

ELECTRICAL ENGINEERING

# New Transmission System Permits Wide D-C Use

## Short Circuit Causes Drop in Power Instead of Increase; Makes Nation-Wide Network of Lines Possible

**A** NEW system of direct current electric power transmission which may overthrow present alternating current methods was presented before the New York meeting of the American Institute of Electrical Engineers.

The new system, described by B. D. Bedford and Dr. F. R. Elder of the General Electric Co. and Prof. C. H. Willis of Princeton University, has possible ramifications—although not mentioned officially at the meeting—in the field of government generation and transmission of power such as T.V.A. and the use of great direct current generators as are foreshadowed by the 10,000,000 volt apparatus of Prof. Robert Van de Graaff of the Massachusetts Institute of Technology.

### Radical Changes Forecast

So highly is the system regarded in some electrical circles that the editor of the *Electrical World* remarked, "Engineers have only themselves to blame if they miss hearing why direct current transmission is just about to crowd the heels of present transmission practice."

Biggest drawback of direct current power transmission systems in the past, and one of the major reasons why today most systems use alternating current, was the danger of flashing sparks of miniature lightning whenever the d-c system short-circuited. This obstacle, it is claimed, has now been overcome.

The new system is so arranged that when the short circuit occurs power in the circuit decreases instead of increasing. Thus the greatest handicap of d-c transmission in its competitive battle with a-c is overcome. Once the problem of high current short circuits in d-c systems is conquered electrical engineers can take advantage of the long-known benefits of this type of system.

One advantage is that a number of generators can be fed into a single transmission line at different places. With present a-c systems this is possible but a problem of great technical difficulty, for each generator station must be in step, or synchronized, with all the

others. With d-c systems all talk of phase relations and such technical subjects is removed.

The picture envisioned by the new system includes great, nationwide power lines fed at intervals by either steam or hydroelectric plants. Power networks could be strung out indefinitely.

### Giant Vacuum Tubes

In experimental installations at Schenectady direct current of 15,000 volts was obtained from alternating current lines by the use of phanotron and thyatron tubes. These giant vacuum tubes turned the incoming power supplied to the buildings at 13,800 volt, sixty cycle, three-phase, alternating current, into d-c at 15,000 volts and 200 amperes.

After being transmitted through 15,000 feet of underground test conductor the d-c was turned back into the alternating current line with the necessary characteristics. Complete control by the operator was effected at all times.

Among demonstrations showing that short-circuits are not serious in the new system, the electrical engineers tried to create an arc across one of the large insulators used on 11,000 volt transmission lines by short-circuiting it with a small wire. The voltage on the line fell almost to zero but the current remained constant. When the short-circuit was removed the voltage returned rapidly to its full rating and the current was still constant. The experiment with short-circuiting insulators is similar to that encountered when lightning strikes a high-powered transmission line.

The tests indicate that overhead lines can be built with fewer insulators than is now required for a-c transmission, because, while there may be an arc over during a lightning strike, the dynamic current of the system is limited and the arc will extinguish itself. Each insulator on such a system therefore becomes a lightning arrester to clear the line of any high-voltage transient currents.

A new type of electric motor which scientists hail as revolutionary was described before the meeting by the

world-famous Swedish-born electrical engineer, Dr. E. F. W. Alexanderson, who is consultant for the General Electric Co.

Here is what makes Dr. Alexanderson's new motor revolutionary:

1. It can be "plugged in" right across the leads of a 2,300 volt circuit and start gently and easily and not burn up.

2. It uses electron tubes to turn alternating current into direct current, so that the motor, although it runs off a-c, has the characteristics of a variable speed d-c motor.

3. Instead of being started with a special resistance device for controlling the current supplied to it, the new motor can start from the beginning at "full throttle." The starting of the motor can thus be made entirely automatic from a remote point miles away if desired.

In describing the new application of electron tubes to the field of electric motors Dr. Alexanderson, in his paper presented with A. H. Mittag, of General Electric Co., told how the thyatron tubes employed take the place of the commutator in the usual motor.

A commutator, Dr. Alexanderson indicated, consists of the copper segments at the end of the rotating part of an electric motor. Brushes, usually of carbon, bear against it and pass current through the rotor in the proper way. The make and break of such arrangement finally leads to sparking at the brushes, which requires a cleaning of the commutator and a reshaping of the brushes. With the electron tube commutator device such hindrances are avoided.

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MEDICINE

## Thunderstorms Vitate Asthma Treatment

**T**HUNDERSTORMS and asthma have baffled a group of scientists at the University of Illinois Medical College, Chicago.

These investigators, Drs. Tell Nelson, B. Z. Rappaport, William H. Welker and A. G. Canar, know they can relieve asthma sufferers by putting them in an air-conditioned ward or room, but they are up against a blank wall as to why the thunderstorm sets the patients back. Some factor other than pollen, temperature, humidity and ozone must play a part in bringing on asthma attacks, they believe.

For several seasons they have carried on investigations of the effect of both filtered air and air-conditioning on asthma.

Filtering out the offending pollens helps the asthma sufferers materially, they found. Keeping the humidity low and the temperature relatively constant helps even more, they have reported to the American Gas Association. But even patients who were free of symptoms developed attacks of asthma while in the air-conditioned ward shortly after a severe thunderstorm. Patients in the air-conditioned ward, however, suffered less severe attacks after the thunderstorm and recovered more quickly than patients who had been in a room with filtered but not conditioned air.

The effects of barometric changes and ionization in relation to thunderstorm-induced attacks have not yet been studied, the investigators state.

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MEDICINE

## News !! Afternoon Tea Denounced in Britain

**A**FTERNOON tea, dear to the heart of every true Britisher, has been denounced by two British physicians who find it "difficult to imagine why tea should be such a popular meal."

The two who dare to utter such seeming heresy are Drs. W. C. D. Maile and K. J. L. Scott, honorary physicians to the Woking Victoria Hospital. (*Lancet*, Jan. 5.) They base their un-British opinion on scientific studies of the length of time food consumed at various meals remains in the stomach.

An ordinary meal remains in the stomach from 3½ to 4½ hours, they found by X-ray observations.

"With breakfast at 8:30 A. M., the stomach is likely to be empty at 12:30 P. M., so that lunch at 1 P. M. is reasonable enough," they state.

"But after lunch at 1:30 to 2 P. M. the stomach cannot possibly be empty till 5:30 to 6 P. M., so that tea at 4:30 can only be justified on the grounds of a pleasing interlude. Actually on the grounds of suitable feeding, it would be better to leave out tea and take dinner at 6 or 6:30 P. M. The stomach would then have a little rest before both lunch and dinner, and would be ready to deal with the evening meal, which in the ordinary way would be disposed of by 10:30 to 11 P. M."

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MEDICINE

# Alum Treatment Makes Mice Resistant to Encephalitis

## Study Suggests New Way to Protect Against This and Similar Diseases

**A** NEW WAY of getting protection against infantile paralysis, encephalitis and similar diseases which invade the body through the lining membranes of the nose may result from studies just reported by Dr. Charles Armstrong of the U. S. Public Health Service's National Institute of Health, Washington, D. C.

It was in the course of these studies that Dr. Armstrong himself recently suffered an attack of encephalitis as a result of working with the infective virus for many months.

A three per cent. solution of sodium alum dropped once a week into the nostrils of white mice enabled these animals to resist nasal infection with the virus of encephalitis from the epidemic in St. Louis in 1933, Dr. Armstrong found. This was because sodium alum of just that strength provided the right degree of irritation to make the nasal mucous membrane resistant to the encephalitis virus. Other strengths of sodium alum and other solutions, such as salt and sugar, were not as satisfactory, he found.

### Had Unexpected Effect

In the beginning of his investigation, Dr. Armstrong gave the mice weekly doses of the alum solution for several weeks before giving an infective dose of encephalitis virus. He thought that perhaps "such astringent or mildly irritating treatment, if applied in the face of an epidemic or in the presence of the virus, might enhance susceptibility to infection."

Further investigation, however, showed that dropping the solution into the animals' nostrils just before or soon after the infective dose did not increase their susceptibility to infection but might even lessen it. This point may be of significance in developing the method to give protection during epidemics.

Dr. Armstrong's work has not yet been given practical application, but reading between the lines of his conservative, scientific conclusions, it ap-

pears that he believes it may pave the way for this in the future.

"The experimental work here recorded," he stated, "therefore suggests lines of study which may possibly lead to the development of procedures of practical value in preventing infections contracted by way of the nasal mucous membranes."

Since not only encephalitis but the much-dreaded infantile paralysis is among the diseases that enter the body through the nasal membranes, Dr. Armstrong's research, if it develops practical value, will be of tremendous importance in man's fight against disease.

Dr. Armstrong's latest research started from observations by himself and a number of other medical scientists, that different substances could modify the local reaction to invading disease "germs" and viruses. That the effect is purely a local one was shown by the fact that mice that had had the nasal alum treatment were not able to resist the infective virus when it was injected into the brain instead of being introduced via the nostrils.

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BIOLOGY

## Eat Less, Live Longer, Experiments Indicate

**S**UPPORT for the old adage, "We dig our graves with our teeth," has been found in experiments by Lester Ingles, graduate student at Brown University. Working under the direction of Prof. A. M. Banta, Mr. Ingles found that jars of the little aquatic animal *Daphnia* given short supplies of food lived on the average 50 per cent. longer than did similar colonies kept well fed. Dr. Banta's explanation was that these animals, thus forced into abstemiousness, burned their life-fires lower, produced and used less energy, and consequently did not "wear out" so soon.

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