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ON

ÆTHER

AND

CHLOROFORM

AS ANÆSTHETICS.

BEING THE RESULT OF ABOUT 11,000 ADMINISTRATIONS OF THESE AGENTS PERSONALLY STUDIED IN THE HOSPITALS OF LONDON, PARIS, ETC., DURING THE LAST TEN YEARS.

By CHARLES KIDD, M.D.,

MEMBER OF THE ROYAL COLLEGE OF SURGEONS, ENGLAND;
FELLOW OF THE SURGICAL SOCIETY, IRELAND,
AND OTHER SOCIETIES, ETC.

[Second Edition.]

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1858.

LONDON:
C. W. REYNELL, LITTLE PULTENEY STREET,
HAYMARKET.

To Dr E. BROWN-SÉQUARD.

My dear Sir,

As one who feels indebted for many kindnesses, and for much information during your stay in England, I feel great pleasure in dedicating this little volume to the chief interpreter and physiologist of the Nervous System. I would only fain couple with your name that of the Hospital Surgeons of London, amongst whom, as a class, I have also found the same kindness, the same good feeling, truthfulness, and professional zeal, and I am sure, in dedicating it to you, whom they so much applaud and admire, I am dedicating it to them.

Believe me,

Yours, very faithfully,

CHARLES KIDD.

Sackville Street, London,
October, 1858.

"Man's reason being created after the image of God, he has to use it to discover the laws by which the Almighty governs his creation; and by making these laws his standard of action to conquer Nature to his use—himself a Divine instrument."—*Speech of* H. R. H. the PRINCE CONSORT, *at the Mansion House.*

"'Truth is fruitful and falsehood barren,' whilst the discoveries of the science of the imponderable forces have produced the lightning conductor and the electric telegraph, what fruits have we of clairvoyance or table turning? Astrology was a counterfeit of the truer science of astronomy, and alchemy of chemistry:—apply the test of fruitfulness, and you find falsehood barren, but truth fruitful. You can all readily make the application for yourselves; thus I would invite you also to compare the rapid development in point of utility in our own day of CHLOROFORM, as contrasted with the older discoveries of a like kind."—*Address of Vice-Chancellor* PAGE WOOD, *on the "Tests of Truth."*

With the Author's
kind regards.

PREFACE.

Some friends will probably recognise in the present little book the metamorphosed chrysalis of a former edition of a smaller work of the same kind. So much the better. The administration of chloroform, though a comparatively new, is an ever-changing subject of study, in which the mere bookworm is of little use, except he bring, year after year, his theories to bear on actual facts, as observed in the "fresh fields and pastures new" of the domain of Nature. Our best knowledge of consciousness on the side of the nervous system, as well as our best anatomy of the nervous system itself, are new; we were never before in such a position to understand or explain the action of chloroform, while, on the other hand, in the unequalled beauty of the metaphysical writings of such men as Locke and Schlegel, the giant writers of former years; Emerson, Carpenter, Mill, and Sir H. Holland, still amongst us—we find ever recurring new light to clear up the dark places of chloroform, more especially in its

relation with emotions and the finer actions of the nervous system on the Soul.

It may be and often is objected, that though chloroform is a new, if not ephemeral, it is also a very diminutive subject, scarcely deserving of much attention—that, in a word, any unqualified nurse or assistant with common steadiness of hand may administer it. No doubt chloroform is a small subject: I have made a small book on purpose as a sort of manual; still, as engaging medical men with the study and phenomena of consciousness and the relation of external sensations to ideas in the mind, it is a subject of the very deepest interest, and one, if I mistake not, destined before long to shed some clearer and broader light on psychological medicine and the general phenomena of nervous and mental diseases.

We are still, as regards the mass of the Profession, too much inclined also to look on chloroform inhalation as a sort of lottery—in which it signifies very little whether good or bad æther or chloroform be used—or in how large or how small quantities either of these agents be administered, so that a certain steadiness of hand and inexpensive rule of mere imitation be learned from the out-patients' department of our larger hospitals. But mere steadiness of hand and imitation will not answer in doubtful cases; and a small work like the present, ready in every

way to chronicle every improvement as it arises, must prove more desirable than may at first sight appear.

Lord Bacon says. every man is to be believed in his own Art, and that it is even good to seek help through such aids as rules of science, and something more than steadiness of hand afford,—" for no man," says Bacon, " be he ever so cunning or practised, can make a mathematical straight line or perfect circle by steadiness of hand, which may be easily done by help of a ruler or compass ;" which he may obtain for a few half-pence ! We are beginning to arrive at some such aids or helps as regards the surgical operations adapted to each of the stages of chloroform anæsthesia ; we begin to estimate the comparative value of æther and chloroform, the necessity of using perfectly pure specimens of these agents, as well as the contra-indications to their use, all to be learned by study and attention of the subject rather than by chance hazard.

I have kept two classes chiefly in view in treating on these points in the following pages. One portion of the mass of persons who use chloroform are inclined to underrate the dangers attending its administration ; they " think nothing of chloroform," their rule of thumb, or making a circle by a steady sweep of hand, has been to them of more use than any auguries of evil to be found in the

daily papers. Some "think nothing of a few deaths" from chloroform; but still every conscientious man must shudder at such an idea, and think a great deal of even the chance of one single death, and labour assiduously to obviate its occurrence.

A second class, though probably excellent practitioners, have always done without chloroform, and will go on to the end of the chapter of accidents dissuading their friends from its use. "Our mothers and their mothers did without chloroform in midwifery," said a leading obstetric lecturer to me this year, "and why recommend it to our daughters or wives?" But this—which I call the "old-grandmother argument"—would apply to vaccination equally as well as to chloroform!

The chloroform assistant should be conversant with epileptic disorders, as well as auscultatory signs of disease in the lungs and heart, and he neglects a very serious duty if, in all doubtful cases, he omits to pass his ear over the thoracic walls. He should know if there be mitral disease, or dilated auricles present, or that very enigmatical disease "fatty heart." It is fortunate that chloroform in 999 cases out of a thousand, and especially in hospitals, need never be administered without the skilled ear of the physician of the hospital or family physician having been first made acquainted with what is

going on in the chest. This objection to chloroform, I am sorry to find, though of little moment, is the one that chiefly misleads in practice. The word "diseased heart" is whispered, and chloroform put aside; or, on the other hand, if any tediousness or casualty happen to occur from the surgical operation itself, it is at once set down to the account of the chloroform, and noised about by the patient's friends in no favourable manner.

Not unlike our Medical Reform in general or medical education itself, the subject of chloroform is assuming many new forms. We begin to hear of several distinct things for the first time, such as a "law of tolerance" under anæsthetics, the anticipations of the casualties under chloroform by administration of other stimulants beforehand, such as wine, brandy, opium, &c. We have now, as separate physiological facts, to study common sensation, then also the sense of "touch," the muscular sense or "muscular consciousness" of Duchêne; we have also reflex or diastaltic currents, hitherto but "airy shapes," now taking a prominent place in the prose diagrams of our every-day works on Anatomy and Medicine; we have, also, something every day of the contrasts of æther and chloroform and electricity in practice, and the wide field of mental emotions as bearing on anæsthetics; we have, also, the use of chloroform administered internally—of which I

hope to write again—where chloroform is found to be of value beyond all price. It is, however, in relation to the new, and apparently true, philosophy of the Nervous System recently worked out in France and Germany, that the effect of chloroform on sensation and consciousness, and the reflex or diastaltic system, seems of paramount importance, and the whole subject assumes a new life out of the inert book wisdom of former years.

That some such medicines as anæsthetics existed in former times, I have touched on incidentally; they were called odoraments; the references are only valuable as giving us the actions and reactions of mental and cerebral functions, as observed by such a master of human nature as Shakspeare: indeed, Friar Lawrence seems a master of the art of anæsthetics, as these were distilled from his "baleful weeds and precious juiced flowers."

"Many for many virtues excellent,
None but for some and yet all different.
Within the infant rind of one small flower
Poison hath residence and medicine power;
For this being smelled with that smell cheers each part,
Being tasted wounds the senses with the heart."

And then, when Juliet requires something to put off the pain of being married against her

will, she is presented with a phial, the use of the contents of which is to be followed by

" A cold and drowsy humour, which shall seize
Each vital spirit, for no pulse shall keep
Its natural progress, but surcease to beat.
——— no breath shall testify thou livest,
The roses in thy lips and cheeks shall fade,
And in this borrowed likeness of shrunk death
Thou shalt remain full two-and-forty hours,
And then awake as from a pleasant sleep."

ON ÆTHER, &c.

—o—

CHAPTER I.

HISTORY OF ANÆSTHESIA—ARIEL—EARLY ANÆSTHETICS OF THEODORIC, 1538 — MIDDLETON, OLD ENGLISH POET, 1657 — EARLY EXPERIMENTS WITH CHLOROFORM — EFFECTS ON ANIMALS, BIRDS, LIZARDS, FROGS, FISHES—FOUR STAGES OF CHLOROFORM INTOXICATION —IMPROVED KNOWLEDGE OF THE FUNCTIONS OF THE BRAIN — THE SENSORIUM OF THE ANATOMICAL SCHOOLS AND THAT REFERRED TO BY LOCKE—CONSCIOUSNESS, AS ABOLISHED BY CHLOROFORM.

THE study of CHLOROFORM has now come to be one so essentially of observation in hospitals rather than of mere theory in books that it appears to me that the experience of ten years, derived from constantly watching the peculiarities of this agent by the bedside and in the operating theatre, may tend to some further practical elucidation of the subject.*

* In Feb. 1856, I read a paper before the Medical Society of London, in which the particular surgical operations adapted to each of the three stages of the chloroform process were indicated; that paper, an abstract of which appears in the 'Lancet' of that date, was founded partly on what I had seen in the year 1848-9 in Paris, where I was sent by the

It is not of very much practical interest to trace the history of anæsthetics; it is believed at an early period agents not unlike chloroform were in use. In Shakspeare we have Ariel, the ideal representative of the consciousness of man's inward life—the personified genius of æther or the finer world of spirit, bringing with him a certain form of anæsthesia with which he overshadows the sailors on the island, in imitation of something, no doubt, in the old books of the period:

Alonzo. I wish mine eyes
Would with themselves shut up my [thoughts; I find
They are inclined to do so.
Seb. It seldom visits sorrow; when it doth
It is a comforter. [*asleep*).
Alonzo. Wondrous heavy (*falls down*
Seb. This is a strange repose, to be asleep
With eyes wide open; standing, speak- [ing, moving,
And yet so fast asleep.

---

conductors of the 'Medical Times' to watch the progress of 1,600 surgical cases—men and women wounded in every conceivable manner by gun-shot wounds in one of the *emeutes* peculiar to that city; where I attended day by day alongside the veteran Roux, the experimental Jobert, and the experienced Velpeau, and where chloroform, which had just "come out," was being used in hundreds and hundreds of operations. I subsequently visited Germany on the same mission for the 'Medical Times,' and I have been almost continuously, since 1849, attending operations in the various London hospitals, and contrasting the effects of chloroform in each for that Journal or the 'Lancet.'

In that singular old book, 'Burton's Anatomy of Melancholy,' it is stated that a ball of opium, if inhaled or smelled-to, causes sleep; and pillows of poppies, hops, and henbane were much used at that period. A few years before the discovery of anæsthetics some noise was made in England that æther, being inhaled, had killed asthmatic or other patients, but nothing apparently was made of the fact. There is a very interesting field yet untouched perhaps—viz., the combination of different forms of anæsthetics and narcotics together. We give perhaps too much chloroform; a smaller quantity, with some modification of æther, hops, or henbane, being more safe. In a recent case of operation a patient got two grains of opium immediately preceding chloroform administration. It is well to remember that something like 14 or 15 per cent. of chloroform vapour is considered the *maximum* of this agent which air, respired by patients, can contain; a larger quantity will probably evaporate in summer than winter, but a per-centage, of even half this amount, will be exceedingly dangerous. It does not seem to find any favour with surgeons, except in case of operations on children, to mix chloroform with any other fluid—chloroform mixing badly with other fluids; yet the plan observed on the Continent of mixing æther with chloroform seems very deserving of trial, as we thus insure a certain proportion of chloroform, which, in combination with spirits of wine, should never exceed 5 per cent. in the air respired. Æther, however, is not one-fourth as active as an anæsthetic agent as chloroform is reputed to be.

Many agents that we would now designate anæs-

thetics are noticed in Pliny and Dioscorides, while even so early as the third century the dusty manuscripts of our libraries tell of a certain Chinese physician, named Móa-tho, who performed many surgical operations in this fashion. Guy de Chauliac and Theodoric speak even of anæsthetics applied by inhalation; the references to the operations of the latter by a quaint old writer in 1538 are startling and characteristic. Speaking of the mode of operating, as practised by various surgeons before that epoch, it is said some give their patients anæsthetic medicines, in order that the patients may not feel the cutting with the knife. Opium, mandragora, or succus morellæ, dipping in it a sponge, and letting this dry in the sun, and then, when used, placing this medicated sponge in hot water, which they give to the patient to inhale till sleep is produced, and when the patient is asleep the surgeon then performs the operation. ["Aucuns leur donnent medicines obdormiferes qui les endorment, afin que ne sentent incision; opium mandragoræ succus morellæ et plongent dedans esponge, et la laissent seccher au soleil, et ils mettent cette esponge en eaue chaulde et leurs donnent a odorer tant quilz prennent sommeil, et quant ilz sont endormis lz font l'operation."] This Author even describes what is to be done in case this process of inhalation should prove too soporific and the anæsthetic effect should last too long, for then the patient must be sprinkled with water, and a particularly medicated vinegar, like our aromatic vinegar, should be given the patient to inhale! An old English poet, too, has often been referred to, who says he will "imitate the pity of old surgeons who, before

they show their art," first cast the patient into a sleep, and "then operate on the diseased part!" In fact the references to former anæsthetics are so common that it is possible they may again fall into oblivion.

The special action of chloroform on the inferior animals is very instructive, and seems to be in proportion to the development of the centres of the senses and of respiration—in other words, in proportion or relation to the absorbing surface for the chloroform in the lungs, and the activity of feeling, and of the general nervous system so well mapped out for us now by M. Brown-Séquard.

Birds, for instance, where the respiratory system is so perfect, are more easily affected than lizards or frogs; in birds the entire frame almost, with the cavities of the long bones, are engaged in respiration; the optic ganglia, the analogues of the tubercula quadrigemina, whence may be traced all the nerves of sensation, general and special, are soon brought under the dominion of the anæsthetic, as the latter nerves are so well developed and spread over the body.

In lizards and frogs, on the other hand, and in snakes, the specific irritation of chloroform on their large spinal cords and muscular system is more marked. Snakes, though previously torpid, are roused up by their muscles being thrown into action by chloroform. As fishes, some of these creatures breathe chiefly by gills; their brain, also, is less developed than that of the bird. The posterior end of the spinal cord in man is first rendered insensible, the complex arrangement of nerves and of cerebral grey matter about the head resist longer!

A lesson of practical import arises from this:—that, as we said before, we should observe caution in using chloroform in patients, where we have to fear badly-balanced excitability of the cord or pons varolii, as in epilepsy or hysteria, as we might increase these—as in the soldier lately in Paris, who died—in the second stage of chloroform; or if the consensual group of actions, on the other hand, are likely to be deranged by diseased cord, protracted anæsthesia in the third stage may destroy them altogether, and death follow such a condition. The emotional actions of the brain must also not be forgotten; mixed up it seems, after all, curiously enough at least in man, with the nerves of the sympathetic system; a severe fright or a severe burn may so paralyse the heart and sympathetic system, through the shock to the semilunar ganglion and emotional part of the brain, as to kill a patient, yet leave no trace behind! In chloroform, in a word, as Cullen said of typhus, "we must obviate the tendency to death;" but it is clear, before doing so, we must learn and observe in which direction the tendency is most likely to lie.

Leaving this subject at present, we have perhaps two chief points in practice to attend to—the nature of the anæsthetic we use, and the peculiar constitution of our patient before using it. From some considerable observation of several thousands of operations on persons under the influence of chloroform, both in Paris and in London, I think I may say that we did not, ten years ago, sufficiently attend to the various stages of chloroform anæsthesia, or apportion the dose of chloroform with sufficient slowness; we now read, at that second dawn of anæs-

thetics, of chloroform used by the *half-ounces* at a time; and a minute or two was thought sufficient in point of time into which all the various stages were huddled, if the operation did not end in asphyxia. It is now done (in 1858) with more caution and according to stages—the pulse and respiration being both watched, as well as the sensibility of the eye. Some surgeons, with whom I am inclined to agree, advise the patient—the stomach, of course, being empty—to be brought under the influence of chloroform in a darkened chamber, not in the streaming sunlight and agitation of the operating theatre, the patient having previously taken a little wine; very much of the over-dosing of chloroform (and it will be remembered we have had already over 100 deaths from this agent) arising, they believe, from the increased or cumulative amount necessary to dull the emotional excitement or fear of the operating theatre, added to organic or other disease already existing. This precaution of a darkened room, I cannot help believing, is very necessary to be observed where we have diseased lungs, cancer, or intense emotional agitation. It might be a question whether a very small dose of chloroform might be not more efficient, if a patient were already sleepy from morphia. The sleep of opium is perhaps not very different from the sleep of chloroform; we shout in the ears, and drag the body about, to prevent it falling into the sleep of opium; yet we too often do the same with the patient getting under the sleep of chloroform, and wonder he does not fall asleep. One often sees ingenious assistants hold a woman—plunging in the second stage of chloroform—by her poll of hair, or ears, and yet be

astonished she is not asleep; we should remember this plunging of patients is a thing they cannot control, no more than a somnambulist can prevent himself walking into a river, or an epileptic can prevent his fits.

Chloroform acts on the system evidently in a progressive manner, and this brings us to consider at least four well-marked stages of chloroformisation marked out by nature.

If we watch an infant in which the muscular system and cerebellum are not yet very well developed getting under the effects of chloroform, we notice the first feeble struggles, and crying, gradually end in a gentle sleep; we have here the first and third stages of chloroform well marked.

Practically there are, perhaps, only three stages: One of excitement, or as Jobert styles it "exaltation of sensibility;" one of anæsthesia; and a third of complete prostration; but looking at chloroform inhalation, in a purely physiological point of view, we notice four stages, beginning with slight excitement of the cerebral lobes and cerebellum. Secondly.—Excitement, probably of the pons varolii, as shown in the plunging of patients. The third stage, called the surgical stage by some—here anæsthesia really begins; the functions of the spinal cord are abrogated, the conjunctival surface of the eye-ball, generally so delicate, loses its sensibility; the pupil too, I think, as a rule, contracts, and the eye turns up; the pulse certainly gets larger and softer, whether from the anæsthesia spreading to the sympathetic, as in Bernard's experiments, and a certain relaxation of the muscular coats of the arteries taking place from chloroform, might be a

question of curious speculation. There is a *fourth* stage, but one always to be avoided; a state of helpless and complete immobility, which becomes additionally dangerous if the paleness of face or prostration of nausea also sets in to prolong this very alarming condition.

In strong muscular men, especially those who have undergone tedious irritating wounds, or suffered from disease for some time, the chloroform process—from what I have observed in hospitals—is usually a violent struggle or plunge, almost from first to last, in other words a prolonged *second* stage. The cause of this is, perhaps, that the muscular system is so well developed, and the irritability of the spinal nerves is very great. This second stage of anæsthesia under chloroform is remarkably like ordinary wine-intoxication. It is well known that some of the weakest of the Rhine wines—remarkable for their *bouquet*, or flavour like æther—also produce this species of intoxication much more readily than an equivalent of strong port or sherry or brandy.

To this second stage (so much better seen in adult men than children or women—every where that the muscular system is well developed) succeeds the *third* stage—that of general anæsthesia, or absence of feeling—beginning earlier in the inferior half of the body, or that more immediately under the influence of the uncomplicated cord or simple spinal system, but subsequently engaging the upper half of the body and the brain, more particularly the "corpora striata" and "optic thalami;" these great centres of feeling and consciousness, in fact, no lon-

ger responding, as was their wont, to the peripheral impressions of pain or touch! I have known a patient not feel the sawing of a bone or a red-hot iron as such passed round his shoulder, but he felt a blunt instrument in the one case pressing on the articulation or shoulder, or with his ears heard the saw in the other case. Patients under ice will also not feel the first incision, but feel the deeper incisions acutely, so that the anæsthesia is in all these cases more complete at the distal or peripheral end of the nervous system at the surface than at the centre. The connection yet separation of the two is also well shown in the familiar fact of erroneous sensations of limbs and toes twitching, though long amputated; here also a refracted false light, so to speak, is thrown upon the sun-dial of Locke's *tabula rasa*, the brain proper. The patient, it is true, forgets all about the operation, and as a general rule will not believe when he awakes from his anæsthesia that the operation is all over. Nay, the sensorium itself, as long since well supposed by Locke and others, becomes involved from want of a supply of ideas conveyed by the touch or other senses, "steeped so long in forgetfulness;" while the patient is in this stage he requires all our watchfulness, for it is quite idle to deny that when the sensorium (or all that part of the brain coterminous with the centre of volition in the grey matter of the cord and locus niger, with the vesicular matter of the mesocephalon and medulla oblongata) becomes affected, or its function for the moment destroyed by chloroform, it is idle to deny that the subject of experiment is not in the balance between life and death. A single

dash of cold water or a fresh blast of pure air may save him, or the absence of these hasten him into the fourth stage, that of syncope or collapse—always, I think, to be guarded against, but not always reached, and distinctly different from anæsthesia.

CHAPTER II.

COMPARATIVE VALUE OF ÆTHER AND CHLOROFORM—ÆTHER AS USED IN ITALY, AUSTRIA, AND AMERICA—THE "VIENNA ANÆSTHETIC" MODES OF ADMINISTERING CHLOROFORM—IMPORTANCE OF THE STUDY OF EMOTION!—EXPERIMENTS IN LOWER ANIMALS SOMEWHAT UNSATISFACTORY — EMOTIONS PURELY PSYCHICAL PHENOMENA.

An ounce of chloroform per hour is the quantity generally understood to be necessary in midwifery cases, and Professor Simpson speaks of something moderate in having used in such a case six ounces of chloroform in twelve hours; he is also in favour of quick or sudden induction of anæsthesia by this agent in surgical operations! I think one of the chief objections to sulphuric æther is the enormous quantity of it which is required even in common operations, even so much as twenty ounces! It is advised by some, if the face become pale and agitated, either under æther or chloroform, to stop the inhalation; but I have, over and over again, remarked that the face usually becomes pale when vomiting is impending, so that it requires considerable experience to distinguish one condition from another—a condition of syncope from that of nau-

sea. Many persons are ready to say these peculiarities are of no moment whatever, and may be practically disregarded, and the more generally chloroform is used the less will be the danger. This may be true for a large number of cases, as it may be true that some surgeons have done twenty cases of lithotomy one after another without any casualty, but in the twenty-first case it may make all the difference between life and death—it may embrace the whole art of surgery, in other words (when a difficulty arises) to know what to do.

Sulphuric æther was recently applied by Mr Curling at the London Hospital, but, though immense quantities were used, it did not succeed; I had the advantage of assisting in the application of sulphuric æther more recently in two cases, one day this month, where the patient, a woman, at St Mary's Hospital, was kept well under its influence for about an hour! I say advantage, because with our modern experiences of chloroform and amylene one may study the process by æther, and contrast it with that by chloroform better now than formerly. Our American friends would wish us to believe that there has been no accidental death from æther, but according to cases of this kind collected by M. Trousseau, we find that of forty-nine sudden deaths thirty were from chloroform and nineteen from æther; this strikes me, however, in some very unaccountable manner, as affording a not very exact idea of the relative danger of these two agents. In a communication with Mr Hayward, of Boston, who has applied æther a thousand times without accident, he said to me he knew of no deaths by it in America. The point urged by Simpson of six per cent. of patients saved

after surgical operations by chloroform, though opposed by the statistics of my friend Dr Arnott, has been further corroborated by Bouisson, of Montpelier, and others; and all the nervous symptoms, such as mania, conjured up a few years ago as occurring so often after operations by chloroform, have vanished away. In Italy, as any summer tourist may discover for himself, chloroform is almost unknown, and hundreds of most excellent surgical operations are performed at Naples, Rome, and Genoa, &c., either with æther alone or the "Vienna anæsthetic."

In testing the activity or progress of chloroform inhalation, the absence of reflex sensation in the eyelids ought not to be taken, as recently urged amongst wounded soldiers in the Crimea, as the *earliest* and best test of the action of the anæsthetic; it is, perhaps, the *last* test on which we can rely, we have nothing beyond it; the patient is then almost entirely out of our power. In the French Military service, during the war, where chloroform was used in tens of thousands of wounded, the rational and safe rules were promulgated—never to wait for the total abolishment of sensibility, as bullets, balls, and fragments of shell are best extracted in the *second* steps of chloroform inhalation. This stage may be always ensured by diluting the chloroform.

A very safe substitute for pure chloroform in children's cases offers in what is termed "chloric æther," or a solution of chloroform in spirits of wine. Chloric æther itself, as we might have theoretically expected, has no existence. In America (the birthplace of modern anæsthetics) a mixture of two parts of spirits of wine and one of chloroform is used

under this name, which gives off eight to ten per cent. of pure chloroform. In Austria the State has arranged a combination of æther and chloroform, to ensure safety from sudden deaths; chloroform, according to a recent statement of M. Flourens, however, has been used 25,000 times amongst the French soldiers in the Crimea, without any bad result. All that can be said is that, taking the sensibility of the eye lids as a test of the powers of anæsthetics, both æther and amylene affect this part much less than chloroform!

The relative proportions of chloroform, as we see it every day in practice, varies for particular patients in an infinite number of ways; in other words, the doses of chloroform required in surgical operations are found to change according to the muscular or nervous development of each patient, age, sex, physical capacity of lungs, emotional excitement, &c. It does not seem a good plan to use chloroform sprinkled on a piece of lint with oiled silk, as very commonly adopted at one or two London Hospitals, as the oiled silk hinders air passing, and prevents the evaporation of the chloroform. A common cambric handkerchief in form of a cone, or the simplest kind of inhaler, without complex tubes, seems to answer very well, and as simplicity should be always studied in anæsthetics as in many other things, perhaps either of these should be recommended.

A true philosophy of consciousness and pain is very much mixed up with the safe exhibition of chloroform! Pain, it need hardly be observed, is a great leveller; the "shock" of pain brings down the strongest man to the level of the child. Nor is

there any professional greatness in surgeons visiting the sick with unnecessary pain; even wounded soldiers, that dare the horrors of the battle-field, will wince at the knives and saws of the surgeon. To deny them chloroform, as at the beginning of the present war, seems unphilosophic as regards pain, and not very full of meaning as regards surgery! Chloroform, as a general rule, is not at all a depressing agent. Hæmorrhage, or fear, or protracted pain, or "shock," as the result of a wound—any one or all of these will do more harm than chloroform. We see this every day exemplified in civil practice—in the horrible shattering of limbs by machinery, where the patients beg to have chloroform, and the first effect of which is to equalise the circulation and remove the depressing horrors of pain.

It requires more than moral courage to battle against pain. When Bossuet, for instance, one of the greatest men of his day, was told he had a disease requiring a surgeon, he became sick and quite unmanned, and would not listen to the words "surgical operation." D'Alembert, the intimate friend of Newton, also refused to be operated on for "stone," and no moral courage or entreaty could bring him to submit to a single incision, preferring rather to die without pain. Even Sir Humphry Davy, in our own age, entertained some very singular ideas as to the nature of consciousness and organic life, believing sensibility remained in the dead body till chemical decomposition had entirely destroyed it, and he would not, for the universe, before his death, give permission for a post-mortem examination of his own body to be made after death, fearing the pain! What Dr Hall, in his memorable notice on chloroform

in the Crimea, and Dr Cole, more recently in India, may have intended by pain being a stimulus—and the re-opening of wounds, cutting out of balls and bullets, sawing of bones, probing of inflamed joints, and periosteum, in soldiers torn to pieces on the battle-field, as a sort of mild restorative or cordial, preferable to chloroform—it is not easy to conceive. I cannot help believing that one thing only was wanted to make our Military surgery perfect, and that was chloroform. From some correspondence with Sir Andrew Smith, I believe that is his opinion too. 25,000 times, as we have just said, it has been used in the Crimea by the French. Could Larrey have lived to read such a fact how great would be his delight!

Shakespeare, indeed, more true to the prose of every-day existence, gives us the pain and turmoil of human feelings as making up the entire sum of human life; and when he wishes to give us a world free from pain, he shuts out passion, pain, and suffering by an anæsthesia of his own (no doubt in imitation of something in the books of that age)—the witching herbs and juices of Oberon; the fairies in their dreamy half-conscious scenes, amid their enchanted charms and twilight, giving us some very singular analyses of sleep like that of chloroform—and the same merely animal emotions and consciousness—in the "fierce vexations of their dreams" that we see in invalid, or sick, or hysteric men and women—the modern Titanias and Oberons of every-day life! The errors of consciousness after chloroform, in fact, in hospitals are sometimes not more extraordinary than those of Bottom and other

characters in this play. In other places Shakespeare describes melancholy, lunacy, and delirium, as though they were cases in a medical book, while in the herbs and juices of Oberon I cannot help believing there is some foreshadowing of chloroform, or a description of some old incantations or magic now forgotten and lost.

The study of consciousness is very interesting. Modern psychological science perhaps has solved the difficulty of this consciousness of the poets and metaphysicians. Simple feeling or its excess called pain, blotted out at will by chloroform, is the great peripheral source of consciousness. Memory, though Sir B. Brodie supposes it to have an organ to itself, is perhaps nothing more than the ground and principle of association of these ideas, one with another, set up in this active or healthy consciousness—as colours by specific relations of rays of light, music by specific relations of sound, &c.; even reason itself, the great distinguishing mark or inalienable right of man, is by some thought to be built up also alone of this memory and consciousness scattered to the winds by chloroform. Leibnitz, and some moderns, go higher still, and give us in association with these facts of sensation and consciousness certain innate ideas in the brain or mind—ideas of "good and evil," ideas of time and number, and so forth, denied by Locke, which make man to become as one of an entirely higher series of beings than the lower animals; ideas of harmony and beauty of no use to the lower animals, not disturbed by chloroform more than by common sleep, while in all else man, of course, shares in the same physical

and mental agents—air, and water, and electricity, heat and cold, pain and consciousness with them. This distinction between man and the Gorilla is of very great importance to medical men as regards chloroform, and, in a psychological point of view, very deserving of study.

CHAPTER III.

IMPORTANCE OF STUDYING THE DIFFERENCE BETWEEN PHYSIOLOGICAL EXPERIMENTS ON FROGS, LIZARDS, BIRDS, WITH ÆTHER, CHLOROFORM, &C., AND THE ADMINISTRATION OF SUCH ANÆSTHETICS IN HOSPITALS IN THE CASES OF SICK AND EMOTIONAL MEN AND WOMEN!—EXPERIMENTS ON ANIMALS ONLY "PART OF THE TRUTH"—AS TO PERIOD NECESSARY FOR INDUCING CHLOROFORM ANÆSTHESIA;—SHALL IT BE SHORT OR LONG?—IN FORTY DEATHS FROM CHLOROFORM THIRTY-SIX OCCURRED IN THIS, WHICH MAY BE CALLED THE "EMOTIONAL STAGE"—HOW DOES EMOTION KILL?—EMOTION OF FEAR ACTS PARTLY AS THE RESULT OF DREAD OF SURGICAL OPERATION, PARTLY OF TERROR AT LOSS OF CONSCIOUSNESS — PATIENTS OFTEN UNNECESSARILY FRIGHTENED AT CHLOROFORM—CHLOROFORM PARALYSES THE HEART, ÆTHER DOES NOT—DETAILED EFFECTS OF ÆTHER—METHYLATED ÆTHER.

We even still perhaps, notwithstanding all the advantages of local and general anæsthetics, allow too much pain in surgical operations. Our art, or the benevolent mission of the medical man, henceforth

is as much to do away with pain as to prevent hæmorrhage or fever. There is no peculiar bravery in the surgeon wishing a fellow creature pain; there is nothing in all surgical science now to the man of delicate feeling worth one half-minute's pathological cutting open alive of a human being, or even of one of the lower animals, as told us in the fragmentary legends of Majendie's vivisections. We have no right, nor can it in any way give satisfaction to the rightly-constituted mind, to pain even a midge or a worm. These creatures cannot defend themselves. Many of them, it is true, are not endowed with as complex a sensitive system as we are ourselves, but the apprehension of pain may be the same. None of us can say how much of truth may be in the fine words of Isabella—

"The sense of death is most in apprehension,
And the poor beetle that we tread upon
In corporal sufferance finds a pang as great
As when a giant dies."

These lines might be written with advantage over some of our operation theatres—or do we sometimes forget such a thing as pain; or with one of the Germans, Schlegel, believe it to be a non-existent quantity in our surgical calculations, a mere metaphysical or subjective abstraction, as Schlegel says, for the purpose of giving a zest by contrast to pleasure; that there is no such thing, in short, as pain; the terror of falling off a cliff into the sea, the fright of a thunderstorm, the horrors and blood of a battle-field, &c., merely creating transient impressions of a sudden overpowering kind, making place for elevating emotions of pain if you will, but which he calls pleasure or the sublime! A true philosophy of

pain, as we have remarked, is very much mixed up with the use of chloroform. Metaphysical abstractions of this kind (of Schlegel or Dr Hall) will not satisfy a man having his leg cut off without chloroform! Shakespeare says, he never knew a philosopher who could stand a tooth-ache! Mr Cole, an Army Surgeon, says, pain is a great blessing as a stimulant. He had the care of 18,000 troops in Indian battles, and says he would abolish chloroform altogether—pain being a stimulus in surgical operations, after cannon-shot, which no other stimulus can equal; it is not easy, however, to agree to any such doctrine at all. I believe most thoroughly in the mischief done by "shock" in surgical cases, and I am satisfied a very large portion of the mischief is due to pain!

It is of considerable interest to know and to be prepared for the fact, that, after inquiring at various London hospitals, as to what class of patients require most chloroform, I was told that hysteric and nervous young women—in short, those who most fear pain—are those who are brought with greatest difficulty under the soothing effects of anæsthesia. I am in the habit of placing a word or two also opposite the names of my private patients, to whom I have administered chloroform, as to whether each bears it "well," or "badly," "very well," or "very badly," and I find the last-named phrase "very badly" opposite almost all young female patients!

An interesting fact was also observed amongst *prisoners* in the Crimea, especially French prisoners, who were carried wounded to the field hospital of the eminent Russian Surgeon M. Pirogoff; it is referred to by him quite without reference to any theory,

namely, that the prisoners who were brought in terribly frightened and wounded to the hospitals of Sebastopol, and who were lying in hospital alongside the poor mujik, or Russian serf, almost invariably required double or treble the amount of chloroform that the calm stolid Russian soldier inhaled; this was purely a matter of emotion, and shows that their sense of pain or death, also like that of the beetle, was most in apprehension. The poor mujik, when wounded, was already half asleep from fatigue and exhaustion; the French soldier, on the other hand, was probably taken prisoner in a state of violent passion and excitement, not much lessened by knowing that an arm or leg was to be also cut off at once, as a primary operation, by strange surgeons. What barbarity this would be if done without chloroform, according to Mr Cole, every humane surgeon must be permitted to say for himself!

To understand the action of chloroform on man we require to study its purely physiological, as well as its metaphysical, relations to the brain. Very grave objections have been raised against chloroform for its destroying consciousness of the central organ of which we know so little; and thus trifling with human life, the entire framework or scaffolding of man's moral and sentient existence being built up on this external consciousness. It is probable that in looking for the centre of consciousness, or the soul, we have directed too much attention to the great nervous centres of the brain proper, as the sources of consciousness, life, and thought; and we have neglected the web-work of spinal and diastaltic relations of nerves all over the

frame, as the proper nervous system influenced by anæsthetic vapours. I know in this impression I differ from Dr Hughes Bennett and the Edinburgh School. Sensibility and pain are, it need hardly be observed, the great outlying roots or messengers of consciousness to the brain; if this internuncial function of the nerves be partly destroyed by chloroform in the capillaries, or ice acting on the capillaries, anæsthesia may be induced; yet the centre of consciousness may be perfect (though a *tabula rasa*, as described by Locke), for no sensations from the five senses are referred to it, while the largest dose of chloroform may, in fact, only require proper respiration and an absence of syncope or of asphyxia, for its elimination from the system, or more correctly perhaps from the capillaries, to re-establish the relation between external or internal consciousness. Some, but not all, of the danger of chloroform inhalation arises evidently from going beyond this mere anæsthesia, and by cumulative doses abolishing nervous or voluntary motion, as of the diaphragm to wit, as well as sensation; even abolishing the reflex sensibility of the eyelids. We should always keep before us, as a purely physiological effect of chloroform, that death occurs either from asphyxia or syncope; in other words, from total absence of the natural irritability of the air passages or of the heart. The centre of consciousness all this time, like the sun-dial, though not shone upon, may be ready to receive the impressions of the outward senses; the brain, in other words, may be unaffected; but death begins in the lungs, as though the patient were drowning; or begins in the heart by syncope—so that there is really very little force in the objection

of metaphysicians and divines to chloroform, namely, that we destroy first man's consciousness; we do not really trifle with man's consciousness more than when we prescribe a dose of morphia; the centre of consciousness or the soul is perfect in each case, but we have blotted out the sunlight of external sensations and of the senses, and all is dark!

I believe, in point of fact, that there is a great deal that is highly important in relation to the study of chloroform as regards man and psychical emotions that cannot be arrived at in experience on the lower animals, such as dogs, rabbits, &c. Even if chloroform were used for nothing else but for rendering patients perfectly still during some delicate operations, as those in the interior of the globe of the eye, or in such plastic operations as those for mending a torn bladder in poor married females; or such admirable operations as some resection of joints, &c.; if chloroform did nothing else but relax the parts in other cases, such as old dislocations, or relax the inguinal canal in severe strangulated hernia, &c., still it would be an agent of vast utility; but when we now can appreciate, in addition, its value in lessening or banishing pain from surgery, it is indeed a boon of which the Cheseldens and Astley Coopers in the far-seeing wisdom of their day never had the slightest expectation. It is a glorious thing for us, and even for our friends, the military surgeons, which the "world will not willingly let die."

In studying the effects of chloroform or æther, indeed, in this way it is obvious that anæsthesia becomes influenced in a thousand ways by mental emotion, which we can in no conceivable manner imitate in the lower animals, and influenced by the

nature of wounds and diseases, that it must ever be impossible also to produce artificially. We see patients constantly who fall fast asleep after an operation by chloroform; the emotional dread of the operation, with the pain of previous illness, is at an end. All the history and poetry of the emotions thus becomes useful. Ariel thus contrasts curiously with Caliban the soul or finer emotions of man's nature with his mere animal or brute instincts, Caliban signifying, according to the commentators (χαμαι βαν), one grovelling all fours upon the ground, as a pig eating pig-nuts; not far removed, perhaps, from our poor Russian serf or mujik. Both the mujik and the French prisoner are, no doubt, affected by chloroform, but both differently. As regards emotions, we must now never forget that contractility of muscles may be called into action by *psychical* stimuli or mental acts quite as much as by physical agents. It may be the same with the heart and other parts.

In connexion with chloroform it is well to keep in recollection that the nervous centre from which the muscles derive their impulse to contract is the same whether the movement be prompted by an impression which does not form an idea in the mind or an impression giving a sensation, an emotion, or a volition.

A little while ago I suggested the danger of administering chloroform to epileptic or hysteric patients. The experiments of M. Brown-Séquard fully bear out that impression, as it is only by rendering one side of the face of the animals experimented on insensible and irritating that insensible side that he can induce the fit of epilepsy! Who shall yet speak of the precise parts of the brain

anterior or posterior to the corpus callosum, that emotional half way house where chloroform lingers latest? Reference was made to a very profound remark by M. Brown-Séquard, that we do not yet know at what part of the brain external physical impressions arrive before they furnish *ideas* to the mind, some parts receiving external physical impressions very probably, and sending only reflex impressions again, of which a perfect idea is not necessary, the retina receiving one kind of physical picture at which the mind looks as at a photograph, hyperæsthesia, too, curiously alternating with anæsthesia in these epileptic cases! Nay, whatever causes paralysis of sensation (recognised by decussation at the opposite side) causes this very hyperæsthesia by more blood in the vessels of the limb from paralysis of its vessels! The amount of *vis nervosa* in the body is always a constant quantity; but one of the greatest drains of nervous force is afforded by the emotions of the mind. A man will scarcely die from an amount of exercise more to him than a steeplechase is to a horse, yet such men have dropped dead from the simple nervous exhaustion of a fright, such as looking at a ghost on the stage, or men have died of the alarm from a thunder-storm! On what part of the brain do emotions act? Are they, as some one says, reflex actions of the soul itself on the body? According to Locke, ideas in the brain either are modifications of thinking in that part or perceptions *ab extra*, objectively looked at or studied by the consciousness, we sometimes may thus objectively look at one part of the brain, as it were, receiving certain half-formed impressions from another part.

In America, I am told, patients are brought under the effect of æther in two minutes, and in Austria and Italy even in a shorter period, so that it is not considered remarkable that chloroform anæsthesia may be induced in the same period.

As to the amount of time necessary for bringing a patient under the effects of chloroform, I think seven minutes, as observed by the assistant at St George's Hospital, or ten minutes at Guy's, is too long. The plunging is excessive. At the same time it is difficult to lay down rules. I had two cases this month myself, on the same day, with dentists near Hanover square. One was a lady who had eight teeth out; she bore it admirably, and went as quietly as possible through the process; she was completely anæsthetised in three minutes. In the case of another lady, however, on the same day, who had only one tooth out, I gave her what was thought a more prolonged or mild dose of chloroform; but the mildness, as Professor Simpson suggests, caused violent plunging and restlessness, and I had to increase it. A death at St George's Hospital, from fainting and excess of emotion, exhibited the danger of emotional depression. Dr Snow, however, who had been for years in attendance at that hospital, applying chloroform, did not seem to think it a death fairly ascribed to chloroform. We hear of deaths, for instance, from such a simple operation as perinæal section, but where no chloroform had been given, so that there is nothing more faulty than generalising from a dozen or two of cases at one single hospital; but as I propose to devote an entire paper to this grave and terrible subject of death from chloroform, I will only at present say

that I think a good rule to follow — and one acted on this month in a case by an excellent and cautious surgeon, Mr Lane, of St Mary's—is, in all exceptional cases, to substitute æther for chloroform. In this case the man had had chloroform previously for another operation, and was on the point of death from syncope. Mr Lane was now called on to perform amputation of the thigh for the same disease; so his substitution of æther in place of chloroform, though we watched the pulse with great anxiety, was quite successful.

I am, I hope, not unduly anxious to dwell on this subject of emotional irritability and depression on the part of surgical patients in the preliminary steps of chloroform administration, as it is of necessity very much lost sight of in the large London hospitals. In private practice I have often found, on the other hand, it required a good deal of moral courage, especially in midwifery cases, to decide whether we shall at once induce complete anæsthesia, the emotional anxiety and hysteric jactitation is so great; there is very little or no danger in these cases in doing so.

In expressing a belief that chloroform does not act so profoundly, or in such a specific manner on the brain proper, or that part of the cerebral mass above the *septum lucidum*, as it acts very obviously on the simple grey matter of the cord and medulla oblongata, I feel we are borne out alike by what we see in hospitals, and what is revealed to us in the irritant action of chloroform on the large spinal system of snakes, lizards, birds, &c. I know I differ a little from the last writer of the Edinburgh School, Dr Hughes Bennett, on

this point; but he has probably formed his impression rather from the popular idea of chloroform—viz., the danger of deep insensibility or coma. It is curious that we have very little to fear from this stage of deep chloroform intoxication, or coma; like as a ship in deep sea, with plenty of sea-room, chiefly dreads coming into or going out of the shallow water of a harbour, so we must never forget that of forty well-marked cases of death hitherto from chloroform, thirty-six took place, not in a state of deep coma, but in this preliminary stage of epileptiform convulsion or "exaltation of sensibility!" In fact, in one half of these forty cases, the inhalation of chloroform was stopped—by death—before the surgeon had commenced his operation at all; the third stage of prostration or anæsthesia had not commenced. This explains to me also the danger of chloroform in the second stage in strong adult men and hysterical women rather than in children, where this stage is absent.

I cannot help, in fact, believing that emotional depression so curiously and inextricably interwoven with the functions of the spinal and sympathetic system had much to do with these mysterious deaths, joined perhaps to certain sudden accidents, such as bursting of vessels, &c., from the violent, convulsive, half-epileptic fits so peculiar to this first and second stage of chloroform anæsthesia; in order to prevent this, indeed, in Paris I have observed that a great deal of trouble is taken by many *petits soins* to calm the emotions and assure patients of perfect safety before they begin to take chloroform. The plan is a very good one.

I have tried very imperfectly, but not without a

purpose, to give some idea of a true philosophy of pain and emotion, contrasting from the writings of the greatest of all English writers. The dull emotionless Caliban, one "not honoured with a human shape"—Ariel, who is all touch, all feeling, all passion—and Prospero, whose highest praise seemed that—

"His pulse
Beat as of flesh and blood,"

who rules with the power of an enchanter on his desolate island, but who, at the sight of human faces, —even of his enemies—though otherwise he is indomitable—is overcome at once by his emotions—

"Mine eyes, ever sociable to the show of thine,
Fall fellowly drops."

These are all symbols of what we see, in fact, in chloroform experiments on the lower animals and man—what we see in clinical practice of hospitals, and in hysteric cases in private practice! It may be asked "How does emotion kill? Why speak so much about what is so well known." We hear occasionally of persons dying suddenly from joy, others from fright of a thunder-storm, from the "shock" or fright of a scald or burn, &c. &c. M. Brown-Séquard tells us that in such cases the emotion expends itself on the ganglionic system, and the heart is literally paralysed or stopped. Here, again, by understanding this point in chloroform practice we may often prevent danger. Thus, I have frequently seen patients in Paris "cheated out of their fears," so to call it, as they were told (after their permission was obtained to use the knife) that a certain amputation or operation would be done on a certain

Thursday or Tuesday, but done the day before, or done on the instant!

The amount, even, of healthy, ordinary sleep each day is probably in proportion to the amount of healthy "wear and tear" of the system, and the absence, I think, of emotional excitement; for something in the shape of good news, as well as of bad news, will keep the mind uneasy and awake. Thus, a traveller that is to be up early in the morning to catch an early train will wake to the moment; in fact, he has been scarcely asleep at all—emotion, of some sort or another, has destroyed complete sleep. The condition of the emotions and the state of the pulse of wretched criminals before execution is also well known. Starvation is another cause of want of sleep, as there has been no exercise or wear or tear of muscle. We have all these conditions in hospital patients under chloroform!

Of the new world, revealed by Sleep, poets of all ages have written, of course, a great deal, but we are more interested with the fact that this emotion, or nervous irritability, especially in female patients, which destroys natural sleep, also involves an increase of chloroform to produce anæsthesia. Wordsworth remarks that twilight has the power of removing, softening, harmonising, or rendering abstract certain things otherwise lost in the bustle and blaze of the mid-day sunshine: so it strikes me is sleep; it removes some objects, and makes others more clear—it leaves out a great deal of what is known to us as association of every-day ideas, and introduces us to a world of "innate ideas" and new but useless fancies, and new illusions. Chloroform patients

thus sing songs, under chloroform, they never knew before, &c.

The effect of the emotions or passions in breaking up a dream of this sort is also curious, more especially the complex passions of anger or envy. I need not go into the subject of the seat of emotion in the middle lobes of the cerebrum—a doctrine that has many striking facts in its favour—nor refer to the local seat of consciousness or of the sensorium mentioned previously. The effect of the emotions or passions on the heart or pulse or brain is as old as the love sickness of Stratonice, and as ever-recurring as the fancies of half-a-dozen years ago, when it was believed, especially in midwifery practice, that chloroform had induced many kinds of death and mania, or, as evident and ever-recurring as these, thirty-six deaths out of forty in the emotional stage of chloroform! In fact, there is more than mere poetry in many of these analyses of emotion; the passion of anger breaks up a common dream by the effort of muscular resistance or revenge it calls forth; this wakes up the entire spinal system and sensorium. In the administration of chloroform we have the converse of all this—we have the spinal system and sensorium and the passion of fear to control; I have just said how this is effected occasionally in Paris. I do not feel myself that I overrate the very great seriousness of deaths from chloroform, or the influence of this emotional stage of anæsthesia. A gentleman at one of the ophthalmic hospitals in London, who administers chloroform, and who has seen a good deal of the hospitals also of Berlin and Vienna, tells me he has witnessed personally eighteen to twenty deaths

directly from chloroform, only one at his own hospital, but three at Guy's. Cases of cancer or atheromatous arteries, he believes, are particularly liable to accident, probably from bursting of vessels, in this preliminary stage of convulsive action. The larger number of chloroform deaths are never reported.

Man differs from, and breaks off, so to speak, from the entire animal creation, at this point of emotional excitement or depression; of a love for æsthetic harmony in creation, self-responsibility, and a dread of death; and it is here that poets lend us such great assistance—especially Shakespeare*. I have

* The reason of having so many references to Shakespeare is that his characters are familiar to all readers. An able and forcible writer, "B.W.W.," differs from me in my estimate of Shakespeare, and looks upon the strikingly beautiful analyses of mania, sleep, and anæsthesia, in the writings of the Bard of Avon, as a sort of accident; he says, we have not any evidence that stupefying or anæsthetic medicines were known in the marvellous age of the Drakes and Raleighs, of James and Elizabeth, &c. &c. Now, Shakespeare began to write in 1586, and I have already shown that in the poetry of Middleton and the writings of Du Bartas, Canappes and Theodoric, in 1538, anæsthesia is distinctly referred to; thus Middleton says:

"I'll imitate the pities of old surgeons
To this lost limb, who, ere they show their art,
Cast one asleep, then cut the diseased part."

In Camerarius, who was writing when Shakespeare was alive, we have the original story of Puck and Oberon's juices. Of one of the drugs also of this time, a quintessence distilled from the strongest wine

known patients, over and over again, refuse to have chloroform, and when asked why, they replied they feared death so much from it, they could not conquer their repugnance to anæs-

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five times over, and afterwards distilled with sulphur and salt and lime, we read, "the aforesaid drugs being converted into an essence, this is to be shut up in leaden vessels, lest the subtle aura should escape," and when used, we are told, "the vessel must be brought immediately under the nostrils, and the patient will draw in by breathing, and thereby his senses will be locked up, as it were, in a citadel." I do not want to draw from this that Oberon knew what chloroform is, no more than that Galen knew Dr Chambers because both have hit on the same idea of pepsine.

Shakespeare knew, however, very well the writings of Paracelsus and other

"learned and authentic fellows,"

as he calls Paracelsus and the alchemists. The whole story of 'Macbeth' is, word for word, out of one of the books of these writers; the story of Autolycus is out of another; wherein were written the "vertues of herbs, plants, stones, and minerals, which deceive our senses and produce miraculous alterations in the air," causing plagues, thunders, &c. The most remarkable thing in Shakespeare, I think, as regards anæsthetics is Christopher Sly; yet this is out of another of the books (Holberg). A tinker, as we would say "hocussed" or rendered intoxicated, is removed out of a puddle in the street and lodged in a palace, and deceived, as a sort of joke, into the belief that he is a nobleman; but mark the beautiful analysis of consciousness—by

thesia and entire loss of consciousness. Of course, we cannot study these effects of chloroform and purely human emotion in the lower animals; in the operating theatres, however, of our large hospitals an

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Shakespeare, as the tinker awakens—"Do I dream? he asks,

"Or have I dreamed till now?
I do not dream;—I see, I hear, I speak;
I smell sweet savours and I feel soft things."

It is curious there is no sense of taste here; but Shakespeare was inscrutably and wonderfully right. Modern science shows there is no "gustatory nerve."

Ben Jonson's play of the "Alchemist" is the "Fownes's Manual" of the chemistry of Paracelsus, and of that queer but delightful age; and Shakespeare not only read but corrected and partly edited this play. I believe, in fact, Marlowe, Ben Jonson, and decidedly Fletcher, are the writers of several things in Shakespeare; the Americans say Lord Bacon, but that is not so likely. Lord Bacon's philosophy—which is, I think, much misunderstood of late years—ran, however, much in the direction of the quackeries of Paracelsus, and for all practical purposes is almost as useless as the modern writings of Swedenborg.

There was, in Bacon's time, an entire set of medicines as well known as diaphoretics or anæsthetics amongst us—called "odoraments and suffumigations," consisting of little bags of mandrake (which was a species of belladonna) mixed with opium and rose leaves to be smelled to. "Odoraments" of vinegar and opium are very common, and it is even grimly discussed whether such odoraments may not act as tonics. "In fevers, too,"

extensive field is offered for observing such phenomena. There is an eminently interesting part of the subject, in fact, to watch these emotions and the different functions of the brain in patients, as well

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says Bacon, "cold odoraments serve to refrigerate the brain and the spirits;" in another place it is said, "*Absynthium somnos allicit Olfactu.*" Wormwood induces sleep by inhalation of its vapour. Did time permit we could fill pages with the alleged virtues of these "odoraments." Bacon and Shakespeare were quite familiar with them. By the aid of this sort of light, we understand why Caliban advises the sailors to destroy the books of alchemy of Prospero, and how the power of Ariel, which is sometimes called an "ecstasy," is not so very far from the insensibility and influences exerted by odoraments. Oberon and Puck, I have already said, as well as the witches in 'Macbeth,' are directly copied from the books of alchemy. Chloroform is not there, but the germ of anæsthetics most decidedly is.

"B. W. W." says Shakespeare was "too great a philosopher and too bold a reasoner" to believe in such things as the adder's fork, the poisoned entrails, the toad with sweltered venom—

> "Scale of dragon, tooth of wolf,
> Witch's mummy; maw and gulf
> Of the ravin'd salt sea shark,
> Root of hemlock digged i' the dark."

But is "B. W. W." so very sure of that? Now, it is a curious thing "Curara" poison at the present instant is thus made by a peculiar caste of witches in India, as well pointed out by Claude Bernard; but, as Shakespeare borrowed the whole play of 'Macbeth' from the quacks, as they were called, we

as the regularity with which the different senses or external association of ideas change into singing songs and false illusions, as already hinted at; each, as if by the wand of the enchanter, becoming entangled in the Oberon charm or snare of chloroform; and when the emotions are at rest, we have a new and wonderful world of sleep—thus described by Keats, with great truth:

"Oh magic sleep!
That brood'st o'er the troubled sea of the mind
Till it be hushed and smooth.
Great key
To golden palaces, strange minstrelsy,
Echoing grottoes full of tumbling waves
And moonlight—aye to all the magic world
Of silvery enchantment!"

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are relieved from thinking it one of his reveries or a "*hiccius-doccius*" at all. "B. W. W." is not exactly right when he says the charm of Oberon was an *anti*-soporific, intended to act while Demetrius and the lovers were asleep so as to pervert their love when awake; for Demetrius suddenly says, as he falls asleep in spite of himself—

"Faintness constraineth me
To measure out my length on this cold bed."

And the inimitable wit of Shakespeare reaches its climax when poor Bottom, with his ass's head, so marvellously hairy about the face, amidst shouts of laughing, pleads that he, too, is a victim to the odoraments and suffumigation and charms, for he says unexpectedly—"I have an exposition of sleep come upon me."

CHAPTER IV.

ON ÆTHER—SPECIFIC RELATIONS OF ÆTHER TO THE SENSE OF "TOUCH" AND TO COMMON SENSATION, MORE MARKED THAN THE SIMILAR RELATIONS OF CHLOROFORM—ON ALDEHYDE AND ITS EXISTENCE IN THE INTOXICATING PRINCIPLE OF SOME WINES—NITRIC ÆTHER A POWERFUL ANÆSTHETIC—SULPHURET OF CARBON AND OXIDE OF CARBON—COMMON ÆTHER AND THE CHANGES IT UNDERGOES WHICH DESTROY ITS ANÆSTHETIC PROPERTIES —THE REASON WHY ÆTHER IS LESS DANGEROUS THAN CHLOROFORM—CONVULSION ALWAYS TO BE DREADED DURING ANÆSTHESIA, BY ÆTHER, OR CHLOROFORM—GRAVE NECESSITY OF ALWAYS USING PERFECTLY PURE ÆTHER —MODE OF APPLYING ÆTHER IN ITALY AND AUSTRIA—METHYLATED ÆTHER.

I propose now to speak of inhalation of æther, and the specific action of various agents, or the particular relations of some active medicinal bodies to particular organs. By direct experiment on the lower animals we have now arrived at some good results: thus, veratrine, strychnine, and opium act alone on the grey matter of the cord and brain; coneine and woorara, on the other hand, on the nerve tubes;

prussic acid and cyanurets on muscles; but nicotine and æther, and probably chloroform, on both the grey matter and the nerve tubes in unequal proportions. The action of chloroform, however, with which we as practical men in hospitals have most to do, is its action on the heart. Now, chloroform in hundreds of experiments on the lower animals is found invariably to paralyse the heart, but sulphuric æther cannot be brought to do so; if a quarter of a drop of chloroform be placed with a pin on the heart of a frog it stops its action at once; in the case of æther the action is more diffusible and less formidable.

Some of the æther of the shops is very impure; so that, for purposes of anæsthesia, it will be necessary to use what has been purified. The effect of sulphuric æther is sometimes very curious in hospital patients, and differs very little from the phenomena of wine intoxication. I generally use a large conical sponge, which must be well squeezed out of warm water first, and the æther then poured on it, a couple of drachms at a time, or even more: the patient describes first a sense of fulness and warmth, the vapours of the æther feel to the patient to diffuse themselves through the brain, and to penetrate the body; there is a lightness and sense of elasticity as of a new world; the sense of hearing is confused; sight dim; the muscles are remarkably relaxed; and the patient seems to be floating or sinking. The vapour of æther is not so unpleasantly pungent as chloroform, but requires to be supplied in enormous quantities.

The curious incongruity of feeling occasionally found under chloroform inhalation is experienced also in a very marked manner under æther; the bistoury or

amputation knife is perceived under æther as a blunt instrument streaking out lines upon the skin. I have observed this dozens of times, by asking patients what they felt. The saw is heard sawing the bone, but no pain accompanies it. All this has a practical bearing for the surgeon.

A poor lady, who had half-a-dozen or ten teeth extracted under sulphuric æther, explained the matter to the dentist as a curious dream; she said she felt as if floating in a voyage at sea, and getting into the surf; on a rock she was attacked by a SHARK; down, down, down went the shark, holding her in his teeth, but not paining her in the least; nor was she liberated from the jaws of the monster, she said, till her friend the chloroform or æther doctor, who was present at the bottom, and who by some magic had come "unto those yellow sands," with all that had not faded or

"suffered a sea change,"

of the dentist, too, had pulled all the teeth of the shark, to her great delight! She could feel and hear the crunching of the forceps on the teeth of the shark — the jaws of the shark melting, in fact, by a sort of dissolving view, into her own jaws, just liberated from her four molars and incisors innumerable! The alleged medical facts of *clairvoyance* are obviously not far off from this actual fact of this poor lady and the shark.

One explanation of these phenomena is to be found in the fact, that the sense of "touch," and the sense or perception of pain or common sensibility, are two different things; this is what I previously alluded to, as a true philosophy of pain. It seems now decided that the posterior columns of the spinal

cord conduct impressions of "touch," and the grey substance of the centre of the cord that of sensibility or pain, as from burning or cutting, &c. In this lady, the grey matter was entirely anæsthetised, but the sense of touch remained unchanged; probably coneine, as just mentioned, would have prevented this. The dentist holding her jaw conveyed an idea of "touch" to the sensorium. A patient that I saw operated on not very long ago, by Mr Erichsen, had a similar idea of touch, or of a blunt instrument streaking out lines on his shoulder; but no fancy that it was a red-hot cauterising iron!* I referred before to the great safety of the "Vienna anæsthetic" (that of 1 of chloroform to 6 of æther in cold weather, or 1 to 8 in warm water), as well as the usefulness of a dose of opium in some cases. Here, probably, we have common sensibility and the perception of touch both diminished or abolished, the action of the heart sustained, and the patient saved these dreams, which are not always so agreeable as those just recited. These matters of "touch," common sensation, and reflex action, may appear mere trifles in their relation to chloroform, but they are full of deep meaning when we come to treat cases of paralysis and the myriad forms of maniacal or nervous diseases, or to decide, as I am often asked to do by letters from the country, whether such or such a nervous patient in the country may have

* M. Schiff differs with M. Brown-Séquard as to the exact mechanism of these phenomena in the cord, but about the fact itself all are agreed. In a conversation with M. Brown-Séquard recently he did not make it plain to me that he was right; the view that I have given is that of M. Schiff.

chloroform for some impending surgical operation. I had a letter this week, for instance, from Wigan, and one a little while ago from Pau, in the Pyrenees, to decide such points.

I would only further say, in recommendation of æther, that it may be procured somewhat easier and more cheaply in all parts of the world than chloroform. I see no objection to the use of methylated spirit in the manufacture of æther; and, in fact, I have used it or ordered it in my dispensary practice, in the city, from a feeling of making chloroform and æther, as anæsthetics, as cheap as possible, and accessible alike to the poor as well as to the rich. Many operations in hospital or dispensary practice, such as that of reducing an old dislocation of shoulder or hip (admirably performed under æther), will require a pint of æther; this in America costs a shilling, but in London, Dublin, or Edinburgh perhaps four times this amount; if methylated spirit be used, however, æther in London might be got for what it is in Boston!

We have spoken already of the comparative value of æther and chloroform as anæsthetics, and the general adoption of æther in surgical practice in Italy, Austria, and America, in preference to chloroform, as well as the relative danger of these anæsthetics. It may be well to refer now to a few other anæsthetics which have been recently experimented with, producing effects more or less encouraging, though not generally known to medical practitioners. This may be useful, as much to indicate what importance is still attached to this branch of practice, as to exhibit to the reader that, in the present aspect of chemical science, the cautious surgeon or phy-

sician is very much restricted in his choice to further trials with æther *or* chloroform, or (as I am trying at present) to æther *and* chloroform mixed in the shape of the "Vienna anæsthetic." I do not at present think it necessary to mention some further trials with amylene at Berlin, as in the paramount subject of deaths by anæsthetics it has been "tried and found wanting."*

"Aldehyde," which obviously comes first in order, was suggested very early by Poggiale, and was extensively experimented with, in the form of inhalation, as an anæsthetic. It is, as most readers are aware, a limpid ethereal liquor without colour, mixing freely in all proportions with water, alcohol, and its higher representative, æther; it has an unfortunate tendency, however, to undergo some harlequin transformations into various crystalline compounds like camphor, apparently isomeric with aldehyde; very curious for the chemist to tabulate, but not at all satisfactory or important to the physician who studies anæsthetics. Where aldehyde

* Some very elaborate and minute examinations have been recently made of the amylene of the shops, and it is found to contain variable but large proportions of free chlorine, and probably in shape of chloroform. It is doubtful, in the process directed by Balard (where chloride of zinc is used as recommended), whether any pure amylene is in reality produced: so that all the recent experiments with amylene on animals have been with what I originally stated, amyl-alcohol rather than amylene! It seems also conceded that the quasi amylene has proved less dangerous than chloroform, as I also stated more than once!

has been used in the human subject in place of chloroform, as an anæsthetic, it produced an embarrassing sense of dyspnœa, attended with violent cough, together with a peculiar feeling of constriction of the throat. I mentioned before that some well-known weak Rhine wines, remarkable for their *bouquet* and absence of spirit, produce intoxicating effects and anæsthesia more readily than other wines, like sherry, with an equivalent of brandy in them. These weak Rhine wines, according to the ingenious researches of Mülder, contain aldehyde and some other delicate metamorphoses of amylene or fusel oil. The late Dr Snow told me a year or two ago of some impressions of his regarding aldehyde, which led him to try amylene; he found also that aldehyde produced, in fact, marked anæsthesia.

"Nitric æther" is another compound like aldehyde, which has been experimented with. This fluid is like common so-called sulphuric æther, but is at once known by its sugary taste. I am very much inclined to try this æther; it produces what I have already described as absence of sensation through the grey matter of the cord, as in this typical case of the lady and the dentist, and common æthers—but it leaves the sense of "touch" [shall we call it the reflex or diastaltic sense of appreciating tactile phenomena?] unchanged.

Nitric æther (of course not the *spts. nit. dulc.* of the shops)—pure nitric æther produces insensibility to pain, in fact very readily; but as I think it leaves the sense of appreciating tactile phenomena unchanged, as the patient, though anæsthetised by this æther, is sensible of the rush of blood

through the arteries of the head in a very painful manner; nitric æther by inhalation is also followed by headache. The "nitrous æther" of the shops contains, along with some other elements with which we are not now interested, a large proportion of aldehyde; pure nitrous æther is a different preparation altogether; but it is very easily prepared, and has an agreeable odour of apples. As the vapour of nitric æther is liable to explode, that of this æther is deserving of further trials on some of the lower animals.

"Sulphuret of carbon," and "Oxide of carbon" have also been tried as anæsthetics. The former is a transparent colourless liquid, of somewhat repulsive odour, but a very powerful anæsthetic; the latter, as experimented with by M. Tourdes, of Strasburgh (in several surgical cases), is somewhat too dangerous, as often painfully evinced by persons suffocated by coke fires; it is even more poisonous than carbonic acid gas. In fact, it is now stated that carbonic acid may be inhaled into the lungs if used cautiously, and that in irritative cough it acts as a sedative or anæsthetic, like æther!*

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* I remember a very instructive case of asphyxia from carbonic oxide, some would say, others carbonic acid—perhaps both carbonic acid and carbonic oxide. A poor vestry clerk, his wife, and niece, living in apartments adjoining a church, in some evil moment had the iron chimney of the church stove "let into" the flue a little above their fireplace. One Monday morning it was found that the poor people did not answer the milkman's bell. I was asked what I thought of it; a ladder was got,

Common Sulphuric Æther, or as it is more correctly termed, æther, stands at the head of the list of anæsthetics in historic interest. There is a true sulphuric æther, but as it is so quickly decomposed, it is as useless to us as our old friends Puck or Ariel, or Lord Bacon's odoraments and suffumigations! Æther is so well known that it requires no description. As Locke says of a definition of

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and a man mounted to the window, and said he saw three people inside lying dead. The door of the church was at once broken in, and I shall never forget the sight: the poor vestry clerk was stone dead, lying with his face over his Bible, which he had been reading for the family; his wife was lying against the table, stone dead also. But the most curious feature in the case was the state of the niece; she sat near the door, and, falling anæsthetic on the ground from the gas, her face and mouth came near the bottom of the door, where some slight amount of air found entrance. She was to all intents and purposes dead, without pulse, but quite warm. I had her at once removed into the open air; she slowly revived, began to breathe, but then fell dead! Bichât has shown that black blood in the arteries after apoplexy does not necessarily stop the action of the heart. She had been probably twelve hours previously breathing carbonic oxide and carbonic acid, mixed with such minute portions of atmospheric air from under the door as kept up that sort of circulation, which Mr Paget has spoken of, where we have clot in the large pulmonary vessels; the right side of the heart, too, as in Nysten's experiments, continued still at work, but the left side extinguished for ever!

"time," *si non rogas intelligo*—if you do not ask me to describe it, I know it; so of æther. Its boiling point is 38° C., its specific gravity, 0.71; consequently it may be made to boil in the palm of the hand. In hot countries like India, or in the close wards of an hospital, if preserved in imperfectly-stoppered bottles, æther absorbs oxygen, and has a tendency to go into acetic acid; this impure æther then mixes with water in all proportions, which well-preserved æther, of course, ought not to do. A good instance of how we may be mistaken, after all, in what we deem to be good æther has been quite unexpectedly brought to my notice by Mr Curling's house-surgeon, Mr Rutledge, and as occurring where the chemical ability of Dr Letheby was available, I give the letter in the words of Mr Rutledge.†

† Mr Rutledge's letter is as follows:—

"Dartford, Kent, July 23, 1858.

"Dear Sir, — You state that 'sulphuric æther was recently applied by Mr Curling, at the London Hospital, but, though immense quantities were used, it did not succeed.'

"I presume you have not been very correctly informed as to the administration of the æther in the case to which you allude. The patient, suffering from tetanus, was under the care of Mr Curling, and, as one of the House-Surgeons of the hospital at that time, I was entrusted with the use of the æther; I failed, for two reasons—first, the æther was impure, and secondly, I had an imperfect apparatus. In a subsequent case, the late Dr Snow attempted with his own apparatus to place a patient under the influence of the same æther, but failed. The æther

Why is æther admitted on all hands to be safer than chloroform? It seems generally conceded by good observers that the stage of preliminary excitement during the administration of æther is much shorter than the parallel stage or condition of excitement under the effects of chloroform, and very much shorter than that of amylene. Now I have already shown, by the result of all the best reported cases of death from chloroform, that in forty deaths not less than thirty-six occurred during this stage. This partly explains why æther is not so dangerous, while common experience in hospitals or dental practice helps to corroborate the fact. I perceive that M. Denonvilliers, of Paris, a very cautious observer—who believes, however, that all the deaths from chloroform have been from overdosing—looks also upon the early stage of the chloroform process, or that of emotional excitement, as the most dangerous. It seems, indeed, now pretty well established by good observers that in man, at least, nervous and epileptic complications, or emotional paralysis, are to be feared rather than fatty heart.

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was then examined, and found to be miscible with water; I then ascertained that it had been some time in stock, and I suppose had undergone some decomposition. Since that time I have had no difficulty in placing a patient under the influence of good æther.

"I trust you will kindly take some public notice of this explanation in your admirable Papers, and thus relieve Mr Curling, whom I esteem as an eminent surgeon, from an imputation which might involve his want of professional credit or skill."

Desault mentions that a sort of endemic of diseases of the heart occurred in Paris after each French revolution, caused by the emotional excitement of the period! so that we may have functional disarrangement of the heart brought into active existence, as a secondary result of this emotional agitation. In the lower animals, however, it must be said that we often see the animal, to all intents and purposes, as regards the respiratory movements, lying dead, but the heart still beating. I would advise young experimenters, in fact, to take care of this in experiments on cats and dogs, as such creatures start up and may bite when least expected to do so.

It is rather curious that all the symmetrical portions of the body, as a rule, such as the pons varolii cord, brain, extremities, &c., are those first affected by both æther and chloroform, while the unsymmetrical, as the heart, stomach, &c., are affected, as it were, in a secondary or inferior manner. Now convulsions, as well pointed out by Bichât, usually precede death or serious injury of the former, and are always to be dreaded during the process of anæsthesia. In a case of death at St Thomas's Hospital, the man fell forward on the ground in a convulsion; in the case recently in Paris the soldier was convulsed, &c. I do not wish to say, of course, that deaths without convulsions have not also occurred.

As well as I remember in two deaths from æther in this country, the particulars of which were related to me by the late Dr Snow, in one his impression seemed to be that the fatal result was rather due to excessive hæmorrhage, which set in during the progress of the surgical operation; in the other case, he

thought asphyxia was induced by too much of the vapour of the æther. I have been told by Mr Hayward, of Boston, however, that in Italy and Austria, whence he has recently returned to England, æther is applied in vast quantities in a sort of mask, and the entire face is covered with lint, or a handkerchief saturated with æther! It is calculated that a patient can be brought under the influence of chloroform with only one half the capacity of both lungs exposed to the vapour, but that the capacity of the entire lungs and minute bronchial tubes is almost too small or limited for the vapour of æther.* From the action of æther in asthma, where it acts most beneficially, it is even obvious that the larger bronchial tubes are, under the vapour of æther, relaxed and receive more of this vapour than of common atmospheric air.

This effect of æther, indeed, of relaxing muscular tissues, makes it signally valuable in reducing old dislocations where we have to overcome muscular tension; in strangulated inguinal hernia also it is very deserving of trial in preference to chloroform. It is curious now to look through old dusty books, and find patients with tetanus given up as incurable,

* A curious fact, pointing to the local action of chloroform on *both* lungs, has lately been discovered, viz., that if an animal breathes chloroform vapour in only one lung and common atmospheric air in the other lung, he does not become anæsthetic! Mr Erichsen is in the habit of saying "Take care of chloroform in patients where one side of the chest is permanently dull, or where there is chronic cough." Both observations are suggestive.

but their "passage to the grave" lightened by giving them a little æther to inhale, which unexpectedly cured them. It will be seen in the letter of Mr Rutledge that his account and mine differ in no particular whatever; but it shows us how careful we should be to use none but the very best æther and chloroform for purposes of inhalation. Mr Curling is one of the ablest surgeons in England, remarkable for the accuracy of his practice and the anxiety he evinces to give the patient the benefit of every new and real improvement as it arises. It is a pity then to find the result or object in the treatment baulked by one of the whimsies, so to call it, of chemical science.

We should distinguish such accidental changes in æther from mixtures with æther. I have already said that I see no objection to methylated æther, as it differs little from ordinary æther; its specific gravity is greater, and an occasional "idea" or far off fancy of onions in the smell is not the slightest harm.

CHAPTER V.

ON CHLOROFORM AND ITS EARLY HISTORY—CHLOROFORM MENTIONED IN WOOD AND BACHE'S DISPENSATORY IN 1838 AS AN ANÆSTHETIC—GUILLOT — SIMPSON — HOW CHLOROFORM IS PREPARED—BEST TESTS OF THE PURITY OF CHLOROFORM—MODE OF ADMINISTRATION—INHALERS—WHETHER IT IS BETTER TO USE AN INHALER FOR CHLOROFORM—PRECAUTIONS TO BE OBSERVED AS REGARDS THE PATIENT—THE SYSTEM TO BE IN A STATE OF QUIETUDE—PRECAUTIONS TO BE OBSERVED AGAINST NAUSEA AND VOMITING—THEORY OF VOMITING DURING CHLOROFORM ANÆSTHESIA ACCORDING TO THE AUTHOR—VOMITING TO BE EXPECTED TOWARDS THE END OF THE OPERATION—CHLOROFORM AND ÆTHER, PROBABLE ANTAGONISTIC AGENTS TO—SUGGESTIONS AS TO THE MANAGEMENT OF PATIENTS PREVIOUS TO THE INHALING OF CHLOROFORM OR ÆTHER.

It remains for us now to make a few specific observations on chloroform, having spoken already at no little length of æther and some other anæsthetics. No doubt we are still in much obscurity and darkness as to the causes of death and other ill effects of chloroform; we are like the dwellers in the dark city

underground, spoken of by Plato, who were puzzled by occasional glimpses of sunlight, and could not construe their meaning; so of the steady but occasionally uncertain glances at the truth that we have been arriving at in "anæsthetics," and as to the source of the hundred deaths from chloroform. It is very easy to refer back amongst old books in college libraries and discover, as I have done, rather by accident, that exactly twenty years ago chloroform is mentioned in Wood and Bache's old-fashioned "American Dispensatory" in the following words:—"In affections characterised by difficult respiration, chloroform may be used by inhalation;" this being evidently the first mention of chloroform—the first sign of the great coming event of the second half of the nineteenth century, as it appeared "casting its shadow before." A M. Guillot, also, on the Continent, it seems used it even previously to this shadowy era for "asthma and headache;" still, notwithstanding these and several other facts, I am very much inclined to give nearly all the credit of the invention of chloroform, and the light it has shed on the modern practice of surgery since 1848, to Professor Simpson and to my late much-regretted friend Dr Snow.

It is very probably by happy guesses and half-discoveries of this kind, rather than by slow "induction," so called, from facts, by fortunate use of "analogies," that all the modern triumphs of organic chemistry have been achieved, and chloroform, like the electric telegraph in the Atlantic, has become the great fact of the age!

The usual method adopted for the formation of chloroform is the following:—One part of hydrate

of lime is suspended in twenty-four parts of cold water, and chlorine gas passed through the mixture until nearly the whole of the lime is taken up or dissolved; a little more of the lime is then added to restore the alkaline reaction; the clear liquid mixed with one part of alcohol or wood spirit; and after an interval of twenty-four hours cautiously distilled in a very spacious vessel. A watery fluid, containing a little spirit and a heavy oil, collects in the receiver; the last mentioned, which is the chloroform, is then agitated with water, digested with chloride of calcium, and rectified in a water bath. An impression exists generally in England that the College of Physicians disapprove of wood spirit, and much of the chloroform of the shops, accordingly, is produced by distilling together spirits of wine, chloride of lime, and water. The boiling point of good chloroform is 141° F., that of "Dutch Liquid" 180° F—chloroform is nearly insoluble in water, and is not affected by concentrated sulphuric acid; the density of its vapour, according to Fŏwnes, is 41°.

The smell and taste of chloroform that is quite pure are very characteristic; the taste is peculiarly grateful and pleasant; if rubbed on the hands, the smell of a few drops of pure chloroform should be fragrant and æthereal, to many persons not unlike that of an apartment where the best kind of apples are kept; if the smell be pungent like that of vinegar, or strong or old æther, the chloroform is impure and probably has free formic acid already as one of its constituents. It is not impossible, too, I think that this "fruity" flavour of good chloroform is due to pelargonic or, as it was formerly called, œnanthic æther, which is highly intoxicating, but fragrant.

Chloroform is now used in such large quantities in practice, that the proper care necessary for its delicate purification is not bestowed on it. Pure chloroform should be preserved as much as possible in bottles completely filled, and opaque, as light and atmospheric air combined set up a series of gradual molecular changes in its composition fatal to its anæsthetic properties; as æther has a tendency to go into acetic acid, so chloroform goes back into formic acid under the agency of light and the oxygen of common air.

As much of the so-called "amylene" of the shops proves to be not amylene at all, so also many imperfect specimens of chloroform found in the hospitals, "supplied by contract," are found to contain variable but large proportions of free alcohol, hydrochloric acid, hypochlorous æther, common æther, &c., as well as some other compounds which appear to be more of an accidental character, such as aldehyde, water, and methylene. I have spoken already of the latter and its occasional not disagreeable smell of onions, but this, as well as the "pungency" of æther or chloroform, will differ in different patients, according to individual peculiarities. Another death is reported this week, but the chloroform was found to be impure. I scarcely think, however, this was the cause of the death in this case, as reported.

In testing chloroform in general practice a bit of litmus paper will prove useful, as litmus should not be reddened by pure chloroform, but will display a deeper tinge of red according as the chloroform has been spoiled by exposure to the agency of light and air in half filled white bottles, or according as it

contains free hydrochloric acid. Chloroform, when it is adulterated with spirits of wine or ordinary æther, burns more readily and with a larger flame, free of greenness, than pure chloroform does. The specific gravity of pure chloroform is about 1·500, and it would be easy to extemporise or construct a cork or saccharometer that would exactly float about in such a fluid. I find a bit of ivory, or (what is better) a piece of beef-bone cut with a penknife, barely sinks in good chloroform or nitric acid, which is exactly of the same specific gravity as chloroform, while it, of course, goes to the bottom at once of a bottle of æther or spirits of wine; or another method is sometimes adopted: if a mixture of *equal* parts of distilled water and sulphuric acid be prepared, impure chloroform will float on such a mixture, but perfectly pure chloroform will sink; pure chloroform also should show no "milkiness" on admixture with this or with plain water, and pure chlorine is detected in the ordinary way by nitrate of silver.

An impression gains ground very much in France that we ought to have no deaths from perfectly *pure chloroform*, and that many accidents have occurred rather from imperfect specimens of chloroform and overdosing, than from any peculiarity of patients.*

* I am very much in favour of giving "methylated spirit" a fair trial in general dispensary practice for tinctures, æthers, &c. A clamour was got up a little while ago against it, but what a "union surgeon" (who is not usually as rich as Crœsus) can obtain for five shillings of these tinctures or of chloroform, he is charged eighteen or twenty for! I opposed all along this clamour against methylated spirit, and when I asked a chemist, very recently,

A question which always arises in private practice is, whether it is better to use an inhaler or not? This is not a matter of much moment, but the answer is—Yes, the inhaler prevents the lips of delicate private patients being blistered by applying chloroform on a simple cone of lint directly to the face.

I remember a time very distinctly when the late Dr Snow believed the deaths and other accidents from chloroform arose from not using his inhaler, but from surgeons adopting a folded cambric handkerchief in its stead. The fatality attending the handkerchief in "Othello," as I said to him at the period, was not more formidable, but quite as imaginary; we have, however, grown out of this, and although some of the best surgeons in London prefer a piece of lint folded into the shape of a cone, a contrivance always ready at hand, I believe still a simple inhaling apparatus is preferable. In the practice of dentists it is also undesirable to incommode the gentleman who operates by the vapour of

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near St Paul's churchyard, for the "reason why" he objected to it in dispensary practice—"Well," he said, "physicians are of opinion what with diphtheritis, cholera, the malaria of the Thames and other things, there is a great want of oxygen of late years, especially amongst the poor; now methylene is the same, it contains so much carbon, but patients do not want carbon, there is a great want of oxygen in methylene." This argument will "go down" with hundreds of people, but it is one very obviously of no importance; we might as well, with a similar enlightened chemistry, deny the poor working classes the use of sugar or bread or Wallsend coals!

the chloroform escaping from the large sponge or lint.

I will take for granted now that the reader has procured some pure chloroform, and that he is called on, for the first time, to administer chloroform to an adult patient for a capital operation, such as amputation of the lower extremity above the knee; well, how is he to proceed?

From a careful study of ten or twelve thousand surgical operations under chloroform, I am led to the conclusion that a great deal depends upon the fact whether the patient who is about to undergo such an operation has been in a "quiet" condition previously or the opposite, free from feverishness and alarm, &c., or full of alarm; much depends also upon the assistant who applies chloroform, and his general familiarity with operations, some operations requiring a great deal more chloroform than others, and the manipulations in midwifery cases being entirely different from that of common surgical operations, &c.

The patient ought, of course, to have had no dinner or chief meal four or six hours preceding an operation; this is especially of importance in operations for cataract, as Mr Wharton Jones has informed me, more than once, that a radical and chief objection to chloroform in eye operations, especially cataract, is the facility with which the vitreous humour, if at all softened, escapes during these fits of vomiting.

This vomiting may prove alarming, even in other ways. I saw a man operated on, not very long ago, at St Bartholomew's Hospital, for some disease not very formidable in itself; all of a sudden, however,

during the operation he exhibited signs of suffocation and impending dissolution; great alarm was excited, but when it was proposed to pull out his tongue and turn him over on his side, it was found a large lump of hard meat that had been partly ejected from the stomach was stuck right across the pharynx, pressing on the windpipe. If this fact had not been discovered probably the man would have died, and swelled the statistics of deaths from chloroform. In patients who have once vomited, and then subsequently have been rendered deeply anæsthetic, we cannot be too cautious on this point.

It is always well to have a portable galvanic chain or battery in one's pocket, as well as a supply of smelling salts, cold water, aromatic vinegar, wine, and brandy present in the apartment where a large operation is about to be performed under chloroform, not that they are very often used, but it unfortunately occurs that exactly when we require them they have sometimes to be sent for, and great inconvenience is experienced; of the other necessaries of the surgical operation itself I need not speak.

I remember a caution Mr Guthrie used to press on Military Surgeons, "Take care of very long splints in fractured thighs;" and, if I recollect rightly, he used to mention several cases in the Peninsula where they had been tried, but the men had died of suffocation, as some slight vomiting had come on at night when least expected or when the nurse was asleep; the vomited fluid matter, however, at once got into the trachea and lungs. I believe a few of the deaths from chloroform have originated in a similar cause. A great number of the early deaths from chloroform, too, were treated by large bleedings,

the idea having been at that time that the patient was dying of convulsions, but it was probably the convulsions of a dying or drowning man!

The theory of the cause of the vomiting under chloroform is not at all settled; one often hears it said "Oh, it is cerebral," but I think that this is an explanation that explains very little; it may, of course, arise from irritation of the par vagum, but why does vomiting appear with such uncertainty, and why does it come on chiefly towards the close of the anæsthetic process? To understand the phenomena of vomiting, we must refer to a few other points.

I am almost sure of the fact, that the vomiting, as a rule, only comes on near the termination of the surgical operation (whatever it may be) under chloroform; coupling this with another fact, that chloroform is almost specific in such diseases as the spasm and pain of gall stones in producing paralysis of the duct, I am inclined to think, as much from the nature of the vomited matters as from these peculiarities of chloroform, that in deep anæsthesia there is a short temporary cessation of the action of the pyloric end of the stomach, with regurgitation of the contents of the duodenum; it may be only a regurgitation of three or five minutes' duration, but it is sufficient—as in bad hernia cases—to cause vomiting. I have some doubts whether there is anything gained by the patient "not having had his dinner," as it is termed; we merely substitute the most distressing nausea and collapse, with paleness of surface, &c., for a good blurt of vomited matter. Whether we shall ever prevent the nausea itself must depend on our knowing its true physiological cause.

"One of the best things," says Bacon, "in a true philosophy is that if a man will begin with certainties he shall end in doubts; but if he will be content to begin with doubts he shall end in certainties." This is very true of all that has been written or said of chloroform. It was strongly objected, at one time, that chloroform in midwifery practice, as a dead certainty, made women "drunk and incapable," and so the "amateurs but not surgeons," as Mr Guthrie styled such writers, led to endless confusion, as chloroform in midwifery is a real blessing, even without producing complete unconsciousness at all. We have taken for granted that the deaths as a certainty have been chiefly caused by "fatty heart;" then, as a certainty, that the absence of Dr Snow's inhaler was the "fons et origo mali;" now we are not less certain that the vomiting depends on the patient having had previously partaken of dinner or breakfast. The cause is obviously deeper than this. May it sometimes arise, like the distressing "morning sickness" of pregnancy, from some reflex irritability evolved or brought into action by the surgical operation itself? Or may it arise, even as violent purging sometimes arises, from some unexpected action of medicines already exhibited to the patient?

We know very little of the "reason why" medicines have a peculiar therapeutic action on this or that organ; it has occurred to me very often, however, to suspect, in cases in hospitals, that when a patient is fully under the influence of some one medicine — be it belladonna, antimony, &c. — it would be well to defer operation for a day or two. Belladonna seems, in some measure, to antagonise

the action of opium, as curara neutralises nux vomica. A curious antagonistic action to sulphuric æther — which, like the cyanurets, so paralyses muscular fibre—is found in chloride of barium, which excites muscular fibre; this, of course, is not a common medicine. Ergot of rye has a specific action also over special parts, and bromide of potassium an influence of an opposite kind, &c. Thus, a patient suffering under delirium tremens was subjected to the influence of chloroform inhalation; I cannot say why I think it, but he fell forward quite dead; the effect, I think, of a long-continued quantity of necessary medicine disarranging the anæsthetic action. It would seem, from some experiments of Nysten, as if almost any gas or vapour, if it reaches the lungs, will cause anæsthesia. Majendie tells us, long before the age of chloroform, if an animal be placed in a vessel of common air—a diving bell for instance—and common air be pressed into the lungs, anæsthesia and asphyxia, almost as readily as if there had been no air, are the results. If hydrogen be used, the animal is also anæsthetised; in fact, all our modern anæsthetics arose from a dentist in Connecticut repeating these and the experiments of Sir H. Davy on nitrous oxide, and then trying the vapour of æther!

Not unconnected with this are some experiments given by Bichât, which he was at a loss to explain; experiments where he produced all the phenomena now attending on, and known as, chloroform anæsthesia, by simply injecting the venous blood of the jugular direct into the carotids of the same animal. Here we see that it is just possible anæsthesia, after

all, may be purely a carbonising negative process, and that chloroform or æther offers simply an artificial stimulus to respiration and to the *par vagum*. Cases of strangulated hernia often come into hospital, the stricture is relieved by chloroform; the bowels, that have not been opened for ten days or a fortnight, perhaps, though croton oil may have been administered, and every variety of purgatives, now begin to act in a perfect deluge—the patient may even die from the rush of matter. Patients, forty years ago, died in dozens from purgatives in this state, the only difference being that then the knife did what chloroform does now—viz., relax the stricture.

The chief corollary I wish to draw, however, is that all medicine should be laid aside for the previous twelve or eighteen hours where we intend to induce anæsthesia, and that this is as essential as to lay aside dinner.

If æther is, then, to be the anæsthetic, I think in nervous patients it would be worth trying what a dose of extract of conium, or even of chloride of barium, might effect in lessening the irritability of vomiting, and the sense of "touch!" Where chloroform is the anæsthetic, a good deal of danger, I think, may often be prevented by the exhibition of one or two grains of opium immediately previous to the operation, especially if it be a hernia case, or an operation like that for vesico-vaginal fistula, &c. Some surgeons place a suppository of opium in the bowel high up, by a sort of syringe open at the end, after lithotomy operations: the plan is a good one. But it is quite clear that in all these cases we should be acting with greater safety if

the patient for the previous twenty-four hours were rather debarred the use of all other medicines than all kinds of food.

Conversing with the late Dr Snow several times on these points, he opposed them by saying no absorption of opium, &c., took place under chloroform anæsthesia; but even admitting this, it is so much in our favour, as it is exactly when the patient is returned to bed after operation, we have to fear recurring vomiting and syncope. He falls asleep, and the nurse or "sister" does not wish to disturb him; but if he has had his glass of brandy and water before the operation, or his dose of opium, he is safely allowed to sleep.

CHAPTER VI.

DIFFERENCES IN AMOUNT OF CHLOROFORM REQUIRED IN DIFFERENT CASES—CHLOROFORM MORE SAFE IN YOUNG PATIENTS THAN IN ADULTS—VARIOUS THEORIES OF THE NATURE OF ANÆSTHESIA AND SLEEP—OWSJANNIKOW'S DISCOVERIES—THE SURGICAL OPERATIONS IN DETAIL ADAPTED TO EACH OF THE FOUR STAGES OF CHLOROFORM ANÆSTHESIA.

We will take for granted that the reader has procured some pure chloroform, and is called on for the first time to administer that anæsthetic. How is he to proceed?

It would be easy, in continuation of the previous subject of the mode of administration of chloroform, to publish here precise directions as to the specific form of inhaler to be used—the quantity of chloroform, beginning with ℥j. or ℥iss., to be administered—the exact period of time, whether fifteen, or seven, or five minutes—the latter being a fair average in which anæsthesia should be induced in the great majority of surgical operations. It would be easy also to select some one surgical operation, such as amputation of arm or thigh, and describe in a few words for the non-professional reader what is the usual proceeding, as observed, in giving chloroform

either in the operating theatre or private practice; but I have had a higher object in view, that of delineating the general principles that guide hospital surgeons in the management of this important medicine. No two operations under chloroform are exactly alike: hare-lip in an adult, or staphyloraphy, requires the patient to have "lucid intervals," so to call them, under chloroform, in which, though half insensible, he shall be able voluntarily to assist the operator himself; he must be kept, perhaps, for a half-hour on the verge, as it were, of insensibility, but not insensible; his reflex system must not be anæsthetised. The same patient, if placed under chloroform for other operations, such as an old dislocation to be reduced, or strangulated hernia to be examined, should be so insensible that his reflex system must be completely anæsthetised. As I said before, chloroform vapour, like the odours on the banks of wild thyme of the fairy Titania, in small quantity, may allure to sleep, and to the confusion of common consciousness with dreams, or illustrate all the deadly suffocation of the upas tree! It is thought generally that in the air respired in the inhaler during chloroform administration, 15 per cent. of the chloroform vapour is the maximum which it can contain; but that the inhaler ought never to contain more than 5 per cent. Chloroform acts more safely in young patients, and in smaller quantities, than on old patients, or those about the turning periods of life—45 to 60. This may be explained in one of two ways, either that young patients are saved the dangerous preliminary stage by a large dose of chloroform, or that young patients are free from organic disease.

I believe we shall arrive very soon—indeed, sooner than many persons seem to be aware—at a method of conducting the administration of chloroform—in such operations as amputation of a thigh, for instance—by which the sense of pain may be entirely benumbed or removed; yet there shall be in all cases an agreeable, dreamy consciousness, and sense of "touch" preserved. We may even at present, by some manipulations beforehand, and a judicious administration of small doses of opium, common wine, &c., so change the horrid dreams and nightmare of badly-administered chloroform, that a state almost as bad in some hospitals as amputation without chloroform shall be exchanged for chloroform dreams of an agreeable or soothing kind. I hinted before at female patients, especially when undergoing an amputation of the breast, being held by their poll of hair by ignorant assistants; but we must remember that the sense of "touch" may be most acute in this dreadful nightmare of chloroform thus produced unnecessarily, and that such ignorance merely exchanges one form of torture for another.

Who shall speak of the exact relationship of the sleep of chloroform to the sleep of every-day working life? Yet the difference is not very wide. An ingenious old writer suggests that ordinary sleep is produced once in every twenty-four hours by a certain tiredness of the muscular and vascular systems, which induces a passive congestion in the small veins of the choroid plexus or brain, especially in the former, which then press on the exquisitely delicate parts in contact with them, such parts as the corpus striatum, thalamus opticus, and calamus

scriptorius. We now know, too, that the amount of blood in the vessels of the head is always a constant quantity, the difference being only as to the relative proportions of arterial and venous blood; the more venous blood in the brain, the less arterial blood, and *vice versâ*. The theory of Dr Burrows of an opposite kind is not held by good practitioners. The lining membrane of the ventricles of the brain is a vascular or serous layer distinct from arachnoid, and so connected with the choroid plexus as to prevent communication with the exterior of the brain, and thus points towards some special function of this kind as regards sleep! Lord John Russell delivered a very able but somewhat erroneous analysis of sleep in a lecture a year or two ago, taking as his text the lines in Young, the physiological truthfulness of which he questioned:

"Tired Nature's sweet restorer, balmy sleep—
He, like the world, his ready visit pays
Where fortune smiles, the wretched he forsakes.
Swift on his downy pinions flies from woe,
And lights on lids unsullied by a tear."

Lord John Russell argues that "even where fortune smiles" there is often an absence of sleep, and reinforced his argument from personal experience while a Minister, and from the lines in Shakespeare where the King upbraids sleep for lying with the vile, "upon uneasy pallets stretching him," but denying to weigh the eyelids down of a king. But the truthfulness of both poets is at once apparent; as it is where the brain is in a feverish state, either from emotion or anxiety, in either rich or poor, or where healthy muscular exercise has not been taken, as in the case of a reclusive

minister, that we find this want of tiredness of the muscular and vascular system, and consequently absence of sleep. Opium, too, increases the want of sleep; the true anodyne is relaxation from business and muscular exercise. Then, as to the mechanism of anæsthesia or sleep, shall we, with Bichât, look on sleep every twenty-four hours as merely the *ensemble* of the successive little sleeps of the senses, one following the other according to a law pretty well established now, by what we see under chloroform administration and the few undenied facts of what is called "mesmerism." The association of the senses one with another is very remarkable: thus taste is the association of the two ideas of smell and touch; if one fails, then taste is lessened; in the same way, if hearing becomes exhausted or fails, as during a monotonous lecture or sermon, the association of ideas from that one of the senses fails; sensation, touch, hearing, memory, thought, like the leaves of a flower, all gradually droop, becoming gradually folded down; confusion of ideas follows, with actual sleep! We have this confusion of ideas also under æther or chloroform; but I scarcely think, as M. Faure does, that the "premier pas" in anæsthesia, as we see it every day in hospitals, is paralysis of the Schneiderian membrane or paralysis of the sense of smell and touch, and subsequently of the other senses. There can now be very little doubt of the truth of the fact, however half eliminated out of the quackery or mystery of mesmerism, that total insensibility or sleep may be thus induced by breaking up the association of the senses generally one with the other by the failure or exhaustion of one of the senses alone!

The failing light of evening, darkening into night, even the accidental darkness of an eclipse, is sufficient to disturb one sense, and then other senses, or association of the senses, one with another in the animal creation, as we observe it in the lower animals. Twilight in "her sober livery" produces that confusion and loss of ideas or forgetfulness that leads insensibly to sleep; but this is aided, too, perhaps, by the tiredness of the muscular and vascular system, already referred to, which supervenes on the moil and toil of the day's work.*

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* An interesting letter was published recently in the 'Times' by the Count de Flahaut, who was one of Napoleon's nearest Aides-de-Camp in the retreat from Waterloo. It is stated in many of the false histories of the time, that on the "Prussians coming up Napoleon fled at full gallop, in a terrible fright, for several leagues along the Charleroi road!" But the Count de Flahaut says, the thunder of the cannon—which had continued for three days—gradually ceased, and Napoleon's brain was so exhausted, after three days' tension of his senses on the arrangements of the battle, that he did not "gallop," as said, but went along confused in his ideas anywhere almost that his horse walked! And, adds the Count, he "several times fell asleep on his horse, and would have fallen off had I not held him on." If Lord John Russell's explanation of the lines of Young be the true one—that sleep does not forsake the wretched—but which every day's experience in medical practice helps to negative, then we, the men of war or peace, have only to say, here was a man peculiarly wretched fast asleep, but the whole life of Napoleon disagrees with this "castle-

How varied the fancies of the brain in sleep—many the result of simple physical causes—is familiar to every one. Some writers, who will signify their adherence to any well-paying or popular quackery, will turn into ridicule any man who strives, as regards anæsthetics, to unweave this tangled skein of emotional influences ; the

"Fickle pensioners of Morpheus' train,
As thick and numberless
As the gay motes that people the sunbeam."

But much of the art of chloroform administration consists of a psychological study of the emotions which interfere with ordinary sleep, and fill the brain with these "thick-coming" fancies, as well as of a careful study of the symmetrical or non-symmetrical parts of the nervous system.

The senses, of course, belong to the symmetrical portions of the body ; it is not improbable that, in some patients, the functions of all the senses are very early abolished under chloroform. Owsjannikow and other physiologists have recently demonstrated what they believe are reflex or diastaltic fibres, crossing in the spinal cord from and to the sense of "touch." We know now how powerfully the reflex system, common sensation, and even mental emo-

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of-cards" sort of theory. Napoleon, who knew nothing of fear, made war a sort of business or trade ; he had gone through three days' exhaustion of his muscular and vascular system ; the cannon had stopped, his sense of hearing became disarranged ; hearing, memory, touch, thought, all began to fail ; confusion of ideas followed ; and (the bravest point in his whole life) he was actually asleep!

tions act and re-act one on the other; it is, to my mind, not at all impossible that nearly all the deaths under chloroform—now numbering over a hundred—have been due to disturbance of these reflex and emotional parts of the cerebro-spinal axis! Dr Edward Smith, who has tried a series of experiments with chloroform, tells me his impression is, that death under chloroform is not at all of the character of asphyxia, as held by some, but is owing to sudden spasm! He has, curiously enough, tried some very exact experiments as to the increase of carbonic acid given off from the lungs by the use of starch, sugar, ale, porter, &c., where we have sugar (the normal stimulus of respiration) in various forms, and he finds that symptoms like those of chloroform intoxication are produced readily by inhaling the vapour of very old well alcoholised port wine; and some articles of diet, such as cheese for instance (like chloroform as found by Dr Snow, and alcohol by Dr Prout), depresses respiratory action, but sugar excites it! Sir B. Brodie also dimly hinted at this a long while ago, arguing from Groves's correlation of physical forces. I took occasion to mention, at the Medical Society of London, in 1856, the peculiar views of M. Brown-Séquard, as they bear on the action of chloroform on the organs of common sensation, and the impression gaining ground at that time that chloroform first stimulates and then acts as a sedative on the self-same grey matter of the cord; we can see therefore how it may act also in a similar way on these curious transverse zig-zag fibres of Owsjannikow, so engaged in reflex and emotional influences. I referred before, at the beginning of this book, to the

fact that chloroform acts on the system in a progressive manner, as if it were absorbed into the blood, and that the surgeon who applies chloroform must be prepared for, at least, four stages of chloroformisation as marked out by nature. [M. Jobert says three stages: one of excitement or exaltation of sensibility; a second of anæsthesia; and a third of complete prostration.] It seems to me more practical or consistent with actual facts in the hospital theatre to give two stages of excitement, probably cerebral and spinal, and two stages of depression or anæsthesia, cerebro-spinal and ganglionic. It may be said, that a dentist's assistant will apply chloroform and profess to know nothing of these fine-drawn distinctions; still it is well to know them, as they undoubtedly exist.

It seems to me a good distinction also, easily kept in mind by the educated Surgeon, that chloroform acts first on the symmetrical organs; next on the reflex, or as we might call it, the partially symmetric, and lastly on the unsymmetrical or ganglionic system. This is a set of distinctions very necessary to observe in ordinary surgical operations: these stages are every day observable, even in the same class of patients, such as cases of midwifery, &c. In the latter, for instance, it is very seldom necessary to annul the ordinary consciousness of the patient; it would seem as if the patient can be kept for no inconsiderable period in a condition favourable to the expulsive act of the uterus, and yet to be very well under chloroform. My friend Dr Vernon has analysed the peculiar nervous arrangement of reflex and gaglionic nerves engaged in this action with great skill; it appears, in a word, very much

made up of this sense of touch and reflex irritability, of which we have already treated at some length. There are no cases where chloroform has been so successful as in obstetric practice; one can here also most readily analyse the progressive phenomena of anæsthesia. Small quantities of chloroform or of amylene rather excite and increase the action of the uterus. Dr Murphy has (as this sheet is passing through the press) directed my attention to the possibility of this depending, as he believes now it does, on the removal of mental emotion or anxiety during the labour pains, giving the uterus fair play to act. The action of the uterus may be suspended, but the effect is only temporary, and very much overstated, as the progress of the fœtal head is sure to re-establish the ganglionic action. I can scarcely go so far, however, as the able professor at University College, when he says, this suspension in many cases is entirely due to emotional dread of chloroform. Patients, at any rate, are not now as frightened at chloroform as they were five years ago. I constantly see about forty operations a week under chloroform for about fifty weeks of the year, and have been six or seven years perpetually in the hospitals, and my impression is, that the public are taking a more favourable view of chloroform than the Profession has been inclined to yield to them. If we might venture to systematise from what is already stated, and from the numberless facts afforded every year in hospital operations, I think we are justified in saying, there are these four well-marked stages of chloroform inhalation, and specific surgical operations adapted to each :

FIRST STAGE.

In the first stage, simple consciousness is disturbed or excited. In this stage polypi of the nose may be removed; operations on the rectum done; the globe of the eye extirpated; hare-lip operations in adults; diseased bursa from the knee extracted when not done by ice; section of tendons—which (though not very painful) sometimes, like whitlow of the finger, produce a tendency to syncope—or any other operation where we wish merely to dull the irritability and anxiety of patients, but where insensibility would be dangerous, staphyloraphy, for instance, as already referred to. Patients now in hospitals are glad to get what is called a "whiff" of chloroform; the mere fact of complying with their wishes removes a great deal of anxiety and emotional depression.

SECOND STAGE.

In the second stage, or that of spinal or of muscular excitement, Midwifery cases should be conducted; in the later or third stage of complete anæsthesia, delivery is impeded,—the deligation of large arteries seems also more feasible in this second stage, as the muscular and other landmarks for the knife are thrown into relief, the sartorious, for instance, in ligaturing the femoral; in this stage I think hernia cases also might be commenced, as the seat of stricture if muscular is sooner felt, and chloroform is now admitted to be of little value in the third stage in assisting the taxis, especially in femoral hernia. In all gun-shot wounds the French in the Crimea searched for bullets, and operated while the wounded were in this second stage of chloroform; the muscles

were thus thrown into relief, and balls were disengaged more readily. On the other hand, lithotomy, or perinæal sections, should not be performed in this stage, as the perinæal muscles are thrown into violent spasms, and the rectum may be wounded. The reduction of dislocations, or cataract operations, also should not be attempted in the second stage.

THIRD STAGE.

In the third stage, or complete anæsthesia, the reduction of old dislocations, extraction of calculi from the bladder, eye operations, excisions, and resections of joints are all best effected, and the great majority of surgical operations not already specified; such as amputations of limbs, removal of painful tumours, &c., all very painful operations; in a word, more especially where we wish to overcome muscular resistance, and long-continued or excessive pain, or emotional excitement.

FOURTH STAGE.

In the fourth stage, not always reached, but I think mostly always to be apprehended in capital operations, especially where there is weak or fatty heart, and the pulse below par, the patient swoons or faints, and does not recover from the anæsthesia as readily as other subjects.* This sometimes may

* A very remarkable death from chloroform was noticed as occurring at Epsom in the practice of a dentist. The operator used what he calls a *minimum* dose of chloroform. The death seems to have been from syncope, in what I call the fourth stage. I should have continued the best means of resuscitation in this case for at least four hours, viz., at first a few sprinkles of cold water,

occur from unexpected and excessive hæmorrhage, or the "shock" of a capital operation. It is very unpleasant when this syncope appears in the middle of an operation, and it is a strong argument for the administration of wine previously, or substituting it and local anæsthesia or sulphuric æther, where at all possible, for so very serious and dangerous an agent as chloroform. There is of course no surgical operation to be advised in this stage, but a great deal often is to be done in this stage to save the patient's life, such as pulling out the tongue, with a forceps if necessary, tying any bleeding vessels, fanning cold air on the patient, dashing cold water over the face, &c. It is advised to use ammonia, but the patient is probably not breathing: to fill the lungs therefore with ammoniacal vapour, for chloroform vapour seems to me of very doubtful value, care should be observed that a piece of vomited food is not stuck in the pharynx; oxygen or fresh air is what is wanted. The patient should also be turned at once over on his side, as we do not know what may be pressing on the diaphragm and aorta, what fluids may gravitate into and cause static congestion in the lungs, &c. The epiglottis and tongue also

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the limbs to be rubbed in the direction of the veins towards the heart (a plan found very valuable in Paris), a pen to be tickled in the ears and on the soles of the feet; the depressing action of the cold sprinkling to be then changed for sudden heat of hot flannels, &c. I am afraid of the Marshall-Hall manipulations, for reasons I explained to that physiologist himself when alive, and galvanism, applied to the par vagum and medulla, actually stops the heart in place of setting it going.

may fall back or close the glottis :—it is to be feared, in some of the deaths which are noted, too much was done. A crowd should be prevented collecting round the patient, and his bed should be at once dragged out into the next open space or hall from the theatre.

As regards this fourth stage, I have been unexpectedly furnished with some interesting facts from Guy's Hospital, by Mr Bryant, in which I can trace the contrast of the operations performed in the time of Mr Aston Key and Sir Astley Cooper, without chloroform, and those at present under Mr Cock, Mr Hilton, Mr Birkett, &c. I believe Mr Bryant, who has seen more of the after-treatment of cases operated on than any surgeon in the borough, is peculiarly qualified to speak on this point. Mr Holmes Coote and Mr Stanley, at St Bartholomew's, have also recently made similar contrasts of operations, as done twenty years ago, and now done under chloroform. I have the statistics and suggestions of those two leading schools, they agree in some measure as to the accidents from the after-effects of chloroform, and quite fortify my original impression of the danger of this fourth stage; it is often marked by vomiting and faintness. Mr Bryant calls it recurrent debility or syncope. The patient is taken back to the ward comparatively "quite right" after his operation, but he falls back again into a stupor, from which it is difficult to rouse him up. From what I have seen of this stage, it seems entirely different from that of convulsive action in the preliminary steps of anæsthesia, which proves fatal. A man was operated on at Guy's for stone this year by "Allarton's plan," so remarkable for absence of

hæmorrhage ; he fell deeply into this fourth stage, he seemed quite impassive to every conceivable mode of rousing him up, and was for a quarter of an hour looked on as dead. Happening to be present, I advised to continue the means then adopted, even for five or six hours if necessary ; but if it had been the sudden convulsive fit of the early stage of chloroform I should be entirely without hope. The poor man recovered, but it took at least five or six hours to bring him round. If we might venture on an explanation of this fourth stage, it might be said to depend on a return of imperfectly decarbonised blood, as in the latter stage of epilepsy, to the brain.

CHAPTER VII.

CONTRA-INDICATIONS TO THE ADMINISTRATION OF CHLOROFORM—ACTION OF MEDICINES LIKE HYDROCYANIC ACID, DIGITALIS, ANTIMONY, CROTON OIL, &c., COMPLICATE THE PHENOMENA—SMALL OPERATIONS SOMETIMES VERY DANGEROUS — PROFESSOR MILLER'S LAW OF TOLERANCE — DELIRIUM TREMENS, HYSTERIA, WEAK OR DILATED HEART, EPILEPSY, &c.; EXISTENCE OF ANY OF THESE CONTRA-INDICATES THE USE OF CHLOROFORM.

It may be asked, even before we proceed to the application of chloroform, Are there any contra-indications to be thought of in its administration? any precautions to keep in mind? I believe there are a great many. If I have dwelt so much on the necessity of recognising certain stages in the chloroform process, and if I have spoken of the necessity of intermitting the use of strong medicines like croton oil, hydrocyanic acid, digitalis, tartar emetic, &c. (and these are no wild fancies of mine, I can assure the reader),—it is with the serious and sobering fact before us, that in such surgical operations as that for strangulated hernia, where croton oil has been used, the life of the patient depends very often on his not having too much, or his not having too

little chloroform: the patient is going down an inclined plane, from which it will be difficult to rescue him. If a common assistant of a dentist, or a second year's student for instance, administered the chloroform, in such case this inclined plane would probably end in the patient's grave. In cataract, again, if the vitreous humour be softened, we must be careful for vomiting, or the patient will be stone blind for the rest of his life; though I do not exactly go as far as Mr Wharton Jones on this point,—as I have seen, literally, hundreds of operations for cataract at other hospitals under chloroform without any evil result ascribable to the chloroform. I should be afraid of chloroform where the patient had been previously using, as a medicine, digitalis or hydrocyanic acid, &c., or had suffered from "mania a potu," simply because these things, like epilepsy or hysteria, interfere with the usual normal progression of events under chloroform. Sometimes, on the other hand, we make a sort of compromise with the patient's judgment; and in such trivial operations as amputations of fingers, evulsion of toe-nails (which I have seen beautifully done with congelation by ice), Wutzer's operation for hernia, &c., we allow the patient to have chloroform, as that alone helps to banish a thousand fears from his mind; but as the patient is probably argufying, and before he is completely under the anæsthetic, the operation, in the twinkling of an eye, is performed! Patients have died under chloroform while a whitlow was being opened, a syphilitic wart removed, and another from ligaturing a hæmorrhoid, or extraction of a tooth. Professor Miller has recently made some remarks on a "law of tolerance," that where a

patient is labouring under great irritability and pain, he bears chloroform best; this is only another explanation of the view I have taken, that patients bear large operations under chloroform best; but deaths occur in the early stages, or from hysteric affections, or epilepsy, or delirium tremens, as may be perceived from the following contra-indications to chloroform:

1. A patient may take chloroform three or four, or more times, and yet die on the fifth or sixth, from lessened or altered irritability; or from what is not at all impossible, viz., the use of impure chloroform, or the supervention of a new disease, such as delirium tremens.

2. Any unusual *difficulty* in bringing a patient under the full effect of chloroform must always be looked upon with very great cautiousness, if not suspicion, as the absence of tolerance, or cumulative doses of chloroform in one part of the nervous system may do mischief in another part, when least expected, ex. gr., the largest amount of chloroform that may not be able to annihilate the sensibility of an over-sensitive ulcerous skin, in a diseased limb, before amputation, may annihilate the action of the brain or a weak heart, without the slightest chance of recovery. In some of the older or earlier deaths by chloroform, we now read of chloroform used by the half-ounce at the time poured into the inhaler, and on pocket-handkerchiefs. One hears also of "recurring syncope" from this state of things. Occasionally, I have known patients obliged to be removed from the operating table, as no amount of chloroform seemed to affect them or to establish tolerance; here it would be obviously

wrong to continue its application, for fear of the bad effects of the cumulative doses. Hysteric women, as I said previously, require large quantities of chloroform, but, as a rule, we should never in such cases pour more than ℥j into the inhaler each time.

3. Various lesions of the vascular system, such as atheromatous deposit in the arteries, or fatty or dilated heart, have been also forcibly urged as causes of death. When we remember, however, that one of the first effects of chloroform is not to depress the heart, but to stimulate it, one cannot help believing that, perhaps, too much emphasis has been laid on this single sign as a contra-indication to the use of chloroform. It is always right to pass the ear over the chest and examine the heart before applying chloroform. It must not be forgotten, however, that in deaths from chloroform the heart is sometimes found firmly constricted and healthy.

4. It has been recently urged that the existence of hysteria in patients is almost sure to lead to death. If such patients be placed under chloroform, the latter is required in such quantities. Tetanus and epilepsy also contra-indicate its use. Opisthotonos was very common under amylene! I have occasionally seen patients with complete opisthotonos, the result of chloroform. Emprosthotonos is very common. A tendency to faint is also a very dangerous complication!

5. A full stomach must be avoided at the time of operation under chloroform, as impeding the action of the diaphragm. The depression or emotion of fright is also a thing to render the surgeon doubly cautious; the chloroform dream, so to speak, may be influenced by fright.

6. Excess of venery and masturbation have been much dwelt on also by continental surgeons, as weakening the spine and destroying its proper reflex irritability, and if suspected in patients, it should prevent their running the risk of complete paralysis from chloroform. I may say I do not entirely agree with Professor Miller's idea of a "law of tolerance," but it may be accepted, provisionally, as the best interpretation we have yet of the fact I have dwelt on, that the deaths occur under chloroform independent of the seriousness or extent of the surgical disease or operation for which chloroform is used.

CHAPTER VIII.

LOCAL ANÆSTHESIA BY ICE A SUBSTITUTE—CONTRAST OF THE SAME OPERATION AS PERFORMED BEFORE AND AFTER THE DISCOVERY OF CHLOROFORM—RESECTION OF JOINTS ENTIRELY DUE TO THE BENEFITS OF CHLOROFORM.

There are two classes of practitioners for whom, chiefly, I have intended the various observations already made on chloroform and æther. One set of men to be met with in hospitals very often commit mistakes from too much boldness or recklessness in the administration of anæsthetics; others are intimidated for want of hospital experience—though ever so willing to give chloroform a fair trial, they seem to know nothing about it. If I am anxious "to bestow all my tediousness" on the reader, it is due to the fact that some recent very remarkable deaths from the use of chloroform, as well as the great uncertainty still attending its inhalation, have led me to the conviction that the danger attending the administration of this uncertain but popular agent is, perhaps, still too much underrated by practitioners, and that by re-opening the subject completely, and continuing to collect observations together, more certainty might be introduced into the subject, and our increasing experience every

year serve to dispel various prejudices so long gaining ground. It has occurred to the writer also, as doubtless to many other practitioners, to be obliged to admit that the value of local anæsthesia by freezing or ice, in some surgical operations, has been also too much underrated,* more particularly

* It may be practically useful to give a few of Dr Arnott's directions for the ice and salt anæsthetic. I had occasion to try it myself this month and with good effects : "Although there are several modes of employing intense cold as an anæsthetic, I shall here confine myself to the most simple and generally applicable of these—viz., the placing a frigorific mixture immediately on the part, or with the interposition only of a piece of thin gauze or tulle containing it. This piece of gauze (formed, for the sake of convenience, into a small net or bag), the components of the frigorific mixture, a canvas bag or coarse cloth, a mallet or flat iron, a large sheet of paper, a paper-folder, and a sponge, constitute all the articles required for congelation. The common frigorific of ice and salt will generally possess sufficient power; when greater is required, saltpetre or an ammoniacal salt may be added. Every systematic work on chemistry contains tables of frigorific mixtures, as well as instructions for making ice, which, when but a small quantity is required, may be thus artificially procured almost at as little expense as from the fishmonger.

"A piece of ice the size of an orange, or weighing about a quarter of a pound, will be sufficient for most operations. It is put into a small canvas bag or a coarse cloth, and beaten, by the quickly repeated strokes of a mallet or flat iron, into a fine powder. As it is important that the powder should

in hospital practice, and that if chloroform were not in such every-day excessive use, we should hear of fewer accidents, more especially amongst persons outside the Profession. Ice and carbonic acid, as local anæsthetics—in fact, together with chloroform—offer a wide field for research; in which, every day, new facts are being turned up.

So much is now ascertained of the usefulness of ice as a local anæsthetic,—we see it act so well in private practice so often, where chloroform is forbidden—that some comparative results of anæsthesia after ice, and anæsthesia after chloroform, must have already impressed themselves on every operating surgeon's mind. Chloroform, it must not be forgotten, is not in too much favour with some surgeons,—as one of our chief collegiate surgical

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be fine, it is not ridiculously minute to state, that the bag should be turned in various directions during the pounding, and that the pounded ice, squeezed into a cake by the iron, should have its particles again separated by rubbing the bag between the hands. Instead of pounding it, the ice may be pulverized by the ice-plane.

"The pounded ice having been placed on a large sheet of paper, any loosely-cohering particles may be separated by a paper-folder, and the unreduced larger bits removed. Beside it, on the paper, about half the quantity of powdered common salt is placed, and they are then quickly and thoroughly mixed together, either by the ivory folder while on the paper, or by stirring them in a gutta percha or other non-conducting vessel. If the mixture be not quickly made, the extreme cold of one part of it may again freeze other parts into lumps.

"The mixture is now put into the net (which may

teachers in London lately stated in public, at a leading hospital, that the day was not far distant when chloroform would have so disappointed the world, that it should be as completely forgotten as the elixir vitæ or philosopher's stone! It cannot be said that one shares in this opinion with any satisfaction or pleasure. It may be so, but we shall have got, perhaps, some other anæsthetic better than chloroform. Again, we have persons with a very large and abounding faith in the virtues of ice or æther anæsthetics, either of which is to supersede chloroform some particular month and year! We must make allowance for immature exaggerations on the part of the enthusiasts for ice on one side, of chloroform or æther on the other. In avoiding one excess of zeal at one side, we have had lately a

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be conveniently supported and preserved from contact by placing it in the mouth of a jar or ewer), and as soon as the action of the salt on the ice appears established by the dropping of the brine, it is ready for use.

"In applying the net, the part which is to be benumbed should be placed in as horizontal a position as possible; and it is well to raise the net for a moment every three or four seconds, in order to secure the equal application of the frigorific, and watch its effect. If the part be not horizontal, it may be necessary to hold the gauze bag containing the frigorific against it by the hand covered with a cloth; and if the net does not cover the whole of the surface to be benumbed, it must be passed to and fro over it. A moistened sponge placed lower than the net will absorb the fluid escaping from it, or this, on some occasions, may be allowed to drop into a basin placed underneath."

tendency in this subject, after the classic maxim, to run into an excess of another kind on the opposite side. Individually, I have seen very bad effects from both ice and chloroform used as anæsthetics. Neither is entirely perfect; it is only just to add also, however, that the good effected by both agents far and immeasurably preponderates over the evil. Ice or chloroform is almost equally dangerous if not used with proper precaution; ice leading to mortification of limbs and frost-bite if used unscientifically or for too long a time, or, as I have seen it, causing sloughing, and in a few cases preventing the healing of wounds made for removal of tumours, not otherwise serious,—while chloroform may lead to fatal syncope or asphyxia ending in death, as is too familiar to us all. The danger attending ice or chloroform is not very great—it cannot be said too often—if the proper administration of either of these agents be observed or understood. An overdose of ice, or an overdose of chloroform, will probably kill with as much certainty as an overdose of opium. It is said one death in ten thousand cases is sufficient to condemn chloroform on moral grounds; but we are here arguing against the *use* of a most valuable remedy from its abuse. An overdose of opium will kill, but if it were not opium it would not produce all the very estimable blessings of opium in producing sleep. Opium and prussic acid cause death, but that does not, in a *moral* point of view, prevent well-educated practitioners recognising them as the most valuable agents on which they can sometimes rely—as, for instance, in pain and palpitation of the heart.

Chloroform, as the most efficient agent we at

present possess for the removal of pain, promises to remodel or revolutionise the entire science of surgery. Some operations are now undertaken, and undertaken under the most unfavourable circumstances, which were not previously advised at all on account of the long-protracted pain; thus, excision of joints may be cited as altogether a new page in surgery, which we owe, not to this or that surgeon, but to chloroform. The late Sir P. Crampton, and Mr Syme, and Mr Abernethy gave up "excision of joints" in despair, on account of the pain!

In females, again, about to undergo what they conceive a very formidable operation, even under chloroform, such as the removal of a breast or limb, everything to their minds is very frightful; the emotional parts of the brain, and those connected with intelligence, are those most excited. I have seen women who had been reading about it even refuse chloroform, as they could not conquer a dominant idea they would die under its effects, as described by some doctors. It is interesting to observe that this excitement or irritation of the cerebral lobes (so much engaged in the emotions and intelligence) does not cause convulsive movements in these women, or plunging, but leads rather to manifestations of excited operations of the mind, followed by heavy sleep; and we here go back to the first and third stages, and the woman, like the child, talks or sings, and recounts half her life as if in a dream, but suddenly, without much plunging, falls off into the third stage of complete anæsthesia or sleep,—as corroborating the various proofs of the special function of the anterior lobes of the brain, as connected with intel-

ligence. I may mention here, a grown-up girl often seen at St Bartholomew's Hospital in perfect health, but in whom the whole front of the forehead above the frontal sinuses may be said to be absent, from a surgical accident—the dura mater and brain are observed pulsating under the skin; the child has never had convulsions, and is only stupid if one presses the part. In another poor child, during the past couple of years, a large piece of a glass bottle was driven forcibly into the brain in front, and during an entire week there were no convulsions, nor no symptoms of any kind, in fact, to indicate such an injury. We have not much to fear, therefore, from the action of chloroform on this anterior or intelligential part, though this is perhaps the first, or amongst the first, parts of the brain affected by it. Contemporaneous with this change, another however, especially in male patients, is also observable, viz.,—a specific irritant or convulsive action of the chloroform on the tubercula quadrigemina and pons; the patient's limbs are convulsed or flung wildly about; one, in fact, now and again recognises a curious similarity, if not identity, between this stage of chloroform and an ordinary fit of hysteria or epilepsy. It is not at this *second* "convulsive" stage, I think, that the fatal *fourth* stage, or "syncope," is suddenly to be feared. This second stage, when well marked in male patients, is generally looked upon rather in a favourable light than otherwise; it certainly shows that the spinal system is healthy, but not yet paralysed. Consciousness is not entirely abolished in this stage also, so that it is more like hysteria, perhaps, than epilepsy, and I believe the means of resuscitating patients in

impending death in the second or fourth stage in syncope or asphyxia—as in the two last cases of death at Epsom and Towcester—are quite and entirely different.

The increased sensibility of the lower limbs especially shown every day in hospital practice, in convulsive attacks, such as tetanus, epilepsy, hysteria, puerperal convulsions, &c., all depend on a peculiar condition of the anterior column (?) and the ganglionic centre of the spinal cord, which condition occasions these movements, without the patient's knowledge or consciousness; all these are very singularly excited too by chloroform, as in the epileptic plunging of patients, sickness of stomach, convulsive action of small perinœal muscles, &c. M. Brown-Séquard terms the fifth nerve the most sensitive nerve in the system; this explains why it is so late in coming under the effect of chloroform, and that touching the eyelids or conjunctiva, as I said before, is not the most delicate test of anæsthesia under chloroform; but the *last* test—we have nothing beyond it. It is not yet exactly known what nerves supply the inside of the skull; hence the difficulty of explaining some of the phenomena of ordinary headache and sickness after chloroform. The remedy, however, I find most useful for the latter is carbonate of ammonia in a state of effervescence, soda water and brandy, and sleep.

I have recently witnessed within a single week two cases that illustrate the advantages of chloroform, as regards the comfort or recovery of the patient, as well as half-a-dozen other cases in another week that show how variable the proportions or quantity of chloroform required for different opera-

tions; some operations requiring only ʒii. of chloroform, other operations ʒiv. and ʒ v. !

One of the first cases was a patient operated on at Guy's Hospital; it was an old case of resection of the elbow-joint, in which eighteen years previously Mr Aston Key had performed, or had striven to perform, this then very novel experiment, leaving the poor man (who is a letter-sorter in the General Post Office) a very imperfect use of the elbow and forearm. The man had a most perfect or correct recollection of the agony, torture, and horrors of the first operation, and wished now for amputation of the limb, which had recently begun to pain him very considerably; this, however, was denied him, and it was explained to him that the parts could now be explored and cut into without any pain; he said he could sooner die than go through Mr Key's operation again—yet go through it he did, like a child asleep, and on my speaking to him when consciousness was restored, and he opened his eyes, he wished only to know when the horrid operation would commence, for he had been in a beautiful dream—not knowing, poor man, or associating in his dreams all the ancient gouges, saws, mallets, knives, &c., that had been again delving and cutting through his elbow, and half forgetting, or puzzled to find, that the "ivory gates of sleep," with all the sawing of bones and blood, through which he had now again passed a prisoner, were no longer guarded by the dogs of the inferno, painted so deeply in his memory, but by the gentle spirit of chloroform!*

* Somewhat different from the views of Shakespeare, Young, &c., as referred to previously in

Such an operation as this, I may here say, would require ʒiii. of chloroform; such an operation as iridectomy, ʒvi.; lithotomy or cataract, ʒiv.; cases of club foot, &c., even less, or about ʒii.

In the second case above alluded to, the operation of amputation at the hip-joint was performed under chloroform at St Bartholomew's, but Mr Stanley quoted the opinion of Mr Abernethy, out of some manuscript notes, where Mr Abernethy said that on

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Lord John Russell's lecture, the ancients spoke of "two gates" to the Temple of Sleep, in which I think I can detect a reference of an obscure kind to one gate for entrance to the refreshing fountains of true sleep.

"Qua veris facilis datur exitus umbris,"

from whence the tired spirit re-enters the world refreshed, and where the soul is strengthened by a new stock of "innate" ideas. We know, for instance, that Byron and Coleridge both state the fact that they composed some of their exquisite bits of poetry in this state! The other "gate" of sleep is represented as being made of more polished and perfect ivory, "the gate of false visions and dreams," where the sensorium or "internal sense, made up of soul and spirit," as termed by the leading philosopher of Europe, lies a prey rather to the rough jostling of the external world and external senses! In chloroform anæsthesia we have more to do with the latter than the former condition of the brain and external senses, and, as I have said more than once, when chloroform is properly administered with due regard to external sensorial impressions we may change a horrid night-mare into a refreshing and delicious dream, and thus take advantage of our poeticisings.

account of the "pain" this operation ought never to be described in lectures or attempted! Yet, as a "secondary" amputation, the vessels tied as the surgeon goes along, this operation is now often performed with a considerable share of success. In point of fact, as remarked already, this operation, as well as all, or nearly all, our modern resections, of which there have been now some hundreds, as well as our large and tedious plastic operations in the female, are all the result directly of the discovery of anæsthetics and chloroform, as surgeons could not conscientiously attempt resection of the knee, for instance, in the absence of chloroform.

CHAPTER IX.

CHLOROFORM IN OBSTETRICS—EXPERIENCE OF THE SCHOOLS OF DUBLIN, LONDON, AND EDINBURGH—DEATH FROM CHOLROFORM.

I referred before (Preface) to the weak objections urged usually against chloroform in obstetric practice. We have a want in London, that there is really not one "Lying-in Hospital" for general instruction in obstetrics. One gets reconciled to this as a matter of humanity after the recent debate in Paris on puerperal fever; but it is to be feared our statistics on this subject, as regards chloroform, will long remain very imperfect.

Professor Dubois speaks well of the extreme laxity induced in the muscular layers of the perinæum under the effect of æther, even in primiparæ, with a state of anæsthesia kept up only for an interval of a quarter of an hour, the uterus after delivery regaining its firm contracted condition. Dr Simpson found under æther in some patients a state of apathy and insensibility, other poor ladies moved about and told their sorrows over during uterine contractions with an unusual misery and mystery, but forgot all about it when common consciousness was restored; yet in all, the uterine contractions continued as regular as before the inhalation had

begun. I believe, however, from what I have seen of chloroform in anæsthesia of parturition, that it renders the labour a little slow, it requires also some little caution, so as not to go beyond the earlier stages. I find it to be an admitted fact, however, that a great deal more mischief occurs to the infant from the forceps and secale cornutum than from chloroform,—the ergot acting sometimes directly as a poison, as well as keeping up pressure of a contracted uterus on the circulation in the funis.

I deem it right to state that I have been very much disappointed in the result of certain inquiries I set on foot this year bearing on chloroform in obstetrics, though I have found no difficulty whatever in arriving at superabuudant data on chloroform in other departments of surgery. Not a few of the leading men associated with obstetric practice in the professional mind have informed me, as a matter well known, that they do not attend ordinary midwifery cases; that they have not taken any new cases during the last six or ten years since chloroform came in, &c. &c., so that it is in a direction quite different from what is generally considered in London, that we shall have to look for any reliable data on this subject, in the maternity department of our large hospitals I have found a large number of most valuable statistics ; if I shall have succeeded, however, in inducing some men to think the subject over, one of my leading objects in this work will be attained ; we must not, however, go on copying the useless controversies in such books as that of Dr Ramsbotham, for whom, in everything else but chloroform, as an *habitué* of the London Hospital, I have a great respect.

As we have no large lying-in hospitals in London at all like the Rotunda at Dublin, or hospitals in Vienna or Paris, we have no statistics.

In 360 cases of poor women chiefly out of hospital, under the administration of æther, and 180 under chloroform in the practice of one leading obstetric physician, and 1,519 women delivered while under the effects of chloroform alone by another, there was not the slightest accident or casualty traceable to the anæsthetics. One cannot help harbouring a suspicion, that if there had been even half a dozen deaths and inquests in these two thousand cases, it would have been fatal to chloroform in obstetrics.

I have been favoured with the impressions of some of our leading men on the subject, and on one side I think I may fairly range the experience and practice of Sir C. Locock, Dr Murphy, Dr Montgomery, Dr Rigby, Dr Beatty, Professor Simpson, as well as several French and German medical men that I have met in the hospitals. On the opposite side, Dr Lever of Guy's, Dr Ramsbotham, Dr Barnes, hold no inconspicuous places as opponents of chloroform, while, in point of fact, the men who really know most about the subject from actual experience are Dr Murphy, Dr McClintock of Dublin, Dr Beatty, Mr Baker Brown, and his able assistants at St Mary's, Professor Simpson, Dr West, Dr Waller, Dr Chowne, and a few others.

As a practical summary of the phenomena of ordinary chloroform inhalation, in its three stages (page 8), I know of no class of patients which so well exhibit these stages as an ordinary case of labour; premising only that the expression of the

patient's feelings by herself, is not an actual measure of the amount of pain endured, as she will often cry out hysterically when there is no pain whatever, while, on the contrary, she is calmly dreaming of some innate fancy of her baby or husband—she is anticipating "the joy that a man is born into the world," but in no pain whatever, exactly at a moment when other poor women suffer most intensely. I have not described what takes place when a patient is placed under chloroform, as it is a thing every one should see for himself. The amount of chloroform used need be very little in midwifery cases. Dr Snow mentioned to many the particulars of the case in which the tenderest sympathies of the public were twice excited on certain memorable occasions, and the quantity was very small. ʒi of chloroform by measure varying to ʒiss, is what Dr Murphy uses at first, some patients will do with less, and the inhaler or sponge should be withdrawn in the intervals of the pains, as the tendency of the chloroform itself, it must be admitted, especially in some cases in the early stage of the labour, when the purely reflex nerves are acting, is to lengthen out these intervals, and make the labour somewhat slow, a recommendation I fear of no favourable kind to the Poor-law surgeon or general practitioner, to whom time is money, but amongst whom terrible tales are told of the mischief done by ergot and forceps! I merely say this, as it explains why a mass of professional prejudice has grown with the growth of chloroform in the favour of the public, and that the same agitation got up against the use of ergot or forceps, if founded on the number of deaths these agents produce would do more good. The chloroform, as I said before,

should be as much as possible restrained in ordinary labour cases to the point of the second stage (page 9). In cross births, however, or necessary operations with instruments, or for the space of a few minutes, as the head of the infant is pressing on the perinæum, it is right to go on a slight shade farther into the third stage.

Dr Lever tells me of a class of cases where he has found chloroform very valuable, though his general impression is against chloroform in obstetrics, they are cases where there is transverse or other troublesome presentations, and it is desirable to turn ;—Dr Murphy also has reminded me of cases where the cervix of the uterus itself is compressed between the fœtal head and pelvic bones, the pain here is often very great, nay the os itself may not be dilated at all, in the midst of this chapter of horrors! But here chloroform pushed into the third stage is an invaluable boon, nay, it will prevent convulsions like a charm, while the old routine man is looking for his lancets to bleed the patient! The first effect of chloroform is merely to blunt the pains of ordinary labour, then the patient complains of a tingling sensation through the arms and legs ; the arm perhaps fails to hold on by the towel tied round the bed post, the pulse is tranquil ; she says, "I know I have a pain, but yet I do not feel it ;" but she may speak of palpitations or vertigo, or feel frightened, and the friends refuse to let her have any more.

Here the moral courage of the physician is often put to a severe test, and I doubt if the doctrine of some surgeons holds good, that chloroform must be always decided for by the patient. She exaggerates

her pains as already referred to, and these dreamy fancies take on a form of rather anxious incoherency she or her friends are no jndges at all. The experienced physician, however, is not frightened, no more than the surgeon in the hospital theatre at the patient's kicking about, rambling and singing of songs, &c. I don't understand a fine drawn vain opinion of some learned Thebans, that there is pain, but no memory of pain, it is like Dr Cole's idea that pain is a stimulus! It is desirable to be careful as to certain examinations made,* and to use the greatest

* We have a vivid picture how external sensation re-acts on the brain proper during sleep in the description of Queen Mab in "Romeo and Juliet."

There has been no use ever made of some of the curious legends picked up and edited by Mr Crofton Croker; many of them are tales not unlike this of Queen Mab, to which one may at least safely refer for descriptions of ordinary and extraordinary anæsthesia or intoxication, those of the legends that are not of geological origin; begin in some fanciful manner about banshees, pookahs, or pixeys, then branch out into the wide territories of the land of dreams, and end by the dreamer finding himself suddenly woke up, as his wife or the landlord finds him, asleep under a table, having drained the last drop of his bottle of whisky made in a bog-hole, and very full of what we now call amylene or potato spirit! The description of Queen Mab is so exquisitely true, as a physiological fact, it is deserving of study; and, as the sailors on the island, under the spell of Prospero and Ariel, "standing, speaking, moving," though asleep, refer to what we now know as somnambulism or a special condition of the cerebellum, Queen Mab

kindness and mildness, as the mind of the poor woman for a short interval is in a state of dreaming, from which of course it is quickly set free. I give here some of the less favourable results of chloroform, which have also been ridiculously exaggerated in our medical literature, and too often remind me

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typifies an analogous state of the cerebrum and external feeling:—

Romeo. I dreamt a dream to-night.
Mercutio. And so did I,
——— that dreamers often lie—
Romeo. In bed asleep while they do dream things true.
Mercutio. ——— Queen Mab hath been with you,
She is the fairies' midwife, and she comes
Drawn with a team of little atomies
Athwart men's noses as they lie asleep.
* * * * * *
Her whip of cricket's bone; the lash of film,
Her waggoner, a small grey-coated gnat:
And in this state she gallops night by night
Through lovers' brains, and then they dream of love;
O'er lawyers' fingers, who straight dream of fees;
And sometimes comes she with a tithe-pig's hair
Tickling a parson's nose as he lies asleep—
Then dreams he of another benefice.
Sometimes she driveth o'er a soldier's neck,
And then dreams he of cutting foreign throats.
——— and then anon
Drums in his ear, at which he starts, and wakes,
And being thus frighted swears a prayer or two
And sleeps again.

of Bacon's sensible words, that in whatever is great, and new, and true—"a mixture of a lie doth ever add pleasure;" for doth any man "doubt that if there were taken out of men's minds vain opinions but it would leave them poor shrunken things, melancholy and unpleasing to themselves."

Professor Montgomery tells me that chloroform has been found generally satisfactory in Dublin when judiciously used, he has never known it to produce or aggravate mania; if chloroform be given too freely it certainly debilitates the uterine contractibility, and leads to *post partum* hæmorrhage, and for the same reason will of course impede labour! This experience of chloroform in Dublin I obtained without offering the slightest idea of my own opinion on the matter. Dr Murphy, who has used chloroform continuously for ten years, whose statistics I have already given, writes to me, professing his great delight that chloroform is emerging out of the darkness of former times:—"I confess I am greatly surprised," he says, "at the boldness of the statements made as to chloroform: so far from causing mania or anything like it, I find one of its greatest advantages to be the rapid and favourable recovery of the patient, and for this alone I should use it, even if it did not relieve pain, but the relief of pain saves nerve force, and enables the patient to resist those causes of fever and inflammation which so frequently interfere with a patient's recovery." Dr Murphy believes that the action of the uterus under chloroform is not generally interrupted, and hundreds of women are delighted with the relief that chloroform affords. Dr Rigby gives similar evidence to Dr Murphy. The same dose of chloroform given in the same manner pro-

duces different effects on different constitutions, as I referred to previously in the art of dentistry. There can be no doubt that there are many things calculated to embarrass a practitioner in the sick room; the female's friends and *sage femme* hold many a deliberation on the metaphysical subtleties of chloroform, and mania, and the new baby; and if the advocate of chloroform in obstetrics has the misfortune to have some "discreet and experienced practitioner" brought into consultation, I agree with Dr Murphy that the fears and metaphysics of the *sage femme* will be confirmed, and chloroform banished in all future labours.

Dr Ramsbotham gives, in this way, a case of so-called death from chloroform in obstetrics; it was the poor woman's fourth child, and in the first labour the long forceps were found necessary; in the three subsequent labours she had chloroform, which agreed admirably with her; but in her last labour, though she went through it very well, and the uterus contracted very well, it was found that at the end of an hour and a half distressing dyspnœa came on; this was soon followed by convulsions, and death. It seems she had never been totally unconscious, and frequently "expatiated on the relief afforded her." I think, if not a death from some cause irrespective of chloroform, it was a case of what I have called recurrent syncope or fourth stage, and probably the proper means of resuscitation were not tried. Dr Ramsbotham speaks of the chloroform as discontinued for five hours, so that it was certainly not a case of what would be commonly called death from chloroform. Another case recently in Paddington, where the woman had been under chloroform, was even still more problematical as to

its depending on chloroform. Occasionally distressing vomiting continues ; the best remedy is, as Dr Rigby and Dr Druitt advise, effervescing draughts and a mild purgative ; the latter is quite in accordance with my hypothesis of the cause of vomiting.

CHAPTER X.

NATURE AND CAUSES OF DEATH FROM CHLOROFORM.

Having mentioned the several contra-indications to the use of chloroform in surgical practice, as well as described the two modes of recuscitation in impending death,* and as I believe death is not a necessary result of the administration of this agent, but an accident, it will be necessary to say only a few words on the nature and causes of this terrible accident. The majority of tens of thousands of patients under chloroform are relieved from the most

* I do not know that I have any particular remark to make on a communication by Mr Lobb, who doubts if my statement be true that electricity along the eighth pair of nerves, when tried for the purpose of reviving the action of the lung, stops that of the heart; but if Mr Lobb will try the experiment, as referred to by Mr Paget and Mr Huxley, and not mind "books on physiology" of fifty years ago, he will probably come to the same conclusion as the first physiological lecturer in England on this subject. There is a good deal of quackery about electricity at present, the "post hoc" cures put for "propter hoc," but I believe this experiment is of a different kind, and new!

horrible agony, "shock," and suffering of a cutting and sawing operation, but we hear very little of the fact, whilst a single death naturally excites much alarm. Thousands of patients rejoice like Endymion —one would think he was speaking of æther—

"Long in misery
I wasted, ere in one extremest fit,
I plunged for life or death. To interknit
One's senses with so dense a breathing stuff
Might seem a work of pain; so not enough
Can I admire how sweet a dream it felt!
At first I dwelt
Moving but with some mighty ebb and flow
Forgetful utterly of self-intent.
Then like a new-fledged bird that first doth show
His spreaded feathers,
I tried in fear the pinions of my will."

As to the immediate cause of death from chloroform, or the mode in which death occurs, it is singular how opinions vary. Gibert, of St Louis, in Paris, one of the latest authorities, is satisfied all deaths in France have been from convulsive fits or syncope; in Germany too this opinion prevails, and they believe that air is evolved in the veins from want of tonicity of their coats. In England, on the contrary, very many of the deaths, especially those in the infancy of anæsthetics, have been decidedly from bad management and asphyxia, with stertorous breathing; in every ten cases of death I find the proportion to be about four asphyxia and six convulsive fits or syncope! I have looked carefully through the old deaths from chloroform, and I think they bear about this proportion. Syncope seems by far the worst accident, as you can do almost nothing,

while in asphyxia the patient has been brought about once or twice by artificial respiration alone; as the pulse remains good the chloroform is got rid of by respiration.

Chloroform acts more safely on the young than the old, or, as it might perhaps be otherwise explained, in the old we have a smaller stock of irritability to work with, and once extinguished by chloroform it is not readily restored; hence we have asphyxia. In the old, too, there are many more chances of old organic disease, such as a tendency to epilepsy, heart disease, *ramolissement* of the brain, &c. In the young the chloroform is quickly absorbed, there is very little plunging of the patient or excitement of the muscular system, and anæsthesia is quickly induced; speaking generally, there have been no deaths of children from chloroform, though we see them in dozens, and of all ages, brought under its action. It does not seem probable, either, that in widwifery practice the mother ever suffers, or the child is ever killed by chloroform exhibited to the mother; the fœtus is already beginning an independant state of existence from the first disturbance of the placenta, and previously from its mere passive vegetative life, the sensibility of the spinal nerves must have been very much in abeyance.

As to deaths from chloroform, I believe they are still very often due to inexperience of chloroform, and want of knowledge on the part of the administrator, and very often on mental emotion. It is the wildest fancy to think that as suggested by some ardent admirer of tubes and inhalers at St George's Hospital, that deaths occur from the use of folded lint, or sponges, or handker-

chiefs, in place of tubes and inhalers; some of the deaths are unmistakeably from overdoses: thus a patient, named Bennett, in 1849, died in Westminster; half an ounce was used without effect, and when two hours after some more chloroform was obtained he suddenly expired.*

* I do not like the idea sometimes of changing the chloroform one is using, and on no account ought persons to speak to or interrupt the surgeon while he is applying chloroform. I believe it is very necessary during inhalation of chloroform that the patient shall also very cautiously begin with what may be called a "maximum" dose of ʒiss. or ʒi., and then go on to smaller and smaller quantities of ʒss., but never in the reverse order. Bernard has shown that in ordinary respiration of atmospheric air, if an animal is confined in a bell-glass, and at the end of an hour and a half it is still active, that such is the gradual adjustment of the animal's system to the new state of things, it will go on breathing; but if a fresh animal of the same kind be now introduced, it will die almost instantaneously, in consequence probably of the want of this adjustment. It seems pretty well established, too, that the poisonous influence of a vitiated air soon adjusts itself to the feeble, sickly organism, while a fresh perfectly healthy individual, going especially fasting early in the morning into a cholera district or a fever ward, though a nurse or other patients may escape, will be almost certain to suffer.

Experiments in animals, no doubt, are sometimes faulty. It is known that cold-blooded animals will breathe very wonderfully in pure hydrogen, which permits the exhalation of carbonic acid from the blood. I referred before to the ingenious experiments

The French Academy decided that the handkerchief had nothing to do with death from chloroform, and in London at the leading hospitals nothing else is used in about six out of ten of these institutions.

We know that æther will not cause those very sudden deaths by syncope, that chloroform is, perhaps, fairly chargeable with (I now speak more especially of experiments with these two agents respectively on the lower animals); it has been recently recommended accordingly to use a large admixture of æther with chloroform, and I think it is very advisable in the extremes of life in patients, viz., in infancy and old age. Æther, if swallowed in any large quantity in a fluid state, produces signs of intoxication with obtunded sensibility, the pulse remaining little affected; it might be useful as a preliminary, like the administration of wine or opium, and if we are to take the experience of Mr

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of Dr Edward Smith, conducted along with Dr Snow, where the amount of carbonic acid given off from the blood is decreased under chloroform, but increased very much by the stimulus of starch or sugar in food. It may be that chloroform interferes with the exhalation of carbonic acid from the blood where used for a long time; but I am afraid the pretty theory of M. Ozanam, copied by a "Consulting Surgeon" recently in the 'Times,' is not at all true. Exercise and vegetable food increase the amount of carbonic acid given off from the lungs, so that it may be well never to give chloroform after a patient, exhausted after a long walk, as in the woman at Epsom recently, or after a meal; this patient at Epsom also had spts. ammoniæ and water poured into the throat—a thing which, I believe, never does good.

Hayward of Boston, and M. Quadri of Naples (both of whom have afforded me recently every information possible on the subject of æther as an anæsthetic), as fair exponents of the safety of æther, it certainly deserves to be used much oftener than at present! Deaths from chloroform I think occur in two distinct and different ways—one by syncope and to be combated as syncope, the other by drowning or asphyxia, the patient is drowned in vapour of chloroform.

I am very unwilling to say much of death from chloroform, more than has been already suggested by the points already dwelt on, such as the contra-indications to chloroform, the danger of the early stage, the law of tolerance of Professor Miller, the dangers of impure chloroform, &c.; it would be easy to head a chapter "Mors in Olla," and go with my friend Dr Ramsbotham over the matter, but I fear it would be of very little practical utility. Let us all strive to prevent deaths from chloroform by better and cheaper medical education in our medical schools under the new medical reform so long wanted; let us have every little suggestion to save life garnered up as a treasure.

Although it may not be desirable to withhold all kinds of food from a patient before operating under chloroform, as the patient may have beef-tea, wine, &c., as usual it is distinctly to be prohibited that very solid food should be taken. I think for two reasons quite different from those usually made, that the emotional turmoil in the patient's mind previous to operation suspends digestion, the other that this mechanical load of a now passive and heavy stomach presses on the aorta, semilunar ganglia, dia-

phragm, &c., adding to the hideous Queen Mab nightmare of the operation.

Then as to the mental emotion that it disturbs digestion, as it disturbs sleep as referred to before, has not escaped the true and delicate observation of Shakespeare, where every one remembers the double-dealing Wolsey returned his double-dealing letter by Henry VIII, when the latter is about to dismiss him —"Read o'er this," says the King—and after this (his dismissal)—

"And then to breakfast, with
What appetite you have."

In this one line we have the voluptuous and unfeeling King, and all the tale of poor Catherine of Arragon in a nutshell, but most chiefly have we Shakespeare's most true observation of emotion as destroying digestion.*

* I may take this opportunity of saying that it has been solely with the object of explaining to the general reader what we mean by the effect of emotion and mental depression in the body that I have more than once referred to Shakespeare. In estimating the value of the philosophy of this great poet, we should compare it with the feeble and disappointing fancies of the 'Novum Organon'—a most overrated work, where one walks through the dusty paths of science with peas in his shoes. Bacon's style, and his 'Moral Essays,' are the finest things in the language; but he is sometimes very violent. Thus Shakespeare speaks of Galen and Paracelsus in 'All's Well that Ends Well,' as those "learned and authentic fellows." But let us hear Bacon on Paracelsus, whom he hated but copied, and on Galen, whose experiments on the spinal cord Sir C. Bell and

It is very advantageous that the patient should have a thorough confidence in whoever administers chloroform; we referred before (page 23) to the case of Russian prisoners at Sebastopol requiring a double amount of chloroform to quell the emotional alarm in their mind. This emotion will destroy appetite for food; it will impede labour pains in obstetric practice; it will set the heart beating; it will destroy sleep, as already referred to by the poet Young. The "shock" of emotion is primarily on the sympathetic system, and we must remember that the broad distinction between the symmetrical and the unsymmetrical or sympathetic system is that in the former, where we have two symmetrical halves, one part may assist the other, one arm or leg or eye may assist the other, but a shock to the unsymmetrical organ is fatal; one symmetrical half may take rest or sleep while the other is active.

In hospitals I most fully believe we should imitate or be subservient to Nature, and if we do we shall have very few deaths from chloroform. If I have mentioned that I have seen about 11,000 adminis-

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Brown-Séquard have admired. "Galen," says Bacon, "is an idle caviller, a man of very narrow mind; while Paracelsus, for his insolence, deserves to be separately chastised as a monster blinder than fate and more rash than chance." Hippocrates is a "creature patched up of antiquity, and the designs of Celsus are not so faulty as they are useless." It is quite clear that we must not go to Bacon, then, for any ideas on the nervous system odoraments or suffumigations, whereas Shakespeare is quite full of what Lucentio calls "the sweets of sweet philosophy."

trations of chloroform, it is partly for the purpose of adding that I have witnessed only two deaths in all that number. I may say I attended the post-mortem examination in four cases; all had healthy hearts, but none were cases in my own practice. We should imitate Nature, and administer the chloroform in a quiet, somewhat-darkened apartment, away from the knives and saws and the "fierce vexation" of an operating theatre filled with strangers. Patients have been kept so long as an hour and a quarter fully under chloroform, their existence balanced between life and death, but one occasionally sees some patients, females especially, ready to drop dead with alarm, bashfulness, and mental emotion, not easy to analyse, but all which interferes with chloroform inhalation. I will only say, in conclusion, that I think death from chloroform is not a casualty depending so much on the proper administration of that agent as an accident which may become almost or entirely unknown in a few years.

FINIS.

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