**A treatise on the inhalation of ether for the prevention of pain / by Mayo G. Smith.**

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A

# TREATISE

ON THE

# INHALATION OF ETHER

FOR THE

# PREVENTION OF PAIN.

BY MAYO G. SMITH.

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BOSTON:
J. P. JEWETT & CO.
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# PREFACE.

THE interest felt in the subject of ethereal inhalation, and the demand for information concerning the history, safety, and process of its administration, as a lethean for painless surgical operations, has induced the author to give publicity to such facts and observations concerning this pain-obliterating agent as he has been able to collect from various sources, and to make known the results of its use in his own practice, and its varied effects on the system, and to suggest the manner, in which the patient, through its administration, may be conducted to a favorable and happy issue. For some important facts and suggestions, the author is indebted to the British Foreign Review, the Boston Medical and Surgical Journal Prof. Simpson, of London, Profs. Warren, Hayward, and Channing, of Massachusetts Medical College, Prof. Jackson, Drs. Morton and G. G. Hayden, and others.

ERRATA. — The explanation under Fig. 2, page 42, belongs under Fig. 3, page 43, where it should have been inserted.

# INHALATION OF ETHER.

## CHAPTER I.

CONTENTS. — Introduction of the lethean. Observations of Davy, Brodie, and others. Effects of ether. Drs. Jackson and Morton's claims to the discovery. Dr. Horace Wells's opposition. Nitrous oxide. Dr. J. C. Warren's testimony. Objections to the use of ether considered. Dr. Kissam. Properties of ether. Its introduction into Europe. Profs. Miller and Syme. The lethean tested. Ether in verterinary practice. Apparatus for administering it. Directions for use. Ether in certain complaints. Advantages of ether. Usual effects.

### INTRODUCTON OF THE LETHEAN.

Since the first introduction of the Lethean to the public, by Dr. Morton, of Boston, in September, 1846, it has been the subject of much discussion, involving much personal and professional feeling, and is still rejected by some, cautiously entertained and suspiciously examined by others, but hailed with joy by the mass of the people; and many of the most scientific and experienced surgeons and dentists of this country and Europe unite in feelings of gratitude and thankfulness to the discoverer of a process by which the infliction of pain and the endurance of suffering may be avoided.

But as there exists a difference of opinion on this subject, we shall impartially examine it, and weigh the principal objections which have been urged against the use of ether. It will be our present endeavor to ascertain with certainty, whether this apparent good be one in fact, — a positive evil in disguise, — or of doubtful utility. And in order to do this, we shall go back to the first experiments with ethereal and other vapors; trace the history of experiment on the subject of inhalations as medicinal agents, and by a vast amount of facts which have come to our knowledge from other sources — not a few by our own experience — endeavor to establish the true value of this pain-obliterating agent.

It is not, perhaps, known to some, that the idea of inhaling ethereal and other vapors has been recommended and adopted occasionally for medicinal and other purposes.

"Medicated inhalation has often been directed to the amelioration of various pulmonary affections, with indifferent success. Instruments called *Inhalers* were employed long ago, by Mudge, Gairdner, and Darwin; and the apparatus fitted up by Dr. Beddoes and Mr. James Watt, for respiring various gases, has given birth to some octavo volumes. More recently, Sir Charles Scudamore has advocated the inhalation of iodine and conium in phthisis, and the vapor of tar has often been inhaled in the same disease. The effects of stramonium, thus administered, have been noticed by Sigmond.

"*The inhalation of the ethers* has been recommended in various maladies, among which may be mentioned

phthisis and asthma. "On sait que la respiration de l'ether sulfurique calme souvent les accidents nerveux de certains croups."*

I find that mention of the inhalation of this agent is usually coupled with a caution against its abuse, grounded apparently upon two or three cases, quoted and requoted. Of these the first is from Brande's Journal of Science, where it is thus reported: — "By imprudent respiration of sulphuric ether, a gentleman was thrown into a very lethargic state, which continued from one to three hours, with occasional intermissions and great depression of spirits — the pulse being for many days so low that considerable fears were entertained for his life." Christison quotes the following from the Midland Med. and Surg. Journal, to prove that *nitric* ether in vapor is a dangerous poison when too freely and too long inhaled: — "A druggist's maid servant was found one morning dead in bed; and death had evidently arisen from the air of her apartment having been accidentally loaded with vapor of nitric ether, from the breaking of a three gallon jar of the Spiritus Æth. Nitric. She was found lying on her side, with her arms folded across her chest, the countenance and posture composed, and the whole appearance like a person in a deep sleep. The stomach was red internally, and the lungs were gorged." The editor of the journal in which this case is related, says he is acquainted with another instance, where a young man was found completely insensible from breathing air

* We know that the respiration of sulphuric ether will quiet the nervousness attending certain diseases of children. — *Dic. des Sc. Med.*

loaded with *sulphuric ether*, remained apoplectic for some hours, and would undoubtedly have perished had he not been discovered and removed in time. Ether is now very commonly administered *internally* as a diffusible stimulant and antispasmodic, in a dose of one or two drachms. But here, also, we have the evidence of a few experiments, that ether is capable of producing grave results under certain circumstances. Orfila killed a dog by confining a small quantity in the stomach by means of a ligature around the œsophagus. Jager found that ʒss. acted as a fatal poison to a crane. It was for a long time supposed to be injurious to the animal economy. The old Edinburgh Dispensatory, republished here in 1816, explicitly states that it is to be inhaled by holding in the mouth a piece of sugar, containing a few drops, and also that regular practitioners give only a few drops for a dose; "though," it adds, "empirics have sometimes ventured upon much larger quantities, and with incredible benefit." p. 566. Nevertheless, it was known to have been taken in correspondingly large doses with impunity. The chemist Bucquet, who died of scirrhus of the colon, with inflammation of the stomach and intestines, took before his death a pint of ether daily, to alleviate pain (he also took 100 grs. of opium daily); — and Christison mentions an old gentleman who consumed for many years ʒxvi. every eight or ten days. Such facts probably led Merat and De Lens, in their Matiere Medicale, to question its grave effects when swallowed. Mentioning the case of Bucquet, they say, even of its inhalation, that it produces only "un senti-

ment de fraicheur que suit bientôt une legère excitation."*

"This variety of evidence tends to show that the knowledge of its effects, especially those of its inhalation, was of uncertain character. Anthony Todd Thomson well sums up what I conceive to have been the state of knowledge at the time upon this subject, in his London Dispensatory, of 1818. "As an antispasmodic, it relieves the paroxysm of spasmodic asthma, whether it be taken into the stomach, or its vapor only be inhaled into the lungs. Much caution, however, is required in inhaling the vapor of ether, as the imprudent inspiration of it has produced lethargic and apoplectic symptoms." In his Materia Medica and Therapeutics, of 1832, however, omitting all mention of inhalation, he uses the following words:— "Like other diffusible excitants, its effects are rapidly propagated over the system, and soon dissipated. From its volatile nature its exciting influence is probably augmented; as it produces distension of the stomach and bowels, and is thus applied to every portion of their sensitive surface. It is probable that it is absorbed in its state of vapor, and is therefore directly applied to the nervous centres. It is the diffusible nature of the stimulus of ether which renders it so well adapted for causing sudden excitement, and producing immediate results. Its effects, however, so soon disappear, that the dose requires to be frequently repeated.'"

That many persons have made experiments with

* A feeling of coolness that follows a slight excitement.

ether and other gases, there is no doubt. Probably many individuals have approached almost the consummation so much desired, and at last so happily found; but all who have thought, all who have experimented on a given subject, even though the results have been partially or wholly successful, cannot be acknowledged as discoverers so long as they keep the secret locked up in their own breasts. It is he that not only thinks, studies, and experiments, but who also promulgates his discoveries to the world, and applies them to practice, who will ever be looked upon as the real benefactor of his race.

Among the claimants of the honor belonging to the discoverer of this antidote to human suffering, are found some individuals in France and England, as well as those who have opposed the patentees in this country.

In Paris, "a Mr. Granier de Cassagnac has published an article in the *Presse*, claiming to have made the discovery seventeen years since, and published an account of it in the *Journal Politique et Litteraire de Toulouse.*

"His pretensions fell dead, without any one even offering to contradict them."

It has also "been claimed by R. H. Collier, M.D., of England; but the most which his claim amounts to is, that of having published, in 1843, an account of the unconsciousness which may be produced by the inhalation of ether; but this, as we have already stated, was long since known."

It is worthy of remark, that Sir Humphrey Davy, at

one period of his life, was much interested in the "pneumatic medicine," as it was then called, or the inhalation of gases — some of his experiments with which nearly cost him his life.

In John Davy's edition of his works, the following remarkable passage occurs: — "As nitrous oxyde, in its extensive operations, appears capable of destroying pain, it may *probably be used with* advantage during surgical operations, in which no great effusion of blood takes place." Vol. iii. p. 349.

A London paper says of this discovery, — it has been asserted "that our most eminent surgeon, Sir Benjamin Brodie, by some former experiments on the effects of inhaling ether, led the way to this great discovery; but witness a passage in his discourse delivered at St. George's Hospital, so lately as the 1st October, 1846. He is speaking only of mesmerism: —

"There is no greater desideratum, either in medicine or surgery, than to have the means of allaying or preventing bodily pain, not only in cases of surgical operation, but in other cases also; but there is too good reason to apprehend that it has not been reserved for the revival of animal magnetism under a new name, to accomplish that for which all physicians and surgeons have been looking in vain, from the days of Hippocrates down to the present time."

Dr. Pearson, so early as 1795, recommended the inhalation of ether, as beneficial in pthisical cases. "It abates," he says, "the hectic fever, checks the sweats, removes the dyspnœa, and greatly improves the quality of the expectorated matter." It was his custom to put

a small quantity of ether in a saucer, or any convenient vessel, and permit the patient to draw in the vapor with his breath, till it was exhausted. He also added flavoring and other medicinal substances. It does not appear, however, that these inhalations were designed to, or that they did, produce unconsciousness.

In the year 1815, Nysten strongly recommended the inhalation of ether in diseases of the lungs, on account of its anodyne property. He also speaks of an instrument for inhaling it, but of what it consisted we do not know.

In the 1223d number of the London Lancet, p. 164, a case is related of an old gentleman, who used the vapor of ether as a sedative. It seems that a varied and not strictly moral life had brought him to desire some means of quieting the uneasy feelings and "compunctuous visitings with which he was affected; and in the fumes of ether to seek oblivion from all intruding thoughts." His plan was to put an ounce or two of the article in some open vessel, and, as it were, "snuff it up." He often declared it to be "soothing to an immeasurable degree." But it does not appear to have occurred to him or his friends, that it is capable of assuaging bodily as well as mental pain.

In Brand's Journal of Science and the Arts, 1818, a writer speaks of "the effects of inhaling the vapor of sulphuric ether," with the best manner of using it, and precautions in regard to it, &c.

In France, likewise, during the reign of Charles X. a proposition was submitted to the Academy of Medicine in Paris, by an English doctor named Hinchnam,

to render patients, about to undergo surgical operations, insensible, by means of "inhalations;" but whether of ether or something else, we are not informed.

Indeed, it appears that experiments with vapors and gases have been extensive and numerous, approaching so near to the character of those which induced Messrs. Jackson and Morton to make a public announcement of their discovery, that instead of being astonished at their success, we only wonder that of the many who have stood upon the threshold, all should have turned back, and neglected a further prosecution of their researches.

That ether was known to produce unconsciousness is readily conceded; but the idea of using it as a sedative agent in operative surgery, is *the* idea for which we are indebted to the American patentees.

Since Dr. Morton first published his discovery to the world, in Boston, in September, 1846, not a few individuals have set up claims to priority of discovery; but up to this time, Messrs. Jackson and Morton have, we think, fully substantiated their right to be considered the inventors. We would, by no means, impugn the motives of all who have set up counter claims; but we must say, that if any individual *had* made so valuable a discovery, calculated, as we may reasonably anticipate, to confer so great a benefit upon almost every individual to be found in civilized society, at the present and in all future time, the person is hardly excusable who should withhold the information from the public. A discovery which involves *only* pecuniary benefits, might very properly be withheld by the discov-

erer until every arrangement had been made to secure the profit to himself. But an invention or discovery which is destined to alleviate the sufferings of poor dilapidated humanity, the medical profession have a right to know about; and this the world have a right to demand. While, therefore, we admit the probability that many others have, by experiment or otherwise, arrived at *nearly* the same results as Dr. Morton, we must maintain, that not having put them to any practical use, they have no right to claim the invention. But there is another class "in every community, and probably always will be, of persons constantly on the look out, ever ready and eager to avail themselves of the labors and inventions of others. When they are about to seize upon the improvement of some one else, they commonly begin by crying out that they thought of it before,—they first attempted or accomplished it themselves;—and then proceeding to appropriate the benefit of it to their own private use, they endeavor to make the most of their 'ill-gotten gains'—as long as they can set justice at defiance, or hold on with impunity."

One of the most determined and persevering opponents of Messrs. Jackson and Morton's right to the patent, is Mr. Horace Wells, of Hartford, Connecticut, who has published a pamphlet containing affidavits, from respectable sources, tending to show priority of discovery; but he is met by Dr. Morton with a letter, over his own signature, in which he speaks of the discovery as Dr. Morton's, and suggests to him to make arrangements for disposing of *his rights*. After an

examination of the statements of Dr. Wells and his friends, we have arrived at the conclusion that Dr. Wells rests his claim to the discovery on his use of *nitrous oxide gas*, which he states that he had used a number of times *in preference to ether*, which he considered more dangerous, but neither of which he used for any length of time, not finding them to answer the purpose he expected. Dr. Wells, however, went to Europe, and succeeded in convincing Dr. Brewster, and some others, of his right to the discovery.

In regard to the use of nitrous oxide, by Dr. Wells, we may remark, that it was nothing more than an application of what Sir Humphrey Davy discovered long ago. Mr. Edward Warren gives the following account of it, and the effect it had upon Davy: —

"The nitrous oxide gas (known to chemists as the *gaseous oxide of azote*, or the *protoxide of nitrogen*), differs from atmospheric air only in the proportions of its ingredients, air being composed of twenty-seven parts of oxygen and seventy-three of nitrogen, while the nitrous oxide consists of thirty-seven parts of oxygen and sixty-three of nitrogen. Sir Humphrey Davy first discovered that this gas could be safely inhaled, and that, for a short time, it would support respiration. He was surprised to learn, as he did by experiments on himself, that it produced a species of intoxication. In breathing it, he says, 'The first inspiration caused a slight degree of giddiness. This was succeeded by an uncommon sense of fullness in the head, accompanied by loss of distinct sensation and voluntary power, — a feeling analogous to that produced in the first

stage of intoxication, but unattended by pleasurable sensations.'

"At another time, on returning from a fatiguing journey, he was shut up in an air-tight breathing box, in which he became habituated to the gas, by its gradual introduction. After breathing it an hour and a quarter, during which eighty quarts were forced in, he came out, and began to inhale twenty quarts of pure nitrous oxide. As respiration went on, a thrilling was felt, from chest to extremities, until, as the pleasurable sensation increased, he lost all connection with external things, and seemed to exist in a new world. 'When,' says he, 'I was awaked from this same delicious trance, by Dr. Kinglake, who took the bag from my mouth, indignation and pride were the first feelings produced by the sight of the persons about me. My emotions were enthusiastic and sublime, and, for a moment, I walked round the room, perfectly regardless of what was said to me. As I recovered my former state of mind, I felt an inclination to communicate the discoveries I had made during the experiment. I endeavored to recall the ideas; they were feeble and indistinct. One recollection of terms, however, presented itself; and, with the most intense belief and prophetic manner, I exclaimed to Dr. Kinglake, — Nothing exists but thoughts; the universe is composed of impressions, ideas, pleasures, and pains.'

"Sir Humphrey also says (in his Researches, p. 465), that, on two occasions, the inhalation of nitrous oxide *removed headache.* Furthermore, he found that it

greatly *mitigated, or wholly removed*, the pain he experienced while cutting a wisdom-tooth."

The first recorded instance of the extraction of a tooth, without pain to the patient, he being under the influence of vapor of sulphuric ether, occurred at the rooms of Dr. Morton, in Boston, September 30th, 1846.

J. C. Warren, Professor of Anatomy and Surgery of the Massachusetts General Hospital, also certifies "that he had never heard of the inhalation of sulphuric ether as a means of preventing pain in surgical operations, until it was suggested to him by Dr. W. T. G. Morton, in the latter part of October, 1846." Also, Dr. C. F. Heywood, House Surgeon of Massachusetts General Hospital, certifies that he "assisted in the administration of Dr. Morton's preparation to two patients, operated upon by Drs. Warren and Hayward, at the Massachusetts General Hospital, on the 16th and 17th of October, 1846 — the operations lasting from five to ten minutes, without suffering to the patients, who speedily recovered."

It is generally known that the patent was taken out in the names of Charles T. Jackson and Wm. T. G. Morton, and bears date 27th October, 1846.

Subsequently Dr. Jackson claimed the sole merit of the discovery, inasmuch as he *suggested to Dr. Morton the inspiration of ether*, as a means of allaying the pain of operations upon the teeth. But upon Dr. Morton's acting upon his suggestion, Dr. Jackson disclaimed all connection with it, fearing dangerous results. Both had made experiments; but Dr. Morton having the earliest and best opportunity of testing it

upon his patients, soon demonstrated the result which Dr. Jackson had pointed out; though it is but justice to Dr. Morton to state that he had, previous to the hint from Dr. Jackson, been experimenting for months with ethereal and other gases, chiefly with a view to being able to extract teeth without pain. Dr. Jackson has been long and favorably known as an experienced chemist and geologist. Dr. Morton was formerly his pupil, and until he devoted himself to the profession of dentistry.

Objections to the use of ether, from interested and disinterested sources, have been many and various. One of the first that attracted our attention, was an article published by Mr. Richard Kissam, in the Journal of Commerce, an influential newspaper of New York. He avers,

1st, That our physical organization is such, that if the sensation of pain were obliterated, we should be liable to destroy our bodies and limbs, where now we are warned to preserve and shield them, by the suffering consequent on any injury.

2d, That when a wound or other external injury is received, the pain which usually follows stimulates and sets in action the recuperative process, which much facilitates the cure, while, in cases where pain at the time of injury is not felt, on account of strong mental excitement, from the presence of alcohol, or other stupefying articles in the system, the danger of death is much more imminent, the cure always retarded, and the subsequent pain much greater.*

* During the recent bombardment of Vera Cruz, a soldier was wounded, and amputation of both legs (at the thigh) was found necessary. He sur-

We admit the first proposition as an universal affirmation, but perceive no applicability to the medicinal use of ether. It is not proposed that persons should keep themselves constantly under its influence, with the idea of being invulnerable to pain. The use of the article, *as such*, would be highly improper, and productive of more injury than benefit. But that its occasional use, under the direction of an experienced person, for some specific purpose, has any such tendency, we do not admit.

The second proposition is fallacious. The idea "that the absence of pain during an operation — or, the *external exhibition* of *feeling* nccessarily causes greater subsequent pain," demands consideration; for, if it be true under all circumstances, we should look upon any article, designed to allay pain, as of *very* "doubtful utility." He affirms, that during the excitement of battle, soldiers sometimes do not feel their wounds; but that, after the excitement is over, they suffer most severely. He states, also, as a fact (which is hardly susceptible of proof), that "a person under the influence of strong drink may receive severe injuries, and not be sensible of them at the time; yet, on recovering his senses, his tortures are exceedingly augmented." To prove this, it would be necessary for the same individual to receive exactly the same amount

vived the operation of amputating one limb, but so great was the pain, that the surgeon declared that the amputation of the other limb would produce death. He inhaled ether, and it was removed. During the operation, he was unconscious of pain, and finally recovered.

Now if pain be necessary to a cure, how much quicker would the soldier have recovered without ether?

and kind of injury with the same state of general health, and every other attendant circumstance, in a state of sobriety. One reason why inebriated persons may suffer greater injuries from the same apparent causes, which less affect a sober man, is that their *power of resistance* to falls and blows is less ; but that their recovery from the same kind and amount of injury is more painful and difficult, is a mere assertion without proof.

In cases of wounds or injuries, in which pain is not experienced during surgical operations or otherwise, through the influence of strong mental emotions, or where, through pride, all *expression* of pain is subdued, we are aware that the nervous system subsequently suffers.

We recollect the case of a lady, who endured, for three or four hours, some exceedingly painful operations upon her teeth, without exhibiting the least symptom of pain, though at times it must have been very severe. She had made up her mind to preserve perfect calmness, and succeeded ; but a subsequent reaction was the result, and more than a week of nervous prostration and debility was the penalty.

But neither theories nor facts, showing that absence of pain, by reason of some all-controlling nervous excitement, renders more severe and difficult the curative process, militate against the use of ethereal vapor, as an anodyne ; for, if these facts prove any thing, they prove too much ; for, if the extraordinary excitement of one set of nerves does a subsequent injury to another set, and thus retards the restoration of

the general health, we should say that those individuals, who, by superior power of brain, quell pain, or the exhibitions of it, and thus aggravate future suffering — *they* are the very individuals who should use, not a partial anodyne, like opium, nor a stimulant, like alcohol, but an agent like the ethereal vapor, which tranquilizes, not one class of nerves at the expense of another, but *all*, — and diffuses its benign influence over the whole system.

But, admitting the presence of pain to be necessary for the healing of wounds, &c., many minor operations, such as the *extraction of teeth*, are exceptions; for, unless the surrounding parts are diseased, there is no subsequent pain occasioned by the extraction of a tooth, when the operation is properly performed. So that though it might be improper to use the vapor in operations in general surgery, it would not necessarily be improper in dental operations.

We have thought proper to answer these objections at some length; for, although they are plausible, they are sophistical, and therefore calculated to mislead those who are not in the habit of thinking for themselves. We will dismiss Dr. Kissam with one question: — *If pain be so necessary to the curative process, why have intelligent physicians in all ages sought for an agent to remove it?*

But the most serious charge consists in the allegation that *ether* is in itself injurious; that it is liable to produce headache, sickness at the stomach, delirium, asphyxia, death. Statements have been made in the

public journals (whether true or false, we know not), respecting injuries, more or less serious, from its use.

*We have administered it in several thousand cases, to both sexes, and to persons of all ages, and of every temperament, and under a great variety of circumstances, and we have yet to hear of the first instance of injury* KNOWN *to have resulted through ethereal inhalation, in our practice.* We believe, therefore, where injury has resulted, that either the ether was not pure, or it was improperly administered.

In regard to the preparation of ether, it is necessary to observe that there are many different kinds; and that which was entirely unsuitable for the purpose may have been administered, in some cases, through ignorance; and experiments may sometimes have failed in consequence of a want of confidence by or in the operator; and this shows why such different results have been produced by *what is called* sulphuric ether.

*Ether* is the name *of a class* of very light, volatile, inflammable, and fragrant spirituous liquids, obtained by distilling in a glass retort a mixture of alcohol with almost any strong acid. Every acid modifies the result in a certain degree, whence several varieties of ether are produced.

There are several methods of preparing it; one, where the whole quantity of acid and alcohol is mixed at once, and directly subjected to distillation; by another, the alcohol is gradually admitted into a body of acid, previously mixed with a little alcohol, and heated to 220° F.

The theory of etherization demonstrates that when

strong sulphuric acid is mixed with alcohol, there is formed, on the one hand, a more aqueous sulphuric acid; and on the other, sulphovinic acid is decomposed, its dihydrate of carbon combines with the alcohol, and constitutes *ether;* while the proportion of sulphovinic acid progressively diminishes.

*Pure* ether possesses the following properties: It is limpid; has a specific gravity 0·713, or 0·715 at 60°; has a peculiar, penetrating, and strong smell; a taste at first acrid, burning, sweet, and finally cooling. It has neither an acid nor alkaline reaction, and refracts light strongly. It is very volatile, boiling at 96° or 97° F., and produces, by evaporation, a great degree of cold. At the temperature of 62·4 the vapor of ether balances a column of mercury fifteen inches high, or half the weight of the atmosphere. When ether is cooled to 24° F., it begins to crystalize in brilliant white plates; and at 47°, it becomes a white crystaline solid.

Ether alters gradually by contact with air; absorbing oxygen, and progressively changing into acetic acid and water. Ether should, therefore, be preserved in bottles perfectly full and well corked, and kept in a cool place; otherwise it becomes sour, and is destroyed.

Ether acts as an exhilarant or sedative, according to it purity. Common sulphuric ether was used as an anodyne in Guy's Hospital, London, in 1811, but abandoned, as it was found in many cases to excite, instead of composing the nerves. The difference between pure sulphuric ether and that commonly obtained from apothecaries, will be seen when the process of manufacture is described.

"*Pure sulphuric ether* is regarded as an oxide of ethule, and is represented by the formula C4 H5 O; its symbol is, therefore, Ae O. It is prepared by decomposing highly rectified alcohol, by means of sulphuric acid, or oil of vitriol. Five parts of alcohol, of 90 per cent., are mixed with nine parts of oil of vitriol, in a vessel of copper or iron, placed in cold water, so as to cool the mixture. The action of sulphuric acid on alcohol is catalytic; bisulphate of oxide of ethule is formed, which, by elevation of the temperature and brisk ebullition, is decomposed, and the oxide of ethule passes over in vapor; the sulphuric acid remaining with a portion of undecomposed alcohol, the water which passes over in vapor no longer uniting with the ether. Alcohol is repeatedly added to the sulphuric acid, which would decompose an indefinite quantity of it, were it not diluted by the water introduced — ten per cent. of which is conveyed to it by common alcohol.

"The distilled liquid is next to be treated with an alcoholic solution of potash, to neutralize the acids, and to render it slightly alkaline. It should then be redistilled in a water-bath, and the operation is to be arrested as soon as the ether has attained a specific gravity of 0·72 at 80° F. The specific gravity may be still farther reduced, by allowing it to stand for some days over dry chloride of calcium, and then redistilling it in contact with that hygrometric substance. Its boiling point is at 96° F. It has a penetrating, aromatic odor, and is highly inflammable. It should not change the color of blue litmus paper."

*Common ether* is made by pouring a quantity of sulphuric acid upon an equal weight of rectified spirits of wine, which ingredients are, by agitation, intimately mixed. This mixture is heated rapidly in a glass retort. Boiling generates the ether, which is preserved condensed, and offered for sale. Now, sulphuric ether, thus prepared, is always mixed with alcohol. It differs from it, only in being destitute of water; the formula of this ether being C4 H5 O, while that of alcohol is C4 H5 O H O.

Individuals ignorant of the difference, have used the latter. And here we have an elucidation of most of the difficulties which have occurred.

Inhalation of the purest ether, without a proper admixture of atmospheric air, will produce asphyxia, and subsequently, death. With a properly constructed inhaler, the possibility of such results is avoided.

In Stockton's Dental Intelligencer, of May 1st, 1847, after enumerating the objections proposed by the "dissenting dentists of Boston," a statement is made, that "fatal results have supervened after the administration of ether; and that uterine hæmorrhage and abortion have been produced;" but no particular cases are cited, no facts are given, no proof of the truth of the assertions adduced. Hence we feel at liberty to suppose these cases *ideal* instead of actual — especially as we have frequently administered it to pregnant females, suffering from toothache, and always with the best results.

Dr. Morton is opposed because he did not at once give the world its benefits gratis. Be it so. But does

this prove he was not the discoverer? Was it to be expected that he would transfer a knowledge of his discovery to an institution to which he neither felt indebted, nor expected aught, until he had first secured any pecuniary or honorary benefits which might arise from it? Dr. Morton, we believe, did not, after the first few experiments, pretend to keep the article "secret;" the very opposite of "patent," which means to open, or spread. And when a patent is granted by Congress, any person, for a shilling, can examine the records of the office, and obtain an exact description of any article which is patented. Some, no doubt, have honestly opposed this anodyne, who would now be very happy to retract, if the Lethean itself could be applied to the record of their opposition, and its existence become the subject of asphyxia. Had the discovery been made in another way, and by some other persons, its reception with many individuals would probably have been extremely different. We would, by no means, be understood as objecting to medical or dental institutions, *as such;* we regard them as indispensable to the prosperity of the profession; but we merely express what we have long felt,—that these institutions, through the ignoble spirit of minor members, have generated a spirit of exclusiveness, which has caused learned and intelligent men, *without the pale*, to look upon them with a *little* of that distrust, so *much felt by themselves*, for that large but unfortunate class without their honors.

The most intelligent of the medical profession are the least illiberal; while those with nothing but the empty

honor of a graduation-ticket, frown upon all who cannot pronounce the "shibboleth" of their *alma mater*, and who cling to their diploma like drowning men to straws. Such men would naturally scout the idea of so great a discovery coming "out of Nazareth," instead of a medical college. Was it for fear that "*Mister*" Morton might have been the discoverer, that certain members of the profession were so much incensed, because their reasons for disproving it were few?

Ether, as a lethean, was thus introduced into Europe on the 28th of November. Dr. Bigelow, of Boston, writes to his friend, Dr. Boott, in London, announcing the "new anodyne process," and giving instances of its success.

On the 14th of December, Dr. Boott sends Dr. Bigelow's letter to Mr. Liston, naturally anxious to make so important a communication, without loss of time, to one so preëminent in the operative department of surgery. And that distinguished surgeon, worthy of the confidence reposed in him, speedily tested the matter, in the hospital of University College. His success was most complete, on the 21st of December. On the morning of the 23d of December, his former pupil, Prof. Miller, of Edinburgh, was not a little surprised, doubtless, to receive the following epistle:—

"An American dentist has used ether (inhalation of it), to destroy sensation in his operations, and the plan has succeeded in the hands of Warren, Hayward, and others in Boston. Yesterday, I amputated a thigh, and removed, by evulsion, *both* sides of the great toe

nail, without the patient's being aware of what was doing, so far as regards pain. The amputation-man heard, he says, what we said, and was conscious, but felt neither the pain of the incisions, nor that of tying the vessels. In short, he had no sensation of pain in the operating theatre. I mean to use it to-day, in a case of stone. In six months, no operation will be performed without this previous preparation. The ether must be washed.

Thine always,

R. L."

This was read by Prof. Miller to his class, within an hour after its receipt; and a somewhat similar announcement was also made by Prof. Syme, in the after part of the day.

A few days after, Prof. Simpson visited London, and witnessed the effect of ether in the Hospital. He procured the best inhaler, and returned to Edinburgh, where, in the Royal Infirmary, an arm was amputated, without pain to the patient, who was under the influence of ether.

## THE LETHEAN TESTED.

As, after all, the value of this discovery must be decided by experiment, we shall proceed to give a collection of facts, giving a fair average account of the effects produced by its administration. We commence with an account of the first cases which occurred in the Massachusetts General Hospital.

"*Operation for Tumor on the Face.* — The ether was administered at the Hospital, by Dr. Morton (on the 16th October, 1846), to a man, upon whom Dr. Warren was to operate for a tumor on the face. The effect, in this case, was not complete; the suffering, however, was very much less than it would have been under ordinary circumstances; and the result was, on the whole, so satisfactory, that a second trial was made on the following day."

"*Removal of Tumors.* — The patient to whom the ether was administered on the 17th of October, was a female, with a fatty tumor on the arm, between the shoulder and the elbow. At the request of Dr. Warren, Dr. Hayward performed the operation. The patient was insensible during the whole time."

*Amputation of the Thigh.* — In the third case, "the patient was a girl of twenty years of age, named Alice Mohan, who had suffered, for two years, from a disease of the knee, which terminated in suppuration of the joint and caries of the bones. For some months before the operation, her constitutional symptoms had become threatening; and the removal of the limb seemed to be the only chance for her life. The ether was administered by Dr. Morton. In a little more than three minutes, she was brought under the influence of it; the limb was removed, and all the vessels were tied but the last, which was the sixth, before she gave any indication of returning consciousness or of suffering. She then groaned and cried out faintly. She afterwards said that she was wholly unconscious and insensible up to that time; and she seemed to be much

surprised when she was told that her limb was off. *She recovered rapidly, suffering less than patients usually do after amputation of the thigh*, regained her strength and flesh; and was discharged as well, on the 22d of December."

The following case is reported by Dr. A. L. Cox, of New York: —

"*Operation for Tumefied Glands.* — On the 8th of this month (December, 1846), I was present, by the polite invitation of my distinguished friend, Dr. Mott, at an operation which he performed on a lady, for the removal of a cluster of tumefied glands from the right axilla. After inhaling the vapor, for a sufficient time to induce a state of insensibility, an incision four or five inches in length, was made, parallel to the edge of the pectoralis major; and after some progress had been made in the operation, the patient was asked by Dr. Kimball, how she felt. She replied, 'Very comfortable.' 'Do you feel any pain?' 'No.' To the same question, repeated after a short interval, a similar reply was made; and after a further lapse of time, the patient, partially arousing, inquired, 'Have they begun the cutting?' — thus manifesting her total unconsciousness of what she had passed through, up to that period. Afterwards, the sense of pain appeared, for some time, considerably blunted; but she became gradually more conscious of what was being done, until, at last, the sense of suffering seemed to be entirely natural."

"*Amputation of the Leg.* — An accident recently occurred to a man at the St. Helen's Auckland Colliery, requiring the amputation of his leg. The inha-

lation of the vapor of ether soon produced insensibility, and the operation was proceeded with, the first steps of which were not attended with the slightest pain. Consciousness returned before the operation was quite completed, when the usual amount of pain was experienced. The medical men present, Messrs. Hutchinson, Jobson, and Kilburn, were satisfied with the wonderful effect of the ether, and attributed the partial failure to the imperfection of the apparatus procured on the emergency."— *Newcastle* (*England*) *Journal.*

"*Cæsarian Operation.* — The subject was a dressmaker, aged twenty-seven, of mild disposition, and only four feet one inch in height, on account of the great distortion of the pelvis and lower limbs, from rickets during childhood. Her general health good. She was not aware of being pregnant until the seventh month; when she consulted a surgeon, who, conscious of her dangerous position, sent her to Mr. Sakey, under whose care she was admitted into St. Bartholomew's Hospital. It was recommended, no operative proceeding should be adopted until the full period of utero-gestation; and that the Cæsarian section would then be the most proper measure. The nature of the case being fairly and fully explained to the patient, she readily consented to undergo any operation which offered the best chance of relief. At two o'clock, in the morning of the 25th of January, she was awakened from sleep by the commencement of labor. The operation, therefore, was no longer delayed. The vapor of ether was inhaled by the patient for six minutes, be-

fore its effects were manifest; an incision, eight inches in length, was made down to the linea alba, commencing two inches above the umbilicus, and terminating two inches and a half above the pubes. The linea alba was then divided to the same extent on a broad dinetor. Adequate pressure over the front and sides of the abdomen was necessary to prevent protrusion of the intestines. An incision, from five to six inches in length, was then made into the lower axis of the uterus, from which a well-formed, healthy-looking female child was easily removed. The placenta was extracted shortly afterward. Thus far, the operation lasted six minutes. Immediate contraction of the uterus to one-half its previous size, followed the removal of the child. The free venous hæmorrhage which took place from its cut surface, was arrested by cold water and pressure between the hands. In half an hour, the uterus had contracted to such a size as to render its replacement within the abdomen, safe. It may be as well to observe, that the inhalation of the ether produced insensibility to the pain of the first incision. Its prolonged exhibition was not allowed, lest it might possibly interfere with the contraction of the uterus.

"Without ether, the pain in this case must have been most severe, and, from the circumstances mentioned, of more than ordinary duration; but, happily, the patient was spared it all. The apparatus employed, was one invented by Mr. Bell, chemist, of Oxford Street, who was present, and assisted Mr. Tomes in his application." — *Lon. Med. Gaz.*

*Vapor of Ether applied to Veterinary Practice.*— The following cases are introduced to show that the wonderful effects ascribed to the new anodyne, are totally distinct from those produced by mere operations upon the imagination, and that they bear no analogy to the Mesmeric, and similar influences, to which have been ascribed results very nearly resembling those of the inhalation of ether.

"The vapor of sulphuric ether was employed at the Royal Veterinary College, Camden Town, on a sheep and a horse, with the most decided success. The first-named animal was, and had been for many months, affected with an incurable disease of the hock-joint. The pain was so severe, that the poor sheep was quite unable to put her foot to the ground without experiencing much suffering. On being brought into the theatre, she was caused to inhale the vapor of ether through a tube, and in about five minutes after, it was evident that she was under its influence. The leg was then amputated by Mr. Simonds at the thigh, without the slightest indication of any pain whatever. The operation occupied about six minutes; and within twenty minutes from the commencement, the animal was removed from the theatre restored to sensation and consciousness. The horse was laboring under a chronic affection of the near fore foot, commonly known by the name of the "naricular disease," for which the operation of "unnerving" is generally resorted to as a remedy. This is necessarily a very painful operation; and oftentimes the operator has to contend against the violent struggles of the animal, particularly at the in-

stant when the division of the nerve is effected. In this case, the ether vapor was inhaled for about thirteen minutes, when the horse fell forwards, and the nerve on each side of the leg was divided by Mr. Spooner, without the least manifestation of pain; a slight convulsive action of the limb, similar to that which takes place when a nerve of a recently killed animal is cut through, alone giving indication of any sensation. Within twenty-three minutes, this animal, also, had perfectly recovered from the effects of the ether. No restraint whatever was resorted to, to keep the animals in the required position for these operations."

"*Reduction of Dislocation.* — A stout, healthy carpenter applied at the Massachusetts General Hospital, one afternoon, with a dislocation of the left shoulder. The accident happened the evening previous, from slipping down. Ineffectual attempts at reduction had been made by a practitioner, at first unaided, and afterwards with the assistance of several other persons of fair bodily power, by means of a sheet, &c. In the absence of Dr. Hayward, the visiting surgeon of the Hospital, I was immediately sent for, to take charge of the case. The dislocation was *sub-coracoid*, presenting the usual appearances. The pullies and counter-extending band being applied in the customary manner, the inhalation was commenced under the superintendence of the house physician, Dr. Bertody, by an apparatus furnished by Dr. Morton to the Hospital. After about two minutes, its influence was seen to be established; indicated not so much by any decided apparent insensibility, as by a certain incoherence of manner; unattended, however, by any attempt at

resistance or the like; the patient said he 'had got enough.' Traction was commenced, and after, say a couple of minutes, the head of the bone was felt to move, and at once entered the socket with an audible snap. During this time, not a groan escaped the patient; neither was there the slightest resistance felt, on the part of the muscles, in the vicinity of the joint. The patient's manner continued slightly incoherent for a few moments, but he soon recovered himself, and denied having experienced the slightest pain, though he remembered the sensation of the snapping of the bone into its place. I need not say, that, having already experienced the pain of previous, ineffectual, and somewhat prolonged attempts, he expressed himself highly delighted, and was profuse in his compliments.

"The power exerted by the pullies was very slight; and I feel confident that I could have reduced the bone, unaided by them, with my hands alone. I am in the habit, every year, of producing this dislocation, among others, upon the dead subject, for demonstration in the lectures of Dr. Warren; and it is worthy of remark with what ease these factitious dislocations are reduced; in fact, it is hardly possible to handle the limb, without the head of the bone flying into the socket — showing the muscular power to be the chief, if not the sole obstacle, in these cases, in the living. In the instance above detailed, so utter was the abolition of the muscular power, and so easy was the reduction, that I was strongly reminded of my experiments upon the dead body.

"The application of this agent to this class of cases,

has undoubtedly suggested itself to every one who has seen its employment; and it only remains to apply it to a dislocated hip joint, to add another to its triumphs. In cases of dislocations, it will probably not only annul pain in the patient, but render unnecessary those violent exertions, on the part of the surgeon, which are by no means agreeable to the by-standers to witness, or to himself to make. S. PARKMAN, M.D.

*Dec.* 9, 1846. *Surg. to Mass. Gen. Hos.*"

"*Case of Operation of Lithotomy in England.* — At the Middlesex Hospital (England), the efficacy of the ether was put to as severe a test as it has yet been subjected to. A man of sixty-eight had been admitted, with symptoms of stone, and diseased bladder; so much pain, straining, and struggling attended the attempts at sounding, that it was with difficulty satisfactorily accomplished. The verical tenesmus was incessant, amounting to total incontinence of urine. Endeavors were made, for several weeks, to allay this extreme irritability, so that some urine might be retained, or some water received as an injection, but in vain; neither could be endured; lithotrity was consequently out of the question, and Mr. Arnott determined to perform the operation of lithotomy, unpromising as the case was, but, if possible, whilst the patient was under the influence of the ether. In seven minutes from the commencement, but in reality only two from the effectual inhalation, its influence was obtained. The catheter was then introduced, and some water attempted to be injected; but not above two or three ounces could

be borne, and this, retained by pressure, was ejected immediately on the introduction of the staff, which, owing to the state of the parts, was effected with some difficulty, and consequent delay; the bladder was cut into; the stone was grasped at once, but crumbled under the forceps, requiring their reintroduction several times; the scoop was employed to remove calculous matter like mortar; and lastly, the bladder was injected four or five times, so as to wash it out. During the whole time, from first to last, the patient gave not the slightest indication of suffering; indeed, it was not until he was removed to bed, and had been some time in it, and taken some brandy ammonia, that he did so, and then of soreness merely. Nor was the influence of the ether limited to this; its anodyne effect was maintained during the evening, the man remaining in a dreamy and 'very comfortable state,' as he termed it. He declared he suffered no pain; he knew that something was being done, but he recollected nothing distinctly, 'after blowing the horn.' Up to the evening of the third day, he was going on very favorably."

"*Removal of Tumor of the Breast.* — On the same day, a large assemblage of the professional gentlemen of this vicinity, took place at the Suffolk General Hospital (England), to witness the operation of removing a tumor from the breast of a female, while under the influence of ether. Some difficulty was experienced in bringing the patient fully under the influence of the ether; but she was laid back on the pillows in a state of complete insensibility. The operation was then

commenced, and the tumor, about the size of an orange, was rapidly removed by Mr. Image, the patient making only an indistinct moaning noise. As some dissection was necessary in order to separate the diseased part, the woman had a second application of the inhaler, so that the insensibility was maintained as long as was required. And now came the most interesting part of the procedure. A towel having been laid over the bosom, so as to conceal the effects of the operation, and the patient having recovered her senses, she was asked how she felt, and whether she was ready to undergo the operation. She replied that she was quite resigned and willing; that she knew that it must be painful, but that Mr. Image might commence as soon as he liked. This answer was elicited from her several times by Dr. Ranking, that the spectators might have a full opportunity of ascertaining that she was perfectly unaware of any operation having been performed. Dr. Ranking then informed her that the tumor had already been removed, and that nothing more was to be done; upon which her countenance put on an expression of delight and grateful astonishment, which it is impossible to depict. In fact, she appeared quite incredulous, until she had raised her head, and herself inspected the wound, when she could not sufficiently thank those around her, for having been spared an amount of suffering which, she had justly supposed, would, under any ordinary circumstances, be extreme. Nothing could, in the estimation of the majority present, have been more demonstrative of the power of this agent, than the present case. It

was one which required careful dissection, and was not, therefore, so rapid as others. The expression of willingness to submit to the supposed impending operation was genuine, as were also the incredulity and subsequent gratitude. The woman has since positively declared, that 'she *felt nothing*, but was in a dream, and taken away from the present world.' Her pulse and general aspect were not like those of a person who had so large a portion of the body excised."

"*Insensibility to Pain from a hot Iron.* — An exhibition of extraordinary interest to humanity occurred at the Massachusetts General Hospital, in Boston. A patient was presented — *a man somewhat advanced in life* — who, we understand, was laboring under paraplegia, having its origin in a caries of the lower dorsal vertebra, for which Dr. Warren proposed the actual cautery. After the patient had inhaled the lethean, Dr. Warren passed an iron rod, heated to a white heat, to the length of about two feet, up and down the back, on each side of the spine, — burning two lines on one side and one on the other, — and then carried it zigzag across, between the spinous processes, the same distance. As the flesh smoked, and the hot iron hissed on the surface, the spectators were filled with admiration at the entire immunity from pain, and the perfect stillness of the patient while subjected to this most painful and appalling resort of surgery. On his return to consciousness, he was quite ignorant that the operation had been performed, and said he had been in a delightful dream, and that his sensations were more agreeable than they had been for a year."

"*Removal of Cicatrix from Lip.*—A boy, twelve years of age, in vigorous health, was brought to me by his parents, on account of a scar on the upper lip, about an inch in length, which had been caused by a contusion. The red part of the lip had united irregularly, and produced considerable deformity. The operation necessary for the relief of this accident, was likely to be painful, protracted, and to require much delicacy. It was important, therefore, that the patient should be kept in the most perfect state of quietude. This was not likely to be the case, as he stoutly resisted the idea of submitting to any suffering. His parents were, therefore, very desirous for him to take the ether.

"During the operation, which consisted in dissecting out the cicatrix from the lip, he remained immovable; not the slightest shrinking or muscular action, of any kind, being perceptible. He recovered from this insensible state while the edges of the wound were being adjusted and the sutures inserted, but did not make any complaint. The pulse was now found to be slow (say sixty in the minute); the pupils dilated. He vomited a little, and was faint for half an hour; but when I saw him in the afternoon, he had quite recovered from the effects of the application." — *Dr. J. Mason Warren.*

*Application in Insanity.* — One of the many interesting and singular results that have followed the inhalation of ether, is recorded in a foreign journal — the subject being a *mad girl.*

"The vapor was administered at the Insane Asylum at Pau, by Dr. Cazenovia, to a girl who had been mad for five months, and had not slept during that time.

After five inhalations, the irritation of the patient was allayed, and she sunk into a sleep, which continued twenty-five minutes, when she awoke, with no appearance of her disorder remaining; nor, up to the last accounts, had she any relapse."

"*Ether in Mania.*—In the licensed lunatic wards of the St. Marylebone Infirmary, Dr. Boyd has tried the inhalation of sulphuric ether in four cases, one chronic and three acute, of violent mania, amongst females, with excellent effect, and without any unfavorable results. The tranquilizing effect was produced at various intervals of from two to ten minutes; at a time too, when the patients were unusually violent. All of them appeared to become intoxicated. Before this effect was fully produced, their anger in every instance seemed turned to joy; a soporific effect was the utmost that was produced in any case." — *Lancet.*

## APPARATUS FOR ADMINISTERING ETHER.

The apparatus which we have improved, and now use for administering the ether, is a glass reservoir, large enough to hold about a quart. The reservoir has two circular openings, from one and a half to two inches in diameter, to one of which is attached a tube with a glass mouth-piece, flattened, at the extremity, to suit the shape of the mouth. To this tube, near the orifice, is attached a valve, by which the expired air from the lungs is prevented from returning to the vessel, and is dissipated. This valve is covered with wire gauze.

Fig. 2.

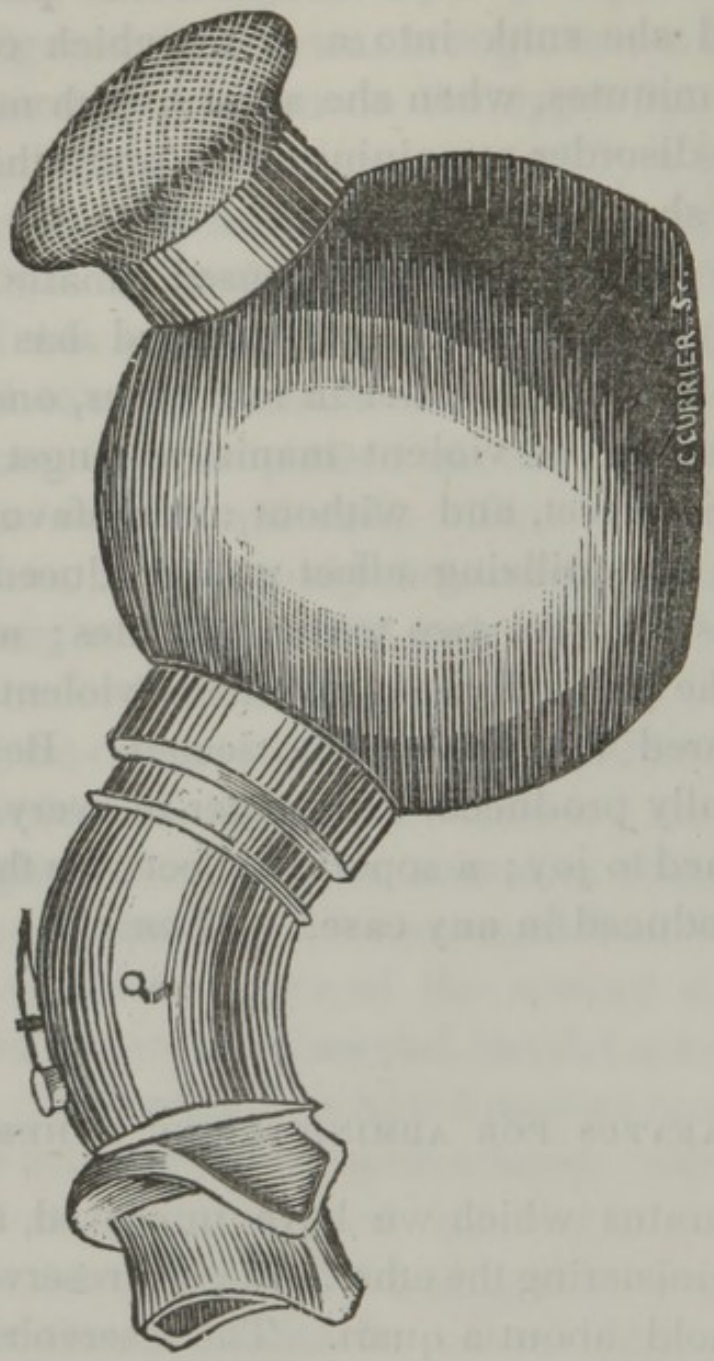



Fig. 2 represents an inhaler we have received from Paris. This is supposed to be the only instrument of the kind in this country, excepting the one now in the possession of Dr. Hayden, of Boston, who also has used it with great success.

The other opening should be provided with a glass stopper, and is used for the admission of atmospheric air. We have made a wire gauze cap, as a safety-valve by lamplight. By this improvement, ether can-

not explode or ignite. Around the elevation which bounds the orifice of the tube, a French apparatus is sometimes affixed—a simple apparatus for compressing the nose of the patient. It consists of spring wires, padded and covered, which clasp the nose with a gentle pressure, and prevent the too large inspiration of atmospheric air. In the reservoir it is only necessary to place a sponge, well saturated with the ether, for a brief operation. If the process of inhalation has to be repeated, a small quantity, from one to one and a half ounces of ether, may be placed in the reservoir. Some have recommended the use of linen folds instead of sponge; but we have found the latter best adapted to the purpose, as it presents a larger evaporating surface.

Fig. 3.


1, Inhaler. 2, Admits air. 3, Emits ether and air. 4, Admits air. 5, Allows the ether and air to pass into the tube. 6, Orifice of tube to admit air. 7 and 8, Tube with valves for inhalation. 7, Admits air. 8, Valve for expired air to escape.

We have often used a sponge, but the patient is not so readily affected by its use; and where a large quantity is administered, the atmosphere of the room is filled with ethereal vapor, and the *perpetual* inhalation of

so much of it, by the operator, is rather unpleasant. Having used the ether in our practice ever since its use in the Massachusetts General Hospital, during which time we have administered it to a great number of persons each day, we feel to speak with some degree of confidence as to its effects.

## DIRECTIONS FOR USE.

1*st*, The patient should always be placed in the position he is to occupy during the operation.

2*d*, If a sponge be used, it should be concave, and bell-shaped, and large enough to cover the mouth and nostrils. A portion of it may be covered with a piece of kid or oil skin, or a folded towel, to prevent the too rapid liberation of the ether; but care should be taken, in all cases, not to exclude entirely the atmospheric air; this is very essential.

3*d*, Before using the apparatus or sponge containing ether, the patient should be instructed how to "draw," or "breathe." If an instrument is to be used, the patient might practise breathing through the tube, before putting ether into the reservoir.

4*th*, If there be witnesses present, they should preserve silence after inhalation has commenced. Nothing more retards the process, than talking, questions, and exclamations; especially, if the subject be at all timid; in which case, the operator should kindly encourage the patient with assurances of the perfect safety of the operation. All unnecessary movements, such as opening and shutting doors, moving chairs, &c., should be avoided. All noise tends to disturb and retard the process.

5*th*, Where *instruments* are to be used in labor, operations for stone, &c., they should always be applied *before* inhalation is commenced, as the risk of doing injury is thus avoided. The operator can easily distinguish the complaints produced by injurious malposition of an instrument, and those caused merely by the new and unpleasant feeling of its introduction.

6*th*, Sometimes the patient declares that the ether "chokes him," he "can't breathe it," &c., and that the smell offends him. He must then be persuaded and encouraged to try again. Insist on his persevering, and in a short time he will be so much under its influence, as to be indisposed or unable longer to resist. A winning deportment almost always produces the effect; but sometimes it is necessary to speak out loudly and sharply, to enforce inhalation.

7*th*, The progress of inhalation is generally more rapid when the eyes are kept closed, as the attention is thus not diverted.

8*th*, The operator must always have confidence in himself, exhibit no embarrassment, coolly meet every emergency, and closely watch the first indication of ethereal effect.

9*th*, Let each step of every operation be persevered in with the utmost composure, and the abiding conviction that the state which ether has produced may be surely and with safety continued as long as the circumstances may demand.

10*th*, By a rapid, steady, full inspiration, the best effect is produced, and the least quantity of ether required. When the inhalation is abrupt and irregular,

and the patient restless, much of the ether is wasted, and the process protracted; friends are sometimes alarmed, and the patient discouraged. Again, if a sedative result on the general circulation be wanted, bleeding in the arm should be resorted to; but it is found that many ounces of blood are required when it is drained slowly away; but when from a large orifice in the vein it is rapidly abstracted, "*pleno rivo*," the patient soon faints, and less blood is therefore necessary. It is the sedative effect that is wanted in surgery, and we have ever found, in our practice, that the quicker an individual could be etherized, the better; particularly in the case of nervous patients.

Usually, the first few inspirations produce the effect. It is at first a decided stimulant, and afterwards operates as a powerful sedative; like opium, which, when taken in small quantities, causes excitement, but becomes a powerful narcotic when taken in large quantities. Some inhale just enough ether to become excited, when the operation is unwisely relinquished.

11*th*, For the extraction of teeth, the patient should commence to inhale with the mouth open; as some persons obstinately refuse to open their mouths when under the influence of ether. We have sometimes placed a cork between the teeth, to keep the jaws apart. In some instances, the mouth can be forced open, but this is impossible in others.

12*th*, If the pulse should rise above one hundred and forty, or sink to fifty-five pulsations in a minute, ether should be used with great caution. We were once called upon to extract a very bad tooth, present-

ing uncommon difficulty, for a middle-aged lady (of very nervous temperament), who was anxious to take the ether; which I gave her, and painlessly removed the tooth. This was done in the presence of Drs. Cross and Warren, the latter of whom kept his fingers continually upon her pulse, but could detect no variation in the movement of the heart.

It has been supposed, that ether should not be administered in certain cases, and to those affected with certain complaints; that it should not be used in the following cases: —

1*st*, Disease of the heart; on the supposition that fatal syncope would result.

2*d*, Where there is a tendency to hæmorrhage of the lungs, apoplexy, or congestion of the brain.

3*d*, To highly nervous persons, females subject to hysteria, &c.

4*th*, Cases of chronic bronchitis, or where any irritation of the air-passages exists.

5*th*, Cases of tubercles of the lungs.

6*th*, Epilepsy, mania, and delirium tremens.

7*th*, Operations for deep-seated tumors of the neck.

8*th*, Very young subjects.

9*th*, Those subject to convulsions.

But the safe inhalation of ether, by persons affected with *these complaints*, proves these objections to be purely ideal. The following, among many cases, indicates the advantage and even benefit of ether, in *mania a potu*: —

"Dr. Upham, of Boston, has contributed to the Boston Medical and Surgical Journal, an account of the

successful treatment of a case of delirium tremens, by the inhalation of ether. The patient was in a high state of nervous excitement; and after the usual treatment by opium, in the form of morphine, had failed to induce sleep, on the day of the experiment, he was still in a state of wakefulness and high delirium, but so much exhausted as to make it a matter of the highest moment to induce sleep immediately. In this state it was determined to resort, as a last experiment, to ethereal inhalation, and the ether was accordingly administered by a sponge. Dr. Upham thus details the result: —

"The patient was very refractory, and required to be held by assistants, in the mean while struggling, raving, and cursing. After inhaling the vapor for the space of ten or twelve minutes, he appeared quiet, and was thought to be fully under the ethereal influence; but upon removal of the sponge, he sprang up and commenced raving anew. The process was repeated, and continued for ten minutes more, at the end of which time, the patient was brought fairly under the desired influence, and fell asleep. From this state of artificial sleep, he passed, without waking, into a quiet, deep, and untroubled slumber, which continued without intermission for four and a half hours.

"He was seen several times during the continuance of this sleep, and within a few minutes after he awoke. He then appeared perfectly rational, called for cold water, and asked to have his leg dressed (he had bruised it badly during the delirium). In the course of half an hour he fell again (as was anticipated) into a

quiet sleep, which continued, with few intermissions, during the afternoon and night.

"Next morning (Saturday) he appeared perfectly rational and well, though weak. He had no recollection of any thing that had happened, from nightfall on Monday, to the time of his first waking on the Friday afternoon."

We hold in our possession a statement of Mrs. W., of Mobile, formerly of F—— Street, N——t, and who has been for years laboring under stricture and hæmorrhage of the lungs, and to whom we administered much ether, several times, on different occasions, for three months, and without the slightest injury.

An operation has been performed, with ether, at the Massachusetts Medical College, on a child only three months old; and in Europe, young children have been painlessly operated upon, and in no instance injuriously affected by ether.

A patient in London, was translated, as it were, to the realms of bliss, immediately after a painful operation. Four verses of a psalm were sung by him very loudly, with his eyes fixed, his body in a tremor, and intense fervor shown in every movement. He would not be interrupted, and could scarcely be prevailed on to leave the operation-room, seeing that he found himself so wonderfully happy there. He said he had been in heaven, and had seen his Saviour; on reaching his bed, he fell on his knees and was wrapped in prayer.

It has always been a leading object, in practical surgery, to diminish, as far as possible, the amount of

suffering during the manipulations of that art. Accordingly, in some operations, tight pressure has been made above the part to be cut, applied by a tourniquet, by bandaging, or by the powerful grasp of an assistant.

"In medical practice, wine, whisky, and brandy are every day given (even for long continuance) in such doses as must prove more or less intoxicating; in low fevers, for example, or in threatened sinking, after severe shocks by injury. And here the saving of life, is held to justify the means. Employed as a mere experiment, their use would assume more than a doubtful character. In the time of the cholera, when it raged in its first onset, a late physician in Edinburgh, attached to one of the hospitals, experimented largely in the injection of saline matters into the veins; and with no indifferent success. One old man resisted the ordinary injection; and, in a reckless moment, it was resolved to inject whisky into the veins instead. The effect was electrical. The man — before cold and clammy, and blue; without voice, or pulse, or power of motion — rose up in bed, a living corpse; fancied he was in a change-house; called loudly for more drink; trolled merry songs; and, after a few minutes of ghastly gayety, fell back, and sank again, and died."

The *advantages* of ether, besides the mere removal of pain, are numerous; and

1*st*, Among these, is the *removal of fear*, by which many diseases may be cured, that would otherwise be permitted to progress to a fatal extent, through dread of a surgical operation. For it is well known that per-

sons of the most undoubted courage, who have faced death upon the battle-field with an unblanched countenance, and calmly braved the "perils of the deep," and boldly risked the contagion of hospitals and "pestilential climes," have instinctively shrunk from an operation requiring the surgeon's knife, and permitted a fatal disease to progress, rather than submit to a surgical operation.

2*d*, The prevention of those *shocks* to the system which are *always* produced by the suffering of pain; for, in the cases in which ether is successfully administered, no pain is felt; that which is mental or emotional, being avoided; for all anticipation of pain is removed. There is, however, another kind of shock, that produced on the spinal and ganglionic systems, which may remain after the use of ether. But the certain prevention of mental shocks, and those produced by suffering, greatly facilitate recovery; as there is not then that strong reaction to contend against, which usually follows surgical operations — a reaction or exhaustion of the system that tends to inflammation, or irritation, caused by overtasking the nervous system to bear up under the excitement of an operation.

3*d*, Not only does the etherized patient avoid suffering *during* the operation, but the pain which follows is materially mitigated by the soothing effects of ether in the system. Neither is the mind afterwards haunted by the recollection of suffering: *hence, those who have undergone surgical operations by the inhalation of ether, in the Hospital at Boston, have recovered quicker than the same class of cases without ether.*

4*th*, The advantage to the operator of a *passive* subject, in most cases, is immense.

5*th*, The reduction of dislocation is found much easier. "The patient may be calm, and anxious to assist the surgeon; but when violent extending force is applied to the limb, he strains himself greatly, and renders the muscles connected with the displaced joint as rigid as if they were of wood or plaster."* Etherization removes this rigidity.

6*th*, In hernia, which may be called the dislocation of the bowels, "it prevents the straining of the patient, which every experienced surgeon knows is so greatly obstructive of reduction. In a recent case of rupture, the bowels were constantly protruding from the wound, and could not be replaced, on account of the great and incontrollable action of the abdominal muscles; ether was administered, the patient became unconscious, the abdomen lay quiet, and the protruded parts were then, without the slightest difficulty, replaced and retained." *

### USUAL EFFECTS OF ETHER ON THE PATIENT. RESTORATIVES. DANGEROUS SYMPTOMS.

Upon the first attempt at inhalation, the patient is often affected with a tickling and burning sensation in the throat, especially if there has not been admitted with the ether a full supply of atmospheric air. Sometimes violent coughing is induced; to this may succeed nausea, or even vomiting. This, however, sel-

* B. and F. Review.

dom happens, unless the vapor is received into the stomach, which may always be avoided, by giving the patient proper directions how to "breathe" the vapor. When the patient begins to feel the influence of the ether, there is a loss of voluntary muscular power; the eyes close, and the hands drop; if requested to open his eyes, the patient either neglects the request entirely, or, if he endeavors to comply, it is with an effort, and he soon closes them again; at this time the pupils of the eye will be found dilated, sometimes turned up, or fixed; sometimes the countenance is red, and in other cases unusually pale. The pulse is generally increased in rapidity and power; if, however, the pulse falls to sixty in an adult, or in a child to seventy-five or eighty, the ether should be withdrawn. A flow of saliva, with unconsciousness to surrounding objects, loss of sight (though the eyes may remain open) and of hearing, are also accompanying symptoms of the full effects of ether. If the countenance assume a livid appearance, with heavy, irregular, and labored breathing, the inhalation should be immediately discontinued. Cold water dashed forcibly into the face, is often the best and quickest restorative; the introduction of oxygen gas into the lungs, or the internal exhibition of *aqua ammonia*, will effect the same purpose. Sometimes, with hysterical females, a cold shivering will come on, accompanied with weeping. In such a case, the patient should be laid in a horizontal position, and warmly clothed; the hands should be rubbed, and warm wine administered; if heat be not soon restored, warm applications should be applied to the feet.

The above are the *external* symptoms; those which are unpleasant or dangerous occur but rarely, and no one person exhibits them all. A minor operation, such as the extraction of a tooth, does not require so full etherization of the patient, as where the operation is more severe and of longer duration.

The *internal* effects of ether are as various as the outward symptoms; and in the cases which we shall present that have come under our own observation and that of others, it will be seen that they are as various as the persons who received it. When fully etherized, the patient often sinks into a dreamy revery, in which his mind is employed in recalling the reminiscences of the past, or enjoying some imaginary delights of the present.

# CHAPTER II.

## USE OF ETHER, ETC.

CONTENTS. — Use of ether in labor. Cases in Paris and Edinburgh. Cases related by Drs. Townsend, Channing, and others. Author's experiments on men and animals. Effects. Experiments on bees, frogs, leeches, fishes, dogs, chickens, &c. Result. Operation of ether. Phenomena. Case at Newburyport.

As this subject is so important, we have devoted much inquiry to it, and present the following facts for consideration. It has been said by an eminent physician (Dr. Merriman), "that there is no operation in surgery more painful than that of labor." His description is truthful and vivid. "The pulse increases in quickness and force; the skin grows hot; the face becomes intensely red; drops of sweat stand upon the forehead; perspiration, sometimes profuse, breaks out all over the body; frequent violent tremblings accompany the last pain, and, at the moment that the head of the child passes into the world, *the extremity of suffering seems beyond endurance.* Or, take the picture of the sufferings of the mother in the last stage of natural labor, as portrayed by the most faithful of living observers, Prof. Neagele, of Heidelberg: 'The pains,' he observes, 'of this stage, are still more severe, pain-

ful, and enduring; they return after a short interval, and produce a far greater effect upon the patient than those of the previous stage. Their severity increases so much the more from the additional suffering arising from the continually increasing distension of the external parts. They convulse the whole frame, and have hence been called the *dolores conquassantes*. The bearing down becomes more continued, and not unfrequently there is vomiting. The patient quivers and trembles all over. Her face is flushed, and, with the rest of the body, is bathed in perspiration. Her looks are staring and wild; the features alter so much, that they can scarcely be recognized. Her impatience rises to its maximum, with loud crying and wailing; and frequently, expressions are used which, even with sensible, high-principled women, border close upon insanity. Every thing denotes the violent manner in which both body and mind are affected.' "

Under the influence of ether, in labor, not only has all pain been removed, but the most exquisite pleasure has been enjoyed; and many mothers have blessed God for the removal of that curse introduced through the disobedience of Eve, upon her exodus from Eden; since which, that fiat of the Deity, "in sorrow shalt thou bring forth children," has been inseparable from childbirth, until now graciously removed by this "last best gift" to woman.

Cases are reported of instrumental labor, in a Paris hospital, under the use of ether, which were fatal, in consequence of the supervention of puerperal fever; but this will hardly be ascribed to ether, or urged as

an objection to its use, as puerperal fever existed, at the time, at the hospital; and all who are acquainted with that disease, know how readily it extends itself from patient to patient, in hospitals. "I have not in memory," says Dr. C., "a single case of instrumental labor of so much severity as that of Mrs. H. (reported in another place), from which recovery was so rapid, and so complete, and in which suffering was so slight."

Not only in Paris, but in Edinburgh, also, ether has been used in labor. To no one is the profession more indebted in this respect, than to Dr. Simpson, professor in the Edinburgh University.

Forbes's Medical Review, the leading authority in medical literature in Europe, contains the following: —

"In a communication which we have received from Edinburgh, dated 22d March, Dr. Simpson states that he had, up to that date, used etherization some forty or fifty times, with the most perfect safety and success. His first application of ether, was to a difficult case of turning, in a deformed woman. A painful operation had to be performed within the womb; and then the child had to be pulled forcibly away. Much force was necessary, and, in ordinary circumstances, much pain must have been endured, and the recovery must have been tedious. In this case, during the whole process, there was either very little or no pain, and the recovery was rapid and perfect.

In one case, he kept a person etherized four hours, and in another six, without the fœtal heart varying above ten or twelve beats during the time. The mother, in both cases, recovered perfectly, and both were, of

course, astonished, at being delivered without being aware of it.* Dr. Channing, of Boston, also kept a person etherized for *nine* hours.

He reports a case of Mrs. S., aged twenty-three. By inhalation from a sponge, in one minute she was unconscious. "In the first efforts with the instrument, instead of a *bearing-down* effort, an opposite one was made by the patient. The lower limbs were straightened out with much force, and the instrument drawn inwards into the pelvis. This was very striking. But a very short reäpplication of the sponge obviated this difficulty entirely, and the child favorably descended, and no farther organic resistance to delivery occurred. The head was born. The child breathed, and every thing promised well. But pains did not occur for some time. As happens not unfrequently after the accomplishment of delivery thus far, after very severe labor, contractions cease as from exhaustion, and the child remains in great peril. Perhaps as many children are lost in this way as from any other accident in delivery. At length, however, an arm was brought down, the womb acted, and very slowly the child was born. Some time elapsed before the placenta was

* On the 22d of February, Baron Paul Dubois, Clinical Professor of Midwifery at the Faculty of Paris, read a paper to the Academy of Medicine in that city, detailing his experience of etherization in the practice of midwifery. His conclusions are the following: — 1. It has the power of preventing pain during obstetric operations; such as turning, application of forceps, &c. 2. It may momentarily suspend the pains of natural labor. 3. It does not suspend uterine contraction, nor impede the synergetic action of the abdominal muscles. 4. It appears to lessen the natural resistance which the perinæal muscles oppose to the expulsion of the head. 5. It has not appeared to exert any bad influence over the life and health of the child.

detached, but this came naturally away. The child was alive, and cried. It was a boy, and weighed nine pounds.

She said she remembered nothing, from the first inhalation to the moment when the afterbirth was taken away. I told her she had talked, had described her feelings after inhalation, had told us where she had been, &c. &c. Well, she said, she did not know any thing about that. She could only repeat what she just said, that she remembered nothing about it; not a word, not a syllable. I asked if she did not recollect that I was there, and used instruments, and endeavored to bring to her remembrance other matters. She said, again and again, she remembered nothing about it. In Mrs. H.'s case, I stated that she had *sense*, but not *feeling;* that she knew she was alive, and that people were about her, and assisting her, &c., but that she felt nothing — had no pain.

Let it be especially borne in mind, that insensibilty to pain, a perfect unconsciousness in regard to suffering, may be present, while the patient may be perfectly conscious of other things; namely, of persons about him, what is doing, &c. This it is which makes one of the most curious facts in etherization, and demands the special notice of the practitioner. The application of ether in labor has been made because its fullest agency does not interfere with the involuntary agencies, the action of the womb, on which delivery depends. The womb acts under the fullest effects of ether, just as regularly as does the heart or the lungs. Nay, I have observed obviously good effects during ether-

ization, in the absence of voluntary efforts, the *bearing-down*, to which the patient is so strongly tempted, in order to bring to a more speedy close the extreme suffering that is experienced. There has been far less exhaustion after labor, from the absence of the voluntary effort; and the danger of graver accidents is much diminished. Effort is in an important sense proportionate to the demand, and relaxation goes on steadily, and in harmony with the pressure which demands it. Professor Simpson thinks he has seen that an increase of uterine effort, where it was demanded, has been the result of etherization.

June 18. *Case of Mrs. R.*, aged eighteen. In labor; great pain; refused the ether, but finally consented to breathe it; was unconscious in one minute; pain returned; she got hold of the sponge, without being seen, and breathed at it with great avidity; so much so, that it was found difficult to remove it when discovered. The child was born in four or five pains after etherization. The placenta was soon thrown off — the womb contracted well, and a swathe was carefully applied.

The return to consciousness was slow. There was exhibited more excitement than I have before met with. There was a full expression of previous most perfect freedom from suffering. A state of entire pleasure was expressed. She sung, talked, raised her arms high in the air. She did not recollect me, or anybody about her. Her child's cries, which were very loud, strongly attracted her notice. She passed her hand over her abdomen firmly, as if to learn what

had happened, and her countenance expressed much surprise. Pulse continued natural; complexion good; temperature as during labor. Some hæmorrhage, but not enough to do harm. She said she was very hungry and thirsty; and took, with much relish, gruel and water. After-pains occurred, in about half an hour after labor was over, with much severity, and for which I prescribed camphor and opium in pills; I left her otherwise comfortable. Slight hæmorrhage. June 13, she was perfectly well.

Case of a lady aged twenty-five. When etherized, she exclaimed, 'I am dying, I am dying!' I had my finger on the wrist, and carefully examined the pulse. It was about ninety before etherization. It rose to ninety-eight, and this was its number, with temporary changes, during the whole of the labor after ether. Excitement soon passed by, and a pleasant calm succeeded. The expressions were now of pleasure only. 'How beautiful! how beautiful!' was the language she used. The state of etherization was moderately sustained during the whole day. Mrs. W. had some latent feeling about the remedy which much influenced the case. She would vehemently demand the sponge, and that it should be thoroughly wet with ether. She would put it aside as soon as she began to feel its effects. At times, however, she would experience its full effects. She was thus by no means wholly unconscious; I mean in that degree of it as to be unaware of people and things around her. Sometimes she would say, 'I know you, Dr. C. 'I know you, Mrs. F.,' &c. &c.; as if to let us understand that though

she was unconscious of pain, she knew all other things. She would say, when demanding the sponge, 'Do n't be afraid of hurting me. I know just how much I want, and will tell you when to take it away.' And this was done after a manner which I have seen in no other case. The labor was delayed by the state of the perineum. It was very wide, leaving the os externum very small. Through this protruded a round mass of scalp, and a conical-shaped bony mass of scull. The occiput had fairly cleared the arch of the pubis; still delivery did not take place. After an ointment of ext. of belladonna and simple cerate was liberally used inside the vagina, and over the perineum, dilatation took place readily, and the child was born. There was perfect abolition of pain in this closing period of labor, and when suffering is, I may say, always so great. The womb contracted well. The placenta was easily detached by natural effort, and, with some coagula, was expelled. A swathe was applied. Child, a female, weighing seven and a half pounds. It did not breathe immediately after its head was born, but soon breathed after cold water was dashed on its face and breast, and did perfectly well. During the labor, 3 j. ergot was infused into about 6 oz. boiling water, and the tea without the powder taken. Some increase of pain undoubtedly followed its use. The bladder was emptied with the catheter once during the day.

Labor began in this case at twelve the preceding night, and was ended at six, P.M., the following day. The ether was first inhaled between eight and nine, A.M., and its influence was sustained, as above de-

scribed, till nearly five, P.M. Mrs. W. described her state, when consciousness returned after labor, as one of perfect ease and enjoyment. She had hardly had a pain. She had little memory of pain. The ether had made tolerable, what she thought she could hardly have lived through without. She had been in pain, she said, during the three preceding weeks; her nights disturbed, and her days most uncomfortable. She expressed her gratitude for this means of her comfort, through a whole day, after a manner which I have not heard paralleled. Her pulse was calm, her manner natural, and her head free from all pain."

Another case of a lady, aged thirty-six, delivered with instruments. "It seemed impossible for Mrs. A. to express the gratitude she felt for the pleasure and the ease afforded to her by the ether. It was astonishing to her, that she who had always suffered so much in labor, and for so many nights and days, in this last one, and who after former labors had been in such distress — it seemed most wonderful to her to feel now so easy and so happy."

"The action of the womb, in some cases, in the absence of all voluntary agency, was very striking. Not only was there natural expulsatory effort, which aided the manual, but the effort was marked occasionally by its audible expression, the bearing down, which is so well known. I was reminded of this effort during insensibility, by a case of most severe puerperal convulsions, which came under my notice the day after the above case. The organic effort, in the entire abolition of voluntary power, was most striking. I have known

a child born by this organic agency, without the least apparent consciousness of the event on the part of the mother at the time, or any recollection of it afterwards. In view of the facts established by so many and such varied observations, at home and abroad — and of the fact of efficient uterine action, during the full effect of a well-known agent, ether — the use of which has thus far been so safe, and the application and *modus operandi* of which, a wider observation will do more and more to determine, — may we not, in view of such facts, look with confidence to the time when labor will be accomplished with an ease and a freedom from suffering, contrasting strongly with the pain which has accompanied it, and which hitherto has been regarded as its necessary condition?"

Drs. Townsend and Channing relate a case of delivery by forceps. Before the birth, not the least complaint was made. The case was very difficult, and the pain ordinarily intense during the process of delivery. The ether was exhausted, and the patient made most earnest demands for more. So great was her agony, that more ether was procured, and entire relief afforded. The child was born without her knowledge!

"So difficult was her case," says Dr. Channing, "I have not in memory a case of instrumental labor of so much severity, from which recovery was so rapid or so complete, and in which suffering was so slight, at the time or afterwards."

Profs. Simpson and Channing say that they have observed no harm whatever to result from the use of ether in labor, either to mother or child. Prof. Simp-

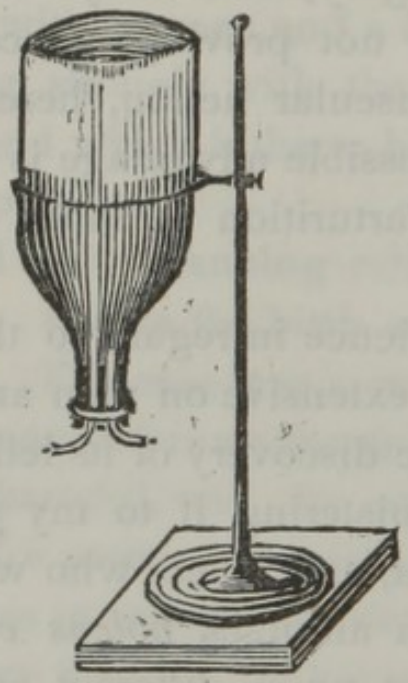
son says of one case, "On the fourth day, the patient walked out of her room to visit her mother." In several cases of extraction by forceps, the results of etherization have been equally satisfactory. In every case, the uterine contractions continued as regularly after the state of etherization as before. In some cases, the pains appeared to have increased as the consciousness of the patient became diminished. This occurred where ether was combined with tincture of ergot, or contained a solution of its oil. And thus, though in some cases of surgery, ether may seem to labor under a disadvantage in not proving a successful opponent of involuntary muscular action, here, in the obstetric art, the greatest possible advantage is derived from that circumstance. Parturition is shorn of pain, and yet not ratarded.

Our own experience in regard to the administration of ether has been extensive on men and animals. Immediately after the discovery of its letheanic properties, and before administering it to my patients, I experimented on myself, and others who were willing to receive it, and upon animals, *nolens volens*, to find out the particular effect upon different constitutions, temperaments, &c. Without knowing at that time, how the sulphuric ether was prepared for inhalation by the patentees, we knew by our own experiments, that different qualities of sulphuric ether produced, in the same persons and animals, different results, as the ether was more or less free from alcohol. Knowing the affinity of alcohol for water, we instituted a series of experi-

ments for separating the former from the latter. After a series of experiments, we think the following the most simple and effectual: —

Take a common decanter with a cork stopper, through which pass two glass tubes; one to admit air, the other to emit fluid. The former may reach nearly to the bottom, while the other terminates at the inner end of the stopper, as exhibited in Fig. 4. Both outer ends of the tubes may be provided with cork stoppers.

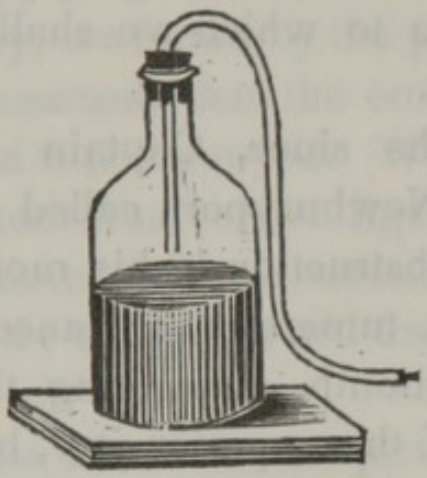
Fig. 4.



Put in equal quantities of water and ether, and intimately mix them by shaking. In a few minutes the ether separates, and, being the lightest, floats on the top, as represented in Fig. 4. By inverting the vessel, and holding it in the hand or in a retort, and removing the corks from the tubes, the water and alcohol can all be drawn off, and the pure ether retained or put into another vessel. The ether is now washed.

Another way to draw off the ether is, by bending a glass tube (over a lamp) into a syphon, as seen in

Fig. 5.



To prove that the alcohol has united with the water, apply a lighted match, and it will burn.

Ether can be extemporaneously and thoroughly washed by mixing water and ether in any narrow-necked, transparent vessel. Invert, and let the fluids separate, to allow the water to pass through a perforated cork, and arrest the ether when the water has escaped.

Out of the immense numbers to whom we have given the ether, of course we can particularize but a few; but, in selecting the cases for publication, we shall have particular reference to the important object of obtaining a correct general result; not choosing from one sex, class, or peculiar disposition, but giving an average, by which correct conclusions may be drawn as to the value of the application. And in order to do this, we shall not limit ourselves to dental operations;

as the general effects upon the system may be better learned by ascertaining its effects under a great variety of circumstances; so extensive a field, of course, could not be found in the dental profession.

The first case to which we shall allude, is that of Captain Adams.

Some months since, Captain A., a respectable shipmaster, of Newburyport, called on me for advice concerning an obstruction in his mouth. On examination, I found a tumerous substance running horizontally across the mouth, connecting the dexter and sinister portions of the superior jaw, by union with the alveolar periosteum adjoining the necks of anterior and posterior molars. Its length was one and a half inches, circumference one inch, form cylindrical, texture firm, surface smooth, and not painful to the touch.

Suppose a cord, passed through the interstices of the two upper double teeth, carried across the mouth, and resting on the gums between the corresponding teeth on the opposite side of the jaw, drawn tight, and firmly secured. This furnishes a good idea of this physiological curiosity. Through this eccentric canal, which spanned the palatial chasm, the blood pulsated regularly, as it was propelled through the arteries from the heart. The surrounding parts preserved their integrity.

We recommended an operation, to which he assented; he also wished the lethean, which we administered; only about two minutes inhalation of which sufficed to render him unconscious of what was going on around

him. Taking a piece of strong silk, waxed, to prevent premature decomposition, we tied it firmly round one extremity of the tumor, by which the circulation was cut off; applying a similar ligature around the other extremity, we found by the pallid appearance that the tumor assumed, that the connection with the general circulation was destroyed. We then took a lancet, and, equi-distant from either ligature, divided it; both portions immediately contracted, retaining the horizontal position; a few arrested drops of blood only were discharged.

A few moments after the completion of the operation, the patient awoke to consciousness, having suffered nothing from the compression or excision of the tumor. In two or three weeks, the remaining portions sloughed off, and, hanging by a small peduncle, were easily removed. No symptoms of any reappearance.

This substance originated some ten years since, when Capt. A. was on a sealing voyage round Cape Horn, where the continued stimulus of salt diet debilitated the venous and absorbent systems, and produced *scorbutic* affection. Ulcers formed in his mouth, and he was unable to speak. Struggling to do so, on one occasion, the ulcers broke, and the mouth healed. But he discovered a thread-like substance, stretched across his mouth, which had been increasing in size ever since, until at last the obstruction materially interfered with his speech.

All to whom he had applied for removal, fearing hæmorrhage, declined the responsibility.

The gentleman now enjoys good health; nor could any one detect, on examination, the slightest evidence that such an anomaly had ever existed. Nor have I been able, after much research, to find a precedent.

A young lady, the wife of an officer in the navy, a resident of Portsmouth, N. H., seeing an advertisement concerning the ether in a newspaper, immediately came to my office at Newburyport, to have a tooth extracted. While under the influence of the vapor, she seemed to be travelling the distance over again; thought she was in the carriage with her husband, talking with him as to the probability of her going through the operation devoid of pain.

Mrs. S——, the wife of a methodist clergyman, after taking the ether for some moments, suddenly arose, and wished one of the young ladies accompanying her, to play a tune on the piano, and she would dance.

On this occasion, the ether was unwashed. On a subsequent occasion, when pure ether was administered to the same lady, she exhibited highly excited religious feeling. "The glories of heaven were open to her view; she no longer saw through a glass darkly," &c.; and, devoutly clasping her hands in ecstatic raptures, cried out, "Glory to God! *this is* happiness; thanks, eternal thanks to God, for my creation, for making such enjoyment for me; my soul is full of bliss," &c.

In the case of Mr. H., while under the influence of lethean, he "thought he was trading in horses, and that he told the man with whom he imagined he was trad-

ing, that he was going in to Dr. Smith's, to have a tooth taken out; that he came in, showed me the tooth, and took the operating chair. *After the tooth was removed*, some one came to the window and knocked for him, when Mr. H. answered, "*hold on until my tooth is out.*"

In this, as in many, if not most cases, the dreams are connected with that idea or impression which is most prominent at the time when inhalation commences.

"Where am I?" "What have you been doing?" are the most common exclamations of persons recovering from the effects of lethean, in the manner of a person who has fallen asleep in a strange place, and at an unusual hour. On awaking, they gaze around in amazement, bewildered and perplexed, not knowing what they have been doing, nor how much time has elapsed. Especially, on recognizing the operator and the room, their astonishment is increased; and they frequently suppose weeks, months, and sometimes even years, have elapsed since they entered the apartment.

One peculiarity exhibited by patients having inhaled lethean, is the amount of time apparently consumed during the almost momentary operation.

A stage-driver, who was under its influence not more than two minutes, supposed he had driven through his entire route, more than twenty miles.

It is said that Mahommed lived several years in one of his visions, travelled thousands of miles, &c.; though he had, in fact, been confined to the precincts of a tub of water, into which, for a moment, he had thrust his head, while in fancy he had roved almost illimitably.

Any one who administers the lethean, will find that the race of Mahommed is not yet extinct.

Gave the lethean to a young lady, aged nineteen, the daughter of a highly respectable gentleman in Ipswich, and under its influence removed four diseased teeth without pain. She subsequently declared to her father, who was bending over her, "that while *he* could hear nothing but the crushing of mouldering bones, she heard the most enchanting music that ever charmed the human ear;" and while the merciless forceps were deeply buried in, and moving about swollen and inflamed gums (searching out objects of creative anguish), and the blood from fractured arteries was pouring from her mouth, she lay reposing, like some sleeping fairy, totally unconscious of the progress of the operation.

Strange indeed is that subtle power, which so delightfully steals through the frame, binding the giant like a "strong man armed," and by its invisible but entrancing effect, locking up every sense from consciousness of pain, but diffusing, through countless nerves which everywhere radiate and ramify the body, the most delightful sensations, when, without its agency, the keenest torture must be endured.

Ordinarily, every nerve is as a telegraphic wire connected with the brain, the great "station," conveying instant intelligence of the most trifling injury which the body receives. But under the influence of the lethean, every nerve has a holiday; and with almost delirious rapture every little truant sentinel forgets its duty, and even the brain itself reposes quietly, or revels in gor-

geous day-dreams, while the body, placed under its guardianship, is subjected to all the horrors of the actual cautery, or the surgeon's knife.

Gave the lethean to a sailor. After inhaling it for about five minutes, he began to show a little restlessness; but being apparently insensible, we removed the mouth-piece, and extracted a large molar tooth. After making some significant gestures with his hands, he jumped out of the chair, and, looking very fierce, muttered some unintelligible threats. In a few moments, he returned to consciousness. He stated that he thought he was in Liverpool, in Mother Baker's cellar, taking a glass of wine, when some little trouble occurred, and a landlubber threw a tumbler at his head. "Shiver my timbers!" said he; "I sprang from the table to knock the fellow down, when I was brought up all standing, snug at home, right side up on this side the pond." He mistook the crashing of a rotten tooth for the breaking of a tumbler.

Gave the ether to a very large, stalwart man, of uncommon muscular power. Nearly ten minutes elapsed before he was sufficiently under the influence to justify commencing operations. Soon after, he appeared stupefied; and, though he made some resistance to opening his mouth, I succeeded in extracting the tooth requiring removal, when he immediately sprung from the chair, much excited, and threatened to knock me down. I asked him for what? "For extracting my tooth so easily." He swore the tooth was not out; that we could not fool him; "I know what you are about; you have just put your nippers into

my mouth and made a motion, and now say the tooth is out. You don't humbug me so." Seeing that opposition, in his present excited state, would only increase his irritation and tempt him to violence, I soothingly replied, "Well, perhaps I am mistaken; I will examine again;" and taking his hand, placed his finger in the vacuum lately occupied by his tooth, which I picked up from the floor. This seemed partly to recall him to his senses; and between laughing and crying, he clasped me round the neck, kissing me, and lifting me like a child's toy from the floor, till I released myself from his grasp. Gradually he calmed down, finally declaring that he knew nothing of the extraction of the tooth; nor could I convince him that he had threatened me with violence. In this case the unwashed ether was used.

The ether inhaled in this case, was Fah's best concentrated sulphuric ether, but it was unwashed.

But the purest ether will sometimes similarly affect some peculiar temperament; and to guard against any unpleasant occurrence, we have given directions respecting it in another place.

A lady who coughed while taking ether, thought she was coughing in Mr. Dewey's church, New York, and was apprehensive of disturbing him.

One evening a carriage was driven rapidly to our door, and a gentleman alighted, who requested us to accompany him with the lethean. We did so, and as we entered the house into which he led us, we heard the most violent outbursts of unrestrained hysteric laughter, which we soon found proceeded from a young lady

who was subject to hysteria; but in this instance, the operation of it was unusually violent and protracted.

She inhaled the ether, at first making some resistance. In a few minutes, however, she was in a deep, calm sleep. Her mother became alarmed, fearing her daughter might not wake. She spoke to her and called her by name; but there was no answer. She took her hand, shook her, and appeared almost frantic, crying out that she was dead. I applied the valve of the oxygen bag to her lips, and almost instantly she began to assume her natural appearance, and started up and looked around. Observing her friends gazing at her and at each other with so much concern, she looked surprised and disappointed, and inquired with great pathos and earnestness of her mother, "why she had called her back." "Called you from where?" said her mother. "Oh! I was in such a delightful place, with beautiful birds and angels, and sweet little children! Why *did* you call me back?"

Gave the ether to Miss B., a highly respectable young lady of Newburyport, and painlessly removed a tooth. In this case we used oxygen gas. She was of a plethoric habit, and there was a delay of returning consciousness. She inhaled oxygen, and at once revived.

A young lady took the ether, and had a tooth removed — thought she had been to church, heard a sermon from the Rev. Mr. Stearns, and was totally unaware of the extraction.

We removed six teeth for Mr. H., of the Boston Theater, under the influence of ether. He most eloquently recited a portion of one of Shakspeare's plays.

A lady repeated, in her *sleep*, a poem she could not repeat when *awake*.

Dr. Cross, of Newburyport, wished me to give the ether to a sailor, for the removal of a finger joint, exostosis of the bone having resulted from a neglected whitlow. He had suffered for months, and was deprived of sleep for nights in succession. He impatiently declared, "This sucking of ether is useless," and said he should not get asleep. Dr. Cross, however, at the same time skilfully cut out the first joint of an index finger, with such dexterity that the incision of the flesh, the separation of the joint, and the removal of the bone appeared to be simultaneous.

During this operation, he thought he was on board the ship, having a fine time with his messmates. Had not felt so well for months. The finger healed rapidly.

Mr. J. Dole, of Rowley, Mass., for two years had been troubled with a tumor on the left breast. Gave him lethean. Dr. Wyman made an incision about five inches in length. The tumorous matter was of an extraordinary character; instead of being consolidated within the radii of six inches, there was a cluster of small tumors occupying a circumference of eighteen inches, all of which he most skilfully and happily removed.

Mr. D. was wholly insensible, except for a moment; while tying an artery, he was slightly conscious of pain, which was instantly dispelled by another inhalation, and he lay in a calm sleep until all tumoric matter was removed, and the wound dressed. On recovering and finding that the tumor was gone, he

expressed the greatest emotions of joy and gratitude, and exclaimed, "*This discovery is from God, not men!*" Said he felt no pain, save a single instant, and, if it had continued, no man could have held him; but by the ether, he lay with his hands and body in the position of peaceful sleep. So well did he feel, that he arose immediately and *said* "that he was well, and was going down to get some dinner." *What is remarkable, he not only felt no pain while cutting or stitching, but none subsequently.*

Dr. D. G. Varney, an assistant of mine, inhaled the ether, and painlessly extracted a front tooth *for himself.*

Sometimes, when there is a difficulty in inhaling the ether, the mind becomes confused, and the effect is observed.

A student at Cambridge thought he was undergoing a rigid examination, and was demonstrating one of Euclid's propositions at the black board, which suddenly turned *white*, and he stood confounded, and utterly unable to see his figures just as he was proving "*quod erat demonstrandum.*"

Gave the lethean to Mrs. L., and, in the presence of the junior editor of the Newburyport Herald, and others, extracted twenty-nine diseased teeth and roots. She says, that during the extraction, and subsequently, she suffered no pain, and her gums have healed and hardened unusually fast.

The above and the following cases have been published.

Removed a tooth for a lady, after many unsuccessful attempts to remove it, by two different dentists.

The muscles of her jaw became rigid; she could not open her mouth, and was fed by a spoon for weeks. She inhaled ether, and for the first time for months, the muscles of her face were relaxed, and we removed the tooth without difficulty.

## EXPERIMENTS WITH ETHER,

### *On Bees, Frogs, Leeches, Fishes, Dogs, Chickens, and an American Eagle.*

*Experiment* 1, *on Bees.* — A full hive contains about eighteen thousand. We etherized one box of about three thousand. We made three divisions of them. On one we sprinkled iced cold water; another we left in the open air; a third we put into a box, through an aperture of which we introduced oxygen gas.

The first, treated hydropathically, revived in twelve minutes; those left to themselves, in twenty minutes; some of those oxygenated, revived and became sensible almost immediately; some of them became so in a few minutes, and *some are insensible yet.*

The ether was given on a sponge. It was of an ordinary kind, and contained alcohol, which acted first as a powerful stimulant, then as a powerful sedative. The oxygen was made of per oxide of manganese. When excited, some of them stung each other; when sensible, they stung us. Bees never sting each other; when attacked by other bees, they war by biting off wings and legs. A queen bee never stings except when in mortal combat with another queen. She may be cut in pieces, but will not sting.

Bees know each other by a peculiar scent of each hive, and none can enter unless by a satisfactory olfactory examination by sentinels, identity being of a nasal character. These etherized bees were repulsed. We then etherized the whole swarm, and all were admitted, for all were alike.

In two days we etherized them again, but purified the ether; that is, removed the alcohol. They were not so excited, but fell as if dead. We had prepared some oxygen of a much purer kind; but before it could be applied they fled.

We subsequently etherized a box of bees with impure ether, and gave them oxygen of a better kind, which we made from chlorate of potassa, and with good effect.

Bees from some other apiary having attacked and began to rob a hive, we made a little swing door, by which they could go *in*, but not *out*. Having thus secured in bees what we lost in honey, we etherized them, and allowed them, through a small aperture, to file out; and as they did so, we spotted many of them with vermilion, by a camel's-hair pencil. During the day they came back, having been expelled from their hives, as we anticipated,

"For the scent of the ether hung round them still."

Through the politeness of Hon. E. Mosely, we received a swarm of bees soon after being similarly indebted to E. Stedman, Esq., for a queenless hive; by the assistance of Mr. T. D. Tompson (a pupil of mine), we etherized both hives, and removed them by hand into another hive without being stung, although thousands were handled. They do well.

*Experiment* 2, *on Frogs.* — These were particularly interesting, owing to the transparency of their feet; as, by a magnifying glass, thousands of little globules of blood could be seen chasing each other, more or less rapidly, as the ether affected the circulation. In some there was no pulsation; and from this state of apparent death we revived them by powerful shocks of electro-magnetism, after they had been insensible seventy-six minutes. In some cases, after magnetism had failed, we put them in cold water apparently dead, where they lay two hours, and then exhibited vitality. When much etherized with impure ether, they sunk immediately to the bottom; when pure ether was administered, they floated on the surface.

*Fishes.* — In a large glass globe filled with water, we etherized several small fishes, by a sponge saturated with ether, and then sank to the bottom.* They came to the surface with open mouths, for more air; but compelling them to remain under water, they soon turned on their backs, and lay as if dead; as the ether escaped they revived. The body of an etherized eel was painlessly divided; one part was thrown into pure cold water, and soon betrayed sensibility by motion. The remaining etherized portion lay in a quiescent state, until a stream of pure oxygen gas was forced through a pipe into the water, when muscular activity was exhibited.

* Water not only contains oxygen, but air in its pores. The blood of fishes is thus oxygenated, as the water passes through their gills, which are to them what lungs are to man.

*A dog* which was subject to violent and convulsive ague fits, was etherized when they commenced, and calmed immediately.

A large *American eagle*, whose outstretched wings measured seven feet, was a subject of our experiments for upwards of six months, a part of which time, from three to twenty times daily, he was etherized, and on one occasion, for thirty consecutive hours, a sponge was pinned over his nostrils, and saturated with ether. A few inhalations made him insensible, and when so, electro-magnetism instantly aroused him.

He would bite at the metallic button of the battery, and holding it in his mouth, was thus etherized. The other button being placed on the flexor muscles, he soon threw it from him. Much ether (if impure) caused convulsions. The battery removed them.

*A hen* was etherized, on whose breast the eagle lay his head, when as consciousness waned or increased, the feathers on his head bristled, and he made a pass at the hen, but a cork on his beak prevented any injury.

Upon dogs, pigeons, canary birds, and leeches, we have performed various experiments, from which we deduce,

1*st*, Impure is a greater stimulant than pure ether.

2*d*, Impure ether prolongs insensibility.

3*d*, The continued and frequent use of pure ether is comparatively harmless.

4*th*, Ether changes the blood to a darker color.

5*th*, Tactility may be lost while the intellect remains.

## THE EFFECTS OF ETHER WHEN INHALED.

"The first mouthful or two is felt to be harsh, and unpleasantly pungent; but, in continuance of inhalation, that feeling gradually disappears, and the sensation becomes rather grateful than otherwise — sometimes intensely so, as in the case of the nitrous oxide gas; the inhaler obstinately and violently refusing to forego his delectation, if attempts be made to take the tube from him. Coughing is not always produced, but more frequently than not; and, in some cases, it proves so distressing as to impose on the practitioner great difficulty in proceeding, even with the best assistance on the part of the patient. In general, however, by letting on the full supply of ether gradually, the coughing proves slight, and speedily ceases. Sometimes a profuse discharge of saliva takes place from the mouth; in almost all cases, the secretion from the lining membrane of the windpipe and lungs seems to be very considerably increased; and from this latter cause, a cough, with expectoration, may come on during the latter stage of a prolonged inhalation, quite independently of any direct irritation from the pungency of the ether. In the course of some time — varying from one to twenty minutes, but usually within two or three minutes, when the inhalation is duly conducted from the first — the patient shows signs of a departure from his ordinary condition. His face grows pale and

leaden, sometimes with a livid congestion about the mouth and nose; his eyes are less brisk in their movements, and their glance is less keen; the eyelids move sluggishly over the eyeballs, and tend to droop; the hands and feet grow very cold, and so do the legs and arms; bent positions of the limbs gradually relax themselves; the patient breathes more slowly and fully; his chest is seen to take in large supplies at each inspiration. The pulse has been all along more and more rapid in its beats; it is now very frequent; and soon it may run away to nothing, almost ceasing to be felt. The eyelids are now motionless; on elevating the upper one, it falls slowly down again, evidently under no control of muscle. The pupil of the eye began to dilate early; and the dilatation has kept pace with the progress of inhalation. The eyeball is now glassy, fixed, often turned upwards, and thoroughly 'void of speculation.' Then is the evidence of full etherization complete, and the operation may be proceeded with.

Such is a sketch of the ordinary effects, as observed; but there is great variety. Sometimes the pupils are but slightly dilated, if at all; and sometimes the pulse, too, is slow to alter. Sometimes the patient withdraws the tube from time to time, to tell his feelings, with great volubility and energy. Sometimes, but rarely, he expresses a strong dislike to it, and is with difficulty induced to resume its use. Sometimes he mutters through the tube, sometimes incoherently, sometimes sanely enough, in reference to circumstances which he observes. Sometimes he laughs im-

moderately, as if under the influence of nitrous oxide gas; and yet without recollection of any ludicrous idea after recovery. Sometimes he twists his limbs about, and sometimes he rolls his head from side to side, with a wild motion of his eye, and with a stupid, yet strong expression of inquiry in his gaze. Sometimes he takes to low moaning and whining through the tube; more especially if he has been much agitated by previous apprehension. Sometimes he comes to breathe more heavily, and with a snorting noise that is not quite agreeable. Sometimes a tendency to convulsions manifests itself, requiring instant disuse of the inhalation.

Supposing the trance complete, the phenomena educed by the operation vary. In general, the patient remains quiet and motionless, as if inanimate; the muscles often quivering slightly, however, at each play of the knife, as if by the mere physiological stimulus which their contractility receives; and knitting of the brows, occasional or fixed, is extremely common; giving an expression by frowning, rather of annoyance than of pain. Sometimes there is slight shrinking of the part from the knife, the patient seeming to make some little effort to move it away. Sometimes the part is violently contorted, requiring more than the usual complement of assistants to restrain it. Sometimes the patient gives sundry abrupt loud exclamations, as if in pain; sometimes he moans and breathes hard; sometimes, though rarely, he roars lustily. And all this may happen without any sensation, or at least, without any subsequent remembrance of pain.

The effects, as indicated by the patient's own recollection, are also various. In general, they are somewhat as follows: — A pleasing sense of soothing succeeds the first irksomeness of the pungent vapor — a soothing of both mind and body. Ringing in the ears takes place, with some confusion of sight and intellectual perception. The limbs are felt cold and powerless; the hands and feet first, then the knees; and the feeling is as if these parts had ceased to be peculiar property, and dropped away. This sensation may gradually creep over the whole frame; the patient becoming, in more senses than one, truly etherealized; reduced to the condition of no body and all soul. The objects around are either lost sight of or strangely perverted; fancied shadows flit before the eyes, and then a dream sets in — sometimes calm and placid, sometimes otherwise. Emerging, consciousness and self-control return, a tendency to excited talking is very manifest, movement is unsteady, and, both in mind and body, very unequivocal signs of intoxication are declared. In plain language, as in plain fact — there is no disguising it — the patient is drunk. The tipsiness, however, is of a light and airy kind; very pure, very pleasant, and very fleeting; and, when gone, leaving very little trace behind. If the ether be good, and properly inhaled, 'there is no headache in a gallon of it.'

When the patient awakes fully to consciousness, it may be supposed that he awakes to much misery, because to much pain. But it is not so. Not unfrequently, every sense is fully restored, except the sense

of pain. The patient sits up, talks rationally and calmly; is aware of every circumstance, knows of his wound, by seeing and hearing of it, and yet feels no pain; the smarting of a raw wound is often averted for some hours in this way; and when it does supervene, at length, there is good reason to believe that in many cases it comes in a mitigated form. Often the patient sobs and cries, immediately or soon after return to consciousness — a state resembling hysteria, or else very like the maudlin grief of a drunken man; but such tears are no sign of suffering; on the contrary, they are not unfrequently the offspring of dreamy joy and gratitude.

This operation of the ether's influence is an important matter. It is brief; and yet it is strange that the ether itself seems to remain long in the system; being plainly and even offensively perceptible in the breath, not merely for hours, but even for days, after protracted inhalation.* The full effect seldom lasts above a few minutes; time enough for the performance of some operations; such as that of tooth-drawing. When protracted procedure is contemplated — as in amputation, stone, rupture, removal of tumors, &c. — the inhalation is proceeded with during the operation, at what is termed 'half-speed.' The ordinary signs having evinced attainment of the full effect, the operation is begun; and then the inhalation may be for a few moments

* The rapidity with which ether pervades the whole system, is also well shown, by amputated parts retaining a strong flavor of ether, even for many days after removal; although perhaps not more than two or three minutes had been spent in inhalation, previous to the making of the incisions.

discontinued, to be afterwards renewed; or, what is better, the mouth-piece is kept continuously applied, the valve, for entrance of atmospheric air, partially or wholly open, so as to dilute the vapor. If, at any time, the patient show signs of prematurely returning consciousness, the valve is shut, and the full power of the ether restored; the patient being made to breathe much or little of the vapor, according to the effects observed.

At first, it may seem that this brief duration of the ether's influence is a disadvantage. The operator soon learns, however, that it is the contrary. Prolonged duration is readily within his power, by continued inhalation; and much of comfort and safety resides in the fact of the effect being transient.

In general, no unpleasant sign showing itself, the inhalation is carried to the point of complete stupefaction; and this, as already stated, is sought to be maintained by a continued, though minor use of the ether. A strange fact, however, is now to be stated; namely, that stupefaction is by no means essential. Experience has fully shown that the brain may be acted on so as to annihilate, for the time, what may be termed the faculty of feeling pain; the organ of general sense may be lulled into profound sleep, while the organ of special sense, and the organ of intellectual function remain wide awake, active, and busily employed. The patient may feel no pain under very cruel cutting, and yet he may see, hear, taste, and smell as well as ever, to all appearance. We have seen a patient follow the operator with her eyes most intelligently and watchfully, as he shifted his place near her, lifted his knife,

and proceeded to use it; wincing not at all during its use; answering questions by gesture, very readily and plainly; and after the operation was over, narrating every event as it occurred — declaring that she knew and saw all; stating that she knew and *felt* that she was being cut, and yet that she felt no pain whatever. Patients have said quietly, 'You are sawing now,' during the use of the saw in amputation; and afterwards, they have declared most solemnly, that though quite conscious of that part of the operation, yet they felt no pain. We have seen a patient enduring amputation of a limb, without any sign of suffering, opening her eyes during the performance, at its most painful part, descrying a country practitioner at some distance — under whose care she had formerly been, and whom she had not seen for some considerable time — addressing him by name, and requesting that he might not leave town without seeing her.

In the Royal Infirmary of Edinburgh, the patient managed all the details of the inhalation himself, loudly insisting that the experiment was quite a failure, and would never do; that the matter must be deferred to another opportunity — and all the while the painful operation was busily proceeded with.

Physiologists are somewhat puzzled as to the exact statement of the effects produced by ethereal inhalation on the nervous system. Of the brain proper, the spinal system and the ganglionic system — as the different parts of the nervous system are termed — which is the part affected? Strychnine is supposed to influence the spinal system mainly; digitalis, the gan-

glionic; — which does the ether affect? It is probable that the brain proper is the part mainly influenced; and sometimes only a portion of it; for, as has already been stated, the intellect may be active, and the special senses, too, may retain all their acuteness, while the patient is wholly unconscious of procedure, which otherwise could not but be accompanied with the severest torture." Tactile sense may be asleep, while intellectual and special sense may be wide awake.

We have recently been informed that a young lady, daughter of a very respectable gentleman in Newburyport, visited a dentist to have a tooth removed. She inhaled "the ether," and was made insensible, and remained so; the dentist was alarmed, and called for assistance. Two physicians came, both of them being scientific men. One of them was one of the ablest and oldest physicians in Essex county. After laboring some time to resuscitate her, it was observed that it was of no use; she was "*as much a corpse as she ever would be.*" In this state of *coma*, or death-like sleep, she remained two hours. *How much ether she inhaled* is not known. This extraordinary case deserves consideration. Her prolonged unconsciousness, and the abortive attempts at resuscitation are remarkable. Either the ether was impure, or it was improperly given, or she took too much. One of these positions must be admitted, unless the subject admits a fourth alternative, namely, an idiosyncrasy of constitution. But we learn there was none;* and if there

* Will exclusion of the air from the lungs by closure of the glottis from spasm of the laryngeal muscle, produce coma?

were, Drs. Warren and Channing, in letters to the author, deny any bodily liability to produce a similar result. Dr. Mott admits a disease of the *heart* or lungs might preclude ethereal vapor, but we understand neither of these complaints existed.

As this case has been much spoken of, and may have deterred some from availing themselves of the benefit of ether, we think it proper to say,

1*st*, We think this state of coma, or prolonged insensibility, might have been avoided.

2*d*, The protracted interval of two hours is the only case on record of similar protracted insensibility.

In our experiments, we have, either by the use of cold water, externally or internally, by means of oxygen gas, or electo-magnetism, or *aqua ammonia*, always produced restoration.

Convulsions may occur, slight or violent, transient or protracted. Of course, the first appearance of them is the signal for the discontinuance of the ether, which is to be resumed, if the operation be not completed, so soon as the system has again become quiet. Fainting may take place, the pulse become very rapid, and, at last, imperceptible; and the faintness may prove of such intensity and duration, as to cause serious alarm. But this is not likely to occur, except in the case of diseased heart. Signs of congestion in the brain may manifest themselves; the patient threatening to pass into what is technically termed the condition of *coma*, as indicated by complete insensibility, dilated pupils, relaxed muscles, snoring, and labored breathing. Lastly, the experiment may fail; the patient becom-

ing excited and confused, but not dead to pain. This result, however, we feel convinced, will seldom, if ever occur, *when good ether is well administered with suitable apparatus.*

It is possible, also, that the irritation of the air passages may leave some permanent traces behind, threatening to pass on into bronchitis or pneumonia. Happily, however, direct proof of such casualties, is still wanting.

A feeling of hurry, growing out of the fear that the effects of the ether will pass off before the operation is completed, should not exist. Let every step of every operation, says Dr. Channing be proceeded in with the utmost composure, and the abiding conviction, *that the state which ether has produced may be surely and with safety continued as long as the circumstances of cases may demand.*

The effect of ether is usually very different when taken as a mere experiment, and as an amusement, from that experienced in the business use of it, as a prelude and accompaniment to surgical operation. In the former case, excitement is very apt to ensue, with restlessness and talking; in the latter, the sedative effect is much more speedily and smoothly attained. In fact, there is what is termed a *tolerance* of ether, when ether is really required; just as in particular diseases, whose cure demands certain remedies, there is engendered a tolerance of those remedies in the system. A grain of tartar emetic, for example, in the healthy, produces great sickness and vomiting; and during inflammation of the lungs, the same dose,

or one much larger, may be taken every second hour without producing either. In health, a few ounces of blood taken from the arm may produce fainting; in serious inflammation, an approach to faintness will seldom be perceived until many ounces have been abstracted. Thirty drops of the tincture of Indian hemp produces, in health, a full narcotic effect, often very unpleasant; in tetanus, the same dose has been given every half hour to a girl of eleven years of age. In health, a grain of opium will produce heavy sleep; in delirium tremens, that dose may be repeated every hour, until ten times the amount is given, and still the patient may be wakeful as at first. A tolerance of bleeding is engendered by inflammation; of tartar emetic, by inflammation of a certain organ; of Indian hemp, by tetanus; of opium, by nervous excitement from drink. It would seem that a like tolerance of ether is engendered by the occurrence of surgical pain; or perhaps rather by the conviction of its certain approach, and the preparation of body and mind suitable for its advent.

In public practice, etherization has been found very useful in detecting feigned diseases. The patient having been, *nolens volens*, thrown into helpless unconsciousness, stiff joints have become supple, crooked backs have grown straight, and various other decrepitudes have thawed into normal shape and form.

One field of inquiry, vast and important, seems just opening to the profession; namely, the inhalation of other remedial agents, in the form of vapor, with or without ether — as practised by Dr. Pearson and others,

in the end of the last century. And who knows, but, by the resuscitation of "pneumatic medicine," many diseases may be brought more thoroughly under control; the remedies, in small quantity, being directly mixed with the circulating blood — borne along thereby, rapidly pervading the whole system, and both speedily and effectually exercising their remedial agency? *

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In order to remove some honest doubts about etherization that may yet exist, we present to the reader the following communications on this subject, by several distinguished surgeons of this country, viz.: Dr. WALTER CHANNING, Dean of the Medical College attached to Harvard University, for upwards of twenty years; Dr. J. C. WARREN, of Boston, the late distinguished surgeon of the Massachusetts General Hospital; Dr. VALENTINE MOTT, known not only in this country but also in Europe, as one of the greatest of living surgeons. Having addressed letters to these gentlemen, requesting their opinions on the use of ether in certain cases, and the result of their observations as to its effects in others, we give the following extracts from their letters in reply: —

* According to Wagner, vaporizable substances thus applied to the bronchial cells, "seem to make their way into the blood through the unbroken vascular membrane, with the same certainty and ease as when they are injected directly into the veins."

"BOSTON, OCT. 26, 1847.

DEAR SIR:

Yours of the 22d inst. is received. In reply, I would say to your

1*st* question, "of the agency of ether in retarding the curative process in surgery," I can learn of no case in which ether has retarded the curative process in surgical operations. A surgeon of much power of observation and ample opportunities, to this question, answered — *No*, without qualification.

2*d*, I know of no case in which ether has caused *uterine hæmorrhage*, *abortion*, *delirium*, or *asphyxia*.

3*d*, I have never known *coagulation* of the blood *more perfect* than after use of ether in labor.

Questions 4th and 5th, relating to classes of persons to whom ether should not be administered. I know of no such class. I have known ether used in phthisis with great comfort to the patient; in headache, in cough, in spasmodic diseases; in one patient who had suffered from symptoms of diseased heart. * * This patient was etherized for nine hours, viz. from eight A.M. to five P.M.

Yours truly,

W. CHANNING.

To Dr. MAYO G. SMITH,
Newburyport."

"BOSTON, OCT. 23d, 1847.

DEAR SIR:

The questions in your letter, which I received this day, would require, to be satisfactorily answered, re-

plies rather more extended than my time will at present permit me to devote to them.

In the mean time, I will state, for your satisfaction, that the objections to the use of ether, as proposed in your note, are without foundation. [See questions referred to, in preceding letter.]

Respectfully yours,

J. C. WARREN.

To Dr. MAYO G. SMITH,
Newburyport."

"NEW YORK, OCT. 27th, 1847.

SIR:

To the questions you ask in yours of the 22d inst., I can make some reply, at least to some of them.

The use of ether inhalation does not in the least retard the curative process.

It does not cause the edges of the wound to be everted or retard the healing.

Blood *does* coagulate during operations performed under the influence of ether.

It must be a mere assertion that tubercles of the lungs are produced by the ether. * *

Yours very respectfully,

VALENTINE MOTT.

To Dr. MAYO G. SMITH,
Newburyport."

Dr. Crosby, the distinguished Professor of Surgery and Obstetrics at Hanover Medical College, has performed many capital operations while patients were

under the influence of ether; and he recently informed the author that he never knew of an unhappy result. He has administered it to all classes and constitutions, and in obstetrics, with remarkable success.

1*st*, In all cases for difficult operation prior to inhaling ether, he administers from twenty to sixty drops of laudanum.

2*d*, He places the subject under an intelligent nurse and allows no conversation.

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William T. G. Morton, who has been called by the London Lancet, "the unknown dentist in the Athens of America," was born in Charlton, Worcester county, Massachusetts, in 1821.

At an early age he was thrown upon his own resources. He subsequently made the science of *dentistry* his study, and unwilling to confine himself to the mechanical department, he wished to gain all necessary medical and surgical information on the subject. He became the pupil of Dr. Charles T. Jackson, and attended lectures at the Massachusetts Medical College, "where," says Dr. Jackson, "he dissected, with diligence and zeal, those parts of the head and throat particularly important to the surgeon dentist."

During his connection with the college, he was compelled to witness much pain in surgical operations, and his humane mind shrunk from the suffering necessarily inflicted. He was therefore much impressed with the importance of obtaining some agent to remove pain, both from its advantage to the operator, and its comfort to the patient, as suggested by the

senior surgeon, Dr. Warren, and his associates, in their lectures before the medical students.

Having closed his studies with Dr. Jackson, and his attendance on the college lectures, he resumed his labors with great assiduity.

The great, ever-present idea of the obliteration of human pain, followed him; and having many teeth to extract for the insertion of numerous sets of artificial teeth, he instituted a series of experiments to enable him to do so painlessly.

He applied, as it was very natural he should do, to his former teacher, Dr. Jackson, for advice; who, in the course of conversation, observed that he had better be careful, or he would be considered more of a humbug than Wells, with his nitrous oxide gas. "When I inquired the effect of ether gas," says Dr. M., "Dr. J. stated that it might be used, and spoke of its effects upon college students, and suggested the use of sulphuric ether as an anodyne."

Dr. Morton, after various experiments, believed he had found the desideratum, — an object of unwearied search by physicians and surgeons of the old and new world.

He applied to Dr. Warren for an opportunity to demonstrate to the world the practicability of his theory; which was promised him on the succeeding day.

For the more perfect administration, a suitable inhaling vessel was thought necessary. In conversation with his friend, Dr. Gould, the valvular instrument was spoken of, when the idea was instantly seized by Dr. M., who cried *eureka*, and rushed, like Archim-

edes from the bath, through the streets of Boston, at the still hour of midnight, to the residence of Mr. Drake, a well-known philosophical instrument maker, and nervously ringing his door-bell aroused him from his slumbers, and besought him, as if the destinies of the world hung upon the issue, to make the inhaler.

Mr. Drake hurried to his shop, and daylight, stealing through its windows, found them bending over their unfinished task. Hour after hour passed away, but he was not quite ready. In another part of the city lay a poor man, awaiting an operation; his heart tremulously alternated between hope and fear, as he prayed for the arrival of Dr. Morton.

The hour of trial arrived, but not Dr. M., at the hospital. Dr. Warren, after waiting for half an hour, was about commencing the operation, when the door opened, and Dr. M. entered hurriedly, apologized for the delay, applied his inhaler, etherized his subject, pronounced him insensible, and handed him over to Dr. Warren.

A company of distinguished surgeons surrounded him. Around the amphitheatre arose tier upon tier of students, forming a galaxy of animated faces, influenced as by one mind, and gazing with fixed intensity upon the scene. A company of surgeons were around the body of the subject, on their knees, to witness every movement of the knife, and the effect of its keen edge on the living nerve. A tumor was to be removed from the neck. An incision three inches in length was made; and, says Dr. Warren, "*to my great surprise, without any starting or crying out, or other indication*

*of pain.*" All was silent even as the surrounding walls, in which had reverberated unnumbered groans, and shouts, and cries of agony.

The operation was over, and the sleeper awoke, as from a dream, inexpressibly grateful that he had felt no pain. Then and there, on the 17th of October, 1846, in the Massachusetts Hospital, in Boston, was witnessed the first painless surgical operation in the world's history through the influence of ether.

October 19th, Dr. Hayward removed a limb for an etherized patient. This was the first capital operation ever performed under the influence of ether.

In both instances the ether was administered by Dr. Morton, who now had Dr. Warren to stand godfather to his discovery; and Dr. Hayward acted as sponsor to an agent calculated to rob earth of a portion of that sentence pronounced against man, and "his seed after him," when God arraigned Adam in Eden for trial.

What must have been the feeling of Warren, now in the evening of a life made brilliant and venerable by professional excellence! At this decisive and eventful moment, it is said, a tear trembled on his cheek, and for a moment he was lost in meditation.

For centuries surgeons had sought a means to alleviate human suffering, and they were about to realize the full fruition of their hopes. This wonderful news spread rapidly, and thousands of poor dilapidated specimens of humanity, in hospitals and infirmaries throughout the world, with straining eyes and outstretched arms looked to this land of the pilgrims for

this heaven-sent boon to the human race. Who cannot rejoice that in the good providence of God, when so many contingencies occur, in a world of casualties like ours, there exists a means of sufficient potency to enable us effectually and harmlessly to remove human pain? Who more rejoice than woman, for the remission of any portion of a sentence she has long borne, and which was primarily passed on the morning of creation upon the mother of us all?

Who does not rejoice that its discoverer should be an American? "It is," says the London Lancet, "a high honor to our transatlantic brethren, next to the discovery of Franklin; it is the second and greatest contribution of the new world to science, and it is the first great addition to the medical art."

For the discovery of vaccination, the world honored Jenner. In 1775 Jenner was a medical student in England.

A peasant girl came into the office of his preceptor, and laughingly told him she would never take the small-pox, because she had observed that those who milked the cows and received from them the kine-pox, never took the small-pox. The same fact had been observed in other dairy counties. This conversation impressed the mind of Jenner, who startled England in 1796, by announcing his prevention for this loathsome disease. Yet Jenner was opposed.

A distinguished physician stated that it would make men roar like bulls, and convert those who were vaccinated into a kind of mongrel, half animal and half man. A clergyman denounced it from the pulpit, and

averred this vaccination was the same kind with which God permitted Satan to inoculate his servant Job. A Philadelphia medical publication denounced it as indelicate.

Poor Jenner came to the United States, and landed at Boston, where enraged men sought him for days, with ropes in their hands, threatening to hang him upon the first tree.

Dr. Waterhouse, a Professor of Yale College, permitted his family to be vaccinated, and soon Jenner was almost worshipped by the same phrenzied populace that sought his life; and in two or three years after, every man, woman, and child was inoculated in a single week.

Thus we see Jenner *applied*, but did not *discover;* his application, however, constituted discovery. Opposition to a principle never proves it to be incorrect. If Jenner was rewarded for the mere application of a remedy, ought not Dr. Morton to be rewarded for applying, if not originating, his lethean?

# GLOSSARY

## OF TECHNICAL AND SCIENTIFIC TERMS.

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*Albumen*, a viscous fluid without taste or smell.

*Allopathy* (Greek, ἄλλος, other, and πάθος, condition), a method of curing disease by producing a condition of the system, inconsistent with the existence of the disease.

*Alumen*, an earth, or earthy substance.

*Alveolar*, containing sockets like the jaw, in which are placed the teeth.

*Amaurosis*, a loss or decay of the sight, without any visible defect in the eye.

*Anastomosis*, the communication of vessels with one another.

*Animalcule*, a small animal invisible to the naked eye.

*Anodyne*, a medicine which allays pain and causes sleep.

*Anti-septic*, opposing or counteracting putrefaction.

*Anterior*, before.

*Articulation*, the joining or juncture of bones or teeth.

*Assay*, the trial of the purity, weight, value, &c. of metallic substances.

*Atrophy*, a gradual wasting away without any visible cause.

*Bicuspides* (Latin, *bis*, two, and *cuspis*, a point), the teeth immediately posterior to the cuspid or canine teeth.

*Calcined*, made friable by heat.

*Calcareous*, of the nature of lime.

*Calculus*, gritty, hard, like stone.

*Canine*, sharp-pointed teeth, like dogs' teeth, from which the name *caninus* is derived.

*Capillary*, fine long tubes resembling a hair.

*Carbon*, pure charcoal.

*Carotid arteries*, two arteries which convey the blood from the aorta to the brain.

*Cartilage*, gristle, a smooth, solid, elastic substance, softer than bone.

*Cataplasm*, a poultice.

*Cathartic*, a purgative medicine.

*Caustic*, having the quality of burning, corroding, or destroying animal flesh.

*Cellular membrane*, in animal bodies, is composed of an infinite number of minute cells, which communicate with each other.

*Cephalic*, pertaining to the head.

*Chyme*, that particular modification of food which it assumes after it has undergone the action of the stomach.

*Cicatrix*, a scar, a little seam or elevation of the flesh, remaining after a wound or ulcer is healed.

*Cicuta*, a poisonous plant, often called water hemlock.

*Condyle* (Latin, *condylus*) a protuberance on the end of a bone, a knot or joint, knuckle.

*Condyloid process*, the posterior protuberance at the extremities of the under jaw.

*Corrosive*, having the power of eating or wearing gradually.

*Cuspidati* (from Latin, *cuspis*, pointed), the teeth situated immediately after the incisors.

*Cutaneous*, belonging to the skin.

*Cuticle*, outer coat of the skin.

*Deciduous*, the first teeth.

*Decoction*, a liquid obtained from a substance boiled in water.

*Dens*, a tooth.

*Depletion*, the removal of the blood in the vessels by venesection ; blood-letting.

*Dexter jaw*, the right jaw.

*Diagnostic*, distinguishing characteristic, indicating the nature of a disease.

*Diagnosis*, the distinctive knowledge of a disease.

*Diathesis*, particular disposition or habit of body.

*Digastric*, having a double belly, a name given to a muscle of the lower jaw.

*Digitalis*, a plant, usually called foxglove.

*Duct*, a channel for the fluids of the body.

*Dysopsy*, dimness of sight.

*Ecchymosis* (εκχυμωσις), in medicine, an appearance of livid spots on the skin, occasioned by extravasated blood.

*Edentate* (Latin, *edentatus*), destitute or deprived of teeth.

*Ellipsis*, an oval figure.

*Emphysema*, in surgery, a puffy tumor, easily yielding to pressure.

*Epilepsy*, a disease accompanied with spasms, or convulsions, and loss of sense.

*Equilateral*, having all the sides equal.

*Erosion* (Latin, *erosio*), the state of being eaten away ; corrosion, canker.

*Excision*, the cutting out or off of a tooth, or any part of the body.

*Exostosis*, unnatural protuberance of a tooth or bone.

*Expectorant*, any medicine which promotes discharges from the lungs.

*Fauces*, (the plural of Latin, *faux*), the top of the throat.

*Filament*, fine threads, of which flesh, nerves, and skin are composed.

*Fossa*, a kind of cavity in a bone, with a large aperture.

*Fossil*, petrified, organic substance, dug from the earth.

*Friable*, easily crumbled or pulverized.

*Gangrene*, to become mortified.

*Gastric*, a fluid separated by the capillary vessels of the stomach ; the principal solvent of the food. It has a saltish taste ; is inodorous.

*Gomphosis*, the connection of a tooth with its socket.

*Gland*, a distinct soft body which secretes some fluid from the blood.

*Graminivorous*, subsisting on grass.

*Granulated*, formed into grains.

*Gypsum*, plaster of Paris, sulphate of lime.

*Hæmorrhage*, flow of blood from ruptured blood vessels.

*Hemicrany*, a pain that affects only one side of the head.

*Homœopathy*, the theory of curing diseases by producing affections similar to the disease.

*Hygenia*, health, that department of medicine which treats of the preservation of health.

*Hyoides*, bones of the tongue.

*Imponderable*, not having sensible weight.

*Imputrescible*, not subject to putrefaction.

*Incarnative*, a medicine that promotes the growth of new flesh, and assists nature in the healing of wounds.

*Incisor* (from Latin *incido*, to cut), a fore-tooth which cuts, bites, or separates.

*Inferior*, lower.

*Inosculation*, the union of two vessels of an animal body at their extremities, by which a communication is maintained.

*Inspiration*, the act of drawing air into the lungs.

*Integument*, that which invests or covers another thing.

*Labiodental* (Latin, *labium* and *dens*), formed by the co-operation of the lips and teeth, as in the pronunciation of *f* and *v*.

*Lachrymal*, pertaining to tears, conveying tears.

*Lamina*, a thin plate or scale.

*Lateral*, pertaining to the side.

*Levator* (from Latin *levare*, to lift), a muscle, whose office it is to raise or elevate certain parts.

*Ligament*, a strong, compact substance binding one bone to another.

*Ligature*, a cord or string for tying the blood-vessels to prevent hæmorrhage.

*Linguadental* (Lat. *lingua* and *dens*), formed and uttered by the joint use of the tongue and teeth, as in the pronunciation of *d* and *t*.

*Lithodeon*, a Greek word, meaning "stony batter."

*Luxation*, the act of lifting a tooth, or moving or forcing a bone from its proper place.

*Macerate*, to remove flesh by soaking or steeping.

*Malformation*, bad formation.

*Maxillary sinus*, the cavity between the exterior aud interior plates of the jaw bone.

*Meatus*, a passage.

*Membrane*, an extensive fibrous substance which envelopes different parts of the mouth and the body.

*Molar* (*molaris*, to grind), the grinding or double teeth.

*Mollient*, softening, assuaging.

*Morphine*, a poisonous vegetable, extracted from opium.

*Mucus*, a moistening viscid fluid, secreted by the mucous membrane.

*Necrosis* (νεκρωσις), the dry gangrene, a species of mortification, a disease which affects the bones and teeth.

*Nitrogen*, the element of nitre ; that part of the air sometimes called *azote*.

*Occiput*, the back part of the skull.

*Œsophagus*, the gullet, or canal, through which food passes to the stomach.

*Opaque*, not transparent.

*Osseous*, bony, or resembling bone.

*Ossify*, to change to bone.

*Parotid*, certain glands below and before the ears, or near the articulation of the lower jaw.

*Parietes*, walls, or those parts which form an enclosure.

*Pathology*, explanation of the nature, causes, and symptoms of diseases.

*Pepastic*, a medicine to help digestion.

*Periosteum*, a nervous, vascular membrane, endued with quick sensibility, immediately investing the bones or teeth.

*Peripneumony*, an inflammation of the lungs, or some part of the thorax.

*Pharynx*, the upper part of the gullet, below the larynx.

*Phlogistic*, a natural degree of vital energy and strength of action in the heart and arteries, inflammatory.

*Phrenitis*, an inflammation of the brain, attended with fever and delirium.

*Platina*, a metal nearly of the color of silver, the heaviest and one of the most valuable of the metals.

*Plexus*, any union of vessels, nerves or fibres, in the form of net work.

*Posterior*, behind.

*Posterior tooth*, a tooth back of another.

*Process*, any protuberance, eminence, or projecting part of the bone or jaw.

*Pterygoid process* (from *peterux*, a wing), and *eidos*, likeness), is so called from its likeness to a wing.

*Rachitis*, inflammation of the spine.

*Ramus*, a branch of the jaw.

*Resolution*, the disappearing of any tumor without suppuration; the dispersing of inflammation.

*Salivate*, to excite an unusual secretion and discharge of saliva; it is usually done by means of mercury.

*Scarify*, to make small incisions in the skin or gums.

*Scirrhus*, a hard tumor usually proceeding from the induration of a gland, often terminating in a cancer.

*Scorbutic*, affected with scurvy.

*Sensorial*, pertaining to the brain and nerves.

*Septic*, that which promotes the putrefaction of bodies.

*Sinister*, left, the opposite of dexter.

*Sinus*, a cavity in a bone or jaw, or other part, wider at the bottom than at the entrance.

*Slough*, the part that separates from a foul sore, as the dead part in mortification.

*Splanchnology* (Greek, σπλαγχνα and λογος), description of the internal parts of the body.

*Staphyloraphy*, a remedy for palatine deformity.

*Sthenic* (Greek, σθνος), in medicine, that which increases the vital energy and action in the heart and arteries; phlogistic.

*Strumous*, having swellings in the glands.

*Styptics*, articles of a binding quality, to stop hæmorrhage.

*Sublimated*, brought into a state of vapor by heat.

*Sudorific*, a medicine that produces perspiration.

*Soporific*, producing sleep.

*Superior*, upper.

*Suppuration*, the formation of the purulent matter in a wound or abscess.

*Suture*, the union of bones with dentiform margins.

*Therapeutics*, that part of dentistry or medicine which relates to the discovery and application of remedies.

*Thorax*, that part of the human skeleton, which consists of the bones of the chest; also the cavity itself.

*Thyroid* (Greek, *θυρεος* and *ειδος*), a term applied to one of the cartilages of the larynx.

*Trachea*, a cartilaginous canal, thro' which the air passes to the lungs.

*Tumefied*, swelled, enlarged.

*Turgid*, unnatural distension, by the operation of some internal agent.

*Tympan* (Latin, *tympanum*), the hollow part of the ear, behind the membrane of the tympanum.

*Uvula*, a soft, round, spongy body, suspended from the palate near the foramina of the nostrils, over the glottis.

*Vascular*, full of vessels, or consisting of vessels, such as veins, arteries,&c.

*Vesicle*, a little bladder, or a portion of the cuticle separated from the skin, and filled with humor.

*Virus*, foul or contagious matter of an ulcer; poison.

*Viscera*, the contents of the abdomen and thorax.

*Viscid*, glutinous, sticky, not readily separated.

*Vitreous*, pertaining to, consisting of, or resembling glass.

*Vitrify*, to convert into glass by fusion, or by the action of heat.

*Vomic nut*, or *nux vomica*, the seed of the *Strychnos nux vomica* — a tree in India. It is *not* emetic.

*Xerodes*, a tumor attended with dryness.

*Xiphoid*, or *ensiform cartilage*, is that which is situated at the base of the breast bone.

*Zygomatic* (Greek, *ζευγμα*), pertaining to a bone of the head; called, also, *os jugale*, or cheek bone; or to the bony arch under which the temporal muscle passes.

*Zygomatic muscles*, the muscles which rise from the zygomatic bone, and are inserted into the corner of the mouth; the zygomatic suture is that which joins the zygomatic processes of the temporal and cheek bones.

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