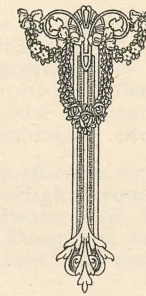




Directions for operating
STYLE "E" COMBINATION
Physician's Electrical Cabinet



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PREAMBLE "E."

The contents of this small booklet were intended to assist the student in the Electro-Therapeutical world, in obtaining the best possible results from the style "E" Physicians Cabinet.

The treatment of disease by means of electric current has become as firmly established as with drugs or other methods, and today the various currents are known and appreciated for their value, in hundreds of conditions. In earlier days, one of the chief disadvantages of the use of the different modalities was the lack of apparatus sufficiently powerful to produce the most profound physiological effects.

Style "E" is a thoroughly efficient, complete, result producing appliance. X-Ray—D'Arsonval—Oudin—High Frequency—Ozone—Tankless Compressed Air—Nebulizers—Fluid Heater—Air Heater—Vibrators—Biers' Hyperemia by Vacuum—Cautery, Diagnostic and Sinusoidal Circuits, each and every one has a field of its own; and attachments for their proper use are included with the outfit.

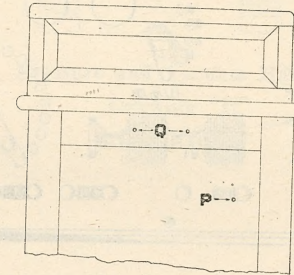
These instructions were carefully compiled for the style "E" Generator, and, as extreme care was exercised in simplifying, you should be able to derive excellent results by observing them as written.

Please read them carefully, and when in trouble consult the proper page for advice before registering a complaint.

Installing Instructions

The top drawer contains, in addition to the direction booklet, the High Frequency Electrodes, which are held in place with metal clips.

The bottom drawer contains the X-Ray Tube Holder, Casters and Handles for Vacuum and Pressure Controls.



Side of Cabinet

Dwg. "L 5"

You will find a small hole on each side of the cabinet, near the front and near the top, indicated on drawings as "P." These are for the Nickel Plated Holders for the Vacuum & Pressure Handles. Screws for these will be found in an envelope in the drawer.

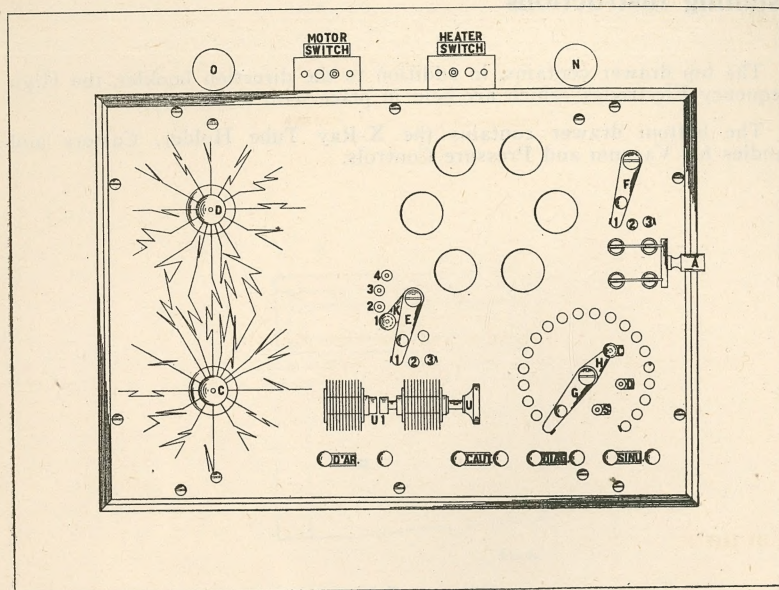
You will also find two holes in left side near the top and in the center see Drawing "C."

These are for the X-Ray Tube Clamp.

Move your Cabinet in some convenient part of your office and screw plug on end of black connecting cord to Lamp Socket. Investigate, and see that your current Voltage does not vary more than 10% from that stamped on Name Plate. Also see that you have 10 Ampere Fuses in the service box from which you draw your current.

Lift up Glass Cover, and set sprays and plain bottles in place in holes in Marble. See that switch "A" is open, and turn on Current at Lamp Socket.

Your Cabinet is now ready for action.

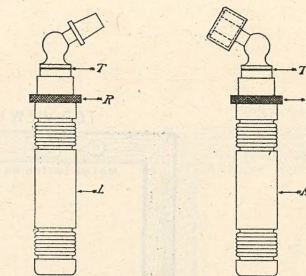


Top of Cabinet, Complete
Drawing "E 1"

Press White Button on **Heater Switch** at back of top of Cabinet. This illuminates the bottles with a red glow, and after a very short period the contained liquids will become warmed to Body Temperature. The object being to prevent the resulting chill of a cold spray upon the sensitive Tissue or Wound under treatment.

Pressure

To obtain Pressure to operate Nebulizer, Atomizer, etc., press White Button on Switch marked **Motor**. Set pointer on Handle "N" to farthest point on Plate marked **Pressure**. Attach Spray Bottles to Taper end on Pressure Handle "L" on right side of Cabinet. To operate Control on handle to obtain various degrees of Pressure, see cut "H." Knurled Collar "R" is turned to right to gradually increase Power and to left to decrease. To relieve Pressure instantly, pull Collar "R" down. **Always make it a point to have Valve in Pressure Handle Open when starting Motor.**



Pressure and Vacuum Handles
Drawing "H"

Vacuum

To obtain Vacuum for use with the various Cupping appliances, start Motor same as for Pressure. Set pointer on button "O" to farthest point marked Vacuum.

Attach Cup by pressing into Rubber Bushing with a slight turning movement. Handle is controlled same as on Pressure Side, having the same quick release by means of collar "R."

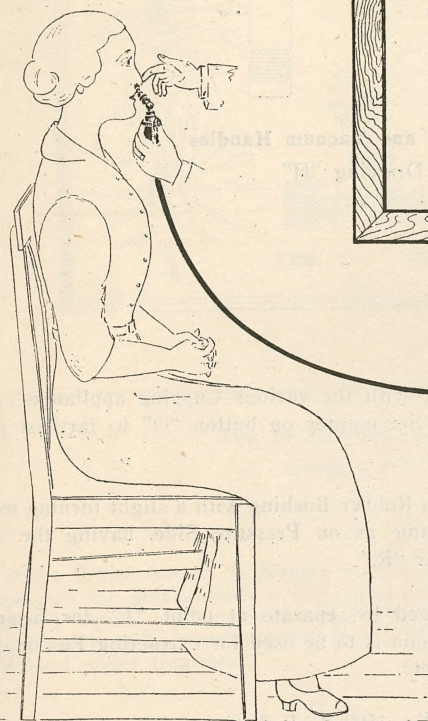
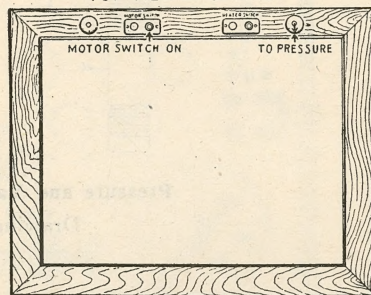
The handle "M" is arranged to separate at point "T," for inserting Gauze or Cotton when the Vacuum is to be used for extracting Pus or other similar substance from Boils, etc.

The Glass Vacuum Cups No. 1500 A, B & C are for use over smooth flat surfaces, and the flexible rubber attachments No. 1555 and 1556 will be found very desirable where Edges and Angles are encountered.

Any device gotten up by Dr. Bier can be attached to the Vacuum Handle the same way.

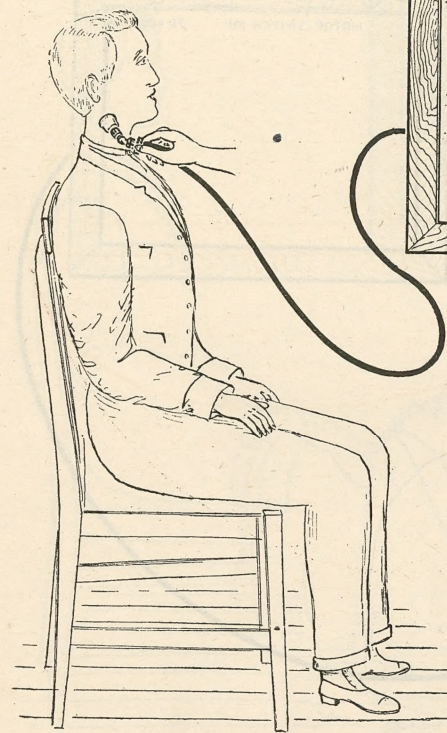
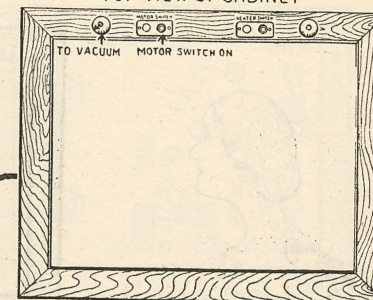
No mistake can be made in making connections with either the Air Handle or the Vacuum Handle, as vacuum attachments will not fit on Pressure side, and vice-versa.

TOP VIEW OF CABINET

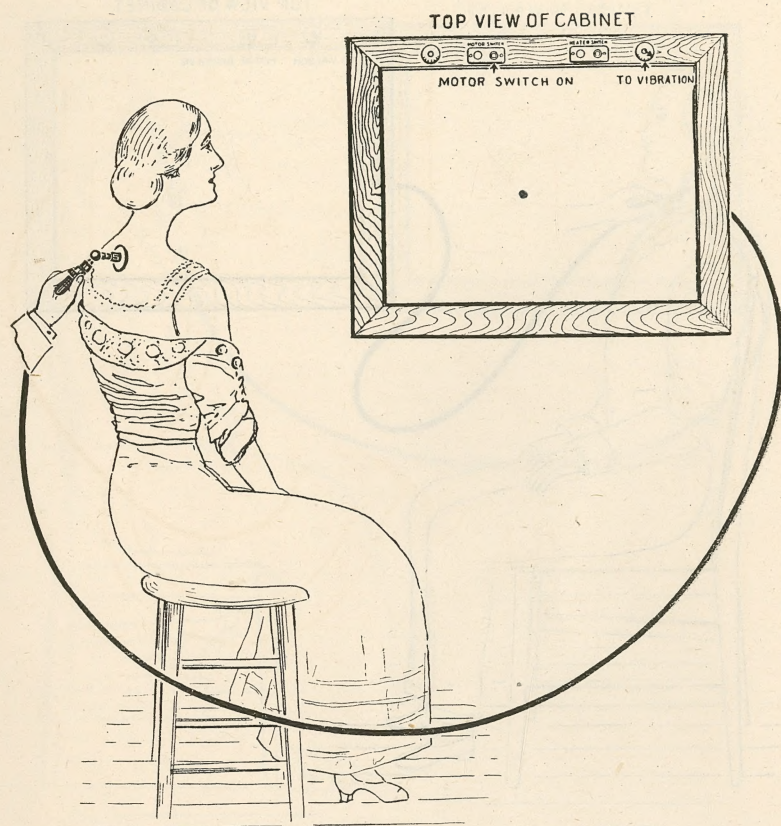


Eustachean Tube Opener
Drawing "P"

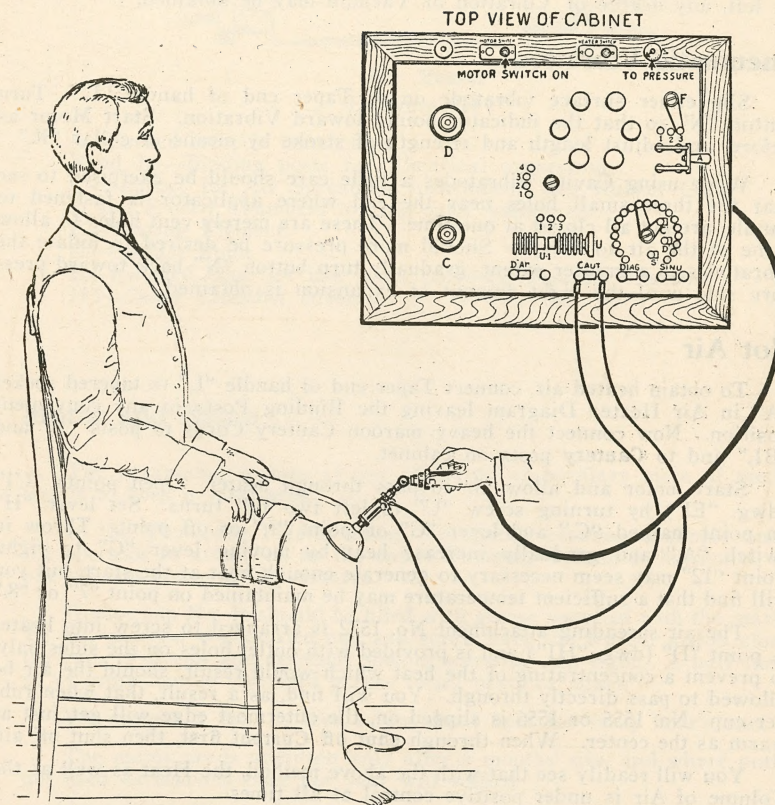
TOP VIEW OF CABINET



Vacuum Application



Vibration



Hot Air
Drawing "A 2"

Vacuum and Vibration

By turning button "O" until indicator points to farthest point toward side marked Vibration, you will find that although you still have some sucking effect, it pulsates rapidly. By turning this same button to right or left, any degree of Vibration or Vacuum may be obtained.

Pneumatic Vibration

Slip either surface vibratode on to Taper end of handle "L." Turn button "N" so that the indicator points toward Vibration. Start Motor as before, and adjust length and strength of stroke by means of collar "R."

When using Cavity Vibratodes a little care should be exercised to see that the three small holes near the end where applicator is fastened to handle, are not all closed at one time. These are merely vent holes to allow some of the air to escape. Should more pressure be desired to inflate the vibratodes to a greater extent, gradually turn button "N" back toward pressure side until the right amount of expansion is obtained.

Hot Air

To obtain heated air, connect Taper end of handle "L" to tapered socket "A" in Air Heater Diagram leaving the Binding Posts in any convenient position. Now connect the heavy maroon Caution Cords to posts "B" and "B1," and to Caution posts on cabinet.

Start motor and allow air to pass through heater. Open points "U1" (dwg. "E1") by turning screw "U" to left two full turns. Set lever "H" on point marked "C," and lever "G" on point "I," or off point. Throw in switch "A" and gradually increase heat by moving lever "G" to right. Point "12" may seem necessary to generate enough heat at the start, but you will find that a sufficient temperature may be maintained on point "7" or "8."

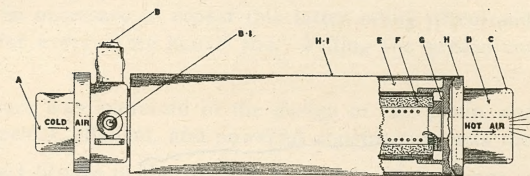
The air spreading attachment No. 1572 is arranged to screw into heater at point "D" (dwg. "H1") and is provided with outlet holes on the sides only, to prevent a concentrating of the heat which would result, should the air be allowed to pass directly through. You will find, as a result, that when rubber cup No. 1555 or 1556 is slipped on, the outermost edge will get just as warm as the center. When through shut off Current first, then shut off air.

You will readily see that with the above method, the Heat as well as the Volume of Air is under positive control at all times.

Continued contraction and expansion caused by the repeated heating and cooling, is apt to loosen the unit "F." When this occurs, and heater fails to work, tighten same by screwing fast Tube "H."

Our endeavor in designing this heater has been to make it as small as is consistent with the life of a coil necessary to furnish the required amount of air at the heat required. Both quantity and heat of air are independently adjusted to any degree. Every heating element is given a thorough test and if the instructions above are carried out, the coil will give service for a long period of time. New units can be purchased at 75 cents each. Postpaid.

No other heating element on the market can be so readily renewed.



Air Heater
Drawing "H1"

- A—Socket for Air connection.
- Band B1—Binding posts for Electrical connections.
- C—Support for Air Spreading Attachment, and Rubber Cups.
- D and E—Air Chambers to keep outer walls cool.
- F—Heating Element.
- G—Contact Point.
- H—Knurled edge for use when removing Heating Element.
- H1—Outer Chamber cover.

Motor and Pump

The paramount feature of any revolving or oscillary piece of mechanism is to keep it lubricated.

In the Thompson Plaster Pump this matter becomes a simple one for the operator to attend to, as the entire Pumping System is lubricated from one oil cup conveniently situated.

Grease cup No. 16 should be filled with grease supplied with the machine. To fill, unscrew the knurled cap and screw back the leather piston close to the cap. Fill cup and re-insert piston, screwing cap tight. A half turn or so of cross handle will feed grease to all parts of pump.

We suggest a turn of feed screw about once for every hour's run.

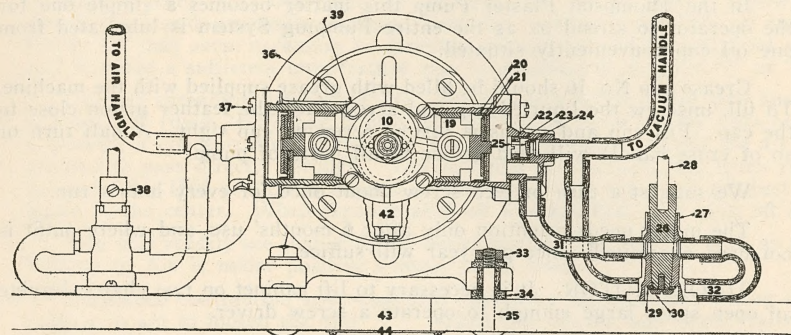
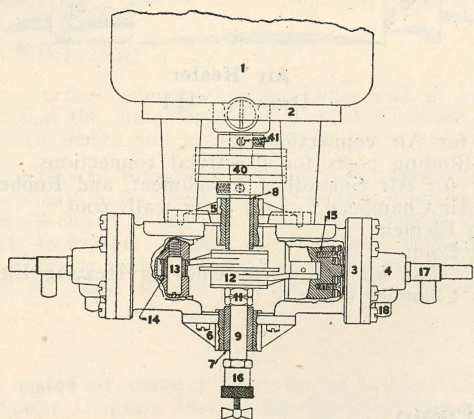
The motor needs attention only after 6 months' use, and where outfit is not used excessively once per year will suffice.

TO OIL MOTOR. It is necessary to lift cabinet on two chairs, leaving an open space large enough to operate a screw driver.

Take off plate No. 44.

Now remove the cups No. 42 with large screw driver, and after cleaning in Benzine, refill and replace, being careful to get wick in center so that it will reach the shaft.

Should the operator prefer to oil motor without lifting the cabinet, this can be done by using a good motor oil and putting a few drops in the oil holes on top and on each end of motor shaft.



Sectional Views: Motor and Pump

It will be necessary to repeat this latter oiling often, and we suggest a few drops for every three hours' run. Filling the grease cup is the better method.

Much care was exercised in the design of this pump, and a product of smooth, noiseless, efficient, and powerful construction was the result.

The finest bronze in the country is used in the bearings and piston connecting rods, insuring "long life."

A novel four leather link coupling makes the direct connection between pump and motor.

No belts, no gears, no chains, but positive direct drive of noiseless construction. See No. 40.

The valves are positive, and are readily replaced if necessary.

Should any piece prove faulty at any time, order by name and number. Parts are made interchangeable, and instructions to attach will accompany each piece called for.

- | | |
|---------------------------------|-----------------------------------|
| 1—Motor. | 24—Cylinder Head Valve. |
| 2—Support For Pump. | 25—Cylinder Head Valve Reinforce- |
| 3—Main Cylinder. | ment. |
| 4—Cylinder Head. | 26—Control Valve Plug. |
| 5—Rear End Bearing Support. | 27—Control Valve Body. |
| 6—Front End Bearing Support. | 28—Valve Operating Rod. |
| 7—Front Bearing Bushing. | 29—Valve Plug Washer. |
| 8—Rear Bearing Bushing. | 30—Valve Plug Screw. |
| 9—Crank Shaft. | 31—Rubber Connection to Valve. |
| 10—Removable Eccentric. | 32—Rubber Connection from Valve. |
| 11—Lock Nuts (For Removable Ec- | 33—Motor Bolt Nut. |
| centric). | 34—Rubber Dampening Cushions. |
| 12—Connecting Rod. | 35—Motor Bolts. |
| 13—Wrist Pin. | 36—Screw for Attaching Pump to |
| 14—Connecting Rod Bushing. | Frame. |
| 15—Piston Cup Clamp Screw. | 37—Cylinder Head Screw. |
| 16—Grease Cup. | 38—Valve Control Rod Screw. |
| 17—Cylinder Double Nipple. | 39—Front and Rear Bearing Support |
| 18—Cylinder Single Nipple. | Screw. |
| 19—Piston Follower. | 40—Coupling. |
| 20—Leather Piston Cup. | 41—Coupling Screw. |
| 21—Piston Washer. | 42—Motor Grease Cups. |
| 22—Cylinder Head Valve Binding | 43—Holes in Cabinet for Removing |
| Screw. | Grease Cups. |
| 23—Cylinder Head Valve Bushing. | 44—Cover for Grease Cup Holes. |

What are High Frequency Currents?

This question is made clear in a graphical way by comparison with water.

In our demonstration we will assume that the voltage will be the water pressure at the Hydrant. When we increase the pressure we increase the amount of water we can draw due to the speed with which the water flows.

The voltage obtained from style "E" combination is 100,000 volts, or approximately 1,000 times the voltage of the average electric lamp used. If you were to touch both terminals of a lamp socket, you would receive a severe muscular shock, though the voltage of the current would be only 1-1,000 of what you would receive from style "E" coil.

Let us see what 1,000 times the pressure of the water at the hydrant would mean. Upon opening the faucet a stream of water would travel at such speed that anything brought into contact with it would be struck as with a blow from a sword.

This same condition would prevail if electrical currents of 100,000 volts were permitted to enter the human body. It would be as a sword thrust that would cleave from head to heel.

Now let us take this tremendous pressure and force water through an atomizer with hundreds of thousands of tiny holes. The result would be a mist of spray, that would penetrate the entire surrounding atmosphere. The most delicate of flowers could be refreshed and could thrive when treated in conditions produced in this manner.

In the generation of High Frequency currents, an Electrical Condenser is connected in the Circuit, acting as does the atomizer in separating the flow into minute impulses of such rapid succession that no sensation affects the nervous centers. Likewise there is no muscular contraction.

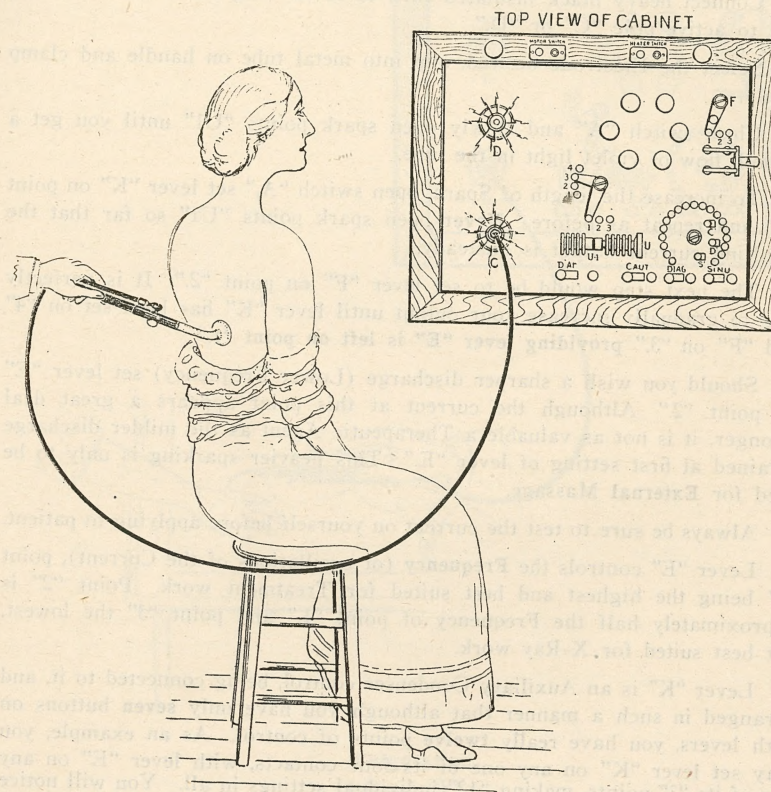
The human nervous system can detect oscillations in an electrical current up to 10,000 per second, and as the frequency increases, the sensation decreases. Style "E" has a frequency of over One-Half Million per second.

The operator has therefore at his command a tremendously powerful agent, from which more benefit can be derived in a few seconds' treatment than with hours with the one time Battery Outfit.

There is no quackery or uncertainty about it, and it is not put forward as a "Cure-All;" but, being a thorough cell massage and peculiarly healthy stimulant, its intelligent use is a wonderful aid in restoring the normal equilibrium wherever it has been disturbed, and the physical condition impaired from almost any cause, and used as directed, with ordinary discretion, its results are almost universally beneficial and never harmful.

Any physician once initiated into the results obtained from the use of High Frequency, high potential violet ray currents such as generated by the style "E," finds their use absolutely indispensable.

The term High Potential is merely indicative of High Pressure or Voltage, the same running in various treatment machines as high as from 10,000 to 100,000 Volts.



High Frequency (Violet Ray)
Drawing "H-F"

High Frequency

To obtain this valuable current from style "E" for use with the various Glass Electrodes; set lever "E" on point "1," "F" on point "1," and "K" on point "1," (see dwg. "E1"). Close interrupter point "U1" by turning screw "U" gently to right.

Connect heavy black insulated cord to Metal ring on insulated handle, and to active pole "C" or "D."

Select the Electrode desired, slip into metal tube on handle and clamp firmly.

Close switch "A" and slowly open spark points "U1" until you get a smooth flow of violet light in the tube.

To increase the length of Spark, open switch "A," set lever "K" on point "2," and repeat as before. **Never** open spark points "U1" so far that the resulting current output is unsteady.

The next step would be to set lever "F" on point "2." It is perfectly safe to gradually increase your output until lever "K" has been set on "4" and "F" on "3," **providing lever "E" is left on point "1."**

Should you wish a sharper discharge (Lower Frequency) set lever "E" on point "2." Although the current at this point appears a great deal stronger, it is not as valuable a Therapeutic Agent as the milder discharge obtained at first setting of lever "E." This heavier sparking is only to be used for **External Massage**.

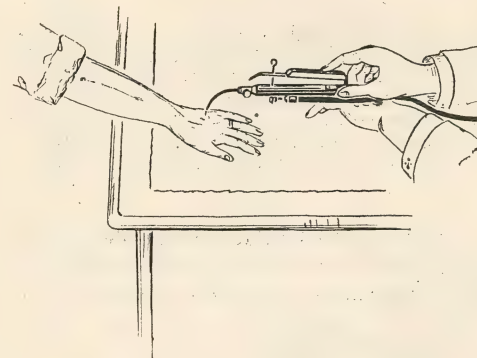
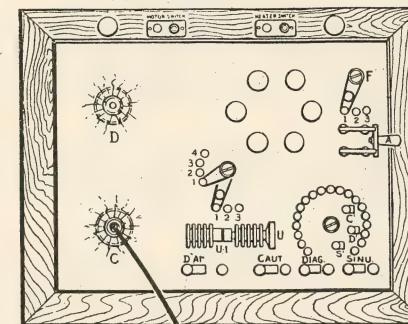
Always be sure to test the current on yourself before applying to patient.

Lever "E" controls the **Frequency** (or oscillations of the Current), point "1" being the highest and best suited for Treatment work. Point "2" is approximately half the Frequency of point "1," and point "3" the lowest, but best suited for X-Ray work.

Lever "K" is an Auxiliary Condenser control, being connected to it, and arranged in such a manner that although you have only **seven** buttons on both levers, you have really **twelve** points of control. As an example, you may set lever "K" on any one of its four contacts, with lever "E" on any one of its "3" points, making "12" individual settings in all. You will notice a decided difference in length of sparks at poles "C" or "D" with each different setting of lever "K."

Lever "F" is the Rheostat, and controls the volume of current entering the transformer; point "1" being setting of greatest resistance and weakest output, and point "3" the strongest. Varying the settings of lever does not have a very great effect on the length of the sparks from "C" or "D" as it does not change the voltage to any great extent: its main object being Amperage control.

TOP VIEW OF CABINET



Fulguration
Dwg. "F"

Fulguration

Set levers "F," "K" and "E" on points "I." This treatment requires a very mild current, and it is necessary to keep spark points "UI" quite close together.

Connect the heavy black insulated cord to either pole "C" or "D" and to Fulguration handle. Insert either one of the three assorted points furnished, into the handle, and clasp firmly. Apply directly to part to be treated, and make contact with spring lever, using index finger.

Two or three applications of a few seconds' duration, (depending on the size of the affected area), generally suffices in obtaining the desired result with this method. Should a longer spark be desired set lever "K" on point "2."

After using the machine for heavy discharge for any considerable length of time, the points "UI" may become somewhat carbonized, and cause a slight irregularity in the spark. To clean these points, wet with **Saliva** a corner of a card, and slide between until both surfaces are quite wet. Then burn off with current by closing switch "A." Repeat two or three times, then insert a **dry** part of the card, and close points on same gently. This will serve to take up any foreign matter which may still be present, in the form of carbon.

You will note a very fine control of **High Frequency or Fulguration** currents after cleaning in this manner. Should your points get exceedingly rough at any time, you may have to resort to the **Sand Paper** method of cleaning. Take a small piece of very fine sand paper and fold back to back so that you have a rough surface exposed on both sides. Insert this instead of the plain card, close points carefully, and slowly withdraw. Do **not** use this method more often than absolutely necessary, as it is liable to make the points uneven.

For treating the cavities of the body, the **Insulated Electrodes**, as illustrated in the back of this booklet, will be found almost indispensable, as the current discharge from them can be confined to any section desired.

Be sure to open Switch "A" when through using.

Do not touch the **Metal** parts of your cord or handle when in use.

Do not make or break connection with Active pole on machine before first cutting off current at switch "A."

Never turn on current when Active posts are out, or if either one should be broken.



D'Arsonval (Auto-Condensation)

D'Arsonval (Auto-Condensation)

There is probably no more valuable method of using Electricity Therapeutically, that is so easily applied, and so well known universally, than the D'Arsonval: (Auto Condensation). The amount of Milli-Amperage ranges in various treatments from 200 to 800, depending on the condition of the patient.

A Milli-Ampere Meter may be used to ascertain this amount, but the **Color Scale** supplied with the outfit will be found just as satisfactory and much more simple. This scale will be explained later.

Set lever "E" and "F" on points 1, and lever "K" on point "3." Now connect one heavy maroon cord from one binding post marked **D'Arsonval** and to long nickel plated handle. Other cord from other D'Arsonval post to connection on Auto Condensation Pad. See that your patient is firmly seated on the pad, and resting comfortably against the back, and grasping the long handle in both hands.

Close points "U1." Throw in knife switch "A," and gradually increase current to patient by turning screw "U" backward slightly. It is well to remember here, that the closer the points, the higher the frequency and the smoother and heavier the current output.

Never open points "U1" far enough to cause an unsteady sparking there, or so that sparks jump from "C" to "D," as the resulting current to patient will be very unsteady, and of too low a frequency to be of any real Therapeutic value.

Amount of Current in M-A. - Color Scale

To ascertain amount of current being delivered by means of Color Scale: Open switch "A;" break connection from machine to metal handle, and fasten cord to small binding post on end of lamp furnished. The tip on the nickel plated clip should now be fastened into clamp on end of the long handle, and the clip itself snapped over the brass threaded portion of the lamp.

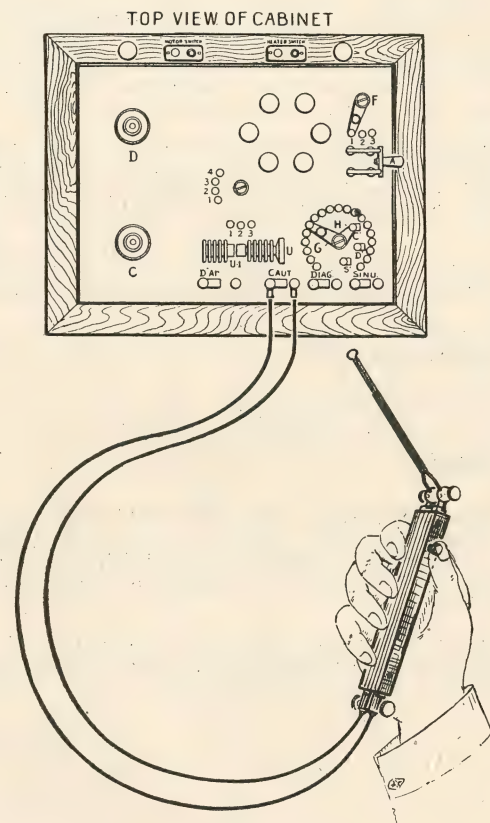
Now seat the patient as before, start current same way, and you will find the lamp glow to different grades of color, depending on the settings of points "U1." To further increase output try setting lever "F" on points "2" and "3" respectively, and then lever "K" on point "4." The maximum output, and smoothest flow, will be generated with lever "K" on "4," "E" on "1," and "F" on "3" with points "U1" almost closed.

While the current is passing through the lamp, (in series with the patient) hold the color scale close to the lamp and match the color of same to some one of the numbered shades.

As an example: should you desire 600 Milliamperes and lamp color matches shade marked 450 or 700, either increase or decrease current by changing settings of levers "K" or "F" or adjusting points "U1."

The lamp should only be used for **testing** purposes, and when the desired setting is attained, should be again removed from the circuit. The resistance of this lamp cuts down the current given to the patient 20%, and the operator should figure accordingly.

After continuous service, points "U1" should be cleaned, as in Fulguration.



Cautery
Drawing "C"

Cautery

See that switch "A" is open. Open spark points "U1" about $\frac{1}{8}$ of an inch, by turning screw "U" to left about two turns. Set lever "G" on point "1," or Off point. Set lever "H" on point marked "C."

Connect heavy maroon cords to posts marked Cautery, and to Cautery Handle. Close transformer circuit with switch "A." The cautery handle has a switch for convenience in operating, and pressing the button closes the circuit to the knife. Although you have only "12" buttons in this circuit, you really have "36" points of control, as you may set your lever "G" on any one of its "12" buttons, and vary the current each time by means of lever "F." A light cherry red is the proper color for Cautery work.

If your knife does not heat when connected try some other circuit to make sure you have current entering the cabinet. Then look closely at levers "G" and "H" and see that they are making good contact on the buttons. Also see that the blades and contacts of switch "A" are clean, and fit snugly.

Your knife itself may even be at fault, the copper bars in which the platinum tips are held probably being jammed together in packing.

Care must be used not to advance lever "G" too far as you are apt to burn out your platinum knives.

Diagnostic Lamp

Set same as for Cautery, but have lever "H" on point marked "D." Connect tips of Diagnostic Lamp cords to posts marked Diagnostic, and bring the color of Filament to any degree of brightness you may desire. Care should be exercised same as for Cautery, to avoid going too far and burning out your lamp.

Any other lamp for diagnostic purposes can be used in the same manner, the regulation being fine enough, and the capacity ample; ranging from $\frac{1}{2}$ Volt on point "1" to 12 Volts on point "16."

Sinusoidal

Set same as for Cautery, but have lever "H" on point marked "S."

Use light maroon cords and connect to metal handles and to posts marked Sinusoidal. Regulate the same as for Cautery by means of lever "G."

A moist pad or sponge electrode as illustrated can be used to advantage in many places where the round metal handle would be found rather inconvenient.

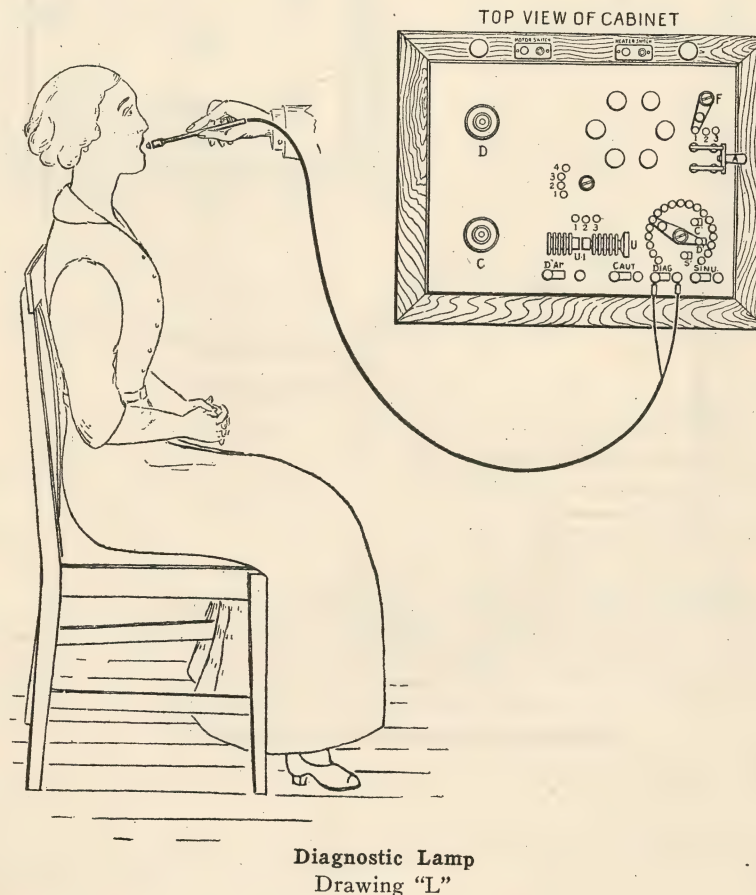
You will find, in following out the above, that when lever "H" is set for Cautery that you have "12" points of regulation; when set for Diagnostic, "16" points, and for Sinusoidal "20" points.

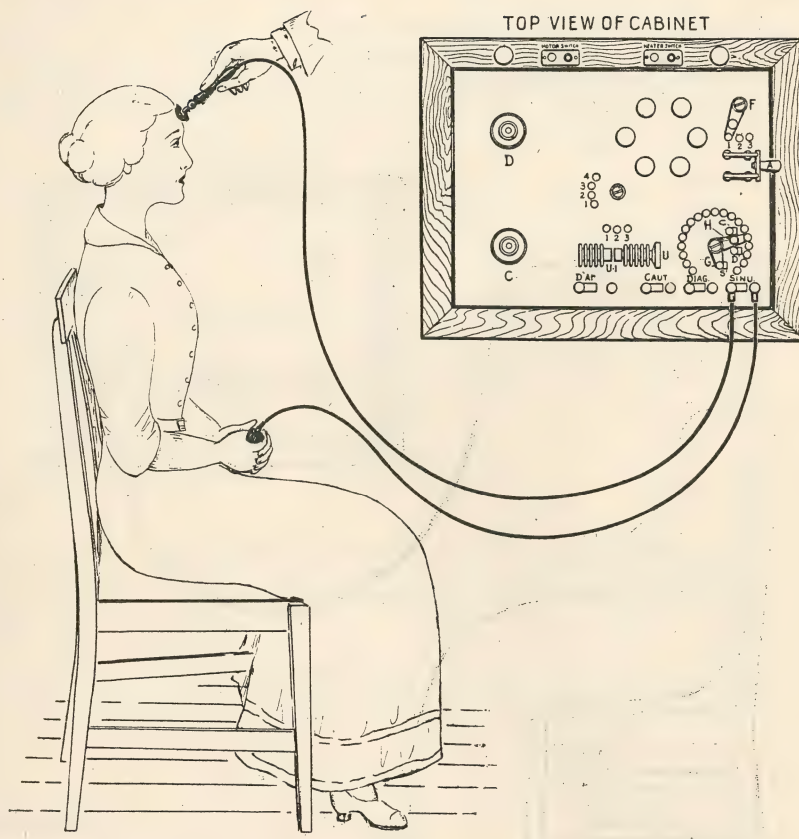
The settings of lever "K" and "E" have no bearing whatever on the workings of the Cautery, Diagnostic and Sinusoidal Circuits, being cut off therefrom by opening points "U1."

Do not let lever "G" stop between points.

Do not make connections with switch "A" closed.

Do not expect to get Cautery Circuit with lever "H" on point "D" or "S," and vica versa.





Sinusoidal Application with Spongio Discs

Suggestions for correcting errors in operating Cautery, Diagnostic and Sinusoidal Circuits

If machine should apparently "Go Dead," that is, you are unable to obtain any current from it, first unscrew connecting plug from lamp socket, and try for current in same manner by inserting lamp. If the lamp fails to light, look for a burned out fuse in the cut-out box where the Electric current enters your building.

Should your lamp light up when trying as above, again connect the machine, but before closing switch "A," bend the small contacts together slightly so that the blades of switch fit in more snugly.

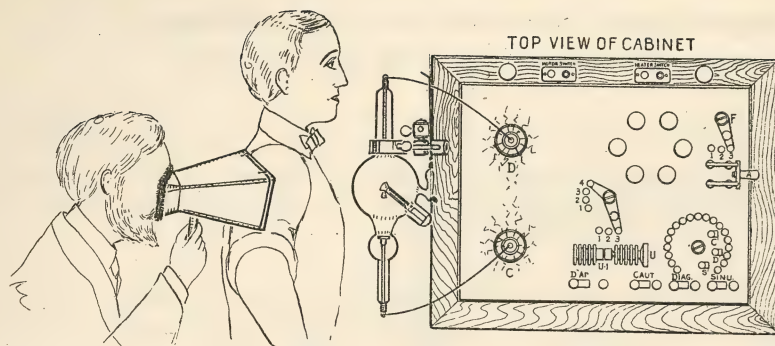
Should your knife fail to heat when connected to Cautery circuit, test for trouble as follows: Remove Cautery knife from handle, and set lever "G" on button "6." Short circuit with knife blade, or other piece of metal, across from one post on the handle to the other, and when making and breaking, observe whether there is any sparking. If no sparks can be seen, you know your trouble is not in the knife, but somewhere nearer the machine. Now disconnect the wires from the handle, and, still with lever "G" on "5" or "6," touch the metal cord tips together. Should you even now see no sparking, you must look still farther.

You will notice on the marble switchboard, that the small metal plate marked "Cautery" is clamped under one of the binding posts. Throw on your current again and touch the plate with one copper bar of the knife, and the opposite post with the other bar of the knife. Should even this fail to give you results, it should be reported to us at once. In making these tests BE SURE that levers "B" and "G" make GOOD CONTACT on the buttons.

Much the same procedure can be followed with the Diagnostic and Sinusoidal Circuits. When your lamp fails to illuminate, first be sure it is screwed into the small socket firmly. Or remove lamp entirely, and after setting lever "G" on button "4" or "5," touch side of brass shell on base of lamp to name plate, and end of lamp to opposite post.

Try also with metal lamp holder by shorting across from post to post, and also watch for sparking.

If ever the binding posts appear dead, with switch "A" closed and tested as above, report to us at once.



Fluoroscropy

X-Ray

Set lever "F" on point "3."

Set lever "K" on point "4."

Set lever "E" on point "3."

Close interrupter points "U1" as for High Frequency. Throw in switch "A" and gradually open points "U1" until you get a continuous flow of sparks between poles "C" and "D." The wider the space at "U1" the lower the frequency, and the heavier the flow of current. Do not open the points too wide, however, as doing so will cause an **uneven** discharge, and is to be avoided.

Now turn off current entirely, and connect X-Ray cords from poles "C" and "D" to ends of tube marked "L" and "M." The discharge being Bi-Polar, i. e., both posts equal, it makes no difference in results which post you connect to either terminal. It is advisable however to have the live hemisphere turned away from you when in use.

Close switch "A," and gradually open points "U1" until you get a steady green glow in the tube. If tube is operating properly the half directly in front of the Anode or target will light up with an apple green color, while the back half remains considerably darker.

To see this best, stand directly on side of tube and look through. A distinct hemisphere must be apparent. The more pronounced this hemisphere the better will be your results.

High, Medium and Low Vacuum Tubes

To determine just about how much penetration your tube has, observe carefully the sparking between poles "C" and "D."

A high vacuum tube (one of high penetration) will back up the full distance from "C" to "D"—5½ inches; a **medium** tube, of less penetration, but delivering rays of more **therapeutic** value—4 inches; while a comparatively **low** vacuum tube will not back up more than 2 or 3 inches. A low tube of this kind will generally show some white patches behind the Anode.

The reason for the above is the fact that the internal resistance of a high vacuum tube is very great; and the energy from the machine, instead of passing through, and producing X-Rays, will jump the less resisting air gap between the posts "C" and "D."

The more gas you allow into the tube, the less the internal resistance; the tube absorbs more of the current, and leaves less to leak off at the terminals.

A **hard** tube produces less X-Rays, but of more penetrating quality; suitable for heavy work.

A **medium** tube produces more X-Rays than a hard tube, but of less penetration, and is best suited for medium-radiographic or fluoroscopic work such as foot, elbow, knee, etc.

A **soft** tube, of low vacuum, produces a great quantity of X-Rays, but of slight penetration. While this tube will make excellent radiographs of the hand, it should never be used for heavier work. This tube is, however, very well suited for treatment purposes.

Should your tube fail to glow properly, or sparks jump the full gap from "C" to "D" in making these tests, your tube is **too high** in vacuum, and must be reduced; or your spark points "U1" are too far apart.

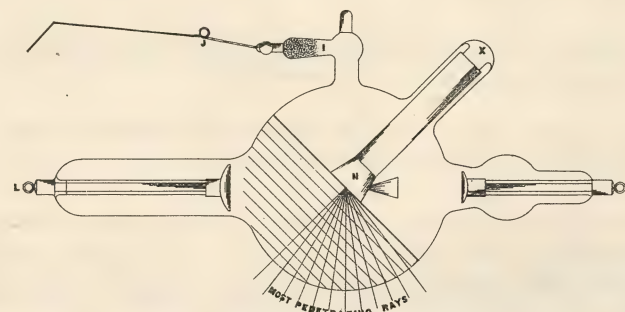


Diagram "X 2"

How to Reduce Vacuum

To reduce vacuum, open switch "A," set lever "E" on "3;" "K" on "3" and "F" on "3." Bring down the small wire "J" leading from chamber "T" (on diagram "X 2") to about one-half inch from Cathode terminal "L."

This chamber "T" is filled with asbestos, treated with a chemical which is vaporized as a gas by the passage of the current: this same gas reducing the internal Electrical resistance. Adjust points "U1" until nearly closed, and snap in switch "A," one or twice; not more than a second or two at a time. Then raise wire "J" up about 5 inches, and try tube as before.

If you still do not obtain the desired hemisphere in the tube, repeat the reducing process. **Caution** should be used not to overdo this, as you can repeat the operation any number of times, whereas if you allow too much gas into your tube, your only recourse is to send it back for re-exhaustion.

Very often tubes are considered too high in Vacuum by the novice, and over-reduced, when the real trouble has been too great an opening at points "U1." These should be adjusted so that when tube is disconnected an even steady flow of sparks jump from "C" to "D," and when tube is in the circuit it illuminates with no spasmodic flickering lights, but with a steady glow.

You may easily determine this for yourself by trying a few times both with and without the tube. The best setting for average X-Ray work should be obtained by closing "U1" entirely, and then opening about $\frac{1}{4}$ turn of screw "U." For X-Ray treatment work good results may be obtained by setting lever "E" on point "2."

For Fluoroscopic or Radiographic work, a little judgment must be used as to the density of the object to be penetrated.

A stout patient is not necessarily difficult to radiograph; while a muscular person will be found considerably harder.

A good point to remember here is this: You can almost always gauge the opaqueness (to the X-Ray) of any object, by its specific gravity. A piece of pine wood of any thickness will offer considerable less resistance to the Ray than a piece of oak of the same size. To make a Radiograph of an ordinary woman's shoulder, will require less exposure than if your patient was a laborer, with hardened muscles.

Exposure Chart

Owing to the fact that so many factors enter into the determination of the proper lengths of exposures, the following schedule is only approximate. It is based on a medium weight patient, with lever "K" on point "4," lever "E" on point "3" and lever "F" on point "3," and using Paragon Plates.

Part to be Radiographed	Distance of Anode from Plate Inches	Thickness of Object Inches	Time of Exposure In Seconds
Hand -----	15	1 $\frac{1}{4}$	4
Wrist-Lat. -----	15	1 $\frac{1}{2}$	6
Wrist Ant. Post -----	15	2 $\frac{1}{2}$	8
Elbow -----	15	3 $\frac{1}{2}$	10
Foot-Lat. -----	15	3	10
Foot Ant. Post -----	16	2 $\frac{1}{2}$	10
Ankle-Lat. -----	15	3 $\frac{1}{2}$	11
Ankle Ant. Post -----	17	4	12
Upper Arm -----	17	4	14
Knee -----	17	5	22
Shoulder -----	17	5 $\frac{1}{2}$	25
Head-Lateral -----	18	6 $\frac{1}{2}$	40
Head Ant. Post -----	18	8	60
Head of Femur -----	18	7 $\frac{1}{2}$	55
Chest -----	18	8	45
Spine -----	18	8	60

For patients weighing over 150 pounds use a trifle longer exposure than above. For smaller patients shorten time.

For dental work on small films 18 seconds.

When using the full power of the coil, it is not advisable to run the tube over 10 seconds at a time. Should you wish to make a radiograph of a spine and the exposure chart calls for 60 seconds, break up the exposure into 6 sections, allowing at least five seconds between each flash. The reason for the above lies in the fact that the passing of the intense current heats up the tube; the heat of the tube tends to reduce the vacuum, and also the power of penetration.

You will be able to make a better negative in 25 seconds by keeping the tube temperature down, than in 45 seconds by allowing it to get overheated.

For Therapeutic work, where less current is used (with lever "K" on "2" or "3" and "F" on "2") and points "U1" nearly closed, it is perfectly safe for both machine and tube to run for the entire length of treatment; generally from 5 to 8 minutes.

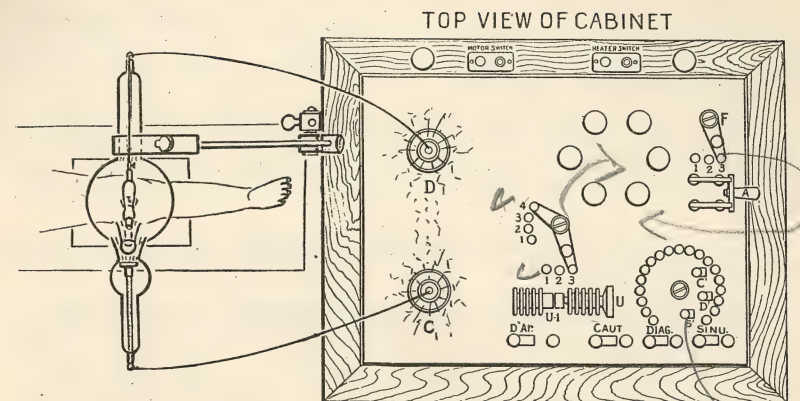
The time of exposure will vary with the distance of the tube from the plate, greater exposures being necessary as the distance increases; the thickness of the object; transparency of that same object; and the vacuum of the tube and its consequent penetration.

Radiography is Shadow-work, and you cannot get a good outline of a part unless it differs in density from surrounding parts.

As the intensity of the rays vary inversely with the square of the distance between the tube and the plate, the tube should not be too far away; otherwise the exposure will have to be lengthened considerably. On the other hand, setting the tube too close to the plate tends to enlarge and distort the image.

The age of the patient should also be taken in consideration, as a softer, lower vacuum tube will give best results with children, where the contrast between the tissues and bony structures is great. With aged patients it will be harder to show bone detail, owing to the bones and tissues passing an almost equal amount of ray.

Make your exposures as short as practicable, as long exposures tend to produce an effect in some plates whereby they will not develop out clear due to chemical changes in the silver salts in the emulsion.



Position for Radiograph

The most penetrating X-Rays are those proceeding from the center of the target, at right angles to a line drawn from end to end of the tube, and 45 degrees from the face of the target; consequently it is best to place the tube in a horizontal position (see diagram) with the center of the target on the anode directly over the center of the part to be radiographed.

Before placing the plate into position, be sure the tube is tested to work properly at the desired setting. The plate should be placed to center directly under the tube in order that the image may be in the center, and the full part desired will then appear on it.

It is always desirable to have the patients clothing removed from the part to be radiographed, as it is easier to place the tube and plate properly.

Buttons or other objects cause shadows which will interfere greatly with the diagnosis on body work.

The part to be radiographed should always be nearest to the plate, and in as close actual contact as possible.

Do not use your hand continually in front of the Fluoroscope to test the penetration of your tube, as this is bound to leave a bad effect in time.

If a little care is used no danger of burns need be feared by the operator, for himself or patient. Practically all of the burns we hear of were produced years ago, due to lack of knowledge of the ray.

Using sand-bags for fracture work is advisable to hold the part quiet; and, as the slightest movement of the patient will blur the detail in the finished negative, it is important that the patient be made as comfortable as possible during the exposure.

Always bear in mind that a new tube must be treated with considerable more care than a seasoned one, as it is what is commonly called **green** and untrained. With proper use, that is, care taken not to overheat or over-reduce, your tube should be better at the end of a year's time than when new.

It is advisable to have two tubes on hand of different degree of vacuum, for different classes of work.

Your tubes will last longer when used alternately, and give better results; and should any accident befall one you always have one on hand for the emergency case.

Keep your plates in a cool dry place, standing boxes on edge if possible. Dampness, turpentine or oil odors, and heat are equally harmful.

Plate Protection

Do not depend on an ordinary wall for protection from the X-Ray. Either place your plates in a lead lined box (1-16 inch thick lead will do), or fifty feet from the tube.

Do not load plates into the envelopes in large quantities, unless they are to be used at once. When possible the plates should not be loaded more than two days before you intend to expose them, as the paper has a tendency to fog the emulsion.

Dark Room

The room or space to be used as your dark room must be Absolutely Dark, except for the ruby lamp. It must have no cracks, holes or curtains through which even the faintest trace of light can enter, as X-Ray plates are as sensitive as any photographic plate to white light, and fog easily.

Running water should be had if possible. Keep your trays absolutely clean; rinse them thoroughly both before and after using. Do not use a Hypo Fixing tray for Developing; mark your trays and **NEVER** change.

Your Dark Room equipment should consist of at least two trays, ruby lamp, glass stoppered bottles for developer and hypo, glass funnel, glass graduate, drying rack and lead lined plate box.

Loading Plates

It will be found very convenient, saving time and trouble, if you will arrange your envelopes before turning out the light. They should be alternated, first laying down an orange and then a black envelope, with the flaps toward you, and the seamed side up. In this way there can be no question as to which envelope was picked up in the dark, nor any delays caused by inserting the plate into the orange envelope first, which of course will not fit into a black one.

By passing the ball of the thumb lightly over the corner of the plate, the film side can be selected, in the dark, it having a fine matte-surface in contrast to the other, or clear glass side.

Care should be exercised in this as the glass will cut off some of the ray if plate is loaded wrong and the image will appear reversed.

Place the plate with the film side against the smooth blank side of the envelope; close the flap, and insert flap first into the orange envelope in the same manner, leaving the seamed sides of both turned the same way.

When this rule is followed, you can always be sure the film or sensitive side of the plate is turned toward the smooth side of both envelopes; and you will never have trouble taking the radiograph through the glass accidentally, if the printed side of the envelope is always turned away from the patient.

Another advantage of this is that if the tube happens to be a trifle low in vacuum, the mucilage, or four thicknesses of paper at the seam, will not show on the finished plate.

Caution!

Do not overlook the fact that after your plates are loaded in the envelopes they are just as sensitive as before, and should not be allowed in the same room as the tube when testing same, unless under lead cover.

Developing - Washing - Fixing

To get best results, use some good standard formula. (Paragon M. Q. in packages has proven excellent); at a temperature between 65 and 68 degrees Fahrenheit. Do not attempt to develop more than 5 or 6 plates in one tray of solution. You may try this, and imagine you can develop twelve just as well as six, but on close examination you will find that the last six were very inferior in appearance to the first.

If your plate has had sufficient exposure, it should grow denser as the time of development increases.

Start developing in the dark, being sure the plate is instantly covered all over with the solution, only using your ruby lamp at intervals to watch that you do not carry development too far.

Take your plate out of the envelopes. Life up one edge of your tray so that all of the developing solution flows to the opposite edge. Place plate in the tray and quickly drop flat. This causes the plate to be covered evenly and at once with the fluid, and will prevent streaks which would otherwise show on the finished negative. Continue to rock the tray throughout the development.

Five minutes' time is generally sufficient, if tube, exposure and developer are right.

At the end of approximately five minutes, your plate should appear about the same shade on front and back, when held up to the ruby light, and dense enough that no red light shines through.

If this result is obtained in less time, you have over-exposed your plate, or your developer is too warm.

A tube of the proper vacuum will give an absolute dense black on the plates, where the body does not cover it. If you can see your hand through this after developing you have not used the best technique throughout.

If longer than five or six minutes are necessary, your trouble may be too cold developer or under-exposure.

Too high vacuum tubes will not give plates the desired dense black; they will show lack of contrast, and appear thin.

Too low tubes will give a dense black to the part of the plate not covered by the body, but will show the bones clean and with no detail.

Too long exposures will cause the plates to appear dense all over; while if your exposure has been too short, no end of development will bring the desired density.

After developing, wash plate thoroughly in cold water, being careful not to touch the emulsion side with the fingers, and put in the Hypo bath.

Use an Acid Hypo fixing bath, strong enough to clear all the milky white appearance off the plate in five minutes. After plate is clean, allow it to remain in the bath at least five minutes more.

A plate is not ready for final washing as soon as the white appearance has left, but should be considered only about half fixed. If taken out, washed and dried at this time, you may look for a stained, fogged plate later, as some of the silver is sure to be left on it.

Caution!

Do not attempt to use old Developer or old Hypo.

Do not use warm Developer.

Do not examine plate by white light before thoroughly fixed.

Do not use too bright a ruby lamp. Our All Metal Lamp is as safe as can be had.

Do not allow the ruby light to shine on the plate throughout development. Any lamp will cause some fogging if this is permitted.

Do not take the plate from the developer to fix until it is perfectly dense to the ruby lamp.

Do not use Pyro developer on X-Ray Plates, as, although it is used for landscapes and portraits, it seldom gives good results on radiographs.

After thorough fixing, plate should be washed in running water at least 20 minutes. Where no running water is to be had, wash for 1 hour, changing water at least 6 times. Do not allow a stream of water to run directly onto the plate as you will blister the emulsion. After washing, set on edge to dry. Never set them in sunlight, as it increases the density, and is apt to melt the film.

When finished, study your plate; decide how to improve it; decide to make the next one better, and in a surprisingly short time, you will find that you have mastered the game.

The average photographer should never be given X-Ray plates to develop, unless he is thoroughly instructed as how to handle them. A photographer is guided entirely by the appearance of the image on the plates, and takes them out too soon. Poor radiographs are the result, and you will blame the machine or tubes when really the trouble all lies in the dark room.

Remember: you cannot see through a good plate when fully developed, when held up before a dark ruby light. The length of development depends largely on the speed of the developer, the time of exposure, temperature of the solutions, vacuum of the tube and the purity of the chemicals.

A good plate marker is of value in making records permanent as possible, and is absolutely necessary in medico-legal cases.

Always rinse the hands thoroughly after dipping in developer or hypo, as some chemicals have a poisonous effect on some people, as well as staining the fingers.

Always remember that one drop of hypo in your developer will ruin it, and if fingers have any hypo on them and plate it touched while developing, a patch of stain or fog will result.

Good diagnosis is as important as good radiographs. Learn to look for the unexpected and do not be a mere photographer. Textbooks and radiography do not always agree as to location and shape of parts, but a thorough knowledge of anatomy will assist greatly in focusing a tube, and knowing how the parts should look on a finished plate.

A good illuminating box covered on the inside with flat white paint is absolutely necessary for correct examination of plates.

STYLE "E" CABINET

Is guaranteed for a period
of 2 years from date
of purchase against
Inherent defects