H. PEARCE.

AERATING MACHINE.

APPLICATION FILED FEB. 11, 1908.

922,183.

Patented May 18, 1909.

5 SHEETS—SHEET 1.

Fig 1 MD7

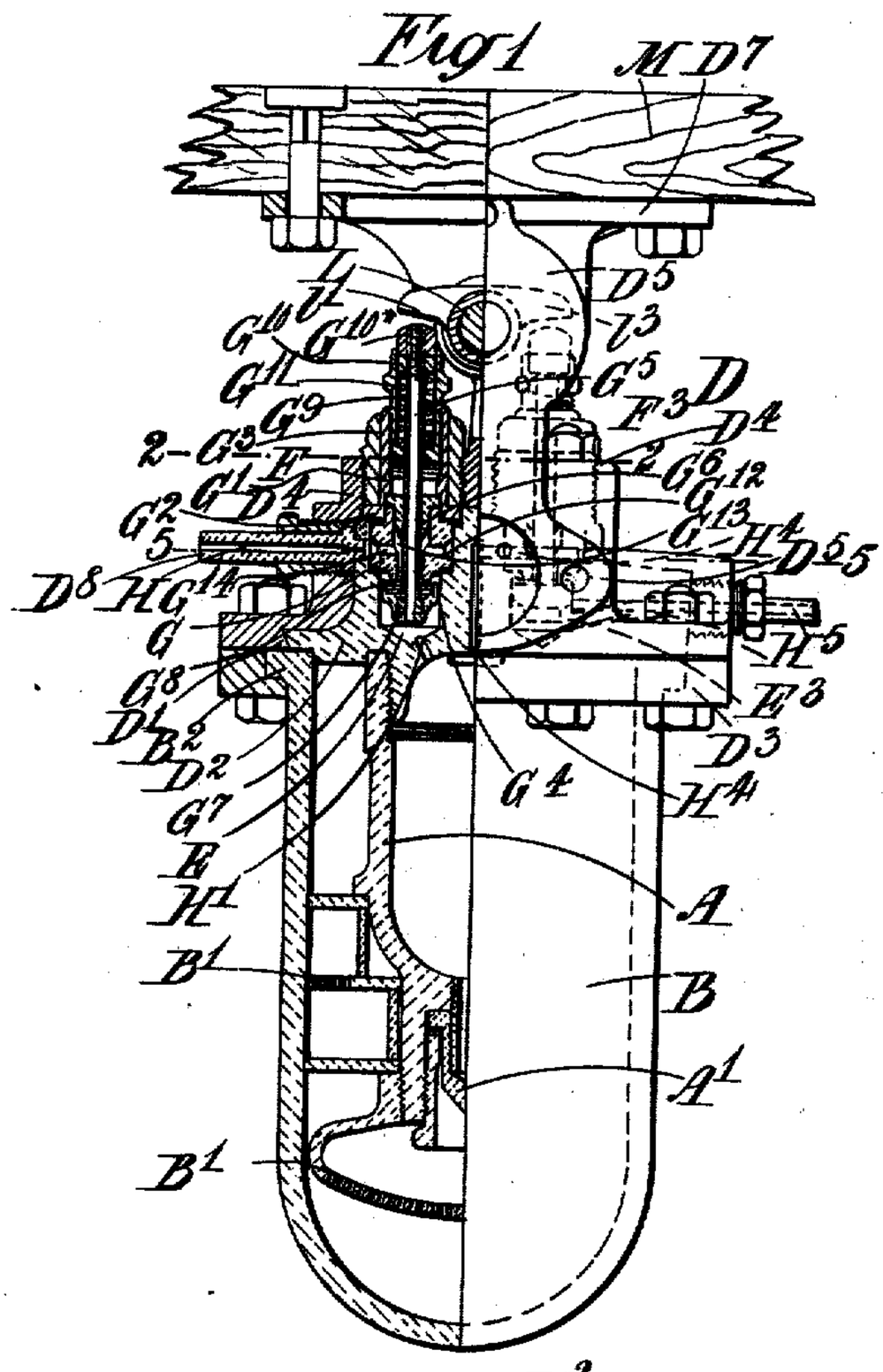
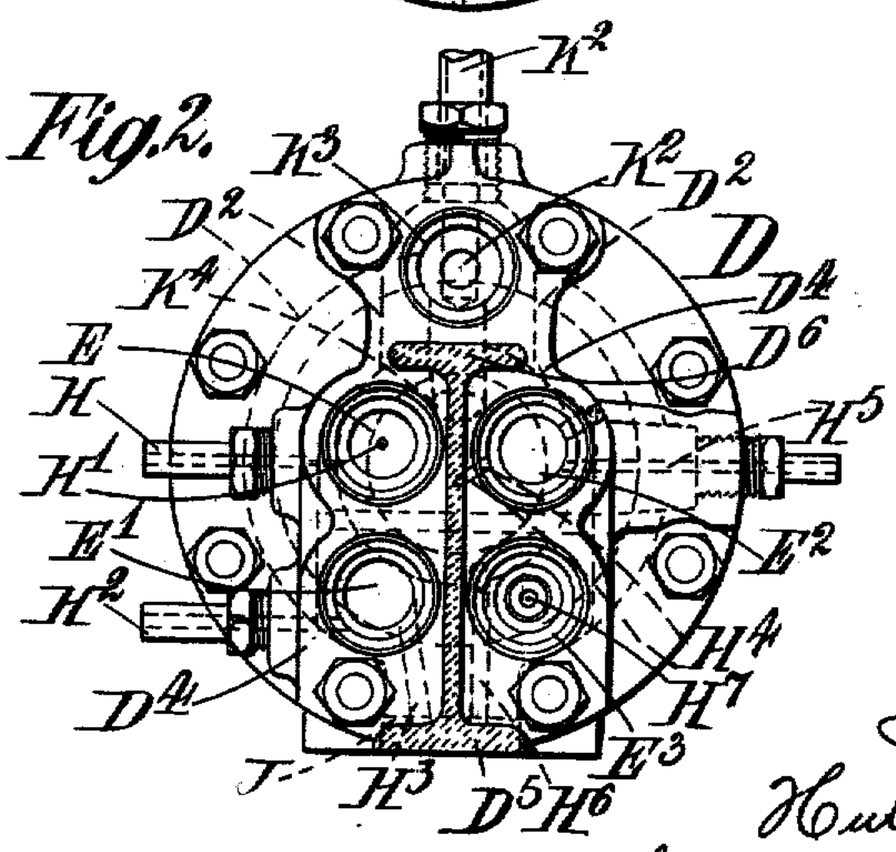


Fig. 2.



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5 SHEETS—SHEET 2.

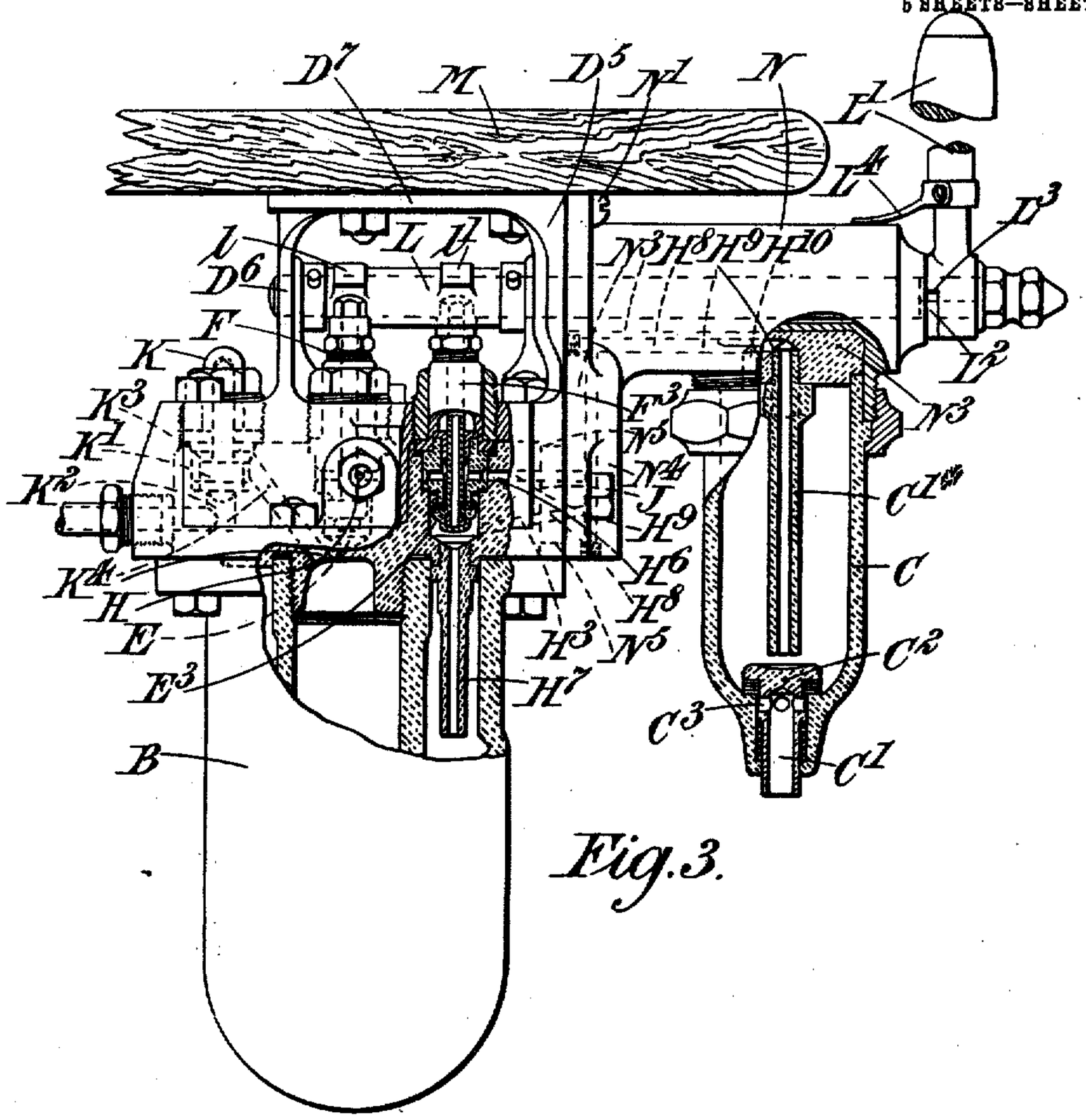

Fig. 3.

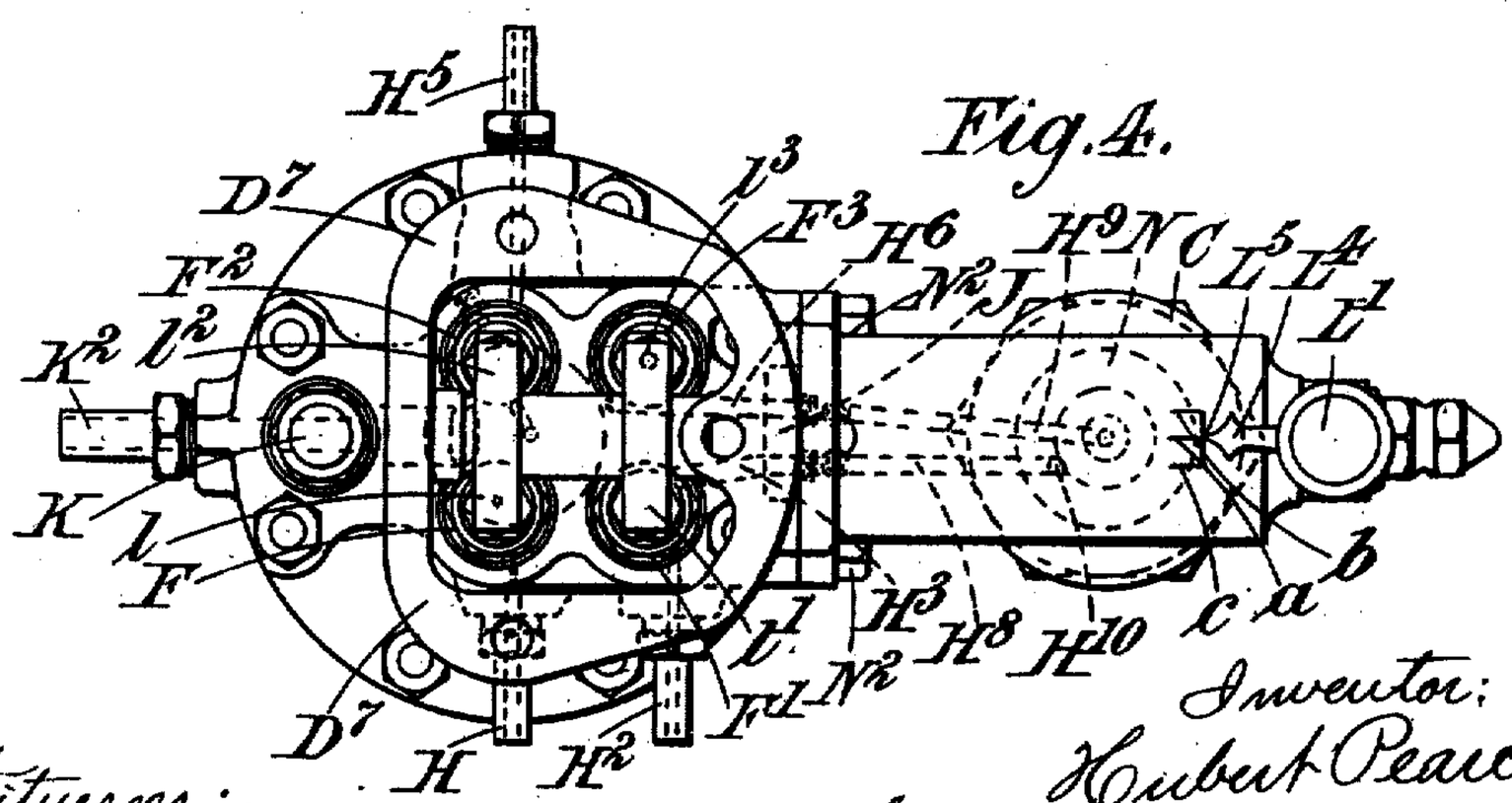

Fig. 4.

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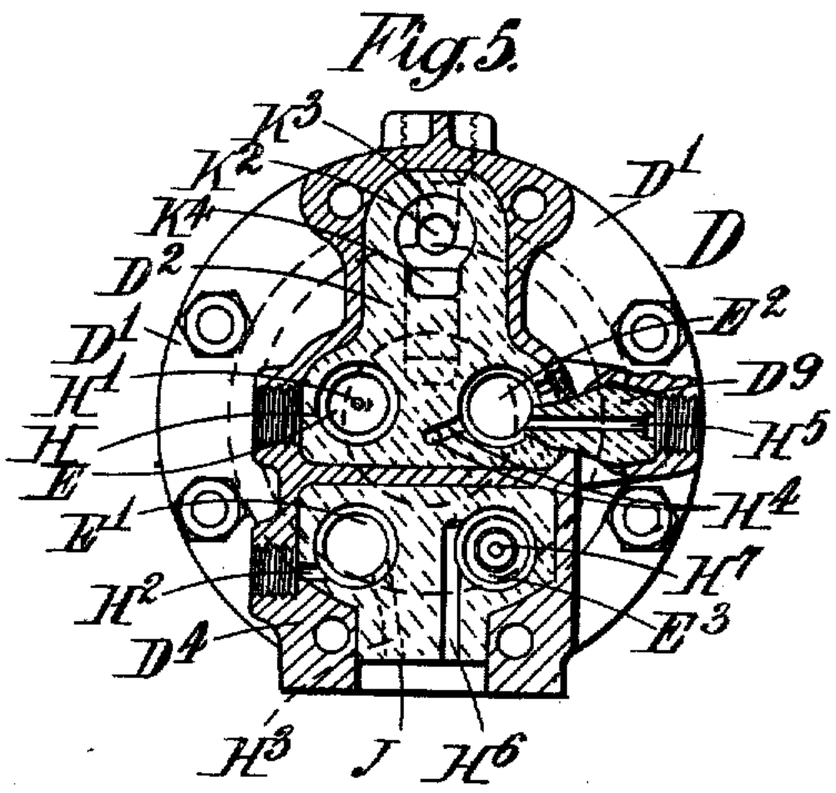
5 SHEETS—SHEET 3.

Fig. 5.



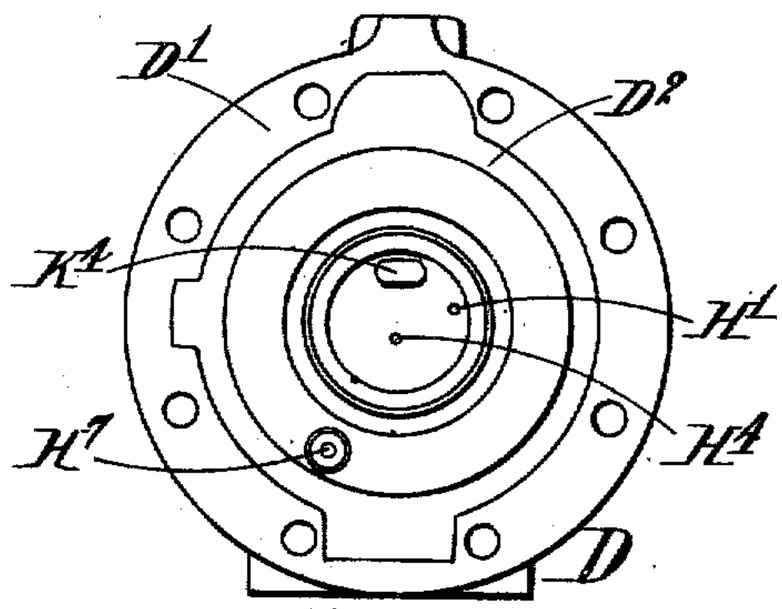


Fig. 6.

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5 SHEETS—SHEET 4.

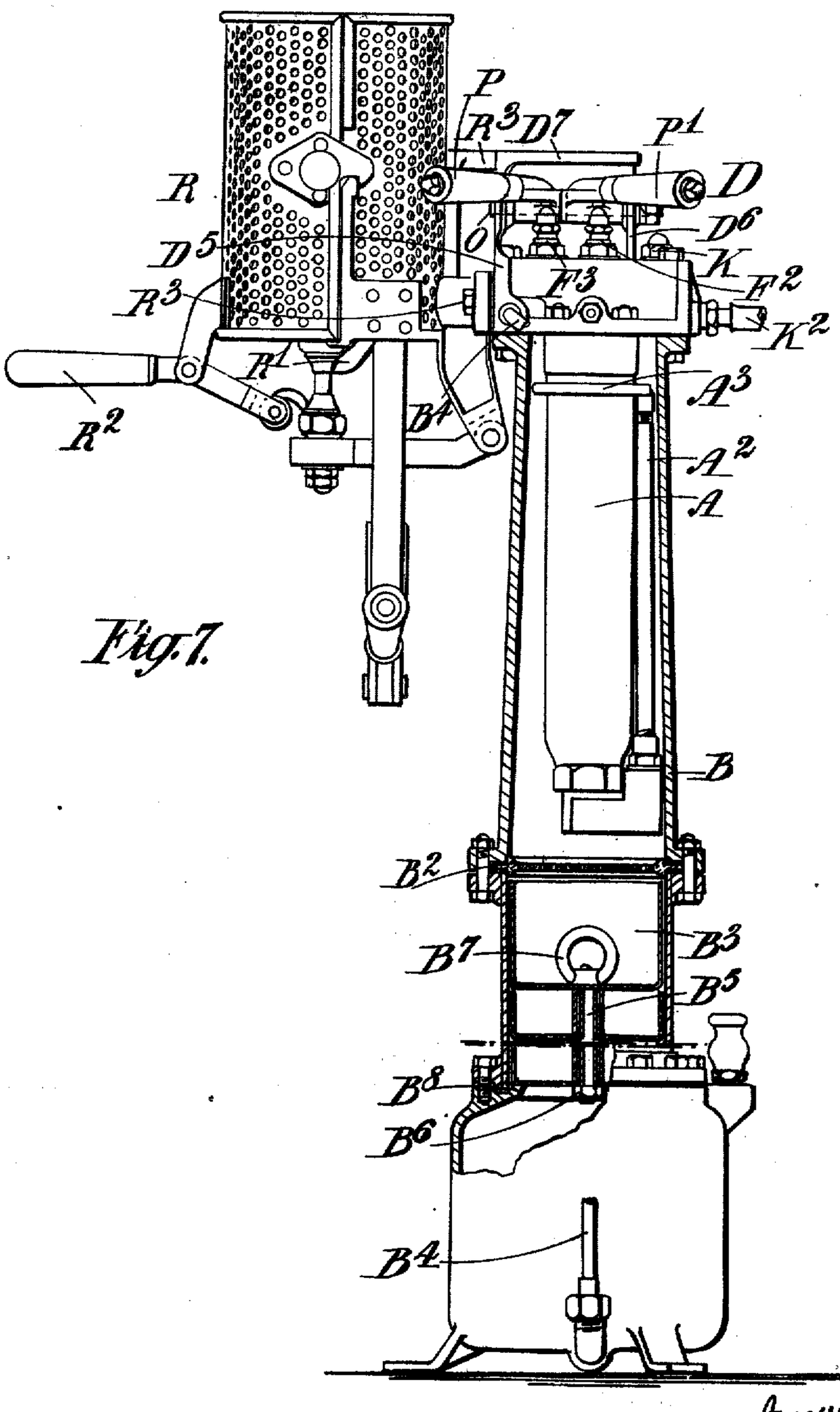

Fig. 7.

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5 SHEETS—SHEET 5.

Fig. 8.

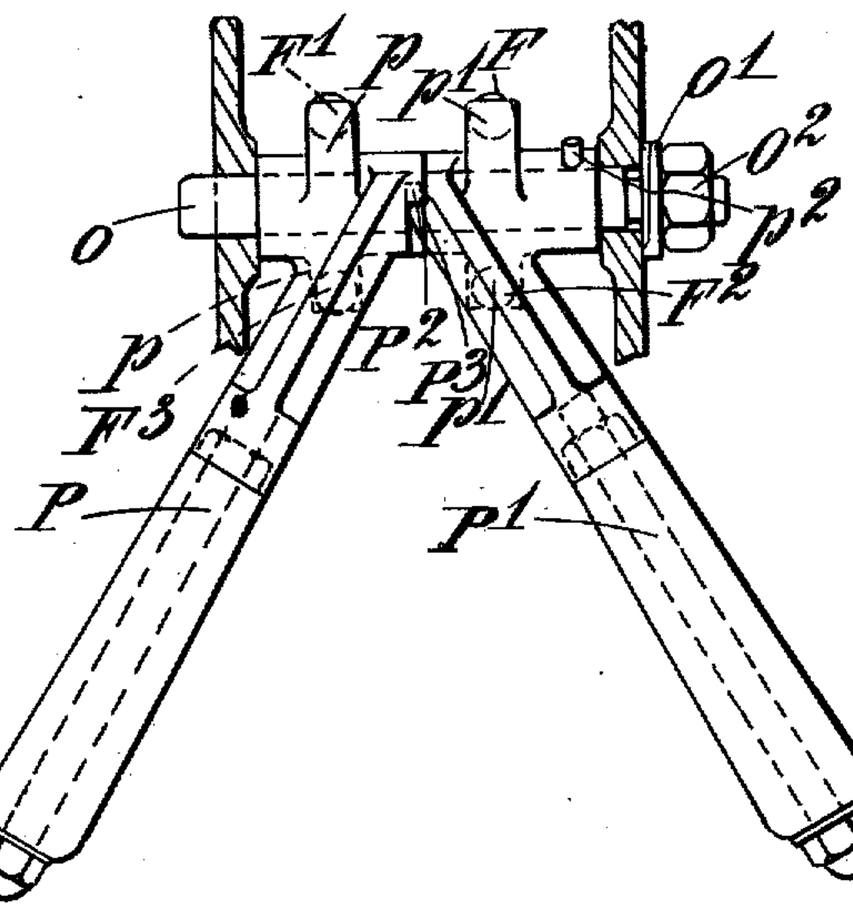
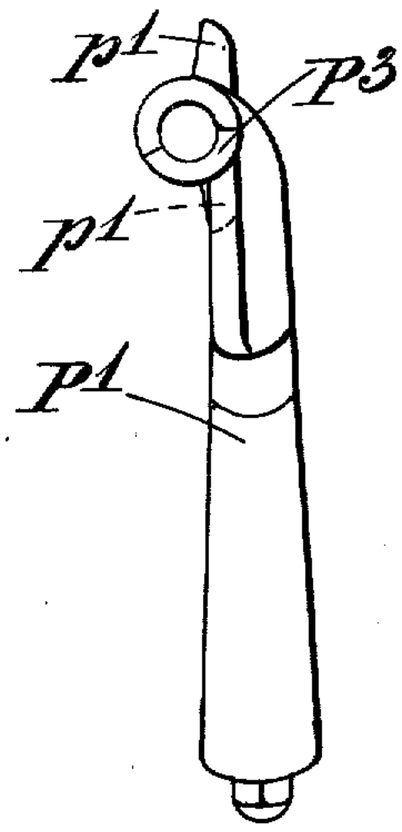


Fig. 9.



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UNITED STATES PATENT OFFICE.

HUBERT PEARCE, OF STANSTEAD ABBOTS, ENGLAND, ASSIGNOR TO BRITISH AUTOMATIC AERATORS LIMITED, OF LONDON, ENGLAND.

AERATING-MACHINE.

No. 922,183. Specification of Letters Patent. Patented May 18, 1909.

Application filed February 11, 1908. Serial No. 415,406.

To all whom it may concern:

Be it known that I, HUBERT PEARCE, a subject of the King of England, and residing in Stanstead Abbots, Hertfordshire, England, have invented certain new and useful Improvements in Aerating-Machines, of which the following is a specification.

This invention is for improvements in or relating to aerating machines, *i. e.* machines wherein the mechanism for controlling the admission of gas and liquid, the mixing chamber and delivery apparatus are all combined as distinct from aerating plants having separate mixing apparatus communicating with one or more machines for drawing off the aerated liquid as required—and has for its main object to provide a machine of this class wherein the valves are grouped together in such manner as to simplify the operating mechanism and the general construction of the machine.

The invention also has reference to the specific construction of the valves and their connected parts together with the specific form of operating mechanism employed.

The invention more particularly refers to machines of this type wherein a given charge of liquid is aerated and delivered at each operation, and it is described in this specification as applied to an aerator of this type.

The main body of the machine is of known construction but where new features are introduced such will be found to be clearly differentiated from what is old in the claims appended to this specification.

According to this invention a pair of snift valves and two other valves, one for the aerating gas and the other for the aerated liquid, are grouped together so that the snift valves lie on one side of a given plane approximately parallel to the axes of the valves while the other valves are similarly disposed on the opposite side of such plane: when so arranged they may be operated by a single shaft situated in the plane of the dividing line. This shaft preferably takes the form of a rocking tappet-member and carries a single operating handle whereby movement in one direction causes two of the valves to be operated and movement in the reverse direction effects the operation of the other two valves and releases the first two. The four valves grouped together as described are carried in a cover-plate or head comprising a shell of hard metal and a filling of block tin, *i. e.* solid tin as distinct from a coating of tin such as might be obtained by electro-plating or dipping and the term block tin is used in this sense throughout the specification. Chambers are formed in the block tin filling to receive the valves and the valves themselves are formed of block tin while passages within the tin filling communicate between the valves and the various chambers or conduits of the aerator. Detachably secured to the shell of the cover-plate is a horizontal extension, also of hard metal, and depending from this extension is the delivery vessel. The valves are disposed vertically and the operating shaft is mounted horizontally within the extension referred to. The free end of the operating shaft projects beyond the extension and carries the operating handle.

In one form of machine, instead of a single operating shaft being used, two separate levers are employed each carrying two tappets whereby each valve may be separately operated. With this construction, however, it is preferred to employ a device whereby one lever is caused to move with the other in one direction but not in the reverse direction, and a retaining device is preferably employed to hold the lever thus operated in whichever position it may be set.

In the accompanying drawings, Figure 1 is an elevation of an aerator constructed according to this invention, the upper portion of this figure being in part section through one of the valves, while the lower portion is a central vertical section through the main body of the aerator. Fig. 2 is a horizontal section of the machine on the line 2—2 of Fig. 1 with the valves removed, Fig. 3 is an elevation of the aerator in part section at right angles to Fig. 1, Fig. 4 is a plan of the machine, Fig. 5 is a horizontal section through the machine on the line 5—5 of Fig. 1, Fig. 6 is an underside view of the cover-plate or head of the machine, Fig. 7 is an elevation of a modified form of the machine in part section, Fig. 8 is a plan of the operating mechanism of the machine shown in Fig. 7, and Fig. 9 is a side elevation of one of the levers of such operating mechanism.

Like letters indicate like parts throughout the drawings.

The aerator is provided with the usual inner or measuring receptacle A which receives the charge of liquid and whence the liquid is

forced by the gas admitted behind it through the outlet A^1 into the mixing or aerating chamber B. In the mixing chamber a series of perforated plates or baffles B^1 are situated so that the liquid becomes thoroughly saturated with the gas as this is passed to the delivery vessel C whence it is drawn off for use by the outlet C^1. All of these parts may be of known construction but a special arrangement of the valves and connected parts is employed for controlling the passage of the liquid and the gas.

In the construction of this machine care is taken to provide block tin for all those parts touched by the gas or liquid as it traverses the machine, but those parts with which the gas or liquid do not come into contact are of a harder and cheaper substance such as gun-metal. Throughout the drawings the parts not of tin are hatched in the usual manner when shown in section but those parts which are of block tin are indicated when in section by broken hatching.

The valves for this purpose are all mounted in a single cover-plate or head D comprising an outer shell D^1 of hard metal such as gun-metal and a filling D^2 of block tin. The cover-plate preferably has a circular base to which the mixing chamber B is secured by a clamping ring D^3 which is bolted to the cover-plate and engages the mixing chamber by a flange B^2 thereon. The cover-plate has an elevated portion D^4 of approximately oblong form into which the tin filling extends. In the upper face of the tin filling four valve chambers E E^1 E^2 E^3 are formed and the upper portion of the shell D^1 is bored through opposite these chambers so that valves may be inserted therein. The valve chambers and consequently the valves are arranged in opposed pairs. The valves F and F^1 in the chambers E E^1 are employed for snift valves and are placed side by side. Similarly the valves F^2 F^3 in the chambers E^2 E^3 are arranged side by side and disposed opposite the two snift valves so that the four valves are grouped together as clearly shown in Fig. 4. All of these valves are of similar construction and the valves F and F^3 only are shown in central vertical section in Figs. 1 and 3 respectively. Each valve comprises a body portion G, of block tin which is held in place by a hard metal bush or cap G^1. The cap G^1 has a shoulder G^2 whereby it is held in place by a screw-threaded ring G^3. The ring G^3 engages the correspondingly threaded bore of the shell D^1 of the cover and serves to hold all of the valve parts in place by clamping the bush G^1 down upon the valve body G which is thus gripped between the bush and a shoulder G^4 formed in the wall of the valve chamber. A block tin spindle G^5 is mounted in the body G of the valve and is guided therein by a bush G^6. This bush is preferably made of lignum vitæ as tin is found to abrade. At the base of the spindle a valve head G^7 is secured and a seating G^8 is provided on the underside of the body G to receive the valve head. At the upper end of the valve a cup-shaped member G^9 is screwed into the bush G^1 and the spindle G^5 extends into this member and receives at its free end a closing washer or plug G^{10} and nut G^{10*}. Between the plug and the base of the member G^9 a spring G^{11} is mounted whereby the valve head G^7 is normally kept upon its seating G^8. The body G of the valve is provided with a surrounding groove G^{12} and has an interior chamber G^{13}. Transverse passages G^{14} communicate between the interior chamber and the annular groove G^{12} and the spindle G^5 is smaller than the central bore of the body of the valve so that when the valve head is lifted from the seating, communication is established between the valve chamber and the surrounding annular groove G^{12}. In the valve F this annular groove communicates with a discharge conduit H and the chamber E wherein the valve is carried communicates by a conduit H^1 with the inner receptacle or measuring chamber A. Similarly, the corresponding annular groove in the body of the valve F^1 communicates with a discharge conduit H^2 while the valve chamber E^1 communicates with a passage H^3 in the body of the tin filling and which passage extends to the face of the filling as shown at J, Fig. 2. The annular groove in the body of the valve F^2 communicates with a passage H^4 which traverses the interior of the tin filling D^2 and opens into the measuring chamber A as shown in Fig. 1. The chamber E^2 of this valve communicates with a conduit H^5 connected to the aerating gas supply. The annular groove in the body of the valve F^3 communicates with a conduit H^6 which extends through the body of the tin filling D^2 to the face J already referred to. The chamber E^3 of this valve communicates with a conduit H^7 (Fig. 3) which extends into and communicates freely with the interior of the mixing chamber B. The valves F F^1 are snift valves as will hereinafter be explained and therefore may discharge through the conduits H H^2 to waste. The valve F^2 controls the supply of gas to the inner chamber A and the valve F^3 controls the passage of the aerated water from the chamber B to the delivery vessel C.

In addition to the four valves already described, an automatic non-return valve K is provided. This valve may be of any convenient construction and comprises a plunger K^1 (Fig. 3) normally seated upon the inlet of a conduit K^2 communicating with the supply of water or other liquid. From the chamber K^3 wherein this plunger is mounted, a conduit K^4 extends to the inner or measuring chamber A and the valve is so arranged

that so long as there is pressure in the measuring chamber, water is prevented from passing thereto from the conduit K^2 but as soon as this pressure is released the valve plunger K^1 is lifted and the water passes into the chamber.

The head D has two vertical arms D^5 D^6 which are conveniently made integral with the hard metal shell D^1. These vertical arms constitute bearings for a horizontal operating shaft L and they are connected together at their upper ends so that a foot D^7 is provided, whereby the whole apparatus may be secured to any suitable support, indicated at M. The arms D^5 has a flat face on that side remote from the main body of the machine and has detachably secured to it a horizontal extension N. This extension is of hard metal and is secured to the part D^5 by any convenient means and depending from its underside is the delivery vessel C. The horizontal operating shaft is carried through the extension and projects beyond the end of the same where an operating handle L^1 is secured to it. Within the lower portion of the extension N is a tin filling shown at N^3 and this tin filling is carried down through a depending flanged portion N^4 whereby the extension is secured to the part D^5. At the lower end of the flange N^4 the filling projects in the form of a tongue N^5 which enters the part D^5 of the head D and abuts against the face J of the tin filling within the latter. It will be seen that by this means a tin body is provided extending from the face J in the head D to the filler and through this tin body conduits H^8 H^9 extend. One end of the conduit H^8 registers with the conduit H^3 of the valve F^1 in the head and its other end communicates with an orifice H^{10} opening into the upper end of the delivery vessel C. Similarly one end of the conduit H^9 registers with the conduit H^6 of the valve F^3 in the head D and at the other end communicates with the discharge pipe C^{1*} within the delivery vessel C. Making the extension N detachable enables the passages in the filling N^3 to be bored without difficulty as the horizontal part of the filling can be bored from the flanged end of the extension while the vertical part in the flange can be bored from the bottom of the flange to meet the horizontal borings; similarly the tongue N^5 can be bored from its projecting end to meet the vertical borings in the flange. Obviously that part of the extension N which carries the horizontal portion of the filling N^3 could be lowered so that this portion of the filling would aline with the passages H^3 H^6. The vertical part of the filling situated in the lug N^4 could then be dispensed with but brackets would have to be carried up from the extension to support the shaft L. The shaft L is free to rock in its bearings and is situated in a vertical plane dividing the valves F F^1 and F^2 F^3 into opposed pairs. On this rocking shaft oppositely disposed tappets l l^1 and l^2 l^3 are formed. The tappets l l^1 lie over the spring-controlled spindles of the valves F F^1 respectively while the tappets l^2 l^3 are situated above the spring-controlled spindles of the valves F^2 F^3 respectively. The rocking shaft can turn in its bearings a sufficient distance to cause the tappets to engage and depress the valves but stops L^2 (one only of which is shown in the drawings) are provided to limit its movement. These stops coöperate with a corresponding projection L^3 on the operating handle L^1 and the handle carries an index L^4 whereby its position relatively to a scale L^5 on the extension N can be readily ascertained.

The operation of this machine is as follows: When the handle is in the central position, indicated by *a* on the scale L^5, all of the tappets are free of the valves F F^1 F^2 F^3 so that these remain closed, but the valve K which is automatic in action has allowed a charge of water to enter the measuring chamber A and the mixing chamber B also contains a charge of aerated liquid received by it during a previous operation. If it is now desired to draw a charge from the machine, the handle L^1 is moved over to the position indicated by *b*. This will cause the tappets l^2 l^3 to depress the spindles of the valves F^2 F^3 whereby these valves are opened. The valve F^2 thus permits a charge of gas to enter the measuring chamber A by the conduits H^5 H^4 while the valve F^3 allows the charge of aerated liquid already in the mixing chamber B to pass up the discharge pipe H^7 and to traverse the conduits H^6 H^9 to the delivery vessel C which it enters by the central tube C^{1*}. Normally the usual spring-controlled plug C^2 at the bottom of the delivery vessel rests against the lower end of the central pipe C^{1*} and closes the same, but as the liquid under pressure enters the delivery vessel C, this plug is forced down as shown in the drawing and closes the outlet of the delivery vessel C. It will be understood that the passage of the aerated liquid to the delivery vessel is effected as is common practice, by the pressure of the gas whereby aeration is effected. A pressure of gas already exists in the mixing chamber and consequently when the valves F^3 F^2 are opened the aerated liquid in the mixing chamber B passes to the delivery vessel. This discharge from the mixing chamber to the delivery vessel is aided by the pressure of the fresh charge of gas admitted to the measuring chamber and the water in this chamber passes into the mixing chamber as the charge therefrom leaves the same. It will be understood that when first starting the machine one or more operations of the valves is necessary before delivery takes place such

operation or operations serving to fill the mixing chamber. Once this is filled the cycle of operation is that already described. The handle L^1 is now moved over to the position marked *c* on the scale L^5. This releases the valves F^2 F^3 and causes the tappets *l* l^1 to depress the spindles of the valves F F^1 whereby these valves are opened for the purpose of snifting the surplus gas from the measuring chamber A and the delivery vessel C respectively. The passage of the gas from the chamber A is via the conduit H^1 (Fig. 1) to the valve chamber E whence it passes by the central chamber G^{13}, radial passages G^{14}, and annular groove G^{12} of the valve F^1, to the discharge conduit H. The gas from the delivery vessel escapes by the orifice H^{10} to the conduits H^8 H^3 and thence by the valve F^1 to the discharge conduit H^2. As soon as the snifting is thus effected by means of the valves F F^1 the pressure being thereby relieved in the delivery vessel C permits the valve C^2 therein to rise so that the charge contained in the delivery vessel traverses the transverse passages C^3 of the plug to the outlet C^1 whence it falls into any receptacle provided to receive it. The pressure, having been similarly relieved in the chamber A by the snifting, no longer retains the valve K closed so that a fresh charge of liquid automatically enters this chamber. This charging of the chamber A is completed during the delivery of the aerated liquid from the vessel C. The charge previously contained in the chamber A and which has already been aerated, has previously passed to the mixing chamber B ready to be passed on to the delivery vessel C at the next cycle of operations.

It will be seen that this machine is so constructed that all the parts with which the gas or liquid come into contact are of block tin. As is well known, machines used for aerating liquids commonly have some of their parts plated, or washed only with tin, with the result that the tin easily wears off or is displaced by corrosion beneath it. The shell D^1 of the cover-plate or head D is as already stated conveniently of gunmetal and the tin filling D^2 may be run into it in a molten condition. The filling approximately follows the contour of the cover in outline *i. e.* in the lower portion of the cover it is circular in plan, but in the elevated part D^4 it is approximately oblong as clearly shown in Fig. 5 which is a section through this part. Where it is desired to make connection between the filling and a conduit, a spigot is employed as shown at D^8, Fig. 1. Where desirable the filling may be run out to meet the conduit as shown at D^9, Fig. 5. The part D^9 in this figure is on the level of the conduit H^5 (Fig. 1) whereas the main section is on the line 5—5 of that figure as already described. The tongue or projecting part N^5 of the filling N^3 in the extension N prevents any leakage to the surrounding shell of both parts by butting against the face J of the filling in the head D so that the liquid passes without fear of contamination from the filling in one member to that within the other. The delivery vessel with its associated parts and also the chamber A and B with their associate parts are all of block tin as shown by the broken hatching or sectioning.

In place of operating the valves F F^1 F^2 F^3 by a single handle L^1 it will be seen that their being grouped together in the manner described *i. e.* with the snift valves on one side of a dividing line and the other valves on the opposite side of such line, permits them to be each separately operated if desired by using two operating handles or levers in place of one. Such an arrangement is shown in Fig. 7, where the valves are grouped as before but instead of the horizontal rocking shaft L a pin O is mounted in the vertical extensions D^5 D^6 of the head D. On this pin two operating levers P P^1 are carried and the lever has on it two tappets *p p* respectively and the lever P^1 carries two tappets p^1 p^1. The tappets *p p* of the handle or lever P lie over the valves F^1 F^3 and the tappets p^1 p^1 of the lever P^1 are situated vertically above the valves F F^2. The lever P is free on the pin O but the lever P^1 is secured thereto by a pin p^2 whose object is to prevent endwise displacement of the lever on the pin O. That end of the pin O shown to the right of the figures extends beyond this support D^6 and carries a spring-washer O^1 and a nut O^2 whereby the lever P^1 is held friction tight against the support D^6. The lever P has a lateral projection or dog P^2 on that side which is toward the lever P^1 and the lever P^1 has a similar dog or projection P^3 on the side which is toward the lever P. These dogs are so situated that they butt against each other when the levers are in the middle or normal position and when in this position the dog on the lever P is in advance of that on the lever P^1 so that should the lever P be depressed it must carry with it the lever P^1. The lever P^1 being friction tight remains in the depressed position after displacement while the lever P may be raised and elevated beyond its normal position without displacing the lever P^1.

The machine shown in Fig. 7 is of the vertical or standard type wherein the mixing chamber B is extended to form a supporting pillar. The chamber is divided by a perforated diaphragm B^2 and below this a series of perforated cups B^3 is provided. These cups are all carried on a rod B^5 having a fastening nut B^6 at one end and a screw-threaded eye B^7 at the other. The cups are threaded on this rod and secured by the eye and nut respectively, so that they can be inserted bodily into or lifted bodily from the chamber B by means of the eye B^7. The bottom cup

rests upon a shoulder B^8 within the chamber B and the chamber is divided at the point where the diaphragm B^2 is inserted so that by removing the upper portion ready access may be had to the cups. The measuring chamber A has connected at its lower end a discharge conduit A^2 whereby the liquid is, after leaving the chamber, raised to the top of the chamber B and discharged in the form of a spray from a perforated ring A^3. At the base of the chamber B is a conduit B^4 whereby the aerated liquid is carried to the delivery vessel or its equivalent via the valve F^3. In place of the extension N and the delivery vessel C employed in the form of machine previously described, a siphon filling attachment R is shown in conjunction with this machine. Any suitable holder may be provided whereby the siphon is held in position so that its nozzle R^1 registers with that end of the conduit B^4 which lies on the discharge side of the valve F^3 and a lever R^2 is provided for depressing the trigger of the siphon while filling is proceeding. This attachment is bolted bodily on to the support D^5 of the head D by a bracket R^3 as will be readily understood. The operation of this machine is as follows: After the siphon has been placed in position and its trigger raised by the lever R^2 the handle P is depressed and carries down with it by means of the dogs P^2 P^3 the handle P^1. This causes the tappets p p^1 on that side of the levers nearest the operator to depress the valves F^3 F^2 whereby gas is admitted to the measuring chamber A and a way is opened by the valve F^3 to permit the passage of the aerated liquid already stored in the chamber B to pass to the siphon via the conduit B^4. The gas thus forces the charge of liquid in the chamber A out of the same and up the conduit A^2 whence it is delivered from the ring A^3 into the chamber B as the aerated charge already therein leaves the same. The liquid and gas from the ring A^3 is retarded in its passage to the perforated cups B^3 by the perforated diaphragm B^2 so that should the machine be operated quickly the cups B^3 do not become over-charged. The object of preventing over-charging of the cups is to insure that all the liquid and gas shall pass through the perforated bottoms of the cups and become thoroughly mixed, which would not be so effectively the case if part were allowed to escape over the edges of the cups. That part of the chamber B above the diaphragm B^2 is made sufficiently large to contain more than a single charge of liquid and gas so that should the machine be operated quickly, more than the one charge may be stored in this upper portion while it is still controlled in its passage to the cups B^3 so that these do not become surcharged. The siphon is now approximately half-filled and owing to compressed air and surplus gas will fill no further until the same is released. The handle P is therefore now raised above the normal position, whereby the valve F^1 is depressed and snifts this air and gas from the siphon. During this operation, the handle P^1 remains down owing to its frictional engagement with the support D^6 so that the gas pressure is still maintained in the measuring chamber A. A further depression of the handle P now admits more aerated liquid to the siphon and if it should not quite fill, the snifting operation may be repeated. The handle P^1 is now raised above the normal position and thus opens the snift valve F whereby the pressure is relieved within the measuring chamber A so that a further charge of liquid now enters the measuring chamber and any surplus passes therefrom by the snift valve to waste. The raising of the lever P^1 however also carries with it the lever P by means of the coöperating dogs P^2 P^3 so that the snifting is simultaneously effected from the passages on the delivery side of the valves leading to the siphon the valve of which is closed previous to the raising of the handle P by the releasing of the handle R^2. The handle P^1 is now returned to the normal position while the handle P returns by gravity. A fresh siphon can now be put in place and all the parts are then ready for a repetition of the cycle of operations. It should be noted that in this machine only one pair of handles is employed for effecting the aerating of the liquid and also the filling and snifting of the siphon, and that except when snifting by means of the handle P^1, each of the handles can be operated independently, that is, the valves F F^1 F^2 F^3 can be independently operated but when the valve F is operated the valve F^1 is also opened. This situation of the filling handle P and aerating handle P^1 in proximity to each other on a draft aerator machine permits both operations to be controlled and the siphons to be entered and withdrawn from the filling attachment by a single operator.

It will be understood that the term tin employed in the following claiming clauses is intended to cover any non-corrosive substance used, a tin alloy being the most suitable material according to present practice.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In an aerator the combination of a main chamber, an interior chamber, a cover-plate that extends over both chambers, two snift valves carried by the cover-plate and disposed on one side of a given plane that is approximately parallel to the axes of the valves, two other valves similarly disposed on the opposite side of such plane and controlling the supply of the aerating gas and the aerated liquid respectively, means for operating these four valves, a conduit controlled by one of these valves and extending

through the cover-plate to the inner chamber, and a conduit controlled by the other valve and extending from the main chamber through the cover-plate to the discharge nozzle, substantially as set forth.

2. In an aerator the combination of a main chamber, an interior chamber, a cover-plate that extends over both chambers, two snift valves carried by the cover-plate and disposed on one side of a given plane that is approximately parallel to the axes of the valves, two other valves similarly disposed on the opposite side of such plane and controlling the supply of the aerating gas and the aerated liquid respectively, means for mechanically operating these four valves, a conduit controlled by one of these valves and extending through the cover-plate to the inner chamber, a conduit controlled by the other valve and extending from the main chamber through the cover plate to the discharge nozzle, a liquid-supply conduit that passes through the cover-plate and communicates with the inner chamber, and a non-return valve that automatically admits liquid to the chamber when the pressure therein permits, substantially as set forth.

3. In an aerator the combination of a main chamber, an interior chamber, a cover-plate that extends over both chambers, two snift valves carried by the cover-plate and disposed on one side of a given plane that is approximately parallel to the axes of the valves, two other valves similarly disposed on the opposite side of such plane and controlling the supply of the aerating gas and the aerated liquid respectively, and rocking members disposed over the valves and arranged to rock about an axis that lies in a plane between the two sets of valves, these members being so connected that when the valve on one side of the plane is opened the corresponding valve on the other side is left closed, substantially as set forth.

4. In an aerator the combination of a main chamber, an interior chamber, a cover-plate that extends over both chambers, two snift valves carried by the cover-plate, and disposed on one side of a given plane that is approximately parallel to the axes of the valves, two other valves similarly disposed on the opposite side of such plane and controlling the supply of the aerating gas and the aerated liquid respectively, a rock-shaft arranged to rock about an axis that lies in a plane between the two sets of valves and carrying tappets which lie over the valves, and a single operating handle whereby movement of the rock-shaft in one direction opens the two valves on one side of the plane referred to leaving the other two closed while movement in the opposite direction reverses this action, substantially as set forth.

5. In an aerator the combination of a main chamber, an interior chamber, a cover-plate that extends over both chambers, two snift-valves carried by the cover-plate, and disposed on one side of a given plane that is approximately parallel to the axes of the valves, two other valves similarly disposed on the opposite side of such plane and controlling the supply of the aerating gas and the aerated liquid respectively, a rock-shaft arranged to rock about an axis that lies in a plane between the two sets of valves and carrying tappets which lie over the valves, and a single operating handle carried by the shaft whereby movement in one direction opens the two valves on one side of the plane referred to leaving the other two closed while movement in the opposite direction reverses this action, the cover-plate having an elevated portion D^4 for the valves and vertical extensions D^5 D^6 to carry the rock-shaft and to provide means for attachment to a support, substantially as set forth.

6. In an aerator the combination of a main chamber, an interior chamber, a cover-plate that comprises a shell of comparatively hard metal and that extends over both chambers, a filling of tin in the cover-plate the under face of which filling is shaped to receive the chambers referred to while the upper face is recessed to provide valve-chambers disposed in pairs two on opposite sides of a given plane that is approximately parallel to the axes of the valves, and conduits formed in the tin filling for communication with the valve chambers, main chamber and interior chamber, substantially as set forth.

7. In an aerator the combination of a main chamber, an interior chamber, a cover-plate that comprises a shell of comparatively hard metal and that extends over both chambers, a filling of tin in the cover-plate the under face of which filling is shaped to receive the chambers referred to while the upper face is recessed to provide valve-chambers disposed in pairs two on opposite sides of a given plane that is approximately parallel to the axes of the valves, conduits formed in the tin filling for communication with the valve chambers, main chamber and interior chamber, a nozzle-extension (N) detachably secured to the cover-plate and a tin filling therein that registers with a portion of the tin filling in the cover-plate whereby conduits may be formed through the extension to register with those in the cover-plate, substantially as set forth.

8. In an aerator the combination of a main chamber, an interior chamber, a cover-plate that extends over both chambers, two snift valves carried by the cover-plate and disposed on one side of a given plane that is approximately parallel to the axes of the valves, two other valves similarly disposed on the opposite side of said plane and controlling the supply of the aerating gas and aerated liquid respectively, a discharge nozzle, a conduit controlled

by one of these valves and extending through the cover-plate to the inner chamber, a conduit controlled by the other valve and extending from the main chamber through the cover-plate to the discharge nozzle, a detachable extension (N) carrying the discharge nozzle, a horizontal rock-shaft carrying tappets for operating the valves and whose axis lies in the plane between the two sets of valves and alines with the detachable nozzle extension through which the shaft projects, vertical extensions D^5 D^6 on the cover-plate to carry the rock-shaft one of such extensions constituting a support for the detachable nozzle-extension (N), and an operating handle on the shaft beyond the extension, substantially as set forth.

9. In an aerator the combination of a main chamber, an interior chamber, a cover-plate that comprises a shell of comparatively hard metal and that extends over both chambers, a filling of tin in the cover-plate the under face of which filling is shaped to receive the chambers referred to while the upper face is recessed to provide valve-chambers disposed in pairs two on opposite sides of a given plane that is approximately parallel to the axes of the valves, conduits formed in the tin filling for communication with the valve chambers, main chamber and interior chamber, a plurality of hard metal bushes (G^2) in engagement with the hard metal shell of the cover-plate and disposed one over each of the valve chambers formed in the tin filling, a plurality of tin valve bodies (G) clamped in place one by each bush, a plurality of valve spindles (G^5) one being allotted to and free to slide in each valve body and a plurality of heads (G^7) of block tin one secured to the end of each spindle and arranged to cover and uncover a passage through that valve, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HUBERT PEARCE.

Witnesses:
HARRY B. BRIDGES,
HERBERT BURRAGE.