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THORIUM

URANIUM'S INTERESTING STEPCHILD

Teddy Roosevelt was President. The age of Victorian splendor was in full swing. And incandescent gas lamps were lighting America. The heart of these glowing lamps was the gas mantle – made, for the most part, of thorium.

Lindsay was a famous name in the gas-light era, a major producer of gas mantles.

The manufacture of gas mantles calls for the impregnation of a knit fabric cone of ramie or rayon with thorium nitrate and cerous nitrate. The organic fiber is burned off, leaving a relic structure of thorium and cerium oxide which glows white hot in a gas flame.

Around 1920, gas illumination was largely supplanted by electric lighting. Demand for thorium dropped. Then came the atomic age. Thorium again became important because of its value as a reactor fuel breeder.

At the present, there are two systems in which thorium can be used as a fuel material breeder. One is the use of metal or a thorium-bismuth alloy; the other, a thorium oxide slurry reactor. Both procedures are being investigated by the AEC and private industry. It is believed that at the assumed burn-up rate of thorium oxide (one pound of ThO_2 for six megawatt hours of electrical energy) the thorium-rare earth industry is probably capable of handling domestic demands without excessive expansion. Thorium looks good as a reactor fuel for private industry because it is much more plentiful and economical than uranium.

So much for the Buck Rogers stuff . . . what's ahead for thorium, excluding the energy field? The answer to that is "plenty" and chances are it can be of immense value to you – it already is in a number of industries.

The most common thorium salts are the nitrates, oxides, fluorides and chlorides. Lindsay produces all of them in purity ranges from that required for ordinary technical use to the most critical "reactor" grade where extremely high purity is a must.

Let's see how some of these salts are being used in industry. Perhaps you'll see a potentially profitable use for them in your own operations.

$Th(NO_3)_4 \cdot 4H_2O$ – Manufacture of incandescent gas mantles. A starting material for other thorium compounds and thorium metal. Nitrate is the standard commercial thorium salt.

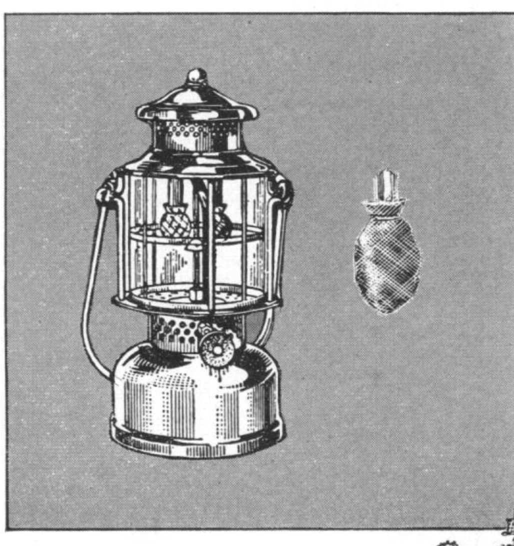
ThO_2 – Thorium oxide has the highest melting point of any metallic oxide (3220°C) and has use as a refractory material. It is also used with lanthanum oxide in the production of "rare-element" optical glass for unbelievably accurate aerial camera lenses. It is a source material for making thorium metal. The AEC and several private companies are studying its use in a thorium oxide-water slurry reactor. It has some use as a catalyst.

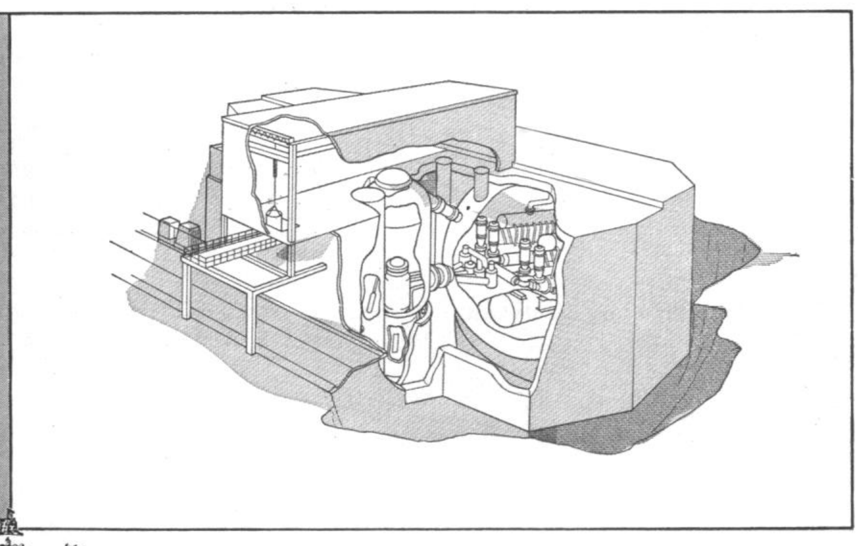
Thorium-magnesium alloys have high strength, good creep resistance and elastic modulus values in the 600-700°F temperature range and are used in jet engine castings, supersonic air-frame constructions and satellite rockets where high temperature service is required.

Thoriated tungsten (tungsten containing 1 to 2% ThO_2) is used as a filament in electron tubes and as non-consumable electrodes in inert gas-shielded arc welding.

Lindsay is the oldest and largest producer of thorium compounds for the government and private industry but we don't make thorium metal. Naturally, since we've been in the business 54 years, we've learned a good deal about this remarkable, versatile element. Data is available to you and the counsel of our technical staff is yours for the asking.

We feel certain that thorium has enormous potentials in a variety of industries and we want to share our knowledge with you. If you think that thorium chemicals may be useful in improving one or more of your products or processes – or in the development of new products – let us be of help.





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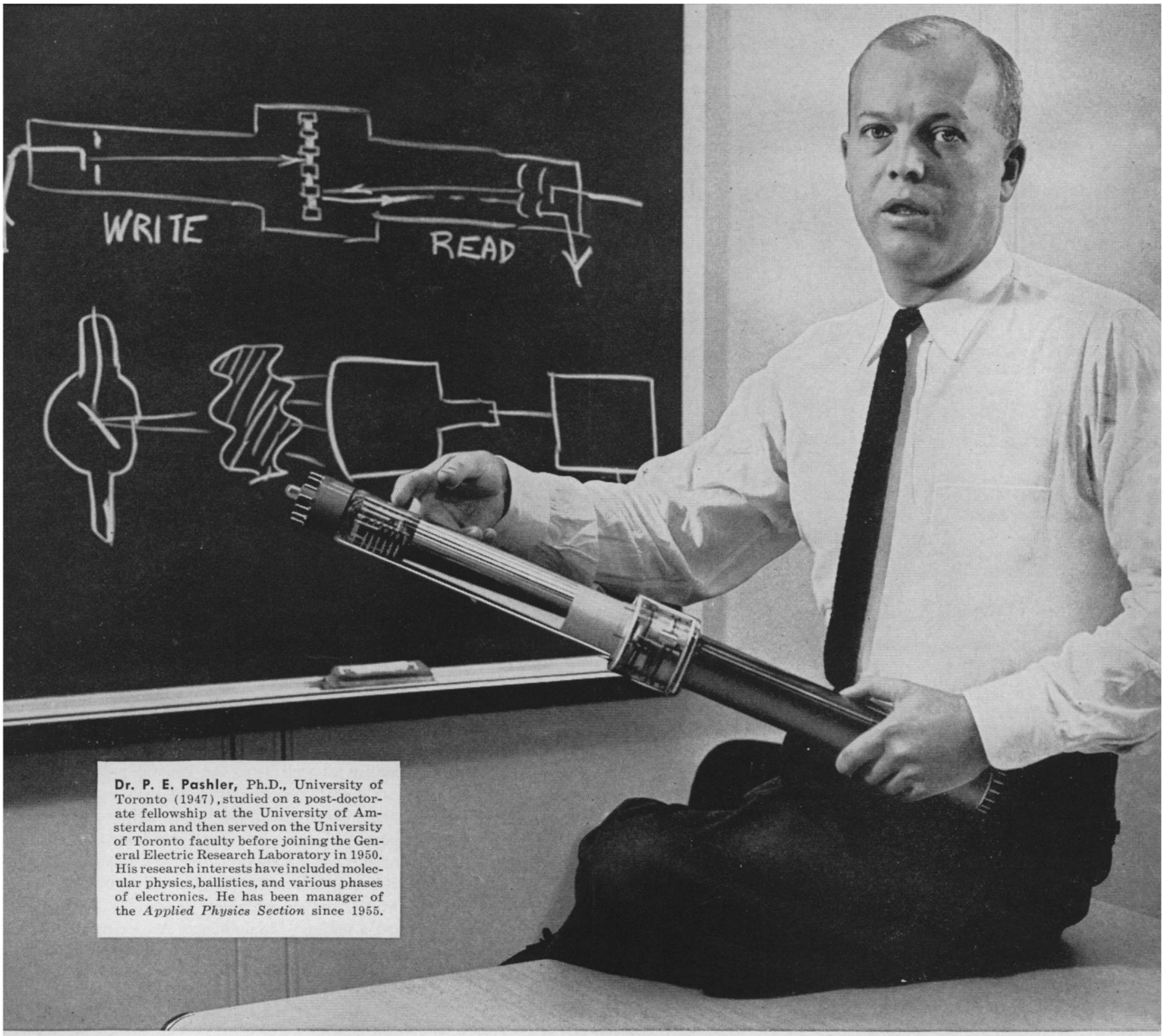

Dr. P. E. Pashler, Ph.D., University of Toronto (1947), studied on a post-doctorate fellowship at the University of Amsterdam and then served on the University of Toronto faculty before joining the General Electric Research Laboratory in 1950. His research interests have included molecular physics, ballistics, and various phases of electronics. He has been manager of the *Applied Physics Section* since 1955.

Making electrons more versatile

Dr. P. E. Pashler of General Electric studies the basic phenomena associated with electronic devices

Hearing, speaking, and seeing are among the "human" functions that electronic equipment has been performing since the birth of radio and television. Newer electronic systems demand devices that also can read, write, remember, and calculate.

Dr. P. E. Pashler and a group of his associates at the General Electric Research Laboratory are seeking a better understanding of the basic principles of electronic materials and devices through studies of such fundamental phenomena as secondary electron emission and noise in electron tubes.

Among the recent accomplishments of Dr. Pashler's *Applied Physics Section* are the improvement of photoconductors to give camera tubes the special sensitivity and quick response required for x-ray television, and the development of an information storage tube with a tiny memory cell only an inch square that will remember nearly a million "bits" of information.

As we see it, providing scientists with freedom and incentive to extend the frontiers of knowledge is fundamental to the creation of better products, better jobs, and more opportunities for human satisfactions.

Progress Is Our Most Important Product

GENERAL ELECTRIC