

No. 638,603.

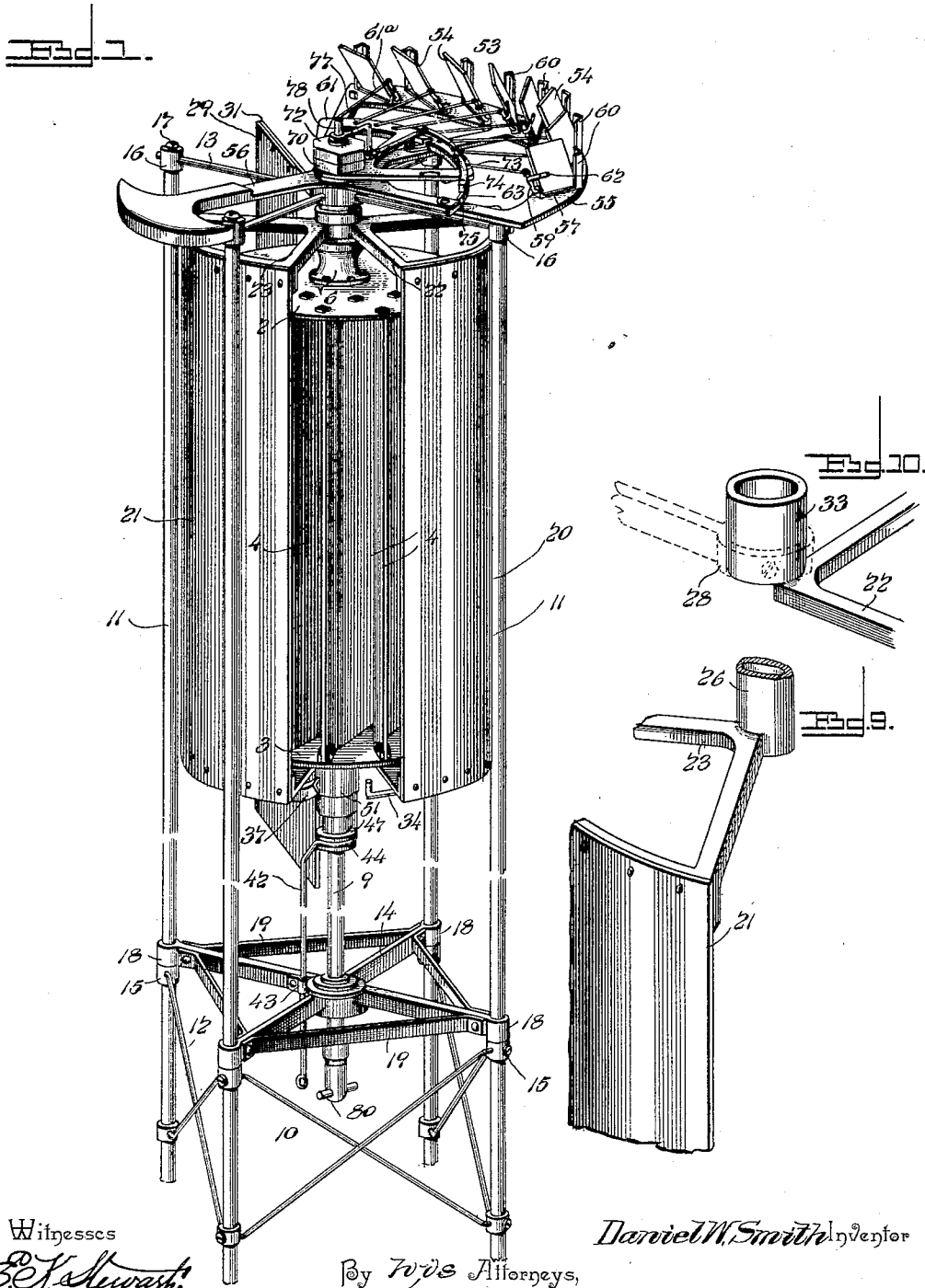
Patented Dec. 5, 1899.

D. W. SMITH.
WINDMILL.

(Application filed Apr. 24, 1899.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses
E. F. Stewart

J. F. Riley

By *W. S. Attorneys*,

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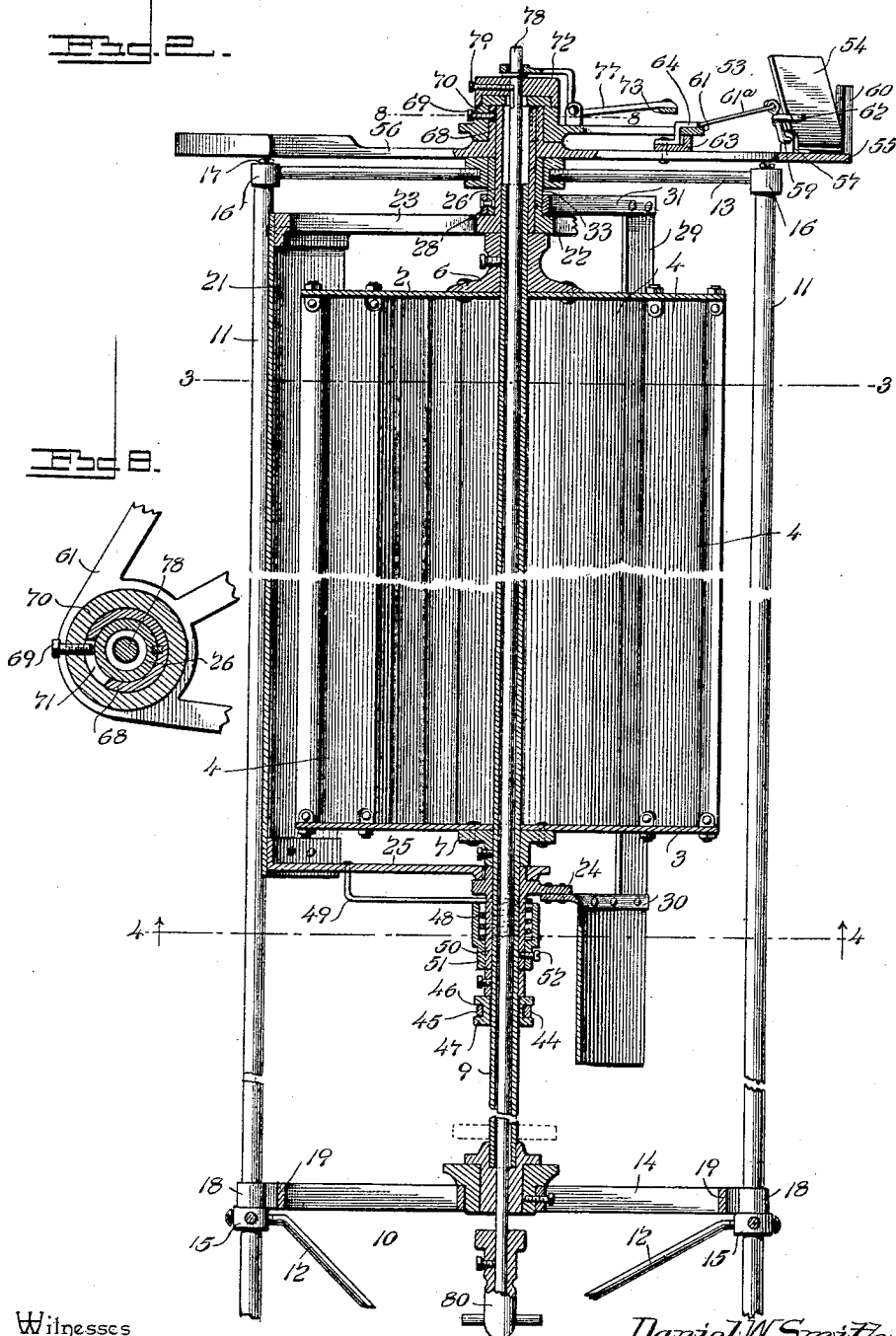
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3 Sheets—Sheet 2.



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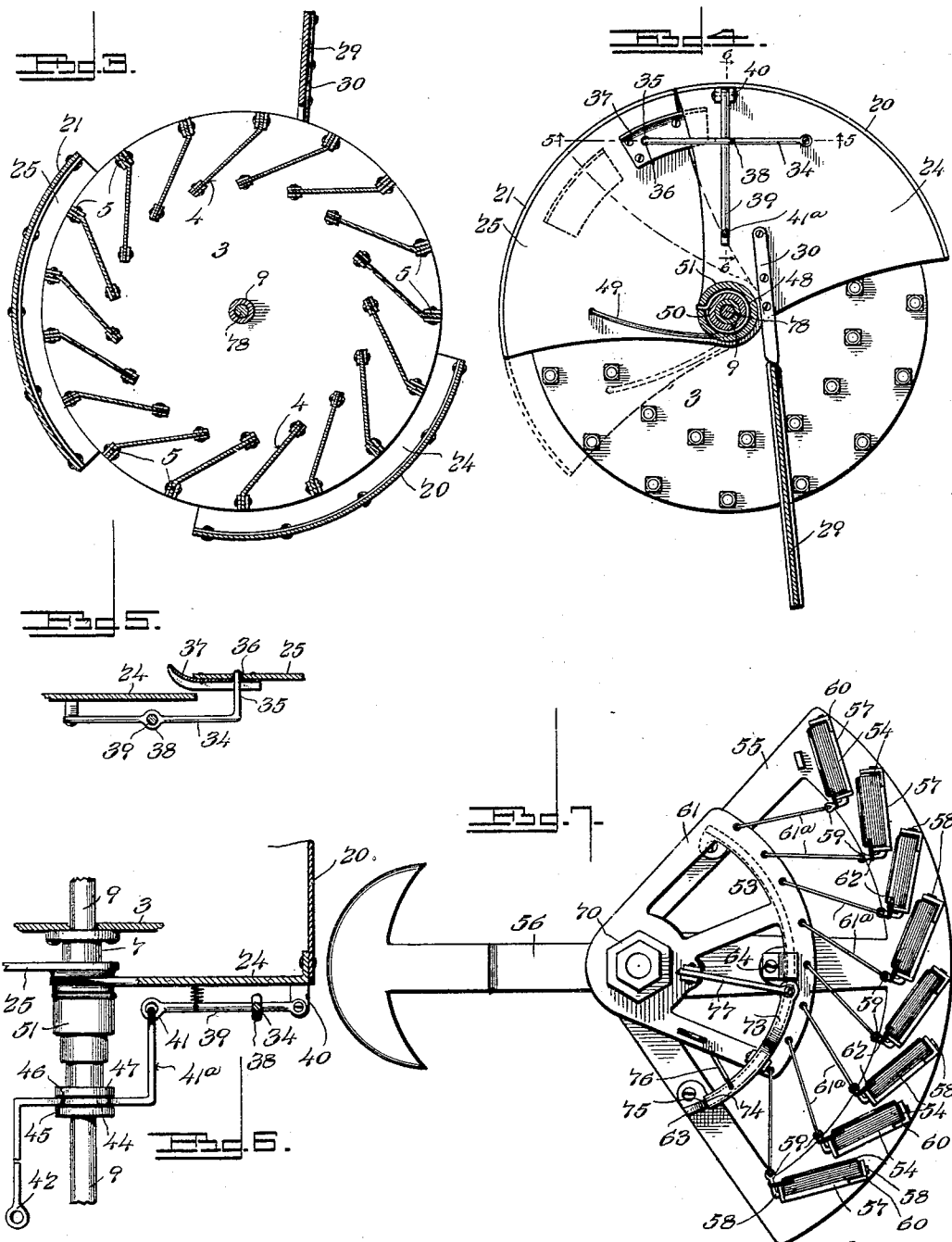
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3 Sheets—Sheet 3.



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UNITED STATES PATENT OFFICE

DANIEL W. SMITH, OF SOUTH OMAHA, NEBRASKA.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 638,603, dated December 5, 1899.

Application filed April 24, 1899. Serial No. 714,206. (No model.)

To all whom it may concern:

Be it known that I, DANIEL W. SMITH, a citizen of the United States, residing at South Omaha, in the county of Douglas and State of Nebraska, have invented a new and useful Windmill, of which the following is a specification.

The invention relates to improvements in windmills.

The object of the present invention is to improve the construction of windmills, increase their efficiency, and provide a simple and comparatively inexpensive one which may be readily thrown into and out of operation and which will automatically regulate itself and run at a uniform speed.

The invention consists in the construction and novel combination and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and pointed out in the claims hereto appended.

In the drawings, Figure 1 is a perspective view of a windmill constructed in accordance with this invention. Fig. 2 is a vertical sectional view of the same. Fig. 3 is a horizontal sectional view on line 3 3 of Fig. 2, the casing being open. Fig. 4 is a similar view on line 4 4 of Fig. 2, the casing being closed. Fig. 5 is a detail sectional view on line 5 5 of Fig. 4, illustrating the construction for locking the casing in its closed position. Fig. 6 is a detail sectional view on line 6 6 of Fig. 4. Fig. 7 is a plan view of the governor. Fig. 8 is a horizontal sectional view on line 8 8 of Fig. 2. Figs. 9 and 10 are detail perspective views of the upper arms of the sections of the casing.

Like numerals of reference designate corresponding parts in all the figures of the drawings.

1 designates a horizontal wind-wheel composed of top and bottom disks or plates 2 and 3 and a series of vertical blades 4, arranged around the wind-wheel and secured at their ends to the upper and lower plates or disks 2 and 3 at the peripheries thereof and extending inward from the same. The blades are provided near their outer edges with bends, forming deflected vertical portions 5, arranged at an angle to the inner portions of the blades and forming a depression therein adapted to catch and hold the wind. The

wind-wheel is provided at its top and bottom with upper and lower hubs 6 and 7, secured to the top and bottom plates 2 and 3 and fixed to a tubular shaft 9 by means of set-screws or other suitable fastening devices, as clearly illustrated in Fig. 2 of the accompanying drawings.

The tubular shaft 9, which is vertical, is supported within a tower 10, composed of vertical corner-rods 11, connected by suitable crossed bracing-rods 12 and provided with bearing frames or spiders 13 and 14, disposed horizontally and located at the top and at an intermediate point on the tower. The crossed bracing-rods have their terminals threaded into clamping-collars 15, secured to corner-rods by clamping-screws or other suitable fastening devices. The upper bearing frame or spider consists of a central bearing and diagonal rods having a threaded connection at their inner ends with the central bearing and secured at their outer terminals to the upper ends of the corner-rods by caps or couplings 16, having openings to receive the rods and provided with set-screws 17 for engaging the same. The lower bearing frame or spider 14 is composed of a central bearing and diagonal bars or members provided at their outer ends with eyes 18, arranged on the corner-rods and supported by the adjacent clamping-collars 15, and the said bars or members are connected near their outer ends by horizontal tie bars or braces 19, arranged at the sides of the tower.

The vertical shaft 9, which is stepped in the bearing of the frame 14 and supported by the bearing of the upper frame 13, has a shield or casing journaled on it and composed of two curved sections 20 and 21, arranged at the periphery of the wind-wheel and adapted to close over the front of the same to shield it from the wind and to open to expose the wind-wheel to the wind, and by varying the opening or space between the sections more or less fan-surface is exposed to the wind, and the speed of the wind-wheel is thereby regulated, as hereinafter described. The curved sections 20 and 21, which are preferably constructed of sheet metal, are provided with upper horizontal arms or portions 22 and 23 and lower horizontal arms or portions 24 and 25, sector-shaped in plan view and journaled on

the vertical shaft 9. The upper sector-shaped arms 22 and 23 are constructed of stout metal, and the lower ones, which are preferably constructed of sheet metal, are provided with openings to receive the vertical shaft, and the said upper arms 22 and 23 are preferably open-work castings composed of radial side portions and having a curved outer portion conforming to the configuration of the curved section and secured to the inner face of the same.

The section 21 of the shield or casing is provided at the inner end of its upper arm 23 with a sleeve 26, and the arm 22 of the other section of the casing is provided at its inner end with an outer sleeve 33, arranged on the sleeve 26 and journaled in the bearing of the spider 13 and receiving a collar or band 28 of a vane 29, connected with the section 20 of the casing and adapted to hold the same in position to protect the blades of the wind-wheel from the wind as they come into the same.

The vane 29, which is disposed vertically, is located at the back of the windmill, and it extends longitudinally of the wind-wheel from the top of the shield or casing to a point below the same, and it is connected near its lower end with the section 20 by metal straps 30, arranged at opposite sides of the vane and having their inner ends extended beyond the same and secured to the lower face of the lower sector-shaped arm 24. The top of the vane has an inwardly-extending horizontal arm 31, provided at its inner end with the said collar or band 28, which is secured to the sleeve 33.

The sections of the casing are held in a closed position by a catch 34, consisting of a piece of spring metal bent to form a shank and having one end extended upward to form an engaging portion 35. The other end of the shank is secured to the lower face of the arm 24 of the section 20, and the engaging end 35 is adapted, when the casing is closed, to extend into a perforation 36 of the section 25, whereby the casing is held securely closed. The engaging portion of the catch is directed to the perforation or socket 36 by a guide 37, consisting of a plate having a side flange and provided with an inclined or deflected outer portion, as clearly illustrated in Fig. 5 of the accompanying drawings.

The shank of the catch is provided between its ends with an eye 38, through which passes a lever 39, fulcrumed at its outer end in a perforated ear 40 of the section 20 and provided at its inner end with an eye which is linked into a corresponding eye of an upper section 41 of an operating-rod 41^a. The operating-rod is composed of the upper section 41 and a lower section 42, extending downward from the wind-wheel and provided at its lower end with a suitable handle or grip and guided in an eye or opening 43 of the lower bearing-frame 14. The adjacent portions of the sections 41 and 42 of the operating-rod are bent

horizontally substantially at right angles and are provided with registering eyes or rings 44 and 45, which are arranged in an annular groove 46 of a sliding sleeve or coupling 47, whereby the sections of the operating-rod are swiveled together to permit the casing to rotate on the shaft 9 with the vane.

The sections of the casing or shield are held normally separated by a coiled spring 48, connected with the section 20, and provided with a horizontal arm 49, secured at its outer end to the section 21 of the casing, and when the catch is disengaged from the same by drawing the operating-rod downward the spring will operate to swing the section 21 from the section 20 to open the casing.

The section 20 of the casing is provided at the inner end of its lower arm with an inner depending sleeve 50, around which the spring 48 is coiled, and the inner end of the spring is connected to an adjustable sleeve or housing 51, arranged on the inner sleeve and provided at its upper portion with an interior annular recess for the reception of the coils of the spring. The lower portion of the adjustable sleeve or housing fits the inner sleeve and is provided with a set-screw 52, adapted to engage the same, whereby the sleeve or housing 51 is secured at any desired adjustment to regulate the tension of the spring for a purpose hereinafter described.

The speed of the wind-wheel is controlled by a governor 53, connected with the spring-actuated section 21 of the casing, and provided with a series of blades 54, adapted to be engaged by the wind, whereby when the force of the same exceeds the power of the spring the section 21 of the casing will be closed to a greater or less extent, and thereby expose less of the fan-surface of the wind-wheel, and by varying the tension of the spring the speed of the wind-wheel may be regulated. The governor, which is located above the tower, has a substantially sector-shaped supporting-frame 55, disposed horizontally and provided with an arm 56, located at a point diametrically opposite the series of blades 54 and adapted to counterbalance the same, said arm 56 being provided at its outer portion with a weight, as shown, for this purpose.

The blades 54 of the governor are arranged in a curved series at the periphery of the frame and are journaled in suitable bearings in brackets 57. Each bracket is provided with inner and outer arms having bearing-openings for the reception of a pintle 58, arranged at the lower edge of the blade 54 and provided at the inner edge of the same with an arm 59, to which the operating mechanism is connected. The inner arm or side of the bracket is short, as shown, and the outer side, which is about half the length of the blade 54, is provided with a flange 60, forming a stop and limiting the forward or outward swing of the blades. The curved series of blades is connected with an oscillating segmental or sector-shaped frame 61 by short

connecting-rods 61^a, extending from the periphery of the oscillating frame 61 to the arms 59, which are connected with the adjacent edges of the blades 54 by metal straps 62, forming braces.

The oscillating frame 61, which is arranged above the upper face of the frame of the governor, is supported near its periphery by a curved flange or track 63, secured to the frame of the governor, and a guide 64 is arranged at the center of the curved track and is provided with a horizontal arm extending over the oscillating frame and retaining the same on the track. The sleeve 26 of the upper arm of the section 21 of the shield or casing extends vertically through the upper bearing frame or spider and is keyed or otherwise secured within a hub 68 of the frame of the governor, whereby the said frame is rigidly coupled with the spring-actuated section of the casing.

The hub 68, which projects from the upper face of the frame of the governor, forms a bearing on which the oscillating sector-shaped frame turns, and the oscillating movement of the same is limited by a screw 69 or other suitable fastening device mounted on a boss or hub 70 and extending into a slot 71 of the hub of the frame of the governor. The boss or hub 70 is provided with a polygonal upper portion which is engaged by a cap 72, which is capable of a limited vertical movement to operate a catch 73, that locks the blades 54 in operative position.

The catch 73 consists of a lever fulcrumed between its ends on the oscillating frame and extending longitudinally of the periphery thereof and mounted at one end of the same. The outer end of the catch is bent downward to provide an engaging portion 74, which is adapted to interlock with a shoulder 75, formed by a recess located near one end of the curved track, and the catch is retained in such engagement by a spring 76, secured at one end to the oscillating frame and having its other end attached to the catch. The inner arm of the catch is connected with one arm of a bell-crank lever 77, fulcrumed at its angle on the oscillating frame and having its other arm connected with the vertically-movable cap 72, and when the latter is raised the inner end of the catch is depressed to lift the outer end out of engagement with the shoulder of the curved track. The bell-crank lever is provided at its inner end, which is arranged above the cap, with an eye through which passes a central vertical operating-rod 78, connected with the cap by a set-screw 79 or other suitable fastening device and extending through the tubular shaft 9 to the lower portion of the tower. The lower end of the central operating-rod is provided with a grip or handle 80 to enable the cap to be raised to disengage the catch, and by rotating the cap and the oscillating frame the blades 54 will be swung on their pintles to raise or lower them.

The windmill is adapted to obtain a maximum power from a given force of wind which is held in the angle of the blades and operates to actuate the wind-wheel until it has passed the rear edge of the spring-actuated section. The speed of the wind-wheel is automatically regulated by the governor, which has its curved series of blades disposed at a point substantially diametrically opposite the spring-actuated section of the shield or casing, and when the curved series of blades is forced rearward by an increased force of the wind the spring-actuated section of the casing is correspondingly closed. When the force of the wind abates, the casing will be again opened by the spring which is connected with the section 21.

When it is desired to stop the windmill, the central operating-rod is moved vertically to disengage the catch from the curved track, and the rod is then rotated to close the blades 54 and fold the same upon the frame of the governor, and a continued rotation of the rod will close the section 21 of the casing on the section 20 and carry the socket of the former in position to be engaged by the catch of the latter, whereby the casing will be locked in its closed position. To start the windmill, the casing is opened by forcing the operating-rod 41^a downward to release the spring-actuated section. The central operating-rod is then rotated to raise the blades of the governor and arrange the latter in operative position.

The rotary shaft 9 may be connected by gearing with any suitable machinery and may be employed for pumping, grinding feed, shelling corn, and various other kinds of work, and the power of the windmill may be increased by increasing the size of the wind-wheel or by employing more than one section of the same.

The invention has the following advantages: The windmill, which is simple and comparatively inexpensive in construction, is positive and reliable in operation and it is capable of automatically governing itself and of running at a uniform speed. It is adapted to obtain a maximum amount of power from a given force of wind, and the casing, which forms an effective shield when it is closed, is provided with means for regulating it, so that it will require a greater or less force of wind to close it. The blades, which are hinged to the governor, are supported in an upright position and are adapted to be operated from the ground to arrange them in a vertical position and to fold them on the frame of the governor. The weight, which is located at a point diametrically opposite the center of the series of blades 54, counterbalances the governor and enables the same to rotate freely.

Changes in the form, proportion, size, and the minor details of construction within the scope of the appended claims may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

What is claimed is—

1. In a device of the class described, the combination of a wheel, a casing composed of two sections adapted to close over the wheel, a
5 vane connected with one of the sections of the casing, and a governor connected with the other section of the casing, arranged at the top of the latter and provided with a blade hingedly mounted and adapted to fold to a
10 horizontal position to arrange it out of the wind, substantially as described.

2. In a device of the class described, the combination of a wheel, a casing composed of two sections arranged to close over the wheel,
15 a vane connected with one of the sections of the casing, a governor rigid with the other section of the casing and having a series of folding blades, and a rod connected with and adapted to actuate the folding blades and extending to the base of the tower, substantially
20 as described.

3. In a device of the class described, the combination of a wheel, a casing composed of two sections adapted to close over the wheel,
25 a series of blades hinged to a suitable support, said support being rigid with one of the sections of the casing, a vane connected with the other section of the casing, and means for operating the blades by hand to fold and unfold
30 them, substantially as described.

4. In a device of the class described, the combination of a wheel, a casing composed of two sections, a vane connected with one of the sections of the casing, a frame or support
35 rigid with the other section of the casing, a series of blades mounted on the frame or support and arranged to actuate the section carrying the same, and an automatically-operating catch mounted on one of the sections
40 and arranged to engage the other section, substantially as described.

5. In a device of the class described, the combination of a wheel, a casing composed of two sections arranged to close over the wheel,
45 a vane connected with one of the sections of the casing, and a governor rigid with the other section of the casing and having a series of folding blades arranged to actuate such section, substantially as described.

6. In a device of the class described, the combination of a wheel, a casing composed of sections arranged to close over the wheel, a catch mounted on one of the sections and
50 arranged to engage the other, a lever fulcrumed on the casing and connected with the catch, and operating mechanism attached to the lever and adapted to oscillate the same to disengage the catch, substantially as described.

7. In a device of the class described, the combination of a horizontal wheel, a casing composed of curved sections arranged to close over the wheel, one of the sections being provided with a socket and having a guide, a
60 vertical shaft supporting the wheel, a catch mounted on the casing and arranged to engage the socket to hold the same closed, a slid-

ing sleeve mounted on the shaft, and an operating-rod composed of upper and lower sections having eyes receiving the sleeve, one of
70 the sections being connected with the catch, substantially as and for the purpose described.

8. In a device of the class described, the combination of a wheel, a casing composed of
75 sections and adapted to close over the wheel, inner and outer sleeves having an intervening space between them and connected with one of the sections, the outer sleeve being adjustable, a spring connected with the other
80 section and having coils arranged in the space between the sleeves and connected with the outer sleeve, and means for adjusting the latter to regulate the tension of the spring, substantially as described.

9. In a device of the class described, the combination with a wheel, and a casing adapted to close over the wheel, of a governor connected with the casing and comprising a supporting-frame, a series of blades hinged to
90 the frame and arranged to fold down upon the same, means for operating the blades to raise and lower the same, and a device for locking the blades in an operative position, substantially as described.

10. In a device of the class described, the combination of a wheel, a casing composed of sections, a vane connected with one of the sections of the casing, and a governor rigid with the other section of the casing and comprising a frame located at one side of the
100 center of the wheel and provided with a counterbalancing-weight located at the opposite side of the same, a series of blades pivotally mounted on the frame and adapted to open
105 and close, and means for operating the blades, substantially as described.

11. In a device of the class described, the combination with a wheel, and a casing, of a governor comprising a frame, a series of
110 blades pivotally mounted on the frame, an oscillating frame mounted on the frame of the governor, rods connecting the blades with the oscillating frame, and means for operating the oscillating frame and for locking the
115 blades in their operative position, substantially as described.

12. In a device of the class described, the combination with a wheel, and a casing, of a governor comprising a supporting-frame, a
120 series of blades pivotally mounted thereon, an oscillating frame mounted on the supporting-frame and connected with and adapted to open and close the blades, a catch carried by one of the frames and arranged to engage
125 the other to hold the blades in their operative position, a lever fulcrumed between its ends and having one arm connected with the catch, and operating mechanism extending to the bottom of the windmill and connected
130 with the other arm of the lever, substantially as described.

13. In a device of the class described, the combination with a wheel, and a casing, of a

governor comprising a supporting-frame, a series of blades pivotally mounted thereon, an oscillating frame connected with the blades, a track supporting the outer portion of the oscillating frame and provided with a shoulder, a catch mounted on the oscillating frame and arranged to engage the shoulder to lock the blades in their operative position, and operating mechanism connected with the catch and adapted to release the same, substantially as described.

14. In a device of the class described, the combination with a wheel, and a casing, of a governor comprising a supporting-frame, brackets mounted thereon and having sides provided with flanges forming stops, blades pivotally mounted at their lower edges on the brackets and arranged to engage the stops, and means for raising and lowering the blades and for holding them against the said flanges, substantially as described.

15. In a device of the class described, the combination with a wheel, and a casing, of a governor comprising a sector-shaped supporting-frame, a curved series of blades pivotally mounted at the periphery thereof, a curved track mounted on the supporting-frame, an oscillating sector-shaped frame mounted on the supporting-frame and supported by the track, rods connecting the blades with the oscillating frame, a guide engaging the oscillating frame and retaining the same on the track, and means for operating the oscillating frame, substantially as described.

16. In a device of the class described, the combination with a wheel, and a casing, of a governor comprising a supporting-frame, blades pivotally mounted thereon, an oscillating frame connected with the blades and adapted to swing the same on their pivots, and an operating-rod connected with the oscillating frame and adapted to be rotated to open and close the blades, substantially as described.

17. In a device of the class described, the combination of a horizontal wind-wheel having a tubular vertical shaft, a casing, a horizontal supporting-frame, blades pivotally mounted on the supporting-frame, an oscillating frame connected with the blades, a catch for holding the blades in their operative position, and a rod passing through the tubular shaft and connected with and adapted to actuate the oscillating frame, said rod being also connected with and adapted to operate the catch, substantially as described.

18. In a device of the class described, the combination of a vertical tubular shaft, a wheel mounted thereon, a casing, a supporting-frame connected with the casing, blades mounted on the supporting-frame and ar-

ranged to fold against the same, an oscillating frame connected with the blades and provided with a boss or hub, a cap interlocked with the boss or hub, and a rod passing through the tubular shaft and connected with the cap and adapted to rotate the same, substantially as described.

19. In a device of the class described, the combination of a vertical tubular shaft, a wheel mounted on the shaft, a casing, a supporting-frame, blades movably mounted on the supporting-frame, an oscillating frame connected with the blades and having a boss or hub, a cap interlocked with the hub and capable of a limited vertical movement thereon, a locking device for holding the blades in operative position, a rod passing through the shaft and adapted to move the cap vertically and also to rotate the same, and means for connecting the locking device with the cap, whereby when the latter is raised the locking device will release the blades, substantially as described.

20. In a device of the class described, the combination of a wheel, a casing composed of two sections, one of the sections being provided with a vane, a supporting-frame connected with the other section, means for holding the sections normally open, blades mounted on the supporting-frame, and operating mechanism for opening and closing the blades and for swinging the supporting-frame to close the sections of the casing, substantially as described.

21. In a device of the class described, the combination of a vertical tubular shaft, a wheel mounted thereon, a casing composed of sections 20 and 21, the section 21 being provided with a sleeve at its top, a supporting-frame provided with a hub and connected with the sleeve, an oscillating frame mounted on the hub and having a limited rotary movement thereon, blades mounted on the supporting-frame and connected with the oscillating frame, a catch carried by the oscillating frame for locking the blades in operative position, a cap interlocked with the oscillating frame and having a limited vertical movement, a lever connecting the cap with the catch, and a rod passing through the tubular shaft, connected with the cap and adapted to rotate the same and move it vertically, substantially as described.

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

DANIEL W. SMITH.

Witnesses:

K. W. HUNT,
C. M. HUNT.