No. 674,100. Patented May 14, 1901.

J. STEIN.

WINDMILL.

(Application filed July 13, 1900.)

(No Model.) 2 Sheets—Sheet 1.

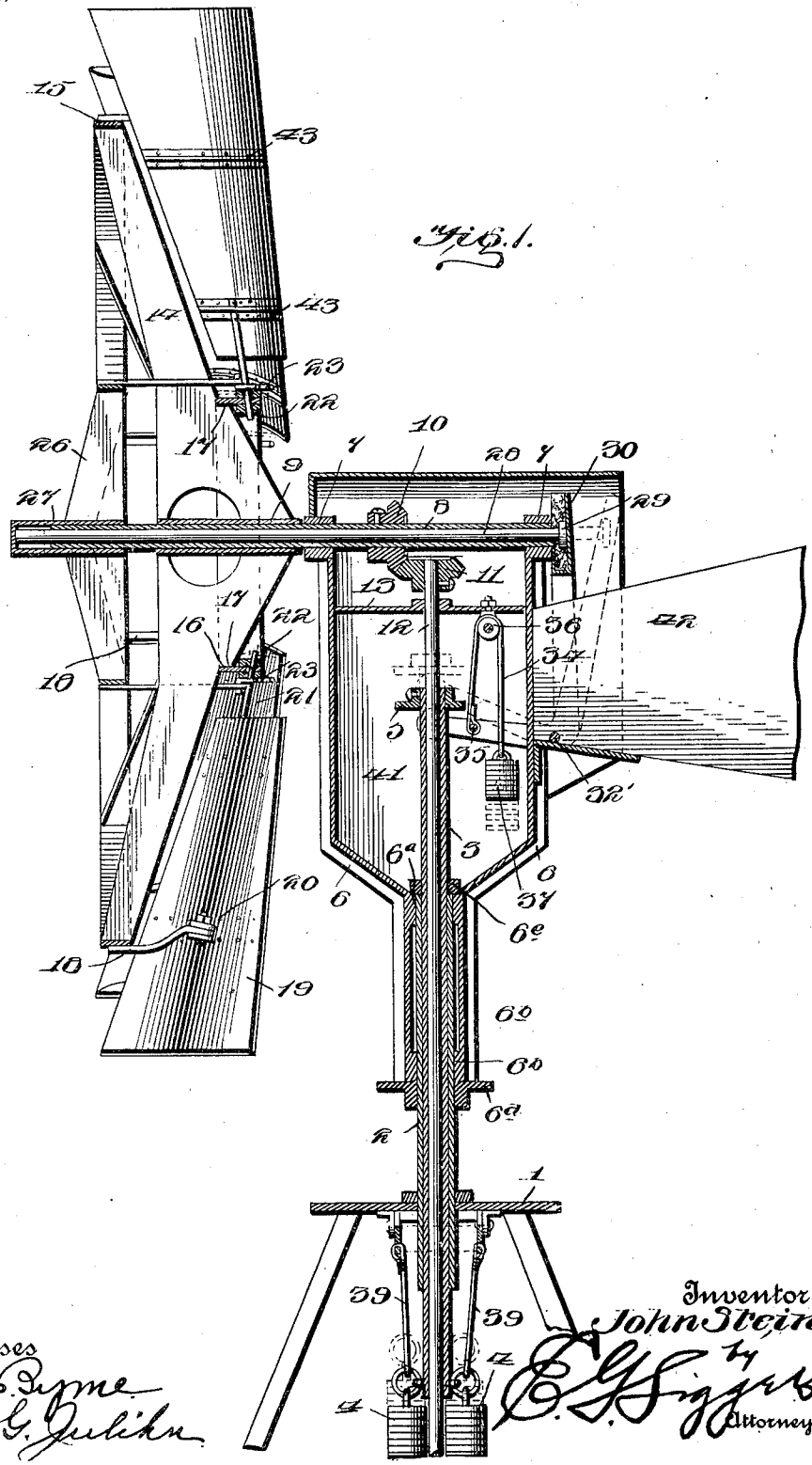


Fig. 1.

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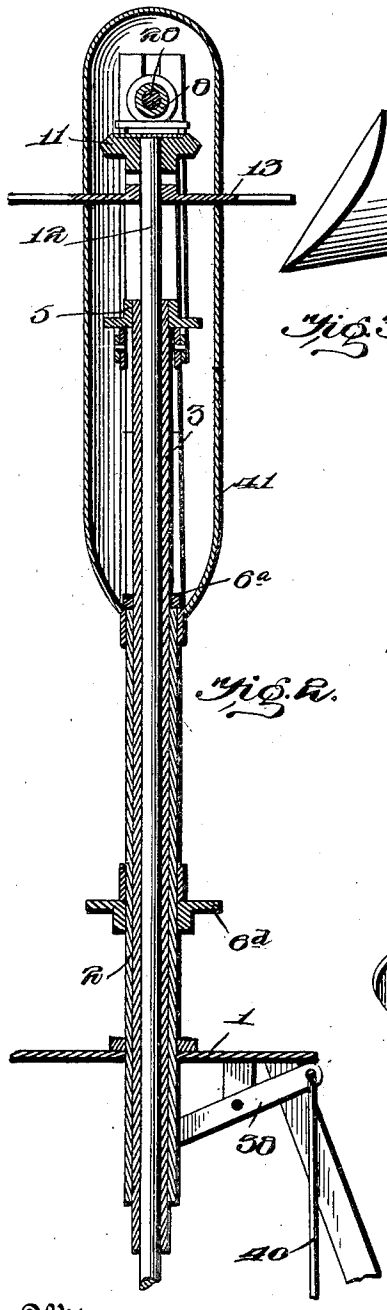


Fig. 2.

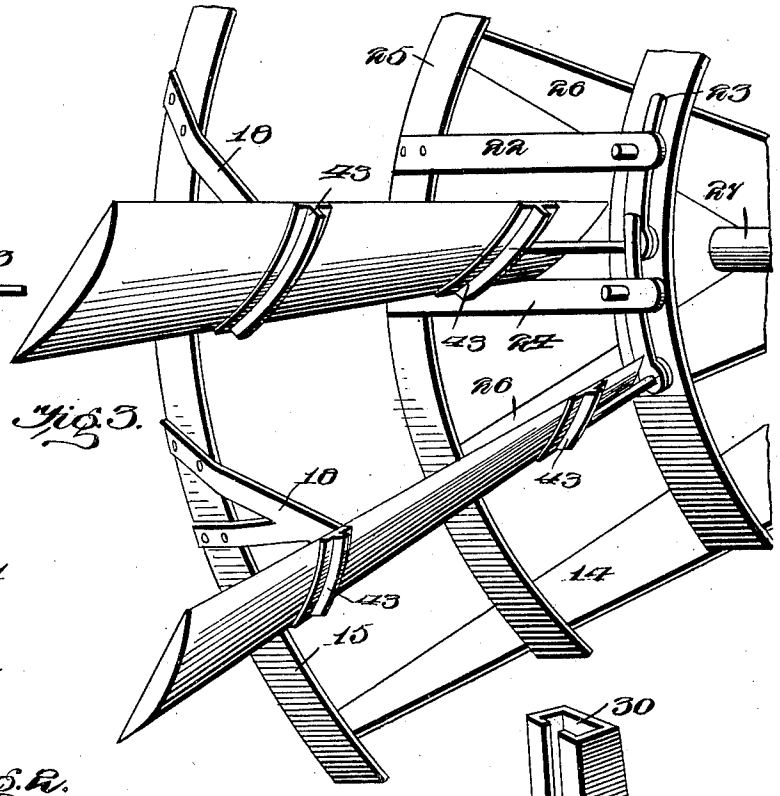


Fig. 3.

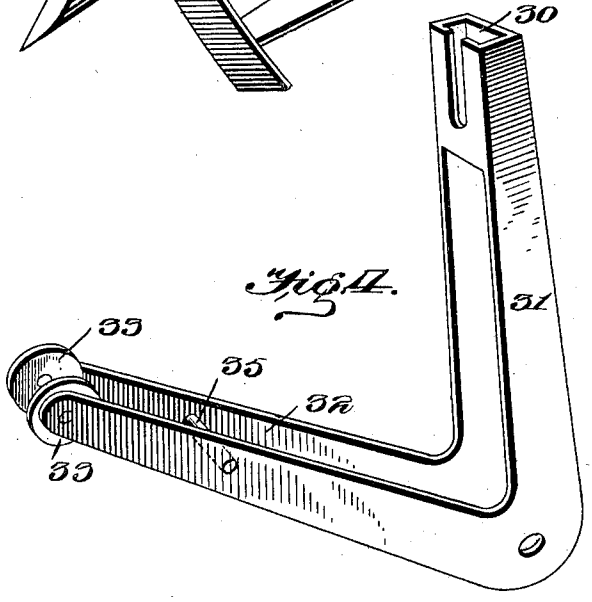


Fig. 4.

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UNITED STATES PATENT OFFICE.

JOHN STEIN, OF FREDERICKSBURG, TEXAS.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 674,100, dated May 14, 1901.

Application filed July 13, 1900. Serial No. 23,521. (No model.)

To all whom it may concern:

Be it known that I, JOHN STEIN, a citizen of the United States, residing at Fredericksburg, in the county of Gillespie and State of Texas, have invented a new and useful Windmill, of which the following is a specification.

My present invention relates to improvements in windmills, and has for one object the production of a mill equipped with an automatic governor for regulating the speed of the windmill and for preventing injury to the apparatus by throwing the blades of the wheel into or out of the wind in a manner to secure the most effective operation of the device at all times.

A further object of the invention is to so construct the governor mechanism that it may be adjusted for the purpose of equipping the wheel for actuation under varying conditions, and a still further object is to produce a mill of simple and durable construction and having all of its operating parts, with the exception of the wheel, housed and protected within the casing composed of separable sections designed to permit ready access to the parts for the purpose of adjustment or repair.

To the accomplishment of the several objects stated the invention consists in the construction and arrangement of the parts herein to be described, illustrated in the accompanying drawings, and defined in the appended claims.

In said drawings, Figure 1 is a central vertical section of the windmill complete, the lower portion of the tower and the lower end of the mill-shaft or pump-rod being broken away. Fig. 2 is a sectional view taken at right angles to the line of section of Fig. 1 and in the plane of the mill-shaft. Fig. 3 is a detail perspective view of a portion of the wind-wheel, and Fig. 4 is a detail perspective view of the governor-lever.

Referring to the numerals of reference indicating like parts in each of the views, 1 indicates the mill-tower, which sustains an elongated bearing-sleeve 2, within which is received a reciprocatory hollow blade-actuating shaft 3, having weights 4 suspended from its lower end and provided at its upper end with a fixed collar 5. The bearing-sleeve 2, which is of course a relatively-fixed part, serves as a support for a pair of vertical bearing-arms 6, connected adjacent to their lower ends by a pair of bearing-sleeves 6^a and 6^b, designed to support the arms in a manner to permit them to revolve around the axis of the sleeve 2, said sleeves being confined between annular flanges 6^d and 6^e upon the sleeve 2. These arms 6 are provided at their upper ends with bearing-boxes 7 for the reception of the revoluble hollow wheel-shaft 8, to which are keyed or otherwise secured the hub 9 of the wind-wheel and a beveled pinion 10. The pinion 10 is keyed upon the wheel-shaft at a point intermediate of the bearing-boxes 7 and is intermeshed with a similar pinion 11, keyed upon the upper end of the mill-shaft or pump-rod 12. The shaft 12 has a bearing in a horizontal bearing-plate 13, carried between the arms 6 just below the pinion 11, and has an extended bearing within the hollow blade-actuating shaft 3, through which it extends to a point at the bottom of the tower, where said shaft or pump-rod is designed to be operatively connected with pumping or other machinery. The wind-wheel, which is carried by and actuates the hollow wheel-shaft 8, is composed of a number of radial spokes 14, extending from the hub 19 and supporting a rim 15 at the ends of the spokes and a blade-carrying band or flange 16, supported upon shoulders 17, formed in the rear sides of the spokes 14 at points between the hub and the rim 15, but somewhat nearer the former.

At suitable intervals upon the rim 15 are provided rearwardly-extending blade-supporting arms 18, corresponding in number to the blades 19, which latter are provided upon their front faces with bearing-ears 20 for pivotal connection with the rear ends of the arms 18. At their inner ends each of the blades 19 is provided with a short blade-shaft 21, extending through the blade-carrying flange 16 and retained in place in any suitable manner, but preferably by nuts 22, screwed upon the shafts 21 and clamping the flange 16. It will thus be seen that the blades 19 are pivotally supported in a manner to permit of their being thrown into or out of the wind by such axial movement as will present their front faces or their edges, as the case may be, to the force of the wind.

For the purpose of causing the simultane-

ous operation of the several blades when thrown into or out of the wind each of the blade-shafts 21 is provided with a radially-extending blade-arm 23, said arms being pivotally connected to the rear ends of a series of actuator-arms 24, extending rearwardly from what may be termed the "blade-actuator" 25. The actuator 25 is in the form of a circular rim supported at the ends of radial spokes 26, springing from a hub 27, mounted to slide upon the end of the hollow wheel-shaft 8 in front of the wheel. Obviously as the hub 27 of the actuator is moved in one direction or the other the actuator-arms 24 will swing the blade-arms 23 and will turn the blades 19 into or out of the wind, as the case may be. Ordinarily the blades are designed to be held into the wind by the maintenance of the actuator in its forward position, as shown in Fig. 1 of the drawings. To accomplish this end, a reciprocatory governor-rod 28 is passed through the hollow wheel-shaft 8 and has its front end extended into the actuator-hub 27 and attached thereto in a manner to cause the reciprocation of the hub upon the front end of the wheel-shaft as the governor-rod 28 is moved longitudinally in one direction or the other. At its opposite or rear end the rod 28 is provided with a head 29, retained within a stuffing-box 30, formed at the upper end of one arm 31 of a bell-crank governor-lever fulcrumed upon a stud 32', extending from one of the arms 6. At the end of the other arm 32 of the lever, which is preferably of double form, are mounted a pair of antifrictional rollers or disks 33, disposed directly under the collar 5 upon the blade-actuating shaft 3. Assuming the shaft 3 to be weighted, as stated, the collar 5, carried at its upper end, will depress the arm 32 of the lever and will cause the arm 31 to be swung forward to operate the governor-rod 28 for the purpose of reciprocating the blade-actuator in a direction to throw the blades into the wind. If, however, the wind has attained a greater velocity than is contemplated by the resistance opposed by the weights 4, the blades will be automatically turned out of the wind, which will force the actuator rearwardly, reciprocating the rod 28, oscillating the governor-lever, and causing the blade-operating shaft 3 to be raised to the position indicated in dotted lines in Fig. 1 against the resistance of the weights 4.

For the purpose of cushioning the movement of the parts and to insure the oscillation of the lever to retract the actuator when the shaft 3 is elevated for the purpose of throwing the wind-wheel out of gear I connect one end of a cable 34 with a cross-bar 35, carried by the lever-arm 32, and after passing said cable around a pulley 36, supported at the under side of the plate 13, a weight 37 is suspended from its opposite end. The weight 37 exerts a constant force, tending to oscillate the lever and to throw the wheel-blades out of the wind; but ordinarily this tendency is overbalanced by the weight of the blade-operating shaft 3 and the superior weights 4, connected to the lower end thereof. For the purpose of operating the shaft 3 to release the governor-lever when it is desired to throw the mill out of operation I provide a lever 38, fulcrumed upon a bracket depending from the platform of the tower and having a bifurcated end connected through pitmen 39 with the shaft 3. If desired, the opposite end of the lever 38 may be connected to a cable 40, extending downwardly to within reach of an operator standing upon the ground, a pull upon said cable serving to elevate the hollow shaft 3 to release the governor-lever and permit the weight 37 to oscillate the lever, and thereby effect sufficient movement of the actuator to throw the wheel-blade out of the wind.

For the purpose of protecting the mechanism located at the rear end of the wheel-shaft a sectional housing or casing 41 is mounted upon the opposite sides of the arms 6, and from the rear open end of this casing extends the tail-vane 42, secured at its inner end to the adjacent arm 6 and braced by the usual brace-wires. While the blades 19 may be of various forms so long as they are capable of axial movement into or out of the wind, I prefer to construct them of light sheet metal transversely curved somewhat and having end walls at their outer extremities, which practically convert the blades into pockets designed to more effectually receive the impact of the wind.

The operation of my device is as follows: The wind striking against the tail-vane 42 will rotate the frame composed of the arms and housing upon the bearing-sleeve 2 and will present the wind-wheel squarely before the wind. The superiority of the weights 4 over the somewhat-smaller counterweight 37 will hold the blade-actuator in its forward position and will consequently present the wheel-blades effectually before the wind. If at any time it is desired to throw the wheel out of the wind for the purpose of discontinuing the operation of the mill, it is simply necessary to exert a pull upon the cable 40, which will cause the blade-actuating shaft 3 to be raised to remove the collar 5 out of effective proximity to the governor-lever. The counterweight 37 will now cause the governor-lever to be oscillated, retracting the governor-rod 28 and removing the actuator 25 and swinging the blades 19 into positions edgewise to the wind. If, however, during the operation of the mill the wind attains a velocity which endangers the integrity of the working parts of the mill, the blades will be forced back against the resistance opposed by the weights 4, it being obvious that the mill may be set for automatic regulation at any desired speed by adding to or taking from the weights 4 in an obvious manner.

Attention may be called to the fact that the weight 37 takes up all play in the connections

of the operative parts and constantly urges the rollers 33 against the collar 5 to take up the end play of the blade-actuating shaft 3 when the blades are out of the wind.

From the foregoing it will be seen that I have produced a simple, durable, and efficient windmill comprehending mechanism by means of which the various objects stated may be accomplished; but while the present embodiment of my invention appears at this time to be preferable I wish to reserve the right to effect such structural changes and variations as may be desired by the skilled constructor and which may be comprehended within the spirit of the invention.

What I claim is—

1. In a windmill, the combination with a wheel comprising a series of individually-movable blades, an actuator common to the several blades, and a governor-rod connected to the actuator, of a governor-lever connected to said rod, means for urging said lever to throw the blades out of the wind, and a weighted blade-actuating shaft having a projection disposed across the path of movement of said lever to hold the blades into the wind by preventing the actuation of the governor-lever.

2. In a windmill, the combination with a wheel comprising a hollow shaft and a series of individually-movable blades, of an actuator common to the several blades and slidably supported upon the wheel-shaft, a governor-rod connected to the actuator and extended through the wheel-shaft, a weighted bell-crank lever connected to the governor-rod at the end opposite the actuator, and a weighted blade-actuating shaft provided with a collar disposed directly across the path of movement of the bell-crank lever to hold the blades in the wind by preventing the actuation of the governor-lever.

3. In a windmill, the combination with a wheel comprising a series of individually-movable blades, of a hollow wheel-shaft, an actuator common to the several blades, a governor-rod extending through the wheel-shaft and connected to the actuator, a mill-shaft geared to the wheel-shaft, a weighted bell-crank lever connected to the governor-rod, and a hollow blade-actuating shaft encircling the mill-shaft and operatively connected with the bell-crank lever.

4. In a windmill, the combination with a tower and elongated bearing-sleeve, of a supporting-frame rotatably mounted upon said sleeve, a weighted blade-actuating shaft movable within the sleeve, and a mill-shaft extending through the blade-actuating shaft, of a hollow wheel-shaft journaled in the bearing-frame, a wheel mounted upon said shaft and provided with individually-movable blades, an actuator slidably mounted upon the hollow wheel-shaft beyond the wheel and operatively connected with the several blades, a governor-rod connected to the actuator and extended through the wheel-shaft, gearing intermediate of the wheel-shaft and mill-shaft, a bell-crank governor-lever pivoted upon the bearing-frame and connected at one end to the extremity of the governor-rod, an adjustable weight exerting a constant tendency upon the governor-lever to throw the blades out of the wind, means carried by the blade-actuating shaft arranged to obstruct the movement of the governor-lever, adjustable weights carried by the blade-actuating shaft, and means for operating said shaft in opposition to its weights to effect the release of the governor-lever for the purpose of permitting the blades to be thrown out of the wind.

5. In a windmill, the combination with a bearing-sleeve, supporting-frame and a wheel provided with a series of individually-movable blades, of a wheel-shaft, an actuator common to the several blades, a governor-rod connected to the actuator, a mill-shaft geared to the wheel-shaft, a weighted lever connected to the governor-rod, and a hollow blade-actuating shaft encircling the mill-shaft and extending through the bearing-sleeve for operative connection with said lever.

6. In a windmill, the combination with a wheel comprising a series of individually-movable blades, of a wheel-shaft, an actuator common to the several blades, a governor-rod connected to the actuator, a mill-shaft geared to the wheel-shaft, a weighted lever connected to the governor-rod, a hollow blade-actuating shaft encircling the mill-shaft, and a collar carried by the blade-actuating shaft and disposed to obstruct the path of movement of the lever.

7. In a windmill, the combination with a wheel comprising a series of individually-movable blades, of a wheel-shaft, an actuator common to the several blades, a governor-rod connected to the actuator, a mill-shaft geared to the wheel-shaft, a bell-crank lever connected to the governor-rod, and a weighted blade-actuating shaft encircling the mill-shaft and provided with a projection disposed above the horizontal end of the bell-crank lever.

8. In a windmill, the combination with a tower and a fixed bearing-sleeve, of a bearing-frame rotatably carried by said sleeve, a wheel-shaft journaled in the bearing-frame, a wheel carried by said shaft, a mill-shaft geared to the wheel-shaft, governor mechanism supported by the bearing-frame and operatively connected with the wheel, a blade-actuating shaft passed through the sleeve and connected to the governor mechanism, weights carried by said shaft below the sleeve, and a removable casing entirely inclosing the bearing-frame, governor mechanism and gearing, said blade-actuating shaft being hollow for the reception of the mill-shaft.

9. In a windmill, the combination with a tower and bearing-sleeve, of a wheel, wheel-shaft and governor mechanism in coöperative

relation and mounted above the sleeve, a weighted blade-actuating member passed through and below the sleeve and having operative connection with the governor mechanism above said sleeve and a mill-shaft passing through the blade-actuating shaft and geared to the wheel-shaft.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

JOHN STEIN.

Witnesses:
C. A. ADAMS,
W. D. GARLOCK.