

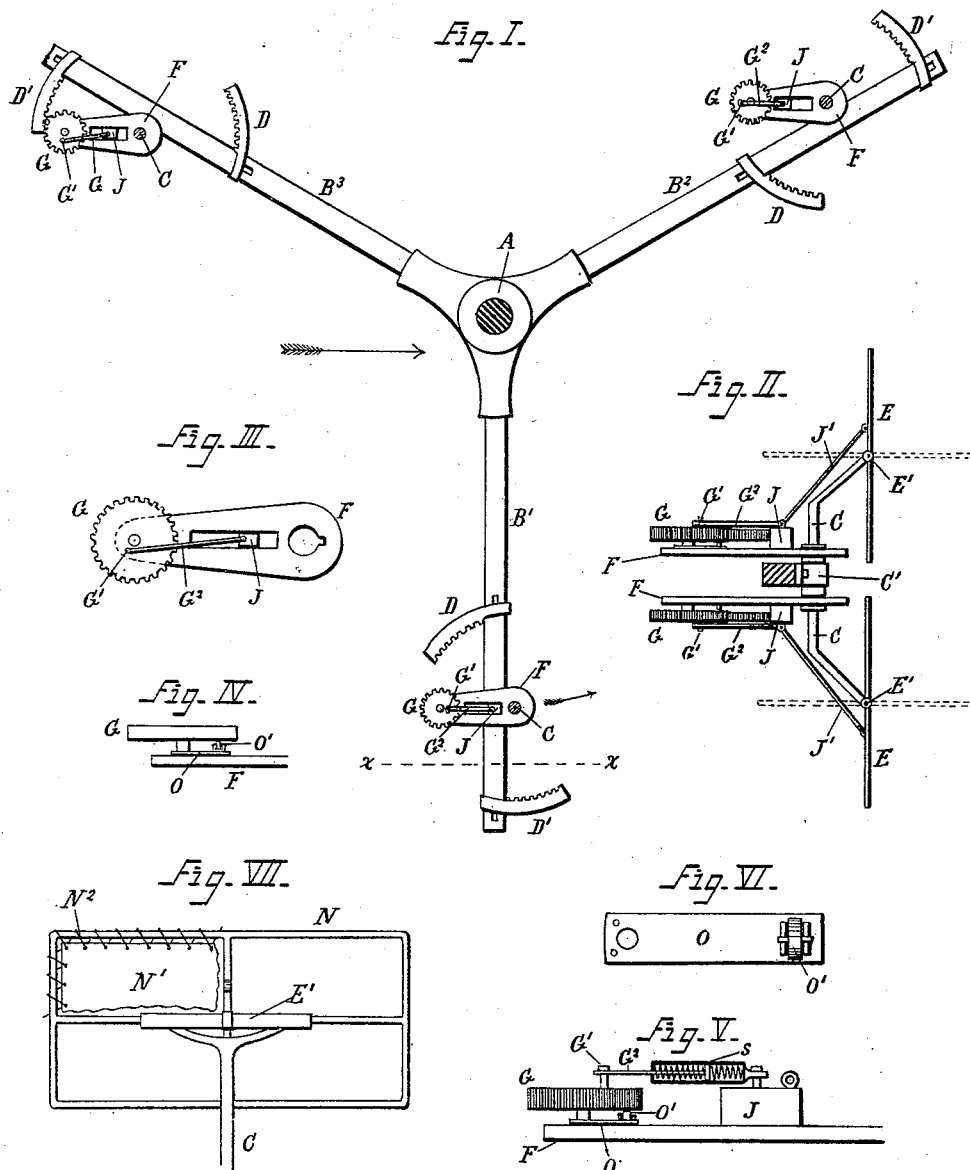
(No Model.)

2 Sheets—Sheet 1.

D. HALL.  
WIND ENGINE.

No. 457,272.

Patented Aug. 4, 1891.



WITNESSES:  
Jas. L. Corbairt.  
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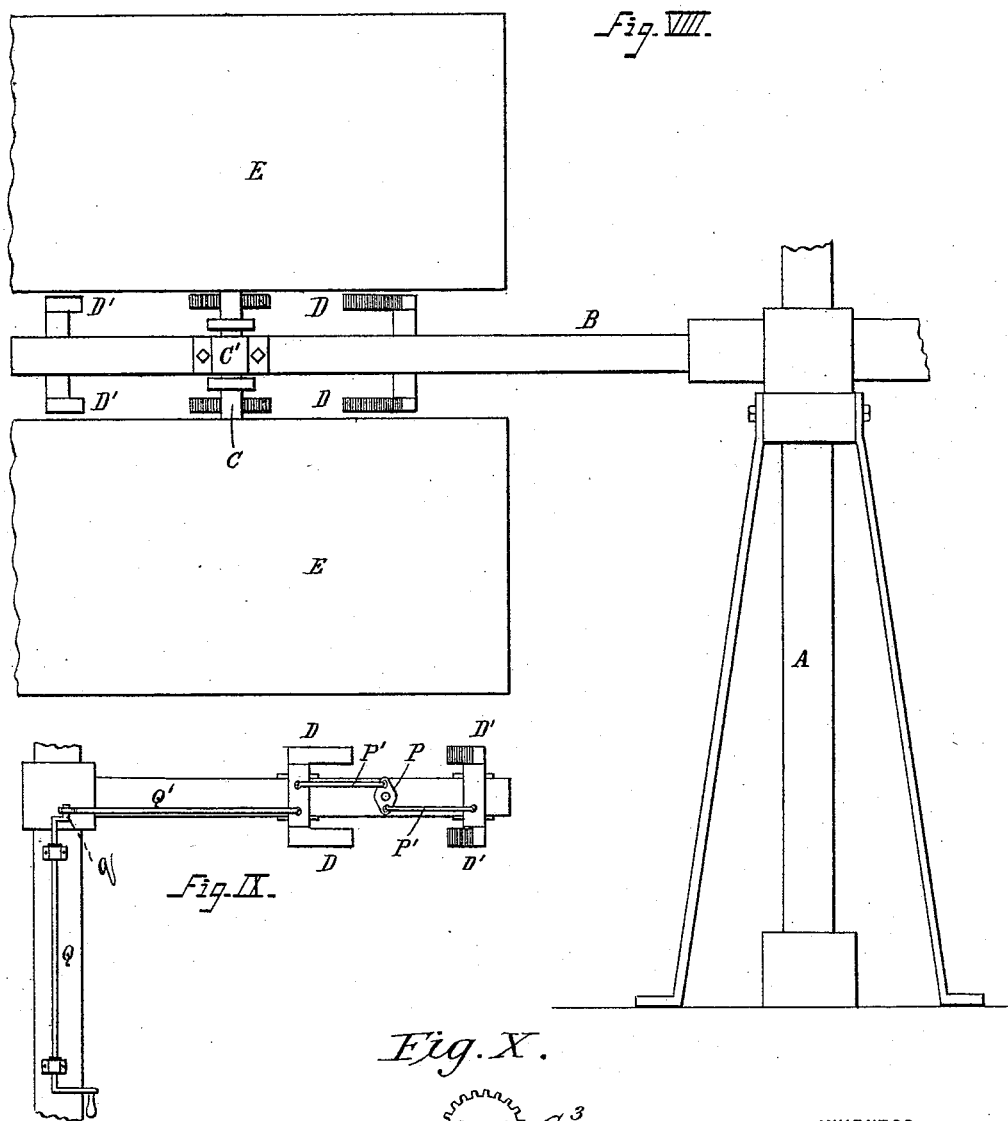
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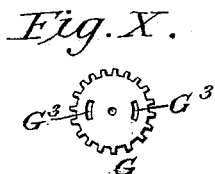
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WITNESSES:  
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# UNITED STATES PATENT OFFICE.

DANIEL HALL, OF NEW YORK, N. Y.

## WIND-ENGINE.

SPECIFICATION forming part of Letters Patent No. 457,272, dated August 4, 1891.

Application filed November 12, 1889. Serial No. 330,086. (No model.)

### *To all whom it may concern:*

Be it known that I, DANIEL HALL, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Wind-Engines, of which the following is a specification.

My invention relates especially to horizontal wind mills or engines in which the sails travel in a horizontal plane and about a vertical spindle receiving motion from the sails.

The object of my invention is to obtain a simple and effective means for automatically adjusting the sails of such engines in relation to the direction of the wind, causing the sails to assume a vertical and a horizontal position, respectively, as they are presented to and against the wind, whereby the resistance offered to the impulse of the wind is raised to a maximum and reduced to a minimum, respectively.

In the accompanying drawings, Figure I represents a horizontal section of a wind-engine embodying my invention. Fig. II represents a vertical section of a portion thereof, taken in the line *xx*, Fig. 1, but on a larger scale than in said figure. Fig. III represents a plan view of a horizontal frame concomitant to the sail-adjusting devices. Fig. IV represents a side view of a portion thereof. Fig. V represents a side view, partly in section, of a modification thereof. Fig. VI represents a plan view of a yielding stop on said frame. Fig. VII represents a front view of a sail-frame with a portion of the sail thereon. Fig. VIII represents a side view of a portion of the engine. Fig. IX represents a side view of a gear for stopping or starting the engine. Fig. X represents a detail view of a cog-wheel forming part of a yielding stop.

Similar letters indicate similar parts.

The letter A indicates the vertical shaft or spindle of the engine, and B' B<sup>2</sup> B<sup>3</sup> a series of radial arms mounted thereon usually in sets of three arms, of which one set is shown in the drawings. Each of these arms B is substantially a counterpart of the other and carries a vertical shaft C, which is a sail-bearing shaft, together with horizontal racks D D' of segmental shape, which are arranged in pairs, one above and the other below said arm, with those of each pair concentric to said

shaft, all these parts being at or near the outer end of the radial arm. The sail-bearing shaft C is journaled at about its mid-length in a box C' of either radial arm B', &c., and in a suitable manner for sustaining it vertically, and at each end of said shaft is a sail E, which is hinged or jointed thereto on a horizontal axis E' for permitting the sail to assume a vertical or a horizontal position, said axis being at about the middle of the sail-frame. The ends of the sail-bearing shaft C project above and below the radial arms, bringing the sails E to those points, and each of said ends is bent to form a spur or offset C<sup>2</sup>, Fig. 2, which is the part receiving either sail. Said two offsets C<sup>2</sup> of the sail-bearing shaft coincide with each other in relation to the shaft, and the sails E are hinged thereto at points equidistant from the shaft-axis, with the effect of bringing the sails not only in vertical alignment, but lateral or eccentric to the shaft, so that the sails are adapted to take and maintain a position beyond the shaft in the direction of the wind, which facilitates and insures their retention at right angles to the wind at all times—namely, by the action of the wind upon the sails—in which position of the sails the shaft remains stationary, or nearly so, while the journal-box C' turns around it.

Above and below either radial arm B', &c., is a horizontal bed or frame F, which is firmly mounted on the sail-bearing shaft C, and in which frame is journaled a horizontal pinion G, lying in the plane of either pair of the racks D D' of the arm. In suitable guideways of the frame F is fitted a horizontal slide J, which is connected to one of the sail-frames E by a pivoted rod J', Fig. II, and on the outer face of the pinion G (or to an arm of the pinion-shaft) is secured a crank-pin G', which is connected to said slide by a rod G<sup>2</sup> for imparting motion to the slide from said pinion.

The operation of the engine is substantially as follows: Assuming that the wind is blowing in the direction of the arrow marked opposite to Fig. I, and that the sails of one of the radial arms, as B', are vertical, the slide J is at the inner end of its guideways and the pinion G is at a point intermediate of the racks D D'. When in the motion of said arm B' by the impulse of the wind against the

sails it reaches the middle of the circle traversed by the sails in the line of the wind, the pinion G is thrown in gear with the inner rack D, and traveling along said rack acts on the slide J through the crank-pin G', with the effect of bringing the slide to the outer end of its ways, while the slide in turn acts on the proper sail for bringing the latter into a horizontal position. Said position of the sails is maintained until in its return motion the radial arm again approaches the middle line of said circle, as at B<sup>3</sup>, when the pinion G is thrown in gear with the outer rack D', and said action of the parts is reversed, returning the sails to a vertical position, so that when the arm passes said middle line the sails are ready to receive the full force of the wind.

With each of the pinions G is combined a yielding stop O, Figs. IV, V, and VI, consisting of a flat spring, which is arranged on the frame F to bear against the inner face of said pinion at one end where said spring carries an anti-friction roller O', said lower face of the pinion being constructed with sockets G<sup>3</sup>, Fig. X, diametrically opposite each other to receive said roller when the sails are either in a vertical or a horizontal position, so that by the stop thus formed the pinion is held against accidental displacement in said positions of the sails.

In order to avoid a jar in the action of the crank-pin G' on the slide J the rod G<sup>2</sup> may be provided with a spring-cushion s, as shown in Fig. V.

Each of the sails E is composed of a rigid frame N, Fig. VII, and of a sheet N', of flexible material, such as canvas, covering said frame, the edges of which sheet are secured to the rim or holder of said frame by elastic cords N<sup>2</sup>, passing alternately through said sheet and over said rim, whereby the flexible sheet is adapted to yield to the wind, while it is kept always in a state of tension upon the frame—namely, by reason of the elastic condition of the attaching-cords.

Referring to Fig. IX, the letter P indicates a shifting-lever, which is connected to the racks D D' of either radial arm by two rods P', said lever being pivoted to the radial arm intermediate of said racks; and Q, a crank-shaft, which is mounted on the spindle A, and the crank q of which is connected to one of said racks by a rod Q', so that by turning this shaft in one or the other direction the racks may be moved toward or from each other, and thereby brought into or out of the path of the pinion G, with the effect of starting or stopping the engine, said racks being

fitted in suitable guideways to slide on the arm.

I claim—

1. In a wind-engine, a vertical spindle with a radial arm carrying horizontal racks, a vertical sail-bearing shaft, a sail jointed to said shaft, a horizontal frame on the sail-bearing shaft, a horizontal pinion on said frame in the plane of said racks of the arm, a horizontal sail-adjusting slide on said frame connected to the sail, and a crank-pin on said pinion connected to the slide, the whole adapted to operate substantially as herein described, for the purpose set forth.

2. In a wind-engine, a vertical sail-bearing shaft, a sail hinged to said shaft, a horizontal frame on said shaft, a horizontal pinion on said frame, connected with the sail, a means for operating the pinion, and a yielding stop for engaging said pinion, substantially as and for the purpose described.

3. A sail for a wind-engine, composed of a rigid frame, a flexible sheet covering said frame and elastic cords passing alternately through said sheet at its edges and over the rim of said frame, thereby producing a yielding connection of the sheet with the frame, substantially as shown and described.

4. In a wind-engine, a vertical spindle carrying a radial arm with movable racks for engaging a pinion, as specified, a shifting-lever pivoted intermediate of said racks on the radial arm, rods connecting said lever to both racks, a crank, and a rod connecting said crank to one of the racks, substantially as and for the purpose described.

5. In a wind-engine, the vertical spindle carrying the radial arm, the vertical sail-bearing shaft journaled and mounted in suitable boxes at a point on said arm, sails hinged horizontally to said shaft above and below the arm, and the devices for automatically adjusting the sails to the vertical and horizontal position at fixed points, substantially as and for the purposes described.

6. In a wind-engine, the vertical spindle carrying the radial arm, the vertical sail-bearing shaft journaled and mounted in suitable boxes at a point to said shaft above and below the arm, and the devices for automatically adjusting the sails to the vertical and a horizontal position at fixed points, substantially as and for the purpose described.

DANIEL HALL.

Witnesses:

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