

OPTICS

Electronic "Brain"

A new computing gunsight increases the effective range of the Air Forces machine guns, giving them an accuracy approaching that of stationary guns.

► A NEW electronic computing gunsight that increases the effective range of the Army Air Forces' .50-caliber machine guns, making it possible for gunners to shoot down the fastest enemy planes with an accuracy approaching that of stationary guns firing at stationary targets, was revealed by Erwin Hale, engineer in charge of airborne fire control instruments of the Fairchild Camera and Instrument Corporation, New York, at the meeting of the Institute of the Aeronautical Sciences, held in Dayton.

The newest of the "electronic brains", designated by the Army as the "K-8" gunsight, was invented jointly by Mr. Hale and Irving Doyle, another Fairchild engineer. It extends the effective range of .50-caliber machine guns mounted on aircraft to more than 1,000 yards. As much as 50% to 90% as many hits have been obtained with the K-8 as when firing at a stationary target from a stationary platform, Mr. Hale reported.

"When it is realized that a pursuit ship must come within 200 to 400 yards of a bomber in order to score effective hits, it is readily apparent that the K-8 provides a really deadly defense against pursuit attack," Mr. Hale remarked.

Installed in aircraft gun turrets, the K-8's provide the correct deflection between the line of sight and the guns to insure hits on enemy aircraft. It is only necessary for the gunner to keep the ring of light in the sight lined up with the target to set up the correct deflection of the gun to compensate for all factors which affect the course of the bullet in flight and to provide the necessary lead to compensate for the enemy aircraft's relative velocity.

All computations are made electrically, and the final voltage representing the desired offset between the line of sight and the gun is then sent to an electronic servo system, which adjusts the guns to the desired offset.

In referring to the differences between the Fairchild sight and the similar type of gunsight developed by the British and now in production in this country, Mr. Hale stated that because development of the British sight began at a later date

than the Fairchild sight it "does not provide as complete a solution to the problem."

Electronic gunsights cost less to manufacture than mechanical gunsights, Mr. Hale pointed out, since many parts of the electrical computer are standard radio equipment and a large part of the assembly work consists of wiring up the various units in proper combination, requiring less skilled help than is needed for mechanical sights.

Another advantage of the electronic gunsight is that computations are made instantaneously, a matter of great importance when the gunner is dealing with enemy aircraft moving at speeds of 300 to 400 miles an hour, and bullet velocities of 2,700 feet a second.

Predicting a postwar use for electronic gunsights, Mr. Hale pointed out that they are adaptable for solving complex

mathematical problems involving several variables which are difficult or impossible to handle by mechanical means. These gunsights can be adapted to obtain accurate solutions to such problems without time lag and with a minimum of equipment and expense.

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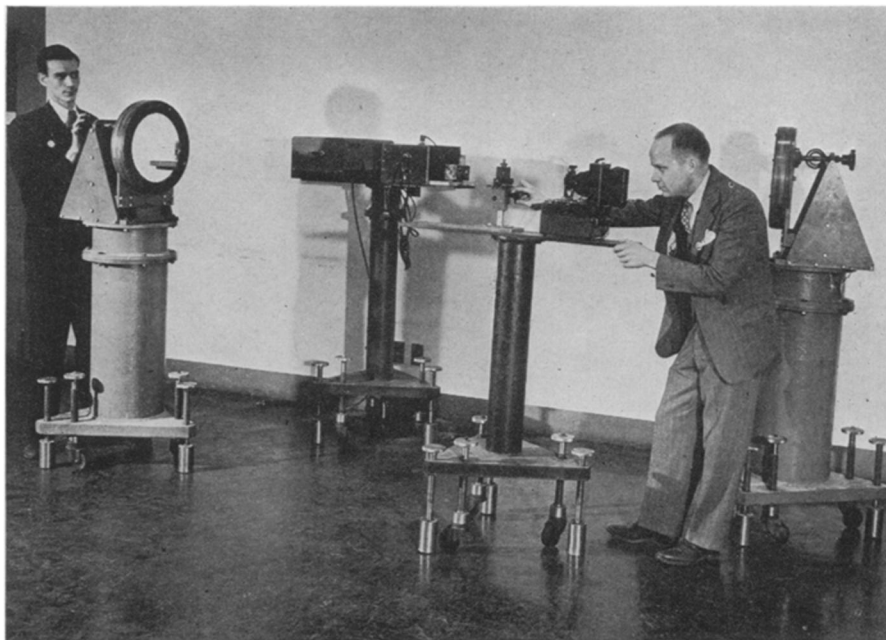
ORDNANCE

New Explosive Bullet Is Subject of Invention

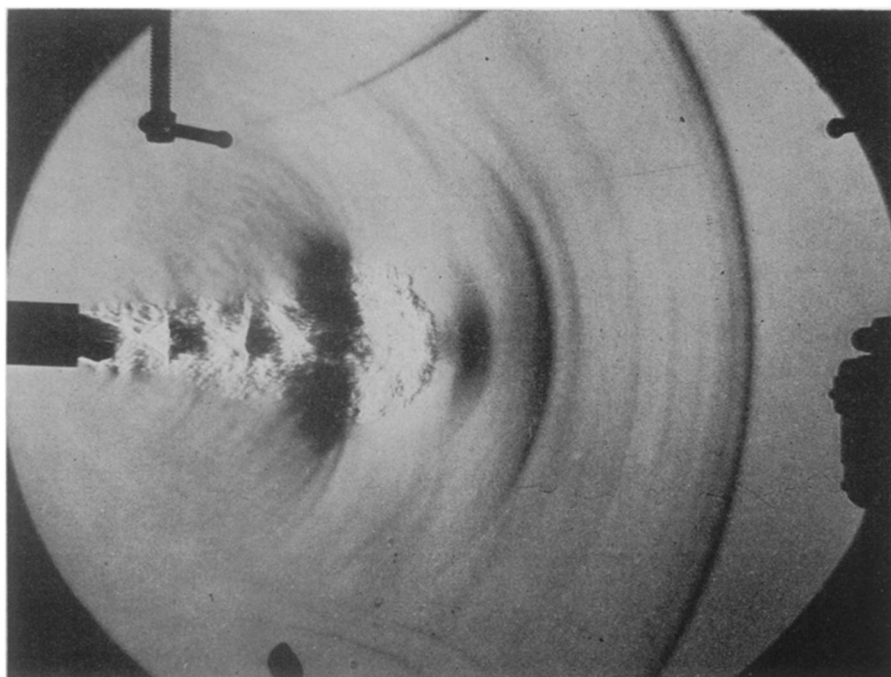
► A NEW type of explosive or incendiary bullet is the joint invention of an officer and a civilian, Col. W. T. Moore, U. S. Army, and Richard N. Nelson of Black River Falls, Wis., employed in the Ordnance Division. The core of a jacketed bullet is made hollow, to receive the explosive charge. Between the core and the nose of the jacket is a small hollow space, through which a small metal capsule containing a detonating cap can move. When the bullet strikes, this detonator snaps forward, strikes the inside of the jacket, explodes and sets off the main charge.

Rights in the patent, No. 2,361,955, are assigned to the government.

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PICTURES THE INVISIBLE—Such invisible things as sound waves, heat and the flow of gases are photographed by the apparatus shown here being adjusted by the two General Electric engineers who developed it. S. Lawrence Bellinger (left), focuses one of two telescope-type, extremely precise mirrors used, while Norman F. Barnes synchronizes the knife-edge assembly which cuts off from the camera all light except that affected by heat and pressure. The process, called the Schlieren photographic process, was used in taking the picture on the opposite page.



BLAST—This is what happens to the air surrounding the muzzle of a gun when it is fired. Coming from the muzzle, shown at left center, are gases that are expelled. Long, dark, curved line shown at the right is the high pressure, or sound, wave. This is produced when the compressed gas in the barrel first begins to expand from the muzzle. The short, black, curved line at the top of the picture is a reflection of the sound wave from a metal plate. This picture was taken in only four-millionths of a second, by the Schlieren process.

PSYCHOLOGY

Morale Builders

➤ SOLDIER morale depends on two things: faith in his leaders and faith that the folks back home are backing him up, not only by buying war bonds but in their attitude and daily behavior, Dr. Edward A. Strecker of Philadelphia, consultant in psychiatry to the surgeons general of both Army and Navy, declared at the meeting of the Chicago Institute of Medicine.

"An army may march to its objective on its belly," he said, "but it takes its objective by its morale."

His contact with soldiers in and from various combat areas leads him to believe that almost irrespective of educational and cultural levels and before giving consideration to questions such as why we are fighting this war, we must satisfy the soldier's urgent need for faith in his leaders and in support from the home front.

"The morale barometer of troops in the field," he said on this last point, "dropped appreciably at the news of the coal and other strikes."

A skeleton neuropsychiatric organization capable of expansion in case of need should be kept in the Army after the war, no matter how small the peacetime Army may be, he said.

The surgeon general should be a member of the General Staff, he urged.

"It is incomprehensible," he declared, "that the surgeon general, who presides over the medical health and care of more than 8,000,000 men, should be under the line, which, if it chooses, may override his judgment in medical matters."

Turning to the future, he declared that the neuropsychiatric experience of this war teaches that we "must learn at once a sounder evaluation of democratic civilization and put it into practice before it is too late."

Although the considerable segment of young men discharged from the Army after a short trial of service and the larger segment rejected at induction are best described as temperamentally unsuited for military life, the records show, Dr. Strecker stated, that the majority had

not adjusted satisfactorily in civilian life.

"One makes no progress at all," he said, "by precipitating arguments as to whether these men are really sick. Of course they are sick, even if there should happen to be a considerable element of malingering in the situation.

"Much more important is it to know what the sickness expresses, its significance for democracy and, if possible, its origin."

Most of these men, he said, are not only unable but unwilling to serve. They show "a profound disturbance of the 'I and You' relationship."

Explaining, he pictured each individual as the center of a series of concentric circles representing his inalienable rights, which eventually expand to a point where they begin to impinge on the circles surrounding other individuals.

"The intermediate mutually held territory between I and You should be and in fact must be a land of fair give and take, of reasonable concession and of decent tolerance. While this area must necessarily have shifting boundaries, yet it is so significant that I do not think it is too much to say that the survival or the death of democracy will depend on a clearer understanding and a more accurate delineation of the I and You relationships enclosed in the area."

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final assembly line, they already carry gas tanks, two-and-a-half-ton main landing gear, and four giant nacelles.

Four assembly lines that move regularly send completed planes out the front door to be tested and flown. On each of these assembly lines a pair of ten-ton overhead cranes carries the 17-ton in-board wing section, all in one piece, and lowers it into place in a slot between the double bomb bay and nose section, with only quarter-inch tolerance. Finally the tail assembly is fitted on and pushed by the same workers who complete the final assembly. The completed B-29, weighing 120,000 pounds, is rolled out through the giant doors of the plant toward its first take-off on the road to Tokio.

There are more women than men employees at the Boeing-Wichita plant where the bulk of the B-29s are being fabricated. Most of the more than a million rivets that go into each plane are driven by women. Many were nurses, schoolteachers, students or housewives.

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