(No Model.)

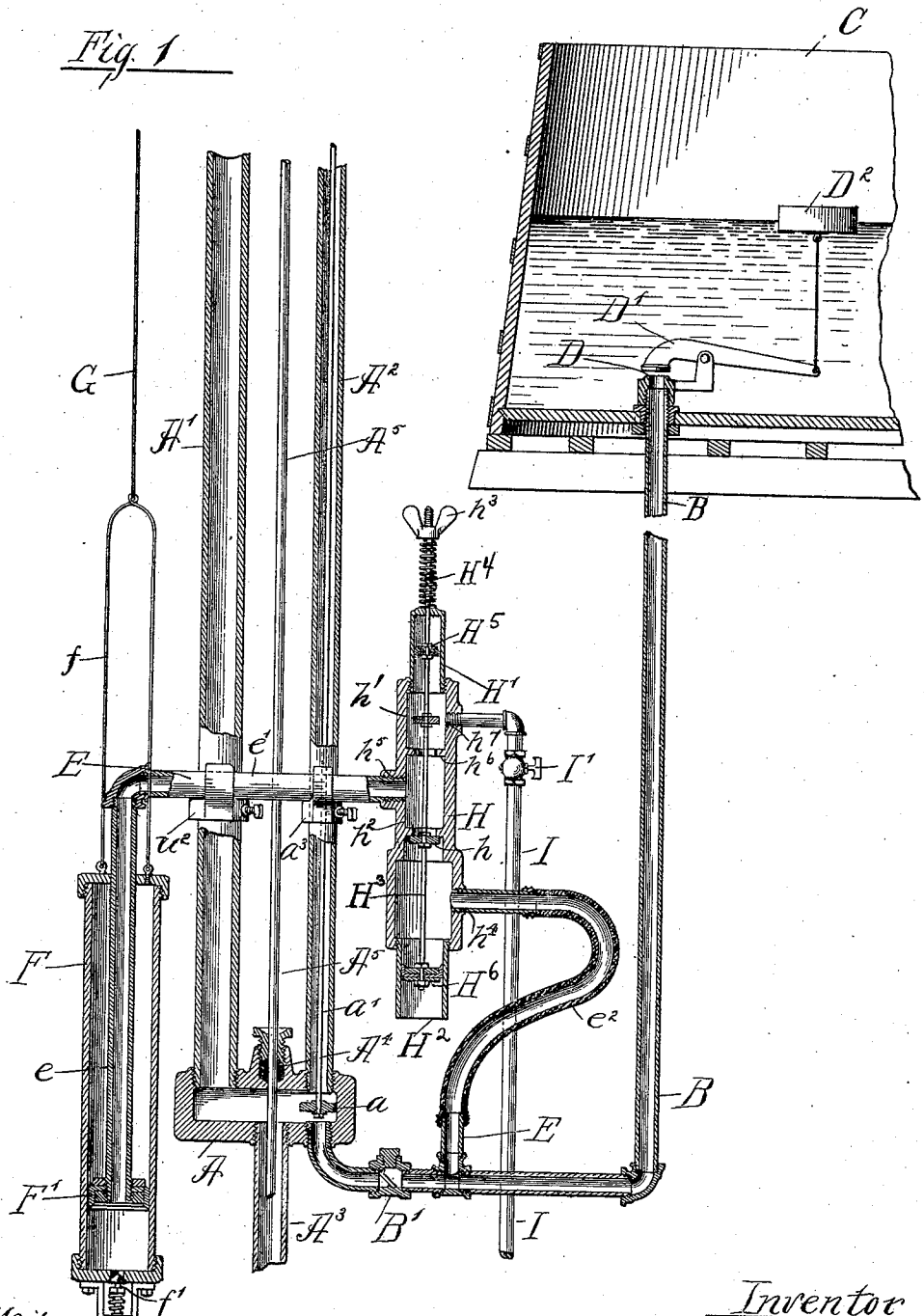
2 Sheets—Sheet 1.

S. A. ROUSE.

WINDMILL REGULATOR.

No. 576,078. Patented Jan. 26, 1897.

Fig. 1



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(No Model.) 2 Sheets—Sheet 2.

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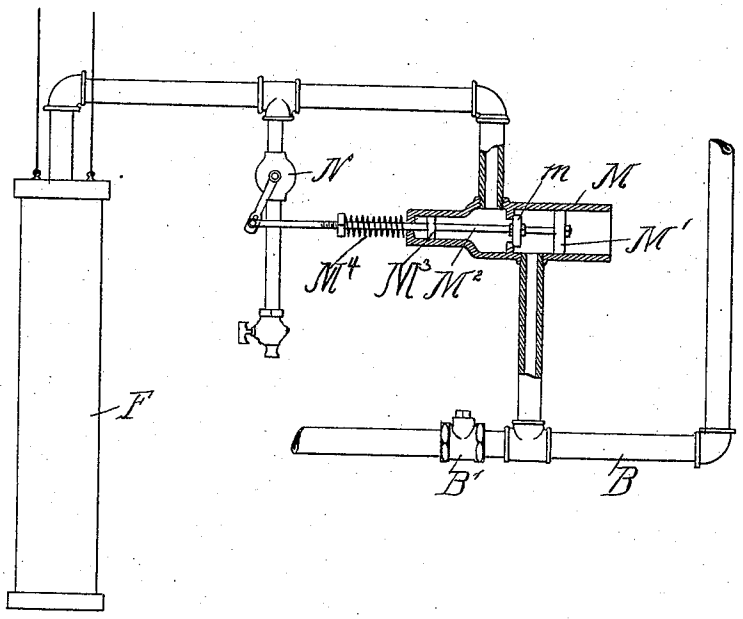
Fig 2



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UNITED STATES PATENT OFFICE.

SEYMOUR A. ROUSE, OF CHICAGO, ILLINOIS.

WINDMILL-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 576,078, dated January 26, 1897.

Application filed December 9, 1895. Serial No. 571,464. (No model.)

To all whom it may concern:

Be it known that I, SEYMOUR A. ROUSE, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Windmill-Regulators, of which the following is a specification.

This invention relates to improvements in hydraulic regulators for windmill pumping outfits of that class which operate to pull the mill out of the wind or otherwise check its operation when the water in a tank supplied by the pump reaches a predetermined depth. Regulators of this character usually embrace a float-valve which controls the service-pipe leading from the pump to the tank, and a hydraulic cylinder and piston communicating with said service-pipe and connected with a pull-out or furl wire or equivalent mechanism of the mill, whereby an increased pressure caused by the continued action of the pump after the service-pipe is closed by the float-valve will operate on said hydraulic cylinder and piston to pull the mill out of the wind and check the pumping operation. One class of valves for controlling the action of the hydraulic cylinder and piston operates to alternately open communication between said cylinder and the service-pipe and between said cylinder and an exhaust-passage, so that after the regulator has been brought into operation to stop the mill a decreased pressure in the service-pipe will permit the controlling-valve to cut off the latter from the cylinder, which will then exhaust its contents through said exhaust-passage and permit the mill to come again into action.

The object of the present invention is to provide a regulator having an improved valve of the class last referred to which shall be simple and inexpensive in construction and effective and durable in operation under the rough usage and lack of care to which devices of the character under consideration are ordinarily subjected.

In the accompanying drawing the figure is a general view of the pumping outfit provided with the regulator and valve constructed in accordance with my invention.

In said drawing, A designates the upper portion or coupling of a windmill-pump, B the service-pipe leading from said coupling, and C a tank into which the service-pipe discharges. As herein shown, the coupling A is connected with a vertical air-pipe A′ and an upwardly-extending discharge-pipe A^2, which may lead to the pump-spout on the well-platform above. Said pipe A^2 is furthermore herein shown as leading out of the coupling at a point directly opposite the service-pipe B, and a valve *a*, secured to a valve-rod *a*′, is adapted to direct the water into either the spout-pipe A^2 or the service-pipe A, according as the valve *a* is raised or lowered. Any suitable device ordinarily located upon or adjacent to the pump-spout may be used to raise and lower said valve. The coupling A is connected with the pump-cylinders (which are not herein illustrated) by the depending pipe A^3, and on the upper side of the coupling, opposite said pipe A^3, is a stuffing-box A^4, through which the plunger-rod reciprocates. The parts thus far described constitute in themselves no portion of the present improvements, and may be of any other suitable or preferred construction.

The flow of water through the service-pipe into the tank C is controlled by a suitable valve D, so as to be shut off when the depth of the water in the tank exceeds a certain predetermined limit. As herein shown, said valve D embraces a valve-plate that is located in the tank immediately above the open mouth of the pipe B and is secured to an end of the lever D′, the oscillation of which is controlled by a connected float D^2. The latter is made sufficiently buoyant to overcome the pressure exerted on the valve from the service-pipe and serves to hold said valve closed when the tank is filled to the desired level.

E designates a branch pipe leading from the service-pipe to the regulator-cylinder F, which is made to reciprocate vertically upon a hollow fixed piston F′, carried at the lower end of the rigid vertical terminal portion *e* of the pipe E. The upper end of the cylinder F is connected by a yoke *f* with the pull-out wire G or an equivalent part of the windmill mechanism, and the usual resetting devices of the mill normally exert a constantly-upward tension, tending to maintain the cylinder F in its uppermost position. When, however, an abnormal pressure of water is admitted through the pipe E and hollow piston F′, said cylinder will be forced down to pull the mill out of the

wind against the tension of the resetting devices in the same general manner as in other regulators of this type.

My improved controlling-valve comprises an outer casing H, usually of cast-iron, having terminal cylinders H′ H², preferably made of brass, the upper one of which cylinders is considerably smaller than the other. The casing H incloses two valve-plates h h', which are secured to a common valve-stem H³, that extends longitudinally through the casing and cylinders. The valve-plate h is normally held in contact with an annular seat h^2 of the casing by means of a spring H⁴, which is applied to the upper end of the valve-stem and the tension of which may be adjusted by the thumb-nut h^3 or equivalent device. The pipe E enters the casing at a point h^4 below the seat h^2 and leaves it at a point h^5 above said seat, so that the valve-plate h serves to normally close said pipe. The valve-plate h' is arranged for contact with an annular seat h^6, located in the casing above the point h^5, but normally stands separated from said seat, so as to afford free communication between the hydraulic cylinder and the waste-pipe I, which leads off from the casing at a point h^7 between said seat h^6 and the upper cylinder H′.

H⁵ H⁶ designate pistons secured to the valve-stem H³ and fitting within the top and bottom cylinders H′ and H² of the casing. The area of the pistons H⁵ and H⁶ are so proportioned with respect to each other and to the tension of the spring H⁴ that under the normal head of water due to the height of the tank C said spring will hold the valve h closed. When, however, the float-valve operates to close the service-pipe, by reason of the increased depth of water in the tank, the continued operation of the pump will increase the normal head in said service-pipe and force down the larger piston H⁶ in opposition to the smaller piston H⁵ and spring H⁴, and will thus carry the valve H away from its seat, so as to admit a flow of water from the service-pipe to the regulator-cylinder F. The latter will thereupon act in the manner before described to pull the mill out of the wind and will continue to hold it thus out of operative position until the pressure in the service-pipe is reduced to normal again, as, for example, by the opening of the float-valve when sufficient water is drawn off from the tank, when the spring H⁴, aided by the piston H⁵, will overcome the pressure exerted on the piston H⁶, close the valve h, and open the valve h'. The cylinder F is thereupon relieved from the pressure of the water in the service-pipe, and under the tension of the resetting devices of the mill will discharge its contents through the waste-pipe I and thus permit the mill to be brought into action again. The cock or valve I′ in the waste-pipe I may be adjusted to vary the effective area of the waste-pipe and will enable the apparatus to be set so as to permit the mill to resume its operations more or less rapidly, as desired.

The portion e' of the pipe E which leads from the casing to the cylinder F is herein shown as rigidly connected with the casing at one end by an ordinary screw-joint and at its other end is connected by an elbow with the vertical terminal portion e of the pipe which extends into the regulator-cylinder. The entire mechanism is then shown as rigidly supported from the air-pipe A′ and spout-pipe A² by means of clamping-collars a^2 and a^3, which embrace the pipe-section e'. The lower section e^2 of the pipe E, which leads from the service-pipe into the casing H, is conveniently made in the form of a flexible hose, so that said service-pipe may be carried off in any direction from the coupling A without interfering with the support of the regulating mechanism in the manner described. A check-valve B′ is also herein shown as inserted in the usual manner in the service-pipe B between the pipe E and the coupling A.

To provide for the relief of any excessive pressure in the regulator-cylinder due to an unexpected working of the mill and pump after being supposedly thrown out of action by the regulator, as may sometimes occur in high and variable winds or resulting from any other causes, said cylinder is herein shown as provided at its lower end with a safety-valve f', which may be adjusted to open whenever the pressure in the cylinder exceeds a safe limit.

One important advantage of my present improvement consists in the fact that the differential pistons obviate the necessity of a stuffing box or boxes, which if packed sufficiently tight to prevent leakage would inevitably cause the valve-rod to bind and materially interfere with the proper work of the regulator, since the spring would then have to be screwed down hard enough to overcome the initial friction as well as the predetermined pressure at the beginning of the return stroke, and this excess of spring-tension would unite with the initial friction at the beginning of the downward stroke to unduly resist the starting of the regulator. Under such circumstances, therefore, the regulator would be slow and uncertain both in going into and out of action, and the tension of the spring would, moreover, require to be readjusted each time the stuffing-box was tightened or its packing renewed and at various other times to compensate for the variation in friction as the packing became worn. These disadvantages are especially apparent in a mechanism of the character under consideration, since its position within the well renders it difficult of access, while the persons in charge of the apparatus are usually entirely unskilled as well as very careless in the handling of machinery of any kind. Moreover, while obviating the use of the stuffing-boxes, the pistons provided are not in themselves liable to undue wear or to require frequent attention or replacing, since their provision in cylinders

located at the opposite ends of the casing and outside of the several ports avoids the necessity of their reciprocating across such ports and the cutting of the packing ordinarily incident to constructions in which the pistons so operate.

In Fig. 2 I have illustrated a modified construction embodying my improvements, in which the valve-casing M is provided with cylindric end portions containing differential pistons M′ and M^3 and a valve *m* on the valve-stem M^2 in the same manner as in Fig. 1. The ports leading to the hydraulic cylinder F and service-pipe B are located between the pistons M′ and M^3, and the valve *m* is normally held closed, so as to cut off communication between said service-pipe and cylinder, by an adjustable spring M^4, applied to the valve-stem, as before described. The waste-valve in this case is, however, provided in the form of a separate valve N, which is operated by a continuation of the stem M^2, said valve N being normally open. When the pressure in the service-pipe is abnormally increased, the piston M will be forced out against the spring M^4 and piston M^3 and will simultaneously close the waste-valve N and open the valve *m* and thus bring the regulator into operation.

I claim as my invention—

1. In a windmill pumping outfit, a regulator embracing a hydraulic cylinder and plunger operatively attached to the pull-out mechanism of the mill, a supply-passage leading to said cylinder from the service-pipe which connects the pump and tank and means for controlling the flow of water to and from the hydraulic cylinder, comprising a casing provided at its ends with cylindric portions, pistons fitting said cylinders and attached to a common stem, an adjustable spring applied to the valve-stem in opposition to one of the pistons, ports between the two pistons leading to the hydraulic cylinder and service-pipe, a valve on said stem normally closing communication between said ports, a normally open exhaust-passage communicating with the hydraulic cylinder and a valve for closing said passage when the first valve opens.

2. In a windmill pumping outfit, a regulator embracing a hydraulic cylinder and plunger operatively attached to the pull-out mechanism of the mill, a valve for shutting off the discharge of the service-pipe in the tank when the water in the latter reaches a predetermined limit, and a controlling-valve comprising a casing provided at its ends with cylinders of differing diameters, differential pistons fitting said cylinders and attached to a common valve-stem, an adjustable spring applied to said valve-stem in opposition to the larger piston, valve-plates on said stem cooperating with valve-seats in the casing, a port between the valve-seats communicating with the cylinder, a port between one valve-seat and the larger piston communicating with the service-pipe and an exhaust-port between the other valve-seat and the smaller piston, substantially as described.

3. In a windmill pumping outfit, the combination with a pump and its upwardly-extending pipes, the tank and its service-pipe and valve, of a transverse pipe clamped to a pump-pipe and provided with a downwardly-projecting terminal and hollow plunger at the end of said terminal, a regulator-cylinder fitting over said terminal and plunger and connected with the mill pull-out, and a regulator-valve rigidly secured to the opposite end of said transverse pipe comprising a central casing having terminal cylinders of greater and less diameter, differential pistons in said cylinders on a common valve-stem, an adjustable spring applied to said valve-stem in opposition to the larger piston, valve-seats in the casing above and below the transverse pipe, valve-plates in the stem coöperating with said valve-seats, a flexible connection leading from a point below the lower valve-seat and the longer piston to the service-pipe and an exhaust-pipe leading from a point between the upper valve-seat and the smaller piston.

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