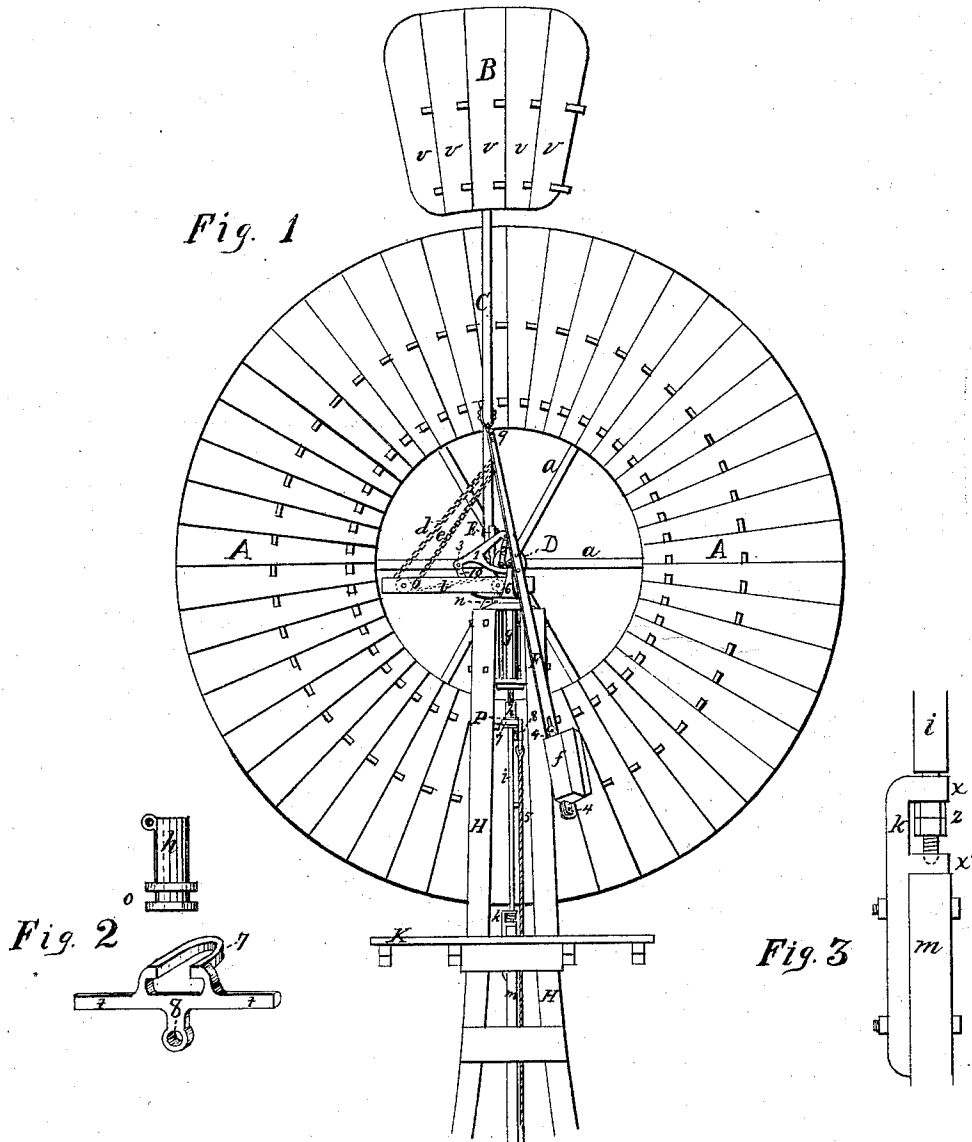


M. CROSSMAN.
WIND-MILL.

No. 170,063.

Patented Nov. 16, 1875.



Witnesses

Dr. H. Faulkner.

Frank S. Hendon.

Inventor

M. Crossman

per Welles Bros
Att'y

M. CROSSMAN.
WIND-MILL.

No. 170,063.

Patented Nov. 16, 1875.

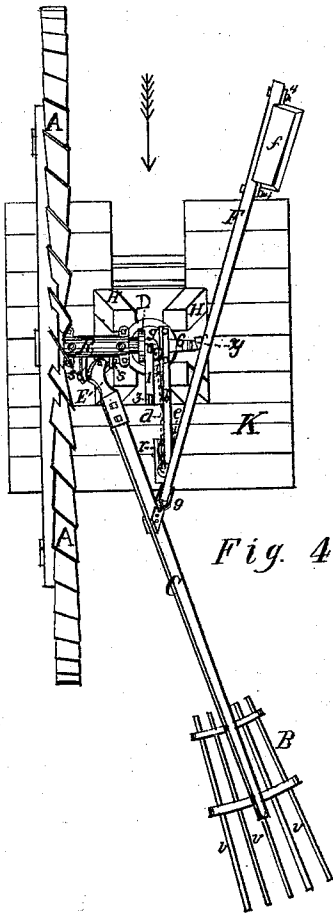


Fig. 4

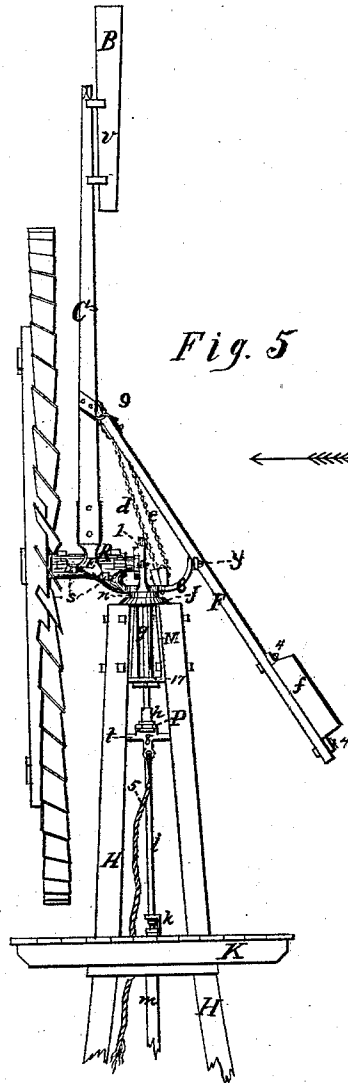


Fig. 5

Witnesses
G. H. Faulkner.
Frank S. Henderson

Inventor
M. Crossman
per Welles Bros
Att'y

M. CROSSMAN.
WIND-MILL.

No. 170,063.

Patented Nov. 16, 1875.

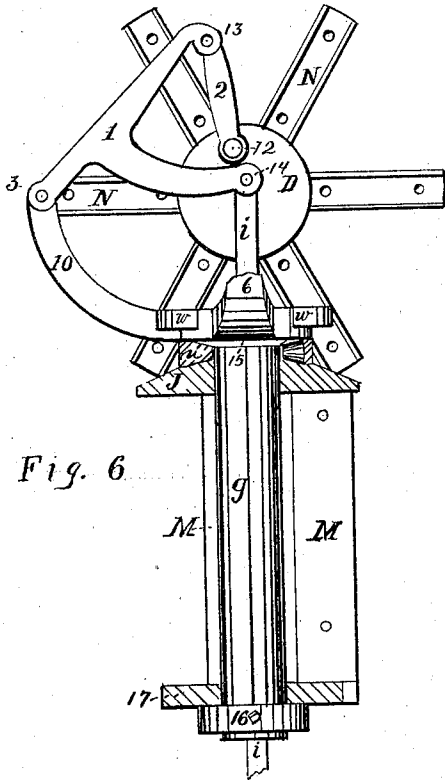


Fig. 6

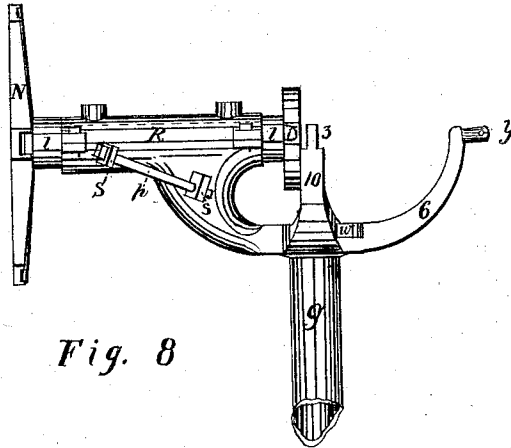


Fig. 8

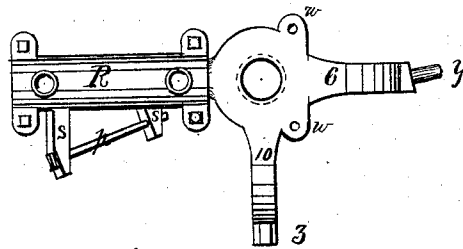


Fig. 9

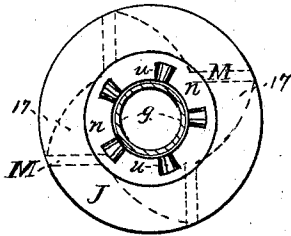


Fig. 7

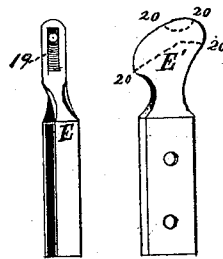


Fig. 10

Witnesses

W. H. Faulstich,
Frank S. Henderson

Inventor

M. Crossman
per Welles Bros
Atty

UNITED STATES PATENT OFFICE.

MONTGOMERY CROSSMAN, OF MARSHALL, MICHIGAN, ASSIGNOR OF ONE-HALF HIS RIGHT TO PRATT A. SPICER, OF SAME PLACE.

IMPROVEMENT IN WINDMILLS.

Specification forming part of Letters Patent No. **170,063**, dated November 16, 1875; application filed August 2, 1875.

To all whom it may concern:

Be it known that I, MONTGOMERY CROSSMAN, of the city of Marshall, State of Michigan, have invented certain new and useful Improvements in Windmills, of which the following is a full and accurate description, when taken in connection with the accompanying drawings, and the letters and figures of reference thereon.

Like letters and figures refer to like parts in the different figures.

My invention relates to that class of windmills that are built with "solid wheels."

Figure 1 is a face view of the wheel as "in the wind" and running. Fig. 2 is an enlarged view of the sliding swivel upon the pitman. Fig. 3 is an enlarged view of the pitman-swivel *k*. Fig. 4 is a top view of the mill as thrown "out of the wind" and at rest. Fig. 5 is a side view of the mill in the wind and running. Fig. 6 shows the pitman and face plate connections, and a section of the main socket. Fig. 7 is a plan of the main socket ring and rollers, and a cross-section of the main pivot. Fig. 8 is an enlarged side view of the main shaft and pivot. Fig. 9 is a top view of the main pivot. Fig. 10, a side and edge view of the regulator-hinge E.

A A is the wheel, built upon the spider N, shown upon a larger scale in Figs. 6 and 8. This spider N, face-plate D, and shaft *l*, are all cast in one solid piece, thus avoiding the annoyance of keys or set-screws, which are always liable to get loose. B is the regulating-vane, having its wings *v v v* set at an angle similar to those of the wheel. The staff C of the vane is attached to the bearing R of the main shaft *l*, by a hinge, E, of peculiar shape, so arranged as to revolve the staff C, and, of course, its vane B, (when brought over from a vertical to a horizontal position,) through an angle nearly equal to that of the wings with the plane of the wheel, so that when the vane and arm C assume a horizontal position the breadth of the wings *v v* lies in vertical planes. This movement is accomplished by the arrangement of the parts of the hinge E, as shown in detail in Figs. 8, 9, and 10. There are two short arms, *s s*, upon the side of the bearing R—that next to the

wheel being the longer—through which passes a bolt, *p*, on which the hinge E vibrates, and forms the axis of the joint. This bolt *p* makes an angle with both the vertical and horizontal planes passing through the axis of the wheel, each about equal to one-half that through which the vane B is required to revolve—the angles as at present used being about eighteen degrees.

Fig. 10 shows two views of that part of the hinge that is bolted to the staff C. E shows the edge toward the wheel. 19 is the opening through which the bolt *p* passes, slotted vertically to admit of a slight rocking motion in the direction of the length of the bolt *p*, to allow of the vane B being brought round toward that side of the pivot opposite the wheel, as it assumes a horizontal position. E' is a side view of the hinge. 20 20, dotted lines, showing the general form of the slot 19. F, Figs. 1, 4, and 5, is a weighted lever, hinged at its upper end to the staff C by interlocking clevises, or some equivalent joint. This lever has its fulcrum at *y* upon the curved supporting-arm 6. A weight, *f*, upon the end of F holds the vane B in an upright position. The bearing or fulcrum *y* has its axis in a line drawn from the center of the bolt *p*. The stop-chain *e* is attached at its upper end to the arm F, and at its lower end to the pulley-arm *b*, and serves to hold the vane from passing over beyond an upright position, and straining the hinge E against the bearing R. The chain *d* is attached to the upper end of F, passes down around the pulley at the outer end of the pulley-arm *b*; thence over another pulley directly over the pivot *g*; thence down through the pivot, and is attached to an eye in the sliding collar *h* of the swivel P on the pitman-rod *i*. The above-described regulator is novel in its arrangement, simple in construction, and effective and durable in operation.

The swivel P is shown in detail in Fig. 2, where *h* is the sliding collar, pierced vertically with a square hole corresponding in size to the square pitman-rod *i*, in which it slides freely. On its outer periphery is a groove, *o*, in which the yoke 7 fits loosely. Below the yoke is a cross-bar, *t t*, and a short arm, 8, having an

eye in its lower end for attaching the rope or wire 5, which reaches down to the bottom of the tower on which the mill runs. The bar t rests between the upright timbers H, or against the mast, when one is used, thus preventing the rope 5 from coiling round the pitman-rod m , and at the same time permitting the chain d , with its attached collar h , to be carried round as the mill shifts with the wind.

I thus avoid the use of expensive guide-rods for carrying the yoke or clutch 7 8, and yet accomplish the object by a much simpler and cheaper device.

J M 17 is the socket in which the pivot plays. This is shown in more detail in Figs. 6 and 7, where J is the upper plate resting upon the top of the timbers H. 17 is the lower plate occupying the central space between the timbers. These two plates are perforated centrally to receive the hollow pivot g . Connecting these two plates are broad flat bars M, to which the timbers H of the tower are bolted, making a simple and exceedingly strong connection for the timbers.

Playing loosely between the shoulder of the pivot and the upper plate of the socket J is a ring, n , in the inner periphery of which are several recesses, in which are placed rollers u , on which the whole weight of the mill and its attachments rests, thus forming a turn-table on which the mill easily turns with the shifting wind, or in obedience to the regulator B.

The pitman and face-plate connection are shown on a larger scale in Fig. 6. The Y-shaped lever 1 is hinged to the supporting-arm 10 at 3. One arm of this lever is hinged to the pitman-rod i at 14. The other arm is connected with the wrist-pin 12 on the face-plate D by means of the short link 2 jointed to 1 at 13.

By means of this simple arrangement the rotary motion of the face-plate is converted into a nearly vertical motion of the pitman-rod, thus avoiding the necessity of a large pivot to give room for the motion of the pitman-rod, as is the case when attached directly to the wrist-pin.

Another very important advantage gained is, that the upward stroke of the pitman requires over one-half a revolution, while the downstroke is accomplished by as much less, thus giving the advantage of leverage when pumping.

I do not in this application claim the above-described devices, consisting of the link 2, Y-shaped lever 1, and face-plate D, in connection with the pitman-rod, as claims for such devices are incorporated in and form part of a distinct application of mine for improvements in devices for converting motion.

The upper portion i and lower portion m of the pitman-rod are connected together by means of a swivel-joint, k , (shown on a larger scale in Fig. 3.) The lower end of i is rounded and screw-threaded. This part passes freely through the bearing x , while the tip rests in a cavity in x' , or simply abuts against x' . A nut and jam-nut, z , secure the two parts, and, in connection with x and x' , provide for taking up the wear of the parts, and at the same time provide against

lost motion and undue vibration. m is a square rod, of wood, bolted to k , and playing freely in square bearings below, and reaching down to the point of application of the power. $w w$ are the ears to which the pulley-arm b is bolted. K is the platform on the tower.

The operation of the mill will be understood by reference to Figs. 1, 4, and 5. The arrows indicate the direction of the wind. Since the wings v of the vane B are set at an angle similar to those of the wheel, the pressure of the wind tends to force the vane over to the left, (see Fig. 1,) or toward the observer. (See Fig. 5.) This tendency is opposed by the weight f . When the pressure rises above a certain amount, to which the weight and its lever-arm have been previously adjusted, the vane B is thrown out of its vertical plane and exerts a side pressure greater or less as the vane recedes from or approaches to a vertical position, thus tending to turn the wheel edgewise to the wind. When the staff C and vane B are brought to a horizontal position, the wheel is held firmly with its edge to the wind, and ceases to revolve, since, by the peculiar construction of the hinge E, the vane B has been made to revolve on its longitudinal axis so far as to bring the breadth of its wings into vertical planes, converting the vane into a simple rudder. Again, the proportion of the lever-arms y 9 and 9 E, and the position of their combined axis of motion, are such that, although the vane, when vertical, stands nearly parallel to the plane of the wheel, when horizontal, it is brought round partly to that side of the pivot opposite the wheel, as shown in Fig. 4, so that the tendency of the action of the wind to force the wheel back into the wind is opposed by its action on the vane. As the vane turns over, the angular setting of the wings loses its power to control the motion of the vane while the leverage of the weight f is increasing; but this is again offset in part by the fact that the wheel has moved partly round, and now the wind, by its friction on the wings and direct impact upon the staff C and ribs of the vane, will actually, in practice, in severe gales, hold the vane in nearly a horizontal position, and consequently the wheel edgewise, to the wind and stop it.

The rope or wire 5 furnishes a means of stopping the mill whenever desired.

The mill will be seen to be in all its parts of great simplicity, strength, and durability, having but few points of friction, and those relieved and reduced to the minimum. It is peculiarly adapted to the wants of farmers and railroads, for pumping, for which purpose the mill is especially designed.

I am aware that casting several parts in one solid piece is a common practice in the art of constructing machinery, but know of no instance where it has heretofore been applied in the construction of the main shaft and its attachments in a windmill.

I am aware that the Patent No. 119,972, granted to Crossman and Spicer, exhibits a regulator so hinged as to vibrate in a plane ob-

lique to that of the wheel; but the axis of the hinge at the foot of the vane-staff there exhibited makes only a horizontal angle with the axis of the wheel, that axis being coincident with the line from it to the bearing of the weighted lever, and forming the principal axis on which the regulator, taken as a unit, turns; hence the wind-wings, being of necessity oblique to this axis when standing upright, remain oblique to it throughout the whole extent of their vibration, and, therefore, any front action of the wind upon the vanes exerts the same tendency to turn the regulator upon this principal axis throughout its entire limits. On the contrary, in my hinge, as shown in Figs. 8, 9, and 10, the axis p of the hinge, together with the loose joint at 9, Fig. 5, making a vertical angle with the principal axis $p y$, the breadth of the vanes is brought gradually into planes perpendicular to the principal axis $p y$, and hence any front action of the wind upon the vanes v gradually loses power to turn the regulator down as it approaches the horizontal limit of its vibration, and herein consists the novelty of the device.

I am also aware that sliding collars and clutches or yokes have been heretofore used for chain or rope swivels upon the pitman-rods of windmills and are not new; but these have had their yokes or clutches carried by guide-rods or some similar device attached to the mast or tower of the windmill.

I am aware that sockets have been long in use for uniting the timbers of a windmill-tower; but these have thus far been tubular and confined to the timbers by means of encircling rings with arms and nuts.

I am aware, also, that swivel-joints have been before used to connect the two parts of the pitman-rod of windmills; but I am aware of no provision of a second bearing, as x' , to give greater steadiness and firmness to the coupling.

Therefore, I do not broadly claim the several devices referred to in the above limiting paragraphs; but

What I claim as new, and desire to secure by Letters Patent, is—

1. In a regulator for a windmill, the hinge consisting of the parts s , s , p , and E , when arranged and combined with the regulator and with the windmill, substantially as and for the purpose as shown and specified.

2. In a windmill, the bar $t t$, in combination with the yoke or clutch 7 of the swivel P and with the timbers H of the tower, when arranged and operated substantially as and for the purpose shown and described.

3. In a windmill, the socket $J M 17$, in combination with the timbers H of the tower and the pivot g , when constructed and arranged substantially as and for the purpose shown and specified.

4. In a windmill, the swivel-joint k , having a second bearing, x' , in combination with the two parts of the pitman-rod, when constructed and arranged substantially as and for the purpose shown and specified.

MONTGOMERY CROSSMAN.

Witnesses:

PRATT A. SPICER,
J. C. WELLES.