

(No Model.)

2 Sheets—Sheet 1.

W. J. CUNNINGHAM.
WINDMILL.

No. 427,975.

Patented May 13, 1890.

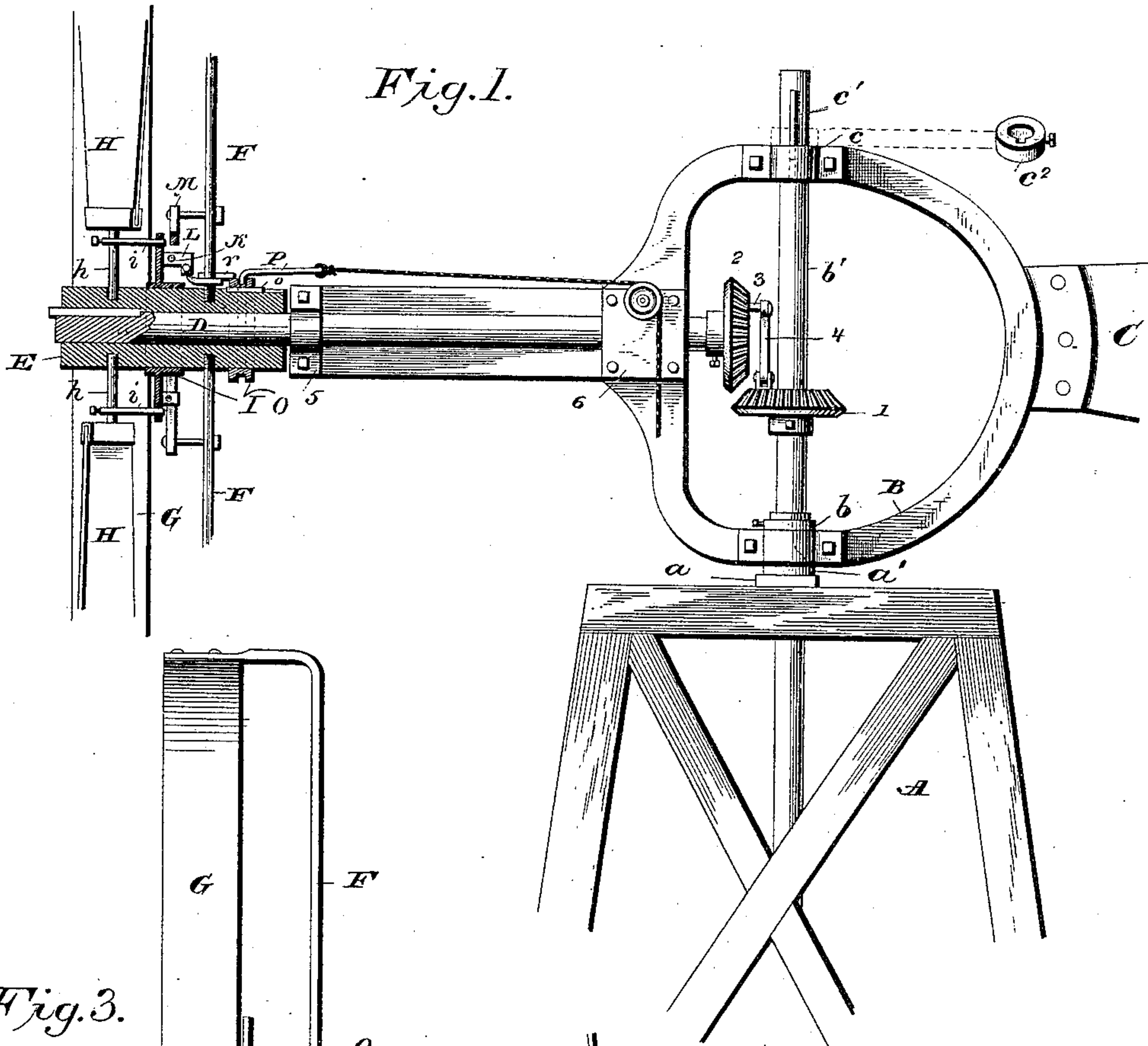
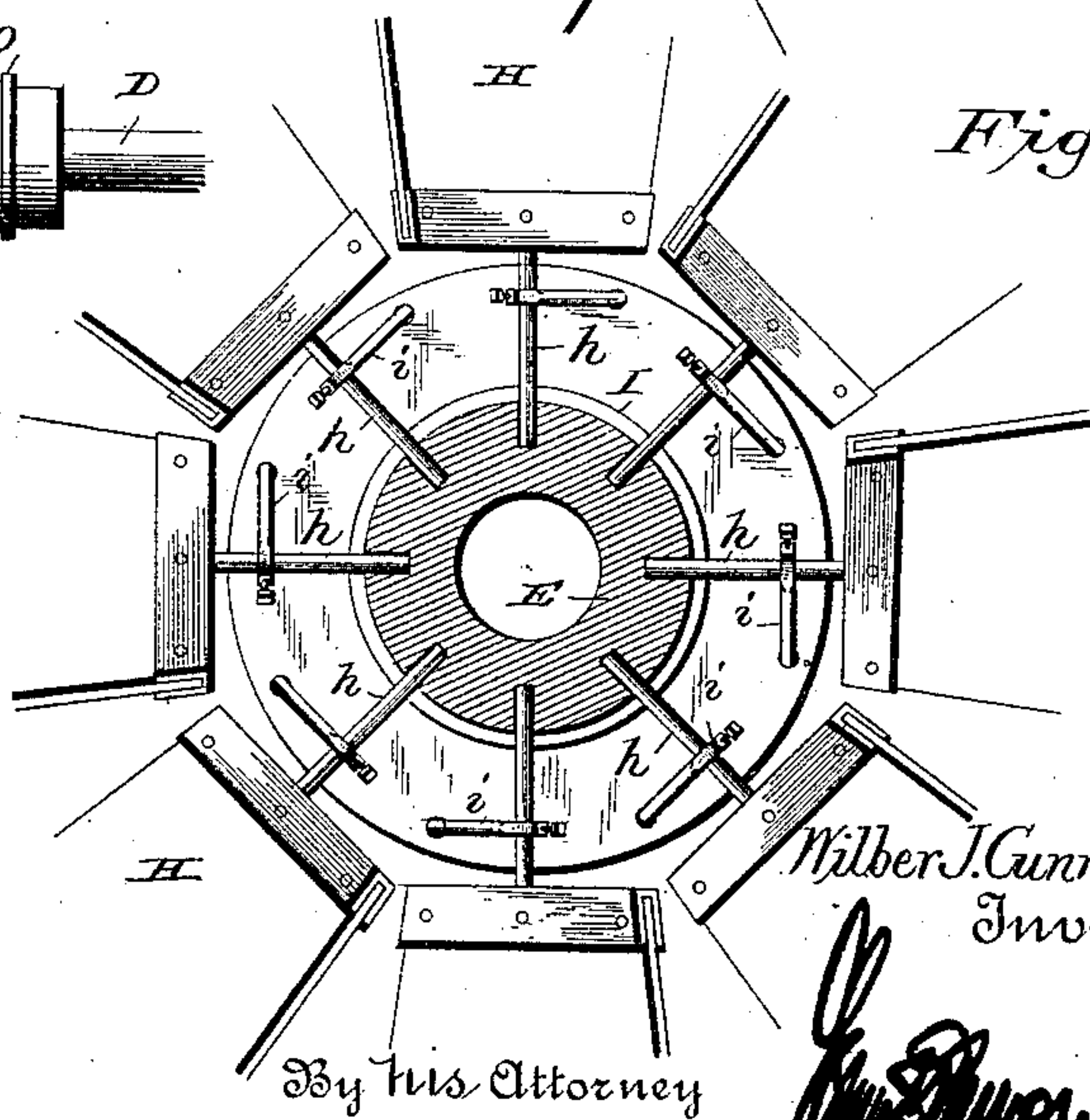
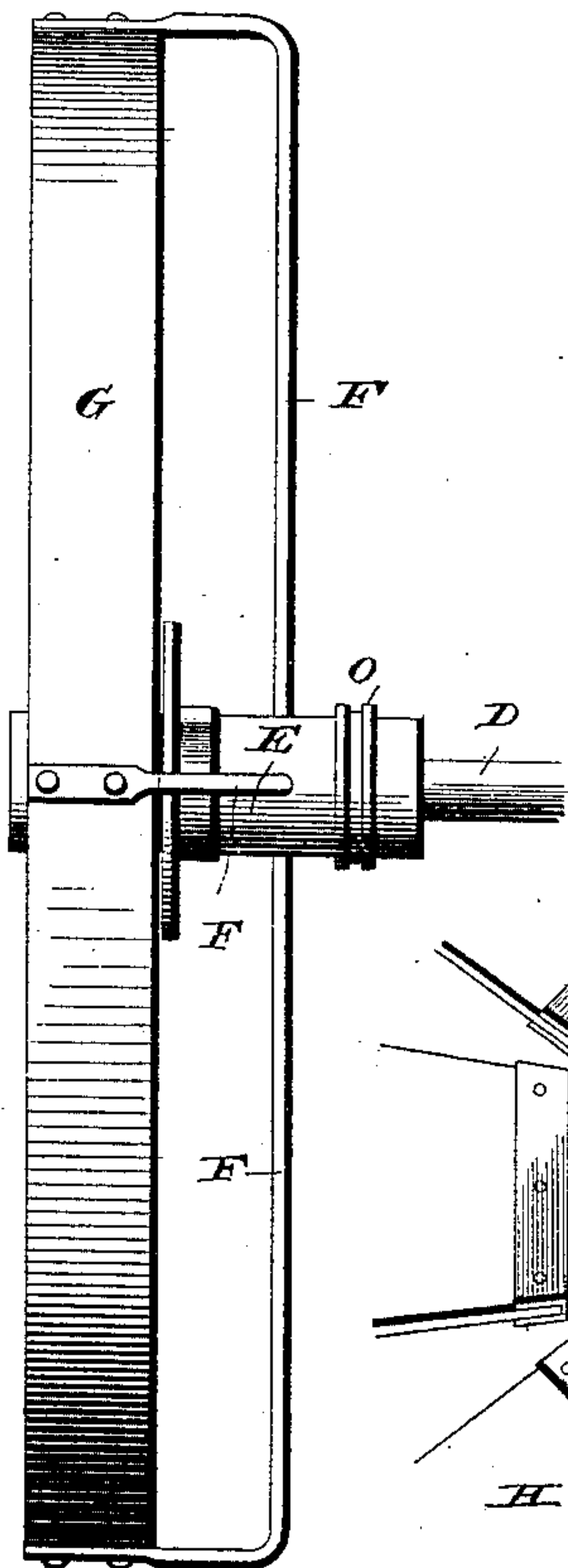


Fig. 3.



Witnesses

L. S. Elliott.
E. M. Johnson

Wilber J. Cunningham.
Inventor

By His Attorney

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Fig. 4.

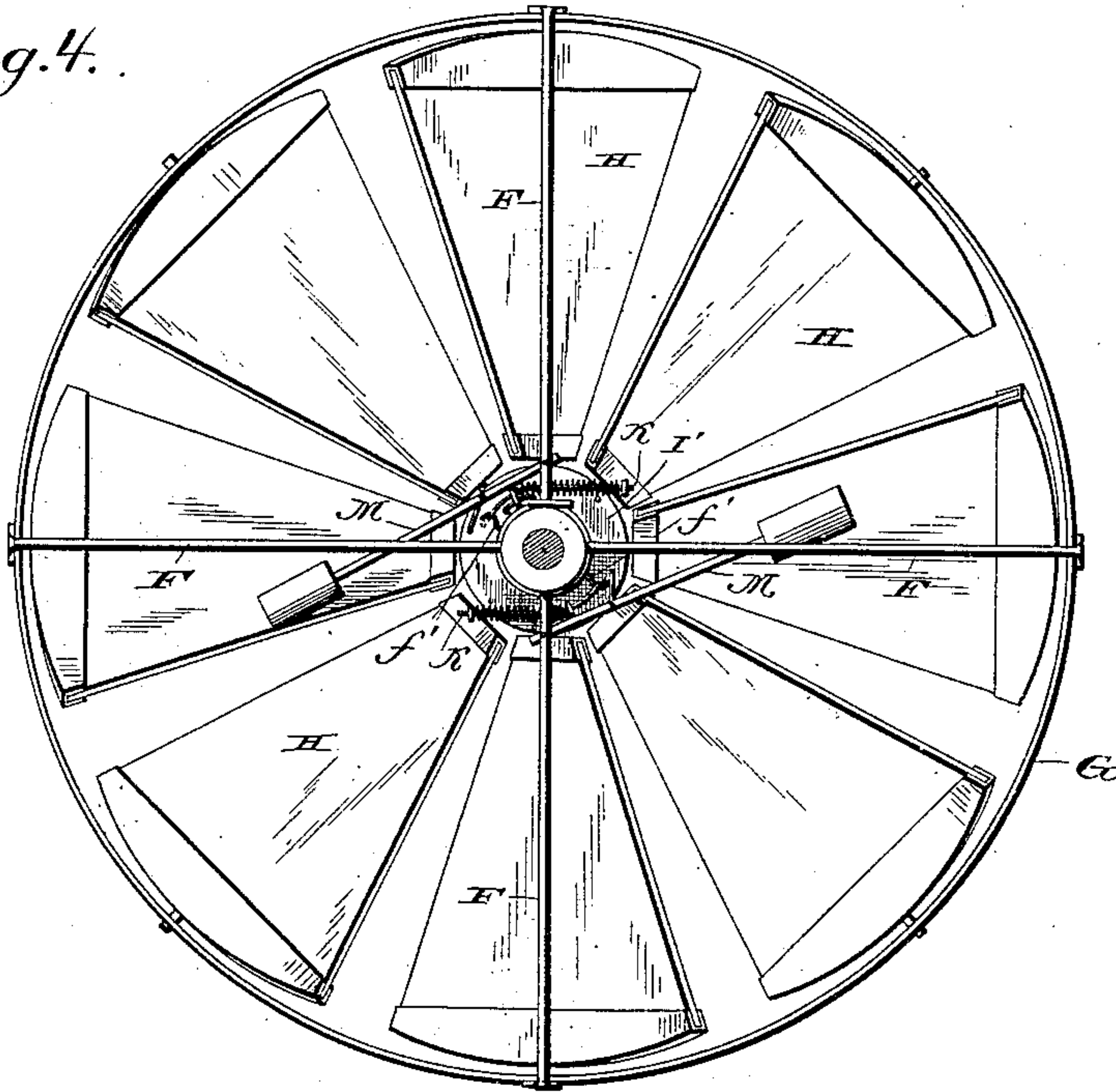
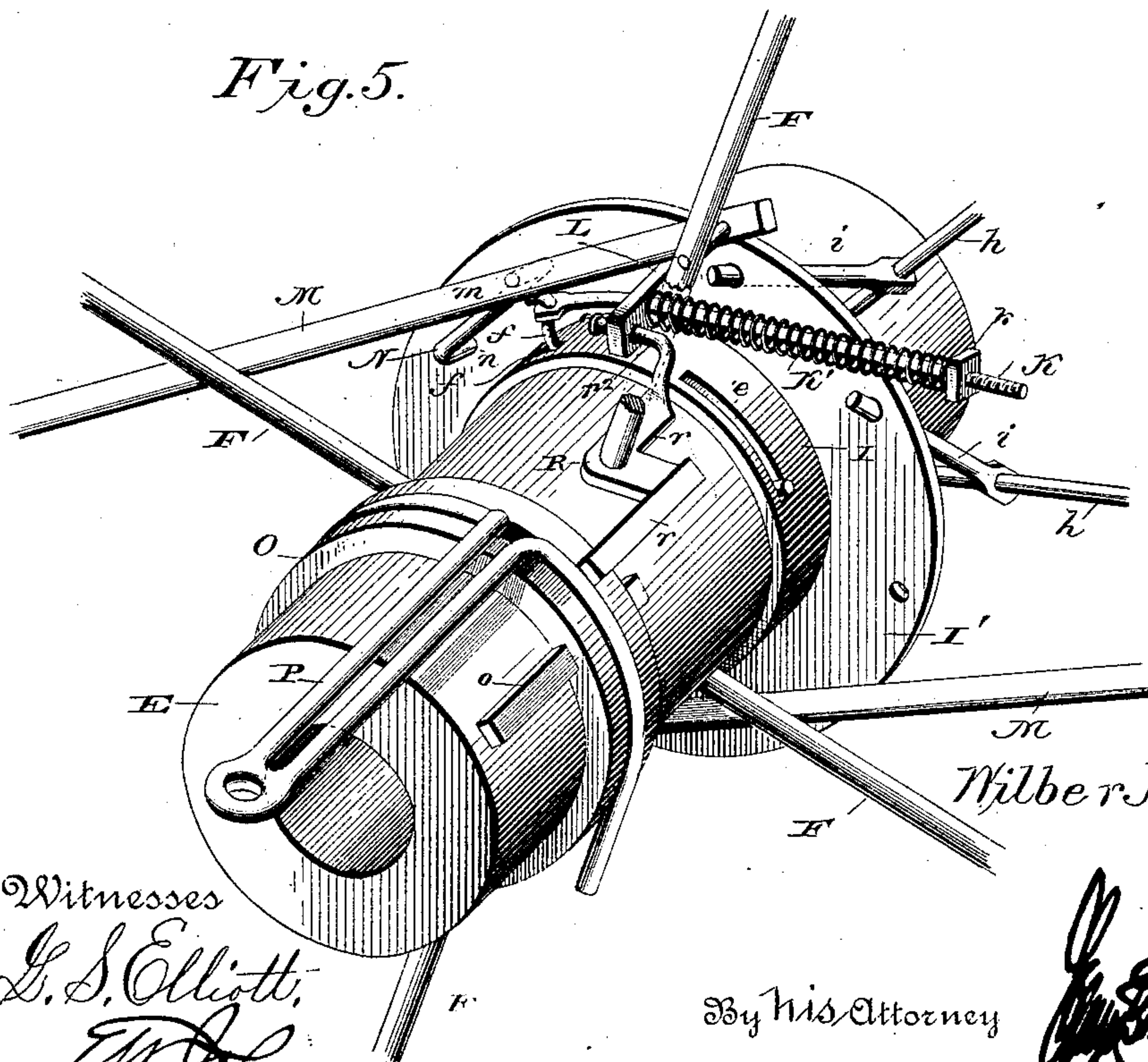


Fig. 5.



Wilber J Cunningham

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L. S. Elliott,
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Inventor

By his Attorney

UNITED STATES PATENT OFFICE.

WILBER J. CUNNINGHAM, OF RAPID CITY, SOUTH DAKOTA.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 427,975, dated May 13, 1890.

Application filed March 10, 1890. Serial No. 343,358. (No model.)

To all whom it may concern:

Be it known that I, WILBER J. CUNNINGHAM, a citizen of the United States of America, residing at Rapid City, in the county of Pennington and State of South Dakota, have invented certain new and useful Improvements in Windmills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to certain new and useful improvements in windmills, the object thereof being to provide a wind-wheel having vertical blades with means for automatically feathering the same and with means for closing or changing the angle of the blades manually; also, to provide an improved gearing whereby the rotary movement of the operating-shaft can be converted into a reciprocating movement; and the invention consists in a wind-wheel having a series of vertical blades pivotally attached to the hub of the wheel, the radial arms carrying the blades being connected to a turning collar and weighted arms, the said turning collar being also provided with springs and stops, as well as connections, which engage with the collar for turning the blades manually, all as will be hereinafter fully set forth and particularly claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a side view, partly in section, of a windmill constructed in accordance with my invention. Fig. 2 is a front elevation, partly in section. Fig. 3 is a side view; Fig. 4, a rear view, partly in section; and Fig. 5, a detail perspective view.

A refers to the tower of the windmill, which may be of ordinary construction, and to the upper platform thereof is secured a turn-table *a*, upon which rests the main casting or frame B, which is provided at its lower end with bearings *a'*, through which passes the collar or tube forming the turn-table, the same being rigidly bolted to the upper portion of the platform. The upper end of the collar or tube *a*, directly above the bearing *a'*, is en-

circled by a collar *b*, secured thereto by a set-screw, so as to permit the turning of the casting B, but at the same time preventing the lifting or elevation of the same. The driving-shaft *b'* passes through the collar or turn-table *a*, and is free to slide or rotate therein, and has secured thereto in any suitable manner—as a set-screw—a pinion 1. The upper end of the shaft *b'* passes through the bearing *c* at the upper end of the casting or frame B, and this bearing *c* has a vertical groove or recess formed therein, within which the spline *c'*, formed on the shaft, is adapted to move to prevent the rotation of the shaft when the parts are positioned as shown in Fig. 1. This shaft is adapted to be raised or lowered, and when raised to its full extent the pinion 1 will mesh with the pinion 2 on the horizontal shaft to which the wind-wheel is attached, and when in this position the spline *c'* will be out of engagement or above the bearing *c*, and will be held elevated by a collar *c'*, which can be placed and secured over the upper end of the shaft.

The pinion 2, which is rigidly secured to the horizontal shaft, carries a wrist-pin 3, with which engages one end of a link 4, while the other end is attached to the upper face of the pinion 1, and this link is employed when it is desired that the rotary motion of the shaft of the wind-wheel be converted into a vertical reciprocating motion.

The casting B has a tail or vane C attached thereto in the usual manner, and from the opposite side of the casting B extends a projecting portion having bearings 5 and 6, in which is journaled the horizontal shaft upon which the wind-wheel is mounted. To the outer end of this shaft D is rigidly secured a hub E, and from this hub radiate four or more fixed arms F, the ends of which are bent and rigidly secured to the rim G. The blades H are rigidly attached to the radiating arms *h*, which are journaled in the hub E and rim G. These radiating arms *h* between the periphery of the hub and inner edges of the blades may be squared for the rigid engagement therewith of the pins *i*, which can be provided with set-screws for adjustably connecting and rigidly fixing the same upon the radial arms *h*, while the other ends engage

with perforations in the flange of the turning collar I. This collar I is mounted loosely on the hub E, and is provided with slots *e*, through which pins pass and engage with the hub E to limit the rotary movement of the said collar. This collar is also provided with slots *f* of the same length as the slots *e*, through which pass pins *f'*, having bent or hooked ends, with which the ends of the spring-supporting rods K engage, said rods having screw-threaded outer ends, upon which are placed adjusting-nuts for varying the tension of the springs. The springs K', which are placed over these rods, bear against the nuts *k* at one end and at the other against the projecting arms L, rigidly attached to the flange I' of the fixed collar, and these springs have a tendency to turn the flanged collar to hold the blades H in an operative position or at an angle with the hub.

On opposite sides of the hub to the spokes or fixed arms F are pivotally attached weighted arms or governors M, which are provided with perforations, with which engages one end of the bent links N, the opposite ends of said links engaging with perforations *n* in the flange L', and these weighted arms serve as governors for the wind-wheel, and when thrown outwardly by the centrifugal force of the wheel will turn the blades H more or less, according to the speed of the wheel, and thereby reduce the speed of said wheel, as there will be less force exerted upon the blades by the wind. By properly adjusting the nuts on the rods K the springs will coact with the governor-arms or weighted bars M. The hub E is also provided with a sliding collar O, which is provided with a circumferential groove, in which lie the ends of a bifurcated bar P, to which is attached a flexible connection, which passes over suitable guide-pulleys to below the platform, and by drawing upon this flexible connection the collar which slides upon the key *o* will be moved away from the flanged collar I, and as this sliding collar has attached thereto a link *r*, connected at one end to a crank-lever R, pivoted upon one of the spokes adjacent to the hub, it will be turned upon its pivot, so that the opposite end, which passes through the projection L, extending rearwardly from the flanged collar, will turn said collar and throw the blades H so that their edges will be presented to the wind and out of an operative position. The crank-lever R has on its front arm *r'* an extension or bar *r''* with an enlarged end, and said end engaging with the projection L causes the movement hereinbefore described. It will also be observed that the spring acts to retract the sliding collar O when it has been moved manually.

By means of the hereinbefore-described device I provide a wind-wheel the operative parts of which are all compact and which are not liable to get out of order. The weights on the ends of the arms M can be fixed to be adjusted thereon when desired.

I am aware that prior to my invention it has been proposed to employ governors or weighted arms which are connected to the pivoted blades of the wind-wheel, so that when the wheel runs at a higher rate of speed than is desired the weighted arms will be thrown outwardly by centrifugal force and turn the blades at an angle to the wind, so as to reduce the surface presented to the wind, and consequently the speed of the wheel, and it has also been proposed to provide springs which will serve to bring the weighted arms back to their normal position, and I therefore do not claim, broadly, a vertical wind-wheel having feathering-blades and weighted arms or centrifugal governors; but

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

1. In a wind-wheel, the combination of a hub carrying pivoted radial arms upon which are secured the blades, pins projecting from said radial arms so as to engage with a turning collar having slots and means for limiting the movement thereof, projections carried by the collar through which pass rods carrying springs, and weighted arms having links connecting the same to the turning collar, substantially as set forth.

2. In a windmill, the combination of a hub, spokes extending therefrom so as to form a support for the outer rim of the wheel, blades pivoted to the hub and outer rim, a flanged collar I, having slots for limiting the rotation of the same upon the hub, pins fixed upon the shafts of the blades at one end and engaging with the flange of the turning collar at the other, projections L, through which pass rods K, springs mounted on said rods to engage with the said projections and nut for varying the tension of the spring K', and a weighted arm pivoted at one end to the spokes, links N, adapted to engage with said bar and the flanged collar, and means, substantially as shown, for turning the flanged collar manually, the parts being organized substantially as shown, and for the purpose set forth.

3. In a windmill, the combination of a hub provided with a flanged collar which is adapted to turn upon said hub, a sliding collar in rear of the same and turning therewith, means for automatically governing the blades, said flanged collar having rearwardly-projecting portions L, and a crank pivoted upon the hub, one end of said crank passing through the projection L of the flanged collar, while the other end of said crank is connected by a link to the sliding collar, said sliding collar being adapted to be moved manually in one direction and automatically by the springs of the governor device in the opposite direction, substantially as set forth.

4. The combination, in a self-governing windmill, of a hub rigidly fixed upon the driving-shaft, said hub having spokes which serve as supports for the outer rim of the wheel, a series of blades pivoted, as shown, to the hub and outer rim, weighted arms pivoted

to said spokes and provided with links which engage with a flanged turning collar, projections L, rigidly secured to the flange of the turning collar and provided with a perforation through which rods K pass, the inner ends of said rods engaging with hooked pins f' , fixed to the hub and passed through slots f therein, springs K' and nuts k , for adjusting the tension of said springs against the projection L of the flanged collar, cranks R, pivoted upon the spokes, said crank having a member r^2 with enlarged head, which is adapted to move through and engage with the projecting portion L of the collar, and a link r , for connecting the crank I to a sliding collar O, substantially as set forth.

5. The combination, in a windmill, of a turning support or casting having bearings for the horizontal driving-shaft of the windmill and vertical shaft, the vertical shaft b' and horizontal driving-shaft mounted in said bearings, and means for raising and lowering the vertical shaft and holding the same in a raised position, so that the same can either be reciprocated or rotated, substantially as shown.

6. The combination, with a shaft D, having pinion 2 and wrist-pin 3, of the vertically-

movable shaft having pinion 1 and capable of either rotating or reciprocating, and a link 4, for connecting the pinions 1 and 2 to each other, so that the rotary motion of the shaft D will be converted to a vertical reciprocating motion, the connecting-link 4 being removable, so that the pinions can be thrown in gear with each other when the vertical shaft is elevated, substantially as shown, and for the purpose set forth.

7. In combination with a turning support or casting B, having bearings for a horizontal shaft D, and a vertically-movable shaft, the upper end of the vertical shaft having a spline c' , which is adapted to engage with the upper bearing c , a removable collar c^2 , for holding the shaft elevated and the spline out of engagement with the bearing c , and pinions 1 and 2, for gearing the shafts to each other, substantially as set forth.

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

WILBER J. CUNNINGHAM.

Witnesses:

G. S. ELLIOTT,
E. W. JOHNSON.