

Washing Your Blood OUTSIDE YOUR BODY.

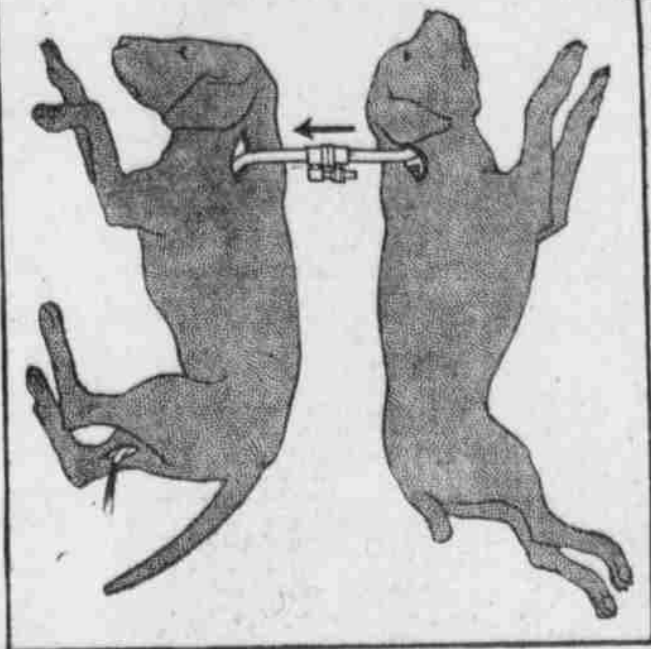


Diagram Showing How One Dog That Had Been "Bled White" Was Restored by the Blood of Another Dog Being Forced Through Its Jugular Vein. One of the Preliminary Experiments That Resulted in the Discovery of the New Blood Washing Method.

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THE most remarkable achievement of modern surgery is the discovery of a method whereby the blood can be drawn from the body, washed clean and returned without the heart missing a single beat.

This does not mean, of course, that the blood is washed in tubs like a shirt. Cleansing of the life stream, with its hosts of red and white corpuscles, its serum and its ferments, is a far more complicated matter. Nevertheless the new method of purifying is quite as extraordinary as though the circulation were sent out to be laundered.

The invention by which the washing is done is that of Professor J. J. Abel, one of the most brilliant experimental surgeons in America, and Drs. L. G. Rountree and B. B. Davis, all three of Johns Hopkins. The cleansing outside the body is made possible by the action of what is known as osmosis. Osmosis is the tendency to mix of all liquids and gases by passage through a membrane or porous wall separating them.

Let me make this process clear. Suppose you take a vessel and half fill it with distilled water. Then suspend in it a bag made from membrane parchment, the coverings of the intestines, a bladder. Fill this membranous bag with sweetened water and leave it immersed in the pure water for an hour.

Now if you carried this bag around for an hour by itself you would not lose a drop from it. But when at the end of your hour of immersion you test your enclosing water you find it also sweet. The liquid in the bag has strained out through the minute interstices in the confining membrane and the enclosing liquid has strained in, and this process will go on until the fluid outside the bag is just as sweet as that inside. We call this the osmotic process.

Again, the pores of the skin throw off waste matters and poison from the blood. How do these products get into the pores from the little

blood vessels we call the capillaries? Again by osmosis. They circulate in the blood stream and strain out under the osmotic pressure into the sweat glands—just as they strain out inside the body and poison the vital organs—if their quantity is too great to be removed through the skin or if the pores are not working properly.

Now of recent years hydropathy, or the treatment of certain diseases by frequent and long continued baths, has developed greatly. It has been proven that some forms of insanity due to persistent poisons in the blood can be mitigated and sometimes cured by soaking the patient for hours in warm water. The secretion through the skin is stimulated by the water and the poisons are carried away directly from the blood through the sweat glands. The vapor bath and its like for removing an excess of uric acid is an ancient institution. It is true that these methods do not remove the causes of the poisoning, but by relieving the blood stream of the poisons they give Nature a mighty help toward cure.

Dr. Abel's system is a highly specialized form of hydropathy in which, by the aid of fifty feet of mica tubing, the circulatory system is extended outside the body and is brought directly in contact with a cleansing liquid. During its passage through this liquid the blood stream is washed by osmosis free of its poisons and goes back into the body pure.

The apparatus itself consists, as has been said, of fifty feet of mica tubing. This is shaped by S turns into thirty-two continuous tubes which in their turn are immersed in a glass cylinder. Mica is used because its texture is the nearest thing to the texture of the walls of the arteries and veins. Mica, like the blood vessel walls, is slightly porous and so susceptible to osmotic pressure. The apparatus is so small and delicate that the whole does not take up more than a cubic foot of space. A rubber tube is attached to each

The Newest Miracle of Medical Science That Forces Your Heart to Pump the Life Stream Into Fifty Feet of Cleansing Tubes and Then Pump It Back Into the Veins with All Its Poisons Strained Out

of the two openings. The mica tubes are filled with a normal salt solution—a heaping teaspoonful of salt mixed in a quart of sterilized water. The enclosing glass cylinder is filled with the same saline mixture. The whole apparatus rests in a box where by certain appliances a constant temperature is maintained for the liquid.

So much for the appliance. Now how is the blood to be carried through it for washing? Here enters the miracle of surgery. The neck of the patient is opened and the carotid artery and the jugular vein on one side is laid bare. The carotid carries the freshly oxygenated arterial blood away from the heart and the jugular vein carries the returning current of depleted, waste-laden blood back to the heart for fresh oxygenation by the lungs. There is a carotid artery and a jugular vein on each side of the neck.

The exposed artery and vein are frozen at a certain point and cut. To one of the severed ends of the carotid is attached the rubber tubing that leads into the intake of the mica pipes. The exhaust end of the mica piping is attached to one end of the jugular in the same fashion. The other parts of the severed vessels are then tied.

We then have the circulatory system increased by fifty feet of artificial artery. The heart pumps the blood through just as though it were a part of the body.

And here enters the reason for the saline solution that fills the mica tubes. Manifestly, if there were nothing within them when the heart began to force the blood through there would be withdrawn from the circulation at one time enough blood to fill the tubes. In the experimental apparatus in use this would be six hundred cubic inches, or roughly seven and a half pints. As the blood of a man is normally one-thirteenth his weight, such a quantity withdrawn at one time would be apt to cause trouble. Again, if there was a vacuum within the tubes the blood would be drawn into them from both ends. And if there were air, the forcing of it into the circulation and into the heart would at once prove fatal.

But saline solution can be injected

into the circulatory system without any harm. Indeed Dr. Alexis Carrel, of the Rockefeller Institute, has kept animals alive for days upon such "artificial blood." The serum of the blood is practically of the same composition as sea water. Cases of hemorrhage in which the patient has almost been "bled white" have been held fast to life and set toward recovery by the injection of saline solution.

So it is, then, that when the saline solution in the tubes is forced through the jugular veins and seven and a half pints of it at once go coursing through the body, there are no evil results. The heart goes on pumping it just as though it were the normal life stream.

In the meantime the real blood has entered the tubing and is racing along between the mica walls. As the normal serum in which the red and white corpuscles move is of the same density, the same composi-

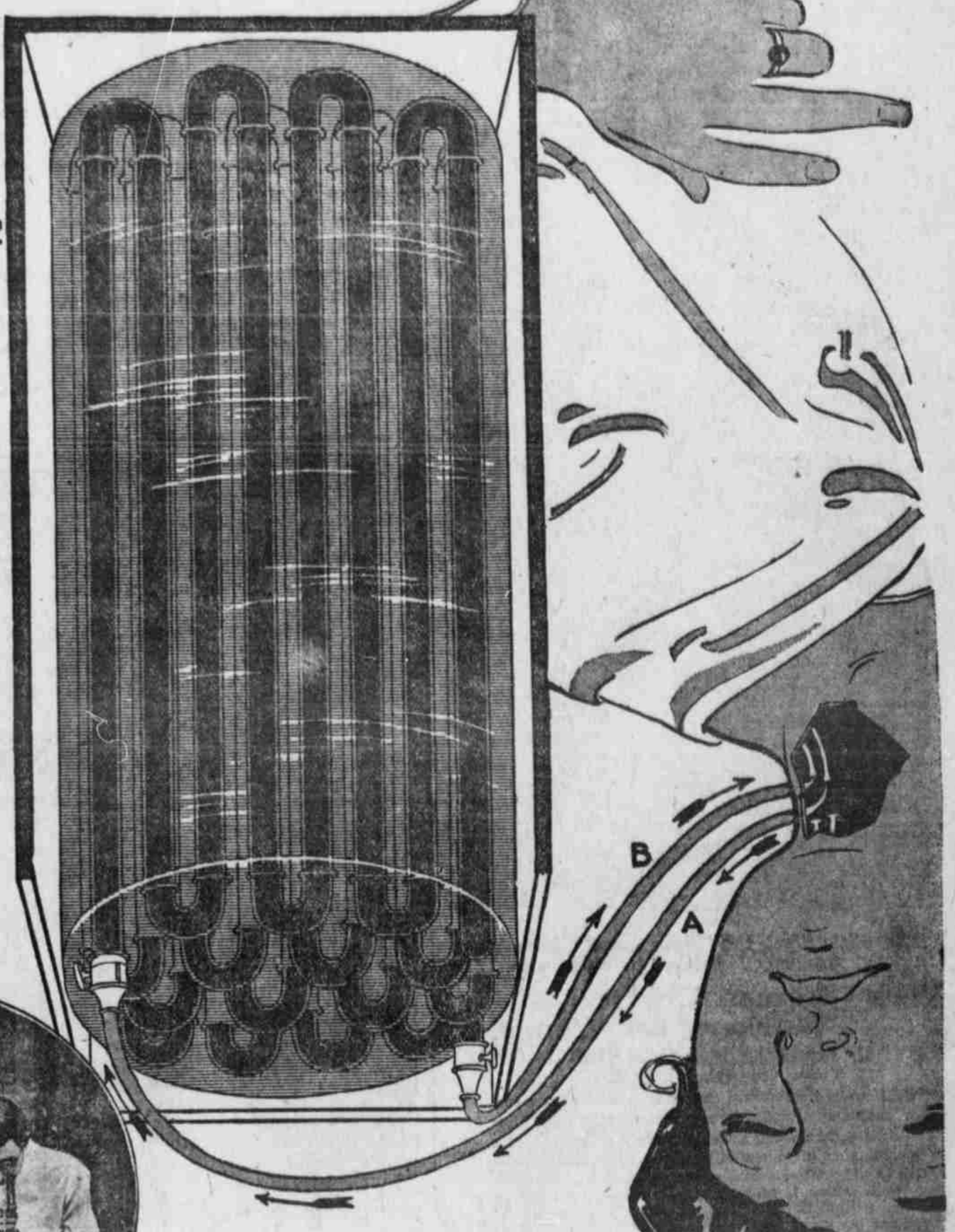
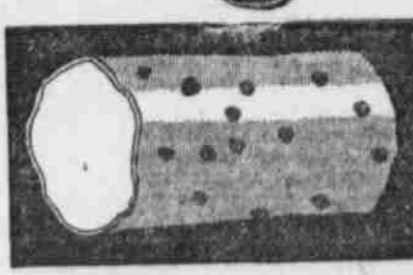


Diagram of Dr. Abel's Blood Washing Apparatus Illustrating Its Method of Operation.

The Fifty Feet of Mica Tubing, shown by the Dark Pipes, Are Contained in a Glass Cylinder Filled with Salt Water of the Same Temperature and Density as the Blood. The Carotid Artery is Cut and the Rubber Tube (A) is Connected with One Severed End. Rubber Tube (B) is Connected with the Severed End of the Jugular Vein. The Heart Pumps the Blood Through the Rubber Tube (A) into the Mica Pipes, Through Them and Out into the Rubber Tube (B) Which Carries the Life Stream Back into the Jugular and So into the Body Again. During the Progress Through the Mica Tubes, Whose Walls Resemble Those of the Arteries in their Porosity, the Saline Solution in the Glass Cylinder Bathes It, Removing by Osmotic Pressure the Poisons Within It That Produce Disease.



Surgeons Examining the Blood Vessels of a Dog Whose Life Stream Has Just Been Washed by the Abel Method.

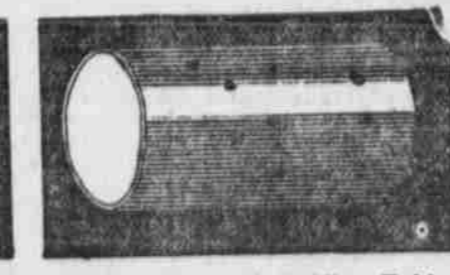


Greatly Magnified Section of a Blood Vessel Showing the Little Interstices Through Which Poisons in the Circulation "Leak" Out.

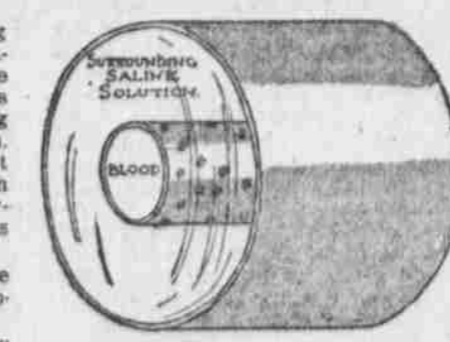
tion and temperature of the bathing salt solution that washes the outside of the tubes and of therefore the same osmotic pressure, it does not leak out into the surrounding medium. But the foreign substances, the poisons, which are of a different osmotic pressure, do filter through the mica walls out into the glass cylinder and the blood, purified, is pumped back into the body.

How often, you will ask, must the blood be passed through the apparatus before it is cleaned?

And how long is this great quantity of the life stream actually outside the body? The answer to the first question depends upon the kind and quantity of the poison within it. It may be necessary to wash it only once, or it may be necessary to wash it many times. In answer to the second question—it takes the blood twenty-two seconds to make a complete revolution through the body. Naturally it goes through the tubes at the same rate. It passes through twenty inches of the pipes every second. This would not long enough under any circumstances to weaken,



Enlarged Section of Mica Tubing Showing How the Blood Vessels' Wall Texture is Duplicated in the Blood Washing Machine.



A Mica Tube Immersed in Saline Solution Within a Glass Cylinder Showing How the Poisons in the Blood Are Washed Out of It Through the Tiny Holes.

and there is, it must be remembered, the artificial blood which is taking its place.

The blood may be allowed to leave the body as many times as it is necessary to remove every trace of the poison. This is determined by examination of the bathing solution and examination of the blood. The

apparatus is so arranged that the cleansing liquid can be constantly freshly replaced. The liquid can also be altered by chemicals to suit the action required upon the blood.

After the washing is completed the ends of the artery and the vein are fastened together by the delicate but now uniformly safe method in use, and the patient feels none the worse for the operation and all the better for the clean blood.

Dr. Abel made a successful demonstration of his invention before the Federation of American Societies for Experimental Biology at Philadelphia. The subject was a dog. The apparatus has not yet been used upon a human being, but before this article appears it is probable that a number of cases will have been treated.

The practical value of the method is enormous. In his demonstration upon the dog, Dr. Abel said that the process in that particular case robbed the animal of the sugar urea and all the diffusible elements in the blood. By varying the chemicals with which the flowing stream was treated outside the body, he declared, almost any poison or material could be removed from it.

We grow and are nourished by the diffusion of things in the blood that pass then into the kidneys, brain, heart, lungs, muscles and other tissues and organs. We are poisoned by other things in the same way. Therefore, if the blood can be washed of the harmful and destructive things, and all the beneficial and helpful things be left in—what an advance!

The various forms of uric acid that causes rheumatic fever, joint diseases, and so on, can be removed. So, too, of a swarm of other blood, kidney, heart, lymph, nerve and other tissue poisons.

would neutralize the poisons or the microbes causing the maladies cannot be taken into the body because of their deleterious effect upon certain vital organs. The cure, to use an old expression, is worse than the disease.

But by bringing the blood stream outside the body into contact with such neutralizing compounds, there is no necessity of introducing them into the body.

Mercurial poisoning, arsenic, strychnine, snake-venom—any kind of poisoning can be rapidly washed away before it has a chance to cause the death of tissues.

It is even predicted that microbial diseases, now difficult or tedious to treat, can be easily reached by charging the solution washing the mica tubes with chemicals that destroy such bacilli.

Although some doctors who witnessed the Philadelphia demonstration were inclined to believe that the method would be of great value in treating cases of diabetes, I am extremely doubtful upon this point. There is of course an enormous amount of sugar in the blood in this disease. The distress and death are not, however, caused by sugar. They are caused by the fact that sugar is not burned up in the body and changed into substances necessary for nutrition. A death from diabetes is really a death from sugar starvation even though the blood carries an abnormal quantity of it.

Washing the sugar out of the blood would not cure diabetes any more than destroying food a man could not eat would satisfy his hunger. But if the poison in the blood which prevents it from transforming the sugar into food could be neutralized or removed, then of course, the patient would be benefited.

An Invention That Doubles a Bicycle's Speed

THE torpedo bicycle is a remarkable but simple French invention that promises to double the speed of the ordinary bicycle. This machine is the invention of M. Etienne Bunau-Varilla, who is a relative of the noted M. Bunau-Varilla, the French financier who sold the rights to the old French Panama Canal to the United States Government. The torpedo bicycle is an ordinary bicycle

with a peculiarly constructed windshield that removes all air pressure and friction from the body of the rider. The wind shield is made of aluminum. This increases the rider's power enormously.

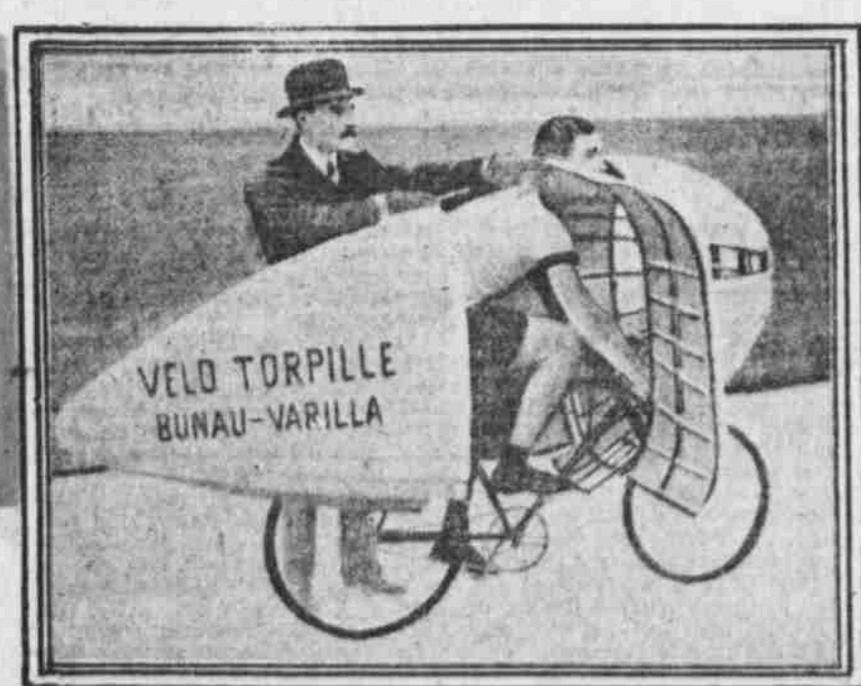
The shield is constructed somewhat like a torpedo, but with the broad end in front and the pointed part behind. Large celluloid windows enable the rider to see the road in front of him.

Using this machine the French runner Berthet, who is not supposed to be in the same class as first class bicycle riders, easily beat the records of the best riders. It is stated by the French authorities that he easily beat the world's record for one kilometer, or 3,280 feet, by eight seconds. The record for this distance is said to be fifty-five seconds. If the new machine can make such an enormous reduction as eight seconds in fifty-five when used by a comparatively slow rider, it is expected that a rider like Walthour would be able to cut the record nearly in half.

Berthet made another remarkable record with the torpedo bicycle. Riding very easily he covered a distance of five kilometers, or about three and three-quarter miles, in five minutes and forty-seven seconds at the Palace of Sports in Paris, beating the world's record by one minute and four seconds.

It is suggested that this machine will make a very pleasant and economical substitute for the motorcycle. It enables a rider to travel as fast as anybody can wish to go and at the same time protect himself from the wind and dust.

The construction of the torpedo-like windshield is based upon very carefully studied scientific principles. A superficial observer might think that a shield pointed in front and broader behind would cut through the air faster, but as a matter of fact this would hinder the progress of the machine by creating air friction at the rear. The fling down of the aluminum envelope to a point has the most important effect in reducing air resistance. The same principle has been followed to some extent in constructing boats, and even passenger cars.



How the Bicycle Rider Sits Inside the Torpedo. The Side Flap Shuts Tight, Enclosing Him in the Egg-Shaped Body.