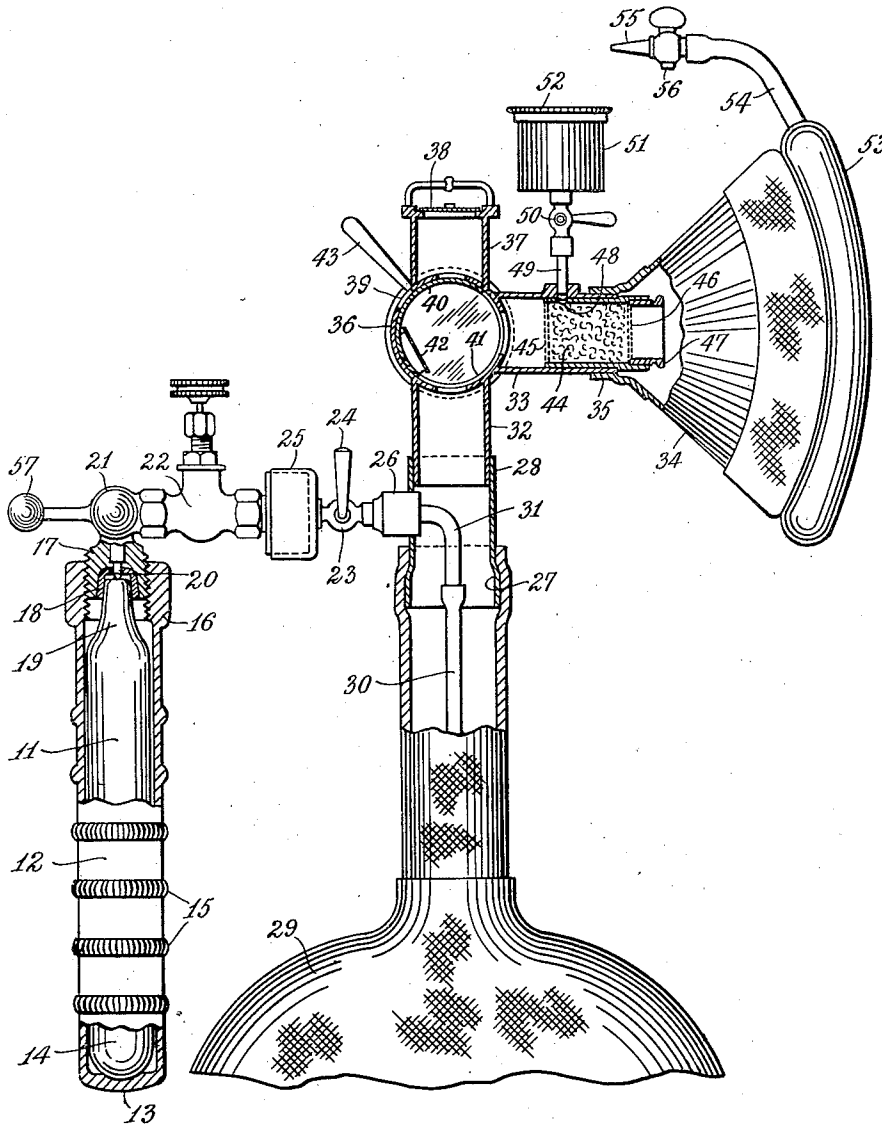


APPARATUS FOR ADMINISTERING GASES AND THE LIKE MEDICINAL AGENTS.

Patented Oct. 31, 1916.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

1,203,391.

Fig. 3.

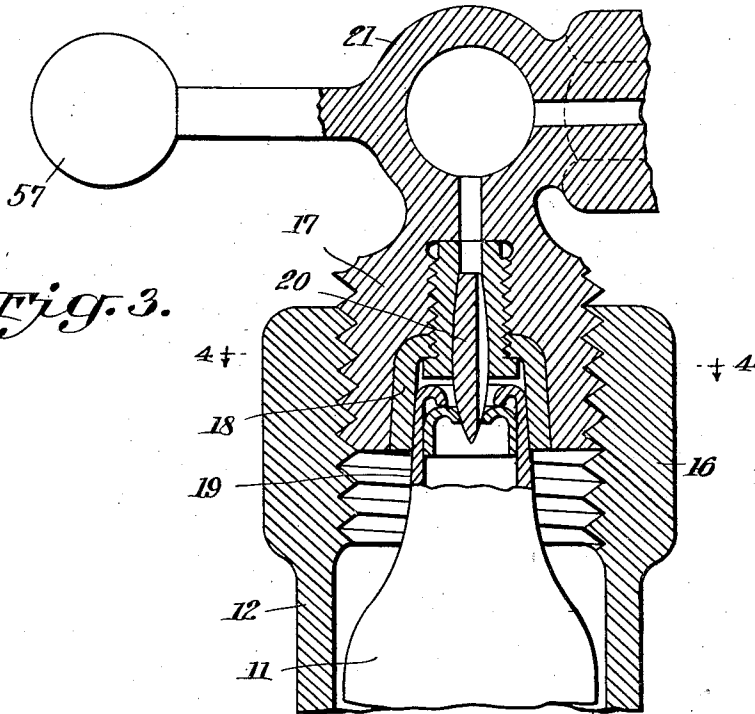


Fig. 2.

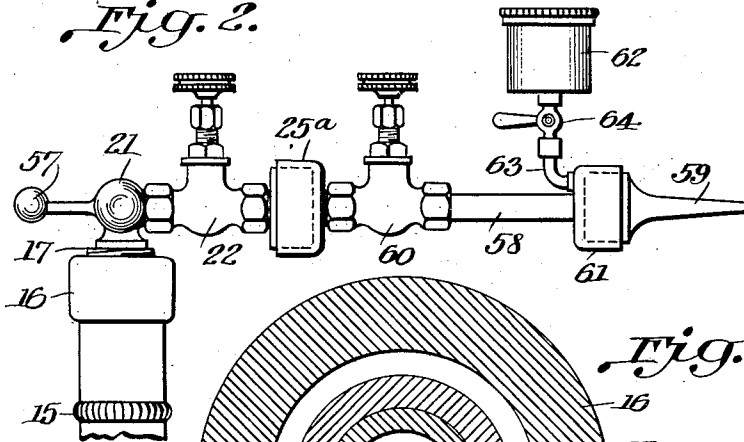
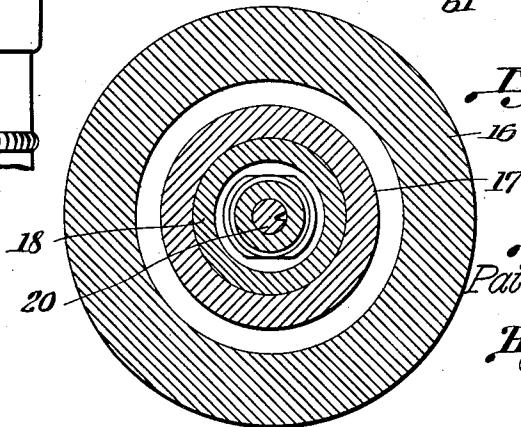


Fig. 4.



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UNITED STATES PATENT OFFICE.

PATRICK SHAUGHNESSY O'DONNELL, OF CHICAGO, ILLINOIS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF EIGHTEEN ONE-HUNDREDTHS TO HENRIETTE ELISABETH CATHARINA VAN HECK, OF HARROW, ENGLAND, TEN AND THREE-FOURTHS ONE-HUNDREDTHS TO ALBERT DAVID WHEATLEY, OF LONDON, ENGLAND, AND ONE AND THREE-FOURTHS ONE-HUNDREDTHS TO ALBERT JOHN WILLIAM RUSSELL JOHNSON, ONE-HALF ONE-HUNDREDTH TO GERALD JOHNSON RICHARDS, AND ONE-HALF ONE-HUNDREDTH TO ERNEST CUNNINGHAM, ALL OF LONDON, ENGLAND, AND ONE ONE-HUNDREDTH TO MATHILDA WAINWRIGHT, OF HARROW, ENGLAND.

APPARATUS FOR ADMINISTERING GASES AND THE LIKE MEDICINAL AGENTS.

1,203,391.

Specification of Letters Patent.

Patented Oct. 31, 1916.

Application filed January 21, 1915. Serial No. 3,584.

To all whom it may concern:

Be it known that I, PATRICK SHAUGHNESSY O'DONNELL, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, United States of America, have invented certain new and useful Improvements in Apparatus for Administering Gases and the like Medicinal Agents, of which the following is a specification.

This invention relates to apparatus for administering gases and the like medicinal or therapeutic agents, primarily by inhalation, and it has for its object to provide means for enabling compressed gases (such for example as oxygen and nitrous oxid), which have hitherto been available for medicinal and therapeutic purposes only when stored in comparatively large cylinders containing a supply sufficient for several applications, to be made use of when put up in metal capsules of relatively small dimensions containing each a supply sufficient for (say) only a single application so as to be readily portable. By the present invention, therefore, the difficulties incidental to the storage and transport of the usual bulky and heavy cylinders are obviated, and the employment of any gaseous remedial agent (more especially in urgent cases of emergency) is greatly facilitated, since the requisite appliances occupy but little space and, together with a number of capsules containing each a supply of the compressed gas as above stated, may be kept at hand in any readily accessible position and can, when occasion arises, be conveniently and safely carried in the pocket or in a handbag; a consideration of great importance not only in clinical practice but also in circumstances where surgical operations have to be performed in emergency, as for example after a railway accident or during fighting on the battle-field.

According to the present invention the gaseous agent is contained, in a highly compressed state, in metal sealed capsules each holding (say) a quantity sufficient for a

single application, and for purposes of administration one of the capsules is placed in a holder or cradle provided with devices for piercing the capsule and regulating the consequent flow of gas therefrom, the holder being connected with devices for enabling the effluent gas, after having been (if so desired) impregnated with some radio-active or other therapeutic agent, to be inhaled by or otherwise locally applied to the person of the patient.

In the accompanying drawings Figure 1 is a side elevation, partly in section, of a convenient arrangement of apparatus embodying the invention as employed for the administration of gases and the like by inhalation. Fig. 2 is a similar view illustrating the same apparatus as adapted for the administration of gases and the like by local application. Fig. 3 is an enlarged vertical sectional view showing in detail the capsule piercing means, Fig. 4 is a horizontal section of same taken on line 4—4 of Fig. 3.

Referring, first, to Fig. 1, 11 is the sealed capsule which (in the example illustrated) is shown as "single-ended", that is to say provided at one end only with an obturator adapted to be pierced. The capsule 11 is inclosed in a holder 12 constituted by a metal tube closed at its outer end 13 against which the rear end 14 of the capsule abuts, the holder being externally corrugated, fluted, or otherwise adapted (as indicated at 15) to afford a firm grip when employed as a handle for the apparatus as a whole. The forward end of the holder forms the female member 16 of a screw-union, being internally threaded to screw over the externally threaded male member 17 of the union, while the interior of this male member presents a socket or seating which is lined at 18 with rubber or other suitable elastic material so as to be adapted to make a gas-tight joint around the neck 19 of the capsule. The male member 17 of the union is provided with a central tubular piercer 20 for puncturing the capsule (preferably at the obturator which as usual seals the neck 19 of the cap-

sule) when the members 16 17 of the union are screwed together, said piercer having the usual longitudinal V-shaped groove in one of its sides which is common with this type of piercers. In Fig. 1 the piercer 20 is ready to puncture the capsule 11.

The male member 17 of the screw-union forms one arm of a right-angled bend-tube 21 whose other arm is provided with a screw stop-valve 22 serving as the primary means of controlling the escape of gas from the capsule 11 after the latter has been pierced. Beyond this valve 22, the exit passage for the gas is provided with a small-bore rotary plug-valve 23 having a lever-handle 24 adapted to be actuated by the finger, this plug-valve 23 serving as a secondary means of controlling the delivery of the gas after the pressure has been reduced by the passage of the gas through the screw-stop valve 22. These two valves 22, 23 are united by a friction spigot-and-socket coupling 25 (of relatively large diameter) so as to permit of the capsule 11 in its holder 12, together with the screw stop-valve 22, being readily disconnected from the rest of the apparatus (now to be described) when it is desired to employ the gas for (say) spraying the throat or for external application as hereinafter explained.

The rotary plug-valve 23 forms part of the inhaling apparatus properly so called, for which purpose the plug-valve is fixed on the central arm 26 of a T-shaped tube the axis of whose relatively wide lateral arms 27, 28 extends parallel to the axis of the capsule-holder 12. Of these lateral arms, the one 27 serves for the attachment of an elastic bag 29 forming a collapsible reservoir into which the gas is delivered by way of a small-bore rubber tube 30 extending to near the bottom of the bag from a nozzle 31 forming an extension, within the T, of the arm 26, so as to communicate with the exit from the plug-valve 23. The other lateral arm 28 of the T forms one member of a friction spigot-and-socket coupling whereof the fellow-member 32 constitutes the inlet-branch of an inhalation control-valve, to the outlet-branch 33 of which a face-mask 34 of any convenient form is united by a similar coupling as at 35. This inhalation control-valve comprises a cylindrical body 36 whose axis intersects at right angles the axes of the inlet and outlet branches 32 and 33, the axes of these branches 32, 33 extending at right angles to one another, while a third (or expiration) outlet 37, provided on the body 36 at a point opposite to the inlet-branch 32, is furnished with a non-return outlet flap-valve 38. The body 36 of the inhalation control-valve has an aperture 39 communicating directly with the external atmosphere, and within the body fits a rotary cylindrical hollow plug 40 peripherally

slotted as at 41, and also furnished with a non-return inhalation flap-valve 42; the relative positions of the various apertures being such that according to the angular position of the rotary plug 40 the patient, in breathing through the mask 34, will be enabled either to breathe pure atmospheric air, or a mixture of air and gas in any desired proportions, or pure gas. The rotary plug 40 is furnished with a handle 43 whereby it may be actuated by the finger, and the opposite ends of the valve-body and rotary plug are preferably closed by mica disks affording a view of the interior of the valve.

Within the outlet branch 33 of the inhalation control-valve is a chamber 44 for the reception of cotton-wool or the like absorbent material adapted to be saturated with a volatile substance with which the gas, on its way to the face-mask, will thus become impregnated. This chamber may consist (as indicated) of a short length of tube adapted to fit within the outlet branch 33 and closed at its opposite ends (as at 45 and 46) with fine wire gauze or the like, the gauze at either or each end being removable so as to permit the insertion and removal of the absorbent material. In the example illustrated the gauze 46 at the outer end of the chamber 44 is shown as held removably in position by means of a gland 47. The chamber 44 has a lateral opening 48 which registers with a corresponding opening in the wall of the outlet branch 33, this latter opening communicating by a short length of small-bore pipe 49, controlled by a rotary plug-valve 50, with a filling-vessel 51, closed by a screw-cap 52, for the reception of a liquid volatile substance.

In the example illustrated, the face-mask 34 is shown as provided with the usual pneumatic sealing-cushion 53 around its outer periphery; this cushion being inflated by means of a flexible tube 54 furnished with a mouth-piece 55 and stop-cock 56 in the well-known manner. The projection 57 shown upon the bend-pipe 21 is designed, by affording a firm grip for the fingers, to facilitate such forcible screwing together of the members 17, 16 of the screw-union whereby the capsule-holder 12 is united to the rest of the apparatus, as is necessary in order to accomplish the piercing of the capsule 11.

The apparatus of the present invention is capable of being used for the administration of gaseous and similar remedies not only by inhalation through the respiratory canal, as above described, but also locally by direct application, as for example in the treatment of wounds, ulcers and other local affections, as well as affections generally which require external or internal localized treatment, by means of oxygen, ozonized air, a gas charged with a radio-active substance, or other suit-

able antiseptic or remedial agent. In order to adapt the apparatus for such purposes, the face-mask is replaced by a nozzle either in the form of a trumpet-mouth somewhat similar in general form to a face-mask and provided like the latter with a pneumatic sealing-cushion around its edge, or of other convenient shape; a trumpet-mouth being generally suitable for use in local external applications, and a relatively fine nozzle for local internal applications as for example per rectum, or in spraying the throat. Again, by the use of a fine delivery-nozzle in conjunction with a capsule containing compressed or liquefied carbon dioxid, the apparatus may very conveniently be made to serve in the production (especially in emergency) of carbon dioxid "snow" or carbon dioxid "points."

When it is desired to administer or otherwise utilize a compressed gaseous fluid otherwise than by inhalation, a construction such as that illustrated in Fig. 2 may be employed. In this arrangement, the capsule 11 in its holder 12, together with the screw stop-valve 22, is disconnected from the inhaling apparatus properly so called (including the bag 29 and face-mask 34), and attached by an intermediate length 58 of small-bore metal tubing to a suitable nozzle such as shown at 59. The intermediate length 58 of tubing carries a screw stop-valve 60 to serve as a secondary means of controlling the pressure of the gas on its way to the nozzle, and is furnished at each end with one member of a friction spigot-and-socket coupling of relatively large diameter, the coupling-member 25^a at the rear end being adapted to engage that member of the coupling 25 which is attached to the screw stop-valve 22, and that at the other end being adapted to engage, as indicated at 61, a corresponding coupling-member on the nozzle 60.

The friction-coupling at 61 serves as a chamber for the reception of cotton-wool or other absorbent material, while a vessel 62 (similar to the vessel 51 previously described) to contain a volatile liquid for impregnating the absorbent material is attached to and communicates with the interior of the chamber by means of a short length of small-bore tube 63 controlled by a rotary plug-valve 64.

What I claim is:—

1. A portable apparatus for administering gases and the like medicinal agents, comprising a delivery-member for applying a stream of gas to the person of a patient, a closed holder for a capsule containing a gas under pressure, means for piercing the capsule within said holder, a passage for conducting the gas from the holder to the delivery member, two manually controllable valves interposed in series in said passage,

and a separable friction-coupling interposed in the passage between said valves.

2. A portable apparatus for administering gases and the like medicinal agents, comprising a delivery member for applying a stream of gas to the person of a patient, a closed holder for a capsule containing a gas under pressure, means for piercing the capsule within said holder, a passage for conducting the gas from the holder to the delivery member, a chamber for containing absorbent material, interposed in said passage adjacent to the delivery member, means for introducing a liquid into said chamber, two manually controllable valves interposed in series in said passage, and a separable friction-coupling interposed in the passage between said valves.

3. A portable apparatus for administering gases and the like medicinal agents, comprising a delivery member for applying a stream of gas to the person of a patient, a closed holder for a capsule containing a gas under pressure, means for piercing the capsule within said holder, a passage for leading the gas from the holder to the delivery member, a pipe connecting with said passage, a collapsible gas-bag in communication with the passage through said pipe, two manually controllable valves interposed in the passage between said pipe and the capsule holder; and a separable friction-coupling interposed in the passage between said valves.

4. A portable apparatus for administering anesthetics and the like medicinal agents by inhalation, comprising a face-mask, a closed holder for a capsule containing a gas under pressure, means for piercing the capsule in said holder, a passage for leading the gas from the holder to the face-mask, a pipe connecting with said passage, a collapsible gas-bag in communication with the passage through the said pipe, a manually controllable valve interposed in the passage between said pipe connection and the face-mask having an inlet for atmospheric air and an expiration-outlet each normally closed by a non-return flap, said valve being adapted for regulating the relative proportions of gas and of atmospheric air respectively inhaled by the patient, two manually controllable valves interposed in the passage between the capsule-holder and the pipe connection; and a separable friction-coupling interposed in the passage between the two last-mentioned valves.

5. A portable apparatus for administering anesthetics and the like medicinal agents by inhalation, comprising a face-mask, a closed holder for a capsule containing a gas under pressure, means for piercing the capsule in said holder, a passage for leading the gas from the holder to a face-mask, a pipe connecting with said passage, a collapsible gas-bag in communication with the pas-

sage through said pipe, a manually controllable valve interposed in the passage between said pipe connection and the face-mask having an inlet for atmospheric air and an expiration outlet each normally closed by a non-return flap, said valve being adapted for regulating the relative proportions of gas and of atmospheric air respectively inhaled by the patient, a chamber for containing absorbent material interposed in the passage adjacent to the face-mask, means for introducing a liquid into said chamber, two manually controllable valves interposed in the passage between the capsule holder and the pipe connection, and a separable friction coupling interposed in the passage between the two last mentioned valves.

6. A portable apparatus for administering gases and the like medicinal agents, comprising a delivery member for applying a stream of gas to the person of a patient, a substantially cylindrical holder for a capsule containing a gas under pressure, said holder being adapted to form a handle for the apparatus as a whole, a removable screw-plug for closing one end of the holder, said screw-plug having an outlet passage for the gas extending in substantial alinement with the axis of the holder, means for making a gas-tight joint between the mouth of said outlet passage and the neck of a capsule in the holder, and means for effecting the piercing of said capsule when the plug is screwed home into the holder, a passage for leading the gas from the outlet passage in said screw-plug to the delivery member, the axes of said passages extending substantially at right angles to one another where they meet; two manually controllable valves interposed in

series in the passage which leads to the delivery member, and a separable friction coupling interposed in said last mentioned passage between said valves.

7. A portable apparatus for administering gases and the like medicinal agents to the person of a patient, consisting of a delivery member and a substantially cylindrical holder for a capsule containing a gas under pressure and constituting a handle for the apparatus as a whole, and having an outlet passage at one end for the gas, means for piercing the capsule within the holder, a passageway for conducting the gas from the holder to the delivery member, and comprising two sections separably connected by a friction coupling, a manually controllable valve in each section of the passage, and means for introducing a volatile liquid to the delivery device.

8. A portable apparatus for administering gas and the like medicinal agents to the person of a patient consisting of a delivery member and a substantially cylindrical holder for a capsule containing a gas under pressure and constituting a handle for the apparatus as a whole and having an outlet passage at one end for the gas, means for piercing the capsule within the holder, a passage for conducting the gas from the holder to the delivery member and comprising two sections connected by a separable friction coupling, and a manually controllable valve in each section of the passageway.

PATRICK SHAUGHNESSY O'DONNELL.

Witnesses:

GEORGE ERNEST MINTERN,
FLORENCE GIESSMANN.