H. C. SCHNEIDER.

WINDMILL REGULATOR.

APPLICATION FILED APR. 21, 1910.

983,406.

Patented Feb. 7, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

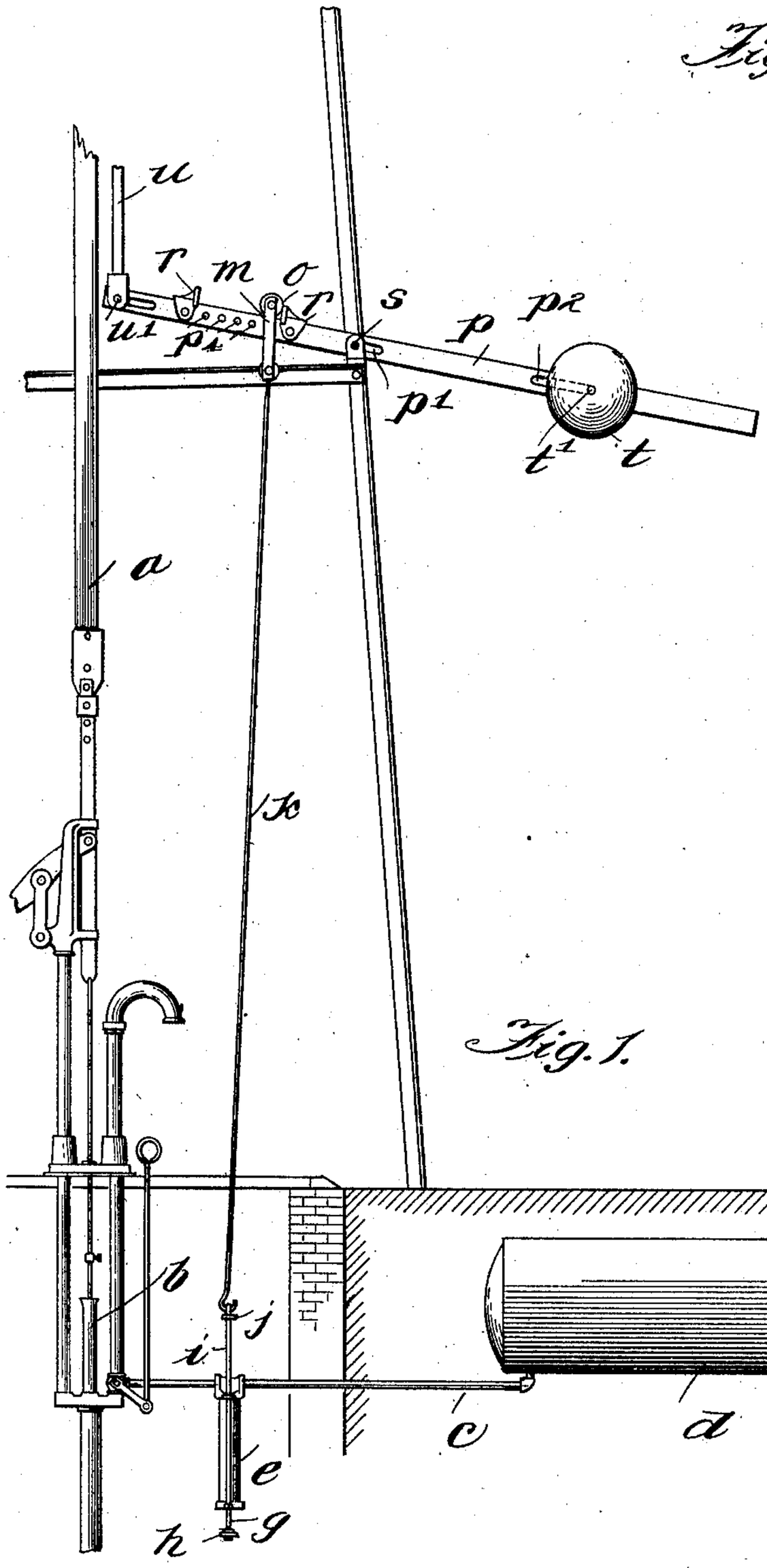
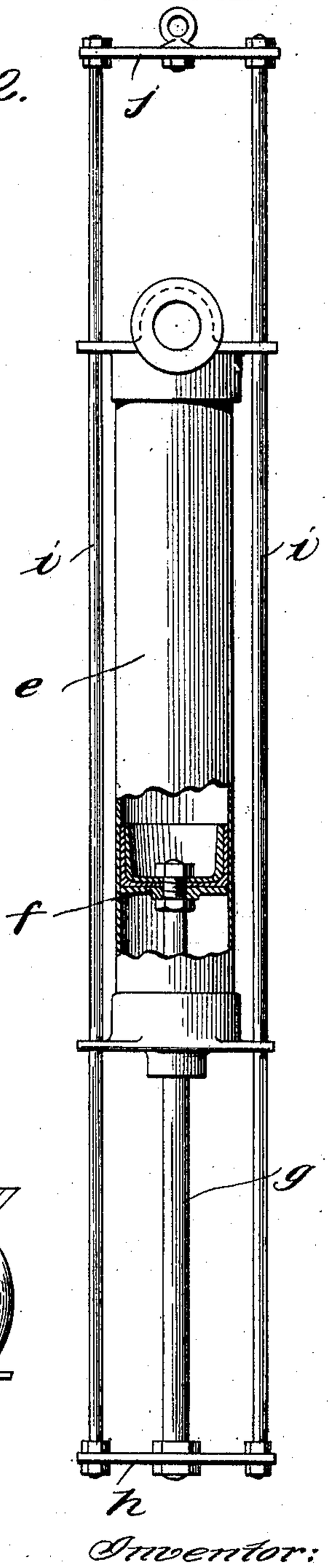


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

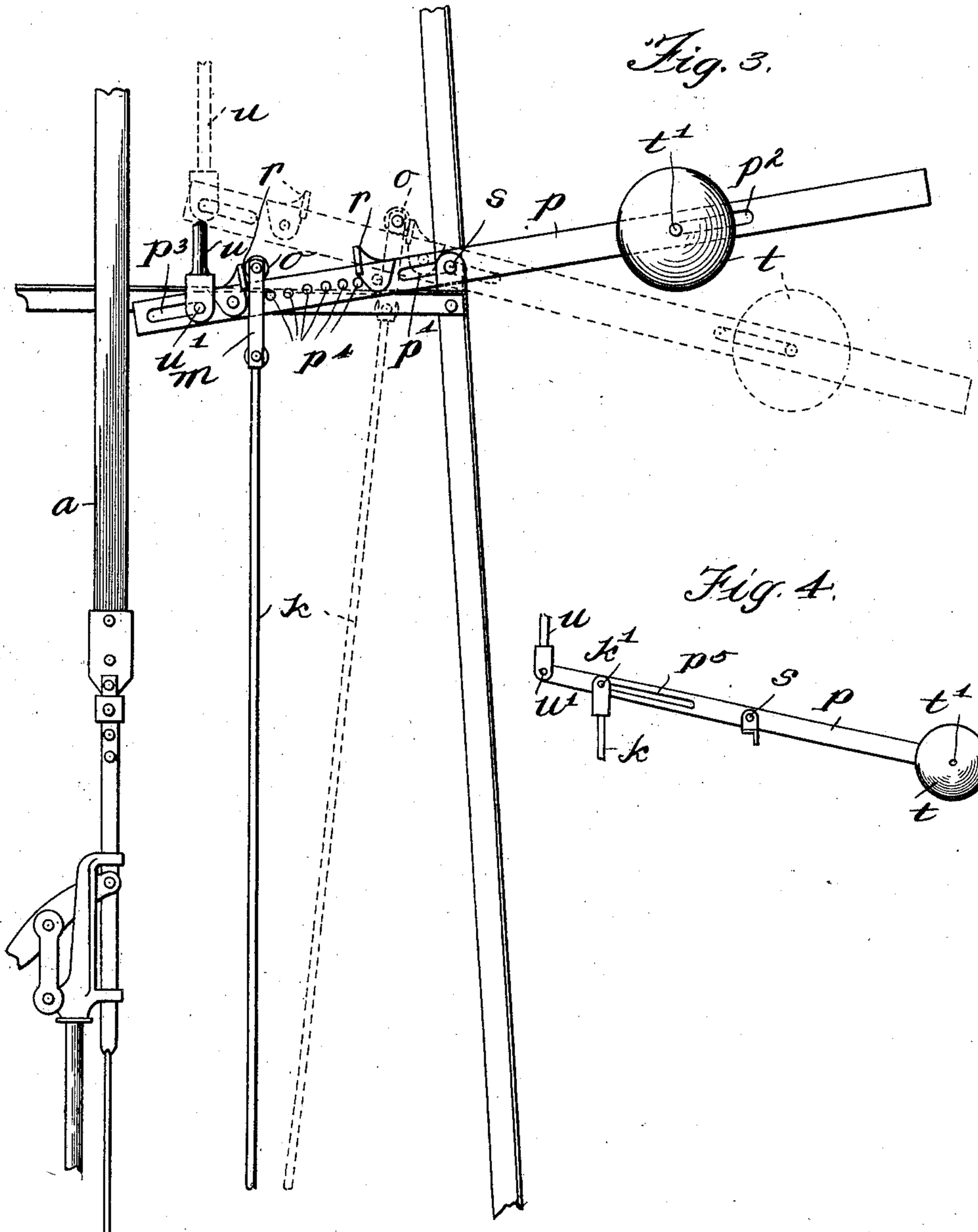

Fig. 4.

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UNITED STATES PATENT OFFICE.

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WINDMILL-REGULATOR.

983,406. Specification of Letters Patent. **Patented Feb. 7, 1911.**

Application filed April 21, 1910. Serial No. 556,700.

To all whom it may concern:

Be it known that I, HENRY C. SCHNEIDER, a citizen of the United States, residing at Beloit, in the county of Rock and State of Wisconsin, have invented a certain new and useful Improvement in Windmill-Regulators, of which the following is a specification.

This invention relates to windmill regulators for furling and unfurling the mill as the pressure or quantity of water in the storage vessel increases or decreases above or below predetermined limits.

In ordinary windmill regulators the regulating mechanism starts to furl the windmill long before the maximum water pressure is reached, and pulls the mill only partially out of the wind. Then, if a little water is drawn from the tank it immediately throws the mill into the wind again.

The object of my invention is to produce a regulator which is more stable in its action and will hold the mill squarely into the wind until a predetermined maximum pressure is reached and will then completely furl the mill and hold it furled until there has been a substantial drop in pressure. This prevents the continual throwing of the mill into and out of the wind, and renders the action more complete when it does take place.

I obtain my objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a general side elevation showing my regulator connected up with a windmill and pump. Fig. 2 is a side elevation partly in section of the regulating cylinder. Fig. 3 is similar to Fig. 1 but shows the parts in changed position. Fig. 4 shows a modification in the connection between the regulating rod and the regulating lever.

Similar letters refer to similar parts throughout the several views.

In the form selected to illustrate the invention, the rod *a* of the pump *b* is connected to the mill in the ordinary manner. Leading from the pump is a discharge pipe *c* which conveys water from the pump to any suitable tank *d*. Said tank may be of any desirable type, for example, a pressure tank or a storage tank, so arranged that the pressure will vary in proportion to the amount of water present.

A regulating cylinder *e*, shown in detail in Fig. 2, is connected up to the system in such a way that its plunger *f* will be subject to the pressure in tank *d*. In the present instance the cylinder is shown to be connected in pipe *c* between the pump and the tank, and the cylinder is arranged to extend vertically downward from said pipe. The plunger rod *g* is fastened to the plunger and extends through the lower cylinder head. It is connected by suitable means, such as the cross-frame *h*, to the connecting rods *i*, which pass upwardly along the sides of the cylinder, and are connected at their upper end to another cross-frame *j* of any suitable construction. Frame *j* is articulately connected to the regulating rod *k*, which, in the form shown in Figs. 1 and 3, has a clevis *m* at its upper extremity provided at the top with a roller *o* adapted to roll upon the upper edge of the regulating lever *p*. Stops *r* are adjustably secured to said lever in such manner as to permit a limited amount of travel of the roller *o* lengthwise of said lever. Lever *p* is fulcrumed upon a pin *s* located in a convenient position in the tower of the mill. Said pin passes through a slot p' formed longitudinally in lever *p*.

A counter-balance weight *t* is slidingly mounted upon the lever *p*, the sliding movement being limited by any suitable means, for example, the pin t' passing through the slot p^2 formed longitudinally in said lever.

A furling rod *u* is articulately connected to lever *p*, and in the present instance the connection is a sliding one, said rod having a pin u' sliding in a slot p^3 extending longitudinally in the lever. Rod *u* furls and unfurls the windmill according to any suitable principle, this being not directly concerned with my present invention. It is sufficient to say that the operation is such that when the furling rod is in raised position, shown in Fig. 1 and in dotted lines in Fig. 3, the mill will be in unfurled condition, and active, and that the pulling down of said rod, for example, to the position shown in full lines in Fig. 3, will furl the mill and render it inactive.

In operation, the parts normally occupy the position shown in full lines in Fig. 1 with the furling rod *u* up and the mill in acting condition. The plunger *f* will at this time occupy a position at the top of the cylinder *e*, and the lever will slant in the direc-

tion shown in Fig. 1, under which conditions four things concur to minimize the pulling effect of the rod *k*, towit, first, the counter-weight *t* slides outward along the lever away from the fulcrum thereof; second, the clevis *m* and roller *o* move along the lever toward the fulcrum, thus decreasing the leverage of rod *k;* third, the lever itself shifts upon its fulcrum in such direction as to increase the leverage of the counter-weight *t* and decrease the leverage of the regulating rod *k;* fourth, the furling rod *u* slides outward along the lever away from the fulcrum thereof, thus decreasing the effect which a given amount of torque in the lever will produce upon said furling rod. As the mill is in operation under these conditions it will operate the pump and force water through the pipe *c* into the tank *d*. When the pressure in the tank reaches a certain point the piston *f* will commence to descend and pull down the rod *k*, and as soon as the lever has passed the horizontal position four things happen, all of which tend to increase the pulling effect of the rod *k*, towit, first, the counter-weight *p* slides inward along the lever toward the fulcrum, thus lessening its effect; second, the clevis *m* and roller *o* move along the lever away from the fulcrum, thus increasing the leverage of rod *k;* third, the lever itself shifts upon its fulcrum in such direction as to decrease the leverage of the counter-weight and increase the leverage of the regulating rod *k;* fourth, the furling rod *u* slides inward along the lever toward the fulcrum thereof, thus increasing the effect which a given amount of torque in the lever will produce upon said furling rod. These conditions are illustrated in full lines Fig. 3. Thus, the action of the parts automatically varies the leverage of the organism with the result that the action is self-augmenting. In other words, the pressure of the tank has a greater effect in holding the mill furled after it is once furled than it has to furl the mill while the latter is in operation. This permits the pressure in the tank to vary considerably between predetermined limits without affecting the condition of the mill. For example, suppose the parts are so adjusted that the lever and furling rod will not be pulled down until the pressure in the tank reaches twenty pounds per square inch. As soon as twenty pounds pressure is reached and the parts are pulled down, as shown in full lines in Fig. 3, the effect of the regulating rod with respect to the rest of the mechanism is increased, and as a result, a much smaller pressure, for example, five pounds per square inch, will serve to hold the parts down, and the parts will not return to normal position until the pressure has dropped below the lower limit of five pounds. The action of the regulator is thus rendered less sensitive, and a range of variation of pressure may occur without changing the condition of the mill. Furthermore, as a result of the automatically varied leverage the mill may be held in completely furled condition when furled and squarely in the wind when unfurled.

By adjusting the position of the stops *r* upon rod *p* the sensitiveness of the apparatus may be varied, the lever having a series of apertures p^4 therein for this purpose.

The details of construction may be varied without departing from the spirit of the invention, for example, instead of the clevis and roller arrangement shown in Figs. 1 and 3, the lever may be slotted, as shown at p^5 in Fig. 4, to accommodate a pin *k'* at the upper end of said rod.

While I have shown a construction in which four different actions contribute to the automatic increase or decrease in the effect of the regulating rod upon the rest of the system, it must be clearly understood that the same kind of effect may be obtained, but to a correspondingly lessened degree, by a construction in which any one or any two, or any three of said actions may occur. For example, the same kind of effect would be obtained if the counter-balance weight were non-shiftable upon the lever, the lever were non-shiftable upon its fulcrum, and the furling rod were non-shiftable along the lever, the regulating rod *k* remaining shiftable along the lever, as shown. In fact, under certain conditions this last named construction is preferable as it is less complicated.

What I claim as new and desire to secure by Letters Patent, is:—

1. In a windmill regulator, the combination of a furling member, a lever connected to said furling member for operating it, and a regulating member contacting said lever for operating it, the point of contact being automatically shiftable along said lever toward and from the fulcrum thereof.

2. In a windmill regulator, the combination of a furling member, a lever connected to said furling member for operating it, and a regulating member adapted to engage said lever at different points lengthwise thereof, said regulating member being free to swing laterally whereby the point of engagement may be readily shifted toward and from the lever fulcrum.

3. In a windmill regulator, the combination of a furling member, an approximately horizontal lever connected to said furling member, and a laterally free regulating rod having a sliding connection with said lever whereby the point of contact will move toward or from the lever fulcrum depending upon the slant of the lever.

4. In a windmill regulator, the combination of a furling member, an approximately horizontal lever connected to said furling member, a laterally free regulating rod and

a rider attached to said regulating rod and adapted to travel along said lever.

5. The combination with the tower and furling rod of a windmill and the pressure tank of the storage system, of a lever fulcrumed upon the tower and connected to the furling rod, a cylinder communicating with said tank, a plunger in said cylinder, and a regulating rod operated by said plunger and connected to said lever, the regulating rod being laterally movable and free to contact the regulating rod at different points along the lever.

6. The combination with a windmill of a furling rod, a lever connected to said rod, a roller traveling along said lever toward and from the fulcrum thereof, a regulating rod having said roller journaled at one end thereof, the said end being free to move laterally, a vessel, a pump for pumping thereinto, a cylinder communicating with said vessel, and a plunger in said cylinder connected to said regulating rod.

7. In a device of the class described the combination of a lever, a shiftable lever resting upon its fulcrum at different points along the lever depending upon the slant of the latter, a regulating rod acting upon said lever at different points depending upon the slant of the lever, a furling rod operated by said lever at different points along the lever depending upon the slant of the lever, and a counterweight on said lever adapted to slide to different positions thereon depending upon the slant thereof.

In witness whereof, I have hereunto subscribed my name in the presence of two witnesses.

HENRY C. SCHNEIDER.

Witnesses:

ALBERT WALTON,

GEO. B. INGERSOLL.