(No Model.)

F. H. RICHARDS.

AUTOMATIC WEIGHING MACHINE.

No. 548,844. Patented Oct. 29, 1895.

Fig. 1.

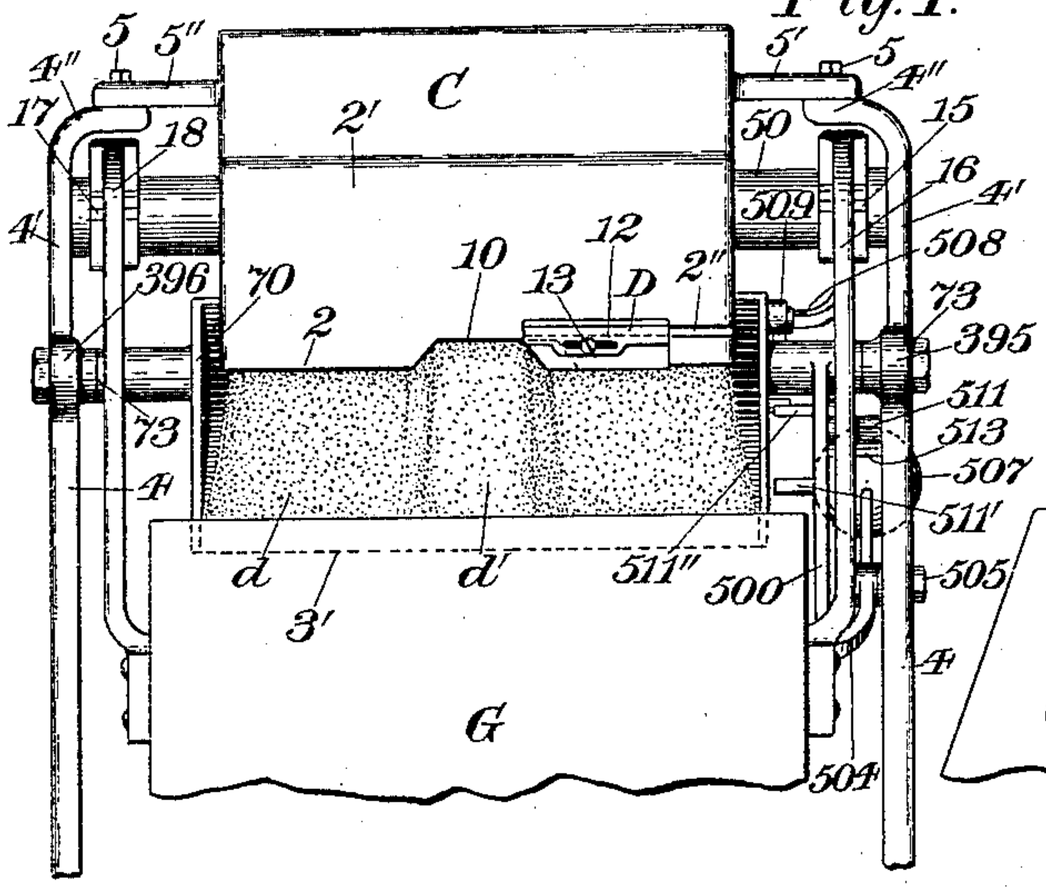


Fig. 2.

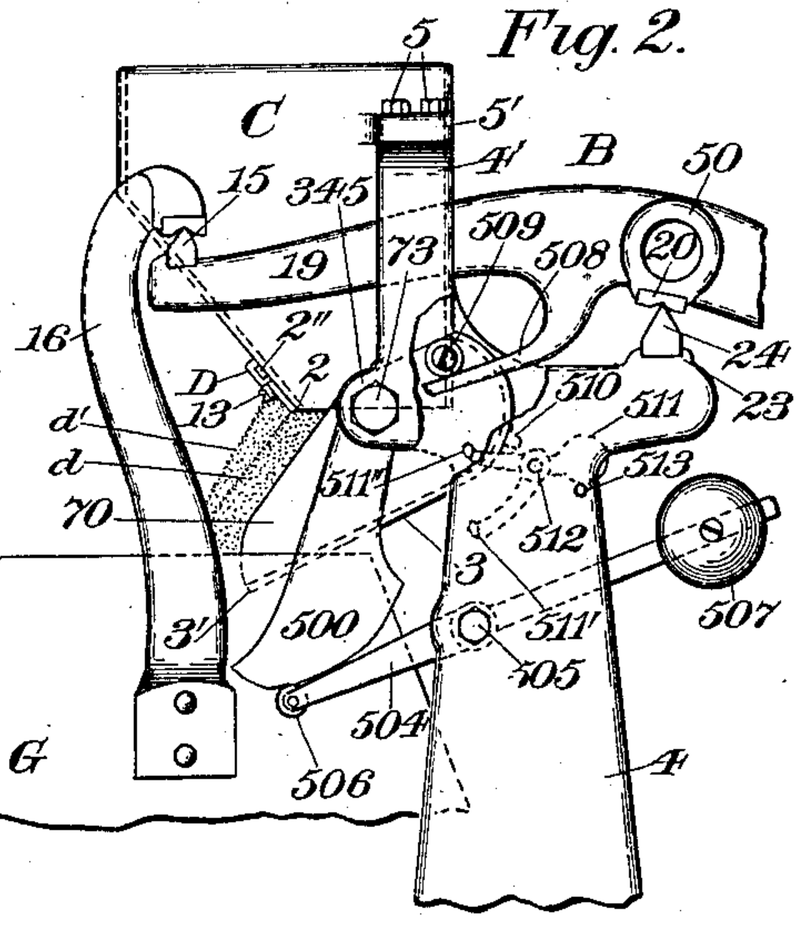


Fig. 3.

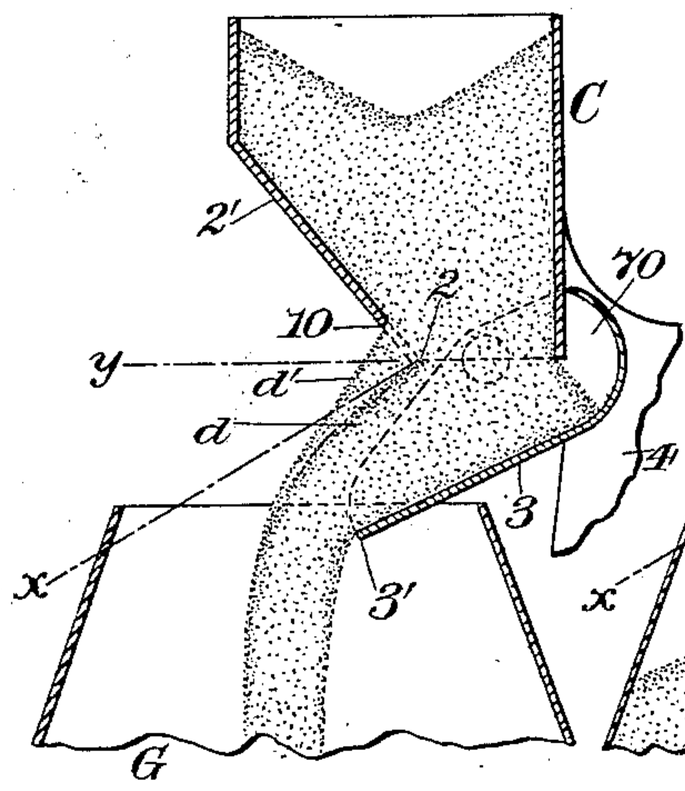


Fig. 4.

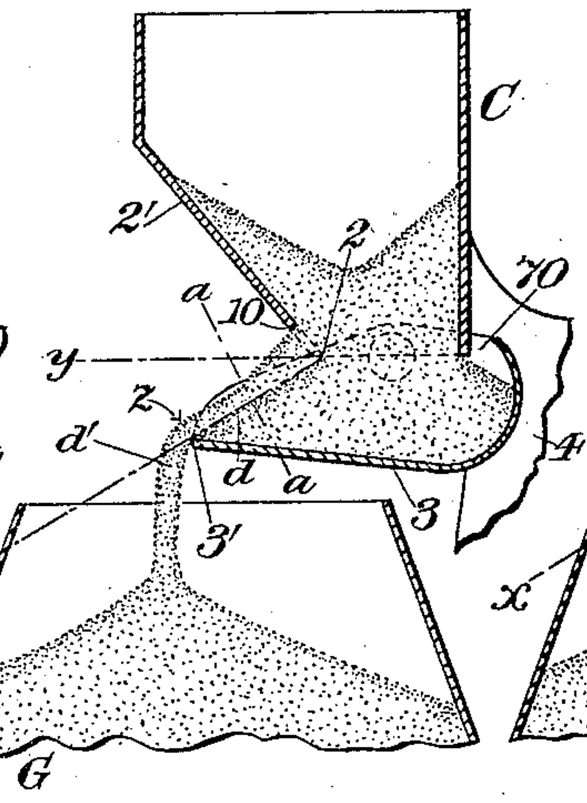


Fig. 5.

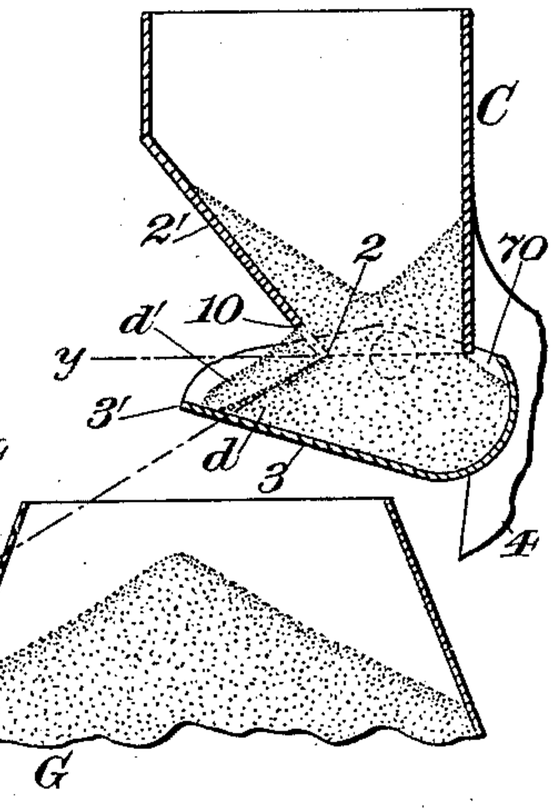


Fig. 6.

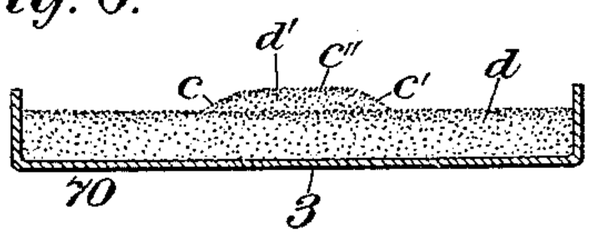
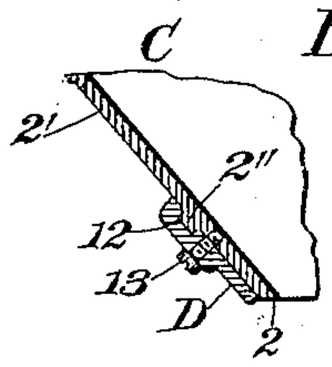


Fig. 7.



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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

AUTOMATIC WEIGHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 548,844, dated October 29, 1895.

Application filed March 18, 1895. Serial No. 542,137. (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 valve mechanism for automatic weighing-machines, and has for its object to furnish an improved valve and spout especially adapted for delivering, when the valve is opened a relatively-large supply-stream to the weighing-machine, and for delivering, when the valve is partially closed, a relatively-small drip-stream running over a bed formed by the principal or supply stream, this surface constituting a bank or bed formed of the same material as the drip-stream and lying at the normal angle of repose of such materials.

In the drawings accompanying and forming part of this specification, Figure 1 is a front elevation of the upper portion of an automatic weighing-machine, showing my present improvements. Fig. 2 is a side elevation of the same. Fig. 3 is a sectional side elevation showing the valve wide open. Figs. 4 and 5 are similar views showing, respectively, the valve in the drip position and closed. Fig. 6 is a sectional view on the line *a a*, Fig. 4, showing the peculiar relations of the supply and the drip streams as they issue from the supply-chute. Fig. 7 is a sectional detail of the lower front portion of the supply-chute, showing the horizontally-movable drip-opening adjusting-plate, this view being on a slightly-enlarged scale.

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

Heretofore in this art it has been customary to provide for the drip-stream by forming a channel on the wall of the spout at a point in the horizontal plane of the valve edge and located in opposition thereto, the size of the drip-stream being gaged by the space between said valve and wall. According to my present improvement, however, the drip-stream is gaged or has its size determined in a different manner, which has been practically demonstrated to be a material improvement over the existing methods employed for securing this result.

I will now proceed to briefly describe those parts of an automatic weighing-machine (shown in the accompanying drawings) which are convenient for clearly setting forth the operation of my present improvements.

The framework for carrying the operative parts of the machine usually and as shown in the drawings (see Figs. 1 and 2) comprises two side frames or uprights 4, having the vertical extension 4′, upon which a supply-chute (designated by C) is shown secured by means of bolts 5, passing through lateral arms 5′ and 5″, extending from said chute and through lateral arms or brackets 4″ of the side frame 4.

The grain-bucket G is of the "single-chambered" type and is suspended under the supply-chute C by means of the hangers 16 and 18, that are fixed to the bucket and are suspended by V-shaped bearings on the pivots or knife-edges 15 and 17, respectively, of the principal arms 19 and 21 of the scale-beam B. This beam has V-shaped bearings, one at each end of the hollow shaft 50 thereof, which rest on the pivots or knife-edges 24. The said bearing is shown at 20, its knife-edge 24 resting on a suitable bearing 23 of the framework. There is shown in Fig. 2 but one side of the hollow shaft 50, and consequently but one of the V-shaped bearings 20, knife-edge 24, and knife-edge bearing 23. It will be understood that the hollow shaft 50 is similarly equipped at its other side.

As a means for actuating the valve 70, a lever 504 is shown pivoted to one of the side frames 4. The lever 504 is shown as having at its forward end a friction-roller 506, adapted to engage the cam-faces of the cam-lever 500, which is shown integral with the pivot 73 of the valve. The lever 504 is shown weighted at 507 at its rear, the purpose of this weighted lever being to exert a pressure against the cam-faces of the cam-lever sufficient to close the valve 70. This feature constitutes in part the subject-matter of a prior application, Serial No. 541,551, filed March 13, 1895.

For opening the valve 70 the scale-beam B is shown provided with an actuating-arm 508. The valve 70 is shown provided with a fric-

tion-roller 509 in such position that the actuating-arm 508 will be under it and engage the roller to raise the rear edge of the valve for opening the same as the beam rises.

For checking the closing movement of the valve at the end of the reducing period the valve is shown provided with a stop-arm 510, located at its rear under side and in the path of a swinging detent-catch 511′, forming part of a suitable holding device 511, the swinging detent being shown pivotally mounted upon a pin 512 upon one of the side frames 4 of the machine. The holding device 511 is shown weighted at the rear of its pivot. A stop is shown at 513, its function being to limit the downward movement of the holding device at the rear of its pivot. This holding device 511 is also shown as having an arm 511″ in advance of its pivot, which arm is in the path of the tripping-arm 508 of the scale-beam. The purpose of the tripping-arm is to swing the holding device on its pivot to release the detent 511′ from engagement with the stop-arm 510 of the valve 70. A more detailed description of the parts and their operations thus far described, which are shown in Figs. 1 and 2 of the drawings, can be had by reference to my prior application, to which I have hereinbefore referred.

In my present improvements the spout or supply-hopper (designated in a general way by C) may be of any ordinary description as to the principal features thereof. The valve for the spout is of the improved kind described and claimed in Letters Patent No. 535,727, granted to me March 12, 1895, to which reference may be had.

The valve 70 is shown of the oscillating class and suspended under the lower edge 2 of the spout or supply-hopper C. The valve-blade is shown at 3 and at a relatively considerable distance below the spout, which distance, in ordinary practice in weighing-machines intended for weighing small grain like wheat, &c, I make from one inch to one and one-half inches in height and of greater distance for coarser materials, such as the smaller sizes of coal, and for lumpy materials, as mixed feed and the like.

It will be remembered that the improved valve described in the Letters Patent hereinbefore referred to operates to cut off the flow or supply of grain by being swung or oscillated to carry its forward edge (shown at 3′) beyond the line of the normal angle of repose (this line being indicated by *x* in Figs. 3, 4, and 5) of the mass of material supported on the valve. For instance, if the lower edge of the spout be at the line indicated by *y* in Figs. 3, 4, and 5 and the forward edge 3′ of the valve is thrown forward of or intersects the line *x*, indicating the normal angle of repose of the mass of material supported on the valve, said material will thereby be held from flowing over the edge of the valve, or, in other words, the supply-stream will be cut off. Under these circumstances, as indicated in Figs. 4 and 5, an inclined surface (shown at *d*) which constitutes a bed or bank is formed of the material being weighed. If now a narrow opening relatively to the supply-chute be made, preferably about midway of the width of the supply-spout, as shown in Fig. 1, and be located above the line *y*, indicating the lower edge of the supply-spout, the line *x* of the normal angle of repose from the upper edge of said drip-opening will extend beyond the edge of the valve-plate 3 by the distance indicated at *z*, Fig. 4. The drip-opening in the supply-chute is shown at 10 and with its front walls above said lower edge and as intersecting the lower edge of the supply-spout. By reason of this drip-opening 10 the upper line of the drip-stream will intersect the line *x* of the normal angle of repose, the intersecting point being a little forward of the forward edge 3′ of the valve 70 when the valve is in the position shown in Fig. 4, this intersection forming the drip-stream which flows over the edge of the valve into the bucket of the weighing-machine.

The peculiar relation of the drip-stream to the described bed of material is shown in Fig. 6, which represents a section through the loaded valve on the line *a a*, Fig. 4.

It will be observed that the drip-stream *d′* has its edges *c*, *c′*, and *c″* (as soon as it issues from the supply-spout) free of restraint, and is only restrained or retarded in its flow down said inclined bed *d* by reason of the friction of the material of the drip-stream on the material of the bed. This friction of the running stream of granular material upon the bed of the same material has a peculiar retarding tendency, whereby the velocity of the moving stream is not greatly accelerated during its discharge over said inclined bed. This improvement of the drip-stream results in a gradually spreading and reducing in thickness and in the discharging thereof over the edge of the valve at a relatively-slow velocity, so that in practice the drip-opening may be of relatively-great depth and the drip-stream of relatively-small volume as compared with the corresponding openings and drip-streams in the older kinds of weighing-machines.

In weighing granular materials, especially of the coarser sort, this feature of a relatively-large drip-opening, as compared with the resultant drip-stream, is one of great practical importance, since it permits the passage through the drip-opening of considerable lumps of material, which would otherwise check the drip opening, and thus stop the operation of the machine.

By reason of the valve-plate 3 being set relatively remote from and below the spout the length of the inclined bed *d* is relatively great, so that the drip-stream has to traverse a considerable distance after issuing from the drip-opening 10 and before reaching the edge of the valve. This distance, as has been pointed out, permits of the spreading of the drip-stream, whereby the flow of the material is

equalized and retarded, especially near the edges of the stream.

The size and proportions of the supply-spout C and also those of the valve 70 should, of course, correspond to the material being weighed; also the size and especially the height of the drip-opening 10 should correspond to such material and should be relatively larger in the case of lumpy materials than for those of a more uniform size.

For regulating the size of the drip-stream relatively to the main stream but without changing the depth of the drip-opening, whereby this opening might be so closed as to prevent the passage of the larger lumps of the material, means are provided for regulating the drip-opening in a direction longitudinally of and not vertically to the valve. For this purpose the wall 2′ of the supply-chute is shown provided with a horizontally-movable drip-opening adjusting-plate D in position and adapted to be adjusted longitudinally of the valve for regulating the width of said drip-opening 10. There is shown more clearly in Fig. 7 one of the means for holding this plate D in place. It is shown provided with a groove 12, fitting over a corresponding rib 2″, formed on the forward wall 2′ of the supply-spout.

A binding-screw is shown at 13 passing through a longitudinal slot in the plate, it being in position and adapted for clamping said plate or drip-gage to the spout. By loosening the binding-screw 13 the drip-gage or plate may be slid outwardly or inwardly, to either increase or decrease the width of the drip-opening, and may be reclamped in such position by means of said screw.

The ends of the drip-opening 10 are shown inclined upwardly and inwardly, so as to give an initial form to the supply-stream which shall coincide in a general way with the form of said stream as it approaches the edge of the valve shown, for instance, in Fig. 6.

By means of my present improvements it is found practicable to operate the weighing-machine for weighing materials having therein occasional lumps very much larger than the average size of the grains of the material, and I find that by reason of the peculiar organization of the spout-wall and of the drip-opening therein, with the valve in the flow of the mass of material downwardly through the said spout to the valve, and especially during the flow of the drip-stream just succeeding the stoppage of the main stream, the larger lumps of material flow in the direction of said drip-opening, so that the larger particles or lumps pass through said opening and thus avoid the shallower opening between the lower edge of the spout-wall and the valve-plate, and thereby avoid stopping the machine by the wedging of such extra large lumps between the spout and valve at those points. This peculiar action takes place with such materials as corn having pieces of corncob therein, and also in the weighing of the smaller size of anthracite coal—such, for instance, as buckwheat-coal or pea-coal—having therein occasional lumps of much larger size.

From a comparison of the drawings with the preceding description it will now be obvious how the thickness of the supply-stream as this leaves the valve is not directly gaged by the size of the drip-opening, which, according to my present improvements, may be of relatively-great depth without necessitating an equally large drip-stream. By means of my present invention, therefore I am enabled to use a relatively-large drip-opening, so as to permit the passage of lumpy materials and at the same time secure such a relatively-small drip-stream as will permit the machine to be operated with precision.

The drip-opening adjusting-plate D is shown having its operative portion located over the middle portion of the valve-plate, and relatively remote in a lateral direction from the vertical plane of the edge of the valve, and the regulation of said opening is effected entirely by the horizontal adjustment of said adjusting-plate D, which, it will be noticed, has no vertical adjustment, it not being desired in the present instance to regulate the vertical opening between the spout and the valve.

It will be observed that the forward wall of the drip-opening, as clearly shown in Figs. 3, 4, and 5, is in advance of the line of the normal angle of repose of the material. I consider this feature as being of importance, since, when the drip-stream issues from the drip-opening, it is, by virtue of this peculiar construction, directed in a line in advance or forward of the main stream, and which will intersect the main-supply stream, so that when the forward edge of the valve is at or has crossed, the line of the normal angle of repose the drip-stream will continue to flow to fill the bucket and make a complete load. This feature has rendered possible in practice the filling of the bucket with exact nicety.

In connection with the valve I employ a cam having successive faces of varying power. As hereinbefore stated, an actuator is employed for coacting with the cam for closing the valve. This actuator successively coacts with each of the cam-faces of the cam for operating the valve with varying forces exerted on these cam-faces, whereby the main and the drip streams will be cut off in succession.

Having thus described my invention, what I claim is—

1. In a weighing-machine, the combination, with a supply-chute having a drip-opening formed in the lower edge of its front wall; of a valve substantially as described, in position under the supply-chute, and operable for controlling the stream from said chute; and means for holding the valve with its forward edge, substantially coinciding with the angle of repose of the material; whereby the main supply-stream will be cut off, and the drip-stream be permitted to flow out of said drip-

opening, and over an inclined bed of material supported on the valve, and be discharged over the edge of the valve, substantially as described.

2. In a weighing machine, the combination, with a supply-chute having a drip-opening in the lower edge of its front wall; and with a valve in position and operable under the supply-chute for controlling the discharge of material from the chute; of means for operating the valve for closing the same; a stop for holding the valve in position to cut off the main stream, while permitting the drip-stream to continue; and means for releasing the valve for cutting off the drip-stream, substantially as described.

3. In a weighing-machine, the combination, with a supply-chute having a drip-opening in the lower edge of its forward wall; and with the oscillating-valve in position and operable under said chute; of a horizontally-adjustable drip-gage in position and adapted for regulating the size of the drip-stream by adjustment, in a direction horizontally of the valve, but not vertically thereto, substantially as described.

4. In a weighing-machine, the combination, with a supply-chute having a drip-opening in the lower edge of its front wall; and with a valve in position and operable under the supply-chute for controlling the discharge of material from the chute; of means for operating the valve to close the same; connections for retaining the valve in a position to cut off the main stream by the intersection of the forward edge of said valve with the angle of repose of the main stream; thereby forming an inclined bed over which the drip-stream will continue to flow; and means for releasing the valve for cutting off the drip-stream, substantially as described.

5. In a weighing-machine, the combination with a supply-chute having a drip-opening; of a valve in position under the supply-chute, and operable for controlling the stream from said chute; a cam having successive faces of varying power and operative with the valve for effecting the closure thereof; and a valve-actuator for exerting a pressure on said cam-faces, and for coacting with said cam for operating the valve with varying forces for cutting off the main and drip streams in succession, whereby, when the main stream is cut off, the drip-stream will be permitted to flow out of the drip-opening and over an inclined bed of material supported on the valve, and be discharged over the edge of the valve, substantially as described.

6. In a weighing-machine, the combination with a supply-chute having a drip-opening with the walls thereof located above the lower edge of the supply-chute; of a valve in position under the supply-chute, and operable for controlling the main and drip streams from said chute; and means for holding the valve with its forward edge substantially coinciding with the angle of repose of the main-stream to cut off said main-stream, and for cutting off the drip-stream, whereby, when the main-stream is cut off, an inclined bed will be formed and supported by the valve, and over which the drip-stream will be permitted to flow, and be discharged over the edge of the valve, substantially as described.

7. In a weighing-machine, the combination with a supply-chute having a drip-opening of a narrow width, relatively to the supply-chute; of a valve in position under the supply-chute, and operable for controlling the streams from said chute; and means for holding the valve with its forward edge substantially coincident with the angle of repose of the main-stream for cutting off said main-stream, and for cutting off the drip-stream; whereby, when the main-stream is cut off, an inclined bed will be formed, and be supported by the valve, and over which the relatively-narrow drip-stream will be permitted to flow, and be discharged over the edge of the valve, substantially as described.

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