(No Model.)

2 Sheets—Sheet 1.

K. DOUGAN.

AUTOMATIC FEED REGULATOR.

No. 504,125. Patented Aug. 29, 1893.

Fig. 1.

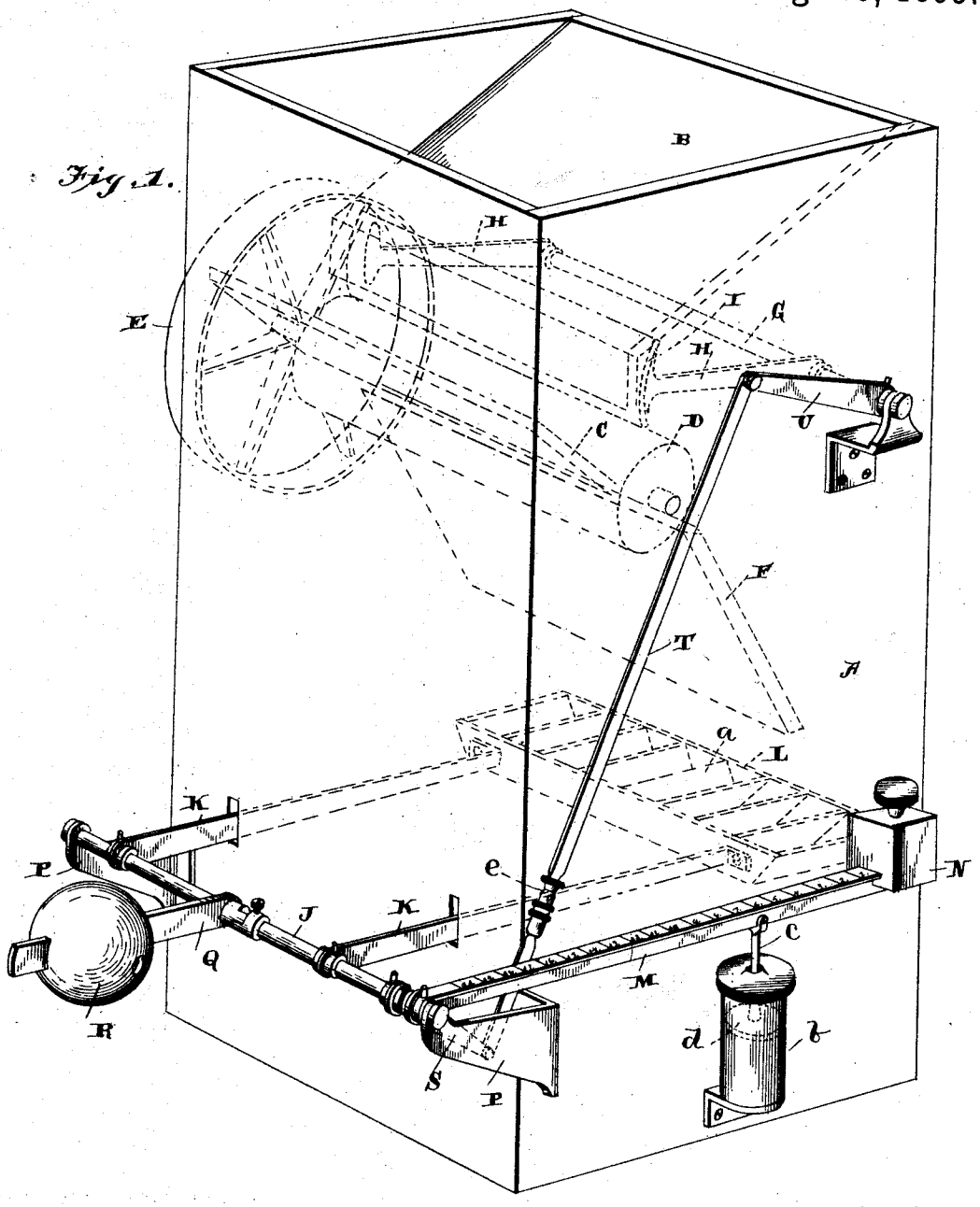
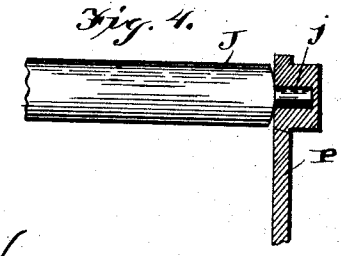


Fig. 4.



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(No Model.) 2 Sheets—Sheet 2.

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AUTOMATIC FEED REGULATOR.

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Fig. 2.

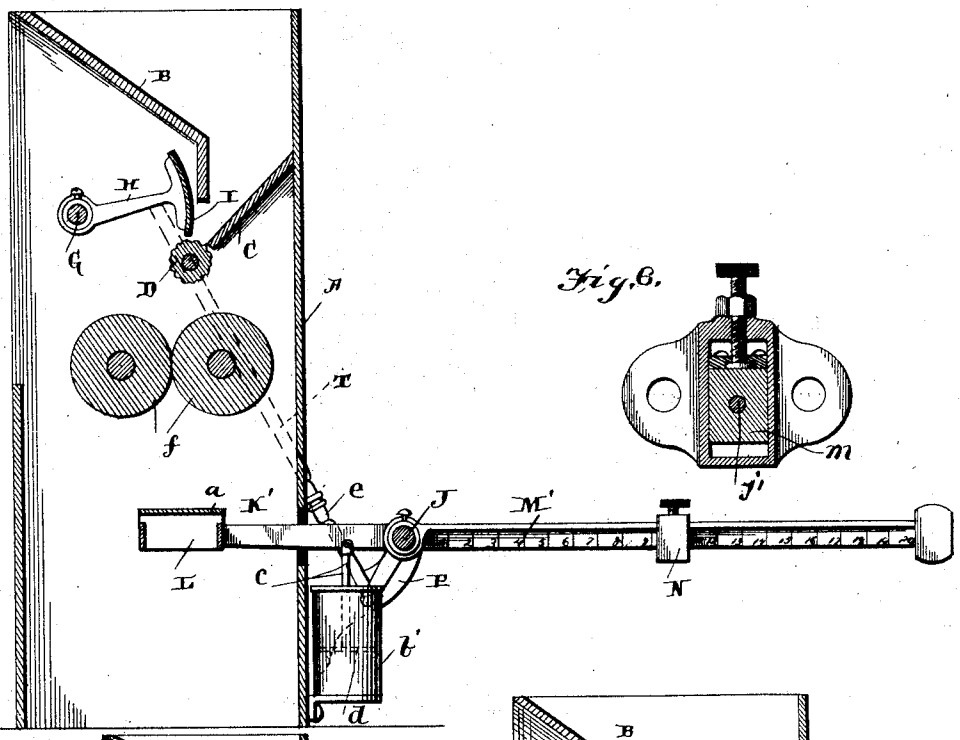

Fig. 6.

Fig. 5.

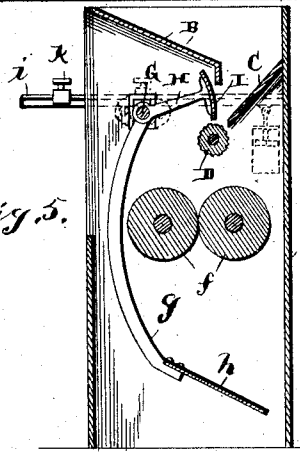

Fig. 3.

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UNITED STATES PATENT OFFICE.

KENNEDY DOUGAN, OF MISSOULA, MONTANA, ASSIGNOR TO THOMAS DOUGAN, OF SALEM, MISSOURI.

AUTOMATIC FEED-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 504,125, dated August 29, 1893.

Application filed October 4, 1892. Serial No. 447,833. (No model.)

To all whom it may concern:

Be it known that I, KENNEDY DOUGAN, of Missoula, in the county of Missoula and State of Montana, have invented certain new and useful Improvements in Automatic Feed-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 it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to improvements in automatic feed regulators, and it consists in the construction and arrangement of parts which will be fully described hereinafter and particularly referred to in the claims.

The object of my invention is to provide a machine that will feed in a continuous stream, liquid, grain, or other material equal to a given number of pounds per unit of time. That is to say, to provide a machine that when set to feed a given number of pounds of one kind of material per unit of time, will adjust itself automatically to feed the same number of pounds of any other kind of material that may be delivered thereto.

This machine depends for the correctness of its work upon the assumption that a stream of liquid, grain or other material equal to a given number of pounds per unit of time, when properly directed against a movable plate or receiver will operate said plate and valve in proportion to the number of pounds striking it per unit of time regardless of the specific gravity of the material, the resistance of the movable receiver remaining the same.

In the accompanying drawings,—Figure 1 is a perspective view of one form of my invention. Fig. 2, is a vertical sectional view, of a modification of my invention, the same being shown in connection with crushing rollers. Fig. 3, is a similar view, showing a modification of the invention. Fig. 4, is a detached view of one end of the shaft J, showing a reduced bearing. Fig. 5, is a vertical sectional view, showing the preferred form of my invention. Fig. 6, is a detached view of the shaft bearing shown in Fig. 5.

I here show my invention constructed to be applied to a mill of any kind, but I wish it understood that the invention is adapted to be used in connection with elevators, for feeding grain, or can be used for feeding water at a specified rate, or for feeding any desired material or substance at a specified rate no matter what may be the pressure, weight or bulk of the material or substance in the hopper or source of supply to the machine.

A indicates a casing which is preferably made rectangular in shape as shown, and which contains the operating parts, though it may be made in any other convenient or desired shape, without in any way departing from my invention. Placed in the upper end of this casing A is an inwardly declined board B, which extends partially across the casing, and extending from the opposite side of the casing and in the opposite direction from the board B is a second declined board C. This board C is considerably below the board B, as clearly shown, and journaled below the inner edge of the board B, a suitable distance is a roller D, the inner edge of the board C being sufficiently near the roller to prevent the escape of any material between the board and the roller. Also extending from the same side of the casing as the board C, and declined inwardly, is a board F, upon which the material falls after passing between the roller and the gate, as will be more fully described farther on.

Extending transversely through the casing beneath the board B, is a horizontal shaft G, suitably journaled, and secured rigidly at their outer ends to the shaft G, and extending inward are the arms H. Connected to the inner ends of these arms is a gate or valve I, which fills the space between the inner edge of the board B and the periphery of the roller, when the said valve is down.

A horizontal shaft J is suitably journaled to the casing preferably, though not necessarily by means of brackets P, to which the outer ends of the horizontal arms K are firmly attached. To the inner ends of these arms is attached a receiver, which is here shown constructed of parallel plates *a*, between which the grain passes after it falls thereon from the inclined board F. However, I do not limit myself to any particular form of receiver, for this may be varied almost indefinitely without affecting the spirit of my invention, as will appear farther on. I preferably provide

the ends of the shaft J, with the reduced pintles *j*, shown in Fig. 4, which are journaled in correspondingly shaped openings in the brackets P, the object of which is to reduce friction as will be readily understood. Attached to this shaft J and extending in the opposite direction from the arms K is a balance weight arm Q carrying a weight R. As shown the arms K extend through suitable openings made in the casing, and have a free up and down movement when the shaft to which they are connected is oscillated.

Extending in the same direction as the arms K, but preferably outside of the casing, is an arm M, carrying an adjustable weight N, and this arm M is graduated, so that the weight can be set to any desired graduation thereon, for a purpose to be fully explained presently.

Projecting from and secured to the shaft G, is an arm U, which is connected by means of a rod T with an arm S connected to the shaft J. Owing to this construction when the shaft J is oscillated, the shaft G is correspondingly oscillated, and therewith the gate I moved up or down, thus opening or closing the opening between the inner edge of the board B and the roller D.

The operation of my invention is as follows:—The material to be fed is run into the hopper at the upper end of the casing formed by the boards B and C, and the roller is revolved by means of a belt passing around the pulley E, which is attached to the shaft of the roller, thus carrying the material over the roller between it and the lower edge of the gate, dropping it upon the board F. From the board F the material or substance drops upon the receiver L, thus weighing it down, and thereby rotating the shaft J, which moves the end of the arm S, and through the medium of the rod T the arm U, shaft G and the valve or gate I, as will be readily understood. The weight R is set so that when the weight N is at the end of the arm M, the valve will either be against the roller, and the opening for the material to pass through entirely closed, or so set that the minimum amount will be allowed to pass when so balanced, which will prevent any less than that amount passing through the machine, no matter how the parts are set. Should any more material fall through and upon the receiver L, the weight of the material upon the receiver will carry it down, and as before described move the valve I down, and partially close the opening, thus reducing the amount passing through the machine. Should it be desired to have a greater amount of material pass through the regulator in a given time, the weight N is moved in upon the arm M, thus requiring more material to depress the receiver. When sufficient material is not passing through to depress the receiver, the receiver will move up, thus opening the gate or valve wider and allowing more to pass through. As soon as the valve is at the right distance to allow sufficient grain or other material or substance to pass between it and the roller, to balance the weight R, the valve is held at that point, for if more material is or should attempt to pass through between the valve and the roller than is required to balance the said weight R, the receiver is depressed, as will be seen, and the valve I partially closed, which will decrease the amount being fed. In this manner, any desired quantity of material will be fed through the regulator, and at a uniform rate as will be perceived. The inward movement of the weight N adds virtuallly to the weight R, thus requiring more material upon the receiver to depress it, and in this manner, (that is by the movement of the weight N,) any desired quantity of material or substance is fed at a uniform rate through the regulator. For instance, should it be desired to feed twenty bushels of wheat per hour through the machine, the weight N will be moved to the number 20 upon the arm M, and the machine is so set that that amount will pass through the regulator. Should it be desired to feed any less quantity through, the weight is moved out upon the arm M, which virtually decreases the weight or heft of the weight R, thus requiring a smaller amount of material upon the receiver to depress it and close the valve.

The receiver instead of being formed of parallel plates as here shown, can be made of a single plate inclined either inward or outward, upon which the material will fall and then roll off; or it may be made in the form of a funnel or hopper with an opening in the bottom, in which hopper or funnel shaped receiver the material falls from the board F, and then through the hopper or funnel, or the receiver may be made in the form of a pan or trough with perforations through which the material will pass. It is only necessary that the receiver be so shaped as to receive the material, and then to discharge it, and this as will be readily understood can be done in many ways.

In order to prevent the regulator from being too sensitive, and to prevent the receiver from vibrating when it has reached the balancing point, for feeding the material through at a prescribed rate, a rod *c*, is attached to the arm M at a suitable point and carries a diaphragm or disk *d*, which fits loosely in a cylinder *b*, which latter is filled with a fluid, preferably oil, though air may be used if desired. This will prevent a vibrating movement of the receiver, and also make the feed steady and regular.

While I here show a cylinder and a disk moving therein it will be readily understood that I do not limit myself to the use of a cylinder, for an ordinary rubber diaphragm with an air opening connected at its edges and to which the rod *c*, would be connected will accomplish the same purpose.

For the purpose of regulating the distance the lower edge of the valve shall be from the roller when the weight N, is at the outer end of the arm M, and the parts balanced, the

rod T is made in two parts with their ends screw-threaded and entering a swivel *e*. By means of this swivel the rod T can be lengthened or shortened as desired. By shortening the rod T, the valve will be brought toward or against the roller, and by lengthening the rod T, it will be carried away. In this manner the minimum amount of material to be passed through the regulator can be determined, as will be seen.

I here show a roller for the purpose of facilitating the feed of grain and other analogous material, but I desire it understood that this roller may be omitted, and the operation of my invention not affected in any manner.

In Fig. 5, I show a construction which I prefer, owing to its simplicity, as compared to the forms illustrated in the other figures. I here show crushing rollers *f*, of a mill, and extending from the shaft G, one or more arms *g*, which are secured firmly to the shaft so that when the arms are moved, the shaft is correspondingly rotated. Attached to the lower ends of these arms is a receiver *h*, of any suitable and desired form, but which is here shown as being in the form of an inclined plate. A weight lever *i*, is connected intermediate its ends to the shaft G and preferably outside of the casing A. Sliding upon this arm is a weight *k* and connected with the arm is a rod carrying a disk which moves in a cylinder in the same manner and for the same purpose as described in Fig. 1. The ends S′ of the shaft G are supported in adjustable bearings *m*, by the movement of which the relative position of the valve I to the roller D is regulated and which serves the same function and purpose as the adjustable connection T in Figs. 1 and 2. The receiver, operated by the fall or impact of the material and in the same manner as in Fig. 1, regulates the quantity of material fed in a given time.

In Fig. 2, the weight arm M′ extends in the opposite direction from that shown in Fig. 1, which enables me to dispense with the counter-weight R, shown in Fig. 1, and in this figure the cylinder *b′*, is placed adjacent to one of the arms *k′* which support the receiver L. Referring to Fig. 3, this differs from Fig. 2, in that the weight arm *n* is connected with the receiver at the opposite side thereof from the arms K′ of Fig. 2, and in that the cylinder is placed under the weight arm. In this instance the cylinder *a′*, is adjustably arranged upon a bar *e′*, and a float is placed within the said cylinder. From this it will be seen that the float holds up the receiver and the amount required to depress it is regulated by the adjustment of the cylinder in and out. This figure also shows arms or rods S which connect directly the valve I and the arms K′, thus doing away with crank arms, shown in Figs. 1 and 2.

While I here show the receiver below the crushing rolls it will be readily understood that it can be placed above the rollers and below the valve or gate without in any manner affecting its operation or function.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A feed regulator comprising a valve or gate, feeding a continuous stream of material, a movable receiver in uninterrupted communication with the flow from the valve and receiving and actuated thereby, and an operating connection between the valve and the actuated receiver.

2. A feed regulator comprising a valve or gate, a receiver in uninterrupted communication with the flow from the valve or gate, a connection between the valve and receiver, and a diaphragm for preventing vibration of parts.

3. A feed regulator comprising a valve or gate feeding a continuous stream of material, a movable receiver in uninterrupted communication with the flow from the valve receiving and actuated thereby, an operating connection between the valve and receiver, and an adjustable balancing device for the receiver.

4. A feed regulator comprising an adjustable valve or gate feeding a continuous stream of material, a movable receiver in uninterrupted communication with the flow from the valve receiving and actuated thereby, and operating connections between the receiver and the valve.

5. A feed regulator comprising a valve or gate feeding a continuous stream of material, a receiver in uninterrupted communication with the flow from the valve receiving and actuated thereby, and a connection having one end connected directly with the receiver and its opposite end connected directly with the valve.

6. A feed regulator comprising a valve or gate feeding a continuous flow of material, a receiver in uninterrupted communication with the flow from the valve receiving and actuated thereby, a weight arm connected with the valve and carrying an adjustable weight, the parts arranged to be balanced at a prescribed point, and a diaphragm for preventing the arm from vibrating.

7. A feed regulator comprising a valve or gate feeding a continuous flow of material, a receiver in uninterrupted communication with the flow from the valve the same being constructed to continuously and substantially simultaneously receive and discharge the continuous flow of material from the valve, and an operating connection between the receiver and the valve, whereby the continuous flow of material controls the valve and thereby the amount of material fed within a given time.

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

KENNEDY DOUGAN.

Witnesses:
ALLEN S. PATTISON,
ROLAND A. FITZGERALD.