No. 666,052. Patented Jan. 15, 1901.

# E. HARRIS & J. M. CARRUTH.

## WINDMILL.

(Application filed Aug. 28, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

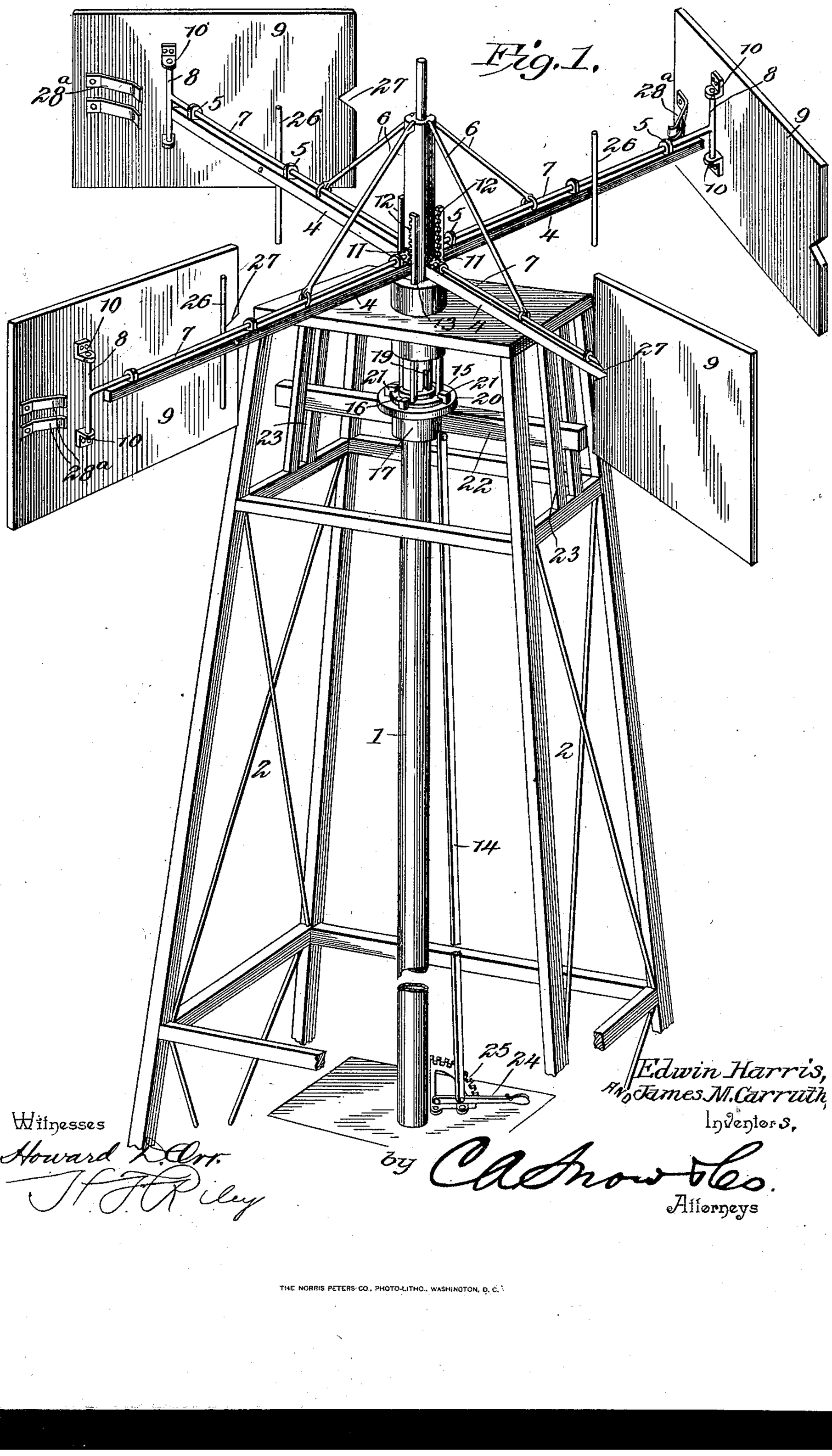


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Fig. 2.

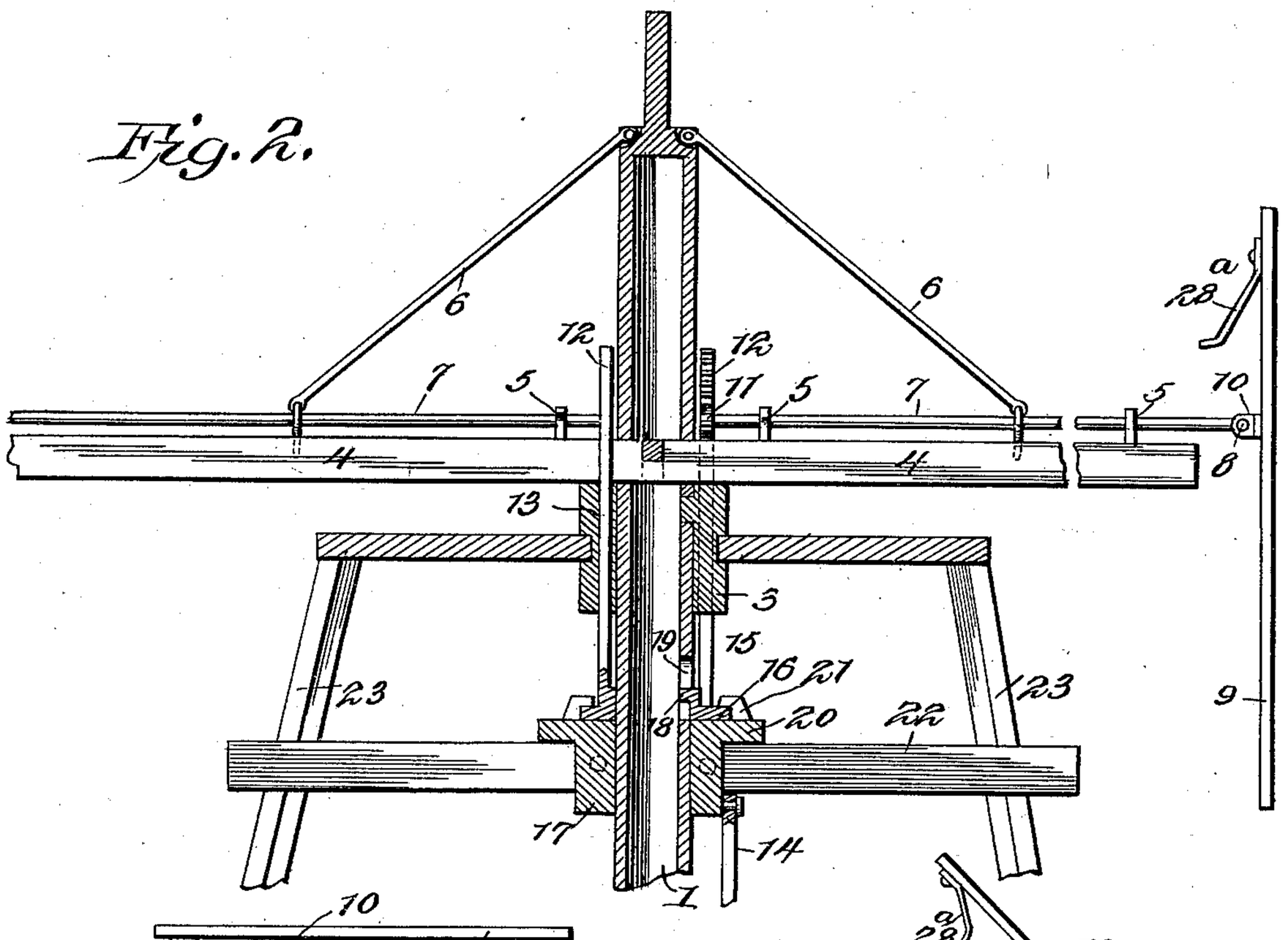


Fig. 3.

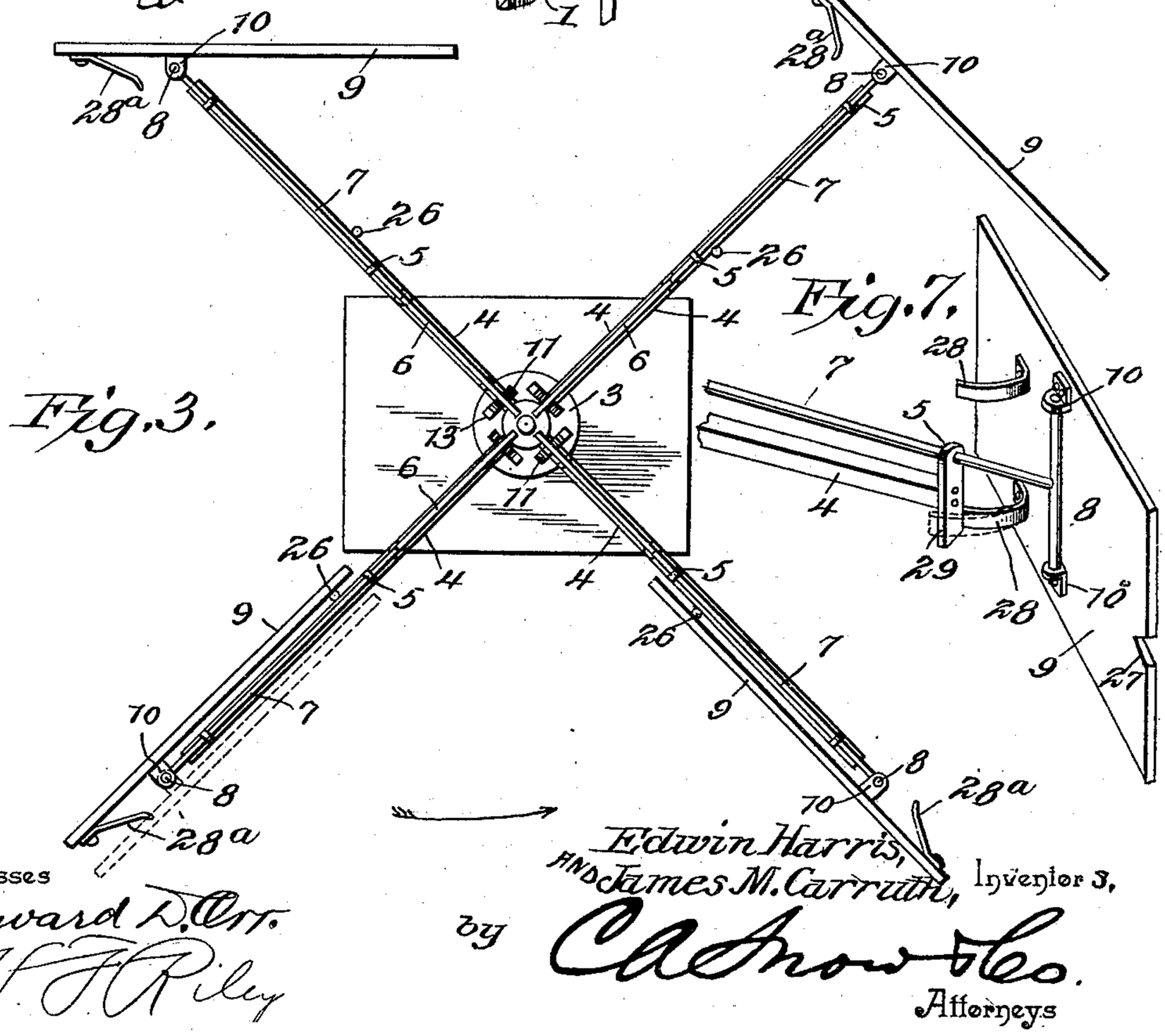


Fig. 7.




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Fig. 4.

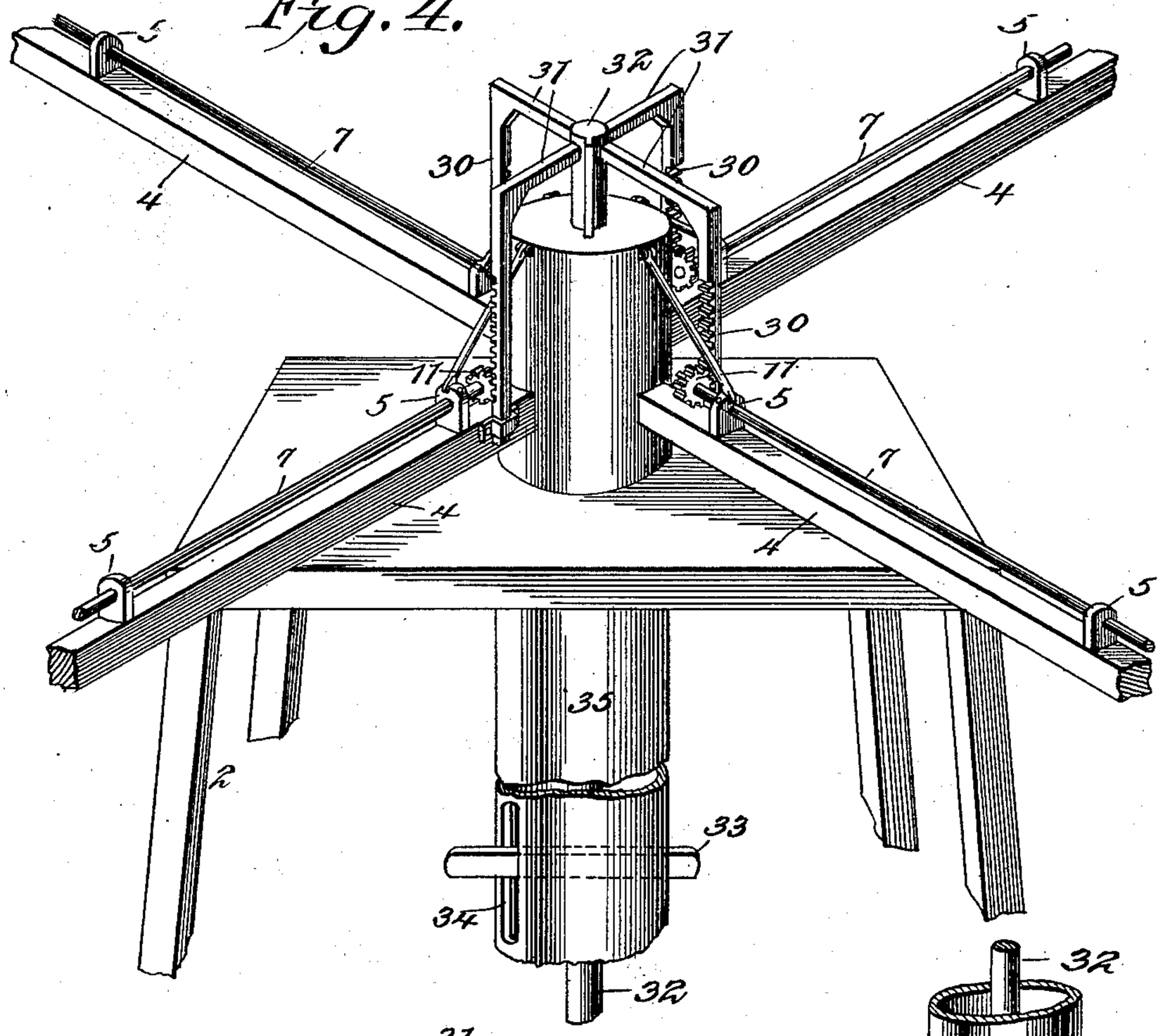


Fig. 5.

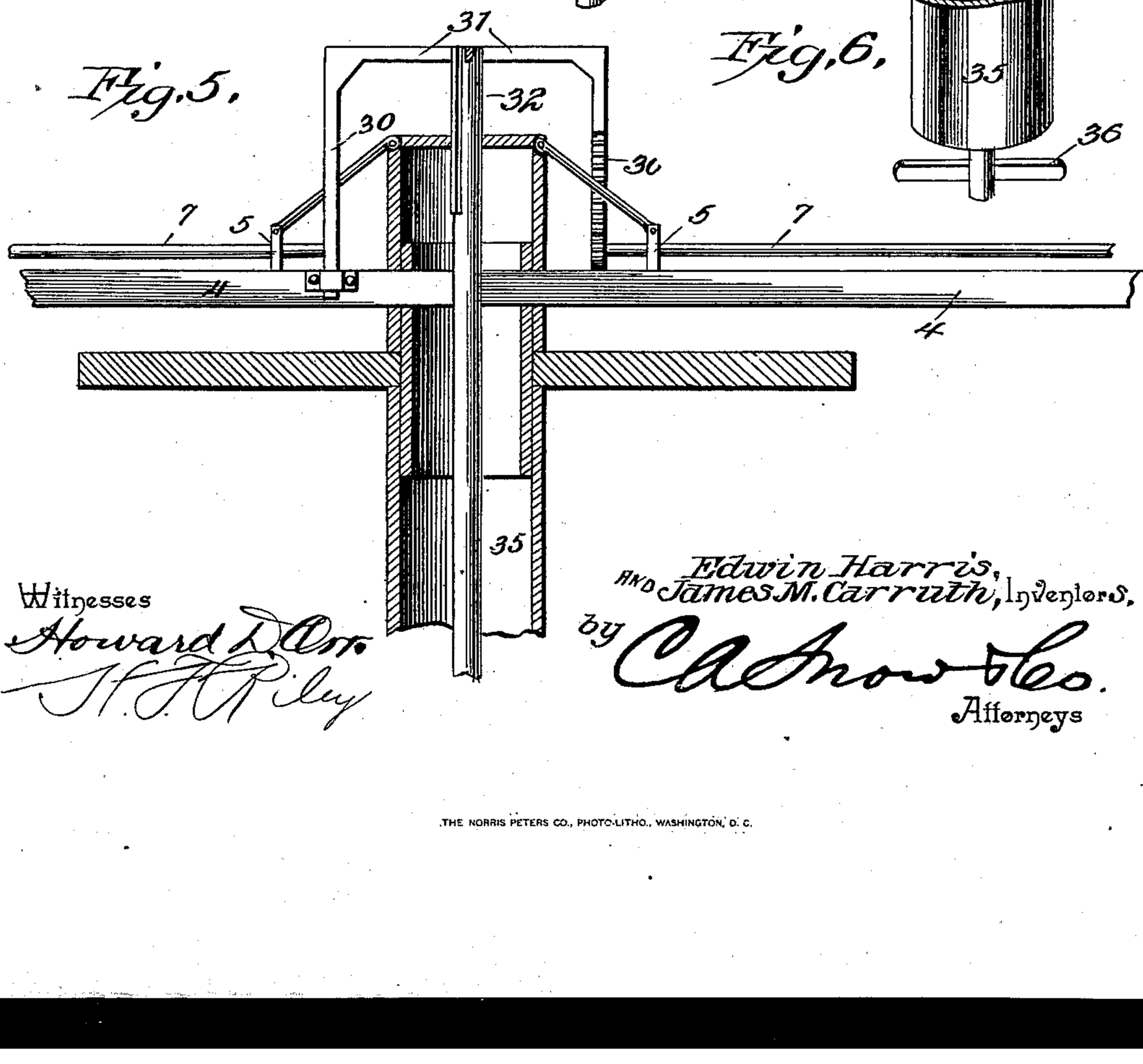


Fig. 6.




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# UNITED STATES PATENT OFFICE.

EDWIN HARRIS, OF PINE GROVE, AND JAMES M. CARRUTH, OF BERRYVILLE, TEXAS.

## WINDMILL.

SPECIFICATION forming part of Letters Patent No. 666,052, dated January 15, 1901.

Application filed August 28, 1900. Serial No. 28,325. (No model.)

*To all whom it may concern:*

Be it known that we, EDWIN HARRIS, residing at Pine Grove, and JAMES M. CARRUTH, residing at Berryville, in the county of Henderson and State of Texas, have invented a new and useful Windmill, of which the following is a specification.

The invention relates to improvements in windmills.

One object of the present invention is to improve the construction of windmills and to provide a simple and comparatively inexpensive one which will be unaffected by the change in the direction of the wind and which will be adapted to have the wind-wheel supported upon the ground, so that the tower will be subjected only to the strain resulting from the wind.

Another object of the invention is to provide a windmill of this character adapted to be readily operated to change the direction of its rotation and to throw it out of operation and capable of being readily constructed to obtain the desired power and of transmitting the same to the base of the tower directly to reduce the friction to a minimum.

The invention consists in the construction and novel combination and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and pointed out in the claims hereto appended.

In the drawings, Figure 1 is a perspective view of a windmill constructed in accordance with this invention. Fig. 2 is a vertical sectional view of the upper portion thereof. Fig. 3 is a plan view. Fig. 4 is a perspective view of a portion of a windmill, illustrating a modification of the invention. Fig. 5 is a vertical sectional view of the same. Fig. 6 is a detail view illustrating the construction of the vertically-movable operating-rod when the power for actuating it is applied to its lower end. Fig. 7 is a detail view illustrating the preferred arrangement of the cushioning-springs.

Like numerals of reference designate corresponding parts in all the figures of the drawings.

1 designates a vertical wind-wheel shaft designed to extend to the base of a tower 2, so that the weight of the wind-wheel shaft and the wind-wheel, hereinafter described, may be supported upon the ground to relieve the tower 2 of such weight and to enable the same to be constructed mainly for resisting the strains incident to the force of the wind. The tower may be constructed in any suitable manner, and it is provided at its top with a suitable bearing for a collar 3 of the shaft 1, which extends above the top of the tower, as clearly shown in Fig. 1. The upper portion of the wind-wheel shaft, which is preferably hollow, is provided with openings through which pass guards which form the supporting arms or spokes 4 of the wind-wheel, and the bars which constitute the spokes 4 and which form a wheel-frame are arranged at right angles to each other and are centrally connected, as shown in Fig. 2; but the number of the arms or spokes may be varied and the arms may be connected with the vertical shaft in any other suitable manner. The collar 3 is arranged to support the arms, and the latter are provided at their upper edges with bearings 5 and are supported by suitable guy-rods or braces 6, extending from the said arms, at points between the ends thereof, to the upper end of the vertical shaft 1.

Within the bearings 5 are arranged shafts 7, disposed horizontally and extending longitudinally of the arms and adapted to be rocked by the means hereinafter described to arrange pintles 8 of their outer ends, either vertically or horizontally, and to rotate feathering-blades 9 one-half a revolution to change their position with relation to the arms of the wind-wheel to reverse the same. The pintles 8, which are rigid with the rock-shafts 7, are arranged in suitable eyes 10 of the blades 9 and are located at points between the centers of the blades and one end, so that a greater portion of the blades will be located at the back to produce the proper feathering ation and to cause a positive operation of the blades. The eyes 10, which receive the ends of the pintles, may be constructed in any suitable manner; but they preferably consist of perforated portions of L-shaped plates secured to the blades, as clearly shown in Fig. 1 of the drawings.

The rock-shafts 7 are provided at their inner ends with pinions 11, meshing with vertically-movable rack-bars 12, which extend

through suitable guide-openings 13 of the collar 3 of the vertical shaft 1, and the lower ends of the entire series of rack-bars are connected with a bar 14 by a coupling 15, consisting of an upper ring or plate 16 and a lower sliding collar 17. The upper ring or plate 16, which rotates with the shaft 1, is interlocked with the same, preferably by means of a lug 18, engaging a slot 19, and the sliding sleeve 17, which is held against rotation, is provided at its upper end with a horizontal supporting-flange 20 and has a series of hook-shaped lugs 21 engaging over the upper ring or plate 16. By this construction the upper section of the coupling is permitted to rotate on the lower section or sleeve 17. The slot 19, which receives the lug 18, limits the movement of the coupling, and the lower section or sleeve of the latter is connected with a horizontal guide-bar 22, extending across the tower and having its ends arranged in vertical guides 23. The guides 23 consist of a pair of vertical or substantially vertical bars located at each side of the tower and spaced apart to form a vertical opening for the ends of the sliding bar 22. The connecting-bar 14, which extends to the base of the tower, has its lower end pivoted to an operating-lever 24, carrying a suitable detent or pawl for engaging a curved ratchet 25, whereby the blades are locked at the desired adjustment to cause the wind-wheel to rotate in the proper direction and also to throw the windmill out of operation.

The blades 9 have their major diameters or axes arranged horizontally when the windmill is in operation, and by arranging the longer sides of the blades as shown in Fig. 3 of the accompanying drawings the wind-wheel will rotate in the direction of the arrow of the said figure, and by rotating the blades one-half a revolution to bring their longer sides in a diametrically opposite position the direction of the wind-wheel will be changed. By this construction the windmill will be adapted for a variety of work which would necessitate other devices for changing the direction of the motion if it traveled in one direction only. When the blades are squarely operated on by the wind, the latter will carry the longer portions of the blades against the arms of the wind-wheel, and it will be apparent that as the blades during the operation of the windmill are adapted to swing horizontally on vertical pivots or pintles they will feather automatically and present a maximum surface to the wind when they are in a position to be actuated by the wind to propel the wheel, and they will present a minimum surface in coming into the wind and will offer a minimum resistance and will not materially retard the wind-wheel.

When the longer portion of the blade is arranged contiguous to the adjacent arm, it is supported by a vertical rod 26, which relieves the operative mechanism of strain and prevents any liability of the blade to twist or turn when subjected to the full force of the wind. The blades are arranged vertically or with their major diameters in a vertical plane when it is desired to stop the windmill, and the pintles or pivots will then be horizontal, and the said blades will be adapted to swing in either direction to practically a horizontal position to prevent them from being strained or injured by the wind, and they are provided at the ends of their longer sides with notches 27, adapted to receive and permit the blades to clear the lower portions of the vertical rods 26 when the lower or rear portions of the blades swing beneath the horizontal supporting-arms 4 of the wind-wheel. By this construction the longer or rear portions of the blades are prevented from striking and injuring the vertical rods or supports 26.

In order to prevent the blades from being injured or in any manner injuring the arms 4, the blades are provided with upper and lower springs $28^a$, arranged in pairs, as clearly shown in Fig. 1. The springs are arranged one above the other, and one of them is adapted to engage the arm 4 when the blades are in either of their horizontal operative positions. It is preferred, however, to arrange the springs as illustrated in Fig. 7, wherein they are spaced apart to clear the arms 4 when the blades are arranged with their pintles in a horizontal position to stop the windmill. The arm is provided at its outer end with a depending projecting 29, arranged to be engaged by the lower spring; but the relative positions of the springs and the projection 29 may be changed. The projection 29 depends from the arm 4, and the lower spring is located below the arm and the upper one is arranged above the arm 4; but one of the springs will be in position for engaging the projection when the blade is in either of its horizontal operative positions. The springs, which may be of any desired construction, are slightly curved and are arranged or set at an angle, as clearly shown in Fig. 1, and they are adapted to cushion the blades as the latter turn on their pivots to assume a position in which they will be edgewise to the wind after having been operated on by the same. The upper left-hand blade of Fig. 3 of the accompanying drawings is parallel with the wind, and the lower left-hand blade has its longer or rear portion arranged against the arm 4, which serves as a stop to limit the pivotal movement of the blade, and consequently the wind acting on the face of the blade of the lower left-hand arm of Fig. 3 serves to actuate the wind-wheel. The blade remains in this position, against the arm, until it passes the position occupied by the lower right-hand blade of Fig. 3, and when it passes beyond a position parallel with the wind the latter will operate on the longer or rear portion and swing the same around the end of the arm, as indicated in Fig. 3, at the upper right-hand blade thereof. At this time the spring will serve as a cushion and relieve the blade and

the other parts of the wind-wheel of strain and jar.

In Fig. 4 of the accompanying drawings is illustrated a slight modification of the invention, in which the rack-bars 30 are connected at their upper ends by horizontal arms 31 with the upper terminal of a vertically-movable rod 32, extending through the hollow shaft and adapted to be raised and lowered to rotate the rock-shaft for changing the position of the blades of the wind-wheel. The arms 31 extend over the upper end of the hollow wind-wheel shaft, and the vertically-movable rod 32 may be connected with the mechanism for actuating it at a point between its ends or at its lower end. The mechanism for actuating the rod 32 is designed to be connected with a transverse piece 33, which may extend to a slot 34 of the vertical shaft 35 at a point between the ends thereof, or a similar piece 36 may be arranged at the lower end of the rod, as shown in Fig. 6.

In addition to cushioning the blades the springs 28ª and 28 are designed to support the blades in the proper angular position with respect to the wind when the latter is acting against the inner sides of the blades, as indicated in Fig. 7 of the drawings, so as to force the wheel forward and prevent the blades from being blown flat against the arms of the wheel.

The arrangement of the springs 28 in Fig. 7 has been provided to facilitate the moving of one of the blades into its operative position when it bears a certain relation to the wind. For instance, suppose the blade 9 (shown in Fig. 2) is upon the leeward side of the wheel and in its inoperative position and the wind is strong enough to lift the lower and longer portion of the blade, and thereby bring the upper portion thereof down upon the arm 4, with the spaced springs 28 at opposite sides of the arm and out of engagement therewith. The shaft 7 is then turned to throw the blade into its operative position, with the springs upon the top and bottom sides of the arm, respectively. The upper spring will not be in engagement with the arm; but the back of the lower spring will bear against the adjacent side of the stop projection 29, as indicated by the dotted lines in Fig. 7. As the longer end of the blade is swung around upon its pintle by the wind the free end of the spring will be drawn across the stop projection until it snaps by the latter and assumes its proper position, with its convex side in engagement with the opposite edge of the stop projection, thereby cushioning the blade and also maintaining it in its proper angular relation to the adjacent arm and the direction of the wind, so as to force the wheel to turn forwardly.

The essential difference between the springs 28ª and 28 is that the former spring inclines inwardly or toward the pintle of the blade, while the latter inclines outwardly and away from the pintle. Also the springs 28 are spaced apart, so as to lie at opposite sides of the arm when the blade is lifted by a strong wind. Moreover, the attached end of the spring 28 is nearer the pintle 8 than is the stop projection 29, while the free end of the spring is farther away from the pintle than is the projection, so that the free end of the spring may bear against the stop.

What is claimed is—

1. In a device of the class described, the combination with a wheel-frame, of a horizontal rock-shaft, a blade hinged to the rock-shaft at a point between its ends on a normally vertical pivot and arranged to swing normally horizontally to feather, and adapted to engage the said support, and means for rotating the rock-shaft, whereby the blade is reversed to change the direction of the wheel, or is arranged in a vertical position to stop the wheel, substantially as described.

2. In a device of the class described, the combination of a wheel provided with normally horizontally swinging blades hinged on a normally vertical pivot between their ends at a point between the center and one end, and means for rotating the blades to reverse them for changing the direction of the wheel and to arrange them vertically to stop the wheel, substantially as described.

3. In a device of the class described, the combination of a wheel provided with a normally horizontally swinging blade hinged between its ends and having its rear portion of greater length than its front portion, means for rotating the blade to reverse it and also to arrange it vertically, and a cushioning-spring carried by the front portion of the blade, substantially as described.

4. In a device of the class described, the combination of a wheel provided with a normally horizontally swinging blade hinged between its ends, means for rotating the blade to reverse it, and also to arrange it vertically to stop the wheel, and a pair of springs carried by the blade and spaced apart, whereby a spring will be in position for engaging the body portion of the wheel when the blade is in either of its horizonaal operative positions, substantially as described.

5. In a device of the class described, the combination of a suitable support, a normally horizontally swinging blade hinged between its ends, means for rotating the blade to reverse it and to arrange it vertically, a projection carried by the support, and a pair of springs spaced apart and mounted on the blade and adapted to clear the support when the blade swings vertically, and arranged to engage the projection when the blade is in either of its horizontal operative positions, substantially as described.

6. In a device of the class described, the combination of a wheel having horizontal arms, rock-shafts journaled on the arms and extending longitudinally thereof, the normally horizontally swinging blades hinged between their ends to the outer ends of the

rock-shafts or normally vertical pivots, pinions mounted on the rock-shafts, rack-bars meshing with the pinions, and means for reciprocating the rack-bars, whereby the blades are rotated to reverse them and to arrange them vertically, substantially as described.

7. In a device of the class described, the combination with a tower, of a vertical wind-wheel shaft extending to the base of the tower, horizontal arms arranged at the upper portion of the wind-wheel shaft, rock-shafts extending longitudinally of the arms, blades hinged on normally vertical pivots to the outer ends of the rock-shafts and arranged to swing normally horizontally to operate the wheel, pinions arranged at the inner ends of the rock-shafts, vertically-movable rack-bars meshing with the pinions, a coupling composed of upper and lower sections forming a swivel connection, the upper section being adapted to rotate with the shaft and connected with the rack-bars, and operating mechanism connected with the lower section, substantially as described.

8. In a device of the class described, the combination of a tower provided at opposite sides with vertical guides, a vertical wind-wheel shaft, arms extending from the shaft, rock-shafts arranged longitudinally of and supported by the arms, blades hinged to the outer ends of the rock-shafts on normally vertical pivots, a coupling composed of upper and lower sections, gearing connected with the upper section of the coupling for rotating the rock-shafts, a sliding bar arranged in the guides of the tower and connected with the lower section of the coupling, and operating mechanism connected with the coupling, substantially as described.

9. In a device of the class described, the combination of a horizontal support, a series of radially-arranged rock-shafts disposed horizontally and provided at their outer ends with vertical pintles, blades hinged between their ends to the vertical pintles and arranged to swing normally horizontally, and means for operating the rock-shafts to arrange the pintles in a vertical or in a horizontal position, substantially as described.

10. In a device of the class described, the combination of a support, a vertical rod mounted on the support, a horizontally-swinging blade hinged between its ends and arranged to engage the rod and provided at one end with a recess, and means for rotating the blade to reverse the same and also to arrange the blade in a vertical position, substantially as described.

In testimony that we claim the foregoing as our own we have hereto affixed our signatures in the presence of two witnesses.

EDWIN HARRIS.
JAMES M. CARRUTH.

Witnesses:
D. B. MIZELL,
GEO. R. MCNAIR.