

Feb. 23, 1932.

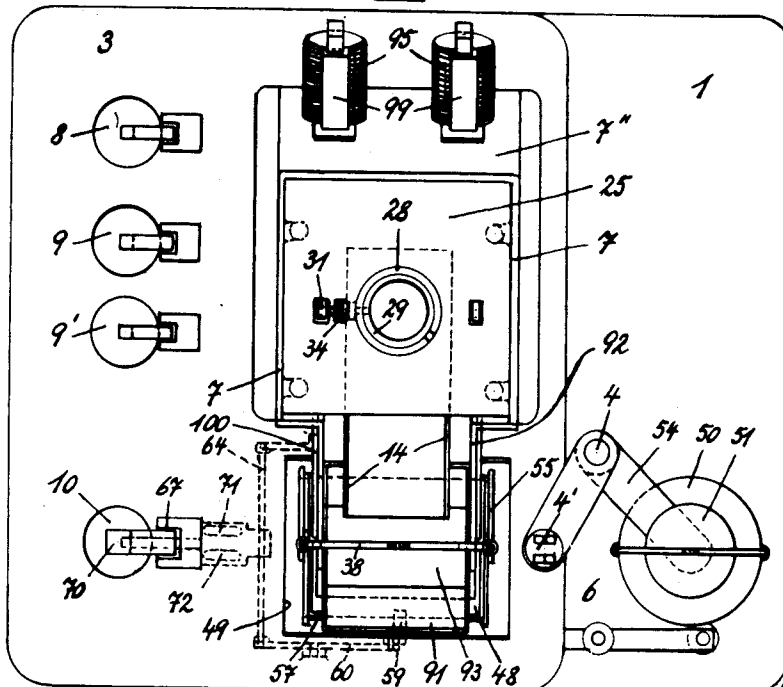
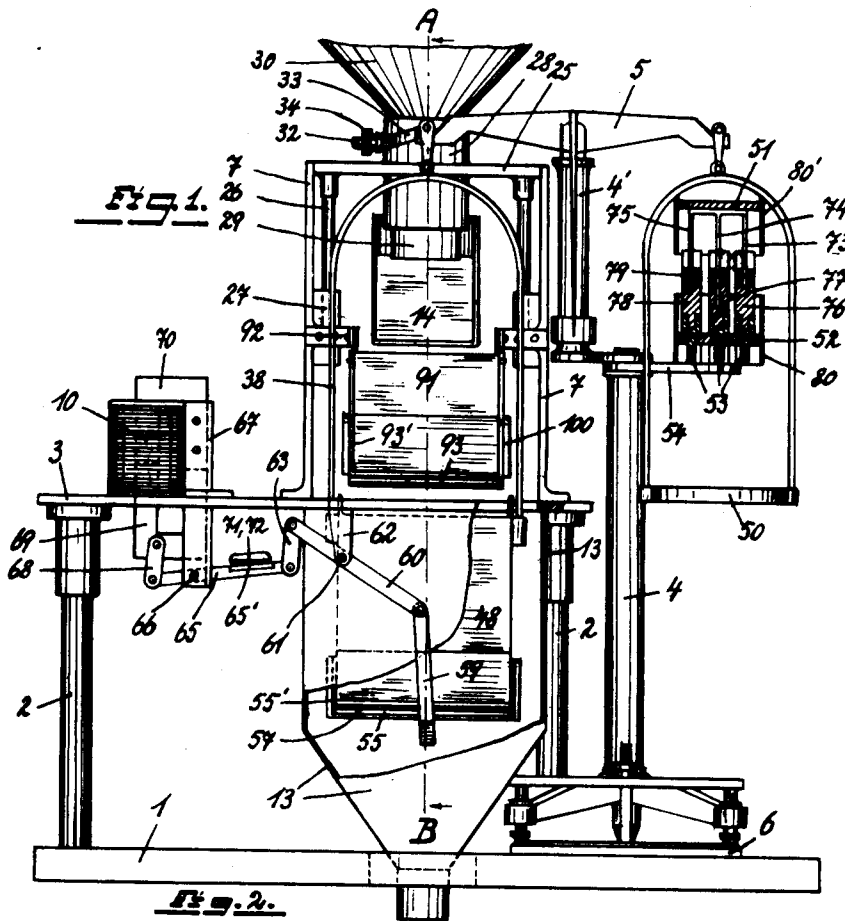
E. RUMPF

1,846,148

AUTOMATIC FEED WEIGHING APPARATUS

Filed June 25, 1929

3 Sheets-Sheet 1



Inventor:

ERNST RUMPF.

by His Attorney:

R. W. H. H. H.

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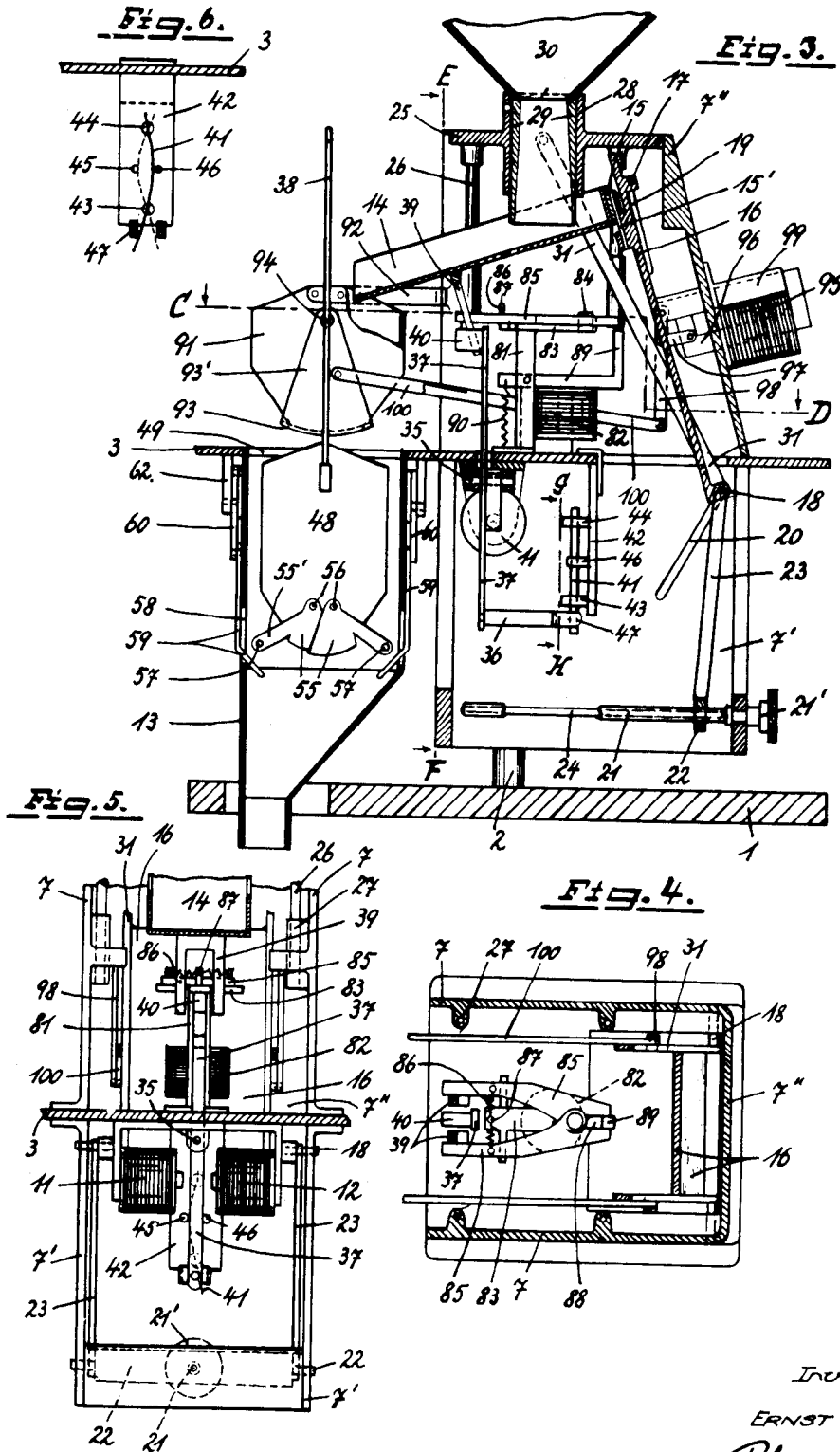
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3 Sheets-Sheet 2



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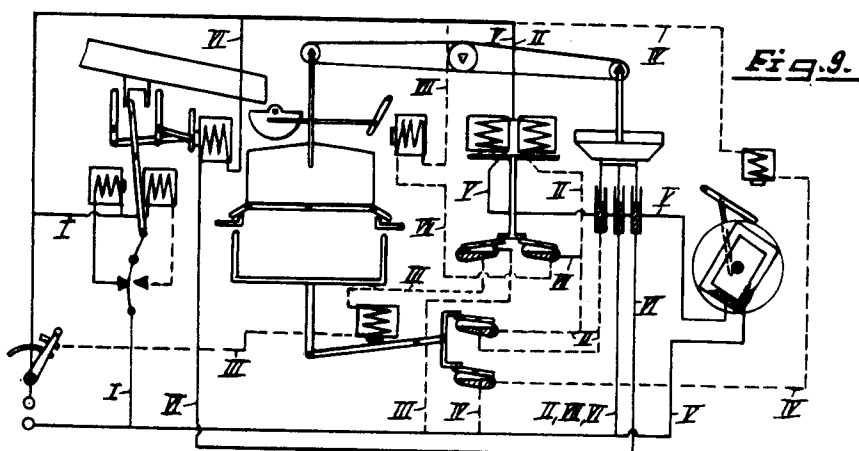
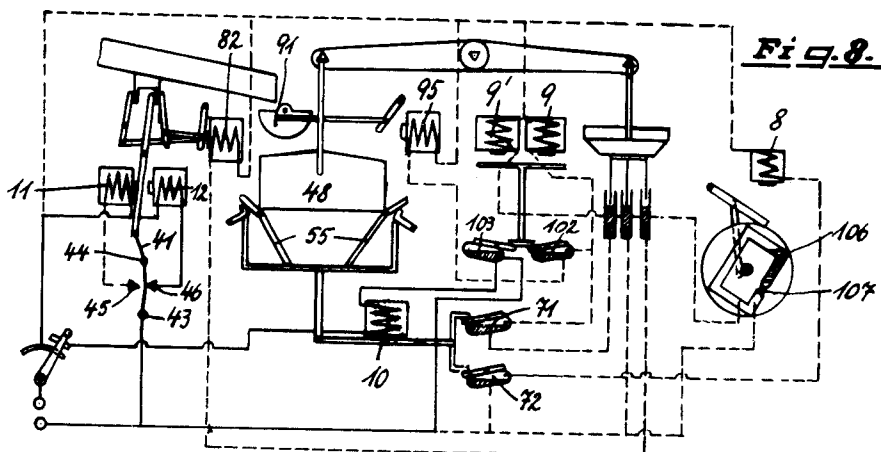
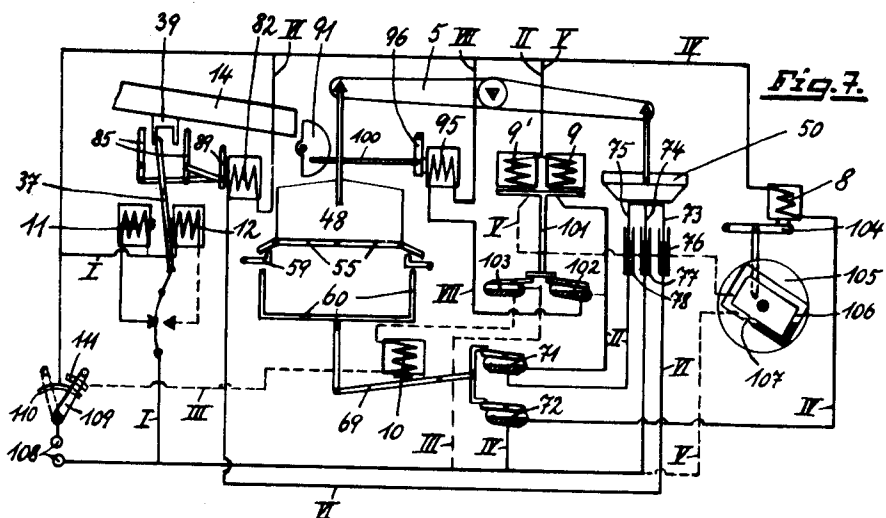
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AUTOMATIC FEED WEIGHING APPARATUS

Filed June 25, 1929

3 Sheets-Sheet 3



Inventor:

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UNITED STATES PATENT OFFICE

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AUTOMATIC-FEED WEIGHING APPARATUS

Application filed June 25, 1929, Serial No. 373,607, and in Germany June 29, 1928.

The invention relates to weighing apparatus for granular material, the term granular material being here used in the sense denoting any solid material which can be fed to the apparatus in a stream. The apparatus is of the kind in which the balance mechanism automatically controls the feed of the material, and the discharge thereof when weighed, and the object of the invention is to provide improved apparatus of this kind, capable of very accurate operation.

An embodiment of the invention is shown in the accompanying drawings, in which

Fig. 1 is an elevation thereof, partly in section,

Fig. 2 a plan view, with parts removed,

Fig. 3 a section on the line A—B of Fig. 1,

Fig. 4 a section on the line C—D of Fig. 3, partly broken away,

Fig. 5 a section on the line E—F of Fig. 3, and

Fig. 6 a section on the line G—H of Fig. 3.

Figs. 7, 8 and 9 are diagrams illustrating successive stages of operation.

The apparatus shown has a bed plate 1 with pillars 2 thereon, supporting a table 3, and a pillar 4, 4' supporting a balance beam 5, there being a sheet of lead 6 on the plate 1, under the pedestal of the pillar 4, 4'. Partly upon the table 3, and partly below it, there is a casing having side walls 7, 7' and a back wall 7'', and below the table there is a discharge hopper 13. Fixed to the table are electromagnets 8, 9, 9', 10, 11, 12 and 82. Partly within the casing there is a chute 14 having its rear end connected by a hinge 15 to an adjustable plate 16, whereby its angle of inclination can be regulated, the chute being also capable of rocking on the pin 15' of the hinge. The plate 16 has studs 17, 18 engaging into slots 19, 20 in the walls 7, 7', and the studs 18 are connected by two pivoted links 23 to a cross bar 22, which has a screw threaded eye engaging a horizontal screw spindle 21. The ends of the bar 22 engage into horizontal slots 24 in the walls 7', and by turning the screw spindle, which has for that purpose a milled button 21', the bar is moved horizontally, lifting or lowering the studs 18 in the inclined slots 20 which they

engage, so that the angle of the plate 16 and chute 14 is regulated, the height of the discharge end of the chute remaining, however, approximately the same.

Within the casing there is a horizontal plate 25 fixed to vertical rods 26, which are slidable in eyes 27 fixed to the casing. The plate 25 has an aperture, in which is fixed a cylindrical socket 28 for the discharge tube 29 of a feed hopper 30. The bore of the discharge tube 29 is coned, its internal diameter increasing towards the lower end. By raising or lowering the plate 25 with the feed hopper 30 the lower end of the tube 29 is kept at an approximately constant distance from the chute 14. Two pivoted links 31 connect the plate 25 to the studs 18 on the plate 16, so that when the studs are moved the plate 25, with the hopper 30, is also moved. The hopper itself, with the discharge tube 29, can be separately adjusted relatively to the plate 25, the tube 29 having fixed thereto a bolt 32 projecting through an inclined slot 33 in the socket 28, so that the hopper can be raised and lowered by turning it. On the bolt there is a nut 34, for fixing the hopper at the selected height.

The chute 14 is vibrated horizontally by means of the electromagnets 11, 12, which have between them an armature 37, pivoted at 35. The armature has fixed thereto an elastic buffer 40, extending with lateral clearance into a fork 39 projecting from the chute, the effect of the buffer being that when the armature is vibrated it pushes the fork strongly to one side or the other towards the ends of its vibratory movement.

In the circuits of the electromagnets 11, 12, there is a switch, best shown in Fig. 6. An insulator 42 fixed to the table 3 carries two rotatable studs 43, 44, to which a contact spring 41 is so fixed that it is bent, under stress, and normally assumes either the position shown by a solid line or the position shown by a broken line in Fig. 6. In these two positions the spring makes contact with contact studs 46 and 45 respectively, thereby closing the circuits of the electromagnets 12 and 11 respectively. One end of the spring lies between the limbs 47 of an insulating

fork 36 fixed to the armature 37, so that vibration of the armature causes the spring to snap into contact with the studs 45 and 46 alternately, making and breaking the circuits of the electromagnets 11 and 12. It will be seen that when the apparatus is at rest one or other of the circuits is always closed, and that the breaking of the closed circuit does not occur till the swing of the armature, with the chute, is nearly completed.

Upon the table 3 is a post 81 with an arm 83 having at 84 a pivot for two levers 85 capable of operating in the manner of a pair of nippers. The longer arms of these levers abut against the outside surfaces of the fork 39 fixed to the chute 14, these arms being pulled towards each other by coiled springs 86 attached to them and to a stud 87 on the arm 83. Between the shorter arms of the levers there is a gap 88. An electromagnet 82 near the post has an armature 89 pivoted to the post, with an upwardly directed arm and a spring 90 tending to rock it so that this arm enters the gap 88, but when the electromagnet is energized the arm is withdrawn from the gap. The chute 14 discharges into a container 91, and when this pan has received nearly the full charge the electromagnet 82 is automatically de-energized, as will be described hereinafter, so that the armature arm, which preferably has a rounded end, enters the gap 88. This practically stops the rocking movement of the chute, which is then only capable of very slight vibration, so that its rate of discharge is much reduced.

The container 91 is above the scale bucket 48 and is carried by brackets 92. It has a bottom aperture with a shutter 93, the latter being connected by hangers 93' to pivots 94 on the container. This shutter can be opened by means of electromagnets 95 fixed to the wall 7'' of the container. The electromagnets 95 have armatures 96 connected by links 97 to levers 98 suspended from brackets 99, and the levers 98 are connected by links 100 to the hangers 93' of the shutter, so that they open the shutter when the electromagnets are energized.

The bucket 48 is suspended from one end of the balance beam 5 by means of a yoke 38, and hangs within the hopper 13, the table 3 having an opening 49 for the bucket. The latter has at the bottom an opening, for which there are two shutters 55 pivoted at 56. These shutters, which are rounded, overlap each other when closed, and each of them has two arms 55' connected to each other by a cross bar 57. Facing the bars 57 the hopper wall 60 has openings 58, through which project the inwardly bent ends of rods 59 suspended from levers 60 pivoted at 61 to brackets 62. The levers 60 are connected by links 63 to a rod 64 fixed to a lever 65, which is pivoted at 66 to a U-shaped support 67 and is connected

by a link 68 to the armature 69 of the electromagnet 10, the armature being guided by the support 67, to which the core 70 of the electromagnet is fixed. Upon an enlargement 65' of the lever 65 there are two mercury switches 71, 72, consisting of tubes partly filled with mercury, and having wires extending thereinto, for a purpose to be described hereinafter. When the electromagnet 10 is energized it lifts the rods 59, which strike the bars 57 and open the shutters 55.

The balance beam 5 has at its other end a weight pan 50, to the yoke of which is fixed, near the top, an insulating plate 51 with three thin contact rods 73, 74, 75 projecting downwardly therefrom. An arm 54 of the post 4 carries an insulating plate 52, upon which are three mercury cups 76, 77, 78, the cups having terminals 53 at the bottom, for connecting wires thereto. The contact rods 73, 74, 75 enter the cups, and to prevent sparking when they are withdrawn there is a layer of oil 79 over the mercury in each cup. Around the lower parts of the mercury cups there is casing 80 and a similar casing 80' is fixed to the plate 51.

The electromagnets 9, 9' below the table 3 have an armature 101 (Fig. 7) common to both, and this armature acts on two pivoted mercury switches 102, 103, as will be described hereinafter.

The electromagnet 8, also below the table 3, has a pivoted armature 104 (Fig. 7) connected by a link to a rotatable disk 105. To this disk is fixed a tubular mercury switch 106 having a constriction 107 whereby the flow of the mercury therein is retarded in certain positions of the switch.

The circuit arrangements and the working of the apparatus will now be described with reference to the diagrammatic representation in Figs. 7, 8 and 9. It is, however, to be noted that in these figures the parts are not all shown in their true positional relation to each other. Moreover, the container 91 is in Figs. 7, 8 and 9 represented as a bowl which is tilted for discharging its contents, instead of having an opening with a shutter at the bottom, and the levers 85 are shown as being separately pivoted, instead of having a pivot common to both. Only one electromagnet 95 is shown. The wires comprised in the electric circuits are represented in part by solid lines and in part by broken lines, the latter being in general used where the wires are dead.

There is a circuit I including the spring 41 controlling the connection to the electromagnets 11 and 12 which vibrate the chute 14.

There is a circuit II including the electromagnet 9, the mercury switch 71, whereby this circuit is broken when a certain tilt is given to the lever 65, and the mercury cup 78 and rod 75.

There is a circuit III including the elec-

tromagnet 10 and the mercury switch 103, which breaks this circuit when tilted into a certain position.

A circuit IV includes the electromagnet 8 and the mercury switch 72.

A circuit V includes the electromagnet 9' and the mercury switch 106.

A circuit VI includes the electromagnet 82, the mercury cup 76, and the contact rod 73.

A circuit VII includes the electromagnet 95 and the mercury switch 102; this circuit is branched off the circuit II.

There are terminals 108 for connection of the circuits to the mains, the connections being controlled by a main switch 109 with contact segments 110 and 111.

In Fig. 7 the parts are shown in the positions occupied during the weighing of a quantity of material passing from the feed hopper 30 by way of the chute 14 to the bucket 48, the appropriate weight or weights being placed on the weight pan 50, and the main switch 109 being closed.

The circuit I being energized, the chute 14 is vibrated by means of the electromagnets 11 and 12 to cause the discharge of the material therefrom, the electromagnet 82 in the circuit VI being likewise energized, so that the armature 89 is withdrawn from the levers 85. The circuits II and VII being likewise energized, the electromagnet 95 tilts the container 91 (or holds open the shutter 93 shown in Fig. 3) so that this container allows the material to pass into the bucket 48. The electromagnet 8 is energized, and by means of its armature 104 holds the mercury switch 106 in open position, so that the circuit V is dead.

When a certain weight of material has been discharged into the bucket 48 the lifting of the scale pan 50 withdraws the contact rod 73 from the mercury cup 76 and breaks the circuit VI, de-energizing the electromagnet 82, so that its armature 89 engages the levers 85 and nearly stops the vibration of the chute 14, greatly reducing the rate of discharge. When the weight of material in the bucket 48 balances the weight on the scale pan from the contact, rod 75 is withdrawn from the mercury in the cup 78, so that the circuit II is broken, de-energizing the electromagnet 9, so that the switch 102 breaks the circuit VII. The conditions shown in Fig. 8 are then established.

The electromagnet 95 is de-energized, causing the container 91 to be rocked, or closed, so that it retains material discharged by the chute 14. The electromagnet 10 is energized, and its armature opens the discharge opening of the bucket 48, allowing the weighed material to be discharged into some appropriate receptacle. By rocking the lever 65 this armature also opens the switch 71, so that the circuit II remains broken, though the weight pan descends after the discharge of the

weighed material, and causes the rod 75 to enter the mercury cup 78. The switch 72 is also opened and breaks the circuit IV, de-energizing the electromagnet 8, so that the switch 106 rotates to the position shown in Fig. 8, preparatory to closing the circuit V, the mercury flowing slowly through the constricted part 107 and closing the circuit after an interval sufficient to allow of complete emptying of the bucket 48 before the electromagnet 9' is energized. When the descending weight pan causes the rod 73 to enter the cup 76 the electromagnet 82 is energized and withdraws its armature 89 from the levers 85, so that the chute 14 is again strongly vibrated, but the material which it discharges is still for a time retained by the container 91. However, after an interval the switch 106 closes the circuit V, as shown in Fig. 9, causing the electromagnet 9' to open the switch 103, whereby the electromagnet 10 is de-energized and allows the shutters 55 to close the bucket 48. The switch 71 is closed, closing the circuit II, so that the electromagnet 9 closes the circuit VII, so that the electromagnet 95 rocks or opens the container 91, which discharges its contents into the bucket 48 and allows the chute 14 to discharge directly into that bucket. The switch 72 is also closed, so that the electromagnet 8 opens the switch 106, de-energizing the electromagnet 9', without, however, allowing the armature 101 to drop, because the electromagnet 9 is energized. In Fig. 9 broken lines are used to represent the wires of the circuits II and IV, though these circuits are live, this being done to differentiate from Fig. 7.

When the main switch is closed the switch lever 109 first touches only the segment 110, and then contacts also with the segment 111, which is in the circuit III, all the other circuits being connected to the segment 110. This ensures that the switch 103 is opened before the circuit III is energized, and so prevents risk of the bucket 48 being opened temporarily at the start.

If the switch lever 109 is left in contact with the segment 110 alone, as indicated by broken lines in Fig. 7, all the operations described take place except the opening of the bucket 48. This enables the accuracy of the weighing operation to be tested, by observing the balance at rest when the container 91 has cut off the supply of further material to the bucket 48.

What I claim as my invention and desire to secure by Letters Patent of the United States is:—

1. In weighing apparatus the combination of a balance having a goods receptacle and a weight receptacle, an inclined feed chute for charging said goods receptacle, an electromagnetically actuated device for vibrating said chute, an electromagnetic device for opening said goods receptacle for the dis-

charge of goods, having in its circuit switch mechanism controlled by said balance, and an electromagnetically actuated device having in its circuit switch mechanism controlled by said balance, for damping the vibration of the chute prior to completion of the balancing operation.

2. The combination claimed in claim 1, the electromagnetic device for vibrating the chute including two electromagnets, a vibratory armature common to said electromagnets, two electric contacts in the circuits of said electromagnets respectively, and a contact spring connected to said armature under stress, whereby it has two alternative positions of rest against said electric contacts respectively.

3. The combination claimed in claim 1, together with a receptacle and electromagnetic controlling means therefor, for intercepting goods discharged from the chute at the end of each weighing operation, and then discharging the intercepted goods into the goods receptacle of the balance.

4. The combination claimed in claim 1, together with means for adjusting the angle of inclination of the feed chute without substantially varying the position of the discharge end of said chute.

5. The combination claimed in claim 1, together with a casing partly surrounding the feed chute, a supporting plate for said chute, slidably engaged with said casing, and means for adjusting said plate for regulating the angle of said chute without substantially varying the position of its discharge end.

6. The combination claimed in claim 1, together with a casing partly surrounding the feed chute, a supporting plate to which said chute is pivoted, slidably engaged with said casing, and means for adjusting said plate for regulating the angle of said chute without substantially varying the position of its discharge end.

7. The combination claimed in claim 1, together with a feed hopper discharging into the chute and means for collectively adjusting said hopper and said chute so that the angle of inclination of said chute is altered without substantially altering the distance between said chute and said hopper.

8. The combination claimed in claim 1, together with a feed hopper discharging into the chute and means including a screw spindle for collectively adjusting said hopper and said chute so that the angle of inclination of said chute is altered without substantially altering the distance between said chute and said hopper.

9. The combination claimed in claim 1, together with a feed hopper discharging into the chute and means including a screw spindle and a vertically guided plate supporting said hopper for collectively adjusting said hopper and said chute so that the angle of

inclination of said chute is altered without substantially altering the distance between said chute and said hopper.

10. The combination claimed in claim 1, together with a feed hopper discharging into the chute and means including a screw spindle and a vertically guided plate supporting said hopper for collectively adjusting said hopper and said chute so that the angle of inclination of said chute is altered without substantially altering the distance between said chute and said hopper and including also means for vertically adjusting said hopper on the plate supporting the same.

11. The combination claimed in claim 1, together with a receptacle interposed between the chute and the goods receptacle of the balance, having a discharge orifice and a shutter therefor, and an electromagnetic device having in its circuit a switch controlled by the balance, whereby said shutter is closed at the end of each weighing operation.

12. The combination claimed in claim 1, together with two double armed levers having a common fulcrum, engaging the device which vibrates the chute, springs connected respectively to one arm of each of said levers, and an electromagnet having an armature adapted to engage between the other arms of said levers, and having in its circuit a switch controlled by the balance, whereby said armature is caused to engage between said arms and damp the vibration of the chute prior to completion of the weighing operation.

13. The apparatus claimed in claim 1, having the controlling electromagnets 9, 9', the armature 101 common to said magnets, and the switch 102, 103, substantially as illustrated.

14. The apparatus claimed in claim 1, having the electromagnet 10, armature 69, lever 65 and switch 71, 72 substantially as illustrated.

15. The apparatus claimed in claim 1, having the electromagnet 10, armature 69, shutter 55, and actuating mechanism 68, 65, 63, 60, 59, substantially as illustrated.

16. The apparatus claimed in claim 1, having the mercury cups 76, 77, 78 and contact rods 73, 74, 75 arranged substantially as illustrated.

17. Weighing apparatus having in combination a balance, feed mechanism and discharge mechanism, and electromagnetic devices controlling the same, having the circuits I, II, III, IV, V, substantially as illustrated.

18. Weighing apparatus having in combination a balance, feed mechanism and discharge mechanism, and electromagnetic devices controlling the same, having the circuits I, II, III, IV, V, VI, substantially as illustrated.

19. Weighing apparatus having in combination a balance, feed mechanism and discharge mechanism, and electromagnetic de-

vices controlling the same, having the circuits I, II, III, IV, V, VI, VII, substantially as illustrated.

5 20. Weighing apparatus having in combination a balance, feed mechanism and discharge mechanism, and electromagnetic devices controlling the same, having circuits I, II, III, IV, V, and a main switch whereby the circuit III is closed subsequently to the closing of the other circuits, substantially as illustrated.

10 21. The apparatus claimed in claim 1, having the mercury cups 76, 77, 78 and contact rods 73, 74, 75, the longest rod 74 supplying the current, the shortest rod 73 controlling the circuit VI, and the third rod 75 controlling the circuit II, substantially as illustrated.

15 In witness whereof I have signed this specification.

20 ERNST RUMPF.

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