(No Model.)

D. HALL.

WIND ENGINE.

No. 457,273. Patented Aug. 4, 1891.

Fig. I.

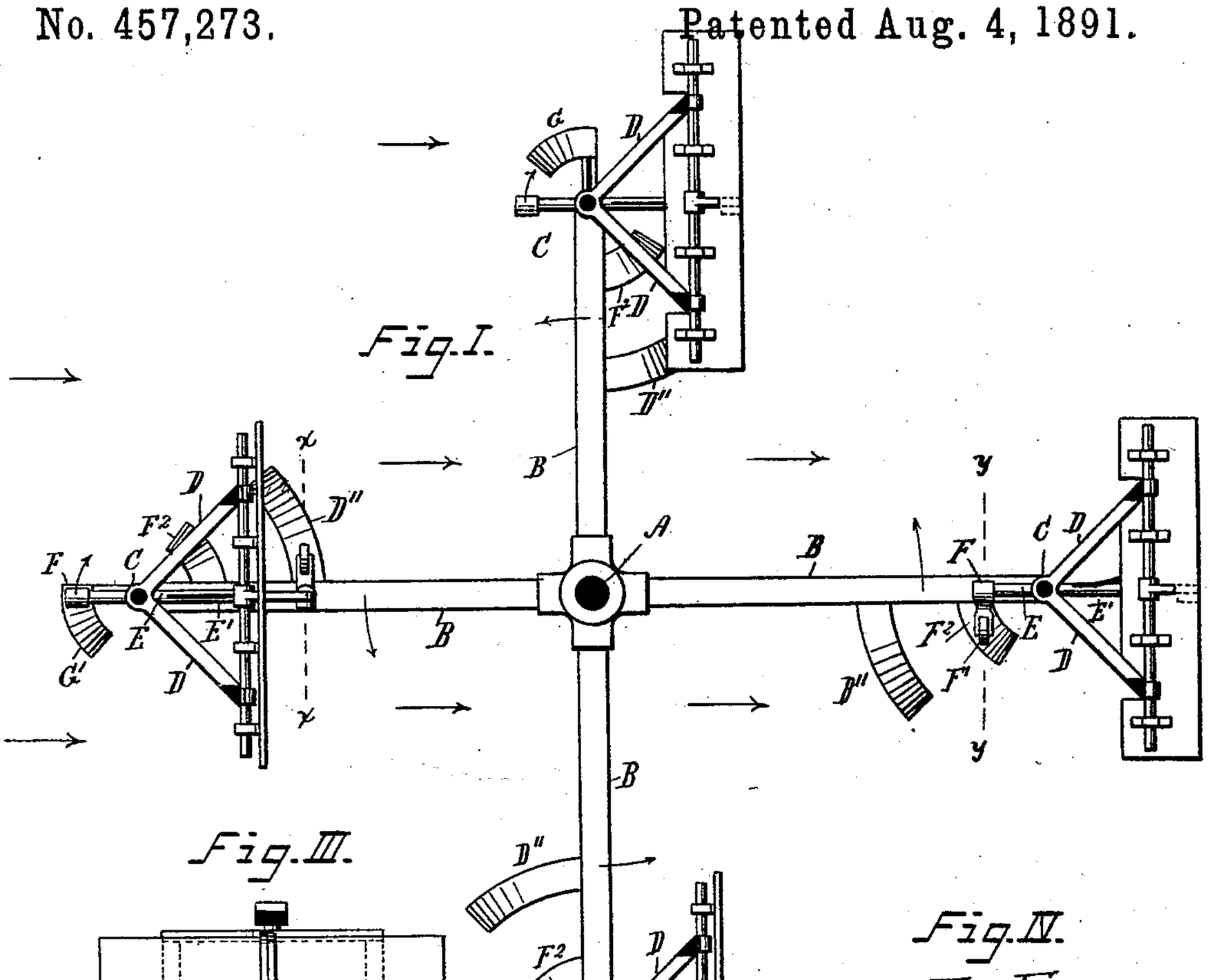
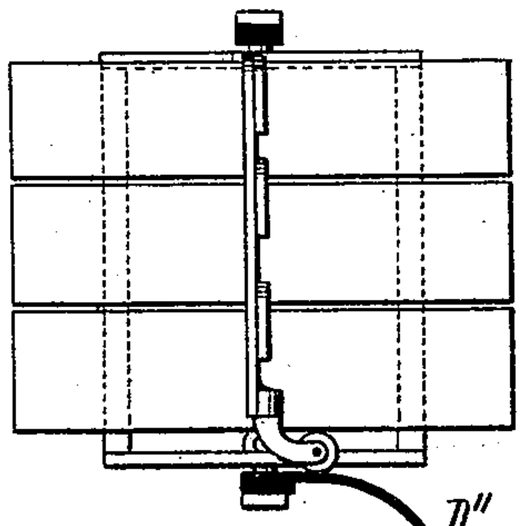


Fig. III.



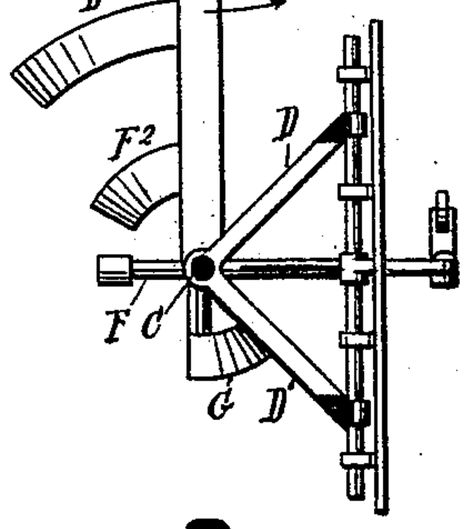


Fig. IV.

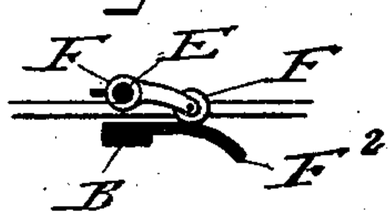
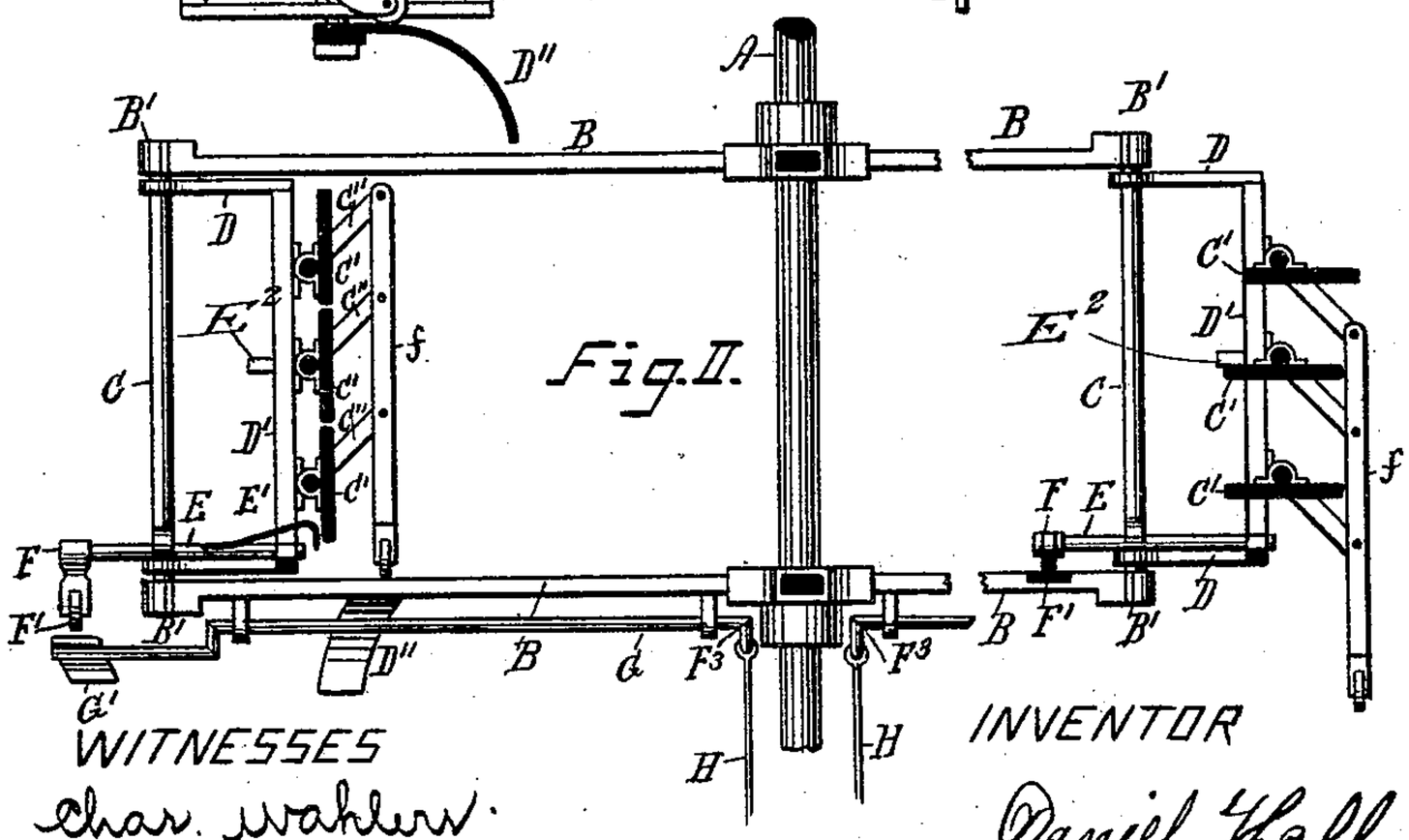


Fig. II.



WITNESSES

Chas. Wahlen.

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INVENTOR

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UNITED STATES PATENT OFFICE.

DANIEL HALL, OF NEW YORK, N. Y.

WIND-ENGINE.

SPECIFICATION forming part of Letters Patent No. 457,273, dated August 4, 1891.

Application filed December 3, 1890. Serial No. 373,493. (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 that class of wind-engines for which I filed an application for Letters Patent of the United States on the 12th day of November, 1889, Serial No. 330,086.

My present invention consists of the novel and useful method herewith described for mounting and automatically controlling the adjustment of the sails, bringing them into a vertical and a horizontal position, respectively, as they are presented to or against the wind, and at the same time causing them to maintain a position at right angles to the direction of the wind during their entire passage around their primary center of revolution—to wit, the center of the vertical rotary spindle—and also at the same time around their secondary center—to wit, that point in the radial arm of the vertical rotary spindle at which the sail-shaft is mounted—the whole invention being fully illustrated and described in the accompanying drawings.

Figure I represents a horizontal section of a wind-engine embodying my invention. Fig. II represents a side view thereof, partly in section. Fig. III represents a cross-section on the line *x x*, Fig. I. Fig. IV represents a like section on the line *y y*, Fig. I.

Similar letters of reference indicate similar parts.

The letter A indicates the main shaft or spindle carrying the radial arms B in any desired number, preferably not less than three, and said arms duplicated in rows perpendicularly one below the other to any desired number of rows, preferably not less than two, at any point in those arms, preferably near their outer extremities and equidistant from their common center. Boxes B′ are mounted, constructed, and adapted to receive and carry a perpendicular or vertical journaled shaft C, which is to be mounted there, and which may be denominated a "secondary" or "sail" shaft. From the sail-shaft at points equidistant from and preferably near to its journaled bearings are constructed arms D at right angles to the perpendicular shaft. These arms are both dual and bifurcated and terminate at an equal length or distance from the shaft that carries them and each several pairs of ends connected vertically by a rigid rod D′. Sails C′, composed, preferably, of some material of great prehensile power in proportion to its weight, thickness, and superficial area and with pivotal spines running longitudinally near or through their centers, are mounted in sections by means of those pivots placed in bearings horizontally and vertically one above the other on the rods D′, connecting the ends of the bifurcated arms D of the sail-shaft C, or the sail-shaft C, instead of being journaled and mounted in boxes, as set forth, may be constructed hollow through its center from end to end like a pipe or sleeve and mounted at the same point on the radial arms B occupied by the boxes B′ by means of a pivot-center running through the sleeve and firmly secured in aforesaid radial arms. Also, in like manner, the primary vertical spindle, instead of being rotary, may be made stationary, in which case it will act as a pivot, and the radial arms attached to a sleeve will revolve around it, the one construction being the equivalent of the other, amounting simply to a change of journaled bearings. Each of the pivotal spines of the sails C is provided with a crank-arm C″, which stands at an upward angle of forty-five degrees from the sail-spine when the sail is vertical, and the extremities of each of these crank-arms is pivoted to a vertical connecting-rod *f*, having its lower end curved and provided with an anti-friction roller at its lower end adapted to ascend the incline D″ of the lower radial arm with the effect of shifting the sails from a horizontal to a vertical position.

At the point on the lower one of the arms B cut by the circle and in the radius of the circle described from the center of the sail-shaft C by the lower end of rod *f* is securely attached a permanent inclined plane to engage the anti-friction roller at the base of the rod *f* on its approaching a fixed point in its rotary passage, to wit—as it approaches that point from which the wind is blowing—for the purpose and with the effect of shifting the sails from a horizontal to a vertical position.

Immediately in front and at mid-length of the bottom of the lower section of the sail C is placed a rock-shaft E, having on its upper side a yielding stop or spring E′, having a vertical end and adapted to yield to the pressure of the sail-blade when assuming a vertical position, and so adjusted as to engage and retain the sail in a vertical position. This rock-shaft is provided with a bearing near the end carrying the spring-stop on a bar thrown from one to the other of the lower pair of bifurcated arms D. Near its other end it is supported by a bearing on the sail-shaft C.

From the outer end of the rock-shaft E and vertically beneath it hangs the crank-shaft F with the anti-friction roller F′.

On the lower radial arm B and at the point on it cut by the circle described from the center of the sail-shaft C at the distance measured by the shorter end of the rock-shaft E and in its radius I place the lesser incline F^2 to engage the anti-friction roller at a given point in its rotary passage around the primary center in the vertical spindle A—viz., a point near that to which the wind is blowing—causing the rock-shaft E to perform one-quarter of a revolution, and thereby throwing the spring-stop into a horizontal position, with the effect of releasing the sail from its vertical and allowing it to assume a horizontal position.

A permanent stop E^2, as shown in Fig. II, is placed on the rigid rod D′ to hold the sail in a horizontal line when against the wind or when the engine is stopped.

To stop the engine, it is simply necessary to keep the sails in a horizontal position, and I effect this by preventing the spring-stop E′ from engaging them when presented to the wind. This I accomplish by suspending the rock-shaft G in bearings underneath the radial arms B, with the incline G′ attached to its eccentric extremity beyond the end of the arm B and in the radial path of the anti-friction roller F′ as it approaches the point from which the wind is blowing and the crank-arm F^3 on the other end near the vertical rotary spindle in such position that when the crank F^3 is drawn to a vertical position by means of the hand-rod H the rock-shaft G will make one-fourth of a revolution, causing its incline G′ on its eccentric end to rise up in the path of the roller F′, causing it to turn the rock-shaft E, so that its yielding stop will be horizontal instead of vertical and allowing the sail to resume a horizontal position.

To start the engine, it is simply necessary to release the hand-rods H, allowing the rock-shaft G to revolve, when the weight of the incline G′ on the eccentric end of its rock-shaft will cause it to descend out of the path of the anti-friction roller F′. The engine being then moved forward in the direction of the arrows, as the sail reaches the direction from which the wind is blowing it will assume and maintain a vertical position till it arrives at a point to which the wind is blowing by the automatic action of the devices, as set forth, and for the purposes set forth.

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

1. In a wind-engine, the vertical rotary spindle with radial arms having a center at any fixed point on said arms round which sails mounted on suitable devices revolve with each revolution of the vertical spindle, and devices for automatically adjusting the sails at fixed points in their passage round their rotary centers, substantially as and for the purposes set forth.

2. In a wind-engine, the vertical spindle carrying pairs of radial arms one above the other, a vertical sail-bearing shaft in each of said pairs of arms, sails mounted on said shafts between the arms, and devices for automatically adjusting the sails at fixed points, substantially as and for the purpose described.

3. In a wind-engine, the vertical spindle carrying pairs of radial arms one above the other, a sail-bearing shaft in each of said pairs of radial arms, bifurcated arms on said shaft, uprights connecting the bifurcated arms, a sail having a series of sections, each hinged to said uprights, and devices for automatically adjusting the sail-sections at fixed points, substantially as and for the purpose described.

4. In a wind-engine, the vertical spindle carrying pairs of radial arms one above the other, a sail-bearing shaft in each of said radial arms, bifurcated arms on said shaft, uprights connecting the bifurcated arms, a sail having a series of sections, each hinged to said uprights and provided with a crank-arm, a sail-adjusting rod pivoted to said crank-arms of the sail-sections, an incline on the lower of the radial arms for engaging the sail-adjusting rod, and devices for automatically locking the sail-sections in vertical position and releasing the same at fixed points, substantially as and for the purpose described.

5. In a wind-engine, the vertical spindle carrying pairs of radial arms one above the other, a sail-bearing shaft in each pair of said radial arms, bifurcated arms on said shaft, uprights connecting the bifurcated arms, a sail having a series of sections, each hinged to said uprights, devices for raising the sail-sections at a fixed point, a spring-stop adapted to engage one of the sail-sections for locking the series thereof in vertical position, a rock-shaft carrying said stop, a gravitating arm on said shaft, and an incline on the lower of the arms for engaging said arm of the rock-shaft at a fixed point, thereby releasing the said sections, substantially as and for the purpose described.

6. In a wind-engine, the vertical spindle carrying pairs of radial arms, a sail-bearing shaft in each pair of said radial arms, bifurcated arms on said shaft, uprights connecting the bifurcated arms, a sail having a series of

sections, each hinged to said uprights and provided with a crank-arm, a sail-adjusting rod pivoted to said crank-arms, a spring-stop adapted to engage one of the sail-sections, a rock-shaft carrying the stop, a gravitating arm on said shaft, and two inclines on the lower of the radial arms, one for engaging the sail-adjusting rod and the other for engaging said gravitating arm of the rock-shaft, substantially as and for the purpose described.

7. In a wind-engine, the vertical spindle carrying a radial arm or arms, a vertical sail-bearing shaft on said arm, a sail having a series of hinged sections, devices for raising the sails, a spring-stop adapted to engage one of the sail-sections, a rock-shaft carrying the stop, a gravitating arm on said shaft, an incline for engaging said gravitating arm, and devices for adjusting said incline in relation to the arm, substantially as and for the purpose described.

8. In a wind-engine, the vertical spindle carrying a radial arm or arms, a vertical sail-bearing shaft on said arms, a sail having a series of hinged sections, devices for raising the sail-sections, a spring-stop adapted to engage one of the sail-sections, a rock-shaft carrying the stop, a gravitating arm on said shaft, an incline for engaging said gravitating arm, and a crank-shaft on the radial arms having two cranks, one carrying said incline for permitting its adjustment in relation to the gravitating arm, substantially as and for the purpose described.

DANIEL HALL.

Witnesses:
JAS. S. EWBANK,
CHAS. WAHLERS.