1884

On the Value of Electric-ity in the Treatment of the Insane.

with a Note on the galvanic-excita-bility of the Muscles in General Paralysis

by

William Richardson
M.B., & C.M. Edin: Univ: 1874.

*

Contents.

I
Introduction.

That there should have been much mystification in the subject of electro-therapeutics is what might be expected, when we take into consideration the very occult nature of the remedy and remember the saying of Michael Faraday that "he once thought he knew something of electricity, but the more he investigated it the less he understood it." Uncertainty and difficulty in apportioning the proper value to a remedy, which must operate in the ever-changing conditions of living bodies, meet physicians and physiologists to daily; perhaps the complications are more entangled and difficult of solution in the case of electricity than of most other therapeutic agents.

It is not a matter of surprise that in early times it was assoc-

-cated with witchcraft and that some operators devised means of applying it which tended to impose on the gullibility of mankind and could only act through the imagination of the patient.
We are told that some physicians filled their Cylinders for generating frictional electricity, with purgatives, which were said to have their legitimate effect on the patients subjected to the electricity. Beckensteiner maintains the conducting bodies become "etherealised" by the electricity passing along them and that of all gold is the best! - also that electricity becomes "animalised" by being first transmitted through the body of the operator; further that by making certain passes with the electrodes near a patient he receives an electrical influence in some mysterious manner without Contact. Again Dr Dropsy of Cracow speaks of Curing disease by changing the "pathological electrical formula" into the "physiological formula". To effect this he places a bifurcate electrode

from a faradic apparatus in contact with the head and epigastrium, a quadrifurcate one in contact with the four extremities – the "physiological formula" being that sensitiveness to electricity diminishes from the summit of the head to the feet!

Further electricity has always been a hotly debated subject and the history of its use is intimately associated with the names of the Champions who have fought over its mode of production, its best therapeutic varieties, and manner of application: the names of Galvani and Volta, Duchenne and Remak & of numbers of "polarisers" versus "directionists" recall many battlefields of opinion.

It may be accepted as certain that all the processes of organic life, movement thought &c., the chemical decompositions and combinations, the generation of heat – in fact all molecular changes in the animal body are accompanied by variations in the electrical condition of that part

where the changes occur. owing to the quantity of saline fluids in the body and the absence of real non Conducting materials there is usually no generation of free electricity but the equilibrium is at once restored.

Seeing therefore that electricity normally accompanies or one might say intimately pervades our life and being; it would be surprising if applications of it from the exterior were not found to be of use in restoring the body from disease to health. There can be no doubt that given in certain doses electricity assists the general processes of nutrition as is exemplified in the experiments of Onimus and Legros° who electrified some puppies for a quarter of an hour daily for some weeks with the voltaic current: they placed one fore & one hind paw of each in basins of tepid water connected with the different poles. Those electrified were found to weigh more & have grown larger than those not so operated on.

° quoted in Tibbits' Handbook of Medical & Surgical Electricity (1877) Chapter IV Page 114

Heidenhain° found that the voltaic current Cond restore to the muscles of the frog the excitability lost by fatigue &. Also Dr. Poore† has demonstrated that, by means of passing a constant Current along the arm of a man sustaining a weight, a much greater weight Can be supported for a longer time than without the current; the feeling of pain is removed and the susceptibility of the muscles to the stimulus of the will is increased - called the "refreshing" effect of the Current.

Passing from it effects on General nutrition and on the muscles the voltaic current especially has been of great use in neuralgia, anaesthesia, hysterical and spasmodic affections. Some physicians also recommend a gentle current after Cerebral apoplexy.

In the treatment of the multiform diseases which are grouped under the name of Insanity one would expect (without pre-judging the matter) that electricity should have a place and that its three forms (franklinic, galvanic,

° Physiologische Studien (1856) page 65.

† a Text Book of electricity in Medicine & Surgery by G.V. Poore M.D (1876)

and faradic) with their different ways of application might be adapted to the relief and cure of the many phases which mental aberration assumes. Yet it is apparent at the outset that there are many cases of insanity in & out of our asylums which are hopeless as regards cure; it remains however to be seen whether even in these some amelioration of their distressing mental impotence and degradation cannot be achieved by the use of this potent remedy — one which in directness of its action on the brain tissue and circulation is second to none & is capable of being adjusted with great precision. ° Dr. Niemeyer stated "that in the constant current we have a means more powerful than any other of modifying the nutritive condition of parts that are deeply situated" and altho' it cannot renew nervous tissue and there is no identity between electrical and nervous force; yet its influence on the nutrition of the brain and nervous system of the insane is very marked

° Text-book of Practical Medicine. translated by Drs Humphreys & Hackley (1874) Vol II Page 290.

and worthy of Consideration.
Further in the case of most diseases there are generally several ways of attempting or achieving their cure and I believe that electricity has fair to be one very useful assistant to the asylum doctor that no fully equipped asylum will be without its Electrical Room.

II

Sketch of use of Electricity in Mental Disease and Biblio-graphy.

During the 18th Century Frankinic electricity was used in a multitude of diseases including epilepsy and spasmodic affections.
One of the first authors to recommend Galvanism in disorders of the mind was Aldini of Bologna, nephew and pupil of Galvani, in his "Essai théorique et expérimentale sur le galvanisme" (1804 Paris)
Professor Remak of Berlin in his "Application du courant constant au traitement de

Névroses" (Paris 1865) advocated localised galvanisation of the Brain and Sympathetic. Benedict also used the Constant Current in several cases of mental alienation successfully and Dr Arndt has had a large experience with good results.

In this Country Dr Clifford Albutt treated a number of Cases and recended his experience in the West Riding Asylum Reports 1872 Vol ii. The Journal of Mental Science for April 1873 (p. 79) contains a paper by Dr A. H Newth on a number of cases treated by him in the Sussex County Asylum at the Request of Dr Williams.†

-!- Dr Althaus strongly recommends galvanisation of the Brain in Cerebral exhaustion and Cases merging into Insanity

In American Asylums galvanism has been used and× Beard & Rockwell relate several Cases treated by them.

o Die Electricität in der Psychiatrie. Archiv für Psychiatrie und Nervenkrankheiten vol II page 271.

† Report of Sussex Asylum (1872). London Medical Recrd July 2nd 72.

-!- A Treatise on Medical Electricity by Julius Althaus M.D (1873) Page 495

× a Practical Treatise on the Medical & Surgical Uses of Electricity by G. M. Beard M.D. and A. D. Rockwell M.D. (1881). Page 416

Magneto-electric machines were in use in early times in the French and German asylums. M Teillaux gives his experience of Faradism in his article "De l'application de l'electricité au traitement de l'aliénation mentale" in the Annales medico-psychologiques 1859 Tome V. p. 353 (3rd Series) also Dr. Anzoux in the same volume P. 527. Messrs Beard° and Rockwell recommend General Faradisation of the body in Insanity.

From the above enumeration it is evident that the treatment of insanity by electricity has occupied Considerable attention and quite recently a remarkable case of Recovery with electrical treatment after 5 years' illness has been recorded by Dr. Robertson of Glasgow.

The Battery I employed is the "Physicians 60. cell combined Battery" of Coxeter & Son. in use in the Southern Counties' Asylum, Dumfries.—

° The treatment of Insanity by Electricity by G. M. Beard M.D. Journal of Mental Science Oct. 73. page 355.

III

Methods of Using Electricity in Insanity

I Galvanisation of the Brain.

In applying the Continuous Galvanic Current to the Head the following precautions should be observed:-

a To begin with a minimum dose. (Say 3 or 4 cell of a Coseten a Leclanché Battery) and in this connection it may be well to recall Duchenne's unfortunate accident. He applied a continuous current from 40 cells to the facial muscles of a patient. "The man saw a light & called out 'your room seems all on fire'" In spite of treatment almost entire blindness on one side was the result. No one can help admiring the courage and candour of the Great Electrician in recording this case.

b The strength of the current should be gradually increased - it is necessary to use some kind of rheostat so as to include successive cells in the circuit without interrupting the current - also when the application has been made

o a Treatise on Localised Electrisation translated by H. Tibbits M.D. Page 17.

the current is to be gradually and evenly diminished in strength.

Various ways have been suggested to test if the patient is receiving sufficient of the current. The galvanometer fixed on the battery is a useful aid but in applying the same strength (or nearly) to several successive cases I have noticed it is curious what a difference there is in the resistance of different heads. Not unfrequently a patient, whose head offers much resistance and in whose case accordingly the galvanometer records the passage of only a slight current, can not bear the same amount of electricity as one in whom the resistance is less. The galvanometer, therefore, cannot be implicitly relied on.

Dr. A. H. Nauth° recommends as a test to reverse the current and if the patient is receiving sufficient he will start. A very good way is first to apply the current to one's own body and this though not a mathematical test is a very useful one.

° Journal of Mental Science: april 1873. page 80.
Vol XIX

Lastly the patient's sensations are of Considerable value even in the Insane — I have noticed a marked sensitiveness to the current in cases of Dementia where I had no expectation of it. The patient should not be hurt and as a rule mild Currents are most useful.

V. The Electrodes should be large - Soft - well moistened sponges being preferable as they can be gradually applied and the current increased by pressure.

In transmitting the Galvanic Current through the head, interruptions, reversal and sudden Variations are to be avoided - they cause dizziness, flashes of light and discomfort without any compensating advantage.

Beard and Rockwell° recommend the negative pole to be applied first on account of less dizziness being caused if the current is opened and closed by the positive pole.

The usual Positions for applying

° Op: cit: Page 335.

the Electrodes are the Temples, the mastoid Processes, the Parietal regions, one on the Frontal and one on the occipital region or the back of the neck: the latter or Fronto-Cervical direction is the one which I came to prefer as the current probably influences directly & indirectly the largest tract of the brain in that case. In my first Case I passed the current in 2 or 3 directions at one sitting but I think that better results are obtained by transmitting it in only one direction.

Dr. Newth placed one pole in contact with the head and the other in contact with the feet which were dipped in acidulated water.

The Duration of Application Recommended by different authorities varies. Benedict advises never longer than 30 seconds and to be stopped on the occurrence of the slightest giddiness. Althaus, 60 to 90 seconds Meyer, 2 to 3 minutes. These times however do not specially refer to the treatment of Insanity - chiefly to that of Cerebral apoplexy. In the case of the

On Paper already quoted.

Insane the duration of application may with benefit be extended to 5, 10 or even 15 minutes - the operator always "feeling his way" carefully so as not to hurt or weary the patient. Generally it may be said that a gentle current (say 2 milliwebers) applied for from 5 to 15 minuts will produce the greatest therapeutical effect.

With regard to time of the day. When the Continuous current is being used to induce sleep it is best applied towards evening and I have often used it in the case of patient troubled with restlessness and insomnia, after they have gone to bed.

The dose may be repeated daily or intermitted according to the progress of the patient and the manner in which the treatment is borne.

2. Galvanisation of the Cervical Sympathetic is a procedure which has had many champions and detractors - Benedict strongly recommending it in Cerebral

Disease while others have argued as though the Sympathetic trunk could not under any circumstances be reached by the current.

There are several methods of application:- one electrode may be pressed into the auriculo-maxillary fossa and the other over the transverse process of the 6th or 7th Cervical vertebra or else on the manubrium sterni close to the sterno-mastoid muscle. Another method is by placing one electrode in the auriculo-maxillary fossa & the other in the mouth opposite the lower maxillary articulation.

In the first two methods mentioned either the Spinal Cord and base of the brain or nerves such as the Vagus, Glosso pharyngeal, Superior-laryngeal Spinal accessory will of necessity be affected by the current.

Dr. De Watteville[o] very justly argues that the assertion, there are no marked changes in the pupil & Circulation of the side of the Head, is no reason for

[o] A Practical Introduction to Medical Electricity Page 107.

maintaining the Sympathetic is not affected at all – "they might as well deny the Continuous passage of a Galvanic current through any nerve because it calls forth neither sensation nor motion." Dr Clifford Albutt° thinks that the effects attributed to Galvanisation of the Sympathetic are due to reflex action and may be called forth by any strong impression upon the Cutaneous nerves of the region – such as blistering.

This method is one which I have not used much as in my opinion better results are got by a direct application to the Head & by the method of Central Galvanisation.

3. Central Galvanisation

is a method of application much recommended by Drs Beard & Rockwell of New York and it is treated at great length in their work†.

One pole (usually the negative) is placed at the epigastrium and re-

° British Medical Journal Sept 2nd 1871.

† Opus cit: page 376.

- mains stationary; the positive pole is passed over the forehead & top of the head, down the inner borders of the sterno-mastoid muscles to the sternum, round to the nape of the neck and down the entire length of the spine. Interruptions should be carefully avoided & the current (4 mm 6 to 8 cells) applied to the head for 1 or 2 minutes, down the neck for 1 to 5 minutes, down the back for 3 to 6 minutes - in the latter case 10 to 30 cells may be used.

Beard and Rockwell° claim that this method is especially useful where the whole Central nervous system is exhausted and irritable ~~(without any special part being affected)~~ as in Chronic nervous diseases of obscure pathology and that in these the current has a general tonic effect on the entire system. They further urge that Central Galvanisation brings the whole Central nervous System under the influence of one pole & that

° op: cit: page 380.

Its tonic influence is much greater than that of an application to the head only. I have employed this method with very satisfactory sedative results in Cases of obstinate insomnia & restlessness (nocturnal) occurring in chronic Cases of insanity (Cases Nos 12. 13. 14.

4. General Faradisation.

is also much advocated by Drs Beard and Rockwell[o] and its object is to bring all parts of the body as far as possible under the influence of the Faradic current. One electrode remains stationary say in contact with the sacrum and the other is passed over the surface of the body. A sponge is usually used for the movable electrode but the operator's hand may be used which enables him to judge precisely of the strength of the current. The neck and spine are the two localities which demand special attention. The Duration of application may be from 5 to 25 minutes according to circumstances.

o Op: cit: Page 347.

Beard and Rockwell recommend this method where there is general debility of the vital functions and impairment of nutrition.

It probably acts by promoting nutrition and tissue change also by influencing the electrical Condition of the body.

It is specially useful in cases Complicated with amenorrhoea and a few applications in the neighbourhood of the uterus will usually restore the menstruation.

Duchenne° has put on Record a Case showing the Care with which faradism should be applied in the neighbourhood of the neck.

5. I have employed the Continuous Current by introducing one electrode, insulated at its sides, into the external Auditory meatus filled with water & placing the other on the mastoid Process of the opposite side of the Head, in a case of Auditory hallucin-ations with delusions (No 10). The

° a Treatise on Localised Electrisation translated by H. Tibbits M.D. Page 80.

Case however was not a hopeful one and this plan of treatment did not produce any good result in the way of modifying the auditory symptoms.

6. Lastly another method of treating the insane with electricity is that described by Dr. Teillaux° Superintendent of the Female Division at Maréville who used it in some instances as a means of repression when one patient had struck another. This use belongs to a former age when it was the custom on such occasions "donner une douche à l'insensé ou le fêner dans un corset de force". In order to produce a "salutary impression on the disorded intelligence of the patient" he charged the most powerfull Leyden Jar, gave the delinquent two violent shocks and sent him back to work.

Dr. Teillaux says with good result— "Le moyen était bon" and he further maintains that the violent acts in such cases disappeared or became

° Annales Médico-psychologiques - 3me Series Vol V. Page 357.

less frequent under the treatment.
At the end of his paper (Page 389) in summing
up the uses of electricity in the Insane
he advises its employment for therapeutic
diagnostic and repressive purposes "Comme
mesure de répression". This last use
of electricity is one which I have not
attempted; it is quite foreign to the
treatment of the irresponsible afflicted
ones placed under our charge; a de-
privation of some little privilege and
kindness with firmness being usually
sufficient to correct any such aggressive
tendency.

IV

The Phenomena resulting from

(1) Galvanisation of the Brain.

Anyone may easily ascertain the subjective sensations by passing a gentle current (say 2 millivebers strong) through the Temporal Region. A flash of light is seen on application of the electrodes with a slight amount of Confusion of thought: While the current is running there is not more than a sense of fulness: on breaking the current a more vivid flash is seen the giddiness is more marked, sometimes amounting to an inclination to fall from the chair. A flow of saliva is usually excited; there is a "galvanic taste" in the mouth. In the skin under the electrodes there is of course a slight painful prickling. In some cases flushing of the face is observable with suffusion of the eyes and not unfrequently I have seen the movements like Nystagmus described by "Hitzig" a quick jerk of the eye to one side with a slower return in

o Du Bois und Reichert's Archiv 1871 (Page 716)

the opposite direction: the objects in the field of vision appear to the patient to move. The pulse in some cases is quickened in others is retarded. Further I have often noticed in patients a drowsiness during the passage of the Current, others (chiefly melancholiacs) described a feeling of lightness and bienêtre.

If the current is much stronger the following symptoms have been described by Hitzig as occurring:- on making the current, staggering and a tendency of the Head and body to turn towards the side where the positive electrode is applied: when the current is broken the body turns towards the side of the Cathode. If one electrode is removed from the head and applied to another part of the body, the head then turns to the side of the electrode applied to it.

Three degrees of Galvanic Giddiness are described by Hitzig°

(1) a sense of fulness chiefly felt on breaking the Current.

° Opus cit: also London Medical Record March 5th 1873.

(2) apparent movements of objects from the anode to the Cathode, Such are re- - versed on breaking the current

(3) Staggering and rotation of the Head and Body towards the anode with in- - clination to the Cathode on breaking the Current.

He further states that in Locomotor Ataxy there is great susceptibility to Galvanic giddiness and that it is always most easily caused by placing one electrode in the auriculo-maxillary fossa and the other (say) in the opposite hand. owing to the perfusion of Blood Vessels through the skull in the occipital & mastoid regions the galvanic current will reach the Brain more easily.

Hitzig has sought to explain the real and apparent movements by the theory that with a transverse current one cerebral hemisphere is in a state of anelectrotonus and the other of Catelectrotonus so causing a feeling of disturbed equilibrium and an effort to regain the balance.

2. Galvanisation of the Sympathetic
The following phenomena result from this method
(1) a feeling of sleepiness and drowsiness with a general sensation of warmth over the body sometimes also sensible perspiration.
(2) The pulse rate is usually diminished: some observers say the force of the pulse is increased, some that it is diminished.
(3) Variable changes in the way of Contraction or dilatation of the pupil.

3. In Central Galvanisation
there are (1) Sensations of sleepiness
(2) Diminution of the pulse rate: I have also noticed irregularity.
Actual sleep almost always follows immediately even in cases usually wakeful and noisy. (Cases Nos 12. 13. 14)

4. General Faradisation
causes a feeling of exhilaration & usually accelerates the Heart's action.

5. The Phenomena resulting from Galvanic ataxia of the auditory nerve have been most carefully studied by °Brenner of St Petersburg. Who states

(1) on making cathodal Closure there is a noise in the ears which gradually diminishes during the Continuance of the Closure of the circuit.

(2) Cathodal opening Causes no noise

(3) Anodal Closure Causes no noise

(4) If the current is strong enough there is a noise at the moment of the anodal opening

° Untersuchungen und Beobachtungen über die Wirkung elektrischer Ströme auf das Gehörorgan im gesunden und kranken Zustande. 1868 Leipzig.

V

How the Galvanic Current affects the Brain.

As the Brain is so completely encased by the bony skull with its internal membranes and the periosteum and scalp externally; it was at one time seriously doubted whether a galvanic current of moderate strength, such as might be safely used for therapeutic purposes, could really penetrate through the dense coverings and traverse the cerebral substance. There can be no doubt but that many of the animal textures offer great resistance; bones convey electricity 19 times less freely than muscle; while the dry epidermis is a bad Conductor.

Dr. Poore° states that the resistance of his own body was found to be twice as great as that of the Atlantic Cable. According to †De Watteville 2,500 ohms may be assumed to represent

° A Textbook of electricity in Medicine & Surgery. by G. V. Poore M.D. p. 13.

† A Practical Introduction to Medical Electricity by A. De Watteville p. 31.

the average resistance of the human body.

Professor Erb° of Heidelberg was I believe the first to perform a series of experiments on the dead subject which to my mind are quite Conclusive on this matter. One of these which is quite simple I repeated for my own satisfaction as follows:-

The skin of the scalp was reflected forwards and backwards as in an ordinary Post-mortem examination: a quadrilateral piece of bone $2\frac{1}{2}$ in. by $1\frac{1}{2}$ in. was removed from the Vertex with the Saw and Chisel. The dura mater Corresponding to the opening, and the underlying Cerebral substance to the extent of $1\frac{1}{2}$ inch, were removed. The Cavity thus Caused was carefully dried and a piece of sponge left in it to soak up any fluid: the pericranium was scraped away from around the opening and the edge of the bone dried. The body was then left for about 4 hours sufficiently near a

° Deutsches Archiv für Klinische Medicin Vol III p. 237.

fire to make the denuded bone perfectly dry.

A "galvanoscopic frog's leg", with the entire length of the sciatic nerve from the knee to the spinal column attached, was prepared and laid in a piece of gutta percha tissue with the nerve suspended and lying partly packed among the Cerebral substance.

On applying the electrodes of the Battery to the sides of the head just above the ears (the skin being partly replaced) distinct Contractions were caused on closing and opening by a current from 12 cells: on further trial slight trembling of the toes was noticed with a current (also galvanic) from 3 cells — on making and breaking the circuit.

In another of Prof: Erb's experiments he covered the vertex with layers of muscular tissue but in spite of its well conducting properties the current still traversed the cerebral substance.

°Burckhardt has also Corroborated Erb's experiments and in one instance

° Deutsches Archiv für Klinische Medicin 1870. Vol VIII p. 100

he injected warmed salt water into the arteries giving much stronger Currents so he inferred that the current traverses the head more easily during life than after death.

When one the Galvanic Current has overcome the resistance of the epidermis and bone it extends and diffuses itself throughout the Cerebral substance which Conducts better than the peripheral nerves and, as the brain Contains a large quantity of Blood (one fifth of the whole quantity passing Constantly through it) as well as the Cerebro-spinal fluid which bathes its membranes and ventricles, the derived Current will of necessity be distributed in a highly irregular manner which it is impossible to predict. In reaching a point midway between the electrodes the diverging paths again begin to Converge to a focus at the other electrode. There can therefore be no absolute localisation and the derived Current are weaker the

longer and more circuitous their course.

It should further be remembered that the galvanic current has an extensive and deep action as is proved by the experiments of Dr Nimo° who found that on passing a current through the anterior limbs of a large animal, the needle of a galvanometer, connected with wires introduced into the posterior limbs of the same animal, deviated. Similarly, in the case of a patient at the Hospice de la Salpétrière on introducing platinum needles into the forearm and allowing the needle to revolve to zero, a deviation occurred when the current was passed through the opposite shoulder. The constant current in this characteristic that it cannot be localized, differs from the Faradic.

It must also be taken into account that the human body being an indifferent conductor, immediately after breaking the circuit a current of polarisation in the opposite direction to the original one ~~occurs~~

° Practitioner. Sept 74 Pp. 193 & 194.

is generated has a therapeutic effect.
Moreover as the human body is a
mass of cells which contain and are bathed
in a warm saline fluid some of the
effects caused by the constant current
may be due to the electrolytic changes
which of necessity take place in the tissues.

There cannot be the slightest doubt
also that many of the results of galvan-
ism are due to reflex action through
the nervous system: menstruation some-
times is induced in women by galvanising
the feet and shoulder also the galvanic
taste is felt when some peripheral part
is being operated on. One eminent
Electrician [o] Dr. Julius Althaus lays
much stress on this and maintains that
the transmission of the continuous
galvanic current to the brain is effected
not only physically but largely physio-
logically by nervous action. In support
of this he adduces a most interesting [†] Case of
anaesthesia of the fifth pair of Cranial
nerves in which no cerebral symptoms were
produced on application of a current pass-

o a Treatise on Medical Electricity page 152.

† do. page 144 et seq.

20 Daniells cells, only very slight sensations from 30 cells which caused intollerable pain, hissing, flashes &c. when applied to the head of a healthy person. The exquisite sensitiveness of the fifth pair of nerves and the powerful reflex actions occasioned by their irritation in such simple matters as dashing cold water on the face suggest the probability of some of the sensations occasioned in galvanisation of the brain being due to reflex action but on the other hand the high diffusibility of electricity must be taken into account when the argument is advanced that a flash of light is caused by applying the pole of a battery to a part of the face where the brain is not in the direct line of the current — therefore all the cerebral symptoms must of necessity be reflex.

In Dr. Althaus' case apparently the brain itself did not react to the galvanic current. Several experimentalists however have shown that on stimulating certain parts of the brain directly in animals well defined and constant movements

are caused Corresponding to the area stimulated. Frisch & Hitzig employed the galvanic current, Ferrier the faradic; altho' their results are somewhat different yet they both agree in the Capacity of part of the Cerebral Convolutions to be irritated or excited by electricity, in fact the movements like nystagmus seen on external galvanisation of the brain appear to be due to direct action on the intra-cranial centres.

When we reflect on the activity of circulation in the brain and the vital & chemical changes which constantly take place in it - all associated with an alteration of electrical state, it is at once suggested that the current must have a therapeutic effect quite different from other agents by its influencing the natural electricity of the Brain.

Further by dilating the Blood vessels and causing increased activity of the circulation, it possibly assists in the absorption of the plaques and thickenings of the membranes so common in

Chronic insanity — the "Catalytic" action of Remak.

D. Ralfe° has performed an ingenious experiment which indicates how the current may possibly affect the nervous tissues.

Again the endosmotic action of the galvanic Current is well shown in an experiment of Dutrochet.† A tube Containing gum water and Closed at one end by animal membrane was placed in a vessel of Common water. The positive pole of a battery was put into the water, the negative pole into the gum water — the latter rose rapidly and on reversing the Current the reverse occurred.

The amount of heat evolved on passage of a current through the head will be infinitesimal in its parts, due to the fine active circulation already noticed.

To sum up When a galvanic Current of therapeutic strength is applied to the head it passes through the brain directly and also influences it by

° Lancet July 4th 1874

† Beard & Rockwell's work page 178.

reflex action through the fifth pair; it has electrolytic, endosmotic, catalytic and to some extent Chemical & thermal effects: the bloodvessels are dilated & the circulation becomes more active. It thus produces direct and important Changes in the nutrition of the Brain.

VI
Clinical Cases

Case 1. H. D. Dementia following
" 2 J. T. Dementia secondary to mania
" 3. H. P. Epilepsy with
" 4 J. I. Epilepsy with
" 5 John L. Acute Melancholia with de -
" 6 S. K. Acute Melancholia (with
" 7 William McK. Acute Melancholia
" 8 Mrs K. " Acute Melancholia
" 9 Mrs McK. Acute Melancholia
" 10 Arch: L: Delusional Insanity
" 11 S. J. W. Mania (acute)
" 12 Charlotte M. Chronic Mania - insomnia
" 13 Isabella A. Chronic Mania - do
" 14 David B. General Paralysis do

		Page.
Melancholia with violence,	Recovery.	39.
in a case of Congenital weakness.	Improvement.	46.
Imbecility -	Fits diminished in number & strength.	53
Imbecility	do.	59
- lesions (Brain disease).	Relief & temporary improvement.	61.
brain disease)	Temporary Relief	66
(Senile)	no improvement	70
	no improvement.	71
	no improvement.	72
(with brain disease)	no improvement.	73
	Improvement.	75
Nocturnal noisiness	Sleep & Quiet produced.	76
do	do.	78
do.	do. but not always.	79.

Case I.

H. D. became insane on the 2nd June 83 she was admitted into the asylum on the 12th June 83. The medical certificates described her as "thinking that she has lived a very bad life & is lost, that her children are to be taken from her" also as "wanting to run out of the house naked, refusing food, being very violent and sleeping badly." She is married 38 years of age, dark & of "lymphatic temperament".

On admission she was covered with bruises had two broken ribs. She at once passed into a condition of great apathy and stupor: her health was very bad; oedema of the feet, eczema and abscesses under the scalp appearing.

August 16th H.D. is in a condition of pronounced Dementia, she rarely speaks, is restless at night in an aimless manner, gets under the bed &. Current from 6 – 9 elements was passed through head in antero-posterior

direction. She struggled very much so that the pulse could not be observed: she was unable to describe her sensations except that she had a feeling of burning where the electrodes were applied to the skin.

Duration = 10 minutes.

Result = On returning to her gallery patient began to talk about her previous life and occupation which she had not done since admission: she also did some work. On the following day however this improvement had in great part disappeared.

17th August: Current from 6 – 9 elements passed thro' head in anteroposterior direction – patient struggled a good deal. Duration = 10 minutes.

Result = she continues less torpid.

18th August: Current from 9 cells (1½ millivebers) passed thro' head in fronto-occipital direction. Duration = 10 minutes.

Result = it had a rousing effect.

19th August: Current from 6 cells

(3 millivebers) passed in fronto-occip-
-ital region: patient struggled a good
deal. Duration = 10 minutes.
Result = some flushing of the face:
mentally she remains much the same.
20th August:
Current of 2½ m.vebers fmn 12 cells passed
through head in antero-posterior direction
2 m.v. fmn 15 cells through the Parietal
region and 4-5½ m.v. from 9-12 cells
through the Temporal region -
Patient struggled less to day.
21st August
2 m.v. fmn 12 cells passed in antero posterior
direction.
3. m.v. fmn 6 cells passed through the
temporal region -
Result. Patient struggled somewhat
she also gave expression to delusions of
identity - she now sleeps much better
22nd August:
1½ m.v. from 6 cells passed in fronto-occip-
-ital direction: 3-5 m.v. from 9 to 12 cells
passed through temporal region.
Patient cried most of the time "I will

never get home, Ive no money and have lost my children."

23rd August

1 M.V. from 6 cells passed through the fronto-occipital region: 1 3/4 M.V. frm 6 cells passed thro' the Temporal region. The pulse afterwards was 88. per minute.

Result: the patient is much more composed more talkative, observant of her surroundings and more rational: sleeping better.

24th August:

2 M.V. frm 6-9 cells passed in fronto-occipital direction: 2-3 M.V. frm 6-9 cells passed in temporal direction.

Pulse after sitting 92 per minute

Result: Patient Continues better and more cheerful: sleeps well.

25th August 1 1/2 M.V. passed through the Temporal & Fronto-occipital regions - in both case frm 6 cells. Pulse before the sitting 84, after it 80.

Result: Patient now makes her bed, cleans her room and dresses herself the latter for the first time since admission

26th August. 3 M.V. frm 12 cell passed

through the Temporal Region 2 m.v. fmn 12 cells passed thro' the Fronto-occipital. Duration 10 minutes. Patient Cried a good deal during the time. Duration 10!

27th August.

1¾ m.v. from 9 cells passed through the Temporal region: 1 m.v. from 9 cells through the Fronto-occipital. Duration 10 minutes Pulse before setting 84, after it 80 per min: Patient is more composed and rational: spoke correctly of her former places of abode but she still thinks she is not- nurs D: she rests well at night.

28th August:

2½ m.v. from 6 cell passed through Tem- -poral region 2½ m.v. also passed through Fronto-occipital region: 12 cells were not well borne. Duration: 10 mins. Pulse before 76, after 75 per minute. Patient memory is good but she wont- acknowledge her husband.

29th August.

1¼ m.v. fmn 6 cells passed through Temporal region, 1 m.v. through Fronto- -occipital. Duration 10 minutes Pulse after 86. Patient continues more rational + sleeps well.

30th August:

1 m.v. passed through Temporal region
1 m.v. through Fronto-occipital both
from 6 cells. Duration 10 mins.
Result:- Pulse before 85 after 81. per
min: she continues more rational.

Sept: 1st:

2 m.v. passed through Temporal Region
1½ m.v. through occipito-frontal both
from 9 cells. Duration 10 mins.
Result:- Pulse before 82 after 80 per.
min: Patient Continues better.

Sept: 3rd

1 m.v. frm 6 cells passed through
Temporal Region ½ m.v. through the fronto-
-occipital - Duration 10 minutes
Result: Pulse before 83 after 76.

Sept: 5th

1 m.v. frm 6 cells passed through
the Temporal and occipito-frontal regions
Duration 10 minutes
Result: Pulse before 75. after 76: patient
Continues better and is progressing steadily

Sept: 6th

½ m.v. frm 6 cells passed through the

Temporal region 1 m.v. from 9 cells through the Occipito-frontal region.
Result:- Pulse before 76 after 71. per min:
Patient now works industriously, converses intelligently on ordinary topics and is in good spirits.
The Battery was discontinued and H.D. was discharged on the 25th Sept: 83 by Dr Rutherford - Recovered.

Remarks:-

In H.D's case a notable improvement took place after the first application: the progress afterwards was more gradual. Sleep returned and as a rule the pulse was reduced in frequency by the application.

Case 2.

J. T. is a single woman, 25 years old and a domestic servant: She has a low narrow forehead while the lower part of the face is largely developed. At School she learnt slowly: the menses did not appear until the age of 20. A year later, on hearing suddenly of her father's death, she became very maniacal manifesting strong religious excitement and aversion to her friends. She was admitted into the Southern Counties' Asylum Dumfries on the 8th January 1879 on medical certificate which state that "she thought she was dead & that her uncle was the devil" also that she suffered from violent excitement and restlessness.

After admission she sank into a Condition of degraded Dementia and at the time electrical treatment was Commenced she was & had long been of wet and dirty habits both by night and day, unable to dress or undress herself, doing no work

silent except when she exclaimed "she's daft" which was the limit of her vocabulary. She was treacherous and apt to strike other patients.

10th October 1883

A current of 5 milliebers strength from 15 cells was passed through the temples, one of 2 milliebers through the antero-posterior direction. Duration 10 minutes

Result - slight lacrymation.

11th October.

6 m.v. passed through temples, 3 to 4 m.v. in occipito-frontal direction, both from 15 cells. Duration 10 minutes

Result: She sighs frequently when the current is running & starts when the circuit is broken or closed.

The nurse reports her better in her habits and more pliable.

12th October

1½ m.v. from 9 cells through the temples 1½ m.v. from 12 cells passed in occipito-frontal direction - Duration 10 minutes.

She sighs frequently during the sitting.

15th " October.

15th October.
5 m.v. passed thro' Temporal region, 2½ m.v. thro' fronto-occipital, both from 12 cells. Duration 10 minutes, Pulse both before and after the sitting 104 per min: She has since shown psychistic tendencies & knocked another patient down.

16th October
3½ m.v. passed thro' Temples, 1 m.v. in the antero-posterior direction - both from 12 Cells - Duration 10 minutes.
There was slight lacrymation she started when the electrodes were removed.

17th October
3 m.v. from 12 cells passed thro' the Temples, 2 m.v. from 6 cells thro' occipito-frontal region - 12 cells were not well borne in the antero-posterior direction - Duration 10'
Result: the patient dressed herself in the following morning (18th) - the first time for a long period.

18th October:
½ m.v. from 6 cells passed thro' the Temples & ½ m.v. in the antero-posterior direction Duration 10 minutes.
She remarked "she's daft" during the sitting.

She continues to dress herself.

19th October.

1½ m.v. passed thro' the Temporal & occipito-frontal regions both from 9 cells.

Pulse before 86, after 92 per minute

20th October.

1 m.v. from 9 cells passed through the Temporal and occipito-frontal regions.

Duration 10 minutes.

22nd October

½ m.v. from 9 cells passed thro' Temples

1½ m.v. from 12 cells in occipito-frontal direction.

23rd October

6 m.v. passed through the Temples, 2 m.v. through the occipito-frontal region - both from 12 cells Duration 10 minutes

24th October

½ m.v passed thro' fronto-occipital direction

1½ m.v. thro' the Temples both from 12 cells. Duration 5 mins

Remarks: Patient is more cheerful & lively: habits during day are now satisfactory: she continues to dress herself.

25th October

½ m.v. from 6 cells passed from the forehead.

to the nape of the neck "cervico-frontal" direction and 1 m.v. through the Temples both from 6 cells ! duration 5 minutes.

29th October.

2 m.v. from 9 cells passed thro' the Temples Duration 5 minutes

30th October.

½ m.v. from 6 cells passed in Cervico-frontal direction - Duration 5 minutes

31st October.

1½ m.v. from 9 cells passed thro' Temples. Duration 5 minutes.

1st November.

Current from 6 cells passed in Cervico-frontal direction for 5 minutes.

2nd Nov

1 m.v. from 6 cells passed thro' the Temples for 4½ minutes

3rd Nov!

¾ m.v. from 6 cells passed in Cervico-frontal direction for 4 minutes

5th Nov. Patient was faradised with a wire brush over the upper extremities Duration 5 minutes

6th Nov.

Faradisation repeated for 4 minutes

7th November.
General Faradisation of the body - cheefly the back - one electrode being placed over the sacrum the other (a sponge) moved over the back & chest - Duration 10 mins. Menstruation appeared on the next morning - it had been in abeyance for many months.
10th November
¾ M.V. from 6 cells passed in the Cervico - frontal direction - Duration 5 mins.
13th November
2½ M.V. from 6 cells passed through the Temples - Duration 5 mins.
Patient is more irritable today & has been striking the others.
14th November.
1 M.V. from 6 cells passed in Cervico - frontal direction: Duration 5 minutes.
Patient is again quiet.
The electrical treatment was now discontinued but the patient continued to improve, sewed knitted and worked industriously. Her habits became quite satisfactory both by day & night and

She talked freely though in a simple way. Her mental condition of course remained one of imbecility.

Remarks :-

This case was chosen as a test of what electrical treatment might do in a case of apparently hopeless degraded Dementia and altho' the result was not a "recovery" yet the patient was lifted from an abject condition to a state of usefulness to herself and others.

Case. 3.

A.P. is single, 22 years of age & a Labourer. He was brought to the asylum (Dumfries) frm the Poorhouse on the 16th September 80 in a state of epileptic mania. An imbecile of slow intelligence he is able to read and write also to do barrow work &c. He takes epileptic fits daily the number varying from 1 to 5. From the 1st to the 14th August 83 inclusive he had 35 fits chiefly severe grandmal.

He was treated with the voltaic current passed thro' the head

August 15th

Current frm 6-9 cells passed through the head for 12 minutes.

Result: The pulse was increased 12 beats per minute: he complains of pain at the seat of electrodes: no fits during the 24 hours after

August 16th

Current passed frm 9 cells through temples, mastoid region & in the antero-posterior direction. Duration 18 minutes

Result: the eyes were suffused with tears

And somewhat injected, face flushed, pulse quickened by 12 beats per min: No fits in the succeeding 24 hours

August 17th:

Current from 9 cells passed in antero-posterior direction: from 6 cells transversely

Result: no fits in next 24 hours.

August 18th

Current (2 m.v.) from 3 cells passed in antero posterior direction. He seemed more sensitive to the current today

Result - no immediate: patient had one fit in the following 24 hours

August 19th

2 m.v. passed in the occipito-frontal direction 4 m.v. in the inter-parietal both from 6 cells. Duration 10 minutes

Result: patient fell asleep shortly after the application: no fits in the 24 hours after.

August 20th

2 2/3 m.v. passed through the fronto-occipital direction 5 through the parietal, 6 1/2 through the Temporal all from 6 cells

Result: no fits in the 24 hours after.

Duration: 12 minutes.

August 21st.

3½ m.v. passed in Fronto-occipital direction 3½ m.v. in the parietal both from six cells. Duration:- 11 minutes. The pulse during the sitting rose to 92 from 82.

Patient had 4 fits in the following 24 hours

August 22nd

5½ m.v. passed in fronto-occipital direction 2½ m.v. in the Parietal - both from 6 cells: an epileptic fit came on during the passage of the current transversely. It was only a slight one and on the strength of the current being increased by other six cells the patient appeared to be conscious of some sensations & shortly regained full consciousness.

It is reported that when this patient does take fits they are not nearly so severe as formerly & chiefly vertiginous - he sheels round but does not fall sometimes the convulsion is limited to a spasm of the fingers. The patient also sleeps much more soundly.

23rd August:
2½ m.v. through the Fronto-occipital region
2½ m.v. through the Parietal, 2⅔ through
the Temporal: all from six cells
Pulse before the sitting 100, after it 96.
He had two slight fits in the succeeding
24 hours
24th August:
2 m.v. passed through Temples 2½ in the
Fronto-occipital direction both from 6 cell
Fits in succeeding 24 hours = one.
25th August.
3½ m.v. from 6 cells through Temples. pulse 102
5 " " " " - in Fronto-occipital direction - pulse 96
The pulse before the sitting was 90. patient
had no fits in succeeding 24 hours
26th August - Pulse before sitting 80.
5 m.v. through Temples - pulse 89
2⅓ " " Fronto-occip: region pulse 92
6 cells used in each case. the pulse after
the sitting was 85. patient had
no fits in the succeeding 24 hours
27th August
Pulse before sitting 85
3 to 5 m.v. were passed in the Temporal

region, 4½ m.v. in the Fronto-occipital.
Pulse after 85. Duration 10 minutes
Patient had one fit in the succeeding
24 hours.

28th August: Pulse before sitting 68
2 m.v. from 6 cells were passed thro' the
Temples 4½ through the Fronto-occipital
direction. Duration 10 minutes.
Pulse after sitting 81. Patient is noticed
to be more sleepy than usual: after
falling asleep then seated. Duration 10'.
He had two slight fits in the succeeding
24 hours

29th August:
4 to 5 m.v. through the Temples
2 m.v. thro the occipito-frontal
direction both from Six cells.
No fits in the succeeding 24 hours

30th August: Duration 10 minutes
6 m.v. passed through the Temples
4½ through the occipito-frontal direction
both from six cells. Duration 10 minutes
Pulse before 83 after sitting 89.
Remarks
As might be expected there was no

improvement in the imbecility of the patient but quite a remarkable diminution in the number of fits which were reduced to two-thirds the former number

From 1st to 14th August 35 fits (before treatment)
" 15th to 29th " 12 " (during treatment)
" 1st to 14th Septem: 18 " (after treatment)
" 15th to 30th " 26 " do.
" 1st to 14th octob 25 " do.
" 15th to 30th Octob. 32 " do.

It will further be noticed that after the Constant Current was discontinued the fits gradually increased until the latter half of october when they were almost as numerous as before treatment. The fits were further much less severe during the time of the faradaic treatment.

Another point of interest is that altho' the ~~reduced~~ Current diminished the fits in number severely yet it did not prevent the actual advent of a fit as occurred on the 22nd August.

Case 4.

J. J. is a boy, 14 years of age, single, stout and healthy looking. He has been epileptic "from childhood" and immediately before his admission into the asylum he was in a state of epileptic mania, tried to jump out of a window and was outrageous. He is weak minded, very slow in comprehension and utterance.

He was treated from the 29th october till the 16th November with the Galvanic current passed through the brain once daily for 4 or 5 minutes: the current being generally derived from 6 cells and its strength varying from 1 to 5 milliwebers.

Epileptic fits from.

1st to 16th November 5 - during the treatment
17th to 1st october 10 - after " "

Remarks.

This case shows the same reduction in number of fits as H. P's case: there was no improvement in the patients' mental condition. He was

removed from the asylum by his friends so that his case could not be further studied.

Case 5.

John L. is 47 years of age, married and by trade a Sailor. He is a tall spare, anxious looking man & when admitted on the 26th May 1883 to the Southern Counties' Asylum, Dumfries he was reported to be suicidal and dangerous. One doctor describes him as being "very excitable, quoting texts of Scripture in an incoherent way says he saw Jesus Christ who told him to attend to his body and take his medicine, says as long as the lamp held on to burn he might have been saved but the lamp went out last night: he thinks that he is an evil spirit and that his soul is lost."

The patient's case was one of acute Melancholia in which however there were signs of actual brain disease. When electrical treatment was commenced he was still in a state of deep depression.

August 15th Current from 9 cells passed through the head transversely and

longitudinally - not so well borne in the ~~antero-posterior~~ transverse direction. Duration 10 minutes.

16th August

Current up to 5 milliwebers strong from 6 to 9 cells passed in fronto-occipital direction for 10 minutes.

Dilatation of the pupils was noticed & some pain was complained of at the positive electrode.

17th August:

2 to 3 milliwebers passed in the fronto-occipital direction also through the temples. In the latter case giddiness complained of.

Duration 20 minutes - Pulse rose 4 beats during the application

18th August:

Duration of applic 15

3½ m.v. (6 cells) passed in fronto occipital Direction - pulse 72
3½ do (9 cells) " in parietal " pulse 74.
4½ do (6 cells) in temporal " pulse 72.

Result: patient is less depressed and he sleeps better.

19th August: Pulse before application — 67

5 m.v. (9 cells) passed in fronto-occipital Direction - pulse 70
5 m.v. (12 cells) " " parietal " " 72
10 m.v. (9 cells) " " Temporal " " 74.

Duration 10 minutes.

20th August: Duration 10 minutes.

3¾ m.v. (6 cells) in fronto-occipital direction - pulse 73.
2 to 4 m.v. (6 to 9 cells) " parietal " " 76
5 to 6 m.v. (6 cells) " temporal " " 70

Patient is sleeping much better

21st August:

2⅔ m.v. (6 cells) in fronto-occipital direction, pulse 76.
2⅓ " do. in parietal do do 82
4½ to 6½ do. in temporal do " 80

Duration 10 minutes

Patient is more cheerful, takes more interest in his work and personal attire, &.

22nd August

2 Milliohms in fronto occipital direction pulse 81.
2 " parietal do do 85
5 " Temporal do do 78.

all from 6 cells - Duration 10 minutes

23rd August

3½ m.v. in fronto-occipital direction -
2 " passes in the parietal do } Duration
4½ " " " temporal } 10 minutes

Pulse before the application was 83
after it 86 - again not sleeping quite so well.

24th August

Pulse before the application 80 per minute

6 M.V. (6 cells) through Temples - Pulse 82 per min:
1 to 2 " " " Parietal region " 82 " "
3 " (9 cells) " Fronto-occipital " " 80 " "
Pulse after application 81 - patient again slept better

25th August. Pulse before 84.
6 M.V. passed thro' Temples - Pulse 89 per min:
5 " " " Fronto-occip: Region " 86 " "
Pulse after 85

At this stage of the treatment John L. appeared to be much better & expressed himself as feeling lighter and more buoyant after each application: he slept sounder: his spirits were good and he worked in a hearty way. He rarely referred to his morbid ideas and I was sanguine he would be scored as a recovery. Owing to my absence from the asylum the treatment was intermitted and he distinctly relapsed & became again deluded and low spirited.

The treatment was again commenced & carried on from the 22nd October till the 27th November 83

The applications were of 5 to 8 minutes duration each day, the strength from 1 to 7 millivebers and the direction alternately through the Temples and from the forehead to the nape of the neck. He again improved somewhat but it was evident that there was organic brain disease and that permanent improvement was not to be expected.

a minor point of interest in this case is the Pulse, which was increased in frequency by the galvanisation more especially when the current was passed transversely. Further in this patient the brain tissue generally had a high degree of Conductivity which was very noticeable in Comparison with other patients on whom the same strength of current was used — but the galvanometer usually indicated in John L's case a considerable stream of electricity.

Case 6.

S. K. a case of Acute Suicidal Melancholia was admitted into the Southern Counties' Asylum, Dumfries on the 3rd January 1883 She had been insane 7 or 8 months previously She was single: a Domestic Servant and 46 years of age. Treatment with Digitalis and opium was tried, but without any benefit, for the intense distress from which she suffered. She groaned constantly, demanded to be killed, constantly wrung her hands, tore her clothes and struggled with the attendants for the Keys.

16th August

Current from 9 cells passed through the temples: nystagmus of both eyes observed, she groaned less frequently, & the pulse (100 per minute) was reduced 4 beats In the fronto-occipital direction the current up to 12 cells caused no effect on the eyes.

As the patient was sick & dyspeptic on the two following days, the Current was next applied on the 19th inst when

3 to 5 milliwhen's strength of current from 12 cells was passed in the antero-posterior direction. During its passage the patient groaned less frequently. 5 m.v. from 9 cells were passed through the temples & nystagmus of both eyes was noticed.

After the application the patient was more composed and did not groan.

20th August:

3 m.v. from 12 cells passed in antero-posterior direction
2 to 6 " 15 cells " " parietal direction
6½ " 9 cells " " temporal direction

Duration 15 minutes. patient Continues quieter and more Composed.

21st August:

3 m.v. from 12 cells passed in fronto-occipital direction
1⅓ " " " " Parietal do.
8 " " " " Temporal do. nystagmus occurred when the current was passed through the temples.

22nd August.

2½ m.v. (12 cells) in Fronto-occipital direction
1½ m.v. do. in Parietal do.
9 m.v. do in Temporal do
Patient Continues quieter & more Composed.

Galvanic treatment was continued in this case daily upto the 7th September - the current being passed in two directions - through the Temples and from the forehead to the occiput - usually for 10 minutes - the strength varying from 1 to 6 milliwebers. Beside the nystagmus already noticed there was frequently drowsiness during the passage of the current.

The patient steadily improved up to a certain point: became quiet & composed, did some work and slept much better at night but she relapsed again afterwards.

Treatment was again commenced & carried on from the 23rd October till the 22nd November 83. the current being passed through the head daily and alternately through the Temples or from the forehead to the nape of the neck. The Duration being 5 minutes.

The patient again improved somewhat but her delusions remained.

Remarks.

From the descriptive Remarks at the Commencement it will be seen this Case was an Extremely bad one & it was Chosen on that account as a test of the Galvanic Current was of any use.

Improvement did take place yet was no doubt due to the Sedative effects of the Current on the Brain and its sleep producing influence which was very well-marked in this woman's Case.

A Cure was not expected from the character of the delusions.

Case 7.

William M'K. is a Farmer, Single, 73 years of age: he became insane in June 83 & was admitted into the Southern Counties' Asylum, Dumfries on the 9th October 82. Before admission he was very violent, Struck his relatives and broke the furniture: he had delusions that his relatives and the public had conspired to kill him, that he was lost and his condition generally was one of terror and unhappiness.

This patient was treated with the Continuous galvanic current passed through the head daily from the 15th October 1883 until the 29th November - usually from 6 cells and of 1 to 2 milliwebers strength. The duration was 5 minutes.

Little if any improvement resulted from the treatment. The patient was very sensitive to the current.

Case 8.

Mrs K. is 32 years of age, a gardener's wife: she has suffered from delusions that people are going to take her away and injure her, she attempted to commit suicide by cutting her throat, was sleepless, and would not take her food.

When the galvanic treatment was commenced she was depressed, tearful and apathetic.

The galvanic current was passed through the head daily from the 24th August until the 7th September usually of 1 to 3 milliwebers strength the application lasting 10 minutes.

The pulse was increased in frequency by each sitting sometimes 16 beats per minute: the patient was very sensitive to the current, dilatation of the pupils and giddiness usually accompanying each application.

Little if any improvement resulted from the treatment.

Case 9.

Mrs M.L. is 34 years of age, is the wife of a wood cutter & was admitted into the Southern Counties' Asylum Dumfries on the 2nd October 83.
She was reported to have made a suicidal attempt & when galvanic treatment was commenced great taciturnity and obstinacy were two prominent features of her condition
She was treated with the galvanic current passed through the head daily from the 22nd October till the 30th November a currently 1 milliveltre strength from 6 cells being usually used. The Duration of application was 5 minutes.
No perceptible improvement took place in this case.

Case 10.

Archibald L, single, a Painter, 32 Years of age was admitted into the Southern Counties' asylum, Dumfries on the 18th December 82. He had been 3 weeks insane & the alledged cause was alcoholic excess. He was a stout well built man, dark & of adinary height: he was a good workman and had a pleasant address.

Before & after admission he suffered from hallucinations of hearing to a very great extent: at first he was preoccupied, evidently listening to the voices, afterwards he would shout himself hoarse in answer to them.

This patient was treated with the Continuous galvanic current passed thro' the head daily from the 15th August 83 until the 6th September usually for from 10 to 15 minutes & the strength of current varying from 2 to 6 milliwebers. He bore the current well: sometimes nystagmus was noticed in passing the current thro' the temples. No improvement of any consequence was noticed in the patient's Condition.

As the auditory hallucinations were very troublesome to the patient, the current was passed into the External auditory meatus (filled with warm water) by an electrode insulated except at the point & the other electrode was placed over the opposite mastoid Process.
This was repeated daily from the 29th October until the 29th November 83. the electrode being introduced into the ears alternately – usually the anode was employed for this purpose. The strength of current was about 2 milli-vebers

Result: There was no improvement in the auditory hallucinations or in the general Condition of the patient.

Case. 11.

S. J. W. was a young woman, 23 years of age single she resided at home. Her mental Condition was one of acute mania: she was restless, excited, swore incoherently, had delusions about people speaking about her and was violent and indecent.

She was treated with the Constant Galvanic current passed through the head daily from the 29th October 1883 until the 7th December, for from 4 to 7 minutes daily - the strength of current being from 1 to 3 milliwebers.

The passage of the current had a soothing effect and from the time it was applied she slept remarkably better further there was some improvement and steadying in her mental Condition

Case 12

Charlotte Mc C. was a case of chronic mania who had been regularly noisy every night for two months preceding the application of the Constant Current. Her circulation was languid and her feet oedematous & altogether she was not one in whom I thought it judicious to try the usual medicinal sedatives

22nd November at 8.30 pm.

"Central galvanisation" was performed one (the negative) sponge electrode being applied to the Epigastrium: the positive being applied to the vertex and gradually brought down by the sternomastoid & down the spine according to Beard & Rockwells method. The galvanometer indicated 1 milliweber

Result The patient rested well on the nights of the 22nd & 23rd

24th November.

Central galvanisation repeated for 8 minutes: 15 to 18 cells were used & ½ milli-weber was indicated.

Patient was quiet and slept well for 3 nights but was again noisy on the 27th inst

28th November

Central Galvanisation for 7 minutes, 12 to 18 cells used and 2 to 3 milliwebers indicated
Result: Patient had a quiet night slept.

29th November.

Central Galvanisation for 7 minutes: 12 to 18 cells used: 3 to 4 milliwebers indicated.
Result. Patient had a quiet night & slept.

30th November.

Central Galvanisation for 5 minutes 12 cells used & ½ milliweber indicated.
Result - a quiet night.

Remarks

As this patient had been noisy nightly for two months the effect of the current was very marked and there could be no doubt but that the improved sleep was due to the sedative effect of the Galvanism on the Brain. The patient had now & then returns of her noisy tendencies but not so continuously as before.

Case 13.

Isabella A.

a case of Chronic Mania with delusions had been noisy & sleepless for a week and was so on the evening of the 1st December 83.

Central Galvanisation was performed for 8 minutes - ½ to 3 milliwebers were indicated.

Result: Patient had a quiet night and slept well. She remained quiet at night until the morning of the 5th 5th December.

Central Galvanisation for 3 minutes. 12-15 to 6 cells were used - as the pulse was irregular & there was some faintness it was not continued the usual time.

Result: Patient slept well in the night of 5th to 6th 6th December.

Patient was noisy, on going to bed Central Galvanisation for 6 minutes: 12 cells used: one milliweber indicated

Result:

Patient had a quiet night and slept well.

Remarks.
The positive pole was always applied to the head or spine: the negative to the epigastrium.
The sleep-producing effect of the galvanic current was very marked in this case.

A similar method of treatment was tried in the case of David B. a general paralytic who was noisy nightly also successfully altho' not uniformly so.

VII

Conclusions.

After a careful trial it must be confessed that electricity is no panacea, when confronted with the multiform diseases grouped under the heading of "Insanity."

In Dementia it is of greatest use in calling into action tracts of the brain which have become dormant through exhaustion caused by prolonged excitement &. as in Case 1. or from inhibition as some writers suppose.

Further I believe that by a patient and persevering application of it in such chronic demented cases as J. J. (No 2) modest but very satisfactory results may be obtained and the patients be lifted a step higher from conditions of abject helplessness.

Galvanisation of the Brain with General Faradisation of the body are the best methods of treatment.

Epilepsy in asylums is so

advanced and the brain is already so ravaged by disease that it offers little prospect of amendment: it will be seen, however, that in Nos 3 & 4 (H.P. & J.I.) a most notable diminution in the number and severity of the fits took place during Galvanisation of the brain and Dr. Julius Althaus recommends electricity especially in cases where the menstrual function is dormant or irregular.

Of all mental diseases Melancholia was to me the most disappointing in its results. From a priori Considerations I thought that the Continuous Current which is so potent to relieve and cure Neuralgia would also be an efficient aid in relieving the distressing mental pain of Melancholia and in 2 of the five cases (John L. & K) distinct but temporary relief was given.

In this my experience agrees with that of Dr. T. Clifford Allbutt (West Riding Reports 1872. Vol II. p. 207). It must however be remarked that in most of my

-|- a Treatise on Medical Electricity 3rd Edition 1873 Page. 576.

Cases there was reason to believe the existence of organic disease of the brain and I would be inclined to think that in simple Melancholia depending on Cerebral exhaustion & generally in similar Cases in the borderland of Insanity the Galvanic Current should be of Considerable service.

-:- Drs Beard & Rockwell & Dr A. H. Newth † relate instances of recovery from Melancholia under Galvanic treatment. Drs Beard Rockwell also recommend it in Hypochondriasis. (Page 402) but I found that in Hypochondriacal Melancholia it was of no use. The Continuous Galvanic Current passed through the Brain was the method I used in Melancholia.

Galvanisation of the Brain and auditory nerves does not relieve auditory hallucinations (Case 10) and generally where there is progressive brain disease it is unable to restore the physiological Conditions of health.

In acute Mania Galvanisation of the Brain was found beneficial by Drs

-:- a Practical Treatise on the Medical & Surgical uses of Electricity 3rd Ed. Pp. 404 & 418

† Journal of Mental Science. April 1873 p. 79.

North and Clifford Albutt and I would recommend it from my experience.

About the soporific effects of the galvanic current there can be no doubt and I believe that it will be extensively used by asylum physicians in such cases as Nos 12, 13 & 14. It certainly has not the baneful (sometimes debasing) effects of Chloral and morphia &., being very unlikely to be abused in the same way as those drugs. There are no unpleasant after-effects and further it can be used in chronic mania where there is much nocturnal excitement combined with a weak circulation, oedema of the feet &. in which one would hesitate to give the large doses of sedative drugs necessary to produce sleep in such cases: moreover its effects generally last for a few nights. Central Galvanisation is the best method of application.

In Hysterical insanity the faradic current has been found of use.

In articles referred to on preceding page.

as a "mental-Counter-irritant" - the somewhat coarser & more irregular current from the magneto-electric machine being of most service.

Frictional Electricity has been almost entirely superseded by Galvanism and Faradism & with regard to the Shock from the Leyden Jar recommended by Dr Veilleux, Dr Russell Reynolds says that "short of being hanged he Could not imagine anything more unpleasant."

VIII

Note on the altered galvanic-Excitability of the muscles in General Paralysis of the Insane.

The subject of the Farado-excitability of muscles in this disease has been investigated by several writers. Dr Lowe records his results in the West Riding Asylum Reports (1873) pp. 205 & 214; Drs Bucknill & Tuke in their "Psychological Medicine" p. 460 (3rd Edition). The general conclusions, in which all agree, is that there is, especially in advanced cases, a loss & in some patients an abolition of Faradic-excitability in the muscles of the face, arms, legs. (In the 1st & 2nd Stages of the disease Dr Lowe states that he found no change in the irritability of the facial muscles).

I have examined the excitability of the muscles to the Galvanic Current and find that in the 2nd & 3rd Stages there is a marked Qualitative change in their reaction, which so far

as I have been able to learn, has not yet been described.

The order of Contraction with the different poles and on opening & closing the Circuit I found to be altered and different from the usual order in health of

(1) Cathodal Closing Contraction C.C.C
(2) Anodal Opening Contraction A.O.C.
(3) Anodal Closing Contraction A.C.C.
(4) Cathodal Opening Contraction C.O.C.

The following two Cases will illustrate the point shortly.

Case I. Thomas B: in the 2nd Stage of General Paralysis.

Biceps muscle - Right arm

(1) C.C.C (slight) with current from 6 elements (1 m.v. indicated
C.C.C. (fair) " " 12 "
(2) A.C.C. " " 9 " (1½ m.v. "
(3) C.O.C. " " 21 " (8 m.v.

No anodal Opening Contraction absent.

Tibialis Anticus (left)

(1) C.C.C. with 15 elements - 1½ millivebers indicated.
(2) A.C.C. " 24 " - 4 " "

no anodal Opening Contraction & Cathodal Opening Contraction with current up to 7½ millivebers.

Tibialis Anticus (right)

(1) C.C.C. (slight) with 15 Elements – Current 1½ millivebers.
full " 18 "

(2) A.C.C. " 27 " 4 do.

Anodal opening Contraction / Cathodal opening Contraction absent.

Case II. John O'N. General Paralytic in the 3rd stage.

Tibialis Anticus (left)

C.C.C. with 24 elements – 3½ millivebers
A.C.C. " 30 " 6 "

The strength of current was increased up to 10 millivebers with 42 Elements and neither Cathodal Opening Contraction nor Anodal opening Contraction was elicited

Biceps (right arm).

(1) C.C.C. slight with 15 Elements 1¼ millivebers
fair " 18 " 1¾ "

(2) A.C.C. " 24 " 5 "

(3) C.O.C. " 30 " 10 "

no anodal opening Contraction.

The first qualitative change in the

Galvanic excitability of the muscles in General Paralysis is the delay of the Anodal opening Contraction till after the Anodal Closing Contraction then it disappears entirely. The next to disappear is the Cathodal opening Contraction. Further it may be added that there is also a quantitative change in the Contractions, which are weaker than in health: often the muscles respond in a partial ineffectual way to currents which would not affect them in health.

Finis