

June 14, 1949.

W. T. LIBERSON

2,473,378

ELECTRIC CONVULSIVE THERAPY

Filed March 16, 1946

Fig. 1

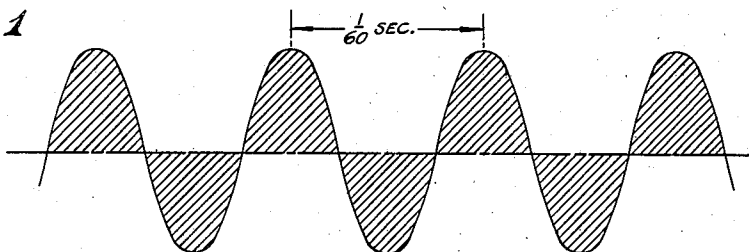


Fig. 2



Fig. 3

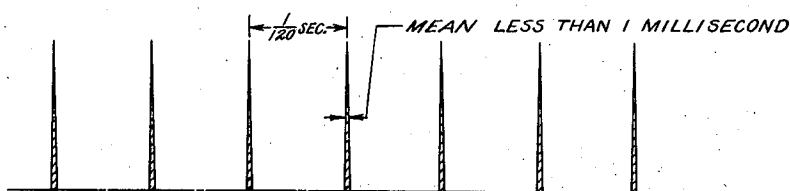


Fig. 4

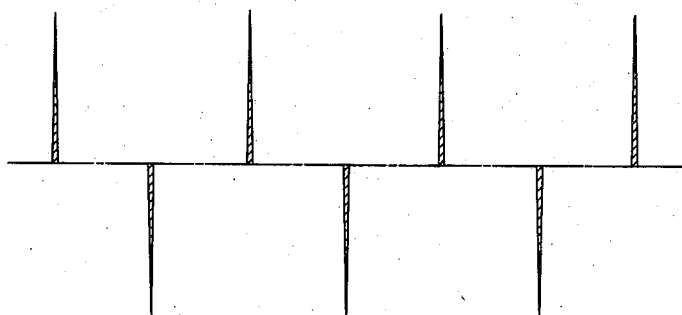


Fig. 5

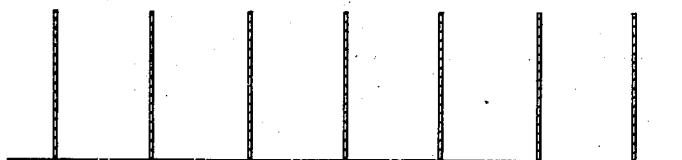
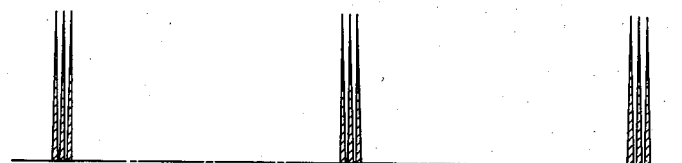


Fig. 6



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2,473,378

ELECTRIC CONVULSIVE THERAPY

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Application March 16, 1946, Serial No. 654,882

4 Claims. (Cl. 128—421)

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In the treatment of patients having certain mental diseases, such for instance as involuntional melancholia, it is recognized practice to subject the patient to electric shocks applied by means of electrodes placed on the head of the patient, as for instance at the temples, so that the current is directed through the brain. Usually 60 cycle current at from 70 to 150 volts has been utilized, as this is more commonly available, thus subjecting the patient to 60 stimuli per second in one direction and 60 stimuli per second in the opposite direction, the duration of each stimulus being $\frac{1}{120}$ second. Other frequencies and voltages have been used, but for the most part the type of current has been selected because of its convenient availability rather than because of any known advantages in its characteristics. The stimuli are continued until a convulsion results, usually after approximately 0.1 to 0.4 second with 60 cycle current at 70 to 150 volts.

While beneficial therapeutic results are ordinarily attained by the described conventional treatment, the total amount of electrical energy dissipated in the head of the patient and particularly in the brain is relatively high. Memory disorders may follow such a treatment and there is a possibility of actual damage to the brain.

In order to decrease memory disorders and to reduce the possibility of structural damage to the brain, it has heretofore been proposed to use unidirectional current only, by eliminating the alternative oscillations of conventional alternating current. If 60 cycle current is used the frequency in one direction remains 60 per second, and the total amount of electrical energy per unit of time is substantially smaller, thus reducing the hazards of the conventional shock treatment first described, but the necessary total duration of the current application is considerably increased.

I have considered the probability that the duration of each individual stimulus in the conventional treatment, or in the modified treatment described, is much longer than is necessary to produce the desired convulsion, and that satisfactory shock results could be obtained with very much shorter stimuli without the harmful effects that may follow from existing methods. The chronaxies of the peripheral human nerves and of the corresponding motor points of the cortex are approximately 0.2 millisecond or possibly less, and it was believed that any duration of each individual stimulus beyond or substantially beyond this period of chronaxie is not only unnecessary for attaining the desired results but also hazardous and perhaps definitely injurious.

The general object of the present invention is to provide a method of brief stimulus technique in electric convulsive therapy wherein the successive individual stimuli are greatly decreased

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in duration, thus reducing the amount of energy transmitted through the brain without, however, reducing the stimulating effect which elicits convulsion.

A further object of the invention is to provide a method of the type mentioned wherein the duration of each stimulus is greatly reduced as above stated, wherein an optimum frequency of the stimuli is attained, and wherein the voltage and the amperage are so regulated and controlled as to produce the best therapeutic results with a minimum of memory impairment and with a minimum possibility of brain damage.

While I have referred particularly to the treatment of patients having mental diseases, it is to be understood that my improved method is not necessarily so limited, and that it may be used for the treatment of other patients in accordance with the judgment of the therapist.

The method as now preferred will be described in detail with reference to the accompanying drawing, but it will be understood that there may be variations from the preferred method and that the drawing and description are not to be construed as defining or limiting the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

Of the drawing,

Fig. 1 is a diagrammatic view showing the wave form of 60 cycle current which has heretofore been commonly used.

Fig. 2 is a view showing a wave form similar to that shown in Fig. 1 but with each alternative oscillation eliminated.

Fig. 3 is a diagrammatic view showing one wave form of current which may be utilized in practicing the method of the invention.

Fig. 4 is a diagrammatic view showing an alternative wave form.

Fig. 5 is a diagrammatic view showing another alternative wave form.

Fig. 6 is a diagrammatic view showing still another alternative wave form.

Referring to the drawing, Fig. 1 shows the standard wave form of 60 cycle alternating current such as has heretofore been commonly used in electric shock convulsive therapy. The voltage is ordinarily within the range of 70 to 150 volts. The current is directed through the intact skull and the brain of the patient by means of electrodes applied to the temples or otherwise, and it will be seen that the patient is subjected to 120 stimuli per second, there being 60 pulsations in one direction and 60 pulsations in the opposite direction. The shaded areas represent the quantity of electricity dissipated in the head of the patient.

In Fig. 2 there is shown another wave form that has been used, this being similar to that shown in Fig. 1, except that each alternative

oscillation has been eliminated. This reduces the total quantity of electricity dissipated per unit of time, but it also reduces the total number of stimuli per second and the length of time required to elicit a convulsion is substantially increased. The increase in total time often produces anxiety in the patient due to some degree of memory of the shock experience. When the current is increased to shorten the time required to elicit convulsion, this anxiety is eliminated but there is a noticeable increase in the impairment of immediate recall following the treatment.

Fig. 3 shows a wave form of current such as may be used in practicing my improved method, but the showing may not be drawn accurately to scale. Furthermore, the wave form may not be exactly triangular as shown. The successive pulsations or impulses are unidirectional and the duration of each of them is very short, the mean durations of the impulses ordinarily being less than one millisecond and preferably within the range of 0.3 to 0.7 millisecond. Usually and as shown each individual impulse is ordinarily less than one millisecond and is preferably within the stated range. There are intervals of time between certain of the impulses within the stated range of duration, ordinarily between successive impulses, these intervals being relatively long as compared with the duration of the impulses. The peak voltage may be somewhat greater than with the conventional wave forms shown in Figs. 1 and 2. The peak voltage is within the range of 150 to 550 volts and it is preferably within the range of 150 to 350 volts. The peak amperage is within the range of 150 to 1000 milliamperes and it is preferably within the range of 200 to 600 milliamperes. The frequency is shown as 120 per second which is regarded as the optimum, but there may be variations from this and the frequency may be within the range of 60 to 200 or more.

I do not limit myself to any particular apparatus for generating or producing an electric current having the wave form characteristics shown in Fig. 2. The desired results may be attained by mechanical means or by electronic means, or otherwise.

In treating a patient the electrodes may be applied to the two temporal regions of the intact skull, or in accordance with the judgment of the therapist the electrodes may be applied unilaterally, as for instance one on one temporal region and one on the vertex. The passage of current through the electrodes and through the intact skull and the brain of the patient is continued until a convulsive condition is elicited, this ordinarily occurring in 0.5 to 1.5 seconds, but may be continued as long as required to elicit convulsion.

The shaded areas in Fig. 3 represent the quantity of electricity dissipated in the head of the patient, and by comparison with Figs. 1 and 2 it will be observed that the total amount of energy so dissipated is but a very small fraction of that dissipated when a conventional wave form is used such as represented in Fig. 1, or even when a modified wave form is used as shown in Fig. 2. However, the convulsive effect is the same as with the prior technique represented in Fig. 1, this being probably due to the fact that the time of each stimulus is in any event not substantially greater than the period of chronaxie. Due to the greatly reduced amount of total electrical energy, the possibilities of brain damage are considerably diminished.

Furthermore, I have found by actual records of the treatment of patients that the memory defects resulting from the shock treatment in accordance with my improved method are very substantially less than those resulting from any prior technique.

Fig. 4 shows an alternative wave form that may be used if preferred, this being similar to that shown in Fig. 3 except that it is diphasic rather than unidirectional. The effect on the patient is the same or substantially the same as that already described, and repetition of the detailed description is unnecessary.

Fig. 5 shows another alternative wave form that may be used if preferred, this being similar to that shown in Fig. 3 except that each impulse approximates a rectangular form instead of a triangular form. If the peak current of each pulsation is the same, the amount of energy dissipated in the head of the patient would be substantially increased, but this may be compensated for by reducing the duration of each pulsation or stimulus.

Under some circumstances, it may be preferable to use a wave form having the characteristics shown in Fig. 6. It will be noted that this is similar to that shown in Fig. 3 except that the successive pulsations are differently timed. There are successive groups of closely spaced pulsations or stimuli, each group comprising two or more pulsations or stimuli, with longer intervals of time between the groups. As shown, there are three pulsations or stimuli in each group but the number may be varied.

What I claim is:

1. The method of electric convulsive shock therapy which consists in applying electrodes to the head of a patient, in transmitting through the electrodes and through the intact skull and the brain of the patient a series of electrical impulses having peak amperages within the range of 150 to 1000 milliamperes which said impulses have a frequency within the range of 60 to approximately 200 per second, the mean duration of the impulses being less than one millisecond but at least approximately 0.3 millisecond, and in continuing the series of impulses until convulsion is elicited.

2. The method of electric convulsive shock therapy which consists in applying electrodes to the head of a patient, in transmitting through the electrodes and through the intact skull and the brain of the patient a series of electrical impulses having peak amperages within the range of 200 to 600 milliamperes which said impulses have a frequency within the range of 60 to approximately 200 per second, the mean duration of the impulses being within the range of 0.3 to 0.7 millisecond, and in continuing the series of impulses until convulsion is elicited.

3. The method of electric convulsive shock therapy which consists in applying electrodes to the head of a patient, in transmitting through the electrodes and through the intact skull and the brain of the patient a series of rectangular electrical impulses having peak amperages within the range of 150 to 1000 milliamperes which said impulses have a frequency of 60 or more per second with relatively long intervals of time between the impulses, the mean duration of the impulses being less than one millisecond but at least approximately 0.3 millisecond, and in continuing the series of impulses until convulsion is elicited.

4. The method of electric convulsive shock

therapy which consists in applying electrodes to the head of a patient, in transmitting through the electrodes and through the intact skull and the brain of the patient a series of electrical impulses having peak amperages within the range of 150 to 1000 milliamperes which said impulses have a frequency of 60 or more per second with the impulses arranged in closely spaced groups and with relatively long intervals of time between successive groups, the mean duration of the impulses of each group being less than one millisecond, and in continuing the series of impulses until convulsion is elicited.

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