

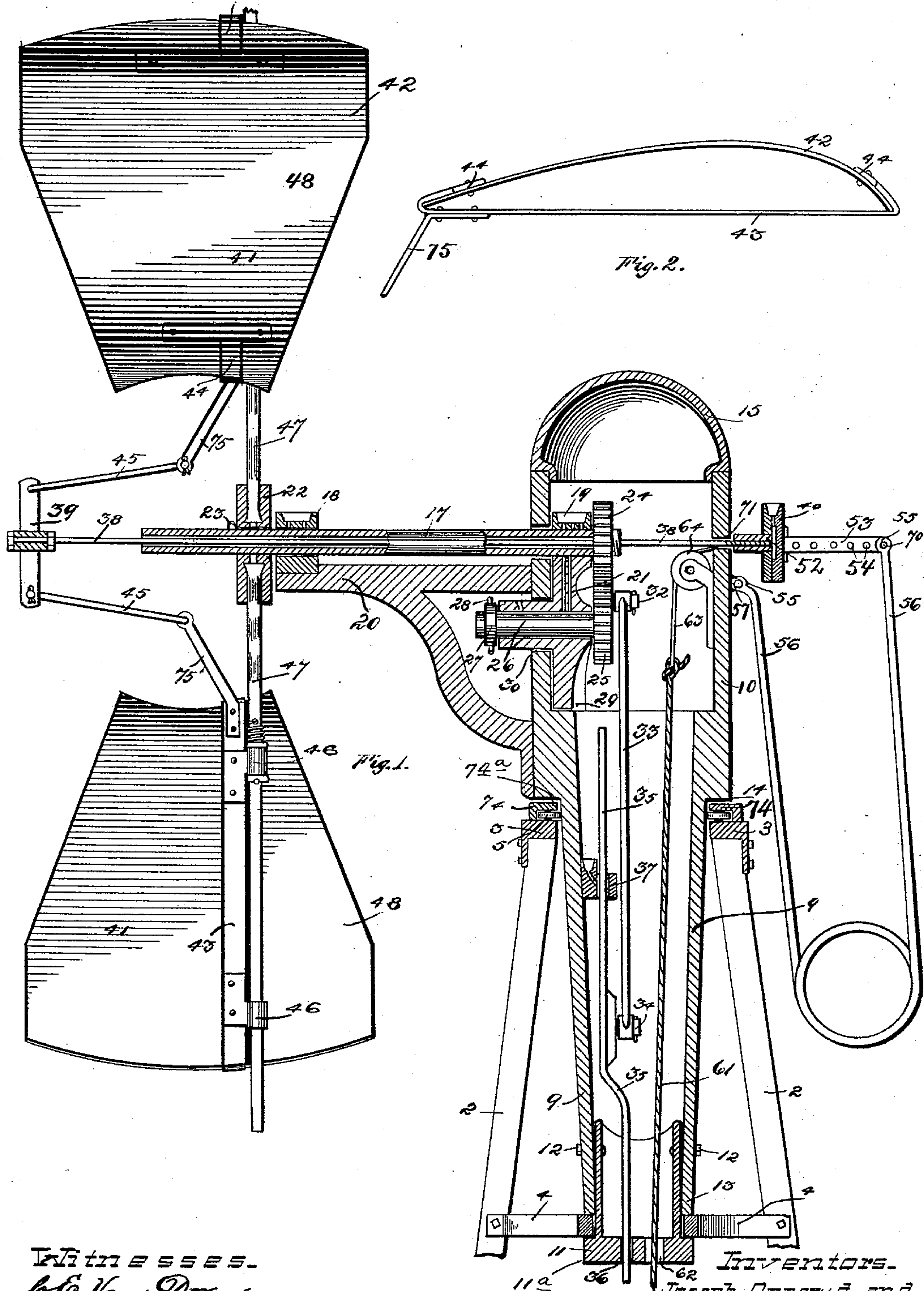
(No Model.)

3 Sheets—Sheet 1.

J. OPPERUD & J. I. BRORBY.
WINDMILL.

No. 488,087.

Patented Dec. 13, 1892.



Witnesses.
C. E. Van Dorn,
C. Hawley.

Inventors.
Joseph Oppenud and
Jacob I. Brorby.
By Paul M. Munn, Attys.

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3 Sheets—Sheet 2.

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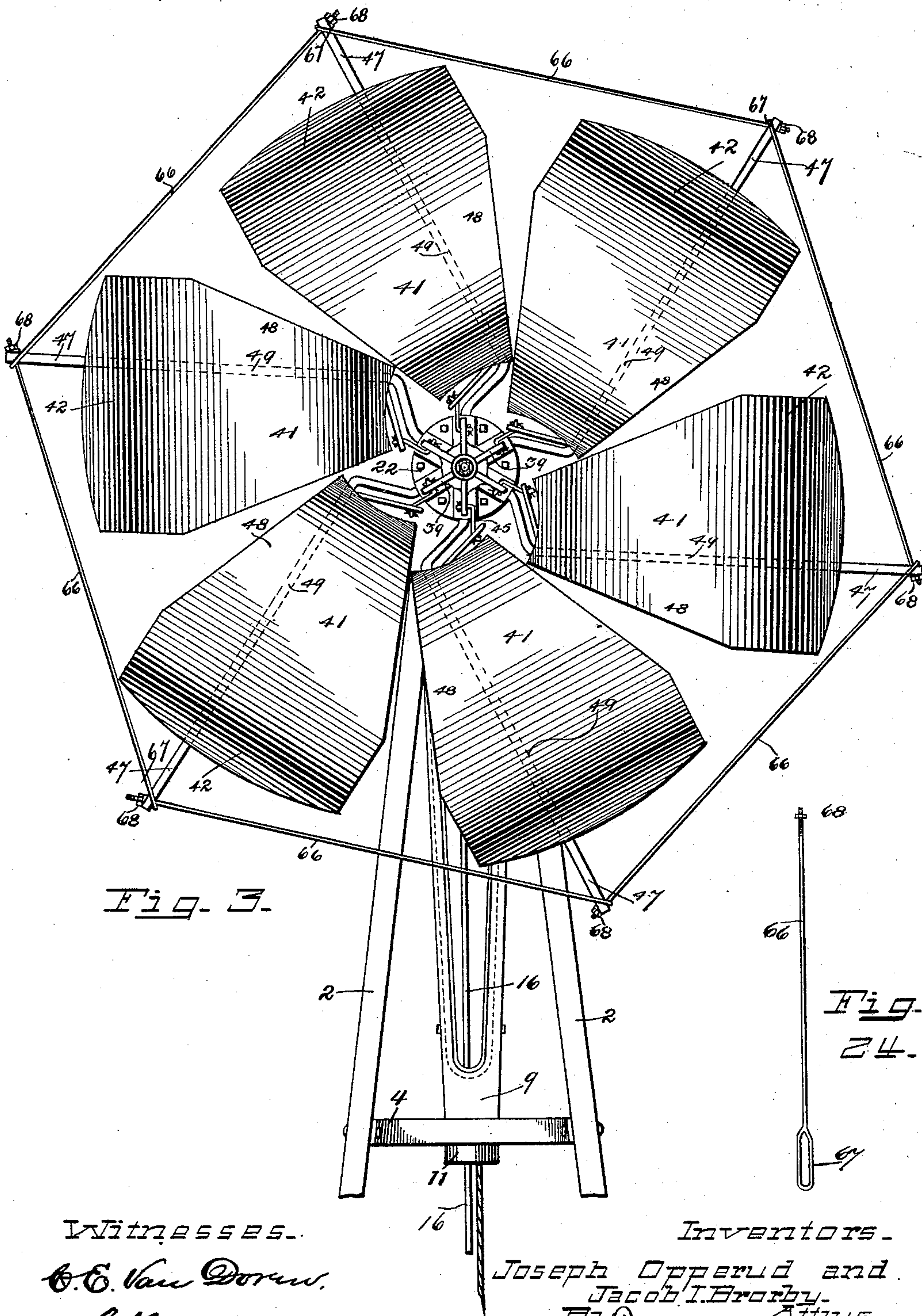


Fig. 3.

Fig. 24.

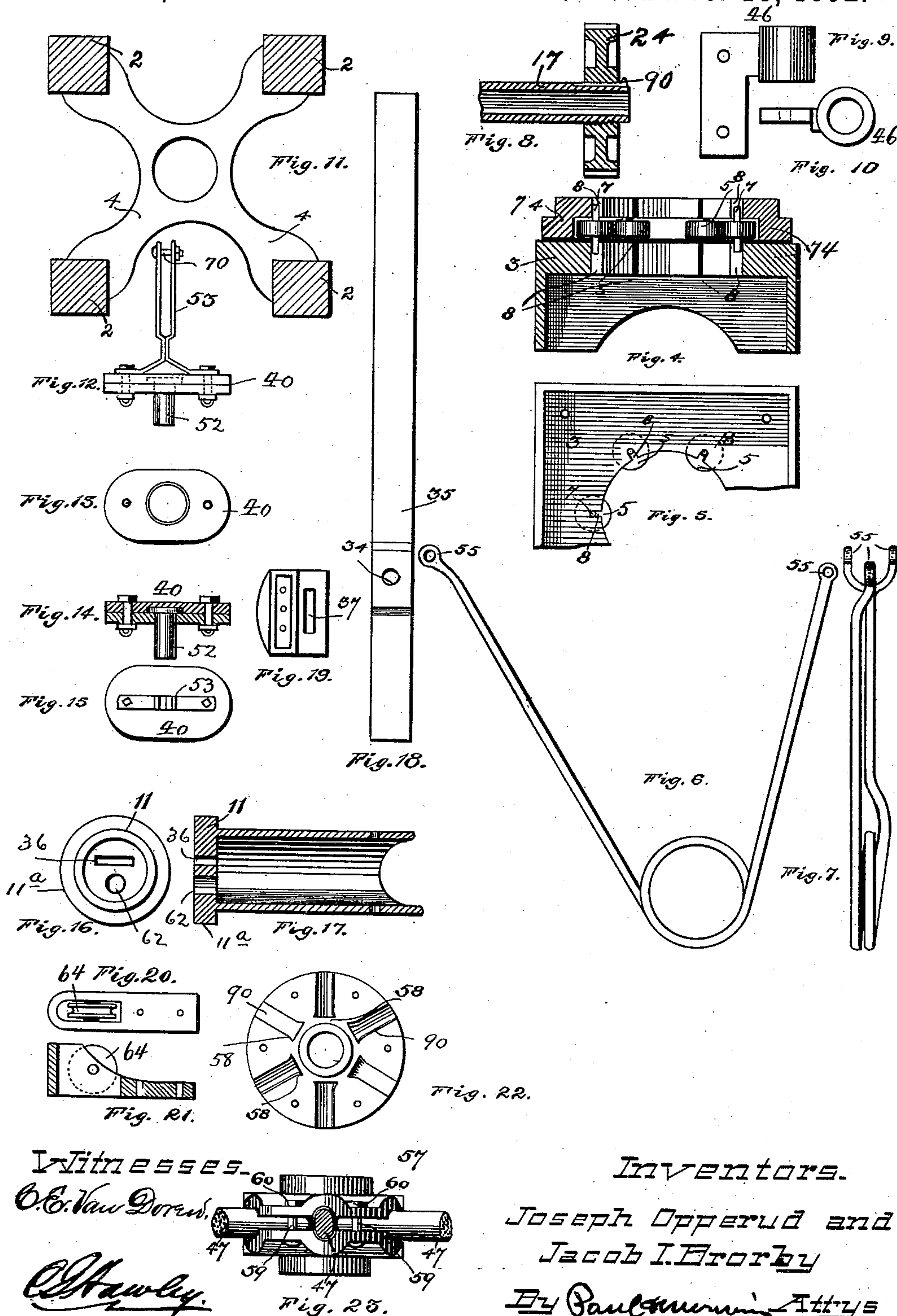
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UNITED STATES PATENT OFFICE.

JOSEPH OPPERUD AND JACOB I. BRORBY, OF MADISON, SOUTH DAKOTA.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 488,087, dated December 13, 1892.

Application filed October 23, 1890. Serial No. 369,123. (No model.)

To all whom it may concern:

Be it known that we, JOSEPH OPPERUD and JACOB I. BRORBY, of Madison, in the county of Lake and State of South Dakota, have invented certain Improvements in Windmills, of which the following is a specification.

Our invention relates to improvements in windmills of that class in which the fans or wings are independently pivoted upon angle-spokes extending from a common hub upon the power-shaft and connected with a horizontally-movable spring-actuated shaft, whereby the angle of the fans or wings presented to the wind is automatically adjusted or regulated by the force or power of the wind.

The object of the invention is to improve the construction of such windmills, whereby superior advantages are obtained with respect to efficiency in operation.

The invention consists in the novel construction and combination of parts hereinafter fully described and claimed.

In the accompanying drawings, Figure 1 is a sectional longitudinal elevation of a windmill embodying our invention. Fig. 2 is an edge view of one of the windmill-fans. Fig. 3 is a vertical elevation of the wind-wheel as shown from behind the wheel, all of the fans being therein shown in position almost squarely across the wind. Figs. 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, and 24 are detail views showing the construction of the various parts of the machine.

It is not deemed necessary to illustrate fully the tower upon which the mechanism is raised and supported. The upper ends of the tower-timbers 2, however, are shown in Figs. 1 and 3 in connection with the cap-plate 3 and the base-supporting plate 4, the cap-plate 3 being provided with a top plate or ring 74, having an inwardly-projecting flange 74^a, forming an annular opening or groove, in which is located a series of friction-wheels 5, journaled in the said top plate and cap-plate by means of short axles 7, engaging in slots 8. (See Figs. 4 and 5.) The top and cap plates are formed with concentric annular openings, through which passes the shank 9 of the dome 10. The lower end of the shank 9 is firmly held in position by the base-plate 4, provided with a circular opening, through which passes a slotted sleeve 11, inserted in

the lower end of said shank and removably secured thereto by bolts 12. The lower end of the sleeve is formed with an annular flange 11^a, forming a shoulder, which abuts against the lower side of plate 4. The lower end of shank 9 rests upon the upper side of said plate, and by these means the working parts are supported and the shank prevented from any vertical movement. The upper part of the dome is of somewhat-greater diameter than the shank, forming a shoulder 14 above the top plate 74, and is provided with a removable cap or cover 15. It will thus be seen that the dome and its shank form a closed cylinder or housing, the shank, however, being provided on one side with a slot 16, by which access may be had to the interior, which is closed by means of iron shields. (Shown by dotted lines, Fig. 3.)

The numeral 17 denotes the power-shaft, journaled and rotatable in bearings 18 and 19, secured to the arm or bracket 20 and to the gear-block 21, respectively. The block 18 is made in two pieces, the lower piece being removably secured to the arm 20, while the upper part of the bearing 19 is bolted directly to the gear-block 21. The shaft 26, with the gear 25, is secured in this "bearing," as it may be called, by the collar 27, secured thereon by the split pin 28, passing through the end of the shaft. The lower end of the gear-block 21 rests on the shoulder 29, formed on the interior of the dome, while the bearing-sleeve thereof extends through a rectangular opening 30 in the wall of the dome and is secured thereto by means of bolts.

The crank-pin 32 is secured to the face of the gear 25 in any suitable manner, which gear is provided with a series of openings to receive the same at varying distances from the center in order to vary the stroke of the pump-rod. The pitman 33 connects the crank-pin with a similar pin 34 on the pump-rod 35. This rod moves up and down in bearings 36 and 37 in the sleeve 11 and the dome-shank 9. An oil-cup is provided in the bearing 37.

The power-shaft 17 is hollow and receives a small shaft 38, extending from the spider 39 to the block 40. This shaft plays back and forth through the hollow shaft as the sails or fans move in and out. In the drawings six sails or fans are shown, although this

number may be varied. These sails are exact duplicates of each other and are approximately triangular in shape with the apex or inner point of each cut-off, so as to be properly connected with the hub. Each fan is made as shown in Fig. 2, so as to present a concave surface to the action of the wind, and is strengthened by means of stay-rods 43. Each of these stay-rods is provided with an arm 75, extending therefrom at an angle both to the plane of the rod 43 and to a perpendicular erected therein. These rods are linked to the spider 39 by connecting-rods 45. The fans or sails are pivoted to bearings 46 upon the angle-spokes 47, extending from the hub 22. As shown, each spoke is bent in such a way as to carry the outer portion of the spoke away from the hub at almost a tangent thereto, so that the parts 49 of the spoke stand at an angle of about forty-five degrees to the inner end of the spoke by which the same is secured to the hub.

The rod or shaft 38 extends through an opening 71 in the front of the dome and is screwed into the head 52, secured to the two-part swivel-block 40. This block is shown in detail in Figs. 1, 13, 14, and 15. A rod 53 extends from the forward part of the block 40 and is provided with a series of holes 54 to receive a pin 70, holding the outer end of a spring 56. By means of these holes and pins the tension of the spring can be regulated.

This spring is secured to the dome at its other end, being formed with a yoke 55, (see Figs. 6 and 7,) provided with eyes which engage with studs 57, formed on the dome.

The hub 22, as shown in Figs. 22 and 23, is of peculiar construction, and consists of two plates provided with notches 90, having the enlarged inner ends 58, adapted to engage the sides of the spokes 47 and the flanged or upset ends of the same. Bolts 59 extend through the plates and are secured together by nuts 60.

A rope 61 extends up through an opening 62 in the sleeve 11 and is connected with a short piece of wire cable 63, passing over a sheave 64 and secured to the swivel-block 40. By pulling upon this rope the rod 38 is forced outward or back, so as to shift the sails so that their edges will be presented to the wind. The spokes 47 extend beyond the sails and are connected together by tie-rods 66. The loop 67 slips over the ends of the spokes in each case and is secured thereon by the nut 68.

The operation will be readily understood. As the sails are revolved by the wind the pump-rod will be reciprocated by the power-shaft and connections. When the force of the wind is so great as to overcome the tension of the spring 56, the sails will turn upon their pivots and be thrown more or less out of the line of the wind. As the force of the wind decreases, the spring will cause the sails to be returned to normal position. The tension of the spring can be regulated by means of the holes 54 and pin 70. By pulling upon

the cord or rope 61 the sails can be turned with their edges to the wind, so as to offer no resistance thereto.

Having thus described our invention, what we claim is—

1. In a windmill, the combination, with the dome or housing, the rotatable hollow power-shaft, the pump-rod and connections, and the hub and angle-spokes, of the sails pivoted to said spokes, the horizontally-movable shaft passing through said power-shaft, connected at one end with the sails and at its other end provided with a bar having a series of holes, the bent spring secured at one end to the dome and its other end provided with an eye, and the pin passing through said eye and the holes in the said bar, substantially as and for the purpose described.

2. In a windmill, the combination, with the dome or housing, the rotatable hollow power-shaft, the pump-rod and connections, and the hub and angle-spokes, of the sails pivoted to said spokes, the horizontally-movable shaft passing through the power-shaft connected with the sails, the two-part swivel-block provided with a head connected with said movable shaft, the bifurcated rod secured to said block, provided with a series of holes, the bent spring secured at one end to the dome and provided at its other end with an eye, and the pin passing through said eye and the holes in said rod, substantially as described.

3. In a windmill, the combination, with the fans and the angle-spokes therefor, having their portions 49 at an angle with their ends 50, engaging the hub on the power-shaft, said fans being substantially triangular and presenting concave surfaces to the action of the wind, of the stay-rods 43, having the eye-bearings 46 and extending between the ends of the fans, said stay-rods being located in positions forward of the middle points of said fans, and the arms 75, engaging the governor-rod 38 by means of the spider 39 and the links 45, and the spring connected with said rod 38 and tending to normally draw said rod forward, substantially as described.

4. The combination, in a windmill, of fans each consisting of a substantially-triangular plate of suitable material, said plate being curved to present a concave surface to the action of the wind, the rod 43, extending between the ends of the fan and placed forward of the middle thereof, and means whereby said fans are pivotally connected with the spokes of the wheel, substantially as described.

5. The combination, in a windmill, of the dome 10 with the shank 9, means whereby said dome is pivoted upon the top of the tower, the power-shaft 17, the rod 38, adapted to move longitudinally therein, the bearing-block 21, provided within the dome and having bearings for the power-shaft 17 and for the shaft 26, the gear 25, secured on

5 said shaft 26, the spring 36, secured to the forward side of the dome, the swivel-block 40, the rod 25, having the openings 54 and a pin 55, engaging the outer end of said spring, the bracket 20, provided with the bearing 18, the hub 22, the spokes 47, rigidly extending therefrom, the fans 41, pivoted upon said spokes, arms 44, provided on said fans, the spider 39, and the links 45, connecting said

arms and fan, substantially as and for the purpose specified.

In testimony whereof we have hereunto set our hands this 8th day of October, 1890.

JOSEPH OPPERUD.

JACOB I. BRORBY.

In presence of—

N. M. STOTT,

L. M. SCOGGIN.