

lines, must be reflected back to the earth if they are to be heard at any great distance. Tiny electrified particles in the ionosphere bounce the short waves back to earth.

The ions that compose this reflecting layer are produced mainly by the action of the ultraviolet in sunlight which splits electrons off the atoms and molecules high up in the rarefied air. Some of the electrical particles may also be produced by impact of tiny corpuscles shot off from the sun, some by cosmic rays and some by meteors.

The lower portion of the ionosphere is rich with free electrons during the day due to the action of sunlight, Dr. McNish pointed out at a General Electric Science Forum. Directly after sunset most of the electrons are gone because they become recombined with molecules.

"Yet—and herein lies the mystery—a

sufficient number of electrons persist at this lower height all through the night to reflect radio waves," Dr. McNish said.

"Judging from the rate of electron-decay just after sunset, one would not expect to find any significant number beyond midnight."

Meteors may be the agency responsible for reflecting the radio waves at night. Astronomers estimate that more than a thousand billion of these particles, smaller than grains of sand, enter the earth's atmosphere during a 24-hour period. Travelling at speeds up to 200,000 miles per hour, they would smash violently into atoms and molecules of the upper air. These meteors would tear some of the electrons from these particles to which they belong and thus maintain the radio roof throughout the night.

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explanation of how such factors aggravate or may even precipitate an arthritic process."

These studies were made on a group of 25 patients, of whom 21 had some form of arthritis. Tests showed that skin temperatures were fairly normal while joint temperatures were definitely elevated in cases of degenerative joint disease, chronic gout, and infectious arthritis.

This method is therefore of use in following the course of joint diseases and in evaluation of the effects on the joint temperature of such treatment as rest, exercise, physical therapy, drugs and X-rays.

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PSYCHOLOGY

Brain Operation Found To Reduce Intelligence

➤ REDUCTION of intelligence has been noted following a certain brain operation now sometimes used for epilepsy, it was reported to the American Psychological Association in Boston by Dr. Robert B. Malmo, of McGill University, Montreal, Canada, and the Allan Memorial Institute of Psychiatry.

The operation is one called gyrectomy

ENGINEERING

More Mileage Per Gallon

➤ TOMORROW'S AUTO engine is going to give 25% more miles per gallon and you will be filling up at the gasoline pump on such high-compression fuels as triptane, toluene, benzene and trimethylpentane as well as superleaded "gas."

The American Chemical Society was told in St. Louis by leading petroleum chemists that new fuels for more efficient engines can be ready by the time the automotive engineers can build, test and produce them commercially.

Since 1930 the efficiency of fuel utilization in passenger cars has increased by more than 30%, John M. Campbell and Dr. Lloyd L. Withrow of the General Motors Research Laboratories, Detroit, told the chemists. In addition to this improvement, high-compression ratio engines combined with high-octane gasoline of early-war aviation grade could push the efficiency 45% further.

Today's auto engine wastes 75% to 80% of the gasoline's energy and a gain of only 1% would save one to two millions of gallons of gasoline daily in the United States.

Present commercial gasolines sold at filling stations range between 70 to 90 octane and engines of newer passenger cars have compression ratios of about 7-to-1.

Sizable saving would occur with 8-to-1 engines and gasoline in the 96 to 98 octane range, a grade that the petroleum industry could produce to the extent of about 20% of its total gasoline volume.

Push the compression ratio up to 12 and 15-to-1, and new fuels chemically tailored by the newer methods of refining will be needed.

Experimental engines using these new fuels have been built and given road tests, several research groups reported.

The higher the compression ratio the better the antiknock quality of the fuel needed, R. W. Scott, G. S. Tobias and

P. L. Haines of the Standard Oil Development Co., Elizabeth, N. J., concluded.

Any upgrading of the fuel quality of auto engines should be established sufficiently ahead of the engine production so that the refiner can develop his methods of production. This was suggested by W. C. Offutt, J. E. Taylor and G. B. Swartz, Jr., of Gulf Research and Development Co., Pittsburgh.

Superfuel of 100 octane for the new engines of the immediate future can be made by adding a teaspoonful of tetraethyl lead to gasoline, Dr. H. A. Beatty and Dr. W. G. Lovell of the Ethyl Corporation, Detroit, told the chemists.

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MEDICINE

Temperature of Joints Taken with New Method

➤ THE TEMPERATURE OF JOINTS crippled by disease has been obtained by the use of a technique applied for the first time to man, the American Congress of Physical Medicine was told in Washington.

A needle from which the syringe is removed is inserted into the anesthetized joint. Then tiny temperature measuring units are threaded over this needle and are inserted two to three inches into the inner recesses of the joint.

This means that for the first time doctors will know what effect any treatment being used has on the crippled joint, Drs. Joseph L. Hollander and Steven M. Horvath, of the School of Medicine and Hospital of the University of Pennsylvania, pointed out.

"It appears significant," they reported, "that cold, pain, fear and even smoking produce an identical effect, i.e., the apparent constriction of the skin vessels and dilation of the vessels within the joints. Perhaps this observation may lead to an



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