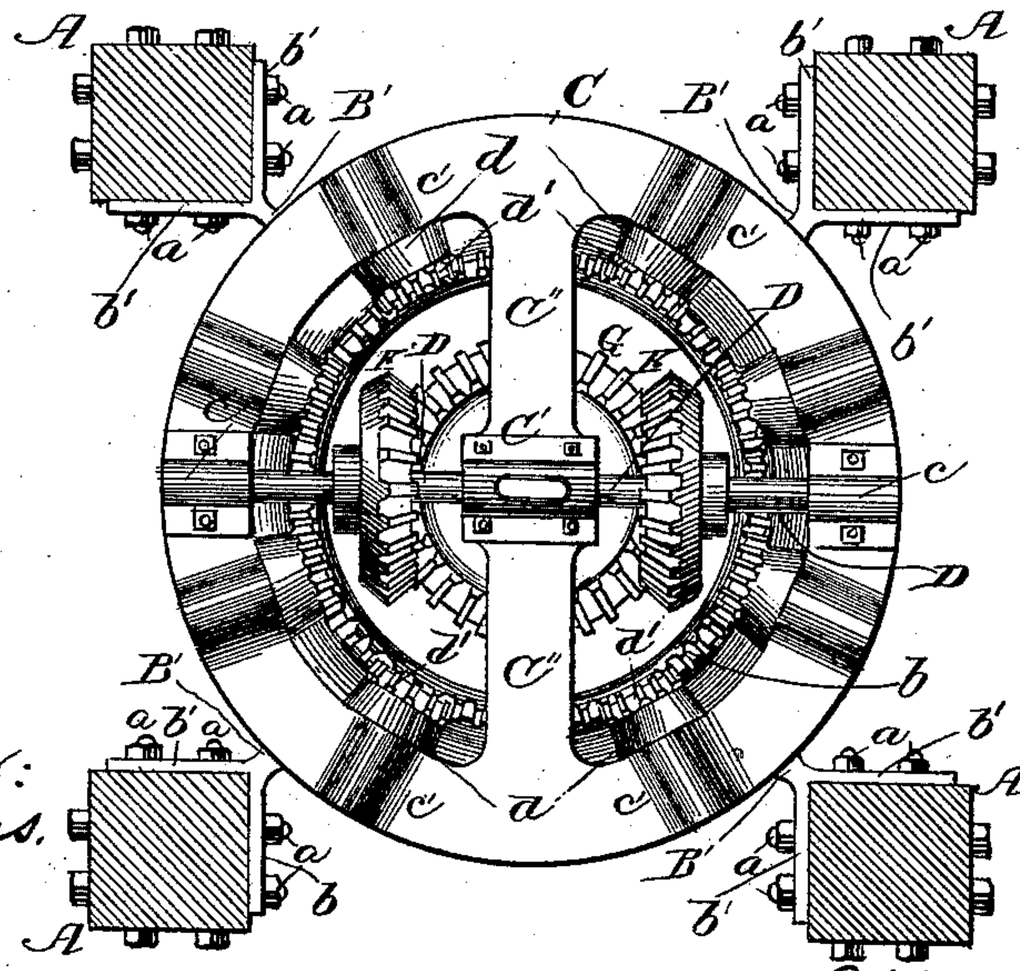


Fig. 3.



UNITED STATES PATENT OFFICE.

ALLEN S. BAKER, OF EVANSVILLE, WISCONSIN.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 370,756, dated October 4, 1887.

Application filed June 1, 1886. Serial No. 203,695. (No model.)

To all whom it may concern:

Be it known that I, ALLEN S. BAKER, residing at Evansville, in the county of Rock and State of Wisconsin, and a citizen of the United States, have invented a new and useful Improvement in Windmills, of which the following is a full description, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation, partly in section and broken out; Fig. 2, a sectional elevation of the auxiliary turn-table; Fig. 3, a top or plan view of the auxiliary turn-table with the shafting and one of the gear wheels removed.

This invention relates to gearing for power-windmills, and has for its objects to prevent the reaction of the vertical shaft upon the turn-table of the mill by throwing such reaction upon the fixed tower of the mill, and to improve the construction and operation of the wind-wheel in regard to the carrying or mounting of the same upon the tower and its connection with the vertical rods; and its nature consists in the several parts and combinations of parts hereinafter described, and pointed out in the claims as new.

In the drawings, A represents the corner posts or uprights forming the tower, the entire posts not being shown in full length, as they can be of any of the ordinary and well-known forms of construction and arrangement.

B is an annular ring or plate located within the space of the four uprights A, and connected to each upright by an arm or bracket, B′, cast or otherwise formed with the plate B, each arm or bracket having a fork, *b′*, to receive the corner of the post A and be secured thereto by bolts *a*. The upper face of the plate B is smooth, and its inner periphery is provided with a series of cogs or leaves, *b*, extending entirely around the periphery, and, as shown, from the under side of the plate, running to a common center, *b″*, are arms B″, which form a spider to brace and support the plate B, the center *b″* being in the form of a hub or collar.

C is a flat ring located above the plate B. This ring is provided with journal-boxes *c*, and between these journal-boxes, on each side, is a series of tubular enlargements, *c′*, and extending across the ring is a bar, C″, having at the center a journal-box, C′, which is in line with the journal-boxes *c*.

D is a traveling shaft, made in two parts, as shown, the end of each division being supported in a journal-box, *c*, on the ring C, and the center being supported in the journal-box C′, as shown in Figs. 2 and 3. On each side of the traveling shaft and around the interior of the ring is located a series of anti-friction rollers, *d*, each roller having a stem which enters the tubular bearing or box *c′* on the ring C. Each roller, as shown, has a beveled traveling face, and the track or face on which the roller rests of the plate B is also beveled, as shown in Fig. 2, and the inner end of each anti-friction roller is provided with cogs or leaves, forming a gear, *d′*, to mesh with the gear *b* of the plate B.

E is a plate corresponding to the plate B in dimensions, and having its inner periphery provided with cogs or leaves to form gears *e*, to mesh with the gears *d′* of the anti-friction rollers *d*, and this plate has arms E′ running therefrom to a hub or center, *e″*, to form a spider. The under face of the plate E, which travels on the face of the anti-friction rollers *d*, is beveled to correspond to the incline of the face of the rollers, and, as shown, the outer periphery of the plate E has a depending flange, *e′*, which forms a stop against outward movement of the anti-friction rollers, and a corresponding flange is formed on the plate B for the same purpose, as shown in Fig. 2.

F represents gear-wheels one for each section of the traveling shaft D, and firmly attached to the shaft by a key, *f*, or in some other suitable manner, and lying within the circle of the plates B E and ring C.

G is a gear-wheel meshing with the gears F on the upper side, and G′ a gear-wheel meshing with the gears F on the under side, as shown in Fig. 2.

H is the vertical shaft to be driven by the turning of the wind-wheel, to the lower end of which is firmly attached, by a key, *g*, or otherwise, the gear G, and the extension H′ of this shaft H has its upper end firmly secured, by a key, *g*, or otherwise, to the gear G′, the shaft H′ passing through the center or hub *b″* of the spider of the plate B. The upper end of the shaft H has keyed or otherwise firmly secured thereto a beveled gear, *h*, as shown in Fig. 1.

I is a tube or hollow shaft, through which

the shaft H passes. The lower end of this tube is firmly secured to the collar or hub *e''* of the spider of the plate E, and, as shown, at the lower end is a filling or bearing, *i*, for the shaft H.

J is a head firmly secured to the upper end of the tube I, and having an arm or extension, J', extending upward to receive the tubular bearing of the wind-wheel shaft, from which bearing also extends upward an arm, J''. The head J turns in the collar or bearing *j*, located around it, and secured by brackets *j''* to the upper ends of the posts A by bolts or otherwise, and this head J on one side has a vertical opening or passage, *j'*, as shown in Fig. 1.

K is the tubular bearing for the wind-wheel shaft, formed with or suitably secured to the arm J', so that the arm J' and head J form a turn-table to allow of the rotation of the wind-wheel in turning into the wind.

L is the wind-wheel shaft, having at its inner end a gear, L', which meshes with the beveled pinion *h*, and having attached to its outer end, in any firm manner, the spider K', for the wind-wheel arms or blades K'', the spider and arms being of the usual construction.

M is a tubular head or collar located around the bearing or sleeve K, so as to be free to slide forward and back on the sleeve K to turn the sails into or out of use.

N is a ring or collar encircling the slide M and free to turn thereon with the rotation of the wind-wheel, and, as shown, the connection between the collar N and slide M is formed by a flange, *m*, on the slide and a flange, *m'*, on the collar, over which flanges a cap or boxing, *n'*, fits, locking the collar and slide together, so that the collar moves with the slide, but is free to revolve thereon. The connection between the collar N and the wind-wheel is made through the bracket or arm *k*, attached to the wind-wheel arms, and supporting a triangular piece, *l*, one corner of which is pivoted to the bracket by a pin or pivot, *k'*, and another corner of which is connected with the collar N by a link, *l'*, and to the other corner of which is connected a socket, *o*, which receives the lower end of the rod by which the sails are turned.

O represents the rods for turning the sails of the mill, each rod being attached at its lower end to the socket *o* by a set-screw or otherwise.

P is an L-lever, pivoted by a suitable pin, *p'*, to a fork, P', on the end of the arm K'', and to the arm *p* of which is pivotally connected the rod O.

Q is an arm, the forward end of which is attached by pivots *q* to each side of the slide M.

R is an L-lever, pivotally mounted on the arm J'' by a pin, *r''*, and to one arm, *r*, of which is pivotally connected the outer end of the arm Q, and to the other arm, *r'*, of which is pivotally connected the lower end of a bar, *s'*, a bar, *s*, being also provided, the lower end of which is pivoted onto the pivot *r''* of the lever R.

S is an arm connected with the arm J'' by a link, *s''*, the ends of the link being pivoted, respectively, to the arm S and to the end of the arm J'', and to this arm S are pivotally connected the upper ends of the bars *s s'*, and on this arm S is mounted a sliding weight, S'.

T is a rod, the upper end of which is pivotally connected to the arm S, the rod passing down through the opening *j'* of the collar J.

U is a collar mounted on the tube I, and having a socket, *u*, in which is secured the lower end of the rod T by a set-screw, *t*. This collar U has an annular groove therein to receive a ring, U', as shown in Figs. 1 and 2.

V is a fork, the arms of which are pivotally connected with the ring U' on opposite sides, and this fork V has an arm portion pivotally mounted on a shaft, *v'*, in brackets *v*, attached to the posts A, and each side of the fork has an arm or extension, V' V''.

W and Z are wires running from the arms or extensions V' and V'', to be within reach of the operator on the ground or other support for the tower.

The plate or support B is attached to the corner-posts A by the brackets B' at the proper height for the location of the auxiliary turn-table, and the plate C, with the traveling shaft D and gear-wheels F on the traveling shaft and anti-friction rollers *d*, is placed on the plate or track B. The plate E is dropped into place to rest on the anti-friction rollers *d*, and the tube or hollow shaft I is connected with the hub or center *e''*, connecting the plate or track E with the tube I. The shafts H H' are then placed in position and the gear-wheels G G' connected therewith and brought into mesh with the gear-wheels F, which completes the connection of the auxiliary turn-table with the shafting. The wind-wheel is connected with the tube I through the head or collar J, arm J', tubular bearing K, shaft L, and spider K' on the shaft L, and the motion of the shaft L is transmitted to the vertical shaft H through the gears L' *h*, as usual, and such rotation is transmitted to the lower vertical shaft, H', through the gearing F, G, and G'. The wheel is swiveled to the tower, so as to turn freely with every change of the wind by the head J, which turns in the collar *j*, attached to the tower, and with every change of the wind the wheel will be swung around.

In the use of common beveled gearing for power-windmills having a turn-table swiveled in a fixed tower the reaction of the vertical shaft on the swiveled turn-table is exactly equal to the power being transmitted through it, and which operates to turn the wind-wheel away from the line of the travel of the wind, and thus destroying its effectiveness. The reaction of the vertical shaft is caused by its resistance to the motive energy of the power being delivered to it, and hence always acts in the opposite direction from what the motive

force is operating. The reaction of the vertical shaft H upon the swiveled turn-table of the mill tends to turn it in the opposite direction from that in which the shaft H is being driven with a force exactly equal to that imparted to the shaft H. This force or strain thrown upon the swiveled turn-table will be imparted to the tube I and plate E, secured to its lower end, and as plate E rests upon and has a geared contact with the rollers *d*, which rest upon and have a geared contact with the plate B, fixed to the tower, it will be seen that this reacting force operates on the rollers *d* in exactly the same manner and with exactly the same force as the power which is being transmitted through the gear-wheels F operates on them, but in the opposite direction, both of them operating as levers prying over their journals as fulcrums, and as the journals of both are fixed in the turn-table C, these forces, working in opposite directions, meet and are exactly balanced in turn-table C. It will also be seen that the strain thrown upon plate B by geared rollers *d* is exactly equal to the strain thrown upon gearing *g'* by gears F, but in opposite directions. Thus the reaction of vertical shaft H is transmitted through tube I, plate E, geared rollers *d*, and plate B to the fixed tower of the mill, and the power of the wind-wheel is transmitted through shaft L and gears L' *h* to the vertical shaft H, gear-wheels G, F, and G', and thence to the driven machinery, and all reacting tendency perfectly balanced. The sails of the wind-wheel are thrown out of the wind by the operator taking hold of the wire W and pulling down thereon, which carries down the arm V' of the fork V and raises the end of the fork attached to the ring U' of the sliding collar U, raising such sliding collar and carrying up the rod T, which raises the weighted end of the lever or arm S, carrying down the other end thereof, which, through the bars *s s'*, throws the lever R backward, carrying with it the connecting-rod Q, withdrawing the sliding collar M, and such withdrawal of the sliding collar through the connection thereof with the rods O turns the bell-lever P to throw the sails out of use, and when the wire W is released the parts are brought back to their normal position by the weighted end of the lever S being carried down by the weight. Should it be desired to increase the speed of the wind-wheel, it is obvious that a weight may also be attached to the lower end of wire Z by the operator on the ground. The rod T, passing through the slot *j'* of the head J, is carried around with the rotation of the head, so as to maintain the same relation between the sliding collar U and lever S with the tube or hollow shaft I, on which the sliding collar is mounted, by which arrangement the hand shifting devices are always in position for use, as the fork V remains unchanged in position, the sliding collar turning in the ring U', which ring is held stationary by the fork.

The arm V'', with the wire Z thereto attached, enables the operator to lock the weighted arm firmly against upward movement, so that, if desired, the sails of the wind-wheel can be held in one position without liability of changing, and this arm, with its wire, can also be used, if necessary, for the purpose of drawing down the weighted lever S to turn the sails into operating position. The rod T, through which the sails are operated, by this arrangement is located outside of the tubular shaft, thus enabling the vertical shaft H to be placed within the tubular shaft I without interference from the shifting-rod, and as this rod is carried by the tubular shaft it is always in the same relation to the parts which it operates, rendering it at all times in condition to perform the office for which it is designed.

It will be seen that when the wind-wheel is at rest and the turn-table formed by the parts J J' of the mill is rotated around the tower the gear-wheels F perform the same office in tracking on the gear-wheels G G' that the geared rollers *d* perform in tracking on the surfaces of the plates B and E, and this movement does not move or affect the windmill shaft L in its bearings or rotate the vertical shaft H', thus demonstrating that the upright shaft is swiveled as effectually as the wind-wheel itself is swiveled in the tower. This arrangement of a secondary or auxiliary turn-table produces an effectual counterbalance or compensation for the reaction of the vertical shaft H on the wind-wheel shaft L and its transmission to the turn-table or swivel J J' of the wind-wheel shaft, for the reason that the force of the gearing of the wind-wheel shaft to rotate in one direction is counterbalanced or counteracted by the force of the tubular shaft in the opposite direction, thus maintaining a perfect equalization between the two forces, by which no strain is transmitted to the wind-wheel shaft and its bearings.

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

1. The combination, with a wind-wheel, of a swiveled head carrying its shaft, a vertical shaft to which the power is communicated, a hollow tube connected to the swiveled head, a spider connecting said tube with a geared plate, a similarly-geared plate mounted upon the tower, an auxiliary turn-table, and gears journaled therein and meshing with the geared plates, substantially as described.

2. The combination, with a wind-wheel its shaft, and power-shaft, of miter-gears having a vertical axis, miter-gears meshing therewith and carried by independent horizontal shafts, an auxiliary turn-table on which said shafts journal, geared plates above and below said turn-table, one of said plates being fastened to the tower, and gears intermeshing with said plates and journaled in the turn-table, substantially as described.

3. The combination, with the geared plates B and E, the former being connected to the

tower, of the ring or turn-table C, geared rolls *d*, journaled in said ring, hollow tube I, spider K′, and head J, substantially as described.

4. The combination, with the shaft of a wind-wheel and a vertical shaft, H, of a traveling shaft, D, plate C, shaft H′, gear-wheels F G G′, plates B E, having gears *b e*, and geared rollers *d*, journaled on the plate C, and meshing with plates B and E, substantially as and for the purposes specified.

5. The wind-wheel shaft L, shaft H, tube I, and support J J′, in combination with the shaft H′, gearing E F G G′, traveling shaft D, and rolls *d*, having journals mounted on turn-table carrying the shaft D, a plate, B, secured to the tower, and a plate, E, resting on said rolls and supporting tube I, substantially as and for the purpose specified.

6. The plate or track B, having a gear, *b*, and plate or track E, having a gear, *e*, in combination with the plate C, geared rollers *d*, traveling shaft D, and a gearing-connection with the vertical shaft H and tube I for counterbalancing purposes, substantially as specified.

7. The stationary track or plate B, having a gear, *b*, and plate C, having geared rollers *d*, and carrying a traveling shaft, D, in combination with a movable track or plate, E, having a gear, *e*, and carried by the vertical tube I, and the vertical shaft H, geared with the traveling shaft D and driven by the wind-wheel shaft, substantially as and for the purposes specified.

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