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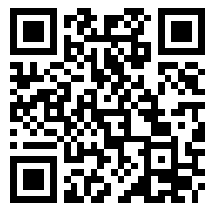
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The Official Organ of the British Electrotherapeutic Society.

VOL. IV. No. 4.  
New Series.

OCTOBER, 1903.

# MEDICAL ELECTROLOGY AND RADIOLOGY,

AN INTERNATIONAL QUARTERLY REVIEW.

(With which is Incorporated "The Journal of Physical Therapeutics.")

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American Editor, Dr. M. A. CLEAVES.

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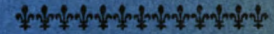
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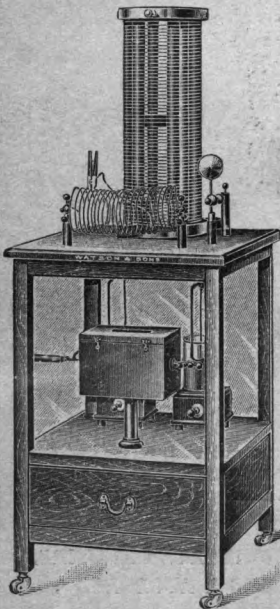
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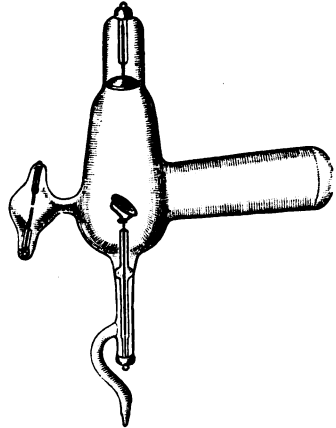
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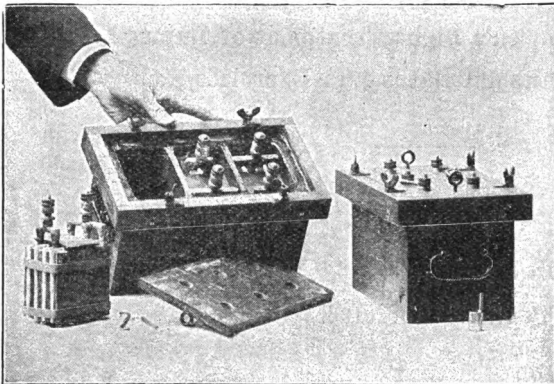
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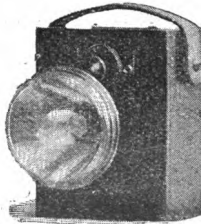
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MEDICAL

# Electrology and Radiology.

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No. 4.

OCTOBER, 1903.

VOL. IV.

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## BRITISH ELECTROTHERAPEUTICS.

By Dr. H. LEWIS-JONES.

THE promotion of the subject of electrotherapeutics to the dignity of a separate sub-section at the Annual Meeting of the British Medical Association, at Swansea this year, was fully justified by the quality of the discussions and the papers presented, as well as by the numbers of those who attended the meetings. It is to be hoped that when the readers of this Journal receive the reports of the proceedings they may be stimulated to further efforts for next year.

The study of electrotherapeutics still languishes in Great Britain. The subject is sorely in need of the support of men of greater ability, and of the assistance to be derived from better equipped and better manned departments at the hospitals. Our status in this respect does not seem to be very satisfactory. In the July number of the official bulletin of the French Society of Electrotherapeutics and Radiology there are two letters from members of that Society who had been asked to visit Great Britain and Spain and to report on the condition of electrotherapeutics in the two countries. From these letters it appears that we seem to be more backward than they are in Spain; and it is humiliating to read the opinion of our French critic when he writes of one of our largest London hospitals that "the work in electrotherapeutics seemed to be a little primitive, both in organisation and in equipment," so that he felt "very doubtful as to its being of any great utility." Could not a similar criticism have been made of more than one of our hospital electrical departments?

We also need more co-operation among those who practise electrotherapeutics. There seems to be a sort of feeling of mutual distrust abroad among us. The British Electrotherapeutic Society is doing something to remove this unpleasant feeling, and in time, it is to be hoped, it will do much more. If the Society could secure the real active working help of every medical man who holds any official post in the electrical departments of our hospitals, whatever branch of the work he may be specially interested in, then

the advance of electrotherapeutics would be greatly helped. Here is a manifest duty to be done. Let us assemble all the available talent at the meetings of the British Electrotherapeutic Society and work cordially together until we no longer compare unfavourably with Spain in our public electrotherapeutic work.

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**BRITISH MEDICAL ASSOCIATION ANNUAL MEETING,  
SWANSEA.**

IN our July number there appeared an account of the Electrotherapeutic Sub-section. The report was necessarily a very short one, inasmuch as the meeting was in progress whilst the Journal was actually going through the press. The papers presented will shortly be published *in extenso* in the *British Medical Journal*, but in the meantime it may be useful to supplement the account already given by a brief abstract of the discussions.

*Wednesday, July 29.*

The PRESIDENT (Dr. Lewis Jones) in opening the proceedings, made some introductory remarks of commendable brevity. He said that this meeting marked an epoch in the history of electrotherapeutics. This sub-section and the formation of the Electrotherapeutic Society were the outcome of the efforts that had been made by medical men to place therapeutic electricity on a proper basis. It was to medical men that recent advances in the application of the X-rays to therapeutics, and an improved apparatus and procedure, were chiefly due. The so-called "cures of cancer" introduced by impostors and "boomed" by the lay press had done much harm, and medical men must be careful not to associate themselves with the lay public when once the field of therapeutics was entered upon. In rodent ulcer the X-ray had established itself as a satisfactory form of treatment. As to cancerous growths, it could at least be said that pain was often relieved and the size of the tumour diminished. There was still much to learn about the best methods of procedure. Seeing that so far as rodent ulcer was concerned the usefulness of the X-ray is no longer in question, he proposed that the discussion be limited as far as possible to the treatment of epithelioma, sarcoma, and carcinoma. In the first mentioned he advocated early excision in a certain number of cases. He thought that there was evidence that epithelioma had been cured by X-rays, but authentic and scientific reports by trustworthy and trained observers of, say, six cases would be of great value. He was uncertain whether the production of a dermatitis was necessary. He preferred a "medium" tube.

He was inclined to think that the cathode rays, as well as the X-rays, played an important part, and to test this point suggested the use of tubes without an anti-cathode pole, such as were used in the early era of the X-ray.

Mr. J. HALL EDWARDS would have no hesitation in treating any case of epithelioma in which the glands in the immediate neighbourhood were not implicated. He mentioned a case of cancer of the rectum treated by X-rays through the sacrum; there was great improvement, but the disease was, so far, not cured.

Mr. CHISHOLM WILLIAMS said that in using high frequency currents for the treatment of malignant disease high vacuum electrodes should be used, the vacuum being sufficiently high to produce X-rays. Such electrodes could produce dermatitis, but the latter would be limited to a small patch, and the necessity for covering the neighbouring tissues would not arise. The first effect of the application would be anæsthetic. General electrification by high frequency is often useful in addition to the local treatment.

Dr. C. H. ALLFREY referred to the case detailed by one of the previous speakers where iodide of potassium had proved useful, and assuming that toxæmia was produced by absorption of broken-down material, suggested the possibility that the removal of such *débris* was owing to the administration of the drug.

Dr. HORACE MANDERS gave a history of five cases of cancer treated by high frequency currents. Although the disease had already proved fatal in four of the cases, they had certainly been benefited by the treatment. He had used high vacuum tubes and general electrification. In abdominal malignant growths there was almost invariable relief of pain by employing high frequency through large metal electrodes (back and abdomen) attached to each end of the small solenoid.

Dr. LOVELL DRAGE had injected hypodermically a 10 per cent. solution of cinnamate of sodium in glycerine (the effect of which was to bring about leucocytosis), and there was no recurrence of the disease in the neighbouring glands. The dose was 30 mm., injected once a week into the neighbourhood of the inflamed gland.

Dr. J. F. BOLTON related a case in which high frequency currents seemed at first to produce astonishing improvement, but this did not last, and the case got rapidly worse. In a case of uterine cancer he felt that the tumour had grown in size, but the pain was relieved.

Dr. W. KENNETH WILLS thought that experimental work in the direction of combining the application of drugs with X-rays offer a hopeful field for research. No doubt under such measures new chemical compounds were formed in the tissues. He related a case of cancer in which raying had



produced little effect upon the disease beyond the relief of pain.

Dr. M. BANNISTER laid great stress upon the production of leucocytosis, and advocated systematic blood examination during the progress of treatment. He referred to the usefulness of permanganate of potass combined with X-rays.

Dr. W. B. C. TREASURE asked about the use of radium in the treatment of malignant disease.

Dr. V. H. RUTHERFORD asked a very pointed question, viz., what is the longest time that the cure of a case of rodent ulcer had lasted before recurrence? He mentioned a case in which the latter had taken place in four months, and another case in which after sixty exposures the disease had recurred within two months. In a third case of rodent ulcer there had been no recurrence in two years.

The PRESIDENT, in closing the discussion, said he would have been glad to have heard more of the personal experiences of recognised workers. The remarks of Mr. Hall Edwards and of Mr. Chisholm Williams were of great interest and importance. The brush discharge of a static machine frequently relieved the pain of malignant growths, and certainly improved the condition of a rodent ulcer. He had no experience of radium, and the difficulty of procuring it had so far prevented its extended use. He thought that the means in question might be supplemented by the use of drugs such as cinnamate of sodium. He mentioned a case of malignant growth in one breast, where a similar growth appeared in the breast of the opposite side after treatment by X-rays, and it was possible that the treatment had contributed to this result. In another case the X-rays were applied twenty-seven times in three months after the removal of malignant glands. At the end of that time the scar began to get lumpy, but the disease had not really reappeared, for examination showed that the fresh nodules were altogether different in appearance from the original ones. Microscopical examination made it clear that the treatment had retarded the growth, and the result might have been better had treatment been more energetic.

*Thursday, July 30.*

#### THE TREATMENT OF TUBERCULOUS DISEASE BY ELECTRICAL METHODS.

Mr. CHISHOLM WILLIAMS introduced the subject by reading a paper, of which the following is a short abstract:—

The electrical treatment of tuberculosis was considered under two headings: (1) general electrification; (2) direct applications to superficial manifestations of the disease. For this purpose there is in high frequency currents a new electrical method of great promise. Reference was then made to the

author's paper read at the Association meeting at Cheltenham in 1901. The treatment of forty-three cases of pulmonary tuberculosis by high frequency currents was therein detailed. It was found that patients increased in weight, with improved appetite and digestive power. The temperature at the time was raised, according to the strength and duration of the application. The night sweats, slightly increased at first, gradually disappeared. The bacilli soon showed a considerable increase, shortly, however, forming clumps, getting misshapen, short and stumpy, and as a rule curved, and taking the stain more readily. Later they begin to decrease, and may disappear entirely, perhaps reappearing again after some weeks. The usual diarrhoea seems improved by the treatment, probably in consequence of the improved digestion.

However much the temperature rises it will be found, as a rule, that the patient recovers his usual normal within forty-eight hours. The dose must be regulated according to the tolerance of the patient. When the treatment can be borne for more than half an hour daily for one week, the temperature at the same time remaining steady at normal and sub-normal, it is safe to say that the disease has at least been arrested.

The author then referred to the experiments of Drs. Lagriffoul and Denoyés upon the action of high frequency currents on tuberculous guinea-pigs, which prove that an actual inflammation is produced around the pulmonary foci, which finally abates and leaves the lung clear of bacilli. The experiments of Dimitriewski in working with various toxins show similar results, the toxins becoming innocuous. The tubercle bacilli seem to be acted upon much in the same way, as if by X-rays. Dr. Forbes Ross and Dr. N. Wolfenden have shown that on being rayed, bacilli rapidly increase in number and tend to form clumps; they then decrease in number and size, and readily stain, but are pale in colour. They are attenuated by overgrowth.

Of the writer's original forty-three consecutive cases, detailed in the paper read at Cheltenham, 1901, three have died, their certificates being pneumonia, tuberculous kidney, and lardaceous disease. In tuberculosis of other parts, joints, &c., the best results have been obtained by general electrification by high frequency currents, combined with the use of high vacuum electrodes from the resonator, or an ordinary X-ray discharge. The method is often useful in persistent sinuses. As to lupus, although the Finsen treatment is admittedly effective in 90 per cent. of the cases, it is by no means superior to other methods. The small area that can be treated, the necessary use of the compressor, the long duration of the treatment and its consequent expense, are amongst its disadvantages. Further, it is by no means painless. In fifty-

three cases treated by the Finsen lamp there is a history of pain in forty-two. Neither is the cosmetic result better than by other methods. In all cases and under all methods the resulting scar depends upon the following factors: (1) The original depth of the disease; (2) the amount of inflammatory reaction produced by the treatment; (3) the application of such caustic application as pure carbolic or pyrogallic acids; (4) the forcible removal of crusts.

The static effluve has been used with great advantage in lupus, a slight disadvantage being the stinging nature of the brush discharge. But it has the advantage, shared with high frequency, of the ability to employ by its means general electrification at the same time. That high frequency currents afford a very effective method of treating lupus was demonstrated so long ago as 1897 by Dr. Brock, who reported sixty-two cases, all cured with the exception of sixteen. The application may be carried out in four ways: (*a*) by ordinary brush effluve; this containing a vast quantity of ultra-violet rays should be painless; (*b*) by highly exhausted vacuum electrode attached to the top of the resonator. This, when in actual contact, is warm but painless, may be regulated by withdrawal from the skin; (*c*) by general electrification, preferably "condensation"; (*d*) the last-named combined with *a* or *b*.

The PRESIDENT thanked Mr. Chisholm Williams for his interesting and instructive paper, and said that he (the speaker) had not much experience of high frequency currents in tubercular disease, but he would suggest that the subject be discussed under three heads: the treatment (*a*) of pulmonary disease, (*b*) of deeply-seated tubercular tumours, (*c*) skin affections, lupus, &c.

Dr. P. ABRAHAM had seen cases treated by all the methods mentioned, but thought the X-ray produced the best results. The cases he had sent to Mr. Chisholm Williams for high frequency had done well.

Dr. JOSEPH BOLTON having been impressed by Mr. Chisholm Williams's paper at the Cheltenham meeting in 1901, had supplied himself with an apparatus and treated every case of tuberculosis that had presented itself. In many cases high temperature developed early under the treatment, and such cases did very badly. In every case the pleuritic pain was relieved. Often there was no rise in temperature in the mouth; but a rise might be quite apparent when taken in the rectum. He often gave a sitting of half an hour's duration with good results. Cases of bone disease with high temperature should be very carefully dealt with. The high frequency treatment of lupus was not satisfactory. Constipation was relieved by applying the current through an electrode in the rectum.

Dr. V. H. RUTHERFORD considered that the Finsen lamp



was very effective in dealing with small patches of lupus, but altogether the X-ray was the method of choice.

Mr. J. HALL EDWARDS said that his personal experience of the treatment of tubercular disease by high frequency currents was hardly extensive enough to justify the expression of an opinion. He thought, however, that more convincing evidence than had yet been placed before the profession was required. As to X-rays, it was now generally admitted that they possessed no bactericidal property; the scar produced in lupus by X-rays was quite as soft and pliable as that resulting from other methods. Published statistics he regarded with some misgiving; he considered them often misleading, and did not think possible the number of cures reported. He had been to some extent disappointed at the results of high frequency; his best results were obtained in chronic dilatation of the stomach, anal fissure, and some obstinate cases of obscure neuralgic pain. From a physiological point of view he could not see the difference between "auto-condensation" and "auto-conduction." It seemed to him that some of the meaningless terms used by medical electricians might be discarded.

Dr. HULBERT considered that the active agent in all electrical methods was the ultra-violet ray, and power of penetration was the most important factor.

The PRESIDENT congratulated the reader of the opening paper, and referred to the success of the discussion. He thought that the technique of high frequency was as yet ill understood, and that further experimentation was called for. He had little personal experience of the employment of high frequency currents in general tuberculosis, but gave some details of a case of tubercular disease of the spine successfully treated by X-rays.

Mr. J. HALL EDWARDS then read a paper on "Some Debatable Points in the Application of the X-rays to Therapeutics," and amongst other points referred to the following: It is not yet decided what part purely electrical action plays, independently of the action of the X-rays themselves. It is possible that in the treatment of rodent ulcer the results are due to the X-rays alone, whilst for lupus both the X-rays and the electrical action may be required. Before discussing the various theories of the mode of action of X-rays, various phenomena that follow their application may be considered: (1) The drying of moist and discharging surfaces; (2) pigmentation of the skin; (3) relief of pain; (4) erythema; (5) falling of hairs; (6) destruction of tissue and necrosis; (7) formation of new and healthy tissue. Such results necessarily point to important tissue changes. It has been considered that the action of X-rays is due simply to irritation. Whilst admitting that in order to obtain a decidedly beneficial result it is generally necessary to produce a dermatitis, it must be

remembered that the result may be obtained without any such symptoms of irritation being observed. With better knowledge it might be possible at one sitting to obtain the result that is at present achieved by means of small and frequent doses. In the latter case the effects of the rays are said to be cumulative. But at *one* exposure there may possibly be produced a severe burn. It follows, then, that accumulative action does not in such a case play any part in the result. Even supposing that a satisfactory method of measuring doses were available, there is much that must still be learnt. Quite apart from electrolytic or electrostatic action, which always accompany the production of X-rays, we have probably to reckon with a number of other rays with properties entirely unknown to us. There are certain facts which go to prove that therapeutic results are not chiefly due either to the *amount of X-rays* (fluorescence of the tube), or to their *penetrating power* (fluorescence of the screen), and thus there lies before us a wide field for long and careful observation.

The reading of the paper was followed by a discussion.

*Friday, July 31.*

A discussion followed the reading of a paper on "High Frequency Currents as a Remedy for some Forms of Deafness," by Dr. J. C. Fergusson. Dr. J. Bolton contributed a paper on "X-rays as a Diagnostic Agent in Pulmonary Conditions." Drs. D. Baynes, W. H. Sellers, W. K. Mills, J. C. Fergusson, J. E. Garner, R. B. McVitie, and Chisholm Williams took part in the discussion. Dr. W. S. Hedley sent a paper on "Some Points in Practical Muscle-Testing," and Dr. Donald Baynes presented one on "The Treatment of some Cases of Painful Stumps, &c., and Un-united Fractures by Electricity." Dr. W. K. Mills showed a new form of ultra-violet lamp.

## A.

**METHODS OF RÖNTGEN-RAY TREATMENT OF MALIGNANT DISEASES OF THE UTERUS, RECTUM AND BLADDER, WITH DESCRIPTIONS OF TUBES.**

## B.

**A WATER-COOLED LAMP FOR GYNÆCOLOGICAL WORK.**

By MARGARET A. CLEAVES, M.D. (New York).

## A.

MUCH of the treatment of internal malignant growths has thus far been done by means of external applications of the X-ray energy. It<sup>1</sup> is reasoned that, as the X-rays produce an image on a screen at a very considerable distance from the source of energy, it must, therefore, by its penetrating power, be equally efficacious when applied therapeutically. This is incorrect (1) on physical grounds; it has been pointed out<sup>2</sup> that the chemically disorganising action of the X-rays in the tissues of the human body, assuming that the chemical substances have equal stability, should diminish with the depth, partly by reason of the increased distance from the radiant source or anticathode, and partly by reason of increased absorption and attenuation at each successive layer of traversed tissue. It follows, therefore, that, the nearer the seat of the lesion the X-ray energy is expended, the better the result. (2) On physiological grounds; whenever the tissues of the body, no matter what the locality, are subjected to an external X-ray application, such toxic products of diseased tissue as are released in consequence of the treatment are thrown into the general system, and there may result—and in many cases there has been reported—a toxæmia from which the patient has not been able to recover, and a fatal result has ensued because of this empoisonment.

Hyde, Montgomery and Ormsby<sup>3</sup> state that they have seen not only in their own experience, but in the experience of others, cases of surface carcinoma, in which the usual swelling and reaction produced by successive treatments have been followed by a complete disappearance of the growth, with a subsidence of the reaction, but that after a few weeks' rest

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<sup>1</sup> *Medical Record*, November 15, 1902, p. 799.

<sup>2</sup> "The Röntgen Rays and Ultra-violet Light in the Treatment of Malignant Diseases of the Uterus, with Report of an Inoperable Case," *Medical Record*, December 13, 1902.

<sup>3</sup> "A Contribution to the Subject of Radiotherapy and Phototherapy in Carcinoma, Tuberculosis, and other Diseases of the Skin." Hyde, Montgomery and Ormsby, *Journ. Amer. Med. Assoc.*, January 3, 1903.



there has been rapid extension of the growth into the neighbouring tissues, producing in several instances, within two or three weeks' time, a larger tumour than that for which the patient was originally treated. The growth has been more rapid than anything they have ever seen in unmolested carcinoma, and presents all the clinical symptoms of the disease. Sections taken from the doubtful tissue showed it to be a typical carcinoma. It is their belief that metastases have occurred during the successful treatment of the primary growth. They have had this experience in the treatment of surface carcinomata involving the deeper tissues. This being the case, it follows that in internal growths the danger of dislodgment of carcinoma cells which have not succumbed to the action of the rays, and the establishment of foci of disease elsewhere, and also the danger of profound toxæmia, is greatly increased. Therefore, external applications of the Röntgen rays to malignant growths, approachable by accessible mucous cavities, and especially when the natural course of drainage is such as to prevent, to a very great extent, the danger of systemic absorption, as in the female pelvis, should not be made. From clinical observations in extensive and inoperable malignant growths of the uterus, adnexa and adjacent organs in women, the writer believes that the danger of the establishment of metastases in the liver and peritoneum, as well as of a general toxæmia, is very great from external applications, and that the approach should be by way of the accessible mucous cavities, just so far as it is possible to devise the means of conveying the X-ray energy within these cavities. If in treating such growths, and especially of the uterus, the natural accessible mucous cavities are utilised, there follows, not only an expenditure of the energy directly at the site of the disease, but also where the number and distribution of the lymphatics are such that drainage is obtained without the danger of unloading the poisonous material into the general system. It is, therefore, much more within the possibility of the patient to withstand the effects of the toxæmia. It is not only that this is the natural way of drainage, but it is also true that the pelvic peritoneum is more tolerant to violent usage and less susceptible to infection than the abdominal peritoneum.

The uterus is abundantly supplied with anastomosing channels, and numerous ducts discharge into the lumbar glands. There can be no question that the depth at which alterative changes occur as the result of X-ray treatment is such that only the lymphatics or the general circulation can carry the effete matter away. It follows, therefore, that whenever possible the X-ray energy should be so localised as to minimise the possibilities of systemic infection, facilitate the best drainage, and that, in addition, no known effort should be spared to keep the patient in the best fighting trim. Malignant

diseases of the uterus are not regarded as constitutional primarily by the best pathologists, and they offer, therefore, if secured sufficiently early, a specially favourable class for treatment. The adjoining cavities, rectum and bladder also, by reason of their anatomical position, lymphatic circulation, and easy accessibility, can be advantageously treated locally.

Whenever the disease can be removed surgically, it should be done, and the X-rays used both before operation and subsequently.

The writer's experience has been with the most desperate cases; cases in which the destruction of tissue, the involvement of the adnexa and the cachexia have been so great that nothing could be done surgically, not even curettement. In one inoperable case the recto-vaginal septum was involved to such an extent that perforation took place, and gas and fæces escaped through the vagina. This was completely and promptly healed by vaginal applications of the X-rays.

In a recurrent scirrhus, in which the whole pelvis was filled with a stone-like mass, the rectum was so encroached upon as to limit function, even under the influence of strong laxative medicine and enemata. By intravaginal and intra-rectal X-ray applications, in six weeks' time over one-half of the mass in the pelvis has gone, and the bowels act well with but 10 to 15 minims of fl. ext. cascara sagrada, while the pain, which was constant, sword-thrust like, has disappeared.

In a case with destruction of two-thirds of the cervix, enlargement and involvement of the body of the uterus, only a shell left, involvement of the broad ligaments and of the bladder, utero-vaginal fistula, enlargement of lumbar and inguinal glands, intravaginal and intrauterine X-ray applications have been made, with the result of arresting in two months hæmorrhage and discharge, controlling odour and pain, diminishing the size of the uterus and of the remains of the cervix to about normal.

In addition, intravesical X-ray applications have been made, securing marked modification of the vesical uneasiness and pain upon urination, which was almost unbearable, and also securing better vesical control, small quantities of urine being voided in the natural way without uneasiness or pain.

These applications have been made with the tubes shown in the cuts given on p. 216 :—

Fig. 1 shows the vaginal tube devised by Mr. E. E. Caldwell for the writer, which has a water-jacket with concave end, adapting it to the cervix as suggested by the writer. The writer has also had a tube constructed for rectal work upon the same principle and which is also provided with a water-jacket. It has a diameter of about one-half of the vaginal tube. It has also been used for intrauterine applications in a patient with a utero-vesical fistula, in which case

the constant oozing of the urine served to do away with the necessity of the water-jacket.

Fig. 2 shows a tube for intravesical, and which may also be used for intrauterine, applications when a tube of lesser calibre than the rectal tube is desired. It was designed, however, for vesical use primarily, and is in use in cases of vesical involvement. In the bladder the urine serves to prevent burning from the heating of the tube, providing the urethra is protected. The handles with which these electrodes are provided were added at the writer's suggestion. With

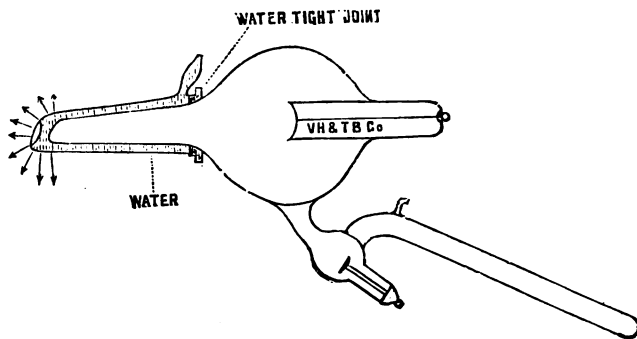


FIG. 1.

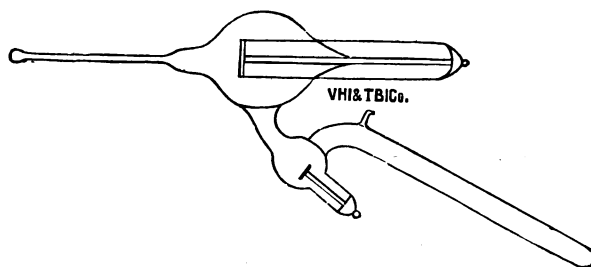


FIG. 2.

them it is possible to make the applications without the operator being exposed to the activity of the rays, and ease of holding the tube during treatment is also facilitated.

By reason of the distance of the distal prolongations of the smaller tubes from the impact of the cathode stream as well as their lessened calibre, they are necessarily of low vacuum, but in view of the fact that soft tubes are better adapted to the treatment of mucous membranes than hard ones, this does not militate against their usefulness.

Because of the intense heating of the target in the original Caldwell tube, heat burns were produced, and, moreover, the radiance did not proceed in a straight line ahead as well as to the sides of the tube. In the treatment of the pelvic organs it is necessary to expose all the tissues, the sides and vaginal vault as well, to the action of the rays.

If it should be proved that in inoperable cancer, which tends to be rapidly destructive, a vigorous attack with a high tension tube is better, then the method which was used in the writer's first pelvic case should be selected. A high tension tube contained in a tube-box was adjusted directly over the mouth of the vaginal speculum. There is some risk, however, of deep burns which may result fatally, but less than with skin resistance. Thus far the writer has never produced an X-ray burn in any application she has made. Moreover, in a case with extensive destruction of the vaginal mucous membrane of the posterior *cul-de-sac*, healing did not take place with the use of such a high tube adjusted as described, but promptly followed the use of the tube for vaginal applications.

In order to avoid the use of the water-jacket, which minimises to a slight extent the activity of the X-ray energy, a focusing<sup>1</sup> tube may be used. These tubes are constructed upon the same principles as the tubes for external use, but are made entirely of lead glass, save the prolongation which is to be carried into the mucous cavities or applied to a part, as in the axilla, for example, and which is of ordinary flint glass.

The patient is not exposed to the action of the rays save at the active part of the tube. This remains cool, while the heat, which is generated in the middle of the tube, is absorbed by the insulating bulb of lead glass. One objection to these focusing tubes is that there is a slight electrical discharge at the junction of the different kinds of glass. This is not serious, however. The fact that in these tubes the rays are projected straight ahead may offer a more serious objection. This can be obviated to a certain extent by moving the tubes within the cavity undergoing treatment, thereby changing the angle. With the Caldwell tube the rays are projected in every direction, which is a great advantage. The prolongation of the focusing tube, with its "glass window," as the active part has been called, may be of any shape or size desired, compatible with the physical laws governing their construction. The writer has had one constructed for vesical work, which she has also used for intrauterine applications. The glass tubes which cover the terminals are still further projected by rubber caps permanently connected with rubber-covered

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<sup>1</sup> *Archives Röntgen Ray*, London.

conducting cords, about two feet in length, in order to make the connection with the coil or influence machine beyond the possibility of contact with the patient. This is necessary in gynæcological work, as the slightest shock from the electrical discharge is very trying to patients already over-worn with suffering. This tube has given excellent satisfaction in the class of cases under care. Tubes of the same type have also been used in vaginal and rectal work. The technique and time of administration is the same with both types of tubes described, and both do good work.

In his original experiments, Röntgen<sup>1</sup> observed that some metals, particularly zinc, reflected X-light in an angular manner. Tesla also published a table showing the proportions of transmitted and reflected light.

These observations have been utilised by Rollins,<sup>2</sup> who has made zinc cones with a curved end, for the treatment of malignant growths of the mouth. The tube is covered with lead in order that no light may escape save through the open end, and is secured by the large or proximal end to the opening of the diaphragm in the tube. In pelvic cases in which it is not desirable to expose the entire vaginal mucous membrane to the action of the X-ray energy, this device of Rollins' might be adapted.<sup>3</sup>

## B.

The interest in light therapy and the good results obtained from its use in relieving pain and stimulating absorption in a variety of chronic skin conditions, as well as in localised septic conditions, blood poisoning from insect bite, inflammation of labia majora prior to pus formation, &c., suggested the desirability of utilising a water-cooled vaginal lamp in the treatment of chronic diseases of the uterus and appendages.

There is presented herewith a lamp devised by the writer ten years since for the purpose of demonstrating the possibilities of transillumination of the pelvic tissues. This was presented to the American Electro-Therapeutic Association at its fourth Annual Meeting in 1894.<sup>4</sup> In transilluminating the pelvic tissues it was found that wherever there was morbid material, either in the form of exudative matter or abnormal growths, as fibroid tumours, sarcoma, &c., the tissues were not transilluminated, but remained absolutely

<sup>1</sup> *Wuerzburg, Physicalisches Institut der Universitaet*, December, 1895.

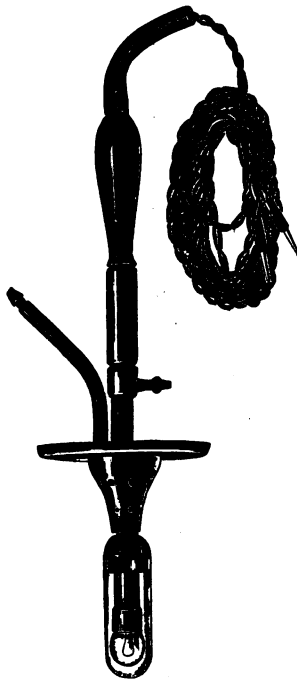
<sup>2</sup> "Notes on X-light," by Wm. Rollins, *Electrical Review*, March, 14, 1903.

<sup>3</sup> A considerable portion of the above has already appeared in the *Philadelphia Medical Journal*.

<sup>4</sup> *Transactions, American Electrotherapeutic Association*, 1894.

black. In the absence of these two pathological states, the tissues were transilluminated to within two inches of the umbilicus, but nothing was demonstrated save the course of the blood-vessels.

From the experimental work done at that time, the writer was convinced that transillumination of the pelvis was of doubtful utility as an aid to diagnosis, and the lamp was for a time laid aside. It has recently been taken up, however, and used therapeutically in the writer's gynæcological practice and has been found to be a very practical and efficient means of applying light directly to the pelvic organs.



The instrument consists of a hard rubber device (it could be of blown glass) constructed upon the same principle as the electrode used for vaginal hydro-electric applications. It is provided with an inflow and outflow and also an obturator to close the introitus when desirable. The vaginal tube, instead of being fitted with a perforated hard rubber bulb at its distal end as in the electrode, is provided with a metal socket into which the lamp bulb is fitted, and to which the electric-light wires are carried. The handle serves not only for holding the instrument in position but to transmit the



wires to the lamp socket. A metal collar with screw threads surrounds the vaginal tube just below the lamp socket. Over the lamp bulb is placed a glass tube, one inch in diameter and two and one-half inches long, perforated at its distal extremity to permit a continuous flow of water around the lamp bulb and into the vagina. At its proximal end, inside, is sealed a metal ring. By means of this it is securely screwed into the metal collar on the vaginal tube, making an absolute water-tight joint.

The lamp now in use requires 32 volts and .8 amperes, giving 8 candle-power. Lamps of less and greater candle-power can be used, and the writer has used lamps of even 20 candle-power.

By reason of the construction of the instrument it can be rendered absolutely aseptic by immersion in suitable solutions.

The lamps are constructed for both a 110-volt direct current and a 104-volt alternating current circuit, and can be used with a suitable shunt resistance, or by a series lamp resistance.

In the writer's office, two 16 candle-power lamps in series suffice.

Recently Makaveyeff has devised and is using in chronic uterine conditions a water-cooled vaginal lamp with good results.<sup>1</sup>

With the lamp described all the radiant energy of an incandescent light which passes through glass can be utilised, excepting the heat rays which are practically eliminated by the passage of water which is kept not higher than body temperature, and often lower, if no contra-indication exists. There can be no, or but little, effect from the short high-frequency waves or ultra-violet rays of light because of the glass enclosing the lamp filament as well as the water-cooling tube. The effect obtained is due to luminous and the actinic rays below the ultra violet. As yet the writer is not prepared to estimate the therapeutic value of the rays which are permitted to pass independent of the lower and higher frequencies which are eliminated in the one instance by the water and in the other by the glass, but there is no question as to the value of the light vibrations secured by this device.

In a case of par-ovarian cyst there has been established in four weeks' time marked relief from the pain and soreness with a diminution of fully one-half in the growth.

A fountain syringe or an irrigating jar is connected with the inflow, while the water drains into a rubber douche-pan, placed under the patient, into a basin at the foot of the operating table. Applications are made daily at first, subsequently three times a week and later less frequently, and from fifteen to twenty minutes at a sitting.

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<sup>1</sup> *Rusky Vratch*, May 3, 1903.

It is the writer's belief, based upon clinical experience, that light locally applied has a wide field of usefulness in gynæcological practice. The arc light, independent of any lens, is used through a glass speculum in malignant cases as supplementary to the X-ray. The parts are rendered anæmic by adrenalin, or by filling the speculum with ice.

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### **A COOLING DEVICE FOR THE CALDWELL VAGINAL X-RAY TUBE.**

By G. H. STOVER, M.D. (Denver, Colorado).

ONE of my vaginal X-ray tubes, when I received it, had a test tube, which was to contain water, slipped over the vaginal prolongation of the tube. This small quantity of water soon became heated, so I arranged a plan for giving a constant circulation of cool water. In this tube there is a prolongation, situated directly opposite the cathode; the end of the "arm" is thus the target. First I placed a couple of pieces of catheter between the "arm" and the jacket test tube, one of them on the upper side, extending into the cooling place about one inch. In use this is to carry off the warm water, being attached to a tube leading to a basin on the floor. In the lower side of the cooling space I placed the other catheter, pushing it in almost to the end of the cooling space. This is connected to a fountain syringe, suspended from a stand. To make a water-tight joint between the "arm" and the open end of the jacket tube, I first packed in as well as possible some soft red dental rubber, then with tape used by electric wire-men, wrapped this thoroughly. Then I melted some common resin, added to it an equal amount of shredded crude gutta percha, and when the mixture became a pasty mass, applied two heavy coatings of it, being careful to extend it somewhat beyond the tape wrapping. I put cut-offs on the tubes leading from syringe reservoir and to basin, and am now using this arrangement for treating epithelioma of nostril, sarcoma of nostril, epithelioma beneath upper lip, and two post-operative recurrences of cancer of uterus, and my tube remains cool all the time.

## THE TREATMENT OF LUPUS AND OTHER DISEASES BY THE ULTRA-VIOLET RAY LAMP.

By HAROLD E. GAMLEN, M.B., B.S., &c.

Now that the light treatment has been established as a permanent curative agent, attention is being directed to the adoption of means which will secure the quickest and best results. Of these there are primarily three :—the X-rays, the ultra-violet rays, and the more recent method embodied in high frequency currents.

Comparisons therefore are interesting and instructive. For the class of cases to which my experience extends I believe that the ultra-violet rays are the most efficacious. This, of course, is merely an individual conclusion, and can only be regarded as a single contribution to that wisdom which alone can be found in the multitude of counsellors. The type of lamp which I have used is the Leslie Miller, and the success attained may be attributed to the introduction of a process which eliminates the majority of the heat rays, thus allowing the ultra-violet rays, which are the essence of the treatment, to have full play upon the diseased parts. This applies not only to lupus vulgaris, but to lupus erythematosus, alopecia areata, rodent ulcer, parasitic eczema, keloid, &c.

### THE APPARATUS.

In the Leslie Miller lamp the "light" rays are formed at the arc between the electrodes, and these are directed upon the diseased surface. A piece of ice, or quartz, is interposed between the lamp and the skin, which has the effect of cutting off some of the heat rays, at the same time allowing the chemical or healing rays to pass. The small current, which forms the arc, has a tension of 5,000 to 10,000 volts, with probably 2,000 or more oscillations per second. It is conveyed to the lamp from a large condenser, charged from the terminals of a coil and then discharged across the two iron points which form an air gap.

I find as a general and definite principle that, provided the supply of current is adequate, the larger the coil the more effective the result. Should facilities be available it is preferable that the current be obtained from the main and reduced to the required strength by a resistance. In my case I derive through the mains an amperage of six or seven at a pressure of 100 volts. Satisfactory results, however, can be secured from battery power, but if less than 24 volts be available the treatment becomes tediously slow.

As a large amount of current is essential for the supply of the condenser, a platinum break with its limited power is

comparatively useless. Experiments with various patterns show that a rotary dipping break, making six or eight hundred revolutions per minute, is undoubtedly the best, but to obtain efficiency the rod of the break must be dipped well into the mercury. On the voltage from the main the lamp is most successful when the electrodes are separated a distance of half an inch. Then a brilliant white light appears. It is thick and penetrating. And around this bright luminant there is a faint tinge of blue and red. The blue and white lights are the effectual agents, the red light has merely heating effects. The electrodes are therefore abnormally widened in order to eradicate as much of the bright red light as possible.

Two facts have been proved beyond doubt, that the ultra-violet rays possess a genuine germ-killing power, and that having a near affinity for oxygen they break up the tissues with which they come in contact. Provided that the rays are not excessively intense, healthy tissues are not affected; and in this sense, it may be said that these rays have a selective influence on lowly organised or diseased tissues. From photographic experiments it has been proved that alone the ultra-violet rays have not a high penetrating power. But when they meet the tissues probably secondary rays are developed which are effective. Adequate pressure must be applied to the part under treatment, and the skin thus becomes white and anæmic owing to the pressure and contact of ice. The ice is cut into blocks two by one and a half inches in size. The electrodes are bent so that they may project over a quarter of an inch outside the lamp, and when everything is arranged their tips are just behind the ice surface.

The aim of the light treatment should be to obtain an intense and concentrated accumulation of chemical rays upon the diseased parts. The part must, therefore, be made anæmic as the blood will otherwise intercept them. When in action the lamp makes a curious hissing sound. If sufficient current is not being transmitted, taking into consideration the distance apart of the electrodes, a noisy rattling sound is produced, and the distance between the gaps must be gradually decreased until the proper "hiss" is again heard. The solitary objection which can be urged against the lamp is this peculiar noise, but this is a very minor drawback.

When the power is derived from a battery of twenty-four volts, the electrodes must be placed comparatively near, say, about a quarter of an inch apart. Here, again, correct distance of electrodes may be gauged by the nature of the sound. When eight to ten minutes have elapsed, a short interval is necessary for the apparatus to cool.

In the treatment of nodules and ulcers varying in size, I use fibre blocks, and as it is sometimes necessary to allow the rays to fall upon a limited area of healthy tissue surrounding the diseased parts, these vary in size of aperture.

To remove the large amount of peroxide of iron formed by constant use, and which in conjunction with damp, would produce short circuit, it is essential to repeatedly clean the interior of the lamp and the electrodes with methylated spirit. The electrodes should also be kept sharp by filing. Fine well-kept points throw the light a good distance out of the aperture and enable the operator to control the rays, so that they reach the parts which it is particularly desired to treat.

#### METHOD OF TREATMENT.

The heat from the lamp melts through the ice in about ten minutes, which is the usual period of sitting, and towels placed around the part under application absorb the water. A severe reaction is produced, but after an interval of about three days the patient is ready for more treatment. Ten minutes may be regarded as the standard limit of length of application to each diseased part. Again, it must be borne in mind that as the lamp covers a fairly large area, much practical work can be effected in an hour.

In non-ulcerated cases it is sometimes necessary to produce an ulcer over the seat of disease. This can be accomplished by an abnormally prolonged sitting, the plentiful use of mercury ointment, or an ointment containing resorcin, ichthyol, &c. A judicious scraping of the part might also be helpful. Recently I have ascertained that fifteen minutes' exposure under a generous dosage of light from the lamp will cause the dermatitis necessary in such cases. With respect, however, to the time necessary to complete a cure, attention must be paid, not only to the character of the disease but to the constitution of the patient. For instance, much depends upon the colour of the skin. In dark people the pigmentation to some extent nullifies the influence of the rays. Again, non-ulcerated nodules are much more obstinate than those which are ulcerated, a factor particularly applicable to scar tissues. The situation of the disease is not material, provided there is adequate facility for ice pressure. After a few days when the primary reaction has subsided the patient returns with a semi-detached crust covering the part under treatment. Harm is done by rubbing, and therefore no antiseptics or coverings are used. A free access of light and air to the ulcers actually constitutes part of the treatment, but should any of the scars appear repulsive a veil may be worn. After the removal of the crust by ointment and ether, sittings may be resumed.

On ulcerated surfaces the growth of the new and delicate epithelium is augmented by the application of zinc ointment. This is preferable to boracic ointment, which often causes excessive reaction, unnecessary pain, and sometimes operates as a caustic. Short and frequent sittings save time when the

patients are in a low condition or are of an exceptionally sensitive temperament. This remark also applies to cases where the ulcerations are extensive and facial. The pressure, also, should at the same time be somewhat lightened, in order to avoid a too severe reaction, which might not disappear for a fortnight or more, thus causing delay. And here again, individual necessities must be studied and judgment used. Care should also be taken to prevent the rays from falling upon the patient's eyes, even if the lids are closed, otherwise conjunctivitis may ensue.

#### CASES AND COMPARISONS.

I have had under treatment forty cases of lupus, some of them exceedingly obstinate and extensive in character, but so far there has not been a single failure. Personal experience with the lamp covers eighteen months—a period, of course, which cannot guarantee finality. Some of the cases were referred to in an article in the *British Medical Journal* of June 6. Here, however, is an additional case:—

Miss S., aged 38; disease, lupus vulgaris. At the age of eleven years the patient was troubled with a small spot, which appeared immediately under the left eye and was treated as a boil. For several months she attended the local eye infirmary. When thirteen years old she was an in-patient at a hospital for eight months. Next she received twelve months' treatment at a Royal Infirmary for struma. During the next few years she used various ointments, lotions, &c., but when nineteen years of age the disease appeared on the right side of the face, and had spread over the nose and left cheek to the upper lip. She returned from visits to Bath and Harrogate in a worse condition. So virulent was the disease that it rendered her almost blind—in fact, she completely lost sight in one eye. At the age of twenty-four the outbreak began to discharge. More medicinal treatment followed, and in 1896 and 1897 the parts were scraped by two well known specialists. The improvement, however, was only temporary, and five years later the disease again began to spread. Then she went to the London Hospital, where she was given six weeks' X-ray treatment. The patient consulted the writer on February 22, 1903. Her condition then was as follows.

On the right cheek there were two ulcerations, one of them extending to within an inch of the eye and the other near the chin. On the left side the nose was nearly covered by large ulcerations which had spread over the cheek bone, and in front of the ear there were two more large ulcerations. Below the angle of the mouth extensive ulceration existed. After nineteen sittings of five minutes' application to each part a complete cure was effected, and there has not been the slightest recurrence. The skin resumed a healthy, normal



appearance without scar or blemish. Success might, of course, have been achieved with X-rays, but under these conditions all scars and stains would not have been so completely eradicated. And while dealing with an issue which raises the comparative merits of X-rays and ultra-violet rays, the following case which came under my notice is particularly appropriate :—

M. M., aged 26; a case of lupus erythematosus. For three years this patient was subjected to medical treatment, and during eight months received the attention of specialists, but without marked improvement. About January this year he visited the writer, and his condition then was briefly as follows.

The area of disease was over both ears and above each eye-brow; on the left side in the centre of the cheek it extended over the ala of the nose. One part I treated with the X-rays, another I subjected to the ultra-violet rays (Lupus lamp), while a third was placed under the influence of an electrode from a high frequency current apparatus. I then watched the case carefully, and the result of the experiment was, to say the least, significant. Owing to the slow progress made by the X-rays I ceased this form of treatment, and although the high frequency current was successful, the ultra-violet rays undoubtedly proved the quickest and most effective healer. It should be explained that I used exceedingly low tubes for the X-rays.

So far I have only made one definite comparison. From this single instance it would seem that low tubes, usually so effective in lupus vulgaris, are not reliable in dealing with lupus erythematosus.

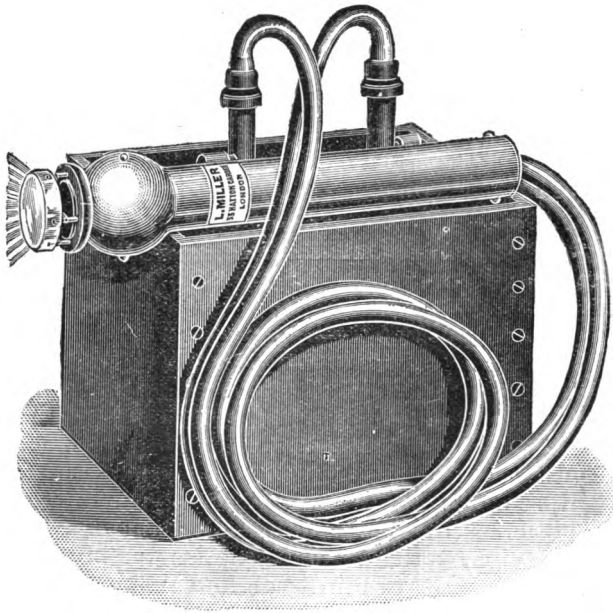
The application of ultra-violet rays may require more trouble and manipulation than the X-rays, but the result is well worth the extra time and pains expended. The cure is thorough; there is no staining of the tissues; scars left from former operations are eradicated; and the appearance of the skin is rendered supple and what in reality it again becomes, natural and healthy. All these advantages the ultra-violet rays produce in a more marked degree than the X-rays.

#### GENERAL CONCLUSIONS.

According to some versions the lamp has not been a general success. Personally, I regard it as an instrument which, by the exercise of watchful supervision, practical judgment, and a patience not unmingled with experience, possesses unique curative capabilities. Want of success in many instances is due to the relegation of the work to assistants who lack that personal interest so essential to success. Those who commence the treatment should be prepared to persevere;

one case will be an invaluable help in dealing with another, and so on until the best possible results are obtained. And in deciding upon the length of time necessary to effect a cure it must be remembered that scar tissue (often the legacy of former operations with the knife or spoon) makes success extremely difficult, but no doubt the day will come when incision and scraping for lupus will be relegated to the things of the past.

[We are glad to be able to insert the following illustration of the lamp above described. It will be seen that although the arc is formed between iron points, this lamp in no way



resembles the Bang lamp in its mode of action. A condenser charged from a coil discharges across the space between these iron terminals. The arc is therefore formed by a high tension current of, say, 5,000 to 10,000 volts, and having probably at least 200,000 oscillations a second.

As stated above, a high voltage supply suits the apparatus best, and then the best results are obtained when the electrodes are  $\frac{1}{2}$  inch apart. When the battery power is 24 volts only, the electrodes must be approximated to not less than  $\frac{1}{8}$  inch apart, the correct distance being determined in either case by the sound.

When the lamp has been in action from three to five minutes it gets so hot that the hands have to be covered. At

the end of about seven minutes the operation must be suspended for the lamp to cool. Dr. Gamlen elsewhere states that if ten minutes are given to each seat of the disease, a fairly severe action is produced just short of blistering. In the course of a few hours the reaction dies away, and after an interval of about three days the patient is ready for another application. If the sittings are extended to fifteen or twenty minutes the reaction causes blisters, and the attendant inflammation does not subside in less than a week.

The opportunity may appropriately be taken of referring to the large share that Dr. Hugh Walsham had in devising this lamp. And in this connection it may be added that, although his lamp is now generally known as "The Miller," it will be remembered that in the first instance the maker, with characteristic modesty, called it the "St. Bart's."—EDITOR.]

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## Reviews and Notices of Books.

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THE RÖNTGEN RAYS IN THERAPEUTICS AND DIAGNOSIS. By Dr. W. A. Pusey and E. W. Caldwell, B.S.  $9\frac{1}{2} \times 6$ . Pp. 591. (Saunders.)

It is a pleasure to revert to this work, and to supplement the short mention made of it in a former number by a more detailed notice in this. It is a splendid volume, well and carefully put together, and certainly destined to form a classic in the literature of the Röntgen Ray. The X-ray outfit, radiography, radiostereoscopy and fluoroscopy are lucidly and fully dealt with in eight ably written chapters by Mr. Caldwell. Therapeutics occupy two-thirds of the volume, and it is scarcely necessary to say that the subject meets with ample justice at the hands of Dr. W. Allen Pusey, of the University of Illinois. It perhaps cannot be said to contain much that is strikingly novel, its value lies rather in its clearness and completeness. The reader will heave a sigh of relief at the announcement (p. 16) that the description of simple electrical apparatus will not be included here. But this promise is scarcely fulfilled, inasmuch as several succeeding pages are made up of such sentences as the following: "The Influence machine is an apparatus which converts mechanical energy into electrical energy;" "The Induction Coil is an electro magnetic apparatus which transforms the energy of the ordinary electrical current," &c. ; "An Electrical Battery consists essentially of two electrodes of dissimilar metals immersed in a conducting solution," and so on. For such elementary

electrical knowledge the reader had best be referred to the ordinary electrical text books.

In the article on stereofluoroscopy and radiography it cannot be said that the writer shows anything but an imperfect acquaintance with what has been done in England, and the order of its doing. So far as radiostereoscopy and localisation of foreign bodies is concerned the sequence of events in its earlier stages was this : On October 16, 1897, there appeared in the *Lancet* an article by Mr. Mackenzie Davidson and Dr. W. S. Hedley, entitled "A Method of Precise Localisation and Measurement by Means of Röntgen Rays," which describes the string method of localisation exactly as it exists to-day. In March, 1898, there appeared in the *Lancet* an article entitled "Radiostereoscopy," by Dr. W. S. Hedley. This was the first time that attention had been drawn to the latter subject in England, but the writer did not fail to point out the work that had already been done in France. Afterwards Mr. Mackenzie Davidson devised and patented an apparatus for obtaining stereoscopic effects on the fluorescent screen.

When (at p. 243) the author states that the variations in the susceptibility of individuals to X-rays is a fact beyond question, the statement will not meet with universal acceptance. But the view (p. 272) that two sorts of prominent histological changes occur as the result of X-ray exposure, viz., (1) evidence of peculiar structural changes in the cells themselves ; (2) certain proliferative changes in the inner coats of the blood-vessels, will be generally endorsed. According to the author (p. 285) the behaviour of bacilli in living tissues under the influence of X-rays is quite different from that when they are growing in inert media. If this be established it will materially alter the significance of the well known experiments of Wolfenden and Ross. It certainly seems beyond doubt, the author considers, that the ordinary pyogenic organisms, when situated in superficial tissues, are destroyed under the influence of X-rays, and that whatever the mode of action, the X-ray certainly has a germicidal effect upon mycelial fungi ; and further, that the cure of lupus under X-rays, their effect on tubercle bacilli, &c., and the result of similar treatment in several bacterial diseases, are clear evidence of an influence on pathogenic organisms. If by this it is to be understood that X-rays have direct bactericidal properties, the author will find many to differ with him.

Passing to theoretical points, the author considers that the physical resemblances between X-rays and light are very close. They are "both transverse vibrations of the ether, essentially identical in character, differing only in unessential variations in the quality of the waves, and (p. 297) . . . the fact that X-rays cannot be diffracted, refracted or,

reflected, offers no obstacle to the theory that X-rays and light are forms of energy of essentially the same nature." Perhaps not, but here a definition of what constitutes an "essential difference" might in the first instance be desirable.

In discussing the employment of X-rays in diseases near the eyes, the author admits that conjunctivitis is in a number of cases the almost necessary result of the exposure, but he adds that all the "conjunctivides" (what have we done to deserve such an addition to our vocabulary?) that he has seen have yielded to the ordinary remedies.

The opinion that the treatment of hypertrichosis by X-ray treatment is only a very "modified success," will meet with general acceptance, even on the part of those who are not unacquainted with its lucrative employment in a distant European capital.

It is scarcely necessary to add that no inconsiderable portion of the second part of the volume is taken up by the usual before-and-after-treatment pictures (in this case beautifully executed) that so plentifully adorn the modern monograph.

On the whole it may be said of this book that, although it contains nothing very new, it gathers together and formulates our scattered knowledge; it marshals the whole mass of material before us in clear and orderly array; it shows us what has been done and tells us how to do it.

#### ZEITSCHRIFT FÜR DIÄTETISCHE UND PHYSICKALISCHE THERAPIE.

The May and June (1903) issues of this journal contain articles describing experiments on "Feeding mice with sterilised cow's milk"; on "The influence of mineral water on the condition of the blood"; "The effect on the vascular system of the employment of heat"; on "The susceptibility of the reaction of the brain in healthy and in nervous individuals"; on "The influence of perspiration on the composition of the blood"; and an interesting article by Dr. Franz Tripold on "The ratio which urinary excretion bears to the intake of fluids in health and disease." The author concludes that:—

The intake of fluid and the urinary excretion stand in a strict ratio to each other. The excretion of urine is abundant when the air is very damp, and small when only slightly damp. Sudden abstinence from alcohol and its replacement by cold water produce powerful diuresis in a healthy subject. Natural CO<sub>2</sub> water produces powerful diuresis in a healthy person. Melancholy causes diminished excretion. When the intake of fluid is the same in quantity and quality for a long period, the quantity of urine excreted fluctuates so enormously from day to day that we are compelled to assume a law of its periodicity.

There is a long article—parts of which appear in each number—by Dr. E. Stuertz on intravenous oxygen infusion. The author infused the purest oxygen obtainable into the crural vein of dogs in order to determine the following points :

(1) The maximum quantity of oxygen per kilogramme of body weight that can be infused with safety in a given time. (2) the extent to which the infused oxygen is assimilated ; (3) the extent to which the respiratory gas exchange is affected.

Finding that 750 cm. of oxygen per hour per kilo. of body weight was the quantity necessary for the carrying on of life, he gives the quantity of infused O in fractions of this. The amounts of gases are stated at 0° Celsius and 760 mm. pressure.

He infused four dogs, injecting one dog by separate syringefuls of O repeated at intervals of from two to five minutes, the quantity being increased at nearly every infusion ; and the other three by means of a continuous current of O, the amount of which was gradually increased. With three of the dogs the quantity was increased till they died—the increase causing various bruits over the right heart, a loud systolic murmur indicative of tricuspid regurgitation, a small pulse and increasing irregularity of respiration, the systolic murmur, and state of pulse and respiration, being always signs of danger.

Immediate *post mortem* showed in each case the right heart, vena cava inferior, and coronary veins distended and filled with gas, there being no trace of gas in the right heart and aorta—thus proving death to be due either to too sudden large quantities of O, or a too long and too strong infusion.

He concludes from these experiments that one-fifth of the quantity of O necessary for carrying on life continued for one hour is a safe dose with a normal heart, and he gradually increases this up to one-fourth. That the crural vein in dogs and the saphenous vein in man is the most suitable for infusion, because the O is thus brought into contact with a large quantity of venous blood, and is largely dissolved in it, and thus less free O arrives at the heart than it would from a vein of the arm or neck. That injection should never be done by separate syringefuls, as death may occur without warning ; but always by a continuous stream, as one is warned to desist by the above mentioned derangements of circulation and respiration. That the infused O is almost entirely assimilated by the body.

Regarding the respiratory gas interchange, he finds that as the infused O is increased more O is expired, and less O absorbed from the inspired air, and that the CO<sub>2</sub> is unaffected, this fact proving that there is no disturbance of circulation in the lung capillaries from small emboli of oxygen.

He considers that the indications for O infusion in man



will always be very limited. He regards pneumonia as a contraindication, as the right heart is embarrassed. He, however, believes that it can help patients in the moments of greatest peril, and eventually save life, in the case of diphtheria membrane, or foreign bodies impacted in the air passages—especially if the muscles of respiration are not acting, and the strength of the heart is good.

**ELECTRO-STATIC MODES OF APPLICATION, THERAPEUTICS, AND THE USES OF THE X-RAY.** By Wm. Benham Snow, M.D. New York. Second Edition, Revised and Enlarged. (A. L. Chatterton and Co., 97-99, Reade Street, N.Y. 12s.)

The second edition of this practical work is not only a more complete exposition of the subject than the first, but is greatly improved as to classification. It is divided into three sections. Section I., electro-static methods and therapeutics, discusses the various forms of administration, according to their physical nature, viz., disruptive, connective and conductive methods, avoiding the use of terms of only local significance, and without fundamental physical basis. There is a clear and practical exposition of the X-ray in skiagraphy in Section II., while Section III. is devoted to the therapeutic uses of the X-ray. The work is well and abundantly illustrated. It is the outcome of the clinical experience of a practical worker, and is well adapted to the needs of the physician undertaking the use of static electricity and the X-ray.

**MEDICAL AND SURGICAL USES OF ELECTRICITY.** By A. D. Rockwell, A.M., M.D. New Edition. (E. B. Treat and Co., 241-243, West Twenty-third Street. In cloth, 20s. net; half morocco, 24s.)

After having passed through eight editions, this well-known book is presented to the profession in an entirely new edition. The pioneer work done by Beard and Rockwell is classic, and it is gratifying to see a book which has stood the test of time so fully brought up to date. The central idea, which is after all the secret of successful electro-therapy, which has dominated every edition of this book is paramount in the new edition, viz., the influence of electricity over nutrition, and the necessity for generalised applications, no matter what form of electrical energy is used.

It seems unfortunate to-day to introduce a detailed discussion of fundamental electro-physics into a work on electro-therapeutics. The physicist rather than the physician seems to the writer of this notice the fittest person to do this. It would advance and facilitate scientific electro-therapeutics if, as a profession, we would adopt the text-books prepared by

the physicist for our use. The work would then be approached with the same grounding in electro-physics, and the use of the same technicalities and nomenclature. It would also reduce the size of books devoted to electro-therapeutics—a thing to be much desired.

In view of the widespread interest in high frequency currents, light, and the X-ray, the chapters devoted to them seem short and hardly commensurate with their importance. The book is a valuable one, epitomising the clinical experience of many years of conscientious work on the part of a true pioneer, who is to be heartily congratulated upon this new edition.

The *New York Medical Journal* and *Philadelphia Medical Journal*, both well known and valuable in their respective fields, have combined their forces and appear henceforth as one journal, under the combined name of the two. The chief office is in New York, with branch offices in Philadelphia and Chicago, and the able editor of the *New York Medical Journal*, Dr. Frank P. Foster, remains the editor in chief of the combined journals. The joint publication maintains all the good features of the individual journals, and has taken a broad step in advance in medical journalism in the signed editorials which appear in each issue from the pens of physicians well known in their special departments. Such consolidation of forces and unification of purpose is to be commended, and the new combination has our best wishes.

**HUMAN PERSONALITY.** By W. F. Myers (Longmans). By W. L. Courtney (reprinted by special permission from the *Daily Telegraph*).

Two elaborate volumes by the late Mr. F. W. H. Myers, comprising in all 1,300 pages of closely-printed matter, and dealing with a recondite subject in language that does not, primarily at all events, appeal to the vulgar, do not constitute the kind of work which can be dismissed in a column by a facile and irresponsible reviewer. Mr. Myers was a classical scholar, a man whose essays on "The Greek Oracles" and on "Virgil," represent the high-water mark of literary interpretation. He was also a prominent member of the Psychological Society, a friend of Henry Sidgwick and Edmund Gurney, and one who seriously interested himself in all those curious phenomena which we class under the general name of Spiritualism. The book—which is, as it were, his dying testament to the world—is designed to carry to a further stage what Mr. Gurney attempted to do in his "Phantasms of the Living," but it is also an important contribution to all that the philosophers have told us on the subject of mind, or soul, or self, or whatever it may be which signifies and is equivalent to human personality. And lastly, though in this hasty summary

I omit many of the aspects of the work, it is meant to be a powerful auxiliary to the Christian doctrine of a future life, which, according to the author's views, can be explained and justified on grounds appealing to men of science and exhibited in accordance with approved scientific methods.

How shall we put before ourselves such an august theme in a manner which may be fairly intelligible to the majority of the thinking public? Let me try in my own fashion to sketch the outlines, availing myself of the nomenclature of the spiritualist, and expounding the arguments as far as possible from the spiritualist's point of view. The Psychical Society, as we are aware, has for years occupied itself with the curious phenomena related, amongst other subjects, to mesmerism, hypnotism, apparitions, phantasms of the living and of the dead, trances, so-called demoniacal possession, and the rest of the machinery which in some way or other is supposed to indicate the possibility of communication with a world different from that of our ordinary sensation and experience. A great many experiments conducted under all sorts of conditions and circumstances—various stories submitted to such scientific tests as are available—have gradually suggested a conclusion which recommends itself to men like Wallace, Crookes, Sidgwick, Myers, Gurney and others, that what we call the ordinary waking rational consciousness of man is based on and supported by a vague, indefinite, but still real personality called "subliminal"—with the meaning that it exists *below the threshold* of our customary senses. In virtue of this subliminal consciousness man is no longer a "planetary" being—that is to say, he is not limited to conditions of time and space and the inevitable processes of corporeal decay but is also at the very roots of his nature a "cosmic" being, in communication with and in relation to a larger, spiritual, "metethereal" order of things. As a planetary creature, man lives his little span of life, feels hunger and thirst, is pricked with material desires, finds his faculties gradually decay, and undergoes a corporeal death. But all the time this outward and visible existence is founded on and supported by an inward and spiritual grace, no longer material in its qualities or powers, inexplicable, vague, in large measure unrealised, a home, so to speak, of many mansions, in which his spirit roams free. As the creature whom we see every day with our eyes, man disappears and leaves no trace behind. But the essence of him does not so easily perish; while—and that is the capital point of Mr. Myers' book—the slow, steady, gradual evolution of his personality brings him every day more and more into recognition and full enjoyment of that superior existence which makes him one with, not so much the eternal stars, as the innermost reality and essence of being. Such is the grandiose theory, which, after all, is only another

way of putting before us the old familiar doctrine that man is a composite being, in many respects like the beasts that perish, in other respects a spiritual essence that lives for ever.

And now for some of the arguments on which so wide, elusive, and baffling a doctrine rests. We begin with some very ordinary facts. Some men are greater than they know, as their work testifies. In the presence of a Shakespeare, we feel in communication with an intelligence almost uncanny in its width and range of power. Many men and women have heard voices which have inspired them in their tasks. Socrates had his own familiar *dæmon*; Joan of Arc listened to messages only intelligible to her ears. How are we to explain such instances of genius? There is the common theory that genius is itself an aberration, a kind of disease, just saved from insanity by subtle, almost imperceptible differences. That is not Mr. Myers' theory. The greatest genius is not the man who is a freak, a sporadic variety, an occasional aberration, but the man who lives more, so to speak, on his subliminal self than he does on his ordinary consciousness. So far we are on relatively secure ground. Now we pass to the phenomena which have been so patiently investigated by the *Psychical Society*. I have not the patience to go through all the facts, if facts they be. Briefly, there are spirit-reading and spirit-writing, automatism of seeing and hearing and moving, the odd experiences of hypnotism—above all, that which we know as telepathy, the influence from afar of mind on mind. Here is a crucial point in the theory. We have got many recorded instances of phantasms of the living when a man, far away, appears in his bodily habit as he lived to his friend in moments of crisis. We have also got instances of apparitions at moments of death. Mr. Myers adds that we have besides phantasms of the dead—communications from the supposed world of spirits long since passed from our ken, and made to kindred souls who are still alive. Now, if there is such a thing as telepathy—and we can satisfactorily prove that such communication, made through avenues of which we are not aware, exists, not only between living and living, but between living and dead—then we gradually arrive at the conclusion which Mr. Myers' volumes are intended to establish. There is the ordinary human personality, and there is an unconscious subliminal self. There is man as material and planetary, and there is man as spiritual and cosmic. There is a perishable world of corporeal forms, and there is an enduring world of spiritual essences. And finally, there is immortality, because the spirits that have passed away reveal to us their still enduring existence in messages addressed, not to our waking sight or sound, but to an underlying consciousness receptive of such influences—moods, it may be, of ecstasy or

trance, which, nevertheless, are real because capable of being produced artificially, and, therefore, subject to scientific tests.

Fascinating, inspiring, interesting beyond most mundane interests, such speculations undoubtedly are, but also more than a little fantastic, and it is to be feared, illusory. What is the attitude which an educated man of common-sense and experience, who tries to keep an open mind, but also desires to preserve his own sanity, instinctively adopts towards theories of this kind? He sees that all the phenomena of so-called spiritualism have attracted round themselves a mass of fraud, of silly and vain superstition, of chicanery, deceit, and imposture, beyond any other phenomena with which he is acquainted. He observes that foolish men and women have been the prey of vulgar wonder-workers, who have used their arts for no higher purpose than the mere making of money under false pretences. He remarks, further, that the men who allow themselves to be attracted by these subjects lose no small portion of their logical acumen and understanding, just in proportion to their indulgence in such speculations. He notices, again, as an unfortunate matter of common observation, that a thinker, sound in nine out of every ten branches of study, may yet be hopelessly perverse and insane on the tenth, and especially, perhaps, he is aware of this in the case of some of the greatest thinkers and men of science that have ever lived. Or, once more changing the point of view, he asks what good all these revelations from the spirit-world have ever done humanity? For the most part the ghosts are very stupid ghosts, and their messages are absolutely valueless. If they have intelligence, it is intelligence lower than that of most rational human beings. Above all, we discover that in the slow evolution of culture and knowledge we have, on the one side, a steady, broadening advance of useful, illuminating truths, the value and accuracy of which we recognise every day of our lives, and on the other hand, a slowly diminishing region of superstition and mysticism containing doctrines and a procedure difficult to grapple with because so vague and impalpable, and incapable, so far as we can see, of adding much that is of any service and help to the world. Religion, if it is wise, will do without so dubious an ally.

Apart from these points, which, of course, occur to most minds who desire to view life steadily, and view it whole, there is a special metaphysical problem which cuts at the root of all such pretended revelations of the unseen. I observe that Mr. Myers carefully distinguishes his own views from those, for instance, of Dr. A. R. Wallace. The latter is inclined to think that all, or almost all, supernatural phenomena are due to the actions of spirits of the dead. As against this view, Mr. Myers holds that by far the larger proportion are due to the action of the still embodied spirit of the agent or

percipient himself. If we translate these sentences in our own way we are face to face with the undoubted fact that in the case of any given apparition no one is really able to say how far the whole phantasm is not due to the illusions of his own sense or mind. If a man of common judgment were to see a ghost, I imagine that he would think his liver was out of order, and would give himself a pill. Although Mr. Myers says so plainly that most of the recorded phenomena are, without doubt, due to the action of the percipient, nevertheless, by a transition which I confess is by no means easy to understand in its logical completeness, he believes that some phenomena—the so-called phantasms of the dead—come entirely from the outside, and are in no sense resolvable into the agency, conscious or unconscious, of the percipient. Does anyone yet realise the enormous potentialities of self-delusion which we all of us possess? By what tests can we be sure that any given phenomenon is really objective, and not subjective? That, I take it, is the crux of the whole question, and it is the merit of Mr. Myers' book that he sets himself to give us instance after instance, and story after story, designed to break down our ingrained and not unintelligible scepticism. What is the issue of the whole matter? Mr. Myers has bequeathed to us an interesting and important work. He has recorded with infinite care and, on the whole, with great fairness, the phenomena which have occupied the attention for years of the *Psychical Society*. He has also invented a most useful terminology of his own. But, as to positive results, we must distinguish between two things. He has proved once more what psychologists for a good many years have realised, that beneath the conscious personality of man there lies an unconscious, or, as Mr. Myers calls it, a subliminal self. That is, of course, no new discovery, although Mr. Myers has largely reinforced the doctrine with his suggestive arguments. But as to communications between living men and the spiritual world, the real object, as I understand it, of a book intended to carry on Mr. Gurney's "*Phantasms of the Living*" to an inevitable sequel of "*Phantasms of the Dead*," we are still forced to hold our judgment in reserve. The order of established facts accredited by science and verified by centuries of experience is so strong and so secure that exceptions to the known rule, even if they could be proved, would still be regarded as exceptional—in other words, as not yet explicable—but not necessarily as momentous revelations of a higher truth.

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## THE "INTERNATIONAL EXPOSITION" OF 1904 AT ST. LOUIS, U.S.A.

IN connection with the above, members of the Electrotherapeutic Society are reminded that there is to be a Congress of Electrotherapeutics and Radiology. The arrangements for this, as for the other electrical sections, are in charge of the American Institute of Electrical Engineers,<sup>1</sup> who will presumably delegate the work to a medical Committee. Under any circumstances it must be clearly understood by those responsible for the management that, once the field of therapeutics is entered upon, the rules of medical ethics are strict and binding.

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### Digest of Current American Medical Literature.

#### AIR.

DRY SUPERHEATED AIR IN THE TREATMENT OF SEPTIC INFECTION.—Skinner's claims for this mode of treatment are very great, although he does not assert that all cases of septic infection can be cured by the use of dry superheated air. Three cases are reported, illustrating the action of the treatment upon what he considers the three chief types, clinically speaking, of septic infection : (1) Those in which the infection has taken place in a limb and has not yet produced glandular involvement ; (2) those in which the lymphatics of the trunk have also become involved, but where the original focus of infection has not yet become so profoundly affected as to demand removal ; (3) those in which the lymphatics of the trunk are involved, and the tissues originally invaded are so hopelessly diseased as to demand immediate surgical intervention.

The author's idea of septic infection does not correspond with the one usually held, nor can the three cases reported be regarded as convincing. While it is not within his knowledge that hot air has been used in a case of septic infection in which streptococci have been found in the blood, from the physiological action he believes it will be helpful even in this ordinarily hopeless condition. Physiological effect and technique are fully discussed.—*Medical News*, July 11, 1903.

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<sup>1</sup> For information apply to R. G. Brown, Esq., 158, Montague Street, Brooklyn, New York.

## EXERCISE AND EXERCISES.

REPORT OF A CASE OF STAMMERING AND METHOD OF TREATMENT.—Brown reports the case of a man so afflicted who was greatly improved by deep breathing, slow speaking, and strengthening the muscles of his tongue and lips by appropriate exercises. He does not believe that all cases of stammering can be cured by the method he reports, but he wishes to call attention to how much may be accomplished by extremely simple means.—*Medical News*, June 27, 1903.

## MECHANICAL THERAPY.

THE SUBCUTANEOUS USE OF PARAFFIN IN DEFORMED NOSE, WITH A SUPPLEMENTARY REPORT.—Foster points out that Gersung, of Vienna, was the first physician to inject paraffin for the correction of nasal deformities. In 1899 he successfully injected it as a substitute for the testicles after castration, and to close small openings between mouth and nose after cleft palate operations. Several of his patients went through a long attack of typhoid fever, and the paraffin remained in perfect position, thus showing that the high temperature had no ill effect upon it. As early as 1896 Corning, of New York, injected solidifying oils into the tissues for mechanical purposes. The literature of the subject is contributed to both by American and English physicians, who report cases. Suitable cases are "saddle-back" nose, from any cause, sunken-in nose from perichondritis, congenital or acquired luetic nasal deformities, also where the septum has been destroyed or crushed in, as in atrophic rhinitis. Foster has used it successfully in three cases, and believes it has a permanent place in correcting nasal deformities, in which all other measures have heretofore failed. He prefers the commercial paraffin, which is made sterile by boiling a few moments before using. This will be at a temperature of from 104 to 140° F., according to the grade of paraffin used. Careful technique is necessary. As a rule local anæsthesia suffices. The correct temperature of the paraffin, careful introduction of the needle below the deformity, the point carried to the exact place to be filled in, and pressure on the part above the deformity by an assistant, are insisted upon. Foster does not think it suitable to use on the tip of the nose on account of the elasticity of the tissues. He has not been able to find reports of untoward results in the literature of the subject. Experiments made by Meyer and Stern of Berlin, on animals, failed to produce oil embolism.—*New York Med. Journ. and Phil. Med. Journ.*, July 18, 1903.

## ROENTGEN RAY.

AN EXPERIENCE WITH THE X-RAY IN KRAUROSIS VULVÆ.—G. H. Storer reports a case of kraurosis vulvæ of several years' duration, referred to him for X-ray treatment. The area involved consisted of the labia minora and all the mucous membrane between them, and the pain was most acute. Prior to the exposure the patient was told that nothing was known of the effect of the X-ray in this condition, and with that understanding the treatment was undertaken. Prior to the exposure the patient removed all the emollient dressing, under the impression that the ray would not penetrate, and she was therefore in great pain. The source of E.M.F. was a 220-volt direct current. A Kinraide coil was used, and a tube of medium vacuum, at a distance of six inches and for ten minutes. The surrounding skin was protected by a shield of sheet lead. The exposure was made at 2 p.m., March 14, 1903; that evening her suffering was so great that her physician was called. He found increased redness and swelling, the appearance being much like that of erysipelas. Raying was discontinued, and after a week or two, when the inflammation had subsided, the affected tissue was excised.

Storer was much surprised on learning of the condition, and was disinclined to attribute it to the X-ray. In many thousand radiations given he has never seen a reaction occur in anything like so short a time, but his experience had not included a kraurosis vulvæ. If the ray did influence the result, he believes that the rubbing and cleansing which the patient gave the parts for the removal of the emollient likewise contributed to the result.—*New York Med. Journ. and Phil. Med. Journ.*, July 25, 1903.

RESULTS IN RADIOTHERAPY.—Varney, in a lengthy and statistical paper, sums up the results of his experience in carcinoma, sarcoma, epithelioma, lupus, acne, hypertrichosis, keloids and other benign growths, eczema, sycosis and scleroderma, tubercular glands of neck and other lymphatic enlargements, and tubercular joints. Fifty cases of cancer had been treated, of which 38 were grave inoperable recurrent cases, 13 were sarcoma (6 lymph sarcoma, and 7 osteo-sarcoma), 37 carcinoma (19 of which were epithelioma). With the exception of 8 cases still under treatment, one year had elapsed since the rest were discharged, those living to date being constantly under observation or in communication. Of the 50, 10 ended fatally, 5 were discharged unimproved or discontinued treatment, 4 were referred for operation, 8 were improved and still under treatment, 4 referred to other operators, and 19 discharged clinically cured. The ages of the patients ranged from 18 to 84; 19 women, 31 men.

In addition, good results were obtained in lupus, 10 out of 12 cases in eighteen months being discharged clinically cured. Acne has yielded with attention to diet and exercise, with good cosmetic effect. In hypertrichosis the results were not encouraging, two cases; in keloids, verruca, hard and soft, they were most gratifying, also in eczema and sycosis, and to prevent pitting from small-pox. The latter cases were treated as soon as possible after their discharge from the hospital, before all inflammation about the affected area had subsided. Mild irradiations for a period of three weeks rendered the characteristic scar so like the normal skin that it was difficult to discover any trace of the disease. Equally good results were obtained in scleroderma and tubercular glands and joints; but of equal interest with the specific conditions named is the result of ray treatment in general hospital work as a most powerful general tissue stimulant for all forms of retarded healing, sloughing flaps after amputation, varicose ulcers, painful bone conditions, painful adhesions after operations, &c., &c. Old chronic ulcers that have existed for years can be assisted to rapid healing with no other treatment, and but few irradiations. Emphasis is laid upon the necessity of the ray being used by trained and skilled intelligence.—*American Medicine*, June 6, 1903.

*Remark.*—The author deserves commendation for calling attention to the good results obtained in general hospital work from the use of the X-ray as a powerful general tissue stimulant. All manifestations of electrical energy, skilfully used, and we include light and the X-ray, are of incalculable benefit in general hospital work, and the surgeon who recognises this fact and avails himself of these means will secure the best results, not only in so far as a brilliant operation is concerned, but in modifying or controlling disabilities produced by slowly healing wounds, painful adhesions, as well as from the nervous shock and general debility so often following operative measures.—*Am. Ed.*

**RADIOTHERAPY IN ENTERITIS AND COLITIS.** — Sinclair Tousey suggests the use of the X-ray in the above conditions. He has begun this line of treatment in cases in which there is a chronic condition of pain or discomfort, with frequent discharges of mucus, and occasional discharges of blood or false membrane, and which have failed to yield to the use of intestinal antiseptics, such as naphthalene given by the mouth, and to the use of other antiseptics given by enteroclysis. The mucus from these cases is often stringy, and is found, upon microscopical examination, to consist of mucin, many disquamated epithelial cells, and many of the *Bacilli coli communis*. Exposures are made with the patient in the dorsal position, the abdomen exposed, and the X-ray tube supported about

eight inches from the surface, with the light directed toward the point of greatest pain or discomfort. From three to five minutes' application is made at first, the time being gradually increased at subsequent sittings. Care is taken not to allow the platinum disc to become red-hot, and in this way of avoiding the danger of an X-ray burn. The parts not to be treated should be protected by means of sheet lead or material similarly opaque to the X-ray. In addition, Tousey uses vacuum tube discharges to the abdominal surface, evidently insulating his patient more or less completely, but does not know whether this insulation is necessary or not. He concludes that the few patients under treatment show the improvement which would naturally be expected from a novelty, and that his expectation of lasting benefit is not so much on account of the well-known germicidal action of the X-ray as on account of the stimulative and alterative effect of the combined applications of the X-ray and the high-tension discharge from the vacuum tube.—*New York Med. Journ. and Phil. Med. Journ.*, July 11, 1903.

*Remark.*—Experimental work shows that the X-ray is not directly germicidal, therefore the result obtained from its use in the conditions described cannot be attributed to a germicidal action. Repeated exposures tend to the attenuation of germ cells. The same thing happens as the result of high frequency discharges, and more—for the high frequency discharge administered with vacuum tube electrodes, or by metallic contacts, initiates circulatory changes and tends from the first to initiate nutritive changes which, if continued long enough, results in the establishment of as nearly normal nutrition as the pathology ever admits.—*Am. Ed.*

A STUDY OF THE HISTOLOGIC CHANGES IN EPITHELIOMA UNDER THE X-RAY: A PRELIMINARY REPORT.—In a well-illustrated paper Stewart concludes that (1) it is probable that when epitheliomata react favourably to X-ray treatment that characteristic histological changes will be found; (2) the important early changes are fatty degeneration and vascularisation of the epithelial pearls; (3) leucocytic infiltration and various degeneration processes complete the destruction; (4) bodies indistinguishable from "Plimmer's bodies" multiply as epithelia degenerate.—*Journal American Medical Association*, July 18, 1903.

SOME CASES TREATED BY THE X-RAY.—Morton reports in all 16 cases treated by the X-ray; a cure was obtained in 15 cases. Detailed histories are given, and the article is illustrated to show the results obtained in some of the cases. There are reported, carcinoma, 2 cases, both cured; epithelioma, 5 cases, 4 cures and 1 failure; carbuncle, 1 case and 1 cure; cheloid,

## DIGEST OF CURRENT AMERICAN LITERATURE

2 cases, both cured; acne, 1 case, cured; alopecia areata, 1 case, cured; sycosis, 1 case, cured; fibroid tumour of uterus, 1 case, cured symptomatically, the tumour mass itself being reduced by one-third; lupus vulgaris, 1 case, cured; and psoriasis, 1 case, cured. In the case of psoriasis the author states that the X-ray seems to have exerted a constitutional influence, since patches on the scalp which were not subjected to local treatment disappeared also.—*Medical Record*, July 25, 1903.

## DIET.

**THE DANGERS OF AN EXCLUSIVE MILK DIET IN NEPHRITIS.**—Croflan believes that this method of feeding is directly harmful and dangerous, excepting, possibly, in a few cases of acute nephritis, and then only for a few days.

Three indications are to be met in selecting a dietary for kidney patients: (1) General nutrition must be maintained; (2) the renal epithelium must receive a minimum amount of irritation; (3) the function of other organs must not be overtaxed. Regarding the first point, too little iron and too much albumin is supplied by an exclusive milk diet. As to the second, when nephritic patients are fed exclusively on milk, much water, much urea, and much phosphate are carried to the kidney in large quantities, and they all act as irritants to the renal epithelium. Thirdly, the digestion and cardio-vascular functions are impaired by this diet when continued for a long time. With our present knowledge it is impossible to formulate any fixed rule in regard to the feeding of nephritics. Hence clinical experience and the reaction of the *sick individual* treatment, not laboratory findings, and the reaction of the kidney function alone, must be our guides.—*Medicine*, June, 1903.

**A CLINICAL OBSERVATION OF NINETY CASES OF TYPHOID FEVER, WITH FOUR DEATHS, WITH SPECIAL REFERENCE TO THERAPEUTIC FASTING.**—In an article with the above title Harbin reports 90 cases, with a total mortality of only 4.4 per cent. He attributes the good results he has obtained to the fasting to which he has subjected his patients. It is believed by Harbin that all severe cases of typhoid should be starved from twenty-four to forty-eight hours, in order to relieve the active symptoms which do the patient more harm than lack of food. His experience has shown him that fasting and a restricted diet are capable of shortening the course of the disease, which, at times, may be made to run an abortive course.—*Journal of the American Medical Association*, July 11, 1903.

## PHOTOTHERAPY.

EXCLUSION OF ACTINIC RAYS OF LIGHT DURING OPERATION FOR GENERAL PERITONITIS.—Clinton, in stating that diffused or concentrated sunlight is generally considered bactericidal in action, asks "What do we know about the necessity for the presence of sunlight in the development of bacteria?" In his opinion streptococcus of the skin will not occur in the absence of sunlight or active rays. This is seen in small-pox, where the secondary pustular period will not develop if actinic rays be absolutely excluded from the patient. The analogy between this condition and acute general peritonitis is, he believes, apparently as strong as between the curing of lupus and tubercular peritonitis by the action of sunlight. Finsen has shown that the pustulation of small-pox is due to the stimulation of the secondary streptococcic infection by actinic rays. There are cases of general peritonitis in which the symptoms of the patient are not at all in proportion to the actual condition present. These patients are seen forty-eight hours or more after the onset of the condition, and may show a pulse and temperature only slightly elevated above the normal. When opened, washed and drained they promptly drop into a state of septic collapse from which they do not rally. Does not the effect of the operation suggest that a severe infection has been stimulated in a severe manner? Based upon the analogy, which seems to exist between these cases and small-pox, the suggestion is made that such cases should be operated upon in a clinic where the actinic rays of light are excluded. Clinton to this end suggests the use of red electric light bulbs during the operation.—*Annals of Surgery*.

A FINSEN LIGHT HOSPITAL FOR CHICAGO.—An institute for phototherapy will shortly be opened in Chicago by Drs. W. T. and H. J. Stewart, who have been in Copenhagen studying Dr. Finsen's methods.—*New York Med. Journ. and Phil. Med. Journ.*, June 27, 1903.

NEURASTHENIA AND ITS TREATMENT BY ACTINIC RAYS.—Albert E. Sterne read a paper on the above subject before the section on Nervous and Mental Diseases at the meeting of the American Medical Association, May 5-8, 1903, which is summarised as follows: (1) Actinic rays are chemic in their quality, but of small caloric value; (2) they exist mainly in the ultra-violet zone of the spectrum; (3) actinic rays derived from high power electric light are similar or identical to those of solar radiation; (4) their use is as rational as that of sunlight itself; (5) their value lies in their decomposing, but at the same time reconstructive molecular, action upon the body tissues, mainly the fluid elements; (6) by the method herein

spoken of, their activity is enhanced by the generation of ozone in free and nascent form ; (7) their ultimate effect is one of oxidation, and consequently they increase the metabolic changes, thereby augmenting the natural processes of regeneration within the system ; (8) the germicidal action is especially pronounced, on account of the fact that few germs can exist in the presence of free or nascent oxygen.—*American Medicine*, June 6, 1903.

### ELECTRICITY.

**THE ELECTROTHERMIC ANGIOTRIIBE IN VARICOCELE.**—Horwitz finds in the electrothermic angiotriibe devised by Downes a safe method of dealing with enlarged veins. By it infection is prevented and there is no possibility of the formation of a thrombus. A patient with a large varix associated with intractable neuralgia was selected as a suitable subject for an operation. The dilated plexus was exposed, separated from the vas deferens, and folded into a loop so as to shorten the cord to the desired extent. The base of the loop was then grasped by the angiotriibe, compressed, and the current was allowed to pass for forty seconds. The battery was then disconnected and the loop beyond the jaws of the instrument was cut away. The stumps from the resection were found, upon opening the angiotriibe, ribbon-shaped and firmly adherent. These were replaced, and the skin united by two silk-worm sutures. There was no tenderness nor pain such as commonly follows ligature, and there seems less danger of orchitis. The instrument has been used by Downes in a large number of operations, and in no instance was there infection or secondary hæmorrhage.—*Proceedings of the Phil. Med. Soc.*, March 31, 1903, vol. xxiv., No. 3, p. 79.

**HÆMOSTASIS BY COMPRESSION AND HEAT.**—In a paper on the above subject Keefe completes the report of a series of fifty cases in which he has used the electrothermic angiotriibe of Downes instead of ligatures. The operations reported include 55 cœliotomies, 1 amputation of the thigh, 1 of the leg, and 2 vaginal hysterectomies. Keefe heartily favours this method, for which he claims, among other advantages, the following : (1) The exclusion of ligatures and of the dangers consequent upon their use ; (2) reduction in the danger of septic infection from the escape of contaminated material ; (3) absence of painful and irritable stumps, and decrease in the tendency to post-operative adhesions ; (4) less post-operative pain. Keefe gives the history of his last thirty-eight cases.—*Boston Med. and Surg. Journ.*, June 11, 1903.

**GASTROPTOSIS.**—Le Conte discusses the above subject in relation to its etiology, symptoms, complications, and treat-



ment, and bases his discussion upon 38 cases, 19 men and 19 women. Indications for treatment are: (1) Mechanical support for the prolapsed stomach and other viscera; (2) restoration of the lost tone and motor activity to the gastric and abdominal muscles; (3) increased nutrition; (4) treatment of the complication. He finds the best form of mechanical support to be a carefully fitted elastic abdominal bandage. For dispensary practice the use of zinc adhesive strips, as recommended by Rose, applied to the abdomen so as to serve as a support commends itself. Injurious constriction at the waist should be forbidden, and the weight of all clothing transferred to the shoulders by means of a corset waist. Rest in bed for several weeks in a severe case bordering on neurasthenia is valuable, but ordinarily more is gained by out-door air and exercise and the avoidance of mental depression caused by enforced confinement to bed. Rest in reclining position, with clothing loosened, for at least half an hour after meals is directed.

Intragastric electricity for the restoration of tone to the gastric walls, abdominal muscles, and at the same time as a general tonic, is especially valuable. Le Conte finds it impossible to formulate any fixed line of diet, the character of which must depend largely on the motor and the secretory functions. As a rule, fried food, condiments, and concentrated sweets should be forbidden. A light lunch, midway between regular meals, should be given in cases showing marked emaciation. The total quantity of fluids at a meal should be limited to a glass or a glass and a half, thereby relieving the stomach of some of its burden and facilitating its speedier emptying. Regular hours of sleep, gentle exercise, open air, and the avoidance of physical or mental overstrain should be insisted upon. General massage is of value, as in all conditions of malnutrition, but localised massage is of doubtful value, according to Le Conte, and has been known to produce peritonitis. Water, applied to the abdomen in the form of a Scotch douche, is of value; the warm water at 95° F., alternating with the cold at 55° F. every few seconds, the application extending over a period of three to four minutes. Gastric lavage is not indicated unless there is catarrh or marked retention of food or fermentation.—*New York Med. Journ. and Phil. Med. Journ.*, July 25, 1903.

*Remarks.*—Not only intragastric electricity is of value in gastroptosis, but external applications as well. In the beginning, the chemical action of a continuous current, with large, well-milled surface contacts, applied to the epigastrium and abdomen (negative), and to the dorsal and lumbar cord (positive), with from 10 to 30 m.a. of current, followed by an alternating E.M.F., the sinusoidal or the Franklinic used conductively, and applied in the same manner, will be found

to yield excellent results when conjoined with other measures indicated. To improve the general nutrition general applications of the Franklinic current should be made as well.—*Am. Ed.*

### HYDROTHERAPY.

**HYDROTHERAPY IN PEDIATRICS.**—Borts states that the use of the tub-bath in all severe cases of febrile diseases in children, especially scarlet fever and cholera infantum, has given him greater satisfaction than other methods. He finds that the method can be carried out easily and successfully in family practice. Two conditions must receive especial consideration in the use of the tub in children's diseases—the one the temperature of the water, and the other the duration of the immersion. A higher temperature will secure the same result for a child as a lower one for an adult; for the former 90°, where the latter would require a bath at 70°. In febrile conditions the cold bath, with cold applications to the head, reduces the fever, allays nerve irritability, and secures restful sleep. In chronic exhausted conditions the hot bath is indicated, and Borts has found it useful in the later stage of long-drawn-out cases of typhoid fever. While he regards the tub as the simplest method, there are many conditions where equally good results may be obtained by a thorough sponging or a wet pack, given either hot or cold. In cholera infantum he believes, with Holt, that on stopping the milk diet the stomach should be irrigated and the larger intestine washed out. The washing of the stomach rarely need be repeated, but the irrigation of the bowels should be repeated two or three times daily in all severe cases of enterocolitis. Normal salt solution is preferred over plain water. Two cases are reported:—

**CASE 1.**—Margery S., aged 6, April 17, 1899, 2 p.m.; temperature 104°, restless, vomiting, and stupor; no eruption nor throat symptoms, but scarlet fever was suspected. Vigorous treatment by drugs. Condition next morning much worse in every way; temperature 106°. Profound stupor; water or medicine by the mouth ran out as from a cadaver. Throat red, but no rash. Prognosis unfavourable. Tub-bath recommended to parents, who acquiesced. A tub-bath, temperature 90°, with cold affusions to head, was given every two hours, day and night, for fifteen minutes. There was no change the first day, except that the temperature was reduced to and held at 103°. Stupor much less after twenty-four hours' bathing. Resisted the bath and drank a little water and milk. The baths were continued and some medicine was given. The rash appeared on the fourth day, and was very profuse two or three days later. Throat symptoms also severe. There were no sequelæ of any kind, except five or six abscesses that developed during convalescence. Recovered.

CASE 2.—Infant, aged 9 months; enterocolitis; convulsions treated by tubbing every three hours at 90°; affusions to head, 50° to 55°; intestinal irrigations three times daily for three or four days. Made an excellent recovery.

Borts states that both patients would have died, in his opinion, had it not been for the use of water.—*Cleveland Med. Journ.*, August, 1903.

HOT WATER INJECTIONS IN VASCULAR TUMOURS.—Wyeth has determined experimentally that very hot water injected into a blood-vessel produces coagulation of the blood, not only in the injected vessel but also in its branches. Since his experimental work he has employed this principle with very great success in the treatment of vascular tumours and with temporary benefit in the treatment of sarcomatous tumours. Ackard reports a number of fistulæ cured by this method, and he thinks so well of it that he intends to employ it in a number of other conditions, for example, "tubercular adenitis preferably before pyogenesis, gonorrhœal bubo, ranula, small cysts and abscesses, and lipomata." The author details the technique of the operation and reports a number of cases. The operation consists of injecting suitable quantities of boiling water into the substance of the tissue it is desired to destroy. The method cannot be regarded as free from danger. No serious complications have occurred up to the present time. Sloughing of the tissues will not ordinarily take place if the tension from the injected water is not excessive, and if care is observed not to make the injection too near the surface of the skin.—*Journal of the American Medical Association*, June 27, 1903.

#### AIR.

ROOF GARDEN FOR CONSUMPTIVES.—Director Martin has recommended that a portion of the roof of the Philadelphia Hospital be converted into a roof garden, where consumptives may sleep during the summer months in the open air. Not only will the roof serve as a sleeping place, but a portion will be set aside where work may be planned and done by the inmates. Flowers and shrubbery will be scattered on the roof, and everything will be made as attractive for the afflicted patients as may be. It is believed that this is the first attempt to inaugurate this plan of open-air treatment on a large scale in the United States. Dr. Martin's plan will be watched with interest.—*American Medicine*, June 13, 1903.

TENTS FOR CONSUMPTIVES.—*Charities* gives a general description of the tents and tent-life for the treatment of tuberculosis in connection with the Metropolitan Hospital, Blackwells Island. At the outset the patients were rather reluctant to use the tents, believing that they would be

draughty and uncomfortable. They were persuaded with some difficulty to try it, but without exception, after a few nights all were so much impressed by the tent life that it is with the greatest difficulty that any of them are persuaded to return to the buildings, if for any reason this becomes necessary. The first tent was occupied in April, the weather being still quite cold, and although the temperature was near the freezing point, the occupants neither asked for nor desired artificial heat.—*American Medicine*, June 13, 1903.

**TENT LIFE IN THE TREATMENT OF PULMONARY TUBERCULOSIS.**—R. W. Craig (Phoenix, Arizona), in a paper read before the Section on Sanitary Science and Hygiene, American Medical Association, May 5 to 8, 1903, states that the treatment is based upon the curability of tuberculosis, and that cure depends upon early diagnosis before the secondary infection by pyogenic bacteria. The altitude of a region is not as important as the relative humidity of the atmosphere, the presence of sunshine, moderate exercise, and good food, with the absence of dust.

In Arizona there are less than fifteen rainy days during the entire year. A dry climate is the best for the tuberculous patient. The temperature is not so important as the relative humidity of the atmosphere. The sensibility to heat is much less in Arizona than in Chicago. It is impossible to obtain perfect ventilation in a room, and the ideal sleeping apartment for the tuberculous patient is the tent-house. At Phoenix, Arizona, they are built on the pavilion plan, with sides of wood for the lower half and canvas curtains for the upper half. The wooden floor is raised at least two feet from the ground. There are two or three rooms in each house. In addition to the tent-house they have tent-yards, which are enclosed in canvas, but open to the sun. Patients can thus get the benefit of the sun by reclining in these yards, with no danger from draughts. The results from the treatment have been excellent, and are increased appetite, with an increase in metabolism, and subsidence of cough, anorexia, and malaise.

In the discussion which followed, McConnell (New Mexico) said that the value of tent-life could not be over-estimated. An octagonal tent is best, lessening the danger of the wind entering at the corners. The boarding at the sides should not be flush with the flooring, but an intervening space of about one foot should exist, and this closed by canvas, which can be raised after the patient is in bed. An umbrella-like opening in the roof of the tent, which can be opened after the patient retires, affords good ventilation with no draughts. Hurty, of Indianapolis, emphasised the necessity of educating the masses as to the importance of ventilation. The custom of closing the sleeping-room air-tight is an abominable one, and because

a child has a temperature is no reason for keeping it in a closely confined room. Indianapolis has sent out lecturers to the various schools to lecture upon the value of good ventilation. Watt (N. Y. City) stated that in the Arctic regions the Indian has no sunlight during the winter, and at the end of the winter he is run down, emaciated, and anæmic, and tuberculosis is common among them. Craig formulates the hypothesis that the amount of lime salts in the waters around Phoenix, of which patients drink considerable quantities, influences the formation of calcareous nodules which he has found in all his autopsies.—*American Medicine*, June 13, 1903.

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## New Instruments and Apparatus.

### THE RADIO-STROBOSCOPE.

THE following improvements in stereoscopic apparatus, modifications of the instrument of Mr. Mackenzie Davidson, have been introduced by Mr. K. Schall, of 35, Great Marylebone Street, who has been kind enough to show them to us.

The commutator is placed under paraffin oil and is connected by means of a toothed gear on one side with a jet interruptor, and on the other side with a flexible shaft leading to a stroboscope. In the stroboscope<sup>1</sup> a revolving shutter opens or closes alternately one of the holes through which the operator is looking, and by means of a handle on the stroboscope the shutter can easily be adjusted so that the right eye is free while the current is discharging through the tube on the left, and the hole on the left side is open while the current is discharging through the tube on the right (see diagram, fig. 2). It works with clock-like precision, the adjustment is extremely simple and easy, and the whole apparatus is very small compared with the earlier forms of the apparatus. The stroboscope can be easily moved about.

With reference to the two separate tubes originally used, it was difficult to find two new tubes which were exactly alike in degree of penetration, &c., and after some use they were sure to differ materially in this respect; this is a point of vital importance, because unless the tubes are alike we cannot get stereoscopic relief. To overcome this difficulty the bulbs of two separate tubes were united by a glass tube, and thus the vacuum remained the same alike in both tubes, but this arrangement was too fragile, the tubes broke at the joints on

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<sup>1</sup> στροβος (στρεφω) a whirling round.

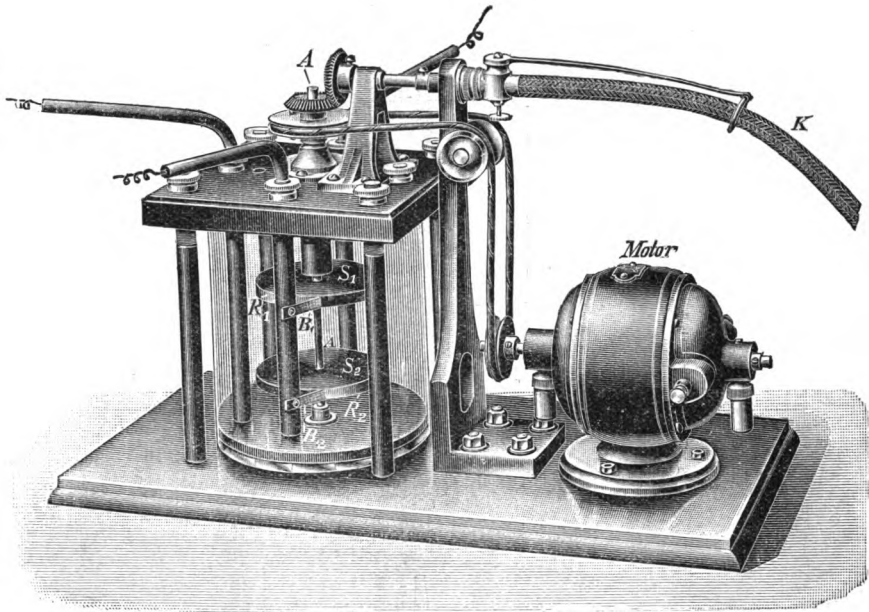


FIG. 1.

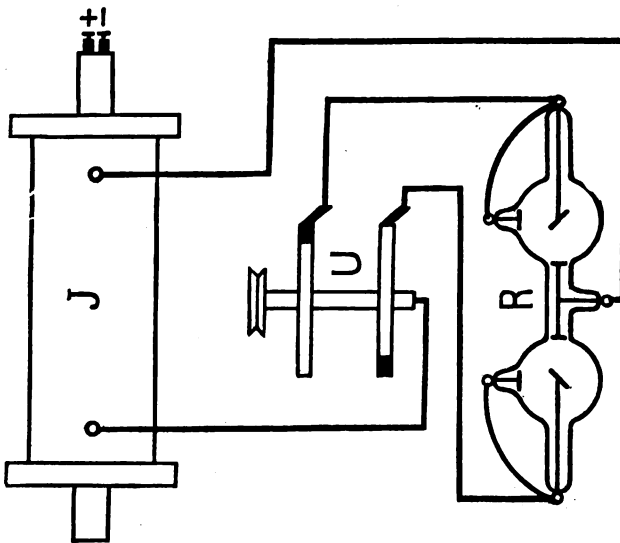
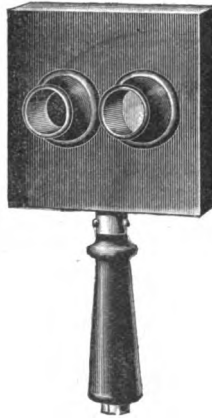


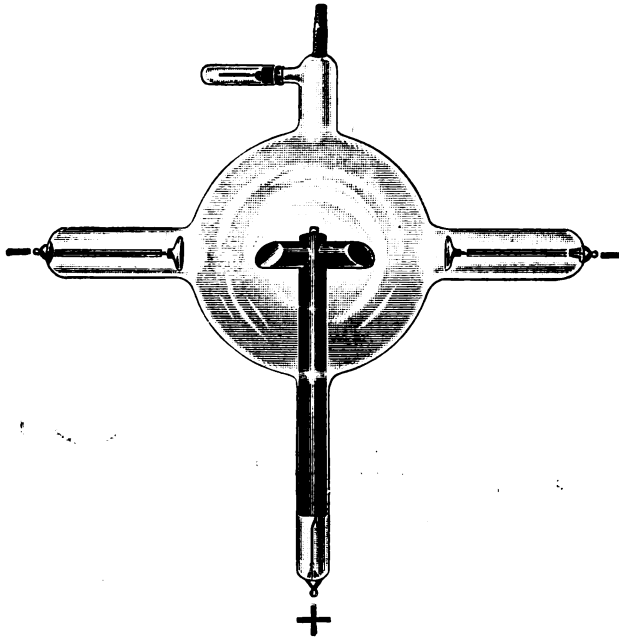
FIG. 2.

*Jl. Electrology—19*

the smallest provocation. The difficulty has been entirely overcome by the construction of the tube shown in the illustration; two anticathodes are connected with the pole



STROBOSCOPE.



marked +, the distance between them is equal to the distance between the eyes, the cathodes are placed opposite. One large glass bulb encloses the whole, and there is an arrangement for regulating the vacuum of the tube,

## INSTRUCTIONS FOR USING AND MAINTAINING HIGH FREQUENCY RESONATORS.

*(Compiled by Mr. A. E. Dean.)*

THE resonator must be connected to the induction coil by a suitable length of stout copper wire, which may be bare, or insulated, but preferably single strand wire.

These wires should connect the terminals of the secondary windings of the coil to the terminals on the resonator marked coil.

They should not be allowed to train on to the coil or resonator, but should be clear of them, and not to touch one another, or damage to the coil may result.

Care should be taken that the connections are good and that there is no moisture present on the machine.

Before operating coil it should be seen that the lower helix of movable wire is making contact with the "movable contact." The contact should be situated at about half way up the helix.

The spark gaps in the detonating box should be pushed right in, but never touch one another.

It is also important to clean the detonating box (where it exists) with alcohol and allow it to dry.

The coil must be provided with a primary of low self induction, and with a reliable easy running interrupter, preferably of the plunging mercury type, as it breaks best.

The coil is started and the spark gap of the resonator gradually lengthened, until it ceases to leap; it is then reduced by pushing in the spark point so that the spark leaps readily, breaking circuit each time.

The speed of the interruptions should be moderately fast. After each application, push in spark gap pillars to their minimum length.

Arcing must not be allowed to occur, as it prevents the proper discharge of the condensers and generates heat in them.

When the resonator is operating normally a blue effluvia is seen leaping upwards from the exterior coatings of the condensers.

If a light of any kind is seen on the inside or outside of the condenser, it is evidence of bad contact and steps must be taken to correct it, or puncture of the condenser will ensue.

A light with a greenish hue is evidence of burning metal and is dangerous to the machine.

It is highly important that sparking of any description other than at the spark gap should be suppressed.

It is necessary in resonators constructed with covered detonators, whether made of glass, porcelain, wood, ebonite, or other material, to see that they are free from moisture.

The frequent leaping of the spark decomposes the air and forms an acidulated moisture, which creates an alternative path for the passage of the spark. This will result in destruction to the apparatus and may cause muscular pain to the person connected with it. It is therefore necessary to clean the spark box, points, and knobs, with methylated spirit whenever evidence of irregular sparking is manifested.



When the resonator is adjusted at its normal point, a person connected with it feels no sensation whatever other than a slight sensation of heat. Any other sensation is due to the machine being in a condition inappropriate to the patient.

The auto-condensation couch or the solenoid, is connected to the high frequency machine by the terminals marked "patient." In using the latter the long helix or resonator is removed.

When it is desired to know the quantity of current flowing to a patient a meter (of special make) may be inserted in the circuit on the portion between the handles and the machine.

The amount of current which passes is measured on a hot wire instrument whose degrees are those of the heat generated by the passage of the current translated into milliampères.

The quantity passing depends on the construction of the machines and the resistance of the patient, and the speed of the interrupter.

On small resonators, or half size machines, a current of 150 milliampères may be reached. For those of general use 300 or 350 may be obtained.

On large machines 500 to 1,100 milliampères may be attained. The latter figures are only reached on alternating electrical mains or by special devices.

A moderate average current is one of 250 milliampères.

The small electrodes are all used from the terminal situated on the top of the resonator and are consequently monopolar electrodes.

These vary in form for their specific purposes.

The most common is the effluer for applying the current in the form of a long sinuous bunch of sparks, varying from  $\frac{1}{2}$  in. to 12 ins. in length, according to the output of the group of machines. This may be used with an earth wire to the left hand terminal marked "patient."

The coil employed should be of the multi-sectional type, if the above-mentioned figures are desired. The bi-sectional type is quite unsuitable, owing to the small amount of current generated at the secondary terminals.

Electrodes of suitable form and capacity are made for use as follows:—

Skin (large and small surfaces), Centres (large and small surfaces), Ear, Throat, Mouth, Chest, Perineum, Rectum, Vagina, Urethra, Bladder, Anus, Massage (pair, one connected to patient and one to massaging hand), Hands.

When a resonator is causing any muscular sensation it must be speedily remedied. Capable authorities on these matters lay special stress on this point. The cause may be found in one or more of the following abnormal conditions. Too heavy a current for the frequency of interruption used. Bad adjustment of the spark-gap. Dirty or unpolished dischargers. Spark insufficiently ventilated, which is arcing instead of breaking. Bad contacts in the machine. Bad interruption of the primary circuit. Too much self-induction in primary. Too large or too small a capacity in the condensers for the current used. Moisture present on the machine.

Under such circumstances it is advisable to clean the whole and re-start from the several zero points.

## Notes.

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**The Phenomena of Radium and the Age of the Sun.**—Radio-activity in relation to the age of the sun (and therefore of the earth) is an interesting question. The suggestion that radium might be a factor in solar radiation was first made by Mr. W. E. Wilson. Then Prof. G. H. Darwin, in a communication to *Nature*, considered that the discovery of this new source of energy, viz., the disintegration of the atoms of radio-active substances, had a bearing on previous estimates of the sun's age. On the assumption that the energy given out by the sun is derived from gravitation by the concentration of its mass, Lord Kelvin's well-known estimate of one hundred million years was arrived at. Prof. Darwin estimates that the energy derivable from this source is  $2.7 \times 10^7$  m. Calories. But the sun would be capable of emitting  $10^9$  m. calories if constituted of a radio-active material equal in strength to radium, and this without reference to gravitation. And so the sun may be ten or one hundred times older than the theory of Helmholtz and Kelvin would allow. The geologist has always estimated the earth's age much higher than has the physicist. The multiplication of the latter's estimate by ten or twenty would bring his views into line with those of the geologist. The question is, how much of such bodies as radium does exist, or has existed, in the interior of the earth. It has been the hard task of the geologist to plead for the millions of years necessary for the deposition of continents in the first place, and then for the long periods during which elevation was silently going on, and lastly, for the slow processes of denudation which figured out the surface of our globe into its present form. In the light of the phenomena manifested by a few milligrams of radium the necessary millions of years may be handsomely conceded and a puzzling problem perhaps solved.

**Modern Views on Matter.**—This was the subject of the Romanes Lecture recently delivered by Sir Oliver Lodge in the Sheldonian Theatre, Oxford. The lecturer began by discriminating between theses which were generally accepted by physicists and speculative opinions or hypotheses which were now being thrown out on the strength of experimental evidence of an at present incompletely conclusive, but very suggestive character. The first thesis was that an electric charge possessed the fundamental property of matter, called mass or inertia, and that if a charge was sufficiently concentrated it might represent any amount of matter desired. There were reasons for supposing that electricity existed in

such concentrated small portions, which were called "electrons," and could either be associated with atoms of matter, to form the well-known chemical ions, or could fly separate, as was observed in the cathode rays of vacuum tubes, and in the loss of negative electricity when ultra-violet light fell upon a clean negatively charged surface. The lecturer went on to say : The hypothesis suggested on the strength of these facts is that the atoms of matter are actually composed of these unit electric charges or electrons, an equal number of positive and negative charges going to form a neutral atom, a charged atom having one electron in excess or defect. On this view a stable aggregate of about 700 electrons in violent orbital motion among themselves would constitute a hydrogen atom, sixteen times that number would constitute an oxygen atom, and about 150,000 would constitute an atom of radium. The attractiveness of this hypothesis is that it represents a unification of matter and a reproduction of all material substance to a purely electric phenomenon. The strongest argument in its favour is that mass or inertia can certainly be accounted for electrically, and that there is no other known way of accounting for it. If matter is not electrical, then there are two distinct kinds of inertia which exactly simulate each other's properties. Assuming this electrical theory of matter, that the atoms are aggregates of electric charges in a state of violent motion, two consequences follow. One of these consequences depends on the known fact that radiation or light, or an ether wave of some kind, is emitted from any electron subject to acceleration ; consequently the revolving constituents of an atom must be slowly radiating their energy away, must thus encounter a virtual resistance, and must in that way have their velocity increased. The second consequence is that when the speed of an electrified body reaches that of light its mass becomes suddenly infinite ; and in that case it appears not improbable that a critical condition would have been reached at which the atom would no longer be stable but would break up into other substances. And recently during the present year a break-up of the most massive atoms has been observed by Rutherford, and has been shown to account for the phenomenon of radio-activity, some few of the atoms of a radioactive substance appearing to reach a critical stage, at which they fling away a small portion of themselves with great violence, the residue having the same property of instability for some time, until ultimately it settles down into presumably a different substance from that at which it started. The matter flung away appears to be a light substance not very different in atomic weight from hydrogen or helium, and it is surmised that possibly certain chemical inert elements may be the by-products of radio-activity ; and that this process of dissociation of the atom may constitute the evolution of the

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chemical elements, such as has on theoretical grounds already been speculatively surmised. An analogy, the lecturer said, may be drawn between this supposed gradual collapse of an atom and the contraction of a nebula, which at certain stages becomes unstable and shrinks off a planet, the residue constituting an extremely radio-active mass or sun. But whereas the astronomical changes observed in cosmic configurations of matter occur in a time reckoned in millions of years, the changes to be expected in the more stable atoms would seem likely to require a time reckoned in millions of millions of centuries; but, nevertheless, according to known laws, and on the hypothesis of electric constitution, the change seems bound ultimately to occur; and so a state of flux and decay is hypothetically recognised, not only in the stars and planets, but in the foundation-stones of the universe, the elemental atoms themselves. A process of regeneration, however, is also thinkable, and would occur if the separate electrons were ever to aggregate themselves together by their mutual attractions into fresh material. And, inasmuch as the life of a highly radio-active substance must be very limited, being, perhaps, not more than a few thousands of years in some extreme cases, it appears necessary to assume that some such regenerative process is constantly at work, and that, just as we have suns of various ages and exhibiting the process of evolution in different stages, so it may be that the progress of research will lead us to recognise the existence of atoms of matter in like case, some recently formed, and some very ancient; and the whole argument seems to lead to an atomic astronomy of surprising interest.—*Times Report*.

**An Attractive Theory, but beset with Difficulties.**—Commenting on portions of the above, the *Electrical Review* makes the following remarks: This is, indeed, a very attractive theory, but it presents many difficulties which appear to be insuperable. An electric charge, it is true, obeys the same law of acceleration as a mass of matter, but we may have positive and negative charges of electricity, while all mass is of the same sign. The 350 positive units of electricity which, together with the 350 negative units of electricity, make up, according to Lodge's theory, the atom of hydrogen, would exactly neutralise each other, and a hydrogen atom constituted in this way would have no mass. We must evidently go deeper than the electric charges on the atoms to get the true explanation of inertia. An equally attractive, and, we think, equally unsound, hypothesis was put forward by the lecturer to explain radio-active phenomena. Since the atom consists, according to his view, of an aggregate of electrons in violent orbital motion, each of these electrons is undergoing acceleration of direction, and is consequently radiating electric waves

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into space. It can be shown that this loss of energy will result in an increase of velocity of the revolving electron. When the speed of the electrified body reaches that of light its mass becomes infinite, and in that case a critical condition is reached in which the atom is no longer stable but breaks up into other substances. It is to be presumed that the masses of the positive and negative electrons which make up the atom, according to Lodge's theory, are equal, since their electric charges are equal. But no positive electron is known with a mass less than about 1,000 times that of the negative electron. The positive fragments thrown off from radium are about equal to this—*i.e.*, about equal to the mass of the hydrogen atom. The disintegration of the atom gives no proof of the existence of the positive electrons imagined by Sir Oliver Lodge. The Romanes lecturer appears to favour the view that each atom has a definite length of life, at the end of which it breaks up, or disintegrates. This, indeed, follows from his theory that disintegration is due to the loss of energy by radiation of electric waves. He draws an analogy between the collapse of the atom and the contraction of a nebula, which at certain stages becomes unstable and throws off a planet, the residue constituting an extremely radio-active mass, or sun. But whereas the astronomical changes observed in cosmic configurations of matter occur in a time reckoned in millions of years, the changes to be expected in the more stable atoms would seem likely to require a time reckoned in millions of millions of centuries. Each atom according to this hypothesis has a definite lifetime, and the radio-activity of a substance would be proportional to the death-rate of its atoms. With equal length of life, the death-rate of atoms would be the same as their birth-rate, but Rutherford has shown clearly that radio-activity decays according to a law of geometrical progression—that is, the death-rate of the atoms is proportional to the number of the survivors. This does not point to a fixed lifetime for the atom, but rather to the view of J. J. Thomson, that a fixed percentage of the atoms always reach a critical velocity, which determines their disintegration.

**The Dynamics of Electrons.**—By way of further comment the following appears in the *Electrical Review* of October 2 : It has lately been a favourite hypothesis with certain physicists that the mass or inertia of matter may not be due to the presence of a material substance, but may simply be due to a disembodied electric charge on the ultimate particles, which, as far as we know at present, are the electrons. An interesting discussion of the mathematical consequences of this theory, by Max Abraham, will be found in the *Annalen der Physik*, for January, 1903. The results obtained are not always in agreement with Newton's laws of motion. For instance, the

“mass” of an electron is not of fixed value, but increases with its velocity. The very rapidly moving electrons in Becquerel rays (having a velocity 95 per cent. of the velocity of light) have a greater mass than the more slowly moving electrons in the cathode rays. Kaufmann has shown experimentally that the facts agree with theory in this case. The mass of an electron accelerated in the direction of its motion (longitudinal mass) is not the same as its mass when accelerated at right angles to its direction of motion (transversal mass). Uniform motion of an electron in a straight line when once established is steady or permanent. But uniform motion in a circular orbit is accompanied by a continuous radiation of energy, so that such motion must ultimately cease if not maintained by some external agent. A continuously accelerated electron stores an increasing amount of kinetic energy which can be regained by stopping the electron, and, in addition, it radiates energy continuously; but this part of the energy is lost. There is thus a drag upon the electron, which resembles viscous friction, but depends upon *acceleration* and not on *velocity*. An electron under way will, if quickly stopped and released, start up again of itself, and move with diminished velocity in the original direction. This, which is quite unlike the behaviour of matter as we know it, may be understood when we remember that the electron carries along with it a wave of ether stress which is not annihilated by a short stoppage of the electron. When an electron gains a certain velocity under the action of an accelerating force, and the force suddenly ceases to act, then the electron loses some of its velocity, and continues to move at a slightly decreased uniform velocity. The kinetic energy of an electron is not proportional to the square of its velocity. The amount of electrical energy stored in the electric field which surrounds an electron is estimated at  $6 \times 10^{13}$  joules (or forty-four million million foot-pounds) per gram of electrons. Owing to the excessively small size of the electrons, they are always at a great distance apart in comparison with their size, so that variations of total energy due to different forms of electron aggregation are but a small fraction of the total energy. Thus the diminution of energy due to the formation of a gram of water is only one four thousand millionth part of the total electron energy. The volume integral of ether stress—which may be the fundamental cause of gravitation—is also independent of states of electron aggregation to about the same degree of approximation.

**Radium again.**—The process for extracting radium from pitchblende is described as follows in the *Lancet*: Operations for the extraction are commenced by crushing the pitchblende, and then roasting the powder with carbonate of soda. After

washing, the residue is treated with dilute sulphuric acid; then the sulphates are converted into carbonates by boiling with strong carbonate of soda. The residue contains radium sulphate, which is an exceedingly insoluble salt. The soluble sulphates are washed out, and the residue or insoluble portion is easily acted upon by hydrochloric acid, which takes out, among other things, polonium and actinium. Radium sulphate remains unattacked, associated with some barium sulphate. The sulphates are then converted into carbonates by treatment with a boiling strong solution of carbonate of soda. The carbonates of barium and radium are next dissolved in hydrochloric acid and precipitated again as sulphates by means of sulphuric acid. The sulphates are further purified and ultimately converted into chlorides, until about 15 lbs. of barium and radium chloride are obtained by acting upon one ton of crushed pitchblende. Only a small fraction of this mixed chloride is pure radium chloride, which is finally separated from barium chloride by crystallisation, the crystals from the most radio-active of the solutions being selected. In this way the crystals ultimately obtained are pure radium chloride of a very high degree of radio-activity.

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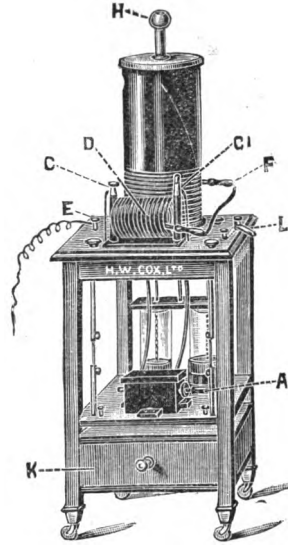
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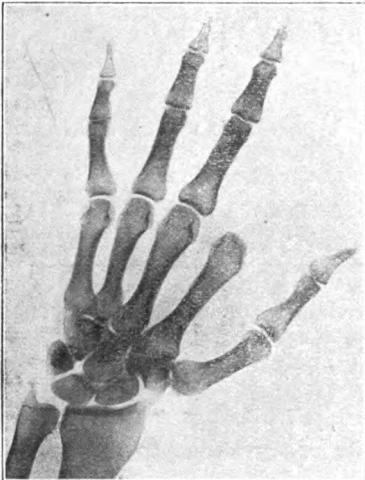
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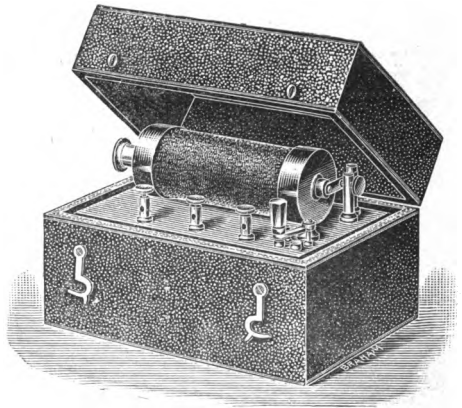
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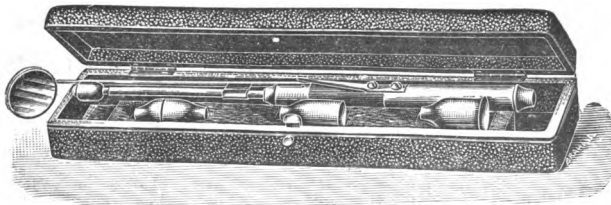
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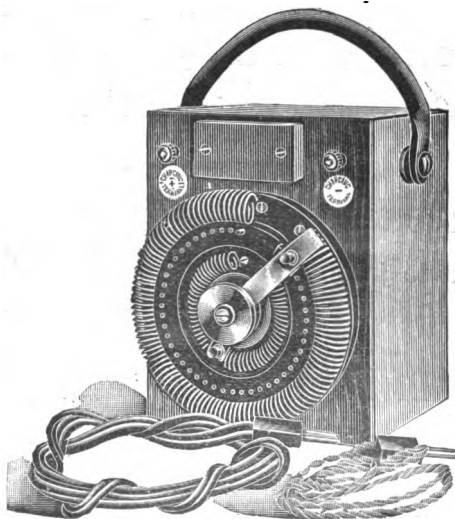
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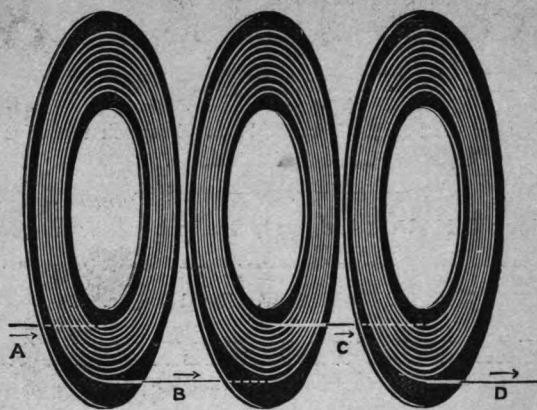
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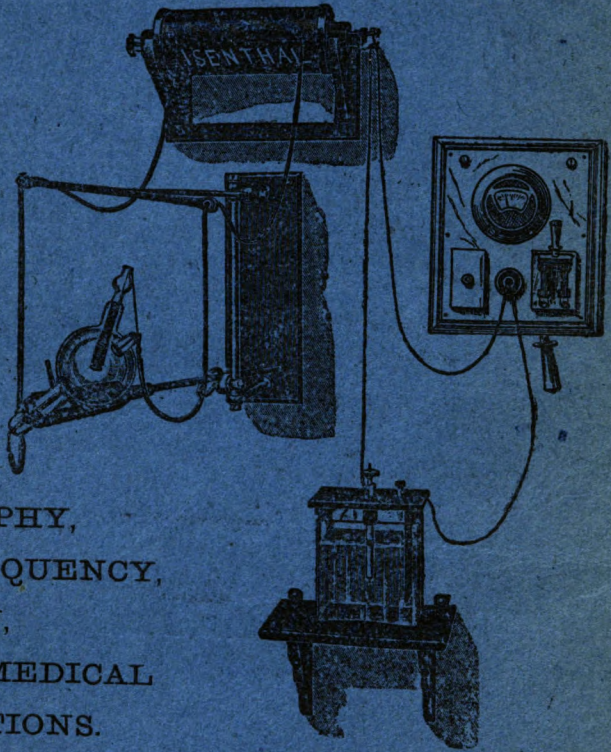
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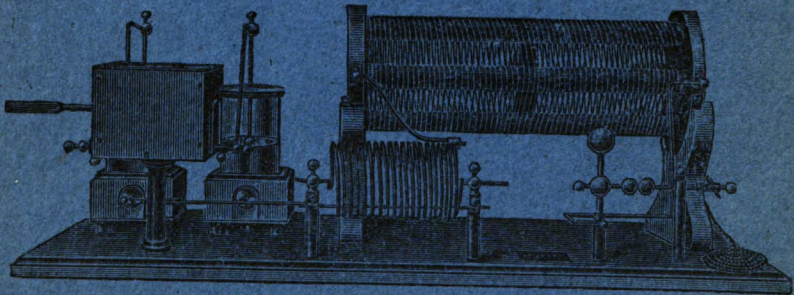
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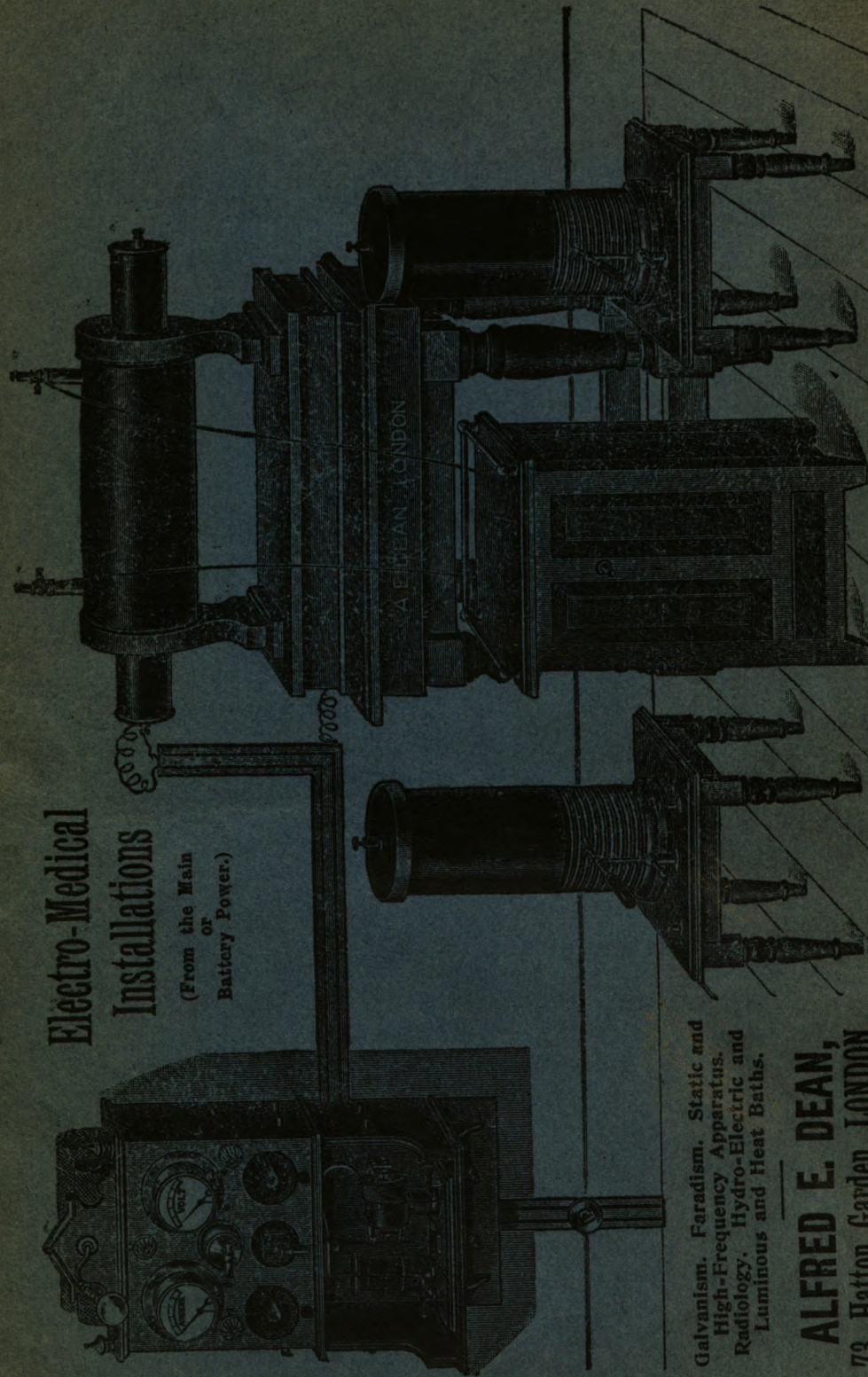
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