A famous engineer in charge of a great research laboratory has made a discovery that physicians are now using to help cure a hitherto almost hopeless disease. He noticed that workers with short wave radio transmitters frequently have fever.

His scientists then harnessed these radio waves, the same that carry speech great distances through the ether, to make them give patients much or little fever whenever desired. And the fever, without injuring the patients, kills the germs that cause the disease.

Radio Waves Cause Fever In Patients To Cure Dreaded Paresis

Medicine—Electricity

By Jane Stafford

"HELLO, Australia!" Young America is speaking over a short wave radio set made in America by youthful hands and brains. Through 12,000 miles to the far-off kangaroo land the mysterious vibrations of the high-frequency radio now carry voice, laughter and greeting to fellow radio "hams."

Look into this research laboratory. There are the same radio tubes. But there is no cheery conversation between continents. White-gowned physician and assistants are experimenting with a new device for the treatment of disease. The same short radio waves that carry messages across oceans, intensified and localized, produce promising effect upon animals and man.

When these radio waves pass through the body they raise its temperature, producing a fever. Artificial fever is one of the latest methods of modern medicine for treating disease. Doctors have been trying to find a satisfactory way of producing such a fever and now scientists think they have found it in the short radio waves that link continents.

Heat, applied on the outside of the body, has long been used in the treatment and relief of disease. But fever has always been considered a sign of disease, like pain. When the patient had fever, the treatment was planned to reduce it and so make him more comfortable.

During the last few years this idea has been somewhat reversed. Fever, at least in some conditions, appears to be one of the body's means of defense against the invading disease germs. For example, it is now known to cure general paralysis, or paresis, which was a nearly hopeless condition until a few years ago. If the sufferer from paresis is given malarial fever as well, he has a good chance to recover from the more terrible paralysis. The heat of the fever apparently kills the spirochetes causing the paralysis. Then the patient can be given quinine which kills the malaria germs.

However, there is a drawback to this method. It is hazardous to give a man a disease like malaria. Medicine is not infallible, and occasionally physicians have been hard put to it to clear up the malaria after the original paralysis had yielded to the fever treatment.

Malaria is a fairly persistent disease, comes and goes, and sometimes, when it seems to have been completely driven out of the system, the patient suffers a relapse and has another attack. All this is very weakening, as well. So physicians looked about for another method of inducing artificial fever that would be hot enough to burn up the spirochetes of paresis, and that still could be controlled and gotten rid of when it had served its purpose.

Out on the Pacific Coast, and elsewhere, continuous hot baths were tried. This was a much safer method than introducing a disease into the patient. The heat could be easily controlled and the fever induced was maintained for some time. Dr. J. Cash King of Memphis and Dr. Edwin W. Cooke of Bolivar, Tenn., have demonstrated that electric current from a diathermy machine also produces a beneficial fever.

The first hint that radio waves might be used came when Dr. W. R. Whitney, director of the research laboratories of the General Electric Company at Schenectady, N. Y., found that men working in the field of a short wave radio transmitter were having fever. Immediately investigators began searching for a method of harnessing this energy and putting it to work at producing this beneficial fever which could relieve sufferers from general paralysis and possibly from other diseases as well.

Powerful radio equipment was made in the Schenectady laboratories, and Dr. Helen Hosmer of Albany Medical College studied its possibilities. In one test with this equipment, a tadpole's temperature was raised twelve degrees. Dr. Hosmer also was able to raise the body temperature of other small animals, and of solutions containing varying amounts of salts. She issued a warning, however, upon the extreme danger of exposing human beings to intense fields of short radio waves until more is known about them.

Now Dr. Charles M. Carpenter and Albert B. Page have perfected equipment with which they have been successful in raising the temperature of the body rapidly to a point where it is of value in treating disease, and without great discomfort to the patient. With extreme caution, after many preliminary trials, they ventured to use this method on actual patients, and found there were no unfavorable effects unless the high temperatures were continued for too long a time.

Their equipment has been constructed on the same principle as a short wave radio transmitter that sends messages across oceans. Instead of an aerial liberating currents carrying messages, this radio set has two aluminum plates called condenser plates which concentrate the electrical energy within the apparatus so that it may be used to elevate the patient's

temperature. The apparatus is enclosed within a case about three feet high, three feet wide and six feet long, mounted on wheels so as to be portable.

The patient is suspended on interlaced cotton tapes stretched across a wooden frame. The under surface of this frame is covered with composition boards, forming an air chamber beneath the body. A cover of the same material is fitted over the frame so that the head of the patient projects through an opening at one end. In this way there is a fairly tight air chamber around the patient as he lies on the tapes.

He rests on his back and the condenser plates, which concentrate the energy that is to produce the fever, are placed at each side of the box so that the radio waves oscillate through his body from one side to the other at the rate of from 10,000,000 to 14,000,000 a second. The distance between the plates can be varied but is generally kept at 30 inches. These plates are covered with hard rubber so as to prevent arcing and consequent burning of patient or attendant.

Two small hair dryers are placed in openings at the foot of the apparatus, one above and one below, so as to circulate hot air around the body. These decrease loss of heat and equalize the humidity throughout the enclosed atmosphere, and thus increase the efficiency of the apparatus and also help to keep the patient comfortable.

The 30-meter waves, the same length used by amateur operators, are produced by a tube familiar to all up-to-date radio fans, the recently developed four-element screen-grid tube. This tube is especially adapted for use at the higher frequencies and has the nominal output rating of a small broadcasting station, 500 watts.

By carefully applying the plates and by enclosing the body, it is heated rapidly without causing great discomfort to the patient. Dr. Carpenter and Mr. Page were able to raise the temperature of the body 5 or 6 degrees Fahrenheit above normal within an hour or one hour and twenty minutes. In one instance the temperature reached 106.5 Fahrenheit. Even higher temperatures could be obtained with this apparatus, the investigators believed, but they have been extremely cautious because of the limited experience with such apparatus and methods.

When the desired temperature is reached it may be held either by decreasing the voltage, by increasing the plate distance or by using only the hot air blowers.

The temperature very slowly goes back to normal if the patient is left in the box and wrapped in heated, heavy woolen blankets. Occasionally a patient feels nauseated or has a headache, but on the whole he does not appear to be greatly distressed or tired when the maximum temperature is maintained for one hour and then allowed to drop to normal while he is well blanketed. The pulse and breathing rate increase and the blood pressure decreases as the temperature rises.

"We believe that the condition of our patients after treatment is much more satisfactory than that reported by investigators who have used other methods to produce artificial fevers," the Schenectady investigators reported.

They explain the rise in temperature when the body is exposed to short radio waves as being due to the resistance of the body to the conduction of a current between the surfaces adjacent to the opposed plates. Other theories have also been advanced to explain this phenomenon.

From their studies of infectious diseases in laboratory animals, these investigators think that two desirable effects are produced by fever. First, the increased heat within the body makes a less favorable environment for the multiplication of a disease-producing virus, because viruses and germs in general only grow and multiply when the temperature is just to suit them, and that is the normal temperature of the human body.

Second, the heat somehow speeds up the development of immunity, perhaps by increasing the rate of the chemical processes concerned with it and the general defenses of the body against infections.

Another scientist who has shown that radio waves could be used to treat paresis is Prof. W. T. Richards of Princeton University. Prof. Richards has worked at the private laboratories of Alfred L. Loomis at Tuxedo, N. Y., but with much less powerful apparatus.

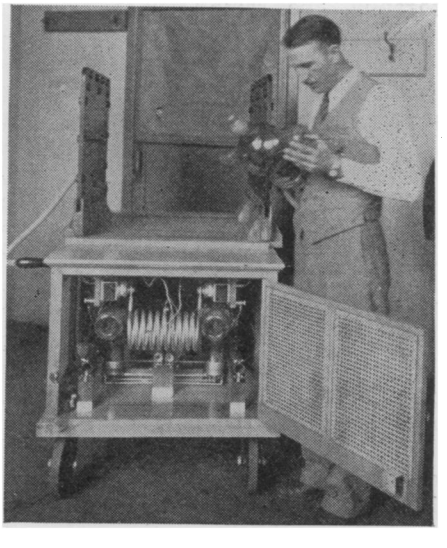
Radio waves have also made a preliminary attack on cancer, although so far the tests have been on animals rather than on human beings. This work has been conducted by the U. S. Public Health Service under the direction of Dr. J. W. Schereschewsky in his laboratory at Harvard Medical School.

Mice with tumors artificially acquired in the laboratory were improved by being subjected to doses of oscillating electricity produced by vacuum tubes similar to those used in radio. The frequencies Dr. Schereschewsky used in his experiments ranged from 8,300 to 135,000 kilocycles per second, a range that expressed in more familiar language corresponds to wavelengths below about 40 meters. The most effective frequencies were found to be at about the middle of the extremes used and more deaths of mice occurred at the high and low ends of the frequency range.

"In a considerable number of instances tumors exposed in this way receded and disappeared with the eventual recovery of the tumor-bearing animal, while in control animals the tumor grew progressively, causing the death of the animal in from four to six weeks," said Surgeon General Hugh S. Cumming in an official report of the work.

One of the disadvantages of the radio method of raising the temperature was that physicians could not be sure just how the patients would heat up. Recently Prof. J. C. McLennan of the University of Toronto and A. C. Burton discovered through tests that the heating is dependent on the conductivity of the material through which the high frequency current is pulsating. (*Turn to page* 45)

With this apparatus, short radio waves are used to induce artificial fever that is beneficial in treating disease, particularly general paralysis or paresis.



Search For Poisonous Plants

Entomology

POISONING the water to catch fish is illegal in almost all civilized countries, as well as in many of the lands of the sun that have become the "white man's burden"; yet the leading governments of the world are now engaged in a zealous search for the most efficacious of the plants used as fish poisons by savage peoples. In a bulletin of the Royal Botanic Gardens at Kew, England, F. N. Howes, well-known British botanist, summarizes the knowledge so far obtained.

These fish-poisoning plants are desired not for poisoning fish but for fighting insect pests. The artless savage takes insects for granted, but the more advanced nations of Europe, Asia and the Americas, dependent for their food on the highest efficiency of agriculture, fight the devouring hordes with every weapon they command.

A chief dependence has been arsenical sprays. These are very effective, but some insect pests have developed resistant strains that can swallow considerable quantities of arsenic without suffering harm. Hence the search for new kinds of poisons.

Fish poisons made from plants have been found highly efficient substitutes. Dilutions of one part in a million or more of water are fatal to insects, usually on mere contact. Derris, an East Indian plant, or rather group of plants, is already in considerable use. It is proposed to spray for several seasons with arsenicals, then for several with derris or one of its relatives, thus catching the arsenic-immune strains that may have evolved with something to which they are not immune.

Most of the fish-poison plants thus far experimented with are of tropical origin. One of the most promising recent additions is the South American "cube," pronounced "koo-beh." Both derris and cube, together with the majority of other fish-poisoning plants, are members of the legume family, relatives of clover and peas. It is proposed to grow them as fertilizer crops in rubber groves and other tropical plantations, thus obtaining two paying crops off the same land with the same labor, and enriching the soil at the same time.

But many other fish-poisoning plants belong to other plant families. One which used to be used in southern Europe is the common mullein, which is now thoroughly naturalized in America as well. If mullein turns out to be an efficient insecticide, its cultivation should present no particular problem, for it is the rankest kind of a weed.

Science News-Letter, July 19, 1930

Radio Fever—*Cont'd*

Prof. McLennan and his associates made their tests on chemical solutions similar to those contained in living things. As a result of their tests, physicians will be able to tell just what wavelengths to use to produce fever in any part of the body. There is one optimum wavelength for heating a material of given conductivity to the greatest degree.

The liver, heart and other parts of the body have different conductivity for these short waves, the scientists found. Taking advantage of this fact, physicians may be able to aim the high frequency treatments at a special organ or part of the body that needs heat treatment.

Scientists point out that the effective amounts of radio waves used in the cancer investigations and also in the production of the artificial fevers are far larger than could be obtained from radio broadcasting. There is little likelihood of beneficial or harmful radio waves entering the home along with political speeches, jazz or other radio programs of today.

Science News-Letter, July 19, 1930

Honors for Fliers

BY special congressional action, all members of the Alaskan Aerial Survey expedition, which mapped nearly 13,000 square miles of wild country in that region in June, July, August and September, 1926, are expected soon to be given the distinguished flying cross by the Navy Department. A bill providing for this honor has been passed by the House and is on the calendar of the Senate awaiting its turn.

Each plane was in the air about 180 hours during the mapping and each plane flew about 18,000 miles, over mountainous, largely uninhabited country. No safe landing places were available excepting on a few small lakes which were seldom accessible and from these take-offs could not have been made, states a report made to Congress by the naval committees of both houses.

Officials of the Department of Agriculture and the Department of Commerce recommended the awards, and told of the value of the work done in inventorying national forest resources, and locating power sites.

Aviation

Science News-Letter, July 19, 1930