

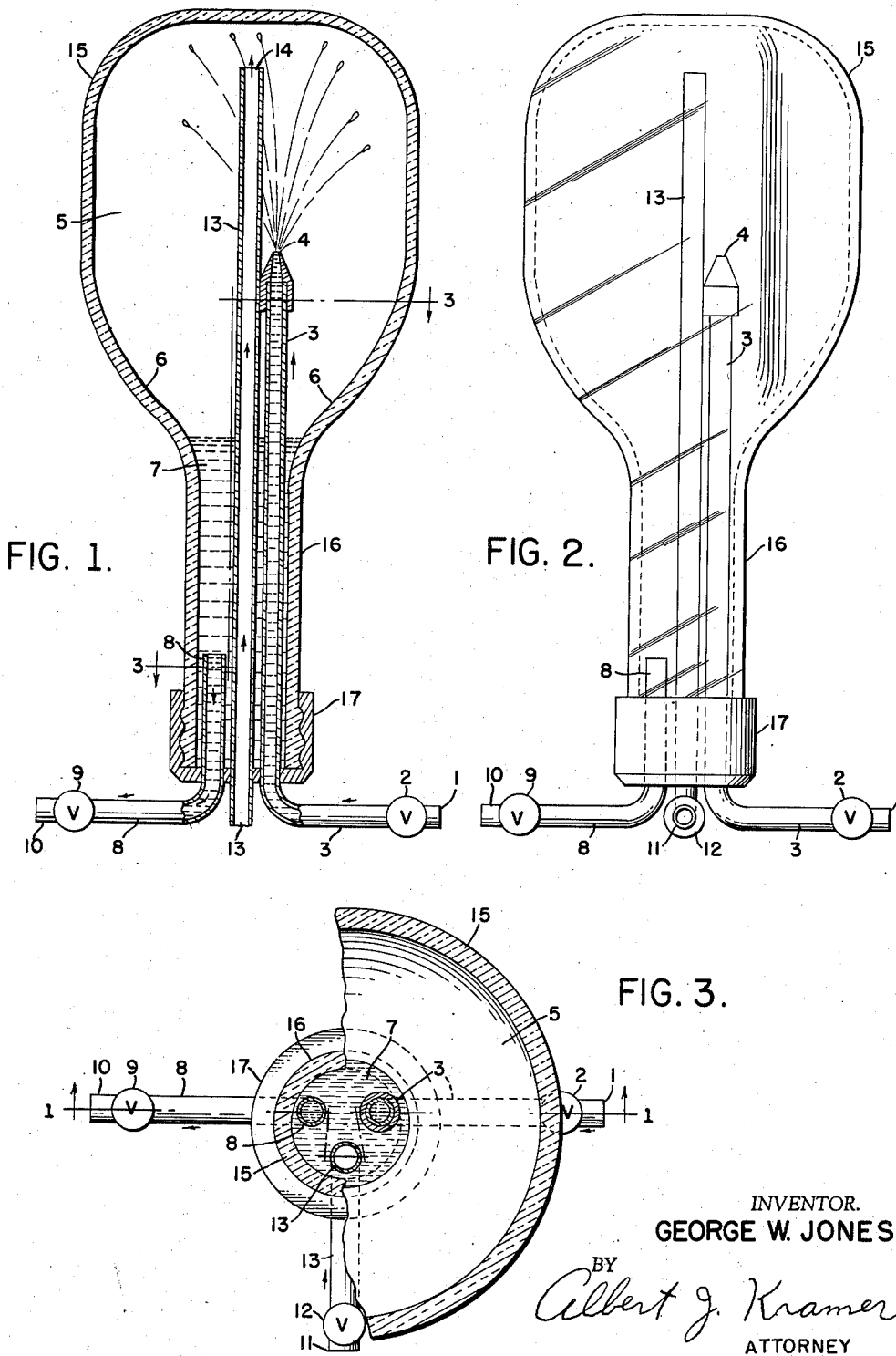
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2,827,901

MEANS FOR OXYGENATING BLOOD

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1

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MEANS FOR OXYGENATING BLOOD

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5 Claims. (Cl. 128—214)

This invention relates to blood oxygenators and has for its primary object the provision of a device of this character which will permit the rapid oxygenation of blood.

Many types of apparatus for the oxygenation of blood have been suggested heretofore. Prior apparatus, however, has been found to be crude, bulky, or complex and to be generally unsatisfactory. The art has long desired a simple apparatus that would serve to oxygenate human blood as a part of auxiliary heart and lung mechanisms.

It is also an object of this invention to oxygenate blood that might be pumped to and from it by means of the human heart. This invention would do the work of the human lungs if for some pathological reason the oxygen could not pass through the lung tissue to the blood stream. It could do the work of the lungs if for some reason the blood could not be pumped to or from the lungs by the heart, to be oxygenated.

It is, therefore, among the objects of the present invention that it provide a small, compact, and inexpensive device that would be exceedingly effective in oxygenating a limited amount of blood in such a way that brain, and other cells, may be kept alive until medical or surgical help could be obtained for the victim of an accident. Such an accident might be due to asphyxia in which the oxygen system may be restored if certain vital cells are kept alive with a small and continuous supply of oxygen.

A further object of this invention is to produce a device that will be effective in oxygenating blood quickly, such as would be required to keep the brain and other vital cells of a human being alive, in the event of a cardiac accident which might cause standstill, or fibrillation. In many such accidents the victim can be saved if it is possible to supply oxygen to vital cells until the heart is brought out of standstill, or fibrillation, and made to function again.

Still a further object of this invention is to make a small, compact oxygenator that can be packed and carried in a handbag, such as is used by practicing medical physicians, and used as an emergency means for oxygenating the blood of the victim of an accident, until the victim can be transported to a hospital or a surgical operating room. Many accidents of the type requiring oxygenation of the blood, do not happen where life saving and surgical equipment is handy for emergency use. These accident victims are generally found in houses, along the banks of streams or lakes, in industrial plants, out in the fields, or along streets and highways. The physician who can carry one of these oxygenators in his medical-bag, along with an auxiliary heart, will be in a position to save many lives that otherwise would not live to reach the emergency operating room.

Another important object of this invention is to provide a mechanism of few parts which may be readily assembled and disassembled in such a manner that all parts may be easily sterilized.

2

A further object of this invention consists in providing a method of fusing a gas with a fluid by exposing the greatest amount of the fluid surface possible to a gas. This is accomplished by changing a fluid liquid into a fluid gaseous state, or into small drops.

Other objects and advantages of the invention is accomplished by means of such structure and relative arrangements of parts as will be apparent with the following description when taken in connection with the accompanying drawings; in which,

Fig. 1 is a sectional view taken along the lines 1—1 of Fig. 2, and 1—1 of Fig. 3.

Fig. 2 is a front elevation showing an embodiment of this improved device compactly assembled.

Fig. 3 is a cross section taken along the line 3—3 of Fig. 1.

Referring to the drawings, a glass bottle or flask 15 serves as the chamber for the oxygenating process. The container 15 is supported in an inverted vertical position, with the inlet and outlet tubes entering and leaving through its mouth. A cap 17 is affixed to the mouth of the container 15 by such means that the internal or external pressures will not cause it to be forced away from the opening. The neck 16 of the container 15 is long and narrow so the least possible amount of blood 7 is required to prevent air bubbles from entering the opening of tube 8, which is situated slightly above cap 17. The fluid 7 in the neck 16 of the container 15 and chamber 5 is maintained at a predetermined level by the control valve 9. The tubes 3, 13, and 8 may be removed for cleaning, repairing, sterilizing, or adjusting by removing the cap 17, all three tubes come out of chamber 5 as cap 17 is withdrawn.

Referring to Fig. 1, the blood entering at numeral 1 is usually treated with an anticoagulant and as it flows through the control valve 2 the desired pressure is obtained. From the control valve 2 the blood flows through the horizontal tube 3 until it enters the container 15 through the cap 17 at a sharp angle as it turns from the horizontal direction to a vertical direction and continues upward through tube 3 until it reaches the orifice 4 where it is discharged into chamber 5 in the form of droplets. As the small drops of blood are sprayed into chamber 5 the oxygen in the chamber combines with the hemoglobin of the blood, oxygenating it.

After the drops of blood pick up the oxygen in chamber 5 they fall down along the sides 6 and flow from there into the fluid 7. The fluid 7 flows through the opening of tube 8, through tube 8 until it reaches the control valve 9, where its volume and pressure are controlled. From the control valve 9 the fluid leaves the oxygenating device by means of tube 10. As the blood is expelled from tube 10 it contains the oxygen picked up in chamber 5 and is ready to be returned to the circulatory system of a human being.

The oxygen, or other gases, to be used in chamber 5 is sent through horizontal tube 11 under the desired pressure. This pressure is controlled by the control valve 12. The oxygen is carried from the control valve 12 to tube 13, which takes it in a horizontal plane until it enters the container 15 through the cap 17 where it makes a sharp angle to a vertical direction and continues up through tube 13 to almost the top of chamber 5, then it is expelled through the opening 14 into the chamber. The oxygen combines with the drops of blood and is carried down the sides of chamber 5 by gravity until it reaches 6 where it flows into the fluid 7 and becomes a part of that fluid. Gravity, or the pressure of the oxygen in chamber 5, forces the oxygen carrying blood vertically downward towards the opening of tube 8, which is found a small distance above cap 17. As the blood enters the opening of tube 8 it continues downward through

3

this tube until after it passes through cap 17, then it makes a sharp angle in a horizontal plane to the control valve 9, thence through the control valve 9 to the tube 10, where it is distributed as oxygenated blood.

From the foregoing description it will be readily seen that a device has been produced as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such may be resorted to as do not form a departure from the spirit of the invention as defined by the appended claims.

Having thus described this invention what is claimed as new and useful and to secure Letters Patent is:

1. A blood oxygenator comprising a vessel having a bulbulous portion; an elongated, relatively narrow neck portion extending downwardly from and in communication with the interior of said portion; a closure member for the neck portion; a first tube for carrying into the vessel, blood under pressure to be oxygenated, said tube extending from the exterior of the vessel, through the closure member and neck portion, and terminating within the bulbulous portion at a point between its top and bottom; means for subdividing blood escaping from the upper end of said tube; a second tube for discharging oxygenated blood from the vessel, said second tube projecting upwardly from the exterior of the vessel, through the closure member and terminating at a point within the neck portion below said bulbulous portion; a third tube for carrying an oxygenating gas into the vessel, said third tube extending from the exterior of the vessel through the closure member and terminating at a point in the bulbulous portion between the top and bottom thereof, and a control valve connected to each of said tubes.

2. A blood oxygenator as defined by claim 1 in which the closure member is a removable cap.

3. A blood oxygenator as defined by claim 1 in which the third tube terminates above the first tube.

4. A gas-liquid contact device comprising a vessel having a bulbulous portion; an elongated narrow neck portion extending downwardly from and in communication with the interior of said portion; a closure member for the neck portion; a first tube extending from the exterior of the vessel, through the closure member and neck portion, and terminating within the bulbulous por-

4

tion at a point between its top and bottom; means for subdividing liquid escaping from the upper end of said tube; a second tube projecting upwardly from the exterior of the vessel, through the closure member and terminating at a point within the neck portion below said bulbulous portion; a third tube extending from the exterior of the vessel through the closure member and terminating at a point in the bulbulous portion between the top and bottom thereof and a control valve connected to each of said tubes.

5. A gas-liquid contact device comprising a vessel having a bulbulous portion; an elongated narrow neck portion extending downwardly from and in communication with the interior of said portion; a closure member for the neck portion; a first tube for carrying into the vessel liquid under pressure, said tube extending from the exterior of the vessel, through the closure member and neck portion, and terminating within the bulbulous portion at a point between its top and bottom; means for subdividing liquid escaping from the upper end of said tube; a second tube for discharging gas treated liquid from the vessel, said second tube projecting upwardly from the exterior of the vessel, through the closure member and terminating at a point within the neck portion below said bulbulous portion; a third tube for carrying treating gas into the vessel, said third tube extending from the exterior of the vessel through the closure member and terminating at a point in the bulbulous portion between the top and bottom thereof and a control valve connected to each of said tubes.

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UNITED STATES PATENT OFFICE
Certificate of Correction

Patent No. 2,827,901

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George W. Jones

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, lines 16, 23, 29, 33, 40, and 45, and column 4, lines 6, 8, 12, 18, 25, and 28, for "bulbulous" read —bulbous—.

Signed and sealed this 28th day of April 1959.

[SEAL]

Attest:

T. B. MORROW,
Attesting Officer.

ROBERT C. WATSON,
Commissioner of Patents.