(No Model.)

R. G. FERGUSON.

APPARATUS FOR MIXING LIQUIDS AND GASES.

No. 591,830. Patented Oct. 19, 1897.

FIG. 2.

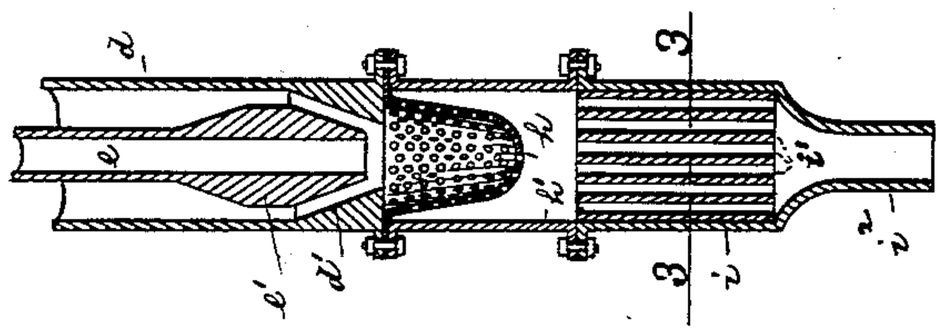


FIG. 1.

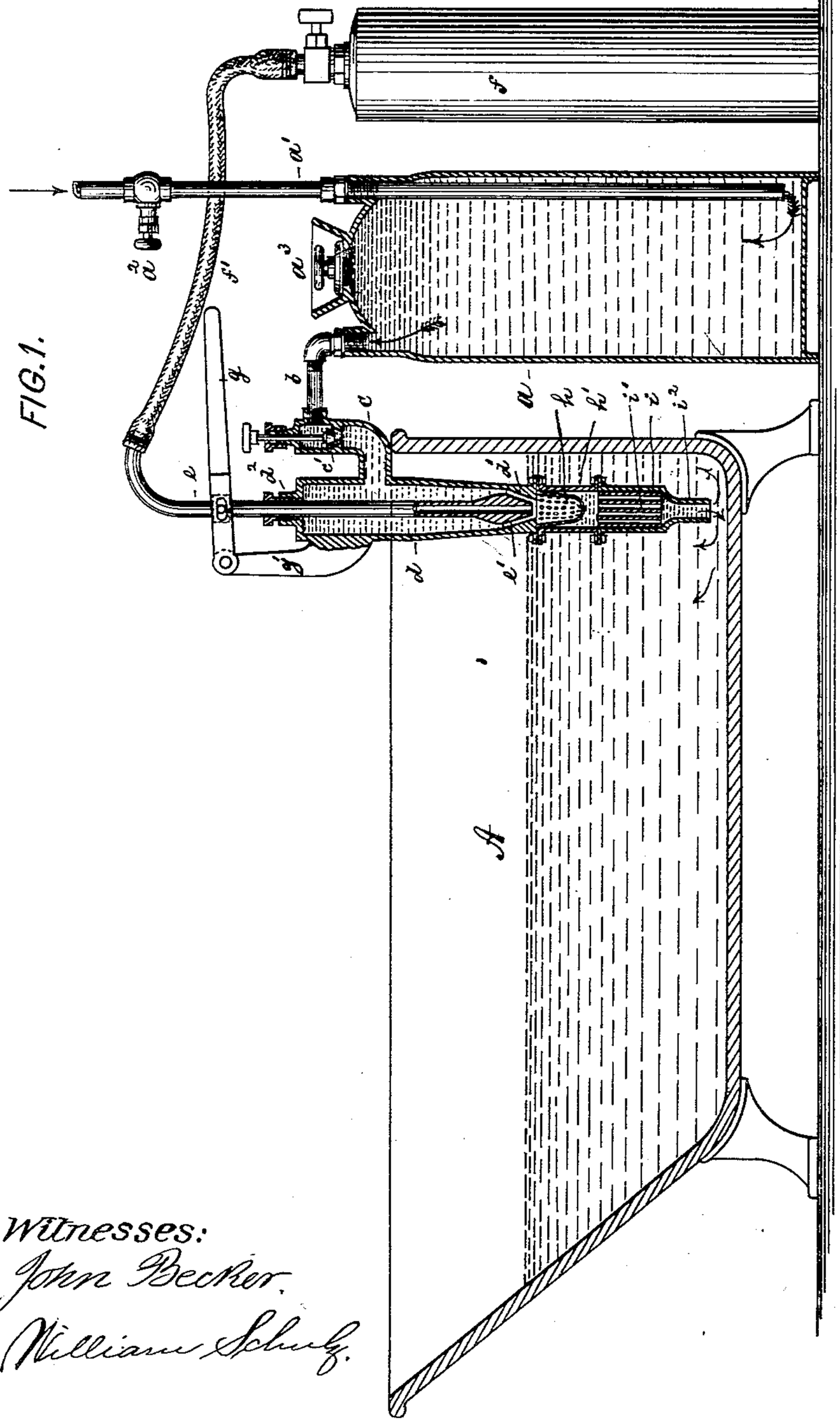
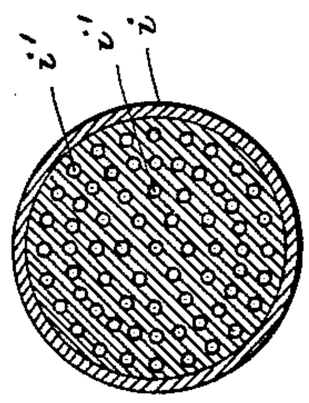


FIG. 3.



Witnesses:
John Becker.
William Schulz.

Inventor:
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UNITED STATES PATENT OFFICE.

ROBERT G. FERGUSON, OF LAKEWOOD, NEW JERSEY, ASSIGNOR OF ONE-HALF TO ABRAHAM M. ELKUS, OF NEW YORK, N. Y.

APPARATUS FOR MIXING LIQUIDS AND GASES.

SPECIFICATION forming part of Letters Patent No. 591,830, dated October 19, 1897.

Application filed January 22, 1897. Serial No. 620,229. (No model.)

To all whom it may concern:

Be it known that I, ROBERT G. FERGUSON, a citizen of the United States, and a resident of Lakewood, in the county of Ocean and State of New Jersey, have invented certain new and useful Improvements in Apparatus for Mixing Liquids with Gases, of which the following is a specification.

This invention relates to an apparatus so constructed that it will charge liquids with gases in such a manner that the latter will be finely subdivided and will be suspended in the liquid in the form of small bubbles, that will be slow to escape.

The invention is well adapted to be applied for the production of effervescent or "Nauheim" baths in which a saline liquid is charged with carbonic-acid gas, but it is clear that the invention may be applied to other purposes.

In the accompanying drawings, Figure 1 is a longitudinal section, partly in side view, of my improved apparatus, showing it applied to a bath. Fig. 2 is a detail longitudinal section through the injector; and Fig. 3, a cross-section on line 3 3, Fig. 2.

The letter *a* represents a fixed or portable vessel designed for the reception of a suitable liquid, such as water. The vessel *a* may communicate with the water-main by a pipe *a'*, having valve a^2, and extending to within a short distance of the bottom of the vessel. Suitable chemicals, such as salts, may be introduced into the vessel *a*, through a hand-hole a^3, which will be thoroughly dissolved by the water admitted by pipe *a'*. Near its upper end the vessel *a* communicates by pipe *b* with a valve-chamber *c*, which in turn communicates with the outer tube *d* of an injector or mixer. A valve *c'*, in chamber *c*, is adapted to control or check the flow of liquid.

Through the outer or liquid tube *d* there extends centrally the inner or gas tube *e*, which is connected with a gas-cylinder *f* by a flexible hose *f'*. The lower end of tube *e* terminates in a conical head or valve *e'*, adapted to engage a conical valve-seat *d'*, in which the tube *d* terminates. The tube *e* is longitudinally adjustable, so as to increase or diminish the size of the liquid-passage formed between the parts *d' e'*, and to thus regulate easily the relative proportions of admixed liquid and gas.

To permit the vertical adjustment of tube *e*, I have shown it connected to a hand-lever *g*, fulcrumed to a fixed support *g'*, while a stuffing-box d^2 holds the tube at any elevation at which it may be set.

To the lower end of tube *d* there is attached a foraminated thimble *h*, through the small perforations of which the admixed gas and liquid are ejected in the form of a fine spray. This spray is collected in a chamber formed by a surrounding tube *h'*, and thence flows downward through a number of parallel upright ducts or channels *i'* of a perforated nozzle *i*, to be finally discharged into a bath-tub A or other receptacle through nipple i^2.

By the particular construction of the injector the gas is divided into small bubbles, which will be slow to rise through the saturated body of liquid within tub A, so that an effervescent bath is obtained which permits a prolonged use without loss of the original properties of the admixture. The injector furthermore so breaks the force of the current that the charged liquid will escape into the tub through the nipple in a quiet stream, and not in the form of a violent current. Finally the apparatus enables a constant or unceasing renewal of the admixture in its full strength for any desired period of time.

It is clear that the invention may be applied to different purposes from the one specified, it being adapted generally for the admixture of volatile, semivolatile, or gaseous substances or of solid or semisolid substances (under pressure) with liquids.

What I claim is—

1. In a mixing apparatus the combination of an outer tube with an inner tube, a perforated thimble at the bottom of the outer tube, a surrounding chamber, and a nozzle having a series of ducts and arranged beneath said chamber, substantially as specified.

2. In a mixing apparatus the combination of an outer tube having a valve-seat with an inner longitudinally-adjustable tube having a head adapted to engage said valve-seat, means for operating the inner tube, a perforated thimble at the bottom of the outer tube,

a surrounding chamber, and a nozzle having a series of ducts and arranged beneath said chamber, substantially as specified.

3. In a mixing apparatus the combination of a vessel with a liquid-feed pipe extending into the same to within a short distance of its bottom, an outer tube having a valve-seat and connected to said vessel, a valve between vessel and tube, a gas-cylinder, a longitudinally-movable headed inner tube connected thereto, means for operating the inner tube, a perforated thimble at the bottom of the outer tube, a surrounding chamber, and a nozzle having a series of ducts and arranged beneath said chamber, substantially as specified.

Signed at Lakewood, in the county of Ocean and State of New Jersey, this 19th day of January, A. D. 1897.

ROBERT G. FERGUSON.

Witnesses:
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