



GRADWOHL

School of Laboratory Technique

Internationally known. M.D. supervised. Coeducational. G.I. Approved. H.S. diploma required. Enter monthly. One-year course, modern procedures. Placement service, big demand, good salaries. Write for catalog. Stanley Reitman, M.D.
3528 Lucas Avenue, St. Louis, Missouri 63103

Your mind is our proving ground

Your're a young man or woman who likes to ask questions . . . who wants to delve deeper into the meaning of things. Why not let Belknap College develop your intellectual and emotional capabilities to their fullest? Belknap offers Bachelor's in arts, sciences, business administration, education or meteorology and Associate's in arts and sciences. Coed. Excellent instruction and guidance. Varied cultural activities. Sports, skiing. Quarter plan.

BELKNAP COLLEGE

Catalog Z: Center Harber. N.H. 03226 • Phone: 603-279-4576



SPECIAL NUCLEAR SHIELDING
CHEMTREE CORPORATION
Central Valley, N.Y.
914-928-2293



NEW GIANT 148-Pg. CATALOG FREE!
Completely new, 1968 edition. New items, categories, illustrations, easy-to-read pages with nearly 4000 unusual bargains. Enormous selection of Astronomical Telescopes, Microscopes, Binoculars, Magnifiers, Lenses, Prisms, parts, accessories, math learning aids, do-it-yourself kits, exciting exclusives. Write for free Catalog "G."
300 EDSCORP BUILDING
BARRINGTON, N.J. 08007

CONTACT LENS USERS! Our New EYE-MIRROR

Provides accuracy with Ease to Set Contacts Safely in Place. Newly invented EYE-MIRROR, 5 POWER, makes insertion of lenses fast, simple, precise. Insures full comfort, less risk of loss. Ideal, too, for eye make-up, removing foreign matter, etc. Optical glass, polished and aluminized, gives undistorted high reflectivity. 1 1/2" diameter. In hinged Lucite holder. See for yourself! Sent Ppd. **\$3.50**

HARRY ROSS 61-L READE ST. NEW YORK, N.Y.

CUT ANY MATERIAL WITH SUPER-HACK



In less than two minutes you can rip thru the hardest piece of metal (a FILE). This amazing tungsten-carbide saw will make curves, notches, straight cuts in materials formerly considered to be unsawable! You can cut glass, glazed tile, bricks, tool steel, marble, and with very little effort. Famous cousin of diamond, the furnace-made tungsten carbide now joins the saw blade (a du-Pont development) and you have this miracle blade. Fits any hacksaw. Ship as follows:

1 at \$2.79 3 for \$6.20
6 for \$2 ea. (total \$12) ppd.

Order by Mail
MEREDITH SEPARATOR
Dept. YSN
310 West 9th St., Kansas City, Mo. 64105

LETTER FROM LONDON

Superconducting motor

Knowledge of the phenomenon of superconductivity goes back almost to the turn of the century. Electric motors go back considerably further. Pairing the two, as is now being contemplated, could be the first industrial application of superconductivity, as well as a complete break in the traditional design of electric motors.

Developed by International Research and Development Co. Ltd., the superconducting motor has important potential applications—especially in fields such as steel and paper mill drives, power stations, ship propulsion, compressors and fans.

The design principles also open the possibility of a new type of motor for electric vehicles.

The development was backed by the National Research Development Corp., which has placed a \$1.2 million contract for a 3,000 horsepower superconducting motor for installation at the new power station at Fawley, where it will drive a main water coolant pump to demonstrate its industrial capability.

The pilot version—a 50 horsepower model—runs at 2,000 rpm.

"This has been a most rewarding project from the engineering point of view," says A. D. Appleton, who heads IRD's design team, "and the spin-off includes such possibilities as a new type of motor for electric vehicles. This would not be superconducting, but would use the new design principles which allow increased power-to-weight ratio and permit the motor to be mounted in a wheel."

Initial work began in September 1963, with a feasibility study undertaken for the Ministry of Defense. This led to the design and construction of the 50 hp experimental motor.

The design stage of the Fawley motor is now complete and many components are on order. The new motor will be assembled and partially tested at IRD early in 1969, before delivery and commissioning at Fawley.

Although superconductivity had been a well-known phenomenon for many years, it became significant as a technology as late as 1960, when the new, high field alloys and compounds capable of carrying very high currents became available.

IRD began work on superconductivity shortly after it was realized that this development could have industrial significance in the long term.

It was decided that a model motor should be constructed but, as little was then known about the behavior of superconductors, it was originally thought wise to limit the design to an output of 2 hp. However, advances in the development of stabilized superconducting materials and improvements in electrical design made it possible to achieve the 50 hp motor running at 2,000 rpm.

Discussions were held with the Central Electricity Generating Board and it was agreed that a 3,000 hp superconducting motor could be tested at the new Fawley power station. The existing cooling water pumps at Fawley are rated at 3,250 hp at 200 rpm and are designed to be driven by a conventional alternating current motor at 900 rpm through a 4.5-to-1 reduction gearbox. The superconducting motor will be used for about a year to replace a conventional motor and supply the full power at 200 rpm.

The superconducting motor for Fawley will employ a fully stabilized niobium titanium/copper composite superconductor in the field winding, 4.5 long tons or 18.5 miles of it, equipped with a closed circuit helium refrigerator. The rotor is not at cryogenic temperature but it is in fact water-cooled; the motor is basically of the simple homopolar type but employs a new principle for allowing a higher voltage to be developed.

The Appleton Homopolar Principle is claimed to have a major advantage in allowing the power to the motor to be taken from a conventional supply, as it does not require the very high current at low voltage which is normally associated with homopolar machines. This is the feature that presages use in electric cars.

The \$100,000 helium refrigerator which will be responsible for supplying the necessary cold will be built by British Oxygen's cryoproducts division.

A comparison in weight, cost and efficiency between a conventional motor and one of comparable power of the superconducting type shows that an 8,000 hp, 50 rpm, conventional type would weigh 370 tons, cost \$530,000 and have 94 percent efficiency; a superconducting motor would weigh 40 tons, cost \$310,000 and have 97 percent efficiency. These figures are based on the estimates of costs prevailing in 1970.

F. C. Livingstone

