after the first application, which only destroys the skin, and a little cellular tissue, has the flow of blood been found to cease in the veins; and they are never found converted into a hard cord, impermeable to the blood. It is only after being opened that these changes occur. M. Bonnet has not even once seen a tendency in the inflammation to propagate itself along the course of the veins, although three or four applications of the potass had been made on different parts of their course, and in the greater number had opened their cavity; the inflammation was, therefore, in all these cases, limited by the bands of adhesion, and perfectly circumscribed. These results prove that destroying the veins with caustic potass does not expose the patient to the danger of phlebitis, "and," says M. Bonnet, "finding every-day proofs of the innocence of this remedy, I now take no other precaution than that of confining my patients to bed."

It is a question for the consideration of surgeons whether it were better to make a sufficiently deep eschar on the first application of the caustic, so as to destroy the vein, or to apply it a second time, as recommended by M. Bonnet. I have found it necessary in a few instances to apply the caustic a second time, but in a very large majority of them the eschar was sufficiently deep by the first application to destroy the vein, indicated by its becoming converted into a hard cord-like substance. Whenever I found the vein continuing pervious, which is denoted by its continued distension, I re-applied the caustic. I have only found it requisite in ten cases to use the caustic, as recommended by M. Bonnet, at several parts of the vein; in five of these it was necessary to use it in two places; in two it was applied in four places; in two in three places; and in one in nine places. I do not advise its application at intervals of two or three inches at several parts of the vein, as adopted by M. Bonnet. Where the first application is sufficient to take in the vein, it is usually found sufficient for the cure. It may be requisite to apply it in more than one place, but this forms the exception to the rule. When the slough comes away, a healthy ulcer is left, which usually heals by the simplest means, and generally at the same time with the original ulcer.

ON THE PHYSIOLOGICAL ACTION OF INHALED ÆTHER.

By J. BLACK, M.D., Physician to the Manchester Union Hospital.

The remarkable, and, we may now say, the popular, administration of æther, by inhalation, for producing insensibility to pain, during surgical operations, and some idiopathic affections of the body, has been put to a very general trial throughout the kingdom. The result, according to the numerous reports, has been, in the great majority of cases, declared satisfactory, and in many cases so successful, that the process has been pronounced

in several quarters, as the discovery of discoveries of the nineteenth century, and as one of the greatest blessings to suffering humanity. It is true that some cases have been reported unsuccessful, and a few others have been candidly represented as either fatal in the result, or followed by injurious effects.

Amidst all these generally favourable and exceptionable reports, although mostly given with practical detail, I have, as yet, seen no scientific solution of the *modus operandi* of this novel application of æther on the animal and sentient organism, and scarcely any attempt at a rationale of the process. Some have stated that the physiological action is narcotic; others sedative; while the majority of those who have touched the question, have compared the effects of inhaled æther with those of intoxication from alcoholic liquors, or the Indian hemp.

After so much practical experience of the visible effects of this remarkable process, it may not be considered premature now to examine some of the essential conditions of the question, to see whether we can approach to any fair physiological solution of it.

In the first place we have the chemical substance, rectified sulphuric æther, long known and used in medical practice as a quick diffusible stimulant and antispasmodic. It is a compound of carbon, oxygen, and hydrogen, and has a specific gravity of 0.750 at 40°, and 0.715 at 60°, according to Dumas and Brande. What is its more peculiar property is the density of its vapour, being at the mean pressure and temperature, as 2.58 to air, as=1. The elastic force of its vapour is another property of most important consideration, being at 54°, Fahrenheit=10.3 inches of mercury, at 64°=15, and at 96°=30 inches, gradually increasing in tension, till at 212° it has a force of 240, according to Dalton; it, moreover, boils under a pressure of 30 inches, at 98°, Fahrenheit.

Let us next examine the conditions of the subjective part of the theorem—the animal lungs and body, to see if there is any physiological path for us safely to follow. The human body has a temperature, varying from 98° to 100°, and we may consider the lungs, immediately after expiration, to be about either of these temperatures. The temperature of the æther inhaled has been at various degrees, from what is called temperate, up to 75°. On this difference of temperature depend greatly the physical and other effects of the æther vapour on the tissue of the lungs, and its ultimate force on the sentient brain. According to Dr. Snow, air, saturated with the vapour, at 54°, contains about one third of its bulk of vapour, and at 75° it contains more than one half. The simple result then of inhaling this vapour, at whatever degree of saturation, will be to increase its elastic force or extrinsic pressure, from 15 to 30 inches of mercury, if it is inhaled at a temperature of 64°. If taken at 75°, at the full point of saturation, the practical increase of elastic force will not be very much less. There can be no condensation of this vapour in the lungs, for even if imbibed in a liquid state, the heat of the body, at 98°, would soon throw it into vapour, that temperature being its boiling point, which is a very curious coincidence.

From these conditions, extrinsic pressure must be, with greater or less force, made on the air-cells of the lungs; it may be hazardous to calculate the amount

but it must be great. The question now is, upon what tissue is this increased elastic pressure expended to produce the phenomena of *ætherization*, among which, insensibility to physical pain and suffering is the most conspicuous? Is it chiefly or solely through the channel of the blood-vessels or the nerves of the lungs, that this exaggerated pressure or irritation is conveyed to the *sensorium commune*? for it appears that the physiological climax is there exploded.

To solve, in some approximative manner, this point, and to see how far the law of *endosmosis* might be concerned in the first part of the process, I inclosed, at the common temperature, some rectified æther, in a piece of recently killed lamb's small intestine, which, after being firmly secured and made perfectly tight by ligature, was found to weigh two drachms, including the contents, which only filled one half of the cavity to allow of safe expansion. This little sac of æther was, with the assistance of Mr. Hallsworth, apothecary of the Union Hospital, immersed and kept down in a vessel, containing about six ounces of blood, freshly drawn from a healthy adult, and which was placed in another vessel of water, kept at the temperature of 100° Fahrenheit. The sac of æther was gently kept under the surface of the blood by a stiff feather, without agitation, and being withdrawn after ten minutes, was washed clear of blood, and cooled down to its temperature before immersion, when it was found to have lost fifteen grains, or about one-eighth of its former weight. This loss was entirely of the æther, for the gut-membrane was the same as before; it was still tight to liquid æther, and therefore the loss must have been by *exosmose* through the gut-membrane. Besides, the blood at the end of the experiment smelled strongly of æther.

This rude and simple experiment may be taken for as much as it is worth, but I cannot help considering it as very much countenancing the view, independent of a *priori* probability or reasoning, that the vapour of æther, through the elastic pressure which it exerts, permeates the walls of the air-cells of the lungs, becomes absorbed by the blood currents, is thence conveyed directly to the heart, and so quickly carried in a direct stream to the brain. All this may be done in less than ten seconds, according to the experiments of Mr. Blake on the transmission of poisons by the blood-vessels. After the vapour reaches the blood current, its elastic pressure is still kept up, if not increased, by the heat of the heart and other internal tissues. This adventitious force will at most, only increase the reaction of the central organ, and distend, more or less, the elastic calibres of the efferent vessels; but when the distending agent reaches the brain in the current of the circulation, this elastic force meets with a counter pressure in the resisting case of the calvarium; its tension will therefore become increased, and the consequence will be, the cerebral mass will suffer pressure, even to paralysis of some of its functions. This adventitious pressure being, however, occasioned by elastic vapour, and not by fluids, however attenuated they may be, as alcohol, it may not, and does not seem in general to lead to any serious or permanent lesion; in most cases the brain soon becomes relieved by the dispersion of the very permeating vapour throughout the tissues, if not by its decomposition,

Professor Christison mentions two cases where inhalation of sulphuric æther produced,—in one, intermitting lethargy for thirty-six hours, with depression of spirits and lowness of pulse; and in the other apoplexy for some hours, and the person would have perished had he not been discovered. Brande appears no farther acquainted with its physiological effects than that “it produces a remarkable species of intoxication when its vapour is respired, mixed with air.”

It is unnecessary to advert much to the actual phenomena that occur after inhalation, as corroborating the views of excentric pressure and distension obtaining in the heart and blood-vessels, with more or less corresponding irritation. We witness, where the process has been successful, frequency and softness of the pulse, swelling and general fulness of the vessels of the neck, head, and face, with laborious breathing, congestion of the eyes, and dilatation of the pupils. It would appear that in many cases, while there seemed to be perfect insensibility to pain, and a suspension of all voluntary movements, yet a consciousness of the surrounding objects and operations remained, rendering this state very similar to that of the mesmeric trance. This appears to be the most difficult part of the question to solve, and requires the most refined analysis for explanation.

Not to leave the solution of this very interesting point altogether unattempted, might not the partial dislocation of nervous function be occasioned by the newly imbibed pressure on reaching the encephalon, being at first and for a time, expended on the base of the brain, which is more immediately in contact or connection with the arteries that convey the blood directly from the heart. The sensory ganglia are here also more exclusively located, and will first suffer suspension of their functions; but if the blood has taken up an undue charge of the elastic vapour, or if inhalation be continued too long, or if the subject is of feeble resistance, the whole parts and functions of the brain will suffer, and enervation, apoplexy, or death, may follow.

Without intruding farther upon your columns at present, I have only to say, that as the whole subject is full of interest, it is very desirable to withdraw it as much as possible from the domain of speculation into that of science; and if the few observations which have here been made tend to provoke some more exact and experimental researches on this engrossing subject, the writer will feel gratified to see the physiology of the matter placed upon a more satisfactory basis than it is at present.

Manchester, March 15, 1847.

ON THE EMPLOYMENT OF NUTRITIVE ENEMATA.

By KENRICK WATSON, Esq., F.R.C.S., Stourport.

The following cases may perhaps be interesting to some of the junior members of the profession as shewing the confidence which may be placed in enemas in those cases, in which either from severe injuries of the throat or fauces the power of swallowing is lost, or on account of irritability or exhaustion the stomach rejects whatever is swallowed. I am very