Iron Wire Acts Like Nerve

Physiology

A striking similarity between nervous action, particularly heart action, and the behavior of iron wire in a nitric acid bath has been discovered and studied by Ralph S. Lillie, professor of physiology at the University of Chicago.

According to A. J. Carlson, chairman of the department of physiology at the University of Chicago, the study of this similarity is of fundamental importance in the acquisition of knowledge concerning nervous action. "The obscure problems of physiology," said Dr. Carlson, "and the problems difficult to work out on experimental animals must be approached through study on easily controllable materials. The work of Dr. Lillie on the iron wire, because it yields results so similar to the observable phenomena in living nerves, is highly suggestive with reference to further research and ultimate knowledge." A popular demonstration of the experiment consists of a pure iron wire, 1 to 5 centimeters long, immersed in a bath of nitric acid of 60 to 80 per cent. A colorless film immediately forms over the wire. If the wire is scratched at one end, a wave travels rapidly along the wire. If a small glass tube is placed in the acid around one end of the wire, rhythmical waves pass the length of the wire at a rate of from 14 to 120 times a minute, depending on the strength of the solution, the temperature, and the length of the wire.

What happens, according to Dr. Lillie, is that a sort of battery is formed. The film, which is the thickness of only one molecule, has an electrical charge negative to that of the wire. When the film is scratched a current sets up which dissolves the film next to the bare spot. This continues until the bare spot, which is seen as a wave, has passed the length of the wire. The film forms again after the wave has passed. The glass ring at one end of the wire establishes an area of permanent activity because the acid becomes less concentrated. Thus, as if the film were being continually scratched, rhythmical waves pass along the wire as rapidly as the film is re-formed. "The process may be regarded," says Dr. Lillie, "as a two-dimensional explosion."

The analogy to nervous action is emphasized by the effect which outside factors have upon the rhythm of the wire. The influence of temperature, electrical polarization, concentration of acid and length of the wire, have been shown by Dr. Lillie to be the same as the influence of these factors on living nerves.

Science News-Letter, September 8, 1928

White Coal for Iron Horse

Electricity

Whoever has seen the glories of the Rocky Mountains from an open observation car on the back of a steam locomotive drawn train realizes that a mouthful of smoke and cinders does not aid the enjoyment of the scenery. But such a state of affairs is passing. Electric locomotives are already replacing steam ones on some of the Western railroads, one of which is shown on the cover of this issue of the SCIENCE NEWS-LETTER. It depicts the Oriental limited of the Great Northern Railroad climbing through the Cascades in the state of Washington. The picture is from a painting made for the General Electric Company by Walter L. Greene, whose paintings of the aircraft carrier Saratoga, and of an airport at night, have previously appeared on our cover.

With the electric locomotive smoke and cinders are a thing of the past. One can even remain on the observation platform when passing through a tunnel, watching the spot light of the opening as it rapidly decreases and, if the tunnel is long enough, finally vanishes.

One economic advantage of the electric locomotive is that descending trains help pull others, even though they may be miles away. The motors act as generators when coasting, and actually feed current into the lines, instead of taking it out. *Science News-Letter, September 8, 1928*

In This Issue—

SCIENCE NEWS-LETTER, The Weekly Summary of Current Science. Published by Science Service, Inc., the Institution for the Popularization of Science organized under the auspices of the National Academy of Sciences, the National Research Council and the American Association for the Advancement of Science. *Medical Progress* is merged into the SCIENCE NEWS-LETTER.

Edited by Watson Davis.

Publication Office, 1918 Harford Ave., Baltimore, Md. Editorial and Executive Office, 21st and B Sts., N. W., Washington, D. C. Address all communications to Washington, D. C. Cable address: Scienservc, Washington.

Entered as second class matter October 1, 1926, at the postoffice at Baltimore, Md., under the act of March 3, 1879. Established in mimeographed form March 13, 1922. Title registered as trade-mark, U. S. Patent Office.

Subscription rate—$5.00 a year postpaid. 15 cents a copy. Ten or more copies to same address, 5 cents a copy. Special reduced subscription rates are available to members of the American Association for the Advancement of Science.

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