

Electrical anaesthesia : comprising a brief history of its discovery, a synopsis of experiments, also full directions for its application in surgical & dental operations / by W.G. Oliver.

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Oliver (W. G.)

ELECTRICAL

ANÆSTHESIA,

COMPRISING A BRIEF HISTORY OF ITS

DISCOVERY, A SYNOPSIS OF EXPERIMENTS,

ALSO, FULL DIRECTIONS FOR ITS APPLICATION IN

Surgical & Dental Operations

DEDICATED (BY PERMISSION,) TO DR. FRANK HAMILTON, PROFESSOR OF
SURGERY IN THE BUFFALO MEDICAL COLLEGE.

BY W. G. OLIVER.



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1858

AN ATTEMPT

TO DISCOVER A SYNOPSIS OF EXPERIMENTS

IN SURGICAL & MEDICAL OPERATIONS

BY J. W. G. O'LEARY



1855

PREFACE.

In presenting the following pages to the Profession, I feel somewhat diffident, being aware of my inability to explain scientifically the theory of my discovery. I am aware, also, of the critical position I thus voluntarily assume, for it was said by some ancient Cynic, "Oh that mine enemy would write a book;" it has also been said, that "fools rush in where angels fear to tread." I would not be considered presumptuous or egotistical, so distinctly waive all claims of a literary character, and simply aim to give a brief history of the discovery of a "new fact in Science," which I believe destined to be of great use as an Anaesthetic agent.

I deem it best in the following pages to describe at some length the principal experiments that have been made with this wonderful agent, in order that the Profession may have the fullest benefit that can be derived from a knowledge of what has *been accomplished*, and thus avoid the unnecessary trouble in future experiments, of going over ground that has already been explored. I shall endeavor to give a plain statement of facts in the order in which they occurred, as near as possible; but, if I should appear to give precedence to Surgical operations, it is because they are deemed of most importance.

It is presumed that sufficient has been said in this article to show that the author of these pages is a practical man, composed of sterner stuff than authors or poets are usually made, consequently if critics should hurl their shafts at his target, they will at least fall harmless, if they do not rebound and act like young chickens, "who always go home to roost."

I use the term *Surgical* in those pages to designate operations other than Dental; such as amputations. I am aware that the Dental operations in which an Anaesthetic agent is needed, strictly speaking, appertain to Dental Surgery, and are usually termed surgical, but on the present occasion, for the sake of convenience, it is deemed advisable to make the above distinction.

PREFACE.

In presenting the following paper to the Profession, I feel somewhat diffident, being aware of my inability to explain adequately the object of my journey. I am aware, also, of the critical position I thus voluntarily assume, for it may well be said by some, "On the whole, many things were said, but it was also said that 'looks into' in which words I am to search." I would not be considered presumptuous or dogmatic, but I am fully aware of a literary character, and simply aim to give a brief history of the discovery of a "new fact in Science," which I believe destined to be of great use as an Anæsthetic agent.

I deem it best in the following paper to detail not only the principal experiments that have been made with this wonderful agent, but also the various ways in which the full and complete knowledge of what has been accomplished, and thus avoid the unnecessary necessity of making over a second time the already been explored. I shall endeavor to give a plain statement of facts in the order in which they occur, not as they are presented, and if it is well adapted to give facts in a logical order, it is because they are based on most appearance.

It is presumed that the reader has been told in this article to show that the history of these papers is a practical one, composed of records and facts, and not a mere theory. Consequently, it is not intended that their value at this time, they will at least be satisfactory, if they do not rebound and not the young physician "who always" is known to more.

I am the more obliged to these papers to describe operations, rather than theories, such as operations. I am aware that the Dental profession is, with an Anæsthetic agent is needed, entirely dependent upon the Dental Surgery, and not really worth anything, but on the present occasion, for the sake of convenience, it is deemed advisable to make the above distinction.

HISTORY OF THE DISCOVERY.

It has always been a source of deep regret to me, that I could not, on all occasions, render the operation of extracting painless, and when the "Morton Letheon" was introduced to the profession I was in hopes—indeed felt confident—that a very great need was supplied, and was one among the first in this locality to purchase the right to use it. My experience was that of thousands, and after a few years' use, with great caution, was abandoned as too dangerous for anything but severe protracted surgical operations. During the summer of 1857, the idea crossed my mind that by the proper application of an electrical current, the pain incidental to Dental operations could be mitigated, if not entirely controlled. I owned a magneto electrical machine, and designed to make the experiment with it as soon as I could obtain it from a friend to whom I had lent it. He was a Captain of a vessel, and was absent on a voyage. I must confess I was not very sanguine of success, notwithstanding the idea continually haunted me, for about eighteen months previous I had been called to extract some teeth at the house of a patient, who was under treatment for a nervous affection, and was taking a current daily from a magneto Electric Machine, as a remedial measure. The operation proved difficult and painful, and his medical adviser (who was present) prescribed a current through a sponge applied to the face, after each tooth was extracted, and I really could not perceive that any benefit was derived, and the patient told me subsequently that if he had been aware of the operation being so painful he never would have submitted to it.

At length the apparatus was obtained from my friend, and put in order for experiments. We attached the forceps first to one pole of the battery then the other, and tried the effect upon our own teeth, (brother and self,) and found that the current was much more agreeable when the instrument was attached to the negative, for when attached to the positive it gave a disagreeable thumping sensation. We

decided on trying the experiment of extracting on the first patient who would submit, attaching the forceps to the negative wire. In a short time an intelligent German lady presented herself to have the two inferior molars removed. We made the proposition to her of passing a current through the tooth to be extracted, at the same time telling her candidly that it was an experiment, and assured her if it did no good it would certainly do no harm. She very generously left the entire matter to our discretion, stating that she had the fullest confidence in our integrity. The metallic rod was connected to the positive, and the forceps to the negative wire. My brother placed a pair of silk gloves on his hands to insulate himself from the current. All being ready I commenced to generate a current by turning the crank of the machine—slowly at first, increasing gradually, until it was supposed to be sufficient, and the tooth was extracted. She made no exclamation, but still we felt anxious to hear the verdict from her own lips. A faint idea may be formed of our delight when in answer to the question as to whether she felt pain during the operation, she said “No, only very little. I declare, it is truly wonderful.” The second tooth was taken out with like results. We questioned her as to her sensations during the operation, and found that she felt no actual pain, nothing but the current, which she said was rather disagreeable. She said also that she felt the force used, and heard the *crash* caused by the separation of the tooth from the jaw, *but no pain.*

I have deemed it proper to give this first experiment in full, feeling that when an important fact is demonstrated, (even partially,) it is entitled to our consideration, even to the minutest particular. We were inspired with sufficient confidence by the result of the first experiment to use the Magneto-Electric Machine in every case of extracting that presented itself afterwards. The news flew around, and the patients presented themselves “thicker and faster” to have their teeth extracted by the new process. We operated with various degrees of success for several weeks. Some times our failures were so frequent, (particularly on a fine, clear day,) that I some times felt the whole thing was a delusion—a good deal like eating garlicks to take away the taste of onions. A great many complained that the current was painful, and we came to the conclusion that the interruptions were too sharp, and I endeavored to alter it by making six points on the eccentric motion of the shaft in place of two, but it would not work. I

then procured a vibratory machine, (which we still use,) and by screwing the armature down to the smallest possible vibration, we succeeded in softening the current very much. We kept a faithful record of all the cases, and found on figuring up—after we had used the new vibratory instrument a few weeks—that with the Magneto-Electric Machine, our successful cases averaged about 60 per cent. Whereas under the influence of the vibratory machine, our success was full 90 per cent.; and now, after nearly a year's experience, it is certainly 98 per cent., besides we have devised means of applying the battery to prevent pain, in every other operation appertaining to the Dental profession.

As soon as it was demonstrated that the nerve of a tooth could be so paralyzed by an electrical current as to prevent pain in extracting, it became evident that any and every nerve in the human system could be similarly affected by the same agent, when the proper mode applying it should be developed. With this view a series of experiments were commenced. 1st, a lancet was attached to the positive pole of the battery, an incision made in the fleshy part of the arm, (the rod held in the hand,) which gave intense pain, as tho' the instrument was red hot. An incision was then made with the lancet on the negative wire, which also proved very painful. Then one was made without the aid of the current, which proved much less painful than either of the others. 2d—Metal bands were placed on the left arm, one at the wrist and one by the elbow, to which the negative wires were attached. The metallic rod from the positive pole was held in the right hand. A current was established about one minute, then a needle was passed through the arm below the elbow. The experiment was then tried without the aid of the battery, and it was found that although the operation was not painless, still there was great benefit derived from the aid of the battery.

About this time I called on Prof. Frank Hamilton, and related to him in brief, the success we had met with, and solicited the privilege of exhibiting the electrical apparatus in a surgical case at the public Hospital, of which he was Surgeon. He very naturally expressed himself incredulous as to the claims set up for this new Anaesthetic

NOTE.—It is a fact that on a fine, clear day, it requires a stronger charge to produce the desired result, than it does on a dull, cloudy one. I am not prepared to give a reason for this difference, but that such a state of things do occur we have abundant proof.

agent, and suggested that our success was attributable to a peculiar kind of eloquence, which he termed mesmerism; however, he very kindly gave his consent that we should make experiments in surgical cases at the Hospital under his supervision. The following report of cases is believed to be correct in every particular, being made up from memorandums taken at the time they occurred:

“*Buffalo Hospital*, Feb. 10, 1858.”

First operation under the influence of the Electrical Anaesthesia, in presence of the Clinique of the Medical College, Prof. Frank Hamilton, Surgeon. Subject: a woman about 25 years of age; swelling of the varicose veins, left leg. A naked copper wire was wound around the leg, just above the knee, about 9 or 10 times. A similar wire was placed around the leg, just above the ankle, and the negative pole attached to them both. A metallic rod was attached to the positive pole, and grasped in both hands of the patient. The circuit being complete the battery was put in motion, and a current passed through the patient, entering at the hands and passing out at the leg, above and below the part to be operated on. The current was very slight at first, and was increased occasionally, which caused the patient to complain of pricking and burning sensation where the wires touched the flesh. The current was reduced to a slow, uniform one, and the operation commenced by the Professor passing a needle and ligature thro' the part affected, taking up a piece of flesh about one inch in thickness and two inches through. The ligature was then tied, and the same operation was performed about two inches below the first, and during the operation the patient appeared to suffer considerable pain, but in a few seconds after the ligatures were tied, the pain ceased entirely, and the current was stopped. In a few seconds the patient complained of severe darting pains in the region of the operation, which seemed to increase until they became almost insupportable. A gentle current was then passed through the patient as before, and in 8 or 10 seconds the patient was free from pain. In a few minutes the current was stopped again, and in a few seconds the pains returned, (less violent than before.) The current was again established, and the pain ceased. In about five minutes the current was again stopped, and the patient left in the hands of the dresser, free from pain.”

Remarks suggested and recorded at the time: I am unable to say how much relief was afforded by the current in this operation, but one

thing was palpable, I think, to all present, viz: the pains after the operation were very severe in the absence of the current, and entirely relieved by its presence. I also learned that to be useful in painful cases, the current must be increased, and some means devised by which it could be softened and diffused, so as to render it painless in its application.

Second operation—Elkoplasty. Prof. Frank Hamilton, Surgeon. Present, the class and four or five medical gentlemen. Subject: an intelligent seaman, (American.) This man had an ulcer of long standing on the front of his left leg, having a space of diseased flesh of about 5 inches by 3. A wet bandage, about 3 inches wide was wound around the leg a few inches above the ulcer, and a copper wire then wound over the bandage about 20 times and secured. A similar bandage and coil of wire was placed at the ankle. The positive pole was attached to the upper, and the negative to the lower bandage. A gentle current was then established and increased until the muscles began to quiver, and he complained of severe pressure, as though the bandages were being tightened. The current was checked slightly, and kept steady for five minutes, and the operation commenced by the Professor cutting all around the edge of the diseased flesh, and then sliced the whole of it off, and removed every particle of diseased flesh. The patient was asked if he felt pain, (by myself and others,) and he invariably answered, "No, only a pressure at the bandages." The apparatus was then removed and placed in a similar manner on the right leg. A piece of healthy flesh was then taken corresponding in size and shape to the orifice made by the extirpation of the ulcer. The flow of blood from the healthy leg was so profuse that the operator could not proceed, and he remarked that he should check it by dropping scalding water on to the parts, which he said was the *most painful part of the operation.* The water was procured and dropped on to the wound from a sponge, until the hemorrhage ceased. The patient was frequently questioned as to whether he felt pain. He said no, each time. During the time of checking the flow of blood the Professor purposely dropped some hot water on the other leg, above the knee. The patient immediately called out, "O, that's hot!" This experiment was perfectly successful in my estimation, and I have no doubt was so considered by the medical gentlemen present, for three of them called at our office the following day and voluntarily gave a certificate,

(one of them a practitioner of 40 years' standing.) This certificate, with others, will be found in the Index, under the head of Certificates.

Third Case. Buffalo Hospital, Feb'y 20, 1858. Prof. Frank Hamilton, Surgeon. Subject: a German, about 30 years old. Ulcer on the leg. Prof. Hamilton's operation of Elkoplasty was again successfully performed in this case, which was in every respect similar to the one of the 17th February. The Electrical bandages were placed above and below the ulcer, as before, and the connecting wires attached. A current was passed through the limb for about five minutes, and the operation proceeded. It was evident that the patient suffered some pain, and when questioned he said, "Yes, a little." The current was then increased, and he complained of pressure at the bandages. (They were perfectly loose.) The contraction of the muscles caused by the strength of the current was doubtless the cause, as the same phenomenon had been observed before on the completion of an operation, the bandages were removed. It was then discovered that the poles had been reversed by mistake, viz: the positive at the ankle and negative at the knee. This accounted for the pain exhibited during the operation, and confirmed the results of other experiments, which proved that in order to have the Anaesthesia complete, the current should traverse the nerve in a contrary direction to its normal course. Although there is very little doubt but the operation could have been rendered painless by the application of another Electrical bandage on the upper part of the thigh, also attached to the negative pole, thus having two negatives to one positive bandage.

Fourth case. Buffalo Hospital, Feb'y 27th. Prof. Frank Hamilton, Surgeon. Subject: a German youth, about 19 years old. Index finger of left hand shattered by bursting of a gun. Case of long standing, very much inflamed and swollen. Electrical bandages were placed on three parts of the arm and hand; one above the elbow, to which the positive pole was attached; one at the wrist, and one around the third and fourth finger, to which the negative wire was connected. A pretty strong current was generated for about three minutes, when the remaining portion of the finger was removed at the joint. After which a considerable amount of carious bone was removed. Operation lasted about 10 or 12 minutes. The patient witnessed the operation, and gave utterance to a low guttural sound, which the majority of those present interpreted as the language of fear. He was questioned after

the operation as to whether he felt pain, and said, "Very little." He was asked if he felt pain at the bandages, and he said, "Yes, very little." The only inference to be drawn from those answers seems to be, that the contraction of the muscles, caused by the passage of the current, being a novel one to him, he supposed it was pain. He had complained that his hand was very painful at nights, and was asked if the pain of the operation was anything like that, he quickly said, 'O, no.' The three medical gentlemen who witnessed the operation agreed that under ordinary circumstances it would have proved a very painful one, and gave it as their opinion that there was certainly little evidence of pain exhibited.

It is deemed proper in this place to say, that out of about thirty medical gentlemen, to whom application has been made the last six months for an opportunity to exhibit this new local Anaesthesia, *only one*, (Prof. Hamilton) has been in a position to respond; and to him I tender my most sincere thanks for the privilege he has afforded of demonstrating, even in a limited degree, that Electricity possesses a power heretofore unknown. It is also proper to state that Professor Hamilton is not responsible for anything that is put forth in these pages, except that he permits me to say, however, that he is prepared to admit its efficacy as a local Anaesthesia, in Dental operations, but suspends his judgment as regards its usefulness in Surgical cases until it has been more thoroughly tested in his own practice, or in the practice of others. The Professor is conservative, and should be, for occupying the front rank in the profession as a Surgeon, should he endorse a new theory which would not stand the test of time, his reputation would suffer. In such a case he has everything to lose and nothing to gain.

Local Anaesthesia in Child-Birth.—There has been no opportunity offered of testing the Electrical Anaesthesia in cases of Obstetrics, although it has been diligently sought, owing to the difficulty of finding persons willing to try a new thing at such a momentous time; at least twenty of the Faculty have been consulted, who have an extensive practice in this branch of medical science, and not one has been found who apprehends the slightest danger to mother or child from the proposed mode of applying it. In a conversation with Dr. Richardson of Toronto, (in March, 1858,) who has an extensive practice in Obstetrics, he gave it as his opinion that Electricity could be rendered

useful in cases of child-birth, by the use of the Electrical Bandages, as explained at that time. He related a case that he had attended several years ago, in which the patient had been in labor many hours, and was so debilitated from previous sickness that there did not appear to be sufficient vitality left to produce the necessary muscular contraction to expel the foetus. A galvanic battery was procured, and a shock administered over the womb, when the child was suddenly born—almost as sudden as the current was administered; after which the mother and child did well, and were evidently not injuriously affected by the current.

Electrical Bandages.—It will be observed that in the foregoing experiments, in Surgical cases, I used a naked copper wire, wound around and over wet bandages. There are many objections to bandages constructed in that way, especially in cases of labor. To obviate those objections I have constructed some that are beautifully flexible, in the following manner: Some pieces of sheeting were cut the length and width desired; then a metallic braid, composed of fine copper wire, gilded, (such as is used in ornamenting Masonic Regalia.) The braid is sewed side by side, the whole length of the bandage, until completely covered *on both sides*. Then a piece of copper wire is so bent as to form a loop in the middle to receive the hook, and the ends are sowed along the ends of the braids so as to connect them all. In using them I propose—after having selected the size suitable to the case—to connect the hook to the loop of the bandage; then have a wet cloth the same length, and five or six times as wide, and wrap the Metallic Bandage in the wet one, and place it around the parts and secure by pins.

Obstetrical Cases.—In cases of labor, it is proposed to have four insulated, flexible, conducting wires—two from the positive, and two from the negative end of the battery. An Electrical Bandage should be placed around each ankle of the patient, to which the negative wires must be attached a bandage around the waist, just below the breasts, and one around the neck—to both of which the positive pole must be attached. The conducting cords can be several yards long, so as to have the battery entirely out of the way on the farthest side of the room. It is presumed that the nerves of sensation can be so effectually tied by the above means (for the time being,) that the pains can be so controlled as to mitigate, if not entirely alleviate them, and that

too without interfering with the process injuriously. It is also suggested that as the nervous system has a greater affinity for an extraneous Electrical current, than the muscular; that the prevention or alleviation of pain in such cases may be effected without at all interfering with the muscular contractions; and it is also suggested that in case the contractions are not sufficiently powerful, they can at any time be increased by an increase of the Electrical current, to any amount, in shocks or otherwise, as may be needed.

Amputations.—In cases of amputation, it is deemed advisable to have two or three wires from the positive, and at least two from the negative pole of the battery; and that the bandages above the part to be operated on, (or between the part to be operated on and the brain) should be connected with the positive pole, and to the bandages immediately above and below should be attached the negative, for example: Suppose an amputation is desirable just below the knee joint, an Electrical Bandage should be placed above the ankle, another just above the knee, to both of which the negative wires should be attached; then a bandage should be placed on the thigh, near the body; one around the lower part of the body, and one at the waist, and if needed one around the neck, to all of which the positive pole should be attached; all being ready, a gentle current should be generated, commencing slowly and increasing gradually, until the point is reached at which it becomes disagreeable to the patient, the force may then be slightly checked, and a steady current kept up for five or six minutes, when the operation may commence, and if at any time during the operation pain should be exhibited, the current can be increased so as to give immediate relief. It is recommended that in all Surgical cases an interrupted current be used, such as is generated from Davis & Kidder's Magneto Electric Machines.

N. B.—When the limb is separated, it is suggested that the wire should be taken from the ankle, and attached to the knee while the operation is finished.

Theory of Operation.—It has been fully demonstrated by Du Bois, Reymond, Matteucci, and other celebrated writers on animal electricity, that every muscle and every fibre of muscle, of every living thing, possesses electrical qualities inherently, and that the nervous system also possesses an electro motive force; hence is a good conductor of electricity, and I certainly think it will not be assuming too much to assert,

that the very art of conveying sensation from the seat of pain to the sensorium, is as much of an electrical phenomena as the passage of a message on the telegraphic wires. I would refer to the above named authors for proof of the correctness of the positions I have here taken.

Assuming, then, from the foregoing premises, that the nerves of the human system are good conductors of an extraneous electrical current, let us bear in mind that they (the nerves) operate but in one direction, viz: from the extremities to the center of sensation, the brain. Now let us suppose that the polarity or force of the nervous fluid is equal in power to a battery composed of six cups. Then suppose an extraneous current from a battery of twelve cups is introduced into the nerve, in a contrary direction to its usual course of action; will it not be apparent that as size is a measure of power throughout nature, that the extraneous current being the stronger, the nerve will be incapacitated to convey sensation? This seems to me to be the true philosophy of the Anæsthetic property of electricity. I am not tenacious of this view of the matter, for I know that theory is not my forte. I also know by experience that to be successful as a local Anæsthetic, the current *must* be sent in a contrary direction to the normal action of the nerve; and when so sent I believe it has the effect of disarranging, depolarizing or reversing the operation of the nervous force. All I aim at on the present occasion, is to act as pioneer in placing this new fact in science before the world, leaving it to abler minds to work out the problem, and give a scientific disquisition as to its mode of operation. I can not close this portion of my subject without a quotation or two from that celebrated writer on Animal Electricity Matteucci, the more especially as they seem to confirm the views I have set forth.

On page 279 of Matteucci's Lectures by Pereira, it is recorded, among other experiments, on living animals, that "all animals having a certain degree of development, possess organs by which they are enabled to influence their muscles, and by the intervention of which they perceive external actions. These organs constitute the cerebro-spinal nervous system, which is principally composed of an infinite number of ramifications, disseminated throughout the body of the animal, and uniting in a central mass, constituted by the brain and spinal marrow. If we divide one of these ramifications in a living animal, and afterwards touch, with either a red hot iron or potash, or wound with a needle, or pull with pincers, the portion which remains

in communication with the cerebro-spinal axis, the animal manifests evident signs of pain, but if we apply these irritants below the section or ligature of the nerve, no signs of pain are exhibited, and we perceive merely contractions in the muscles to which the irritated nerve is distributed. If we excite the uninjured nerve, both pain and contraction simultaneously occur. Lastly, if *we tie the nerve, in two places, and then irritate the part included between the two ligatures, we produce neither pain nor contraction.* The nerve, then, has no other office than that of transmitting and propagating the action of the stimulant applied to it. This double action consists in a sensation carried to the brain, and in a muscular contraction communicated to the muscles."

This experiment of Matteucci confirms the theory of my discovery, for local Anæsthesia, in Surgical operations only, instead of tying the nerves of sensation with the ligatures. I tie the *nerves* and *muscles* too, with powerful Electrical Bandages, composed of wet cloths and bands of wire, and then by passing a current of electricity through the part to be operated on, in a *contrary* direction to the usual polarity of the nerves of sensation, they become depolarized or reversed in their position; hence are unable to convey sensation, consequently the parts are paralyzed for the time being, and may be lacerated with impunity.

On page 277 of Matteucci's Lectures, it is also demonstrated that the electric current possesses the power of coagulating the serum of the blood; hence surgical operations performed under my new mode would be less liable to hemorrhage than by any other mode known to the profession at present.

DENTAL OPERATIONS—ARRANGEMENT OF BATTERY.

For Dental purposes, the Vibrating Electro Magnetic Machine is best, to be attached to a battery composed of a copper pot, holding about a quart, with a zinc cylinder; the zinc cylinder must be placed into the copper pot, then the connections should be made between the battery and machine, by means of copper wire, at the end of the machine where the magnet is situated; connect the zinc with one post, (near the magnet,) then attach the metallic rod to the post at the other end of the machine, (*same side*;) the copper pot should be connected to the other post, (near the magnet,) and the wire for the reception of the forceps must be attached to the remaining post, at the further end; then attach the forceps to the hook of the negative wire; (zinc is positive, copper negative;) make a solution of sulphate of copper, (or blue vitriol) in the proportion of $1\frac{1}{2}$ oz. of sulphate to a quart of soft water; when entirely dissolved pour into the copper pot until full. The screw that regulates the vibration of the armature should be turned down until the smallest possible amount of vibration is produced with which the machine will work. All is now ready for operation.

Extracting—Rules to be Strictly Observed.—The piston must be withdrawn from the wire cylinder, (or helix,) and the metallic rod placed in one hand of the patient, and the forceps in the other. Now pass the piston slowly into the helix until the muscles of the wrists begin to contract. You have now the measure of the susceptibility of the patient. *Notice the figure on the piston.* (My pistons are all furnished with a scale, composed of figures and spaces.) Withdraw the piston; take the forceps from the patient, and place it on the tooth; let the rod be grasped in both hands of the patient; then pass the piston in the helix until the figure is reached that was indicated in the first place; (if it is done slowly the current will approach so gently as hardly to be perceptible;) the tooth may now be removed deliberately, *the sooner the better*; and it is only when the tooth is extracted and the circuit broken, that the least disagreeable sensation is felt, (which is a slight shock.) The operator must insulate himself by wearing a silk glove on the hand that holds the forceps when extracting, unless the handles are insulated.

Extirpation of Living Nerves, or Excavation of Sensitive Cavities. When a tooth is so far decayed as to be beyond the preservative pro-

cess of filling, it is oft times deemed advisable to graft an artificial one on to the root, and if the nerve is alive, the operation under the old process of the actual cautery, or tearing out by a barbed probe, is extremely painful. This can all be avoided by the following process: Make a conductor of an old steel scaling instrument, flatten it at the end, and file a scollop there to fit the neck of the tooth; then file a flat place on opposite sides of the end of the handle, and drill a hole to receive the hook of the negative pole of the battery; insulate the conductor by a coating of shellac varnish, (*all over,*) except where it is intended to touch the tooth or the connecting hook. Forceps and all other instruments that are likely to come in contact with the lips, should be so insulated. Now to saw through a tooth with a living nerve, or to extirpate one, connect the conductor with the hook; take out the piston and start the battery; let the patient hold the rod in both hands, then place the conductor on the neck of the tooth, close to the same; pass the piston into the helix until about two-thirds as much current is produced as is usual in extracting. The operation may then commence, and if there should be any exhibition of pain the current must be increased by passing the piston further in, until sufficient is obtained, when the operation can be performed without pain. This process applies to cutting off or excising teeth. Extirpation of nerves, or excavation of sensitive cavities preparatory to filling, the operator holds the conductor in place with one hand while with the other (which need not be insulated) he is at liberty to manipulate with any kind of an instrument.

Ulcerated Teeth and Fangs.—In extracting teeth or roots, where a deposit of pus has taken place, it is well known that the pain after their removal, is oft times more severe than during the process of supuration; in such cases relief may be effectually administered by the patient retaining the rod in the hands. Place the conductor on to the hook, then withdraw the piston and place the conductor into the orifice the tooth has left; enter the piston again, and pass a gentle current for a few seconds, and the pain will vanish never to return. In cases where it is deemed advisable to use the lancet to give vent to pus, take the hook of the negative pole and wrap it in several folds of a wet cloth, and lay it above the part affected, and pass a current for a few seconds through the part, and the puss may be let out without the least pain.

Previous to extracting teeth by this process, it is essential in every case that the susceptibility of the patient be measured in the manner previously described. Still, after all due care has been exercised, cases will occur occasionally in which the operator will find he has been mistaken, and the current will prove either too strong or too weak; it will be found a good rule of practice to commence the operation of extracting very slowly, at first, until confidence is acquired by practice in this process, and if the patient should exhibit symptoms of pain, desist at once, and ascertain by enquiring the cause. If it is found that pain was felt, withdraw the piston and commence again, taking care to increase the current by passing the piston two or three degrees further in. But if the foregoing rules have been strictly observed, it will be found, nine times in ten, that the exclamation was caused by fear, not pain. It very often occurs with us, *after nearly a year's experience*, that patients will make just as much fuss as they did under the old process of extracting without an Anæsthetic, and when questioned as to why they did so, will answer, "I was afraid it would hurt!!!"

I observe it is asserted in a Report of the Committee of the Franklin Institute of Philadelphia, who were appointed to investigate the claims advanced by Dr. Francis of that City, in favor of the Electrical process for extracting teeth, that "most persons suppose there is a *shock* experienced on its application, or that it is painful to the tooth; these objections are not correct; we applied it in many cases and the pain was *considerably less* than in the ordinary way, in all except one case." Now, whether my theory of its operation is correct or not, it is quite plain to me that the positions here assumed are untenable. *I know* that by the Francis process the operation is performed under the influence of a *shock*. In the August No. of the *Dental Reporter*, it is asserted on the part of the Francis process: "It is well to have the cord or wire from the machine to the hand interrupted, but so arranged by means of a foot board that the circuit can be completed by pressure on the foot board, and that the current be *not allowed* to flow until the forceps grasp the tooth ready to be extracted, as it has been observed that the current does not paralyze the sense of pain. *When it has been applied a little length of time*, only the shock of its application, and the *immediate* loss of sensation seemed to answer the purpose completely."

I think it will be admitted that by the above quotations, the shock is disposed of. In case it is not, I will state a case that occurred in our office, a few weeks ago. A gentleman presented himself, for whom we extracted four teeth, (molars and bicuspid.) When asked how he liked the operation, he remarked, "I have had teeth pulled by electricity before, but it was not like this; the shock was so great I *thought it would knock me out of the chair.*"

One more error I must notice ere I leave this unpleasant theme. It is always unpleasant for me to be compelled to differ with friends, even when we can agree to do so. It has been asserted on the part of the Francis process, that the current does not paralyze the sense of pain when it has been applied a little length of time, &c. By referring to the experiments in Surgical cases, described in the first part of this book, it will be perceived that the *longer* the current was established previous to the incisions, the greater was the success of the operations. There are other fallacies in the claim set up for the Francis patent, that I have not time or space for, on the present occasion. But should it be deemed necessary they will be noticed as they deserve at some future opportunity.

The question has frequently been asked, will Oliver's process infringe upon the Francis patent? In my opinion decidedly no. *They are very different*; and as to the question of superiority, the profession must decide.

I can not close this article without impressing upon the minds of my readers, that in all cases where electricity is employed in order to ensure success, *conditions must* be strictly attended to.

1st, then, in preparing the battery and apparatus for use, be sure the connexions are perfect, or the current will not pass.

2d.—Each time the operator requires the use of the battery he should take the poles in his own hands to test the passage and power of the current.

3d.—Previous to extracting, the susceptibility of the patient must be accurately measured as before described, and in passing the current through the tooth the approach should be very slow; and if the patient gives signs of uneasiness, stop a few seconds and then proceed to increase until the number desired is reached; then extract the tooth carefully and slowly.

4th.—As soon as the operation is completed, take the zinc cylinder out of the solution to stop the corrosion; by that you stop everything but evaporation, and by having some solution in a vessel ready for use the deficiency can be made good as fast as it occurs.

5th.—As fast as the zinc becomes corroded it must be scraped off; it will depend of course upon how much the battery is used, as to how often it needs scraping; about once a week suffices in our practice, and we make a new solution about as often.

6th and last.—It is presumed that if the foregoing rules are observed any Dentist of ordinary capacity can, with very little practice, extract teeth quite as successfully as we do; and I have no hesitation in saying that the operation is rendered painless by us certainly 98 times in 100. Where is the Anæsthetic agent that has ever proved as uniform as this? Echo answers, "Where?" There has certainly none been as free from danger or objection as this. Experience has taught us that when teeth are extracted by the Electrical process, the hemorrhage is much less than by the old method; the parts heal more rapidly, too. Talented writers on Animal Electricity have remarked that an electrical current has a tendency to coagulate the serum of the blood.

Situation of Battery.—The most convenient place for the battery is immediately in rear of the operating chair. We have had a case constructed of wood, which answers the purpose admirably. It is of the form of a square pyramid, about 3 feet 6 inches high, with a box on top to hold the machinery. The battery stands in a dish, in the lower part; but a small stand or table will answer. The cords leading from the machine to the patient should be about 3 yards long each.

In the latter part of March, at the suggestion of friends, we got up a certificate for patients to sign, who approved of our mode of extracting teeth. It will be found in this book, under the head of Certificates.

Concluding Remarks.—As soon as it was demonstrated that the nerves of sensation could be controlled in Dental operations by a current of electricity, it became evident that the same agent could be used with advantage for the prevention of pain in Surgical operations; also to regulate and control the pains of labor, just so soon as the proper mode of its application could be developed. With this view of the matter I waited on several medical gentlemen, soliciting an opportunity of using the battery according to the plans I had devised, both in Surgical and Obstetrical cures; and incredible as it may appear, it

is nevertheless true, that although I made *repeated* applications to physicians and midwives during a period of several months, only one (Dr. Hamilton) was in a position to respond to my earnest desire, (and to him I feel grateful.) I could not find that any one of them apprehended any unpleasant or injurious results from the use of electricity as proposed. I received many promises—some direct promises of cases actually under treatment—but they were all broken. One case of an amputation of the leg, I was promised faithfully, and after dancing attendance at the office every day or two, for a period of three weeks, I found that the operation had been performed under the influence of chloroform. I met the Surgeon shortly after, and asked him why he failed to keep his promise. He replied that he could not imagine how the connection could be sustained when the limb was severed. I simply told him that I was sorry on his account—not my own—for I felt satisfied the operation would have been rendered painless by the aid of electricity; and as to breaking connection, I could so arrange the apparatus that the leg could be cut off inch by inch, and not break connection. I felt sorry for him. Another gentleman, who stands deservedly high as a practitioner in Obstetrics, promised me the first favorable case that should occur in one of our public institutions, (if it came in the day time.) He said he had lanced a felon a few days before, and would like to have tested the battery in that case. I told him I was willing to attend at any time or place, and would stake my reputation upon rendering the operation painless by the aid of the battery. I have heard nothing from him, so suppose he has not had a favorable case of Obstetrics, (in day time,) nor another case of felons.

I could mention many cases of a similar character, but it is not necessary. I merely cite these to show in a slight degree how difficult it is for a new truth to force its way into public notice.

I am aware that a Patent has been issued for Extracting Teeth by Electricity, *but can not be sustained*, for many reasons. *I have a claim in the premises*; but, independent of that, the Patent can be invalidated in any Court of Law. But, the most powerful reason why it can not be sustained is, the universal prejudice in the minds of the profession, averse to Patents. Now I am as much averse to Patents and monopolies of every description, as any one can be; notwithstanding I have obtained two Dental Patents, which so far have proved a source of expense; notwithstanding my aversion to Patents, I am in favor of

persons being remunerated who devote their time and money in perfecting an improvement in art and science that will benefit the human family; and I think the Dental Conventions will do well to consider this matter; But I think this constant outcry against Dental Patents may well be questioned, when we so often see professional men, some of them of high standing as conductors or contributors to the Dental and Scientific Journals of the day, applying for Patents when a new thought crosses their mental vision, some have been so unfortunate as to obtain an idea from a Patent already granted and by a little twisting and altering without effecting the principle involved, obtain a Patent for what really appears to be a "mares nest;" such men sometimes take an old process and christen it with an Hifalutin or Greek name and thus obtain a Patent. Oh consistency thou art indeed a jewel. There are others who when they hear of a new discovery in science or art, claim to have "done the same thing years before" but thought nothing of it; strange as these assertions may seem, they have all occurred under my own observation the past few years.

In the month of May 1858 I was in New York City, and my attention was called to an advertisement of the exhibition of a new process of extracting teeth, at a house in Bond street; inviting Dentists to be present: I attended there, and found some fifteen or twenty Dentists assembled. I was introduced to them, and enquired if the gent was present who claimed to discover the process; I was told no, he had either gone or was going to California, I expressed my regret and claimed to be the discoverer of the very process they were there to witness. I was then introduced to Dr. Clark, who, I was told had bought the whole interest in the discovery of extracting by electricity, of the reputed discoverer Dr. Francis. I proposed a conference with him, with a view of comparing dates and thus decide the question of priority, promising that, if I discovered he had any claims to respect them, presuming that it was possible the discovery had been made in two places simultaneously. He refused to confer with me, but referred me to his Lawyer, I then asked him if it had been applied to surgical cases, he replied he believed it had been in one case, but was a perfect failure, and was not supposed to be applicable to anything but extracting teeth, I then showed several certificates testifying to its usefulness in surgical operations; one of which by request was read to the gentlemen assembled, proving beyond the possibility of a doubt that as far

as surgical operations were concerned that I was certainly entitled to priority. I claim priority in respect to extracting teeth by electricity, on the grounds that we had the battery in operation in our office *publicly* for several weeks previous to the first of February, when I filed a caveat in the Patent office, and in March I heard of its being in use in several of the eastern cities, such a thing could not be kept quiet long in those days of telegraphic facilities, again it is a maxim with me, that truth and right do not, nor cannot suffer by investigation, and the fact that Dr. Clark refused to compare dates with me justifies me, I think, in the position I have assumed as being the discoverer of the electrical Anæsthesia; notwithstanding we have nearly a years experience, still I do not assume that the best mode of its application has been devised, by no means; and would respectfully suggest that as fast as improvements are made in this respect, that they be forwarded to me to be embodied in another edition of this subject, which will probably be needed in a short time; such improvements will be duly credited to their authors; it is presumed that the directions embodied in this work are sufficient to enable any Professional man to apply this new agent successfully, but if not, any question appertaining to this subject will be cheerfully answered by letter, if accompanied by a return stamp. In compiling these pages I have endeavored to be brief I could have said much more. I do not see how I could have said less, in justice to the subject.

THIS IS TO CERTIFY, that I was a constant attendant at the office of W. G. & F. Oliver, during the month of March, 1858, and assisted in the operation of extracting teeth by W. G. Oliver's new method: I worked the battery nearly the whole of said month, so had a good opportunity of judging of its merits, and desire to testify to the efficiency of the process, by stating that it far surpasses any other Anæsthesia that I am acquainted with, for it is perfectly harmless, and does not seem to interfere with the functions of the brain.

WALTER KING.

Witness, FREDRICK OLIVER.

Buffalo, New York, April 22d, 1858.

THIS IS TO CERTIFY, that on Wednesday the 17th of February, 1858, before the Clinique of the Buffalo Medical College I witnessed an operation performed by Dr. Frank Hamilton, called a plastic operation, on the leg of a man, in which the knife was used freely, both on healthy and diseased flesh, and which operation was rendered painless by the application of Oliver's new Anæsthesia Electro Magneticism, as applied by Dr. Oliver himself, on this occasion.

Buffalo, February 18th, 1858.

H. D. LACOSSITT, M. D., from Mercer County, Pa.

S. RANKIN, M. D., Buffalo, N. Y.

W. C. ADAMS, D. D. S., of Toronto, C. W.

Witness, FREDRICK OLIVER.

Buffalo, May 26th, 1858.

In the latter part of February or the beginning of March, 1858, I witnessed at the Buffalo Medical College an amputation of part of the hand of a youth, about nineteen years old. W. G. Oliver's application of Electricity was used on that occasion with perfect success, in as much as the hand was very highly inflamed, and swollen to three or four times its natural size, and the bone was also diseased and exceedingly sensitive, under ordinary circumstances the operation I know would have been severely painful, whereas, it was evident to me that this patient did not suffer any pain.

FREDRICK OLIVER, M. D.

Witness, J. S. SCHOLFIELD.

February 17th, 1858.

I witnessed at the hospital Prof. Hamilton's new operation for the cure of old ulcers, termed Elkoplasty. It consists in removing the diseased parts of the sore, and fitting into it a flap of integument and muscle from the sound limb, still adhering to it by a pedicle, until the flap has become attached, when it is cut off, thus the flap grows in and occupies the place of the ulcer, and the limb is well.

The operation is necessarily quite severe, but in this case the patient gave little evidence of suffering, a current of electricity was kept constantly passing through the limb, according to the method of Mr. W. G. Oliver, and under his immediate supervision, to which in great

degree it is probable that the patient owes his immunity from severe pain.

BENJ. H. LEMON, M. D.

Witness, W. G. OLIVER.

Buffalo, New York, May 28th, 1858.

THIS IS TO CERTIFY, that on the 17th, of February, 1858, an operation was performed on me at the public hospital in Buffalo, in which operation an ulcer of eighteen months standing on the front part of my left leg was cut out, having a space of diseased flesh of about five inches long by about three inches broad; a piece of flesh corresponding in size and shape to the ulcer, was cut out of the calf of my right leg and inserted into the orifice made by the extirpation of the ulcer, and although it was deemed necessary by the operator to pour scalding water on to the newly cut healthy flesh to stop the bleeding; still the whole operation was performed without pain, by the aid of Dr. Oliver's new mode of applying electricity; I was conscious during the operation, and believed that no part of my system was affected by the electric current, other than the part operated on, I have felt no ill effect from its use since.

THOMAS LEONARD.

Witness, W. G. OLIVER.

Buffalo, N. Y., March 27th, 1858.

The undersigned citizens of Buffalo, in the State of New York, hereby certify, and each for himself certifies, that he has had one or more teeth extracted by Dr. William G. Oliver's new method of extracting teeth by the use of Electricity, and that the operation was entirely free from pain. And I also certify that I was fully conscious during the operation and that my brain was wholly unaffected thereby.

I believe that insensibility was produced in no part of my system except in the locality of the tooth. I experienced no ill effect whatever from the operation so far as I know, and believe it to be a great and valuable discovery.

To which was appendid one hundred and thirty three names, showing that two hundred and sixty teeth were extracted during a period of forty days.

A Battery, complete for Dental purposes, will be furnished for \$12. The scale that accompanies each book is intended for the Piston.

This is to certify that on the 11th of June 1858
 an operation was performed on me at the Hospital in London, in which
 operation a large cyst containing matter was removed from the
 left leg, was cut out, and the matter of the cyst was
 removed by about 1 1/2 inches broad; a hole of the corresponding
 in size and shape to the ulcer was cut out of the cut in my right leg
 and inserted into the ulcer in the left leg, the operation of the ulcer and
 although it was done I was very much surprised to find that the
 wound on the right leg healed very much more rapidly than the
 whole operation was performed with a knife, by the hand of Mr. Oliver's
 new mode of applying electricity; I was conscious during the opera-
 tion and believed that no part of my system was affected by the
 electric current other than the part operated on, I have felt no ill effect
 from its use since.

THOMAS LEONARD
 Witness W. A. OLIVER

London, 21 March 1858.
 The following statement of the result of the operation of the 11th of June 1858
 is given, and each for himself, stating that he has had one or more teeth
 extracted by Mr. William C. Oliver's new method of extracting teeth
 by the use of the electric current, and that the operation was entirely free from
 pain. (The patient states that I was fully conversant with the operation
 and the result was wholly unobscured thereby.)
 I do not think it possible that any part of my system
 except in the vicinity of the tooth, I experienced no ill effect what-
 ever from the operation on either my head, and believe it to be a great
 and valuable discovery.
 As when a large tooth was pulled out and that three times shown
 that two hundred and sixty teeth were extracted during a period of
 thirty days.
 A further certificate for dental purposes will be furnished for \$15.
 The state that accompanies each book is intended for the patient.