(No Model.)

E. B. DENNY & A. B. GRIFFEN.

APPARATUS FOR MIXING AERIFORM FLUIDS.

No. 327,146. Patented Sept. 29, 1885.

Fig. 1.

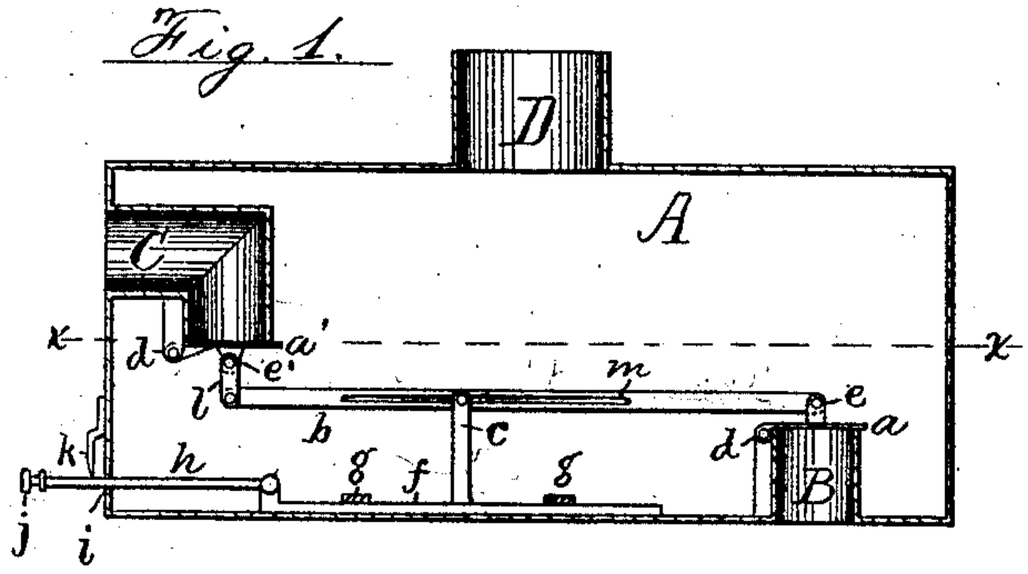


Fig. 2.

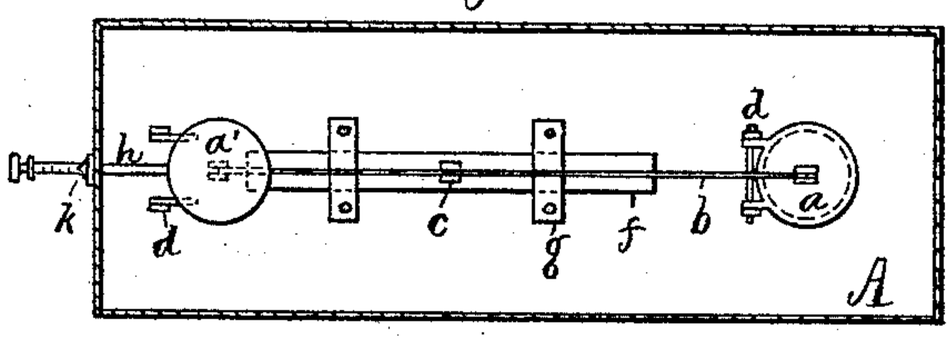


Fig. 3.

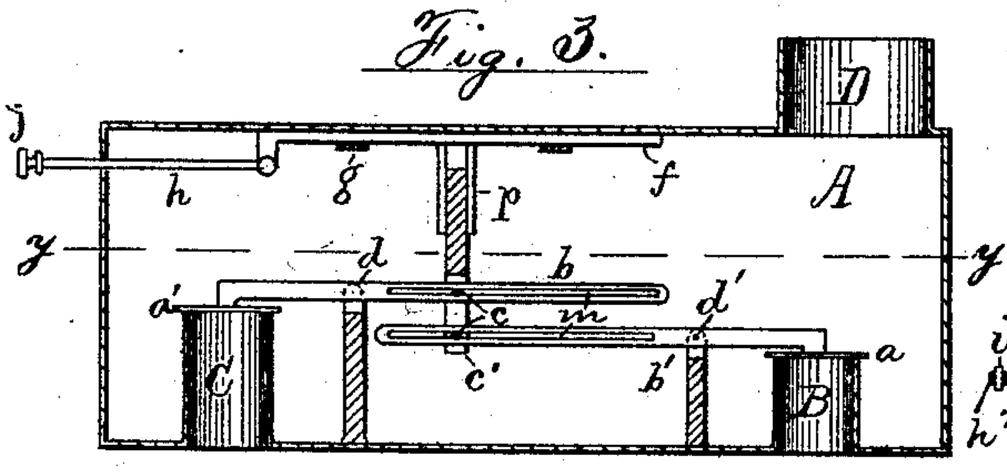


Fig. 4.

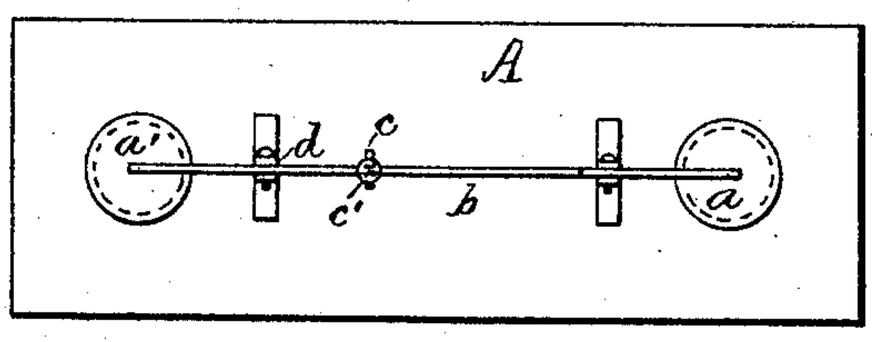


Fig. 6.

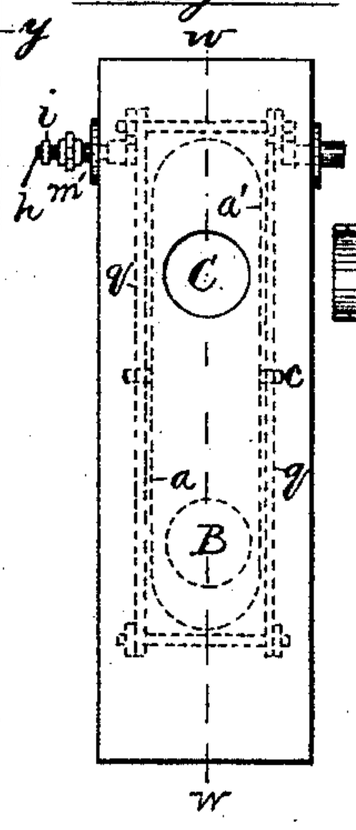
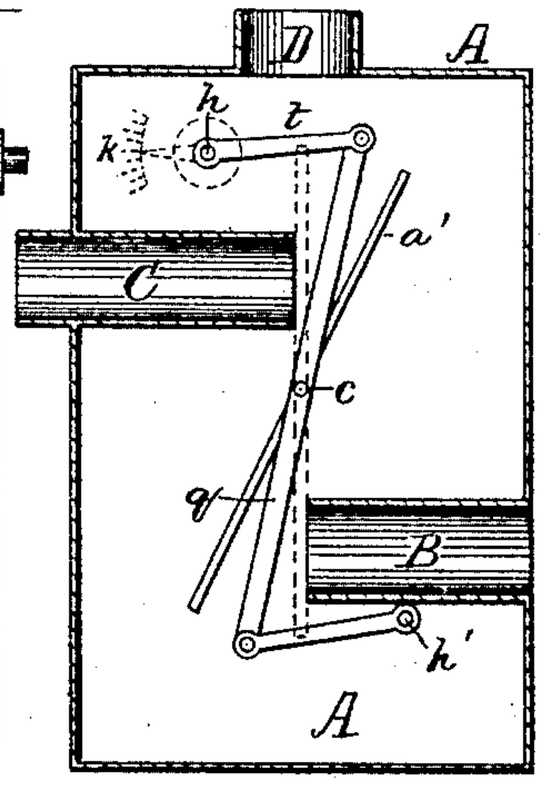


Fig. 5.



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UNITED STATES PATENT OFFICE.

EDWARD B. DENNY AND ARTHUR B. GRIFFEN, OF NEWARK, N. J., ASSIGNORS TO THE IMPERIAL MANUFACTURING COMPANY, OF NEW JERSEY.

APPARATUS FOR MIXING AERIFORM FLUIDS.

SPECIFICATION forming part of Letters Patent No. 327,146, dated September 29, 1885.

Application filed March 31, 1883. (No model.)

To all whom it may concern:

Be it known that we, EDWARD B. DENNY and ARTHUR B. GRIFFEN, citizens of the United States, residing in Newark, Essex county, New Jersey, have invented certain new and useful Improvements in Apparatus for Mixing Aeriform Fluids, fully described and represented in the following specification, and the accompanying drawings forming a part of the same.

This invention consists in the combination, with valves operated by the direct pressure of the transmitted fluid, of a lever or levers to secure a proportional movement of the valves.

It also consists in providing the connecting-lever with an adjustable fulcrum or connecting pin at some point, so that the proportional movements of the two valves may be varied at pleasure, and in details of construction fully set forth herein.

We hereby disclaim the subject-matter of application No. 90,104, filed by us simultaneously herewith, and in which we have made broader claims to the invention herein described.

The object of the invention is to admit to a mixing-chamber certain fluids—as air and gasoline vapor—in regulated proportions, and to vary such proportions at pleasure by a simple adjustment of the device connecting two automatic valves, and to dispense with the mechanical means heretofore used to produce movement in the regulating-valves. Our invention therefore includes the means for moving the valves by the direct pressure of the moving fluids in lieu of the diaphragms and equivalent mechanisms heretofore used when two valves have been connected to move proportionally, so as to deliver different and regulated volumes of fluid simultaneously.

The nature of the invention will be understood from the annexed drawings, in which four different constructions of the apparatus are shown, Figure 1 being a central vertical section of a mixing chamber or casing, A, provided with two flap-valves connected with opposite ends of a single lever, and Fig. 2 is a plan of the same in section on line *x x* in Fig. 1. Fig. 3 is a vertical section of a casing provided with valves having separate levers, and Fig. 4 is a plan of the same in section on line *y y* in Fig. 3. Fig. 5 is a central section of a casing having the two valves and their connecting-lever combined in a single flat plate, and Fig. 6 is an edge view of the same casing.

B and C are inlets for the two fluids, which are to be mixed in given proportions, and D an outlet for the mixture formed in the casing.

The inlet-pipes are shown formed with round apertures inside the casing, and the valves are applied to such apertures and secured either to hinges at the side of such valve-seats, as in Figs. 1 and 2, or to the levers used by us to move the valves simultaneously, as in the other figures.

a a' are the valves, and it is obvious that if they are connected by levers their relative movements must be in the same proportion as their distances from the common fulcrum, provided a single lever pivoted between the valves be employed, as in Figs. 1 and 5. The valves are formed in all the figures as flat plates pressed toward and upon the mouths of the inlets by a slight preponderance of weight, so as to close normally unless opened by the fluid pressure, but adapted to yield to so light a pressure as to oppose, practically, no resistance to the passing current.

It is obvious that the fluid pressure may be induced by the generation of the gas under pressure, or by suction applied to the outlet, so as to develop atmospheric pressure at the inlets.

b is the lever, and if its fulcrum were in the middle the movements of the valves at its opposite ends must be exactly equal and opposite in direction. In such case the two inlet-pipes must obviously be faced in opposite directions, as shown in Figs. 1 and 5; but it is obvious that valves with a definite proportional movement or area will admit fluids only in a fixed ratio, and as the richness of the gas or vapor derived from volatile fluids diminishes in degree as the fluid is consumed, some means of varying the proportional movement of the lever-connected valves is needed to make the apparatus more useful. Such variable element we provide by changing the location of the point of connection between the valves, which may be effected either by shifting the fulcrum of a single lever or by shifting an adjustable link between two levers

having fixed fulcra, one valve being attached to each of the separate levers. In either case the proportion between the movements of the valves will be altered in the desired manner, so that one may deliver a greater volume of fluid than the other. These constructions will be understood by reference to the drawings. Thus, in Fig. 1 the valves *a a'* are hinged to joints *d* at the sides of the valve-seats, and the lever *b* is mounted upon a movable fulcrum, *c*, and connected to one valve, *a*, by an eye, *e*, upon its back, and to a similar eye, *e'*, upon the other valve by a link, *l*, the lower valve, *a*, being made somewhat heavier than the valve *a'*, so as to keep the valves pressed gently upon their seats until opened by the fluid pressure.

The pivotal connection of the valve *a* at *d* and of the lever to it at *e* prevents any tendency to end movement in the lever *b*, and the fulcrum *c* may therefore be made movable in relation to the valves without deranging their connection. To effect such movement, the lever *b* is formed with a slot, *m*, extending along the middle and one end of the same, and a pin, *c*, is mounted upon a movable slide, *f*, guided in straps *g*, and applied to the slot to form a fixed point for the lever to turn upon. When the pin is midway in the lever between the two valves, their movement must necessarily be equal, whichever one receives a moving impulse, and as the lever-fulcrum is moved toward *a'*, as shown in Fig. 1, the latter valve is moved less in proportion to the opening of the former.

The link *l* is employed to permit a free movement of the end of the lever at *a'*, the end at valve *a* being necessarily moved in a curve from the hinge *d*.

To move the slide *f*, a rod, *h*, is attached thereto and extended through a tight joint, *i*, in the side of the casing to a handle, *j*, upon the outside. The rod *h* is provided with an index and scale, *k*, by which the position of the fulcrum *c* may be indicated, and the proportional movements of the valves deduced.

In Fig. 3 fixed fulcra are shown, and the valves *a a'* are fixed directly to the end of two parallel levers, *b b'*, the joints or fulcra for which are permanently fixed at *d d'*, and the levers themselves slotted at *m*, to receive a movable connecting-link, *c'*. This link is provided with two pins, *c*, at the distance of the two slots from one another when the valves are closed, and the link itself is formed with an extension or stem fitted to slide (with the vibrating movement of the two levers) in a movable socket, *p*, which is mounted and adjusted, like the fulcrum *c* in Fig. 1, upon a slide, *f*. The connecting-link and pins *c*, operating to change the point of connection between the two valves, effects the same result in the latter as in the former construction described.

In Fig. 5 the lever and valves are all combined in one piece, and the variable movement is effected by shifting the fulcrum of the lever. This movement brings a different part of the valve-surface opposite the inlets, but does not change the function of the valve in closing the openings. The valves are both formed of a single plate pivoted by its middle, but made slightly heavier at the lower end, so as to hang normally with its opposite ends against the mouths of the inlets B and C, the latter facing in opposite directions and being closed by opposite faces of the valve-plate.

The fulcrum *c* is mounted in two links, *q*, which are sustained, as in an engine of parallel motion, by oppositely-projecting cranks, *t*, fitted to rock-shafts *h h'*. The shaft *h* is extended outside the casing, like the rod *h* in Figs. 1 and 3, and affords the means to move the cranks and links by a handle, *j*, so as to vary the relation of the fulcrum *c* to the two valve-seats. When the fulcrum coincides with a line midway between the valve seats or inlets, the movement of the valve-surfaces upon the plate is equal to and from both seats; but as the fulcrum is moved toward the inlet C the valve-surface at *a'* has a lesser movement than that at the other end of the plate. The shaft *h* is shown provided with a stuffing-box, *m'*, at the joint in the casing A, and the rod *h* in the other constructions may be similarly fitted, if required.

With all these constructions the operation is the same, the valves lying normally against their seats until the fluid pressure acts upon one of the valves, when both are simultaneously and automatically opened in the ratio determined by the adjustment of their pivotal connections *c*, and such ratio is maintained, whether the valves are opened more or less, until it is desired to alter the proportion in which the two fluids are mingled, when the operator changes the leverage from the outside of the casing by any of the means shown herein, and thus alters the proportionate movement of the two valves. Our invention therefore involves a positive connection between two valves, so that one must move with the other and in a given proportion to its motion; and it also involves the use of valves connected only with one another by such means as to rest normally on their seats and to move freely under the fluid pressure operating within the inlets and upon the valve-faces only, so that we may dispense with every auxiliary agent heretofore used to give motion to two valves actuated with such proportionate movement. By dispensing with all such auxiliary mechanism we greatly simplify the construction and avoid the danger of derangement, especially that danger arising from the use of a floating diaphragm or gas-holder, the water in which is liable to be frozen in cold weather.

The means we have shown for changing the leverage of the connection between the valves also serve to alter their relative motions without affecting their automatic action, and thus adapt the construction especially for diluting

the vapor arising from gasoline, for the reason that such vapor varies in density as the fluid is reduced in bulk in the evaporator.

From the above description it will be evident that all the constructions exhibit proportionally-moved valves whose relative movement is derived from a lever-connection which secures simultaneous action in both.

We are aware that valves to regulate the relative flow of gas and air have been located within a gas-holder and actuated by the rise and fall of the same; but our invention differs from such constructions in that the mixing-chamber requires no movable sides to perform its functions, but consists merely in a box large enough to contain the two valves and their lever-connections, the latter, with their fulcra, being wholly inclosed within the chamber in our invention, so that the valves may be applied to the inlets within the chamber, and the fluids flow directly from the inlets into contact with one another and be properly mixed before they are discharged.

We are fully aware that two valves have been combined with levers and a moving diaphragm, as in United States Patent No. 234,904, to produce simultaneous and proportionate movements, and we do not therefore claim such a combination, but employ a part of the said combination—*i. e.*, the valves and levers—without the diaphragm, and in combination with a new means of moving the valves in lieu thereof.

We are also aware that a valve moved automatically by fluid pressure is not new, but has long been used as a self-acting check in pumps and pipes; but our invention includes two such valves and the lever-connections necessary to secure the desired proportional movements; and

We therefore claim the same as follows:

1. The gas-qualifier consisting in the mixing-chamber provided with gas and air inlets, and an outlet for the mixed product, and containing two valves connected positively together by a lever having its fulcrum within the chamber, the valves being adapted to normally and automatically close the inlets, and being actuated only by the pressure of the fluid within the inlets, substantially as herein shown and described.

2. The gas-qualifier consisting in the mixing-chamber provided with gas and air inlets and an outlet for the mixed product, the two valves applied to the inlets within the chamber, a lever-connection between the two valves, substantially as described, a pivotal connection, *c*, adjustable between the valves to vary their proportional movement, and means, substantially as described, for adjusting such pivotal connection from the exterior of the casing, as and for the purpose set forth.

3. In a gas-qualifier, the combination, with the mixing-chamber, of the inclosed valves formed at opposite ends and sides of a flat pivoted plate, the inlets arranged to open within the chamber at opposite sides and ends of said plate, the outlet from said chamber, and means, substantially as described, for shifting the pivotal supports of the plate, and thereby varying the proportional movement of the valves, as and for the purpose set forth.

4. The gas-qualifier consisting in the mixing-chamber provided with gas and air inlets and an outlet for the mixed product, the two valves applied to the inlets within the chamber, a lever-connection between the two valves, substantially as described, a pivotal connection, *c*, adjustable between the valves to vary their proportional movement, and means, substantially as described, for adjusting such pivotal connection from the exterior of the casing, and a scale or index upon the exterior of the casing to indicate the position of the pivotal connection *c*, as and for the purpose set forth.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

EDWARD B. DENNY.
ARTHUR B. GRIFFEN.

Witnesses:
THOS. S. CRANE,
JOHN A. RODRIGO.