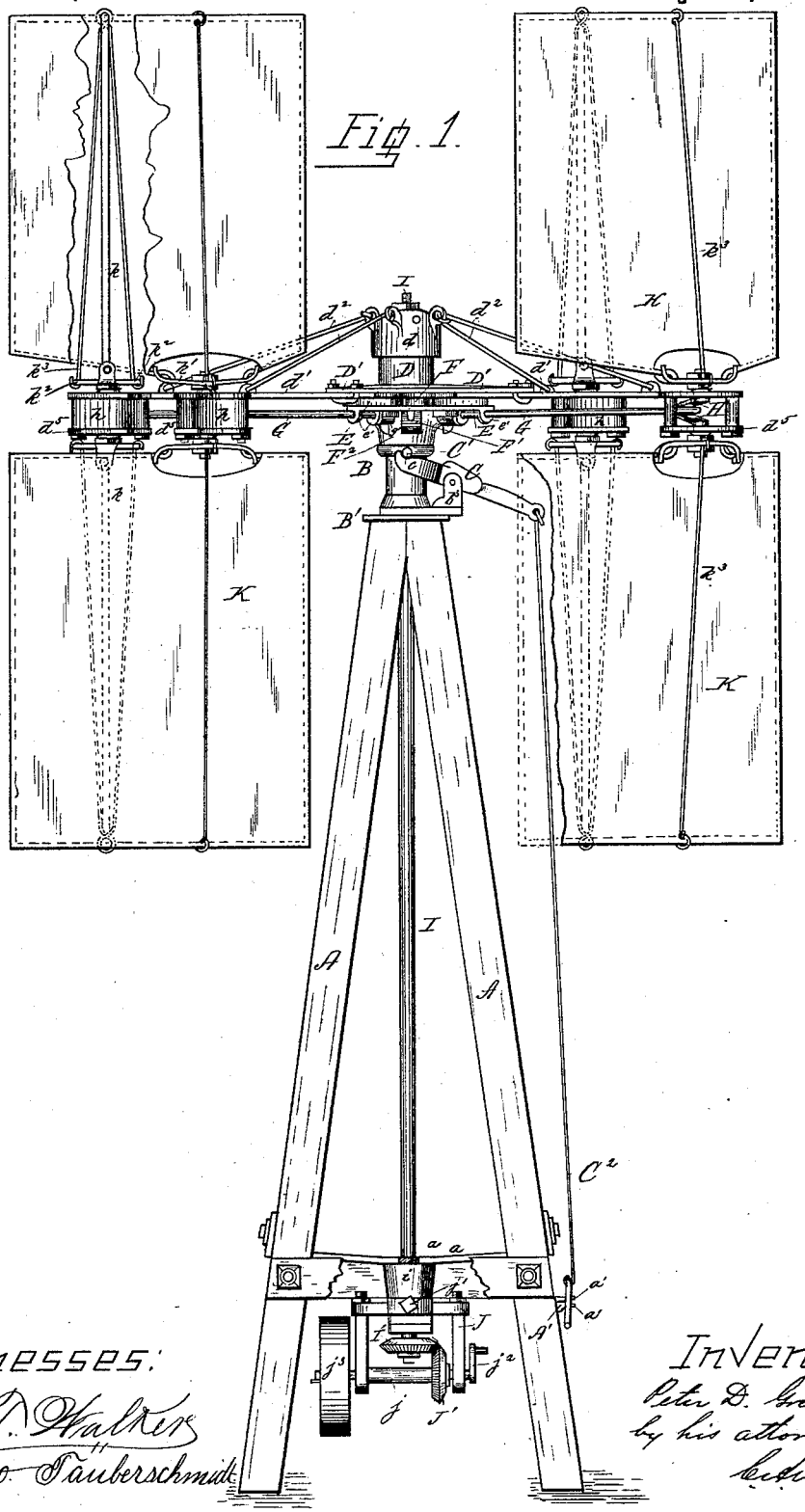
(Model.) 2 Sheets—Sheet 1.

P. D. GRAHAM.

WIND ENGINE.

No. 302,246. Patented July 22, 1884.

Fig. 1.



Witnesses:
E. D. Walker
Geo. Tauberschmidt

Inventor
Peter D. Graham
by his attorney
E. G. Siggers

(Model.) 2 Sheets—Sheet 2.

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Fig. 2.

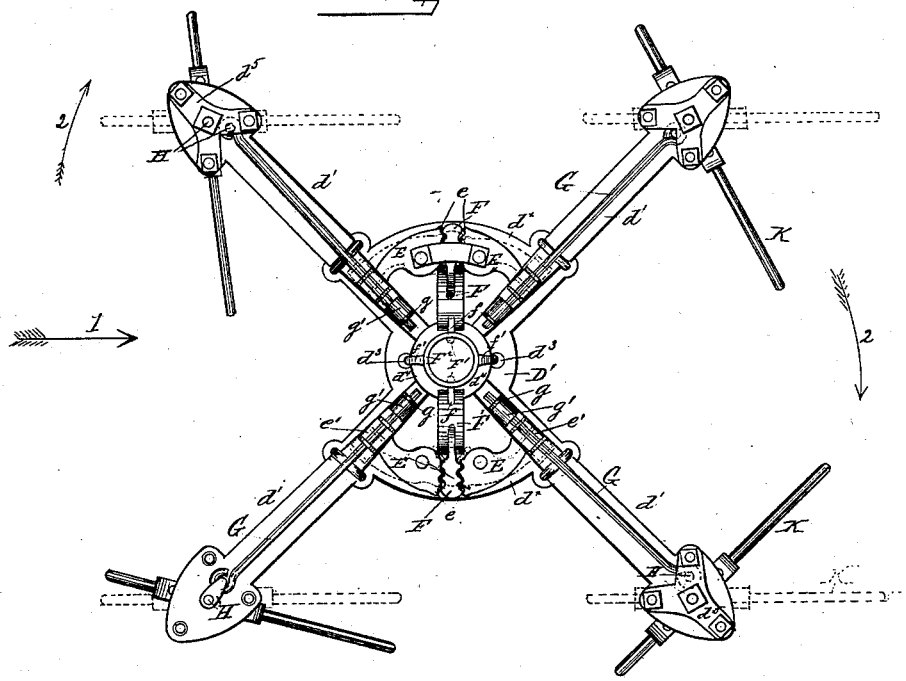


Fig. 4.

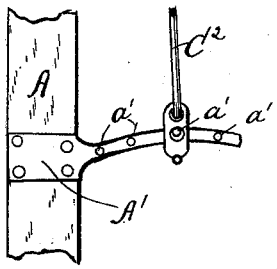
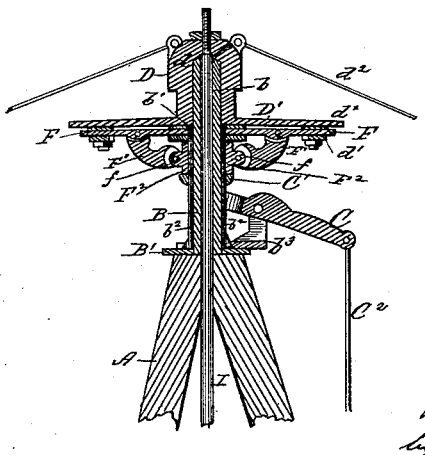


Fig. 3.



Witnesses:
E. F. Walker
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Church Teale

UNITED STATES PATENT OFFICE.

PETER DUNLAP GRAHAM, OF CORUNNA, INDIANA.

WIND-ENGINE.

SPECIFICATION forming part of Letters Patent No. 302,246, dated July 22, 1884.

Application filed August 9, 1883. (Model.)

To all whom it may concern:

Be it known that I, PETER D. GRAHAM, a citizen of the United States of America, residing at Corunna, in the county of De Kalb and State of Indiana, have invented certain new and useful Improvements in Wind-Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to that class of horizontal wind-wheels in which the vanes are so secured to their vertical cranked pivots that as the wheel is moved by the wind said vanes will be automatically shifted.

One object of my improvement is to so arrange the adjusting mechanism of the vanes that the speed of the wheel may be changed or the machine be thrown in and out of gear by a regulating device located at the base of the frame.

Another object of the invention is to render the structure more solid by mounting the wheel upon a fixed part of the frame, which part also forms the upper bearing for the main or driving shaft of the machine.

Another object of the invention is to so construct the wheel-spider and arrange the working parts of the wheel in connection therewith that the latter will be protected from rain or snow, thus rendering such parts less liable to become rusted or clogged with ice.

With these objects in view my invention consists in certain novel features and combinations, which will be fully described in the ensuing specification and briefly set forth in the claims at the close thereof.

In the accompanying drawings, Figure 1 is an elevation of my improved wind-wheel and its frame, certain parts being broken away in order to more clearly show working parts which would be otherwise concealed. Fig. 2 is a plan view of the wheel looking toward the bottom. In this view the parts are shown in operative position by full lines, the dotted lines representing said parts when the machine is out of gear. Fig. 3 is a vertical section taken through the axial center of the wheel-hub and its bearing. Fig. 4 is a detail showing the arrangement of the spring-bar.

The arrows 1 in Fig. 2 indicate the direction of the wind, and the arrows 2 indicate the direction in which the wheel revolves.

The corresponding parts illustrated in the several figures of the drawings are designated by the same letters of reference.

Secured to the top of a stout frame, A, of any suitable or preferred construction, is a standard, B, the upper cylindrical portion of which forms a bearing, *b*, for the wheel-hub. The bearing *b* terminates at the bottom in a shoulder, *b'*, and the portion of the standard below the shoulder *b'* is provided with one or more longitudinal grooves, b^2. The lower end of the standard terminates in a base-block, B', which is firmly secured to the top of the frame A; and projecting from the base-block B' is a bracket, b^3, in which is pivoted a lever, C, the short arm of which is bifurcated to straddle the standard B and support the studs or trunnions *c*, projecting outward from the opposite sides of a ring, C', which encircles and is adapted to slide upon the grooved portion of the standard.

The wheel is composed of a spider consisting of a flanged hub, D, and radial arms *d'*. In the outer ends of these arms *d'* are journaled the double cranks H, to which the vanes are secured. The hub D terminates at the top in a dome or cap, *d*, on which are formed eyes, and it is provided at the bottom with a flange, D', to the under side of which the arms *d'* of the spider are secured. To prevent these arms from sagging under the weight of the vanes, they are provided on their upper sides with eyes, in which are secured the outer ends of tie-rods d^2, the inner ends of which are secured in the eyes on the cap *d* of the hub.

Projecting downward from opposite sides of the flange D' are posts d^3, the inner sides of which are grooved, as shown in Fig. 2, and between these posts d^3 a ring of metal, d^4, is secured to the under side of the flange D'.

Pivoted beneath the wings $d^\times$ of the flange D' are levers E, on the short arms of which are formed rack-teeth *e*, which engage with teeth formed on the opposite sides of the sliding rack-bars F.

To the long arms of the levers E are swiveled eyes *e'*, in which are mounted to slide the connecting-rods G, the outer ends of which are secured to the cranks H, on which the vanes K are mounted. The inner ends of these connecting-rods G are threaded and provided with adjusting-nuts *g*. I prefer to interpose spring-

buffers g' between the nuts g and the eyes c' of the levers E, to cushion the throw of the cranks when they are turned outwardly by the shifting of the vanes. The inner ends of the sliding rack-bars F work through slots formed in the ring d^4, and at about the center of each of said rack-bars is pivoted the upper end of a link, F'. The lower ends of these links are pivoted to lugs f, projecting from opposite sides of a sleeve, F^2, which sleeve is also provided with spurs f', the outer ends of which project within the grooves formed in posts d^3. The hub D is longer than its bearing b on the standard B, so that when said hub is bored out to receive the bearing a solid web may be left at the cap d, which web will rest upon the upper rounded end of the bearing, and the weight of the wheel be thus supported by said bearing. The standard B is cored out to form the upper bearing for shaft I, the lower bearing, i, of which is secured to cross-braces a at the base of the frame A. The upper end of the shaft I projects sufficiently above the standard B to pass through an aperture formed in the cap d of the hub D, and be secured by a nut or other suitable means. The shaft is rigidly secured to the hub D by feather and groove, or otherwise, so that it will turn therewith, and I prefer to so connect these parts that the weight of the shaft will be borne by the hub.

Secured near the base of the frame A is a spring-bar, A', provided with projecting studs a', adapted to engage a perforation formed in the adjusting-rod C^2, the upper end of which is secured to the long arm of the lever C.

The lower end of the shaft I is provided with a bevel-pinion, I', which meshes with a similar pinion, J', secured to a horizontal shaft, j, journaled in a hanger, J, swivelingly connected to the lower bearing, i, of the shaft I. This hanger J is provided with a set-screw, j', by means of which it may be locked to the bearing i after having been turned to the desired position. The ends of the shaft j project beyond the arms of the hanger J, and are provided, one end with a crank, j^2, and the other end with a pulley, j^3.

To provide a double bearing for the cranks H, I secure a plate, d^5, below and to the outer ends of the arms d' of the spider by means of stay-bolts; and to protect said cranks from being clogged with snow or ice, I secure a housing, h, between said arms d' and plates d^5.

The vanes K are constructed of a stout frame, k, (preferably iron,) over which or to which is secured a sail of any suitable material. The vanes are provided at one end and to one side of the longitudinal center with socket-irons k', adapted to receive the ends of the cranks H. These socket-irons are provided on each side with an extension, k^2, to the outer end of which is secured one end of a tie-wire, k^3, the other end of said wire being secured to the opposite end of the frame of the vane, to give rigidity thereto.

The cap of the hub D is provided with an oiling-aperture, preferably of the reservoir class, to supply lubricant to the hub and shaft bearings. It will be seen that, as the shaft I projects above its bearing but just a sufficient distance for connection with the hub, it will not be subjected to lateral strain, owing to the fact that said hub is mounted on a bearing rigidly secured to or forming part of the frame, thus preventing a binding of said shaft in its bearings. As the cranks H, rods G, and their operating mechanism are located beneath the flange and arms of the spider, there will be but little liability of said parts becoming clogged by snow or ice or becoming coated with rust.

The shaft J is provided with both a crank and pulley, so that power may be transmitted either by means of a belt or pitman. By this means I am enabled to obtain both a rotary movement for driving grindstones, circular saws, &c., and a reciprocating movement for working a pump-rod. By loosening the set-screw j' and detaching the pump-rod, the hanger may be turned to transmit power in any direction.

The operation of my machine is as follows: Supposing the adjusting-rod C^2 to be free from the studs of the spring-bar A', the machine is out of gear, the spider being locked by means of the inner ends of the rack-bars F engaging with the grooves b^2 of the standard B. While the rack-bars remain in this position the long arms of the levers E will be in their outermost positions, thus permitting the connecting-rods G to slide freely through the eyes c', and the vanes, being pivoted to one side of their longitudinal centers, will swing free and present a thin edge to the wind.

To place the machine in working condition or "in gear," the adjusting-rod C^2 is pulled down and hooked to one or the other of the studs a' on the spring-bar A'. By this action the lever C raises the ring C', and as the sleeve F^2 rests upon this ring said sleeve will be lifted, thus carrying upward the lower ends of links F'. As the upper ends of these links are pivoted to the sliding rack-bars F, said bars will be caused to slide outwardly from the standard, carrying with them the short or toothed ends of levers E, and this action will cause the long arms of said levers E to move toward the standard, carrying with them the connecting-rods G, and causing the cranks H to be turned toward said standard. The vanes are now in the position required to drive the machine. The nuts g are so adjusted on the inner ends of the connecting-rods G as to give the cranks H sufficient play to permit the vanes to shift themselves automatically when their rear edges are presented to the wind.

The machine may be set to run fast or slow in a stiff wind by securing the adjusting-rod nearer to or farther from the free end of the spring-bar A', as, if said rod is secured at the free end of the spring-bar, the latter will yield slightly, and thus allow of the slight shifting of the vanes to bring them more in the direction of the wind, thus causing them

to present less surface to the action of the wind, and decreasing its pressure upon the wheel. By securing the adjusting-rod nearer to the fixed end of the spring-bar, the leverage will be lessened, and the power of the spring to resist the swinging action of the vanes be proportionately increased.

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

1. In a windmill, the frame A, provided at its top with a fixed standard, forming exteriorly a bearing for the wheel-hub and interiorly a bearing for the main shaft.

2. In a windmill, the combination, substantially as before set forth, of the standard, provided at its top with an exterior bearing, the hub, mounted to rotate on said bearing, and the main shaft, secured to and supported by said hub and adapted to rotate in bearings arranged below its support.

3. The combination of the standard, the spider journaled thereon, the cranks journaled in the arms of the spider, the connecting-rods secured at one end to the cranks and at the other end to levers pivoted to the spider, and means, substantially such as described, for operating said levers to control the position of the cranks.

4. The combination, substantially as before set forth, of the standard, the spider, the cranks, a sleeve mounted to slide upon the standard, the rack-bars, links connecting the sleeve with the rack-bars, mechanism for connecting the rack-bars with the cranks, and means for elevating the sleeve.

5. The combination, substantially as before set forth, of the grooved standard, the spider, the cranks, a sleeve mounted to slide upon the standard, the rack-bars, links connecting the sleeve with the rack-bars, mechanism for connecting the rack-bars with the cranks, and means for elevating the sleeve.

6. The combination, substantially as before set forth, of the standard, the sleeve mounted to slide on the standard, a lever for elevating the sleeve, the spring-bar, and means for connecting the lever with the spring-bar.

7. In a windmill, the combination, substantially as before set forth, of the upper bearing for the main shaft, the hub-bearing arranged concentric therewith, and the hub provided with a single oiling-aperture to supply lubricant to both of said bearings.

8. In a horizontal windmill, the combination of the flanged hub, the radial arms removably secured thereto, the cranks having their upper bearings in the outer ends of said arms, and mechanism secured to the under side of said flange and arms for controlling the position of the cranks, substantially as before set forth.

9. In a vane for windmills, the combination, substantially as before set forth, of the frame provided at one end with a socket-iron having lateral extensions, and the tie-wires secured at one end to said extensions and at the other end to the opposite end of the frame.

In testimony whereof I affix my signature in presence of two witnesses.

PETER DUNLAP GRAHAM.

Witnesses:
G. H. MILES,
F. G. FRIED.