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## CONTENTS.

### ORIGINAL COMMUNICATIONS.

Ununited Fracture.....	49
The Prophylaxis and Treatment of Puerperal Eclampsia.....	53

### SOCIETY PROCEEDINGS.

Abstract of the Proceedings of the Third Annual Meeting of the American Electro-Therapeutic Association—(Continued).....	57
The Nutritional Effects of Static Electricity Considered in Relation to High Frequency and High Potential Currents, and the Transparency of the Dielectric.....	57
Electro-Medical Eccentricities.....	58
The Action of the Continuous Current within Living Tissues as Distinguished from the local Polar Action.....	59
Observations on the Treatment of Goitre.....	59
Case of Ascites Cured by Galvanism. Metallic Electrolysis.....	60
Some Observations on the Fine Wire Coil or Current of Tension.....	62
The Influence of Frequency of Inter-	

ruptions and Character of Induced Current Waves upon the Physiological Effect.....	62
Induction Coils.....	62
Remarks upon Apparatus to produce Induction Currents and the Character of the Waves of Individual Apparatus, with especial reference to those applicable to Medical Uses.....	
The Graphic Study of Electrical Currents in Relation to Therapeutics. In Medical Induction Coils, how does the Current of the Primary differ from that of the Secondary; and what Influence has this difference upon the respective Physiological Effects.....	63
A Study of Electrical-Anaesthesia and Frequency of Induction Vibration.....	64
On the Influence of Frequency and the Graphic Curve on the Results of Gynaecological Electro-Therapeutics, particularly with the Sinusoidal Current.....	64
The Alternating Current in Electro-Therapeutics.....	64
The Treatment of Dysmenorrhœa by the Galvanic Current.....	65

The Treatment of Subinvolution by Electricity.....	66
A New Intra-Uterine Electrode.....	66
A Contribution to Electro-Therapeutics in Salpingitis.....	67
What are the Possibilities of Electricity in the Treatment of Fibroid Growths.....	67
Improvements in Electro-Static or Influence Machines.....	68
Faradization as it was and as it is with the Controllable and Recordable Current, as provided by a New Apparatus.....	69

### EDITORIAL.

The Causes of Rheumatism.....	70
Imperial Honors for the Canadian Medical Profession.....	71
Thyroid Glands as Medicine.....	72

### BOOK NOTICES.

Le Médecin de la Famille.....	72
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## Original Communications.

### UNUNITED FRACTURE.

By LLEWELLYN ELIOT, A.M., M.D., *President of the Medical Association of the District of Columbia, Surgeon to the Eastern Dispensary, Consultant to St. Ann's Infant Asylum, etc., Washington, D. C.\**

It is with much hesitation I appear before such an august and critical assemblage of surgeons as are gathered here, for I feel nothing I may say will appear new to the majority of you.

The subject—Ununited Fracture, Delayed Union, Pseudarthrosis—has received attention at the hands of writers on Surgery from the earliest time, and engaged the attention of the best and ablest surgeons. To follow its literature would be an almost endless task, and to

review, in detail, the various methods of treatment would occupy much more time than I desire to consume. According to writers on Surgery, firm union between the fractured ends of a bone may sometimes be delayed beyond five or six weeks, the period of time usually required for their repair. This condition constitutes what is termed non-union, ununited fracture or pseudarthrosis. This delayed firm union may be temporary or permanent, it may correct itself or it may require the intervention of the surgeon. The character of the union in these cases is of a fibrous or ligamentous nature, or is a proliferation of brittle callus.

The causes of this non-union are divided into two classes,—those of a constitutional character and those of a local character. Among the constitutional are hæmorrhage, scorbutus, diarrhoeal diseases, excessive lactation, pregnancy, shock, any state of the system attended by a diminution of the vitality of the patient. The reparative

\*Read at the Section of Surgery, First Pan-American Medical Congress, Washington, D.C., September, 1893.

process itself may be at fault, since the callus thrown out about the fractured ends may be so proliferative that it softens and dissolves before it has performed its part in the repair, or it may become so brittle as to be useless. Old age, cancer, paralysis, rheumatism and syphilis are passive and *not* active constitutional causes, although the contrary is strongly asserted. As local causes we enumerate: the interposition of a foreign body between the ends, such as a piece of muscle, tendon or clothing, the destruction of the blood supply of the bone, improper adjustment of fragments, defectively applied fixation apparatus, where the fragments are not held in a proper position, but are movable. More cases occur in hospital practice than formerly, as the hospital internes are allowed greater liberty in the treatment of fractures to-day than they were accorded some years ago.

There should be no difficulty in the diagnosis of cases of non-union after fractures. The condition, as a rule, is apparent.

The treatment of cases of ununited fracture must be in accord with the cause of the delay. Iron for the anæmic, iodide of potash and the salicylates for the rheumatic, mercury for the syphilitic constitute our remedies for those cases which depend upon some fault of the system. But even with this course, many patients become tired and discouraged at the delay, and demand that more active measures be adopted. It is then that rubbing the ends together, injections of irritants, introduction of setons, caustics and pins, resection of the ends of the bone, bone grafting, wiring, and finally amputation of the member must be considered. One or more of these methods may be adopted; of course it is to be understood, any faulty position must be corrected. The history of these various procedures is entirely out of place in a practical paper, and then, again, you are all familiar with them. The best method, so

far as my limited experience goes to show, is that of resection, resection with wiring of the freshened ends of the bone. After the operation I encourage free suppuration, believing the bone which results will be firmer and more permanent, since, as Wyeth has written: "If the broken ends do not come in contact with the air—that is, if the fracture is not *compound*—the process of repair in bone after an injury is similar to the physiological process of development of this tissue—name'y, the embryonic tissue is developed into cartilage-cells, and these, undergoing proliferation, develop into a secondary embryonic tissue, which is formed directly into bone. If, however air is admitted to a wound in bone, the process of ossification in the embryonic tissue is more rapid and direct, since the intermediate stage of cartilage-cell formation does not occur."

Repair begins in adult subjects generally about the tenth day, the callus is solid from the fifteenth to the thirtieth days, and is absorbed by the sixtieth day.

I have seen four cases of ununited fracture during the last twenty years; in two success followed resecting the ends and wiring, one died from shock following amputation of the thigh, and the fourth would not consent to any operative treatment, and has a perfect pseudarthrosis of the lower third of the thigh, without disability, but a shortening of about two inches.

CASE I. B. S. P.—White, adult. Was first seen and treated for secondary syphilis. Further examination revealed the presence of a pseudarthrosis of the right humerus at the upper-third, of several years duration. The arm was perfectly useless to him, hanging flail-like by his side, so when an operation, looking to its improvement, was proposed to him, it was gladly accepted. Under a mixed anæsthesia of chloroform and ether, an incision three inches long was made along the outer aspect of the arm, the bone exposed, and the ends found to

be bound together with strong fibrous bands. The fracture had been oblique, the lower end was resting high up on the latter and on the inner side. Dividing the ligamentous bands, the periosteum was pushed out of the way and the ends of the bone freshened, about half-an-inch being taken from each end. The freshened ends were pierced with strong silver wire, and tied tightly, the ends of the bone having been brought into exact apposition and the periosteum drawn down. The wound was allowed to heal by granulation. In four weeks the bone was united, and in six months he was dismissed from treatment. At the expiration of two years, the wires had worked their way to the surface and were removed, the arm at that time being strong and of equal size as the other.

CASE 2. W. H. R.—White, adult. Sustained a double fracture (simple) of the right femur. After months of treatment, he came under the care of one of the most distinguished surgeons of the District of Columbia, in a frightfully debilitated condition. A fracture just about the junction of the middle and lower thirds, and another nearly midway of the lower third, allowed the intervening fragment to remain loose. After consultation, wiring was considered, but the lower end of the bone was so unhealthy that amputation was done at the upper third.

Case 3. P. M.—White, aged 25 years, blacksmith, of good muscular development. History of syphilis contracted about two years previously, at which time he was circumcised under cocaine anæsthesia. Was treated at irregular intervals with the protiodide of mercury, stopping treatment when the eruption had become dried. Has been a very hard drinker of whiskey for the past twelve years. On May 28th, 1892, while under the influence of alcohol, he boarded the engine of an express train; after riding a few blocks, about a quarter of a mile, he jumped off,

thereby sustaining a comminuted fracture of the right tibia and fibula. He was carried to hospital in the police patrol. After being made comfortable for the night, the next morning an extension apparatus with weights was applied, and retained on the leg for twelve days, when a plaster of Paris bandage was substituted, the weight extension being continued. This bandage was allowed to remain on the limb for one month, when it was removed and another applied. At the end of six weeks he was allowed to get out of bed and walk about the ward on crutches. On July 26th the plaster bandage was removed, and he was discharged as cured. During his stay in hospital he was treated for syphilis with iodide of potassium. He now came under my care; was impatient, and wanted something done for him. After attempting to set up an inflammation by rubbing the fragments together, I determined upon resection and wiring. Having been given a soap bath and his leg shaved, this was done on August 5th, at half-past-six in the morning, Drs. T. M. Vincent, J. V. Carraher and R. A. Neale assisting. The anæsthesia was begun with chloroform, but as he took it so badly, ether was substituted. An incision extending downwards from the promontory of the tibia to very near the end of the bone was made; this was supplemented by a T incision over the seat of non-union, the bones separated from their muscular attachments, and the following condition found: a fracture at the middle of the tibia, united; a fracture half an inch below this, united; a long fracture starting from the internal angle of this last fracture and extending down at an angle of about 75°, united by fibre; in the lower fragment the bone had been split for an inch. The fibula had been shattered, but had united in all its fragments with much shortening. Each fragment of the ununited portions of the tibia was resected obliquely, an inch-

and-a-half of bone being removed; with a jeweller's drill each freshened end was perforated in two places and wire passed through the perforations, drawing the ends together, the wires were twisted, the ends pressed well down upon the bone and the periosteum drawn over them. Eleven sutures were required to close the wound, a drainage tube introduced at the angle of the wound and an iodoform dressing applied. The leg was then placed in a fracture box with bran supports. Given morphia sulphate gr.  $\frac{1}{4}$ . Reaction from the anæsthesia good. 7 p.m., temp.  $101\frac{1}{2}^{\circ}$ ; pulse 120. Has vomited several times; has not eaten anything; given whiskey at intervals; pain along tibial nerve severe; morphia sulphate gr.  $\frac{1}{4}$  every two hours if necessary.

August 6th, 10.15 a.m., temp.  $100\frac{1}{2}^{\circ}$ ; pulse 96; slept very little during the night, as muscular contractions were very painful and annoying; morphia sulphate gr.  $\frac{1}{4}$  as necessary.

August 7th, 11 a.m., temp.  $100\frac{1}{2}^{\circ}$ ; pulse 96; slept during the night; feels comfortable; wound is discharging at angle over the wires, other parts look well; washed with a solution of carbolic acid and dressed with iodoform.

August 8th, 7.30 p. m., temp.  $102\frac{1}{2}^{\circ}$ ; pulse 120; wound at angle is discharging very freely around and through drainage tube; tube taken out, wound washed with carbolized water and dressed with iodoform; given bromide of potassium and chloral hydrate; muscular contractions not so severe; has eaten nothing since the operation; milk punch continued.

August 9th, 12 m., temp.  $100\frac{1}{2}^{\circ}$ ; pulse 112; feels comfortable; has eaten chicken broth and toasted bread; wound discharging freely.

August 10th, 11 a. m., temp.  $100^{\circ}$ ; pulse 100; suppuration free; has pain and jerking in leg; dressed with carbolized water and iodoform.

August 11th, 12 m., temp.  $99\ 2-5^{\circ}$ ; pulse 96; suture at angle taken out to allow freer drainage; iodoform dressing; batting changed; morphia sulphate and chloral hydrate as necessary.

August 12th, 11 a. m., temp.  $100\ 1-5^{\circ}$ ; pulse 112; delirious during the night, attempted to get out of bed; suppuration free; took out sutures, wound at upper portion healing, leaving the T incision open, felt bones of leg jump; sulphate of magnesia.

August 13th, 12 m., temp.  $100\ 1-5^{\circ}$ ; pulse 112; slight pains in leg.

August 14th, 11.15 a.m., temp.  $99\ 3-5^{\circ}$ ; pulse 96; feels comfortable; felt bones jump during the night, pads changed, suppuration free.

August 16th, 10 a. m., temp.  $99\ 4-5^{\circ}$ ; pulse 90; feels well, except little sickness at stomach; bones give him the sensation he had when they were uniting, dressed with carbolized water and iodoform; laxative.

August 18th, a. m., temp.  $98\ 4-5^{\circ}$ ; pulse 88; has malarial symptoms. R. quinine sulphate gr. ii every three hours.

August 22nd, temp.  $98\ 3-5^{\circ}$ ; pulse 88; bones uniting.

August, 24th temp.  $99\ 3-5^{\circ}$ ; pulse 90; doing well, bedding changed.

September 12th, abscess at upper extremity of incision incised, and a large amount of clean, healthy pus evacuated.

September 18th; doing well, no discharge, wound healed, wires cannot be felt.

September 26th; put on posterior tin splint with foot piece, allowed to get out of bed and go about his room on crutches.

October 9th; dressing removed, tin splint re-applied with silicate of potash bandage; allowed to go about at will on crutches.

October 20th; new silicate of potash bandage applied, can lift leg without pain or strain when no bandage is on it. In

January went to work at horse-shoeing, wound up with a heavy sprec and hard fight, was thrown down and dragged about the room, felt no bad effects in the leg, union perfect.

February 16th; leg still doing well wears the last bandage. Has secondary syphilitic symptoms; given hydrarg. protiodide gr.  $\frac{1}{4}$  every four hours.

February 26th; bubo incised; continue pills.

July 4th; bandage taken off, wires still in the bones, leg perfectly strong, can do as good a day's work at horse-shoeing as before injury. He wears a shoe that prevents any limping.

Cases 1 and 3 prove to me syphilis is not a cause of non-union, and that the bony union following free suppuration is stronger and more permanent than that following the closed method of treating these cases.

#### THE PROPHYLAXIS AND TREATMENT OF PUERPERAL ECLAMPSIA.

By GEORGE T. MCKEOUGH, M.D., M.R.C.S. Eng., L.R.C.P. Edin., F.O.S. Lond., Chatham, Ont.\*

In selecting the subject of Puerperal Albuminuria and Eclampsia for a short paper before this Society, I scarcely think any apology necessary, as no subject can have greater interest or be of more supreme importance to the obstetric physician.

The suddenness, frequently of its onset, its grave character, the conflicting opinions still held both as regards the pathology and the treatment of the complication, render it a subject peculiarly fit for a profitable and instructive interchange of opinions.

First, regarding the prophylactic treatment of eclampsia. In many cases, unfortunately, we have not an opportunity to advise or adopt any preventive measures,

as we may find our patient in convulsions at our first visit, the attack occurring unexpectedly and without warning. This, however, is not always the case, and we are either consulted by a pregnant woman in reference to symptoms which suggest an examination of her urine, or we are simply informed our patient is *enccinte*, and the management of her case left in our hands. Frequent examinations of her urine should thus become imperative, especially should this be attended to in primipara, as seven-eighths of the cases of eclampsia occur in first pregnancy. (Goldberg, *British Med. Journal*, July, 1892.)

Observers differ as to the percentage of albuminous urine in pregnant women. Galabin, at Guy's Hospital Charity, found only 2 p. c. with the ordinary tests of heat and nitric acid; on the other hand, some French observers have found from 14 to 20 p. c. In these last observations the amount discovered in most cases was very small, and only with very delicate tests, and was possibly due in some instances to cystitis or gonorrhœa. From my own observations, however, among French Canadian women, I believe they are more susceptible to this complication than women of other races.

The conditions, however, that produce albuminuria during pregnancy may not in every instance induce eclampsia, and some pregnant and parturient women may have albumen in their urine without having convulsions. Still, if albumen be found in any quantity, and persists, the patient cannot be too carefully watched and instructed.

The diet should be strictly regulated: if the patient can be persuaded to limit it to milk or buttermilk, it will be advisable to do so; otherwise, barley water, oatmeal gruel, arrowroot, chicken broth, etc., may be allowed. The patient should be warmly clothed, and especially warned to avoid chills and draughts. In my own

\* Read before the Canadian Medical Association, London, Ont., Sept. 21st, 1893.

practice convulsions occurred in one case, and grave nervous prodromata in another, after taking a cold bath—in neither case were there any symptoms previous to the bath sufficiently alarming to cause the patient to consult a physician. The emunctories, especially the bowels and skin, should be fully acted upon. For the bowels, Rochelle or Epsom salts, Pulv. Jalapae Co., Bicarb of Potash or Elaterium, are deservedly favorite laxatives. The kidneys can be flushed as well with pure water, or some of the innumerable mineral waters, as with other more powerful diuretics. For the skin there is no other remedy probably as good as the warm bath so highly recommended by the German obstetricians. When possible and convenient, the following method, described by Dr. Earle of Chicago (*Amer. Jour. Obst.*, Vol. 22, 1889, page 853), and known as the Vienna method, is excellent:

“The patient is placed in a bath tub filled with water slightly above 99°F. The tub is covered with a heavy blanket, leaving the face free, and the temperature of the water gradually elevated to 110°F. or 112°F. The patient remains in the bath tub from 20 to 30 minutes. A towel wrung out of ice water and placed upon the head relieves any distressing cephalic sensation. While in the bath, the patient drinks large quantities of water. Upon emerging from the bath she is covered with a warm sheet and enveloped in an upper and lower layer of thick blankets, so that only the face is exposed. Within a very few minutes free perspiration is observed. The sweating is continued for two or three hours, according to the gravity of the case; the bath may be repeated once daily for an indefinite period.”

When it is not possible to carry out this plan of inducing sweating, the ordinary hot vapor bath can always be extemporized, and answers very well.

If, notwithstanding these efforts carefully

and assiduously carried out, the quantity of albumen remains large, persists or increases in quantity, the proportion of urea diminishes with or without œdema, with or without nervous symptoms, the induction of premature labor should unhesitatingly be resorted to, especially if the pregnancy has advanced to or beyond the seventh month. The cause of the albuminuria is undoubtedly the pregnancy,—by ending the cause, the effect is soon relieved.

In the practice of my partner, Dr. Holmes, and myself, we have induced labor in nine (9) cases of albuminuria of pregnancy, after first adopting the means related without amelioration of threatening symptoms; in all cases the child was born alive and the mothers made good recoveries.

Labor was induced by means of an aseptic gum elastic catheter usually prostatic on account of its length, gently inserted between the membranes and uterine walls posteriorly, well up to the fundus; uterine contractions will be accelerated and labor terminated much more speedily by the injection of glycerine.

When pains become established, labor may be hastened by rupturing the membranes. If convulsions seem imminent, dilatation of the cervix may be assisted by the fingers or Barne's bags.

About an hour previous to the introduction of the catheter a full dose of chloral is usually administered for the joint purpose of relaxing the os uteri and allaying nervous irritation. The patient is afterwards carefully watched, and if headache is complained of, or other nervous symptoms observed, chloral or chloroform is administered.

But despite preventive measures, eclampsia may occur, or, what more frequently happens, the first introduction to the patient finds her in convulsions.

In treating eclampsia, three important factors in its etiology should be remem-

bered. The first is the exalted nervous and vascular tension peculiar to pregnancy; the second is that some noxious material, whether the result of a kidney lesion or the toxine product of some pathogenic microbe, or some other cause, as yet to be demonstrated, is retained and circulates in the blood. Dr. Anvard expresses it aptly when he says that eclampsia is the result of a strike on the part of the organs of elimination; the third is the ultimate cause of the complication,—the presence of the child in utero. The therapeutics of eclampsia are therefore reduced to the following indications: sedation, elimination, and the evacuation of the uterus. The patient should be quieted as soon as possible. Have the light in the room subdued, the surroundings calm, take the precaution to protect the woman's tongue by inserting a soft gag, or have one ready for immediate use. Then put her immediately under the influence of chloroform. This should be done before any attempt is made to draw off the urine, to introduce the finger into the vagina, or to administer any medicine, as the slightest irritation in the highly sensitive condition of the nervous system may precipitate another convulsion.

Besides quieting the patient and allaying the fears of excited and anxious friends, you have, while administering the anæsthetic, a few moments for quiet reflection, which in the face of probably an unexpected exigency may be desirable. Small quantities of chloroform usually suffice to produce the desired effect and ward off the threatening fit.

As soon as the patient is resting comfortably, the sedative action of the chloroform should be assisted and maintained by chloral or morphine; the latter drug is more easily administered and acts more promptly, and obstetric literature during the past few years is replete with favorable reports. Dr. Fry (*Amer. Jour. of*

*Obst.*, Vol. 21, 1888, page 536) says: "In the treatment of puerperal eclampsia we have as palliatives, chloroform, chloral, potassium bromide and morphine. Of these, morphine administered hypodermically is by far the best and most reliable. Dr. Washburn (*Med. News*, Vol. 59, page 29) highly extols the virtues of morphine in all forms of anæmic poisoning. It is unnecessary to mention other favorable experiences with morphine, as most physicians have had more or less experience with it. From my own personal use of the two drugs, morphine in eight cases, chloral in six cases, and morphine and chloral together in six cases, I prefer chloral in most instances. The action of morphine upon the kidneys is disputed, some authorities asserting that it increases the flow of urine. Stephen McKenzie's *Lancet*, vol. 2, 1891, page 209, reports a case of chronic uræmia, in which morphine not only relieved the distressing symptoms but largely increased the flow of urine. Others again believe that it usually diminishes the flow. But whatever its action on the kidneys, morphine certainly constipates the bowels and interferes with the rapid action of the hydrogogue cathartic, which is highly essential in the successful treatment of most cases of eclampsia. If morphine is preferred for any reason, do not make the mistake that I unfortunately did once some years ago, of injecting a dissolved triturate of morphine and atropine. The atropine, by reason of its action on the skin, is contra-indicated. If the patient is comatose or unable to swallow, the chloral may be given by enema, or by inserting a long soft rubber catheter or tube through the nose or mouth into the œsophagus, and injecting it through the catheter into the stomach, using due care to see that the tube is some distance into the œsophagus, and have the patient slightly elevated.

The sedatives having been administered, our attention should now be directed to



elimination. This is equally important as the first indication of treatment. The bowels should be freely, very freely, moved; this is not only the best portal for carrying off excrementitious material in the blood, but by bleeding the patient moderately as it were into her own intestines, vascular tension is lowered as well as the excessive action of the heart. Rochelle salts or salicylate of magnesia, on account of their rapid hydragogue action, are most useful. It can be introduced into the stomach, if necessary, in a way similar to the chloral. Besides the bowels, the skin should be made to secrete freely. This can readily be accomplished by abundant covering and artificial heat placed about the body of the patient.

These means can be assisted by the action of pilocarpine, in cases when the coma is not profound, in doses of  $\frac{1}{16}$  to  $\frac{1}{4}$  hypodermically every two, four or six hours, according to its action on the skin.

The patient quieted, and under the influence of the anæsthetics, the purgative administered, the skin secreting freely, proceed to terminate labor as speedily as possible consistent with safety to mother and child.

Early in the stage of pregnancy, before the cervix is effaced and the os undilatable, a catheter is introduced (as previously referred to). Puncturing the membranes if possible will accelerate labor, and the escape of the liquor amnii is not uncommonly followed by cessation of the convulsions. Dilatation of the os may be expedited by the fingers or Barne's bags, and delivery hastened and completed by the forceps or turning and extraction.

Special care should be taken that all interferences should be done upon strictly aseptic principles.

Efforts must not cease as soon as delivery is accomplished, the patient should still be carefully watched, and all nervous symptoms allayed with chloroform and

chloral. The bowels should still be kept open, and the skin secreting until the kidneys act freely and the albumen markedly diminishes in quantity.

If the procedures thus indicated are persisted in, the physician will be rewarded in most cases by the recovery of his patient. But if, in spite of chloroform, chloral, morphine and elimination the convulsions continue, the question of venesection may arise, and its value is probably one of the most unsettled questions in the treatment of eclampsia. It is one of the oldest remedies, and is still relied upon by many as one of the most efficacious means to control convulsions.

Dr. Swayne of Bristol (*British Med. Jour.*, Sept., '91) gives a record of 36 cases of puerperal eclampsia, in 24 of which bleeding was used, and in 18 it was decidedly beneficial. Barnes says: "It is not wise to make venesection a rule in practice, but the empirical evidence in its favor in appropriate cases is incontestable; nothing so quickly lowers the excessive action of the heart."

Many others publish good results, but the weight of authority, I think, is opposed to venesection.

At Guy's Hospital, in the last 50 cases in which venesection was used the mortality was 30 per cent. In 34 cases since, it has been 20½ per cent. Kucher, of the Vienna School, where the results have been very good, says that blood-letting has been completely discarded. In Schroeder's clinic, bleeding is not now practised. Winckel is also opposed to blood-letting. In my own cases I have resorted to bleeding in three instances in large amounts, 30 to 40 oz., when other means were apparently failing to control the convulsions, with the result of stopping the convulsions, but losing my patient in each instance. From what I can gather from my reading, from statistics and my own experience, I believe better results would be

obtained in these cases by persistingly carrying out the indications I have endeavored to lay down in this paper.

But there is a class of cases one meets with usually in strong and plethoric subjects; the patient has had one or more convulsions, is probably comatose, there is great venous congestion, the veins of the neck are turgid, the lips purplish, the face bloated and suffused; there is much embarrassment of respiration, when it always seems to me reasonable and good practice to extract a moderate amount of blood; and when I have resorted to it, the symptoms have improved, the color of the face becomes more natural, the respirations easier, and the general condition of the patient more favorable; perhaps also a brain lesion is prevented, absorption favored, and the action of other remedies assisted.

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## Society Proceedings.

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### ABSTRACT OF THE PROCEEDINGS OF THE THIRD ANNUAL MEETING OF THE AMERICAN ELECTRO-THER- APEUTIC ASSOCIATION.

HELD IN CHICAGO, SEPTEMBER 12, 13 AND 14,  
1893.

AUGUSTIN H. GOELET, M.D., *President.*

FIRST DAY—SEPTEMBER 12TH.

AFTERNOON SESSION—*Continued.*

The fixation of the tumor may be accomplished with the help of an instrument called the vesical tenaculum caché, and this instrument can be used as a guide to the introduction of the electrode. With this method a cannulated platinum needle is employed, which not only allows of the easy introduction of the needle, but is so arranged that the needle is projected only a certain distance beyond the end of the cannula into the tumor—a distance which can be determined beforehand by the proper adjustment of the instrument.

All the operations were done through the urethra, without the employment of anæsthesia,

the production of pain, or interference with the patient's occupation. The author did not wish to be understood as asserting that electrolysis would cure all benign tumors of the bladder, yet he claimed very satisfactory results in the cases which he had thought proper to subject to this treatment.

"The Nutritional Effects of Statical Electricity Considered in Relation to High Frequency and High Potential Currents, and the Transparency of the Dielectric."

Dr. William J. Morton, of New York, read a paper with this title. Through the recent labors chiefly of D'Arsonval, Tesla and Elihu Thompson, statical electricity has assumed new and important relations to electro-therapeutics. In contra-distinction to the low frequency of the current obtained from the ordinary faradic coil, the high frequency high potential current is simply a periodical current, or one in which the electrical energy is cut up into many waves or periods—ten thousand to ten million per second. With this high frequency there is a correspondingly high electromotive force, and it is mainly these factors and not electrolytic conduction which is the important point to be considered when studying the electro-therapeutic effects of this current.

When a Leyden jar is suspended in connection with any electrostatic machine and the spark caused to pass, every time the spark passes there is a corresponding discharge in the Leyden jar, and with each discharge oscillations take place many thousands of times a second. This is the periodical current with which we are dealing in electro-statics. The oscillations are reduced in frequency in proportion to the resistance in the circuit.

The high frequency current seems to possess an unlimited power of penetrating tissues of the body. As the static machine is set in motion and a spark passes, every particle of ether in the room is also set in motion, and the same vibration is set up in our own bodies.

According to the modern view of electricity, the electrical energy which produces what we call the current is around the wire and not in the wire, and the electrical influence is felt in the medium around the wire. If this is not a conductor, then these same ether vibrations impinging on the dielectric put it in a condition of strain. The dielectric is a non-conductor, having a charge, and being in relation to another body also having a charge. It is found that these periodical currents are conveyed both by our conductors and our non-conductors, and in the technical language of the present time it is said that a dielectric is "transparent" to periodic currents.

The principal object of the paper was to present the results of a series of observations which the author had made at his clinic in the New York Post-Graduate Medical School.

The secretions were affected. That the circulation is visibly affected is shown by the dilatation of the cutaneous vessels following immediately upon the application of sparks locally or generally. A series of tabulated cases were shown, showing that in a great number of cases under observation the pulse was lowered by statical electrization from fifteen to twenty beats, and that the body temperature was usually increased from half to one degree. Stating broadly, he thought he might deduce the law that the disposition of statical electrization is to produce an equalization by acting upon the centres—reducing a frequent pulse and elevating a subnormal temperature, or vice versa.

Observations were also presented, which showed that in cases of chronic articular rheumatism this treatment resulted in greatly diminishing the quantity of uric acid and correspondingly increasing the quantity of urea. It was also noted that many patients while under this treatment gained in weight very perceptibly—one patient gaining forty-two pounds in five weeks.

The author concluded by expressing the conviction that statical electrization was only the beginning of a new and extremely important era in which the periodical current would play a prominent part, and lead to much better practical results. The very mechanism which the author was the first to describe, and which was published in 1881, is to-day found to be essential for producing these wonderful electrostatic effects of alternating currents.

#### DISCUSSION.

Dr. H. E. Hayd, of Buffalo, said he could vouch for the statement that statical electricity profoundly affects the secretions, for he had frequently observed that it increased the specific gravity of the urine. He also knew from personal observation that it stimulated the circulation, and was especially useful in muscular rheumatism owing to its power of increasing the activity of the hepatic function. He could also confirm what had been said about the increase in body weight and in the quantity of urea excreted.

Dr. Massey referred to a recent case in which the improved nutrition could only be attributed to the effect of the static charge.

Dr. Herdman said that the effect of statical electrization on the circulation was sufficient to explain many of the beneficial results mentioned. He believed that in spinal irritation, and in neurasthenia, the good effects of this treatment were directly attributable to its action in relieving the passive congestion which he considered to be the fundamental cause of these affections.

A few days ago, Tesla admitted in his presence that his experiments with the high fre-

quency current were the result of his attention being directed to the subject by Morton's description of his method of producing the static induced current.

Dr. Holford Walker, of Toronto, said that although his experience with statical electricity extended only over the past year, he had observed beneficial effects from its use, which could only be explained by its action in increasing the circulation.

Dr. J. B. Greene, of Indiana, said that the author had not shown any marked change in the temperature as a result of statical electrization, although claiming a marked effect on the pulse; nor had he exhibited any sphygmographic tracing from these patients. This he considered a very serious omission. His own observations had led him to believe that the good effects observed after statical electrization were largely due to "suggestion."

Dr. W. B. Sprague, of Detroit, said that although using one of the small static machines which had been characterized as a "toy," he had obtained gratifying results with it in cases of neurasthenia.

Dr. P. S. Hayes, of Chicago, said that his experience with statical electrization during the past ten years justified him in endorsing what had been said in its favor. Taking into account the high tension of statical electrolysis, he believed that the current acted directly on the contents of the cells in the tissues, and not merely on the fluids surrounding the cells.

Dr. Margaret A. Cleaves, of New York, said that she had also observed a remarkable increase of body weight in many cases. She also called attention to one very practical point—viz: that constipation of many years' standing is very commonly relieved by statical electricity applied over to the lumbar and sacral plexes of nerves and to the abdominal parietes.

Dr. Morton, in closing the discussion, said that if "suggestion" were capable of uniformly affecting the pulse and temperature in the manner exhibited in his tables, it might well be adopted instead of electrical treatment. A rather intimate acquaintance with the subject of hypnotism had failed to convince him that it possessed any such remarkable power. A change of one degree uniformly in given cases he considered a "marked change."

A paper on "Electro-Medical Eccentricities," by H. Newman Lawrence, Esq., of London, Eng., in the absence of the author was read by the Secretary.

He first discussed a very common defect of many text-books on electro-therapeutics, viz: the apparent lack of connection between the part which treats of electro-physics and that which treats of the therapeutical applications of electricity.

He next suggested that there should be a proper standard of qualifications for medical

electricians, and that those so qualified might with advantage carry out the electrical treatment of cases referred to them by general practitioners. The third topic which received attention was the existence of so much quackery under the name of electricity or magnetism. The author thought the medical profession should no longer remain silent in regard to so-called magnetic apparatus and appliances dependent for their action upon the well-known process of electro-physics, and he suggested that the Association appoint a committee to consider the best way of overcoming these abuses.

The paper was discussed by Dr. Morton and Dr. Herdman, both of whom expressed the opinion that any attempt to overcome such outrages by legislation would produce the very opposite result to that which all desired. It was only by individual effort in the dissemination of correct popular information on medical electricity that we could hope to defeat these quacks.

"The Action of the Continuous Current within Living Tissues as Distinguished from the Local Polar Action."

Dr. W. J. Herdman, of Ann Arbor, read a paper on this subject. Whenever a tissue is subjected to the action of a continuous current, owing to the fact that the tissue is made up of cells containing fluids and surrounded by cell walls having a greater resistance, these fluids must be absorbed. This is by a process of convection and not of conduction. This theoretical view that electricity must exert a systematic effect is confirmed by experiments made by the author and by others on healthy animal and vegetable tissues. It was found that when these tissues were exposed to a feeble current of electricity for a short time daily, their growth was decidedly increased, but it was retarded by a more prolonged action of the current.

#### DISCUSSION.

Dr. Massey said that the abdominal walls of many patients undergoing the Apostoli treatment for uterine fibroids became the seat of an increased deposit of fat owing to the improvement of the general health consequent upon the treatment.

Dr. Morton said that the experiments of G. Weiss, the physiologist in Paris, bore out the point made in the paper regarding electrolytic action and its effect on functional activity of the cells. This investigator passed a strong continuous current through one leg of a healthy frog. After a week it was found that the excitability of this leg was about ten times less than that of the other leg. The speaker said he believed in the polar effect, and believed it reached deeply. Acting on this purely physical view of the action of the electrical current in

the human body, he had been in the habit of applying the positive pole to the spine for all spinal cord degenerations, and the negative pole for all inflammations. This was exactly the reverse of the usual treatment, but his experience with this method of treatment had only served to convince him that it was founded on a correct theory.

Dr. Herdman, in closing the discussion, said that although many electro-therapeutists did not believe at all in the intra-polar action of the current, he not only believed in it, but considered it very important. By the term "convection" he had meant to convey the same idea as we represent in the expression "progression of the atoms."

"Observations on the Treatment of Goitre."

Dr. Charles R. Dickson, of Toronto, read a paper with this title. He now uses Goelet's modification of Apostoli's clay pad, and begins with a current of 10 to 15 m.a. for ten minutes. The treatment is continued on alternate days, and the strength of the current gradually increased up to 100 or 120 m.a., although in exceptional cases over 200 m. a. may be used. He considers a strong current applied for a short time preferable to using a weak one for a long time. After the treatment, the parts are sponged off with a cold solution of boracic acid. If after several weeks of this external treatment there is no result, it is proper to resort to puncture. Strict antiseptic precautions are observed, and the puncture is made with a surgeon's needle insulated with several coats of collodion. The puncture should be made, if possible, low down through the isthmus, and during the introduction of the needle the patient should be directed to swallow, so that puncture of the larynx may be avoided. The subsequent punctures are all made at the same spot.

In the cystic form the external treatment is of little use. Here the author advises inserting an aspirating needle, drawing off the contents and filling the sac with a solution of salt in boiled water. The object of this is to make use of an electrode which will fill the deepest recesses of the sac. The aspirating needle is used as an electrode, and after the application the fluid is withdrawn.

In conclusion, the author said that he still maintains that in electricity we have one of the most valuable agents in the treatment of all forms of goitre, and that it is the safest treatment. He had known even external applications of iodine to produce so much œdema that death from asphyxia seemed imminent. Electrical treatment in exceptional cases may have to be extended over a period of two years.

#### DISCUSSION.

Dr. Massey said that some years ago he had succeeded in absolutely curing a cystic goitre which had resisted other means. Four out of

six cases of exophthalmic goitre he had completely cured by the external application of a current of 10 m. a.

Dr. Morton cited one case in which he had succeeded in reducing a very large goitre to one-third its original size by means of the faradic and galvanic currents used simultaneously by a combining switch.

Dr. Walker spoke of a case in which a lady received such prompt relief from electrical treatment that she would not continue it long enough for a cure to be effected, but preferred to return once each year and receive treatment for about three weeks.

Dr. Dickson said, that in one case where the goitre was large and distinctly fibrous, there was a protrusion of the right eye-ball, which diminished in proportion as the goitre was reduced.

## SECOND DAY—SEPTEMBER 13TH.

### MORNING SESSION.

Dr. Holford Walker, of Toronto, reported a "Case of Ascites Cured by Galvanism." The patient, a little boy, was treated by galvanism, thirty-nine applications being given. The positive pole was a large clay abdominal electrode, and the negative a large metal disk, which was applied alternately to the shoulders and back every other day for fifteen minutes. The patient was unable to tolerate a current of more than 50 to 75 m.a. At the end of three weeks it was evident that the fluid was being absorbed, and in a month or two it entirely disappeared, and since then the patient has continued well except for a mild attack of rheumatism. Previous to resorting to electricity, all the usual remedial measures had been tried, and had failed.

### DISCUSSION.

Dr. Newman cited from memory the case of a man with extensive anasarca and ascites who was brought to him after a number of consulting physicians had expressed the opinion that in spite of treatment he could not live more than two days. Not more than this time elapsed before he measured three inches less than before the electrical treatment was begun, and he ultimately recovered entirely. The speaker could not recall the original diagnosis recorded in his case-book. He thought that the treatment caused the withdrawal of some of the fluid, and that it stimulated the secretions.

Dr. Engleman cited a case of ascites, seemingly just as severe, where two very able physicians gave a similar prognosis. At this juncture, some of the patient's family insisted upon calling in a quack, whose treatment consisted in making certain "passes" about the patient. One of the regular physicians con-

tinued to call, in order to watch the treatment. The patient immediately began to improve, and during the ten years which had elapsed since then, she had remained entirely well. In that case, microscopical and chemical examinations of the urine confirmed the diagnosis of renal disease which had been made by the physicians originally in charge of the case.

Dr. Eugene C. Gehrung, of St. Louis, thought that an ascites associated with kidney disease was due largely to spasmodic irritation, and that a cure was brought about by the relaxing effect of electricity on the nervous system.

Dr. J. B. Greene, of Indiana, said that he had been called in consultation a few months ago, to a similar case, where the diagnosis of renal disease was substantiated by the results of the microscopical and chemical examination of the urine; yet, to his surprise, the attending physician afterwards informed him that from the time galvanism was begun the patient began to improve, and eventually recovered.

Dr. Walker, in closing the discussion, said that the diagnosis in his case had never been clear. As the boy had been standing daily immersed in water up to his waist, it was possible that the ascites was the result of an ordinary subacute peritonitis, or of tubercular peritonitis, as there was a history of tuberculosis on the maternal side. The kidneys were perfectly healthy.

### "Metallic Electrolysis."

Dr. Margaret A. Cleaves, of New York, read a paper on this subject. By this term was meant treatment by inserting in the natural cavities and in the tissues soluble metallic electrodes, such as those made of copper, zinc and iron. Experiments were cited, which proved not only that an oxychloride of copper was deposited in the tissues, but that subcutaneous injections of comparatively large quantities of this deposited salt failed to produce in rabbits any toxic symptoms. Other experiments indicated that this copper salt had a more powerful bactericidal action than the ordinary galvano-caustic applications, and that by the cathodic action of the current, the deposited metallic salt is made to penetrate deeply into the tissues. This is a convenient method of applying a metallic salt in the very depths of the most tortuous sinuses, and it should not be forgotten that the salt so deposited, being in the nascent state, is peculiarly active.

The author stated that for intra-uterine work a current of 25 to 50 m. a. is sufficient when given for fifteen minutes, and that then a reversed current of 10 or 15 m.a. should be given for six or eight minutes in order to loosen the electrode. However, it should be noted that this adherence of the electrode to the tissues may be avoided by gentle and continued manipulation in suitable localities during the application of the current. Too frequent

applications are liable to retard the progress of the case. The work of elimination and repair which takes place in the neighboring tissues without pain and without inflammatory reaction extended over a period of eight days. Metallic electrolysis has proved extremely efficient in controlling uterine hemorrhage. The electrodes should be carefully rubbed with emery paper after each application.

Cases were also cited in which the author used metallic electrolysis successfully in uterine fibroma, endometritis, urethritis, granular degeneration of the cervix, hypertrophic rhinitis, trachoma and hemorrhoids. Improvement was observed in most of these cases after one or two sittings, and the cure was both speedy and permanent.

An especial set of electrodes for applications to the conjunctival membrane were presented by the reader of the paper, as well as needles for puncture.

#### DISCUSSION.

Dr. Morton said he had proposed the name "metallic-electrolysis" instead of "interstitial electrolysis," as used by Gautier, because interstitial electrolysis may occur anywhere where there is a powerful continuous current, even though the electrodes are not metallic. He had been surprised to find in a book written by Butler, in 1876, a very good description of a similar method of treatment, but without any reference to its application in gynecology.

Dr. Morton then exhibited special forms of electrodes which had been found useful in applying this treatment to the nose, uterus, urethra and rectum. The adhesion of the electrode to the tissues is particularly noticeable in the treatment of urethritis, and it is probably due to the formation of a soluble albuminate of the metal constituting the electrode. The speaker then cited a case in which he had promptly cured a gonorrhœa of three months' standing, and also the treatment of a cyst on the side of the neck. He also described the action of metallic electrolysis in curing hemorrhoids and atrophic rhinitis, the cure in the latter condition, he thought, being probably due to a restoration of the activity of the few glands which have escaped the destructive process.

Dr. Hayd objected to the treatment from theoretical consideration. He thought it was unduly magnifying the local action of the current, and at the same time encouraging the already too prevalent practice of employing intra-uterine treatment.

Dr. Massey said that the objections made by the last speaker did not apply to the *experimental* use of intra-uterine applications. We have metallic electrolysis every time we use the galvanic current, unless the patient be protected by a very large clay pad to catch the particles

of metal which pass off from the metallic conductor. As regards this mode of treatment in connection with hemorrhoids, he wished to state that he had applied a current of 40 or 50 m.a. with a carbon electrode to hemorrhoids, and had seen them reduced by this means, so that it could not be said that metallic electrolysis is essential for such reduction.

Dr. Green also objected to this indiscriminate probing of the uterus as unwise and unsafe. He had quickly cured one case of hydrocele by galvano-puncture of the sac with a zinc needle, without withdrawal of the fluid. There had been no relapse.

Dr. P. S. Hayes said that while admitting the dangers likely to follow upon the employment of intra-uterine galvanic treatment in improperly selected cases, he felt that in suitable ones the expert operator could have accomplished his purpose much more safely than by the usual topical applications of medicines. It was important to remember that without due regard to the proper technique of metallic electrolysis, it was an easy matter to produce a trauma as a result of the agglutination of the electrode to the tissues. The speaker also emphasized the peculiar powers possessed by metallic electrolysis by virtue of the metallic salts being in the nascent state, and the current carrying them deeply into the tissues. It is probably because of this penetrating action that it has been found so useful in the treatment of gonorrhœa.

Dr. Gehring remarked that this cathaphoric action of the current carried along one portion of the medicament before another particle was presented to the tissues, thus preventing a clogging up of the spaces with the medicine.

The President said that he was the first to call attention to the uterine colic excited by cupric electrolysis. Further investigation convinced him that the astringent action of the application tended to constrict the canal and obstruct drainage, and some of the gas which was evolved during the electrolysis did not combine with the metal of the electrode, but remained free in the cavity. By securing better drainage from the cavity by means of previous dilatation, cases which had before suffered from colic were able to receive the treatment with entire freedom from this unpleasant complication. He knew of nothing superior to cupric electrolysis for controlling the most severe forms of uterine hemorrhage, but for endometritis and granular degeneration of the cervix, he preferred zinc electrolysis. Zinc electrolysis was also useful in promoting the healing and obliteration of the sac of suppurating vulvo-vaginal glands after incision and evacuation of the contents. He had also treated successfully by zinc electrolysis a large keloid involving the anterior surface of the thigh, using 5 m. a. for each zinc-needle, for 10 minutes, about 10 or 12 applications being required. He had employed zinc electrolysis also in one case of fibroid by

means of vaginal puncture, and had noted that it produced decided softening and marked diminution in the size of the growth.

Dr. Cleaves, in closing the discussion, said that while she believed a great deal of intra-uterine treatment is unnecessary, she was satisfied that in certain cases the results from such treatment were quicker and more lasting than from any other. In her own practice, she did not exceed a current of 30 m. a., and oftener used a less current strength.

"Some Observations on the Fine Wire Coil or Current of Tension."

Dr. H. E. Hayd, of Buffalo, read a paper on this subject. He said that his own induction coil consists of 3500 feet of No. 32 wire, tapped at three points, so as to permit of using lengths of 1500, 2500 and 3500 feet respectively. He had been informed that the vibrator made from 250 to 350 vibrations per second. In securing a sedative action from such a coil, it is very important that the action of the vibrator should be both rapid and smooth. The current from the fine coil may be considered a specific in the relief of that form of neuralgic dysmenorrhœa characterized by tenderness over the ovaries, marked epigastric tenderness, nausea and vomiting. The treatment is safe and painless, and the current is best administered by means of a simple bi-polar vaginal electrode. These conclusions were supported by a number of illustrative cases.

#### DISCUSSION.

Dr. A. Laphorn Smith, of Montreal, said that at least half a dozen cases which had not been relieved by laparotomy and the removal of the appendages had come to him subsequently, and had been completely relieved of all symptoms by the use of the fine wire current.

Dr. Engleman said that very vague notions prevail regarding the speed of the ordinary interruptors on induction coils. If the author had used a speed of 350 vibrations per second, the patient would not have felt the current. The average vibrator he had found by actual experiment made from 2000 to 2400 vibrations per minute, and the best of the old kind of vibrators which he had been able to find in the market—that of Gaiffe—only vibrated 3000 times per minute, or 50 per second.

(At this point the discussion was interrupted in order that it might form a part of the formal discussion on this subject which had been arranged to take place in the afternoon.)

#### AFTERNOON SESSION.

#### DISCUSSION.

"The Influence of Frequency of Interruptions and Character of Induced Current Waves upon the Physiological Effect."

Dr. William James Morton, of New York,

opened the discussion. He said we possessed three mechanisms for exciting induced currents, viz.: (1) the induction coil; (2) dynamo-electric machines; and (3) condensers—Leyden jars, etc. It has been found that the current with long periods will kill instantaneously while one with short periods is harmless. The speaker said that in April, 1881, the *New York Medical Record* published an article, in which he described a new induced current obtained from the static machine. His conclusions were: (1) That the current possessed great diffuseness; (2) that it produced an analgesic effect; (3) that it produced a vaso-motor effect, manifested by dilatation of the superficial blood vessels and the occurrence of perspiration; and (4) that it caused an elevation of the body temperature. His mechanism, then published, is the fundamental electrical mechanism necessary to produce the high frequency high potential currents now so thoroughly familiarized by the labors of Tesla, Elihu Thompson and D'Arsonval.

In February, 1891, Tesla published his first article on high frequency currents. In this article he made the statement that the writer's experiences tend to show that the higher the frequency the greater the amount of electrical energy which may be passed through the body without serious discomfort.

About the same time, Elihu Thompson was investigating the same subject. He found: (1) that the higher the frequency the less the effect on an animal; (2) that the cause of pain lies chiefly in the muscular contractions produced; (3) that the cutaneous nerves were less painfully affected at a higher rate; (4) that the visual mechanism was not excited at a higher rate, even with a pressure of fifteen volts.

D'Arsonval's conclusions were: (1) That the high frequency current had no effect on the organs of feeling; (2) that it produced no muscular contractions; (3) that there was a diminution of the sensation of pain; (4) that there was a dilatation of the blood vessels; (5) that it caused an increased perspiration; (6) that it caused increased tissue change, manifested by increased absorption of oxygen and increased elimination of carbonic acid; and (7) that it caused no increase of body temperature.

Dr. Morton then exhibited a medical induction alternator affording sinusoidal current, which Mr. A. E. Kennelly had constructed at his suggestion. It gave a current having 1200 periods per second.

The discussion was continued by a communication from A. E. Kennelly, Esq., of the Edison Laboratory, entitled "Induction Coils."

In his absence, the paper was read by Mr. E. M. Smiles. The author began by giving a strictly technical description of the magnetic laws involved in the working of induction coils. Observation shows that the primary current does not instantly reach its full value, but there

is developed in the primary coil an electromotive force which is always in opposition to that of the battery. This is called self-induction. As soon as the vibrator spring leaves the contact point, the metallic circuit is broken, but not instantly, for there is induced a secondary flux in both the primary and secondary coil, and in such a direction as to sustain the battery current. The duty of the faradic coil is to supply a certain strength of alternating current at a given frequency. Probably no two coils give precisely the same wave characters; long coils and many windings produce smoother flowing and less abrupt waves. The ordinary form of spring vibrator rarely supplies more than 250 vibrations per second, while the ribbon spring easily makes 1000 vibrations per second; but both are very irregular. If a current of 5 m. a. be supplied by an ordinary faradic coil at 250 alternations, there will be much uncertainty as to the wave characters, but if the primary be excited by a sinusoidal current of the same frequency, the character of the waves can be accurately determined.

A communication from Professor Edwin Houston, of Philadelphia, entitled "Remarks upon Apparatus to produce Induction Currents and the Character of the Waves of Individual Apparatus, with especial reference to those applicable to Medical Uses," was read by Dr. Morton in the absence of the author.

Reference was made to the remarkable change in the physiological effect which resulted from a change in the frequency of the interruptions of the current. The harmlessness of the high frequency current is probably due to the fact that it is unable to reach the deeper organs, for, if the effect of the discharge on a bar of solid copper is very superficial, the effect on the human body must be still more superficial.

Dr. J. H. Kellogg, of Battle Creek, continued the discussion in an article entitled "The Graphic Study of Electrical Currents in Relation to Therapeutics."

Dr. Kellogg said that he thought thus far in the discussion two or three different forms of current had been confounded, for the rapidly interrupted current is not a sinusoidal current. He first described this current in a paper read before the American Medical Association in 1888. The effects obtained from it varied with the speed on the machine. When only fifteen or twenty alternations were made per second, it produced vigorous muscular contractions with complete relaxation at each alternation. The sensory effects are best obtained by giving the machine a high velocity; under such circumstances, it will be found that if the electrode be placed in the region of the eye, the subject will perceive a luminous field which varies its position with that of the electrode.

He had made more than twenty thousand applications of the sinusoidal current, the

greater number being in gynæcological cases, and with it he had been enabled to cure hundreds of women who had previously suffered many things at the hands of gynæcologists. The current is chiefly useful: (1) In exercising muscles which are not easily brought into action by voluntary effort; (2) for producing muscular contraction in cases where degenerative changes have advanced so far that the muscles fail to respond to the faradic current; (3) in connection with "the rest cure" for giving exercise to feeble patients. Here it is superior to the faradic current on account of the painlessness of the contractions and their greater vigor. The application is also more easily made as it is not necessary in most cases to locate accurately the motor points. (4) It is very valuable when used alternately with massage. (5) It is of the greatest advantage in strengthening relaxed abdominal muscles, which are often responsible for displacements of various abdominal viscera, and the occurrence of various reflex symptoms. (6) For the treatment of hyperæsthetic conditions of the nervous system. Here it is necessary to employ an extremely delicate rheostat, and to use the current obtained from the machine while at a high speed. In marked contrast with the faradic current, he had found no idiosyncrasy to the sinusoidal current.

He believed the rheotome was a fatal element of weakness in the induction coil, and that this well known instrument is inherently faulty as an agent in electro-therapeutics. Nothing but the graphic method would enable the medical practitioner to regulate a faradic apparatus so as to obtain exactly the same current at all times, and he predicted that the faradic apparatus would have to give place to a more reliable instrument.

(Discussion postponed until next morning.)

### THIRD DAY.—SEPTEMBER 14TH.

#### MORNING SESSION.

(Discussion of yesterday concluded.)

H. Newman Lawrence, Esq., M.I.E.E., of London, England, sent a contribution to the discussion, entitled, "In Medical Induction Coils, how does the Current of the Primary differ from that of the Secondary; and what Influence has this Difference upon the Respective Physiological Effects?"

The charging current can be measured both as to voltage and amperage; the secondary current is the source of alternating impulses, and dependent for voltage and amperage upon the number of turns around the primary, the strength of the charging current, and the rate of interruption of the vibrator. Muscular contraction may be produced by an infinitesimal amperage, provided it be sufficiently concen-



trated. In general, therefore, when muscular contraction is required, the primary current is the more painful to use; but owing to its other properties it may be found in certain cases less painful when applied to the nerves.

The discussion was continued by the reading of a communication from Dr. William F. Hutchinson, of Providence, R. I., entitled, "A Study of Electrical-Anæsthesia and Frequency of Induction Vibration." This paper was supplementary to one on the same subject read at the last meeting of the Association. By means of Cook's reed-pipe, the author had been able to more accurately determine the number of vibrations. He now believed that the cause of electrical-anæsthesia must be looked for in that principle of mechanics known as the superposition of small motions. In a vibrating wire it is found that there is a "dead point" or spot at which the wire is at rest. Replacing the reflected wave on the wire by an efferent impulse along the nerve, we can imagine that electrical-anæsthesia is due to the formation of a similar "dead point" along the nerve. Just as many vibrations must be imparted to a sensory nerve inwardly as are proceeding outwardly upon it, in order that a dead point or zone of anæsthesia be created. The rate of the electric wave and that of the nerve impulse seem to be identical, and hence, pain is the mechanical expression of disturbed energy, and it is to be destroyed temporarily by such vibratory action as will restore rest to the nerve. The writer admits, however, his inability to explain why it is that the anæsthesia should be confined to an area not much greater than the electrode, although it is easy to demonstrate that the current traverses the whole length of a nerve.

The President here took part in the discussion, making some remarks "On the Influence of Frequency and the Graphic Curve on the Results of Gynæcological Electro-Therapeutics, particularly with the Sinusoidal Current."

His conclusions were based upon observations made with the faradic current and an apparatus constructed for him by the Kidder Manufacturing Co., consisting of an alternator run by a motor, by which an alternating current having 800 alternations per second could be sent through the primary coil of his induction apparatus. With five Leclanche cells in the primary, the current obtained in this manner and with this, this number of alternations was almost imperceptible to the hand, but he noted that it was appreciable in the vagina. It had a marked soothing effect on the patients upon whom he had tested it. He claimed to be able to cure endometritis with the alternating current or the interrupted induced current as obtained from the improved faradic apparatus he had devised. The way in which it accomplished this was, in

his opinion, by its influence upon the vasomotor supply in relieving pelvic congestion which is often the primary cause of the trouble. When the canal is not patulous, free drainage was secured by occasional negative galvanic applications of very moderate strength.

He believed with Mr. Bland Sutton, that in the great majority of cases of salpingitis the obstruction in the tube is due to tumefaction of the mucous membrane; and if this can be removed, as is often possible, by means of a proper application of the current, it is an easy matter to secure natural drainage of the tubes through the uterine cavity.

One very noticeable effect of this current was a very decided improvement in the systemic condition even when it was applied to the pelvic organs.

(The discussion was here interrupted to allow Dr. Kellogg and Dr. Morton to demonstrate the properties of the alternating current as obtained from their machines.)

Dr. A. Laphorn Smith then resumed the discussion. He said that the same increase in weight which is observed after the application of the sinusoidal current results from ordinary exercise. Referring to the fitness of the interruptions, he said that an excellent vibrator for this purpose could be made out of a piece of ferrotype metal. He had been able to obtain with the fine wire faradic current all that Apostoli claimed for the sinusoidal current. The improvement in the circulation was principally due to the muscular contractions produced by the current.

"The Alternating Current in Electro-Therapeutics."

Drs. Georges Gautier and A. Larat, of Paris, France, sent a paper with this title. It was translated and read in abstract by Dr. A. Laphorn Smith.

The paper stated that the faradic current attained its maximum quite suddenly, whereas the sinusoidal current reaches its maximum much more gradually, and consequently a larger dose can be borne. They claimed that any current having oscillations not over 20,000 per minute is a sinusoidal current, and that the action of the sinusoidal current, even when muscular movements are absent, is to increase the absorption of oxygen and the elimination of carbonic acid and urea. One curious point noted was, that if after a person has eaten asparagus he be subjected to the action of the sinusoidal current, the asparagus will not impart its peculiar odor to that person's urine. They claim that the current is useful in reducing obesity and in treating certain forms of eczema and vitiligo, and that it is peculiarly efficient in the treatment of infantile and pseudo-hypertrophic paralysis. They recommend that the current be applied through electrodes hanging over the edge of a porcelain

bath, and they add that for the sake of propriety it is desirable that the water of the bath should be rendered opaque by the addition of starch.

Dr. Herdman said he had had very little personal experience with the high frequency currents, but he had been using for the past three years the Thompson-Houston dynamo current, giving ten thousand alternations per minute. It was an agreeable current, but exerted a peculiar tonic effect on the vaso-motor system. We must admit that vibrations producing musical tones have some special physiological effects, but remarkable results are obtained with vibrations extending even beyond the limits of such tones.

Dr. George J. Engleman, of St. Louis, thought in this discussion the faradic current had been treated in a pitiable way. The objections which had been made against it were those which applied to the old-time instruments and which he had overcome by his separate vibrator and interruptor. Determining the number of the vibrations by musical notes is not only time-consuming, but is necessarily inaccurate on account of the large personal equation which it involves. He had gone still further with his investigations, and had shown that in addition to the improvements already mentioned, special coils must be constructed for certain definite effects. He had no experience with the sinusoidal current, but from what he had seen and heard from those who had introduced it, he had not been tempted to experiment with it.

Dr. Morton, in closing the discussion, said that he thought the criticisms of the preceding speaker admitted the objections which had been made upon the unreliability and limited efficiency of the faradic coil as ordinarily constructed.

He had been much puzzled by Dr. Hutchinson's paper, for if he understood it correctly we were asked to assume that the vibrations of an electric current, which are given at 540 per second, interfere with the vibration of nerve impulse, which are about 11 to 19 per second. Although he admitted the power of the current to produce certain analgesic and subjective effect, he did not believe it could produce true anæsthesia, and he could not but deprecate the fact that at neither the last meeting nor the present one had Dr. Hutchinson demonstrated his method of producing electrical-anæsthesia.

"The Treatment of Dysmenorrhœa by the Galvanic Current."

Dr. A. Laphorn Smith, of Montréal, read a paper on this subject, in which he took the ground that dysmenorrhœa is very commonly due to endometritis rather than to stenosis of the canal. Thus, many cases are not at all relieved by rapid dilatation of the canal unless this procedure is followed by curetting or

the application of iodine. From theoretical considerations he had been inclined to believe at first that the method of intra-uterine galvanization which he advocated for the relief of dysmenorrhœa, would result in sterility, but further experience has shown this not to be true. Apostoli quotes thirty cases in which pregnancy followed such applications. This important theoretical objection being disposed of, he felt free to urge the adoption of this treatment, as the mild currents employed rendered it both safe and painless. If the uterus be large and the menstrual flow profuse, he would use the positive pole in the uterus; but if the uterine horns were poorly developed, and the flow scanty, then he would prefer negative pole.

After a careful bi-manual examination has excluded pregnancy, and has enabled the operator to form a correct idea of the condition of the pelvic organs, the vagina should be disinfected with a douche, and a large Simpson sound, curved to correspond with that of the uterine canal, is passed through the flame of an alcohol lamp, cooled, and insulated with rubber tubing to within about  $2\frac{1}{2}$  inches of its tip. Under the guidance of the finger it is then gently passed into the canal until an obstruction is met with, when a current of about 10 m. a. is turned on. The instrument soon passes on, and after a current of from 20 to 50 m.a. has been allowed to flow for about five minutes, it is gradually reduced and turned off. The sound will then usually almost drop out of itself. A boroglyceride tampon is then inserted in the vagina, and the patient allowed to go home. No precautions, such as resting in bed, are considered necessary, and, as a rule, the patient only received the treatment twice a week for from three to six weeks, when the second period will usually come on without pain. When the intra-uterine electrode is connected with the negative pole, the positive pole consists of a clay abdominal electrode. Where the positive pole is made the active one, this pole must be of platinum, carbon or zinc.

#### DISCUSSION.

Dr. Massey said he could endorse all that the author had said about the simplicity and safety of this treatment. He rarely saw atresia except after the use of very strong currents, or where the operator had neglected to insulate the cervical portion of the electrode. For this purpose, he preferred shellac to a rubber tube.

Dr. W. B. Sprague, of Detroit, said he had very rarely failed to relieve dysmenorrhœa by intra-uterine application of electricity. He preferred to use the negative pole with a current of moderate strength, and so far from producing atresia, he had relieved such as already existed. In this class of cases he never used currents stronger than 15 m.a., and he was inclined to believe that the menstrual pain is due to hyper-

sensitiveness of the nerves rather than to endometritis; for he had relieved the condition by currents so mild that they could hardly be expected to cure an endometritis.

Dr. P. S. Hayes, of Chicago, said he wished to be placed on record as fully endorsing the claims made in the paper.

Dr. Margaret A. Cleaves, of New York, said that after an experience of six or seven years, she could corroborate what had been said in the paper. She thought the dysmenorrhœa was quite as often due to pelvic congestion as to endometritis, and that this explained why it was relieved by such mild currents. A number of her patients had become pregnant within a few months, and she did not believe that intra-uterine galvanization caused sterility after the treatment. She greatly preferred leaving an interval of from five to seven days between the treatments.

Dr. Kellogg had found that although there was no stenosis of the canal, many cases of dysmenorrhœa are associated with vegetations, which he believes swell up at the menstrual period, and so produce a temporary obstruction. At any rate, such cases readily yield to applications of 10 to 20 m.a., usually with the positive pole in the uterus. Where the trouble seems to be due to simple hyperæsthesia, he had found the positive pole especially effective. His experience was entirely opposed to the idea that the treatment prevented pregnancy.

Dr. C. R. Dickson believed with Dr. Cleaves that dysmenorrhœa is very frequently due to simple pelvic congestion. He was glad to see that operating surgeons were showing a greater disposition than formerly to refer these cases to those who make a specialty of electro-therapeutics.

Dr. Franklin H. Martin sounded a note of warning against recommending such intra-uterine treatment too freely to the general profession. The initial step should be the making of an accurate diagnosis. If the dysmenorrhœa were due to non-development of the uterus, the faradic current of slow vibration would be much more appropriate than the galvanic; if, on the other hand, it were due to tubal or ovarian disease, the galvanic treatment would result disastrously. Where dysmenorrhœa is due to endometritis or stenosis of the canal, positive galvanisms to the interior of the body of the uterus only was indicated.

Dr. Walker said that when the pain was most marked two or three days previous to the appearance of the flow, he was always very suspicious of the existence of disease of the appendages, and therefore would not resort to galvanic treatment until a careful examination under chloroform had excluded such a condition.

Dr. Smith, in closing the discussion, said that he had taken it for granted that an accurate

diagnosis was a pre-requisite to safe and successful treatment. Believing, as he did, that in the majority of cases dysmenorrhœa is due to reflex spasm of the fibres of the internal os, brought about by an endometritis, he preferred to apply a mild current *directly* to the internal os.

#### AFTERNOON SESSION.

"The Treatment of Subinvolution by Electricity."

Dr. Charles G. Cannaday, of Roanoke, Va., read a paper with this title. The author believed that the greatest benefit is to be obtained in the shortest time from the use of electricity. He recommended for restoring the tone of the uterus that a current of 30 m.a. be applied to the interior of the uterus for ten minutes at a time, and that this be followed by the application of the faradic current from an Engleman coil of 600 meters, using a bipolar vaginal electrode. He thought that free use of ergot during labor predisposed to subinvolution, and, therefore, when this drug had been used in this way, he favored as a routine measure the daily application to the uterus of the faradic current.

#### DISCUSSION.

Dr. Hayes thought no agent superior to electricity for reawakening the retrograde physiological process necessary to complete involution, but he preferred the galvanic to the faradic current. He more commonly employed the positive pole, as there is ordinarily a condition of undue moisture present.

Dr. Sprague did not think it made much difference whether the galvanic or the faradic current was employed, but to obtain the best results the applications should be made on alternate days.

Dr. Massey used the faradic current chiefly in cases which had not existed for more than six months; for the more chronic forms, he preferred galvanism. He believed subinvolution to be due to microbic infection of the uterus at the puerperal period, and if the infection be due to the gonorrhœal germ, the case will prove most obstinate to treatment.

Dr. Smith also thought that septic infection was chiefly responsible for subinvolution. He corroborated what had been said about the value of the continuous current.

Dr. Cannaday, in closing the discussion, said that where sub-involution had lasted for a year or more, the congestion had in large measure subsided, and, therefore, greater benefit was likely to follow negative galvanization.

"A New Intra-Uterine Electrode."

Dr. Plym. S. Hayes, of Chicago, exhibited an intra-uterine electrode made of a platinum spiral with a stilette in its centre. The object

of this special construction was to furnish an instrument which would allow of the free escape from the uterus of the gas evolved during the Apostoli treatment. He had found that by attention to this detail in the treatment, much of the after-pain could be avoided.

## DISCUSSION.

Dr. Eug. C. Gehrung, of St. Louis, said that when he first employed the Apostoli treatment by galvano-puncture, he found that the gas accumulated in the tumors, and formed the basis of future abscesses; so he had constructed an electrolytic trocar and caula, which was described and illustrated in Dr. Massey's book. It was found that the gas and fluids sometimes escaped from the tube for days after the treatment.

Dr. Massey said he had observed enormous quantities of gas escaped from the canula, but he thought most of the irritation observed after the treatment was due to the use of inflexible instruments.

Dr. Dickson thought that the tip of the instrument should be protected, and that any such spiral instrument was objectionable on account of the trauma likely to be produced during its introduction and withdrawal.

Dr. Hayes replied that there was not in reality so much difficulty in introducing and withdrawing the instrument as one would suppose who had not tried it. The evolution of gas is so great when strong currents are employed, that it prevents in a measure the adherence of the tissues to the electrode.

"A Contribution to Electro-Therapeutics in Salpingitis."

Dr. W. B. Sprague, of Detroit, read a paper on this subject. The paper contained the histories of several cases of salpingitis, in which the author had been able to introduce an electrode through the uterus and into the Fallopian tubes at a time when these tubes were distended with pus. In each case, there was a free discharge of pus, and prompt relief to the symptoms. Of course, in many cases he found it impracticable to carry out intra-tubal galvanization, but he had succeeded in other cases besides those reported in the paper, and in no instance had serious symptoms followed the treatment. His experience with this method extended over a period of three years. The treatment is necessarily of limited application, but is still extremely useful in appropriate cases. He used a sound with a curve slightly sharper than the normal one, and was of course careful not to use any force. If after the instrument has reached the cornu of the uterus a mild current be turned on, it will be found usually that in proper cases the instrument will soon pass on into the tube.

## DISCUSSION.

Dr. Smith said that many would not believe it was possible to catheterize the tubes, but when in Liverpool, Dr. Wallace had shown him no less than six cases in his hospital at one time, in which the uterine sound had been passed into the Fallopian tubes.

Dr. M. S. Weber, of Detroit, referred to the sneering, doubting manner in which the first communication of the author on this subject had been received by the Michigan State Society, but he felt sure from what he had seen of Dr. Sprague's work, that he was to be congratulated upon what he had accomplished.

Dr. Massey said that in 1880 he brought up this subject before the Philadelphia Obstetrical Society. At that time, he had succeeded in emptying a number of tubes through the uterus. It should be remembered, however, that this was work suitable only for experts.

Dr. Sarah H. Stevenson, of Chicago, said that she had long been convinced that such treatment was feasible, but had hitherto lacked the courage to try it.

Discussion.—"What are the Possibilities of Electricity in the Treatment of Fibroid Growths?" Those participating in the discussion were asked to do so under certain specific heads.

Dr. Kellogg opened the discussion. He said that the improvement in the general health observed was due to the influence of the electric current on the abdominal sympathetic. The growth could be arrested, and in certain cases near the menopause, retrograde change could be expected. He had on a former occasion reported a series of fifty cases, in seven of which the tumor disappeared. Since then, he had not been quite so fortunate. No one would think of employing anything but the constant current except for the relief of pain. He usually employed a coulombmeter in conjunction with the milliamperimeter, thus avoiding troublesome calculations. His personal experience had led him to think that the phlebitis sometimes excited where very powerful currents are employed is a decided help in bringing about retrograde changes in the tumor. He would not employ this treatment in rapidly growing tumors unaccompanied by hemorrhage, in rapidly growing tumors appearing after the menopause, where ovarian cysts accompany the fibroid tumor, where the application is followed by inflammation, and in cases which do not show improvement after a reasonable trial. Recently he had been employing milder currents because they caused less inconvenience, and admitted of more frequent applications. Seventy-five per cent. of his cases had been symptomatically cured; in 55 per cent. the tumor had been very much reduced, and in 14 per cent. it had entirely disappeared.

Dr. Felice La Torre, of Rome, Italy, sent a contribution to the discussion. The galvanic current, in his opinion, certainly arrests hemorrhage, but the diminution in size of the tumor was rare. He discussed a number of theories as to the action of the current, and concluded that it acts chiefly in two ways, viz.: (1) by causing energetic contraction of the uterus, and in this way causing compression of its vessels and arrest of hemorrhage; (2) by producing a disturbance in the molecular interchange of the elements of the tumor, by which the nutritive juices are transformed into peptones or other substances which are absorbed or eliminated by the kidneys, thus giving rise to absorption of the fibroma.

Dr. A. Laphorn Smith had found that this treatment arrests hemorrhage, even in every desperate case, and the general health is at the same time improved. In about half of his cases there was arrest of growth, and in about half of these, the tumor had diminished in size. In only one case was he sure that the tumor had entirely disappeared. The treatment is contra indicated when there is reason to believe there is pus in the tubes. He favored the use of mild currents, and the sittings not oftener than twice a week. He had never given in any one case of this kind more than one hundred applications, and he usually observed marked improvement after about fifteen applications.

Dr. Cleaves said that she had found the treatment of especial value in intra-mural growths, and that in this class of tumors the pressure symptoms were invariably relieved, the general health improved, and in hemorrhagic cases there was arrest of the hemorrhage. In a limited number of cases there was anatomical retrogression, but in no instance had she observed a complete disappearance of the tumor. She believed that the arrest of the hemorrhage was as largely due to the cataphoric action of the current as to the chemical cauterization. She called attention to the experiments made by Mr. Stewart, of Owen's College Laboratory, by which he had demonstrated the increase of liquids at the negative pole and also an accumulation of salts at the negative pole. In order that there should be such an accumulation, it was necessary that first there should be a decomposition and redistribution of the salts. Fibroid tumors and inflammatory products are rich in salts, especially in chloride of sodium, and are very largely dependent upon the presence of these for the maintenance of their nutrition and growth. The experiments to which she referred go to show that the removal of a considerable proportion of the salts, even if that removal were temporary, would result in the destruction of the tissue, while the removal of a small proportion would affect its nutritive activity. She had also found the induced and static-induced currents of very great value as an ad-

juvant to the treatment of fibroid growths by means of the constant current. Cases in which the static-induced had been used noted a marked sense of well-being, buoyancy and lightness, not only in the pelvis, but in the entire abdominal region.

Dr. Massey said that in a series of eighty cases, in all of the thirty-four hemorrhagic ones, the hemorrhage was controlled; in ten, the growth was simply arrested; in forty-nine, there was distinct retrogression; and in seven, the tumor disappeared. The average current strength was 50 to 150 m.a., and the duration of active treatment varied from six weeks to three months.

Dr. Engleman had had much the same experience as the other speakers. He did not doubt that the tumors could be reduced in size provided they were placed under treatment at the proper time; but he was also compelled to admit that he had seen some very large tumors disappear without any treatment, and this had been the experience of other surgeons. We should be very careful not to employ electrical treatment if there is reason to suspect that the tumor had already begun to undergo malignant metamorphosis, for under such circumstances electricity will certainly aggravate the condition.

The President said that one of the principal uses of electricity in some cases of large tumors is to so improve the general health of the patient when it is so much deteriorated as to admit of operative procedures when they are demanded. He had observed considerable retrogression in favorable cases, but had never seen a complete disappearance of the tumor. It was almost always possible to effect a symptomatic cure. He preferred strong currents and short sittings, and did not think much could be accomplished in less than six months. In recent growths, and in myomata, he would expect retrogression. He advocated the use of the positive pole in myomas and where hemorrhage was a symptom, and the negative pole in fibromas. He called special attention to the danger of producing stenosis, even with negative applications of only 50 m.a., when the cervical canal is included in the action exerted by the current.

Dr. Hayes thought a useful adjuvant to the ordinary Apostoli treatment consisted in applying the static-induced current by means of abdominal and vaginal electrodes.

"Improvements in Electro-Statical or Influence Machines."

Paper by Dr. Wm. James Morton. The improvements related to important points in mechanical construction and to utilizing Dr. Morton's discoveries for converting statical discharges into currents. There are two directions in which influence machines are of use to physicians, one, the spark and its modifications, the other, the Morton currents. The former are familiar to all, the latter exhibit the phenomena

of high frequency, high potential currents now familiarized by the labors of Tesla, Elihu Thomson and D'Arsonval.

As a result of continued medical work for 13 years with static machines, the writer had had constructed, by the Galvano Faradic Company of New York City, a machine which embodied, in his opinion, every modern advance. It was fundamentally of the Wimshurst-Holtz type; it had 8 revolving plates, each one 30 inches in diameter; it was provided with a simple device, by aid of which the physician could employ at will the spark, spray, static-induced and the transformer current. In its present shape the new machine answered every purpose in medicine to which influence machines could be put. It was known as the Morton-Wimshurst-Holtz machine.

#### EVENING SESSION.

Dr. William J. Morton exhibited a new transformer for use with influence machines. The transformer consists of two flat spirals placed in an ebonite box containing oil. The static induced current is led into one coil, and from the secondary coil the current passes to the patient.

This current produces a peculiarly vigorous but painless muscular contraction.

Dr. Morton also exhibited a helmet such as was employed by Charcot in the treatment of disease by means of rapid percussion. The vibrations are produced by a small electric motor. The application of this helmet uniformly and almost immediately relieves the sensation of fatigue, and in some cases it will relieve, at least temporarily, most excruciating neuralgic headaches.

Dr. E. H. Woolsey, of California, called attention to the fact that the relief was probably obtained through the agency of the spine, and was similar to the relief experienced by some when riding on horseback or on a railroad.

"Faradization as it was and as it is with the Controllable and Recordable Current, as provided by a new Apparatus."

Dr. George J. Engleman, of St. Louis, read a paper with this title. The author described his method of separating the interrupter from the faradic coil, so that the current of the latter may be independent of the slow or rapid action of the vibrator. The apparatus is provided with a comparatively slowly revolving wheel, by which one can easily compute the number of interruptions. In view of the fact that the full current from the fine wire coil is scarcely bearable when the interruptions are 2000 to 3000, and yet when they are 15,000 the current is scarcely perceptible, the importance of determining the rate of vibration is evident. Personally he thought the useful limit was 50,000 interruptions. Again, where external irritation is desirable, a short coil of fine wire is required, whereas an entirely different construction is needed for producing

a sedative effect. In addition to noting the number of vibrations of the interrupter, it has been found that the essential points to be recorded are the resistance, the number of windings, and the fineness of the wire.

#### DISCUSSION.

Dr. Massey remarked that a very objectionable feature of the ordinary faradic apparatus is the rapid oxydation of the contact surfaces of the vibrator.

Dr. Herdman said that this objection had been done away with in the new apparatus, because the rubbing of the contacts on the brake wheel sufficed to keep these surfaces bright. He did not think the physiological limit of such an apparatus had yet been determined.

Dr. Engleman replied that he thought the physiological limit had been reached, for experiment had shown that the best physiological effects were obtained when the number of windings did not exceed thirteen thousand.

The following papers in the absence of the writers were read by title:

"Notes upon some uses of Galvanism in Surgery." By D. B. D. Beaver, M.D., of Reading, Pa.

"An Unconsidered and Important Factor in the Explanation of the Action of Electricity in Uterine Disease." By Henry McClune, M.D., of Cromer, England.

"The Present Position of Electricity in the Treatment of Eclopic Gestation." By A. Brothers, M.D., of New York City.

"Uterine Displacements and their treatment by Electricity." By G. Betton Massey, of Philadelphia.

"Synovitis treated by Calaphoresis." By F. H. Wallace, M.D., of Boston, Mass.

"The Primary Action of the Galvanic Current on the Blood. It increases the Amount of Ozone it Contains, as shown by Chemical Tests of the Blood in the Arteries." By J. Mount Bleyer, M.D., and M. M. Weil, M.D., of New York.

"The Use of Static Electricity in Incipient Insanity." By W. E. Robinson, M.D., of Albany, N.Y.

"The Conservation of Energy as a Successful Factor in Electro-Therapy." By Horatio R. Bigelow, M.D., of Philadelphia, Pa.

Dr. W. J. Herdman, of Ann Arbor, was elected President, and Dr. Margaret Cleaves of New York, Secretary; Dr. Franklin H. Martin, of Chicago, and Dr. A. Laphorn Smith, of Montreal, Vice-Presidents; Dr. R. J. Nunn, of Savannah, Ga., Treasurer, for the ensuing year. It was decided to hold the next meeting in New York City, on the last Tuesday in September, 1894.

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MONTREAL, DECEMBER, 1893.

## THE CAUSES OF RHEUMATISM.

It seems strange that after so many years of study of this disease, with an abundance of clinical material, it should still be so little understood. We have more than once in these columns endeavored to show that the disease is entirely due to the supersaturation of the blood with uric acid, which is the last stage of oxydation of nitrogenous food before the final one of urea. We have shown that the malady is entirely preventable in one or all of three ways: First, and most important, by abstaining from such articles of diet as are known to consist very largely or almost entirely of nitrogen, such as lean meat, cheese and milk; second, by taking in as much oxygen by means of active exercise as may be necessary to oxydize all the nitrogen in the blood; and third, if one is unwilling or unable to eat less meat and take more exercise, then the next best thing to do is to drink enough pure water to dissolve as much of the unoxydized nitrogen as possible, and thus to eliminate it by means of the kidneys from the blood.

This subject has been brought prominently to mind by the appearance in the Journal of the American Medical Association, 4th November, 1893, of an interesting and exceedingly instructive paper by Sir James Grant of Ottawa, on "Some rare forms of gout and rheumatism." After relating several rare and interesting cases of pulmonary gout, perityphlitic gout and rheumatic perityphlitis, he goes on to say: "Errors

in diet, as an etiological factor, have much to do with the production of both gout and rheumatism, and such strengthens the metabolic theory that rheumatism depends on a morbid material, produced within the system, the result of defective processes of assimilation. True, Prout, Latham, Richardson, Mitchell and Dr. William H. Porter of New York have thrown much light on the subject of rheumatism, and certainly the present case points to rheumatic complications as the outcome of defective assimilation,—an important factor in its production. Thus the chemical laboratory of the human system becomes disturbed, resulting in false products, enabling us to establish a connecting link between even perityphlitis and rheumatism. In the structure of the intestinal walls there is undoubtedly a large amount of fibrous tissue, just as in the fascia and the tendons of the joints, and it is reasonable to suppose that these structures should be influenced in the same manner. Assuming that the case under consideration was even quasi-rheumatic in its character, it affords one more illustration as to the importance of giving due consideration to the line of action embraced in medical or surgical treatment under like circumstances."

One of his most striking observations is the following one, which Sir James Grant is especially qualified to make, for Ottawa is not only the official residence of the Governor General, to whose family he is the attending physician, but it is also the greatest lumbering centre in Canada, and Sir James has practised there for at least 40 years. "After noting," he says "the life history of many thousands of our lumbermen I have been amazed at the few attacked by rheumatism. Bread, pork and strong tea constitute their chief articles of diet, and the general inference is that the tea enables them to digest the pork with remarkable comfort, and certainly after a hard winter's work they return home well nourished and healthy in every particular." How can we explain this apparent anomaly? These men pass six or eight months of winter in the forests about the head waters, of the Ottawa river, very near the latitude of Hudson Bay; and although the cold is intense, and they are out in it from daylight to dark, still, rheumatism is almost unknown among them. If cold would cause rheumatism, then every lumberman ought to have it.

For us the explanation is quite clear: they have nothing in their blood to make the little sharp pointed crystals of uric acid out of, for to these latter is due the severe pain of articular and the dull pain of muscular rheumatism. Uric acid crystals cannot be made without an immense surplus of nitrogen in the blood, for if there is just enough nitrogen for the quantity of work done and oxygen inspired, all the nitrogen will be converted into urea. These lumbermen perform the hardest kind of muscular work, and yet they consume less nitrogen than a city clerk who is carried to his office in the morning, breathes the smallest quantity of bad air necessary to sustain life all day, and is carried home again at night. The lumberman on the one hand consumes large quantities of hydrocarbons in the shape of starch and fat, but very little nitrogen, for the fat pork contains almost none, the main supply being found in the gluten of the bread. He has no milk for his tea and he never tastes cheese. His luxuries are dried apples and molasses, and in some cases baked beans which mostly consist of starch. As Sir James Grant says, these facts point to the importance of simplicity of diet. Our progenitors frequently attained the age of three-score and ten, nourished by grain ground between two stones." To us rheumatism is a disease of diet, not of climate, and we are therefore neither surprised at the immunity from it of the lumberman, as observed by Sir James Grant, nor do we expect anything else but rheumatism to result for the man of sedentary occupation deprived of sufficient oxygen who gorges himself with meat and milk and cheese three times a day. It would be interesting to hear from some of our confrères practising in other and distant sections of the country, down South for instance, where the negro lives largely on hog and hominy, whether he enjoys the same freedom from rheumatism as does the wood chopper in the ice-bound forests of the far North. We have always been astonished at the treatment of rheumatism practised by our leading hospital physicians in this city, who, with the absolute control of the patient's diet in their own hands, deliberately place the suffering rheumatic on an almost exclusively nitrogen diet, as found in the cheese of two quarts of milk a day. No wonder the urine continues to be high colored and loaded with uric acid and

urates, and that he takes an average of six weeks to be cured. To add insult to injury, as it were, he is by some deprived of water. We trust, for the sake of the sufferers, that these lines may lead the physicians to put them on an exclusive hydrocarbon diet, with an abundance of water. When a few days with or without the aid of salicylate of soda or bicarbonate of potash the sharp little uric acid crystals will soon be dissolved out of the blood, and the patient will be cured.

Lest any may say that cold certainly has something to do with the disease, we must of course admit that given a blood liquid at a temperature of 100 degrees F, super-saturated with a given solid, this solid will be precipitated in a shoulder or hand or knee joint, if the temperature of the latter should fall to ninety degrees. But when the blood is free from uric acid there is nothing to be precipitated in the joints, no matter how cold they become.

#### IMPERIAL HONORS FOR THE CANADIAN MEDICAL PROFESSION.

When we glance over the list of Canadians who have received imperial honors, we cannot fail to be struck with the small number of physicians in comparison with the lawyers and politicians, a condition of things very different from that which exists in Great Britain and Ireland. There are at present more than five thousand physicians practising in Canada, nearly every one of whom has more than once performed an act of heroism, although it may have been unnoticed and unrecorded in the book of fame, but none the less the equal of any deed of valor on the field of battle. Of these many have reached a high degree of eminence, and some have become celebrated not only throughout our own land but even throughout Europe. Apart from that, the profession as a whole stands high throughout the world. And yet so far but one Canadian physician as such has ever received an imperial honor. Dr. Taché and Dr. Tupper, it is true, were knighted, but that was for political services and not as medical men. Many people attach but slight importance to these distinctions, but so long as they are conferred somewhat lavishly upon judges and lawyers, we must protest against this continued slight to a profession which, it cannot be denied, renders services which are in-



finitely greater. These distinctions, moreover, are the means of drawing more closely the bonds of affection which bind the various parts of the empire together. Neither does the giving of them when done with discretion impoverish the royal source whence they flow. We attribute this apparent neglect to the well-known self-negation of the members of our profession whenever its interests are concerned; this is evidenced by the unbounded charity and unselfish devotion of the medical man often in the face of the basest ingratitude. Lawyers seldom give their services day after day without the hope of pecuniary reward, and yet when a lawyer reaches a certain position in his profession on the bench he receives the honor of knighthood as a matter of course. The medical profession of Canada has long considered this lack of appreciation as a slight as well as an injustice, and we think it is now time for it to ask whether it should not at least receive the recognition which it deserves and which it receives elsewhere.

#### THYROID GLANDS AS MEDICINE.

We see in a recent number of the *Medical Press and Circular* that thyroid glands are supposed to be of such value in several diseases, notably myxœdema and psoriasis, that the butchers have put up the price. Even a physician, who is suffering from psoriasis, writes to the above journal to know whether the thyroid of any animal would do as well as that of the sheep.

It sounds more like witchcraft than nineteenth century science to see such evidences of credulity as are witnessed every day by the vaunting of different parts of animals for the cure of special diseases. We smile when we read the fashionable prescriptions of five thousand years ago, which include such articles as parts of a dog's foot, legs of a black spider, skin of a frog, etc.; but are we really very much in advance of our ancestors when we gravely eat "a ragged bit of flesh like liver, about half the size of a rabbit's ear," as the writer above referred to describes it, with the firm belief that it is going to cure a case of inveterate psoriasis? If people with psoriasis would pay more attention to their diet, eat less meat, drink more water and breathe

more good air, they would be more likely to be cured than if they ate an unlimited quantity of thyroid glands.

#### BOOK NOTICES.

LE MÉDECIN DE LA FAMILLE, World Publishing Company, Guelph, Canada, 1893.

Is the title of a new work just issued, which is the French edition of that excellent and reliable family medical book, *The Practical Home Physician*. The newly revised edition of the latter stands at the head of all similar works. "*Le Médecin de la Famille*" in typography, paper and binding presents a superior appearance to its English prototype. The text in both the English and French editions is correct in style and intelligible to every reader. New contributions appear from the pens of Dr. Sévérin Lachapelle and Dr. L. E. Fortier of our City, members of the Medical Faculty of Laval University.

The work is well called not only the Home Physician, but an Encyclopædia of Medicine and of Hygiene, public and private. It is a large volume of over 1300 pages, profusely illustrated with about 230 engravings and colored plates. The manikins of the head and of the body, and the other colored anatomical plates are exceedingly good, and interesting to the medical practitioner as well as to the general reader. The various subjects treated of are very numerous, but the exhaustive and complete Indexes enable you quickly to find any particular matter desired.

Everyone should have a general knowledge of Anatomy and Physiology, of the laws of health, of the diseases and accidents commonly met with, and the remedies usually applied. The intelligent patient could thereby better appreciate the importance of the science of medicine, and could better assist the physician in his practice.

In the work before us a vast amount of useful information about Hygiene in its application to our daily life is set forth in about 100 pages, which should be read and studied by every household. To be forewarned is to be forearmed. The knowledge herein given as to the various diseases, their causes, symptoms and treatment, including most excellent prescriptions, is such that the intelligent reader may better guard against disease, and when present can more successfully manage and control it.

The book is of great value to every household; the subscription price of \$4.75 or \$5.75, according to binding, brings it within the reach of all.