

showed the same conditions, had the same treatment with the same result.

From this time all cases of conjunctivitis lymphatica were treated in this way and it was noticed that those were soonest benefited in which the efflorescence was marked by lachrymation and congestion of the palpebral conjunctiva, while the elevations at the limbus showed irregular outlines and little disposition to surface softening.

Why there should be this difference or why the pyoktanin should, in any case of this character, be as effective as the time honored mercurials I do not know.

Pharmaceutically the mercurials were as perfect as possible. The Pagenstecher's ointment I prepared by a method which could hardly be improved, as the product stands the test of inspection through a powerful lens. And the calomel was of the best quality, thoroughly dried and lightly dusted.

The pyoktanin was Merck's, dissolved in water which had been boiled thoroughly. A fresh solution was prepared when any change was noted in the color.

DISCUSSION.

Dr. G. C. SAVAGE, Nashville—Just before leaving home I prescribed pyoktanin for three cases of phlyctenular conjunctivitis and as Dr. Price has just entered the room I should like to know from him what the result has been.

Dr. PRICE—The only one of the patients that has returned is doing well. It was a bad case and had shown no improvement under a week's use of the yellow oxid.

FRANKLINIZATION AS A THERAPEUTIC MEASURE IN NEURASTHENIA.

Read in the Section on Neurology and Medical Jurisprudence at the Forty-seventh Annual Meeting of the American Medical Association, held at Atlanta, Ga., May 5-8, 1896.

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Looking at it from a purely scientific point of view the recognition under the head of neurasthenia of the many and varied expressions of nerve weakness is most unfortunate, and must have a tendency to hinder that investigation into the true nature of the underlying conditions which is absolutely essential to the advancement of the science of medicine. On the other hand this recognition has led to the establishment of excellent therapeutic methods, which, however, are so familiar as not to need enumeration here.

Among them Franklinization takes an important place, and although it is the oldest form of electric treatment, its value is not yet fully appreciated by the profession.

It is not within the scope of this paper to discuss the nature of neurasthenia, interesting as the subject is, suffice it to say that neurasthenia in an acquired form, may be regarded as primary or secondary; primary when due to the immediate effects of nervous overstrain or to a primary toxic disorder of nutritional processes, and secondary when consequent upon other diseases having a general pathologic diathesis with its peculiar and exhausting toxic influence.

The nutrition of nerve cells is primarily at fault,

and they break down even under slight overstrain, whether of work or mental anxiety. They lack in stability, and are incapable of ridding themselves of the results of physiologic activity. The toxicity thus induced plays an important rôle in the production of the varied manifestations of physical and mental discomfort to which the neurasthenic is subject.

The problem before us in the treatment of neurasthenia is to prevent undue waste of nervous substance from excessive fatigue as well as to eliminate the toxic influence of self-produced waste products. To this end whatever can be done to establish and maintain the highest nutritive activity is absolutely imperative.

Whether we regard the neurasthenic condition as due to exhaustion, starvation or poisoning of nerve centers its treatment by means of Franklinization is absolutely rational.

There is nothing of the occult about it, nor can the action of general Franklinization either by means of the convective or disruptive discharge be, in any sense, attributed to suggestion, hypnosis or to some subtle influence upon the nervous system. The same effects can not be reproduced by such methods.

The grand function of all electric treatment is to promote nutritive processes, and in general Franklinization there is no exception to the rule. On the contrary, by reason of its physical characteristics it is the most efficient of the varied manifestations of electric energy. The ease with which it can be used, requiring no preparation nor tedious detail in its administration as do other currents, renders its application very acceptable to patients.

The influence of high frequency and high potential currents upon nutrition has been established by observations in physiologic laboratories and in clinical work.

In all neuroses there are abnormal chemic conditions of the tissues and aside from the influence of heredity, deficient constructive and deficient destructive metabolism are the two prominent factors therein. The need therefore in our therapeutics of a means which will influence a more nearly normal metabolism is imperative. The rationale of general Franklinization lies in its ability to set up processes resulting in the production of physiologic effects.

The increased activity of an organ is indicated by the increased amount of blood circulation. When an organ is completely inactive, as in the case of a paralyzed muscle or the peripheral end of a divided nerve, the amount of blood and the nutritive exchange of fluids diminish within these parts. Thus thrown out of activity they become pale and relaxed, and ultimately undergo fatty degeneration. If cells are imperfectly deprived of their detritus they do not appear to take up oxygen readily, consequently are not adequately nourished and undergo degenerative changes.

The average neurasthenic patient is not in a condition to take the active exercise necessary to bring muscular tissues into activity so as to profoundly influence circulatory changes. It is impossible to change the nutritional state of cells without a profound stimulating action. The general circulation in these conditions is impaired, while vascular changes in the nervous system exist. These are of the nature of a cerebral hyperemia and probably hyperemia of the spinal gray matter as well. The vaso-motor

neuro-mechanism is believed to be at fault. The extremities are cold and the heart's action feeble. If the blood stream does not circulate with normal activity new material is not supplied to the tissues, nor is effete material removed from them. As a general rule the stimulation is more energetic, the more rapid the variations of the electric current applied to the nerve (Du Bois Reymond).

In the great variations of potential which the patient subjected to general Franklinization experiences, may be found a reason for its profound stimulating effect. A constant and inconceivably rapid variation of potential characterizes every Franklinization, whether by means of the convective or disruptive discharge. And this variation must result in profound stimulating action upon nerve cells, enabling them to alter their nutritional state.

In employing currents of great frequency the organism is traversed without manifesting any reaction. If the frequency of these currents were lowered their energy would be destroyed in so far as the production of characteristic physiologic effects are concerned.

It is believed by D'Arsonval that these currents exercise upon nerve centers and upon muscles the action studied by Brown-Séquard under the name of *inhibition*. The tissues traversed by them are those less susceptible to the ordinary excitements. The physiologic effects demonstrated by D'Arsonval and others would indicate that currents of high frequency have a profound influence upon the organism affecting nerve centers, however deeply placed, even though the application electrically alters or disturbs the superficies of the body alone.

The vaso-motor nervous system is also strongly influenced. After an experiment upon the human organism with these currents has been long enough continued there can be seen upon the cutaneous surface dilated capillary vessels and the skin is found to be covered with perspiration. There is also an increased intensity of the respiratory combustion. The excretion of urea is increased and uric acid, if present, diminished, or on the other hand a normal or more nearly normal relation is established between them. The ultimate effects are upon all the nutritive processes. Oxidation is furthered and metabolic changes hastened.

By means of the disruptive discharge or spark a profound perturbatory effect is produced. Whenever a spark impinges there is produced an effect upon the vaso-motor nerve followed at first by a vaso-constriction as evidenced by the pearly white or goose-flesh appearance of the skin. This in turn is followed by a vaso-motor dilatation evidenced by redness of the skin. If for any reason there is a localization of the disruptive discharge there may be produced a distinct dermatitis as the result of the application. Also as a result of the disruptive discharge more or less profound muscular contraction is produced according to the character of the spark, larger and more extensive with the long spark gap; shorter, sharper and quicker with the lesser spark gap.

The rôle of muscular activity is one that is well established, and the effect is to produce an increased activity of the blood stream within the muscles of an intact body. The blood vessels dilate so that the amount of blood flowing through them is increased. At the same time the motor fibers are excited, the vaso-motor fibers are also. Muscular contraction is

attended by the production of heat. This is greater or less according to whether these contractions are many but small, or fewer and larger. In the latter case more heat is generated. This shows that larger contractions are accompanied by a relatively greater metabolism than small contractions, which is in accord with clinical experience.

Then again, we have to deal with the two-fold influence of the nervous system upon metabolism. On the one hand it acts indirectly through its effects upon the blood vessels, by causing them to contract or dilate through the agency of the vaso-motor nerves, whereby the amount of blood supplied, as well as the blood pressure, are influenced. But metabolism is still further influenced, independently of blood vessels, through the trophic nerves.

The afferent supply of blood current carries to the tissues the proteids, fats, carbohydrates and salts from which the tissues are formed, and any interruption of the arterial supply diminishes the supply of nutriment. On the other hand, the efferent stream carries away decomposition products from the various tissues, more especially urea, CO_2 , H_2O and salts, and transfers them as quickly as possible to the organs through which they are excreted. With the supply of nutrient material thus provided and the removal of the products of organic life, the vagaries, morbid fears, melancholias even, the aching and weariness as well as the hyperemias, are relieved.

The convective discharge is the treatment *par excellence* for neurasthenic patients. By it is meant what is commonly known as the static spray or breeze. It is in reality a succession of infinitesimal sparks as obtained from the powerful Holtz machines, which passes into a continuous stream between the two discharging rods or the insulated patient and the administering electrode. This discharge is non-oscillatory in type and, so far as can be seen from its physical nature, produces but superficial effects. The effect, therefore, upon the interior of the body is by a secondary influence, produced primarily upon the superficies, by which it becomes electrically altered or disturbed. If the charge is mild, this convective discharge will only be felt as a cool wind, but when these machines are working to their full capacity, and particularly if the patient holds the chain in the hands, establishing connection with one prime conductor of the machine, there is a marked tingling, stinging and pricking as of many needles. By localizing this discharge to any point desired, the seat of an obstinate pain, there can be produced an extensive redness and blistering (dilated capillary vessels) of the skin, and in sensitive conditions of the spine where there is pain on pressure, I am in the habit of continuing the localization long enough to produce this effect.

When a piece of woolen cloth or a patient with woolen clothing is placed upon the platform in contact with the distributing chain and subjected to a localized convective discharge, the clothing or the fabric is microscopically¹ burned as though by many minute coals of fire.

Ordinarily, the passage of one coulomb of electricity through a circuit in one second of time means a rate of flow or current strength of one ampere, on the average during that time. If this coulomb passes through the circuit in one-thousandth of a second,

¹ With my large 8 plate, 30 inches in diameter, Holtz machines, this burning is not only microscopic, but macroscopic as well.

² Houston and Kennelly: Electricity in Electro-therapeutics.

the mean current strength would be 1,000 amperes, and if in the millionth part of one second the mean current strength would be 1,000,000 amperes. For this reason the total quantity of electricity, in a pair of leyden jars for instance, or in the case of a working conducting circuit where the patient represents the one leyden jar and the grounded area the other, even when charged at a pressure of thousands of volts, is very small; yet owing to the great frequency or rapidity with which this charge is passed through the circuit, the current strength during that time may be considerable. The action upon the woolen fabric would indicate that such is the case. The patient in this conducting circuit is doubtless traversed by an alternating current of greater strength than would be borne without pain under ordinary conditions.

In the convective discharge there is produced an effect upon the nervous system, affecting the vaso-motor nerves, causing first a vaso-constriction, as evidenced by the sense of chill and shivering when first subjected to its action, followed by a vaso-dilatation, with an ultimate equalization of the blood stream. Under the influence of the convective discharge the activity of the skin is increased with perspiration, most noticeable in palms of the hands; the temperature, if subnormal, is raised, if abnormal reduced, while the heart's action is regulated. Corresponding circulatory changes are established, as shown by the number of pulse-beats before and after the discharge, the change in volume and the sphygmographic trace. Such physiologic effect can not be produced without causing a change in the patient's condition and inducing a feeling of well-being.

The pains and weariness, the morbid fears and fixed ideas disappear under these more nearly normal conditions, but the disappearance at first is only temporary. The changes set up are not sufficient to endure perhaps for more than a few minutes, a half hour; in rare instances, twenty-four or forty-eight hours. More work must be done before nutritive changes are established to such a degree as to prevent a recurrence of former conditions. The flagging energies are aroused by the stimulating influence of the application, which, however, if not persisted in, is as valueless as the whip and spur to the exhausted horse without rest and food.

In the desultory and unscientific way in which Franklinization has been used are to be found the reasons for its failure. Only with a large clinical experience is it possible to reach definite conclusions as to the manner of its application, the length and number of sances, and to formulate a law governing its administration. Personal idiosyncrasies, as well as the duration of the disease and the manner of its manifestation, must be considered.

Moral means must never be lost sight of; in addition to the general Franklinization, the rest or exercise, according to the character of the case, is of paramount utility.

In the treatment of neurasthenic conditions by means of the Franklinic current, I find that I can secure without enforced rest and seclusion the return of health to a considerable class of neurasthenic patients, with greater independence of character and increased volition, than is possible by means of the rest cure and massage. These last named measures have their value, but to a large number the seclusion, the dependence upon others for

every thought almost, certainly for every volitional act, is pernicious in the extreme. Habits of invalidism are fostered, with fixed ideas as to the suffering and disability endured, which means a changed nutritional power on the part of nerve cells.

In a paper upon the "Psychical Treatment of Neurasthenia," by Dr. J. J. Putnam of Boston,³ the influence of general Franklinization upon temperature and pulse in neurasthenic patients is considered. He shows a similar influence with the patient placed upon the platform and no connection made, but the machine still in motion as in the ordinary application of the convective discharge. The conclusion that he seems to draw therefrom is that the changes in temperature and pulse are due to some subtle influence upon the nervous system, rather than from the Franklinization. He does not state whether in the latter instance the machine was in a state of charge or not; the inference must be that it was. Such being the case, the patient still remained in the electro-static field even though the insulating platform was not connected with the source of energy.

From the physical laws governing electricity at these potentials it is absolutely impossible to keep it within bounds. There is a constant leakage from the metal finishings of the machine, and a disturbance is created in the entire atmosphere of the room. Henry has shown that a spark from an electric machine extends its influence to a distance of many feet. Physiologic effects may be obtained by standing in the vicinity of powerful dynamos in operation, and physicians from various sections of the country have told me of sending their sleepless neurasthenic patients to electric power houses that they might have the benefit of the electric disturbance thus created.

But there is also another influence at work. It is absolutely impossible to have an electro-static machine in operation without the production of ozone. Chemic tests demonstrate the existence of ozone in the atmosphere, and it is shown that it exists in greater quantities in the country than in the city, at the sea shore and in the mountains in still greater abundance, notably in the best climatic resorts of high altitude. It is, no doubt, one great source of the healthful influence of such places. Near the backbone of the mountain range of the Blue Ridge in North Carolina, it is so abundant as to be constantly apparent by its peculiar odor. Its increased chemic activity renders it more effective than oxygen. It is not necessary here to speak of its intense oxidizing action, antiseptic properties and power of destroying offensive odors. Recently its physiologic effect has been very carefully studied by M. M. D. Labbe and P. Oudin and published in the *Bulletin Officiel de la Société Française d'Electrothérapie* for November, 1894.

These observations showed, even after ten minutes inhalation of ozone, an increase in the amount of hemoglobin of from $1\frac{1}{2}$ to 2 per cent. Subsequent examinations, made several days later, demonstrated that the increase persisted. The examinations were made by means of the spectroscope. There was also a proportionate increase in the number of red blood corpuscles and a progressive diminution in the number of white, and the conclusion arrived at both from physiologic experiments and clinic results was that ozone most powerfully modified the blood and nutri-

³ Boston Med. and Surg. Journal, May 23, 1895.

tion, resulting in the establishment of health. One of the sources for its production are the large Holtz or influence machines used in medical work.

When the influence machines in my office are in motion, the electro-static field extends not only over the entire floor occupied by the machine, but to the basement below, sparks being drawn from the gas pipes, etc. The electro-static field is enormous in its extent, and while we secure our best results from the use of an insulating platform, it is not necessary to obtain physiologic effect.

By the action of the electric spark upon the air a synthesis is produced whereby we have ozone formed. At least a part of the benefit derived from general Franklinization by means of the convective discharge is due without doubt to the production of ozone, and in Dr. Putnam's cases this influence could not have been eliminated, as the ozone pervades not only the atmosphere of the room where the machine is placed but adjoining rooms as well.

During three years' work at the Electro-Therapeutic Clinic at the Post-Graduate Medical School the nurses who were sent to the clinic for two or three hours three times a week to assist in the work, spoke to me of a general physical improvement of which they were conscious, with relief from menstrual pain and improved sleep. Their appearance indicated a nutritional gain. Different nurses made these statements from time to time during their term of service, and after my attention was called to it I was in the habit of watching them closely, taking their weight, etc., and inquiring as to physiologic functions, in order to establish the correctness of their reports.

In dealing with this form of electric energy we must remember that on account of its high frequency and high potential it pervades all space around the conductor. The metallic prime conductors, the conducting rod connecting the same to the platform, merely provide a surface from which the charge can enter and influence the air around it. The charge really resides in the air, or more strictly in the air and ether surrounding the body. The energy is distributed through all the ether in the room, although not equally. The greatest current density exists upon the insulating platform and about the body of the patient; after that in the space near the machine, and consequently the greatest difference of potential would be maintained in the former instance, with a greater and more effective convective discharge.

I can sit upon an insulating platform entirely disconnected from the machine and still demonstrate that I am in the electro-static field by the movement of a silk thread toward and to one prime conductor. With the platform disconnected, and the machine grounded as in ordinary use, there is not only a convective discharge that is apparent by the usual physical phenomena, but a disruptive discharge can be produced by approaching any part of the body to the electrode connected with the ground or the prime conductor. This discharge is of the non-oscillatory type. Therefore the observations to which I referred are not convincing.

THE TECHNIQUE OF ADMINISTRATION.

In connecting a machine for use it should always be grounded. The insulating platform is connected to one prime conductor by means of the conducting rod, while the other is connected by means of a chain to some suitable ground in the room or near by, as for instance a gas or water pipe.

The disruptive discharge when the machine is not grounded, is of the non-oscillatory type, as is indicated by its thin, blue straggly appearance. It has a biting and irritating character, which renders it extremely objectionable to the average patient, especially the neurasthenic.

Grounding the machine enlarges the area over which a charge may be distributed before it is discharged by its spark, and practically amounts to the use of large condensers, *i.e.*, Leyden jars. It increases the electrical capacity; there is not only a greater charge, but a greater discharge, whether convective or disruptive. The character of the discharge is changed in some instances from an non-oscillatory to an oscillatory one, while in others there is produced a more typical oscillatory discharge. The disruptive discharge thus obtained is vivid, clean and thick and not inclined to break up nor irritate as the spark obtained from the direct method. This is due to the change in the character of the discharge, from an non-oscillatory to an oscillatory one, and in this physical fact is found the reason for grounding our machines for medical work.

Until recently the question of insulation was regarded as an important one, as the physiologic action of the different insulations, *i.e.*, positive and negative, had not been accurately determined.

Some six years since Damian of Paris made a series of observations upon temperature and pulse and the urine to determine what, if any, difference there was in the different insulations. The published statement showed that with the positive insulation there was a regulation of the temperature and heart's action, an increase of urea and diminution in uric acid; while with the negative insulation these changes were less marked in so far as temperature and pulse were concerned, and that the volume of the urine was increased, but no change in its organic constituents.

Within the past five years I have made a great many observations upon the physiologic effect of positive and negative insulations in order to determine if possible the therapeutic indication. Those with the positive insulation upon temperature and pulse were made at the Electro-Therapeutic Clinic of the Post-Graduate Medical School and upon urine in my private practice; while those with the negative insulation were made in the New York Electro-Therapeutic Clinic, Laboratory and Dispensary. In both instances the physiologic effect has been the same, *viz.*, a regulation of temperature, raising a subnormal, lowering an abnormal; a regulation of the heart's action with corresponding circulatory changes, and an increase of urea and diminution of uric acid.

This is in accord with the physical laws governing the Franklinic current. It does not matter, therefore, which prime conductor, whether positive or negative, is connected with the insulating platform, nor which is grounded. As a matter of fact, the spark with the negative insulation is much less biting, sharp and stinging in character, therefore it is preferable for sensitive patients.

The patient is placed upon the platform and the machine set in motion. Patients are often timid at first and need reassuring. Everything that would jar, shock or disturb is to be avoided. It is therefore best to allow the patient to sit quietly upon the insulating platform, without placing the stand holding the electrode near the platform, or using an electrode in the hand connected with the grounded area. Profoundly

neurasthenic patients are easily alarmed and their confidence destroyed at the outset by so doing. As a patient sits upon the platform, he is in a condition of charge and may be likened to a leyden jar. The grounded area of the other prime conductor may be likened to another leyden jar. The patient's potential is raised and any movement, no matter how slight, results in some discharge or equalization of the difference of potential as he comes in contact with the stress existing in the air about him. Therefore it is impossible to regard the condition as simply one of charge, for in reality a mild convective discharge is taking place all the time. The completeness of this discharge is greatly increased by approaching the stand, holding the electrode and connected to the ground, to the patient, or by swaying the pointed electrode back and forth over the entire general surface of the body. At first the automatic application is best, for with the electrode in hand, even if great care is observed, the difference of potential is often unintentionally overcome by reduction of distance, resulting in a disruptive discharge in the form of a spark which greatly disturbs the patient.

Nervous patients will sit quietly on the platform in a condition of "charge," or even with an electrode at rest at a fixed distance, when if it be moved gently to and fro by the operator they will become exceedingly nervous and apprehensive, shrinking in a blind terror from the application. Tact and patience will later enable the operator to use the electrode for a general application or any desired localization. As confidence is established the strength and consequently the effectiveness of this convective discharge may be increased by having the patient hold in the hands the distributing chain, thereby placing him in direct connection with one prime conductor of the machine; then by approaching the electrode fixedly placed in the stand, or in the hand toward the patient, he is placed under the influence of a strong convective discharge which is known as the *needle spray*. From this we proceed to a friction spark, produced by rubbing the patient lightly with the ball electrode. This must be swiftly done or else it will be intolerable. The sensation is as of thousands of hot needles, but if well done is followed by such distinct relief in the average case as to be uncomplainingly submitted to. The effect is a revulsive one and there is sent through the peripheral nerves an influence to the nerve centers most beneficial in its effect. It is a well known fact that by peripheral excitation the nutrition of ganglionic cells is altered. Applications by means of long percussive sparks should follow upon the "charge," "spray," "needle spray" and friction spark, and often in neurasthenic patients should not be used at all. When the need for strong far-reaching muscular contractions exists, the disruptive discharge should be resorted to.

As a rule neurasthenics do not tolerate the disruptive discharge. It has too powerful a perturbatory effect, producing as it does profound contraction of muscular tissue. After its use patients are exhausted, trembling, and later on sore and bruised, unable to sleep and so profoundly shaken up as to be unwilling to submit to another treatment. This is especially true of the neurasthenics of the exhausted type. But where the condition of nerve exhaustion is really one of infection from self-poisoning, or where the nutrition state has been improved by rest, forced feeding, massage and seclusion even, without corresponding im-

provement in the mental manifestations, the disruptive discharge is indicated after toleration has been established. In Franklinization it is necessary to remember that exercise should always be kept within the limits of fatigue.

In all cases the treatment should be begun by means of the convective discharge. It is characteristic of living tissues to respond to stimulation, but that stimulation must not necessarily be applied in the form of profound shocks. Leave the severe measures until later in the treatment of these cases.

In sexual neurasthenia, with impotence or irritation, the localization should be to the lumbar and sacral plexuses and by means of the director electrode to the perineum carrying the electrode as far forward as the anatomic structures permit. When we bear in mind the number of nerves which center in the perineum, the beneficial reflex effects from so powerful a stimulation can readily be appreciated.

In the beginning of the treatment with the Franklinic current, in neurasthenia, the earlier seances should preferably not last more than ten minutes, as there is danger of inducing an over-stimulation. This should always be avoided. If it is found that a ten minutes' sitting is well borne, the next sitting may be slightly lengthened, and when a patient's toleration is fully established it may be extended to as much as thirty minutes. The crown electrode, fixedly attached to the electrode stand, should be placed over the head during the first of the sitting, while the latter part of the application should be made by means of the point to the entire general surface of the body, localizing it to the spine, especially the nape. In those conditions where there is a tendency to a passive congestion of the brain, the application should be made by means of the point adjusted so as to localize the discharge to the spine, preferably the nape, in order to obtain an influence over the vaso-motor center. Sometimes in cases where such congestion exists the use of the crown electrode intensifies the discomfort and patients will complain of a full, bulging feeling in the head, which is most undesirable. When it is found that the convective discharge is well borne, which will be indicated by an improvement in the temperature, in rate and volume of pulse, in the moisture of the skin, naturally much less marked than with the disruptive discharge, also by a sense of well being and often times a sensation of quiet with a desire to sleep, then if the indication exists for a profounder revulsive effect, the friction sparks may be used to the entire general surface of the body, the localization being as before to the spine and especially to the nape for the influence upon the vaso-motor center.

As to the frequency of the application. In most neurasthenic patients and particularly the exhausted type, daily seances at first are preferable. The gain is surer and the time of treatment shortened by daily applications for the first week, two weeks, or possibly a month or six weeks. Rarely should the maximum time be exceeded however. The period of time for daily seances is to be determined by the persistence of the relief established from a single treatment; as soon as it is found that the relief established continues over twenty-four hours, then the treatment should be given every other day and subsequently as the improvement maintains itself for a longer time every third day to once a week, and finally to a discontinuance of the application. It is not possible to lay down a fixed

rule for the length of time that a patient should remain under treatment, because the recuperating power of some of these cases is very much greater than others; while their environments differ to such an extent as to modify the effect. The indications, however, for the discontinuance of the treatment, the nutritional gain and relief from symptoms are very clear.

The work can only be done slowly and as soon as the organism ceases to respond to the stimulation which has been used, and which has for the moment set up more nearly normal chemic action, then it should be repeated. Nothing is gained by waiting after that time comes, and much is lost. In the exhausted type of neurasthenics daily seances are necessary. Patients judge very clearly as to when less frequent applications are desirable. During the period of great exhaustion, physical and mental, the craving for the electro-static bath is very great. As nutritive changes are set up, followed by increased strength and energy, these patients are able to go on with comfort for a period of two or possibly three days without treatment.

Nerve cells undergo certain changes in the course of their functional activity which can only be interpreted as those of fatigue and we must remember that in neurasthenia we have to deal with nerve cells unable to get rid of fatigue or toxic products. They may be said to have undergone the "molecular or chemic variation," and as a result have an "exhausted or changed nutritional power." The whip and spur must be applied as soon as they lag. But we must understand clearly that while there is a stimulation, it is not an evanescent effect, but one that results in chemic changes tending to the establishment of nutrition and healthful function.

It must be constantly born in mind that it is work which is being done in the tissues of the body, and that the indications for the repetition of that work lies in the permanency of its results.

When we connect a sphere⁴ to a terminal of an electro-static machine having an electro-motive force of say 200,000 volts, it will receive a comparatively large quantity of electricity, which will be a certain fraction of a coulomb. Suppose the charge communicated to the sphere be 1-1,000,000 of a coulomb, delivered at a pressure of 100,000 volts. In that case the work delivered to the sphere would be equal to 0.1 of a joule or 0.0738 foot pound.

This energy is received by the air and ether surrounding the sphere and held there during the maintenance of the charge. It is distributed throughout the room, although not equally. A certain fraction of a joule is charged in each cubic inch of space, the greater amount being in the immediate neighborhood of the sphere and lessening with distance from the same. Just the same thing happens with the patient on the insulating platform connected either directly or indirectly to the prime conductor. The air and ether about him receive the energy and the work in this instance is delivered to the patient, representing work of so many foot pounds or fraction thereof according to the electro-motive force and coulombs furnished. The charge is passed into the ether by electric displacement. This takes place along defined lines or curves which are called lines or curves of electro-static flux.

After ten minutes' application the patient is very

apt to volunteer the statement: "I feel so quiet and sleepy." When this condition exists it is an indication for ending the seance. In my office I am in the habit of having such patients lie down or rest before leaving for their homes, and if they feel inclined to sleep encourage them to do so. Upon examination such a patient's skin will be found warm, moist in the palms of the hands, the temperature which before treatment was subnormal raised more nearly to normal, the pulse either raised or lowered, as it was slow or rapid before, but invariably with improved volume while a sense of general well-being is experienced. This beneficent influence may persist for an hour, even less, or it may last until the next day, seldom longer after a first treatment.

Rarely do I allow such patients to talk during the time of administration, and for that reason I prefer to use an electrode connected permanently with the stand, rather than one in the hands of the operator. One need only bear in mind the pathologic condition, the nature of the agent being used and what it does within the tissues, to appreciate the necessity of perfect quiet and relaxation in order to secure the best results. Work, as we have seen, is being done. Nerve cells must participate in the activity, whatever its ultimate nature, and by reason of this activity, energy is given them with corresponding ability to perform healthful functions. This should be expended in that direction and not in an effort at cerebration or muscular movement. Such effort can be made judiciously later on.

There should always follow the treatment a sense of "glow" or warmth, and a feeling of well-being. The vaso-motor nerves are stimulated, the cutaneous vessels dilated and activity of the skin established. No treatment should be persisted in when this reaction takes place. The perspiration appears first upon the palms of the hands, then upon the forehead, upper lip and finally, with the use of the disruptive discharge, all over the entire body.

In rare instances it happens that instead of the desired reaction of cutaneous vaso-motor dilatation a vaso-constriction is established with contraction of the peripheral vessels, goose-flesh and coldness of skin; the surface is pale, the patient chilly and mentally irritable, uneasy and apprehensive, indicating that the blood vessels of the brain are also in a state of contraction. Continuous treatments may abate this condition, but I have known it to persist to the extent that it seemed best to terminate the sitting, leaving the patient apparently unbenefited. This state of affairs is most commonly observable in neurasthenics. The best way to avoid it is to begin treatment very gently by aid of a mild convective discharge or "spray," and later on in the same sitting to use a stronger convective discharge or the "needle spray." This class of patients do not do so well under the disruptive discharge until the nutritional change has been established. If good reaction follows the use of the "needle spray," they may be gradually accustomed to Franklinization by means of the disruptive discharge or "spark" applied preferably to the spine at the first sittings.

It is common for neurasthenics, after the first treatment by the disruptive discharge, to experience an overpowering sense of lassitude and sometimes extreme muscular soreness. This is no doubt due to the release of degenerated and toxic substances.

Two classes of cases are appended. The first from 1

⁴ Houston and Kennelly: Electricity in Electro-Therapeutics.

to 16 are dispensary patients for whom change in environments, food, habits, etc., was not made, and for whom no medication was used. The second, 1 to 8, are private or office patients for whom such medication was used as was indicated, as arsenic and iron, cascara sagrada in constipation and sodium bromid in the restless, sleepless and excitable cases. The action of Franklinism is to increase the activity of drugs and very small doses are used.

The nutritional improvement established is progressive and enduring. In my experience if overstrain of any sort induces a relapse, it is but a modification of the primary condition and disappears quickly under treatment.

One of the first results obtained from the judicious use of the Franklinic current is relief from insomnia. In five years I have not prescribed a hypnotic save on one occasion for a business man who could not take time to come for treatment. I am in the habit of giving 10 to 15 grains of sodium bromid three times daily for the first few weeks of treatment in order to prevent undue expenditure of the energy until such a time as the nutritional changes are established. In cases of obstinate insomnia among dispensary patients nothing is given or permitted save the general Franklinization with careful localization to the spine, especially the nape, and preferably with the frictional spark. The results in the latter class of cases have been good. It must be borne in mind, however, that the extremely nervous, restless and irritable type of neurasthenic patients, are more frequently met with in private than in dispensary practice.

The constipation from which neurasthenic patients in common with many others suffer is almost invariably relieved by the Franklinic treatment; the relief resulting in consequence of improved nutrition. The nutrition of the whole can not be established without the nutrition of a part. Disease is arrested, modified or cured by curing the patient.

In conclusion permit me to repeat that the grand function of Franklinization is to improve and restore nutrition not only of a part but of the whole, a function which indicates a usefulness as wide as the domain of medicine. By reason of this function Franklinization is a means of inestimable value in the treatment of neurasthenia.

DISPENSARY CASES.

Case 1.—O. F. B., male; age 56, physician, March 23, 1892. Cerebrasthenia with insomnia. Duration two years. Insomnia most marked symptom; resorted to 10 grains of sulfonal from one to four times weekly. Sleep obtained much broken, waking every hour or two. Nutrition poor.

Treatment: Franklinic current, positive insulation, frictional sparks to spine, localized to nape (insomnia), needle spray to head. Ten treatments given, extending over three weeks. The night after first treatment had seven hours of uninterrupted sleep. Improvement continued, characterized by marked nutritional gain, improved appetite and sound, refreshing sleep.

Case 2.—T. C., male; age 42; single; clergyman; June 8, 1892. Neurasthenia, cerebro spinal. Four years' duration. Insomnia; occasional frontal headache; languid and distressed, easily moved to tears; appetite fair, distress and acid eructations after eating; flatulence; bowels regular. Excessively thin.

Treatment: Franklinic current, positive insulation, needle spray to general surface, frictional sparks to spine and epigastrium. First treatment badly borne, inducing a fit of weeping. Three treatments given, extending over two weeks. Interval between the first two, twelve days. The night after the first treatment patient slept well, also the following night, and felt better during the interval. Sparks were better borne at third visit and patient expressed himself as feeling light and buoy-

ant in consequence of the treatment. The patient made a good convalescence.

Case 3.—R. D., male; age 29; designer; Sept. 23, 1892. Neurasthenia. Duration one year. Unable to sleep until 3 o'clock in the morning; irritable and inclined to be morbid. Spine-ache, cervical, dorsal and lumbar. Appetite fair; tongue coated; digestion impaired; bowels regular. Weight 125 pounds.

Treatment: Franklinic current, positive insulation, long percussive sparks to spine and general surface, to epigastrium, also long and frictional to nape. Forty-two treatments given, extending over six months. Immediate results from first treatment; less nervous and a more buoyant feeling. At second visit reported that he was sleeping better. At end of two weeks less depressed; sleep improved, also appetite. At end of third week had gained three pounds, at end of fifth week four pounds, and at end of three and a half months seven pounds. Continued his work during treatment. Discharged, recovered.

Case 4.—W. A. J., male; age 57; married; hotel keeper; July 5, 1893. Neurasthenia. Extreme nervous shock following an accident twenty-five years prior to admission. Not well since. Complained of loss of power in left arm and hand. Pain from occiput down to lumbar enlargement; no spinal lesion. Sleeplessness.

Treatment: Franklinic current, positive insulation, long percussive sparks to entire surface of body, localized to spine and affected arm. Returned for second treatment July 7, 1893, when he complained that it had made him worse; said he felt sore and tired all over, as though beaten, but that he had slept all the previous night and again during the entire morning. This case is reported simply to indicate the necessity for a more gentle application to a neurasthenic patient at first.

Case 5.—N. C. M., female; age 27; single; saleswoman; Dec. 9, 1891. Neurasthenia with hysterical symptoms. Not well for eight years. Contracted gonorrhea eight years prior to admission; acute attack three weeks' duration; abscess in groin, opened externally; six months later pregnant, abortion procured at two months; four years ago pelvic trouble; irritable bladder from that time. In August last, gave birth to a living child; less well since. On admission headache; back-ache, especially lumbar and sacral, pain in right groin and dragging sensation; marked irritability of the bladder; capricious appetite; distress and heaviness after eating; constipated bowels; extremely nervous; sleepless, depressed and hysterical. Tenderness on pressure over spine, entire length. Uterus normal; ovaries neither enlarged nor sensitive; sensitiveness on pressure over fundus of bladder; general nutrition fairly good.

Treatment: Franklinic current, positive insulation, long percussive sparks to spine, localized to nape, lumbar and sacral plexuses, hepatic area and abdominal walls and entire general surface. Sixty-six treatments given, extending over eleven months. At fourth visit, sleeping better; slight improvement in digestion. Improvement slow, marked by many relapses into former condition. Eventually, however, a marked improvement in general health was noted, with increased strength, lessened nervous irritability, better self control; regular bowels; diminished pelvic discomfort. June 10, 1892, went into the country for two months. Seven applications were given after her return, when she discontinued her visits in better health than she had been for many years.

Case 6.—C. R., male; age 32, married; carpenter; Feb. 8, 1893. Neurasthenia, with hypochondric symptoms. Duration two years. First noticed sense of pressure across chest; unable to breathe freely; breathless upon exertion. Past year difficulty of breathing, nervous, pain at back of neck, and entire length of spine; appetite fair; distress after eating; bowels regular; occasional frontal headache; depressed and self-centered; unable to work with any regularity; circulation poor; all organs interrogated, but no lesion discoverable.

Treatment: Franklinic current, positive insulation, long percussive and frictional sparks to spine and general surface, localized to nape and to epigastrium. Eight treatments were given extending over one month. At second visit felt much better. At fifth visit circulation much improved. At seventh visit improvement much more marked; no depression; "catch" in back gone, also difficulty in breathing; no epigastric heaviness. One more treatment given and patient discharged, recovered.

Case 7.—J. R., male; age 29; married; butcher; March 24, 1893. Sexual neurasthenia. Not well for a year and a half. Morbid, depressed and self-centered. Twitching movement, first in left shoulder, then in right, then in back of neck, then in eyes. No trouble when quiet and not at work. Unable to "fix his mind" on anything; general health fair; appetite

good; bowels regular; sense of numbness front of thighs; knee-jerk normal. History of gonorrhea before marriage. Sexual excesses since.

Treatment: Franklinic current, positive insulation, long percussive sparks to spine and general surface, localized to lumbar and sacral plexuses, anterior surface of thighs, and with director electrode to perineum from anus to scrotum. At third visit reported much better after second treatment, with diminution of distressing sensations. At fourth visit less dejected, felt stronger. At fifth visit no muscular twitchings. Eight treatments given extending over one month and at last visit, April 24, 1893, could fix his mind on what he read or was doing; no muscular twitching, no distressing symptoms, skin clearer; expression bright and hopeful.

Case 8.—S. F., male; age 29; single; brass-polisher; July 10, 1891. Sexual neurasthenia; masturbation, nocturnal emissions, pain in back, lumbar and sacral; headache; appetite good; digestion fair; complexion muddy; anemic; heart irregular; no murmur, palpitation; sleepless.

Treatment: Franklinic current, positive insulation, long percussive sparks to spine and general surface, localized to nape, lumbar and sacral plexus, and with director electrode to perineum from anus to scrotum. Nineteen treatments given extending over four months. An interval of twelve days between first and second treatments; sleeping better; no emissions. Improvement continued, and on Nov. 16, 1891, visits discontinued, general health improved, sleeping well, relieved of pain in back and head. Second admission Sept. 1, 1893; well for one year after treatment. On admission, pain in back, lumbar and sacral—also in right sciatic; tenderness on pressure at sciatic notch, middle of thigh, popliteal space, in knee, calf of leg and ankle; sensation as though asleep; insomnia; nervous; badly nourished; bowels regular. Eight treatments given extending over seven weeks. Relief established at once and continued. Discontinued visits Oct. 20, 1893, recovered.

Case 9.—S. E., female; age 38; widow; seamstress; Sept. 6, 1893. Neurasthenia; three years duration; nervous, easily depressed; morbid fears; backache—sacral. Sleep broken, bad dreams; buzzing noise in left ear; afraid of dying; appetite good, gaseous eructations; bowels regular; weight 110½ pounds.

Treatment: Franklinic current, positive insulation, needle spray to head and general surface for fifteen minutes with a few long percussive sparks to spine. Spray used at first to establish confidence. Nine treatments given extending over six weeks. At second visit looked brighter. At third visit patient said she was better. At fifth visit less depressed. Able to come to clinic alone. Weight 113½ pounds, gain 2¾ pounds. Digestion improved; daily movements; and on Oct. 20, 1893, patient discontinued visits. Improved.

Case 10.—B. T., female; age 20; single; reader; April 16, 1894. Neurasthenia; "irritable spine for eight years;" tenderness on pressure in dorsal spine especially about midway. Tired aching feeling in muscles of neck and shoulders; pain extended down both arms; legs and arms felt as though asleep; worse at night, sleepless and restless; depressed, badly nourished; gaseous eructations; irregular bowels.

Treatment: Franklinic current, positive insulation, long percussive sparks to spine and general surface localized to sensitive area in spine, muscles of neck, shoulders and arms. Sixteen treatments given extending over twelve weeks. Relief from first treatment lasted three and a half hours. Nutritional gain established; relief from pain, aching and weariness; bowels regular; sleeping well; no depression. Recovered.

Case 11.—M. K., female; age 26; nurse; April 8, 1895. Neurasthenia; duration six months; extremely nervous; weak; palpitation; gaseous eructations; bowels regular; amenorrhea for two months; pain in left ovarian region; general sense of exhaustion; distressing dreams; backache; poor circulation; irritable cough. Sensitiveness on pressure at lumbar spine. Mucous membrane anemic; heart and lungs normal.

Treatment: Franklinic current, positive insulation spray to entire general surface over a period of three weeks. Immediate result from first treatment; slept better; after fifth treatment felt very well; appetite good. To the sixth and seventh treatments were added long percussive sparks to entire general surface, localized to spine, lumbar and sacral plexuses and abdominal walls. Recovered. April 8, 1896, patient has kept well during the year and able to work.

Case 12.—K. L., female; age 29; married; April 19, 1895. Neurasthenia. Pain and weariness at back of neck; insomnia; headaches; nausea and occasional vomiting; hysteric attacks; neuralgic pains; prolapsed ovary removed two years since; less pain since operation; laceration of the cervix uteri.

Treatment: Franklinic current, positive insulation, spray to

entire general surface for fifteen minutes, localized to spine and ovarian region. Three treatments given extending over a period of two weeks; to the third treatment was added long percussive sparks localized to lumbar and sacral plexuses, hepatic area and abdominal walls. With the first treatment, relief from constipation; head better; improved.

Case 13.—J. F. L., male; age 31 years; married; Sept. 6, 1895. Sexual neurasthenia with impotence. Twelve years ago gonorrhea, followed by stricture. Constant irritation of prostate; frequent urination; deficient muscular power; anemic; voracious appetite; bowels regular; drinks and smokes to excess; depressed; morbid fears; easily fatigued. Genito-urinary organs normal.

Treatment: Franklinic current, negative insulation, long percussive sparks to entire general surface, localized to spine and with director electrode to perineum. Three treatments given extending over a period of six weeks; improved.

Case 14.—N. female; age 41 years; widow; thirteen children; Sept. 20, 1895. Neurasthenia; depressed; introspective; tired in the morning; throbbing pain under right scapula and precordia; dizziness; bowels regular; heavy feeling in epigastrium after eating; pain and tenderness in knees; very nervous; sharp pain in left side during last menstruation; weariness and aching and a sense of weakness in cervical region extending into arms; anemic.

Treatment: Franklinic current, negative insulation, spray to entire general surface for five minutes, followed by long percussive sparks to spine, hepatic area, abdominal walls, epigastrium and extremities. Fifteen treatments were given extending over a period of two and one-half months with marked improvement from the first; pain in shoulder and knee relieved; marked nutritional gain; improved circulation; increase in weight and disappearance of symptoms.

Case 15.—M. F., male; age 41 years; married; farmer; Sept. 15, 1895. Neurasthenia; morbid fears and depressed. Eight years since had gonorrhea. No symptoms except dragging sensation in perineum and testicles. No lesion other than a perineal eczema.

Treatment: Franklinic current, negative insulation, long percussive sparks to entire general surface, localized to spine, especially to lumbar and sacral plexuses also with director electrode to perineum. Twelve treatments given extending over nine and one-half weeks; after second treatment less discomfort. Disappearance of depression, morbid fears and tendency to introspection. Recovered.

Case 16.—J. P., male; age 25; single; wire weaver. Oct. 11, 1895. Neurasthenia, sexual with impotence. Duration four years; weak feeling; short breath on exertion; has had gonorrhea; painful micturition, irregular in quantity; impaired vision; falling of hair; seminal emissions two or three times a week and no muscular power; varicose veins of scrotum; morbid fears, depressed; introspection.

Treatment: Franklinic current, negative insulation, long percussive sparks to entire general surface localized to spine, especially lumbar and sacral plexuses and with director electrode to perineum. Nine treatments given extending over a period of eighteen days. Recovered.

Case 17.—C. W., male; age 29 years; married; laborer; Oct. 24, 1895. Sexual neurasthenia. Five years ago sexual indulgence excessive; for last four years mucous discharge from urethra; last six months backache; headache constantly for last two months. For one year sexual desire diminished; tired and drowsy on rising; forgetful and despondent; bowels constipated.

Urine analysis: Specific gravity 1012; granular casts; urea 1.2 per cent.; acid reaction.

Treatment: Franklinic current, negative insulation, long percussive sparks to entire general surface, localized to spine, especially to lumbar and sacral plexuses, hepatic area and abdominal walls and with director electrode to perineum. Four treatments extending over a period of one week; relief from pain in back; stronger. Urine analysis, specific gravity 1024; acid; no casts. Urea 2.4 per cent.

OFFICE CASES.

Case 1.—A. H., March 12, 1895; age 51; widow; superintendent of hospital. Neurasthenia; duration four years; menopause at 49; anorexia; nausea and vomiting; flatulence; constipation alternating with diarrhea; headache; spine aching; cervical and dorsal; insomnia; nervous and depressed.

Treatment: Franklinic current, positive insulation, needle spray to entire general surface, localized to spine and epigastrium for fifteen minutes. Twenty treatments given extending over a period of one and one-half months. To the sixth and following treatments were added long percussive sparks to spine, nerve trunks and distribution. April 22, 1896. This

patient has been actively at work during the past year and reports to me under present date that she is well.

Case 2.—Mr. H.; Feb. 14, 1895; age 40. Neurasthenia; duration two years; morbid; depressed; nervous and melancholy; insomnia; anorexia; impaired digestion; constipation; thin; impaired strength.

Treatment: Franklinic current, negative insulation, needle spray with crown electrode for ten minutes and long percussive sparks to entire general surface; twenty treatments given extending over a period of two months. After the first treatment no change; looked cold, wan and apprehensive; reaction not good. The disruptive discharge badly borne and discontinued; second treatment needle spray to entire general surface for fifteen minutes; to third treatment added frictional sparks localized to spine from nape to lumbar enlargement for two minutes. At tenth treatment long percussive sparks given. Patient did not sleep so well. No doubt over-stimulated by the action of the sparks, but as in my judgment the time had come when the disruptive discharge was indicated I persisted in the use of long percussive sparks to the entire general surface localized to spine, especially nape, lumbar and sacral plexuses, hepatic area and abdominal walls. Marked and continued improvement; April 9, almost complete disappearance of symptoms; sound and refreshing sleep; good appetite; good color; increased strength; less nervous; bowels regular; slight gain in weight.

Case 3.—Mr. J. B. H.; March 19, 1895; age 48. Neurasthenia. Within the last ten or fifteen years has broken down several times from over-strain; two days since felt worse than usual, took a drink of whisky, went out, fell down, got up and wandered about, knowing nothing of his whereabouts. Not an intemperate man. Congestive condition at base of brain; sense of fullness in left ear and on left side with inability to move head around quickly without pain; vertigo, sometimes falls; when walking sense of falling; two years ago marked weakness of left side amounting to paresis for twenty-four hours; gradually improved; marked tremor of right arm and hand; insomnia; exaggerated mental activity; knee-jerk slightly diminished; general health good; some backache, lumbar and sacral; is obliged to consider his coordination, pupils respond to light and to accommodation; far sighted.

Treatment: Franklinic current, positive insulation, needle spray for fifteen minutes, followed by long percussive sparks to entire general surface, localized to spine, from occiput to lumbar and sacral plexuses, sciatic nerves and distribution; frictional spark to nape. Treatment induced free perspiration followed by relief from pressure at base of brain. Twenty-two treatments given extending over a period of six weeks. Improvement with first treatment; improvement continuous, and after one month relieved of former symptoms and better than before the acute attack in March. May 29, recovered.

April 22, 1896, patient has been well during the year.

Case 4.—J. W. P. Oct. 26, 1893. Male; age 41; single; teacher; neurasthenia with hypochondriac symptoms. Duration two years; sense of dizziness at first not localized, now occipital; pressure, sub-occipital; numbness, creeping in left side, arm, leg and side of body; sometimes on right side but not to such an extent as on left; intolerable sleepiness in the afternoon with slight rise of temperature; queer feeling in head relieved by counter pressure; darting pain in course of spinal accessory nerves, increased by excitement; constant consciousness of a feeling as though force pump sending blood down heels; excessively nervous; sensation of "lump" midway dorsal spine; feels suddenly now and then a touch here and there, sometimes hot and cold, then gone; sees double disks at times which coalesce; eyes astigmatic; sleeps very well, except when under excitement; dreams; profoundly depressed; great nervous irritability; morbid fears, thinks he will become insane; appetite good, gaseous eructations; no heaviness; bowels regular; knee jerk normal; stands and walks well; no incoordination; pupils respond to light and accommodation; palpitation on effort or with emotion.

Treatment: Franklinic current, positive insulation, needle spray for fifteen minutes, followed by long percussive sparks to entire general surface, localized to spine especially nape for five minutes. Forty treatments given extending over a period of six months and twelve days. Following first treatment relief of discomfort in head which lasted nine hours. November 21 no longer thinks of becoming insane; amelioration of pain in back of neck. Subsequently slight exacerbation due to an attack of "grippe." After recovery from "grippe" improvement continued; floor and ground do not wave under him; eyes accommodate better. April 29: Improvement established has been maintained during the past two years and a half; no return to former conditions.

Case 5.—D. I. P. Dec. 12, 1892. Female; age 36; married.

Seven years since acute nerve exhaustion; since then backache, sacral; irritable bladder; leucorrhea; appetite capricious; nausea; distress and heaviness in stomach; flatulence, intestinal; constipation; hemorrhoids; headache, neurasthenic helmet and sub-occipital; sensitiveness to noise; emotional, easily moved to tears; profound depression; confusion; weariness in head; possessed of fear all the time; afraid to go out alone; thin, pale. Examination: immense cluster of hemorrhoids, external, largest size of walnut, ulcerated; half a dozen smaller ones; lacerated cervix; endometritis; hyperplasia; anemia; heart and lungs normal. *Treatment:* Franklinic current, positive insulation, spray to entire general surface with a few sparks to spine at first. Subsequently long percussive sparks to entire general surface, and frictional sparks to spine. Fifty-one treatments given extending over a period of six months and fifteen days; after nine days no depression; no headache; nervous fears very much less; appetite better; bowels acting better; from Dec. 12, 1892 to Jan. 5, 1893 gained three and one-third pounds; passed first menstrual period without local pain; sense of pressure and pain in varicose veins of right leg, usually exaggerated at menstrual period, markedly less. After one month's treatment she came alone to the office, first time she had gone out without some member of the family in six years; continued to improve so far as neurasthenic condition concerned notwithstanding the fact that she was absent from regular treatment from January 18 to February 20, during which time I operated on hemorrhoids. By the middle of March able to work and assume the care and responsibility of her family; May 9, normal movements for past ten days, before no action without medicine. After symptomatic relief was established in consequence of the nutritive changes set up by general Franklinization, uterine treatment was given with the continuous and induced currents according to indications. Recovered. October 1894, returned with nervous symptoms due to fright and excitement. After two week's treatment restored to former condition.

Case 6.—S. V. A., Oct. 5, 1895. Female; age 48; teacher; neurasthenia; duration fourteen years, broken down at that time; rested one year; menopause five years since; better at times; appetite fair; no indigestion; bowels regular; pain back of neck extends at times over head; occasional supra-orbital pain; insomnia; extreme nervous irritability; pricking sensation all over, especially calves of legs; morbid and unreasonable over little things; feels like crying; bronchial irritation with cough; post-nasal discharge; slightly deaf; anemic.

Treatment: Franklinic current, positive insulation, spray to entire general surface for ten minutes, frictional sparks to spine, especially nape. Fourteen treatments given extending over a period of one month and four days; felt better from first treatment. Treatment suspended for a month or two; recommenced and continued once a week to date. Marked nutritional improvement; able to keep at work all winter. Relief from all distressing nervous and mental symptoms.

Case 7.—R. W. May 2, 1895. Female; single; neurasthenia with hysterical symptoms. Duration nine years; eight years since both ovaries and tubes removed; history of abscess since operation, discharged per rectum, pus, no blood; occasional backache; intestinal flatulence; constipation; during winter acute attack of stomach and intestinal indigestion; tired head; sensitiveness on pressure over cervical and lumbar vertebrae; paresis of facial muscles in October; insomnia; depressed; nervous; irritable; self-centered; excessively thin; worn and ill looking; worse in the morning.

Treatment: Franklinic current, positive insulation, needle spray to entire general surface, localized to spine and right sciatic. Thirty-six treatments given extending over a period of two months. After a week improved sleep; bowels more regular. To eighth treatment added long percussive sparks to spine, lumbar and sacral plexuses, sciatic nerves and distribution, to epigastrium and abdominal walls. Improvement continued; gained eighteen pounds under treatment.

Case 8.—A. H. W. March 16, 1893. Female; married; age 34. Neurasthenia. Not well since first confinement eight years ago; unable to stand; conscious of pelvic organs; bearing down; veins of both legs, anterior surface, enlarged. February 1891, operation on cervix and perineum. Backache constant, vesical pain; leucorrhea, increased by exertion or undue fatigue; post-menstrual exhaustion; headache; fullness of head; pressure at nape; distress in spine, especially dorsal; insomnia; nervous and excitable; irritable; despondent; appetite capricious; flatulence, gastric; constipation; anemia; circulation poor; appearance of faulty elimination.

Treatment: Franklinic current, positive insulation, spray to entire general surface for ten minutes, sparks to spine. At subsequent treatments long percussive to entire general surface localized to spine. Forty-five treatments given extending

over a period of four months; marked improvement from the outset. After two months walked one and one-half miles and took a bicycle lesson of twenty minutes without fatigue; no backache save when over-fatigued; appetite good; bowels regular. Recovered. June 28, 1894, confined.

April, 1895, operation, curettement and trachelorrhaphy. May 9, 1895, came under writer's care again. Incomplete union at site of highest stitch right side of cervix; perineum extremely sensitive; pelvic congestion; vaginal walls relaxed; anterior wall prolapsed; constant sense of discomfort, bowels constipated; liver inactive; skin sallow and pigmented.

Treatment: Franklinic current, positive insulation, needle spray to entire general surface, localized to spine for twenty minutes. Eleven treatments given extending over a period of one month and three days with disappearance of symptoms, as well as improved local conditions.

HOMICIDE IN THE UNITED STATES.

Read before the American Academy of Medicine.

BY PAUL BARTHOLOW, B.A., M.D.

PHILADELPHIA.

Murders are of very great frequency in this country. The number reported last year was 10,500, an enormous figure! We might, if there were not some reasons against it, take this number as the annual average, which in most countries is a fairly constant quantity. But here, owing to some conditions that I shall endeavor to particularize, the amount of homicide in any year, taken as a standard, does not give us the least reason for predicting that the succeeding year will be marked by a similar number of murders, neither many more nor less. In 1885, for instance, the homicides reported numbered 1,808; in 1890, 4,290; in 1894, 9,800, and I have just mentioned 10,500 in 1895. That is to say, there was nearly six times as much homicidal crime reported last year as in 1885, an increase almost in arithmetical ratio. In a word, the population loses every year from murder as much as from a battle or a plague. Such an amazing development of murder has never before been observed in any other country. There must be some especial cause or causes at work to produce such a result, but, before entering upon a discussion of these, let us undertake a comparative view of the above figures. We shall thus be enabled fully to appreciate their gravity. Let us take as affording a sufficiently vivid comparison, the amount of homicide perpetrated in war. The total killed in battle on the Federal side during the late war was in round numbers 49,000 (Medical and Surgical History of the Rebellion). That is an annual average of little more than 10,000 (the time being a period of nearly five years), or about the same as the total number of homicides reported last year. During the Franco-Prussian war of 1870, the Germans lost in battle 17,500 men, a figure that sinks into insignificance beside our total of homicidal crime, for the conditions favoring homicide in war are or ought to be vastly greater than the conditions favoring it in peace. (Oettingen, *die Moralstatistik*, p. 729.)

Again, let us compare last year's total of murders with the annual average of other countries. In order to make this comparison as absolutely true as possible, I shall adopt the method of estimating the total amount of murder during any given period, recommended by Bosco, who has studied this subject with the greatest care. In his own words, his method is described as follows: "As the composition of the population, with respect to age, varies in different countries, and as it has to be remembered that all the population under ten years of age has no share, at

least under normal conditions, in the crime of murder, it has seemed to me a more exact method to calculate the proportion of murders to the inhabitants who are over ten years of age than to include the total population." (Quoted by Morrison: *Crime and its Causes*, p. 30.) I may mention here that with respect to this country, such a method of calculation is extremely difficult. The composition of the population varies greatly; in some States there is undoubtedly a preponderance of adults; in others, on the other hand, the proportion of children under 10 years of age is probably very high, in such regions as Pennsylvania and New York, for instance, where the birth rate is respectable and the casualties, inevitable amid such enormous trade and manufacture, are great and compose very material losses of adult population, we have powerful causes tending to raise the proportion of children under 10. It might be supposed that immigration, including chiefly adult males, would neutralize this result. Doubtless it does modify the proportion of children to adults, but not, I think, to any great extent. In fact, considering the high birth rate in those sections that receive the most immigration, and considering, too, that the rate throughout the country is normal, I think we shall not be far wrong in supposing that the proportion of children under 10 years of age is as great here as in England or Germany. Supposing then the population of the United States at the present day to be 65,622,000, which is reached by calculating the excess of births over deaths and the amount of immigration since the last census, when the population was put at about sixty-two millions, and taking off 20 per cent. of the whole as representing the population under 10 years, we ought to get the total population which under normal conditions, as Dr. Bosco puts it, might be physically able to commit murder. The total thus calculated is 52,478,000. Taking last year's number of homicides, and calculating the rate per 100,000 of population we get the high proportion of 20. Comparing this rate with the rate in other countries, according to Bosco's tables, we find that homicide is a fourth higher here than in Italy, nearly twice that of Spain, nearly five times that of Austria, nine times that of France, nearly twenty times that of England, Scotland or Germany. All this is bad enough. In order, however, to bring this high rate into greater relief, let us compare it with the rate in India. We have, as Mr. Morrison tells us, excellent statistics of Indian crime. It is, besides, a country that in point of size and severity of climate, resembles our own. We might, if it were not for some social prohibitive causes, expect a high rate of murder. But what is really the fact? In Mr. Morrison's words, "India stands to-day in the proud position of being more free from crimes against the person than the most civilized countries of Europe." Astonishing as it seems, India with its 185,000,000 of population over 10 years of age has an annual average of but 1,930 cases of homicide, scarcely one-fifth of the number last year in our population of 52,000,000! In other words, in India with its enormous population the rate of homicide per 100,000 of population is but 1.31, a percentage unmeasurably inferior to ours. Mr. Morrison ascribes this low rate of homicidal crime to the prohibitive influence of caste, but before undertaking a discussion of this subject, let us look at these figures from another point of view. The annual average of homicide in India is the whole number of cases