

## TECHNOLOGY

# Very Accurate Measuring

Practical equipment for comparing lengths to the nearest ten-millionth of an inch, developed at National Bureau of Standards, will be used to check industry's master gage blocks.

► DIFFERENCES of only a ten-millionth of an inch, or about one-thousandth the thickness of a human hair, can be accurately measured using an instrument developed by the National Bureau of Standards.

The device uses light waves as "measuring sticks" to determine the difference in length of two gage blocks, which are precision measuring instruments.

Practical equipment for comparing lengths to the nearest ten-millionth of an inch has been greatly needed because of the extremely small tolerances required for parts used in guided missiles, jet aircraft, machine tools and other precision instruments.

Theodore R. Young and James B. Saunders designed the device to check the length of industry's master gage blocks, which control the tolerances of mass-produced machine parts. It was exhibited to industry representatives at a Conference on Gage Block Research in Washington. Regular appropriated funds for its development were supplemented by grants from ten manufacturers.

Dr. Allen V. Astin, the Bureau's director, said the program's objectives were to develop instruments and methods to enable the Bureau to certify master gage blocks to the nearest ten-millionth of an inch, and to develop more stable alloys for gage blocks so that measured length will remain more nearly the same.

A gage block is a rectangular block of a hard metal, usually steel, whose opposite faces are precisely ground and polished so they are parallel and a given distance apart.

Mass production of mechanical parts depends on the accuracy of the calipers and micrometers used in the shop. These instruments are checked by the manufacturing company against its master gage blocks, which in turn are periodically submitted to the National Bureau of Standards for checking against standard gage blocks. The Bureau's blocks are linked back to the national standard of length, the platinum-iridium meter bar, which is kept in a vault.

Master gage blocks are now certified to an accuracy of the nearest millionth of an inch for inch-long blocks.

To the manufacturer of machines and tools, a set of precision gage blocks in various sizes is as indispensable as are the square and rule to the carpenter or measuring tape to the surveyor. Without accurately calibrated gage blocks, mass production of interchangeable parts, such as automotive cylinders and pistons, would not be possible.

Dr. Astin said a major problem yet to be solved is the development of means for the "absolute" measurement, to the

nearest ten-millionth of an inch, of the primary standard gage blocks with which the Bureau compares industry's master gage blocks.

The absolute measurement will involve comparing the entire length of the gage block with light wavelengths. This measurement will be much more difficult than comparison of two gage blocks.

For one thing, a much longer distance must be compared with light waves. Also, extremely accurate control of temperature, air pressure, and other conditions will be necessary.

As mechanized industry becomes steadily more complex, the tolerances that can be permitted in machine parts is continually decreasing.

Manufacturing firms supporting the Bureau's gage block research program are E. I. duPont de Nemours & Co., Greenfield Tap and Die Corporation, Hughes Aircraft Co., the Taft-Peirce Manufacturing Co., the Timken Roller Bearing Co., the Van Keuren Co., the Sheffield Corporation, the DoAll Co., Dearborn Gage Co., and Pratt and Whitney Division of Niles-Bement-Pond Co.

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**PRECISE DEVICE**—This accurate measuring instrument was developed at the National Bureau of Standards for comparing lengths of gage blocks to the nearest ten-millionth of an inch. Theodore R. Young, one of the scientists who designed the device, is shown demonstrating its use.

## ● RADIO

Saturday, September 8, 1956, 1:45-2:00 p.m. EDT

"Adventures in Science" with Watson Davis, director of Science Service, over CBS Radio Network. Check your local CBS station.

Dr. Armand Spitz, director of Spitz Laboratories and inventor of the Spitz Planetarium, coordinator of Visual Satellite Observations of the Smithsonian Astrophysical Observatory, will discuss "Seeing Satellites."

## MANPOWER

### Rare Trumpeter Swans Dyed Yellow in Oregon

► SIX TRUMPETER SWANS have been dyed yellow so their dispersion pattern may be traced if they leave the Malheur Waterfowl Refuge, Burns, Oreg.

The trumpeter, biggest of our North American waterfowl, was near extinction 20 years ago. At that time only 73 of the big birds could be counted. With careful watching, the trumpeter flock has grown to over 600, according to the U. S. Fish and Wildlife Service.

The yellow dye is part of the control program. Observers have reported the low-flying swans, with their six-foot wing spread, migrating between nesting areas in the United States and Canada.

Science News Letter, September 1, 1956

## ENTOMOLOGY

### Mosquitoes Resist DDT With Same Enzyme as Fly

► MOSQUITOES resist DDT with the same enzyme that house flies use to detoxify the insecticide.

Large amounts of DDT dehydrochlorinase, commonly called DDE, have been found in mosquitoes from Florida and Spain, two scientists report in *Nature* (Aug. 18).

The two groups of mosquitoes, both DDT-resistant, were compared with non-resistant mosquitoes from other areas. The non-resistant strains produced insignificant amounts of DDE, but the resistant insects produced enough of the enzyme to enable them to counteract DDT.

Each larva of resistant yellow fever mosquitoes produced an average of about one-fourth as much DDE as an average resistant house fly, which weighs about four times as much.

Further research showed that mosquitoes produce the enzyme under different conditions than house flies. Additional study is expected to reveal the nature of these conditions.

The investigation was carried out by Dr. A. W. A. Brown of the University of Western Ontario, London, Ontario, and A. S. Perry of the U. S. Public Health Service Technical Development Laboratories in Savannah, Ga.

Results of their studies are being made available in a report to the World Health Organization.

Science News Letter, September 1, 1956