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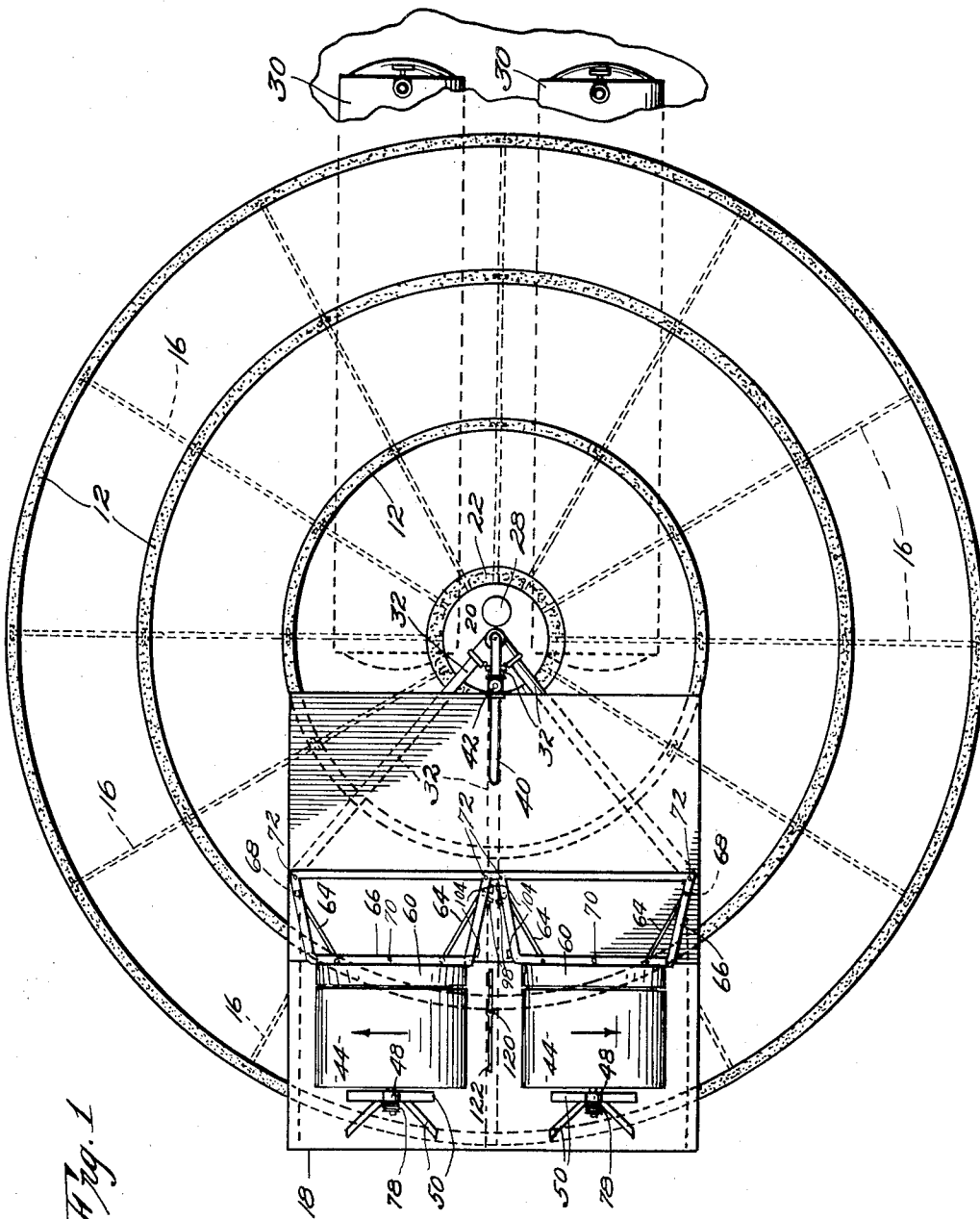
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1,936,233

WIND TURBOGENERATOR

Filed Feb. 4, 1932

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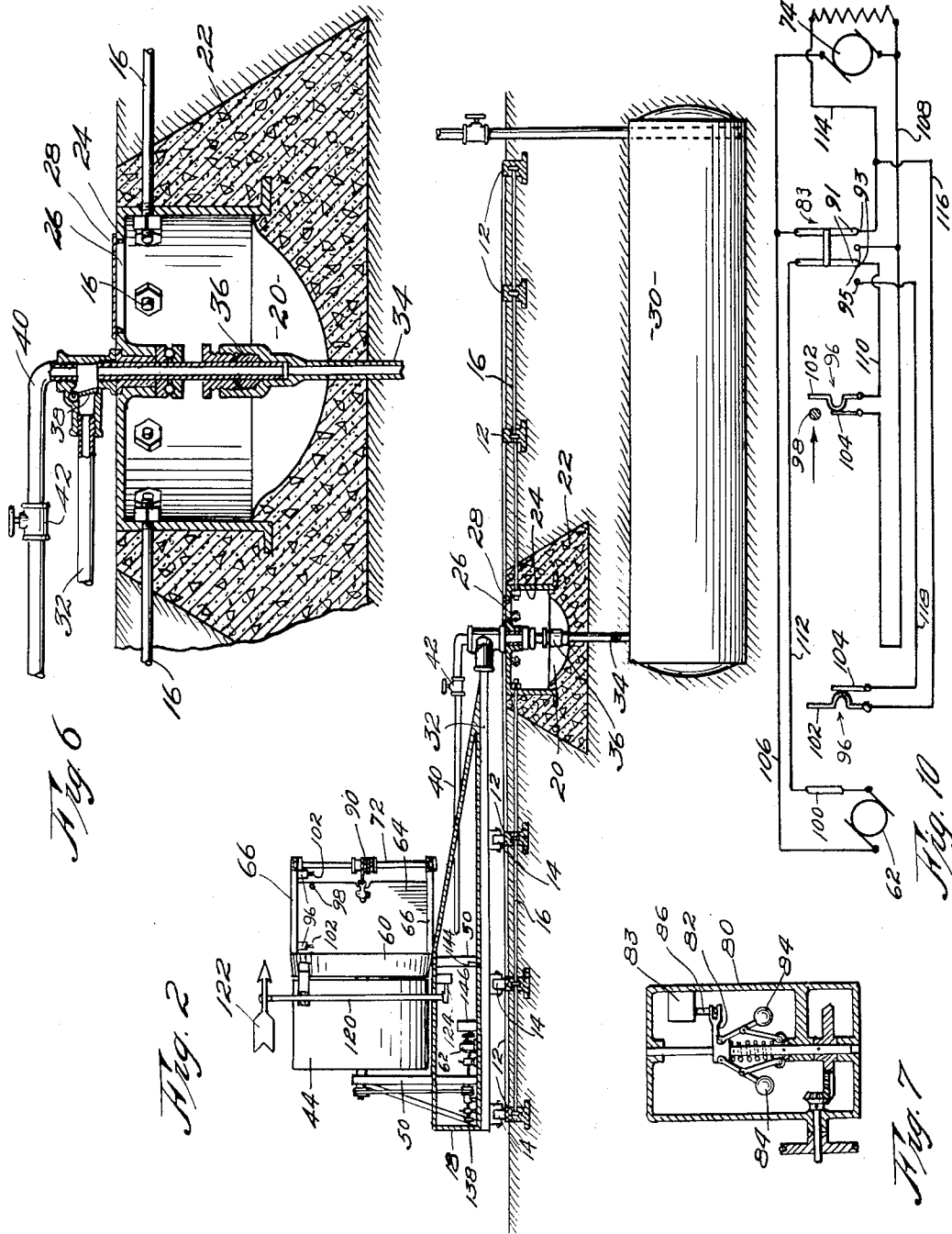
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4 Sheets-Sheet 2



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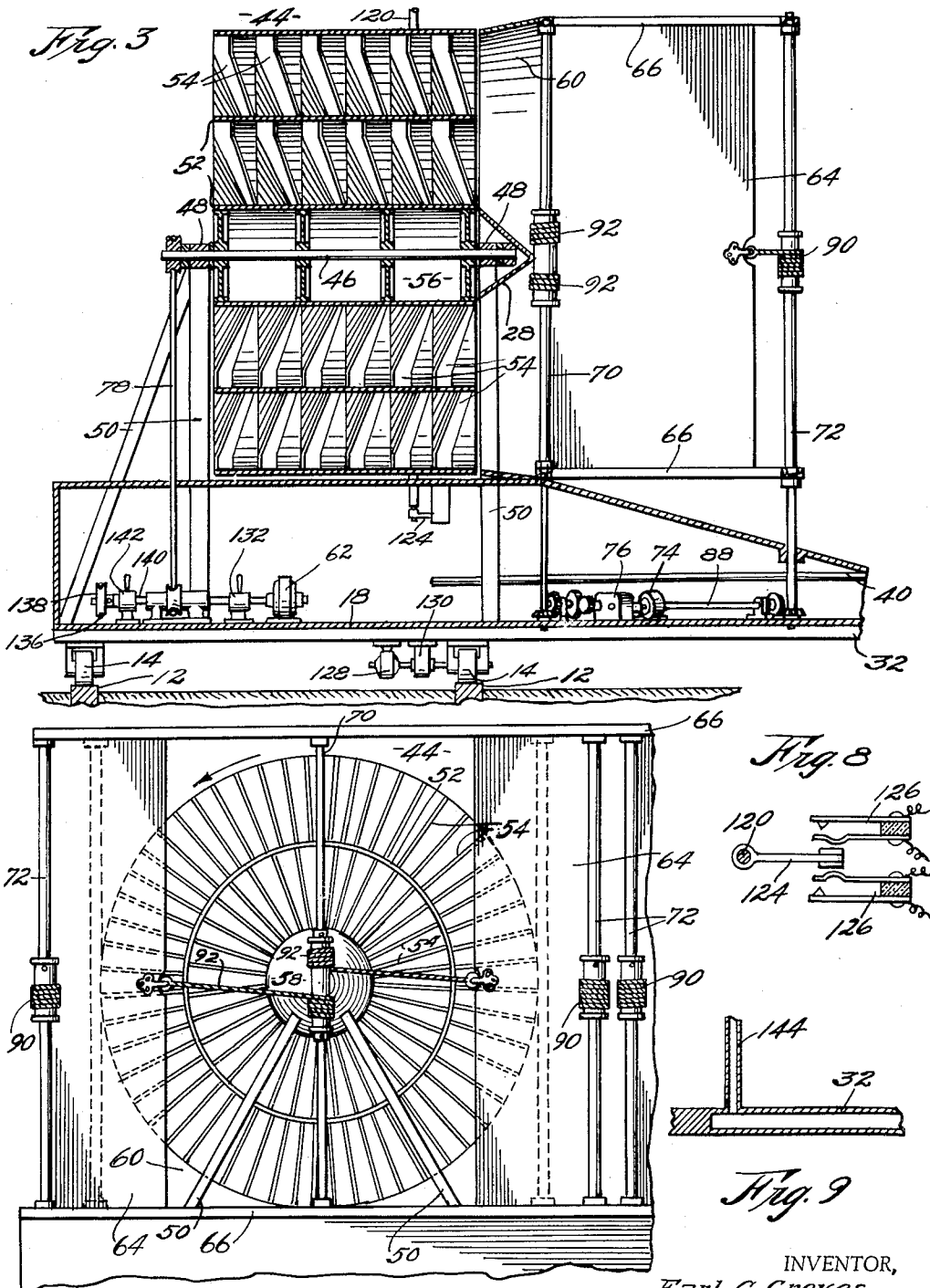
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WIND TURBOGENERATOR

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4 Sheets-Sheet 3



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WIND TURBOGENERATOR

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4 Sheets-Sheet 4

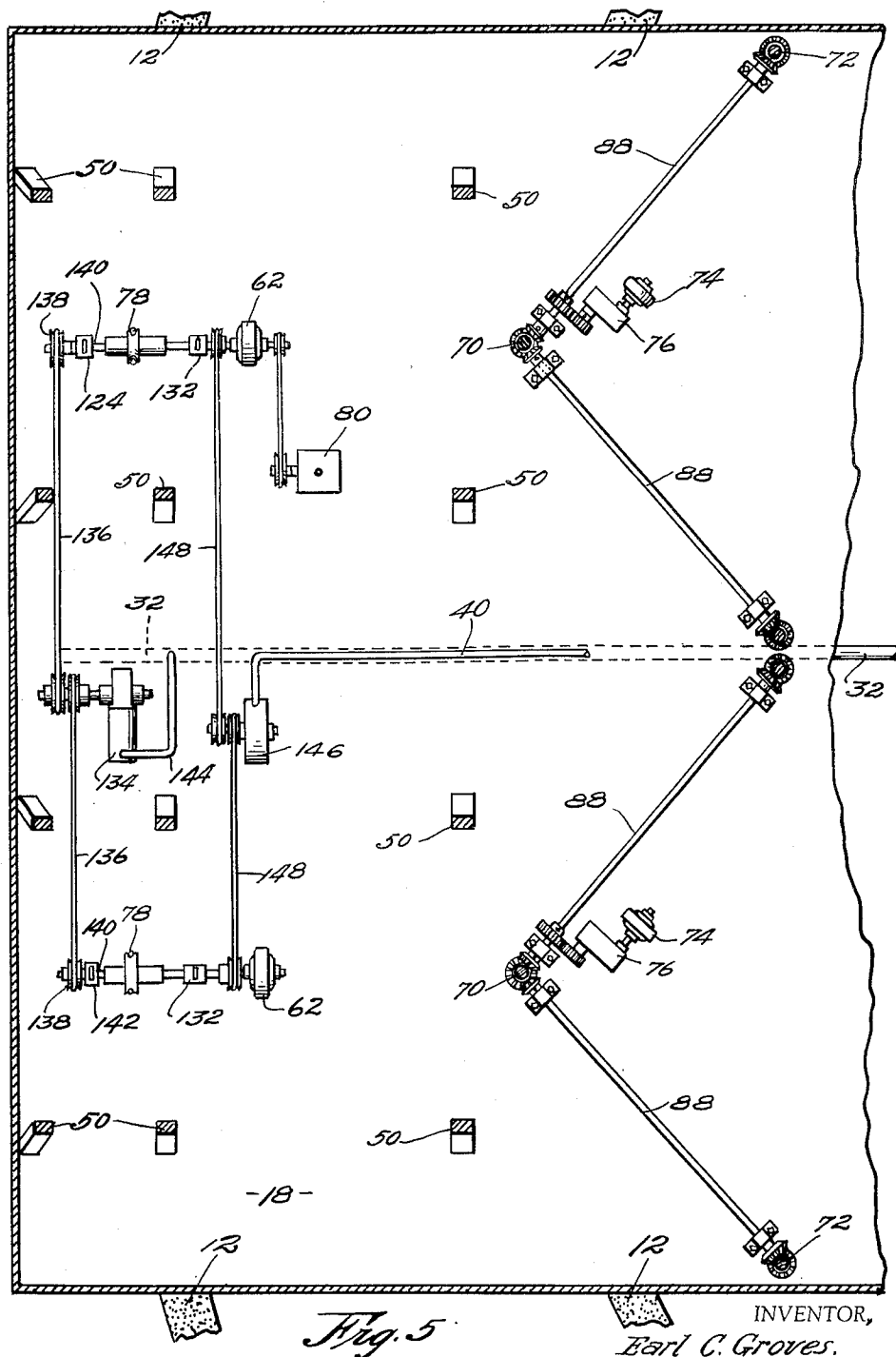


Fig. 5

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WIND TURBOGENERATOR

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Application February 4, 1932. Serial No. 590,843

2 Claims. (Cl. 170—5)

This invention relates to generating apparatus and contemplates novel structure for the utilization of natural forces in producing electrical energy through the medium of an ordinary generator directly connected to the apparatus, or indirectly driven thereby by interposing suitable energy-storing means which may be drawn upon when the natural forces normally used are not available.

One of the primary objects of this invention is to provide a wind-operated turbogenerator that is mounted in unique fashion whereby to always be maintained in proper operative position in the direct path of travel of the air currents being utilized.

A yet further object of the instant invention is the provision of generating apparatus, wherein is included means for automatically controlling the amount of wind force used; structure operated by the change in the direction of wind travel for moving the generating apparatus to a position where it will most efficiently operate; and a unique turntable for supporting all parts of the apparatus whereby they may be moved as a unit about a fixed center.

An even further object of the invention is the contemplation of simple, durable and novel structure for accomplishing the above broad objects, and for embodying minor objects of the invention which will be specifically set down and described in the specification, referring to the accompanying drawings, wherein:

Figure 1 is a top plan view of a wind-operated turbogenerator constructed in accordance with the preferred form of this invention.

Fig. 2 is a vertical cross section through the apparatus, including the part thereof which is normally underground.

Fig. 3 is an enlarged, fragmentary, vertical, cross section through a part of the turbogenerator, showing particularly one of the wind-driven rotors in cross section.

Fig. 4 is a front elevation of one of the wind-driven rotors, illustrating the appearance of the same when viewed from a position forward of the shutters associated therewith.

Fig. 5 is a horizontal section through the generator housing which is mounted upon the turntable, said section illustrating the relative positioning of the apparatus in the generator housing.

Fig. 6 is an enlarged, detailed, vertical, sectional view through the parts of the generating apparatus as they appear at the axis thereof.

Fig. 7 is a detailed, sectional view through the governor housing.

Fig. 8 is a diagrammatical showing of the double switch which is actuated by the movement of a wind direction indicator.

Fig. 9 is a fragmentary, sectional view through a portion of the conduit which carries compressed air from compressor to tank, and,

Fig. 10 is a diagrammatical showing of the electrical circuit forming a part of the shutter-actuating mechanism.

An understanding of the turbogenerator contemplated by this invention teaches that the same may be used in meeting power requirements for dwellings, groups of buildings, such as camps and farms, and even small towns or villages that are located in parts of the country where it is not uncommon for the wind to blow steadily for long periods of time.

While the drawings herewith illustrate the wind-driven rotor combined with an electrical generator and an air compressor, it must be understood that the force procurable from its rotation might be transmitted to any mechanism and harnessed for the accomplishment of any type of work.

In describing the preferred embodiment of the invention, reference will be made to similar parts of the apparatus through the use of like reference numerals.

Since it is possible for wind to travel toward this generating apparatus from practically any direction, it becomes necessary to provide means for easily accomplishing the proper positioning of the parts thereof, which are driven by the wind currents. The numeral 12 indicates a circular track, including a number of concentric paths formed of any suitable material that will support the weight and allow wheels 14 to freely ride thereover. In some instances track 12 is formed of concrete, reenforced and maintained in spaced relation by a number of tie bars 16, which radiate from the axial center of track 12, as shown in Fig. 1. The axis of track 12, about which travels turntable 18, is indicated by the number 20 in Figs. 1, 2 and 6. Since radial movement on the part of turntable 18 is precluded by the holding power of the structure of axis 20, the same should be foundationed in concrete 22 and provided with a steel anchor 24, having an opening and cover 26 and 28 respectively to permit easy access to the chamber formed within foundation 22. As illustrated in Fig. 6, certain swivels and other parts forming a connection to compressed air storage tanks

30 are housed within the chamber formed at the axis.

As previously set down, turntable 18 moves along tracks 12 about axis 20. Connection from axis 20 to turntable 18 is set up through the medium of a number of tubular arms 32, as shown clearly in Fig. 1. The central arm 32 serves the purpose of conveying compressed air to tanks 30 when the hereinafter mentioned compressor is operating. Pipe 34 joins tanks 30 and central arm 32, a stuffing box 36 is employed to permit rotation of arm 32 about axis 20. A check valve 38 precludes back pressure and a by-pass 40 having a valve 42 interposed therein permits drawing off of compressed air from tanks 30 for the purpose of operating a later described turbine when conditions require such action.

One of the basic principles of this invention is built into the unique wind-driven rotor 44 which is shown in detail in Figs. 3 and 4. While it is possible to use any number of these rotors 44, it is preferred to employ even numbers and to arrange the same so that the direction of travel thereof will be equalizing to the entire apparatus. Each rotor is revolvably mounted on a horizontally disposed shaft 46, journaled in bearings 48 and supported high above turntable 18 by standards and braces 50 of any suitable nature. More specifically, each rotor consists of a plurality of annular walls 52, between which is placed a series of rearwardly inclined blades 54. It has been found that this particular type of rotor is exceptionally efficient and the employment of blades 54, which do not have free ends and which incline rearwardly from their point nearest shaft 46 to their connection with walls 52, efficiently utilizes the minutes air current. A drum 56 is created around shaft 46 by one of walls 52 and deflectors 58 and 60 direct the wind against blades 54.

In view of the fact that generator 62 should be driven at a substantially constant speed, and since the wind forces will vary from time to time, it is necessary to supply shutters 64 to maintain a substantially constant wind pressure against said rotor. Basically, shutters 64 should be movable to and from a position where they close entirely the entrance to rotor 44 through deflector 60. The structure whereby shutters 64 may be operably mounted is herein illustrated to be an upper and lower frame 66 that slidably engage the upper and lower edges of shutters 64 through the medium of pins or rollers 68. Each rotor 44 should have two shutters 64 and mechanism for actuating the shutters simultaneously should be carried by turntable 18. A central vertical shaft 70 and a shaft 72 at each side of the entrance to rotor 44 are rotated to move shutters 64 in the appropriate direction.

Vertical shafts 70 and 72 are driven by motor 74, geared to actuate said shafts as shown in Figs. 3 and 5. Obviously, a speed reducer 76 might be utilized and since it becomes necessary to rotate shafts 70 and 72 in both directions, motor 74 is of the reversible type. Power to drive motor 74 is obtained from generator 62, which is driven by connection 78 as long as rotor 44 is turning about shaft 46. A governor assembly 80 is combined with the mechanism to be driven by rotor 44 simultaneously with the aforementioned generator 62. A detailed showing of this generator and governor connection is shown in Fig. 5 and a more specific illustration of the governor itself is illustrated in Fig. 7. Current to motors 74 is supplied thereto by the

closing of the appropriate circuit only when air currents to rotor 44 are such as to effect the desired constant speed of generator 62. That is to say, when the force of wind diminishes to a point where generator 62 will decrease its speed of rotation below a predetermined minimum, governor arm 82 will be moved upwardly by governor weights 84, whereby to move the operating lever 86 of switch 83 to a position where it will carry contact points 91 to engage similar points 93 which causes motor 74 to rotate shafts 88 in the appropriate direction to move shutters 64 toward the completely opened position. Manifestly, the rotation of shafts 70 and 72 in a direction whereby shutters 64 are opened, will wind cable 90 and unwind cables 92 at the center shaft 70. As shutters 64 are moved to an open position, an increased wind pressure will be set up against rotor 44 and its speed of rotation will be increased to a point where governor 80 will move governor arm 82 downwardly to disconnect switch points 91 and 93. If wind pressure is increased sufficiently to cause rotor 44 to travel at an excessive speed, governor weights 84 will move arm 82 downwardly to carry contact points 91 against contact points 95, whereby the direction of rotation on the part of motor 74 is reversed from that previously mentioned and shutters 64 are drawn toward the closed position.

To preclude running of motor 74 after shutters 64 have reached the completely open or closed position, there is provided a pair of switches 96 for each shutter 64 or, to fulfill the purpose of the invention it is necessary to equip but one shutter 64 of each set thereof with two switches 96. These switches 96 are stationary and project into the path of travel of a pin 98, carried by the adjacent shutter 64. When the shutter reaches the end of its path of travel in either direction, one of said switches 96 is opened to break the circuit supplying energy to motor 74. The other of said switches 96 is in the closed position and a movement on the part of governor 80 to close that circuit of which said closed switch 96 is a part, will immediately actuate motor 74 to draw shutters 64 back through a path of travel opposite to that through which the same just traveled. Thus, there is provided mechanism controlled by the rotor-actuated governor 80 which controls the speed of rotor 44 by varying the wind pressure thereagainst. A main switch 100 should be interposed in the shutter-actuating circuit whereby the whole may be made inoperative if such becomes desirable or necessary.

Reference is here made to Fig. 10 for an understanding of the circuit which is in operation as the shutters 64 are being moved toward the completely opened position. As previously set down, contact points 91 and 93 are together. Main switch 100 is closed, generator 62 is supplying current to motor 74 and pin 98 is moving toward yieldable contact point 102 now in engagement with fixed point 104. Energy will pass from generator 62 by way of wire 106 to motor 74; thence from motor 74 by conductor 108 to rigid arm 104; to contact point 102; wire 110; contact point 93; contact point 91; conductor 112; main switch 100 and thence back to generator 62. Assuming that shutters 64 are being closed and contact points 91 are engaging points 95, motor 74 will be traveling in a reverse direction from the aforementioned condition, and the circuit defined as follows:

Generator 62; wire 106; contact point 91; contact point 95; conductor 108; through motor 74; 150

to wire 114; to branch 116; to contact point 102 of switch 96. Thence to rigid arm 104; to wire 118; to contact point 95; to contact point 91; to conductor 112; main switch 100; and thence to generator 62.

Governor 80 may be of the well known commercial type, wherein is incorporated means for changing the effective operation of the same with respect to causing it to commence actuation of shutters 64 at any predetermined rate of rotation on the part of rotor 44.

As previously set down in the objects, means is provided for automatically facing rotors 44 directly into the path of travel of the air current. The necessity of such an expedient becomes obvious when it is remembered that the direction of wind travel might be diametrically opposite within a very short length of time. One embodiment of this point of the invention is illustrated in the drawings and shown to be a rotatably mounted vertical shaft 120 having a vane 122 thereon and projected an appreciable distance above the entire generating apparatus. The lowermost end of shaft 120 supports an arm 124, the free end of which is disposed between a pair of electrical switches 126, interposed in a circuit having as a part thereof, generator 62. Swinging arm 124 to one side or the other will close the appropriate switch 126 lying in its path of travel and such closing will immediately set up rotation of motor 128 hung beneath turntable 18 and drivingly connected with wheel 14 forming a part of the group thereof beneath turntable 18. A speed reducer 130 might be used if required, and since the closing of one switch 126 causes motor 128 to rotate in a direction opposite from that which is caused by the closing of the other of said switches 126, it is obvious that the entire generating apparatus mounted upon turntable 18 will be moved along track 12 as the change in wind direction alters vane 122 sufficiently to swing arm 124 toward switches 126.

Generator 62 is driven by connection 78, and may be selectively disconnected through the use of any well known multiple speed transmission 132. Tanks 30 are supplied with compressed air when air compressor 134 is driven by belts 136 which pass over pulleys 138, mounted on driven shaft 140 and which is rotated by rotor 44 through the medium of connection 78. A suitable transmission or clutch mechanism 142 might be employed to selectively operate compressor 134 as conditions warrant. Branch 144 carries air from compressor 134 to tube 32 and when wind pressure is insufficient to rotate rotor 44 it is possible to utilize the compressed air stored in tanks 30 to drive generator 62, and the same is removed therefrom through the structure previously described at axis 20 and particularly through pipe

40 which joins the hollow swivel at a point beyond check valve 38 from compressor 134. A turbine 146 receives this air under pressure, drives generator 62 through the utilization of connections thereto, such as belts 148, clearly indicated in Fig. 5.

The operation of this wind operated turbo-generator has been made clear throughout the foregoing specifications. It has likewise been set down that alterations with respect to size might be made without departing from the broad concepts and especially without digressing from the scope of the appended claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. Generating apparatus comprising a horizontally disposed, wind-driven rotor; vertically positioned, slidably mounted shutters at one side of said rotor; and mechanism for moving the shutters to and from a closed position in front of the rotor, comprising a motor, a series of vertical, rotatable shafts mounted for actuation by the motor and cables connecting said shutters and shafts, one of said shafts being positioned centrally between the shutters with a cable extending therefrom to each of the adjacent inner edges of the shutters, an outer shaft adjacent the outer edge of each shutter respectively and a cable joining said outer edge and the adjacent shaft, said central shaft being geared to unwind the associated cable as the outer shafts wind the cables joined thereto when the shutters are drawn open and to rotate in an opposite direction when the shutters are drawn toward the closed position.

2. Generating apparatus of the character described comprising a wind-driven rotor; a turntable supporting said rotor; an upper and a lower frame each having a portion extending at an angle outwardly and laterally in front of the rotor at each side thereof and a part joining said portions and extending across the front of the rotor; a pair of vertically disposed shutters slidably mounted in the said frames; and cables secured to the vertical edges of the shutters for moving the same to and from a closed position across the front of said rotor whereby to maintain a substantially constant wind pressure against said rotor, the innermost, vertical, adjacent edges of each door of the pair being between the frame part extending across the front of the rotor and the other vertical edges of said shutters being between said portions of the frame extending at an angle outwardly and laterally in front of the rotor whereby when the shutters are open the same form outwardly diverging walls to direct air currents toward the said rotor.

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