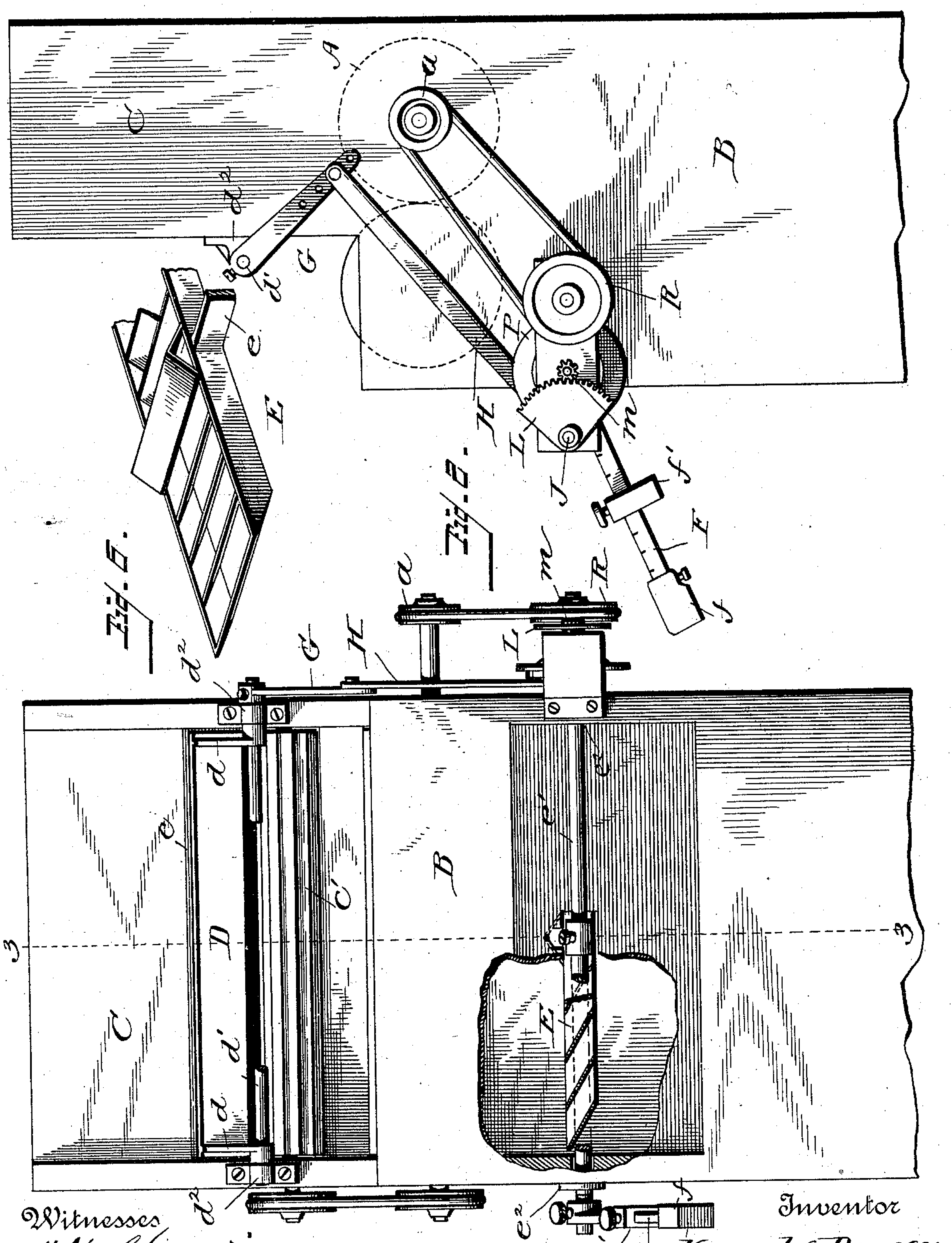
(No Model.)

3 Sheets—Sheet 1.

K. DOUGAN.

GOVERNOR FOR FEED REGULATORS.

No. 558,900. Patented Apr. 21, 1896.



Witnesses

Wm H. Heiden.

B. W. Miller.

Inventor

Kennedy Dougan

By his Attorneys

Baldwin, Davidson & Wight.

ANDREW B. GRAHAM, PHOTO-LITHO. WASHINGTON, D.C.

(No Model.) 3 Sheets—Sheet 2.

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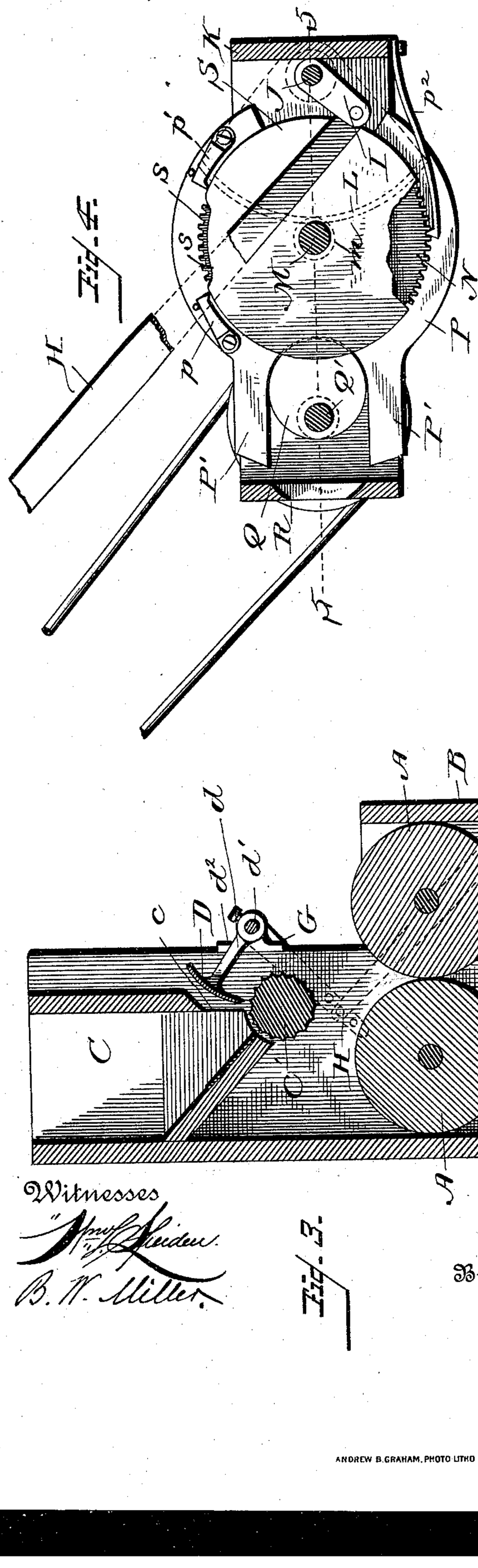

Witnesses
W. J. Leiden.
B. W. Miller.

Inventor
Kennedy Dougan.

By his Attorneys
Baldwin, Davidson & Wright.

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K. DOUGAN.

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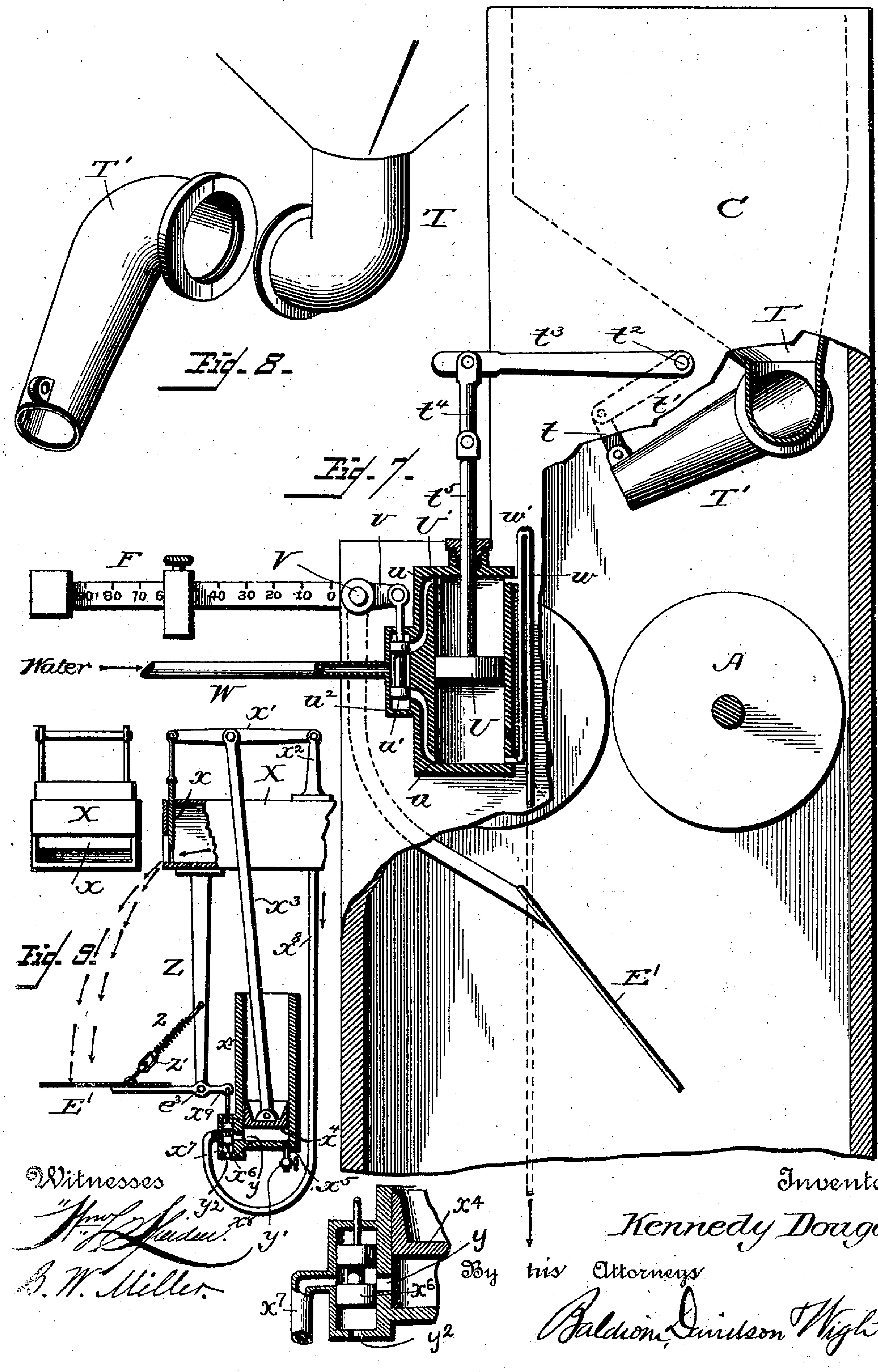

Witnesses
Wm. J. Snider
B. W. Miller

Inventor
Kennedy Dougan.
By his Attorneys
Baldwin, Davidson & Wight

ANDREW B. GRAHAM, PHOTO-LITHO. WASHINGTON, D.C.

UNITED STATES PATENT OFFICE.

KENNEDY DOUGAN, OF MISSOULA, MONTANA, ASSIGNOR TO A. P. DOUGAN, OF SALEM, MISSOURI.

GOVERNOR FOR FEED-REGULATORS.

SPECIFICATION forming part of Letters Patent No. 558,900, dated April 21, 1896.

Application filed October 10, 1892. Serial No. 448,357. (No model.)

To all whom it may concern:

Be it known that I, KENNEDY DOUGAN, a citizen of the United States, residing in Missoula, Missoula county, Montana, have invented a new and useful Governor for Feed-Regulators, of which the following is a specification.

My improved feed-regulator is especially designed to regulate or govern the quantity, amount, or number of pounds of grain fed from a bin, elevator, or other source of supply to a mill, meter, or other receiver or receptacle. My invention may, however, be also employed to regulate the feed of water, meal, or other like substance or material.

Heretofore the supply of grain and the like has usually been regulated or governed by the weight of the material acting on the counterbalanced doors of feed-hoppers or of meters or by the weight of the grain in suspended chutes connected with the doors or gates of meters; but such apparatus does not measure, control, or regulate the supply with the desired accuracy.

The object of my invention is to accurately and uniformly feed for any length of time any desired quantity, amount, or number of pounds per unit of time of grain, water, or other fluid or like substance.

My improvements are based on the fact that if a receiver, such as a plate or grid, is placed under or in the course of a stream or current of grain, water, or the like and is adjusted to stand at a given position it will always maintain this position as long as the amount or quantity of the substance delivered to it remains the same, and it will move from this position and assume another position when the amount varies.

By causing the position of the gate to correspond with the position of the receiver a definite quantity of material may be fed to the receiver, and the receiver will usually maintain the same position; but, as is well known, the amount or number of pounds of material fed through the grain-passage from the source of supply varies, and consequently the number of pounds of material fed to the mill or other machine also varies.

In my machine a larger or smaller amount may pass the gate for a short time; but this change in the amount is immediately felt by the receiver, which is moved in either one direction or the other, and a corresponding movement of the gate is caused, so that the gate is made to accommodate itself to the pressure in the passage, closing to the desired extent when the pressure increases and opening when it decreases. It is evident, therefore, that by my improvements the quantity or amount of grain or other substance fed from a source of supply to a receiver or receptacle may be determined in advance by suitably adjusting the apparatus, and an accurate account may be kept of the quantity passing from the supply.

As will be hereinafter more fully explained, the grain or other substance is directed against the receiver and operates upon it not only by its weight but by its momentum, and the action of the receiver does not depend upon the weight of the material, but is influenced also by the rapidity with which the substance is delivered to it.

So far as I am aware no machine acting on the principles above set forth has been devised prior to my invention, and while I have shown in the accompanying drawings, and will hereinafter describe, specific ways of carrying out my invention, I do not wish to limit myself to the precise organizations of instrumentalities or the details of construction which I have selected to illustrate my improvements, and the manner of applying them, but wish it understood that, so far as the broad features of my invention are concerned, I desire protection broad enough to cover any apparatus working in substantially the same way as the apparatus illustrated, for analogous purposes or for accomplishing the same results.

In the annexed drawings, Figure 1 is a front elevation, with parts broken away, of my improvements applied to the feed-hopper of a roller-mill. Fig. 2 is a side elevation thereof. Fig. 3 is a vertical central section on the line 3 3 of Fig. 1. Fig. 4 is a detail view, on an enlarged scale, of the gate-operating mechanism and the gate-adjusting devices. Fig. 5 is a view, partly in section, on the line 5 5 of Fig. 4, of the principal parts of the same mechanism. Fig. 6 is detail view, on an enlarged

scale and partly broken away, of the receiver. Fig. 7 is a view, partly in side elevation and partly broken away, of a modification. Fig. 8 is a detail view, on an enlarged scale, of some of the mechanism shown in Fig. 7. Fig. 9 is a diagram of a further modification of the invention adapted especially for regulating the supply of water for irrigating purposes. Fig. 9^a is a detail view, on an enlarged scale, of the mechanism shown in Fig. 9.

I will first describe my improvements as applied to grain-feeding mechanism, as illustrated in Figs. 1 to 6, inclusive, of the drawings.

Ordinary rolls A are shown mounted in a suitable casing B beneath a feed-hopper C, which may be connected with a chute leading to a grain-bin, elevator, or other source of supply. At the lower end of the hopper there is an opening *c*, beneath which is a feed-roller *c'*. Adjacent to the opening *c* and above the roller *c'* is mounted a gate or valve D, secured by arms *d* to a horizontal shaft *d'*, mounted in bearings d^2 on the frame B. This shaft is adapted to rock about its axis and to move the gate D in the arc of a circle to vary the size of the feed-opening of the hopper.

Below the rolls A is located what I term a "receiver" E, which may be a plate, or grid, or other device adapted to receive the grain delivered by the rolls or passing from the source of supply to the final delivery-point. Preferably, however, this receiver is made in the form of a grid, as clearly shown in Fig. 6, so that the grain will not accumulate on it, but will be merely resisted on its way through it.

The receiver has an arm *e*, secured to a horizontal shaft *e'*, mounted in bearings at e^2 on the frame A. An arm or lever F is secured to the shaft *e* and is preferably provided with a stationary weight *f* at its outer end and with an adjustable weight *f'*, adapted to slide back and forth toward and from the stationary weight *f* to counterbalance the receiver E, or, rather, to counterbalance it in such manner that it will stand at a determined position against the force of the determined amount of grain delivered to it. The arm F may be graduated, as indicated, so that the position of the weight *f'* on the arm will determine the amount of grain to be fed past the feed-gate.

A direct connection might be made from the receiver or its shaft *e'* to the feed-gate; but I prefer to employ intermediate devices in order that the action of the apparatus may be more uniform and will not be affected by the friction of any of the parts of the mechanism or by the friction or clogging caused by variations in the condition of the grain. I therefore employ what I call "gate-operating devices," which act on the gate to change its position, and "gate-controlling devices," which control or determine the action of the gate-operating devices, either to prevent their changing the position of the gate or to change or adjust it to the desired extent. In carrying out these features of my invention I secure to the shaft *d'* an arm G, to which is adjustably secured a link H, extending to an arm I on a shaft J, mounted in bearings in a housing K. The shaft J carries a toothed segment L, gearing with a pinion *m* on a shaft M, carrying at its inner end, within the housing, a cog-wheel N. The shaft M passes through a sleeve O, secured to the housing, as indicated in Fig. 5, and surrounded by a hub or pawl-carrier P, which is adapted to move about it on an axis coincident with the axis of the shaft M. This hub has a pair of arms P', which embrace a cam Q on a shaft Q', carrying a grooved pulley R, which is belted to a pulley *a* on the shaft of one of the rollers A. The hub P carries a pair of gravity-pawls *p p'*, adapted to engage with the cog-wheel N. A detent p^2 engages with the cog-wheel to steady it, but permits it to move in either direction when acted upon by the pawls. By this organization as long as the mill is in operation motion is imparted to the pulley R, and the cam Q is continuously operated to act upon the arms P' of the hub P. The arrangement is such that the hub is oscillated about its axis and the pawls *p p'* are correspondingly oscillated, and if free to engage with the cog-wheel N would turn it in a direction corresponding to the movement of the pawls. In order, however, to control the action of the pawls on the cog-wheel, I provide a shield S, and secure it to the shaft *e'*, which carries the receiver E. The shield S is approximately circular or disk-shaped, and is larger in diameter than the cog-wheel N, but is cut away at *s* for a short distance, the arrangement being such that when the cut-away portion *s* is beneath one of the pawls or beneath the path traveled by one of the pawls it is free to engage with the cog-wheel; but when the cut-away portion is not under the pawl it is held away from the cog-wheel and does not act upon it to move it. When, therefore, the shield is so located that neither of the pawls can act upon the cog-wheel, the cam may be continuously actuated without turning the cog-wheel and without changing the position of the gate, and this is the arrangement when the receiver is in the desired position; but when the receiver is moved out of its position by a change in the quantity of grain fed the shield is shifted and allows one of the pawls to act upon the cog-wheel, and thereby to impart motion to the feed-gate to change its position. As soon, however, as the amount of grain fed reaches the predetermined degree the receiver assumes its original position and the pawls are thrown out of operation again.

The mechanism is so nicely adjusted that the feed-gate is made to let pass the predetermined amount of grain uniformly, and as soon as any change in this amount is felt by the receiver the position of the feed-gate is correspondingly changed to compensate for this variation.

The power for moving the feed-gate is derived from the power which actuates the mill, and is consequently sufficient to overcome all resistance and there can be no failure in the proper operation of the mechanism which actuates the feed-gate. Motion or power for moving the feed-gate is, it will be observed, not derived from the receiver, the receiver merely acting to determine when and to what extent the power shall be applied to the gate.

In order to have it clearly understood that I do not limit myself to the mechanism just described, and that I need not necessarily use a valve or gate of ordinary construction, I have shown in Figs. 7 and 8 of the drawings a modification in which, instead of employing a valve or gate, I employ a movable spout, the degree of inclination of which determines the amount of grain or like material fed. In this modification I have also shown how the spout or adjusting device for the grain or passage may be actuated by fluid-pressure, such as water-power, and instead of showing a grid I have shown a flat plate.

The hopper C is provided with a discharge-pipe T, which has hinged to it a spout T′, connected by a link t and an arm t' on a shaft t^2, in turn connected by an arm t^3 to a link t^4, attached to the end of a piston-rod t^5. The piston U works up and down in a cylinder U′, provided at each end with ports u, controlled by a valve u', working in a valve-chest u^2. The valve is connected by an arm v with a shaft V, to which the receiver E′ is attached and which also carries a weighted lever F.

Water or other fluid is supplied through a pipe W, and an overflow or discharge pipe w, having an air-vent w', is connected with each end of the cylinder U, as indicated. The area or cross-section of the pipe w is smaller than that of the feed pipes or passages, and the arrangement is such, as will be clear by an inspection of the drawings, that the fluid-pressure may be made to cause the piston to move up or down and correspondingly change the inclination of the spout T′. The mechanism is so adjusted that by giving to the spout T′ a greater or less degree of inclination it is made to deliver more or less grain corresponding in amount to the amount which the receiver is adjusted to let pass—that is to say, if the amount of grain fed to the receiver increases or decreases or varies from the predetermined amount the inclination of the spout will be correspondingly varied to regulate the supply, so that it shall resume the predetermined amount.

In Fig. 9 I have shown a further modification where my invention is adapted to mechanism for supplying water for irrigating purposes. The chute or flume X is provided with a gate x, connected with a lever x', pivoted on a standard x^2. A link or pitman x^3 connects the lever x' with a piston x^4, working vertically in a cylinder x^5, having an entrance-port y and a waste-pipe y' of smaller area. A valve x^6 is arranged to reciprocate or slide loosely in a valve-chamber x^7, having an opening y^2 in the bottom and to which water is supplied through a branch pipe x^8. The arrangement is such that when the loosely-fitting valve is closed water will continuously but slowly pass to and from the cylinder, and the weight of the piston and gate is supported by a water-cushion below the piston. The valve is connected to an arm x^9, secured to the shaft e^3, to which the receiver E′ is attached. The shaft e^3 is here shown as supported on a bracket or hanger Z, and a spring z connects the hanger with the receiver and is provided with adjusting devices z', by which the resistance of the receiver may be regulated—that is to say, by this mechanism the receiver may be set to receive a predetermined quantity of water without causing the gate-operating devices to act; but when the supply of water varies the position of the receiver will vary, and consequently the valve x^6 will be shifted to either admit water freely to lift the piston and raise the gate or to cut off or impede the flow of water and allow the gate to fall. When the gate is thus adjusted to deliver the predetermined amount, the receiver and the valve mechanism will assume their normal position.

Further modifications of mechanism for carrying out my invention might be illustrated, and a further enumeration of the different kinds of material or substances the flow of which might be regulated could be set forth; but enough has been shown and described to make clear that my invention is not confined to any particular apparatus for regulating the flow of any particular material, and

What I claim as my invention is—

1. An apparatus for regulating, governing or controlling the supply of a fluid, such as grain or water, comprising a receiver onto which the fluid is delivered, a gate or device for opening and closing or adjusting a fluid-passage, gate-operating mechanism, and devices connected with the receiver and moved by it independently of the movement of the gate-operating mechanism to control the action thereof.

2. An apparatus for regulating, governing or controlling the supply of a fluid, such as grain or water, comprising a receiver onto which the fluid is delivered, a gate or device for opening and closing or adjusting a fluid-passage, means for adjusting the receiver to resist or impede the passage of a predetermined quantity of fluid, gate-operating mechanism, and devices connected with the receiver and moved by it independently of the movement of the gate-operating mechanism to control the action thereof.

3. An apparatus for regulating, governing or controlling the supply of a fluid, such as grain or water, comprising a receiver onto which the fluid is delivered, adjustable counterbalancing devices for the receiver, a gate or device for opening and closing or adjusting

a fluid-passage, power-driven gate-operating mechanism, and devices connected with the receiver and moved by it independently of the movement of the gate-operating mechanism to control the action thereof.

4. An apparatus for regulating, governing or controlling the supply of a fluid, comprising a receiver onto which the fluid is delivered, a gate or device for opening and closing or adjusting a fluid-passage, gate-operating devices, power-driven mechanism for actuating them, and devices connected with the receiver for applying the power-driven mechanism to the gate-operating devices to effect the adjustment of the gate.

5. An apparatus for regulating, governing or controlling the supply of a fluid, comprising a receiver onto which the fluid is delivered, a gate or device for opening and closing or adjusting a fluid-passage, gate-operating devices, continuously-actuated power-driven mechanism for acting on the gate-operating devices, and devices connected with and operated by the receiver for causing the power-driven mechanism to be applied to the gate-operating devices.

6. An apparatus for regulating, governing or controlling the supply of a fluid, comprising a receiver onto which the fluid is delivered, a gate or device for opening and closing or adjusting a fluid-passage, a cog-wheel, mechanism connecting the cog-wheel with the gate, a pawl-carrier having pawls adapted to engage with the cog-wheel, a cam for actuating the pawl-carrier, mechanism for operating the cam, and a shield connected with the receiver for regulating the action of the pawls.

7. The combination with the hopper of a mill, of a gate for opening and closing or adjusting the grain-passage from the hopper, a receiver below the gate, counterbalancing devices for the receiver, gate-operating devices, substantially such as described, power-driven mechanism for actuating the gate-operating devices, and devices connected with the receiver for controlling the action of the power-driven mechanism on the gate-operating devices.

8. The combination with the feed-hopper of a mill, of a gate for regulating the discharge-opening therein, rolls arranged below the gate, a receiver below the rolls, a shaft to which the receiver is connected, a cog-wheel, mechanism connecting the cog-wheel with the gate, a pawl-carrier, pawls thereon adapted to engage with the cog-wheel, mechanism for actuating the pawl-carrier, and a shield applied to the shaft of the receiver for controlling the action of the pawls on the cog-wheel.

In testimony whereof I have hereunto subscribed my name.

KENNEDY DOUGAN.

Witnesses:
LLOYD B. WIGHT,
C. M. BROOKE.