

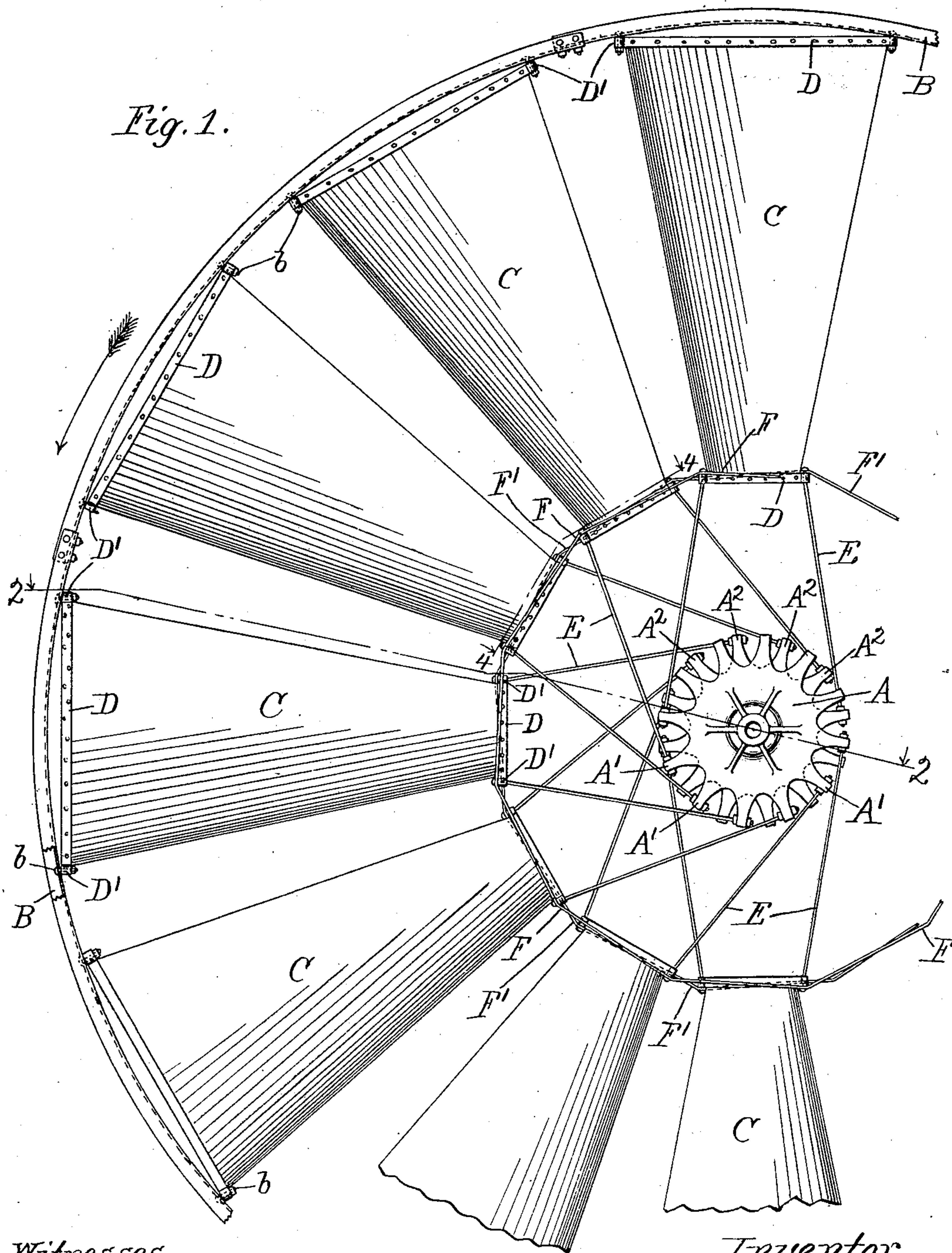
(No Model.)

2 Sheets—Sheet 1.

DE LONSON E. BARNARD.
WIND WHEEL.

No. 565,414.

Patented Aug. 4, 1896.



Witnesses.

E. T. Wray
J. C. Elliott

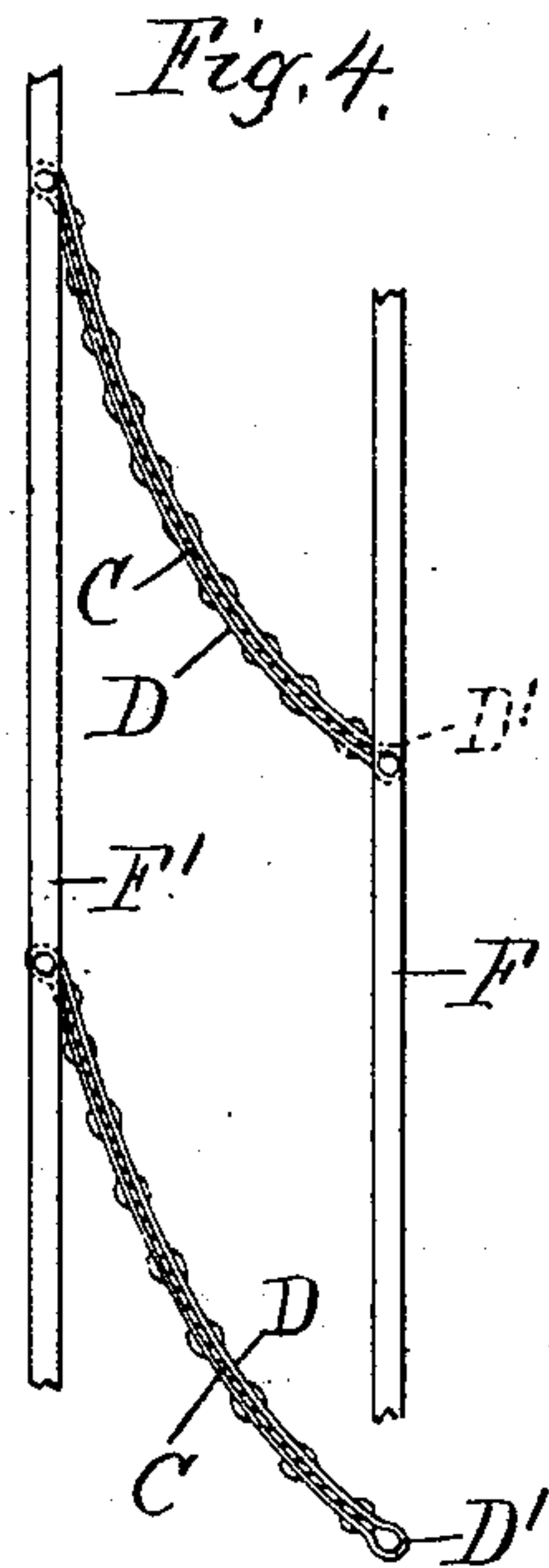
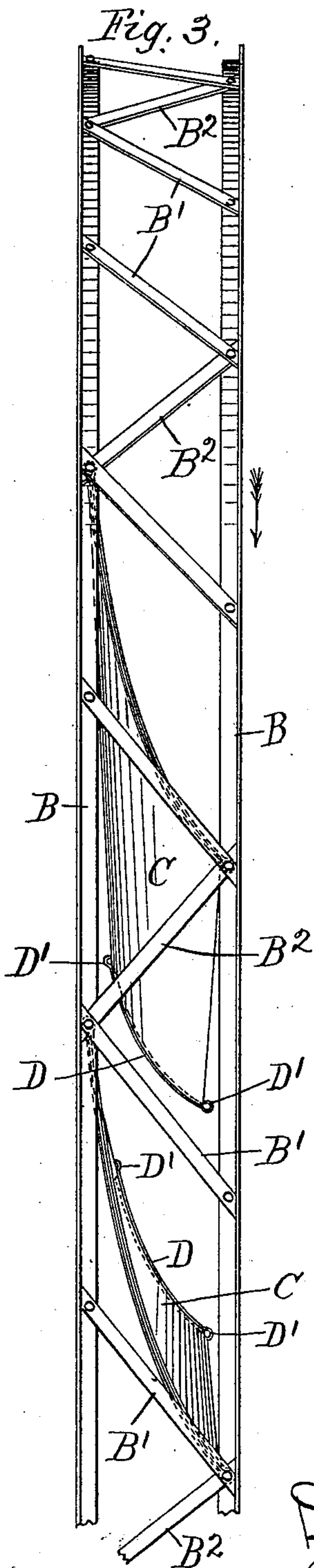
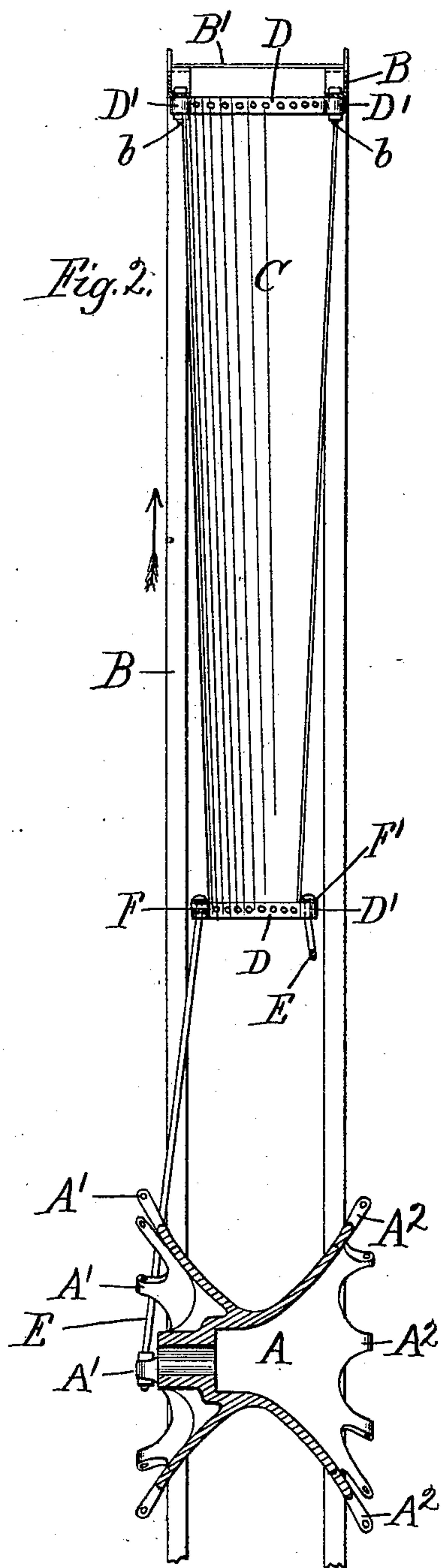
Inventor.

D. Elmy Barnard
By. Burton & Burton
his Attys.

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UNITED STATES PATENT OFFICE.

DE LONSON ELROY BARNARD, OF CHICAGO, ILLINOIS.

WIND-WHEEL.

SPECIFICATION forming part of Letters Patent No. 565,414, dated August 4, 1896.

Application filed July 19, 1894. Serial No. 517,965. (No model.)

To all whom it may concern:

Be it known that I, DE LONSON ELROY BARNARD, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Wind-Wheels, which are fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

In the drawings, Figure 1 is a face view or front elevation of a portion of a wheel embodying my improvements. Fig. 2 is a section at the line 2 2 in Fig. 1. Fig. 3 is a detail plan or edge view of a portion of the wheel. Fig. 4 is a section at the line 4 4 in Fig. 1. Fig. 5 is a detail section on an enlarged scale, in a plane at right angles to the outer end edge of one of the sails, showing the sail clenched over the bands which clamp it to increase the security of the fastening, being in this respect a modification of the structure shown in the other figures.

My improved wheel belongs to the class commonly known as "tension-wheels;" that is to say, wheels in which the rim is held in proper relation to the hub or center by longitudinal stress or strain upon the connections between the hub and rim.

The invention and novelty in my improved wheel consist in making the sails constitute a portion of the strained connection between the hub and rim, as distinguished from making them merely supported on a framework which has such strained connections.

It consists, further, in detail, in the arrangement of the sails with respect to the remainder of the strained connections and with respect to the hub and rim, so that the lines of stress on the sail do not lie at the edges thereof, but extend diagonally from corner to corner through the body or middle of the sail.

It consists, further, in the arrangement of the tension-rods in such manner that those which experience the driving strain are substantially relieved from the strain due to the direct pressure of the wind, and that those which experience the latter pressure are relieved substantially from the driving strain.

It consists, further, in details of construction which are set out in the claims.

A is the hub or spider at the center of the wheel.

The rim comprises two marginal bands B B, connected by diagonal braces B' B', &c.

C C, &c., are sails. The sails are made of comparatively thin sheet metal dished or curved, as shown in the drawings, and tapered, widening from the inner toward the outer ends. The sails are bound by metal straps D D at the inner and outer ends, respectively, the straps being folded to form eyes D' D' and lapped upon both surfaces of the sails at the ends, the eyes D' standing just beyond the side edges of the sails. The end of the metal constituting the sail is then preferably clenched over the strap on one side or the other, as shown in Fig. 5, and the straps may then be secured by rivets extending through both laps of the band and the intervening sail. By means of the eyes D' at the outer corners of the sails they are secured to the marginal bands B B, respectively, of the rim, suitable bolts or rivets b b passing through the eyes and bands. From the eyes D' at the inner corners of the sails the tension-rods E E extend to the spider, the rod from the forward corner of the sail extending forward in the direction of rotation of the wheel and being inserted through an eye in such a lug or spur A' at the forward end of the hub or spider as will make the rod substantially tangent to the circumference of the circle in which said eyes or extremities of the lugs stand.

The tension-rod from the eye at the rear inner corner of the sail extends backward in the direction of rotation and is in like manner connected to an eye in such one of the spurs or lugs A² at the rear end of the spider as will make the rod substantially tangent to the circle in which said rear eyes or extremities of the lugs stand. The tension-rods are headed at one end, most conveniently at the end next the sails, and the other end is provided with two nuts between which the lug or spur of the spider is bound, thus stopping the rod in both directions.

Upon considering this structure it will be observed that when the tension-rods are strained tight by the adjustment of the nuts which secure them to the spider two lines of

tension are developed, one extending from the end of the tension-rod at the forward end of the spider to the forward inner corner of the sail and thence diagonally in the surface of the sail to the rear outer corner thereof, where the sail is fastened to the rear marginal band B, the other line of tension extending from the end of the rear rod, where it is secured to one of the rear lugs of the spider, thence in the line of the rod to the rear inner corner of the sail, and thence in the surface of the sail to the forward outer corner thereof, where the sail is attached to the forward band B of the rim, the oblique position of the sail with respect to the plane of rotation of the wheel and the torsion of the sail between its ends giving it a sharper curvature and greater obliquity to the plane of rotation at the inner than at the outer end, and the spreading of the tension-rods toward the opposite ends of the spider or hub at the same time that they are spread toward the opposite sides of the circumference of the spider are the features which coöperate to produce the result stated.

It will be observed also that the wheel rotating in the direction of the arrow in Fig. 1, as would result from the direction of obliquity of the sails, causes the driving strain to be experienced by the rear tension-rods, which extend rearward with relation to the direction of that rotation in a direction substantially tangential to the circumference of the circle at which they are attached to the hub or spider, giving thereby the most advantageous relation for driving by direct tension without any strain tending to bend the rods or sails.

It will be observed also that the strain due to the direct pressure of the wind upon the face of the wheel will be experienced and resisted by the forward tension-rods, which extend obliquely forward from the sails to the forward end of the hub or spider while they extend also forward in the direction of rotation of the wheel tangentially with respect to the circumference of the circle at which they are attached to the spider.

It will be observed also that the rim comprising the two marginal bands B B is braced in one direction by the obliquely-situated sails and does not really require further bracing in that direction but is rendered practically rigid by the addition of the braces B', which extend obliquely in the other direction. Additional braces B² B², &c., may, however, be added to relieve the sails of any portion of the strain which might have a slight tendency to flatten or curve them transversely.

In order to prevent any winding or "weaving" of the sails and tension-rods, I connect the outer ends of the forward set of rods successively around the wheel by the ties F F, &c., and in like manner and for the same purpose I connect the outer ends of the rear set of tension-rods by the ties F' F'.

The result of the construction described is

that wind-pressure on the wheel tends to stiffen it, and the greater the pressure, which might under some circumstances tend to bow the sails, the more certainly are they held straight by the increased longitudinal tension which they experience from such pressure.

I claim—

1. A tension wind-wheel having the sails constituting respectively part of each of the strained or tension connections from the hub to the rim.

2. In a wind-wheel in combination substantially as set forth, the rim, the hub or spider and the sails longitudinally strained between them; the sails being set oblique to the plane of the wheel's rotation, and the rods which strain them toward the hub extending from their inner corners respectively tangentially to opposite sides of the spider's circumference at opposite ends thereof.

3. In a wind-wheel in combination with the rim and the spider, sails secured at their outer corners to the rim obliquely to the plane of the wheel's rotation and connections from their inner corners to the spider, the rods which form the forward connection of the sails extending forwardly in the direction of rotation and toward the forward end of the spider and the rods which form the rear connection extending backward in the direction of rotation and toward the rear end of the spider, whereby the driving strain is caused to operate upon one set of rods and the wind-pressure strain to operate upon the other set, substantially as set forth.

4. In a wind-wheel in combination with the spider, the rim and the sails having their ends bound by metal straps folded about the side edges to form eyes and having the ends of the sails clenched upon the straps, the rods connected to the inner corners of the sails at such eyes and strained thence to the hub, substantially as set forth.

5. In a wind-wheel in combination with the spider, the rim and the sails connected to the rim, the rods from the inner corners of the sails strained toward the hub and connected to opposite ends thereof at opposite sides of the circumference, and the ties F and F' connecting the ends of the rods at each face of the wheel in circumferential series around the wheel, substantially as set forth.

6. In a wind-wheel, a rim comprising two marginal bands, the sails secured oblique to the plane of the wheel's rotation to such bands and braces extending between the bands obliquely to said plane, and having the direction of their obliquity the reverse of that of the sails, substantially as set forth.

In testimony whereof I have hereunto set my hand, in the presence of two witnesses, at Chicago, Illinois, this 10th day of July, 1894.

D. ELROY BARNARD.

Witnesses:

CHAS. S. BURTON,
JEAN ELLIOTT.