

# Device Guides Missiles

(Continued from page 259)

as the Schuler-tuned pendulum, which can indicate the vertical regardless of the acceleration of the aircraft with respect to the earth.

Schuler-tuned pendulums are based on a principle first proposed by Dr. M. Schuler of Germany more than 30 years ago. The devices developed by the Instrumentation Laboratory employ accelerometers in a complicated feedback design.

The inertial guidance system can determine the latitude and longitude of the aircraft by measuring the angle between the vertical at the beginning of the flight, indicated by the gyroscope, and the vertical at any moment during the flight, indicated by the Schuler-tuned pendulum, and using a clock to correct for the rotation of the earth. The system determines position automatically and continuously, and guides the aircraft to its destination.

The gyroscopes and pendulums used in inertial guidance are complex and fantastically precise instruments. The smallest one shown in the diagram (see p. 259) is no bigger than a medium sized spool of thread.

The gyroscope is a delicate gyro wheel, enclosed in a complicated double shell.

Constructed with greater precision than a fine watch, it forms a unit about the size of a tomato can, called a HIG (Hermetically-sealed Integrating Gyro). The electrically driven gyro wheel spins at a rate of 12,000 revolutions per minute, which is fast, but not extremely fast. The wheel is enclosed in an inner cylinder, which is called a float.

A thin layer of heavy, molasses-like fluid fills the space between the float and the outer cylinder, and the float actually floats in the fluid. Because the float is suspended in fluid, it pivots on sapphire bearings that are virtually frictionless.

The floated gyro is far more accurate than any other kind of gyro, and constitutes a major advance in gyro technology.

Three gyros are used, mounted in a package with their spin axes at right angles to each other. The package is mounted on gimbals so that it can rotate freely in all directions.

The three accelerometers used in the Schuler-tuned pendulum are mounted in a package of similar shape and size.

Other parts of the inertial guidance system make allowance for the roll, pitch and yaw of the aircraft, and calculate automatically the earth's rotation.

Science News Letter, April 27, 1957

## MEDICINE

# Measure Blood Flow

► MEASURING abdominal blood flow may disclose what happens to the body's circulation during serious shock, members of the New York Heart Association's annual science writers' tour learned from Dr. Stanley E. Bradley, Columbia University College of Physicians and Surgeons.

Dr. Bradley and his associates have worked on blood flow for 12 years and have developed widely used techniques for measuring the blood in the viscera, the abdominal area that includes the digestive tract, pancreas, spleen and liver.

In their present study of shock for the U. S. Army, Dr. Bradley's group hopes to find out if this visceral blood flow falls down in patients undergoing shock. One theory is that the visceral "bed" may dilate or expand, trap blood and cause the injured person to "bleed into it." There is not much evidence so far that this occurs but such "trapping" might be found elsewhere in the body, they reported.

The viscera holds about 20% of the body's blood volume and is the area for food digestion and waste elimination. It also plays an important part in blood circulation, probably being the reservoir from which the body sends supplies of blood to meet the crisis of hemorrhage, or bleeding.

Some researchers believe that after severe

hemorrhage, too much blood may accumulate in the abdomen and result in irreversible shock.

By tracing the path of blood through the viscera with radioactive iodine, Dr. Bradley found that about one and a half quarts of blood are held in this area. This entire amount is estimated to be completely changed about once a minute, he reported.

Science News Letter, April 27, 1957

## Do You Know?

Cooking utensils, sink tops and other household items that are often made of stainless steel may in a few years be made of *titanium*.

The worst U. S. outbreak of *gypsy moth* on record occurred in 1953, possibly due in part to hurricanes along the New England coast in 1948 that carried caterpillars to previously uninfested areas.

*Witchweed*, a small, harmless-looking weed with reddish flowers, does its damage below ground, by penetrating the host plants' roots.

## YOUR HAIR and Its Care

By Oscar L. Levin, M.D.  
and Howard T. Behrman, M.D.

If you want healthy hair, lovely hair, then you need the expert advice in this book.

Two medical specialists have here pooled their knowledge to give you in plain language the up-to-date scientific facts now available about hair. They tell you what to do (and what not!) to save and beautify your hair, stimulate healthier hair growth, and deal with many problems, common and uncommon, as:

**Dandruff—gray hair—thinning hair—care of the scalp—baldness—abnormal types of hair—excessive oiliness—brittle dryness—hair falling out—infection—parasites—hair hygiene, etc., etc.**

Medical science is better equipped today than ever before to prevent trouble above the hair line; or, should some difficulty already have arisen, to deal effectively with it.

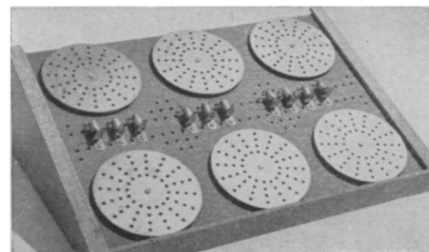
"A worthwhile book full of important information."  
—Ohio State Medical Journal

price \$2.50, incl. postage. 6-day-Money-Back Guarantee  
EMERSON BOOKS, Inc., Dept. 36-L  
251 W. 19th Street, New York 11

## "QUOTES"

"It has been a pleasant surprise to find how many research directors read SCIENCE NEWS LETTER, as indicated by responses to our ads!"—New York

## Can you think faster than this Machine?



Control Panel of GENIAC set up to do a problem in check valve research.

Be careful before you answer. GENIAC, the first electrical brain construction kit, is equipped to play tic-tac-toe, cipher and encipher codes, convert from binary to decimal, reason in syllogisms, as well as add, subtract, multiply and divide. Specific problems in a variety of fields—actuarial, policy claim settlement, physics, etc., can be set up and solved with the components. Connections are solderless and are completely explained with templates in the manual. This covers 33 circuits and shows how new ones can be designed.

You will find building and using GENIACs a wonderful experience; one kit user wrote us: "this kit has opened up a new world of thinking to me." You actually see how computing, problem solving, and game play (Tic-tac-toe, nim, etc.) can be analyzed with Boolean Algebra and the algebraic solutions transformed directly into current diagrams. You create from over 400 specially designed and manufactured components a machine that solves problems faster than you can express them.

SEND for your GENIAC kit now. Only \$19.95 with over four hundred components and parts, fully illustrated manual and wiring diagrams. We guarantee that if you do not want to keep GENIAC after one week you can return it for full refund plus shipping costs.

MAIL THIS COUPON  
SCIENCE KITS, Dept. SL 47-D, Oliver Garfield Co.  
126 Lexington Ave., N. Y.

Please send me:  
1 GENIAC Electric Brain Construction Kit and Manual

\$19.95 (East of Mississippi) .....  
\$20.95 (Elsewhere in United States) .....  
\$21.95 (Outside the United States) .....