(No Model.)

W. H. & C. A. HOLCOMBE.

WINDMILL.

No. 271,635. Patented Feb. 6, 1883.

Fig. 1.

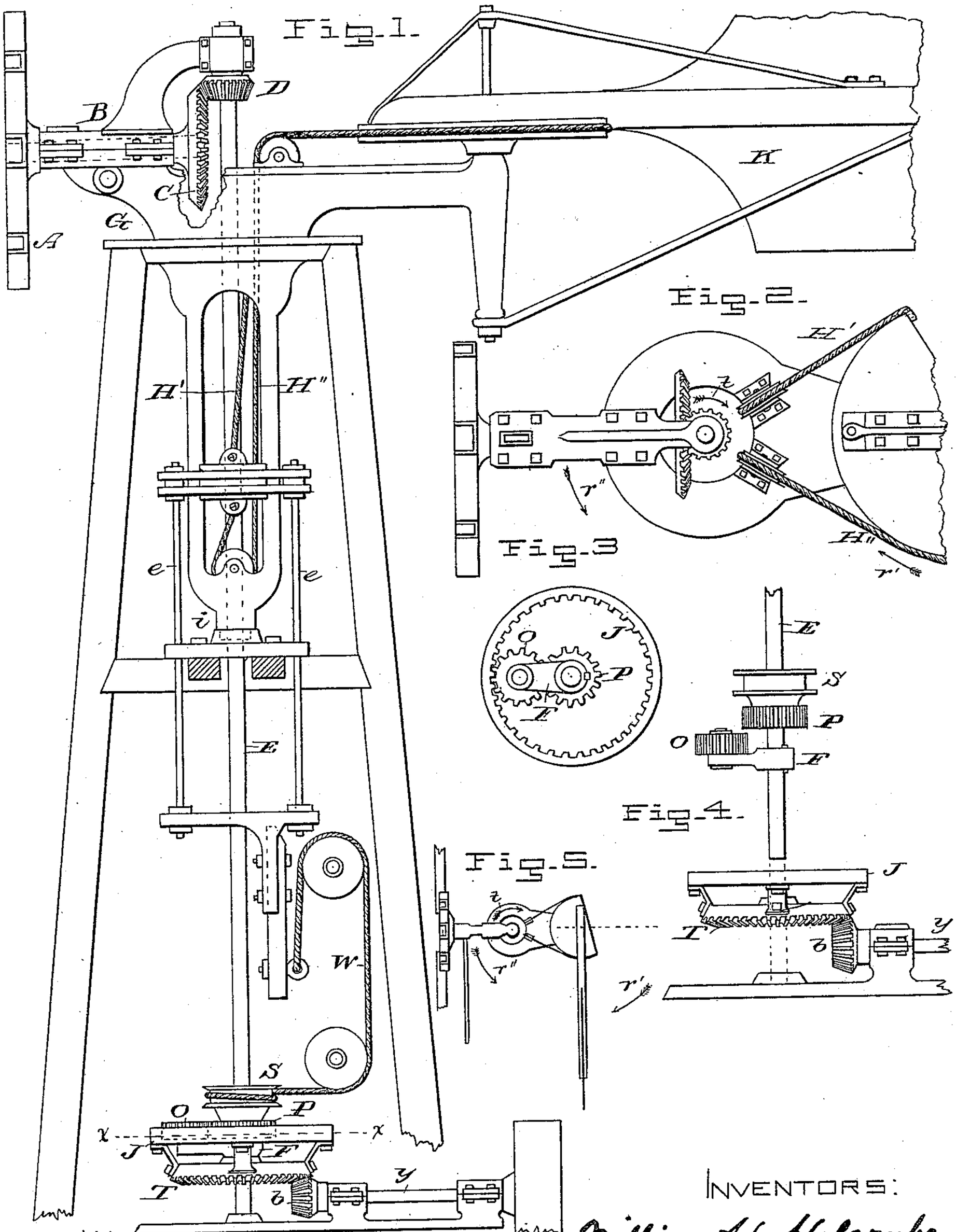

Fig. 2.

Fig. 3

Fig. 4.

Fig. 5.

WITNESSES:

Jas. F. Duhamel.

Walter S. Dodge.

INVENTORS:

William H. Holcombe,

Clifford A. Holcombe,

by Dodger Son,

Attys.

UNITED STATES PATENT OFFICE.

WILLIAM H. HOLCOMBE AND CLIFFORD A. HOLCOMBE, OF BELOIT, WIS.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 271,635, dated February 6, 1883.

Application filed July 10, 1882. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM H. HOLCOMBE and CLIFFORD A. HOLCOMBE, citizens of the United States, residing at Beloit, county of Rock, and State of Wisconsin, have invented certain new and useful Improvements in Windmills, of which the following is a specification.

Our invention relates to improvements in windmills in which the rotary motion of the wind-wheel is transmitted through gearing and shafting and the windmill is regulated automatically by connecting rods, ropes, or chains and an intermediate gear-arm and drum; and the objects of our invention are, first, to hold the wind-wheel to the wind when in operation, and, second, to assist in regulating the speed of the machinery and governing the mill by operating on the rudder-vane to turn it to or from the wind. We accomplish these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a perspective elevation of the machine. Fig. 2 is a vertical bird's-eye view of windmill. Fig. 3 is a top view of the gearing and arm at dotted line X X. Fig. 4 is a perspective view of same gearing, with each part raised up on the shaft apart from each other to more clearly show their construction. Fig. 5 is a top view of the mill with the wheel and rudder-vane turned out of the wind and parallel with each other.

Similar letters refer to like parts in the different views.

A, Fig. 1, represents the wind-wheel, and dotted lines B the wheel-shaft with a bevel-gear, *c*, keyed to it. The gear *c* operates the pinion D, and the rotary motion is transmitted through the upright shaft E, arm F, pinion O, gear J and T to pinion *b* and shaft *y*.

The different parts of the windmill are supported on a suitable frame, G, which rests on a pivot, I, which allows the mill to turn in any direction. The mill is provided with a rudder-vane, K, which, as shown, is pivoted to one side of the upright shaft E; but it may be pivoted or hung around said shaft.

When the mill is at work the face of the wheel A is to the wind and the rudder-vane stands in line with the wind and at right angles with the face of the wheel. In this position they are prevented from coming toward each other in the opposite direction from that indicated by the arrows *r' r''* by suitable stops, so that the wind-wheel and rudder-vane are always rigid on that side when in full working position, and can only approach each other for regulating purposes in the direction indicated by the arrows *r' r''*. When the motion of the shaft E meets with resistance from any work required at *y* the tendency of the gear *c* is to travel around the pinion D in direction of the arrow *t*, Fig. 2, which in mills as heretofore constructed would prevent the mill from being regulated automatically by the wheel and rudder turning toward each other in the direction of the arrows *r' r''*, Fig. 2, as they should, because said movement around pinion D in direction of arrow *t*, Fig. 2, keeps the wind-wheel in a position where it is impossible to fold out of the wind, and in a heavy gale the result would be the breakage of some part of the mill or machinery. Through this travel of wind-wheel in said direction of arrow *t*, Fig. 2, the rudder-vane is forced around against the wind in direction of arrow *r'*, Fig. 2, and in this position the wind-wheel is to one side of the line of the wind and the rudder-vane is on the opposite side of said line, being rigid on the lee side without any chance to fold up on this lee side. It is easily seen that the wind-wheel must come around square to the wind in the direction of the arrow *r''*, Fig. 2, before it can begin to fold with the rudder-vane and regulate by the help of the devices now in use. Besides, as the gear *c*, traveling in the direction indicated by the arrow *t*, Fig. 2, carries the wind-wheel in same direction partially out of the wind, the speed is slackened and the power diminished, when the wind, acting on the rudder-vane with the wind-wheel partly out of the wind and speed slackened, forces the wheel back to the wind, the velocity of the wheel is at once increased, and the machinery subjected to great strain; but the resistance at *y* causes a repetition of the travel of gear *c* and wind-wheel in direction of arrow *t*, as described. This frequent repetition of going in and out of the wind at the wrong side produces great inequality in speed and a great strain on the machinery by the suddenness of these changes.

In our machine the drum S and pinion P are fastened together and fit loosely on the shaft E. The arm F, Figs. 3 and 4, is securely fastened to the shaft E and supports the pinion O by a stud or wrist-pin, upon which the pinion turns. The internal gear, J, and gear T are also fastened together, and are loose on the shaft E. The drum S is connected with the rudder-vane of the windmill by means of the rope or chain W, rods *e e*, and ropes or chains H′ H″.

The operation of the device is as follows: When the shaft E revolves by the force communicated to it from the wind-wheel A through gear *c* and pinion D, the arm F, fastened upon the shaft E, communicates the motion through pinion O and gears J and T to pinion *b* and shaft *y*. All the power of the wind-wheel is transmitted through the arm F either to the shaft *y* or to the rudder-vane K by the proper connections, as shown. The resistance of the machinery on shaft *y* produces the tendency heretofore described of gear *c* to travel in the direction of arrow *t*, Fig. 2, running the wheel out of the wind on the wrong side; but at the same time the said resistance at *y* acts as a brake on gear J and compels pinion O to revolve pinion P and drum S, winding up the rope W, and so forcing the rudder-vane against the wind in the direction of the arrow *r*″, Fig. 2, and the force of the wind against that side of the rudder-vane holds the wind-wheel in position to the wind and prevents the gear *c* from traveling around pinion D.

When the windmill is in operation the power of the mill and the resistance of the driven machinery is constantly and perfectly balanced or equalized by alternately winding or unwinding the rope W on the drum S, as described.

We are aware that windmills as now constructed for pumping purposes, where the work is done by crank-and-pitman motion, are practically self-regulating; but the same self-regulating devices, when applied to geared mills, are rendered ineffectual, because the tendency of the gear *c* to travel around pinion D, as already described, overbalances and destroys the force of the regulating device of a crank-mill to control the geared mill and prevents the wheel from regulating automatically, from folding out of the wind, and from being kept in the wind by the devices suitable to a crank-mill. By the use of our device the tendency to travel around the pinion D is transferred to the rudder-vane and forces the vane around against the wind in the direction of the arrow *r*′, Fig. 2, and in that way the wind-wheel is held in position squarely to the wind, so that the regulating devices may operate as intended and control the mill.

We have shown our regulating gearing-arm and drum in position at the lower end of shaft E, near the driven machinery; but it may be placed at or near the top and be connected directly with the rudder-vane, and so dispense with a portion of the intermediate connecting-rods.

Having thus fully described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In a windmill, the automatic governing device, consisting of the drum S, pinion P, internal gear, J, arm F, and pinion O, substantially as described.

2. In a windmill, the combination of the rudder-vane with the drum S, pinions P and O, internal gear, J, and arm F, and connecting ropes or chains W and H′ H″, substantially as described, for the purpose specified.

3. In a geared windmill, the combination of the wind-wheel, the rudder-vane, and an automatic governing device, substantially such as described, whereby the position of the rudder-vane to the wind is caused to be regulated in proportion to the force of the wind and the power required, substantially as set forth.

4. In a geared windmill, the combination of the wind-wheel and rudder-vane, and means, substantially such as shown, whereby the power of the wind-wheel is exerted equally on the driven shaft *y* and rudder-vane K, substantially as explained.

5. In a geared windmill, the combination of an upright shaft geared with and driven by a wheel on the wind-wheel shaft, a loose drum connected by chain or band with a pivoted rudder, a loose gear for transmitting motion to other machinery to be driven, and an intermediate connection, substantially such as shown, between the transmitting-gear and the drum, whereby the position of the rudder is regulated and adjusted proportionately to the resistance offered and the force of the wind.

WILLIAM H. HOLCOMBE.
CLIFFORD A. HOLCOMBE.

Witnesses:
E. S. GREENE,
ROBT. H. TODD.