

## TECHNOLOGY

# Power Sources—Old and New

Atomic reactors are important, but so are the sun, the wind and underground steam, as scientists seek answers to one of the world's most challenging problems, David Meier reports.

► THE PROBLEM of finding and developing new sources of power in an increasingly mechanized world deeply concerns scientists everywhere.

It is a problem shared by the most technologically advanced nations, where the flick of a switch commands power equal to that of a hundred human laborers, and the nations just starting to develop, where human and animal muscle power still keeps most of the wheels turning.

Even the countries with the richest reserves of the fossil fuels—coal, gas and oil—are well aware that the fast-dwindling supply will not last forever. Rapid advances in determining new, cheap ways of generating energy are needed now to keep scientists of the future from fighting desperately to save civilization from a power death. Today's scientists are meeting this challenge.

The only really new source of power found in recent years is, of course, atomic energy from man-made reactors. The atomic power industry works constantly at an intensive research and development program aimed at cutting the cost of producing electricity from nuclear sources. In another eight years, studies indicate, present costs of nuclear power should be halved, bringing them into line with power costs from conventional fossil fuel plants.

This is a development which will be welcomed in areas where large industrial centers or extensive electrical transmission systems make large-scale atomic power plants practical.

But it will mean little to such citizens of the modern world as the man in India who cooks the food he needs for his muscle energy over a cow-dung fire, leaving his land, his crops and himself undernourished because the dung should have been used as manure instead.

## Needs Solar Stove

While he waits for the advent of inexpensive, small-scale reactors, his present status could be bettered immeasurably by a low priced solar stove to cook his meals by the sun's rays, a windmill to pump water, or a source of hot steam or gases in the earth's crust to generate electricity cheap enough to do both.

The sun, the wind and the boiling kettles in the earth's crust are age-old sources of power, but new ways of harnessing these sources are getting world-wide attention. Scientists, engineers, economic experts and government administrators from 61 nations will discuss them at length when the first United Nations Conference on New Sources of Energy convenes in Rome on Aug. 21.

They will try to devise the best means for putting solar, wind and geothermal energy to work to raise living standards in underdeveloped areas. Geothermal energy, coming from underground steam or hot water, will be examined for the first time on an international basis.

Scientists have rediscovered the sun as a power source. Methods of trapping the sun's rays to serve mankind are increasing in scope and ingenuity. Practical applications of solar energy range from simple solar cookers, the size and shape of an inverted umbrella, to the giant reflector proposed for a solar furnace in Europe's Pyrenees mountains, where a mirror 55 yards in diameter would capture sunlight to generate 1,000 kilowatts.

## Ponds and Batteries

Two promising developments due for particular emphasis at the Rome meeting are solar ponds and solar batteries.

Instead of using vast expanses of expensive mirrors, a solar pond traps heat in shallow water. The pond must have a bottom layer

of heavy salt water and a top layer of fresh or less salty water. The black bottom of the pond retains heat, making the bottom layer of water hot. The top layer, with its different density, acts as a lid that keeps the heat from escaping.

Israeli scientists who contrived an experimental "pond" in the Dead Sea found that the surface layer stayed lukewarm, but the salty water two or three feet down got scalding hot.

In sunlit desert countries, the curse of salty waste water could be turned to a blessing if the heat from solar ponds was converted to electricity.

Solar batteries, first built for use in satellites, release electricity when their silicon crystals are activated by sunlight. They are too expensive for any wide use in underdeveloped countries, but continuing research for space applications is expected to bring production costs down. Meanwhile, prospects for the use of treated plastics instead of the costly, delicate crystals are being thoroughly checked.

The use of wind power to pump water or make electricity boils down generally to a problem of getting the right windmill in the right place. Wind is free and plentiful, but unpredictable. More research is needed to locate sites where the supply is relatively consistent, before this neglected resource can be fully utilized.

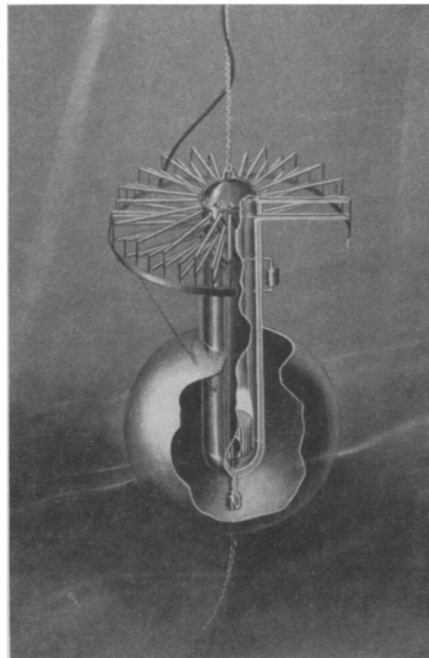
## Windmills Revolutionary

On well-chosen sites, windmills can revolutionize life in remote villages. Windmills with simple sails made of reeds can generate enough electricity to light 30 bulbs of 100 watts each. Big wind installations can develop enough electrical capacity to serve a small community, and might be linked with sun-powered facilities and conventional diesel-generators to form a network so that one power source could begin operating when another stopped.

The importance of power from geothermal steam and gases in underground "kettles" has been recognized only in recent years. Research indicates that many hidden subterranean furnaces may exist in areas where no surface geysers can be seen. Formations where heat sources may exist are expected to be sought and discovered by geologists, geophysicists and geochemists using every modern method available.

Once it is tapped, geothermal power is cheap, constant and reliable. Its use is spreading in Iceland, where power from natural steam fields and active springs heats the homes of 46,000 persons, and Italy, where plants at Larderello can supply enough power to run the entire Italian railway system. New Zealand's Wairakei plant supplies one-eighth of the total power production on North Island, which has a population of more than a million.

The mounting need for new power sources in the United States is clearly in-



**POWER IN THE DEEP**—Undersea atomic plant will be developed by General Dynamics Corporation, San Diego, Calif., as thermoelectric power source for naval units. Tubes at top change reactor heat to electricity.

licated in a recent report from the Department of the Interior's Bureau of Mines.

According to 1954 figures cited in the report, fossil fuels supplied 94% of the nation's total energy output. Of this, 38% came from petroleum, 29% from natural gas, and 27% from coal.

Some of the power-producing devices envisioned as replacements for depleted fossil fuel reserves will do their work without the familiar steam-driven turbo-generators, still needed for use with atomic reactors.

Thermoelectric generators will convert nuclear energy or solar energy directly into electricity.

Thermionic generators, working from a nuclear heat source, will convert energy

to electrical form by heating conductive material to cause electrons to "escape" to an outside circuit.

Fuel cells will yield electrical energy from chemical reactions. Units capable of developing thousands of watts of power have been demonstrated.

Magnetohydrodynamics, or MHD, sends gases through a magnetic field at high temperatures and high velocities, providing free electrons such as are found in copper in a conventional generator. Scientists at Westinghouse Electric Corporation, Pittsburgh, have built and operated an experimental MHD generator.

• Science News Letter, 80:106 August 12, 1961

## INVENTION

# Patents of the Week

► A MANNED BALLOON capsule for studying the upper atmosphere has been patented.

The capsule, one of a series designed for the U. S. Navy's upper atmospheric program, Project Stratolab, was invented by Harold E. Froehlich, New Brighton, and Richard L. Schwoebel, Minneapolis, Minn. Rights of patent No. 2,993,663 were assigned to General Mills, Inc.

"Photographing the atmosphere of other planets in the clear air of the stratosphere and measuring its temperature, ozone content and pressure have been accomplished with these manned balloon junkets," Mr. Froehlich told SCIENCE SERVICE in a telephone interview. In 1956, the first flight in one of these balloons during Project Stratolab lofted Malcolm D. Ross 70,000 feet above the earth, a record height at that time. Since then, a manned balloon flight has topped the 100,000-foot mark.

The compactly built, cylindrical shaped gondola is suspended from a plastic balloon at a 30- to 60-degree angle to provide the smallest possible shell enclosing a man in a sitting position. The flight is controlled by releasing ballast.

The gondola's aluminum-coated nylon "skin" reflects the sun's hot rays during the day, whereas an inside layer of aluminum prevents excessive loss of heat from the pressurized cabin during cold nights. An adjustable seat permits the "space man" to reach the instruments easily or view the upper atmosphere through a porthole.

A method of manufacturing phonograph records that do not collect dust is claimed by three Japanese. Yuzo Miura, Tokyo; Tomomichi Tsukada, Kawasaki-shi; and Shizuo Hayashi, Tsurumi-ku, Yokohama, won patent No. 2,993,234 and assigned the rights to Tokyo Shibaura Electric Co., Ltd., Kawasaki-shi, Japan. An antistatic agent, such as stearamide-propyldimethyl-beta-hydroxyethyl ammonium nitrate, is added to the plastic resin powder for making record disks, obtaining "ever clear phonograph records," the patent claimed. "The present invention can be applied not only to phonograph records but also to electric fan blades and lighting fixtures with favorable results," the inventors said.

"A new concept in the ground handling

of heavy aircraft," especially jet planes, is claimed in patent No. 2,993,549 by Jerome I. Davis, Bedford, N. Y., John E. Steinback, Stamford, and Raymond J. Enyeart, Westport, Conn. Rights were assigned to Consolidated Diesel Electric Corporation, Stamford. Huge 125-ton jet aircraft can be taxied from a hangar or parking area to a passenger loading gate with "wheel movers." The self-propelled wheel movers are clamped to the landing gear and can actually move the craft at speeds up to five miles an hour. The plane can be turned by propelling one wheel forward while simultaneously reversing the direction of the other wheel. The units can be controlled by the pilot or a ground crewman.

An improved multi-stage flash evaporator for converting salt water to fresh water won for Charles P. Nilan, Rye, N. Y., patent No. 2,993,844. Rights were assigned to Chicago Bridge & Iron Company, Chicago. Sea water flowing through a maze of pipes is continually heated and then vaporized in a series of compartments. The vapor, now fresh water droplets, is then filtered off. The evaporating compartments are arranged to preheat the incoming cold sea water contained in the pipes.

A "hypodermic syringe" for injecting materials such as antiseptics or fireproofing substances into wooden poles or trees was invented by Stanley Henry Reece, Morden, England. Rights of patent No. 2,993,245 were assigned to Cobra (Wood Treatment) Limited, London. Two needles connected to the syringe are driven into the wood after clamping the unit to the tree. As the needles slowly move into the tree, the piston automatically injects the foreign substance at a uniform rate.

A gas-inflated life preserver that does not tend to lose gas or become dangerously brittle after a period of time is claimed by Richard Switlik, Allentown, N. J., in patent No. 2,993,217, assigned to Switlik Parachute Company, Inc., Trenton, N. J. A baffle within the life preserver spreads the gas evenly when inflating so that any cracking will be limited to the baffle and not occur in the outer fabric, the patent stated.

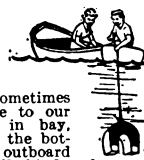
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