(No Model.) 3 Sheets—Sheet 1.

B. SIMONS.

WEIGHING APPARATUS.

No. 564,945. Patented July 28, 1896.

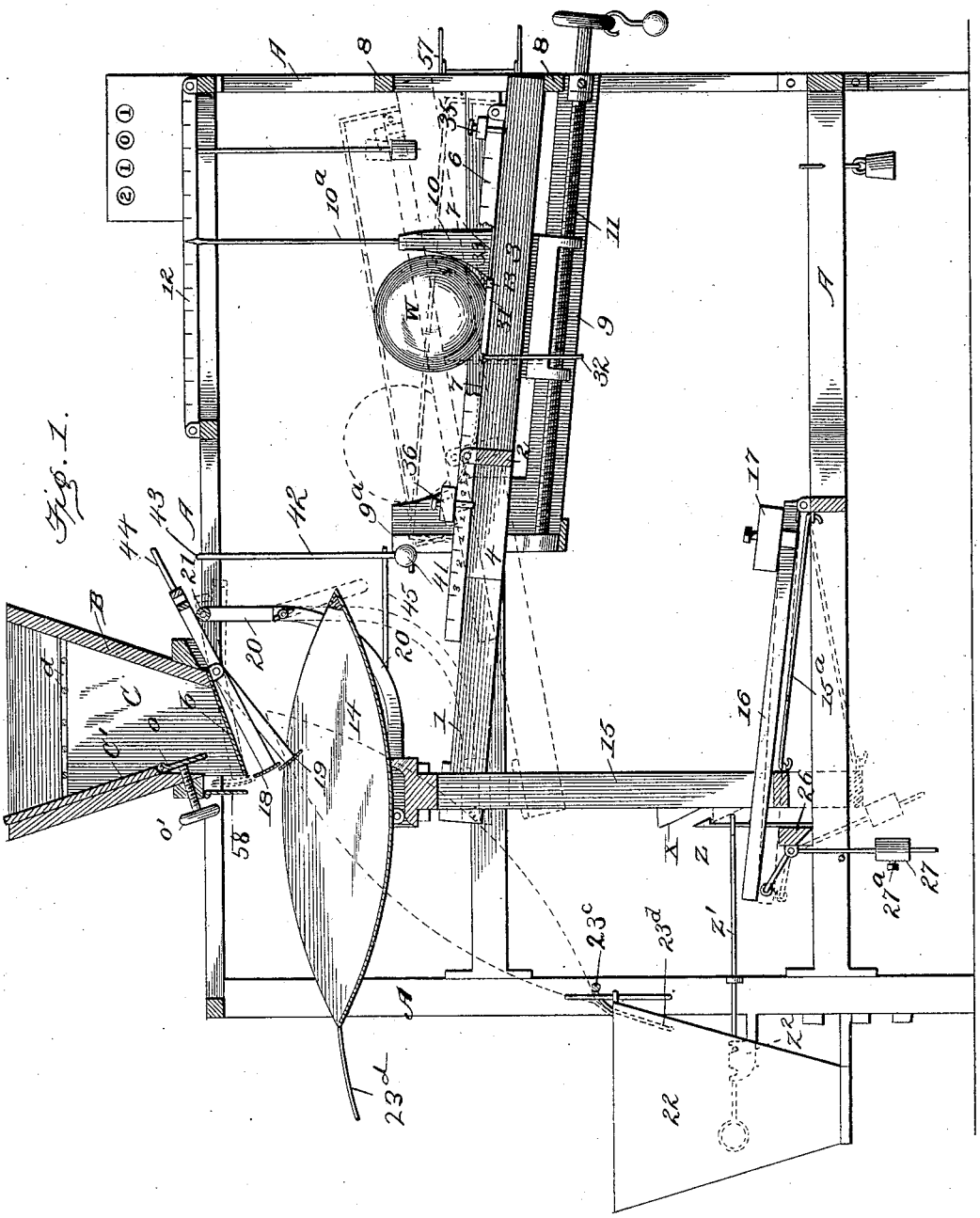


Fig. 1.

WITNESSES:

Edwin L. Bradford

W. S. Blondell

INVENTOR

Benjamin Simons

BY

V. D. Stockbridge & Son

his ATTORNEYS

(No Model.) 3 Sheets—Sheet 2.

B. SIMONS.

WEIGHING APPARATUS.

No. 564,945. Patented July 28, 1896.

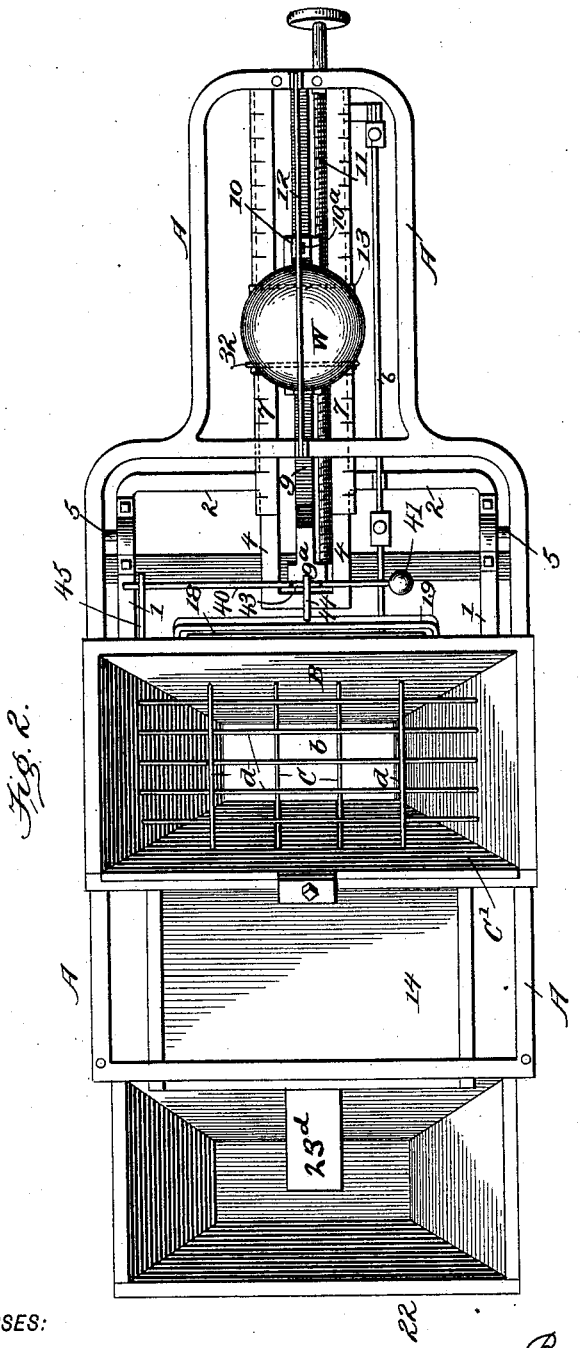


Fig. 2.

WITNESSES:

Edwin L. Bradford

M. D. Blondel.

INVENTOR

Benjamin Simons

BY

V. D. Stockbridge & Son

his ATTORNEYS

(No Model.) 3 Sheets—Sheet 3.

B. SIMONS.

WEIGHING APPARATUS.

No. 564,945. Patented July 28, 1896.

Fig. 3.

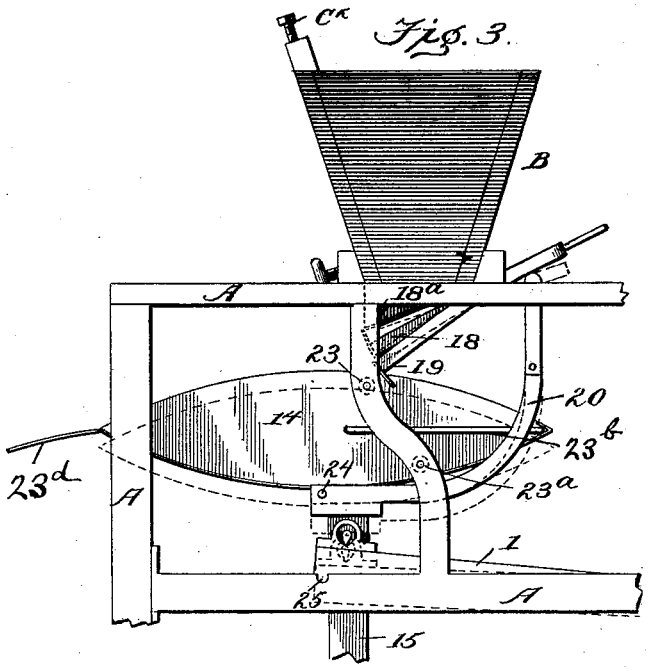
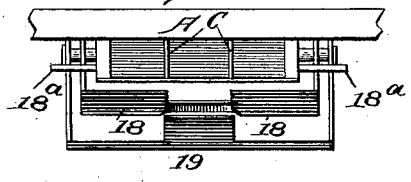


Fig. 4.



WITNESSES:

Edwin L. Bradford

M. D. Blondel.

INVENTOR

Benjamin Simons

BY

V. S. Stockbridge & Son

his ATTORNEYS.

UNITED STATES PATENT OFFICE.

BENJAMIN SIMONS, OF CHARLESTON, SOUTH CAROLINA.

WEIGHING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 564,945, dated July 28, 1896.

Application filed July 18, 1895. Serial No. 556,412. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN SIMONS, a citizen of the United States, residing at Charleston, in the county of Charleston and State of South Carolina, have invented certain new and useful Improvements in Weighing Apparatus; 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 appertains to make and use the same.

My invention relates to improvements in automatic weighing machines of the character described in my Patent No. 494,035, dated March 21, 1893, whereby great accuracy and sensitiveness is secured in continuously-operating machines.

The invention consists in certain combinations hereinafter fully described, and pointed out in the claims.

In the drawings forming a part of this specification, Figure 1 is a vertical longitudinal sectional view of my machine, showing the general arrangement of the operative parts. Fig. 2 is a plan view of the same. Fig. 3 is a side elevation of the forward end of the machine, the rear parts being broken away. Fig. 4 is a front view of the mouth of the feeding-hopper.

A is a suitable frame or support upon which the operative parts are mounted.

B is the hopper, through which grain or other material to be weighed is fed to the weighing-pan. The mouth of this hopper is arranged to discharge the material laterally downward from an inclined bottom part *b*. It is divided into compartments by transverse partitions C, which extend from the bottom toward the top, and has wires *d* extending longitudinally or crosswise thereof.

Grain being fed to the machine in the usual way first fills the central compartment and then overflows to the side compartments and fills the hopper. In case the hopper supply is cut off during the operation of the machine the central compartment becomes a reserve hopper to supply a drip-stream, as will hereinafter appear.

A hopper having inclined sides, with shelving bottom and lateral mouth, will discharge its contents at about a constant rate, whether it be wholly or partially filled. Some materials flow more freely than others, and therefore the size of the mouth-opening must be regulated to correspond with the character of the matter being weighed. To accomplish this, I arrange a vertically-adjustable gate or slide C′ next the front wall of the hopper to contract or enlarge the throat or mouth. The gate is slotted or notched at the lower edge, so that it will extend between the partitions C, and it is conveniently operated by an adjusting-screw C^2. This gate is also jointed to its carrying-frame at *o* in order that it may be adjusted toward and from the middle of the hopper to compensate for sluggishly-moving material. This adjustment is secured through the medium of the set-screw *o′*. This form of hopper having a side mouth or throat and having partitions and wires prevents the passage of elongated objects, as a bolt, a spade or the like, into the throat, and thus prevents interference with the valves or cut-offs, and consequent derangement of the working parts of the machine. Should an object lodge in the throat across the path of movement of the cut-offs, the stream of material would continue and no indication of the amount would be made.

My scale-beam or balance-frame, as shown in this application, consists of side bars 1 1, lateral parts 2 2, longitudinal extensions 3 3, arranged near each other and joined together at their rear extremities, and parts 4 4, extending forwardly from the parts 2 2, the parts 4 4 being also joined together. This scale-beam is preferably cast or made integral in substantially the form shown and is further provided with knife-edge balancing-points 5 5, the whole being supported in bearings on the main frame A in a well-known way.

Attached to and forming a part of the balance-frame is a graduated bar 6, for a purpose which will be described.

The adjacent parts 3 3 may serve as the track for a rolling weight W, in which case they would be graduated to indicate the proper place to adjust the ball-gage for a predetermined weight. I prefer, however, to removably attach to the upper surface of the parts 3 3 graduated trackways 7 7 for the rolling weight. These tracks are graduated, and their upper faces should be inclined, so that dirt will not lodge and interfere with the

movement of the weight. The forward ends of the tracks are by preference curved upwardly slightly in order to cause the rolling weight to start promptly on its return movement after the material has been dumped. The main frame A has thwarts 8 8 at the rear end which serve as rests and stops to limit the movement of the scale-beam, and has a longitudinal beam or way 9 arranged in planes between and below the parts 3 3 of the scale-beam. Upon this way is mounted an adjustable chock 10, which serves to stop the rolling weight when the scale is returned to loading position. This chock is conveniently operated and set at any desired point with relation to the scale-beam by means of the hand-screw 11, operating in lugs on a horizontal attachment of said chock. The horizontal attachment of the chock 10 is so adjusted that when the scale-beam is counterbalanced the ball-weight will be mainly supported on said attachment. By this means the scale-beam is relieved from the full pressure of the weight at all times except when a load is in process of being balanced.

Projecting upwardly through the space between the parts 4 4 is a fixed post or stop 9^a, suitably supported on the frame or extending from the beam or way 9. This stop is curved, as shown, and is arranged nearly opposite the scale-beam pivot and limits the forward movement of the rolling weight when the scale-beam tilts to dump the contents of the pan or bucket, the curved abutment serving to accelerate the return of the weight. The chock 10 carries a pointer 10^a, which, through a scale 12, indicates the weight to be taken for each operation of the machine.

In adjusting the machine for a predetermined weight the chock and its pointer are set at the desired point indicated on scale 12, and an adjustable ball-gage 13 is also set to the scale on the track 7 for the same weight. The office of the chock is to take the blow and force of the rolling weight, and that of the ball-gage 13 is to hold the weight after it has come to rest just out of contact with the chock, and thus prevent any rubbing friction of the weight against the chock as it is lifted by the scale-beam in the operation of weighing. The ball-gage may be anything which will hold the ball away from actual contact with the chock after it comes to rest, but that which I prefer consists of a cross bar or piece 13 to lay across the track in front of the chock. This cross-bar is provided with arms 31 31, which extend forwardly along the track, one of the arms having a secondary bar or stop-piece 32 jointed to it, as shown. The cross-bar 13 is secured in the desired position on the track by means of set-screws 33. The secondary bar or part 32 is for use to hold the ball in adjusted position for regulating and testing the machine.

The screw 11 may be held fast against the effects of jars in its adjusted position by means of a set-screw or a weight, as shown.

14 is a weighing pan or bucket supported on the forward extremities of the parts 1 1 of the scale-beam upon knife-edge pivots in the usual way.

A frame or loop 15 hangs on and depends from the forward end of the scale-beam, and within this loop is suspended the free end of a loosely-pivoted arm 16. The frame 15 is held to move in a vertical plane by means of a rod or link 15^a, which is parallel to and of the same length as the forward arm of the scale-beam. The main rolling weight balances the weight of the pan and its attachments at the forward end of the beam and the main portion of the material to be weighed, and the remainder of the load is balanced by the arm 16, which carries an adjustable weight 17 in order to time and regulate the first movement of the scale-beam.

18 and 19 are valves or cut-offs pivoted to the hopper, as shown, the former serving to throttle or partially cut off the flow of material being weighed at the first movement of the scale-beam, and the latter serving as the final or complete cut-off when the final descent takes place to dump the material from the pan. These valves are counterbalanced just enough to bring them to closed position against stop 18^a when not held open by external means.

Attached to the frame 15 are arms 20, which carry at their upper extremities a rod or rollers 21, which bear against the arms of the valves and hold them open when the pan is at rest and while it is receiving a load. The arms 20 are jointed, as shown, so that they may be bent to position shown in broken lines to enable the operator to test the machine and secure a balance of the beam and its connections as well as a balance of the beam when the pan is loaded while free from pressure of the valve-arms.

The pan is pivoted to the frame 15 and properly balanced to stand in normal position. A rod or pin carrying a roller 23 extends inward from the frame, serving as a stop to limit the swing of the pan as it dumps and as a means to bring it back to normal position when the pan and its frame rise to position for a fresh load. There is also a rod or pin 23^a, projecting inward from the frame, which, engaging a projection 23^b on the pan, serves to positively tilt or dump the pan on the downward movement of the scale after it has received its proper load or quantity to operate the machine. A tongue or plate projects from the pan, and when the pan is dumped projects down into the bin 22. The front end of the pan comes in contact with bar 23^c, and the rear end of the pan comes in contact with a stop 23 whenever the pan is dumped. These stops serve to take up the first impact of the pan, but recoil is liable to follow and strain to be transmitted to the scale-beam and its knife-edge pivot. In order to overcome this difficulty, I provide pins 24, projecting from the sides of the pan-

support, and also provide notches or sockets 25 at the sides of the frame, so that when the pan is dumped recoil and strain on the scale-beam pivots will be prevented. 23^d is a flap or apron connected with the main frame to positively guide the stream into the bin, whatever its horizontal position.

A thwart or bar 26 constitutes a part of the main frame and serves as a stop for the free end of the arm 16 when the pan and its attachments descend in the operation of weighing. 27 is a pendulous weight hung to the frame, as shown, in the range of the arm 16 and serves the function of preventing the vibration of the scale-beam and its connections when the beam makes its preliminary movement and allows the throttling-valve to close. The weight of the stream with a given opening at the mouth varies according to the specific gravity of the material and with its capacity to flow freely. To compensate for this variation and prevent vibrations of the pan at the end of its first or preliminary downward motion, I adjust the weight 27 vertically by means of set-screw 27^a to proportion its action to the weight of the stream which falls while the pan is moving from starting-point to its resting-point. By arranging the extremity of the laterally-extending arm of the pendulum out of contact with but in the path of the arm 16 and proportioning the increasing weight or resistance of the pendulum to the increasing weight of the bar 16, which is regulated by the weight of floating stream as it passes into the pan, the weight of the counterbalance 16 17, which serves to cause the pan to start on its first movement, will be partially but gradually taken up by the resistance of said pendulum, and the pan will settle gently down to the end of its first movement and momentarily come to rest without vibrating when bar 16 reaches cross-bar 26. The weighted bar 16 in connection with the pendulum thus becomes a variable counterbalance to carry the pan down by a constant, not increasing, preponderance of weight.

The graduated beam or bar 6 extends both ways from the pivot of the scale-beam and serves as a convenient means of testing the accuracy of the machine.

The bin 22 being adjusted at any given height will become filled after one or more dumps from the pan and the material will hold and prevent the pan from returning to normal position when full or when it extends over the projecting tongue or plate. The pan will thus be held until the bin or its contents are removed. In order to provide for weighing more or less material when the machine is adjusted to a given weight of material, I make the bin or the platform upon which the receptacle rests adjustable up and down, so that the receptacle may receive one or a plurality of dumps, as the case may be.

When the machine is used for bagging grain and the like, the bin is removed from the platform and a catch device is adjusted so as to prevent the pan from rising until it has been released by the operator. This catch device consists of a shoulder X on the frame 15 and a spring-hook Z to automatically engage therewith. When the machine is arranged for automatic or continuous operation, the spring-hook is removed and locked from engaging position by any suitable means, as by a rod or pull Z′, having a suitable catch to engage a shoulder Z^2 on the frame. 35 is an adjustable weight strapped to the scale-beam for trimming and maintaining the scale-beam on an even balance, and especially to compensate for change of balance upon adjustment of the ball-gage, and 36 is also a movable weight strapped to the graduated bar or beam 6 for counterbalancing the weight of the floating stream suspended in the air between the mouth of the feed-hopper and the pan when the cut-off takes place.

To adjust the machine for weighing different materials, first set the pointer 10^a to indicate on scale 12 the weight desired; then set ball-gage 13 to a corresponding point on scaled plate or track 7; place weight 36 over fulcrum, lower arms 20, take off ball W and balance scale-beam; then replace ball and rollers to engage lever-arms and bring stop 32 in front of the ball to hold the weight from movement; then feed from hopper to pan, and if first descent of pan and closure of the cut-off valves is approximately continuous from the start adjust weight 17 forward on the bar 16, so as to bring the loop in frame 15 down to a plane coincident with that of the top of cross-bar 26 of the frame before a full load has been deposited in the pan. When the full weight is taken in the pan and the final cut-off is closed, the pan stop or projection will come in contact with roller-pin 23^a on main frame and come to rest, the ball-weight being held from rolling forward by stop 32. Now, to show what is the actual weight of material in the pan, which is the amount indicated on scale 12, plus the weight of the floating stream, which varies according to material, capacity of mouth of hopper, and speed of current, lock the scale-beam to limit further upward and downward movement by means of bracket 37; then remove the ball-weight, lower arms, and place a standard-scale weight on the graduated-bar 6 and thus obtain the exact weight of the contents of the pan.

The difference between the actual weight and the weight indicated on the scale 12 is the measure of the floating stream which falls into the pan after the stream has been cut off. As the floating stream is constant for a given material with a given mouth-opening, I next move from over the fulcrum the weight 36 toward the pan to indicate the difference in weight of the material in the pan from that desired. The machine is now properly adjusted to operate automatically, and the standard weight may be removed from arm 6 and

the ball weight replaced, the stop 32 being swung to one side and arms replaced. When adjusted, the weight 36 is firmly clamped in place and remains there until a change is made in the mouth-opening or a different material is to be weighed.

Instead of removing the roller weight and employing a standard-scale weight to ascertain the actual weight of material in the pan, the ball or roller weight is locked by means of its stop 32, the grain is allowed to flow, the pan descends, the valves close, and the scale comes to rest against the rod or pin 23^a. The pan now contains the weight desired plus the weight of the floating stream. To show how much this is, slide the compensating weight 36 from the fulcrum on bar 6 to the right, or toward the main weight, until a balance is obtained between the weights and the grain; then observe the indicated weight on scale 6, which will be the weight of the floating stream; then move weight 36 forward of the fulcrum toward the pan to a point corresponding with the indicated weight of floating stream and finally clamp the weight in position. The scale is now adjusted to discharge the exact amount of material desired and as indicated on scale-bar 12.

In order to relieve the pan-frame from the weight of the counterbalance-frame of the final cut-off valve before the final descent of the pan to dump its contents, I attach to the main frame a vibrating frame to support and hold the final cut-off valve open until tripped by the descending pan. This vibrating frame consists of a pivoted beam or bar 40, carrying a counterweight 41 and a standard riser 42. The riser 42 has a rest or seat 43, which normally stands in the range of arm 44, when the pan and frame 20 are elevated to loading position. When the preliminary movement of the pan takes place and the throttling-valve 18 is closed, the projection 44 comes in contact with rest 43, and valve 19 is thereby held open out of contact with any connection of the pan. When the pan takes its second descent, a projection 45 from the pan-frame tilts the beam 40 and riser 42 and suddenly releases valve 19, which then promptly closes. Under this arrangement the valves may be heavily counterweighted to cut off coarse and heavy material without disturbing the accuracy and efficiency of the machine.

58 is a hood arranged in front of the mouth of the hopper to deflect the stream downward as it passes from the feed-hopper.

It should be noted that the blade of the throttling valve or gate 18 is cut away in the middle part and entirely closes the mouth of the hopper at the sides while permitting a narrow stream to flow from the middle of the hopper. This dribbling stream supplies the final quantity or load of material to the pan to cause its complete descent. The valve of gate 19 extends across the gap or notch in the throttling-valve and when released by the falling frame 20 or standard-riser 42 entirely cuts off the stream. These valves, operating in connection with a hopper divided into compartments by partitions C C, regulate the dribbling floating stream, so that its weight will be constant for a given material.

It should be understood that whenever a group of elements is referred to in the claims without special limitation any other group which will perform the same function is the equivalent thereof.

To prevent accidental displacement of the main weight from its track, I attach guard rails or rods to the scale-beam, as shown by broken lines in Fig. 1.

Having now described my invention, what I claim is—

1. In a weighing-machine, the combination of a scale-beam, an automatic weight, an adjustable chock supported on the main frame to arrest the weight at a predetermined point without shock to the scale-beam pivots, and a graduated scale to indicate the predetermined point of adjustment, substantially as described.

2. In a weighing-machine, the combination of a scale-beam, an automatic weight, an adjustable chock supported by the main frame to arrest the weight at a predetermined point, a pointer carried by the chock and a graduated scale, substantially as described.

3. In a weighing-machine, the combination of a scale-beam, an automatic weight, an adjustable weight-gage to hold the weight in predetermined position and a bar or stop connected with the weight-gage to prevent the weight from moving from adjusted position, substantially as described.

4. In automatic weighing-machines, the combination of an automatic cut-off valve, a scale-beam having graduations numbered in opposite directions and extending both ways from its fulcrum and an adjustable weight operative after closing the valve to compensate for the floating stream, substantially as described.

5. In a weighing-machine having a scale-beam provided with supplemental graduations, as 6, a cut-off valve, a counterweight and stop to give primary movement to the beam and weighing-pan and then allow a pause, the combination of such graduated scale-beam, and a second weight operative after the closing of the valve to compensate for the floating stream, substantially as described.

6. In a weighing-machine, the combination of a scale-beam frame having supplemental graduated testing-bar, an automatic weight, a weight-gage, and means connected with the scale-beam to hold the weight in gaged position, whereby the apparatus may be tested and adjusted to discharge a predetermined weight, substantially as described.

7. In a weighing-machine having an automatic weight, the combination of a scale-beam having a track for the weight and a movable support or way carrying the posterior adjust-

able chock only arranged between and below the trackway to sustain the weight while the pan is being loaded, substantially as described.

8. In a weighing-machine having an automatic weight, the combination of a scale-beam, a movable weight-gage and a trimming-weight to compensate for change of position of said weight-gage, substantially as described.

9. The combination of a feed-hopper having a laterally-discharging throat or mouth, upwardly-swinging cut-offs or valves and a movable support supported directly on the main frame to hold the valves open, substantially as described.

10. In a weighing-machine, the combination of a feed-hopper having a lateral discharge-mouth and partition extending from the bottom upward to separate the hopper into compartments, a counterbalanced throttling-valve swinging from below upward to register with and close one or more of the compartment-openings and a bracket to hold the valve open while the pan receives most of the load, substantially as described.

11. In a weighing-machine, the combination of a hopper, counterbalanced throttling and cut-off valves both pivoted behind the throat of the hopper and a jointed frame carrying rollers to normally open and hold the valves open while the pan is being loaded, substantially as described.

12. A feeding-hopper for weighing-machines having partitions extending from the bottom upward and forming within the main hopper a separate central reserve hopper or compartment and having combined therewith a throttling-valve as described so that the final drip-stream will be constant under variations of supply to the hopper.

13. In a weighing-machine, the combination of a weighing pan or bucket, a counterweight resting on balance-frame below the bucket before and during the preliminary movement of the scale-beam, a stop or holder for the counterweight, and a variable and adjustable counterbalance independent of and below said counterweight, substantially as described.

14. In a weighing-machine, the combination of a weighing-pan, a counterweight operatively connected with said pan, a stop for the counterweight, and a variable counterbalance for said weight, substantially as described.

15. In a weighing-machine, the combination of a weighing-pan, an adjustable counterweight operatively connected with said pan, a rest or stop for said weight and an adjustable pendulous weight to variably support the counterweight as the floating stream reaches the pan, substantially as described.

16. In a weighing-machine, the combination of a feed-hopper having a lateral discharge-mouth, a counterbalanced gate or valve, a support independent of the balance-frame to hold the cut-off valve open, and means for tripping said support after the movable support on the pan-frame has passed beyond the range of the valve-arm, substantially as described.

17. In a weighing-machine, the combination of a feed-hopper, a counterbalanced gate or valve for closing the mouth of said hopper, an independent support to hold the valve open a vibrating arm mounted on the frame and a projection from the pan-frame in the range of said vibrating arm, whereby, when the pan drops and the movable supports of the valve are out of the range of the valve-arms, the independent support is tripped and the valve closes, substantially as described.

18. In a weighing-machine, the combination of a scale-beam, an automatic weight, an adjustable chock and an adjustable weight-gage to hold the weight out of contact with the chock, substantially as described.

19. In a weighing-machine, the combination of a scale-beam, a pivoted pan or bucket suspended from said beam, stops to arrest the movement of the pan when dumped, and means to prevent recoil from being transmitted to the scale-beam pivots, substantially as described.

20. In a weighing-machine, the combination of a scale-pan, a pendant connected with said pan, and means connected with the frame to catch and hold the pan in its depressed position and thus arrest the operation of the machine, substantially as described.

21. In a weighing-machine, the combination of a scale-pan, a pendant connected with said pan, a catch connected with the frame to hold the pan and stop the machine, a handle to operate one part of the catch, and a lock or stop to hold the catch out of operative position, substantially as described.

22. In a weighing-machine, the combination of a feed-hopper divided into a plurality of compartments and having a lateral discharge-mouth, a throttling-valve notched to register with and close one or more of the compartments, substantially as described.

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

BENJAMIN SIMONS.

Witnesses:

V. D. STOCKBRIDGE,

HUGH M. STERLING.