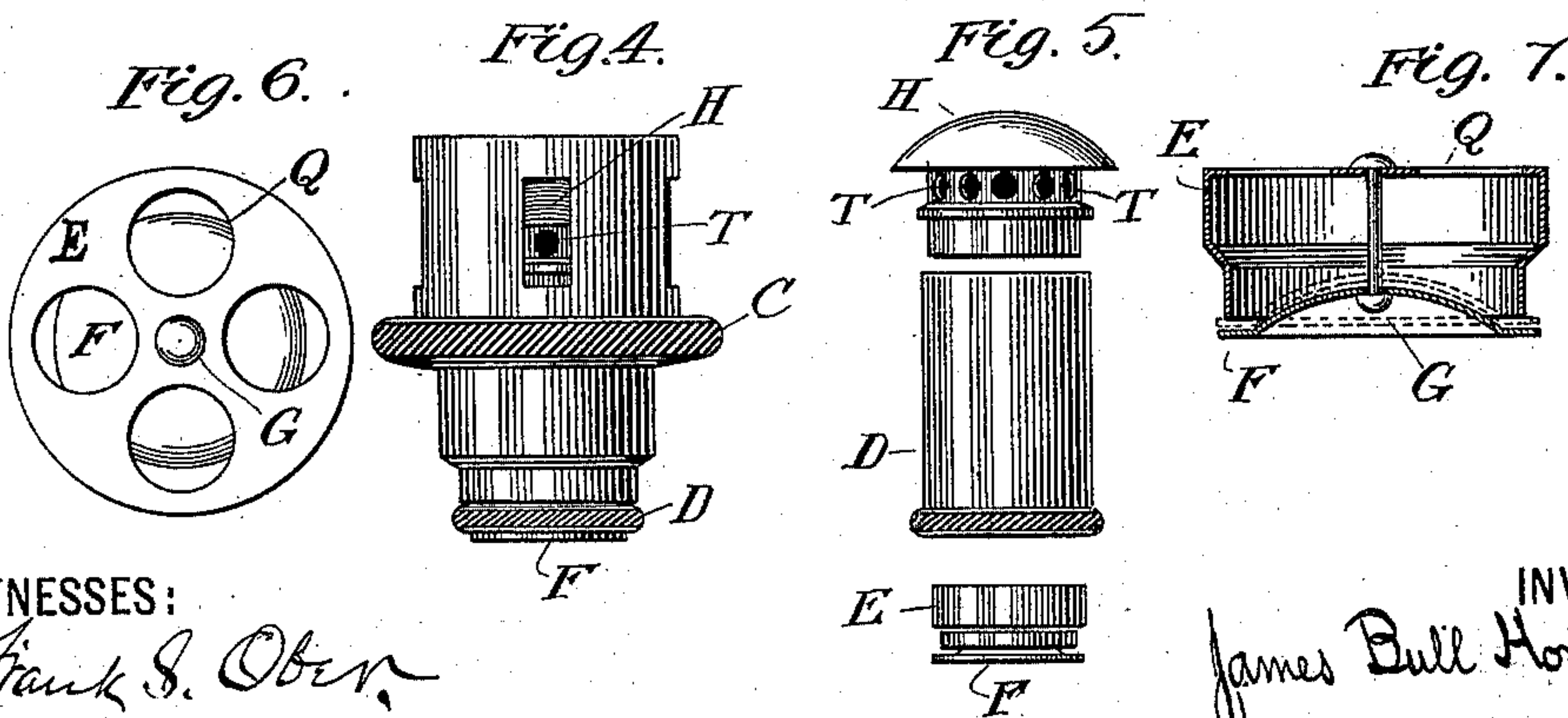
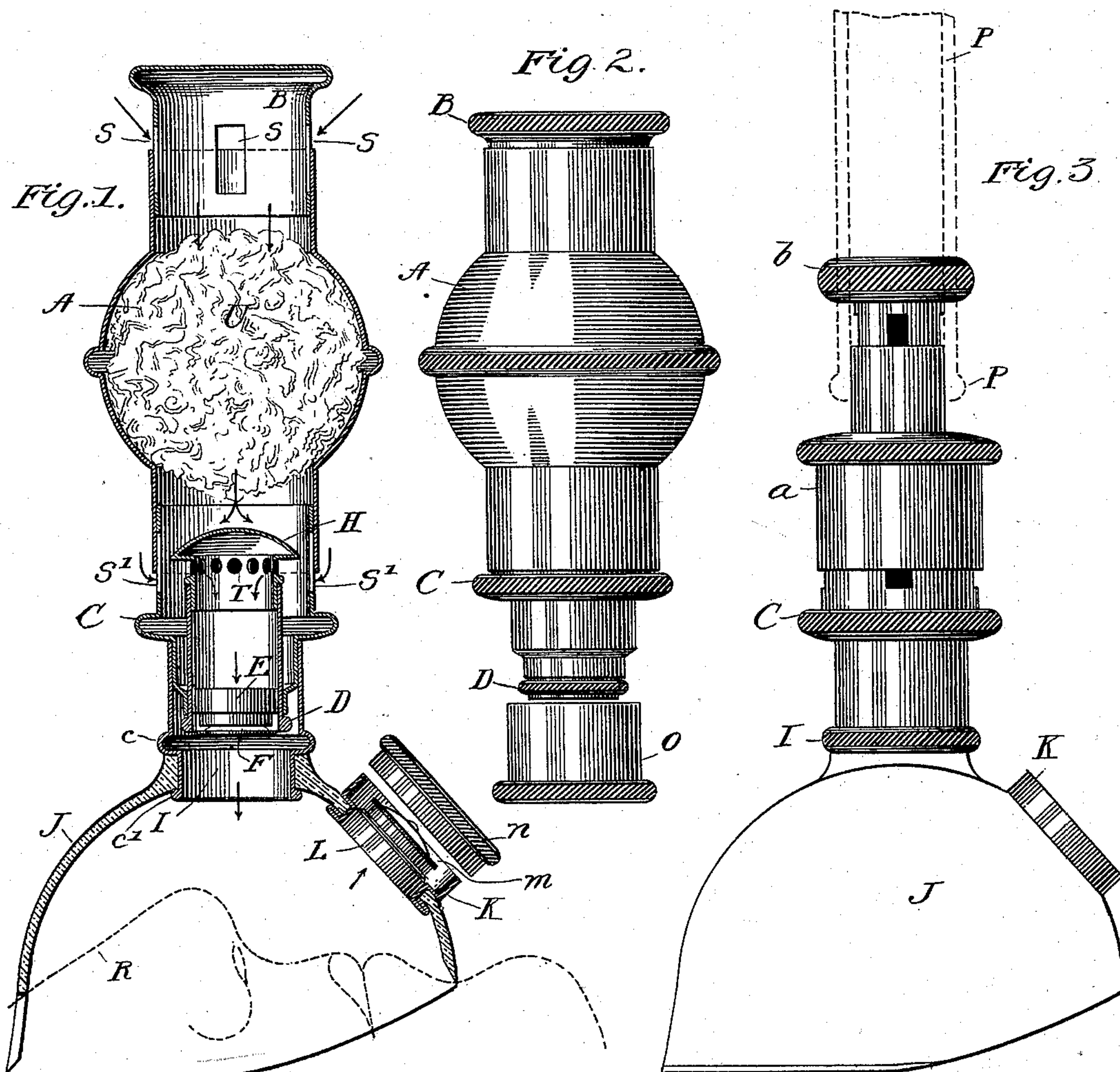


(No Model.)

J. B. HORTON.  
INHALER AND RESPIRATOR.

No. 533,127.

Patented Jan. 29, 1895.



WITNESSES:

Frank S. Ober,  
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# UNITED STATES PATENT OFFICE.

JAMES BULL HORTON, OF BROOKLYN, NEW YORK.

## INHALER AND RESPIRATOR.

SPECIFICATION forming part of Letters Patent No. 533,127, dated January 29, 1895.

Application filed October 26, 1893. Serial No. 489,167. (No model.)

### *To all whom it may concern:*

Be it known that I, JAMES BULL HORTON, a citizen of the United States, and a resident of the city of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Inhalers and Inspirators, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a longitudinal half-section of that arrangement of an instrument containing my said inventions and improvements of which a side elevation is shown in Fig. 2. Fig. 3 is a side elevation of a modification of parts, of which an instrument containing my said inventions and improvements is capable. Fig. 4 is a side elevation of the well plug hereinafter described. Fig. 5 is a side elevation of the valve plug D, the umbrella plug H and the inhalation valve F, all in close proximity to each other, but slightly separated to show the parts more plainly. Fig. 6 is a top view of the inhalation valve frame, &c., increased in size. Fig. 7 is a central vertical cross-sectional view of Fig. 6.

Among the objects of my invention are the following: The production of an aseptic instrument, strong, simple, and economical in its construction and operation, having a minimum number of parts, being of minimum size and weight, and readily, and effectively, separable and interchangeable, and which instrument shall in practical use be readily, effectively and advantageously applied at will to the various methods of administering anæsthetics, whether liquid or gas, in connection with or without either valves, rubber bags, tubing or other attachments; which instrument shall be so constructed as to eliminate the annoyances and dangers hitherto encountered from overflow of the anæsthetic, and with valve surfaces of such construction and method of operation as to insure constantly free action; which instrument shall be further so constructed as to permit of the absolute control of the anæsthetic and the regulation of the amount of air admitted therewith, all at the will of the operator, and which instrument shall further be so constructed as that when either in or out of use the amount of waste of the anæsthetic through evaporation shall be minimized, and shall insure at the same time the greatest possible safety and

comfort both to operator and patient, including exemption to the latter of, any risk attending the inhalation of expired alkaloid organic poison and carbonic acid gas, as well as dangers of explosion; and which instrument, finally, shall be also adapted to effective use in the production of enforced inspiration. I obtain these objects by means of an instrument containing the various parts of peculiar construction which constitute my said improvements, as follows:

In the first place I provide an absorbent chamber of any convenient shape and of sufficient internal capacity to contain the amount of absorbent material necessary to contain the amount of liquid which it is desired to use. For instance, the chamber may be shaped like either A or  $\alpha$  in the drawings. These chambers are provided at each extremity with terminal extensions of elongated and preferably cylindrical form, adapted to receive closely fitting plugs having correspondingly elongated walls or sides and which may be applied to the extensions either as shown in the drawings within the latter, or if preferred, on the outside thereof, and which shall be so closely fitted relatively with each other as to provide sufficiently extended frictional surfaces to insure the stability of the two parts relatively to each other under ordinary conditions, whereby they may be adjusted or shoved in and out or around relatively to each other and when released from the hand of the operator will remain in position. Either these plugs or the walls of the said terminal extensions are provided with slotted openings S S, S' S', of convenient shape, so situated that simply by the insertion or withdrawal of the plugs, apertures may be opened, or closed, or regulated in the orifice, whereby communication is established between the external atmosphere and the absorbent. In the drawings I have shown the said openings in the plugs, which is the construction which I prefer. Of these plugs the one farthest removed from the patient may be designated as the "charging plug," and is represented by B, Fig. 1, and  $b$ , Fig. 3. The function of these plugs is to cork or to close entirely the absorbent chamber when not in use, to constitute a removable opening for the purpose of charging the absorbent with the liquid used, and an adjustable apparatus



for the purpose of admitting or excluding air in proportion as the plug is withdrawn or inserted within the limits of the apertures S.

The plug at the opposite end of the absorbent chamber and situated between the latter and the hood J may be designated as the "well plug." It is as aforesaid provided with slotted openings S' S', and, proportionately as the same is inserted or withdrawn from the terminal extension of the absorbent chamber, the uncovered extent of the said slots is regulated so as to increase or diminish at will the amount of atmospheric air admitted between the patient and the absorbent. I construct this well plug with a terminal extension of smaller cross section than the opposite extremity of the plug. Within this smaller terminal extension I seat another plug which I designate the valve plug D, and in the one extremity of which I seat a removable valve which I will hereinafter more fully describe. The walls of this valve plug I continue a considerable distance in the direction of the absorbent and I seat in the extremity opposite the valve another plug, the top of which is closely covered in the direction of the absorbent, and the sides of which are provided with apertures T for the passage of the vapors.

It will be observed that by reason of this construction, as shown in Fig. 1, a very considerable space is formed around the valve plug and between the exterior walls thereof and the inner walls of the well plug, thereby constituting a chamber, or "well," into which any overflow from the absorbent is drained and collected, and thus diverted from the valve mechanism and the patient. It will be further observed that by means of this construction when the apertures S' S' are open for the admission of air, drain openings will be produced through them which will entirely prevent the rising or inflow of any liquids through the apertures T T of the umbrella plug H. In this connection the umbrella plug H also takes part in the diversion of the liquid, the top or umbrella of this plug being so shaped and extended as to protect the apertures below from any drip.

In the bottom of the valve plug I seat my improved removable valve. This valve is preferably constructed substantially as shown in Figs. 6 and 7, and consists of a valve frame E, adapted to fit a seat within the extremity of the valve plug D, and having a floor containing suitable perforations Q. To this frame is attached a stationary pin G, by which the valve is supported and upon which it slides back and forth so as to open and close alternately as shown in Fig. 7, in which the dotted lines represent the valve as closed. It will be observed that by this method of constructing the valve, I am enabled to close the same against a narrow metallic lip or knife edge. I seat upon the end of the well plug C a hood plug I, one extremity of which is provided with a double annular flange c c'. The

annular recess produced between these flanges is utilized for the purpose of forming a connection between the rubber hood J, and the hood plug. The aperture is in the rubber, being of such diameter as to cause the elastic hood to tightly embrace the plug between the flanges when sprung into position. The rubber hood J is also similarly sprung around the neck or annular groove of a metal valve seat K, within which is seated the exhalation valve, and valve seat L, the construction and operation of which are similar to that of the inhalation valve already described, but so placed as to be reverse in its action. The rubber hood is otherwise shaped as usual, so as to generally conform to the outlines of the face of the patient. The exhalation valve seat K is provided with a cap n, whereby it may be closed when desired. Another cap O is also provided to closely fit and cork the well plug C when required.

The dotted lines P, Fig. 3, serve to indicate the rubber tubing, which may be connected with the terminal extension of the chamber plug a when on the removal of the plug b, it is desired to connect the instrument with rubber tubing, rubber bags or other attachments, as desired.

The operation of my improved instrument is as follows: When it is desired to administer anæsthetics in liquids the form of absorbent chamber illustrated in Fig. 1 is used. Any absorbent matter,—preferably cotton yarn,—is introduced into the chamber A, as shown at U, Fig. 1, and the absorbent is next saturated with the liquid, as will be well understood. The terminal plug B is then seated or placed in position, likewise the well plug C, the latter carrying within it, each seated in its respective position, as shown in Fig. 1, the valve plug D, with its valve seat E and valve F and its umbrella plug H, and the hood plug I with its attached hood J and exhalation valve seat and valve, L. The hood is then applied over the nose and mouth of the patient in the well-known manner. The supply of atmospheric air which is to be inhaled through the saturated absorbent by the patient is regulated by the extent to which the terminal plug B is inserted, whereby the size of the slotted orifices S is increased or diminished according to requirement. The atmospheric air entering through these orifices passes through the saturated absorbent and charged with the vapors of the anæsthetic is drawn against and passes by the overflow umbrella H as indicated by the arrows, thence through the orifices T, of the umbrella plug, to and through the orifices Q in the floor of the inhalation valve frame E, and passing around the valve F, which, in the position shown in Fig. 1 is normally open by reason of its gravity, passes into the hood, and thus into the respiratory organs of the patient, whose inspiration has simultaneously served to close the exhalation valve m. On the patient in turn exhaling, the valve F, as will be readily understood, is closed against



its knife edge seat and the exhalation valve M is opened. The operation of the instrument is continued in this way until the desired result has been obtained. It will of course be understood that the valve F can be readily raised from its seat by the suction produced by the inspiration when the same is in a reverse position from that illustrated in Fig. 1.

It will be observed that I have placed my exhalation valve in such relative position to the mouth of the patient as to insure its being alternatively blown open and shut with the least effort.

In cases where a smaller amount of absorbent will answer the purpose of the operation, as for instance, where the anæsthetic used is chloroform as distinguished from ether, or in cases in which it is desired to combine liquid with gaseous anæsthetics I use in lieu of the absorbent chamber A and its terminal plug B, the absorbent chamber *a* with terminal plug *b*, as shown in Fig. 3, the other parts being used the same as aforesaid. In this case, the absorbent chamber is smaller, and therefore more conveniently handled, and the terminal extension is likewise of narrower diameter and adapted to fit a rubber tubing, rubber bags or other attachments, as may be desired. In the latter case, the plug *b*, is of course removed prior to such connection. In this case, the saturated absorbent having been passed into the chamber *a* as aforesaid, the parts are used in the way in which I have already described, or the plug *b* having been withdrawn and the connection made with any convenient reservoir of nitrous oxide gas for instance, a combination of liquid and gaseous anæsthetics may be, as will be well understood, readily administered to the patient. Finally, by removing the absorbent and anæsthetic and combining the terminal of the chamber *a* with a source of compressed air, such as a bellows, by means of any convenient tube P, the instrument will become effective for the purpose of producing forced inspiration.

Among the advantages of my improved instrument may be enumerated its compactness, the ready separability of all of its parts, whereby they may be easily cleansed at all times, and the aseptic qualities of the instrument preserved. It will be observed that this quality of separability extends even to the hood, and its connections, all of which are readily separable from each other, as will be understood. The peculiar construction of valves which I have described results in the greatest delicacy of operation, and at the same time, prevents any interference in the valve action by adhesion of parts. It will be observed that the valve rests upon the narrowest possible seat or bearing, being substantially a knife edge only, and thus is so constructed as to avoid at any time the contact and adhesion of any extended flat surfaces. Again, the chamber produced by the peculiar

construction of my well plug and its contained parts further assists in maintaining the efficiency of the apparatus in preventing liquid from interfering with the valve action, and also in excluding the anæsthetic or other liquids from the patient.

What I claim as new, and desire to secure by Letters Patent, is the following, viz:

1. In an absorbent and inhaler and between the absorbent chamber or gas supply and the patient, the combination of an elongated longitudinal extension, and fitted thereto and reciprocating therein so as to make frictional joint therewith a corresponding elongated longitudinal plug provided with elongated slots and seated in said plug a plug provided with a valve seat; last mentioned plug being of lesser diameter than the first mentioned plug, so as to form between the two plugs an annular well or chamber at that end of the first mentioned plug which is nearest the hood, and at the other end of which and remoter from the patient another plug H provided with a top or cover of greater width than the diameter of said plug H, said top or cover being opposed to the direct currents of inhalation and said plug *h* provided also with lateral perforations T sheltered under the projecting portions of said cover, substantially as and for the purpose described.

2. In an inspirator or inhaler the combination of a plug C, plug D, valve F, plug H, having perforations T, substantially as and for the purposes described.

3. The combination of absorbent chamber *a* slotted terminal plug *b*, slotted well plug C, valve plug D, perforated umbrella plug H, valve F, hood J, and exhalation valve *m*, substantially as and for the purposes described.

4. In an inhaler or inspirator, and intermediate between the source of gas or vapor supply and the patient, an inner tube or plug H, having lateral openings T, protected by a projecting shield, interposed to meet the impact of direct currents of inhalation; said plug H being seated in an outer tube or plug C of larger diameter and extending below said openings to constitute an intervening drip chamber, substantially as and for the purpose described.

5. In an inspirator and inhaler a hood plug *c c'*, constituting an annular recess of substantially rectangular cross-section in combination with a rubber hood having edges fitting said recess.

6. In an inhaler and inspirator and intermediate between the source of gas or vapor supply and the patient an inner tube or plug H seated in an outer tube or plug C of larger diameter to constitute an intervening drip chamber substantially as and for the purpose described.

JAMES BULL HORTON.

Witnesses:

THOS. COOPER BYRNES,  
NORMAND KLEIN.



It is hereby certified that in Letters Patent No. 533,127, granted January 29, 1895, upon the application of James Bull Horton, of Brooklyn, New York, for an improvement in "Inhalers and Respirators," errors appear in the printed specification requiring correction as follows: In line 76, page 3, the word "absorbent" should read *inspirator*; and in line 119, same page, the word "constituting" should read *containing*; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 19th day of February, A. D. 1895.

[SEAL.]

JNO. M. REYNOLDS,  
*Assistant Secretary of the Interior.*

Countersigned:

JOHN S. SEYMOUR,  
*Commissioner of Patents.*