ENGINEERING

# Dye Shows Metal Flaws

**Fluorescense detects defects in war metals. New method is more sensitive than old procedure. New alloying methods also reported at meeting of Society for Metals.**

➤ HOW MINUTE cracks, porosity and surface blow holes in metals, invisible to the eye and to X-rays, can be beautifully shown up by use of a fluorescent dye and ultraviolet light, was shown to the American Society for Metals meeting in Cleveland, by Taber de Forest, research engineer of the Manaflux Corporation of Chicago.

The method is far more sensitive, Mr. de Forest said, than the old kerosene and whitewash method that has been used for this purpose. The liquid which carries the dye penetrates the minutest cracks by capillary attraction, and is washed off from the rest of the surface by plain water.

It is true that either of these methods reveals only cracks that reach the surface, but deep-seated defects, Mr. de Forest said, are often connected with the surface by a network of capillary cracks. Fatigue cracks, it is known, originate on the surface, and shrinkage cracks of castings often appear there. Besides, a small crack is often the starting point of a later failure.

These small cracks are not revealed by X-rays because only a relatively spacious void will show up.

*Science News Letter, October 24, 1942*

## Diffusion of Metals

➤ A SIMPLER and faster method for observing the rate at which one solid metal diffuses into another, an important matter in many practical fields, was described at the American Society for Metals meeting by Howard S. Coleman and Henry L. Yeagley, physicists of the Pennsylvania State College, State College, Pa.

An extremely thin film of the one metal was condensed on the surface of a microscope slide, and a similar film of the other metal deposited on top of it. Such extremely thin films are semi-transparent. The reflecting power of the contact surface between the two metals was measured and recorded continuously by a photoelectric method, using a powerful automobile headlight as a source of light. As the one metal diffused into the other, the reflecting power of the surface diminished, and was shown by a drooping curve. In some cases the experimenters declared, a test could be made in five minutes.

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## New Alloys Made

➤ A NEW method of making alloys of metals that do not mix when melted, and therefore cannot be alloyed in this manner, was described in a paper by M. L. Samuels, A. R. Elsea and K. Grube, research metallurgists of the Battelle Memorial Institute of Columbus, Ohio, presented at the meeting of the American Society for Metals.

For example, aluminum and lead when melted do not dissolve in each other. However well the mixture is stirred, when it solidifies nearly all the lead is found at the bottom, nearly all the aluminum on top, since lead is more than four times as heavy as aluminum.

But aluminum and tin do mix well when melted. On cooling, the aluminum, having the higher melting point, solidifies first in tree-like forms that interlace throughout the mixture. The spaces between are filled with the still molten tin. On further cooling, the tin solidifies and an alloy is produced in which the two metals are well and uniformly mixed throughout the mass.

The experimenters have found that this aluminum-tin alloy can be converted into an equally good aluminum-lead alloy by displacing the tin with lead. To do this, the alloy is heated in a pot to a temperature which melts the tin but not the aluminum. Molten lead is then poured on top, and seeps into the metal, pushing the tin before it. The latter runs out through a hole in the bottom of the pot. In this way, an aluminum-lead alloy is produced having the same intermixture of metals that the aluminum-tin alloy had.

The method is applicable not only to metals that do not mix at all, but also to those that do not mix well enough to produce a good alloy, thus opening the way to improving these alloys. Thus copper and tin, when the tin content is high, do not mix well. By first making an alloy of copper and bismuth, and later replacing the bismuth with tin, the experimenters succeeded in producing a superior and hard alloy. In fact, they produced a number of impossible alloys, and improved several difficult ones.

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## ● RADIO

***Saturday, October 31, 1:30 p.m., EWT***

**"Adventures in Science," with Watson Davis, director of Science Service, over Columbia Broadcasting System.**

**Dr. Eugene P. Pendergrass, of the University of Pennsylvania, will describe new research on X-ray.**

***Tuesday, October 27, 7:30 p.m., EWT***

**Science Clubs of America programs over WRUL, Boston, on 6.04, 9.70 and 11.73 megacycles.**

**One in a series of regular periods, over this short wave station to serve science clubs, particularly in the high schools, throughout the Americas. Have your science group listen in at this time.**

***Monday, October 26, 9:15 a.m., EWT***
***Repeated at 1:30 p.m., PWT***

**Science at Work, School of the Air of the Americas over the Columbia Broadcasting System, presented in cooperation with the National Education Association, Science Service and Science Clubs of America.**

**"Liquid Power" will be the subject of the program.**

AERONAUTICS

## View on Cover Shows Test In Engine Research Lab

### See Front Cover

➤ AN INSIDE view of the engine propeller test chamber of the new Aircraft Engine Research Laboratory of the National Advisory Committee for Aeronautics is given in the picture on the front cover of this week's SCIENCE NEWS LETTER. The mighty wind stirred up by the propeller gives information about what its performance will be in an actual airplane. Many other tests are made at this great plant to insure that our airmen get engines as nearly perfect as possible.

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