(No Model.) 3 Sheets—Sheet 1.

A. C. HOUGH.

AUTOMATIC REGULATOR FOR WINDMILLS.

No. 437,783. Patented Oct. 7, 1890.

Fig. 1.

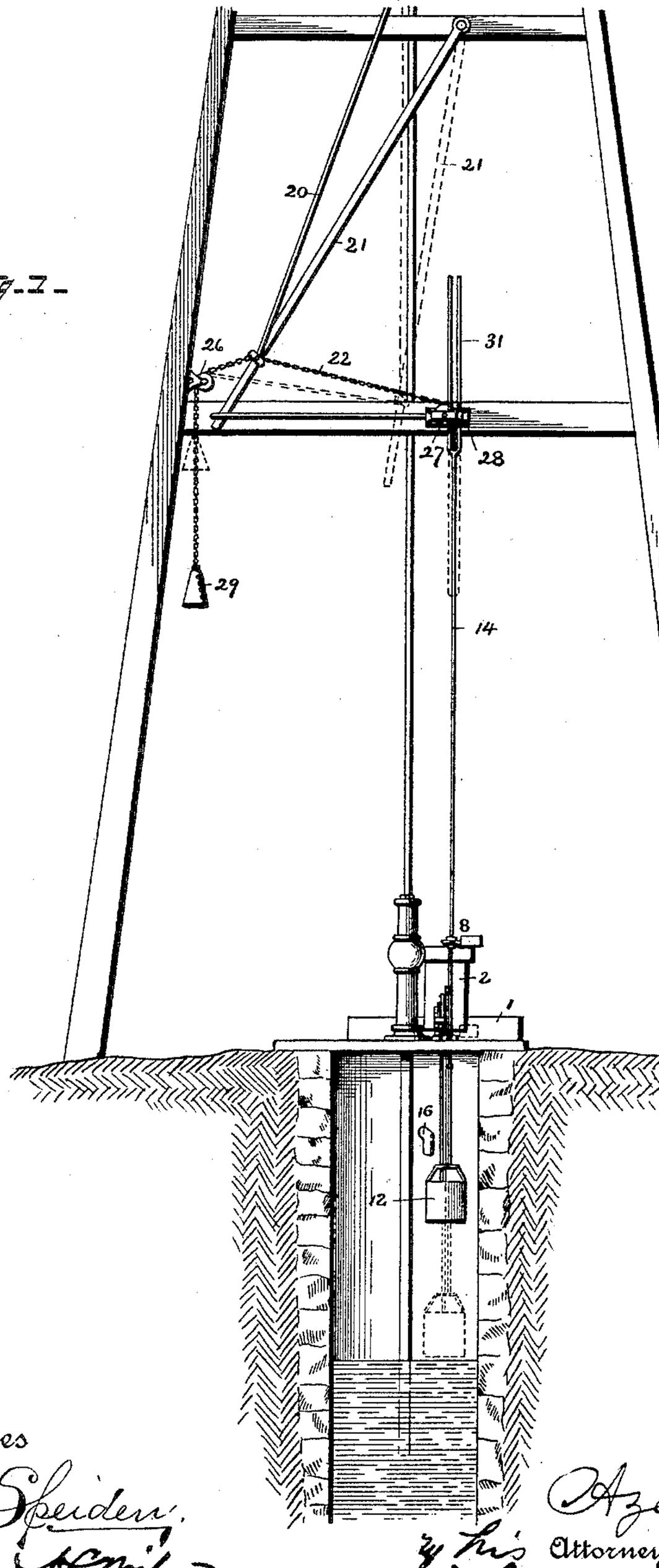
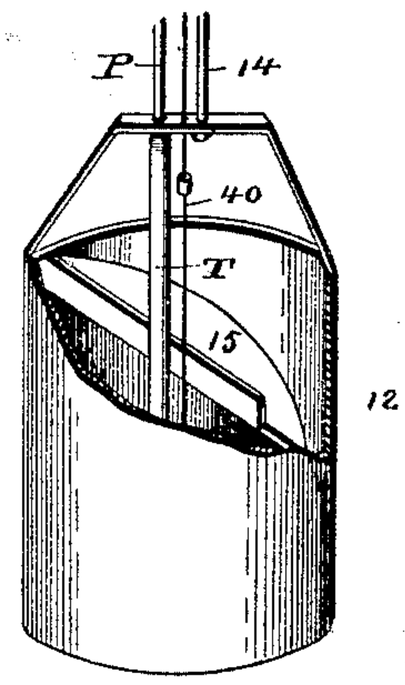


Fig. 5.



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(No Model.) 3 Sheets—Sheet 2.

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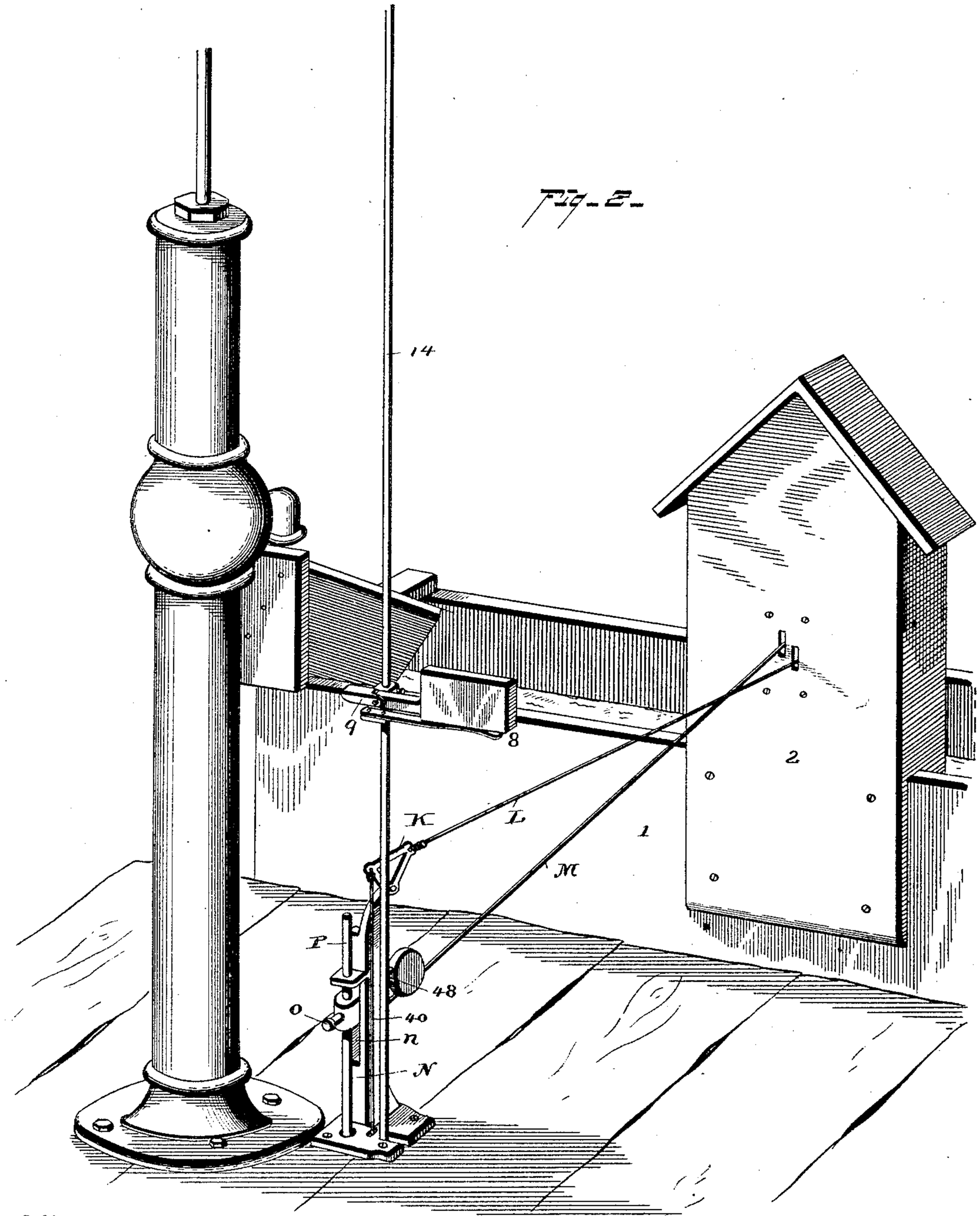
Fig. 2.



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(No Model.) 3 Sheets—Sheet 3.

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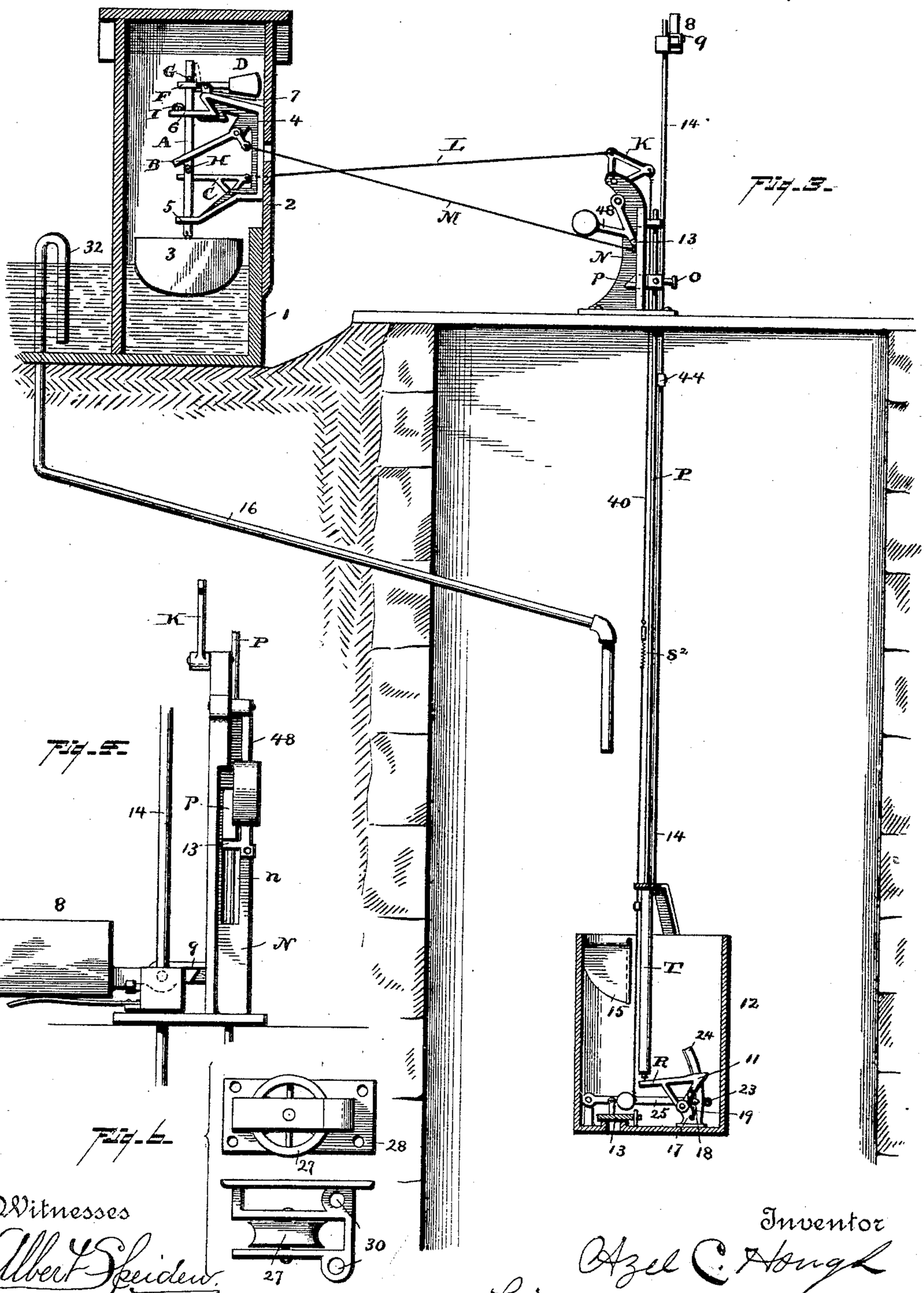

Fig. 3.

Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE.

AZEL CLARENCE HOUGH, OF SOUTH BUTLER, NEW YORK.

AUTOMATIC REGULATOR FOR WINDMILLS.

SPECIFICATION forming part of Letters Patent No. 437,783, dated October 7, 1890.

Application filed May 21, 1890. Serial No. 352,606. (No model.)

To all whom it may concern:

Be it known that I, AZEL CLARENCE HOUGH, a citizen of the United States, residing at South Butler, in the county of Wayne and State of New York, have invented certain new and useful Improvements in Automatic Regulators for Windmills; and I do 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 appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to windmill governors or regulators; and it has for its object to prevent unnecessary wear on the mill by throwing the same out of gear the instant the water in the trough reaches the predetermined level, and which will be positive in its action and will throw the mill into gear when the water in the trough reaches a low level.

A further object of the invention is to dispense with the complex valves and delicately-adjusted parts, which have been the chief objection to this class of devices as heretofore constructed, thereby obviating the necessity of packing and rearranging the parts of such devices as are now generally used.

A still further object of the invention is to provide an apparatus which will be automatic in its action in starting and stopping the mill, and which will be simple, compact, and durable in construction and will require very little attention to keep it in working order.

The improvement consists, first, of a tilting lever having a support pivotally connected therewith, which is adapted to sustain a weighted float in the water trough or tank until the water falls below the predetermined level, when the said float, overcoming the force of the said tilting lever, will drop and throw the mill into gear; second, of a transmitter which is operated by the stem of the float to open and close a valve in the suspended bucket to effect the starting and stopping of the windmill; third, in a bucket which is suspended in the well, and which is counterbalanced and connected with a lever, which lever is in connection with the mechanism for throwing the mill in and out of gear; fourth, in the valve-gear for closing and holding open the valve in the said bucket during the interval between the starting and stopping of the mill; fifth, in the overflow-pipe for conveying the surplus water from the trough when the said water exceeds the predetermined level to the aforesaid suspended bucket for the purpose of overcoming the bucket's counterbalance and throwing the mill out of gear.

The improvement also consists in the novel features of construction, and in the peculiar construction, combination, and arrangement of parts, which will be hereinafter more fully described and claimed, and which are shown in the accompanying drawings, in which—

Figure 1 is a side view showing the application of the invention and showing the operation of the same in dotted lines. Fig. 2 is a perspective view showing the application of the invention. Fig. 3 is a side view, partly in section, showing the relative arrangement of the parts. Fig. 4 is a front view of the transmitter. Fig. 5 is a perspective view, parts being broken away, of the suspended bucket. Fig. 6 is a side and top plan view of the pulley-block which is attached to the derrick, through which the chain and forked end of the suspension-rod passes and are guided in their movements.

The watering-trough 1 is of usual construction and arrangement, and is placed at any convenient point to which the stock has free access.

In any convenient place in the trough is located a box or case 2, in which is arranged the regulating devices which comprise the weighted float 3, the tilting lever D, and the levers B and C. The levers B, C, and D are pivoted to a bracket 4, which is bolted or otherwise secured to the side of the box or case 2, and which has arms 5 and 6 at different levels to form guides for the stem A of the float to work through. The guide 6 is provided in its outer end with the anti-friction roller I to prevent binding of the said stem in its movements through the guide 6.

The tilting lever D is pivoted near its inner end, which end is provided with the support F, which is pivotally connected therewith, and which is adapted to turn up and

permit the passage of the stop G on the float-stem A to pass above it, but which will be held in a horizontal position beneath the said stop G to support the float 3. The outer end of the tilting lever D is weighted, the weight being sufficient to sustain the float 3 when the latter is buoyed up by the water in the trough, but which will be overcome by the superior weight of the said buoy 3 when the water falls beneath it.

The spring 7, secured to the bracket 4, is provided to form a cushion for the weighted end of the said lever D when the same falls back after being tilted. The lever B is elbow-shaped, and its longer arm projects within the path of the stop H on the float-stem A, and its shorter end is connected by cable M with the weighted lever 48 of the transmitter. The lever C is approximately triangular in shape and has an arm projecting within the path of the said stop H. The projecting ends of the levers B and C extend on opposite sides of the said float-stem A, so as not to interfere with each other. It will be observed that the bottom of the float is oval-shaped or beveled upward from a central point. This is of advantage, as it permits the water to gradually recede from the said float when lowering in the trough.

The transmitter comprises the triangular lever K, the weighted lever 48, the stop O, and the tilting lever 8, which is provided at its forward end with the pivoted catch 9, which catch is adapted to turn up when passing the stop O, but which is held from turning beyond an approximately horizontal position when supporting the said stop O. The weighted lever 48 and the triangular lever K are pivotally supported on the standard N, which forms a guide for the upper end of the rod P, which extends into the well and is adapted to press upon a trip-lever 11 in the bottom of the bucket 12 and release the weighted valve-lever 25, thereby permitting a closure of the valve 13 in the bottom of the bucket. The stop O is secured to the rod P and has a beveled projection *p*, which extends through a slot *n* in a rib of the said standard N and is guided and limited in its movements therein. This projection *p* extends within the path of an arm 13 on the weighted lever 48, and the stop O projects within the path of the pivoted catch 9 of the tilting lever 8.

The bucket 12 is suspended in the well by the rod 14 and is provided at its lower end with an opening which is closed by the valve 13, which is attached to the weighted lever 25. This bucket is provided near its upper end with a spiral shell 15, which breaks the force of the water as it flows into the bucket from the overflow-pipe 16.

The tube T, depending from the bail of the bucket, forms a guide for the lower end of the rod P. The catch 11, pivoted on the standard 17, has its horizontal end arranged to come directly beneath the guide-tube T, which end is trough-shaped to prevent the slipping of the rod P when the same presses thereon to release the weighted lever 25. The standard 17 has a curved extension 24, which is beveled at one edge, and the lever 25 has a stop 23 to travel on the outer edge of this curved extension 24, and a hook or inwardly-extended projection 18, which embraces the other edge of the said extension and holds the said lever 25 to the said extension 24. The catch 11 projects beyond the outer edge of the extension 24 and is adapted to come beneath the stop 23 on the lever 25 and support the said lever 25 and hold the valve open.

The lever 21, pivoted at its upper end to the derrick, has its lower end connected with the rod 20, which throws the mill in and out of gear, and with the chain or cable 22, which is connected with the cord or rod 14. This chain 22 passes over pulley 26 and the pulley 27 in the pulley-block 28, and is provided at its free end with the weight 29, which forms a counter-balance for the bucket 12 and lifts the same when emptied. Any suitable counterbalanced lever adapted to the purpose may, however, be substituted for the lever 21 shown in the drawings. The pulley-block 28 is provided with guide-openings 30, which receive the forked end 31 of the rod 14 and guide the same in its vertical movements, so as to prevent turning and tangling with the chain 22.

The overflow-pipe 16 is provided at one end with a siphon, which extends in the trough and determines the height to which the water may rise therein. The other end of the overflow-pipe extends within the well and terminates over the bucket 12, so as to discharge the water into the said bucket.

The triangular lever K is connected with the valve-lever 25 by the chain or cord 40, and a spring S^2 is interposed in the length of the cord or chain 40 to prevent sudden strain on the parts when the float falls to throw the mill into gear.

The operation of the invention is as follows: The mill being in gear, the parts are disposed as follows: The float 3 is supported on the water in the trough, and the bucket 12 is, at its highest point, being balanced by the weight 29, which is at its lowest point, and holds the lower end of the lever 21 to the left. The stop G on the float-stem A is below the support F on the tilting lever D, the valve in the bucket is open, and the rod P is held at its highest limit by the beveled end *p*, resting on the arm 13 of the weighted lever 48. As the mill pumps water into the trough, the float rises, the stop G presses the support F of the tilting lever D up and passes above it, and when the water has reached its predetermined level the stop H of the float-stem A engages with the lever B, causing B by means of the cable M to withdraw the arm 13 of the weighted lever 48 from beneath the beveled end *p* of the stop O, and thus allowing the rod P to fall upon the catch 11 of the valve, and thereby close the valve. Now, as sufficient surplus water was

allowed to accumulate in the trough before the valve closed to fill the bucket, the bucket is immediately filled by said surplus water passing through the siphon 32 and being discharged by the overflow-pipe 16 into the bucket until the latter overcomes the superior force of the weight 29 and descends, thereby lifting the weight 29 and drawing the lever 21 to the right and throwing the mill out of gear. As the water in the trough recedes, the float tends to follow until its weight overcomes the weight of the tilting lever, when it descends suddenly, and the stop H, striking the lever C, opens the valve 13 by means of the cable L, triangular lever K, and the cable 40. The valve is held open by the stop 23 on the valve-lever 25 passing above the catch 11. The water escapes from the bucket, which, becoming lighter than the weight 29, rises and permits the mill to go into gear by reason of the weight 29 carrying the lower end of the lever 21 to the left. As the bucket rises, the lever 8, which is secured to the rod 14, likewise ascends, and the catch 9, engaging with the stop O on the rod P, lifts the said rod P until the beveled end *p* thereof goes above the arm 13 of the weighted lever 48 and reaches the top of the opening *n*. The bucket continuing to rise, the lever 8 tilts to permit it to pass beyond the stop O, and is limited in its movement by the collar 44 on the rod 14 engaging with the under side of the well-platform. The mill being in gear pumps water into the trough. The water rising lifts the float, and the stop H, engaging with the lever B, draws on the cable M and releases the stop O by withdrawing the arm 13 from beneath the beveled end *p* and permits the rod P to fall. The rod P as it falls strikes the catch 11 and withdraws it from engagement with the stop 23, thereby allowing the valve to close. As the water in the trough continues to rise, the stop G on the float-stem is carried above the support F. The water in the trough rises, and when it passes the predetermined level again throws the mill out of action by the instrumentalities hereinbefore specified.

A regulator such as I have described may be used in connection with any suitably counterbalanced lever attached to the derrick, said lever to be connected with the bucket and the shut-off rod of the mill in substantially the same manner as the form of lever shown in the drawings.

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

1. A windmill-governor composed of the following elements: a weighted float, a weighted lever having a pivoted support for sustaining the float under normal conditions, a suspended bucket provided with a valve, valve-gear for opening and closing the valve in said bucket from the said float, an overflow-pipe for carrying the surplus water from the trough to the bucket, and the counterbalancing-weight for holding the bucket in suspension when the mill is in gear, substantially as described.

2. The combination, with the float and the suspended bucket having a valve, of the tilting lever D, having a pivotal support F, the rod P, extended into the well to rest upon a lever in the bucket, the stop O on the said rod P, connections between the rod and the said support, and the lever C, operated by the float to open the valve in the bucket, substantially as described.

3. The combination, with the float, the suspended bucket, and the valve in the bucket, of the lever C, having connection with the said valve, the vertical rod P, extended into the well to rest upon a lever in the bucket, the lever B, adapted to release the said rod P for closing the valve, and a stop, as H, on the float-stem for operating the said levers B and C, substantially as described.

4. The combination, with the float and the suspended and counterbalanced bucket, of valve-gear for opening and closing a valve in the said bucket, the tilting lever 8, secured to the rod which holds the bucket in suspension, and the rod P, extended into the well and adapted to press upon a lever in the bucket and having stop O, which is adapted to be engaged by the said lever 8, substantially as and for the purpose described.

5. The combination, with a counterbalanced bucket which is adapted to throw the mill in and out of gear and which is adapted to receive the surplus water from the trough, of a valve in said bucket, a pivoted catch for holding said valve open, and a rod adapted to engage with the said catch and disengage it from the said valve and permit the latter to close, substantially as described.

6. The combination, with the float, the counterbalanced bucket, the valve in the bucket, and a catch for holding the said valve open, of the devices intermediate the bucket and the float, consisting of the lever K, having connection with the valve in the bucket, the weighted lever 48, the rod P, normally supported by the weighted lever 48, and the connections between the said levers 48 and K, and the float for effecting an opening and closing of said valve, substantially as herein specified.

7. The combination, with the bucket 12 and the valve, of the standard 17, having the curved projections 24, the pivoted catch 11, for supporting the valve, lever 25, for holding the valve open, and the hook 18, for engaging the edge of the extension 24, substantially as set forth.

8. The combination, with the float, the counterbalanced bucket, the valve in the bottom of the bucket, and the catch for holding the valve open, of the rod P, the weighted lever 48, for holding the said rod P in an elevated position, and the valve-gear for opening the valve and releasing the rod P, substantially as described.

9. In a windmill-governor, the combination,

with the counterbalanced bucket and means for imparting a vertical movement thereto for throwing the mill in and out of gear, of the pulley-block 28, having guides 30, and the rod 14, having prongs at its upper end which pass through the said guides, substantially as described.

10. The combination, with the float having a stem and the stop G on the said stem, and the bracket 4, having the guides 5 and 6 for the stem A to work through, the tilting lever D, and the anti-friction roller I, arranged to take up the lateral thrust of the said lever D, substantially as specified.

11. In a windmill-governor, the combination, with the bucket, the valve and catch for holding the valve open, and the rod 14, for supporting the bucket and having the tilting lever 8 secured thereon, of the rod P, having the stop O secured thereon and having the beveled edge *p*, the weighted lever 48, having the arm 13, the levers B and C, connections between said levers B and C and the weighted lever 48 and the valve in the bucket, the float having a stop on its stem to operate the said levers B and C, and the overflow-pipe between the water-trough and the bucket, substantially as described.

12. In a windmill-governor, the combination, with the suspended bucket having a valve, a catch for holding the valve open, and the rod P, for releasing the said catch, of the stop O, secured to the said rod and having a beveled edge, and a weighted lever 48, for engaging with the beveled end of the said stop O and holding it in suspension, substantially as specified.

13. In a windmill-governor, the combination, with the bucket having a valve and a catch for holding the valve open, of a guide-tube and a rod passing through the said tube and adapted to trip the said catch, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

AZEL CLARENCE HOUGH.

Witnesses:
C. N. WHEELER,
C. H. BETTS.