

Franklinism. bm-10

Isly



FRANKLINISM;

OR THE
TREATMENT OF DISEASE

—BY—

Statical Electricity,

WITH A

*Description of the necessary Apparatus
and Appliances.*

(Compiled from Eminent Authorities by H. D. HALL.)

PUBLISHED BY

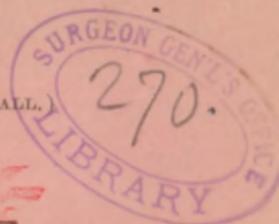
J. & H. BERGE,

Manufacturers of Electro-Static Apparatus, &c. for Medical Purposes,

No. 191 GREENWICH ST., New York City.

—JUNE, 1882.—

PRICE, 25 CENTS, POSTPAID.



We desire to render our sincere thanks to DR. WM. J. MORTON, No. 15 E. 45th Street, of this city, for the very generous and kindly aid which he has afforded us in our labors upon the improvement of Statical Electrical apparatus. DR. MORTON we consider the "pioneer" in the revival of the medical use of Statical Electricity in this country (having used it with great success in his private practice since 1879), and has devised many ingenious appliances to facilitate the use of Statical Electricity and adapt it to modern medical practice. Among them, perhaps his greatest contribution is his discovery of the new *Induction Current*, thus rendering *Statical Electrization* fully equivalent to Faradization.

We also desire to express our indebtedness to MR. C. VAN BRUNT, of this city, for his valuable scientific suggestions upon the subject of Statical Electricity (especially that of statical induction). MR. VAN BRUNT'S very interesting and valuable investigations upon the subject of induced Statical Electricity are well known to the scientific world, in this country and abroad.

J. & H. BERGE,
N. Y.

Entered according to Act of Congress, in the year 1882 by,

J. & H. BERGE, N. Y.,

In the office of the Librarian of Congress, at Washington, D. C.



DR. MORTON

ON

STATICAL ELECTRO-THERAPEUTICS

With the kind permission of Dr. W. J. Morton, we present here a few interesting extracts from his valuable paper read before the New York Academy of Medicine, and published in the *Medical Record* on "Statical Electro-Therapeutics":

"Up to comparatively recent times frictional electricity for medical purposes was produced from a single glass wheel. Its tension was low and its quantity small. But the invention of Holtz, in 1865, marked out for modern statical electricity the possibilities of a new career. In the Holtz machine we have an apparatus simple and durable in construction, and capable of furnishing electricity of high tension and in great quantity. And by means of the Leyden-jar condensers, and of the possibility of increasing the number of wheels, both tension and quantity are within the control of the operator. At a given length of spark or tension, every additional wheel adds only to the quantity, and Holtz machines, with as many as twenty revolving wheels, have been constructed, in which the quantity, of course, was very great. This very fact of a greatly increased working quantity of statical electricity justifies the expectation that modern electro-statical therapeutics will take a step greatly in advance of its past.

The machine which I have the pleasure of exhibiting to night is a double Holtz, so called. It has two stationary and two revolving wheels. Its condensers or Leyden jars have about twenty-four inches each of tinfoil surface. It gives with ease, in all weathers, an eight-inch spark, and a large quantity.

The motor power for driving the machine may be the hand, steam, gas, or water. The one I exhibit is turned by hand. A similar one in my office is run by a Backus water-motor, at the ordinary pressure of the faucet. I need not say that the regular turning of a mechanical motor is much preferable to the uncertain action of hand-power.

In treatment by electro-statics the patient is first electrified, in other words, the state of electrification produced by means of frictional induction electric machine is communicated to his body. But in order that he may retain this condition of electrification he must at the same time be insulated—i. e., cut off from communication with the earth. This is done by placing him on a glass-legged stool or platform. He now receives a

“charge,” by which we mean to say that his body is raised to a potential higher than the potential of the earth, which is 0. Here, as in all treatment by electrification, whatever effect is produced is effected by creating a “difference of potential.” In the Kinetic method the difference is at either electrode, its minimum or 0 at the point of equilibrium within the body, about midway between the two electrodes. In the static the highest of positive potential is the patient’s body, the lowest the earth. Hence if an electrode attached to the earth by a chain is approached near to the patient’s body, an equalization of potentials or discharge at once takes place at the point of approximation or contact. Of course, the higher the patient’s potential the more active will the discharge be.

It is obvious, then, that we may treat our patient by simple insulation, raising him even to a high potential without producing any discharge whatever, but simply allowing his charge, constantly maintained by the machine at work, to diffuse itself into the surrounding air. If a discharge or equalization of potentials is provoked during insulation, the effect is a “*spark*,” “*spray*,” or *electric wind*, according to the form of the electrode which we attach to our earth connection.

The usual electrodes are balls of various sizes, of metal, wood, or other substance for the spark, and a collection of small metal points for the spray, or a single sharp point, preferably of metal, for the electric wind, all mounted on glass handles.

The spark is due simply to the equalization of the patient’s and the earth’s potential, and represents a very brief but violent current.

The spray, so-called, is the familiar “brush” discharge.

The “electric wind” is produced by means of the sharp-pointed metal electrode. It is due to agitation of the air intervening between the insulated patient and the metal point, and, as its name indicates, creates upon the surface of the skin the impression of a strong breeze. The feeling is extremely agreeable.

By shock we mean the subjection of the patient entirely, or in portions of his body, to the discharge of the Leyden-jar. Its medical use will be referred to under therapeutical considerations.

By the discovery, in the Holtz machine, of a new current, which I shall describe later, it may be also used in all instances in which the ordinary faradic and magneto-induction coils are now used. Thus a single machine combines franklinism and faradism.

Thus far, in describing the methods of administering static electricity for medical purposes from the induction electrical machine, I have confined myself to what has been previously known on the subject. The three main methods of administration up to the present time have been by insulation, by sparks, and by shocks.

I now venture to add a fourth method, that of the *induced current* produced by static electricity, and capable, like the currents induced by magnets and the voltaic circuit, of causing physiological tetanus. In other words, by a simple arrangement, the Holtz machine may be con-

verted into a machine which will do all the work of the best faradic machine.

We thus have at command in a Holtz machine all of faradism, in addition to the static electricity. For working purposes we have all the advantages of both systems.

A superficial trial shows one difference in favor of the static-induced, as compared with the galvano or magneto-induced current. The static-induced both produces more efficient contractions and gives less pain to the patient, where pain would be produced by any of the three. With it the whole motor apparatus of the body may be called in action at its several points, nerves stimulated, and other effects produced, just as with faradism.

This current is, furthermore, soft and agreeable, and produces no shock. As has been said, it produces a maximum of muscular contraction with a minimum amount of pain. A comparison with the sensations experienced from a Runkorf coil, a magneto-induction apparatus, or an ordinary galvano-faradic instrument, amply sustains this assertion. In treating children, the painless character of the current is an important consideration.

The current may be regulated to a nicety by means of the discharging-rod, ranging from an almost imperceptible tingle up to extreme and rigid flexion of the arms, should, for instance, the electrodes be held in the hands.

This, then, is an entirely new current in medicine, and it is not a little curious that with all the experience with frictional machines, it should remain undiscovered up to the present day.

THERAPEUTICAL CONSIDERATIONS.

Whatever form of electricity we make use of, we have to do, of course, with one and the same force, represented by the voltaic, induced, static, and other phases. True as this may be in a general sense in medical electricity as in the laboratory and in the arts, it would be ridiculous to expect equivalent results from an indiscriminate employment of any one of these various forms. Wide differences in indications for use and curative results exist, both in the nature of the electricity used and in the manner of its use.

If, then, both in nature and method, static electricity has therapeutical effects peculiarly its own, if both medical practice and analogies of physics teach this, we are called upon, as practical physicians, to accept the fact.

But static electricity, as we have already seen, has never had fair play in modern medicine. The older practitioners (1740 to 1800) have left us glowing records of its value—records embodied in a period of literature still full of fruitful suggestions in other branches of medicine, though in none more advanced than in the treatment by electricity. The physicist of to-day cannot neglect the work of Franklin, of Symmer, of Du Faye, of Cavendish, and the long line of the men of their time, who unrolled to view the mysteries of the new science. No more can the physician neglect, from a medical point of view, De Haen, Boze, Bertholon, Nollet, Wilkinson, Cavallo, Manduyt, and a dozen others. True, the mantle of their

labors decked in a degree the new galvanism and the newer faradism, while in the act static electricity dropped from sight. It found conscientious revivers in Sir William Gull, Golding Bird, and Wilks, in 1850 and thereabouts, and it is gratifying to note in their writings the highest appreciation of its merits. When at last it fell from their hands again abandoned, it was only and simply because of the inconvenience of administering it. The machine of their day refused to work in the damp of London fogs, and it was necessary in the electrical room of Guy's Hospital to keep a large fire constantly burning to dry the air; and even to-day, in Paris, one may visit the rooms of a practitioner, heated summer and winter.

But these disadvantages have now been removed. Static electricity was again revived, and with great success, by Professors, Clemmens in Germany and Sewanda in Austria. In France, its revival has already received a notable impetus from the labors of Dr. Vigouroux, though as yet we have no published record of his opinions and results.

Static electricity, then, may now again fairly come before the profession of America to be judged on its merits.

CONCLUSIONS.

First—Static electricity, as a curative agent in medicine, may fairly be placed on a level with galvanism and faradism. In certain diseased conditions, it is superior to either.

By insulation and sparks, paralyzed muscles and nerves are stimulated just as by induced currents.

Second—The main objections to static electricity are based upon the inconvenience, the working uncertainties of the apparatus, and the difficulty of measuring and controlling the electricity administered.

These objections fail to have weight with the use of a modern improved Holtz machine, and a proper electrometer.

Third—Insulation and sparks, both or either, more notably sparks, relieve cutaneous anæsthesia more quickly than galvanism or faradism. In hemiplegia with organic lesion, numbness and anæsthesia is at once relieved by this treatment.

Fourth—Decided motor improvement may be obtained in hemiplegia of long standing. The dragging of the toe, the tread on the outer side of the foot, the outer swing to the leg, the rigidity at the knee, elbow and shoulder, may all be to a very apparent degree, and often entirely, removed.

Fifth—In paraplegia and systemic diseases of the spinal cord in general, there is every reason to expect that by means of long and strong sparks to the spine, that results not now attainable may be reached.

A distinguished and careful observer,* familiar with the treatment by sparks, thinks that "patients suffering from paraplegia who are now benefited by the constant current, were previously cured by static electricity."

Sixth—In the sense that medicines are tonic, the positive electrical insulation is tonic.

* Dr. Wilks, a physician of long experience at Guy's Hospital, London, where static electricity was formerly largely used.

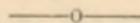
Seventh—Static electricity by insulation and sparks is principally useful in conditions of paralysis, spasm, and neuralgia, and pre-eminently in subacute and chronic rheumatic affections, whether tendinous, fascial, or muscular.

Eighth—Static electricity cures diseases, as other forms of electricity do, by stimulations of nerves and muscles, organs, and nerves of special sense. It likewise cures, by aid of the spark, in virtue of a sharp, deep, mechanical agitation of the diseased tissue, acting in this instance like physical exercise and massage, by causing alteration of nutrition.

But above and beyond these methods of curative action is the principle, as lately established by Brown-Séguard, of reflex action in remote parts by peripheral irritation of the terminal distribution of the sensory nerves. In electrification by insulation, electricity of high tension is actively accumulating on and beneath the skin, *i. e.*, the nerve distribution, and as actively discharging; the effects of static electricity are then in this instance produced from the periphery; and, *owing to the fact that the electrification is general and the tension high, no other form of electricity offers equal promise in the treatment of diseases or conditions that can be effected in a sedative or stimulating manner from the general peripheral nerve-distribution*. The recent experiments of Brown-Séguard lead us to believe that many diseases may be thus acted upon.

Ninth—The invention by the author of a method of obtaining an interrupted static induction current from a Holtz electric machine adds to medical electricity a new and practical means of electrical treatment. This current is more agreeable in its administration than ordinary induction currents. Both nerves and muscles are stimulated by it to a higher degree than is possible by means of any other induction current now in use, and a corresponding advance in the efficacy of electrical therapeutics in these two directions may be confidently expected.

The new current, furthermore, greatly enlarges the scope of statical electrical machines in medicine *by combining in a single machine all the advantages both of static and inductive electricity.*



To the Medical Profession.

Since the publication of our last pamphlet upon the necessary apparatus for the successful *medical use of Statical Electricity* (in April, 1881), we have devoted a large share of our special attention to the subject; particularly have we endeavored to improve the apparatus in all respects where the necessity existed. We have been aided by the valuable counsel of some of the most eminent electro-therapeutists of this country. Having therefore gained much in experience and knowledge, we think we can now justly claim with confidence to have devised the most *durable*, well-constructed, and perfect *self-changing medical Holtz Machine* yet made.

The many testimonial letters which we have received from physicians

using our improved form of Holtz machines in their daily practice attest the opinions of the best of judges, *i. e.*, those employing the apparatus in actual service.

Of the real and great absolute value of Statical Electricity as a remedial agent in the treatment of diseases (especially of the nervous system) we need not here speak, as it is now becoming so well and favorably known that its pre-eminent position in Electrology is well established. We might fill many pages of a much larger pamphlet than this with brief details of cases in which it had been of undoubted advantage, and attested to by medical men of the highest authority and standing.

Suffice it for us to refer you in this connection to a few excerpts we have made from the admirable paper upon this subject read by Dr. W. J. MORTON before the New York Medical Society, and also to a few extracts from other eminent writers upon the subject. (See pp. 20-22.) The fact that there exists no necessity for the removal of the clothing of a patient while treating him or her with *Statical Electricity*, is in itself a great recommendation in its favor, which every physician will recognize. It may be of interest in this connection for us to very briefly epitomize a few of the various methods in vogue for applying the electricity from these machines.

1st. The direct shock or spark, obtained by seating the patient on the insulated platform, and connecting the electrode used with the positive pole of the machine, the negative (or left hand side) being connected with the insulated platform. This gives quite a severe shock, and is only used when such an effect is required.

No. 2. The indirect shock or spark. This is the connection generally used in almost all cases, and is obtained by connecting the positive pole with the nearest convenient metallic ground connection and attaching the electrode chain with the nearest gas pipe.

No. 3. Insulation. This is done by placing the patient on the platform and connecting the positive pole with the ground. No electrodes are used.

No. 4. The electric wind and spray produced by using electrodes Nos. 0, 12, 20.

No. 5. The direct or interposing spark or shock. This is obtained by using the Hall's Body Electrode, No. 29, making direct connection with both poles. (No insulation is needed in this.)

No. 6. The induced current (invented by Dr. W. J. Morton.) For a full and interesting description of this see page 18.

No. 7. The interrupted discharge obtained by using Dr. Morton's Electrode No. 4, page 12.

No. 8. The interrupted direct current, obtained by removing the connecting rod between the Leyden jars and using Sponge Electrodes No. 1, the "break" is produced by connecting one end of electrode cord with a ball electrode, and bringing it near or close to one pole.

There are also other methods used, and yet others will suggest themselves to the experienced operator as in his judgment suited to cases in hand.

NOTE.—When employing methods Nos. 1 and 2 the two prime discharging balls of machine should be drawn apart, so that no spark will pass between them.

Special Notice.

All of our *Statical Electrical Apparatus* are made under our personal supervision, in our own shops, directly from the raw material. They are constructed with great care, the material used being of best selected quality. For instance, the heavy steel supporting spindles of the Holtz machines are mounted at their "bearing" parts in composition brass boxes, and are therefore adapted to run by power of any kind. All of principal wood-work of cases, &c., is made of best *well-seasoned* polished mahogany. The machines when completed and in their elegant finished cases present a very fine appearance, and are an ornament to any physician's office. All the important *glass* insulating parts of our electrodes, supports, pillars of our fine large insulating platforms, glass for the Leyden Jars, &c., is *made especially for the purpose*, and affording therefore *perfect insulation*. In all of the fine, hard black rubber work upon our machines or electrodes we employ only the best quality of "stock," made from Para rubber, which is more expensive but better than the cheaper kinds. We endeavor also to extend the same pains-taking care in manufacture to every detail in our business,

A few Words to Prospective Purchasers of Electro-Statical Outfits.

Before selecting size or kind of machine which you may require, please read carefully testimonial letters on page 16, and numbered, also page 15. Please bear in mind that, as we have before stated, *statical electricity*, when properly applied, *possesses great and wonderful therapeutic value* (which is now a *demonstrated* fact), yet its *full* value and effects *cannot* be brought into practical use excepting when a sufficient volume or amount possessing the requisite tension is produced. This desideratum can only be obtained by the employment of a machine having *two or more* revolving plates of sufficient size. We have therefore taken the liberty of suggesting to intending purchasers the following machines as well adapted for the successful medical application of this form of electricity.

At this point we would also like to mention that a glass case enclosing the machine is very essential, as there is no statical machine made (without exception) but what will work to better advantage in a glass case properly adapted to it, and in mid-summer it is almost a "sine qua non." Also, our machines are so well mounted that they are easily turned by hand power (a boy of 15 years can easily turn our largest size.) Yet whenever it can be done conveniently, a suitable *motor* of small power, using either water, steam, gas, or electricity, will be found to be a *great convenience*. We are prepared to furnish at manufacturers' prices water motors (or other light power motors.)

Recommended Electro-Static Outfits.

The numbers refer to Price-list on page 10.

No. 8. Well adapted for the rather infrequent office use of a physician having a general family practice. This machine is a very excellent one, giving a good amount of electricity and working well. It will occupy a floor space of about 45 by 40 inches, and stands about 60 inches high. (These dimensions refer to the case and stand.) The necessary Electrodes, Insulated Platform, and other appliances for use with this machine will cost about \$35 additional to price of machine, making the the total outfit \$225. + \$35. = \$260.00.

No. 9. This machine has four revolving glass discs (or plates) and three stationary plates. The revolving plates are of the same dia. as the No. 8 machine, *i. e.*, 20 inches (dia. of stationary plates is always about 2 inches greater than the revolving plates.) The floor space occupied by this machine is about 12 inches more than the former machine (No. 8), and is especially adapted for general and constant use. In fact, we regard this particular size of machine as our best medium size, and take pleasure in advising its use in the majority of cases.

No. 11. This machine is nearly the same size case as No. 12, but has only two revolving plates, 25 inches in diam. It occupies considerably more floor space than the No. 9, and is a very fine and imposing machine. It affords a large amount of electricity of high tension but not any larger volume than can be obtained from the No. 9. Where a physician has plenty of office room this will be a good machine for him. The cost of outfit about \$40. + machine \$375. = \$415.

No. 12.—This machine is the one which we specially recommend for the use of physicians who make a specialty of treatment of diseases by electricity. It has four revolving plates or discs, each 25 inches in diameter, and three stationary plates. It presents a very beautiful appearance, and is the finest and largest machine made, affording a large and constant supply of statical electricity, possessing ample volume or quantity and also high tension.

No. 13. This machine we recommend for *hospital* use, or where several patients are to be treated at the same time.

We also recommend No. 12 as an excellent size for use in Hospitals, Asylums, &c.

No. 13 we also especially recommend for use as a "ozone"-producing machine. (See page 9.)

We will build machines specially adapted for any given purpose *to order* (or any special sizes.)

We send very full and complete directions for setting and using our "Improved Statical Electrical Machines for Medicinal Purposes," with all apparatus sent out of town. We also pack with great care, so that they may be sent to all parts of this continent with little or no danger of breakage.

We will *insure* against breakage at the rate of 2½ % ct.

Terms are CASH, and all prices mentioned herein are strictly *net* (without

discount.) When machines are sent in New York City (or its immediate vicinity) we will set up machine and also send a competent and experienced man to instruct in its use.

Special forms of Electrodes and other Electro-Medical Apparatus made to order. Address

J. & H. BERGE,
191 Greenwich Street,
New York City.

SPECIAL NOTICE.

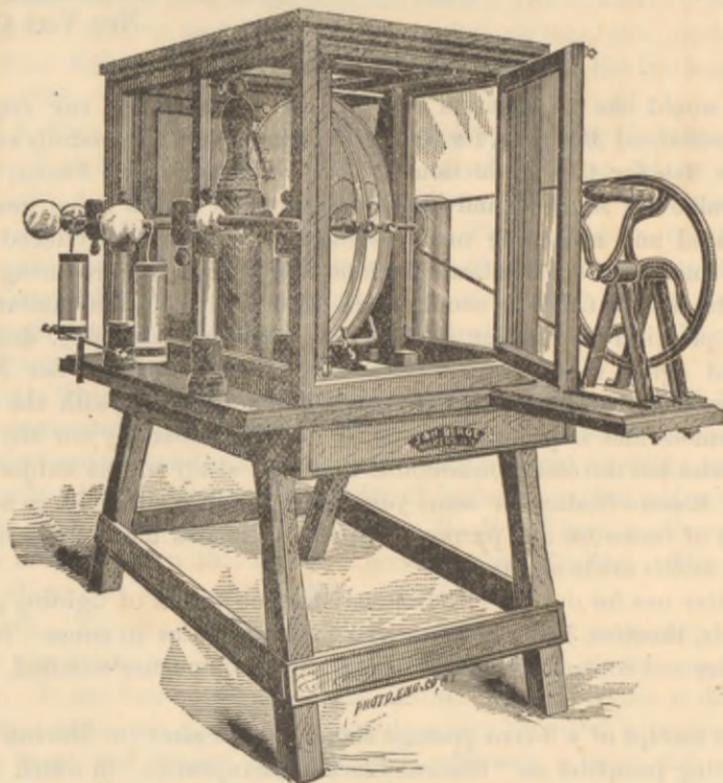
We would like to mention one or two *new uses for our Improved Electro-Static Machines*, for which they can be very successfully employed, viz: 1st, for the production of that wonderful agent Ozone, whose great value for *sanitary* and *industrial* purposes is now being generally recognized and attracting much attention. We have introduced some improvements to our Statical Machine, adapting it for producing large amounts of pure *Ozone* or ozonized air, for either medical or sanitary use, or its practical application in the arts, such as bleaching, deodorizing and aging wines, liquors, &c., &c. We recommend our No. 13 machine, page 10, as a good *ozone-producing machine*, as with the use of an ingenious and improved form of *Ozonizer* (invented by our Mr. H. D. Hall), who has devoted considerable time and study to this subject, and that of Electro-Statics for some years past, it will easily produce a large amount of ozone for any purpose. Special estimates made for *ozone-producing outfits* made at any time.

Another use for our Electro-Static Machine is that of lighting gas in churches, theatres, halls, &c., &c., also for firing fuses in mines. Special estimates and contracts made, to order. Correspondence solicited.

On receipt of a 3-cent postage stamp we will send Dr. Morton's very interesting pamphlet on "Statical Electro-Therapeutics," in which will be found a number of detailed cases treated by this form of electrical action. Dr. Morton has now in course of preparation a book upon this subject, which will be of general interest to the Profession. It will probably be published some time during the present summer.

REVISED PRICE LIST —OF— ELECTRO-STATICAL MACHINES FOR REMEDIAL PURPOSES.

All Medical Holtz Machines of our make have our latest improved **self-charging attachment**, thus enabling the machines to be used constantly in all weathers and at all seasons of the year.



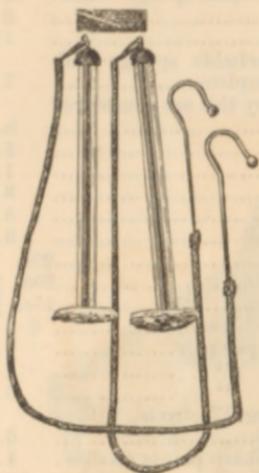
[This cut represents our No. 9 Machine.]

No. 1.	Berge's Latest Improved Medical Holtz Machine, self-charging, with 2 revolving plates, 12 in. dia., and with stationary plates 14 in. dia., on finely finished mahogany base.....	\$ 60.00
No. 2.	The same as above only in air-tight mahogany case, with glass sides ...	100.00
No. 3.	With 2 revolving plates, 15 in. dia., stationary plates 17 in. dia. on base.	80.00
No. 4.	Same as above in air-tight case, (finely finished).....	130.00
No. 5.	The same, with 4 plates (revolving and 3 stationary) in case and on finely built stand or table, complete.....	225.00
No. 6.	2-20 in. revolving plate machine, on mahogany base.....	135.00
No. 7.	Same as above, only on stand.....	165.00
No. 8.	Same as above, only in air-tight case.....	225.00
No. 9.	Same as No. 7, only with 4 20 in. revolving plates and three stationary	300.00
No. 10.	2-25 in. revolving plates, on fine stand.....	250.00
No. 11.	The same in case.....	375.00
No. 12.	Same, with 4 revolving plates.....	450.00
No. 13.	6 revolving 20-in. plate machine, on stand and in case.....	350.00
No. 14.	<i>Extra large, splendidly finished</i> and mounted improved Holtz Machine, in <i>elegant case</i> , with 2 revolving plates each 33 in. dia., and 2 stationary plates, each 36 in. dia. This is a strong and most <i>magnificent</i> machine. Price complete.....	600.00

Other Sizes made to special order.

N. B.—We can furnish any other form of Statical Electrical Machines to order, at the regular prices.

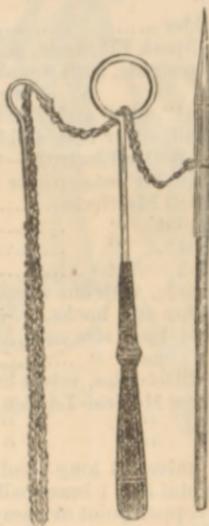
Electrodes, Etc.



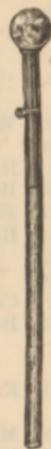
No. 1.



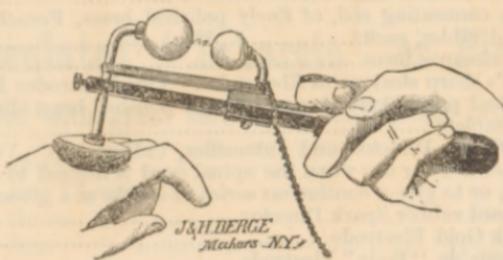
No. 2.



Nos. 0 and 3.



No. 3a.



J. & H. DERGE
Makers N.Y.

No. 4.



No. 5.



No. 8.



No. 9.



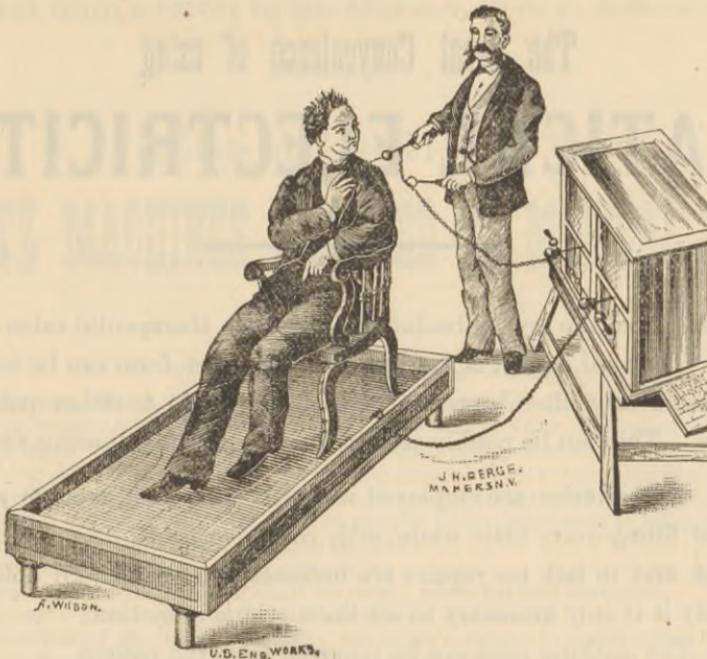
No. 10.



No. 11.



No. 12.



Large Insulated "Tabarets" or Platforms,

Constructed with great care to insure Perfect Insulation.

No. 1.	For one Chair.....	\$15.00
No. 2.	" two Chairs.....	25.00
No. 3.	" three ".....	30.00
No. 4.	" four ".....	40.00

These "Tabarets" are made very STRONG, and will easily sustain a direct weight of 1,000 lbs.

With every Machine we give one pair of Berge's Improved Medical Leyden Jars, with attachments for giving the new Morton Induced Static Current, also a wrench and oil can.

Motors for running any of our Holtz Machines furnished to order, at Manufacturers' Prices.

FUSED CHLORIDE OF CALCIUM

pecially prepared for use inside of cases of Med. Holtz Machines for keeping the air dry, 50 cts. per lb.

SPECIAL NOTICE.

For Physicians that desire them, we have *single* revolving plate Holtz Electrical Machines (without stands or cases, but with our latest improved continuous charging apparatus attached), *wel. made* and nicely finished, with 10 in. plates for \$25; 15 in. for \$50; 20 in. for \$75; complete with Leyden jars, etc. We do not recommend *single plate machines* in the use of Statical Electricity for *medical purposes*.

The Great Convenience of using

STATICAL ELECTRICITY.

Aside from the great absolute and distinct therapeutic value of this form of Electrical action, is the *fact* that no other form can be so easily and conveniently administered, or with less trouble to either patient or operator. This can be readily seen by looking at the following *facts*, viz:

1st. No batteries are employed with the attendant trouble and expense of filling every little while with corrosive acids, &c. No zincs to wear out, and in fact no repairs are necessary for years. To obtain the electricity it is only necessary to set the machine in motion.

2d. The clothing need not be removed from the patient.

3d. If need be several patients can be treated at same time by one machine (even in an adjoining room.)

4th. Please read the following letter from a prominent Brooklyn Physician:

BROOKLYN, N. Y., April 27, 1882.

MESSRS. J. & H. BERGE:

Dear Sirs—Since you placed your perfected machine for Static Electricity in my office last August, I have used it every day and with entire satisfaction. I have used it in the large range of nervous diseases in which I have been accustomed to use the Galvanic and Faradic currents, and I have not failed to obtain all the beneficial effects with it that I did with either or both of these, *and without the unpleasant necessity to my patients of removing their clothing.*

Very respectfully yours,

J. N. FREEMAN, M.D.,
No. 80 Hanson Place.

Extract from a letter by Dr. Morton, to *N. Y. Medical Record*.

SIZES AND KINDS OF HOLTZ MACHINES ADAPTED TO MEDICAL USES.

TO THE EDITOR OF THE MEDICAL RECORD.

DEAR SIR—As the time at my disposal will hardly allow me the pleasure of answering separately nearly two hundred letters from your subscribers or readers in all parts of the Union, asking, in the main, pretty much the same questions concerning details on the subject of electro-statical therapeutics suggested by my paper on the subject published in the *Record* of April 2d and 9th, will you kindly allow me brief space to respond simply to the main points, viz., what size and kind of improved Holtz machine to get?

Two main considerations at once arise:

First—That the machine shall be large, powerful and complete.

Second—That it will work in all weathers, wet or dry.

The tenor of the letters received indicates a desire to make small machines (one foot diameter, single plate) answer medical purposes. I am confident that this would end only in disappointment to their possessors and detriment to the subject in general. A two-cell galvanic battery will not answer where forty cells may or should be used. Both tension and quantity should be great in modern stational electrization. Simple length of spark between the discharging rods is not a fair criterion, for this spark, in a machine giving electricity of a very high tension, may at the same time be thin, wavering and infrequent. It should be strong, thick, straight and frequent, *i. e.*, denoting quantity as well as tension. With the patient simply sitting in a chair on the insulating platform—the latter, and not the body of the patient, being connected to the machine by a polished brass rod—the operator should be able to draw, by aid of a “ground connection,” sparks from one and a half to six inches in length, each spark distinct and clearly defined. The thin, divided, “sputtering” sparks, derived from small machines, are stinging and painful, and, I believe, comparatively ineffective.

Static electricity is probably seldom tested at its full worth, for the reason that it has not been given strong enough, though here, as in all electrization, the operator should first test the strength upon himself in order to determine what can be properly borne by patients. But, by “strength” of administration, we do not refer to the shock from Leyden jars. The latter is seldom indicated.

It is better, then, to get a large Holtz machine, or not get one at all. And by a large machine, from a medical standpoint, is meant a double Holtz of from twenty to thirty-inch revolving plates, or a quadruple Holtz, with fifteen-inch or larger plates. My own machines are double Holtz (two revolving and two stationary glass plates), constructed by Andriveau, Paris, on the exact model of Dr. Vigouroux's machines, used at Prof. Charcot's clinic. From careful examination of their work, I think that equally as good machines may be found at J. & H. Berge's, formerly Hall & Benjamin, scientific instrument makers, 191 Greenwich Street, though beyond this opinion I have no interest or responsibility in the matter, as some of my correspondents have apparently supposed. A four-plate fifteen-inch Holtz, or a twenty-inch double Holtz is then, I venture to suggest, the *smallest* machine that should be bought.

Feeling assured, finally, that if a large and unfailling machine be procured, that in other details it will give a good account of itself, I close with the hope that my correspondents will accept this brief note as a general answer.

Very truly yours,

WILLIAM J. MORTON, M.D.

Testimonial Letters.

We publish herewith a *few* letters, selected from a number received, which we think will prove of interest:

NEW YORK, March 15, 1882.

MESSRS. J. & H. BERGE :

Dear Sirs—My quadruple 25 inch Holtz Machine (No. 12) as now arranged (which you constructed for me last August), is most satisfactory. It charges in all weathers and it is never out of order. It is indeed the most reliable Electrical appliance that I have in my office. The results of my continued experience with very large machines lead me to reiterate what I have so often said, that in the medical use of Static Electricity the chief desideratum is a great *volume* of Electricity. Tension you may get with any small Holtz with proper Leyden jars. Volume must come from the increased number of glass wheels. (I often administer, for instance, to the vertebral column a perfect fusillade of 6 to 8 in. sparks.) In real practice I deem the small single plate 12 inch machine a plaything, ineffective in treatment and harmful in its shortcoming to the progress of Electricity, particularly of the statical form. There will be no quicker way to relegate Statical Electricity to charlatanism than to send forth a swarm of small and cheap machines. This I say not in your interest but in the interest of the cause of scientific electrization. I must add a word in praise of your many Electrodes. With their aid it is possible to realize in practice the axiom "treat the affected part."

Wishing you every success,

I am very truly yours,

WM. J. MORTON, M.D.

Physician to the Department for Nervous Diseases, Metropolitan Throat Hospital, New York, and Professor of Diseases of the Mind and Nervous System, University of Vermont, &c.

NEW YORK, Feb. 3d, 1882.

No. 43 W. 54th Street.

MESSRS. J. & H. BERGE :

Gentlemen—The Statical Electrical Machine (No. 12) which you constructed for me is in every respect satisfactory. In the dampest weather I can readily get a spark of eight inches and in dry weather one of nine inches and a half. Moreover the spark is thick, an important point in the treatment of various affections of the nervous system. Besides that the quantity is so great that the sparks follow each other with a rapidity likewise very desirable. I do not know that I could make any suggestions for the improvement of the machine.

Yours sincerely,

PROF. WILLIAM A. HAMMOND, M.D.,

Late Surgeon Genl U. S. A.; Prof. Mind and Nervous Diseases Med. Dept University N Y., &c., &c.

NEW YORK, April 12, 1881.

No. 52 W. 34th Street.

MESSRS. J. & H. BERGE, No. 191 Greenwich St. :

Gentlemen—I have now been using your apparatus (No. 8) for Statical Electricity nearly for one year. I like it in all respects. I find I can depend upon it at all seasons, damp or dry, to get all the force I desire. At the Paris Electrical Exposition I saw all the representative machines for Statical Electricity, but I am sure that none of them were superior to yours, if indeed they were equal, for practical convenience to your latest modification. My regret is that I could not have had this machine or one like it many years ago, so as to have used it in connection with galvanism and Faradism.

Very truly,

GEORGE M. BEARD, M.D.

BROOKLYN, No. 80 Hanson Place,

October 19, 1881.

J. & H. BERGE :

Dear Sirs—The Improved Holtz Machine (No. 9) (4 twenty inch revolving plates under case) which you furnished me last July has been and is working to my entire satisfaction. I am using it daily, often many times, and am much pleased with the results.

Very truly yours,

JOHN N. FREEMAN, M.D.

MESSRS. J. & H. BERGE :

Gentlemen—The Static-Electrical Machine (No. 9) furnished me is all you claim for it. There can be no doubt of the great therapeutic value of this form of electricity in the treatment of neuraesthesia, certain forms of hysterical and real paralysis, muscular, rheumatic, or gouty soreness, and above all in general anaemia attended with insomnia.

Very truly,

MONTROSE A. PALLEN, M.D., LL.D.

158 MADISON AVENUE, Jan. 10, 1882.

MESSRS. J. & H. BERGE :

Gentlemen—The double 20 inch plate Medical Holtz Electrical Machine (No. 8) of your improved form (in case) which I purchased of you last November I am using daily in my practice with much satisfaction. I have also used the machine in my lectures upon Electricity at the College. It has never failed to work and I am very well pleased with it.

Sincerely yours,

F. LERÓY SATTERLEE, M.D.

NEW YORK, March 29, 1882.

No. 62 W. 46th Street.

MESSRS. J. & H. BERGE :

Dear Sirs—I have used your self-charging Statical Electrical Machine (No. 8) for several months with much satisfaction. So far it has never failed to work every day and in every weather. It is well and carefully made in every respect.

C. L. DANA, M.D.,

Prof. of Physiology Woman's Med. College of N.Y.; Physician to the class of Nervous Diseases North Eastern Dispensary, &c.

NEW YORK, Feb. 15, 1882.

MESSRS. J. & H. BERGE : To my professional friends who have so frequently asked me for information as to the most reliable machine for eliminating Static Electricity in unfavorable weather, I would beg to state that in my experience in the use of Static Electricity for over fifty years (having used the ordinary friction machine), I have only recently obtained (after several efforts to obtain), the most Improved Holtz Induction Machine, that would constantly serve in damp, rainy weather. I now have such a machine (No. 5) made by J. & H. Berge of this city, and in use in the Hospital for the relief of the Ruptured and Crippled, 135 E. 42d Street.

Most Respectfully,

JAS. KNIGHT, M.D.,

Surgeon in Chief of Hospital.

NEW YORK, April 20, 1882.

No. 22 E. 42d Street.

MESSRS. J. & H. BERGE :

Gentlemen—The four plate Static-Electrical Machine (No. 8) which you furnished me recently (December 31), has proved entirely satisfactory and has been very useful in several cases of lumbago and of muscular rheumatism, &c.

Very truly yours,

ANDREW H. SMITH, M.D.

NEW YORK, June 21, 1881.

No. 46 E. 31st Street.

MESSRS. J. & H. BERGE :

In reply to your communication asking for my opinion as to the reliability of my Franklinic apparatus manufactured by you, I would say that thus far I can but regard it as a decided success. I am using it constantly in all sorts of weather. To-day, for example, it is very warm, with a condition of atmosphere that would render inoperative an ordinary Holtz machine; with your "tüsel," however, mine gives forth sparks entirely satisfactory.

A. D. ROCKWELL, M.D.,

Electro Therapist to the N. Y. State Woman's Hospital, &c., &c.

AUBURN, N. Y., March 9, 1882.

No. 126½ W. Genessee Street.

MESSRS. J. & H. BERGE :

Dear Sirs—Please find draft on New York enclosed to pay balance due on Med. Holtz Machine (No. 9). When I returned home on Saturday I had the machine working in less than thirty minutes and it has worked continuously ever since. I am very much pleased with it.

Very truly yours,

SHELDON VOORHEES, M.D.

BOSTON, Mass., May 8, 1882.
No. 9 Tremont Place.

MESSRS. J. & H. BERGE:

Gentlemen—With this please find my check for bill. I hasten to tell you that the large Holtz Improved Electrical Machine (No. 12) which you made for me is at work and doing admirably. We do not need more than 100 or 200 revolutions to get good ample effects. Already I have treated some of my patients with it, especially "writers' cramp," "the painful shoulder cases," also numbness in legs and feet as sequel to old sciatica, &c., with marked effects. *I am delighted with the machine so far.* I have now ample quantity of Statical Electricity with its intensity controllable, the thing that I have sought for the past 25 years. This apparatus as you make it must be equally superior for philosophical purposes or where static Induction electricity in great quantities is wanted.

Respectfully yours,

ALFRED C. GARRATT, M.D.

We take pleasure in introducing the following testimony to the high scientific value of our improved Holtz Machine, from Prof. Robert Spice, F.C.S., of the Brooklyn Polytechnic Institute, Brooklyn, N. Y.:

MESSRS. J. & H. BERGE:

Gentlemen—I take pleasure in stating that I have examined your latest improved Self-charging Holtz Electric Machine, and find it remarkable for the quantity of electric sparks produced; in this respect being a great advance on any other, of the same size, I have yet seen. Another point in its favor is that it will work in a perfectly satisfactory manner in weather which would be fatal to the ordinary machine.

Yours faithfully,

ROBERT SPICE.

NEW YORK, March 14, 1882.

MESSRS. J. & H. BERGE:

Gentlemen—The large improved Holtz Electrical Machine (No. 12) I purchased from you last fall has given full satisfaction. Unfavorable as the past winter has been for the working of the common Holtz Machine, the improvements made by you, coupled with good and substantial workmanship, have enabled me to use the machine uninterruptedly every day in my practice. I regard the improved machines built by you superior in every respect to those imported from France.

Respectfully,

J. V. MEYER, M.D.

DR. W. J. WATSON says: As a physician interested in the neurological side of diseases, I am confident that statical electrization has a place in effective treatment as fixed, understandable and reliable as strychnia, the bromides, the douche, or as have the more familiar galvanization and faridization.

THE NEW INDUCED STATICAL CURRENT, INVENTED BY DR. W. J. MORTON, OF THIS CITY.

In regard to the results from this new statical induction current, Dr. Morton says as follows, viz:

The results referred to are nerve and muscle reactions, produced from a Holtz machine, and exactly similar to those produced by the ordinary Faradic machines. These results were publicly and practically demonstrated before the New York Academy of Medicine, and they have been admitted by all physicians and electrical experts who have witnessed them.

It is of these reactions that Dr. Bartholow writes: "The impression made by the electricity is like that of the faradic machine, but is much less painful, and strong muscular contractions are thus induced with greatly less pain than can correspondingly strong contractions of the muscles be obtained by faradism. We have thus added to our resources an immensely useful instrument for the production of these effects hitherto obtained from faradism."

Dr. Bartholow's observations have all the more force, since they were made independently of my own experiments, and were published only a few weeks later.

To produce the current in question, remove the connecting bar or chain between the two outer tin-foil coatings of the two Leyden jars usually attached to a Holtz machine. Connect proper conducting wires and wet-sponge electrodes to each outer coating respectively, and finally connect the two inner coatings by the discharging rod. As soon as the machine is set in motion, and the

Leyden jars are filled, the discharging rods must be drawn out a *very small fraction of an inch*, and at once a current is felt between the two sponge electrodes, which in its general characteristics cannot be distinguished from the ordinary Faradic current. The experiment succeeds best with a large Holtz machine.

Next, is this an induced current?

It is a "current," according to the recognized definitions of the term, for it is an equalization of two potentials along a conductor. Every electric discharge, however brief, is a current; the spark is a brief current. The voltaic, or so-called "continuous current" is no more nor less than a succession of brief discharges; in other words, the potentials are continuously kept up to a rapid discharging point. The Faradic, or induced current, in the same manner, consists simply of the alterations of direction in a current set up through a dielectric by a voltaic discharge; *i. e.*, a "make" and "break" in the battery current.

I consider it demonstrated, then, that whatever electrical process takes place along the conducting wires or through the wet-sponge electrodes, while a Holtz machine is arranged and working as above described, is a current. For the unequal potentials exist in the *outer* tin-foils of the Leyden jars, constantly kept at a fixed point of discharge by the working of the machine; while their equalization takes place along the conducting wire and between the electrodes properly placed. In this current, as in the induced current, the term is loosely applied to a succession of alternating discharges or influences along a conductor.

Next, is this current an induced current?

It is *induced* or created by influence through the dielectric glass, and by the respective positive and negative electricities *inside* the jars.

We will, for instance, set the machine in motion with its discharging rods one-sixteenth of an inch apart. What happens? A spark, *i. e.*, a current in brief form, passes between the positive electricity of the inside of one jar and the negative electricity of the inside of the second jar. At the same instant, an induced current, *i. e.*, a brief equalization of potentials, takes place between the outsides of the same two Leyden jars. If, now, the discharges from the inside of the two jars are very rapid, as between the electrodes of a Holtz machine, the discharges on the outside are also very rapid, but the discharges from the inside, passing through a bad conductor like air, take the form of zig-zag lines of so-called sparks; while the discharges from the outside being led through tolerably good conductors, do not take a spark form (though they may be able to do so), and we thus have at the sponge electrodes connected to the two respective outsides an "induced current." It is "induced" for the reasons given. It is a current for the reason given. It is rapidly alternating, like any true induced current; and, to carry the analogy further, the discharge between the inside of the jars is no more nor less than the counterpart of the "battery current," and the succession of spark discharges at the usual discharging rods is no more nor less than the ordinary "make" and "break" in the battery current of an ordinary Faradic machine. In the one case a continued static discharge, or equalization of potentials, takes place; in the other we have a voltaic or galvanic discharge and equalization of potentials.

Now, the current obtained from any induction coil (ordinary Faradic batteries) is often termed the Voltaic induced current. I ventured to call, by analogy, the current I have discovered the "static induced." I have yet to be shown that my terminology is not well selected.

Lastly, as to the point: Is this induction current new?

As a current capable of producing muscle and nerve reactions similar to other induction currents, I claim that it is. Its novelty lies not in the simple scientific fact that a discharge of static electricity provokes in a neighboring but untouching conductor an induced discharge or current, but in the fact that this induced discharge or current of static electricity may be so affected by an *inter-ruption* in the inducing discharge as to cause physiological action in nerve and muscle. Uninterrupted, this induced current produces in the human body no appreciable effect—interrupted, it is a serviceable ally in medicine. After many attempts at manufacturing an efficient interrupter, I found that the spark discharge between the discharging rods was the simplest and best.

And medically it is "a new induction current." In spite of the large medical use to which static electricity has been put during more than a hundred years, I am not aware that any one, before my experiments or publication, made use of any similar medical application of static electricity by means of any arrangement of Leyden jars with any form of frictional or inductive electrical machine. I

may then, in short, say that although an induction discharge of static electricity was known to exist, no one ever interrupted it and applied it to the human body, and got physiological results. Herein lies its novelty, and herein it is a discovery or invention.

This is not the place to refer to the *physiological effects* of the new current. I will simply say that it seems to me, and to others who, on investigation, have come to the same conclusion, that the *static induced current produces stronger and more diffused muscular contractions, and with less pain, where pain is necessarily produced, than the voltaic induced currents now in use.* In many cases of paralysis (of the anterior tibial group of muscles, of the deltoid, in Bell's paralysis, in infantile spinal paralysis, etc., etc.) I have obtained muscular contractions, where I have not been able to do so with a Gaiffe battery, or with one of the best faradic apparatus made in this country.

A FEW EXTRACTS FROM A PAPER ON THE MEDICAL USE OF STATICAL ELECTRICITY.

BY GEORGE M. BEARD, A.M., M.D.

[Read before the American Neurological Association, June, 1881.]

Of the three forms of electricity—faradism, galvanism, and franklinism—the latter, franklinism, was first to be used, and is now again coming into use. For one hundred and fifty years franklinism has been used in medicine, and claims of a most stupendous character have been made for it as a therapeutic agent. Franklism has a history of tremendous promise and tremendous disappointment. It was expected one hundred and fifty years ago, and was then claimed, and has been claimed during the last century and a half and during the last few months, in Europe and this country, that franklinism is superior, as a means of cure of disease, to galvanism or faradism. It is quite possible that it may have some advantages, in some diseases or for some temperaments, over galvanism and Faradism. It is possible—indeed, it is *quite probable*—and it seems to me, in fact, *more than probable*, that there are certain diseases, or at least certain temperaments, for which statical electricity, used in the form of sparks, or of insulation, or of shocks, or by the secondary statical current, or by all combined, will be of *more service* than the ordinary forms of galvanism and faradism with which we are all familiar; and I have hopes that in the future this will be demonstrated. During the past year I have myself been using statical electricity, more or less, every day, and am trying as best I can to answer that question. The reason that this question has not been sooner answered is, that we have had no machine that would go at all seasons of the year—no machine on which we could depend. *That objection is now done away with.* In Paris, Vigoroux has been using a modification of the Holtz machine, which is enclosed in a glass case, so as to keep out the atmospheric moisture, and is run by a small gas-engine. Inside the glass receiver is chloride of calcium, to absorb the moisture. Dr. Morton has described this machine. Mr. Berge, of this city, has lately constructed for me a machine which goes at all seasons of the year—even in the early summer. It is, like all modern statical machines, a modification of the Holtz machine—the leading features being the use of gold tinsel, instead of points of charge, and four glass discs instead of merely two. It is run by boy-power, but a small gas-engine would answer very well if any one thought it necessary. It gives all the current force needed, even during the last month, which we know has been unusually damp.

Statical electricity acts both directly and reflexly, like other forms of electricity. It causes muscular contractions if used strong enough and condensed enough, just as other forms of electricity. It acts as an irritant, like other forms of electricity. The general philosophy of the sedative and tonic effects it produces is precisely like those of the other forms of electricity described in my writings on that subject. Ultimately analyzed, it is simply a molecular disturbance. The comparative value of franklinization, galvanization, and faradization, can only be estimated by those who are familiar with galvanization and central galvanization. Franklization cannot be localized accurately—it must act upon the whole system; and any comparison between franklinization and the use of the other forms of electricity, in medicine, must be with their *general Faradization* and *central galvanization*, and not with local faradization and local galvanization. In Paris, Vigoroux told me that he obtained sedative and tonic effects from the use of statical electricity.

It is needless to detail cases here, but this may be stated: *that I have seen,*

during the past year, *quite a number of cases of nervous diseases that have seemed to be more benefited by franklinization than by either galvanization or faradization.* I make this general statement, taking into full consideration the sources of error to which I refer, and am open to all the correction that comes from larger experience of myself or others. The difference in the effects of franklinism and faradism and galvanism is of degree, or not in quality; and it is very difficult, with a limited number of cases, to determine how great a degree of advantage there may be in franklinism in certain temperaments. One thing is established, and that is that delicate ladies will bear this treatment, and are not frightened by it, as it might be supposed they would be, when it is used carefully and without causing excessive pain.

The convenience of not being obliged to remove clothing is, practically, not to be ignored, and in those cases where any current answers, *will decide for franklinism.*

I do not intend *hereafter to abandon the electrical treatment of any obstinate case of nervous disease until statical electricity has been tried.*

DR. W. R. D. BLACKWOOD (*Phil. Med. Times*, Oct. 22, 1881) presents some cases treated by his Holtz machine. Of a case of melancholia, after having been simply "charged" for one half an hour three times a week for four months, the doctor says: "Although to my mind she is yet abnormally depressed at times, she is in every way better."

Of a case of hystero-epilepsy, treated tri-weekly and part of the time daily for two months, "marvellously improved." The doctor remarks: "I have every reason to expect a perfect cure in her case."

A case of periodical supra-orbital neuralgia, worse at menstrual epoch, was cured by simple charging and taking sparks from the brow. The duration of treatment is not mentioned. A case of intercostal neuralgia, treated by sparks from a small Leyden jar, became in "three weeks a different-looking man," "in two months relieved completely," but afterward, "at long intervals he has slight twinges."

A neuralgia of the testicle, cord, and perineum was cured in two months.

Dr. A. Arthuis (Paris) treats, in a memoir on static electricity and hysteria, in the first part, of the historical aspects of the question, and in the second, of the operative procedures and therapeutic applications.

DR. JAS. KNIGHT, surgeon in chief of Hospital for Ruptured and Crippled, says in regard to the remedial value of this form of electrical action as follows, viz: "Statical electricity is controlled by many forms of application differing from the dynamic form, and is, as we believe, more extensively useful as a therapeutic agent producing two distinct influences upon the animal system, an *excitant* and a *decidedly sedative.* The dynamic is merely an excitant, *not available in diminishing excessive nervous energy* without impairing vitality, as in the case of insulating patients and exciting a powerful current of static electricity—surcharging them—and then drawing it off with a sharp metallic point connected with the earth." "The application of statical electricity is of valuable service in *relieving local congestion, as in cases of local inflammation.*"

DR. WM. A. HAMMOND says statical electricity is a valuable "counter-irritant," and has devised a useful electrode for that purpose, which we notice in our list of Electrodes, page 12.

The eminent Prof. CHARCOT, M.D., of Paris, France, says a recent writer, has attained remarkable results in the treatment of hysteria by means of static electricity. His apparatus is essentially such a static machine as is used in physical laboratories, although somewhat modified. The patients are placed upon insulated stools, connected with the conductor, and thus subjected to the uninterrupted action of electric currents, which, escaping from prominent points of their bodies, produce prickling and tingling. The appetite is increased and the cutaneous functions stimulated. Special dischargers are provided for the excitation of individual organs, particularly those of special sense. Hysterical contractions, hemianæsthesia, and achromatopsia were completely relieved by the electric bath.* Anæsthesia is often permanently, but sometimes only temporarily removed. On the whole, Prof. C. believes static electricity to be more efficacious

* Meaning the Electro-Statical air bath or "insulation."

than the other forms of electricity in restoring the sensibility of anæsthetic parts, and in diminishing the tendency to attacks of hysterical anæsthesia.

We take the liberty also of introducing here a few brief extracts from the admirable recent work of (1881) by DR. ROBERTS BARTHOLOW, A.M., LL.D., upon Medical Electricity. He says: "As a means for promoting the activity of the nutritive functions the electric bath is highly serviceable. For superficial neuralgic sparks drawn from the trajectory of a nerve are often successful. I can confirm from my own experience the efficacy of Static Electricity in chorea. In spinal irritation, so-called, hemianæsthesia, hysterical paralysis, and in rheumatic paralysis, my experience has been equally favorable with the reports of Addison and Golding Bird. I have found it also an excellent remedy in amenorrhœa, and in functional impotence in the male, sparks being drawn in the last-named malady from the penis and scrotum."

"I have lately had results so remarkable in the maladies above mentioned, as to incline me to reaffirm the declaration of Wilkes, that 'Static Electricity has not been successfully superseded by the newer methods of galvanism and faradism.' Especially have I been surprised and delighted with the marked improvement in the condition of some cases of phthisis, to whom I administered static electricity, by sparks (the patient insulated) for the purpose of relieving chest pains. The diminution of cough, the quiet sleep, the improved nutrition, so plainly due to the remedy, afford much encouragement for the future."

PROF. SCHWANDA of Vienna (a high medical authority) has recently said "that the static electricity yielded by a improved Holtz machine has same effects in paralytic conditions as the Faradic current, also that for anæsthesia of the skin it is better than either galvanism or faradism. It is also very useful in passive hyperæmia and swelling of the integument. Moreover the ozonized air (constantly produced while machine is in motion) is also of valuable use in certain pathological conditions." Prof. S. further says "that the general effects of the application of Static Electricity are increased heat and perspiration and improved appetite."

DR. WILKS, of London, says "that he found the application of the faradic current to the back was not productive of same good as the withdrawal of sparks from same region of body by means of Static Electricity, also that patients suffering from paraplegia, who are benefited by the constant galvanic current, are cured by Static Electricity."

Drs. Golding Bird, of Guys Hospital, London, Vigouroux, of Paris, and Fromhold and Clemens, of Germany, all highly endorse the great remedial value of Static Electricity.

Extracts from a Lecture upon the Employment of Static Electricity in Medicine, delivered at the Hospice de la Salpêtrière December 26th, 1880, by Prof. J. M. CHARCOT, M.D., of the Paris Faculty of Medicine, and Physician to the de la Salpêtrière, &c., &c.

"It is important to observe, gentlemen, that Static Electricity, aside from hysterical and hysterio-epileptic cases (its beneficial action in which you have already noticed on the last two patients before you), has seemed to us able to render great service in a large number of various affections of the nervous system and *even in some not to be replaced by any other agent*. I will not attempt to-day the enumeration of all the facts in this regard, but will limit myself to several examples, viz: there are certain cases of peripheric facial paralysis you know difficult to treat by Faradization or galvanization; in such circumstances Static Electricity has several times led the case to a good termination, and when the morbid contraction already existed has caused them to disappear. Another action which is appropriate to Static Electricity is seen in paralysis-agitans. In this disease the electric 'wind' with also feeble sparks stop instantly the tremblings of the parts upon which we direct them; the malady itself is also most favorably influenced. In certain neuropathies, spinal irritations, dyspepsia, dysmenœas, &c., &c., the static electrization has given results which a long treatment by other means could not procure. In cases of hemianæsthesia also the restoration of sensibility is remarked.

"It is also very easy by means of the spark to use *localized* muscular electrization, and with this view I will cite a fact which has importance, viz: *In certain cases of spinal paralysis, when the muscles could not respond to the*

strongest of our Faradic apparatus, the spark with much less pain would provoke beautiful contractions. I add that the strong spark, despite its rather frightful aspect, is quite inoffensive, and simply leaves on the skin a little spot of redness which disappears in a few hours.

"But I believe that I have said enough necessary to demonstrate that *Static Electricity* is not an agent to be despised, and that it truly merits to be drawn out from the oblivion in which certain prejudices have left it for so long a period."

DR. A. D. ROCKWELL, A.M., Electro-Therapeutist to the New York State Woman's Hospital, etc., says:

"The *absolute* value of franklinic electricity as a therapeutic agent is, without question, very great.

"Franklinic electricity will occasionally relieve pain where the dynamic fails, and in general is undoubtedly superior for this purpose to the faradic current alone.

"*Tonic* and *sedative* effects of a very interesting and positive nature can be obtained from *franklinization*, either by insulation or sparks."

"A still further advantage lies in the fact that little if any disrobing is necessary, since the drawing of sparks and the general stimulation of the surface is accomplished through ordinary clothing. Another important reason for the use of *franklinic electricity*, and one which to my gratification I have thoroughly tested, is its occasional value in supplementing, and, if it may be so stated, of reinforcing the constitutional tonic effects of general faradization.

"It is one of the familiar things in medicine, that a remedy which at first acts most effectually, may, after returning to the original treatment, act with renewed vigor. The same principle holds good in regard to the dynamic and franklinic forms of electricity.

"Occasionally cases of nervous exhaustion, as well as other forms of disease, after improving up to a certain point under the influences of galvanism or faradism, hang fire, as it were; but, by submitting the patient to the action of *franklinization*, a new impulse seems to be given. In this way—one treatment supplementing and reinforcing the other—results are obtained far more satisfactory than could possibly follow the exclusive use of general or localized faradization—central galvanization or franklinization."

"In the enlarged joints of subacute and chronic rheumatism the treatment by sparks is frequently more efficacious than either faradization or galvanization."

A PARTIAL LIST

of some of the Diseases in which *Statical Electricity*
is of Unmistakable Benefit.

-
- | | |
|------------------------------------|-------------------------------|
| Anæsthesia, | Irritation, Spinal, |
| Atonic Dyspepsia, | Lead Palsy, |
| Atrophy, Progressive Muscular, | Locomotor Ataxia, |
| Amenorrhœa, | Liver, Disorders of, |
| Angina Pectoris, | Lumbago, |
| Asthma, Spasmodic, | Marasmus, |
| Aphonia, | Migraine, |
| Ataxia, Locomotor, | Myalgia, |
| Bell's Paralysis, | Melancholia, |
| Congestion, | Milk, Difficient Secretion of |
| Cephalalgia, | Muscular Atrophy, |
| Chorea, | " Contractions, |
| Contractions, Muscular, | " Rheumatism, |
| Constipation, Nervous, | Neuralgia, |
| Cramp, | Neurasthenia, |
| Diphtheritic Paralysis, | Obesity, |
| Dyspepsia, | Odontalgia, |
| Dysmenorrhœa, | Paralysis of all varieties, |
| Dysphonia, | Palsy, Shaking, |
| Deafness, | Paraplegia, |
| Eczema, | Posterior Spinal Sclerosis, |
| Epilepsy, | Prolapsus Uteri, |
| Epileptiform Neuralgia, | Phthisis, |
| Exhaustion, Nervous, | Prurigo, |
| Eye, Inflammation of, Paralysis of | Psoriasis, |
| the Muscles of, | Rheumatic Paralysis, |
| Facial Neuralgia, | " Gout, |
| " Paralysis, | Rheumatism in all forms, |
| " Spasm, | Sciatica, |
| Gastralgia, | Spermatorrhœa, |
| Headache, | Spinal Paralysis, |
| Hemianæsthesia, | Sprains, |
| Hiccough, | Sphincter, Paralysis of, |
| Hysteria and allied Affections, | Spinal Congestion, |
| Hypsterical Paralysis, | Tetanus, |
| " Deafness, | Tic-douloureux, |
| Hemicrania, | Torticollis, |
| Hemiplegia, | Urethra, Hyperæsthesia of, |
| Hypochondriasis, | Uterus, Diseases of, |
| Impotence, | Writers' Cramp, |
| Infantile Paralysis, | &c., &c., &c. |
| Insomnia, | |

Improved Magneto Electric Machine

FOR MEDICAL PURPOSES.

With Handles & Cords mounted in compact, Finely-finished Mahogany Case.

To use this machine it is only necessary to turn the handle to evolve a strong current of electricity. Price complete, \$8.00.

Improved Magneto-Electric Machine, same as above only larger, \$10.00

MAGNETS.

Large improved French Permanent Compound Magnets, made with great care expressly for MEDICAL USE, of best steel, with keepers.

No. 1, Extra Size.....	\$25.00
No. 2, Medium Size.....	20.00
No. 3, Small “	15.00
No. 4. “ La Petite”	10.00

GAIFFE'S POCKET MEDICAL BATTERY,

Genuine imported French.

No. 1, \$8.00; No. 2, \$10.00; No. 3, \$12.00.

TROUVE'S POLYSCOPE (with Plante Cell.)

Price complete in case with Electrodes, \$75.00.

(For description see Bartholow's Medical Electricity, page 234.)

Also, Lombard's Differential Thermo-Pile and Galvanometer.

BATTERIES OF ALL KINDS

Furnished at Manufacturers' Prices.

Electro Medical Apparatus Repaired

at short notice and at reasonable prices.

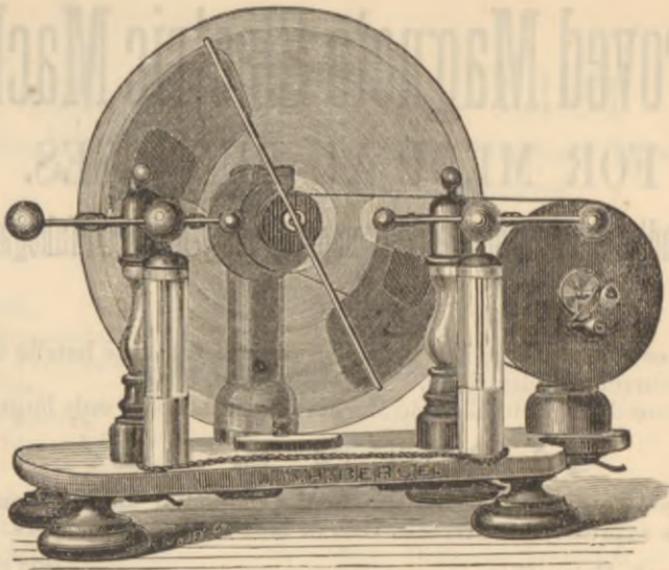
URINOMETERS of Best Quality.

MEDICAL THERMOMETERS of Best Quality

COMPLETE URINE TEST CASES, from \$10 to \$25.

&c., &c., &c.

BOCK-STIGER'S CELEBRATED ANATOMICAL MODELS
AND CHARTS.



SPECIAL NOTICE.

We desire to call your attention to our acknowledged **excellent moderate Priced Holtz Machine**, of our **latest improved style**, for Philosophical purposes.

These Machines we devised in response to a universally expressed demand for a low-priced but effective Holtz Induction Electrical Machine, for the use of Schools with moderate means, Students, Amateurs, Experimentalists, etc., etc. We have sold large numbers of them in the United States and Canadas, to the perfect satisfaction of buyers (as we can show by numerous and unsolicited written testimonials).

We have lately much improved these Machines, and now have in stock two sizes, made in the most substantial and workmanlike manner, mounted on solid black walnut bases, (well seasoned). No. 1, or the "**Pony**" size, we offer at the low price of \$25.00, complete, with catskin and rubber. The revolving plate of this size is twelve inches in diameter, and the stationary plate is fourteen inches. It will give a six-inch spark.

The No. 2, or "**Normal School**" size, has a revolving plate twenty inches in diameter, and stationary plate twenty-two and a half inches, and will readily give a full, intense, nine-to-ten-inch spark. We offer these at the remarkably low price of \$50.00 each, *complete*.

The illustration at the top of this page is an accurate representation of these two Machines. For most uses these Machines will take the place of an Induction Coil. They can be safely packed and sent to any portion of the United States and Canadas.

The **low prices** of these Machines place them within the reach of all taking any interest in the marvelous Science of Electricity, and will prove a source of most interesting and instructive amusement.

Caution.—To avoid mistakes, please notice that all the above mentioned Improved Holtz Machines have a metal plate with our name and address.

A BRIEF DESCRIPTION

By DR. MORTON

OF A FEW OF HIS METHODS OF APPLYING

STATICAL ELECTRICITY.

a. Insulation.—By this we mean, of course, insulation and electrification, a process termed the “*electric bath*” by the older writers. The patient sits on an insulated platform connected with either of the condensers of the machine, according as we wish to administer positive or negative electricity. Many cases are treated by insulation alone. The state of electrification produced is constantly lowered by diffusion from the patient’s body into the surrounding air and as constantly renewed from the machine. Insulation is employed, in some instances, simply for the “refreshing effect” common to all electrifications, again for permanent tonic effects, as in the use of medicinal tonics, also in rheumatism and neuralgia, and finally to relieve spasm, as will be seen in the reports of cases. Other reasons for using the simple insulation would, of course, occur to each practitioner. Special indications can no more be given for it than for the “*douche*,” the bath, or other form of hydrotherapy.

From twenty minutes to half an hour is the usual duration. If continued too long it produces a decided feeling of fatigue. In some instances this is desirable. Much to a physician’s convenience, two, four, or even six patients may sit on the insulated platforms at once. With an improved Holtz I find that four may be thus treated. The connecting-rod itself may be held in the patient’s hand, if strong electrification is desired. The pulse was thought by old writers to be increased. From observations taken to decide this point, I cannot find that the pulse is either increased or diminished. There is, however, generally a mild diaphoresis.

b. Sparks and spray.—The spark is a peculiarly distinctive phenomenon of frictional electricity, and, therefore, very naturally holds a prominent place in treatment by it. The patient is first insulated; in this condition sparks will fly between any point of the body and a conductor more or less directly connected with the earth. Their strength and shape may be graduated within large limits by the operator, from a minute prickle to a blow passing through six inches or more of intervening air. In certain forms of anesthesia and paralysis, as well also as along the spine, which is particularly insensible to their superficial effects, these long sparks may be used with great advantage. A little practice shows in what regions strong sparks are not disagreeable and in what regions they are painful. The question as to whether the spark is considered painful or not further depends upon the size and shape of the electrode. The spark from a brass ball two inches in diameter causes no pain, while a spark of the same length from a quarter-inch ball causes a prickling sensation. I much prefer, on many accounts, the large electrodes. In all instances, in “drawing” sparks, I use a ground connection, easily effected by connecting the chain to the nearest gas or water-pipe. The operator may employ a great variety of electrodes, large and small metal balls, or balls of wood, charcoal, and other substances. A large metal ball and a sharp-pointed rod are in general sufficient, though special forms are needed for the ear, mouth, nose, and some other organs.

It is never necessary to remove the patient's clothing, since the sparks pass through any fabric without injury to it, and without any diminution of their effect. When a spark of considerable strength strikes the skin, a whitish spot is seen at the point of contact, and in regions where there are hairs a condition resembling "goose-flesh." A little uticularial wheal, even, may appear on sensitive skins, which is soon replaced by a slight erythematous blush. These effects disappear in from half an hour to two hours.

We administer sparks to excite muscular contractility, to excite the function of organs and special senses, to cure by reflex action, and to stimulate the general skin surface. For this latter effect a metallic roller electrode is desirable.

But the spark may be pre-eminently antispasmodic. Its action in this instance depends upon the cause of the spasm. If of central irritative origin, the sparks are drawn from the head and back of the neck; if local, from the affected part; if from a reflex, from the peripheral point which controls the reflex. Oftentimes when the distribution of a motor nerve can be reached, a spasm may be at once controlled by the simple mechanical numbing effect of a succession of sparks. For instance, in a patient subject to violent tonic spasm of a great number of muscles on the left side, particularly the region supplied by the facial nerve and the spinal accessory, I have often made this experiment.

At times, when an attack was coming on, about to last invariably several hours, I have applied the static induced current (equivalent to the current from the ordinary faradic battery) to the facial nerve, and caused the facial group of muscles to respond, not in a clonic but in a tonic manner, *i. e.*, the mouth strongly drawn up at the corner, the eye closed, etc., etc. In less than a minute a few sparks would resolve this spasm. Again produced, it could be again as quickly resolved, and this repeated as often and in as varied a manner as desired. In torticollis, in spasms of irregular forms of epilepsy, and in a large variety of hysterical spasms I have seen the same results, as well, also, as in muscles grown rigid by pain, rheumatism, or paralysis of their antagonists.

In the relief of neuralgic pain the spark is in almost every instance successful, often instantaneous (ten to twenty minutes).

In subacute and chronic rheumatic pains, its curative power is equally certain and rapid. I have never seen from medication results at all comparable to the effects of static electricity. A variety of rheumatic pains, characterized by deep-seated, constant, wearisome, and disabling pain, oftentimes translatable, generally worse upon getting up in the morning, is relieved with great certainty and at once. The same is true of muscular rheumatism.

c. Shock.—In electricity the word "shock" signifies the effect produced on a person submitted to the discharge from the outer and inner coating of a Leyden-jar. In the improved Holtz machine the shock may be graduated by means of the discharging-rod to proportions easily borne by patients, but however administered it is severe, and the practitioner would probably not use it generally. It is well borne by hemiplegics; in some I have frequently given a shock corresponding to a three-inch spark from the discharging-rod; profuse perspiration, a tremulous feeling at the epigastrium and in the knees, and a feeling of being mentally demoralized and unstrung may follow a strong shock like this, but no ill-results have ever been known to follow. I have found no advantage in the shock for hemiplegics. Much greater benefit arises from the sparks and from insulation.

The shock may, for instance, be administered with the idea of favorably affecting a diseased liver. In the only case I have tried it, undoubtedly it did good.

But, on the whole, the shock should be little used. The careful practitioner will seldom need to avail himself of a remedy thus heroic.

It was by the shock that Jallabert, of Geneva, cured his first patient of a paralyzed arm of fifteen years' standing.

d. The static induced.—This new current has already been fully described. It has never before been a working part of the frictional machine, nor has it been used medically, so that it has a record yet to make. Simple wet sponge electrodes, of the usual sizes, are used for its administration.

A D D E N D A .

A brief mention of a few cases treated with Statical Electricity from Dr. Morton's Record-Book.

CASE III.—December 2d, 1880. Miss C——, twenty-three years of age. Muscular rheumatism. Subject to rheumatism for ten years. Began with a severe attack of acute articular rheumatism. Scarcely a week during the last five years but she has felt pain in some part of her; frequently as a "stiff neck." Had sciatica for one year and walked with a cane.

Present condition began eight months ago, though worse during last few weeks. Has pain and feels stiff in the neck, back, legs, and arms. Every movement occasions great pain. She is, in short, crippled. Each morning she must be raised from bed, but in several hours she is able to get about better than at first.

Treatment.—Positive insulation and slight sparks. Patient improved with each day's treatment. December 6th. All pains had disappeared, and patient, for the first time in many months, walked freely. December 7th. After overwalking, suffered again from a moderate general lameness in the muscles. December 10th. Every vestige of pain disappeared. Appetite much improved. Though so well, patient was so fearful of a return of pain that she continued treatment up to January 7th, when she discontinued it, satisfied that the cure was absolute. Up to date, nearly two months ago, no return has occurred. No other treatment was used. A number of cases of rheumatism may be alluded to very briefly.

CASE IV.—December 15th. Mrs. B——, thirty-four years of age. Pain in both shoulders to such extent that she never raised the arms; deltoids and trapezei chiefly affected; also pain in right hand; this condition existing very steadily for three years.

Treatment.—Insulation and sparks; one application. Pain has never returned.

CASE V.—December 6th. Mrs. J. B. F——. After sitting in the draft from a window one year ago, pains began in the right arm and shoulder. At present does not raise her arm on account of pain in the shoulder-joint. Has also pain in the wrist and in the joints of the fingers, some days in one joint, some days in another. The arm feels "woolly," *i. e.*, anæsthetic, and heavy. Insulation and sparks. Complete relief in twenty minutes, with no return to date.

CASE VI.—Mr. U——. Chronic rheumatic pains and stiffness in both shoulders. During the entire winter it has been impossible for him either to raise the arms at the shoulders or put them behind his back.

Treatment.—Insulation and two inch sparks. To the patient's great surprise, he was able, after five minutes' application of the sparks, to throw his arms about freely in every conceivable direction. No pain or impairment of motion remained. The result was surprising also to a number of physicians who were present.

CASE VII.—December 31, 1880. Miss R——, twenty-two years of age. Pain in left biceps; also in elevator muscles of left scapula. Unable to use left arm, and suffering much with it during the last month.

Treatment.—Insulation and sparks. Relieved by the first application of every vestige of pain, and enabled to use the arm freely. No return to date. It would be wearisome and needless to quote more of these cases from my record-book. I have known no instance of failure to completely relieve in from one to ten insulations all cases of muscular rheumatism. Lumbago of long standing seems to require patience for one, and to ensure entire recovery, perhaps two weeks.

A single instance of sciatica and cruralgia will suffice for all.

CASE VIII.—December 11, 1880. Mr. H——, twenty-eight years of age. Begun three years ago. Subject to severe attacks of shooting, throbbing pain in hip, thigh, and extending to the toe, lasting generally three or four weeks. He walks lame, seldom sleeps more than an hour at a time during the night without waking up in pain. During the last week, in addition to a painful sciatica, he has had great pain in the line of the anterior crural nerve extending as far as the inside of the knee. Medicines and a great variety of liniments have given no relief.

Treatment.—Insulation and very severe sparks (three inches), since patient was perfectly willing to take them. December 12th (next day). Patient reports that he has had no pain since leaving the office, that he slept well, and now walks without lameness. Up to date no return of trouble.

CASE IX.—*Bell's paralysis*, right side. Mr. F——, medical student, twenty years of age. Referred to me by Dr. Hammond. January 1, 1881. Patient, after walking in a very cold wind on December 19th, noticed the next morning that his face drew to the left side. The next day he could not close the right eye, and on examination found that the whole right side of his face was paralyzed. Faradic electricity and strychnia had been used up to January 1st, with no effect. He accordingly wished to try the static electricity. At the time of beginning treatment there was no possible voluntary motion on the part of the muscles supplied by the facial nerve. Water ran out of his mouth, and food lodged between the cheek and teeth.

Treatment.—Each muscle was singled out and treated by sparks, and also the trunk of the facial nerve.

The patient writes: "After the third insulation there was a marked im-

provement in some of the muscles each day, and after the seventh my face was entirely straight."

CASE X.—*Bell's paralysis*.—January 7th, 1881. Mrs. A——, aged forty. Absolute right facial paralysis, of two months' standing (untreated). Right eye open and staring and much inflamed; saliva flowing from right angle of mouth, and other symptoms usually seen in these severe cases.

Treatment.—Insulation and sparks. January 8th. Can now very nearly close the eye. January 9th. Buccinator less flabby; eye closes. January 14th. At the end of the seventh application all the paralyzed muscles had recovered their proper action with the single exception of the occipito-frontalis. I continued treatment two weeks longer, hoping to restore this muscle, but was unable to do so. Its nerve-supply is apparently irreparably injured, owing probably to two month's neglect in treatment.

CASE XI.—*Pressure paralysis*.—Mr. A. D——. One week previously went to sleep with his arm thrown over the back of a chair. On waking up, found his arm paralyzed; it was numb, heavy and pricking, as if asleep; he could not hold objects in his hand. To tests of sensibility there was anæsthesia; dynameter, right hand, five; left hand, sixty.

Treatment.—Insulation and sparks. After the fifth application the arm was cured.

CASE.—XII.—*Progressive locomotor ataxia*.—The early diagnosis of locomotor ataxia carries with it a promise of cure directly in ratio to the accuracy of the diagnosis and the immediate application of remedial measures. November 24, 1880. Mr. A. L——, aged sixty. During the last year patient describes very accurately the the symptoms common to pre-ataxic or neuralgic stage locomotor ataxia. He is now just entering upon the ataxia stage. Present condition: shooting, stabbing pains in the leg, occurring in paroxysms, particularly preceding changes in the weather. The same pains sometimes occur in the arms. Patient often rolls in agony on his bed during a paroxysm of several hours, and, though a strong man, the the pain is such as to bring tears to his eyes. No spot in his legs seems to be free from these pains, though they are worst in the thighs and great toes. The exclusion of simple sciatic pain was clear, espially as the affection is bilateral. The patellar tendon reflex is absolutely abolished at the left knee, and but a very weak response can be evoked at the right. The vesical and rectal reflexes are also much diminished. Urination and defecation are both slowly accomplished and difficult. Sexual power is absolutely abolished. No strabismus or ptosis, but diplopia has existed for two years. The reaction of the pupillary reflexes is diminished; carefully tested in shade and light they showed but little normal response. The patient seems to be just entering upon the ataxic stage, for he walks with a heavy cane, complains that he does not feel the ground well, particularly on the sole of the left foot; cannot walk in the dark without retaining his hold on the wall or banisters, and exhibits the usual swaying with closed eyes.

The whole group of symptoms, fulgurating, bilateral pains, abolished reflexes, and ataxia, render the diagnosis of locomotor ataxia perfectly clear.

I found the patient in a paroxysm, and prescribed the usual remedies, proposing that the next day he should begin treatment by electricity.

Treatment.—The treatment was simple and offers little variety in the records. It was insulation and heavy sparks from the spine, continued daily, from November 24th to December 23d, in all twenty-two applications. The pains disappeared at the end of the tenth application. The patient returned to his home cured of his ataxia and of his pain.

In a note written ten days ago, nearly two months and a half since his return home, he says: "I now walk perfectly well, and have had no pains, not even a twinge, since my return home.

Sparks in Sciatica.—H. Meyer, German, brewer, 34. Had had severe attack of sciatica lasting three weeks. Powerful sparks from static electrical battery were applied high up. Two applications relieved him entirely. It is the experience in this dispensary* that no other single agent gives so much and so rapid relief in sciatica as *static electricity*.

C. L. DANA, M.D.

* Department of Nervous Diseases, Metropolitan Throat Hospital, N. Y., 1882.

BECK'S HISTOLOGICAL DISSECTING MICROSCOPE

Combines a Compound Microscope with a Single and Dissecting one in a compact, practical, and economical manner.

The illustrations show it in both forms; when desired to use it as a Dissecting Microscope, the compound Body is unscrewed, and the single lens of one inch focus rests in the opening in the arm, which is also fitted with the Society Screw, whereby any Objective can be used with it. The Mirror is upon a double jointed bar, allowing it to be turned above the stage for illumination of opaque objects. Diaphragm, with various sized openings, revolves beneath the stage. Extension Draw Tube to the compound Body, Rack adjustment for focus.

THE HISTOLOGICAL MICROSCOPE is furnished with a single Lens, of one inch focus, for dissecting and botanical work, an Achromatic Objective $\frac{1}{4}$ inch (Economic), giving a range of powers of between 200 and 300 diameters, pair of Brass Pliers, two Dissecting Needles in handles. Glass Plate with ledge, all packed in neat Mahogany Case, with Lock, \$25.

NEW MODEL DISSECTING MICROSCOPE—\$15.00.

Stand all brass, with broad circular Base and large firm Stage; Jointed Arm to carry the lenses, with rack-and-pinion adjustment of focus; Concave Mirror and Side Condensing Lens with complete adjustments; two *single* lenses of $1\frac{1}{2}$ and 1-inch focus; the whole packed in a strong Mahogany Case, with handle and lock.

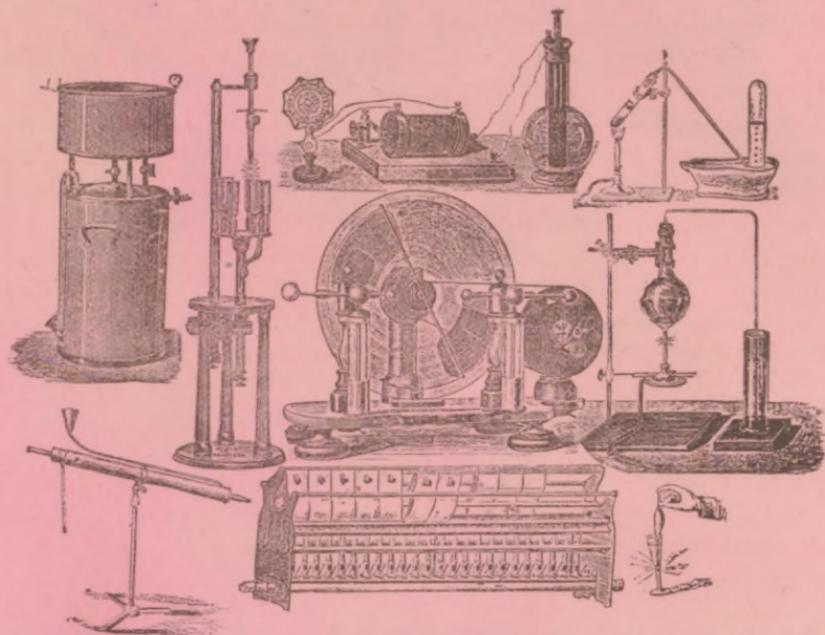
FOR SALE BY J. & H. BERGE.

ESTABLISHED 1850.

J. & H. BERGE,

NOS. 191 GREENWICH STREET, AND 95 JOHN STREET,

NEW YORK CITY.



Importers and Manufacturers of

Chemical & Philosophical Apparatus

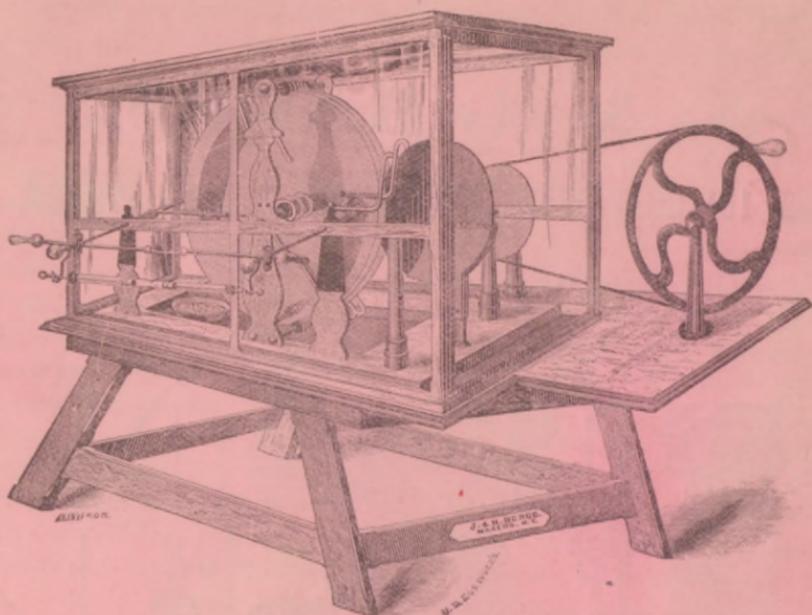
OF ALL KINDS.

BOHEMIAN GLASSWARE, GERMAN CHEMICAL PORCELAINWARE.

ASSAYERS' SUPPLIES ELECTRICAL APPARATUS,
PURE CHEMICALS, Etc., Etc.,

KEPT IN STOCK, IN LARGE VARIETY.

FINE METAL WORK AND REPAIRING, A SPECIALTY.



This Cut represents a fine large (No. 12) Machine, which we built for Dr. WM. A. HAMMOND, of this City. We also built a similar one for Dr. W. J. MORTON.

BERGE'S

IMPROVED

HOLTZ ELECTRICAL MACHINES

—FOR—

Medical, Philosophical and Scientific Uses.

DIPLOMA OF EXCELLENCE AWARDED BY AMERICAN INSTITUTE

1881.