J. S. & W. S. EVERETT.

APPARATUS FOR AUTOMATICALLY VARYING THE PUMP STROKE IN WINDMILLS AND THE LIKE.

APPLICATION FILED DEC. 12, 1916.

**1,293,389.**

Patented Feb. 4, 1919.

4 SHEETS—SHEET 1.

FIG. 1.

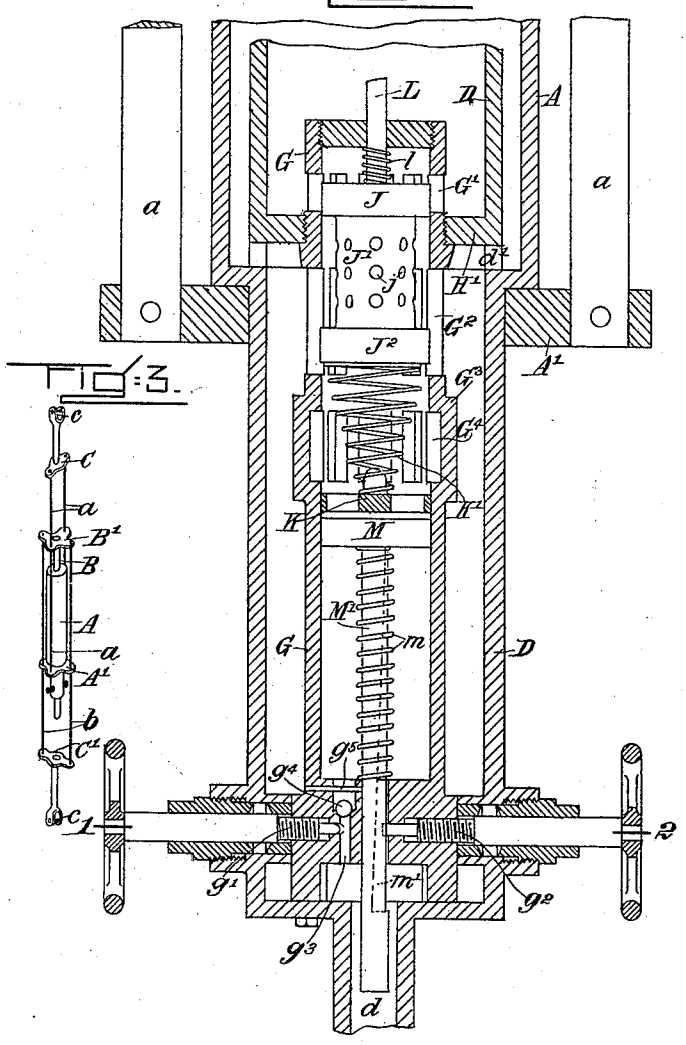



FIG. 3.




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4 SHEETS—SHEET 2

FIG. 1.

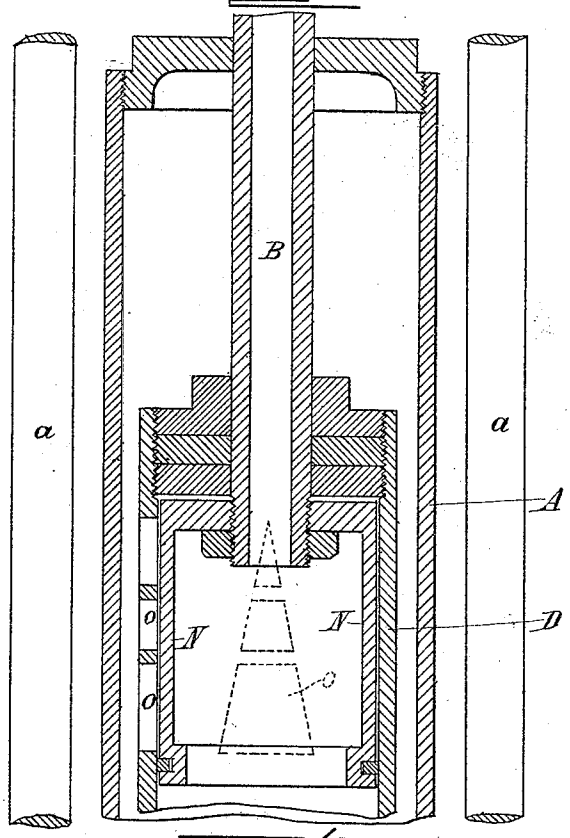
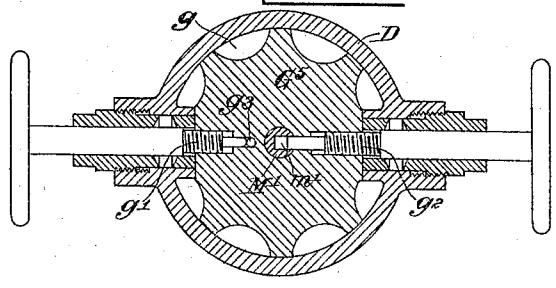



FIG. 2.




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4 SHEETS—SHEET 3

FIG: 5.

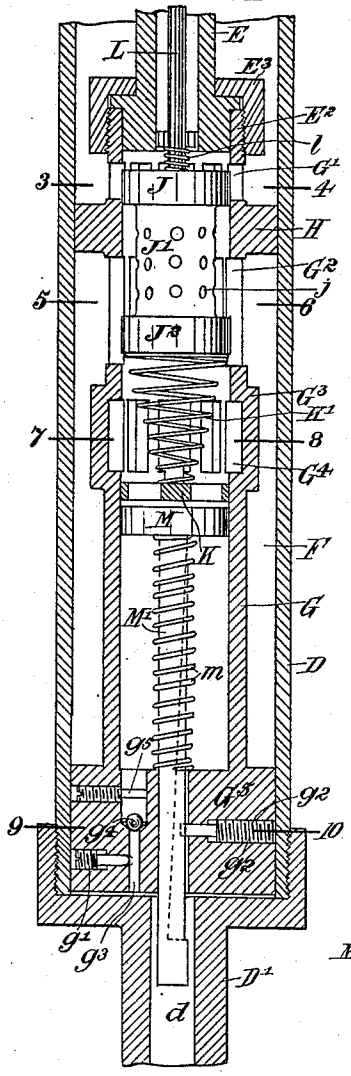



FIG: 4.

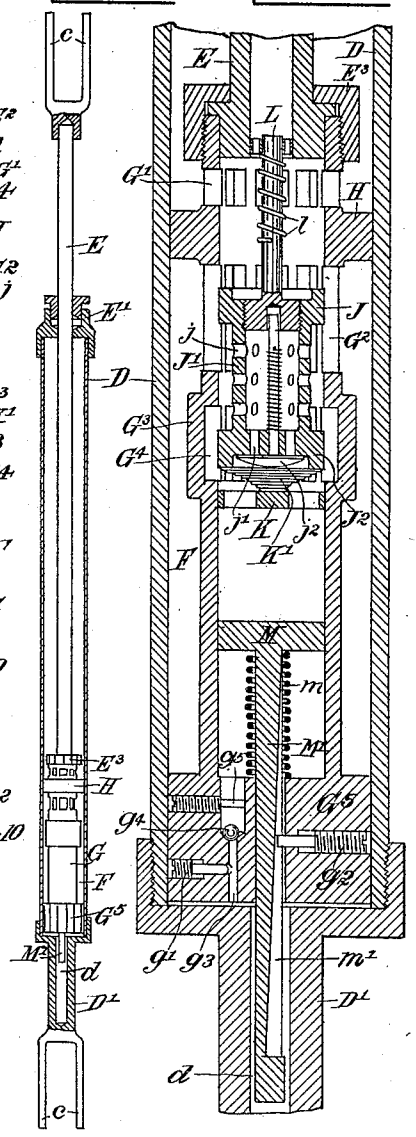



FIG: 6.




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4 SHEETS—SHEET 4.

Fig. 7.

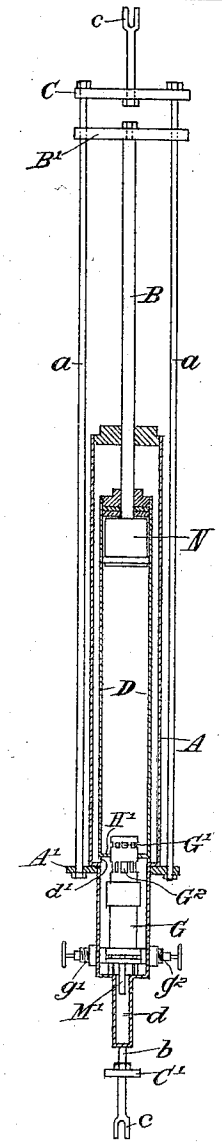



Fig. 8.

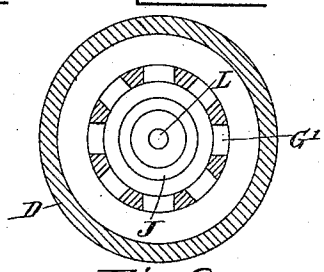



Fig. 9.

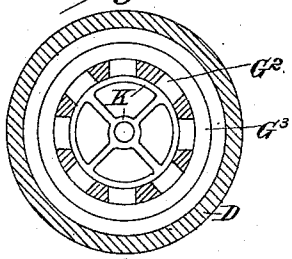



Fig. 10.

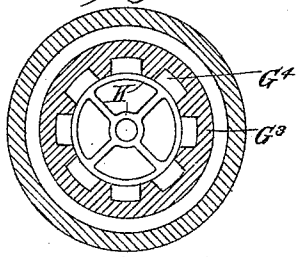
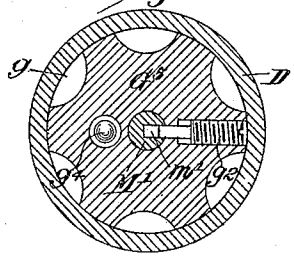



Fig. 11.




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# UNITED STATES PATENT OFFICE.

JOSEPH SILVERTON EVERETT AND WALTER STANLEY EVERETT, OF COORANBONG, NEW SOUTH WALES, AUSTRALIA.

## APPARATUS FOR AUTOMATICALLY VARYING THE PUMP-STROKE IN WINDMILLS AND THE LIKE.

1,293,389. Specification of Letters Patent. Patented Feb. 4, 1919.

Application filed December 12, 1916. Serial No. 136,389.

*To all whom it may concern:*

Be it known that JOSEPH SILVERTON EVERETT and WALTER STANLEY EVERETT, subjects of the King of Great Britain and Ireland, residing at Cooranbong, in the State of New South Wales, Commonwealth of Australia, have invented new and useful Improvements in Apparatus for Automatically Varying the Pump-Stroke in Windmills and the like, of which the following is a specification.

The invention consists of an insertion into the downrod of a windmill that connects the crank of the windmill with the plunger of the pump. The insertion may be applied to the downrod working heavy pumps and light pumps, necessitating certain variations in the details of the invention, but, practically, the two kinds of insertion are identical in principle, the invention as applied to heavy pumps requiring additional external parts to enable the insertion to resist the internal pressure when the latter is applied in a downward instead of an upward direction. The insertion for heavy pumps will comprise two concentric cylinders with a third composite cylinder within the inner cylinder, the composite cylinder containing a floating valve and floating piston, the whole being filled with oil which cannot escape, but the working parts may be forced through the oil and to enable this to be done effectively, certain ports are provided.

But in order that the invention may be properly understood, reference will be made to the accompanying sheets of drawings, in which:—

Figure 1 (Sheets I and II) is a vertical section of the apparatus as applied to windmills that drive heavy pumps.

Fig. 2 (Sheet II) is a transverse section on the line 1—2 of Fig. 1, Sheet I.

Fig. 3 (Sheet I) is a perspective general view of the appliance as it would appear when inserted into the downrod.

Fig. 4 (Sheet III) is a sectional elevation of the apparatus as it would be applied to a windmill adapted to drive a pump of average capacity.

Fig. 5 (Sheet III) is a sectional elevation of the interior parts of the insertion.

Fig. 6 (Sheet III) is a vertical section of the insertion, taken on its axial line.

Fig. 7 (Sheet IV) is a vertical section of the insertion as applied to heavy pumps.

Figs. 8, 9, 10, 11 (Sheet IV) are a series of transverse sections of the insertion, taken on the lines 3—4, 5—6, 7—8, 9—10, respectively, of Fig. 5, Sheet III.

It is important it should be understood that in Figs. 1 to 3, the internal pressure is applied downward, with external means whereby this may be effected; in Figs. 4 to 6, the internal pressure is applied upward, consequently, the external means, employed to apply the pressure downward, are dispensed with as unnecessary.

In describing the invention, it will be convenient to deal first with the external parts shown in Fig. 3, and then describe the parts as shown in Figs. 5 and 6, and their several functions.

Fig. 3 shows the whole of the insertion as applied to heavy pumps. Fig. 4 shows the whole of the insertion as applied to light pumps. In Fig. 3, the external casing A is mounted upon a butterfly plate $A^1$, having four points of attachment; the piston rod B is mounted on a second butterfly plate $B^1$, having four points of attachment. Above the plate $B^1$ is a butterfly plate C with but two points of attachment, and below the butterfly plate $A^1$ is a fourth butterfly plate $C^1$, having but two points of attachment, disposed at right angles to the plate C. The butterfly plate $A^1$ is connected by rods *a* to the plate C, passing, intermediately, through perforations in the four point plate $B^1$; the butterfly plate $B^1$ is connected by rods *b* to the plate $C^1$, the four rods *a*, *a*, *b*, *b*, being the corners of a square figure: It is therefore obvious that the terminal parts *c*, *c*, that are connected to the downrod, except for the parts within the cylinder A, which control the movements, can rise and fall independently of one another.

Referring now to Figs. 4, 5 and 6, D is a cylindrical casing adapted to contain oil, such casing at its lower end being constructed so that it may be readily attached to the lower part of the downrod, as shown at *c*, the upper part of the downrod being connected to the upper end of a piston rod E, that passes through a gland $E^1$ in the upper part of the casing D and connects to the

upper end $E^2$ of a composite combined cylinder and piston, which will now be described in detail. $E^3$ is a hollow nut whereby the piston rod is connected to the composite cylinder; the walls of the outer and inner cylinders are concentric, allowing an annular space F to contain oil. The wall G of the inner cylinder is irregular in shape; immediately below the upper end $E^2$ are a number of open ports $G^1$, below which is a ring H, forming a piston, that makes a piston fit with the inner side of the wall of the outer cylinder D; below the piston H is another set of open ports $G^2$, much longer than the ports $G^1$ above the piston; below the ports $G^2$ is an enlargement $G^3$ that is adapted to inclose an annular series of spaces $G^4$ within the inner cylinder wall G; the wall G then continues uniformly downward until it merges into a piston-like formation $G^5$, having a fluted periphery, shown at $g$, Fig. 11, Sheet IV, the salient parts of the periphery, between the flutes, making a piston fit with the inner side of the wall of the outer cylinder D. The piston-like formation $G^5$ contains two regulating set screws $g^1$, $g^2$, respectively, and a through opening $g^3$, leading through to the interior of the composite cylinder G, such opening being controlled by a ball valve $g^4$, the ball being prevented from escaping by a cross bar $g^5$. The functions of these several parts will be referred to when the working of the apparatus is described. Axially disposed within the composite cylinder G is a floating piston valve J, $J^1$, $J^2$, of peculiar construction; the body of the piston valve is concentric with, but of less diameter than, the interior of the composite cylinder, while the top and bottom, J, $J^2$, of the same, make a piston fit with the inner surface of the wall of the composite cylinder; the body is hollow, with lateral openings or ports $j$ that allow free passage for the surrounding oil; there are also ports $j^1$ in the bottom part, but these ports may be closed, under certain circumstances, by the axial spring valve $j^2$. Between the ends of the composite cylinder G is a perforated partition K, upon which rests the lower end of a spiral spring $K^1$, the function of which is to press the floating piston valve upward, after it has been forced down. Projecting from the upper end of the piston valve is a spring stem L, the function of which is to maintain the piston valve in a truly centered position; the stem, when pushed upward, entering the piston rod, which is hollow throughout its length.

Below the partition K is a piston M that fits the interior of the composite cylinder; the piston M is provided with a rod or stem $M^1$, that axially traverses the fluted piston $G^5$, descending into a recess or pocket $d$ within the lower end of the stem $D^1$; around the stem $M^1$ is a coiled spring $m$, the function of which is to return the piston M to its highest position as shown in Fig. 5. The stem $M^1$ is further provided with a taper groove $m^1$, into which the set screw $g^2$ may be set to any required distance, thus regulating the travel of the piston M and the sectional area of the part of the taper groove $m^1$ through which oil can escape or enter the cylinder.

The operation of the apparatus shown in Figs. 4, 5 and 6, is as follows: In Fig. 5, the piston H has completed its downward stroke, and the floating valve J occupies the position shown wherein the upper valve J prevents passage of the oil from the upper to the lower side of the piston H. When the piston rod E starts on its up-stroke, valve J is ultimately moved downward by the downward pressure of the oil upon the head or valve J, to the position shown in Fig. 6, whereby communication between ports $G^1$ and $G^2$ is established, thus permitting the oil on the upper side of the piston H to pass to the lower side which permits free and unrestricted movement of the piston upwardly. However, this movement of the valve J is not instantaneous because it is controlled by the piston M in the following manner: As the valve J starts to descend against the tension of the spring $K^1$, downward pressure is exerted upon the oil between the valve J and the piston M thereby transmitting the pressure to the piston. If the piston M is immovable, the valve J will also be immovable by virtue of the incompressibility of the intervening body of oil. Consequently, the valve moves downward only in accordance with the movement of piston M. The downward movement of the piston M is in turn controlled by the passage of oil from beneath the piston. When downward pressure is exerted on the piston M, the oil therebeneath escapes from the cylinder G through the slot $m^1$, then upwardly through the flutes $g$ and into the outer cylinder D; but by virtue of the restricted area of the slot $m^1$ and the quantity of oil within the cylinder, the piston does not instantly move but moves only after the pressure of oil is sufficient to escape through the groove $m^1$. It will therefore be seen that the valve J does not immediately descend upon upward movement of the rod E, thus temporarily locking the cylinder D to the rod E so that they move upward together. The time required to exhaust the oil from beneath the piston remains fixed irrespective of the pressure applied thereto, but may be varied by adjusting the set screw $g^2$ to increase or decrease the area of the outlet through the groove $m^1$ according as the screw is moved horizontally in one direction or the other. From this operation, it will be evident that the opening

of the valve J may be correspondingly advanced or retarded.

From the foregoing, it will be manifest that at the commencement of the up-stroke of the piston rod E the whole of the insertion will be practically rigid therewith, but after the piston M has descended sufficiently to allow opening of the valve J, the piston H will pass freely through the oil in the cylinder D which in turn permits the piston E to rise, thus lengthening the down rod correspondingly, and decreasing the length of stroke so that the amount of water raised will be correspondingly small.

As the movement of the valve J determines the length of the stroke of the piston rod E, and the valve J is controlled by the piston M, it will be evident that by adjusting the screw $g^2$, the working stroke of the piston rod E may be varied accordingly.

When the rod E starts on the downward stroke, the pressure of oil below the piston H causes the floating valve J to rise to its highest point against the pressure of the spring $l$ on the guide rod L. With the movement of the valve J to this position, the ports $G^1$ and $G^2$ are in communication so as to permit passage of the oil or rather to permit the piston H to move downwardly within the casing D. At the bottom of the stroke of the piston rod E, the upward pressure of the oil against the floating valve J is removed, thus permitting the spring $l$ to force the valve downwardly to the position shown in Fig. 5, and thereby closing the ports $G^1$ and $G^2$.

In view of the fact that the valve J occupies its uppermost position during downward movement of the piston H, the cylinder D does not move with the rod E, but remains stationary until the head $G^5$ contacts with the bottom of the cylinder D whereupon the piston E and the cylinder D move downwardly together.

The movement of the valve J to its uppermost position during the downward movement of the piston H is also controlled by the piston M as the intervening body of oil between the head $J^2$ and the piston M permits upward movement of the valve J only when the piston M is moved upwardly. In other words, they move in synchronism, and the movement of the piston M is controlled by the influx of oil from the cylinder D into the inner cylinder G. The oil enters cylinder G from cylinder D through the port $g^3$, the passage of oil therethrough being controlled by the ball-valve $g^4$ and the area of the port $g^3$ being varied by means of the screw $g^1$. It will be obvious that as the piston M moves upwardly with the cylinder G, the oil within the cylinder G lifts the valve $g^4$ thus opening the port $g^3$ and admitting the oil to the cylinder G. It is of course understood that the upward movement of the piston M is also assisted by the coil spring $m$.

As the upward movement of the piston M controls the upward movement of the valve J, and the movement of the piston M is in turn controlled by the influx of oil into the cylinder G, it will be obvious that by varying the adjustment of the screw $g^1$ in one direction or the other, the movement of the piston may be increased and decreased accordingly.

From the foregoing description, taken in conjunction with the accompanying drawings, it will be manifest that the opening and closing of the valve J to control the movement of the piston M will vary according to the adjustment of the piston M, and that upon initial movement of the piston E it will be practically disconnected from the cylinder D and will move practically independently thereof. But, as the reciprocating movement of the piston E continues, and as the opening and closing movement of the valve J remains constant under the action of the piston M, it will be obvious that the movement of the cylinder D will gradually increase until the piston rod E and the cylinder D move together. It will thus be seen that when this apparatus is connected to the pump of a windmill which is propelled by a light wind, the working stroke of the apparatus will start from zero and gradually increase until the windmill is directly connected to the apparatus. This is highly useful when utilizing the power generated by a light wind because if the apparatus was directly connected to the windmill, the wind would be insufficient to actuate the mill by virtue of the resistance offered by the apparatus, thus rendering the windmill useless under these conditions.

It is to be pointed out that when the floating valve J rises from the position shown in Fig. 6, its low rim $J^2$ makes a snug fit within the cylinder G and thereby would form a vacuum below the valve, if it were not for the ports $j^1$ and the valve $j^2$. During this movement of the valve J, the valve $j^2$ is drawn downwardly to prevent the vacuum, but is immediately returned by virtue of its spring.

In the apparatus shown at Fig. 7, the novel parts are almost identical with those shown in Figs. 4, 5, 6, but there are modifications in the movements. In this case the composite cylinder is made integral with the cylinder D, and with the cylindrical casing A attached to the butterfly plate $A^1$, the cylinder D projecting a short distance below the butterfly plate. In Fig. 1 the modifications that are made in the composite cylinder G are illustrated. The piston H is dispensed with, the partition $H^1$ fulfilling the same function, the piston-like formation $G^5$ is morified so that the adjusting screws $g^1$,

$g^2$ may be manipulated from the outside of the device. The piston rod B is connected, at one end, to the butterfly plate $B^1$ and at the other end to a hollow piston N, which is relatively fixed, the cylinder D sliding over the piston, an inversion of the usual method. In the wall of the cylinder D are a number of ports $d^1$ for the passage of the oil from D to A, and there is also a triangular slot with transverse partitions forming a series of taper ports O, the function of which is to allow of the passage of oil from the outer casing A to above the piston N, as the cylinder D rises; or to permit of the exit of the oil as the cylinder descends. The series of ports O terminate in a point, thus reducing the passage of oil to the cylinder D and leaving a small amount of oil above the piston N to serve as a cushion. The apparatus, as shown in Fig. 7, is provided with two terminal parts $c$, $c$, the upper one being connected to the butterfly plate C, the lower one to the butterfly plate $C^1$; these terminal parts $c$, $c$, serve to connect the insertion of the downrod, as in Fig. 4.

At the beginning of the upward stroke of the crank and downrod, the position of the apparatus will be as shown in Fig. 7, and will be operating rigidly with the downrod, because the pull upon the upper terminal $c$ will be transferred through the plate C, through the rods $a$, $a$, to the butterfly plate $A^1$, upon which the whole of the working parts of the insertion are mounted, but the rigid connection will not be maintained for a lengthened period. Should a light wind persist, the movements of the crank and the downrod will be correspondingly slow, thus rendering the floating valve and the floating piston more mobile with a correspondingly relatively quick elongation and shortening of the insertion, but, should the wind rise to, say, a moderate gale, the movements of the floating valve and the floating piston will be greatly impeded and the rigidity of the insertion with the downrod will be correspondingly increased.

We claim:

1. A stroke regulating apparatus for windmills comprising a down rod including a power section and a working section, valve operated means for operatively connecting said power section and working section, and slow-acting means controlling the last means to gradually lengthen the movement of the working section with relation to the power section.

2. A stroke regulating apparatus for windmills comprising a down rod including a power section and a working section, valve operated means for operatively connecting said power section and working section, and fluid actuated means controlling the last means to gradually lengthen the movement of the working section with relation to the power section.

3. A stroke regulating apparatus for windmills comprising a down rod including a power section and a working section, valve operated means for operatively connecting said power section and working section, slow-acting means controlling the last means to gradually lengthen the movement of the working section with relation to the power section, and means for varying the movement of the slow-acting means.

4. A stroke regulating apparatus for windmills comprising a down rod including a power section and a working section, valve operated means for operatively connecting said power section and working section, and reciprocating fluid actuated means controlling the last means to gradually lengthen the movement of the working section with relation to the power section.

5. A stroke regulating apparatus for windmills comprising a down rod including a power section and a working section, valve operated means for operatively connecting said power section and working section, slow-acting means operable by the last means in one direction to control movement of the last means, and fluid operated means for controlling the slow-acting means when moving in the other direction.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

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WALTER STANLEY EVERETT.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."