(No Model.)

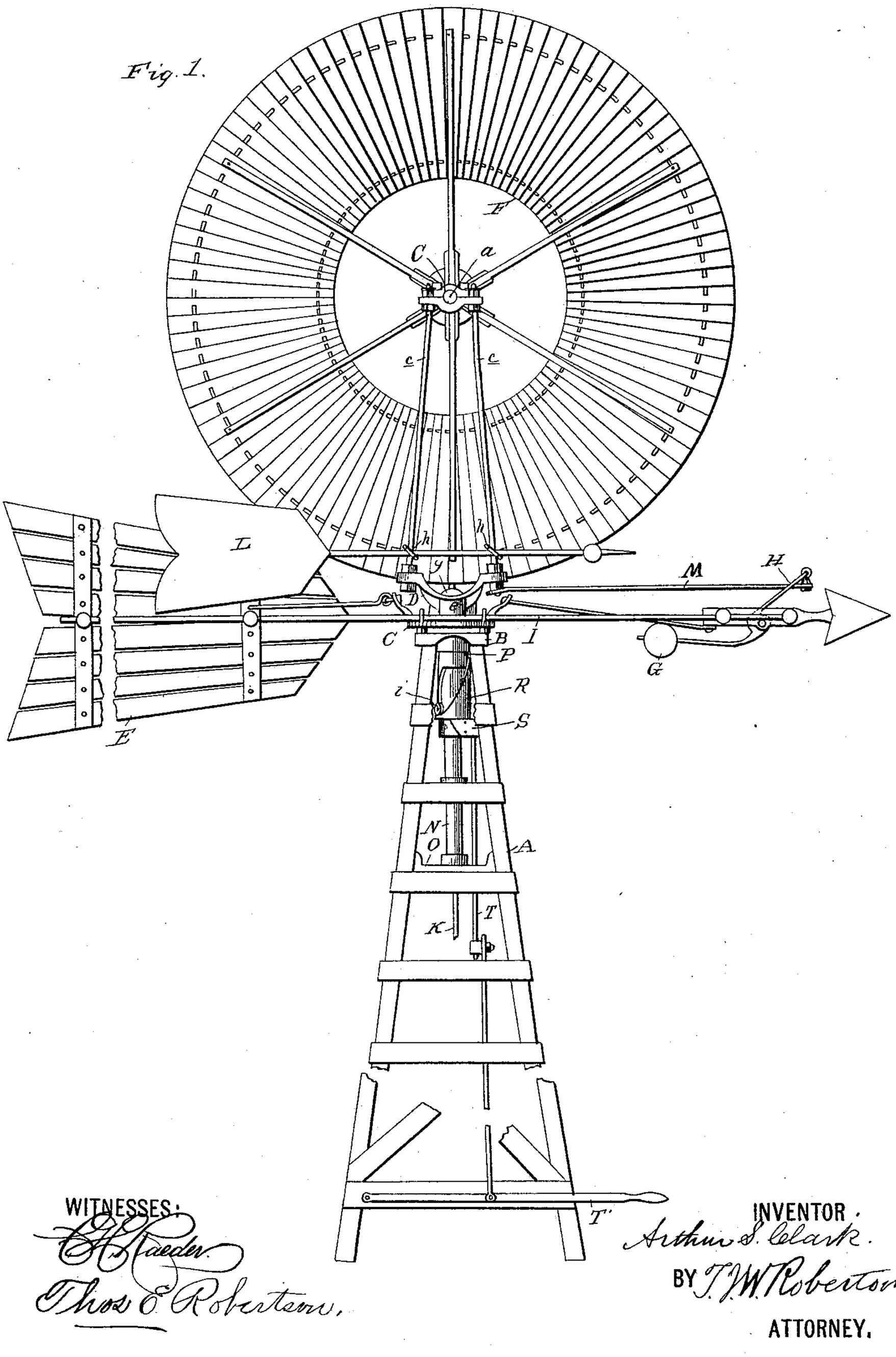
3 Sheets—Sheet 1.

A. S. CLARK.

WIND ENGINE.

No. 386,454. Patented July 24, 1888.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

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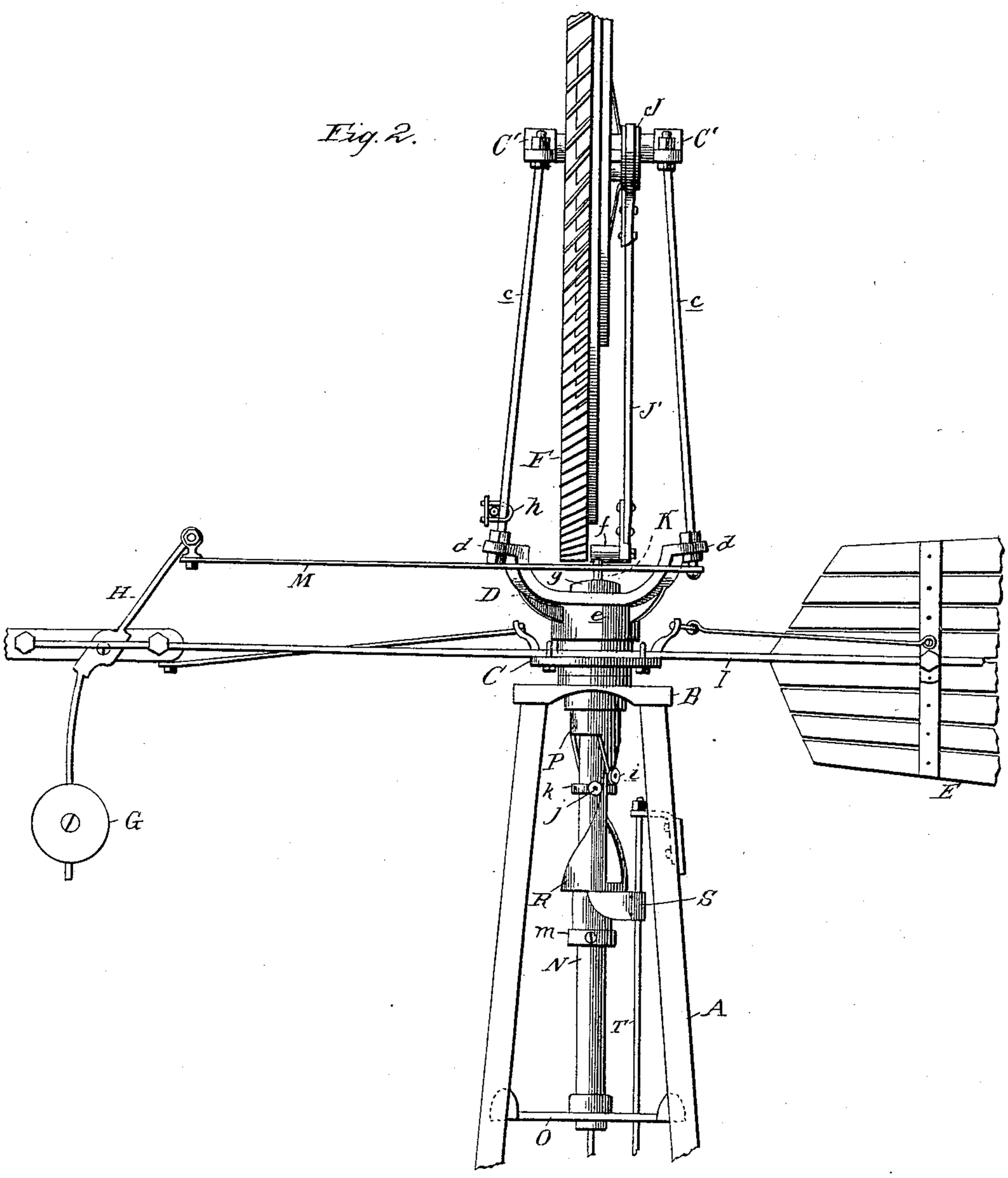
Fig. 2.



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(No Model.) 3 Sheets—Sheet 3.

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Fig. 3.

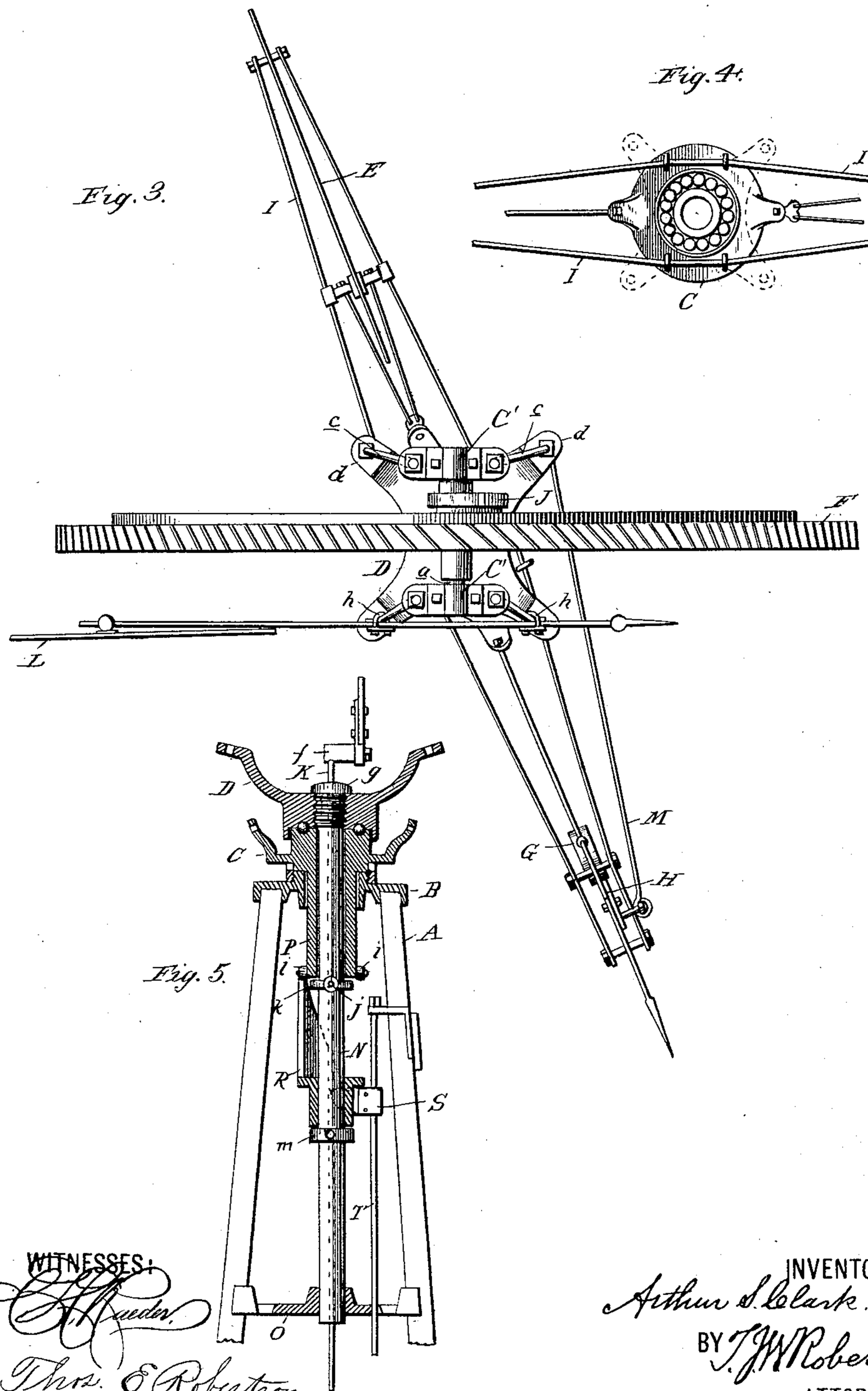

Fig. 4.

Fig. 5.

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UNITED STATES PATENT OFFICE.

ARTHUR S. CLARK, OF SALINE, MICHIGAN.

WIND-ENGINE.

SPECIFICATION forming part of Letters Patent No. 386,454, dated July 24, 1888.

Application filed June 7, 1887. Serial No. 240,545. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR S. CLARK, of Saline, in the county of Washtenaw and State of Michigan, have invented new and useful Improvements in Wind-Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to new and useful improvements in wind-engines; and the invention consists in the improved construction, arrangement, and combination of different parts, all as hereinafter more fully described, and shown in the accompanying drawings, in which—

Figure 1 is an elevation showing the parts in the position when the wheel is turned out of the wind. Fig. 2 is a similar elevation with the wheel full in the wind. Fig. 3 is a plan showing the wheel only partly in the wind. Fig. 4 is a plan of the lower turn-table. Fig. 5 is a vertical central section.

A is the usual derrick, on which the mill is supported upon a bed-plate, B, at the desired altitude. Upon this bed-plate are supported two revolving turn-tables, C D, one on top of the other, the lower turn-table, C, supporting the main vane E and the upper one the wind-wheel F. The upper turn-table rests upon the lower one by means of an anti-friction joint, while the lower turn-table rests upon the bed-plate by means of an ordinary joint, all for the purpose of making the upper turn-table rotate relatively with less frictional resistance than the lower turn-table. A suitable frame, preferably formed of two rods or tubes, I, which are secured upon the lower turn-table, support upon one side of the said turn-table the main vane E and upon the opposite side a governor-weight, G, which is adjustably secured to the lower arm of the lever H. The upper turn-table supports the wind-wheel F directly in the center of the mill on a horizontal shaft, *a*, which is clamped fast in the boxes C′. The latter are supported by uprights *c*, which are secured in the radial arms *d* of the bed-plate *e* of the upper turn-table.

The wind-wheel F is what is called a "solid wheel," and to one side of it is secured the eccentric J, which operates the eccentric-rod J′, to the lower end of which the pump-rod K is attached, which passes through a suitable guide, *g*, in the center of the mill and connects with the eccentric-rod by means of an offset, *f*.

To the upper turn table is longitudinally adjustably secured, by means of suitable clips, *h*, or otherwise, a side vane, L, which lies in front of the wind-wheel to one side of its center and parallel thereto, or nearly so.

The lever H of the governor-weight is connected with the upper turn-table by means of the connecting-rod M in such manner that the rotary motion of the upper turn-table will actuate the governor-weight, as hereinafter more fully described.

In the center of the bed-plate of the upper turn-table is secured the downwardly-projecting tube N, which engages at its lower end into a cross-girt or spider, O, which forms a side bearing to steady the mill. The lower turn-table also has secured in its center a tube, P, which concentrically surrounds the tube N, but does not extend down as far below as the inner tube. To the lower end of this tube is secured a stud or anti-friction roller, *i*, and a corresponding stud or anti-friction roller, *j*, is secured upon the inner tube, N, preferably by means of a collar, *k*.

R is a cam-sleeve slidingly secured upon the inner tube, N, below the tube P, and this cam-sleeve is engaged by a lifter, S, secured upon the lifting-rod T, which extends vertically down to near the foot of the derrick, and is operated by a suitable hand-lever, T′. By means of the lifter and its connection the sliding cam-sleeve R may be pushed up, and if the lifter is lowered the cam-sleeve drops down by its own gravity until it rests on the collar *m*, which is removably secured upon the tube N. The operating-arm of the cam-sleeve is wedge-shaped, as is shown, one face being spirally inclined, forming about one-quarter of a turn and the other forming a vertical plane. In the normal position shown in Figs. 2 and 4 the cam-sleeve is at its lower position and with the upper end of the cam engaged between the studs *i j*. The cam *n* and the rollers *i j* are perfectly duplicated to form two sets of devices for the purpose described, and these parts are placed relatively opposite each other.

The parts being thus constructed and arranged as described, their operation is as follows: The lower turn-table, which carries the

main vane, is free to rotate in any direction under the action of the wind on the main vane. The upper turn-table, which carries the wind-wheel, is free to rotate with the lower turn-table, and is also free to rotate relatively to said lower turn-table through the angle of about ninety degrees. This relative adjustment of the upper turn-table is brought about by the opposing actions of the side vane and the governor-weight. The side vane being placed to one side of the center of the wheel will, under the action of the wind, turn the wheel more or less out of the wind, while the governor-weight opposes this action, and constantly tends to turn the wheel again into the wind. If the force of the wind increases beyond the safe point, the side vane turns the wheel completely out of the wind and holds it in a position parallel to, or nearly so, to the plane of the main vane, as shown in Fig. 1. In this position the lever H has swung the governor-weight from its normal position into a position horizontal, or nearly so, to its pivotal point. This is as far as it will go, and the wind-wheel is held in this position until the action of gravity of the weight G comes again into play.

In Fig. 2 the wind-wheel is shown as being turned fully into the wind, and in this position the governor-weight is suspended below its pivot, or nearly so, while the relative position of the wheel and main vane is maintained against any accidental displacement in the wrong direction by the engagement of the cam *n* between the lugs or rollers *i j*.

If it is desired to throw the mill out of the wind, the lever T is raised as far as it will go, and locked in position by a suitable catch or engagement into a notch. This movement raises the cam-sleeve the full height of the cam *n*, which in forcing itself between the rollers *i j* rotates the upper turn-table with the wheel until it is fully out of the wind, the lower turn-table remaining perfectly stationary on account of the less frictional resistance of the upper turn-table.

It will be seen that in this construction the wind-engine is nicely balanced in position and is very perfectly controlled by the governor.

What I claim as my invention is—

1. In a wind-engine, the combination of a main wheel mounted on a revolving support forming an upper turn table, a main vane secured to a revolving support forming a lower turn-table, an inner tube attached to the upper turn-table and forming its pivot of rotation, an outer tube of shorter length than the inner tube attached to the lower turn-table and forming its pivot of rotation, a sliding cam-sleeve on the inner tube, and two lugs or rollers secured to the outer and inner tubes, respectively, whereby the relative position of the tubes is changed by lifting the cam-sleeve, all substantially as described.

2. In a wind-engine, the combination of a lower and upper turn table forming independent supports for the main vane and wind-wheel and having different frictional resistance when rotated, an outer and inner tube respectively attached to said lower and upper turn-tables and forming the pivots of rotation thereof, two lugs or rollers secured to the outer and inner tubes, respectively, a cam-sleeve slidingly secured upon the inner tube and provided with a wedge-shaped cam having one face straight and the other spirally inclined, and a lifting device for the cam-sleeve, all arranged to operate substantially as described.

3. In a wind-engine, the combination, with the lower turn-table, C, carrying the main vane, of the upper turn-table, D, carrying the side vane and consisting of the bed-plate *e*, resting on anti-friction rollers or balls, arms *d*, formed integral with the upper turn-table, uprights *c*, boxes *b*, and shaft *a*, clamped therein and supporting the wind-wheel, said uprights connecting said boxes and arms and supporting the shaft *a*, all substantially as described.

ARTHUR S. CLARK.

Witnesses:
H. S. SPRAGUE,
ADOLPH BARTHEL.