

(No Model.)

3 Sheets—Sheet 1.

W. SMITHARD.

APPARATUS FOR ADMINISTERING NITROUS OXID GAS.

No. 514,628.

Patented Feb. 13, 1894.

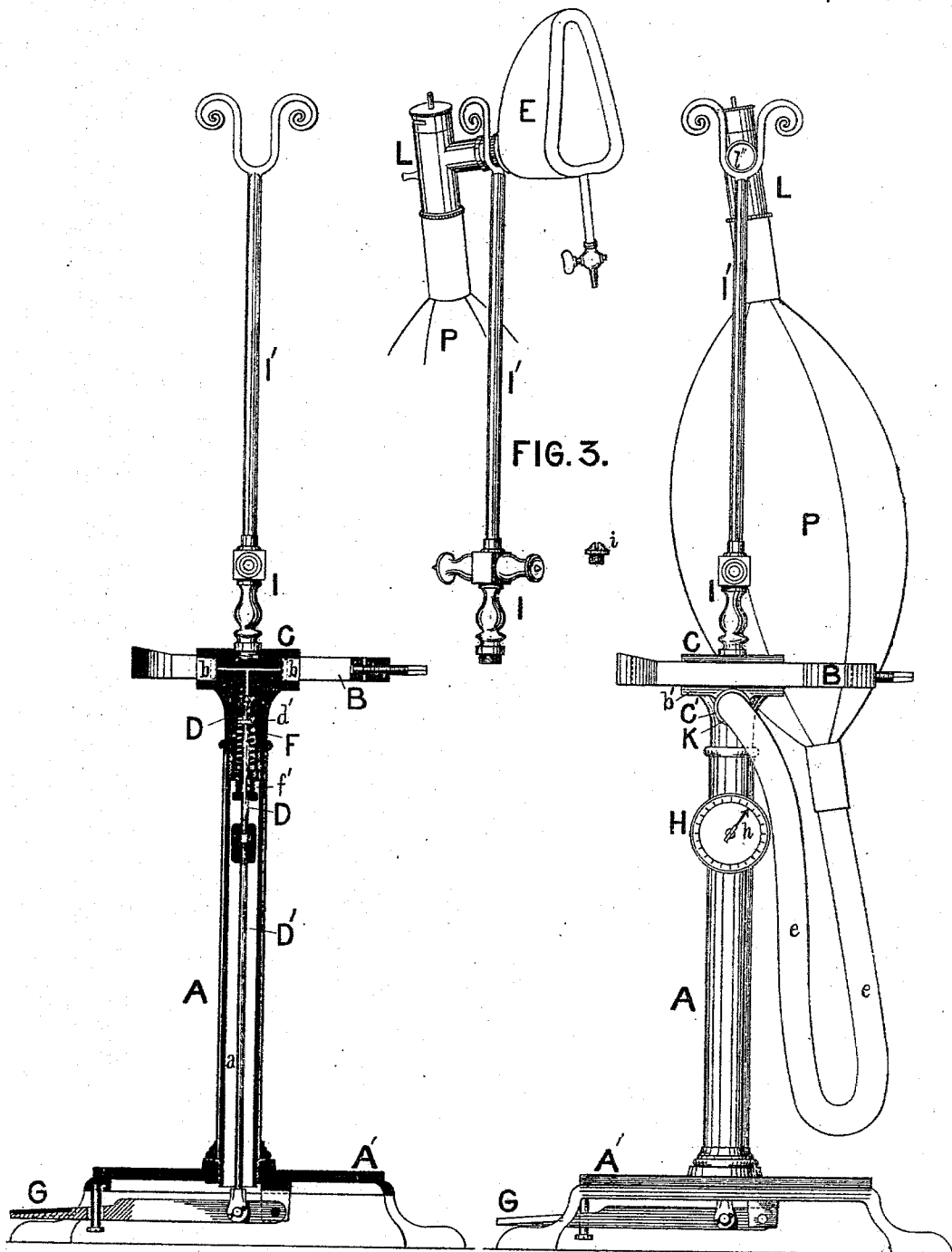


FIG. 2.

WITNESSES

Joseph Pates.
Joseph R. Allen.

FIG. 1.

INVENTOR

Walter Smithard
by Wm. P. Thompson & Co.
attys.

(No Model.)

3 Sheets—Sheet 2.

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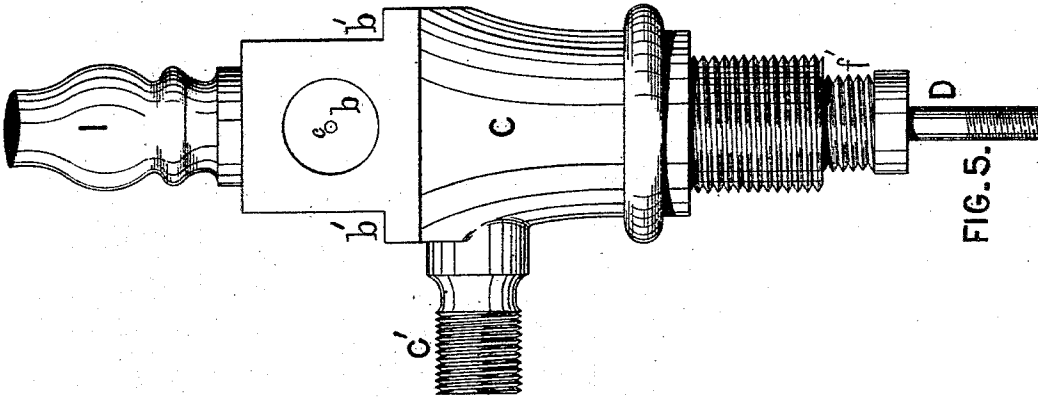


FIG. 5.

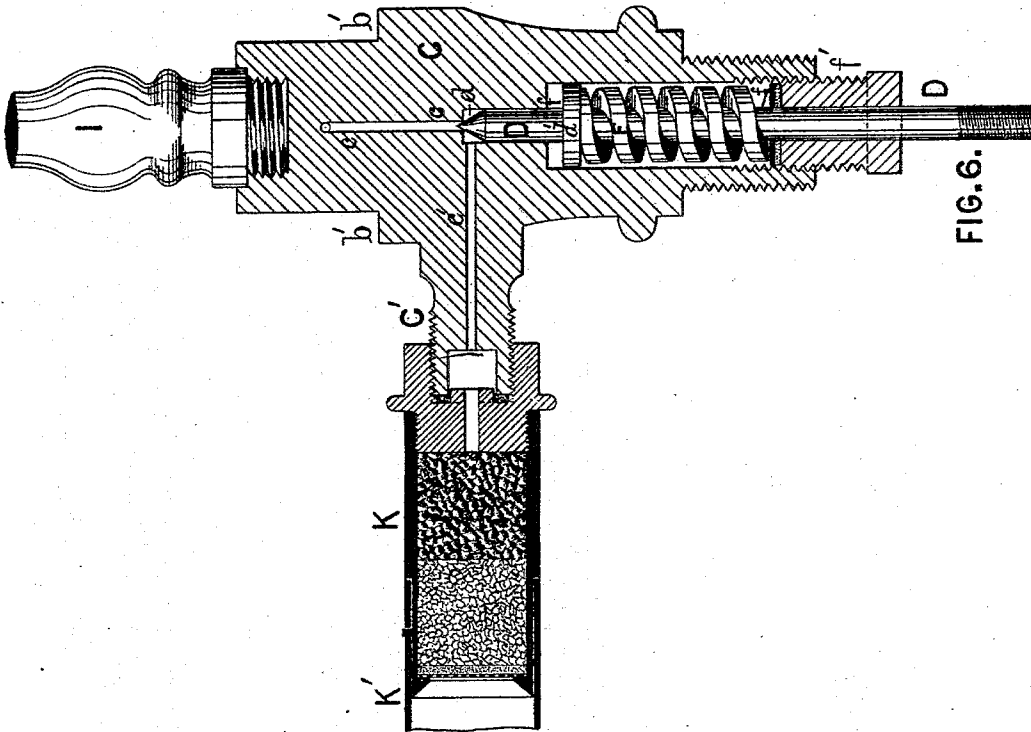


FIG. 6.

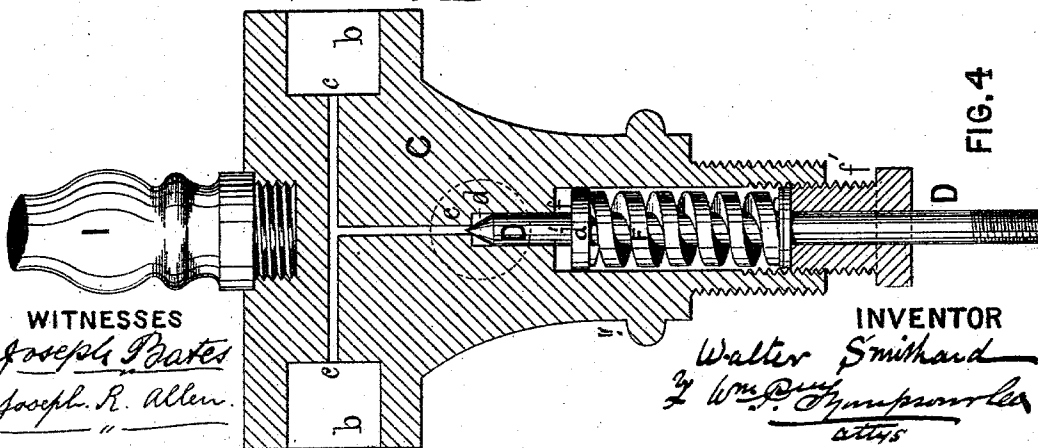


FIG. 4.

WITNESSES
Joseph Bates
Joseph R. Allen

INVENTOR
Walter Smithard
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(No Model.)

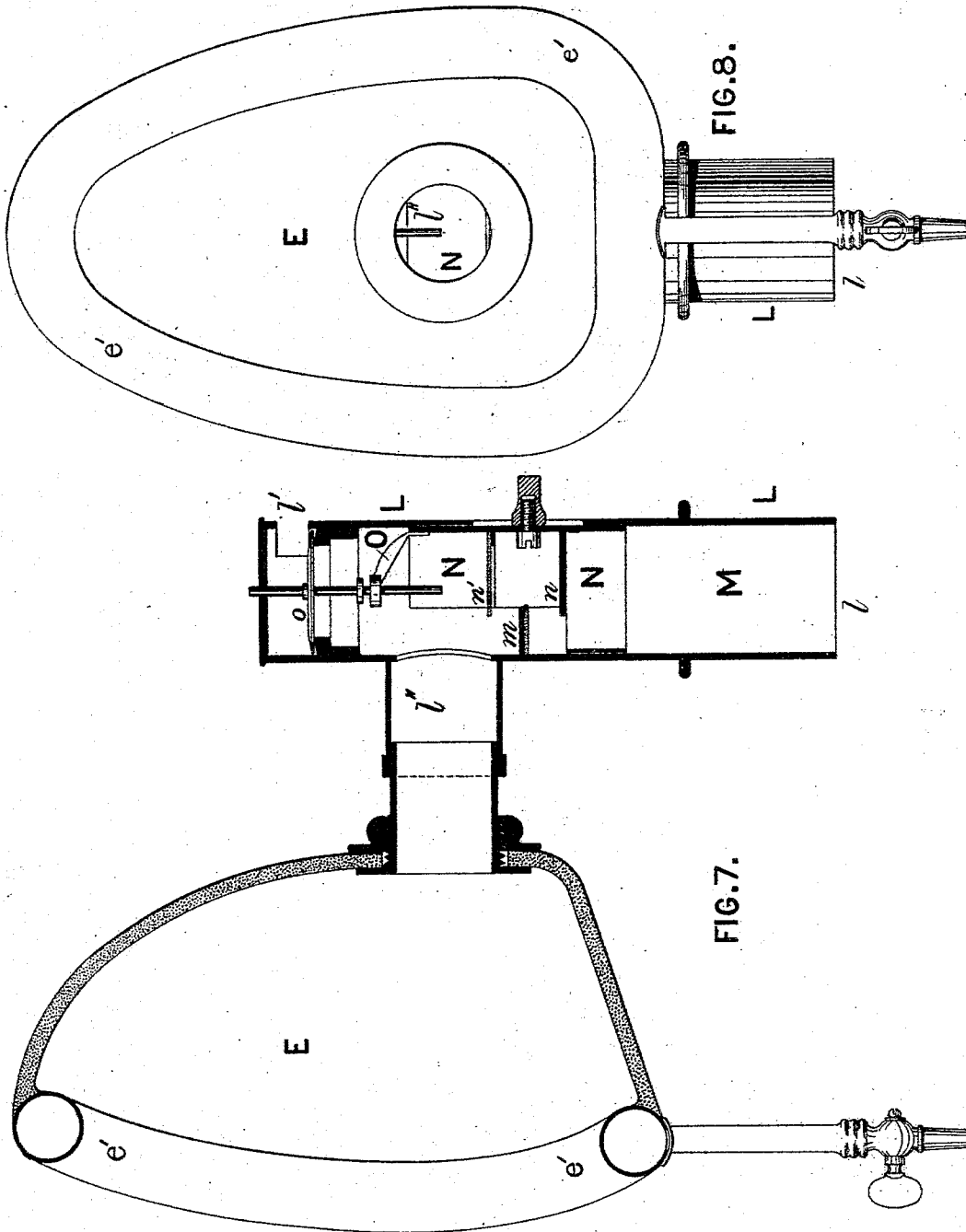
3 Sheets—Sheet 3

W. SMITHARD.

APPARATUS FOR ADMINISTERING NITROUS OXID. GAS.

No. 514,628.

Patented Feb. 13, 1894.



WITNESSES

Joseph Baxter
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"

INVENTOR

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UNITED STATES PATENT OFFICE.

WALTER SMITHARD, OF MANCHESTER, ENGLAND.

APPARATUS FOR ADMINISTERING NITROUS-OXID GAS.

SPECIFICATION forming part of Letters Patent No. 514,628, dated February 13, 1894.

Application filed September 11, 1893. Serial No. 485,271. (No model.)

To all whom it may concern:

Be it known that I, WALTER SMITHARD, a subject of the Queen of Great Britain, residing at Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in Apparatus for Administering Nitrous Oxid or other Gas for Inhalation, of which the following is a specification.

10 The object of the invention is to simplify and make more efficient the construction of apparatus used by dentists and others for administering nitrous oxide or other gas.

It consists essentially in constructing the
15 apparatus with a stand to hold the steel cylinders in which the gas is contained, [and allow the gas to pass therefrom for administration] provided with ports or passages for the gas to flow through a valve actuated by a
20 pedal to control the flow of the gas and a nozzle and tube for conveying the gas to the inhaler; a bracket or attachment for holding the face-piece when not in operation, which can be removed when not required by the operator;
25 an indicating dial and finger on which the number of administrations from the cylinders can be recorded; a silencer and purifier for preventing noise and preventing impurities passing forward with the gas to the patient; an inhaler or inhalation valve, constructed to permit, at the will of the operator, the inhalation of fresh gas at each inspiration, the re-inhalation of the gas after expiration and the inhalation of air without
35 removing the apparatus or closing the ports; and a face-piece covered completely with rubber and of a form to prevent its coming in contact with the gag employed in the patient's mouth for the purposes of the operation.

40 The invention will be fully described with reference to the accompanying drawings.

Figure 1. is a front elevation of the apparatus with the face-piece removed; Fig. 2. a sectional elevation of same; Fig. 3. a side elevation of the attachment for holding the face-piece, showing it in position; Fig. 4. a front elevation in section of top portion of stand containing the shut off valve; Fig. 5. a side elevation of same; Fig. 6. a side elevation in
50 section; Fig. 7. a side elevation in section of

face-piece and inhalation valve; Fig. 8. a front elevation of face-piece.

The apparatus is constructed with a stand A at the head of which the steel cylinders which contain the gas are suspended by the neck, the nozzles of the cylinders fitting into the openings or apertures *b* being clamped or tightly held in that position by the clamp B. The stand is composed of a tubular upright part *a* screwed or otherwise fitted into a base plate A' and carrying at the top a head or upper part C in which the ports and valve are placed. The head C is provided with a port or passage *c* leading from the apertures *b* in which the nozzles of the containing cylinder are held to a central chamber or passage *d* in which works a controlling valve and its spindle D. From this central chamber *d* a second port or passage *c'* leads through the nozzle C' to which the tube *e*, which conveys the gas to the face-piece E, is attached. The valve D is preferably made in the form of a plunger with tapered end which fits into and closes the mouth of the port or passage *c* and is capable of moving to and fro in the chamber *d*. The point of the valve D is made of aluminium, aluminium bronze or other metal not liable to corrosion, to prevent the wear and leakage that would result therefrom. The valve or plunger D is provided with a shoulder or collar *d'* against which a spiral or other spring F bears to hold it against its seat at the aperture of the port or passage *c*. The spring F fits loosely into the chamber *f* and is held in position against the collar *d'* by the screw or gland *f'*—with a metallic and leather washer between—screwed into the bottom end of the head C.

To the lower end of the spindle of the plunger D a connecting rod D' is attached by a screw or other coupling. The lower end of the connecting rod D' is connected to a pivoted lever or pedal G, by which the valve or plunger D is drawn down to and the aperture of the port *c* opened.

The head C of the stand is provided externally with flanges *b'*, one on each side, by which is supported or on which rests the clamp B, which holds the steel cylinders or gas containers in position; these flanges prevent

tilting in securing the cylinder or when the cylinder at one side is lighter than the other, or when only one cylinder is in use. The coupling screw in the end of the clamp is preferably provided with a conical continuation instead of with a shoulder or abrupt termination for the purpose of giving additional strength.

On the side of the stand A I place an indicating dial H, provided with a finger or pointer *h*, by which the number of administrations can be recorded and thereby indicate the quantity of gas withdrawn from the cylinders. The indicator need not be automatic, as the finger *h* can be operated by the administrator either by hand or it may, if desired, be connected by suitable lever and link with connecting rod D' or with the pedal G.

On the top of the stand head C is fixed a bracket and cross bar I forming a handle by which the apparatus can be lifted or moved as required from place to place. In the top of the bracket I is bored a hole to receive the screwed end of the upright attachment I' with a forked upper end to hold or support the face-piece E when not being operated with. When this attachment is not required to be used, it can be unscrewed and removed and the hole into which it fits be closed by the ornamental set screw *i*.

The nozzle C' to receive the end of the flexible tube by which the gas is conveyed to the patient is cast in one piece with the stand head C instead of being screwed thereinto as has hitherto been the case. The silencer and purifier K is screwed onto the nozzle C'. It is hollow for the gas to pass through and is filled internally with granulated cork or sponge and charcoal to prevent any impurities, such as particles of rust, passing with the gas from the interior of the cylinders. It thus acts as a purifier for the gas and a silencer by preventing any rush of gas or noise arising therefrom. The tube *e* is attached to the silencer or purifier K by a ferrule K' which slides over the end and is held in position by a bayonet or other suitable joint. On the tube *e* between the end of the tube and the face-piece E I place an inhaler or inhaling valve L. This inhaling valve is so constructed that it may be opened to the gas and to the air, to the air only, or to the gas only, so that the patient can inhale either gas or air and the gas or air as it is exhaled will pass into the atmosphere or gas may be inhaled and when exhaled pass again into the receiver so that it can then be re-inhaled by the patient. The appliance is constructed with three openings or apertures *l*, *l'*, *l''*. The opening *l* at one end connecting with the gas, the opening *l'* at the other with the atmosphere, and the central *l''* leading to the face-piece E through which the gas or air is inhaled and through which the exhalations also pass. At or near the center or in other convenient position in the tube M is placed a fixed or stationary semi-circular disk or

other diaphragm *m* extending about half way across the tube and in the tube M is placed a sliding or telescopic piece N, carrying two similar diaphragms or valve *n n'* by moving the sliding tube N up or down to which these valves are attached either of them may be brought to rest upon the diaphragm *m* to close the passage through the tube M. The rigid diaphragm *n* when resting in the diaphragm *m* closes the aperture *l* of the apparatus and shuts off all communication with the gas supply. The flexible diaphragm *n'* when resting in the opposite diaphragm *m* also closes the passage aperture *l* and prevents any down current but being flexible allows a current of gas to pass upward on suction being applied to the apparatus above it. These diaphragms are placed and work below the central opening *l''*. The sliding piece N also carries a bracket O to support a light valve *o* above the central opening, the spindle of the valve being guided by the bracket. When the sliding piece N is raised to bring the diaphragm *n* against the diaphragm *m* to close the lower end of the appliance which connects with the gas the top valve is lifted clear from its seating, allowing a free passage both for inhalation and exhalation with the atmosphere through the aperture *l'*. When the sliding piece N is moved to the bottom and the diaphragm *n'* rests on the diaphragm *m* the upper valve *o* and the flexible diaphragm or valve are both in operation the bottom flexible valve or diaphragm *n'* rises to admit gas when the pressure is reduced above it and closes again when the pressure is increased and the top valve *o* is raised from its seat to allow the exhalation to pass to the atmosphere. When in the central position shown in the drawings the passage to the gas is maintained open and the top valve *o* can be held closed by placing the finger on its spindle and holding it closed, thus allowing the gas to pass to and from the receiver to be re-inhaled several times. The top valve *o* may be made of vulcanite or other light material.

In the construction of the face-piece E I dispense with the leather outer covering and form it wholly of rubber so that it may be capable of being more thoroughly cleansed and I also make it of the shape or form shown to avoid coming in contact with the gag. I enlarge it below or on the under side and also above or on the upper side curving it out both top and bottom instead of the conical form at present adopted. The edges are formed with an air tube or pad *e'* to fit close to the face of the patient to prevent the escape of gas.

Between the inhaler and the tube *e* is placed an elastic bag P of ordinary construction in which the gas expands.

What I claim, and desire to protect by Letters Patent, is—

1. In apparatus for administering nitrous oxide or other gas the combination with stand A base plate A' and head C provided with

ports *c* and *c'* through which the gas flows of the valve *D* provided with conical end which closes the aperture of the port *c* the connecting rod *D'* and the pedal *G* by which the valve *D* is drawn down to open the port *c* substantially as described.

2. In apparatus for administering nitrous oxide gas the combination with the stand head *C* provided with ports *c* and *c'* through which the gas flows and a chamber *d* in which a plunger valve works, of the valve *D* provided with a collar *d'*, the spring *F* which holds the valve to its seat, the retaining screw *f'*, the connecting rod *D'* and the pedal *G* by which the valve is drawn down to open the port *c*.

3. In apparatus for administering nitrous oxide gas the combination with the base plate *A'* the tubular upright *a* and the head *C* provided with ports through which the gas flows of the handle bracket *I* provided with a screw hole in the top, the removable upright forked attachment *I'* which holds or supports the face-piece *E* when not being operated with and the ornamental screw plug *i* to fill the hole when the upright attachment is removed substantially as described.

4. In apparatus for administering nitrous oxide gas the combination with the base plate *A'* the tubular upright *a* the head *C* provided with ports *c*, *c'* and the pedal *G* for operating the controlling valve *D* of the indicating dial *H* and pointer *h* for registering the number of administrations substantially as described.

5. An apparatus for administering nitrous oxide gas the combination with the base plate *A'* the tubular upright *a* and the head *C* provided with ports *c*, *c'* through which the gas flows of the hollow silencer and purifier *K* filled with granulated cork and charcoal to prevent any impurities passing with the gas, the ferrule *K'*, provided with bayonet joint for attaching a flexible tube thereto and the flexible tube *e* substantially as described.

6. In apparatus for administering nitrous oxide gas the combination with the stand *A* stand head *C* provided with ports *c*, *c'*, controlling valve *D* and pedal *G* of the purifier

and silencer *K*, the connecting ferrule *K'*, provided with bayonet joint, the flexible tube *e*, provided with an elastic expansion bag and the face-piece *E* substantially as described.

7. In apparatus for administering nitrous oxide gas the combination with the face plate *E* and flexible connecting tube *e* of the tube *M* provided with three apertures *l*, *l'*, *l''*, the fixed diaphragm *m*, the adjustable sliding piece *N* carrying the diaphragms *n* *n'* and the supporting bracket *O* and the top valve *o* whereby the gas to be inhaled and the exhalations from the patient can be directed and controlled as desired substantially as described.

8. In apparatus for administering nitrous oxide gas the combination with the tubular structure *M* provided with three apertures *l*, *l'*, *l''* and the fixed diaphragm *m* of the sliding piece *N*, the diaphragm *n* *n'* carried thereby whereby the passage through the lower port of tube *M* may be opened or closed to the gas and the light valve *o* carried by the bracket *O* whereby the upper port of the tube may be opened or closed to the external atmosphere substantially as described.

9. In apparatus for administering nitrous oxide gas, the combination of the upright stand *A* the head *C* provided with ports *c*, *c'* through which the gas flows, the flexible tube *e*, elastic bag *P*, the inhaling valve *L* provided with a tube *M*, three apertures *l*, *l'*, *l''* diaphragms *m* *n* *n'*, valve *o* and sliding piece *N* and the face-piece *E* enlarged at the under and upper sides to avoid the gag and covered completely with india rubber and the air cushion *e'* around the outer edge to fit close to the face of the patient to prevent escape of gas substantially as described.

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

WALTER SMITHARD.

Witnesses:

J. OWDEN O'BRIEN,
JOSEPH BATES.