

cent. of its final value if dissipation of energy had taken place only in the outside circuit.

*Thus, while the condenser here experimented upon exhibits marked viscous effects, yet we can detect no hysteresis.*

The foregoing experiments were conducted in the Physical Laboratory of University College, London, and our thanks are due in many respects to Professor G. Carey Foster in connection with them.

VI. "On the Changes in Movement and Sensation produced by Hemisection of the Spinal Cord in the Cat." By CHARLES DEVEREUX MARSHALL, F.R.C.S. Communicated by Professor V. HORSLEY, F.R.S. Received January 31, 1895.

(Abstract).

The present research was undertaken in order to determine more exactly the nature and origin of epileptiform convulsions and the paths in the spinal cord by which both afferent and efferent impulses are transmitted.

The method employed was as follows :—

Hemisection of the spinal cord was performed in the lower dorsal region on the right side, the animals being anaesthetized with ether and strict antiseptic precautions being observed.

The animals were kept alive for different periods of time after the operation, and the effects produced on the voluntary movements, sensibility, and the reflexes were carefully noted.

After death the spinal cords were at once removed, and after hardening and staining, by Marchi's method, both the lesion and the tracts of degeneration were investigated by microscopic examination. There were 16 experiments performed.

The following results are briefly what were obtained.

(a.) *Motion*.—After hemisection of the cord there is immediate paralysis of the limb below, and on the same side as the section, this remains for a time, and then gradual recovery takes place to a greater or less extent; sometimes the recovery is so complete that it is with difficulty that one can determine which was the paralyzed limb. At other times more or less permanent weakness is left so as to cause a limp when walking, foot-drop is not infrequently seen and the animal does not appear to appreciate correctly the position that the leg occupies.

(b.) *The Reflexes* are, as a rule, greatly exaggerated below and on the same side as the lesion, and sometimes continue so for a long period; in many cases they get less as time goes on; occasionally they are not so well marked as on the opposite or uninjured side.

(c.) *Sensation*.—This is always interfered with on the side of the lesion. Painful sensations, such as those produced by the prick of a pin, or by touching the foot with a piece of wire which is slightly heated, appear to be felt on both sides, and this was well seen in the monkeys which were used as control experiments; but the evidence seems to show that these painful sensations are more quickly felt on the non-paralyzed than on the paralyzed side, and also that the animal does not localize the painful spot on the injured side with anything like the precision that it does on the unaffected side.

Tactile sensations, such as those produced by the presence of a small clip applied to the skin, are only felt on the non-paralyzed side; the animals were frequently seen to remove the clip from this side, but unless their tails touched it when placed on the paralysed limb, or their attention was directed to its presence in some such way, no notice whatever was taken of it.

The same result was seen with the cold-water test. When water was brought in contact with the feet, the unaffected limb was at once withdrawn and the water licked off it, while on the opposite side the foot was allowed to stand in a pool of water without any notice being taken of it.

#### *Microscopic Examination of the Spinal Cords.*

The portions of the cords containing the lesion were carefully examined for the purpose of ascertaining their exact extent, and a full description is given in the paper.

The following is a short description of the degenerations found in the cord.

(1.) *Descending Degenerations*.—These degenerations were confined almost entirely to the side that was cut, and they occupied the direct and crossed pyramidal tracts; a few scattered degenerated fibres were seen in the antero-lateral tracts of both sides; this was especially marked in the cases where a small part of the opposite half of the cord had become accidentally injured.

(2.) *Ascending Degenerations*.—These degenerations were not entirely confined to the side of the lesion.

The tracts that contained most of the degenerated fibres were the column of Goll, the direct cerebellar tract and the antero-lateral tract. Some degenerated fibres were usually found in the opposite column of Goll, and also in the antero-lateral tract of the uninjured side.