strong hopes are entertained of his recovery. But the next day, perhaps, an inflammation is developed in the brain, lungs, or abdominal viscera, and the symptoms become alarming. The doctor is summoned, and assures the friends that "another fever has set in, and he fears it will go hard with the patient."

It may be laid down as a rule, that if alcoholic liquors relieve, or seem to cure one disease, they cause some other, as bad or worse. The pleasurable feelings resulting from the stimulation lull all suspicion of the mischief going on, which is usually referred to the patient having "taken cold or eaten something to hurt him," or, as not unfrequently happens, that modern scapegoat *calomel* is obliged to bear away all the sin and reproach of this deleterious article. The necessity of stimulants, in such cases, is not so great as is generally supposed. The patient is not always dying when the pulse becomes very feeble and intermittent. This is no very uncommon occurrence when the excitement of fever is gone. If there are latent nervous energies, nature will call them into action; if there are none, stimulants will have no effect. I would not take the responsibility of deciding the point whether stimulants of any kind are ever beneficial in these cases; but I do venture the opinion, that if necessary, we have at our command many articles of that kind which should have the preference to alcohol. Of this character are ammonia, oil of peppermint and spearmint, ginger, Cayenne pepper, serpentaria, &c. Some of these act simply upon the *primæ viæ* as stimulants, and by sympathy upon the brain, heart and other vital organs. If we can give the desired impulse to the heart, brain and nervous system without subjecting these organs to the poisonous contact of alcohol, much is gained.

N. GILMAN, M.D.

[To be continued.]

South Deerfield, Feb. 7, 1854.

THE CIRCULATION OF THE BLOOD.

[Concluded from page 154.]

IF Mrs. Willard's theory is founded in truth, "a piece of apparatus" might be furnished, for its illustration, without troubling the "Smithsonian Institution." It might consist of a human body, no matter how long dead, if organization remained entire. The vascular system, being emptied of its blood, and filled with tepid water, the air-cells of the lungs should be injected, through the trachea, with water of a higher temperature; the injection alternating with a suction pump, for its removal, in imitation of respiration; thus heating and expanding, at intervals, the contents of the pulmonary capillaries. The contents of the bloodvessels should now be found coursing bravely, at every point of their circuit. Dr. Cartwright might propose to mend the experiment with a modicum of his "life"; but I counsel his fair protégé not thus to compromise the claims of "caloric," in the anticipated triumph. The doctor has become slippery, occasioned, doubtless, by the lubrication consequent on his frequent handling of alligators, in his play between

"life" extinct, and "life" suspended. Don't trust him; for, truth to tell, his "life" of the blood is a less reliable motive power than her own "caloric." I am as unsuccessful as herself, in conceiving how his "life" can explain or make intelligible his rationale of the circulation.

What is life? The principle of life, regarded as belonging to the aggregate of animal matter, constituting a human body, can only be known to be present, by certain phenomena appertaining to the body, during its union with this principle; and hitherto all attempts at description, or definition of its essence, have signally failed. The manifestation of the union of this "life" with the tissues of the body, may be nearly comprised in the properties of irritability and contractility; but the rationale of this union, the ultimate process by which it is maintained, or dissevered, I fear is beyond the ken of mortal eye, beyond the scope of human investigation. Thousands of instances occur where the cause of death, or the extinction of life, has eluded all the research that science and skill combined could command. The finger of God is applied, or withdrawn, and life ceases. This is the sum of our knowledge of the principle of life; and we know as little of its essence, as of the Divine existence.

But, admitting "life" to be the motive power, in virtue of its control over all the functions of the body, by which the relations it sustains to other objects may be changed; or by which the relations of its different parts with each other may be varied; still, the doctor rejects the vitality of all other tissues, and claims the "life" of the blood itself, exclusively, as the force by which it circulates. The body moves by the agencies contained within itself; locomotion is effected, and we are justified in supposing we understand the rationale of its performance. But the doctor's theory isolates the blood from all motive agencies, except its "life." Is the union of the "life" with the blood by chemical affinity? Or is it a solution; or a mixture? Is the "life" a biped, or a quadruped? Is it a piston, a tractor, or a lever? Does it push, pull, or pry? The doctor will do well to make terms at once, by resolving his own "life" into the "caloric" of his fair adversary; concluding with another distinguished theorist, that "heat is life."

There have been other projectors, among whom, if my learning be not at fault, was one Archimedes; who proposed to move the entire earth with "a piece of apparatus." Unfortunately, he just lacked a fulcrum. Modern theorists are less fastidious. If the fulcrum is at hand, very well; if not, they quietly finish their demonstration without it.

I beg the indulgence of the readers of the *Journal*, while I present a case of suspended animation, from my own practice, in which recovery was effected without artificial inflation of the lungs; and where the repudiated heart was the last organ to make manifestations of life, and the first to indicate its return. I do this, not for the purpose of questioning the propriety of inflation, as a means of resuscitation; nor intending to deny that it may often be indispensable to success; nor that I would now employ the means, then used exclusively, though successfully, otherwise than as auxiliary.

More than thirty years since, after a protracted attendance on a case

of typhus fever, I closed my patient's eyes with my own hands, supposing him to be dead. An hour was spent in the needful arrangements for such occasions, when a friend of the patient took my arm for a walk, it being on a pleasant afternoon in September. We were soon re-called, in consequence of the alarm of the attendants, who observed, while engaged in the usual offices for the dead, slight contortion of the muscles of the face. On my return, however, the only indication of life I could detect, was the slightest possible tremor, in the region of the heart. No attempts were made to inflate the lungs, which were as quiescent as those of the *fœtus* in utero. A large kettle of water, placed over the fire, *after* the supposed death of the patient, had become heated, to boiling; its presence, perhaps, suggesting the treatment pursued; which was all comprised in enveloping the entire body, at once, in thickly-folded sheets, saturated with the contents of the boiling kettle, hot as the hands of assistants could bear. The only motion given to the body, meanwhile, was lifting it on the hands, for the purpose of placing the folded sheets under it. This might have been repeated twice, or thrice; occupying, in the whole, at least thirty minutes, and probably more; making more than ninety minutes since the suspension of respiration. After this lapse of time, the tremor of the heart, previously so slight that I feared it might prove a mere illusion, became more evident; soon amounting to a distinct impulse, while the lungs were yet quiescent; but soon followed by slight convulsive struggles, speedily ending in re-establishment of respiration and circulation. To my great joy, the patient recovered, and probably yet lives.

If we claim the *skin* as the seat of the "motive power of the blood," and that circulation is maintained by the combination of caloric with that portion of blood contained in its minute vessels, thus expanding its volume; what better confirmation of the theory can be furnished than the case above cited? The skin has an obvious advantage over the lungs, in firmness of tissue, if not in extent of surface, affording a more reliable basis for sustaining propulsive force. In sober truth, the skin does, unquestionably, co-operate with the lungs, in some measure, in the process of oxygenation and decarbonization of the blood; carbonic acid, if I mistake not, being one of the products of cutaneous exhalation. May not this, and the following case, at least furnish a lesson on the folly of jumping at once at the conclusion, that the world is mainly indebted to Mrs. Willard's theory, illustrated by Dr. Cartwright's dissection of alligators, for the means of preserving health and restoring suspended life?

I beg indulgence for the egotism of the following case, as it is evidently inseparable from the *subject*. Fifty years since, on a hot summer day, with a group of school-boys, during recess at noon, I made my way from the village school-house to the banks of a considerable river, a mile distant. There were from twelve to fifteen boys, some of them good swimmers. My own purpose was to become a pupil in the art. Although the water was deep, the gradual slope of the banks and the sluggish current making *wading* practicable, I improved it, as a preliminary trial; pushing onward, as I thought, cautiously, intending to turn

when the surface reached my chin, and attempt swimming to the shore. Unfortunately, an abrupt inequality in the bed of the river took me by surprise, and suddenly engulfed me.

My own recollections of that incident do not correspond with those, recently published, I think, by some medical writer, in some journal or newspaper that has fallen in my way. In that case, occurring under like circumstances, the remarkable activity and rapid process of the memory were such, that all the forgotten incidents, actions and events of a life, were re-called to the mind, with entire distinctness; occupying, of necessity, but a few moments of time in the process. In my own case, there was only a confused apprehension of my condition; flitting visions of the tumult and alarm of my associates; a feeling of hopeless isolation from all human aid; an undefinable sense of constraint and discomfort; perhaps some bodily pain, but certainly no agony, though I was conscious I must die. In my own recollection, the time seems short, after my immersion, till I lost my consciousness. My next recollections are of bodily distress, surpassing in intensity, I think, anything I have suffered before or since. I found myself on the sand of the shore, in the hands of my companions, who were rolling me over its burning surface. It was a northern shore, and had a southern declivity; and was intensely heated by an unclouded meridian sun. My sensations cannot well be defined, but it was as if my body was sustaining the weight of a world, and every rotation it made seemed a redoubling of the intolerable agony of the pressure. At first, I was unable to intimate my wish to my deliverers, that they should desist. In due time, however, I succeeded in uttering a moan, to which they responded with joyful shouts, and redoubling their diligence in tumbling me over the sand. My restoration to life was soon completed. For what transpired during the interval of my unconsciousness, I can only depend on my recollection of the account rendered at the time, by that company of boys, among whom there were none more than 12 years old.

My associates were, soon after my disappearance in the water, aware of my peril, but for a short time surprise and terror disqualified them for action. They soon rallied, however, with the feeling that *a life* must be lost, unless rescued by themselves; and with the deliberation of men, formed their plan. To provide against the loss of another life in saving mine, they formed themselves into a line, those who could not swim taking the shore-end, where a sapling afforded a sure support. In this manner, holding each others' hands, the line was extended from the sapling towards the place where I was found, on the bed of the river; my body recovered, and brought on shore. They found me apparently dead; certainly exhibiting to *them* no signs of life, the skin being cold and livid, with entire suspension of respiration. The description of my appearance, subsequently given by my associates to my father, who was a physician, though not in these terms, was in language of the same import; satisfying him that I had been thoroughly drowned. Some time was lost in devising further measures for my relief; the distance to the village, with an intervening strip of forest, precluding all hope of seasonable aid in that direction. My deliverers were earnest in commend-

ing to each other, this and that expedient, till a master-spirit, in that band of miniature men, gained the attention of his associates, by quoting from his own little store of learning, an instance of recovery from drowning, effected by rolling the body in a barrel. But the barrel was unattainable. They decided promptly that the rotation of the body, and not of the barrel, was the gist of the matter, and proceeded at once to a practical illustration. The result having been given above, I have only to add, I am indebted for my life to the resources of a boy less than 12 years old, in planning and executing, with the aid of prompt and able coadjutors, an enterprise, which in France would have been a better passport to "immortality" than to have been the author of an unproved "theory." My benefactor's name was James Jones, and he probably still lives, in some of the western States.

I beg the indulgence of the editors and their readers for thus occupying the Journal with these somewhat irrelevant details. And yet, may not space sometimes be afforded for the record of a noble deed; and of one, especially, which though it might have done honor to mature manhood, was nevertheless prompted by the humanity and achieved by the unaided resources of a band of tiny school-boys.

But, not wholly to lose sight of the purpose of these details; in my own case, the body, being taken from the water, cold, livid, motionless and insensible, does the history of such accidents justify the conclusion that resuscitation would have been effected, had my body been rolled on the *shaded turf*, instead of the *hot surface of sand*, with its declivity towards an unclouded, vertical summer sun? Admit that in the act of rolling the body, the chest might have been slightly contracted and expanded; could it have been sufficient to have made inflation a primary or "chief" item in the process of restoration? If caloric is the motive agency, operating by expanding the volume of blood in the capillaries, surely, in both cases above cited, the vessels of the skin were favored with access to motive material, furnished by the hot water and the heated sand, in sufficient abundance to effect the "expansion" of their contents, which Mrs. Willard claims to be the propulsive force of circulation. In the former case it would be madness to claim that inflation of the lungs could have preceded the phenomena which denoted returning life. Would she have the temerity to claim that the heat was transmitted through the walls of the chest, from the hot water, to the blood in the pulmonary vessels, thus effecting circulation? Inasmuch as the cutaneous vessels were manifestly provided, both by extent of surface, and proximity to the hot water, with vastly better facilities for the expansion of their contents, than the vessels of the lungs, how will she prove that the skin in that instance, during the first moments of returning action, was not the seat of "chief" motive power? Has the organization of the minute vessels of the lungs a demonstrable peculiarity, by which it fits them exclusively for the expansion of their contents by caloric? Cannot heat be communicated to venous blood, independently of oxygen; and will it not expand it? Admitting expansion of blood in the capillaries to be the motive power, its seat could not be claimed exclusively or the lungs. It should be borne in mind that there are other processes

in the animal economy, besides aeration of the blood, during which caloric must be evolved. Does not the nutritive material contained in the aortic extremities, in the consummating act of nutrition, as it escapes from the capillary, and effects coherence with its appropriate tissue, change from the fluid to the solid form ; and can this change occur without evolving caloric ? And why may not this constitute an equal claim, on the part of the aortic terminations, to the seat of motive power ; the two poles of the circulation thus dividing the empire ?

But what proof has Mrs. Willard, that the caloric evolved in the lungs is mainly expended in the rarefaction of the blood ? May not pulmonary exhalation require an amount of caloric for its purposes, too large to leave anything more than the small remainder, which might be measured by the small difference between the temperature of arterial and venous blood, taken from any region of the circulation, near the aortic extremities ? How much caloric does it require to evaporate an ounce of water, having already the temperature of the blood ? I dare not trouble the " Smithsonian Institution " for the chemist to tell me ; but I have just been reversing the process, by puffing my own blow-pipe against a window pane, in an unwarmed room, the thermometer considerably below zero—and the result is refreshing—a sheet of ice, that would convert a glass of luke-warm water into a delicious beverage.

Have the relations of the nervous system to the circulation been sufficiently regarded, in the speculations of physiologists or pathologists, in their rationale either of healthy or diseased action ? There are many indomitable mysteries in these departments, that must probably find their solution in the future discovery of laws, appertaining to the nervous system, hitherto hidden from scientific research.

In relation to the subject of resuscitation from apparent death, there is one fact which not only militates strongly against Mrs. Willard's assumption, that it can only be effected by inflation of the lungs, but puts at nought a goodly portion of the current theorizing on the proximate agencies, ultimate processes, or rationale, appertaining to many of the phenomena of health, disease, and even death ! Many well-authenticated cases of resuscitation from apparent death have occurred, under circumstances that not only preclude the possibility that inflation of the lungs could have been accomplished, otherwise than as an effect of returning life ; but all other known or supposed means of exciting any of the actions appertaining to life, have been equally inaccessible. The supposed victim of death has been wrapt in his shroud, his face covered, and the apertures leading to the lungs compressed with bands ; the body coffined, and laid in state, where no careless footstep might cause a vibration of his narrow house, where no spoken word might break the stillness of the air, where no genial warmth might intrude. Yet here, after a long repose, in the very stillness of death, life, not only unaided, but sorely encumbered by human appliances, has risen from its quiescence, and resumed its sway !

J. L. CHANDLER.

St. Albans, Vt., February, 1854.