METALLURGY

New Research Field

"Fractography," the study at high magnification of the structure of fractures in metals, may enable metallurgists to enter a little-known field of science.

➤ FIRST facts about "fractography," a new technique that may enable metallurgists to enter a virtually unexplored field of science, the study at high magnification of the structure of fractures in metals, were revealed by Carl A. Zapffe and Mason Clogg, Jr., of the Rustless Iron and Steel Corporation, Baltimore, at the meeting of the American Society for Metals.

Fractography, a word coined by the authors, is defined as, "the micrographic study of cleavage facets on fractured metal specimens."

Cleavage facets are minute flat surfaces which make up the cleavage plane along which the fracture takes place. Cleavage planes, several sets of parallel planes, are present in pure metals, such as iron, and in rocks. When iron is broken, the fracture or splitting usually takes place along the cleavage planes.

Imagine slicing a wooden block horizontally and vertically to form smaller cubes, then cutting the small cubes up into still smaller cubes, and so on indefinitely. The slicing or cutting planes correspond to cleavage planes.

To date, the authors pointed out, all the known information about fractures is based upon observations made with the naked eye or low-power microscopes. The fracture of a metal, which causes it to break down, holds much information for the metallurgist. Brittle fractures, fractures caused by fatigue, corrosion, and other types of failure, all have their own individual characteristics and stories to tell.

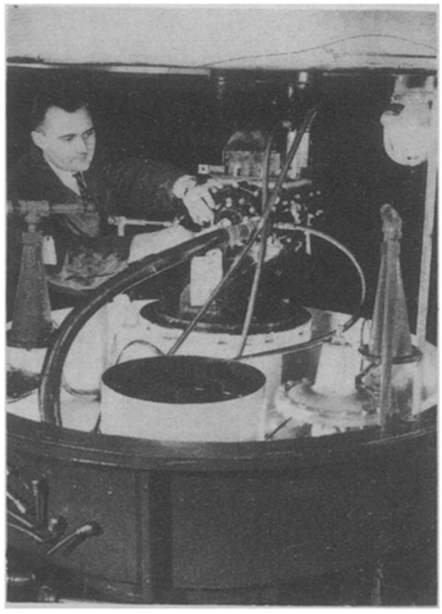
The technique of fractography, as described by the authors, requires three operations. First, the specimen of metal to be examined is fractured by impact or some other means. A mere chip of metal is satisfactory for fractographic examination. Next, one of the individual facets is selected for examination with the aid of a magnifying glass. The specimen is mounted in between clamps with the facet to be studied at right angles to the axis of the microscope on a simple orienting mechanism which is fitted onto the stage of the microscope. Finally, any raised spots on the surface of the specimen which interfere with bringing the objective lens of the microscope into contact with the metal specimen are removed with an electric hand-grinder.

"Probably a principal use of fractography will develop around expanding our information on known structures (by observing them under new conditions)," they stated.

General advantages of fractography as reviewed by the authors include: the fact that odd sizes, shapes, and tiny fragments unsuited to regular examination may be studied; saving of time by avoiding mounting, polishing and etching before examination; the plane of weakness, which is often of greatest interest in studying the failure of metals, is the plane which is observed; observation of structures new to science, which cannot be studied with other present day methods; seeing the specimen in its natural state, disclosing true structure without the effects of polishing and etching.

Through use of fractography, metallurgists may be able to explain why metals with certain types of fracture structures have definite physical properties.

Science News Letter, October 28, 1944



CARBURETORS TESTED—Under simulated flying conditions, this device tests carburetors for Wright Cyclone airplane engines. The hood of the airbox is raised here, with carburetor in place and air and fuel lines attached; when fastened shut, atmospheric conditions at various altitudes can be accurately reproduced. Protecting the tricky operation from fire is the job of the "witches' hats," seen at either side.

ENGINEERING

Coming Age of Rocket Power Is Predicted

➤ THE COMING age of rockets, in which vehicles on land, sea, and air will be powered by rockets, jet propulsion, and gas turbines was pictured by G. Edward Pendray, assistant to the president of the Westinghouse Electric & Manufacturing Co., at a meeting of the Potomac section of the American Society of Tool Engineers in Washington.

Large, fast, high-flying airplanes propelled by jets and rockets, long range rockets that will break into the stratosphere to record weather information, and mail-carrying rockets will be common in the future, stated Mr. Pendray, who is a founder and secretary of the American Rocket Society.

Jet propulsion engines and gas turbines such as are used on warplanes and the Nazi "buzz-bombs" are just as much true rockets as the bazooka projectile, or the airborne rockets, he pointed out.

Five forms of rocket power will eventually come into widespread civilian and peacetime use, Mr. Pendray commented. These include dry fuel, liquid fuel, thermal-jet engine, and two forms of duct engines, intermittent and continuous. The dry and liquid fuels are used today for giving power to rocket projectiles. The remaining three are used primarily on aircraft. The intermittent duct engine is the type which the Nazis used on the famous "buzz" bombs, he stated.

Dr. Robert H. Goddard was referred to by Mr. Pendray as the father of modern rocket science. In 1919, Dr. Goddard published a paper, "A Method of Reaching Extreme Altitudes," which laid the foundation for most of the research which has resulted in our present-day rockets. He was the first to build a liquid fuel rocket, and has continued to conduct experiments in the field for more than a quarter century.

There is no immediate prospect of rockets carrying human cargoes, although rocket-assisted planes may attain speeds approaching 1,500 miles an hour, Mr. Pendray reported.

Science News Letter, October 28, 1944