PUBLISHED
MAY 25, 1943.
BY A. P. C.

T. RIVAL
AUTOMATIC WEIGHING DEVICE
Filed Oct. 5, 1939

Serial No.
298,141
3 Sheets-Sheet 1

FIG. 1

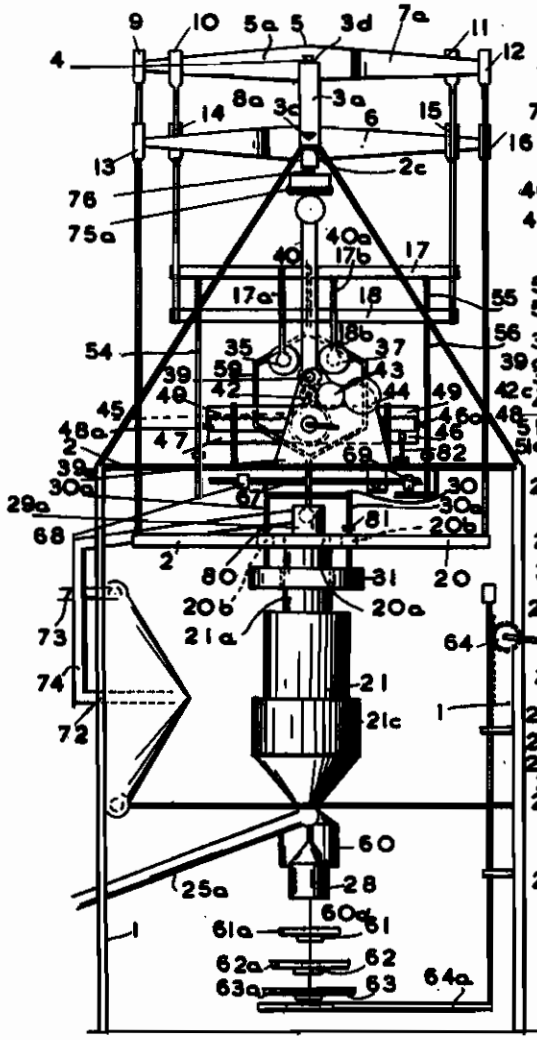

FIG. 2

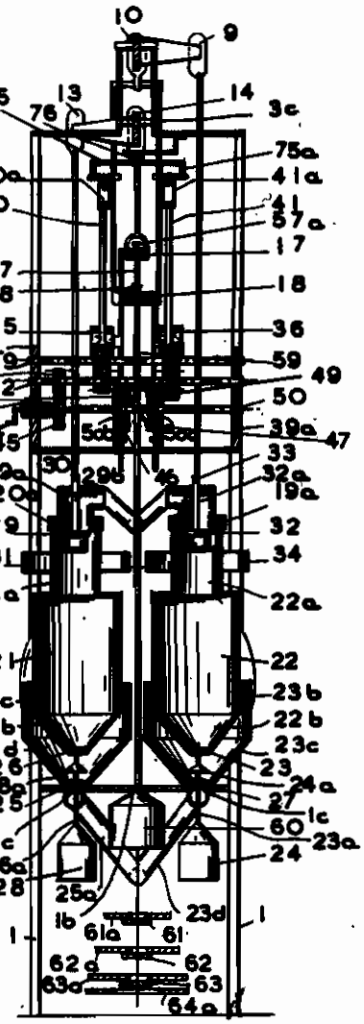

FIG. 4

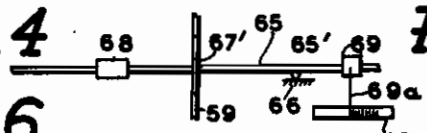

FIG. 5

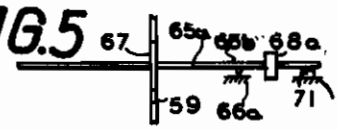

FIG. 6

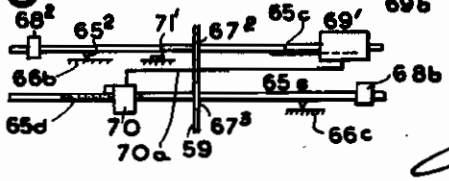

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FIG. 3

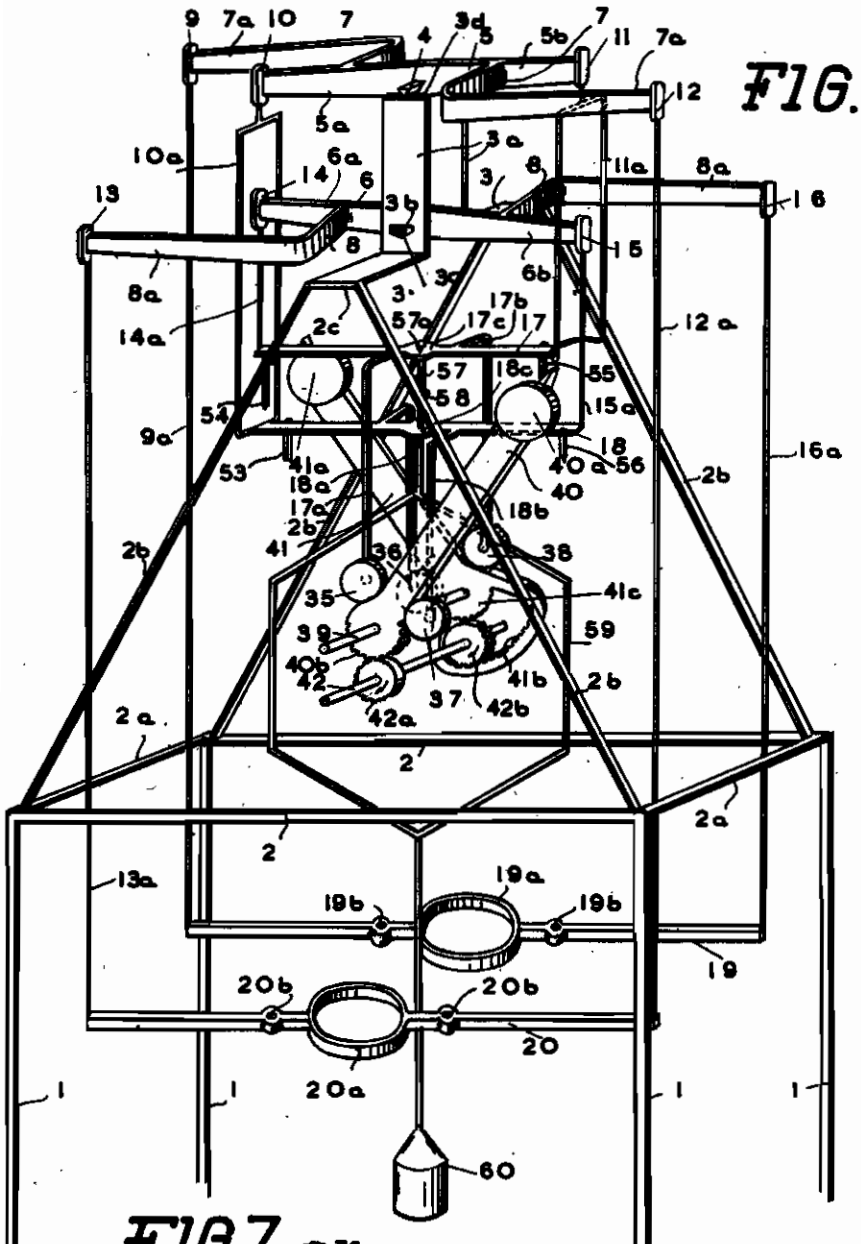

FIG. 7

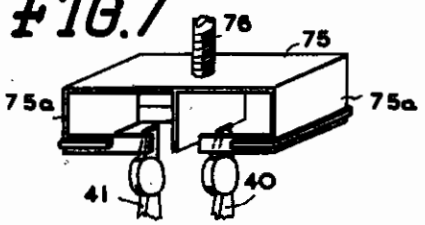

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FIG. 8

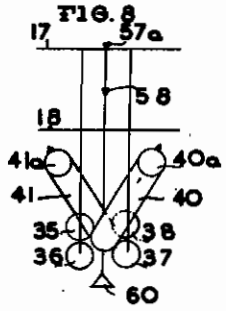


FIG. 10

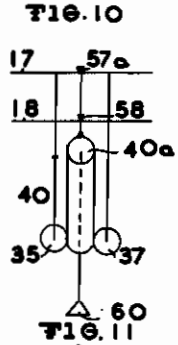


FIG. 12

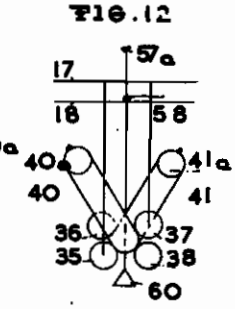


FIG. 14

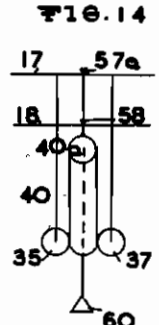


FIG. 16

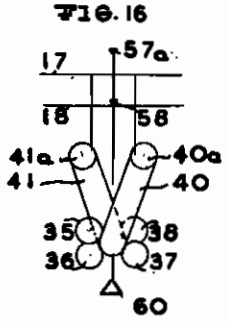


FIG. 9

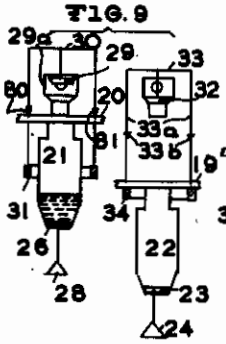


FIG. 11

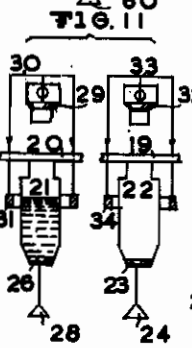


FIG. 13

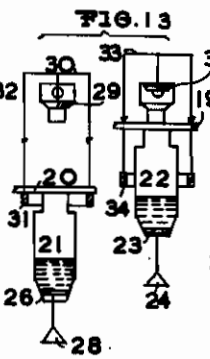


FIG. 15

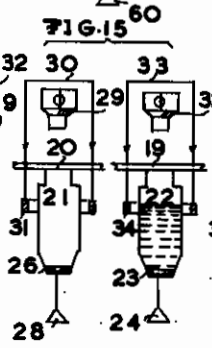
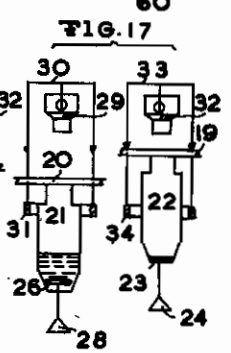


FIG. 17



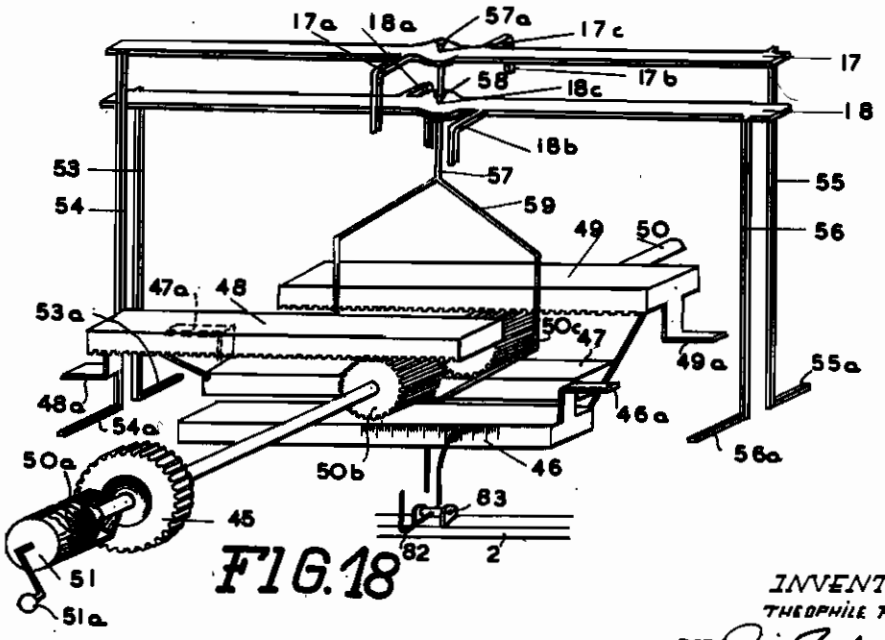


FIG. 18

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ALIEN PROPERTY CUSTODIAN

AUTOMATIC WEIGHING DEVICE

Theophile Rival, Brussels, Belgium; vested in the Alien Property Custodian

Application filed October 5, 1939

This invention relates to measuring devices and has special reference for an automatic weighing device for measuring and discharging successive weighed quantities of material.

The present application is a continuation-in-part of my prior application for patent on automatic scale for weighing et cetera, Serial No. 131,948 filed March 19, 1937.

One important object of this invention is to provide a novel and improved weighing device, wherein a pair of material receiving vessels are alternately filled and alternately emptied, each vessel being filled at the time the other is being emptied.

A second important object of the invention is to provide a novel double tilting beam supporting means for the weighing vessels used, the arrangement being such that the vessels are alternately depressed by weight therein and the beams so tilted as to raise the unweighted vessel.

A third important object of the invention is to provide a novel arrangement of weights and operating means therefor in such a device.

A fourth important object of the invention is to provide a novel arrangement of control weight and operating means therefor in such a device.

A fifth important object of the invention is to provide novel stop means for the device to prevent operation thereof.

A sixth important object of the invention is to provide a novel arrangement for increasing the effective weight of said control weight at a certain stage in the operation of the device.

With the above and other objects in view, the invention consists in general of certain novel details of construction and combinations of parts hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims.

In the accompanying drawings, like characters of reference indicate like parts in the several views, and

Figure 1 is a side elevation of the complete apparatus forming this invention.

Figure 2 is a vertical median section at right angles to Figure 1.

Figure 3 is an enlarged perspective view of the upper part of the apparatus, certain of the parts being omitted and others broken away to better show the remaining parts.

Figure 4 is a detail elevation of a certain supplemental weight device used with this apparatus.

Figure 5 is a detail elevation showing a modification of the device of Figure 4.

Figure 6 is a detail showing a second modification of the device of Figure 4.

Figure 7 is a detail perspective of a form of stop used in this invention.

Figure 8 is a diagrammatic view showing the positions of certain weight arms and the operating means therefor at the start of the weighing operations.

Figure 9 is a diagrammatic view of the weighing vessels and associated parts when the weight arms are positioned as in Figure 8.

Figure 10 is a view similar to Figure 8, but showing a second position of the arms.

Figure 11 is a view similar to Figure 9, but showing a second position of the vessels.

Figure 12 is a view similar to Figure 8, but showing a third position of the arms.

Figure 13 is a view similar to Figure 9, but showing a third position of the vessels.

Figure 14 is a view similar to Figure 8, but showing a fourth position of the arms.

Figure 15 is a view similar to Figure 9, but showing a fourth position of the vessels.

Figure 16 is a view of the arms in position to start a new cycle of operations.

Figure 17 is a view of the vessels in position to start said new cycle of operations.

Figure 18 is a perspective view of certain stop arrangements used in this device.

In the construction of the invention according to the illustrated embodiment, there is provided a lower or main frame of generally rectangular form and having at its corners upright members or legs 1. A platform 1*a* is supported by the legs 1 and is provided with a centrally located opening 1*b*, and a pair of laterally disposed openings 1*c*, the purposes of which will be presently described. The upper ends of the legs 1 are connected by longitudinal members 2 and transverse members 2*a*. At each side of the frame is a pair of side frame members of general inverted V-shape, and each consisting of converging members 2*b*, rising from the ends of a member 2, and connected at their upper ends by a horizontal member 2*c*. Extending toward each other from the members 2*c*, are the horizontal arms 3 of brackets having vertical arms 3*a*, each provided with an opening 3*b*, forming a seat for a knife edge 3*c*, the openings 3*b* being alined to receive the opposite ends of said knife edge. The upper end edges 3*d* of these brackets form knife edge seats for the ends of a knife edge 4. The knife edge 4 is fixed in beam 5, here shown as having arms 5*a* and 5*b* of equal lengths. The knife edge 3*c* is fixed in a beam 6 having arms 6*a* and 6*b*

also of equal lengths. Furthermore, the arms of the beam 5 are equal in length to the arms of the beam 6. Extending from opposite sides of the beam 5 and at equal distances from the knife edge 4, is a pair of arms 7 having terminal extensions 7a arranged parallel to the beam 5 and terminating at equal distances from the knife edge 4. Extending from opposite sides of the beam 6 at equal distances from the knife edge 3c is a pair of arms 8 having terminal extensions 8a arranged parallel to the beam 6 and terminating at equal distances from the knife edge 3c. The moment lengths of the arms 7a in relation to the knife edge 4 are equal to the moment lengths of the arms 8a in relation to the knife edge 3c. The balancing beams 5 and 6 are thus duplicates and equivalents. Knife edge loops 9 and 12 are hooked on the end portions of the arms 7a, and knife edge loops 10 and 11 are hooked on the end portions of the arms 5a and 5b. Knife edge loops 13 and 18 are hooked on the end portions of the arms 8a, and knife edge loops 14 and 15 are hooked on the end portions of the arms 8a and 6b. At 17 and 18 is a pair of horizontally disposed parallel motion bars which are of equal lengths to the beams 5 and 6. A yoke 10a connects one end of the bar 18 to the loop 10, and a yoke 11a connects the opposite end of the bar 17 to the loop 11. The purpose of these yokes is to straddle the ends of the beam 6 and thus to prevent the movement of one beam from interfering with the movement of the other beam. A rod 14a connects the remaining end of the bar 17 to the loop 14, and a rod 15a connects the remaining end of the bar 17 to the loop 15. The loops, yokes and rods just described form hangers for the bars 17 and 18, and it will be noted that the hangers depending from each beam are connected to different parallel motion bars at opposite ends of said bars.

Disposed vertically below the arms 7a and 8a at one side of the beams is a load carrying bar 19, and a similar bar 20 is vertically disposed below the other arms 7a and 8a. The loop 9 is connected to one end of the bar 19 by a rod 9a. The loop 12 is connected by a rod 12a to the opposite end of the bar 20. The loop 18 is connected by a rod 18a to the remaining end of the bar 19, and the loop 13 is connected to the remaining end of the bar 20 by a rod 13a. The loops and rods just referred to form hangers and each beam is connected by hangers to the opposite ends of the respective load carrying bars.

Suppose now that the bar 19 is depressed by weight applied thereto. This will cause the arms 5a and 6b to tilt downwardly and the arms 5b and 6a to tilt upwardly. The tilting of the beams 5 and 8 in this manner will cause the bar 17 to rise and the bar 18 to move downwardly. If, on the other hand, the bar 20 is depressed, then the bar 18 will rise and the bar 17 will be depressed in accordance with the tilting of arms 6a and 5b downwardly and arms 6b and 5a upwardly.

It will be noted that there are two linkage systems, one connecting the bar 19 and the bar 18, and the other connecting the bar 20 and the bar 17, and that the action of each system is to produce vertical movement of the bars 17 and 18 in opposition to the movements of the bars 20 and 19 respectively. Since the several elements of one system are duplicates of the corresponding elements of the other system, one system will balance the other, and unless load is applied to one or the other of the load carrying bars 19 and 20, no movement of the linkage will take place under normal conditions of use.

The bar 19 is provided centrally of its length with a ring or band 19a, and the bar 20 is similarly provided with a ring or band 20a. The bar 19 is also provided at equally spaced distances on each side of the ring 19a with vertically perforated eyes 19b and the bar 20 is similarly provided with eyes 20b. Load receiving vessels 21 and 22 are provided respectively with reduced necks 21a and 22a which are open at their upper ends and fixed in the respective rings 19a and 20a. The vessels 21 and 22 have inverted frusto conical lower portions 21 having openings in their lower ends. The opening in the portion 22b is normally closed by a valve 23 carried on the upper end of a stem 23a, which extends downwardly through one of the openings 1c. The vessel 22 extends at its lower part into a receiving hopper 23b having an inverted frusto-conical lower end 23c opening into a draw-off or discharge pipe 23d, through an opening 27. On the lower end of the stem 23a is fixed a weight 24 which serves to urge the valve 23 to closed position. A collar 24a is fixed to the stem 23a above the opening 27 so that upon downward movement of the vessel 22, the collar 24a will engage the hopper bottom 23c and limit further downward movement of the valve while not interfering with movement of the vessel further downwardly to effect opening of the valve. Similarly for the vessel 21, there is provided a discharge hopper 21c having an inverted frusto-conical bottom provided with an opening 25 alined with the remaining opening 1c, and communicating with a discharge pipe 25a. A valve 26 normally closes the bottom of the vessel 21, and is carried on a stem 26a, which passes through the openings 25 and 1c and carries at its lower end a weight 28. Also the stem is provided with a collar 28a. These parts function in like manner to the corresponding parts associated with the vessel 22.

A valve 29 normally closes the lower end of a filling head or nozzle 29a, which extends loosely down into the upper part of the neck 21a, this valve opening by upward movement. The valve 29 has an upwardly projecting stem 29b which extends upwardly to unite with the transverse member of a yoke 30 having legs 30a which extend downwardly through the eyes 20b. An annular weight 31 is supported by the lower ends of these legs, the weight urging the valve to closed position. Collars 80 and 81 are fixed on the legs 30a above the bar 20 and normally in spaced relation thereto. By this means whenever the bar 28 rises to a sufficient extent, it engages the collars 80 and 81 and lifts the yoke and valve 29, so that the vessel 21 receives material from the head 29a. A similar arrangement is provided for the vessel 22 in which the valve 32 is connected by a stem 32a to a yoke 33 having arms 33a extending downwardly through the eyes 19a and carrying an annular weight 34. The arms 33a are provided with collars 33b and the lifting of the bar 19 effects opening of the valve 32.

Extending first laterally and then downwardly from the bar 17 are roller hangers 17a and 17b. These hangers are preferably spaced evenly from the center of the bar 17 and have lateral projections at their lower ends on which are revolubly mounted rollers 35 and 36. Similarly the bar 18 is provided with hangers 18a and 18b carrying at their lower ends rollers 38 and 37. A shaft 39 is journaled in frame extensions 39a

mounted on the members 2. Pivoted on the shaft 39 is a pair of arms 40 and 41 carrying at their outer ends weights 40a and 41a. The rollers 35 and 37 lie against opposite edges of the arm 40 and the rollers 36 and 38 lie against opposite edges of the arm 41. Under charging and discharging conditions, these arms incline upwardly from the shaft 39 and in opposite directions as shown, but normally the arms extend vertically, one behind the other. In order to cause synchronous opposite movements of the arms 40 and 41, the arm 40 is provided at the shaft 39 with a segmental gear 40b, and the arm 41 is similarly provided with a segmental internal gear 41b. To secure a continual motion the arm 41 is provided with a segmental gear 41c. Journalled in the frame sections 39 is a shaft 42 having fixed thereon a segmental gear 42a meshing with the gear and having also fixed thereon a segmental gear 42b meshing with the gear 41b.

Centrally of the bar 17 is provided an opening 17c and centrally of the bar 18 is provided an opening 18c, which is thus alined with the opening 17c. Through the openings 17c and 18c slidably extend a rod 57 whereon is fixed collars 57a and 58 resting respectively on the rods 17 and 18 when the vessels are in normal unloaded positions. The lower end of the rod 57 carries an open frame 59 which surrounds the shafts 39 and 42, so that the frame can move up and down without interfering with their shafts. Fixed to the lower end of the frame 59 is a downwardly extending rod 59a which carries a weight 60 on its lower end. From this construction, it will be seen that upward movement of either of the bars 17 and 18 will effect lifting of the weight, the rod 57 slipping freely through the central opening of the other bar. The weight 60 is preferably termed the control weight and is increased or diminished in accordance with the weights to be measured in the vessels.

For the actual weighing and dispensing of the substance to be handled, the foregoing apparatus is sufficient, certain refinements and auxiliary apparatus being presently described. In order to follow the operation, reference is now made to Figures 8 to 17. In order to start the apparatus, one or the other of the valves 29 and 32 must be opened and this may be effected by raising the corresponding bar 19 or 20, this being done manually or by any suitable means. Let it be supposed that the bar 20 be raised. The conditions then existing will be as shown in Figures 8 and 9. In these figures, the arm 40 has dropped to the right and the arm 41 has dropped to the left. As the bar 20 is raised, the bar 19 will be depressed in the manner previously described. As the bar 20 moves upwardly, it lifts the yoke 33 by engagement of the bar with the collars 80 and 81 and thus causes opening of the valve 29 so that the substance being measured will flow from the head 29a into the receptacle 21. Also the elevation of the bar 20 will cause upward movement of the bar 17 and downward movement of the bar 18, which will be correspondingly accompanied by upward movement of the rollers 35 and 38 and downward movement of the rollers 36 and 37, thus permitting the weights 40 and 41 to assume the positions shown in Figure 8. Furthermore, elevation of the bar 17 causes, by its engagement with the collar 57, raising of the control weight 60. As the substance being handled enters the vessel 21, the latter tends to drop and cause downward movement of the bar 20, the weights 31 and 60 assisting in this movement since the bars 17 and 20 are linked to move in the same direction. Also downward movement of the bar 17 raises the bar 18. The tendency of the bar 18 to raise is resisted by the weights 41a and 40a since the arms 41 and 40 engage the rollers 36 and 37 attached to bar 18 and tend to hold these rollers down. The parts will continue in the positions shown in Figures 8 and 9 until the unit quantity of material for which the device has been arranged has entered the vessel 21. When this occurs, the weight in the receptacle 21 will cause that receptacle and the bar 20 to first move to the position shown in Figure 11, with consequent movement of the bars 17 and 18 to the position shown in Figure 10. This movement of the bars 17 and 18 causes upward movement of the rollers 36 and 37, the rollers 35 and 38 moving into alinement respectively with rollers 36 and 38. Under these conditions, the arms 40 and 41 extend vertically and consequently the effect of the weights is nullified. At this instance, the effect of the weight 60 is also nullified since the collars 57a and 58 rest on both bars 17 and 18. Also the bar 20 drops free of the collars 80 and 81 and the weight 31 closes the valve 29. The loaded vessel 21 now continues to move downwardly until the parts assume the positions shown in Figures 12 and 13. At this stage in the operation, the arms 40 and 41 are reversed from Figure 8, the arm 40 being to the left and the arm 41 to the right, with the rollers 35 and 38 down and beneath the arms 40 and 41 respectively. The weight 60 is now carried by the bar 18. The valve 29 is still closed but the valve 32 is opened by engagement of the bar 19 with the collars 33b. Finally, the collar 28 has engaged the platform 1, and the valve 26 has been opened to discharge the contents of the vessel 21. The valves at the bottoms of the vessels are larger than the valves at the top, so that discharge takes place more rapidly than inflow. Thus the vessel 21 has been emptied before the vessel 22 has been filled. Figures 14 and 15 correspond to Figures 10 and 11 but with the receptacle 22 moving downwardly, and it is not deemed necessary to discuss these figures or Figures 16 and 17 which show the emptying of the vessel 22 and the vessel 21 again being filled.

A counting or registering mechanism is indicated at 43 and 44 and this mechanism is driven from shaft 42. The mechanism 43 and 44 is simply a usual form of any such device as is commonly utilized for counting strokes of a mechanism, and since its particular construction forms no part of the present invention, it is not deemed necessary to further describe this part of the apparatus.

In order to effect stopping of the action when desired, there is fixed on the shaft 42 a gear 42c, with which a gear 45 splined on a shaft 50 may mesh. The shaft 50 is provided at one end with an enlarged and threaded portion 50a, mounted in an internally threaded sleeve 51, suitably connected to the gear 45 to move the latter longitudinally of the shaft. The sleeve 51 is provided with a crank 51a for rotating the sleeve. On the shaft 50 is mounted a pair of gears 50b and 50c below which are provided rack bars 46 and 47 meshing respectively with gears 50b and 50c. Above the gears 50b and 50c and meshing respectively therewith are rack bars 48 and 49. Thus when the shaft 50 is rotated in clockwise direction, the rack bars 46 and 47 will be simultaneously moved to the left, while rack bars 48

and 49 will move to the right. Reversing the rotation of the shaft 50 reverses the movements of the rack bars. The rack bars 46, 47, 45 and 49 carry L-shaped stop fingers 46*a*, 47*a*, 48*a* and 49*a*, respectively, and these stop fingers have horizontal portions all in the same horizontal plane. Depending from opposite edges of the bar 17 and adjacent the ends thereof is a pair of hanger rods 54 and 55 having respective outwardly extending stop fingers 54*a* and 55*a*. Similarly the bar is provided with hangers 53 and 56 having respective stop fingers 53*a* and 56*a*.

In operation when the gears 42*c* and 45 are in mesh, the shaft 50 is rocked in one direction or the other, and the fingers 45*a*, 47*a*, 48*a* and 49*a* move into the paths of the respective fingers 56*a*, 53*a*, 54*a* and 55*a* thus checking movement of the bars 17 and 18. If the gear 46 is moved by rotation of the sleeve 51 on the screw 50*a*, the gear 45 will be disengaged from the gear 42*c*, so that the shaft 50 may be manually rotated to selectively move the rack supported fingers into and out of the paths of the fingers supported by bars 17 and 18.

Means may be provided for increasing the effect of the weight 60 as it moves upwardly by adding thereto additional weight members. For this purpose, a rod 60*a* extends downwardly from the weight 60 and on this rod are fixed the collars 61, 62 and 63. Spaced above these collars are weight members 61*a*, 62*a*, and 63*a* which are perforated so that the rod 60*a* may slide through the weights. These weights are supported from an arm 64*a* vertically adjustable by the adjusting means 64. By manipulation of the adjusting means 64, the arm 64*a* may be moved downwardly to cause one or more of the weights 61*a*, 62*a* and 63*a* to rest on the corresponding collar.

It is found advisable to slightly over-weight the weight 60 when raised, and in order to effect this, one of the balance devices shown in Fgures 4, 5 and 6 may be employed.

As shown in Figure 4, a scale beam 65 is supported by a knife edge 65' on a knife seat 66 which may form part of the platform 1. The beam 65 passes through the elongated slot 67' formed in the rod 59, the beam being normally at the vertical center of the slot. A balance weight 68 is slidably mounted on the beam. When the rod 59 rises, the lower end of the slot 67' engages the beam and tilts the same upwardly to raise the weight 60 which thus is brought into service to add to the resistance to upward movement of the rod 59. A counter-balance 69 is slidably positioned on the beam 65 and on the opposite side of the fulcrum to the weight 60, which has greater effect than the counter-weight. The counter-weight 69 carries a pointer 69*a* which traverses a graduated bar 69*b* to enable exactness of adjustment between the weights 68 and 60.

In Figure 5, the scale beam 65*a* passes centrally through the vertically elongated slot 67 formed in the rod 59. The beam 65*a* is fulcrumed at 65*b* on the seat 66*a* and carries a sliding weight 68*a*. A stop 71 serves to limit downward movement of the right hand end of the beam 65*a*.

A compound arrangement is shown in Figure 6, in which a scale beam 65*c* is fulcrumed at 65^2 on a seat 66*b* and passes centrally through a vertical slot 67^2 formed in the rod 59. This beam has a weight 68' slidably mounted thereon on one side of the fulcrum and a counter-weight 68^2 slidably mounted on the other arm of the beam to enable nicety of adjustment to be obtained. A stop 71' limits downward movement of the weight 68'. A second scale beam 65*d* is fulcrumed beneath the longer arm of the beam 65*c* at 65*e* on a seat 66*c*. A weight 70 is slidably mounted on the beam 65*d* at one side of the fulcrum and a counter-weight 66*b* is slidably mounted on the other arm of the beam 65*d*. A link 76*a* connects the weights 68' and 76 so that these move in unison, the weight 76 moving away from fulcrum 65*e* while the weight 68' moves toward the fulcrum 65^2, or the weight 76 moving out while the weight 69' is moving in.

By means of one of these arrangements, a required weight is added to the weight 60 as the latter approaches the upward limit of its movement.

A settling tank 72 is supplied with liquid to be weight or measured by a pipe 73 leading from any suitable source, and a pipe 74 leads by branches to the heads 28*a* and 32*a*.

A lever 82 turning on a pivot 83 rised on the longitudinal member 2 permits to press a ticket on the rack bar 46, to print the total of the measured quantity.

Means are also provided for securing the arms 40 and 41 in the vertical position they assume at the time the vessels 21 and 22 are at equal heights. For the purpose, the means best shown in Figure 7 is used. This device consists of an inverted U-shaped head 75, the legs of which are shown at 75*a*. A screw 76 supports this head and is used to adjust the same vertically. Projecting toward each other from the lower ends of the legs 75*a* is a pair of spring stop members 75*b*, which when the head is in its lower position lie in the paths of the arms 40 and 41, so that, in vertical position, these arms engage the stops 75*b* and the arms can not swing until the head is raised.

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