A. R. Randall,

Wind Mill.

No. 109,545. Patented Nov. 22, 1870.

Fig. 1

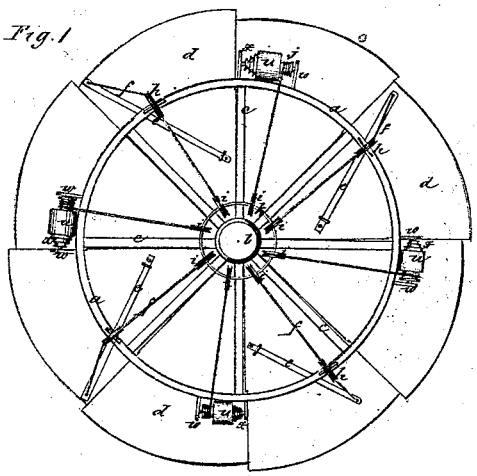


Fig. 3

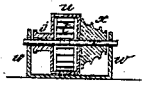
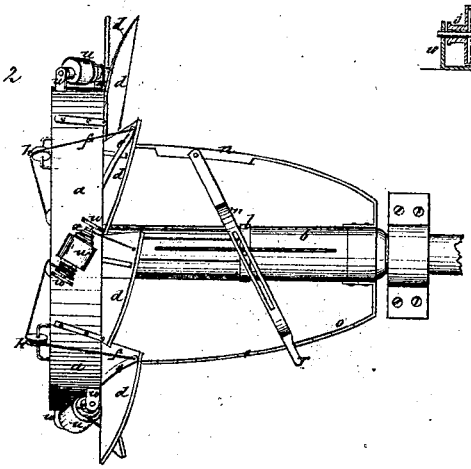


Fig. 2



Witnesses:

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ALEXANDER R. RANDAL, OF AVOLA, MISSOURI.

Letters Patent No. 109,545, dated November 22, 1870.

IMPROVEMENT IN WINDMILLS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, ALEXANDER R. RANDAL, of Avola, in the county of Vernon and State of Missouri, have invented a new and improved Windmill; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawing making a part of this specification, in which—

Figure 1 is a front elevation of the wheel;

Figure 2 is a side elevation of the same; and

Figure 3 is a sectional elevation of the spring-barrel and verge-wheel, which form parts of my second mechanism for operating the sails.

This invention relates to a wind-wheel in which the sails are hinged upon the spokes, and connected with springs, in such a manner that they may be set so as to bear a wind-pressure of any desired number of pounds, and swing back whenever the pressure exceeds this number, so as to practically contract the surface on which the wind acts, and at the same time enlarge the spaces between the sails through which the wind passes, thus getting rid of the surplus pressure of the same, the sails returning to the position in which they were set whenever said surplus pressure ceases.

In the drawing—

a is a wheel, made of any desired size, and fixed on the end of a horizontal shaft, *b*, from which shaft the motion derived by the wheel from the wind is communicated to the machinery to be driven.

To each spoke *c* of the wheel a sail, *d*, is hinged at one edge.

To enable the sails to yield before the surplus power of the wind, two mechanisms, differing in arrangement but alike in principle, are shown in the drawing, each of which I will describe separately.

The first system consists of a spring-bar, *e*, one end of which is made fast to the sail *d*, near the edge of the same, that is, adjacent to the wheel-spoke, while the opposite end of the spring is free, and lies against the sail when in a state of rest; and a cord, *f*, which is fastened at one extremity to the free end of the spring *e*, passes thence over a sheave, *h*, that is fixed on a shaft which is secured to the outer edge of the wheel-rim *a*, thence under a second sheave, *i*, that is placed on a ring, *k*, secured to the outer side of the wheel, within the rim and concentric with the same, whence the cord passes along the shaft *b*, between the spokes of the wheel *a*, until it meets, and is attached at its other extremity to a ring, *l*, that loosely encircles the shaft.

The ring *l* is furnished with trunnions, that enter slots formed in the branches of a forked lever, *m*, that incloses the ring, said lever being jointed at one end to a brace, *n*, which is fastened at one extremity to one of the spokes *c*, and at the other extremity to the shaft *b*, a second brace, *o*, being similarly fixed on the opposite side of the shaft *b*, and being serrated at one edge, as shown in fig. 2, so as to form a rack, in any one of the teeth of which the handle *r* of the forked lever may rest and be held. The spring *e* may, of course, be made of any desired strength.

It is obvious that the nearer the sails are together, or, in other words, the smaller the opening between the free edge of one and the adjacent hinged edge of the next in rear, the greater will be the wind-pressure upon each sail. The minimum size of the opening should be about twenty-two and one-half degrees from the wheel, and stops, *s*, are provided, extending from the wheel-rim, to prevent the sails from closing on the same.

The sails may be adjusted at any desired angle; in other words, so as to receive any desired degree of wind-pressure, by means of the lever *m* and cords *f*. On moving the lever toward the wheel, all the cords *f* are loosened at once, and to the same extent, and the sails fall away from the wheel. On moving the lever away from the wheels the contrary result takes place.

It will be found convenient to mark on each tooth of the notched brace *o* the number of pounds of pressure the sails are subject to when the lever is resting against that tooth. Whenever that pressure is exceeded by the actual force of the wind, the sail swings backward, enlarges the opening between it and the adjacent sail, and at the same time decreases the extent of surface on which the wind acts. On the cessation of the excess of pressure, the spring brings the sail up to its former position.

The foregoing is a full description of the first mechanism.

The second system differs from the first only in the construction and arrangement of the springs. Instead of the elastic bar *e*, a coiled spring, *t*, fig. 3, is employed, the same being stowed within a barrel, *u*, around a shaft, *v*, that is mounted in standards, *w w*, which project from the rim of the wheel *a*.

From one end of the barrel *u* a windlass, *j*, projects outside and upon the shaft *v*. Around the windlass the cord *f* is wound. The subsequent arrangement of the cord *f* is the same as in the first system.

The barrel *u* and windlass *j* are loose on the shaft *v*.

A verge-wheel, *x*, is fixed on the shaft *v*, at the opposite end of the barrel from the windlass *j*, and around the verge-wheel is wound a cord, *q*, whose other extremity is fastened to the sail. The natural tendency of the coiled spring *t* is to draw the sail, with a force proportioned to its strength, by means of the verge-wheel and cord *x*, toward the wheel.

On moving the lever *m* toward the wheel it allows the spring *t* to uncoil, and consequently diminishes its

resisting capacity, so that the sail will the sooner yield before the wind. On moving the lever *m* away from the wheel it coils the spring *t*, thus increasing the resisting capacity of the sail.

The farther the sail is from the wheel *a* the greater is the leverage with which it acts upon the verge-wheel, because then the cord *q* draws upon the larger part of the verge-wheel. But as the sail recedes from the wheel *a*, the coiled spring *t* tightens, so that it is necessary that the leverage of the cord *q* should increase in order to counteract the increasing tension of the spring upon the sail.

The springs of either of the above-described systems of mechanism may be loosened by properly moving the lever, to such an extent that the slightest pressure of wind will open the sails without moving the wheel.

Besides the foregoing, other arrangements, operating on the same principle, may be adopted for regulating the sails. I do not limit myself to any one method.

Having thus described my invention,

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

1. The arrangement of the wheel *a*, wings *d*, cords *f*, spring *t*, barrel and windlass *u j*, verge-wheel *x*, ring *l*, and lever *m*, in the manner specified.

2. The arrangement of the wheel *a*, wing *d*, cord *q*, spring *t*, barrel *u*, and verge-wheel *x*, for the discharge of the separate function of counteracting the increasing tension of the spring by the increasing leverage of the cord *q* upon the verge-wheel, substantially as described.

To the above specification of my invention I have signed my name, this 27th day of August, A. D. 1870.

ALEXANDER R. RANDAL.

Witnesses:
J. H. BLAKE,
J. E. GUTHRIE.