

Electrical Designs

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2271

Farrington Lodge

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2881

# 10

9/18/41

Herr Dr. Löwenbach

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Herr Rose

Paul H. W. Kelly

1-23-42

# ELECTRO-SHOCK THERAPY



*An Annotated Bibliography*



Prepared by

**RAHM INSTRUMENTS INC.**

12 WEST BROADWAY

NEW YORK, N. Y., U. S. A.

Paul H. Welch

1-23-42

# Graphic Recording of Electric Phenomena In Connection With Encephalography, Electro-Cardiography and Related Subjects

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In interpreting the results in encephalography and electro-cardiography, the first practical method of recording involved the use of an Einthoven string galvanometer with a camera attachment. Although the records derived thereby were clear and consistent, it was readily apparent that some means must be developed to make a simultaneous, visible, permanent record of the phenomena. The use of a camera involved a loss of time through developing the records; possible loss of records through improper developing or photographing; and especially the inability to correlate all pertinent factors with the final record. A more recent development, the cathode ray oscilloscope, in conjunction with a camera attachment is also used for recording. These methods are still in use and are advantageous in connection with records of high frequency impulses. For encephalography and electro-cardiography where electro-mechanical recorders can be used effectively, several methods of direct writing have been developed within recent years. These include the ink-siphon method, electrochemical method, and the new Rahm Thermo-Contax Recorder method.\* The following discussion of the electro-mechanical recorders is presented to show the advantages of the RAHM THERMO-CONTAX RECORDER\* over the other methods of graphic recording.

## THE INK-SIPHON METHOD:

The advantage of this method is its cheapness. It involves the use of cheap paper and ordinary writing ink. Its disadvantages are as follows:

1. The writers must be individually started by suction at the beginning of each operation — a very considerable inconvenience in the case of multi-channel equipment or where the equipment is used in a physician's office.
2. At the conclusion of each operation, the siphon ink writers must be cleaned, since if the ink is permitted to dry in the tube, clogging will result. In spite of all precautions, clogging frequently occurs.
3. The frequent handling of the styli makes a permanent, satisfactory adjustment difficult or impossible, with variable final results in operation inevitable.

Paul H. Wilson  
1-23-45

*Equipment for*  
CLINICAL  
ELECTRO-ENCEPHALOGRAPHY  
*and*  
RESEARCH  
ELECTRO-PHYSIOLOGY



**RAHM INSTRUMENTS INC.**

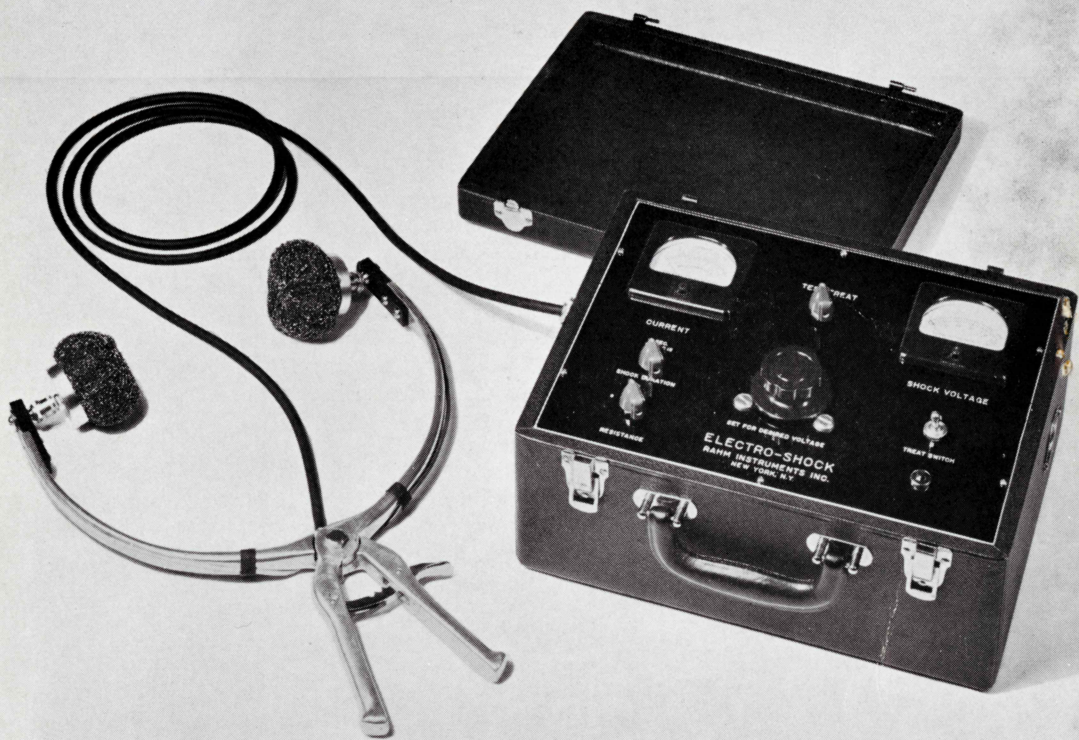
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*Paul Hawley*  
1-23-42

# RAHM ELECTRO-SHOCK AND SURGE CURRENT RECORDER

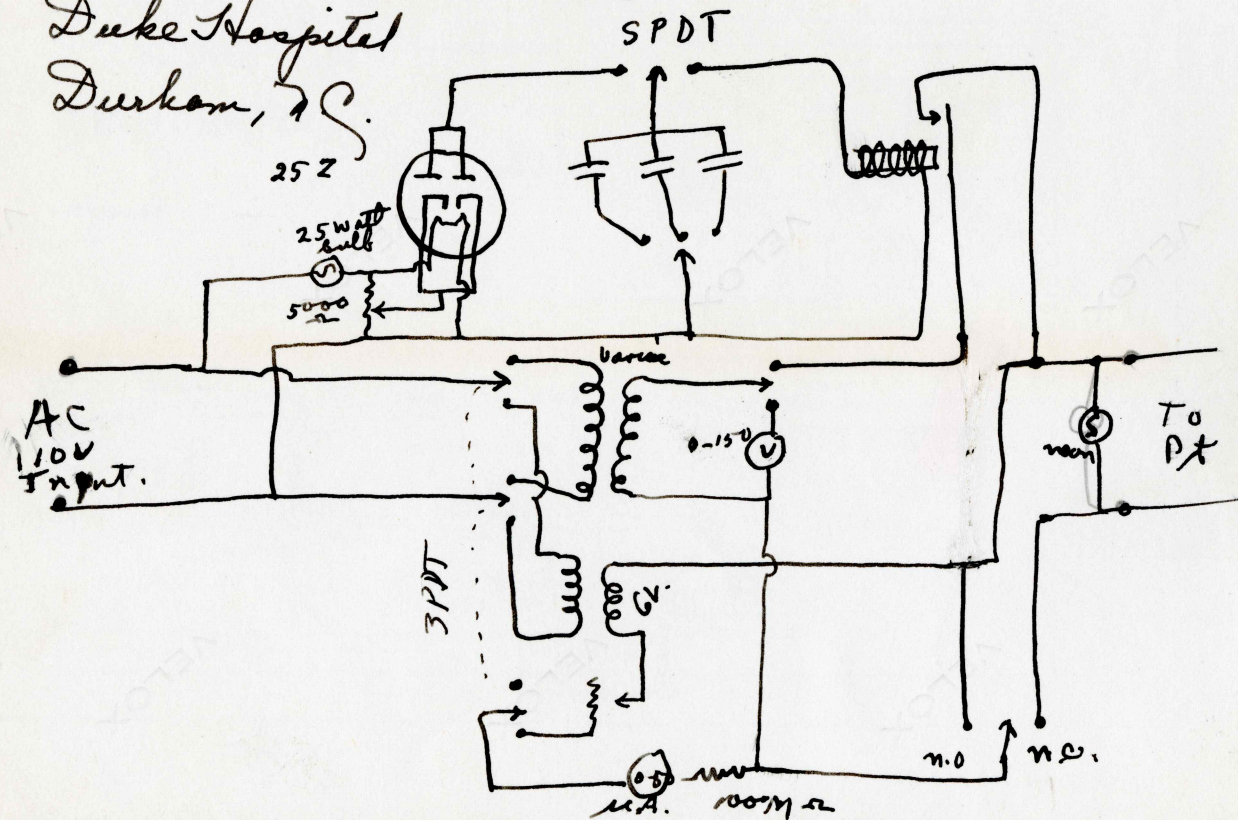


## RAHM INSTRUMENTS INC.

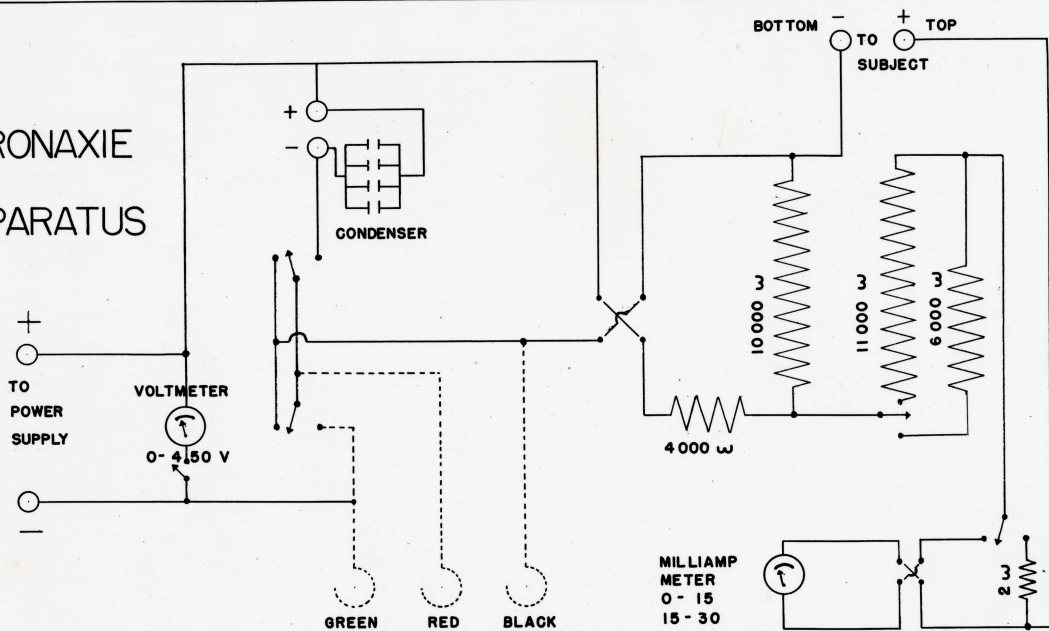
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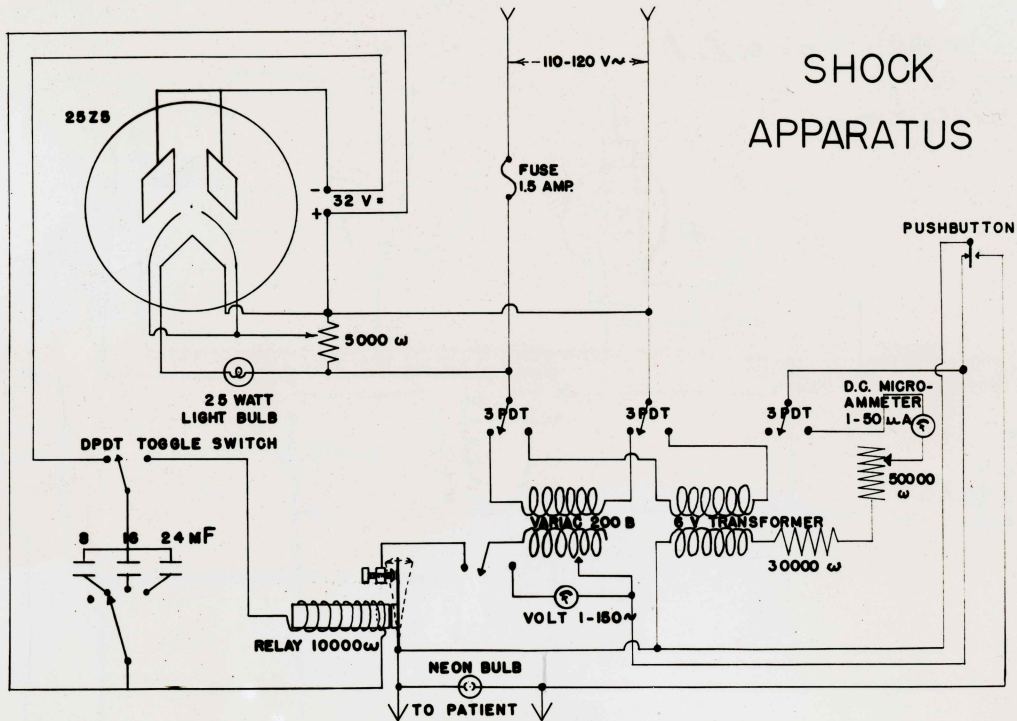
Dr. Hans Löwenbach <sup>change → stimulate</sup>  
 Duke Hospital  
 Durham, N.C.



# CHRONAXIE APPARATUS



# SHOCK APPARATUS





CURRENT  
MAX 100  
0-50 0-25

SHOCK DURATION

RESISTANCE

TEST TREAT

SET FOR D  
VOLTAGE

SHOCK VOLTAGE

TREAT SWITCH

ELECTRO-SHOCK  
RAHM INSTRUMENTS INC.  
NEW YORK, N. Y.

SLUGG CURRENT METER  
RAHM INSTRUMENTS INC.  
NEW YORK, N. Y.

# NEW POSSIBILITIES FOR RESEARCH IN ELECTRO-SHOCK THERAPY

## WITH

### A RECORDING SURGE CURRENT METER.

Using a new type of recording surge current meter developed in our laboratories, we have been able to accurately measure the current passed in the patient circuit during an electro-shock treatment. The recorder permits not only measurement of the maximum current passed but in addition, an accurate determination of the current intensity at any instant during the shock. Further, it gives an indication of the exact duration of the stimulus, and provides a permanent record of each treatment. Accurate measurement of the treatment current also makes it possible to calculate the impedance (AC resistance) of the patient circuit. Measurements made on a group of patients are tabulated below.

<u>Patient</u>	<u>Measured Resistance</u>	<u>Voltage Given</u>	<u>Actual Current Amperes</u>	<u>Actual Impedance</u>	<u>Result</u>
C.W.	400 ohms	115	1.1	105 ohms	Grand Mal
C.W.	600 ohms	105	1.0	105 ohms	Grand Mal
E.L.	300 ohms	90	0.9	100 ohms	Grand Mal
E.L.	330 ohms	90	1.0	90 ohms	Grand Mal
A.J. <sup>1</sup>	375 ohms	130	1.05	124 ohms	Petit Mal
A.J. <sup>1</sup>	175 ohms	140	1.3	108 ohms	Petit Mal
A.J. <sup>2</sup>	400 ohms	130	1.05	124 ohms)	Grand Mal
			1.05	124 ohms)	

It can be seen from this chart that the impedance of the patient circuit is actually quite low and that the measured resistance (determined by passing a small AC current through the patient circuit) bears little relation to the actual impedance. It is also interesting to note that with patient A.J.<sup>1</sup> where two shocks were given the same day, that the measured resistance showed a drop of 200 ohms whereas the actual impedance changed only 14 ohms. It seems therefore that the measurement of resistance as commonly done involves largely contact and surface resistance and bears little relation to the impedance of the actual current path during the treatment. It follows therefore that determining the treatment voltage from the measured resistance is in many cases a fallacious procedure.

Treatments made so far also indicate that there is no change in the impedance during the passage of the current. This is also shown by Patient A.J.<sup>2</sup> where a double shock was given and no change in impedance occurred. Records of the "current envelope" indicate that the current is nearly constant for the whole shock duration. It is apparent that no sharp drop in resistance occurs, as some workers have suggested.

We feel that this accurate Surge Current Meter places at the disposal of the doctor, a totally new and accurate method of controlling and studying Electro-Shock therapy.

# Photographic Recording of Electric Shock Treatment Currents

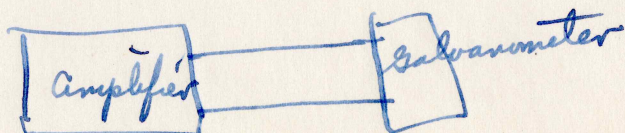
Most PAW 1-12-42  
~~Present~~ Electric Shock instruments in current use do not provide adequate means for knowing the actual current used in the intervals as short as 0.1 sec. Certain common electrocardiograph instruments can easily be adapted for

used to give quite accurate photographic records of the amount and duration of electric stimulation currents applied used in

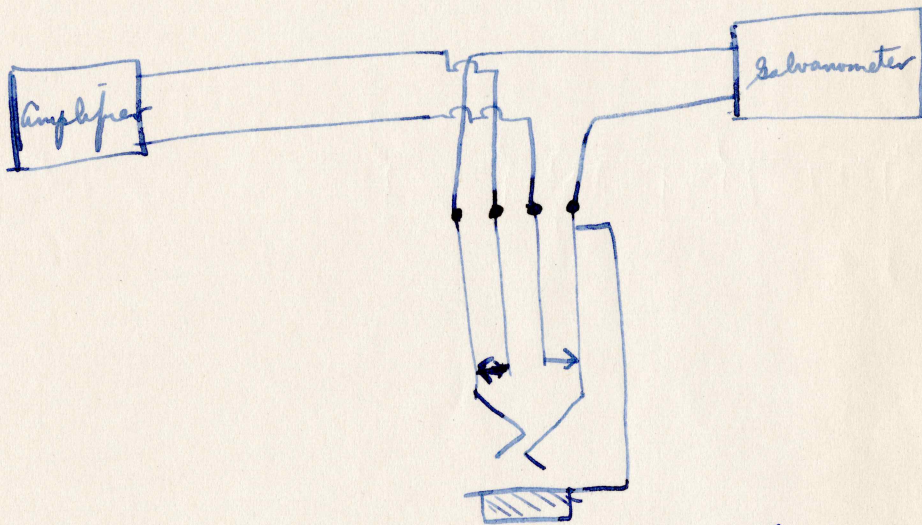
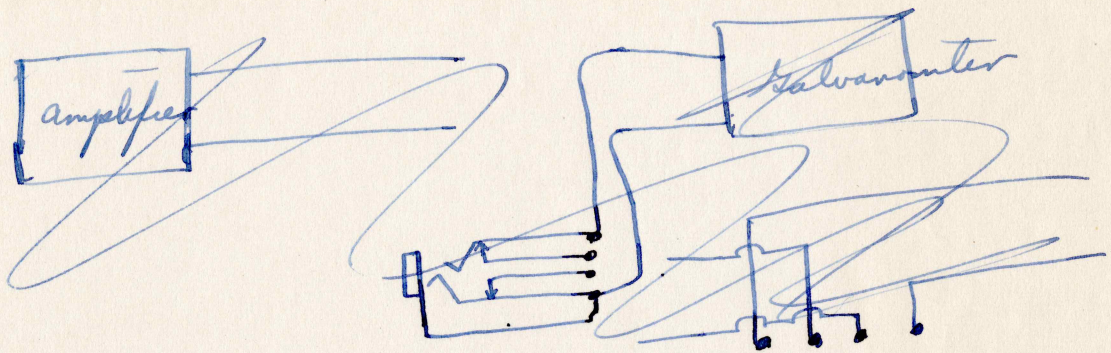
the treatment of mental patients. The types quite widely available they are, convenient for this purpose of instrument best suited for this purpose

consist of three essential parts, viz. a galvanometer, amplifier, and optical system. ~~In these~~ The galvanometer is a rugged, highly damped, fairly quick action type and is sensitive enough without amplification for the present purpose.

Therefore it is only necessary to make the galvanometer available without the amplifier and still use the optical system. A crude diagram of the situation is the following:



In such a case all that is necessary is to insert an ~~interstage~~ <sup>interstage</sup> jack into the circuit as follows:



Thus by merely inserting a phone plug you ~~have to~~ access is had to the galvanometer and the output of the amplifier is automatically disconnected.

~~It~~ In order to use this galvanometer a proper shunt is required. It can be used to record either volts or milliamperes or both in a two channel system.

For this purpose it is necessary to obtain from the maker the characteristics of the galvanometer ~~alone~~ <sup>without the amplifier.</sup> If, for instance, the galvanometer plus the optical system will give a 1 cm deflection on the film when ~~1000 x .0002~~ 0.2 of a volt is applied across the meter then the ~~size~~ <sup>resistance</sup> of the shunt can be ~~adjusted~~ for 50 ma would

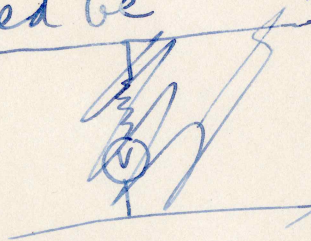
be  $R = \frac{V}{I}$

$$R = \frac{.2 \text{ volts}}{.05 \text{ amperes}} = 4 \text{ ohms.}$$

~~If~~ For 500 ma it would be

$$R = \frac{.2 \text{ volts}}{.5 \text{ amperes}} = 0.4 \text{ ohms.}$$

For 100 volts using ~~at~~ <sup>a one milliamperes action</sup> ~~at~~ <sup>principle</sup> it would be  $R = \frac{.2}{.001} = 200 \text{ ohms plus}$

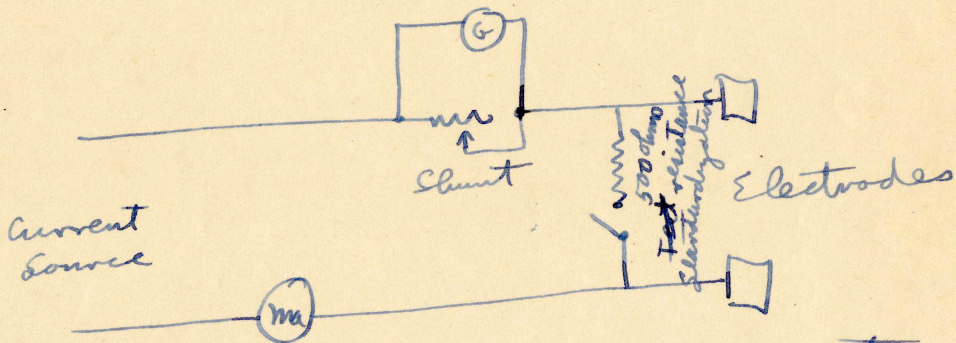
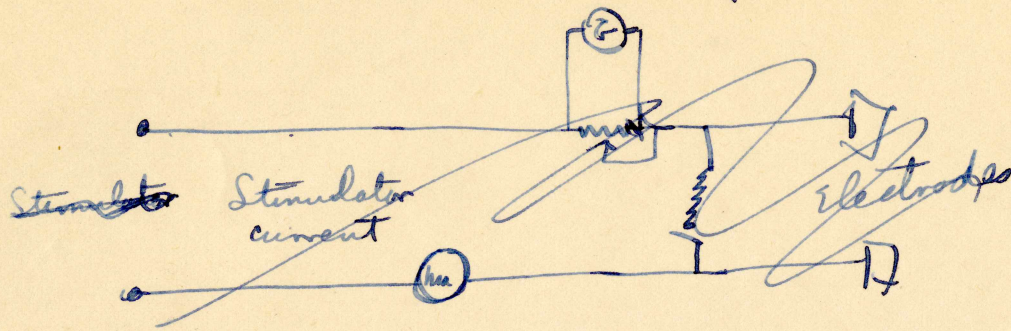


~~99,800~~ 100,000 ohms or to

be exact 99,800 ohms ~~to be~~

(4)

### Current recording circuit:

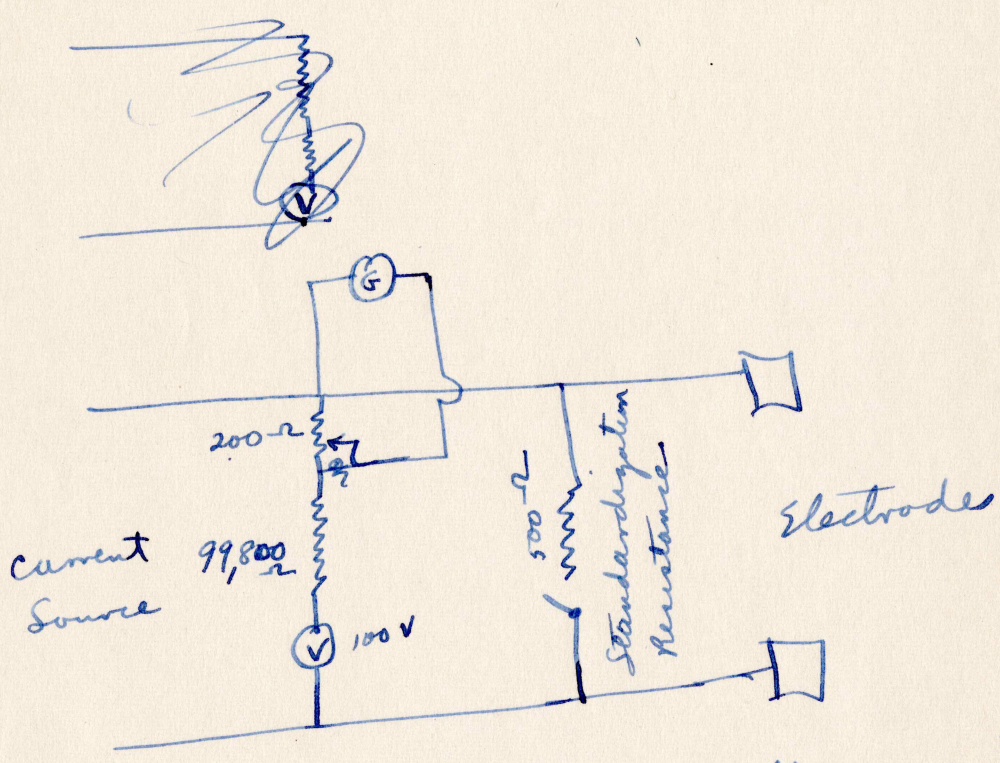


When the standardization resistance is introduced the current can be adjusted to read the desired amount on the milliammeter on the stimulator panel. Then the shunt can be adjusted to give the desired deflection of the ~~electrode~~ recording galvanometer. This amount of deflection is then photographed as the standard ~~and~~ deflection equivalent to the panel meter reading. Then the standardization resistance is ~~is~~ switched ~~is~~ opened and the system

(5)

is ready to record the actual treatment current as desired. When determining the standard, the current should flow long enough for the panel meter to come to rest at its proper deflection.

### The Voltage recording circuit



The same method of getting a standard deflection would apply here.

Samples of current recording on two makes of electrocardiograph are given here. These <sup>galvanometers</sup> are usually adequate for recording 60 cycle frequencies

(6) <sup>such</sup> though occasionally ~~that~~ a galvanometer will be found which gives a false <sup>and varying</sup> frequency if its natural period is near 60 cycles. ~~These galvanometers~~ <sup>they</sup> do not <sup>^</sup> are not fast enough to ~~give~~ ~~fall~~ reach the peaks and back in 60 cycle current, but ~~they~~ their actual deflection is a close linear proportion to the current applied. The standard film speed for EKG. work is 25 mm per sec which is sufficient for these purposes and will measure 0.1 sec intervals quite satisfactorily.