

(No Model.)

G. P. THURSTON.
WINDMILL.

2 Sheets—Sheet 1.

No. 401,867.

Patented Apr. 23, 1889.

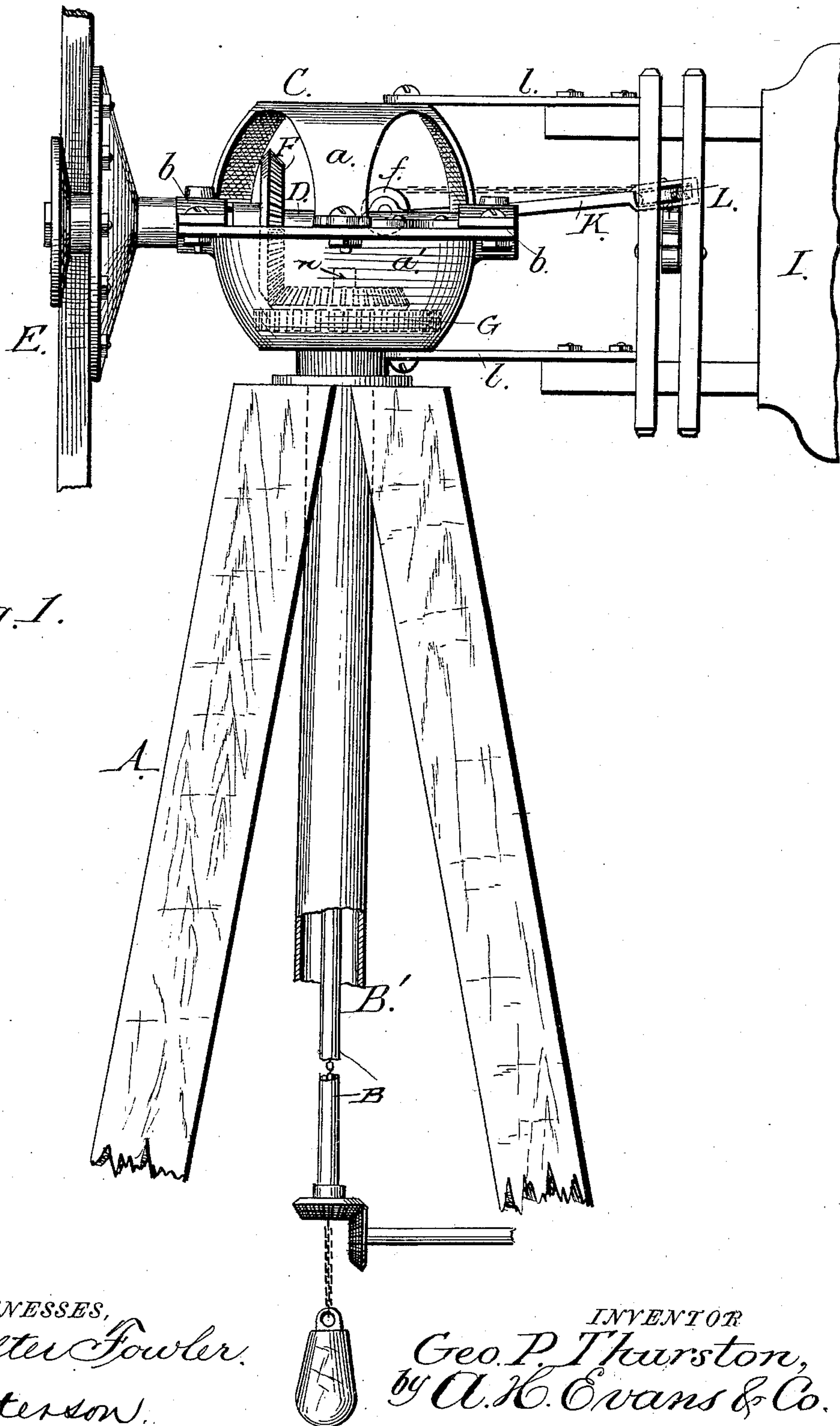


Fig. 1.

WITNESSES,
S. Walter Fowler.
M. H. Patterson.

INVENTOR
Geo. P. Thurston,
by A. H. Evans & Co.
Attorneys

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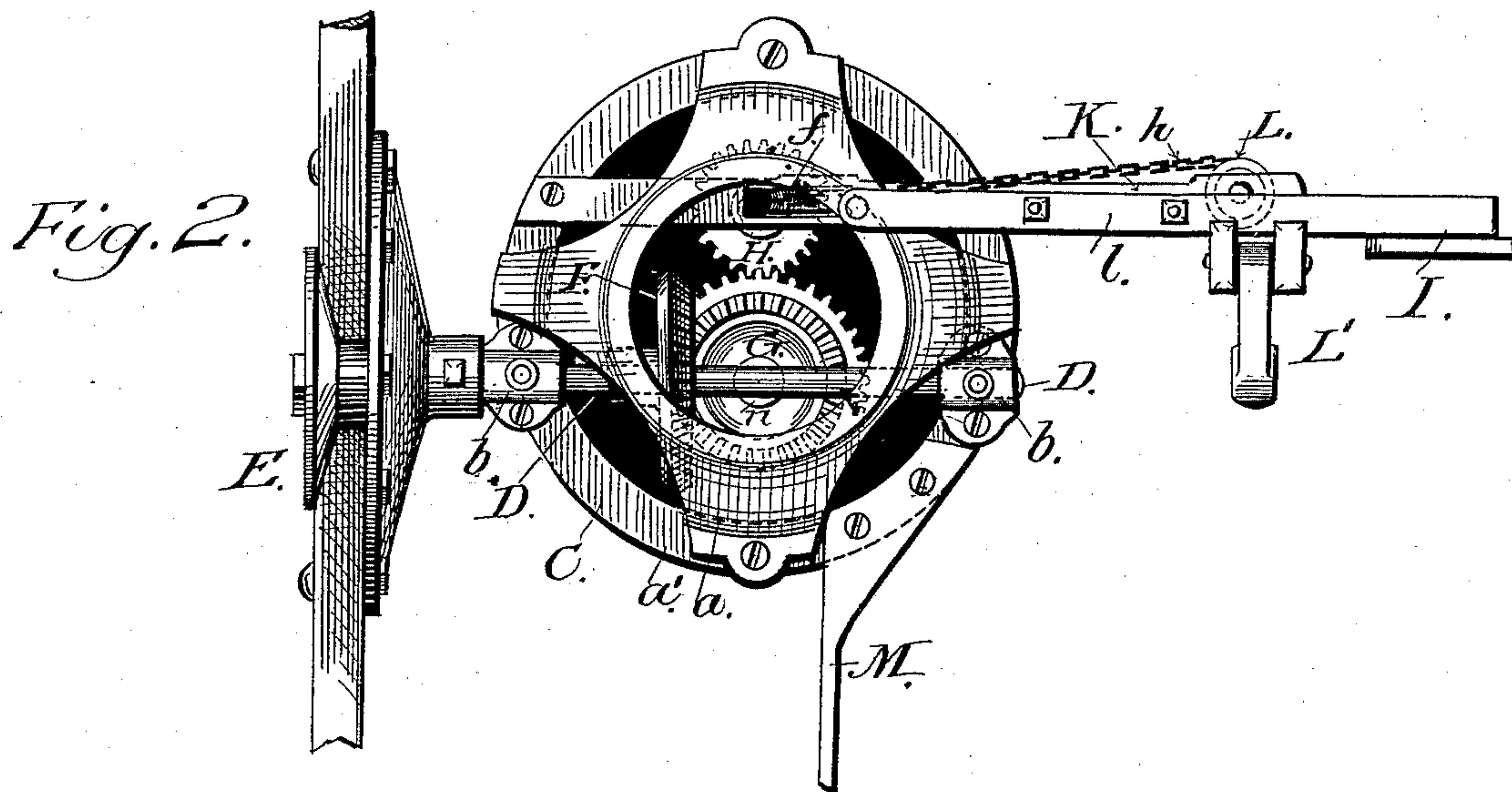
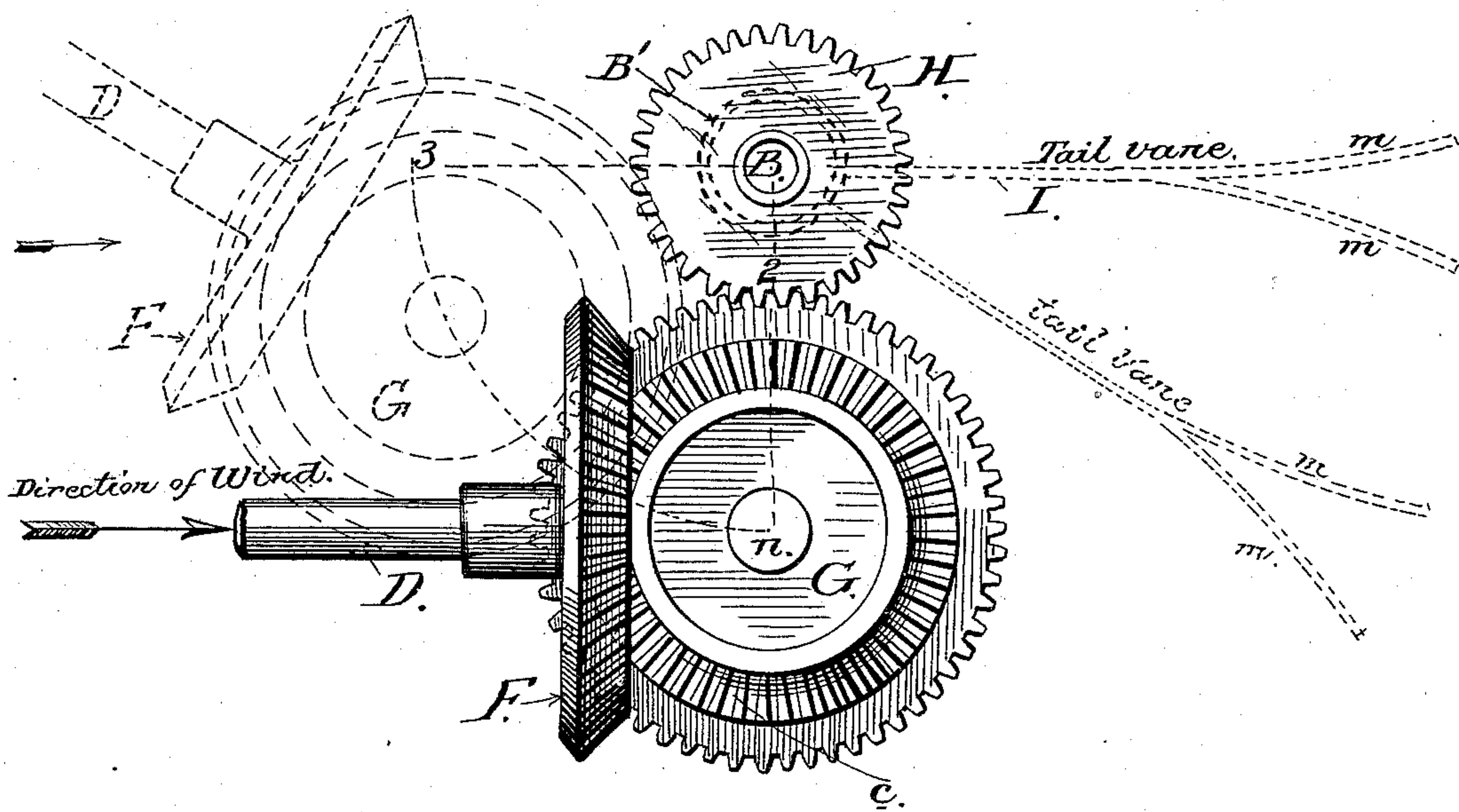


Fig. 3.



WITNESSES.

J. Walter Fowler,
N. H. Patterson

INVENTOR

Geo. P. Thurston,
by A. H. Evans & Co.
Attorney &

UNITED STATES PATENT OFFICE.

GEORGE P. THURSTON, OF SAN FRANCISCO, CALIFORNIA.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 401,867, dated April 23, 1889.

Application filed December 5, 1888. Serial No. 292,736. (No model.)

To all whom it may concern:

Be it known that I, GEORGE P. THURSTON, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Windmills, of which the following is a full and clear description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a side elevation of a windmill embodying my invention. Fig. 2 is a plan view of the same. Fig. 3 is an enlarged plan view of the gears.

My invention relates to that class of inventions known as "power-gearred windmills;" and it consists in the constructions and combination of devices, which I shall hereinafter fully describe and claim.

To enable others skilled in the art to which my invention appertains to make and use the same, I will now describe its construction and indicate the manner in which the same is carried out.

In the said drawings, A represents any suitable form of frame or tower upon which the operative parts of the windmill are mounted, and B is the vertical power-shaft, and B' is the vertical turning-post or hollow shaft through which the power-shaft passes, and which is suitably journaled in bearings supported upon the frame or tower.

To the top of the vertical turning-post is secured a frame, C, which consists of an upper and lower cup-shaped section, *a a'*, which are provided with journal-boxes *b*, in which the horizontal shaft D of the windmill is journaled. The frame C is so placed upon the turning-post B' that the greater portion of it lies to one side of the vertical center of said post, as shown in Fig. 2, and the journal-boxes for the horizontal shaft D are formed upon the said frame C in such positions that the said shaft also is to one side of the vertical turning-post, as shown more particularly in Fig. 2.

The horizontal shaft D carries any well-known form of wheel, E, and on said shaft, just inside of the frame C, is secured a beveled gear-wheel, F, which engages the beveled upper face, *c*, of another gear-wheel, G, which is mounted on a stub-shaft, *n*, projecting up-

wardly from the lower section, *a'*, of the frame C, the said gear-wheel G having also teeth formed around its periphery and forming a spur-wheel, which is designed to engage and impart movement to a similar gear, H, secured to the top of the vertical power-shaft B, whereby the movement of the horizontal shaft is communicated directly to the vertical power-shaft, and from said shaft may be transferred to any desired point.

The gears F, G, and H are so placed with reference to each other and to the wheel and tail-vane I that the windmill always remains in gear whether the wheel is in or out of the wind, and said gearing causes the mill to hold itself into the wind instead of turning out of it. These important results are brought about not so much because of the gears themselves, but rather because of their location, as I will now describe.

The beveled gear-wheel F, as previously described, is mounted on the shaft D, which is located to one side of the vertical turning-post. The double gear-wheel G, which is driven by the gear-wheel F, is mounted on an axis which is in the same vertical plane as the axis of the gear-wheel H, whereby said gear G engages the gear H at its contiguous side portion in contradistinction to its front, as shown more fully in the enlarged detail, Fig. 3.

It will be observed that the tail-vane is secured to the frame C, which rotates with the turning-post, and in its normal position it lies in a plane parallel with the horizontal shaft D. From this description it will be seen that when the wind increases in velocity the tendency of the wheel to "fall off" or "turn out" of the wind is prevented by the resistance offered by the gear-wheel H and the usual gearing at the base of the vertical power-shaft. In other words, as the spur portion of the gear-wheel G engages the gear-wheel H at its side at the point 2, which is at right angles with the horizontal wheel-shaft, it is manifest that to cause the wheel to turn out of the wind the said wheel must move around the axis of the gear H and be thrown far enough around to cause the gear-wheel to traverse that portion of the gear-wheel H indicated between the lines 2 and 3, during all of which movement the tendency to fall off

is being resisted by the usual gearing at the base of the mill. Before the center of motion of the gear G can possibly pass the line 3, which is at right angles to the line 2, the tail-vane which moves with the rotating frame has been moved far enough in the reverse direction to "catch the wind," and thereby bring the wheel back into its normal position in the wind. When the wind-wheel is upon the left side of the vertical central shaft and the gear F is made to engage the beveled portion of the gear G upon the side nearest to the wind-wheel, the wheels turning to the left will cause the spur portion of the wheel G, which engages the wheel H, to act so as to hold the wind-wheel up into the wind, its rotation having a tendency to prevent the wheel from falling off or turning out of the wind. If the rotation of the wind-wheel were to be reversed, the beveled gear F should be placed so as to engage the wheel G upon the opposite side and in the same manner. If the shaft D were to be placed upon the opposite side or right of the vertical shaft B, the rotation of the wheels would have to be reversed, the object in every case being to make the action of the mill in driving the machinery hold the wheel up into the wind, and this is brought about by causing the gears G and H to engage each other at the side portions instead of at the front, as is common with some other wind-wheels, but which is objectionable, because as soon as the wheel moves the gears a distance equal to one tooth the wheel is thrown beyond the center of the vertical turning-post, and the wheel immediately turns out of the wind, unless some pawl-and-ratchet or other holding mechanism is employed to prevent such a result. An arm, K, bolted to the frame C, has its inner end projecting into said frame and provided with a sheave or pulley, *f*, immediately over the vertical shaft B, and the outer end of said arm K carries a horizontally-placed sheave or pulley, L, and around said pulleys or sheaves the usual chain, *h*, passes, and has its upper end secured to the latching-lever L', the lower end of said chain, after passing through the shaft, being connected with a weight, as shown.

The latching-lever L' is fulcrumed in a vertical bar between the upper and lower arms *ll* of the rudder-vane and at such a distance from the hinges that the weight at the base of the mill will act upon the chain and pull the vane around until it stands parallel with the wheel-shaft and until the axes of the gears G H are in a direct line taken transversely through the frame and at right angles with said wheel-shaft.

The tail-vane may be of any well-known construction, but is herein shown as being formed with two wings, *m m*, which project upon either side of the center of the vane, whereby when said vane is thrown to one side by the wheel "falling out" of the wind the wind escaping by the wheel will more quickly strike the outwardly-projecting wing

on that side, and thereby, with the assistance of the weight on the chain, bring the wheel back into the wind.

When it is desired to throw the wheel out of the wind, the weight is removed from the chain or supported so that it does not hang from it. The vane will then swing around, and the latching-lever L' will pass over and engage an arm or catch, M, projecting outwardly from one side of the frame C. To release the latching-lever, the chain is pulled down by adding the weight thereto or otherwise, and the latching-lever lifted out of its engagement and the vane brought around into its normal operative position.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a windmill, the combination, with the horizontal wheel-shaft, the vertical turning-post, and the power-shaft having a gear-wheel at its top, of suitable gearing located to one side of the power-shaft, one of said gears being on the horizontal shaft, while the other gear is mounted on a stub-shaft below the horizontal shaft and in a position where a line drawn through the axes of the vertical and stub shafts will be at right angles with the wheel-shaft, substantially as herein described.

2. In a windmill, the vertical turning-post, a power-shaft having a gear at its top, a wind-wheel having its shaft journaled to one side of said post, a gear on said wheel-shaft, and a double-faced gear journaled on a vertical stub-shaft whose axis is in line with the power-shaft, said double gear having one of its faces engaged by the gear on the wheel-shaft, while its other or spur-face engages the gear on the power-shaft at its side portion, whereby, when the wind-wheel falls out of the wind, the double gear traverses that portion of the gear between its side and front portion, substantially as and for the purpose described.

3. In a windmill, a wheel-shaft with a wind-wheel and gear-wheel thereon, a tail-vane, a vertical power-shaft having a gear-wheel at its top, and a double-face gear on a stub-shaft at one side of said power-shaft, said double gear being engaged by the gears on the wheel-shaft and power-shaft and being adapted to move around the circumference of the gear on the power-shaft a distance approximating one-quarter thereof, whereby the windmill is held into the wind, substantially as herein described.

4. In a windmill, the combination of a vertical power-shaft having a gear-wheel at its top, a horizontal wheel-shaft at one side of said power-shaft and carrying a wheel and beveled gear, a gear-wheel intermediate the gears on the power-shaft and horizontal shaft and traversing the gear on the power-shaft, a frame movable with the turning-post, in which the gears and shaft are mounted, said frame having a turning-post located at one side of

its center, and a tail-vane, substantially as described.

5 5. In a windmill, the vertical turning-post, the two-part frame, with its journal-boxes, a
10 wind-wheel having its horizontal shaft journaled in said boxes at one side of the center of the turning-post and having a beveled gear-wheel keyed to it, a vertical power-shaft
15 journaled to turn within the post and having a spur-gear keyed to its upper end, in combination with an independent loosely-turning gear or idler at one side of the vertical power-shaft, one part of said gear having spur-teeth to engage with the gear upon the vertical
20 power-shaft and the other beveled teeth to engage with the gear upon the wind-wheel shaft, said idler being journaled in a plane passing vertically through the axis of the wind-wheel shaft and to one side of and at right angles to the vertical power-shaft, substantially as herein described.

6. In a windmill, a two-part frame having a turning-post, a vertical power-shaft extending through said post at one side of the center, with a spur-gear wheel secured to the upper end of said power-shaft, a horizontal wind-wheel shaft journaled in boxes upon the frame at one side of the vertical power-shaft and having a beveled gear-wheel secured to it, a loosely-turning independent gear or idler having beveled and spur teeth to engage, respectively, with the beveled gear of the wind-wheel shaft and the spur-gear of the vertical power-shaft, in combination with the tail-vane loosely hinged to a turning-post, and a chain or cord attached thereto passing over guide-pulleys and down through the central vertical hollow shaft, substantially as described.

GEORGE P. THURSTON.

Witnesses:

LINCOLN SONNTAG,
FRED W. PITTS.