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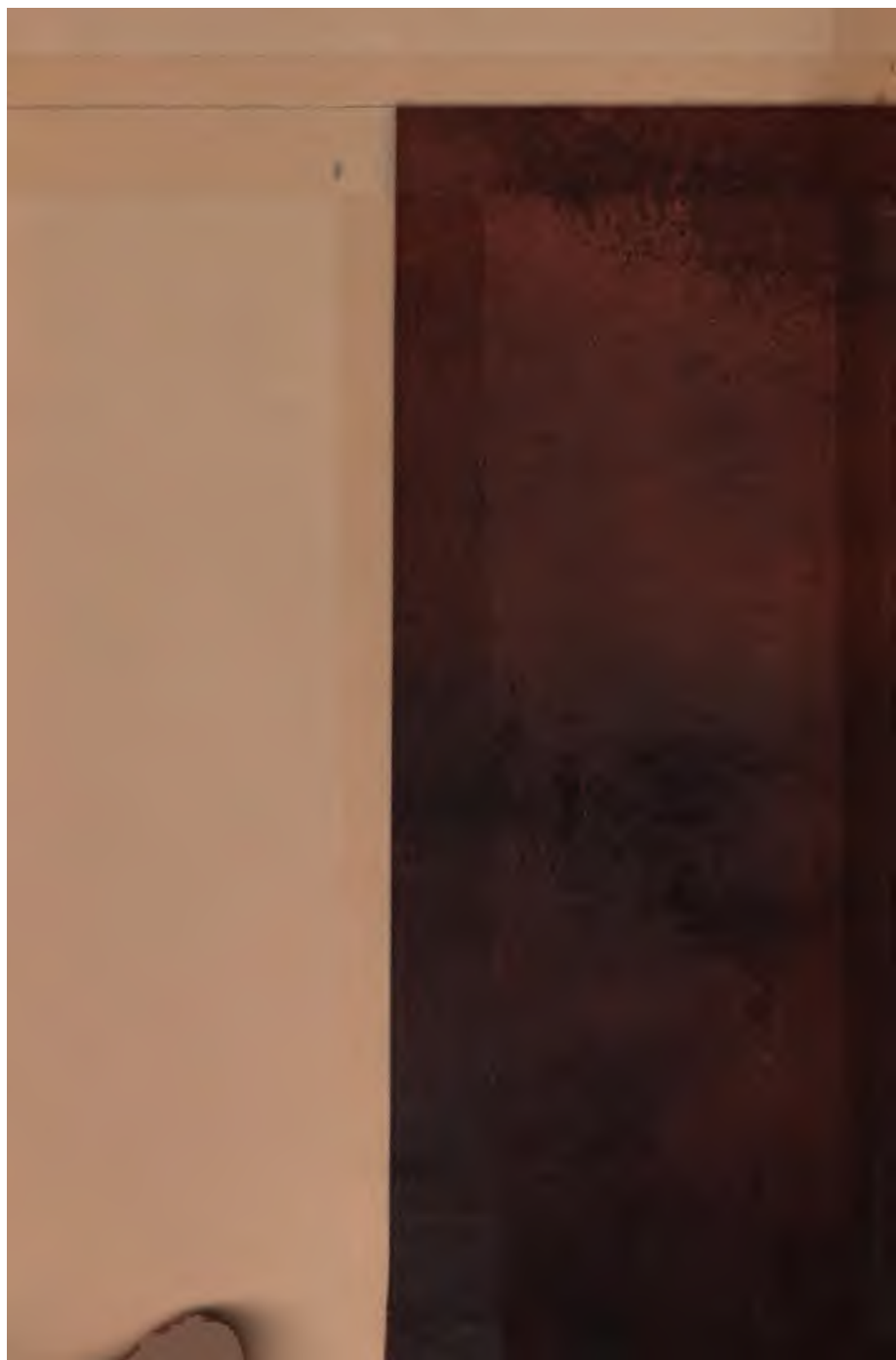
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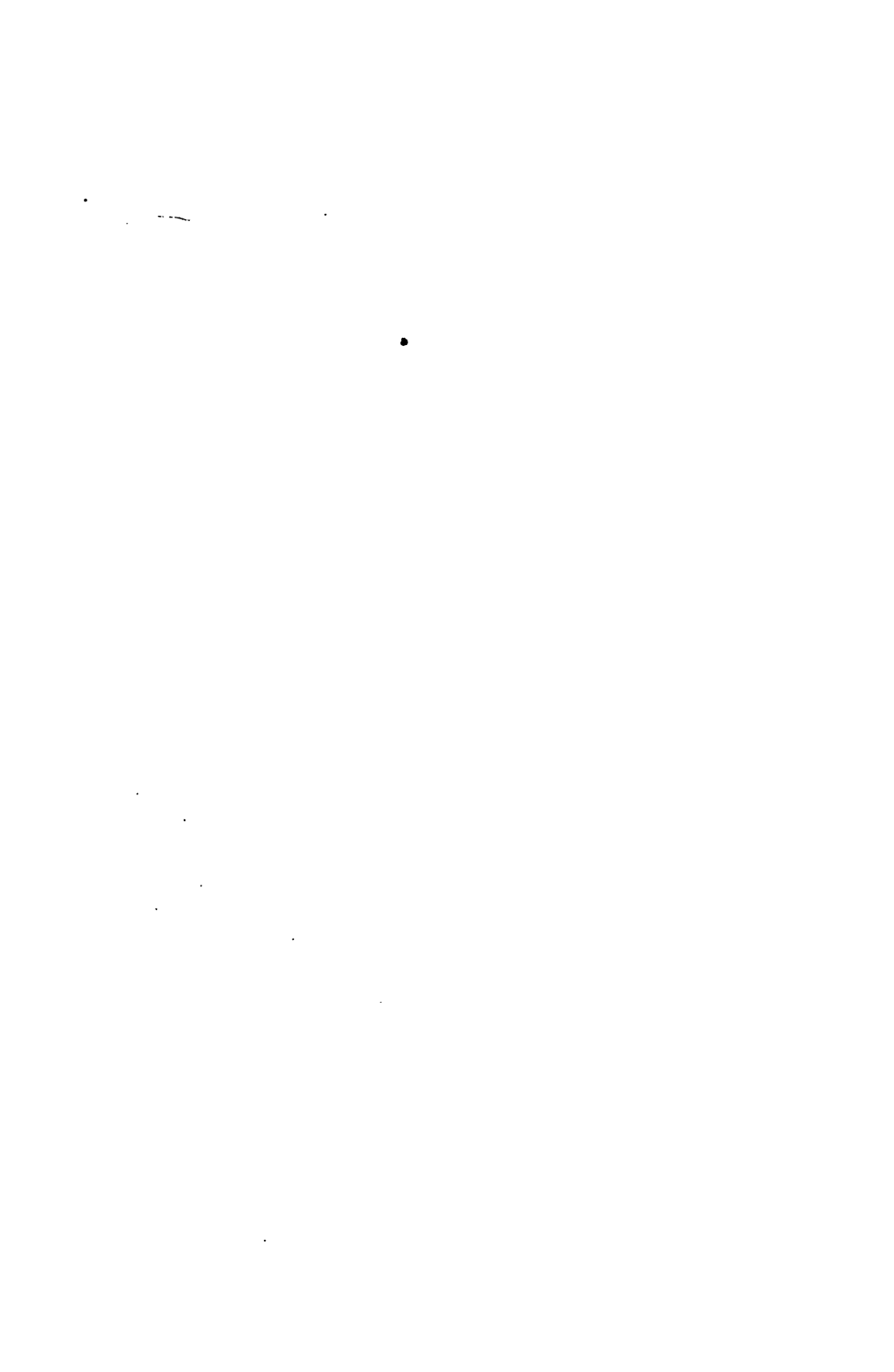
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ELECTRO- THERAPEUTICAL PRACTICE.

A READY REFERENCE GUIDE FOR PHYSICIANS IN THE
USE OF ELECTRICITY.

FIFTH EDITION.

REVISED, REWRITTEN AND GREATLY ENLARGED.

BY

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E. H. COLEGROVE & CO.

CHICAGO:

1898.

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PREFACE.

In presenting this little volume as an aid to the more rational use of electricity in the medical profession the author is not unmindful of the fact that much literature of a contradictory and confusing nature has been written and published.

In the present work, however, all superfluous verbiage has been discarded; no theories are advanced, no pathology given, and there is no war waged on the various writers and teachers of electro-therapy because of different views and theories held by them, but the aim of the writer has simply been to teach *plain facts* and *simple rules* for the guidance of the great mass of practitioners who, it is supposed, have learned theory and pathology from their text-books, but desire to use electricity in their practice principally as an adjunct to other therapeutic agents; it is not intended to convey the idea that electricity is a specific for the various pathological conditions mentioned in this work.

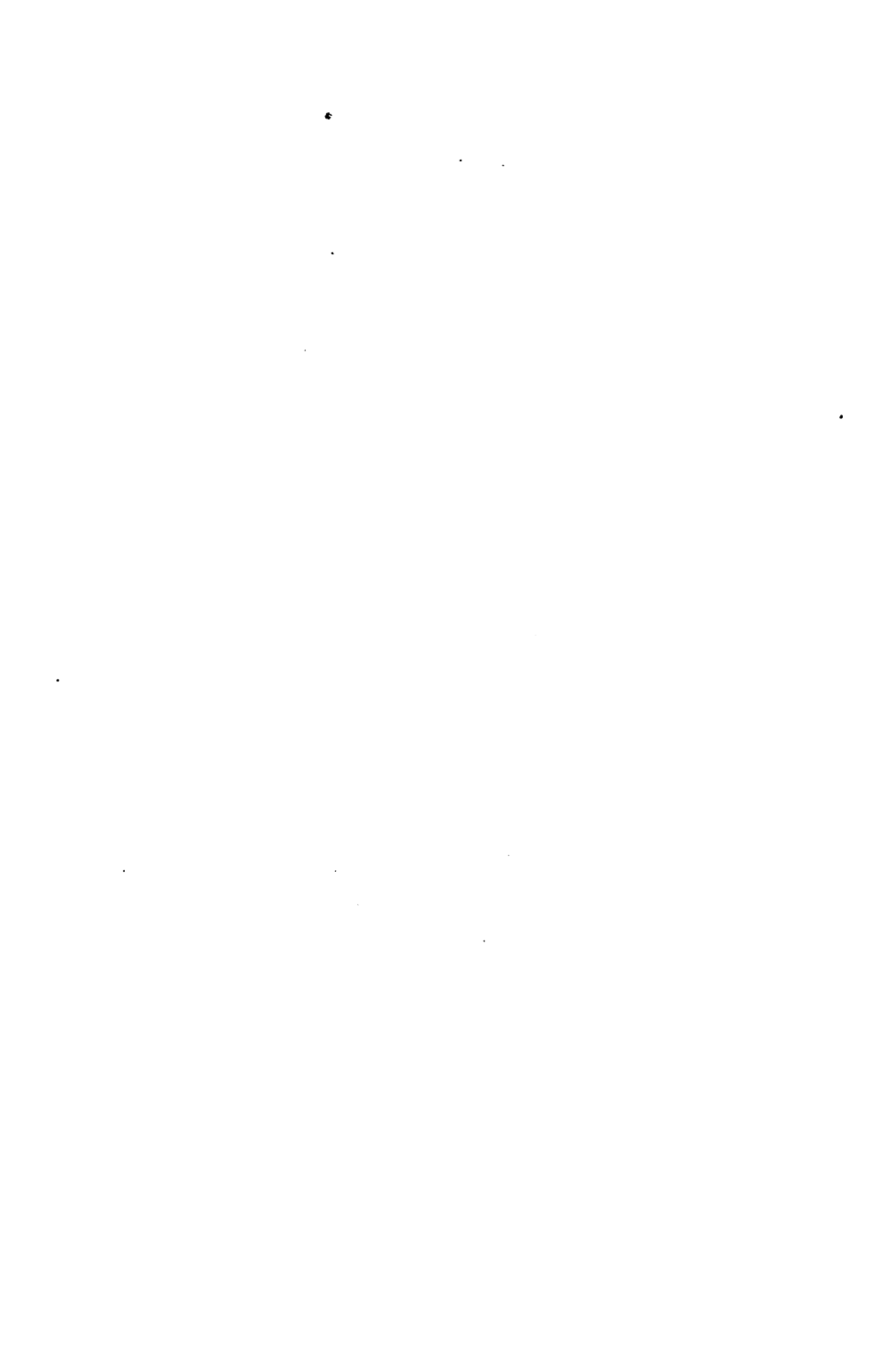
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PREFACE TO THE FIFTH EDITION.

“Life is too short for us to wade through enormous quantities of superfluous matter in order to get a small fund of information. For this reason the writer who can condense the crystallized expression of a good subject in the most complete way is the one most appreciated.”

In revising this work it is not the desire of the author to materially depart from the original intention of making it a condensed guide, but the additional chapters were considered necessary for the better understanding of the abbreviated matter contained in the original text. Ever since the first appearance of the book, nearly three years ago, the author has received numerous requests for such rudimentary physics as would enable physicians to get a better start in the study of electro-therapy, and that is his excuse for the elementary character of the additional matter contained in the present edition.

The rapid advance made in this branch of medicine has necessitated many changes in the technique of the other editions, and the physician is assured that although many of the operations herein given may, by observation on his part, be improved upon, he has the most recent ideas of leading electro-therapeutists.





CHAPTER I.

ELECTRICITY.

Electricity is a natural phenomenon, and the only way to accomplish results either physical or therapeutical is to observe closely and try to interpret the language in which nature speaks to us. It took years of patient study and work for Galvani and Volta to arrive at conclusions, the result of which has been a permanent benefit to mankind and made their names famous for all time; and although we have apparently made much advancement in late years in the application of electricity for the alleviation of many human ills, it yet remains, as it were, a sealed book.

The apathy of physicians in regard to electricity for therapeutical purposes is not being able to measure the results at a glance; they are too apt to expect something phenomenal which, in reality, has never been the case with any great therapeutic agent, and why they should expect it from electricity is another unexplained mystery. Brown-Sequard, Koch and others have furnished splendid examples for the observation of those who would benefit mankind by one great stride in the therapeutical world.

Physicians as well as the laity have been accustomed to surround everything pertaining to electricity with a mysteriousness and awe that have almost precluded its rational study from a standpoint of materiality, and it is a noticeable fact that just as soon as it loses its air of mystery and assumes the shape of something that can be handled, controlled and utilized, great progress is made in its study.

Let us compare electricity with some of the other forces with which we think we are familiar and see how closely they are related. The latest and most plausible theory regarding electricity is, that it is a mode of motion or other manifestation of a very exceptionable form of matter called *the ether*. Referring to some of the properties of this ether, Duff says:

(1) It permeates all bodies and pervades all known space, even to the most distant star.

(2) It is affected by the matter of bodies in which it is. It appears to be concentrated in it to an extent depending on the density of the matter. Ether thus bound differs from free ether in that it transmits short waves more slowly than long ones.

(3) It is continuous, not granular.

(4) Its density is to that of water as is unity to unity followed by twenty naughts (10^{20}), while its rigidity is one-billionth that of steel.

This ether then is electricity in a latent or passive state, but in order to convert it into energy it is necessary to destroy its equilibrium, and kinetic



energy is generated when it seeks to restore that lost equilibrium, much the same as water when raised above its level can be made to do work by the pressure it exerts, e. g., a mill race.

If we take a rubber tube open at both ends and immerse it in a lake the tube will be filled with water but we can do no work with it, although the tube is what we might call a *conductor*, because the water does not flow; but put a force pump at one end of the tube and cause a flow and the work that can be done will be in proportion to the pressure exerted by the pump.

A copper wire is strung up along the street on poles and although the wire is immersed, as it were, in electricity (ether) and is a good conductor of the same, we have no current or flow because the *electric level is not disturbed*; but put a force pump (dynamo) at one end of the line and we can do work in proportion to the *pressure* exerted by the dynamo, such as operating motors, electric lighting, etc.

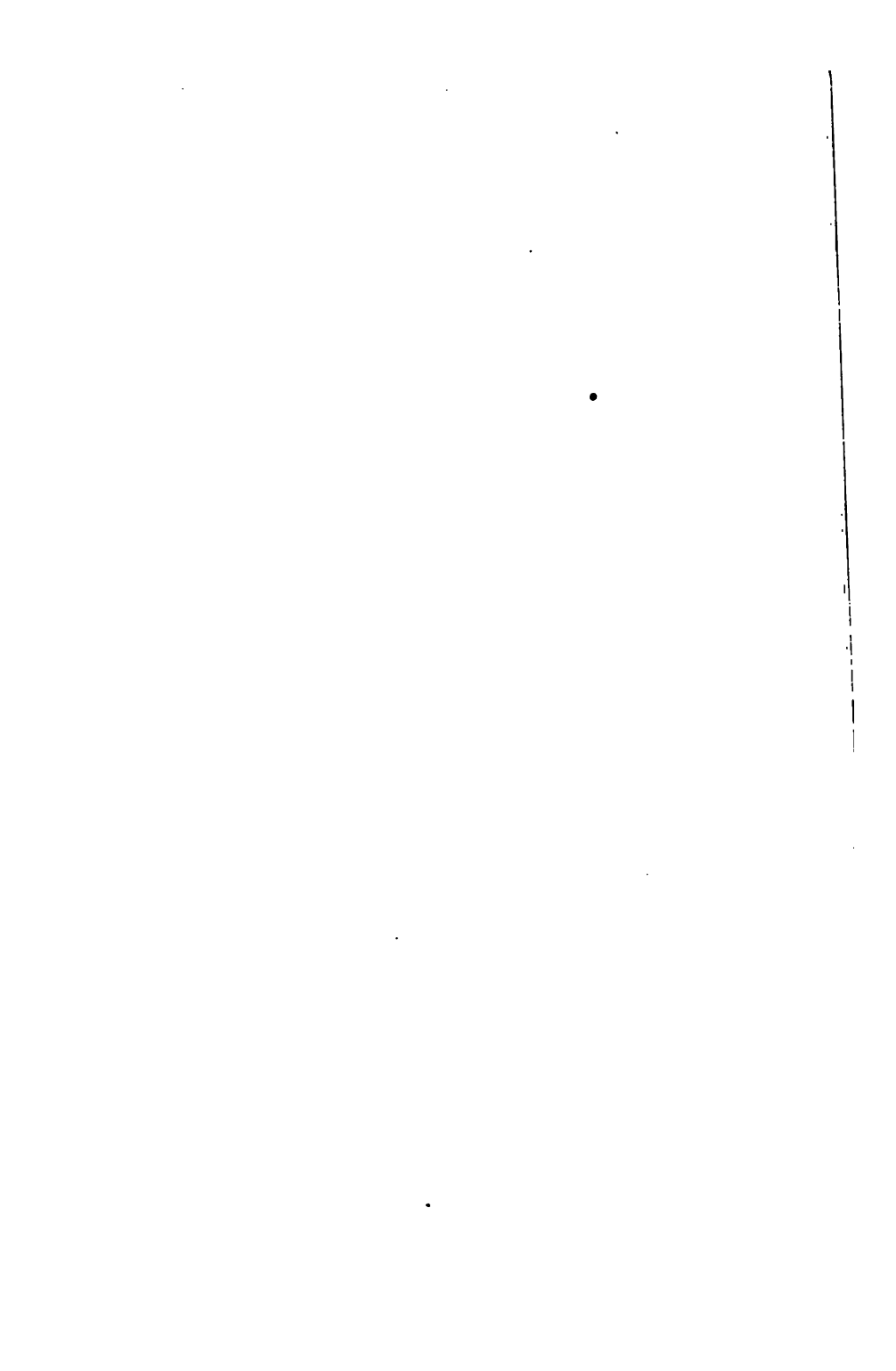
A battery then is merely a machine or instrument for keeping up a difference in electric level and thereby causing a current of electricity to flow.

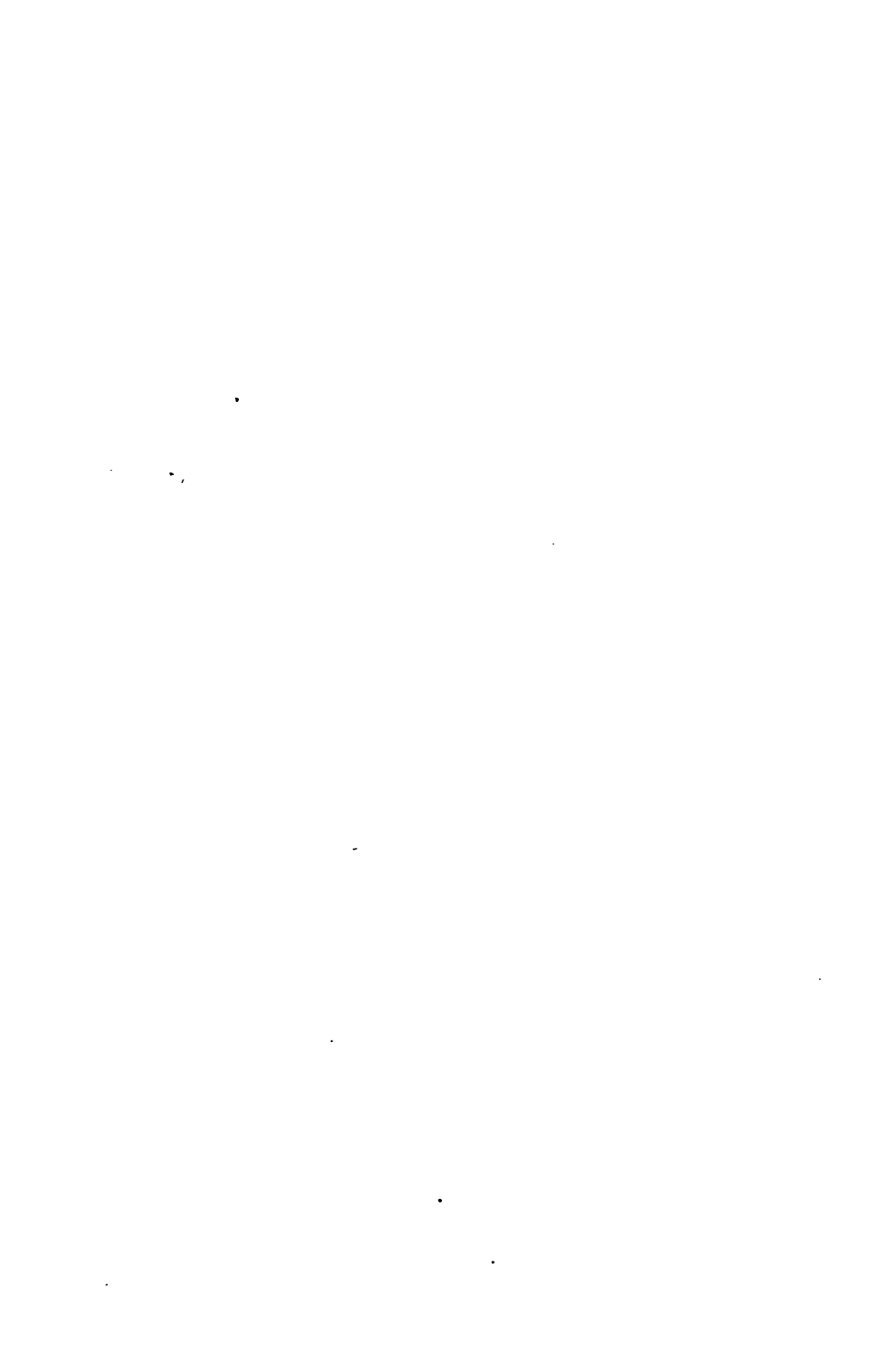
Light is only a transverse vibration of this same ether, the wave lengths being infinitesimally shorter than the other forces, the vibrations of red light being about 400,000,000 per second. Heat and sound are apparent to us by the aid of the same medium, the waves being longer.

We know the laws that govern electricity just as well as we know the laws regulating light, heat, sound and gravitation, and when we observe that they are elucidated by a mathematical process, much of the mystery surrounding them is dissipated and we look upon them as cold facts capable of being demonstrated; but when we come to consider the fact that all animal and vegetable life is not only due to but dependent upon the electrical conditions that surround and are within them, is it not reasonable to suppose that we should be able to restore the equilibrium of the body (health) by supplying electricity from some outside source?

Althaus gives excellent reasons for believing that the work of the brain cell is of an electrical nature and compares the axons to conductors and their myeline sheaths as insulators, so that there is isolated conduction along the whole of fully matured nerve fibers, up to the point where they reach the peripheral or central terminations of the sensory organs or the muscles, where the myeline sheath disappears and the axons become naked, allowing of the free transmission of the current. Thus the axons of the neuron resemble the conducting cords of a battery.

In health the nerves are all in a state of vibration, due, in all probability, to the currents of electricity which traverse the body in every direction, and when a nerve loses its vibratory action its function is destroyed and degeneration commences.





All the nerves respond to different vibrations; for instance, the sun causes a very rapid vibration of the ether and the optic nerve is so constructed that it responds to these vibrations or wave lengths and *we see*.

The sound of the voice disturbs this same ether, only the waves are longer, and the auditory nerve is so constructed that it responds to these wave lengths and *you hear*. If it happened that the optic and auditory nerves both responded to the same vibration, then you could *see the sound* and would not need ears.

CHAPTER II.

VOLTS—AMPERES—OHMS.

The *volt*, *ampere* and *ohm* are the first three measurements in electricity, and it is necessary for the physician to have a proper conception of them before he can hope to apply it rationally for therapeutic purposes.

Voltage is pressure or push power, and is not electricity but the force which impels it. Voltage is therefore produced by a difference in electric level and is due to the difference of potential of the two metals we use as elements in the cell.

If we take two dissimilar metals and plunge them into an exciting fluid they are acted upon differently by the fluid, and the greater this difference of action the greater the difference in electric level; the greater the difference in electric level the greater the voltage or push power.

Suppose we immerse a piece of zinc and a piece of iron in an acid or other exciting fluid, the zinc and iron will be attacked by the fluid in nearly the same proportion, and the difference of potential between the two metals will be so small that the resultant voltage or push power will be very little; but sup-

pose the two metals to be zinc and carbon—the zinc is acted upon readily while the carbon is unaffected by the fluid, consequently these two metals give us the greatest difference of potential and a higher voltage or push power is obtained by their use than by any other metals.

The volt then is the unit of electro-motive force (E. M. F.) and is about equal to the push power or pressure exerted by one Daniells cell, which, although not a technical definition according to the present electrical standards, will serve the purposes of this work and is approximately correct.

Amperage is *electricity* or current and is not to be confounded with voltage, for although each is a component part of electrical energy they serve an entirely different purpose. Voltage is that which *tends to move* current over a conductor, while amperage is electricity and is *that which is moved*.

The water that pours over the falls of Niagara we might compare to the *amperage* or quantity, while the distance it falls we would call *voltage*.

The water in the river represents *amperage*, the swiftness with which it flows (caused by difference of level) the *voltage*. We may have a very large river flowing slowly or a small stream running swiftly, and just so we have electrical currents of high amperage and low voltage, or vice versa.

The ampere is the unit of current (C) and is just as much electricity as can be pushed through a

resistance of one ohm by one volt push power. The ampere being more current than can be used for therapeutic work, it is divided for the convenience of electro-therapeutists into 1,000 parts, called *milliamperes*.

The term *resistance* as used in an electrical sense does not differ in meaning than when the same term is used relative to the other forces and simply means that which opposes the passage of electricity through a circuit.

The *ohm* is the unit of electrical resistance (R) and is approximately equal to the resistance offered by a piece of copper wire 250 feet long and $\frac{1}{20}$ inch thick. The resistance of wires or other conducting material vary directly as their length and inversely as their cross section, and also inversely as their conductivity, therefore a short wire offers less resistance than a long one, and a thin wire offers more resistance than a thick one of the same length; much the same as a large pipe will carry more water than a small one. Of the metals pure silver is the best conductor, but copper so nearly equals it for all practical purposes that it is preferred. Platinum has five times the resistance of copper. Metals being the best conductors of electricity, any solutions of the salts of metals decrease the resistance, as for instance water containing in solution one part of salt (sodium chloride) conducts a hundred times better than ordinary water, and it is for this reason that we

sometimes wet sponges and other electrodes with salt water, i. e., to increase their conductivity by decreasing their resistance. As resistance is quite an important factor, it will be considered more in detail in the chapter on electrical measurements.

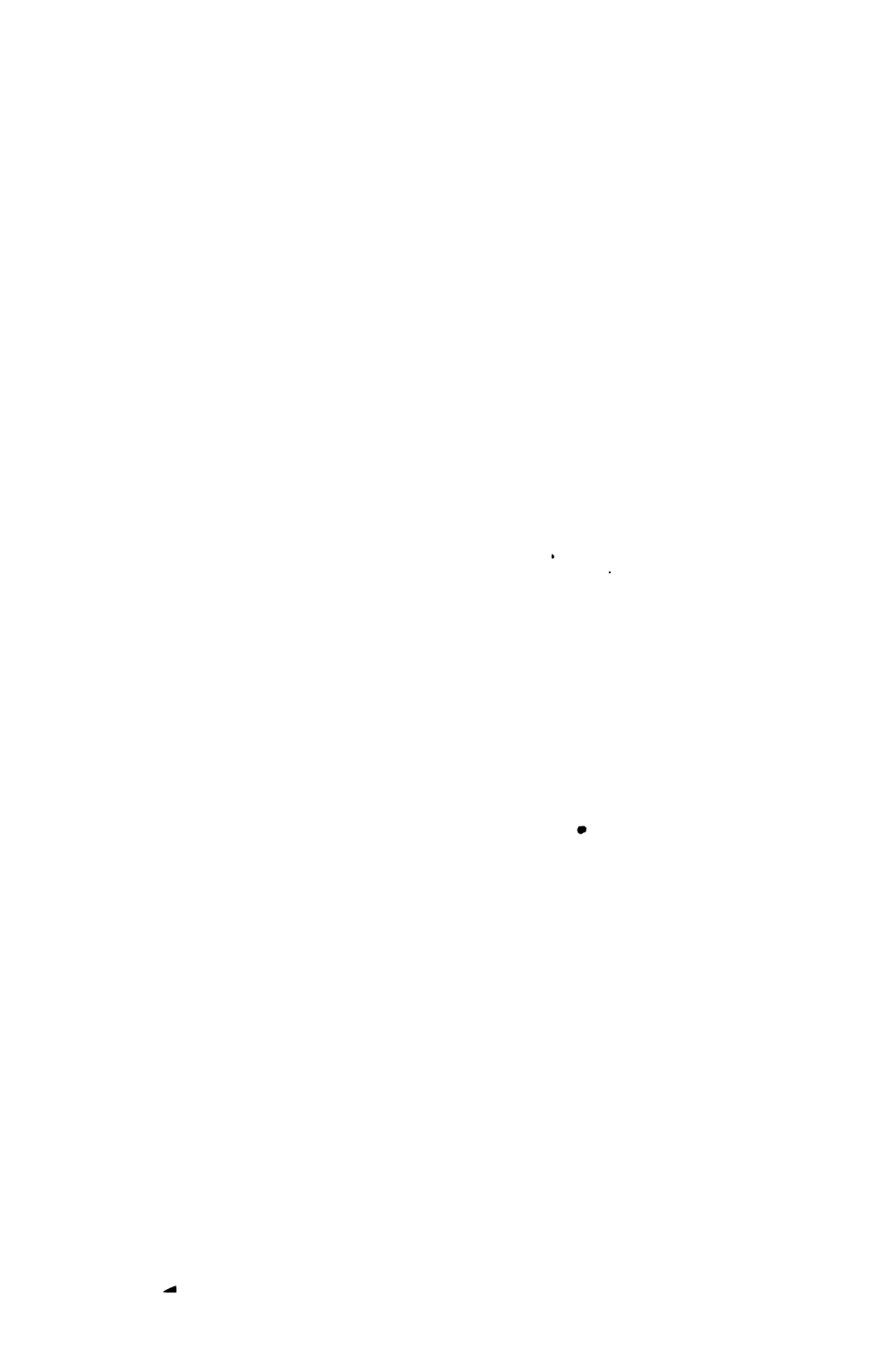
CHAPTER III.

GALVANISM—BATTERY FORMATION.

The galvanic current, sometimes called the *direct* or *continuous* current, is, for therapeutic purposes, generally produced by chemical decomposition—or is merely the conversion of chemical energy into electric energy. It must be remembered that while it is impossible to change matter from one form to another, it is easy to convert one manifestation of force or energy into another; as for instance, heat energy may be converted into mechanical energy—a good example being the steam engine. It is well to also keep in mind the law of conservation of energy which teaches, “that there are no forces in nature to which the law of energy does not apply; the principle that the total energy of the universe is constant, no energy being created or destroyed in any of the processes of nature, every gain or loss in the form of energy corresponding precisely to a loss or gain in some other form or forms.” This is the great fundamental principle of modern physics, and is just as applicable to electricity as any other force.

The fact is, then, that the electrical energy we utilize for the treatment of disease, if derived from a





battery of cells, is generated entirely by the chemical decomposition that takes place within the cell, and if we expect to generate electricity for any purpose, we must have a consumption of the fuel that keeps up the chemical decomposition, and this fuel must of course be renewed as required, much the same as the stove which furnishes heat energy must be supplied with coal as needed.

Although the physician would not expect his stove to furnish heat without a renewal of fuel, yet how many there are who are attracted by the seductive advertisements of those who would furnish them a battery of 20 or 30 cells as large as a man's finger, that is *guaranteed to do heavy work for a period covering years*. This is no fault of the physician, because he has had no special training in this direction, but it has been very discouraging to the use of electricity in medicine, because all who use such apparatus are doomed to failure as far as absolute results are concerned.

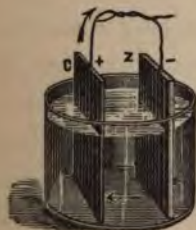


FIG. 1.

BATTERY FORMATION.

The simplest form of a galvanic cell, as shown in Fig. 1, consists of a plate of carbon (c) and a plate of zinc (z) immersed in an exciting fluid. The chemical decomposition that takes place at the zinc makes it the generating plate and causes positive

electricity to be generated there, and this flowing through to the carbon, which is of lower potential, is carried out of the cell through any conducting medium that may join the two elements together from the outside. (See direction of arrows.)

The manner of joining a number of cells together depends upon the kind of work required of them; as for instance, when we wish to treat the human body, which offers a comparatively large resistance to the passage of the current, the cells must be connected in what is called *series* (Fig. 2), in order that we get a greater voltage or push power.

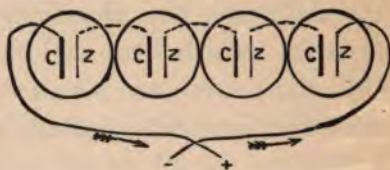
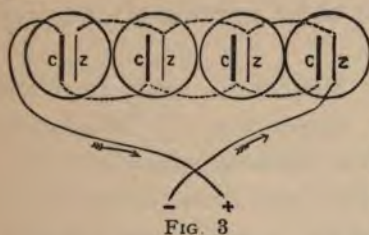


FIG. 2.

To connect cells in series we join the *unlike* elements together by means of a wire or other good conductor; that is, the zinc of first cell with the carbon of the one following until all are connected in a continuous chain. *All galvanic batteries for therapeutic purposes are connected in this manner*, each cell added increasing the pressure or voltage of the circuit. If, however, the work we would accomplish requires a larger quantity or amperage and not so much voltage (the resistance to be overcome being small) such as heating platinum electrodes for actual cautery, then the arrangement must be entirely different, the *like* elements being connected



together as in Fig. 3, which is called *multiple* or *parallel*.



If each of these cells gave a pressure of one volt, and one ampere in quantity, then by the first arrangement (series) we have in the circuit *four volts* and one ampere,

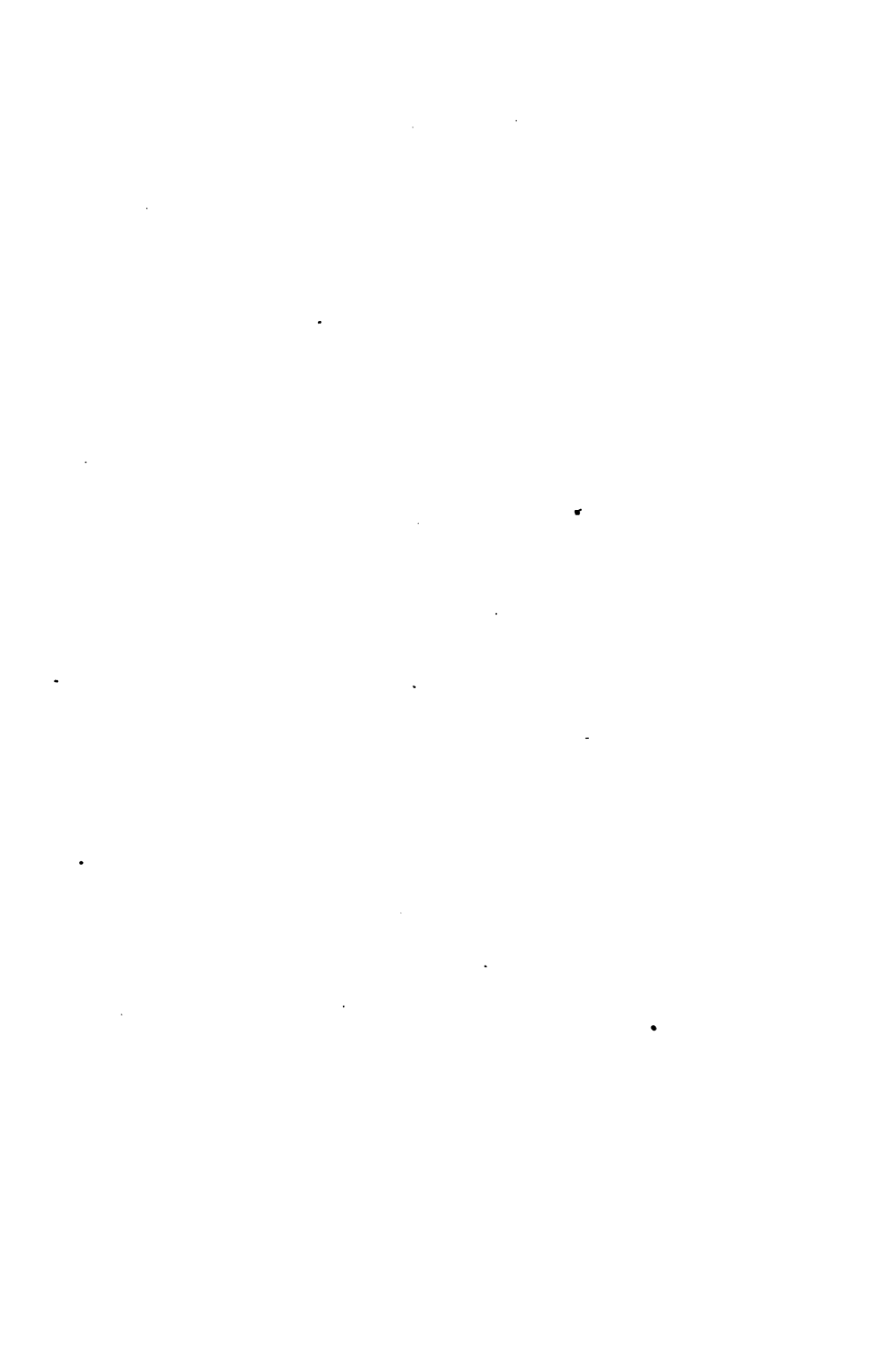
while in Fig. 3 (multiple) we have *four amperes* and one volt, or just the same as one cell with very large elements.

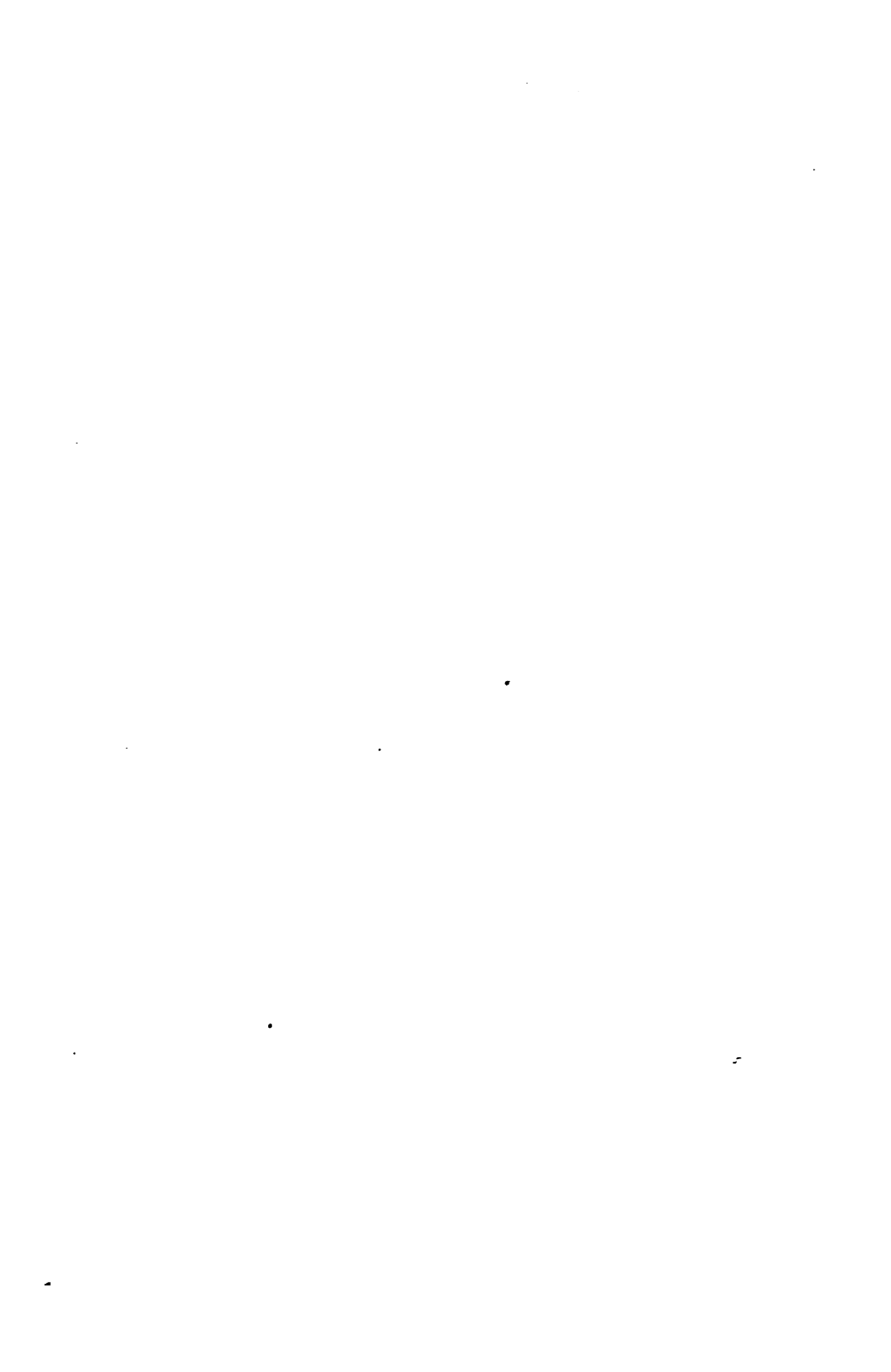
The best type of cell for a portable battery if we would have one that *will do work*, should have elements of zinc and carbon and an exciting fluid composed of a solution of bichromate of soda and sulphuric acid, with a little mercury bisulphate added to keep the zinc elements amalgamated. In such a battery the elements should be immersed in the fluid each time it is wanted for use and removed again after the operation is finished because there is a consumption of material going on as long as the elements remain in the fluid whether the circuit is complete outside the battery or not.

In the office or stationary form of battery—and such a one is always to be preferred unless practice is strictly confined to the country—we use some form of the Leclanche cell, in which the elements are zinc and carbon and the exciting fluid a saturated solution

of ammonium chloride. The elements do not have to be taken out of the fluid in this form of cell, and they will do satisfactory work for a period of one year or more without renewal.

All battery cells are subject to what is called *polarization*, i. e., the deposition of bubbles of hydrogen upon the carbon element which will then become the generating plate and cause a current of electricity to flow from the hydrogen-covered carbon plate *toward* the zinc, thus partially neutralizing the original flow. While many methods are in vogue for preventing this they only partially do so, but owing to the fact that the larger the surface of the carbon the longer time it takes to cover it with the hydrogen bubbles, it would be proper in selecting cells, especially those to be used in stationary or office batteries, to get those having the *largest carbon surface*.





CHAPTER IV.

ELECTRICAL MEASUREMENTS.

About the year 1827 Dr. George Ohm gave us the law that bears his name and which forms the basis of all electric measurements, viz.: "The strength of the current passing through any part of a circuit varies directly as the difference of potential between its elements, and inversely as the resistance of the circuit itself." This may be expressed by the following equation where E represents the electro-motive force of the battery in volts, C the current in amperes and R the total resistance in the circuit in ohms :

$$C = \frac{E}{R}$$

Or, the current is equal to the voltage divided by the resistance.

A very simple illustration, one that is in common use, will serve to elucidate Ohm's law. The quantity of water that flows through the nozzle of an ordinary syringe will be directly proportioned to the force with which it is urged forward by the piston; this force would correspond to the electro-motive force or voltage. The friction will represent the

resistance in the circuit. Now, if we divide the former by the latter we have the quantity of water which flows through the nozzle in a given time, representing the strength of current. If the nozzle of the syringe were longer (the pressure being the same) less water would flow, or if the hole in nozzle were decreased in size the same thing would happen, because in each case the resistance is increased. This being compared with electricity would imply that the longer or thinner the conductor the greater the resistance and consequently the less current would flow.

Let us suppose we have thirty cells each giving a pressure of one volt; if these cells were connected in *series* the pressure at the terminals would be thirty volts.

The human skin offers quite a high resistance to the passage of electricity, interposing with the ordinary sponge discs from 5,000 to 10,000 ohms, so if the proper electrodes were attached to the two terminals of this battery, which gives a pressure of thirty volts, and these electrodes were held in the hands of a person whose resistance is 6,000 ohms, we could, by Ohm's law, compute the amount of current flowing through the person, as follows:

$$\text{Current (C)} = \frac{30 \text{ Volts (E)}}{6,000 \text{ Ohms (R)}} = \frac{1}{200} \text{ Amp. or } 5 \text{ milliamp.}$$

Other parts of the body vary as to their resistance to the current owing to the different texture of

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the skin, while the tissues and underlying fascia are fairly good conductors and offer but little resistance. Again, the larger the electrode the less the resistance, so with a large surface electrode on the abdomen attached to one terminal of the same battery and the other terminal attached to an electrode in contact with a mucous surface in the intrapelvic cavity, the resistance would be much decreased and instead of 6,000 ohms it would be about 300 ohms. Now take the same battery we used for the other experiment, which gives a pressure of thirty volts, and apply the electrodes as above, and, by Ohm's law, we have the following :

$$\text{Current (C)} = \frac{30 \text{ Volts (E)}}{300 \text{ Ohms (R)}} = \frac{1}{10} \text{ Amp. or 100 milliamp.}$$

From this we deduce the fact that the resistance or ohms plays a very prominent part in every operation by electricity, for it has been shown that a certain battery causes five milliamperes to flow through a certain part of the body while the same battery applied to another part of the same body with different electrodes allows a flow of one hundred milliamperes of current. The question then, "How many milliamperes will my battery give?" means absolutely nothing, for the amount of current we are able to get in any electrical operation depends entirely upon the resistance interposed.

If the resistance of the various parts of the human body were known, and if these were the

same in all patients, and if also the voltage of the battery were constant, then the amount of current flowing could always be reckoned by Ohm's law. But unfortunately these are variable factors, for the resistance of the body is constantly changing and the battery because of polarization and other causes is never constant, therefore it becomes absolutely necessary to have some means of determining how much current is flowing, for it is *the current that does the work*, the voltage being only the force that pushes it through.

The instrument we call the milliampere meter, which is used for determining the amount of current



MILLIAMPERE METER.

passing through the patient, should be a part of the armamentarium of every electro-therapeutist, for although we do not always know the exact dosage required, we at least know *how much we are using*, and with any new therapeu-

tic agent this is always desirable for purposes of comparison, and then again the meter is always an index of the condition of the battery.



Not long ago a physician sent for the author to ascertain, if possible, why he was not getting results from the use of galvanism, when it was proven to him that on account of improper manipulation of his battery he had not been getting any current whatever, although he had been using his battery for a period covering several months. *He had no meter.*

It does not mean anything to say you use five, six or ten cells, neither is it possible to gauge the strength of current by the sensation of the patient, for the electro-sensibility of people is as variable as their resistance; and while one person will complain at a current strength of five milliamperes, another will scarcely feel twenty.

With a good meter in the circuit it does not matter what the resistance of the patient, because we can turn on current until the meter marks the required dosage independent of the fact of whether we have used ten cells or five cells.

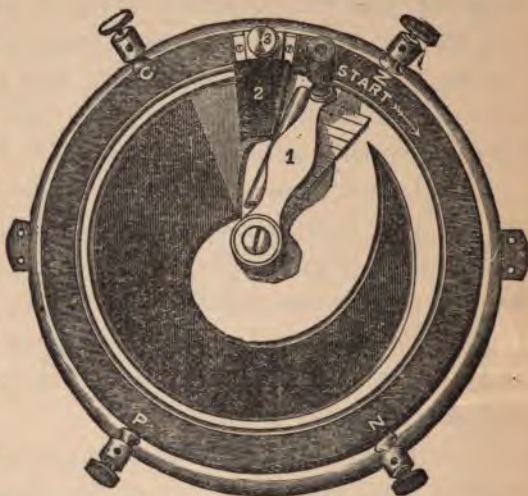
Before leaving this subject we feel impelled to say something of the means for *controlling* the current. Usually this is accomplished by a double switch or cell selector which is quite unsatisfactory, especially in case the electro-sensibility of the patient is above normal, as the adding of a single cell to the circuit oftentimes causes an unpleasant sensation, and we are therefore unable to reach the desired dosage.

The name rheostat is applied to an instrument which has a readily variable resistance, and,

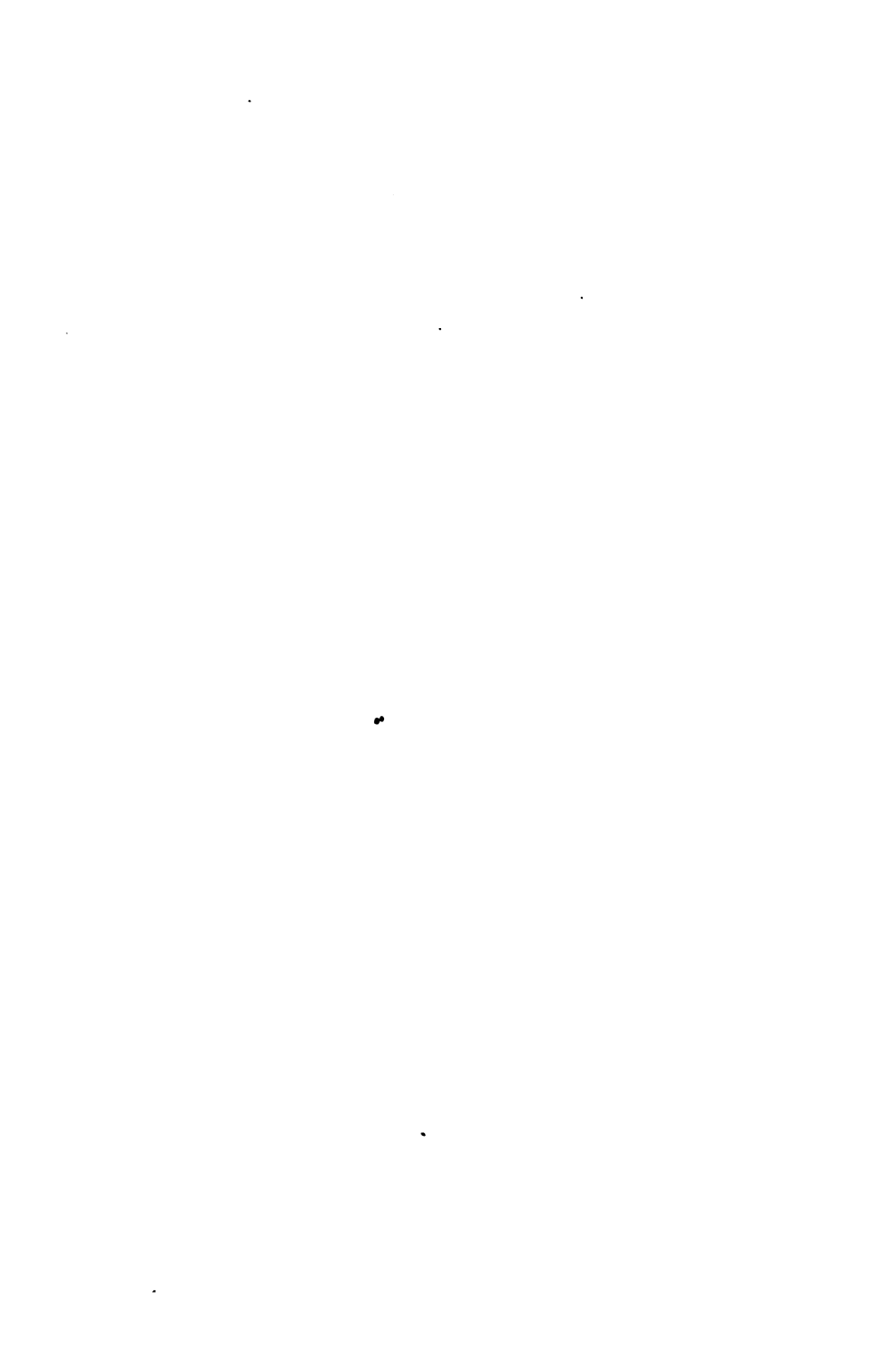
for therapeutical work, one that can be increased or decreased in gradual gradations and *not by steps*. It is only necessary for us to consider the relative merits of the two varieties called the *series* and *shunt* rheostats.

It is not an easy thing to

elucidate the laws of force by using matter as an illustration unless we can imagine certain things ; and, for the demonstration of our subject we will imagine a vertical pipe twenty feet in height which is *always* filled with water. The height of the water in the pipe expresses the *voltage* or pressure, while the water itself is *current* or amperage. A very small hole is made at the bottom of the pipe and a small stream of water will flow, but it will be with great force. The hole is made larger and more water will flow, but the *pressure remains the*



GRAPHITE SERIES RHEOSTAT.



same—thus a rheostat in series would, figuratively speaking, simply make the hole in the pipe larger or smaller, and so would increase or decrease the quantity or amperage, while the voltage or pressure is not increased or decreased correspondingly. This kind of current, called a *current of tension*, is undesirable for therapeutic work because of the pain and discomfort it causes the patient, and therefore the *series* rheostat is fast becoming a thing of the past.

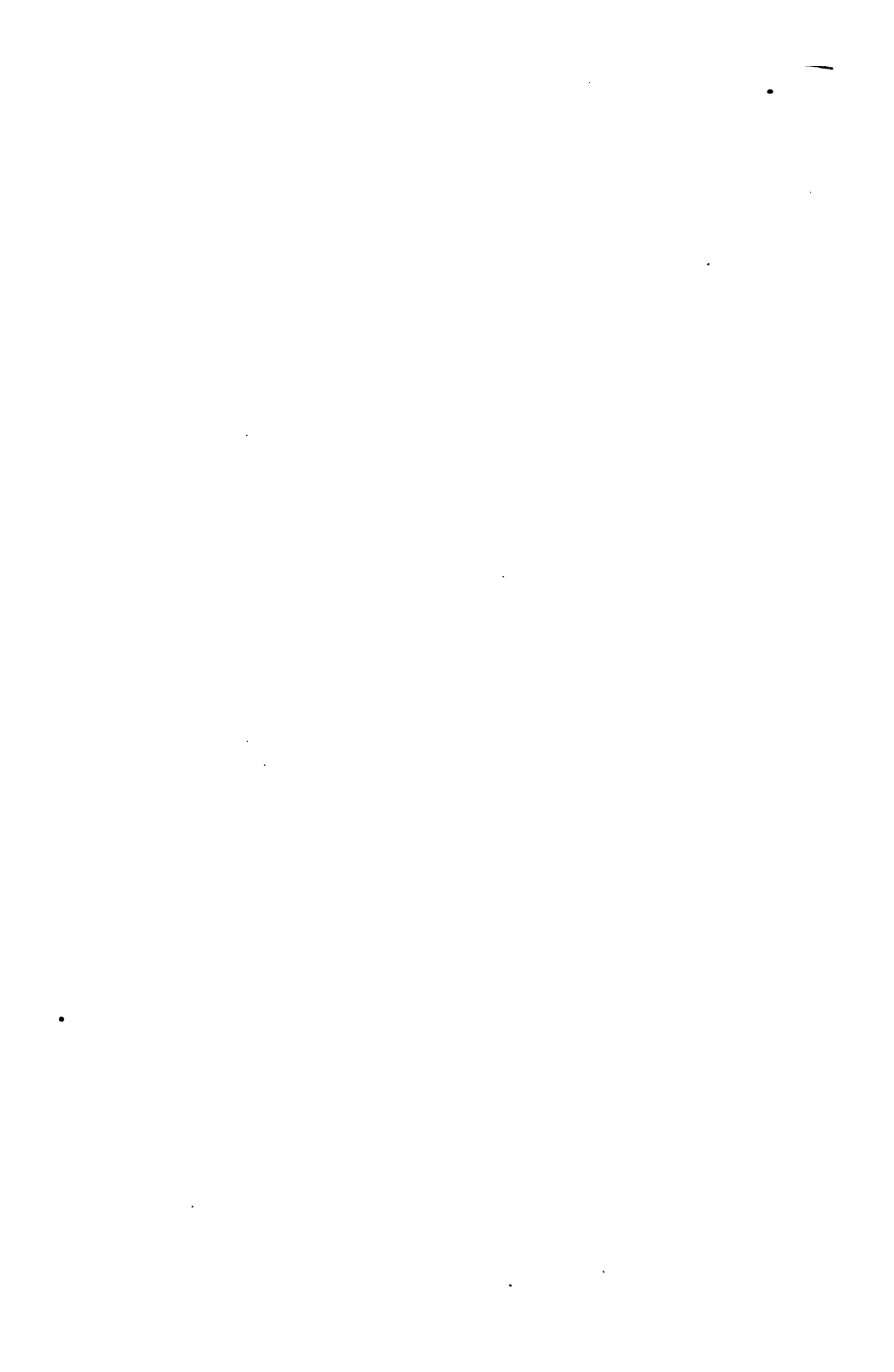
If now we take the same pipe full of water and make a hole in it one foot below the top a certain amount of water will flow but the pressure will not be great. If, however, the hole be moved down another foot the quantity will be increased because the pressure is increased; and thus it is with a *shunt* rheostat which depends for an increase or decrease of current upon a rise or fall of the potential or pressure in the circuit. The same objection holds against shunt resistance arranged in coils as has been stated relative to

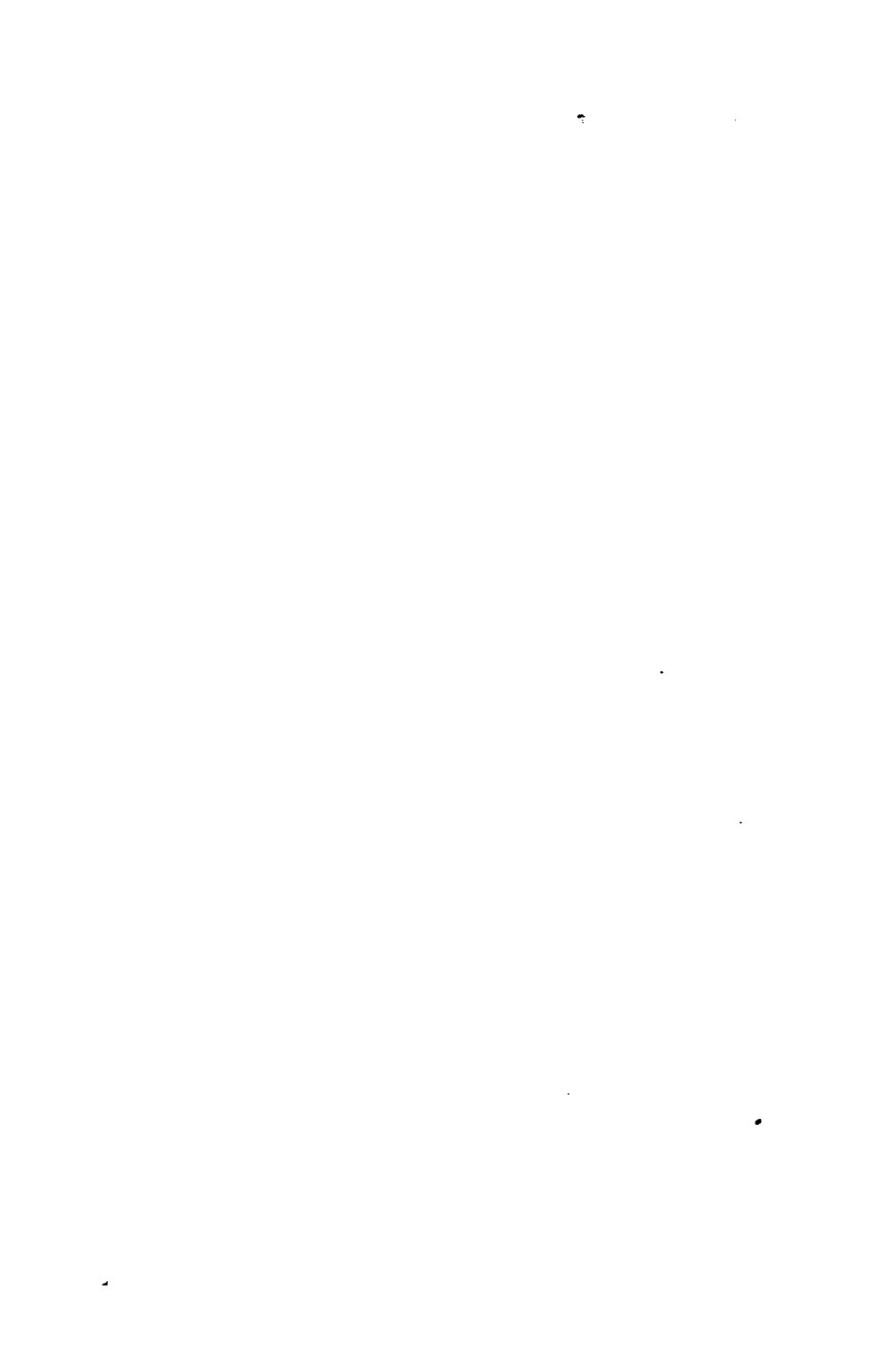


GRAPHITE SHUNT RHEOSTAT.

the cell selector—the shifting of the contact lever from one coil to another causing the same shock as the adding of cells; therefore the graphite *shunt* (see cut) is the best because any increase or decrease is made in gradual gradations.

The cell selector is an excellent accessory on any battery, but it should be used in connection with a good rheostat.





CHAPTER V.

POLARITY AND POLAR EFFECTS.

As has been previously observed, a battery is an apparatus for destroying, by chemical action, the equilibrium of the ether, thereby causing a difference of level, and what we call a current of electricity flows from the higher to the lower level. The higher point is called the anode or positive pole, while the lower is called the cathode or negative pole, therefore a current of electricity flows *from* the positive *to* the negative pole.

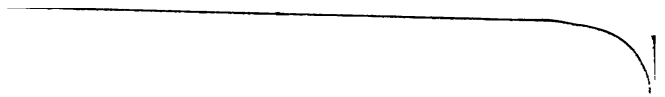
As has been stated in a previous chapter, the generation of electricity in the galvanic cells commences at the surface of the zinc below the fluid, because the chemical decomposition takes place there, and wherever there is a chemical decomposition there is a generation of electric energy. The zinc then is the positive element *within the cell*, because the current flows from that point and the carbon is the negative element; but above or *outside* of the fluid this order of things is reversed, and instead of speaking of the zinc and carbon as elements they are called *poles*; the carbon terminal is called the *positive* pole and the zinc terminal the *negative* pole.

These two poles have certain peculiar properties, both physical and therapeutical, in which they are in diametrical opposition, as the following comparative statement will show :

POSITIVE POLE.	NEGATIVE POLE.
1. Oxygen.	1. Hydrogen.
2. Acid.	2. Alkaline.
3. Will stop bleeding.	3. Increases bleeding.
4. Sedative.	4. Produces hypersensitiveness.
5. Hardens tissue.	5. Liquefies and disintegrates.
6. Is an acid caustic and the resultant cicatrix is hard and unyielding.	6. Is an alkaline caustic and the resultant cicatrix is soft and pliable.
7. Is a vaso constrictor.	7. Is a vaso dilator.

It would then seem that in the application of the galvanic current *polarity means everything* and that if the application of the positive pole were indicated the negative would surely do harm. Physicians just beginning the use of electricity will do well to keep these points in view, as success is largely dependent upon which is used for the *active* pole.

As far back as the year 1859 Funke discovered that a sound living nerve is neutral or feebly alkaline, but changed to acid on coagulation setting in, or on exhausting it by prolonged mechanical or electrical stimulation. The death of the muscle is marked by a progressive acidity and subsequent coagulation of



the muscular plasma. The same is true also of nerve substance as well. Then, if it is true that the death of the muscle or nerve commences when an acid condition sets in, it is also true that an inflamed or overactive condition is due to excessive alkalinity. These points have been well proven and we insert them here without apology or explanation.

All inflammations are due, as stated above, to excessive alkalinity of the part, not because the system contains an excess of alkali, but that we have an unequal distribution of probable normal alkalinity.

We almost fear to state how we believe this pathological condition is brought about, lest we be charged with being too ultra in our deductions; but a few years hence a writer may not be considered a "crank" who advocates that it is due to a disturbance of the normal electrical currents traversing the body; and we are glad to quote in this connection from such eminent authority as Dr. J. Mount Bleyer, who says: "Yet all this points to the one conclusion and the one deduction, that animal electricity comes first; that it is the prime factor in all the processes of change, of chemical action, or otherwise, within the living body. That without its stimulus of polarization no chemical action can be called into life, consequently none can go on, and tissue metamorphosis, which is life itself, must cease."

Why is it then when we place the positive pole over an inflamed and painful surface that the

inflammation and pain subsides? Oxygen is set free at the positive pole. Oxygen is an acid maker and the part in contact with this pole being changed to a condition of acidity, the temporary death of the part has commenced, or is in a state of sedation, evinced by a circumscribed anæsthesia. But what has become of the alkalinity that existed previous to the application of the positive pole? It certainly has not been neutralized by the acidity of that pole, because that would necessitate an evolution of gas which has not taken place.

Alkalies are electro-positive substances and *have affinity for the negative pole*. Consequently the excess of alkali at the point of inflammation is transferred to the neighborhood of the negative pole, which immediately *assumes a hypersensitive condition*, proving that excessive alkalinity causes inflammation, because the part was perfectly normal before the application of the negative pole.

The so-called anæsthesia produced by a rapidly interrupted induction or faradic current is brought about in a different manner than with galvanism and is more the result of mechanical than chemical action; the rapid impulses given the muscles by a high frequency induction current brings on a tetanic spasm which soon wears it out, causing it not only to lose its normal animal cur-





rent but to assume an *acid* condition, which, in this instance, is not due to polar action as with the positive of a galvanic or direct current, but by bringing on the temporary death of the part by fatigue from excessive and prolonged electrical stimulation.

Muscles exhausted by repeated shocks of induction electricity present very small traces of the muscular current (Du Bois-Reymond), and the injurious effects of violent or repeated electrical discharges on muscular irritability have long been known. Veratrine rapidly renders the muscle rigid, unirritable and *acid* (Schiff). It then appears that after the cessation of irritability and the muscular current a *progressive acidulation* commences.

The passage of electricity through any resisting medium is always accompanied by the evolution of heat, and the skin offering considerable resistance, heat is produced at the point where each electrode comes in contact with the skin, because that is the point of greatest resistance; and we have a consequent hyperæmia of those parts. This fact has been used by some writers against the use of electricity where inflammations exist, as all such conditions are coexistent with heat, and the greater the heat the higher the fever or inflammation.

Nothing can be more misleading. As Dr. Burr says, "It is not heat but poison which is the disturbing element. Heat is a symptom, one of the effects of the operating toxæmia, hence its reduction cannot eliminate toxins or destroy microbes."

Physicians oftentimes have brilliant results only because the proper pole was accidentally employed, but there need be no guesswork nor empiricism if the fundamental physics of polarity have been learned; and you will neither try to stop hæmorrhage or allay pain with the *negative* pole.



CHAPTER VI.

ELECTROLYSIS—CATAPHORESIS.

Electrolysis is the separating or breaking up of a substance into its elements by electricity, and certain conditions are necessary before this can take place. Viz: The substance or electrolyte must be a fluid or semifluid; it must be a conductor of electricity, and one of its constituent elements must be a metal or salt of a metal. Hydrogen is considered a metal, and water being a composition of oxygen and hydrogen, it may be supposed that anything containing water fulfills all of the above conditions; and such is true provided the water is in a state of fluidity, but although ice is frozen water, it is not possible to separate it by electricity, because being a *solid* it does not meet all the necessary conditions. Fats and oils, although fluids, are not capable of being electrolyzed because they are *nonconductors*.

When any substance is decomposed by electricity, the products resulting from such decomposition are called *ions*; those ions which appear at the anode or positive pole are called "*anions*,"

and those which appear at the kathode or negative pole, "*kathions*."

The anions are electro-negative and are repelled by the negative pole, because they are the same potential as that pole. The kathions are electro-positive, and being repelled by the positive pole, whose potential is the same, they are drawn to the negative pole in accordance with the well-known law that "unlike poles attract, like poles repel."

The destruction of superfluous hair, warts, moles, *nævi*, etc., all come under the head of electrolytic work, and the products of decomposition in such work are taken up by the absorbents.

In nearly all cases electrolysis of tissue is accomplished by the use of the negative for the active pole, because it acts as an alkaline caustic and has a disintegrating or liquefying effect, while the positive pole, on account of its acidity, has a tendency to harden, dry and produce coagulation of tissue.

The process of introducing medicines into the body by the aid of electricity is termed "*cathoresis*," and as many conflicting statements appear in the literature upon this subject, it is well to consider it in detail from a *physical* standpoint.

Because a constant current goes from the positive pole toward the negative, it is generally



supposed that all medicament must be placed upon the positive pole, so as to be *forced*, as it were, into the tissues by the *direction* of the current alone. Such is not the case, however, for cataphoresis is an electrolytic process, and in every instance the medicament is broken up into its elements, some of them going toward the negative pole and some toward the positive, according as they are electro-negative or electro-positive.

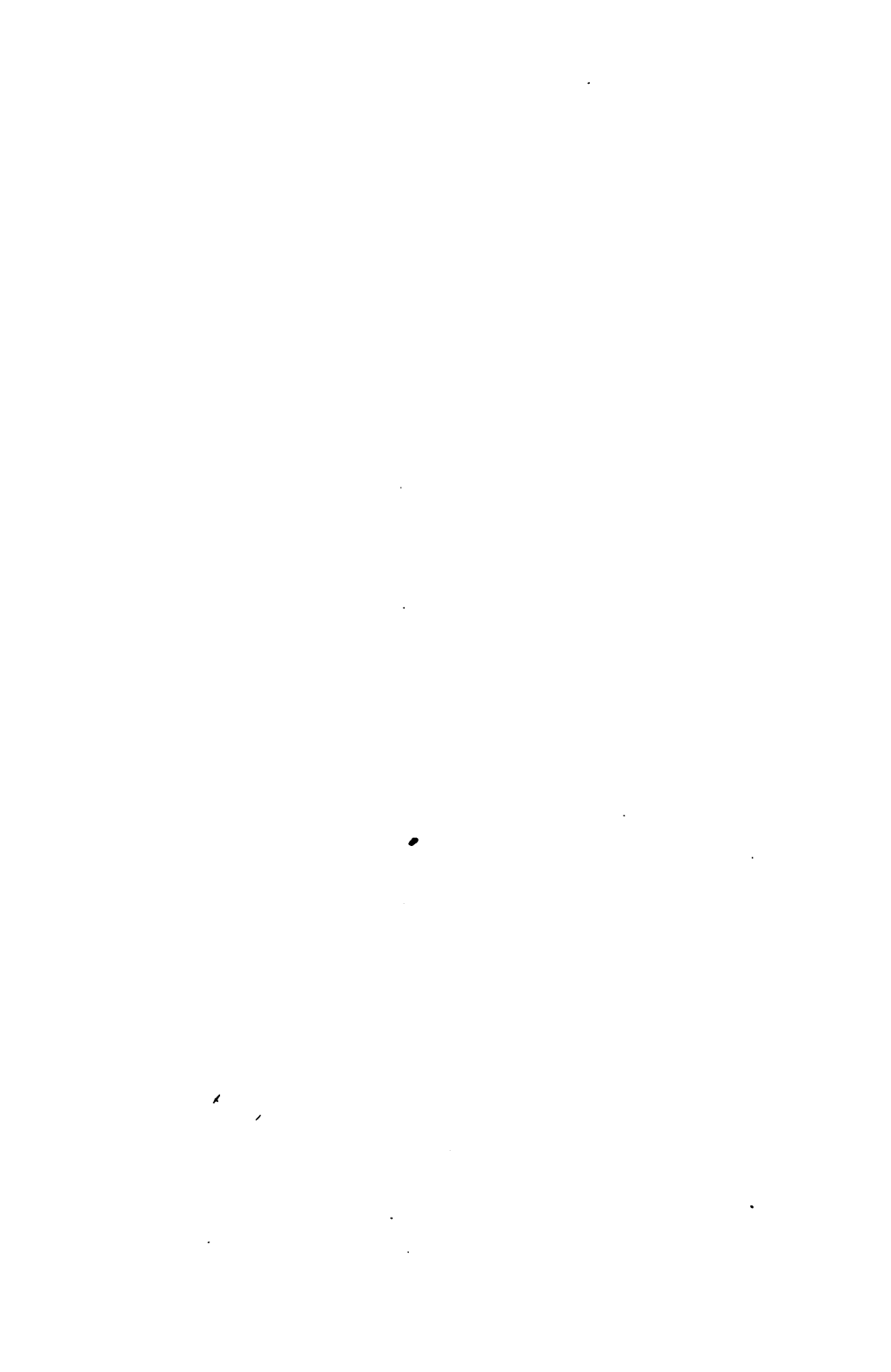
Iodin, bromin, chlorin, oxygen and hydrogen are anions or electro-negative elements and have a strong affinity for the positive pole; therefore, when treating, for instance, an enlarged thyroid gland with solution of potassium iodide, we must use the solution on the *negative* pole if we wish to utilize the resolvent effects of the iodin.

Nearly all of the metals, so far as we know, are kathions and appear at the negative pole; if, then, we put a solution of potassium iodide on the positive pole and complete the circuit through some conducting medium, the potassium hydrate, being a metal and a kathion, will be transferred through the medium to the negative pole, while the iodin, being an anion, will remain at the positive pole, *for which it has an affinity*, and we would not even have a local application of the iodin, because *all of it* would be left on the electrode.

Binary compounds are composed of a base and an acid or that which takes the place of an acid. The acid or that which takes its place (the iodine in potassium iodide takes the place of an acid) is an electro-negative element or anion, all the bases are electro-positive or kathions, and if we were using a solution of morphia sulph. or cocaine hydrochlor., we would apply from the *positive* pole, when the base, which in this instance we wish to utilize, will be transferred through the tissues to the negative pole, *for which it has an affinity*. When using a solution of potassium iodide it is not the purpose of the operation to convey the potassium or base through the underlying tissue, but the iodine.

In order to prove conclusively that cataphoresis is an electrolytic process and not the forcing of the medicament in the direction of the current, the reader's attention is called to the following experiments:

EXPERIMENT 1. The center test tube (Fig. 4) contains a solution of potassium iodide and the test tube at either end contains starch water. The tubes are connected one to the other by a strip of blotting paper, which has thoroughly been saturated with water before putting into the solution to prevent the possibility of capillary attraction. The positive pole of a constant current is attached to the left hand tube and the



negative pole to the right hand tube, both having platinum terminals.

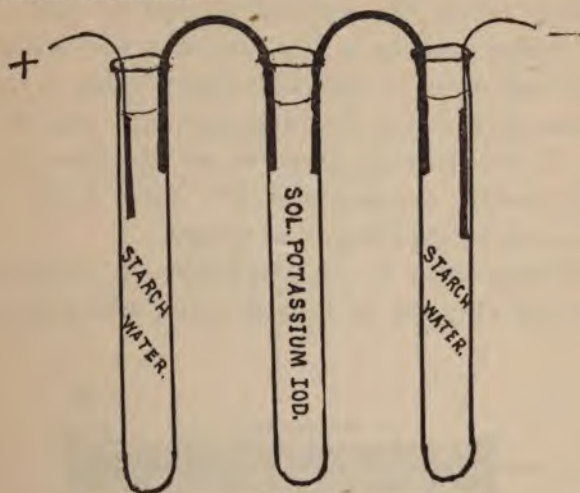


FIG. 4.

ARGUMENT 1. If cataphoresis is purely a physical operation, that is, if substances are transmitted from one pole to the other by a *forcing* of the current from positive to negative, then some of the solution of potassium iodide would be forced into the right hand tube and would be evident by a blue color. If, however, cataphoresis is an electrolytic operation, then the contents of the tube containing potassium iodide will be broken up, the electro-positive elements going one way and the electro-negative the other. The latter happens in this experiment, the deep blue color in the *left hand tube* showing the

formation of the iodide of starch in this tube. We will now continue the experiment reversing the polarity, when the current enters at the right hand tube, and in a few minutes the iodide of starch solution in the left hand tube is again broken up, the free iodin going into the middle tube in the *reverse direction of the current* and finally being deposited in the right hand tube, evidenced by its deep blue color.

EXPERIMENT 2. A glass tube 15 centimeters in length (Fig. 5) is loosely filled with absorbent



FIG. 5.

cotton to within one centimeter of each end. Acidulated water is now poured into one end of the tube until the cotton is thoroughly saturated. A small wad of cotton is attached to the positive terminal of a constant battery, and saturated with the solution of potassium iodide. Another wad of cotton is placed upon the negative platinum terminal and saturated with a solution of starch. A current of 60 ma. is now passed through the tube for eight minutes, when the positive terminal, which was saturated with the potassium iodide, changes to a *deep brown color*, showing free iodin, while the negative terminal



remains *exactly the same color as at first*. The polarity is now reversed, which would bring the positive terminal in connection with the starch electrode and the negative terminal in contact with the solution of potassium iodide. With the same current strength, in 14 minutes the iodine end that was connected with the negative terminal is thoroughly *decolorized*, while the other end of the tube containing the starch electrode has turned a *deep blue*, showing that the transmission of the iodine has taken place through the tube in a *contrary direction to the current*.

ARGUMENT 2. If cataphoresis is a purely physical forcing of the medicament in the *direction of the current*, then the solution of potassium iodide in the first part of this experiment would have been forced *toward* the negative pole, and would have made itself known by the blue color of the starch electrode; such, however, did not take place. In the latter portion of this experiment, if cataphoresis were the physical forcing of the current, then the solution of potassium iodide, which is at the negative end of the tube would have remained there as such, while from the positive end the starch would have been driven through, producing a *blue color at the negative*; the reverse, however, happened.

EXPERIMENT 3. The positive terminal having a wad of cotton saturated with the solution of cocaine hydrochlorate, while the cotton at the negative terminal is simply wet with water. It *must*

here be stated that the solution of cocaine has a strong reaction of hydrochloric acid, and this acid cannot be taken from the solution without impairing the chemical affinity of the solution; but after the passage of a constant current through the tube for ten minutes, the cocaine appears *at the negative terminal*, evidenced by an anæsthetic effect upon the tongue; but the acid reaction which should have been present if the *solution* of cocaine were transmitted through the medium was entirely absent, an *alkaline action* being present instead, proving that the cocaine, or base, has been *separated by electrolytic action* from the acid which held it in combination.

It may be claimed that the foregoing are merely experiments in electrolytic work, and we do not deny it; but then they are demonstrations of cataphoresis as well, for all the conditions are the same as when medicines are administered by electricity—the wet cotton corresponds to the human body, while the positive and negative poles (either one or both containing medicament) have contact with it, and the action that takes place in these experiments occurs in the living tissue, except that in the latter it is more rapid.

From the foregoing physical facts we may formulate the following general rule: *If we wish to transmit the acid, or that which takes its place, into the tissues, the medicament must be placed upon the negative pole; but if it is the base we wish to utilize then the medicine must be used on the positive pole.*

CHAPTER VII.

METALLIC ELECTROLYSIS.

There is no branch of electrolytic work that has so wide a range in the therapeutics of electricity as that consisting of the introduction of the salts of metals into the body and which is called *metallic electrolysis*.

Oxygen combines with all the baser metals, forming oxides; and if one of these metals be used on the positive pole of a galvanic current the oxygen, which has an affinity for that pole, immediately combines with the electrode; if, now, the electrolyte contains sodium chloride (common salt) then the oxide of the metal combines with the hydrochloric acid set free, thus forming the *oxychloride* of the metal.

The fluids of the body all contain sodium chloride, one of the factors necessary to obtain any of the oxychlorides of the baser metals, and when applying the positive galvanic current to any part of the body where the electrode is of soluble metal, such as copper, zinc, iron, etc., we make an application of the oxychloride of such metal at the point where the electrode comes in

contact with the body, which is carried still deeper into the tissues by cataphoric action.

The deposition of this metallic salt is much more marked when the electrode is used subcutaneously or on a mucous surface, because of the greater supply of sodium chloride and lessened resistance; but where application is made to the skin, it becomes necessary to moisten the part with salt water or dip the electrode in the same solution.

So far the application of the copper salts seems to be the most valuable, and such application is commonly called *cupric electrolysis*. The oxychloride of copper is a powerful antiseptic, having eight times the microbicidal power of the current itself and is indicated in all pathological conditions dependent upon germ origin.

In such cases as trachoma, lupus, indolent ulcers, endometritis, fistulous tracts and many other germ troubles its action is not excelled by any other remedy. The application has its advantages and disadvantages, and among the former may be mentioned the fact that inasmuch as the *polar* effect of the current is *expended upon the metal* composing the electrodes it is not so apt to cauterize the tissue in contact with the electrode, and consequently rarely leaves that undesirable hard cicatrix which characterizes an application of the positive pole to a mucous surface. The



principal disadvantage is the sticking of the electrode, which always occurs when a bare metal attached to the positive pole is applied to a mucous surface; this is avoided to a certain extent by gently moving or rotating the electrode while the current is being applied, but if it does happen to stick in spite of this precaution, then it will be necessary, at the end of the seance, to *reverse the current* for a few minutes in order to free the electrode; but be sure that the current is *turned off* before attempting to reverse its direction, as otherwise the patient will receive an unpleasant shock.

When making intravaginal applications with a copper electrode the author always covers the metal part of the electrode with wet absorbent cotton, thus avoiding the sticking of the metal, and finds that the metallic salt is deposited in the tissues almost as well as when used without the cotton; in fact we believe it would be better to *always cover the metal* where practicable with absorbent cotton or chamois leather to prevent its sticking, because when we reverse the polarity for that purpose the active electrode is then attached to the negative pole and, all metals having an affinity for that pole, some of the oxychloride of copper will be taken from the tissues and *redeposited upon the electrode* in the form of metallic copper.

Oxychloride of zinc being a powerful escharotic, the use of that metal is almost limited to

the application to the stump after excision of malignant growths, recurrent cancers, etc., although in many uterine lesions Dr. G. Betton Massey strongly recommends the application of a zinc and mercury amalgam by means of the positive pole.

When using an iron or steel electrode on the positive pole we get all the styptic and tonic effects of the iron locally applied. We have an ocular demonstration of this when the wrong pole happens to be used in removing a hair, viz., leaving a black tattoo mark of the oxide of iron under the epidermis which is not easily removed.



CHAPTER VIII.

FARADISM—MAGNETISM.

The electrical fakir largely prefers the field of faradism, because that current manifests itself by a buzzing noise, more or less intense and gives a current of considerable sensation, both of which tend to impress the patient.

The physics of the faradic or induced current is somewhat more complex than the galvanic or direct current, and ever since the first induction apparatus was made by Faraday, in England, and Henry, in America, so many changes have been made and so many forms suggested by the various manufacturers, that the average physician is totally at sea relative to the best faradic apparatus for therapeutic purposes.

We will here consider briefly enough of the rudimentary physics of faradism so that the various fads and conflicting statements instituted by manufacturers may not be the means of depleting the purse of the credulous and too trusting physician.

We have three kinds of magnets, viz., the lodestone or *natural* magnet, the piece of hard-

ened steel which, when once magnetized, retains its magnetism and is called the *permanent* magnet and the *electro-magnet*, which is usually a very soft iron core surrounded by a coil of insulated wire in which magnetism is induced by a flow of electricity through the coil of wire. The value of the electro-magnet depends upon the fact of its being enabled to rapidly acquire its magnetism on the passage of the magnetizing current and as readily to lose its magnetism on the cessation of such current.

For purposes of illustration please imagine that a certain bar of soft iron is closely packed with an innumerable, indefinite number of small, endless chains which, when a current of electricity is passed around the bar, are thrown out as in



FIG. 6.

Fig. 6, but are immediately withdrawn again when the current around the bar is stopped. These imaginary chains we call the *magnetic lines of force*, and they are supposed to know no barrier

and travel in closed paths from N (north pole) to S (south pole), much the same as a current of electricity goes *from* the positive *to* the negative pole.

Another simple experiment will serve to show what we mean by an induced current: If I take two ends of a noncurrent bearing wire in my hands

and suddenly move this loop into a magnetic field, i. e., into a field permeated by magnetic lines of force, an electro-motive force is generated in the wire *at the time of the transfer only*; but when I again remove the loop from the magnetic field another E. M. F. is induced in the wire during the transfer, but flowing *in an opposite direction* from the first. The quicker I make the transfer of the loop in and out of the magnetic field, the higher the E. M. F. induced in the wire. In a nutshell these are the prime principles of every faradic battery, except that in the latter the magnetic field is the movable factor, while the wire remains stationary.

No change can be detected in the wire so long as it remains at rest relative to these lines of force, but if motion takes place so that the wire is linked with more or less of the lines, then an E. M. F. is generated along the wire during the change.

We will now apply these principles to the faradic or induction coil, and in order to make the matter plainer we will show (Fig. 7) a diagram of an induction apparatus.

As will be seen by this diagram, the essential parts of every faradic coil are, viz.: (1) a primary coil directly surrounding a (2) soft iron core; a secondary coil surrounding the primary, but entirely insulated from it; an automatic hammer for interrupting the current from the battery cells.

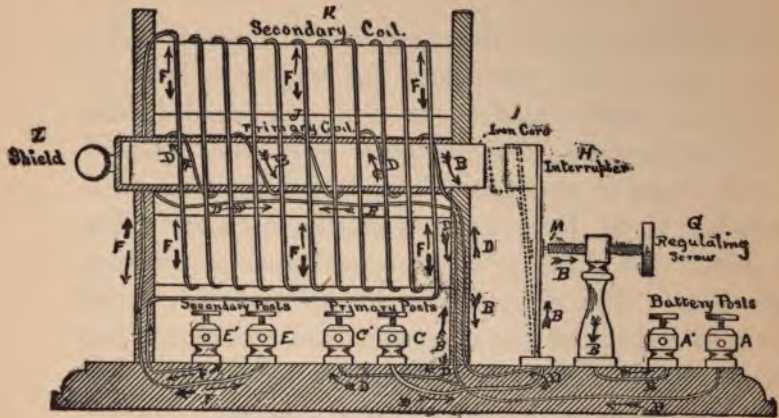


FIG. 7.

Fig. 8 would represent the soft iron core and primary coil of a faradic battery; this core is not a magnet until a current of electricity flows through the wire which surrounds it, when it becomes strongly magnetized and throws out lines of magnetic force, as in Fig. 6, which, in their effort to travel in a circuit from the north to the south pole of the magnet, thread through the convolutions of wire composing the coil and induce a current of electricity to flow in one direction during the influx of the magnetic lines and in the opposite direction at the time of their withdrawal. Just as the current was generated in the loop of wire when held in the hands by being moved into and taken out of a magnetic field, except in this instance the magnetic lines go into the convolutions of wire

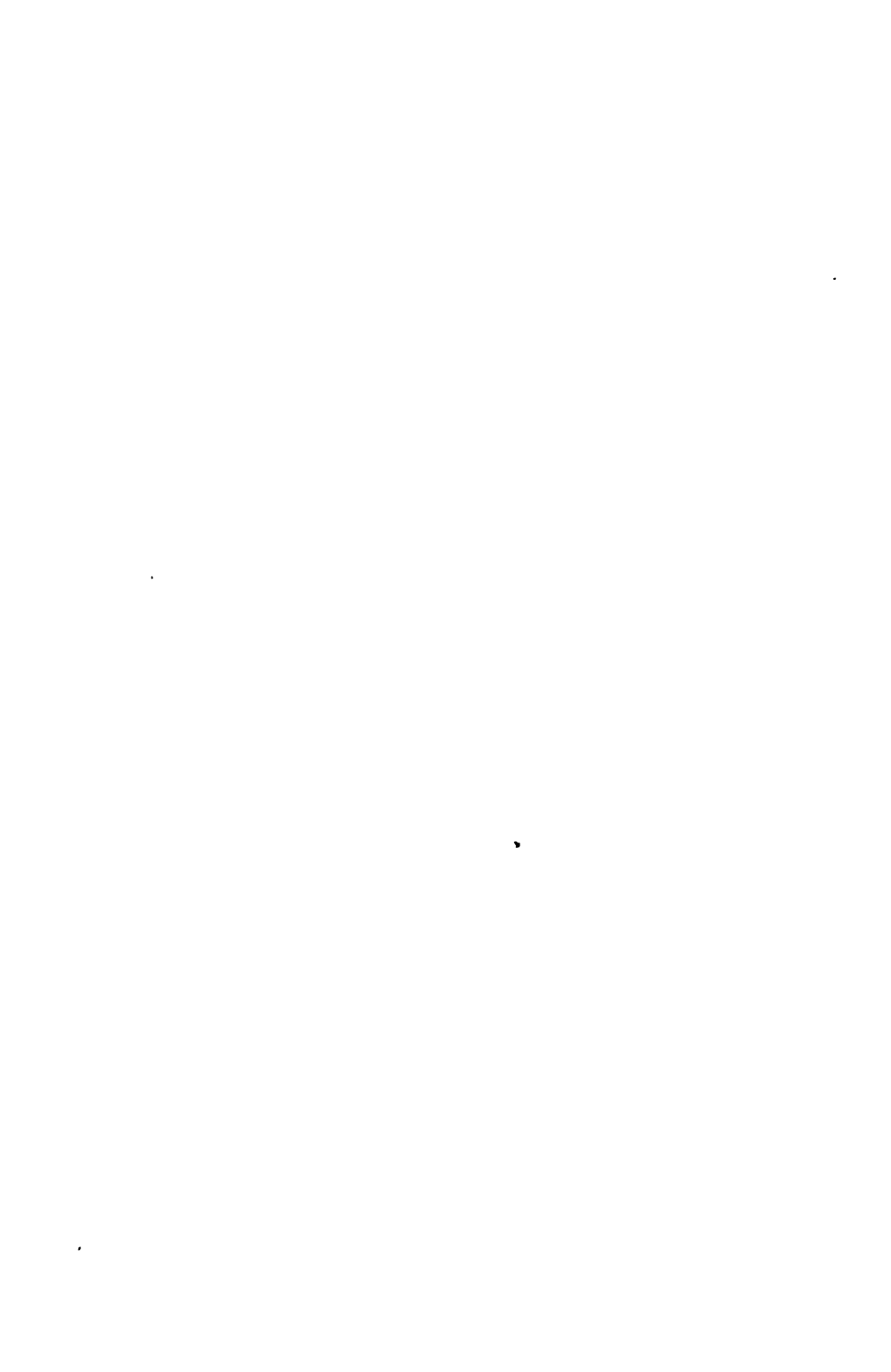




FIG. 8.

instead of the wire being moved into the magnetic field.

This alternate influx and withdrawal of the magnetic lines can be easily understood by referring to Fig. 9. The slender spring fastened in the slot at R *just touches* the point of the thumb-screw, T, at X, and it is at this point that the circuit in the primary wire is "made" and "broken." When the current flashes through the primary, i. e., the coils of the wire directly surrounding the iron core, the latter is magnetized and throws out lines of force, as in Fig. 6, which permeate the convolutions of both the primary and secondary coils; at the next instant, however, by magnetic action the hammer, H, is drawn toward M, which breaks the contact at X, and as the current ceases to flow through the primary coil, the core loses its magnetism and the lines of force are withdrawn from the convolutions of wire, thus generating the inverse current above referred to.

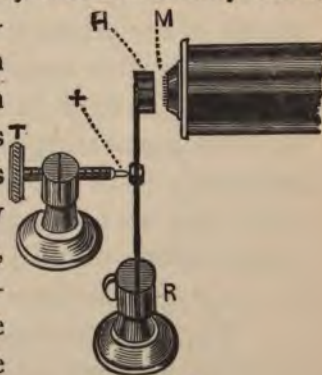


FIG. 9.

The greater number of turns of wire in the coil, or, in other words, the more times we can

cut the magnetic lines, the greater the E. M. F. generated, but the quantity or current will be correspondingly lessened on account of the increased resistance of the wire.

From a careful study of the foregoing principles it will be apparent that the induced current we use in every faradic apparatus is obtained by the agency of magnetism, and the principal office of the primary or inner coil directly surrounding the soft iron core is to convey the current from the battery cell around the core, thus magnetizing it. One or two galvanic cells are sufficient to operate a faradic coil, and although it would be impossible to detect a current from these cells by the sensation, yet when we take hold of the terminals of the primary coil that is operated by these same cells the sensation is considerable. This increased E. M. F. is caused by the magnetic lines of force permeating the convolutions of wire, consequently it is not the current from the battery cells that we feel, but the current *induced* in the convolutions of wire by the influx and withdrawal of the magnetic lines.

The same is true of the secondary coil, which is insulated from and has no connection with the primary, and, therefore, could not be influenced by the current from the battery cells, except that the more cells we add to any faradic apparatus the greater magnetic saturation of the core, and,



consequently, the higher electro-motive force induced in both primary and secondary coils.

The primary coil will answer therapeutically for a coarse wire secondary and give a current of more quantity because it is wound with coarser wire than the secondary, but having a fewer number of turns the voltage will be correspondingly decreased, therefore the term "current of quantity," generally used in connection with coarse wire coils, only means, therapeutically speaking, that the *patient receives less current* because the voltage is lower.

The secondary coil being wound with finer wire, we have cut the lines of force thrown out by the magnet many more times than with the coarser primary wire, and, therefore, have a higher induced E. M. F., and our patient receives more sensation than from the primary; but the greater length of wire in the secondary offering a greater resistance to the passage of the current we get less quantity, and by adding sufficient wire may obtain a current simulating the "static," in which the voltage is very high and the quantity so small as to be almost inappreciable.

The faradic current is a general tonic in its nature, assisting metabolic action and eliminating waste products, but is more mechanical than medicinal. Its greater value is in the slower interruptions, and the improvement in faradic coils will not be in putting a great length of wire in the secondary coil.

The so-called local anæsthesia produced by rapidly alternating high tension currents is simply done by tetanizing and fatiguing the muscle or nerve, and the writer does not believe it is as good or permanent as the relief of similar cases brought about by the action of the positive pole of the galvanic battery.

Let your faradic battery have a good primary coil with sufficient wire to thoroughly magnetize the core, and a secondary coil of finer wire probably about 1,000 yards in length, and an interrupter giving from forty or fifty up to 4,000 or 5,000 interruptions per minute, and trust its manufacture to some reliable firm, and you will not be disappointed in the results obtained from the apparatus.



CHAPTER IX.

FRANKLINIC ELECTRICITY—STATIC CHARGE.

It is only considered advisable to give the reader a few of the principal physical and therapeutic properties at static electricity, believing that any attempt at elaboration might cause confusion, and realizing that correct methods are only gained by experience.

No two operators exactly agree as to the technique to be employed, although the results obtained may be the same, therefore it must be left largely to the operator, who will discover something new and interesting each time the machine is used.

This manifestation of electrical energy properly belongs to that class called "high potential, high frequency currents," in which the voltage is enormous, while the amperage is infinitesimally small, and when we come to consider the fact that it requires about 50,000 volts pressure to force a spark across one inch of air space the tremendous potential energy of static machines becomes apparent, for they are often capable of giving a ten or twelve inch spark.

It is evident, therefore, that the therapeutical effects obtained are not due to electrolytic conduction, because there is little to conduct (competent observers asserting that the amperage generated by the ordinary machines is about .005 milliampere), these effects being mainly due to its oscillatory or vibratory character.

Every time a spark passes between the prime conductors of a static machine oscillations are set up, sometimes many millions per second, and these vibrations, when the patient is included in the circuit, are conveyed to the nerves.

In a former chapter we noted the fact that in health the nerves are all in a state of vibration, and when they lose their vibratory action their function is destroyed and degenerative changes commence. A very simple illustration will serve to show how static electricity does its work and why it is especially adapted for the treatment of disturbances of the nervous system.

We will take five tuning forks—A, B, C, D and E—and place them in an upright position on a sounding board; if, now, we take an extra C tuning fork, and, after causing it to vibrate, bring it in contact with the sounding board, the other C fork will vibrate in unison with it, but none of the others are affected, because the rate of vibration necessary to produce the tone of C is different from that which produces A or B. The nerves

in normal condition vibrate differently, and each one will respond only to the vibration that suits it; so, when the function of a nerve is destroyed, it becomes necessary to bring it within the range or subject it to a rate of vibration equal to its own.

In static electricity we have a wide range of vibration, from a few up to many millions per second, and as long as the patient comes within this area of oscillation each nerve is taking the vibration which suits it, which would account, in a measure, for the almost magical results we sometimes have in certain forms of neuralgia, migraine, etc.

Accurate localization is essential for success with any treatment. Althaus cites several cases which have been under his care at various times in which no progress was perceptible when he applied the electricity to a certain area of the brain which he believed to be affected; but when, on further consideration of the symptoms, a different district of the organ appeared to be at fault, and he altered the localization of the current, a successful result was obtained. Such occurrences, he says, not only give strong support to the theory that an unsatisfactory condition of brain currents may be improved by artificial electricity applied to the diseased area, but it likewise affords a proof that the influence of suggestion, for which now everything and anything is claimed in thera-

peutics, does not enter to any extent as a factor into electro-therapeutics, because, if suggestion were the active agent, it is much more likely that it would do its work in the beginning of the treatment than after the latter had been for some time ineffectual, whereby any suggestive force inherent

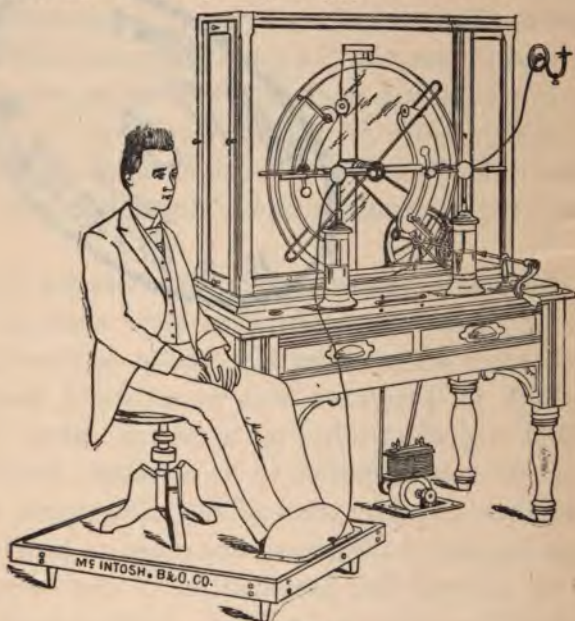


FIG. 10.

to the proceeding must have been lessened rather than increased.

The most popular treatment with this form of electricity is what is called *static insulation*.

Fig. 10 shows *positive* insulation. The patient seated on a insulated platform is connected with the

positive jar of the machine while the other jar is "grounded" or brought to zero potential by being connected to the earth through a gas or water fixture.

In this operation the potential of the patient is raised to that of the machine, which is very high, and as long as the treatment is continued all the nerves, as it were, are on a vibratory strain.

Another very popular treatment with static electricity is the *static bath* or *breeze* (Fig. 11) which is given by placing the patient on an insulated platform connected with one of the jars on the machine, while the other jar has connection with an inverted crown electrode suspended about three or four inches above the head.

The sensation produced by this treatment is quite pleasant to most patients, the feeling being as a gentle breeze on the head. Its action is that of a sedative and it is especially indicated in cases of migraine, insomnia, etc.

The so-called static induced current which has been elaborated and brought to the attention of the profession by Dr. Wm. J. Morton, of New York, is the current from the outside coating of the jars. It is taken from the binding posts in the base of the machine by means of a switch, and in sensation closely resembles the current from a faradic coil, although it widely differs from that current in both physical and therapeutical properties, being capable of produ

ing a muscular contraction after both faradic and galvanic irritability has ceased.



FIG. 11.

In conclusion and briefly, static electricity is an equalizer of the nervous forces, hastens the elimination of waste products, such as urea, carbon dioxide, and causes a dilatation of the cutaneous vessels.





The illustration is a very light, faded print, possibly a watermark or a very light ink drawing. It depicts a person standing next to a large, dark, rectangular object, which could be a chest or a piece of furniture. The person is wearing a long coat and a hat. The overall appearance is that of a very faint, ghostly image on a light-colored background.

Electro-Therapeutical Practice.

Abortion.

Bipolar intra-uterine electrode No. 69 introduced in uterus. Faradic secondary current, medium wire, 500 to 600 interruptions per minute. Seance 5 minutes.

(a) Unipolar method, same current, No. 21 in uterus, No. 66 on abdomen.

(b) Interrupted galvanic used same as above.

—**Threatened.**

Secondary faradic, fine wire, rapid interruptions, vaginal electrode No. 68 against cervix, No. 3 on lumbo-sacral region.

Abscess, Threatened.

Galvanism. No. 88 covered with wet cotton or chamois leather is attached to the positive pole and applied directly to lesion. No. 3 on negative some distance removed. Daily sittings of ten milliamperes for 10 minutes.

—**Mammary, Threatened.**

Galvanism. Cut a sheet of block tin after the

design of an ordinary breast plaster, leaving a hole in the center for the nipple; then take some tenacious clay and mix with water until it is of a consistency that can be spread; put a thick coat on the sheet of tin and apply to the breast. Attach to the positive pole and with a large surface electrode on the negative pole some distance removed, allow 15 to 20 milliamperes to pass for 10 minutes.

—**Tuberculous.**

Galvanism. Metallic electrolysis. Take a copper needle of suitable size and insulate it (see Insulation), attach it to the positive pole and thrust it into the abscess. No. 3 on negative pole at some indifferent point. 20 milliamperes for 5 to 8 minutes, then reverse polarity for 2 or 3 minutes to free the needle.

Acne.

Galvanism. Positive pole to lesion. 5 ma. for 10 minutes daily.

Adhesions, Pelvic.

Galvanism. Electrode No. 68 covered with wet cotton attached to negative pole and well up in vaginal vault. No. 66 on abdomen, 30 to 50 ma. Tri-weekly seances.



Afterpains.

Secondary faradic current, fine wire coil, rapid interruptions. No. 3 electrode on each pole, one to lumbar region, the other over abdomen. 5 to 10 minutes.

Alopecia. See Baldness.**Amenorrhœa**

Galvanism. Positive pole, No. 3, to lumbar region; negative, No. 3, above the pubes. 20 ma. for 5 minutes three times during week preceding regular period.

- (a) Galvanism, negative in uterus, No. 99. Positive, No. 66, on abdomen. 20 ma., tri-weekly.
- (b) Bipolar intra-uterine faradization.
- (c) General faradization (see Faradization).

Anæsthesia, local.

Galvanism, positive pole.

- (a) Fine wire secondary faradic rapidly interrupted.
- (b) By cataphoresis. Cocaine on positive pole, galvanism.

Aneurisms.

Galvano-puncture; No. 106 with platinum needles is used unipolar* and attached to pos-

*See foot note under "Hypertrophy."

itive pole ; No. 3 on negative ; 30 ma. for 15 to 20 minutes, or until clot is fully formed. Turn off current, reverse polarity and turn current on again for a few moments, or until needles can be removed easily.

Angina Pectoris.

Galvanism. No. 96 (4x6 in.) attached to positive and applied over sternum. No. 3 to negative over lower cervical vertebræ ; increase current gradually to 10 ma. for 2 minutes for first few sittings, afterward prolong sitting to 5 minutes.

Anthrax. See Carbuncle.

Aphasia. See Paralysis.

Apoplexy.

Faradism. Secondary current from medium wire coil. No. 3 on positive to base of brain. No. 1 on negative *labile* over the motor points of the nerves supplying the affected muscles. A mild current from 5 to 15 minutes daily. Do not begin treatment until 2 or 3 weeks after the stroke.

Arthritis.

No. 96 (2x6 in.) AROUND the joint attached to





positive. No 3 on negative ; 20 ma. for 10 minutes daily.

- (a) By cataphoresis. Wet the positive electrode with solution of salts of lithium and apply as above.
- (b) Static induced current for 10 minutes daily.

NOTE.—In gouty arthritis of the fingers the positive electrode should be constructed as follows: Take a glass or porcelain dish and fill nearly full of clay about the consistence of thin mortar, and, by means of a metal strip, or otherwise, connect with the positive rheophore. The affected part of the hand is to be immersed in the clay.

Asphyxia.

Faradism. Current strong enough to produce good contractions—one electrode (No. 1) to phrenic, the other (No. 3) along the insertion of diaphragm into thorax wall. Interrupt current by raising one electrode about 20 or 30 times per minute.

Asthma.

Strong faradic current applied to opposite sides of neck for 15 to 20 minutes.

- (a) Galvanism. No. 1 attached to positive at middle of outer edge of sterno-cleido-mas-toid; No. 3 to negative up and down spine. 10 ma. for 10 to 15 minutes.

Atrophy.

Galvanism. No. 96 (5x7 in.) attached to positive over sternum (or some indifferent point); No. 1 to negative *labile* over affected parts. 20 ma. for 10 min. every second day.

- (a) Coarse wire secondary faradic, slow interruptions, same manner as above, 15 minutes daily.

Baldness.

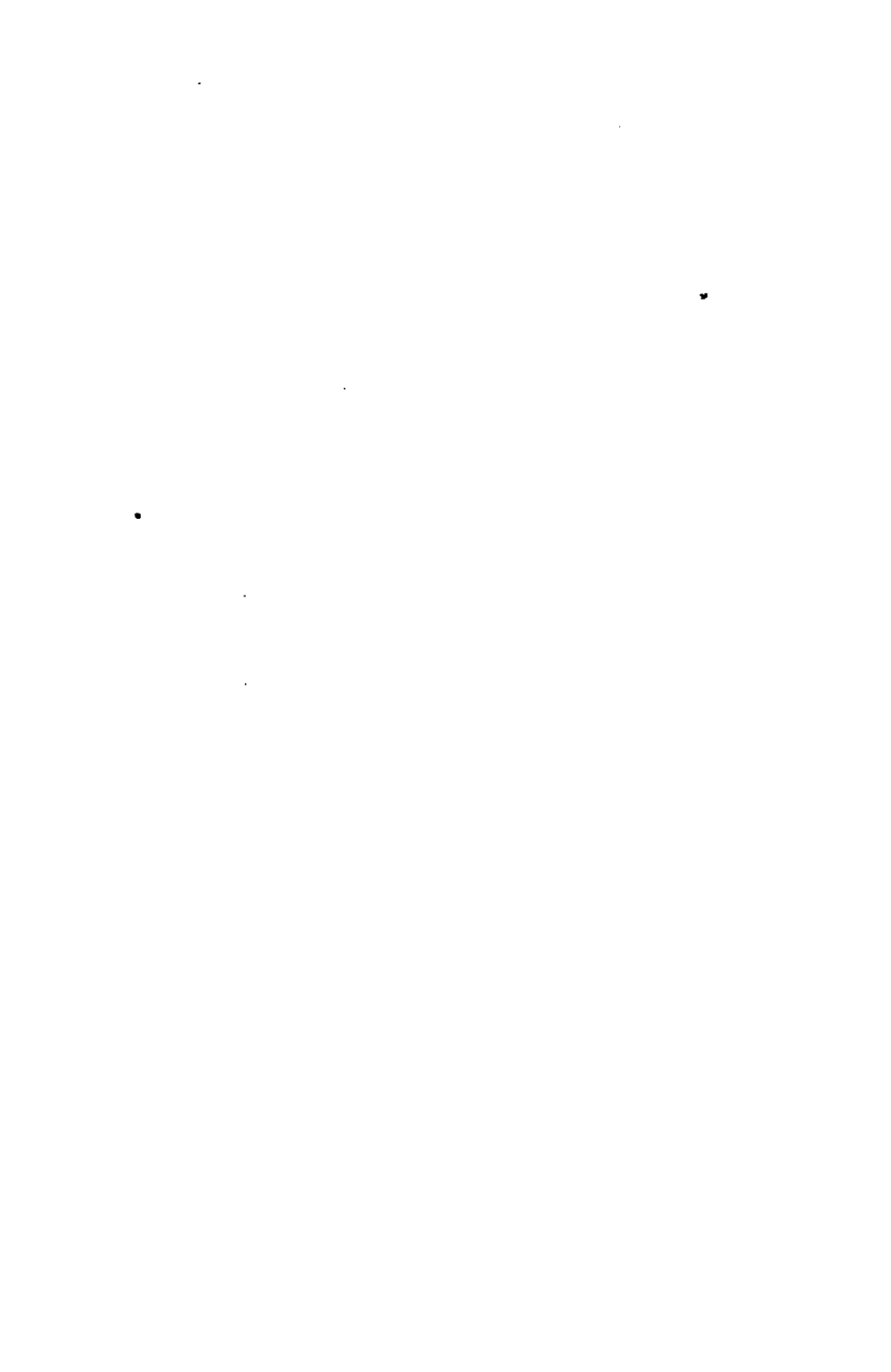
Static breeze to head 15 minutes daily.

- (a) Galvanism. No. 3 on negative to head, positive in hand, 5 to 8 ma. for 10 minutes three times a week.

Bladder, Spasm of.

Faradism. Fine wire secondary, rapid interruptions. No. 21 attached to positive in bladder, No. 66 to negative over symphysis; 5 minutes every day.

- (a) In young girls, where the above treatment is inadmissible, place one electrode over sacrum instead of in bladder, and proceed as above.





Boils, To Abort.

No. 102 or 33 covered with chamois or cotton is attached to positive pole and applied to lesion, No. 3 on negative; 20 ma. for 10 minutes daily.

—When Pus has Formed.

Metallic electrolysis. Copper needle attached to positive in abscess; 25 ma. for 5 minutes. (See also Abscess, Tuberculous.)

Breasts, Female, Development of.

Faradism. Current from coarse wire, secondary coil. No. 0 for active electrode *labile* is always pushed *toward* the nipple (never over it), using considerable pressure on the roller; No. 1 in each hand on the other pole, using a bifurcated or forked cord. Commence with 5 minute sittings, to be prolonged after 8 or 10 treatments to 15 minutes. On alternate days use galvanism with same electrodes in hands attached to positive pole, No. 3 on negative *labile* to breasts; 10 to 15 ma. for 5 to 8 minutes.

Bright's Disease.

Positive static insulation for 25 min. daily.

Bunions.

Static spark 10 minutes daily.

- (a) By cataphoresis. No. 33 covered with cotton saturated with solution of cocaine attached to positive pole, No. 3 on negative ; 20 to 25 ma. for 5 to 10 minutes.

Cancer, See Carcinoma.

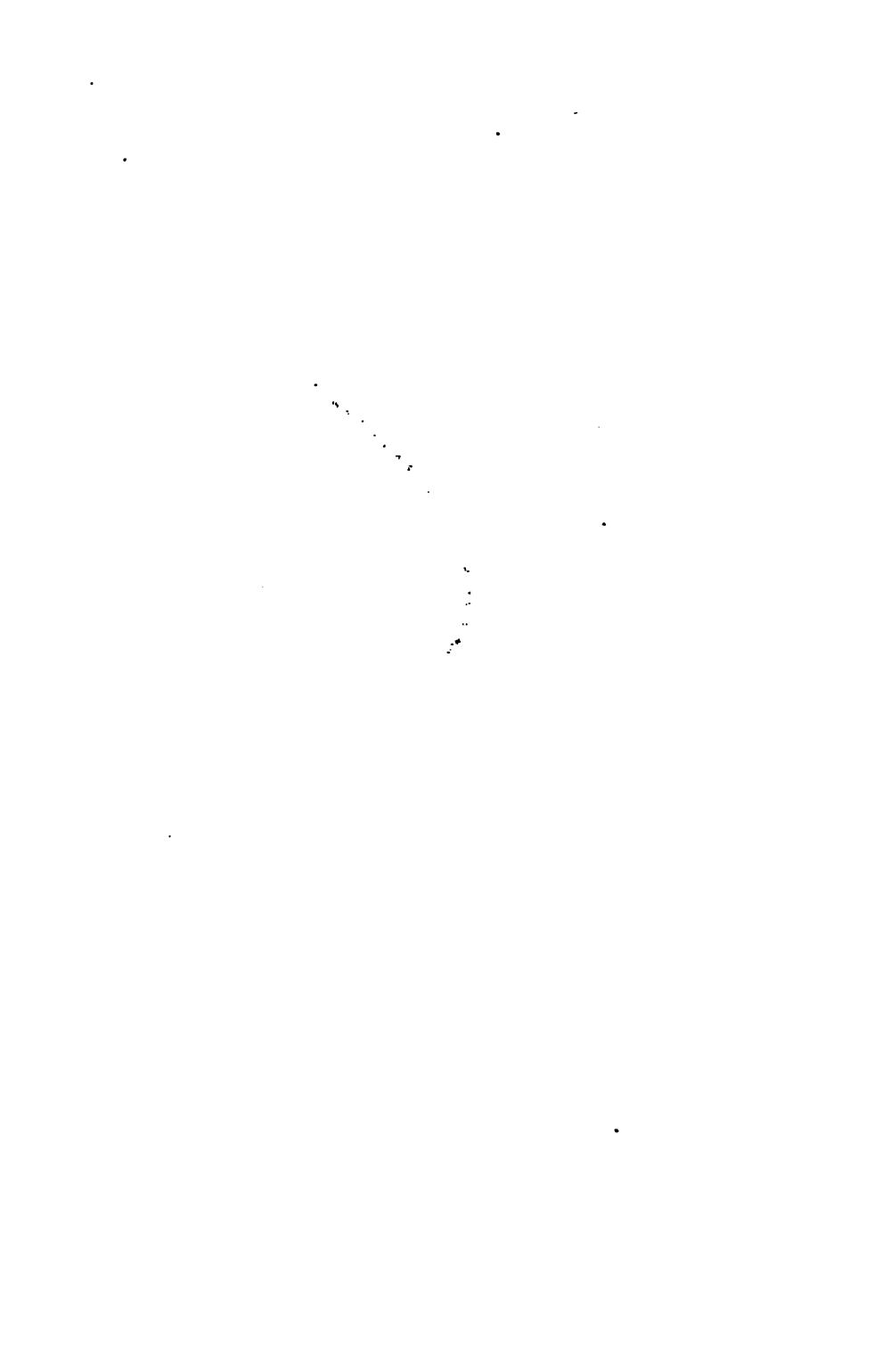
Carbuncle, To Abort.

Galvanism. No. 102 or 33 covered with cotton or chamois well wetted and attached to positive pole is applied to lesion. No. 3 on negative. 25 ma. for 10 minutes daily. If pus has formed plunge a copper needle attached to positive pole into each nodule or head for 5 minutes, using 20 ma. (See also Abscess, Tuberculous.)

Carcinoma, Breast.

Galvanism. Anæsthetize patient. No. 105 to each pole with from 3 to 10 platinum needles according to extent of growth. The needles are plunged into the base of growth one set on each side and the current turned on rapidly until about 400 ma. are obtained when the current is to be reversed by means of pole changer every 2 or 3 seconds for about 30 times, then remove needles and replace on the other two opposite sides of growth and proceed as before.





— **Of Cervix.**

Same technique as above but with single needles introduced through an insulating canula.

Catarrh, Nasal.

Metallic electrolysis. No. 65 made of copper and used unipolar attached to positive pole ; No. 3 on negative at some indifferent part. 15 ma. for 5 minutes three times weekly.

— **Cervical.**

Galvanism. No. 99 in cervix is attached to positive pole ; No. 66 on abdomen to negative. 50 to 100 ma. twice a week.*

N. B. Do not reverse polarity to remove electrode. Use a little traction.

Central Galvanization.

No. 3 attached to both poles. Negative over epigastrium *stabile*. Positive *labile* over forehead, top of head, along inner border of sterno-cleido-mastoid, from mastoid fossa to sternum, at nape of neck and down the entire length of spine. In the former part of treatment, or where the brain is included in the

*These electrodes differ in their active surfaces ; some have two and others four square centimeters. Use 25 ma. for every square centimeter of active surface. The electrodes are marked.

circuit, not more than 5 ma. should be used ; in latter part of the operation the current may be increased to 10 ma. The whole sitting may be a half hour or more.

Chancroids.

Galvanism. Metallic electrolysis. No. 37, or other suitable electrode made of copper is attached to the positive pole and applied to lesion. No. 3 on negative to some indifferent point. The current should be applied long enough and of sufficient strength to deposit the oxychloride of copper deeply into the tissues, which can be ascertained by the green color.

Chilblains.

Galvanism. Metallic electrolysis. Moisten part with salt water and apply No. 14 (made of copper) attached to positive pole. No. 3 on negative. 15 to 25 ma. for 5 minutes every second day.

Chloasma. See Liver Spots.

Chorea.

Galvanism. No. 3 on both poles. Positive to forehead, negative to nape of neck. 3 ma. for 3 minutes. At same sitting with same



— **Of Cervix.**

Same technique as above but with single needles introduced through an insulating canula.

Catarrh, Nasal.

Metallic electrolysis. No. 65 made of copper and used unipolar attached to positive pole ; No. 3 on negative at some indifferent part. 15 ma. for 5 minutes three times weekly.

— **Cervical.**

Galvanism. No. 99 in cervix is attached to positive pole ; No. 66 on abdomen to negative. 50 to 100 ma. twice a week.*

N. B. Do not reverse polarity to remove electrode. Use a little traction.

Central Galvanization.

No. 3 attached to both poles. Negative over epigastrium *stabile*. Positive *labile* over forehead, top of head, along inner border of sterno-cleido-mastoid, from mastoid fossa to sternum, at nape of neck and down the entire length of spine. In the former part of treatment, or where the brain is included in the

*These electrodes differ in their active surfaces ; some have two and others four square centimeters. Use 25 ma. for every square centimeter of active surface. The electrodes are marked.

Corns.

Galvanism. Place the foot on No. 52 covered with a wet towel or cotton and attached to the negative pole. No. 33 covered with cotton or chamois attached to positive over corn. 5 ma. for 10 minutes. If very painful wet the cotton on positive electrode with solution of cocaine.

(a). Static spark for 15 minutes daily.

Deafness, labyrinthine.

Galvanism. No. 31 loosely packed with cotton saturated with a weak solution of potassium iodide (the wet cotton protruding from the distal end of electrode). Attach to negative pole. No. 3 on positive to sternum. 5 ma. for 10 minutes three times a week.

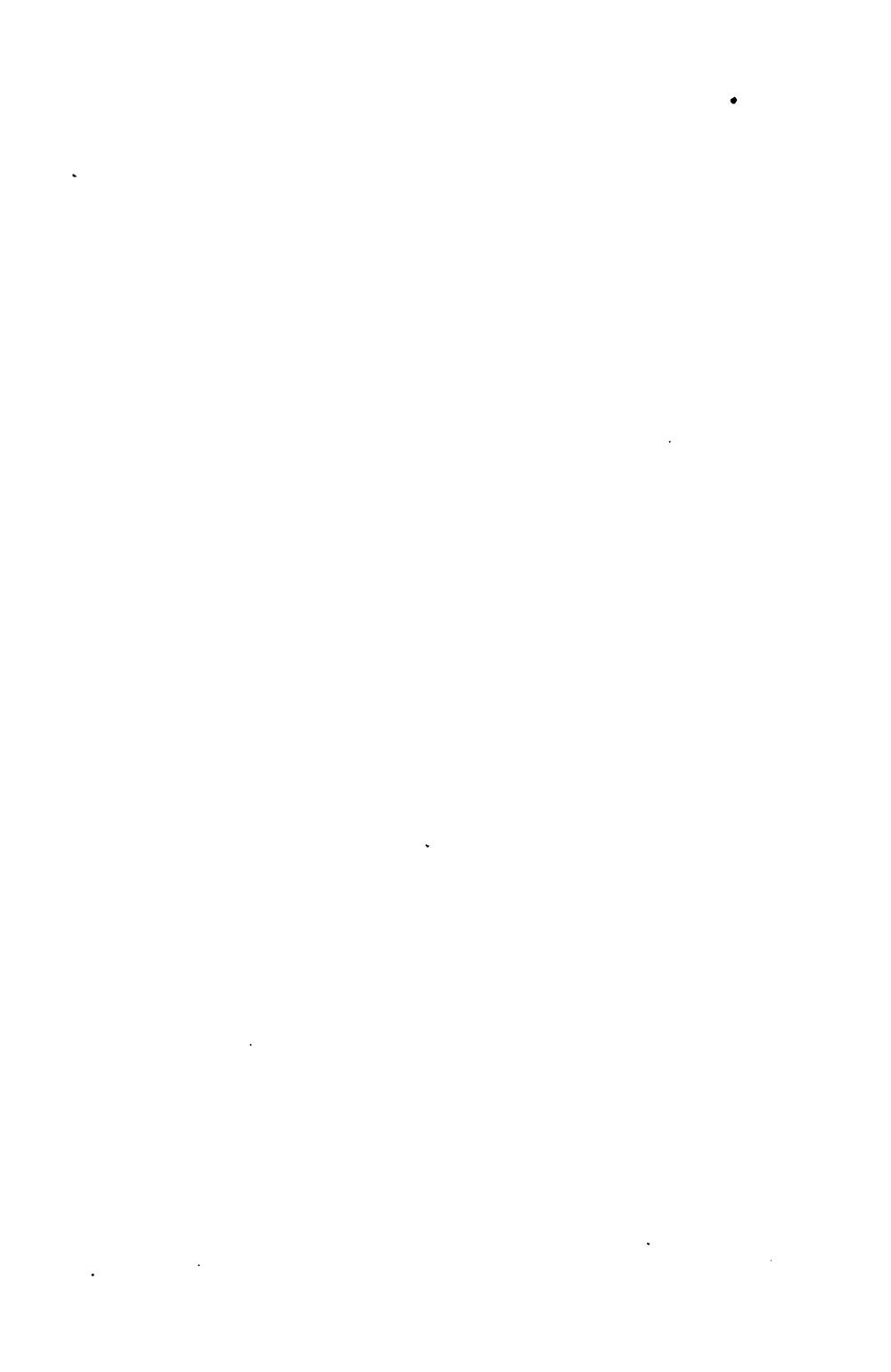
—Nervous.

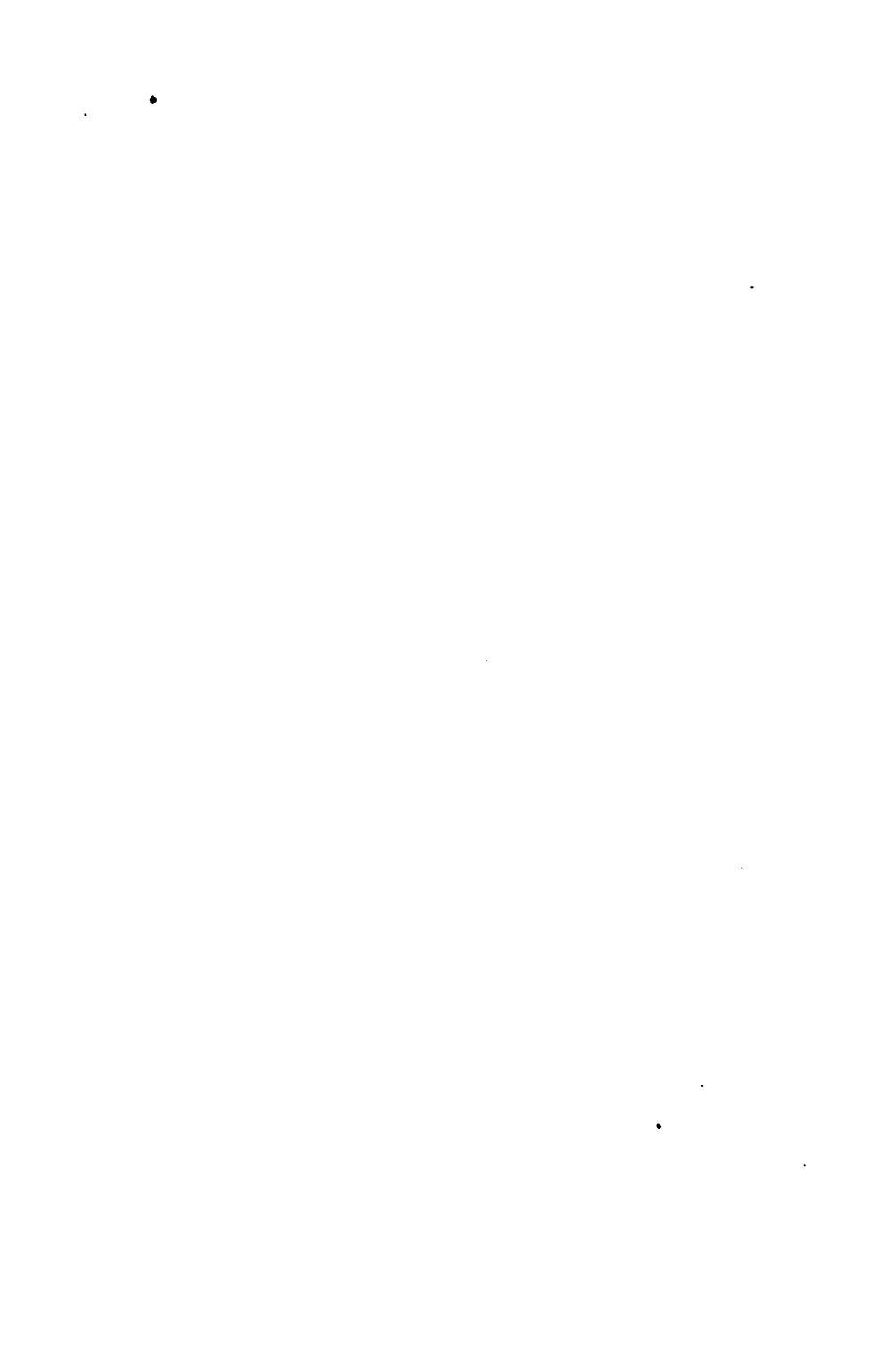
Galvanism. No. 33, covered with cotton or chamois, is attached to positive pole and placed just in front of ear to cover the tragus. No. 3 on negative to sternum. 5 ma. for 10 minutes daily.

Diabetes.

General faradization alternated with central galvanism.

(a) Positive static insulation for 25 min. daily.





Diaphragm, Spasm of. See Spasm.

Diarrhœa, Chronic.

General faradization (see Faradization) combined with frequent applications over abdomen and lumbar regions.

- (a) Galvanism. No. 53, covered with cham-
ois, attached to positive pole in rectum. No.
3 on negative over region of ileo-cœcal valve.
10 ma. for 10 minutes every second day.

Dysmenorrhœa, Congestive.

Galvanism. No. 104 with large copper bulb well packed with wet cotton and attached to positive pole is inserted well up in the posterior vaginal vault. Nos. 66 or 96 on negative to abdomen. 20 ma. for 10 minutes every second day.

— **Membranous.**

Galvanism. No. 99 in uterus, attached to negative pole. No. 66 on positive over abdomen. 50 to 100 ma. every second day for 15 minutes during the week preceding the expected period.

(See foot note under "Catarrh, Cervical".)

— **Obstructive, due to stenosis.**

Galvanism. No. 21 on negative. No. 66 on

positive to abdomen. 5 to 10 ma. for 5 minutes, or until the active electrode passes through the contraction. Seance every third day, increasing size of olive at each sitting.

—**Virginal.**

Galvanism. No. 96 (4x6) attached to each pole. Positive to lumbar region, negative to hypogastrium. 20 to 30 ma., tri-weekly sittings.

Dyspepsia, Atonic.

Faradism. Fine wire secondary with rapid interruptions. No. 96 (4x6) on positive pole a little to the left of the spinous processes, and at a level with the cardiac end of the stomach, No. 3 on negative *labile* over stomach; 10 minutes daily.

Eczema.

Central galvanization. (See Central Galvanization).

Endometritis.

Galvanism. Metallic electrolysis, No. 101 attached to positive in uterus, No. 66 on abdomen; 25 to 40 ma. for 10 minutes tri-weekly. Reverse current for a few minutes to release electrode.

—**Virginal.** (See **Dysmenorrhœa, Virginal.**)

Enuresis.

Faradism. Fine wire secondary with rapid interruptions; No. 3 on both poles, one to lumbar spine, the other to pubes.

(a) Same as above, with No. 53 in rectum.

(b) Galvanism. No. 53 in rectum attached to negative, No. 3 positive over pubes; 5 to 8 ma. for 10 minutes daily.

Epilepsy.

Galvanism. No. 3 on each pole, positive to forehead, negative to nape of neck; 3 ma. for 5 minutes daily.

(a) Central galvanism. (See **Central Galvanization.**)

(b) Static head breeze for 15 minutes daily.

Epistaxis.

Galvanism. Metallic electrolysis. No. 65 (made of copper) is attached to the positive pole and introduced into the nasal cavity in contact with erectile or varicose tissue that causes the trouble; No. 3 on negative to sternum or some indifferent point. The intensity of current should average from 16 to 20 milliamperes, and the length of *seance* from 8 to 10 minutes.

Epithelioma.

Electrolysis. Negative attached to No. 92 or 105 with one or more needles, according to size of growth, is inserted into base of tumor on a line with the skin. No. 3 on positive; 5 to 15 ma. until considerable blanching has taken place. (See also "Carcinoma.")

Erosions (of external os).

Metallic Electrolysis. The electrode designed by Julia L. Fitz Hugh (Page 132) is best adapted for this purpose. Attach to positive pole No. 66 on abdomen. 10 to 15 ma. for 10 minutes every second day.

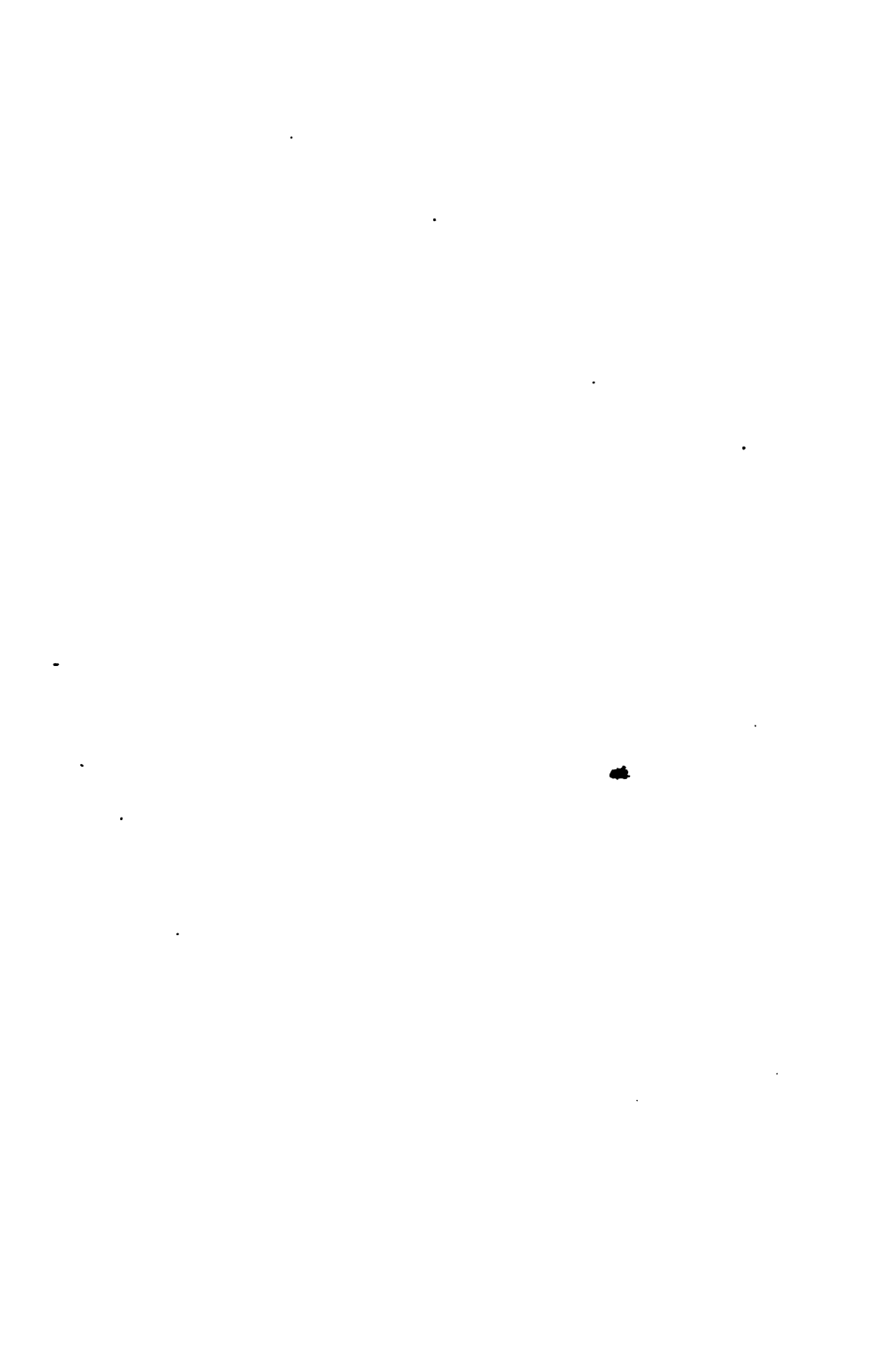
Eustachian Tube, Stricture of.

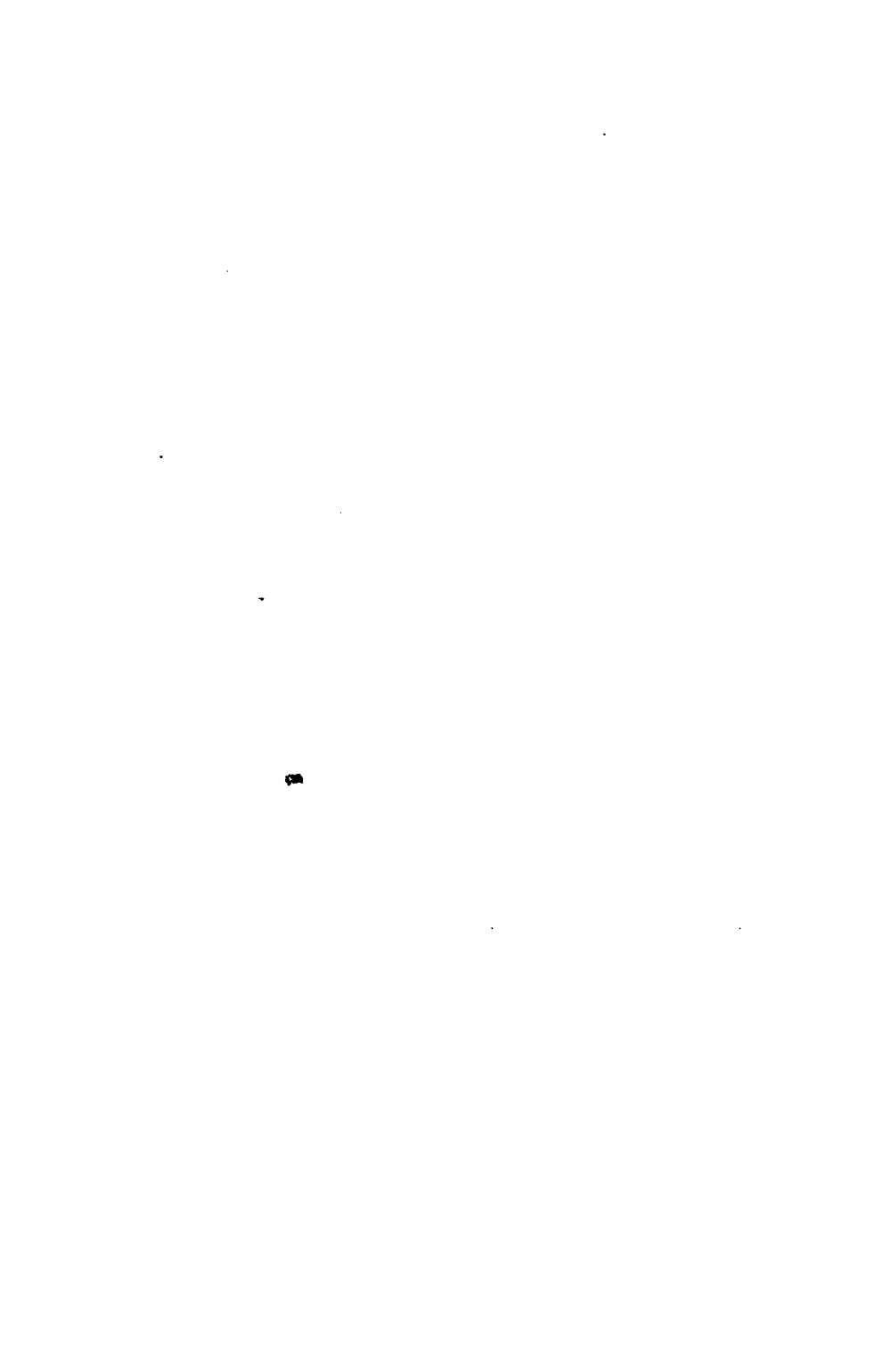
Galvanism. No. 77 on negative is introduced into the tube until stricture is engaged. No. 3 in hand. 3 to 5 ma. about 4 minutes or until distal end of electrode has passed the obstruction.

Eye, Atrophy of Optic.

Galvanism. Positive (No. 3) on nucha; negative (No. 1) on frontal protuberance. 5 ma. for 3 minutes daily.

(a) Galvanism. Positive No. 3 on nucha; negative No. 1 on upper cervical ganglion, 5 ma. 3 minutes.





(b) Galvanism. No. 74 on negative to closed lids; No. 1 on positive to nucha. 5 ma. for 3 minutes daily.

Eye, Trachoma.

Metallic electrolysis. No: 37 (made of copper) attached to positive pole and applied to granular surface. No. 3 negative in hand. 3 to 5 ma. for 5 minutes, or until the membrane has assumed a greenish hue. Use cocaine anæsthesia.

Facial Paralysis. See Paralysis.

—**Spasm. See Spasm.**

Faradization, General.

No. 52 covered with wet towel *stabile* to feet attached to negative. No. 3 on positive *labile* over whole body.

(a) No. 66 *stabile* over coccyx on negative. No. 3 on positive *labile* over whole body. Sitting to last a half hour or longer.

Fever, Convalescent From.

Static electric bath or breeze for 15 to 20 minutes daily.

—**Hay.**

Galvanism. No. 65 (made of copper) is attached to positive pole and applied to sensi-

tive spots in nasal cavity. Negative (No. 3) in hand or on cheek ; sittings daily commencing with 5 ma., gradually increase the current with each seance until 15 or 20 ma. is reached.

Fibroids, Uterine.

These tumors being distinctly of benign origin must be treated with a view of cutting off their nutritive supply or establishing a retrograde metamorphosis. This is nearly always better accomplished by the use of the positive pole intrauterine on account of its power of lessening the caliber of the blood vessels, besides which it will check the hæmorrhage if that be one of the symptoms.

Many operators recommend the use of the negative for the active pole, but if this pole be used it must be with the purpose of actually destroying or decomposing some of the fibrous tissue and this would require the large currents recommended by Apostoli (100 to 250 ma.) which are usually not well borne. If the negative pole was used at all it had better be on those of the sub-mucous variety where the endometrium presents a nodular appearance.



Anatomically all fibrous growths are decreased in size by the use of the current, but the object of such application is not so much with a view to their obliteration (very few entirely disappear) as to make a symptomatic cure and thus enable the patient to pass a comfortable existence.

Fissure, in Ano.

Galvanism. No. 21 on negative applied to whole surface of fissure. No. 3 on positive to thigh. 5 to 8 ma. for 5 minutes. Repeat in a week or ten days if necessary.

— **In Nipples.**

Galvanism. A small copper wire with smooth point attached to positive pole is applied to the full extent of fissure until it turns an apple green, showing that the oxychloride of copper has been deposited. No. 3 on negative in hand, 5 ma. or about 8 to 10 Leclanche cells.

Fistula.

Galvanism. Insert probe-pointed copper wire to full depth of fistula, attach to positive pole. No. 3 on negative to some indifferent point. 10 ma. for 5 minutes. Reverse current to free electrode.

Freckles.

Galvanism. If very black insert fine steel needle attached to negative pole just under epidermis for 2 or 3 seconds. No. 3 to positive in hand. Use four Leclanche cells.

Furuncle. See Boils.**Galactorrhœa.**

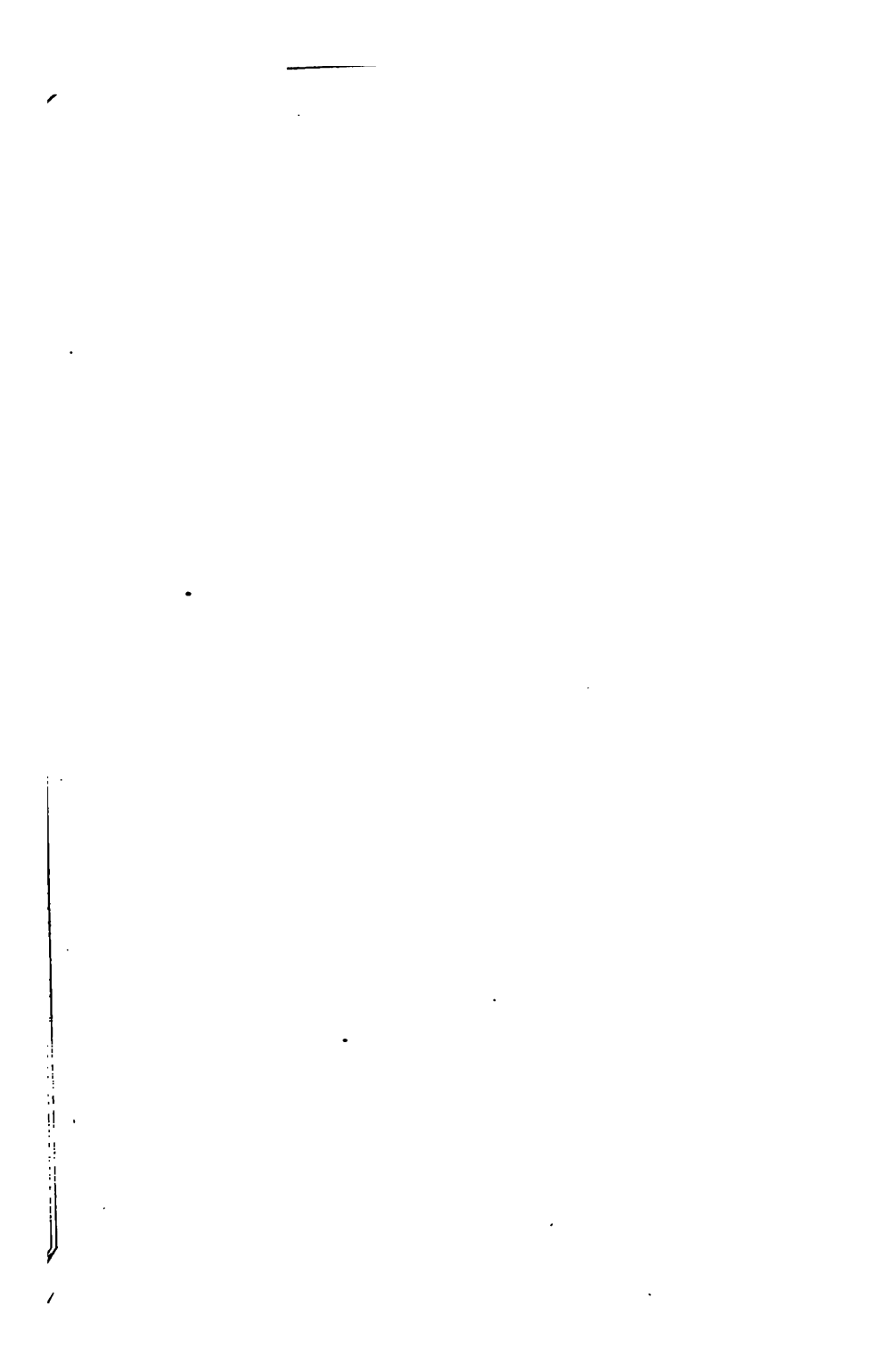
Galvanism. Cut a sheet of block tin after the manner of a breast plaster, leaving a hole in the center for the nipple, and solder onto it a connector for inserting a cord tip. Mix some tenacious clay with water until it is just thick enough to spread. Put a thick coat of this clay upon the block tin, attach to the positive pole of the battery and apply to the breast. No. 66 on negative between the shoulders. 20 ma. for 10 minutes daily.

NOTE.—If the treatments be continued lactation will entirely cease.

(a) Faradism. Fine wire coil rapid interruptions. No. 1 on each pole. Apply current *around* the breasts, not through them. 10 minutes daily.

Gastralgia.

Faradism. Fine wire coil rapid interruptions.



No. 3 on both poles, one over stomach, the other on back.

- (a) Galvanism. No. 3 on both poles. Positive over stomach, negative to back. 20 ma. for 5 minutes.

Gestation, Ectopic.

Faradism. Fine wire coil *slow* interruptions. No. 68 placed against sac per vagina or rectum. No. 66 on abdomen. Five minutes every second day until diminution in size of sac is apparent, then use galvanism, same electrodes, with negative pole to sac. 15 to 20 ma. for 5 minutes every second day.

Gleet.

Galvanism. Copper sound, No. 103, that will easily pass meatus is attached to positive pole and introduced into urethra, often to the full depth. Negative No. 3 or No. 66 to abdomen or thigh. Increase current gradually until 10 ma. is reached. Reverse polarity to free electrode. Five minutes every third day.

Goitre.

Galvanism. Cataphoresis. No. 113 with pad of cotton, lint or blotting paper saturated with strong solution of potassium

iodide attached to *negative* pole. No. 1 on positive to opposite side of growth; 20 ma. for 5 minutes every third day if irritation caused by the current will permit.

- (a) Galvanism. Electrolysis. No. 105, with from 3 to 10 needles according to size of growth, attached to negative and plunged into enlarged gland. No. 96 (6x8) to positive over shoulder blade, 10 to 15 ma. for 5 minutes once in from 5 to 7 days.

— **Exophthalmic.**

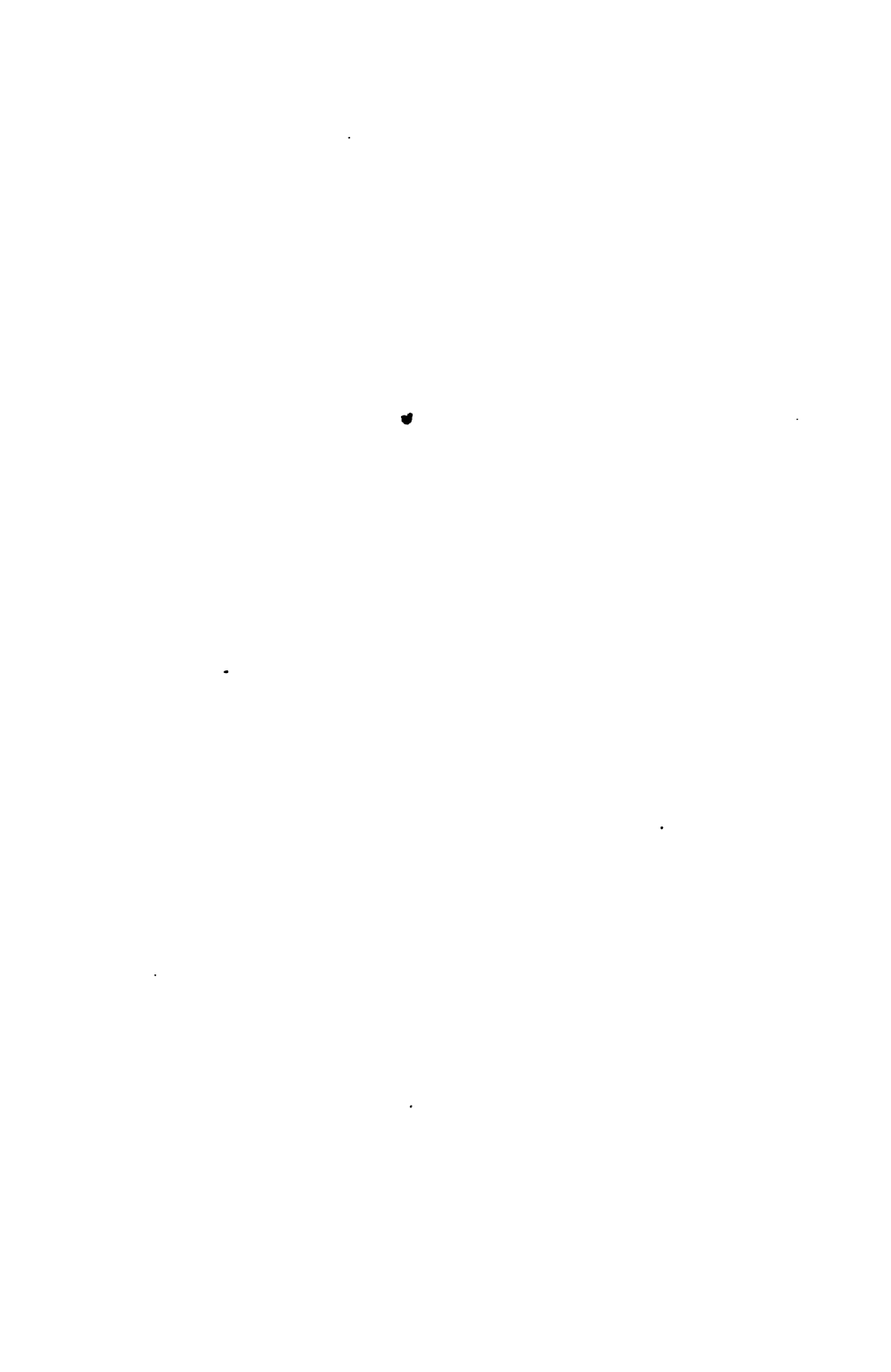
Although galvanism has been used on the gland the author believes it to be harmful on account of its effect on the vagus, inhibiting the heart's action. It is better to pay no attention to the thyroid but give the static breeze for 20 minutes, daily, to improve the condition of the nerves.

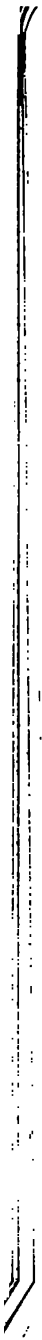
Gonorrhœa. See Gleet.

Gout.

Faradism. Fine wire secondary; rapid interruptions applied with suitable electrodes over painful parts.

- (a) Galvanism. No. 96 of suitable size attached to positive over seat of lesion. Large





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surface electrode to negative; 20 ma. for 10 minutes daily.

- (b) Galvanism. Cataphoresis. Use current same as above but saturate positive sponge with a solution of the salts of lithium.

Hæmatocele, Pelvic.

Galvano-puncture. No. 58 attached to positive. Make puncture through vagina. No. 66 on negative to back or abdomen; 50 ma. for 5 minutes. Reverse current to free electrode.

- (a) Galvanism. No. 94 applied to mass through vagina on positive pole. Negative No. 66 on back or abdomen so as to include the mass between the two electrodes; 50 ma. gradually increased to 75 ma. for 5 minutes every second day if the irritation caused by the negative electrode will permit.

Hæmorrhage, Cerebral.

Galvanism. Position No. 1 to the side of the lesion. Negative No. 3 to opposite side on neck. 5 ma. for 5 minutes daily.

—Post Partum.

Bipolar Faradism. Medium wire, secondary coil. 2,000 to 3,000 interruptions per minute.

No. 69 in uterus. 10 to 15 minutes, or until bleeding is checked.

- (a) Galvanism. No. 99 on positive in uterus. No. 66 on abdomen. 50 to 100 ma. for 5 minutes.

(See footnote under "Catarrh Cervical.")

—Fibroids. See Tumors.

Hæmorrhoids.

Galvanism. No. 53, made of copper, is introduced into the rectum and attached to the positive pole. No. 66 on negative to abdomen. 15 ma. for 10 minutes every second day.

To avoid the sticking of the electrode to the mucous surface of the rectum its metallic surface must be smoothly covered with chamois leather or kid sewed on just like the cover on a ball; wet this with water only. It is not best to use either soap or vaseline; the former by its alkalinity counteracts the polar effect of the current and the latter is a non-conductor. It is not best to change the covering on the electrode for each application for the reason that it takes two to three treatments before the covering becomes saturated with the salts of copper, and if a new cover is used at each seance, we lose, in a great measure, the antiseptic effects of the copper salts. The operator will also find

relief of many reflex symptoms which puzzled him greatly that were due to rectal irritation.

Hair, Superfluous.

Galvanism. A fine, steel needle, bulbous pointed (made for this purpose), is fastened into No. 107 and attached to the negative pole. No. 3 on positive, within easy reach of the patient. Use five cells of the Leclanche form or four of the acid type. Introduce needle into follicle, following the direction of hair shaft. Have the patient complete the circuit by laying hand on sponge electrode. The hair should now be grasped with the forceps (No. 72), but *very little* traction used. When the bulb is destroyed the hair will come out *almost by itself*.

Do not use sharp pointed needle. Do not grasp hair with forceps before introducing the needle. Use magnifying glass if sight is not good.

Hay Fever. See Fever.

Hemicrania.

Galvanism. Positive (No. 1) on supraorbital arch, negative (No. 1) on the mastoid; 5 ma. for 5 to 8 minutes.

- (a) Faradism. The "electric hand." The operator holds the positive electrode in left hand while the patient holds the negative. The operator then uses his right hand as an electrode to the affected part. The hair must be moistened. Use long, fine wire, secondary current, with rapid interruptions.
- (b) Static head breeze for 15 to 20 minutes.

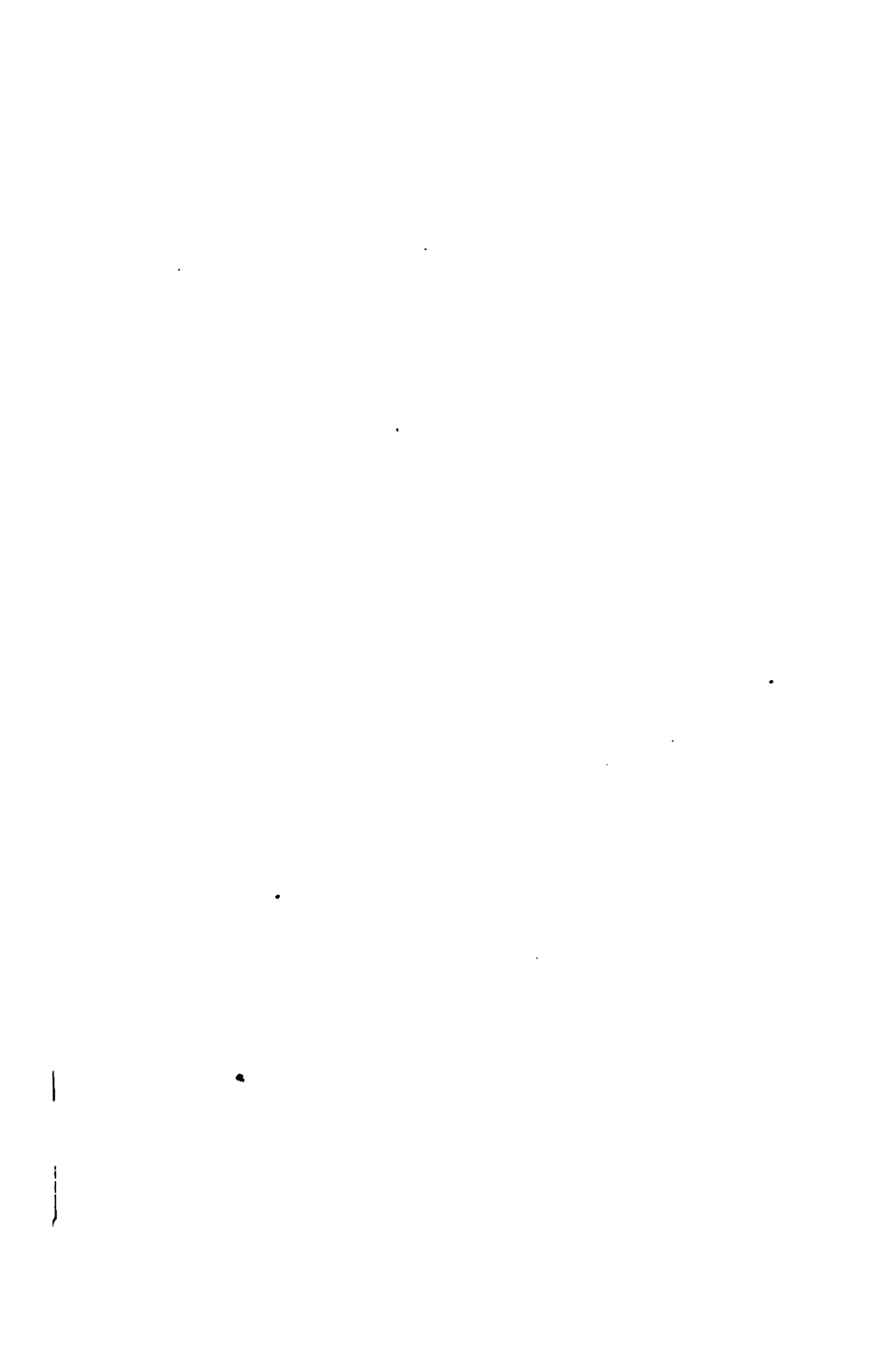
Herpes Zoster.

Galvanism. Negative pole over seat of lesion, positive at some indifferent point; 10 ma. for 15 minutes daily.

Hydrocele.

Galvano-puncture. No. 58 on negative pole in scrotum, No. 96 on positive to thigh or abdomen. Increase current gradually to 40 ma. and continue for 5 minutes.

- (a) Draw off the fluid from scrotum, and inject into the sac about one-half the quantity drawn off of a solution of potassium iodide (1 to 20); then introduce No. 58 attached to *positive* pole with No. 96 on thigh, and turn on current until 18 or 20 ma. is reached. Sitting 10 to 12 minutes.



Hyperæsthesia, Skin.

Galvanic baths. An ordinary bath tub may be utilized in the following manner: Attach a metallic strip to an insulated wire, place the strip in bottom of tub, which must be porcelain or porcelain lined, and cover with lattice or strips of wood to prevent contact with the patient. After the latter is placed in the bath one pole of the battery is attached to the insulated wire running to the metallic strip in tub, the other attached to No. 1 is held in patient's hand, which must be *out of the water*. In this trouble the patient must hold the positive pole in the hand, while the negative is attached to the tub.

—Of Stomach.

Faradism. Fine wire secondary with rapid interruption. One electrode (No. 3) to epigastrium, the other to spine for 5 to 10 minutes daily.

Hypertrophy, Inf. Turbinated.

Galvanism. No. 106 (used bipolar) in turbinated. 20 to 30 ma. for 5 minutes. Seance once in seven or eight days.

- (a) Galvanism. No. 106 (unipolar)* attached to negative in turbinated. No. 3 to positive in hand. 10 ma. for 5 minutes once a week. The use of cocaine is nearly always desirable.

Hypochondriasis.

Static breeze for 15 to 20 minutes daily.

- (a) Galvanization of the spine. 10 ma. for 10 minutes daily.

Hysteria.

Static head breeze for 15 minutes followed by "static induced" for 10 minutes with roller electrode up and down spine.

- (a) Static head breeze for 15 minutes followed by general faradization for 15 minutes (See Faradization.)

Hystero-Epilepsy.

Faradism. Coarse wire coil, fifty to sixty interruptions per minute. No. 52 covered with wet towel to feet; a long sponge or spongopilin covered electrode, 2 x 24 to spine. Seance 10 minutes every second day.

- (a) Static head breeze for 15 minutes daily.

*This electrode is made unipolar by winding a few turns of bare wire around the metal connecting posts on proximal end.





Inertia, Uterine.

Faradism. Medium wire secondary with intermediate interruptions. Use bipolar vaginal electrode No. 86 in vagina. Seance 5 minutes, to be repeated every hour or two.

Infantile Paralysis. See Paralysis.**Insanity.**

Static head breeze followed by "static induced" up and down spine. Seance to last 25 minutes every other day and to be alternated with central galvanization. (See central galvanization.)

Insomnia.

Galvanism. Use a different one of the following methods at each alternate sitting:

Positive, No. 3, to forehead; negative, No. 3, to nape of neck. 2 to 3 ma. for 10 minutes.

Positive, No. 3, on cervical vertebræ; negative to epigastrium. 10 ma. for 15 minutes.

Positive, No. 3, on cervical spine; negative attached to foot bath. 15 ma. for 15 minutes.

(a). Static head breeze for 20 minutes daily.

In the evening is best.

Insulation, for Needles, etc.

Take a wide-mouthed bottle and fill it nearly

full of ordinary orange shellac, pour on sufficient alcohol to cover it and let stand until dissolved. It can be thinned if desirable by adding a little more alcohol. Fasten a camel's hair pencil into the stopper after the manner of a mucilage brush. The needles to be insulated are pushed into a soft cork to the required depth and then painted with the shellac varnish down to the free surface of the cork. They can be used after a few hours. Ordinary uninsulated metal electrodes of any kind can be insulated at any part desired, by painting them with this mixture.

Intercostal Neuralgia. See Neuralgia.

Iritis, Pain and Congestion in.

Galvanism. No. 74 to closed lids on positive; No. 3 in hand. 1 ma. for 2 or 3 minutes.

— **Adhesions following.**

Galvanism. No. 74 to closed lids on negative. No. 3 in hand. 2 ma. for 5 minutes.

Jaundice.

Faradism. No. 52 covered with wet towel to feet attached to negative. No. 3 on positive *labile* to whole surface of body. Sittings one-half hour every second day.

Lactation, Excessive. See Galactorrhœa.

Lateral Sclerosis.

Galvanic Baths. The regular electric bath tub, such as shown on last page, is the one preferred. The current is turned on with the positive to head, the negative to feet, and as the patient only receives about a fifth of the total current passing, the meter should register 200 ma. The bath should continue 10 or 15 minutes and be given every day for 5 or 6 days; then every other day until 15 baths are taken.

Lead Paralysis. See Paralysis.

Leucorrhœa, Vaginal.

Galvanism. Metallic electrolysis. No. 104 with large copper olive covered with a wad of wet cotton is attached to the positive pole in vagina; No. 66 on abdomen. 25 ma. for 5 minutes every third day.

NOTE.—Electrode No. 68 if made of copper is better adapted to the treatment of this trouble. The metal portion of any electrode is, however, easily plated with copper and answers just as well as the solid metal. For process, see Plating.

Liver, Cirrhosis.

General faradization. See Faradization.

- (a) Interrupted galvanic. Positive No. 3 posteriorly over liver, negative No. 66 to epigastrium. 10 ma. interrupted 100 times per minute.

Spots.

Galvanism. Carbon disc, No. 88, covered with cotton is attached to positive and applied over discoloration; negative in hand. 10 ma. for 5 minutes daily.

NOTE.—It is probable that these spots can be removed much better and quicker by the process termed "ecorchement."

Locomotor Ataxia.

Galvanism. No. 96, 2x24, positive to spine. No. 66 to sternum. Commence with a current of 5 ma. for 10 minutes, and gradually increase at each sitting until about 20 ma. is reached.

- (a) Galvanic Bath. See "Lateral sclerosis."
(b) Static direct spark to full extent of spine for 5 minutes, followed by static head breeze for 15 minutes.

Lupus.

Galvanism. Metallic electrolysis. No. 14,

made of thin copper, on *positive* to lesion. No. 96 to sternum, or some indifferent part. 10 to 15 ma. for 5 minutes, or until a thorough application of the oxychloride of copper is made, which can be ascertained by the color.

N. B.—If the seat of lesion is first moistened with salt water the deposition of the salt of copper is very materially hastened.

Mania. See **Insanity.**

Massage.

Faradism. No. 111 bipolar electrode is used over the parts to be influenced. Coarse wire secondary coil with medium interruptions.

- (a) No. 30 attached to the arm of the operator, who then uses his hand as an electrode, the other pole being in contact with patient.

Melancholia.

Galvanism. Positive pole to footbath. Negative, No. 3, to nape of neck and up and down spine. 5 to 8 ma. for 20 minutes every second day.

- (a) Static head breeze for 15 minutes, followed by "static induced" to spine. Sittings daily.

Meningitis.

Galvanism. No. 3 on positive over parietal

region, No. 3 on negative subaural ; 5 ma. for 5 minutes daily.

(a) Galvanism. No. 96 on negative to sternum, No. 3 on positive *labile* over cervical spine ; 10 ma. for 10 minutes.

(b) Static head breeze for 15 minutes daily.

Menopause.

Faradism. Medium wire secondary. Bipolar method, No. 69 in uterus ; 10 minutes daily.

(a) Galvanism. No. 99 attached to negative in uterus, No. 66 on abdomen ; 20 to 25 ma. for 10 minutes every second or third day.

(b) Static insulation has an equalizing effect on the nervous forces, and is, therefore, of much benefit in the "fullness of the head" symptom which almost always accompanies this trouble.

Menorrhagia.

Galvanism. No. 99, of pure tin, in uterus attached to positive pole, No. 66 on abdomen ; 50 to 100 ma., according to active surface on positive electrode, for 5 to 8 minutes every second day.

(a) Galvanism. Metallic electroiysis. No.

104, with zinc olive, in uterus attached to positive pole, No. 66 on abdomen; 25 to 40 ma. for 8 minutes tri-weekly.

Metritis.

Galvanism. Cupric electrolysis. No. 103 or 104 in uterus attached to positive, large electrode on abdomen; 40 ma. for 5 minutes every second day.

(a) Galvanism. No. 99, pure tin, in uterus attached to positive, No. 66 on abdomen; 50 to 100 ma. every third day.

—Peri and Para.

In the acute inflammatory stage use secondary Faradic current from long, fine wire coil with rapid interruptions. Bipolar method with No. 86 in vagina. Seances 15 to 20 minutes each day until the subacute stage is reached, when the following is to be used:

(a) Galvanism. No. 99 attached to positive in uterus, No. 66 on abdomen. Commence with 30 ma. for 3 minutes twice a week, and gradually increase current strength and time to 75 ma. for 5 minutes.

Miscarriage. See Abortion.

10. *[Faint text]*
11. *[Faint text]*
12. *[Faint text]*

Notes:

- 1. *[Faint text]*
- 2. *[Faint text]*
- 3. *[Faint text]*
- 4. *[Faint text]*

(a)

- 1. *[Faint text]*
- 2. *[Faint text]*

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Moles.

Galvanism. Steel needle fastened into No. 107 and attached to the negative pole is introduced into the mole on a line with the skin, not quite through but nearly so. No. 3 on positive within easy reach of patient, who completes the circuit by laying his hand upon it. Use six cells of the Leclanche form or four of the acid variety. Continue application for 5 minutes or until the growth is blanched to an ashy hue. In case the growth is large a holder should be used capable of holding two or three needles. Such a one is shown in Fig. 92 or 106. The needles for this work should always be insulated. (See Insulation.)

Myelitis.

Galvanism. No. 3 over area of lesion. No. 3 on sternum; 10 ma. for 10 minutes, the current to be reversed every half minute.

- (a) Galvanism. No. 3 on positive to nape of neck. No. 3 on negative to lumbar spine. Seance 10 minutes with 10 ma., the current to be reversed three times during the sitting.





Nævus. See Moles.

—**Vascular.** See Vascular Tumors.

—**Pigmentary.** See Wine Marks.

Nasal, Spurs of Septum.

Galvanism. Bipolar needle holder No. 106. The needles are thrust into the growth and a current from 10 to 12 cells is used until the blanched appearance indicates that electrolysis is complete.

—**Stricture.**

Galvanism. Attach to the negative pole electrode No. 21 with an olive one or two sizes larger than the caliber of stricture. No. 3 on negative in hand or on sternum; 3 to 10 ma. until the bulb passes through stricture. Repeat operation in from five to seven days, increasing size of olive at each sitting.

Nettle Rash. See Urticaria.

Neuralgia.

Galvanism. Cataphoresis. No. 1 with sponge saturated with chloroform, attached to positive pole, is applied to lesion. No. 3 on negative to some indifferent point. 10 to 12 ma. for 3 to 5 minutes.

N. B. Care should be taken not to apply current too long, as vesication may result.

- (a) Galvanism. Positive pole over seat of pain, with negative at some indifferent point. If the neuralgia is not about the head a current of 12 to 15 ma. may be applied for 10 minutes daily.
- (b) Faradism. Secondary current from long, fine wire coil, rapid interruptions. Sitzings, 10 to 15 minutes.

—**Hysterical.**

Static head breeze for 20 minutes daily.

—**Trigeminal.**

Galvanism. No. 1 on positive over lesion. No. 3 on negative over upper cervical vertebræ. 3 ma. for 5 minutes two or three times daily.

- (a) Cataphoresis. A disc of blotting paper is saturated with solution cocaine and placed over the exit of the superior maxillary branch. No. 88 attached to positive pole is applied to this. No. 3 to negative in hand. 7 to 10 ma. for 3 minutes.

Neurasthenia.

Static head breeze for 20 minutes daily, followed by static induced current for 10 min-





utes, with one pole to feet, the other (with roller electrode) over parts affected.

—**Cerebral.**

Galvanism. No. 3 to forehead on positive. No. 3 to nape of neck on negative. 3 ma. for 3 minutes. Increase to 5 ma. for 5 minutes if tolerance is good. Sitzings daily.

Obstetrics, Uterine Inertia.

Faradism. Bipolar method. Secondary current from medium wire. No. 86 in vagina. Apply current for 5 minutes every hour.

—**Retention of Dead Fœtus.**

Faradism. Secondary current from coarse wire coil, used bipolar in uterus with electrode No. 69.

Œsophagus, Paralysis of. See Paralysis.

—**Stricture of.**

Galvanism. No. 55 is attached to the negative pole, with an olive one or two sizes larger than the caliber of the stricture. No. 3 on positive to sternum or in hands. 10 ma. until bulb passes through stricture. To be repeated in four or five days, increasing size of olive at each sitting.

Optic Nerve, Atrophy of. See Eye.

Orchitis.

Galvanism. A No. 1 electrode attached to each pole is placed one on each side of the mass and the current gradually turned on until 10 ma. is reached. This should be maintained for 2 or 3 minutes, and the current turned off again gradually, when the polarity is to be reversed and the same amount of current gradually turned on as before. The entire sitting should occupy about 10 minutes.

Ovaritis.

Faradism. Secondary current from long, fine wire coil applied with bipolar vaginal electrode No. 86 for 15 to 20 minutes each day until sensitiveness to pressure has been overcome; then use:

- (a) Galvanism. No. 94 in vagina against the ovary on positive pole. No. 66 on negative to abdomen. 20 ma. for 8 to 10 minutes every second day. Gradually increase current with each sitting until 35 to 40 ma. is reached.

Pain, Relief of.

The positive pole of galvanic current.





- (a) Faradic current from long, fine wire secondary coil rapidly interrupted.
- (b) Cataphoresis. Galvanism. Use solution of cocaine on positive pole.

Paralysis.

Galvanism. Positive pole with large electrode *stabile* over sternum or some indifferent point. No. 1 on negative *labile* over affected nerves and muscles, with current strength easily borne by the patient.

—Agitans.

Static insulation followed by sparks along the course of spine. 15 to 20 minutes.

- (a). Galvanism. Positive to forehead, negative to nape of neck. 3 to 5 ma. for 5 minutes daily.
- (b). Galvanism. Positive pole with large electrode over sternum. Negative, No. 3, *labile* over spine. 10 ma. for 10 minutes daily.

—Aphasia.

Galvanism. Positive pole over the third frontal convolution; negative on opposite side of neck. 3 to 5 ma. for 5 minutes daily.

- (a). Static head breeze for 15 to 20 minutes daily.

— **Diphtheritic.**

Faradism. Coarse wire secondary coil, medium interruptions. No. 28 applied to pharynx. No. 1 low down on front part of neck. Sittings 5 to 10 minutes daily.

NOTE.—If electrode No. 28 causes the patient discomfort, such as gagging, etc., use No. 14 instead on tongue.

— **Facial, Cerebral Origin.**

Galvanism. No. 1 on negative over exit of facial nerve just in front of ear. No. 3 on positive to nape of neck. 3 to 5 ma. for 5 minutes daily.

— **Hemiplegia.**

Galvanism. No. 3 on positive to nape of neck. No. 3 on negative over inferior fronto-parietal region. 3 to 5 ma. for 3 minutes; then change the negative to a subaural position, the positive as before. Same time, same current strength. Next use faradism, coarse wire, secondary coil, slow interruptions for 10 minutes over paralyzed muscles.

— **Hysterical.**

Static head breeze for 20 minutes daily followed by static induced current applied with roller over affected parts.



—**Infantile.**

Faradism. One pole (with bifurcated cord) in hands; the other *labile* over affected parts.

(a) Galvanism. Large surface electrode on positive over diseased focus; negative to spine. 5 to 10 ma. for 10 minutes daily.

(b). Central galvanization (see central galvanization).

—**Intestinal.**

Galvanism. No. 85 attached to negative in rectum; No. 3 on positive *labile* over abdomen; 3 ma. for 10 minutes every second day.

(a) Faradism. Coarse wire secondary coil, medium interruptions. No. 85 on positive in rectum; No. 3 *labile* on negative over abdomen, lumbar and dorsal regions of the back.

—**Lead.**

Galvanic baths after the manner given under "Hyperæsthesia." In this trouble the metal strip in tub is connected with positive pole while the patient holds the negative out of the water.

—**Ocular Muscles.**

Galvanism. No. 74 attached to negative

over closed lids. No. 3 on positive below occiput; 3 to 5 ma. for 5 minutes daily.

(a) Same electrodes in same position with mild faradic current for five minutes.

NOTE.—It is best to alternate these two treatments.

—**Œsophagus.**

Faradism. Coarse wire secondary coil with about 600 interruptions per minute. No. 14 on tongue. No. 3 to upper edge of sternum. Sittings five minutes daily.

—**Paraplegia.**

Galvanism. See "Locomotor Ataxia."

(a) Galvanic Baths. See "Lateral Sclerosis."

—**Peripheral, facial.**

Galvanism. No. 1 on negative over exit of facial nerve just in front of ear, or at the styloid process. No. 3 on positive below occiput; 3 to 5 ma. for 5 minutes daily.

(a) Static induced current with one electrode in hand, the other at the styloid process. Sittings 5 minutes daily.

Pelvis, Inflammatory Exudates and Adhesions.

Galvanism. No. 94 attached to positive well up in the vaginal vault. No. 66 on negative



to abdomen; 20 to 40 ma. for 5 to 8 minutes every second day until all inflammation and tenderness has disappeared, then reverse the polarity in all subsequent sittings and use No. 68 covered with cotton or chamois on the negative pole; same dosage as before.

Piles. See **Hæmorrhoids.**

Plating, Copper, for Electrodes.

Put into a suitable glass vessel a saturated solution of copper sulphate and immerse in it a strip of copper long enough to bend over the outer edge of the jar; to this strip, by means of a suitable connector, attach the positive pole of a battery of two or more cells. Connect the electrode to be plated to the negative terminal and immerse in the fluid until sufficiently plated, which will be in about 10 minutes.

NOTE.—This does not make an *elegant* job of plating, but I have found it to answer the purpose when a copper electrode is wanted for immediate use and there is none at hand. The metal to be plated should be first thoroughly cleansed. This is best done by scouring with a solution of potassium cyanide.

Poliomyelitis. See Myelitis.

Post-Partum Hæmorrhage. See Hæmorrhage.

Pregnancy, Extrauterine. See Gestation.

—Vomiting of

Faradism. Long, fine wire secondary coil, rapid interruptions. No. 3 on positive over epigastrium; No. 3 on negative to back. Sittings 5 to 10 minutes each morning.

- (a) Galvanism. No. 88, covered with a thin layer of cotton or lint, attached to positive pole is applied above the clavicle, between the two branches of the sterno-mastoid. No. 3 on negative over the epigastrium. 8 to 10 ma. for 15 to 30 minutes.

Prostate Gland, Hypertrophy.

Galvanism. While some operators recommend the use of the negative pole to the gland the author believes it to be irrational to use that pole on a gland already patulous. If the reader will follow the exact technique given under "Hæmorrhoids" he will find the prostate decrease in size and the tone greatly improve.

- (a) Galvano-cautery. The galvano-cautery sound used in this operation is devised for the purpose, the best one being after the style

invented by Dr. Newman. It is catheter-shaped, the stem being a hard rubber or metal tube terminating in a hollow olive which holds the platinum burner; a fenestrum in the olive permits the application of the burner to the tissues. An accumulator or storage battery is best adapted for this work.

—**Granular.**

Galvanism. Metallic electrolysis. A suitable copper olive is attached to No. 104 on positive pole and introduced into the prostatic urethra. No. 3 on negative to lumbar region or on abdomen. 10 ma. for 5 to 8 minutes. To be repeated in 4 or 5 days.

Proud Flesh. See **Ulcers, Exuberant.**

Pruritus.

Faradism. Long, fine wire secondary coil with rapid interruptions. No. 3 in hand; No. 1 over seat of lesion. 5 to 10 minutes daily.

(a) Galvanism. Same electrodes. Positive pole to lesion; negative in hand. 5 ma. for 10 minutes daily.

Rectum, Stricture of.

Galvanism. No. 21 with metal olive one or

two sizes larger than caliber of stricture* is attached to the negative pole and introduced into the rectum against stricture. No. 66 on abdomen or lumbar spine, 10 to 15 ma. until bulb passes through. Repeat operation every 4 days using larger olive at each sitting.

— **Ulceration of.**

Galvanism. Metallic electrolysis. An insulated stem with a copper or zinc olive is applied attached to the positive pole, the negative being at some indifferent point. 5 ma. for 10 minutes, repeated every third or fourth day.

Rheumatism, Acute Muscular.

Static induced current applied for 15 minutes daily.

— **Articular.**

Galvanism. Cataphoresis. A suitable flexible, sponge covered electrode, arranged so as to envelop the joint, is saturated with a solution of some of the salts of lithium and attached to the positive pole, the negative (a

*Olive points for this electrode run from No. 10 to 40 French scale.

large electrode) being at some indifferent point. 20 ma. for 10 minutes.

Ringworm.

Galvanism. Metallic electrolysis. Attach to the positive pole a suitable electrode made of copper, No. 14 or 37, and having moistened the spot to be treated with salt water apply the copper electrode directly to the lesion. No. 3, or even a larger electrode is attached to the negative pole and placed at some convenient indifferent point. If the seat of lesion is about the head a very large current cannot be employed, but a smaller current for a longer time will do just as well. On other portions of the body a current of 15 ma. can be tolerated for 5 minutes.

N. B. As the object of the treatment is to deposit the oxychloride of copper deeply into the tissues, the current must be applied long enough and of sufficient strength to give the tissues a greenish appearance.

Salpingitis, Acute.

Faradism. Bipolar electrode No. 86 in vagina. Long, fine wire secondary coil, rapid interruptions. Seance 20 to 25 minutes.

—Subacute.

Galvanism. No. 94 attached to the positive pole well up in the vagina; No. 66 to lumbar region on negative; 20 to 30 ma. for 10 minutes every second day until three treatments are given, then use negative pole in vagina.

—Suppurative.

Galvanism. No. 99 intrauterine attached to negative pole, No. 66 on abdomen; 20 to 50 ma. for 5 to 8 minutes tri-weekly.

Scars.

Galvanism. A fine steel needle is fastened into No. 107 and connected with the negative pole. The needle is introduced just below the superficial layer of skin, and the current continued long enough to separate it from the underlying tissue. The needle should be reinserted at other points until the whole surface of the scar has been acted upon. Six cells are sufficient for the work.

Sciatica.

Galvanism. No. 96 or No. 66 is attached to the negative pole and placed upon the lumbar spine. No. 3 on positive is used *labile* along

the course of the nerve ; 15 to 20 ma. for 10 minutes daily.

- (a) Static induced current used in same manner as above.

Scirrhus. See Cancer.

Sclerosis. See Lateral Sclerosis.

Shingles. See Herpes Zoster.

Spasm, Facial.

Galvanism. No. 3 on positive is placed about 2 inches above the ear, No. 3 on negative to nape of neck ; 5 ma. for 5 to 8 minutes.

- (a) Galvanism. No 1 on positive is placed just in front of the ear, No. 3 on negative to nape of neck ; same current, same time.

Spasm, Diaphragm.

Galvanism. No. 3 on positive pole to epigastrium. No. 3 on negative to back of neck. 10 ma. for 5 minutes, twice daily.

- (a). Faradism. Long, fine wire, secondary coil, rapid interruptions. No. 17 labile over epigastrium. No. 3 to back of neck. 5 minutes 2 or 3 times daily.

—**Sterno-Cleido-Mastoid. See Torticollis.**

Spermatorrhœa.

Galvanism. In this lesion the ejaculatory ducts and seminal vesicles are in a relaxed condition and need the toning that can be given them by the positive pole. This can best be accomplished by using the positive in rectum and negative on abdomen, and exactly the same technique may be employed as that given under "Hæmorrhoids," which see.

Spinal Meningitis.

Galvanism. No. 3 attached to positive pole to occiput. No. 3 on negative *labile* to full extent of spine. 5 to 8 ma. for 10 minutes daily.

Spleen, Enlarged.

Static sparks drawn from region over spleen.

(a). Static induced current. One electrode over spleen, the other on back directly opposite.

(b). Galvanism. No. 3 on positive over lesion. No. 3 on negative to back. 10 to 15 ma. for 10 minutes daily.

Stenosis, Uterine.

Galvanism. No. 21 with an olive of suitable size is attached to the negative pole and in-

roduced into the uterus. No. 66 on abdomen to positive. A current strength of 20 to 25 ma. will generally carry the olive point through the stenosed canal in about 5 minutes.

Repeat every third day, using larger olive at each sitting.

Sterility. Due to nondevelopment of Uterus.

Faradism. Coarse wire, secondary coil, slow interruptions. No. 69 in uterus, bipolar method. Sitzings daily for 5 to 8 minutes.

NOTE.—If the canal is not patulous enough to admit the No. 69, use No. 21 with small olive in uterus and No. 3 on abdomen.

Stricture, Lachrymal Duct.

Galvanism. Take a small olive-pointed probe and insulate it all except about $\frac{1}{8}$ inch at the distal end (see insulating). Fasten it into a "D" connector (see cut) and attach to the negative pole. No. 3 on positive in hands. Introduce the probe into the duct until the stricture is engaged and gradually turn on current until 2 or 3 ma. is reached. The point of probe will pass through stricture in a few moments.

—**Nasal.** See **Nasal.**

—**Œsophagus.** See **Œsophagus.**

—**Rectum.** See **Rectum.**

—**Urethral.**

Galvanism. Use a Newman's sound, shown on next to last page, about three sizes larger than caliber of stricture. Attach to the negative pole. No. 3 or 66 is attached to positive and placed on the abdomen or back. The stricture is then engaged with the sound and the current gradually turned on until 5 ma. is reached. Use very little or no pressure, the alkaline action of the negative pole will carry the bulb through in about 5 minutes. Before the current is turned off the bulb is drawn back through the stricture. Repeat in 5 to 7 days with an electrode having larger bulb.

—**Uterine.** See **Stenosis.**

Subinvolution of Uterus.

Faradism. Coarse wire secondary coil, 500 to 600 interruptions per minute. Bipolar method with No. 69 in uterus. 10 minutes daily.

(a) Galvanism. No. 99 attached to positive





pole in uterus. No. 66 on abdomen. 25 ma. for 5 to 8 minutes every second day.

Syphilis, Chancre. See Chancroids.

Toothache.

Galvanism. Take a short piece of platinum wire and fasten it into an ordinary needle holder (No. 107) and attach to positive pole. Upon this twist a piece of absorbent cotton suitable to the size of the cavity; dip the cotton into a strong solution of cocaine and insert into cavity. No. 3 to negative in the hand. The current strength may be governed by the limit of tolerance of patient.

Tonsils, Hypertrophy of.

Galvanism. No. 106 used after the bipolar method is plunged into the tonsil. 15 to 20 ma. for 5 minutes every third day. Cocaine anæsthesia is always desirable in these cases.

(a) Galvanism. No. 106 is attached to the negative pole and plunged into the tonsil. No. 3 in hand or on sternum. 10 ma. for 5 minutes every second day.

Torticollis.

Stimulate the sterno-cleido-mastoid and trapezius on the *opposite* side from the lesion,

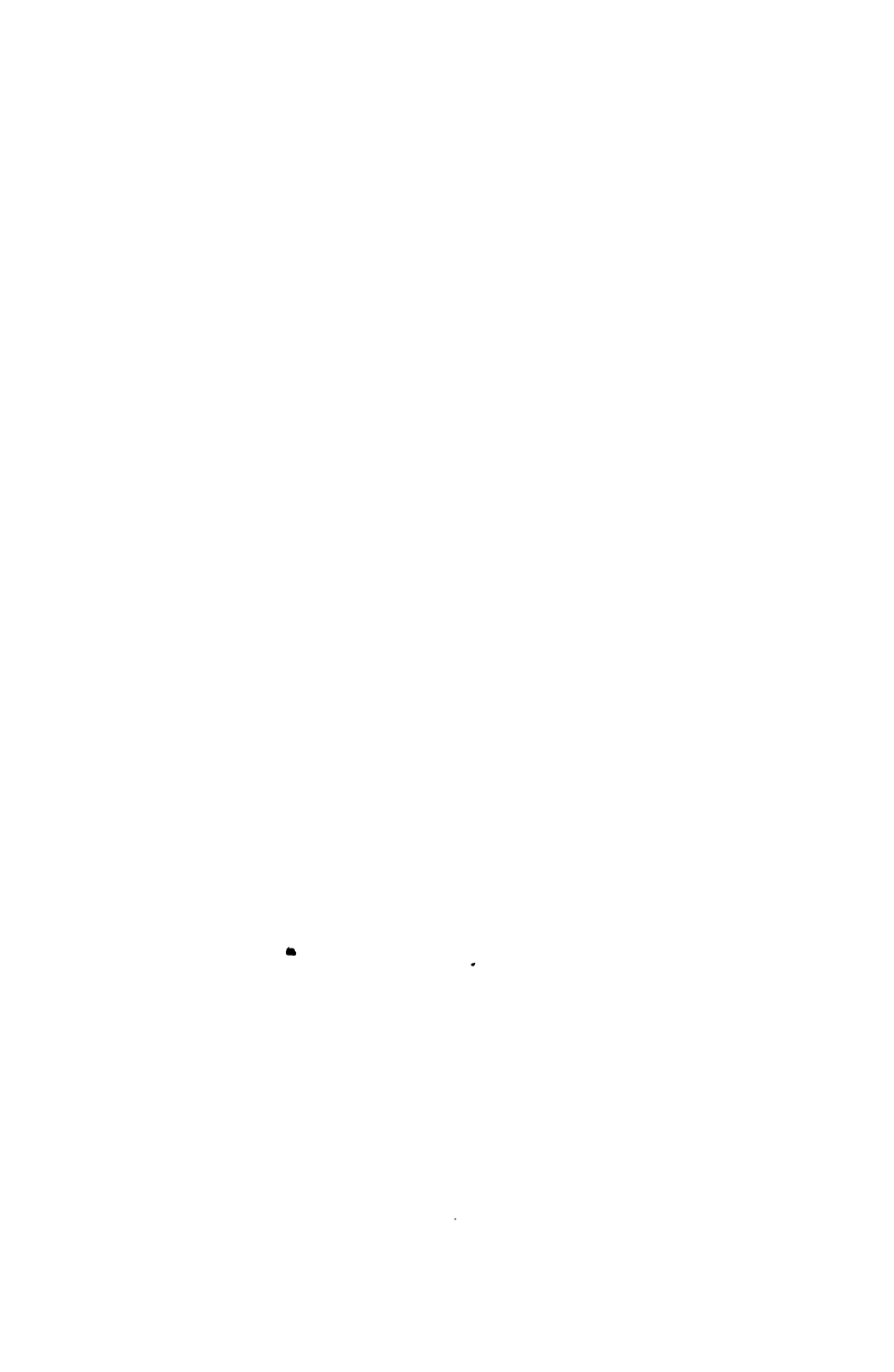
using a faradic current from the coarse wire secondary coil with slow interruptions for 10 minutes every second day. On alternate days use galvanism on the affected muscles. Positive pole *labile* over lesion. Negative, large electrode at some different point. 15 to 20 ma. for 5 to 8 minutes.

NOTE.—As this trouble seems to be dependent upon an overactive condition of the spinal accessory nerve, the more rational treatment (and one in which the writer has had some very good results) seems to be to produce sedation of that nerve by the use of the positive pole over its motor point. (See Duchenne's chart). With No. 1 electrode attached to the positive pole covering the motor point and the negative in the hands. A current strength of 15 to 20 ma. could be tolerated for 5 minutes.

Trachoma. See Eye.

Tumors, Benign.

Galvanism. Use No. 105 with from one to ten needles (according to size of growth), *always* attached to the negative pole; use a *large* surface electrode on positive. Intro-





duce the needles into the base of the tumor on a line with the skin and continue the application until considerable blanching has taken place. In these tumors it is generally only necessary to establish a retrograde metamorphosis. Six to ten cells are sufficient for the work.

—**Malignant.** See **Carcinoma.**

—**Vascular.** See **Vascular Tumors.**

Ulcers, Exuberant or Fungous.

Galvanism. Metallic electrolysis. No. 14, 37, or other suitable electrode (made of zinc) is attached to the positive pole and applied directly to the lesion. No. 3 on negative to some indifferent part; 20 to 25 ma. for 5 minutes. To be repeated in about three days if a healthy granulation has not been established. Where not contraindicated, cocaine anæsthesia should be produced locally before operating.

—**Indolent, Phagedenic, Sloughing, Etc.**

Galvanism. Metallic electrolysis. Used in the same manner as above except that a copper electrode is used instead of a zinc one.

Urine, Incontinence of.

Faradism. Medium wire secondary, medium interruptions. No. 21 in urethra up to the prostate. No. 3 above pubes. Mild current for three minutes; to be followed by a three minute treatment with galvanism as follows: No. 3 attached to positive pole is placed at nape of neck; No. 3 on negative above symphysis pubis; current, 15 ma. At the third of these treatments the time may be lengthened to 4 minutes; and at the fifth to 5 minutes.

Urethra (Female, Polypus.)

Galvano-cautery snare.

—**Stricture of.** See **Stricture.**

—**Urethritis, Granular.**

Galvanism. Metallic Electrolysis. No. 104 with copper bulb of suitable thickness and $1\frac{1}{2}$ inches in length is attached to the positive pole and introduced into the urethra. No. 66 on abdomen. 15 ma. for 5 minutes every third day.

Urticaria.

Faradism and galvanism should be used at each sitting, and as the technique is identical





with that used for *pruritus*, the reader is referred to it.

Uterine inertia. See *Obstetrics*.

Uterus, Cancer of. See *Carcinoma*.

—Displacements of.

Always reposit the organ as nearly as possible in normal position and use a slowly interrupted secondary faradic current from the coarse wire coil in order to stimulate the muscular fiber of the uterine attachments. This current may be used with No. 99 intra-uterine and No. 3 on abdomen, or No. 68 in vagina well up in the vault and No. 3 on abdomen. Should the organ be bound down with adhesions, due to inflammatory deposits, it will first be necessary to break them up before proceeding with other treatment. See "Adhesions."

—Subinvolution. See *Subinvolution*.

Vaginal Leucorrhœa. See *Leucorrhœa*.

Varicose Veins.

Galvano-puncture. Insulate a platinum needle to within $\frac{1}{8}$ inch of the point (See insulating), fasten into No. 107 and attach

- to the positive pole. No. 3 on negative to some indifferent part. 15 ma. for 10 minutes or until clot is formed. See also Aneurisms.
- (a) Static sparks for 15 minutes daily.

Vascular Tumors.

Galvanism. Make No. 106 unipolar by winding a few turns of bare wire around its proximal end ; attach to the positive pole and introduce into the growth at its base parallel with the skin. No. 3 on negative at some indifferent point. Current from 6 to 10 cells for 5 minutes. Reverse current for 2 or 3 minutes to free needles.

Verruca. See Warts.

Vomiting, of Pregnancy. See Pregnancy.

Warts.

Galvanism. A No. 1 surgeon's needle being fastened into 107 and attached to the negative pole is introduced into the growth at its base on a line with the skin. No. 3 on positive is applied near the seat of operation. A current from 4 to 6 cells for 5 minutes is generally sufficient for a wart of ordinary size. Mass of tumor is very easily removed,



as the vitality is very low and it is only necessary to establish a retrograde metamorphosis.

—**Venereal (Thread Warts).**

Galvano cautery snare.

Wine Marks.

Galvanism. No. 108 is attached to the negative pole and pushed through the skin deep enough to reach the congested mass of capillaries ; No. 3 on positive near the seat of operation or in hand. Current from 6 to 8 cells long enough to cause considerable blanching around the electrode.

- (a) A fine jewelers' broach fastened into No. 107 and attached to the negative pole is introduced just under the epidermis and parallel with the skin to its full depth ; a current from 5 cells is gradually turned on for a few moments, when there will be considerable blanching on either side of the needle, which can now be withdrawn and inserted in another place.

It may not be out of place here to state that the writer has had better success in re-

moving small pigmentary marks by using a plaster composed of :

Antimony tartrate.....one part.

Soap plaster.....three parts.

Green soap.....one part.

Melt the soap plaster, add the other ingredients, and stir constantly until cool. Spread thickly, (about 1-12 inch), a plaster the size of the mark and apply. After 3 or 4 days active suppuration will have commenced, when the plaster can be removed and the sore dressed in the usual manner. In most instances the mark is entirely obliterated.

Wounds.

Suppurating or nonhealing wounds are best treated by metallic electrolysis after the manner of indolent ulcers. See Ulcers.

Wry Neck. See Torticollis.

The author had prepared a chart for insertion here, giving the properties, polar effects and general indications for the uses of the various currents, *i. e.*, galvanism, faradism and franklinic or static ; but in lieu thereof has concluded to give a synopsis of an article written

by Dr. W. J. Morton, and presented at the last meeting of the medical society of the State of New York, which appears to be peculiarly suited to the character of this work, and as it coincides with the author's views the synopsis is given without comment :

Of the Galvanic Current it may be concluded:

- (a) That strong currents depress nutrition of tissues and produce structural changes leading to physiological atrophy (20 to 100 ma).
- (b) That mild currents stimulate nutrition and produce physiological hypertrophy (1 to 8 ma).
- (c) That mild galvanic currents, pulsating or alternating, produce similar effects to mild continuous currents.
- (d) That the negative pole is specifically indicated in that large class of cases termed chronic inflammation where newly formed fibrous tissue or exudate occurs.
- (e) That upon the writer's theory—already accepted by several prominent physiologists—and observations, that catabolic or destructive events in tissue uniformly present the sign of negativity ; that is to say, are, at their

origin, electro-positive, (resembling the zinc of a voltaic cell), the negative pole is indicated to arrest the catabolism, the positive to augment it.

- (*f*) That the positive pole is rarely indicated, and, if so at all, upon the basis of an electrotonic effect to produce sedation of neuralgic pain in superficial nerves.

Of the Faradic Current it may be concluded:

- (*a*) That its main uses are to tetanize muscle and to cause sedation of pain.
- (*b*) That the tetanizing current, as now employed to treat paralyzed muscles, is injurious, since it enfeebles the muscle and causes atrophic structural changes.
- (*c*) That to strengthen or properly exercise a paralyzed muscle, a slow rhythm of the faradic current—about thirty waves to the second—should be adopted.
- (*d*) That in some spastic conditions of muscles (due to paralysis of an opposing group) the strong tetanizing current may be used to advantage to overstimulate, and thus to fatigue the muscle.

Of the Franklinic Current, or Static Electricity, it may be concluded that it is an adjuvant of great efficiency in practice, since

- (a) It evokes the usual nerve and muscle reactions.
- (b) It affords a most convenient means of stimulating the peripheral distribution of the nerves in the skin, producing counterirritating, reflex, and other afferent impression effects.
- (c) It has a local perturbatory action (spark).
- (d) It produces profound alterations in the metabolism of the individual, increasing the natural waste products and diminishing the toxic or by-products. For this reason it is specifically indicated in cases of malnutrition, whether local or general.



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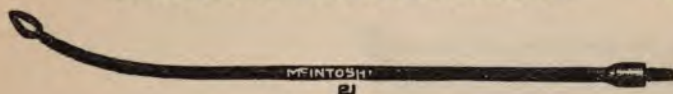
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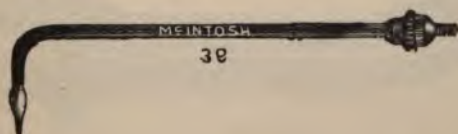
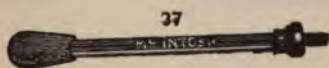
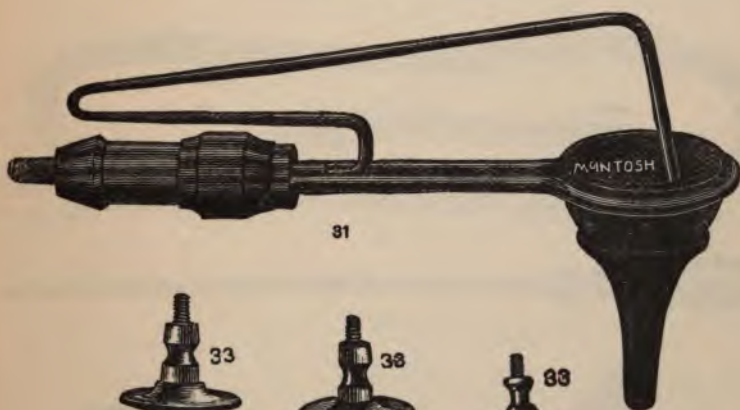
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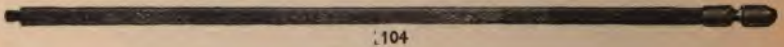
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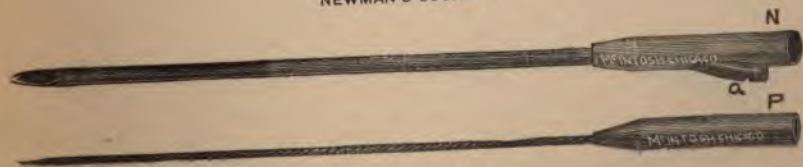
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D CONNECTOR.



NEWMAN'S SOUNDS



EXPLORING NEEDLE,



BATH TUB.



30 ARM.



30 NECK.



FITZ HUGH'S ELECTRODE FOR TREATING EROSIONS OF THE EXTERNAL OS
BY METALLIC ELECTROLYSIS.





Showing method of removing foreign body from the eye with electro-magnet.



Method of operating on large tumors where more than one needle is used.

**STATIC INDUCED CURRENT.**

Open the switch, separate the discharge rods one-sixteenth of an inch, or a little less, connect the poles on either side of the switch with two conducting cords and electrodes, hold one in each hand, or apply to any part of the body; to increase the strength of the current separate the discharge rods slightly. Sensation like a current from a Faradic Battery.

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