

Nov. 18, 1930.

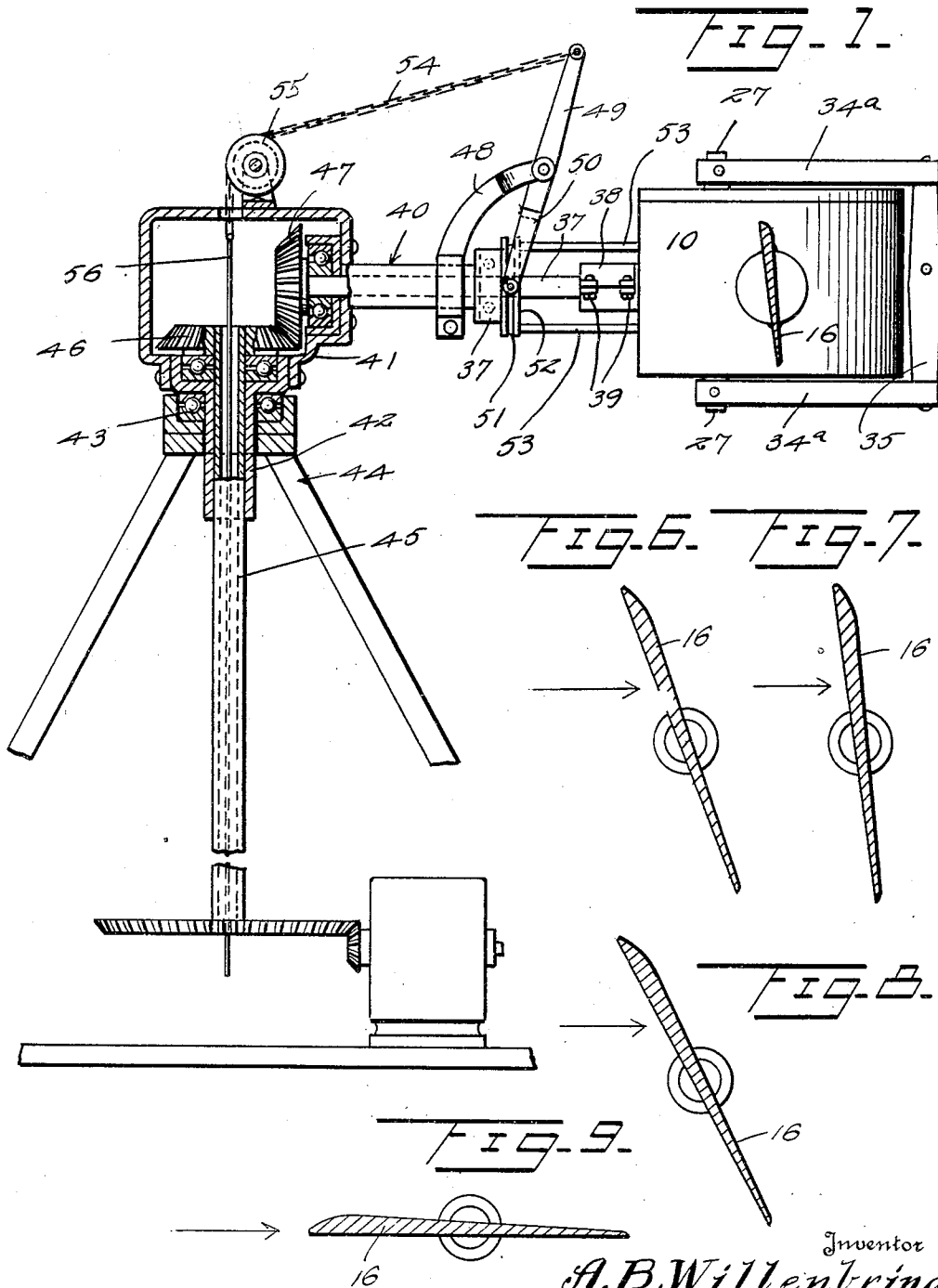
A. B. WILLENBRING

1,782,280

WINDMILL

Filed Dec. 1, 1928

3 Sheets-Sheet, 1



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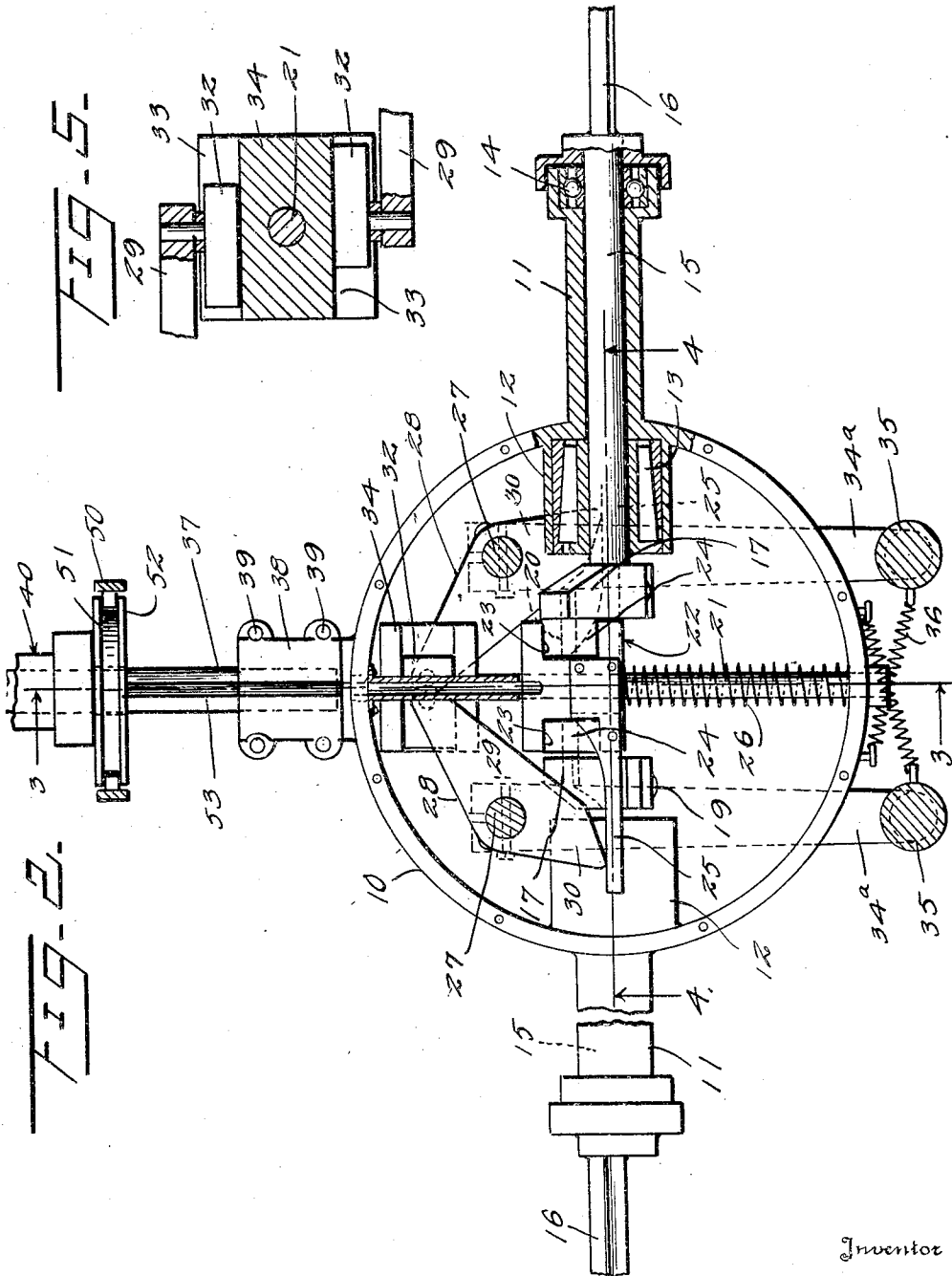
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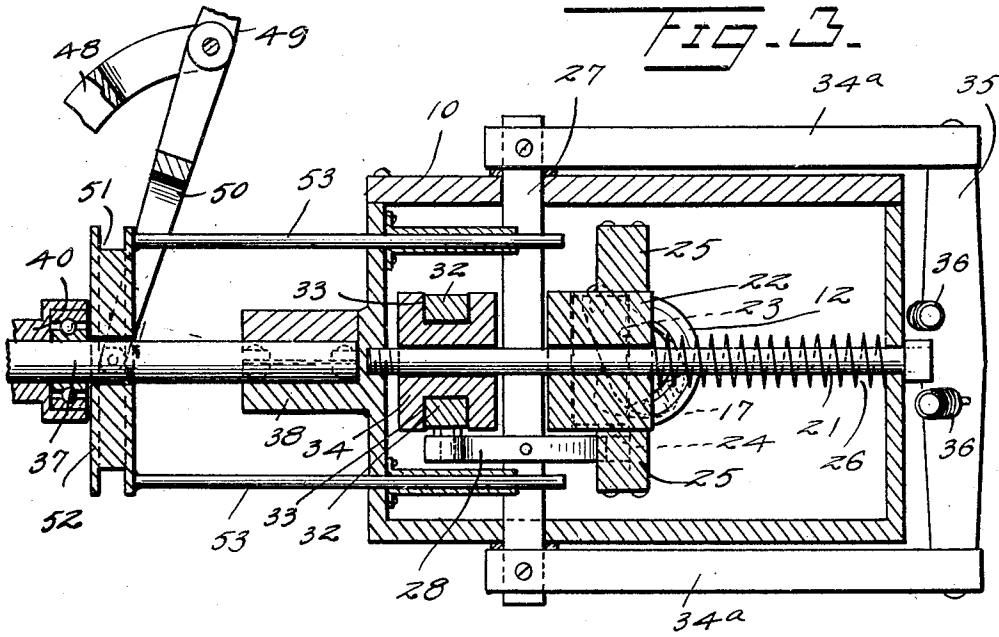
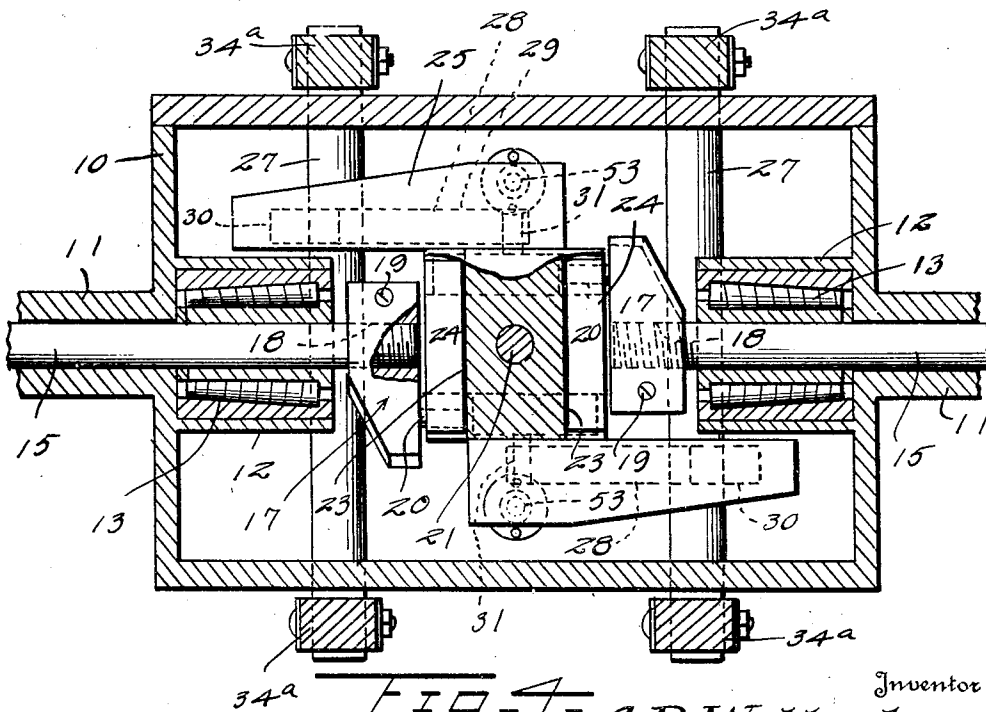
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UNITED STATES PATENT OFFICE

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WINDMILL

Application filed December 1, 1928. Serial No. 323,123.

This invention relates to windmills, and more particularly to a device of this character permitting a proper control of the speed of operation of the propeller vanes, thus adapting the device for use in the operation of generators.

A further object of the invention is to produce a construction such that the speed of operation will rapidly pick up after starting to the desired or normal speed.

A still further object of the invention is to provide a construction permitting the operation to be cut off at any time.

A further object of the invention is to provide in an apparatus of this character a novel and improved governor structure controlling the position of the vanes.

A still further object of the invention is to provide a device of this character which may be readily and cheaply manufactured, which will be durable and efficient in service, and a general improvement in the art.

These and other objects I attain by the construction shown in the accompanying drawings, wherein for the purpose of illustration is shown a preferred embodiment of my invention and wherein:—

Figure 1 is a side elevation partially in section showing a windmill apparatus constructed in accordance with my invention;

Figure 2 is a plan view of the windmill, a section of the hub casing being removed and parts being shown in section;

Figure 3 is a section on the line 3—3 of Figure 2;

Figure 4 is a section on the line 4—4 of Figure 2;

Figure 5 is a detail sectional view through the governor yoke;

Figure 6 is a fragmentary sectional view showing the normal position of the vanes with respect to the wind when the device is stationary;

Figure 7 is the initial position assumed by the blade under the influence of the governor weights in operation;

Figure 8 illustrates a further movement of the vanes under the influence of the governor weight;

Figure 9 shows the position to which the

vanes may be moved by operation of the manual control means.

Referring now more particularly to the drawings, the wind wheel comprises a casing 10 preferably split for convenience in assembly and having disposed at opposite sides thereof outwardly extending tubular bosses 11. Interiorly of the casing and surrounding the inner ends of the bores of the bosses are retaining means 12 for bearings 13, while the outer ends of the bosses mount bearings 14. In the bearings 13 and 14 are mounted shafts 15, the outer ends of which have secured thereto vanes 16 which are rigidly secured to the shaft.

The inner end of each of these shafts is provided with a crank 17 preferably having a threaded socket 18 in which the inner end of the shaft is threaded and which is split and clamped upon the shaft by bolts 19. Each of these shafts mounts the outer end of a crank pin 20, the purpose of which will presently appear.

Mounted in the opposite walls of the casing and perpendicular to the shafts 15 is a guide post 21 having slidably mounted thereon a yoke 22 providing guides 23 for blocks 24 in which the inner ends of the crank pins are engaged. This yoke has secured to opposite sides thereof arms 25, which extend in the same general direction as the shafts 15 and act to assist in controlling the position of the yoke, in a manner hereinafter described.

At one side of the yoke, the guide 21 is surrounded by a spring 26, one end of which abuts the casing and the opposite end of which abuts the yoke, thus constantly urging this yoke in one direction. It will be obvious that if the yoke 22 is moved longitudinally upon the guide, this movement through the crank pins 20 will be transmitted to the shafts 15 as rotary motion, whereby the vanes supported by the ends of the shafts will have their positions altered. Extending transversely of the casing with respect to the arms 25 and inwardly of each arm is a shaft 27, each shaft 27 having secured thereto within the casing and to one side of the guide 21 a crank 28 and a cam 30. Each cam 30 coacts with the associated arm 25. The cranks 28 are

each provided with a pin 31 engaging in a block 32 slidably mounted in a groove 33 formed in one face of a yoke 34 likewise slidable upon the guide 21.

5 The ends of the shafts 27 extend exteriorly of the casing and have secured thereto arms 34^a, the outer ends of the arms of each shaft being connected by a governor weight 35. The governor weights 35 are connected by
10 springs 36 to the casing 10 in such manner that the cam ends 30 of the arms 28 are normally maintained in engagement with the arms 25 of the yoke 22.

In alignment with the guide 21, the casing 10 is provided with means whereby the wind wheel may be secured to a shaft 37, at present indicated as a split tubular boss 38, the sections of which are drawn together upon the shaft by bolts 39. This shaft, exteriorly of
20 the boss, is mounted in an elongated horizontal bearing 40 forming a portion of a casing 41, which has a tubular extension 42 mounted for rotation in vertical bearings 43 carried by a tower 44 or other suitable support. Within
25 this tubular extension is mounted a shaft 45, the upper end of which has secured thereto a bevel gear 46. The inner end of the shaft 37 has secured thereto a gear 47 coacting with the gear 46.

30 Mounted upon a fork 48 secured to the bearing 40 is a shifting lever 49, the lower end of which is in the form of a fork 50 engaging in a groove 51 formed in a disk 52 slidable longitudinally of the shaft. This disk has pins
35 53 projecting into the casing and aligning with the inner ends of the arms 25, and these pins may be engaged with these arms by shifting the disk outwardly. The lever is controlled by a flexible element 54 trained over a
40 sheave 55 mounted in the casing 41 and the inner end of this flexible element is connected to a pull rod or line 56 extending downwardly through the hollow shaft to a point where it may be conveniently operated.

45 In the operation of a device of this character, the casing 41 will rotate under the influence of wind pressure, so that the shaft 37 extends in the direction in which the wind is blowing.

50 When the wind wheel is at rest, the vanes 16 occupy an angular position, with respect to its plane of rotation, which is best adapted to overcome its inertia and the inertia of the shafts and gears by which it is connected
55 to the driven element at present illustrated as an electric generator. This or the starting position of the vanes 16 is shown in Figure 6. The vanes 16 are yieldingly held in this position, until the rate of rotation of the
60 wind wheel increases to a predetermined degree, by the spring 26 which bears against the casing 10 and against the yoke 22, and by the governor controlled cams 30 which bear against the arms 25 carried by the yoke.

65 When the rate of rotation of the wind wheel

increases to the predetermined degree, the governor controlled cams 30 move away from the arms 25, with the result that the guide 22 is freed for movement by the spring 26. The movement imparted to the guide 22 by
70 the spring 26 will turn the blades 16 so as to decrease their angle with respect to the plane of rotation of the wind wheel, with the result that they are positioned more flatly in opposition to the wind. This or
75 the normal operating position of the blades 16 is shown in Figure 7. The blades 16 are maintained in this position, until a further increase takes place in the rate of rotation
80 of the wind wheel, by the spring 26 and the governor controlled cams 30. When this increase in speed occurs the free ends of the governor controlled cranks 28 will be moved
85 in the direction of the yoke 22, with the result that the yoke 34 will contact with the yoke 22 and move it against the tension of the spring 26. This movement of the yoke 22 turns the vanes 16 in a direction to increase
90 their angular position with respect to the plane of rotation of the wind wheel with the result that the rate of rotation will be reduced. This position of the blades 16 is
95 shown in Figure 8. As the rate of rotation of the wind wheel decreases, the yoke 34 will be moved away from the yoke 22 by the governor controlled cranks 28, with the
100 result that the spring 21 reacts to move the yoke 22 in a direction to decrease the angle of the vanes 16 with respect to the plane of rotation of the wind wheel. It will thus
105 be apparent that the vanes 16 when in starting position are at a greater angle to the plane of rotation of the wind wheel than they occupy when they are in normal operating position, that the vanes are moved
110 into their normal operating position when the wind wheel reaches a predetermined degree of speed, and that when the speed of the wind wheel increases, the vanes are turned
115 into a greater angle with respect to the plane of rotation of the wind wheel, with the result that the wind wheel will be easily started and its rate of rotation will be maintained at its desired degree. If, at
120 any time, it is desired to stop rotation of the mill, this may be accomplished by placing a strain upon the pull rod or line 56, thereby shifting the disk 52 outwardly, with the
125 result that the pins 53 will shift the yoke 22 until the vanes 16 are positioned in their feathering position or that position where their edges are in alignment in the direction of movement of the wind and the vanes have no pitch.

It will be obvious that by controlling the movement of the vanes in the manner above described, a maximum efficiency of the vanes both in starting and in operation can be had, as differentiated from those types of governor controls for vanes, wherein the

vane is simply shifted from a normal operative position toward an inoperative position by the governor.

With such devices, it will be obvious that where the vane is disposed, as it must be where it has its maximum efficiency, in this normal position, the initial movements of the governor, which will occur practically immediately, will result in a decreased efficiency of operation and in a decreased speed. Thus, the speed possible in the normal position of the vanes can never be attained with such devices, whereas, with my device, a desired speed can not only be attained but maintained through a considerable range.

Since the construction hereinbefore set forth is capable of a certain range of change and modification without materially departing from the spirit of the invention, I do not limit myself to such specific structure except as hereinafter claimed.

I claim:—

1. In a wheel for windmills and the like, a hub casing, radially pivoted vanes carried thereby, an axially disposed guide within the casing, a yoke slidable upon the guides, slides mounted in the yoke, cranks carried by the inner ends of the vanes, pins connecting said cranks and corresponding slides of the yoke, and means for shifting said yoke longitudinally upon the guide.

2. In a wheel for windmills and the like, a hub casing, radially pivoted vanes carried thereby, an axially disposed guide within the casing, a yoke slidable upon the guides, slides mounted in the yoke, cranks carried by the inner ends of the vanes, pins connecting said cranks and corresponding slides of the yoke, a rock shaft, a lever carried by the rock shaft and having its ends adapted for alternate operative engagement with the yoke, and means for rotating said rock shaft.

3. In a wheel for windmills and the like, a hub casing, radially pivoted vanes carried thereby, an axially disposed guide within the casing, a yoke slidable upon the guides, slides mounted in the yoke, cranks carried by the inner ends of the vanes, pins connecting said cranks and corresponding slides of the yoke, a rock shaft, a lever carried by the rock shaft and having its ends adapted for alternate operative engagement with the yoke, means for rotating said rock shaft, said lever by engagement of either end thereof with the yoke moving said yoke in one direction, and a spring moving the yoke in the opposite direction.

In testimony whereof I hereunto affix my signature.

ARNOLD B. WILLENBRING.