Periscope.

a.—PHYSIOLOGY OF THE NERVOUS SYSTEM.

ACTION OF THE GALVANIC CURRENT ON THE MOTOR NERVES OF MAN.—Drs. Waller and De Watteville have studied the action of the galvanic current on the motor nerves of man, using three modes of excitation: (1) induction currents; (2) makes and breaks of a continuous current; (3) mechanical stimulation. The electrodes consisted of plates of metal covered with chamois leather, and were applied as follows: One electrode of large area, the "indifferent" electrode, was applied to any convenient part of the body remote from the part explored; the other electrode of small area, the "exploring" or "testing" electrode, was applied to selected points along the course of favorably situated nerves, and the effects at this movable electrode were alone considered. These effects are described under the polar terms "anodic" and "kathodic," without reference to any assumed direction of current in the nerve, for a single experiment suffices to show that the position of the "indifferent" electrode, whether central or peripheral to the exploring electrode, does not in any way influence the results obtained at either pole. The experiments were made on themselves, using the peroneal nerve, close to the tendon of the biceps. The muscular contractions, which give the measure of nerve-excitability, were recorded by a Marey polygraph. The condition which they thought necessary to fulfil throughout their experiments was the co-extension of the points of excitation and of polarization, their reason being that owing to current-diffusion, and consequent establishment of opposite electrodes in the nerve in the immediate neighborhood of the electrode, the electrodonic state is variable in kind, degree, and distribution. This condition is fulfilled by conjoining the testing and polarizing currents in one circuit, and by applying one electrode only to the nerve.

I. *Polar Alterations of Excitability tested by Induction Currents.*—Before using induction currents to judge of alterations effected by the galvanic current, they examined the effects of a long series of induction breaks and makes. Their experiments gave the following results:

1. The height of successive contractions by make or break induction currents approaches more and more gradually to a maximum. The figures show a marked and progressive increase, similar to the "staircase" increase obtained with repeated excitations of the ventricle-apex.

2. The stronger the excitations, the more rapid is the initial increase.

The electrical connections were so arranged that either an induction or galvanic current can be reversed independently of the other by the commutators, and the movable electrode can be made at will kathode or anode of the make or break induction current with or without kathode or anode of the galvanic current.

The polar alterations of excitability tested by the break induction current. The first series of experiments were made with the ordinary arrangement of the coil (an electro-motive force of 2 *volts*, and a resistance of 1 *ohm* for the primary circuit), and gave the following results:

1. The effect of the kathode of the break induction current is greater than that of the anode.

2. The effect of the kathode of the break induction current is increased when that kathode is also kathode of the galvanic current.

3. The effect of the anode of the break induction current is increased when that anode is also anode of the galvanic current.

4. The effect of the kathode of the break induction shock is diminished when that kathode is also anode of the galvanic current.

5. The effect of the anode of the break induction shock is diminished when that anode is also kathode of the galvanic current.

6. The increase in the effect of the kathode of the break induction current, when that kathode is also kathode of the galvanic current, is greater than the increase in the effect of the anode of the break induction current when that anode is also anode of the galvanic current.

7. The diminution in the effect of the kathode of the break induction shock, when that kathode is also anode of the galvanic current, is greater than the diminution in the effect of the anode of the break induction current when that anode is also kathode of the galvanic current.

8. With increasing strength of the galvanic current, the effect of the anode of the break induction current, when that anode is also kathode of the galvanic current, diminishes to a minimum, and with further increase in the strength of the galvanic current increases up to and beyond the original normal.

9. With increasing strength of the galvanic current, the effect of the kathode of the break induction current, when that is also anode of the galvanic current, diminishes to a minimum, and with

further increase in the strength of the galvanic current, increases, but not up to the original normal within endurable strength of the galvanic current.

10. The increasing effect of the combined faradic anode and galvanic kathode takes place with a weaker galvanic current than that of the combined induction kathode and galvanic anode; the increase is greater and more rapid in the former case than in the latter.

11. With the ordinary arrangement of the coil used there was no contraction to the make induction current with all combinations and all strengths of the induction and galvanic currents, except the combined anode of the break induction current (*i. e.*, kathode of the make induction current) and kathode of the galvanic current.

II. *Polar Alterations of Excitability during the passage of a Galvanic Current tested by makes and breaks of a Galvanic Current.*—1. The effect of kathodic make is greater than that of anodic make. 2. The effect of anodic break is greater than that of kathodic break. 3. The effect of kathodic make is increased during the flow of a kathodic current. 4. The effect of anodic make is increased during the flow of an anodic current. 5. The effect of anodic break is diminished during the flow of an anodic current. 6. The effect of kathodic break is diminished during the flow of a kathodic current. 7. The increase in the effect of kathodic make during the flow of a kathodic current is greater than the increase in the effect of an anodic make during the flow of an anodic current. 8. The diminution in the effect of an anodic break during the flow of an anodic current is greater than the diminution in the effect of kathodic break during the flow of a kathodic current.

III. *Polar Alterations of Excitability tested by Mechanical Excitation.*—When the kathode rests on the nerve, the polar region being therefore kathodic, the effect of mechanical excitation is increased; when the anode rests on the nerve, the polar region being therefore anodic, the effect of mechanical excitation is diminished or abolished. On breaking the current the contractions appear in both cases greater than before. During and after the passage of a galvanic current, the alterations in the excitability of the sensory nerves of man follow a course essentially similar to those observed in the motor nerves.—*Philosophical Transactions of the Royal Society*, 1882. Introduction à l'étude de l'electrotonus des nerfs moteurs et sensitifs chez l'homme. Thèse presentée à la Faculté de Medecine de Bâle par Armand De Watteville, 1883.

THE SUMMATION OF IRRITATIONS IN THE SENSORY NERVES OF MAN.—Dr. De Watteville, has made several observations on this subject, and arrived at the following result: The action of irritants along the course of a sensory nerve increases (within certain limits) with their frequency.—*Neurologisches Centralblatt*, No. 7, 1883.