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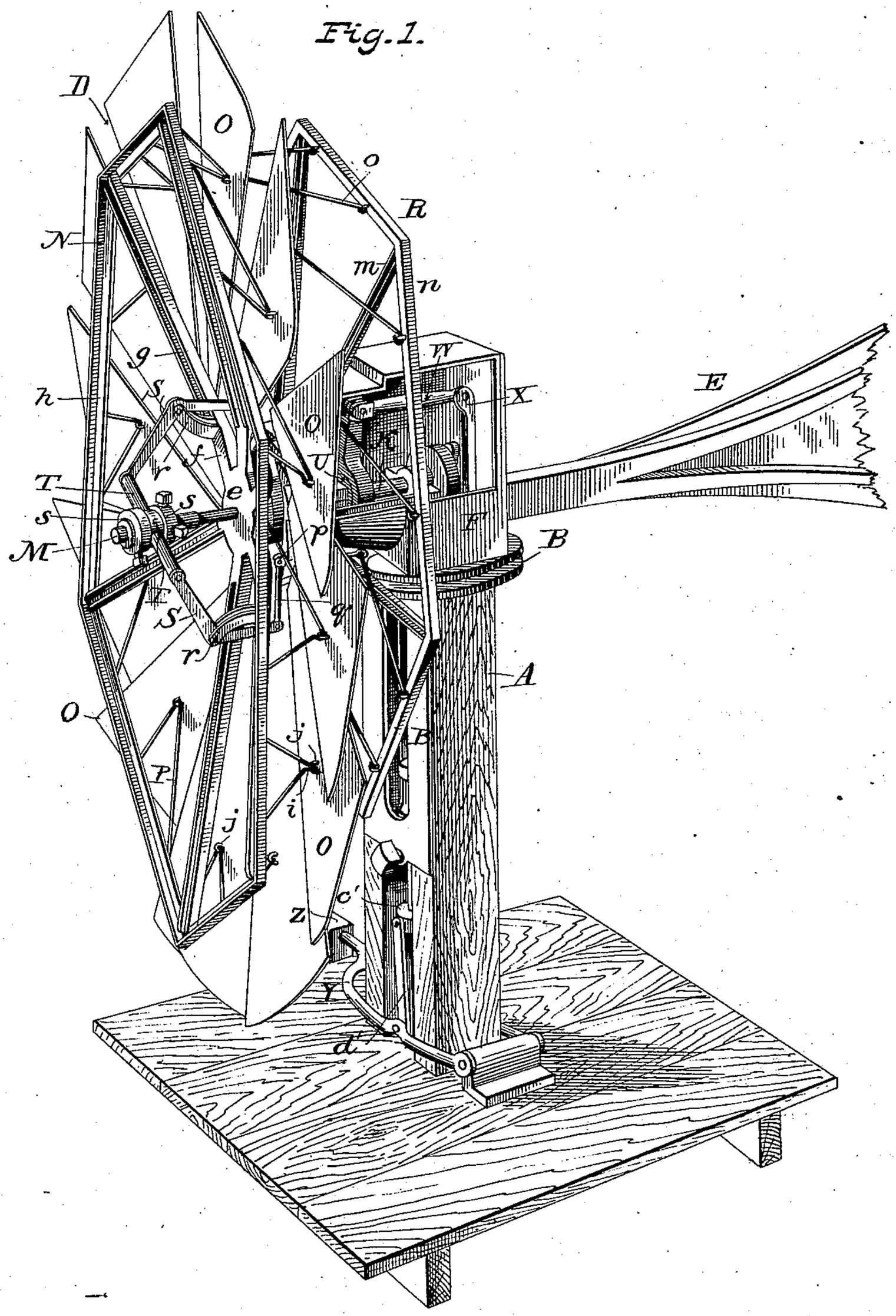
C. J. JONASSON.

WINDMILL.

No. 367,405. Patented Aug. 2, 1887.

Fig. 1.



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(No Model.) 4 Sheets—Sheet 2.

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Fig. 2.

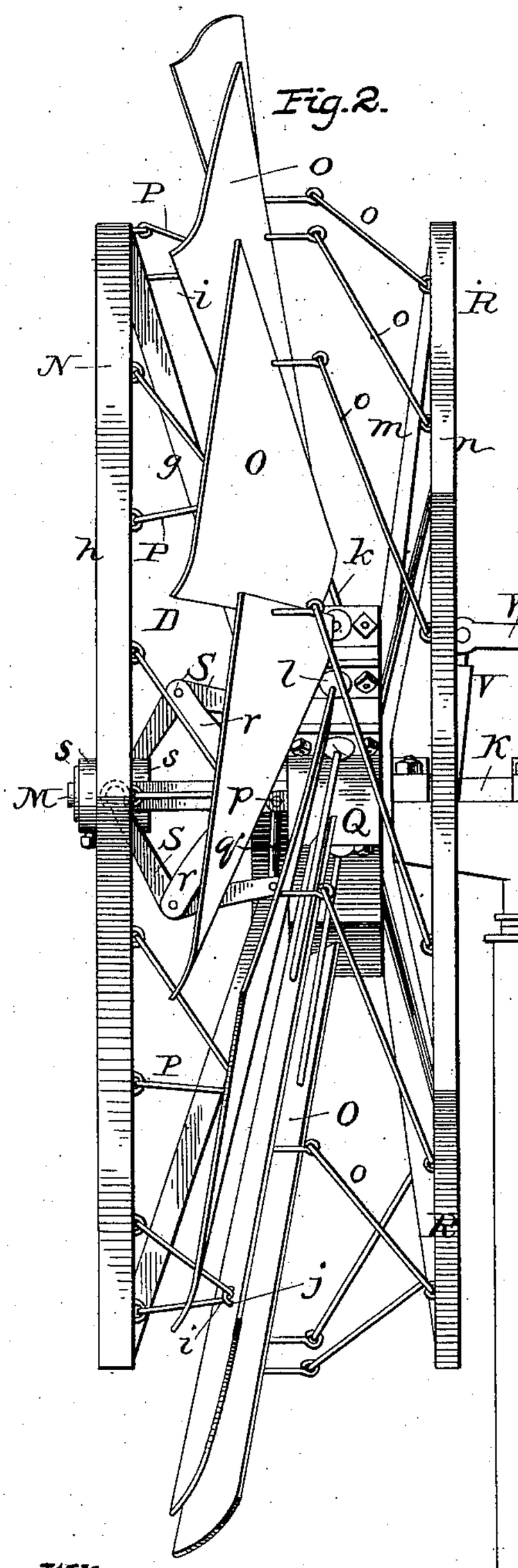

Fig. 3.

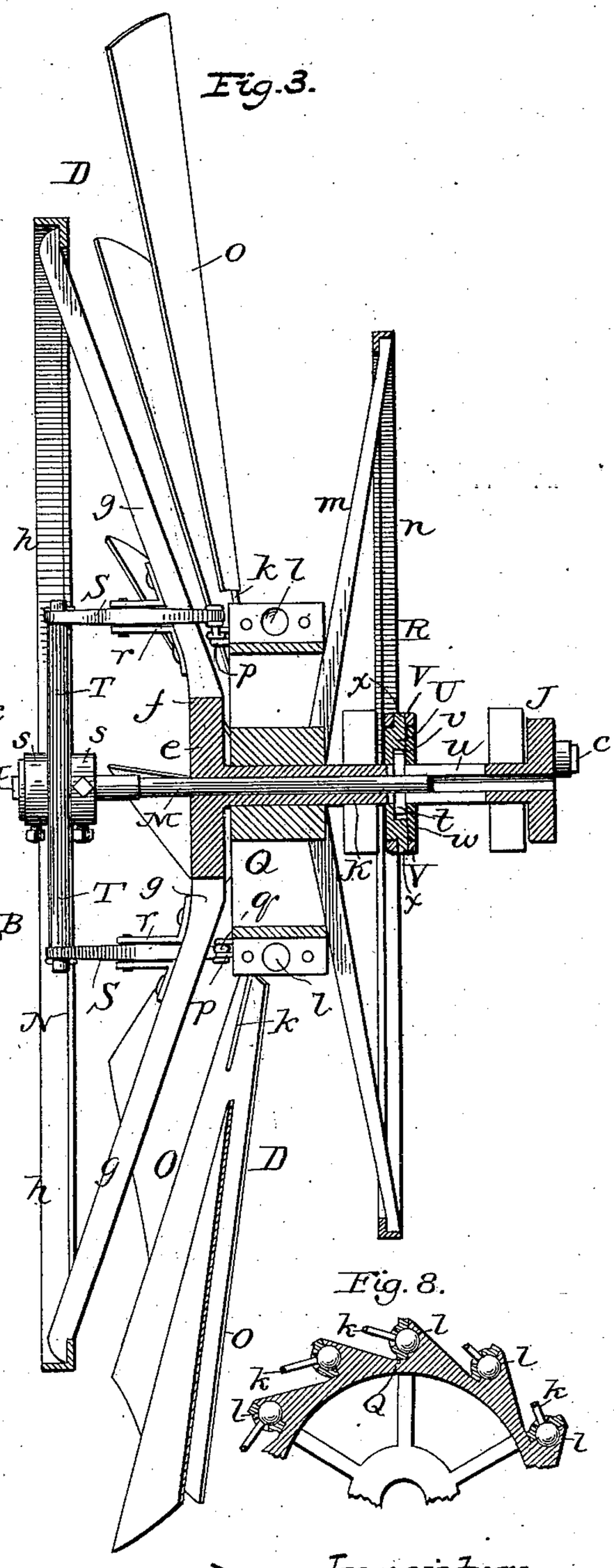

Fig. 8.

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Fig. 4.

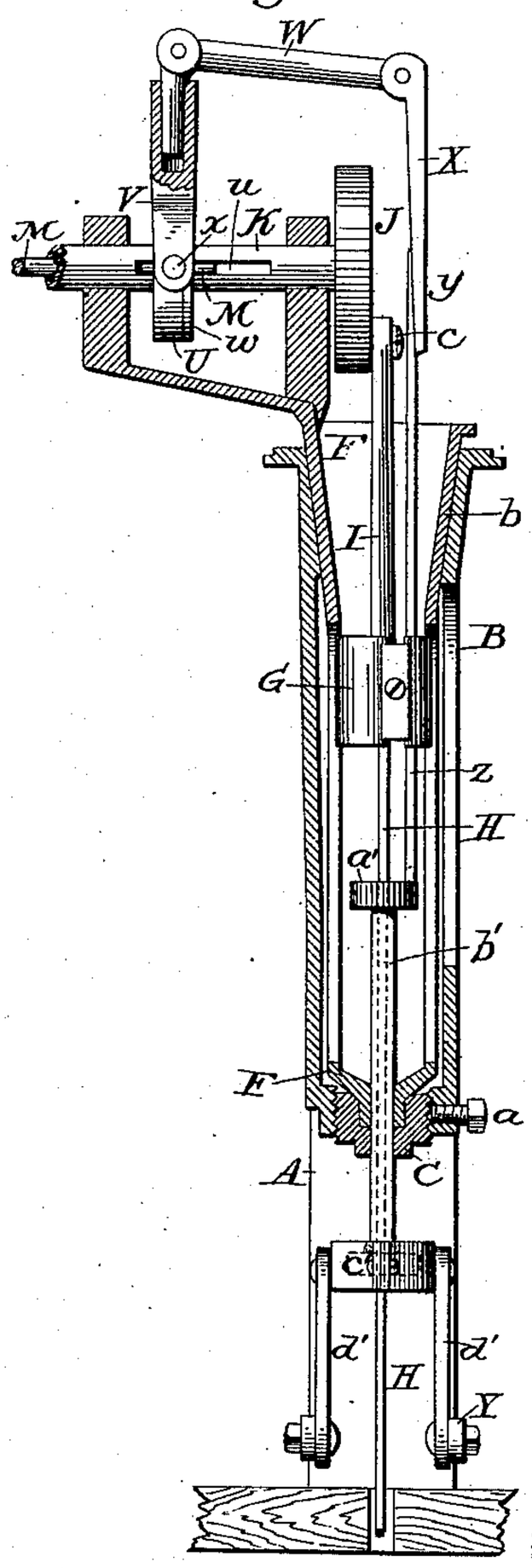

Fig. 5.

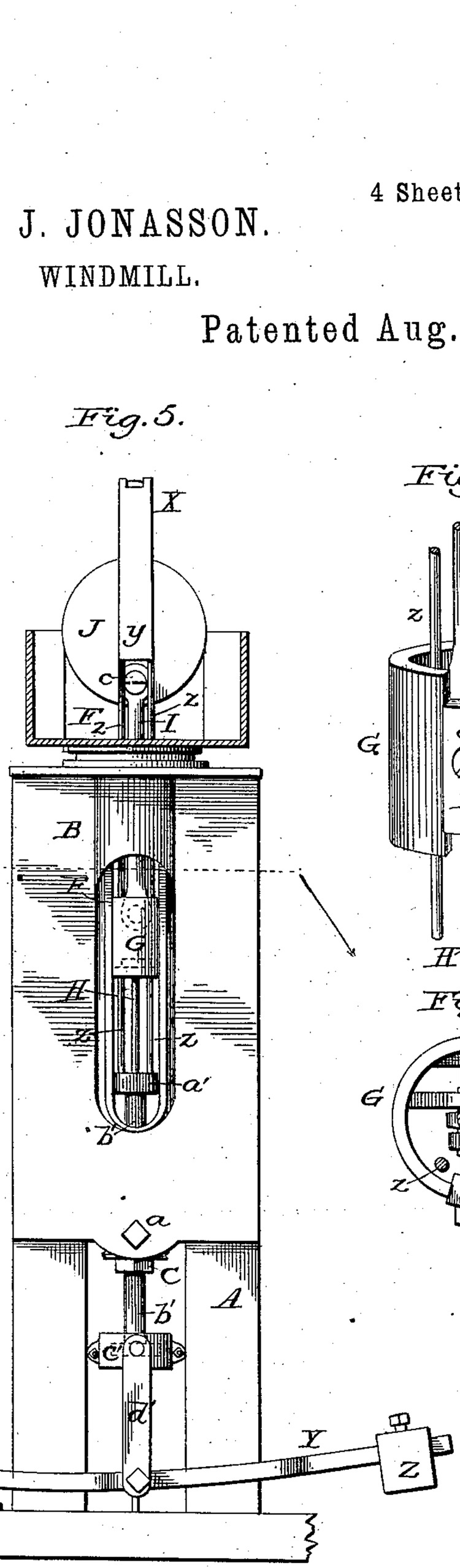

Fig. 6.

Fig. 7.

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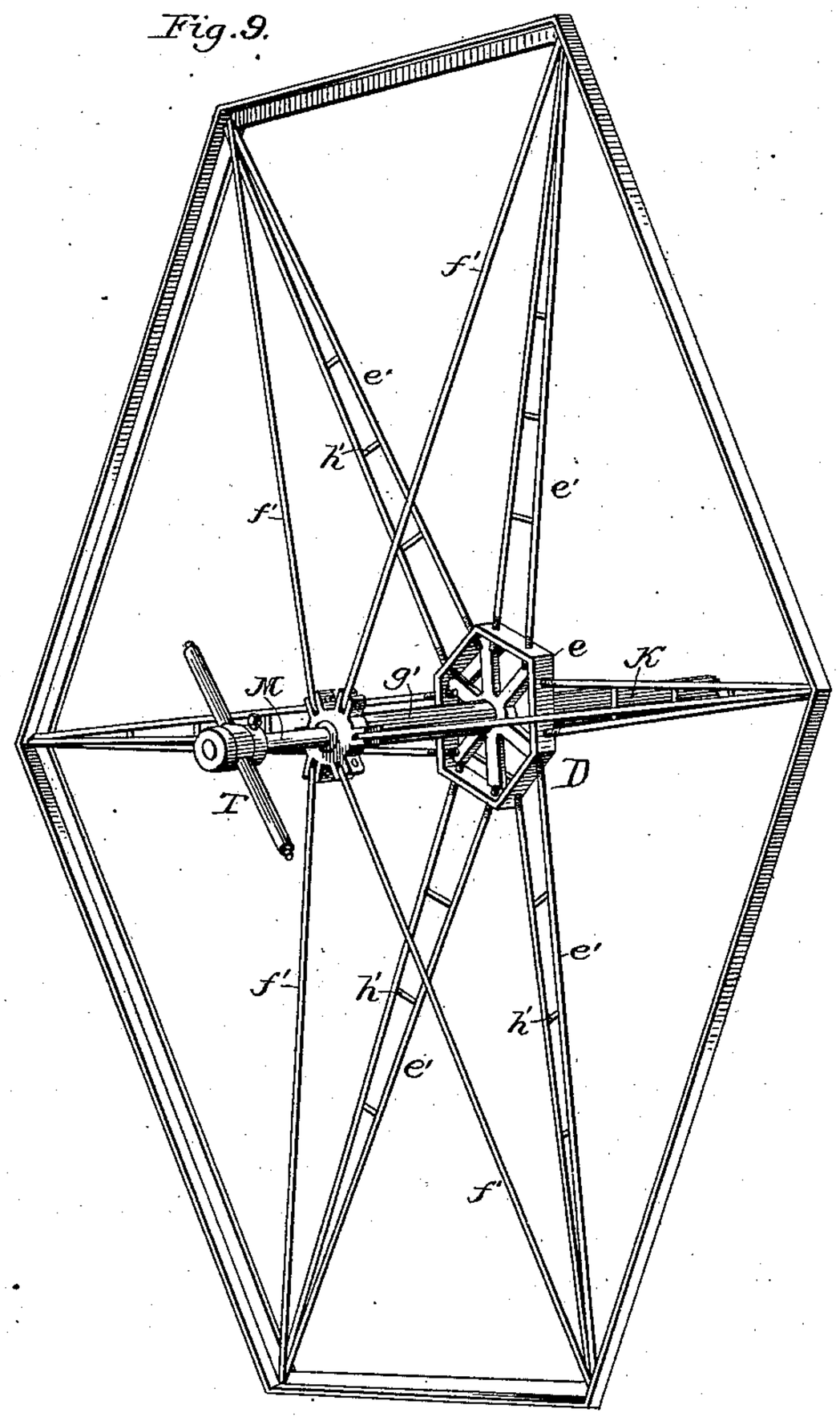
Fig. 9.



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UNITED STATES PATENT OFFICE.

CARL JOHAN JONASSON, OF CUMBERLAND, MARYLAND.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 367,405, dated August 2, 1857.

Application filed January 11, 1886. Serial No. 188,245. (No model.)

To all whom it may concern:

Be it known that I, CARL JOHAN JONASSON, of Cumberland, in the county of Alleghany and State of Maryland, have invented certain new and useful Improvements in Windmills, of which the following is a specification.

My invention relates to windmills; and it consists in a novel construction of the same, whereby the centrifugal force generated by the rotation of the wheel is caused to control and vary the position of the blades, so that as the wind increases in velocity the blades shall be turned to present less surface to the wind, the blades being restored to their normal position through the action of a weight.

The invention embraces, also, various other features and details of construction, which will be hereinafter pointed out and explained.

In the drawings annexed to and forming part of this description, Figure 1 is a perspective view of my improved wheel or mill, looking from the front; Fig. 2, a side or edge view of the same; Fig. 3, a sectional view; Figs. 4 to 8, views illustrating various details of construction; Fig. 9, a view illustrating a modification.

Attempts have hitherto been made to vary the position or inclination of the blades of a wind-wheel through a longitudinal movement of the blades themselves, each blade being in such case attached to the radial supporting arm or spoke by a sleeve having an oblique slot to receive a pin projecting from the spoke, so that as the blade was thrown outward by centrifugal force the oblique slot and pin should cause it to turn and present its edge to the wind. While such construction is correct in principle, it is found faulty, in that it involves too great strain upon the pins and on other parts, and fails to operate with that ease and freedom so essential to perfect regulation.

My invention is designed to obviate the difficulties mentioned and to utilize, in a thoroughly practical and efficient manner, the centrifugal force and longitudinal movement of the blades to regulate the speed of the wheel. This I accomplish by attaching the inner end of each blade by a ball-and-socket or equivalent joint to a hub or boss which has a limited rotary movement about and independent of the main shaft, connecting the rear edge of each blade by a link with a frame carried by said hub or boss, and, finally, connecting the blades at points at or near their outer ends by links or hangers to the main frame of the wheel, which is carried by a hub or boss rigidly secured upon the wheel-shaft. Under this construction each blade is supported at its inner end, at its rear edge, and at a point near its front and outer edge in such manner that when the blades are thrown outward by centrifugal force they turn freely, easily, and without friction or strain.

Referring again to the drawings, A indicates the upper part of the mast or tower, of any suitable or usual construction, upon which is secured a cap, B, which is usually made of cast-iron, tapering from its front to its lower end and provided with flanges for attachment to the mast or tower. The upper portion of the cap or casting B is bored out in conical or tapering form, as shown in Fig. 4, and is furnished at its lower end with a vertically-adjustable step, C, threaded on its exterior and screwing into a similarly-threaded opening in the lower end of cap or casting B, in which it is retained at any desired adjustment by a set-screw, *a*.

The wind-wheel D and its tail vane or rudder E are carried by a rotary head, F, which is supported at its lower end in the step C, and at its upper end is made with a conical portion, *b*, to fit the conical or tapering bore of the cap or casting B.

From long-continued use the bearing-faces of the conical portions wear away somewhat, and at a more rapid rate than the lower end of the head or its step; hence the necessity of making said step adjustable. When this provision is made, wear in the conical portions may be taken up or compensated for by lowering the step and thus bringing the two conical faces into direct and full bearing contact.

The head F is bored out from end to end cylindrically to receive a vertically-moving cross-head or swivel-block, G, in which the head of the pump-rod H is swiveled, and which is connected by a pitman, I, to the crank-pin *c* of a wheel or disk, J, secured rigidly upon the shaft K of the wind-wheel D.

Long-continued and constant use of the mill

causes the bearing-faces of the swivel-block and the bore of the head to wear, permitting play that is injurious to the mill throughout; and to compensate for this wear I make the cross-head or swivel-block G in the form of a split cylinder, open on one side to receive a wedge-block, L, Figs. 6 and 7, which is held in place and drawn more or less into its wedge-shaped seat or opening by a screw, *d*. As wear takes place and play follows, the screw is driven in, causing the wedge-block to expand the cylinder or cross-head, which completely compensates for wear, and at the same time preserves a perfect bearing contact between the cross-head and the bore of the head F.

To give ready access to the cross-head, screw, and other parts, I cut away the sides of the depending portion of the rotary head F, which also renders the same lighter and cheaper to make.

The tail vane or rudder may be of ordinary construction, and the wheel-shaft K is carried in bearings in or upon the forwardly-projecting portion of the head F, as usual.

The shaft K is of tubular form, and a smaller shaft, M, passes centrally through it and projects somewhat beyond its forward end, as shown in Figs. 1 and 3, for a purpose that will presently appear.

The construction of the wheel proper will be readily understood upon reference to Figs. 1, 2, and 3.

As best shown in Figs. 1 and 3, a hub or disk, *e*, provided with short radial arms *f*, is formed upon or rigidly secured to the front end of shaft K, and to the arms *f* are bolted or otherwise attached spokes *g*, which, for wheels of small or medium size, I prefer to make of **U**-shaped angle-iron, as shown. The outer ends of the spokes are connected, and serve to brace one another through connecting pieces or stringers *h*, which in such wheels may be advantageously made of **L**-shaped angle-irons, as shown; but I may say here that I do not confine myself to the use of angle-iron in either place. By thus constructing the spokes I produce a polygonal frame, N, to which the blades are hung, and by which they are supported through the medium of links or hangers P. These links or hangers are preferably made of round rod-iron, bent so as to form three points corresponding to the three angles of a right-angle triangle, an eye or loop, *i*, being formed at each of said points, as shown in Figs. 1 and 2. This construction, which is very cheap and simple, affords two points for attachment of the links to the bars or connecting pieces or stringers *h*, and also a point for attachment to the blades, which is effected by means of a staple or eye, *j*, passing through the eye or loop *i* of the link and riveted or otherwise made fast to the blade. This form of joint or connection is advantageous, in that it is cheap and easy to produce, and particularly because it permits free movement in different directions, which is necessary in this connection.

The inner end of each blade O is provided with a stem or shank, *k*, terminating in a ball, *l*, and the balls of the respective blades are seated and retained by means of cap-plates in sockets formed in a hub or boss, Q, which encircles and has a limited rotary movement about and independent of the main shaft K, as will be seen by referring to Fig. 3.

From the hub or boss Q spokes *m* extend radially, and these spokes are connected at their outer ends by ties or stringers *n*, similarly to the spokes *g* of the front frame above described, thus producing a second polygonal frame, R. The frame thus produced, being supported and carried by the hub Q, has of course a limited rotary motion independently of the shaft K and independently of the front frame, which is fixed to and moves only with the shaft. Each blade O of the wheel has its rear edge connected by a rod or link, *o*, to an eye or staple on the rear frame, R.

From the hub or boss Q of frame R two arms, *p*, project forward, and these arms are each connected by a link, *q*, to one arm of an elbow-lever, S, pivoted at the meeting-point of its two arms in a bracket or hanger, *r*, projecting from the hub *e*, two elbow-levers being employed, one for each arm *p*. The other arm of each elbow-lever is jointed to a cross head or bar, T, mounted upon the forward end of the central shaft, M, which passes through the main shaft, as above explained. The cross-bar is free to rotate upon the shaft, being merely held between two collars, *s*, which are secured upon the shaft by set-screws or equivalent means.

The shaft M extends back to a point between the two bearings or supports of the main shaft K, and is furnished near its rear end with a cross-pin, *t*, the ends of which project through slots or elongated openings *u* in the sides of the tubular main shaft K, and extend into an annular groove or recess, *v*, in a block, U, encircling the main shaft, in which groove the pin is retained by a cap-plate, *w*, secured in place by screws or bolts, or in any other convenient manner.

The block U is provided with lugs or ears *x*, which extend into openings in the arms of a yoke, V, formed with a tubular shank to encircle one arm of an elbow-lever, W, pivoted in or to the rotary head F. The other arm of the lever W is connected by pin-joint to a rod, X, which carries at its lower end a cross-piece, *y*, from which two rods, *z*, pass down through the cross-head or swivel-block G outside of the pump-rod. The rods *z* carry at their lower ends the enlarged head *a'* of a tubular rod, *b'*, which encircles the pump-rod H, and has its lower end flanged or enlarged and swiveled in a block, *c'*, which is connected by links *d'* with a lever, Y, which is pivoted to the framing or tower of the mill, or to any other convenient support, and is furnished with an adjustable weight, Z.

From the foregoing description, and with the understanding that the blades stand and are held normally in the position indicated in

Figs. 1 and 2, with their faces pretty full to he wind, it will be seen that as the speed of the wheel increases the centrifugal force generated will cause the blades O to move longitudinally outward, the links P sustaining them at their centers and the ball-and-socket joints sustaining them at their inner ends. As the blades thus move outward, they cause the rear frame, R, and its hub or boss Q to rotate about shaft K independently of front frame, N, and in addition to the rotation with the shaft and wheel as a whole. As said frame R thus moves away from or in relation to frame N, the links or rods *o* draw upon the rear edges of the blades O and turn them about the axis of the shanks or stems *k*, their centers turning laterally in the joints which connect them with the links P. As this action takes place, the elbow-levers S are swung upon their pivots through the action of the links *q*, and, acting upon the cross-bar T, they force back the shaft M, which carries with it the block U, which in turn moves back the yoke V and throws up the upper arm of the elbow-lever W. The lever W, thus moved, draws up the rod or bar X, which, through the rods *z*, tubular rod *b'*, and links *d'*, raises weighted lever Z, and thus holds in readiness for action upon decrease of the speed a force sufficient to restore the parts to their original position through a reversal of the action just described.

In action the wheel is very sensitive in regulation, and there is no part liable to strain or injury. When the blades are presented edgewise to the wind, the wind passes harmlessly through the wheel, and the feathering action is greater or less, according to the speed of the wheel, so that as long as there is wind sufficient to drive the wheel at average speed the speed will remain practically unchanged.

The above-described construction applies to small wheels and to wheels of moderate or medium size; but for larger wheels I prefer to substitute rods *e'*, either tubular or solid, for the angle-iron spokes, said rods being arranged in pairs, two rods to each spoke. These rods are separated at their inner ends and threaded to enter holes tapped in the hub or boss *e*, which in such case is made of angle-iron, similar to the frames N and R, but much smaller, as shown in Fig. 9. The outer ends of each pair of rods are united in any convenient manner, and the extremities of the several spokes are connected by tie rods or braces to form the main frame to which the blades are hung. From the outer end of each spoke a tie or brace rod, *f'*, is carried down to a hub or head formed upon a neck, *g'*, projecting from the front of hub *e*, or secured rigidly upon the shaft K in advance of the hub *e*. Cross pieces or braces *h'* connect the two rods and serve to make the one under tension support its companion, which is of course under compression.

It is obvious that the details may be considerably varied without departing from the scope or substance of my invention. Thus I propose in larger mills to employ ball-and-socket joints to connect the blades O and the links or hangers P, and I also contemplate stiffening the blades by suitable framing.

It will be observed that under this construction those blades which are below the center are balanced by those above the center, acting through the rotary hub or boss Q, and thus the tendency to fall by gravity is perfectly counteracted.

Having thus described my invention, what I claim is—

1. A wind-wheel consisting of a shaft, a frame or head rigidly secured upon said shaft, a second frame or head mounted upon and adapted to rotate a limited distance independently of the shaft, a series of blades connected with the second frame or head by universal joints, a series of links connecting the blades with the rigid head or frame, and a second series of links connecting the blades with the movable head or frame, substantially as set forth, whereby the blades are adapted to be thrown outward by centrifugal force, and are caused in moving outward to turn the loose head or frame and thus to draw the blades edgewise to the wind.

2. In a wind-wheel, the combination of a shaft, a frame or head rigidly secured to said shaft and adapted to turn loosely upon said shaft a limited distance, a series of blades connected at their inner ends by ball-and-socket or equivalent joints to the loose frame, links or hangers connecting the blades at or near their centers with the first frame or head, and rods or links connecting the rear edges of the blades with the loose frame or head, substantially as set forth.

3. In a wind-wheel, the combination of two heads or frames, one capable of limited rotation independently of the other, and a series of blades connected with the two frames, substantially in the manner explained, whereby the blades are adapted to be moved outward by centrifugal force, and are caused to turn about their longitudinal axis in thus moving outward.

4. The herein-described wind-wheel, consisting of shaft K, hub *e*, frame N, loose hub or boss Q, carrying frame R, blades O, having ball-and-socket or equivalent connection with hub or boss Q, links or hangers P, connecting the blades with frame N, and links or rods *o*, connecting the blades with frame R, all essentially as described and shown.

5. In combination with wheel D, constructed substantially as described and shown, shaft M, passing longitudinally through the wheel-shaft, cross-bar T, carried by shaft M, elbow-levers S, carried by wheel D, links *q*, connecting the elbow-levers with the rotary frame or head Q, and a weight connected with and serving to press shaft M forward to retain the blades in working position.

6. In a wind-wheel, the combination of a main shaft, a head or frame carried thereby, and a series of tangentially-pivoted blades

connected with said frame by links or hangers adapted and arranged to move bodily toward and away from the center of the wheel.

7. In a wind-wheel, the combination of a main shaft, a head or frame carried thereby, a second head or frame mounted upon the shaft and adapted to rotate a short distance independently of the shaft, a series of blades tangentially connected at their inner ends to the second head or frame, and links or hangers connecting the blades with both heads or frames and adapted to move bodily toward and away from the center of the wheel, whereby the blades are caused to move longitudinally outward by centrifugal force, and in thus moving outward to be turned edgewise to the wind.

8. In combination with the regulating-shaft M of a wheel substantially such as described, a swivel-block connected with said shaft, a yoke jointed to said block, an elbow-lever connected with a controlling-weight, and a telescopic or sliding connection between the yoke and elbow-lever.

9. In a windmill, the combination, with a tubular rotary head, as F, of a cross head or block, G, open at one side, a wedge-block inserted in said open side, and a screw adapted and arranged to force said block into the opening to expand the block and to cause it to fill the bore of the head.

10. In combination with cap B, having a conical bore at its upper end and an adjustable step, *a*, at its lower end, a rotary head, F, having a conical portion to fit the bore of the head, and a foot or lower end to fit the step.

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