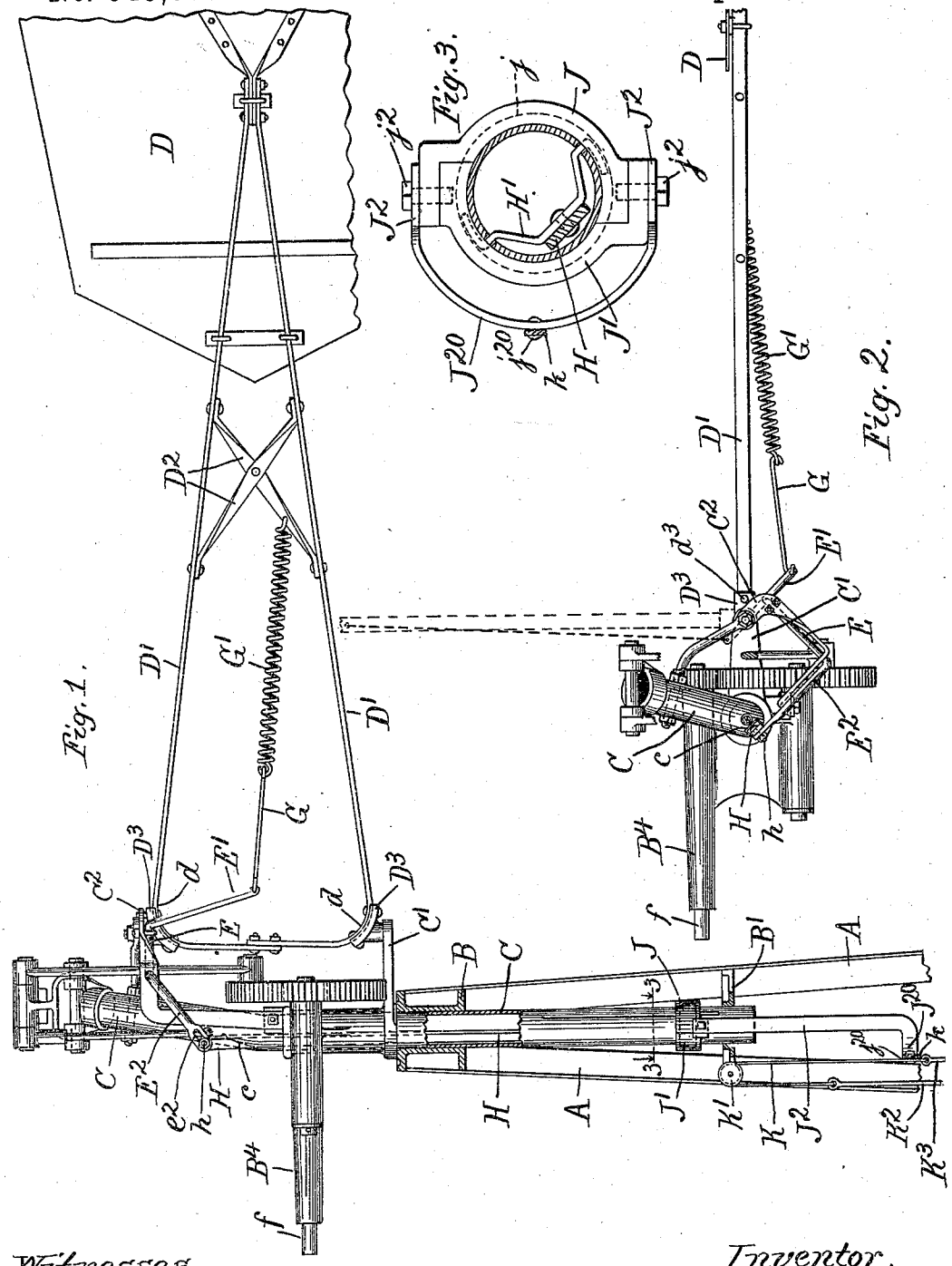
(No Model.) 2 Sheets—Sheet 1.

D. E. BARNARD.

WINDMILL.

No. 545,840. Patented Sept. 3, 1895.



Witnesses.
E. T. Wray
Jean Elliott

Inventor.
D. Elroy Barnard
by Burton & Burton
his Att'ys.

(No Model.) 2 Sheets—Sheet 2.

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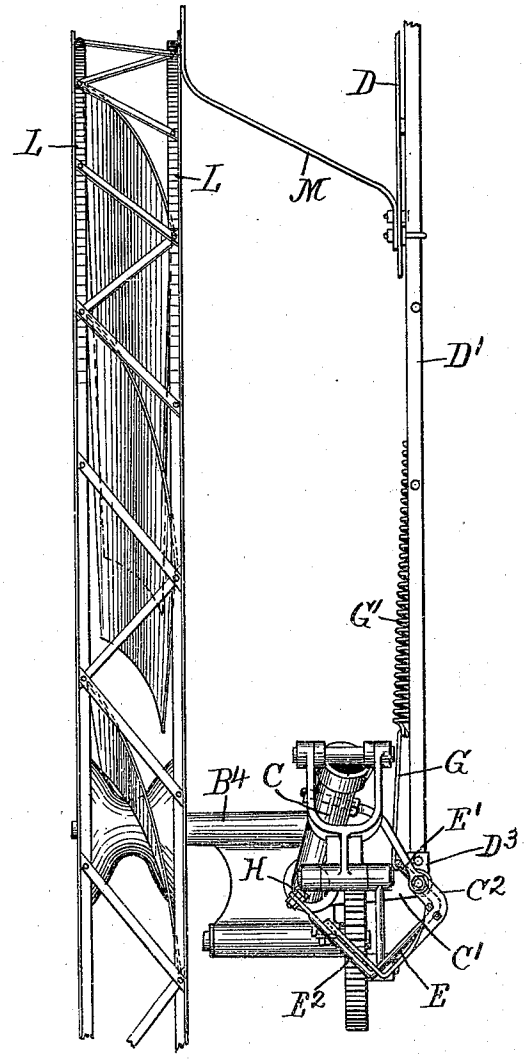
Fig. 4.



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E. F. Wray.
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Inventor.
D. Elmy Barnard
by. Burton and Burton
his Attys

UNITED STATES PATENT OFFICE.

DE LONSON ELROY BARNARD, OF CHICAGO, ILLINOIS.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 545,840, dated September 3, 1895.

Application filed July 19, 1894. Serial No. 517,966. (No model.)

To all whom it may concern:

Be it known that I, DE LONSON ELROY BARNARD, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Windmills, which are set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

In the drawings, Figure 1 is an elevation, partly sectional, of the upper portion of the tower, turn-table, and wheel-supporting frame work and furling devices thereon embodying my invention, the turn-table and its bearing in the tower being shown in vertical section at the upper end of the latter. Fig. 2 is a plan of the same parts shown in Fig. 1. Fig. 3 is an enlarged detail section at the line 3 3 on Fig. 1. Fig. 4 is a plan view showing the wheel out of wind.

The tower is made of corner-posts, of which two A A are shown in Fig. 1, secured together at the upper end by a casting B, in which the vertical tubular stem of the turn-table obtains its uppermost bearing. The turn-table comprises said tubular stem C and portions rigid therewith above the top of the tower for supporting the wind-wheel, gearing-train, steering-vane or tail, and furling mechanism.

Since this invention relates only to mechanism for furling or folding the tail, some details shown in the drawings do not pertain to this invention and will not be particularized in this description.

D is the steering-vane or tail, which is carried on a frame or skeleton made up of the flat bar D′, suitably folded, constituting a triangle with a short base vertical at the pivoted end and braced by the diagonal bars D^2 D^2. At the bends *d d* in the bar D′ clips D^3 D^3 are secured to the bar and afford the immediate means of pivotally attaching the tail to the turn-table horizontal arms C′ at the lower part and C^2 at the upper part of the turn-table affording the means for such pivotal connection of the tail to the turn-table. Considered with reference to the vertical axis of the turn-table, the pivotal axis of the tail is directly behind said turn-table axis, the plane that contains these two axes being parallel with the vertical plane which contains the wind-wheel axis, which is indicated by the wind-wheel shaft *f*, shown protruding from its bearing B^4 on the turn-table. The arm or brace C^2, which affords the upper pivot-bearing for the tail, affords bearings also for a rock-shaft E, journaled horizontally in said arm or brace and at an angle of about forty-five degrees to the vertical plane which contains the axes of the turn-table and tail. From the rear end of this rock-shaft E a lever-arm E′ extends at right angles to the shaft and in a plane approximately at right angles to the plane which contains the rock-shaft and its arm E′. The rock-shaft has the lever-arm E^2. From the arm E′ a link G extends to make connection with one end of a spiral spring G′, the other end of which is connected to the tail-frame, which may be conveniently done, as represented, at one of the cross-braces D^2. To the end of the arm E^2 the furling-bar H is connected at the slot e^2, which permits the pivot-bolt *h*, which effects the connection to slide in the arm to accommodate the relative movement of the two parts thus connected. This furling-bar H extends within the tubular turn-table stem, protruding therefrom above the top of the tower at *c*, where said tubular stem is deflected sideward to afford support out of line with the axis for certain of the power-transmitting mechanism which does not pertain to this invention. The bar obtains vertical guidance in the wall of the tubular stem which it thus penetrates at *c*, and is further guided and actuated as hereinafter more particularly explained. The lengths and relative positions of the several parts mentioned—to wit, the arms of the rock-shaft E, the link G, and spring G′—are such that when the tail extends at right angles to the plane of the wheel—that is, parallel to the wheel-axis, as shown in the plan view, Fig. 2, this being the position when the wheel is held in wind—the arm E′ of the rock-shaft E extends downward obliquely, terminating and having its connection with the link G nearly midway in the vertical width of the triangular frame of the tail formed by the bent bar D′, and at this position the arm E^2 extends, as stated, in a plane nearly at right angles to that which contains the rock-shaft E and its arm E′, and therefore obliquely downward and toward the plane of the wheel.

The oblique relation of the rock-shaft E to the fore-and-aft direction of the tail brings the end of the arm E′, when in the position now being described, at one side of the plane of the triangular frame of the tail, so that the spring exerts its stress upon the tail in a direction oblique to the latter and on the side at which the tail is stopped and opposite the side toward which it can swing to permit the wheel to be set out of wind. (The stoppage of the tail at the position indicated is effected by a stud d^3, which projects upward from the clip D^3, past the arm C^2, and comes into collision with that arm at the fore-and-aft position of the tail as seen in Fig. 2.) It will be understood from this description that if the rock-shaft E is rocked through ninety degrees by pushing the arm E^2 upward through ninety degrees the arm E′ will swing from the position in which it extends in Fig. 2—to wit, obliquely downward, rearward, and away from the plane of the tail on the side at which it is stopped—to a position in which it will extend obliquely downward and forward and away from the plane of the tail on the side toward the wheel; and that at about the middle point of such movement the line of tension of the spring G′ will fall in the plane of the tail, and that upon passing that point the spring will tend to pull the tail over away from its direct fore-and-aft position toward a position at right angles thereto, and that the tail will thus follow the arm E′ through the remainder of the movement of the latter, and when such movement is completed the tail will be at right angles to its forward position and the arm E′ will stand pointing obliquely downward and forward and at the forward side of the tail which now extends parallel to the wheel or at right angles to the shaft of the latter; and that as in the first position the spring tended to hold the tail in fore-and-aft direction, in the new position it will tend to hold the tail in a position transverse to the first. Thus the same spring tends, when the wheel is set in the wind, to hold it there, and when the wheel is set out of the wind to hold it out.

Since the spring which constitutes part of the connection from the rock-shaft to the tail by which the latter is swung does not tend to withdraw the tail from either position toward the other, the devices which operate the rock-shaft must be such as to actuate it positively in both directions. For this purpose I extend the furling-bar H down within the tubular stem of the turn-table to a point near the lower bearing of the latter, which is obtained in a horizontal spider B′, secured between the tower-posts a short distance below the top, and secure it to a cross-bar H′, which is inserted transversely through the tubular stem protruding at both sides, slots being made longitudinally in this part of the stem to permit it to thus protrude and move vertically. The protruding ends are folded down against the outer surface of the tubular stem, as seen in Fig. 3. In order to take hold of this cross-bar by means of the protruding and folded ends, and thereby actuate the bar H, which is within the tubular stem, I provide a two-part collar J J′, adapted to be put together about the stem, encircling it, and said collar has on the inner surface of both its members an annular groove j of suitable size to receive the folded ends of the cross-bar H′. For this two-part collar J J, I provide a yoke handle or stem J^2, secured at diametrically opposite points and most conveniently by means of the same screws or bolts j^2 which fasten the two parts of the collar together. This yoke-stem at the lower end has its bow $J^{2\circ}$ bent aside from the center of the bar, and to it I attach at $j^{2\circ}$ one end k of a cable or chain K, which passes up thence over a pulley K′, mounted on the spider B′ between two of the corner-posts, the cable extending thence down to the ground, or connected to a rod K^2, which extends down to the ground, and in like manner the cable or a rod K^3 therefrom at the other end extends from the point of fastening at $j^{2\circ}$ on the yoke $J^{2\circ}$ down to the ground or within convenient reach of the operator. To push up the furling-rod and throw the wheel out of wind, the end of the cable or rod K^2 will be pulled downward, and to throw the wheel in wind the end of the rod K^3 will be pulled down, the motion communicated to the furling-bar H in both cases being positive.

The wheel which I design to operate by means of furling devices described has a rim L, and to the tail-frame I attach a spring M in such position that when the tail is folded to a position parallel with the wheel, the spring M comes into contact with the edge of the wheel-rim L, and being held against it by the tension of the spring G′ operates as a brake to check the rotation of the wheel. The pressure exerted thus against the wheel by the spring is greater in proportion to the wind-pressure so long as the tail is set to hold the wheel out of wind. The spring G′, therefore, operates not only to hold the wheel in the wind and to hold it out of wind, but also as a brake-spring to check the rotation of the wheel when out of wind. It will be observed that no other stop is provided for the tail at this position. The wheel thus becomes the stop for the movement of the tail as it swings toward the wheel or toward the direction at which the wheel is held out of wind, and to this circumstance is due the fact above stated that the pressure of the brake on the wheel increases as the wind-pressure increases. To this feature of construction also there is due another advantage—to wit, that the tail cannot become entangled with the wheel because the spring-arm which constitutes the stop for the tail stops directly against the wheel.

I claim—

1. In a wind mill in combination with the turn-table and a tail pivoted thereto and adapted to swing from a position substantially at right angles to the wheel to a posi-

tion substantially parallel therewith, an arm supported on the turn-table and a spring connected thereto and to the tail-frame, and means for moving the arm to carry the point of connection of the spring thereto from one side of the angle through which the tail swings to the other side of the said angle, substantially as set forth.

2. In a wind mill in combination with the turn-table and a tail pivoted thereto and adapted to swing from a position substantially at right angles to the wheel to a position substantially parallel therewith, a lever arm pivoted on the turn-table and a spring connected thereto and to the tail-frame and means for swinging the arm about its pivot to carry the point of connection of the spring thereto from one side of the angle through which the tail swings to the other side of said angle, substantially as set forth.

3. In a wind mill in combination with the turn-table and a tail pivoted thereto and adapted to swing through a right angle from a position at right angles to the wheel to a position parallel therewith, a rock-shaft journaled on the turn-table oblique to both said positions of the tail and having the lever arm E′, a spring connection from said lever arm to the tail frame, means for rocking the shaft to carry its arm E′ from one side of the right angle through which the tail swings to the other side of said right angle, substantially as set forth.

4. In a wind mill in combination with the turn-table the tail pivoted thereto and adapted to swing through a right angle from a position parallel to the wheel axis to a position at right angles thereto, a rock-shaft journaled on the turn-table oblique to both said positions of the tail, the tail frame being open and the rock-shaft having a lever arm E′ adapted to swing through the open tail frame from a position at one side of the right angle through which the tail swings to a position at the other side of said right angle, and the spring which connects said lever arm to the tail frame, substantially as set forth.

5. In a wind mill in combination with the turn-table and the wheel supported thereon, tail pivoted thereto and adapted to swing toward a position parallel with the wheel, the wheel having a rim L and the tail having a spring arm adapted to come into contact with the wheel rim as the tail approaches a position parallel with the wheel whereby such spring arm operates as a brake upon the wheel, substantially as set forth.

6. In a wind mill in combination with the turn-table and the wheel journaled thereon, and the tail pivoted thereto, a furling spring to hold the tail yieldingly toward the plane of the wheel, the wheel having a rim L and the tail having a spring arm M adapted to bear against the rim when the tail approaches a position parallel with the wheel whereby the furling spring operates as a brake spring also, substantially as set forth.

In testimony whereof I have hereunto set my hand, in the presence of two witnesses, at Chicago, Illinois, this 10th day of July, 1894.

D. ELROY BARNARD.

Witnesses:
CHAS. S. BURTON,
JEAN ELLIOTT.