

## CHEMISTRY

# "Perfect" Fuel Practical

➤ AMERICA'S ROCKETS and missiles can be made larger, more powerful and will travel farther and faster, thanks to a development that will make utilization of the "perfect fuel" practical.

A technique that makes it easier and cheaper to store and use pure liquid hydrogen, called the "perfect fuel" by rocket engineers, has been announced by the National Bureau of Standards.

Unstable orthohydrogen has been converted to stable parahydrogen in large quantities through the use of chemical catalysts by scientists at the Bureau's Boulder, Colo., Laboratories. The development makes it possible to store liquid hydrogen on the ground and aboard rockets in ordinary Dewar thermos-flask containers.

At present, liquid hydrogen, even in small quantities, must be stored in cumbersome, heavy, constantly operating refrigerator units.

The goal of rocket propellant chemists recently has been to contain as much hydrogen as possible in rocket fuels. A goal that has been hoped for, but not believed to be practical, has been to use pure liquid hydrogen as a fuel. Hydrogen releases more heat energy and imparts more thrust per unit of weight than any other element considered for use in today's rockets.

Because of its very low weight for a given volume, it is necessary to compress and liquefy hydrogen for practical storage. Equipment to do this is too large and heavy for use in missiles, so chemists have compounded hydrogen with lithium and boron, the next most efficient fuel elements, as solids or thick liquid slurries. Although these "exotic" fuel combinations release extremely high energies, they fall far short of the energy attained from pure hydrogen.

Details of our newest high energy fuels are classified, but propellant chemists believe they are probably only about one-fourth to one-half as efficient as pure hydrogen.

To make the hydrogen stable as a liquid, Bureau of Standards scientists treat it with hydrous ferric oxide, an iron rust that has further combined chemically with water. In converting unstable orthohydrogen to stable parahydrogen, the hydrous ferric oxide acts as a catalyst, a substance that increases reaction rates without itself becoming a part of the product.

The research was conducted by the Bureau's Cryogenic Engineering Laboratory under sponsorship of the Atomic Energy Commission.

Science News Letter, November 2, 1957

## TECHNOLOGY

# New Stamps Aid Mail Job

➤ THE BRITISH General Post Office in London will soon have on sale the first stamps with electrical conductors beneath the gum.

These stamps, coated with a chemical called naphthadag, will be capable of giving recognition signals to a machine that will:

1. automatically examine sacks of letters tipped into the machine in random order;
2. rearrange them with the stamps in the top right-hand corner;
3. separate ordinary letters at first class rate and other matter; and
4. print the cancellation mark on the stamp.

The first electronic stamp will be the violet colored 3d. (3.5 cents), the new charge for an ordinary letter. It will have black lines, 1/32nd of an inch thick, running from top to bottom on the back under the gum.

The black lines on the stamps will be hard to find unless the stamp is held up to the light. Naphthadag will be harmless to anybody determined enough to lick off enough gum to get at it.

The sorting machine will have a number of mechanical scanners. A high voltage discharge penetrates the stamp and gives the machine a recognition signal.

An earlier method tried involved the use of photoelectric cells which "recognized" the stamps by their color, but this system presented too many problems.

Stamp collectors will be interested in the stamps incorporating naphthadag. Catalogue publishers will undoubtedly list them as separate varieties in unused conditions, but whether used examples will be readily distinguishable when they are washed off letters remains to be seen.

If a way is later found to sort letters without marking the stamps, these trial printings may have a short life and may consequently rise in value.

## Automatic Mail Sorting

➤ AN ELECTRONIC sorting machine needing only one operator is expected to end the hand-sorting of letters in English post offices.

The letter-sorter, developed by the British Post Office, works this way:

A single operator sits at one end of the machine facing a window behind which the letters pass. When he has read the address, he presses two of 24 keys on a board before him, and an electronic-mechanical system whisks the "sorted" letter on roller tracks along rows of boxes until it has reached its proper box, determined by an electronic "memory."

Another machine, a letter and package separator, is still under development. The letters and packages will be separated by a special "segregator drum" that lets thin

letters slip through its sides, but holds back parcels and packets.

Experiments with an electrically driven machine no larger than a typewriter, for counting postal orders, shows that it can handle up to 300,000 orders a day. About 600,000,000 orders are issued annually from two depots in London and Edinburgh.

Science News Letter, November 2, 1957

## TECHNOLOGY

# Gases Produce Power in New Electrical Generator

➤ A GENERATOR that produces electrical power directly from the chemical energy of gases has been developed.

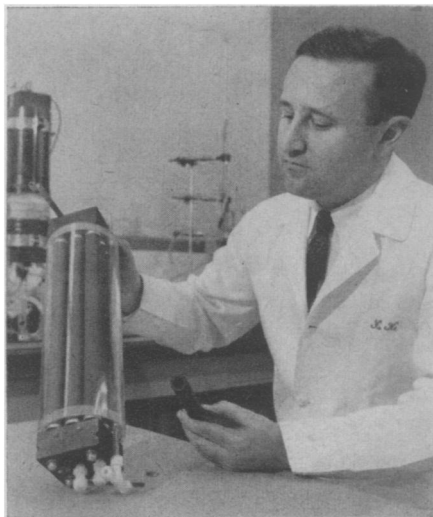
The new fuel cells require no gasoline, steam or hand-driven engine to generate electricity. The chemical energy of hydrogen and oxygen is converted directly to electrical energy, Dr. C. E. Larson, research vice president, National Carbon Company, division of Union Carbide, announced.

The first practical units, developed recently at the Parma, Ohio, laboratory, are now supplying power for the operation of Army "silent sentry" radar sets.

Dr. Larson said the "secret" of the fuel cell's success is the chemically treated, hollow, porous carbon electrodes through which the gases enter the cell and which also conduct the electricity produced by the electrochemical reaction.

A single fuel cell unit consists at present of nine hollow, porous carbon electrodes grouped in a round plastic housing. When in operation, the cell will be filled with a solution of potassium hydroxide which serves as an electrolyte.

Science News Letter, November 2, 1957



**FUEL CELL** — Dr. Karl Kordes, Parma Research Laboratories of the National Carbon Company, holds one of the fuel cells which provide for the direct conversion of the chemical energy of gases into electrical power. The chemically treated hollow porous carbon electrodes through which the gases enter the cell are easily visible. They are the long tubes.