

(No Model.)

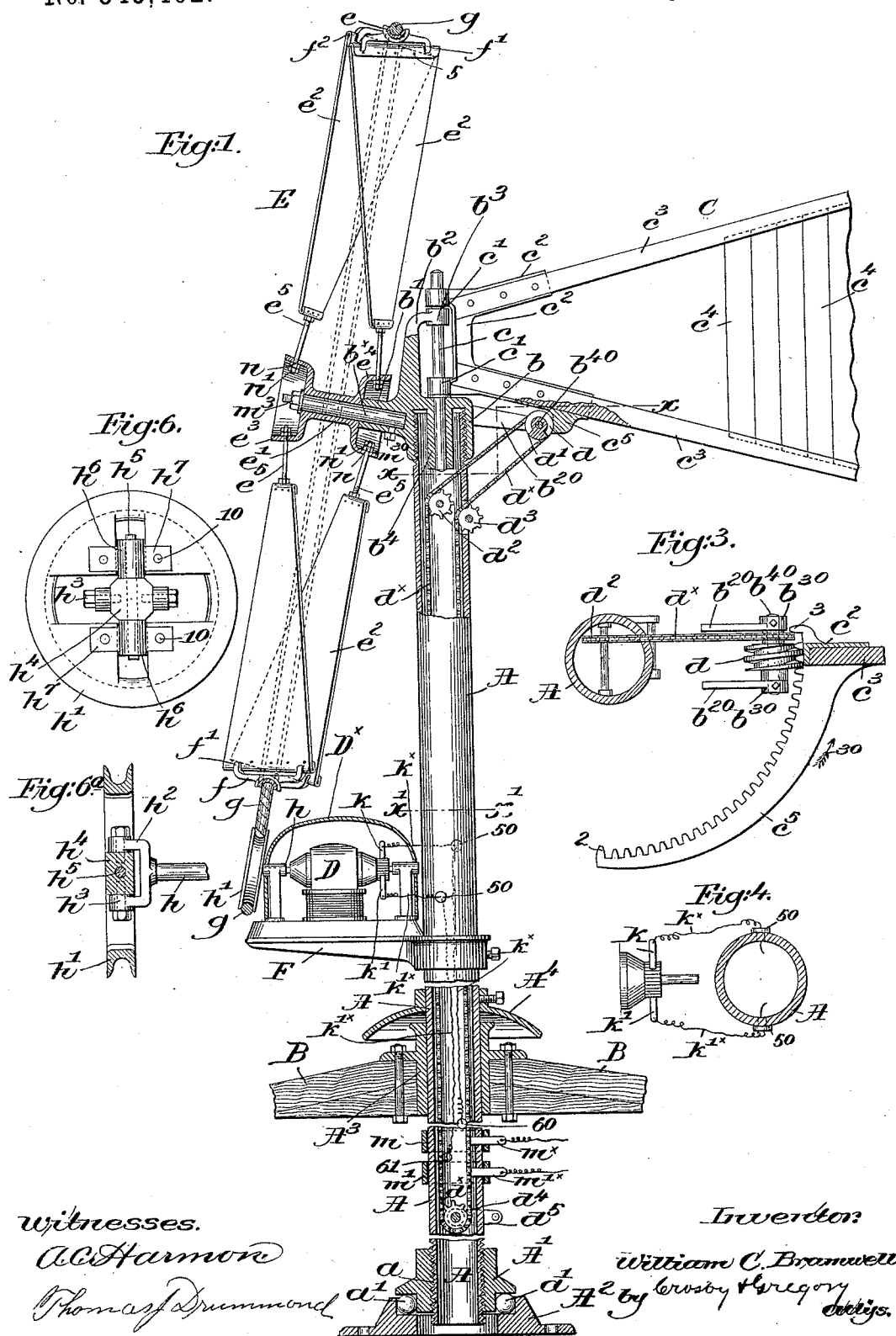
2 Sheets—Sheet 1.

W. C. BRAMWELL.

WIND ENGINE.

No. 543,462.

Patented July 30, 1895.



(No Model.)

2 Sheets—Sheet 2.

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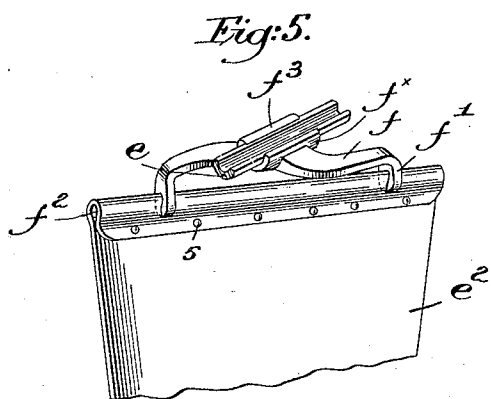
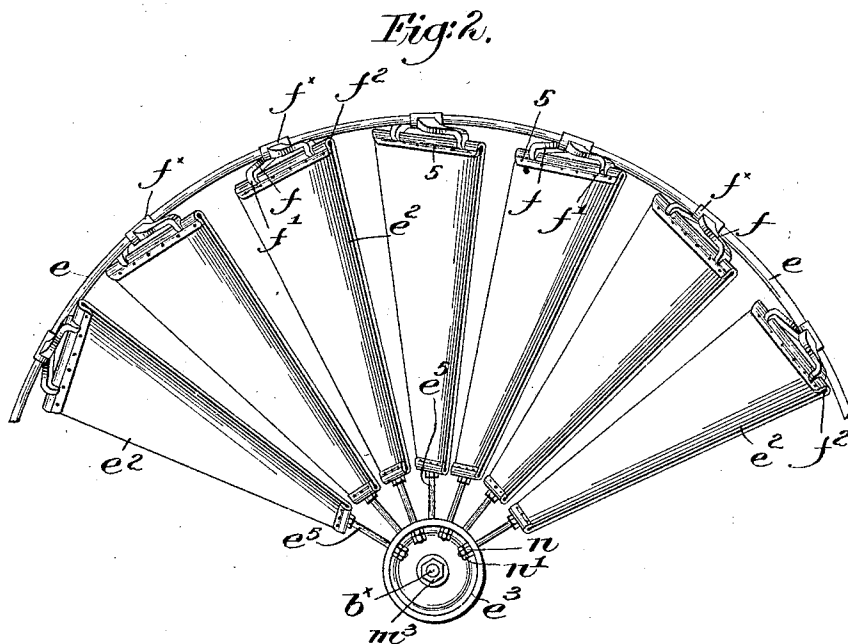
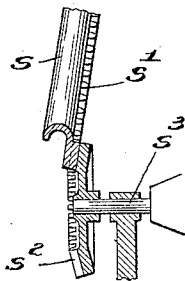


Fig. 7.



Witnesses.

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UNITED STATES PATENT OFFICE

WILLIAM C. BRAMWELL, OF HYDE PARK, MASSACHUSETTS.

WIND-ENGINE.

SPECIFICATION forming part of Letters Patent No. 543,462, dated July 30, 1895.

Application filed July 13, 1894. Serial No. 517,391. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM C. BRAMWELL, of Hyde Park, county of Norfolk, State of Massachusetts, have invented an Improvement in Wind-Engines, of which the following description, in connection with the accompanying drawings, is a specification, like letters and numerals on the drawings representing like parts.

10 This invention relates to that class of engines or motors wherein the power of the wind acting upon a wind-wheel is transmitted to the machine or mechanism desired to be driven. In such apparatus the transmitting
15 mechanism usually comprises a series of bevel gears and shafts for increasing the speed and for changing the direction of rotation from horizontal to vertical, and thereafter back to horizontal, various mechanisms having been
20 devised for accomplishing such purpose. A large part of the power of the wind-wheel is thus dissipated, and its efficiency is so lowered that it has small value as a producer of any amount of power. When it is attempted
25 to drive a machine at high speed—as, for instance, an electrical generator—the loss is still greater on account of the intermediate mechanism necessary to transmit and transform the slow speed of the wind-wheel shaft
30 to the high speed necessary for the armature-shaft of the generator.

This invention has for its object the production of a wind-engine wherein the transmitting mechanism is greatly simplified and
35 so arranged that high speeds can be obtained with a very small decrease in the efficiency of the wind-wheel, the whole apparatus being so constructed as to combine great strength and rigidity with light weight.

40 In accordance therewith my invention consists in various details of construction hereinafter described at length, and more particularly pointed out in the claims.

Other features of my invention will be hereinafter described, and particularly pointed out in the claims.

Figure 1 represents in side elevation and section, and broken out to save space, a wind-engine embodying my invention. Fig. 2 is a
50 front elevation of a portion of the wind-wheel only. Fig. 3 is a detail view on the irregular line $x\ x$, Fig. 1, looking down and on a larger

scale, of the vane or rudder-adjusting mechanism. Fig. 4 is an enlarged detail to be described, taken on the line $x' x'$, Fig. 1, of the
55 commutator of the electric generator and the wires leading therefrom into the standard. Fig. 5 is a detail of the outer end of one of the wind-blades, showing the mode of attachment to the rim. Figs. 6 and 6^a are front and
60 sectional views, enlarged, of the universal joint, to be described, on the generator-shaft; and Fig. 7 is a sectional view of a modification, to be referred to, of the connection between the rim of the wind-wheel and the
65 rotatable member of the machine to be driven thereby.

I have shown in Fig. 1 the apparatus embodying my invention as mounted upon a standard A, preferably hollow, and of metal
70 or other suitable material, its lower end being secured, as herein shown, by a threaded portion a to a casting A', resting upon a series of friction-rolls a' , carried in a step or thrust bearing A², adapted to be secured by bolts or
75 otherwise to suitable supports in the usual tower or other building. Between the ends of the standard A, I have provided a sleeve-like bearing A³, in which it is free to rotate, said bearing being preferably secured to the
80 roof, as B, of the tower or other building on which the apparatus is erected. This bearing may be of any desired or suitable shape or construction, and I have shown in Fig. 1 a
85 hood or cover A⁴ attached to the standard A above the bearing to keep rain or snow therefrom.

A casting having a hub b , herein shown as threaded and mounted upon and thereby rigidly secured to the threaded upper end of the
90 standard A, is provided with a boss b' projecting from one side and adapted to receive therein a stud b^x , upon which the wind-wheel to be described is free to rotate, said stud being held in place by a suitable set-screw m ,
95 Fig. 1. An upright extension b^2 on the casting has formed therein a bearing b^3 in alignment with a second bearing b^4 downwardly projecting from and within the hub b , said bearings receiving therethrough a pintle c of
100 the vane or rudder C. The pintle c passes through the bosses c' of a casting c^2 , to the upper and lower side of which diverging arms c^3 , preferably of wood, are bolted, the inner

sides of said arms being grooved (see dotted lines, Fig. 1) to receive therein the thin partition-boards c^4 of the vane or rudder.

From the foregoing it will be seen that the vane or rudder is adapted to turn on its pin-
15 tle c , and also as a whole with the standard A.

The hub b is provided with a rearwardly-projecting yoke-like portion b^{30} , having bearings b^{30} at its outer ends to receive the jour-
10 nals of a short shaft b^{40} , having fast thereon a worm d and a sprocket or other wheel d' , the teeth of the worm d engaging a toothed segment c^5 , secured to or forming a part of the casting c^2 and extending laterally therefrom,
15 as shown in Figs. 1 and 3, and I have herein shown at each end of said segment extended teeth, as 2 3, to form stops and to limit the lateral movement of the segment.

By an inspection of Fig. 3 it will be obvious
20 that rotation of the worm d in one or the other direction will turn the vane or rudder C through an arc of substantially ninety degrees, the worm acting as a lock to hold the vane at any point between the ends of the segment.

As shown in Figs. 1 and 3, the vane is at
25 right angles to the face of the wind-wheel to be described, fixing the latter exactly in the wind, so that it will be rotated at its maximum speed for a given velocity of wind. If,
30 however, the worm d is rotated to move the vane in the direction of the arrow 30 into its extreme position, the vane or rudder will be brought substantially parallel to the face of the wind-wheel and the latter will be brought
35 up with its edge to the wind and its rotation will be stopped, and at any point intermediate these two extremes various speeds can be obtained, depending on the angle presented by the face of the wind-wheel to the direction
40 of the wind.

Referring to Fig. 1, I have shown idlers d^2 and d^3 supported on suitable shafts carried by the standard and so located that a sprocket or other chain d^x passing about the wheel d'
45 and over the idlers d^2 and d^3 is carried into the hollow standard A and down around an actuating-wheel d^4 within the standard near its base, the shaft of said actuating-wheel d^4 being provided with a suitable handle d^5 at the
50 exterior of the standard, whereby the wheel may be rotated. Rotation of the actuating-wheel d^4 , by means of its handle d^5 , will, through the chain or other connection d^x , cause rotation of the wheel d' and worm d to
55 vary the angle of the vane or rudder with relation to the wind-wheel.

The actuator is supposed to be located at a convenient distance from the lower end of the standard A, so as to be readily accessible to
60 the operator from the part of the tower or other building upon which the apparatus is mounted.

It is obvious that a cable or band may be used in place of the sprocket-chain b^x by simply adapting the sprocket-wheels to such change of flexible connection.

I have herein shown the wind-wheel E as

composed of a rim e and a hub e' connected thereto and suspended therefrom by a series of wind-blades e^2 under tension by means to
70 be described. The hub e' is provided at each end with annular flanges e^3 e^4 , having openings therein to receive bolts e^5 connected to the inner ends of the blades, the ends of the bolts passing through the flanges, receiving
75 thereon and being held in place by suitable nuts n n' , as clearly shown in Figs. 1 and 2, whereby the tension of the blades e^2 may be adjusted. The blades are preferably made
80 of thin sheet metal, such as iron, copper, or other suitable material, and bent over at their outer ends, as best shown in Fig. 5, the main and bent-over portions being connected by
85 suitable rivets 5, the bent-over portions being provided with slots to receive therein the downturned ends f' of the arms f of the hold-
ers connected to the rim e , the ends f' of the holders being provided with holes, through
90 which is extended a pin or rod f^2 , as best shown in Fig. 5, the said rod connecting each blade to its holder. The hub-like portions
95 f^x of the holders at their main or central portion fit around the rim, (herein shown as concavo-convex in cross-section,) and the holders may be secured upon said rim either by be-
100 ing bent over the flange, as at f^3 , Fig. 5, or they may be bolted or riveted to the rim in any desired manner.

It will be noticed from an inspection of
100 Figs. 1 and 2 that the inner ends of alternate blades e^2 are connected, respectively, to the front and rear flanges e^3 and e^4 of the hub, such arrangement of the blades providing
105 for lateral bracing of the wind-wheel without additional braces having that sole function, thereby decreasing the weight of the wheel.

The hub e' of the wind-wheel rotates upon the stud or spindle b^x fixed in the casting on the standard A, and it is retained in place
110 thereon by a suitable nut m^3 on the outer end of the stud, the said stud being herein shown as slightly inclined to the horizontal, so that the face of the wind-wheel is inclined
115 at an angle of about ten degrees to receive the impact of the wind most advantageously.

It will be understood that if the holders are retained upon the rim e by the inturned edges or flanges f^3 the said holders will be placed upon the rim before its ends are con-
120 nected.

In Figs. 1, 2, and 5 the rim e of the wind-wheel is shown as concaved on its outer face to receive a flexible band or cable g to transmit the power from the wind-wheel to the machine to be driven by the wind-wheel, such
125 machine being herein shown as a dynamo D, supported upon a suitable casting F, adjustably secured to the standard A above the roof B of the tower or building, said casting F being laterally extended to form a plat-
130 form of suitable size for the dynamo, which latter is preferably bolted thereto. The armature-shaft h of the dynamo has connected thereto, by a universal joint, a pulley h' hav-

ing a concaved periphery to receive therein the flexible connection g , which passes around the rim e of the wind-wheel, whereby the rotation of the latter is communicated to the dynamo.

Inasmuch as the face of the wind-wheel is inclined as described, it is necessary to connect the pulley h' to the shaft h by a universal joint, so that the pulley may during its rotation keep in alignment with the rim of the wind-wheel, and for this purpose I have shown the end of the dynamo-shaft as forked at h^2 , through the ends of which bolts or studs h^3 are extended into a block h^4 , through which is extended at right angles to the studs h^3 a short shaft h^5 , the projecting ends of which are adapted to rock in bearings h^6 , (see Fig. 6,) suitably secured to the web of the pulley by bolts or other fastenings 10, extended through their flanges h^7 . The pulley is thus adapted to rock about the studs h^3 or at right angles thereto about the short shaft h^5 .

By tilting the dynamo so as to bring its armature-shaft at right angles to the plane of the rim of the wind-wheel a pulley rigidly secured to the armature-shaft could be used, or if the plane of the wind-wheel rim was vertical the same arrangement could be used, the dynamo then being level.

The commutator-brushes k and k^2 have connected thereto suitably-insulated wires k^x and k'^x to lead through porcelain or other insulating holders 50 to the interior of the standard A, thence downward to the lower part thereof, and out through other insulating tubes 60 and 61 to insulated rings m and m' exteriorly secured to the standard, and from which the current can be taken by suitable brushes m^x m'^x and by connecting-wires to a secondary or storage battery or to any other electrical device desired.

From an inspection of Fig. 1, taken in connection with the foregoing description, it will be seen that changes in the direction of the wind acting against the vane or rudder C will turn it and with it the vertical standard A, and as the latter supports the various mechanisms described they will be turned with it, retaining, however, their relative positions, whatever may be the direction of the wind, so that the operation of the dynamo will be continuous so long as the wind-wheel is rotated, and, furthermore, the apparatus can be started, stopped, or regulated from within the tower or other building upon which it is supported, a very great desideratum in inclement weather.

The dynamo is protected from the action of the elements by a removable cover D^x .

In Fig. 7 I have shown a modification of the connecting means between the wind-wheel and the shaft to be driven, wherein the rim s of the wind-wheel has secured to or forming a part of it an annular gear s' , adapted to engage the teeth of a bevel-gear s^2 fast on the shaft s^3 of the armature or other device to be driven, the bevel of the gear s^2 being such

that the inclination of the wind-wheel is compensated for and the gears s' s^2 always maintained in engagement without necessitating a universal joint between the smaller gear and its shaft.

It will be obvious from the construction shown in Fig. 7 that instead of toothed gears friction-gears might be substituted, operating precisely in the same manner.

While I have herein shown a dynamo as the machine to be driven by the wind-wheel, it is obvious that any other machine could be driven; and so, too, the shaft h could readily be extended within the standard A and be geared to a vertical shaft passing through the center of the standard and below its lower end, and a pulley or other power-transmitting device could be secured to the projecting end of the vertical shaft to transmit the rotation of said shaft to a dynamo or other machine within the building without interfering with the adjustment of the wind-wheel to changes in the direction of the wind, as described.

Inasmuch as a dynamo well illustrates a machine which must be driven at a high speed, it presents a good type of machine particularly adapted for use in connection with my apparatus, wherein the comparatively slow speed of the wind-wheel is transmitted thereto and utilized without the employment of speed-increasing gearing, and by connecting the dynamo with a storage-battery the variable and intermittent power of the wind may be transformed, stored up, and utilized at a very small cost.

That very high speed may be attained by an apparatus embodying my invention is clear, if we take into consideration the fact that the rim of a wind-wheel ten feet in diameter, for instance, will have a velocity of four hundred and seventy feet per minute at fifteen revolutions, while its shaft—say, of two inches in diameter—will only have a surface speed of about eight feet per minute.

To drive apparatus from the shaft the speed would have to be geared up in a ratio of about fifty-nine to one to equal the speed of the rim, necessitating considerable intermediate gearing, and in consequence greatly reducing the useful power of the wind-wheel.

I claim—

1. A hollow rotative standard, a wind-wheel mounted thereon, a platform-like support attached to and longitudinally adjustable on the standard below the wind-wheel, an electric generator on said support, an endless belt directly connecting the rim of the wind-wheel and the rotatable member of the generator, insulated conducting rings around the exterior of the standard, wires connecting said rings and the commutator of the generator, and current carrying brushes contacting exteriorly with the rings, substantially as described.

2. In a wind-wheel, a hub, and a series of wind blades connected thereto at their inner ends, adjacent blades being secured to oppo-

site ends of the hub, substantially as described.

3. In a wind-wheel, a rim, a hub, and a series of wind blades under tension connecting
5 said hub and rim, the inner ends of adjacent blades being secured to opposite ends of the hub, substantially as described.

4. In a wind-wheel, a rim, a hub, a series of wind blades under tension connecting said
10 hub and rim, and adjustable connections between the inner ends of adjacent blades and opposite ends of the hub, whereby the tension of the blades may be regulated, substantially as described.

5. In a wind-wheel, a hub having annular
15 flanges at its ends, wind blades, connections between the inner ends of the blades and the annular flanges of the hub, and means to adjust said connections independently, substantially as described. 20

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM C. BRAMWELL.

Witnesses:

GEO. W. GREGORY,
JOHN C. EDWARDS.