THE TRANSFUSION OF BLOOD.

The idea of returning to an animal blood which has been lost, or, rather, of replacing the vital fluid which has disappeared through the effects of increasing age or the ravages of illness, by transfusion from the veins of another animal in full health, was known to the ancients. It is described in the "Metamorphoses" of Ovid, and repeatedly alluded to in the works of the old alchemists, who believed that, by such means, perpetual regeneration of the body might be accomplished. Toward the middle of the seventeenth century, the subject appears to have enlisted the attention of French physicians and philosophers; and in the month of June, 1667, experiments, which previously had been frequently practised successfully upon the lower animals, were for the first time tried upon man. Eight ounces of the arterial blood of a lamb were injected, by Denis, into the veins of a child. Subsequently calf's blood was transfused into the blood vessels of a maniac, who shortly thereafter regained his reason. While, starting from these attempts, the operation was again and again repeated, sometimes successful, sometimes the reverse, until it became common in the practice of almost every French physician. Too common, however,—whether through the rude means employed for forcing the fluid into the veins of the patients, or whether from the lack of skill on the part of the operators, or, more probably, a lack of caution on the part of the latter, due to supposed familiarity with all the consequences of the operation—for accidents soon became more frequent than successes. In the course of a few months, failures became the rule and cures the exception; the people became alarmed, and finally, in the beginning of 1668, the Parliament of Paris proscribed the practice, and the fulminations of Rome, closely following, effectually arrested any further investigation and experiment. The physicians, however, carefully preserved and printed their records; and from an old treatise, called the *Clysmatica Nova*, printed in Brandenburg in 1667, we reproduce an engraving showing how, in those days, the operation was performed, Opening a vein and inserting the end of a common syringe constituted the whole process, in marked contrast to the delicately adjusted instruments and careful measurements now employed.

For a century the subject was abandoned, to be taken up again, however, at the lapse of that period, by Harwood, whose researches showed that blood could not be transfused from one animal to another of different families without killing the latter within a few days after the operation. From this discovery date the modern investigations, which have culminated in the acquisition of knowledge sufficient to admit of the safe practice of transfusion of blood from man to man.

The early experiments of Denis, and of others subsequently, would seem to negative the above mentioned truth, but the details of the operations, as handed down, are very defective, and in some instances it is known that individuals, at first benefitted by the transfusion, subsequently died from its effects. There is certain evidence, however, that death was repeatedly caused by transfusion between widely differing animals. More modern experiments, especially those of Prevost and Dumas, prove that the blood of calves or sheep, injected into the veins of a cat or rabbit, is fatal, and mammifers inoculated with the blood of birds rapidly succumb. On the other hand, Lower has shown that the fluid from the veins of one variety of dog acts beneficially upon another dog of different characteristics; and from the experiments of Milne-Edwards and Lafond, of still later date, it appears that it suffices for the two animals to be of the same natural group, although belonging to distinct species. An ass, for example, whose blood was nearly exhausted, was reanimated perfectly by the blood of a horse.

If it is true, then, as facts demonstrate, that, in the case of man or other animal whose life is almost extinct through abundant hemorrhage, revivification may be gained by transfusing a quantity of blood much less than that lost, it becomes an interesting matter to determine to what elements the liquid owes its reanimating properties. Prevost and Dumas show that an injection of serum—that is, blood deprived of fibrin and globules—is utterly without effect. On the other hand, blood containing the globules, but in which the fibrin has been destroyed by agitation, gives strong revivifying results, and hence, as extended investigation has abundantly shown, the perfect globule is absolutely indispensable.

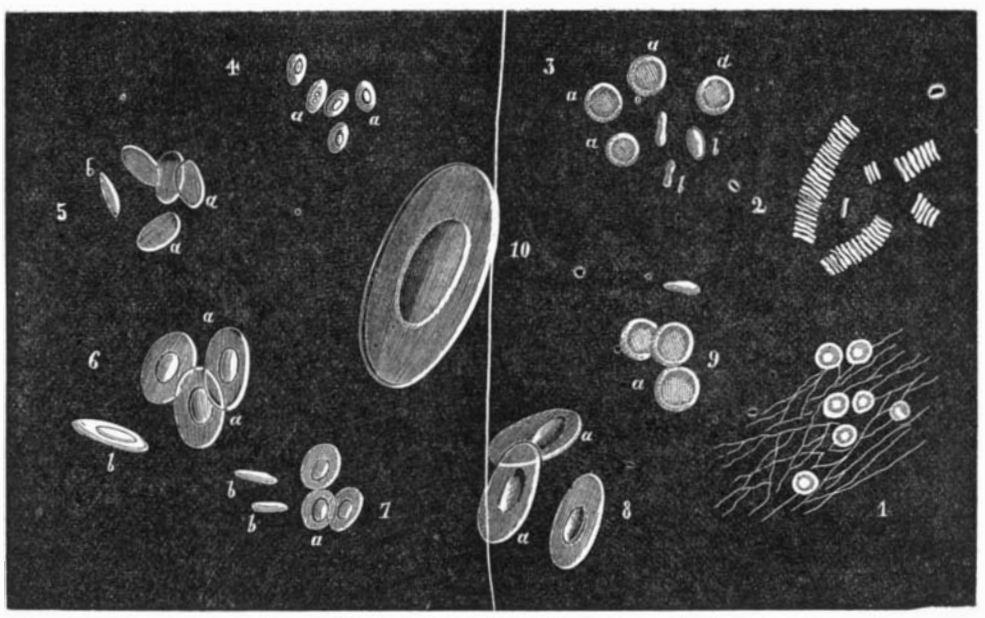
In order to comprehend the hurtful effect of the blood of widely differing creatures, as above alluded to, it is necessary to take into consideration the greatly varying shape of the globules in the blood of various vertebrates. The annexed engraving, representing these globules very much magnified, will, in this regard, be of interest. No. 1 represents human globules imprisoned in the fibrin of coagulated blood. No 2, the same in rolls. No. 3, globules detached, showing them as circular biconcave disks, diameter 0·00026 inch to 0 00017 inch, weight 0 000001 grain, surface 0·000004 inch. No. 4, globules of the camel, elliptical disks, diameter 0·00031 inch. No. 5, globules of pigeon, elliptical, biconvex, diameter 0 0006 inch. No. 6, globules of frog, elliptical, diameter 0·0008 inch. No. 7, globules of cobitis, round, diameter 0·0005 inch. No. 8, globules of water lizard, diameter 0 0015 inch. No. 9, globules of ammocoetis, diameter 0·0004. No. 10, globules of proteus (species of batrachian), diameter 0·0048. *a*, in all the figures indicates front, and *b* side, views.

The results of later investigations prove that the blood of mammifers may be injected into man without producing hurtful effects, so long as the red globules of the animal do not differ greatly in form and dimensions from those in human blood. If the globules become dissolved and soon disappear in the organism into which they are transmitted, they nevertheless produce advantageous though not permanent results. It would seem, then, that, when human blood is unattainable, that of animals may be used.

THE TRANSFUSION OF BLOOD, A. D. 1667.

The mode of performing the operation at the present time is graphically depicted in the large engraving on the opposite page, extracted from a French contemporary. The young woman represented as receiving the blood was a servant, twenty-two years of age, who had become extremely exhausted through hemorrhage and overwork. She was received into the Hospital de la Pitié, in Paris, and the transfusion was accomplished by Dr. Béhier from the arm of Dr. Strauss. The aspirator used was so arranged that by no possibility could any air enter with the blood. The latter was sent into a cup from the veins of the donor and collected in the inferior part of the instrument, whence it was pumped by a small piston worked by a handle. It was then forced through a canula into the veins of the patient. The instrument, in order to prevent coagulation of the fluid, was first immersed in tepid water, and the tubes used were of gold. Before employment, the apparatus was filled with blood, so that considerable of that obtained from the healthy veins was lost. In all about one ounce, out of three, was administered, but this was sufficient to secure restoration to the patient, and to enable her, after a lapse of seven weeks, to resume her ordinary occupation.

The New York *Medical Record*, of recent date, contains an interesting paper on this subject, by Dr. J. W. Howe, visiting surgeon to a charity hospital in this city. He gives an account of his treatment of an invalid woman, forty years of age, whose pulse was weak and irregular, and at times imperceptible. He says: "I abstracted, by means of the aspirator, four ounces of blood from the median basilic of a healthy man. The blood thus obtained was injected into the cephalic vein of the patient. In a few moments she expressed herself as feeling better. There was an immediate and marked improvement in the volume and force of the pulse. This was so perceptible as to be noticed by all present, and prevented me from transferring any more blood. The next morning I found her pulse still improving and her general condition excellent." The patient subsequently regained her strength and recovered.



BLOOD GLOBULES. MAGNIFIED.

Testing Colors for their Fastness.

For this purpose, Professor W. Stein gives the following schedule of directions:

Red.—A small sample of the yarn or fabric is boiled firs in soap water, which should not affect the shade and become but slightly tinged itself; secondly, in lime water, which also should neither affect the shade nor extract it. These tests are sufficient to demonstrate the presence or absence of logwood, sanders, and aniline.

Yellow.—Boil samples successively in water, alcohol, and lime water. Shades which are not fast enough tinge the water and alcohol sensibly, and turn the lime water red. Annatto and turmeric are the most fugitive yellows; fustic is a little faster.

Blue.—1. Boiled in alcohol, a fast blue should not give a red, purple, or blue liquid. 2. Boiled in muriatic acid and water, or alcohol, the liquid should not turn red, nor should the shade on the yarn or fabric change to red or reddish brown.

Purple.—The only fast shades of this class are those derived from combining a vat blue or indigo carmine blue with cochineal, and the madder purple. Boiled with dilute alcohol (one half water), and left to stand ten or fifteen minutes, fast purples suffer no change; nor should they turn brown or reddish brown when boiled with dilute muriatic acid.

Orange.—Boil in water; if it becomes yellow, reddish yellow, or red, the dye is not fast. If the water remains unchanged, boil in alcohol, which should likewise leave a fast orange unaltered.

Green.—Boiled in dilute alcohol, it should not color it blue, green, or yellow; muriatic acid should not be colored red or blue.

Brown.—It is very difficult to test these for their fastness. Boiliug water should not change them to red; when steeped in alcohol they should not become yellow.

Black.—Boiled in water and hydrochloric acid, they should not be yellow.

Prevention of Waste in Manufactures.

In the economy of trade and manufactures, there is nothing more interesting than the prevention of waste, or the discovery of a way by which waste material may be turned to a profitable use. A remarkable case in point has recently occurred. In the manufacture of the beautiful blue and violet dyes that make silken textures and the wearers thereof look so beautiful, there has always been produced a large quantity of dark colored substance, known among chemists as Hofmann's gum. In some aniline dye works the accumulation of this refuse amounts to hundreds of tuns, and has long been a hideous burden. But recently Mr. J. Spiller, a member of the Chemical Society, has discovered that, by the process which chemists describe as destructive distillation blue and violet dyes, quite as good as those extracted in the first instance, can be got out of this gum; and so, as if by magic, the hideous heaps, now lying on the outskirts of many chemical works in England and on the Continent, become as valuable as gold mines, and enterprising chemists reap the reward.

Another instance is reported from Cornwall. The drainage of certain mines there is discharged from a great pit, and flows into the sea. A few enterprizing individuals rented a piece of waste land at the outfall, dug a few catch pits, into which the water poured and threw down a sediment ere it finally escaped. This sediment is ocher, useful for paint and many other purposes, and the quantity collected in this simple way, in one year, was about 2.000 tuns, worth from $2.75 to $5 a tun. These economizers, however, have let some of their profit slip, for a keen contriver dug a pit to intercept their waste water, and in the same year got $1,500 worth of ocher as the reward of his ingenuity,

One more comes to us from Southern Italy, where the people press the oil from olives in common wooden presses, and burn the husks as fuel. A Frenchman from Marseilles went among them, and bought the husks at $4 a tun, and shipped them to France, where, after treating them chemically, he squeezed them in a steam press, and extracted therefrom 20 per cent of oil.—*Chemical Review.*

WATERPROOF PAPER.—A nice article, transparent and impervious to grease, is obtained by soaking good paper in an aqueous solution of shellac in borax. It resembles parchment paper in some respects. If the aqueous solution is colored with aniline colors, very handsome paper for artificial flowers is procured.