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W. SMALLEY

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APPARATUS FOR ADDING ONE LIQUID TO ANOTHER

Filed Feb. 16, 1944

2 Sheets-Sheet 1

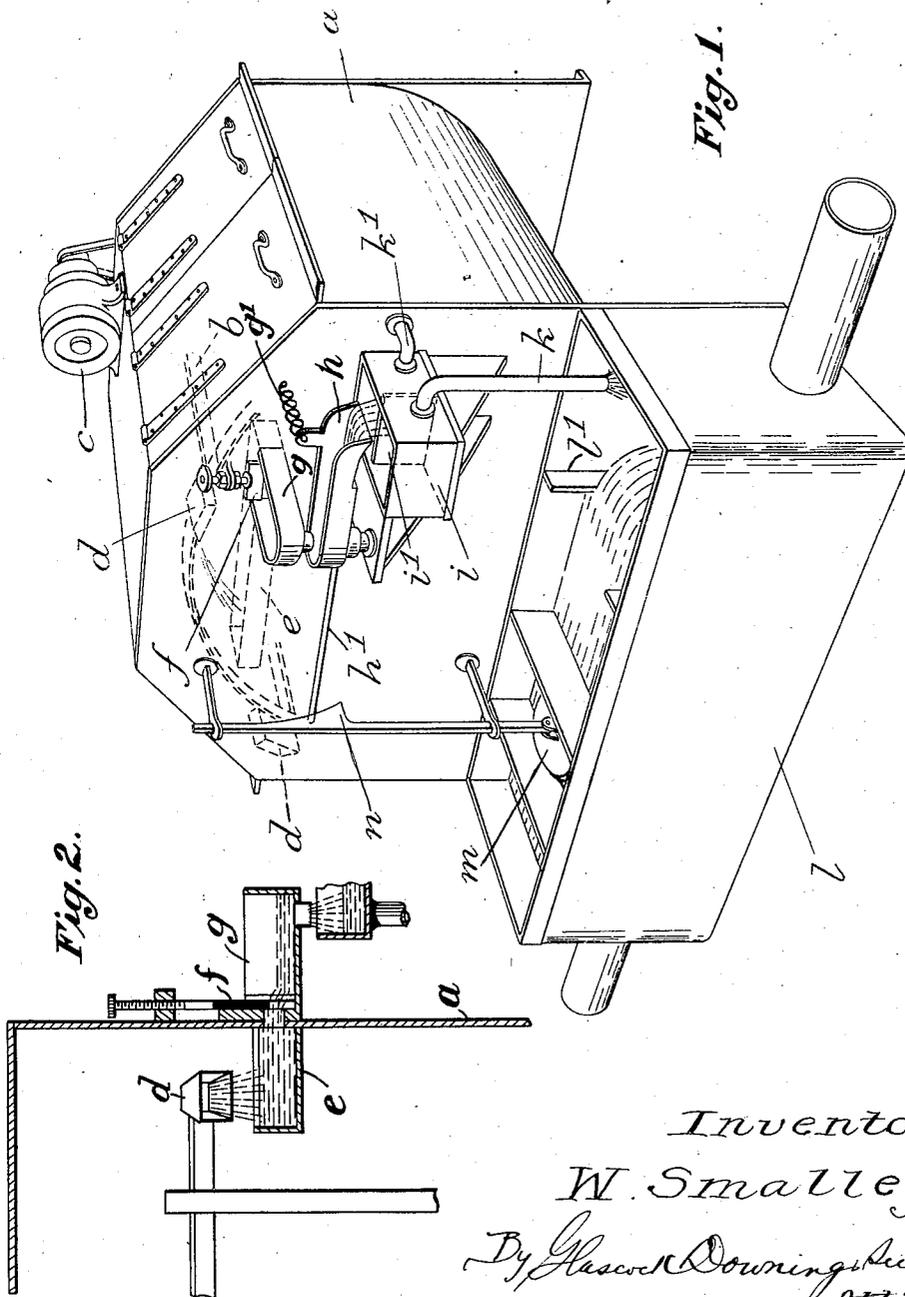


Fig. 1.

Fig. 2.

Inventor
W. Smalley
By *Glenn Downing* *Subra*
Atty

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2 Sheets-Sheet 2

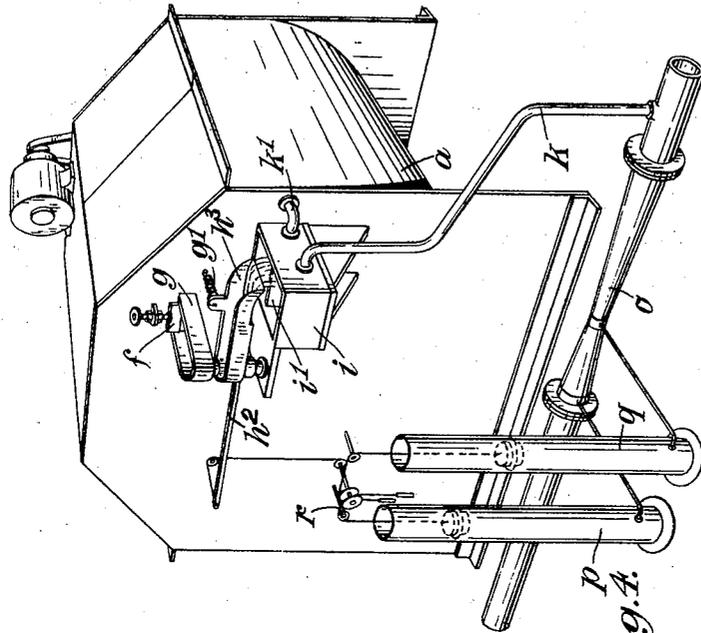


Fig. 4.

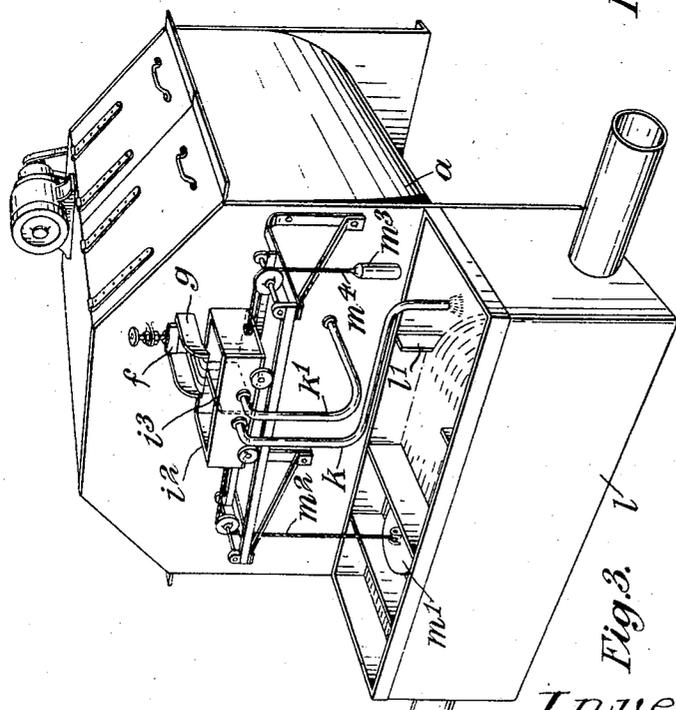


Fig. 3.

Inventor
W. Smalley
By *Glenn Downing Techell*
Attys.

UNITED STATES PATENT OFFICE

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APPARATUS FOR ADDING ONE LIQUID
TO ANOTHER

William Smalley, London, England, assignor to
The Paterson Engineering Company Limited,
London, England

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This invention relates to apparatus for effecting the proportional addition of one liquid to another and has for its object to provide an improved apparatus for this purpose that is simple and effective and which is particularly suitable in cases where the liquid to be proportioned contains suspended solids as, for example, milk of lime for water softening or effluent neutralization although it will be understood that the invention is capable of more general application.

The invention resides in apparatus for the purposes referred to comprising a dosage regulating device to which an excess of addition liquid over the maximum required is fed and means for dividing this feed into two parts, one of which is the correct dose and which passes to the liquid to which it is to be added, while the other is excess and is returned to the source of supply or otherwise dealt with.

In the past many forms of apparatus have been proposed in which an excess of addition liquid or reagent was supplied to a first stage and this divided into two parts, one of which was delivered to the receiving liquid and the other returned to the supply source. All such apparatus, however, fell short of fully meeting the situation that commonly exists in that they did not include means for adjusting the dosage with respect to two variables in the receiving liquid.

Thus, for instance, in the treatment of water the volume of the flowing stream of water entering to be treated will vary in accordance with the requirements of water for use. While at the same time the character of the water may itself vary requiring a different dosage for the same quantity of water. In some cases as, for instance, where the water supply is taken from a stream the changes in amount of reagent for a given quantity of water may be frequent and rapid. In the past it has been the practice to meet such changes in the character of the liquid by varying the strength of the dosage reagent but this is not readily done particularly so as the need for a change may occur when the container containing supply is, for instance, half full and a double computation is required as to the making of a change. A principal object of my invention is to overcome this difficulty and provide for changing the dosage quickly whenever required. This permits the reagent solution to be always made up of the same strength which is a great convenience.

Further features of the invention will be apparent from the description given hereafter.

Figure 1 is a perspective view of the preferred form of apparatus in accordance with the inven-

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tion. Figure 2 is a sectional detail on a slightly enlarged scale through the submerged adjustable orifice controlled by a regulating valve. Figure 3 is a perspective view of a modified form of the apparatus in which the trough is shiftable, and Figure 4 is a perspective view along the lines of the preferred form but embodying the modification of a venturi connected to two float columns.

In carrying my invention into effect in one convenient manner as shown in Figures 1 and 2 I provide a suitable container *a* in which the cream of lime or like addition liquid is maintained in a constant state of agitation by paddles *b* driven, for example, by a motorised reduction gear *c* which may be located upon the container. The paddles are conveniently provided with lifting cups *d* which discharge the liquid into a trough *e* arranged within the container and above the general level of the liquid therein, and from this trough the liquid flows through a regulating gate *f* into a pocket *g* on the outside of the container discharging into a trough *h* mounted for horizontal movement about a vertical axis and which trough is referred to hereafter as the distributing trough.

The swinging movement of the trough is made dependent upon the flow of the main body of liquid to which the addition liquid is to be fed and such distributing trough delivers the liquid into a dividing box *i* furnished with a partition *i'* dividing the box into two separate chambers, one of which has an outlet *k* leading to the main liquid flow while the other has an outlet *k'* returning excess addition liquid to the supply container.

In the particular construction illustrated the main liquid flow passes through a weir chamber *l* in which is a float *m* riding on the surface of the liquid above the weir *l'*, and the float in its movements dependent upon the volume of liquid flowing actuates a cam *n* which bears against an arm *h'* secured to the distributing trough *h*, contact between the cam and arm being maintained by a suitable torsion spring *g'*.

The arrangement is such that the addition liquid delivered from the distributing trough is divided so that the correct proportion depending upon the volume of flow of the main liquid is delivered at all times to the said liquid while the excess not required for the correct dosage is returned to the supply container. The rate of dosage may at any time be very conveniently increased or decreased by regulation of the calibrated adjustable gate *f* through which the liquid emerges from the trough within the container.

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There is shown in Figure 3 a modified arrangement of the invention in which the box rather than the trough is shiftable and in this arrangement the box i^2 with division plate i^3 is moved backwards and forwards by movement of the float m' to which it is attached by a flexible cord m^2 with a counterbalance weight m^3 similarly connected by cord m^4 to the opposite end of the shiftable box i^2 . The other parts of the apparatus correspond to that shown in Figure 1.

In Figure 4 there is shown an arrangement somewhat similar to that in Figure 1 but modified by a venturi v connected to two float columns p and q respectively, the floats in which, operating through the differential gear r actuate the arm h^2 to move the trough h^3 in unison with variations of flow through the venturi.

It is apparent that the differential head created by the venturi is used to position the distributing trough. Otherwise the parts are the same as shown in Figure 1.

It will be understood that the foregoing details of construction are given purely by way of example to indicate the nature of the invention and not to limit its scope.

Having thus fully described the invention what is claimed as new and desired to be secured by Letters Patent is:

1. Apparatus for effecting the proportional addition of one liquid to another comprising a dosage regulating device to which an excess of addition liquid over the maximum required is fed, said device comprising a first feed control means in the form of a gate, means ahead of the gate adapted to maintain a constant liquid head on the gate and including a source of supply and means following the gate for dividing the liquid which passes through the gate into two parts including a trough member and a dividing box member having chambers for receiving said two parts, one of the chambers receiving the correct dose and the other receiving the excess liquid, means for passing the correct dose from the chamber to the liquid to which it is to be added, means for passing from the other chamber the excess liquid and returning it to the source of supply, said trough member and said box member being laterally shiftable one relative to the other in a direction to change the relative position of the trough member on the one hand and the box member on the other hand, means for shifting the shiftable of said members including a movable member and means for moving said movable member by the liquid to be dosed in response to the variations in the rate of flow of said liquid and means for transmitting motion from the last mentioned movable member to the shiftable of the first two mentioned members.

2. Apparatus for effecting the proportional additional of one liquid to another comprising a dosage regulating device to which an excess of addition liquid over the maximum required is fed, said device comprising a first feed control in the form of a gate, means ahead of said gate adapted to maintain a constant liquid head on said gate, means following said gate for dividing the feed into two parts one of which is the correct dose which passes to the liquid to be dosed while the other is excess which is returned to the source of supply, said dividing means including a distributing trough member and a dividing box member, said trough member and said box member being laterally shiftable one relative to the other in a direction to change the relative positions of the trough member on the one hand and

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the box member on the other hand, and means for shifting the shiftable of said members, said shifting means comprising a movable member and means for moving said movable member by the liquid to be dosed in response to variations in the rate of flow of said liquid and an articulated connection joining said movable member and the shiftable of the two first mentioned members.

3. Apparatus for effecting the proportional addition of one liquid to another in a main liquid flow and wherein an excess of addition liquid is fed comprising in series an adjustable gate, said gate controlling a normally submerged orifice a regulating device to which an excess of addition liquid over the maximum required is fed, said regulating device comprising a distributing trough member and a dividing box member, said trough member and said box member being laterally shiftable one relative to the other, said apparatus further comprising means for shifting the shiftable of the members, said shifting means comprising a movable member positioned to be moved by said main liquid flow and an operable connection joining said latter movable member and the shiftable of the first mentioned members.

4. Apparatus according to claim 3 in which the movable member of the shifting means is in the form of a float riding upon the main liquid flow and comprising a cam operably connected to the float and in operable connection with the trough member.

5. Apparatus as claimed in claim 3 wherein the said shifting means comprises a differential pressure creating device in the path of the main liquid flow, the movable member positioned to be moved by the main liquid flow is in the form of a differential pressure sensitive device, said device being joined to said differential pressure creating device.

6. In combination in apparatus of the type described, a supply container for a first liquid, a flow channel for a second liquid and control means for effecting delivery of a predetermined proportion of the first liquid to the second liquid, said means being characterized in that it comprises a first and a second control whereby the proportion of first liquid delivered to the second may be varied responsive to variations in quantity of the second liquid, said control means comprising a receptacle in said container, means for delivering an excess of liquid into said receptacle from said container, an overflow return from said receptacle to said container, a delivery outlet from said receptacle, a manually adjustable member controlling flow through said outlet, a trough member receiving liquid from said outlet, said trough member having a broad and relatively shallow discharge end, a receiver member below said discharge, a partition dividing said receiver member into two chambers, an outlet from one of the chambers of the receiver member discharging back to said container, an outlet from the other of the chambers of the receiver member discharging to said channel, the trough member and the receiver member being laterally shiftable one relative to the other in a direction to change the relative positions of the discharge end of the trough member on the one hand and the partitions and chambers on the other hand to vary the quantity of the first liquid delivered to each of said chambers, and means for shifting the shiftable of said members upon changes of flow in said channel, said last means comprising a float on the liquid in said channel and means compris-

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ing at least one movable member joined to said float and to the shiftable of the members whereby motion will be transmitted from the former to the latter.

7. Apparatus for effecting the proportional addition of one liquid to another comprising a supply container for the liquid to be added, a flow channel for the receiving liquid, a chamber in said container, means to deliver an excess of liquid from said container to said chamber, said chamber having a return overflow establishing a predetermined level therein and an outlet, an adjustable control whereby flow through said outlet may be varied, a trough member receiving liquid from said outlet, said trough member having an outlet adapted to discharge liquid therefrom in the form of a stream that is broad relative to its depth, a receiving member placed to receive the stream discharged from said trough member, a partition dividing said receiving member into two chambers, an outlet from one of said chambers leading back to the supply container, an outlet from the other chamber leading to the receiving liquid in the flow channel, the said trough member and said receiving member being laterally shiftable one relative to the other, and means to laterally shift one of said members, said means comprising a meter positioned in the channel to meter the receiving liquid, said meter having a part moving with changes in the quantity of receiving liquid and a linkage operatively joining the moving part and said laterally shift-

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able of said members, whereby the quantity of supply liquid discharging into said other chamber will vary with variations in the quantity of receiving liquid.

WILLIAM SMALLEY.

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