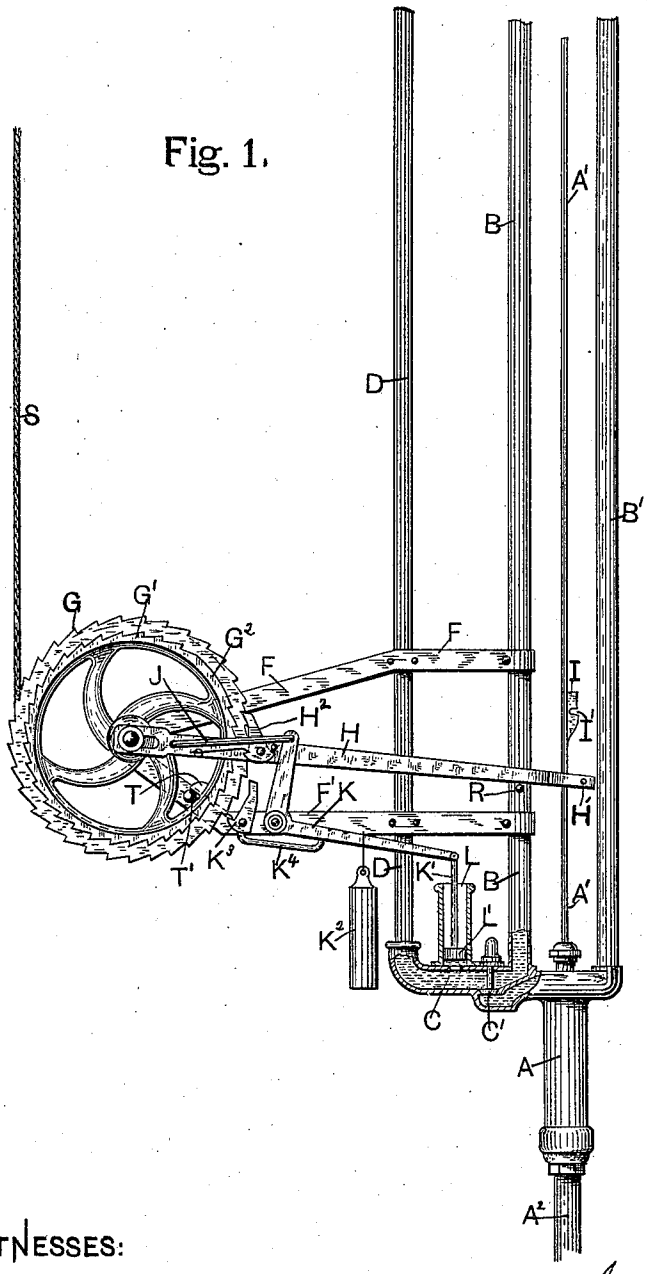
(No Model.) 3 Sheets—Sheet 1.

J. N. SWANSON.

WINDMILL REGULATOR.

No. 577,495. Patented Feb. 23, 1897.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 2

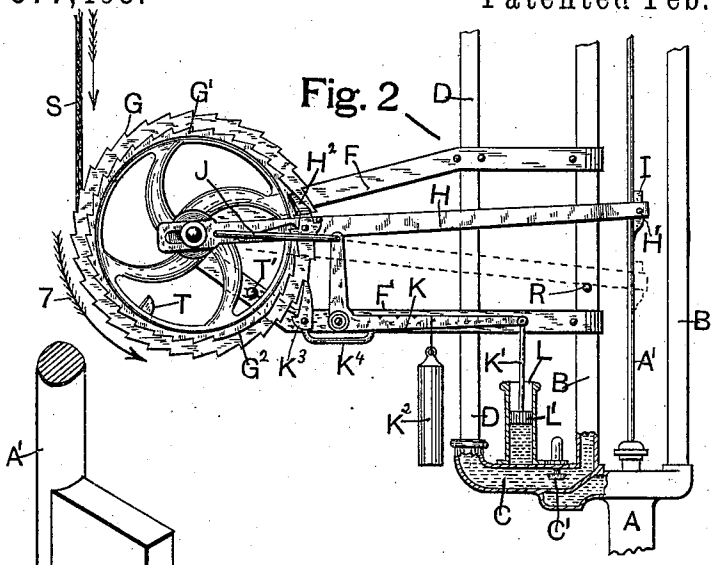


Fig. 3

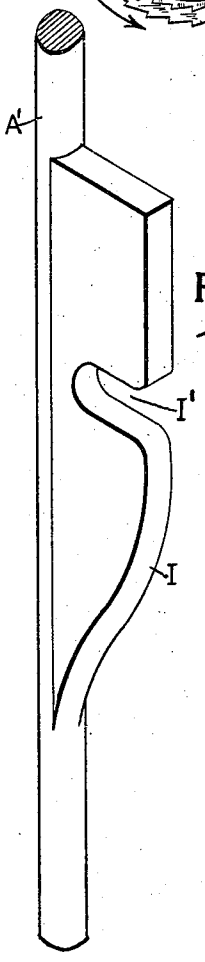
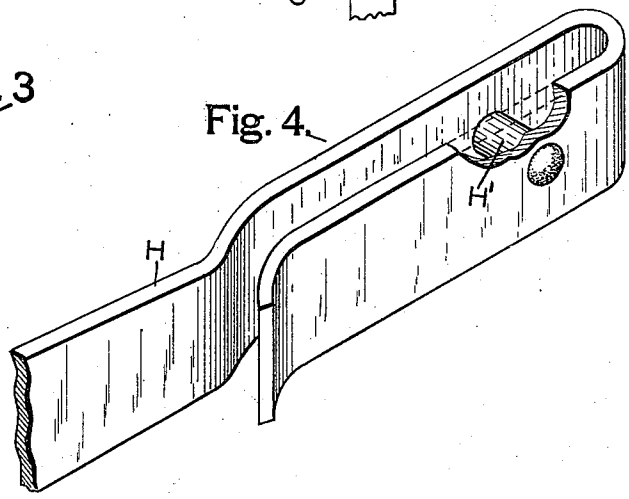


Fig. 4.



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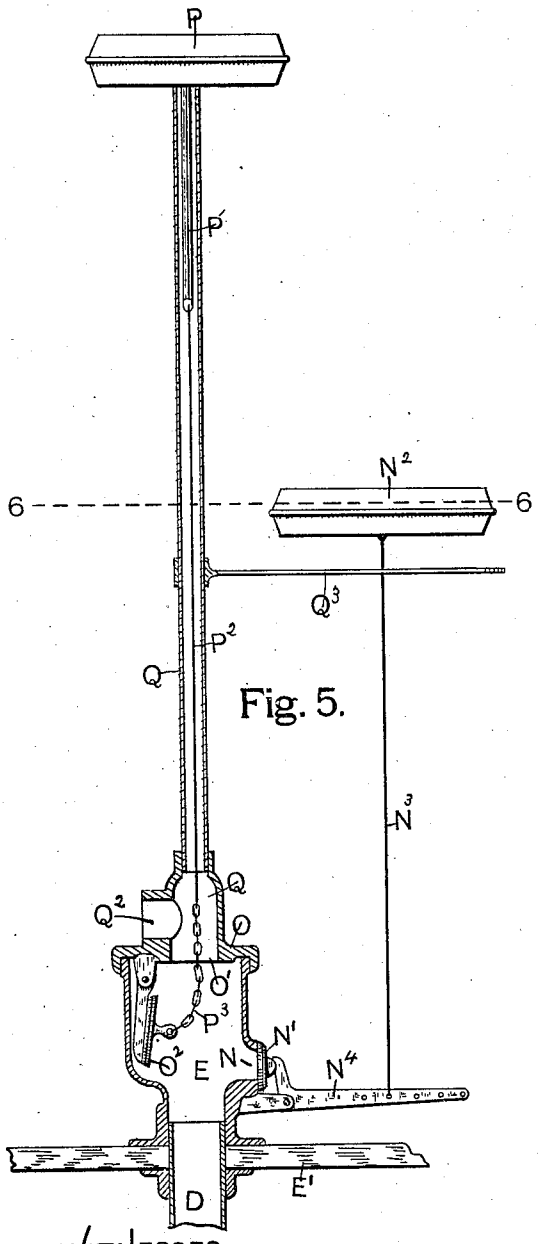

Fig. 5.

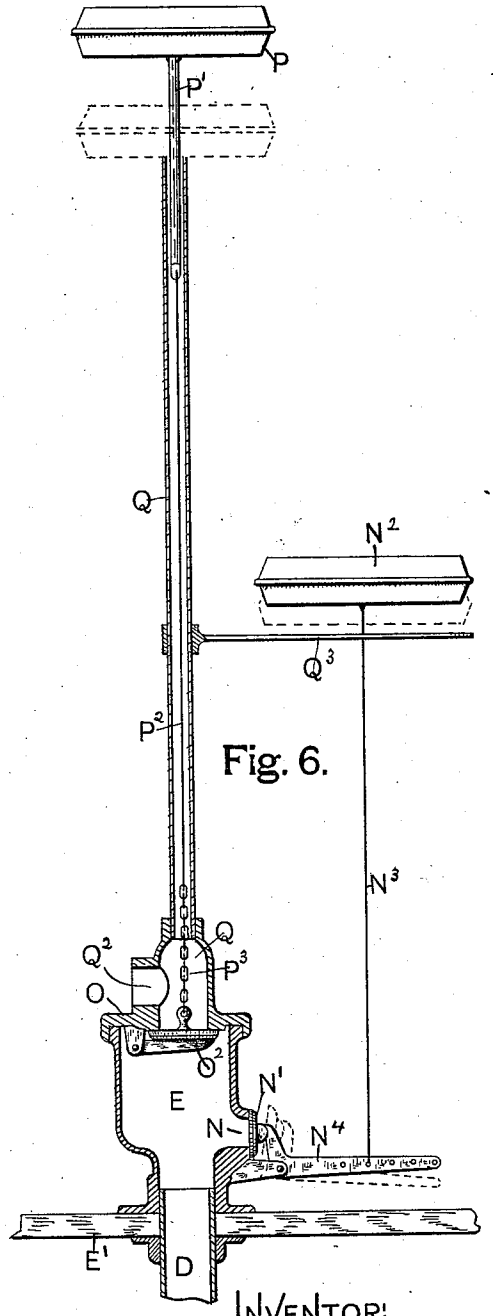

Fig. 6.

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UNITED STATES PATENT OFFICE.

JOHN N. SWANSON, OF CHICAGO, ILLINOIS.

WINDMILL-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 577,495, dated February 23, 1897.

Application filed March 16, 1896. Serial No. 583,377. (No model.)

To all whom it may concern:

Be it known that I, JOHN N. SWANSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Windmill-Regulator, of which the following is a specification.

My invention relates to regulators for windmills which are used for driving pumps which supply elevated tanks with water; and my object is to provide a means for this purpose which is not only adapted to automatically stop and start the wind-wheel and pump at the proper time to insure the tank being supplied with water in proportion to the demand, but also to automatically throw itself entirely out of action after the wind-wheel is started, and thus save not only the amount of power required to move the parts of the regulator when not in use for the purpose intended, but also prevents an undue amount of wear therein.

My new regulator is described hereinafter, and is illustrated in the accompanying drawings, in which—

Figure 1 is a front elevation comprising the parts which are usually placed in a well or cistern in close connection with the pump and are shown in the initial position, a portion of the top of the pump, the lower portion of the air-chamber, and the regulator pressure-cylinder and chamber in connection therewith broken away to an axial section to illustrate the action of the water in starting the operative parts of the regulator. Fig. 2 is an elevation similar to Fig. 1, but with the parts of the regulator in the operative position, as is hereinafter fully described. Fig. 3 is an isometric perspective view of a portion of the pump-rod with a catch-block attached thereto; and Fig. 4 is an isometric perspective view of a portion of the free end of the regulator starting-lever, with a small portion broken away to show a pin which is engaged by a notch in the catch-block shown in Fig. 3. Fig. 5 is an axial section of a pressure-chamber attached to the bottom of and inside the water-tank, there being a pipe shown also in axial section which is attached to the top of the pressure-chamber and which supports and guides a float at the top thereof, which latter, together with two valves which guard openings in the pressure-chamber and a lever connected to one of the valves and a float connected with the lever, are shown in elevation. Fig. 6 is the same as Fig. 5, with the exception that some of the operative parts are shown in a changed position relative to what is shown in Fig. 5.

Similar letters indicate like parts throughout the several views.

As before stated, the parts shown in Figs. 1 and 2 are usually placed in a well or cistern below the wind-wheel, from which source of power extends downwardly the pump-rod A′ into the pump-cylinder A, whose supply or suction pipe A^2 extends downwardly to the water to be pumped.

At B and B′ are shown the usual two pipes for suspending the pump in the well, the upper ends of these pipes being secured to the well platform or cover. Pipe B serves also as an air-chamber by having the top end closed, as usual, and the lower end attached to and in communication with a hollow chamber C, which latter is connected with a vertical pipe D, which is connected to and communicates with pressure-chamber E, Figs. 5 and 6, in the elevated water-tank.

At C′ is a check-valve which prevents a return of the water from chamber C to the pump.

At F and F′ are shown the members of a frame which is attached to the support or air-chamber B and to pipe D, and to the outer end of this frame is pivotally mounted upon a pin a combined ratchet-and-rope wheel, which is furnished with two circles of ratchet-teeth G and G′, the rope-wheel being at the rear of the larger ratchet-circle, and not shown in the drawings. A lever H is pivotally mounted at one end to the pivotal pin of the ratchet-wheel, which is disposed in a slot in the lever, so that the lever may vibrate in a vertical plane, and also slide longitudinally, the other end of the lever being doubled upon itself, Fig. 4, and provided with a pin H′, which latter is adapted to engage a slot I′ in a catch-block I, which is firmly secured to one side of the pump-rod A′.

At H^2 on lever H is a panel which is adapted to engage with the smaller circle of ratchet-teeth G, when lever H is in the operative position shown in Fig. 2.

A bell-crank lever K is pivotally attached

to the lower member F of the frame, and the short arm of this lever is connected to lever H by rod J, and the long arm of lever K is connected to a piston L′ in cylinder L by a rod K′, the cylinder L being in communication under piston L′ with the chamber C.

At K^2 is a weight adjustably secured to the long arm of lever K, and at K^3 is a detent pivotally secured to the lower member F of the frame, which detent is adapted to engage with the larger circle of ratchet-teeth G′, when not lifted out of engagement therewith by the movement of the long arm of lever K, contacting a tail-rod K^4, which is attached to the detent.

The pawl H^2 and detent K^3 are held in engagement with the ratchet-teeth by springs, and pawl H^2 is provided with a stop to hold the same in the proper position against its spring when drawn back from the ratchet, Fig. 1, and not in action, the tail-rod K^4 serving as a stop for detent K^3.

The apparatus shown in Figs. 5 and 6, as before stated, is situated in the water reservoir or tank whose bottom is shown at E′, into which tank the water from pump A is forced, and this apparatus comprises a pressure-chamber E, secured water-tight to the bottom E′ of the tank, and is connected with pipe D, Figs. 1 and 2, at the lower end, as shown. There is a side orifice guarded by a valve N′, which is movably held on its seat by the buoyancy of float N^2, operating through rod N^3 and bell-crank lever N^4.

At O is a top cover for pressure-chamber E, in which is an opening O′, and there is a valve O^2, which closes opening O′ when lifted to the position shown in Fig. 6 by the buoyancy of float P, which is connected to the valve by guide P′, rod P^2, and chain P^3, which are disposed in pipe Q and chamber Q′ in cap O, which latter chamber is provided with an opening O^2, communicating with the tank.

Float N^2 is guided and limited in its downward movement by an arm Q^3, attached to pipe Q.

In describing the operation of this regulator we will suppose the windmill has been operating the pump A and water has been forced through pipe D into pressure-chamber E out through orifice N, which is open when the tank is empty, and through orifice Q^2 into the tank until it has been filled up to the broken line 6 6. Then the buoyancy of float N^2 will operate valve N′ and close orifice N, as shown in Fig. 5. If now the wind-wheel continues to operate the pump, the water will continue to flow out at opening Q^2 until the tank is filled up to float P, which is gradually lifted to the position shown in the broken lines to that shown in the solid lines, Fig. 6, and with it the connected valve O^2, until the latter closes the opening Q′, when instantly, on account of the flow of water being stopped, the pressure will suddenly rise in chamber E, pipe D, and the chamber C at the top of the pump, together with air-chamber B, Figs. 1 and 2, when the piston L′ in cylinder L will rise and cause bell-crank lever K to force lever H outwardly while in the position resting on pin R, Fig. 1, when pin H′ will engage with notch I′ in the catch-block I on the pump-rod and the pawl H^2 engage with the teeth of ratchet-circle G^2 and the tail-piece K^4 of detent K^3 be released, so that the detent engages ratchet-circle G′, when the reciprocations of the connected pump-rod will vibrate lever H and cause pawl H^2 to turn the ratchet-wheel in the direction indicated by arrow 7, Fig. 2, which serves to wind on the attached rope S, which stops the wind-wheel by operating the stop mechanism thereof, to which the top end of the rope is secured. During the time the rope S is being pulled down to operate the stop mechanism of the wind-wheel the pump will necessarily be in operation, and since it is necessary to not only preserve a pressure more than normal in the cylinder L of the regulator and also permit the escape of the water being pumped the valve N′ serves as a relief-valve, which will uncover the orifice N whenever the pressure in chamber E exceeds an amount which is necessary to operate piston L′ in cylinder L, and which pressure may be regulated by the attachment of the lower end of rod N^3 of float N^2 at the proper distance from the pivotal center of lever N^4. During the time the wind-wheel and pump are not in action a pressure must still be maintained in regulator-cylinder L to hold pawl H^2 and the detent K^3 in engagement with the ratchet-circles G and G′, so that the rope S is held wound on the pulley of the ratchet-wheel, and thus also holds the stop mechanism of the wind-wheel in the position to prevent the wind-wheel from revolving by the action of the wind. If, however, water is being drawn from the tank, the surface of the water will lower after the pump has stopped working, until the float P rests upon the top of pipe Q, when the pressure in chamber E serves to hold valve O^2 on its seat, instead of the buoyancy of float P, and if the surface of the water continues to lower it will reach float N^2, which, on being carried down from the position shown in the solid lines to that shown in the broken lines, Fig. 6, will release valve N′ and lower the pressure in chamber E, when valve O^2 will drop and open orifice O′, which also relieves the abnormal pressure in regulator-cylinder L and cause the gravity of weight K^2 to move piston L′ back to the initial position and lever K from the position shown in Fig. 2 to that shown in Fig. 1, and to force pin H′ out of engagement with notch I′ in catch-block I, which permits lever H to fall to the initial position, Fig. 1, resting on pin R, and also disengage pawl H^2 and detent K^3 when the ratchet-wheel is revolved backwardly by the upward pull of rope S, caused by the gravity of the weight connected with the usual starting-gear of the wind-wheel, which when released operates to start the wind-wheel and

the pump, which is adapted to force water up through pipe D and out an orifice N and Q^2 into the tank until float N^2 is again lifted and orifice N closed by valve N′, when the balance of the hereinbefore-described cycle of actions is repeated in case the supply of water from the pump is greater than the demand from the tank.

Should an accident occur to prevent stopping the wind-wheel, as usual, after almost a revolution of the ratchet-wheel, a blank space covering the space of the pitch of several teeth is made at G^2, at the end of the series of ratchet-teeth on ratchet-circle G′, where actuating-pawl H^2 cannot operate the wheel further. The ratchet-wheel has a lug T on the inside of the rim, which rests against a stop-pin T′ when the wheel is in the initial position shown in Fig. 1.

In most windmills to which this regulator is adapted from one-fourth to one-half of a revolution of a twelve-inch ratchet-wheel is all that is necessary to pull in sufficient length of rope S to operate the stop mechanism of the wind-wheel. This stop mechanism is particularly adapted to use for windmills where there is a variable demand for water, for the reason that it will hold the wind-wheel in the inoperative condition for longer periods than is usual with other regulators, and since no part of the regulator is in operation continuously with the wind-wheel, the regulator only operating for a few moments at the high and low stages of water in the tank, much unnecessary wear is saved and the perfect working condition of the operative parts extended over a much greater length of time than is the case where the wind-wheel on light duty is almost continuously in action.

I claim as my invention—

1. The combination in a regulator for a pumping-windmill, of a pump having a discharge-pipe communicating with a pressure-chamber having a discharge-opening communicating with an elevated tank, the discharge-opening normally open, but provided with a valve opening outwardly, which valve is operated to close the discharge-opening by the buoyancy of a float in the tank, a check-valve in the discharge-pipe of the pump between the pressure-chamber and the pump, a pressure-cylinder in free communication with the said discharge-pipe, a piston in the pressure-cylinder, a ratchet-wheel having a rope connected therewith and to the stop mechanism of the windmill, and means connected with the said piston for engaging a lever with the pump-rod, and a pawl attached to the said lever, and a detent with the ratchet-wheel, whereby the reciprocating motion of the pump-rod serves to operate the stop mechanism of the windmill, at the time and in the manner described.

2. In a pumping-windmill which discharges water into an elevated tank, in the regulating mechanism therefor, a ratchet-wheel to which the stop mechanism of the windmill is connected, a pressure-cylinder having a piston therein and in communication with the discharge-pipe of the pump between the pump and the elevated tank, a lever connected with the said piston, which latter operates to engage the lever through a pawl mounted thereon with the ratchet-wheel, and with the pump-rod, and operates the stop mechanism of the windmill, in the manner and for the purpose stated.

3. The combination in a means for regulating pumping-windmills which discharge water into an elevated tank, of a ratchet-wheel to which the stop mechanism of the windmill is attached, a pressure-cylinder having a piston therein and in communication with the discharge-pipe of the pump between the pump and the elevated tank, the said piston, by virtue of the pressure of water in the discharge-pipe, adapted to operate the ratchet-wheel and the said stop mechanism, a pressure-chamber in the tank communicating with the discharge-pipe of the pump and having a discharge-orifice normally open, but provided with a valve opening inwardly which is closed by the buoyancy of a float in the tank, whereby a greater than usual pressure is attained in the discharge-pipe of the pump, and a second discharge-orifice in the said pressure-chamber normally closed by a valve opening outwardly which latter is held in a closed position by the buoyancy of a float in the tank, and opened at the time, in the manner and for the purpose stated.

In testimony that I claim the foregoing I have hereunto set my hand, this 15th day of February, 1896, in the presence of witnesses.

JOHN N. SWANSON.

Witnesses:

WILLIAM FRINK,

J. L. TURNER.