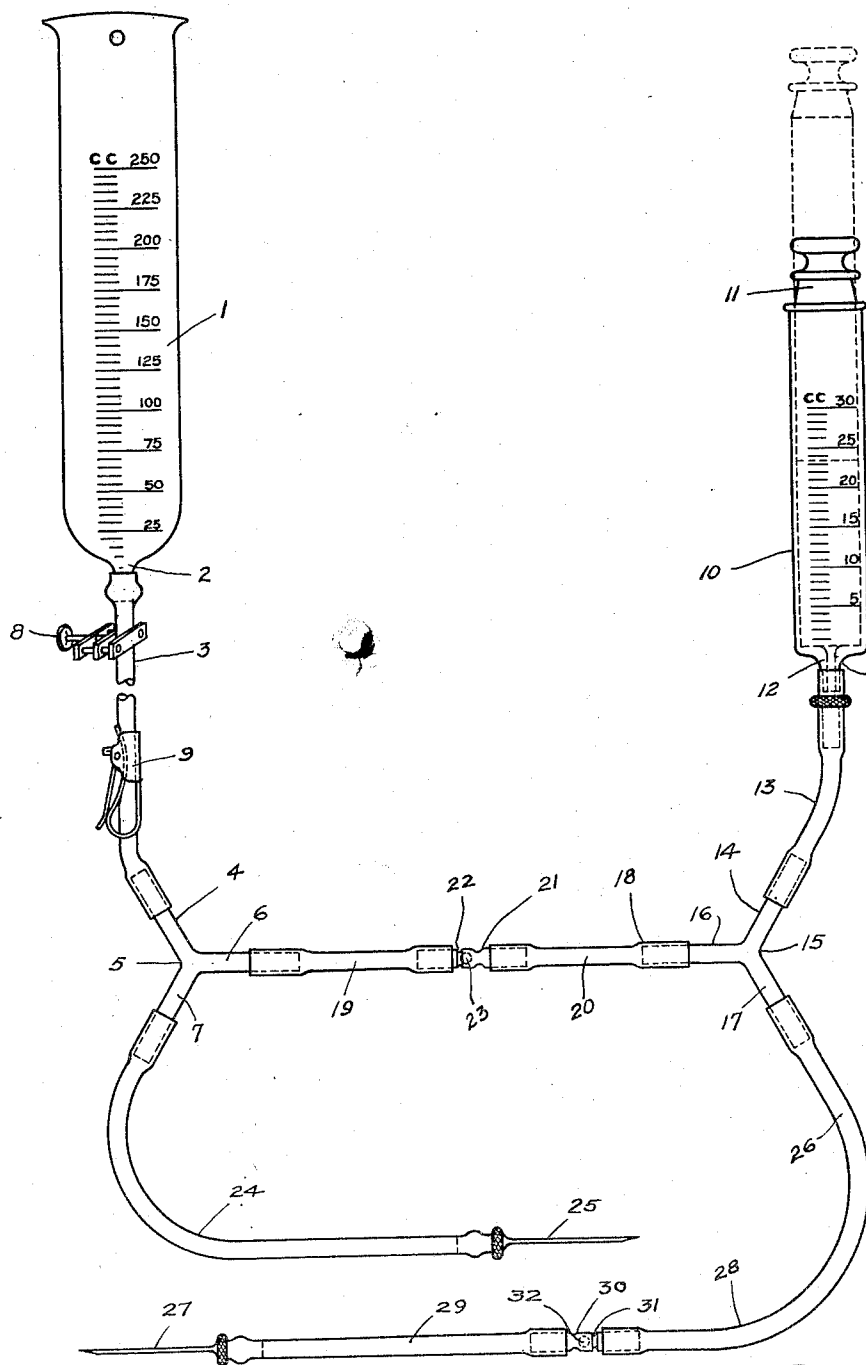


Dec. 2, 1924.

1,517,849

D. McLELLAN
BLOOD TRANSFUSION APPARATUS
Filed May 5, 1922



INVENTOR
Daniel McLellan
By *Marksb Clerk*
Atty.

UNITED STATES PATENT OFFICE.

DANIEL McLELLAN, OF VANCOUVER, BRITISH COLUMBIA, CANADA.

BLOOD-TRANSFUSION APPARATUS.

Application filed May 5, 1922. Serial No. 558,584.

To all whom it may concern:

Be it known that I, DANIEL McLELLAN, a subject of the King of Great Britain, residing at the city of Vancouver, in the Province of British Columbia, Canada, have invented certain new and useful Improvements in Blood-Transfusion Apparatus, of which the following is a specification.

My invention relates to improvements in blood transfusion apparatus, and the object of my invention is to devise a simple, convenient, inexpensive and highly practical apparatus by means of which the blood may be drawn from one individual and injected into another with the utmost facility and free from contact with the atmosphere while at the same time enabling the actual quantity of blood transfused to be accurately measured. A further and important object is to provide for the treatment of the blood during the transfusion process with sodium citrate, or other medicament for the prevention of clotting, the citration, as it is termed, being effected simultaneously with the transfusion so that coagulation of the blood is thus positively prevented.

I attain these objects by the means illustrated in the accompanying drawing in which the figure shows an assembled view of the apparatus.

1 indicates a suitably graduated glass cylinder of the kind provided at its lower end with a nozzle 2, to which nozzle is connected one end of a flexible tube 3 the opposite end of which tube has inserted in it a branch 4 of a Y member 5, which Y member is preferably of glass and has its other branches designated by the numerals 6 and 7. The tube 3 is of compressible material, such as rubber, and mounted on it is a screw clamp 8, of any approved form, by means of which the flow from the cylinder 1 through the tube 3 may be regulated, while 9 indicates a spring clamp also mounted on the tube capable when closed of instantaneously compressing the tube 3 to shut off the flow entirely.

10 indicates a suitably graduated syringe, preferably of glass, having the plunger 11 and to the nozzle 12 of which is connected one end of a flexible tube 13 the opposite end of which has inserted in it a branch 14 of a Y member 15 similar to the Y member 5 hereinbefore mentioned, the member

15 having its other branches designated by the numerals 16 and 17.

The branches 6 and 16 of the respective Y members 5 and 15 are connected together by a flexible tube, indicated generally by the numeral 18, which is, however, divided intermediate its ends, the divided portions 19 and 20 being connected together by a sleeve, preferably of glass, constructed to form a valve chamber 21 having a valve seat 22, with which seat co-operates a non-return ball valve 23 arranged to be opened under suction in the syringe and to be closed under pressure therein or, in other words, the valve 23 opens to permit flow from tube 19 into tube 20 but closes to prevent return flow from tube 20 into tube 19.

24 indicates a length of flexible tubing connected at one end to the branch 7 of the Y member 5, its opposite end being provided with a hollow needle 25 such as is used for intra-venous injection, while 26 indicates a length of flexible tubing connected at one end to the branch 17 of the Y member 15, its opposite end being provided with a needle 27 similar to needle 25, this tube 26 being divided intermediate its ends and having the divided portions 28 and 29 connected together by a sleeve formed as a valve chamber 30 similar to the valve chamber 21 already described and having the valve seat 31 and non-return valve 32 co-operating therewith, this valve being arranged to close under suction in the tube 26 and to open under pressure therein.

The manner in which the apparatus is operated may be described as follows. The cylinder being filled with a designated quantity of sodium citrate solution, or sodium citrate solution diluted with sodium chloride solution, or other medicament for the prevention of coagulation, air may be expelled from the tubing system described in the foregoing by allowing a portion of the solution to fill the tubes and run out at the needles, giving the plunger of the syringe a stroke or two to expedite the expulsion. The amount of flow from the cylinder 1 is then regulated by screwing in the clamp 8 until the amount which will pass through the tube 3 from the cylinder 1 will be that estimated as the quantity necessary to properly citrate or medicate the blood for the purpose of preventing clotting during transfusion, and the transfusion operation is effected thus: The

needle 25 is inserted in the vein of the giver of the blood, who is called the "donor," and the needle 27 is inserted in the vein of the one receiving it, termed the "recipient," when, by drawing the plunger 11 upwardly, the syringe being preferably held in a vertical position with the mouth up, a quantity of blood will be drawn from the vein of the donor through the needle 25, the tube 24, the branches 7 and 6 of the Y member 5, the tube 19, through the sleeve 21 past the non-return valve 23, the tube 20, the branches 16 and 14 of the Y member 15, and the tube 13 into the syringe, a quantity of the solution in the cylinder 1 being drawn simultaneously through the tube 3 and the branch 4 of the Y member 5, mixing with the blood as it passes through the Y member so that the mixture in the syringe at the end of the upstroke of the plunger consists of blood in a properly citrated or otherwise medicated condition. The plunger is then pushed downwardly, forcing the citrated blood mixture down through the tube 13, the branches 14 and 17 of the Y member 15, the tube 28, through the sleeve 30 past the non-return valve 32, and the tube 29 and needle 27 into the vein of the recipient. The operation is repeated through alternate suction and discharge strokes of the plunger until the desired quantity of blood has been taken from the donor and injected into the recipient, and it should be particularly noted that the needle in the vein of the donor is all the time kept clear due to the continuous flow of solution therethrough under gravity from the cylinder during the injection stroke of the plunger and also to a slight discharge under pressure which takes place at the commencement of the injection stroke before the valve 23 closes. It should be noted further that on the upstroke of the plunger the blood injected into the vein of the recipient is maintained therein, as the valve 32 automatically closes on the suction stroke and prevents any return of the injected blood.

An inherent advantage possessed by the apparatus is that any air gaining access therinto through leakage or otherwise during operation bubbles and rises to the surface of the fluid in the syringe and accordingly does not enter the discharge tube.

From the foregoing it will be seen that blood may be transfused from one person to another by my apparatus in an extremely simple and convenient manner, that during the transfusion operation it is kept free from contact with the atmosphere and can be properly citrated in a definite and positive manner, and that the quantity of blood drawn may be accurately noted, since by subtracting the amount of solution used from the total reading of the syringe the actual amount of blood transfused is obtained, as the amount of solution entering

the vein of the donor can be approximately estimated, although it is so small that it may be practically disregarded in relation to the total reading.

What I claim as my invention is:—

1. A blood transfusion apparatus comprising a pair of hollow needles one for insertion into the vein of the donor and the other into the vein of the recipient, a gravity cylinder tubularly connected to the donor needle normally in direct communication therewith and a syringe tubularly connected to the recipient needle, and a tubular connection between the donor needle connection and the recipient needle connection. 70
2. A blood transfusion apparatus comprising a pair of hollow needles one for insertion into the vein of the donor and the other into the vein of the recipient, a gravity cylinder tubularly connected to the donor needle and a syringe tubularly connected to the recipient needle, a tubular connection between the donor needle connection and the recipient needle connection, and a valve in the said tubular connection arranged to establish when open communication between the syringe, the cylinder, and the donor needle and when closed to prevent communication therebetween. 80
3. A blood transfusion apparatus comprising a pair of hollow needles one for insertion into the vein of the donor and the other into the vein of the recipient, a gravity cylinder tubularly connected to the donor needle and a syringe tubularly connected to the recipient needle, a tubular connection between the donor needle connection and the recipient needle connection, and a valve in the said tubular connection arranged to establish when open communication between the syringe and the cylinder and donor needle and when closed to prevent communication therebetween, said valve being adapted to be opened and closed by suction and pressure respectively within the syringe. 90
4. A blood transfusion apparatus comprising a pair of hollow needles one for insertion into the vein of the donor and the other into the vein of the recipient, a gravity cylinder tubularly connected to the donor needle and a syringe tubularly connected to the recipient needle, a tubular connection between the donor needle connection and the recipient needle connection, and a valve in the recipient needle connection adjacent the needle arranged to establish when open communication between the syringe and the needle and when closed to prevent communication therebetween. 100
5. A blood transfusion apparatus comprising a pair of hollow needles one for insertion into the vein of the donor and the other into the vein of the recipient, a gravity cylinder tubularly connected to the 110

donor needle and a syringe tubularly connected to the recipient needle, a tubular connection between the donor needle connection and the recipient needle connection, and a valve in the recipient needle connection adjacent the needle arranged to establish when open communication between the syringe and the needle and when closed to prevent communication therebetween, said valve being adapted to be opened and closed by pressure and suction respectively within the syringe.

6. A blood transfusion apparatus comprising a pair of hollow needles one for insertion into the vein of the donor and the other into the vein of the recipient, a gravity cylinder tubularly connected to the donor needle and a syringe tubularly connected to the recipient needle, a tubular connection between the donor needle connection and the recipient needle connection, and a clamp member mounted on the donor needle connection capable of operation to compress the connection and restrict its bore.

7. A blood transfusion apparatus comprising a pair of hollow needles one for insertion into the vein of the donor and the other into the vein of the recipient, a graduated gravity cylinder tubularly connected to the donor needle and a graduated syringe tubularly connected to the recipient needle, a tubular connection between the donor needle connection and the recipient needle connection, a valve in the said tubular connection adapted to be opened and closed by suction and pressure respectively within the syringe to establish or close communication between the syringe and the cylinder and donor needle, a valve in the recipient needle connection adapted to be opened and closed by pressure and suction respectively within the syringe to establish or close communication between the syringe and the needle, and a clamp on the donor needle connection capable of operation to compress the connection and restrict its bore.

8. A blood transfusion apparatus comprising a pair of hollow needles one for insertion into the vein of the donor and the other into the vein of the recipient, a graduated gravity cylinder tubularly connected to the donor needle and a graduated syringe tubularly connected to the recipient needle, a tubular connection between the donor needle connection and the recipient needle connection, a valve in the said tubular connection adapted to be opened and closed by suction and pressure respectively within the syringe to establish or close communication between the syringe and the cylinder and donor needle, a valve in the recipient needle connection adapted to be opened and closed by pressure and suction respectively within the syringe to establish or close communication between

the syringe and the needle, a screw clamp mounted on the donor needle connection capable of operation to compress the connection to restrict its bore, and a spring shut-off clamp also mounted on the donor needle connection capable of operation to close the bore of the connection entirely.

9. A blood transfusion apparatus comprising a graduated gravity cylinder having a nozzle in its lower end, a flexible tube connected at one end to said nozzle and having one branch of a Y member inserted in its opposite end, a flexible tube connected at one end to another branch of the Y member and provided at its opposite end with a hollow needle, a graduated syringe, a flexible tube connected at one end to the syringe nozzle and having one branch of a second Y member inserted in its opposite end, a flexible tube connected to another branch of the second Y member and provided at its opposite end with a hollow needle, and a flexible tubular connection between the two remaining branches of the respective Y members.

10. A blood transfusion apparatus comprising a graduated gravity cylinder having a nozzle in its lower end, a flexible tube connected at one end to said nozzle and having one branch of a Y member inserted in its opposite end, said tube being provided with means for restricting or closing its bore, a flexible tube connected at one end to another branch of the Y member and provided at its opposite end with a hollow needle, a graduated syringe, a flexible tube connected at one end to the syringe nozzle and having one branch of a second Y member inserted in its opposite end, a flexible tube connected to another branch of the second Y member and provided at its opposite end with a hollow needle, a non-return valve in the last-mentioned tube adapted to be opened and closed by pressure and suction respectively in the tube to open or close the bore of the same, a flexible tubular connection between the two remaining branches of the respective Y members, and a non-return valve in the said tubular connection adapted to be opened and closed by suction and pressure respectively to open or close the bore of the connection.

11. A blood transfusion apparatus including a pair of hollow needles, one for insertion into the vein of the donor and the other into the vein of the recipient, a conduit connected to each of said needles, a syringe having its barrel operatively connected to said conduits, an automatically operating check valve controlling one of said conduits and adapted to be closed by suction created by said syringe when the syringe is on its suction stroke, an automatically operating check valve adapted to control the other conduit and adapted to

close by pressure created by the syringe when said syringe is on its pressure stroke, a medicament receptacle, and means for feeding medicament by gravity from said
5 receptacle to one of said conduits.

12. A blood transfusion apparatus including a pair of hollow needles, one for insertion into the vein of the donor and the other into the vein for the recipient, a conduit connected to each of said needles, a
10 syringe having its barrel operatively connected to said conduits, an automatically operating check valve controlling one of said conduits and adapted to be closed by suction created by said syringe when the
15

syringe is on its suction stroke, an automatically operating check valve adapted to control the other conduit and adapted to close by pressure created by the syringe when said syringe is on its pressure stroke, 20
a medicament receptacle from which a medicament may flow by gravity, and conveying means connecting the medicament receptacle to one of said conduits, whereby medicament may constantly flow into the last 25
named conduit.

In testimony whereof I affix my signature at Vancouver, B. C. this 24th day of April, 1922.

DANIEL McLELLAN.