

The History of Anesthesiology

Reprint Series: Part two



W. T. G. MORTON, M.D., BOSTON, MAKING THE FIRST PUBLIC DEMONSTRATION OF ETHERIZATION AT THE MASSACHUSETTS GENERAL HOSPITAL SURROUNDED BY THE MEDICAL STAFF OF THAT INSTITUTION.

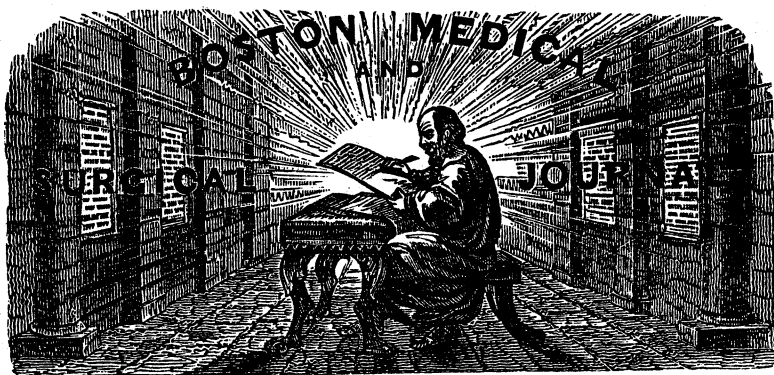
INSENSIBILITY DURING SURGICAL OPERATIONS

by Henry J. Bigelow, M.D.

October 16, 1846, continues to be one of the outstanding days in history as is indicated by the enclosed replica of Bigelow's account of Morton's first public demonstration of the value of ether in a surgical operation. News of such a discovery spread rapidly, as the communications of Dr. Francis Boott and Dr. Robert Liston in the *Lancet* indicates.

Containing No. 16 November 18.

THE



HIPPOCRATES IN TEMPLO ASCULAPII TABULAS VOTIVAS EXSCRIBENS.

NOVEMBER 18, 1846

BOSTON :

PRINTED AND PUBLISHED BY DAVID CLAPP.

184 WASHINGTON STREET.

Price Three Dollars a Year, payable in advance.

WEEKLY SERIES, PUBLISHED }
EVERY WEDNESDAY }

{ MONTHLY SERIES, THE FIRST
OF EVERY MONTH.

THE BOSTON MEDICAL AND SURGICAL JOURNAL.

VOL. XXXV.

WEDNESDAY, NOVEMBER 18, 1846.

No. 16.

INSENSIBILITY DURING SURGICAL OPERATIONS PRODUCED BY INHALATION.

Read before the Boston Society of Medical Improvement, Nov. 9th, 1846, an abstract having been previously read before the American Academy of Arts and Sciences, Nov. 3d, 1846.

By Henry Jacob Bigelow, M.D., one of the Surgeons of the Massachusetts General Hospital.

[Communicated for the Boston Medical and Surgical Journal.]

It has long been an important problem in medical science to devise some method of mitigating the pain of surgical operations. An efficient agent for this purpose has at length been discovered. A patient has been rendered completely insensible during an amputation of the thigh, regaining consciousness after a short interval. Other severe operations have been performed without the knowledge of the patients. So remarkable an occurrence will, it is believed, render the following details relating to the history and character of the process, not uninteresting.

On the 16th of Oct., 1846, an operation was performed at the hospital, upon a patient who had inhaled a preparation administered by Dr. Morton, a dentist of this city, with the alleged intention of producing insensibility to pain. Dr. Morton was understood to have extracted teeth under similar circumstances, without the knowledge of the patient. The present operation was performed by Dr. Warren, and though comparatively slight, involved an incision near the lower jaw of some inches in extent. During the operation the patient muttered, as in a semi-conscious state, and afterwards stated that the pain was considerable, though mitigated; in his own words, as though the skin had been scratched with a hoe. There was, probably, in this instance, some defect in the process of inhalation, for on the following day the vapor was administered to another patient with complete success. A fatty tumor of considerable size was removed, by Dr. Hayward, from the arm of a woman, near the deltoid muscle. The operation lasted four or five minutes, during which time the patient betrayed occasional marks of uneasiness; but upon subsequently regaining her consciousness, professed not only to have felt no pain, but to have been insensible to surrounding objects, to have known nothing of the operation, being only uneasy about a child left at home. No doubt, I think, existed, in the minds of those who saw this operation, that the unconsciousness was real; nor could the

imagination be accused of any share in the production of these remarkable phenomena.

I subsequently undertook a number of experiments, with the view of ascertaining the nature of this new agent, and shall briefly state them, and also give some notice of the previous knowledge which existed of the use of the substances I employed.

The first experiment was with sulphuric ether, the odor of which was readily recognized in the preparation employed by Dr. Morton. Ether inhaled in vapor is well known to produce symptoms similar to those produced by the nitrous oxide. In my own former experience, the exhilaration has been quite as great, though perhaps less pleasurable, than that of this gas, or the Egyptian *haschish*.* It seemed probable that the ether might be so long inhaled as to produce excessive inebriation and insensibility; but in several experiments the exhilaration was so considerable that the subject became uncontrollable, and refused to inspire through the apparatus. Experiments were next made with the oil of wine (ethereal oil). This is well known to be an ingredient in the preparation known as Hoffman's anodyne, which also contains alcohol, and this was accordingly employed. Its effects upon the three or four subjects who tried it, were singularly opposite to those of the ether alone. The patient was tranquillized, and generally lost all inclination to speak or move. Sensation was partially paralyzed, though it was remarkable that consciousness was always clear, the patient desiring to be pricked or pinched, with a view to ascertain how far sensibility was lost. A much larger proportion of oil of wine, and also chloric ether, with and without alcohol, were tried, with no better effect.

It may be interesting to know how far medical inhalation has been previously employed. Medicated inhalation has been often 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 been often 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'éther sulfurique calme souvent les accidents nerveux de certains croups," is from the Dict. des Sc. Med.; but 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

* Extract of Indian hemp.

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 where this case is related, says he is acquainted with a similar instance, where a young man was found completely insensible from breathing air 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 ʒ ss. 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 his excruciating pains (he also took 100 gr. opium daily);—and Christison mentions an old gentleman who consumed for many years ʒ xvi. 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 sentiment de fraicheur que suit bientôt une legere 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 inspira-

tion 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 also 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."

Nothing is here said of inhalation, and we may fairly infer that the process had so fallen into disrepute, or was deemed to be attended with such danger, as to render a notice of it superfluous in a work treating, in 1832, of therapeutics.

It remains briefly to describe the process of inhalation by the new method, and to state some of its effects. A small two-necked glass globe contains the prepared vapor, together with sponges to enlarge the evaporating surface. One aperture admits the air to the interior of the globe, whence, charged with vapor, it is drawn through the second into the lungs. The inspired air thus passes through the bottle, but the expiration is diverted by a valve in the mouth piece, and escaping into the apartment is thus prevented from vitiating the medicated vapor. A few of the operations in dentistry, in which the preparation has as yet been chiefly applied, have come under my observation. The remarks of the patients will convey an idea of their sensations.

A boy of 16, of medium stature and strength, was seated in the chair. The first few inhalations occasioned a quick cough, which afterwards subsided; at the end of eight minutes the head fell back, and the arms dropped, but owing to some resistance in opening the mouth, the tooth could not be reached before he awoke. He again inhaled for two minutes, and slept three minutes, during which time the tooth, an inferior molar, was extracted. At the moment of extraction the features assumed an expression of pain, and the hand was raised. Upon coming to himself, he said he had had a "first rate dream—very quiet," he said, "and had dreamed of Napoleon—had not had the slightest consciousness of pain—the time had seemed long;" and he left the chair, feeling no uneasiness of any kind, and evidently in a high state of admiration. The pupils were dilated during the state of unconsciousness, and the pulse rose from 130 to 142.

A girl of 16 immediately occupied the chair. After coughing a little, she inhaled during three minutes, and fell asleep, when a molar tooth was extracted, after which she continued to slumber tranquilly during three minutes more. At the moment when force was applied she flinched and frowned, raising her hand to her mouth, but said

she had been dreaming a pleasant dream, and knew nothing of the operation.

A stout boy of 12, at the first inspiration coughed considerably, and required a good deal of encouragement to induce him to go on. At the end of three minutes from the first fair inhalation, the muscles were relaxed and the pupil dilated. During the attempt to force open the mouth he recovered his consciousness, and again inhaled during two minutes, and in the ensuing one minute two teeth were extracted, the patient seeming somewhat conscious, but upon actually awaking he declared "it was the best fun he ever saw," avowed his intention to come there again, and insisted upon having another tooth extracted upon the spot. A splinter which had been left, afforded an opportunity of complying with his wish, but the pain proved to be considerable. Pulse at first 110, during sleep 96, afterwards 144; pupils dilated.

The next patient was a healthy-looking, middle-aged woman, who inhaled the vapor for four minutes; in the course of the next two minutes a back tooth was extracted, and the patient continued smiling in her sleep for three minutes more. Pulse 120, not affected at the moment of the operation, but smaller during sleep. Upon coming to herself, she exclaimed that "it was beautiful—she dreamed of being at home—it seemed as if she had been gone a month." These cases, which occurred successively in about an hour, at the room of Dr. Morton, are fair examples of the average results produced by the inhalation of the vapor, and will convey an idea of the feelings and expressions of many of the patients subjected to the process. Dr. Morton states that in upwards of two hundred patients, similar effects have been produced. The inhalation, after the first irritation has subsided, is easy, and produces a complete unconsciousness, at the expiration of a period varying from two to five or six, sometimes eight minutes; its duration varying from two to five minutes; during which the patient is completely insensible to the ordinary tests of pain. The pupils, in the cases I have observed, have been generally dilated; but with allowance for excitement and other disturbing influences, the pulse is not affected, at least in frequency; the patient remains in a calm and tranquil slumber, and wakes with a pleasurable feeling. The manifestation of consciousness or resistance I at first attributed to the reflex function, but I have since had cause to modify this view.

It is natural to inquire whether no accidents have attended the employment of a method so wide in its application, and so striking in its results. I have been unable to learn that any serious consequences have ensued. One or two robust patients have failed to be affected. I may mention as an early and unsuccessful case, its administration in an operation performed by Dr. Hayward, where an elderly woman was made to inhale the vapor for at least half an hour without effect. Though I was unable at the time to detect any imperfection in the process, I am inclined to believe that such existed. One woman became much excited, and required to be confined to

the chair. As this occurred to the same patient twice, and in no other case as far as I have been able to learn, it was evidently owing to a peculiar susceptibility. Very young subjects are affected with nausea and vomiting, and for this reason Dr. M. has refused to administer it to children. Finally, in a few cases, the patient has continued to sleep tranquilly for eight or ten minutes, and once, after a protracted inhalation, for the period of an hour.

The following case, which occurred a few days since, will illustrate the probable character of future accidents. A young man was made to inhale the vapor, while an operation of limited extent, but somewhat protracted duration, was performed by Dr. Dix upon the tissues near the eye. After a good deal of coughing, the patient succeeded in inhaling the vapor, and fell asleep at the end of about ten minutes. During the succeeding two minutes the first incision was made, and the patient awoke, but unconscious of pain. Desiring to be again inebriated, the tube was placed in his mouth and retained there about twenty-five minutes, the patient being apparently half affected, but, as he subsequently stated, unconscious. Respiration was performed partly through the tube and partly with the mouth open. Thirty-five minutes had now elapsed, when I found the pulse suddenly diminishing in force, so much so, that I suggested the propriety of desisting. The pulse continued decreasing in force, and from 120 had fallen to 96. The respiration was very slow, the hands cold, and the patient insensible. Attention was now of course directed to the return of respiration and circulation. Cold affusions, as directed for poisoning with alcohol, were applied to the head, the ears were syringed, and ammonia presented to the nostrils and administered internally. For fifteen minutes the symptoms remained stationary, when it was proposed to use active exercise, as in case of narcotism from opium. Being lifted to his feet, the patient soon made an effort to move his limbs, and the pulse became more full, but again decreased in the sitting posture, and it was only after being compelled to walk during half an hour that the patient was able to lift his head. Complete consciousness returned only at the expiration of an hour. In this case the blood was flowing from the head, and rendered additional loss of blood unnecessary. Indeed, the probable hemorrhage was previously relied on as salutary in its tendency.

Two recent cases serve to confirm, and one I think to decide, the great utility of this process. On Saturday, the 7th Nov., at the Mass. General Hospital, the right leg of a young girl was amputated above the knee, by Dr. Hayward, for disease of this joint. Being made to inhale the preparation, after professing her inability to do so from the pungency of the vapor, she became insensible in about five minutes. The last circumstance she was able to recal, was the adjustment of the mouth piece of the apparatus, after which she was unconscious until she heard some remark at the time of securing the vessels—one of the last steps of the operation. Of the incision she knew nothing; and was unable to say, upon my asking her, whether or not the limb had been removed. She refused to answer several

questions during the operation, and was evidently completely insensible to pain or other external influences. This operation was followed by another, consisting of the removal of a part of the lower jaw, by Dr. Warren. The patient was insensible to the pain of the first incision, though she recovered her consciousness in the course of a few minutes.

The character of the lethargic state, which follows this inhalation, is peculiar. The patient loses his individuality and awakes after a certain period, either entirely unconscious of what has taken place, or retaining only a faint recollection of it. Severe pain is sometimes remembered as being of a dull character; sometimes the operation is supposed by the patient to be performed upon somebody else. Certain patients, whose teeth have been extracted, remember the application of the extracting instruments; yet none have been conscious of any real pain.

As before remarked, the phenomena of the lethargic state are not such as to lead the observer to infer this insensibility. Almost all patients under the dentist's hands scowl or frown; some raise the hand. The patient whose leg was amputated, uttered a cry when the sciatic nerve was divided. Many patients open the mouth, or raise themselves in the chair, upon being directed to do so. Others manifest the activity of certain intellectual faculties. An Irishman objected to the pain, that he had been promised an exemption from it. A young man taking his seat in the chair and inhaling a short time, rejected the globe, and taking from his pockets a pencil and card wrote and added figures. Dr. M. supposing him to be affected, asked if he would now submit to the operation, to which the young man willingly assented. A tooth was accordingly extracted, and the patient soon after recovered his senses. In none of these cases had the patients any knowledge of what had been done during their sleep.

I am, as yet, unable to generalize certain other symptoms to which I have directed attention.* The pulse has been, as far as my observation extends, unaltered in frequency, though somewhat diminished in volume, but the excitement preceding an operation, has, in almost every instance, so accelerated the pulse that it has continued rapid for a length of time. The pupils are in a majority of cases dilated; yet they are in certain cases unaltered, as in the above case of amputation.

The duration of the insensibility is another important element in the process. When the apparatus is withdrawn at the moment of unconsciousness, it continues, upon the average, two or three minutes, and the patient then recovers completely or incompletely, without subsequent ill effects. In this sudden cessation of the symptoms, this vapor in the air tubes differs in its effects from the narcotics or stimulants in the stomach, and, as far as the evidence of a few experiments of Dr. Morton goes, from the ethereal solution of opium

* Since the above was written, I find this irregularity of symptoms mentioned in the case of poisoning by alcohol. Dr. Ogston, according to Christison, has in vain attempted to group together and to classify the states of respiration, pulse, and pupil.

when breathed. Lassitude, headache and other symptoms lasted for several hours, when this agent was employed.

But if the respiration of the vapor be prolonged much beyond the first period, the symptoms are more permanent in their character. In one of the first cases, that of a young boy, the inhalation was continued during the greater part of ten minutes, and the subsequent narcotism and drowsiness lasted more than an hour. In a case alluded to before, the narcotism was complete during more than twenty minutes, the insensibility approached to coma.

Such cases resemble those before quoted from Christison and other authors, and show that the cessation of the inhalation, after it has been prolonged for a length of time, does not produce a corresponding cessation of the symptoms; while, if the inhalation is brief, the insensibility ceases in a short time. Recovery, in the latter case, is not improbably due to the complete and rapid elimination of the vapor from the lungs; the more gradual return of consciousness, in the former case, to the presence of a larger quantity of unexhaled particles. A fact mentioned by Christison bears upon this point. This author states that insensibility from the presence of a large quantity of alcohol in the stomach, often gives place to a complete and sudden return of consciousness, when the alcohol is removed by the stomach pump. It is probable that the vapor of the new preparation ceases early to act upon the system, from the facility with which it is exhaled.

The process is obviously adapted to operations which are brief in their duration, whatever be their severity. Of these, the two most striking are, perhaps, amputations and the extraction of teeth. In protracted dissections, the pain of the first incision alone is of sufficient importance to induce its use; and it may hereafter prove safe to administer it for a length of time, and to produce a narcotism of an hour's duration. It is not unlikely to be applicable in cases requiring a suspension of muscular action; such as the reduction of dislocations or of strangulated hernia: and finally it may be employed in the alleviation of functional pain, of muscular spasm, as in cramp and colic, and as a sedative or narcotic.

The application of the process to the performance of surgical operations, is, it will be conceded, new. If it can be shown to have been occasionally resorted to before, it was only an ignorance of its universal application and immense practical utility that prevented such isolated facts from being generalized.

It is natural to inquire with whom this invention originated. Without entering into details, I learn that the patent bears the name of Dr. Charles T. Jackson, a distinguished chemist, and of Dr. Morton, a skilful dentist, of this city, as inventors—and has been issued to the latter gentleman as proprietor.

It has been considered desirable by the interested parties that the character of the agent employed by them, should not be at this time announced; but it may be stated that it has been made known to those gentlemen who have had occasion to avail themselves of it.

I will add, in conclusion, a few remarks upon the actual position of this invention as regards the public.

No one will deny that he who benefits the world should receive from it an equivalent. The only question is, of what nature shall the equivalent be? Shall it be voluntarily ceded by the world, or levied upon it? For various reasons, discoveries in high science have been usually rewarded indirectly by fame, honor, position, and occasionally, in other countries, by funds appropriated for that purpose. Discoveries in medical science, whose domain approaches so nearly that of philanthropy, have been generally ranked with them; and many will assent with reluctance to the propriety of restricting by letters patent the use of an agent capable of mitigating human suffering. There are various reasons, however, which apologize for the arrangement which I understand has been made with regard to the application of the new agent.

1st. It is capable of abuse, and can readily be applied to nefarious ends.

2nd. Its action is not yet thoroughly understood, and its use should be restricted to responsible persons.

3d. One of its greatest fields is the mechanical art of dentistry, many of whose processes are, by convention, secret, or protected by patent rights. It is especially with reference to this art, that the patent has been secured. We understand, already, that the proprietor has ceded its use to the Mass. General Hospital, and that his intentions are extremely liberal with regard to the medical profession generally, and that so soon as necessary arrangements can be made for publicity of the process, great facilities will be offered to those who are disposed to avail themselves of what now promises to be one of the important discoveries of the age.

THE FEVERS OF THE CHAMPLAIN VALLEY.

An Essay read before the Vermont Medical Society, at their Annual Meeting, Montpelier, October 14th, 1846.

By Charles Hall, M.D., Burlington, Vt.

[Voted, by the Society, that the Editor of the Boston Medical and Surgical Journal be requested to publish the same.]

It being generally admitted that the fevers in the vicinity of marshy lowlands and stagnant waters, differ from those contiguous to bold shores and rapid currents—that both grades differ from the fevers of hilly regions and mountain ridges, and that the surrounding influences of each of these localities tend to vary the character of the disorder, the fevers of each are subjects of special inquiry and investigation. I have therefore selected, for my present theme, *The Fevers of the Champlain Valley*—fevers of my own vicinity.

“That marshy lands, in which an extensive surface of wet soil is exposed to the action of the sun, are notoriously unhealthy,” is evinced only by their fevers possessing more largely the peculiar

THE LANCET.

A Journal of British and Foreign Medical and Chemical Science, Criticism,
Literature and News.

MDCCCXLVII.

IN TWO VOLUMES ANNUALLY.

VOLUME I.

EDITED BY

THOMAS WAKLEY, SURGEON,

M.P. FOR THE METROPOLITAN DISTRICT OF FINSBURY,
AND CORONER FOR THE COUNTY OF MIDDLESEX.

LONDON:

PRINTED FOR THE EDITOR, AND PUBLISHED BY GEORGE CHURCHILL, 423, STRAND.

pleura over the pericardium. The whole internal surface of the left pleura was drawn and puckered like old strumous scars, and deeply and profusely inlaid, and elevated with flattened white malignant tubercles. The floor of the cavity was contracted and drawn up. The pericardium contained about two ounces of clear serum; its reflected surface was marked with small flattened nodulated elevations, and the subjacent structure was much thickened and indurated; the attached surface, except a large point of attrition anteriorly, was healthy. The substance, cavities, and valves of the heart, were generally healthy, except perhaps a little thickening of the mitral valve. Right side distended with fibrinous coagula; aorta natural; around and in the muscular substance of the oesophagus were found points of hard malignant matter; the mucous membrane was healthy; no trace of any rib having been broken.

Abdomen.—Peritonæum healthy; mesenteric glands enlarged, one consisting of a hardened cretaceous mass. The stomach was distended; vessels on the inner aspect somewhat injected and arborescent; mucous membrane softened here and there, of a dull greyish-white colour, and easily scraped off; in several parts irregularly dotted, of a dusky colour. Liver rather large, dark, firm. Spleen healthy. Kidneys rather large and congested; structure healthy.

Remarks.—The symptoms for the relief of which this patient first applied were clearly to be attributed to the stomach, and the result of the necropsy showed the justice of this opinion. No history of any acute attack was given, nor any symptom, other than to be accounted for by a state of chronic inflammation of the mucous membrane of the stomach, and which, from his occupation, I was induced to think likely, with probably some chronic disease of the liver. His cough was but cursorily mentioned, as he considered it of secondary importance to the suffering caused by the stomach derangement. Though very excitable, he was, withal, most unwilling to give way, and avoided rather than willingly imparted any extended account of himself or his feelings. The relief was but slight, and on his cough beginning to assume a more prominent position, I examined his chest carefully, and was at once convinced of the presence of advanced disease on the left side. Leading questions and the statement of his wife furnished the additional history, which was, however, with difficulty obtained, even in its incomplete form. The succession of symptoms seem to be, a blow some months ago on the left side, followed by pain there for a day or two, exposure to wet, and after an interval, dry cough of a very severe character, occurring in paroxysms, dyspnoea, inability to lie on the sound side, scanty and clear expectoration, without febrile symptoms, or anything to indicate active mischief. In the course of the attack, gastric symptoms arose, which for a time were very prominent. Lastly, universal dullness, and fixed condition of the left chest, and altered position of the heart, the very faint sounds of which induced me to suspect a preternatural quantity of fluid in the pericardium.

The symptoms, so far, were those commonly met with in pleurisy of a sub-acute or chronic form, succeeded by persistent effusion; they were, however, equally compatible with a solid growth in the chest, of malignant character, and to this opinion I was inclined throughout, and for the following reasons: the veins of the chest were enlarged; a scirrhus tubercle followed the blow; it is not general to have much pain on lying on the affected side in mere effusion; the dullness on percussion was perfectly wooden; and the peculiar sounds elicited by the stethoscope appeared to require more than mere effusion to account for them. The existence of enlargement in the axillary glands would have been an additional reason for suspecting malignant disease, but I did not notice this fact during life. The voice also was peculiar, and showed great obstruction to respiration, and the inability to sit up in bed is not a usual sign in effusion. The heart may be displaced in either case, and malignant disease may exist without characteristic expectoration.

With this uncertainty in my own mind I was desirous of another opinion, and Dr. Addison was kind enough to examine this patient's chest, and investigate his case, the result being that the presence of fluid alone did not satisfy him, and he was inclined to suspect malignant disease to be the cause of the peculiar symptoms.

Increased severity of the weather, and perhaps debility from insufficient nourishment, owing to his gastric mischief, tended to accelerate and rapidly bring on the more urgent symptoms.

On the 30th, Dr. Birkett (to whom I am also greatly indebted for valuable assistance in recording the appearances found after

death) saw him with me, and examined his chest as far as could be without distressing the patient—indeed, only anteriorly,—and was rather inclined to the belief that there was fluid present. In the evening of that day, I again visited the patient, in company with my father and Dr. Birkett, and took with me the tapping instruments, intending, should our examination of his chest seem to justify it, to explore at least, and if fluid were present, to remove it, as affording the only hope of relieving the extreme oppression. The reasons which deterred me from this were—1st. The inability to find by auscultation any one spot where the sounds conveyed to the ear might seem, as far as could be, to ensure the safety of exploring. 2nd. The heart was more audible in the left infra-mammary region, and its sounds clearer than heretofore. (Could this have been at all occasioned or influenced by the accession of a tympanic condition of the stomach?) And 3rd. On applying the ear briefly to the posterior parietes of the left chest, the sounds were too close to the ear. Careful examination was out of the question, as in the semi-recumbent position alone did he seem able to breathe, I may almost say, at all. The exploration was reluctantly abandoned, and death soon terminated the patient's sufferings.

In concluding, it may be well briefly to consider the connexion between the symptoms during life and the morbid condition displayed by the post-mortem examination.

1st. The presence of the extensive collection of fluid, the result of that form of disease denominated by Laennec hæmorrhagic pleurisy, fully explained all the symptoms supposed during life to indicate effusion; and the commencement of this, I think, may justly be assigned to a period shortly after the blow. The effusion on the right side was evidently very recent.

2ndly. The condition of the contents of the posterior mediastinum will explain the sounds heard in the left infra-clavicular region, and account for the transmission of the sounds of the opposite lung, or apparent laryngeal respiration.

3rdly. The density of the fluid rendered it a better conducting medium for sound; and the position of the lung against the posterior parietes, and its not being quite impermeable to air, will explain the sounds posteriorly. And

4thly. The gastric symptoms are fully and sufficiently accounted for. What, then, would have been the effect of tapping? Unquestionably, relief, but only temporary, for the malignant disease would have very probably been excited to increased action by the withdrawal of the fluid, and speedily terminated life, even supposing his powers had rallied, and his cough had been subdued. I am, however, quite convinced, that though the position of the lung was against the ribs, yet had exploration been performed, (where it was intended, if possible, to have done so—viz., in the posterior lateral region, five or six inches from the spine, and not low down,) that the whole of the fluid might have been removed also, with perfect safety, as regards any injury likely to have been inflicted by the trocar.

Original Papers.

SURGICAL OPERATIONS PERFORMED DURING INSENSIBILITY,

PRODUCED BY THE INHALATION OF SULPHURIC ETHER.

(Communicated by FRANCIS BOOTT, M.D.)

To the Editor of THE LANCET.

SIR,—I beg to call your attention to the report of an anodyne process, by means of which surgical operations have been performed without pain. I think it would be interesting to the profession if published in THE LANCET. I also send a letter from Dr. Bigelow, bearing date more than three weeks after the report drawn up by his son. I wish to add, that Dr. Bigelow is one of the first physicians of Boston, a Professor of the Medical School of Harvard College, and a man of great accomplishment.—Yours sincerely,

Gower-street, Bedford-square, Dec. 1846.

F. BOOTT.

Extract from a private letter from Dr. BIGELOW to Dr. FRANCIS BOOTT.

"Boston, Nov. 28, 1846.

"MY DEAR BOOTT,—I send you an account of a new anodyne process lately introduced here, which promises to be one of the important discoveries of the present age. It has rendered many patients insensible to pain during surgical operations, and other causes of suffering. Limbs and breasts have been amputated, arteries tied, tumours extirpated, and many hun-

dreds of teeth extracted, without any consciousness of the least pain on the part of the patient.

"The inventor is Dr. Morton, a dentist of this city, and the process consists of the inhalation of the vapour of ether to the point of intoxication. I send you the *Boston Daily Advertiser*, which contains an article written by my son Henry, and which is extracted from a medical journal, relating to the discovery.

Let me give you an example. I took my daughter Mary, last week, to Dr. Morton's rooms, to have a tooth extracted. She inhaled the ether about one minute, and fell asleep instantly in the chair. A molar tooth was then extracted, without the slightest movement of a muscle or fibre. In another minute she awoke, smiled, said the tooth was not out, had felt no pain, nor had the slightest knowledge of the extraction. It was an entire illusion.

"The newspaper will give you the details up to its date, since which other operations have been performed with uniform success.

"Dr. F. Booth."

The following paper, by HENRY JACOB BIGELOW, M.D., one of the Surgeons of the Massachusetts General Hospital, was read before the Boston Society of Medical Improvement, Nov. 9th, 1846, an abstract having been previously read before the American Academy of Arts and Sciences, Nov. 3rd, 1846.*

It has long been an important problem in medical science, to devise some method of mitigating the pain of surgical operations. An efficient agent for this purpose has at length been discovered. A patient has been rendered completely insensible during an amputation of the thigh, regaining consciousness after a short interval. Other severe operations have been performed without the knowledge of the patients. So remarkable an occurrence will, it is believed, render the following details relating to the history and character of the process, not uninteresting.

On the 16th of October, 1846, an operation was performed at the hospital, upon a patient who had inhaled a preparation administered by Dr. Morton, a dentist of this city, with the alleged intention of producing insensibility to pain. Dr. Morton was understood to have extracted teeth under similar circumstances, without the knowledge of the patient. The present operation was performed by Dr. Warren, and though comparatively slight, involved an incision near the lower jaw, of some inches in extent. During the operation, the patient muttered, as in a semi-conscious state, and afterwards stated that the pain was considerable, though mitigated; in his own words, as though the skin had been scratched with a hoe. There was probably, in this instance, some defect in the process of inhalation, for, on the following day, the vapour was administered to another patient with complete success. A fatty tumour, of considerable size, was removed by Dr. Hayward from the arm of a woman, near the deltoid muscle. The operation lasted four or five minutes, during which time the patient betrayed occasional marks of uneasiness; but upon subsequently regaining her consciousness, professed not only to have felt no pain, but to have been insensible to surrounding objects—to have known nothing of the operation, being only uneasy about a child left at home. No doubt, I think, existed in the minds of those who saw this operation, that the unconsciousness was real; nor could the imagination be accused of any share in the production of these remarkable phenomena.

I subsequently undertook a number of experiments, with the view of ascertaining the nature of this new agent, and shall briefly state them, and also give some notice of the previous knowledge which existed of the use of the substances I employed.

The first experiment was with sulphuric ether, the odour of which was readily recognised in the preparation employed by Dr. Morton. Ether inhaled in vapour is well known to produce symptoms similar to those produced by the nitrous oxide. In my own former experience, the exhilaration has been quite as great, though perhaps less pleasurable, than that of this gas, or of the Egyptian *haschish*.† It seemed probable that the ether might be so long inhaled as to produce excessive inebriation and insensibility; but in several experiments the exhilaration was so considerable that the subject became uncontrollable, and refused to inspire through the apparatus. Experiments were next made with the oil of wine, (ethereal oil.) This is well known to be an ingredient in the preparation known as Hoffman's anodyne, which also contains alcohol, and this was accordingly employed. Its

effects upon the three or four subjects who tried it were singularly opposite to those of the ether alone. The patient was tranquillized, and generally lost all inclination to speak or move. Sensation was partially paralyzed, though it was remarkable that consciousness was always clear, the patient desiring to be pricked or pinched, with a view to ascertain how far sensibility was lost. A much larger proportion of oil of wine, and also chloric ether, with and without alcohol were tried, with no better effect.

It remains briefly to describe the process of inhalation by the new method, and to state some of its effects. A small, two-necked glass globe contains the prepared vapour, together with sponges, to enlarge the evaporating surface. One aperture admits the air to the interior of the globe, whence, charged with vapour, it is drawn through the second into the lungs. The inspired air thus passes through the bottle, but the expiration is diverted by a valve in the mouth-piece, and escaping into the apartment is thus prevented from vitiating the medicated vapour. A few of the operations in dentistry, in which the preparation has as yet been chiefly applied, have come under my observation. The remarks of the patients will convey an idea of their sensations.

A boy of sixteen, of medium stature and strength, was seated in the chair. The first few inhalations occasioned a quick cough, which afterwards subsided; at the end of eight minutes the head fell back, and the arms dropped, but owing to some resistance in opening the mouth, the tooth could not be reached before he awoke. He again inhaled for two minutes, and slept three minutes, during which time the tooth, an inferior molar, was extracted. At the moment of extraction the features assumed an expression of pain, and the hand was raised. Upon coming to himself he said he had had a "first-rate dream—very quiet," he said, "and had dreamed of Napoleon—had not the slightest consciousness of pain—the time had seemed long;" and he left the chair, feeling no uneasiness of any kind, and evidently in a high state of admiration. The pupils were dilated during the state of unconsciousness, and the pulse rose from 130 to 142.

A girl of sixteen immediately occupied the chair. After coughing a little, she inhaled during three minutes, and fell asleep, when a molar tooth was extracted, after which she continued to slumber tranquilly during three minutes more. At the moment when force was applied, she flinched and frowned, raising her hand to her mouth, but said she had been dreaming a pleasant dream, and knew nothing of the operation.

A stout boy of twelve, at the first inspiration coughed considerably, and required a good deal of encouragement to induce him to go on. At the end of three minutes from the first fair inhalation, the muscles were relaxed and the pupil dilated. During the attempt to force open the mouth he recovered his consciousness, and again inhaled during two minutes, and in the ensuing one minute two teeth were extracted, the patient seeming somewhat conscious, but upon actually awaking, he declared "it was the best fun he ever saw;" avowed his intention to come there again, and insisted upon having another tooth extracted upon the spot. A splinter which had been left afforded an opportunity of complying with his wish, but the pain proved to be considerable. Pulse at first 110, during sleep 96, afterwards 144; pupils dilated.

The next patient was a healthy-looking, middle-aged woman, who inhaled the vapour for four minutes; in the course of the next two minutes a back tooth was extracted, and the patient continued smiling in her sleep for three minutes more. Pulse 120, not affected at the moment of the operation, but smaller during sleep. Upon coming to herself, she exclaimed that "it was beautiful—she dreamed of being at home—it seemed as if she had been gone a month." These cases, which occurred successively in about an hour, at the room of Dr. Morton, are fair examples of the average results produced by the inhalation of the vapour, and will convey an idea of the feelings and expressions of many of the patients subjected to the process. Dr. Morton states, that in upwards of two hundred patients, similar effects have been produced. The inhalation, after the first irritation has subsided, is easy, and produces a complete unconsciousness at the expiration of a period varying from two to five or six, sometimes eight minutes; its duration varying from two to five minutes; during which the patient is completely insensible to the ordinary tests of pain. The pupils in the cases I have observed have been generally dilated; but with allowance for excitement and other disturbing influences, the pulse is not affected, at least in frequency; the patient remains in a calm and tranquil slumber, and wakes with a pleasurable feeling. The mani-

* From the Boston Medical and Surgical Journal.

† Extract of Indian hemp.

festation of consciousness or resistance I at first attributed to the reflex function, but I have since had cause to modify this view.

It is natural to inquire whether no accidents have attended the employment of a method so wide in its application, and so striking in its results. I have been unable to learn that any serious consequences have ensued. One or two robust patients have failed to be affected. I may mention as an early and unsuccessful case, its administration in an operation performed by Dr. Hayward, where an elderly woman was made to inhale the vapour for at least half an hour without effect. Though I was unable at the time to detect any imperfection in the process, I am inclined to believe that such existed. One woman became much excited, and required to be confined to the chair. As this occurred to the same patient twice, and in no other case as far as I have been able to learn, it was evidently owing to a peculiar susceptibility. Very young subjects are affected with nausea and vomiting, and for this reason Dr. Morton has refused to administer it to children. Finally, in a few cases, the patient has continued to sleep tranquilly for eight or ten minutes, and once, after a protracted inhalation, for the period of an hour.

The following case, which occurred a few days since, will illustrate the probable character of future accidents. A young man was made to inhale the vapour, while an operation of limited extent, but somewhat protracted duration, was performed by Dr. Dix upon the tissues near the eye. After a good deal of coughing, the patient succeeded in inhaling the vapour, and fell asleep at the end of about ten minutes. During the succeeding two minutes, the first incision was made, and the patient awoke, but unconscious of pain. Desiring to be again inebriated, the tube was placed in his mouth and retained there about twenty-five minutes, the patient being apparently half affected, but, as he subsequently stated, unconscious. Respiration was performed partly through the tube, and partly with the mouth open. Thirty-five minutes had now elapsed, when I found the pulse suddenly diminishing in force, so much so, that I suggested the propriety of desisting. The pulse continued decreasing in force, and from 120 had fallen to 96. The respiration was very slow, the hands cold, and the patient insensible. Attention was now, of course, directed to the return of respiration and circulation. Cold affusions, as directed for poisoning with alcohol, were applied to the head, the ears were syringed, and ammonia presented to the nostrils and administered internally. For fifteen minutes the symptoms remained stationary, when it was proposed to use active exercise, as in a case of narcotism from opium. Being lifted to his feet, the patient soon made an effort to move his limbs, and the pulse became more full, but again decreased in the sitting posture, and it was only after being compelled to walk during half an hour that the patient was able to lift his head. Complete consciousness returned only at the expiration of an hour. In this case the blood was flowing from the head, and rendered additional loss of blood unnecessary; indeed, the probable hæmorrhage was previously relied on as salutary in its tendency.

Two recent cases serve to confirm, and one, I think, to decide, the great utility of this process. On Saturday, November the 7th, at the Massachusetts General Hospital, the right leg of a young girl was amputated above the knee, by Dr. Hayward, for disease of this joint. Being made to inhale the preparation, after protesting her inability to do so, from the pungency of the vapour, she became insensible in about five minutes. The last circumstance she was able to recall was the adjustment of the mouth-piece of the apparatus, after which she was unconscious until she heard some remark at the time of securing the vessels—one of the last steps of the operation. Of the incision she knew nothing, and was unable to say, upon my asking her, whether or not the limb had been removed. She refused to answer several questions during the operation, and was evidently completely insensible to pain or other external influences. This operation was followed by another, consisting of the removal of a part of the lower jaw, by Dr. Warren. The patient was insensible to the pain of the first incision, though she recovered her consciousness in the course of a few minutes.

The character of the lethargic state which follows this inhalation is peculiar. The patient loses his individuality, and awakes after a certain period, either entirely unconscious of what has taken place, or retaining only a faint recollection of it. Severe pain is sometimes remembered as being of a dull character; sometimes the operation is supposed to be performed by somebody else. Certain patients whose teeth have been extracted, remember the application of the ex-

tracting instruments; yet none have been conscious of any real pain.

As before remarked, the phenomena of the lethargic state are not such as to lead the observer to infer this insensibility. Almost all patients under the dentist's hands scowl or frown; some raise the hand. The patient whose leg was amputated, uttered a cry when the sciatic nerve was divided. Many patients open the mouth, or raise themselves in the chair, upon being directed to do so. Others manifest the activity of certain intellectual faculties. An Irishman objected to the pain that he had been promised an exemption from it. A young man taking his seat in the chair and inhaling a short time, rejected the globe, and taking from his pockets a pencil and card, wrote and added figures. Dr. Morton supposing him to be affected, asked if he would now submit to the operation, to which the young man willingly assented. A tooth was accordingly extracted, and the patient soon after recovered his senses. In none of these cases had the patients any knowledge of what had been done during their sleep.

I am, as yet, unable to generalize certain other symptoms to which I have directed attention.* The pulse has been, as far as my observation extends, unaltered in frequency, though somewhat diminished in volume, but the excitement preceding an operation has, in almost every instance, so accelerated the pulse that it has continued rapid for a length of time. The pupils are, in a majority of cases, dilated; yet they are in certain cases unaltered, as in the above case of amputation.

The duration of the insensibility is another important element in the process. When the apparatus is withdrawn, at the moment of unconsciousness, it continues, upon the average, two or three minutes, and the patient then recovers completely or incompletely, without subsequent ill effects. In this sudden cessation of the symptoms, this vapour in the air tubes differs in its effects from the narcotics or stimulants in the stomach, and as far as the evidence of a few experiments of Dr. Morton goes, from the ethereal solution of opium when breathed. Lassitude, headache, and other symptoms, lasted for several hours when this agent was employed.

But if the respiration of the vapour be prolonged much beyond the first period, the symptoms are more permanent in their character. In one of the first cases, that of a young boy, the inhalation was continued during the greater part of ten minutes, and the subsequent narcotism and drowsiness lasted more than an hour. In a case alluded to before, the narcotism was complete during more than twenty minutes; the insensibility approached to coma.

The process is obviously adapted to operations which are brief in their duration, whatever be their severity. Of these, the two most striking are, perhaps, amputations and the extraction of teeth. In protracted dissections, the pain of the first incision alone is of sufficient importance to induce its use; and it may hereafter prove safe to administer it for a length of time, and to produce a narcotism of an hour's duration. It is not unlikely to be applicable in cases requiring a suspension of muscular action, such as the reduction of dislocations or of strangulated hernia; and finally, it may be employed in the alleviation of functional pain, of muscular spasm, as in cramp and colic, and as a sedative or narcotic.

The application of the process to the performance of surgical operations, is, it will be conceded, new. If it can be shown to have been occasionally resorted to before, it was only an ignorance of its universal application, and immense practical utility, that prevented such isolated facts from being generalized.

It is natural to inquire with whom this invention originated. Without entering into details, I learn that the patent bears the name of Dr. Charles T. Jackson, a distinguished chemist, and of Dr. Morton, a skilful dentist, of this city, as inventors,—and has been issued to the latter gentleman as proprietor.

It has been considered desirable by the interested parties that the character of the agent employed by them should not be at this time announced; but it may be stated that it has been made known to those gentlemen who have had occasion to avail themselves of it.

I will add, in conclusion, a few remarks upon the actual position of this invention as regards the public.

No one will deny that he who benefits the world should receive from it an equivalent. The only question is, of what nature shall the equivalent be? Shall it be voluntarily ceded

* Since the above was written, I find this irregularity of symptoms mentioned in the case of poisoning by alcohol. Dr. Ogston, according to Christison, has in vain attempted to group together and to classify the states of perspiration, pulse, and pupil.

by the world, or levied upon it? For various reasons, discoveries in high science have been usually rewarded indirectly by fame, honour, position, and occasionally, in other countries, by funds appropriated for the purpose. Discoveries in medical science, whose domain approaches so nearly that of philanthropy, have been generally ranked with them; and many will assent with reluctance to the propriety of restricting, by letters patent the use of an agent capable of mitigating human suffering. There are various reasons, however, which apologize for the arrangement, which I understand to have been made with regard to the application of the new agent.

1st. It is capable of abuse, and can readily be applied to nefarious ends.

2nd. Its action is not yet thoroughly understood, and its use should be restricted to responsible persons.

3rd. One of its greatest fields is the mechanical art of dentistry, many of whose processes are by convention, secret, or protected by patent rights. It is especially with reference to this art, that the patent has been secured. We understand, already, that the proprietor has ceded its use to the Massachusetts General Hospital, and that his intentions are extremely liberal with regard to the medical profession generally; and that so soon as necessary arrangements can be made for publicity of the process, great facilities will be offered to those who are disposed to avail themselves of what now promises to be one of the important discoveries of the age.

To the Editor of THE LANCET.

SIR,—I forwarded a few days ago, for publication in THE LANCET, Dr. H. J. Bigelow's report on the anodyne effects of the inhalation of the vapour of strong, pure sulphuric ether; and since that time I have received an Address, delivered by the Hon. Edward Everett, (late Minister from the United States to the Court of St. James's,) at the opening of the new Medical College in Boston, an extract from which will be interesting, as affording his high testimony to the safety and efficacy of the process. In a note, Mr. Everett, the President of Harvard College, says—"I am not sure that, since these remarks were delivered, a discovery has not been announced which fully realizes the predictions of the text. I allude to the discovery of a method of producing a state of temporary insensibility to pain, by the inhalation of a prepared vapour. I witnessed a very successful instance of its application, on the 18th of November, and was informed at that time by Dr. Morton, that he had employed it in several hundred cases of dentistry. It has also been made use of with entire success at the Massachusetts General Hospital, and elsewhere in Boston, in capital operations of surgery. The few cases of failure may, perhaps, be ascribed to irregularities in the process of inhalation, or to peculiarities of temperament or constitution on the part of the patient. I understand that great confidence is placed in the discovery by the most distinguished members of the medical profession of this vicinity, and that they are disposed to regard it as an effectual method of inducing complete insensibility under the most cruel operations, by means easily applied, entirely controllable, and productive of no subsequent bad consequences. It seems not easy to overrate the importance of such a discovery."

I beg to add, that on Saturday, the 19th, a firmly fixed molar tooth was extracted in my study from Miss Lonsdale, by Mr. Robinson, in the presence of my wife, two of my daughters, and myself, without the least sense of pain, or the movement of a muscle. The whole process of inhalation, extracting, and waking, was over in three minutes; yet the same apparatus was used in three or four cases afterwards, and failed in each case to produce insensibility. I attribute the failure to the defect in the valve of the mouthpiece, by which the expired air was returned to the bottle, instead of passing into the room. The valve was a ball-and-socket one, and required a very strong expiration to make it act freely. I would add, that the efficacy of any apparatus must depend upon the facility of breathing the vapour, and the perfect action of the valve, admitting the expired air to pass easily into the room. In Miss Lonsdale's case, we all observed she breathed strongly, and thus, no doubt, opened the valve. In all the other cases, we had great difficulty in making the patients breathe through the mouthpiece.

Yours sincerely,

F. BOOTT.

Gower-street, Dec. 21, 1846.

To the Editor of THE LANCET.

Gower-street, Dec. 22, 1846.

SIR,—If you have not heard of Mr. Liston's success in the use of the inhaled ether, the following note I have received

from him will interest you, as confirming the American report:—

"Clifford-street, Dec. 21, 1846.

"MY DEAR SIR,—I tried the ether inhalation to-day in a case of amputation of the thigh, and in another requiring evulsion of both sides of the great toe-nail, one of the most painful operations in surgery, and with the most perfect and satisfactory results.

"It is a very great matter to be able thus to destroy sensibility to such an extent, and without, apparently, any bad result. It is a fine thing for operating surgeons, and I thank you most sincerely for the early information you were so kind as to give me of it.

"Yours faithfully,

"ROBERT LISTON.

I hope Mr. Liston will report of these cases more fully.

Yours sincerely,

F. BOOTT.

To the Editor of THE LANCET.

SIR,—Having noticed, in several periodicals and newspapers, reports of two operations recently performed by Mr. Liston, at the University College Hospital, upon patients under the anodyne influence of inhaled vapour of ether, in which amputation of the thigh in one case, and evulsion of the nail of the great toe in the other case, were effected without pain to the patients, I take this earliest opportunity of giving notice, through the medium of your columns, to the medical profession, and to the public in general, that the process for procuring insensibility to pain by the administration of the vapour of ether to the lungs, employed by Mr. Liston, is patented for England and the Colonies, and that no person can use that process, or any similar one, without infringing upon rights legally secured to others.

I am aware that doubts exist in the minds of some as to the liberality of rendering inventions or improvements, which tend to alleviate suffering, subjects of patents; but I cannot see why the individual who, by skill and industry, invents or discovers the means of diminishing, or, as in this instance, annihilating human suffering, is not full as much entitled to compensation as he who makes an improvement in the manufacture of woollen or other fabrics. Indeed, he is entitled to greater compensation, and for a stronger reason,—he has conferred upon mankind a greater benefit.

With this view, I have accepted from the American inventors, or their representatives, the agency of affairs connected with the English patent; and it is my intention, while I hold the trust, to adhere to such a course, that the charge of illiberality shall rest upon any persons rather than upon the proprietors of the patent, or upon their agent,

Duke-street, St. James's, Dec. 28, 1846.

JAMES A. DORR.

ON

CRITICISMS UPON PHRENOLOGY.

A REVIEW REVIEWED.

By GEORGE COMBE, Esq., Edinburgh.

(Remarks on an article in the British Quarterly Review, for November, 1846.)

(Concluded from last volume, p. 663.)

DR. SKAE does not quote Mr. Noble's work, or allow him fairly to speak for himself on these topics; but as if, in the fifty years before mentioned, no step had been made in the investigation, either by friend or foe, he comes forward with new principles, new measurements, and new results, all of his own devising; and he does so under the pretence that his method is one of strict scientific accuracy, fairly entitled to supersede all the others. Let us, then, briefly consider its merits.

First, he asks, "What, then, is the size of an organ in the estimate of a phrenologist's eye?" The true answer has already been given—*Its length and its breadth*. But Dr. Skae's answer is different. He informs us, that "It can be only its degree of prominence, as compared with the neighbouring surface of the cranium, or its distance from some central point. Of the breadth of the organ, it is impossible that he can form any estimate, except such as depends upon the breadth or size of the entire head; for if the organs do not always occupy the same relative part of the surface of the entire cranium, it is impossible for any phrenologist to define the precise surface of their cranial limits. Will any phrenologist undertake to say that the organ of Benevolence occupies a greater relative portion of the surface of the cranium in one

Wood-Library-Museum of Anesthesiology 1972