

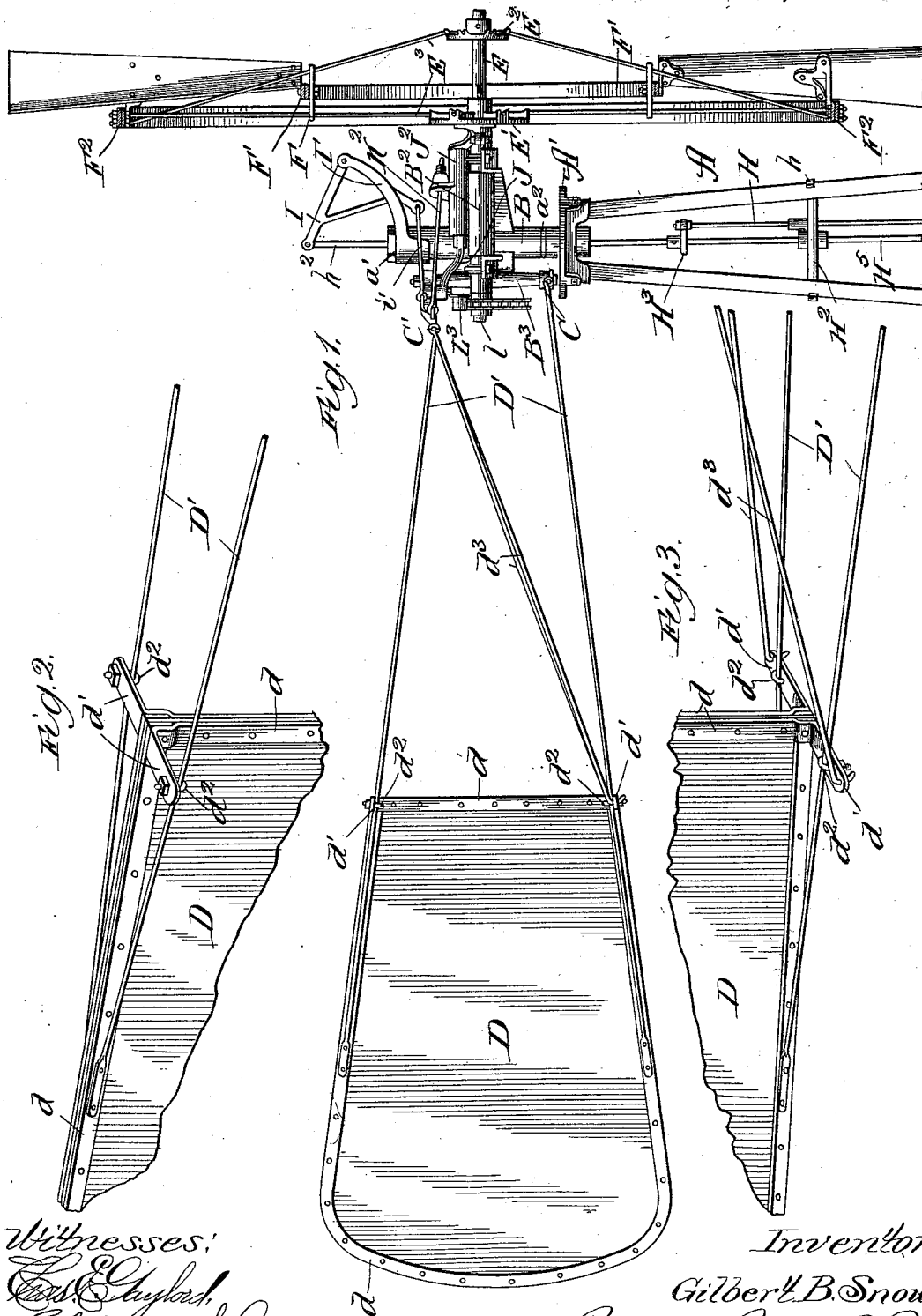
(No Model.)

5 Sheets—Sheet 1.

G. B. SNOW.
WINDMILL.

No. 517,198.

Patented Mar. 27, 1894.



Witnesses:
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Inventor,
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By *Dunning* *Dunning* *Dunning*
Attys.

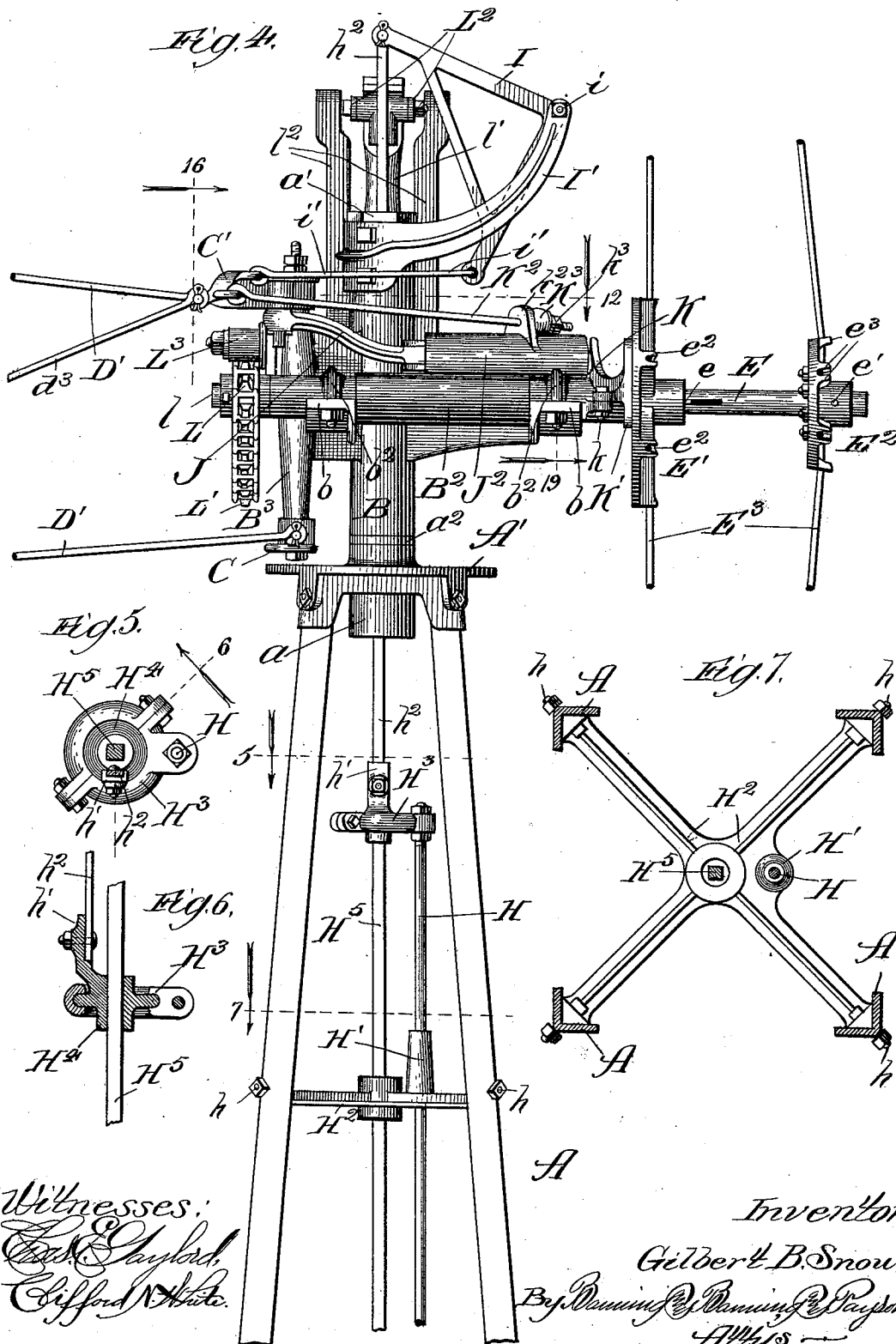
(No Model.)

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Fig. 8.

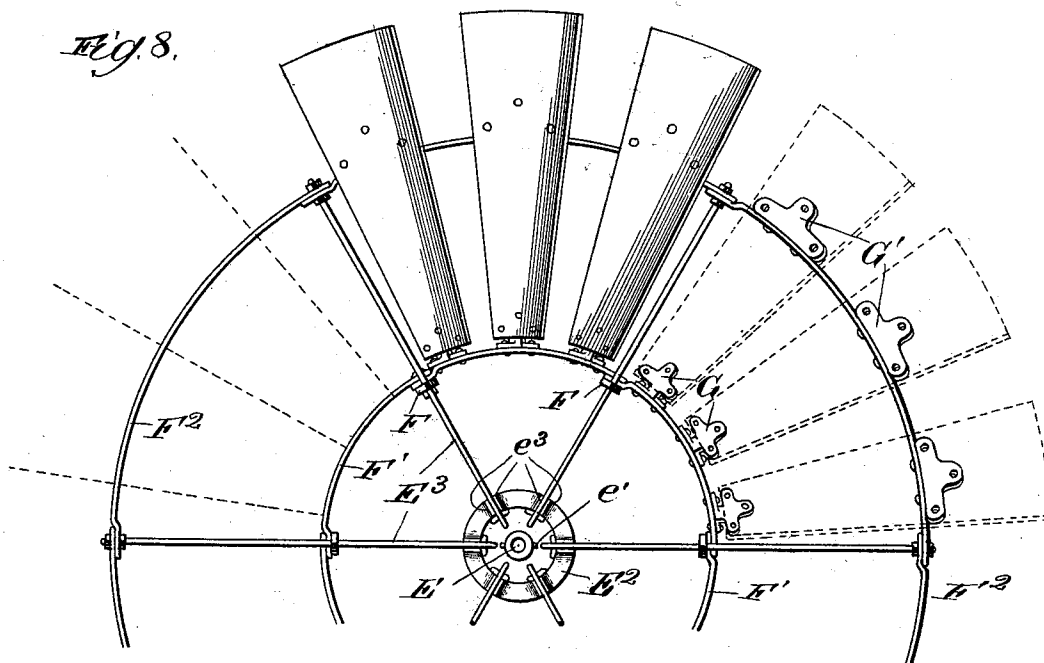


Fig. 9.

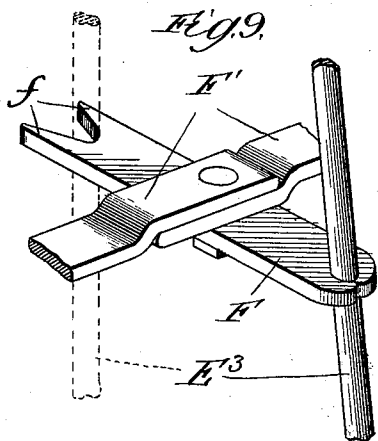


Fig. 10.

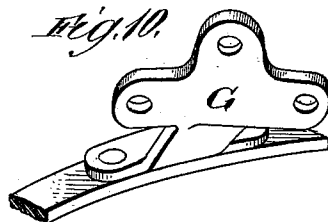
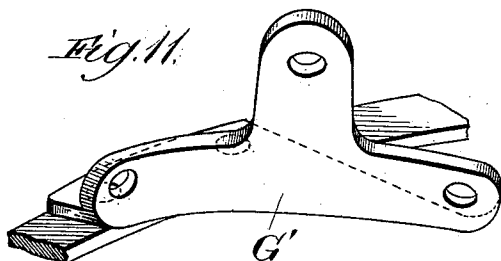


Fig. 11.



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(No Model.)

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Fig. 12.

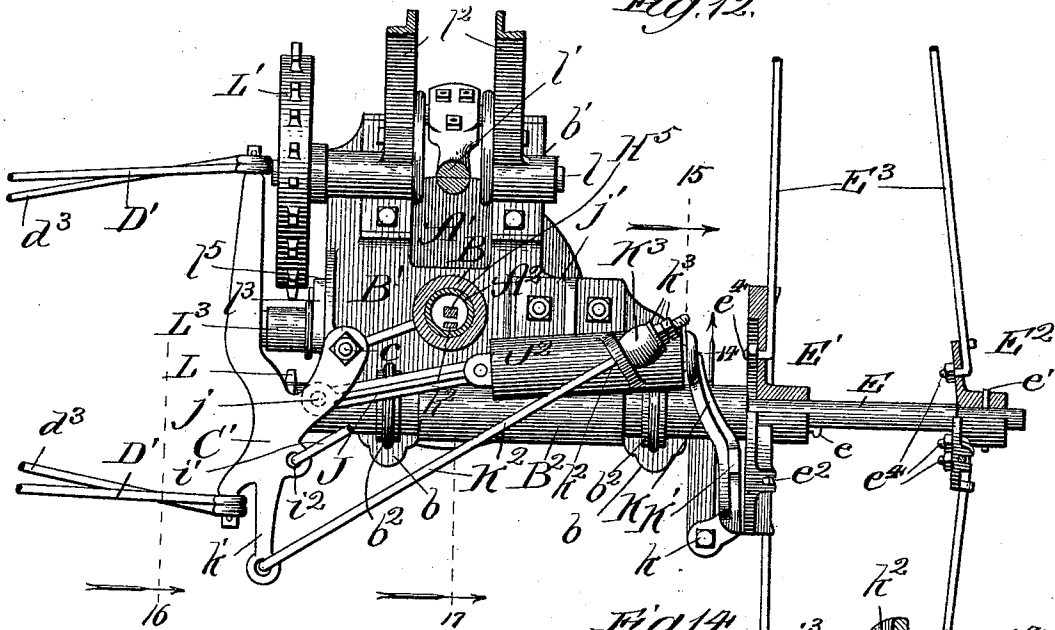


Fig. 14.

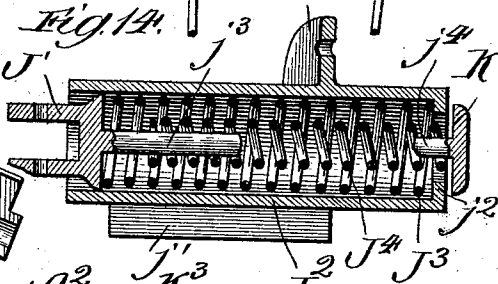


Fig. 13.

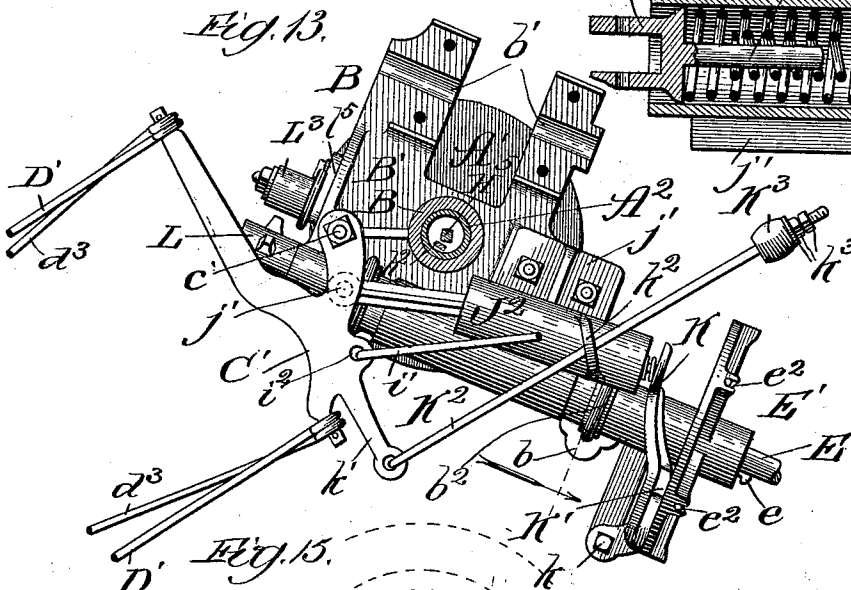
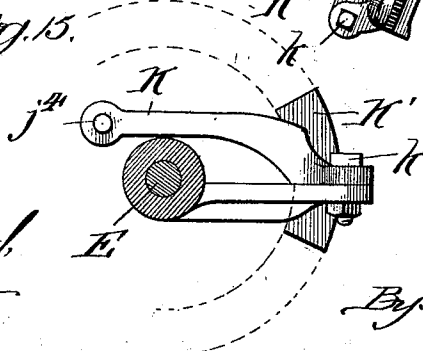


Fig. 15.



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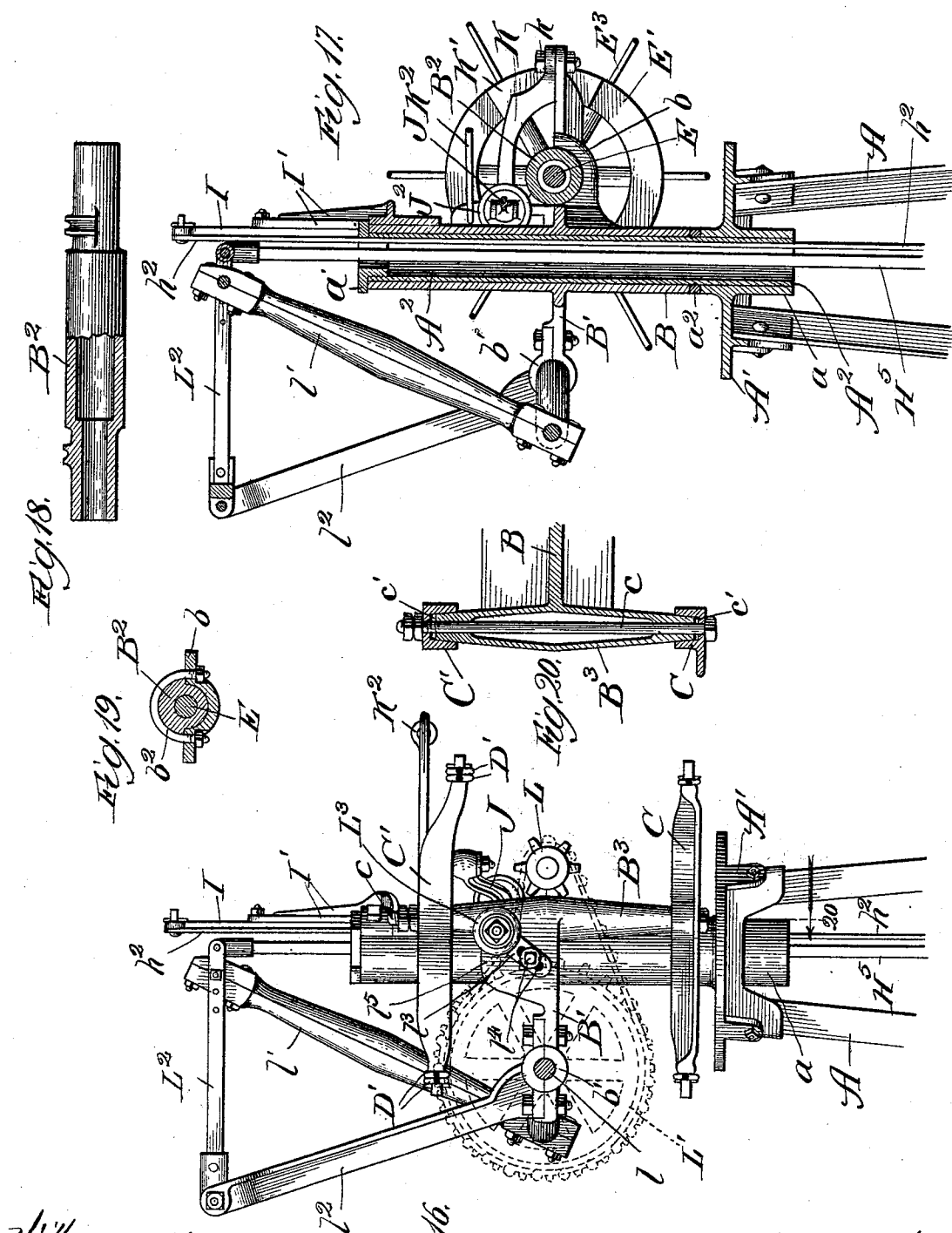
(No Model.)

5 Sheets—Sheet 5.

G. B. SNOW.
WINDMILL.

No. 517,198.

Patented Mar. 27, 1894.



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UNITED STATES PATENT OFFICE.

GILBERT B. SNOW, OF ELGIN, ILLINOIS, ASSIGNOR TO THE ELGIN WIND
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WINDMILL.

SPECIFICATION forming part of Letters Patent No. 517,198, dated March 27, 1894.

Application filed February 21, 1893. Serial No. 463,233. (No model.)

To all whom it may concern:

Be it known that I, GILBERT B. SNOW, a citizen of the United States, residing at Elgin, Kane county, Illinois, have invented certain new and useful Improvements in Windmills, of which the following is a specification.

The object of my invention has more particular reference to what are known as steel windmills of the solid wheel type; and the invention relates to a number of improvements in the details of construction and manner of operation of the various parts, as hereinafter described and claimed.

15 In the drawings, Figure 1 is a sectional elevation of the upper portion of a windmill provided with my improvements; Fig. 2 a perspective view of the upper inner corner of the vane; Fig. 3 a perspective view of the lower inner corner of the vane; Fig. 4 an enlarged elevation of a portion of Fig. 1; Fig. 5 an enlarged plan section taken in the line 5 of Fig. 4; Fig. 6 a broken vertical section taken in the line 6 of Fig. 5; Fig. 7 a plan section taken on the line 7 of Fig. 4; Fig. 8 a detail view of a portion of the sail; Figs. 9, 10 and 11 are details entering into the construction of the sail; Fig. 12 a plan sectional view taken on the line 12 of Fig. 4; Fig. 13 a similar view showing the parts in different position; Fig. 14 an enlarged sectional view on line 14 of Fig. 12; Fig. 15 a detail view taken on line 15 of Fig. 12; Fig. 16 a side elevation taken in line 16 of Fig. 12; Fig. 17 a vertical section taken on line 17 of Fig. 12; Fig. 18 a broken detached view of the sleeve bearing; Fig. 19 a cross section taken on line 19 of Fig. 4, showing the method of supporting the sleeve bearing to the table; and Fig. 20 a sectional view taken on line 20 of Fig. 16.

40 In making my improved solid wheel windmill, I make a tower A, which may be of the usual construction and of the desired height. At the top of the tower, I mount a chair A', which may be bolted or otherwise secured in place as desired. The chair is provided with a central hollow hub *a*, which extends preferably both below and above the surface of the chair, as shown in Fig. 17. I arrange a suitable piece of tubing A² in the hub of the chair, preferably by driving its lower end into

the hub, so as to securely connect the two together. This tubing extends the desired distance above the hub, and is preferably provided with internal screw threads at its upper end to receive a cap *a'*, provided with a hole. I arrange around the tubing, immediately above the top of the hub, a ring *a*², made of brass or other soft material, adapted to minimize friction. I mount on the tubing a vertical sleeve B, adapted to rest on the ring and to rotate freely around the tubing. The upper end of the sleeve is preferably covered or confined by the flange of the cap *a'*, so as to retain it securely in place. Arranged on the vertical sleeving B, and preferably cast integral therewith, is a supporting table B', adapted to receive and support various parts of the mill as hereinafter explained. One side of this table is preferably provided with outreaching arms *b*, affording a curved recess to receive a horizontal supporting sleeve B², which may be attached thereto by clevises *b*². At the other side of the table is arranged a bearing *b*⁴, adapted to receive a crank shaft. At one side of the table, and preferably cast integral therewith, is a vertical sleeve B³, adapted to support cross arms C and C' at its bottom and top. These cross arms are fastened or held to the respective ends of the vertical sleeve by a tie rod or bolt *c*. The ends of the vertical sleeve are also preferably tapered, and the cross arms provided with projecting hubs fitting over the tapered ends, but with a space, *c'*, between the ends and the inner surface of the hubs, so that, as wear takes place, the tightening of the nuts on the bolt will compensate for the same. The arms C and C' afford the means for supporting and pivoting the vane D. The vane is preferably constructed of sheet metal, bound by straps *d* extending around its edges. At the inner upper and lower corners, the bands across the inner end are turned out at right angles, as shown in Figs. 2 and 3, to form stays *d'*, to assist in holding the supporting rods D' in proper position. These rods are fastened at their outer ends along the upper and lower edges of the vane, and extend to the ends of the arms C and C', passing through eye-bolts *d*² on the braces. The upper rods are secured to the

upper cross arm, and the lower rods to the lower cross arm. Two additional brace rods, d^3 , extend from the stays at the lower inner corner of the vane to the ends of the upper cross arm, preferably crossing each other, and with their ends arranged on the ends of the upper cross arm, preferably outside of the ends of the upper rods D' , where they are held in place by pins, as shown in Figs. 12 and 13.

In order to support the wind wheel of the mill, I arrange in the horizontal sleeve, B^2 , a spindle E , which is suitably held in the sleeve, so as to be permitted to rotate therein. The outer end of the spindle carries an inner hub E' , and an outer hub E^2 . The inner hub is preferably fastened to the spindle by a spline e , and the outer hub by preferably a pin, e' , so that the hubs will rotate with the spindle. The inner hub is provided with a number of radial grooves, e^2 , arranged, as shown in the drawings, in radial arms—though they can be otherwise arranged if desired. The outer hub is shown as a solid disk with projecting lugs e^3 . The grooves on the inner hub, and the lugs on the outer hub, are intended and adapted to receive the inner portions of spokes E^3 , preferably made of round rods, whose inner ends, as shown in Fig. 12, are turned at right angles to pass through the hubs, where they are secured by nuts e^4 . The inner spokes are preferably arranged at right angles to the spindle, and the outer spokes preferably inclined inward, so that the outer ends of the spokes cross each other, as shown in Fig. 1. At a desired distance from the spindle, I connect the outer and inner spokes together by a yoke F . This yoke, as shown in Fig. 9, is made with V-shaped notches in the ends, so that the projecting sides, f , of the notches may be bent or clinched around the spokes, as shown at one end of the yoke illustrated in Fig. 9. As the spokes diverge in the one direction and converge in the other, the yokes will be held and prevented from unduly moving in or out. I mount on the yokes a rim F' , preferably made in sections, as shown in Figs. 8 and 9, with the end of one overlapping the end of the next adjacent one, and bolted or riveted to the yoke, as shown in Fig. 9. I mount an outer rim, F^2 , on the ends of the spokes. This outer rim is also preferably made in sections, with the end of one overlapping the end of the next adjacent one, when they are secured to the outer ends of the spokes by nuts, as shown in Fig. 8. By making the inner and the outer rims in sections, the work of putting them together, taking them apart, or removing and replacing a broken part is greatly facilitated. I arrange a number of brackets, G , on the inner rim, and a number of brackets, G' , on the outer rim, attaching them to the rims by rivets, or in any other desired ways. These brackets are adapted to receive the blades of the wind wheel, and the brackets are made at the proper angle, as

shown in Figs. 10 and 11, to hold the blades at the desired angle on the wheel, as shown in Fig. 1.

In order to effect the shifting of the wheel, so as to throw it in and out of the wind, I arrange a shifting rod H , which extends down through the tower a desired distance, when, by suitable connections—as wire or cord—it may be operated from the ground. This rod is confined in a sleeve H' , shown in Fig. 4, which is supported on a bracket or spider H^2 , whose arms are connected to the uprights of the tower by means of bolts h . The upper end of the rod is attached to a collar H^3 , surrounding a hub H^4 , shown in Figs. 5 and 6, which incloses the pump rod H^5 . Extending up from the collar is a lug h' , to which a rod h^2 is attached by a bolt or otherwise, to form the connection. This rod extends up through the vertical sleeve B , and its upper end is pivoted to the upper arm of a bell crank lever, I , fulcrumed at i , as shown in Fig. 4. This lever is supported in a bracket I' , secured to the sleeve B . Pivoted to the lower end of the bell crank lever is a rod i' , which is pivoted at the other end to a hole i^2 in the cross arm C' . As the rod H is drawn down by some one on the ground, the upper arm of the bell crank lever, through the connections above described, is also drawn down, and the lower arm moved out, so that the cross arm C' , through means of the rod i' , is oscillated on its pivotal point, and in its movement the position of the vane shifted, as indicated in Fig. 13. As the vane is shifted, the action of the wind gives the wheel a relative movement out of or into the wind, as the case may be.

In order to operate a friction brake on the wheel, to prevent its too rapid or violent movement and to secure it from rotation out of the wind, I pivot a link J , at a point j on the upper cross arm C' , eccentric to its pivotal point, and carry it to a head J' , to which it is also pivotally connected. This head is arranged in the end of a cylinder J^2 , attached to the table, B' , by a bracket j' . This cylinder contains an outer coiled spring J^3 , against which the head abuts, while the other end of the coiled spring is confined by a flange j^2 at the other end of the cylinder. The spindle j^3 extends from the head a desired distance into the cylinder, and I arrange around it an inner coiled spring J^4 , which is somewhat shorter than the outer spring. The other end of the inner spring is arranged around the stud j^4 , extending into the outer end of the cylinder from a brake arm K , which is pivoted at k to an extension of the table B' . This brake arm is provided with a friction brake surface K' , which is adapted to bear against the inner hub E' of the wheel, when forced out into its braking or operative position. As the wheel is shifted, as above explained, the upper cross arm in turning moves the head J' in, through the instrumentality of the link J , and compresses the outer coiled spring in the cylinder. As it moves farther in, it bears

against the inner coiled spring and compresses it, which forces the free end of the brake arm out and brings the braking surface into contact with the inner hub of the wheel, so as to effect the necessary friction to hold the wheel against rotation. When the shifting rod is released, the outer spring carries the head J' back and moves the upper cross arm into a position to bring the vane parallel with the axis of the wheel, as shown in Fig. 12. To prevent it from passing beyond this position, I arrange a rod K², with its outer end pivoted to an extending finger k' of the upper cross arm, and with its other end passing through an ear k² on the upper side of the spring cylinder. To prevent shock or straining I arrange a buffer K³, preferably of rubber, on the rod, which is held between the ear and the end of the rod by a washer and nuts k³. I arrange on the inner end of the vane shaft E, a sprocket pinion L, which is connected by a drive chain to a sprocket gear L'. This sprocket gear is mounted on the end of a crank shaft l, supported in the bearing b'. A pitman l' extends from the crank on the crank shaft to rods L², pivoted at their outer ends to upreaching arms l², extending from the bearings b', so that as the crank rotates the inner ends of the rods L² these arms are raised and lowered through means of the pitman. The upper end of the pump rod is suitably attached to the inner ends of the arms L², so that as they are raised and lowered, they will impart a corresponding motion to the pump rod to enable it to do the work. A suitable belt tightener L³, shown in Fig. 16, may be used to hold the sprocket chain at the proper tension around the sprocket pinion and sprocket gear. This tightener is mounted on an arm l³, adjustably secured through means of a slotted hole and bolt l⁴, to an upwardly projecting flange L⁴ on the table B'.

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

1. In solid wheel wind-mills, the combination of a tower, a vertical sleeve supported upon the tower, a wind wheel supported upon the vertical sleeve, a spring inclosing cylinder supported on the vertical sleeve, a head in the cylinder connected with the shifting

mechanism of the mill, an outer spring in the cylinder against which the head rests, an inner spring in the cylinder of less length than the outer spring, a brake to hold the wheel from rotating when shifted out of the wind, and a pivoted brake rod against which one end of the inner spring bears, whereby as the shifting mechanism is operated the outer spring is compressed a desired distance before the inner spring is compressed or the brake applied, substantially as described.

2. In solid wheel wind-mills, the combination of a tower, a horizontal supporting table arranged thereon, a vertical sleeve supported by the horizontal table, upper and lower cross arms pivoted on the vertical sleeve, a vane provided with supporting rods connected to the ends of the cross arms, and brace rods extending from the lower inner corner of the vane to the ends of the upper cross arms, substantially as described.

3. In solid wheel wind-mills, the combination of a tower, a horizontal supporting table arranged thereon, a vertical sleeve supported by the horizontal table, upper and lower cross arms pivoted on the vertical sleeve, a vane bound by straps around its edges with the straps across its inner end turned out to form stays, and supporting rods attached to the vane and passing through eyes near the ends of the stays and connected to the ends of the cross arms, substantially as described.

4. In solid wheel wind-mills, the combination of a tower, a horizontal supporting table arranged thereon, a vertical sleeve supported by the horizontal table provided with taper ends, upper and lower cross arms pivoted on the vertical sleeve provided with hubs fitting over the beveled ends of the vertical sleeve and leaving a space between the ends and the bottoms of the holes in the hubs, and a tie rod passing through the vertical sleeve and connecting the cross arms thereto, whereby by tightening the nuts on the tie rod, wear may be compensated for, substantially as described.

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