No. 860,476. PATENTED JULY 16, 1907.

J. W. HORNER.

INHALER.

APPLICATION FILED FEB. 8, 1907.

Fig. 2.

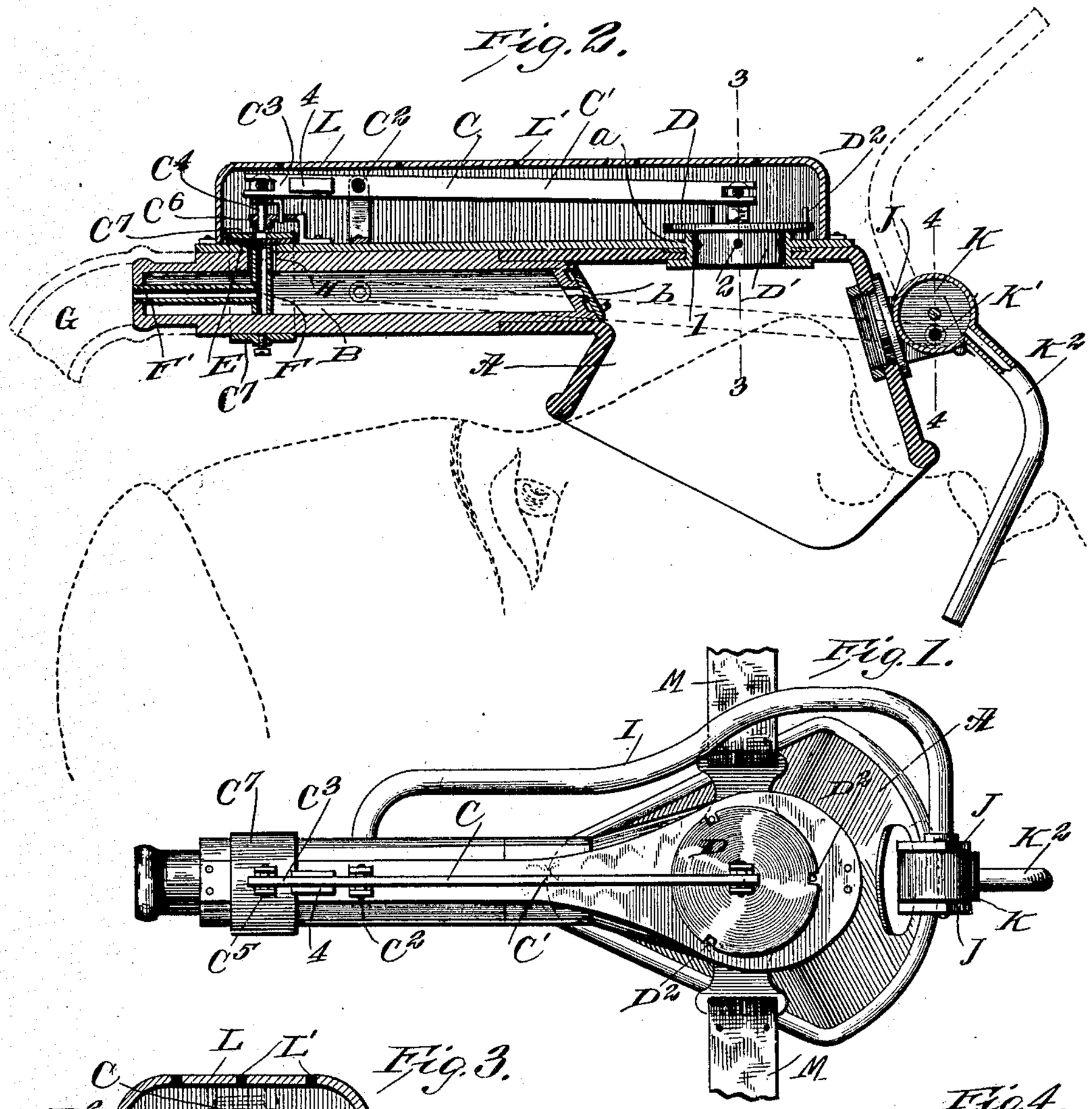


Fig. 1.

Fig. 3.

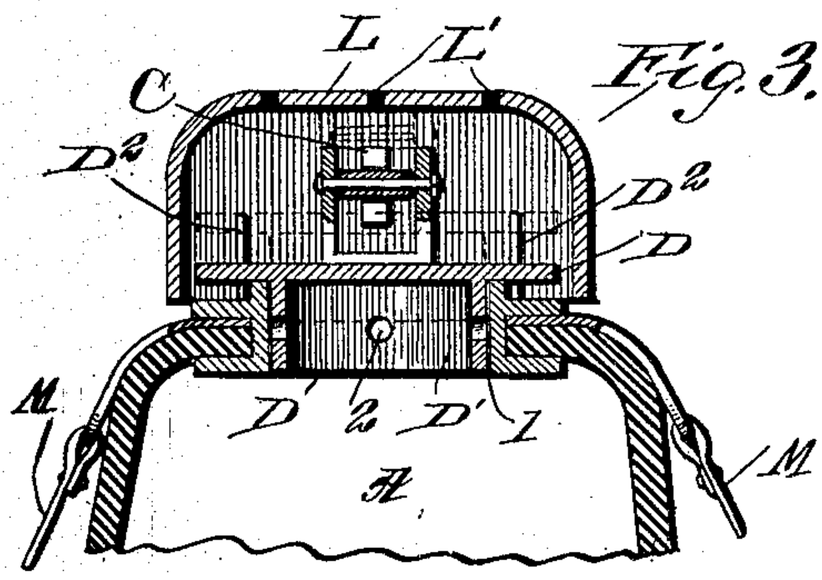
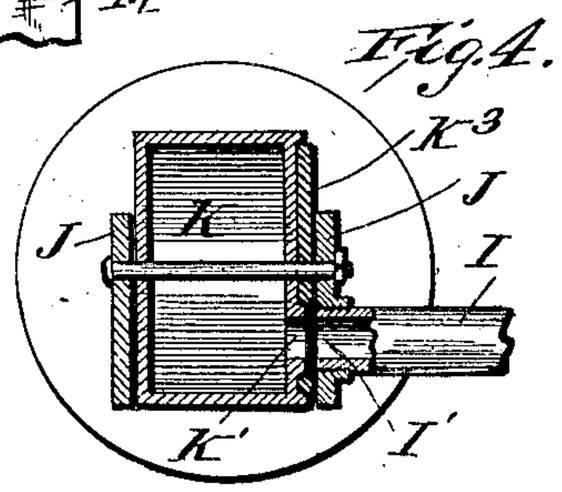


Fig. 4.



WITNESSES

E. M. Callaghan.

Perry B. Turpin

INVENTOR

JACOB W. HORNER

BY Munn & Co.

ATTORNEYS

UNITED STATES PATENT OFFICE.

JACOB W. HORNER, OF COLUMBUS, INDIANA.

INHALER.

No. 860,476. Specification of Letters Patent. Patented July 16, 1907.

Application filed February 8, 1907. Serial No. 356,358.

To all whom it may concern:

Be it known that I, JACOB W. HORNER, a citizen of the United States, and a resident of Columbus, in the county of Bartholomew and State of Indiana, have made certain new and useful Improvements in Inhalers, of which the following is a specification.

My invention is an improvement in inhalers for the administration of nitrous oxid gas or other gases; and the invention consists in certain novel constructions and combinations of parts as will be hereinafter described and claimed.

In the drawing—Figure 1 is a face view of an inhaler embodying my invention, the cover plate or hood being removed. Fig. 2 is a vertical longitudinal section of the invention as in use. Fig. 3 is a cross section on about line 3—3 of Fig. 2, and Fig. 4 is a cross section on about line 4—4 of Fig. 2.

The inhaler as shown is especially designed for using gas under high pressure, directly from a cylinder charged with gas in a liquid form, facilitating the use of such gas directly from the cylinder without employing a gasometer or gas bag as is now commonly practiced.

By my invention I seek to provide together with other improvements, a novel construction whereby the gas may be administered through the nose or through the mouth or both and whereby to avoid a constant flow of gas while the patient is exhaling, as in the operation of many inhalers all the gas supplied during exhalation is wasted and the only gas utilized is that which flows during the time the patient is inhaling. In carrying out this feature of my invention I provide the inhaler with valves so constructed and arranged that during exhalation the supply of gas is automatically cut off and during inhalation it is automatically opened or reëstablished, thus avoiding waste of gas and resulting in a considerable saving to a busy operator.

In the construction shown the inhaler has an ordinary inhaler body A, which may be generally of the ordinary construction and is connected with one end of a tube B which may be of metal or other suitable material. The body A has an outlet or exhaust port *a* which is controlled by a valve D preferably in the form of a large disk to give ample area for the air pressure from the patient in exhaling. This valve has a depending tubular portion D′ operating within the cylindrical seat 1 of the exhaust port and provided between its ends with openings 2 through which the exhaled air and gas may discharge when the valve is raised to the position indicated in dotted lines, Fig. 3. In this position the exhaled air and gas will pass out through the ports 2 into the hood or casing L from which it may discharge through suitable openings L′ as will be understood from Figs. 2 and 3 of the drawing. This valve D is guided by suitable pins D^2 and is carried on the long arm C′ of a lever C, which is pivoted at C^2 as shown in Figs. 1 and 2 and has its short arm provided with means for controlling the inlet valve.

In securing a control of the feed of gas by the pressure of the patient's breath in exhaling, I find it desirable in overcoming the high pressure of the gas to utilize the force of the lever by supporting the exhaust valve on the large arm of the lever and operating the feed valve from the short arm of the lever and also to multiply the area of the exhaust valve relatively to that of the feed valve many times in order to secure the advantage of such variation in area. The short arm C^3 of the lever C operates the feed valve, which controls the passage of gas to the nose-piece or body A of the inhaler. As shown the short arm C^3 of the lever is arranged to directly operate a pin C^4 connected with the lever at C^5 suitably guided in a bearing C^6 below the short arm of the lever and adapted to pass through an opening in a cover plate C^7 overlying a flexible diaphragm or plate E, which forms the valve controlling the feed port and is adapted to be closed by the pin C^4 against the said port to shut off the passage of gas. This feed port F is in communication with a pipe G leading to the gas holder and feeds the gas to the tube B and thence to the nose-piece or body of the inhaler. In the construction shown the feed port F is at the inner end of a pipe F′ of small diameter extending within the tube B and communicating at its outer end with the supply tube G and forming the only passage for the gas to the inhaler. The inner end of this tube extends within a relatively enlarged chamber H and opens within said chamber which forms a channel or by-pass for the gas to the interior of the tube B and also permits the play of the flexible diaphragm forming the feed valve as before described.

The tube B, forming a gas chamber, is provided between the feed port and the body A and preferably adjacent to the latter with a check valve *b* opening into the nose-piece A during the act of inhaling and closing by the pressure of breath in exhalation, as will be understood from Fig. 1 of the drawing.

In the operation of the described construction it will be noticed that the flexible diaphragm moves outwardly under the pressure of the supplied gas under ordinary circumstances and may be depressed by the operation of the pin C^4 when the lever C is rocked by the outward movement of the valve D as the patient exhales, the reverse operation being true during inhalation. The short arm of the lever may be weighted at 4, see Figs. 1 and 2, to aid its operation whenever desired.

Some patients because of obstruction in the nose experience difficulty in inhaling properly through the nose and it is sometimes desirable to administer the anesthetic both through the nose and mouth and I therefore prefer to provide means for conducting the gas to the mouth and to construct the same as best shown in

Figs. 1, 2 and 4. In this construction a pipe I taps the inhaler tube B at a point between the mouth-piece and the feed valve and leads thence to a point below the body A and opens at I′ through a plate J to which is pivoted eccentrically to the port I′ a drum K having a port K′ which may be turned into and out of register with the port I′ as will be understood from Figs. 2 and 4 and from this drum projects a tube K^2 which may enter the mouth of a patient when the parts are in the position shown in Fig. 2, in which position the ports K′ and I′ will register and gas will be supplied through the rocking mouth-piece or the mouth-piece may be turned to the dotted position shown in Fig. 2 when it is not desired to administer gas to the mouth and when so adjusted the ports K′ and I′ will be adjusted out of register and cut off the supply of gas through the parts K and K^2. Any suitable packing may be provided at K^3 to prevent waste of gas between the parts J and K.

Straps M may be connected with the inhaler for securing the same upon the head of a patient.

It will be understood that in operation the mouth-piece K^2 will offer no substantial obstruction to the manipulation of forceps within the mouth of the patient so that the operation of extracting may go on during the administration of the anesthetic and also that the mouth-piece may be thrown from the position shown in full lines Fig. 2 to the dotted line position indicated in the same figure, when it is desired to shut off the administration of the anesthetic through the mouth or move the mouth-piece entirely out of the way.

I claim—

1. An inhaler comprising a nose-piece, a tube extending therefrom, a feed tube extending within said first tube and open at its inner end, a chamber being provided surrounding said opening, a flexible diaphragm extending over said chamber opposite the open end of the feed tube, a cover plate overlying said diaphragm and perforated in line with the open discharge end of the feed tube, a pin arranged to pass through said opening in the cover plate to operate the flexible diaphragm, a lever having a short arm operating said pin and a long arm and an exhaust valve connected therewith and arranged for operation by the pressure of the patient's breath in exhaling, a mouth tube, a drum or chamber in communication therewith and having an inlet port, a plate to which said drum is pivoted eccentrically to its inlet port and having a port with which the inlet port of the chamber may be registered, a pipe for conducting gas to the port in said plate, said pipe connecting with and receiving its supply from the tube in connection with the nose-piece, substantially as and for the purpose set forth.

2. An inhaler having a nose-piece, a tube extending therefrom, a feed port in communication with the tube, an exhaust port in communication with the nose-piece, feed and exhaust valves controlling their respective ports, a lever for operating said valves, a mouth pipe adjustably connected with the nose-piece whereby it may be shifted into and out of position to deliver the gas to the mouth of a patient, a pipe for conducting gas to the mouth pipe and means operated by the movement of the mouth pipe for establishing and cutting off communication with its supply pipe, substantially as set forth.

3. An inhaler comprising a nose-piece having an exhaust or exhaling port, means connected with said nose-piece and having a feed port for delivery of gas thereto, a lever having one arm provided with a valve controlling the exhaust port from the nose-piece and a valve operated by the other arm of the lever and controlling the passage of gas to the mouth-piece substantially as set forth.

4. An inhaler having a feed port and an exhaust port, a valve controlling the feed port and consisting of a flexible diaphragm, a valve controlling the exhaust port and a lever extending between said valves, and a pin operated from the short arm of said lever and arranged when depressed to press the diaphragmatic feed valve against its port, substantially as set forth.

5. An inhaler having a tube, a diaphragm supported by the tube and forming a feed valve, a feed port opposite said diaphragm and means whereby said diaphragm may be closed upon the feed port by the pressure of a patient's breath in exhalation, substantially as set forth.

6. An inhaler having a feed port, a diaphragm opposite said feed port and movable in closed position against the same, a pin whereby to press the diaphragm against the feed port, a lever having a long and a short arm and having its short arm arranged to operate the said pin for operating the diaphragm, and a valve in connection with the long arm of the lever and arranged to be operated by the air pressure of a patient's breath in exhaling, substantially as set forth.

7. An inhaler comprising a body having an exhaust port, a tube projecting from said body, a check-valve in connection with said tube, a feed port opening into the tube, a valve controlling said feed port, a valve controlling the exhaust port from the body, intermediate devices between the said exhaust and feed valves whereby they may be operated relatively, means for delivering gas to the mouth of a patient and a pipe in connection with said means and connected with the tube in advance of the check valve of the latter, substantially as set forth.

8. An inhaler having a nose-piece, a mouth piece connected movably with the nose-piece, means for conducting gas to the mouth-piece, a feed port, an exhaust port, an exhaust valve arranged to be operated by the air pressure of a patient's breath in exhaling, a feed valve, and intermediate devices between the feed valve and exhaust valve.

9. An inhaler comprising a nose-piece having an exhaust port, a tube projecting from the nose-piece, a feed port opening into said tube, a valve controlling said feed port, a valve controlling the exhaust port of the nose-piece, intermediate devices between said valves, a check-valve controlling the connection of the nose-piece with the tube projecting therefrom, a mouth-piece, a pipe for supplying said mouth-piece and connected with the tube in advance of said check valve and means for controlling the discharge of gas from said pipe to the mouth-piece, substantially as set forth.

10. An inhaler having means for administering gas to the nose and means for administering gas to the mouth, and means arranged to be operated by air pressure of a patient's breath in exhaling whereby to cut off the passage of gas to both said administering means.

11. An inhaler having a nose-piece, a mouth-piece, a gas chamber in connection with both the nose-piece and mouth-piece, a check-valve between the nose-piece and said chamber, a feed valve controlling the passage of gas to the gas chamber and means for automatically closing the feed valve by the air pressure of a patient's breath in exhaling.

12. An inhaler, comprising a body having a feed port, a valve controlling the feed port, and means whereby the said valve may be closed by the pressure of the patient's breath during exhalation to prevent waste of gas at such time.

JACOB W. HORNER.

Witnesses:
SOLON C. KEMON,
PERRY B. TURPIN.