July 23, 1940. J. A. HEIDBRINK 2,208,633

ANESTHETIZING APPARATUS

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Fig.-1

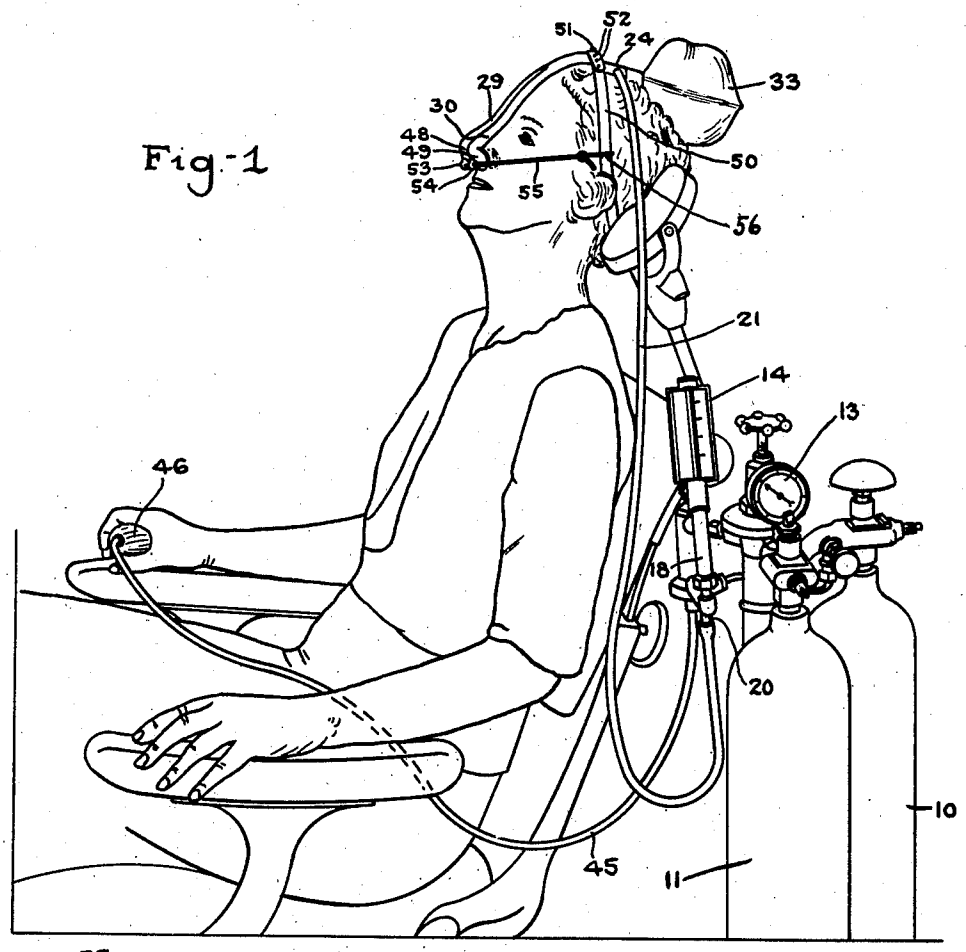

Fig.-2

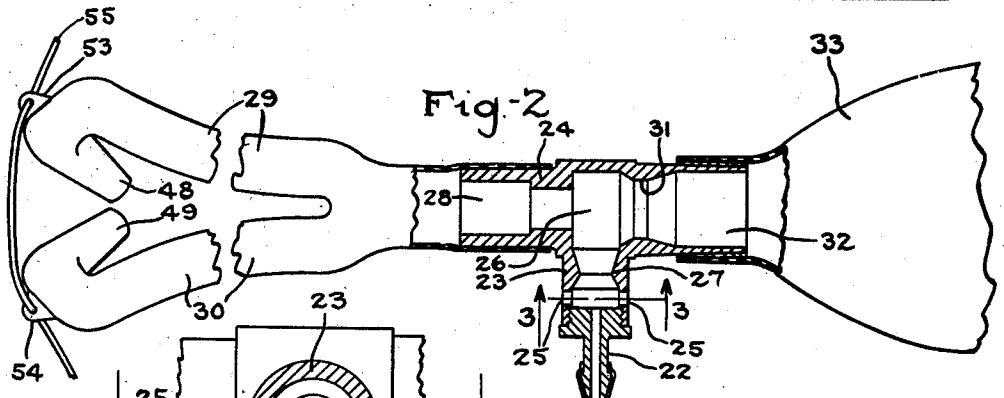

Fig.-3

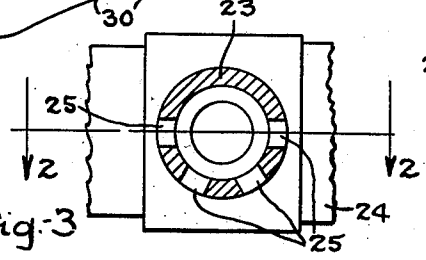

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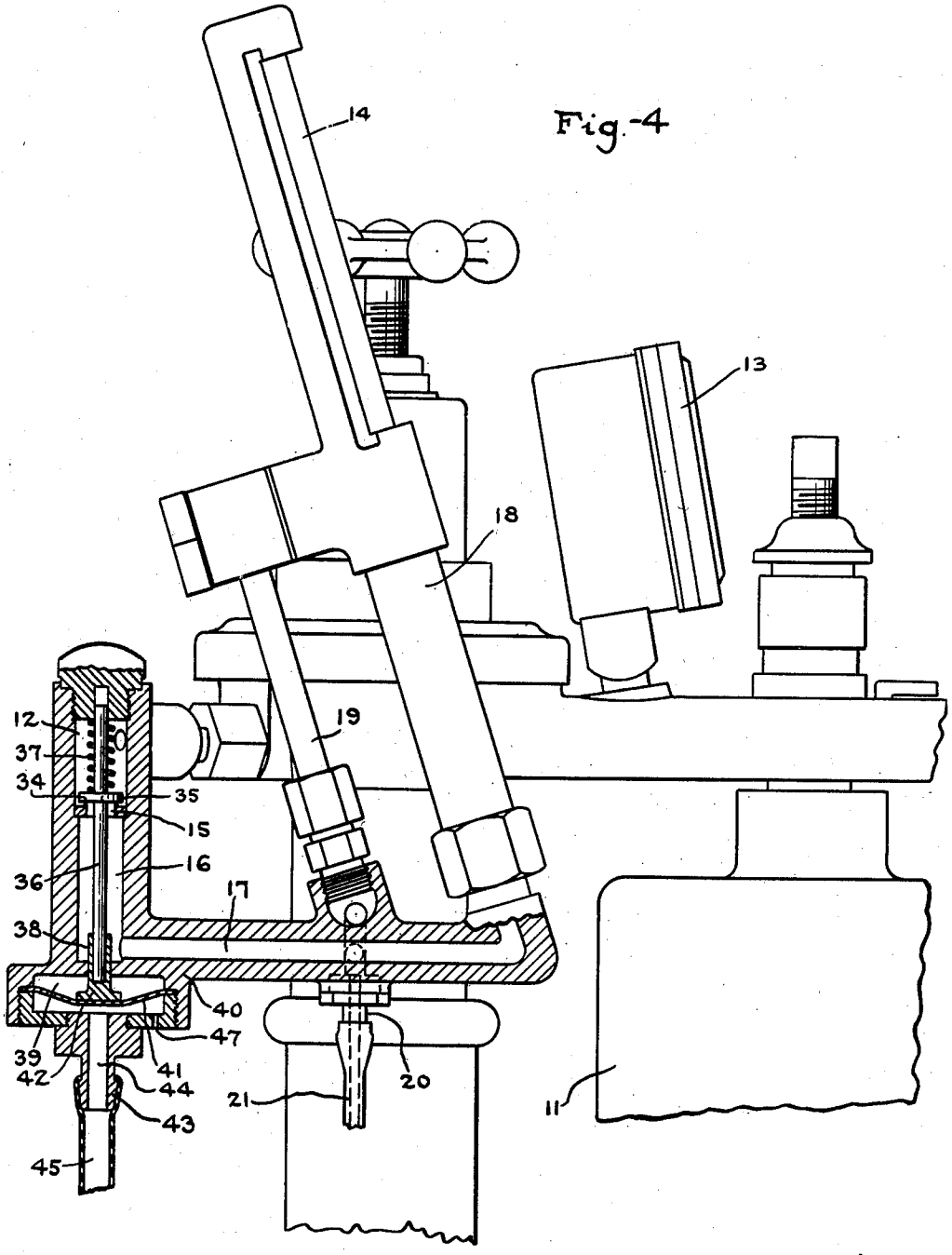
Fig. 4



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UNITED STATES PATENT OFFICE

2,208,633

ANESTHETIZING APPARATUS

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Application July 19, 1937, Serial No. 154,444

5 Claims. (Cl. 128—203)

My invention relates to anesthetizing apparatus for administering anesthetizing gases through the nose to produce analgesia, and has for its object to provide in combination with a gas-administering machine of any desired type a nasal inhaler with valve means associated therewith such that the patient will breathe anesthetizing mixture in conjunction with air mixing therewith in such proportions that deep anesthesia is impossible but a normal and sufficient state of analgesia will be produced to relieve from pain and discomfort in, for example, operations for repairing cavities and injuries to the teeth.

It is a further object of my invention to provide a nasal inhaler in conjunction with a rebreathing bag supported directly on the head of the patient with novel means for holding the inhaler and bag in position on the head of the patient. It is a further object of my invention to provide means associated with said inhaler and bag whereby atmospheric air will go to the lungs of the patient along with gas mixture on inhalation, and air will go into the passageways and to the rebreathing bag on exhalation, the latter part only of exhalation exhausting to atmosphere.

It is a further object of my invention to provide means under the control of the patient for admitting anesthetizing mixture to the inhaler intermittently and in such proportions in relation to the amount of air admitted to the inhaler as to produce a desired depth of analgesia, but such that deep anesthesia is automatically prevented.

The full objects and advantages of my invention will appear in connection with the detailed description thereof, and the novel features of the invention are particularly pointed out in the claims.

In the drawings illustrating an application of my invention in one form—

Fig. 1 is a perspective view of the apparatus in position on the head of a patient. Fig. 2 is a part sectional plan view of the inhaler and air-admitting elements thereof, the section being taken on line 2—2 of Fig. 3. Fig. 3 is a transverse sectional view taken on line 3—3 of Fig. 2. Fig. 4 is a side elevation part sectional view of a gas-administering machine adapted to be employed in connection with my invention showing the patient-controlled valve mechanism for admitting supply of gas mixture.

As illustrated, the machine is associated with tanks 10 of oxygen and 11 of nitrous oxide. These gases flow through well-known connections to a valve chamber 12, gauges 13 and 14 indicating proportions and volume of gases delivered. The valve chamber 12 communicates through an opening 15 with passageways 16, 17 and thence through passageways in flow valve chamber 18 of the flow valve 14 and a return passage in member 19 to a discharge nipple 20, from which said gases go through tubing 21 to the bore of a nipple 22 on a tubular extension 23, Fig. 2, on inhaler valve casing 24. As clearly shown in Fig. 3, the tubular extension 23 is formed with a multiplicity of apertures 25 opening to atmosphere. And between said apertures and the chamber 26 within casing 24 is formed a Venturi opening 27, as clearly shown in Fig. 2. The chamber 26 communicates on one side through passageway 28 with nasal inhaler tubes 29 and 30, and on the other side through a venturi 31 with a hollow tubular extension 32 which supports a rebreathing bag 33.

Within the chamber 16 is located a lipped valve ring 34 which is engaged by a valve disc 35 mounted on a stem 36 and moved into valve-closing position by means of a coil spring 37. The stem 36 is united with a holder 38 which projects from chamber 16 into a chamber 39 located in the valve casting 40. Within chamber 39 is a flexible diaphragm 41 which is secured to or engages the bottom portion 42 of the holder 38. A nipple 43 is secured to the casting 40 with a bore 44 which opens into chamber 39 below diaphragm 41. A flexible tubing 45 is secured to the nipple 43 and has at its outer end a bulb 46 adapted to be gripped by the hand of the patient, as indicated in Fig. 1. When so gripped air pressure will operate on diaphragm 41 to lift stem 36 and valve disc 35 to permit flow of gas mixture through the various passageways and tube 21 to the inhaler chamber 26. A bore 47 through casting 40 into chamber 39 is of such dimension as to permit gradual exhaust of air from chamber 39 below diaphragm 41, thus permitting spring 37 to close valve disc 35 even if the patient continues to hold bulb 46 squeezed tight. In this way continued feed of anesthetizing gas mixture will be prevented until the patient again actuates the bulb 46.

The inhaler member 24 and the attached rebreathing bag 33 are supported on the head of the patient with the nasal inhaler tubes 48 and 49 in position with the nostrils of the patient by the following novel means: A band 50 passes from toward the front of the upper part of the head around the back of the head being made

adjustable with respect thereto by means of a projection 51 extending through one of a number of holes 52 in the band so that the band may be brought tight upon the head of the wearer. As shown in Fig. 2, the nasal inhaler members 48 and 49 are provided with projections 53 and 54 through which slides a cord 55 which may be of elastic material. Respective ends of this cord are secured in proper adjusted position to the band 50 by any suitable means, such for example as that indicated at 56 on Fig. 1, wherein the ends of cord 55 are shown looped over the band 50 and secured by tying, although snaps or clasps can be substituted for tying. The whole combination operates to hold the inhaler valve casing, rebreathing bag and nasal connections 29, 30 in balanced position on the head of the operator, which is thus free to move around to any extent desired for expectorating into the dental bowl or relieving the patient from strain.

The method of operation and advantages of my invention appear clearly from the above description thereof. The device is designed for use in connection with oral operative treatment in which deep anesthesia is not desired, primarily for use in connection with the grinding and excavating accompanying the repairing of teeth. The patient at all times breathes through the nostrils. When the bulb 46 has been squeezed the anesthetizing gas will pass through tube 21 into chamber 26. On inhalation this gas is mixed with air which is caused to draw through the apertures 25 by reason of the inlet through venturi 27. The inlet of gas and air as above noted will mix with the rebreathing mixture from the rebreathing bag 33. On exhalation as the exhaled gases first pass to the rebreathing bag the venturi 31 and tubing 21 will have the effect of siphoning in additional air through the apertures 25, thus providing a mixture of air and rebreathed gases. For this reason a patient cannot put himself in a condition of deep anesthesia. For to obtain continuous anesthetizing gases the bulb 46 would have to be repeatedly squeezed at close intervals. But the moment any approach to anesthesia begins to be felt by the patient his muscular control over the bulb will cease, and whether it is held squeezed by him or released flow of anesthetizing gas mixture will be terminated and the inlet air from ports 25 and admixture with the gases being breathed will easily restore the patient from any effect of deep anesthesia, maintaining, however, a continuous state of analgesia which sufficiently deadens sensitiveness and pain for the type of operative treatment for which the apparatus is adapted.

It will be understood, however, that the terms anesthetizing agent or anesthetizing mixture as used herein do not require any specified proportions of mixture of gases such as, for example, nitrous oxide and oxygen, but that any mixture in any proportion or in which pure nitrous oxide is used without any admixture of oxygen are within the scope of the invention and are contemplated by the above-referred-to terms.

As the apparatus is employed the patient is positioned in whatever type of operating chair may be deemed desirable, and holds within his hand the bulb 46. It may be that the gas administering machine is connected up to deliver a stream or jets of pure nitrous oxide. When the patient squeezes the bulb such a stream or jet of nitrous oxide passes through the air port chamber 25 and the venturi 27 and siphons or drags along with it a quantity of air, and the amount of this air so taken in with the anesthetizing agent will be increased by the patient's breathing. The relation of the pressure and size of delivery bore for the anesthetizing agent to the air ports, to the siphoning effect of the venturi and to the patient's breathing is such as to produce a mixture of, say nitrous oxide and air, in proportions to oxygenate the blood and to dilute the anesthetizing agent to a point where the patient will arrive at the desired plane of analgesia. In practice the flow of the anesthetizing gas will be intermittent, the patient preferably operating the bulb at each inhalation. If, however, the patient ceases for a time to operate the bulb and the jets of anesthetizing gas will be completely stopped, there cannot be such an accumulation of anesthetizing gas as to produce deeper analgesia or anesthesia, but, rather, the patient will tend to come out from the state of analgesia and thereby will be prompted again to squeeze the bulb and start a fresh flow of anesthetizing gas. Always, however, whether jets of anesthetizing gas are being delivered through the venturi or whether it is cut off and the patient is breathing back and forth to and from the rebreathing bag, additional quantities of air will be siphoning in to the mixture, which thus tends to become more dilute and produce less effect upon the patient and thereby warns him of the need for again operating the bulb to provide a fresh supply of anesthetizing gas. In this manner the patient himself is able to keep himself continuously at a point approaching the desired state of analgesia, while the machine will operate to prevent the patient going under to deeper analgesia or into anesthesia. And all the time the patient's blood will be properly oxygenated.

I claim:

1. Anesthetizing apparatus for producing analgesia comprising a connected inhaler and rebreathing bag, a mixing chamber in the connecting passage between the inhaler and rebreathing bag, a Venturi opening into said mixing chamber, means for causing a stream of anesthetizing fluid to enter the mixing chamber through the center of the venturi, and means for admitting air to points adjacent said venturi and around said fluid stream, whereby air is taken into the mixing chamber by action of said fluid stream and the inhalations of the patient.

2. Anesthetizing apparatus including a double-plugged nasal inhaler and associated mixing chamber and rebreathing bag, means for securing the same upon the head of the patient so the patient's head is free to move in any direction in the operating chair, including a band secured to the body of the inhaler and adapted to be held tight about the head from the upper front portion to around the lower back portion, and a cord having sliding connection with both nasal plugs adapted to be adjustably secured to the band.

3. Anesthetizing apparatus for producing analgesia comprising means for delivering anesthetizing fluid to the patient including a jet-forming breathing passage and a rebreathing bag, means for introducing air into the fluid on inhalation including a port open to atmosphere between the breathing passage and the rebreathing bag, and means including a venturi located between the rebreathing bag and the port and in alinement with the breathing passage for syphoning air into the rebreathing bag as the patient exhales.

4. Anesthetizing apparatus for producing an-

algesia comprising a restricted breathing passage and a rebreathing bag closely connected therewith, a mixing chamber in the connecting passage between the breathing passage and rebreathing bag, means for admitting anesthetizing fluid and air into the mixing chamber, and means including a venturi located between the rebreathing bag and the mixing chamber and close to the latter and in alinement with the breathing passage acting to cause air and anesthetizing fluid to move to the rebreathing bag upon exhalation of the patient.

5. Anesthetizing apparatus for producing analgesia comprising a restricted breathing passage and a rebreathing bag closely connected therewith, a mixing chamber in the connecting passage between the breathing passage and rebreathing bag, a Venturi opening into said mixing chamber, means for causing a stream of anesthetizing fluid to enter the mixing chamber through the venturi, means for admitting air to the venturi, said venturi acting to draw air into the mixing chamber upon inhalation, and means including a second venturi located between the rebreathing bag and the mixing chamber and close to the latter and in alinement with the breathing passage acting to cause air and anesthetizing fluid to move to the rebreathing bag upon exhalation of the patient.

JAY A. HEIDBRINK.