

REPORT

ON

MODERN MEDICAL ELECTRIC AND GALVANIC INSTRUMENTS, AND RECENT IMPROVEMENTS IN THEIR APPLICATION:

WITH SPECIAL REGARD TO THE REQUIREMENTS OF THE MEDICAL PRACTITIONER.

VII.—*Electro-Therapeutics.*

THE precise mode in which the various forms of electricity produce their therapeutical effects is still, to some extent, shrouded in mystery; but much more is now known of it than was the case formerly.

A. *Static Electricity*, which is now very rarely used, is a powerful stimulant, especially for the sentient nerves, and may be used with benefit wherever it appears desirable to produce a profound modification of their condition, as in anæsthesia, headache, and certain forms of neuralgia and spasm.

B. The effects of the *constant current* are much more complicated than those of static electricity, but Pflüger's physiological researches on electrotonus appear to us to supply the key to the large majority of the medical applications of the current. Pflüger has shown that a continuous current which passes through a nerve causes certain alterations of excitability in the same, viz., a zone of increased excitability in the neighbourhood of the cathode, and a zone of diminished excitability in the neighbourhood of the anode. Cyon has proved that Pflüger's researches, which were made on frog's limbs, hold good for the nerves of the living man likewise; and the *systematic production of catelectrotonus and anelectrotonus for the purpose of increasing or diminishing the excitability of diseased portions of the nervous system, has thus been shown to be a therapeutical possibility.* The polarising or electrotonic effects of the current may, therefore, be utilised in certain forms of paralysis and anæsthesia, where catelectrotonus should be produced, and in spasm and hyperæsthesia, where anelectrotonus finds its appropriate sphere of action. We have thus found a scientific explanation for what Remak called the antiparalytic and antispasmodic effects of the current. With regard to the mode of applying it in such cases, it may be laid down as a general principle that for the nervous centres the continuative (Remak's stable) application is under all circumstances the most appropriate; while for the peripheral nerves and muscles the continuative application should be generally combined with an intermittent application, which produces particularly stimulating effects.

This brings us to a second point which we have to consider in using the current. Electro-physiology teaches us that the constant current is a *powerful stimulant* for all the different portions of the nervous system, and that these stimulating effects become more particularly developed where an intermittent application and voltaic alternatives are resorted to. Passes with the cathode, and voltaic alternatives in the metallic circuit, are, therefore, the necessary complement of catelectrotonus in cases where a powerfully stimulating effect upon certain portions of the nervous system is required.

The *refreshing or restorative* effects of the current may likewise be utilised in a variety of pathological conditions, particularly in cases of exhaustion of the several parts of the nervous and muscular systems, in consequence of over-exertion. The inverse current is more effective in these cases than the direct.

The *electrolytic* action of the current is unquestionably one of its most important properties. That such an action takes place during the percutaneous application of the current, is not only *à priori* probable, but is also definitively proved by the peculiar effects of the anode and cathode on the unbroken skin. For, if the cathode be armed with a metallic conductor, a small vesicle is formed which, after a time, projects considerably beyond the surface. Its contents are found to consist of layers of epidermis imbibed with serum, and are strongly alkaline. After a time, this serum assumes a brownish hue, and the vesicle is surrounded by an inflammatory areola. On the anode there is at first ischæmia, which is followed by the formation of a papule containing acid serum. The cathode is not altered, while the anode is oxidised. It is at present not settled what peculiar kind or influence the electrolytic effects of the current, when percutaneously applied, exert in therapeutics, nor in what classes of cases they are practically useful; but a persevering study of this difficult point will, no doubt, in course of time lead to scientific and practical results of the greatest importance.

Remak has called *catalytic effects* of the current those which are produced by direct stimulation of the vaso-motor nerves, which latter

transmit the influence to the blood-vessels and lymphatics. In this way the processes of nutrition throughout the system may be influenced by galvanisation. It appears to us that for catalysis we might substitute the more intelligible term of "catelectrotonus." By catelectrotonus of the vaso-motor nerves absorption is promoted, and effusions may thus be removed into the general circulation. Most probably the therapeutical effects of the current in rheumatism and rheumatic gout, in neuritis, in dropsy of the joints, etc., are owing to what may be called catalysis, or better *catelectrotonus of the vaso-motor system of nerves.* One of the best modes of utilising those effects of the current is, to resort to the proceedings known as "galvanisation of the cervical sympathetic nerve."

C. The mode in which *faradisation* acts is not nearly so complicated, and, therefore, much better understood. The faradic current is capable of disturbing the molecular equilibrium of the motor nerves and muscles, so as to produce the state in which they are physiologically active. This disturbance, if judiciously produced, tends to re-establish or to ameliorate the lost or impaired function of the motor nerves and muscles. The faradic current likewise allows the necessary alternate contraction and expansion of the muscles, without which their nutrition is soon seriously impaired, augments the oxidation of the contractile tissue, and causes a more abundant supply of arterial blood to it, which is evidenced by an increase of heat and bulk in the parts which have been faradised. In anæsthesia, hyperæsthesia, and spasm, faradisation acts in the same manner as static electricity, viz., by modifying the condition of the sentient nerves of the parts submitted to its influence.

We now proceed to cast a short glance on the diseases in which either galvanism or faradism may be employed with a fair chance of success.

In certain *Disorders of the Mind* both currents may do a great deal of good. Faradism is useful where anæsthesia, atony, and want of cerebral activity are prominent symptoms. Abulia and depression are by its means relieved, nervous energy is roused, and circulation improved. Its action on the skin is in many cases useful, as the function of that organ in lunatics is generally impaired, and often nearly lost. Faradisation appears chiefly suitable for apathy and stupor, but may also be employed for overcoming resistance and defiance, and may replace the strait-waistcoat and douche. It should not be used where there is increased excitability, or a high degree of irritable weakness; but chiefly in atony of the brain, depression, and paralysis of function. The stimulation of the diseased nerve-centres produced by faradisation is, of course, not a direct one, but owing to transmission of the faradic influence from the sentient nerves of the skin and the muscles to the brain and spinal cord. Faradism appears, therefore analogous in its action to cold baths, the douche, and other stimulating applications of cold water; in all cases where these answer, faradism will do good, and *vice versâ.* It has, however, the advantage over those means of being more manageable and easily controllable in its action, while it is devoid of unpleasant consequences, as patients do not catch cold after it. Dr. Arndt, of Greifswald, who has gone more deeply into this subject than any previous observer, believes faradism to be equally important in the treatment of insanity with iron, quinine, and baths, and much more important than narcotics. He finds that the reason why up to the present time this subject has not been better worked up, is the circumstance that the applications have been unsystematic, and that alienists have not been sufficiently critical in their selection of cases for such a treatment.

The constant current will probably, in course of time, come to be very much employed in the treatment of certain forms of insanity. It has the advantage over faradism of having an immediate effect on the nervous-centres; and it may be used both in states of depression and of excitability, catelectrotonus being suitable for the former, and anelectrotonus for the latter. Old cases and structural diseases will be found to resist its influence, while recent cases and functional diseases may be benefited by it.

Cerebral Exhaustion, without actual mental disease, is a complaint frequently met with now-a-days, and is generally owing more to functional derangement, and a bad performance of the finer processes of nutrition, than to structural disease. The condition of anæmia seems to be more prevalent in these cases than hyperæmia; and the almost invariable cause is, not hard work, but worry, anxiety, and affliction, in the middle-aged or the aged. The medical treatment of this affection often yields but unsatisfactory results; while the production of catelectrotonus of the suffering nervous centres is often rapidly successful. Even where symptoms of restlessness and irritability are prominent, these are generally owing to more impaired nutrition of brain-matter than to vascular excitement, and yield, therefore, more easily to catelectrotonus than to anelectrotonus. The results of the first few applications, however, must be decisive, and overrule any theoretical views we may have formed of

the nature of the case. Where catelectrotonus does not answer, or makes the patient worse, anelectrotonus should be substituted for it; and if the patient do not rapidly improve under either plan of treatment, the use of the current had better be given up.

It is, however, chiefly in the various forms of *Paralysis* that faradisation as well as galvanisation find a most legitimate and useful sphere of action. The constant current may be used soon after a paralytic stroke, whether this has been due to cerebral hæmorrhage, to softening, or to embolism of an important cerebral artery. It has been recommended by some recent authors to galvanise the brain and sympathetic nerve as early as seven or eight days after the attack; but we think it necessary to postpone the galvanic treatment until the danger of cerebral fever, which often follows an attack of hæmorrhage, should have passed off; and as this, if it occur at all, comes on in the second or at the commencement of the third week, the application of the current may be considered safe when from fourteen to eighteen days have elapsed since the occurrence of the attack. If we were to wait much longer, the prospects of ultimate recovery would be diminished. The application must be short and gentle; and it is at this stage sufficient to produce anelectrotonus of the injured hemisphere and the cervical sympathetic nerve. In cases where several months have elapsed since the occurrence of the attack, peripheral galvanisation or faradisation must be combined with the central application.

All kinds of paralysis may be benefited by a judicious use of the constant current, even where they are produced by poison in the system, such as lead, syphilis, and diphtheria; or by disease of the nervous centres and motor nerves. The prognosis, however, is always more favourable in recent cases, in the young, and where there is not much structural disease, than in the opposite conditions.

In *Spasmodic Diseases*, electricity is not nearly as valuable as in paralysis, with the only exception of chorea and scrivener's palsy, in which latter the constant current is our best remedy; but the treatment must, in such cases, be persevered with for a long time. In tetanus a few unquestionable successes have been obtained with it; but experience is still very limited in this particular. The production of anelectrotonus of the cord, however, appears a rational remedy for tetanus, and may be resorted to without hesitation.

That the various forms of electricity should be useful in two such apparently opposite conditions as *Anæsthesia* and *Hyperæsthesia*, seems at first singular; but it is explained partly by the circumstance that we may diminish as well as increase nervous excitability, *ad libitum*, according as we induce anelectrotonus or catelectrotonus; and partly by the therapeutical fact that many forms of hyperæsthesia require stimulating rather than depressing treatment. Dr. Anstie's researches on the pathology of neuralgia have been very suggestive in this respect, and point to the conclusion that catelectrotonus may be more effectual in the treatment of some forms of tic and sciatica than anelectrotonus.

In *Asphyxia* and *Syncope* from poisoning by chloroform, charcoal fumes, opium, from drowning etc., faradisation of the phrenic nerves is a ready and excellent measure. Farado-puncture of the heart may be used when the just-named proceeding does not answer. In puncturing the heart, we must take care to hit the apex of the organ, which bears injuries very well; and this may be accomplished by introducing a needle into the middle of the fifth left intercostal space, about one and a half inches from the left edge of the sternum. By acting in this way, the left pleura, the coronary arteries, and the internal mammary are avoided. The puncture should be made perpendicularly, and should be one and a half inches deep; in fat persons rather deeper than that. All unnecessary manipulations of the needle, more especially on taking hold of it when the heart's action recommences, should be carefully avoided. This needle is connected with the positive pole of the faradic apparatus, and a moistened sponge-conductor connected with the negative pole is placed over the pit of the stomach, or over the left seventh intercostal space. The current should be weak, and only act for a second at a time, then be interrupted and used again in a similar manner. Faradisation of the phrenic nerves is performed at the neck, where those nerves are accessible to the electrodes on the anterior surfaces of the scalenus anticus muscles. Moistened sponge-conductors are forcibly pressed for a second or two to the points named, when an artificial respiration is produced; the thorax is expanded, and the air rushes with force into the lungs. Expiration is then effected by pressing the abdominal parietes from below upwards. Faradism is then again applied to the phrenic nerves for a second or two, and again followed by mechanical expiration. It is also useful to faradise the motor nerves of those muscles which act in combination with the diaphragm, viz., the branches which proceed from the cervical plexus to the trapezius, levator scapulae, and serratus muscles.

In *Basaloid's or Graves's Disease*, the chief symptoms of which are palpitation of the heart, enlargement of the thyroid body, and exoph-

thalmus, the proceeding known as galvanisation of the cervical sympathetic nerve has been successfully used.

In *Progressive Muscular Atrophy*, *Progressive Locomotor Ataxy*, and *Labio-glossopharyngeal Paralysis*, galvanisation of the diseased structures appears to be the most rational treatment. These diseases are rarely, if ever, cured by it; but their progress is generally arrested, and the patient's existence is rendered much more tolerable, especially if the current be used in the commencement of the affection.

In *Rheumatism* and *Rheumatic Gout*, and certain diseases of the digestive organs, owing to atony, faradisation and galvanisation may be employed with a fair chance of success. In paralysis of the bladder, impotency, and spermatorrhœa, chronic metritis, and stoppage of the lacteal secretion, both kinds of current have been frequently used with satisfactory results.

In *Surgery*, the galvanic current finds a continually widening field of action. The old ideas about dissolution of stone in the bladder by the aid of electricity, to which even so acute an observer as the late Dr. Bence Jones attached some importance, and other similar chimeras, have long receded into that obscurity from which they should never have emerged; but both the galvanic cautery and electrolysis have opened up vistas of an easier and more successful treatment of certain surgical affections than could be obtained by other means. The galvanic *écraseur* is chiefly used for removal of the tongue; and other forms of cauteries are employed for nævus, epithelioma, and similar growths. Electrolysis is apparently the only remedy which can be employed with some chance of success in intrathoracic aneurism; while in some forms of tumours, such as nævus, hydratids of the liver, lipoma, and cystic goitre, it seems to be superior to most other plans of treatment. It is by far the most effective remedy for the pain that accompanies cancerous affections; is useful in epithelioma, and may, in course of time perhaps, with improved methods of application, become an important remedy for the treatment of some other forms of external cancer, more especially in relapses after excision.

In *Midwifery*, faradisation is useful for troublesome forms of *post partum hæmorrhage*. It is unable to induce uterine action of itself, while it may increase it considerably after such action has once commenced.

A great deal might be written on *electric quackery*, which is nowadays most rampant. It will, however, be sufficient to say: "Beware of advertisements, and of medical galvanists without a diploma."

PRESENTATION OF A TESTIMONIAL PORTRAIT TO MR. SAMUEL HEY.

A SUBSCRIPTION portrait of Mr. Samuel Hey, painted by Mr. Sydney Hodges of London, to be placed in the Leeds Infirmary, was lately publicly presented to the governors.

Mr. C. G. WHEELHOUSE, Senior Surgeon of the Infirmary, being called on, said that, having for a long time been aware that an earnest desire existed in the minds of many of his friends to possess a good portrait of Mr. Samuel Hey, it had been represented to him that he was the fit person to take the initiative in the matter. Mr. Hey was so widely beloved and revered, that it had been determined to limit the subscription to a small sum, and chiefly to his fellow-practitioners, and to old patients who claimed the privilege of being allowed to join. Notwithstanding this precaution, there was a surplus. He eulogised Mr. Hey as a practitioner, generous, kind-hearted, and considerate; as a consultant, in securing whose assistance all felt that the utmost had been done for the patient. Mr. Hey's reputation was indissolubly connected with the institution in which this faithful representation would henceforth find a place of features so heartily welcomed by very many in their time of trouble, as conveying assurances full of hope and comfort.

The CHAIRMAN expressed the pleasure with which the Board accepted the portrait.

Mr. SAMUEL HEY said he could not adequately express his thanks for this graceful mode of perpetuating his connection with that beneficent institution. No doubt a portion of the lustre of the merits and labours of those who founded and carried on the duties of the charity, was reflected on all who take part in its working; and of this he reaped the benefit. If ever he wished an honour, it was such as his profession could give. He was infinitely indebted to Mr. Wheelhouse both for the initial action and the extreme delicacy he had observed throughout. The responses had recorded sundry virtues of which he was profoundly ignorant, and the declaration of which he could still only regard with considerable incredulity. Mr. Hey described at length his appreciation of the extreme happiness of a professional life in such a hospital as that: the intellectual interest of the studies involved; the varied gifts and experience of senior colleagues; their kindly recognition of a

junior as an equal; their forbearance and sympathising help for a long series of years; the kindness, delicacy, and attention of new colleagues, renewing the enthusiasm of his youth, adding fresh teachings to old experience, and so affording new interests and additional knowledge. The combined duty of teaching the rising generation brought benefits, it might be hoped, to them, ending in mutual affectionate remembrance. The gratitude of many patients for sorrow and suffering alleviated and cured was earned not by the sole performance of duty, but by heartfelt sympathy in suffering. There was a natural revulsion from the sight of pain. It was only high motives which kept them by the bedside in the hour of distress. "In conclusion," said Mr. Hey, "I will say no more than this, that I am convinced that, if we are all pervaded with simplicity of spirit, singleness of intention, and harmony and unison of feeling, our various offices, high or low, will work together for our great object—the succour of the afflicted in body or in soul. Once more I thank you."

Mr. Hey having resumed his seat amid much applause, Mr. WHEELHOUSE said that, as Mr. Sydney Hodges had come from London for the purpose of painting the picture, and remained a fortnight in Leeds, he should suggest that, with the approval of the subscribers, the small balance remaining after paying all expenses should be handed over to that gentleman.

This proposition was carried *nem. con.*, and the meeting then separated.

CLUB PRACTICE.

WE would request the attention of gentlemen interested in this subject to the resolutions passed on the subject of Club Practice at the last meeting of the West Somerset Branch. They will be found in the next column; and we shall be happy to publish any suggestions on this subject which are likely to assist the Council of the Branch in their further deliberations.

THE BROWN INSTITUTION.

THE subject of the second and third lectures to be delivered by Dr. Burdon Sanderson at the theatre of the University of London, Burlington House, December 12th and 16th, will be Pyrexia, and its relation to the other Constituents of the Febrile State.

PART I.—Fever is not essentially a disorder of the nervous system. The neurotic theory of febrile pyrexia, viz., that fever has its original seat in the cerebro-spinal nervous system, and consists essentially of impairment of the function of an hypothetical heat-regulation centre. (Virchow, *Handbuch der Spec. Pathologie*, 1852, p. 37.) The essential effect of the theory is, that if it were true it would only account for the continuance of pyrexia, not for its existence. Supplementary theory of "trophic nerves." (Samuel, *Die trophischen Nerven*, 1869.) Recent vindication of the neurotic doctrine by Naunyn. (Beitr. zur Lehre von der fieberhaften Temperaturerhöhung, *Arch. für Pathologie*, Juli 1873.) Criticism of his arguments, a. Production of pyrexia in man by injury of the spinal cord in the cervical region. (Sir B. Brodie, *Med.-Chir. Trans.*, vol. xx, 1837). b. Comparison of the effects of injury of this part of the spinal cord in man with those observed in animals. c. Explanation of the loss of bodily temperature which follows the injury in small animals. d. Rise of temperature which occurs under the same circumstances in large animals.—Naunyn's explanation.—Reasons for adopting a different one. Certain cases of extreme pyrexia are neurotic, e.g., "hyperpyrexia" and "sunstroke." They cannot be identified with febrile pyrexia.

PART II.—Fever is not essentially a disorder of circulation. Physiological prolegomena. Arterial tonus: its variations under the influence of the vaso-motor nervous system. Law which governs these variations, viz.: that the arterial tonus is so adapted to the contracting power of the left ventricle as to secure the greatest possible effect in a given time, that it cannot be increased or diminished without diminution of velocity. Heidenhain's demonstration (1), that increase of arterial tonus does not, as was formerly supposed, retard the blood-stream, but accelerates it; (2), that acceleration of the circulation diminishes bodily temperature and *vice versa*. (Heidenhain, Ueber den Einfluss des vaso-motorischen Nervensystems auf den Kreislauf und die Körpertemperatur. *Pflüger's Archiv*, iv, p. 77.) a. The increase of vascular tonus supposed to occur during rigor would, if it had any effect, tend to oppose the rise of bodily temperature. b. No effect as regards temperature can be attributed to the diminution of tonus in the subsequent stages of fever.

PART III.—Fever is not essentially a disorder of secretion. Examination of recent views and researches on the reaction of fever. The subject of the fourth lecture (December 19th) will be "Bacteria and their influence on the organism in health and disease."

ASSOCIATION INTELLIGENCE.

SOUTH EASTERN BRANCH: EAST SURREY DISTRICT MEETINGS.

THE next meeting will be held at the Greyhound Hotel, Croydon, on Thursday, December 18th. Dr. Carpenter will take the Chair at 4 P.M. Papers, etc., are promised by Dr. Dukes, Dr. Parsons Smith, Dr. Adams, etc.

The dinner will take place at 6 P.M.

HENRY T. LANCHESTER, M.D., *Hon. Sec.*
Croydon, December 6th, 1873.

GLOUCESTERSHIRE BRANCH: ANNUAL MEETING.

THE annual meeting of this Branch was held at the County Infirmary, Gloucester, on Tuesday, November 25th. In the unavoidable absence of the President, Dr. RUMSEY of Cheltenham, Dr. SANKEY took the Chair.

The officers for the next year were elected.

Papers.—1. Dr. BOND, the Medical Officer of Health for this portion of the county, read a paper on Drinking Waters and their Impurities.

2. Dr. WILSON (Cheltenham) read a paper on the Value and Uses of Various Disinfectants.

Public Health.—The following resolution was adopted on the motion of Dr. BOND:

"That, in the opinion of this meeting, it is essential to the protection of the public health that all premises on which milk, butter, or cheese, are stored or made for sale, should be placed by law under the supervision of a medical officer of health, who shall have adequate powers to deal with such premises in case he shall consider their condition to be at any time prejudicial to health."

The members afterwards dined together at the Bell Hotel.

WEST SOMERSET BRANCH: AUTUMNAL MEETING.

THE Autumnal Meeting of this Branch was held at the Squirrel Hotel, Wellington, on Friday, November 7th, at five P.M. Fourteen members were present; GEORGE GILLET, Esq., of Taunton, President, in the chair.

Club Practice.—After dinner, the following question (of which due notice had been sent to each member of the Branch) was put from the chair: "Is Club Practice conducive to the interest and welfare of the Profession?" The Secretary read letters from Messrs. J. B. Collins, J. Cornwall, H. B. Hurman, and E. Stephens (who were unable to come to the meeting); the purport of the letters being to return a negative answer to the question. The responses of the gentlemen present were then given *seriatim*; they were of a very varied and interesting character, as the question was approached from different points of view. The good and the evil, the use and the abuse of clubs, were descanted on; and, as at present conducted, club practice was unanimously disapproved of. A strong feeling was expressed by some speakers that clubs should be abolished, and the provident dispensary system substituted; but, after a long and animated discussion, the following resolutions were passed. 1. That club practice, as at present paid for, is not conducive to the interest and welfare of the profession, but that if proper rules for preventing the abuse of clubs and provident societies were insisted upon by medical men, such institutions are not to be condemned by the profession. 2. That with a view to arriving at some practical conclusion on this subject, the Council be requested to take into their consideration the question of club practice, and to frame such rules as they may consider appropriate, for preventing the abuse of clubs and provident societies, and generally for giving effect to the preceding resolution; and, as soon as they can conveniently do so, to report the same to a general meeting of the Branch.

Inversion of the Uterus.—Mr. G. R. NORRIS, of Wiveliscombe, read a paper on a case of acute inversion of the uterus, which led to a short discussion.

Public Health Act, 1872.—Dr. H. J. ALFORD, officer of health for the sanitary district of Taunton and the Taunton Union, read a paper