(No Model.) 3 Sheets—Sheet 1.

J. A. CHAPMAN.

WINDMILL.

No. 535,193. Patented Mar. 5, 1895.

Fig. 1.

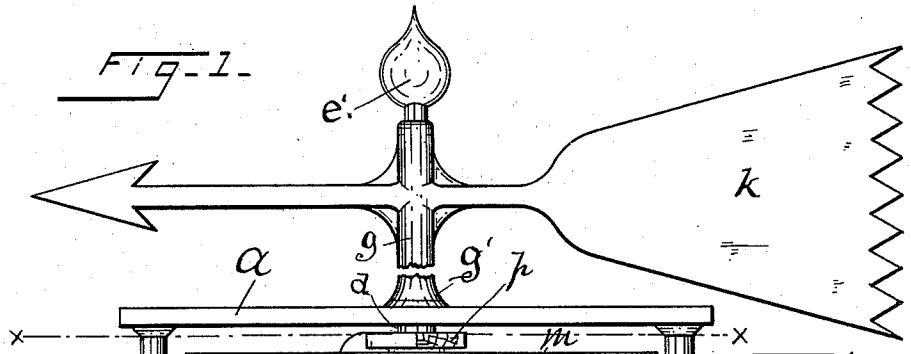


Fig. 4.

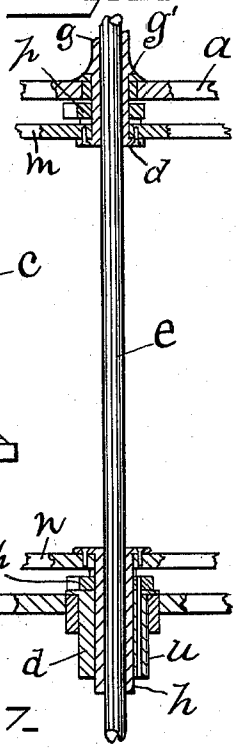


Fig. 6.

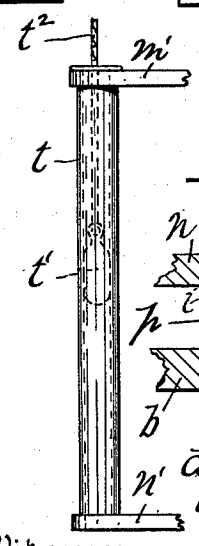


Fig. 5.

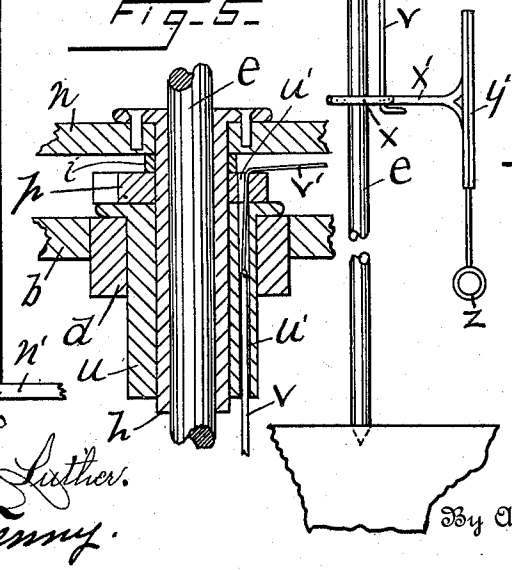
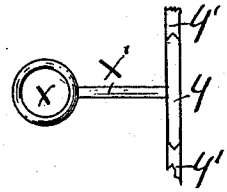


Fig. 7.



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(No Model.) 3 Sheets—Sheet 2.

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WINDMILL.

No. 535,193. Patented Mar. 5, 1895.

Fig. 2.

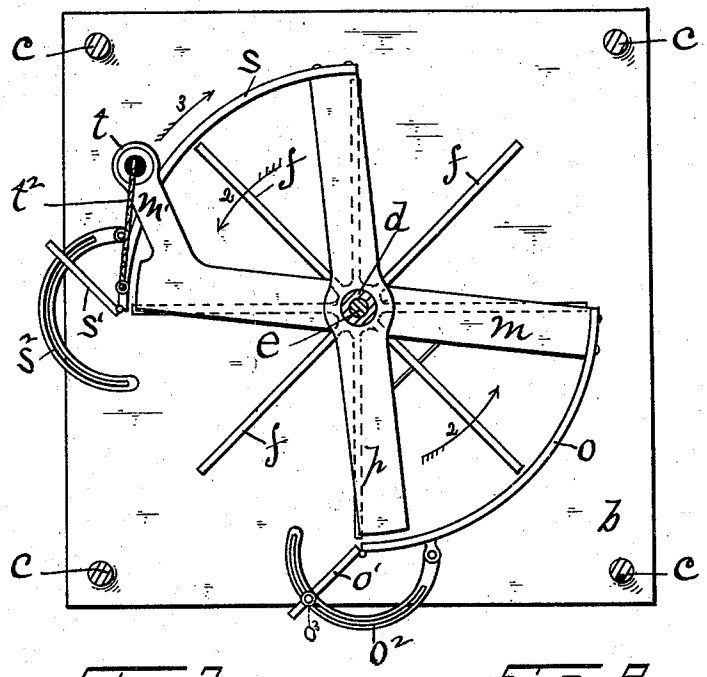


Fig. 3.

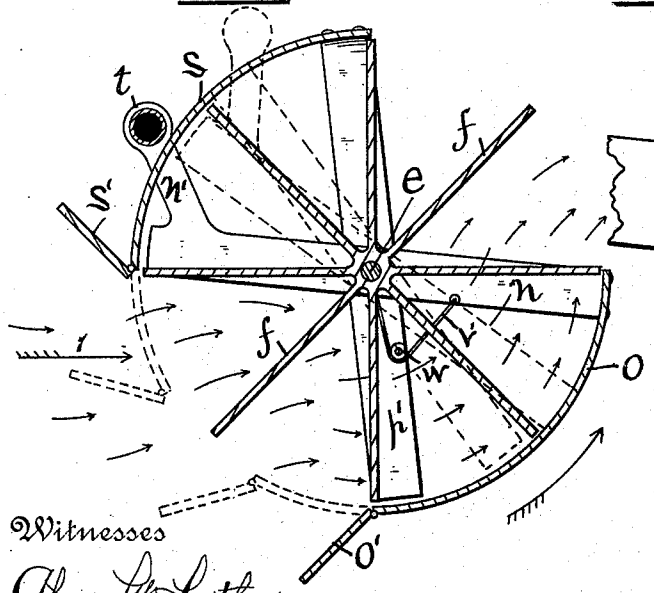
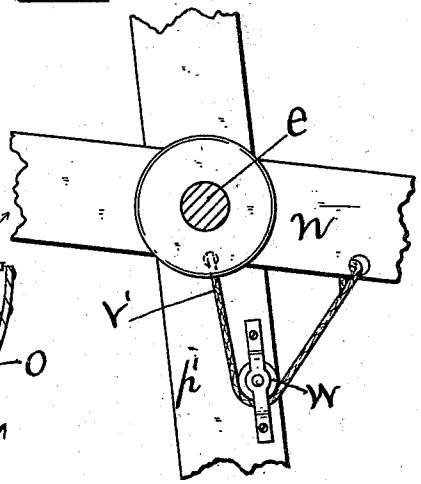


Fig. 8.



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(No Model.) 3 Sheets—Sheet 3.

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WINDMILL.

No. 535,193. Patented Mar. 5, 1895.

Fig. 9.

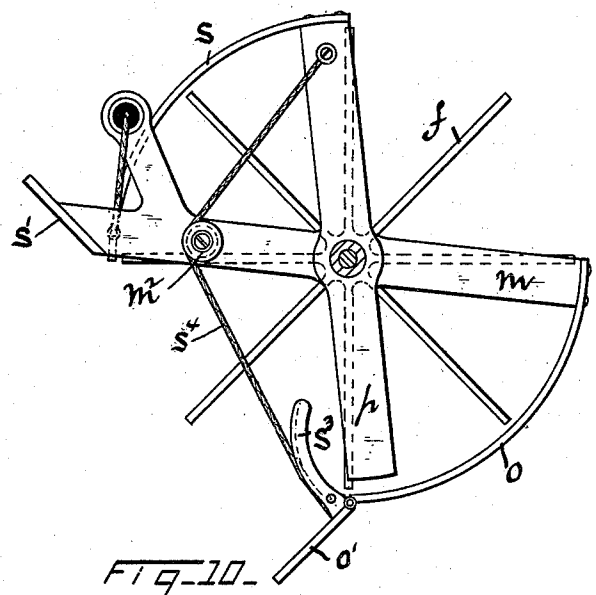
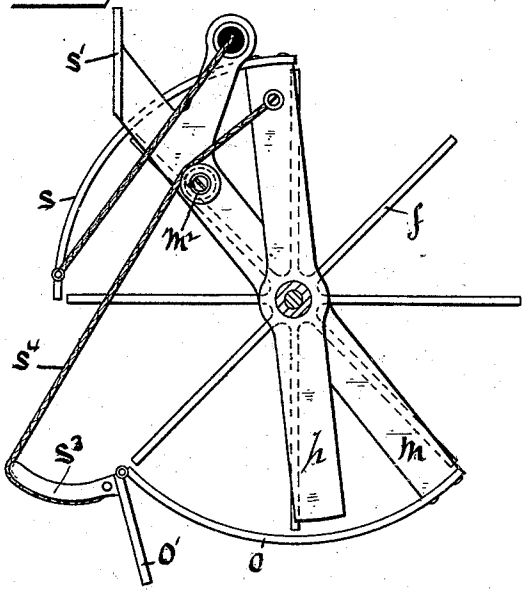


Fig. 10.



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UNITED STATES PATENT OFFICE.

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WINDMILL.

SPECIFICATION forming part of Letters Patent No. 535,193, dated March 5, 1895.

Application filed May 29, 1894. Serial No. 512,857. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH A. CHAPMAN, a citizen of the United States, residing at Bay City, in the county of Pierce and State of Wisconsin, have invented certain new and useful Improvements in Windmills, which improvements are fully set forth and described in the following specification, reference being had to the accompanying three sheets of drawings.

The object of this invention is to produce a wind-mill, that shall automatically adjust itself to receive upon its wheel, to the best advantage, the current of air serving to drive the latter, regardless of the direction in which said current may be traveling, said mill being so constructed that the current of air introduced upon said wheel and utilized to drive the same may be regulated at will, to produce greater or less power as may be desired.

To assist in explaining my invention the accompanying drawings have been provided, illustrating the preferred construction and the various elements comprising my device, which elements are all specifically described and denoted by reference letters hereinafter.

In the drawings Figure 1 is an elevation of my windmill, and Fig. 2 is a plan view, partly in section taken on the line *x*—*x* of Fig. 1. Fig. 3 is also a sectional view, somewhat similar to Fig. 2, taken through the central portion of the structure shown in said Fig. 1. Fig. 4 illustrates in section the means by which the vertical main shaft is supported in its bearings, and Fig. 5 is an enlarged, sectional, view of the lower of said bearings. Fig. 6 illustrates a certain detail of my device, hereinafter fully described. Fig. 7 is an enlarged plan view of a certain ring that is shown in elevation in Fig. 1. Fig. 8 is an enlarged plan view of certain arms which form important elements of my invention, mechanism being shown mounted thereon whereby said arms are adjusted relatively to each other. Figs. 9 and 10 illustrate means for connecting the two shield sections whereby the opening for the inflow of wind is graduated automatically.

My wind wheel is supported within a suitable framework consisting of plates *a b*, plate *a* being supported above plate *b* by a number of vertical pillars *c*, the complete frame being supported at a proper elevation in any suitable manner. Located at or near the central portions of plates *a b* and in vertical alignment with each other are journal bearings *d* which serve to support vertically the main shaft *e* of my device, said bearings being more fully described hereinafter. The lower end of shaft *e* may be provided with any suitable bearing (shown in Fig. 1 as a conical step bearing), and the upper end of said shaft may support suitable fanciful finish as denoted by letter *e'*.

Fixedly secured to shaft *e*, between plates *a b*, is the wind-wheel *f*, which wheel when revolved imparts motion to the shaft *e*, from which latter power is imparted in suitable manner to do the work desired.

The wheel just referred to is shown in Figs. 1, 2 and 3 and consists of a number of blades or fans projecting radially from a central hub, pinned or otherwise fixedly secured to shaft *e*, thereby causing the latter to revolve in unison therewith, as just described.

Located upon shaft *e*, within bearings *d* of plates *a b* respectively, are short pieces of tubular shafting *g h* that serve to support upon their adjacent ends, slightly above and below the wheel *f*, arms *m n* respectively, said arms being fixedly secured in vertical alignment midway their length to the tubes *g h* and bearing, outside of wheel *f*, a quarter section of a cylindrical shell denoted by letter *o*. Tube *g* extends upward considerably above plate *a* and bears a weather vane *k* and, to prevent said tubes *g h* from traveling downward by gravity, on shaft *e*, a flange *g'* is provided upon tube *g* to abut the collar *d* of said plate. (See Fig. 4.)

From the foregoing description it will be seen that tubes *g h*, through their arms *m n*, supporting segmental shell *o*, will be caused to move in unison and motion will be imparted thereto by the vane *k* secured to tube *g*, and it will also be readily understood that, when said vane is veered by the wind, shell *o* will be caused to correspondingly move around wheel *f*.

Pivotally hung, midway their length, on tubes *g h*, are arms *p p'*, similar to arms *m n*, said arms *p p'* being located respectively

above and below arms m n and free to revolve upon tubes g h, washers i being introduced between said arms m p and n p' at their central portions. Arms p p', like arms m n, are in vertical alignment and serve to support a segmental shell s inclosing one quarter of the wheel, said shell s being opposite the shell o first described.

Should shells o and s be in the positions, relatively to each other, shown in Figs. 2 and 3, it will be seen that, when the wind is blowing in the direction of arrow 1 in Fig. 3, it will be properly introduced to the wheel, between shells o s, to cause said wheel to revolve in the direction of arrow 2 of Fig. 2, the manner in which the wind acts upon the fans of the wheel f being clearly illustrated by small arrows in Fig. 3.

In Figs. 2 and 3 it will be seen that shell s acts as a shield and protects the blades or fans after having been acted upon by the wind and while passing around to again receive impulse from the entering current of air. If no such protection were provided the wind would act with equal force upon the blades each side of the vertical central hub, thereby balancing said wheel and preventing its rotation. When my said mill is in operation the shell o serves, by reason of its convexity, to guide the wind more directly into the spaces between the blades than it would naturally go and, consequently, utilizes to the greatest possible extent the current of air that actuates the wheel, the principle being much like that of a turbine water-wheel.

Extensions or lips o' s', hinged respectively to the shells o and s, may be provided which, when set as shown in Fig. 2, serve to guide a greater current of air onto the wheel than would otherwise pass within the partial casing o, said lips being locked in any desired position by means of slotted circular arms o^2 s^2 hinged to shells o s and coacting with set-screws o^3 s^3 located respectively on the upper and lower ends of the lips as shown; the said lips and the manner in which they are adjusted being readily understood by reference to Figs. 1 and 2.

The circular slotted arms o^2 s^2 are hinged respectively near the top and bottom of shells o s in order that they may not interfere when sections o s are brought more nearly together. The device, as shown in Figs. 2 and 3, is open to its greatest possible extent and as receiving the greatest amount of wind upon its wheel. Should it be desired to reduce the force of wind, and thus reduce somewhat the speed and power of the wheel, it is only necessary to bring together shells o and s (see dotted lines Fig. 3) until the desired current of air is actuating the wheel and, to control shells o s, the following described mechanism is provided: Supported outside shell s, by means of the free ends of arms m and n, or by extensions m' and n' of said arms as shown in Figs. 2 and 3, is a tubular chamber t in which is arranged to travel a weight t' connected by a cord or chain to section s (Figs. 2, 3 and 6). The tendency of weight t' is always to move downward by gravity and therefore (through its cord t^2) to pull shell s in the direction of arrow 3 in Fig. 2, it being assumed that the weight in said Fig. 2 has reached the bottom of the tube.

Within bearing d of plate b, and free to revolve around tubular shaft h, is a tubular shaft u the upper end of which is fixedly secured to arm p, revolving with the latter, and bored longitudinally through this tubular shaft u is a hole u' which latter is also bored through arm p'. In this hole u' is arranged to slide a rod v to the upper end of which is secured a cord v', which cord passes from said hole to and around a pulley w located on arm p' and thence the said cord passes to arm n to which it is secured.

When rod v is caused to travel downward in its hole u' carrying with it cord v', it will be readily understood by reference to Figs. 2, 3, 5 and 8 that said cord, drawing from arm n around pulley w, will gradually draw into vertical alignment the parts of arms m n and p p', thereby bringing together shells o and s, as shown in dotted lines in Fig. 3.

When shells o and s begin to travel toward their positions shown in dotted lines the tubular chamber t will likewise travel away from the point at which cord t^2 is secured to section s, thereby causing weight t' to move upward in said chamber, but said weight acts with a constant tendency to bring the parts into their normal positions so soon as rod v is allowed to slide upward in hole u'. The lower end of rod v lies within a ring x that encircles shaft e, said ring being formed of a rod x' secured to and supported by a plate y arranged to slide vertically in ways y'. The extreme lower end of rod v is bent at an angle, as shown, to prevent its being withdrawn from ring x but it will be seen that said rod v is free to move around shaft e, within ring x, when carried by arm p'. Plate y is provided with a handle z by means of which it may be slid vertically in its ways. When said plate is moved downward it carries with it ring x and rod v and thus draws together the shells o and s, the plate y being locked in desired position by any suitable means. When plate y is released sections o and s, by reason of weight t', at once resume their normal positions.

In Figs. 9 and 10 I have illustrated the lips o' s' as arranged to operate automatically, under the varying pressure of the wind, to partially close the opening for the inflow of wind, thus providing, in effect, an automatic regulator to prevent the wheel from "running wild" during high winds. In said Figs. 9 and 10 the lip s' is shown as secured rigidly to the extended end of arm m, instead of to shield section s, while lip o' is hinged to shield section o, as first above described. When the wind blows strongly it acts upon lip s' with a tendency to force it in the direction of the ar-

row 3 of Fig. 2. This serves to move the shield section *o* (which is secured to arm *m*) correspondingly and partially closes the opening through which the wind enters the mill. To further aid in utilizing the force of the wind to control and regulate said opening I preferably form the hinged lip *o'* with an arc shaped arm s^3 whose outer edge is grooved to receive and guide a cord s^4. One end of said cord is secured near the hinge of lip *o'* and the other end is secured to the arm *p* that carries the shield section *s*, the cord being passed around an idle roll m^2 on arm *m*. When the force of the wind against lip *o'* seeks to swing said lip on its hinge, as in Fig. 10, the cord acts to draw shield *s* toward the said hinged lip, thus closing partially the opening and reducing the inflow of wind. It will thus be seen that any excess of normal pressure upon both the lip *o'* and its companion *s'* will result in closing said opening automatically.

It has already been stated that shell *o* is controlled by the weather vane *k* and, from the above description, it will be understood that, when the position of shell *o* is changed by reason of the shifting of the wind, the position of shell *s* will be correspondingly changed, from which it will be seen that my mill, through its vane *k*, will at all times present itself in the position most advantageous to be acted upon by the wind.

My described windmill is simple in its construction, does away entirely with the bevel gearing necessary in the ordinary wind-mills, in which the wheel is mounted upon a horizontal shaft, and the power furnished may be easily regulated to any amount within the limits of the machine.

Having described my invention, I claim—

1. In a wind-mill, the combination, with a frame, of a vertical shaft journaled therein, a wind-wheel rigidly secured to the shaft between the top and the bottom of the frame, a pair of arms loosely mounted upon the shaft above and below the wheel, two segmental shells secured to said arms, a vane connected with one of the shells, and means for automatically operating the other shell by the first mentioned shell, substantially as set forth.

2. In a wind-mill, the combination, with a frame, the top and bottom of which are each provided with a bearing, of a tube through each bearing, an arm secured to the inner end of each tube, and a vane secured to the upper end of the upper tube, a shaft through the tubes provided with a wind-wheel, a segmental shell secured to the corresponding ends of said arms, a pair of arms loosely mounted upon the tubes between the first mentioned arms and the bearings, a segmental shell secured to the corresponding ends of said second mentioned arms, and means for changing the position of said shells relatively to each other, substantially as set forth.

3. In a wind-mill, the combination, with a frame, the top and bottom of which are each provided with a bearing, of a tube through each bearing, one of which tubes is provided with a longitudinal opening, and the other tube is provided upon its upper end with a vane, a shaft through the bearings, provided with a wind-wheel, a pair of arms secured to the inner ends of said tubes, a segmental shell secured to the corresponding ends of said arms, a cord secured to the lower arm and passed through the opening in the tube, and provided with means for regulating the position of the shell, a pair of arms upon the tubes between the other arms and the bearings, a segmental shell secured to the corresponding ends of the second mentioned arms, a vertical tube adjacent the frame, and a cord and weight therein, the opposite end of the cord being secured to one of the second mentioned arms, substantially as set forth.

4. In combination, a wind-wheel, a two-part shield for the same, a vane connected with one part of said shield, a weighted cord connecting said shield parts as set forth, to hold said parts normally open, and mechanism for closing the same consisting of a cord with a downwardly projecting rod, as described, and means consisting of a vertically movable ring *x*, for adjusting said rod, all substantially as specified.

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