(No Model.) 4 Sheets—Sheet 1.

F. H. RICHARDS.

AUTOMATIC WEIGHING MACHINE.

No. 589,286. Patented Aug. 31, 1897.

Fig. 1.

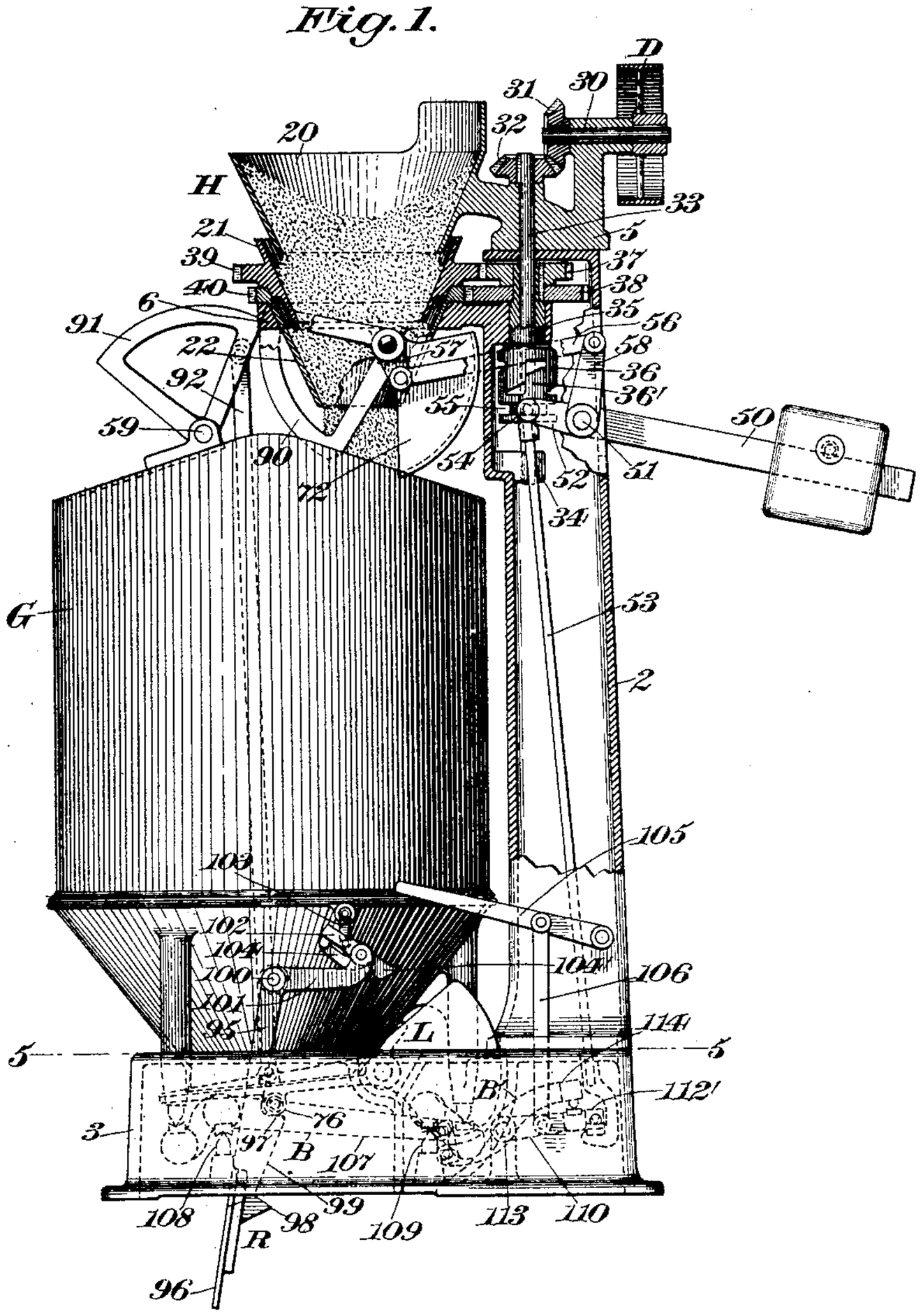

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Fig. 2.

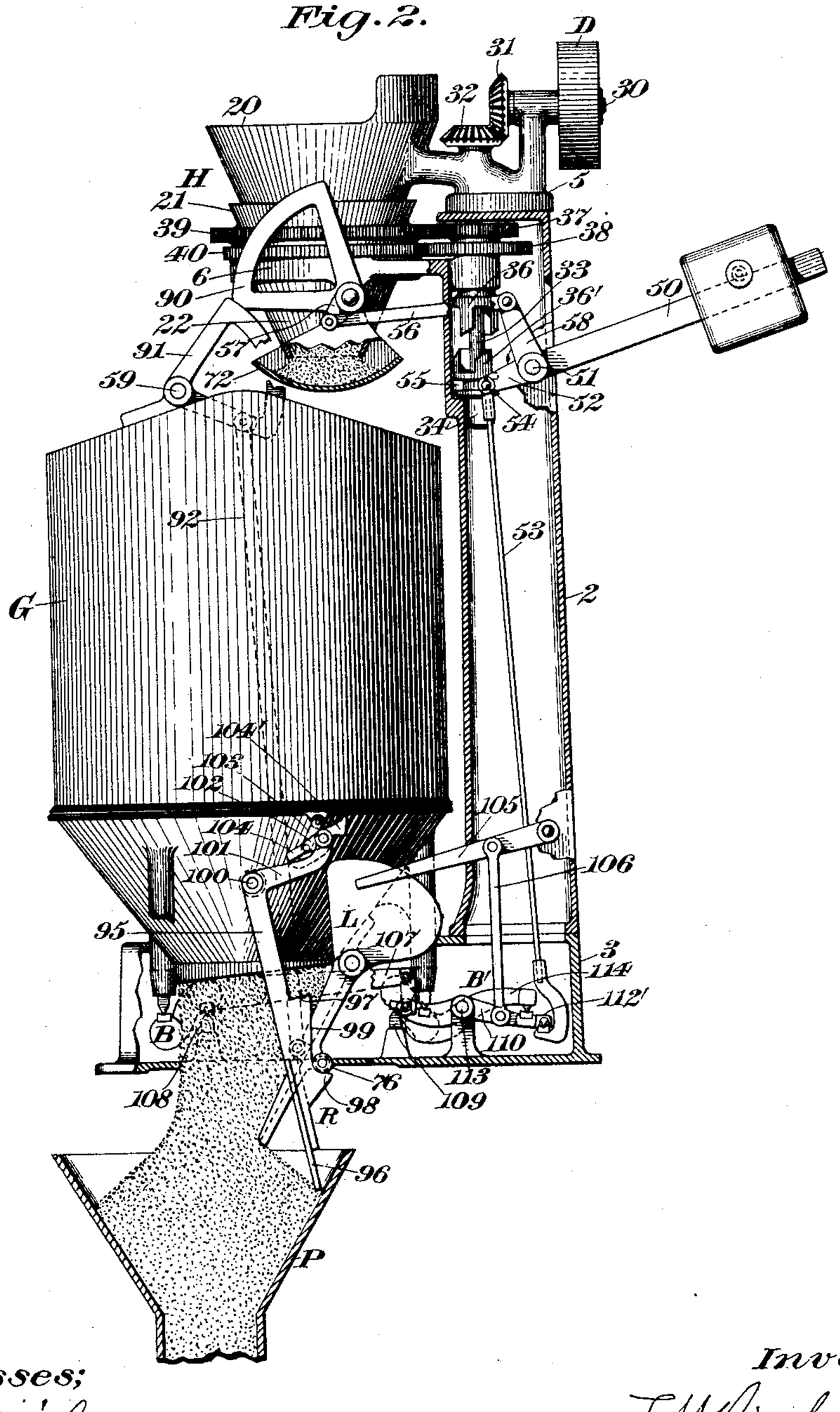

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Fig. 3.

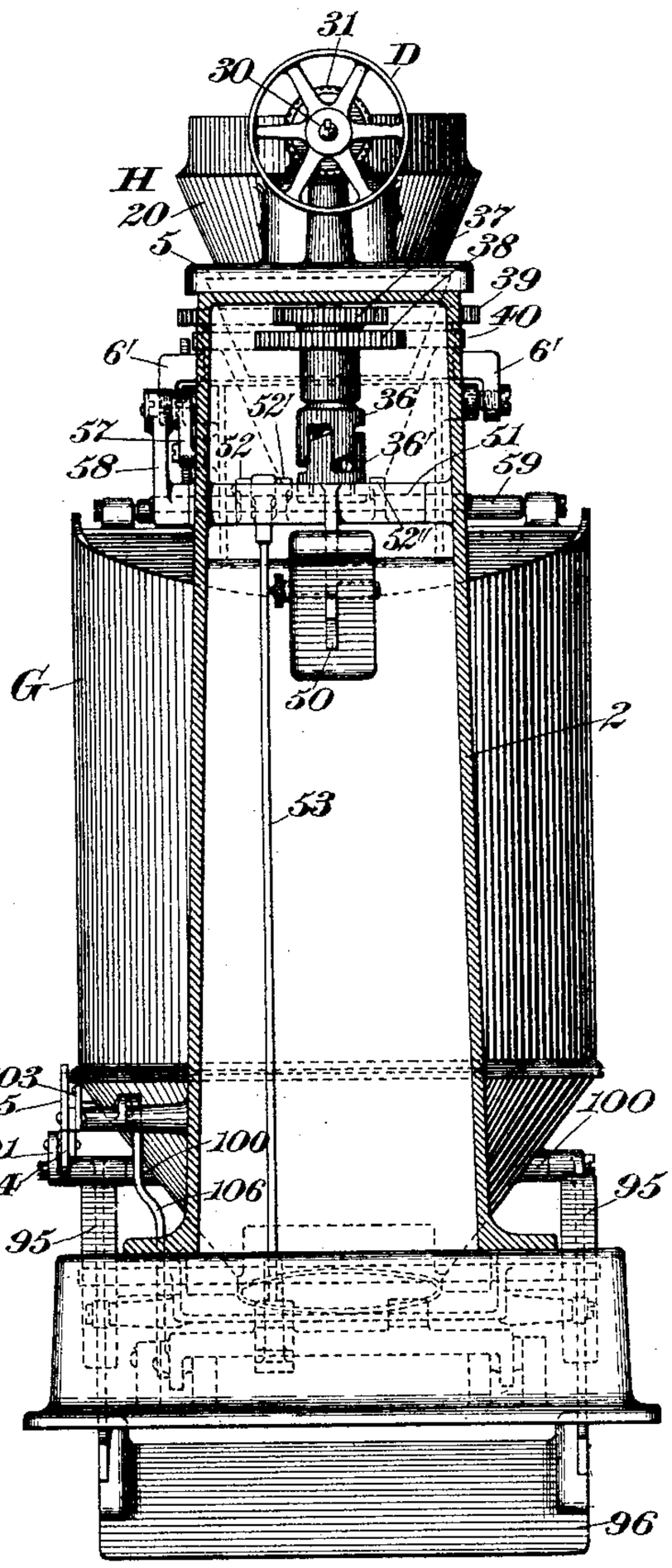
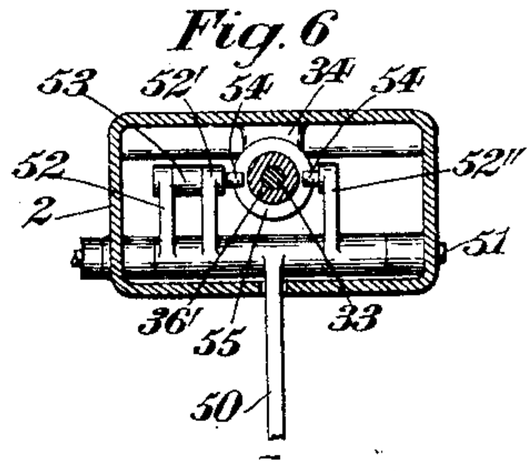


Fig. 6



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AUTOMATIC WEIGHING MACHINE.

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Fig. 4.

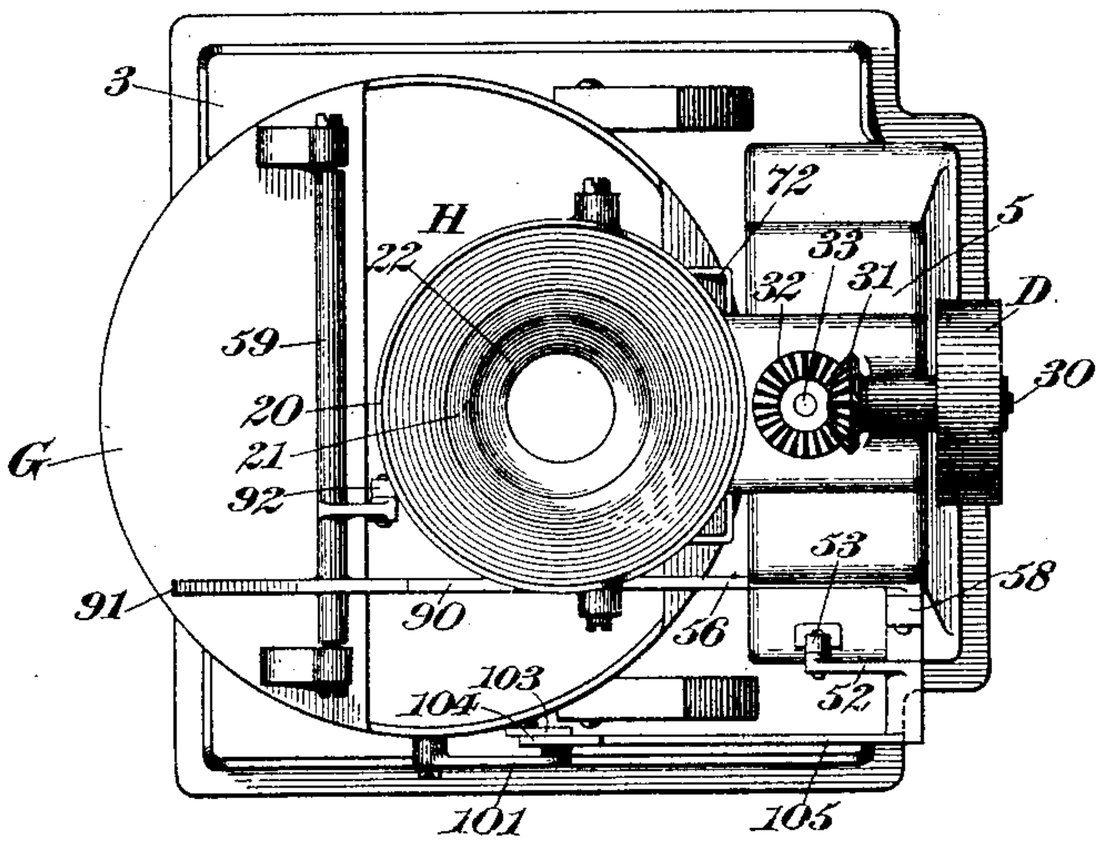
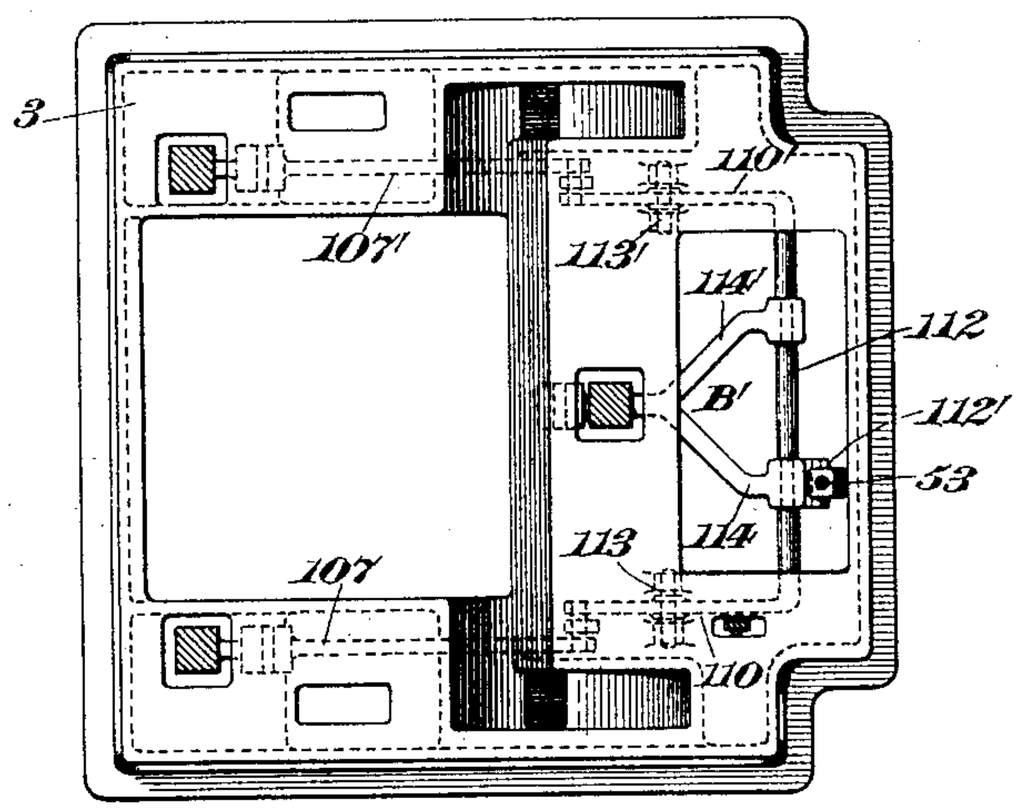


Fig. 5.



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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

AUTOMATIC WEIGHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 589,286, dated August 31, 1897.

Application filed December 22, 1896. Serial No. 616,614. (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 Automatic Weighing-Machines, of which the following is a specification.

This invention relates to weighing-machines, and particularly to that class of mechanism adapted for automatically weighing predetermined quantities of granular or other materials; and it has for its main object the provision of an improved machine of this character by means of which sluggish materials—such, for example, as some kinds of flaky cereals used for breakfast foods—may be supplied to the usual load-receiver or bucket without breaking the flakes or separate particles of the mass or reducing them to a fine powder.

Another object of the invention is the employment, in connection with the closer, of closer-latching means adapted for locking the closer of a single-chambered bucket in its open and closed positions, respectively, the preferred construction being one in which the regulator serves as a closer-latching means, and is operative when in its non-regulating position to latch the closer shut and when in its regulating position to lock the closer open until all of the material from the bucket has passed by the regulator. I also employ, in connection with suitable stream-supplying means and the usual bucket of an automatic weighing-machine, beam mechanism by means of which the bucket may be supported on beam-arms constructed as levers of different orders, and so organized and connected that the bucket will be supported at the free end of one or more beam-arms and will also be pivoted on another beam-arm at a point between the beam-pivot and the point of connection of such beam with the other arms of the beam mechanism.

In the drawings accompanying and forming part of this specification, Figure 1 is a sectional side elevation of a weighing-machine constructed in accordance with my present improvements and showing the valve open for delivering the full stream into the bucket. Fig. 2 is a similar view showing the valve closed and the closer open and delivering material into a suitable hopper. Fig. 3 is a sectional rear elevation of the machine. Fig. 4 is a plan of the same. Fig. 5 is a horizontal section of the same, the section being taken in line 5 5, Fig. 1; and Fig. 6 is a detail hereinafter referred to.

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

The several operative parts of my improved machine are mounted upon a suitable framework, which in this instance comprises a hollow base 3, in which the beam mechanism is contained, and a hollow column or pillars, such as 2, secured to the rear end of said base, said hollow column supporting at its upper end a forwardly-extending frame member 5, while near the upper end of the column a forwardly-extending bracket is shown at 6.

The stream-supplying means which I prefer to employ is in the form of a hopper, and in the present instance it consists of several nested frusto-conical sections, the upper one of which is designated by 20 and may be fixed to the frame-piece 5 or formed integral therewith, while the lowermost section (designated by 22) is supported by the bracket 6, which bracket in the form shown herein is in the nature of an annulus encircling the section 22 and supporting the same on the upper and inner sides of said annulus. Between the sections 20 and 22 of the hopper is another section, which is designated by 21, and may be loosely supported for rotation on the upper side of the lower hopper-section 22, it being understood that the adjacent annular faces of these members where they contact should be smooth in order to permit the parts to turn readily upon one another.

The hopper illustrated in the drawings of this application is especially designed and intended to serve as a means for agitating the mass of material flowing therethrough, and I have illustrated herein a suitable means for positively turning or rotating the two sections 21 and 22 thereof relatively to the upper or fixed section 20. Moreover, in the preferred construction I make use of driving means for imparting a relatively rapid turning movement or movement of rotation to one of the hopper-sections relatively to the other in order to agitate more thoroughly the mass

of material flowing through the hopper. The driving means employed in this instance for so rotating the hopper-sections will now be described. The main driving-wheel of the machine, from which power is obtained for operating the sections 21 and 22, is designated in a general way by D and is in the nature of a band-wheel supported on a short shaft 30, carrying at the forward end thereof a bevel-gear 31, meshing with a corresponding bevel-gear 32, supported on a vertical shaft 33, mounted for rotation at one end in a long journal in the frame-piece 5 and at its other end in a bearing 34 inside of the hollow column 2.

The shaft 33 constitutes a driving member for imparting movement to a train of differential gearing, two driving members of which are fixed in the present instance on a long hub 35, journaled on the shaft 33 and having at its lower end one member 36 of a coupling device, the function of which will be hereinafter stated.

The two driving members of the differential-gear train are designated, respectively, by 37 and 38 and will in this case mesh with corresponding gears fixed to the respective hopper-sections 21 and 22. In the construction shown two large annular gears (designated by 39 and 40) encircle the hopper-sections 21 and 22, respectively, and are fixed thereto, the gear 39 meshing with the small gear or pinion 37, while the smaller gear 40 meshes with the larger pinion or gear 38 on the driven member or hub 35. It will be obvious that when said hub is rotated the two pinions will turn and will rotate the gears 39 and 40, and thereby the hopper-sections 21 and 22, at different rates of speed, the lower section 22 being intended in this case to rotate at a relatively rapid rate of speed as compared with the movement of the hopper-section 21. Hence when material is supplied to the fixed section 20 of the hopper H it will flow therethrough into the section 21, whereupon the turning movement of said section will cause the mass therein to be rotated and thoroughly agitated without breaking the separate particles thereof, while when said material reaches the lowermost section this latter, turning at a relatively rapid rate of speed with respect to the movement of the intermediate section, will agitate the material still more thoroughly before it is discharged into the load-receiver or bucket of the weighing mechanism.

The member 36 forms one part of a coupling device which is intended to alternately connect the hub 35 to and disconnect it from the shaft 33, the complementary member of the coupling device being designated by 36′ and being fixed to the shaft 33 so as to rotate therewith. The coupling member 36′ is splined on said shaft to slide freely thereon and, as will be obvious, will cause the turning of the hopper-sections 21 and 22 when the parts of the coupling are connected. This coupling action is intended to be effected on the ascent of the bucket, a counterweighted lever being represented at 50 for this purpose. This lever is secured to a rock-shaft 51, journaled at its opposite ends in the sides of the column 2, and said shaft has secured thereto three rock-arms, (designated by 52, 52′, and 52″, respectively, Figs. 3 and 6,) a connecting-rod (designated by 53) being pivoted between the free ends of the first two of the rock-arms and connected at its lower end to the beam mechanism. The rock-arms 52′ and 52″ have inwardly-projecting pins 54, which work in a circumferential groove 55 in the coupling member 36′, these pins constituting shipping means for shifting such coupling member into and out of engagement with the complementary member 36. The counterweighted lever 50 in this instance constitutes a valve-opening actuator for imparting an opening movement to a valve 72, which is mounted for oscillation in hangers 6′, depending from the sides of the bracket 6, as shown most clearly in Fig. 3. This valve is of the usual type, adapted to oscillate about an axis passing through the stream delivered from the hopper II, and is connected to the actuating-lever 50 by means of a link 56, articulated to a pair of rock-arms 57 and 58, the former of which is fixed to and has its axis of movement coincident with that of the valve 72 and the latter of which is fixed on the end of the rock-shaft 51. The valve 72 also carries in this case in fixed relation therewith the usual stop-segment 90, which is adapted to coöperate with a corresponding stop or rocker 91, supported for oscillation by a rock-shaft 59, journaled in bearings on the top of the bucket. (See Fig. 3.) These two stops constitute, as will be evident, reciprocally-effective valve-opening-movement and load-discharging-movement limiters, the stop 91 being connected to the closer by means of the usual thrust-rod 92.

The load-receiver or bucket of the weighing mechanism is designated in a general way by G and is pivoted in the usual manner upon the arms of the beam mechanism, which will be hereinafter more particularly described.

The usual counterweighted closer L is pivoted to the bucket at one side of the mouth thereof, and this closer has at its edges stops in the form of antifriction-rolls 76, these stops being adapted to coöperate with suitable latches, one of which is intended to lock the closer shut and the other to hold the closer in its open position while the load is discharging and until all of the material shall have run out of the bucket. For this purpose I employ in connection with the closer a double-action closer-latch, which is preferably in the form of a closer-latching regulator, which regulator is held in position to prevent the shutting of the closer until all of the material discharged from the bucket shall have passed beyond the regulator and into some suitable

receiving bin or receptacle. Said regulator is designated by R, it being oscillatory and mounted on the side of the bucket in such a manner that when it is in position to lock the closer shut and is tripped to release the closer it will swing, preferably by reason of its own weight, into position for latching the closer open. In the present instance this regulator preferably comprises a pair of side arms 95, connected at their lower ends by a plate or blade 96, which constitutes the regulator proper. The side frames 95 have thereon a pair of stop-faces in the form of catches, these being designated, respectively, by 97 and 98 and being connected in this case by cam-faces 99, along which the respective rolls 76 travel when the closer moves from one position to the other. At the upper ends thereof the arms 95 are journaled on studs 100 on the sides of the bucket G, and one of these arms has secured thereto a short angle-arm or rock-arm 101, which carries suitable devices for releasing the regulator when the closer is to be opened. These devices may comprise a link 102, pivotally connected with the end of the arm 101 and having pivotally secured thereto near the center thereof a second link 103, which is pivoted at its other end on the side of the bucket, and a by-pass lever or stop loosely pivoted on the end of the arm 101, with its axis of movement coincident with that of the link 102. This by-pass lever is designated by 104 and at its forward end supports and bears against the forward end of the link 102, while at the rear end of said by-pass is a rearwardly-projecting arm 104′ in position to be actuated by any suitable tripper on the descent of the bucket, to thereby release the regulator and unlatch the closer. The tripper employed in this case is in the form of a trip-lever 105, mounted on the framework—as, for instance, on the side of the hollow column 2—said lever being operatively connected to the beam mechanism by means of a connecting rod or link 106 and having its forward or free end in position to engage the coöperative rear end 104′ of the by-pass lever on the descent of the bucket, it being apparent that on the ascent of the bucket the end of the trip-lever will raise the rear end of said by-pass lever and pass by the same without operating the toggle connection. The beam mechanism which I prefer to employ is in this case inclosed entirely within the base 3 of the machine, and it comprises two beams, one of which is designated in a general way by B, while the other is indicated by B′. For the purpose of properly supporting the bucket the beam B is preferably made up of two beam-arms, which are designated, respectively, by 107 and 107′, (see Fig. 5,) both of these arms being levers of the first order, having their beam-pivots between the ends thereof. These beam-pivots are shown at 108 and rise from the floor of the base 3, while a third beam-pivot is represented at 109 in the rear of the pivots 108 for the purpose of supporting the beam-arm B′. This beam-arm is a lever of a different order, having its beam-pivot at the forward end thereof, while the bucket-pivot is between the beam-pivot and the rear end of such beam-arm. In the case of the beam-arms 107 and 107′ it will be noticed that the bucket-pivots are in advance of the beam-pivots and are carried at the extreme forward ends of said beam-arms.

It will be apparent that when the bucket is in position and properly supported on the beam mechanism the forward short ends of the beam-arms 107 and 107′ will be carried down on the descent of the beam mechanism, and thus cause the rear ends of said arms to rise and travel through an arc of relatively considerable radius, while on said movement of the bucket the beam B′ will be carried down as a whole, its rear end also moving through a considerable arc. It will be obvious now that for properly connecting these beam-arms some means must be provided which will have at one point therein an ascending movement and at another a descending movement. Hence I have provided a rock-frame, which in this instance comprises a pair of end pieces 110 and 110′, (see Fig. 5,) connected by a bar or rod 112, the arms 110 and 110′ being journaled for oscillation in bearings 113 and 113′, rising from the floor of the base 3. At the forward ends of said arms 110 and 110′ the rear ends of the beam-arms 107 and 107′ are connected thereto in any suitable manner, while the beam B′ is also joined at its rear end to the rock-frame in the rear of the axis of movement of the latter. In the present case two divided arms 114 and 114′ of the beam B′ are supported on the cross-bar 112 by means of suitable knife-edge bearings.

It will be noted that in the construction shown in the drawings of this application no counterweight is carried directly by the several parts of the beam mechanism, but instead a suitable counterpoise is mounted on the framework of the machine and is properly connected with the beam mechanism for counterpoising the latter. The counterweighted lever 50 constitutes in this instance the counterpoise for such beam mechanism and is joined thereto, as before stated, by means of the connecting-rod 53, this connecting-rod being intended in this instance to engage an extension 112′ of the rock-bar 112 at the rear of said rock-bar and at the under side thereof, so as to support the same. Suitable knife-edge bearings are shown in the drawings for properly carrying these parts.

It will be apparent that when the bucket descends if the arms of the beam-levers are properly proportioned the weight of the loaded bucket will be divided evenly between the two beams B and B′, the rear ends of the arms of the former pulling up on the forward ends of the rock-arms 110 and 110′ and the rear ends of the arms of the beam B′ bearing down upon the rear ends of said rock-arms and exerting thereon practically the same

pressure, thus equalizing the strain at opposite sides of the rock-frame. The counterweight 50 of course exerts a constant upward pull upon the connecting-rod 53, and thereby tends to maintain at all times the proper connection between the lower end of said rod and the rock-frame.

The operation of a weighing-machine constructed in accordance with my present improvements is as follows: It being understood that the parts are in the positions shown in Fig. 1, with the valve wide open and delivering material into the bucket, the closer shut tight, and the band-wheel D continuously rotating and driving the bevel-gears 31 and 32 and the shaft 33, it will be seen that the members of the coupling device are coupled and that the differential gearing is turning the sections 21 and 22 of the hopper, the former at a relatively slow speed and the latter at a considerably faster rate, so as to agitate positively the material in the hopper, and thereby assure the proper feeding of the same into the bucket. At the same time also the rocker 90 is in position to block the movement of the rocker 91, and thereby prevent the opening of the closer, while the catches 97 on the regulator R are in engagement with the stops or rolls 76 on the closer. As soon as the load is made up in the bucket the latter descends, and the rock-bar 112 draws down the connecting-rod 53 and oscillates the counterweighted lever 50 from the position shown in Fig. 1 to that illustrated in Fig. 2, at the same time withdrawing the coupling member 36′ from engagement with the upper member 36 of the clutch. This oscillation of the lever 50 is transmitted, by means of the link 56 and the rock-arms 57 and 58, to the valve 72 and causes the valve to gradually close to cut off the stream discharged from the hopper H. As soon as the valve is entirely shut and the members of the clutch disconnected it will be apparent that the weight of the material in the several sections of the hopper and the friction of the moving parts will cause the rotation of the gears of the differential train to stop instantly, thus stopping the movement of the hopper-sections 21 and 22. The descent of the beam B′ also causes the trip-lever 105 to be carried down with it, and as soon as the full load is completed in the bucket the forward end of the trip-lever will be in position to engage the rear end 104′ of the by-pass lever mounted on the regulator and bearing down on the rear end of said by-pass will cause the forward end of the latter to push up on the forward end of the link 102 of the toggle connection to straighten out said toggle and throw the regulator R slightly forward to release the latches 97 from the rolls 76. As soon as the closer is unlatched the material will flow out of the bucket and carry the closer to the position shown in Fig. 2 and will also carry with it the regulator, the rolls 76 riding down the cam-faces 99 and being stopped at the ends thereof against the stop-faces 98 of the regulator-arms, thus causing the closer to be latched in its open position.

Some suitable discharge-hopper, such as P, will receive the material flowing from the bucket and will bank such material up against the forward face of the regulator and hold the latter in its regulating position (shown in Fig. 2) until all of the material has passed out of the bucket and beyond the lower end of the regulator, whereupon the counterweight carried by the closer will become effective by engagement of the rolls 76 against the cam-faces 99, to carry the regulator back to the position shown in Fig. 1, and said regulator will latch the closer shut again. On the ascent of the bucket and the return of the beam mechanism to its normal position the counterweight 50 will descend again and carry up the clutch member 36 into position to couple the driving and driven members controlled thereby, and thus start the hopper-sections 21 and 22 rotating. At the same time the counterweight 50 becomes effective as a valve-opening actuator to carry the valve to its wide-open position and permit the stream to flow again into the bucket, whereupon all of the parts will have been restored to their normal positions for making up a new load.

In view of my pending application, Serial No. 613,541, filed November 27, 1896, I do not herein claim, in a weighing mechanism, the combination, with a bucket, of a bucket-closer, and a closer-latching regulator having a latch thereon for holding the bucket-closer when the latter is open, and thereby latching the closer in its open position; nor do I broadly claim herein regulator mechanism operative to control the opening and closing of a bucket-closer.

Having described my invention, I claim—

1. In a weighing mechanism, the combination, with a transversely-divided hopper comprising a plurality of stream-supplying hopper-sections, of power mechanism for actuating one of said sections in a curvilinear path; and stream-controlling means controlling the delivery of material from said hopper.

2. In a weighing mechanism, the combination, with a transversely-divided hopper comprising a plurality of rotary stream-supplying hopper-sections, of power mechanism for rotating one of said sections; and stream-controlling means controlling the delivery of material from said hopper.

3. The combination, with a divided hopper comprising a plurality of stream-supplying hopper-sections, of means for actuating said sections at different rates of speed.

4. In a weighing mechanism, the combination, with a transversely-divided hopper comprising a pair of stream-supplying hopper-sections, one supported on the other; of power mechanism for actuating one of said sections in a curvilinear path; and stream-controlling means controlling the delivery of material from said hopper.

5. In a weighing mechanism, the combination, with a transversely-divided hopper embodying a pair of stream-supplying hopper-sections, the upper supported on the lower; of power mechanism for actuating the upper section in a curvilinear path; and stream-controlling means controlling the delivery of material from said hopper.

6. The combination, with a pair of stream-supplying hopper-sections, of a driving-shaft; and differential gearing connecting said shaft and hopper-sections.

7. The combination, with a plurality of stream-supplying hopper-sections, of a driving member; a driven member connected with one of the hopper-sections, for turning the same; a bucket; beam mechanism; and a clutch operative with the beam mechanism, for connecting and disconnecting said driving and driven members.

8. The combination, with a plurality of stream-supplying hopper-sections, of a driving-shaft; a differential gearing connected with said hopper-sections, for rotating the same at different rates of speed; a bucket; beam mechanism; and a clutch operative with the beam mechanism, for connecting said driving-shaft and differential gearing on the ascent of the bucket and for disconnecting them on the descent of the bucket.

9. In a weighing mechanism, the combination, with a bucket, of a bucket-closer; and a double-action closer-latching regulator having a pair of catches operative, when the regulator is in its non-regulating and regulating positions, respectively, for latching the closer in its respective shut and open positions.

10. In a weighing mechanism, the combination, with a bucket, of a counterweighted bucket-closer having a stop; and an oscillatory closer-latching regulator mounted on the bucket and adapted to be held in its regulating position by the material discharged from the bucket, and having a pair of catches in position, respectively, for engaging the stop on the closer when said closer is in its respective closed and open positions.

11. In a weighing mechanism, the combination, with a bucket and with a closer therefor, of a closer-latch mounted on the bucket; a toggle connection between said latch and the bucket; a by-pass lever on said latch, for actuating said toggle; and a tripper for operating said lever.

12. In a weighing mechanism, the combination, with a bucket and with stream-supplying means therefor; of bucket-supporting beam mechanism comprising a rock-frame, a pair of pivotally-supported beam-arms having bucket-pivots at corresponding ends thereof and connected at their opposite ends to the rock-frame at one side of the axis of movement of the latter, and a pivotally-supported beam-arm between said pair of beam-arms and having a bucket-pivot between its supporting-pivot and the free end thereof and connected at its free end with said rock-frame at the opposite side of the axis of movement of said frame.

13. In a weighing mechanism, the combination, with the framework, of a bucket; stream-supplying means therefor; bucket-supporting beam mechanism comprising a pair of pivotally-supported connected beams, one having a bucket-pivot at the end thereof opposite its point of connection with the other beam, and the other having a bucket-pivot between its supporting-pivot and such point of connection; a counterweighted lever supported on the framework and connected with said beam mechanism; a driving member; a driven member; and a coupling member operative by said lever, for coupling the driving and driven members.

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