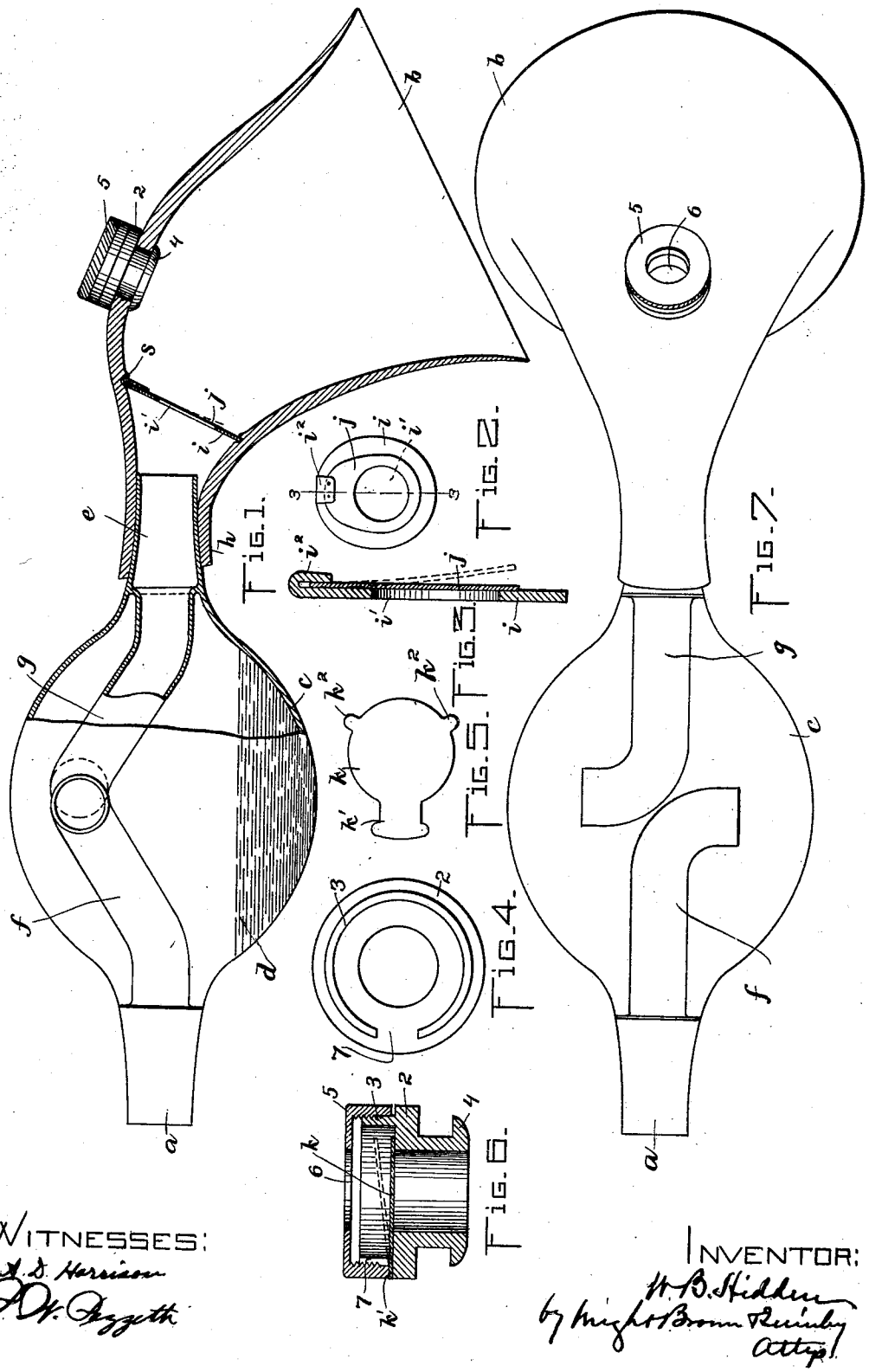
No. 673,021. Patented Apr. 30, 1901.

W. B. HIDDEN.

INHALER.

(No Model.) (Application filed Mar. 15, 1900.)



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UNITED STATES PATENT OFFICE.

WILLIAM B. HIDDEN, OF BOSTON, MASSACHUSETTS.

INHALER.

SPECIFICATION forming part of Letters Patent No. 673,021, dated April 30, 1901.

Application filed March 15, 1900. Serial No. 8,756. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM B. HIDDEN, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Inhalers, of which the following is a specification.

This invention relates to inhalers for administering an anesthetic, such as chloroform; and it has for its object to prevent the warm breath exhaled by a patient from coming in contact with the inhalant.

It is well known that when chloroform is administered by means of a sponge which is saturated with the chloroform and held in close proximity to the mouth and nose of the patient the breath exhaled by the patient impinges directly upon the chloroform and by its warmth creates such an increase of pressure as to entirely expel the air from the vicinity, the result being that the patient inhales nothing but the evaporated chloroform, which without a proper admixture of air causes strangulation and nausea. I obviate this difficulty by providing an inhaler which comprises an air-conduit having a receiving end, a delivery end, an inhalant-holder adjacent to the receiving end and arranged so that air passing through the conduit is forced into contact with the inhalant and is impregnated thereby, and a valved partition between the said holder and the delivering end which communicates with the mouth of the patient, said partition permitting free inhalation through the holder and into the patient's lungs, but preventing the breath exhaled from entering the holder, the result being the admission of a uniform and proper proportion of air into the patient's lungs at every breath, thus preventing strangulation and nausea. I have also provided a construction of inhaler which provides both holder and mouthpiece so formed and arranged that it can be used in any position that may be desired for the patient to assume without interfering with the operation of either of the valves or permitting the escape of any liquid from the holder.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a partial side elevation and partial section of an inhaler embodying my invention. Fig. 2 represents a side view of the valved partition shown in Fig. 1. Fig. 3 represents a sectional view on the line 3 3 of Fig. 2. Fig. 4 represents a plan view of the valve-casing with its clamping-cap removed. Fig. 5 represents a plan view of the outlet-valve. Fig. 6 represents an enlarged sectional view of the outlet-valve and its casing. Fig. 7 represents a plan view of the apparatus.

The same reference characters indicate similar parts or features wherever they occur.

In the drawings, *a* represents the receiving end, and *b* the delivering or mouthpiece end, of a conduit through which air is adapted to be drawn by respiration, the air entering at *a* and after being medicated in the conduit, as hereinafter described, passing with the evaporated inhalant into the mouth of the patient at *b*, the delivering end being preferably enlarged, so that it is adapted to cover the mouth and, if desired, the nostrils of the patient.

c represents a shell or casing, the interior of which forms a part of the conduit and also a holder for the liquid inhalant, which is represented at *d*. The shell *c* has a reduced end *e*, constituting the outlet of the shell and a part of the general conduit.

f is a tube which constitutes an extension of the inlet end *a*, and *g* is a similar tube constituting an extension of the outlet end *b*. Said tubes extend from the parts *a* and *b* into the interior of the shell *c* and communicate with said interior, the tubes being disconnected from each other within the shell and preferably curved in opposite lateral directions at their ends, as shown in Fig. 7, and also curved upwardly from one side of the shell, as shown in Fig. 1. This arrangement of the laterally-deflected inner ends of the tubes *f* and *g* causes the air which is drawn into the receiving end *a* to pass through the tube *f*, then laterally into the central upper portion of the shell, then downwardly, impinging against the liquid inhalant, then upwardly into the tube *g*, and through the latter and the outlet portion *e*, thus revolving over the surface of the body of liquid in the shell or holder and taking up the proper amount of evaporated inhalant without becoming unduly impregnated with or saturated by such inhalant, as would be the case if the inhalant were distributed throughout the

holder by means of an absorbent material. The shell *c* and the parts *a e f g* are preferably made of glass, their construction being such that when a suitable quantity of the inhalant is present in the shell it cannot escape through either of the tubes unless it is withdrawn by a flexible tube inserted in one of said tubes and formed as a siphon. The shell *c* and its tubes *f* and *g* constitute an inhaler substantially similar to that described in my Patent No. 604,935, dated May 31, 1898.

The delivering portion of the inhaler, as here shown, is made as a separate part or member, having a reduced end *h*, formed to embrace and closely fit the delivering end *e* of the casing *c*, the said member constituting a mouthpiece whereof the reduced portion *h* is one end and the delivering-mouth *b* is the opposite end. The said mouthpiece is preferably made of flexible material, such as vulcanized rubber, although it may be of rigid material, if preferred.

Between the receiving inner end *a* and the delivering outer end *b* of the mouthpiece is a valved partition, which, as here shown, comprises a flat plate *i*, formed to fit the interior of the mouthpiece portion of the conduit between the inner and outer ends of the latter, said plate having orifices *i'*, one of the sides of the plate constituting a valve-plate surrounding said orifices. Attached at one end to the plate *i* is a valve *j*, which is preferably a sheet of flexible material, such as mica, secured at one end to the plate *i* by suitable means, such as by an ear i^2, formed on the plate and bent over and pressed down upon one end of the valve *i*, as clearly shown in Figs. 2 and 3. The valve *i* is arranged to open toward the outer end *b* of the conduit, so that when the patient is inhaling the valve yields, as indicated by dotted lines in Fig. 1, admitting the free passage of air and evaporated inhalant through the mouthpiece portion of the conduit. When, however, the patient exhales, the valve *j* closes on the plate *i* and prevents the return of the warm breath to the casing *c*. Hence there can be no contact between the warm breath and the liquid inhalant, the patient inhaling a uniform proportion of air with each breath.

k indicates an outlet-valve, which coöperates with the valve-seat in the holder, hereinafter described, in permitting the patient to exhale through a portion of the conduit—namely, that portion between the valve *j* and the outer end *b*—so that the patient will experience no inconvenience in exhaling when the apparatus is in use. The valve *k* is held by a casing or holder, which comprises a ring 2, constituting a valve-seat and having a flange 3 surrounding the chamber, in which the valve *k* is movable, a tubular clamping-shank 4, which engages the threaded interior of the ring 2 and passes through an orifice in the wall of the conduit, and an internally-threaded screw-cap 5, having an orifice 6 to engage the externally-threaded flange 3. The flange 3 has a slot or opening 7, Fig. 4, and the valve *k* has a shank *k'*, formed to extend through the slot 7, so that when the cap 5 is screwed into place its lower edge bears upon the outer surface of the shank *k'* and clamps the same against the ring 2. The shank *k'* constitutes a hinge for the valve, the body portion of the valve being free to swing in and out and provided with projections k^2 k^2, which prevent edgewise displacement of the valve in the chamber in which it works. The valve *k* is also preferably made of a sheet of mica.

It will be seen that the described construction of the shell *c*, whereby it serves as a part of an air-conduit and as a liquid-holder from which liquid cannot escape without the aid of a siphon whatever may be the position of the patient, enables chloroform to be conveniently and safely administered, without spilling the liquid, to a patient occupying any position that the exigencies of the case may require, whether lying on the back or face downward or in any position which the human body can assume, care being taken to adjust the shell *a* so that the ends of the tubes *f* and *g* shall be above the body of liquid. This may be accomplished by partially rotating the shell in the mouthpiece portion in accordance with the position of the patient.

As above stated, the liquid cannot escape from the shell or holder whatever may be the position of the patient. It is also to be noted that the construction of the valves *j* and *k* is such that they are normally held to their seats by the resiliency of the material of which said valves are made. The normal position of said valves therefore cannot be disturbed by the action of gravity upon them regardless of the position of the patient or of the device. Therefore there is a particular coöperation between the holder constructed to effectually retain the liquid in any position and the construction of the valves so that they will remain normally closed in any position, opening only under the influence of the inhalations and exhalations of the patient. Of course it should also be understood that there is an advantage in having the holder of the liquid arranged close to the mouthpiece rather than it should be a separate vessel placed on the floor and connected with the mouthpiece by a pipe. To place the holder at a distance from the mouthpiece and connect it therewith by a pipe would prevent the convenient use of the apparatus in some positions and would also be objectionable by reason of the long section of pipe which would necessarily contain a considerable quantity of air that would have to be gradually displaced by the gas and gradually taken up by the patient. In other words, the holder for the inhalant is in close proximity to the mouthpiece, so that the patient will not have to set in motion a long current of air, and therefore gives an immediate result from the very beginning.

The mouthpiece portion when made of flexible elastic material and of the flaring or trumpet form shown in the drawings can be readily turned inside out to cleanse its interior. This operation separates the valved plate *i* from the mouthpiece portion, the latter having an internal shoulder *s* bearing on the outer side of the plate *i* and coöperating with the elastic body of the mouthpiece in removably holding the plate. The flexibility and elasticity of the mouthpiece also enable the casing of the outlet-valve to be readily separated from the mouthpiece by stretching the portion of the mouthpiece that surrounds said casing.

I claim—

1. An inhaler comprising a holder for the inhalant having an air-inlet and an outlet for the air and the evaporated inhalant and provided with means for producing a revolving current of air over the surface of the body of liquid in the holder, and a mouthpiece connected with said outlet and having an automatic inwardly-opening check-valve which permits inhalation through the holder and mouthpiece and prevents exhalation into the holder.

2. An inhaler comprising a holder for the inhalant having an air-inlet and an outlet for the air and the evaporated inhalant, a mouthpiece connected with said outlet and having an automatic inwardly-opening check-valve which permits inhalation through the holder and mouthpiece and prevents exhalation into the holder, and a valved outlet in said mouthpiece adapted to permit the escape of exhalations therefrom.

3. An inhaler comprising an air-conduit having a receiving end, a delivering end, an inhalant-holder adjacent to the receiving end, and a partition between the said holder and the delivering end and having an automatic valve adapted to permit inhalation through said holder and to prevent exhalation into the same.

4. An inhaler comprising an air-conduit having a receiving end, a delivering end, an inhalant-holder adjacent to the receiving end, a partition between the said holder and the delivering end and having an automatic valve adapted to permit inhalation through said holder and to prevent exhalation into the same, and a valved outlet between the said partition and the delivering end, said outlet permitting exhalation through a portion of the conduit.

5. An anesthetic inhaler, comprising an air-conduit and a liquid-holder having provisions for receiving and conducting the same over the confined liquid, and for preventing the escape of the liquid, and a partition between the liquid-holder and the delivering end of the conduit, and having an automatic valve adapted to permit inhalation through the holder and to prevent exhalation into the same.

6. An inhaler comprising a holder for the inhalant having an air-inlet and an outlet for the air and the evaporated inhalant, the inner ends of the inlet and outlet being laterally deflected to form a revolving current of air over the body of liquid in the holder, and a mouthpiece connected with and in close proximity to said outlet and having automatic valves for permitting inhalation only through the holder and exhalation only through the mouthpiece.

7. An inhaler comprising a holder for the inhalant having an air-inlet and an outlet for the air and the evaporated inhalant, said inlet and outlet extending into the holder to prevent the escape of liquid therefrom when the holder is tilted or moved about and having their inner ends laterally deflected to form a revolving current of air over the body of liquid in the holder, and a mouthpiece directly connected with said outlet and having automatic check-valves adapted to remain normally closed but arranged to permit inhalation from the holder and exhalation from the mouthpiece only to the external atmosphere.

8. An inhaler comprising a holder *c* having an inlet *a* and a tube *f* extending therefrom into the holder, and having an outlet end, and the tube *g* extending into the holder from said outlet end, the inner ends of the inlet and outlet tubes being laterally deflected to form a revolving current of air over the body of liquid in the holder, and a mouthpiece connected with the outlet end of the holder and having a valve *j* across its end near the connection with the holder and adapted to remain normally closed by spring-pressure to prevent the passage of any air from the mouthpiece to the holder, and a valve *k* to permit the escape of air from the mouthpiece to the external atmosphere, said valve *k* being held normally closed by spring-pressure and adapted to prevent the passage of air from the outside into the mouthpiece, whereby liquid may be retained in the holder and the valves will remain normally closed regardless of the position in which the device may be held.

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

WILLIAM B. HIDDEN.

Witnesses:
C. F. BROWN,
A. D. HARRISON.