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between the walls. *Salbei* circulates by entering the outer inlet through the double wall, and acts as a coolant before it goes into the combustion chamber proper. This last is effected by six equidistantly spaced holes almost concentric with the three holes in the inner tank holding *Tonka*. The holes meter the delivery rate of fuel to the combustion area, where spontaneous combustion takes place.

Control : The control system for the X-4 shows great similarity to the FX radio-corrected armor-piercing bomb, which was the work of the same designer. The rake-spoilers in the tail fins vibrate five times per second, moving as far as possible to each side with each vibration. Control of flight is effected by the variation of duration of stay at each limit of travel. When no control is applied the spoilers vibrate for equal time-durations to each side. When a turn is desired the spoilers are made to remain longer at one limit of travel with corresponding reduction of time of stay at the opposite limit. The control unit in the aircraft is a small instrument (10 centimeters square) carrying a single control stick which moves forward and back for elevation and from side to side for azimuth correction.

Inside the unit are two drums which revolve at a rate of five times per second. One drum controls elevation and the other controls azimuth. The control stick governs the position of a spring contact along each drum. Each drum is built up of two surfaces so that when the contact is at the mid-point it rests for equal time-durations on each surface, but when moved towards either end there is an increase in contact time on one surface with an equal decrease of contact time on the other surface.

The azimuth drum provides polarity change to a sensitive relay in the X-4 and the elevation drum current change to a second relay. Since current and polarity changes are passed simultaneously down the length of connecting wire, the elevation relay is fed through a rectifier and resistance bridge circuit so that it is unaffected by the polarity changes present in the signal, and reacts only to current change. To allow for voltage drop in the wires connecting aircraft to rocket, 190 volts DC are provided by a small power pack using the 36 volt 500 cycle supply which

runs up the gyro prior to launching. The relays connect the small $1\frac{1}{2}$ watt solenoids in each tail fin to the nine-volt battery carried in the rocket. Time duration to each solenoid depends on the control being applied.

The rocket rotates about its axis at the rate of one rotation per second. This rotation causes symmetrical cancellation of errors in manufacture and consequent simplification of the stabilizing mechanism. If a missile of this kind did not rotate it would require gyro-stabilization both in azimuth and elevation. In this way the X-4 is stabilized in line of flight by a single gyro.

Fixed to the gimbal mount is a segmented commutator. As the rocket rotates, the elevation and azimuth signals are applied to the appropriate fins in cyclic succession. The main segments are 60° with subsidiary segments of 15° spaced by 15° to each side. The application of 15° of counter control inserted in the timing cycle greatly increases the overall stability of the missile.

Launching of the X-4 was intended to be from FW-190 and Me-262 fighters. The one modified X-4 bomb carrier found was of a single-hook electrically-fired type, fitted with a mechanical jettison linkage. The usual fuse-charging arm had a seven-pin socket (fitted in place of a fuse-charging head) to connect with the seven-pin plug on the rocket body. Through this connection current is supplied from the aircraft to spin and decharge the gyro, fire the piercing detonators, arm the fuse and function the fin tip tracer candles. The gyro is spun up some minutes before the rocket is launched by separate control, while remaining operations take place at the instant the pilot of the parent aircraft presses the bomb release switch to launch the missile.

The carrier is also fitted with two arms, one on either side of the rear of the carrier frame to which the pull-off connections from the wire spools are attached. The plug-in connections of the spools are attached near the carrier to the underside of the aircraft mainplane. It is expected that the carriers would be fitted outboard of the propeller arc on the FW-190, and on the fuselage or outboard of the jet units of the Me-262.



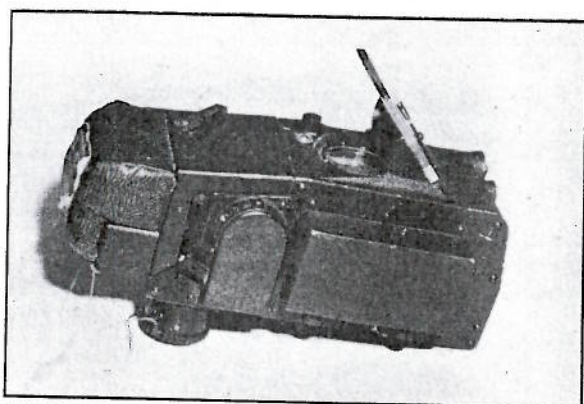
New Compensating Gunsight Found on FW-190 D-9

A GERMAN gyroscopically-controlled, optical, compensating gunsight, similar in principle to American and British gyroscopic gunsights used on fighter aircraft, was found mounted on a FW-190D-9 at Ziegenhain Airfield. It differs from Allied gunsights in that most of the computing mechanism is mounted in the tail of the aircraft instead of being incorporated in the sight head as is the case with equivalent American equipment.

Designated the Revi EZ42A-1, the gunsight con-

sists of three units: a sighting head, pilot's controls, and the computing mechanism.

Sighting Head : This unit is placed in the conventional position for a fixed gunsight in a fighter aircraft, just aft of the windshield and in line with the pilot's eye. It consists of (1) a conventional reflector; (2) a conventional lens; (3) a mirror which may be moved in both elevation and in azimuth by very small electrical-drive motors which are controlled



SIGHTING HEAD OF REVI COMPENSATING SIGHT

by the computing mechanisms; (4) an assembly consisting of a lens, a ground glass in which are etched cross hairs and a variable aperture or iris similar to those used in cameras; and (5) an electric light bulb.

Pilot's Gunsight Controls : The pilot has two sight controls. The first, in which he makes settings to compensate for changes in altitude, is mounted in the cockpit on his left. The other is the range-setting mechanism, which is controlled by a small lever located on the end of the throttle quadrant.

Computing Mechanism : All of the computing units, except those actually incorporated in the sight head, are located in the aft part of the aircraft and mounted on the right-hand wall of the fuselage. The units include two gyroscopes, one mounted with its axis parallel to the line of flight of the aircraft, and the other mounted with its axis parallel

to the vertical axis of the aircraft. These are linked electrically through potentiometers, to a unit containing amplifying tubes, condensers and transformers, to the mirror drive motors. Also associated with the computing mechanism are two motor generator units which are used as a power source either for the gyroscopes or for the mirror drive motors.

Gunsight Operation : For lead, any deviation of the course of the aircraft from a straight line causes one of the gyroscopes to precess. This precession of the gyroscope is proportional to the angular distance by which the target must be led to satisfy the conditions for securing a hit. An indication of the amount of precession of the gyroscope is transmitted electrically, as described briefly above, to the mirror drive motors and causes such angular displacement of the gunsight mirror as is necessary to give the correct lead.

For range, the wingspan of the target aircraft is set into the sight by means of a knob beneath the sight head. The dimensions of the cross hairs as seen by the pilot may be calculated by adjusting the size of the ir's, which is controlled by a small lever on the throttle. If the pilot adjusts the cross hairs so that their dimensions are just equal to the wingspan of the target aircraft as seen through the gunsight, the range problem is solved electrically and the mirror drive motors elevate or depress the mirror accordingly.

Airspeed and Altitude Corrections : These corrections are made by the introduction of a resistance into the mirror drive motor circuit. This resistance is pre-set by the pilot through the use of two rheostats.



Me-328 Is Flying Bomb or Ramming Aircraft

PAPERS found at the Schweyer aircraft factory at Darmstadt reveal some new details of the Me-328, an experimental aircraft noted in SUMMARY No. 66 (page 15), and never reported to have reached an operational stage of development. Had experiments been continued, a development of the Me-328 may have been intended for use as a flying bomb or ramming aircraft.

In March, 1943, Schweyer began an experimental program on the "V" (experimental) series of the Me-328B. The A sub-type is thought to have been used only for static and destruction tests.

In the B sub-types the V-1 was a glider used to flight-test the general design of the series. (This recalls the development of the Me-163, which was originally tested as a glider before the power unit was installed.) The V-2 is powered by two Argus Rohr As-0014 impulse-duct units of 660-pound

thrust. The Argus Rohr firm manufactured the propulsion unit for the FZG 76 flying bomb.

The C sub-type was meant to be fitted with one Jumo 004B-2 turbo-jet unit, but the project was abandoned in October, 1943.

The V-1 of the B sub-types was ready for flight tests in March, 1944, and three months later the V-2 and ten further "V" aircraft were manufactured by Kittelberger of Höchst Bregenz. The document deals only with the B sub-type but lists the features of that aircraft in fairly complete detail.

The fuselage is of semi-monocoque construction and has a plywood skin. The captured information refers to "Polystal" and "Kaurit" as bonding media for the skin. The cockpit had a bullet-resistant windshield and a cockpit cover which could be jettisoned. The pilot's seat was said to be so weak in construction as to endanger the pilot.

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 IN EUROPE
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20 May 1945
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