No. 664,780. Patented Dec. 25, 1900.

F. RICE.

WINDMILL REGULATOR.

(Application filed July 25, 1900.)

(No Model.) 2 Sheets—Sheet 1.

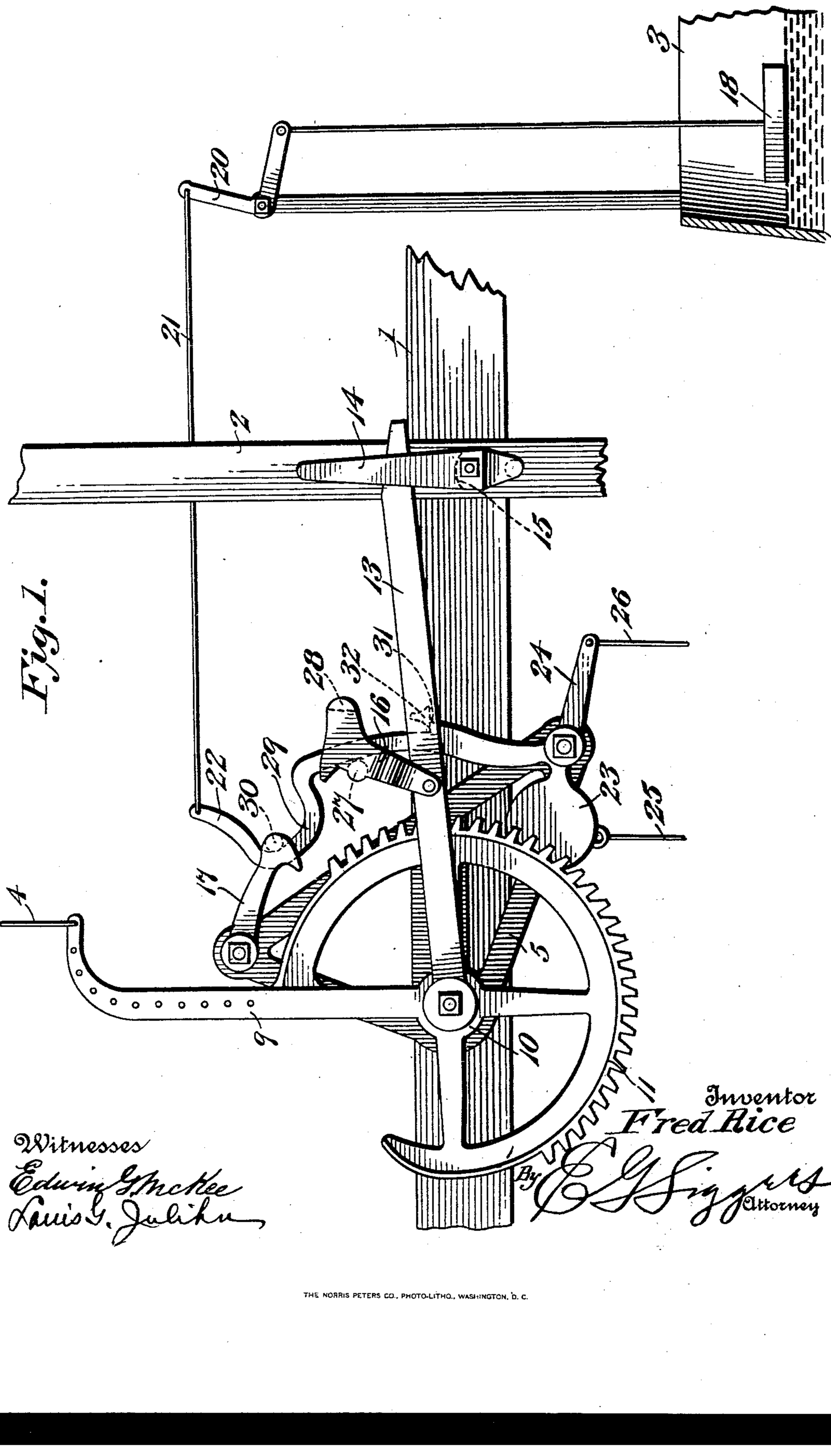

Fig. 1.

Witnesses
Edwin G. McKee
Louis G. Julihn

Inventor
Fred Rice
By E. G. Siggers
Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 664,780. Patented Dec. 25, 1900.

F. RICE.

WINDMILL REGULATOR.

(Application filed July 25, 1900.)

(No. Model.) 2 Sheets—Sheet 2.

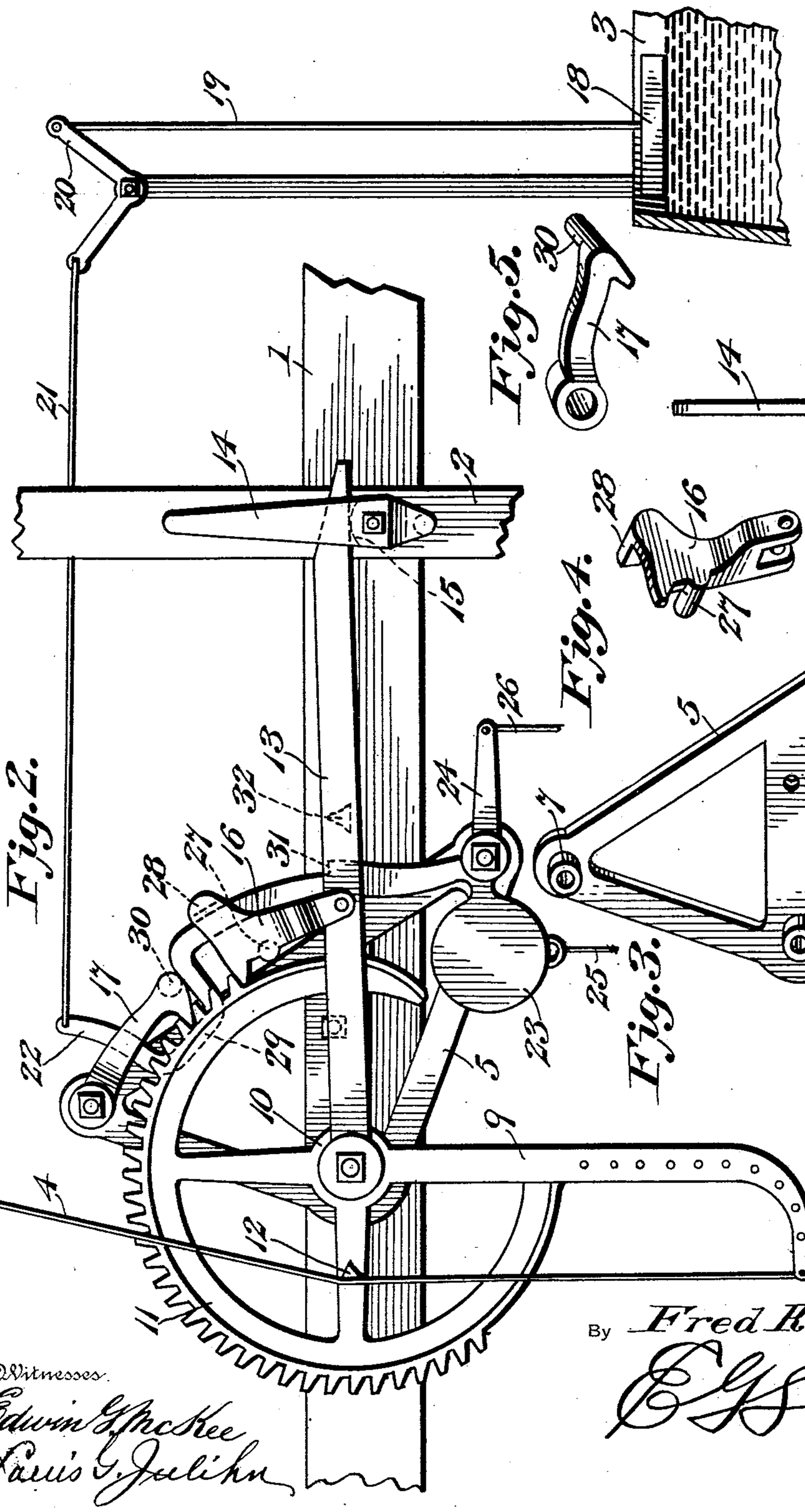

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Witnesses.
Edwin G. McKee
Paris G. Julihn

By Fred Rice Inventor
E. G. Siggers
Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

FRED RICE, OF SHOPIERE, WISCONSIN.

WINDMILL-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 664,780, dated December 25, 1900.

Application filed July 25, 1900. Serial No. 24,818. (No model.)

To all whom it may concern:

Be it known that I, FRED RICE, a citizen of the United States, residing at Shopiere, in the county of Rock and State of Wisconsin, have invented a new and useful Windmill-Regulator, of which the following is a specification.

My present invention relates to improvements in windmill-regulators, and has for one of its objects to produce a simple, durable, and efficient mechanism for automatically regulating the operation of a windmill through the rise and fall of the water-level in a tank or reservoir into which water is pumped by the mill.

A further object of the invention is to provide such automatic mechanism with manually-operated means for effecting its actuation to start the mill at such times as the water-level may be between those points at which the mechanism is adjusted to operate automatically.

To the accomplishment of these ends the invention consists in the construction and arrangement of parts hereinafter described, illustrated in the accompanying drawings, and defined in the appended claims.

In said drawings, Figure 1 is an elevation of the regulating mechanism complete with the parts in position to permit the operation of the windmill, fragments of the tower, pump-rod, and tank being illustrated for the purpose of disclosing the relation of the mechanism to these elements. Fig. 2 is a similar view with the parts in position to hold the mill out of the wind. Fig. 3 is a detail perspective view of the supporting-plate. Fig. 4 is a similar view of the operating-pawl. Fig. 5 is a detail perspective view of the check pawl or dog, and Fig. 6 is an edge view of the keeper detached.

Referring to the numerals of reference employed to designate corresponding parts in each of the several views, 1 indicates a portion of a horizontal frame-bar constituting a portion of a windmill-tower, 2 the usual reciprocatory pump-rod, and 3 a reservoir or tank designed to be supplied with water by pumping machinery operated through the reciprocation of the pump-rod, which is in turn operated by the wind-wheel.

Inasmuch as the construction and arrangement of the windmill proper, the pumping mechanism, and the necessary connections form no part of my present invention and as these structures are well understood by those skilled in the art, I have deemed it unnecessary to include them in the illustrations, it being understood that approved forms of windmill and pumping apparatus are employed and that the mill is designed to be thrown into or out of the wind through the medium of the wheel-regulating cable or rod, a portion of which is indicated in the drawings by the numeral 4.

For the purpose of mounting the entire mechanism upon a single support in order that the equipping of a mill with my regulating mechanism may be readily effected I provide a supporting-plate 5, preferably of substantially triangular form and bolted or otherwise secured to the beam 1 at a suitable distance to one side of the pump-rod 2. The supporting-plate is preferably cast with studs or trunnions 6, 7, and 8, extending from one side face at or adjacent to the several corners of the plate, the trunnion 6 being preferably in the plane of the beam 1 and the trunnions 7 and 8 being disposed respectively above and below the beam, with the latter slightly nearer the pump-rod, as shown.

9 indicates the "regulating-arm" of the mechanism, so termed because its outer extremity is connected to the end of the operating cable or rod 4 for the purpose of causing the windmill to be thrown into or out of the wind, according to the position of the arm. The regulating-arm 9 is provided at one end with a bearing-hub 10, journaled upon the trunnion 6 and having a series of radiating arms or spokes carrying a toothed sector 11, preferably slightly more than semicircular in extent and concentric with the hub 10. One of the spokes of the sector is provided with a guide-lug 12, against which the cable 4 is designed to rest in one position of the arm 9 for the purpose of preventing the cable from interfering with the operative parts to be described. It will now appear that the swinging of the arm 9 to a vertical position above or below the beam will permit the wind-wheel to be thrown into the wind or will effect its withdrawal from the wind for the purpose of controlling the operation of the pumping mechanism. Obviously, therefore, the automatic regulation of the mill may be effected

by causing the swinging of the arm 9 to the desired position when the water in the supply-tank reaches predetermined levels. I have therefore devised mechanism by means of which the power generated by the mill-wheel is utilized to throw the regulating-arm 9 from the position shown in Fig. 1 of the drawings to that shown in Fig. 2 for the purpose of throwing the wheel out of the wind. This I accomplish by swinging an operating-lever 13 from the end of the trunnion 6 immediately beyond the face of the hub 10 and by extending the free end of said lever into a keeper 14, mounted upon the pump-rod of the mill and having a shoulder 15, arranged to engage the lever to effect the oscillation of the latter as the pump-rod is reciprocated. This oscillation of the operating-lever is converted into a step-by-step movement of the sector through the medium of an operating-pawl 16, pivotally mounted upon the lever at a point intermediate of its ends and engaging the teeth of the sector, which latter is prevented from moving back by a check pawl or dog 17 during the retraction of the operating-pawl 16. It will therefore appear that if the pawls 16 and 17 are in operative relation to the sector the oscillation of the lever through the reciprocation of the pump-rod will cause the sector to be given a step-by-step rotation to swing the regulating-arm 9 in a proper direction to move the wind-wheel out of the wind through a pull upon the regulating-cable 4. It now becomes necessary to provide means controlled by the liquid-level in the tank 3 for effecting an operative connection between the pump-rod and the arm 9. This means is embodied in a float 18, located in the tank 3 and having its stem 19 connected to a bell-crank lever 20, which is in turn connected through a wire or rod 21 with what may be termed the "governor-lever" 22 of my regulating mechanism. The governor-lever is so termed because it is operated by the float to govern the relation between the actuating mechanism and the regulating device—that is to say, the function of said lever is to make or break an operative connection between the operating-lever 13 and the arm 9 for the purpose of causing the pump-rod to shift the regulating-arm 9 to one position or the other as predetermed levels of water in the tank 3 are reached. This governor-lever 22 is fulcrumed upon the trunnion 8 upon the lower corner of the supporting-plate 5 and is provided with a counterweight 23 and with a short arm 24 extending in opposition to the counterweight, an operating-cable 26 being connected to the arm 24 for the purpose of manually operating the governor-lever at periods between the automatic operations of the mechanism.

The control of the operative connection between the operating-lever 13 and the sector is effected through the lever 22 by an operative connection between the latter and the operating and check pawls 16 and 17, the latter of which is swung from the trunnion 7 at the upper corner of the supporting-plate. This operative connection is effected by providing the operating-pawl 16 with a pair of laterally-extending lugs 27 and 28, between which the lever 22 is located and which are suitably spaced to permit a limited independent movement of the operating-pawl. Above the pawl 16 the lever 22 is offset, as indicated at 29, for engagement behind a lug 30, projecting laterally from the free end of the pawl 17. At a point a proper distance from its fulcrum the lever 22 is cut away at one edge to provide a rest or shoulder 31, designed under certain conditions to support a stop-lug 32, extending from the lever 13.

Let us now assume that the parts are in the position shown in Fig. 1 of the drawings, wherein the regulating-arm 9 is in position to slack the regulating-cable 4 to permit the wind-wheel to be located in the wind. The governor-lever 22 is then drawn back by the gravitation of the float 18, bringing the rest or shoulder 31 under the lug 32 to hold the lever 13 out of operative proximity with the shoulder 15 of the keeper and to swing the operating and check pawls out of operative proximity to the sector. The mill is now operating and the water is being pumped into the tank 3; but the elevation of the lever 13 by the governor-lever has removed the free end of the operating-lever to a position where it will not be effected by the pump-rod during its reciprocation. Assuming now that the float 18 has been elevated to a level at which it is desired to cut off further supply of water to the tank, the counterweight 23, which until now has been overbalanced by the float, will throw the governor-lever toward the sector to cause the engagement of the operating and check pawls 16 and 17 with the teeth of the sector and to remove the shoulder 31 from under the stop-lug 32 to permit the operating-lever 13 to drop upon the shoulder 15 of the keeper. As the pump-rod reciprocates the lever 13 will be oscillated to effect the step-by-step rotation of the sector 11 under the impulse of the operating-pawl 16, the sector being dogged in each advance position by the engagement of the check-pawl with its teeth. This operation will be continued until the regulator-arm has been swung down to the position shown in Fig. 2 of the drawings to pull the wheel out of the wind. The mill will now remain motionless until the level of the water in the reservoir 3 has dropped to a predetermined level, at which time the gravitation of the float 18 will overbalance the counterweight 23 to effect the retraction of the governor-lever 22. The movement of the latter will cause it to engage the lugs 30 and 28 of the pawls 17 and 16 to effect their removal from engagement with the teeth of the sector, the operating-pawl 16 dropping back beyond its center to bring the lug 27 against the lever, as shown in Fig. 1. The regulating-arm 9 will thus be released and will swing

around to its normal position to recommence the pumping operation, and as soon as the operating-lever has been lifted the shoulder 31 of the lever 22 will be moved under the lug 32 to hold the lever out of operative relation with the pump-rod. If it is desired at any time to throw the mill into operation, regardless of the means provided for the automatic regulation thereof, the operating-cable 26 is drawn down to throw the governor-lever 22 to the position shown in Fig. 1.

From the foregoing it will be observed that I have produced a simple, durable, and inexpensive windmill-regulating device mounted upon a single operating-plate and designed to regulate the operation of pumping or other machinery by automatically throwing the windmill out of the wind or by permitting it to move back into the wind under predetermined conditions; but while the present embodiment of my invention appears at this time to be preferable I do not limit myself to the structural details defined, but reserve the right to effect such changes, modifications, and variations as may fall within the scope of the protection prayed.

What I claim is—

1. In a windmill-regulating device, the combination with a regulating-arm and a reciprocatory pump-rod, of an operating-lever operatively related to the regulating-arm and arranged for oscillation by the pump-rod, and automatically-operative means engaging and sustaining the operating-lever at one limit of its movement to prevent further actuation of said lever by the pump-rod.

2. In a windmill-regulating device, the combination with a regulating-arm and a reciprocatory pump-rod provided with a shoulder, of a sector movable with the regulating-arm, a check-pawl arranged for engagement with the sector, an oscillatory operating-lever having its free end opposed to the pump-rod and provided with an operating-pawl arranged for engagement with the sector, a governor-lever arranged to engage the pawls and to obstruct the path of movement of the operating-lever, and means for actuating the governor to operatively connect the pawls and the operating-lever with the sector and pump-rod or to effect the disconnection of said elements.

3. In a windmill-regulating device, the combination with a regulating-arm and a sector movable therewith, of a reciprocatory pump-rod, an operating-lever arranged for oscillation by the pump-rod and provided with an operating-pawl for engagement with the sector, and an automatically-operative device having direct coöperative relation with the pawl and operating-lever for throwing the pawl out of engagement with the sector and for directly supporting the operating-lever out of operative relation with the pump-rod.

4. In a windmill-regulating device, the combination with a regulating-arm controlling the operation of the mill, and a reciprocatory pump-rod, of a sector movable with the regulating-arm, an operating-lever mounted for oscillation by the pump-rod and having an operating-pawl designed to engage the sector, a check-pawl likewise engaging the sector, and an automatically-operated device for throwing both pawls out of engagement with the sector and for supporting the operating-lever out of operative relation with the pump-rod.

5. In a windmill-regulating device, the combination with a regulating-arm controlling the operation of a windmill and a reciprocatory pump-rod having a shoulder, of a sector movable with the regulating-arm, an operating-lever having its free end arranged for engagement with the shoulder of the pump-rod, and an operating-pawl mounted upon the lever, of an automatically-operated device for throwing the operating-pawl out of engagement with the sector and for directly supporting the operating-lever at a point above the path of movement of the shoulder during the reciprocation of the pump-rod in the intervals between the operations of the controlling mechanism.

6. In a windmill-regulating device, the combination with a regulating-arm controlling the operation of the mill and a reciprocatory pump-rod provided with a shoulder, of a sector movable with the regulating-arm, a check-pawl arranged for engagement with the sector, an oscillatory operating-lever having its free end opposed to the shoulder of the pump-rod and provided with an operating-pawl arranged for engagement with the sector, each of said pawls and the operating-lever being provided with projections, a governor-lever arranged to engage the projections of the pawls and provided with a shoulder arranged for engagement with the projection upon the operating-lever, and means for actuating the governor-lever to connect the pawls and the operating-lever with the sector and pump-rod or to effect the disconnection of said elements.

7. In a windmill-regulating device, the combination with a regulating-arm arranged to control the operation of the mill and a reciprocatory pump-rod provided with a shoulder, of a sector, an operating-lever arranged to be engaged by the shoulder of the pump-rod, an operating-pawl carried by the lever for engagement with the sector, a governor-lever disposed to throw the operating-pawl into or out of engagement with the sector and to engage and retain the operating-lever at one limit of its stroke to prevent the engagement of the operating-lever by the shoulder of the pump-rod, means for automatically operating the controlling-lever, and independent means for effecting its manual actuation.

8. In a windmill-regulating device, the combination with a regulating-arm controlling the operation of the mill and a reciprocatory pump-rod provided with a shoulder, of a sector movable with the regulating-arm, an operating-lever arranged to be engaged by the shoulder of the pump-rod, an operating-pawl

carried by the lever for engagement with the sector, a check-pawl likewise mounted to engage the sector, a counterweighted governor-lever mounted for direct engagement with both of the pawls and with the operating-lever to control the engagement of the pawls with the sector and to sustain the operating-lever at one limit of its movement to prevent further actuation of said lever by the pump-rod, and a float controlling the operation of the governor-lever.

9. In a windmill-regulating device, the combination with a triangular supporting-plate provided with trunnions extending laterally at each corner thereof, of a regulating-arm and an integral sector mounted for axial movement upon one of the trunnions, an operating-lever mounted upon the same trunnion, a check-pawl and a governor-lever mounted, respectively, upon trunnions at opposite corners of the supporting-plate, an operating-pawl carried by the operating-lever, a pump-rod provided with a shouldered keeper engaging the operating-lever, and means for shifting the position of the governor-lever to effect the disengagement of the pawls from the sector and to retain the operating-lever out of operative relation with the shoulder of the keeper.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

FRED RICE.

Witnesses:
JOHNSON DUNN,
EVERT FONDA.