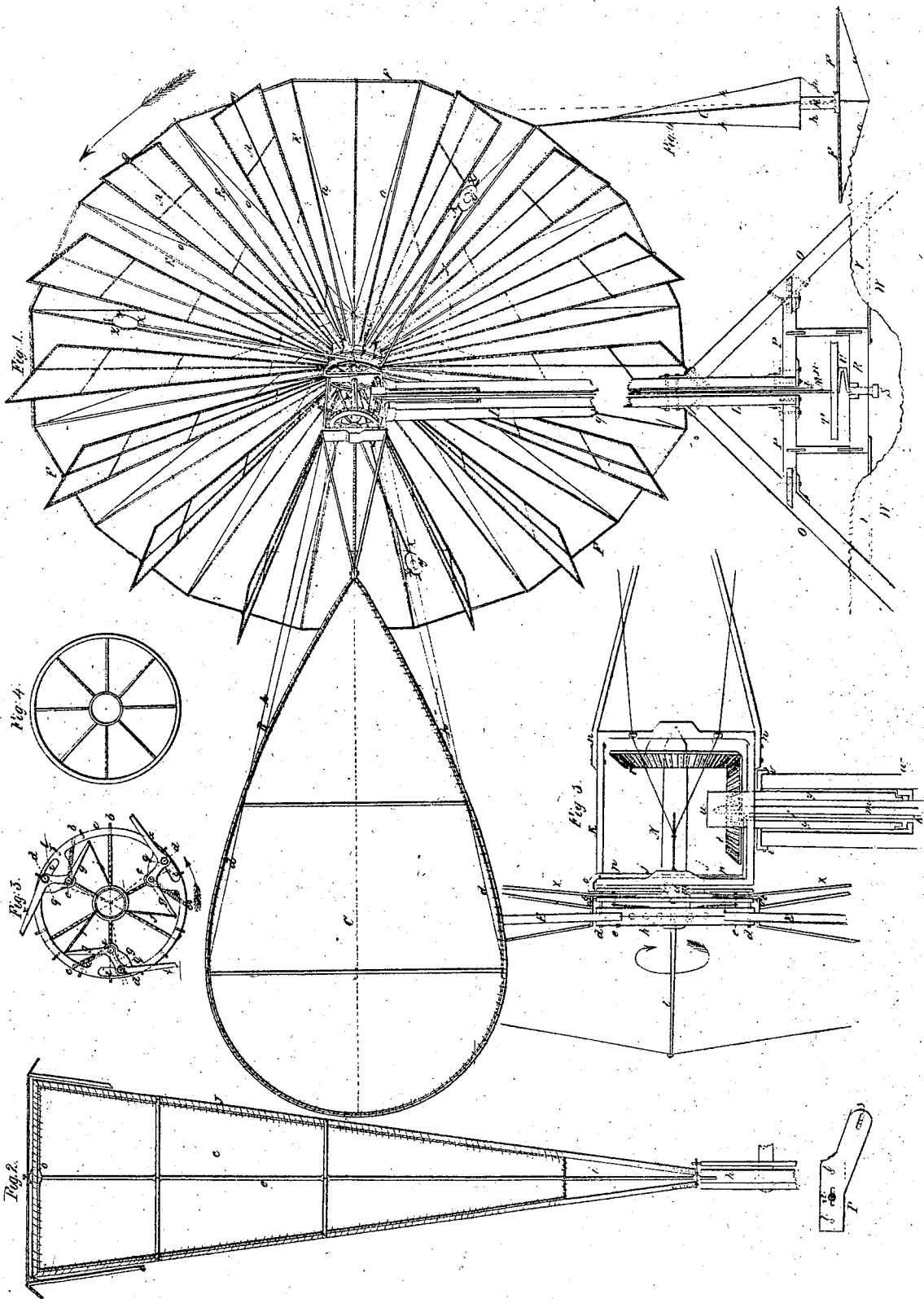


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F. G. JOHNSON.
WINDMILL.



UNITED STATES PATENT OFFICE.

FRANK G. JOHNSON, OF BROOKLYN, NEW YORK.

SELF-REGULATING WINDMILL.

Specification of Letters Patent No. 12,208, dated January 9, 1855.

To all whom it may concern:

Be it known that I, FRANK G. JOHNSON, of the city of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in the Method of Constructing, Regulating, and Stopping Windmills; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings and the letters of reference marked thereon, in which—

Figure 1 is a perspective view of my improved windmill, as completely adjusted for operation. Figs. 2, 3, 4 and 5 represent respectively one of the fans, the regulating wheel and levers, the brake-wheel, and a geometrical section which in part constitute the mill, and are introduced to facilitate the general description, as also to illustrate the manner in which these several parts are constructed.

The great objections to windmills, as heretofore made, are: First. They are in their general construction very heavy, bulky and clumsy, rendering them expensive and unmanageable; as, also, liable to be carried away by gales of wind. Second. The want of some perfect regulating apparatus, which, depending not upon the force of the wind for its operation, but solely upon the velocity of the mill and resistance presented to it, shall have the effect (within certain limits) to increase or diminish the force of the wind, so as to correspond with different degrees of resistance, which at different times it is desirable to overcome. Third. The want of such a regulator makes it impracticable to use a sufficient amount of sail to take the advantage of a light breeze without, in a strong wind, rendering the machinery liable to dangerous and even destructive velocity; as also placing the entire mill in danger of being blown down, and conversely, sails that would be ample in a heavy wind would answer no purpose in a light wind. Fourth. As a consequence of these last two objections, and the very uneven force and sudden changes of the wind, there has not been even an approach to uniformity of velocity in the motion of windmills. Fifth. The want of a cheap, simple method of communicating the vertical rotary to a horizontal rotary motion, (without making use of the disadvantageous method of an intermediate vertical reciprocating motion), and which shall allow the mill perfect freedom to exactly face

the wind, however slight be the changes in the direction of the same; and so constructed or connected, at the same time, that the power of the mill, however great, being exerted upon the resistance, or perpendicular shaft, shall have no tendency or effect to turn the face of the windwheel away from the wind. Sixth. The want of some simple contrivance or device by means of which, without the least effort, the fans can, at pleasure, be completely thrown or turned out of or into the wind, and the entire mill thereby stopped or set in motion as readily as a water-wheel or a steam-engine can be; so that any desired changes can be made in the machinery connected with and operated by the mill; as also to prevent unnecessary wear and tear whenever its use is not required.

To overcome these objections in a cheap, durable and perfectly simple manner, and thereby to render the windmill more practicable and useful, constitutes the object of my invention; the nature and operation of which I explain as follows:

I fit on to a shaft (N, Fig. 5) three iron wheels *h*, *c* and *d* which I designate respectively the "hub" or "spoke-wheel," the "regulating wheel," and "brake-wheel," the hub being keyed on to the shaft, while the regulating-wheel and brake-wheel are fitted to the shaft but not keyed, and are free to move backward and forward through part of the arc of a circle.

The regulating-wheel together with three levers (X X X Fig. 3) connected therewith constitute the regulating apparatus while the brake-wheel constitutes the chief part of the stopping apparatus; both of which apparatuses are connected together and to the windwheel, of which they constitute a part, and all revolving together, and being in every sense and to all intents and purposes a self regulating windwheel and wholly independent of any other connection for its operation, and would regulate its own velocity if placed on a simple shaft and otherwise wholly disconnected with every other part of the mill.

A A A represent three of the fans or sails in the wind wheel, of which there are sixteen, as seen in the drawing; represented as showing their edges turned toward the wind with their planes lying in the direction of the wind.—B, the vane, consisting of oiled canvas, C, laced into an iron frame

d d. *E E E*, three iron or wooden spokes of the windwheel, of which in all there are sixteen, being in any case a number equal to the number of fans. *F F F*, an iron band passing over the outer ends of the spokes and firmly fastened to the same, to receive the outer pivots, *g g g*, of the fans. *h h*, iron rods fastened to the vane and iron head-piece or frame *K*, (Fig. 1) to brace the vane. *a a a a* cords or wires used to brace the spokes. *L L*, sections of an iron or wooden post, of adequate dimensions, the center being bored out to admit the perpendicular shaft *M*, which communicates the power of the mill from the horizontal or windshaft, *N*, down to the machinery below; which post is to sustain the entire mill above, being itself sustained and braced by four iron or wooden standards and braces,—only two standards, *O O*, and two braces, *P P*, being represented in the drawing. *R*, a cross beam which supports the perpendicular shaft *M*. *S*, a screw passing through the beam *R* to serve as a bearing for the shaft *M*, and by means of which the shaft can be elevated or depressed. *T*, a pulley and *U*, a crank or elbow on the shaft *M*. *V V*, beams to brace the cross beam *R*, and *W W*, the ground.

J J, a wooden frame, having laced on to it an oiled canvas *c*, the lower or inner portion being covered with a thin board, *i*. *e*, a rod of iron the inner or lower end of which serves as the inner or lower pivot, *h*, of the fan. The outer end of the rod *e* is secured to the center of the cross piece, *y*, of the frame and fastened to the cross braces *v v*; the use of the rod *e* being chiefly to strengthen the frame *J J* and to prevent it from twisting from end to end, while being turned out of and into the wind. *P*, a plate of iron fastened on to the inner end of the frame *J J* by screws passing through the holes, *l l*, having in the projection a slot *s* to receive the pins on the periphery of the regulating wheel Fig. 3, and by means of which the fans are turned out of and into the wind.

Fig. 3—*c c c*, an iron wheel; *b b b*, iron pins fastened into the periphery of the wheel *c c c*; *V V V*, three levers having their fulcrums at *d d d*, the termination of the long arms being seen at *X X X* (Fig. 1,) with weights *Z Z Z*, fastened thereto by thumb screws *y y y*. The fulcrums *d d d* consist of the bolts *q q q*, one for each lever, passing through the slots *i i i* in wheel *c c c* and fasten into the hub-wheel *h* (Fig. 5). *e e e*, bolts fastened to the short arms *g g g* of the levers, having attached to them, after passing through slots in the wheel *c c c*, three spiral springs *o o o* which pass out nearly to the periphery of the hub-wheel *h* (Fig. 5) and are attached thereto for the purpose of keeping the short arms, *g g g*, drawn back, as also, thereby, to keep the wheel *c c c*

turned back into its present position Fig. 3, which by means of the pins *b b b* working in the slots *s*, has the effect to always keep the fans adjusted to receive the force of the wind, and *j j j*, cords fastened to the projections or extremities *g g g* of the short arms and to the grooved rim or hub, *m*, of brake-wheel (Fig. 4), best seen at *m* Fig. 5.

Fig. 5.—*h*, the iron hub-wheel into which are fastened the inner ends of the spokes, *E E E*, (Fig. 1)—*c*, regulating-wheel (Fig. 3)—*d*, the brake-wheel (Fig. 4). *l*, a bar of iron fastened into the horizontal shaft *n*, to the extremity of which is fastened the rods *a a a a* (Fig. 1.) *K*, a strong iron frame, having a tubular projection, *y y*, passing through an opening in the iron cap *v v* and extending three or four feet down into the post *L* (Fig. 1), terminating in an iron ring or washer *w*, which tubular projection serves as the spindle on or around which the mill turns to face the wind, and through which passes the shaft *M*. *r. t*, a set of beveled gearings. *u*, a brace passing over the wheel *t*, being a part of the frame *K*, to afford a bearing for the upper extremity of the shaft *M*. *b b*, two of the pins seen in the wheel *c c c* (Fig. 3). *a a*, bolts as seen at *a a* (Fig. 3). *j j*, cords as seen at *j j j* Fig. 3. *x x*, levers as seen at *X X X* Figs. 1 and 3. *p p*, a brake which is made to act upon the brake-wheel, *d*, at the point *o*, by means of the cord *i*, seen also at *i* in Fig. 1, and *q*, a bolt and nut used to tighten the braces *h h* Fig. 1 and to give the vane a greater or less angle with the direction of the wind shaft *N*.

Fig. 6.—Represents the line of the wind shaft and vane as seen from above, to show the position of the vane, which is bent or turned out of the direction of the wind-shaft about seven or eight degrees (more or less) for the purpose of counteracting the tendency of the resistance on the shaft *N*, to turn the windwheel out of the wind. *F F*, the windwheel—*K*, the iron frame (*K*, Fig. 1). *C, c*, the vane.

The operation of my windmill is as follows: The several wheels are supposed to rotate as indicated by the arrows. The fans being wholly supported at the center of each extremity by very small pivots working in iron sockets or fastenings, are perfectly free to be adjusted and turned to the wind by means of the regulating-wheel *c c c* (Fig. 3) and levers *x x x*.

First. The wind wheel (Figs. 1 and 5) is supposed to be revolving at its maximum velocity, causing the weights *Z Z Z* (Fig. 1), by centrifugal force to be thrown out to their greatest distance from the center of motion; which has the effect, through the medium of the levers and regulating-wheel to turn all the fans edgewise to the wind (Figs. 1 and 5). The tendency of the mill

now is to revolve slower and slower, until the tension of the springs *o o o* Fig. 3 shall overcome the centrifugal force of the weights *Z Z Z*, which will have the effect to turn
 5 all the fans back with their surfaces to the wind again, to receive the force of the same, when the levers will stand as seen in Fig. 3; thus giving to the wind wheel (whenever the wind is sufficiently strong)
 10 a uniform velocity, irrespective of the amount of resistance presented to it; for an increase of resistance has the tendency to lessen the velocity which simultaneously diminishes the centrifugal force of the weights
 15 *Z Z Z*, thereby giving a corresponding increase of the motive power by presenting more surface of sail to the wind.

Second. To give the wind-wheel, at pleasure a greater or less velocity I move the
 20 weights *Z Z Z* by means of the thumb screws *y y y*, at a less or greater distance from the center of motion.

Third. By using a large number of fans (as shown in Fig. 1) I am enabled to bring
 25 the wind wheel close up to the standard *L* (Fig. 1), which allows the vane to keep the mill easily turned to the wind; as also it allows the largest possible amount of sail in a given diameter and the greatest proportion of the same at the greatest distance
 30 from the center of motion, where it has the greatest mechanical effect.

Fourth. In strong and sudden gusts of wind the regulator is not dependent upon
 35 the velocity of the mill for its operation, but upon the inertia of the weights *Z Z Z*. Thus, if a strong rush of wind strikes the fans the wheel will instantaneously start, but the weights, by their inertia, will not
 40 start with it, so that the fans are as instantaneously, or simultaneously, turned edgewise to the wind. Otherwise, before the necessary velocity for operating the regulator could be obtained, the entire mill might be
 45 carried away.

Fifth. By preventing the wheel, *t* (Fig. 5), from turning;—then, in a given wind, the mill will be turned out of the direction of the wind by its own power acting on
 50 the resistance, or wheel *t*; this angle of deviation being found by experiment, and being the same in all degrees of wind, I crook or turn the vane, at its attachment, *n* (Fig. 5), as many degrees out of the direction

of the wind-shaft *N* (Fig. 1) as are equal 55 to the number of degrees of said angle of deviation; which arrangement will, in all degrees of wind, have the effect to keep the face of the wind-wheel presented directly to the wind; thereby enabling me to make use
 60 of the simplest, cheapest and most advantageous method of communicating the power from the lateral to the vertical shaft:—viz; by one set of simple gearings *t* and *r* (Fig. 5). 65

Sixth. To stop and start the mill, at pleasure, a light weight *n* (Fig. 1) is hung upon the wire or cord *i* (Figs. 1 and 5), which crowds the brake, *p p* (Fig. 5), upon the brake-wheel, *d* (Fig. 5), at the point, *O*, 70 (Fig. 5), which partially stopping or rather holding back the brake-wheel *a*, while the wheels *c* and *h*, (Fig. 5) pass on, has the effect to wind the cords *j j j* (Figs. 3 and 5) around the grooved hub or rim *m*, of the 75 brake-wheel *a* (Fig. 5), which throws the long arms of the levers out and turns the fans edgewise to the wind. By taking off the weight *n* (Fig. 1) from the wire *i* the springs *o o o* (Fig. 3) will draw the long 80 arms of the levers in again, which will turn the fans back with their surfaces presented to the wind.

I do not claim as my invention the method or principle of regulating wind- 85 mills by the use of weights or governors revolving with or by means of the wind-wheel and controlling the sails thereof through the intervention of levers and cords. 90

What I do claim as my invention and desire to secure by Letters-Patent is:

First. I claim the combination together of the hub or spoke-wheel, the regulating-wheel (Fig. 3) and the brake-wheel (*d*, 95 Fig. 5) with their several parts constructed, operated and controlled substantially in the manner and for the purpose herein set forth.

Second. I claim the combination together of the weighted levers (*X X X*), the hub or spoke-wheel and the regulating-wheel (Fig. 3) substantially in the manner and for the purpose herein set forth. 100

FRANK G. JOHNSON.

Witnesses:

J. A. STANTENBROUGH,
 DANIEL F. TOMPKINS.