J. A. HEIDBRINK.

ANESTHETIZING MACHINE.

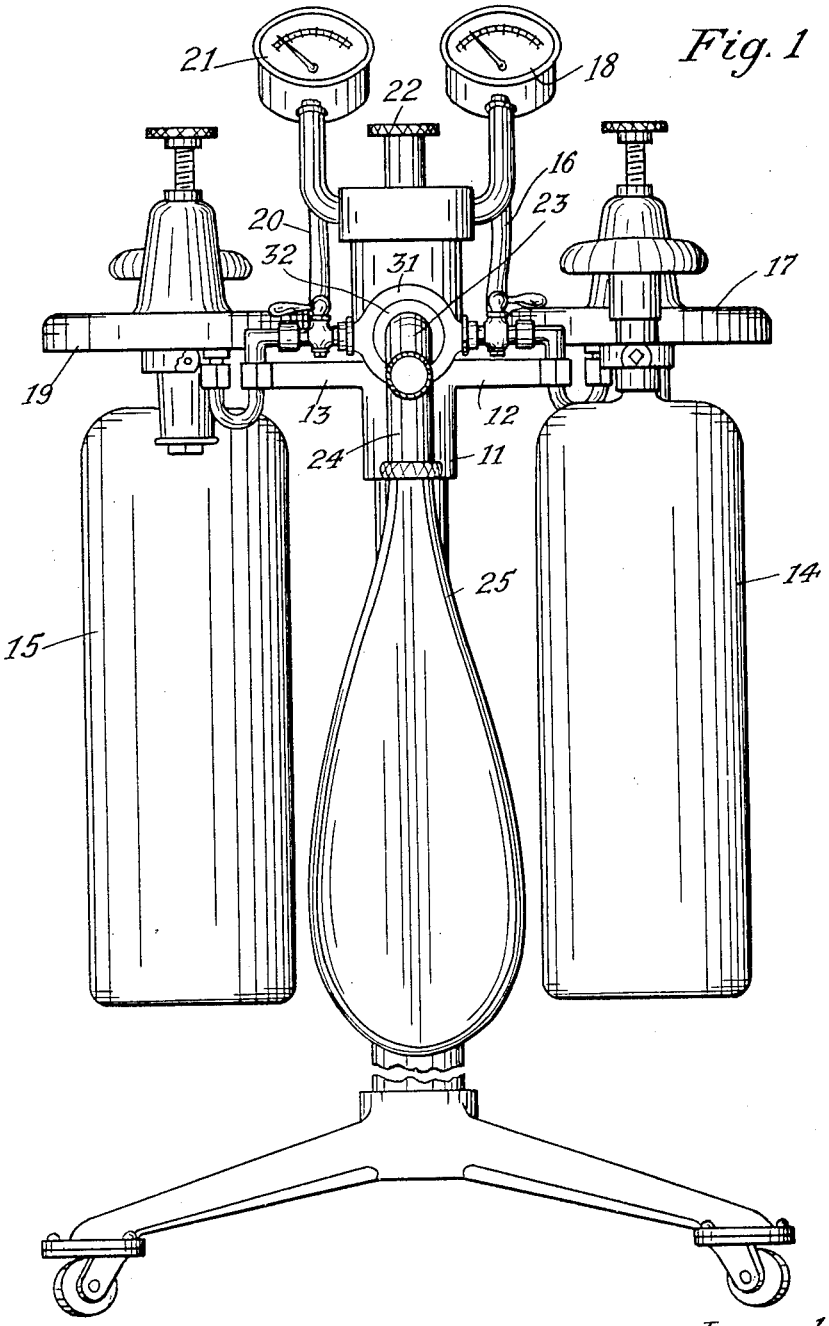
APPLICATION FILED SEPT. 10, 1917.

1,387,647.

Patented Aug. 16, 1921.

3 SHEETS—SHEET 1.

Fig. 1



Inventor:
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his Attorney.

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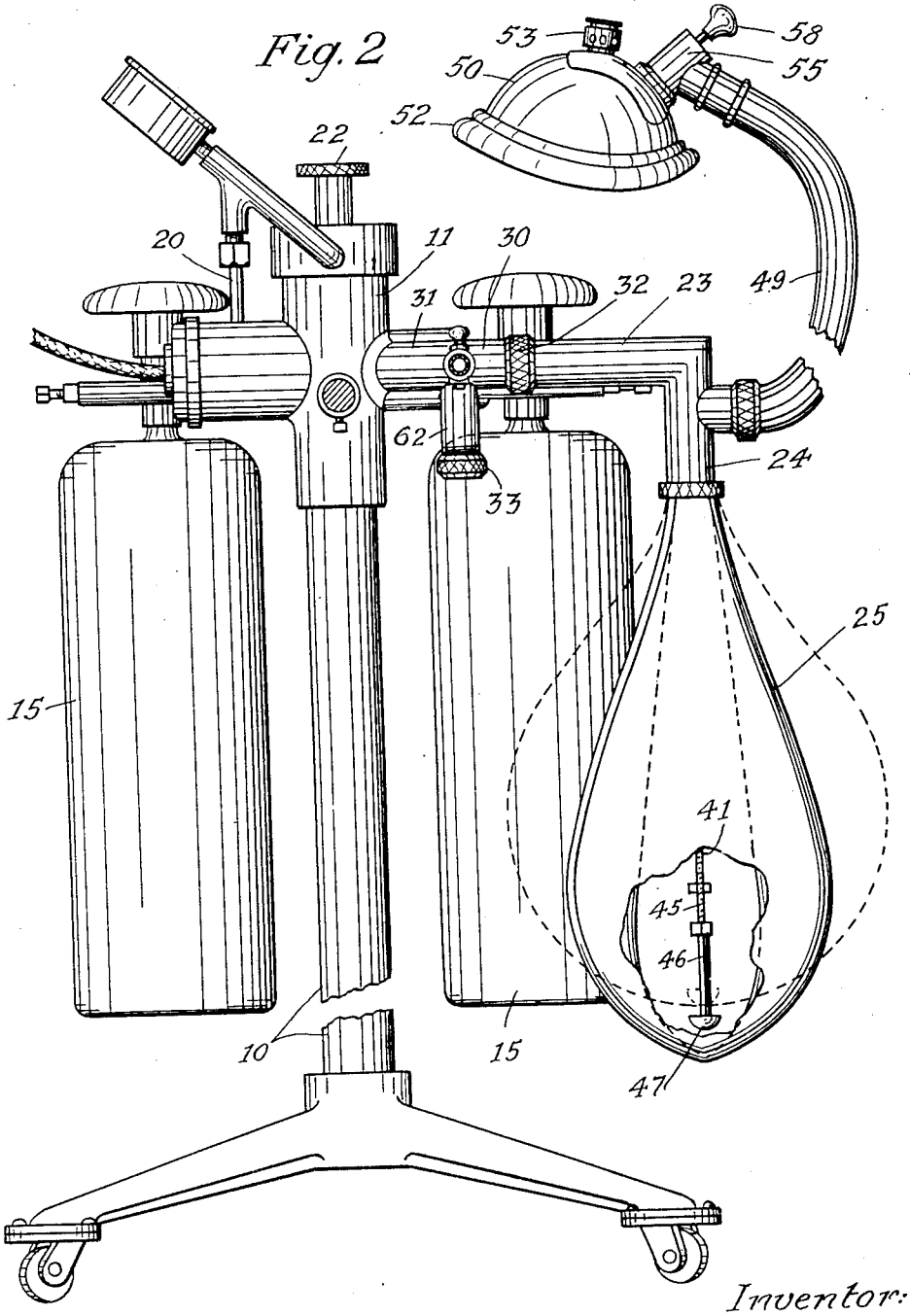
3 SHEETS—SHEET 2.

Fig. 2



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3 SHEETS—SHEET 3.

Fig. 3

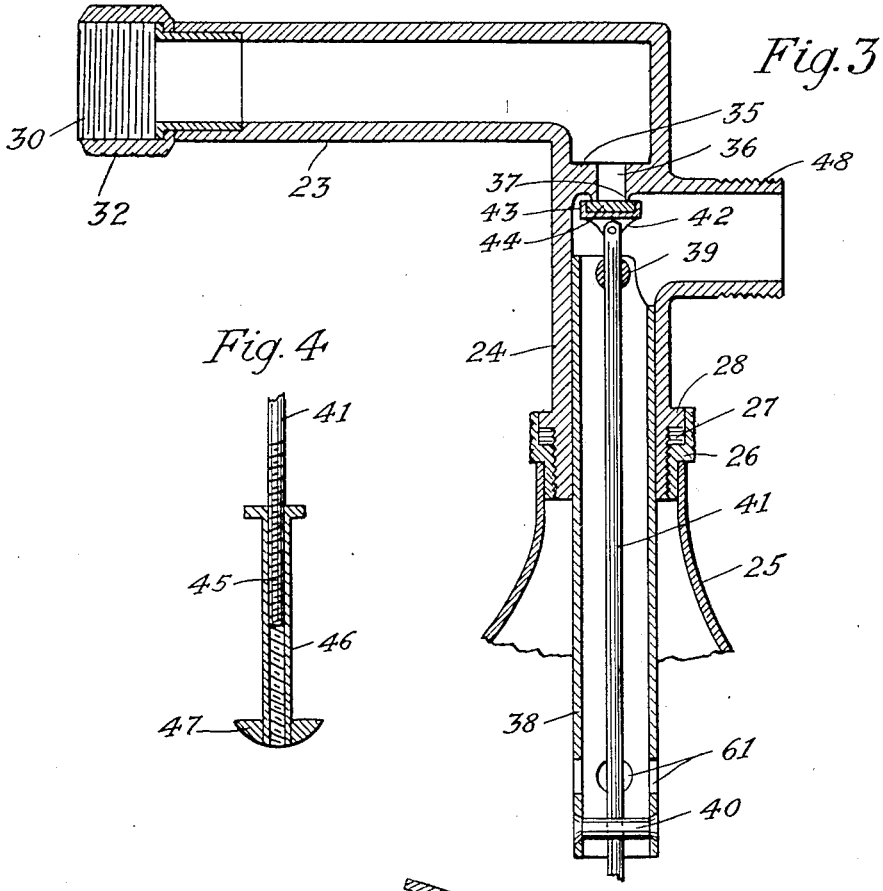
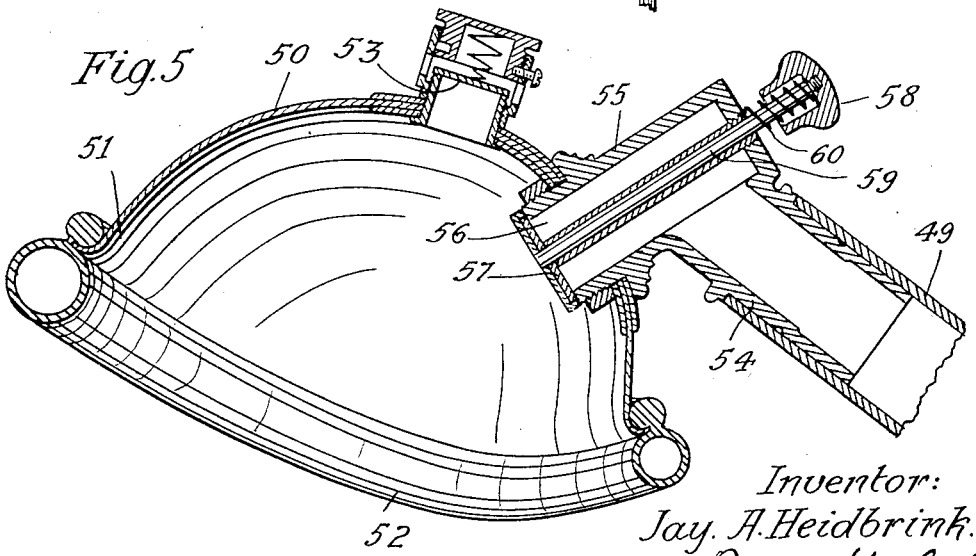


Fig. 4

Fig. 5



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UNITED STATES PATENT OFFICE.

JAY A. HEIDBRINK, OF MINNEAPOLIS, MINNESOTA.

ANESTHETIZING-MACHINE.

1,387,647. Specification of Letters Patent. Patented Aug. 16, 1921.

Application filed September 10, 1917. Serial No. 190,525.

To all whom it may concern:

Be it known that I, JAY A. HEIDBRINK, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Anesthetizing-Machines, of which the following is a specification.

My invention relates to anesthetizing machines and has for its object to provide in combination with mechanism for mixing and delivering a mixture of gases in fixed proportions at a definite and predetermined rate of flow, means for receiving said mixture after the same is formed and for rendering operative or inoperative the delivery mechanism in accordance with the quantity of mixture in the receiving means at any given time. It is the purpose of this invention to provide a reservoir for the mixture which shall automatically shut off the flow of the mixture when a certain predetermined quantity of mixture at a predetermined pressure is obtained in the reservoir. At other times as when the patient is breathing the mixture through the reservoir, the delivery mechanism will be fully operative to permit delivery of mixture to the patient in qualitive and quantitative relations fixed by the anesthetist for such delivery means. More specifically, my invention consists of means for forming a mixture of nitrous oxid and oxygen in fixed proportions and for delivering such mixture at a fixed and predetermined rate, as pointed out and claimed in my co-pending application, Serial Number 722,455, filed September 26, 1912, patented May 14, 1918, Patent No. 1,265,910 in combination with an expansible bag to which the mixture is delivered after it is formed. The bag is of elastic material so as to contain different volumes of gases at different pressures according to the degree of distention of the bag and is of a size sufficient to contain a volume of mixture to supply a full breath to the patient under varying degrees of pressure such as may be determined in advance. A valve mechanism is provided for delivering the mixture to the bag, and within or associated with the bag is a lever mechanism operative upon the valve such that when the bag is distended to a predetermined point the valve will be closed, and when the mixture is withdrawn below that point the valve will be opened to permit continuous flow of mixture under regulation of the above indicated mechanism of the machine.

It is contemplated as a part of my invention to employ an inhaler having a trip delivery valve. With this organization of elements it is possible at all times to have ready for the patient a volume of mixture already formed and held under a desired pressure to permit the patient to take a full breath and to project such a volume of mixture to the paient so as to insure a quick movement under pressure to the tissues of the patient's lungs during such breath, thereby producing a maximum of absorption into the circulation and consequent quickened response of analgesia. This is of peculiar advantage in confinement cases in which the patient has very brief forwarning of the beginning of severe pain and a quick analgesic effect instantly upon commencement of pain is desirable. With the apparatus herein described and claimed such a patient can herself control the trip valve and inhaler so as always to receive a full analgesic dose the instant the pain begins. If the patient thus holding the trip valve should become, or tend to become, unconscious relaxation of the muscles will release the valve cutting off the mixture from the patient. Immediately upon regaining consciousness and the sense of pain another dose will be available under pressure the delivery of mixture to the bag and the determination of the pressure within the bag when the mixture is not being consumed being at all times entirely automatic.

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

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

Figure 1 is an elevation view of a complete apparatus embodying the principles of my invention. Fig. 2 is a side elevation of the same. Figs. 3 and 4 are sectional views of the valve-operating mechanism. Fig. 5 is a sectional detail view of an inhaler for use in connection with my invention.

As illustrated, my machine embodies a standard 10 which supports a head 11. From the head 11 extend arms 12 and 13 from which are supported a container of nitrous oxid 14 and of oxygen 15. The gas from the container 14 passes through a reducing valve 17 and a connection 16 into passageways extending within the head 11

which are in communication with a gage 18, finally reaching a mixing chamber within the head 11. Similarly, the oxygen from container 15 passes through a reducing valve 19, passageway 20 and passages extending within the head 11 which are in communication with a gage 21, also ultimately reaching the mixing chamber in casing 11. The pressure of the gases is determined by the reducing valves 17 and 19 and the gages 18 and 21, by which means the proportions of the mixture are determined. A single valve controlled by hand screw 22 regulates the rate of flow into the mixing chamber of the two gases in the proportions thus predetermined. These features of my device are fully pointed out and claimed in my co-pending applicatiton Serial Number 722,455, filed September 26, 1912.

From the mixing chamber the mixture of gases so predetermined, and at a rate also predetermined, goes through a passageway 23, and a depending portion 24 which has secured thereto an expansible bag 25. A head 26 of the bag is screwed on to the lower end of the member 24 wherein a packing ring 27 is caused to engage a flange 28, thus rendering the connection between the bag and the gas passageways air-tight. The pipe 23 is, in fact, an attachment being adapted to be connected to a threaded end 30 formed on an extension 31 from the casing 11 in communication with the mixing chamber therein. A hand nut 32 rotatably secured upon pipe 23 is adapted to secure the same rigidly upon the end 30. The extension 31 is provided with a depending pipe member 62 which may directly receive the bag when desired, being closed by a head nut 33 when the attachment formed by the pipe 23 is used.

The dependent pipe portion 24 is provided with a partition 35 having therein an aperture 36 formed with a milled valve seat 37. Seated in the extended portion 24 and extending into bag 25 is a cylinder 38 having therein a pair of pins 39 and 40 each provided with central apertures through which a rod 41 extends. Swiveled upon the upper end of rod 41 is a head 42 provided with an upwardly-extended cup 43 in which is seated a rubber disk 44 adapted to engage the valve seat 37. The rod 41 is threaded as indicated at 45, and secured on to the threaded portion is an interiorly-threaded sleeve 46 which carries at its bottom a semi-spherical head 47 adapted to be engaged by the bottom of the bag 25 when the same is distended a sufficient amount, and which comes out of engagement when the bag is emptied, as indicated in full and dotted lines in Fig. 2.

To a nipple 48 extended outwardly from pipe member 24 is secured a flexible tube 49 connected with an inhaler 50. This inhaler, as best shown in Fig. 5, embodies a face mask 51 having an air cushion 52 and breathing-out valve 53. The tube 49 is directly connected with an extension 54 of a casing 55 which extends through the mask 51, forming at 56 the admission opening into the inhaler. A valve piston 57 is normally held so as to close the opening 56 by means of a spring 60 surrounding the stem 59 of the valve between that and a push button 58. The admission of gas mixture to the patient is thus under the instant control of the operator.

In operation the reducing valves 17 and 19 are set by means of gages 18 and 21 to deliver to the mixing chamber gases in desired proportions. Valve 22 is operated so as to deliver the mixtures in such proportions at any desired rate of flow. The mixture of gases so formed passes through extension 31, pipe 23 and opening 36, tube 38 and openings 61 therein into the interior of bag 25. By this means the bag is distended and going from the full-line position to the dotted-line position of Fig. 2. As it is distended the bag finally comes into contact with the plunger-head 47 and slides the rod 41 in its bearings, moving the valve-head 43 until the disk 44 is firmly seated upon the valve-seat 37, thus closing the same and shutting off further supply of gas mixture. The apparatus may be retained in that condition as long as is desired and at any moment, by pressing the push button 58, the patient may be provided with a full breath of the gas mixture which is immediately available in the bag 25. As the patient withdraws gas from the bag 25 the bag will collapse and the head 47, which may be a weight if desired, will follow the bag, withdrawing the disk 44 from the valve-seat and permitting further flow of gas into the bag so that the patient may continue to breathe the gas as long as desired. When, however, it is no longer desirable to administer the gas mixture the inhaler valve 57 is released, cutting off flow of gas, whereupon the bag 25 will fill to the desired maximum capacity and thereby operate valve 44 to discontinue further delivery of gas.

My invention is of peculiar advantage for use in producing gas anesthesia or analgesia in confinement cases where there are alternating periods of pain and rest, and it is only desirable for the patient to have the relief of anesthesia during the periods of pain. By the use of this apparatus for confinement cases the patient is nearly, if not quite, relieved of all sense of suffering, and at the same time there is no inhibition of the natural muscular impulses accompanying the pains and the patient's nervous organization and the functions of the various organs are not interfered with. When the trip admission valve of the inhaler is closed the bag is

always full of properly proportioned mixture. This consists of more than sufficient to give the patient a full breath instantly upon release of the trip valve, which, as heretofore pointed out, enables the patient herself to administer a complete analgesic dose (or, if desired, an anesthetic dose) at the very instant when a pain begins. The patient cannot injure herself by continuing to breathe the mixture, as the quality of the mixture is fixed by the means for delivering the same to the mixing chamber, and mixture of that quality which has been predetermined by the attending physician or anesthetist for the particular case will continue to be delivered to the mixture-containing bag as fast as it is withdrawn by the patient. Yet, if for any reason the patient discontinues withdrawal of the mixture, the bag control valve mechanism will shut off flow of the same to the bag as soon as, and not until, the bag has been properly distended to provide a quantity of mixture suitable for a succeeding full breath and a complete analgesic or anesthetic dose.

I claim:

1. An anesthetizing machine comprising sources of supply of nitrous oxid and oxygen respectively, means for forming a mixture of said gases in fixed and predetermined proportions, a receptacle for receiving a predetermined quantity of said mixture in excess of a full breath of the patient, and means controlled by expansion of the receptacle caused by the inflow of mixture for cutting off such inflow of mixture when it reaches such predetermined amount in the receptacle.

2. An anesthetizing machine comprising sources of supply of nitrous oxid and oxygen respectively, means for forming a mixture of said gases in fixed and predetermined proportions, a receptacle for receiving a predetermined quantity of said mixture in excess of a full breath of the patient, means controlled by expansion of the receptacle caused by the inflow of mixture for cutting off such inflow of mixture when it reaches such predetermined amount in the receptacle, and means controlled by the patient for delivering such predetermined amount of mixture to the patient.

3. An anesthetizing machine comprising sources of supply of nitrous oxid and oxygen respectively, means for forming a mixture of said gases in fixed and predetermined proportions, a receptacle for receiving a predetermined quantity of said mixture in excess of a full breath of the patient, means controlled by expansion of the receptacle caused by the inflow of mixture for cutting off such inflow of mixture when it reaches such predetermined amount in the receptacle, and means including an inhaler provided with a cut-off valve adapted to be operated by the patient for delivering said predetermined amount of mixture of gases to the patient at the will of the patient.

4. An anesthetizing machine comprising sources of supply of nitrous oxid and oxygen respectively, means for forming a mixture of said gases in fixed and predetermined proportions, a receptacle for receiving a predetermined quantity of said mixture in excess of a full breath of the patient, a valve for admitting mixture into the receptacle and a stem within the receptacle connected to the valve and having a head adapted to be engaged by a wall of the receptacle so that expansion of the receptacle from the inflow of mixture will cause the stem to close the valve when the said predetermined amount of mixture has entered the receptacle and deflation of the receptacle will release the valve to admit additional flow of gas to fill the receptacle with the said predetermined amount.

In testimony whereof I hereunto affix my signature.

JAY A. HEIDBRINK.