No. 680,530. Patented Aug. 13, 1901.

L. E. JONES.

WINDMILL.

(Application filed July 20, 1899.

(No Model.) 3 Sheets—Sheet 1.

Fig 1

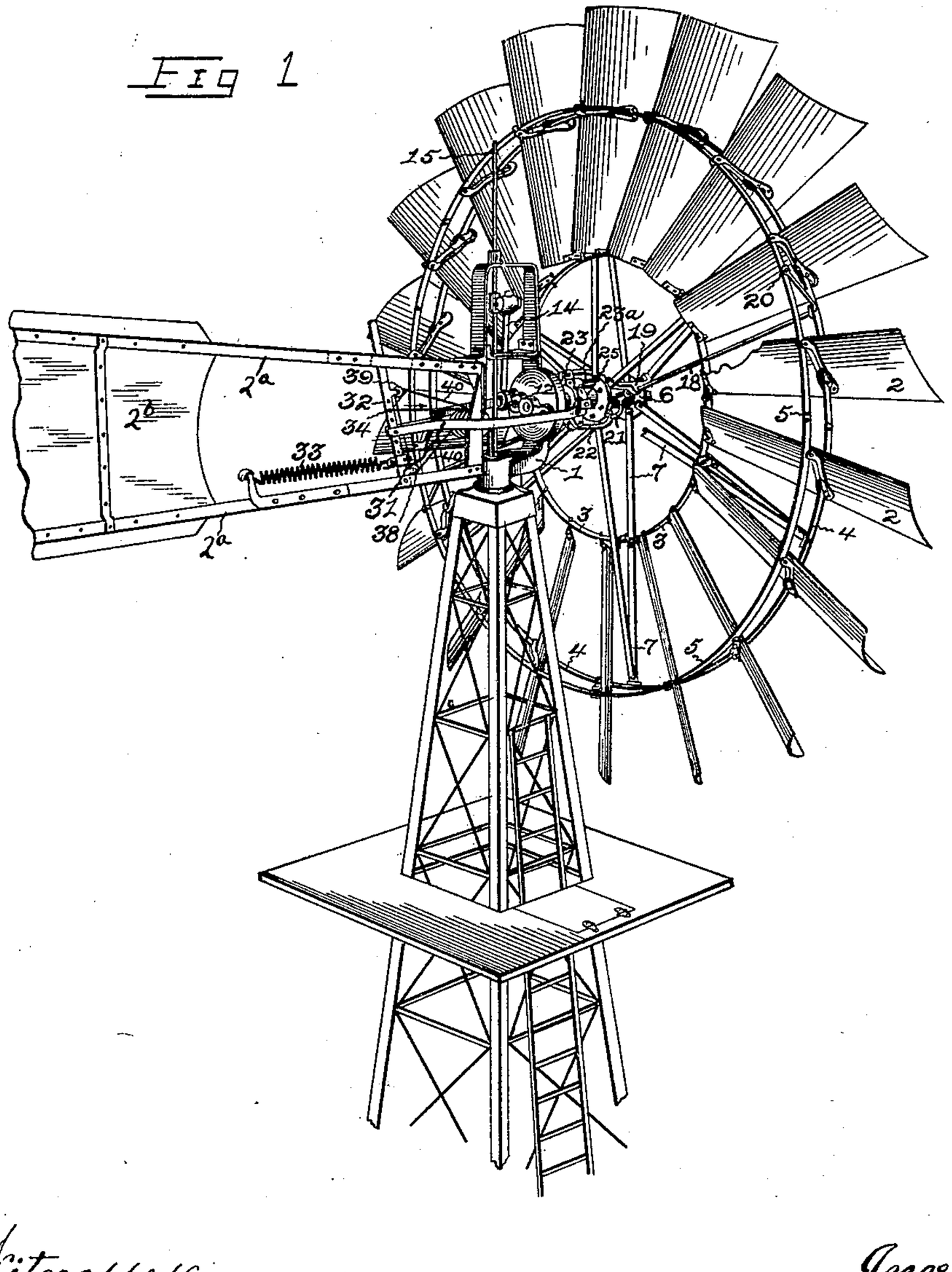

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Fig 2.

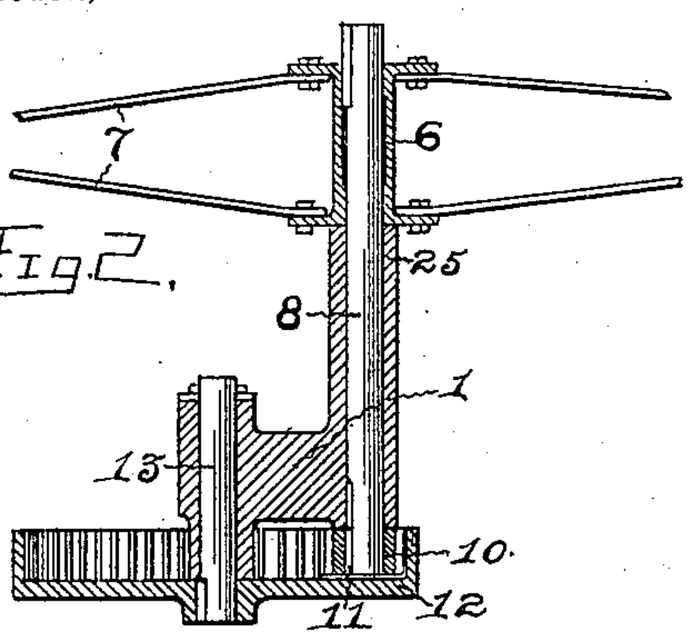


Fig 2a

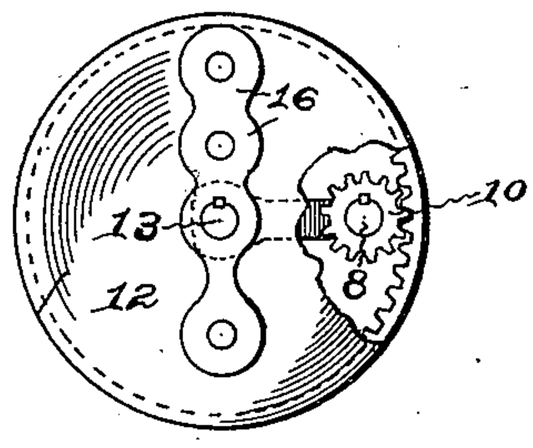


Fig 3.

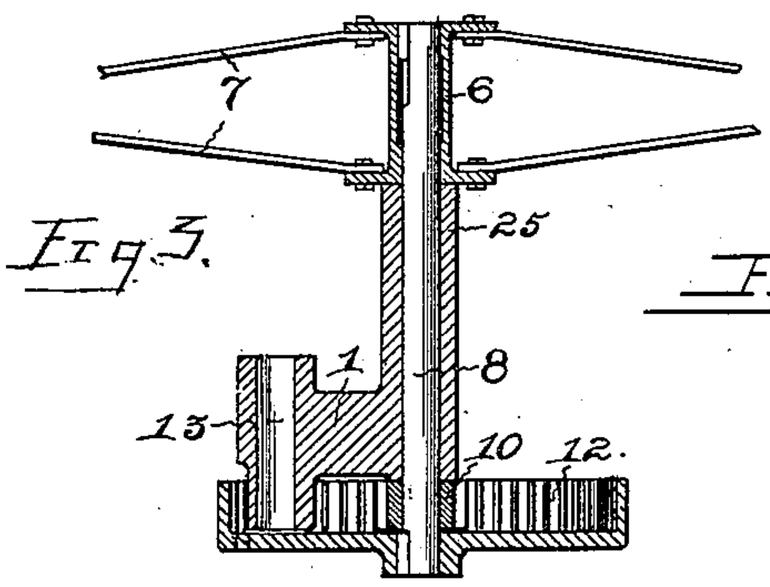


Fig 3a

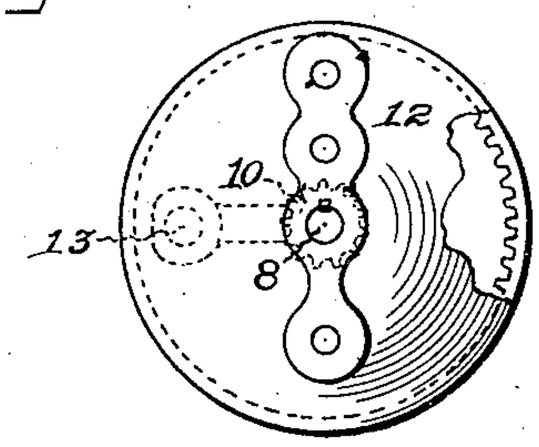
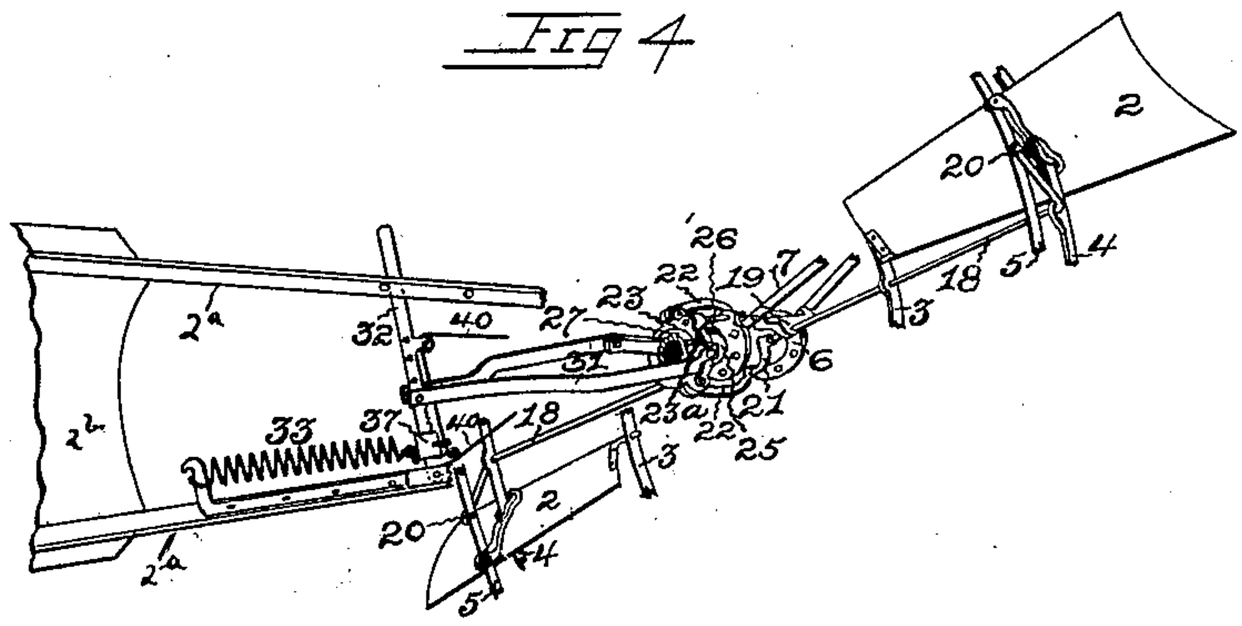


Fig 4



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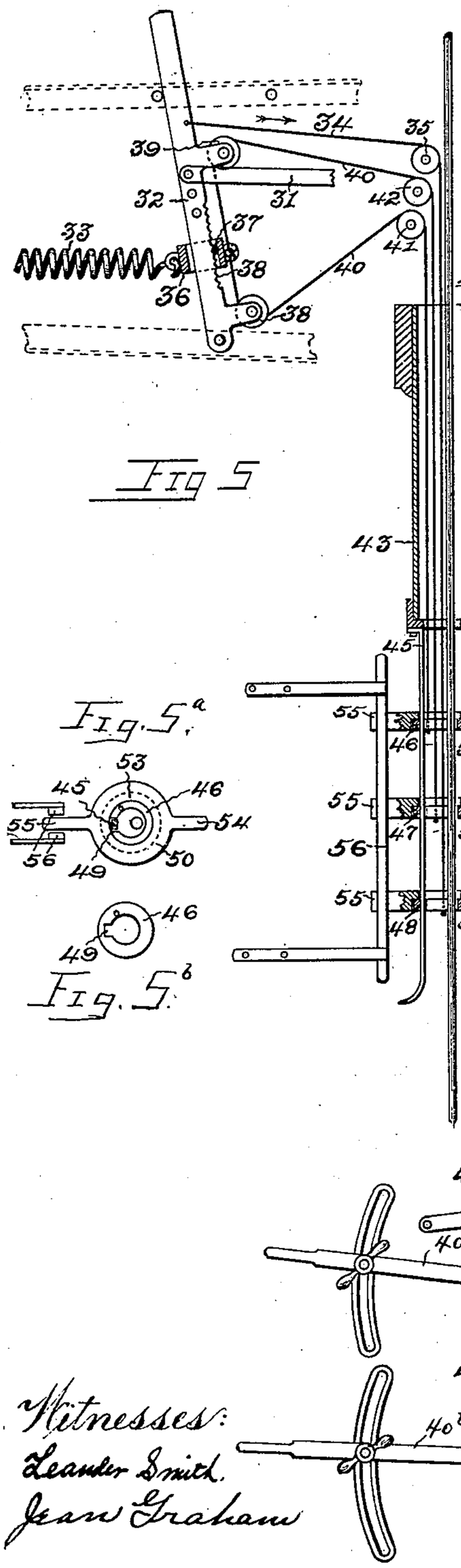

Fig 5

Fig. 5a

Fig. 5b

Fig 6

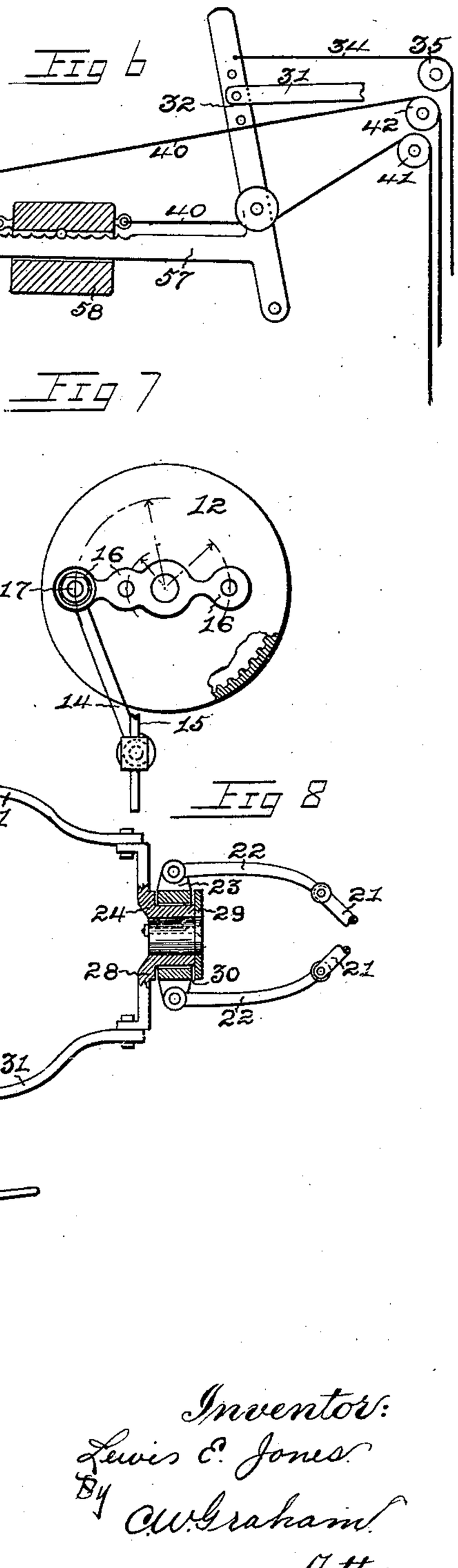

Fig 7

Fig 8

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UNITED STATES PATENT OFFICE.

LEWIS E. JONES, OF MILFORD, ILLINOIS.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 680,530, dated August 13, 1901.

Application filed July 20, 1899. Serial No. 724,537. (No model.)

To all whom it may concern:

Be it known that I, LEWIS E. JONES, a citizen of the United States, residing at Milford, in the county of Iroquois and State of Illinois, have invented new and useful Improvements in Windmills, of which the following is a specification.

My invention relates to the class of windmills having automatically-adjustable vertical feathering-blades, and has for its object certain elements and combinations of elements whereby the automatic adjustment of the vertical feathering-blades is accomplished in a simple, practical, and efficient manner.

My invention has further for its object the provision of suitable means for manually manipulating the automatically-operating devices from the base of the tower, whereby the power of resistance of the vertical feathering-blades against the pressure of the wind is varied, by means of which more or less power is developed and more or less speed given to the wind-wheel, according to the requirements at hand.

My invention has further for its object a driving-gear mounted in a framework of such a construction as will admit of changing the windmill from a geared mill to a direct-stroke mill, such change being accomplished without the addition of any new elements in the combination and leaving the windmill subject to the same variations of adjustment as before.

My invention has further for its object the provision of a crank-wheel of such a construction as will admit of an adjustment of the wrist-pin mounted thereon for the purpose of increasing or decreasing the leverage of the driving mechanism and simultaneously lengthening or shortening the stroke of the pump-rod.

My invention has also certain other features, all of which will be fully described and claimed in the annexed specification.

Reference being now had to the accompanying drawings, Figure 1 is a perspective view of my improved windmill, showing the different parts and elements in their normal relative positions. Fig. 2 is a sectional plan view of the driving mechanism as arranged in constructing a geared windmill. Fig. 2^a is a bottom plan view thereof. Fig. 3 is a sectional plan view of the driving mechanism on the same sectional line as Fig. 2, showing the gearing as arranged in converting a geared mill to a single-stroke mill. Fig. 3^a is a bottom plan view thereof. Fig. 4 is a diagrammatic view showing the automatic regulating device and its connections with the vertical feathering-blades. Fig. 5 is a diagrammatic view showing the mechanism for manually manipulating the automatic regulating device from the base of the tower. Figs. 5^a and 5^b are detail views of a portion of a regulating device. Fig. 6 is a modification of the device shown in Fig. 5, wherein a weight is substituted as a regulating means. Fig. 7 is a vertical plan view of a crank-gear, showing the manner of increasing or decreasing the leverage of the mill and simultaneously lengthening or shortening the stroke of the pump-rod. Fig. 8 is a detail view of one of the connecting elements of the automatic adjusting device.

1 represents the main supporting-frame of a windmill pivotally mounted on the peak of a tower in the ordinary manner.

2 designates the vertical feathering-blades pivotally mounted on the movable rings 3, 4, and 5, the said blades 2 being arranged equidistant circumferentially and extending radially from the ring 3, also connected to its proper frame 2^a in the vane 2^b. The concentric rings 3 and 4 are supported by radially-extending arms or spokes 7, said arms or spokes being mounted on a central hub 6, while the movable ring 5 is supported by the inner edges of the vertical feathering-blades 2 and serves as a medium for maintaining the pivotal alinement of the blades 2 and also is the means for producing a simultaneous pivotal movement of the blades 2 in their function of regulating the speed and power of the windmill.

The wind-wheel, comprising the hub 6, spokes 7, blades 2, and rings 3, 4, and 5, is mounted upon and keyed to a driving-shaft 8, which shaft finds a bearing in a horizontally-extending hub 25 of the main supporting-frame 1. Upon the inner end of the driving-shaft 8 is mounted a driving-pinion 10, Figs. 2 and 3, maintained in constant relation with the shaft 8 by means of a key 11, the said pinion 10 meshing with an internal

gear 12, said gear 12 being mounted upon a rotating shaft 13, which shaft 13 lies parallel and in the same horizontal plane with the shaft 8. The internal gear 12, having one closed side, also serves as a crank-wheel, Fig. 7, carrying one end of the pitman 14, which operates the pump-rod 15.

By reference now to Figs. 2 and 3 the method of changing from a geared windmill to a direct-stroke windmill, or vice versa, will be readily comprehended. In arranging for a geared mill the pinion 10 is mounted upon the driving-shaft 8 and meshes with the internal gear 12, which is mounted upon the shaft 13. The arrangement as shown is usually geared about two and one-half to one—that is, the wind-wheel makes two and one-half revolutions to one revolution of the crank-wheel 12 or to one complete movement of the pump-rod—while in arranging for a single-stroke mill the operation is thus: The shaft 8, which carries the wind-wheel and pinion 10, is moved endwise through its bearing a sufficient distance to admit of placing the internal gear 12 on the inner end, abutting against the pinion 10, but not meshing therewith, in which case the pinion 10 simply acts as a collar on the shaft 8, the function of which is to maintain the internal gear 12 in the same vertical plane as it occupied when placed on the shaft 13 and meshed with the pinion 10. In this arrangement the shaft 13 can be removed from its bearing and stored away for future use when changing back to a geared mill.

The internal gear or crank wheel 12 when placed on the shaft 8, as just described, is coincident with the wind-wheel in its rotation, so that to each revolution of the wind-wheel a complete movement is imparted to the pump-rod 15 through the medium of the pitman 14.

By reference to Fig. 7 it will be seen how the leverage of the wind-wheel is increased or decreased and the simultaneous adjustment of the stroke of the pump-rod 15 is accomplished. On the face of the crank-wheel 12 are positioned bosses 16 for the reception of the crank-pin 17, which when placed in either of the bosses 16 will vary the leverage and also adjust the pump-rod accordingly, which operate the same whether in a geared or single-stroke mill.

The automatic adjustment of the vertical feathering-blades is accomplished in the following manner and by the following means: Rotatably mounted in the wind-wheel are the rods 18, finding radial bearings in the concentric rings 3 and 4, Figs. 1 and 4, and in brackets 19, secured to the spokes 7, the outer ends of the rods 18 being bent to form cranks, the said bent ends having pivotal connection at 20 with the concentric ring 5. The inner ends of the rods 18 are also supplied with cranks 21, which cranks are curved and extend on opposite sides of the hub 6 and have diametrically opposite connections with the links 22, which links 22 extend inward between the spokes 7 and have connection with a rotating ring 23. The ring 23 is in turn carried on the sliding keeper-block 24, Fig. 8. The keeper-block 24 is mounted upon the projecting hub 25 of the main frame 1, which hub 25 also forms a bearing for the shaft 8. By reference to Fig. 8 the construction and adaptation of said keeper-block 24 and ring 23 will be more readily comprehended. The hub 25, Fig. 4, is provided with a longitudinal feather 26, and the keeper-block 24 is provided with a longitudinal recess 27, so when the keeper-block 24 is placed in its proper relative position on the hub 25 it has a free longitudinal movement, but is prevented from rotation by means of the feather 26 engaging the recess 27. The said keeper-block 24, Fig. 8, is also provided with a flange 28 on one end, formed integral therewith, and a ring-flange 29, secured to the other end, which flanges 28 and 29 form an annular recess or groove 30 in the said keeper-block 24. The rotating ring 23 is positioned in this recess or groove 30, where it has free rotation, while by means of the flanges 28 and 29 it has also a longitudinal movement coincident with that of the keeper-block 24. Extending in an approximately horizontal plane on either side of the main frame are arranged shifting bars 31, having pivotal connection with the keeper block or collar 24 and having an adjustable pivotal connection with a lever 32, which lever 32 is mounted in the wind-vane. Also arranged within the wind-vane is the elastic element 33, contained in the automatic regulating device, which in this case is shown as an extension-spring, one end of which is attached to the lever 32 and the other end is secured by any suitable means to the framework of the wind-vane. The operation of this automatic regulating device is as follows: The end of the spring 33 is arranged at any desired point between the fulcrum of the lever 32 and the pivotal connection of the shifter-bars 31 and will exert a resisting force in proportion to the distance it is arranged from the fulcrum of the lever 32. When the spring 33 is so positioned, the lever 32 is held back to the limit of its movement, resting against a stop arranged on the top bar of the wind-vane. By means of the shifter-bars 31, keeper-block 24, ring 23, links 22, cranks 21, crank-rods 18, and concentric ring 5 the vertical feathering-blades are elastically held in their normal working position. The resistance with which they are held in this position is of course variable, depending on the relative position of the end of the spring 33 and the fulcrum of the lever 32. When the wind is directed on the feathering-blades, the wheel will revolve, and the tension of the spring 33 will be sufficient to hold the feathering-blades in their normal working position so long as the wind remains steady and uniform; but should a sudden gust strike the wheel, instead

of perceptibly increasing the speed of the wheel the feathering-blades will turn on their pivots, thus presenting less surface to the action of the wind, and thereby maintain a uniform rotation. Should the wind increase or diminish while the blades are thus held in equilibrium, they will, through the medium of the elastic tension device 33, adjust themselves automatically to the varying conditions. Should it be found that the tension of the spring 33 was too strong or too weak to properly manipulate the feather-blades during a gust of wind or variable winds, the connection of the spring 33 with the lever 32 can be adjusted relative to the fulcrum of the lever 32 by means of cables from the base of the tower in the following manner: One end of the spring 33 is secured to a movable block 36, Fig. 5, which block is slidably mounted on the lever 32. A pin 37 is placed in the block 36, adapted to engage in serrations 38, arranged on the edge of the lever 32. At suitable positions on the lever 32 are located guide-wheels 38 and 39. A cable 40 is secured to a suitable eyelet on the block 36, one end passing over the guide-wheel 38 to the sheave-wheel 41 and thence to the base of the tower. The other end of the cable 40 passes over the guide-wheel 39 to the sheave 42 and thence to the base of the tower. An intermediate arrangement of the following construction is supplied for the purpose of preventing the cables 34 and 40 from winding around the pump-rod when the windmill turns on the tower: Secured to the lower end of the extension 43 of the main frame 1 is a cap 44, having a vertically-extending guide-bar 45. Arranged in juxtaposition to the said cap 44 are circular disks 46, 47, and 48, the disks 46 and 47 being secured to the respective ends of the cable 40, while the disk 48 is secured to the end of the cable 34. Arranged near the periphery of each of the said disks 46, 47, and 48 are openings 49, adapted to receive the guide-bar 45, the function of the guide-bar 45 being to rotate the said disks coincident with the rotation of the windmill in the tower. The guide-bar 45 is of sufficient length to admit of the necessary vertical movement of the disks 46, 47, and 48 in their normal operations. Supported by each of the disks 46, 47, and 48 are shifting rings 50, 51, and 52, the said rings having central openings large enough to admit of an uninterrupted rotation of the guide-bar 45 and the cables 34 and 40 when rotating with the windmill, but smaller than the diameter of the said disks 46, 47, and 48. Arranged concentric with the openings in the said rings 50, 51, and 52 are annular recesses 53, forming seats for the said disks 46, 47, and 48. Located on opposite sides of the rings 50, 51, and 52 are lugs 54 and 55, the lugs 54 providing means for securing ends of cables or rods for continuing the cables 34′ and 40′ to the base of the tower. Connected to the lower ends of these cables are the levers 34^a, 40^a, and 40^b, these levers being adapted to be operated separately to shift the position of the lever 32.

Secured to the tower in any suitable manner and located near its vertical center is arranged a vertical guide 56, adapted to engage the lugs 55 on the rings 50, 51, and 52, the office of the guide 56 being to prevent the rings 50, 51, and 52 from rotating with the disks 46, 47, and 48 from frictional contact, but permitting a free vertical movement of the rings 46, 47, and 48 when manipulated by means of the cables at the base of the tower. It will thus be seen that I provide stationary rings 50, 51, and 52, in which are rotatively mounted the disks 46, which are connected to the lower ends of the cables 34 and 40, and by this connection it will be seen that any one of the levers 34^a, 40^a, or 40^b can be operated separately to lower any one of the rings 50, 51, and 52, which are adapted to pull upon their respective cables to operate the lever 32. When the lever 32 is pulled to the right, U-sheaves 38 allow the cord 40 to pass over the sheaves without in any way changing the relative position thereof, as they simply form a rolling bearing for the cord.

The cable 34 is attached to the lever 32, extends over the roller 35, and thence down to the base of the tower and there is secured in any convenient manner. The object of the cable 34 is to provide a means of throwing the wind-wheel out of the wind, which object is accomplished in the following manner: By pulling the cable 34 in the direction of the arrow the lever 32, shifting bars 31, universal coupling or keeper block 24, and links 22 move laterally toward the wind-wheel, and as the links 22 are pivotally connected to the cranks 21 of the crank-rods 18 a rotary motion is imparted to the crank-rods 18, the outer ends of the crank-rods 18 having connection with the concentric ring 5, which ring 5 has connection with all of the feathering-blades. A simultaneous pivotal movement is imparted to the feathering-blades sufficient to turn the blades edgewise in the wind, in which position the wheel will not receive any impulse from the wind, but is free to rotate upon manual application. When the parts are placed in the positions just described, the spring 33 is extended and is constantly exerting its influence in the opposite direction, so that when the cable 34 is released at the base of the tower and is slackened the spring 33 immediately closes and through the medium of the different elements turns the feathering-blades into the wind, Fig. 1, and holds them in such position with sufficient resistance to enable the wheel to develop the power necessary for the work in hand.

A weight 58 of sufficient capacity, Fig. 6, could be used as a counteractant instead of the spring 33, the lever 32 having an extending arm 57, serrations located on its upper edge, an engaging pin or lug positioned in

the said weight and adapted to engage into the said serrations, guide-wheels conveniently arranged to carry the cable 40, thereby providing means for adjusting the position of the weight 58 relative to the fulcrum of the lever 32, which adjustment would increase or decrease the resistance of the feathering-blades against the force of the wind.

The universal coupling mounted on the hub 25 of the main frame 1, consisting of the keeper-block 24 and ring 23, Fig. 4, is provided with a driving-pin 23^a, which driving-pin 23^a is securely fastened to a projection on the ring 23 and extends laterally toward the wind-wheel and has longitudinal movement in a peripheral projection on the hub 6 of the wind-wheel, the object of the pin 23^a being to provide a positive means of driving or rotating the ring 23 on the sliding block 24 coincident with the rotation of the wind-wheel and still permitting a free and uninterrupted lateral or sliding movement of the entire coupling in the operations of the windmill. By using the pin 23^a for rotating the ring 23 on the keeper-block 24 all torsional strain is taken off the links 22, and their function of operating the crank-rods 18 is thereby unimpaired.

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

1. In a windmill having vertical feathering-blades, a resisting means arranged within the wind-vane of said windmill, a lever pivotally mounted in said wind-vane, one end of said resisting means having adjustable connections with said lever, the other end of the said resisting means having connection with the said wind-vane, shifting bars having adjustable pivotal connection with said lever, the said shifting bars extending on either side of the main frame, the other ends of said shifting bars having diametrically opposite pivotal connection with a slidably-mounted coupling, links having pivotal connection with the said sliding coupling, said links extending into the said wind-wheel and having pivotal connection with crank-rods, which crank-rods are pivotally mounted in the said wind-wheel and being in the same vertical plane as the vertical feathering-blades of the said wind-wheel, and a movable ring arranged in juxtaposition to the feathering-blades of said wind-wheel, said movable ring having pivotal connection with each of said vertical feathering-blades, and also having pivotal connection with the crank-rods, all adapted in their operation to automatically regulate the speed and power of the windmill.

2. In a windmill having vertical feathering-blades, a wind-vane connected with said blades, a resisting means arranged within the wind-vane, a pivotally-mounted lever arranged within the said wind-vane, an adjustable connection between said lever and the blades, a block mounted upon said lever and having direct connection with the resisting means, and manually-operated cables connected with said block and guided to the base of the windmill.

3. In a windmill the combination of vertical feathering-blades, a wind-vane, a resisting means arranged within said wind-vane, a pivotally-mounted lever connected with said resisting means manually-operated devices extending from the base of the tower up to said lever and means for adjusting the point of application of the resisting means upon the lever mounted in the wind-vane frame.

4. In a windmill, the combination of vertical feathering-blades, a wind-vane connected with said blades, a pivotally-mounted lever arranged in the wind-vane, a sleeve adjustably mounted on said lever, means for holding said sleeve and consequently the lever at its proper adjustment, a sliding coupling mounted on the frame of the windmill and having a longitudinal and rotary movement, and an adjustable means connecting the sliding coupling and lever.

5. In a windmill, the combination of vertical feathering-blades, a wind-vane connected with said blades, a pivotally-mounted lever arranged within the wind-vane, adjustable connection between said lever and the blades, an adjustable sleeve mounted upon said lever to give the lever a proper incline, cables connected to said lever, and means for operating said cables to adjust the sleeve upon the lever.

6. In a windmill, the combination of a framework, vertical feathering-blades, a wind-vane connected with said blades, a pivotally-mounted lever arranged within the frame of the wind-vane, means for adjusting said lever consisting of a spring-actuated sleeve adjustably mounted on the lever, a sliding coupling arranged on the frame of the windmill and having longitudinal and rotary movement, and mechanism for giving rotary movement to the said coupling as the wind-wheel rotates.

7. In combination, a windmill comprising a framework, a wind-wheel consisting of a central hub, spokes radiating therefrom, a movable ring secured to said spokes, another ring secured to the outer ends of said spokes, a series of feathering-blades arranged radially upon said framework, the lower ends of said feathering-blades having pivotal connections with said ring, said blades being provided with slots for the passage of said outer ring, a movable ring arranged in juxtaposition to said outer ring, and having pivotal connections with the edge of each of the blades, crank-rods extending from said hub and having pivotal bearings in said inner and outer rings, cranks arranged on the outer ends of said crank-rods and pivotally connected with said movable ring whereby when a pivotal movement is imparted to said crank-rods, a rotary movement is imparted to the movable ring, the movable ring imparting a simultaneous piv-

otal movement to each of said blades, a framework connected with the axle of said wheel, a wind-vane carried by said frame and connected with said blades, a pivotally-mounted lever arranged within the wind-vane, adjustable connection between said lever and the blades, an adjustable sleeve mounted upon the lever to give the lever a proper incline, cables connected with said lever, and means for operating the cables to adjust the sleeve upon the lever.

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