(No Model.) 2 Sheets—Sheet 1.

H. L. FERRIS.

WINDMILL REGULATOR.

No. 351,503. Patented Oct. 26, 1886.

Fig. 1.

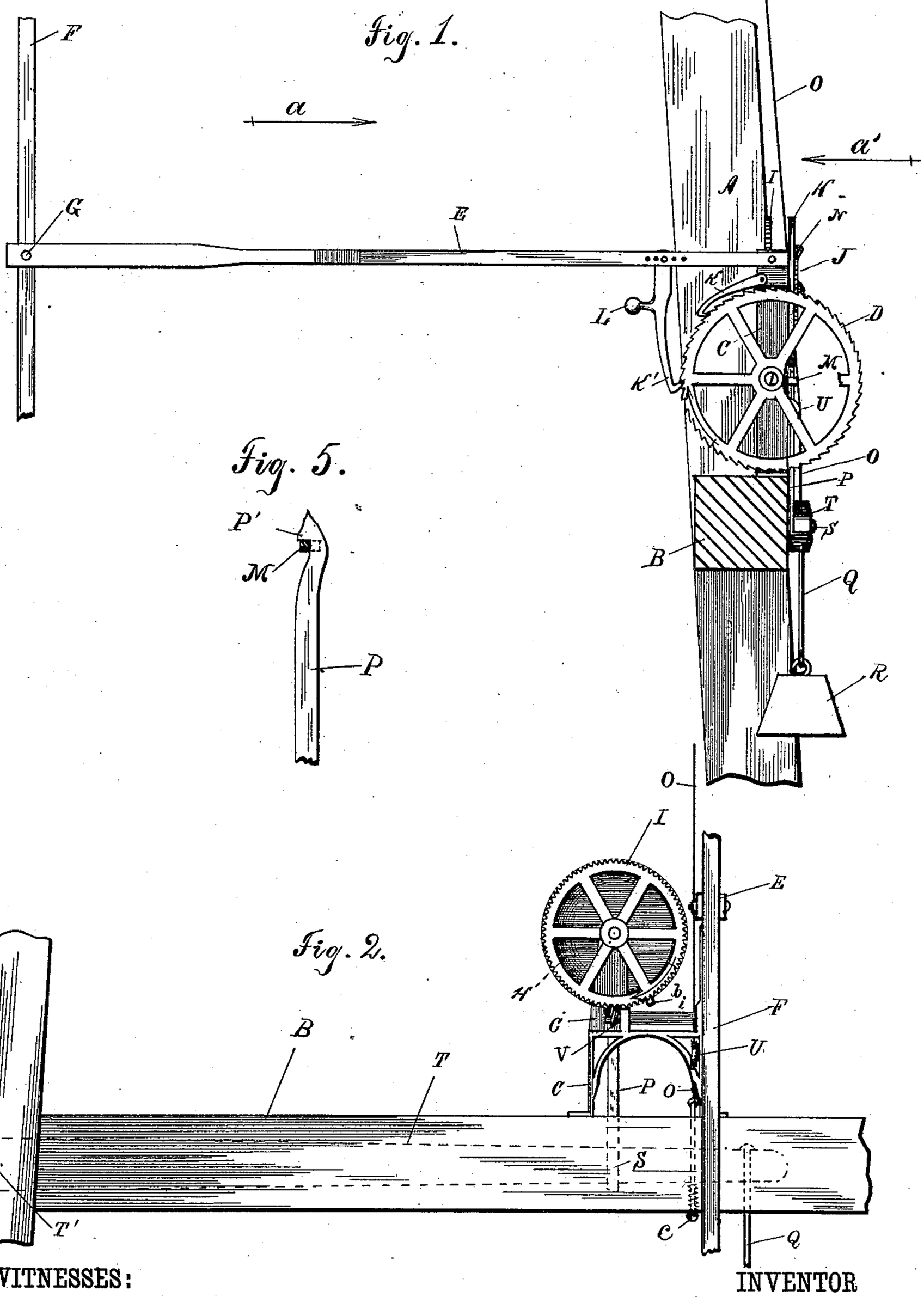

Fig. 5.

Fig. 2.

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(No Model.)

2 Sheets—Sheet 2.

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Fig. 3.

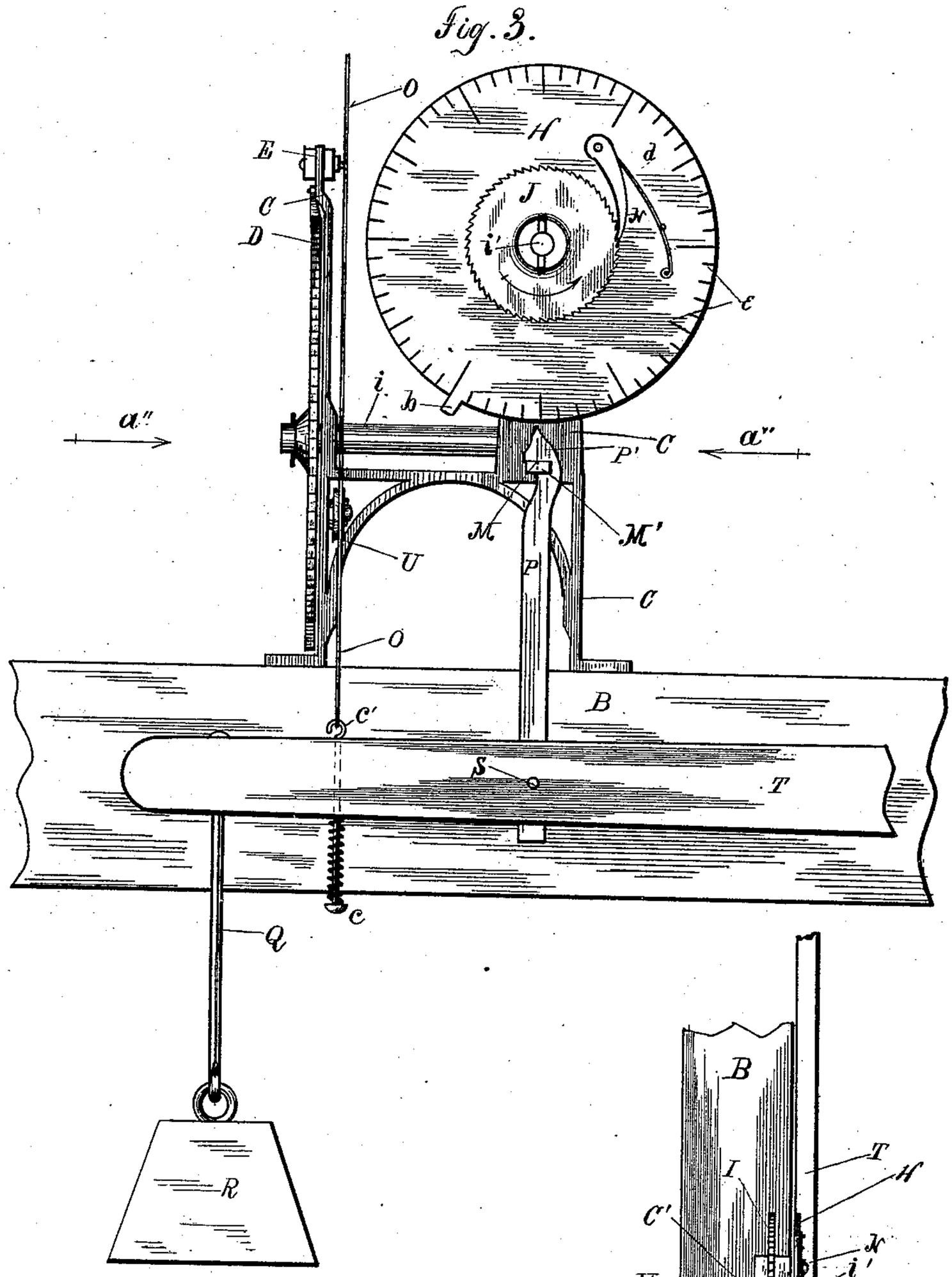
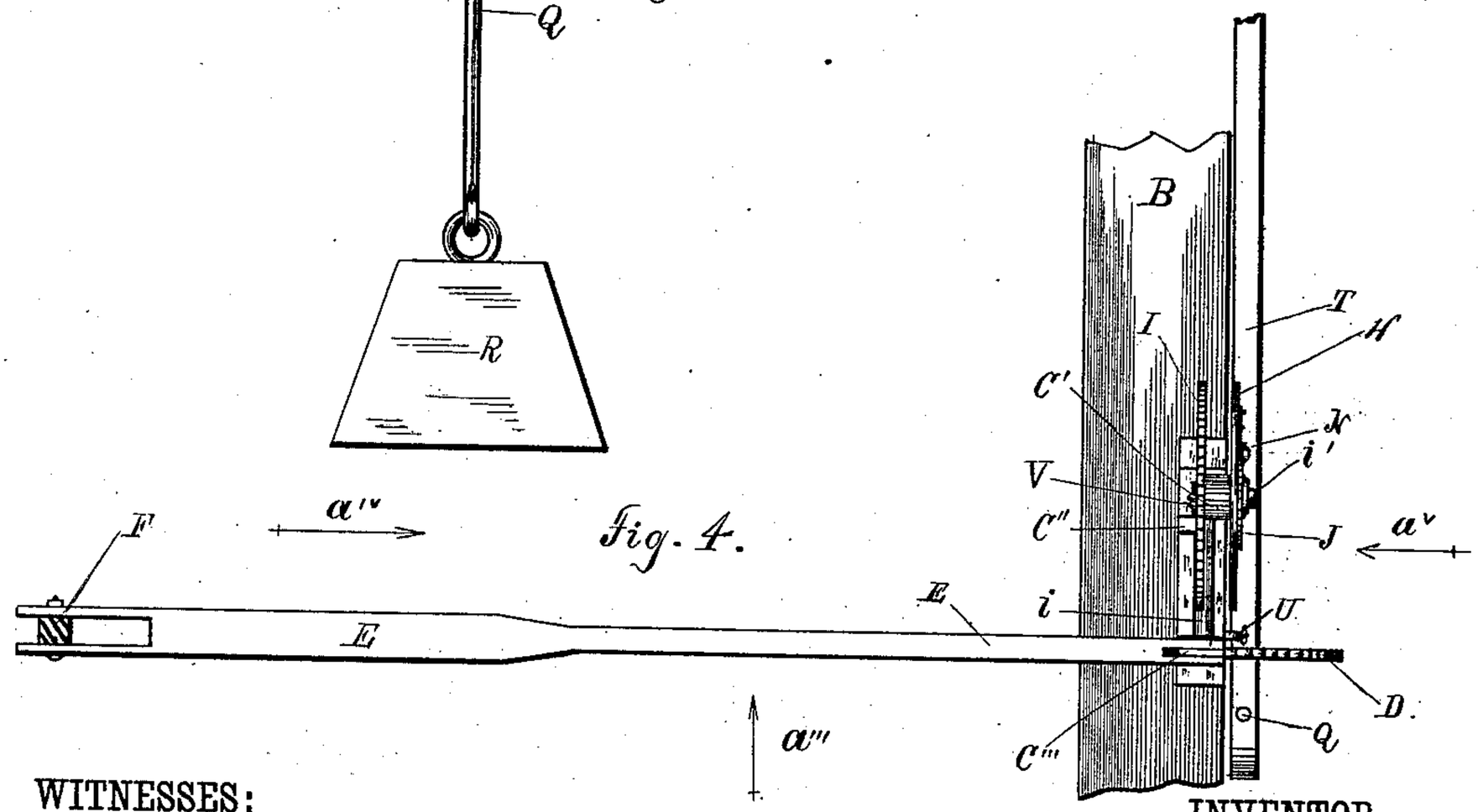


Fig. 4.



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UNITED STATES PATENT OFFICE.

HENRY L. FERRIS, OF HARVARD, ILLINOIS.

WINDMILL-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 351,503, dated October 26, 1886.

Application filed January 24, 1885. Serial No. 153,876. (No model.)

To all whom it may concern:

Be it known that I, HENRY L. FERRIS, a resident of Harvard, in the county of McHenry and State of Illinois, have invented certain new and useful Improvements in Windmill-Regulators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention is an improved mechanism adapted to be attached to the tower of a windmill and connected with the pump-rod thereof, and with the cord or rod, by means of which the wind-wheel is thrown "out of the wind," the construction of the mechanism and its connection with the other parts named being such that a given number of strokes of the pump-rod will release a weight or other power attached to said cord, and thus draw the wheel out of the wind.

The invention is described and explained in the following specification, and one form thereof is shown in the accompanying drawings, in which—

Figure 1 is a front elevation of the mechanism, looking in the direction indicated by the arrow a^{II}, Fig. 3, and the arrow a^{III}, Fig. 4; Fig. 2, a side elevation thereof, looking in the direction indicated by the arrow *a*, Fig. 1, and the arrow a^{IV}, Fig. 4; Fig. 3, a side elevation of the same, looking in the direction indicated by the arrow a^{I}, Fig. 1, and the arrow a^{V}, Fig. 4; Fig. 4, a top plan of same; Fig. 5, a detail view showing connection of hook P′ and lug or catch M, the catch being cut by a vertical plane immediately in front of the hook, as shown in Fig. 3.

In these views, A is one of the corner-posts of a windmill-tower of ordinary construction, and B a horizontal timber bolted to the two posts forming one of the sides of the tower.

F is the pump-rod of the mill; O, the cord, wire, or rod by means of which the wind-wheel may be drawn out of the wind from the foot of the tower; and T a lever to which the lower end of the cord O is fastened, one end of the lever being pivoted to the post A by means of a pin or bolt, T′, and the other end being provided with a weight, R, sufficiently heavy to draw the wind-wheel out of the wind. The end of the cord O may be fastened to the lever T in any desired manner; but I prefer to fasten it, as shown in Fig. 3, by means of a long bolt extending through the lever and having an eye, *c′*, above the lever, and a head, *c*, below it, a spring being interposed between the head of the bolt and the lower surface of the lever to take up any shock or jar of the parts.

To the lever T is pivoted, on a pin, S, an upwardly-extending bar, P, formed at the upper end into a hook, P′, and when the lever is raised sufficiently to allow the wind-wheel to stand "in the wind" this hook is in position to engage with and be supported by a lug, M, formed upon or attached to a rigid frame, C, which rests on and is bolted to the upper surface of the timber B. The hook is brought into engagement with the lug by raising it to the proper height and moving it in the direction indicated by the arrow a^{VI}, Fig. 3, and a lip, M′, formed on the lug, extends along the side face of the hook when in engagement, and prevents its disengagement except when moved in the direction indicated by the arrow a^{II} in said Fig. 3.

It is evident that so long as the hook is in engagement with the lug the weight R is supported by the stationary frame C, and has no effect on the cord O or on the wind-wheel; but that if the hook be disengaged from the lug and allowed to drop down the weight will act on the cord and draw the wind-wheel out of the wind.

The mechanism by means of which the pump-rod disengages the hook from the lug is mounted on the frame C and is constructed as follows: A lever, E, pivoted at one end to the pump-rod and at the other end to the frame C, is provided with a dependent gravity-pawl, K′, which engages with the teeth of a ratchet-wheel, D, the wheel being rigidly mounted on a horizontal shaft, *i*, which is journaled in the frame C. At each upward motion of the pump-rod the pawl K′ turns the wheel in the direction indicated by the arrow on the wheel in Fig. 1, and a pawl, K, pivoted to the frame C, prevents backward rotation of the wheel during the downward stroke of the pump-rod. The pawl K′ is pivoted to the lever E at such a point as to move, at each stroke of the pump-

rod, through a space not less than one, but less than two, of the spaces between the teeth of the ratchet-wheel, and the wheel therefore turns through one such space at each upward stroke of the pump-rod.

On the opposite end of the shaft *i* from the ratchet-wheel D is a worm, V, Fig. 2, which engages with a toothed wheel, I, and one complete rotation of the shaft *i* and worm V turns the wheel I in the direction indicated by the arrow on its face in Fig. 2, through a space equal to the distance between two contiguous teeth. The wheel I is rigidly mounted on a short horizontal shaft, *i'*, journaled in the frame C, and on the outer end of said shaft is a rigidly-mounted ratchet-plate J and a loosely-mounted dial-plate, H, of greater diameter than the ratchet-plate, and connected therewith by a spring-pawl, N, pivoted to the dial and engaging the teeth of the ratchet-plate. As the wheel I rotates, the ratchet-plate J turns with it in the direction indicated by the arrow on the plate in Fig. 3, and the pawl-and-ratchet connection of the plate and dial insures the rotation of the latter in the same direction. A tooth, *b*, projects from the periphery of the dial and is of such length as to strike the hook P' and force it from the lug M, thus bringing the weight R to bear upon the cord R, and throwing the wind-wheel out of the wind. While the pawl-and-ratchet connection of the plate J and dial H forces the dial to rotate when the plate rotates, it also permits the independent rotation of the dial for the purpose of setting it in any desired position.

The gearing connecting the lever E and the dial may of course be so varied as to give one complete rotation of the dial for any desired number of strokes of the lever. In the machine illustrated in the drawings the gearing is such as to turn the dial once for every six thousand strokes of the lever, and each of the smallest divisions on the dial represents one hundred strokes of the lever or of the pump-rod, which is the same thing. This being known, the number of strokes of the pump-rod required to rotate the dial from any given position to the position in which the tooth *b* shall strike and disengage the hook P', and so throw the wind-wheel out of the wind, may be readily determined. Thus, from the position shown in Fig. 3, the dial should be so far rotated as to throw off the hook at the end of about four hundred strokes of the pump-rod; and it is evident that the dial may be so set that any number of strokes, from a single one up to six thousand, shall disengage the hook. By the use of this mechanism, then, it is possible to set a positive limit to the amount of work a windmill shall do before go**n**; out of working position, and the operator having set the dial at any desired point, can leave his mill with the assurance that when the limit of work is reached the mill will cease to run.

I have made the limit of the dial in the machine, as I have put it into use, at six thousand strokes of the pump-rod, as being sufficient for all ordinary purposes of a pumping-mill; but it is unnecessary to say that this limit may be indefinitely increased without the use of very complicated gearing. The movement of the parts is so slow that their friction is inappreciable, and the gearing requires no such nicety of construction as is necessary in many machines.

It is evident that the gearing which connects the pump-rod with the regulating-cord O may be varied in an almost unlimited number of ways without in any degree affecting the gist of my invention; and I desire, therefore, not to limit my invention to any particular form of gearing. I am aware, however, that there are already in use a number of devices for drawing the wind-wheel of a windmill out of the wind after the mill has pumped a given amount of water. The best known example of devices of the class referred to is that in which a bucket is attached to the cord which draws the mill out of the wind, the bucket being connected with an overflow-pipe from a tank or other water-reservoir. When the tank has been filled to a given height by water pumped by the mill, it overflows into the bucket, thus increasing the weight of the bucket sufficiently to draw the wind-wheel out of the wind. There are other devices in which the mill is drawn out of the wind by means of the increased weight of the tank when the requisite amount of water has been pumped, and it is evident that a great number of forms may be devised for the same purpose, all depending for their operation on the amount of water pumped by the mill. The mechanism shown and described in this application operates, however, upon an entirely different principle, since its action is wholly independent of the amount of water pumped by the mill. It is evident that this device operates precisely the same whether the amount of water raised at each upward stroke of the pump-rod be great or small, or even if the pump-rod be wholly disconnected from the pump. In other words, this mechanism is a positive connection of the pump-rod and the regulating-cord of the mill, by means of which the mill is drawn out of the wind through the motion of the pump-rod without reference to the amount of work performed by the rod. So far as I know, the device shown and described herein is the first of its class, and that being the case I do not desire to limit the scope of my invention to any particular form of mechanism. The means necessary to accomplish the result desired are exceedingly simple, as is evident from an examination of this application, and after the way is once opened by the construction and exhibition of a single machine of the class, any mechanic of ordinary skill can devise numberless forms equally adapted to perform the same work.

I have not shown any part of the upper works of a windmill, since in all pumping-mills the power is transmitted through a pump-rod, and in all such mills a cord or wire runs

down through the mill to the foot of the tower, and affords a means of drawing the wind-wheel out of the wind. These devices are so well known that no illustration of them is necessary, and I have therefore shown only the connection of the pump-rod and regulating-cord with the weight-releasing mechanism.

The frame C is represented and spoken of as attached to the tower. It may, however, be attached to any stationary support, conveniently located for connecting with the pump-rod and cord O.

It is evident that a spring may be substituted for the weight R, if desired.

Having now described my invention and explained its operation, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with the pump-rod of a windmill, the cord by means of which the wind-wheel of the mill may be drawn out of the wind, and a weight or its described equivalent connected with the cord and sufficient to draw the wind-wheel out of the wind, of a support for the weight independent of the cord, and mechanism connected with the pump-rod and adapted to release the weight from its support, whereby the motion of the pump-rod releases the weight, actuates the cord, and draws the wind-wheel out of the wind.

2. The combination, with the reciprocating pump-rod of a windmill, the cord by means of which the wind-wheel of the mill may be drawn out of the wind, and a weight or its described equivalent connected with cord and adapted to actuate the same, of a support for the weight independent of the cord, mechanism connected with the pump-rod and adapted to convert its reciprocal into rotary motion, and mechanism connected with the converting device and adapted to release the weight from its support, whereby the operation of the converting device releases the weight, actuates the cord, and draws the wind-wheel out of the wind.

3. The combination, with the reciprocating pump-rod of a windmill, the cord by means of which the wind-wheel of the mill may be drawn out of the wind, and a weight or its equivalent connected with the cord and adapted to actuate the same, of a support for the weight independent of the cord, a rotating ratchet-wheel, a pawl connected with the pump-rod and engaging with said ratchet-wheel, whereby the reciprocal motion of the pump-rod rotates the ratchet-wheel, and mechanism connected with and actuated by said ratchet-wheel, whereby a given rotation of the ratchet-wheel releases the weight from its support, and actuates the cord.

4. The combination, with the reciprocating pump-rod of a windmill, the cord by means of which the wind-wheel of the mill may be drawn out of the wind, and a weight or its described equivalent connected with the cord, and adapted to actuate the same, of a support for the weight independent of the cord, means connected with the pump-rod, and adapted to convert its reciprocal into rotary motion, and mechanism whereby the motion of said converting device may release said weight from its support, said releasing device being adjustable with reference to the point of support of said weight, whereby the amount of motion of said converting device required to release said weight may be varied at will.

5. The combination, with the reciprocating pump-rod of a windmill, the cord by means of which the wind-wheel of the mill may be drawn out of the wind, and a weight or its equivalent connected with the cord and adapted to actuate the same, of a support for the weight independent of the cord, a ratchet-wheel, a pawl connected with the pump-rod and engaging the ratchet-wheel, whereby the reciprocal motion of the pump-rod rotates the ratchet-wheel, and mechanism connected with the ratchet-wheel, whereby the rotation of the ratchet wheel through a given angular space may release the weight from its support, the weight-releasing device being adjustable with reference to the point of support of the weight, whereby the amount of rotation of the ratchet-wheel required to release the weight may be varied at will.

6. The combination, in a mechanism for the purpose set forth, of a pawl-and-ratchet mechanism, or its equivalent, adapted to be connected with the pump-rod of a windmill, and to convert the reciprocal motion thereof into rotary motion, a weight adapted to be connected with and actuate the regulating-cord of the mill, a support for the weight, and mechanism whereby the motion of the pawl-and-ratchet device may release the weight from its support.

7. The combination, with the pump-rod of a windmill, the cord by means of which the wind-wheel of the mill may be drawn out of the wind, and a weight or its equivalent connected with the cord and adapted to actuate the same, of a support for the weight independent of the cord, a pawl-and-ratchet mechanism connected with the pump-rod, and adapted to convert the reciprocal motion thereof into rotary motion, a suitably-journaled shaft receiving rotary motion from said pawl-and-ratchet mechanism, and a tooth or projection rotating in unison with said shaft, and adapted after a given rotation of said shaft to reach the point of support of said weight and disengage the weight from its support.

8. The combination, with the pump-rod of a windmill, the cord by means whereof the wind-wheel of the mill may be drawn out of the wind, and a weight or its equivalent connected with and adapted to actuate the cord, of a support for the weight independent of the cord, a pawl-and-ratchet mechanism connected with the pump-rod and adapted to convert the reciprocal motion thereof into rotary motion, a suitably-journaled shaft receiving rotary motion from said pawl-and-ratchet mechanism, and a tooth or projection rotating with

said shaft and adapted, after a given rotation of the shaft, to reach the point of support of the weight and to release the weight from its support, the distance between said tooth or projection being adjustable at will, whereby the amount of rotation of the shaft required to release the weight may be varied.

9. The combination, with the pump-rod of a windmill, the cord by means of which the wind-wheel may be drawn out of the wind, and a weight or spring attached to said cord and sufficient to draw the wind-wheel out of the wind, of means for supporting said weight or spring independently of said cord, a rotating wheel or plate provided with a tooth adapted to disengage said weight or spring from its support, and an intermediate pawl-and-ratchet mechanism, or its equivalent, connected with the pump-rod and the plate, whereby each stroke of the pump-rod shall rotate said plate through a given distance, and a given number of strokes of the rod shall rotate the plate from any given position to that position in which said tooth shall detach said weight or spring from its support and bring it to bear on said cord, and thus throw the wind-wheel out of the wind.

10. The combination, with the pump-rod of a windmill, the cord by which the wind-wheel may be drawn out of the wind, and a weight or spring attached to said cord and sufficient to draw the wind-wheel out of the wind, of means for supporting said weight or spring independently of said cord, a rotating dial adapted upon reaching a certain point in its rotation to disengage said weight or spring from its support, and an intermediate pawl-and-ratchet mechanism, or its equivalent, connected with the pump-rod and the dial, whereby a fixed number of strokes of the pump-rod rotates said dial through an angular space of three hundred and sixty degrees, and a proportionate number of strokes rotates it through the angular space indicated by one of the divisions on the dial.

11. The combination, with the pump-rod of a windmill, the cord by which the wind-wheel may be drawn out of the wind, and a weight or spring attached to said cord and sufficient to draw the wind-wheel out of the wind, of means of supporting said weight or spring independently of said cord, a rotating dial adapted on reaching a certain point in its rotation to disengage said weight or spring from its support, an intermediate pawl-and-ratchet mechanism, or its equivalent, connected with the pump-rod and the dial, whereby a certain number of strokes of the pump-rod rotates the dial through an angular space of three hundred and sixty degrees, and a proportionate number of strokes rotates it through one of the spaces on the dial, and means whereby said dial may be rotated independently of the pawl-and-ratchet mechanism, and thus set in any desired position.

12. The combination, with the pump-rod of a windmill, the cord by means of which the wind-wheel may be drawn out of the wind, and a weight or spring attached to said cord and sufficient to draw the wind-wheel out of the wind, of means for supporting said weight or spring independently of the cord, a rotating dial adapted on reaching a certain point in each rotation to detach said weight or spring from its support and bring it to bear on said cord, a rotating ratchet-wheel, a pawl engaging with said ratchet-wheel and connected with the pump-rod, whereby each stroke of the pump-rod rotates said ratchet-wheel through a given angular space, and means connecting said ratchet-wheel with said dial, whereby the rotation of the ratchet-wheel is communicated to the dial.

13. The combination of the ratchet-wheel D, the pawl K′, engaging the ratchet-wheel, and the lever E, connecting the pawl with the pump-rod of a windmill, the weight-supporting hook P′, and a support therefor, the dial H, provided with a tooth or lug adapted to disengage the hook from its support, and speed-varying mechanism connecting the ratchet-wheel and the dial, substantially as and for the purpose set forth.

14. The combination, with the pump-rod F, of the shaft *i′*, the ratchet-plate J, mounted rigidly thereon, and the dial H, mounted loosely thereon, the spring-pawl N, connecting the plate J and dial H, and a pawl-and-ratchet mechanism, or its equivalent, adapted to connect the shaft *i′* with the pump-rod, substantially as and for the purpose set forth.

15. The combination, with the pump-rod F of a windmill, the cord O, by means of which the wind-wheel of the mill may be drawn out of the wind, the pivoted lever T, to which the cord is fastened, the weight R, or its equivalent, attached to the lever, the hook P′ and stationary lug M, supporting said lever, the shaft *i′*, adapted, when rotated through a sufficient angular space, to disengage the hook from the lug, and a pawl-and-ratchet mechanism connecting the pump-rod and the shaft *i′*, whereby the reciprocal motion of the pump-rod rotates the shaft *i′*, substantially as and for the purpose set forth.

16. The combination, with the pump-rod F, of the lever E, receiving reciprocal motion from the pump-rod, the ratchet-wheel D and its shaft *i*, the pawl K′, attached to the lever E and engaging the ratchet-wheel D, the worm V, formed on the shaft *i*, and the toothed wheel I, engaging with the worm, the ratchet-plate J, rotating with the wheel I, the dial H, and the spring-pawl N, connecting the plate J and the dial, substantially as and for the purpose set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

HENRY L. FERRIS.

Witnesses:
LUDWIG SCHMEISSER,
J. G. CALLENDER.