METALLURGY

New Revolutionary Alloy

Scientists at Naval Ordnance Laboratory develop a non-critical, heat-resistant alloy that has been termed "universal." Great impact upon metallurgical field foreseen.

➤ SCIENTISTS AT the Naval Ordnance Laboratory have stumbled upon a revolutionary, non-critical, heat-resistant alloy that opens a whole new field to the metallurgist and jet-airplane engineer.

Known as Thermenol, "this universal alloy some day may be as common as iron and may replace some stainless steels in jet engines," Carroll W. Lufcy, head of NOL's magnetics division, told the 40 teen-aged winners of the nationwide Science Talent Search when they visited the laboratory at White Oak, Md.

Thermenol is expected to have a great impact upon the field of metallurgy, because it does not require critically scarce nickel, cobalt or chromium as alloying materials. Instead, small quantities of vanadium or molybdenum, both of which are abundant in the United States, are added to an alloy of iron and aluminum to produce Thermenol.

While running routine tests on 16-Alfenol, a rock-hard magnetic metal which the laboratory learned to roll last year (see SNL, March 7, 1953, p. 150), NOL metallurgists J. F. Nachman and W. F. Buehler noticed its high heat-resistant properties. Working with Mr. Lufcy, the two young scientists probed 16-Alfenol to see what would happen when non-critical materials were used to alloy it.

They produced an alloy which had amazing qualities: it was lightweight; it resisted heat and corrosion; it retained much of its strength at high temperatures, yet it required no high-priced, critically scarce ingredients. The NOL scientists concluded that their new metal was better than some stainless steels.

A sample was rushed to the Lewis Flight Propulsion Laboratory in Cleveland, Ohio, operated by the National Advisory Committee for Aeronautics. Experiments there verified NOL's almost unbelievable findings. The NACA pronounced Thermenol "better than some forms of stainless steel being used widely in the aircraft industry today."

"The metal offers definite possibilities of being a substitute for some of the high-temperature alloys now used in jet engines," Mr. Lufcy said. "We don't know what industry will eventually do with it but it is a natural for such things as airplane, truck and automobile exhaust systems where hot, corrosive gases must be handled.

"It also seems to offer great promise as a heating-element material for coffee makers, electric ranges, toasters and commercial annealing and heat-treating furnaces," he said. "This is because its electrical resistivity is 50% higher than that of the more expensive nickel-chromium alloys now used in these heating elements."

The metal is 20% to 25% lighter than stainless steel. Coupled with its strength and its heat and corrosion resistant properties, this quality makes it a likely candidate for use in jet tail cones and in other areas of the engine which are subjected to scorching temperatures.

It would not only reduce the weight of the jet plane, but would simultaneously release scarce nickel, cobalt and chromium for other uses. These three metals have been in short supply since World War II.

"As far as cost is concerned," Mr. Lufcy said, "the raw materials of Thermenol are less expensive than for stainless steels. However, Thermenol requires a modified manufacturing process. If industry can get set up to mass produce Thermenol, stainless steel just will not be able to compete with it because of Thermenol's low-cost, non-critical components."

The NOL magnetics division is excited over the possibilities created by Thermenol. For the first time, a good alloy has been made with easy-to-get elements. Thermenol opens the door to a whole new field in metallurgy. It is the first of a completely new family of alloys.

Science News Letter, March 6, 1954

METALLURGY

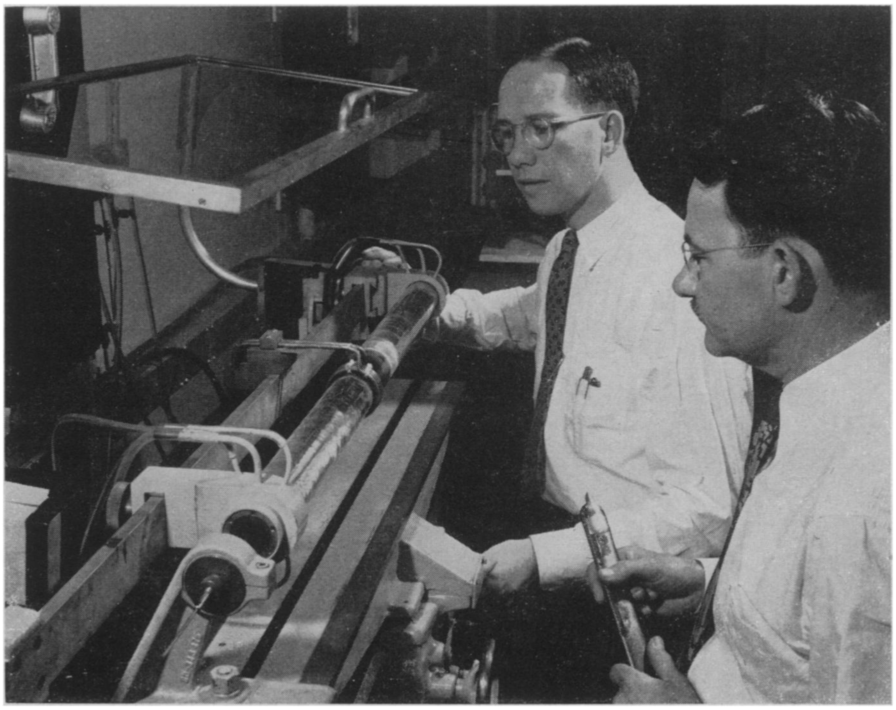
Hot Leap Moves Germanium to Purity

➤ MELTED IN moving sections by jumping through a hoop of hot wire, the wonder metal germanium rids itself of impurities as it goes, in a new process just announced.

The improved purification method, useful for the controlled blend of pure germanium with traces of other specific elements essential for transistor construction, was invented by W. G. Pfann of Bell Laboratories.

As an ingot of germanium passes through a hoop of induction heating wire in this process, a narrow band of the germanium melts and its impurities are dissolved in the liquid zone as it moves the length of the metal bar. Only one part in ten billion of anything but germanium remains, while other material becomes concentrated at the end of the bar. This end is then sawed off, leaving the pure germanium ready for final reworking into transistor material.

Science News Letter, March 6, 1954



PURITY INSURED—A new and simple refining method developed at Bell Telephone Laboratories melts germanium in moving sections, the ingot passing through a hoop of induction heating wire. In the photograph, W. G. Pfann, left, inventor of the "zone-melting" process, is shown operating the refining equipment, while J. H. Scaff holds a large single crystal of germanium purified by this technique.