

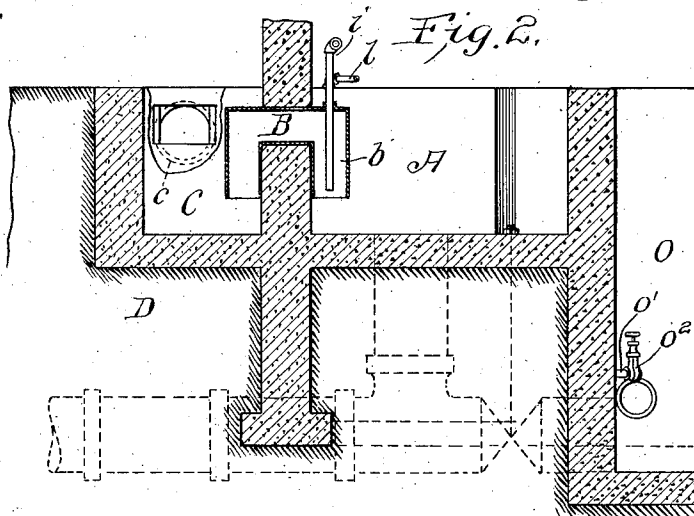
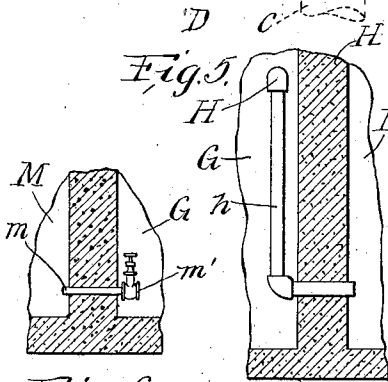
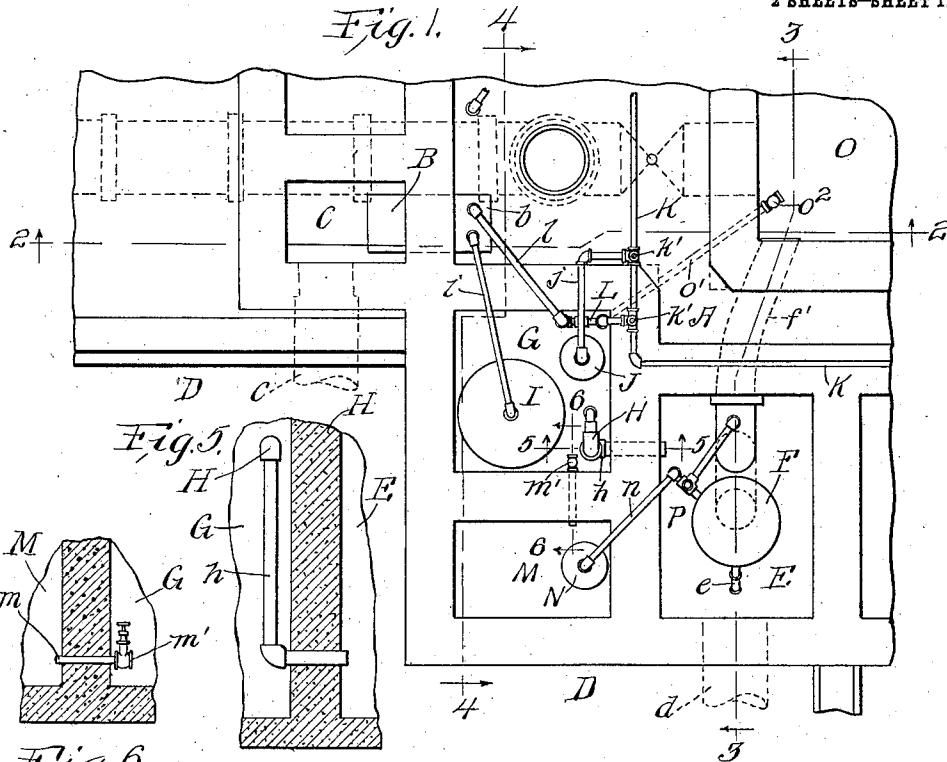
L. E. REIN.
TIMED SIPHON.

APPLICATION FILED MAY 25, 1912.

1,063,595.

Patented June 3, 1913.

2 SHEETS-SHEET 1.



Witnesses:

Harry S. Guther
Charles Boole

by

C. Clarence Boole

Inventor:
Lester E. Rein

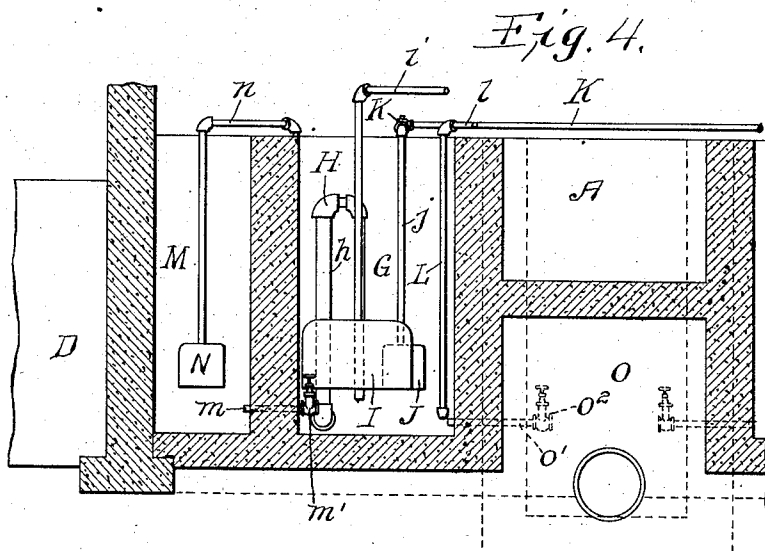
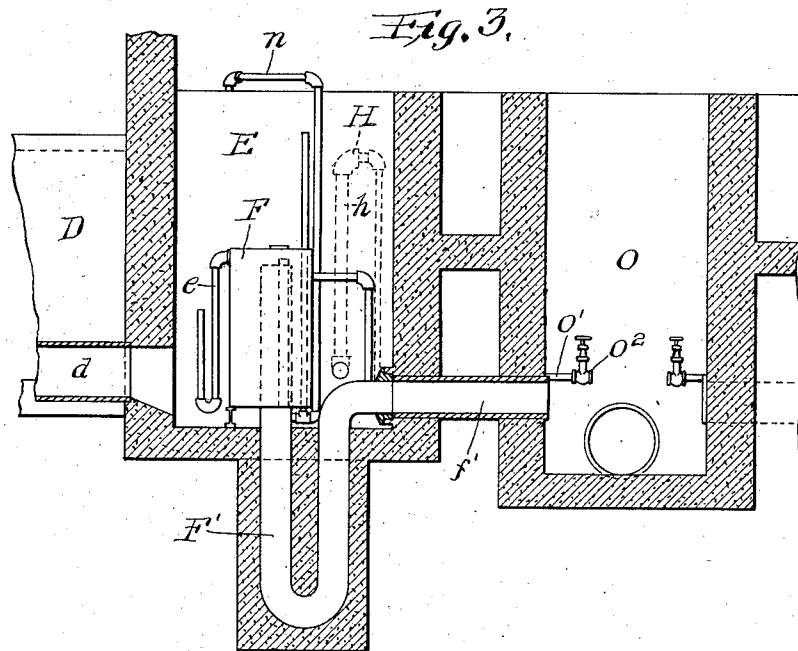
Atty.

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2 SHEETS—SHEET 2.



Witnesses:

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UNITED STATES PATENT OFFICE.

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TIMED SIPHON.

1,063,595.

Specification of Letters Patent.

Patented June 3, 1913.

Application filed May 25, 1912. Serial No. 699,716.

To all whom it may concern:

Be it known that I, LESTER E. REIN, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Timed Siphons; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to means for filling and emptying the contents of liquid tanks or receptacles, applicable more particularly for the purpose of charging and discharging the contact beds of sewage purifying or liquid filtering systems, but adapted for other like purposes.

The invention consists in the matters hereinafter set forth and more particularly pointed out in the appended claims.

The improvements constituting my invention are shown in the accompanying drawings as applied for use in connection with contact beds and in the description which follows will, for convenience, refer to any tank or receptacle to be filled and emptied, as a contact bed. It will be understood, however, that an apparatus embodying my invention is adapted for filling and emptying any tank or receptacle wherein the conditions are analogous to those of a contact bed in respect to the manner in which the liquid is delivered to and discharged from a contact bed.

The principal object of this invention is to provide means for filling and emptying contact beds or other liquid tanks and receptacles, which are so constructed and arranged that the filling and emptying operation may be prolonged or timed to such an extent as to insure the proper operation of the contact beds under varying amounts of the liquid to be treated and more especially to insure the proper operation of the apparatus under the conditions of a very limited and uncertain supply of the liquid.

The construction hereinafter more fully described is especially applicable in the case of filtration systems located in regions in which the supply of water to be treated is very limited during a part of the year.

A purification or filtration system of the kind herein referred to, comprises a series

of contact beds, separated from each other, and filled with broken stone or other suitable material. Each of said contact beds is connected to a main inlet tank and is filled to a predetermined level therefrom. The liquid remains in contact with the broken stone for a length of time sufficient to effect its proper treatment, and is then discharged therefrom into a common outlet. Before said contact bed can receive another charge of the liquid, it must be aerated, that is to say, the surface of the broken stone or other suitable material must be exposed to the atmosphere for a length of time necessary to effect the oxidization of the impurities remaining therein, resulting from the contact of the liquid with the broken stone in the contact bed.

The means for filling the contact beds shown in the accompanying drawings, embrace a feeding device embodying the principle fully pointed out in the prior U. S. Letters Patent to Adams, No. 648,325, and of a form of the same, such as is fully described in the prior U. S. Letters Patent to Miller No. 899,750. The means for discharging the liquid from the contact beds herein shown, is a deep seal siphon embodying the principle fully described in the prior U. S. Letters Patent to Miller No. 727,991. The operation of the siphon is controlled by an auxiliary siphon or blow-off trap, the principle of which is also fully described in the aforesaid U. S. Letters Patent to Miller No. 727,991.

The object of the present invention is to provide improved features of construction in an apparatus, including the above-mentioned devices, to obtain certain novel results, as will hereinafter appear.

As shown in the drawings Figure 1 is a plan view of a portion of a filtration system, showing a part of one contact bed and the improved filling and emptying apparatus therefor; Fig. 2 is a view in vertical cross-section, taken on line 2—2 of Fig. 1; Fig. 3 is a view in vertical section, taken on line 3—3 of Fig. 1; Fig. 4 is a cross-section taken on line 4—4 of Fig. 1; Fig. 5 is a detail cross-section taken on line 5—5 of Fig. 1; Fig. 6 is a detail cross-sectional view taken on line 6—6 of Fig. 1.

Referring to the drawings, the several contact beds receive their charge of the liquid to be treated from a common inlet tank A.

Connecting the inlet tank A and a chamber C, is a feed-device B, which passes through the partition separating the said inlet tank and chamber. Said feed-device consists of
 5 a pipe or tube of inverted U-form, associated with means for introducing air into and releasing it from the said pipe or tube; the air so introduced forming an air lock, as set forth in said prior Adams Patent No.
 10 648,325. A portion of one of the plurality of contact beds, each of which is in communication with the chamber C by means of a pipe *c*, is indicated by D. Connected with the contact bed D by means of a pipe *d*
 15 is a siphon chamber E, containing a deep seal siphon and an auxiliary siphon, blow-off or W-trap. The said deep seal siphon comprises a bell-shaped intake member F, which is inverted and supported above the
 20 floor of the chamber E, and vented in the usual manner by a pipe *e*.

F' indicates the discharge member of said siphon, or deep seal trap, the receiving limb of which extends vertically into and terminates in the top of the intake member F and the discharge limb *f'* of which communicates directly with the common discharge or outlet well O adjacent to the siphon chamber E. Adjacent to the siphon is a compression chamber G, shown in the drawings as communicating with said siphon chamber through the medium of a U-shaped pipe H, which is a pipe siphon of the form constructed according to, and operating as described in, the prior U. S. Letters Patent to
 35 Miller, No. 903,395. The lower part of the limb *h* of said pipe siphon extends horizontally through the wall separating the compression chamber and the main siphon chamber, near the base of said wall.
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I indicates a large bell-shaped vessel, commonly known as a stop-dome, opening downwardly and provided at its top with a pressure transmitting pipe *i* connecting said
 45 stop-dome with the intake limb of the feed-device B and extending downward into the same. The said compression chamber contains a smaller and similarly shaped vessel or starting bell J, the same communicating
 50 with a pipe line K by a pressure transmitting pipe *j*.

L indicates a so-called W-trap or auxiliary siphon, of a form described in connection with a discharge siphon in the prior U. S. Letters Patent to Miller No. 727,991, and in this case performing the function fully pointed out in the prior U. S. Letters Patent to Miller No. 904,141. Said auxiliary siphon is inserted in a pipe line connecting
 60 the feed-device B and the main pipe line K. The branch pipe *l* of the auxiliary siphon L extends to and downwardly into the inlet arm *b* of the feed-device and the branch pipe *i* of the same communicates with said main
 65 pipe line K. The pipe line K is divided

into several unit sections by the provision of a proper number of valves or two-way cocks *k'*, adapted to be so regulated as to transmit the air pressure of the stop-dome J through the medium of the pipe *j* to the feed-device of an adjacent contact bed, and to transmit the air pressure of a similar "stop-dome" J associated with an adjacent contact bed through the main pipe line K and the pipe *l* to the feed-device B of the contact bed D. Connecting the compression chamber G with the outlet well O is a pipe O', by which said compression chamber may be drained when desired by opening the normally closed valve O² in said pipe. The apparatus also includes a timing chamber M, which is separated from, but has communication with, the compression chamber G. Such communication is afforded by means of a pipe *m*, provided with a hand-valve *m'*; the said feed-pipe extending through the partition wall separating the said chambers and being located near the base or bottom of said wall. In said timing chamber M is located a starting bell N, which opens downwardly and is provided at its top with a pressure transmitting pipe *n*. Said pipe *n* is connected to one limb of the W-shaped blow-off trap or auxiliary siphon P, the same acting to operate the discharge siphon F and being located in the siphon chamber with said discharge siphon F. The construction and mode of operation of said auxiliary siphon P is fully described in the prior U. S. Letters Patent No. 727,991, and need not be further referred to herein.
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The principal parts of the apparatus described operate generally in the manner set forth in the prior applications hereinbefore referred to.
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In the operation of the apparatus constructed as described, when the liquid which is supplied to the contact bed or receptacle D through the feeding device B, reaches its maximum predetermined level in the said receptacle and the siphon chamber, it will flow through the open bend of the pipe siphon H and pass into the compression chamber, and when the liquid begins to enter the latter chamber, it will continue to enter and will fill said chamber by a certain and continuous flow. Such flow continues until the compression chamber is filled to the level of the liquid in the contact bed and regardless of the rate of flow into said contact bed. As soon as the level of the liquid in the compression chamber rises above that of the feed pipe *m*, the liquid will begin to flow from the compression chamber into the timing chamber through said feed pipe but as the siphon pipe is larger than the feed pipe *m*, the liquid will enter the compression chamber more rapidly than it will flow therefrom through said feed pipe *m* into the timing chamber. When the liquid has risen
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in the compression chamber to its maximum level therein, the air pressure developed in the compression dome will be sufficient to effect the air locking of the feed device B and will thereby stop the flow of liquid into the contact bed. The compression chamber being thus filled, liquid will continue to flow therefrom into the timing chamber until it reaches its predetermined maximum level in said timing chamber, when the pressure developed in the starting bell N will be sufficient to break the seal of the blow-off trap and vent the main siphon, thereby starting the same in operation to discharge or empty the contact bed. The feed pipe *m* is made of such size, or the valve thereof so regulated that the liquid will be retained in the contact bed the desired length of time. After the main siphon has been started in operation and the level of the liquid falls in the contact bed, the pipe siphon H will operate by siphonic action to withdraw the liquid from the compression chamber, and by the time said contact bed has been emptied, the liquid will have been withdrawn from the compression chamber to the level of the lower end of the limb *h'* of said pipe siphon H. As soon as the level of the liquid in the compression chamber descends below that in the timing chamber, the liquid in the latter will flow therefrom through said feed pipe into the compression chamber, and said pipe siphon will continue to operate until the liquid has been withdrawn from both the compression chamber and the timing chamber to the level of said lower end of the limb *h'* of the pipe siphon H. It being understood that the several contact beds will be filled and emptied in succession by the apparatus described, there will be ample time for the emptying of the timing chamber through the feed pipe, before the contact bed associated with such timing chamber is again filled.

It may some time occur that, in the discharge of the liquid from the contact bed, the level of the liquid in the latter will fall so rapidly as to effect the discharge of the liquid from the compression chamber through the pipe siphon H more rapidly than the flow from the timing chamber into the compression chamber. Under such circumstances when the liquid level in the compression chamber reaches the level of the lower end of the limb *h'* of the pipe siphon, the siphonic action of the same will cease, and the liquid then remaining in the timing chamber will continue to flow into the compression chamber until the level of the liquid in both chambers becomes equalized, and so much liquid might in that case be retained in the timing chamber as to prevent the venting of the starting bell contained in said timing chamber. Obviously this condition would prevent the proper action of

the main siphon during the succeeding operation of the contact bed.

In order to drain the compression chamber and timing chamber under these circumstances, the drain pipe O' is utilized, the valve O² in said pipe being left open to permit any liquid retained in the compression chamber and the timing chamber to escape therefrom, thereby restoring the proper operating conditions in said chambers before the succeeding charge is received into the contact bed. The drain pipe O', when left partially open, as described, further performs the function of discharging from the compression chamber any liquid which, in case the liquid rises very slowly in the contact bed, may flow in a small stream through the upper bend of the pipe siphon into the compression chamber, before the liquid in said contact bed reaches the level required to start the flow through said pipe siphon to the full capacity of the latter.

Referring further to the prior construction, in which the timing chamber is filled directly from the contact bed by a feed pipe having its inlet located at a short distance below the maximum predetermined liquid level of the contact bed, it has been found that said prior construction may fail to properly operate under all conditions, as for instance, when the feed of liquid in the contact bed is very slow. In the operation of an apparatus of the said prior construction, it is necessary that the liquid shall reach its maximum predetermined level in the contact bed before the feed to the contact bed will be stopped, and when the liquid is supplied very slowly to the contact bed, and the rise of the liquid in the contact bed is correspondingly slow, the timing chamber is liable to become filled through the feed pipe, and the main discharge siphon started in operation before the liquid in the contact bed reaches the level necessary to effect the stoppage of the flow of liquid through the feeding device. Under such conditions the liquid may flow through the feed pipe for such length of time, before the liquid finally reaches its maximum level in the contact bed, as to result in the filling of the timing chamber and the starting of the main siphon into operation before the contact bed is filled or when it is only partially filled. This will be better understood by consideration of the fact that there are many conditions affecting the rate of rise of the liquid in the contact bed, such as variations in the supply to, and leakage from, said bed, so that in the device of the prior construction, it is necessary to locate the inlet to the feed pipe at a considerable distance, usually several inches, below the predetermined maximum liquid level in the contact bed in order to make certain the filling of the timing chamber even when the liquid fails to reach the predeter-

mined maximum level in the contact bed, but such location of the feed pipe inlet has resulted, at times when the liquid rises very slowly in the contact bed, in the timing chamber being filled and the main siphon being started in operation before the liquid reaches its maximum level, as above stated, thus making it practically impossible to properly regulate the intervals of time between the operations of the feed device and the discharge siphon. The present construction possesses the advantage of insuring the certain action of the feed devices and the timing apparatus, independently of the rate of rise of the liquid in the contact bed and regardless of the rate of liquid supply to said contact bed.

A further important advantage gained by the improved construction described arises from the fact that, in the operation of the same, the emptying of the timing chamber takes place through the feed pipe *m* as the liquid is discharged from the compression chamber. I am, therefore, enabled by the present construction to avoid the use of a well in the bottom of the timing chamber adapted to form a water seal for a discharge pipe connected with the discharge member of the main siphon, such as is shown in the prior Miller Patent No. 867,669; it being understood that in the present construction, the liquid is discharged from the compression chamber through the medium of the pipe siphon *H* and the liquid in the timing chamber is discharged simultaneously through the feed pipe *m* from the timing chamber into said siphon chamber.

It is to be understood that a chamber, separate from the contact bed or main receptacle and also separate from the timing chamber, and adapted to be filled from said main receptacle or the siphon chamber by a pipe siphon, arranged as described, may be employed as a source of supply for filling the timing chamber, instead of a chamber designed to contain the compression dome of a feeding device, as is the case in the construction shown in the drawings. I do not, therefore, desire to be limited to a construction in which such separate chamber constitutes the compression chamber of the apparatus, although this latter construction is preferred by reason of the simplicity and economy of construction thereby obtained.

An apparatus embodying the general principles of construction hereinbefore set forth, may be variously modified with regard to its structural details, and I do not desire to be limited to the specific features illustrated in the drawings and hereinbefore described, except in so far as the same are pointed out in the appended claims as constituting parts of my invention.

I claim as my invention—

1. As a means for filling and discharging

a receptacle, the combination with such receptacle, of a feeding device for said receptacle, a main siphon, means for venting said siphon, embracing a starting bell, a timing chamber containing said starting bell, a separate chamber, means for supplying liquid to and withdrawing liquid from said separate chamber, operating to fill said chamber when the liquid in the receptacle reaches its maximum level and to empty said chamber when said receptacle is emptied, means contained within said separate chamber adapted to automatically close said feeding device by the rise of the liquid therein, and a feed-pipe connecting the bottom of said separate chamber with the bottom of said timing chamber.

2. As a means for filling and discharging a contact bed or other receptacle, the combination with such receptacle, of means controlled by air pressure and embracing a compression dome for supplying liquid to the receptacle, a compression chamber containing said compression dome, means for filling and emptying said compression chamber, operating to fill the chamber when the liquid rises to its predetermined maximum level in the receptacle and to empty said chamber when the receptacle is emptied, a siphon for discharging the receptacle, means for venting said siphon, embracing a starting bell, a timing chamber containing said starting bell, and a feed-pipe connecting the bottom of the compression chamber with the bottom of the timing chamber.

3. As a means for filling and discharging a liquid tank or receptacle, the combination with such receptacle, of a feeding device for said receptacle, a main siphon, means for venting said siphon, embracing a starting bell, a timing chamber containing said starting bell, a chamber separated from said timing chamber, a pipe of inverted U-form adapted to deliver water from the receptacle to the said separate chamber, and to withdraw liquid from said chamber by siphonic action, means contained within said separate chamber adapted to close said feeding device by the rise of the liquid in said separate chamber, and a feed pipe affording communication between the lower parts of the timing chamber and said separate chamber.

4. As a means for supplying liquid to and discharging liquid from a receptacle, the combination with the receptacle, of a feeding device having a feed passage adapted to be air-locked, and an air-compression dome in communication with said feed passage, a compression chamber containing said compression dome, a feed siphon connecting the receptacle with said compression chamber, a main siphon for discharging liquid from said receptacle, a blow-off trap for venting said main siphon, a starting bell for operat-

ing said blow-off trap, a timing chamber containing said starting bell, and a feed passage connecting the bottom of said compression chamber with the bottom of said timing chamber.

5 5. As a means for filling and discharging a liquid tank or receptacle, the combination with the receptacle, of a feeding device having a feed passage adapted to be air locked, 10 a main siphon, means for venting said main siphon, embracing a blow-off trap, a starting bell communicating with said blow-off trap, a timing chamber containing said starting bell, a separate chamber, a compression 15 dome contained in said separate chamber and communicating with the feed passage of said feeding device, means for supplying

liquid to and withdrawing it from said separate chamber, operating to fill said chamber when the liquid in the receptacle reaches its maximum level, and to empty said chamber when the receptacle is emptied, a feed pipe connecting the bottom of said separate chamber with the bottom of the timing chamber, and a valved drain pipe 20 leading from said separate chamber. 25

In testimony, that I claim the foregoing as my invention I affix my signature in the presence of two witnesses, this 21st day of May A. D. 1912.

LESTER E. REIN.

Witnesses:

CHARLES H. POOLE,
EUGENE C. WANN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."