



T. B. GRAY & J. D. KNOX.  
Windmills.

No. 196,524.

Patented Oct. 30, 1877.

FIG. 3.

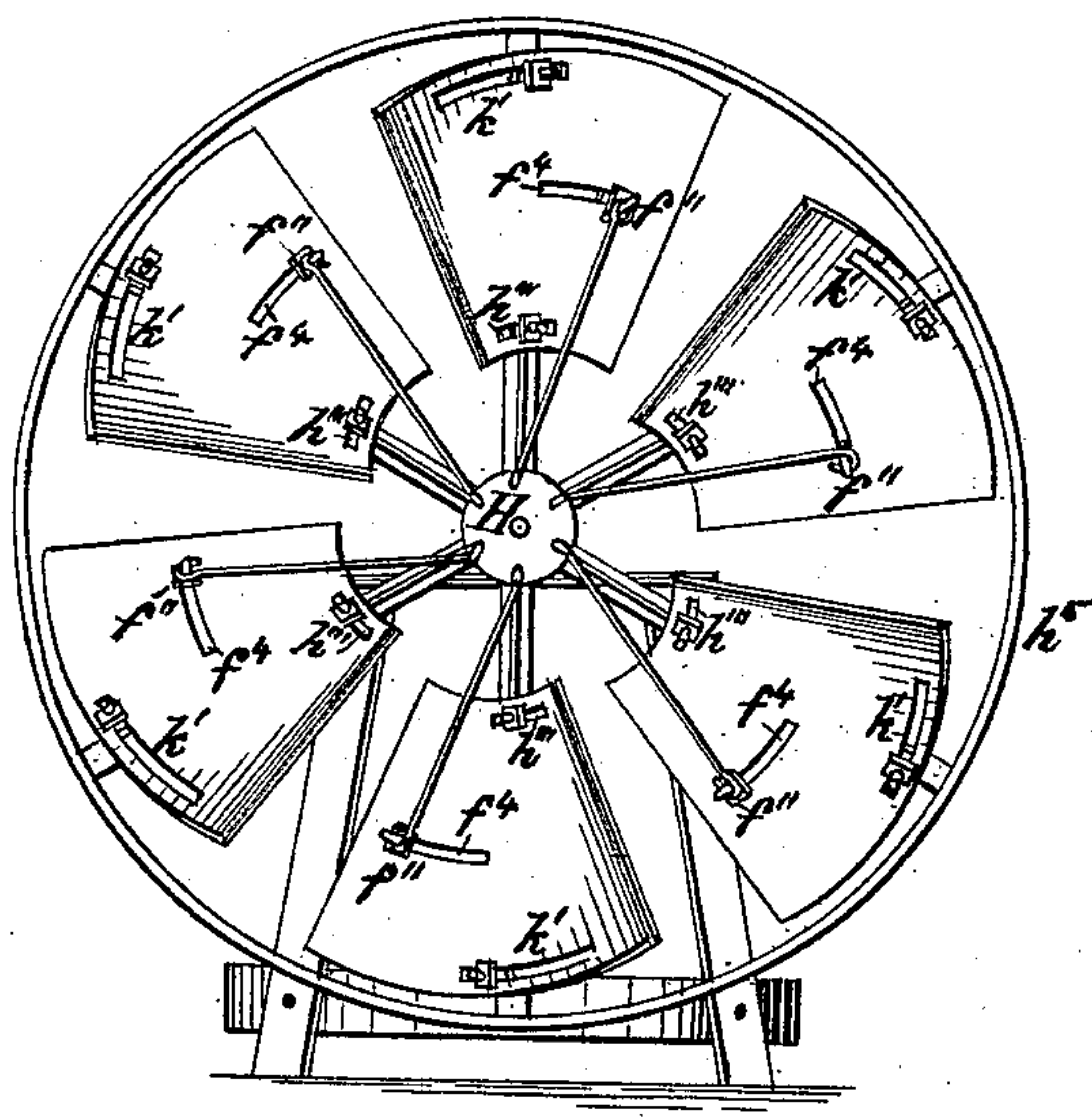


FIG. 4.

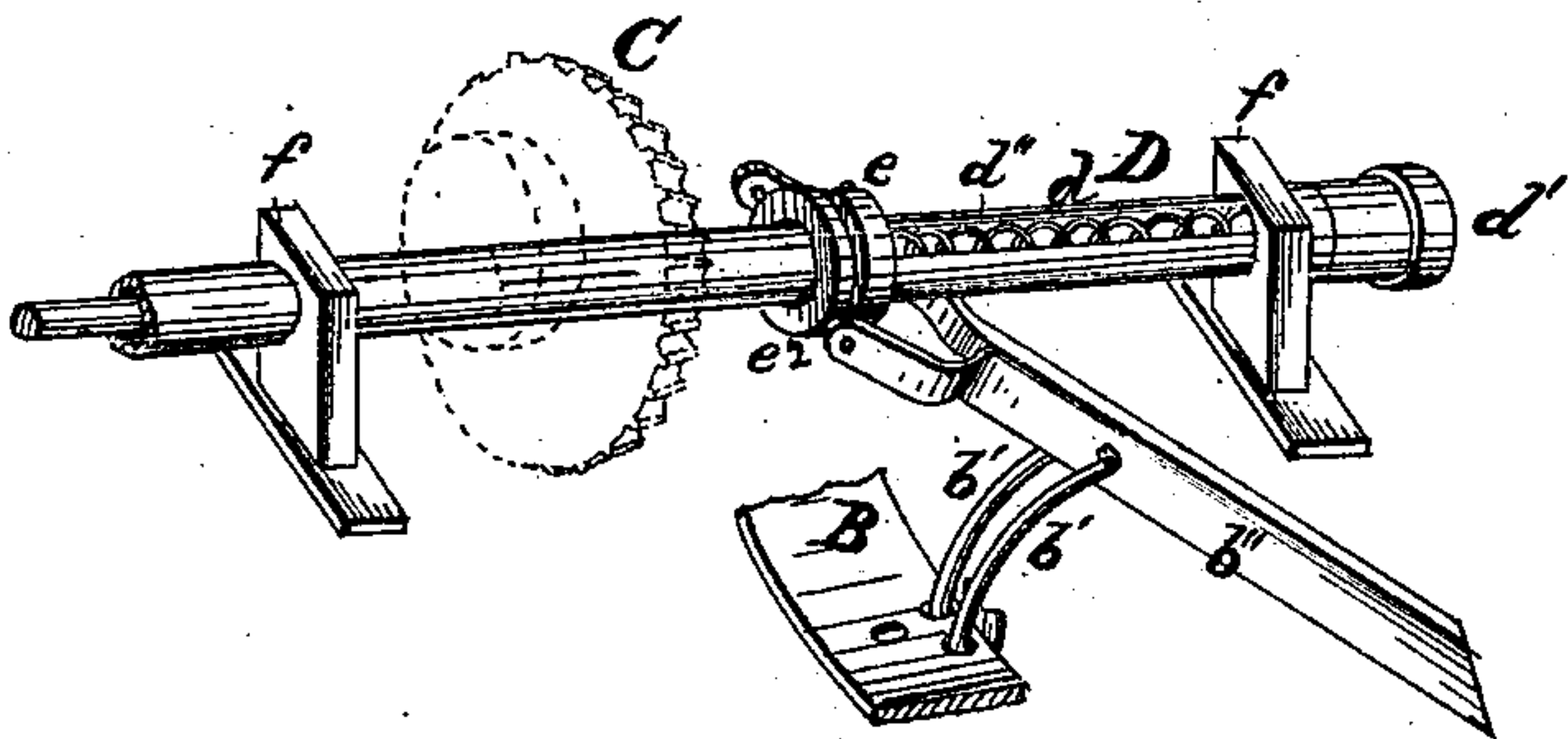
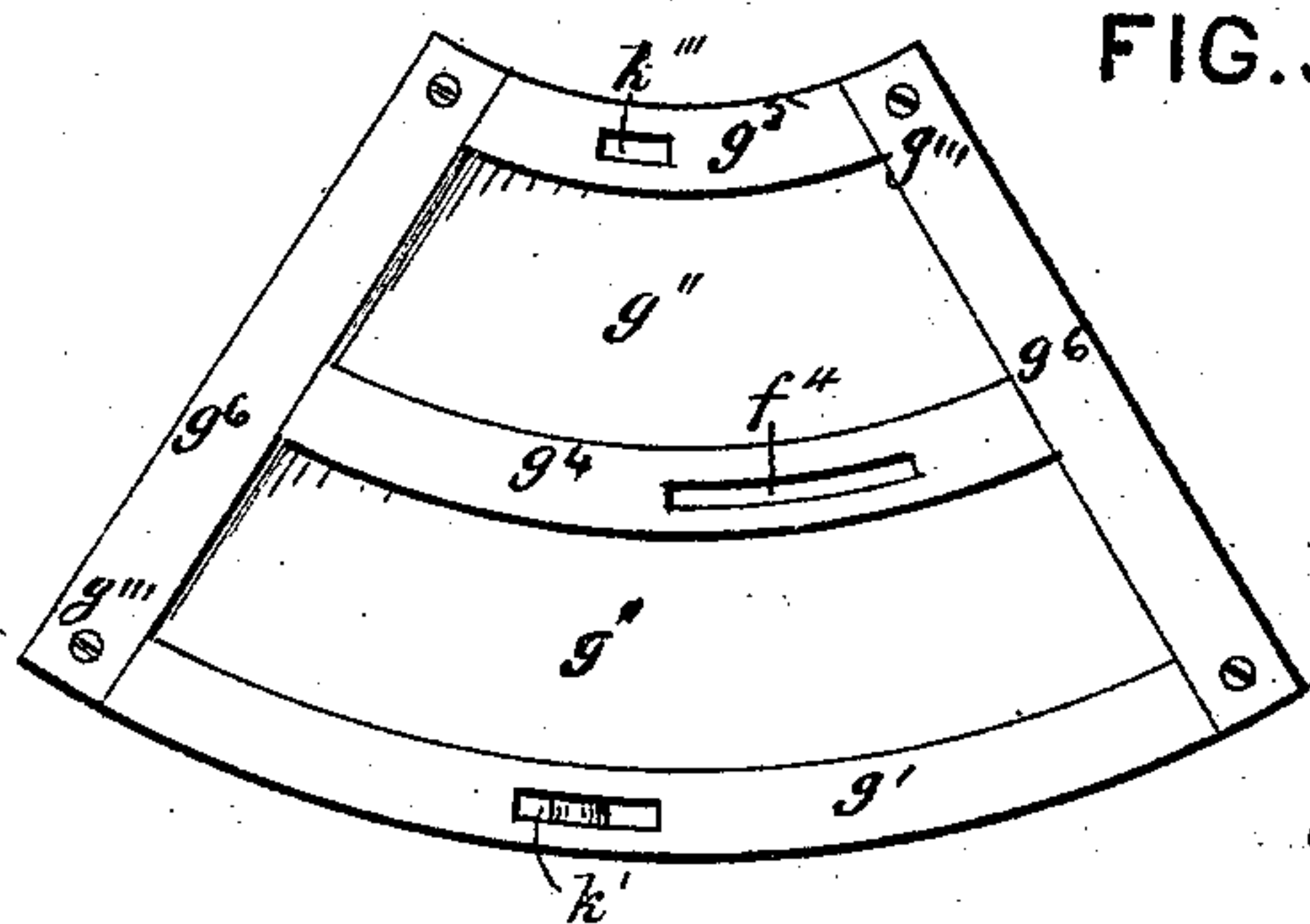


FIG. 5.



WITNESSES

*Saml R. Turner*  
*R. H. Lacey*

INVENTORS.

*Thomas B. Gray*  
*John D. Knox*  
By *R. S. Lacey*  
ATTORNEYS



# UNITED STATES PATENT OFFICE.

THOMAS B. GRAY AND JOHN D. KNOX, OF TOPEKA, KANSAS.

## IMPROVEMENT IN WINDMILLS.

Specification forming part of Letters Patent No. **196,524**, dated October 30, 1877; application filed August 18, 1877.

*To all whom it may concern:*

Be it known that we, THOMAS B. GRAY and JOHN D. KNOX, of Topeka, in the county of Shawnee and State of Kansas, have invented certain new and useful Improvements in Wind-Wheels; and we do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

Our invention consists in constructing the shaft of the wheel in two parts, one of which is hollow, the other solid and sliding in the hollow part, and in combining with this double shaft the mechanism for operating the fans; and it consists, further, in the particular constructions of the fans, and in the mode of regulating the movements of the wheel, and in other improvements, all of which will be hereinafter fully set forth.

In the drawings, Figure 1 is a side view. Fig. 2 is a vertical longitudinal section; Fig. 3, a front view; and Figs. 4 and 5 are detail views of the wheel.

A is the tower, on which is mounted the turn-table A', composed of the fixed plate *a* and revolving plate *a'*. The plate *a'* is held to the fixed plate *a*, with capability of revolving freely thereon, by the lips or flanges *a''*, turned down and under the outer edge, as shown.

Affixed to the revolving plate *a'* are the bearings *f*, in which the wheel-shaft revolves, and a cross-bar, B, bent downward in the middle, and adapted to provide a suitable support and bearing for the vertical shaft, which connects the wheel with the machinery below. The bar B is rendered firmer in position by the brace *b'''*, arranged as shown.

D is the main shaft, which carries the fan and necessary mechanism for communicating motion to the machinery below. It is made hollow, as shown, and has formed through its rear end a longitudinal slot, *d*, through which is passed a pin, *e'*, which passes through the collar *e* and the rear end of the inner shaft F, hereinafter described. It is provided with a cap, *d'*, which holds the coiled spring *d''* se-

curely in its place in the shaft. It has formed on it a hub, I, having suitable flanges or projections *h<sup>4</sup>*, to which are secured the arms which support the fans, and it has a collar or flange, H, on its front end, to which are secured braces for holding the fan-arms.

F is the sliding shaft, the rear end of which enters the shaft D, and has secured to it, by the pin *e'*, the collar *e*, placed around the outside of the main shaft D. The coil-spring *d''* bears against its end, and holds it pressed outward, with pin *e'*, against the outer end of the slot *d*, as shown in Fig. 4. On its front or outer end is placed a collar or flange, *g*, to which are affixed actuating-rods *f'*, which connect with the fans G. It may be moved to the rear in the shaft D by a forked lever, *b'''*, having its fulcrum on a rod, *b'*, attached to the bar B, and having its forked end pivoted to a movable collar, *e<sup>2</sup>*, placed on the shaft D, and bearing against the collar *e*.

The fans G are supported by a frame composed of the arms *h'* and braces *i*, having their inner ends fixed to the flanges *h<sup>4</sup>* of the hub I, and having their outer ends secured by the circular rim D', which prevents the arms from being strained or bent sidewise out of position. *h* are short braces connected with the collar H and the arms *h'* below the line of the inner ends of the fans G.

The arms *h'* are provided with suitable staples or hooks, to which are hinged the movable bearings or hinges of the fans.

G are the fans. They are largest at their outer ends, and in the aggregate of their surfaces which are exposed to the wind they cover about seven-eighths of the area of the circumference of the wheel. Each fan is formed with the slots *k' f<sup>4</sup> h'''*, arranged as shown, in which are placed bearings or hinges *k f''' h''*.

The bearings *k f''' h''* are so constructed that they may be moved back and forth, and be fixed stationary at any desired point in their respective slots.

The bearings or hinges *k h''* are arranged on the rear side of and attached to the hooks or staples on the arms *h'*, so that they permit the free turning of the fan to and from the wind.

The bearings *f'''* are placed on the front side of the fan, and have attached thereto, by



a loose coupling, the rear ends of the actuating-rods  $f'$ .

In Fig. 5 is shown the preferable construction of the fan G, on an enlarged scale. The reduced scale on which the other figures were made rendered it impracticable to show therein this preferable construction of fan.

The fan is constructed of a substantial frame, composed of the side bars  $g^5$  and the curved cross-bars  $g^1 g^4 g^5$ , in which are formed the slots  $k' f^4 h'''$ , as shown. The edges of the bars composing the frame are suitably grooved, and adapted to receive the panels  $g''$ , which are, by preference, made of lighter material than the bars of the frame. The panels  $g''$  may be readily removed for any desired purpose by first taking off one of the end bars  $g^5$ .

In a fan thus constructed is embodied great strength and breadth of surface, without great weight, which are very desirable properties in wind-wheels.

One or both of the panels  $g''$  may be removed, if desired, to reduce the wind-face of the fan.

E are vanes, which are pivoted to the revolving plate  $a'$  of the turn-table A'. They are composed of the arms E' and sails  $e'''$ . The arms E' are pivoted to the plate  $a'$  on opposite sides of the rear end of the main shaft D, and cross each other, as shown, and are connected by a spring,  $e^4$ , placed between the point at which they cross each other and their pivoted ends. The spring  $e^4$  will hold the sails a considerable distance apart, and at an angle to the course of the wind, when the latter is not strong, and will permit them to approach each other when the wind is blowing with greater force.

By this construction and arrangement the wheel will be held steadily to the wind, whether the latter be blowing gently or with greater force, and thereby prevent that swaying of the wheel so common where a single vane is employed.

The fans may be moved to and from the wind, and locked in position by the lever  $b'''$ , acting on the collar  $e''$  and collar  $e$  on the end of the inner shaft F.

The fans G may be set at different angles to the wind by moving the bearings or hinges  $f''' h'' k$  in the proper direction in the slots  $f^4 h''' k'$ . When the wind is blowing with great force the fans will be turned edgewise, and will draw upon the rods  $f'$ , which will force back the shaft F. When the wind lessens its force the

spring  $d''$  will push the shaft F forward, and thus draw the fans to the wind again.

Having described our invention, what we claim, and desire to secure by Letters Patent, is—

1. A fan, G, constructed with the slots  $f^4 h''' k'$ , and provided with the movable bearings or hinges  $f''' h'' k$ , and adapted to be supported on spokes or arms of the wind-wheel, substantially as and for the purpose set forth.

2. In a wind-wheel, the fan G, composed of the bars  $g^1 g^4 g^5 g^6$ , grooved on their inner edges, and constructed with the slots  $k' f^4 h'''$  for the reception of adjustable hinges and panels  $g''$ , substantially as set forth.

3. The combination of the hollow main shaft D, constructed with a slot,  $d$ , and provided with a suitable hub, I, adapted to carry the fan-frame, shaft F, having pin  $e'$ , and spring  $d''$ , substantially as set forth.

4. The combination, with the hollow shaft D, constructed with slot  $d$ , sliding shaft F, having cross-pin  $e'$ , and collar  $e$ , arranged as shown, of the spring  $d''$ , collar  $e^2$ , and pivoted lever  $b'''$ , substantially as and for the purposes set forth.

5. The turn-table A', composed of the fixed plate  $a$ , revolving plate  $a'$ , having lips or flanges  $a''$ , bar B, brace  $b''$ , and bearings  $f f'$ , substantially as set forth.

6. The combination, with the fan-arms  $h'$  and braces  $i$  and  $h$ , arranged and supported on the main shaft D, as described, of the rim  $h^5$ , secured on the outer ends of the fan-arms, and outside of the outer ends of the fans G, for the purpose specified.

7. The combination, with the fans G, hinged to the arms  $h'$ , and actuating-rods  $f'$ , of the shaft F, having pin  $e'$ , hollow main shaft D, and spring  $d''$ , substantially as and for the purposes set forth.

8. The combination, with the wind-wheel D', of the vanes E, pivoted to the turn-table A', and crossed in rear of the shaft D, and provided with a spring,  $e^4$ , substantially as set forth.

In testimony that we claim the foregoing as our own we affix our signatures in presence of two witnesses.

THOMAS B. GRAY.  
JOHN D. KNOX.

Witnesses:

H. C. PATTERSON,  
WESLEY L. KNOX.