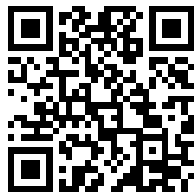
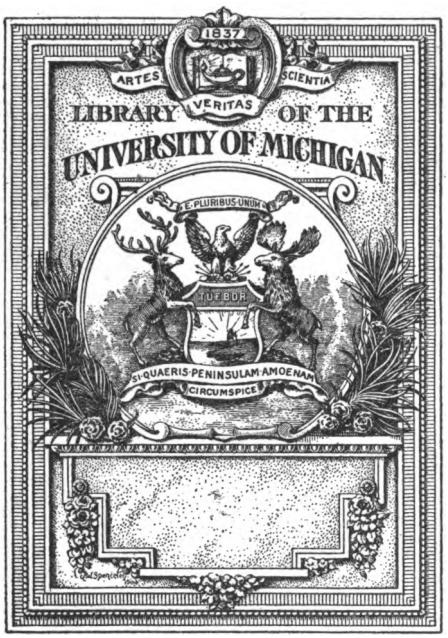


Medical electrology and radiology



Medical electrology and radiology

THE JOURNAL

OF

PHYSICAL THERAPEUTICS

AN INTERNATIONAL QUARTERLY REVIEW

EDITED BY DR. W. S. HEDLEY

AMERICAN EDITOR, DR. M. A. CLEAVES

VOLS. I., II., III.

1900—1902

LONDON
JOHN BALE, SONS & DANIELSSON, LTD.
OXFORD HOUSE
83-89, GREAT TITCHFIELD STREET, W.

INDEX TO VOLS. I., II. AND III.

THE

Journal of Physical Therapeutics

No. 1. JANUARY 15, 1902. VOL. III.

Editorial.

(STANDING ANNOUNCEMENT.)

IT is the aim of this Journal to furnish not only a record of current progress and contemporary work in the field of Physical Therapeutics, but also a detailed and critical account of what has been accomplished in the past.

Owing to recent progress in physical and biological science, the *modus operandi* of such methods is now, in some measure, beginning to be understood; but there is pressing need for further work in this direction. Moreover, the successful employment of these agents usually requires a carefully executed technique, and such information as is available on these points is not always easily accessible. It is therefore considered that such a journal as this need offer no apology for its existence; it is hoped that it will fill a gap—that it will supply a want.

A knowledge of the effects and mode of action of the remedial measures at our disposal, says Dr. Carter,[1] "amounts to something more than mere pharmacology. It includes also a knowledge of the physiological action of those powerful agents which for the sake of convenience we may call natural remedies, diet, heat, cold, rest, exercise, massage, baths, electricity, climate." After expressing the opinion that these deserve "a place in the front rank of therapeutic agents," Dr. Carter continues: "In a general sense the importance of such remedial agents is widely recognised, and in a general way every practitioner nowadays makes use of them; but the great advances which have taken place in our knowledge of their modes of action, the improvements that have been made in the method of their employment, and the extraordinary potency of their influence upon the nutritive processes of the body, are still, in my opinion, far from being adequately realised."

It cannot be necessary to remind the reader that to devote the pages of a journal exclusively to the consideration of the agencies in question is by no means to deal with them as something apart from general medical practice, still less to assign to

[1] *British Medical Journal*, November 3, 1900.

them any predominant *rôle* in the treatment of disease. They represent only one class of weapon in the varied armoury of medicine. Medical men are appealed to to rescue such weapons from the incompetent and unworthy hands into which they sometimes fall.

The almost simultaneous appearance of three important works on Physical Therapeutics is a very significant fact. Two of these, viz., *Handbuch der Physikalischen Therapie*, and *Physiological Therapeutics*, have been noticed in a former number; the third, *Traité complet de Thérapeutique par les Agents Physiques*, by Dr. H. Colombo, is on the point of publication. That three such treatises should appear, and appear almost together, can only mean that professional interest has been thoroughly and suddenly aroused, and that the subjects in question are now beginning to receive a due though tardy scientific recognition. It is no longer only to a small band of exclusive specialists that such volumes appeal, they address themselves to a wide and fast widening circle of medical practitioners anxious for information about a class of remedies which they now begin to recognise as indispensable additions to their ordinary therapeutic resources. Such books certainly mark an epoch. They do for the whole subject of Physical Therapeutics what Erb's work in the eighties of last century did for Therapeutic Electricity; like it, these treatises will compel the attention of medical men in England, and wake them up to take their part in a productive field of work in which hitherto they have been strangely behindhand.

Although its limits are not ill-defined, Physical Therapeutics is a widely comprehensive term—embracing, as it does, electro-therapeutics, hydro-therapeutics, vibro-therapeutics, or treatment by vibration, photo-therapeutics, or treatment by light, radio-therapeutics, or treatment by the radiations of an X-ray tube, balneo-therapeutics, or treatment by baths, aëro-therapeutics, or treatment by compressed or rarefied air. Therapeutic and hygienic exercises, massage and manipulations, dietetics, climatology, and last, but not least, the valuable agencies of heat and cold, all come within the scope of Physical Therapeutics.

A NEW DEPARTURE.—A series of theoretical and practical balneological and physical-dietetic lectures and courses was held in Baden-Baden from the 14th to the 21st of October last, and were attended by nearly eighty physicians. This new departure is due to the initiative of the Grand Ducal Government, and especially to the Medical Referee Privy Councillor Dr. Battlehner-Karlsruhe, and to the President of the Bath Commission, Privy Councillor Haape-Baden-Baden. The technical organisation was in the hands of Drs. W. H. Gilbert and Curt Hoffmann, of Baden-Baden.

Names such as Erb (Heidelberg), Rosenbusch (Heidelberg), and Schottelius (Freiburg), were in themselves a guarantee of

the interesting matter contained in the theoretical part of the programme; the Baden-Baden physicians undertook the practical portion of the course, and as might be expected demonstrated the various methods of treatment in a most competent manner, having the advantage of the splendidly arranged bathing establishment, so well known throughout the world. The mornings were devoted to serious work, the afternoons to excursions in the beautiful environs of Baden.

The Grand Ducal Government attaches great importance to the development of this new institution, and the Grand Duke sent a telegram expressing his satisfaction at the success of the movement.

It has been decided to hold these courses annually.

UNDER the title of "Electro-Therapeutics," and the editorship of Dr. W. B. Snow, of New York, a new journal is about to appear. It is to be the organ of the American Electro-Therapeutic Association. Knowing the keen interest that attaches to the subject throughout America, and aware of the wide and well-earned reputation of its Editor, every one interested in therapeutic electricity or other methods of physical treatment, will look forward with interest and high expectation to the appearance of the forthcoming journal.

THE AMERICAN SKIAGRAPHIC ASSOCIATION.—An organisation under the above name has been effected, and will be devoted as its name implies, to the Röntgen Ray. The temporary officers are Dr. L. A. Weigel, President; Dr. F. N. Wilson, Secretary; and Drs. Lloyd, Beck, and Hopkins, Committee on Constitution and Bye-laws. No effort will be spared to make it a strictly scientific and representative organisation. THE JOURNAL OF PHYSICAL THERAPEUTICS will gladly give details of the plan and scope of the Association in another issue when the permanent organisation is completed.

In the meantime we offer the American Skiagraphic Association our good wishes. We bespeak for it the confidence of the medical profession, and venture to predict that it will fill a wide field of usefulness.

AN interesting and exhaustive paper by Dr. M. Cleaves, on the Lethal and Destuctive effects of Electric Currents, appears in the *Electrical Review* of November 29 and December 6. It is reproduced from the "Handbook of the Medical Sciences" (U.S.A.)

"THE LONDON PSYCHO-THERAPEUTIC SOCIETY."

IT would appear that the Christian Science healers are no longer to have it all their own way. A circular, signed Arthur Hallam, 23, Dante Road, S.E., has come to hand which com-

mences as follows: "At a meeting of medical men and others interested in the study and application of Psycho-Magnetics, Mesmerism, Hypnotism and kindred Psychic and Mental Forces, held at the Frascati Restaurant, London, on April 1 last, it was unanimously decided to establish an organisation under the title of *The London Psycho-Therapeutic Society.*" Continuing,—it is explained that "a distinctive feature of the Society will be the use of Psycho-magnetics, Mesmerism, Hypnotism, &c., for remedial purposes."

Seeing that the first requirement for psychical as for any other form of healing is to know when to use a remedy and when to leave it alone, and in view of the further fact that such knowledge can only be acquired by a complete medical training, it may be hoped that it is only the medical members of this Society, and not the "others;" who propose to use it for therapeutic purposes.

Although he stands on a different platform, the lay psycho-therapeutist is not less dangerous than the Christian Science healer. Whereas the former believes in the reality of disease, and of certain forces which may be utilised to dispel it, the doctrine of the Christian Scientist, as expounded by Lord Dunmore, affirms that it is neither mind cure, nor mesmerism, nor hypnotism, nor is it through blind faith in a personal God that the curative work is accomplished, but "through the understanding and realisation of two of the main axioms of Christian science, viz., first, that there is but one mind (God), and that mind governs all; secondly, that man being God's spiritual idea is the reflection of his Divine Father." How far it is possible to distinguish such a doctrine from a kind of crude pantheism it is not the province of *Physical Therapeutics* to discuss; and the further tenet that "disease has no existence, and that sickness is a mental illusion" needs no discussion.

To what extent this "revelation" will bear criticism, has already appeared from former articles in this Journal. It is evident that the one grain of truth and fact which makes such pretensions possible is to be found in the undoubted influence that the mind exercises upon the body. Knowing what we do of emotional jaundice and of the influence of emotions on other secretions, such as the renal, intestinal, sweat, and lachrymal, knowing the importance of psychical influences as factors in the evolution of hysteria and Graves's disease, knowing it even to be within the range of physiological possibility that mental and emotional conditions can cause a blister on the skin, or produce a bloody sweat, it is evidently desirable that so potent an influence should be harnessed to the requirements of medical practice. As a matter of fact the medical man witnesses such influences either in the form of friend or foe constantly at work around him; he is aware that every remedial measure, every drug, has a psychical as well as a physical

aspect. A sleepless patient takes some inert substance in the accustomed cachet under the impression that it is as usual trional, and sleeps. A constipated person takes a bread pill, thinking that it contains a purgative, and the effect may be aperient. A weak or anæmic person is aware that he is taking an "iron mixture" or "steel drops," or a "ferruginous tonic"—how much of the good effect of such medicine is due to the effect of the iron—how much to "suggestion,"—to the association of ideas which connects iron with strength and endurance? Such instances are the common-place of medical practice; the medical man does not fail to take them into account, and he has an open mind about other forces yet unknown. By all means let every one investigate; but the right of non-qualified persons to dabble in these questions for curative purposes cannot for a moment be admitted.

It is not expected that such reasoning will appeal to the Faith curer, but considerations of the following kind may, perhaps, have some influence on his patients. Firstly, it has been decided in France that the treatment of patients by hypnotism, or so-called magnetism, by those who do not possess proper medical qualifications constitutes a breach of the law. Secondly, that insurance companies are declining to insure persons who, trusting to such treatment, do not avail themselves of the resources of ordinary medicine and surgery. Thirdly, that according to the *New York Tribune*, the leaders of a sect of Faith curers, calling themselves the Christian Catholic Church, have been declared by a coroner's jury to have been criminally responsible for the death of Mrs. Emma L. Judd, who died recently at "the Zion Home and Hospital," after sixteen hours of unrelieved suffering. Her child expired a short time before; no doctor had been called in either case. Such instances are not difficult to multiply, nor to find yet nearer home.

Dr. J. Leonard Corning, of New York, in a discussion of *Spinal Anæsthesia by Cataphoresis* (Cataphoric medication) reports experiments and details of methods. He performed it on one man by making an incision and injecting through an insulated tube, which passed down through the ligamentum subflavum, 15 minims of a 2 per cent. solution of hydrochloride of cocaine, which was deposited between the dura and vertebral canal. Then the electric current was passed from a sponge on the abdomen to the tube, $\frac{3}{10}$ of a milliampère. Anæsthesia appeared slowly, fully one half hour being required. The attendant began to give ether, when it was found that the patient was anæsthetic and the operation proceeded under the cocaine anæsthesia. The anæsthesia of the legs continued for an hour afterwards. Corning considers that the operation was a failure, practically because of the time required and the paraphernalia, but physiologically it was a success.—*New York Med. Jour.*, May 4, 1901.

PRACTICAL MUSCLE TESTING.

By W. S. Hedley, M.D.

For information about the motor nervous system we interrogate the muscles. There are various means at disposal for doing this, but by none can there be elicited so clear and true a response as by electrical stimulation. To attempt any adequate clinical study of diseases of the nervous or muscular apparatus without the aid of electro-diagnosis is to grope about in the uncertain twilight for something that might be looked for in the light of day. Uncontrolled by the patient's will, uninfluenced by his story, the electrical reactions of a muscle tell their own tale, and often reveal the one objective feature, the one distinctive physical sign, that alone is necessary to differentiate the morbid change. It is scarcely an exaggeration to say that what the stethoscope is to pulmonary and cardiac conditions, what urine analysis is to renal disease, what the X-ray is to abnormalities of bone or other relatively opaque structures, such is electrical exploration to normal and abnormal conditions of the neuro-muscular system. By this means not only is it often possible to distinguish with certainty disease of the lower segment of the motor path, to affirm the presence of a neuritis or of an anterior polio-myelitis, to exclude the paralysis of cerebral disease, of diseases limited to the white matter of the cord, of hysterical paralysis, of pure myopathies, but there are cases frequently occurring, and recent warfare has been prolific of such, where the distribution among the muscles of the abnormal electrical reactions may lead to a localisation yet more exact, and disclose with something like certainty the actual seat of the morbid process.

Such claims may appear less comprehensive and more modest if stated in another way:—Electro-diagnosis enables us to affirm or deny the presence of "Reaction of Degeneration;" in other words, to affirm or deny the presence of abnormalities (beyond a certain amount) in that part of the motor tract which, commencing at the motor ganglion cells, terminates at the nerve endings in the muscles. It is true that there are refinements of electro diagnosis over and above this, but beyond this point no certain light appears, no sign that seeing we can clearly interpret and turn to practical account. Yet under patient observation such signs grow daily clearer, and the day must come when it will be possible to affirm that electrical contractility is normal only when motor centres, motor nerves, and the muscles that they innervate are absolutely sound and intact.

It must not be imagined that an electrical diagnosis is quite an easy and simple matter. It requires a considerable experience and involves a procedure that ought to be rigorously exact, approaching, indeed, as far as possible, the conditions of a physiological experiment. Yet there is nothing mysterious in the

methods, nor complex in the instrumentation, nor too exacting in point of time. The merest outline only of electrical knowledge is necessary. An induction coil, and a battery of not less than 40 cells is the chief apparatus required. The so-called "Combined Battery" is of various forms, and all of these are fully explained and illustrated in the catalogues of the instrument makers. There should be a double "current-collector," *i.e.*, a means of throwing the cells into action one by one, commencing with any particular cell that may be desired; or in place of this, or better, in addition thereto, there should be a Rheostat, by means of which resistance to the passage of a constant electromotive force can be gradually diminished. The induction coil should be of the "sledge" type, *i.e.*, one in which the secondary coil can be pulled over the primary. It is of consequence that the contact-breaker work evenly and at the same note, and that its rapidity of vibration be easily adjustable. A milliampère meter is a *sine quâ non*, and there must usually be a means of securing for it a good level by screw adjustment or otherwise. The battery must also be provided with a "current changer" for changing quickly from galvanic to faradic, and a "pole changer" for changing the sign (+ or −) of the testing electrode. It need scarcely be added that attached to the poles of the battery by "connecting cords" ("rheophores") there must be two electrodes: (1) The large, or *indifferent* electrode, having a surface of about 100 square cm. (say 4 by 4 inches); (2) the small or *active* electrode about 1 cm. (about $\frac{3}{8}$ of an inch) in diameter. The latter should have an "interrupting handle."

If a continuous current be applied to an uninjured nerve or muscle in the living body, the extent to which that nerve or muscle is excited will vary (*a*) according to the pole which is applied; (*b*) according to whether the circuit is opened or closed; (*c*) according to the intensity used. And inasmuch as this current acts as a stimulus at the moment that the circuit is closed (closure contraction), and also at the moment the circuit is opened (opening contraction[1]), and as this occurs at both poles, it is evident that the neuro-muscular apparatus may be excited in four different ways. In other words, there are to be systematically studied four "electrical reactions," viz., one at closure and one at opening with the negative pole applied to the part under observation, and one at closure and one at opening with the positive pole applied.

Now selecting a normal "subject"[2] let the large or indifferent electrode (having a superficial area of say 100 sq. cm.) be well wetted in hot water, attached to the positive pole (anode),

[1] There are effects known as "Duration" contraction during the steady flow of a strong current, and perhaps during the steady flow even of ordinary currents there is a shortening of the muscle.

[2] The experimenter will do well to begin by trying upon himself.

and placed upon the sternum or abdomen, or most conveniently just below the back of the neck. The electrode may be kept in position by means of a towel crumpled up and pushed in between the electrode and the clothing. Taking now the "small," "active," or "testing" electrode (having a diameter of say 1 cm.), let it be well wetted and attached to the negative pole (kathode). Then holding this electrode by its interrupting handle (the finger or thumb upon the interrupter) place the electrode upon a motor point. Suppose the latter to be that of the ulnar nerve at the elbow, about an inch above the condyle, at the inner border of the triceps. Now with one hand holding the electrode upon this point, with the other hand move the rheostat handle or the current collector, until an electro-motive force of 6 or 8 volts (5 or 6 cells) is secured. Continue to take out R. or to put more cells into action, and as the electro-motive force is gradually increased, *i.e.*, as fresh cells are added, or R. taken out, keep closing the circuit at short intervals by means of the finger upon the interrupter in the handle of the electrode. At one of these closures a muscular contraction will appear—a "short, sharp, well-defined jerk." Now keeping the circuit closed for a moment, note the intensity of the current as registered by the galvanometer. It may be one milliampère.[1] In this case, the testing electrode being attached to the kathode, and the contraction having been noted at the closure of the circuit, it is therefore a "kathodic closure contraction" (K.C.C.); and the current necessary to produce it being 1 m.a. (in this particular instance) the fact is expressed K.C.C. = 1 ma. Now the circuit being kept broken by means of the interrupter, but with the testing electrode still upon the same motor point, move the switch upon the element board, which has hitherto been pointing to normal (N.), across to the reverse side (R.). The testing electrode, which was before kathode, now becomes anode. Put back the handle of the cell collector or the rheostat to zero and gradually throw into circuit one cell after another or take out resistance by means of the rheostat as before. Still keep making occasional closures by means of the interrupter. A moment will come when another contraction occurs—"anodic closure contraction" (A.C.C.). Keeping the circuit closed, again read the galvanometer. It perhaps now may register 2 ma., therefore A.C.C. = 2 ma. But only one milliampère was required to produce the "kathodic closure contraction;" therefore kathodic closure contraction is a stronger stimulus than anodic closure contraction, and the fact is noted K.C.C. > A.C.C. With the electrode on the same motor point, but this time keeping the circuit closed, increase the intensity as before, at the same time occasionally breaking circuit by means of the interrupter.

[1] The intensity required to produce contraction will vary with the stoutness and muscular development of the individual and other circumstances affecting current density.

Another contraction soon becomes visible. Again read the galvanometer—perhaps it marks 3 ma. Here the testing electrode being anode and the contraction occurring at opening or break of the circuit, it is an "anodic opening contraction;" and the strength of the current necessary to produce it being 3 ma., A.O.C. = 3 ma. But anodic closure contraction required only 2 ma.; therefore the anodic closure contraction is (in this case) a stronger stimulus than the anodic opening contraction, *i.e.* A.C.C. > A.O.C. (In the case of some nerves A.O.C. appears before A.C.C. Sometimes these two stimuli are of equal strength. The cause of the difference is a physical one and depends perhaps upon polarisation currents, as well as on relative differences in current density, the latter in its turn depending as already said on differences in the nature and bulk of the structures through which the current has to pass on its way to the nerve). Again, having broken circuit but with the testing electrode on the same motor point, put the reversing switch back to normal (marked N. on the element board). This makes the testing electrode once more kathode. Again putting the handle of the cell collector or the rheostat back to zero gradually increase the intensity of the current, and when this has attained a considerable amount, say two, three, or four times the strength of the current in the preceding test, break circuit by means of the interrupter. Perhaps a contraction follows. The galvanometer may mark 10 ma. Here the testing electrode being kathode, and the observation made on opening the circuit, it is a "kathodic opening contraction" (K.O.C.); and as 10 ma. is required to produce it, the fact is noted K.O.C. = 10 ma. If no contraction appear on opening such a circuit, the latter must not be closed again until the cell collector has been put back to zero, on account of the violent closure contraction that would otherwise ensue. Starting again from zero the current is gradually raised to a higher intensity than before and the experiment of opening the circuit repeated. But in actual practice this process ought not to go on indefinitely. In every electrical examination there is a limit beyond which the intensity of a current should not be pushed. With an electrode so small as that used in electrical exploration, not only does the process become insupportably painful as an intensity of 20 to 25 ma. is approached, but no good purpose is served by it, inasmuch as the violent contraction of neighbouring muscles is apt to mask, and may be mistaken for, the contraction of the muscle under examination. The contractions produced in electrical testing ought to be "minimal," that is to say, the minimum current ought to be used that is capable of producing a contraction; and, as far as possible, neighbouring muscles ought not to be excited.

(*To be continued.*)

TECHNIQUE OF HYDROTHERAPY—I.

By Dr. C. J. Whitby.

Introductory Remarks.

Under the above heading I propose to give simple directions for the application of this branch of physical therapeutics. The procedures chosen for description will be those which my twelve years' experience have led me to consider most useful, and particularly those which are most suitable to the exigencies and limitations of general practice. For a detailed description of the less commonly employed methods and those requiring more or less complicated apparatus, reference must be made to the larger works bearing on the subject, such as the monograph of Professor Winternitz, in Von Ziemssen's "Handbook of General Therapeutics" (vol. v.), and the "Principles and Practice of Hydrotherapy," of Dr. S. Baruch, reviewed by the present writer in No. 2 of this Journal. In these and other works will be found interesting accounts of experimental observations bearing on the physiological effects of baths, &c., which must here, for the sake of conciseness, be omitted. The main result of these researches and of general hydrotherapeutic experience may, however, be summarised in the form of certain axioms, which, if carefully borne in mind, will greatly assist those who wish to make an intelligent, not merely empirical, use of the methods here classified.

The following are the considerations which bear more especially upon the effects of those baths which will first be described:—

(1) Water is, for curative purposes, largely employed as a vehicle for thermal and mechanical stimuli.

(2) By means of such stimuli the circulation can be modified at will.

(3) Excess or defect of metabolic or functional activity is always associated with excessive or defective blood supply to the tissue or organ concerned.

(4) By the repetition of processes calculated to correct faults of circulation, the associated disorders of metabolism or function will also be alleviated.

From this point of view hydrotherapy may be regarded as a training of the vaso-motor centres, with a view to the correction of morbid habits and the substitution of healthy ones. The theory is not exhaustive, but it is sound as far as it goes. And its practical value as a guide to treatment is enormous.

One golden rule must ever be borne in mind by the practitioner who aspires to success in the sphere of hydrotherapy. The

line[1] which separates thermal stimulation from thermal *irritation* must for each individual be carefully ascertained and *must not be over-stepped.* The reaction which follows stimulation is immediate, beneficial, and of moderate amount; that which follows irritation is deferred, and, when it comes, excessive and detrimental. As the patient progresses towards health, temperatures, which at the outset would have acted as irritants, will fall within the widened range of stimuli, and may thus be employed with advantage. This is particularly the case as regards low temperatures, which, in disease, are worse borne than high ones.

Baths.

(1) *The Half-Bath.*—This is generally considered the most useful of all hydrotherapeutic procedures. It is also one of the most elastic, in the sense of being easily modifiable to suit the requirements of various conditions. It may be given in any bath, provided that there is room for the patient to sit upright in it, with the legs extended, but an ordinary long, reclining bath is best. The water should be of a depth sufficient to well cover the pelvis when the patient is sitting up, as one of the main objects in view is to cause a reactionary diversion of blood from the congested cerebral, pulmonary or splanchnic regions to the pelvic vessels and those of the lower limbs. The water employed may be of a temperature anywhere between 74° F. and 90° F. In the majority of cases of chronic disease it will be well to begin with a somewhat high temperature (say 88° F.), and as the condition improves, to gradually work towards the lower one mentioned. In fever cases the ruling principle, contrary to what is, I believe, the usual practice, should be that the higher the temperature of the patient the higher should be that of the water employed in the bath. Too cold a bath will, by inducing a violent reaction, simply defeat the object in view, which, however, be it remembered, is something more than the mere abstraction of heat.

On entering the bath the patient should have the face and neck well sponged. The nurse, attendant, or best, of course, the practitioner himself, then takes an ordinary hand bowl or scoop in his right hand, and standing on the left side, near the head of the bath, proceeds to dash bowlfuls of water scooped up from the bath over the shoulders and back of the patient. The patient meanwhile, sitting upright in the water, rubs his chest, abdomen and legs, or if too ill for this, it is carried on by a second attendant. From time to time the ladling process is intermitted, and the bowl transferred to the left hand, so that the right hand, thus freed, may be employed in friction of the patient's back. After two or three minutes the patient may recline on his back, and the body and limbs are rubbed under water. He then sits up

[1] In theory a constantly shifting one, of course, but practically ascertainable enough.

and the ladling process is resumed. In febrile cases the bath is continued until a distinct lowering of the temperature has been effected, or until the first signs of chilliness are felt. He is then rapidly dried, or if not feeling chilled may return to bed without drying. In the treatment of chronic diseases the "tempered" half-bath may last from five to ten minutes; six minutes would be about the average duration. Cool (64° to 60° F.), or cold (54° to 50° F.) half-baths, which are advised by Winternitz for the treatment of anæmia, will seldom be given for longer than from four to two minutes.

Excellent results have been reported from the use of half-baths in cases of pneumonia, scarlet fever, the minor febrile diseases of infancy, and even in diphtheria and meningitis. They have also a good record as part of the treatment of spinal diseases of various kinds, all conditions characterised by abdominal or pulmonary congestion, and in uterine disorders. Winternitz recommends the half-bath combined with cold affusions (the pouring of cold water from a height) to the abdomen, as a remedy for constipation. Cerebral or spinal neurasthenia is also an indication for the systematic use of the half-bath, or that which will next be described.

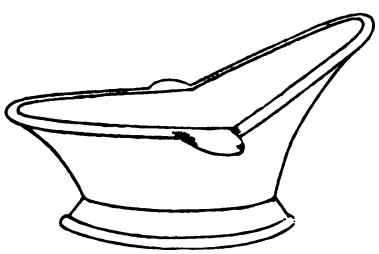


FIG. 1.—Trunk Bath.

(2) *The Trunk Bath.*—A bath suitable for the administration of this very useful form of treatment will be found in most well-appointed households. Its peculiarity is the sloping form of the back (see fig. 1), which permits of a comfortable semi-reclining attitude on the part of the bather. In order to prevent the possibility of compression of the popliteal vessels, the feet (previously wrapped in flannel or a small blanket) should be supported on a footstool. When the patient is leaning back in the bath, the water should, if possible, be high enough to cover the cardiac region. On account of the exclusion of the lower limbs, the trunk bath can be borne at a considerably lower temperature than is usual with the half-bath. I have frequently prescribed it to be taken for two or three minutes or longer quite cold, generally preceded (or accompanied) by a hot foot-bath or some other warming process. In asthenic cases it may be well to begin with a higher temperature, say between 70° and 80°, or 80° and 90° F., and for from two to four or six minutes at a time.

Whatever the temperature employed, the bath is arranged as follows: the patient leaning back as described, has the feet and legs wrapped in flannel or blanket, and resting on a stool. If the bath is given in a properly warmed room the patient's body is best left uncovered, otherwise a blanket may be fastened cloakwise round the neck. The bather takes a piece of jute or rough towelling, and briskly rubs the submerged parts, particularly the abdomen, throughout the continuance of the bath. This is a most important detail, and if the patient is too weak to carry it out, it must be done by an attendant. On leaving the bath friction should be employed till reaction sets in, followed by exercise *in the open air*, or if this is forbidden by weakness, the patient should get into bed and rest there till thoroughly warm.

On account of the comfortable position occupied by the bather the trunk bath is particularly well suited for the use of asthenic patients. Fortunately, it is just in these cases that it is therapeutically indicated. It would undoubtedly prove beneficial, administered with proper watchfulness and judgment, in a large proportion of phthisical cases. Brief immersion in low temperatures, preceded, if necessary, by some slight warming process (*e.g.*, a foot or arm-bath), has a generally stimulating effect and promotes nutrition. Trunk baths are also recommended in chronic gastric and enteric affections, anæmia, leucocythæmia, chronic affections of the ears, eyes, throat, &c., uterine displacements, and as a strengthening bath for pregnant women. They may also be used, as a substitute for the half-bath, in febrile diseases, a somewhat higher temperature being, of course, employed, than when they are prescribed for the chronic maladies just enumerated.

(3) *Sitz Bath.*— The bath generally known by this name differs from the trunk bath in shape (see fig. 2), the back being somewhat higher and more upright, in accordance with the position assumed by the bather when it is in use. The quantity of water should be such that when the patient is seated in the bath it reaches to the umbilicus. The temperature may, of course, be varied in accordance with the requirements of the case, but by far the most useful and most frequently employed form of this bath is the so-called "tempered" sitz bath, of from 70° to 80°, or 88° F., and its average duration is from ten to twelve minutes. During the last two minutes of this time it is usual to allow some of the water to flow out of the bath,[1] if an outlet is available, and to replace this by an equal quantity of cold water, poured or run in in such a way as not to come into direct contact with the body. It is not essential for the patient to undress completely, but care must be taken that the garments are kept clear of the water. During the continuance of the bath the patient should freely rub the abdomen and other submerged parts, or, as

[1] Or, if no outlet be available, cold water may, if necessary, be added to the water already in the bath.

some advise, this may be done by an attendant. If the patient be disposed to feel chilly, a blanket may be pinned cloakwise round the neck, or a special blanket, with a slit to admit the head, may be draped over and round the bath. If the patient be of short stature, it may be necessary to prevent compression of the popliteal vessels by raising the feet on a stool, but this will seldom be required. Before entering the bath the patient should sponge the face and neck with cold water, and this is a rule that applies to *all* immersion baths of comparatively low temperature.

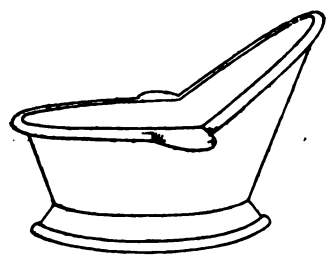


FIG. 2.—Sitz Bath.

The indications for the use of the tempered sitz-bath follow strictly from a consideration of its physiological effects, which have been almost exhaustively investigated by Winternitz, Schweinburg, and others. The general character of its action has been summarised as "a gradual and lasting reduction of (local) temperature, with absence of any marked (or violent) reaction." It will often effect a cure in chronic gonorrhœa, stubborn leucorrhœa, chronic metritis, vesical catarrh, in hæmorrhoidal inflammation, ovaritis, and spermatorrhœa. Taken an hour or so before bedtime and followed by gentle exercise, it will often prove serviceable in cases of insomnia. Sitz-baths of 85° F., followed by affusions have produced striking results in cases of menorrhagia. Sitz-baths of 85°, combined with abdominal friction, and the temperature reduced by two degrees daily till 60° is reached, are advised by Baruch in cases of constipation occurring in anæmic subjects.

Brief *cold* sitz-baths, two to four minutes, have a powerful derivative effect, and are useful in cases attended by cerebral hyperæmia. They are contraindicated by the existence of sexual irritability, *e.g.*, nocturnal emissions, &c. Prolonged cold sitz-baths (thirty minutes and longer) are asserted to be a *sovereign remedy* for obstinate diarrhœa.

Hot sitz-baths (102° to 115° F.) are much less frequently employed than those of lower temperature, but will give immediate relief in colic and other spastic abdominal or pelvic affections, *e.g.*, gouty gastralgia, the tenesmus of vesical catarrh, dysmenorrhœa, &c.

A BIPOLAR RECTAL ELECTRODE.

By Margaret A. Cleaves, M.D., New York City, U.S.A.

The electrode shown in the accompanying cut is constructed on the same principle as the vaginal bipolar electrode, varying only in size and shape to meet the different anatomical conditions.

In a variety of pathological conditions rectal bipolar applications of alternating currents have proved of very great value in the writer's hands. There is no better means of relieving localised congestions, nor one more easily applied.

Either the symmetrical (sinusoidal) or dissymmetrical (induced) type may be selected, according to the underlying pathology; in some instances these may be employed indifferently.

With the sinusoidal a high or low frequency, and with the induced a fast or slow rate of interruption may be used. In acute congestions and inflammations, or even in subacute types, accompanied by pain, sensitiveness, swelling and heat, a high frequency or fast rate of interruption is indicated. Clinical experience as well as physical laws, however, point to the induced current with a secondary of many turns and a fast rate of interruption as the best form to use. The greater E. M. F. of the sinusoidal means more work done in the tissues, which in acute conditions is not well borne.

The minimum expenditure of energy should be employed, sufficient to initiate the circulatory changes necessary to the establishment of normal circulation and nutritive activity. By means of a bipolar application there is an immediate molecular and mechanical action within a localised area, painless but far-reaching in its effect.

In relaxed and prolapsed rectal walls a lower frequency of the sinusoidal or a slow rate of interruption of the induced current should be selected.

The writer has used this method, with results varying from cure to a permanent modification of the symptoms, in constipation dependent upon atony of the lower bowel, hæmorrhoids internal and external, fissure, persistent hæmorrhage, rectal eczema, proctitis, relaxed and prolapsed rectal walls. From the first there is a modification of pain, soreness, swelling, *i.e.*, relief of congestion accompanied by a sense of increased tone and strength in the bowel.

In the cases in which hæmorrhage has been present there has been a diminution in the amount from the first, and in constipation dependent upon atony of the bowel, an improvement in direct relation to the number of *séances*. The ultimate result, whether of complete cure or modification, depends upon improved nutrition.

The instrument well lubricated is gently inserted for from 3½ to 4 inches of its length, with the patient in the recumbent position. If the knees are then approximated the electrode becomes self-retaining.

The current is gradually turned on by means of a current controller and contact is maintained for at least ten minutes. With the establishment of relief, a current of increasing strength and diminished rate can be used at successive *séances*. At first daily applications should be made. Later, as the case progresses favouraby, thrice or twice a week until the maximum benefit is obtained. Everything pertaining to the patient's general health should be looked after, *i.e.*, food, drink, exercise, bathing, dress, &c.

Infection.—Radzievsky (*Centralbl. f. Bakt.*, August 22, 1900) includes under the term "infection" all the effects which follow the entrance of micro-organisms into the animal body. All authors ascribe the most important changes to the action of specific poisons produced during the development of the infecting organism. Some, however, consider these poisons decomposition products of the action of the organism on the tissues, while others have brought evidence to show that there is active poisonous matter in the living structure of the organisms themselves. This active poison is, according to some, secreted as a normal vital act of the organisms, while others believe that the appearance of the poison follows their decay and dissolution. Cantani and Pfeiffer believe that the organisms are killed by contact with living cells, and that the dead specimens are taken up and dissolved, the contained poison being thus carried into the circulation. Radzievsky has observed the course of events in fatal infection with bacillus coli. In the first stage the multiplication of organisms is in the ascendant, in the second stage their destruction is remarkable, and involves a steadily increasing number of examples. When a culture not specially virulent is injected the number of living specimens is notably decreased before death. Bactericidal substances are formed which kill the microbes, and the dead bodies being dissolved, the bacterial poison gains access to the general circulation, and produces the clinical signs of infection. The destruction of the microbes is extra-cellular in the fluid elements of the tissue. The microscopical changes found after infection with a dead culture are the same as those to be observed in infection with living organisms. The author's observations point to there being important toxic substances in the structure of bacteria which are largely responsible, when the latter are killed and dissolved, for the clinical signs of infection. (Abs., *British Medical Journal.*)

EMPLOYMENT OR OCCUPATION NEUROSES—TREATMENT BY ELECTRICITY.

By Francis B. Bishop, M.D.

Without going into a detailed description of this malady, which can be found in any text-book, the author will proceed to discuss the subject from his own experience and according to his view of the structures involved, and their deviation from the normal, under the influence of prolonged and localised fatigue.

As water is said, by constant dripping, to wear away a stone, so the highly specialised nerve centres, by constant reflex irritation, may become "like sweet bells, jangled, out of tune and harsh," and fail to subserve the will by harmonious action in directing the finer and special movements of muscles used in writing, telegraphing, piano and violin playing, sewing, and in other occupations too numerous to mention. Various degrees of neurosis may supervene, varying in degree from simple numbness and tired feeling to a tremor with or without pain, to spasm of the muscles of the fingers or of the entire arm, to complete paralysis of the hand, or hand and forearm, sometimes with wasting and degeneration. Occupations producing the trouble come to be performed with great difficulty, if, indeed, they are possible at all. As the pathology of this disease is of rather a doubtful nature, the writer begs to submit, at least, a working hypothesis, upon which to base his line of treatment.

The spinal centres controlling the muscles involved are large, and superficially situated in the fifth, sixth, seventh and, perhaps, the eighth cervical segments of the cord. Now, taking writers' cramp as a specimen neurosis, the first act is to will to write. The impulse may spring spontaneously from within the intellectual centres, or the impression setting them to work may come from without. In turn, cortical motor cerebral centres are set into action, the motor impulses pass along the pyramidal tracts and stimulate to action the cells forming the motor centres in the anterior horns of the spinal cord; through these the muscles are supplied with energy. Besides the cerebral and spinal motor centres, there must be considered, in this connection, the sensory superficial nerve endings in the finger tips and the muscles of the fingers, hand and arm, and also centres in the posterior columns of the cord. Indeed, the writer is of opinion that the disease originates through the pressure and strain to which the sensory nerve endings are daily subjected. Physiologists tell us that "when the peripheral ends of cutaneous nerves are degenerated there are ataxic phenomena." And again, that "the term, 'center' is merely applied to an aggregation of nerve cells so related to each other as to subserve a certain function"; but, inasmuch as these cells are connected to each other, and with other cells in many ways, various combinations of them

may result. Again, there must also be taken into account the greater or less resistance in some paths than others, and the enormous variety of combinations which these cells may make. These cells give off processes which branch and anastomose with processes from other cells, opening up innumerable paths to nervous impulses by these combinations, so that, in a certain way, a cell may be regarded as a junction of these conducting fibres, or a 'shunt,' whereby an impulse may be 'shunted' to one or other branch in the direction of least resistance, or in the best beaten path, as it were, while there may be a 'block' in other directions."

On account of constant pressure of the pen upon the thumb, index and middle fingers, together with the pressure from supporting the hand on the ends of the little and ring fingers, while the wrist and arm steadily press upon the desk, a degenerate condition of the peripheral ends of cutaneous nerves supplying these points of pressure is not improbable. Add to this the employment of a certain set of muscles in writing, telegraphing, &c., and it is not unreasonable to suspect that this degenerate condition will extend to the motor nerves which supply these muscles with energy. That this is often the case can be readily verified in testing the muscles with the galvanic current. In some of my cases I have found the reaction of degeneration well marked. As we know that nerve currents are slowly transmitted through degenerated nerves, we would naturally expect to find the impulses that should direct the uniform movement of these muscles "shunted" through some other channel offering less resistance; thus, when the attempt is made to write, the opposing muscles receive the stimulus in great part before the paths of greater resistance can be travelled to reach the muscles engaged in writing, and only by the greatest effort of the will can they be even partially controlled; this, in time, produces, reflexly, an irritable condition in sensory centres, and spasm, with pain, is the result, or, when the motor centres are more deeply affected, paralysis may follow.

According to the hypothesis here laid down, the peripheral ends of cutaneous nerves and the muscles employed in writing are first involved, and secondarily the sensory and motor centres in the spinal cord, and perhaps also, the centres in the cerebral cortex. The writer does not believe that the centres are disorganised, but are merely tired out, irritable, and yet capable of resuming their functions in a normal and orderly manner, just as soon as the peripheral resistance can be removed, and the nerves and muscles which they supply can be made to perform their functions without sending irritating impressions through the sensory paths to these centres. Contrary to the frequently expressed opinions by various authors, it has not been necessary, according to my experience, for these patients to entirely discontinue their daily vocations. I have found on the contrary

that they do not progress so rapidly when they quit work altogether as when a moderate amount of work is allowed. The muscles get stiff and sore, and the attempt to resume work after discontinuing it for some time becomes extremely difficult. It is therefore fortunate that this is not necessary, as the vast majority of these subjects are entirely dependent upon their work for their maintenance.

In the treatment, many methods have been suggested and many instruments have been invented to alleviate the condition in order to enable the patient to continue his work, and, if possible, to cure him. The typewriter has been suggested, but the writer had one case of typewriter's cramp in a physician who had given up the pen in consequence of having acquired writer's cramp.

Electricity is almost invariably mentioned as a means of treatment, but I have as yet to see mentioned in any text-book on the subject a rational method of treating these cases as they appear to me. If my hypothesis is correct, the nerves and muscles must be toned, fed and soothed, and any treatment by electricity of an irritating nature, is, in my opinion, liable to do harm. Some authors advise the application of one electrode to the axilla, or at the back of the neck, and stroking the other over the muscles and nerves; this method seems to the writer, not only useless, but harmful as well; all of these cases are, to some extent, neuritic, and nothing is more irritating to irritable nerves than a concentrated moving current. The method which, to the writer, seems most plausible, and which in his hands has been followed by the most satisfactory results, is to apply the continuous current in a stabile manner, not to the muscles affected, as the authors tell us, but to all the muscles (all are more or less affected) of the fingers, hand, and forearm; and if there is the slightest suspicion that the upper arm is involved, the current should be applied to that also.

My method is to have the patient strip his body to the waist; a large pad, 10 × 14, with tinfoil as the conducting medium, is placed between the shoulders and back of the neck, completely covering the nerves proceeding from the cervical and upper dorsal region. The pad is soaked in hot water, and then soaped, to reduce as much as possible the resistance of the skin; it is then attached to the positive pole of a galvanic battery of at least sixty volts pressure, in circuit with a milliampèremeter and a good rheostat; the other pole, or electrode, is water placed in a tin pan, eight inches wide, four inches deep, and twenty-four inches long, for the hand and forearm; if the upper arm is to be treated also, the pan will have to be about ten inches deep; it must be well painted in order to secure perfect insulation.[1] A piece of

[1] A basin or small foot-bath-tub of paper, commonly sold in the department stores, requires no insulation, is light and convenient to handle, and answers the purpose admirably.—(Am. Ed.)

glass or soft rubber is placed on the bottom of the pan, and under this a metal disc, to which is attached the negative rheophore; the pan is placed by the side of the patient so that he may conveniently immerse both hand and arm. It is then filled with water comfortably hot, and the current turned on very gradually to 30, 40 or 50 ma., according to the tolerance of the patient. With the large electrode at the back and the water electrode for the arm, the patient will frequently stand 50 ma. for half an hour without the slightest difficulty, and a full half hour should be given to each daily sitting. At the expiration of half an hour, the current should be very carefully turned off, avoiding always sudden and severe shocks. There is one condition which should always modify the treatment; if, when turning on the current, the patient complains of drawing of the muscles, it should be turned off until the drawing sensation ceases and the arm is comfortable; after a while it may be gradually increased without contraction of the muscles. When a treatment is finished and the arm withdrawn, it will be quite red; the blood will have been attracted to the whole arm and hand; the entire system of conducting paths, from centre to periphery, has, steadily flowing through it, a current soothing, and, at the same time, giving tone to the centres; the cells of the cerebral cortex are reached reflexly through the sympathetic, and, after a few sittings, the patient will (as an old negro once told me of his wife) "complain of feeling much better." Whether my hypothesis is right or not, this treatment has acted well in my hands, and I have yet to see a case of occupation neurosis which has not been materially benefited thereby. In some instances, the treatment has been supplemented with the static ozone breeze from my static cage. The static cage is used when the condition of the patient indicates the need of a general systemic tonic.

Two physicians of this city, who were secretaries of medical organisations, from using the pen in writing numbers of professional papers, were badly afflicted with writers' cramp, and were cured in my office by the method outlined here. An architect, who thought he would have to give up his business entirely, has been cured and is now pursuing his work as comfortably as ever. A telegraph operator, who had been working in misery for fifteen years, has been under my care for the last fourteen months, and, during that time, he has not only almost completely recovered, but has actually doubled his work; formerly, he could, with great difficulty, "worry through" a part of the night, but since he has been under treatment, he not only attends to his Associated Press work at night, but has been filling a position in a broker's office during the day, as telegraph operator, with comparative comfort, and is improving all the time. Time is an element with which we have to reckon, and as all occupation neuroses are necessarily chronic we cannot promise our patients immediate relief, but we can promise to relieve them

in time if they will stick to the treatment,—and they generally will. When there is considerable anæsthesia from the treatment the arm and hand are wiped dry and subjected, for about five minutes, to a very mild indirect static vibratory treatment. This treatment as devised by myself consists in placing the patient upon an insulated platform, to which one pole of the machine is attached. No attachment is made for the other pole, but the resistance of air is placed in circuit, and the operator separates the discharging rods an inch or more, according to the strength required; he may then concentrate the current upon any part desired by rubbing the ball electrode or wire brush over the part. If a very gentle effect is desired, an ordinary "whisk" brush may be used. This produces a very pleasant and gentle vibratory sensation, which has a tendency to stimulate and tone the sensory nerve endings without causing pain and without disagreeable reaction.

Raw Meat in Tuberculosis.—Under the name "zomo-therapy" Richet and Héricourt describe a form of treatment of tuberculosis which gives them definite results. C. Fraenkel and G. Sobernheim (*Berl. klin. Woch.*, July 15, 1901) have tested these results, and the conclusion they arrive at is that raw meat diet has no influence on the course of tuberculosis, and they cannot agree with Richet and Héricourt that the method is worthy of a trial on human subjects.—*British Medical Journal.*

Can Solutions of Native Proteids Exert Osmotic Pressure?—The following is the report of *The Times* of Professor E. Waymouth Reid's paper on the question, "Can Solutions of Native Proteids Exert Osmotic Pressure?" in which he discussed experiments on this point conducted by himself. He observed that the assertion that proteids in solution exerted osmotic pressure was stated to be based upon work with impure samples. By using recrystallised proteid which had been thoroughly washed, no evidence of osmotic pressure could be obtained on a membrane made of formalised gelatine. If this observation were correct, it followed that the so-called "solutions" of proteid were not true solutions but fine suspensions. Professor Reid also contributed a paper on "Ionic Effect in the Small Intestine," in which he referred to experiments upon absorption in the intestine in the presence of sodium and potassium ions. Professor Loet, of Chicago, had indicated that many vital phenomena were influenced by the presence of the ions of sodium and potassium and calcium especially; indeed, that such were necessary in certain proportions for the manifestation of vital phenomena. A striking example of this was the fact that the unfertilised eggs of the marine annelid Chœtopterus would not develop in plain sea-water, but immediately started to divide on the addition of a little of a potassium salt to the water. A series of interesting experiments by Professor Reid himself had shown that the absorption of glucose by the intestine was favoured by the presence of potassium ions as contrasted with those of sodium.

NOTES ON DIET.

By Dr. Thomas Dutton.

Gout.—It is most unfortunate that the etiology of gout is so very unsatisfactory. Although the majority of those who have studied it have demonstrated its causation—to their own satisfaction, such theories have usually proved more scientific than practical, and all that can yet be safely said is that the nitrogenous elements of the food undergo some disturbed retrograde metamorphosis. But whatever be the correct theory as to its causation, it must be universally admitted that a careful and scientific regulation of the diet is the most important factor in its treatment.

In considering the dietetic treatment of gout I usually divide the latter into three classes: (*a*) rich man's gout, (*b*) "financial" gout, (*c*) poor man's gout. In the: (*a*) class the physician should try to knock off by degrees all nitrogenous and alcoholic foods; in (*b*) class he must allow these foods, but they must be given in so condensed a form that they can be easily digested and assimilated, and combined with a mixture of farinaceous foods and some fruit; in the last class (*c*), which very rarely comes before the private physician, the patient requires an extra amount of nitrogenous food with about three glasses of good old port wine a day.

The more common class which has come under my observation during the last few years is the class I name "financial gout." There are many city men who, whenever there is a financial panic, and who have weathered the storm after having undergone days of extreme anxiety, always seem to end up with a bad attack of subacute gout. There is no doubt that any very prolonged distress or anxiety of mind brings about a similar set of symptoms, viz., undefined pains all over the body, a furred tongue, constipation, irregular pulse, and great depression of spirits.

There are two further symptoms usually found in patients who are "gouty," viz., an extreme offensiveness of the fæces, the urine being at the same time very pungent and full of urates.

It is in order to alleviate these two last symptoms that dieting is so beneficial; but in order to prepare the system for a regulated diet, it is well to first give a large dose of calomel followed by ten grains of pure salicylate of soda three times a day. These drugs are very efficient in eradicating all the uric acid from the system.

Having prepared the patient for a suitable dietary, we should select those foods that are not prone to undergo quick fermentation, but which are easily digested and assimilated. The following are most suitable, viz., strong clear soups, white fish, poultry, mutton, lamb, sweetbread, young green vegetables

(carefully cooked), stewed fruit (pears, apples, and apricots), sweetened with saccharine and served with cornflour or custard. Skimmed milk may be drunk in any quantity, either plain or combined with Vichy or soda water. Some pure natural water is useful as a drink, being safe and containing alkalies beneficial in gout. Among other beverages whisky, claret, tea, can often be taken by gouty subjects without doing any harm, but in the majority of cases they are best left alone.

Far more important in the dietetic treatment of gout, in all its stages, is to tell the patient what *not* to eat and drink; the advice should include all highly-seasoned foods, pickles, spices, strong condiments, salted foods, beer, port-wine, brandy, and all saccharine drinks. These undoubtedly do increase the poison of gout; they also increase fermentation, produce congestion of the liver, and irritate the excreting substance of the kidneys.

Indigestion.—The causes of indigestion are so numerous and its symptoms so varied that we are, in the first instance, confronted with the difficulty of making a correct diagnosis. Nothing requires a closer observation and a wider experience than to diagnose the special part of the digestive system which is at fault, and what reflex causes are at work, causes which although they have nothing to do with the digestive system, yet can produce symptoms of severe indigestion suggestive even of serious lesion. In no disease that the physician has to treat is he better repaid for time spent in diagnosis than in this; for, unless it be due to some malignant cause, the treatment (if faithfully followed out by the patient) ought always to be successful. But patients must remember that it is a disease which seldom cures itself, and the tendency of the condition is to go from bad to worse.

In nearly every case, no matter what the exact cause, it is best to begin by resting the stomach as much as possible. In the first place, give a good saline purge and wash out the stomach, either mechanically, or by giving frequently half a pint of hot water to sip; then for two days let skimmed milk be taken with three teaspoonfuls of plasmon solution with every half pint, a little clear soup with toast in the middle of the day, and the white of three eggs, with a pint of skimmed milk, at night. When all symptoms of indigestion have passed off the patient can gradually be put on a light, nutritious diet, selected from among the following: clear strong soup, white fish, white meat, *young and well cooked* vegetables — peas, beans, asparagus, Brussels sprouts, cauliflower—skimmed milk, eggs, stewed fruit, custard, jellies, and ripe sound fruit. None of these foods, if carefully selected and properly cooked, will undergo fermentation if the stomach has been rested a sufficient time and is ready to receive a meal.

A city gentleman lately came under my care who had lived well but not wisely, and who had suffered great pain from indigestion for the last five years. He suffered from chronic

catarrh of the stomach, his breath was most offensive, and all the medicine and food he took soon fermented, and the gas generated dilated his stomach and produced dyspnœa and other cardiac symptoms. He had undergone a variety of medical treatment, all with apparent benefit at the time, but always followed by relapse, and I explained the latter by the fact that a strict and definite diet had never been prescribed. Therefore, after washing out the stomach, he was at once placed on a diet of skimmed milk, with three teaspoonfuls of plasmon solution to each half pint, the white of eggs, bananas and plasmon biscuits, for fourteen days, with a quarter of a minim of creasote three times a day. The improvement in his condition was as astonishing as it was rapid, and when it was thought that the time had arrived to place him on a more solid diet he at first asked if he could not remain on the milk diet, as he had never felt so well for years. I gradually did put him on a light solid diet, and he is now quite well. Such cases, severe and apparently almost incurable, are often rapidly relieved by insisting on the use of the foods named in the diet card—no more, no less.

NEW INSTRUMENTS AND APPARATUS.

A LUMINOUS ELECTRIC RADIATOR.[1]

It cannot be doubted that for the relief of some kinds of pain, and the treatment of certain inflammatory and post-inflammatory conditions, as well as in many forms of arthritis, whether rheumatic, rheumatoid, or gouty, the local application of a very high temperature is often an effective remedy.

It is evident that any apparatus which offers itself for the application of such temperatures to the body must (1) be capable of localising upon a part as high a temperature as can be borne with safety; (2) such an apparatus must be easily movable and adaptable to the whole body or to any and every part of it; not only to every articulation, including the hip, shoulder, and vertebral column, but to cavities and organs; (3) it must admit of an easy position for the patient, and one which is easily variable during the course of the necessarily long application; (4) it ought to get quickly into action, and not require time to "heat up," and the temperature must be capable of being raised or lowered easily and instantly; (5) it must not by its fumes contaminate the air; (6) it must admit of the part under treatment being easily accessible to view and manipulation.

The method about to be described was originally suggested by Dr. W. S. Hedley (in charge of Electrotherapeutics at the London Hospital), and the apparatus constructed by Mr. H. J. Dowsing, who adapted to it a patent of his own. It was described

[1] Dowsing System.

and shown by Dr. Hedley at a meeting of the Balneological and Climatological Society, several years ago. These heaters are made on the principle of the electric incandescent lamps, and have carbon or high resistance metals enclosed in hermetically sealed glass protectors from which the air is exhausted. These heaters are placed at the apex of an angle in reflectors of copper, aluminium, or other bright surface. They can be easily arranged to take in the whole body or to treat any particular part.

There is certainly a great difference, both from physical and therapeutic points of view, between the Dowsing radiant heat bath and the "hot air baths" (whether heated by gas or electricity) which use "obscure" heat, because—

1st. It is demonstrable that heat rays from a luminous source are much more intense than those from an obscure source.

2nd. So far as mere "sudation" effect is concerned this can be produced at a much lower temperature (and consequently with much less distress to the patient) when the heat is derived from a luminous source than from an obscure one. But much more than a mere sudation effect can be produced by means of the luminous radiation at high temperature falling directly upon the skin. There is then obtained a "counter irritant" or mustard plaster effect over a widely extended surface, which fulfils many valuable indications from a curative point of view.

Should a case arise which it is desirable to treat merely by hot air, it is of course easy to secure this in such an apparatus by simply screening the luminous heaters.

The "Dowsing electric heater" is fast coming into use for warming rooms, cabins of yachts, saloon railway carriages, &c. It has the advantage that no combustion takes place, that no fumes are created, that no chimney is required, and that the heat is available immediately the current is turned on. This electric "fire-place" is elegant in form, consisting of the heaters mounted in a fan-shaped or square reflector, especially devised to throw the heat forward, at the same time being as portable as an ordinary fire-screen. It is claimed, and with justice, that in all applications where radiant heat is required a far higher efficiency can be attained by these luminous heaters than by any other form. The current consumption is $\frac{1}{4}$ unit for each heater per hour.

Serratus "Lameness" Improved by the Application of Local Heat (Dr. Heermann).—This was a case in which a patient, through lifting a heavy load, produced a complete disablement of the right serratus, with tenderness on pressure and pain in the brachial plexus. As this condition had remained unchanged for several months, there was applied, from the shoulder up to the neck, every day for half to three-quarters of an hour, a spiral of lead tubing, through which hot water circulated. At first the pains disappeared during the heating, to return afterwards, but in a few days they ceased to reappear, and on the fourth night the arm could be raised into the vertical position.

Reviews and Notices of Books.

L'Année Electrique, Electrotherapique et Radiographique. By Dr. Foveau de Courmelles. (Ch. Beranger, Paris.)

This is the first number of what is to be an annnal review of electrical progress, and may justly be described as one of the most useful books of the year. Its interesting and instructive pages present a bird's eye view of everything of novelty or interest which has occurred in the electrical world during the preceding twelve months. The reader who has mastered its contents will find himself well abreast of the most modern developments in every branch of the subject. It was of course to be expected that the present number would in the first instance deal with the Great Exposition. After this follow concise but comprehensive records of recent progress in electro-chemistry, electric lighting and heating, telegraphy and telephony, electric traction, electricity in war, electric accidents, electrotherapeutics and radiography. The Editor is Dr. Foveau de Courmelles, and the record of what he has already done in electrical literature is the best guarantee of his fitness for the work that lies before him.

Ueber die Bedeutung und Wichtigkeit der physiologischen und morphologischen Anpassung der Muskeln in der Pathogenese und in der Behandlung gewisser Beweglichkeitsbeschräkungen. Von Dr. Pierre Régnier, Oberarzt am Zanderschen Institut in Bordeaux.

This *brochure*, on the meaning and importance of the physiological and morphological adaptation of the muscles in the pathogenesis and treatment of certain limitations of movement, is concerned with a subject of great practical interest. Dr. Régnier points out that the length of the red fibres of a muscle is always in relation to the extent of the movement which it undergoes in contraction, as well as to the passive extension it undergoes during the contraction of the opposing muscles. Thus Marey removed a half of the calcaneus of a rabbit and a kid, thus considerably limiting the scope of contraction of the flexors inserted therein. A year later he observed a considerable shortening of the muscle fibres, compensated by an equal increase in the length of the tendons. All lesions, according to Jules Guèrin, which cause a limitation of movement (anchylosis, fractures, dislocations), are followed by a similar diminution of the length of the red fibres of the muscles concerned, and this shortened muscle only permits of a circumscribed movement, and its passive extension is opposed by an increased resistance. The law that applies to the elasticity of inorganic substances can also be applied to living muscular tissue. The length of a muscle which is extended by a given weight stands in direct ratio to its original length and in inverse ratio to its thickness.

This diminished contractility and increased resistance of a muscle whose movements have been limited for a certain time, has an important bearing on the pathogenesis and treatment of the joint-stiffness following long immobilisation for the treatment of fractures. The joint-stiffness is in fact due, not as commonly supposed to a contraction and modification of the capsule, still less (in cases of moderate duration) to any intra-articular changes, but to the shortening of the disused muscles whose function it was to flex and extend the joint. On examining such a joint by means of the active-passive

apparatus of Zander, which permits of the production of very slight movements of regulated amplitude and rapidity, it is found that the voluntary and reflex opposition is insensibly overcome, and that, as the amplitude of the movements is gradually increased so the mobility of the joint is at the same time demonstrated, and, by methodical treatment, in due course established. The operation produces no tearing or stretching sensations, and the increased mobility that results is not due to any rupture of contracted fibres. Other conditions which are in greater or less degree associated with, or dependent upon, muscular shortening, and which may be relieved by the same treatment are, (1) the rigidity produced by long confinement to bed, where the psoas major and the calf-muscles are apt to become contracted; (2) traumatic or congenital luxations; (3) unilateral limping; (4) spinal curvature, which is always attended by a shortening of the muscles of the concave side. The rigidity which is present in these and kindred conditions is usually ascribed by surgeons to fibrous bands, adhesions, &c., but on examination by Zander's method, proves to be of an elastic nature. Operative interference in the form of forced flexion or extension is not necessary, and if resorted to commonly fails. We have to do with contracted muscles, some of the length of whose fibres is replaced by tendon, and these shortened and contracted muscles exert a relatively far greater resistance to forced extension than would be required in the case of a muscle at rest and otherwise normal in condition.

There are some muscles in which the contractile elements and others in which the elastic predominate. The first are found in the neighbourhood of joints which undergo rapid movements, the second in parts where only slow and gradual movements occur. In the case of the first, when pathologically contracted, extension is more rapidly and easily produced than in that of the second. A stiffness of the knee from retraction of the quadriceps femoris is, for example, more easily overcome than one of the tibio-tarsal articulation.

An exact estimate of the degree of resistance exerted by the retracted muscles and the amount of extension permitted by the lengthened ones is of great importance as a guide to treatment. Manual examination is no safe guide to this estimate, as it will give the impression of a more absolute rigidity than in fact exists, a rigidity which will be at once overcome in greater or less degree by means of the rhythmic movements by Zander's apparatus. Nor is manual flexion or extension, as commonly practised for the cure of this condition, an efficient substitute for the rhythmic treatment.

The rational treatment of these conditions is based on the following principle enunciated by Ling: every muscle whose extremities are periodically withdrawn from one another becomes extended, and, conversely, a muscle whose ends are periodically or continuously approximated, contracts.

C. J. W.

ARCHIVES DES SCIENCES BIOLOGIQUES. Pub. par l'Institut Imperial de Med. Experim. à St. Petersbourg. Tome viii., Nos. 3 and 4, 1901.

No. 3 contains an interesting paper by M. S. K. Dzierzgowski, "De la transmission de l'immunité artificielle vis-à-vis de la diphthérie des parents aux enfants." The experiments of Wernike, Ehrlich and Vaillard have established the fact that artificial immunity from various diseases is transmitted to the offspring of the immunised animals *via* the female parent and not *viâ* the male. Experimenting with horses immunised against diphtheria, M. Dzierz-

gowski has endeavoured to elucidate the questions (1) under what conditions as regards the acquisition of immunity, are found the spermatozoa in the case of the male and the ovule in that of the female parent ? (2) what are the conditions of the acquisition of immunity during fœtal life ? He finds that the testicular fluid of even strongly immunised horses contains very little antitoxin, whilst the liquid contents of the Graafian vesicles of immunised mares contains a relatively very high quantity, and sometimes even as much as the blood-serum itself. Spermatozoa present in the vas deferens are also bathed in a fluid very poor in antitoxin, and one not likely, therefore, to confer any marked degree of immunity upon them. The fluid contents of the Graafian follicle enter the Fallopian tube at the same time as the ovule itself, and as this fluid is very rich in antitoxin, the ovule during the whole of its course through the tube towards the uterus is in a favourable condition for passive immunisation. Whether the process of immunisation of the ovum continues during the period after its entering the uterus, but previous to the formation of the placenta, is an open question. After the formation of the placenta, the process of immunisation of the fœtus is arrested, This is due to the fact that the placenta possesses an " elective power " of marked degree, in virtue of which toxins and antitoxins are arrested and prevented from penetrating into the fœtus. The immunity thus conferred by female parents upon their young is not to be regarded as the true inheritance of an acquired characteristic, but merely as a passive and temporary result. The degree of immunity acquired is of course always less than that of the parent from whom it has been derived.

M. P. P. Krelow gives an account of statistics of 1,075 cases of patients bitten by rabid animals and inoculated against hydrophobia at the Pasteur Station in connection with the Hospital of Samara. Taking into consideration cases where death occurred within fifteen days of the commencement of treatment, and also one case where the cause of death was doubtful, there was a mortality of 0·09 per cent. Reckoning also the cases in which death occurred within the first fifteen days, the mortality was equal to 0 47 per cent.

The latter part of No. 3, and the first part of No. 4 are occupied by M. E. S. London's account of a series of investigations into the nature of hæmolysins. These are substances which manifest their presence when the blood of one animal is introduced into the circulation of another of a different, or, in some cases, of the same species. Hæmolysins are separable into two components, one of which M. London calls the alexin and the other the desmon, and of which the former only is affected as regards its hæmolytic function by the action of extreme temperatures. The effect of the presence of these hæmolysins in the blood serum of a given animal is that on the introduction of blood taken from an animal of another species they enter into chemical combination with the stroma of the red blood globules of the alien blood, and these are in consequence dissolved. By injecting different sorts of blood into a given animal different specific substances are caused to appear, each exercising a selective dissolving power upon the globules of the alien blood by whose presence they were called into activity or being. Blood derived from another member of the same species does not always give rise to the formation of hæmolysins (called isolysins, when in such cases they do appear). The spleen plays a predominant part in the elaboration of hæmolysins. When an alien blood is introduced into an organism its elements are destroyed, and the products of its dissolution conveyed to the spleen there undergo modification. On their return to the general circulation they enter into a

combination with the particular desmon which has been evoked by the introduction of the blood in question. The desmon, in M. London's opinion. agglutinates the globules, and the alexin completes their destruction. In the elaboration of these protective substances the spleen plays an essential part, but once they are formed, all the struggle against the harmful principle is conducted on the physico-chemical domain. Both the cellular and the humoral theories of the production of artificial immunity are therefore, taken separately, incomplete, and only the cellulo-humoral theory, resulting from the fusion of both, will adequately explain the facts observed.

No. 4 of the Archives also contains the following papers:—"De la Réaction de Oumikoff sur le lait de femme," par Madame N. Sieber; "De la vitalité du microbe de la peste bubonique dans les cultures," par N. K. Schultz; "Les vaccinations antirabiques à St. Petersbourg," par le Dr. V. Kraïouchkine; and "Recherches sur la peste," par M. D. Zabolotny.

C. J. W.

CORRESPONDENCE.

To the Editor of the JOURNAL OF PHYSICAL THERAPEUTICS.

SIR,—In the JOURNAL of PHYSICAL THERAPEUTICS of October 15, there appears a description of the Lortet-Genoud Lupus lamp. In this connection I venture to place upon record the fact that priority in the matter of simplifying the voltaic arc, for the purposes in question, belongs to me. My apparatus was shown in action at the Institute of France, on December 24, 1900; that is to say, before the lupus lamp of MM. Lortet and Genoud which was described at the Academie des Sciences de Paris, on March 4, 1901. As mentioned in your Journal the last named apparatus is protected by patent, and I beg to add that besides this drawback it is also more costly, more complicated, and less effective, than the chemical radiator devised by myself and M. Trouvè. This, not having been patented, is at the service of all instrument makers. I feel sure, therefore, that your sense of fairness will afford me space in your Journal to draw attention to my undoubted priority in this matter.

I beg attention to one further point, viz., that the usefulness of our invention extends also to tubercular lung disease, a fact that I was the first to point out.

In proof of the claim I put forward I beg to refer to my communications: (1) Institut de France, December 24, 1900; (2) Academie Royale de Méd. de Belgique, December, 29, 1900, and March 30, 1901; (3) Académie de Méd. de Paris, April 16, 1901; (4) Société de Dermat. et de la Syphil. de Paris, May 2, 1901.

I am, yours &c.,

(Dr.) FOVEAU DE COURMELLES.

Paris,
November 23, 1901.

The following illustrations represent the Foveau-Trouvé lamp; it is thus described by the inventor in the *Journal d'Hygiene* :—

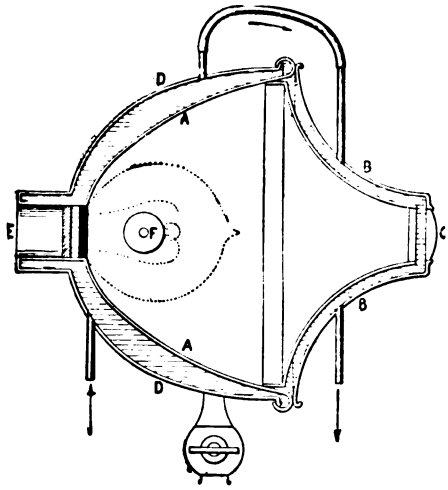


FIG. 1.—Apparatus seen in section.

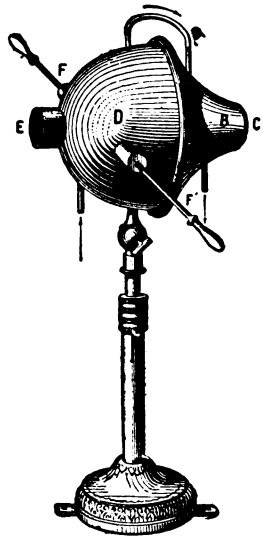


FIG. 2.—A, Parabolic mirror; B, prolongation of cone of concentration; C, quartz chamber (compressor) for the utilisation of the entire chemical radiator; D, inner cooling covering; E, opening for the utilisation of both direct and other rays, for inspection and regulation of the arc; FF, carbons which can be regulated at will; G, adjustable support for the apparatus.

"Instead of an arc requiring eighty ampères, a special installation of lenses, a great circulation of cold water, a cupro-ammoniacal solution, costly sittings of an hour and a quarter in duration, for

the treatment of an area of one or two centimetres, the apparatus in question consists of an incandescent lamp with special carbons, consuming from five to eight ampères placed in the focus of a parabolic reflector with a conical metallic concentration, a small circulation of water and two plates of quartz forming a compressor" (*Institut*, December 24, 1900); or an arc lamp answers even better (*Bulletin de l'Acad. de Méd. de Belgique*, December 29, 1900).—(EDITOR.)

ON THE RED LIGHT TREATMENT OF SMALLPOX.[1]

SMALLPOX is now of such comparatively rare occurrence that few can realise the horrors of its constant presence, before the introduction of immunisation. In countries, however, where vaccination is not enforced, as in Egypt for instance, and in all English dependencies, there are still ample opportunities of collecting pathologic and therapeutic knowledge from thoroughly typical cases.

A small epidemic in Cairo and its vicinity[2] afforded the writer an opportunity of testing Finsen's red light treatment against the disease. In consequence of the early abatement of the epidemic only twenty-five cases (but all of an exceedingly severe type), could be dealt with in the pavilion specially arranged to carry out treatment according to Finsen's method. Four (or five) cases ended fatally. In another pavilion all the other cases were treated and showed a nearly equal mortality, but as the author observes, the number of cases was too small to give a reliable comparison of statistic averages.

Still, clinical observations clearly showed that the red light treatment did not seem to have any influence on the appearance of the rash excepting that the hæmorrhagic variety was never seen.

It was different when the rash had already appeared, for, excepting in the case of the mucous membranes, the good effect was evident.

As previous observers have found, in recent eruptions the formation of pustules is interrupted, in slight cases pustulation is prevented, and in severe cases considerably mitigated in severity and duration. Even in the confluent form no lasting or serious complications occurred, and no deep radiating loss of tissue. Further, in the four typical cases of death, the throat, upper air passages and bronchi were severely affected, and this condition was accompanied by a very high temperature. In general, the

[1] Engel: "Therapy of the Present Day," May, 1901.

[2] The epidemic was stopped by wholesale vaccination.

more the mucous membranes were affected the less was the influence of the treatment on the case. The secondary fever, which more or less depends upon the inflammation of the mucous membranes, is, and will continue to be, a very dangerous symptom.

Multiple vaccination (*i.e.*, vaccination in more than one spot) did not seem to be more protective than vaccination at a single spot.

ON THE THERAPEUTIC ACTION OF THE BLUE ELECTRIC LIGHT.[1]

By Dr. A. W. Minin, St. Petersburg.

Senior Medical Officer of the Imperial Bodyguard Cavalry Regiment.

Notwithstanding the fact that to-day scarcely anyone doubts the energetic therapeutic action of the blue electric light, still I consider it may be useful to mention a few cases which, thanks to that treatment, have undergone a mild course and had a very rapid recovery. The undoubted superiority which belongs to the blue electric light principally depends upon its action upon the vasomotor nerves. The action of heat is precluded on the ground that the blue electric light is more active at a certain distance than in close proximity. The effect of the blue electric light is the reverse of that of the white. The difference will appear in what is to follow. I would now only point out that a granulating surface will become anæmic under the influence of the blue light and hyperæmic under that of white light.

The degree of pain-allaying power possessed by the blue electric light is far greater than I have hitherto observed. Although I had often been astonished at the alleviation brought about so quickly by the blue electric light in acute pleurisies, still I had only used it for making a tender spot tolerant to investigation, but now my experience has shown that far stronger claims may be made for its efficacy in this respect. Now we resort to these rays instead of cocainisation to render incisions and stitching of wounds painless, and the blue electric rays not only cause a more complete anæsthesia, but powerfully promote the healing from the very beginning.

As examples I may relate my experience in two cases with persons of widely different social position and education.

(1) Mr. X., secretary of a foreign embassy, cut his finger with a piece of glass. The cut was on the outer side of the third

[1] Translation.

finger and about 3 cm. long. After a ten minutes' radiation with blue electric light from a small lamp of fifty-candle power, two stitches were made without any pain. Healing commenced at once and was completed in four days.

(2) A soldier of the Bodyguard Cavalry Regiment cut the dorsal surface of his left thumb, the wound being about 3 cm. in length. After cleansing and a ten minutes' radiation three stitches were introduced, and also in this case the patient felt no pain. He chatted the whole time with someone present, and thought "a soft cotton ball was pressed on to the wound." On the third day healing had occurred by the first intention.

These two cases place beyond doubt the fact that stitches may be introduced and removed without pain, under the influence of the blue electric light.

A LAMP ON A NEW PRINCIPLE FOR LIGHT TREATMENT.[1]

Dr. S. Bang, manager of the Laboratory in Finsen's Light Institute, writes a preliminary notice on a new lamp. He observes that the arc lamp has hitherto been used as the artificial source of light. But as the therapeutically active rays (the blue, violet and ultra violet) are mixed with a number of indifferent and partly harmful rays, it was necessary to remove them by an energetic filtration process (through water), a proceeding which results in only a small portion of the initial energy being left for effective use. The apparatus of Lortet and Genoud to some extent got rid of this difficulty, by making it possible to bring the patient very close to the arc by means of the interposition of a glass screen which is cooled by a current of water.

Both methods possessed the disadvantage in common that the only lamps available were constructed for optical purposes and no lamp existed so constructed as to produce the coldest light, whilst at the same time the richest in ultra-violet rays.

The author states that he has now succeeded in constructing such a lamp by using metals of suitable spectral properties, as for instance iron, the spectrum of which is well known to be very rich in the desired rays, as electrodes; and this has been possible by cooling the electrodes by water, either by making them hollow and letting a current of water pass through, or by larger lamps and placing them in water contained in a suitably constructed vessel.

In this simple way a light of unexpected properties is obtained. While with the carbon electrodes the greatest quantity of light comes from the points of the incandescent carbons, especially

[1] From "Finsen's Medical Light Institute," Copenhagen.

from the crater of the positive carbon, the arrangement in question gives a real arc light, as it is almost exclusively the arc between the electrodes that emits radiation. The effect of the cooling is therefore not only prevention of the fusing of the electrodes, but also that the formation of the crater is much reduced; the energy developed thus passes to the arc, and the arc rays are produced rather than the electrode rays.

The bactericidal power of these rays is such as has not hitherto been realised. Whilst the usual arc lamp of 25 ampères and 55 volts at 66 cm. distance and under the most favourable conditions kills Staphylococcus pyogenes aureus in 4½ min., the latter is killed by the lamp described, with iron electrodes and equal current power and other conditions, in somewhat less than 4 sec., which shows a bactericidal power of sixty times that of the usual arc light. Similar results are shown regarding the irritant effects on the skin of these cold rays. Five minutes' radiation at 1 metre distance from the lamp is sufficient to produce a well marked light erythema of the whole face, which lasts for several days.

For local treatment the writer explains that he has constructed quite a small lamp, which, including various adjuncts, is not much bigger than a tablespoon. This lamp is placed upon the skin *in toto*, as the light arc is so cool that it can be placed at 1 to 1½ cm. from the skin. More than 150 trials, upon sound as well as upon lupus skin, have shown that a lamp of 5 ampères and 40 volts gives in 5 min. (generally in 3 min.) over a surface of 10 sq. cm. light reaction of the same strength as from the usual apparatus of 60 ampères and 50 volts in 5¼ hours. In other words, to obtain this effect with the old apparatus 33,500 kilowatt seconds were necessary, which treated four patients, therefore 3,375 kilowatt seconds per patient; whereas with the new lamp only 60 kilowatt seconds, or one fifty-sixth of the energy formerly consumed. As is quite natural, the effect is higher if a stronger current is used, but as the effect of the usual lamps are in practice nearly proportional to the ampères, it would appear that the bactericidal power of the new lamp is proportional to the whole quantity of energy, or to the number of watts (5 to 10 ampères and 30 to 50 volts). The most suitable current seems to me to be 8 ampères and 40 volts. As the light of this lamp is very powerful no concentration is necessary. In consequence of this, and as no automatic regulation is necessary, the lamp is very cheap to construct, and it can be used on any ordinary installation for incandescent lamps.

As he has found that unauthorised makers have distributed low quality products under the name of "Finsen's apparatus," and quacks have made "improvements" upon them, he has applied for patents for this lamp in its different forms, as technical uses may be found for it. The applications are dated from July 29th, to August 17th, 1901.—*Deutsche Wochenschrift.*

THE AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION.

The eleventh annual meeting of the American Electro-Therapeutic Association was held in Buffalo, New York, on September 24, 25 and 26, 1901, Dr. Ernest Wende, of Buffalo, presiding. The address of welcome was made by the Mayor of the city Dr. Conrad Dighland, and responded to on behalf of the Association, by Dr. Robert Newman, of New York.

The President, in his address, dwelt upon the progress that had been made in his city in harnessing the power of Niagara, stating that one-fifth of the electrical power now used in Buffalo was furnished by the great cataract.

The possibilities and limitations of electro-therapeutics were next considered. The Bottini operation was referred to as holding out greater prospect of benefit to the prostatic sufferer with less attendant risk than any other. In chronic rheumatism currents of high frequency were most effective, and success was the rule if the treatments were persisted in. Brief reference was made to electric light and X-ray therapy, to the cataphoric treatment of cancer, and to electrolysis in the treatment of urethral stricture.

"Rectal Stricture treated by Electrolysis" was discussed in a paper by Dr. W. H. White, of Boston. The treatment was necessarily slow and involved careful cleansing of the parts. A case was reported, previously under care of a rectal specialist for over a year, the method of dilatation being employed. The stricture was three and one-half inches from the anus. Treatment was administered at intervals of about four days for a short time, and at first cocaine was used to annul the pain. The treatment was suspended for two months soon after instituted (patient absent from city) and then recommenced. The active electrode, a metal sound, was attached to the negative pole, and introduced into the rectum, indifferent contact positive, to the back. Fifteen minutes were required to pass through the stricture. At the next sitting a larger sound was used; time ten minutes. Subsequently zinc electrolysis was used. Although the treatment was frequently interrupted, in less than a year the stricture was completely cured. (No dose given in data at command.—AMERICAN EDITOR.)

"Neurasthenic Paralysis." A paper on this subject was read by Dr. F. B. Bishop, of Washington, with report of a case, in which treatment by the continuous (galvanic) current, in addition to the free use of water and methods of improving the general nutrition, was successful.

Dr. M. F. Wheatland, "Value of Electricity in the Gynæcological Work of the General Practitioner," directed attention chiefly to its value in dysmenorrhœa, endometritis, uterine subinvolution, suppurative inflammations, and fibromyomata.

Dr. Wheatland also presented a modified intrauterine electrode for cataphoresis. The discussion following its presentation pointed out the dangers attending the use of such an electrode (Dr. Nunn) and the superiority of cataphoric medication, per vaginam (Massey-mercury) and metallic electrolysis, intrauterine (Phelps). The latter stated that after thirty years' experience in gynæcology, he regarded metallic electrolysis as in advance of all other methods of treating chronic endometritis.

Dr. Wilson, of Montreal, presented a new transformer, constructed on the principles of an induction coil, claiming that it did not heat, and made very little noise.

The "Effect of Electro-Static Modalities upon Hyperæmia and Pain" was discussed by Dr. W. B. Snow, who emphasised the well-known effects of static electricity in such conditions. He pointed out the value of the conductive method (with insulation and grounded area) in the treatment of joint affections. When ankylosis had not taken place and the joint strictures had not been affected, the inflammatory process could always be stopped, most of the products of inflammatory action removed, and pain and disability overcome. Sciatica, in common with other forms of neuritis, was promptly cured. Pain and hyperæmia were rarely contraindications to its use. The value of the convective discharge in skin conditions, and wherever a rubefacient was indicated, was emphasised. The work should be done with at least an eight-plate machine, thirty inches in diameter, and capable of being operated at a speed of 300 revolutions per minute. Stress was laid upon the necessity of continuing treatment until sedation was secured, with reduction of hyperæmia and the repetition of treatment before recurrence of pain.

Dr. Robert Newman discussed the conductive method of the Franklinic current, *i.e.*, insulated platform and grounded area, with Werber's insulator, for which the inventor made the following claims: (1) That the entire current of the machine is utilised as a working current instead of a small fractional part of it as in the ordinary conductive method; (2) that all the current is caused to pass through that part of the body or other object interposed between the electrodes delivering and re-collecting the current to be dissipated by sparks and before the interruptions are made; (3) that the voltage of the working current is therefore much greater, thereby increasing the effectiveness of the machine, or in other words, enabling one to make a satisfactory use of a smaller static machine; (4) that the tonic and alterative effects are exerted most vigorously at the point of exit from the body under the return electrode instead of at the point of entrance; (5) that this interrupted current is under perfect control, and can be made to pass from the centre to the periphery, or in any direction; (6) that using the whole volume, with increased electromotive force, the current will produce better results with a less number of *séances* and of shorter duration. Dr. Newman stated that he had secured the same results in ten minutes by the use of this device as formerly in thirty minutes.

"Ozone in Tuberculosis," was the title of a paper by Dr. J. D. Gibson, of Birmingham, who described his experience with ozone generated by a static machine, and used in connection with medicated nebulæ.

"Electric Lighting at the Pan-American Exposition" was interestingly described by Mr. Henry Rustin, Chief of the Mechanical and Electrical Bureau of the Exposition.

Dr. F. H. Morse read a paper upon the "Electrical Treatment of Neuritis." The treatment depended upon the cause and the stage of the disease. In the acute stage great care and gentleness and a very mild galvanic current would give good results. In cases of long standing the object is to improve the nutrition of the part. The Faradic brush and coarse coil, with slow interruption, and the interrupted galvanic current would benefit many cases when the high tension current would be of no avail.

"Why I use Electricity in General Practice," was the subject of a paper by Dr. S. W. Bayliss, of Buffalo, who presented a number of lantern views.

Dr. L. A. Weigel, of Rochester, described the cause and prevention of common errors in radiography. He found the common errors: (1) General

distortion from improper relation between the object photographed and the source of illumination; (2) improper exposures; (3) imperfect development of the photographic plate; (4) chemical defects in the plates themselves; (5) failure to make two plates at right angles to each other verify certain observations; (6) ignorance of X-ray anatomy, especially epiphyseal lines in young subjects; (7) the superposition of various planes; (8) movement of the subject. The author was positive that the fluoroscope was responsible for more errors in connection with X-ray work than any other one thing.

Dr. G. Betton Massey reported a case to show the danger of forcible dilatation of the cervix.

Dr. Robert Reyburn presented an easy method of testing the strength of the galvanic current.

The Report of the Committee on the Röntgen Ray was offered by Dr. Charles J. Files, who also referred to a new coil which gave a spark of remarkable intensity and which enabled the exposures to be greatly reduced.

Mr. E. E. Kinaide, the originator of the coil, described it in theory and in detail. It was the high frequency of the current produced which rendered the time of exposure shorter.

Officers elected for the ensuing year were: *President*, Dr. Frederick H. Morse, of Melrose, Mass.; *First Vice-President*, Dr. Daniel R. Brower, of Chicago; *Second Vice-President*, Dr. Alfred T. Livingstone, of Jamestown, New York; *Treasurer*, Dr. R. J. Nunn, of Savannah, Ga.; *Secretary*, Dr. George E. Bill, of Harrisburg, Penna.

Digest of Current American Literature.

ELECTRICITY.

The Influence of Electric Ozonisation upon Disease.—This was the subject of a paper presented by Dr. G. Lenox Curtis, at the meeting of the Section on Medicine, New York Academy of Medicine, October 15, 1901. The author uses a high potential coil, having an E.M.F. of one million volts and an amperage of one-sixth. The coil is monopolar, but portable, and can be used at the bedside instead of the ordinary oxygen apparatus, provided an electric lighting current is at command. The application is given in a cabinet in which the patient remains from twenty to thirty minutes in order to secure the best results, and during this time receives not only the application of the high frequency current, but the inhalation of ozone as well. In addition, an electric massage is given. The electric current is conveyed to the patient through a vacuum glass electrode, and is devoid of sensory disturbance otherwise than a sensation of warmth. The effect of the treatment on the blood was shown in an increase of the number of red blood corpuscles and in the percentage of hæmoglobin, together with a diminution in the number of white blood corpuscles. As a rule, where daily applications were given, an ordinarily good result would be manifest in a month. The author reported 250 cases, and had come to the conclusion that the method was of value in both acute and chronic conditions. He had observed a benefit from its use in tuberculosis, syphilis, carcinoma, locomotor ataxia, neuritis, torticollis, paresis, nerve exhaustion, impotence,

diabetes mellitus, Bright's disease, septicæmia, oöphoritis, dysmenorrhœa, anæmia and leukæmia. A considerable number of cases of pulmonary tuberculosis, associated with fever and bacteriological evidence of mixed infection, had been treated. In these cases, two treatments were given daily, and in each instance the sputa had become more liquid, the night sweats had diminished, and food which had previously been rejected, was retained. In a week or two there was improvement in pulse and respiration, with free expectoration of shreds of tissue and a very large number of bacilli. The cases were advanced ones, and were treated only to observe the effect, but not with any expectation of averting the fatal termination. Daily examinations of the sputa demonstrated the action on the bacilli, which the author attributed to the influence of the ozone. In external suppurative inflammation, in two or three instances, he regarded the results from the use of this method as little short of marvellous. It was especially noticeable in cases of mastoiditis, where operative measures were apparently indicated. In ten cases of diabetes mellitus, the results were gratifying. The quantity of sugar averaged in these cases from 1½ to 4½ per cent. Brilliant results had been obtained in both acute and chronic alcoholism. In cancer the general health had been markedly improved, with diminution of the pain, odour and discharge Twenty-five cases of muscular rheumatism were treated with complete success. In rheumatoid arthritis the results were equally good, though obtained much more slowly.—*N. Y. Med. Record, November* 9, 1901.

High Potential Electric Modalities in the Treatment of Diathetic Diseases and Inflammatory Conditions.—This paper was presented by D. W. B. Snow at the same meeting as the above. The subject matter is essentially the same as that which appears in the extract of the proceedings of the Electro-Therapeutic Association.

These papers were discussed by Drs. A. D. Rockwell, W. J. Morton, Robert Newman, Mary Putnam Jacobi, O. D. F. Roberston, John B. Rich, and Margaret A. Cleaves. Drs. Morton, Jacobi and Cleaves believed that the salutary effects obtained by Dr. Curtis were largely due to the action of the high potential and high frequency current, and while recognising the value of ozone, did not believe that the effects were due to its action to so great an extent as evidently believed by Dr. Curtis. Dr. Cleaves pointed out that as the negative pole of high potential and high frequency currents was very rich in the ultra-violet rays, the beneficial results obtained in the treatment of cancer were in all probability due to the penetration of these rays rather than to the influence of the ozone.—*N. Y. Med. Record, November* 9, 1901.

Muscular Atony an Important Factor in Uterine Displacements.—Henry C. Coe, in a paper read before the Medical Society of the State of New York, October 15, 1991, concludes that: (1) muscular atony is an important factor in the causation of uterine displacements either alone or associated with the usual causes, over-weight of the uterus and weakening of its ligaments and of the pelvic floor; (2) mere restoration of the organ to its normal position with regard to the axes of the pelvis is not sufficient to cause permanent relief of the symptoms, provided additional support is not afforded by firm pelvic and abdominal muscles; (3) the prognosis as to the cure of malpositions by operations is influenced by the general muscular tone of the individual; (4) hence it should be the aim of the physician to endeavour to restore such a

healthy condition of the muscles, either before or after operation, by appropriate treatment, baths, massage, electricity, gymnastic movements, out-of-door exercise, tonics, and such regulations of the patient's dress and mode of life as seem best fitted to the individual case. In short the work of the physician often begins where that of the surgeon ends, if the result is to be complete and permanent.—*N. Y. Med. Journ.*, November 9, 1901.

[There is no doubt of the relation between cause and effect as pointed out by Dr. Coe, nor of the beneficial influence of the skillful and scientific use of the physical agents enumerated by him; but in many such cases greater good can be secured to the individual by the use of these agents not only before, but in preference to, operative measures. This statement does not apply to those cases where there is a complete or partial destruction of the perineal floor. In cases not so complicated, however, electricity alone is of signal value, but much greater when associated with the regimen indicated by Coe. There is no more need of surgical intervention in the relaxed and atonic muscular structures of the pelvis than for example in the same condition of the legs and arms. A woman, aged 35, married, four children, had been an invalid for four years. She complained of general weakness, lowered nerve tone, insomnia, constant backache, dragging and weight in pelvis. Upon examination she was found to have a prolapsed uterus, cervix within one inch of the introitus in the recumbent position, no perineal tear, general relaxed condition of all the pelvic tissues as well as of the general muscular system. There was marked anæmia with profound depression of spirits. Under electrical treatment, vaginal hydro-electric douche, four quarts normal saline solution neg., indifferent contact to abdomen 45 square inches in area, 20 ma.; followed by vagino-abdominal applications of the Franklinic current, conductive method, medium-sized Leyden jars in circuit, spark gap, 2 to 4 inches, regulated to toleration through current controller for from ten to twenty minutes there was gain from the first, evinced by a sense of well-being, improved circulation, lessened nerve irritability, good sleep, increased strength, diminished weight and dragging in the pelvis, and lessened backache. Upon examination at the end of the week, the cervix uteri was three inches from the introitus. After treatment, for six weeks, at first daily, then three times a week, the general health was established, the patient gained in weight, and the improved position of the uterine organ and strength and tone of all its supports were maintained. At this writing, four years later, the improvement is maintained, although twice since, when the patient has been over-tired, she has had vagino-abdominal applications of the Leyden jar current for from three to four weeks, and always with the result of improved conditions and the establishment of nutritive changes. This is only an illustrative case. The same results can be obtained, to a greater or less extent, in all uterine displacements, uncomplicated by destruction of tissue, according to the patient's recuperative power and duration of the condition, under appropriate electrical treatment and regimen, and without the aid of pessaries.—THE AMERICAN EDITOR.]

Electrocution.—Leon F. Czolgosz, the assassin of President McKinley, suffered the penalty of the law in the State Prison at Auburn, New York, October 29, 1901. Two electric contacts were made occupying in all one minute and five seconds. In the first contact the pressure was maintained at 1,800 volts for over seven seconds, then reduced to 300 volts for twenty-three seconds, increased to 1,800 volts for four seconds, and again reduced to 300

volts for twenty-six seconds. The second contact was maintained at 1,800 volts for five seconds. The instant contact was made the body was thrown into a state of extreme rigidity, every fibre of the muscular system being in a marked condition of tonic spasm. At the same time consciousness, sensation and motion were apparently abolished. It was conceded by all the witnesses present that conscious life was absolutely abolished the instant the first contact was made. The autopsy extended over three hours, and embraced an examination of all the organs, including the brain, all of which were found to be in a perfectly normal state. It was not permitted to remove any portion of the body from the prison, therefore no sections of the brain were secured. Accurate drawings and detailed anatomic descriptions were made, however, by Mr. Edward A. Spitzka, who performed the autopsy, and will be made the subject of future study and report. In the opinion of Dr. Carlos F. McDonald, from whose report this abstract is made, there was not disclosed by any of the examinations of Czolgosz the slightest evidence of mental disease or degeneracy.—*American Medicine*, November 9, 1901.

Electricity gives an account of two operations that have been performed by means of powerful electro-magnets (after radiographic localisation of the foreign bodies), introduced through tracheotomy openings, whereby nails in the bronchi of children were successfully removed.—*American Medicine*, September 7, 1901.

RÖNTGEN RAY.

The Therapeutic Value of the X-Ray in Lupus Vulgaris.—In this article C. A. Greenleaf reports four cases treated by this method. He finds that repair begins almost immediately; that the danger attending the treatment is slight; that the surroundings and general condition of the patient are of importance in securing ultimate results; that cases not subjected to surgical treatment react rapidly and ultimately recover, whereas cases that have been surgically treated react more or less slowly, according to the extent of previous surgical intervention. He regards the use of the X-ray as the most satisfactory treatment in this condition.—*Buffalo Medical Journal*, October 19, 1901.

The Treatment of External Forms of Carcinoma is discussed by F. H Williams, who states that healing or improvement (the latter in reference to a case still under treatment) followed in every case in which the treatment was persistently carried out. Exposure of the diseased area to the X-ray is made for a few minutes two or three times a week for several weeks, or with extensive growths a longer time may be necessary. In early cases ten exposures may suffice. In a microscopic examination of a case of epidermoid carcinoma undergoing treatment, it was found that the central portion of the ulcerated area were entirely free from carcinoma, but near the edges of the ulceration there was still a few islands of epithelial cells. This, Williams believes, was due to the position of the lead shield which prevented the X-ray from striking the healthy skin near the carcinoma. He concludes, therefore, that an area of apparently healthy skin about the growth should always be exposed. Of the cases treated some were typical epitheliomas; others were of the rodent ulcer type; while still others were ulcers with indurations and had persisted for months or even years. Within two or three weeks the first effects of the applications were apparent, and in some cases within a few days. The article is accompanied by illustrated cuts.—*Boston Med. and Surgical Jour.*, September 12, 1901.

The Treatment of Cutaneous Epithelioma.—Dr. Charles W. Allen, from a "limited and insufficient observation," is inclined to the belief that the X-ray as well as treatment by the chemical rays of light (sun and the electric arc) as in the method of Finsen, has a promising future. Both have their drawbacks and difficulties. Many sittings are required, the X-rays are not wholly within control, and the Finsen method is painful, often to such an extent that patients are forced to give it up. [This statement, judging from a personal experience as well as a knowledge of Finsen's work, is directly opposed to the facts. Treatment by means of the chemical rays of light is absolutely devoid of pain. —AMERICAN EDITOR.] Allen points out that electricity also is of use as an adjuvant to other means, and cites a case of a pearly epithelioma present beneath the left eye of a young man for over a year. In October, 1898, a puncture by means of a flat needle attached to the negative terminal of the battery was made (dose and time not given). This patient he has just seen and finds a soft white scar ¼ by ¾ of an inch in size marking the site of the operation. Microscopic examination of a tiny portion of the growth prior to the puncture, confirmed the diagnosis of epithelioma.—*N. Y. Med. Jour.*, November 9, 1900.

Conjunctivitis from X-Rays — Incipient Retinitis apparently due to the same cause. – J. W. Sherer reports the case of a physician, aged 29, suffering from photophobia and eye fatigue. He developed conjunctivitis later. For three and a half years he had been exposed daily to the action of the X-rays. The histories of several similar cases are given. Sherer believes that the changes in these cases were analogous to those resulting from the prolonged and excessive exposure to solar light.

[NOTE.—There can be be no doubt but that Sherer is correct in his opinion as to the analogy existing between the exposure to the X-ray and solar light. In both instances the result was dependent upon the action of the chemical rays.—AMERICAN EDITOR.]—*N. Y. Med. Jour.*, September 21, 1901.

Röntgen Rays in the Treatment of Diseases of the Skin.—Pusey reports nine cases of hypertrichosis in which treatment began not less than four months since. Two were compelled to give up treatment before results could have been expected. In the seven other cases, partial or complete alopecia has been produced. Two extreme cases are reported in detail. Eighty-five sittings were given in all, at the rate of five or six a week, and with intervals after the first 27, of one month; the next 25, three weeks; then 24 followed by an interval of three months. A few fine hairs were left, which at the end of the three months were small and inconspicuous and disappeared after nine more treatments. Considerable erythema was developed from time to time, but at time of writing the skin was white, smooth, and perfectly normal in appearance. In the second case 167 sittings were given with the same result. Three cases of lupus vulgaris are also reported, with illustrative cuts. Case 1 recovered; Case 2 had been free from any evidence of the disease for two months; while Case 3 was still under care, improved, but not cured. One case of epithelioma is reported treated, with complete cure. Pusey believes that the ray is identical with the chemical rays of light and, therefore, that the method of treatment is identical in principle, with that of Finsen.—*Jour. Amer. Med. Asso.*, September 28, 1901.

Light and Radiance in the Treatment of Disease.—Under the above heading, Dr. George C. Hopkins, in two consecutive articles, discusses (1) The

Treatment of Carcinomatous growths by Röntgen Rays, and (2) Pulmonary Tuberculosis. In cancer he prefers the X-ray from a static machine with a soft tube. The parts not treated are protected by several layers of lead foil glued to paste board or more flexible material, with an opening in the screen where the action of the rays is desired. [A high vacuum tube means a considerable energy in the short and high frequency rays which radiographic work show to be the rays active in destruction of superficial surfaces, while a soft or low vacuum tube has a preponderance of the longer waves, capable of more profound penetration and therefore indicated where morbid subcutaneous conditions are to be overcome with avoidance of destructive action upon the skin.—AMERICAN EDITOR.]

He finds that the long wave of the soft tube produces more destructive disintegrating effect. In making the exposure the tube is placed from 12 to 30 inches from the part to be treated. In a case of cancer of the breast (not broken down) reported, the exposure lasted from eight to twenty minutes, and was made daily for fifteen consecutive days, with two exceptions. Then an interim of eight days and again daily treatments for a week, one day excepted. The next month but four treatments were given, while the following month, April 1901, seven treatments were given. A change was noted in the density and size after the first four treatments. This improvement was progressive and on discontinuance of the treatment, April 18, the size of the organ was about normal and all symptoms had disappeared.

Another case of ulceration along the cicatrix, necrosis an inch deep, treated under the combined influence of the X-ray and Finsen light; while a third case of fungating cancer—the hardened right breast at least 7½ inches in diameter—with offensive discharge treated by the X-ray, was marked by diminution of odour, change in character of discharge, retraction of the mass, softening of its substance, and relief from pain and discomfort. The change in the consistency of the growth should govern the time of the exposure.

(2) *Pulmonary Tuberculosis.*—Two cases are reported in detail, treated by the electric arc. A 50-ampère arc with a 20-inch condensing lens arranged with an adjuster, was used so that at a distance of 15 feet the light could be concentrated on a surface an inch in diameter if desired. On account of the intense heat, a screen of strips of blue glass is interposed. The chest of the patient is bared and the light concentrated to a circle of from 15 to 20 inches, according to the tolerance of the patient, exposure varying from half an hour to an hour. Ten cases in all have been treated with relief in every case within the first few days, of cough, temperature, expectoration and sweats. —*The Phila. Med. Journ.*, September 21, 1901.

[The experience of Hopkins is corroborative of the work done and reported by the American Editor, in a paper read before the American Electro-Therapeutic Association, September 1898.]

FOOD AND DRINK.

Report of the Summer Work of the Milk Commission of the Medical Society of the County of New York.—This report, made by Henry Dwight Chapin, shows that the milk of New York averages about 4 per cent. in butter fat. When the Commission began its work, much was to be desired in point of cleanliness, the index of which was the bacterial count, and 30,000 was fixed as the maximum number. The features considered by the Commission were, the condition of the barn, cows, milkers, utensils, process of cooling and

transportation, condition of cans and bottles when returned, and the relation of each of these to contamination is discussed in detail. The individual farm or dairy, and not the milk company, has been regarded as the unit of study. Results show that an expensive plant is not necessary, intelligent attention to detail alone being needed, and a small producer can furnish clean milk; a creamery is not regarded as essential. All visits made by the Commission were educational, not only to the farmer, but to his neighbours. Great advances have been made, even when the milk has not reached the standard for certification. In spite of the summer having been the hottest in thirty-one years, all those who have been certified, have kept up to the standard. —*Medical News*, October 19, 1901.

On the So-called Gluten and Diabetic Foods of Commerce.—H. C. Sherman and H. M. Burr examined eleven samples of gluten and diabetic foods. They selected the brands which were most widely advertised and apparently most generally sold. In most instances they were specifically recommended for diabetic patients. The result of their examination showed that of these samples, not half are noticeably higher in protein or lower in carbohydrate than ordinary whole wheat or Graham flour, and many were scarcely better than ordinary white flour or bread. In only three samples was there any material increase in the proportion of gluten, and all of these contained at least three-fourths as much carbohydrate as ordinary baker's flour. Twice as much carbohydrate as protein was found in the best sample examined.—*N. Y. Med. Journ.*, October 12, 1901.

CLIMATE.

In an article upon the Influence of the Colorado Climate upon Pulmonary Hæmorrhages, S. F. Bonney has made a statistical study of his cases, from which he concludes: (1) Hæmorrhage by itself, save with few exceptions, furnishes no criterion upon which to base the choice of climate, the indications for a high altitude in uncomplicated and not too far advanced cases is highly imperative independent of this single manifestation; (2) in Colorado an exceedingly small proportion of recurrences may be expected, although not necessarily reflecting accurately the degree of ultimate improvement secured; (3) recurrences are more likely to result, and speedily in those cases with hæmorrhage immediately preceding arrival, hence the advisability of a short delay following the hæmorrhage before leaving home, and unusual precautions regarding rest upon arrival; (4) primary hæmorrhages are comparatively rare in Colorado, and as a rule occur in rapid, progressive, destructive changes in the hopeless cases, or, as a natural result of some external assignable cause which under proper *regime* could be avoided; (5) hæmorrhage, while less likely to occur in Colorado than at sea-level, is, as a general rule, more severe and associated with greater shock; (6) to avoid hæmorrhage, particularly in the early months of Colorado life, demands a most rigid compliance with detail instructions.—*N. Y. Med. News*, October 12, 1901.

Pearce, "The Influence of Climate upon Nervous Diseases Considered from a Physiological Standpoint," finds that neurasthenia, chorea, and other diseases are unfavourably affected by high altitudes and high winds. Therapeutic climatic results are, he believes, dependent upon the state of atmospheric pressure and consequent nutritional modifications. Peripheral circulation and nutritive changes are favoured by high altitudes; the trophic functions may advance too rapidly, however, with too great ascents. On account of the

weakened central nervous system, neurasthenics, who must appropriate nutriment slowly, do not do well in high altitudes. The lower altitudes are beneficial to insomnia, also in chorea, hysteria, and most of the functional diseases. Melancholia and depression are helped by high winds with moderate heat, which aid in general metabolism. The organic diseases dependent on central or peripheral lessons, perverted function, as pain and sluggish circulation, will be improved by altitude. In disease of the central nervous system, a greater altitude is desirable, while in cases of peripheral diseases, as in neuritis, vasomotor palsies, exophthalmic goitre, &c., a lower altitude is indicated.—*N. Y. Med. Journal*, October 5, 1901.

The Importance of an Early and Radical Climatic Change in the Cure of Pulmonary Tuberculosis.—Gardner, in a review of the subject, finds that the percentage of arrested or cured cases, treated in the first stage in Colorado, without the aid of any specially closed sanatorium, but in boarding-houses, in their own homes, or in general sanatoriums, is from 76 to 90 per cent., while sanatoriums in damp regions show only 70 per cent. Attention is called to the fact that the air of the dry regions has a special quality not yet recognised in a strictly scientific way. It is not only dry, but because of the purification by the rays of the sun over a vast area, is absolutely uncon taminated. He notes that the effect of such air when breathed by the individual upon tuberculous processes in the lungs, is its evident power to arrest the septic condition. It is therefore of greater value, as a curative agent, than the air of less favoured regions. He finds that as much benefit will be derived from four hours' exposure to the dry, sunny air of Colorado, as from eight hours spent in the damp and cloudy climate of some regions of the East. In a dry climate patients can be kept out of doors day and night, summer and winter, without risk and with benefit, and it is because of this that Colorado offers such advantages for the cure of the tuberculous. He believes that the sanatoriums now established by the Government at Fort Bayard, New Mexico, and Fort Stanton, New Mexico, will in time prove the marked advantages of sanatorium methods and the best climatic cure combined.—*N. Y. Med. Journ.*, August 24, 1901.

MASSAGE.

The Rationale and Technique of Pneumatic Aural Massage, is discussed by B. Alexander Randall, who notes that the great majority of defects are due to impaired conducting apparatus. As the middle ear is essentially a pneumatic structure, pneumatic massage, both because of its gentleness, wide range of applicability and diagnostic value, is of more use than other methods. He regards the Siegel otoscope, with the rubber bulb substituted for the mouthpiece, as the best instrument. The variations of pressure, in almost all cases, should be made in plain view, and harm can only result from vigorous measures in the most careless hands. The injection of the manubrial plexus and other vascular areas must generally be induced, but will usually be lost as quickly as evoked. The fear of extension of leucocytes and sclerotic changes is, in his sight, mostly fanciful. In the mobilisation of the stapes, and to a less extent of the round window membrane, much of the value is to be found. Close inquiry as to the symptoms in the intervals between treatment, should be instituted. The article contains a description of the technique of the procedure. Dr. Randall finds that devices embodying rhythmic vibrations have been proved seriously destructive of nerves and

other tissue, and regards the skilled hand, guided by the intelligent eye, as the best means. Finger-tip massage may be used with hardly a possibility of mischief.—*Journ. of the Amer. Med. Assoc.*, August 31, 1901.

COLD.

Cold as a Therapeutic Measure in Traumatic Tetanus is discussed by Dr. Joseph G. Rogers. That the use of cold in tetanus is not a new therapeutic measure is well known, but texts-books barely mention it. In former times it was applied generally, rather than locally; usually ice to the spine. From this form of application Carpenter claimed excellent results. Its topical application is based on the fact that the tetanus germ cannot grow or sporulate at even a moderately low temperature (55 F.) If it develops its toxins apparently at the point of entrance into the body a cooling application below its working temperature would be a rational therapeutic measure. Dr. Rogers suggests (1) prompt local injections deep in and around the wound of a 2 per cent. carbolic acid solution of glycerine with a 2 per cent. of hydrochloric acid added, and (2) reduction of local temperature by immersion of the part in ice-water or the application of ice-bags.

His opinion as to the value of the method is supported by two cases of pronounced traumatic tetanus, spasms involving trunk and limbs, both of which were successfully treated by cold applications to the injured part. In one case relief was established in a few hours and all symptoms had ceased on the fifth day, when the patient removed the ice-bladders, and a relapse followed. Treatment was again instituted as before and complete recovery ensued in a few days. In neither case were drugs or other local applications employed.

These cases occurred in Dr. Rogers' practice some years ago, and the treatment was adopted with a view of lessening the irritability of the local nerve terminals. In the light of present knowledge, however, he is disposed to ascribe the results to the effect of the cold on the microbe, depressing its vitality, preventing sporulation and reducing the evolution and distribution throughout the blood of the poisons it generated. There is no reason why the treatment should not be tried in every case of traumatic tetanus, not to the exclusion of other measures, but as a possibly valuable and certainly innocuous adjunct.—*Editorial. Journal, Amer. Med. Assoc.*, November 2, 1901.

To the Editor of the JOURNAL OF PHYSICAL THERAPEUTICS.

SIR,—In the excellent notice of Jacoby's volumes on electrotherapy in the October number of the JOURNAL OF PHYSICAL THERAPEUTICS, the reviewer takes exception to the author's advocacy of "Apostoli currents" in the treatment of uterine fibroids, specifying the currents as from 150 to 200 ma., and remarks that such teaching is scarcely in accord with a growing consensus of opinion that the electrical treatment of these growths must be regarded only as a symptomatic one, and that the method of moderate intensities (30 to 50 ma.) is fast rising into favour.

I extract this statement from the review because of the fact that it is very far from being in accord with my own experience

in the matter. It is true that there has been a considerable change in the attitude of many of us towards this subject, but this was because of a misconception of Apostoli's claims, leading many to think that a direct electrolytic disintegration of the growth was aimed at. This was by no means the claim of the author of this method as I understand his statements, but he did claim an arrest of the growth and its retrogression in a large proportion of suitable cases as well as a symptomatic cure.

I can testify to the correctness of this estimate of the method bequeathed to us by its author, but it is clear to me that these results cannot be attained in full by those who limit themselves to 30 to 50 ma. Fifty ma. may be sufficient, it is true, for certain cases, but I doubt if thirty is often capable of attaining the full value of the method in any case. It should be remembered that Apostoli currents are those that are found to be adapted to a given case, and yet effective, and are not necessarily above a hundred. The occurrence of pain in an application of 50 or 75 ma. indicates the limitation of the current to that amount. If 100 or 150 ma. can be reached without excessive pain or unpleasant reaction, that amount should be used judiciously in preference to a smaller dosage.

It has been my observation of the work of some others that a mistake is often made in the duration of the application, this at times being as long as ten minutes. I believe that this is wrong, except possibly in some very hæmorrhagic cases where the fluid contents of the uterus themselves mask the local effect by diffusion. The local irritation of such a prolonged application is often sufficient to interfere with subsequent applications, and the mere production of chemical changes in the endometrium by weak currents, long continued, is very different indeed from the trophic blow that may be administered to these growths *en masse* by a strong current which is not allowed to flow more than three or four minutes.

G. Betton Massey.

1831, *Chestnut Street, Philadelphia.*
November 26, 1901.

Notes.

THE PROFOUND ACTION OF CHEMICAL RAYS UPON TUBERCULOSIS.

SUMMARY.

On November 16, 1901, Dr. Foveau de Courmelles made a communication to the Sociétié de Biologie to the following effect:—

The violet and ultra violet rays act with static electricity, high frequency, and X-rays, to produce certain favourable effects in both external and internal manifestations of tuberculosis. In separating from the voltaic arc the chemical

rays by means of a current of cold water and quartz lenses (Institut de France, December 24, 1900) there may be produced with a low intensity (12 ampères and 80 volts) sufficient rays to be effective in lupus vulg. and lupus erythem., in various dermatoses, and (what is a new fact) in pulmonary tuberculosis. External reaction in the shape of burning is by no means necessary to demonstrate the penetration. A case of lupus with cutaneous and osseous lesions of twelve years' standing with cough, and a slight souffle at the apex of the left lung, was submitted in the Hospital of Saint Louis to the influence of the radiator, and after five sittings of ten minutes each the souffle had disappeared (September, 1901). Since then various patients have undergone this treatment and, notwithstanding the absence of heat, have all experienced an immediate sense of well-being (*bien-être*) followed by diminution in the cough and improvement in the stethoscopic signs. These facts deserve to be pointed out with a view of their being confirmed or denied, or at least made generally known.

REPORT has it that some of the trees on the Embankment cannot thrive because they are deprived of rest at night. Powerful electric lights take up the work when the sun sets, and the trees, it is said, languish from arboreal insomnia. It is the light, not the kind of it, that does the mischief, for electricity stimulates growth. The victims cannot, like the tired night-worker, draw down a dark blind and make an artificial night: nor imitate the lyric maiden who "closed her eyes when she went to sleep." The tree is nearly all eye—its leaf is eye, lungs, and skin. A pretty experiment which Professor Dewar showed the other day illustrates all this. The end of a plant, covered with leaves, is immersed in a small tube containing water, and a picture is thrown on the screen. Instantly the water can be seen flowing into the plant. Then the leaves are stripped off, and at once the transpiration of fluid ceases. If too long continued light be the *vera causa* of the trees languishing, then it would seem they also need rest for reparation.—*Standard.*

Dr. Martin S. Fischer writes of *Ionisation in its Physiological and Pathological Relations.* He discusses the gradually developed theory of the dissociation of electrical conductors when in solution into radicals with opposite affinities. He sums up the evidence that in dealing with the action of dilute solutions of inorganic on organic substances, we deal with the action of anion or kathion alone, or with these in conjunction with an undissociated remainder. The theory is exemplified (1) in the action of electrolytic products on germinating seeds; (2) on muscle tissue in relation to absorption of water; (3) in the analogy of (2) with the combination of water with soaps; (4) in the discovery that striped muscle fibre contracts rhythmically only in solutions of electrolytes; (5) in the toxic effect on protoplasm of ions, even those of $NaCl_1$, when present in pure solution, protoplasm being probably a proteid in combination with several ions; (6) in the occurrence of salt-albumen compounds whose stability is explainable only by supposing combinations with both ions of a given salt. The characteristics of dissociable organic compounds apparently at variance with the laws of ionisation is explained by their supposed transformation in living tissues into compounds in harmony with those laws.—(*Am. Med.*, April 6, 1901.)

Pain-Relieving Action of the Röntgen Rays.—Stembo (*Therapy der Gezenwart*, 1900, Heft. 6).—It has frequently happened in the experience of the author that in applying Röntgen rays the patients have mentioned that

they felt an amelioration of their pain without their having been questioned about it. This led him to make systematic experiments upon neuralgic patients, by placing the painful regions at a distance of 20 to 30 cm. (according to the tenderness) from the antikathode surface and letting the rays play upon the spot from three to ten minutes. Three sittings every second day were, in general, sufficient to cure the pain. Sometimes as many as ten sittings were necessary.

Of twenty-eight cases of neuralgia, twenty-one were cured, four improved and only four did not show any result.

That suggestion had anything to do with this good result is denied by the author, on the ground that by the use of the anode rays instead of the X-rays the pain did not decrease in any single case.

The Nursing and Prophylaxis of Heart Disease.—(Rasenbach, *Journal für Kranken.*, 1900, No. 2.)—The author lays down the lines upon which the rational management of heart disease ought to be carried out. It is above all necessary to regulate the faulty work of the heart, that is, to adjust its work to the conditions of the case, and therefore the right selection of diet, dress, home, and kind of occupation constitute the chief points in treatment. In advanced heart disease all bodily exertions and excitements are to be avoided, while certain light forms of work, which do not involve lifting heavy weights, or undergoing muscle work, can safely be undertaken. The question whether persons suffering from heart disease may marry, the author generally answers in the affirmative. It is only in advanced cases, or where compensation disturbances are already present, that it must be forbidden. As to dress, it must be so arranged that it does not become a load, and further, that the respiration, upon which the chief part of the compensation depends, is not impeded. Lastly, the circulation and the muscle and skin function must have free play. Regarding the dwelling, care must be taken that it is not situated too high up, as walking upstairs enormously increases the heart's work. Further, it should not be too cold or damp, and, on the other hand, it must not be too dry.

It is almost impossible to give any universal rule as to diet. The necessity to prevent overloading of the stomach, especially with heavy and indigestible food is obvious; and still more important than the prohibition of too much food is the prevention of too free a supply of drink; the judicious use of water forms a means of regulating the most important processes in the economy of the body.

Turning to bath cures, the author considers that their principal advantage lies in the fact that the patient, for a longer space of time, is free from the exertions of his business and other detrimental influences; no specific action of baths is admitted.

At a preliminary meeting recently held in London by a number of medical men interested in Therapeutic Electricity, it was agreed that a Society be formed for "the study of electricity in its application to medical science." It was decided that only duly qualified medical men should be elegible as ordinary members. A provisional committee was appointed, and a further meeting is to take place on January 10, when members will be

enrolled, and questions of organisation will be further discussed and decided upon. Particulars of the time and place of meeting will be duly circulated, and in the meantime further information may be obtained from Dr. Chisholm Williams, 20, Bedford Square, W.C.

At the moment of going to Press a further volume (Teil II., Band I.) of "Handbuch der Physikalischen Therapie" reaches us, and it is with great regret that we are therefore obliged to defer the notice of it until next number.

LIST OF EXCHANGES.

American Medicine.
New York Medical Journal.
The Post Graduate.
The Electrical Review (U.S.A.).
Medical Review of Reviews.
Iowa Health Bulletin.
The International Medical Magazine.
The Journal of Inebriety.
The Brooklyn Medical Journal.
Cleveland Medical Journal.
Mississippi Medical Record.
Electro-Therapeutics.
Dietetic and Hygienic Gazette.
Medical Brief.
American X-Ray Journal.
Archiv für Lighttherapie.
Revue de Cinésie et d'Electrothérapie.
Annales d'Electrobiologie.
Zeitschrift für Klin Kurote und Sanatoria.
Revue Internationale de Thérapie Physique.
Monaco Médical.
Journal of Balneology and Climatology.
Eira.
Hygiaea.
Zeitschrift für Diätet und Physikalische Therapie.
Vie Médicale de Paris.
Gazette Médicale de Paris.
Hospitalstidende.
Societé de Kinesithérapie.
Archives des Sciences Biologiques.
Giornale Internationale delle Scienze Mediche.
Archives Générales d'Hydrologie.
Annales de Médicine et Chirurgie Infantiles.
The Therapist.
Science, Arts, Nature.
Zeitschrift für Electrotherapie und Artz electrotechnic.
The Electrical Review.
Philadelphia Medical Journal.

PART I.

A SYMPOSIUM ON THE TREATMENT OF CANCER BY RÖNTGEN RAYS, LIGHT, AND ELECTRICITY.

By M. A. Cleaves, M.D., New York.

INTRODUCTION.

The necessity for the use of an agent in the treatment of malignant conditions, which will not only destroy the foci of disease visible macroscopically, but will reach the microscopical outlying cells as well, is self-evident. The tendency to recurrence after surgical measures with the development of metastases shows conclusively that this agent is not the surgeon's knife alone, and that it must be supplemented by other means, and in some instances be supplanted by them. The attention of the profession at the present moment is turned to the trinity evoked in this symposium. Of the three, despite the results obtained in the treatment of lupus vulgaris and epithelial cancer with light by the Finsen method, and especially in the hands of Finsen and his associates, the Röntgen ray is unquestionably of the first importance. There can be no doubt but that the principle involved in the use of light and the X-ray is the same, and the only difference in effect is in degree, not kind. In the high frequencies of the X-ray beyond those of light, as well as in the irregular and disorderly procession, as it were, of X-ray vibrations, rather than in the lower frequencies and more orderly and wave-like procession of Light vibrations, must be found the explanation of the more far-reaching and powerful effects of the former as against those of the latter.

With the improved technique of to-day in handling the X-ray, the danger of burns has been reduced to a minimum and a serious obstacle to the use of the rays removed.

In the method of mercuric cataphoresis as developed and practised by Massey two agents are at work; the current in doses destructive of tissue, and the extensive diffusion of a powerful antiseptic and tissue altering chemical into the diseased mass. Massey's results command the thoughtful attention of the profession. In the writer's experience the same amelioration of pain

and distressing symptoms were obtained in an inoperable cancer of the œsophagus and the patient's last days made comfortable. As in the case reported by Greenleaf, treatment was undertaken too late to do more. In an inoperable cancer of the breast there was obtained by the Finsen method a relief from pain from the first *séance*, an arrest of bleeding and also a slight diminution in size.

The work of Beck, Williams, Pusey, and numerous others demonstrates conclusively, however, that cure as well as relief results from the use of the X-ray. As yet sufficient time has not elapsed to determine whether or not the disease will recur. Pusey has the histories of three cases of lupus, six or seven of epitheliomas, some of them very extensive, two recurrent carcinomas of the breast, one sarcoma of the neck, and two cases of Hodgkin's disease, cured as far as appearances show.[1]

Whether the Röntgen ray, light or electricity (mercuric cataphoresis) is used, the field of action extends farther than that of the surgeon's knife. Whether these outlying cells are reached and destroyed remains to be demonstrated both by the chemical and histological changes in structures exposed to the action of these agents and by the subsequent clinical history of cases treated.

DESTRUCTION AND REGIONAL STERILISATION OF CANCEROUS GROWTHS BY MERCURIC CATAPHORESIS.

By G. Betton Massey, M.D., Philadelphia.

This method of destruction of a malignant growth and its immediately outlying extensions, originated in some experiments made by the writer in 1893 and 1894, and was first employed with the patient under a general anæsthetic in 1897. In addition to a number of previous communications, a full statement of the method and its results to date appeared in the *Transactions of the American Electrotherapeutic Association for* 1900.

The efficacy of the method depends on the conjoined facts that we can at will produce by an electric current nascent chemicals in such an electrolyte as a living cancer, and at the same time radiate or disperse the chemicals by ever-changing molecular unions, through the living tissues of which the cancer is composed. When this active anode is a gold tube coated with quicksilver or a zinc instrument likewise coated with metallic mercury, the laws of electrolysis dictate the production of oxychlorides of mercury, and of zinc and mercury, respectively, from a union of the abundant oxygen and chlorine of the tissues

[1] Reports of these cases were to have appeared in this issue of the Journal, but the MSS. did not reach the editor in time.

of the cancer. At the instant of the production of these nascent compounds cataphoresis sets in, impelling the molecules away from the electrode, the molecules necessarily uniting with the albumen of the tissues, including all forms of protoplasm, until with ever-changing protoplasmic partners, the molecules only come to rest on the cessation of the impelling current.

The destruction of cell life in any given portion of the body, rendering that region for the time completely sterile, is therefore merely a question of electro-chemical engineering. In its adaptation to medicine as a process for the eradication by sterilisation of a disease focus, it demands only that the focus be on or near the surface, that the operator possess surgical as well as electrical expertness, and usually that the patient be under anæsthesia.

In its application to the destruction of a cancerous growth this process is designed not only to destroy at one application all cell life in the growth proper, which is included in the area of necrosis produced by the diffused chemicals, but beyond the limits of this area [which are determined by the subsequently developed line of demarcation] *a zone of sterilisation is produced by the radiating chemicals, in which the microbicides are in sufficient density to kill the latent cancer cells in the peripheral prolongations without destruction of normal cells.*

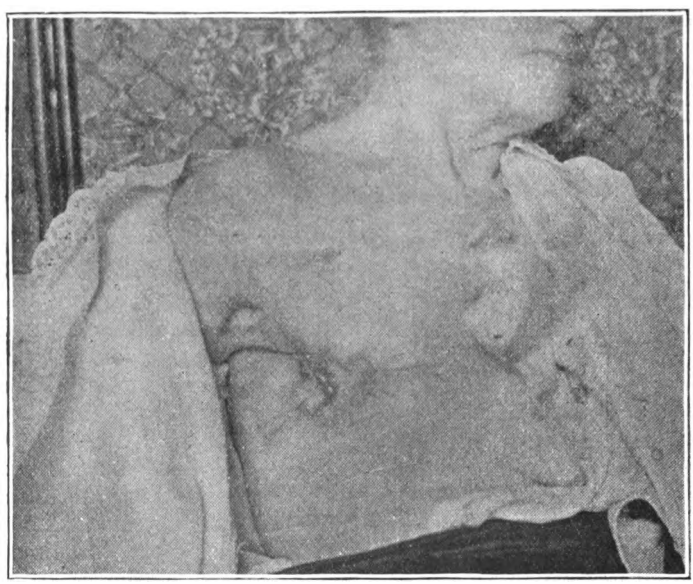
It is in the production of the zone of sterilisation in particular that this method is thought to be superior to any known process for the treatment of cancer, for while the necrosis of the tumour proper by the method possesses the advantage over the knife or caustics of being bloodless, of killing all germs at once and thus avoiding possible auto-inoculations, and of leaving an absolutely sterile slough to be thrown off by nature, the method is the only one by which cancer germs may be killed beyond the edge of the wound made in the attempt to remove the disease. The extent of this zone of sterilisation varies with the strength and duration of the current employed. In an average application, which may be stated to be from 400 to 600 milliampères for one hour, the surrounding tissues will be sterilised to a distance of from one to three inches, or possibly more.

The stream of chemicals flows more freely along cellular prolongations and planes of malignant extension, hence tending to follow cancerous processes in greater force than the non-affected tissues.

It is impossible in the space at my disposal to do more than briefly indicate the *modus operandi* of the cataphoric treatment of cancer, the extent and situation of the growth indicating many important modifications of the technique in actual practice. Generally speaking, the applications may be divided into those employing the major method, which must be used invariably in the more malignant varieties of both carcinoma and sarcoma, and those employing the minor method, which should be strictly limited to very small growths of any variety, and those slow-

growing carcinomas or sarcomas that show their malignancy by repeated recurrences only.

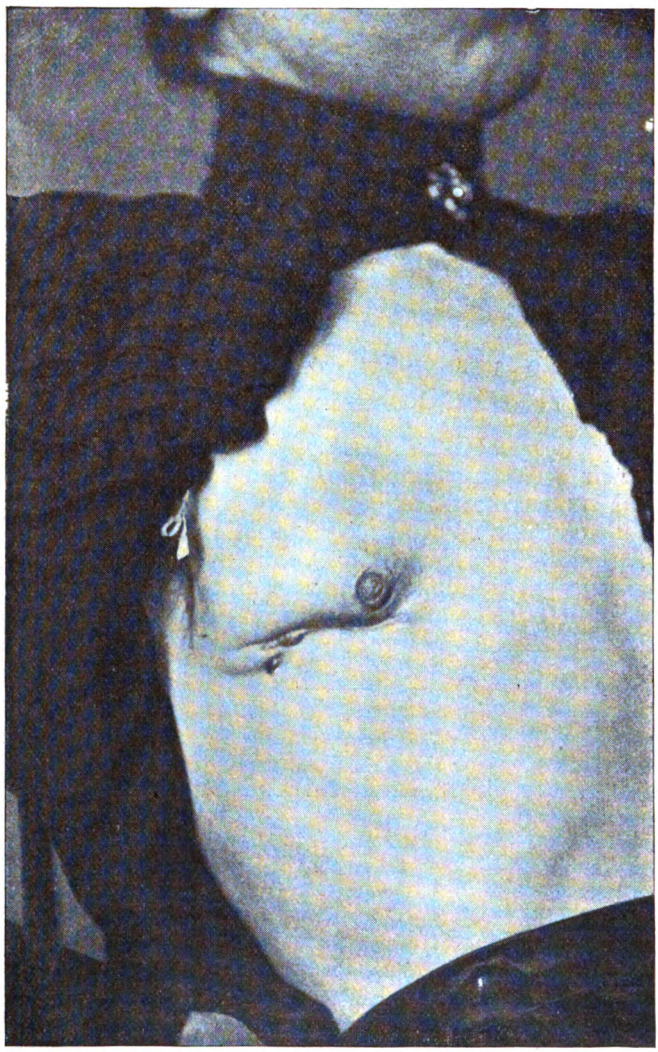
The Major Method.—In the major method it is the purpose of the operator to completely necrose all evident portions of the growth at one *séance*, a sufficient current strength being maintained long enough to secure this result and, at the same time, secure a puffy reaction in surrounding structures as evidence of the production of a zone of sterilisation. The average case will demand that the patient be under a general anæsthetic an hour or more, the current being gradually turned on until from 400 to 800 milliampères is reached, unless the growth is a small one, when less will be sufficient. The active electrodes are tubes of



18 carat gold, freshly amalgamated with mercury, which are inserted into the interior of the cancer and through which an excess of mercury is injected by a glass syringe, together with additional pointed amalgamated zinc electrodes attached to the same, positive, pole of the battery. The purpose of the zinc-mercury electrodes is the development simultaneously of a zinc oxychlorid with the mercuric salt, in order that large growths may be destroyed with a minimum of current and time, the pure mercuric oxychlorid being developed about the periphery of the growth by placing the gold-mercury instruments in this situation.

Aside from the active instruments mentioned, the other apparatus required are: a meter and controller capable of governing a current from zero to at least 1,500 milliampères without

break or shock; a battery force aggregating 120 to 160 volts, which may be obtained by connecting in series two or three carbon-zinc-acid batteries of substantial make; and a treatment couch made from a spring cot and mattress covered with a water-



proof sheet on which is laid the negative plate and pad. This plate is made of thin flexible lead, about 12 × 22 inches, and has a binding post at one side for attachment of a wire to the negative pole of the battery. The pad covering this plate must be very thick, considerably larger than the plate, and

thoroughly wetted before the patient lies upon it, with a gallon or more of warm water, in which a cupful of vinegar has been poured, to prevent burning the skin.

The progress of the sterilising process is both visible and palpable in surface cancers, the growth turning a light lead colour and becoming soft. The resulting eschar is painless, inodorous, and will separate in from seven to twenty-one days, leaving a healthy cavity to fill by granulation.

The minor method is the major method in miniature, save that general anæsthesia is replaced by cocaine injections or cocaine cataphoresis. It is indicated in office cases in which daily applications should be made. By its use some extensive growths of slow formation have been cured.

At the present writing, February 24, 1902, the author has employed this method in 50 cases, mostly of desperate and inoperable character, with the following results: 16 cases were cured, 7 died during or shortly after the application, and 27 cases were locally improved or eradicated, but subsequently died of pre-existent metastases.

The result in these poorly selected cases, therefore, is 32 per cent. of absolute cures, a mortality of 14 per cent., and failure to arrest the disease due to metastases in 54 per cent.

Of the sixteen cases cured one each has remained well nine, seven and six years; three cases have remained well five years, and one has remained well three years. The remaining eight cases have not yet passed the two-year period since treatment.

The accompanying photographs show the scars made after the removal of breast cancers, both microscopically diagnosed as acinous carcinoma.

ON RÖNTGENTHERAPY.

By Carl Beck, M.D., New York.

From the observation of the more or less serious accidents produced in the early era of skiagraphy, we have learned how to apply the Röntgen rays as effective therapeutic means. In chronic inflammatory processes caused by prolonged irradiation, constriction of the vessels takes place and the papillæ starve. Integumental specimens show thickening of the tunica intima of the small blood-vessels, a process which tends to narrowing their calibre. Fibrous tissue in reticular arrangement is deposited. The tunica muscularis and adventitia are affected in the same manner.

The influence of the rays in integumental disease is similar. In regard to hypertrichosis, favus, eczema, psoriasis, rosacea, acne vulgaris, prurigo, &c., I may refer to my previous publication ("Text-Book on Fractures," with an appendix on the

practical use of the Röntgen rays: Philadelphia and London, 1900).

The tissue change taking place in neoplasms is also of the nature of a chronic inflammation. The nutrition of their superficial strata is disturbed, the cells starve, and if over-irradiation is continued necrosis may be the result.

Thus we understand the curative influence on lupus, carcinoma and sarcoma, especially if these neoplasms are confined to the integument.

Successful treatment of lupus is reported by many. To the cases published by me previously, I may add one of facial lupus erythematodes in a woman, aged 25, who was irradiated fifteen times (intervals of two days at least on an average, for twenty-five minutes each time) until reaction occurred. It was not until the twentieth exposure that the intense redness decreased and some of the nodules began to shrink. After the twenty-sixth exposure the ulcerations had cicatrised, the scabs had disappeared and no nodules could be found. The redness still persisted and disappeared gradually after being treated with unguentum zinco-salicylicum. The patient has a history of tuberculosis. A brother as well as a sister died from pulmonary tuberculosis. She had three children, of which one was still-born and another died from meningitis (tuberculous?); the third is healthy.

The curing influence of the Röntgen rays on carcinomatous tissue also cannot longer be doubted. Pusey, Williams, Weigel and others besides myself, have reported cures in epithelioma. All integumental forms of carcinoma are accessible to Röntgen-therapy, also the tongue and the cervix uteri at an early stage. In spite of this fact I would regard it extremely unwise to leave to the rays what can be done much quicker and more effectively with the scalpel, namely extensive removal.

But irradiation should be considered in the after-treatment as well as in inoperable cases. Even after a thorough operation carcinoma cells are often left in the deeper strata which cannot be reached by the surgical knife. It seems that the rays have an influence on them. If these cells could really be destroyed, as future experiments have to prove, a great advance in the treatment of this horrible disease would have been made. I have so far treated four cases of recurrent carcinoma mammæ after operation. In all of them decided improvement could be observed. In a case of adeno-carcinoma, recurring three months after a most extensive removal by an excellent surgeon, a large infiltrated mass reaching from the sternum to the axilla had formed within another three months. The supraclavicular region, the shoulder and the whole upper extremity of that side were œdematous to the utmost. Near the sternum was a small ulcerating area. The patient suffered temporary pain of great intensity. I frankly stated to the husband that I did not believe that there was a possible chance even of improvement, but he urged me to try

irradiation nevertheless. The whole area was then exposed, first at intervals and then every day, at an average for twenty minutes. There were sixteen exposures altogether until now. After the fourteenth exposure the infiltrated area began to shrink and the œdema disappeared nearly entirely. The recurring growth had reached the pleura, as is evident from skiagraphic representation as well as from the presence of a pleuritic effusion which was aspirated. A specimen taken from the irradiated area for microscopic examination showed colloid degeneration, the adenoid character having entirely disappeared. This seems to show to some extent the mode of cell-metamorphosis which the cells undergo after irradiation. The patient is at the present time free from pain and her appetite is increased. A few days ago the superficial layers around the ulcerating area shed themselves as scabs.

While the final outcome will hardly be averted, the most powerful influence of the rays in this desperate case appeared to me to be marked.

In such cases hard tubes must be chosen, while in neoplasms confined to the skin soft tubes are preferable. My observations suggest to me that irradiation should be begun as soon as union is perfect after the removal of a neoplasm, and should be kept up for a period of several weeks.

As to the technique of Röntgentherapy, it is advisable to expose five minutes first and after a week for about ten minutes. If, after a third exposure, two weeks after the first one, no reaction has manifested itself, the patient apparently shows no idiosyncrasy. Then he may be irradiated every second or third day and at last daily, until intense reaction shows.

During the tentatory exposures the distance of the tube should be four inches, later on it may be half an inch only. Some patients like the direct contact with the tube, and I have seen no harm from it in resistant individuals.

A shield of lead must be fastened over the area to be irradiated. It may be attached by a bandage. Under the uneven surface of the margin tinfoil or a piece of cork may be pushed. Corresponding with the area to be irradiated a hole is cut in the shield.

In the treatment of neoplasms, however, the use of a shield is improper, since it is intended to have the influence of the rays extend as far as possible. During the intervals xeroform salve (1 to 10 lanolin) should be employed.

In the treatment of sarcoma it fell to me to first advise Röntgentherapy (*Munich Medical Weekly*, May 6, 1901; also see *New York Medical Journal*, November 16, 1901).

REPORT OF A CASE OF SARCOMA OF THE THYROID TREATED BY THE X-RAYS.

By Clarence A. Greenleaf, M.D., Rochester, N.Y.

During the past three years the treatment of some forms of skin disease and of some cutaneous cancerous growths by means of the X-ray has given good results. More recently this treatment has been more generally employed in all forms of malignant growths, with an encouraging number of favourable results. There is undoubtedly a wide field for study along these lines, not only to determine what may be done in curable cases, but to what extent relief may be afforded in inoperable and hopeless cases.

The following case is of interest and demonstrates the degree of relief that may be given by the X-ray treatment, even though the final result was unfavourable. On December 23, 1901, I was called to see Mrs. K., a housewife, aged 63, who gave the following history: Two years ago she noticed a swelling on the front of her neck, which continued to enlarge in spite of active medication, until it reached its present size. No surgical interference had been attempted. During the past few weeks the growth had been rapid, and several days before coming under observation the skin and other tissues at the lower portion of the tumour had broken down. There were frequent hæmorrhages from the ulcerated surface, and on one occasion a cupful of blood was lost. The constant oozing saturated the dressings completely in the course of two or three hours. She complained of severe pain in her left shoulder, and for a long time had been unable to sleep without the application of heat to the painful part. She was unable to turn on either side in bed. Loss of body weight was rapid.

The clinical picture was that of a sarcoma of the thyroid measuring 10½ inches in circumference, irregular in outline, and extremely painful to pressure. There was an opening about 1 inch in diameter at the lower part of the tumour, and for about 2 inches around this opening the tissues were much discoloured. A microscopical examination of the growth proved it to be a sarcoma of the thyroid. Treatment by the X-ray was decided upon, and the patient entered the Rochester City Hospital on December 27, 1901. Her temperature was 99·8, pulse 120, and respirations 28. Urinary examination negative. I began the treatment the following day, using a soft tube excited by a static machine. The tube was placed at a distance of 6 inches from the surface, and an exposure of fifteen minutes given. The use of a protecting screen was dispensed with. The following day and on the twelve succeeding days two treatments were given, one each morning and evening. The distance of the tube from the surface of the tumour was never greater than 6 inches, and

occasionally less, but no unfavourable reaction was noted. During the first two days there was no change in the hæmorrhage, but by the third day the discharge became serous; at no time, however, was there any further loss of blood from the opening. By the end of the third day the tumour had decreased 1 inch in circumference, and seven days later the diminution was $1\frac{3}{4}$ inch. From this time on the disintegration was rapid, so that the continued decrease in size may have been due to the loss of substance. After the third treatment the pain ceased, and during the remainder of her life she was free from it, at no time requiring an anodyne. After the fourth day of treatment she could turn upon either side and rest comfortably, and pressure upon the growth produced but little pain. Œdema began in the upper extremities at the end of the second week and soon became general, but caused no discomfort, and was readily controlled by the administration of Basham's mixture. After twelve treatments the X-ray was employed at irregular intervals, and simply for the purpose of keeping the patient comfortable. About the third week she showed signs of failing strength, and from that time declined rapidly. During the last days of her life she had some dyspnœa, which, however, did not give rise to great discomfort. Her death, which occurred February 1 of this year, was painless.

I think this case forcibly demonstrates the relief that may be afforded by the X-ray treatment in hopeless cases of malignant growths. The friends of the patient had looked forward to an extremely painful course of the disease, and their relief to note the absence of suffering may be appreciated.

In view of the fact that there was a rapid increase in the size of the tumour from day to day with a corresponding increase in the amount of pain, previous to the X-ray treatment, and that all symptoms were promptly relieved by it, there can be no question as to the value of this new therapeutic agent. There certainly is no other known method of treatment that could have produced such a marked and rapid change, and given the relief obtained in this case.

Precancerous Keratosis, probably due to X-Rays.—Johnston reports two cases. In both he believes that the condition bore a direct causative relation to the action of the rays, and was not influenced by the developing and toning fluids used in photographic work. Examinations of the hands of both amateur and professional photographers show slight redness and roughness, exceptionally after years of hard work; but never any approach to the nodular keratosis of the second case. The cornifications he regards as essentially malignant, and advises excision with grafting, as well as the use of various ointments, and rest from the use of the X-ray. The second case, a surgeon, aged 40, had used an X-ray apparatus for four or five years. Improvement followed upon the above line of treatment.

PRACTICAL MUSCLE TESTING.

By W. S. Hedley, M.D.

(*Continued.*)

Electrical Exploration with Coil Currents.—Passing to the induction coil current ("Faradism") proceed experimentally as before. Having attached the large electrode to the positive pole of the secondary coil (the terminal marked + on the element board) apply it to an indifferent part of the body. The small, or testing electrode, being connected to the negative pole, the faradic switch (F.) having been turned on, and the contact breaker of the coil having been put to its slowest rate of vibration (its lowest note), the testing electrode held by its interrupting handle is placed over the motor point of the nerve as before. With the other hand placed upon the secondary winding of the induction coil (the secondary having, to begin with, been quite pulled back from the primary), the secondary is gradually pushed over the primary; or a Rheostat may be used. Having reached a certain point, a muscular contraction appears on closing the circuit, quick and lightning-like, as in the case of the galvanic stimulus. The figure on the graduated scale which marks the relative position to each other of the primary and secondary coils, is now noted.

The notation on this scale does not of course afford any definite measurement of the actual strength of the current. Indeed, nothing has hitherto militated against the usefulness of the induction coil current, for diagnostic as well as for therapeutic purposes, so much as the inability to measure it exactly. The "Faradimeter" of Edelmann, which appeared some years ago, was a step in this direction. With a given coil and a definite inducing current and a given number of interruptions, this instrument measured in volts, but only on short circuit. When the body is interposed it ceases to be serviceable. Such a measurement is obviously insufficient for our purpose; what is required is to know the actual strength of current passing through the body. Other methods have also been suggested, such as comparing the deflection in the electro-dynamometer produced by a single break impulse of the coil with the deflection produced by the discharge of a condenser, say of one micro-farad capacity upon the same instrument. But such readings are obviously records of *quantity*, *i.e.*, of Intensity multiplied by Time (I. × T.) micro-coulombs. But no quantity measurement is adequate for the purpose, because there are many conditions affecting the physiological effects of the Faradic current which are independent of quantity. Neither will an *average* measurement suffice, because it is the *maximum* of the impulse, the maximum extent of change, which produces the physiological

effect; and not only the maximum *extent* of the change, but the *suddenness* with which the change is made.

An instrument has lately been devised by Dr. Sloan, of Glasgow, for the exact galvanometric measurement of such currents. To this the above remarks doubtless in some measure apply, but I do not propose to enter into that question now; it is sufficient to say that the instrument is constructed on the principle of the electro-dynamometer, and that by a milliampère of Faradic current is meant the electro-magnetic equivalent of an amount of sinusoidal current, the galvanometric measurement of whose sinusoidal galvanic equivalent would be one milliampère. It was fully described by Dr. Sloan at a recent meeting of the "British Electrotherapeutic Society," the proceedings of which are officially reported in the present number of this Journal.

I have lately had an opportunity, through the kindness of Dr. Sloan, of trying this instrument, and I must say that for practical purposes, both of diagnosis and treatment, its indications seem to be very definite and uniform. With an inducing current of 400 milliampères, the indifferent electrode (11 × 7 cm.) being at the bottom of the neck, and the active, or testing electrode, having a diameter of 1 cm., I find that the average excitability of certain sound muscles comes out as follows:—

	Milliampères of Induction Coil Current.	Milliampères of Continuous Coil Current.
Tibialis antic.	1	4
Soleus	$\frac{4}{5}$	4
Peroneal, n.	$\frac{2}{5}$	2
Ext. c. dig.	$\frac{3}{5}$	3
Sup. long.	$\frac{3}{5}$	3
Ext. c. rad. l.	$\frac{3}{5}$	3
Flex. c. rad.	$\frac{4}{5}$	$3\frac{1}{2}$
Flex. sub. dig.	$\frac{4}{5}$	3
Opp. Pol.	1	$3\frac{1}{2}$
Abd. m. dig.	$\frac{3}{5}$	3
Inteross. dors.	$\frac{3}{5}$	3
Med. n.	$\frac{3}{5}$	$2\frac{1}{2}$
Ul. n.	$\frac{1 \cdot 5}{5}$	1

These figures are for strictly minimal contractions; and I find that to get correct readings, the circuit must be allowed to remain closed for two or three seconds. For purposes of comparison I have inserted also the average amount of continuous current required in the few cases I have tested, these being the same normal individuals (two children and two adults) upon whom I had already tested the induction coil current and "Faradimeter." For further purposes of comparison, I may add as an example of morbid conditions, that in a case of traumatic cord trouble of eighteen months' standing, where the knee-jerks were increased without ankle clonus, and where there was diminution of motor power, with a slight amount of foot-drop,

the *Tibialis anticus* required for a minimal contraction, 2½ ma. of "Faradic" current and 10 ma. of continuous current.

It would thus appear that for muscle excitation the required milliampères of continuous current seem to bear the proportion of 3 or 4 to 1 of induction coil current.[1] Readings vary somewhat with speed interrupter.

If, therefore, with such an instrument, instead of being content in electrodiagnosis, with such expressions as "diminished" or "increased" excitability to "Faradism," we can express the extent of this excitability in definite units; and if in treatment, instead of describing a coil current as "weak" or "strong," we can state its actual strength, it must be admitted that an advance has been made in the exactitude of electrotherapeutic procedure.

Electricity in Renal Disease.—Rockwell reports five cases. Analysis of the urine demonstrated the presence of albumen, hyaline and granular casts, as well as the associated conditions. His cases were treated by prolonged applications of the induced (faradic) current of high tension and localised applications of the Franklinic (static) current. The conductive method with grounded area of the latter was used.

In the use of the induced current, electrodes of block tin three inches in diameter, covered with sponge or layers of absorbent cotton, were placed over the region of the kidneys respectively, and carefully bound in place. The current was increased gradually as toleration was established, to almost a sense of discomfort, and the *séances* were increased from ten at first to forty-five minutes in later sittings.

In order to establish general nutritive changes an application of the induced current should be made to the entire general surface in addition to the local application, where the only apparatus at the physician's command is the induction coil.

The writer gives preference, however, to the Franklinic current, on account of its effect upon the general nutrition, even with localised contact. For this purpose the conductive method with grounded area is the better method of application, for by reason of its pressure (tension) and frequency, a current of greater magnitude and of far greater force and rapidity of oscillation can be administered than from an induction coil. The motor and sensory effects are not appreciable when electrode contact is carefully made, yet the applications are capable of profound molecular and mechanical action with marked results on circulation and combustion. There is, in common with all electrical applications, a lowering of blood pressure at the moment of application, followed by increased pressure and vascularisation. The result of this active circulatory drainage in conditions of passive congestion is of great value. The author points out that anything which heightens blood pressure and increases renal filtration relieves the burdened organ of much stress and strain. In addition is the influence upon general metabolism, than which nothing is of more importance in the treatment of disease. The results obtained in the five cases reported varied from improvement, characterised by disappearance of symptoms subjective and objective, to recovery.—*New York Medical Journal*, January 18, 1902.

---

[1] Primary of coil 0·8 mm. (21 B.W.G.) 400 turns. Secondary 0·2 mm. (36 B.W.G.) 5,000 turns. (Schall.)

TECHNIQUE OF HYDROTHERAPY—II.

By Charles J. Whitby, M.D.

Baths—(*Continued*).

Two modifications of the sitz-bath are worthy of mention here, as they constitute methods of treatment of very wide application, simple and well-adapted for use in private practice.

The Spinal Sitz-Bath.—Into an ordinary sitz-bath is poured water of the required temperature to a depth of about six inches. In this the patient wholly or partially undressed sits down, and an attendant, taking a piece of rough cloth in his right hand, proceeds to lave the spine for its entire length, from above downwards, with water dipped up from the bath. A sponge may be used if preferred, but is not so suitable, as from its smoothness it does not produce so good a reaction. An ordinary rough "tea-cloth" does very well, but the material known as raw silk is perhaps best of all. The laving process may, for a start, be continued for three minutes, and gradually increased week by week until it can be borne for five or even ten minutes. The temperature of the water is a matter not to be arbitrarily determined. It may be anything between that of so-called "cold" water (say 50° F.) and 70° to 80° F. Of course, here, as in other tonic procedures, the rule is to begin the course with the higher and work towards the lower temperatures. In cold weather, or with sensitive patients, the bath will be better borne if the feet are immersed in hot water. Before the conclusion of such a bath where only moderately cool water has been employed, it is a good plan to pour a pailful of "cold" water slowly and steadily on to the upper part of the spine, thereby considerably enhancing the tonic effect aimed at. Such a local pouring process is technically called "an affusion." After drying the back and immersed parts the former is well rubbed with a dry hand for a minute or so.

Spinal Ablution.—A similar but somewhat milder procedure, suitable for children and very sensitive persons. A board six inches wide, and long enough to bridge the bath, is laid across the front part of the sitz-bath. On this the patient sits down. Two pails are filled, one with water at the lowest obtainable temperature (say 45° F.), the other with water at 80° F. (or any other prescribed degree). The pail containing the water of higher temperature is placed bodily in the bath behind the patient. Using a cloth or sponge, as in the procedure just described, the back is similarly laved for (say) four minutes; then the pail is lifted out and replaced by the one containing cold water, and the laving process continued for another minute. Week by week the duration of the *cool* laving is diminished and that of the *cold*, increased until cold water only is employed. Conclude with dry friction as above.

The indications for these tonic procedures are sufficiently obvious, but their value can be appreciated only by those who, like myself, have made daily use of them for innumerable maladies over a long course of years. For convalescence after acute and debilitating illnesses, for the treatment of neuroses of various kinds, and the early stages of spinal disease, they are invaluable adjuncts to general and medicinal treatment. For incontinence of urine and uterine disorders of asthenic type the spinal sitz-bath is naturally to be preferred, combining as it does the effects of the ordinary hip-bath with those of the spinal ablution.

Both these procedures should, whenever possible, be followed by exercise in the open air.

Hand-Bath.—This may be given in any tub or pail of convenient shape and size, but there is a form of bath used in German sanatoria, and specially adapted to the purpose, with openings to admit the arms. It has a movable cover, supported by a bar, and this enables the hot hand-bath to be taken for ten or fifteen minutes without perceptible lowering of the temperature. The arms are stripped almost to the shoulders and (the bath having been three-fourths-filled with water of the prescribed temperature) are immersed to about half-way up the upper arm. The hand-bath is usually prescribed either (1) hot as can be borne, say 115° F.; (2) cold; or (3) alternately hot and cold. The last-named is given by means of two baths containing hot and cold water. The arms are first immersed in very hot water for three minutes, then in cold for half a minute, and so on, until they have been thrice immersed in the water of each bath.

The *hot* hand-bath has a general warming effect, sufficient in some exceptional cases to induce free perspiration. It may therefore be prescribed as a preparation to some general tonic procedure, such as a douche or cool half-bath. But it has also distinct indications of its own. It will frequently be found very serviceable in gouty and rheumatoid dactylitis, or inflammation of the wrist joints. For chilblains and for mild cases of writers' cramp, very hot hand-baths are among our most effectual remedies.

But it is in chronic respiratory diseases, and especially those associated with that distressing symptom known as *spasmodic asthma*, that the hand-bath finds its chief application. Many asthmatics will derive considerable benefit, even during an attack, from the immersion of the hands and forearms in very hot water, and may with advantage resort to this simple remedy twice or even four times daily. Each immersion should of course be followed by cold ablution of the immersed parts.

The relief is probably in part due to a directly sedative effect and partly to a vaso-motor derivative action upon the respiratory organs. It is an established fact that dilation of the arterioles in one part of the body, however produced, is always associated with a compensatory contraction of arterioles of some other part.

Probably there are certain parts of the body which have a tendency to vary inversely as regards their vaso-motor condition. Thus, coldness of the feet is a general accompaniment of mental excitement (cerebral hyperæmia?) and Winternitz thinks there is some such relation between the hands and the respiratory organs. Certainly, I have noticed that, during an attack, the hands of asthmatics are frequently very cold.

Winternitz recommends the *cold* hand-bath for spasmodic asthma. Personally I have usually found more benefit, on emergency, from either the hot, or alternate, form of bath, but a prolonged cold hand-bath may be preferable in some cases. "Extremes meet" in hydrotherapy, and the *ultimate* physiological effect of a cold hand- or arm-bath is much the same as the *immediate* effect of a hot one.

Foot-bath.—This is best given in a boot-shaped bath constructed for the purpose, but an ordinary pail does perfectly well, of course. The temperature of the water should be somewhat high, say 110° to 115° F., according to the sensibility of the patient. The water should reach to within a few inches of the knees, and the bath is usually given for from ten to fifteen minutes. After the bath the feet and legs are freely sponged with cold water, and in most cases it is well to order two or three minutes "paddling" (*i.e.*, treading water, or marking time) in a flat bath containing 4 inches of cold water, to follow the ablution. Or the "knee-douche," to be subsequently described, may be given instead. Tepid or cold foot-baths are often useful, and when these are ordered care should be taken that the feet are kept moving and rubbed together in the bath. Their duration may be from two to four or five minutes.

Foot-baths are, of course, one of the minor procedures of hydrotherapy, but they are one of the most serviceable of all. For insomnia, for chilblains, for commencing coryza, for headache, as a preparation for a tonic half-bath, or trunk-bath, as a sedative in the febrile diseases of children, or in the treatment of any condition associated with cerebral hyperæmia, or an imperfect circulation, hot foot-baths are, or should be, in daily requisition. For passive œdema of the ankles alternate foot-baths (hot three minutes, cold half a minute, thrice repeated), followed by massage of the feet and ankles, will generally prove effectual. Cold foot-baths, paddling in cold water, or barefoot walking on wet grass, or in the sea, or in running water, are strongly to be recommended for children and adults of weak circulation, for those especially who have a tendency to catarrhal affections of the nose and throat, and for children with weak ankles. Due care should, of course, be taken to guard against excess.

VIBRATORY THERAPEUTICS IN OZÆNA.[1]

By Professor Ch. Colombo (Rome).

The patient was a young girl of lymphatic temperament, with marked bradytrophic symptoms, and a neurotic family history. At the age of 12 she began to suffer from troubles of the mucous membrane of the nose. The irritation spread from the nostrils to the retronasal and pharyngeal mucous membrane; there was also cough and profuse expectoration. At the same time headache became established, most marked over the spheno-ethmoid region, and always increased after a night's rest.

The nasal secretion had become slightly purulent and extremely malodorous, and the voice became distinctly nasal in tone. In this condition the patient, then 13½ years old, was taken to a rhinologist, who immediately resorted to the heroic remedy of cauterisation, repeated five or six times in the space of two months. The result was negative; the symptoms not only continued, but became worse. Eight months afterwards she consulted another specialist, who again cauterised the parts, using an electric cautery, and prescribed daily irrigations of water containing salt or iodine for two months; and afterwards a course of inhalations containing the same substances, in a well-known health resort. This treatment was scrupulously carried out, and slight improvement followed. By this time the patient was 15. So far as the genital functions were concerned, puberty was not yet established, but in the psycho-nervous sphere it was in full vigour.

It was for these reasons that I directed my attention to the general condition of the patient, as well as to the local trouble. I subjected her to a dietetic and mechanical *régimé* with a view of stimulating the general circulation and the organic exchanges, having recourse to systematic medical gymnastics, to hydrotherapeutic and electrotherapeutic measures, and to hypodermic injections of iron and strychnia. At the same time the appearance of menstruation was hastened by inducing some congestion in the organs of the pelvis by long and constant applications of the "exocarde" of Forlanini.

To deal with the local trouble in the nose, I resorted to vibratory therapeutics carried out in the following way. A small metallic sound, about 3 mm. in diameter and 28 to 30 cm. long, was roughened at one end and a little pledget of cotton wrapped round it, of such a size that it could easily pass into the nostrils. The cotton, saturated with a medicated solution, is brought into contact with as large a surface as possible of the nasal mucous membrane, and then, tightly holding it between the thumb and

[1] An abstract kindly sent to us by the author.

the index and middle fingers, a soft and rapid vibratory movement is imparted to it, which is transmitted from the cotton to the mucous membrane.

For the first month the introduction of this cotton pledget, although it was very small, was very difficult and painful, and vibrations could be practised for only a few seconds, and only over the alæ of the nose. Then little by little the pledget could be pushed higher up, and the patient could bear gradually lengthened sittings. At the end of four months the covered sound could easily be brought into contact with the whole nasal fossa, and even the pharynx, without pain, and the pledget emerged only a little soiled with thick, slightly fetid mucus; but there was no pus, crusts, nor blood. The auditory troubles and conjunctivitis were cured. The headache, however, persisted, although less violent, and there was still pharyngeal catarrh and nasal tone in the voice.

Thanks to the general treatment, the circulation had become more vigorous, and menstruation was established; and thus the pathological condition of the nose progressed towards recovery. Hyperæmia, and therefore the tumefaction of the mucous membrane, diminished little by little and disappeared. The pharangeal catarrh and the odour of the secretion and headache also disappeared. The cotton pledget, twice the size of that formerly used, could now be inserted, and it emerged untainted with any secretion. There was no trace of erosion or ulcer. After about nine months of treatment the patient was sent home quite well.

The results of the trial made in this case, and in a dozen similar ones treated in succession, convinced me that in the treatment of ozæna attention ought to be directed both to the local troubles and to the general pathological condition of the organism, and especially those of the organs of reproduction. Further, I feel quite sure that the most effective means to combat hyperæmia of the nose, upon which are engrafted the processes of decomposition characteristic of ozæna, is vibrotherapeutics or vibratory massage, by virtue of its stimulating action on the vasomotor nerves.

Therapeutics of the X-Ray. — Lee reports a case of lupus vulgaris, duration twenty years, and one of lupus erythematosus of four years' duration. The former had been treated with Koch's tuberculin, cauterised, and subjected to a plastic operation. Irregular treatments with the X-ray for a year resulted in marked improvement. The latter had been treated with various ointments, and subjected to the use of carbolic acid cauterisations without improvement. Eleven X-ray treatments had been given with marked improvement, manifested by the more nearly normal appearance of the skin.—*Brooklyn Med. Journal*, February, 1902.

THE MORTON CURRENT.[1]

At the annual meeting last year of the American Electrotherapeutic Association, upon the motion of Dr. W. J. Morton, a committee was appointed, consisting of Dr. W. J. Herdman, of the University of Michigan, and Mr. W. J. Jenks, to report on a question of priority concerning a method of producing from static apparatus what has been claimed to be a new form of undulatory or oscillatory current, which sometimes has been referred to as the "Morton current."

It appears that Dr. A. D. Rockwell had in letters to a medical journal contested the priority of Dr. Morton, in the discovery of a new so-called static induced current and means of producing the same. In his articles he said that in a book by Mauduyt, published in Paris in 1783, is given "both in descriptive and illustrative detail what is now called the 'static induced current.'" Referring also to Tibbett's "Handbook of Medical Electricity," published in London in 1873, he says: "Dr. Morton has simply copied in its essential details this illustration, or some similar one from earlier French or English issues—Mauduyt, Wilkinson, Adams, or Cavallo—and given to the current that these old fellows used the name of 'static induced.'" Again, referring to Adams' "Essay on Electricity," published in London in 1792, and to an illustration therein, he says: "These are nothing more nor less, could be nothing more nor less, than what Dr. Morton calls his wonderful discovery of 'static induced currents and physiological tetanus.'"

The report in considering the question of priority goes into considerable detail and includes three illustrations, of which reproductions are given herewith. Fig. 1 illustrates Cavallo's method of about 1780; fig. 2, Duchenne's method of 1872; and fig. 3 outlines Morton's method of 1880-81. Referring to fig. 1, the circuit of discharge of the Leyden jar condenser is completed through the patient and the spark-gap, which are in simple series. Commenting on this arrangement, the report says that the patient thus receives the direct shock of the discharge and all of the current which causes the spark. A Lane electrometer is used to regulate the frequency and force of each shock. In this method the static generator is constantly revolved.

Fig. 2 indicates Duchenne's method of 1872. Here the circuit of the discharge of the Leyden jar condenser is completed through the spark-gap and the generator, all three of which are in simple series. Commenting on this arrangement, the report says that with it the patient receives the direct shock of the discharge and all of the current which causes the spark, as in the action of Cavallo's apparatus and method; but that in this case the regularity of the force and steadiness of the succession of shocks is less certain because the generator is turned a certain number of times to charge the condenser, after which the discharging rod is moved toward the patient until the spark jumps to his body, the generator then being again turned and the cycle repeated. A Lane electrometer is here used only as a safeguard to sidetrack a heavy charge which might be inadvertently stored in the condenser, and to discharge it before it could do any damage.

Fig. 3 outlines the Morton method. Two Leyden jar condensers are used, the inside terminal of one being connected to the positive prime conductor of

[1] *The Electrical World and Engineer.*

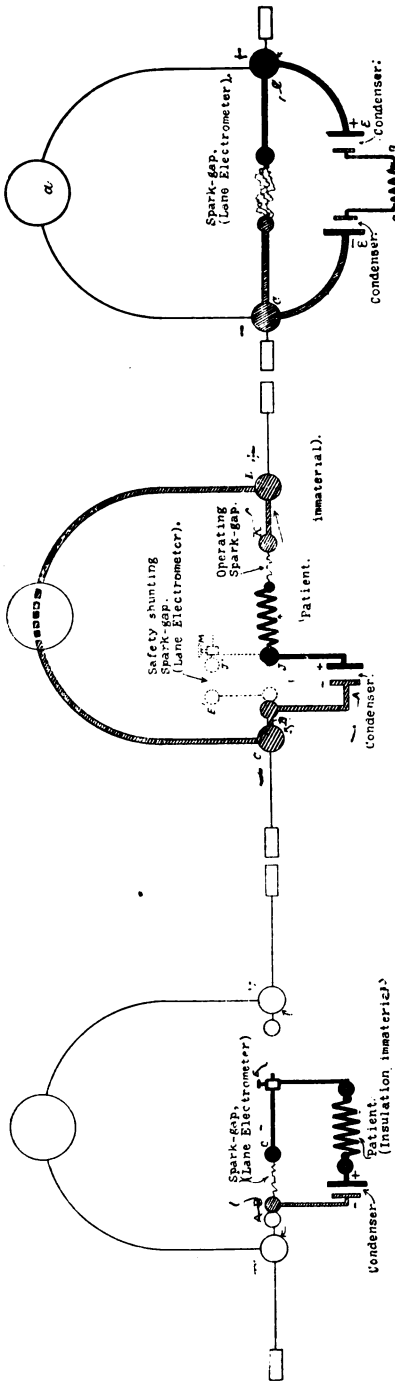


FIG. 1.—Cavallo and Mauduyt.

FIG. 2.—Duchenne.

FIG. 3.—Morton.

the static generator, and the inside terminal of the other connected with the negative prime conductor. Commenting on this arrangement, it is stated that the two outside terminals of the two condensers are connected together through the patient so that the secondary or induced current which surges backward and forward is the only current the patient receives. The discharge between the two inside terminals is completed through the balls of the prime conductors, the adjustable discharge rods and the spark-gap. The direct shock thus traverses the spark-gap, but it does not traverse the patient, thus differing from the arrangements of Cavallo and Duchenne. The adjustable rods constitute the Lane electrometer used for the same purpose as that Cavallo described, viz., regulating the frequency and force of every spark. As in the Cavallo's method, the static machine is operated continuously.

The conclusion of this part of the report is that in Morton's apparatus the frequency and force of the spark determine, through the medium of the condensers, the frequency and force of the pulses in the secondary circuit (which, with reference to the generator, is in shunt with the primary), while the current thereby induced is radically different in its characteristics from the inducing disruptive discharges such as Cavallo and Duchenne had utilised.

The report states that the committee has not attempted to analyse the precise physical difference between the electric current which traverses the patient under the conditions of Cavallo and Duchenne (figs. 1 and 2), and that which is applied by the Morton arrangement of fig. 3. It is added that statements from several eminent medical electrical authorities which appeared in several French publications, and which are quoted, indicate their opinion that the high-frequency currents which Hertz secured and described several years later, were developed by Dr. Morton and medically applied in 1880, though he did not then clearly recognise or characterise them as such. The committee considers the fact has no force that Dr. Morton did not at the time of his discovery or invention of the static induced arrangement and method fully appreciate the nature of the electric pulses which he secured or all the accompanying phenomena, or foresee all of their features of utility. The committee considers it sufficient that the devices and methods be clearly described, in the best form and mode of application which the experimenter may have worked out (so that others skilled in the same art may follow him), to entitle him to the credit of their discovery and reduction to practice, and to a claim to the foundation on which others may subsequently build structures of which he has or may have no conception.

The final conclusions are that the evidence before the committee indicates that in 1880 or thereabouts Dr. W. J. Morton devised and used an arrangement of previously existing static electrical apparatus, and in its use practised a method of producing currents, which have been widely adopted and recognised as useful in subsequent medical work; that the arrangement and method had not theretofore been known or practised, and were not evident to those skilled in the art as the result of their prior knowledge and experience, and that Dr. Morton's claims of priority as made by him are entitled to the recognition of the American Electrotherapeutic Association.

We understand that the above report was rendered at the meeting of the Association this September, and its recommendations adopted unanimously; also that a committee consisting of Mr. W. J. Jenks, Dr. S. Sheldon and Dr. A. E. Kennelly, has been appointed to investigate during the year 1901-2 the physical pecularities of the "static induced," and similar currents, which constitute the results of the experiments of Morton since 1880.

Reviews and Notices of Books.

HANDBUCH DER PHYSIKALISCHEN THERAPIE. Teil II., Band I. (Leipzig, 1902.)

This second volume of the important work on physical therapeutics now appearing under the supervision of Drs. Goldscheider and Jacob, of Berlin, contains much that is novel and interesting in a high degree. The first chapter, devoted to the treatment of skin diseases, is by Dr. C. Kopp. The most generally applicable form of hydrotherapeutic treatment in this class of maladies is, he thinks, the full bath of 34° to 35° C. Hard water is unsuitable, and should be modified by the addition of borax, meal, pine extract, or, best, of course, by boiling before use. The continuous warm full bath of Hebra is, he considers, invaluable for its sedative and absorptive effect in certain cases of pemphigus, for severe burns, dermatitis exfoliativa, lichen ruber acuminatus, pityriasis rubra, &c. For skin diseases caused by or associated with nervous debility, *e.g.*, pruritus, angioneurosis, and hyperidrosis, he recommends sea baths of short duration (five minutes, or less). Generally speaking, the rule is, that in irritative conditions mild procedures, and in torpid processes stronger measures and more extreme temperatures, are to be employed. The neglect and depreciation of hydrotherapy in this class of maladies he attributes to the facts that (1) it requires great skill and judgment; (2) failing these, it may easily do harm; (3) it must be applied with close regard to individual requirements, not in an arbitrary or hard and fast way; and (4) it is seldom sufficient to effect cures in the absence of treatment of other kinds. For acute skin diseases in general, antiphlogistic methods, such as the long wet bandages of Priessnitz and Leiter's cooling apparatus, are most generally useful. Chronic inflammatory cutaneous diseases, on the other hand, require soaking and macerating procedures, *e.g.*, steam baths, warm full baths, packs, and stimulating wet bandages. For psoriasis, warm or tepid baths, softened, if necessary, by the addition of bran, will prove serviceable in the removal of scales, and should be followed by appropriate medication of the skin. General tonic procedures (rain baths, "Scottish" douches) will also assist the cure, but Dr. Kopp is doubtful whether in psoriasis the results of hydrotherapy are superior to those of the administration of arsenic. In cases of lichen ruber, purely hydriatic treatment often fails to effect a cure. For excessive secretion (hyperidrosis) of the hands and feet, alternate hot and cold local baths are a serviceable remedy. For chronic urticaria, short and frequent cold half or full baths are recommended. In the section devoted to thermal treatment of skin diseases Dr. Kopp supports the theory which explains the good effects of thermal treatment partly by the increased elimination, and partly by the direct modification or destruction of toxins. He recommends hot-air treatment for certain cases of localised eczema, for phagedæna (syphilitic or otherwise), ulcus cruris, &c. In this country the older forms of hot-air apparatus have been largely superseded by appliances deriving heat from an electrical source.

In the section (contributed by Dr. Friedländer) on the treatment of muscular rheumatism, it is somewhat surprising to find no mention of the treatment by arc-light radiation, which, in the writer's hands, has given excellent results in this affection, as well as in sciatic neuritis. Discussing the thermal treatment of chronic articular affections, Dr. Freidländer attributes its

beneficial effects partly to the increased metabolism resulting from artificial pyrexia, and partly to the experimentally established curative effects of active hyperæmia on chronically inflamed tissues.

The writer is pleased to find that Dr. Friedländer's experience confirms the result of his own observations, that in the treatment of rheumatoid arthritis electric light baths (cabinet baths) give better results than Turkish or Russian (steam or hot air chamber) baths. The two last-named are objectionable in the treatment of this difficult malady because (1) they hardly admit of very precise dosage; (2) they have here a weakening effect; and (3) they make a serious demand on the circulatory system.

On the other hand it is disappointing to find no reference to the hydro-electric treatment (continuous current bath) of rheumatoid arthritis.

Priessnitz's long wet bandages are recommended as the best form of cooling treatment of acute gouty inflammation. Dr. Friedländer is averse to any form of mechanical treatment of acutely inflamed gouty lesions, but other observers have reported excellent results obtained by gentle massage in combination with mild galvanisation.

In the section on organic spinal curvature, contributed by Dr. Hoffa, a full account is given of the special apparatuses of Mikulicz, Beely, and others, and of the methods of applying them for the reduction of deformities.

The physical therapeutics of the various infectious diseases is dealt with by Drs. Kohts and Rumpf; and this section demands careful study, as it is concerned with a subject that has been grossly neglected in England. Discussing the treatment of scarlet fever, Dr. Kohts considers that in cases of moderate intensity (temperature 102·2°, or less) little beyond general hygienic precautions, local ablutions, and an ice-bag or cold cephalic effusions for the relief of headache, is required. When the temperature ranges to 104°, whole ablutions (68° to 82° F.) should be administered three or four times daily, followed by envelopment in blankets with the apposition of hot water bottles. With still higher fever (105·8°) complicated, as will usually be the case, by delirium, rigor, &c., half baths of 100·4° to 95° F., gradually cooled down to 89·6° or 86° F., during a bath of three to seven minutes' duration, are to be administered once, or in case of a rapid re-accession of fever, twice, daily. For collapse, coma, or severe convulsions, Friedländer advises recourse to cold affusions, the patient sitting in an empty bath, or to very brief immersions in cold water. The latter procedure is adopted from the practice of the late Dr. Currie, one of the English pioneers of hydrotherapy.

The fifth chapter of this volume is devoted to metabolic diseases, and contains an interesting paper by Dr. Weintraud, on the treatment of diabetes mellitus. He, no doubt rightly, assigns a leading *rôle* to the scientific regulation of the dietary, laying due stress on the importance of variety in this matter. There are some interesting remarks on the influence of hygiene and physical treatment on the toleration of carbohydrate foods, which, it appears, may by such measures be demonstrably increased. In cases complicated by cirrhosis, gastric catarrh, or constipation, dietetic treatment should be augmented by the administration of appropriate saline waters. Whatever treatment be adopted its effect must be carefully watched, and especially as regards glycosuria and the general strength of the patient. Dr. Weintraud attaches considerable importance to the careful supervision of the amount of muscular exercise in these cases. He quotes the observations of Trousseau, to the effect that some diabetics recover from the disease as the result of regular walking

exercise without other treatment. Hunting has also been known to entirely relieve the symptoms of thirst and polyuria in a few cases, while the positive influence of exercise on sugar excretion has been experimentally verified by the observations of Küly on a considerable number of diabetics. In those cases (by no means the exception, of course) in which any active exertion proves injurious, general massage, administered for twenty minutes, morning and evening, over a period of three months, will sometimes cause the disappearance of sugar from the urine. There is no mention of the electrical (*haute fréquence*) treatment of diabetes, but hydrotherapy receives a somewhat grudging commendation as an adjunct in selected cases.

The seventh, and longest, chapter, on the treatment of respiratory diseases, contains contributions by Drs. Friedrich, Gutzmann, Fraenkel and Egger. The treatment of stammering by exercises in reading, speaking, singing and articulating is very fully discussed. In the section devoted to emphysema, the "breathing chair" of Rossbach is figured and described. This ingenious contrivance, the effects of which the writer has had considerable opportunity of observing, and which he has certainly found beneficial in the treatment of various respiratory diseases, should be adopted in English hospitals, especially those devoted to this class of maladies. It compels the patient, while using it, to breathe deeply and to completely empty the lungs.

The general impression left by the perusal of this new volume of the work under observation, is that the subjects discussed are dealt with in a sane, masterly, and comprehensive way. One cannot help thinking, as already hinted, that the space devoted to electrical treatment is hardly adequate to the modern conception of its importance. No doubt in the chapters dealing with nervous diseases we shall have fuller opportunities of estimating the work of our German colleagues in this department of therapeutic science.

C. J. W.

L'Année Electrique, Electrotherapique et Radiographique. Revue Annuelle des progrès Electriques en 1901. By Dr. Foveau de Courmelles, Paris. (Beranger, 15, Rue des Saints-Pères, Paris.)

This, the second number of this admirable annual review, covers the year 1901. It equals in interest, and exceeds in bulk, its predecessor of 1900. Not only the electrical engineer and the medical man, but the general public also will find in it a wealth of interesting information; it is not a mere book of reference. Any one who wishes to see at a glance the progress of electrical science, radiography, phototherapeutics, and even of electrocution during the past year, has only to turn to the 430 instructive pages of "L'Année Électrique." The chapter on Phototherapeutics is new, and no one could be more competent to write it than its author. The worst that even the most captious critic could say of it would be that the views and personality of the writer come out in this chapter almost too forcibly for the unbiassed and judicial pages of an annual review.

The Röntgen Ray in Medicine and Surgery. By Francis H. Williams, M.D., Boston. (Macmillan and Co. 1901. Cloth. Pp. 658. Illustrations, 391.)

In this very excellent exposition of the above subject the author states that it is to be regarded "as a report of progress rather than a final presentation of the subject." It is designed for the use of practitioners and students, nor

need they fear from the above statement that they will not find in its pages a fund of practical information, for it is more than a report of progress, and covers very completely our working knowledge of the subject to-day.

Equipment, methods of examination, and therapeutic applications are discussed very fully. The different mechanisms for generating the X-ray, *i.e.*, coils and influence machines, are described in detail.

The author's work has largely been done with a static machine of the Holtz type, with four revolving plates, 6 feet in diameter, and four stationary plates, 6 feet 4 inches in diameter.

It is possible that the busy practitioner and non-expert may feel a lack of authoritative advice as to the selection of equipment, for the author limits his description of apparatus to one or two makers. This is especially true of tubes.

There is no doubt but that the static machine, as made in America, is a very efficient generator of the X-ray, as well as a means of almost unlimited therapeutic usefulness. Doubtless the elucidation of the question as to which is preferable, the static machine or the coil, will be found in the commercialism of powerful coils of the Tesla type, equally adapted to X-ray and therapeutic work.

The technique of examinations in medicine, surgery and dental surgery is entirely the outcome of Dr. Williams' experimental work, and covers the ground very thoroughly.

In the chapters devoted to the therapeutics of the X-ray, illustrative cases, accompanied by cuts, are reported, and the technique of applications given. Among the conditions in which encouraging results have been obtained, the author mentions lupus vulgaris, lupus erythematosis, eczema, nævus vasculosus, sycosis, favus, hypertrichosis, lymphomata colli, psoriasis, acne, tuberculosis (lungs, larynx, and joints), neuralgia trigeminal, carcinoma (breast and stomach), superficial cancers, epitheliomas and rodent ulcer, articular rheumatism, and also the action of the ray on bacteria, and as an analgesic.

Its place in determining food adulteration as well as its medico-legal relation are referred to; and, in closing, the author suggests that in all probability an important future awaits the application of the X-ray to veterinary surgery.

The physiological action of the X-ray receives a bare mention as offering an inviting field for study.

CONSERVATIVE GYNÆCOLOGY AND ELECTROTHERAPEUTICS; A PRACTICAL TREATISE ON THE DISEASES OF WOMEN AND THEIR TREATMENT. By G. Betton Massey, M.D. (F. A. Davis Company, Philadelphia, 1902.)

The author gives two special reasons for electricity as a remedy in the diseases of women. One of these is the prevalence of nutritional and functional affections of the uterus and adnexa, readily curable in this way. The other reason is that it offers a choice of methods in a class of affections "notoriously maltreated at present by methods almost invariably involving the sacrifice of organs." This edition, which is the third, treats more fully than its predecessors of the nature and causation of the diseases of women in which electricity may be used. Many minor points essential to the successful employment of electricity in appropriate cases are discussed in full detail. Electricity can be used without danger, risk, or mutilation in

properly selected cases, to check microbic invasion and its consequences to remove pain, to restore function, to correct nutritional faults, to check hæmorrhage, to cause retrogression of benign growths, and to restore local and general health. The limitations of the use of electricity in gynæcology are brought forward, and a just estimate urged of the comparative desirability in given cases of drugs, electricity, or of the knife. The author treats more fully than in previous editions of the nature of inflammatory diseases of the uterus and adnexa, and of the neural disorders most frequently found among women. He describes fully Apostoli's methods for uterine fibroids and his own method of mercuric cataphoresis for the treatment of cancer.

The work does not claim to cover the field of the great treatises on abdominal and pelvic surgery. The author rather refers to non-operative gynæcology, the sphere of the average physician, and a department too easily cast into the shade by the brilliant gynæcologic surgery of the present day.

The book is divided into two parts. Part I. is devoted to the consideration of electricity in the diseases of women; Part II. contains a practically separate treatise upon the rudiments of medical electricity, which might very properly have been published in a separate volume.

PULMONARY TUBERCULOSIS; ITS MODERN PROPHYLAXIS AND THE TREATMENT IN SPECIAL INSTITUTIONS AND AT HOME. By Dr. S. A. Knopf. (P. Blakiston, Son and Co., Philadelphia, 1899.)

The author, who is an enthusiastic student of tuberculosis, comprises in this work "the latest thought of the leading European and American hygienists, sanitarians, and physicians on this subject," as well as the results of his own studies and researches in the field of phthisiotherapeutics. He prefers the "hygienic and dietetic method in either a closed establishment or under careful medical supervision at home." Under the heading of Aërotherapeutics, Dr. Knopf describes his modified method of the use of the pneumatic cabinet. Dietetics, climato-therapy, and hydrotherapeutics receive special attention for their importance in the treatment of phthisis. Lists and descriptions of special hospitals, sanatoria, homes, camps, and colonies for the care and treatment of consumptive patients in various parts of the world is a valuable feature of the work. The volume as a whole is an excellent and useful treatise upon a subject of universal interest.

TUBERCULOSIS AS A DISEASE OF THE MASSES, AND HOW TO COMBAT IT. By Dr. S. A. Knopf. (M. Firestack, New York, 1901.)

This essay for popular reading was awarded the International prize of the *International Congress to Combat Tuberculosis as a Disease of the Masses*, convened at Berlin in May, 1899. The subject is wonderfully well covered in the eighty-six pages of this little brochure; and the clearness and conciseness of its presentation will make the essay peculiarly valuable for distribution among lay readers. The essay has been published in the German, English, Dutch, French, Italian, Russian, Bulgarian, Brazilian, Mexican, Spanish, and Hebrew languages.

THE CONTREMOULINS-GAIFFE INTERRUPTER.

By Ch. Gaiffe.

Had not the Masson wheel presented certain serious defects, it would have been the kind of interrupter adopted from the first; but it was necessary to move it by hand, electric motors being then in their infancy. The friction of the brushes impeded the movement, and as soon as the coil attained a certain size, the sparks of the extra current of rupture burning both the collector and the brushes, soon rendered the instrument unserviceable.

A consideration of this question some years ago, by Dr. d'Arsonval and the present writer, showed us clearly that if this interrupter were plunged into water or petroleum, or alcohol, it immediately worked satisfactorily, at least during the first few seconds. Then the movements of the wheel again became impeded by the above-named causes, both interrupter and brush were destroyed, and it became necessary to rearrange everything before the operation could be resumed. So the matter remained until M. Contremoulins suggested that the metal contact should be replaced by a carbon brush, and immediately this was done the instrument worked well.

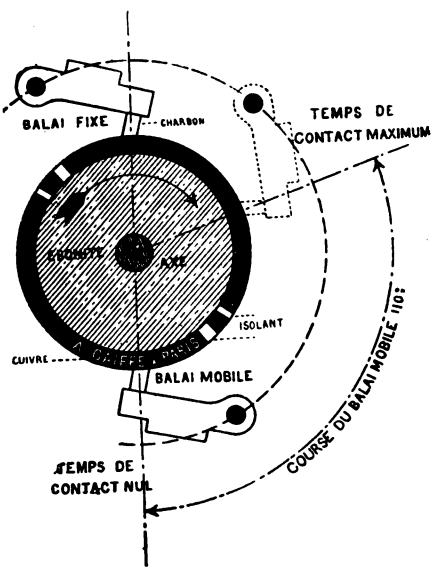


Fig. 1.—Plan of the Interrupter.

In principle, the apparatus consists of a tube of copper, cut into two halves longitudinally; the two halves are insulated from each other and from the axis upon which they are fixed. Two systems of independent brushes, supported by stems, are in contact with this collector; the current reaches one of the two stems which carry the brushes, and the carbons of the latter play upon the surface of this bisected collector. It is easy to see that the current will not return by the other brush support unless the two systems of brushes are upon the same half of the collector.

Now turn the collector. Suppose one of the brush carriers to be movable, in a circle having for its centre the axis of the interrupter. It is easy to see that if we fix one brush at an angle of 180° from the other, the time of contact will be almost *nil*, and therefore the time the current takes to pass will be very short. If the insulating material between the two halves of the collector is wider than the thickness of the carbons, the current will be absolutely *nil*. If we bring the brush carriers nearer to each other, it is evident that the time of contact, and consequently the passage of the current, will go on increasing until a maximum is reached when the brushes are placed upon one and the same vertical line. It is this regulation of the time of passage of the current, and consequently of the intensity of the current in the coil, that we make practical use of, in our apparatus. Some details are necessary. It is composed of: (1) A glass vase containing an insulating

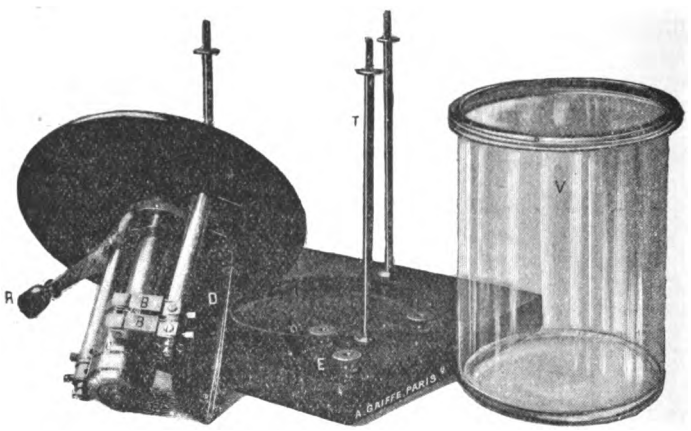


FIG. 2.—The Interrupter taken to Pieces.

material, generally petroleum. (2) Supported by three columns above the glass, and without touching it, in order to permit of its easy replacement, in case of accident, there is an ebonite cover which carries: (*a*) The fixed brush carrier attached to one end; (*b*) a block fixed to the centre, in which rotates the axis of the interrupter; this axis is furnished with gear so that it can be moved by any kind of motor. Upon this block, and under the ebonite cover, is fixed by its centre an attachment, carrying the movable brush. This attachment can be moved through an angle of 120°, of which about 10° belong to the part in which the brushes do not communicate, leaving 110° for the remainder. It is evident, therefore, that the time during which the current passes can be regulated with all necessary exactness.

This interrupter has given us the following results:—

Spark in Air.—At every speed the length of spark of a 35 centimetre coil can be made to vary from a few millimetres to the full length, by simply regulating the position of the moving brush, without the interposition of a resistance, upon any voltage from 50 to 110. We have even gone to 160 volts.

The number of visible sparks is 8 to 10 at a time, *i.e.*, as the persistence

of the luminous impressions upon the retina is $\frac{1}{10}$ of a second, there are 80 to 100 interruptions a second, or 5,000 to 6,000 a minute. Increasing the current the sparks actually join into one spark, very sinuous in character, having exactly the appearance of the sparks of a Wenhelt, but 33 centimetres in length, instead of 25, as in the case of the Wenhelt, and with a much smaller current—5 to 8 ampères instead of 15 to 18.

With the coil placed directly upon the voltage, without a rheostat in circuit, we have with 110 volts, the interrupter working at full speed—0·5 sparks without the ampère meter showing any visible deflection; 35 centimetre-spark with 2·5 ampères; 35 centimetre-spark (of a sinuous character), 4·75 ampères. If, on the contrary, we regulate the current by a rheostat, the interrupter being in the position in which the current occupies the longest time

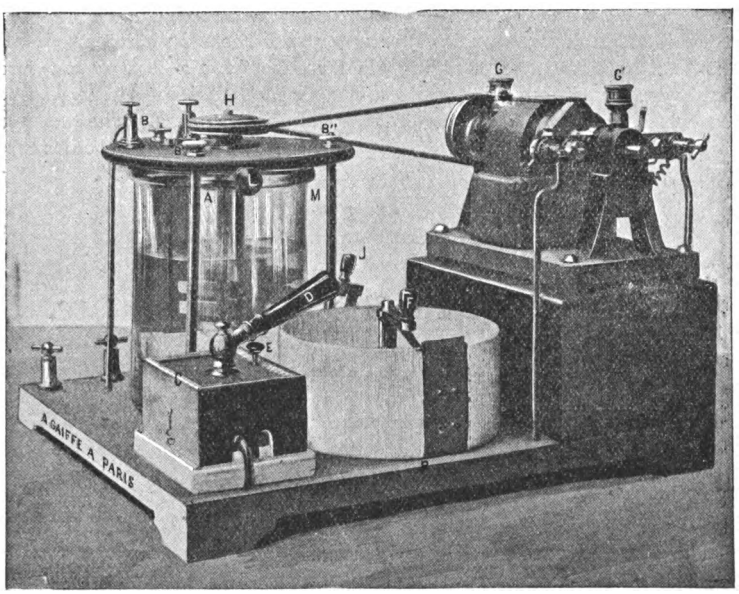


FIG. 3.—The Interrupter Complete.

in passing, the intensities are: At 35 centimetre-spark, 5 ampères; at 35 centimetre-spark (sinuous), 6·5 ampères.

The result is interesting from the point of view of expense. In all applications in which the coil works as in air, in radiography and radioscopy for example, no rheostat is used; but when we come to close the induced current on short circuit, as by a high frequency condenser, it is necessary to have a small permanent resistance in series with the inducing circuit (fig. 3).

The interrupter can be had by itself: Generally it is mounted upon a bedplate with an electric motor which works it. There is a rheostat for regulating the number of interruptions, a special interrupter, a current reverser, terminals to attach it to the coil, to the source of supply to the condenser and to the external rheostat. The interrupter is so arranged, that in a first

movement, which is limited by a stop, current is supplied to the motor only. Once the regulation of speed is effected, a button is pressed commanding a spring, this allows the preceding movement to be continued, and sends the current into the coil.

Results.—In high frequency, without changing the speed, the physiological effects can be directly regulated by the interrupter, and at a maximum (in treatment by our method of auto-conduction for instance), the effects are easily double those obtained with a coil of the same dimensions, furnished with ordinary interrupters.

In radiography, a large coil can be regulated to suit any kind of tube, only a 5 or 6 centimetre-spark being necessary, and the tubes, thanks to the frequency and regularity of the interruptions, present the same steadiness as if they were illuminated by a static machine, but with much greater power.

A comparison between this interrupter and those hitherto used, shows that it has the advantage of giving greater effects for a less expenditure of current and of remaining always the same. It does not present the inconveniences which are seen even in the best mercury interrupters. The latter cease to work normally, because it always happens that the mercury becomes exceedingly dirty, necessitating a troublesome cleaning of the instrument.

Digest of Current American Literature.

ELECTRICITY.

Metallic Electrolysis.—Huzinga, in discussing the pathology, etiology and treatment of granular lids, recommends, in addition to the classic measures, metallic electrolysis. As the result of several years' clinical experience he regards it as one of the most valuable agents at our command, and deserving of more universal recognition than has been accorded to it heretofore. He refers to the well-known action of the copper and silver salts and the infectious nature of the disease, and estimates the amount of the salt deposited in the tissues with a current of 5 ma. for five minutes, the way of least resistance, at $\frac{1}{300}$ of a grain. Experiments with a previously infected piece of raw beef demonstrated that the immediate anodic area was sterile after such an application.

Technique.—Following cocainisation, the conjunctiva is thoroughly cleansed of all secretions, and a flat copper or silver electrode is carried up into the upper fornix and the current turned on gradually until it reaches 5 ma. The electrode is moved carefully over every part of the conjunctiva, until it assumes the characteristic greenish tint (copper), or blackening of the tissues (silver). This indicates his time limit.

Applications are repeated once or twice a week according to the nature of the case and the severity of the action. Treatment is supplemented by a 25 per cent. solution of proto-argol once or twice a day, and a boric acid wash every hour. In all cases of follicular conjunctivitis and in all light and acute forms, the above method yields gratifying results.

In the chronic forms and those in which cicatrices had pretty generally replaced the conjunctiva, Huzinga obtained his best results from an application

once a week with the negative pole, dose not given. "It is said that this has a dissolving effect on this form of tissue; but whatever its physiological action may be, this is certain, that it invariably gives the patient great relief and comfort." He does not consider these cases curable, but believes that whatever relief can be given this unfortunate class of patient is well worth the endeavour.

A cure is accomplished in ordinary cases in from four weeks to four or five months.—*American Medicine*, November 16, 1901.

[An extensive clinical experience (ten years) in the use of metallic electrolysis is confirmatory of Huzinga's work. In simple conjunctivitis, silver electrolysis is given the preference because of the less extensive diffusion of the silver salt and more localised action, as compared with copper. In longer standing and more deep-seated pathologies, for example, the second stage of granular lids, copper will produce the best results, as it is transferred much more deeply into the tissues by cataphoresis. In the third stage, where scar tissue has replaced the normal conjunctivitis, the negative pole acts by bringing to the part an increase of fluids and salts (increased blood supply) at the expense of all the organised products of inflammatory action (exudates and scar tissue). This means increased activity of the absorbents as well, and results in establishing nutritive changes within the conjunctival membrane, with symptomatic relief. Zinc electrolysis is also of great value in the stage of sclerosis, and is to be preferred to the negative pole in that no scar tissue is formed. A profound reaction follows the use of an agent capable of the escharotic action, characteristic of zinc.—AM. ED.]

Inoperable Tumours.—Martin, in discussing the treatment of tumours characterised by a sloughing of gangrenous masses, with odour and hæmorrhage, and where the body of the uterus is occupied by a large soft tumour, presenting, perhaps, on its peritoneal surface projecting nodular masses, while the cervix is soft and patulous, the canal large and irregular and possibly a nodular mass presenting at the os uteri, states that in many cases where the diagnosis of cancer had been made by men of more than ordinary knowledge and skill, that he has obtained symptomatic recovery from electrical treatment. The canal is dilated when practicable, and the *débris* removed with a dull curette. Then the largest copper electrode which can be introduced into the uterine cavity is carried to the fundus, connected to the positive pole, and the indifferent contact is placed upon the abdomen. The current is turned on gradually until 200 ma. is reached, or the maximum which the patient will tolerate.

The applications are repeated every second day. Antiseptic douches are used night and morning. He finds that these cases respond rapidly, and that the powerful antiseptic action of the copper salt is manifested by lessening of the odour of the discharge. He attributes the action of the treatment to a tanning effect of the salts of copper, which have been diffused into the tissues by the cataphoric property of the current, resulting in a lessening of the discharge of blood, the patient at the same time being toned by the general effect of electricity on her system.—(*Am. Med.*, November 30, 1901.)

[This method is of great value in the condition described by Martin, as well as all forms of endometritis. Curettement is not essential prior to the use of cupric electrolysis, save in exceptional cases. In conditions where the entire

uterine mucosa is involved, the indifferent contact should cover not only the abdomen but the lumbo-sacral region as well, connection being made by means of a bifurcated cord to the negative terminal. In this way every part of the mucous membrane is brought within the conducting path, thereby securing a diffusion of the salt more nearly into its entire circumference.

As a very considerable quantity of copper salt, 5·9 milligrams, is deposited with 30 ma., continued for 600 seconds, it hardly seems necessary for so large a dose as 200 ma. It were well to avoid an undue expenditure of energy if a lesser amount will secure the desired result.

As from seven to eight days are required to complete the cycle, congestion, elimination, and repair, the indication for a repetition of the treatment would seem to be at the expiration of this time rather than every second day.

One great advantage of this method over other methods, for example, the action of the current directly and curettement, whatever the anatomical site of the mucous membrane involved, whether eye, nose, throat, urethra or uterus, lies in the fact that no scar tissue is produced. When the reparative process is complete the mucous membrane is absolutely sound and without a blemish.—Am. Ed.]

The Treatment of Xanthema of the Eyelids is discussed by Leviseur, who condemns internal medication, excision of the affected tissue, and the Paquelin and electro-cauteries. He regards electrolysis as by far the best method of removing these patches.

Technique.—The needle, fixed at an angle of 45°, attached to the negative pole, is introduced horizontally into the skin, penetrating in the direction of the levator palpebrarum muscles; indifferent contact to hand and a current from two to three milliampères is used for about thirty seconds. The time limit is a matter of experience, some cases requiring a longer *séance*. After the scab falls off any xanthematous tissue remaining is exposed to view, and can easily be treated in a similar manner. — *New York Medical Record*, December 7, 1901.

[The habit of placing the indifferent contact in the hand is not good practice, as it interposes unnecessary resistance in the conducting path. In this instance, it would be better placed at the nape of the neck. No unpleasant cerebral sensation is experienced from so small an expenditure of energy.—Am. Ed.]

EFFECTS OF DIRECT, ALTERNATING, TESLA CURRENTS, AND X-RAYS ON BACTERIA.

Zeit, as a result of experimental work (article elaborated in detail and well illustrated), finds that a continuous current of 250 to 300 ma. passed through bouillon cultures kills non-resistant bacteria by heat; that 48 ma. used for two or three hours are antiseptic, not germicidal; that non-resistant forms are killed by a current of 100 ma. after an hour and a quarter through the formation of electrolytic products; that anthrax spores are killed in two hours, and spores of bacillus subtilis were alive after three hours. He finds that at the positive pole chlorin is liberated and forms with oxygen hydrochloric acid, while the alkaline reaction at the negative pole is due to sodium hydroxid and hydrogen gas.

With 100 ma. for two hours it required 8·82 milligrams of H_2SO_4, to neutralise 1 cc. of the culture fluid at the negative pole. Spores of bacillus

subtilis lived four hours at the negative pole, but anthrax spores were killed at both poles. Excluding the chemic effect of ions by the use of Du Bois Reymond non-polarising electrodes, the continuous current alone is neither bactericidal nor antiseptic. The apparent antiseptic effect is due to electric osmose. He finds no antiseptic nor bactericidal effect from magnetic fields, and that alternating currents from a three-inch Ruhmkorff coil, favour growth when passed through bouillon cultures for ten hours. No antiseptic nor bactericidal effect resulted from passing Tesla currents around a bacterial suspension within a solenoid. When exposed to the brush discharges ozone is produced and kills the bacteria. Forty-eight hours' exposure at 20 mm. distance from the X-ray did not kill non-resistant bouillon and hydrocele cultures. Suspensions of bacteria in agar plates, exposed for four hours were not killed. After six hours' exposure tuberculous sputum caused miliary tuberculosis. He suggests that the clinical results may be explained by production of ozone, hyperchlorous acid, necrosis and phagocytosis.—*Journal of the American Medical Assoc.*, November 30, 1901.

[Forbes Ross and Norris Wolfenden (*Effects Produced in Cultures of Tubercle Bacilli by Exposure to the X-ray Tube, Archives of the X-ray*, August, 1900), concluded as the result of their experimental work, that the X-ray does not kill tubercle bacilli, but stimulates them to excessive over-growth, and only affects them adversely by attenuation from over-growth. In connection with the conclusious of Zeit, it is interesting to note that Chisholm Williams states that tubercle bacilli, under the influence of high potential and high frequency currents, seems to follow the same course.—AM. ED.]

RONTGEN RAYS.

Notes on X-Light; Radiable Windows in X-Light Tubes.—Rollins advises that the hole in the non-radiable mask be covered with transparent celluloid gelatin or collodion, held in place by rubber or other elastic cement. The celluloid is covered with a non-radiable paint up to the edges of the diseased area and the mask adjusted to the patient. Fresh paint is applied as this area is diminished under treatment. White lead in japan, or shellac in petroleum, may be used. The paint may be made of metals of high atomic weight instead of their oxides or salts, when it is desirable to protect a patient from the space of strained ether, in which case the mask should be grounded.—*Boston Med. and Surg. Journal*, December 19, 1901.

Notes on X-Light.—In a synopsis of recent articles appearing in different journals relative to X-ray burns, Rollins points out that by some the burns were said to be due to electricity, while others held that ozone and nitrous acid were responsible for the death of the guinea-pigs upon whom the experiments were made. In a series of carefully conducted experiments with guinea-pigs Rollins has proved that X-ray burns can be produced by X-ray light when no electricity is present, and conversely by electricity when no X-ray is present. —*Boston Med. and Surg. Journal*, January 9, 1902.

The X-Ray in so-called Sprains is discussed in an exceedingly interesting and convincingly illustrated paper by G. T. Ross and M. J. Welbur. By their examinations they show the frequency of fractures and dislocations in sprains which otherwise had not been determined.—*Am. Med.*, January 25, 1902.

What Reliance can be placed upon the Image produced by the X-Ray from a Medico-Legal Standpoint.—C. L. Leonard believes that great reliance

can be placed upon the image thus produced. The method he regards as more accurate than any other, and capable of rendering the greatest service by demonstrating the value and efficiency of the methods of treatment. Whenever practicable its employment should be demanded.—*Am. Med.*, January 25, 1902.

Notes on X-Light.—Rollins, as the results of his researches to find radio-active membranes as a substitute for the X-light, advocates the local application of capsules containing radium, or in the form of moisture-proof plasters, to cutaneous diseases where treatment by means of light and the X-ray are indicated, as for example, lupus, superficial cancers, &c.—*Boston Med. and Surg. Journal*, January 23, 1902.

A Röntgen Ray Symposium.—*The Philadelphia Medical Journal* of February 1 devotes considerable space, both editorially and in original articles, to the X-ray. The necessity of extended and accurate observation, not only to explain the X-ray's destructive action, but to determine its physiological and therapeutic effect, is pointed out editorially.

Results of X-Ray Diagnosis and of Operation in Injuries from Foreign Bodies in the Eye, is the subject of an article by Sweet, who gives the statistics of 102 cases examined by the X-ray, for the purpose of determining the presence or absence of foreign bodies. Of these sixty-five showed the presence of a foreign body in the eyeball or surrounding tissues, while in thirty-seven cases the results were negative. Of the foreign bodies in the sixty-five cases, one was glass, five copper, six small shot, and fifty-three were wire or steel. They occupied the following positions: In the eyelid one, orbit outside the eyeball three, iris one, crystalline lens three, and vitreous, retina or choroid, or imbedded wholly or in part in the optic nerve, fifty-seven. In every instance, so far as the findings in the cases reported could be verified by the extraction of the foreign body, or after enucleation, the substance was situated at the spot indicated by the radiograph. The method of localisation employed is simply the triangulation of the shadow of the foreign body from two different positions, in relation to the shadows on the photographic plate of two known points, so that accuracy in the results must follow, with proper care in working. The article closes with the conclusions drawn from the study of the group of cases, not only as to the value of the X-ray, but as to the use of the magnet and extraction.

A New Localiser for Determining the Position of Foreign Bodies in the Eye by the Röntgen Ray.—This article, by Webster Fox, is instructively illustrated and the localiser described. It consists of an oval band of gold or silver, about 0·75 mm. in width, so shaped and curved as to conform with the outline of the eye, and provided with two gold strands crossing in front at right angles, thus dividing the instrument into quadrants. An outer band of lesser diameter is substituted in his later modification with the result of lessening the shadow. Only the most minute objects would be eclipsed by this localiser.

Technique.—The skiagraphs are taken with the eye cocainised. The localiser adjusts itself to the eyeball, but does not prevent rotation or following the other eye. In order to bring the crossed wires directly over the centre of the cornea of the eye to be photographed, it is necessary to direct the sound eye at a fixed point. Duration of exposure in the living subject: temporal side, five to ten seconds; occipito-frontal axis, two and one-half minutes; freshly enucleated eyeball, from two-fifths of a second.

Treatment of Epithelial Skin Cancers and Sycosis non-parasitical with the X-Ray.—Rhinehart reports three cases of epithelial skin cancers, one of rodent ulcer and one of sycosis non-parasitica of the upper lip, with recovery. Exposures were made daily from five to six minutes. On the eleventh day a fifteen minutes' exposure was made in the epitheliomas. This longer exposure was followed by marked inflammatory reaction, which gradually disappeared, however. The epitheliomas recovered in two weeks, the rodent ulcer after six treatments, and the sycosis after eight treatments. The cosmetic effect was good in every instance. In the case of sycosis the hairs of the diseased area were destroyed.

Rhinehart advocates the shorter exposures that the efforts at repair may be in excess of the destructive action. The anode of the tube was brought to a red glow in each instance, and the tube was placed within six inches of the zone, the healthy tissue being protected by a lead mask.— *Philadelphia Medical Journal*, February 1, 1902.

A Case of Round-Celled Sarcoma, successfully Treated by X-Ray Exposures.—Kirby reports a case, male, aged 64. The history and family history are given in detail, the latter on the mother's side showing malignant predisposition. In February, 1899, a waggon pole fell and hit him on the neck, leaving a contusion which lasted about a week. Two months later, noticed a swelling the size of a pea, which gradually increased in size and became much less mobile. A second injury—strain—sixteen months later, was followed by more rapid growth and pain. About two years after accident, came under the author's observation. Tumour, the size of a large goose egg, firmly fixed with indurated borders; surface dark and tense. Condition pronounced inoperable by two eminent surgeons. The tumour soon broke down, discharging a sero-purulent substance. It grew very rapidly, was treated by means of leeches, excision, and by local analgesics to relieve pain. Nothing relieved the pain, and on November 20, 1901, after a section of the growth had been examined microscopically, disclosing a typical round-celled sarcoma, treatment was instituted by means of the X-ray. Measurements: through upper border of ear, 7 inches laterally; through base of ear, 10 inches; vertically, past back of ear, 5 inches; area of ulceration, 5 inches laterally by 3½ vertically.

Fifteen applications to entire ulcerated area were made with tube, 10 inches from diseased surface; duration fifteen to twenty minutes. Treatment began November 20, 1901, and ended January 3, 1902. Improvement from the first, characterised by lessened induration, increased mobility, diminution of size, relief from pain, healthy granulations, followed by formation of scab. The scab area gradually diminished and healthy skin formed underneath.

First photograph taken December 7, shows ulcerated area; second, taken January 7, ulcerated area covered with healthy skin entirely free from tenderness; cosmetic effect good.—*Advanced Therapeutics*, February, 1902.

The X-Ray in the Treatment of Sarcoma.—Pusey reports three cases. The first case, a young man, had enlarged glands in both cervical regions, and had previously undergone an operation on one side by Ochsner. The growth was found to be a round-celled sarcoma. One month after the operation the growth on the opposite side had grown very large, and extended from the front of the angle of the jaw to within an inch of the posterior median line, and from the mastoid process to the clavicle. Before treatment was instituted

the circumference of the neck was 21 inches, and the growth was hard and not freely movable. Twenty-one exposures with a hard tube and a weak light were made, varying in length from ten to fifteen minutes. The exposures were discontinued upon the development of a dermatitis. This disappeared very rapidly. After ten days the growth was perceptibly smaller and mobility increased. After the treatment the circumference of the neck was 16¾ inches. In six weeks no trace was left of the disease save a small, freely movable and painless gland, which subsequently became much smaller. The patient reported, January 12, 1902, a gain of 12 lbs. in a little over four months, and good general health.

The other two cases were each over 60 years of age, with extensive growths, and but little effect was noted from the treatment.

A boy, aged 4, with Hodgkins' disease, made wonderful improvement on exposure to the rays. Another case of Hodgkins' disease, aged 50, was also treated. In these cases the ray was directed to the epitrochlear gland, which was very hard, and the size of a goose egg. As a result of the treatment, the gland was reduced to the size of an olive. — *Journal Am. Med. Assoc.*, January 18, 1902.

The Röntgen Rays.— In differentiating between osteomyelitis, osseous cyst and other *osseous lesions, with skiagraphic demonstrations*, Carl Beck illustrates the points suggested by the above title by a series of very excellent skiagraphs. In osteomyelitis an early diagnosis can be made, and Beck claims that every focus of disease can be demonstrated. Necrosis and other slow inflammatory conditions can be clearly determined. A sequestrum which cannot be felt with a probe can be observed by means of the rays, while the size and shape of sequestra and their position can be established. Definite information as to the site and exact extent of tubercular lesions of the bones and joints is possible. Fine, spiculated trabeculæ which radiate from the surface he finds characteristic of periosteal sarcoma. In the skiagraphs of soft sarcomas occurring in the medulla, the absence of osseous tissue is shown, although sometimes small bony fragments are observed.

The outlines of an osteo sarcoma proper are very irregular; more osseous tissue is shown, however, than in the former. The definition of osseous cysts is possible, and the skiagraphic expressions of syphillis are, in Beck's opinion, characteristic.

In acute inflammatory processes, whether due to infection or not, the integrity of the articular outlines is well marked. In infective cases the extent of serous or purulent effusion may be represented by the skiagraph. Chronic rheumatic processes in the joints reveal an irregular bone line. In arthritis the contour of the bone epiphyses appears irregular, and arthritic deposits are recognisable by light shadows.

Although not taking the place of other methods of diagnosis, the author regards the rays as valuable adjuncts and sometimes as determining factors in doubtful cases.—*Journ. Am. Med. Assoc.*, January 4, 1902.

CLIMATE.

Climatology of Arizona, with Especial Reference to the Climatic Treatment of Pulmonary Tuberculosis.— That place having the most sunshine, least moisture, and most even temperature is the ideal spot for consumptives. Arizona very nearly fulfils these conditions. The climatic conditions of Arizona are unlike anything else in the world. The territory is

situated between the two greatest ranges of the Rocky Mountains. It is largely an extensive plateau, hundreds of miles from any large body of water, traversed by lofty mountain chains, and surrounded for several hundred miles on every side by sandy deserts. Arizona is almost exactly the same altitude as Cairo in Egypt, and has a very similar climate. The even high annual temperature and dryness of the atmosphere are Arizona's chief claims to merit.

The lack of moisture in the air, as reported by the U.S. Weather Bureau, at Phœnix, was on several occasions in July, 1900, as low as 1 per cent., as compared with 50 and 60 per cent. in eastern cities. One especially noticeable effect of the dry air is the great diminution in the amount of sputum in those cases where there is excessive bronchial catarrh accompanying the tubercular lesion. Phœnix, Arizona, has the greatest percentage of sunshine recorded by any United States Weather Bureau Office. In 1900 the average daily sunshine for the month of November was nine hours twelve minutes. Davos Platz, pre-eminent in Europe for its sunshine, had four hours twelve minutes as its average for the same month.—*Journ. Am. Med. Assoc.*, January 25, 1902.

The Relation of Sunshine to the Prevalence of Influenza.—Dr. H. S. Anders believes that the following conditions tend to increase the prevalence of influenza: (1) Abnormal increase in the barometric pressure and in the absolute range between the highest and lowest pressures for the epidemic months; (2) sudden frequent and extreme alterations of abnormally high and low temperature ranges; (3) comparatively lower relative humidity during the prevalence of sharply epidemic influenza; (4) diminished precipitation, but short periods of unusual fogginess alternating with periods of dryness; (5) marked prevalence of strong northerly winds, frequently alternating with very calm weather; (6) predominance of relatively clear and sunshiny days during exacerbations of influenzal attack; these attacking periods having invariably been preceded by sudden thaws, and relatively warm, damp, murky weather.—*Med. News*, November 9, 1901.

Jamaica as a Health Resort.—Dr. J. Howe Adams, of Philadelphia, exploits Jamaica as a health resort. The natural arrangement of the island is most favourable for invalids. It rises from the sea in a series of mountain chains which culminate in a central range reaching the altitude of 7,400 feet. From these peaks seventy rivers pour down to the sea. The island has two seasons, a wet and a dry. The air is both healthful and exhilarating; the variations in temperature are small, and there is no *mistral*, which is so trying on the shores of the Riviera. Living is inexpensive and most comfortable. The mineral springs and baths are of various kinds. There are sulphurous sodic-calcic thermal, saline-calcic thermal, saline-calcic cold, strong chloro-calcic, and acidulous ferro-aluminous. The local physicians claim that the effect of these baths on proper cases is almost magical. In skin diseases, chronic rheumatism and gout, amenorrhœa and chlorosis, syphilis, spleen and liver troubles, they have been most successful. The variety of surface affords a choice for the consumptive, while the other advantages of the island make it a very desirable residence for him. Many of the present business men of the island, not a few of whom have made fortunes there, went to Jamaica years ago broken down in health. To-day they are superb specimens of manhood, and show the vigour of good living and good climate.—*Internat. Med. Mag.*, January, 1902.

HYDROTHERAPY.

The Riverside Association's Hydriatic Department.—This Association, which maintains a gymnasium, kindergarten club for boys and girls, a penny provident fund, sewing and cooking schools and public baths, also supports a hydriatic department under the medical direction of Dr. Simon Baruch. This department is designed for the water treatment of indigent patients, sent by physicians or dispensaries. During the past six years 1,848 male and 1,780 female patients have been received for the treatment, from 128 physicians and ten institutions. There are only three other similar institutions in the world, connected respectively with the Universities of Berlin, Heidelberg and Vienna. —*N. Y. Med. Journ.*, January 18, 1902.

FOOD AND DIETETICS.

Notes on Cows' Milk and Infant Tuberculosis.—Dr. Abram Jacobi contributed this short paper to the discussion on tuberculosis, before the New York Academy of Medicine, December 19, 1901. The author cites several cases to prove the possibility and the actual occurrence of tuberculous infection through cows' milk. He adds that it is not necessary to prove that such cases are very numerous; their very existence demonstrates the necessity of preventive measures. It is often difficult to say where the invasion took place, through inhalation, aspiration, in the nose, adenoids, the tonsils, or the bronchial glands, or in less frequent cases, in the intestines and mesenteric glands. That is why every road to access should be blocked. The author firmly believes that the intestinal danger is under-estimated. He adds that while intestinal ulceration is not frequent, peritoneal tubercular lesions are very frequent. In conclusion, Dr. Jacobi urges that no rules prohibiting the sale and use of milk of cows with tuberculosis of the udder, or with general clinical tuberculosis, can be strict enough or too strict. We have no dealings, he concludes, with an agricultural or economic problem, but with a very urgent hygienic and sanitary question.—*N. Y. Med. Journ.*

Heart Strain: Its Results and Treatment.— Dr. J. M. G. Carter divides the treatment of heart strain into (1) prophylactic; (2) hygienic; (3) dietetic; (4) medicinal. In the first division he advises the avoidance of over-exertion or any exercise that would produce profound impression upon the heart. Under hygiene, he includes well-regulated exercise, fresh air and sunshine, systematic bathing, regular meals, sufficient sleep, avoidance of dissipation. Dietetic treatment is very important in advanced cases. The patient must avoid foods that have a tendency to produce gas in the stomach or intestines, or digestive disturbance of any kind. Intervals between meals should be sufficiently long. If the work of the heart is increased, liquids must be limited. Hot water acts as a stimulant, strengthening a flagging heart, and also washes out the stomach after digestion. In cardiac asthenia, when dilatation is present, a dry diet is indicated. Patients on a dry diet should take hot water between meals, milk and lime water, lemonade or a weak solution of phosphoric acid. Sudden dilatation requires rest in bed and a milk diet. Hypertrophy may require rest in bed and a non-stimulating diet. Well-cooked fruit may be given. Medicinal treatment in the first stage need not be resorted to, if other measures are carried out.—*Med. Assoc.*, January 18, 1902.

The Food Factor as a Cause of Health and Disease during Childhood, or the Adaptation of Food to the Necessities of the Growing Organism. — Winters refers to the aid that chemistry, physiology, and chemical physiology afford for the rational feeding of children. He points out the paucity of iron in milk, and that while the infant begins life with a store of iron in the liver, this is used up by weaning time, when the system calls for a new supply to be afforded by a change of food. The growing child requires carbohydrates for energy and to shield the proteids and fats from oxidation, so that they may be stored for future needs. Nitrogenous matter is essential to every vital process, and proteids are needed not only for the building up of the muscles, but for the proper growth of other structures. The child, unlike the adult, requires a generous supply of mineral salts with which to build up the osseous system, but they must be in organic combination. An abundance of fat should be the main characteristic of the diet of the young child for heat production. If fat were deficient, rickets would result. Metabolism is especially active in the young child, and an excess of animal food, by over-stimulating this metabolism, interferes with the laying on of fat and of muscular flesh. An excessive meat diet usually created in the child a distaste for cereals, vegetables and milk. The alkaline bases needed were found in organic combinations in certain vegetables and cereals. Vegetable food is probably the chief factor in the production of the colouring matter of the blood.

Dr. Winters strongly objects to the large administration of beef and beef juice to young children, believing that it is largely the cause of the anæmia, rheumatism, valvular disease of the heart, and chorea of the present day. Meat juice should not be given before the age of three, and then but sparingly. *N. Y. Med. Rec.*, January 25, 1902.

PART II.

THE BRITISH ELECTROTHERAPEUTIC SOCIETY.

REPORT OF MEETINGS, JANUARY 10, FEBRUARY 14, AND MARCH 7, 1902.

WITH LIST OF OFFICERS.

Edited by CHISHOLM WILLIAMS, F.R.C.S.(Edin.).

THE First Meeting was held on January 10, 1902, at the rooms of the Medical Society, 11, Chandos Street, Cavendish Square, W.; Dr. W. S. Hedley in the chair. A list of fifty-eight medical men was read and these were duly constituted members of the Society.

The rules suggested by the Provisional Committee were discussed and the majority passed; a few amendments and additions to be brought forward for confirmation at the next meeting on February 14.

The following officers were then elected:—President: Dr. W. S. Hedley; Vice-President: Dr. Lewis Jones; Council: Drs. J. Allan, William Armstrong, Barry Blacker, James Barr, Wilfrid Harris, George Herschell, Hall-Edwards, Robert Jones, Earnest Solly, and Septimus Sunderland; Honorary Treasurer: Dr. H. M. McClure: Honorary London Secretary: Chisholm Williams, F.R.C.S.Ed., 20, Bedford Square, W.C.

The Second Meeting, February 14, 1902, the President (Dr. W. S. Hedley) in the chair.

Twenty members and one visitor present.

Amended rules read and confirmed.

The PRESIDENT delivered a short address:—I suppose that no one present here to-night entertains any doubt that the time has come for the formation of such a Society as this. It is evident to us all that in therapeutic electricity as in other branches of applied electrical science there has been an astonishing advance in recent years. There was a time, it is not long ago, some of us remember it, when electricity was regarded by medical men merely as a muscle-contracting stimulus, it was measured by cells instead of by definite electrical units, its sedative effects were overlooked, its cataphoretic power was ridiculed, its influence on nutrition was unknown. Now, with an increasing knowledge of electrical phenomena and a wider conception of biological

physics, with electricity in many new modalities at hand to help us, as well as a vastly improved instrumentation, the scope of electrotherapeutics has widened and its procedures have become more exact. Its usefulness is no longer limited to diseases of the nervous system nor its methods to strictly local applications. It now resorts to such forms of general electrisation as have an influence on the nutritive processes and on cell life; and what the physician aims to do by treatment of this kind is so to modify the vital activity of cells and tissues as to strengthen their resistance to morbific agencies and to arouse their intrinsic recuperative power. Not less important than the *direct* application of electricity, and with a development much more rapid and striking, are its *indirect* uses for medical purposes. We depend upon it for the production of X-rays, for convenient forms of luminous heat which serve so many useful therapeutic purposes, and for the present at least, we look to it as the source of that cold light, those chemical rays which have proved useful in a variety of conditions that may be said to have defied the therapeutics of ages. Thus, as the field grows wider and more fruitful, isolated individual work is no longer sufficient for its cultivation; organised effort has become necessary, and so this Society in the natural order of events rises up to take the work in hand. There are other grounds, had we time to dwell upon them, upon which this Society may reasonably justify its existence. Thus, we need it for purposes of mutual instruction. If for nothing else, such an Association has become necessary to supplement the ordinary medical education. In the existing state of things a crowded curriculum leaves little room for electrotherapeutics. The student naturally devotes himself to those subjects in which he "must pass." He fails for the moment to see, what he realises to his cost later in life, that to approach the investigation of diseases of the nervous or muscular systems without the aid of electrodiagnosis is to grope about in the twilight for something he might look for in the light of day. Neither is he in any better plight with regard to electrotherapeutics; he finds that his patient wants not only a diagnosing Doctor but a *curing* Doctor. However, be all this as it may, it has come to pass, and perhaps rightly so, that the study of electrotherapeutics has become chiefly a post-graduate affair. We are all post-graduate students, but, even in the case of those whose work lies rather in the future than in the past, life is too short to make it possible to travel to the ends of the earth, or even to go the rounds of the London Hospitals, to study progress or to search after new things. Neither is it necessary now. Let us hope that all that is new, or at least all that is true, will find its way to this Society.

The fact that the subject now appeals to a comparatively large number of medical men is another of the causes which has called this Society into existence. They recognise the work that is being done by such Associations on the Continent and in

America, and they realise the fact that medical men in England must wake up and be prepared to take their part in an interesting and remunerative field of work in which, hitherto, they have been sadly behindhand. Nothing is more certain than that therapeutics, whether electrical or otherwise, can only be dealt with by a strictly medical society; nothing is more certain than that the subject upon whose threshold we stand to-night contains within it a vast variety of work waiting to be done; nothing is more certain than that the duly instructed medical man is the only one competent to do it.

Mr. HALL-EDWARDS (Birmingham) then exhibited some instruments he had designed for the treatment of gonorrhœa, in the male and female, and leucorrhœa, by means of the high tension current from an Oudin resonator. The male instruments consisted of a short, straight metal bougie for the treatment of gonorrhœa in its early stage, and an ordinary curved instrument for the treatment of the later stages of the disease. The female instrument consisted of a nickel plated vaginal bougie, of such a size as to completely dilate the vagina. All the instruments were supplied with long insulating handles, from which they could be unscrewed for the purpose of sterilisation. Mr. Hall-Edwards's experience in the use of the instruments was not of sufficient length to enable him to speak positively of the results; but the results already obtained were so promising, that he had no hesitation in bringing the instruments to the notice of the Society.

In reply to questions, Mr. Hall-Edwards said the appliance shown was for treating early cases of gonorrhœa. He had not used it for cases of chronic cystitis in women, but hoped combined results would be forthcoming. He had tried it on himself, his own uvula and tonsils, before using it on a patient. If carefully applied it was painless, but it must not be made to spark. It should first be placed in contact with the tissue and then the current turned on, and the current should be switched off before removing the electrode, or sparking would ensue. The primary of a d'Arsonval or Tesla should never be used.

Dr. HORACE MANDERS said one of the main points in diagnosis between gonorrhœa and bad leucorrhœa was, that the urethra was affected in gonorrhœa. He preferred to use a glass tube with an electrode at the end, exhausted; and by that means he obtained the best results. It also was less apt to spark. The difficulty was, that in a moist vagina sparking might occur because of the great force used. He therefore suggested that a vulcanite shield should be added, to prevent sparking back. It would also be improved, he thought, by using a longer handle.

Dr. HERSCHELL, in demonstrating the Modern Compound High Tension Induction Coil Apparatus, said: One of the avowed objects of this Society being to extend the use of electricity by

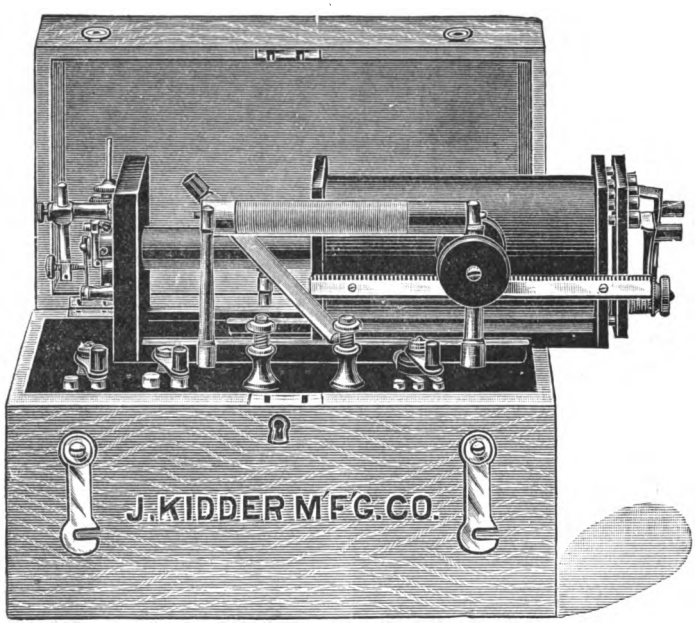
medical men in their daily practice, it follows that some of our members must of necessity be comparative beginners. For the benefit of these, it has been decided that each of our meetings shall include a demonstration of an elementary and practical nature. It has fallen to me to give the first of the series, and I have selected as my subject the modern high tension induction coil apparatus, because it is the most generally useful piece of apparatus which a medical man engaged in general practice can possess, and for this reason probably the first that will be purchased.

The quality of current produced by the secondary of an induction coil will depend upon the number of turns of wire. The oftener you can cut the magnetic lines of force which surround the central iron core, when it is converted into an electro-magnet by the current circulating in the primary coil, or in other words, the greater the number of turns of wire, the greater will be the voltage of the current produced. At the same time the amperage will be proportionally reduced owing to the resistance offered by the length of wire. It is obvious, therefore, that the currents produced by coils of different length and thickness of wire will have different therapeutic effects. Such apparatus has hitherto been constructed with at most three different coils, which could be substituted for each other, but these are far behind the modern compound coil of which the Kidder coil shown to-night may be taken as a type. This instrument contains in its secondary coil the following windings: 1,000 yds. of No. 36 wire, 500 yds. of No. 36 wire, 500 yds. of No. 32 wire, 300 yds. of No. 32 wire, 154 yds. of No. 21 wire, 84 yds. of No. 21 wire. These windings are connected in series but tapped in such a manner that they can by means of a compound switch on the end of the secondary coil be used singly or in various combinations, giving in effect twenty-one distinct coils. The operator can thus select the one, the ampèrage and voltage of which is exactly suitable for the treatment of the case in hand.

The 1,000 yards of No. 36 wire will glow a Geissler tube, and with the whole series of wire coils in circuit, stratification may be readily obtained. The glowing of a Geissler tube offers a ready method of testing whether any given coil is adequate for the production of the sedative effects of the high tension induction coil current so useful in gynæcology and in the treatment of hyperchlorhydria. A coil which will not glow a tube has a greatly restricted field of utility, as with it only surface stimulation of the skin and contraction of superficial muscles can be effected. It is absolutely useless for all nutritional and sedative effects. Of such a kind unfortunately is the small coil usually of German make seen in the hands of nurses and masseuses. With the E.M.F. of one or at most two cells, no rheostat or means of graduating the current in the primary circuit, with a rough and irregularly acting interrupter, it is quite obsolete and useless for all purposes of practical therapeutics.

Dr. Herschell then demonstrated the fact that a clear idea could be obtained of the variations of ampèrage and voltage in the different coils by connecting the terminals of the apparatus with the ear-piece of a telephone. As the greater length of wire was brought into circuit the volume of sound diminished, showing the diminished ampèrage due to the resistance of the wire.

The PRESIDENT: With reference to the demonstration which has just been given, and anticipating the one which is coming next, I am glad to see that the induction coil occupies so



prominent a place in the proceedings of this our first working evening. An old friend like the medical induction coil is apt to be overlooked amidst the multiplicity of new modalities now available for electrical treatment. But this old friend, as introduced by Dr. Herschell to-night, comes to us in a new and glorified form. The instrument before us is certainly one of great power and capability. For my part I must say that when I once get into the mazes of these long secondary windings, with the far-reaching effects of self-inductance before my mind, I feel very considerably bewildered as to what will be the eventual nature of the output between the terminals. In such cases the only thing to do is not to attempt to reason, but to *try*. I am sure, from what I have seen of this coil, that it would come out of such a trial very creditably. What is a medical induction coil expected to do? Speaking broadly, the ordinary

worker wants it to produce (1) muscle-contraction; (2) stimulant or "revulsive" effects; (3) sedative effects. For any of the purposes named one or other of the "tappings" of this coil would doubtless prove satisfactory if properly handled; but I want to lay emphasis on the fact that many other points than the mere instrument must be taken into account to secure a given physiological effect, and this even if the inducing current be kept uniform and the number of interruptions kept even and steady. We must carefully select the electrodes as to character and size, for these determine the density of the current, and largely influence the pain and the penetrating power. For instance, if the current taken from one of these terminals be applied with high surface resistance, that is to say, with small metal electrodes and dry skin, such a current would be found to be painful. Applied, however, with low surface R. by moist electrodes of considerable surface, the application will be painless, notwithstanding the strong contractions produced. Thus it is that mere instrumentation alone is not sufficient; the physiological effect must also depend upon the manner in which the current is applied; the electrical and medical knowledge of the operator, and the actual condition of the patient at the time of the operation must also be taken into account. This is where the personal factor comes into play. Electricity cannot be dispensed by merely turning on the switch. It had better be dispensed *with*. There is a tendency at present, especially at health resorts, instead of having electrotherapeutic installations in the consulting room of the physician, to relegate them to the baths, where their administration is presided over by a kind of superior bath man. It is not surprising that in such hands the effects of treatment often prove the reverse of beneficial, and the sooner that medical men and their patients recognise this the better.

Dr. SAMUEL SLOAN (Glasgow) then showed a "Faradimeter," being an Instrument for the Measurement of Currents from Induction Coils for Therapeutic Use, and explained it as follows:—

Having discovered early in my electrotherapeutic practice that no reliance, so far as continuity of action goes, could be placed on the results of treatment by means of the Faradic or Induced current, it occurred to me that this might be due to the impossibility of measuring the amount given, or even of knowing for certain that there was any current at all in operation. There being no instrument in the market capable of supplying this want I set myself some years ago to design one. The objects aimed at in the instrument were the following:—

(1) That it be able to show the presence and to measure the amount of the current when this was less than a sensitive part of the body, such as the brow, could detect the presence of.

(2) That it be reliable; the same current always causing the

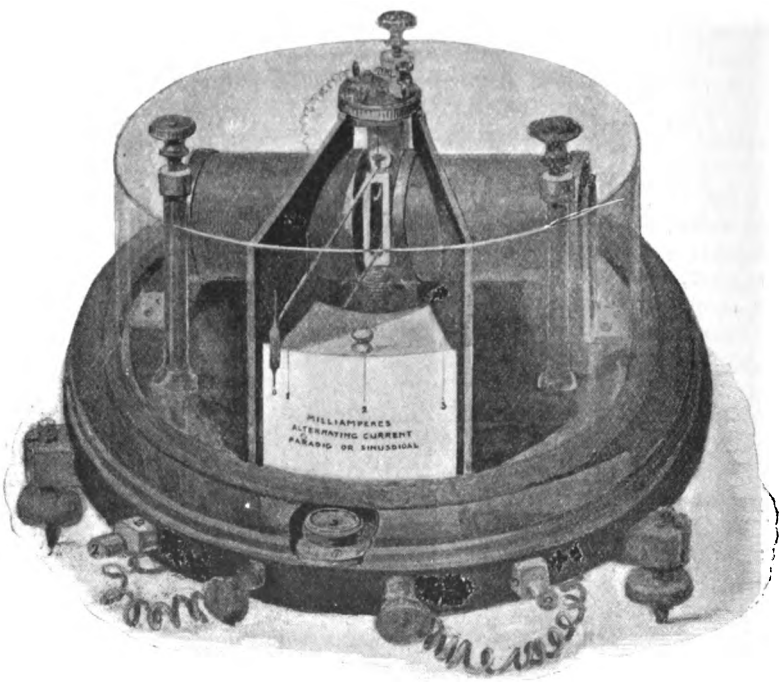
same deflection of the needle, without tapping to coax the needle one way or the other.

(3) That the needle always and absolutely return to the zero point.

(4) That variations of the temperature or draughts of air have no influence in displacing the needle from the zero point.

(5) That parallax be provided against, especially in very small deflections.

(6) That the instrument be dead beat.



Dr. SAMUEL SLOAN'S FARADIMETER, with cover removed (½ nat. size).

(7) That it be independent of iron cores and of permanent magnets.

(8) That the instrument be portable and not require to be placed in the magnetic meridian.

(9) That the resistance be moderate, to allow of a fair amount of current being possible, when the intensity is low.

(10) That the shunts be true for alternating and not simply for continuous currents.

Some of these objects have been more difficult to attain than others; but all the difficulties have now been overcome.

The Faradimeter I show you, is on the principle of the

Electro-dynamometer; but gives direct readings. It indicates instantly any variation in the current. It is composed of two fixed coils, with a rotating coil between them, to which is attached the pointer. All the coils are as close as possible to each other. When the instrument has been levelled the suspended coil is turned so as to bring the needle to any point, which is to be fixed upon as zero, by means of the revolving stage, from which the coil is suspended by about one inch of finest bronze ribbon. If the needle is not absolutely at zero a slight turn of one of the levelling screws will suffice to do this without putting the instrument off the level. Once set, there is no need to repeat this, even when it is moved from place to place, unless some accident happens to it. In this case the revolving stage can be called into requisition again. It is fitted with the means of easily replacing the bronze ribbon and of lowering or raising the suspended coil so as to put it exactly into position. The current is carried off the suspended coil by means of a long spiral of finest bronze ribbon, the halves of this being in reverse directions to prevent displacement of the needle from zero under the influence of changes of temperature on the spiral. The instrument is made dead beat by means of vanes of mica attached to a pointer fixed to the under part of the coil; and to prevent the action of internal currents of air, through slight changes of temperature in the surrounding atmosphere, these vanes are enclosed in a small cell. The indicating needle is also enclosed in a cell, since, though it is extremely fine, some slight deviation from the zero point would otherwise result from its exposure to internal currents, as when placed near an open window. The rotating coil can be easily fixed and kept in this position so as to make the Faradimeter portable, which its comparatively small size renders easy. By means of two shunts the scale can be made to read up to 15 milliampères, the highest reading, I find, required for electrotherapeutic treatment by alternating currents; whilst as low an amount of current as $\frac{1}{5}$ milliampère can be read off on the scale, this being the smallest amount of current required for faradisation of the brain. By one milliampère faradic current, I mean the electro-magnetic equivalent of an amount of sinusoidal alternating current; the galvanometric measurement of whose sinusoidal galvanic equivalent is one milliampère. During calibration only, the earth's magnetism is controlled by a permanent magnet placed at the necessary distance above the coils. Three milliampères sinusoidal galvanic current causes, I find, the amount of deflection brought about by five milliampères from a battery. If a current of definite amount from a battery is passed through a galvanometer and then through the Faradimeter and the deflection noted in each, it will be found, if the current is changed into an alternating one before passing through the latter instrument, that the current in the galvanometer will fall to the medium amount, whilst the deflec-

tion in the Faradimeter will remain as before, thus showing that it registers the maximum current; the galvanometer registering the medium current only. Errors due to parallax are avoided by means of two fine strips of metal rising vertically from the pointer and about an inch apart. The total resistance of the instrument is slightly over 800 ohms. The fixed bobbins have each 250 turns of No. 36 S. W. G. copper wire; whilst the moving coil has about 1,000 turns of No. 47 wire. The wire for the shunts is wound inductively and horizontally immediately below the bronze spiral, so that the currents passing through them may not affect the magnetic field around the revolving coil; and not only are the resistances proportioned to the total resistance of the instrument, but the windings in the shunt coils are also proportionate in number to the total number of windings of the three coils.

I have found this Faradimeter of immense service, and deem such an instrument absolutely essential to the proper therapeutic use of the faradic and the alternating sinusoidal currents.

The instrument has been made to my instructions by Messrs. Baird and Tatlock, Glasgow.

The PRESIDENT remarked that the absence of galvanometric measurement has all along diminished the usefulness of the induction coil for therapeutic purposes. Now what is the measurable element in an induction coil current? If one impulse, say the opening impulse, be sent into an electro-dynamometer and the maximum deviation be noted, and then a condenser be taken of say one microfarad charged to the potential of one volt and its discharge be also sent into the electro-dynamometer and the deflection noted, we now have something definite with which to compare the break impulse of the induction coil current,—but what is this something? It is quantity; intensity multiplied by time, in fact microcoulombs. But physiological effects vary with conditions which only indirectly affect quantity. There are various elements that affect the intensity of the current, that is to say R. of coils, R. of body, size and character of electrodes, &c. The Edelmann "Faradimeter" is another instrument devised for the same purpose. It measures in volts with a given coil, and a given inducing current, on short circuit, but fails when body resistance is interposed. Such a measurement is of course inadequate for our purpose. Now reverting to Dr. Sloan's instrument, what does he measure, and how does he measure it? He measures in what he terms milliampères of faradic current, and he explains that by a milliampère of faradic current he means the electro-magnetic equivalent of an amount of sinusoidal alternating current, the galvanometric measurement of whose sinusoidal galvanic equivalent is one milliampère. That is to say, he measures what a faradic current would be—if it were something else.

That something else is a sinusoidal current which in no way represents the brusque dyssymmetrical rushes of current of the induction coil. I intend, however, to keep an open mind as to this instrument, until I have had the opportunity of trying it in actual work, an opportunity which Dr. Sloan has kindly offered me.

The paper of the evening was then read by Dr. Lewis Jones, on "The Present and Future of Electrotherapeutics":—

It gives me very great pleasure to be addressing an Electrotherapeutic Society in this country. Those who practise medical electricity, few and far between as they are, are apt to feel a certain loneliness, at times, because they so seldom have the opportunity of meeting congenial minds with whom to discuss the various points of practice which are interesting them at the moment. In England we have been particularly badly off in this respect, but I hope that the foundation of this Society marks the beginning of a new era, and that we shall all from henceforth enjoy many instructive and entertaining evenings together for the purpose of discussing matters concerning medical electricity.

Three years ago I had the privilege of attending the Congress of the French Association for the Advancement of Science at Boulogne. The occasion was interesting as being the first time that a sub-section on medical electricity was to meet together under the auspices of the Association. There we had daily gatherings of twenty or thirty members, all keenly interested in electrotherapeutics, and excellent papers were read during the meetings, which extended over a week. I could not help wishing that we should be able to do something of the same kind over here. There is no doubt that the interchange of ideas is stimulating and refreshing both to the one who communicates and to the one who receives them. I myself have felt from time to time that I had some idea which I should very much have liked to talk over with those who were competent to advise upon it and to discuss it with me, and sometimes, merely through lack of such opportunities, the idea has remained a dormant one.

It is now twelve years since I began systematic work in medical electricity, and owing to the rapid progress which electricity has made since then, it is easy to recognise that great changes have occurred, even in that short space of time.

It will be interesting to consider for a moment how medical electricity stood then, and to compare its position with that which it holds now. At that date the treatment of uterine fibroids by electricity, after Apostoli's method, was on trial. The treatment of urethral stricture by electrolysis was in the same stage. Dr. Steavenson, my predecessor at St. Bartholomew's, had just published some admirable papers on the electric bath. To-day the electrical treatment of fibroids and of urethral strictures has practically disappeared. The electric bath, on the other hand, has established its claims to recognition

and now holds a stronger position than it did then. It is useful to consider for a moment why this is so.

Electric methods of treatment, to succeed, must not only be able to achieve a successful result, they must do it more easily or more certainly than the other competing methods. Merely to do as well does not compensate for the introduction of the electrical apparatus, and the time and trouble of learning how to handle it. Apostoli's method has failed, not because it was useless, but because it was unable to compete with other established procedures. The same is true of the electrolysis of strictures. And so it will be found as we go on, that various electrical methods will be put forward, will be strongly advocated by their inventors, will be submitted to a general test by the profession, and will be accepted or rejected according as they meet or fail to meet the primary requirements just mentioned.

Of the things which were firmly established at that date and still hold their ground as firmly as then, I may mention electrical testing. The principles of electrical testing by induction coil and battery current, as built up on a firm basis by Erb, have held their ground indeed, but have not made very much progress since his time; not so much because testing as we have it to-day is perfect by any means, but because of the difficulty of overcoming certain of the obstacles involved. Of these the chief and perhaps the most interesting, is the problem of the measurement of induction coil currents or "faradic" currents. (I hope that Members will note that I am trying to avoid the use of the words faradism and galvanism. These clumsy words are, I venture to submit, quite unnecessary. They are not recognised by Professors and teachers of electricity, nor by electrical engineers, and their use by medical men is apt to give the impression of there being one kind of electricity for doctors, and another kind for the electrical engineering profession, to the disadvantage of the former.) This problem of the measurement of induction coil current affords a field for considerable study, and one which offers a prize to any one who shall succeed. Even the unsuccessful attempt to solve it is likely to do great good to the investigator by compelling him to a close examination of the behaviour of rapidly varying currents in conductors, and of the influence of self induction and of capacity in electrical circuits. The instrument we have seen to-night[1] has the same fundamental defect as several other instruments which have been proposed for the purpose, inasmuch as it measures the mean current in the circuit, whereas the response of the muscles is by no means in proportion to mean current, but rather is in proportion to the maxima, and to the rate of change of current from minimum to maximum. In a paper which I had the honour of reading before the Institution of Electrical Engineers, two years

[1] A beautifully made Faradimeter or electro-dynamometer shown by Dr. Sloan.

ago, I hinted at the possibility of replacing the induction coil by a condenser, in order that the discharges employed for stimulating the muscles should be discharges at a measured voltage from a condenser of measurable capacity. In that way I ventured to say a method of getting round the difficulty would be found. Something of the kind had already been proposed by a Dutch investigator, Dr. J. L. Hoorweg,[1] but much remains to be done. I have myself at the moment some experiments in hand for utilising condenser discharges for electrical testing, which are based upon the method known in connection with the statical machine as Morton's method. Should the results be worth your attention, I shall have much pleasure in laying them before you at some later meeting.

To those who are interested in the matter I would recommend a very interesting paper by Dubois,[2] of Berne, and the chapter on "The Discharges of Tinfoil Condensers," which were written in 1888 by Boudet de Pàris, a talented French experimenter who, unfortunately, died before the completion of the last volume of his admirable book. Certain it is that in the discharges of small condensers we have a means of stimulating muscles with less pain and with less muscular fatigue than is the case with either the induction coil or the constant current battery. Other small points to be noted in connection with electric testing are the "longitudinal reaction," by which is meant the setting up of muscular contraction in a muscle by stimulating its distal end by a current which traverses its fibres longitudinally, and the clearing up of that complication in testing which takes note of the relative strength of the anodal and kathodal closing contractions in health and in disease. This "polar formula," as it is called, with its reversal in cases of the reaction of degeneration is certainly not a constant phenomenon in all stages of that condition, so far, at least, as my experience goes. Another matter which now has to be considered in all comparisons of electrical testings, is the importance of the self-induction of the testing circuit in modifying the results obtained. Dubois has clearly proved that the current necessary for the minimal contraction required to be considerably increased when the testing circuit includes a portion having a high self-induction, and he attributes this to the fact, which has long been well known, that self-induction in a circuit tends to retard the rate of growth of current in the circuit at the moment of closure. Thus the presence of a galvanometer in a circuit has this effect by diminishing the suddenness of the shock to the muscles. Electrical testing is not completely satisfactory, because it does not enable us to distinguish between the reactions which accompany a partly damaged nerve and those which signify a severed one, and it

[1] "Recherche sur l'excitation electrique des nerfs," Haarlem, 1899.
[2] Abstract in Science Abstracts of 1901, p. 178.

cannot yet give clear indications of commencing recovery in a recently sutured nerve. An answer to these questions, so often asked, cannot at present be supplied directly by an electrical test. That is its chief weakness.

A small point which I would wish to draw attention to, as one which deserves further examination, is the remarkable persistence of the reaction of degeneration in certain cases. For example, in infantile paralysis I have on several occasions noted the presence of a typical reaction of degeneration ten, or even twelve, years after the onset of the attack, although in cases of division of nerve-trunk left unsutured, the reaction of degeneration fades away in a much shorter time. This suggests the somewhat paradoxical thought that the persistence of the reaction of degeneration in a muscle implies something short of complete detachment of the muscle from its nervous centres, and at present no explanation can be suggested.

A prominent feature which reveals itself in a review of the past twelve years is the development of public supplies of electricity by electric lighting mains, for this has probably done more than any other thing to help medical electricity. The electric lighting mains have not only given us a source of current without the trouble and expense of batteries, but through them we are able to employ magnitudes of current and high pressures which were not to be thought of a few years ago. The mains have also given us a new type of current, the sinusoidal current, which has been adopted for therapeutic purposes by reason of its great advantages in quite a large class of cases.

At St. Bartholomew's Hospital in the early nineties the maintenance of the batteries was a matter involving considerable labour and expense. Bichromate of potash in large quantities, sulphuric acid, nitric acid, mercury for amalgamation, carbon and zinc in plates or in rods, and sal ammoniac, were all in constant demand. All of these things are now memories of the past, except the last-mentioned salt. The currents from the mains, supplemented by dry cells and a few accumulators for ward work, have now taken their place almost entirely. The amount of electrical energy expended in the department has risen in the same time from a few paltry watt-hours per annum to nearly three thousand watt-hours per month.

Of late years the statical machine has also been taken up anew, and probably it has not yet reached the maximum of its employment. To me it seems still to have latent possibilities that may yet be brought out by patient investigators. The presidential address of Dr. Macintyre to the British Laryngological, Rhinological and Otological Association, is full of significant matter connected with the static machine, inasmuch as he there records successful cases in the treatment by static methods of lupus, of rodent ulcer, and of carcinoma. At St. Bartholomew's Hospital we have several cases of lupus at the

present time under treatment with the static breeze, and the results of them appear to be promising.

Another prominent feature of the electrotherapeutics of the day is the high frequency apparatus. At the present time it is passing through what might almost be called a boom, and various valuable therapeutic qualities are attributed to it. For my own part, I feel that I may perhaps have rather neglected this particular instrument, because for purposes of general electrification I have always had at command the older but well-tried method of the electric bath and sinusoidal current. The results given by that mode of treatment are so satisfactory that I have never been tempted to discard it for the d'Arsonval apparatus, in spite of the fact that the latter is rather easier of application. Besides, there has always seemed to me to be the possibility of fallacy in the basis of the claims made for this apparatus. Reduced to its simplest form, they may be stated somewhat as follows: d'Arsonval, by scientific experiment, succeeded in proving that high frequency applications produce an increased output of heat, an increased expiration of CO_2, and an increase in the urea both in animals and in human beings submitted to them. In a word, he established the fact that the *catabolic* processes of the body can be considerably augmented in this way. That we may accept, I think, without question; but when the inference is drawn for us that the increase of *catabolic* processes implies the setting up of active *anabolic* processes afterwards, we cannot help asking for more direct proofs. In consequence of the observed catabolic phenomena, we were told at the outset that the high frequency apparatus must be good for the whole class of diseases in which there is defective or perverted nutrition, and among these were specially included rheumatism, gout, and diabetes. Experiments upon cases of diabetes with high frequency currents have frequently been reported, but the results have been most disappointing, for although a diminution in sugar during treatment has been established in a number of cases, yet that is not the same thing as a cure of the diabetic condition, and for the most part the cases reported on remained diabetic afterwards. Our attitude must be to ask for more evidence before accepting the position in therapeutics assigned beforehand to treatment by the methods of d'Arsonval. There is one general trophic effect which we must not forget in this connection, and that is an influence in the direction of reducing obesity. This effect may be regarded as much more catabolic than anabolic in nature, and therefore as being much closer to the observed physiological action of this treatment than many of the other things for which it has been proposed. I have myself noted the action of high frequency treatment in reducing the stoutness of one patient, and many instances of the kind have been recorded. The successes which d'Arsonval's methods have won for themselves in medical

practice, as the result of trial and experiment upon actual cases, are in a direction quite different from that indicated by theory. In various skin affections the local effect of the *effluve*, or brush discharge of the apparatus, has been found to be remarkably useful.

In the case of tubercle and tubercular diseases, numerous electrical methods have been suggested in the last few years, and curiously enough the methods have been of the most diverse sorts, for example, sparks from a statical machine to the chest, general electrification, the brush discharge of the statical machine, auto-conduction and other high frequency methods, all have afforded one or more successful cases. But it is too soon yet, in my opinion, to accept with conviction the existence of any real and constant good effect from electricity in these diseases. Different as the modes of treatment are, there is one common factor in them all, and that is the production of ozone, and it is not impossible that the ozone may play a part in the good results obtained. There is room for more work on the use of ozone in pulmonary diseases. A fair amount of literature on the subject exists, chiefly in the writings of French authors, but I am not aware that it has yet been seriously studied in this country. Certainly it deserves attention.

Other changes and improvements of the past few years which may be mentioned here are the disappearance of the old magneto machine and of the brass handles with sponges which were formerly used as electrodes. These things are not quite obsolete even yet, but it is to be hoped that we shall not see much more of them. The galvanometers of to-day are also greatly improved. The dry cell is a boon to medical men for their portable batteries. We have neater electrodes and the use of portable accumulators by surgeons for lamp and cautery instruments has greatly extended the use of that class of instrument. Ten years ago I was often asked to attend at an operation with cautery or with cystoscope and battery. Now I am never required in that capacity. The surgeons have moved with the times and now use those things for themselves.

Attempts have been made to improve the induction coil by fitting it with rapidly acting contact breakers, and by changes in the number of turns in the windings of the secondary wire, or in its diameter and so on. The improvements are mostly what might be called instrument-maker's improvements, and there is not much evidence that they mark any real advances from the time of Duchenne. The requirements of a good coil for medical use have yet to be formulated. When that has been done, it will be easy to design an improved coil.

A field which is much in need of cultivation is that of the treatment of skin diseases electrically. Numerous cases are on record which show that the action of electrical currents upon various forms of skin disease is decidedly useful, and the time is

now ripe for a systematic application of electricity to skin diseases in order to determine its power and its limitations. Obviously, this work must be done by those who make a study of cutaneous disorders, and it may be laid down as an expansion of this particular statement into a general one, that electrical treatment cannot be expected to advance rapidly until its uses for each group of morbid conditions are tested by those who are specially qualified in the class of disease which is to be studied. The electrical specialist cannot be expected to be also specialist in all the branches of medical work. His position is, in a sense anomalous. He cannot be first-rate in all the lines of special work. Applications of electricity in diseases of the eyes or the ears, the nose or the teeth or the chest, &c., &c., ought to be studied by specialists in those subjects.

I hope that our Society will include in its discussions not only those things which belong more immediately to electrotherapeutics, but that it will embrace those collateral branches of physical science which promise just now to have a prominent effect upon the practical therapeutics of the future. For example, we might study with advantage the effect of blue light, which has lately been stated by a Russian observer to have very marked anæsthetic action upon the skin, sufficient to permit of minor surgical operations being done without pain, and the action of ultra-violet light, which is just now being tried by Dr. Hugh Walsham and myself in St. Bartholomew's in the treatment of lupus; and the Becquerel rays. These last are among the most astonishing things of the present time. They appear to occupy a position intermediate between the ultra-violet rays and the X-rays, and are emitted by numerous chemical compounds, and particularly by compounds of uranium, of thorium, and of barium. Doubtless, you may already have heard of the peculiar effects, like those of X-ray burn, which were experienced by Professor Becquerel on his own person as a result of carrying in his pocket a small capsule containing a specimen of highly radio-active material. The radiations of the substance acting through several layers of clothing, and continued only during parts of two days, had the effect of producing a burn, similar to the well-known X-ray burn and corresponding in shape and in size to the capsule which he carried in his pocket. Following this up, other people have observed the same effects, and the importance of this lies in the light which it may in time throw upon the phenomenon of ordinary X-ray dermatitis. The speculations which have been indulged in as to the cause of X-ray burns have not yet resulted in any definite conclusion. We are still not able to settle whether the X-ray dermatitis is due to the X-rays themselves, or whether it belongs to the electrostatic discharge which occurs around the X-ray tube, or to some other associated phenomenon. There is evidence which seems to support either of these two theories, but in the case of

the burns produced by radio-active chemical bodies we have an instance of an analogous condition produced in the absence of all ordinary electrostatic discharges. It is, in fact, a very strong argument that the X-ray dermatitis is really produced by X-ray radiations. On the other side there is a mass of experience which would seem to prove that the danger of X-ray burn is not greatest with the tubes whose output of X-rays is the largest. On the contrary, there is a widespread belief that the X-ray burn is produced much more readily by a so-called soft tube than by a hard one. Moreover, the risk of X-ray burn seems to be largely diminished or prevented by a covering of linen or other fabric, which is quite transparent to X-ray radiations. The radiations of the soft tube differ in quality from those of a hard tube, and it is quite possible that eventually we may be able to say that some X-ray radiations produce dermatitis and some do not. What the future will bring in the treatment of disease by these various radiations is more than we can decide at present. In the case of lupus there are successful results to show, not only from treatment by X-rays, but also from treatment with ultra-violet rays, from treatment with the brush discharges of the statical machine, and of the d'Arsonval apparatus, and from treatment with the blue light of Finsen's arc lamp. I say the blue light of Finsen's lamp, because I think it probable that the light given out by the Finsen apparatus is probably very poor in ultra-violet rays, because of the extent to which these rays are absorbed, not only by glass but also by rock crystal, and considering the various media which are interposed between the source of the light in Finsen's apparatus and the surface of the patient's skin, I cannot help thinking that most, if not all, of the ultra-violet rays must have been filtered out before the radiations of the lamp arrive at their destination. Which of these various methods of treating lupus is the one which is destined to survive is difficult at the moment to say, but I cannot help thinking that the superior power of penetration possessed by the Röntgen rays is likely to give it an advantage in the treatment of all but the most superficial of cutaneous affections. For all we know at present the future treatment of lupus may be by the application of adhesive plasters of radio-active chemicals to the diseased patch.

The treatment of cancer, of course, is the most attractive of all the possible applications of Röntgen rays and other radiations to therapeutics at the present moment. Most of us no doubt have cases in which we are making guarded trials in this direction. It is too soon yet to express any very definite opinion, but it is not too soon to relate any interesting cases which may come under our observation. At St. Bartholomew's we have been entrusted with the treatment of a case of late cancer of the breast, a case of recurrence *in situ* after operation. The patient, when sent to us, had a large open ulcerated wound of the right breast, measuring about four inches in one diameter and five in the other.

Treatment with X-rays was commenced on November 14, and an exposure of ten minutes was given four times a week until January 17, with a few omissions. After a few days signs of healthy cicatrisation began to appear round the margins of the ulcer. This continued to advance until the healing process had extended inwards from the margin for a distance of fully half an inch all round. Curiously, the new epithelium was deeply pigmented. The centre of the wound gradually ceased to slough and appeared to be in process of healing all over. But, unfortunately, the patient being at a late stage of her illness, secondary deposits in remote parts of the body became very disagreeably evident, the patient suffering a spontaneous fracture of both the femur and the humerus, and the X-ray treatment was suspended in view of the hopelessness of the future of the patient. The total number of exposures was seventeen, and it is very important to note that many were made with the ulcerated surface covered by dressing or bandage. Since the suspension of treatment, exactly four weeks ago, the process of healing has gone on quite steadily, and now there is a firm and healthy scar covering the whole surface except about one square inch in the centre. This portion is also a healthy healing surface, though not yet covered over by epithelium. Thus nineteen twentieths of the area of a cancerous ulcer has healed up in three months as a consequence of X-ray applications, and the result is one which obviously is a most significant one. The local effect was splendid, but there was no influence upon the spread of the disease in the remote parts of the body. Indeed, it would have been unreasonable to expect it. We must hope for the opportunity of treating some cases of cancer in the early stage, when the disease is still limited to a superficial part, for when the disease is no longer local, but has implicated distant and deep-seated organs, it is too late to apply X-ray treatment to the original site of the disease. From observations up to date, rodent ulcer appears to be completely controlled by X-ray treatment. Quite a number of cases have been reported by many observers in different parts of this country, as well as abroad, of the successful treatment of rodent ulcer by X-rays; and from its close relations with epithelioma, one may be allowed to hope that simple epitheliomata, such as of the lip, will also by and by be successfully treated by X-rays. These are the points upon which the greatest interest is concentrated at the moment in electrotherapeutic circles, but it will take time to show how far this mode of treatment is likely to be a permanent success.

And now for the scope and aims of our Society. It is probable that we shall be, for some time to come, a small body, but I hope we shall be a compact and united one. We must instruct one another by bringing forward reports of work done, and we must try as far as possible to do our work scientifically. "Measurement, measurement, measurement," must be our

motto. We shall have to try to bring about uniformity in apparatus. We must be able to tell the instrument-maker what we want, and we must not ask him to tell us what we ought to have.

We must be prepared to inform scientific men as to the instruments which they can usefully employ in their investigations. Our Journal must be the medium for putting all our members in touch with what is being done, both at home and abroad. By so doing it will supply a long-felt want. There are numbers of good things described in foreign electrotherapeutic journals which have hardly been heard of in this country through want of such a publication. I would instance Villard's ingenious method of exciting X-ray tubes from alternating mains by means of a high-potential transformer instead of an induction-coil. This apparatus, judging from the descriptions which I have read, is one which might, with great advantage, be studied and employed in this country, not only for its ease and simplicity in working, but also for its singular adaptability to stereoscopic screen methods. Again, there are but few people in this country who have heard of Marie's beautiful stereoscopic localising method.

A very serious matter, which will engage the attention of all of us, is that of the encroachment of unqualified persons upon our field of work. This has always been so, and no doubt will continue so. For example, ten years ago there was a traffic in electric belts which had attained enormous dimensions, so that it was estimated that £70,000 were spent yearly in advertising them. After that the electric bath was dragged in the dirt in connection with massage shops of bad repute; since then there has been a boom in hot-air contrivances, electrical and other. At present the high frequency apparatus is in danger of becoming the stalking-horse of the quack. To-morrow it may be that the curing of cancer by the X-rays will be the vogue. All these things are serious, and difficult to combat; the employment of the physical forces, heat, light, and electricity, for treatment, implies the use of machines and instruments, and the instrument is apt to assume a prominence at the expense of the medical man. Thus it happens that an apparatus is bought by some unqualified person as a commercial speculation, it is put in charge of an attendant, dressed perhaps to look like a nurse, it is advertised freely in every possible way, the patient comes, takes his place at the machine, the switch is turned on, and the attendant has only to stand by and tell fairy-tales of wonderful cures to the eager patient while the machine provides the rest. In some instances, medical men have too thoughtlessly countenanced these new things, and it is only too late that the doctor discovers that he is in danger of finding himself left out in the cold while the institute and the machine attract away his patients from him. At one or two health resorts in this country this kind of thing has already gained a footing. But I cannot

help thinking that the tendency is a dangerous one, and that both the medical man and the patient are much more likely to lose than to gain by the establishment of these institutions. In my opinion, it is very important that we should express our strong views against this kind of thing. So again, with the taking of X-ray photographs by photographers and instrument makers. That is undoubtedly a bad thing for the profession. I was very much struck, on reading Mr. Morgan's Presidential Address to the Medical Society in October, 1900, to see that he expressed exactly the same opinion. He says: "The further development of X-rays to surgery and medicine is a study which I should like to see appropriated by members of the profession. I believe that it is still in its infancy, and that there is a great future before it. But in order that we may obtain the full advantages of its resources, it appears to me that the study must be pursued by men having a thorough medical training and must not be allowed by them to fall into the hands of mechanicians lest its progress as a scientific aid to diagnosis be checked. I heartily commend it as a new form of specialty to those who have time and opportunity to pursue this entrancing study." His views are already amply confirmed. The medical man is discouraged from taking up X-ray photography because he is averse to competition with the chemist round the corner, and X-ray work is languishing a good deal on that account. Not only so, but the taking of photographs by means of X-rays is only the first step. The treatment of lupus by the same persons follows almost as a matter of course, and by no means should the medical profession countenance so serious a matter as the treatment of lupus by any irresponsible person who happens to have an induction coil. With the possibility of the use of Röntgen rays in the treatment of cancer the danger becomes even greater. I have been told already of a fatal case where a patient with cancer died from the effects of X-ray treatment applied by an unqualified person. It is quite probable that many such cases will occur in the future. It would be far better if the profession would resolve to have no dealings with chemists and instrument-makers who engage in unlicensed practice of this kind, and this is a matter upon which this Society may very rightly and properly express a strong opinion.

Much more might be said about the numerous topics of interest connected with electrotherapeutic work, but I venture to hope that in what I have already uttered, there may be matters deserving of serious thought.

We want more earnest workers in the field of medical electricity, and they must be workers of the right sort. Above all is needed a thorough grounding in medical and surgical knowledge, as well as in the technical knowledge of the apparatus. There is too little enthusiasm in this country about electrotherapeutics. Surely there is nothing in it to be ashamed of.

On the contrary, there is a very great deal to be proud of in our special work, associated as it is with the most fascinating of the sciences.

It would be of the greatest advantage to all of us if there were ten times as many workers in medical electricity as there are to-day. There is nothing to be gained by any pretence of exclusive knowledge in the technicalities of the subject. With ten times the number of workers there would be twenty times the amount of work.

Where are the younger men who should be preparing themselves for the hospital appointments of the future? Even at the moment the hospitals of London are hardly able to find men to undertake their electrotherapeutic work, and there are in London to-day, hospitals with medical schools, that actually do not possess any electrotherapeutic department whatever. Can we wonder that patients go to Paris, to Germany, or even to the United States, to seek for electrical treatment.

Vote of thanks to Dr. Lewis Jones proposed by the President, who said: It is suggested that Dr. Lewis Jones' paper be regarded as an opening address, and not subject to discussion. Indeed, it covers such a vast amount of ground that it would be impossible to keep discussion within the limits of the evening's work. We recognise in it not only a masterly picture of present day electrotherapeutics, but also a retrospect and a forecast. I propose therefore, that we simply express our appreciation of it, and our general concurrence in its views, by at once according to Dr. Lewis Jones a hearty vote of thanks.

The PRESIDENT then asked Mr. Edward W. H. Shenton, M.R.C.S., &c. (Radiographer to Guy's Hospital), to read his paper on "A Diagnostic Line about the Hip Joint":—

Mr. PRESIDENT AND GENTLEMEN, — There is so much difficulty in examining the hip radiographically, and in coming to any opinion as to the condition of the bones forming this joint, that the usefulness of the diagnostic point that I am bringing before your notice to-night will, I hope, justify the time taken in its explanation.

Skiagrams of the hip joint and screen examination of this region are often unsatisfactory, from the mere fact that this is the densest portion of the body we have to deal with. It is not so much the actual thickness, but the great density, this part having no hollow viscus to lessen the obstruction to the X-rays, as is the case in the thorax and abdomen. On this account we have at times to be content with the mere outline of the bones of this region, and it is often that the outline cannot be traced much above the middle of the femoral neck. It is in such cases that the knowledge of the relative positions of femur and os innominatum can alone be depended upon for giving us the information we require. This at first sight would

appear unsatisfactory, for the femur can assume so many positions with relation to the pelvis, while the joint is in a normal condition. It was while looking for some constant relationship which would be unaffected by any of the normal movements, that I found a line the broken continuity of which infallibly indicates displacement or trouble in the hip region. This line is formed by the outlines of the upper margin of the obturator foramen, and the inner margin of the neck of the femur. These lines are, of course, not quite continuous, but if connected mentally we have an arch formed, any interference with which at once arrests the attention. Such loss of continuity may arise from any condition that abnormally alters the relation of femur to pelvis. Dislocations, fracture about the neck of the femur, disease of the joint surfaces, or fracture of the pelvis itself may give rise to this imperfection in the normal arch. There are certain instances of trouble in this region which are not made apparent by want of continuity of its curve, such as fracture without displacement, and fracture of the pelvis through the symphysis. Examples of each of these I have here, so that we cannot rely absolutely on the negative evidence. The inability to give absolute negative evidence would appear to be a characteristic of the X-rays. I need only remind you of the difficulty of excluding biliary and renal calculus and fracture of the long bones. I stated before that in many radiograms it is only possible to trace the outline of the femur about half way up the femoral neck. Fortunately, even in such skiagrams, it is usually possible to see an indication of the obturator foramen, and this data will often prove invaluable. In illustration of this, I have brought some radiograms, not selected on account of any photographic merit, but more with a view to showing the every-day application of this line. Nos. 1 and 2 are the examples of unsatisfactory negative evidence to which I referred. No. 1 is a fracture through the symphysis pubis, and here you will notice the line is undisturbed. No. 2 represents an extracapsular fracture in which there is no apparent displacement. In this latter case there was good clinical evidence of fracture, and in the skiagram it is possible to trace its ragged outline, but this diagnostic line is undisturbed. In fig. 3 there is fracture through the pelvis, and in this case the broken continuity of the curve is unmistakable. Fig. 4 is an example, I believe, of congenital absence of the head of the femur. Again, the continuity is lost. It may be noted in this picture how much rotated the pelvis is, especially when compared with No. 5, a quite normal hip joint; and yet there is no material difference in the outlines of the two imaginary arches of the sound side of No. 4, and the corresponding side of No. 5. No. 6 shows the condition markedly, which is better understood by reference to No. 7, a sound hip of the same side in another patient. No. 8, a poor radiogram, is valuable in so much as it gives positive

diagnosis of a dislocation in the right hip joint. Not only was this difficult to ascertain clinically, but the surgeon in whose keeping the patient was, had fully persuaded himself that no displacement was present; and under such circumstances one would not have cared to make any positive assertions concerning this condition save for the presence of the broken arch, which, I am fully persuaded, cannot exist in a mechanically perfect joint. No. 9 is an example of intracapsular fracture, and again the arch is lost.

These will serve to illustrate the practical application of this principle, which I am hoping will prove as useful to others as it is to myself.

A vote of thanks was unanimously accorded to those members who had read papers or demonstrated apparatus.

The PRESIDENT: Now that this Society is formed and fairly on its way, I think we ought to lose no time in expressing to our Hon. Secretary, Mr. Chisholm Williams, our appreciation of the ability and indefatigable zeal with which he has worked in its interests. The labour of organisation has almost entirely devolved upon him; his work is by no means finished, but I propose that for what he has already done we at once record our thanks.

Seconded by Dr. MCCLURE and carried unanimously.

NOTICES.

MEMBERS are reminded that the Annual Subscription (one guinea) was due last January, for the current year.

This Journal is supplied free to members.

FUTURE ARRANGEMENTS.

May 2.—Exhibition Evening.
July 30.—Manchester. October 3. November 7.
December 5.—President's Address.

EXTRACT FROM BYE-LAWS.

"The proceedings shall be published in such a manner and at such times as the Council may direct. A copy shall be forwarded to each Honorary and Corresponding Member of the Society, and to every ordinary member whose subscription is not in arrear. Fourteen days' notice should, whenever possible, be given to one of the Secretaries by any member who wishes to show a clinical case or to make a communication to the Society. A copy of the paper in a form fit for publication in the Proceedings must be furnished at the same time. The paper shall be the property of

the Society for publication in the Proceedings, without prejudice to the author's right to reprint or insert in any recognised medical paper or periodical. In all such cases the author shall state that the paper was read before the Society."

Visitors.

An ordinary member may introduce two medical men as visitors at all ordinary meetings of the Society. Visitors shall sign their names in the book provided for that purpose. On the invitation of the Chairman visitors shall be permitted to take part in the discussions of the Society. The same visitor shall not be introduced more than twice during one Session.

Medical men desiring information about the Society can obtain full particulars from the Honorary Secretary, Chisholm Williams, F.R.C.S.Ed., 20, Bedford Square, W.C.

The third ordinary meeting was held at the Rooms of the Medical Society, Chandos Street, on March 7, 1902, the President in the Chair.

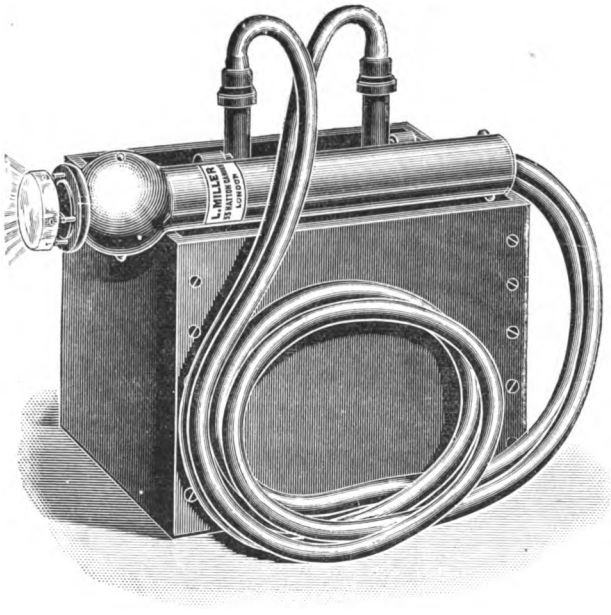
The minutes of the last meeting were read by the Hon. Secretary.

The following were then duly elected members: Drs. Harrison Low, J. A. Codd, R. Cuffe, J. H. Hunter, Brig.-Surg. Lt.-Col. W. Price, Drs. C. H. Wade, G. H. Graham, and E. G. Younger.

Dr. Lewis Jones showed an iron electrode lamp for the production of ultra-violet rays, and said: Mr. President,—This lamp is a simple device for obtaining a very rich output of ultra-violet rays. In connection with the treatment of lupus various forms of light radiations—blue light, X-rays, electric light, and so on, are now being tried. During a series of experiments, using a Tesla coil, we could not help noticing the brightness of the disruptive spark discharge of the condensers used for exciting the Tesla, and at last we managed with Mr. Miller's assistance to arrange this spark for application to patients by protecting the wire conductors by india-rubber tubes. It would take too long here to discuss the whole question of the therapeutic value of the different kinds of light radiations, so I shall confine myself to showing you the lamp in action in order to demonstrate that it gives out a great deal of real ultra-violet light. The fluorescence which it excites in suitable bodies has never been seen so finely before except in vacuum tubes, but with this lamp one can produce the most brilliant fluorescent effects in the open air, so fine is the output of ultra-violet rays. Another advantage which the lamp has is that it can be driven from any apparatus which can charge condensers in the ordinary way. A static machine, an induction coil, or a high potential transformer, operated from alternating mains, charges a condenser, whose overflow gives the thick luminous sparks of this instrument. The

discharging points are of iron, as that metal has a spark spectrum which is rich in rays of high refrangibility, and the metal is also convenient in other ways.

The light of this lamp rapidly discharges an electroscope, and this is a test for the presence of ultra-violet rays. Glass is opaque to these rays, and rock crystal is only imperfectly trans-



parent to them. The most transparent solid body which is handy and convenient is ice, and at the hospital we are treating our cases of lupus with a piece of ice between the spark and the skin to protect them from the heat rays given out by the lamp. It is necessary to have something and the ice keeps the surface of the skin cool, without stopping the ultra-violet rays. I am sorry

that Dr. Hugh Walsham is not here, or he could have told us more than I can of the effect of this lamp on lupus cases, because he has concerned himself largely with this matter. The lamp at any rate represents a new scientific instrument, and one, I think, which will prove useful in many ways.

The CHAIRMAN: We shall be glad to hear any remarks upon this subject.

Dr. BATTEN: I should like to ask, is the condenser necessarily an oil condenser?

Dr. LEWIS JONES: Not at all. The light is simply the light of a Leyden jar discharging between iron points, and the Leyden jar, or condenser, can have any form.

Dr. BATTEN: Have cases been treated for long with this?

Dr. LEWIS JONES: It is about three months since we began to use this form of radiation. We have been experimenting all the time, and I do not think we have arrived at a final form yet.

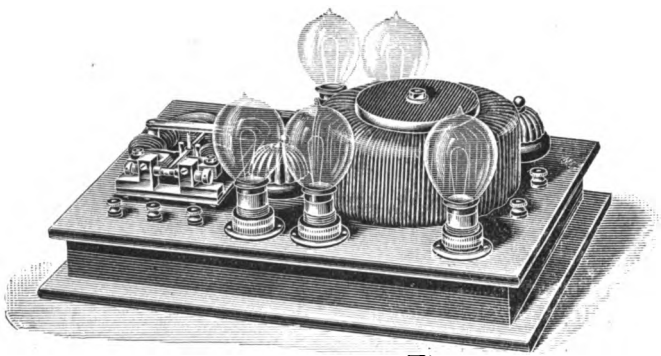
Dr. BATTEN: Do you use it for other cases besides lupus?

Dr. LEWIS JONES: Not yet.

The CHAIRMAN: I am sure the members present are very much obliged to Dr. Lewis Jones for fulfilling his promise, made at our last meeting, to exhibit this lamp to-night. Anything that tends to quicken this cure, or to make it more efficacious, is always welcome. I am confident that if the radiation proceeding from the apparatus now before us proves to be penetrating enough, the ease with which it is manipulated will make it appreciated. While Dr. Jones was making his demonstration, I was thinking of the various and rapid steps that this kind of apparatus has already gone through on its road to perfection. First, there was the Finsen lamp, with its ponderous mechanism, its 80 ampères of current, and its sixty minutes' exposure. Then there came the Lortet-Genoud, with its fifteen minutes' exposure, and its 15 ampères. This was an immense step forwards. Then, I think, almost simultaneously we first heard of the lamp now shown, of one by Dr. Foveau de Courmelles, and of one by Dr. Bang, of Copenhagen, with iron electrodes, using 5 ampères and 40 volts, and covering a very large surface. Dr. Schall's lamp and the "Dermo" of the "Sanitas" Company, Berlin, must also be enumerated. One of the latest devices I see is the use of the partly exhausted vacuum tube, the "Geissler tube," as a source of ultra-violet rays. A writer, whose name I cannot recall, has just published a paper on the subject, but he does not give any cases; his experience, I suppose, has not been long enough. Perhaps the most interesting and the last of these developments is the use of some radio-active substance, *e.g.*, chloride of radium and chloride of barium (the former forming $\frac{1}{10000}$ part of the mixture), employed by placing between celluloid plates and laid upon the surface to be treated. It is evident that much is being done to make the treatment easier and more efficient. By improved methods exposures are shortening, procedures are becoming simplified, and a greater penetration is being obtained.

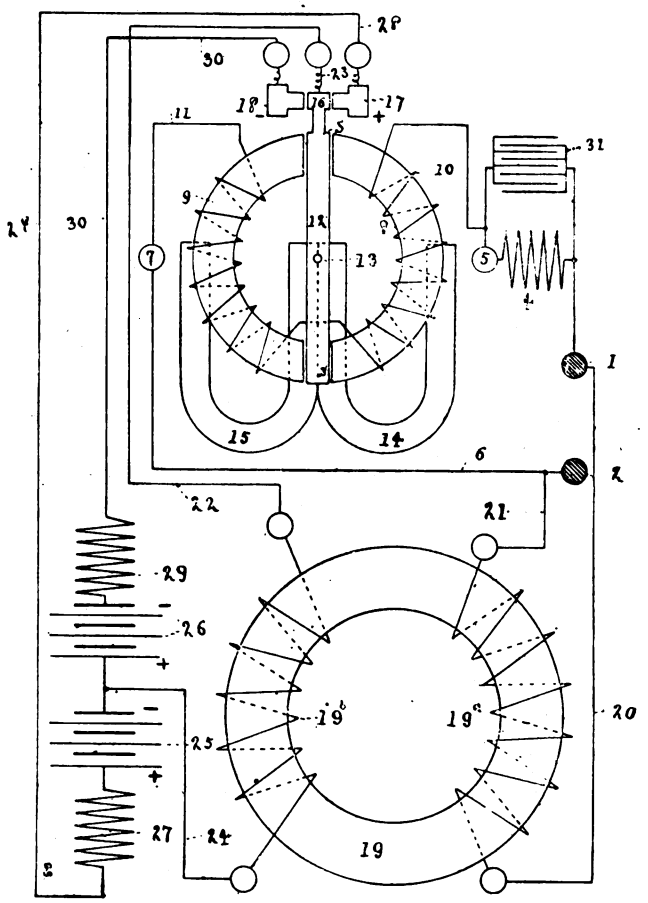
I now ask Dr. Batten to show his "Rectifier."

Dr. GEORGE B. BATTEN then showed his "Rectifier" and said: Mr. President and Gentlemen,—Some couple of years ago I had the alternating current put on at my house in Dulwich, and I thought I was going to do my X-ray work very much more easily than I was accustomed to do it from accumulators, which I had to take a mile and a half to get charged, and as they weighed about half a ton it was rather difficult to transport them. I tried to find a rectifier for producing a constant current, or uni-directional current from the alternating, and I found there was practically nothing in the market under a rotary converter, which cost £45, and required a man to look after it. I worked



the X-ray apparatus with the alternating current and it was very bad for the tubes, as some of you will know. A friend of mine, Mr. George Sutton, and myself, gradually evolved this rectifier. It is practically a polarised relay such as in its germ is used in the Post Office for re-transmitting messages from one station on to another at a greater power. It consists simply of a piece of soft iron poised at its middle—this is the armature here—and is energised by two ordinary 6d. magnets. It consists of two small permanent magnets, their like poles are together, and we produce two consequent poles in the middle of this soft iron armature. The armature is about 3 inches long, and you have two similar poles here. That is a North pole and that is a North pole (indicating.) This is put between two electro magnets. These electro magnets must be laminated, and the alternating current is put through them, so that each end of the electro magnet is alternately north and south; as the alternating current goes through the magnet, so it sucks this armature with its constant poles backwards and forwards. It sways this synchronously with the alternating current. Then to make that useful you have to put contacts. We use silver contacts, and as the armature

moves backwards and forwards it abuts first on one side and then on the other, and this is so arranged that when the alternations in the main are in a positive direction this always goes over to one side, and when the alternations in the main are in a negative direction it goes to the other. So that instead of one alternating current you get two uni-directional currents, that is



to say, this armature which moves backwards and forwards is made part of the conductor, the current is carried through the main through the transformer so that you can get it at any voltage you wish. It is then carried by two little flexible wires, so that the main current is carried to this little armature, and it gives negative impulses and positive impulses to each side of these stops. From the right hand stop you take a circuit to any apparatus you want, such as accumulators ; from the positive

side you take a wire to the positive end, and from the negative side you take a wire to the negative end, and you take a wire from the middle of the accumulators. Suppose you have four accumulators on one side and four on the other, you take a wire from the junction between them back to the other main, so that instead of a current represented by a sine curve which first rises up to one voltage and sinks to another, you have it cut up into two. You have one phase going through one circuit and you have the other phase going through another; you split the two into two circuits, but you join them through the accumulator, so that instead of getting one current which is going in two directions you have two currents, one going one way and then the other in the other way, and you can use these currents for any apparatus which any uni-directional current will work. Its primary object is to charge accumulators (Experiment). This is now only driving the armature, and one can tell by the note it makes what is the number of alternations per second the dynamos in the circuit are making. Now this evening a very peculiar thing happened. This is a very peculiar current in this hall. It is usually 50 volts and 50 alternations per second. Now while we were getting this apparatus ready they suddenly jumped the number of alternations from 50 to 100, and so altered the note of this. The alternations are now 100 per second or 6,000 per minute, in other words, this little armature goes across the space 12,000 times per minute, and it does not matter to this instrument a bit what the number of alternations are. Suppose the alternations in the main are altered, this alters with it; and it really does not matter what voltage you have. You must, however, wind the transformer to suit your higher voltage, otherwise it does not choke back and you burn your fuse, as happened to-night. Now when one wants to charge accumulators you turn on the current from the main. If you turn the current straight on, the accumulators having no resistance you might get 50 ampères, which would burn your fuse, therefore it is very convenient to put in lamps as resistances. Here we have high ampèrage lamps arranged to work at 25 volts and 50 candle power, so that a lot of current goes through. The current from this lamp goes to this wire, and the current from this lamp goes through the other wire to the positive end of the accumulators and they both come back to here. (Indicating.) Now it is working without any sparking at all, because it is arranged in a special way. If you put the current you are driving the armature with and the current you are charging with at the same phase, the driving current would have to have risen to a certain voltage to get sufficient magnetic moment to get the armature to move, and that involves a time element; the charging current would also have risen before that armature got across, and the voltage being high, there will be a spark, and the more so when it breaks because it will break at a position of high voltage. Now we have

got over that by an ingenious and simple device, we put that lamp in. You see it stops working when I take that out. That lamp has a very high resistance—5 candle power, 200 volts. Across that we put a condenser, not a very large one, but an ordinary cheap tin-foil condenser which is made to balance it. Now the effect of that is to accelerate the phase of the driving current. To use an illustration, it is like emptying a tank a little quicker than you fill it. Therefore, the current that goes through the driving is ahead in phase of the current that goes through the working, and therefore the armature gets across before the current in the main arrives, and therefore it has already made contact at a point low down on the sinecurve, and as there is no voltage at that particular moment there is no sparking, and you do not waste current at all. We find that this polarised armature is not new. When my friend went to take out a patent, he found it had been done before; but previous patents never worked properly, simply because they did not accelerate the phase in the driving current. Now self-induction retards the phase and you have simply to head off the point, the driving current being so much ahead of the working current that the armature makes contact at a point of no potential. I suppose, theoretically, that this is practically impossible, but practically, contact is made at such low voltage that there is no sparking. The first instrument of this kind was finished more than a year ago, and I have kept eighteen 40 ampère hour accumulators charged for a year with this instrument at my house. And there is another point I should like to mention—the ordinary way of charging accumulators off a direct current main, of say 100 volts. If you want to charge ten accumulators off a 100 volt current, you have to put in 100 volt lamps and charge through them. Now the accumulators get 20 per cent. and the lamps 80 per cent., and you have to pay for the 100. With this rectifier you want still, we will say, to charge ten accumulators, and you transform, by building a little transformer like this is—which is very cheap—your current down from 100 to 25, not to 20 but to 25. This instrument splits that. You see the voltage as represented by the height of those two curves—from there to there is 100, each side is a half—but we transform it down to 25, so that this only rises to a voltage of $12\frac{1}{2}$, and that sinks to $12\frac{1}{2}$; that is only $2\frac{1}{2}$ above the voltage of the accumulators, so that the accumulators are getting 20 parts out of 25, or 80 per cent. And further, you are only paying for the ampèrage that goes into your transformer. One ampère at 100 volts will give you nearly 4 ampères at 25 volts, so that you will be getting 4 ampères into your accumulators and you are only paying for one. Now that is about eight times as cheap as working off the direct current; and when you have a 200 volt direct current to charge with, of course the comparison is still better for an instrument like this. This instrument has been at the rooms of the General Electric

Company more than three months, and it has worked, charging small accumulators, for eight hours a day. Now if you are content to charge small accumulators and to use a small ampèrage, say up to 2 or 3 ampères, you can go to bed and leave it on and your accumulators will be charged in the morning. At home, I am not content to work at 2 ampères; I have large accumulators; I have eighteen of from 40 to 50 ampère hours, so that I put in 5 ampères through the rectifier. Now with 5 ampères, I should not like to go to bed and leave it on, but whenever I am writing prescriptions, or doing any work in the room where this is, I simply turn it on and let it charge accumulators, and it makes that amount of noise and no more. (Illustrating.) Well, that is a musical note; some people like it, some do not. Indeed, one can charge one's accumulators very easily, I think. Now there are other purposes besides the charging accumulators for which we can use this uni-directional current. Instead of an alternating current, we get uni-directional interrupted pulsating currents. Now I beg to suggest, Mr. President, a therapeutic use for this rectified current. Those who have worked, know the effect of the sinusoidal current. I believe it is useful and it is soothing. Now with uni-directional sinusoidal currents, not only would you get stimulating therapeutic effects, but you ought to get soothing effects also, because it is interrupted very evenly. You see that note, it does not vary much. It is varying a little now, but that is not the fault of the instrument, it is the fault of the way they are running the dynamos. I can tell at once at my house how they are running the dynamos at Wandsworth, which is five miles away. Now if you went into the room, there, you would hear the dynamo pulsation the same as that instrument is doing. Well, for therapeutic purposes you ought to get good trophic effects due to the chemical electrolytic effect on the body. You also get cataphoresis. That it will produce chemical effects I have practically proved, because you can put it through a person. I have done it through myself. If you try it through yourself with pole finding paper you will get red on one side of it, so that it shows if it can produce chemical electrolytic effects in the paper, it ought to do so when it is going through one's self. There is no break except where the phases alter. Practically, when you are using it for therapeutic purposes like I am now suggesting, you get a current which is a succession of rising uni-directional pulsating phases with exactly equal intervals in between; they are always regular and they are very quick, a good deal quicker than the ordinary interruptions of a therapeutic coil. I have tried it through myself, I have not tried it on any patient, I have not had time for one thing, and I find that with from 8 to 20 volts and about 3 to 5 milliampères it is rather pleasant. I have not tried the electrolytic effect through a voltameter. It is not so great, because the voltage in a direct current keeps at the top all the time, so I should like if anybody has

really an opportunity to work this thing, that they would really give that idea a trial. I think a rectified current is quite new in therapeutics. Now so much for that instrument, and that is for charging accumulators and for driving direct current motors, and for the purposes I have now stated.

There is one other point about it which a remark of Dr. Lewis Jones at our last meeting struck me—he said that Professor Villard, in Paris, was working X-ray tubes with a rectified current, and he has invented a thing like this, only it is tuned. Each of his instruments have to be tuned for each periodicity. I simply put this through a transformer like Dr. Jones showed you with his lamp, transforming it from 50 up to 6,000, and I get a very nice three-quarter inch uni-directional spark from it. Now multiply that a little bigger, and one will get a uni-directional spark which will excite an X-ray tube beautifully steadily. There is no interrupter, there is no condenser, there is simply a high tension transformer. Coils are usually very poor transformers; they waste a great deal of current, and though I think there is something in that, it is only another suggestion. Now that is all with regard to this instrument. It is really a very practical instrument, because I have had a year's experience with it, and I find it is easy to work—you simply turn a switch and the thing goes—an occasional fine adjustment of the contacts is all that is ever necessary. Oh, I wanted just to show you this. This is some pole-finding paper, and it shows red on the negative side. (Experiment.) This piece of paper is not very wet, but I think you will see there is absolutely no colour on one side and there is a brilliant red on the other. If you once connect up your instrument and have once found your pole, it will never alter, unless you alter your connections with the main. Now with a slightly modified rectifier we get an interrupter—and this has only been finished in the last few weeks, but I have been using it for therapeutical purposes with very good results. The armature is simply increased in length at one end and the other end is balanced with a string, and when you turn the current on exactly in the same way, as this little armature jigs backwards and forwards, so does this longer one; it has exactly the same movement as this. If you look you will see it has the same bit of mechanism, but this, by being longer, has greater amplitude, and you use that to let it dip into the mercury. With this you want to make it break contact at higher voltage, so we do not take any trouble to make it keep time; we simply let it vibrate in its own way and its own time. And as this sine curve will show (referring to diagram), you will find, if you take the top third, it will occupy more than two-thirds of the time; if you leave it to itself, probably that will come out of the mercury in this upper part, and therefore you break circuit high up in the voltage. So it does away with a great deal of trouble in tuning the instrument.

Now you take the current from the main in the same way, you put it through a transformer and you get it at whatever voltage you want. In this hall the voltage is only 50; we want more. You take it direct to the coil, you take the terminals provided on your coil for an interrupter, or if it has a hammer interrupter you put it across the hammer, and the current goes here along the arm and the other dips into the mercury. Well, of course, when this little piece of copper wire at the end of the armature arm, which is chisel-shaped at the end, is dipping into the mercury, it lets the current go through the coil, and when it is out of the mercury it stops it, so that you get a sufficient interrupter, which makes no more noise than you hear. If you compare the noise of this with what you heard just now with the hammer break, I think you will come to the conclusion that this is a quiet interrupter. I am now working an X-ray tube straight off the alternating main of this hall, solely by the use of this instrument alone. You are simply working through a transformer on to the coil, and so on to the tube. This ammeter is simply to show the amount of current going through. If you want to produce a greater current through the coil, you either raise the level of the mercury and let the wire be in the mercury longer, or you put a higher voltage into your coil. At home I always put about 70 volts into the interrupter, that is, 35 on one side, into the primary of the coil, and you do not pay for the other part of the current that you do not use. For therapeutic purposes that is a consideration. I find a heavy tube working on a lupus case runs accumulators down very quickly, but with this you can let it run for an hour at a cost of twopence. You notice it is a little fitful, because the voltage I have at my disposal here is very low. You also notice the rhythm of that, I mean there is a sort of extra wave in it apart from the periodicity, that is partly the instrument and partly the dynamo. If any of you were at the Röntgen Society last night and heard that electrolytic break, which was like the shriek of an engine, I think you will appreciate this form of interrupter. The price is £10 10s., gross, from the General Electric Company, Queen Victoria Street, who have kindly lent the coil. This instrument as it now stands here on this table is so arranged that it requires no brains to work it; you have simply to turn on the switch, and your accumulators are being charged; you turn it off and the thing stops. But for myself I prefer to have a transformer which is tapped in several places, so that I get any voltage I like from 4 to 136, and I can use it for two purposes at the same time.

Dr. LEWIS JONES: What is the best E.M.F.?

Dr. BATTEN: As little over the E.M.F. of your accumulators as you can get. You want about 20 per cent. over. I have now seventeen accumulators charged by it, eight one side and seven the other, so one side would require 14 volts and the other 16

volts, and the two together come to 35 volts, and I charge them from 44 volts. There is a very peculiar thing about that. Theoretically, the accumulators ought, at the low part of the phase, to be charging backwards, lighting your lamps backwards; but practically I find that does not occur, and I think it is because the current is pulsating it sets up some self-induction which prevents that occurring. So that you can work economically within about 20 per cent. above the voltage of the accumulators. I may say I often work it at 5½ ampères at 50 volts—5½ ampères each side.

The CHAIRMAN: Has any member any further question to ask Dr. Batten, or any remarks to make?

Dr. LEWIS JONES: I am sure we must congratulate Dr. Batten upon the success which he has made of his rectifying device. It seems to me to be a really useful and desirable thing. The problem of obtaining a continuous current from an alternating one is one that has interested me for a long time, because I have always lived in places where the current was alternating. I have seen most of the proposed rectifying contrivances, but many of them have some drawback. The great advantage of Dr. Batten's machine is that its moving part is so simple that, as he says, it can be left to work unwatched all night without any fear that it will wreck itself before the morning. Another important point is that it is economical in working, as he has told us. I think that is a very decided advantage, and I think it may prove a better thing than any rotating converter at present devised. To be of general utility a rotary converter must be capable of being set in action without trouble, and that is a difficulty with them at present; then they are moving mechanisms requiring oil, having a tendency to stick, to fall out of step and suffer damage, to overheat, and generally to want supervision, whereas this little contrivance should be able to run smoothly for long periods of time. To come to a little matter, I noticed that Dr. Batten, to prove to us that his rectified current was uni-directional, used some pole-finding paper to show the chemical effect. When a pole-finder is necessary I would recommend litmus paper. I do not see any need of special pole-finding paper for medical men who have litmus paper always at hand. Litmus makes a beautiful pole-finder.

Dr. BATTEN: Would you mind telling what colour it gives?

Dr. LEWIS JONES: Yes, the positive pole liberating acid makes a red spot on litmus paper, the negative pole liberating alkalies makes a blue mark. Litmus is as quick acting as these other special papers used by engineers. To them litmus paper is not very accessible or well known, but for medical men litmus is the thing; you cannot have a better paper; it gives you a test for both poles, while these other papers give colouration only at the negative pole.

The CHAIRMAN: Dr. Batten has shown us an instrument that

will have a wide field of usefulness beyond the range of electrotherapeutics. Its mechanism is simple, we are assured, but I must own myself it is not quite so easy to understand at first sight as I should like it to be. Of course it does not lay any claim to being the first to commutate an alternating current by means of a vibrating armature, that has been done long ago; but up to the present the vibrations of the vibrating armature have lagged in phase behind the alternations of the E.M.F. that caused the current which produces them.

Dr. BATTEN: No, they used to be in the same phase; now we cause lagging in one and acceleration in the other.

The CHAIRMAN: The "lag" is in the armature, is it not?

Dr. BATTEN: It would be if we did not prevent that.

The CHAIRMAN: Yes; I say up to the present time it has been so. The vibrator does not move until the E.M.F. of the driving current has attained a considerable part of its ultimate value. No result can follow its cause absolutely instantaneously, therefore the E.M.F. that causes the current that drives the vibrator is in front of the actual vibrations of this vibrating mechanism. And this instrument gets over the difficulty and gets rid of the spark. The current from the mains that drives the armature is taken through a lamp. The primary of a transformer is also connected to the mains, its secondary giving the current to be rectified. Thus, the lag in phase of the secondary of the transformer behind the primary, compensates for the lag in movement due to the mechanical inertia of the vibrator.

Dr. BATTEN: Then in addition we accelerate the phase of the driving mechanism by putting a condenser across.

The CHAIRMAN: Quite so. The ingenuity of the idea is evident and the convenience of the instrument to us who are on an alternating current light circuit, inasmuch as we can charge our accumulators by its means, is also evident. With reference to using it for therapeutic purposes I do not see why it should not be a very useful current. Its electromotive force curve with its coarsely pulsating phases, is very different from that of an ordinary direct current, but I think it would fulfil certain therapeutic indications.

We will now conclude by expressing our appreciation of the two demonstrations we have had to-night. I propose that we record a vote of thanks to Dr. Lewis Jones and Dr. Batten.

The proceedings then terminated.

THE

Journal of Physical Therapeutics

No. 3. JULY 15, 1902. VOL. III.

PART I.

THE ACTION OF THE DIRECT ELECTRIC CURRENT IN CAUSING PHORESIS, OR THE MIGRATION OF IONS.

BY WM. J. HERDMAN, M.D., LL.D.

AND

VERNON J. WILLEY, B.S.

(From the Electrotherapeutic Laboratory, University of Michigan.)

IT has now been a decade or two since cataphoresis has been employed in electrotherapeutics more or less extensively. Articles and monographs by the score have been written dealing with its practical applications in medicine, surgery and dentistry. But the nature of the process as a physical phenomenon, the relation it bears to other physical processes, has received but little attention by those engaged in the practice of electrotherapeutics. This is made evident chiefly by the fact that little or no mention is made by the writers of these articles of the reverse and inseparable flowing of particles in the solution in the direction of the anode (anaphoresis) which is as demonstrable as the flowing of particles toward the cathode (cataphoresis), and which likewise can be employed as a therapeutic resource when the proper substances are made use of for the purpose.

In view of this fact that certain substances are actuated to seek the anode while others are moved toward the cathode when a difference of potential is established in the liquid in which they are dissolved, or suspended, it would seem that a generic term, as *phoresis*, should be chosen to designate the therapeutic employment of this physical action of a direct electric current, a term which would comprehend in its meaning the moving power of the current in whatever direction upon particles suspended in it or held in solution by it, while the specific terms, *cataphoresis* and *anaphoresis* would, as now, indicate the direction taken by certain of these substances.

It has long been the belief of one of us that the phenomena of phoresis are intimately associated with those of electrolysis, if not actually an essential step in that process, and sporadic experiments have from time to time been made in this laboratory with the view of casting some light upon this relationship.

The various theories of ionisation and the application which has been recently made of these by certain active and influential investigators in the fields of biology and physiology, have actuated us to undertake a somewhat more systematic observation and record of these phenomena of phoresis.

As a preliminary to an account of the experimental research which we have carried on in this line during the past few months we will, for the sake of clearness, refer to certain of the well-established facts of electrolysis and ionisation.

If the two terminals of a battery be connected by a metallic conductor, or by a graphite resistance, a current of electricity will flow through the system without being accompanied by the motion of any ponderable matter; but if the two terminals be joined to two platinum electrodes, and the latter be immersed in water acidulated with sulphuric acid, we find that while an electric current flows through the system, just as before, the passage of the current is now accompanied by the motion of matter and by chemical phenomena. Oxygen appears at the electrode by which the current enters the solution, and hydrogen at the electrode by which the current leaves the solution. From this we learn that there are two kinds of electrical conduction, namely, metallic conduction, which is unaccompanied by material change, and electrolytic conduction, which is essentially bound up with movement of substances in solution and usually with chemical change of matter. Comparatively few pure substances not in solution act as electrolytic conductors, the exception being fused salts. Fused silver chloride, for example, conducts electricity freely, and is itself decomposed during the process.

Pure water can scarcely be called an electrolytic conductor, its conductivity being extremely small, and in the same way pure liquid hydrochloric acid cannot be called an electrolyte; yet a water solution of hydrochloric acid is an excellent conductor of electricity, and undergoes decomposition when the current passes through it.

The conductivity is therefore a property of the solution, and not of either constituent taken separately. Moreover, the nature of the solvent plays an important part in determining whether the solution will conduct or not. A chloroform solution of hydrochloric acid, for example, will not conduct an appreciable amount of electricity, hence we say that the resulting solution is not an electrolyte. Similarly an aqueous solution of sugar, or of alcohol, does not conduct current much better than pure water, and cannot in the ordinary sense be called an electrolyte. On the other hand, aqueous solutions of salts, bases and acids do conduct electricity, and are therefore termed electrolytes.

In this connection it may be well to make a distinction between electrolytes, half-electrolytes, and non-electrolytes. The first class includes practically all salts, together with strong acids and bases, such as hydrochloric, sulphuric and nitric acids,

potassium and sodium hydroxides. The half-electrolytes comprise the weak acids and bases, such as acetic acid, benzoic acid, and ammonium hydroxide. Non-electrolytes are aqueous solutions of neutral substances which are not salts, such as sugar, alcohol and urea. There is, however, no sharp line of demarcation between these classes, the distinction being placed on the degree of conductivity. We may say that electrolytes conduct electricity well, half-electrolytes rather poorly, and non-electrolytes but very little or not at all. Yet it should be noted that while weak acids and bases conduct electricity poorly, their salts are good electrolytes.

When a solution of sulphuric acid in water is electrolysed, the electrodes being of platinum or other resistant material, oxygen collects at the positive electrode, or anode, which is connected to the positive terminal of the battery generating the current, while hydrogen appears at the negative electrode, or cathode, which is connected with the negative or zinc pole of the battery. Moreover, as was observed by Faraday, the amount of decomposition in such an electrolyte is proportional to the quantity of electricity flowing through it. We have, then, a direct proportion between quantity of matter and quantity of electricity.

In order to explain what happens in the electrolyte during the passage of the current we must assume that matter travels along with electricity. Faraday introduced the term *ion* to denote the matter which travels in the electrolyte, and as in each solution matter travels toward both electrodes, the term *anion* was used to denote the matter travelling toward the anode, and *cation* the matter travelling toward the cathode. In the case of dilute sulphuric acid, the hydrogen is the cation, and oxygen the anion. In a solution of a salt the metal, or metallic radical, or that which corresponds to it, is the cation, while the acid radical is the anion. The cations carry the positive electricity and move toward the cathode, or negative electrode (" with the current "), while the anions carry the negative electricity, and move towards the anode, or positive electrode (" against the current ").

The quantitative phenomena of electrolysis are accounted for if we assume that for monobasic acids and monacid bases and their salts each gram ion is charged with a certain amount (96,500 coulombs) of electricity, which it loses when it comes in contact with the oppositely charged electrode. In the case of sulphuric acid (H_2SO_4) there are two positively charged hydrogen ions to each negatively charged SO_4 ion. Hence it is assumed that the gram ion of sulphion, SO_4, carries two negative charges. In the case of $FeCl_3$, ferric chloride, the cation, Fe, carries three charges of positive electricity, since each of the three anions, Cl, carries one negative charge. It will be convenient to indicate these charges by signs, and in some cases to enclose one or both ions in parentheses. Thus

$H_2SO_4 = H + H + SO_4 =$ or $(H_2)^{++}(SO_4)^{=}$ and $NaCl = Na + Cl$

In this way sodium sulphate, Na_2SO_4, would be written

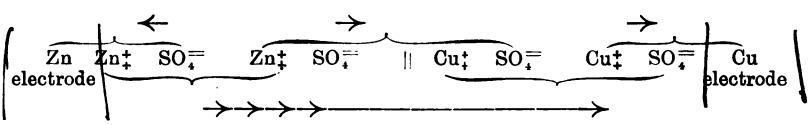
$$(Na_2)^{++}(SO_4)^{=}$$

Neither sodium nor sulphion are capable of independent existence in the presence of water, after being discharged, and are therefore not obtained as the products of electrolysis, but the products of their action on water appears in their stead. The sodium acts on the water with the production of hydrogen and sodium hydroxide according to the equation $2\,Na + 2\,H_2O = 2\,Na\,OH + H_2$. While the sulphion acts on water with the production of sulphuric acid and oxygen :—

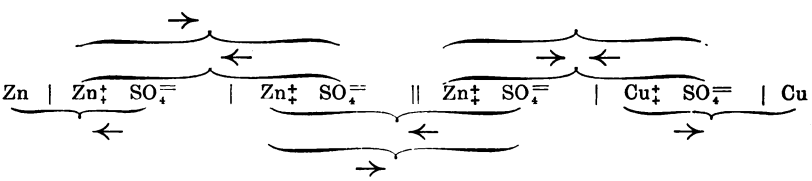
$$SO_4 + H_2O = H_2SO_4 + O.$$

These equations represent the action on water of equivalent quantities of discharged ions, the amounts of hydrogen and oxygen formed by the action being equivalent. According to the above equations, the liquid around the anode should become acid and the solution around the cathode alkaline, which can easily be shown by experiment to be the fact.

In the case of one electrolyte surrounding one electrode, while a different electrolyte surrounds the other, as in the case of a Daniell's battery, we have, by a series of molecular interchanges, or the exchanging of partners of the ions, one substance moving along from one electrode to the other, in its entirety, or as a molecule. The formula of the reactions which take place in the Daniell's battery will make this clear. The zinc electrode is immersed in a solution of zinc sulphate, while the copper electrode is immersed in copper sulphate. The chain of elements is then



The positively charged ions move with the current in the direction of the arrow, and after the first exchange in the ions this becomes



The zinc sulphate travels steadily with the arrow towards the cathode, and the SO_4 ions as they are discharged at the anode attack it, throwing more zinc sulphate into solution, while at the cathode an equivalent amount of copper ions are discharged and go out of solution, increasing the mass of the cathode.

What is important to note here, is that zinc sulphate may by this method be made to travel from anode to cathode as a molecule.

It is presumed that the reader will bear in mind the foregoing facts of observation and the theories that are based upon them in the consideration of what follows, for it is by means of them we have sought to explain the phenomena of phoresis.

A more extended consideration of the details of electrolysis and the behaviour of ions will be aided by referring to any good modern work on physical chemistry or electro-chemistry, such as "The Elements of Electro-Chemistry," by Dr. R. Lüpke, or "Electro-Chemistry," by Le Blanc. We would call attention especially to those chapters in the above works which deal with the Dissociation Theory of Arrhenius, and the experimental work of Hittorf on the migration of the ions.

Experiments.

If we take a solution of methylen blue in water, and saturate with it the absorbent cotton covering of two carbon electrodes attached to a source of direct current of sufficient voltage to produce about 10 ma. of current in the circuit, and then if we place these electrodes upon some convenient parts of the body—as the outer surface of each forearm—and permit the current to pass from fifteen to thirty minutes, we will find at the end of the time specified that the methylen blue has entered deeply the pores of the skin beneath the anode and cannot be removed by washing, while the stain beneath the cathode can be readily erased. The colouring matter migrates as a whole toward the cathode, and is therefore *cataphoric*.

If now we substitute a solution of eosin for the methylen blue upon the cotton covering of the electrodes, and repeat the experiment without varying the conditions in any other respect, we find that the coloured particle of eosin have penetrated the skin beneath the cathode and is irremovable, while it is readily washed from the skin covered by the anode, and thus this substance is seen to be *anaphoric*.

(*To be continued.*)

The Treatment of Malignant Growths by the X-ray.—Under the above title Morton reports the progress made in the treatment of eight cases, and concludes that by this method of treatment there is secured: (1) Relief from excruciating pain and constant suffering; (2) reduction of the size of the new growth; (3) establishment of the process of repair; (4) removal of the odour, if present; (5) cessation of the discharge; (6) softening and disappearance of lymphatic nodes; (7) disappearance even of lymphatic enlargement not directly submitted to treatment, and often quite distant; (8) removal of the cachectic colour and appearance of the skin; (9) improvement in general health; (10) cure, up to date, of a certain number of malignant growths. He finds that the uncertainties and dangers of the method are in the absence of a definite measure of the dosage, the possibilities of a burn, or of gangrene.—*Medical Record*, March 8, 1902.

TECHNIQUE OF HYDROTHERAPY—III.

By Charles J. Whitby, M.D.

The Douche.

In accordance with my intention of describing only those methods which require no complex apparatus, and can therefore be used in general practice, I shall confine myself to the description of the simple but effective system of douches introduced by the late Father Kneipp, of Worishöfen. I believe that by this method most valuable results can be obtained in a large number of maladies of the most diverse descriptions; for in hydrotherapy it is by no means the case that the clinical value of a method varies directly as the complexity of the means employed. It depends far more on the skill and judgment with which the appropriate treatment is chosen and applied.

The Kneipp douches are given with cold water only, and as regards pressure, with no greater force than would be derived by a fall of one or two feet. Where a suitable water supply is laid on, the most convenient method is to fix a flexible tube, two or three yards long, on the cold water tap. The open end of this should be about half an inch in diameter. But Kneipp himself recommends the use of an ordinary gardener's watering-can, because of the smoothness and precision with which the water may be poured on to the required parts. However, the hose will certainly be found more convenient in most cases, as the can should have a capacity of eleven to fourteen quarts, and will therefore be somewhat heavy when filled with water.

The following are the principal forms of douching as practised by Kneipp and his followers:—

(1) *Upper Douche.*—This douche, like some of the others presently to be described, has the great advantage that while producing a powerful general stimulation it does not necessitate complete undressing, and therefore involves but little inconvenience or fatigue. The patient, stripped to the waist only, bends over a sitz or trunk bath, grasping its rim in such a way that the surface of the back slopes slightly from the hips towards the bath; or a stick or board may be laid across the bath, and the hands may grasp the former or rest upon the latter. Raising the can, or holding the free end of the flexible hose-pipe, the attendant allows the water to flow first on to the right hand, then passes slowly up the arm to the scapular region, then down the right side of the back to an inch or two below the costal margin, where a pause is made, letting the water flow here so as to spread evenly in the form of a plate over the back, then across to the corresponding point on the left side,

where a similar pause is made, then up to the left shoulder and down the left arm, to finish at the hand. [Some authorities describe the douche as beginning on the right upper arm instead of on the hand, and finishing on the same part of the left arm.]

If this douche be properly administered there will be no splashing or wetting of the garments, and the water must flow steadily and broadly, spreading out over the part under treatment. The duration of this douche should at first be from one to two minutes, and later from two to four minutes. It may, in cold weather, be preceded by a hot arm bath if necessary.

(2) *Chest Douche.*—This may be prescribed alone, or in combination with the preceding. The patient, stripped to the waist, and with a towel tucked in round the loins to protect the garments, stands at the right side of an ordinary hip-bath. Bending over sideways he grasps with his left hand the left rim of the bath. The douche is applied first near the left hand, then brought slowly up the arm to the left pectoral region, and thence across the front of the chest to that part of the right pectoral region from which the water will spread evenly over the greater part of the chest. Usual duration, one to two minutes. Reaction may be hastened, if necessary, by friction with the bare hand after drying.

(3) *Back Douche.*—(*a*) The patient stands naked in an ordinary flat sponge bath. The douche is applied first near the right heel, then brought slowly up the back of the leg and thigh to the right loin, and thence back to the starting point. The left limb is treated in the same way. Then starting from the left loin, at the highest point hitherto reached on that side, pass slowly up the left side of the vertebral column to the spine of the scapula and down again. Then pass across to the right loin and repeat the process on that side, thus concluding the application. Duration, one to two minutes at first, later, two to four minutes.

(*b*) (Spinal) The patient, sufficiently undressed, sits on a board laid across a sitz bath. The douche is applied to the left loin, thence up the left side of the back, across to the right side, down to the right loin, and then brought slowly up the entire length of the spinal column, resting chiefly at the upper part thereof. Duration, one to two minutes. To be followed by brisk friction after drying the back.

(4) *Knee Douche.*—For this bath the lower garments only need be removed. The patient stands in a flat bath and the douche is first applied to the right heel and thence brought slowly up the back of the leg to the popliteal region, where a pause is made, allowing the water to flow broadly and evenly over the calf of the leg. This process is repeated once or twice, and the back of the left leg is then similarly treated. The patient

now turns round so as to face the operator, and the douche is applied to the right foot near the toes, and thence brought slowly up to the upper border of the patella. The right foot is similarly treated. This douche may last for from two to four minutes, and should be followed by friction and walking exercise.

(5) *Thigh Douche.*—The patient, completely undressed, stands in a flat bath with his back to the operator. Begin at the right heel and pass slowly up the back of the leg and thigh to the right lumbar region, and thence back to the starting point. After one or two repetitions, the back of the left limb is similarly treated. The patient then faces about and the front of both limbs is douched in precisely the same way, the chief pauses being made at the turning points in the right and left iliac regions. Duration, one to three minutes.

(5) *Full Douche.*—The first half of this procedure is precisely the same as the back douche (3a) already described. The patient then faces the operator, and the douche is brought up the front of each limb in succession to the iliac region of the same side, and thence back to the starting point. Then starting from the iliac region of, say, the right side, pass up the right side of the body to the apex of the right lung, thence across to the corresponding point on the left side (pausing on the way at the upper part of the sternum), and thence slowly down to the left iliac region. Duration, two to four, or four to six, minutes.

It may be thought, perhaps, that I have been over precise in the description of these simple procedures. I believe, however, that far better results will be secured by those who take the trouble to follow the above instructions in every detail than by others who may conclude that, so long as cold water be applied, it is a matter of indifference how it is done. "The steadier and more even the flow of the water," says Kneipp, "the more healthy is the full douche. It must not be supposed that you are giving a full douche when you squirt water all over the body in a most irregular fashion."

Indications.—The upper and the chest douche will be found most serviceable in the treatment of chronic bronchial affections and spasmodic asthma. Apart from the immediate bracing and hardening effect, they have a decided tendency to deepen inspiration and to promote expectoration. In many cases, particularly in those of spasmodic asthma, or generally when prescribed in cold weather, they may be preceded by hot hand and forearm baths, given according to the directions previously laid down. It is my usual practice to begin with the administration of the upper douche only, for the first week or so, and then to combine it with a somewhat briefer douching of the chest.

On account of the stooping posture in which these two applications are received, the upper and chest douche may produce

vertigo in subjects of plethoric type, and must therefore in such cases be prescribed with due observance of the immediate effect. They will be well borne by most children, and are an excellent remedy in convalescence from acute illnesses of many kinds. They are also, both for children and adults, well worthy of a trial in the treatment of pulmonary tuberculosis.

The back douche (3*a*) is strongly indicated in cases of neurasthenia, sexual debility, and amenorrhœa. It must be used with caution in the case of patients suffering from hæmorrhoids, as it may cause profuse bleeding. It will also be of great service in promoting convalescence, but should always be preceded by a short course of upper or knee-douches. The spinal douche (3*b*) is indicated in a similar class of cases, but should be preferred for the treatment of very weak persons or those of defective circulation.

The knee-douche is a good remedy for circulatory defects manifested by coldness of the extremities. It is strongly derivative, and may therefore give good results in the treatment of persistent headache, vertigo, etc. Prolapsus uteri and other pelvic derangements of atonic type may also be relieved by its use.

The thigh douche, apart from its powerful tonic effect on the nervous system, has a strong action on the abdominal and pelvic viscera, and may be used with advantage to stimulate the action of the liver or bowels, or to restore menstrual activity.

The full douche is a valuable adjunct to the dietetic treatment of obesity. Generally speaking, it will be better borne by well-nourished individuals than by those of a spare and highly neurotic type. Children bear it well, but it should not be prescribed in any case until the constitution has been in some measure habituated to the strong thermal stimulus of cold water by a course of one of the more localised forms of douches. Morbid conditions associated with general torpidity, defective metabolism, and a slow circulation will be powerfully influenced for good by the action of the general douche.

It should be borne in mind that the immediate stimulation and feeling of increased vigour produced by a general or local douche is followed by a corresponding reaction, and that harm may be done if a second stimulus be applied during this period of temporary depression. Generally speaking, the partial douches (upper, chest, spinal, and knee douche) may be given about once daily, the back and thigh douche about three times in a week, and the full douche not more than twice weekly. Still there are many exceptions, and some patients will easily tolerate the full douche once or even twice daily for a considerable period.

DR. MOLL ON CHRISTIAN SCIENCE.

By Dr. Charles Lloyd Tuckey.

Last July the present writer contributed an article in the Journal of Physical Therapeutics entitled "Christian Science and Medical Treatment," and we now have before us a pamphlet dealing more elaborately with the subject, translated from the German of Dr. Albert Moll.[1]

Dr. Moll is a well-known Berlin physician, and his book on hypnotism and suggestion has had a large circulation in England as well as in Germany. He has studied the development of Christian Science in the country of its birth, the United States, as well as in Germany, and he supplies much interesting information about Mrs. Eddy and her followers.

Newspaper readers will have seen various references of late to the growth of this cult among the upper classes in Berlin, and now the German Emperor has wisely discouraged it. The pamphlet has therefore appeared at an opportune moment, and its temperate criticism will perhaps help to check the further development of a foolish and mischievous movement. As to this desirable result, however, Dr. Moll is probably himself not hopeful, for he contends that people who are impressed by Christian Science are "cranks" who ride every plausible new hobby and theory which offers sensational departures from normal events to death, be it Jaeger's sanitary wool system, vegetarianism, or the Kneipp cure. Dr. Moll says it is not mere accident that we discover most Christian scientists to be inveterate Baconites; and may we add, anti-vaccinationists and pro-Boers?

Dr. Moll looks upon the rise of Christian Science as belonging to the category of physical epidemics which are bound to recur from time to time, and often disappear as mysteriously and suddenly as they arise. To the arguments of reason the believers in such systems do not yield, and to arrive at an agreement with such people is impossible. It is like a discussion between two foreigners ignorant of each other's language. Dr. Moll points out the dangers of Christian Science in that it ignores medical diagnosis, and by confusing serious with trivial ailments leads to neglect and delay which may prove fatal, *e.g.*, in appendicitis, and the early stages of removable cancerous growths.

Dr. Moll attributes the cures he has witnessed of functional ailments by Christian Science and allied physical methods to suggestions in the first instance reinforced by concentration of

[1] "Christian Science, Medicine, and Occultism." Pp. 47. (London: Rebman Ltd.) Price 6d.

the attention in the required direction, and by the emotional excitement produced by the surroundings. He scouts the idea of organic disease being cured by Christian Science or any form of psycho-therapeutics, though its practitioners refuse to draw a line between organic and functional lesions, and do not hesitate to assert that Christ, whose power they claim to possess, made no such distinction. It is no wonder that the clergy of the various churches in America and in Germany, and other countries invaded, are as much opposed to the movement as the medical profession, for in the teaching there is much which strikes the reader as verging on the profane. Dr. Moll challenges the Christian Scientists to produce a single case of congenital malformation cured by them and he explains such cures of alleged organic disease as they claim by throwing doubt on the correctness of the diagnosis. After all, these cures are not more marvellous than those attributed in the advertisement columns of the newspapers to certain syrups and pills.

Though Mrs. Eddy disavows all connection with spiritualism, Dr. Moll shows how in Germany at any rate there is much in common between them. There appears to be a wave of occultism passing over Germany, and he gives quite a formidable list of spiritualistic and kindred societies recently started in Berlin. His experience with spiritualism is that he has never come across a single phenomenon which was not open to explanation by those forces known to reputable science, and the mediums he has come in contact with seem to have been all of the paid and fraudulent variety. In this respect he has been less fortunate than some of the recent investigators of the Society for Physical Research, including men of such eminence as Principal Oliver Lodge, F.C.S., of Birmingham, Professor Barrett, F.R.S., of Dublin, and Professor Hyslop, of Columbia University, whose articles may be read in the Proceedings of the Society of Psychical Research.

It is interesting to note how the scale of fees charged by the Christian Science healer varies in different countries, being probably adapted to the charges made by medical men. Thus in Berlin it is three marks a sitting, but in Hanover only two marks. In London the charge is, I believe, considerably higher. The fees for tuition are, however, the same in all countries, being fixed by Mrs. Eddy at 100 dollars, or £25. In London several retired army and navy officers and others of good social position have adopted this new "profession," but most of the practitioners are, I believe, ladies. Even wealthy and titled amateurs exact fees from all but the very poor, for Mrs. Eddy insists upon the labourer being worthy of his hire, and astutely argues that people value most what they have to pay well for.

PRACTICAL MUSCLE TESTING.

By W. S. Hedley, M.D.

(Continued.)

Reviewing the ground that has been gone over, the two following points have been established:

(1) That the normal muscle responds to electrical excitation whether galvanic or faradic, and whether "direct," *i.e.*, through the motor point of the muscle, or "indirect," *i.e.*, through the nerve trunk, by a short sharp contraction.

(2) With the continuous current the nerve can be excited in four different ways, and to a varying extent. Thus the kathodic closure contraction (K.C.C.), is the strongest stimulus, next comes anodic closing contraction (A.C.C.), or sometimes anodic opening contraction (A.O.C.) and last and long behind the others comes kathodic opening contraction (K.O.C.), which is by far the weakest stimulus.

The law may be formulated thus—

$$KCC > ACC > AOC > KOC$$
$$KCC > AOC > ACC > KOC$$
$$KCC > AOC = ACC > KOC$$

The first of these formulas is the most usual, but we meet both the second and third in normal nerves. This law of normal contraction may be graphically expressed by fig. 1 (after Hoffman), where the non-shaded parts represent the relative strengths of the muscular contraction.

When we interrogate the muscles for information about the motor nervous system, in other words, when electrical stimulation is brought to bear upon muscular contractility, the behaviour of the muscles must be compared with corresponding manifestations on the sound side. In carrying out such investigations the following points may be borne in mind. (1) Stimulation may be "indirect," *i.e.*, effected through the nerve trunk, or "direct," *i.e.*, through the motor point of the muscle. (2) Even in the latter case there is not, as a rule, a strictly direct excitation of the muscular tissue, but in reality an indirect excitation through the intra-muscular nerve filaments. (3) It may be laid down as an axiom in testing neuro-muscular excitability that abnormal reactions are always connected with alterations in the organs examined.

It has been pointed out by Doumer that the many forms of abnormal electrical reactions which have been described ("reaction of degeneration," "myotonic reaction," "reaction of compression," "reaction of the diathesis of contracture," "reaction of exhaustion") are really combinations or groups of elementary or simple reactions, each of the latter being most

frequently independent of one another, and each having its own pathological significance.

That *ensemble* of reactions described by Erb, and known as the reaction of degeneration (R.D.), because it occurs when the nerve is degenerated, is the most familiar. In its typical form it consists of (1) abolition of faradic excitability in nerve and muscle; (2) exaggeration of galvanic excitability of muscle; (3) a contraction which is "sluggish;" (4) inversion of the normal formula, *i.e.*, K.C.C. becomes less than A.C.C. In other words R.D. is characterised by the fact that whilst the faradic excitability of the nerve and the faradic excitability of the muscle are similarly affected, the galvanic excitability of the muscle suffers in a way peculiarly its own. To faradism there is loss of excitability in both nerve and muscle; to galvanism there is loss for the nerve, but increased excitability, inversion of the formula and "sluggish contraction" for the muscle. And of all the signs that stamp the true reaction of degeneration, the most constantly present, the one thing necessary, is the "sluggish contraction."

To follow the course of these changes in their most marked form, consider the case of a nerve cut or bruised; for instance, the ulnar nerve injured in the axilla and stimulated at the elbow:—

Response to faradism.—There may at first be no very apparent change, but in the course of a day or two there is observed a steady diminution of excitability, both in the nerve and the muscle, going on to complete loss, the latter probably occurring about the end of the second week.

Response to galvanism.—Soon after the injury, perhaps in a day or two, there is diminution of galvanic excitability in both nerve and muscle. At about the end of the first, or during the second week, however, instead of the diminution, the excitability of the muscle shows a tendency to become greater than normal, and it may continue to increase to the third or fourth week. Thus the excitability of the nerve growing less and less, and that of the muscle continuing to increase, there has come to be a marked difference in their relative excitability. The nerve probably soon ceases to respond, and on direct stimulation of the muscle there is noticed "inversion of the formula," *i.e.*, K.C.C. is no longer the stronger stimulus (fig. 2[1]). Another change also has been developing. Instead of a short, sharp, well-defined contraction, the muscle displays a reaction which is "lazy" or "sluggish." The condition of exalted "galvanic" excitability lasts for a month or so and then suffers a gradual diminution, while the qualitative change, *i.e.*, the inversion of the formula and the sluggish contraction, remain. If the degenerative changes continue to progress, all contractility dis-

[1] And compare with fig. 1.

appears, the A.C.C. being the last to go, and the muscle ceases to respond to any stimulus, whether galvanic, or faradic, direct or indirect; excepting by a current parallel to the direction of the fibres, known as longitudinal reaction. The latter is the last evidence of any excitability remaining in a muscle, and this also

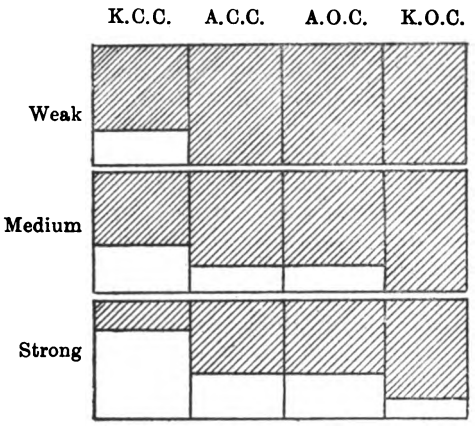


FIG. 1.—The "normal polar formula."

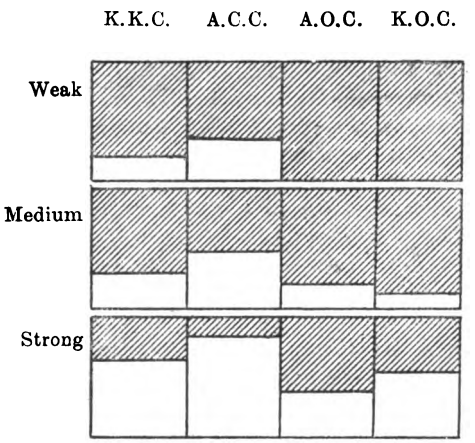


FIG. 2.—Showing "reversal of the formula" in (R.D.).

may eventually disappear. This state of things may be arrived at in weeks or months. If there be arrest and regeneration, returning function first shows itself in an approach to restoration of equilibrium between the action of the affected muscles and their antagonists, and by the effects of gravity ceasing to produce deformity owing to the supporting muscles once more being brought into action. Muscular action in response to electrical

stimulation appears later.[1] But the signs of R.D. in the muscle always persist for a time after the return of sensibility in the nerve.

Return of structure and function may occur at various periods, depending upon the surgical progress of the divided nerve. Cases have been recorded where sensation and motor power have been restored in seven or eight weeks. More probably it may be many months or even more than a year. But no case ought to be given up as hopeless until after a couple of years, and not even then if *any* improvement be in progress.[1]

The different behaviour of the muscle to faradic and galvanic currents is explained by the variations of E.M.F. in the induced current being too sudden to act on the muscle. But it has been pointed out by d'Arsonval that if a condenser of sufficient capacity be placed in parallel with the secondary of the coil, an arrangement which, as we know, has the effect of lengthening the induction wave, contractions are obtained as with a constant current.

The Ice-pack, and its Definite Therapeutic Advantages over other Methods.—Dr. Lester L. Roas claims superior advantages for his method of applying cold. If the temperature of the patient runs above 102·2° F., he is made ready for the ice-pack. If the urine is negative, ʒii. of spiritus frumenti are given before and after the pack. If, however, any trace of renal disorder has been found, plain hot milk is used instead, ʒiv. before, ʒiv. at each change of sheets, and ʒiv. at the conclusion of the pack. The patient lies upon a rubber sheet covered with a blanket. A sheet and a blanket that have been soaked in water at 70° F. are brought to the side of the bed, and as the patient is rolled out of his warm sheets he is rolled into the wet one. One half-hour later, another sheet and blanket, soaked in water at 60° F., is substituted for the first one; again doing this without any exposure at all. At the end of another half-hour the first sheets and blanket are put into water at 50° F., and applied to the patient. At this time the axillary spaces, the arms and the legs, from the middle of the femur down, are covered with cracked ice, packed outside the sheets. This is repeated for the last time with water at 43° F., and the ice, the entire pack consuming two hours. The temperature one half-hour later is always found two to five degrees lower. This pack acts both as a sedative and stimulant. The advantages are avoidance of the sudden shock and rough tumbling of the tub bath or sponge bath, as well as the dislike of the patient to these latter measures; and the lasting effect of the reduction of temperature. The temperature continues to fall after the pack, and remains down for a length of time varying from four to six and eight hours. The author claims that this ice-pack can be efficiently administered by a lay attendant. Its special indication is the hyperpyrexia of typhoid fever.—*Philadelphia Med. Journ.*, March 1, 1902.

---

[1] During the regeneration of a mixed nerve sensibility is restored first, subsequently voluntary motion, and lastly the movements of the muscles when their motor nerves are stimulated directly (Landois and Stirling).

X-RAYS AND THEIR BURNS.

By A. L. Kennelly, Sc.D., F.R.S.A. (Philadelphia).

It was not long after X-rays were discovered that their alterative influence upon the human skin was noticed. The literature of the subject of X-ray burns is already quite extensive. It has been recently summarised with a great deal of skill by Dr. E. A. Codman, of Boston, in a recent number of the *Philadelphia Medical Journal* (vol. ix., Nos. 10 and 11, pp. 438-442 and 491-503).

The physiological action of these rays is, of course, intimately connected with their physical action here considered. In the X-ray tube, under the influence of the powerful electromotive force or voltage impressed at the electrodes, with the aid of the exciting induction coil or influence machine, minute material particles, called corpuscles negatively electrified, are torn from the surface of the cathode and projected in straight lines from that surface. Owing to the very low gaseous pressure within the exhausted X-ray tube, these little projectiles meet with but small obstruction from intervening gaseous molecules, until they strike either the anti-cathode or the glass walls of the tube. The tube is so designed that most of the projectiles shall hit the anti-cathode, which thus becomes the focus of bombardment. The streams of projectiles are called cathode rays. Their speed is believed to be enormous, of the same order as the speed of light. On impact with the anti-cathode the particles are stopped, and a large part of their energy is given up to the anti-cathode in heat, so that the anti-cathode usually becomes red-hot at the focus.

A part of the energy of the projectiles is, however, not given up as heat, but appears in the radiant form emanating as X-rays from the anti-cathode. The X-rays are therefore born at the death of the cathode rays. Where the latter terminate the former initiate. It is generally believed that each impact of a corpuscular projectile with the anti-cathode produces an impulse which radiates out into space, as a solitary ether wave, with the speed of light. These waves differ from ordinary light in two respects; first, in not being rhythmic, and second, in being of invisibly short wave length. If the cathode ray projectiles hit the anti-cathode in rhythmic methodical succession, the X-rays would, it is generally supposed, be indistinguishable from ultra-ultra-violet light. The disorderly rush of the projectiles in uncadenced succession merely produces a series of short-wave individual or solitary light waves. This differs from light beyond the violet of the visible spectrum as does the jangling noise of falling coal in a cellar from the rhythmic beat of a vibrating string producing a musical note.

It seems possible that the physiological effect of ultra-ultra-violet light jangle may not differ, except in degree, from that of ultra-ultra-voilet rhythmic light. If ordinary light possesses alterative power upon the structure of the skin, it would be *à priori* probable that the ultra-ultra-violet light, having a higher

frequency, and therefore more energy than visible light, would possess enhanced alterative power for the same amplitude of disturbance, or extent of vibration. In photography it is the short-wave violet and ultra-violet rays of sunlight that shake up the molecules of sensitively organised molecules and reorganise their structure. It is a similar influence of the ultra-ultra-violet light jangle hypothetically forming X-rays that produces radiographs or skiagraphs on photographic plates.

It might well be imagined then, that X-rays might produce a form of sunburn, intensified as regards an equal amplitude of sunlight, both by reason of the intrinsically shorter wave length, and by the depth to which these rays can penetrate the tissues of the human body without material absorption.

Moreover, X-rays are known to be composite. The wave lengths of the various individual solitary waves they comprise differ considerably, not only with the different X-ray tubes, but also probably in the same tube at any one time. Some of the wave lengths are shorter than others, and would correspond to a higher frequency with reference to rhythmical succession.

These various wave lengths in the general jangle radiate independently, side by side, in the same X-ray beam. Their relative absorptive power and their relative chemical and physiologically stimulating power in all probability differ.

It would appear that a thin shield of aluminium can absorb more of some X-rays than others, and it is supposed that an aluminium shield acts like a filter and is capable of arresting and absorbing the rays that are most likely to produce deleterious influences. At all events, this seems to be the theory of the metal shield as employed in skiagraphy.

X-rays, although at present incapable of definite reflection and refraction, yet radiate rectilinearly from the anti-cathode, and therefore diminish in intensity according to the ordinary law of inverse squares. It is, therefore, reasonable to suppose that the action which produces an X-ray burn is four times less intense at twice the distance from the anti-cathode, and that if the action is truly cumulative in effect, the action will be the doubled distance in quadrupled time. The rule would be likely to error, however, in the immediate neighbourhood of the X-ray tube, or for short distances from the focus, owing to the influence of scattered X-ray foci all over the walls of the X-ray tube from projectiles that hit the walls and miss the anti-cathode.

The chemically disorganising action of X-rays in the tissues of the human body, assuming that the chemical substances encountered have equal stability, should diminish with the depth, partly by reason of the increased distance from the radiant source, or anti-cathode, and partly by reason of increased absorption and attenuation at each successive layer of traversed tissue. The more unstable molecules and compounds would naturally be more likely to become disorganised than the relatively more stable molecules and compounds.

IRON LIGHT IN THE TREATMENT OF LUPUS AND OTHER DISEASES OF THE SKIN.

By Dr. Kattenbracker.

In few diseases has treatment to contend against so many difficulties as in the case of lupus vulgaris, that localisation of tuberculosis which leads to the most destructive skin lesions and produces the most distressing disfigurements. Until recently every attempted remedy had proved ineffective, including cauterization, for after this there remain, even in the most favourable cases, unsightly scars, and the final cosmetic result is by no means satisfactory. With the advent of the method of Finsen, who showed that in the blue, the violet and ultra-violet rays there is to be found a means of treating lupus safely, effectually, and painlessly, hospitals were not slow to adopt it and institutions for its employment sprang into existence. As is well-known, sunlight concentrated by means of large lenses was used, or, in the absence of sun, the light of a strong electric arc lamp, the heat rays being cut off by means of sulphate of copper solution. But the high initial cost of the apparatus, the fact that a special assistant was necessary, the large amount of current (80 ampères) required for the arc, the fact that this large amount of current is out of all proportion to the effective rays, and lastly, the long duration of the sittings, all more or less militated against the general employment of Finsen's method at the hands of the physician, and relegated the treatment to special establishments. To remedy this state of things, Mr. Kjeldsen, an engineer employed in Edison's works, as well as at the Finsen Institute, devised a lamp which with very small current (about 5 ampères), is able to produce such an abundance of bacteria-destroying rays that after applying it for two or three minutes the same therapeutic result is obtained as with the ponderous installation of Finsen. Kjeldsen's idea was to use iron electrodes and in the interior of these to keep water circulating, and the result proves that a cold bacteria-destroying light is produced.[1]

Finsen drew attention to the irritating action of chemical rays: now the lamp in question produces upon sound skin, after three minutes' exposure, and without any great heat, an erythema lasting for several weeks. The following illustration shows the the experiment by which I demonstrated this. On the arm of a healthy man black paper letters were gummed and the "Dermo" lamp was allowed to play upon it for three minutes. The fully-exposed skin became intensely red, while the part under the paper letters, which had not been exposed to the light, remained normal.

[1] The Sanitas Electrical Company, to whom the profession is indebted for much ingenious apparatus, have constructed a lamp, the "Dermo," on this principle. It is cheap and easy to work, and medical men can employ it during the course of the consultation at a small cost and with little loss of time.

In the well-known Aufrecht Bacteriological Institute in Berlin some interesting experiments showing the bactericidal power of this lamp have been carried out.[1] These show that the power of destroying bacteria is about sixty to seventy times as great as with the carbon electrodes. It is not surprising, therefore, that with the aid of such a lamp therapeutic results have been most favourable, not only in lupus but also in a number of other very obstinate skin diseases, such as acne, inveterate eczema, and alopecia. I have already pointed out that every medical man is able, without assistance, to carry out the treatment quickly and effectually, the pressure glass of Finsen having been replaced by the concentrated lens fixed to the tube, and the arrangement has practically revolutionised the light treatment of lupus.

Professor Kromayer, of the Skin Clinic of the University of Halle, has stated that every case of lupus treated with this lamp has shown so much improvement that a perfect cure is probable.

[1] The experiments were arranged as follows: A continuous current of 5 ampères was employed for lighting the lamp, hollow iron electrodes with a central water-cooling arrangement being used. The electric pressure amounted to 40 volts; the distance between the object and the arc-light was 4 ins. The light was *not* collected with a lens.

The test microbes were: *Bacillus tuberculosis*, *B. typhi abdominalis*, *B. choleræ asiaticæ*, *Streptococcus*, *pyogenes aureus*, *Bacterium coli communis*, and *gonococcus*. Gonococcus and tubercle bacilli were cultivated in 2 per cent. glycerine agar coated with sterilised blood, the other microbes in 15 per cent. nutrient gelatine.

The culture media were inoculated with a sterilised feather steeped in an emulsion of the respective microbes in sterile blood serum. All plates, including the control plates which were treated with ordinary light, were kept at 72° F., resp. 99° F.

After forty-eight hours test-tubes were inoculated with microbes taken from

This has been especially notable in a refractory case of lupus erythematosus. In a case of alopecia areata thus treated, by Prof. Kromayer, the growth of hair was in process of being restored. Dr. Stiebel, of Munich, records similar results with the new lamp both in eczema and acute rosacea. Complete recoveries were attained by Dr. Liesse, of Lubeck, in acne and eczema. He says: "It was interesting to watch the speedy improvement in a dry scab on the upper part of the arm of a patient; this had lasted twenty years and was cured after three applications. The lamp also did me good service in two cases of furunculosis." Dr. Below, the Physician-in-Chief of the Red Cross Medical Light Cure Institute, gives in his record of light therapy detailed lists of cases treated by this lamp. In this institution, the first of its kind, which has served as a model for a great number of similar establishments, very favourable results have been obtained in lupus, acne rosacea, obstinate eczema and psoriasis; also in syphilitic ulcers, condylomata, favus and ulcerated hæmorrhoidal nodules.

---

the illuminated portions of cultivations, and kept for two days at a temperature of 99° F.

The subjoined table shows the results of these experiments. To facilitate rapid reference the following symbols have been used:—

2 = luxuriant growth.
1 = diminished growth.
0 = no growth.

Name of Micro-organism.	Duration of Illumination.	Result.
Bacillus typhi abdominalis	1 second	2
,, ,, ,,	3 seconds	1
,, ,, ,,	30 ,,	1
,, ,, ,,	60 ,,	0
,, ,, ,, control experiment	60 ,,	1
Bacillus choleræ asiaticæ	5 ,,	1
,, ,, ,,	30 ,,	1
,, ,, ,, control experiment	60 ,,	2
Bacillus tuberculosis	5 ,,	1
,, ,,	45 ,,	1
,, ,,	60 ,,	1
,, ,, control experiment	45 ,,	2
Gonococcus	1 second	1
,,	5 seconds	1
,,	30 ,,	1
,, control experiment	30 ,,	2
Streptococcus pyogenes	2 ,,	1
,, ,,	15 ,,	1
,, ,,	60 ,,	1
,, ,, control experiment	60 ,,	2
Bacterium coli communis	1 second	2
,, ,,	5 seconds	1
,, ,,	60 ,,	1
,, ,, control experiment	5 ,,	2
Bacterium anthracis	1 second	2
,, ,,	5 seconds	1
,, ,,	30 ,,	0
,, ,, control experiment	30 ,,	1

Reviews and Notices of Books.

AN INTERNATIONAL SYSTEM OF ELECTROTHERAPEUTICS. By numerous associated Authors. By Horatio R. Biglow, M.D. Second Edition. Edited by G. Betton Massey, M.D. (Henry Kimpton, London, 1902.)

The time was fully ripe for a second edition of this book. During the ten years that have elapsed since its first appearance a good deal of fresh ground has been opened in the field of electrotherapeutics. In bulk and general arrangement this edition does not vary much from its predecessor. But it will be observed that its editorship has changed. Dr. Betton Massey is widely known as a lucid and instructive writer—a practical and original worker. How far the book has been thoroughly revised and brought up to date, as its title-page assures us, we leave to its readers to judge after careful perusal. But there are a few points which may be incidentally referred to. Thus, the article on Static Electricity (McClure) stands much as it did, with the exception of a list of new static machines. A similar remark applies to Faradic Current Magnetism and Massage (Engelmann); to Electro-Physiology (Brubaker); to Cataphoresis (Peterson); to Diseases of the Alimentary Tract, Liver and Kidney, Gout and Rheumatism (Rockwell); to Diseases of the Spinal Cord (Morton); to Diseases of the Peripheral Nerves (Leszynsky); to Electro-thermal Surgery (Byrne); to Treatment of Cancer of the Uterus by Electricity (Inglis Parsons). The present writer was under the impression that this special method is an exploded treatment. The article on Disorders of Menstruation (Lapthorn Smith) has not undergone material change; and the same may be said of Disease of the Uterine Appendages (Goelet) and of Electro-physics (Herdman).

There are several additions to Dr. Kellogg's article on "Methods of Apostoli and others," notably a new rationale of the therapeutic effects of percutaneous applications upon visceral or other deep-seated structures. Such a theory is, of course, by no means new or original to the writer in question. It might have been expected that the subject of phototherapeutics would have received some attention seeing the interest it has recently evoked. The therapeutics of the X-ray is amazingly scanty. The treatment of lupus, the only disease noticed in this connection, is dismissed with a few lines and there is absolutely no instruction given as to the *technique* of the treatment. The Galvanic Current, by the editor, contains many features new to the present volume, but these have to a great extent already appeared in another book by the same author.

The same may be said of Dr. Massey's ingenious method of Mercuric Cataphoresis and the excellent article (p. 168) in which he deals with it. It is in the highest degree disappointing to hear nothing of the advances made in high frequency after what the author promises us in the former edition, where he thus writes: "I have recently obtained an apparatus for producing the current of enormous frequency as described by d'Arsonval and shall acquaint myself with the therapeutic value of the current." Ten years have elapsed since this was written, the sound of "High Frequency" is heard throughout the land, and we look in vain for a fulfilment of the author's promise. Is he waiting for another ten years before taking his readers into his confidence? Such a period is by no means too much to test the real merits of High Frequency; but life is short and readers are apt to be impatient.

It will be noticed that many mistakes in the spelling of proper names occur throughout the book, such well-known surnames as Gaiffe and Vigouroux being transformed out of all recognition. If it is fair to judge from minor points like this, and by other intrinsic evidence afforded by the articles themselves, it might be imagined that the latter had not in every instance been submitted to the authors for revision.

THE SECOND VOLUME OF THE REPORT OF THE COMMITTEE OF THE ROYAL MEDICAL AND CHIRURGICAL SOCIETY ON THE "CLIMATES AND BATHS OF GREAT BRITAIN." (Macmillan and Co., Limited.)

This volume deals with the climates of London, the central and northern portions of England, together with those of Wales and Ireland, and is altogether a most valuable volume. The contributors, Dr. William Ewart on London, and Sir John Moore on Ireland, are a guarantee that these parts have had full justice done to them; indeed, if the volume contained no other information than that to be gained from the article on Ireland, it would be very well worth the moderate price of 12s. 6d. which is charged for it. Any one who knows the late President of the Royal College of Physicians of Ireland is fully aware of the magnificent work he has done in connection with climatology in Ireland, and that so keen an observer as he should have written this section is an assurance that everything that is known about the climatology of Ireland has been fully and well set out. At the same time he has not neglected to draw attention to the different points of interest in the neighbourhoods of Ireland, so that one is able to ascertain briefly a suitable place to send a patient to and, at the same time, to take into consideration the attractions, which are so often helpful in producing a return of health, and so valuable an aid to the climate. That it will do much to bring before the notice of English physicians the value of different parts of Ireland as places to send their patients to is certain. Dr. William Murrell deals very fully with the climate on the East coast, and much useful information is to be obtained from his article. In the section on the climate of London and Middlesex, there is an Index of Surface Geologies and Altitudes, with a key to the Index, which cannot but be of the greatest assistance to the busy practitioner, who is consulted as to the particular locality patients ought to live in. There are valuable maps in the volume, statistics as to rainfall, the index is complete and reflects great credit on the indexer (Mr. Archibald Clarke), and the whole volume is well got up; but one notices with regret that the climate of Scotland has been omitted, due to the failure of the Organising Committee in having been unable to secure the necessary local co-operation to produce the report. This is certainly a drawback to an otherwise valuable work.

DYNAMIC ASPECTS OF NUTRITION AND HEREDITY. By Frank Horridge. (Baillière, Tindall and Cox. Crown 8vo. Price 5s. net.)

It is as rare as it is refreshing to encounter a medical book which is the work of a clear and also a profound thinker. The little volume named above belongs to the class which is best characterised by the epithet "suggestive." In its pages the writer attempts, and with no little apparent success, to follow the track of the more intricate and subtle vital phenomena several stages further than is done in the average text-book of physiology.

Succinctly stated, his main position would seem to be that there is in

nervous and metabolic activities a rhythm analogous to that of respiration or circulation. He pictures the nerve-cells as expanding and contracting in unison with the variations of arterial and venous pressure induced by the movements of respiration. When at the beginning of expiration, arterial pressure having attained its maximum, oxygen is forced out of the capillaries into the lymph spaces surrounding the nerve-cells, the expansion of these cells and the oxidation of their molecular constitutents is also in active progress. The molecular movements thus produced cause an increased tension in the ethereal atmosphere which permeates the cell, and the wave of molecular vibration which transmits the effects of this movement along the efferent nerve is associated with an ethereal vibration, which, in the opinion of the author, is in fact the "current of action" of the nerve. Thus the metabolic rhythm of the expanding and contracting nerve-cell is reflected in the corresponding metabolic rhythm of the tissue supplied by the nerve, and the vital processes of the body as a whole are brought under central control. Increased oxidation is, he suggests, always associated with expansion, and diminished oxidation with contraction of the nerve-cell, or, indeed, of any living element in which it occurs. Where contraction predominates metabolism will have an anabolic, and where expansion predominates, a katabolic tendency in the element concerned. The tension of the free ether which, permeating all matter, surrounds the molecules of the nerve-cells, is modified by the vibration of the constituent atoms of these molecules; and if the nerves themselves are conceived as acting as a go-between, transmitting the force proceeding from one set of molecules along the nerve to another set at its termination, the force thus transmitted is electricity. A difference of potential depends, therefore, first on the relative reactive power, in respect of contraction and repulsion, of one class or collection of atoms as compared with another, and secondly, on the higher or lower degree of ethereal tension. In fever the tendency is, of course, towards expansion and an excess of metabolic activity, and the aim of treatment, by baths of low temperature or otherwise, must therefore be to produce a condition of relative contraction with control of oxidation. And this object, I would add, can best be attained by the use of water of a temperature not too much below that of the body; for by the use of water of extremely low temperature a reaction of such violence will be induced that the opposite result to that intended will inevitably ensue. Mr. Horridge considers that electricity has no specific therapeutic effect, its tendency being to accentuate the conditions under which the body is functioning at the time of application. "Thus, electrification of the body under relaxing conditions will intensify their effect, while electrification under the influence of a drug will very greatly intensify both its action and reaction." Of course, much depends on the nature and strength of current and the parts selected for treatment. The increased ethereal tension produces, on cessation of treatment, a reactionary rebound in the opposite direction, and this must be considered in estimating the ultimate result of the application. The increased impressionability of the organism to its environment under electrification is attributed to the intense molecular vibration so produced; for matter in motion is always more easily affected, more pliable, than when quiescent.

In his chapter on the spinal cord and cerebellum, Mr. Horridge argues for the existence of nerves conveying between the intestines and the lower dorsal and lumbar centres impulses of secretory or chemico-sensory origin. The nerves of this system he is inclined to identify with certain fine fibres of the

anterior and posterior roots, which join the cord at about the same level where in all probability the vaso-motor centres of the splanchnic nerves are situated. That the lower spinal centres have a direct trophic influence is suggested by the frequency of bed-sores as a result of injury of this part of the cord.

By a careful analysis of the observed results of removal, injury or defect of the cerebellum, combined with a consideration of its anatomical structure and relations, the author arrives at the conclusion that the cerebellar system (including, for stated reasons, the large cells of Clarke's column in the spinal cord) constitutes essentially a mechanism for the augmentation of nerve-impulses, of whatever nature or origin, by the generation and liberation of accessory impulses, which reinforce and effectualise the original ones. This reinforcing action is ultimately manifested by increased chemical activity in the functioning part, which may be produced partly by direct nervous influence on metabolism, partly through the awakening of the closely-related vaso-motor centre in the medulla.

In his last chapter, Mr. Horridge has some interesting remarks on the dynamic aspects of generation and heredity, and, incidentally, gives reasons for recording his vote in favour of the inheritance of acquired characteristics, a pronouncement which will call down upon him the wrath of the disciples of Weissman, if it happen to meet their eyes.

Apart from the question of the truth or falsity of the theories advanced by the author in this book, a question the discussion of which must be left to experts, this little book may be confidently recommended to all who desire to attain to clearer conceptions with regard to the intricate processes with which it deals; for whatever provokes thought so far favours the clarification of obscurities and the correction of errors. C. J. W.

BULLETS AND THEIR BILLETS. Experiences with the X-Rays in South Africa. By J. Hall Edwards, L.R.C.P., F.R.P.S. (Rebman, Ltd., London.)

The writer is known to us all as an able and enthusiastic radiographer. Having been attached to the Imperial Yeomanry Hospital, he has recently had every opportunity of studying the subject under the conditions of South African warfare. The present brochure, with its happily chosen title, the reprint of a paper read before the Röntgen Society, is the outcome of these experiences, and very interesting and instructive they are.

It has often been the subject of remark that the Mauser and Lee-Metford rifle are more merciful weapons than their predecessors, and this the author fully corroborates. He further considers that there is no evidence that such bullets can be flattened against bone. It is his opinion that X-rays do not prove so useful in field hospitals as in base hospitals. His greatest trouble was of course with accumulators. Foot motors he looks upon as a delusion and a snare, and he insists on the necessity of having for each base and general hospital an oil engine and a dynamo capable of giving current sufficient to work an electrolytic interrupter.

The question of localisation, of course, comes to the front, and this leads to some very uncomplimentary remarks about the telephone probe. But this point need not be discussed here; the telephone probe is an instrument that may well be left to speak for itself.

MODERN VIEWS ON RHEUMATOID ARTHRITIS. A paper read before the Derby and District Medical Society, on February 11th, 1902. By Charles W. Buckley, M.D.Lond. (Buxton). (Morton and Burt, London).

This presentation of a well-worn subject is terse, lucid, and to some extent original. "Modern views" is too often only another name for much that is vague and speculative; such a title, therefore, is not altogether inappropriate to a paper on rheumatoid arthritis. Of course, we cannot expect to escape an early mention of two old friends in this connection—the Egyptian tomb and the Roman sarcophagus; but as an atonement we hear nothing further of the history or mystery of the disease until the earliest years of the nineteenth century, when, of course, it is impossible to pass over Heberden's nodes and Haygarth's "nodosities." Quickly upon this follows a reference to Charcot's classic description of arthritis deformans, and his opinion that it is secondary to true rheumatism. The "nervous" theory is then mentioned, and lastly, in due course, comes the bacillus, with references to Bannatyne, Schuller, Wohlmann, and the latest diplococcus described only a few months ago by Poynton and Payne. To the microbic theory, the writer, being a "modern viewer," naturally inclines. An excellent symptomatic picture of the disease then follows, and lastly, "the whole secret of the treatment" is summed up in "the promotion of nutrition general and local, the relief of pain, and as far as possible the elimination of the toxine." For the latter purpose, will it surprise the reader to learn that "the best method at command" is a course of the Buxton waters.

THE THERAPEUTICS OF THE RÖNTGEN RAYS. By W. E. Schiff. Translated by W. Deane Butcher, M.R.C.S. (Rebman, Ltd.)

A short treatise of 30 or 40 pages, dealing with the treatment of hypertrichosis, lupus, and other skin diseases by X-rays. Dr. Schiff's views on this subject are well known, but hitherto they have had to be sought for scattered up and down through the pages of periodical literature. We are indebted to Dr. Schiff for their publication in pamphlet form, and to the translator and publisher for an excellent "English version."

RÖNTGEN RAY DIAGNOSIS OF RENAL CALCULUS. Ed. W. Shenten, M.R.C.S.

It is scarcely necessary to say that no one is better qualified to write on this subject than Mr. Shenton; and this short monograph, with its twenty-three illustrations, will be welcome and instructive to every medical man who is a radiographer.

NEW INSTRUMENTS AND APPARATUS.

THE EMPLOYMENT OF THE ELECTRIC ARC WITH IRON ELECTRODES IN PHOTOTHERAPEUTICS.

MM. A. Broca and A. Chatin have devised a lupus lamp which is shown in the following illustration. The arc is produced by means of an ordinary regulator enclosed in a metallic tube Om., 14 in diameter, pierced by an aperture Om. 03, near which the part to be treated is placed. It is claimed for this lamp that no refrigeration is necessary even if the part be only 8 cm. distant from an arc of 20 ampères, and that compression is very easily effected by means of a quartz lens upon a mounting conveniently adjusted to the head of the patient. These advantages, combined with the great actinic intensity of the arc, make its inventors extremely sanguine as to therapeutic results.[1]

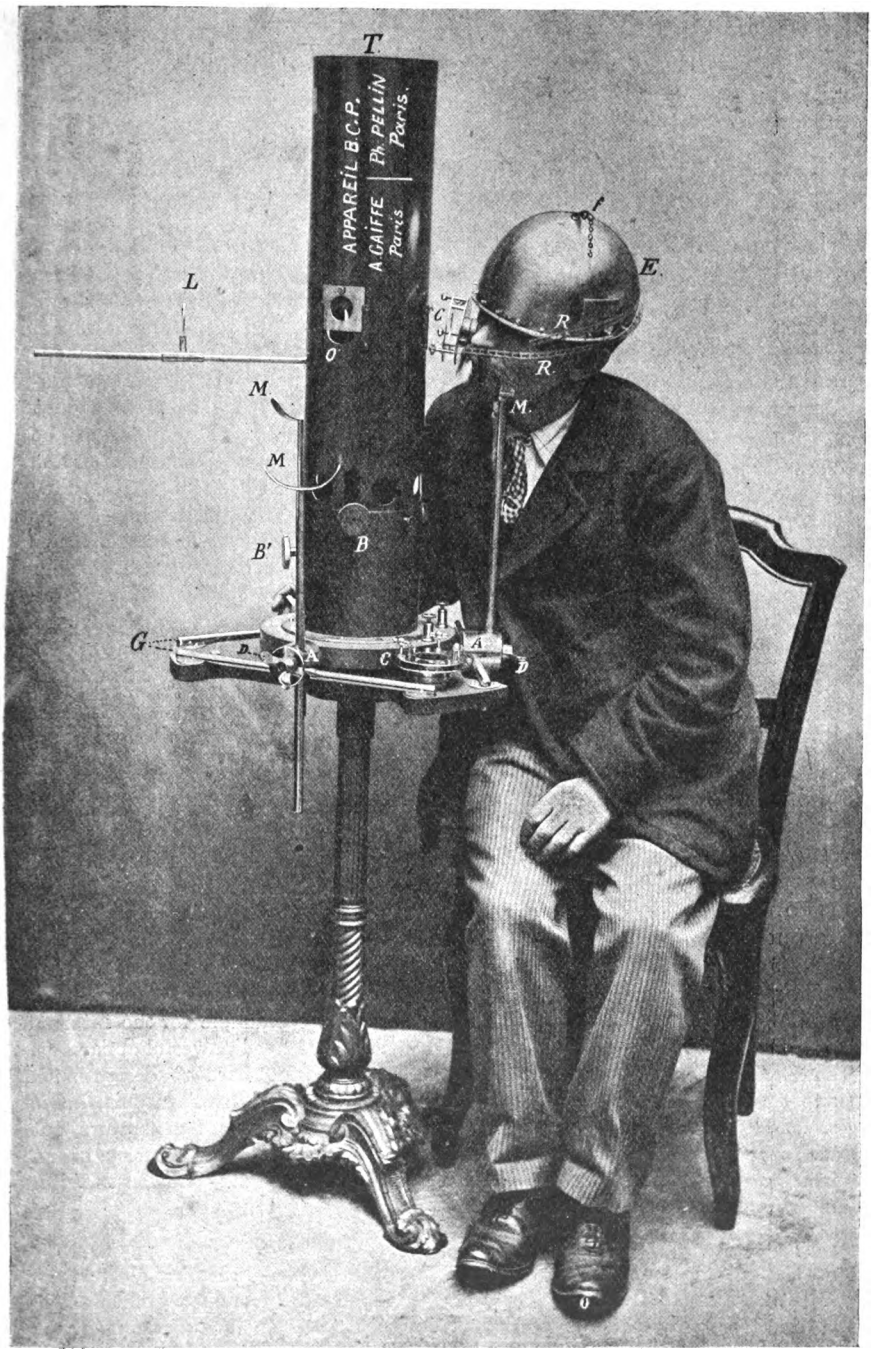
Digest of Current American Literature.

RÖNTGEN RAY.

A Study of the Cases of Accidental X-ray Burns hitherto Recorded. — Codman, of Boston, presents a very interesting series of articles on the above subject, containing tabulated reports of 171 cases of X-ray burns, and refers in a note to additional cases where definite information was not at hand. As a result of his analysis of the above cases, he concludes: (1) The frequency of X-ray injuries has been much exaggerated by the medical press, owing to the wide publicity given to many early cases; (2) the writer has been able to collect somewhat less than 200 cases, less than half of which were serious, and about one-third of which occurred in X-ray workers; (3) judging from the experience with these injuries in Boston, it is the writer's opinion that a fair proportion of the severe burns are included in this series, while the dermatitis of skiagraphers is less well represented; (4) at a maximum estimate it is safe to say that not one patient in a thousand has been injured in the past five years by an X-ray examination, and in the past year not one in ten thousand; (5) more than two-thirds of these injuries occurred in the first two years of the use of the X-ray; only one mild case is reported as occurring in the current year, those cases in which the exposure has been made for therapeutic purposes being excluded; (6) the cause of X-Ray injuries is not definitely known; it is some form of energy closely allied to the photographically active X-ray and radiates with it from the platinum terminal; (7) the primary injury is to the nerves controlling the nutrition of the skin; (8) there is no good evidence of injury to the deeper tissues without primary interference with skin; (9) the

---

[1] A full account of this lamp appears in *Comptes Rendus des Séances de l'Academie des Sciences*. It is manufactured by Gaiffe of Paris.



L, Lens throwing upon the wall real and reversed images of cone of light; *B*, adjustment for the carbons; *B'*, adjustment of carbons to orifice *O*; *O*, opening for the exit of the rays, with one of the obturators; *G*, compressor; *E*, helmet; *F*, adjustment of air-cushion on inside of helmet; *R*, steel supports for fixing the compressor to the helmet; *A*, support for knee-piece; *D*, screw to regulate the lateral and vertical movements of the chin support *M*; *G*, gliders upon which *A* moves; *T*, chimney.

important factors which contribute to the production of X-ray burns are -- the intensity of the current used to stimulate the tube, the quality of the tube, the distance and time of exposure, the idiosyncrasy of the patient; (10) the static machine is somewhat less likely to produce injury than other forms of apparatus; (11) from the data of the reported cases, we can say that no burn has been produced by an exposure equal to or less than the equivalent of five minutes at 10 inches; (12) it is impossible from the data to say how intense an exposure must be to produce a burn, for a comparison of the cases shows that an inconstant factor or factors exist; (13) these inconstant factors are more likely to lie in the complex organism than in the less complicated construction of the tube; (14) general experience has shown that soft tubes produce a more intense effect on the tissues than hard; (15) while we cannot control these inconstant factors therapeutic exposures will continue to be dangerous, and it is therefore important to record the exact conditions of the patient's local and constitutional idiosyncrasies, as well as those of the tube; (16) in cases of injury the time before the appearance of the first symptoms has varied from a few minutes to three weeks; five cases have remained latent for over three weeks, two of these for five months; (17) it is impossible to predict the severity of the lesion from the time of its appearance after exposure; (18) the writer suggests ten minutes at 6 inches from the platinum terminal as a standard therapeutic exposure; this will make comparisons between the inconstant factors easier; (19) unless signs of dermatitis appear within three weeks after the exposure they are unlikely to appear at all; in one-third of the reported cases, the appearance occurred within the first four days, in one-half the cases before the ninth day; (20) in the ordinary X-ray examination with fluorscope or skiagraph, the operator takes the entire responsibility of the injury; in exposures for therapeutic purposes the patient shares the responsibility.

Rollins contributes further observations on the X-light, as the result of his experiments upon guinea pigs, which he regards as of importance in the treatment of disease by the X-ray. In the treatment of internal disease he states that radiation from a tube of high resistance should be used because this light being less absorbed by the superficial tissues, the latter are less affected relatively than when they are subjected to a radiation which is more easily absorbed by them, and thus more of the X-rays are available for the internal organs. He concludes from his experiments that we need powerful apparatus, and he believes that experimenters who are working hard to design such apparatus should be encouraged. As a result of his investigations, he is satisfied that the fault is not in new and powerful types of generators, but with the tube-makers. In conclusion, he points out the necessity of an instrument for measuring the intensity of the X-ray light.—(*Boston Medical and Surgical Journal*, April 24, 1902).

Report of Cases treated with Röntgen Rays.—Under the above title, Pusey reports the results of the X-ray treatment of tuberculosis of the skin, epithelioma, carcinomas of the breast, deep-seated carcinomas of the head and neck, sarcoma, keloid, and other conditions, and presents photographs showing great improvement in a number of cases: 4 cases of lupus, 2 others who were thought to have cutaneous tuberculosis; 8 cases of epithelioma, 6 cases of carcinoma, inoperable and recurrent; 5 cases of deep-seated carcinomas of neck and head; 4 cases of carcinoma in the abdominal cavity; 3 cases of

sarcoma; 1 of granuloma of uncertain character; 1 of keloid; 2 of pseudo-leucæmia; and 1 of leucæmia are reported. He does not report an unbroken series of successful cases, but the results as obtained in the above series of cases, and he believes that these results are such as to give encouragement. With the exception of a few epitheliomas, the whole list presents cases which have baffled skilful men, or had been looked upon as hopeless by masters of the profession. Pusey presents them for what they are worth, recognising that each reader will give them whatever weight they are entitled to. He believes the fact to be clearly established, not only from his own cases, but from the work of other men, that the X-rays have a destructive effect upon tissues of low vitality, and that this effect can be utilised under suitable conditions to cause the destruction of such tissues without destroying the involved healthy tissue. Examination of his sections shows that X-rays cause a degeneration of some sort of carcinomatous tissue and a disappearance of this degenerative substance, presumably by absorption. This disappearance is followed by the formation of firm, healthy scar tissue. A similar process probably occurs in the disappearance of the diseased tissue in tuberculosis, sarcoma and pseudo-leucæmia. The advantages of the method are: (1) It is painless; (2) it destroys diseased tissue, but leaves the healthy tissue in its place; (3) it leaves small scars; (4) it can be used in cases where the surrounding healthy tissue cannot be sacrificed; (5) hence it is available for cases in which ordinary methods involve extensive operations and subsequent serious disfigurement, as, for example, about the eye and nose; (6) it is available in cases in which ordinary methods are impossible because of the amount of destruction of tissue which complete removal would require; in other words, it is applicable to many inoperable cases; (7) it often relieves pain.

Finally, he concludes the use of the X-rays should be limited to those cases which, for any cause, it is inadvisable or impossible to treat by ordinary methods. Until experience with the X-ray has extended over a longer period of time their use, he believes, should be a reserve method of treatment. He emphasises the opinion that he would not advise the use of the X-ray as a substitute for operable malignant growths. In cutaneous carcinomas—epitheliomas—he believes that no strong objection is to be found to the use of the X-ray as a primary method of treatment, and some advantages are to be urged for it. Every other malignant neoplasm should have the advantage of an operation where it is practicable. From the evidence of the effect of X-rays upon malignant neoplasms at hand, he considers the following propositions justifiable: (1) In all cases of malignant disease which have been operated upon there is reason to urge the subsequent use of the X-rays as a prophylactic measure; (2) in all inoperable cases of malignant disease the use of the X-rays should be tried; (3) in all such cases there is a probability of relieving pain and a possibility of inhibiting the progress of the disease.—*Journ. of Amer. Med. Assoc.*, April 12, 1902.

King reports a case of lupus vulgaris successfully treated by the X-ray. The applications at first were made for ten minutes with a "low" tube, 12 inches from the patient. Subsequently the time was increased to thirty minutes, and the tube brought within 6 inches of the diseased area. This established a dermatitis which in a week had completely disappeared. After this the scab fell off, presenting a clean base and healthy granulations. A thick sheet of lead was then substituted for the tinfoil to protect the healthy skin

the tube being placed at 6 inches from the ulcer, and the time of the exposure extended to thirty minutes. No further improvement was noted after four or five treatments. Some improvement followed a forty-five-minute exposure, which ceased after the fourth treatment, when he was given an hour's exposure. As a result in a few days the scab fell off, leaving a healed surface behind. A week subsequently there was found to be a complete cure.—*Advanced Therapeutics*, May, 1902.

The Effect of X-light from High Vacuum Tubes in Intra-abdominal Cancer.—Skinner discusses the above subject, with a report of five cases. Case 1: Carcinoma; diagnosis microscopically confirmed; situated originally in the cervix uteri and recurrent after two operations, the last one being a hysterectomy and ovariotomy. There was a tumour in the cicatrix in the anterior abdominal wall as large as a small orange, and an ulcer in the vaginal vault and anterior wall starting from the cicatrix, as large as a silver dollar. There was profuse bloody purulent discharge from the vagina, and the patient suffered severe pain constantly. After the first X-ray application the pain and soreness were markedly relieved, and the patient slept well the night following for the first time in many weeks. After the fifth treatment she was able to stand upon her feet for the first time in many months. Since the sixth treatment there has been no pain, the large tumour has decreased to the size of an English walnut, the other smaller tumours in the abdomen have disappeared, the ulcer in the vagina has decreased to the size of a dime, and the bloody purulent discharge has become only a trace. Case 2: Carcinoma of the cervix uteri, vaginal wall, bladder, and probably other structures, with a perforation into the bladder, so that all the urine passes through the vagina. Seven treatments given. The pain, which had been excessive, relieved after the second treatment; characteristic discharge beginning to lessen after the second treatment, now reduced to a small stain upon the pad four or five times daily, and shows almost no bloody discolouration. The patient now sleeping well, eating splendidly, and has gained greatly in strength. Case 3: Fibro-sarcoma; recurrent after total extirpation of uterus and ovaries for the growth which originally involved the uterus. Inoperable; size of tumour, lateral diameter, 10 inches; vertical, 8 inches; antero-posterior, 6 to 7 inches. Growth of stony hardness when patient came under observation. After three treatments remarkable softening of the tumour was noticed, extending to a depth of over an inch, and the skin exposed to the action of the ray had become freely movable. Marked relief established from sensations of pressure and discomfort, and patient felt well. Case 4: Nodulated abdominal tumour, probably sarcomatous, in lower lumbar and upper sacral regions. Inoperable. Two treatments resulted in the complete disappearance of the sciatic pain, marked lessening of the backache, but no change either as to the tenderness or size upon palpation of the tumours. Case 5: A growth in the neighbourhood of the left broad ligament, said to be malignant and inoperable by a surgeon who did an exploratory laparotomy; no microscopical examination made; ascites, which accumulates rapidly after tapping. Great tenderness upon palpation is felt, but no pain. Three applications have been made, but without any result. Further report will be made of these cases whatever their terminations.—*Advanced Therapeutics*, March, 1902.

Light and the X-ray.—Hopkins, in discussing the subject of light and radiance in the treatment of disease, believes that in the X-ray is to be found

the therapeutic agent *par excellence* for inoperable cancer, and points out the danger of injury where the operator is careless in protecting the healthy parts, and in the same connection states that his faith in this measure is strengthened daily. In the hemorrhagic forms of carcinoma of the uterine neck and vaginal walls his success, he states, has been gratifying. In those cases he makes use of the chemical rays of light by means of the Finsen tube as well as the Röntgen ray. From his experience he finds that the chemical rays of light will control the hemorrhagic condition much more promptly than anything he has ever used. A case is reported where the patient was brought to him on a stretcher, nine weeks previous to writing the above article, in which the least movement caused profuse bleeding from the cervix. In this case he used the Finsen method for one hour and the Röntgen ray for ten minutes daily. For four weeks there had been no hæmorrhage and she had walked in the street and rode from two to three hours daily. For the treatment of internal conditions he prefers the hard tube, and notes the fact that the trophic disturbances began in the deeper tissues, without any damage being done to the superficial parts. For this reason, the hard tube is the best for internal conditions. He reports favourable results obtained in carcinomas of the breast after amputation, and also states that carcinoma of the stomach has been brought within the curative influence of the X-ray. In a case in which amputation of the tongue was decided upon, because the malignant growth was closing both trachea and œsophagus, the disease yielded to the combined use of the X-ray and Finsen light. In three week's time, with five treatments a week, the patient was able to eat solids, where before he was fed entirely *per rectum*, and had also regained phonation, which had been lost.—*Philadelphia Medical Journal*, April 5, 1902.

[In a case of inoperable carcinoma of the cervix uteri in which both broad ligaments and also posterior and vaginal walls were infiltrated, there has been secured by the combined action of the X-ray light and vacuum tube discharge (negative terminal of an influence machine), four applications in all: (1) Arrest of hæmorrhage; (2) diminution and changed character of discharge; (3) disappearance of odour; (4) relief from pain and pelvic discomfort; (5) gain in strength and vigour; (6) loss of extreme cachexia, with return of pink colouring to face and hands; (7) improved appetite; and (8) a healthy, granulating sore, where before a ragged and bleeding fungoid condition of the cervix prevailed —Case under care, Am. Ed.]

LIGHT.

The Penetration of the Human Body by Ordinary Actinic Light.—The above subject is discussed by Gottheil and Franklin. Light, in a proper concentration, from a source of sufficient actinic power, they find, can be made to penetrate the entire thickness of the human body, including both surfaces of the skin. Hence all the internal organs are accessible to its influence. The time required for the efficient penetration to any depth is only a fraction of that employed in their experiments, which are ten, twenty and thirty seconds respectively, and, conversely, if the time is equal, the chemotaxic effect will be far greater. They regard the penetrability of actinic light as an indication of its value in the treatment of internal organs in view of its admitted efficacy in a number of external affections.—*Medical Record*, April 19, 1902.

[Note.—No doubt can exist as to the penetrative power of the high

frequency waves of light, and their value in the treatment of internal conditions in view of the results obtained in the treatment of pulmonary tuberculosis, tuberculosis of the joints, &c.—AM. EDITOR.]

Physiological Heart Murmurs produced by the Electric Light Bath.—Howell, in conducting a series of experiments to ascertain the physiological effects of light baths upon the human system, has been led to believe that these experiments conclusively demonstrate that very little weight should be attached to the mere presence of a murmur in diagnosticating heart disease. Fifty-two cases were examined with special reference to the influence of the bath upon the heart. Murmurs were heard in the heart or arteries, generally both, in almost every instance. Of the 52, 23 were men and 29 women. A detailed account is given of the number of the cases. Howell believes that if the aorta is temporarily dilated, and there is a vigorously-acting heart, driving the bloo through a now relatively constricted aortic orifice, it is reasonable to presume that vortices form and produce the murmur.—*Boston Med. and Surg. Journ* April 3, 1902.

The subject of Finsen's phototherapy is reviewed very clearly and carefully by Clemensen. The article is well illustrated with productions of Finsen's apparatus, institute, &c., by the courtesy of Finsen.—*Journ. of the Amer. Med. Asso.*, April 12, 1902.

ELECTRICITY.

Electrical Treatment of Aural Vertigo.—In discussing the treatment of the ear vertigo as a symptom of chronic catarrhal inflammation of the middle ear, Scheppegrell points out the value of electrical treatment. In the use of the continuous current, it is his practice to place the indifferent electrode at a distance from the active electrode, for example, in the hand. If placed on the mastoid or neighbouring region he believes that the tendency of the current is to reach the positive electrode through the tissues by the most direct route, and that therefore a greater portion of the current passes through the external tissues and very little to the auditory nerve. Mild currents are advocated on account of the excitability of the acoustic nerve, as well as on account of the irritation that may be set up by the aural contact. Static electricity is also recommended, and should be employed either by means of the connective discharge applied to the region of the ear, or else the conductive method through the intervention of a suitable electrode; if the latter method, mild applications should be used.—*Advanced Therapeutics*, May, 1902.

CATAPHORESIS.

The Technique of Mercuric Cataphoresis in the Cure of Tubercular Deposits in Lymphatic Glands.—Under the above title Massey discusses the use of mercuric cataphoresis in tubercular glands. The tip of a sliver of zinc, 2½ inches long, tapering from one-eighth of an inch in width at the base to a sharp point, is amalgamated with mercury and connected with the positive terminal of the source of electro-motive force, the indifferent electrode occupying a suitable position on the surface of the body according to the location of the diseased area. Under local anæsthesia a slight opening is made through the skin with a narrow bistoury, and into this the amalgamated zinc needle is inserted and 1 to 3 milliampères of current used for ten minutes. An injection

of cocaine may be used to abate the pain. In from four to five days a small plug of necrotic tissue is eliminated, and subsequently the treatment is carried on by means of an amalgamated gold instrument. The treatments are repeated two or three times a week, with 3 to 10 milliampères of current and continued for ten minutes. Between the seances, the opening may be covered with a bit of gauze, held in place by a piece of zinc-oxide plaster. On account of the sterilisation of the region, due to the action of the mercury, no fear need be felt of infection. Two cases are reported cured. Equally good results were obtained in the case of a child where, owing to the size of the tubercular abscess, it was necessary to administer an anæsthetic, and employ on two occasions as much as 50 milliampères of current.—*Advanced Therapeutics*, March, 1902.

[NOTE.—Similar good results have been obtained by the use of cupric electrolysis. The copper electrode was carried to the bottom of the sinus and from 1 to 3 milliampères of current used for five minutes; in all, three applications were made in a given case resulting in recovery.—AM. EDITOR.]

The Prevention of Neurasthenia after Surgical Operations.—In a discussion on the prevention of neurasthenia after surgical operations, Burr points out the fact of its frequent occurrence, and also the necessity of the treatment of the condition by means of rest, diet, massage, and faradic electricity. He also, very pertinently, calls attention to the value of pre-operative treatment in conditions of chronic surgical disease, in order to prevent the occurrence of the neurasthenic state.—*Philadelphia Med. Journ.*, April 19, 1902.)

[NOTE.—There can be no question as to the value of the above methods in all chronic surgical diseases, both before and after operation. If systematically carried out in every case prior to operation, where the indication for surgical intervention is not immediate, many more patients would recover, not only from the operation, but from their condition of ill-health, than is now the case. Post-operative treatment by means of rest, diet, massage, and electricity is of great value, but the danger of the post-operative neurasthenic state can be minimised by careful pre-operative treatment.—AM. EDITOR.]

Therapeutics of Dry Hot Air.—Dr. Skinner, of Stur Hann, Conn., in a series of articles, treats of the use of dry hot air in each disease to which it is applicable, together with the attendant phenomena and clinical results, and the advantages accruing from its employment in each individual case. The successful employment of dry hot air demands knowledge and skill and experience on the part of the operator, and on the part of the prescriber, a good knowledge of its applicability, physiological action, and curative results, as well as correct diagnosis. Dry hot air is applied locally or to the whole body, with differing physiological and therapeutic results. The primary physiological action of the local treatment is made up of two parts; a direct stimulation of the cell metabolism in the part, induced by the raising of its temperature, a reflex acceleration of metabolism through the spinal centres due to the action of the heat upon the numerous nerve endings in the skin, causing and accompanied by a greatly increased blood supply, the phagocytic and reparative properties of which have been further increased by raising its temperature; and secondarily, an improved tone of the organism at large, which, of course, benefits the diseased part proportionate to the betterment of the local condition. In diseases characterised by the presence of pathogenic micro-organisms

in the part treated, as for instance, in septic infection or pneumonia, still another element appears, viz., cell metabolism and the inhibitive influence exerted through raising the temperature of the part upon the growth and activity of the germs, thereby rendering them more susceptible of attack by stimulated leucocytosis. Some germs are extremely sensitive to thermal changes, the pneumococcus, for instance, being entirely inhibited by only a slight rise in temperature of its pabulum. Finally is mentioned the great power of the agent in relieving pain and swelling, of course dependent upon the relief of stasis in the part. All of these results tend to greatly increase the absorption and assimilation of remedies at the seat of the disease. The physiological action in the body treatment is predominantly reflex through the spinal sympathetic, the area of skin treated being so great that the capillary circulation is able to dissipate the heat before it penetrates deeply enough to exert its action directly, as is the case in the local treatment. The whole spinal sympathetic and trophic ganglia that control the regenerations of cell structures are affected. The mouth temperature rises from 2 to 5 degrees F., the pulse increases from thirty to fifty beats per minute, and is markedly increased in volume. If treatment has been too long, the pulse will lose its volume and strength, becoming rapid, small, and soft, but sometimes retains its volume, becoming very soft and slow. The respiration deepens and increases in frequency. The perspiration is profuse. The capillary areas become greatly injected, even those of the face, which is never subjected to the heat. The sensation is rather agreeable. A pleasant languor supervenes and the patient usually drops asleep. If the treatment continues too long the languor gives place to exhaustion, with cardiac palpitation and oppressed heating, which sometimes lasts for hours. By this profound stimulation of the trophic centres we secure a more rapid and complete oxidation of effete materials which are clogging metabolic processes into normal excretory products. Vigorous and healthy cell elements are rapidly produced, which are much better able than their predecessors to resist toxæmia and microbic invasion. Apparatus and technique are carefully described. The various diseases in the treatment of which hot air is at present of demonstrated value are, in the order of importance: rheumatism, sprains, arthritis deformans, nephritis, local septic infection, pneumonia, peritonitis, pleuritis, synovitis, lithæmia, neuralgias and myalgias, varicose ulcers, nervous debility and exhaustion, chronic bronchitis and pulmonary tuberculosis, neuritis, tuberculosis of joints, fibrous anchylosis, miscellaneous conditions. The treatment of rheumatism is discussed with considerable detail, and as adjunctive measures are mentioned salicylates in some form, electricity, diet and cathartics. The advantages exclusively dependent upon its use in this disease are immediate relief of pain, shortening of the duration of the disease, lessening of the liability of cardiac involvement, lessened quantity of drugs required because of aid to their efficiency, no vicious after-effects. The author's frank admission of the limitations of his special agent, and the value of adjunctive measures, invites confidence in his assertions in regard to the therapeutic value of dry hot air.—*Journ. Advanced Therapeutics*, January to May, 1902.

Dietetic Aphorisms for Infant Life.—Dr. J. P. Crozer Griffith, of Philadelphia, offers seven aphorisms for infant feeding: (1) *Nature's way and Nature's food are the best.*—The problems of weaning, and quality and quantity of the breast milk are presented. (2) *Do the best you can with what*

you have.—If human milk cannot be secured for the child follow Nature's lead, and make an artificial food as nearly as possible like human milk. Its composition must vary, even as human milk varies. The mixture must suit the needs of the child. (3) *Keep up to the times.*—The modern method of feeding, the only scientific and truly satisfactory one, requires the knowledge and scientific use of percentages in the composition of the artificial milk. All that is required is that we obtain milk and cream of some definite, or approximately definite, percentage strengths, and that these shall remain uniform. Formulæ for the calculations, after the method of Bance, are given. (4) *Know what you want.*—Know why a certain mixture is best for a certain child. It is best to make the first milk mixture very much weaker than the normal proportions call for. This is particularly true of the proteids. The first food prescribed should be tentative. The author is convinced that it is a radical mistake to change the formula merely because the child is older. Human milk does not change materially during the whole period of lactation after the first four weeks are past. The child should have more food, but no stronger. Weighing of the child should be regular and systematic, every week or every other week. The author expresses distinctly his opinion that barley water or any other foreign substance should not be used as a routine measure, but only when it is distinctly indicated; (5) *Do not be lazy.*—Do not take some ready-made formula or patented food. Study the special needs of the individual case and meet them. Untold harm has been done by commercial foods. (6) *Go slow.*—Guard against a too rapid increase of the strength of the milk at the end of the first year, or feeding with starchy foods. The general condition of the child, and especially its weight, must be the guide to change in diet. Should there be no objection apparent about the age of ten and a half to eleven months, it is well to increase the amount of proteid matter in the food and to diminish the percentage of sugar. Meanwhile, its digestibility, as well as its nutrient power, is often distinctly aided by the addition of small amounts of well-cooked cereal jelly. At the age of a year a little porridge may be begun, made of arrowroot, farina, or other cereal. It should be given at midday and moistened with the usual milk mixture. A little cane sugar may be added. From this time progress is steady. The porridge is gradually shifted to breakfast time, and for dinner is given bread, well-cooked rice, hominy, moistened with beef or gravy free from fat. Next come eggs. Potatoes and well-cooked fruit may be given from the age of eighteen months. (7) *An aphorism for feeding in disease —starve.*—The author insists on a judicious temporary reduction in the amount and strength of the accustomed food in cases of acute illness. Sometimes it is wise to starve in anticipation of disease, as for instance, in days of intense heat in summer. Of course, when a disease is prolonged we must modify the starving decidedly. It then becomes a question of sustaining strength, and of making good tissue waste. The author, while admitting that this reduction of food is but one side of the question of feeding in disease, protests against the undue anxiety often shown in acute cases about the nourishment of their patient, and suggests that a judicious starving may be what is really needed.—*Am. Med.*, May 3, 1902.

Respiratory Gymnastics.—Dr. Albert Abrams, of San Francisco, discusses in a series of articles the methods and applications of respiratory gymnastics. He divides the methods of lung development into: (1) Action on the cutaneous sensory nerves; (2) development of the muscles of respira-

tion; (3) conversion of costal into diaphragmatic breathing, and conversely, diaphragmatic into costal breathing; (4) elimination of a definite group of synergistic muscles concerned in inspiration. The author describes an interesting phenomenon which he calls the "lung reflex." He has demonstrated by experiment that the application of any cutaneous irritant, whether the latter be mechanic, chemic, or electric, would always induce acute dilation of the lungs. He has also demonstrated that acute dilation of the lungs can be invoked in healthy persons by irritation of the nasal mucosa, and conversely, that this condition can be dissipated after removal of the source of irritation. The pulmonary neurosis of dilation can be obtained by firmly compressing cotton in both nasal cavities. Respiratory exercises in the treatment of disease are of value in pulmonary tuberculosis, bronchitis, broncho-pneumonia, bronchiectasis, asthma, emphysema, pneumonia, pleuritis, heart disease, emphysema and atelectasis, and pulmonary anæmia.—*Am. Med.*, February 15, March 1, March 22, 1902.

Auto-Intoxication and Diseases from a Practitioner's Standpoint.—Dr. Beverley Robinson thinks that the neurologist emphasises rather too much intestinal auto-intoxication. The author does not admit the presence of changes in a limited portion of the digestive tract as separated from the rest. This factor of gastro-intestinal fermentation is only an element and not an entirety. We must not overlook the wear and tear of modern life, the influence of impoverished blood, excesses, and poor hygienic surroundings, all of which tend to lower the tone of the nervous system and render the economy an easy prey to microbic infection. While antiseptic medication is indicated, drugs must be supplemented by the free drinking of water, massage, rest, good diet, hydrotherapy, electricity, and systematic exercise. In a class of patients who are languid, depressed, and introspective, a moderate, temporary course of static electricity is often beneficial. Faradism applied through water is frequently curative in cases possessing manifestations of rheumatism due to auto-intoxication. The author does not believe that any amount of flushing of the colon will prove of value unless a suitable purgative is employed at the beginning of the treatment. The question of diet is an important one and must be studied carefully, and the particular needs of each case be determined. *Am. Med. Rec.*, February 15, 1902.

Part II.

THE BRITISH ELECTROTHERAPEUTIC SOCIETY.

REPORT OF MEETINGS, APRIL 4 AND MAY 2, 1902.

Edited by Chisholm Williams, F.R.C.S.Ed., &c.

The Fourth Meeting of this Society was held at 11, Chandos Street, Cavendish Square, W., on April 4, the President, Dr. W. S. Hedley, in the chair, twenty members and seven visitors being present.

The Minutes of the third meeting were read and confirmed.

The following gentlemen were unanimously elected ordinary members :—Lt.-Col. Bartholomensz, Drs. John Shaw, George Hughes, J. R. Riddle and W. F. Brook.

A paper was then read by Dr. Hugh Walsham, F.R.C.P., on "The Diagnosis of Thoracic Aneurysm."[1]

Mr. President and Gentlemen,—It would be perfectly easy for me to project on to the screen the shadows of the thoracic contents, to point to one of these and say, This is the shadow of an aneurysm of the aortic arch. But you want something more than this, in fact a good deal more.

It would be a perfectly legitimate question to ask, Why do you say that this shadow is that of an aneurysm? Why not a new growth? Why not enlarged mediastinal glands? Why not this, that, or the other? A perfectly legitimate question, and one that has been frequently put to me by members of my own staff and others.

So I propose, first of all, to throw on the screen in rapid succession four pictures (see figs. 1, 2, 3 and 4). The first is that of a normal chest, the second a typical example of an aortic aneurysm, the third enlarged bronchial glands, and the fourth a new growth in the left lung.

Again, some of you may say, How do you know that these shadows are really and truly the shadows of what you say they are? Well, I say so because I was present at the *post-mortem* examination of the latter three of these cases, and therefore I am able to speak with a considerable degree of assurance as to the condition present.

Now I think you will agree with me that the shadows in

[1] Only a few of the skiagrams shown are figured in this paper.

all these cases are quite different and quite distinctive—so different, indeed, that it only requires a short glance to distinguish the one from the other.

But before proceeding further, I will ask you to consider for a

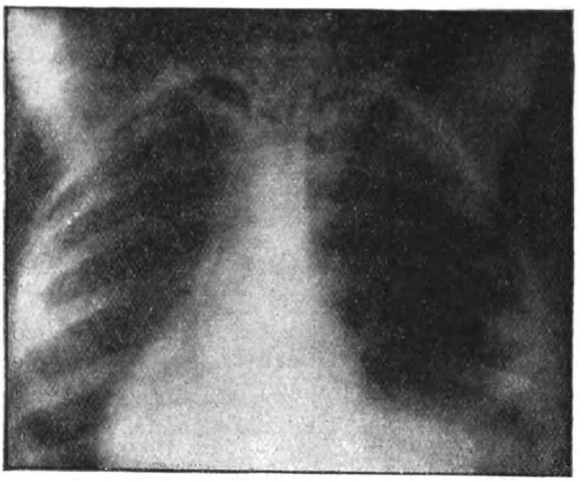


FIG. 1.—Normal Chest.

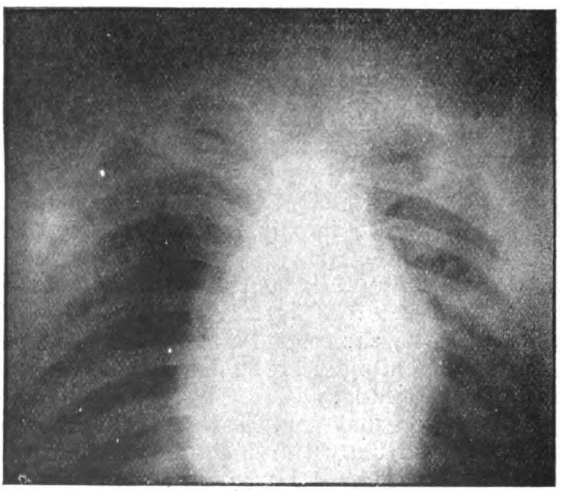


FIG. 2.—Aneurysm of Aorta.

moment certain ill-defined lines and streaks generally seen in skiagrams of the chest which are situated to the right and left of the cardiac shadow. Now, as these cardiac lines are nearly always present they must be looked upon as normal. On what

do they depend? Are they due to the larger divisions of the bronchi? I think not, firstly, because in skiagrams of the lung outside the body only the primary divisions of the bronchi are seen; and secondly, because these cardiac lines are too low in

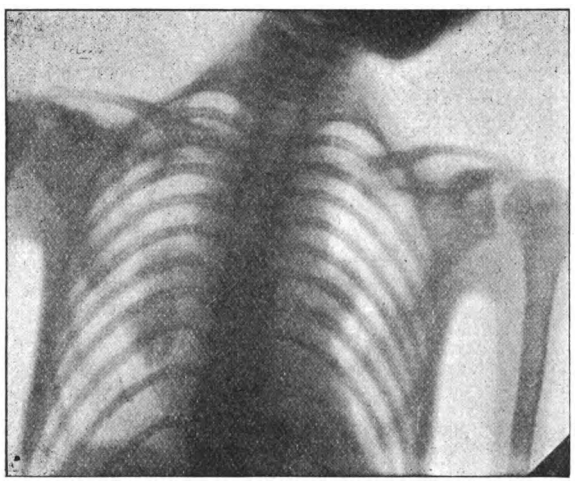


FIG. 3.—Enlarged Bronchial Glands.

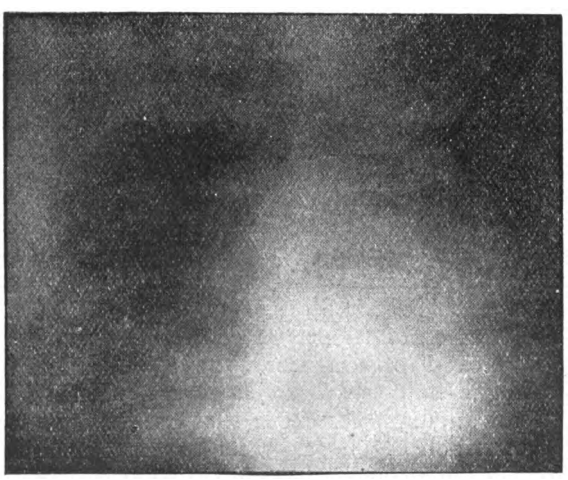


FIG. 4.—New growth in Left Lung.

position to be caused by the bronchi. I have endeavoured to clear up this point in the following way. A skiagram was taken of the thorax of a body on the *post-mortem* table; the heart was then removed, the sternum replaced in position, the integuments

closed over and another radiograph taken. The lines remained. The thorax was again opened and the lungs removed, the chest being closed as before. Another picture was taken. The lines still remained. I show you the final stage on the screen. You see distinctly the cardiac lines running downwards and somewhat outwards from a point corresponding to the base of the heart to the diaphragm. These shadows are, I think, undoubtedly caused by the meeting of the visceral pleura with the pericardium. Of course they are much more distinct now than in the living chest because they are not in constant movement with respiration and with the systole and diastole of the heart. I should like now to call your attention to the picture on the screen. You see that

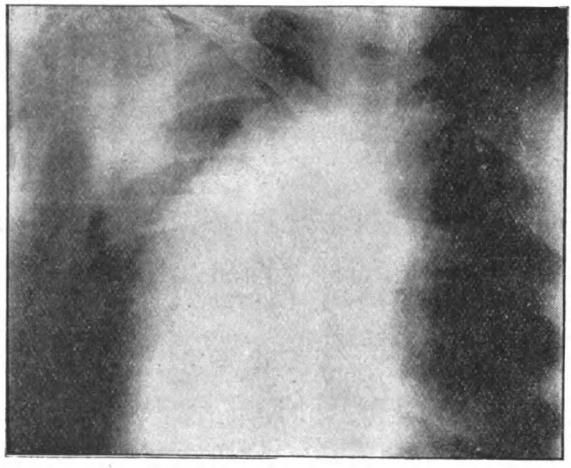


FIG. 5.—Aneurysm of Aorta.

there is a well-marked bulge to the left of the aortic shadow. I have known this left lateral bulge mistaken for a beginning aneurysm. True, it is only seen in some patients, but it depends much on the position of the tube; it becomes much accentuated if the tube be moved to the right of the middle line. I have seen this lateral aortic bulge so frequently in patients in whom no suspicion of an aneurysm existed, that I have come to disregard it as being of much diagnostic value in aneuryism, I think it is more marked in patients with œsophageal obstruction—at least I have seen it mostly in cases of this description.

I will now throw on the screen four pictures of aneurysms that were first detected by a radioscopic examination of the chest.

A gentleman, aged 48, was sent to me by a colleague for an X-ray examination of the chest. This gentleman had been seen

by three consulting physicians in London. He had been under treatment for intercostal neuralgia. The physical signs were obscure. There was a little tenderness on percussion over the upper dorsal vertebræ. There was no dulness to be made out, no tracheal tugging, pupils equal, no cough, and only slight dynspœa. It only required, however, one short glance with the screen to see that this gentleman had a large aneurysm of the aorta. A skiagram was taken, which is now on the screen before you. The chest is viewed from the back (see fig. 5).

The next case was that of a woman, aged 51, whom I admitted to the hospital as long ago as 1897, with the signs of aortic regurgitation. She remained in hospital eight weeks,

FIG. 6.—Aneurysm of Aorta.

and was discharged considerably improved. She returned to the out-patient room in December, 1901, saying that the pain between the shoulders had become much worse lately. As the X-ray apparatus had been installed in the hospital since the first visit of the patient, I examined her with the screen and had no trouble in diagnosing an aneurysm of the aorta. The skiagram of this patient's chest is now on the screen before you. It bears a certain resemblance to the one I have just shown you. They are both somewhat sausage-shaped, and both of descending arch. I think perhaps with increasing experience we shall be able from the shape of the shadow to say approximately the part of the aorta affected. I hoped at one time that the stereoscopic method of examining the chest would be of considerable help in localising the aneurysmal sac, but I must admit I have been

somewhat disappointed with this method of examination for aneurysms of the aorta.

The next case was that of a woman, aged 58, who was sent up from the country with the diagnosis of laryngeal tuberculosis. On examination she was found to have paralysis of the left vocal cord—a suspicious sign of an aneurysm undoubtedly—but there was no other sign of its presence until the patient was examined with the screen, when the shadow of an aneurysm became at once apparent (see fig. 6).

The fourth case was that of a man who was admitted to the hospital with the diagnosis of an aneurysm or new growth. The screen easily distinguished, showing an aneurysm which

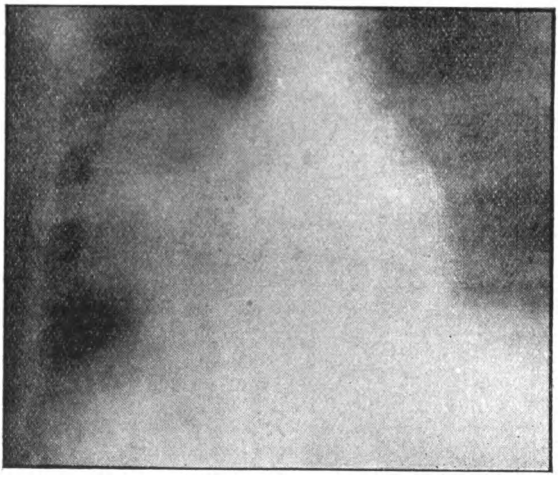


FIG. 7.—A Cardiac Aneurysm.

finally ruptured into the pericardium. I could go on multiplying cases of this kind, but perhaps I have said enough, but with your permission I should like to give one more case.

I was asked to see a gentleman late one evening to make a radiographic examination of his chest. He had been seen by a consulting physician in London, who thought that an aneurysm was not present; but a screen examination left no doubt about the presence of an aneurysm, which ruptured the next evening into the left pleura.

I will now project on the screen some more cases of aneurysm, and with these I must be content (see fig. 7). But I should like to say a word on the position of the heart in aneurysm of the aorta as seen with the screen. Of course it is a well-known fact that although the heart is hardly ever found hypertrophied in aneurysm of the aorta, it is frequently displaced downwards.

Now on examining with the screen you will find that the heart in a large number of aneurysms of the aorta takes up a transverse position in the chest, as in the picture before you on the screen. I think this transverse position of the heart is of great diagnostic value. It has on more than one occasion led me to examine the chest radiographically for an aneurysm. In every suspected case the chest should be examined with the screen, as the pulsation of the sac can only be seen in this way in aneurysms buried deeply in the thorax.

Now please do not for one minute understand me to say that all aneurysms can be detected by the X-rays. Unquestionably there are cases in which we are in doubt between an aneurysm and a mediastinal new growth or a carcinoma of the œsophagus. To be sure of an aneurysm the shadow must be in continuity with the shadow of the heart and aorta. Further, it must be well defined and sharp in outline; and this is where the difficulty occasionally comes in. An aneurysm contracts adhesions with surrounding structures which may by the fuzziness of the shadow lead to doubt. As with the stethoscope so with the X-rays; neither alone will always put one on the right track, the case must be considered from many sides before a correct diagnosis can be arrived at. One word more and I have finished. I think that in the majority of cases of aortic aneurysm we have a very valuable means of diagnosis in the X-rays, and I think we are justified in going so far as to assert that it is the duty of the physician to make use of this means of diagnosis in all doubtful cases of chest disease, especially if from the signs and symptoms an aneurysm be suspected.

Dr. SANSOM: The observations of Dr. Hugh Walsham are very valuable, and confirm my view that in the employment of the X-ray method of investigation we have a method which should never be omitted for diagnosis and tracing of the evolution of intrathoracic diseases, especially aneurysm of the thoracic aorta. There are many fallacies, however, and it behoves the clinical physician to patiently endeavour to interpret the pictures presented to him in every case. This is a great objection to the method, and like objection might have been adduced in regard to the microscope or the ophthalmoscope. One fallacy is illustrated by a case which he (Dr. Sansom) observed, in which he thought the union of physical means of diagnosis and X-ray investigation proved aneurysm of the left side of the thoracic aorta; but it did not, for *post-mortem* experience showed a great dilatation of the left auricle. Yet in many cases where physical diagnosis has shown aortic obstruction and regurgitation without evidence of sacculation, the Röntgen rays have demonstrated an aortic aneurysm. Density of the shadow seems to be a favourable sign, indicating laminated clot in the sac, but further investigation on this point is necessary. The process is no doubt very valuable, especially if repeated several times on

the same case; and in spite of difficulties it ought to be welcomed by every clinical physician.

The PRESIDENT said: Dr. Hugh Walsham's paper deals with a field of work which, I think in this country at least, has not hitherto been sufficiently studied by the physician-radiographer. It is a field that our continental neighbours have cultivated assiduously and successfully from the very first. I think that this has been due partly to the fact that the condition of moving organs, involving as it does a good deal of screen work, could be more efficiently studied by means of the static machine in consequence of the steady screen it gives; whereas in this country, in the early days at least, working as we did with the coil and a very unsatisfactory contact breaker, the screen was too shaky and flickering for this kind of work. I feel sure that Dr. Walsham's demonstration will give a stimulus to the study of the diagnosis not only of diseases of the large blood vessels, but to diseases of the lungs and pleuræ as well—indeed of all thoracic affections. There is one further moral that this paper most forcibly drives home to us, viz., that for the efficient prosecution of such work as Dr. Walsham has brought before us to-night, the physician must be a radiographer, and the radiographer a physician.

A paper was then read by Dr. James H. Sequeira on "The Finsen Treatment of Lupus and other Diseases of the Skin," of which the following is an abstract:—

The paper embodied the conclusions arrived at by the author after two years' study of the Finsen and X-ray treatment of lupus and other skin diseases. The paper was illustrated by a number of cases and by a series of lantern slides made from photographs of patients before and after treatment and by photographs.

The subject of lupus vulgaris was first considered. It was pointed out that this disease was undoubtedly due to local infection by the tubercle bacillus, and that the chemical rays of light had been proved to have a bactericidal power, and also a probably not less important power of exciting local inflammation. The chemical rays of light—the short waves beyond the violet end of the spectrum—could, however, not penetrate tissues which contained blood. Finsen made a great advance when he showed that an anæmic condition of the skin was necessary to get penetration. A great advantage possessed by the light treatment over the cautery, erasion and scraping, and even excision, except when the latter was accompanied by a wide removal of healthy skin, was that the light was applied to apparently healthy areas round a lupus patch, areas which were no doubt already infected by the tubercle bacillus. Such treatment of healthy skin was unaccompanied by any scar formation. Scraping was followed by recurrence in a large number of cases, probably because the operation opened up lymphatic channels, and perhaps even forced the micro-organisms into previously healthy skin.

The beautiful, smooth, pale scars left by the light treatment were demonstrated in the cases present at the meeting. Attention was called to the fact that the presence of lesions of the mucous surfaces was very unfavourable for permanent success. Cases in which the skin only was involved could by perseverance be thoroughly treated, while if the nose and mouth cavities were involved, there was not only great difficulty in curing the mucous membrane lesions, but there was a great probability of recurrence in the skin adjoining, This experience was in accord with that of Dr. Forchammer, Physician-in-chief at the Finsen Institute at Copenhagen. Other conditions which were unfavourable to the light treatment were the presence of pigment in the affected areas and also much scar tissue; both these conditions were barriers to the penetration of the light. It was at the same time pointed out that by prolonged application of the light the scars became softer and more supple.

The light treatment could not be applied to ulcerated surfaces. They were best treated by the X-rays, but in Dr. Sequeira's experience it was better to complete the treatment by the Finsen method. Cases were shown which had been treated for many months by the X-rays, after the manner of Schiff, in which there had been definite formation of lupus nodules while the rays were being applied. In these cases, however, great benefit had been derived from the X-ray treatment.

Stress was laid upon the length of time that was necessary for the thorough treatment of even small patches of lupus. Quite small spots often required ten or a dozen or more sittings, while where the disease involved large areas daily treatment for several months and even for a year or more had been found to be necessary. A few cases were found to be intractable, and where the disease was very widely spread—for instance, where the trunk and limbs were affected, as well as the face—it was often found that while one part was being healed the disease was spreading at others.

The Lortet and Genoud lamp and modifications thereof had been found of great value, as larger areas could be treated at one time, and photographs were shown of cases treated by the lamp in use at the London Hospital. In some cases, however, it was found that the original lamp of Finsen gave better results. The lamp of Leslie Miller, recently shown at the Society, had been used by Dr. Sequeira for some weeks. The immediate results were good, and advantage was found in the use of ice as a compressor, as suggested by Dr. Hugh Walsham. It was found advisable to have the ice made from distilled water. A great drawback to this lamp was the noise produced by the sparking upon which the efficiency of the apparatus depended. Experiments were being made by Dr. Sequeira with poles of iron in the arc lamp, as suggested by MM. Broca and Chatin, of the St. Louis Hospital, Paris. The use of poles made of an alloy of

copper had not been found to be satisfactory, owing to the flaring of the arc. There were so many suggestions being made that it was impossible to give more than a survey of the more important, and judgment must still be suspended as to the best method of applying the chemical rays. In order to demonstrate that the anæmia was not the sole condition of success, as had been suggested by some critics, Dr. Sequeira had subjected patients to pressure for two hours at a time, and had frozen small areas without getting any reaction or any sign of improvement.

It was difficult to speak of recurrence in a method of treatment which had so recently been introduced, but the statistics of the Finsen Institute at Copenhagen showed that over 130 cases had been known to be free from recurrence for from one to five years. Dr. Sequeira had had at the London Hospital cases free from recurrence for as long as twenty-one months, cases in which scraping had to be done every few months before the patient was submitted to the light treatment. Of 118 completed cases up to the end of last year, only 6 cases *where the skin only was affected* (*i.e.*, cases in which there was no mucous membrane lesion whatever) had definitely relapsed. But this statement, though of importance, was discounted by the fact that the treatment had only been in use at the London Hospital for less than two years.

STATISTICS OF COMPLETED CASES.

Treatment completed and patient quite free from any sign of disease. Sent home	64	
Treatment completed and patient quite free from any sign of disease. Under observation and possibly requiring a few more sittings	20	
	--	84
Intractable cases		3
Definite recurrence under treatment (N.B.—Cases free from mucous lesions)		6
Treatment abandoned—		
Deaths: 1 from phthisis, 1 from miliary tuberculosis... ...		2
Retired on account of general health		5
Retired to other places for light treatment		8
Retired for other reasons		10
		118

There are still about 180 under treatment, and the majority of these are doing well. In many, however, there is extensive disease of the mucous membranes.

Lupus erythematosus.—The author pointed out that it is unfortunate that this disease is called lupus, as it differs in so many respects from lupus vulgaris. He expressed the opinion that as it does not depend upon local bacterial infection, but probably owns a general cause, it is unreasonable to expect the same benefit from the light treatment as in lupus vulgaris. In about a third of the cases there is improvement and apparent

cure, but in many cases he had seen relapses. The fact that some cases are aggravated by both the light and the X-ray treatment should be borne in mind.

Rodent ulcer.—Benefit had followed the use of the Finsen treatment, but the writer had abandoned it for the X-ray treatment, which gave infinitely better results.

Alopecia areata.—In Copenhagen and in Paris this treatment had been followed by success in cases of alopecia areata which had resisted the ordinary methods. In a few instances treated at the London Hospital excellent results had followed. The treatment was not, however, uniformly successful.

Dr. GEORGE STOKER: Mr. President and Gentlemen,—I am sure we are all agreed that we have listened to a most interesting paper and seen some remarkable cases, and I beg to offer my sincere congratulations to Dr. Sequeira on the admirable results he has obtained. Any system of treatment that can be successfully practised to combat such a scourge as lupus should meet with our warm interest and approbation; and therefore, I was sorry to observe that Dr. Sequeira entirely omitted any mention of what is known as the oxygen treatment in his *résumé* of the various treatments that have preceded X-rays and the Finsen light treatment. I am at a loss to account for this omission, and I can only regret it. I would like to point out that the oxygen treatment of lupus was begun on account of the nature of the skin obtained by this method in the treatment of ordinary wounds, ulcers, burns, &c. It is to all intents a true skin, and as such I consider it would be more likely to resist further pathological encroachments than ordinary cicatricial tissue, and will venture to read the report on an oxygen cicatrix submitted for examination to the Clinical Research Association.

In this case the patient had had a large ulcer of nineteen years' duration; it measured 8½ by 6½ inches and was deeply excavated. It healed very well till it measured 3½ by 2½ inches, and then, from some cause, healing came to a standstill, and I determined to scrape it, and in doing so I removed a small portion of the cicatrix (under an anæsthetic). I kept half the portion removed for examination, and sent the other half to the Clinical Research Association for examination and report. The specimen proved to be true skin, nearly but not quite physiologically perfect. The following is the report of the Clinical Research Association:—

THE CLINICAL RESEARCH ASSOCIATION, LIMITED,
1, SOUTHWARK STREET,
LONDON BRIDGE, S.W.
June 2, 1897.

LABORATORY REPORT.

To DR. GEORGE STOKER.

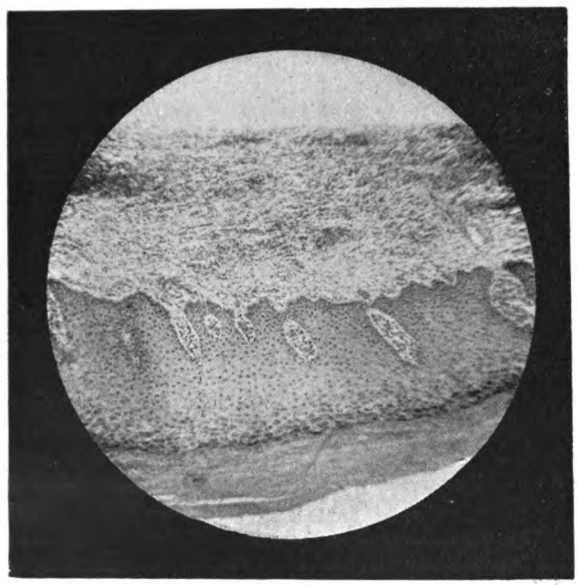
The specimen marked "M. C." received here on May 27 has

been duly examined, and I have been instructed to forward the following report thereon :—

The sections of the tissue examined show that the specimen consists of epidermis and true skin.

The epidermis is thick and possesses a specially thick layer of horny epithelium. This epithelium is of normal character, the stratum granulosum being well developed.

The cutis is infiltrated to a considerable extent throughout with an exudation consisting of round and oval cells. The arrangement of these cells is in groups, probably round blood-vessels, and in lines corresponding to the lymphatic vessels of the skin ; it is also found in the papillæ. "Mast cells" are present in considerable numbers in the neighbourhood of this exudation.



The arrangement and character of the round cell exudation suggests some form of new growth of mesoblastic origin rather than the exudation of inflammation or that of any of the specific granulomata.

N.B.—Probably a more definite opinion could be obtained if some points in the history of the case were communicated.

C. H. WELLS.
J. H., *Secretary.*

One Prepared Slide enclosed as requested.

It will be seen by the foregoing and by examination of the micro-photograph that the new tissue is almost true skin, it lacks

only sweat glands and hairs to be so. The absence of these two structures proves its genuineness, and are conclusive negative arguments showing the new tissue produced by the oxygen treatment in this case is a great deal more than an ordinary cicatrix, and little less than true skin. I am told by a competent authority that some of the cells mentioned in the report are probably of an embryonic nature, and that future developments may be expected in reference to them.

My practice is to remove the diseased surface by scraping, &c., and then apply oxygen, which is after all only a dressing and not intended to supersede the ordinary surgical methods applicable to such cases. I suppose in cases of Finsen treatment scraping cannot be practised, as the pressure of the lenses on the raw surfaces would be too painful, but several of the cases shown to-night have been treated by X-rays; why have these not been scraped?

Suppose the X-rays do render the diseased tissue aseptic; this lately diseased and disorganised tissue becomes incorporated in the new cicatrix, and render it more or less unsightly. I must say it passes me why this obvious, simple, and necessary preliminary step is neglected.

With regard to the nose and accessory cavities, the Finsen treatment absolutely fails, and here oxygen proves successful.

Of the X-rays I think they have the great advantage of being painless, and they do no doubt attack the out-lying secondary deposits, which though present, are not always in evidence. In view of this latter consideration I advocate scraping, the application of oxygen, and also the occasional use of rays for the purpose above indicated.

As regards pain, I believe the recurring attacks of inflammation that the Finsen light treatment induces are extremely painful. The only pain connected with the treatment I advocate is that of the scraping, and as this is done under the influence of a general anæsthetic it does not need serious consideration.

As regards the length of time occupied by the various treatments, that of the oxygen treatment varies from four or five weeks to one year. I observe that the most successful case of Finsen treatment shown to-night occupied two years and three months.

I believe that in all three systems the results are obtained by the chemical changes produced on or in the tissues—a chemical change in the nature of an oxidation which turns the toxins into antitoxins. These antitoxins are in many cases absorbed and attack outlying secondary infected areas. This point has been brought forward in the *Lancet* some years ago in a paper I published dealing with toxic reactions in cases treated by oxygen gas.

As regards statistics, I was very much surprised to learn that only 22 per cent. of cases were cured by the Finsen treatment.

My own figures are as follows. I have only very limited means and resources at my disposition, and I can only offer comparatively few cases for comparison. I have in all treated 44 cases of these; as far as can be ascertained, 22 cases have remained healed without recurrence, as follows: 1 for six years, 5 for five years, 5 for four years, 2 for three years, 5 for two years, 3 for one year, 1 for three months.

Nine cases left the hospital healed, but have recurred as follows: 1 after five years, 2 after four years, 3 after one year, 3 after six months.

Nine cases have been discharged improved, and in 4 cases we have failed to give relief.

In conclusion I would venture to observe, that in comparing the results of various treatments there are several considerations that must be kept in view: (1) the percentage of cases healed and the duration of the healing; (2) the length of time occupied by the treatment; (3) the pain and discomfort the treatment entails; (4) the economic side of the question, or which system is the cheapest. I beg to point out that as far as percentage, duration of healing, length of time occupied by the treatment and economy are concerned, the oxygen treatment compares favourably with any system extant.

The further discussion of Dr. Sequeira's paper was adjourned to the next meeting.

A Special Meeting was held on May 2, at 11, Chandos Street, Cavendish Square, W. The President, Dr. W. S. Hedley, in the chair.

Dr. JAMES ALLAN'S motion, of which due notice had been given, was then considered. To add to Rule 3, after Members—*and Associates.*

To insert additional Rule—"That Registered Medical Students of three years and upwards, shall be eligible as Associates of this Society, they shall pay an Annual Subscription of 10s. 6d. They shall enjoy all the privileges of Membership, voting and holding office excepted."

The amendment of Mr. BOKENHAM and Dr. HARRISON LOW, "That no person shall be eligible unless he be a registered medical man," was put to the meeting (after several speakers, who were all in favour of the amendment had expressed their views), and carried unanimously.

Then followed the Fifth Ordinary Meeting.

The minutes of the last meeting were read and confirmed.

The ballot was then taken for Dr. Thomas D. Smith, which proved unanimous in his favour.

The adjourned discussion on Dr. Sequeira's paper on "The Finsen Treatment of Lupus, Rodent Ulcer, &c.," was then proceeded with.

Dr. LEWIS JONES congratulated the author upon his paper. He felt that there was great need for a minute study of the various light treatments, for while all were promising, none could be as yet considered quite satisfactory. It remained to be discovered which was really the best, and much work remained to be done; indeed, the whole spectral range of light, visible and invisible, needed trial. Röntgen rays also wanted further detailed study.

Mr. HALL-EDWARDS: Dr. Sequeira is to be congratulated upon his interesting paper, in which he said that "the presence of lesions of the mucous surfaces was unfavourable for permanent success." With this he entirely agreed, but he wished to point out that since he had adopted the plan of having all decayed teeth removed early in the treatment, his results had been more satisfactory. Moreover in children where, in addition to the "lupus," there was considerable enlargement of the glands, this in many cases disappeared. He (Mr. Hall-Edwards) strongly advocated rigorous attention to the teeth in all case of lupus under treatment. His experience chiefly lay in the application of the X-rays. He was of opinion that electrolytic, or electrostatic, action played an important part in the production of results; hence, the kind of screen used to protect the surrounding parts was a matter of considerable importance. He had experimented with various forms of screen, and had recently adopted the plan of making a mask specially for each individual case. His masks were made of plaster of Paris bandages moulded upon the patient's face; these masks, when dry, were covered with tin-foil. He had recently used a screen made of a large piece of thick gutta-percha, with a hole of the required size cut in the centre. With this he had noticed that after a considerable number of exposures the hair on the covered parts had been destroyed without the production of any visible signs of dermatitis. He was of opinion that the production of a limited dermatitis was a *sine quâ non* to successful treatment. He would like to know if Dr. Sequeira stopped treatment on the appearance of a dermatitis, and how soon afterwards he resumed it. Mr. Hall-Edwards hoped that the discussion would tend to prove which method of treatment is the best, and would throw some light upon the question of the particular set of rays which was productive of the results.

Dr. HORACE MANDERS pointed out the fact that light treatment and X-ray treatment might be included under the heading of vibration treatment and that the point to be ascertained is the particular wave-length which conduces to the repair and well-being of tissues. The great trouble has hitherto been with lupus of the mucous membranes, the reason probably being that they are well supplied with blood, the red corpuscles of which prevent the penetration of waves of short length. Instead of pressure by ice or otherwise, he suggested the painting of the

mucous surface with a solution of adrenal gland in order to blanch the tissues. In one case in which he had tried this the result was exceedingly satisfactory, but he merely offered the treatment as a suggestion, not as a definite principle; and that he should be very glad to hear at the next meeting the results of any member of the Society who cared to try this method. Dr. Manders also drew attention to the Leslie Millar lamp, a similar instrument to one which he had already been experimenting with, the difference being that instead of the iron electrodes, Dr. Manders used cobalt, with latterly a small proportion of ytterbium, both metals being exceedingly rich in violet and ultra-violet rays.

Dr. F. HARRISON LOW regretted that he had not been able to be present to hear Dr. Sequeira's paper, and to see the cases. He would refer for a moment to the remarks in the abstract of the paper which was put before the members to-night (a most sensible proceeding, much to be advised in other Societies), on the question of the getting at the seat of the disease in lupus in such mucous cavities as the mouth and nostrils. It had seemed to Dr. Low, and experience of cases had shown, that these were just the cases where X-rays were much more useful than any form of Finsen or lamp method of any kind, all these requiring contact and compression in some form, while the X-rays can be directed into the nose or mouth quite easily, and more especially with the later new tubes made with an extension arm with an X-ray window at the end of the tubular arm, and with proper protection can be inserted into any mucous-lined cavity. With reference to the time of exposure referred to by previous speakers, Dr. Low stated that at King's College Hospital, where a number of cases were treated daily, it had been found that cases did very well with a daily, or in some three or four times a week, sittings of three to five minutes' exposure; a few cases being rested for a few days if any signs of extra redness at the margins were observed. On the point of inconvenience and pain in the Finsen treatment, Dr. Low felt bound to report that with some experience of patients who had been through, at anyrate, the earlier courses of Finsen sittings, they all complained very much of the pain they had been put to, and welcomed the X-ray method as a great relief, and in the same way found the high frequency application painless and easy to bear, while the results seemed to be equally good and over a much larger surface.

Dr. G. H. GRAHAM: Dr. Sequeira is to be heartily congratulated, not only on the excellent paper he has given us, but on the very good results he has obtained in the patients he brought before us at our last meeting. The only case which was not satisfactory was the one which, I believe, was treated entirely by X-rays. A matter for congratulation, too, is the comparatively early stage at which Dr. Sequeira has been able to apply the treatment to the majority of these cases; for at

Professor Finsen's Institute in Copenhagen, where at least 120 patients are treated daily, I saw a very large proportion of terribly severe cases showing loss of nose and other deformities. I should like to ask Dr. Sequeira if any of the patients shown have been treated entirely under one lamp, either Finsen's, or the London Hospital modification of the Lortet-Genoud, or whether the treatment by the two lamps has been combined? It would be well to compare the results in cases treated by each lamp separately. The treatment has been called painless, but this is not so in every case. Some patients never have any pain, while others complain a good deal; yet all that I have seen say they would infinitely prefer it to undergoing again the severe pain they had suffered by other methods of treatment. In my opinion the pain, which under the lamp can be controlled to a large extent, if not entirely, by the operator, is in the majority of cases slight.

Having carefully gone into the question of lamps, I confess I have not found a really satisfactory one in all respects at present on the market. Among them all Finsen's is undoubtedly the best, but its cost and expense in working prevent its general use. The telescope of Finsen's apparatus, which used to be kept about 6 inches from the arc lamp, can now, owing to a recent modification of Dr. Rhys's, be brought much closer to it, thus collecting more rays and without damaging the lenses. With regard to the iron electrode lamps, it may be of interest to some to learn Dr. Bang's opinion at all events of his own lamp as compared to Finsen's. He says: "The difference in the power of penetration shows itself most strongly if we compare the concentrated carbon arc light as used in Finsen's apparatus with the unconcentrated iron arc light used in the small hand lamp made by myself. . . . We must therefore expect that the two kinds of light will indicate different uses. While the employment of my lamp may produce a strong superficial reaction, the Finsen apparatus holds its supremacy for deep-seated disease like lupus vulgaris, in which the "iron lamp" light is not advisable, at any rate with the power produced by my small hand lamp of 8 ampères." To the Leslie-Millar lamp there are three serious objections, its noise, the use of ice as a compressor, and the short depth to which the ultra-violet rays penetrate, unless the diseased surface has been previously ulcerated, thus doing away at once with one of the chief advantages of the light treatment. Of the French (Broca-Chatin) iron lamp I have no experience. The results of the Finsen light treatment are so good and permanent in the large majority of cases of lupus vulgaris that it is strange to note the hesitation shown by some of the profession in recommending it to their patients.

Dr. G. B. BATTEN said that progress in treatment by X-rays and allied methods was at present hampered by the want of exact knowledge as to what wave-length of radiant energy we are using in the various treatments. As Professor Clarke Maxwell

had prophesied in 1859, and Hertz had proved in 1888, all forms of radiation, electric heat, light, ultra-violet rays were all similar electromagnetic perturbations of the ether differing in wave-length. Röntgen rays were probably also similar. We should try, or the physicists should try, to find some means of ascertaining what wave-lengths we were using in Finsen, Röntgen ray and ultra-violet treatment. Personally he would be glad to know in what form was the electricity in high frequency effluve, whether alternating current or rotatory magnetic radiant waves?

Mr. SHENTON said: I would suggest that inflammatory reaction and the falling out of hair in the course of X-ray treatment are signs that the patient is being grossly overdosed. During the past two years at Guy's hospital no such signs have been observed and the treatment, as far as I can ascertain, is as satisfactory in this hospital as elsewhere. Exposures have varied from five to ten minutes three to five times a week, the tube being a high one and kept at a distance of from 8 to 12 inches. In many cases a protecting shield is not used for there does not seem to be the least danger from such a moderate dose.

Mr. CHISHOLM WILLIAMS: As the discussion has already passed the bounds of purely Finsen treatment, I should like to speak on the efficacy of high frequency treatment, in such cases as lupus, rodent ulcer, &c. Firstly, pain with the "effluve" of high frequency is absolutely absent. Several patients I have treated who have been for a considerable period under "Finsen treatment" very gratefully appreciate this fact. Secondly, length of time: as far as I have been able to ascertain, nothing is as short as high frequency, not even X-rays. Expense: high frequency is cheaper in initial outlay than Finsen, and cheaper in working than either X-ray or Finsen. Efficacy: high frequency treatment being a general method as well as local surely should be better than a purely local one? Personally speaking, and from what I have seen of the work of others, and after what I have heard of Dr. Sequeira's good results, I can see no advantage of the Finsen treatment over "high frequency" treatment if carried out with efficient apparatus and sufficient skill is exercised in applying the same. The longest time I have ever given a lupus case is ten minutes at a sitting; the patients have hardly time to go to sleep, as they are said to do for an hour or so under the Finsen treatment. Pressure of any kind is apt to be irksome, to say the least of it, to some patients. High frequency requires no pressure in the exercise of its beneficial effects.

Dr. BATTEN said he had found practically that we could break up a long spark into an effluve by increasing the frequency of interruptions in the current on the primary of the spark coil: the quicker the interruptions the shorter the spark from the high frequency resonator and the greater the effluve. He obtained a very heavy 6-inch effluve by use of an Ediswan electrotytic break and an alternating current of 86 volts.

The PRESIDENT said: Dr. Sequeira, with unrivalled opportunities for forming an opinion, considers that Finsen's method of treating lupus is undoubtedly the best in the field. I must say that, so far as this country is concerned, the preponderating, if not the overwhelming, weight of evidence available at this moment irresistibly points to this conclusion.

Still, we must keep an open mind. It is evident that there are more ways than one of treating and curing lupus by various forms of radiant energy. This is clear, not only from the discussion to-night, but from the experience of other workers of other countries. I remember that Dr. Bisserie, during the course of last year, published some cases of Dr. Brocq's, treated so long ago as 1897 by high-frequency discharges. There were altogether 62 cases, 8 of which failed, about the same number abandoned treatment, 33 were cured, and 14 remained under treatment. The treatment had been applied every two or three days; duration of each application two to five minutes; total duration of treatment, shortest twenty-five, longest seventy. Last year, at the Congress of Ajaccio, Dr. Bordier presented two cases cured by high frequency in seven or eight sittings of three to six minutes' duration. Dr. Gibson, of Birmingham, U.S.A., records during the last month or so a case of lupus treated by the static effluve. A large extent of surface was involved, extending from the supraorbital ridges to the mouth; the total extent of surface affected being 5 inches by 9. The patient was insulated and connected to the negative side of the machine, and a pointed wooden electrode (soft maple), connected to the grounding chain, was brought as close to the face as she could bear it, and the powerful brush discharge kept up from fifteen to twenty minutes, moving the electrode about. The reaction was so marked that only two applications a week could be made. After twenty applications cure was complete, excepting a small area over the right eye. A few more applications and the cure was complete and lasting.

In September of last year Leredde, analysing 600 cases treated at the Finsen Light Institute, calculated the successes at 97 per cent. Dr. Sequeira's results do not equal this; they work out at something over 60 per cent. But those who do not wish to be disappointed will be wise to accept Dr. Sequeira's figures.

Gowan reports three cases of lupus erythematosus improved by X-rays, but not cured. Of course the cure of lupus vulgaris by X-rays is now a commonplace fact. Now, do these various methods accomplish their purpose all in different ways? or can we, by comparison and analysis, find any one feature common to them all?

In Finsen's method the active agency is doubtless the chemical rays and their penetration. Bordier has proved that it is not the heat rays that are the effective agent. It is the

chemical rays, and the deeper the penetration, within certain limits, the better; and therefore it is that making the tissues exsanguine by pressure, that is to say, driving away the blood, which is known to arrest the passage of the chemical rays, is of the first importance. Now there is also to be reckoned with a special inflammation or irritation of the skin—the so-called "reaction," and the question arises—does this special inflammation of the skin render the ground unsuitable for the vitality of the micro-organism, or is the latter destroyed by a bactericidal action, however brought about, of the chemical rays?

Passing to high frequency and static discharges: What are the elements that characterise such discharges—electrical effects, thermic effects, ozone, chemical rays? It is difficult to imagine that the latter in such numbers as they are present, and in the absence of compression can be the effective agent. As to thermic effects, we have seen by Dr. Bordier's experiments that, in Finsen's treatment at least, it is not the heat rays but the chemical rays.

As to X-rays it may be, as suggested by Morton and others, that they act by lowering the function of the entire nerve supply of the part. Thus trophic influences cannot reach the part—its normal nutrition being inferfered with to such an extent as is incompatible with the vitality of certain micro-organisms; or is it in the direct effect that X-rays possess of unduly stimulating and so exhausting the growth of certain micro-organisms that we are to look for the cure of certain morbid processes? It seems not improbable that some such effect as the latter also occurs in the case of high frequency in the treatment of tuberculosis.

One thing is certain, viz., that we all know and fear the power that the X-rays have of producing a serious, even a gangrenous, dermatitis. We know how these disastrous effects, after "lying dark" for one, two, or three weeks, suddenly spring out of ambush and confront us with a condition most difficult to control. Perhaps it is this very power for mischief that the X-rays possess, this intractable inflammation they are capable of producing (whether caused by paralysing nerve influence or by some other mechanism) that, when we know better how to harness and control it, is destined to prove our best and most potent ally.

In reply, Dr. SEQUEIRA denied that the application of oxygen after the removal of the whole skin by operation could cause the development of new gland tissue. Every endeavour was made in the apparatus used in the light treatment to exclude the heat rays, either by the passage of a constant current of cold water through the compression apparatus or by ice, as in the Leslie-Miller lamp. The essential point now at issue was how the chemical rays could be best applied, and as a result of comparative experiments made by him at the London Hospital,

Dr. Sequeira was not prepared to say more than that some cases did better with the original Finsen lamp, but that in others, and especially the external cases, the newer lamps saved a great deal of time. In some cases he used both lamps. Great stress had been laid on the question of pain. The Finsen treatment was not absolutely painless. Some patients suffered so little that they were able to sleep while under the lamp. Very occasionally a patient was unable to stand the pressure. The inflammatory reaction was attended more frequently with pain, and more so with the newer lamps, as there was a larger area of inflammation. In conclusion, Dr. Sequeira thanked the speakers for the many valuable suggestions they had made.

NOTICES.

MEMBERS are reminded that the Annual Subscription (one guinea) was due last January for the current year.

This Journal is supplied free to members (see extract from Bye-Laws below).

FUTURE ARRANGEMENTS.

July 30.—Manchester (Business Meeting).

October 3.—Demonstration and paper on "High Frequency Currents in some Diseases," Chisholm Williams, F.R.C.S.Edin.

November 7.—

December 5.—President's Address.

EXTRACT FROM BYE-LAWS.

"The proceedings shall be published in such a manner and at such times as the Council may direct. A copy shall be forwarded to each Honorary and Corresponding Member of the Society and to every ordinary member whose subscription *is not in arrear*. Fourteen day's notice should, whenever possible, be given to one of the Secretaries by any member who wishes to show a clinical case, or to make a communication to the Society. A copy of the paper in a form fit for publication in the Proceedings must be furnished at the same time. The paper shall be the property of the Society for publication in the Proceedings, without prejudice to the author's right to reprint or insert in any recognised medical paper or periodical. In all such cases the author shall state that the paper was read before the Society."

Visitors.

An ordinary member may introduce two medical men as visitors at all ordinary meetings of the Society. Visitors shall sign their names in the book provided for the purpose. On the invitation of the chairman, visitors shall be permitted to take part in any discussions of the Society. The same visitor shall not be introduced more than twice during one session.

The Hon. Secretary will be pleased to hear from any member willing to read a paper, &c., at any of the meetings.

Medical men desiring information about the Society can obtain full particulars from the Honorary Secretary, Chisholm Williams, F.R.C.S.Edin., 20, Bedford Square, W.C.

The Journal of Advanced Therapeutics has now reached its sixth issue; there has thus been ample time to form an opinion as to its merits and defects. It seems difficult to imagine how its contents, both as to quantity and quality, can fail to satisfy the most exacting reader. The one single point where the captious critic might possibly find a loophole would perhaps be its title. To his sensitive ears the word "advanced" might sound a little aggressive, and appear to imply a claim and a comparison. If there be such a critic he may rest assured that those who are responsible for the name would be the last to arrogate to themselves any exclusive rights in our common watchword, "Progress."

THE

Journal of Physical Therapeutics

No. 4. OCTOBER 15, 1902. VOL. III.

THE ACTION OF THE DIRECT ELECTRIC CURRENT IN CAUSING PHORESIS, OR THE MIGRATION OF IONS.

BY W. J. HERDMAN, M.D., LL.D.

AND

VERNON J. WILLEY, B.S.

(*From the Electrotherapeutic Laboratory, University of Michigan.*)

(*Continued from p.* 125.)

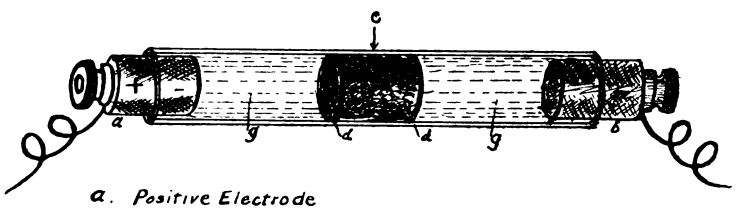
THERE is an advantage in using coloured substances such as methylen blue and eosin for the initial experiments, since the ocular demonstration of what occurs is both convenient and striking and serves very well for a preliminary class demonstration of phoretic action.

But in order to study the details of the process more leisurely and accurately than experiments upon the body will admit, we found it necessary to construct an artificial path for the current wherein the conditions were similar, in the main, to those that obtain in body transmission.

This path was constructed in the following manner: A number of glass tubes ten inches in length and three-fourths of an inch in diameter were taken, and the space of about an inch in the middle of each of these tubes was reserved for the solution chosen for experiment, which was confined in this space either by compact layers of bibulous paper or porous earthenware discs. The remaining space in the tube at either end was then filled with an aqueous solution of gelatin in which some salt, such as sodium chloride, potassium chloride, sodium sulphate, or sodium nitrate was dissolved so as to give to the gelatin the required conductivity and furnish the ions with a path which would not be disturbed by convection currents set up in the electrolytic conductor. The ends of these glass tubes were fitted with carbon electrodes, sufficient space being left between the tube and the electrode for the escape of gases arising from electrolysis.

In the case where a solution of methylen blue or eosin was used for experiment a pledget of absorbent cotton occupying about three-quarters of an inch was introduced into the centre of the tube, with one or more discs of thick blotting paper pressed firmly against one end of the cotton wad. A sufficient amount of methylen blue solution was now introduced into the opposite

end to saturate the cotton and just render the discs of blotting paper moist. Then one or two discs of blotting paper were pressed firmly against this side of the cotton plug, so that the cotton, saturated with the solution of methylen blue, was held firmly in place by these paper discs, which were also moistened slightly, either by the methylen blue or by saline solution. The ends of the tube were then filled with warm gelatin solution containing a small amount of common salt; this end was corked and the other end similarly filled, corked, and the tube immersed in ice water to cool the gelatin and cause it to harden before diffusion of the methylen blue had taken place to any great extent. After the gelatin had hardened the tube was removed, the corks taken out, and in their places the carbon electrodes were introduced. The current used was from a 220 volt direct current lighting system, controlled in voltage by a graphite shunt rheostat. The electromotive force applied to the ends of the tube was measured by a Weston standard volt-meter, and the current measured by a Weston standard milliampère-meter. The length of time of each experiment was carefully noted. The diagram of the circuit including the tube was as follows:—



a. Positive Electrode
b Negative "
c Cotton, saturated with substance.
g Gelatin Solution.
d-d- Blotting Paper discs.

About 20 milliampères of current was passed through the tubes in each of the experiments made; and in the case of methylen blue, and in most cases where coloured substances were used, the substance was seen to have moved quite perceptibly in from ten to fifteen minutes. After the current had been running for an hour the colour had almost entirely left the cotton, and when the current was continued for several hours the colour of the methylen blue would be carried entirely to the cathode. It is not difficult with this strength of current to make the methylen blue traverse the entire length of the tube, through eight inches of gelatin, if the cotton be placed at the anode and the current passed for a sufficient length of time.

We are now prepared to attempt an answer to the questions, What causes the movement of the particles in solution, and what

determines the direction of that movement? To answer these questions we must know the composition or chemical formula of the substance in solution, and also the way in which it becomes ionised. Methylen blue is the chloride of a complicated cation, $C_{16}H_{18}N_3S - Cl$, which tells us that the Cl is the negative ion while the positive is $C_{16}H_{18}N_3S$, or if we let M stand for $C_{16}H_{18}N_3S$, we may refer to this substance as M + Cl −, and we see that by reason of the difference of potential established in the liquid and the nature of the electric charge carried by the particles the M + will migrate toward the negative electrode, while the Cl − with which it is associated will move toward the positive electrode. The M portion of the substance is therefore cataphoric, and if there are Cl ions along its path toward the cathode, it will, by exchanging partners at every step, still be M + Cl − until it actually reaches the cathode, where it will deliver its charge, and electrolysis will take place. The chain of ions at the beginning might be represented by

$$+\,]\ Na + Cl - Na + Cl - Na + Cl - \left(\begin{matrix} Na + Cl - \\ Na + Cl - \end{matrix}\right) \left(\begin{matrix} Na + Cl - \\ Na + Cl - \end{matrix}\right) Na + Cl - Na + Cl\ [-$$

and after the first step

$$+\,]\ Cl - Na + Cl - Na + Cl - Na + Cl - \left(\begin{matrix} Na + Cl - \\ Na + Cl - \end{matrix}\right) \left(\begin{matrix} M + Cl - \\ Na + Cl - \end{matrix}\right) Na + Cl - Na\ [-$$

and the second,

$$+\,]\ \begin{matrix} Cl, \\ Cl \end{matrix}\ NaCl, NaCl, NaCl, \left(\begin{matrix} NaCl \\ NaCl \end{matrix}\right) \left(\begin{matrix} NaCl \\ MCl \end{matrix}\right) \begin{matrix} Na \\ Na \end{matrix}\ [-$$

and so on, not considering the subsequent reactions at the electrodes.

The experiments with eosin showed that just as with the experiment on the arm this substance travelled toward the anode, or was anaphoric, the red colour of the eosin going toward the positive electrode in the same way that the blue colour of methylen blue streamed toward the cathode. The potassium salt of eosin $C_{20}H_6Br_4O_5K_2$, which is soluble in water, is a potassium salt of a complex anion and may be written :—

$$(C_{20}H_6Br_4O_5)^{=}\ K_2^{+}_{+}$$

or, letting E stand for $C_{20}H_6Br_4O_5$, it may be written, for convenience, $E^{=}\ K_2^{+}_{+}$, and if we use KCl in the gelatin, we may write :—

$$+\,]\ \left(\begin{matrix} K+Cl-K+Cl-K+Cl- \\ K+Cl-K+Cl-K+Cl- \end{matrix}\right) K_2^{+}_{+} E^{=} \left(\begin{matrix} K+Cl-K+Cl-K+Cl- \\ K+Cl-K+Cl-K+Cl- \end{matrix}\right)\ [-$$

for the chain of ions, and after the first step :

$$+\,]\ \begin{matrix} Cl\ K+Cl-K+Cl- \\ Cl\ K+Cl-K+Cl- \end{matrix}\ \begin{matrix} K+ \\ E= \\ K+ \end{matrix}\ \left(\begin{matrix} K+Cl- \\ K+Cl- \end{matrix}\right) \left(\begin{matrix} K+Cl-K+Cl-K \\ K+Cl-K+Cl-K \end{matrix}\right)\ [-$$

the eosin migrating toward the positive electrode, or anode. In this case, if we had used NaCl in the gelatin, we would have

changed the potassium salt of eosin into the sodium salt, and in general we may say that *the path of the ions we are dealing with must contain the same kind of ions with which they are associated before the current is turned on, or we will change the nature of the salt.*

The case of potassium iodide will make this clear. If we wish to study the migration of the I ion, or anion, in K I, and at the same time have the potassium salt at all stages of the process, we must have a potassium salt, such as KCl, in our electrolyte, which occupies the remainder of the path from cathode to anode. If we use NaCl as the conducting electrolyte, then after the first step we would have Na I instead of K I.

After this detailed explanation of what appears to be the method by which the transmission of anions and cations to their respective polarities takes place, reference to the remaining substances which have so far been made the subjects of experiment by us will be very brief.

Cocaine hydrochlorate is a salt of hydrochloric acid with the formula $(C_{17}H_{22}NO_4)HCl$, or $(C_{17}H_{22}NO_4)^+ Cl^-$; the complex cation $(C_{17}H_{22}NO_4)^+$ is cathode seeking, and is therefore cataphoric, while the Cl^- is anaphoric.

The salts of morphine are also complex cations, with a simple anion; the hydrochlorate $(C_{17}H_{19}NO_3)HCl$ or $(C_{17}H_{20}NO_3)^+Cl^-$, and the sulphate $(C_{17}H_{19}NO_3)_2 H_2SO_4$, or $(C_{17}H_{20}NO_3)_2 \ddagger SO_4$ = are both cataphoric. The salts of strychnine are also cataphoric according to their formula. The hydrochlorate $2(C_{21}H_{22}N_2O_2 . HCl)$, or $2(C_{21}H_{23}N_2O_2) \ddagger Cl_2$ and the sulphate $(C_{21}H_{22}N_2O_2)_2 H_2SO_4$ or $(C_{21}H_{23}N_2O_2) \ddagger SO_4$ and the nitrate $(C_{22}H_{23}N_2O_2)^+ NO_3^-$ are seen to consist of complex cathode seeking ions and simple anode seeking ions. The ordinary salts of atropine and of quinine are also complex cations with simple anions, and are cataphoric.

These and many other substances were subjected to experiment, all serving to illustrate the fundamental principles herein disclosed and showing that in order for us to know how a substance in solution will conduct itself when subjected to the influence of a direct electric current and used with phoretic intent, we must know, first, that the substance when in solution forms an electrolyte; second, its chemical formula; and third, the way in which it dissociates, or becomes ionised. Then, if we wish to introduce the anion into the body we put the substance on the cathode, and it will travel toward the anode through the electrolyte, for the body is an electrolyte. If we wish to introduce the cation we put the substance on the anode, and it will travel toward the cathode, provided, of course, that in each case there are ions in the solutions and tissues of the body with which it can unite at each step in its migratory path.

THE VALUE OF CHEMICAL RAYS, PRODUCED BY THE GEISSLER TUBE, IN THE TREATMENT OF LUPUS.

By Dr. C. H. Colombo (Rome).

The recent communications of Finsen have directed the attention of medical men to the properties of light as a therapeutic agent. Its nature, physical and chemical characters, as well as its curative action, have all formed the subject of an immense amount of observation and experiment. It was the therapeutic effects of *solar light* that first attracted attention. Then different kinds of artificial light produced by the electric current in various ways became the subject of research, and one after another the incandescent lamp, the arc lamp, the effluve of electrostatic apparatus, of high frequency currents, and X-rays have been applied to photo-therapeutics.

M. Leduc (Nantes), starting from the principle that in every system of photo-therapeutics the useful effect is connected with the action of the chemical (violet and ultra-violet) rays, and that the luminous rays are useless, whilst the calorific rays are hurtful, made some careful observations upon the radiation given out by the Geissler tube, such radiation consisting of chemical rays, cold and almost invisible. M. Leduc thus explains his idea :—*

"The production of chemical rays by the electric arc requires complicated and costly apparatus. The chief part of the energy consumed is transformed into luminous and calorific rays, the latter being undesirable for such medical uses. The heat of the arc prevents its being brought near the patient, and necessitates the employment of condensing and absorbing media, which arrest a certain proportion of useful rays, and thus the output is very unsatisfactory. Since all biological research has shown that the most refrangible rays of the spectrum, viz., the violet and ultra-violet, otherwise known as the chemical rays, have bactericidal properties, and are utilised in medicine, it is well to look for a source of pure chemical rays which can transform the whole energy employed into violet and ultra-violet rays without producing either light or heat, which can be brought near the patient, thus allowing the treatment to be employed under most favourable conditions, and which, in consequence of the large output of useful energy, cheapens the cost."

Mr. Leduc then describes his experiments in detail, and arrives at the following conclusions :—

"Notwithstanding repeated experiments and the care that has been brought to bear on them, it cannot be denied that our results are only approximate. We have applied, for purposes of comparison, a lamp of only 8 ampères, whilst Finsen recommends one of 25 ampères, and himself employs one of 80 ampères; for convenience we have

---

* *Gazette Médicale de Nantes*, December 21, 1901; *et Revue Internat. de Thérapie Physique*, March 1, 1902.

placed the lamp at 1 metre, Finsen allows it to be placed at 75 cm. . . . . In conclusion it may be said that the Geissler tube seems to be the true lamp of the chemical rays."

So promising a report was received with interest amounting to enthusiasm, and the present writer, amongst others, hastened to contribute to the realisation of an idea which seemed simple and logical, and which would obviate the necessity for any elaborate installation for its practical application, a Grenet cell and a Ruhmkorff coil, with a 2 or 3 cm. spark, being sufficient to actuate the Geissler tube. Indeed, M. Leduc's idea seemed destined to have a wide field of usefulness before it.

With a view of testing the matter for ourselves we arranged some experiments as follows: a large Grenet cell worked a coil giving a 4 cm. spark, the reophores were attached to the two extremities of a Geissler tube of large size, such as are commonly sold. When the current passed it produced intense luminous waves between yellow and green which traversed the central part of the tube; the light was less intense at the extremities. At the positive end of the tube there were greenish flashes, at the negative end the luminous radiations were almost nil, but there was a violet opalescent glimmer perceptible. Now, it was the negative end of the tube that, according to M. Leduc, produced powerful chemical rays, and which, therefore, were the ones to apply to the affected part. M. Leduc advises that the negative end be applied above the quartz compressor, which ought to be placed directly over the region involved; thus the source of the light will be at a distance of about 7 or 8 mm. from the skin. It was considered that the best condition would be attained by placing the tube actually upon the skin, at the same time exercising a light compression upon the surface; above the tube was placed a conical reflector with a view of preventing the diffusion of light and concentrating the rays upon the desired point. Under these conditions the Geissler tube was tried on many patients and in different forms of lupus. The present report is limited to three cases which it was possible to follow with exactness and to study the effect obtained upon the progress of the cutaneous lesion.

Case I.—G. M., aged 46; of robust constitution. The nutritive exchanges are defective, and there is a disposition to obesity and multiple neuralgia, with the uric acid diathesis. The patient for four years past has had two patches of lupus erythematosus upon the first phalanx of the third and fourth finger of the left hand. These patches almost cover the dorsal aspect, and are constantly exfoliating. Every form of treatment usual in such cases has been tried without effect. On April 12, 1902, the patient was submitted to the rays of the Geissler tube according to the technique above described—the tube was held in actual contact with the lupus patches, so as to exercise slight compression thereon. The rays were concentrated on the part by the conical reflector. Each sitting lasted on an average fifteen

minutes without interruption. They were carried out every day until June 16; in all sixty-five applications. The result was absolutely negative, unless the slight reddening of the patches and a trifling increase of desquamation are to be considered a success.

Case II.—G. P., aged 26; lymphatic temperament. Has suffered for six years from lupus vulg. on the right ear extending to the cheek, over an area 4 cm. diameter. The patch is moist, covered with crust, with solution of continuity at the insertion of the lobule. Ordinary treatment has been tried without result. Geissler tube treatment was commenced on May 2 of this year, following the technique above indicated, with daily sittings of fifteen minutes. After seventy-six sittings with absolutely negative results, the Geissler tube was abandoned, and the Foveau-Noè radiator used instead.

Case III.—F. V., aged 13. The lupus dates back four years, and consists of a moist crusted patch, which occupies the whole of the left half of the upper lip encroaching on the left side of the nostril of the same side. The crusts become detached from time to time exposing the tissues. Every method of treatment has proved ineffective. On June 14, 1902, the patient was placed under Geissler tube radiation, with daily sittings of twenty minutes' duration. After thirty-three sittings without any kind of result, the treatment was stopped on July 16, and was replaced by the same treatment as in the last case.

It is evident that the results obtained in these three cases are by no means sufficiently good to encourage a further trial of the method. Two objections may possibly be urged against these experimental cases:—(1) The dimensions of the Geissler tube that was employed, and (2) That the applications were made without interposing the compressor, as advised by Finsen in the case of the arc lamp. As to the first point, the indications of M. Leduc were followed, who, with the same intensity of rays, had obtained all the photographic negatives which he mentions in his memoir. As to not using the quartz compressor it was considered that this was amply provided for by substituting direct compression of the part affected by the Geissler tube itself. It may further be remarked in this connection that many writers, both French and German, have obtained good results in the treatment of lupus by direct irradiation from the arc lamp without interposing any compressor. It is not, therefore, necessary to produce anæmia of the skin in order to allow the chemical rays to penetrate the tissues. The present writer proposes to further study this question by means of other lamps, and it is hoped thus to demonstrably prove what is the exact value of compression in photo-therapeutics, inasmuch as in many cases of lupus localised in the interiors of organs and cavities this procedure becomes impossible. We are authorised in concluding, however, that although it is not to be doubted that the negative end of the Geissler tube produces active chemical rays, these rays do not possess an intensity sufficient to exercise any appreciable therapeutic action upon lupus.

TECHNIQUE OF HYDROTHERAPY—IV.

By Charles J. Whitby, M.D.

Packs and Compresses.

There is no class of hydrotherapeutic procedures more perfectly adapted to the requirements of general practice than this; none which, with ordinary skill and perseverance, would give more satisfactory results; scarcely any which, so far as I know, is more absolutely neglected. This may be partly due to the lack of precise information as to the best methods to employ, though such information is by no means inaccessible to those who will take the trouble to look for it.

Packs may be broadly divided into two main classes, according to the therapeutic effect aimed at. They may, that is, be either (*a*) cooling and sedative, or (*b*) heating and stimulating. The first will be more often employed in acute, the second in chronic diseases. Then again, packs may be either general or partial; and we shall therefore have to describe (1) the full pack; (2) three quarters and half pack; (3) trunk pack; (4) waist pack; (5) perineal or cross pack; (6) thoracic or Scotch pack; (7) throat pack, and (8) leg, foot, arm and hand packs. The best material for the moistened portion of all packings, and especially the smaller ones, is tussore or raw silk, a soft, absorbent, non-irritating stuff which is extensively used for this purpose in German sanatoria. For full packs, ordinary cotton or linen sheeting of medium or extra thickness does very well; and for the partial ones, linen cloths, towelling or swansdown calico are efficient substitutes when the raw silk is not obtainable.

(1) *The Full Pack.* (*a*) *Cooling.*—On a bedstead which has been drawn out into the middle of the room, and from which the upper coverings have been removed, is laid a single large blanket. The upper edge of this should rest about half way up the surface of the pillow, and the lower edge should hang a couple of feet or so below the foot of the mattress. A coarse linen, cotton, or tussore sheet measuring, say, $6\frac{1}{2}$ by $4\frac{1}{2}$ ft. is then loosely wrung out of water of the prescribed temperature, and laid lengthwise upon the blanket, its upper edge being about 6 inches further down the pillow than that of the blanket. The naked patient lies down upon the centre of the sheet, and raises both arms well towards the pillow. The right side of the sheet is now drawn across the body, tucked in along the left side of the body, pressed well in between the thighs and legs, wrapped carefully round the feet, and tucked in along the left side of the lower limbs. The arms are now brought down to the sides, and the left side of the sheet is drawn over, its upper border wrapped carefully about the neck, and the edge tucked in along the right side of the body and legs. The right side of the blanket is then drawn across and

loosely tucked in along the left side of the patient, and the packing is concluded by tucking the remainder of the blanket along the right side of the body. A thin wet cloth of oblong shape, wrung out of cold water, should be laid upon the forehead, and re-wetted from time to time. The blanket packing in this case should not be too tightly applied about the trunk, as the cooling effect which is aimed at renders this unnecessary, and it is also apt to produce in feverish conditions a suffocating feeling. As regards the temperature of the water from which the sheet is wrung, in cases of moderate pyrexia it may be about 74° F. Where the fever is more pronounced, a somewhat higher temperature (76° to 84° F.) should be employed, and the abstraction of heat may be favoured by the simultaneous use of two wet sheets instead of one, or by the use of a single very coarse sheet, very slightly wrung out.

The cooling full pack will generally need removal in from forty minutes to an hour, and may, if necessary, be followed immediately by a second or third envelopment. But if the patient fall asleep in the pack all that need be done is to add extra covering of blankets or eider-down quilt, which may in the course of an hour or two more produce a sudorific effect. The procedure is concluded by a tepid ablution, or half-bath at about 86° F.

(*b*) *Stimulating.*—The heating or stimulating full pack differs in some important respects from the above, in accordance with the different effect that is in view. The sheet employed should be of rather thin material, and should be well wrung out of water of a lower temperature than is advisable in the treatment of most febrile cases. The precise degree is a matter of judgment, but according to type and constitution of patient, and the season of the year, may be from 55° to 74° or 82° F. Two blankets (not one only) must be laid on the bed before the wet sheet is placed upon them. The packing process is carried out in the same way, but the blankets must be closely and (except over the thorax) tightly applied, and in most cases it will be found advisable, before enveloping the feet in the outer blanket, to lay a hot water bottle enveloped in wet flannel, or otherwise guarded, against the soles of the feet. Care should be taken that the patient is sufficiently covered to ensure a good reaction, and as soon as the packing is complete and the wet cloth laid upon the forehead, the windows must be widely opened. The minimum duration is one hour, and the maximum three hours. The pack should be followed by a cool ablution (55° to 74° F.) or a tempered half-bath (80° to 88° F.).

(2) *Three-Quarters and Half Packs.*—The three-quarters pack is given in precisely the same way as the full pack, except that the wet wrapping reaches only from the armpits to the feet. It may be given either in the cooling or stimulating form, and the modifications required are the same as those described in the case of the full pack. It will be convenient to use a somewhat

smaller sheet for the three-quarters than the full pack, but the superfluous portions, if any, should in preparing for the administration of the pack be allowed to hang over the foot of the bed. The upper edge of the blanket (cooling form) or blankets (stimulating form) should be so placed that when the patient lies down it will be level with the axillæ, and the upper border of the wet sheet must be about three inches lower down the bed. In bringing the two sides of the sheet across, the right leg should be wrapped in the lower part of the right-hand portion, and the left leg in that of the left-hand portion. Duration of cooling three-quarters pack, forty minutes to one hour; of heating pack, one to three hours. Conclude with half bath or ablution as above.

The half pack is given only in the heating or stimulating form. It has the advantage that complete nudity is not required; the patient may simply remove his coat, waistcoat and trousers, and draw his shirt out of the way. The pack extends from the feet to the umbilicus only. Half an ordinary sheet, or a piece of sheeting measuring about 4½ ft. square, and a large thick blanket, doubled and laid across the lower half of the bed, will be required. The sheet is well wrung out of water at about 68° F., and carefully and smoothly packed round each separate leg and foot. The doubled blanket must also be lightly applied, and over all a couple of blankets or an eider-down quilt is laid. Duration, one and a half to three hours; and conclude with a cold ablution or friction with a cold wet cloth.

Indications. — The cooling full pack is one of the best remedies for acute febrile diseases attended with pyrexia of moderate degree. For hyperpyrexia the cool half or full bath *with friction* is probably more effectual, but repeated packings of somewhat brief duration are a remedy by no means to be despised. Liebermeister asserts that five full packs of ten minutes' duration (temperature of water 65° F.) will abstract as much heat as one full bath at 65° F. for fifteen minutes. The wet pack, as described above, is of course a less heroic measure than the full bath, and its heat-abstracting power may be increased by the simultaneous use of two sheets instead of one. The three-quarters pack is a still milder procedure, suitable for asthenic individuals, delicate women and children.

The stimulating full pack is most useful in acute diseases attended with only slight fever (99° to 100·4° F.), and in numerous chronic maladies, such as anæmia, gouty neuroses, diabetes, obesity and auto-intoxication.

The half pack is indicated in cases of insomnia, cephalalgia, vertigo, delirium, and whenever, in fact, a derivative effect from the cephalic or thoracic vessels is the main object to be attained.

(3) *Trunk Pack.*—The three-quarters, and perhaps too the half pack, may be considered as a mere modification of the full pack. Those which remain to be described are in a somewhat

different category. They may be applied for a much longer time, and are frequently kept on for the whole or greater part of the night. The trunk pack occupies, as it were, an intermediate position between the full pack with its modifications, and the local packs or *bandages* (Umschlägen) properly so-called.

All that is required for the trunk pack is a piece of raw silk or calico, 2 ft. wide and (according to the thinness or stoutness of the patient) from 40 to 50 or 60 in. long, and a piece of soft unbleached flannel about 3 in. wider, and 6 in. longer than the silk. The pack is usually, though not exclusively, administered to a patient in bed, either the last thing at night or during the early morning or forenoon. The raw silk is wrung out of water at between 65° and 72° F., or, in cases of greater weakness and exhaustion, between 72° and 86° F. The patient sits up in bed, and the flannel is laid across the bed with the wet packing upon it, so that when he lies down the upper border of the flannel will just be on a level with the axillæ, and the lower border at or about the level of the hip joints. The patient then lies back, the wet silk packing is smoothly applied to the chest and abdomen, the dry flannel is similarly applied and fastened by three safety pins. If applied at bed-time, the patient should be instructed to remove the pack in three or four hours' time if found uncomfortably hot or chilly, but otherwise to retain it until morning, and on its removal to friction the parts uncovered with a cloth wrung out of cold water. This pack, as also the waist pack, next to be described, is frequently given in combination with leg packs. See paragraph (8) below.

(4) *Waist Pack.*—This is the famous Neptune's girdle of old-time hydropathy, and, simple as it is, one of the most useful of all the resources of hydrotherapy. Except that the raw silk measures only about 4 ft. by 14 in. and the flannel covering 4 ft. by 18 in. and that it is so applied as to cover the loins and abdomen, and not the thorax also, the application of this bandage is precisely similar to that of the trunk pack just described. In many establishments in this country waterproof or oiled silk is used as an outer covering, to prevent evaporation. This I consider unnecessary, and possibly deleterious; and in Germany, it is, I believe, never used. The waist bandage is often prescribed in combination with leg packs, wet socks, or a throat pack.

I would strongly recommend every practitioner who feels the least interest in the possibilities of hydrotherapy to lay in a good stock of raw silk and soft unbleached flannel, cut to the dimensions of the waist bandage. The raw silk should be rolled up, and the flannel (previously edged with wool or silk, *not* hemmed) rolled round it and fastened by two or three safety pins. Such rolled bandages will always be ready for use, and, once tried, will be regarded as indispensable in the treatment of innumerable ailments of gastro-intestinal origin or type

(5) *Perineal or Cross Pack.*—To the middle of the lower border of the raw silk used for the waist pack is sewn at right angles to its length a strip of similar material about 6 in. wide and 20 to 25 in. long. To the middle of the flannel border is sewn a strip of flannel of about 2 in. extra width and length. The T-shaped bandage of raw silk is wrung out of water at the desired temperature, and the waist bandage portion is applied as already described. The perineal strip is then passed between the thighs and brought up till it passes under the front of the waist pack. The flannel covering is similarly applied, and all is made fast with safety pins. Or where an extra cooling effect is desired a soft towel may be folded to the desired width, thoroughly wetted and used in combination with an ordinary waist bandage, covered by a strip of dry flannel, and re-wetted at frequent intervals.

(6) *Thoracic or Scotch Pack.*—This is a combined chest and waist pack, and for an adult of medium size consists of a strip of raw silk about 5 ft. long and 14 in. wide, and a flannel covering 6 ft. long and 17 in. wide. The raw silk, well wrung out of water at the prescribed temperature (usually between 68° and 72° F.) is so applied that its centre rests upon the epigastrium. The two ends are brought round, crossed at the back, brought up over the shoulders, crossed in the front of the chest, and tucked under the upper border of the horizontal portion. The flannel covering is applied in precisely the same way and secured by safety pins. This bandage is usually applied at bedtime, and should be worn for at least three hours, or, if found comfortable, for the whole night. On its removal the chest and back should be briskly rubbed with a cloth wrung out of cold water.

(7) *Throat Pack.*—The raw silk or linen portion of this bandage should, for an adult, be about 3 ft. long and 8 in. wide, and the flannel portion an inch or so wider. The former is loosely wrung out of cold or cool (66° to 72° F.) water wound round and round the neck as smoothly and closely as possible without obstruction of the return of blood from the head. The flannel covering is similarly applied and the bandage is re-wetted as required.

(8) *Leg, Foot, Arm, and Hand Packs.*

(*a*) *Leg Pack.*—Raw silk, linen or calico strips measuring 2 ft. by 22 in.; flannel strips measuring 2 ft. by 26 in. These may be applied so as to cover the leg from the ankle half way up the thigh, or, by doubling lengthwise, to the leg below the knee only. In the latter form they are frequently used in combination with the trunk pack or waist pack, to enhance their derivative and sedative effect.

(*b*) *Foot Pack.*—Cotton socks wrung out of water at the desired temperature (say 64° F.) are put on and covered with dry woollen socks. Or the foot may be wrapped in a wet towel or napkin and a covering of dry flannel applied.

(*c*) *Arm and Hand Packs.*—These, though sometimes useful enough, are not very frequently required, and no detailed description can be necessary to anyone who has read the preceding paragraphs.

Indications.—The cooling trunk pack fulfils in its degree all the indications of the full pack and three-quarter pack. It is of course a less heroic remedy, and in severe cases less effectual as a means of controlling pyrexia and its concomitant nervous and other symptoms, but it has the advantage of involving less disturbance to the patient and less trouble and skill on the part of the attendants. It is an excellent remedy for the febrile diseases of children. The stimulating trunk pack, as also, in a similar class of cases, the waist pack is of great service in the treatment of numerous gastro-enteric maladies. I have found one or other of these two bandages most useful in cases of catarrhal jaundice, enteritis, vomiting, gastric ulcer, gastric catarrh, nephritis, insomnia, dyspepsia and constipation. The waist bandage may be worn every night for weeks or months at a time; the trunk pack three or four times weekly. In many cases the good effects of these bandages will be enhanced by the application of a compress of linen or raw silk wrung out of water of suitable temperature, folded fourfold, and applied over any organ upon which it is desired to produce a derivative effect. The waist pack, when prescribed for insomnia of gastric origin, should be given in combination with leg or foot packs, preceded, if necessary, by a hot foot bath. The perineal and waist pack combined will be found beneficial in urethritis of gonorrhœal or gouty origin, in nocturnal emissions and sexual hyperæsthesia, and in numerous uterine affections. The Scotch pack is indicated in acute bronchitis, pneumonia, pleuritis, also as an adjunct in the treatment of phthisis, chronic bronchitis, asthma, and the pulmonary complications of influenza and other acute diseases.

Exercises for Overcoming the Ataxia of Tabetics was discussed by Dr. J. H. W. Rhein, of Philadelphia, in the section of Nervous and Mental Diseases of the American Medical Association. Attention was specially directed to the simplicity of the exercises, their short duration and the guarding of the patient from fatigue. In the discussion by Leszynsky, of New York, it was pointed out that only a very small percentage of cases of tabetics were suitable for carrying out this treatment—that in all those cases in which the disease had advanced so far as to be associated with paresis, or in some cases with arthropathy, or marked hypotonia, little good could come from re-education. Rhein recommended in cases in which the paresis was so marked that the patient could not lift his legs, a pulley arrangement of Goldschieder's placed over the bed in a sling into which the leg fitted, and that the exercises be carried out in that way.—*Philadelphia Medical Journal*, June 21, 1902.

PRACTICAL MUSCLE TESTING.—IV.

By Dr. W. S. Hedley.

In the last article was described the typical reaction of degeneration, such as occurs, for instance, after a serious traumatism of nerve, or in the "severe" type of Bell's paralysis. But everyone accustomed to electro-diagnosis is aware that apart from such cases, and even where there may be degenerative changes accompanied by profound alterations of nerves and muscular tissues, the abnormalities of response to electrical stimulation are by no means identical with the typical cases described. The exceptions are even more frequent than the rule. Thus:—

(1) The excitability of the nerve may be not altogether lost, indeed only diminished to a very slight extent; yet the changes in galvanic reactions, *i.e.*, the exaggerated excitability, the inversion of the formula and the sluggish contraction, may be present. "This is "Partial R. D."

(2) There may be simple diminution of irritability in both nerve and muscle for coil currents, with sluggish contraction for continuous currents, and without inversion of the formula.

Other anomalous forms are the following:—

(*a*) The muscles may respond by a sluggish contraction to stimulation applied through the nerve trunk.

(*b*) The muscle may respond in a similar sluggish manner to coil currents applied through the muscle itself.

Now in full view of the symptoms which collectively constitute the reaction of degeneration, and having recognised the fact that owing to abnormalities and deficiencies this classic picture is not always clear and complete, and further, being aware that in the present state of electro-diagnosis this "R. D." is the only firm basis on which to build any certain clinical deduction, we are in a position to pass on to ground which, although less secure for the present, is full of promise for the future.

The question is this: Can the whole subject of electro-diagnosis be placed upon a more logical basis and eventually simplified by making an attempt to resolve the various combinations of reactions above considered into their primary component elements, with a view to assign to each its own peculiar significance. It is with this object that Doumer, "breaking with the past," has given the following synopsis:—

The elementary reactions are divisible into two groups: I.—Modifications of excitability to galvanic and faradic stimulation. II.—Modifications in the *character* of the muscular contraction.

I.—The modifications of faradic and galvanic excitability are as follows:—

To faradism—(*a*) Diminution of faradic excitability; (*b*) increase of faradic excitability.

To galvanism—(*a*) Diminution of galvanic excitability; (*b*) increase of galvanic excitability; (*c*) variations in the relative value of K.C. and A.C. (reaction of Erb); (*d*) Variations in the relative value of K.C. and K.O. (reaction of Rich.); (*e*) abolition of all excitability on stimulation through the nerve, but preservation of excitability of the muscular tissue when the latter is stimulated by currents parallel to the direction of the fibres ("longitudinal reaction").

II.—Abnormalities in the *character* of the muscular contraction:—

(*a*) Diminution of lost time; (*b*) increase of lost time; (*c*) diminution in duration of contraction; (*d*) increase in duration of contraction; (*e*) alterations in the form of the curve; (*f*) reaction of exhaustion (*Arch. d'Elect Med.*).

I.—Modifications of Galvanic and Faradic Excitability.

Diminution or abolition of faradic excitability is due either to alteration in the motor nerve, or in the corresponding muscle or in both, and indicates some change at the point stimulated, or peripheral to that point, but it tells nothing of lesions situated above that point. This "simple diminution," *i.e.*, diminution apart from other abnormalities, may occur in old-standing disease of the nervous centres, or in muscular atrophies, whether myopathic or depending on articular disease.

Diminution of galvanic excitability exists in the same diseases, and has the same significance as diminution of faradic excitability, but it is especially found in those changes in the motor nerve-trunks that follow traumatism or disease of the anterior cornua. In such cases it means that the motor nerve-cells and fibres undergo change of a chronic character. They alter gradually and slowly, and as the number of sound fibres is usually in such cases in excess of those destroyed, no qualitative modification in galvanic excitability is detected. There is similar diminution to both galvanism and faradism. As the number of nervous filaments affected gradually increases, the nutrition of the muscle is slowly and steadily impaired. There is no stage of lost faradic excitability and increased galvanic excitability such as we have seen characterises the R. of degeneration. All that has been said above of diminution of faradic excitability is true of diminished galvanic excitability; and Doumer enunciates the following propositions:—

(1) Diminution or abolition of galvanic excitability when present without any qualitative changes is due to alteration in the nerve or muscle, or both.

(2) It always corresponds to changes having their seat at the point explored, or peripheral to it.

(3) No alteration of the nervous centres or of nerve-trunks above that point can produce it.

Increase of excitability to faradism or galvanism.—The pathological conditions which produce these are very imperfectly known; but it is certain that increase of galvanic excitability is the chief and sometimes the only diagnostic sign of tetany. Hyperexcitability often precedes degenerative alterations of nerves; and apart from these, increased excitability is often found to follow diminished excitability in diseases accompanied by contracture, whether the latter be commencing or established. This increased excitability also occurs in a large number of primary scleroses of the lateral columns.

The foregoing points are thus summed up by Doumer: Quantitative alterations in galvanic and faradic excitability can give information only as to the condition of the neuro-muscular apparatus at the point of exploration, or peripheral thereto. But this conclusion is not actually demonstrated excepting in the case of diminished excitability.

Alteration in relative value of K.C. and A.C. (R. of Erb).—Wherever this reaction is found there are serious alterations in the histological elements of the nerve, therefore it occurs in severe neuritis from whatever cause, whether traumatic or toxic, in rapid degenerations of the nerve-trunks occurring in acute affections of the anterior cornua of the cord, in progressive muscular atrophies of Aran-Duchenne and Charcot—Marie type, in infantile paralysis, diffuse myelitis involving the anterior cornua, transverse myelitis at the seat of the lesion, &c.

On the other hand, this reaction does *not* occur in the paralysis of cerebral disease, nor in hysterical paralysis, nor in pure myopathies, nor in diseases limited to the white matter of the cord. It is thus evident that one of the chief uses of R.D. is to exclude a certain number of morbid conditions in which it does not occur. It is also clear that this reaction gives more information than any mere quantitative change. The latter leaves in doubt the question whether it is nerve or muscle that is affected. R.D. proclaims that it is the nerve.

The following propositions relative to this inversion of the formula are laid down by Doumer:—

(1) The reaction of Erb is symptomatic of an alteration of the nerve-fibre at the point of excitation. (This alteration reaches probably the corresponding nerve-cell.)

(2) The reaction of Erb is absolutely independent of the condition of the neuro-muscular apparatus situated outside the point of excitation, whether central or peripheral to it.

We have seen that every degree of alteration in electrical excitability may occur from simple diminution through all the various, partial, and anomalous forms to inversion of the formula marked and complete. These degrees probably point to the varying number of altered nerve filaments, or it may be that

they correspond to different structural changes (parenchymatous neuritis, interstitial neuritis, &c.).

Variations in the relative value of K.C. and K.O. (reaction of Rich) are characterised by the tendency these two reactions have to become equal. It may be seen in R.D., but it is especially apparent in a limb which has been compressed by an Esmarch bandage. In the case of the normal median nerve K.O. requires a current ten times as strong as K.C., whereas in the reaction in question it is 1·25 with K.C. and 1·75 for K.O. The exact pathological signification of this is not known.

Longitudinal reaction ("reaction at a distance"). — It is found that although electrical excitability may have disappeared to stimulation at the motor points, the muscle will display a contraction if the direction of the current be made to act parallel to the muscular fibres; and the contraction will be stronger with K.C. than with A.C. (Doumer, Huet, Ghilarducci). This reaction is the last manifestation of contractility before the latter entirely disappears. It is, perhaps, the only case that corresponds to the direct excitation of the muscle (Doumer). But we cannot say that it indicates loss of excitability in the nerve or degeneration in the muscle, although it only seems to be present in cases of such duration as would point to complete destruction of the nerve. It may, however, only mean that a muscle deprived of any nervous influence contracts best when stimulated by a current moving in a direction parallel with its fibres. Under the influence of curara, which destroys the irritability of the endings of the motor nerves, something very similar occurs.

To elicit this longitudinal reaction the indifferent electrode is placed as usual below the back of the neck, and in the case of long-tendon muscles the active electrode will occupy such positions as the following:—

For extensors of wrist and finger: back of forearm a little above wrist. Flexors of wrist and finger: middle of front of forearm above wrist. Peronei behind ext. malleolus. Ext. l. dig. and Tib. antic.: instep. Calf muscles: Tendo Achillis near its insertion. Deltoid: back of hand of same side. Flexors and extensors forearm: front or back of forearm: sometimes back of hand. Quadriceps fem.: immediately below patella upon the whole upper third of leg; sometimes as low as the instep. Biceps fem.: half of the calf.

It is with kathodic closure that contraction is strongest in longitudinal reaction. This "reaction at a distance" continues after the disappearance of all others, and this has been explained by the fact that the distance of the electrodes from each other increases the mass of electrolyte between them, and therefore the electrical capacity of the circuit is increased, and the time factor increases with the capacity (capacity × R. = time). In other words, the muscle is traversed by electrical waves *slower*

than in the ordinary methods of excitation, hence the stimulus is more effective (Bordier).

II.—Modifications in the Character of the Contraction.

Alterations in character (the "curve") of muscular contraction.—It is not sufficient to know whether or not a muscle acts, it is also important to ascertain *how* it acts. The curves or abnormal contractions have been studied by Mendelsohn, who shows that there may be alterations in any of the various elements of which the curve is exposed, *i.e.*, in the lost time, in the duration of the contraction, in the amplitude of the curve, in the suddenness of the ascent, and in the line of descent. He gives the following types:—

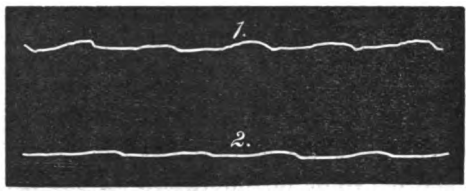


Fig. 1.[1]—R.D. from Pressure of Splint.
1. Myographic tracing of A.C.C. abd. min. dig. 2. Myographic tracing of A.C.C. abd. min. dig. (muscle fatigued). No reaction to K.C.

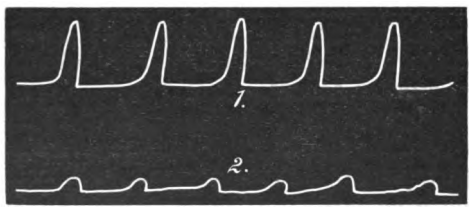


Fig. 2.
1. Myographic tracing of K.C.C. in corresponding muscle of the other hand.
2. Myographic tracing of A.C.C. in corresponding muscle of the other hand.

Degenerative type of contraction-curve.—(1) Increase of lost time. (2) Increase of duration of contraction. (3) Slow ascent. (4) Slow descent with undulations in line. (5) Diminution in amplitude.

Found in atrophy depending on degeneration of the nerve.

Atrophic type of curve.—As above, but never with undulations in the line of descent.

Occurs in simple atrophies of muscle.

Paralytic type of curve.—(1) Prolongation of lost time. (2) Diminution in height of curve occurs in every case of paralysis where there is integrity of the muscular tissue, but where nervous centres are involved.

[1] From Case Books of London Hospital.

Spasmodic type of curve.—(1) Diminution of lost time. (2) Brusque ascent. (3) Long ascent. (4) Diminished amplitude (in confirmed contracture) characteristic of true contracture, whether of sclerosis or contracture.

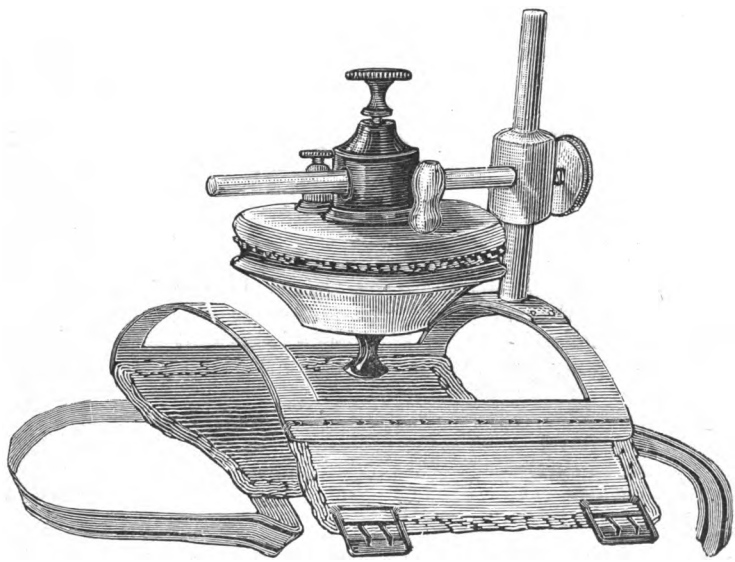


FIG. 3.—CLINICAL MYOGRAPH OF RADIGUET.[1]

In the appreciation of these curves the clinical myograph of Radiguet is useful (see fig. 3).

Electric Light in Respiratory Diseases.—Freudenthal discusses the above subject, with reports of several cases of tuberculosis and one of hay asthma. He regards the electric arc as an adjuvant of great value in the treatment of these conditions, and uses for the applications a marine search light, both with and without the screen of blue glass. In the event of the exposed parts becoming too hot, he keeps on hand a supply of linen on ice with which he bathes them. He reiterates the well-known fact that light, directly and indirectly, exerts a great influence on the metabolism of the whole system when applied to the skin. His results are confirmatory of those which have been reported by other observers in the treatment of these conditions.—*New York Medical Journal*, July 12, 1902.

---

[1] Showing attachment for tube connecting with recording part of the instrument.

PHYSICAL THERAPEUTICS OF EXOPHTHALMIC GOITRE.

"THE Handbuch der Physikalischen Therapie," Band I., has an interesting article by Prof. D. Hermann Eichhorst (Zurich) on the above subject. He considers that whether given to combat prominent symptoms or to deal with the general condition, the drug treatment of exophthalmic goitre cannot boast of any great success. After reviewing the action of various drugs, including digitalis, strophanthus, caffeine, belladonna, iodine, iron, quinine, bromides, organo-therapeutic remedies (thymus and thyroid), he comes to the conclusion that there is no specific treatment for the disease. Owing to the impotency of medicinal agents, it is not difficult to understand that the aid of surgery was willingly accepted. He then proceeds as follows:—

At the present moment there lies before me an imposing list of operations on the thyroid gland for exophthalmic goitre. The latest and most extensive collection to my knowledge being that of Rehn who has collected 319 goitre operations for exophthalmic goitre. It is as follows.

Cured	= 54·8	per cent.
Improved	= 27·9	,,
Not improved	= 4·1	,,
Deaths	= 13·1	,,

From my own experience I can foresee that the number of cures and improvements will be rather less in future; at least I have seen some cases of exophthalmic goitre brought to me by renowned and disinterested surgeons as improved or cured, whereas I could not shut my eyes to the fact that all the symptoms of the disease were demonstrable in a marked and unmistakeable way.

Hypnosis and suggestion have often been tried for exophthalmic goitre, but the results have, without exception, been negative.

Physical curative measures are superior to medicinal treatment for exophthalmic goitre in many respects, and certainly ought always to be used even when drugs have been given. To a certain extent the transition from medicinal to physical treatment improves nutrition and mode of life.

Patients suffering from this disease should avoid everything in their diet which is likely to excite the nervous system. Coffee, tea, spices, acid things, and alcohol should never be taken, and smoking must be forbidden; I have seen splendid results in a large number of cases, by giving an almost exclusive milk diet. Many patients are so emaciated that a real "stuffing" diet seems the best course to take, and this very often materially lessens the more troublesome of the symptoms.

Very often patients get marked relief when ordered a vegetable diet; but care must be taken when recommending carbohydrates and sugar, because the analyses of Chvostek and Goldschmidt show that alimentary glycosuria often occurs, and Osterwald reports over twenty observations of diabetes in exophthalmic goitre.

It is an important and practical rule that patients suffering from exophthalmic goitre should not take any nourishment hot nor should

their meals be separated by too long an interval. Those who neglect these rules soon find that they suffer for it by getting very disagreeable symptoms, such as violent palpitations and troublesome oppression and feeling of fear.

The mode of life of a patient suffering from exophthalmic goitre should be as quiet as possible both physically and mentally. The overworked business man, the worried official, the learned men with ever active brains, must give up their profession entirely for a long time if they look for cure. The housewife who from early morning till late at night has to look after her house and children should change her sphere of activity for a quiet and peaceful spot and should put herself in some suitable hospital or home where she could be under medical observation and have continuous treatment.

Patients with exophthalmic goitre are very properly recommended change of air and climate, but this advice should be given only to those patients who can travel without exertion or difficulty, and who can remain up all day. In many cases a simple quiet country place is sufficient. Shady places, with woods are better than where there are no trees, because the hot rays of the sun usually increase the symptoms. The patient must be very careful about taking walks, especially at the commencement of the cure, and it is better to make a commencement by simply lying out in the fresh air in shady places protected from the wind. If walks are taken later on they should never be long enough to produce fatigue—half an hour's walk morning and afternoon increased to an hour should never be exceeded. The best way to begin is to walk for ten to fifteen minutes, and then take the same period of rest sitting down.

Each patient should be provided with instructions, as it is certain that most people who go away to the country for change, erroneously think that they can never do too much walking.

Gowers and Glax advise the seaside; the latter saw splendid improvement in five patients who stayed at Abbazia. My own experience is not so favourable, and it seemed to me that such a coast should be avoided on account of the frequent strong winds. Some patients I knew of have become infinitely worse from staying at places on the North Sea, whereas they were much benefited by wintering in the Riviera.

Friederich has rightly advised such patients on no account to bathe in the sea; but I have often seen good results from giving warm sea-water baths. Commencing with a temperature of 95° F. to begin with, a duration of ten minutes, and increased every bath five minutes up to half an hour, the patient being put to bed for an hour after each bath. The number of baths were four weekly, and the total number twenty. Gowers advises long sea voyages as well.

Residence at a high altitude agrees surprisingly well with some cases, and it is difficult to understand Gowers' warning against residence in high altitudes. I see in Nothnagel's book (part I., vol. i., p. 112) that he does not approve of sending cases to open-air cures on the mountains.

I have published my own experiences already in part I., vol. i., p. 163, and have shown, like Northnagel, that although some patients were not benefited, others derived a great deal of good even when they stayed at such high altitudes as St. Moritz (1,769 m.). Senator, Stiller,

and Ewald now belong to those who advise patients to sojourn on high mountains. Very often failure is due to the fact that the patients are not careful enough about walking, especially about climbing mountains, which is particularly harmful for such cases.

During the last few years there have been many trials of bathing cures for exophthalmic goitre, more with a view to battle against some special symptom than for the treatmeat of the general disease.

Almost without exception the idea of strengthening the weakened muscles of the heart to perform their work is followed up.

It is best to recommend the carbonated mineral baths—especially those of Nauheim. The carbonate of iron baths of Cudowa, in Silesia, have also been tried. We have not much experience of this yet, but now and then we get a report of very remarkable results in suitably chosen cases, which makes us very hopeful.

The older writers, such as Trousseau, strictly condemn hydrotherapy in Graves' disease. It is best to carefully avoid all interference with the nervous system which tends to excite it more. This advice is very important, at any rate in the beginning of hydropathic treatment. For this reason douches, shower, and sea baths should be avoided as much as possible. Hip baths and whole baths, friction and damp packs are of the greatest service, provided they are carried out by experienced persons. Cold compresses to the back of the neck have sometimes been tried in order to procure a soothing effect on the spinal cord, which is supposed to be the seat of the disease. Derivation is also obtained by applying bandages to the calves. In cases of severe palpitation and visible increase of the heart's action cold in the shape of an ice-bag or Leiter tube should be applied to the region of the heart. People who are going about get great comfort from wearing a heart-shaped bottle filled with cold water.

Under certain conditions much can be done by mechano-therapy. It has been admitted above that general massage, added to overfeeding, is advisable. Local massage of the heart, thyroid gland, and eyes, has also been practised. Zabludowski recommended massage and tapotement to the spine.

I have been able to give some of my patients great relief from distressing palpitations by bandaging them tightly, and thus raising and supporting the heart region. The heart support recommended by Abée can be used.

Electro-therapy, as well as hydro-therapy, is amongst the oldest methods of treating exophthalmic goitre. Lately there has been much opposition and doubt as to the supposed effects of electric currents on the human body, and the old story of referring the whole of the beneficial results of electricity to suggestion has once more been mooted. Such doubts, so far as electrical treatment is concerned, must certainly be admitted, and the great diversity of methods recommended gives some force to the objection, but the latter applies to every other form of treatment, as well as to electricity.

The galvanic current is mostly used as a matter of course, but Vigouroux, and later Plicque, preferred faradism. Rockwell tried static electricity. Lately, electric baths have come more into use again. In every electrical treatment great care must be taken to avoid all excessive irritation, such as strong currents, too lengthy application, and too long a course.

Robert Remak, and later on v. Dusch, first recommended the galvanic current. So long as it was supposed that the disease arose from the sympathetics, galvanism to the throat was prescribed. Choostek, Meyer, Eulenberg, and others have reported very good results, and Cardew has also latterly recommended it. I myself have seen so many surprisingly quick results from galvanising the sympathetics of the throat that I cannot believe them to be the result merely of suggestion, especially as experience teaches that hypnotism and suggestion have no effect in exophthalmic goitre. The current strength for galvanisation of the cervical sympathetics should be between 3 and 5 m.a. The anode is usually chosen for the indifferent electrode (carbon or copper), and should be placed on the sternum or in the fossa jugularis or on the cervical spine. The more exciting pole, the kathode (zinc), having been well moistened, is pressed upon the sympathetics of the throat. The stabile, or labile methods are equally good. For the stabile application the kathode is placed on the auriculo-maxillary fossa immediately behind the ramus of the lower jaw, so as to be able to reach the cervical sympathetic. For the labile application the kathode is slowly moved up and down the large vessels of the neck, as they are known to occupy the same positions as the cervical sympathetics. The individual applications should not last longer than five minutes, and this time should be equally divided between the two sides. Of course it is not necessary to adhere strictly to these rules in every case. For instance, some prefer to vary the treatment by using the anode or kathode in turn, whilst others use both poles at each application.

Fries recommends galvanising the vagus so as to retard the action of the heart. With this end in view he places the kathode or active electrode on the inner side and about the middle of the sterno-mastoid muscles. The possibility of the electric current exciting the vagus and cervical sympathetic separately in the neck seems very doubtful, in fact many have doubted the possibility of an electrical excitation of the cervical sympathetics; for which reason Stintzing proposed to give up the term galvanisation of the cervical sympathetics and to call the application sub-auricular galvanisation. Those who think that the seat of the disease is to be found in the cervical spinal cord advise galvanism to the cervical spine. For this a stronger current is required (5 to 10 m.a.) The anode is placed between the shoulder blades on the fifth dorsal vertebra and the kathode is put on the summit of the spinal column close under the skull. If it is to be a labile application both electrodes can be slowly passed up and down the spine in turn. To galvanise the spinal cord transversely both electrodes are placed immediately behind both mastoid processes. Erb also recommends transverse and oblique currents through the skull. Great care must be taken with regard to the strength of the current in all these cases, and a rheostat should be in circuit so as to reduce the current slowly should the patient complain of giddiness.

Rockwell suggests galvanising the solar plexus by putting the kathode on the sternum and the anode on the abdominal wall. Galvanic currents have also been used locally on those parts specially affected by exophthalmic goitre.

Vigouroux and Charcot recommended galvanising the whole cardiac area and Ziemssen advised strong galvanic currents on the heart, but as

far as I know this treatment has not been considered satisfactory. The galvanic treatment of the thyroid gland is applied either according to the bi-polar or uni-polar method. For the bi-polar method one pole is placed on the right side and the other on the left of the thyroid gland and cross currents sent through the enlarged growth. For the uni-polar application one electrode, usually the anode, is placed on an indifferent part (sternum or cervical spine) and the other electrode on the thyroid gland. As regards the galvanic treatment it has also been attempted to drive in iodide of potassium by cataphoresis into the thyroid gland. Besides using the galvanic current for heart and thyroid glands it has also been used for exophthalmos. The electrodes are placed on both temporal fossæ and on the closed eyelids. Katyschew is using faradic currents in the electrical treatment of the cervical sympathetics with good results. His method consists of faradising the posterior triangle of the neck. He has also tried the electrical brush over the cardiac region with a view to influencing the heart itself. The above-mentioned French authorities, Vigouroux and Plicque especially, employed the faradic treatment for the heart region and the eyes.

In the electrical treatment of exophthalmic goitre the results are occasionally seen very quickly but more often after long perseverance; and it is often advantageous to change the methods from time to time during the course of a long-continued treatment.—(Trans. by Dr. S. Whitaker and M. Nelson Smith.)

Reviews and Notices of Books.

ELECTRICITY IN MEDICINE AND SURGERY, INCLUDING THE X-RAY. By W. Harvey King, M.D. (Boericke and Runyon Co., New York, 1902.)

That a second edition of this work has so quickly followed the first is as gratifying to the author as it is satisfactory to those who view with interest the growing importance of electrotherapeutics. The section on electro-physiology is by Dr. W. Y. Cowl, of Berlin, and that on the Bottini operation is by Dr. A. Frendenberg (Berlin).

The fact that the volume arrives rather inconveniently near our time of going to press must be pleaded as our excuse if the scope of this notice is scarcely commensurate with the importance of the book. Its general plan is on the usual lines which experience shows that it is hazardous to depart from; thus, of its 500 pages the first 100 are devoted to the physics of the subject, including the X-rays Section III. forms a good exposition of electro-diagnosis. Here there seems to be room for difference of opinion with the author on certain minor points, for example, it is here advised that in all examinations of the face, one of the examiner's hands be held against one side of the patient's face to steady it; but, it may be asked, with one hand holding the testing electrode, and the other holding the patient's face, where does the examiner find a hand to manipulate his rheostat, or cell collector, or coil? The motor points (of which plates are given), both for the surface and for the muscles, are full and clear. An ingenious article on "Organic Electrology" follows, which might form

an interesting ground for comment, did time permit. The reader will find that the author has made up his mind at least on one point, viz., that "the burden of proof now lies on those who maintain that the nervous impulse is something else than electricity." The next 300 pages are devoted to electrotherapeutics. This part commences with those "portentous" diagrams of circling lines of current, deviating in their course from point to point neither for muscle, nerve, nor bone, which have held the field since Erb's book in the sixties of last century. For the treatment of patients "by diagram," these regular lines sweeping relentlessly from point to point might prove striking and effective. But they must indeed seem crude conceptions to the electrologist who tries to realise what actually does occur when a current once enters such an electrolyte as the living body. The rest of the section forms instructive and substantial reading, and technique is given with a fair amount of detail in each instance.

Lastly comes an appendix, which is one of the most interesting chapters in the book, bringing it quite up to date, although it must be said that it bears evidence of a hasty putting together. It will be noticed that by "the therapeutic properties of radiant energy," the author refers to the chemical action of the violet, ultra-violet, and the rays above them. It cannot be supposed that he denies the therapeutic power of heat. Again, he speaks of the penetrability of X- and violet rays, when he evidently refers to their power of penetration. And again, is it too great haste or too little care, or merely the idiom, that makes such sentences as the following sound harsh to British ears: "We have never seen" (as a result of X-rays), "any great shrinking of the tumour in scirrhus, yet we have some."

Altogether, Dr. King is to be congratulated on his book and its second edition. It will take immediate rank amongst our standard works, and it will be appreciated by all who are competent to form an opinion.

The volume is well "got up," and therefore the greater the pity that such blemishes (easily remediable in the next edition) as "ulner," "meidian," "locometion," and "skiograph" should so plentifully disfigure its pages.

THE TREATMENT OF TABETIC ATAXIA. By Dr. H. S. Frenkel. Translated and edited by L. Freyberger, M.D.(Vienna), M.R.C.P., M.R.C.S. With 132 Illustrations. (Rebman Limited, London. Price 12s. 6d. net.)

This is an exposition of the principles and practice of compensatory movement treatment. It is a valuable addition to the literature of physical therapeutics, and must be especially welcome to those who are not familia with the German original. Although a translation of Frenkel's book, it has been so carefully and judiciously edited, that everything too theoretical or controversial is omitted.

The printers' work is superbly done, and the 132 engravings leave nothing to be desired. The reader need not be reminded that the Frenkel system consists rather in *practice* than in athletic strengthening of the muscles, and further, that it does not claim to influence the tabetic process, but only to exercise a beneficial influence on the prominent symptoms, viz., the ataxia. It is further well known that this particular system requires but little apparatus, and can be carried out under the direction of the patient's own medical man, without resorting to special establishments. Of course the readers of this Journal need scarcely be reminded, that in cases where the disease is advanced and associated with paresis, or with arthropathy, or with well-marked hypotonia, there is not much to be expected from the re-education of muscles.

"La Théorie des Ions" en Electricité Médicale. By Dr. Manuel Gonzalez Quuano Sanchez. (A. Dugas, Nantes, 1902.)

This is a Paris thesis and (as every such work ought to be) is the outcome of personal and original experiment by its author. Space does not permit the reproduction of any very copious extracts, but the general conclusions may be enumerated:—

(1) Contrary to pre-existing views colloidal substances offer a resistance to molecular and ionic movements in proportion to the concentration of their solutions, and therefore it is reasonable to suppose that vital molecular movements in cellular plasma are less the less water such plasma contains.

(2) An alteration in the composition of a colloidal solution may reverse the resistance to different crystalloid molecules, so that, for instance, the plasma of a glandular cell slightly acidified will stop certain molecules and allow others to pass; if made alkaline such a plasma will act in the reverse way.

(3) The electrical resistance of saline solutions containing a colloid substance increases with the concentration of the latter, which is an expression of the resistance to ionic movements.

(4) It is actually possible to undertake the experimental study of the relationship of ions with the living organism.

(5) The electric resistance of the human body is nothing more than the resistance of the tissues, and especially of the skin, to ionic movement.

(6) It is possible to determine the relative rate of movement of ions in the living tissues; it is not the same as in aqueous solutions: this speed varies with various ions.

(7) A knowledge of their speed is necessary in order to "dose" ions electrolytically introduced.

(8) The curve of conductivity and of polarisation, as well as the speed of ions, varying as it does in different individuals, constitutes a very sensitive reaction of their condition, and ought to prove a means of comparing their physiological and pathological states.

(9) The electric current only penetrates by the glands.

(10) The effects of electric currents on the skin are ionic effects, and vary in the case of each ion.

(11) The ions modify profoundly and in various ways the excitability of the nerves.

Digest of Current American Literature.

THE ROENTGEN RAY.

Three different degrees of burns from the X-ray are distinguished by Carl Beck. The first degree is characterised by the symptoms of hyperæmia, *i.e.*, infiltration of the cutis and slight elevation of temperature. In the second degree blisters are formed, the clear or yellowish contents of which lift the corneous from the mucous stratum of the rete malpighii. The third is characterised by the escharotic destruction of the irradiated tissues and is the most serious. Ordinary burns and X-ray burns are characteristically differentiated. In the first the integumental evidences appear at once, in the latter after a period of incubation of, as a rule, two weeks. First there is a light,

later dark redness, and finally the skin becomes brown and scaled. Recovery ensues in a few weeks, with sometimes slight pigmentation of the skin. Irradiation of a case of lupus was made fifteen times before any reaction occurred. The redness did not decrease or the nodules begin to decrease until after the twentieth exposure, but after the twenty-fifth the ulcerations had cicatrised, the scales had disappeared, and no traces of nodules were to be found. For six weeks longer the redness persisted.—*New York Med. Journal*, May 24, 1902.

Radiotherapy for Cancer and other diseases is discussed at length by Morton, who concludes as follows: (1) Radiotherapy broadens our conceptions of the possibilities of the therapeutics of modern medical science. (2) The X-ray has a general application for the relief of pain. (3) As to technique, a standardisation as to apparatus and its capacity, and as to duration and frequency of treatments and distance of the tube is recommended to operators. (4) The X-ray has a curative effect in internal cancer and other internal diseases. (5) For superficial diseases a medium soft tube may be used, for internal cases a hard tube. The hard tube is applicable, however, in all cases. (6) X-radiation is recommended prior to any operation, to clear the tissue of cancer particles and foci, and to circumscribe the disease. (7) X-radiation is recommended after operation to preclude a recurrence. (8) X-radiation may be recommended in place of an operation, and may be preferable to one for the reason that operation secures but a comparatively moderate percentage of permanent recoveries, and because up to date the X-ray procedure shows a continued improvement in cases, and a percentage of cures which will undoubtedly compare favourably with surgical operations. (9) There is danger to the patient or uncertainty as to what might be accomplished when the X-ray is employed by immature operators. (10) In X-radiation we possess more nearly a solution of the problem of curing cancer than by any other method of treatment.—*New York Med. Record*, May 24, 1902.

X-ray Treatment of Carcinoma.—Johnson and Merrill continue the discussion of the above subject, and report in tabulated form 27 cases of epithelioma, carcinoma and sarcoma treated by means of the X-ray. Of the 16 cases of epithelioma 10 are apparently cured, 4 show improvement, and only 2 cases fail to derive benefit from the treatment other than alleviation of the pain and diminution of discharge. None of the 7 cases of inoperable carcinoma showed any improvement beyond relief from pain. One case of lupus vulgaris gives as good results as any of the epithelioma. Two cases of fibroma showed no improvement.—*American Medicine*, August 9, 1902.

Therapeutic value of the X-ray in Sarcoma.—Coley concludes from the results of his observations: (1) That the results in the cases thus far treated prove that the Roentgen ray has a remarkable inhibitory action upon the growth of all forms of malignant disease, and that this is especially true of sarcoma; (2) that the action in many cases of even far advanced and inoperable malignant disease may result in the total disappearance of the tumours, often without any breaking down of the tissues, the new growth being apparently absorbed; (3) whether the patients have been cured, or the disease has been merely arrested to reappear at some future date, is a question that time alone can decide; (4) recent observations and experiments upon the various forms of carcinoma and sarcoma prove that an agent supposed to be of value only in a limited class of superficial epitheliomata, promises to be of as great or

even greater value in practically every variety of cancer; (5) while at present there is a little evidence to show that deep-seated tumours in the abdomen and pelvis can be cured or benefited by the Roentgen ray, there is still more reason to hope that with improved apparatus, or with greater knowledge and skill in using the apparatus that we now have, even those cases may be benefited; (6) The Roentgen ray has a very marked influence upon the pain of nearly all types of malignant tumours, causing entire relief in many cases.—*American Medicine*, August 16, 1902.

Hæmorrhage of Fibroid Tumours controlled with the X-ray.—Gibson reports a case of multiple fibroid of immense size, in which hæmorrhage has been a prominent symptom. The treatment had been given by means of the continuous or galvanic current for two months, but during six weeks prior to the report the X-ray had been alternated with the galvanic current. For two weeks after the use of 150 milliampères of current hæmorrhage was excessive. A ten minutes' exposure to the X-ray resulted in its control. It has recurred three or four times since, but has been promptly checked by an exposure to the ray.—*Advanced Therapeutics*, September, 1902.

"The Present Status of X-ray as a Means of Diagnosis and as a Therapeutic Agent," was the subject of a paper read by Dr. Bevan before the American Surgical Association. The X-ray he finds of marked benefit in cases of lupus, superficial cancer, sarcoma, Hodgkin's disease and in two cases of tuberculous peritonitis. He believes that all operable cases should be treated with the knife. The X-ray had no effect on deep-seated growths. In diagnosis, diseases of the chest and bones, gall-stones, kidney-stones, also in spine and hip injuries, can often be readily determined. Burns often occur even with experts.—*Philadelphia Med. Journ.*, July 5, 1902.

The Effect of Roentgen Rays on the Blood.—Samuel H. Friend, in a preliminary note, states that while treating patients with the Roentgen rays in a case of inoperable cancer of the breast, and in one of intra-abdominal sarcoma, he observed as one of the effects of treatment a great increase of erythrocytes and a great diminution of leucocytes. A further description of the condition in detail is promised in a future communication.—*American Medicine*, July 5, 1902.

ELECTRICITY.

In the Presidential Address at the meeting of the American Neurological Association, Joseph Collins, of New York, states that the therapeutic value of electricity is a subject upon which neurologists differ quite as much in all probability as almost any subject that can easily be mentioned. The reason is that trustworthy data are not at hand to serve as a guide in putting an estimate upon its value, and that the time and application to make such data is lacking. Reliable experimental work is needed, such as that which gave electro diagnostics a solid foundation. Reference is made to the article by Jellinek, in which the changes in the tissues, principally the nervous system, central and peripheral, produced in men and animals killed by electricity and lightning, are set forth.—*Philadelphia Medical Journal*, July 5, 1902.

Electrical Reactions of the Gastro-Intestinal Musculature is discussed by G. W. McCaskey. He concludes that electricity is a valuable auxiliary in the treatment of muscular atony of the stomach and intestines, although adequate and properly balanced nutrition must be maintained. He regards the induced current (faradic) as the preferable form of electric treatment, the effect of the galvanic being problematical. No great obstacle is offered to the passage of either current by the resistance of the mucous lining of the digestive tube. When applied either percutaneously or with one or both electrodes in mucous-lined cavities the electric current passes directly through the abdominal cavity and the walls of the contained viscera, thus following the line of least resistance. A physiological peristaltic wave of the stomach cannot be produced either experimentally or clinically. Intragastric applications of the induced current and possibly percutaneous applications, produce an increase of tonicity of the stomach wall, with measurable but slight shrinkage in volume. Intraclonic applications, especially if the opposite pole is in the stomach, when continued several seconds, produces active peristalsis. Localised contraction of both the intestinal and gastric musculature can be produced by local application of the current upon the mucosa. If continued it will incite peristalsis in the intestine but not in the stomach.—*Medical Record*, July 6, 1902.

"Electricity in Ocular Affections" is the subject of a paper by Dr. Maurice F. Pilgrim, in which he reports that he has treated twenty-one cases of glaucoma—excluding, of course, the hæmorrhagic and fulminating varieties, in which the sight is rapidly and hopelessly lost—with the galvanic current. He has secured in every instance better results, both temporary and permanent, than he believed would have been possible through the most skilfully performed iridectomy, thereby avoiding a disfiguring coloboma of the iris. In treatment two methods are presented: (1) restoration of function by changing perverted to a healthy local nutrition and removal of the products of malnutrition; (2) the destruction of such products surgically. If the first method is successful the disease is cured, whereas by the second, relief and possibly arrest of the condition only is established. By means of the galvanic current the exudation is absorbed, liberating the filtering angle of the eye, and nutrition improved.

The same subject is discussed editorially by Rockwell, who reports at some length a case of glaucoma treated by means of the galvanic current. The negative pole was applied to the outer angle of the eye and the positive to the cilio-spinal centre. Each seance was ten minutes, the first half being devoted to the galvanic current alone, with a strength of 5 to 8 milliampères, and the latter half to the combined use of the galvanic and faradic. Ocular examination two weeks later showed no widening of the field of vision, but decided increase in the sharpness within the existing field and improved vascularity of the optic disc. The arteries had also increased in calibre.—*Medical Critic*, May, 1902.

Electro-thermic Hemostasis.—Downes, of Philadelphia, under the above title, in giving a *résumé* of his previous paper on this subject, together with a list of operations performed, claimed that he had practically bloodless hysterectomies, and that there were special and logical claims for its use in uterine cancer, salpingitis, and extra-uterine pregnancy operations. In the occlusion and exclusion of the infectious canal of the appendix he considered it ideal. There are no post-operative raw surfaces following its use, and

hence no opportunity for the formation of adhesions. Hæmorrhoids may be readily and cleanly removed. Downes describes some additional improvements in his instruments.—*Journ. of the Amer. Med. Assoc.*

[NOTE.—The above method must not be confounded with the use of the electric cautery. The results claimed for it by Downes are but a repetition of those obtained by the late Skene, who perfected the method.—AM. ED.]

Metallic Electrolysis.—Under the name of glossitis M. L. Ravitch includes leukoma, leukoplakia, glossitis dessicans, ichthyosis, tycosis or eczema, and keratosis, in an article upon the "Action of Silver Nitrate and Chromic Acid in Chronic Glossitis, under the Influence of the Electric Current." He reports briefly five cases so treated, with excellent results. From ten to twenty applications were made. In every instance pain was promptly relieved, followed by disappearance of the hyperæmia, natural condition of the tissues, gradual fading of the patches and restoration of the tongue to normal colour. The patient's tongue was painted with a 15 per cent. solution of nitrate of silver, or 5 per cent. solution of chromic acid. Contact is then made by means of a sponge electrode to the hand, positive; while a metal plate, negative, is moved over the painted diseased area for from fifteen to twenty minutes. Ravitch uses silver mostly, but has used chromic acid satisfactorily. He explains the good results obtained, not by the action of the silver salt, but by the caustic action of the nitric acid anion NO_3, which does not separate as such, but decomposes water in such a way as to produce nitric acid and oxygen. With chromic acid the same technique is employed, and with the result, he claims, of resolving it into its ions; the H. ion going to the negative pole and the negative ion, CrO_4 to the positive pole. The hydrogen of the chromic acid is removed at the negative pole, whereas the CrO_4 penetrates deeper and deeper into the tissues. In the tissues it is decomposed by water into oxygen and chromic acid, which is acted upon by the current as described. Another action is described as taking place, *i.e.*, the chromic acid ion CrO_4 and chromic acid itself, finding themselves in contact with the tissue, rapidly oxidize it with the production of the basic oxide of chromium, which is green in colour.—*Journ. of Amer. Med. Assoc.*, May 31, 1902.

[NOTE.—The explanation of the action taking place as the result of Ravitch's application of silver nitrate seems to be incorrect, and not in accord with physical laws. Silver salts, both from soluble metal electrodes and solutions, are diffused from the positive pole, not the negative. In order to get the action of either the silver salt or the NO_3 anion, the positive pole should be applied to the tongue, not the negative. The movement of the silver ion is to and toward the negative pole, of the acid ion to and toward the positive pole, but to secure these conditions the diffusion must be from the anode. The greatest activity is directly at the pole, although influencing the interpolar region to a greater or less extent, according to the dose and length of application. The technique is also faulty in placing the indifferent contact so remote from the active contact. The nape of the neck would give a circuit of less resistance and a larger contact, greater current distribution, with less sensory disturbance, and there would also be obtained a direct influence upon the nerve supply, which is desirable. It is impossible to diffuse silver salt into the tissues with a negative contact over the painted

area; and further, if the action of the nitric acid anion NO_3 is desired upon water, the action of the current need only be considered, for by its action on living tissue, nitric, phosphoric, sulphuric, and hydrochloric acids are formed at the positive pole, independent of any medication whatever.—AM. ED.]

CLIMATE.

In a discussion on the "Climatology of California," McAdie sums up the general climatic factors of that land of sunshine and of fog, of heavy rainfall and of scant rainfall, as follows. First, because of its proximity to the ocean, a great natural conservation of heat, and moderate and equable temperatures as a rule. Second, that because of the exceedingly diversified topography, there are likewise diversified climatic conditions. Third, that the prevailing easterly drift of the air brings a constant supply of fresh air, neither too hot nor too cold, to most of the State. Fourth, owing to the general path of storm movements lying farther to the north, California escapes many of the disturbances so familiar elsewhere. These factors combine to give a climate different from other sections of the United States, and the effect of the climatic environment is well shown in the flora of the State. He quotes from Dr. Hann the following list of climatic factors which should be given in the discussion of the climatology of a locality: (1) the monthly and annual mean temperature; (2) the mean diurnal range for each month; (3) the mean temperature at two given hours; (4) the extreme limits of the temperature of the months; (5) the monthly and annual extreme temperatures; (6) the absolute highest and lowest temperature; (7) the mean variability; (8) frost data; (9) insolation or solar radiation; (10) terrestrial radiation; (11) soil temperatures; (12) absolute humidity; (13) relative humidity; (14) total precipitation, rain, snow, fog; (15) maximum precipitation per day and hour; (16) number of rainy days; (17) percentage and probability of rainy days; (18) snow, depth, duration, and number of days covering ground; (19) dates of first and last snow; (20) hail storm frequency; (21) thunderstorm data; (22) cloudiness; (23) fogginess; (24) nights with dew; (25) air movement or wind velocity; (26) frequency of wind direction; (27) pressure data; (28) impurities, number of dust particles, bacteria, &c.; (29) electrical potentials.

To this Prof. Abbe, of the Maryland Weather Service, has added the following: (30) sensations experienced: *e.g.*, mild, balmy, invigorating, depressing, expressing the integrated effect of the various factors upon the human body; (31) the number of storm centres passing over the locality, *i.e.*, briefly, its storm frequency; (32) frequency of severe local storms; (33) duration of twilight; (34) blueness or haziness of the sky; (35) frequency and degrees of sudden changes from warm to cold, or moist to dry.—*Philadelphia Medical Journal*, July 5, 1902.

AËROTHERAPY.

Tinnitus Aurium.—The above subject is discussed by Griffin Lewis at considerable length. He regards electricity, either galvanic or faradic, as only of occasional benefit. Inflation of the tympanum may be of benefit in many cases of tubal catarrh, or middle-ear disease, by opening the tube, ventilating the middle ear, and relieving the depression of the tympanic membrane. He believes that massage of the membrana tympani and ossicles, by means of Siegel's otoscope, Lucae's pressure probe, Delstanche's masseur, or Wigmore's ear masseur, loosens and renders more movable a thickened, depressed or adherent

membrana tympani, ankylosed or adherent ossicles, and lessens spasmodic contraction of the intrinsic muscles. The writer regards this treatment as the one *par excellence* for tinnitus due to the causes discussed in his article. Wigmore's apparatus, which can be operated by hand, by compressed air, or by connection with an electric motor, he believes to be the most desirable. A little thumb screw regulates the intensity of the vibrations, and the rapidity of the vibrations may be easily controlled by using compressed air with a pressure regulator.

A more severe, and in some cases more effective, method of massage is one which has been recently adopted in Bavaria, and for which the Bavarian aurists claim marvellous results, especially in cases of tinnitus due to hyperæmia. It consists of a chamber into which the compressed air is forced.

In this connection, the writer refers to a visit to the Hudson River Tunnel in 1891, 3,600 ft. from the Jersey City side. He passed through three caissons, the last of which he was told had an air pressure of 45 pounds to the square inch. When the compressed air was turned into the caisson, his membrana tympani were forcibly pressed in, notwithstanding his efforts to relieve by Valsalva's method of inflation. His head whirled, and he experienced a noise resembling the din of a great battle. During his exit from the tunnel, when the compressed air was exhausted from the caissons, the reverse effect was noticed, namely, the membrana tympani were forced outward, and little if any relief was experienced by inserting the finger tips into the external auditory meatuses. He was informed by one of the inspectors that several of the workmen who were previously deaf had been greatly benefited since they began work in the tunnel. Lewis believes that condensed air is destined to become a great factor in the treatment of aural disease.—*Philadephia Medical Journal*, June 28, 1902.

DIET.

Milk Idiosyncrasies in Children was discussed by Louis Fisher, of New York, in the section on Pediatrics, at the recent meeting of the American Medical Association. He reports the case of an infant for whom a wet nurse was employed for three months, but who was dismissed as the child did not thrive and gained but little in weight. After that time condensed milk was given. The child vomited frequently, was always constipated and required an enema every day. The stools contained shreds of mucus and were foul smelling. Various artificial foods were tried, fifteen or more, and the infant did quite well until milk in some form was added. For several weeks the child lost weight at the rate of two ounces per week. Upon examination it was found rachitic, the extremities were cold, the circulation poor and feeble. A soft hæmic murmur was heard at the base of the neck. After the feeding, the nurse stated that sometimes the child had convulsions, which persisted until the colon was flushed. Spoon feeding was finally resorted to and milk given in various ways, sterilised, pasteurised, raw and peptonised. When patient was first seen, water and whey was being used. Upon this it improved, but as soon as milk was added, became worse. Malt soup was then given, and from that time the infant began to thrive and all symptoms disappeared. —*Journ. Am. Med. Assoc.*, August 2, 1902.

In discussing the subject of "Infant Feeding," A. McAlister, of Camden, N.J., regards breast milk as infinitely superior to artificial feeding, for no chemist had given us a synthetic human milk. The milks of different individuals vary, nor is it the same at different periods in the same individual. Each mother's milk is adapted to the requirements of her child, and no artificial

product can take its place. Cow's casein is not human casein, and cannot be assimilated as readily by the infant.—*Journ. Am. Med. Assoc.*, August 2, 1902.

Hyperchlorhydria is discussed briefly by Max Einhorn. Attention is called to the fact that some clinicians forbid starchy food entirely, and nourish their patients principally on animal diet. Starches are forbidden because the amylolysis in hyperacidity is greatly diminished, the acid checking the conversion of starch into sugar quite early. On the other hand, a number of physicians forbid meat to patients on account of its property of producing an increased flow of gastric juice. There is also a great difference of opinion as to the frequency with which meals should be taken. The writer recommends frequent meals, three large ones consisting of food commonly taken, as breakfast, luncheon, supper, avoiding acid or too greasy and indigestible substances. Butter is freely given, but highly seasoned food is especially to be avoided. He finds intragastric faradisation and also galvanisation of great benefit.—*American Medicine*, June 21, 1902.

OPEN AIR TREATMENT.

The Struggle Against Consumption.—The value of open air treatment in tuberculosis and its curability are emphasised by Otis. The treatment is purely hygienic—life in the open air, good food and avoidance of fatigue. Rest is imperative in the average patient, but some should have moderate exercise, which he believes is best carried out in sanatoria.—*Boston Med. and Surg. Journ.*, June 5, 1902.

The General Management and Constitutional Treatment of Tuberculosis of the Bones and Joints, with especial reference to life in the open air and tents, was discussed by H. P. H. Galloway, of Toronto, in a paper before the meeting of the American Orthopædic Association, Philadelphia, June 5-7.

Galloway points out that while tonics, such as iron and arsenic, are sometimes of value in small doses, that most cases do as well without them, if proper hygienic conditions are secured. Cod liver oil, milk, cream and butter are advised with a simple nutritious diet. He places dependence upon life in tents, enabling the patient to remain in the open air all the time. The sides of the tent should be left open in the summer, while at all times the canvas is pervious to air. Efforts to perfect local and mechanical treatment should not be relaxed. He claims that some patients may be saved through the agency of fresh air and sunshine after all other means have failed. The open air treatment is advised, not as a substitute for surgical and mechanical measures, but as complementary to them. In the discussion which followed, McKenzie, of Toronto, believed that outdoor life at home was successful without taking the patient away, especially if a tent be erected in the yard, while Schäffer, of New York, reported a case successfully treated in a tent in the back yard.—*Philadelphia Med. Journ.*, June 14, 1902.

HYDROTHERAPY.

In discussing the use of hot water drinking for therapeutic purposes, Stern states that in some affections, as, for instance, in the exudative stage of chronic gastritis blennosis, if taken before breakfast, it is frequently followed by beneficial results. In other disorders, as for example, in some forms of chronic obstipation, hot water in large quantities exerts little or no activity at all. On the contrary, he finds that one or two glasses of cold water taken upon

rising will often bring about the desired result. In neurasthenia, nervous irritability or heart disease, the drinking of large amounts of hot water should not be recommended, nor should it be advocated in hypochlorhydria, in motor insufficiency of the stomach, in gastrectasis, and in the presence of a gastric ulcer. Gastroptosis and pyloric stenosis are also conditions in which it is contraindicated.—*Medical Critic*, July, 1902.

[NOTE.—In chronic constipation, more especially of the atonic type, the use of hot water, before breakfast and upon going to bed, has been found extremely beneficial.—AM. ED.]

Some Special Uses for Hot Water in Surgery.—Bissel, in discussing this subject, regards it as the most commonly employed destroyer in germ work, and in emergency work it becomes the surgeon's chief safeguard. In tubercular joint affections, ischæo-rectal abscesses, with long-continued sinus formation, and in chronic bone disease, he regards at the time of operation a flushing with boiling water as important. By its cleansing action particles of broken-down tissue and shreds of pus germs lining membranes, which would otherwise remain, are removed. In addition, the directly stimulating action of heat to the borders of the infected tissues, with coagulation, is of value. Care should be taken to prevent scalding of external parts. Vascular growths of a nævoid character may also be treated by hot water injection, and with results comparing favourably to the use of ligation and excision. Two cases are reported, one a nævus of veins over the superior maxillary bone in a young woman. Ligation and excision were contraindicated on account of scarring, which would of necessity result, also of the possibility of hæmorrhage. Under ether, boiling water to the amount of one half an ounce was injected from a large metallic syringe at two points of puncture from the edge of the mass toward the centre. Distension occurred with a deepening colour of the surface, followed immediately by blanching. In a few moments the vascular tumour upon palpation appeared to have become more solid. In the month that followed, shrinkage and flattening of the surface took place, and the patient was discharged with a much more satisfactory result than would have been possible by dissection. The skin surface did not undergo any morbid change subsequent to the injection.

In the second case the nævus was situated just below the hair line on the forehead to a point well up on the crown of the head, and in size about that of an open palm. It was flat, and over its surface were scattered warty excrescences due probably to irritation of comb and hair brush. The technique was the same as in the previous case after the adjustment of a tight rubber tourniquet around the head from brows to occiput had been made. The appearances after the operation were the same as in the other case, and a cure was secured in six weeks. As ulceration had occurred about the bases of some of the warts, these came away in the form of the crusts, leaving scar tissue, though sufficient hair bulbs remained to produce a covering of hair.—*Medical Critic*, July, 1902.

The Administration of Water in Disease.—Lydston points out the danger of carrying to extremes the principle of flushing out the economy by the free ingestion of water, at present becoming very popular. He asks, very pertinently, whether the action of the water in "washing out" is so intelligently selective as to remove *only effete material*. From the effect of water upon freshly-drawn blood corpuscles it is easy to appreciate the danger that would accrue from an alteration in the integrity of the blood. Excessive ingestion of water may produce a hydræmia, with perturbation of the circulation.

To this cause he ascribes many cases of weak heart, nervous irritability, &c., occurring in the subjects of "water drinking" treatment, as well as the languor and debility which sometimes exist. Each individual case must be considered individually, so far as the absorptive power and gastromotor efficiency of the stomach is concerned. The author suggests the possibility of a "renal" water-habit, analogous to the purgative habit in the bowel from constant taking of aperient medicine, being formed by the ingestion of large quantities of water. He has come to believe that certain waste products which are rapidly removed by the kidney, and the formation of which is limited by the restriction of the proteid food elements, are necessary to the normal performance of the renal function. The presence of a certain amount of proteid substance in the diet in some cases of renal disease is desirable, the kidney, both by heredity and requirement, having become habituated and adapted to stimulation by proteids. If gastromotor inefficiency and impaired absorption of fluids exists, œdema and anasarca, while often relieved by the free ingestion of water, may at times be increased by it. In renal disease vicarious rather than renal elimination is often best. And, finally, he points out that the inflammatory affections of the lower portion of the genito-urinary tract, *i.e.*, cystitis, urethritis, or prostatitis, are often deleteriously affected by excessive water drinking through the mechanical disturbance necessitated by the resultant frequent and copious micturition.—*Medical News*, August 8, 1902.

EXERCISE.

Physical Training underlies Success.—Under the above subject Sargent discusses the value of therapeutic exercises, and points out the necessity of exercise to maintain the normal activity of bodily functions. But of equal importance is the recognition of the fact that by reason of their inheritance and environment, there is a large class of cases for whom but little physical exercise is necessary to keep them in good condition. By "environment" is meant fresh air, suitable temperature, proper food, clothing, bathing, dwellings, and various hygienic conditions and surroundings that tend to promote health. Persons so agreeably situated may often find in certain pursuits into which they enter earnestly and enthusiastically a physical equivalent for a certain amount of bodily exercise. People who take large views of life and fully realise the dignity and importance of their mission in the world, often experience this physical equivalent for exercise in their mental work. When people so constituted read, write, speak, or think, they do so all over, and feel the effects of it in every fibre of their being. But, unfortunately, most people are not so highly organised, and have to resort to other methods to secure good physical results.—*Advanced Therapeutics*, September, 1902.

PART II.

Reports of Societies.

THE BRITISH ELECTROTHERAPEUTIC SOCIETY.

President, DR. W. S. HEDLEY.

Hon. Sec., CHISHOLM WILLIAMS, F.R.C.S.Ed.

MANCHESTER MEETING, AUGUST 1, 1902.

BY the courtesy of the British Medical Association, a room in Owens College was placed at the disposal of the Society, and an informal meeting was held on the above date. In the absence of the President the chair was taken by the Vice-President, Dr. Lewis Jones. Several points were discussed affecting the constitution and management of the Society, and many valuable suggestions were made as to future arrangements. Some of these will doubtless become subjects of further discussion and voting at one or other of the Society's meetings during the coming session. Four nominations for membership were handed in to the Secretary.

REPORT OF MEETING, OCTOBER 3, 1902.

Edited by CHISHOLM WILLIAMS, F.R.C.S.Ed.

THE meeting was held at 11, Chandos Street, Cavendish Square, W. Owing to the indisposition of the President, the Chair was occupied by Dr. Donald Baynes, twenty-one members and nine visitors being present.

The Chairman alluded to the great loss this Society had sustained by the death of Dr. Blacker, who from the commencement had been on the Council and had given much assistance to the Society.

It was then proposed and carried unanimously, that a vote of condolence be sent to Mrs. Barry Blacker.

The Secretary then read the minutes of the Manchester meeting.

Nominations to the number of thirteen were read out and laid on the table for signature.

The ballot was then taken and proved unanimous in favour of:—David Samuel, M.R.C.S., Aberoon, Port Talbot; W. Deane Butcher, M.R.C.S., 5, Cleveland Road, Ealing, W.

Dr. Horace Manders then read his paper on "Some Phenomena of High Frequency Currents," and exhibited a portable apparatus.

The re-establishment of equilibrium in two unequal charges of electricity on two conductors, or, in other words, the neutralisation of two opposite charges of electricity, is called an electrical discharge. The discharge of a condenser, whatever be its particular shape, possesses the peculiar property of oscillation, a phenomenon first noticed by Professor Henry in the year 1842, mathematically proved by Lord Kelvin in 1853, and afterwards thoroughly investigated by Feddersen. What happens is this: So soon as a Leyden jar, or any other condenser, is fully charged, there is an incontrollable tendency for the electricity to regain a position of equal distribution, which is the normal condition of a jar before being disturbed by a charge. A tremendous stress is set up in the dielectric, which suddenly gives way, and the whole positive charge, thus suddenly released, rushes *towards* the opposite armature. It does not, however, stop at the point of equal distribution, where the potential energy is at a minimum, because of the kinetic energy it has acquired; hence the whole charge is carried across to the outer armature, and another (but opposite) condition of inequality is produced. The charge now acquires a fresh potential, or energy of position, which forces it to return to whence it came, again crossing the point of equilibrium by virtue of its kinetic energy, but the whole charge does not pass over *this* time, for some is left permanently on the outer armature, because a certain portion of the energy, which carried over the whole charge to the outer armature, has become dissipated by reason of the spark. Although the charge is thus lessened, there is still a great preponderance on the inner armature, so, once more, the charge goes swinging outwards; this time leaving a portion on the inner armature. This swinging of the electricity from one armature to the other goes on, the quantity of the swinging charge becoming less and less each time, until the distribution becomes the same on both armatures and electrical equilibrium is once more established.

Now, each of these half-swings (from one armature to the other) is accompanied by a spark, which means a loss of energy by transformation into heat, light and noise. You may ask, how can this be, when we can only see one disruptive spark leap from the balls of the discharger? It is perfectly true that we only do see one single flash, but during the exceedingly short space of time in which this occurs, the whole of what I have just been telling you has taken place, and the bright noisy spark we see is really made up of many millions of small sparks. We only see one big one, because the impression of any one of these many millions has not left the retina before many others are superimposed; thus the idea of unity is given. Of course, you will have understood that I have been speaking of a single discharge, not a succession of them.

Tesla's Apparatus.

In Tesla's apparatus for the production of currents of high frequency, and in the handy little apparatus called by Ducretet, its maker, "The Diminutive Tesla Apparatus," only one Leyden jar is used. The charge oscillates through a spark gap, thence through a solenoid of coarse wire in series with it, immersed in a bath of petroleum. The oscillatory currents set up in this solenoid induce similar currents in a secondary solenoid, of much thinner wire and of ten times the number of turns, also immersed in the oil bath either around or within the primary solenoid, currents of far higher potential though of the same frequency. The only objection to this form of apparatus, which I have drawn

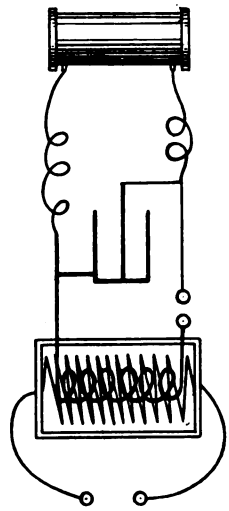


Fig. 1.

in diagram on the black-board (fig. 1) is the possibility of shock either by touching any part of the primary circuit or by a breakdown in the insulation between the two solenoids from carbonisation of the petroleum, the amount of the shock being directly proportional to the potential obtaining at the time at the adjustable spark gap.

D'Arsonval's Apparatus.

In order to obviate the possibility of exceedingly unpleasant and even dangerous results, d'Arsonval adopted a different disposition. As in Tesla's apparatus, so in this, the electrical energy is supplied from a Ruhmkorff coil; but in this case *two* Leyden jars are used, instead of only one, the inner armatures of which, connected to the coil, discharge through a spark gap provided

with ball dischargers. The outer armatures are connected to each other by a solenoid of coarse wire or tubing; through this swings the current induced in the outer armatures by the oscillatory discharge through the spark gap of the inner armatures of the jars, as used in his earlier models, for d'Arsonval no longer uses any but flat condensers. In this arrangement (fig. 2) there is no danger. The currents from the solenoid are collected by attaching flexible wire leads to the solenoid, and in proportion to the number of turns included between the leads, so will be the energy of the action. The potential of this solenoid can be increased by causing it to act upon another of finer wire and of more turns. In this disposition it is not necessary to immerse either of these solenoids in petroleum.

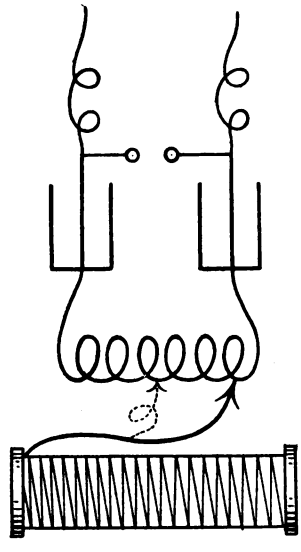


FIG. 2.

RESONANCE.

By a careful adjustment of the connections between these two solenoids an electric resonance can be obtained, comparable to acoustic resonance. With the particular apparatus we have here, which admits of great latitude for producing various effects, the coarse wire solenoid consists of twenty turns and, if both ends are connected to the outer armatures of the condensers, the node, or point where the potential energy is lowest and at which the waves, which start from either end, will interfere with one another, will be found in the centre, that is to say on the tenth turn, where the feeblest spark will be exhibited.

If the resonator, as the larger solenoid of sixty turns, with eight millimetres interval between each, is termed, be connected to the primary solenoid at this spot, then the brush discharge at the end of the resonator will be at the feeblest intensity (fig. 3). If we move the connecting wire, either to the right or the left, the brush becomes brighter. Now, as we move either to right or left of the centre of the primary solenoid whilst its ends are both connected to the outer armatures, it must happen that one part of the solenoid is acting in opposition to the other; therefore it is better to throw one part entirely out of action, by

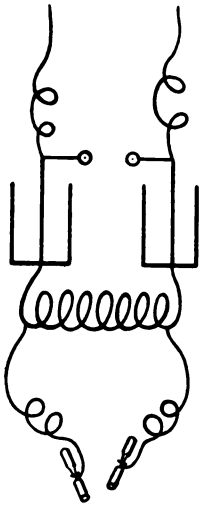


FIG. 3.

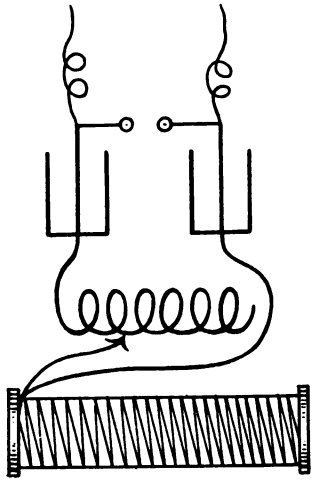


FIG. 4.

altering the connections in the following manner: The outer armature of one condenser is attached to one end of the primary solenoid; the outer armature of the other condenser is attached directly to the end of the resonator, where it is joined by the wire coming from the primary solenoid, to which it is attached at any desired turn. This arrangement will leave part of the primary solenoid free and out of action, in which no oscillations will occur (fig. 4).

If we now create an artificial node, by earthing one end of the solenoid, so that the waves must traverse the whole of the solenoid before they cross, we shall find increase in the force, length and brightness of the spark from the nodal end to the anti-node or loop at the other end. When connected up with the resonator, we shall obtain enhanced brush effects from the end of it.

To obviate the trouble and inconvenience of altering the connections Oudin has designed a very effective and ingenious

resonator, in which the diameter of the wire used in the spiral is the same throughout, and the lower turns are made to do duty as the primary solenoid, of which the resonator is actually the free end. This can be adjusted or tuned by either turning the whole spiral, or by shifting the running connecting wheel. Very delicate tuning can be obtained, and a fine brush is produced at the distal end from the splashing over of the electric waves; but if a wire is attached to this end the result is by no means the same, for the brush falls off and the instrument has to be tuned afresh. This is the case for every alteration in the length of the wire. The brush has a very powerful effect over the skin and exterior part of the body, but very little over the interior of the system. This is also the case if a wire from the distal end of the resonator is used with an electrode by direct contact with the body. Very little effect, that is, compared to the contact effects produced by the primary solenoid. This can be demonstrated at once by the quantity of spark which can be taken from an individual, or the glow produced in a vacuum tube held near him.

Physical Phenomena.

Many, perhaps most, electricians, not medical men, have stoutly denied the possibility of high frequency currents traversing the body, in spite of their enormous potential, and have maintained that skin or surface effects alone are produced. Their line of argument is this: As the rate of alternation of current increases, the impedence increases in the conductor, and it is inversely proportional to the circumference of the wire (conductor), instead of to the area as in steady currents. For currents of a million per second, the thickness of conducting surface or skin of the wire is about $\frac{1}{200}$ of a millimetre for soft iron, and about $\frac{1}{15}$ mm. for copper. Now, this is entirely a magnetic phenomenon, and does not apply in the least to the surface of our bodies as a conducting medium for rapidly alternating currents. It is difficult to understand how thermic, blood-pressure, and katabolic phenomena are produced, as they most undoubtedly are, if the current is limited to the skin. I want you to listen for one moment to the sharp rattle of the disruptive spark. I now take hold of the electrode from the distal end of the solenoid. Notice now how the spark has fallen off in noise, it is comparatively subdued. The spark is also diminished in brightness and force, which shows that the oscillations have become much less frequent. Why so? Because my body has enormously increased the impedence of the circuit.

Again, I take this electrode, which is simply a highly exhausted cylinder of glass, with a cusped end; within it is a rod of aluminium. Now I attach this to a wire connected with the distal end of the primary solenoid, and apply it to the skin of my forearm. I beg you to notice the pale green colour of the con-

vective discharge within the tube; you see that it is the same throughout its length. I now approach my finger to that part of the tube which is nearest to the body; you see that the convective discharge is repelled and forms a bright spot on the opposite side of the tube. By turning my finger gradually round the tube with the tip pointed towards it, the bright spot of the repelled discharge will also travel round the tube. If one of you will approach a finger in the same manner, the same phenomenon will be repeated. For the next experiment, I take in my hand an ordinary nickel electrode attached by a wire to the distal end of the primary solenoid; the vacuum electrode is attached to a wire which runs to earth, but is applied to my forearm as before. You see that there is a great difference in the appearance of the tube; the pale green light is confined to that part of the tube which is farthest from the body, the remainder being filled with a violet light, homogeneous (if I may use the term) when I make deep pressure, but with streams of vivid flashes darting through the violet if the pressure is only slight. This phenomenon is also seen in comparing regions in which the bones lie close beneath the skin (*e.g.*, scapular region) with those in which there is a depth of soft substance, (*e.g.*, abdomen). I now approach a finger to the glowing tube, and you perceive that again the streams of convective discharge are repelled. I ask one of you to point one of your fingers near the tube; you notice that this time the bright stream is attracted instead of repelled. If a magnet is used in these experiments instead of the finger, the phenomena are the same, but rather more intensified.

I cannot account for these varied phenomena if it be true that these currents of high frequency merely pass over the skin.

Finally, I take this good-sized melon, with a thick rind to represent the skin, to which I have given four thick coatings of shellac varnish, with the exception of two round spots about the size of a sixpence opposite to each other. To these I apply metal electrodes, from either end of the primary solenoid, with a small air-gap; the whole is insulated and the current turned on. Immediately a stream of sparks appears in both air-gaps. It may still be argued that the current, even now, passes *over* the rind and *underneath* the varnish, consequently I cut out a groove, half an inch wide and the same in depth, all round the longitudinal axis of the melon. If the current only passes over the rind we should expect that we should see sparks pass across the gap; we can help this by putting two pin points in the skin opposite to each other. The current is turned on and we perceive once more a stream of sparks in the air-gap outside the melon but none in the gap of the groove around it nor across the pin points; therefore the current must have gone through the parenchyma of the melon. A thin copper wire thrust into the parenchyma in the centre of the groove produces sparks to a conductor held to it.

Answers to Remarks.

To Dr. Batten.—The rind of the melon is the nearest approach I can think of to represent the skin and the parenchyma of the fruit to represent the electrolyte of our internal economy. To be scientifically accurate, the ohmic resistance of the rind should be taken and compared with that of the skin.

To Dr. Cohen.—The reason of the severe shocks experienced by the patient arranged for the so-called bi-polar treatment, when the connection of the running wheel to the solenoid is imperfect, is due to the increase of impedence which destroys the oscillatory character of the discharge and converts it into a series of partial discharges.

To Dr. McClure.—There can be no doubt that the body acts as an electrolytic cell, or rather as a compound electrolytic cell.

There is no need for all these spirals, &c., for the production of oscillatory currents, but it is the best that has been done up to the present. It appeared to some of us that the means adopted is clumsy and wasteful in the extreme; for first we use a good deal of wattage, then raise our potential to many thousands, pull it down again by means of condensers, and lower it still further by means of impedence coils. We instituted a long series of experiments, at the end of which Mr. Sharman designed the little portable apparatus you see here. It only measures about 12 inches long by 7 high and 6 wide; it is entirely self-contained and will produce all the phenomena which are necessary at the bedside of a patient. The only thing essential to its functioning is a good earth connection.

Mr. Chisholm Williams then read his paper on "High Frequency Currents in the Treatment of some Diseases":—

Mr. President and Gentlemen,—Before proceeding to read this paper I would just like to state that I hope you will bear in mind that we have this evening to consider a method of applying general electrification, similar to "static" electrification, or the electrification by means of the electrical bath, but probably more convenient to the medical man and possibly more agreeable to his patient. This method of electrical currents of high frequency and high potential, which on the Continent has had many able advocates, has already given sufficiently striking results, that we may very reasonably express a hope that our profession in this country will give it a more extended trial than heretofore.

In 1842 Prof. Joseph Henry, of America, worked at, and drew attention to, the phenomena accompanying the discharge of a Leyden jar, and his researches led him to suggest that it was oscillatory in character. During the next twenty years, notably Lord Kelvin in 1855, and later, Feddersen in 1859, Helmholtz and others, confirmed Henry's original suggestions and gave the theory of their causation.

As early as the year 1881 William James Morton, of New York, made known "A New Induction Current in Electricity," published in the *Medical Record*, April 2 and 9, 1881. He approximated the balls of the exploder of a Holtz machine until the sparks appeared between them, then intercalated his patient in a circuit running from the external plates of the condensers. This oscillatory character of the disruptive spark of the discharge of condensers had not yet been mentioned as capable of being used for the increase of the frequency of an alternating current; Morton was thus the first to produce, somewhat unknowingly, therapeutical high frequency currents.

For several years these oscillations were being worked at by many patient scientists, and it was not until 1886 that Hertz, and in 1887 Oliver Lodge, published their remarkable experiments on Electric Waves, that the subject again came before the scientific world. It is interesting to note, in passing, that they were the forerunners of "wireless telegraphy."

In 1889 Joubert published the first observations on the physiological effects of these electrical oscillations.

In 1890 d'Arsonval, verifying the observations of Ward in 1879, proved that beyond a certain number of excitations, 5,000 per second, the muscular contraction phenomena decrease in a measure as the number of alternations increases; and in order to demonstrate this fact with high frequencies, he constructed an alternator capable of giving 10,000 alternations per second, with a considerable current strength; finally in December, 1890, he again took up the same experiments with the devices of Hertz and Oliver Lodge, and showed, in April, 1891, a few months before the memorable experiment of Tesla, that a current of high frequency and high potential could with impunity be made to traverse the body, that it even decreased the excitability of the tissues, lowered their arterial tension, increased the production of heat from 79 calories to 127 calories per hour, increased the activity of the respiratory combustions in the human being, the output of CO_2 being raised from 17 litres to 37 litres per hour, and also increased the excretion of urea.—(*Annales d'Electrobiologie*, 1893 and 1894.)

In 1893 Oudin devised a resonator which greatly increased the tension of the high frequency currents, and called attention to the fact that the local action was accompanied by general reactions.

Reverting to the experiment of Nikola Tesla, who made use of alternators with a multitude of poles, and by means of transformers raised the potential to tens of thousands of volts, by which means he was able to demonstrate that the high frequency and high potential currents could be passed through one's body with sufficient electrical energy to light up several incandescent lamps, with absolutely no danger to the person.

In relation to this I will quote the observations of Dr. Lewis

Jones (in "Medical Electricity"): "That the current through each lamp must have been 2 ampères, as estimated by d'Arsonval, is almost incredible, for a current of that magnitude, from any ordinary source of electrical currents, whether direct or alternating, would destroy life and produce serious burns of the tissues at the point of contact. One suggested explanation of the incandescence of the lamp filament is that at very high frequencies the resistance of the filament is enormously increased, and a much smaller current at a proportionately higher voltage will make it glow."

Another explanation given is that the rushes of current are very large while they last, but have so brief a duration that the total current passing in a given time is comparatively small; this, however, does not explain the difficulty of the absence of shock. Others, again, incline to the belief that the energy dissipated at the lamp filament is not so much an electrical current as a molecular disturbance or "bombardment," and that the actual current may be remarkably small. This is supported by the incandescence of a lamp when fixed to one electrode only of a high-frequency coil; here the true current must be quite small, and yet the lamp glows.

Let us now consider the question: "What is a high frequency current?" All electric sources have a certain electro-motive force, and all electro-motive forces under certain conditions produce currents or discharges. The character of the current or discharge depends upon the character of the electro-motive force that produces it, and upon the character of the discharge circuit—its resistance, self-induction, and capacity.

When a ball prime conductor of a static machine is made to discharge, it does so in a disruptive manner or as a spark, which consists of a series of discharges between the ball and the object at which it discharges. When a condenser as a ball prime conductor, charged to a very high potential, is discharged into a conductor having a certain self-induction and a small resistance, there are produced extremely rapid isochronous oscillations that constitute a high frequency current.

Hertz proved the frequency of the oscillations to be exceedingly high, at times reaching hundreds of millions per second. In his experiments on the production of stationary electric waves, he made use of an induction coil the terminals of which were wired to two cylindrical rods, each 5 millimetres in diameter, and 1½ metres in length; at their outer ends were fixed two balls, 15 centimetres in diameter, serving as condensers, and at the inner ends of the rods two smaller balls, the gap between being 15 millimetres. Owing to the smallness of the condensers and conductors the above high frequency oscillations were produced.

When we remember that the greatest number of vibrations that can be appreciated in the production of sound is 36,000

per second, we must admit that the term "high frequency" is well merited.

Take as an example a vibrating straight fixed spring; when set in motion it will oscillate for a certain period before coming to a stop if in air, alcohol or water, which are of slight viscosity; but if we increase the viscosity by placing it in heavy oil, there will be no oscillation, but simply an aperiodic return. In this example we have a slow cycle of visible movement, a dissipation of energy in the form of heat, equal to the work necessary for the production of the phenomena.

So an electric circuit, in which a discharge suddenly takes place, will follow precisely parallel laws. The viscosity of the medium corresponds to the resistance of the electrical circuit in ohms. The flexibility of the spring corresponds to the electrostatic capacity of the circuit, or to its capacity as a condenser, and the displacement to the inductance of the circuit. We therefore shall get an oscillatory or non-oscillatory discharge according to the resistance, as compared with capacity and inductance.

We will now briefly consider the apparatus requisite to produce these currents.

Source of Energy.

Electric light mains, direct or alternating; if alternating it must be changed to a more or less direct current by means preferentially of a special rectifying contact breaker. Having worked from the alternating supply main for the past two years, under these conditions I can speak highly of the arrangements in contrast to storage batteries, which are, in my experience, a distinct nuisance from many points of view.

The ideal current is the direct from the main. Storage batteries or accumulators may be used when the street main is not available. They require to be kept fully charged.

The initial energy can also be obtained from a large Wimshurst, Toepler-Holtz, or other static machine. Except in the last case, the current is then passed into the primary of a large induction coil, a 12-inch Ruhmkorff coil being an efficient size. The amount of electro-motive force coming from the secondary terminals may be hundreds of thousands of volts. It is then conducted to the inner coating of two Leyden jars, from which connection is made to an adjustable spark gap. The outer coatings are connected by means of a solenoid of thick wire. When the jars are charged to a certain potential, they discharge across the spark gap and oscillations are set up in the solenoid, which may be utilised by the attachment of conductors to this solenoid; the current thus obtained will be increased proportionately as the number of turns of the solenoid between these conductors is increased. Should it be desirable to further augment the electro-motive force, the solenoid of thick wires may be made to act upon

another of finer wire. This spark gap is usually enclosed in a china, glass, vulcanite, or other box, to deaden the sound, which in most instances is very considerable; it should be frequently wiped out, as moisture and in some boxes nitrous acid compounds are condensed on the inside, thereby lowering the efficiency of the discharge, causing it to leap round the sides. If the knobs or discs of the gap are too close the spark discharge may "arc" and either crack the glass or porcelain, or if made of vulcanite set it alight. Prior to turning on the current the gap should be practically closed, then adjusted to the requisite distance, when the sparks, which should be numerous, will be white in colour with clear cut edges. Then by gently withdrawing one of the terminals, the maximum effluve will be obtained at the free end of the resonator.

The principal methods of application are :—

(1) By having the solenoid made like a cage and large enough to enclose the patient, either with the patient standing up inside it or lying on a couch within. There is no connection between the patient and the solenoid, yet a current of very high frequency is induced in the tissues and may be demonstrated by sparks being drawn from any part of the patient. This method is known as auto-conduction. The experience I have gained of this method has led me to believe that it is the least effectual.

(2) By placing the patient in actual contact, by means of large handles, with the ends of the small solenoid, as the current may be applied to any part of the body by means of suitable electrodes similar to those used in galvanisation and faradisation. This may be termed the bi-polar method.

(3) By making the patient constitute one armature of a condenser, being in connection with one end of the solenoid, whilst the other is connected to a large sheet of metal near him. This is best effected by means of a couch, the patient lying on cushions, stuffed with insulating material, which separate him from the metal sheet below, whilst he holds on to two metal handles, electrodes connected with the other end of the solenoid.

The handles should be large, and fairly firmly gripped by the patient, as Dr. Hedley has shown ("Therapeutic Electricity") that if the electrodes in contact with the skin be progressively diminished in area, a point is reached with very small electrodes, when a distinct sensation becomes perceptible. This applies more especially to the bi-polar method.

By means of a d'Arsonval milliampèremetre one is able to show that 350 to 400 m.a. may be passed through the patient. The milliampèremetre being a hot wire instrument, may not be scientifically correct, but is near enough for workers to compare with one another. This method is known as "auto-condensation." Sparks may be drawn from any part of the body, clothed or unclothed. It is well to remember that through the clothing the sparks may be somewhat sharp to the sensations of the

patient. An ordinary Geissler Tube may be illuminated in actual contact with, and for a foot or so from the patient.

(4) By connecting the solenoid to the beginning of a large number of helically arranged copper spirals, we obtain from the other end a brush discharge or "effluve of very high electromotive force, varying in length from ½ to 12 inches, which can be applied locally by means of metal electrodes, and feels, at a non-sparking distance, to the sensations as a soft breeze. With care it can be applied painlessly to raw, sensitive surfaces. On *healthy* skin to produce redness, or, popularly speaking, a reaction, it is necessary to spark, the time necessary to do this being in relation to the intensity of the spark discharge. On *unhealthy* or ulcerated patches it is unnecessary to spark the soft "effluve," for by using glass vacuum electrodes in actual contact, would be sufficient to cause distinct redness in a few minutes. This reaction generally gets worse for a few hours after the application, and with very little practice can generally be kept within due bounds. With a metal electrode kept at such a distance to produce a painful white spark, an actual blister may be raised.

Of other methods I do not propose to deal this evening, as I believe that the ones that have been mentioned are the most effective.

d'Arsonval and Charrin have published some experiments on the sterilising action of these currents. By immersing a small solenoid of wire of two turns in a U-shaped tube containing broth and pyogenic bacilli, after half an hour's application the culture became discoloured and absolutely sterile. This has been thought to have been due to the molecular shaking that the bacilli may have received.

M. Dimitriewski, of the University of Tomsk, has been working with the various toxins by the "effluve" method exclusively, and has found that the toxins lose their power and become innocuous.

Quite recently Drs. Lagriffoul and Denoyes, of the Montpellier Faculty of Medicine, have published a further series of experiments on the action of "high frequency" on tuberculous guinea-pigs, and have proved that an actual inflammation is produced around the pulmonary foci, that finally this abates and leaves the lung clear of the bacilli.

The therapeutic uses of these currents have been mainly based on the physiological experiments of d'Arsonval and may be broadly stated to be of use in those conditions in which the "metabolism" of the body is affected. They appear to improve the general condition of the patient by allaying pain, improving the digestive organs, thereby increasing the general nutrition of the patient by facilitating the elimination of waste products, and to reduce to the normal the ratio of uric acid and urea.

In July, 1901, I read a paper on "The Treatment of Phthisis" by means of electrical currents of high frequency and high

potential before the British Medical Association at Cheltenham, and observed that 43 consecutive cases were treated. There is reason to believe that the currents act in these cases in the following manner:—

Firstly, on the tubercle bacilli themselves, by making them pursue the same course as if they were under the X-rays. According to the experiments of Drs. Forbes Ross and Norris Wolfenden, in their paper on the "Effects produced in Cultures of Tubercle Bacilli by Exposure to the influence of an X-ray Tube" (*Archives of Roentgen Ray*, August, 1900), they observe that the bacilli rapidly increase in numbers and have a tendency to form clumps, then get small in numbers and shape, and take the microscopical stains very readily, but are pale in colour; and say, in conclusion, "There is not the smallest doubt that X-ray stimulation does not kill tubercle bacilli, but stimulates them to excessive overgrowth, and only affects them adversely by attenuation from overgrowth."

In my experience much the same process goes on under the high-frequency treatment. The tubercle bacilli, which are usually present in fair numbers, quickly begin to increase, and after a few applications are greatly increased; they soon, however, form clumps and get misshapen, short and stumpy, and generally curved, and take the stain far more readily than before. After a time they begin to decrease in numbers; and later, when the patient is obviously getting better in every respect, they may cease entirely, but may reappear in the sputum after weeks of absence, only to depart again, mostly without further electrical treatment.

Secondly, the effects of the currents of high frequency, &c., on the individual cells of the body. We judge this by the appetite and digestive powers increasing and the patient's gain in weight. The general improvement of the body cells possibly makes them more resistant to the inroads of the tubercle bacilli; but whether the lowering of the tubercle's vitality, or a raising of the body cells' resisting power, or a combination of both is at work, for our purpose matters little.

In most cases the temperature is the first thing affected, presuming that the daily variation had been about two degrees between the evening rise and morning fall; either after the first application, or at most, after the third, the evening rise should be higher and the morning fall less. On examining the affected area we find the physical signs at first increased, thus more coarse râles of louder and of greater number could be found; the expectoration becomes greater, and the cough more frequent and easier. After a few applications, if given locally, the patient often complains of pains, or an uncomfortable feeling over the affected part. This, as a rule, passes off after a couple of weeks of treatment, and is never severe, if we pay due attention to the length of time and number of the applications. A slight amount

of pain over the affected area, in severe cases, is often noted from the general methods.

When the temperature has been raised by the treatment, the patient of course may feel rather worse, *i.e.*, lassitude, and the sweats on the fall of the fever are sometimes large in amount; also that during this period the body weight may decrease, or, at all events, remain stationary. I found this in many cases where the fever increased, and in spite of the patient taking presumably a much more nutritious diet, still a slight weekly loss was observed. Some cases will react to the influences of the high frequency currents within twenty-four hours; others may take a few days. The more severe the case, the more quickly does the reaction take place. However much the temperature rises, it will generally be found down to, or below, the patient's usual normal within forty-eight hours, so that the dose can readily be regulated and the patient only given as much as he can comfortably bear. When the patient can be exposed to the currents for over half an hour daily for one week, and it is found that during the whole period the temperature remains steady at normal and subnormal, we may safely predict that the disease is, to say the least, arrested.

I will now give some further information of my original 43 cases: 3 have died, of the rest, 32 have had no treatment of any kind whatever for over eighteen months. Eight cases have had on an average two months' treatment each since that time. This year none of them have needed treatment. The majority, who were workers, are performing their usual duties. The three deaths were due to pneumonia, tuberculous kidney, and lardaceous disease. Briefly, those patients received from ten to twenty minutes' "auto-condensation," and seemingly under that treatment they lost their cough and expectoration, the tubercle bacilli disappeared, but in some a few could be found months after all treatment had been stopped, yet they seemed in good health. The bodily weight increased, in favourable cases a pound a week would be recorded.

When many hundreds of these phthisical patients have been subjected to this method, we shall be in a position to judge of its merits and compare it with the "open air cure," which at present has not shown such a good percentage of "arrests." In my opinion, as a valuable adjunct to a sanatorium it should afford very material assistance, even in the more severe cases, that do not usually gain admittance.

Tubercular skin affections, such as lupus vulgaris, may be best treated by auto-condensation, and locally by means of the "effluve." Dose: generally ten minutes of the former to five minutes of the latter. At the actual time little may be noticed, but the patient and operator may feel some warmth in the patch, which increases for a few hours afterwards; sometimes the reaction may last until the following day and be too severe

to treat; one then has to wait for subsidence. The patch swells up and becomes more succulent, secretion quickly stops, the resultant scar depends on the amount of original ulceration at the commencement, or upon the too severe reactions produced. Most non-ulcerative patches will leave no scar. In my experience it is slightly quicker and much more under control than with the "X-rays." At the West London Hospital we are able to clear up an average non-ulcerative small patch in about sixteen applications of five minutes' sitting two days a week. Any form of vaseline seems to keep up the reaction. I never cover up the patches, but if the patient complains much of the smarting, boracic ointment made with lanoline seems to be a soothing application. If crusted it is best to remove the crusts with oil and poultices. The whole of one side of the face can be treated at a time, the patient's sensation being that of receiving a warm breeze. Actual sparking I have never found necessary. It is unnecessary to use any application to increase, or keep up, the action of these currents.

The following case is a fair example of the use of these currents in gouty rheumatism. The history was as follows:—

B. B., aged 48. Much gout and rheumatism on both sides of his family. Patient had typhoid fever at 18. Dyspepsia, with attacks of acute gastritis, ever since. Rheumatic fever at 26. Came to me with muscular pain fairly general, but especially in lumbar region, and history of several big toe joint attacks. Smaller joints all more or less enlarged. Appetite and sleep both bad. Urine: week by week the urine showed at first gradual increase in the ratio of uric acid to urea, as the following figures will show. Before treatment it was 1 to 51·5, end of first week 1 to 63·5, second 1 to 70·3, third 1 to 64·8, fourth 1 to 46·7, fifth 1 to 41·, sixth week 1 to 34·5. Hopkins' normal being 1 to 35.

At end of sixth week treatment was stopped, as all pain had ceased, the appetite increased and the patient regained his natural sleep. His weight increased $6\frac{1}{4}$ pounds in seven weeks.

Of diabetes, for which this method has been much extolled, I have had only five cases; in four the sugar finally disappeared and has not returned. One case has had two relapses, but very mild ones, in eighteen months, each time the sugar has been more readily eliminated and the intervals between a reappearance have been of longer duration. All the usual accompanying symptoms have become practically normal. In the most "wasted" cases the increase in weight has been very striking.

Hysteria, from the few cases that I have treated, seems to be ameliorated in about the same average time as under the Weir-Mitchell treatment. Auto-condensation alone was used.

Obesity, especially those cases due to perverted digestive function, seems to be markedly affected for good. Personally I have not been able from a variety of causes to experiment on myself, but hope to do so at a future time. From what I have seen it is very effective if thoroughly carried out.

Simple or callous ulcers are stimulated to heal by the application of the "effluve," given preferably through a glass electrode. The reactions are slight and in my opinion healing takes place more rapidly than by another method.

For neuralgias, chiefly of the face, treatment by auto-condensation for about five minutes and the effluve" to affected part for a like time, or the glass electrode in actual contact, but with a mild amount of discharge.

Sciatica.—If the pain is severe a few treatments by auto-condensation, but if bearable the "effluve" to exit and down the course of the sciatic nerve. Both methods, for a few applications, may somewhat increase the pain, but eventually should clear it up.

Headaches of most forms are distinctly benefited by "auto-condensation." It is well to remember that the spark gap should be deadened in some manner, otherwise the noise may deter the patient from persisting in the treatment.

Hæmorrhoids.—If external "effluve" with a few actual sparkings; if internal use a suitable metal electrode, getting it in actual contact with the rectal mucous membrane; this application is absolutely painless, and has given very good results in my hands.

Warts seem to be particularly amenable to these currents. By using a small pointed metallic electrode, using its effluve, and gradually lessening the distance until the wart itself is sparked. Half a dozen applications necessary, but if patient will stand a little pain, can be made to practically slough out at one sitting; the resultant sore heals very rapidly, leaving no scar.

Rodent ulcer.—The effluve can be readily applied and is effectual. In one case, which had returned after operation, I used my thumb as an electrode, the patient being on the auto-condensation couch and connected to one pole, the other was connected to myself, and the circuit completed by my thumb on the ulcer; the first three applications brought away the sloughs, which had become attached to my thumb, afterwards each application seemed to shrink the ulcer up. The hard edges were most resistant, but have nearly disappeared; this patient has had no treatment for, or trouble with, it for eleven months. For large ulcers a glass electrode in actual contact seems the best form of procedure.

Malignant growths.—My experience, although small, has led me to believe that these currents, in suitable cases, will prove of some benefit. Thus in several post-operative recurrent cases, the ulceration has healed up in a very remarkable way, but the growth in other parts has persisted. That most part, if not all, of the pain can be banished, is a fact, so that the patient can be freed from morphia, &c. Also the general condition of the patient can be very materially improved.

In conclusion, Mr. President and Gentlemen, the subject of

general electrification, whether by this or any other means, is an absorbing one, and will well repay the student. 'Tis said that there is a "Boom" just now in high frequency currents. If true, let us hope that it is being assisted by the members of our profession, in a legitimate way, and also, let us further hope that it may be a means of directing the attention of the members of our profession, outside our Society, to the undoubted uses and advantages of electricity in therapeutics. To the X-ray worker, by a small addition to his installation, he will be able to utilise and study this particular form of electricity, and I trust that these few hints may prove of some slight service.

I am fully aware of the imperfections of this paper, but have tried to place before you my personal experience, leaving the more debatable points to the more learned members of this Society. That there are other methods of applying high frequency currents, I am also aware, notably by the "electrified hand," a method used on the Continent, but discountenanced in this country as essentially a method on the "borderland of quackery."

Mr. President and Gentlemen, I thank you.

The papers were discussed by—

Mr. WILLIAM ARMSTRONG (Buxton), who said, after thanking the authors for their valuable contributions, that he had made use of high frequency currents very largely at Buxton, several hundreds of cases of gout, rheumatic gout, and arthritic joints, being in the majority of instances greatly benefited by the electrical treatment. In those distressing conditions of ankylosis of lower jaw, and of the cervical vertebræ, he had seen very marked improvement.

Dr. BATTEN (Dulwich) alluded to his study of these currents with a Tesla coil, many years back, and remarked that castor-oil was the best medium in which to insulate the coil. Had seen good results from this treatment in the "drug habit." He repeated that he did not think Dr. Manders' "melon experiment" conclusive. Ventured to suggest that the body does not act as a conductor, but as an electrolyte. High frequency treatment should be systematised.

Dr. MCCLURE (London), whilst congratulating the authors on their papers, was glad to hear they had attempted to prove the passage of currents through the body. He had always been convinced that static electricity was more than a mere surface action. In his opinion the molecules of the body were insulated from one another, and the electricity became, so to speak, entangled, and the strain or stress between the various cells does the good obtained by the patient.

Dr. COWEN (London) was specially interested in the treatment of phthisis by these methods, but had obtained the greatest good in the actual application of the "effluve," which he used at intervals of a day or so. Shock could be avoided if all terminals are screwed down tightly.

In answer to Dr. Rodman (visitor):

Mr. CHISHOLM WILLIAMS stated that in the five diabetic cases no drugs were used during the electrical treatment. They had been very extensively "drugged" for months previous to their coming under his care. No special diet was ordered, from the fact that they all had been more or less under a good diet, suitable to their condition.

The next meeting will be on Friday, November 7.

Paper by Mr. Hall Edwards on "Some Points in the Application of X-rays to Therapeutics."

Also Dr. G. H. Graham will exhibit the latest "Finsen lamp."

Arrangements are being made to hold an Exhibition and Conversazione early in the month of November.

Members whose subscription is *in arrear* will receive the four numbers of the Journal for this year on sending One Guinea to the Honorary Secretary, Chisholm Williams, F.R.C.S.Ed., 20, Bedford Square, W.C.

The Non-operative Treatment of Retro-displacements.—At the meeting of the American Gynæcological Society the above subject was discussed by F. H. Davenport, of Boston, with recognition of the value of mechanical appliances, pessaries, massage and electricity. The local application of electricity he recognises as an aid in the building-up process. Massage has been used in Sweden and elsewhere with a moderate degree of success, but can hardly be called a method of treatment. Pessaries are useful in simple, uncomplicated cases of displacement, where the uterus is not enlarged. *The Philadelphia Medical Journal*, June 14, 1902.

[NOTE.—The electrical treatment of these displacements, if carefully and skilfully carried out, in connection with mechanical means, suitably medicated tampons of lamb's wool covered with cotton and sometimes the less yielding support of pessaries, in connection with posture, healthful dress and habits, affords valuable help. As the building process is carried on, mechanical means should be used less and less, and the efforts should be made to secure proper circulatory and nutritive conditions with restoration to normal position. It is a difficult task, but the results obtained, whether of amelioration or cure, are worth the effort.—AM. ED.]

ELECTROTHERAPEUTICS AT THE MANCHESTER MEETING OF THE BRITISH MEDICAL ASSOCIATION, 1902.

UNFORTUNATELY no Section was specially set apart for electrotherapeutics; so it happened, as has more than once occurred before, that two most important and kindred discussions were held simultaneously, viz., the Treatment of Inoperable Cancer in the Surgical section, and the discussion on X-ray Treatment, High-frequency methods, and Light Treatment in the section of Dermatology. In the Surgical section the majority of the speakers discussed the treatment by oöphorectomy, Coley's fluid, caustics, &c. Two interesting and instructive papers were presented, one by Mr. Thomas Bryant, F.R.C.S., on the Influence of X-rays in the Treatment of Inoperable Cancer, and the other on Complete disappearance of Mammary Cancer under X-ray Treatment, by Mr. W. F. Brook, F.R.C.S. In the Dermatological section the *pièce de résistance* was, from an electrotherapeutic point of view, the paper by Dr. L. Freund (Vienna) on X-ray Treatment, High-frequency methods, and Light Treatment. The discussion suffered very considerably owing to the unfortunate absence of the author, so that the members had to be content with an abstract kindly read by Dr. Lancashire, one of the Honorary Secretaries. It was not difficult to perceive, from the somewhat guarded remarks of the speakers, that some of the deductions set forth in this paper were open to grave doubt. Had the author been present it is possible that he might have been able to make more plain and probably prove some of his rather remarkable statements. The following summary was placed in the hands of the members.

SUMMARY.

(1) Definitions: Radiotherapy and Phototherapy. All radiant phenomena have the same physical basis. Graduation of one class of ethereal vibrations into another of different wave-length: no sharp boundary between the two.

(2) Physical properties of rays used in dermatology: they possess chemical, fluorescent and electrical properties.

(3) Effect of rays on the human body varies, like that of chemical agents, with the dosage. This effect ranges from mere stimulation to actual destruction of tissue. Used in weak doses the rays favour organic processes, *e.g.*, growth of hair and production of pigment. In stronger doses they lower vitality, produce inflammatory reaction, or actual necrosis.

(4) Radiant heat, light, electricity and X-rays similarly influence cell life.

(5) Clinical effects of radiotherapy:—(*a*) The physiological

effects are in direct proportion to the intensity of the raying, but in inverse proportion to the wave-lengths. (*b*) The reactions appear after a latent interval, the length of which is also inversely proportional to the wave-lengths and intensity of the raying. (*c*) The physiological action of the rays is long persisting. (*d*) Those rays which have the property of exciting fluorescence are also physiologically the most powerful.

(6) D'Arsonvalisation can be included in radiotherapy. The author believes that the physiological effects of this method are solely due to the spark discharges accompanying the use of the apparatus.

(7) All spark discharges may cause physiological effects which may result from: (*a*) the mechanical bombardment of the tissues; (*b*) the production of heat; (*c*) chemical effects, formation of ozone; (*d*) ultra-violet ray formation.

(8) The effects of sparking vary according to its intensity: may be stimulating or destructive. On the skin they affect the vaso-motor system, and tend to cause necrosis of the superficial epithelium.

(9) D'Arsonvalisation useful in the various forms of pruritus; also in lupus erythematosus, and to produce exfoliation in pityriasis versicolor, acne vulgaris, rosacea, pigmentary abnormalities. Favourable effects also in fissure ani, probably through the desquamation. Action of d'Arsonval's apparatus superficial only, and due only to the accompanying spark-discharge.

(10) A simple spark-apparatus: A test-tube filled with water and connected with the negative pole of a coil, the positive pole being earthed. With this apparatus brush-discharges can be obtained equal to those of Oudin's apparatus. The brush-discharge is useful for wide-spread areas of disease, and in the case of nervous people. Spark discharges can be applied to more circumscribed areas. Treatment with the "electrified hand," another spark method, but a very mild one.

(11) The X-Ray method. The effective factors in this are probably the X-rays themselves and the electric surface-tension of the tube. Vaso-motor effects produced as in ordinary spark-discharges.

(12) Skin diseases suitable for X-ray treatment. Clinically one group is separated from the rest, its essential feature being the removal of hair, *e.g.*, ringworm, favus, sycosis, hypertrichosis. In this class the X-rays are much more effective than light rays, but both methods stand much on an equal footing in the remaining class of cases.

(13) The depilatory properties of the X-ray tube due to direct destructive action or to alteration in the blood supply of the follicles. X-rays possess no bactericidal properties.

(14) In the remaining group cell infiltration and proliferation are essentials, *e.g.*, lupus, epithelioma, in which the destructive influence of the rays is beneficial. The rays also exert a powerful

influence in promoting the formation of connective tissue and cicatrices. They may act also directly on the specific poison.

(15) X-raying has a more penetrative effect than can be obtained by the use of chemicals. The rays in weak doses stimulate and in strong destroy hair-growth.

(16) Comparison of X-ray method and Finsen's method for lupus vulgaris. On the whole, much about the same length of time is required in the two methods. Cosmetic results of both equally good. A rational method is first to X-ray large surfaces and treat the remaining foci with Finsen's apparatus.

(17) Should tubes be hard or soft? The best guide to be found, not in the estimated qualities of the tubes, but in the reactions actually observed. Practically identical results can be obtained from either hard or soft tubes by adapting the time of exposure, strength of current, and distance of the tube. Reactions depend largely upon idiosyncrasy, and again upon the parts of the body exposed. Hard tubes perhaps safer. With these the radiation can be pushed till visible effects are produced, whereas with soft tubes one must work more in the dark, and make allowance for reactions before they are visibly manifest.

(18) Clinical effects of X-raying:—(1) Intumescence of the skin; (2) mild erythema; (3) pigment changes; (4) loosening of hairs; (5) subjective phenomena—itching, burning, &c. Importance of being able to recognise above.

(19) Finsen and others have proved the value of blue, violet, and ultra-violet rays. But rays of greater wave-length are also of therapeutic value.

(20) Bang's Lamp. This apparatus has not superseded Finsen's, which retains its superiority. Probably, therefore, the therapeutic value of Finsen's "Light" apparatus is not due entirely to the ultra-violet rays (which, according to the author, are largely absorbed in the epithelial covering of the skin), but to more deeply-penetrating rays, which are also produced.

(21) It is not yet known whether inflammatory reaction or bactericidal effects are solely responsible for results with Finsen's Lamp. Light rays, like X-rays, besides destroying morbid cell-elements, stimulate the production of connective tissue and cicatrices.

(22) The author repeats that for the above results not only the short-waved ultra-violet but also the long-waved yellow and red rays are of value.

Dr. Sequeira (London) opened the discussion with the usual congratulatory remarks to the author, observing that in rodent ulcer in favourable cases wide excision was the best form of treatment; in extensive areas X-rays should be tried. In his experience of X-rays, whether for rodent or lupus, recurrence was common. Of eighty cases of rodent thirty-four were cured. Some of his earlier cases had shown recurrence after eighteen months. In those ulcers in which cartilage or bone are exposed,

there is considerable difficulty in effecting a cure. Sometimes the hard margin refuses to disappear; in such a case the production of an actual burn was, in his opinion, an advantage.

In cases of true epithelioma improvement may occur, but when the lymphatic glands are involved the X-rays seemed, in his experience, to be powerless. Recurrent nodules after amputation of breast may disappear, but the glands are less easy to affect. Lupus may be cured, but relapses are common. In his opinion, the X-rays are the effective factor, for the interposition of an aluminium sheet does not interfere with the effect. In lupus erythematosus X-ray treatment was valueless.

Dr. S. E. DOVE gave his experience of two years' use of Finsen treatment. He considered it important not to overestimate the value and the possibilities of the treatment. The chief advantage is the excellence of the results, and a case may be treated indefinitely without risk of any disfigurement. He advocated the application of pyrogallic acid, or acid nitrate of mercury, to greatly increase the activity of the light.

Dr. MCLEOD also advocated the following to increase the action of the Finsen Light: a 1 per cent. solution potassium permanganate, a weak solution of iodine with glacial acetic acid, and pure carbolic acid. He had obtained some improvement in two cases out of five of L. erythematosus.

Dr. LESLIE ROBERTS believed the inunction of mercury and the application of biniodide of mercury in ether soap was more effective than Finsen treatment.

Mr. HALL EDWARDS spoke exclusively of X-rays, and was of opinion that, unless at least a small amount of reaction is produced, no therapeutic results will follow. Homœopathic doses were useless. It was admitted that hard tubes were best for therapeutic work; hard tubes, however, differed from one another, and he had found that a tube which sparked over quickly brought about reaction. He was still of opinion that the effects were largely electrical.

Dr. PHINEAS ABRAHAM considered X-rays to be especially useful for lupus of the mucous membranes. He had cured an extensive case of L. erythematosus by means of X-rays, but some cases are made worse.

Mr. CHISHOLM WILLIAMS spoke on the high-frequency part of Dr. Freund's paper. The effects produced were not solely due to the spark discharges. He had arrested lupus on face, $2\frac{1}{2}$ in. by 1 in., in a child 8 years old, by means of auto-condensation. Again, he had applied the "effluve" or brush-discharge to the sole of a child for the arrest of lupus of the neck. There had been no return after two years. He did not believe that the inhalation of the ozone given off in this treatment was of much benefit. Dr. Freund maintained that the action of high frequency currents was superficial only (par. 9); there was room for doubt here. How was it that in treating any skin condition with high-fre-

quency currents we always got a general beneficial effect? It is a method of general electrification and acts as a general "tonic" to the system. In this country those who were working with high frequency seldom found it necessary to "spark." It is a showy method, causes pain, and in his (Mr. Chisholm Williams) opinion should never be used. As to the treatment by the "electrified hand" (par. 10), our profession is justly far too conservative to use it. A very remarkable statement by Dr. Freund was that X-rays possessed no bactericidal properties. Drs. Forbes Ross and Norris Wolfenden have shown that tubercle bacilli were enormously increased, and that finally they were vastly attenuated by their overgrowth. In his experience, high-frequency currents caused the tubercle bacilli to behave in the same manner. He was able to judge of that by some dozens of examinations of sputum made by the Clinical Research Association, of a large series of phthisical patients treated by these currents. Lupus was probably cured by the over-proliferating of the tubercle bacilli when present, and in other cases by electrification of the individual cells. Comparing X-rays with Finsen, Freund believes the length of time to be the same. This is not the general experience of workers in this country.

Regarding the Finsen treatment, it was (1) expensive, (2) painful, (3) tedious, and had not as yet been shown to possess any superiority over X-rays, or high frequency currents.

Dr. STOPFORD TAYLOR mentioned some very remarkable results after the application of X-rays in cases of rodent ulcer and epithelioma. He also referred to the assistance of pyrogallic acid to Finsen treatment.

Mr. GEORGE PERNET had found the Lortet lamp very tedious at University College Hospital.

Dr. NORMAN WALKER had noticed the hair grow in two cases while under X-ray treatment. In sycosis the hairs were not merely removed, but much reaction was produced and permanent benefit followed. He had been much disappointed in the Finsen treatment for lupus, it was extremely tedious; but had been pleased with X-rays. Iodine and carbolic acid greatly assist in the production of a reaction. Lupus erythematosus reacts severely to X-rays, but in many cases improvement follows. During the last month he had treated a case of mycosis fungoides with striking benefit, which was noticeable after three exposures to the X-rays; all the nodules had flattened down. He did not consider the ultra-violet lamp to be any improvement.

The PRESIDENT OF THE SECTION (Dr. H. A. Brooke) had also seen marked improvement in a case of mycosis fungoides under the influence of X-rays.

Professor R. B. WILD thought the X-rays of much value in lupus and remarked that it was not always the most superficial nodule which responded best to treatment. X-rays are not free from danger, for he had known one case where a panophthalmitis had supervened, necessitating the removal of the eye.

The remarks of Professor Wild should be taken to heart by any lay person who is dabbling in X-ray work, as the skilled medical man may probably anticipate an acute dermatitis, &c., but to the layman, devoid of special medical training, this must be impossible.

AMERICAN ELECTROTHERAPEUTIC ASSOCIATION.

THE twelfth annual meeting of the American Electrotherapeutic Association was held at the Hotel Kaaterskill, New York, September 2, 3, and 4, 1902, Fred. H. Morse, M.D., of Melrose, Mass., President.

FIRST DAY, Tuesday, September 2.

Committee on Static Machines and Condensers.—Dr. William James Morton, of New York, made a brief report for this committee. He said that he had been especially interested in the machine recently described by Gaiffe, of Paris, for the production of the X-ray, and pointed out the difference between the static machine for ordinary therapeutic work and that designed for the production of the X-ray. He hoped manufacturers would endeavour to improve the speed regulation, inasmuch as high speed machines of smaller size than at present would be an aid to the X-ray worker.

The Action and Uses of the X-Rays in Therapeutics.—Dr. William B. Snow, of New York City, read a paper with this title. He thought the best apparatus for X-ray work was a static machine of ten plates having a diameter of thirty or thirty-four inches, and that recent experience demonstrated that the sphere of usefulness of low vacuum tubes was more restricted than that of the tube of high vacuum. Apparently the X-ray destroyed abnormal tissue of low vitality without unfavourably influencing normal structures unless the exposure were unduly prolonged. The ideal method of treatment of cancer seemed to be by combining operation with the use of the X-ray. Lupus and epithelioma of the skin were particularly amenable to the X-ray and the brush discharge.

Dr. C. R. Dickson, of Toronto, Can., spoke of the diarrhœa that sometimes follows X-ray treatment, and was apparently one expression of the constitutional effect of the breaking down of tissue. The brush discharge should be used in all open cases.

Dr. Robert Reyburn, of Washington, D.C., thought that the very large ampèreage, incident to the use of the Ruhmkorff coil for the production of the X-ray, explained the greater liability to burning with the coil as compared with the static machine.

Dr. Francis B. Bishop, of Washington, D.C., spoke of the great advantages of the X-ray treatment for tuberculous glands of the neck, not the least of which was the slight scarring produced.

Dr. R. J. Nunn, of Savannah, remarked that he had seen X-ray burns follow just as frequently from the use of the static machine as of the coil. He had also observed constipation as one of the constitutional effects of X-ray treatment.

Dr. W. J. Morton said that it was only rational to employ an X-ray of sufficient intensity to penetrate to the part to be brought under its influence; hence the necessity for using the high vacuum tubes in many instances. He advised the discarding of X-ray screens, the frequent moving of the tube from one part to another, and a very wide treatment of the disease. Carcinoma of the abdomen was not a promising field for any treatment because of its tendency to spread rapidly. It was immaterial whether the X-ray tube was excited by the coil or the static machine provided it was properly energised.

Dr. Snow, in closing, said that while he took the same ground as to the effects produced by coil and static machine, the coil wore out the tube very much faster. The brush discharge should be used in all superficial cases, and had proved useful where the X-ray alone had failed.

The Treatment of Cancer by X-rays.—Dr. Clarence Edward Skinner, of New Haven, presented in this paper a report on thirty-three cases. Out of this number there had been three apparent cures, thirteen had been permanently benefited, twelve temporarily improved, two not improved, and three had discontinued treatment too soon. Every one of the cases was considered inoperable and hopeless. The three cured cases were:—(1) a round cell sarcoma of the neck of three years' duration; (2) a recurrent carcinoma of the right breast with metastasis in the deep lymphatics of the trunk, and (3) a nodulated palpable tumour, probably a sarcoma, situated deeply in the lower lumbar and upper sacral regions.

Dr. J. D. Gibson, of Birmingham, Ala., said that, according to his experience, the best results in superficial cancers were obtained with very "soft" tubes and close exposures of from seven to ten minutes' duration.

Dr. R. J. Nunn suggested that it would be more exact to speak of the vacuum tubes according to their penetrating power as determined by measurement with a block of metal of standard thickness.

Dr. A. G. Geyser, of New York City, replied that the penetrating power of the tube varied from hour to hour, and that

it was sufficient for practical purposes to know that a high vacuum tube emitted a green, and a low vacuum a blue light.

Dr. G. Betton Massey, of Philadelphia, said that the X-ray was easier to apply than his mercuric cataphoresis, and should prove specially efficacious in recurrent carcinoma of the breast because of its wide and deep penetration.

Dr. Robert Reyburn said that the caustic paste treatment of cancer was still popular, yet the X-ray appeared to have the penetrating action of the paste, and, at the same time, gave a better cosmetic result. The X-ray appeared to influence the cells surrounding the diseased area in such a way as to wall off the latter from the healthy tissues.

The X-rays in the Treatment of Cancer.—Dr. J. D. Gibson, of Birmingham, Ala., was the author of this paper, and in it he gave the histories of seven cases of epithelioma. He looked upon the X-ray as a specific for malignant growths.

Dr. Robinson, of Lexington, Ky., advocated the use of high vacuum tubes and cautioned against repeating the treatment more often than twice a week in the average case.

Dr. D. Preston Pratt, of Chicago, said that there was absolute proof that the action of the X-ray on the body was due to changes in the ions produced by electrical force. The static breeze had a strong tendency, when used on cancer, to spread the infection.

Dr. Gibson, in closing the discussion, said that he had found the softest rays most useful in skin cancers, but a harder tube would be required for those more deeply located. He also believed the static breeze was liable to cause sepsis when used on other than open surfaces.

Second Day, Wednesday, September 3.

The St. Louis Exposition.—The Association adopted the following resolution, and appointed a special committee on the subject: *Resolved*, That the American Electrotherapeutic Association heartily commends and supports the plans which have been inaugurated for containing an electrotherapeutic display commensurate with the dignity and importance of this branch of electricity.

Epithelioma of the Tongue.—Dr. C. R. Dickson, of Toronto, read this paper, reporting four cases, and stating that he had not obtained as good results from the X-ray in these cases as in other forms of malignant disease.

Dr. F. B. Bishop thought one reason for the indifferent results reported by Dr. Dickson was that he had used with his galvanic treatment an active pole having too large an area for the ampèreage employed.

Dr. Dickson admitted the justice of this criticism, but explained that it had not been considered advisable to employ general anæsthesia, and hence he had used this large electrode.

Some Therapeutic Notes on the X-rays.—Dr. Dickson was also the author of this paper. It was his custom, he said, to keep the tube one or two feet distant for the first two weeks, and then to gradually reduce this distance to six inches. The duration of the *séance* was usually ten minutes, and daily treatments were rarely used. Like other observers, he had found that an application of adrenalin solution intensified the re-action.

Dr. J. D. Gibson thought the most rapid results in the treatment of lupus were to be secured by using both the brush discharge and the X-ray.

Dr. A. D. Rockwell, of New York City, described the hyperstatic current, and expressed the opinion that it was greatly superior to the brush discharge.

Dr. W. B. Snow exhibited some specially designed glass vacuum tubes which he had found useful in closed cavities, such as the rectum and vagina. They were connected with the negative pole of the static machine.

Dr. Willis P. Spring, of Minneapolis, said that he had found the soft rubber used by dentists in the manufacture of artificial teeth a useful means of protecting the tube from short circuiting.

Dr. W. W. Eaton, of Mass., said that he had found the hyperstatic current useful in chronic eczema and in the relief of severe facial neuralgia. He had found a combination of the galvanic current with the X-ray of service in the treatment of carcinoma of the liver.

Dr. D. P. Pratt said that X-ray burns were produced by the driving in of the microbes of the atmosphere, and that they could be prevented by the interposition of a celluloid screen one-sixteenth of an inch in thickness.

Dr. C. E. Skinner doubted this, because it was conceded that microbes are not driven through absorbent cotton, yet he had burned a patient by X-ray treatment through a surgical dressing.

Dr. R. J. Nunn remarked that if this microbic theory were correct it must be possible to drive medicaments in the same way.

Dr. Pratt replied that such was the case, and that Dr. Alexander Wiener, of Chicago, was actually forcing creosote into tuberculous nodes by means of the X-ray.

A New System for Producing a Slow Alternating Current of Large Ampèreage for Therapeutic Use.—Dr. Lucy Hall-Brown, of Brooklyn, N.Y., described this system, exhibiting the apparatus. The latter, in brief, consists of a tub filled with water and having carbon plates on opposite sides. An insulated spindle in the centre, having a plate of carbon or metal at either end, is revolved by clockwork or an electro-motor. As the revolving plates approach the fixed terminals a current is set up in the shunt circuit in which the patient is placed, and this gradually increases until the nearest point is reached, when the current

diminishes again, and the direction of the current is also changed. The current from a galvanic battery, or from the Edison system, is thus transformed by this apparatus into a slowly alternating current of the sinusoidal type, the frequency of the alternations varying at will from one to fifty per minute. The clinical effects of this current were said to be peculiar, and were now under investigation.

Drs. G. B. Massey and D. P. Pratt thought this the best alternator of the kind they had ever seen.

Current Differentiation Illustrated by a Case of Peripheral Neuritis due to Parenchymatous Degeneration of the Cord.—Dr. A. D. Rockwell, of New York City, presented this paper because it afforded an excellent example of current differentiation and of the prompt relief afforded by proper treatment in an obstinate case.

Some Therapeutic Indications from the Use of the Electric Light Bath.—Dr. T. D. Crothers, of Hartford, read this paper. He had made use of a room five feet square and six feet high, lined with tin and lighted by 100 incandescent lights of sixteen-candle power each. With a napkin over the head the patient's body was exposed for about ten minutes, after which massage with cold or hot showers was employed, and the patient then put to bed. He had used this treatment only in drug habitués and various forms of toxic insanity, but had found a marked difference from the action of the ordinary hot-air bath, thus showing that the light played an important part. Sleep was promoted, the circulation improved and the craving of drug-takers controlled.

Dr. W. B. Snow said that the studies of Finsen, in Europe, and of Dr. Margaret A. Cleaves in this country, showed that to get the full effect of light our methods must be changed. For instance, there was reason to believe that the glass of the incandescent lamp cuts off some of the therapeutic action of the light.

Dr. C. O. Files, of Portland, Me., spoke of his favourable experience with the arc light bath in the treatment of tuberculosis.

Some Obstacles to the Progress of Electro-Therapeutics.—Dr. Charles O. Files, of Portland, Me., the author of this paper, mentioned as some of the obstacles the general ignorance of the medical profession regarding electrotherapy, the exaggerations of enthusiasts and the glamour of modern surgery.

A Portable Electric Apparatus for Medical Use.—Dr. Robert Reyburn, of Washington, D.C., described a cheap and convenient apparatus made up of five dry compound cells, each consisting of three cells capable of yielding a current of thirty or more milliampères. A Queen's galvanoscope, calibrated experimentally, takes the place of the milliampèremeter, and instead of the water rheostat is a carbon rod of high resistance with a sliding collar for making connections.

Newman's Portable Galvanic Battery.—Dr. Robert Newman, of New York City, said that his battery consists of twenty hard

rubber cells containing zinc and carbon rods, and having a convenient current selector. The acid bichromate solution, in concentrated form, is not put into the cells until wanted for use, and is afterwards thrown away.

The Diffusion of Iodine by the Electric Current.—Dr. M. F. Wheatland, of Newport, gave in this paper the result of a series of careful experiments, which proved clearly that there was no reason for believing that iodine is projected into the tissues by the positive pole, as some had maintained.

Arthritis Deformans.—Dr. Francis B. Bishop, of Washington, D.C., detailed some interesting results that he had obtained, which gave support to his declaration that even when this disease is advanced, it can be cured by proper electrical treatment, aided by a diet consisting largely of red meat, with milk, eggs and water, and with very little bread.

Dr. D. R. Brower, of Chicago, said that experience had long ago compelled him to believe that these patients required a red meat diet, and that often sugar was not well borne.

THIRD DAY.—Thursday, September 4.

The Relation of Psychic Suggestion to Electrotherapeutics.—Dr. Maurice F. Pilgrim, of Boston, in this communication laid stress upon psychic suggestion as a valuable adjuvant to electrotherapy, and insisted that the relation was natural, and should be close. It was important, however, to rescue it from quacks.

Illustrative Cases in the Cataphoric Treatment of Cancer.—Dr. G. Betton Massey, of Philadelphia, reported a number of interesting cases, exhibiting photographs in proof of what had been accomplished by this method, which he devised and has so persistently advocated.

Officers.—Dr. C. R. Brower, of Chicago, *President;* Dr. Maurice F. Pilgrim, of Boston, *First Vice-President;* Dr. C. Frank Osman, of Boston, *Second Vice-President;* Dr. R. J. Nunn, of Savannah, *Treasurer;* Dr. Clarence E. Skinner, of New Haven, *Secretary.*

The next meeting will be held at Atlantic City in September, 1903.

The International Congress of Medical Electrology and Radiology held its second meeting at Berne from September 1 to 6. Although the actual number of members present was rather small, the papers read and the discussions that followed were of great interest and importance, and will be reported in these pages as space and opportunity permit. In the meantime a short account appears in the *British Medical Journal* of

October 11. Telegrams "*de respectueuse reconnaisance*" were sent to MM. Röntgen and Finsen.

WITH the beginning of the New Year the readers of this Journal are asked to expect certain alterations in its arrangements. As its circle of readers widens, and the subjects of which it treats grow daily in interest and importance, it is felt that a wider collaboration becomes necessary. Perhaps, also, a title may be decided upon more distinctive of its leading aims, and its position as official organ of the British Electrotherapeutic Society.

Retro-displacement of the Uterus.—In a discussion of the above subject, Coe emphasises the fact that it should be the aim of the physician to endeavour to restore a healthy condition of the muscles either before or after operation by appropriate treatment, including baths, massage, electricity, gymnastic movements, out-of-door exercise, tonics, and such regulation of the patient's dress and mode of life as seems best fitted to the individual case. If the result is to be completed permanently, the work of the physician begins where that of the surgeon ends.

G. W. Kaan advised the use of a pessary in all cases in which the retro-displacement is capable of replacement or can be made so by treatment, and in which the pessary is capable of holding it in place and can be worn with comfort. Every case must be carefully managed, and with the onset of the slightest pain the pessary removed. He finds that the ability to do without the pessary within a year or so occurs in 25 per cent. to 30 per cent. of cases. Kaan points out that the error is made of selecting too large pessaries, and makes a plea for the more careful treatment of displacements by suitable applications and by pessaries before resorting to operative measures, which are by no means uniformly successful.—*Philadelphia Medical Journal*, July 5, 1902.

ANNUAL SUBSCRIPTION FIVE SHILLINGS.

VOL. III. No. 4. OCTOBER 15, 1902.

THE JOURNAL OF PHYSICAL THERAPEUTICS

AN INTERNATIONAL QUARTERLY REVIEW.

Edited by Dr. W. S. HEDLEY. *American Editor*, Dr. M. A. CLEAVES.

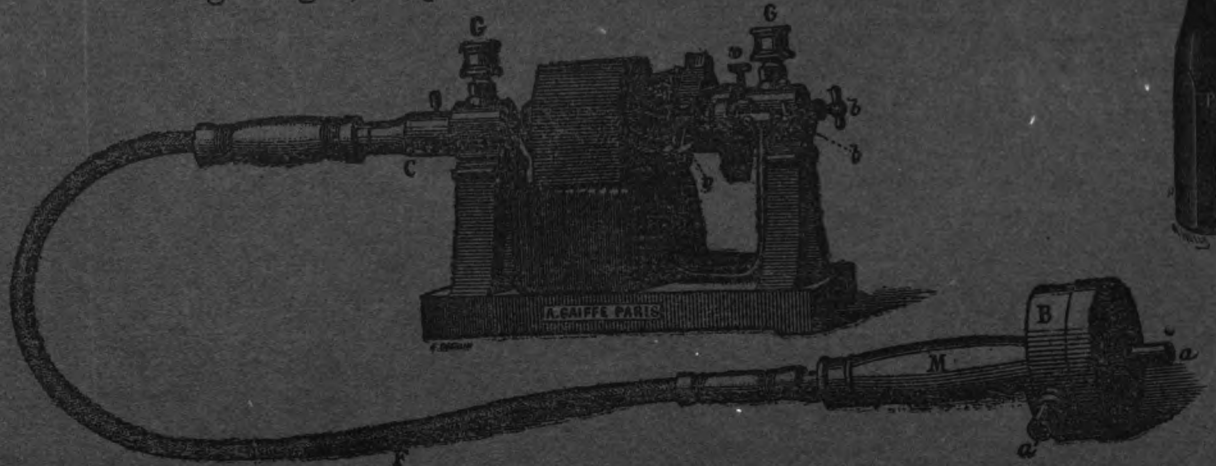
The Official Organ of the British Electrotherapeutic Society.

LONDON:
JOHN BALE, SONS & DANIELSSON, LTD.
Publishers,
83-89, GREAT TITCHFIELD STREET, W.

High Frequency Currents—Sinusoidal Currents.

Method of Dr. D'ARSONVAL.

New Interrupter GAIFFE-CONTREMOULINS Patent S.G.D.G.—without Mercury—working from 50 to 100 Volts —giving 6,000 Interruptions a Minute.



Vibrator, large size, working upon all Voltages.

Smaller Vibrator working upon all Voltages.