March 7, 1933. C. F. WALLACE 1,900,142

APPARATUS FOR FEEDING SOLUTIONS

Filed May 31, 1928 3 Sheets-Sheet 1

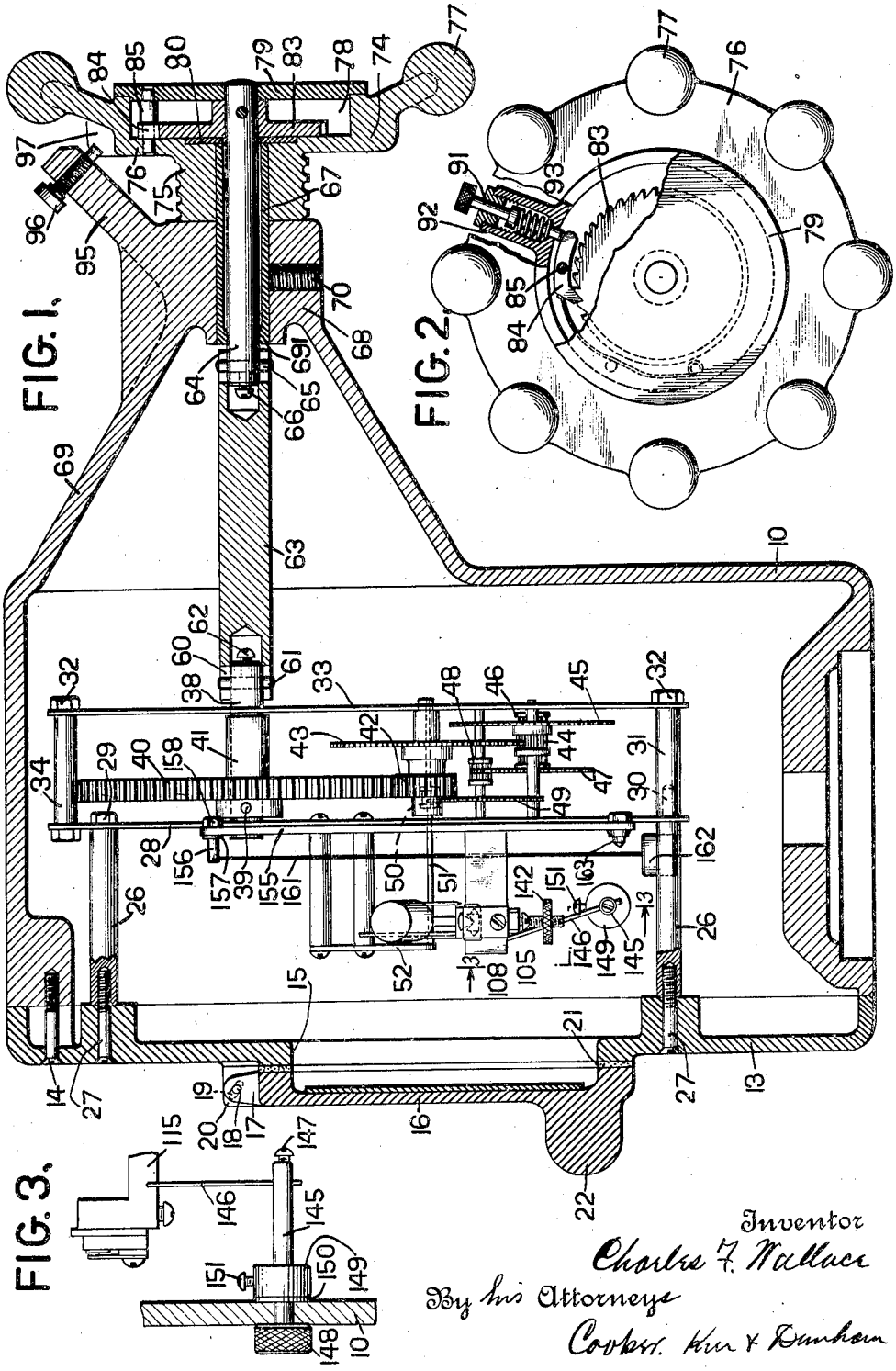


FIG. 1.

FIG. 2.

FIG. 3.

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APPARATUS FOR FEEDING SOLUTIONS

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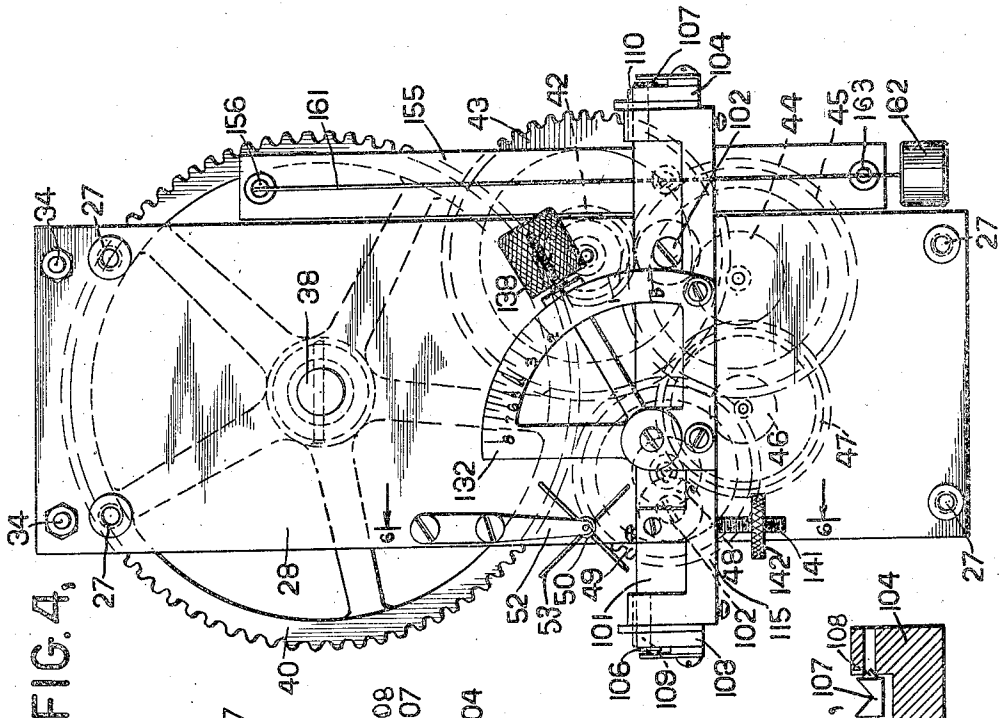


FIG. 4.

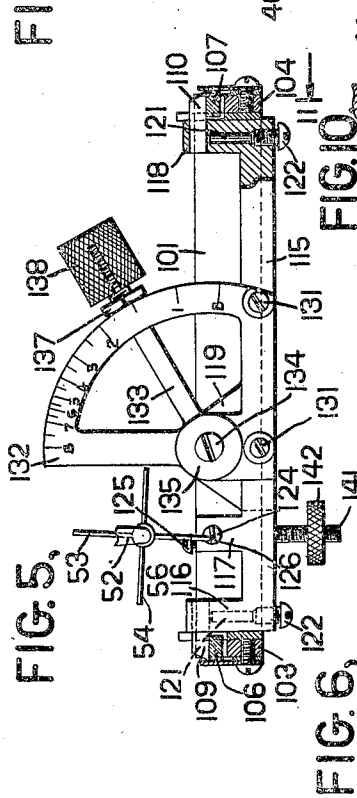


FIG. 5.

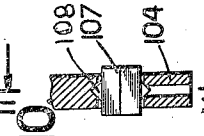


FIG. 10.

FIG. 11.

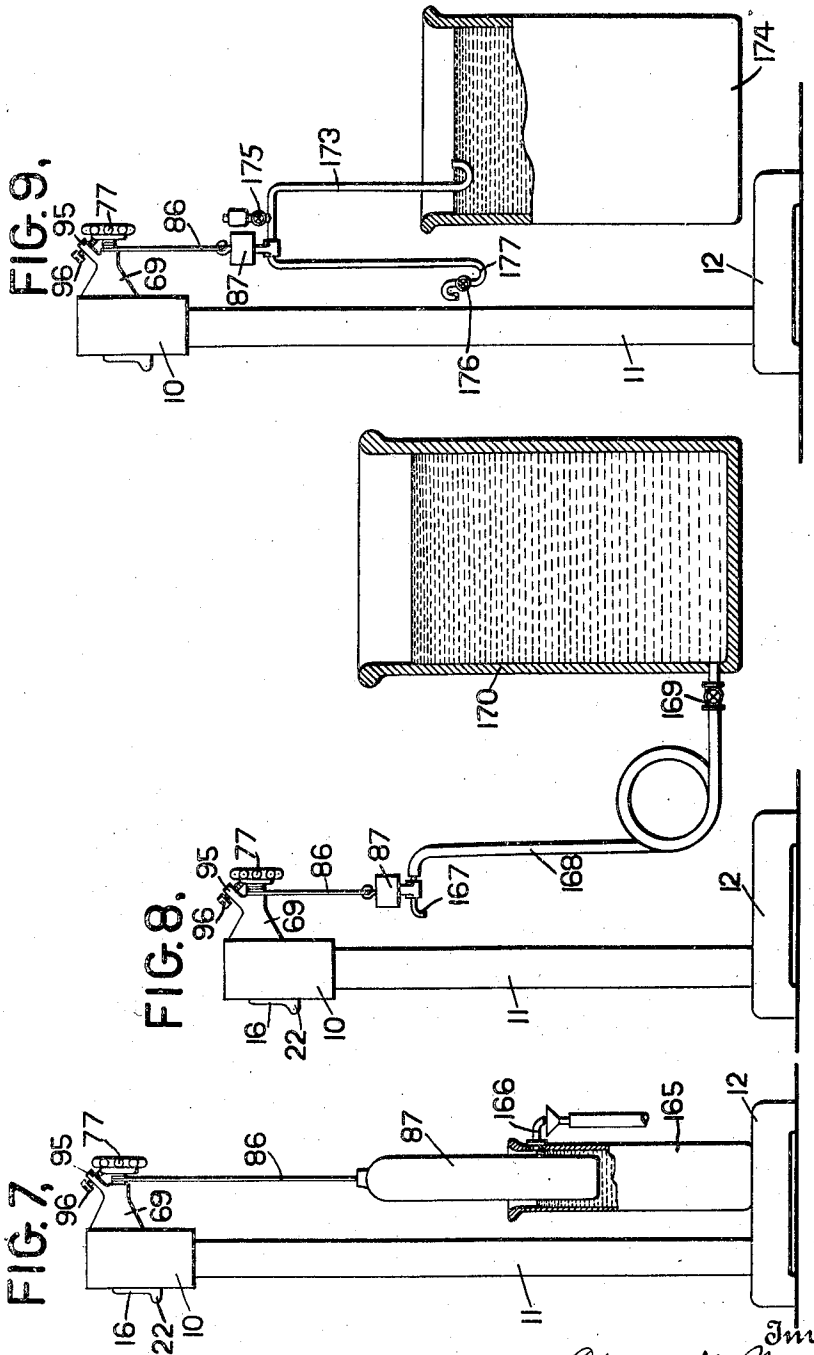
FIG. 6.

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APPARATUS FOR FEEDING SOLUTIONS

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UNITED STATES PATENT OFFICE

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APPARATUS FOR FEEDING SOLUTIONS

Application filed May 31, 1928. Serial No. 282,005.

This invention relates to solution-feeding devices and has for one of its most important objects the provision of an apparatus which will feed a solution at a uniform rate over a comparatively long time interval.

Another object is to provide a solution-feeding apparatus in which the rate of feed can be regulated, after which the new rate will be uniformly maintained during a definite time interval.

Still another object is to provide a solution-feeding mechanism which, in addition to the advantages already stated, is simple and accurate and which will require a minimum amount of attention.

In the present embodiment of the invention the solution is supplied to a container of sufficient capacity to hold enough solution to serve its intended purpose during a certain length of time. Associated with this container is a weight which is lowered at a predetermined rate relative to the container and which, by its movement, controls the flow of the solution from the container to the point of its application.

In the embodiment herein shown and described, the weight is lowered by a novel clock mechanism and may either displace the solution by its own mass so as to cause the solution to flow from an outlet of the container, or it may change the position of an outlet of the container during its descent so that the flow will correspond to the movement of the weight. In the latter event the outlet may be a part of a flexible connection to the bottom of the container or it may be part of a siphon which is lowered relative to the container by the downward movement of the weight.

While a clock mechanism has advantages in regulating flow according to time intervals, it is, as will be clear later on, possible to use a motor for lowering the weight controlling the feed. It is also possible, as will be apparent later on, to use the weight to control the operation of an aspirator or other suction device to draw the solution from the container instead of, as in the present embodiment, depending upon displacement or gravity action at the outlet to cause the flow. Such a motor operation and withdrawal by suction is shown and described in an application Serial No. 282,006, filed the 31st day of May, 1928, by the present applicant. All claims to subject matter common to the present application and said application No. 282,006 are made herein.

With the foregoing and other objects in view, the invention consists in a novel construction and association of parts hereinafter described with reference to the drawings which accompany and form a part of this specification; and the novel features of which are pointed out in said specification and drawings and in the claims appended hereto.

In said drawings:

Fig. 1 is a section through the clock mechanism and devices for regulating the lowering of the weight as well as the devices for raising the weight and incidentally winding the clock.

Fig. 2 is a detail of the winding head and weight reel, the connection between them and the clock mechanism, and a device by which the connection may be disabled.

Fig. 3 is a detail, along the line 3—3 of Fig. 1, of the mechanism for stopping the clock whenever desired.

Fig. 4 is an elevation of the clock mechanism and shows particularly the pendulum apparatus, including the escapement, and the regulator for the pendulum.

Fig. 5 shows the pendulum and speed regulator, with parts in section to show the way in which the pendulum is supported.

Fig. 6 is a view, along the line 6—6 of Fig. 4, of the escapement and pendulum mechanism.

Figs. 7, 8 and 9 show various ways in which the clock weight controls or causes the solution to flow from a container toward a point of application.

Figs. 10 and 11 are details showing the construction of devices for supporting the pendulum.

The apparatus shown in the drawings comprises a casing 10 supported in any suitable way as by a pedestal 11 mounted on a base 12. What may, for convenience, be called the back of the casing, is in the form

of plate 13 (Fig. 1) upon which the clock mechanism is supported, said plate being secured to the body of the casing by any suitable means such as, for example, screws 14. The plate 13 has an opening 15 normally closed by a weighted door 16 having ears 17 carrying pivot pins 18 extending into inclined slots 19 in ears or ribs 20 on the plate 13. A felt ring 21 attached to the plate 13 makes the closure dust proof. The weight 22 on the door 16 and the pin and inclined slot connection 18 and 19 insure holding the door 16 in fully closed position. The door 16 is, of course, to provide convenient access to the clock mechanism, as for example, when it is desired to change the regulator above mentioned and hereinafter described in detail.

The clock mechanism is supported on the plate 13 by four posts 26 (Figs. 1 and 4) secured to the plate by screws 27. The upper posts 26 have reduced and threaded ends (not shown) passing through one plate 28 of the clock mechanism and cooperating with nuts 29 to hold the plate in position. The lower posts 26 have reduced and threaded portions 30 extending through the plate 28 and engaging a threaded interior in the separator or support studs 31. The other ends of the studs 31 have the usual reduced and threaded ends equipped with nuts 32 holding the other plate or frame member 33 of the clock. At their upper ends the plates 28 and 33 are held together in correct relative position by the separator rods 34 of the usual type.

Journaled in the plates 28 and 33 is a shaft 38 to which is pinned, as at 39, the hub of a large gear 40, the shaft carrying also a spacing collar 41 which may, if desired, be integral with the gear. Meshing with the gear 40 is a pinion 42 rigid with a larger gear 43, the gear 43 meshing in turn with a lantern gear 44 attached to a gear 45. The gear 45 meshes with a lantern gear 46 attached to the same arbor or shaft as a gear 47 meshing with a lantern gear 48 rigid with a gear 49. The gear 49 engages a small lantern gear 50 (see also Fig. 6) fastened to a shaft 51 journaled in the plates 28 and 33 and in a bracket 52. Rigid with the shaft 51 are two rods 53 and 54 at right angles one to the other and forming what are, in effect, two pairs of pins, spaced apart as shown and forming a part of the escapement mechanism.

The motive power for driving the gear 40 and, through the intermediate connections described, the escapement shaft 51, is applied to the shaft 38. For this purpose the shaft 38 has a cross-pin 61 held by a set screw 62 and engaging in slots 60 in the end of a rod 63 which is axially recessed to receive the end of the shaft 38. At its other end the rod 63 is recessed and slotted to receive the end of a shaft 64 and engage the ends of a cross-pin 65 held in position in the shaft by a set screw 66.

The shaft 64 is surrounded by a sleeve 67 closely fitting in a tubular recess through a head 68 on an extension 69 from the casing 10. The sleeve 67 is preferably slightly larger in diameter than the shaft 64 except near one end where (as shown at 691) it surrounds the shaft closely enough to give the shaft a good bearing. This construction of the sleeve reduces materially frictional resistance to rotations of the shaft 64. A set screw 70 serves to lock the sleeve 67 in position.

Rotatively mounted on the sleeve 67 is a member 74 comprising a grooved reel 75 and a substantially circular portion 76 provided with knobs or projections 77 to facilitate turning the member 74 by hand. One face of the portion 76 of the member 74 is recessed or hollowed out, as at 78, and is also cut away to accommodate a friction disk or washer 80 at the end of the sleeve 67. The face of the recess 78 is closed by a disk or plate 79 attached to the member 74 and forming a bearing support for the shaft 64.

Fastened to the shaft 64 is a toothed ratchet disk 83 which cooperates with a spring pressed pawl 84 pivoted on a short rod or pin 85 supported between the portion 76 and the plate 79. The construction is such that when the member 75, 76, 77 is turned clockwise (Fig. 2) the pawl 84 will serve to retain the member against return movement. This clockwise movement will wind up on the reel 75 a cord or wire 86 (Figs. 7, 8 and 9) sustaining the weight 87. After such winding the weight causes the pawl 84 to drive the ratchet disk 83, the shaft 64, rod 63, shaft 38, gear 40 and the rest of the train of mechanism extending to and including the escapement arbor or shaft 51.

In order to permit disconnecting the pawl 84 from the ratchet disk 83 when desired, a plunger 91 mounted in a boss 92 on the member 76 may be moved against the compression of a spring 93 against a tail or extension of the pawl to rock the nose or point of the pawl out of the teeth of the ratchet disk. This plunger is provided to permit lowering the weight independently of the clock mechanism whenever desired.

In order to arrest the downward movement of the weight, for example, during the period when no feed of the solution is desired or when replenishing the supply of solution, the head 68 has an arm or extension 95 carrying a thumb screw 96 which can be turned to engage in one or more cuts 97 in the member 76 or which can be clamped against the periphery of the member.

The rate of downward movement of the weight 87 and the speed of the mechanism driven by it, is regulated by a pendulum mechanism cooperating with the escapement rods or pins 53 and 54 (Figs. 4, 5 and 6) on

the escapement shaft 51. The pendulum mechanism referred to comprises a mounting member or bracket 101 secured by screws 102 (Fig. 4) to the plate 28 of the clock mechanism, with its ends at right angles to the length of the bracket to form arms 103 and 104 on which the pendulum is supported. The arms 103 and 104 are cut out at their upper surfaces (see Figs. 10 and 11) to accommodate bearings 106 and 107 supported on pivots 108. The upper face of each of the pivoted bearings has a wide V-shaped notch to receive knife edges 109 and 110 on the pendulum. The pendulum is described in detail further on and it is sufficient to say here that the knife edges 109 on the pendulum and the pivoted bearing supports therefor give a self-aligning construction contributing to great freedom and accuracy of movement of the pendulum.

The pendulum comprises a bar 115 having upwardly extending arms 116, 117 and 118 and a boss 119. The knife edges 109 previously mentioned are on pins 121 inserted in suitable holes in the arms 116 and 118 and held in adjusted position by means of set screws 122.

Mounted in the arm 117 of the pendulum is a rod 124 secured in adjusted position by a set screw 125. The protruding ends of the rod 124 are cut to form cams 126 and 127 cooperating respectively with the escapement rods or pins 53 and 54. The cams 126 and 127 are so disposed in the paths of the pins that when, for instance, one of the pins 53 (Fig. 6) engages the cam 126 the pendulum 115 will be swung counterclockwise and movement of the pendulum in the opposite direction will be effected when one of the pins 54 strikes the cam 127. It will be recalled that the escapement shaft 51 is driven by the weight 87. At each quarter turn of the shaft 51 of the escapement mechanism the movement of the shaft is halted until the pressure applied by the engaging pin 53 or 54 has tilted the pendulum to permit the weight to drive the next pin into engagement with its cam.

In Figs. 5 and 6 of the drawings one of the pins 53 is shown in engagement with its cam at the point where the pin and cam have cooperated to bring the pendulum to a vertical position. When the pin first engaged the cam, however, the tapered side of the pin engaged the edge of the cam to initiate the rocking movement, after which the end of the pin wipes across the upper face of the cam to swing the pendulum past center.

Secured to the bar 115 of the pendulum, by screws 131, is a segmental index plate 132. An arm 133 is pivoted, on a screw 134, between the index plate 132 and the boss 119 on the pendulum bar 115, the screw entering a threaded hole in the boss and serving through a collar 135 to frictionally hold the arm 133 in different positions of adjustment. Near its outer end the arm 133 carries a pointer 137 cooperating with the index plate 132, while on a threaded extension of the arm is a weight 138.

Extending from the lower face of the pendulum bar 115 is a threaded rod 141 carrying a weight disk 142. The arm 133 and the weight 138 thereon, in combination with the disk 142, afford a means of controlling the frequency of the oscillations of the pendulum, and thereby the rate of descent of the weight 87, through quite a wide range. The construction shown is capable of adjustment or regulation by means of 138 and 142 so that from twenty hours to eight days may be used for feeding a given quantity of solution, the twenty hour rate obtaining when the pointer 137 is at or slightly above B on the scale 132, and the eight day rate when the pointer is at the figure 8 on the scale.

While the pendulum as shown has the pendulum set above the pivot points, it is equally feasible to use a pendulum which swings below the pivot points.

In addition to the provision of the set screw 96 (Fig. 1) for holding the winding head against movement by the weight 87, means are provided for stopping the clock by stopping the oscillations of the pendulum. This means comprises a shaft 145 (Figs. 1 and 3) journaled in the wall of the casing 10 and carrying a pin 146 extending up to a point adjacent the bar 115 of the pendulum. The pin 146 is preferably inserted through a hole in the shaft 145 and held in adjustment by a screw 147 in the end of the shaft. Attached to the outer end of the shaft 145 is a knurled knob 148 by means of which the shaft 145 may be rocked to carry the pin 146 against and away from the pendulum to stop and release the pendulum. A collar 149 and washer 150 are held in position on the shaft 145 by a set screw 151, the collar and knob 148 cooperating to prevent endwise movement of the shaft 145, and to hold a given setting by friction.

It is important that the pendulum be level to insure accuracy of operation even though the clock mechanism may not set true, and to make the leveling convenient a plumb mechanism is supplied. This mechanism comprises a metal strip or plate 155 (Figs. 1 and 4) carrying at its upper end a rod 156 carrying a flange 157 which is clamped against the plate 155 by a nut 158 on a threaded end of the rod. It is preferred to slot the rod across the other end to hold a plumb line 161 supporting a weight or plumb bob 162. Near the lower end of the plate 155 is a pointer 163 which, in connection with the plumb line, affords a means of ascertaining when the pendulum is level.

The plate 155 carrying the plumb mechanism is fastened by one or more screws or

by solder to the mounting bracket or plate 101 supporting the pendulum, thereby permitting adjustment of the pendulum and the plumb mechanism as a unit until an accurate level is secured.

In the form of the invention shown in Fig. 7 of the drawings, the clock weight 87 is constructed of any suitable bulky material which will not be affected by the solution to be fed and has a diameter slightly less than the interior diameter of a container 165 for the solution. Near the top of the container is an outlet 166. As the weight 87 is lowered in the container the solution is displaced and a uniform flow at the outlet 166 maintained until substantially all of the solution has left the container. The winding reel 75 is then turned as previously described to raise the weight clear of the container and the container refilled or a full container placed in proper position under the weight. The winding head is then released by disengaging the pawl 84 (Fig. 2) from the ratchet disk 83 and the winding head allowed to turn independently of the clock mechanism far enough to cause the weight 87 to start the flow of the solution.

In the form of the invention shown in Fig. 8, the weight supports an outlet 167 for the solution. The outlet device is connected by means of a flexible tube 168 to a valved member 169 entering the lower part of the container 170. As the weight 87 is lowered by the clock mechanism the outlet 167 is carried along, thereby causing the solution to flow from the container through the outlet. When the container is to be refilled the winding head is turned to raise the outlet 167 and the valve 169 closed. After the container is full, the valve 169 is opened and the weight 87 and outlet 167 lowered independently of the clock mechanism, as before described, until the solution begins to flow from the outlet. The pawl 84 is then allowed to re-engage the clock drive ratchet 83 and thereafter the downward movement of the weight 87 and outlet 167 is as controlled by the pendulum and escapement mechanism.

The embodiment of the invention shown in Fig. 9 is adapted particularly for feeding concentrated solutions of acids. It includes the idea of using the weight 87 to lower a siphon 173 to draw the solution from the container 174. Any suitable way of attaching the siphon to the weight may be employed. The upper part of the siphon carries a suction valve or air vent 175 for use in filling or starting the siphon and a valve 176 in the delivery side which may be closed if the siphon is started by suction applied at the valve 175. The delivery side of the siphon is also formed, as at 177, to form an air seal preventing air from entering while the siphon is in operation. After the siphon is started its operation is maintained as the weight lowers it relative to the container.

From all of the foregoing it is obvious that the apparatus shown and described is capable of maintaining a uniform feed or flow of solution during a time interval, and that the rate of flow can be changed according to the amount required during such interval. The devices for receiving the flow and conducting it to the point of application may be varied according to requirements and form no part of the present invention.

It is also obvious that the descent of the weight to cause the flow might be controlled by a motor geared to the winding head in such a way as to permit a slow descent of the weight, and that this motor might have a governor whereby the rate of the feed could be changed. Such a substitute for the clock mechanism is contemplated by the present invention, although the clock mechanism is preferred.

While the apparatus shown and described is admirably adapted to fulfill the purposes primarily stated, the invention is capable of various embodiments, with suitable modifications and changes, all coming within the scope of the claims which follow.

What is claimed is:

1. An apparatus for feeding solutions comprising a clock gear train, a weight connected to drive the gear train by the gravitational movement of the weight, a container for solution into which the weight descends to displace solution from the container, and a pendulum and escapement mechanism for the gear train controlling the descent of the weight and displacement of the solution.

2. An apparatus for feeding solutions comprising a clock gear train, a weight connected to drive the gear train by the gravitational movement of the weight, a container for the solution into which the weight descends to displace solution from the container, an escapement for the gear train comprising a pendulum, and means comprising a counterbalance for the pendulum adjustable to vary the total gravitational movement of the weight over a range from twenty hours to eight days depending upon the rate of flow of the solution desired.

In testimony whereof I hereto affix my signature.

CHARLES F. WALLACE.