

PHYSICS

Make Liquid Air Without Pressures Formerly Used

Russian Scientist Makes Gas Work As It Expands So It Gives Up Energy and Cools More Quickly

BY MAKING compressed air work as it expands, a new method of making liquid air has been developed by Prof. P. Kapitza in the Institute of Physical Problems of the Academy of Sciences of the U.S.S.R. in Moscow, it has just been learned. A brief description of the process, based on a paper in a Russian journal, is contained in a new issue of the British scientific weekly, *Nature* (July 5).

All commonly used methods of refrigeration, whether in home refrigerators or machines for liquefying gases, make use of the same principle. This is that when a gas is compressed, it is heated; when the pressure is relaxed, it cools to about what it was at first. If it is compressed, then cooled, then decompressed, it drops to a temperature considerably below what it was originally.

Since the nitrogen making up most of the air has a boiling point (where it changes from liquid to gas) of 320 degrees below zero Fahrenheit, it must be cooled to this low temperature to liquefy it. This is done in several steps of compression, cooling and expansion, each one carrying it down some more. The Linde machine, widely used, uses pressures as high as 200 times that of the atmosphere.

It has been realized, however, that if,

instead of merely allowing the gas to expand, it was made to do some work at the same time, still more energy would be removed from it, and the cooling would be still greater. Prof. Kapitza has done this, by making the expanding gas drive a turbine. With this system the necessary cooling can be obtained with an initial pressure of only 5 atmospheres, instead of 200.

In the present Kapitza machine, the turbine revolves at 40,000 revolutions per minute. About 30 kilograms (66 pounds) of liquid air can be produced in an hour, using about 1.7 kilowatt hours of electricity in power for each kilogram. By utilizing the mechanical energy from the turbine, and with improved valves, it is thought that this may be reduced to 1.2 kilowatt hours per kilogram, about the same as with present machines using high pressures. Working on a larger scale, with smaller heat losses, Prof. Kapitza expects to be able to make it still more efficient.

In any event, the writer in *Nature* points out, the Kapitza outfit has many advantages. It can be started in 20 minutes or less, is small in size, and does not need the many auxiliary attachments of the high pressure apparatus.

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periment Station and collected the pest killers.

The insects rode a clipper plane from Hong Kong to San Francisco, then were sent directly to the United States Department of Agriculture insectary at Hoboken, New Jersey, to be tested as "carriers" of tree disease. When no evidence of citrus canker was found in the shipment, the insects were sent to California for trial as red scale predators.

The Chinese insects successfully cleared laboratory test trees of the scale. Orchard tests of from two to four years will be necessary to check the laboratory experiments, and large numbers of the insects have been raised for release in Southern California citrus groves. If normal orchard conditions do not limit their effectiveness, one of the greatest problems of Western citrus growers will be solved.

Sprays and fumigation, costly and sometimes harmful to trees, have been of little help in the war against red scale in recent years. If the Chinese immigrant predator is as effective in orchards as in the laboratory, hundreds of thousands of dollars now spent on other controls will be saved by the living, self-propagating insect control, and bigger and better crops of citrus fruits will be harvested.

Harold Compere, Dr. Stanley Flanders, and Dr. H. S. Smith of the Station Staff have conducted the experiments.

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ENTOMOLOGY

Chinese Predator Kills Red Scale of Citrus Trees

Parasite Pest Killers Collected in China and Flown In Clipper From Hong Kong To San Francisco

A FORTY-YEAR war between agricultural scientists and a parasite is about to be won by the scientists. Red scale, an insect rated as number one pest of citrus groves, has seriously threatened our chief source of vitamin C, yet no control methods have been successful against it.

The University of California Citrus Experiment Station now announces a sure death for red scale; an insect imported from South China that hunts and devours the citrus pest. J. Linsley Gressitt, University of California graduate, now at Lingnan University, went to China at the request of the Citrus Ex-

PALEONTOLOGY

Fifty-Million-Year-Old Animal Skeletons Found

SEVERAL skeletons of an ancient hippopotamus-like animal known as *Coryphodon*, together with "spare parts" consisting of extra skulls, limb bones, jaws, etc., have been found in Colorado by an expedition of the Field Museum of Natural History, under the leadership of Bryan Patterson, assistant curator of paleontology.

Since there are at present only three reasonably complete *Coryphodon* skeletons in all the museums of the world, this new find constitutes a real scientific treasure trove.

Coryphodon was not closely related to the hippopotamus, despite its superficial resemblance. The evolutionary line to which it belonged has become totally extinct. The animal lived in the Eocene period, near the beginning of the Age of Mammals, reckoned at between 50 and 60 million years ago.

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