Feb. 24, 1925. 1,527,927

H. W. C. SCHRÖDER

APPARATUS FOR USE IN ADMINISTERING GASES, VAPORS, AND THE LIKE

Filed June 7, 1923

Fig. 1.

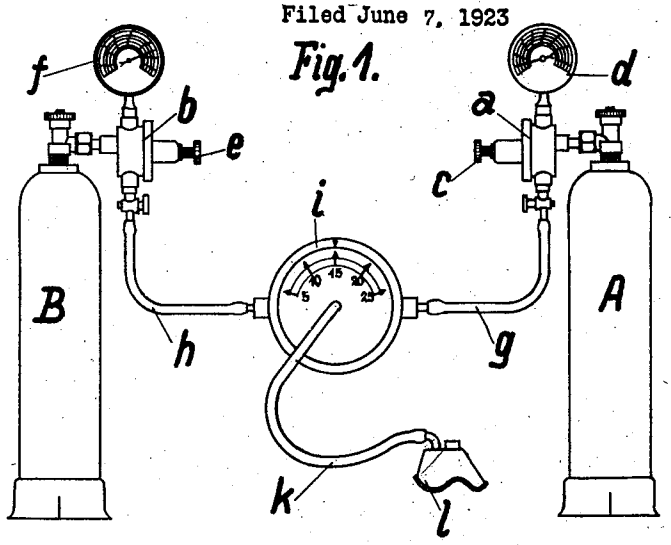
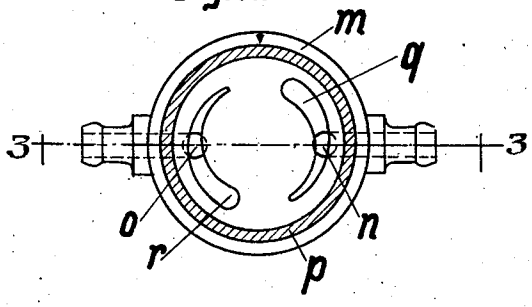


Fig. 2.



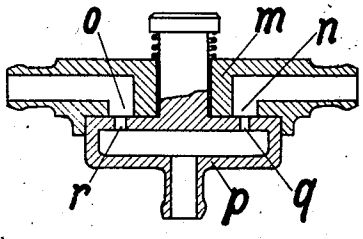
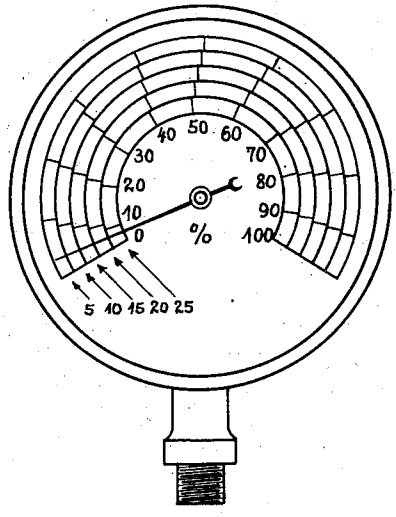


Fig. 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR USE IN ADMINISTERING GASES, VAPORS, AND THE LIKE.

Application filed June 7, 1923. Serial No. 644,015.

To all whom it may concern:

Be it known that I, HANS WILHELM CHRISTIAN SCHRÖDER, a German citizen, residing at Lubeck, Germany, have invented certain new and useful Improvements in Apparatus for Use in Administering Gases, Vapors, and the like, of which the following is a specification.

This invention relates to apparatus for use in administering gases, vapors, and the like, particularly in simultaneously administering two or more different gases &c.

It is well known that, for certain medical purposes, such for instance as adminstering anæsthetics, a mixture of gases or vapors has to be breathed in or inhaled. According to the conditions prevailing, a greater or lesser quantity of gas must be conveyed to the patient according to breathing requirements, and the combination of gases must also be made in accordance with a predetermined percentage of composition so as to obtain a certain definite effect. The regulation of the quantity of gas needed and the alteration of the proportions of the mixture must be effected easily and in a reliable manner.

According to this invention an apparatus is provided by means of which the requirements aforesaid are met.

Referring to the accompanying drawing which shows a preferred embodiment of the invention:

Fig. 1 is a view, in perspective, of the assembled apparatus;

Fig. 2 is a view, partly in elevation and partly in section, of the double slide valve for effecting the mixture of the gases;

Fig. 3 is a horizontal section on the line 3—3, Fig. 2;

Fig. 4 is a view, on an enlarged scale, of the dial of one of the regulating gauges.

In carrying the invention into effect two different gases having therapeutic or anæsthetic properties, which, for convenience are designated A and B, are as shown in Figure 1 of the drawings as contained, respectively, in a compressed state in a pair of steel cylinders of well known form. In order to reduce the high pressures of the gases A and B to proper working pressures, pressure reducing valves *a* and *b* are provided. At the valve *a* the pressure is adjusted by means of the regulating screw *c* according to the gauge *d*, and at the valve *b* by means of the regulating screw *e* according to the gauge *f*. Conduits *g* and *h* (e. g. metal or rubber pipes) conduct the gases A and B to a double slide valve *i* in which the two gases are mixed and the mixture, upon leaving the valve *i* flows through the tube *k* to the respiratory mask *l*.

The double slide valve, which is shown as being arranged to rotate, consists of the stationary casing *m* having gas feed passages *n* and *o*, opening on to a sliding surface, and a mixing cap *p*. This latter is rotatable and contacts in a gas-tight manner with the surface of the casing *m*. From the mixing or collecting chamber of the cap *p* single conduits or passages *q* and *r* of varying width lead to the contacting surfaces of the cap *p* and casing *m*, and are so arrenged that, upon rotation of the cap, they cover up or open the apertures *n* and *o* to the same extent. The different positions of the mixing cap, visible acording to a scale, as shown in Figure 1, accordingly entail the transmission of larger or smaller quantities of uniform mixture of both gases per unit of time. These quantities are intended to coincide with the breathing requirements of the patient and may vary from 5 to 25 litres per minute. Instead of the slide valve a double tap or the like may be used. In relationship with the cross sectional areas adjusted upon the slide valve the gas pressures are adjusted by means of the gauges *d* and *f*. By regulation of the gas pressure, the ratio of both gases to the total amount of the mixture can be regulated and, preferably, the gauge is so graduated that the percentage of the contents can be read off at once. If the quantities of the mixture to be inhaled vary greatly, say between 5 to 25 litres per minute, then in view of the variations in the amount of friction set up in the conduits in the slide valve according to adjustments of the latter, several scales must be provided on the gauges. In this way accurate values are obtained within definite stages of quantity, for instance of 0–5, 5–10, 10–15 litres and so on. If the mixture of gas at 5 litres total quantity, for example, is to contain 20% of the gas A then, by means of the regulating screw *c*, the pressure is so adjusted, that the indicator of the gauge *d* points to the graduation 20 on the section of the scale for 5 litres. The pressure for the gas B is, on the contrary, so adjusted by means of the regulating screw *e* that the in-

dicator of the gauge *f* points to the graduation 80 on the section of the scale for 5 litres.

If required, an alteration in the quantity can easily be effected by means of a short movement on the slide valve. An alteration in the mixing proportion does not, as a rule, require to be made suddenly, so that the regulation at the valves *a* and *b* can be made one after the other. For more rapid regulation, eccentrics or similar devices adapted to effect a quick adjustment may, of course, be provided in place of the regulating screws *c* and *e*. Furthermore, the regulating members can be so interconnected that, by a single operation, on one side a rise, and on the other side a fall, will occur in the pressure (not shown in the drawing). At 50%, that is with equal portions of both gases, both will be under equal pressure.

As will be seen from the description and drawings, the attendance required by the apparatus is extremely simple. The operator can easily control at a glance the adjustment as to quantity and mixing proportion.

The novel feature in the effect or action lies in the fact that, in comparison with the usual throttle devices, and the attendant tedious and complicated calculation of the quantities, a direct regulation is now possible according to divisions or graduations and, moreover, within wide limits. For use in treating patients, however, with their differing cases, only such devices are suitable which, as far as possible, are capable of rapid, perfect and reliable manipulation.

I claim:

In a gas-administering apparatus of the character described, the combination of separate sources of gas supply, a pressure reducing valve for each source of gas supply, each valve having a regulating screw and a gauge, a valve common to said sources of supply, said valve comprising a pair of relatively movable members, one of said members having inlet ports each connected with one of the said pressure reducing valves and outlet ports connected, respectively, with said inlet ports, the other member having a collecting and mixing chamber provided with a delivery-neck and with apertures of varying width in opposite direction movable into and out of register with the outlet ports of the first-named member for simultaneously and similarly regulating the flow of gases through said outlet ports, and a respiratory mask connected to the said delivery-neck.

HANS WILHELM CHRISTIAN SCHRÖDER.