(No Model.) 4 Sheets—Sheet 1.

W. G. TRAFTON.

WINDMILL.

No. 559,876. Patented May 12, 1896.

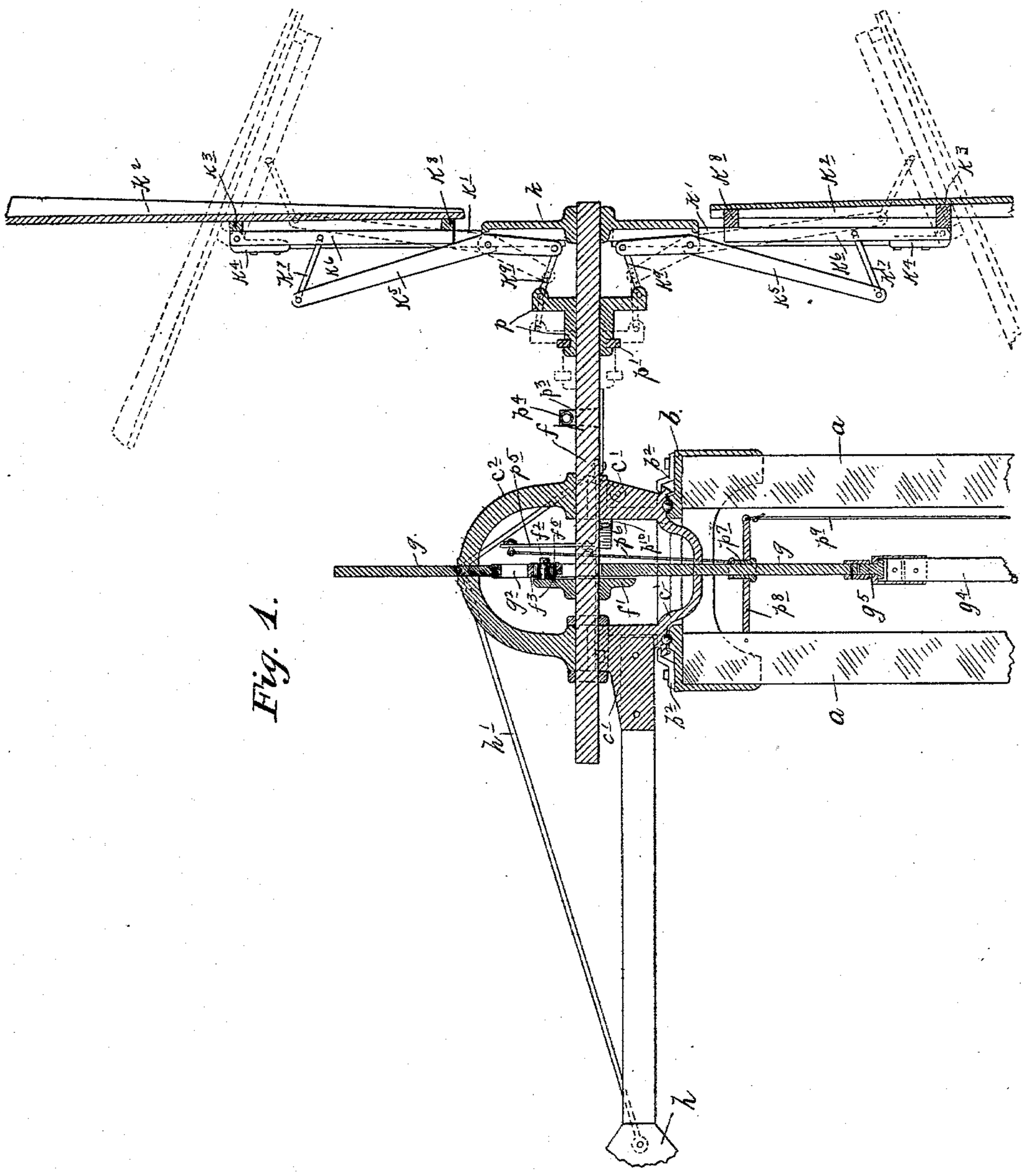

Fig. 1.

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WINDMILL.

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Fig. 2.

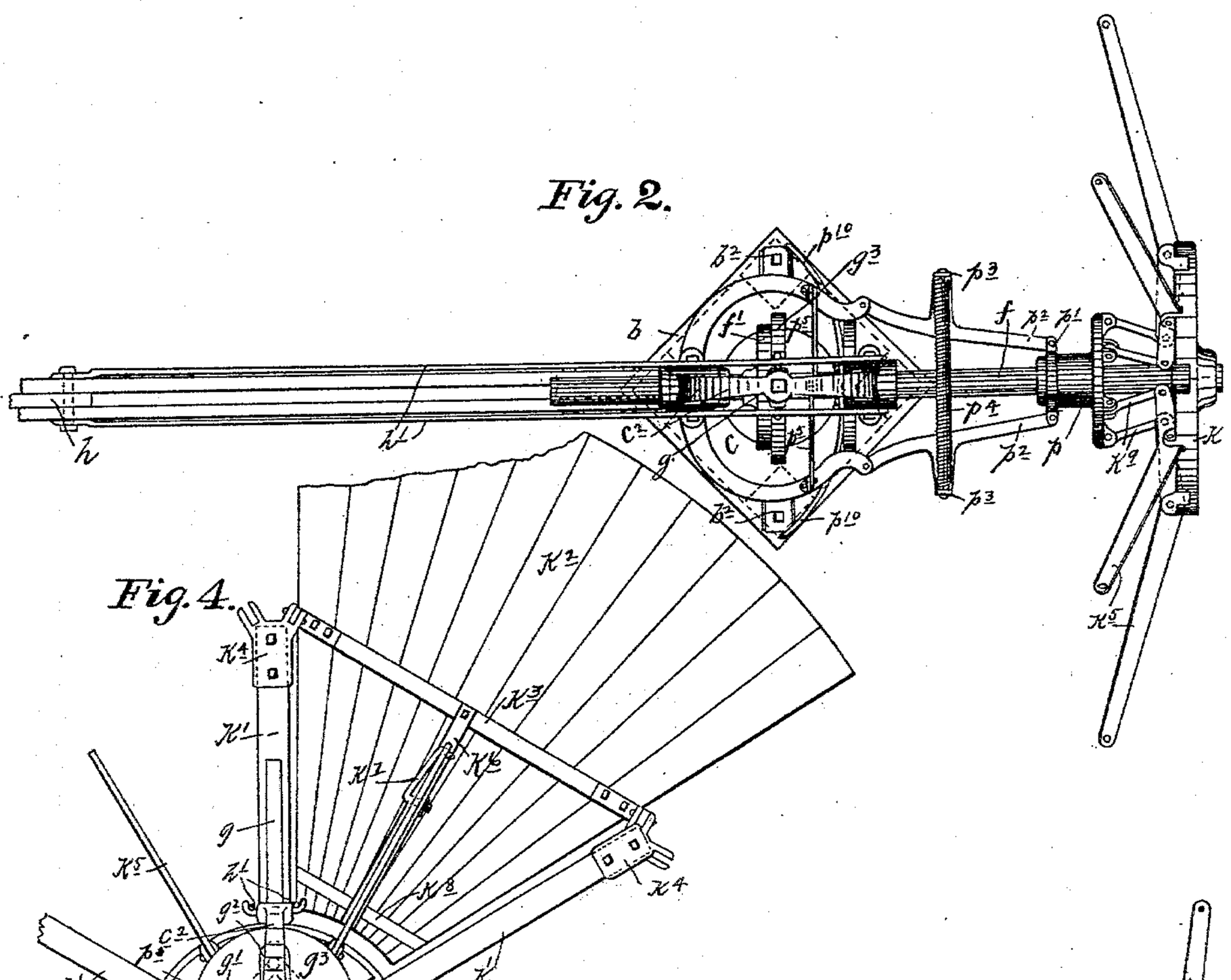

Fig. 4.

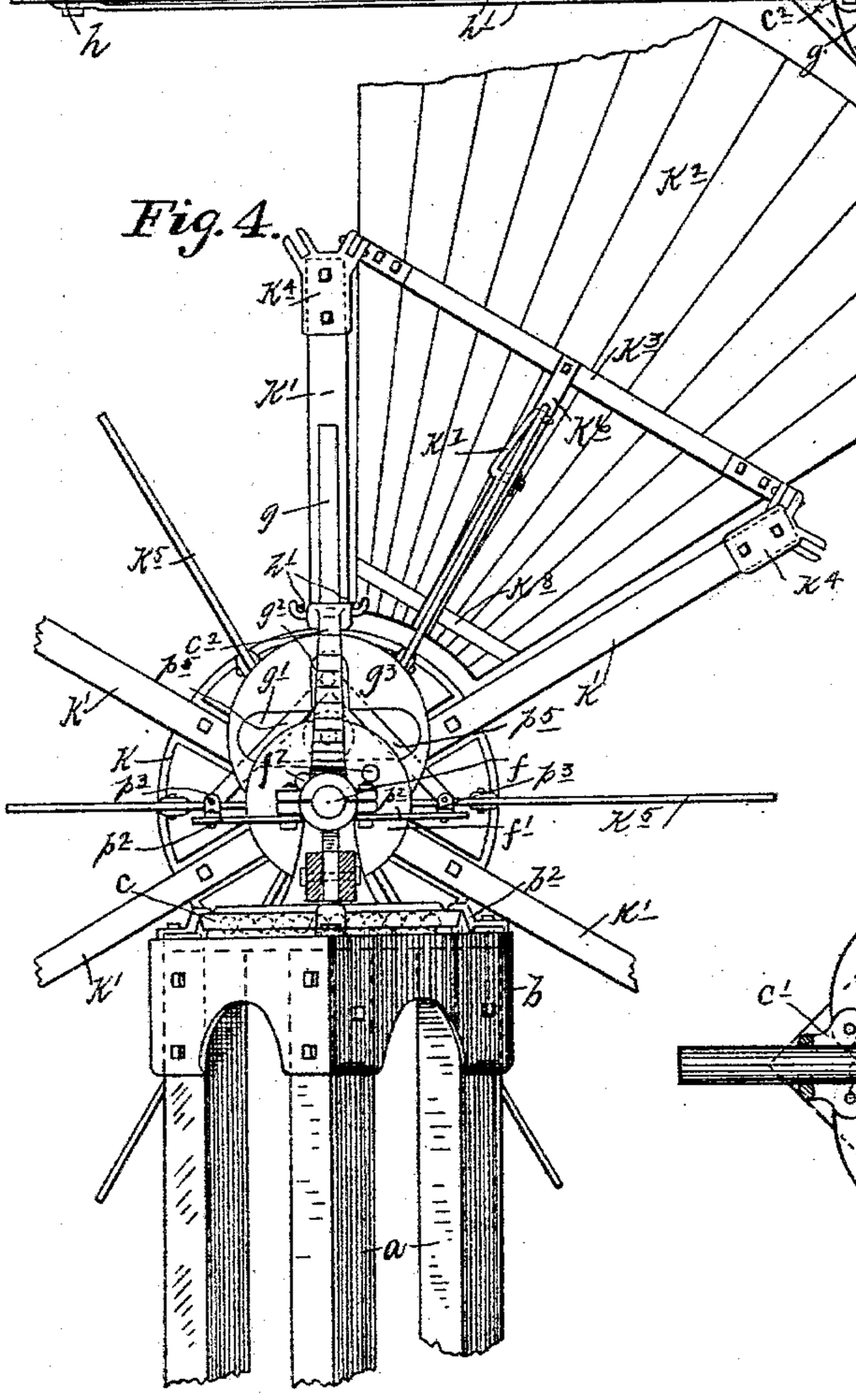

Fig. 3.

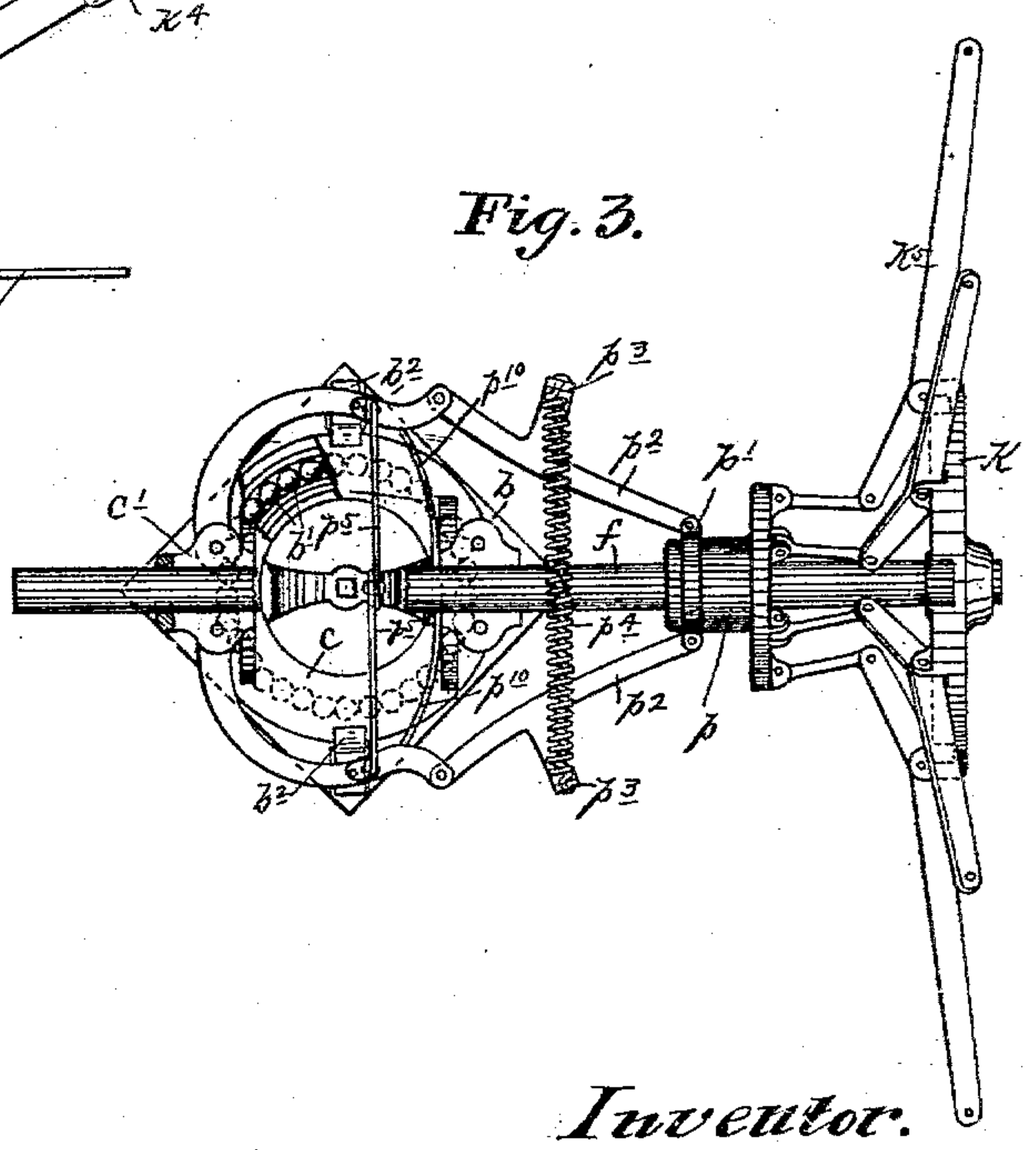

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Fig. 5.

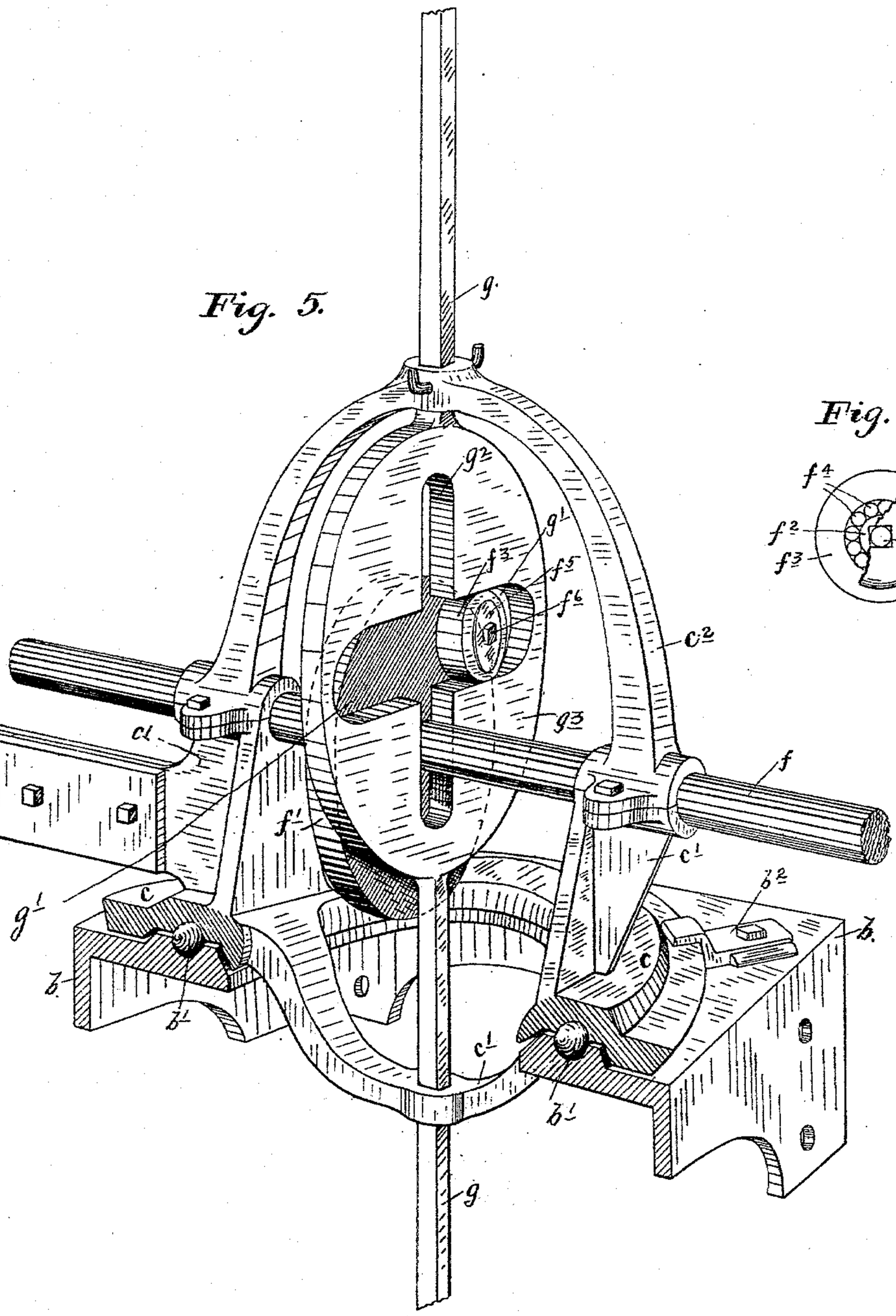

Fig. 6.

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(No Model.) 4 Sheets—Sheet 4.

W. G. TRAFTON.

WINDMILL.

No. 559,876. Patented May 12, 1896.

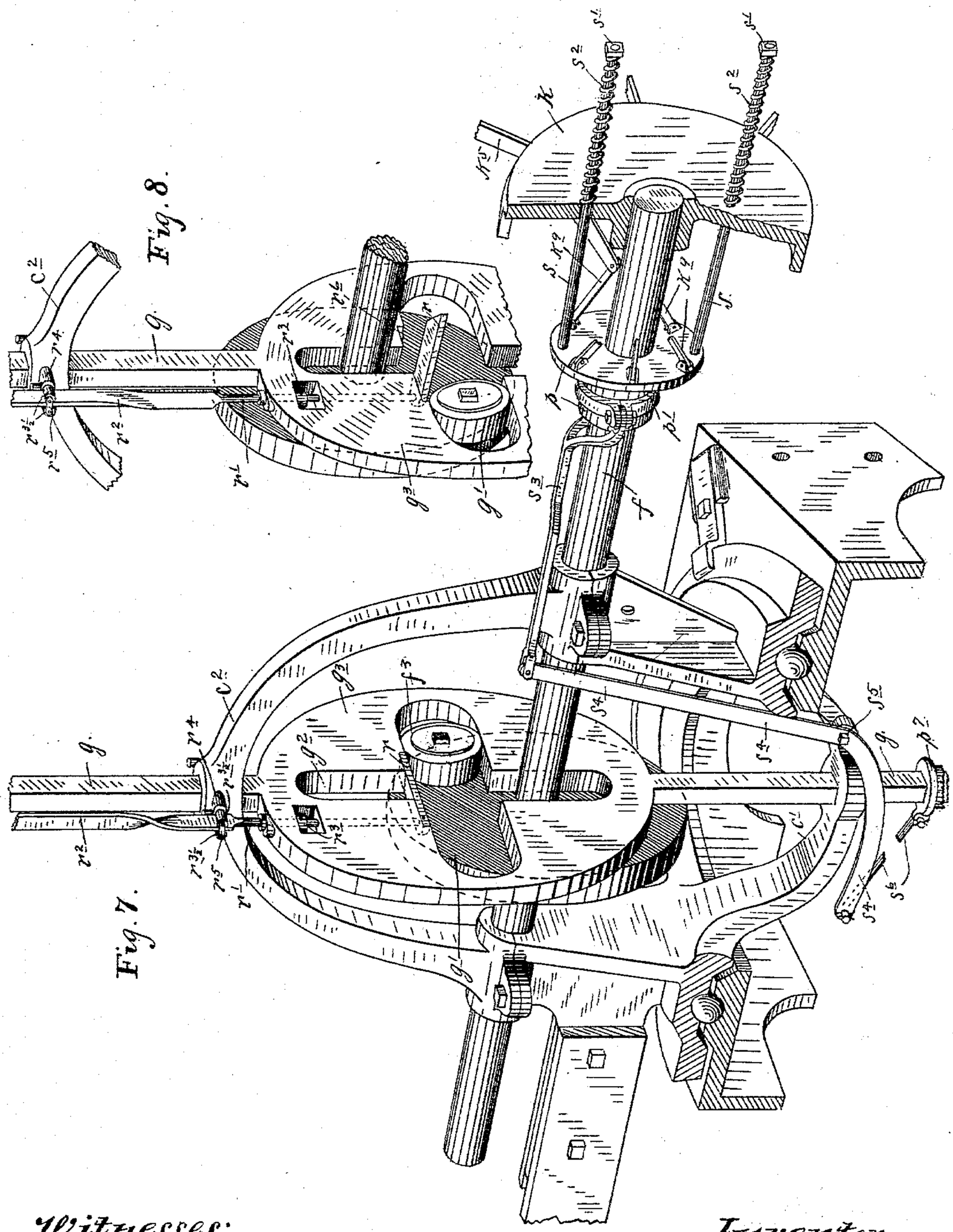

Fig. 8.

Fig. 7.

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UNITED STATES PATENT OFFICE.

WILLIAM G. TRAFTON, OF FAIRFAX, MINNESOTA, ASSIGNOR OF TWO-THIRDS TO LUTHER NICHOLS AND ALBERT L. HORNBURG, OF SAME PLACE.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 559,876, dated May 12, 1896.

Application filed March 30, 1895. Serial No. 543,808. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM G. TRAFTON, a citizen of the United States, residing at Fairfax, in the county of Renville and State of Minnesota, 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.

My invention relates to windmills, and has for its object to provide an improved mechanism for imparting motion to the plunger from the mill-shaft and to provide an improved form of governor for the wings.

To these ends my invention consists in the novel features of construction hereinafter described, and defined in the claim.

The accompanying drawings illustrate my invention, wherein, like letters referring to like parts throughout the several views—

Figure 1 is a sectional elevation of my improved mill with some parts broken away. Fig. 2 is a plan view of the same with some parts removed and others broken away. Fig. 3 is a view similar to Fig. 2 with additional parts removed and others broken away and with the governor parts in an opposite extreme position. Fig. 4 is a rear elevation of the mill with some parts broken away and others shown in section, and Fig. 5 is an enlarged detail in perspective and partly in section for showing the mounting of the mill-shaft and plunger and the means for imparting motion from the shaft to the plunger. Fig. 6 is a detail in plan view, showing the crank-pin and roller and its bearings; and Figs. 7 and 8 are perspective views with some parts broken away and some parts in section, illustrating a modification in the governor and an additional device for coöperation with the crank-pin and plunger.

a represents the tower-legs, which have secured to the upper ends thereof the base-casting *b*. On the said base-casting *b* is mounted the combined turn-table and bearing-yoke *c c' c²*, with roller-bearings *b'* interposed between the base and the turn-table castings and working in a suitable circular groove or runway, formed one-half in each of the said castings. Keepers b^2 engage the outer flange of the turn-table *c* and are bolted to the base-casting *b* for securing the turn-table and mill in working position on the tower. The bearing-yoke for the mill-shaft *f* and the plunger *g* is formed in the two sections *c' c²*, which when bolted together form an elliptical yoke with its longitudinal axis in the line of the plunger-axis and its transverse axis in the line of the axis of the mill-shaft. The two half-sections of the yoke are provided with half-boxes at their meeting points, which when bolted together form the bearings for the mill-shaft *f*. The plunger *g* works through the upper and lower arches of the bearing-yoke and is provided with a transverse slot or camway *g'* and with an axial slot g^2, which slots *g'* and g^2 are at right angles to each other and open into or cross each other, as best shown in Fig. 5. As shown, the said slots *g'* and g^2 are formed in an enlarged or expanded portion g^3 of the plunger in the shape of a disk; but it will be understood that the said slots *g'* and g^2 might be otherwise formed as long as they bear the relation to each other above noted. The mill-shaft *f* is shown as provided with a crank-disk *f'* alongside of the plunger-disk g^3, which crank-disk *f'* is provided with a lateral projection $f^2 f^3$, which works in the transverse slot or camway *g'* of the plunger-disk g^3 for imparting motion thereto. The said lateral projection of the crank-disk *f'* is composed of the pin proper, f^2, and a roller f^3, with ball-bearings f^4 between the roller and the pin proper, and a washer f^5, held in place by a cap-screw f^6, all as shown in Fig. 6. With this construction it is obvious that the rotary motion of the mill-shaft *f* will be converted into a reciprocating motion on the plunger *g*. Inasmuch as the shaft *f* passes through the axial slot g^2 of the plunger the said slot g^2 will permit the motion of the plunger without interference from the shaft, and at the same time the shaft may be made to coöperate with the plunger-passages in the bearing-yoke as a guide to insure the axial motion of the plunger. The axial slot g^2 is of less width than the transverse cam-slot *g'*, and hence the pin-roller f^3 will freely pass the axial slot without dropping into the same under the action

of the crank-disk f'. A crank-arm might be substituted for the crank-disk f'; but the disk is preferable, because it will coöperate with the plunger-disk g^3 to prevent the turning of the plunger. For the same purpose the plunger-stems are of angular form in cross-section and work through passages in the yoke, which are of corresponding shape.

A tail-board h, of the ordinary or any suitable form, is made fast to the lower section c' of the bearing-yoke c' c^2 and is upheld at its outer end by suitable truss-rods h', passing over the top of the bearing-yoke c' c^2 and secured to the wind side of the same. The wheel-head k, with its radial arms k' fixed thereto, is of the ordinary construction. The wings k^2 have cross-bars k^3 pivoted to lugs k^4 on the ends of adjacent members of said arms k', and may be rocked on their pivots lengthwise of the shaft f by means of bell-crank levers k^5, having their angles or elbows pivoted to the head k and their outer ends connected to radial pieces k^6 of the wings by means of links k^7. The radial pieces k^6 connect the cross-bars k^3 and lower end cross-bars k^8 of said wings k^2.

On the shaft f is mounted a governor-sleeve p, to which the lower arms of the bell-crank levers k^5 are connected by links k^9. The sleeve p is embraced by a collar p', to which are attached the outer ends of a pair of toggle-levers p^2. The inner ends of said toggle-levers p^2 are pivoted to the tail-board side of the bearing-yoke c' c^2, as best shown in Fig. 3. The outer arms of the toggle-levers p^2 are provided with angular lugs p^3, which are connected by a tension-spring p^4, which tends to pull the said toggle-levers p^2 together or to spread the same lengthwise of the mill-shaft and force the sleeve p outward, and through the bell-cranks k^5 and their connections k^7 k^9 to throw the wings k^2 into the wind; but when the pressure from the wind becomes excessive or sufficient to overcome the tension of the spring the wings will be rocked on their pivots, so as to assume positions more nearly in line with the mill-shaft and expose less surface to the action of the wind, or, otherwise stated, the said wings will be moved more or less out of the wind or into the wind, as may be required for the safety or proper action of the wheel. The toggle-levers p^2 are also connected by a cross-toggle p^5, as shown best in Figs. 3 and 4, which toggle p^5 has attached thereto a connection p^6, united at its lower end to a sleeve p^7, mounted on the under section of the plunger-rod g. The sleeve p^7 is shouldered at its lower end and works through a pivoted lever p^8, which has attached to its free end a pull-rope or other connection p^9, extending to within reach of an operator on the ground. By the said connections, controllable from the pull-rope p^9, the governor-toggles p^2 may be spread against the tension of the spring p^4 for throwing the wings into an idle or inoperative position approximately parallel with the mill-shaft, as shown in dotted lines in Fig. 1. For holding the wings out of action, as just described, it is necessary of course to pull down the connection p^9 and make the same fast at its lower end in any suitable way. The plunger g g^3, so far considered, is shown as connected to the lower plunger section or bar g^4 by a swivel-head g^5 in the usual way.

From the foregoing description it must be obvious that my improved mill is of extremely simple construction, that the wings are under the control of an automatic governor, which has but few parts and is reliable in its action, and that the motion from the mill-shaft is imparted to the plunger by a converting device, which insures the true axial movement of the plunger and with the minimum of friction. A rest p^{10} underlies the governor-toggles p^2 and serves to prevent the same from being sprung transversely of their axes under the action of the cross-toggle p^5 and the hand connections therefrom.

The crank-disk f' has pin holes or seats f^7 at different radial distances from the center of the shaft f, as shown in Fig. 4, for permitting the crank-pin to be set to give any desired throw on the plunger g.

Referring now to the modifications shown in Figs. 7 and 8, one of the principal features of addition is in the nature of a bridge r for assisting the crank-pin roller f^3 to pass the upper section of the longitudinal slot g^2 in the plunger. The said bridge r is carried on the lower end of a rod r' r^2, which is mounted in the plunger-disk g^3, as shown in Figs. 7 and 8, and is held to reciprocate therewith by pin-collars r^3. The said rod has its upper section r^2 flattened out and twisted on itself to form a spiral cam, which is engaged by a pair of rollers $r^{3½}$, mounted on studs r^4, fixed to the upper yoke-section c^2 and having their outer ends connected by a keeper r^5. The bridge r works in a seat r^6, cut out from the body of the plunger-disk g^3. In virtue of this construction the bridge r will be held in position to span the upper section of the slot g^2, as shown in Fig. 7, under the coöperation of the bar-section r^2 and the rollers $r^{3½}$ at the time when the roller f^3 on the crank-pin passes the slot g^2. Hence the said crank-pin roller will have a continuous bearing-surface on the plunger-disk when crossing the the said slot g^2. This prevents the plunger from dropping on the crank-pin roller when the roller is in line with the said slot g^2, and thereby insures a smooth and even action of the device for converting the rotary motion of the shaft f and the crank-disk f' into a reciprocating motion on the plunger g g^3. On the downstroke of the plunger the parts will assume the positions shown in Fig. 8, and the bridge will be thrown into its open position under the coöperation of the parts r^2 and $r^{3½}$, thereby permitting the shaft to enter the upper section of the slot g^2, as is required to permit the downstroke of the said plunger. Such a bridge is not required for the lower

section of the slot g^2, because the weight of the plunger g g^3 and its load is always carried on the upper wall of the slot g' and the upper surface of the crank-pin roller f^3, and hence there is no tendency of the roller f^3 to enter the lower section of the slot g^2.

The other feature illustrated in Figs. 7 and 8, so far as different from the other views, relates to the governor. Instead of the toggle-levers and the centrifugal spring I fix to the lug-disk of the sleeve p a set of rods s, which extend parallel with the mill-shaft f outward through the wheel-head k, and between the outer end heads or nuts s' of said rods s and the outer face of the wheel-head k are mounted springs s^2, which tend to pull the sleeve p outward and through the lever connections k^5 k^7 k^9 to throw the wings k^2 into the wind. To the collar p' on the sleeve p is fixed the outer ends of a forked link or bar s^3. The inner end of the bar s^3 is pivotally connected to the upper end of a bell-crank lever s^4. This bell-crank lever s^4 is pivoted at its elbow to the lower section c' of the bearing-yoke, as shown at s^5, and the lower arm of the said bell-crank s^4 is pivotally connected by link s^6 to the sleeve p^7 on the lower parts of the plunger g, which is subject to the lever p^8 and the hand connections p^9, as shown in the other views. It is obvious that this form of governor will act in the same way as the other, while at the same time it is of a cheaper and more durable construction.

It may be added that the construction shown in Figs. 7 and 8 is the preferred form of my device as developed from actual working experience with the machine.

It will of course be understood that minor changes might be made without departing from the spirit of my invention.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

In a windmill, the combination with a plunger having transverse and axial slots, crossing each other, of a rotary shaft passing through said axial slot, a crank arm or disk on said shaft, having a lateral projection working in said transverse slot, the pivoted bridge-lever for opening and closing the entrance to the upper section of said axial slot, the torsion-rod, carried by said plunger, secured to said bridge-lever, and having its flattened stem portion twisted to form a torsional cam, and a fixed guide through which said torsional cam works, substantially as described.

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

WILLIAM G. TRAFTON.

Witnesses:

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A. E. CARVER.