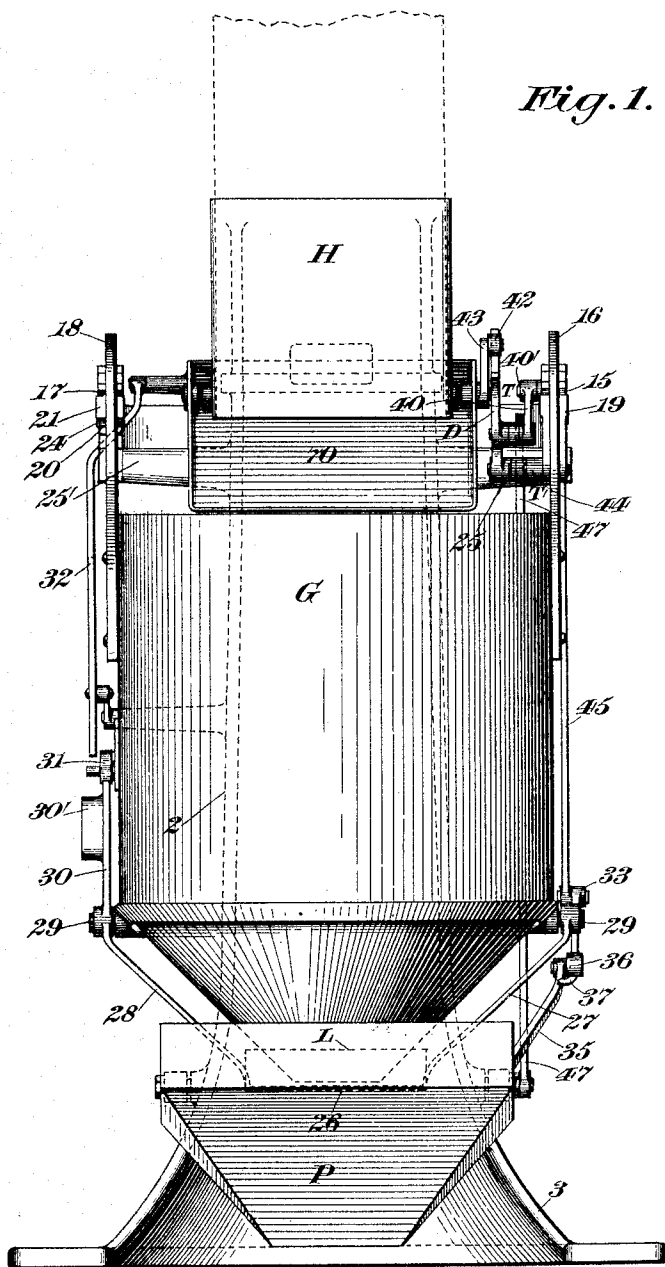


F. H. RICHARDS.
WEIGHING MACHINE.

No. 585,978.

Patented July 6, 1897.

Fig. 1.



Witnesses;

W. Smith
Fred. J. Dole.

Inventor;

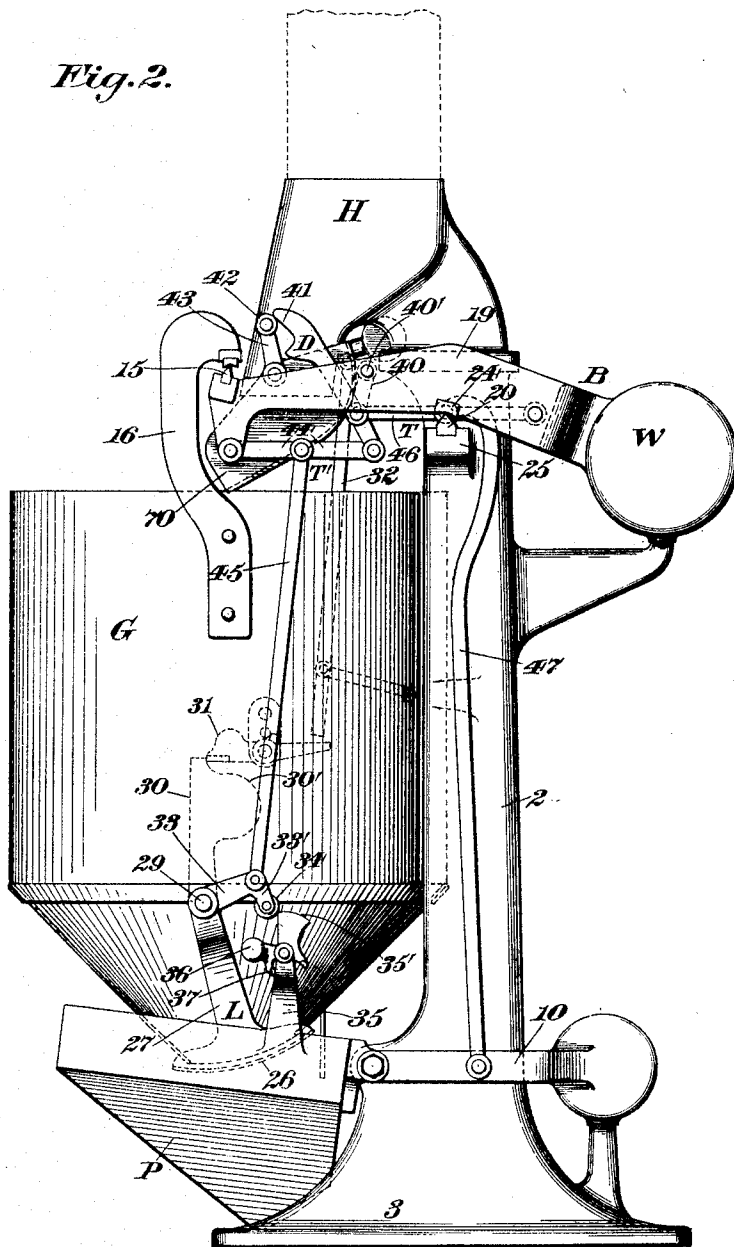
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Fig. 2.



Witnesses;

C. W. Smith
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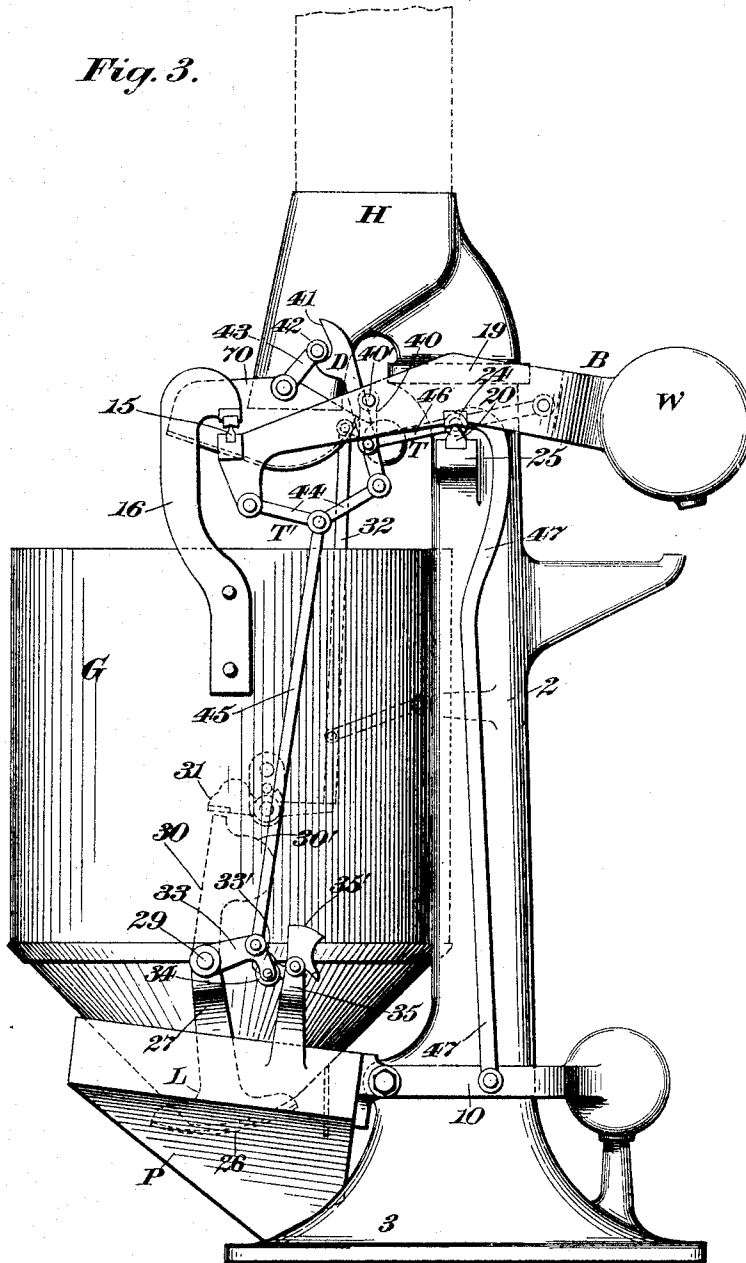
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WEIGHING MACHINE.

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Fig. 3.



Witnesses:

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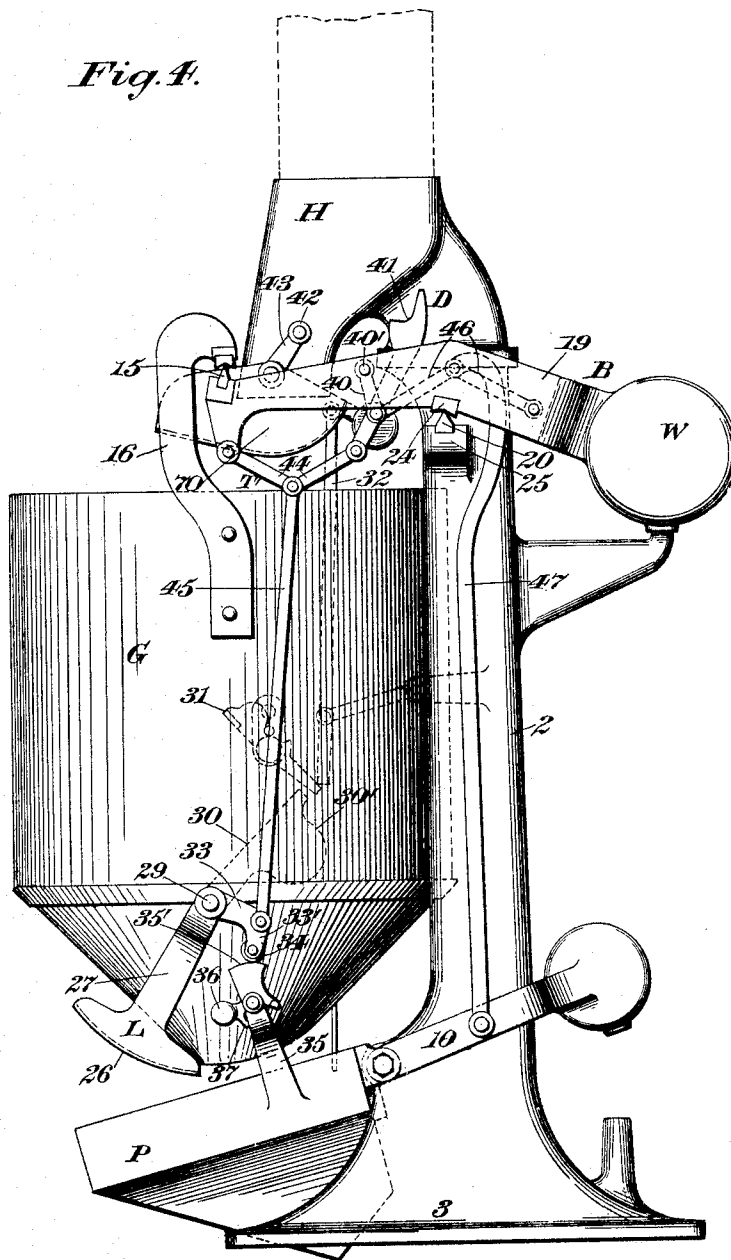
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WEIGHING MACHINE.

No. 585,978.

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Fig. 4.



Witnesses:

Chas. Smith
Fred. J. Dole.

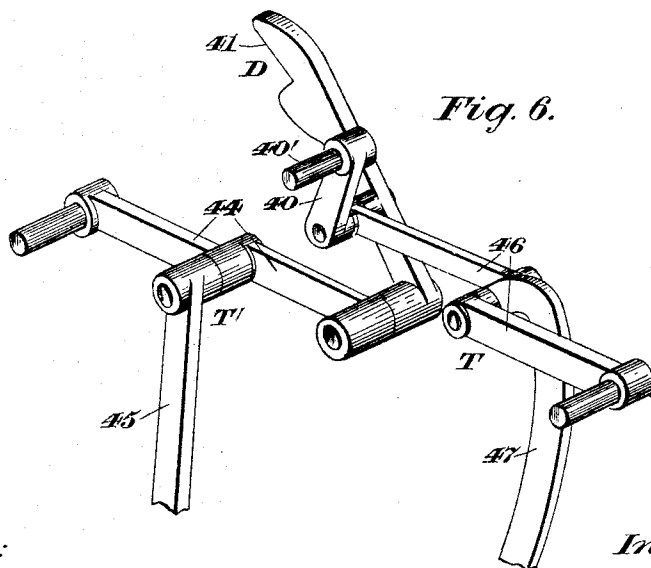
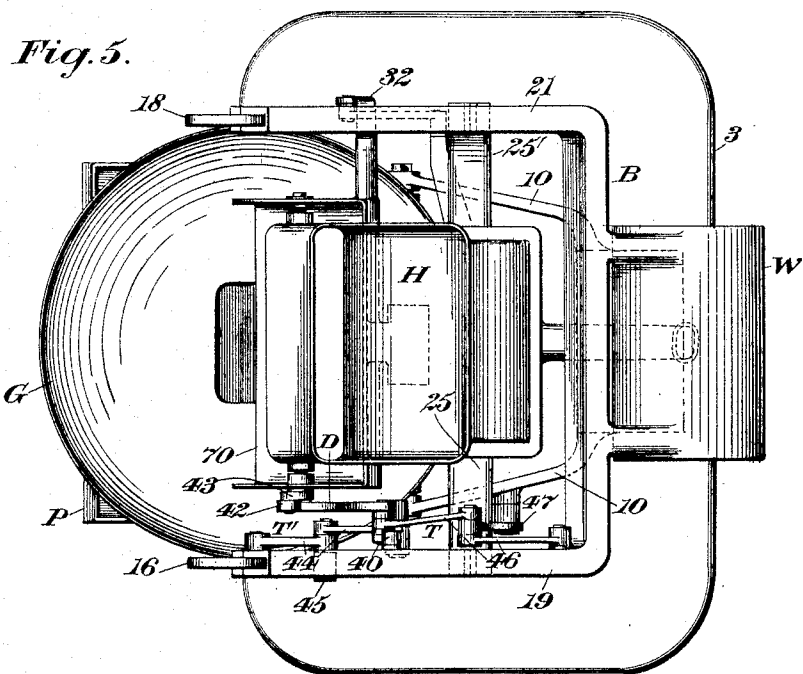
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WEIGHING MACHINE.

No. 585,978.

Patented July 6, 1897.



Witnesses:

W. Smith
Fred. J. Dole.

Inventor:

F. H. Richards.

UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

WEIGHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 585,978, dated July 6, 1897.

Application filed February 12, 1897. Serial No. 623,048. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Weighing-Machines, of which the following is a specification.

This invention relates to weighing-machines, one object of the invention being to provide, in connection with the stream-controller, the closer, and the load-receiving regulator, valve-actuating mechanism the construction and organization of which are such that an opening movement will be imparted to the valve by the conjoint operations of the closer and regulator and such opening movement of the valve will be prevented until the closer is fully shut and the regulator is on the ascent.

A further object of the invention is to provide, in connection with the load-receiver of the weighing-machine, an oscillatory closer, a closer-opening actuator in connection therewith, a gravitative load-receiving regulator supported below the closer and embodying means for imparting a return movement thereto, and means carried on the regulator and effective on the return movement of said regulator for imparting a closing movement to the closer.

A further object of the invention is to provide, in connection with the stream-controller, load-discharger, and receiving-regulator of the weighing-machine, a stream-controller and two coöperative toggle devices operatively connecting the controller, discharger, and regulator, respectively, and to so construct and organize the two toggle devices that the effective movement of the controller-actuator will be dependent upon the conjoint operation of both toggle devices, and to provide, in connection with a regulator, means for imparting a return movement to the discharger and to thereby simultaneously operate the toggle device in connection with said discharger.

In the drawings accompanying and forming part of this specification, Figure 1 is a front elevation of a weighing-machine embodying my invention. Fig. 2 is a side elevation of the machine as seen from the right hand in Fig. 1, said figure showing the valve meech-

anism in the position it occupies when the valve is in its open position, the closer of the load-receiver being shown locked in its closed position and the regulator-hopper being shown in its elevated or load-receiving position. Fig. 3 is a similar side elevation showing the parts of the weighing-machine in the positions they occupy when the valve or stream-controller is in its closed position, the load-receiver being shown in its lowest position and the closer and regulator being shown in the positions they occupy just preparatory to the discharge of the load from the receiver. Fig. 4 is a side elevation of the weighing-machine, similar to Figs. 2 and 3, and showing the parts thereof in the positions they occupy after the closer has been opened and the regulator depressed by the weight of the load from the receiver. In this figure the valve-actuator is shown in its fully-retracted position, and the toggles in connection therewith are shown in the positions they occupy just preparatory to the shutting of the closer by the regulator. Fig. 5 is a plan view of the weighing-machine, and Fig. 6 is a perspective view of a portion of the toggle mechanism that actuates the valve.

Similar characters designate like parts in all the figures of the drawings.

The framework for carrying the operative parts of the machine is shown comprising a longitudinally-chambered standard or upright 2, having a suitable base 3 at the lower end thereof and having at the upper end thereof a suitable hopper or chute H.

The load-receiver G, which is shown of the "single-chambered" type, is suspended under the supply-chute H by means of hangers 16 and 18, that are fixed at their lower ends to the bucket and are suspended by V-shaped bearings on the pivots or knife-edges 15 and 17, respectively, of the arms 19 and 21 of the scale-beam B. This beam has pivots or knife-edges, such as 24, at each side of the framework, near the center of the under side of said beam, which rest on V-shaped bearings, such as 20, secured upon outwardly-extending arms 25 and 25', located near the upper end of and preferably formed integral with the column or upright 2. The arms 19 and 21 of the scale-beam are shown joined together by a counterweight W, which constitutes a

counterpoise for the load-receiver that is supported at the opposite end of the scale-beam B. The load-receiver is shown cylindrical for a portion of its length and is furnished with a conical bottom having a discharge-opening therethrough, which is located substantially in alinement with the longitudinal axis of the receiver. The closer, which is designated in a general way by L and in the present case constitutes the load-discharger, is shown comprising a curved cut-off plate 26, having side walls 27 and 28, which are pivotally supported at 29 at opposite sides of the load-receiver at a point above the discharge-opening and in substantial alinement with the longitudinal axis of said receiver, as shown most clearly in Figs. 1 to 4, inclusive, of the drawings. The pivotal point of the load-discharger L is preferably located substantially midway of the front and rear edges of the cut-off plate 26, so that the center of gravity of the closer or discharge member is located substantially in vertical alinement with the longitudinal axis of the receiver. In contradistinction to self-shutting closers in weighing-machines of ordinary construction the closer or load-discharge member L in the present case is constructed and organized to have a self-opening movement and is normally locked, by means hereinafter described, in its closed position and is positively actuated, in so far as the closing movement thereof is concerned, by mechanical means, said closer being so supported that the load contained in the receiver will not tend to impart an opening movement to said closer.

As a means for imparting an opening movement to the closer or load-discharge member L, said closer is furnished at the upper end of one of the side walls or arms thereof with a closer-opening actuator 30, which is shown as a counterweighted arm constituting practically an extension of one of the side arms or side walls of said closer, the longitudinal axis of said arm intersecting the pivotal point of the closer and coinciding with a line drawn at right angles through the center of the cut-off plate of said closer and the counterweight 30' of said actuator being extended laterally beyond the longitudinal axis of said actuator and being located in position to normally exert an opening stress on the closer.

The stream-supplying means include the hopper or chute II and a valve 70, which may be of any suitable construction, supported with its cut-off plate below the discharge-opening of said chute, said valve being pivotally supported substantially midway of its front and rear edges on the side walls of the chute or hopper II, near the lower end thereof, as will be understood by reference to Figs. 1 to 5 of the drawings. This valve is shown furnished with a counterweight on the rear end thereof, that tends to impart a closing movement to said valve.

Supported below the load-receiver in position to receive the load is a regulator or regu-

lator-hopper which is designated in a general way by P and which is pivotally supported on the lower portion or base 3 of the upright or column 2. This regulator is shown similar in a general way to the regulator employed in Patent No. 535,729, granted to me March 12, 1895, and is furnished with a counterweighted arm 10, which tends to retain the regulator in its elevated or load-receiving position.

As a convenient means for retaining the closer or discharge member L in its closed position I have provided a gravitative latch 31, pivotally supported on the side of the load-receiver in position for engaging the outer end of the counterweighted arm of the closer when said closer is in its shut position and for holding the same against accidental movement; and as a means for actuating the latch to release the closer the valve is provided at the rear end thereof with a depending arm or thrust-rod 32, the lower end of which is located in position to engage the outer end of the latch during the last stages of the closing movement of the valve to thereby operate said latch and release the same from the closer. On the release of the latch from the closer the closer-opening actuator becomes at once effective for imparting an opening movement to said closer, as will be understood by a comparison of the several figures of the drawings.

As a convenient means for imparting a return movement to the closer by the regulator on the return movement thereof the closer is furnished with a crank-arm 33, fixed to a pivot thereof and having a depending portion 33' at its outer end, which is preferably furnished with an antifriction-roller 34, and the regulator is furnished with an upwardly-extending arm 35, having a pivotally-supported by-pass or closer-actuator, the upper end or working face 35' of which is located in position to engage the roller on the outer end of the crank-arm 33 when the closer is in the open position shown in Fig. 4 and which is adapted on the return or upward movement of the regulator for imparting a return or closing movement to the closer. This by-pass has a counterweight 36, and also has a stop 37 on the forward side thereof adapted for normally retaining the by-pass in the position shown in Fig. 4 and at the same time facilitate the backward movement of the by-pass during the ascending movement of the load-receiver when the closer is in the position shown in Fig. 3.

As a convenient means for actuating the valve or stream-controller 70 and to render the opening movement of the valve dependent upon the conjoint movements of the load-discharger and regulator I have provided a valve-actuating mechanism in operative connection with the beam mechanism, the load-discharger, and the regulator, and which mechanism embodies an actuating member in operative relation with the valve. This valve-actuating mechanism, in the preferred form thereof shown in the drawings, comprises a valve-actuating lever or cam (desig-

nated in a general way by D) pivotally supported in position to engage and impart an opening movement to the stream-controller or valve and two lever or cam actuating toggle devices, (designated in a general way by T and T', respectively,) one of which operatively connects the cam D and the closer L and the other of which operatively connects the cam D and the regulator P. In the organization thereof shown most clearly in Figs. 2, 5, and 6 of the drawings the valve-actuating lever D is pivotally supported near the lower end thereof on the crank-arm 40, which in turn is pivotally supported at its upper end, at 40', upon the scale-beam B at a point approximately midway between the pivotal point of said scale-beam and the forward end thereof, said lever having a cam 41 at the upper end thereof in position to engage the roller 42, carried at the outer end of a crank-arm 43, fixed to the pivot of the valve 70, the lever D and the crank-arm 40 on which it is pivoted constituting a vertically-disposed toggle that is actuated by the two toggle devices T' and T. The toggle device T', which connects the lever D and the closer L, comprises a horizontally-disposed toggle 44 and a vertically-disposed actuating member 45, the toggle 44 consisting of two arms pivotally connected at their inner ends to the upper end of the actuating member 45, and one of which arms is connected at its outer end to the lower end of the lever D and the other of which arms is pivotally connected at its outer end to a fixture on the forward end of the scale-beam B, the lower end of the actuating member 45 being pivotally connected to the crank-arm 33 on the closer. The toggle device T also comprises a horizontally-disposed toggle 46 and an actuating member 47, the toggle 46 consisting of two members pivotally connected together at their inner ends and to the upper end of the actuating member 47, and one of said arms being pivotally connected at its outer end to the scale-beam in the rear of the pivotal point thereof and the other member being pivotally connected at its forward end to the lower end of the crank-arm 40, as shown in Fig. 4, the lower end of the actuating member 47 being pivotally connected to the counterweighted arm of the regulator P in the rear of the axis of movement of said regulator. The knuckle of the horizontally-disposed toggle 46 is shown in the drawings coincident with the axis of movement of the scale-beam when said toggle is in its dead-center position. (See Figs. 2, 3, and 4.) This arrangement facilitates the oscillation of the scale-beam without effecting any longitudinal movement of the actuating member 47 of said toggle.

The toggle devices T and T' and the valve-actuating lever D are so connected and organized that on the closing movement of the discharge member L, through the medium of the regulator P, the toggle T' will first act to

throw the working end of the lever D into engagement with the upper end of the crank-arm 43 on the valve, but will not advance the upper end of said lever sufficiently to inaugurate an opening movement of the valve, and the actuating member 47 and the toggle device T will, after the discharge member L has been fully closed by the upward movement of the regulator, straighten the toggle 46 and advance the upper end of the lever D sufficient to effect an opening movement of said valve.

During the return or closing movement of the discharge member L the actuating member 45 of the toggle T' tends to straighten the toggle 44, causing the lever D to have a rotative movement upon its own axis. During this movement of the discharge member and the toggle T' the actuating member 47 of the toggle T is descending and tends to straighten the vertically-disposed toggle of which the valve-actuating member D constitutes a part, thus shifting the pivotal point of the member D forward toward the valve 70. The complete straightening of the toggle 46 does not take place until after the toggle 44 is fully straightened by the complete closure of the discharge member, and this straightening movement of the toggle 46, after the toggle 44 has come to a rest, imparts a rapid advancing movement to the working end of the lever D about that point at which said lever and the toggle 44 are connected, as will be readily understood by a comparison of the several figures of the drawings.

From the foregoing it will be seen that in effect the toggle devices T' and T will complete their movements one slightly in advance of the other, and it will be further seen that an opening movement cannot be imparted to the valve until the discharge member L is in its fully-closed position and the regulator P is in the last stage of its ascending movement.

By reference to Fig. 3 of the drawings it will be seen that the descent of the bucket first tends to break the toggle 44, which throws the valve-actuating lever into position to allow the closing movement of the valve, this closing movement releasing the latch from engagement with the closer, whereby the closer will open, allowing the contents of the receiver to be discharged into the regulator, which descends under the weight of the load and breaks the toggle 46, thus shifting the valve-actuating lever farther backward to the position shown in Fig. 4.

Having described my invention, I claim—

1. The combination, with a reciprocatory load-receiver having a discharge-opening and with a gravitative load-receiving regulator supported below said receiver, of a closer pivotally mounted on the receiver and having a cut-off plate located intermediate the receiver and regulator in position to close the discharge-opening of said receiver; means for imparting an opening movement to the closer;

and means carried by the regulator in position to engage and impart a closing movement to the closer.

2. The combination, with a reciprocatory load-receiver having a discharge-opening and with a gravitative load-receiving regulator supported below said receiver, of a counterweighted self-opening closer pivotally mounted on the receiver and having a cut-off plate located between the receiver and regulator in position to close the discharge-opening of said receiver; and a closer-actuating device carried by the regulator and effective, on the ascending movement of said regulator, for directly imparting a return movement to said closer.

3. The combination, with a reciprocatory load-receiver having a discharge-opening at the lower end thereof, of an oscillatory closer located below the receiver and self-operative in one direction for discharging the contents of the receiver; and a load-receiving regulator shiftably supported below the closer and embodying means for engaging and imparting a return stroke to said closer.

4. The combination, with beam mechanism and with a load-receiver supported thereon and having a discharge-opening, of a closer located below the receiver in position to normally close the discharge-opening thereof; means for imparting a load-discharging stroke to said closer; a load-receiving regulator shiftably supported below the closer; means for imparting an ascending movement to said regulator; and means carried by the regulator, in operative relation with the closer and effective, on the ascending movement of said regulator, for imparting a return stroke to said closer.

5. The combination, with beam mechanism and with a load-receiver supported thereon and having a discharge-opening, of a closer located below the load-receiver in position normally to close the discharge-opening thereof; means effective at predetermined points in the ascending and descending movements of the receiver, for locking and releasing the closer; means carried on the closer, for imparting a discharging movement thereto; a gravitative load-receiving regulator shiftably supported below the closer and embodying means for imparting a return stroke thereto; and a closer-actuating device carried by the regulator, in operative relation with the closer and effective, on the return movement of said regulator, for imparting a return stroke to said closer.

6. The combination, with beam mechanism and with a load-receiver supported on said beam mechanism and having a discharge-opening located in the plane of its longitudinal axis, of a closer pivotally supported on the load-receiver above the discharge-opening and in a plane substantially intersecting the longitudinal axis of said receiver and having a horizontally oscillatory cut-off plate located below the receiver; means carried by

the closer, for normally exerting a closer-opening stress thereon; a latch on the receiver, for normally retaining the closer in its closed position; means for operating the latch to release the closer; a gravitative load-receiving regulator located below the closer; and an actuating device carried by the regulator and effective, on the rising movement of said regulator, for directly imparting a closing movement to the closer.

7. The combination, with weighing mechanism embodying a load-receiver having a discharge-opening in substantial alinement with the longitudinal axis thereof, of a counterweighted self-opening closer pivotally supported intermediate its ends on the receiver above the discharge-opening thereof; a latch for normally retaining the closer in its closed position; stream-supplying means located above the receiver and embodying an oscillatory self-closing stream-controller; means controlled by the closing movement of the stream-controller for actuating the latch to release the closer and permit an opening movement thereof; and a load-receiving regulator located below the receiver and embodying means for imparting a closing movement to the closer.

8. The combination, with weighing mechanism embodying a load-receiver, of a closer pivotally supported on the load-receiver substantially midway of the width thereof and above the discharge-opening; a laterally-disposed actuating-arm fixed to the closer; means on the closer for imparting an opening movement thereto; and a gravitative load-receiving regulator pivotally supported below the load-receiver and embodying means operative on the ascending movement thereof for engaging the actuating-arm of, and for imparting a closing movement to, said closer.

9. The combination, with weighing mechanism embodying a reciprocatory load-receiver, of a counterweighted self-opening closer pivotally carried on the load-receiver above the discharge-opening thereof and having a laterally-disposed actuator-arm; a latch for retaining the closer normally in its closed position; stream-supply means embodying a valve; means for actuating the valve; means controlled by the valve, on the closing movement thereof, for releasing the closer-holding latch; a gravitative load-receiving regulator located below the discharge end of the receiver; and means carried by the regulator and effective, on the rising movement thereof, for engaging the actuator-arm of, and for imparting a closing movement to, the closer.

10. The combination, with weighing mechanism embodying a reciprocatory load-receiver having a discharge-opening in substantial alinement with the longitudinal axis thereof, of a self-opening closer having a pivot-support on the load-receiver above the discharge-opening and in a plane substantially intersecting the longitudinal axis of

said receiver; a gravitative latch pivotally supported on the receiver in position for engaging and normally retaining the closer in its closed position; and means operative on the descent of the load-receiver for operating the latch to release the same from engagement with the closer.

11. The combination, with weighing mechanism embodying a load-receiver having an oscillatory closer normally locked in its closed position and with means carried on the closer for imparting an opening movement thereto, of a gravitative regulator-hopper supported below the receiver; and two coöperative closer-shutting members, one of which is carried on the closer and the other of which is carried on the regulator-hopper and which are effective on the ascending movement of said hopper for shutting the closer.

12. The combination, with weighing mechanism including a load-receiver having a discharge-opening in substantial alinement with the longitudinal axis thereof, of a closer pivotally supported on the receiver above the discharge-opening thereof and having its center of gravity in substantial vertical alinement with the longitudinal axis of the receiver; means carried on the closer for imparting an opening movement thereto; a latch carried on the receiver and normally engaging and holding the closer in its closed position; a stream-supply means embodying an oscillatory valve located above the receiver; means controlled by the valve, on the closing movement thereof, for actuating the latch to release, and permit an opening movement of, the closer; a load-receiving regulator pivotally supported below the load-receiver; means for imparting an upward movement to the controller; and means carried on the controller and operative on the upward movement thereof for shutting the closer.

13. The combination, with weighing mechanism including an oscillatory load-discharger movable in one direction for discharging a load, of a load-receiving regulator located below the discharger; means for imparting an upward movement to the regulator; and means, including a by-pass, mounted on the regulator and effective on the upward movement of said regulator for imparting a return movement to the load-discharger.

14. The combination, with weighing mechanism embodying a load-receiver having a discharge-opening, of a counterweighted self-opening closer pivotally mounted on the receiver in position to close the discharge-opening thereof; a counterweighted gravitative regulator located below the load-receiver; an actuating-arm on the closer; a closer-actuating by-pass pivotally mounted on the regulator in position for engaging the arm of the closer and effective, on an upward movement of the regulator, for shutting said closer; a locking device carried on the load-receiver in position for engaging and normally retaining the closer in its closed position; and means

for actuating the locking device to release the closer.

15. The combination, with weighing mechanism embodying a load-receiver having a discharge-opening, of a counterweighted self-opening closer pivotally mounted on the receiver and effective for closing the discharge-opening thereof; a gravitative regulator located below the load-receiver; means for imparting an upward movement to the regulator; an actuating-arm on the closer; a closer-actuating by-pass pivotally mounted on the regulator in position for engaging the arm of the closer and effective, on the upward movement of said regulator, for shutting said closer; a locking device carried on the load-receiver in position for engaging and normally retaining the closer in its closed position; supply means embodying an oscillatory valve located above the load-receiver; means for imparting a closing movement to the valve; and means controlled by the valve, at the last stage of its closing movement, for actuating the locking device to release the closer and permit an opening movement thereof.

16. The combination, with a load-receiver having a discharge-opening at the lower end thereof and with a closer having a cut-off plate located below the receiver and in position for normally closing the discharge-opening thereof, of a load-receiving regulator located below the receiver and embodying means for engaging and imparting a closing movement to the closer; stream-supply means including an oscillatory valve located above the load-receiver; and a duplex-valve-actuating device operatively connecting the valve to both the closer and regulator in such manner that an effective movement of the valve will depend upon the successive movements of said closer and regulator.

17. The combination, with a load-receiver having an oscillatory valve and with a load-receiving regulator located below said valve; of means carried by the regulator, for imparting a return movement thereto; a closer-actuating arm carried by the regulator in position for engaging and imparting a closing movement to the closer on the return movement of the regulator; stream-supply means located above the load-receiver and embodying a self-closing valve; and duplex actuating mechanism embodying two coöperative actuators, one of which is directly connected to the closer, and the other of which is directly connected to the regulator, and both of which are successively operated, on the successive movements of the closer and regulator, for imparting an opening movement to the valve.

18. The combination, in a weighing-machine, of a reciprocatory load-receiver having a self-opening closer; supply means including a self-closing valve; a gravitative regulator pivotally supported below and in position to receive the load from the load-receiver and to descend under the weight of said load; a du-

plex-valve actuator pivotally connecting the valve to the closer and to the regulator; means carried by the regulator in position for directly imparting a closing movement to the closer on the return movement of the regulator; and means for imparting a return movement to the regulator and for simultaneously imparting a valve-closing movement to the duplex-valve actuator.

19. The combination, with weighing mechanism including a load-receiver having a closer and with supply means including a stream-controller, of a regulator located to receive the load from the load-receiver and adapted to descend under the weight of such load; means for returning the regulator to its normal load-receiving position after the discharge of its load; a duplex stream-controller-actuating device operatively connecting the stream-controller with the closer and the regulator; and means including a by-pass, carried by the regulator in position for imparting a closing movement to the closer on the return movement of said regulator and for simultaneously imparting an opening movement to the stream-controller through the medium of the duplex stream-controller actuator.

20. The combination, with weighing mechanism including a load-receiver having a self-opening closer and with stream-supply means including a self-closing valve, of a regulator pivotally supported to receive the load from the load-receiver and adapted to descend under the weight of said load; means for returning the regulator to its load-receiving position after the descent thereof; a valve-opening actuator in operative connection with the closer and embodying a toggle; and means carried on the regulator and effective, on the return movement of said regulator, for shutting the closer and operating the valve-opening actuator.

21. The combination, with weighing mechanism including a load-receiver having a closer and with supply means including a stream-controller, of a regulator located to receive the load from the load-receiver and adapted to descend under the weight of said load; means for imparting a return movement to the regulator; a latch normally holding the closer in its closed position; means actuated by the closing movement of the stream-controller for releasing the latch from engagement with the closer; means operative with the regulator, on the return movement thereof, for imparting a closing movement to the closer; a controller-opening actuator; and toggle mechanism operatively connecting the controller-actuator, closer, and regulator and controlled by said closer and regulator on the closing and return movements, respectively thereof, for imparting an opening movement to the controller.

22. The combination, with an oscillatory beam and with a load-receiver supported on said beam and having a closer, of stream-supply means embodying an oscillatory valve;

a closer-actuating regulator pivotally supported below the load-receiver; means for imparting a return movement to the regulator; a by-pass carried on the regulator in position for engaging and actuating the closer; valve-actuating means embodying a toggle operatively connecting the valve and the closer and regulator and controlled in its valve-actuating movements by the closer and regulator on the successive return movements thereof.

23. The combination, with weighing mechanism including a pivotal beam and a load-receiver supported on said beam and having a self-opening closer, of supply means embodying a self-closing oscillatory stream-controller; a counterweighted closer-actuating regulator supported below, and in position to receive the load from, the load-receiver and adapted to descend under the weight of said load; and a valve-opening actuator embodying a duplex-toggle device in operative connection with the beam, closer, and regulator, and effective, on the closing movement of the closer and the ascending movement of the regulator, for imparting an opening movement to the valve.

24. The combination, with weighing mechanism including a load-receiver having a closer and with a load-receiving regulator supported below the closer, of stream-supply means including a stream-controller; and stream-controller-actuating mechanism comprising two connected toggle devices, one of which is directly connected with the closer and the other of which is directly connected with the regulator; and means for actuating the two toggle devices in succession.

25. The combination, with weighing mechanism including a load-discharger movable in one direction for discharging the load and with a counterweighted regulator supported below and in position to receive the load from the discharger and adapted to descend under the weight of said load, of stream-supply means including a valve located above the discharger; means for imparting a closing movement to the valve; a valve-opening member pivotally supported in operative relation with the valve; two toggle devices, one of which operatively connects the valve-opening member and discharger, and the other of which operatively connects the valve-opening member and the regulator, and which toggle devices are actuated, respectively, by the discharge and regulator, one slightly in advance of the other, for imparting a valve-opening movement to said member; and means carried by the regulator for imparting a return movement to the discharger.

26. In a weighing-machine, the combination, with a load-receiver and its closer and with a gravitative load-receiving regulator and means for imparting a return movement thereto, of stream-supply means including a self-closing valve having a crank-arm; and a duplex-toggle device including a valve-

opening cam located in position to engage the crank-arm and open the valve, and said duplex-toggle device comprising two toggles, one of which operatively connects the valve-opening cam and closer and the other of which operatively connects said cam and the regulator, the organization being such that the valve-opening cam is dependent for its effective operation upon the combined movements of the closer and regulator.

27. The combination, with weighing mechanism embodying a load-receiver having a closer and with stream-supply means including a valve, of a gravitative regulator supported below the receiver in position to receive and descend under the weight of a load from the receiver; a valve-actuating cam supported in operative relation with the valve; a compound toggle device carried by the weighing mechanism and operatively connecting the valve-opening cam, the closer, and the regulator and so constructed and organized as to first throw the cam into operative engagement with the valve simultaneously with the closing movement of the closer, and next impart a valve-opening movement to said cam during the latter stages of the return movement of the regulator; and means carried by the regulator and controlled by the return movement thereof for imparting a closing movement to the closer.

28. The combination, with weighing mechanism embodying a load-receiver and with stream-supplying means embodying a self-closing valve, of a valve-actuating mechanism including a closer and a regulator one of which is actuated by the other and both of which cooperate to control the opening movement of the valve.

29. The combination, with weighing mechanism including a load-receiver having a closer and with stream-supply means including a stream-controller, of a gravitative regulator supported below and in position to receive the load from the receiver and adapted to descend under the weight of said load; a cam pivotally supported in operative relation with the valve; and two cooperating cam-actuators each embodying a toggle in operative connection with the cam and one of which constitutes a connector between the cam and closer, and the other a connector between said cam and regulator, and one of which actuators is effective, on the shutting of the closer, for advancing the cam through a portion of its stroke and the other of which is effective, on the return movement of the regulator, for completing the cam stroke to thereby impart

an opening movement to the stream-controller.

30. In a weighing-machine, in combination, weighing mechanism embodying a pivotally-supported beam; a load-receiver carried on said beam and having an oscillatory closer; a gravitative regulator supported below and in position to receive a load from the load-receiver and adapted to descend under the weight of said load; stream-supplying means including a self-closing valve located above the load-receiver; a valve-actuating cam pivotally supported on the beam; two toggle-joints pivotally connected at their inner ends to the cam and at their outer ends to the beam; two toggle-actuating members, one of which is pivotally connected at its upper end to the knee of one toggle and at its lower end to the closer, and the other of which is pivotally connected at its upper end to the knee of the other toggle and at its lower end to the regulator; and means for shutting the closer and raising the regulator to thereby operate the toggle-actuating members one slightly in advance of the other.

31. In a weighing-machine, the combination, with stream-supply means including a valve, of valve-actuating mechanism comprising a cam pivotally supported in position to engage and actuate the valve, and two cam-actuating toggles in pivotal connection with the cam and operative one for shifting the cam into operative engagement with the valve and the other for imparting a valve-opening movement to said cam; and means for actuating said toggles.

32. The combination, with weighing mechanism including a beam and a load-receiver and with stream-supplying means including a valve, of two horizontally-disposed toggles pivotally connected at their outer ends to the beam; an intermediate vertically-disposed toggle pivotally connected at the outer end to the beam and at the lower end thereof to one toggle and pivotally connected at its knuckle to the inner end of the other toggle, and one of the members of said intermediate toggle constituting a valve-actuator; and means for operating the two horizontally-disposed toggles and connected intermediate toggle and thereby impart to the valve-actuating member of the intermediate toggle differential valve-opening movements.

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Witnesses:

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