

H. HOWARD,
LIQUID FEEDING APPARATUS.
APPLICATION FILED JULY 1, 1914.

1,265,333.

Patented May 7, 1918.

2 SHEETS—SHEET 1.

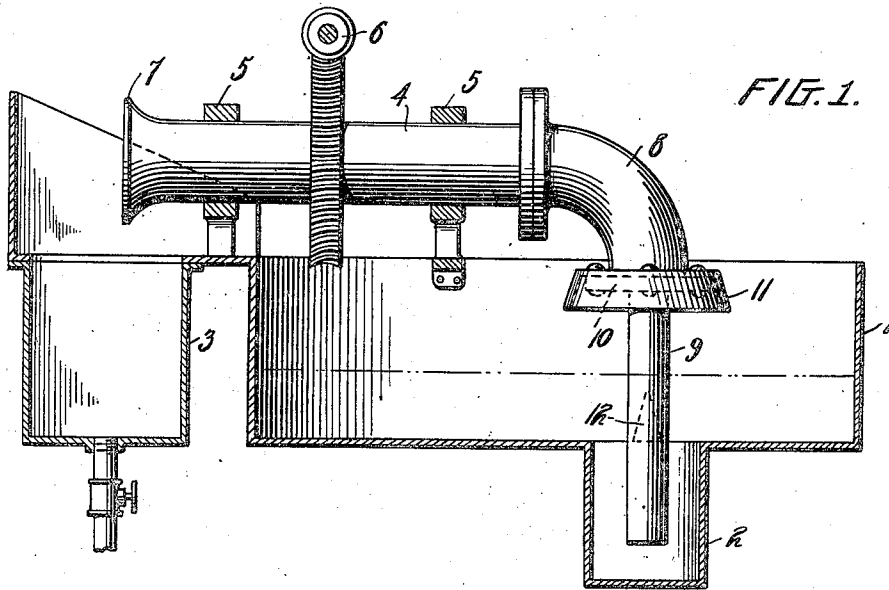


FIG. 1.

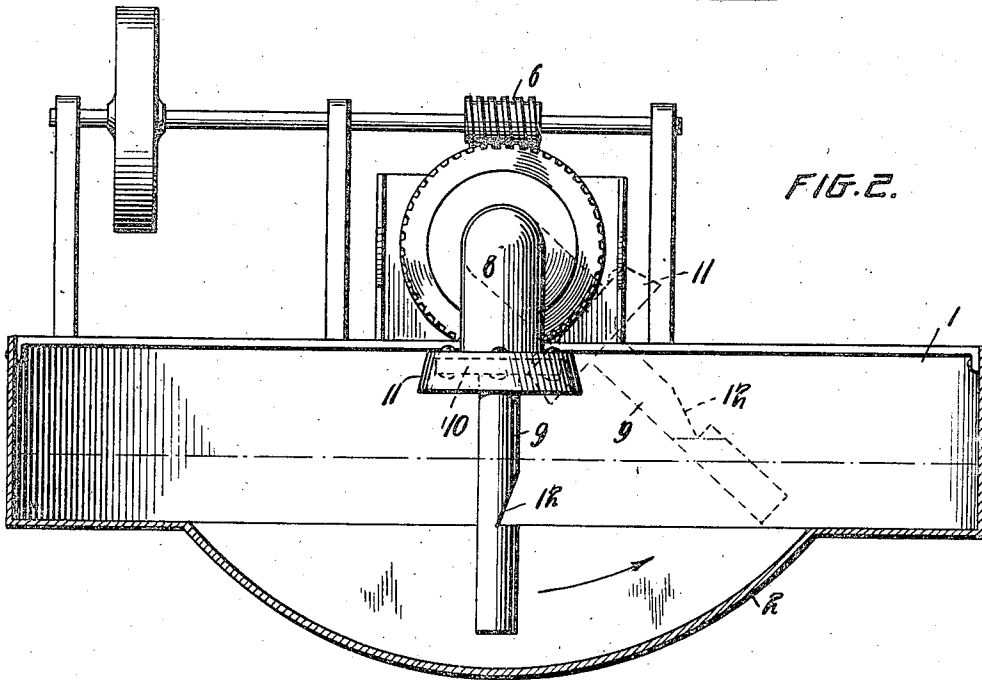


FIG. 2.

Witnesses
R. J. Fulsizer.
C. H. Potter.

Inventor
H. Howard
By James Townsend & Bickelstein
Attorneys

H HOWARD.
LIQUID FEEDING APPARATUS.
APPLICATION FILED JULY 1, 1914.

1,265,333.

Patented May 7, 1918.
2 SHEETS—SHEET 2.

FIG. 3.

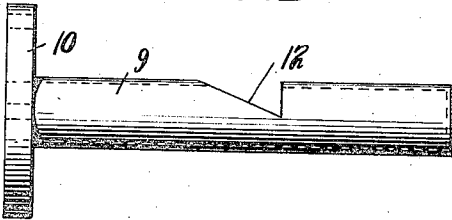


FIG. 5.

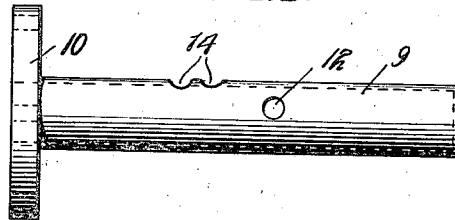


FIG. 4.

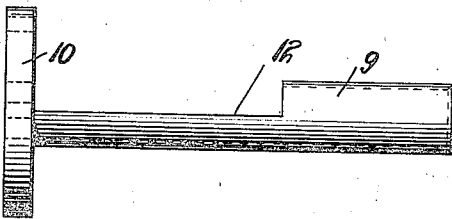


FIG. 6.

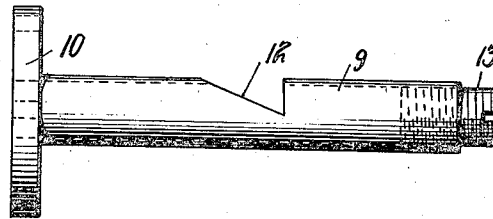
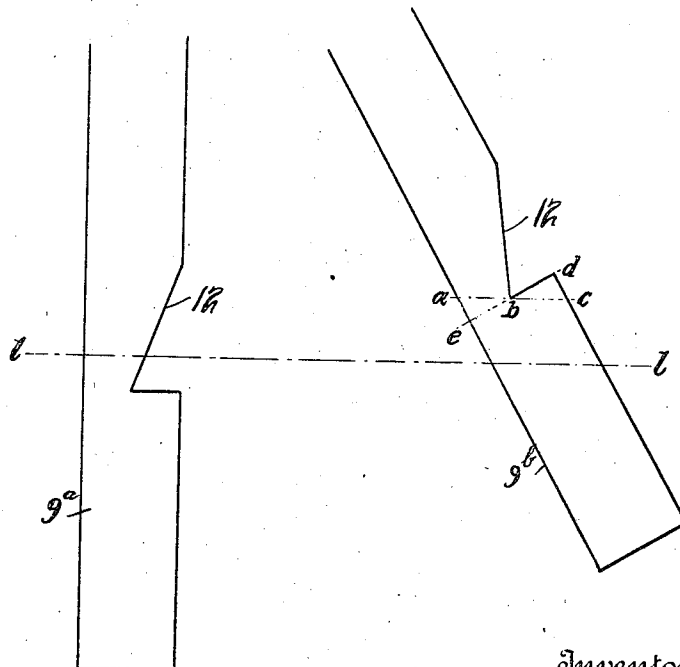


FIG. 7.



Witnesses
R. J. Hulsiger.
C. H. Potter.

Inventor
Henry Howard
By *Bymes, Dornier & Birkenshaw*
Attorneys

UNITED STATES PATENT OFFICE.

HENRY HOWARD, OF BROOKLINE, MASSACHUSETTS.

LIQUID-FEEDING APPARATUS.

1,265,333.

Specification of Letters Patent.

Patented May 7, 1918.

Application filed July 1, 1914. Serial No. 848,457.

To all whom it may concern:

Be it known that I, HENRY HOWARD, a citizen of the United States, residing at Brookline, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Liquid-Feeding Apparatus, of which the following is a specification.

This invention relates to liquid-feeding devices, the object of the invention being to provide a simple apparatus for delivering liquid at a predetermined, accurately controlled rate, from a source the level of which is or may be variable. The apparatus is applicable to many purposes, as for example the introduction of a regulated proportion of sulfuric acid into the charge for a mechanical salt-cake furnace, etc.

The invention will be described by reference to illustrative embodiments shown in the accompanying drawings, wherein—

Figure 1 is a side view of one form of device embodying the invention, the storage and receiving tanks being shown in section;

Fig. 2 is an end view of the same, the acid tank being shown in section;

Fig. 3 is an elevation of a preferred form of dipping-pipe on a slightly enlarged scale;

Figs. 4, 5, 6 are similar views of modified forms of dipping-pipe; and

Fig. 7 is a diagram illustrating the principle of the invention.

The apparatus as illustrated comprises a storage tank 1 for the liquid, which may be provided, in its bottom, with a trough-like depression 2. 3 is a smaller tank into which liquid is to be delivered at the predetermined rate. The liquid-feeding device is mounted above these tanks and comprises a hollow cylinder 4, which may be of stone-ware in case acid liquids are to be delivered. This cylinder is horizontally mounted in bearings 5, 5, and may be slowly rotated, for example by a worm-gear 6. The delivery end of the cylinder 4 may be flared outwardly, as indicated at 7.

The dipping-pipe 9 is rigidly secured to the cylinder 4 by means of an elbow 8, and rotates in a vertical plane in the direction indicated by the arrow in Fig. 2. The dipping-pipe is flanged at 10, and is removably attached. The flange 10 may be surrounded by a basin 11 constructed to intercept any liquid which may flow down the

sides of the dipping-pipe as it rises above the horizontal position.

The pipe 9 is closed at its outer end to provide a cup of suitable capacity, and is provided, on its advancing side, with an aperture 12, so located as to dip beneath the surface of the liquid at each revolution of the pipe. This aperture may assume various forms as described below, it being however essential that it should extend to, but not beyond, the median plane of the pipe, this term being used to designate a plane lying midway between the front, or advancing, and rear walls of the pipe. It is preferred, where the highest accuracy is required, that the aperture should terminate rearwardly in an angle, as exemplified in Figs. 1, 2, 3, 4, and 6. The necessity for positioning the aperture as above described will be apparent from a consideration of the diagram (Fig. 7), in which 9^a and 9^b represent the internal walls of one form of dipping-pipe in two positions assumed during its rotation: and $l-l$ represents an assumed level of the liquid in the tank 1. As the pipe dips beneath the surface, it is of course filled to the approximate level $l-l$ by liquid entering through the aperture 12. As the pipe emerges from the liquid, the excess liquid flows out through this aperture, the level within the pipe falling to the plane indicated by the dotted line $a-b-c$. The quantity of liquid remaining in the pipe is however equal to the capacity of the cup-end of the pipe (that portion of the pipe below the aperture 12). This follows from the fact that the air-space indicated by the triangle $b-c-d$ is precisely compensated by the liquid-volume indicated by the triangle $a-b-e$: inasmuch as these two similar triangles are geometrically equal, the sides $e-b$ and $b-d$ being equal by definition (each extending to the median plane), and the angles $a-b-e$ and $d-b-c$ being opposite angles. It will be obvious that the amount of liquid carried by the pipe, after emergence from the liquid in the tank, is independent of the angular position of the pipe, and is hence independent of the level of liquid in the tank, provided only the tank contains sufficient liquid to fill the cup-end of the pipe in its lowermost or vertical position.

It will also be understood that the pipe need not be circular in cross-section, but may

assume any desired form, such as square or polygonal, provided the internal walls are substantially parallel for the necessary distance above and below the drainage point.

5 The invention is not limited to a V-shaped aperture, nor is it necessary that the aperture should intersect the front wall of the pipe. As instances of modified constructions, Fig. 4 represents a pipe in which the
10 advancing side is cut away to the median plane from the cup to the flange 10. In Fig. 5, the aperture takes the form of a circular opening tangent to the median plane; such opening may be provided on one or both
15 sides of the pipe as desired, and may assume various forms other than circular, it being preferred, as above stated, that the opening should terminate in an angle at the median plane. One or more inlet apertures may
20 also be provided as desired on the advancing side of the pipe, provided they are so positioned as not to affect the level ultimately assumed by the liquid in the pipe. Such apertures are indicated at 14 in Fig. 5.

25 When it is desired to substitute a pipe of smaller or larger capacity, this may readily be done either by replacing the entire pipe at the flanged joint 10, or by providing any suitable means for varying the capacity of
30 the cup-end of the pipe, as for example by the provision of a screw-plug or similar device, as indicated at 13, in Fig. 6. This may be located at any suitable point in the cup and advanced or retracted to vary the capacity.
35

I claim:—

1. In apparatus for delivering substantially equal volumes of liquid, a dipping-

pipe of uniform cross-section closed at its outer end and having a delivery orifice at its inner end said pipe provided with an opening on one side, said opening extending to but not intersecting the median plane of the pipe. 40

2. In apparatus for delivering substantially equal volumes of liquid, a dipping-pipe of uniform cross-section closed at its outer end and having a delivery orifice at its inner end said pipe provided with an angular opening on one side, said opening extending to but not intersecting the median plane of the pipe. 50

3. Apparatus for delivering substantially equal volumes of liquid, comprising a liquid tank, a pipe of uniform cross-section mounted for rotation in said tank on an axis above the level of the liquid in the tank, said pipe closed at its outer end and provided with an opening on its advancing side, said opening extending to but not intersecting the median plane of the pipe. 60

4. Apparatus for delivering equal volumes of liquid, comprising a liquid tank, a pipe of uniform cross-section mounted for rotation in said tank on an axis above the level of the liquid in the tank, said pipe closed at its outer end and provided with an angular opening on its advancing side, said opening extending to but not intersecting the median plane of the pipe. 70

In testimony whereof I affix my signature in presence of two witnesses.

HENRY HOWARD.

Witnesses:

THOS. J. SHANNON,
M. V. O'BRIEN.