

# AIR TRAILS

AVIATION FOR EVERYBODY

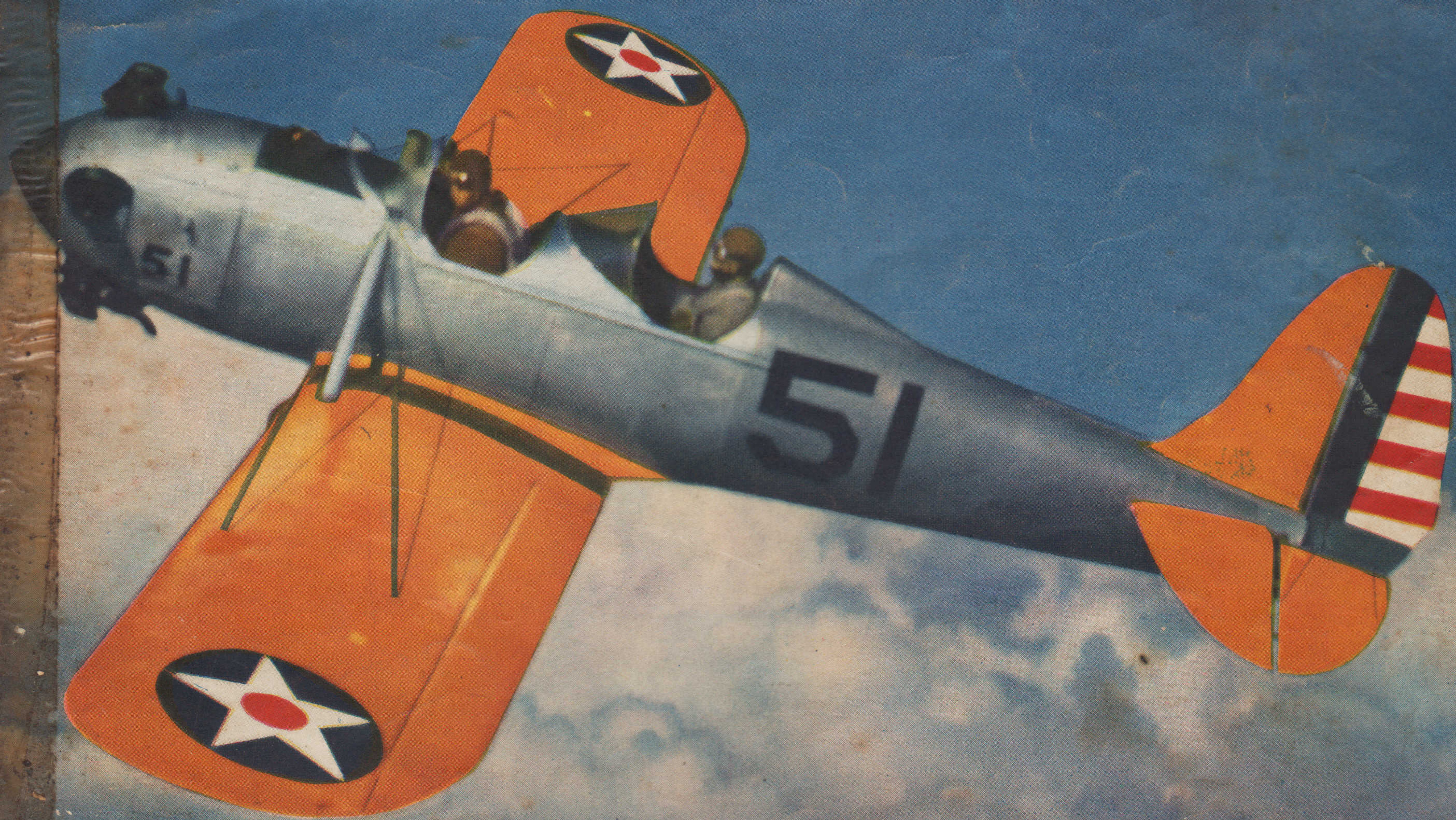
JULY '41

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By the designer of the Airacobra

**JULY**  
1941

**FIFTEEN CENTS**

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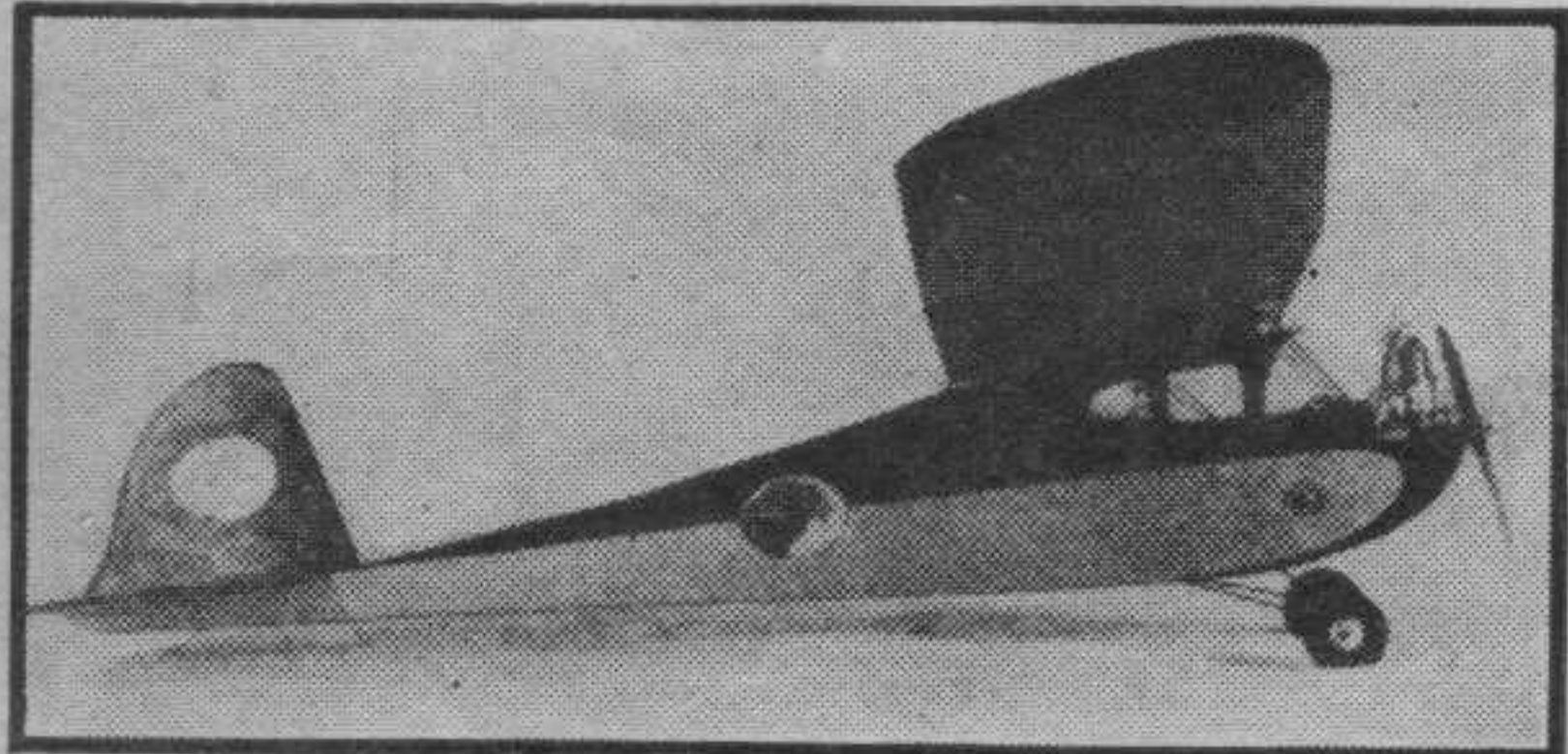




# THOUSANDS SWITCH TO AIRCRAFT KITS

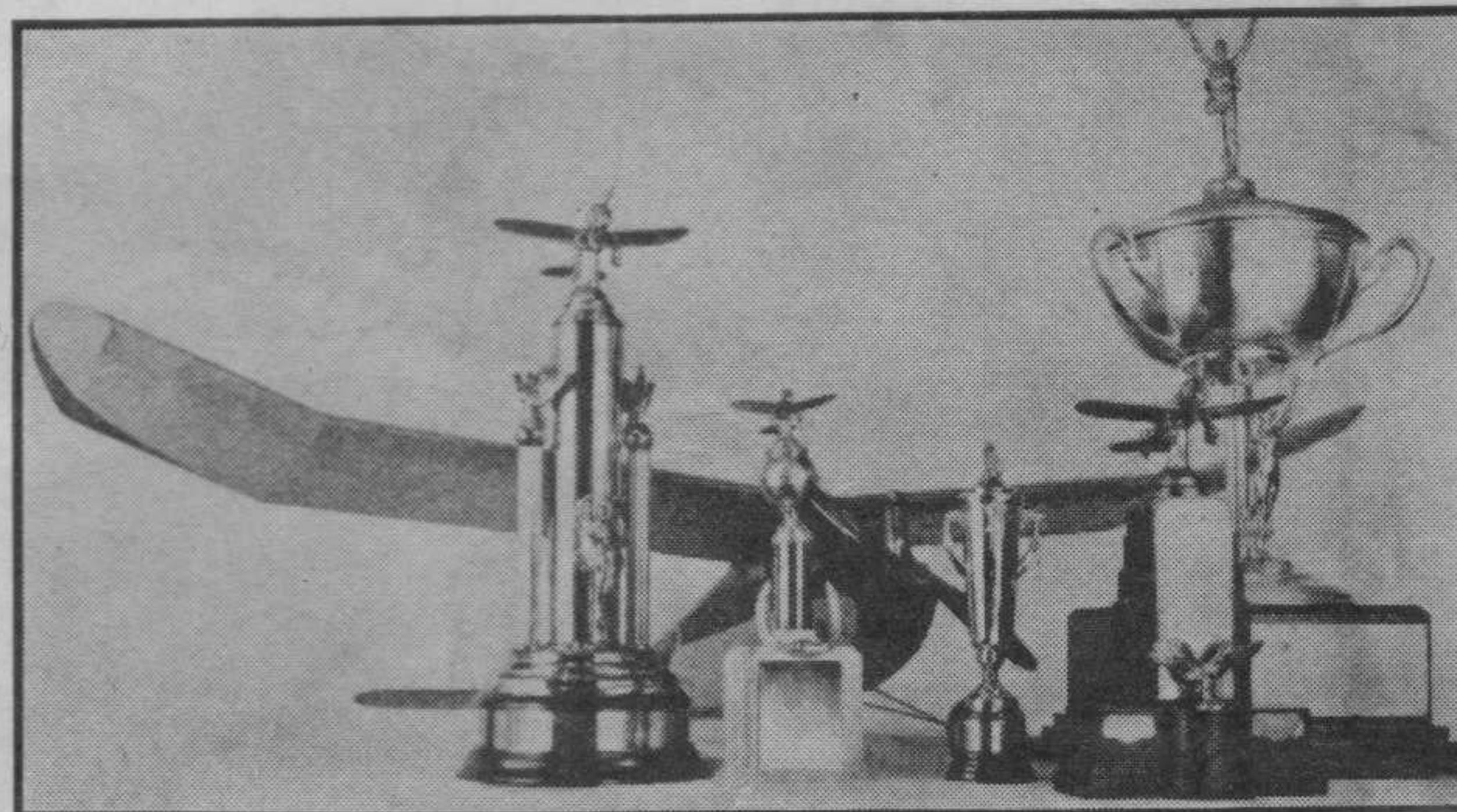
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real easy to build, has super-sturdy construction. If you're a regular gas model builder, you'll instantly recognize this great value! And if you've never built a gas model before, you'll be amazed how easily you can construct the Buzzard Bombshell.

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Any make of Class "C" motor will run the Buzzard Bombshell! You don't need any special kind; use the motor you personally like.

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THIS is the slick little job that won the Class "B" Open title in the 1940 Nationals, two days after the Buzzard Bombshell won the Class "C" Open. "So Long" turned in three out-of-sight flights and brought home the beautiful Gar Wood trophy. It is a cabin job, looks greatly like a real airplane and flies like a National Winner should. . . . It has a very neat appearance, is exceptionally strong. The fuselage is entirely planked and diamond shaped, except up in front. "So Long" has a fast climb, plus a graceful glide and can be used in both "A" and "B" classes. Switch-over from "A" to "B" is easily accomplished by changing from Ohlsson "19" to "23." Both of these Ohlsson motors fit the same motor mounts. . . Act today! Get your "So Long"

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# If It's a Career in Aviation You Want, Read What Parks Trained Men are Doing

*A large percentage of the 1600 graduates of Parks Air College hold responsible positions in aviation and are assisting in the development of this industry which is revolutionizing the thinking and habits of the entire world.*

*Those listed on this page indicate the various activities of Parks graduates.*

**Fred Breitschwerdt, Jr.**, holds a foremanship position in the Maintenance Department of Pan American Airways at La Guardia Field, N. Y. He is in charge of maintenance work of the trans-Atlantic clippers.

**George E. Bevins, '33**, is a member of the Flight Research Department of the Sperry Gyroscope Co., Inc., and has the interesting position of flying their Air Laboratory plane in testing newly developed equipment.

**Joseph W. Yowell, '35**, Sales Representative for Manning, Maxwell and Moore, Inc., instrument manufacturers at Bridgeport, Conn., has charge of instrument sales to foreign governments.

**Capt. Elkin C. Floyd** of American Airlines recently completed 1,000,000 miles of flying and joined the select group of veteran pilots who accomplished this feat. Capt. Floyd graduated from Parks back in '29 and has been employed by American Airlines since 1935.

**Roman M. Spangler, Jr.**, an Aeronautical Engineering graduate, '38, is now an Inspector at the Glenn Martin Aircraft Plant, Baltimore, Maryland, one of the largest manufacturers of military planes for Uncle Sam.

**Hazen R. Bean, '29**, is Check Pilot for Northeast Airlines, Inc. (formerly Boston-Maine Airways).

**Lloyd Hubbard, '35**, has the distinction of being one of the first Flight

detail assembly work on templates at Lockheed.

**Wm. C. Burks, '30**, is District Traffic and Sales Manager for Chicago and Southern at Houston, Texas.

**William Ehart, '38**, is Sales Representative of Frye Aircraft Co., Tulsa, Oklahoma.

**Frank A. Spatz, '37**, operates his own company, the Kansas City Flying Service, Kansas City, Missouri.

**Marvin J. Parks, '28**, is Flight Operations Manager for the Aeroplane Division of the Curtiss-Wright Corporation. He has been directing test, demonstrations and production flying on the CW-20, the world's largest twin engine transport which accommodates 36 passengers and a crew of 4.

**Norman A. Benson** is a Production Design Engineer for Curtiss-Wright Corp. at their Buffalo division. Benson graduated from Parks in '39.

**Bonaventura Gerace** Aeronautical Engineering '38, is a Tooling and Lofting Layout Inspector for the Republic Aviation Corporation, Farmingdale, L. I., which is presently engaged with the work of fulfilling a large backlog of orders and developing fast pursuit planes for U. S. defense.

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**Oscar E. Holt** holds a position as engineer in the Aerodynamics Department of the Curtiss-Wright plant in St. Louis.

**Henry A. Correa**, a Professional Flight student in '37, is now Sales Manager for Atlantic Aviation Service, Du Pont Airport, Wilmington, Del.

**Frederick Hosterman, '36**, is a Senior Design Engineer at Lockheed Aircraft Corporation.

**Carl D. Allmon, '33**, is Project Loftsmen in charge of all lofting and

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Section AT-7

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# AIR TRAILS

JULY, 1941

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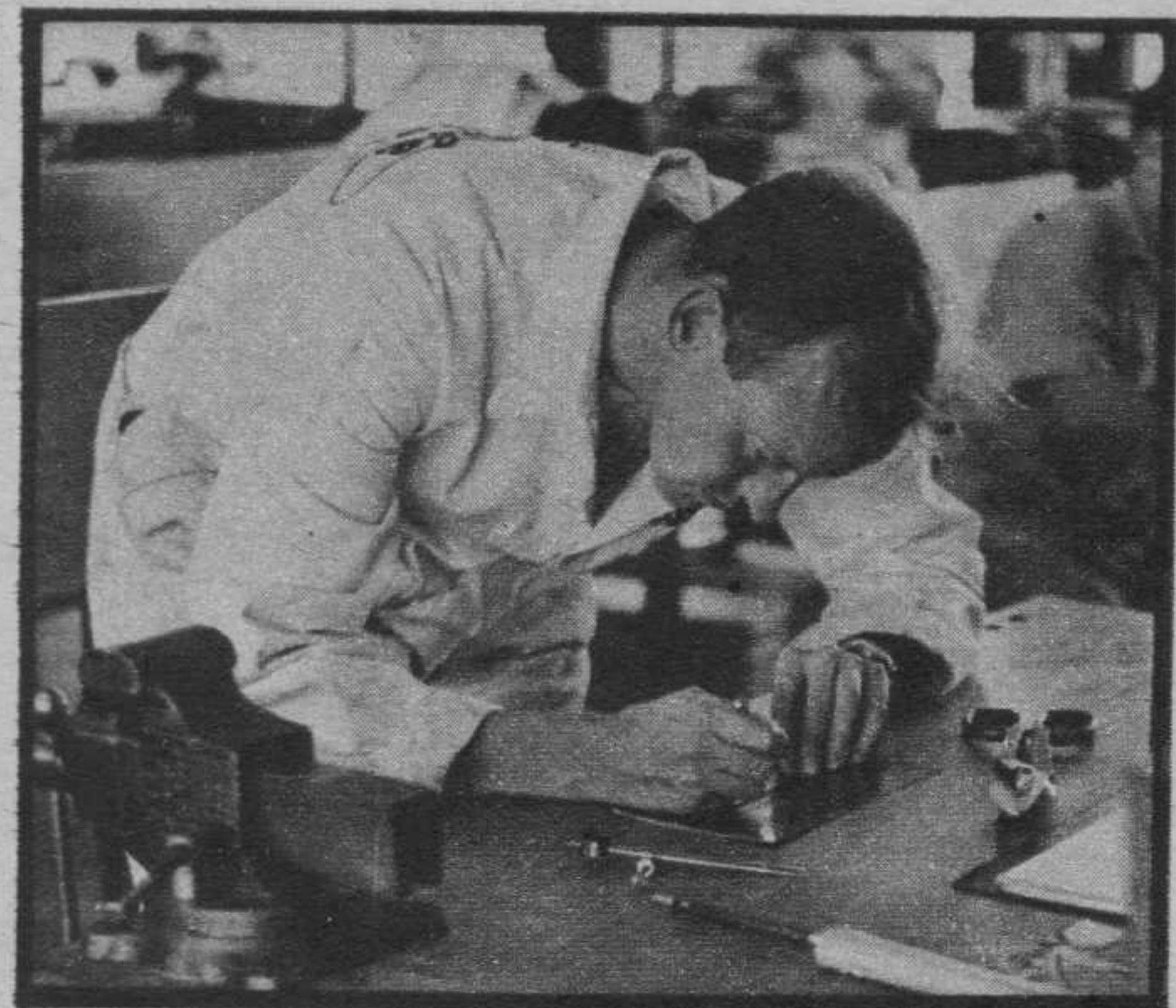
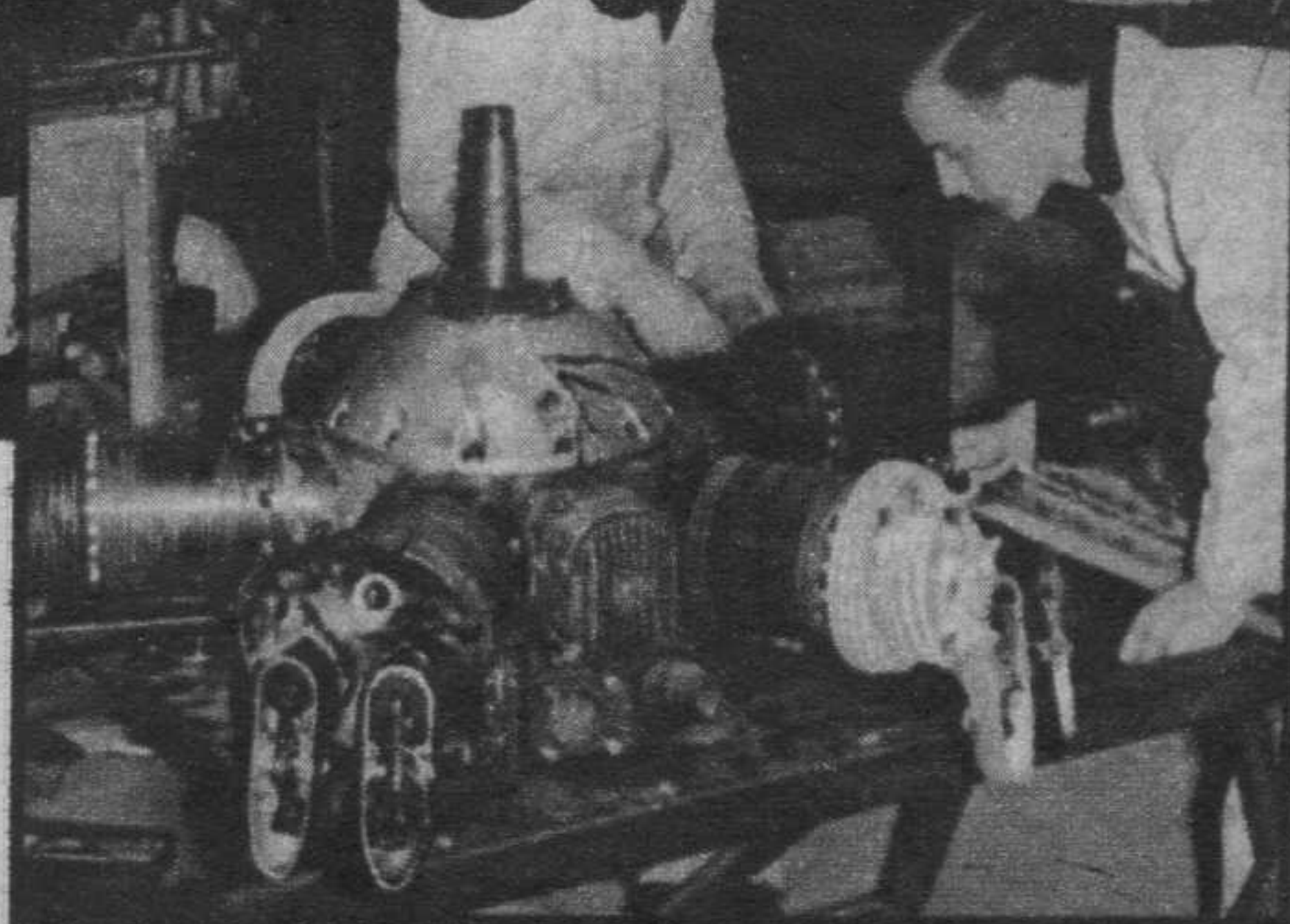
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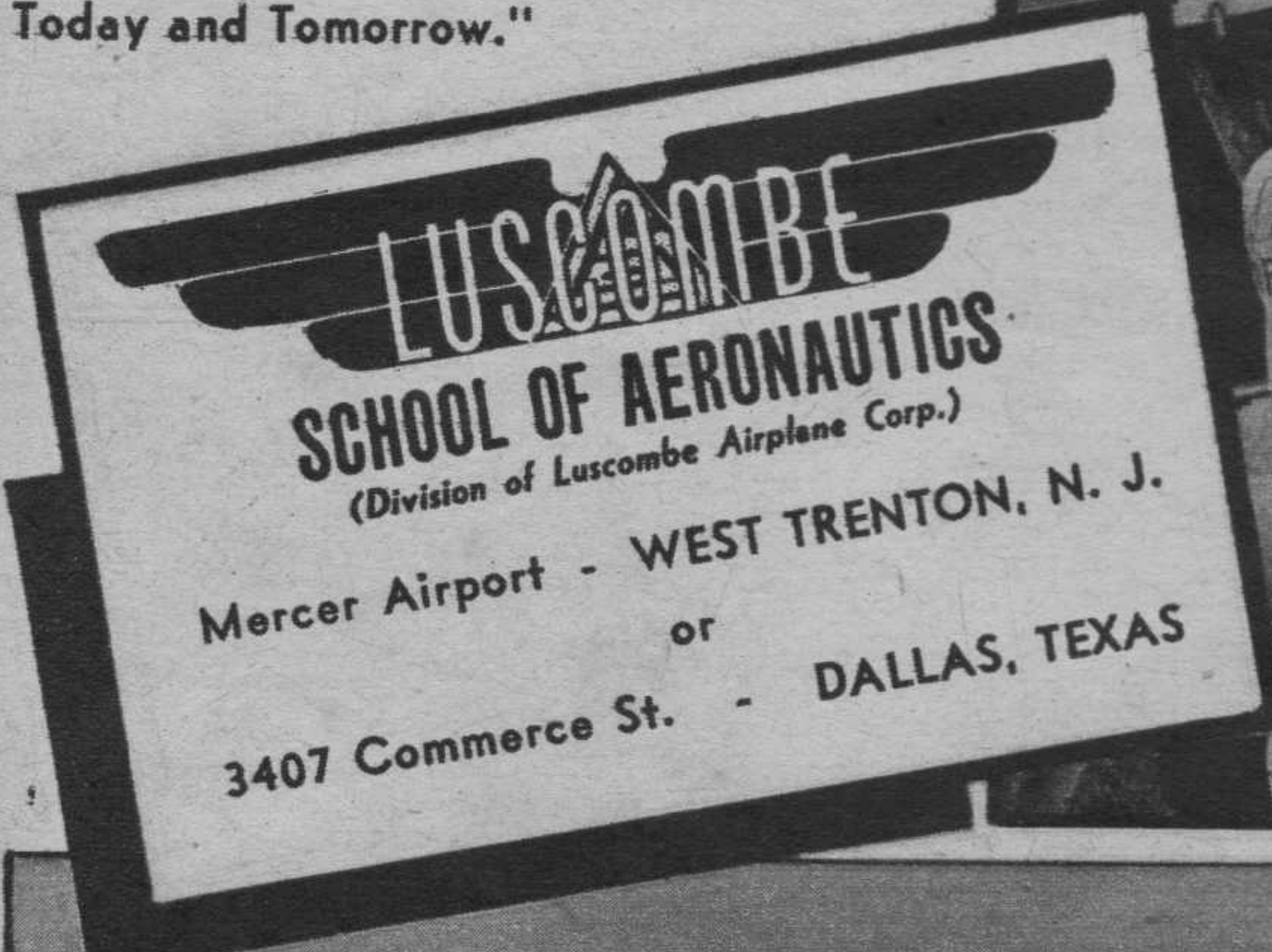
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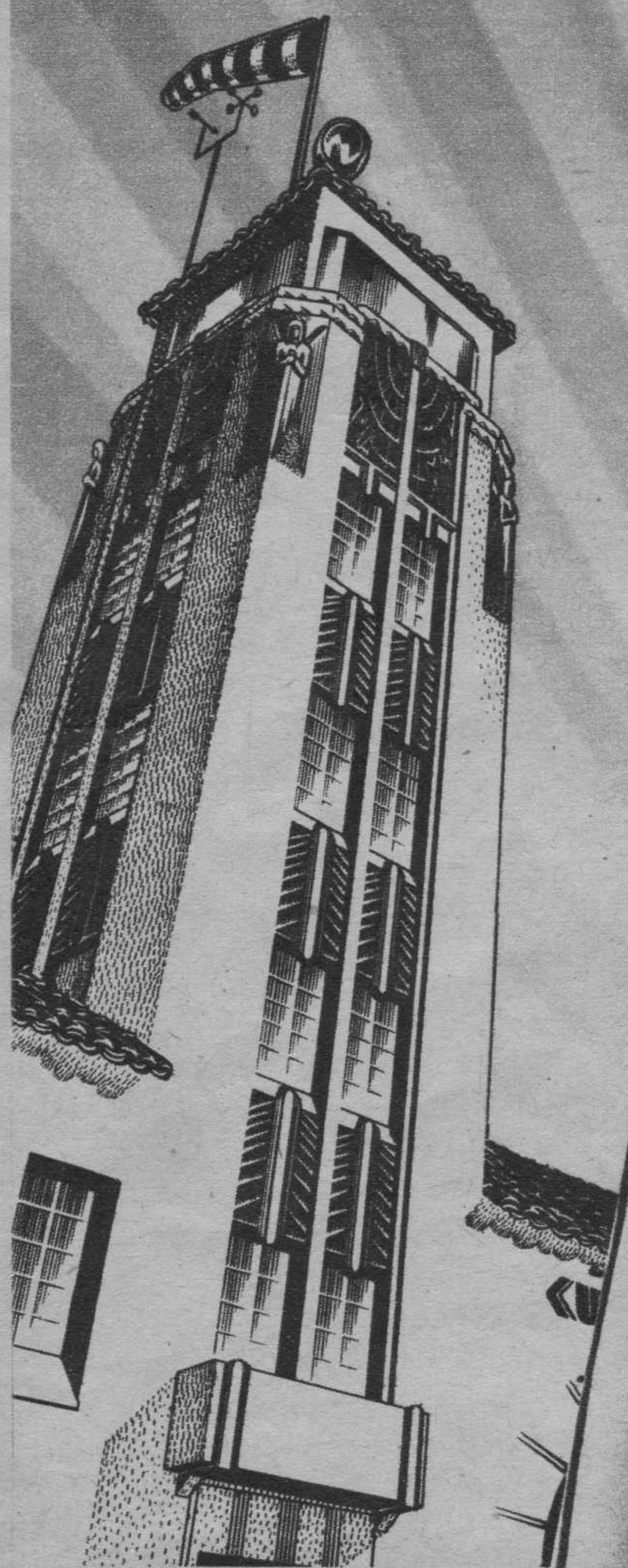
Classes are now forming. Prepare to join the growing list of Luscombe Graduates who are finding their place in aviation. Send for FREE descriptive folder "Aviation Today and Tomorrow."







# BE THE *Master* OF YOUR DESTINY



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This school has never guaranteed positions for its graduates, but practically every graduate has obtained immediate employment and is advancing rapidly. The demand for our graduates far exceeds the supply, and we honestly believe that every student who enrolls here will be able to obtain, with our assistance, immediate employment upon graduation.

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AT-7



# WHAT'S YOUR QUESTION

**QUESTION:** Could you tell me what the requirements are to enter the Aircraft Technical School? I am interested in aerial photography and would like to know more about this course. P. K., Jr., Kalamazoo, Mich.

**Answer:** For all information regarding this school write to the Assistant Commandant, Aircraft Technical School, Chanute Field, Rantoul, Ill.

**Question:** Could you give me any information regarding the plane whose picture is inclosed in this letter? Who makes it, where, price and any other information which may help me in purchasing such a ship. E. J. H., Orange, N. J.

**Answer:** The Monoprep was built by the Monocoupe Corp. at Robertson, Mo. This model has not been in production for quite a number of years, and we do not know where you can obtain one.

**Question:** What causes torque in an airplane, and which way does the plane turn when the propeller is rotating counter-clockwise? A. F., Elsinore, Calif.

**Answer:** The rapid rotation of the propeller causes the torque. The airplane tends to turn in direction op-

posite to rotation of propeller; in the instance cited, clockwise.

**Question:** Would you please tell me the cost, performance and specifications of the Culver Cadet and the ship built by the Naugle Aircraft Corp.? H. H., Schenectady, N. Y.

**Answer:** Specifications and price of the Culver Cadet were published in this department in the February issue. The Naugle Mercury is a cantilever high-wing two-place monoplane. The wing construction is metal spar and ribs, fabric covered; fuselage is all-metal monocoque. The span is 30 ft.; length 21 ft. 8 in.; weight empty 610 lbs.; gross weight 1,150 lbs. It is powered by a 75 h.p. Lycoming engine. The high speed is 145 m.p.h., cruising speed 130 m.p.h., stalling speed 45 m.p.h.

**Question:** Please let me have the addresses of the following aircraft companies: Dart, Pasped, Beechcraft, Fairchild, Fleetwings. Could you also give me the names and addresses of some companies which make open-cockpit biplanes? B. R., Lohrville, Ia.

**Answer:** The Dart company is now the Culver Aircraft Corp., Wichita, Kan. The Pasped Aircraft

Co. is located at Glendale, Calif.; Beech Aircraft Corp., Wichita, Kan.; Fairchild Engine & Airplane Co., Hagerstown, Md., and Fleetwings, Inc., Bristol, Pa. Open-cockpit biplanes are built by Waco Aircraft Co., Troy, Ohio; Southern Aircraft Corp., Garland, Dallas Co., Tex.; White Aircraft Corp., 631 Niagara St., Buffalo, N. Y.

**Question:** Can you tell me the dimensions of the 1,100 h.p. Allison engine? Do you know if the British are perfecting a 2,000 h.p. liquid-cooled engine? W. A., Jr., Connerville, Ohio.

**Answer:** The Allison engine is 41 $\frac{7}{8}$  in. high and 98 $\frac{1}{2}$  in. long. The British have a 2,000 h.p. liquid-cooled engine in active service already. The new Hawker Typhoon is equipped with it; it is built by Rolls-Royce. No figures regarding dimension of this power plant have been released.

**Question:** Could you tell me what power plants were used in the Fokker D-23? What was its performance and size? R. H. H., Rush Springs, Okla.

**Answer:** There were two versions of the Fokker D-23. One was powered by two Walter Sagitta twelve-cylinder air-cooled engines of 460 h.p. each. The top speed of this ship was 326 m.p.h. and it cruised at 242. The other was powered by two Isotta-Fraschini Delta twelve-cylinder air-cooled engines of 700 h.p. each. With these engines the ship had a maximum speed of 345 m.p.h. and cruised at 260. The span of the D-23 was 37 ft. 9 in.

**Question:** I am interested in contacting a concern or publication where I can obtain a book on aircraft welding. M. C., Colorado Springs, Colo.

**Answer:** Write to Air Transport Equipment, Roosevelt Field, Mineola, N. Y. They sell a book on aircraft welding.

**Question:** Could you give me the address of the nearest aviation school to Chicago where I could take up flying? C. F. C., Chicago, Ill.

**Answer:** One of the best flying schools in your neighborhood is the Lewis School of Aeronautics, Lockport, Ill.

**Question:** Are certified flying instructors exempt from the draft? Do you know of any special cram courses I could take up in order to pass the entrance examinations for army flying cadets? G. H. H., Freeport, Texas.

**Answer:** Instructors engaged in the Civil Pilots Training Program get deferment in the draft. However, any-

one with this rating who is teaching privately or connected with an operator who hasn't the program is eligible for draft. Write to the Adjutant General of the Army, Washington, D. C., for a list of subjects and books recommended by the army air corps for the written test required of all applicants who have not the minimum of two years of college necessary to enlist for army flight training.

**Question:** I will appreciate it greatly if you will let me know where I can get a used plane in the vicinity of Philadelphia. M. K., Philadelphia, Pa.

**Answer:** Try Wings Field, Ambler, Pa.; Patco Field, Conshohocken, Pa.; or Bennett Air Service, Hightstown, N. J.

**Question:** To whom can I write to obtain plans and information for a small glider with a wing span between 15 and 20 feet? Does a glider of this size have to be government approved? What kind of fabric should I use to cover it? A. C., Athens, Pa.

**Answer:** Sorry, but plans for gliders of that size are not available. A ship of such a small wing span will fly like a brick. All gliders must be government approved in order to be flown. Use light airplane fabric to cover a glider.

**Question:** Please let me have information on the following airplanes: Hawker Hector, Supermarine Spitfire I and the Gloster Gauntlet. B. M., Rutland, Vt.

**Answer:** Hawker Hector: Two-place army co-operation biplane powered by a Napier-Halford Dagger twenty-four-cylinder H-type air-cooled engine of 805 h.p.; span 37 ft. 3 in., length 29 ft. 9 in.; weight empty, 3,389 lbs., weight loaded 4,887 lbs.; maximum speed 187 m.p.h., cruising speed 171 m.p.h.; rate of climb 1,700 ft. per minute; service ceiling 24,000 ft.; cruising range 4 hours. Armament consists of two guns firing forward and two to rear.

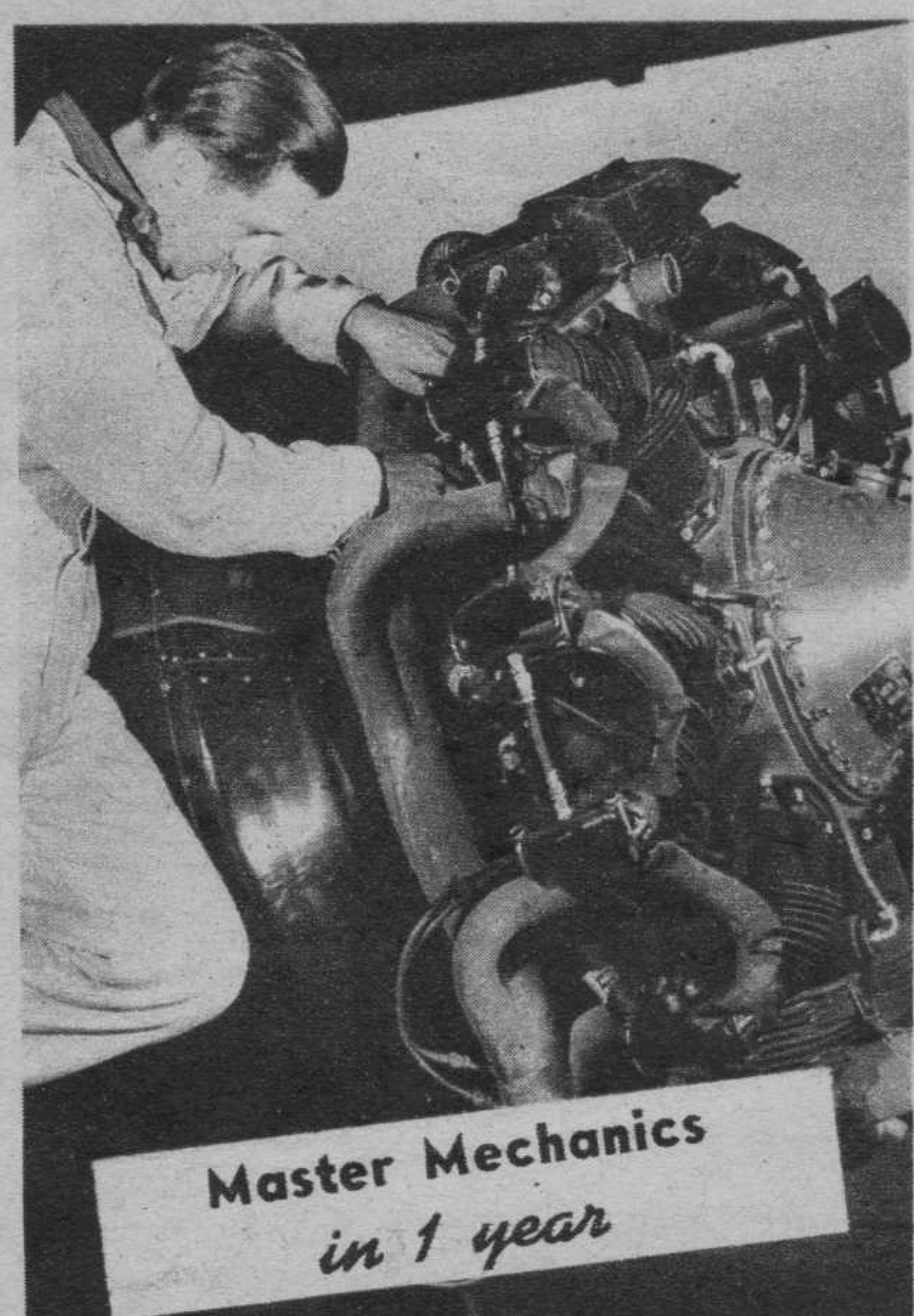
Supermarine Spitfire: Single-place all-metal low-wing monoplane fighter powered by a Rolls-Royce V-12 liquid-cooled engine of 1,100 h.p. Span 36 ft. 10 in., length 29 ft. 11 in.; maximum speed 367 m.p.h., climb 11,000 feet in 4.8 minutes; gas capacity 85 Imperial gals. Armament consists of eight rifle-caliber machine guns located in the wings firing outside of propeller arc.

Gloster Gauntlet single-seat, high-altitude biplane fighter powered by a Bristol Mercury VI-S2 radial air-cooled engine of 645 h.p. Span 32 $\frac{1}{2}$  ft., length 26 ft. 2 inches; weight loaded 3,900 lbs.; maximum speed 230 m.p.h., cruising speed 190 m.p.h., rate of climb 2,200 feet per minute. Armament consists of two machine guns in the side of fuselage firing forward.



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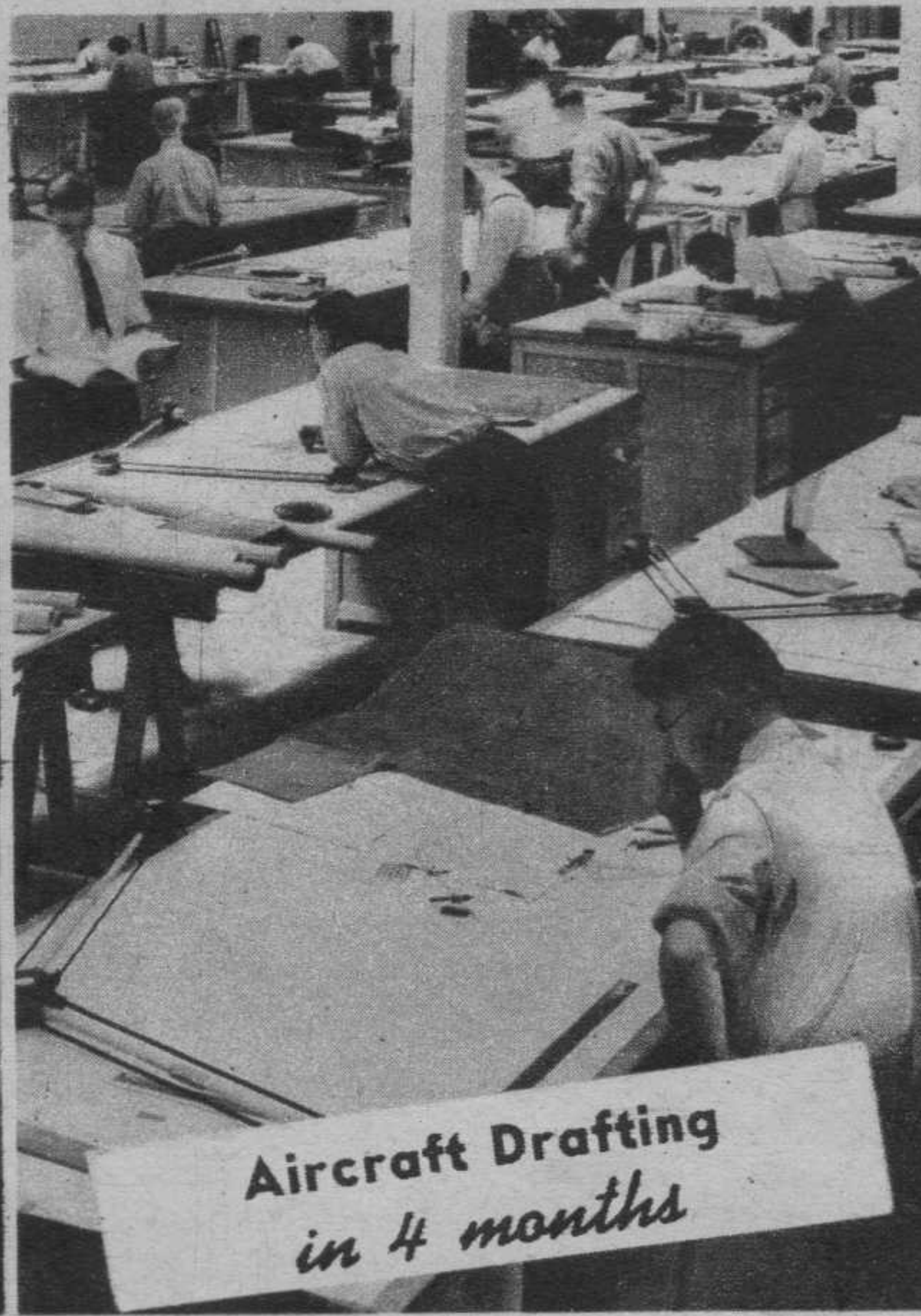
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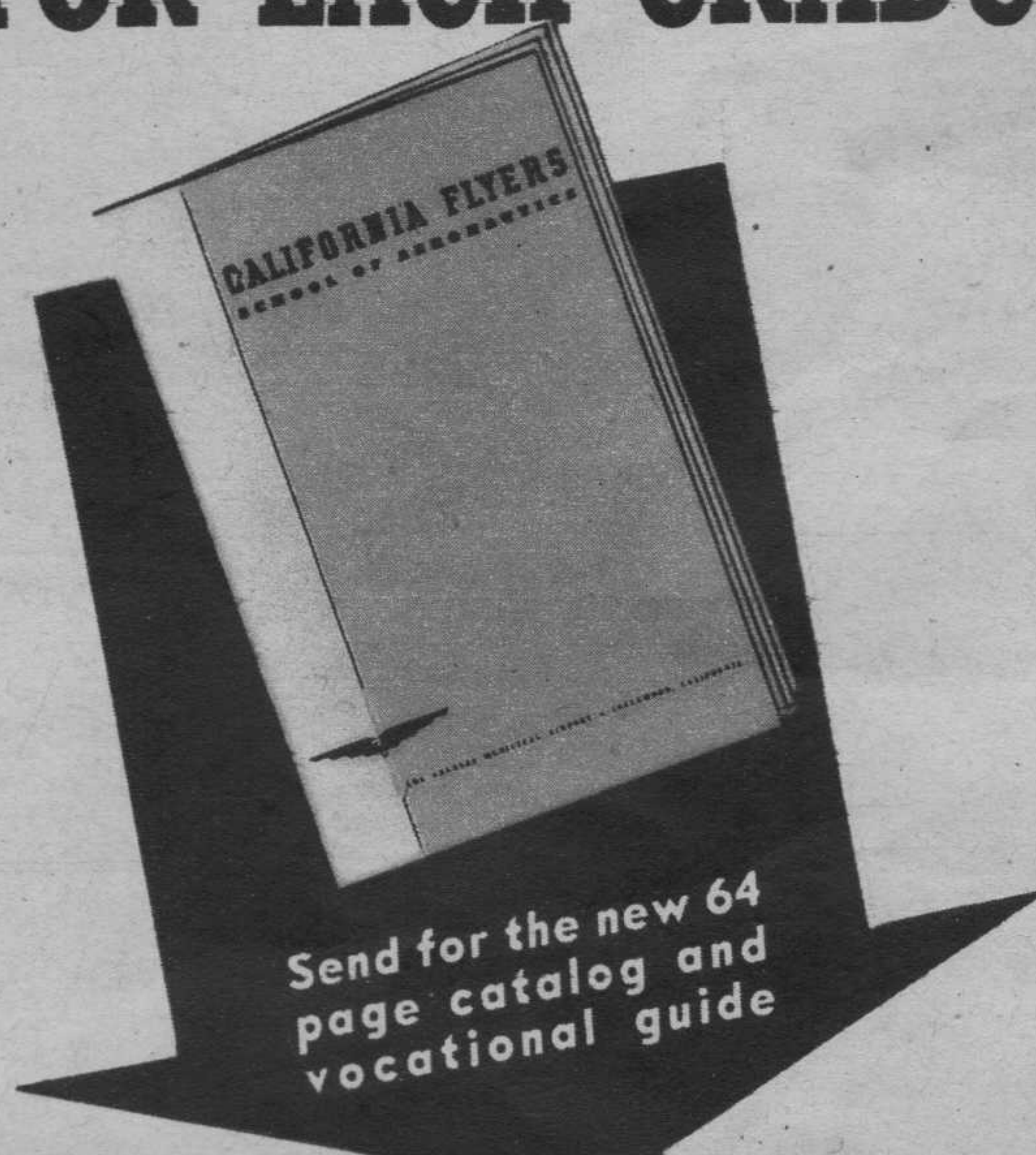
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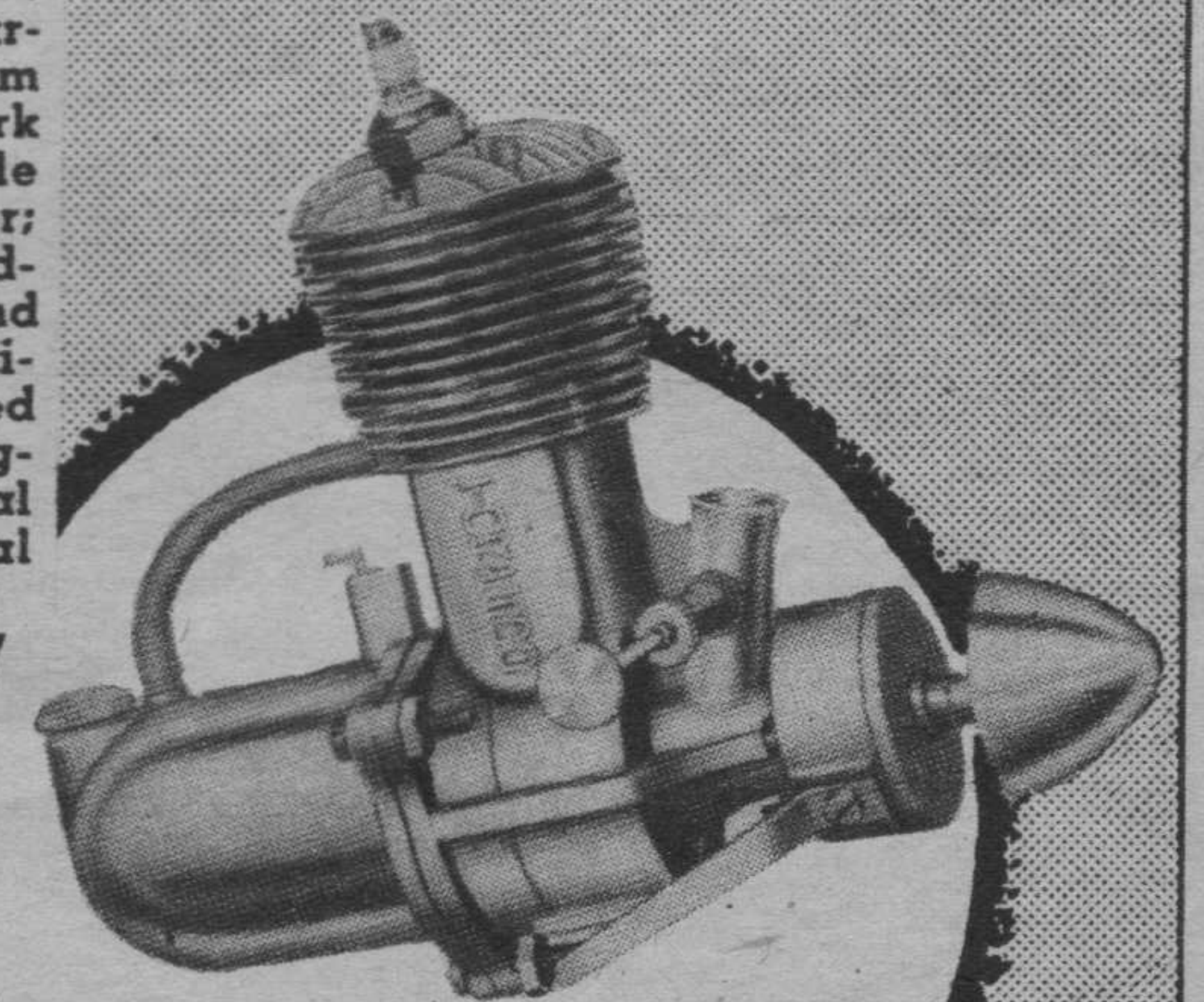
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- Gas tank can be mounted on either side of the fire wall.
- All motors equipped with the new Smith "Fire-Cracker" Coil.
- Torpedo produces almost 1/5 horsepower with weight of 4 3/4 oz. Bullet produces almost 1/6 horsepower with weight of 4 3/4 oz.
- Motors built to be used upright or inverted.
- Your motor on its way 24 hours after order received.
- Every motor power block tested in our factory and sold to you under a bonded factory guarantee.

### NEW VALVE PRINCIPLE AND IMPROVED

### CRANKSHAFT Torpedo Only

#### TORPEDO SPECIFICATIONS

1/7 h.p. @ 14,000 r.p.m.; 2 port 2 cycle type; bore .725; stroke .724; static thrust 30 to 32 oz. plus; displacement .2989 cu. in.; weight 4 3/4 oz.; downdraft carburetion; plus size Magnesium gas tank; Champion V-2 spark plug, exclusive offset principle . . . easier starting, more power; metal enclosed condensers; additional crankcase fins; Diamond bored crankcase; oversize anti-friction bronze bearings; lapped alloy steel piston; die cast Magnesium connecting rod; special new type heavy duty radial mounting.



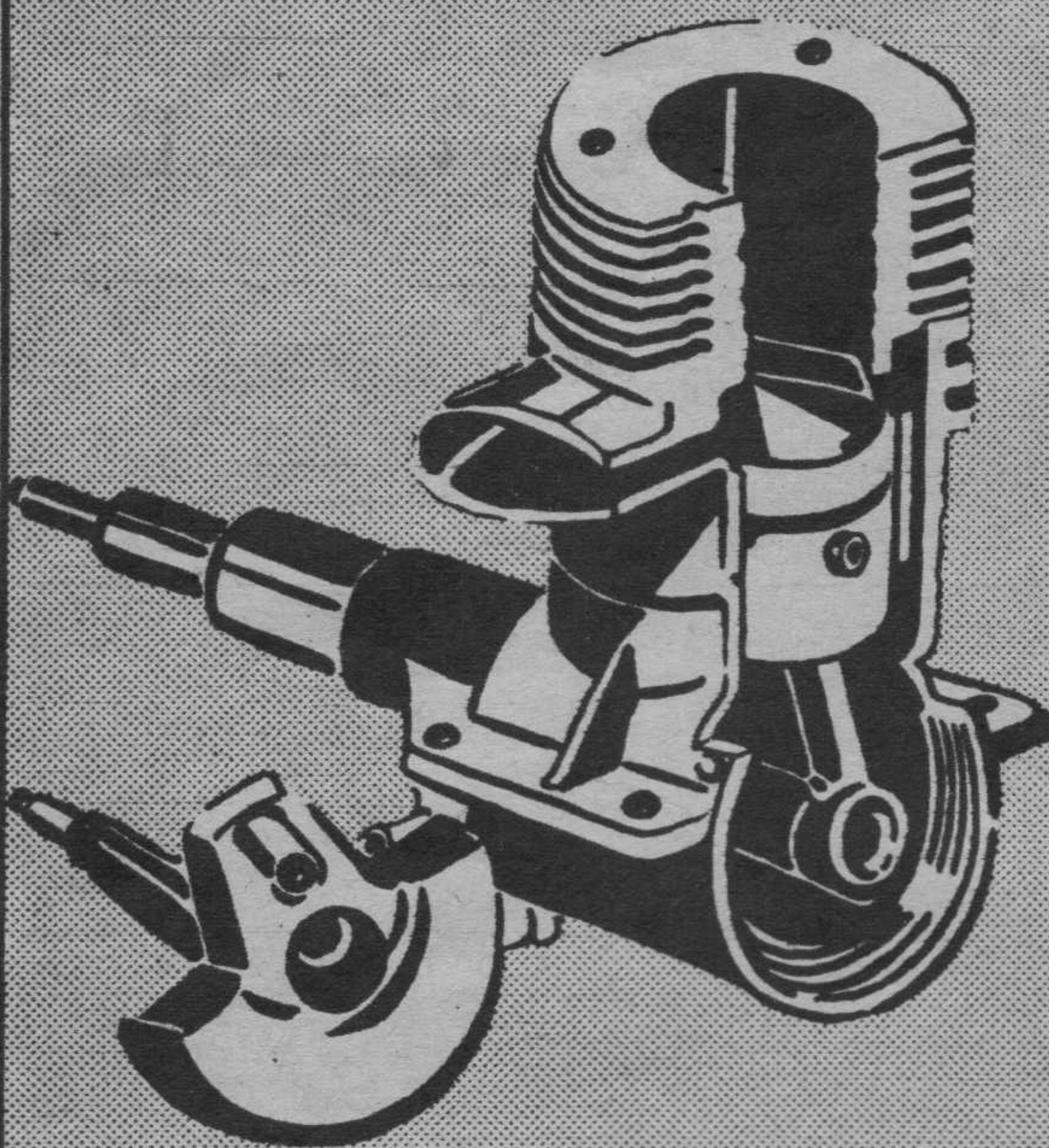
FOR ONLY  
**10.95**

#### BULLET SPECIFICATIONS

1/7 h.p.; 2 cycle rotary valve; 3/4" bore; 5/8" stroke; .275 cu. in. displacement; bare weight 4 1/2 oz. Gravity feed carburetion; Diamond bored crankcase; hardened steel timing cam; solid steel case hardened crankshaft; die cast Magnesium connecting rod; lapped alloy steel piston; fully equipped heavy duty radial mounting.

#### NEW VALVE PRINCIPLE AND IMPROVED CRANKSHAFT IMPROVES PERFORMANCE

Undreamed of performance by use of new SQUARE VALVE increases engine performance as much as 15 to 20%. Square valve stays open longer than old round type. Lets more gas into gas chamber, thereby developing more power. An additional improvement is the new crankshaft which is fully counterbalanced for longer engine life. Made from reduced weight case hardened steel. Features a new small type center hole.



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| <input type="checkbox"/> Special 11 in. hardwood propeller - - - - -   | \$0.49                               |
| <input type="checkbox"/> Miss Tiny Kit, Propeller and Phantom Built "Bullet" \$11.95                         |                                      |

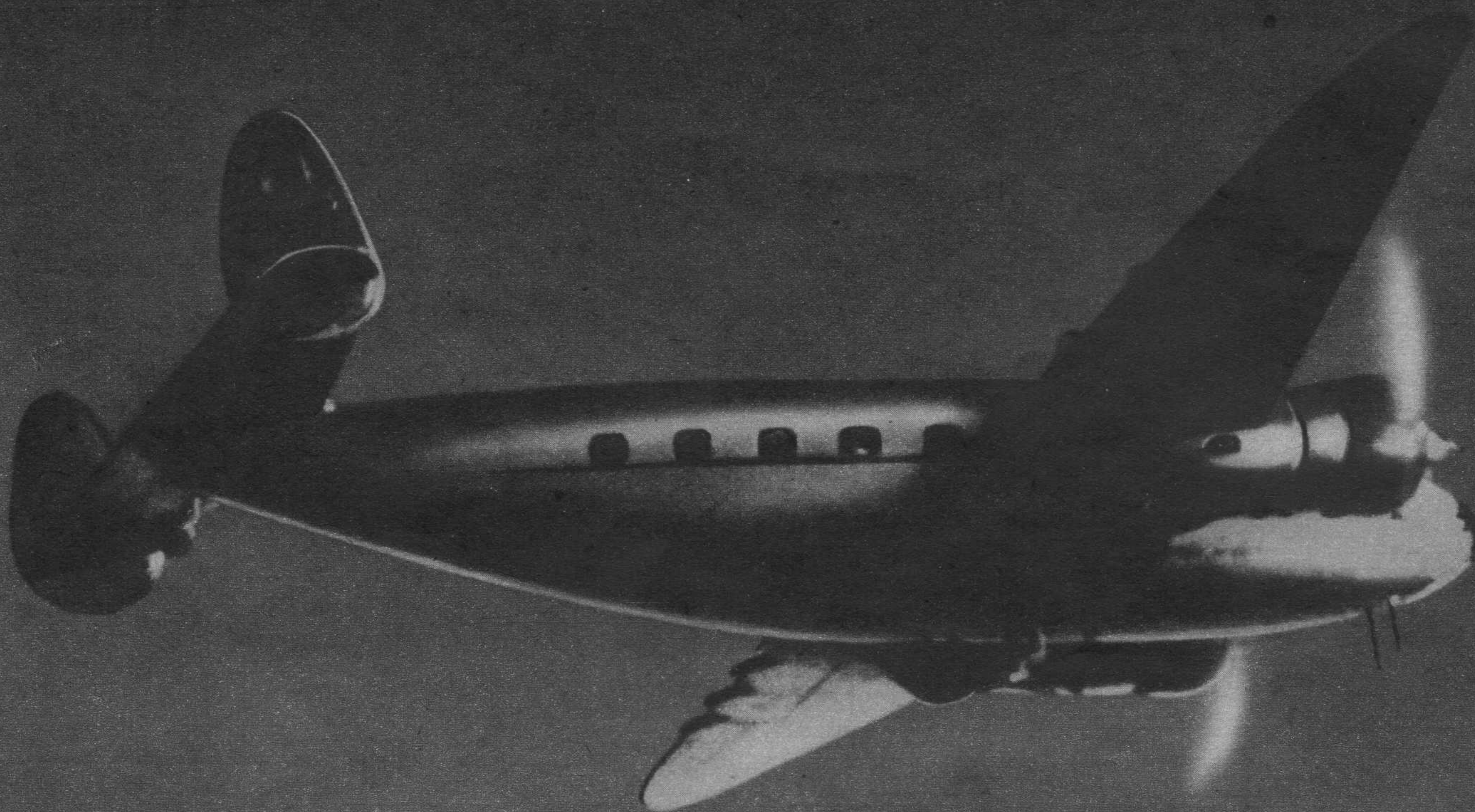
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A-19





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YOU WERE AN  
AIRPLANE PILOT  
OR AN  
AVIATION MECHANIC**

*come to*

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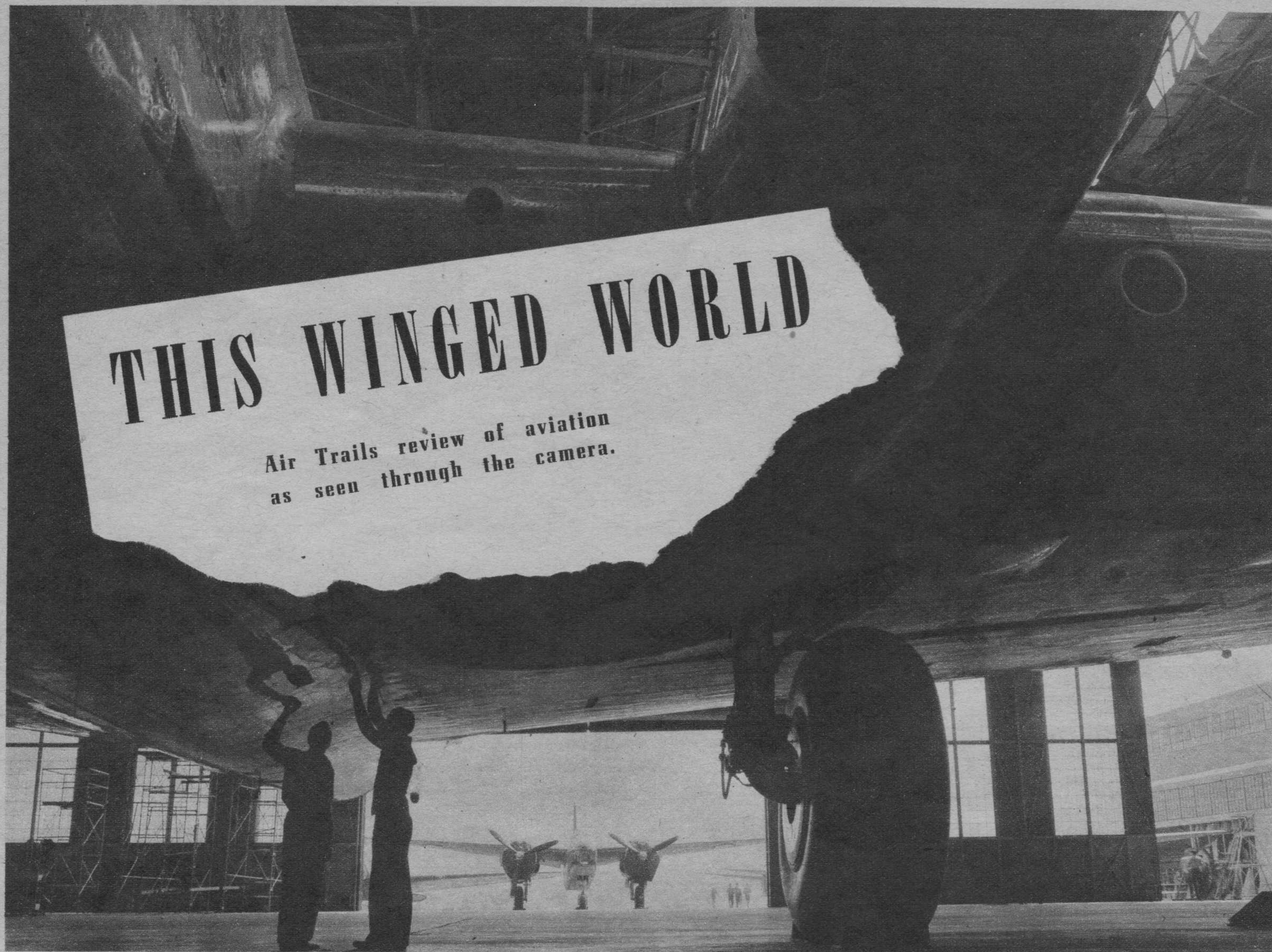
☐ MASTER AIRPLANE & ENGINE MECHANIC

Name.....Age.....

Street Address.....Town.....State.....

AT-JULY, 1941





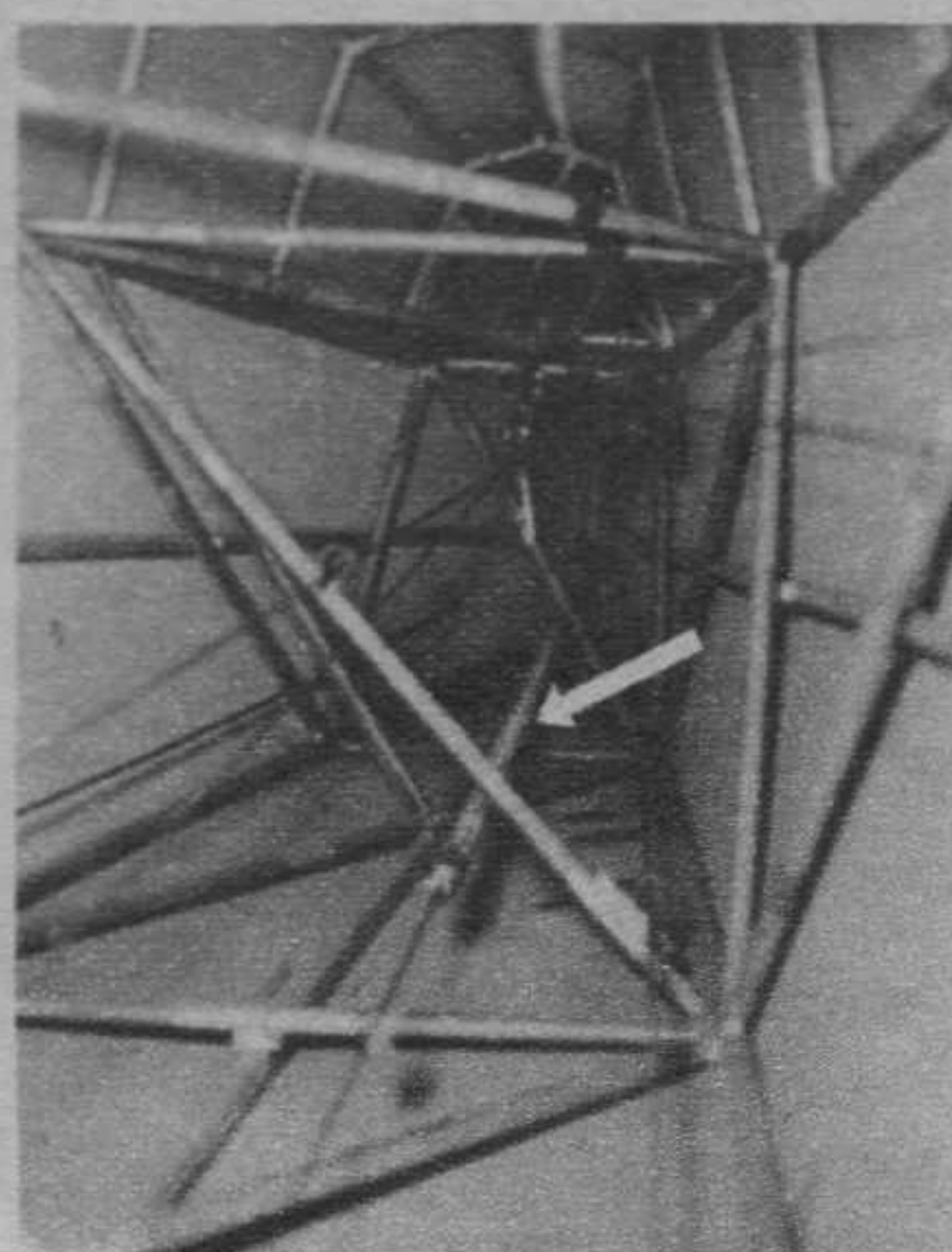
# THIS WINGED WORLD

Air Trails review of aviation  
as seen through the camera.

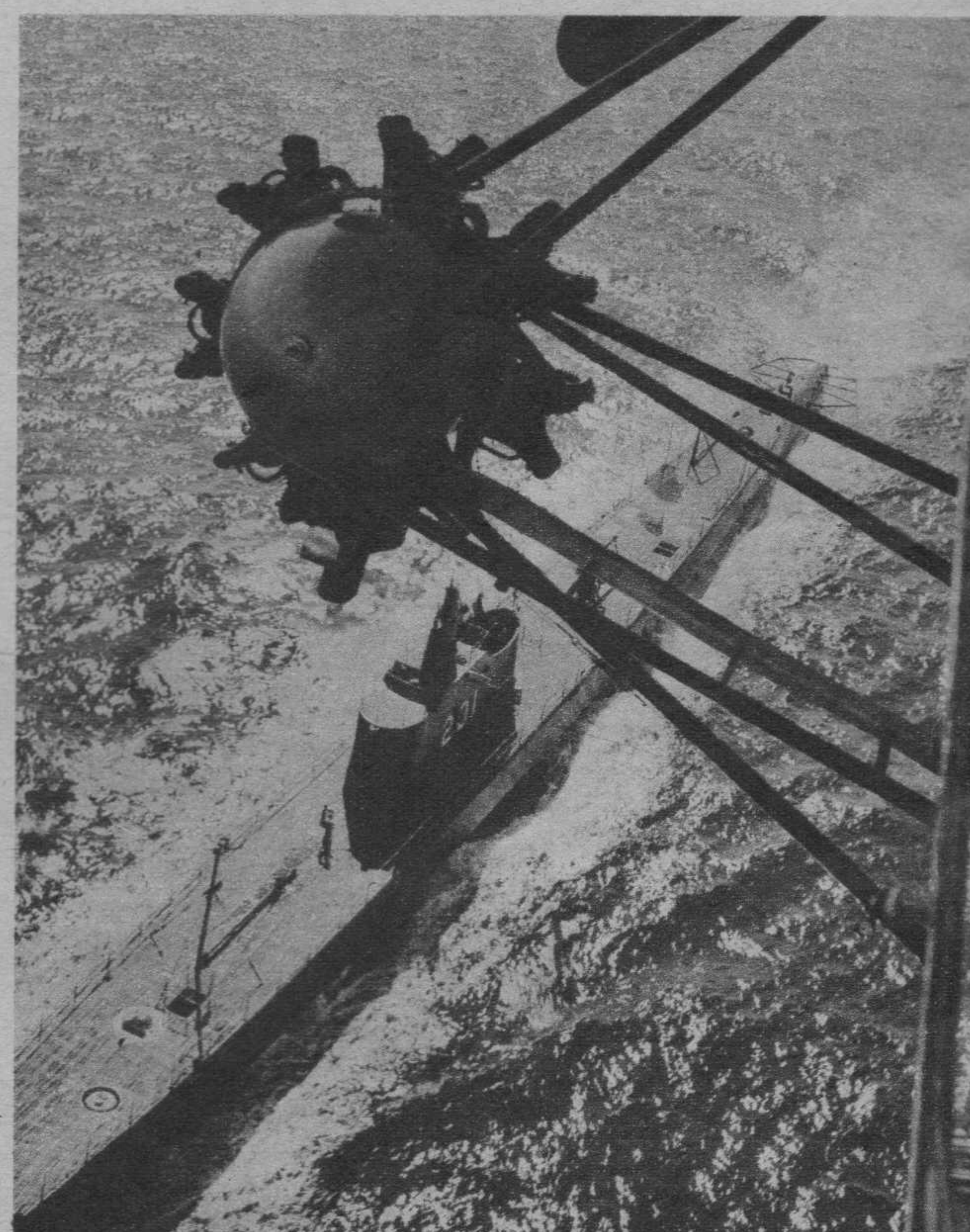
Bigger and, we hope, better. The B-19, world's greatest plane, being inspected in Douglas hangar before test flight. This 82-ton plane has 212-ft. span.



Sleek side view. With landing-gear hatch doors open, the Martin B-26 medium bomber warms her engines. Note the tail turret for defense to the rear and turret on top of the fuselage.



Bill Strohmeier demonstrates: Left, new engine starter under cowl, operated by turning hand crank, center, which stretches shock cord in rear of fuselage, right. Releasing spins the prop.

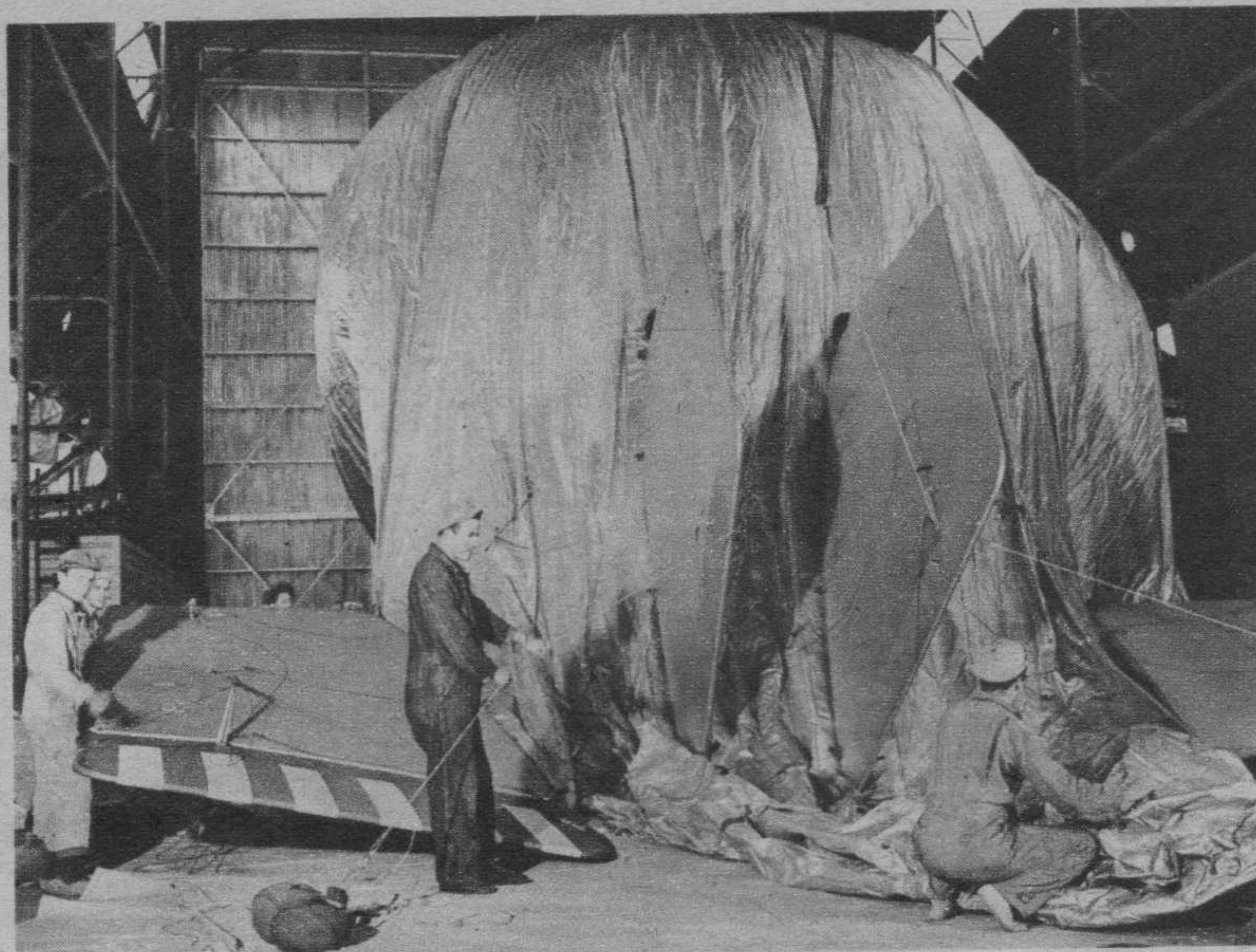


Undersea and oversea patrol meet. The navy blimp G-1 contacts the U. S. submarine Triton while on maneuvers.

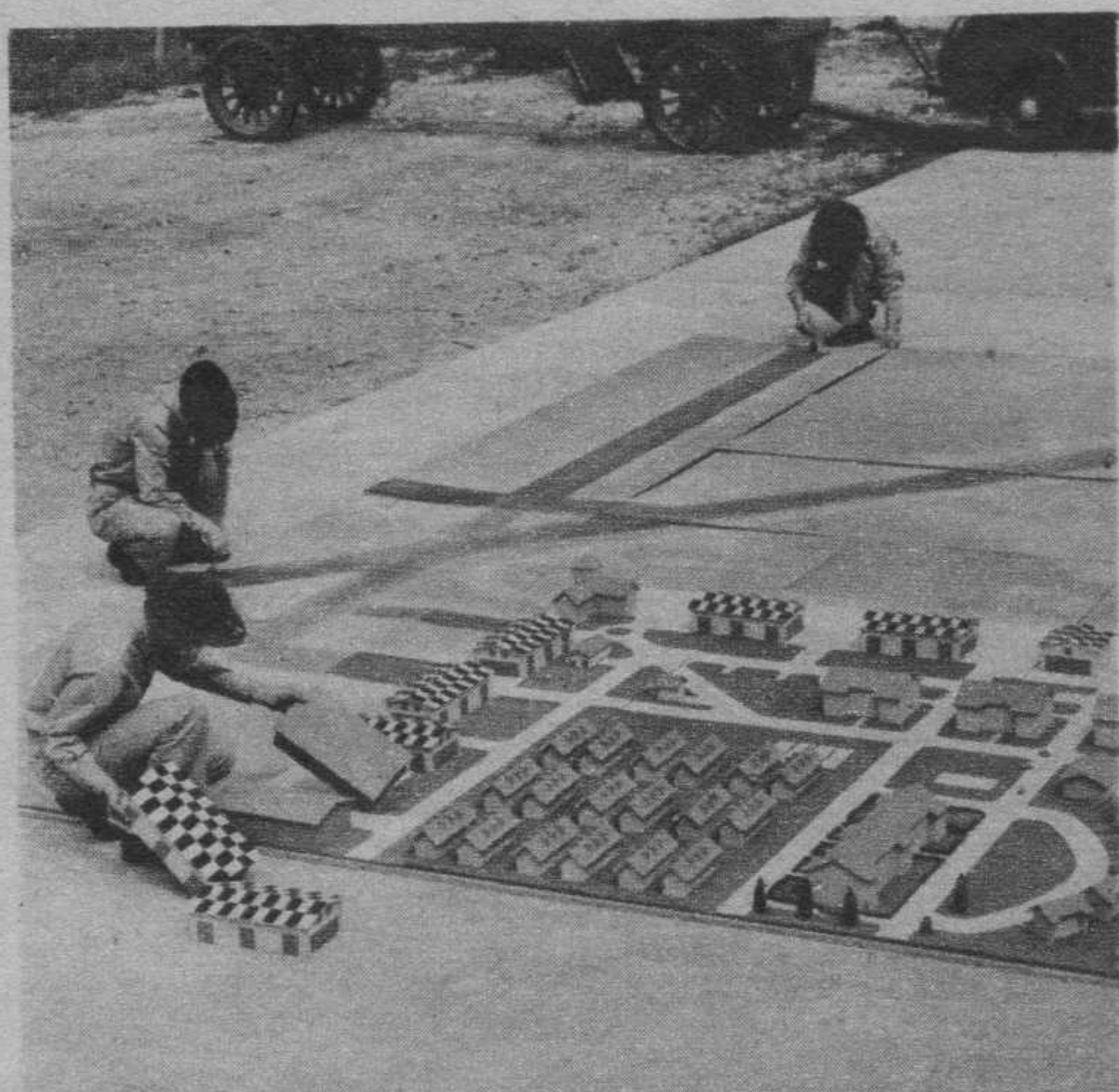




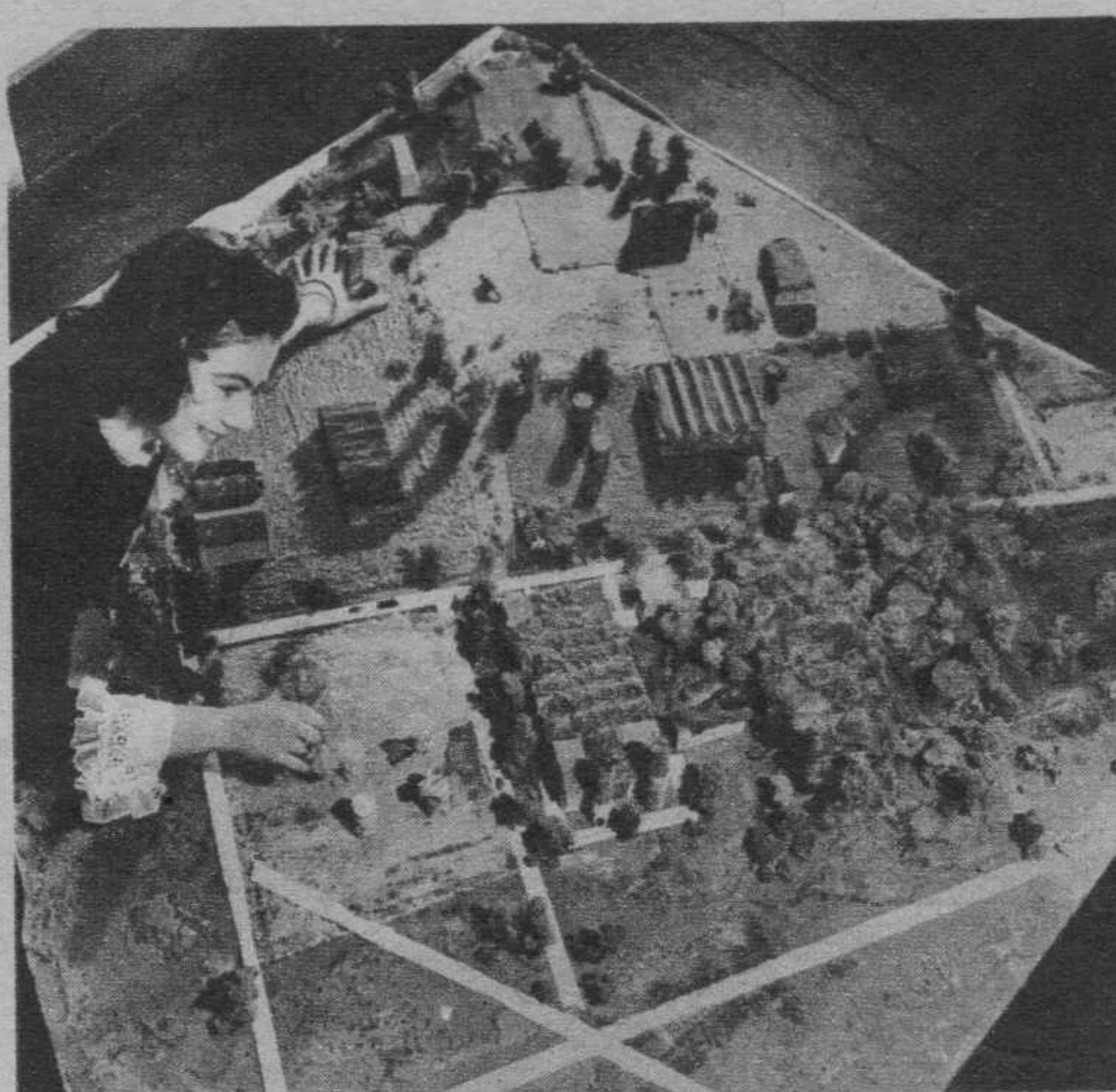
This thousand-dollar model is being readied for wind-tunnel tests at the National Research Council in Ottawa. Ship is the newest Blenheim.



Limp blimp. These men of Fort Lewis, Wash., one of the first posts to have barrage-balloon units, get practice inflating a baby blimp with fins.



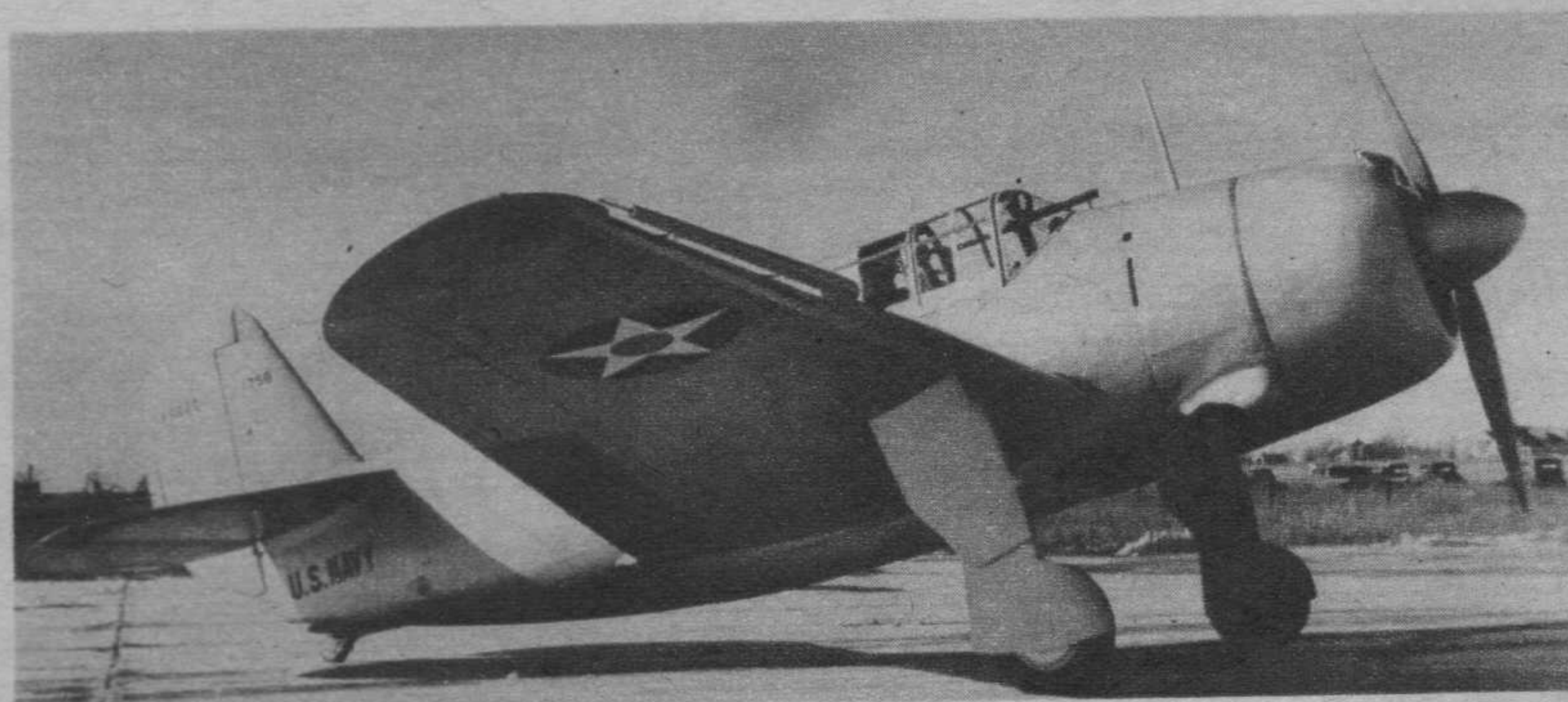
Artists of the air corps. These engineering-board members test new camouflage patterns for use on air-field buildings, hangars and runways.



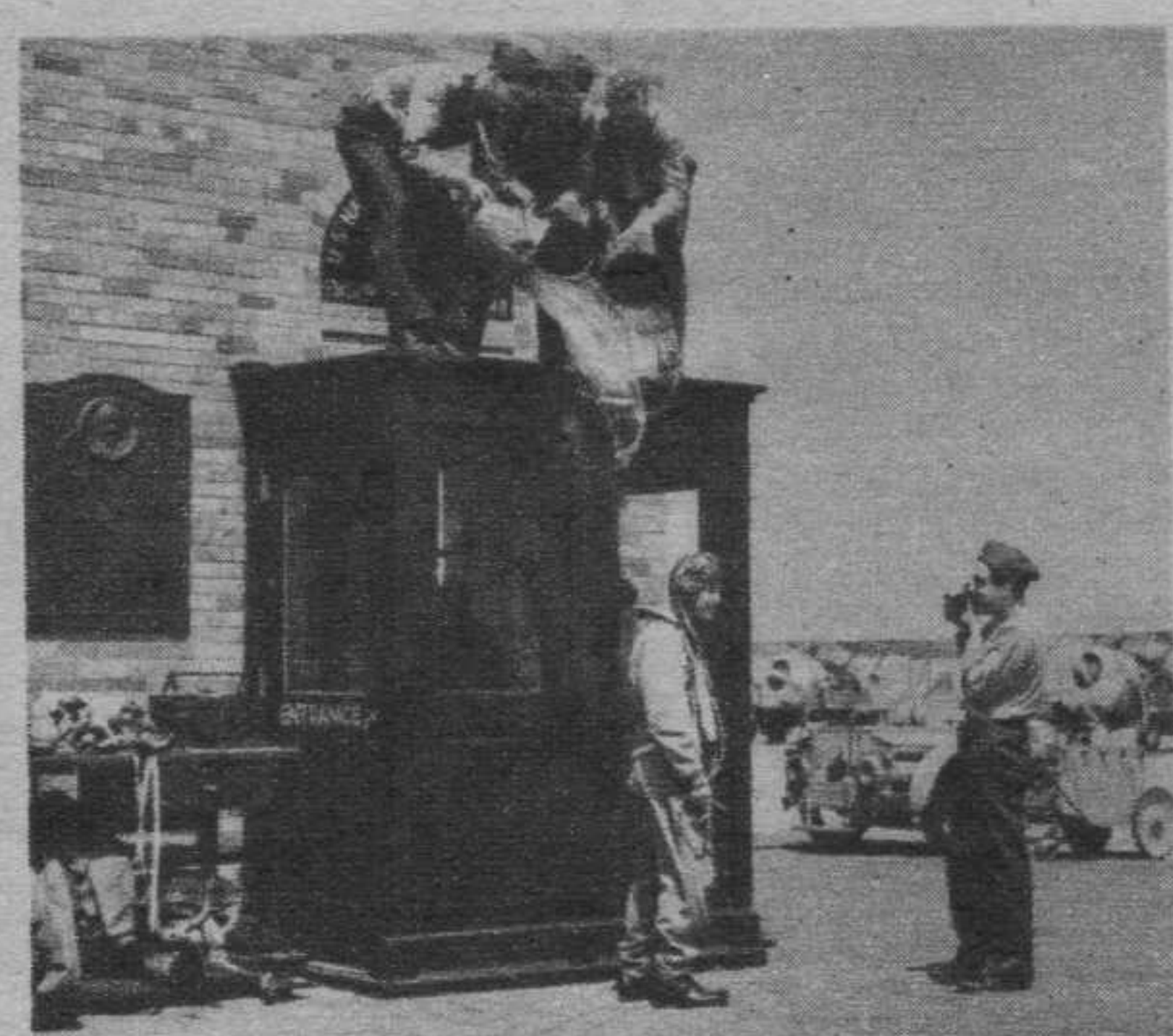
Students at the American School of Design, New York, prepare methods for concealment of factory buildings and oil tanks from enemy planes.



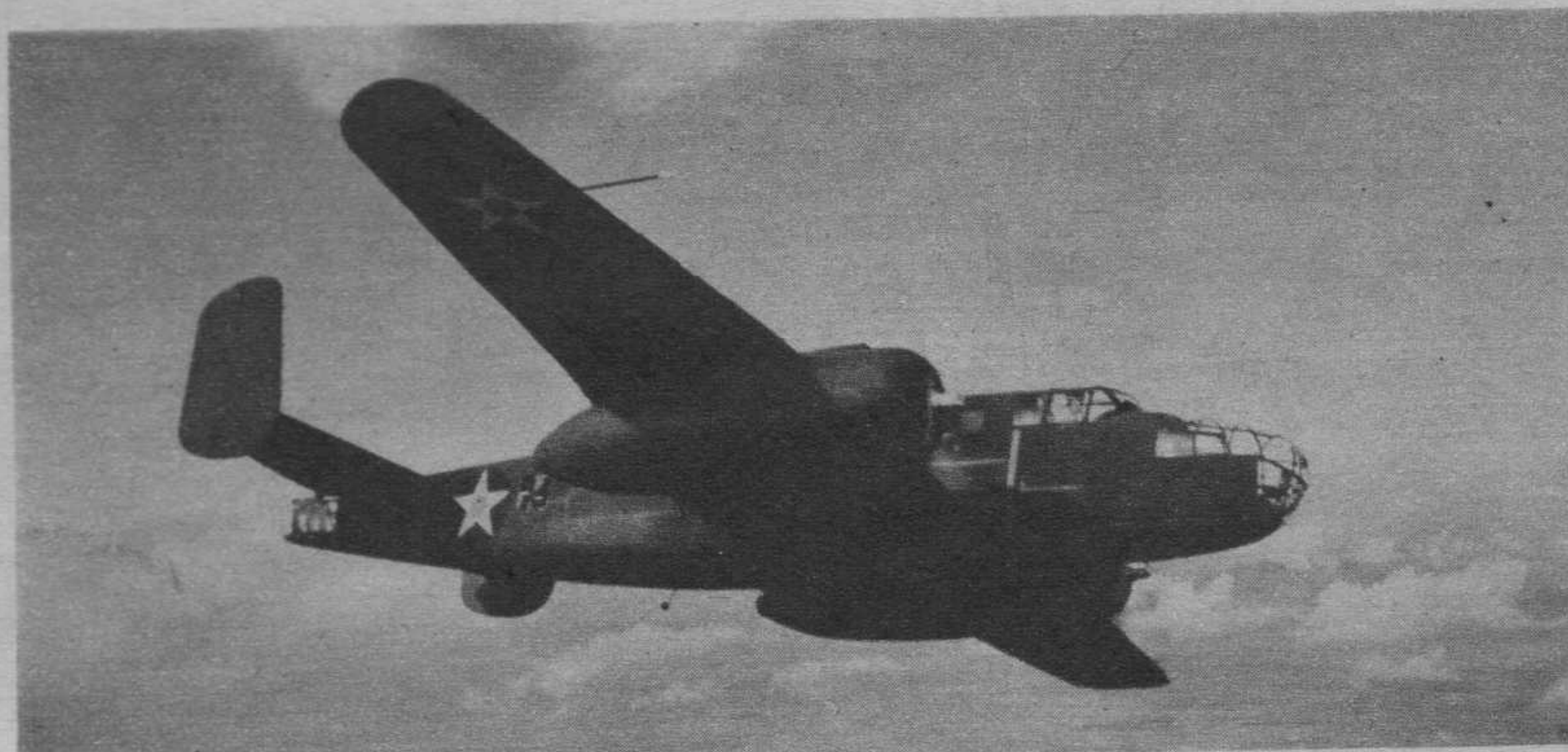
Army's peacetime air ace. Capt. Samuel H. Harris, Jr., army test pilot, holder of D. F. C., has test-flown over 200 "X" planes without loss.



Another "best in the world" wagon. The new navy Curtiss XSB2C-1 dive bomber said to carry bigger bombs farther and faster. Engine is 1,700 h.p.

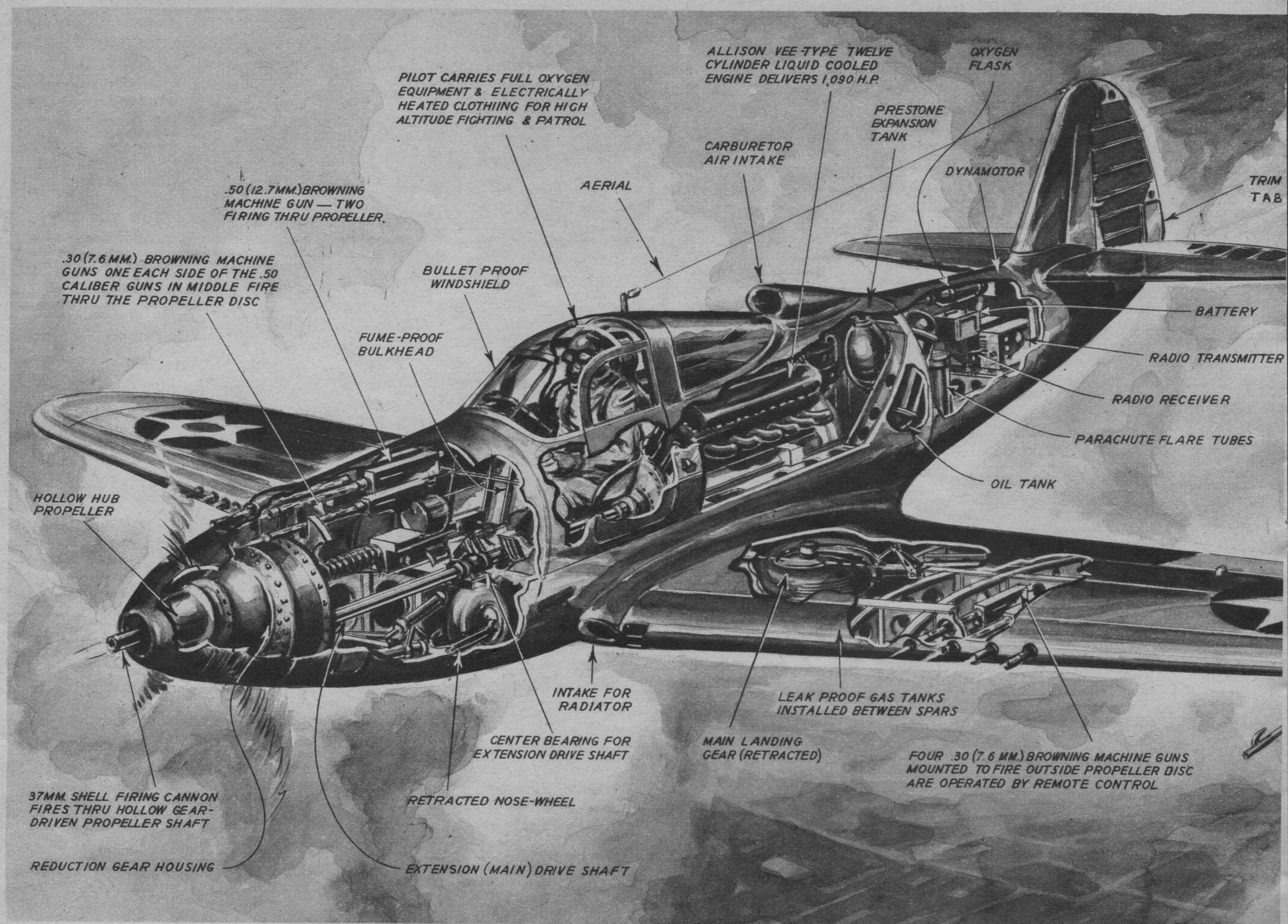


Solo dunk! We've shown you dunkings at Floyd Bennett and in the army. Top shows how Cadet Olsen gets his at U. S. N. R. base in Oakland, California.



Dressed to kill. This camouflaged North American B-25 bomber is one of many to be built at new Greater Kansas City assembly plant. Note tail turret.





# WE BUILT THE GIANT KILLER

Bell's chief designer reveals the fascinating story behind the first Airacobra.

BY ROBERT J. WOODS



L. to R., L. D. Bell, president; Ray P. Whitman, vice president, and Robert J. Woods, chief design engineer, Bell Aircraft Corp.

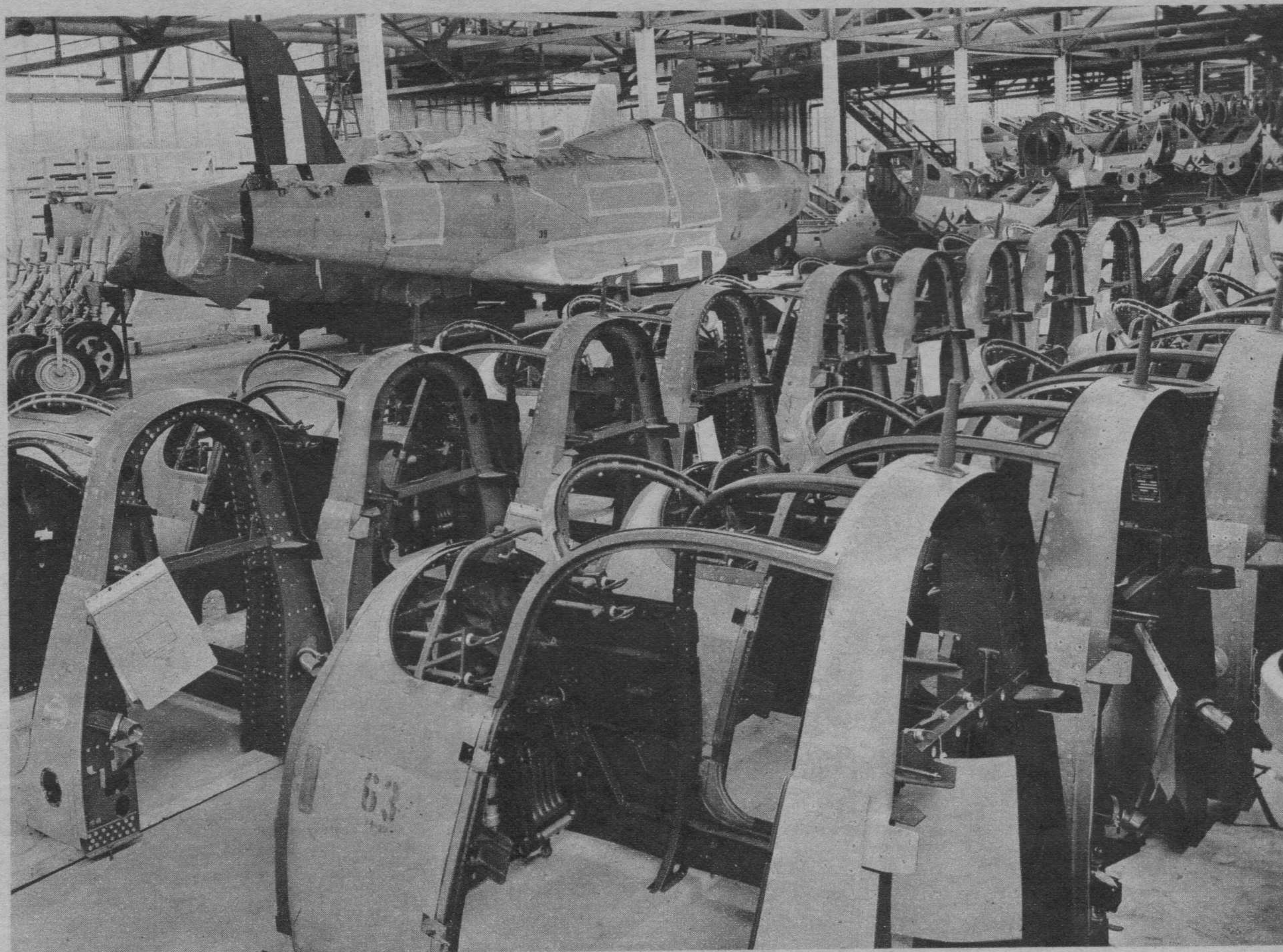
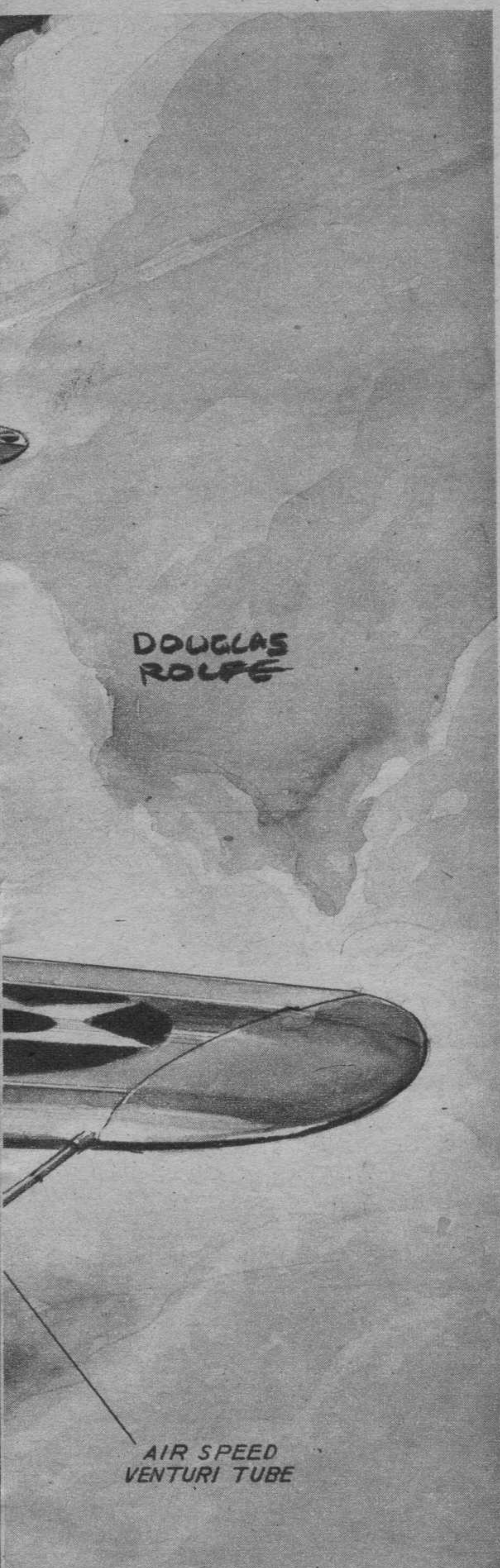
**T**HIS is the story of the design and development of the P-39 Airacobra interceptor pursuit now being built in mass production by the Bell Aircraft Corp. for our air services and England. It is a simple story—a story of the genesis of an airplane design. A story which, with small changes in the telling, might apply to any of our modern aircraft. It is also a story which often threatened to come to a tragically abrupt close long before the happy ending was in sight.

In the very beginning the Airacobra existed solely as an idea about a single feature of a single piece of equipment. The equipment was an explosive-shell gun, and the idea was that it should be of as large bore as possible. This idea that the largest and most powerful explosive-shell-firing gun available should be installed in an airplane of the pursuit type had its background in our own past experience. The same general concept had resulted in the development by Bell Aircraft of the two-motored Airacuda, a multiplace fighter airplane developed for the air corps, mounting two 37-mm. automatic aircraft cannon in the noses of the engine nacelles.

A second factor was that we had observed a series of tests conducted by the air corps and ordnance department at the Ordnance Proving Grounds at Aberdeen, Md., in 1935. These tests were made to determine the destructive effect of various types of ammunition on actual aircraft structures, and in them the American-developed 37-mm. cannon proved itself far superior in destructive power to any of the other guns tested.

Because of this demonstration, all thoughts on the new design revolved around the 37-mm. cannon. But a cannon presented difficulties, some of which were that the gun and its ammunition





Above—Cockpit units ready for assembly line. In background partly completed ships.

Left—Artist's cutaway of Airacobra to show complex details and its construction.

were extremely heavy by comparison with the small bore .50 and .30-caliber machine guns; it was too dangerous to synchronize the explosive shells to fire through the propeller disk, as was the case for the .30 and .50-caliber machine guns; a considerable amount of space at right angles to the line of flight was needed to install the gun and its ammunition and, lastly, it was felt that the gun should be rigidly mounted, preferably on the plane's center line, so the recoil should be absorbed directly by the engine mass.

Preliminary sketches invariably started with a picture of the 37-mm. gun and its ammunition. All other components found in a single-engine fighter were also to be included in the design, but it became obvious that some new arrangement would have to be found to accommodate the large-bore cannon.

Liquid-cooled engines in Europe had been equipped with an offset propeller drive reduction gear which permitted a relatively small-bore cannon—20 or 23 mm.—to be installed in the V between the cylinder banks and to fire through a hollow propeller hub. This arrangement was considered feasible and was next added to the preliminary sketches. But in this country no such engine of sufficient power existed which would permit the cannon to be thus installed. Radial air-cooled engines were not suitable for obvious reasons and the nation's only liquid-cooled engine at that time was the Allison twelve-cylinder 1,150-h.p. model.

Our first proposal was to place the engine farther back in the fuselage, and to install the cannon and its ammunition forward. Power was to be transmitted to the propeller through an extension shaft about five feet long, driving from the front end of the engine crankshaft to the offset reduction gear at the nose. This arrangement permitted designing a streamlined, bullet-shaped nose which

later was found to be essential in the attainment of 400 m.p.h. speeds. This nose enabled installation of a tricycle type landing gear, one of the requirements of which is that it have a reasonably long fore-and-aft wheel base to provide stability and handling qualities on the ground. As a result, also, the engine could be located nearer the center of gravity. The central location of the engine promised reduced polar moment of inertia which gave improved maneuverability and permitted a most economical structure design from a strength-weight standpoint.

In our preliminary designs, following current practice, the pilot was installed in a cockpit aft of the engine. In this position, the pilot occupied a station about two-thirds of the fuselage length to the rear, and while this arrangement had certain advantages from an installation standpoint, it was obvious that even with tricycle landing gear, the pilot's field of view forward and down would be considerably obstructed. Studies were made to improve vision and the pilot arrangement of the proposed Koolhoven airplane, then being publicized, was analyzed for possible application.

In the Koolhoven design the pilot was seated behind the armament with the engine located aft near the trailing edge of the wing. This design, incidentally, was never developed and although the location of the cannon, pilot and engine offered excellent possibilities for pilot vision, the detailed design of the airplane disclosed certain disadvantages. Our first attempts to locate the pilot forward didn't look too promising, and the requirements of maximum speed and performance and minimum weight led to the temporary abandonment of the forward location of the pilot and a preliminary design was prepared with the pilot in the aft location. Preliminary data was submitted to the materiel division of the air corps, and after careful study by engineers at Wright Field, it was reported informally as being generally suitable.

We were told that within a few weeks the air corps would request proposed interceptor pursuit designs for evaluation and that it wished our design to be entered in such competition. We returned to Buffalo and began more intensive study of the detail design required in the airplane and prepared complete breakdowns of the weight and balance of the airplane for evaluation. Soon we received, from the air corps, the promised invitation to submit our design.

In an effort to explain new installations and their (Turn to page 46)



# FLIVVER PATROL

They are still finding new ways for light planes to take an active part in this war.

BY WILLIAM STROHMEIER

**A** LONG the east coast of England and Scotland, today, there is a strange bit of flying going on which is never mentioned in the daily news dispatches of R. A. F. activity. Hundreds of unsung pilots are daily performing yeoman service along the coast, flying longer hours than the bomber pilots. They are a strange assortment of pilots, too. They're not the dashing young Spitfire or Hurricane maestros; none of them has probably ever pushed forward the throttles of a twin-engine bomber. No, they're just run-of-the-mill private pilots, either too old or unfit for military service. But they're doing more for England than just ferrying airplanes behind the lines, or instructing younger pilots to go out and challenge the Luftwaffe. Theirs is a vital mission.

They're patrolling the coast of England and Scotland!

And they're not doing it in twin-engine flying boats, either. They're flying anything and everything that can't possibly be used for other fighting. They're using private airplanes—everything that will fly. The reliable sources which have given this writer the information on this unknown phase of World War II's

flight activity indicate that some of the planes they're using even include some old Avros with rotary engines.

They're guarding the coast of England against the infiltration of spies, the danger of close-in submarine attacks on coast-wise shipping; in short, doing a he-man's job in a way probably more efficient than regular army or naval air force equipment could do it. So important has this patrol work become and so effective have been the results that at the present time a special type of medal is being prepared for these erstwhile private pilots in recognition of their feats.

High-power-conscious naval "experts" will probably lift an eyebrow and wonder how mediocre pilots, who can't stand 9G dives, flying light airplanes and antiquated equipment, can be of any possible use to the Coastal Command. Well, perhaps these power-crazy individuals had better take a good look at this flying and change their views about light planes and national defense.

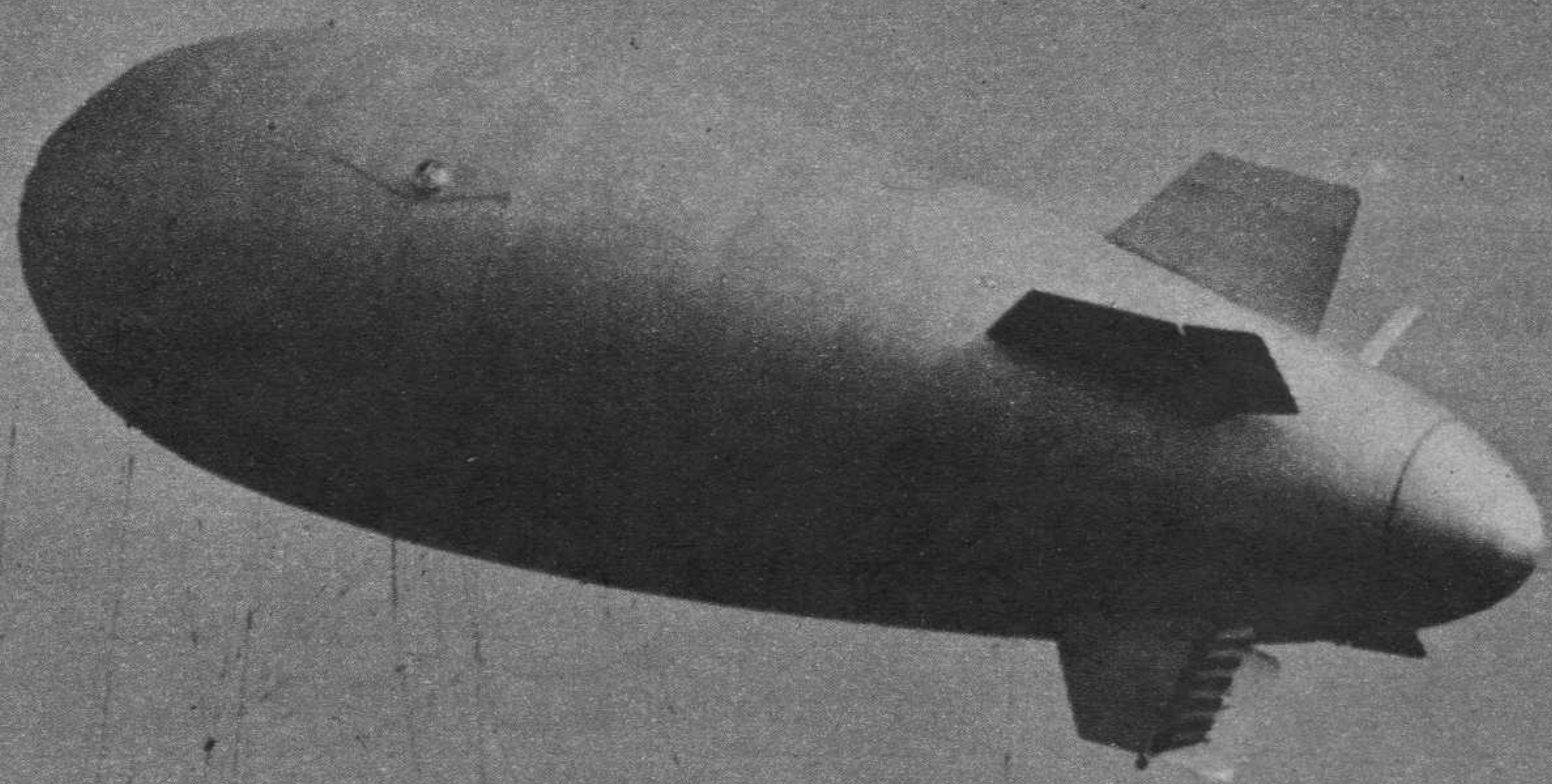
To see how this technique works, let's imagine ourselves as a member of this unique patrol. We're given, (Turn to page 49)

Artist's conception of rebuilt tankers being used as carriers for light planes to act as submarine spotters for a huge convoy of supply ships.





# RUBBER JOINS THE RANKS

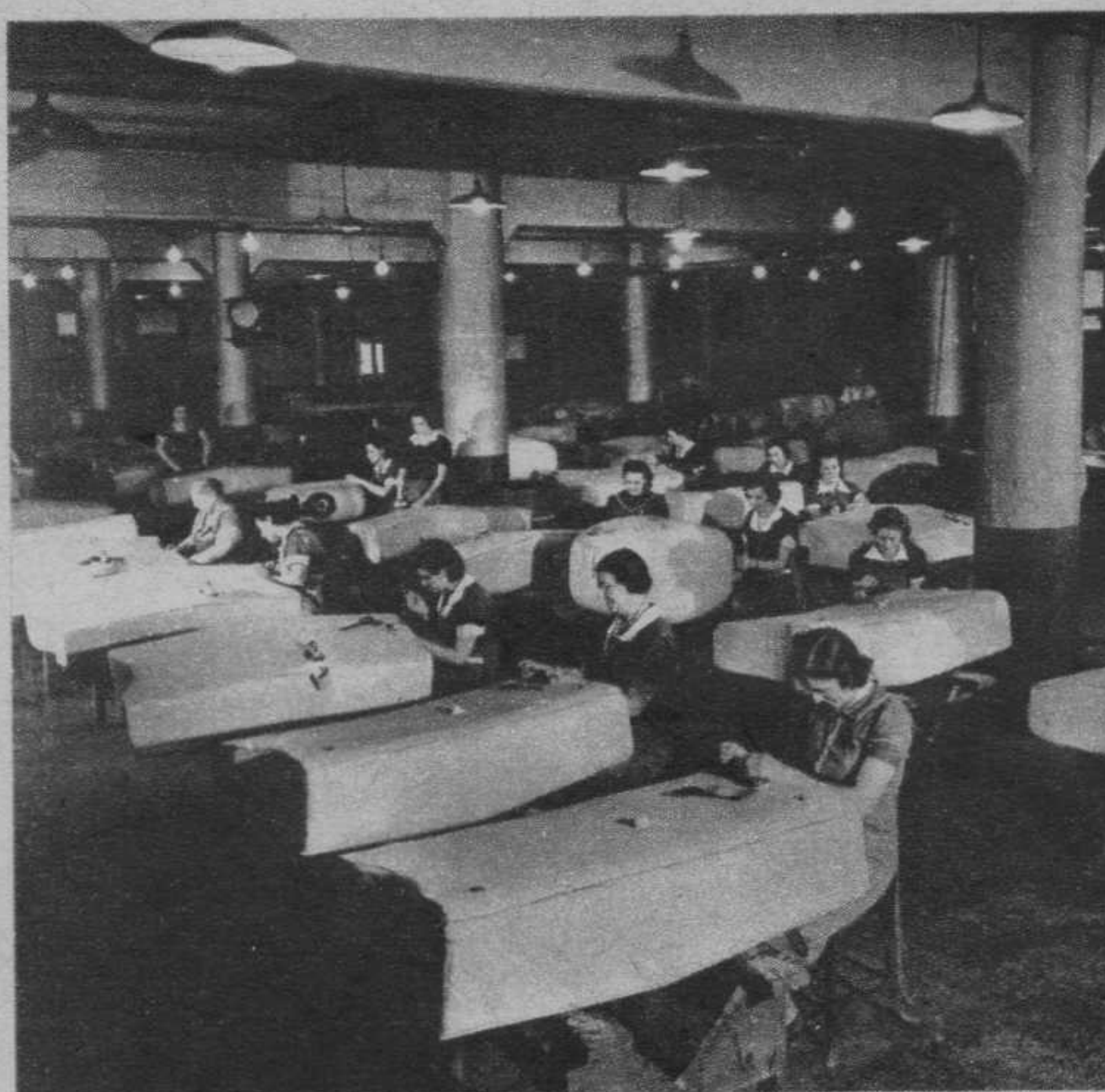


Blimp blitz! Rubber is important in the development of our rapidly growing barrage-balloon units.

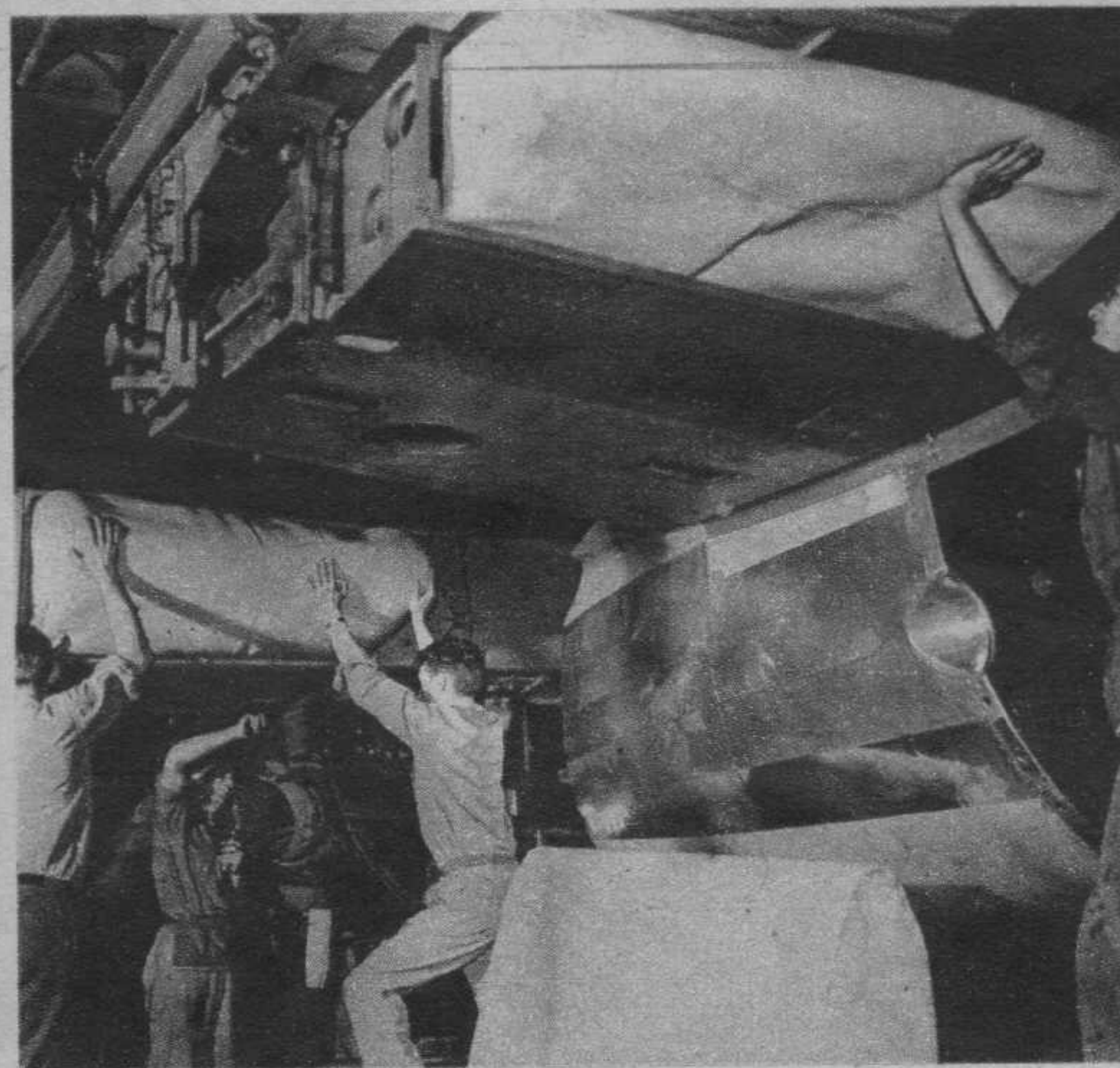
It's not all metal. A lot of rubber is needed in the upstairs war these days, with new purposes being found constantly.



A "Good Year" for defense. These training balloons depend on rubberized fabric for their gas envelope.



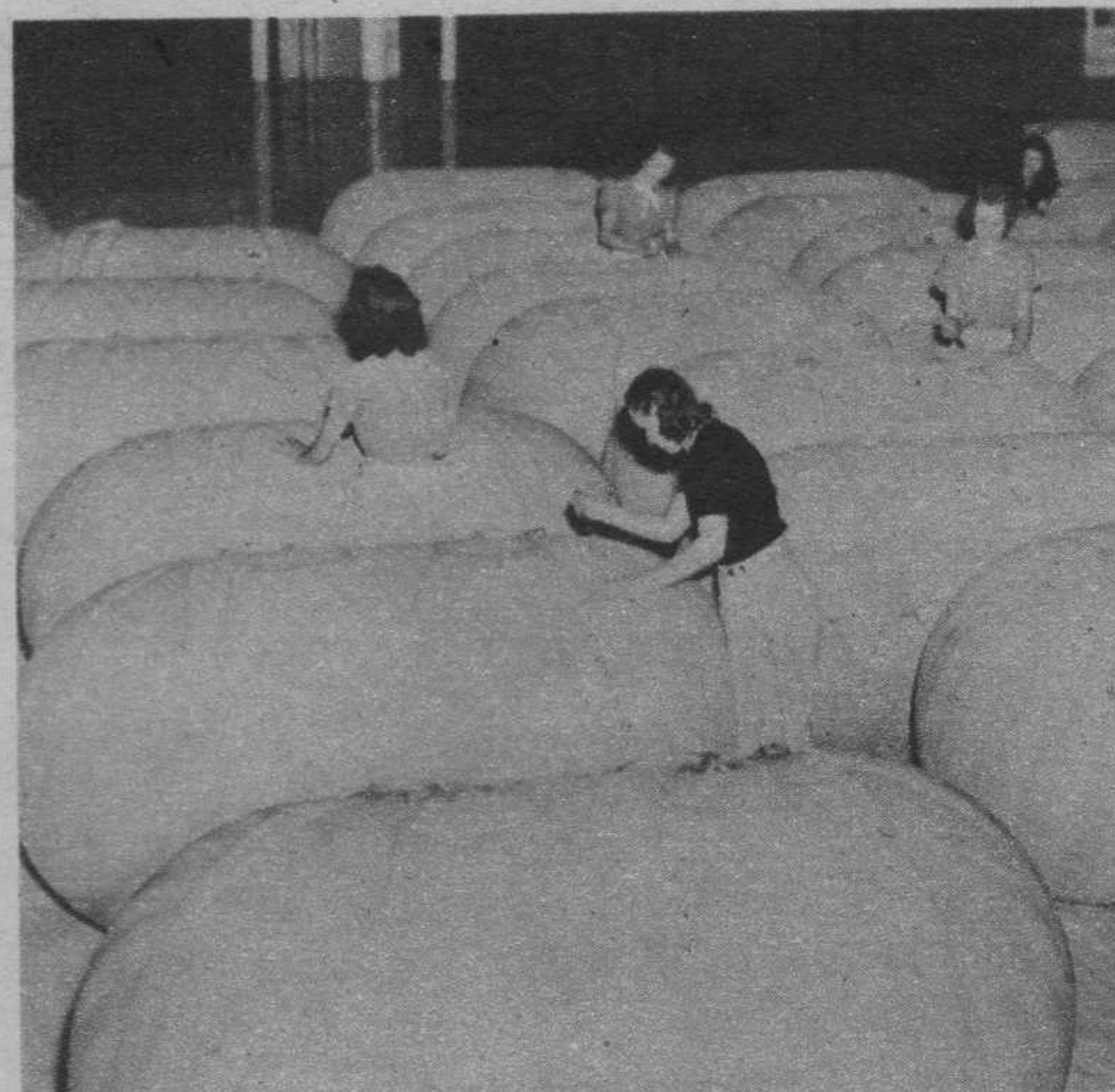
Ladies' aid. Doing their part to speed preparedness, Goodrich workers finish leakproof tanks.



Sealed with safety, these rubber-protected leakproof tanks fit into wings of the DB-7 bomber.



Here finishing touches are added to quick-inflating rubber lifeboats for seagoing planes.



In the bag. These flotation bags of rubberized fabric will save many landplanes down at sea.



# THAT SECRET BOMB SIGHT

Just how accurate? How does it compare with the foreign product? What's rumor and what's fact about our super sight?

BY JOHN R. HOYT

**O**VERHEAD, no planes could be seen. There was no sound of approaching bombers and no indication of an impending attack. The objective seemed to be perfectly safe, and the defense relaxed.

Suddenly they stiffened. The sound of a falling bomb, whining softly, then growing louder, pierced the air. Seconds later it struck with a terrific detonation, striking the objective squarely and doing terrible damage. The effect was demoralizing and the defenders now knew that bombers were flying *so high* that they could neither be seen nor heard. But the worst of it was the fact that from such high altitudes the enemy was hitting the target!

So far as is known from observation abroad, no foreign power possesses a bomb sight that can drop bombs with any accuracy from high altitudes. When it was rumored several months ago that the army's famous bomb sight was to be transferred abroad along with some high-speed bombers, military pilots were aghast. Transfer the bomb sight, by means of which a bomb could be dropped into a pickle barrel from the height of a mile? Unbelievable! It was still a weapon that every one knew existed, but which no one knew much about.

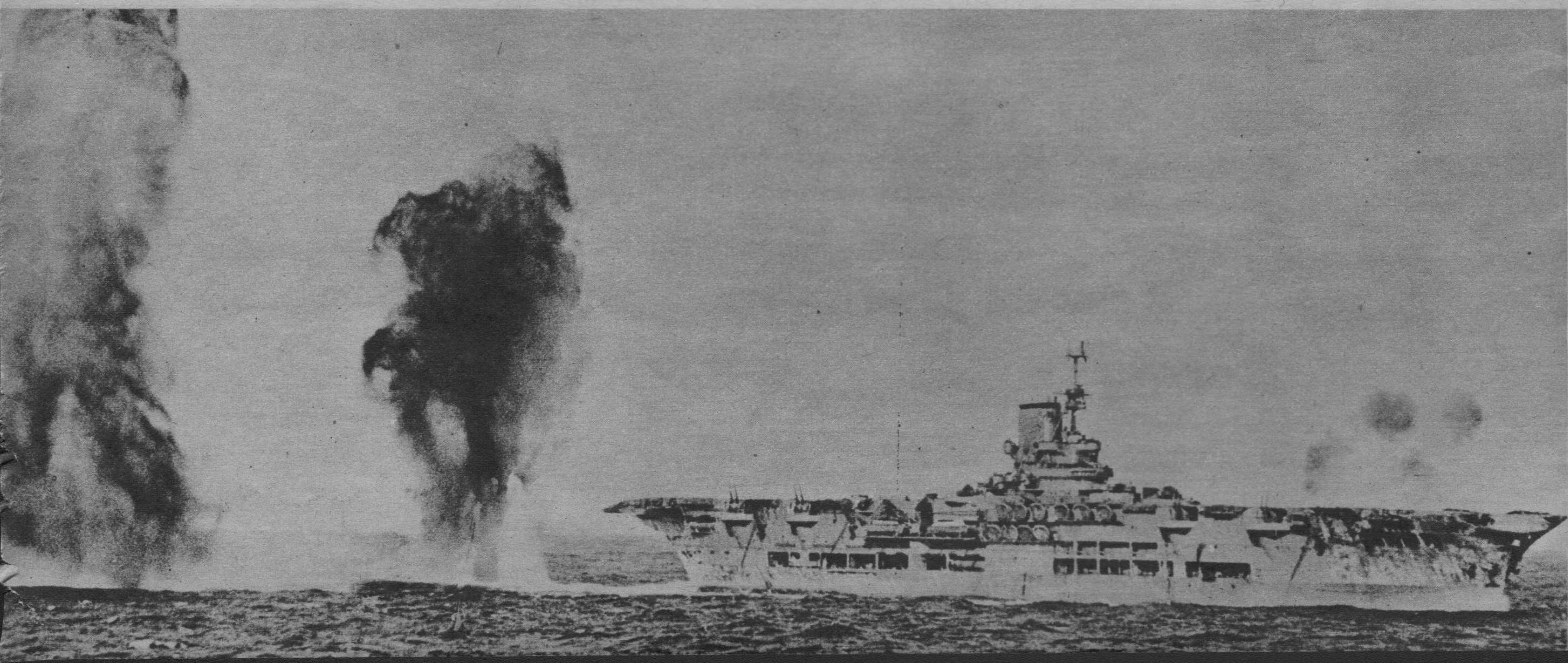
To illustrate how little is known about the bomb sight, take the case of a bombing pilot who was quizzed by an officer of a foreign intelligence unit regarding the instrument. The pilot had used it countless times and was intimately familiar with the method of operation. But when asked how it worked he said, "You press the little knob down, the wheels go round and round and the answer falls out the bottom." And that was actually all he knew about it.

It is doubted that there are any photographs of the weapon, but pilots claim a thousand pictures of it could serve no purpose. Shiny, black, bulky, with a few knobs and an eyepiece: of what value would a picture be if the pilot himself couldn't explain the bomb sight? Especially when it is pointed out that he had studied it, worked with it, and knew it so thoroughly that he could operate the mechanism in the darkness of a night-bombing attack?

So far as pilots knowing what is inside the bomb sight is con-



Two-man classroom. This bombing trainer as described in the article is used to train bombardiers for high-altitude work. Bomb sight, covered for secrecy, drops plumb-bob on moving target simulating a battleship. Below—The oft-sunk Ark Royal still ducks 'em (to date) with some coming close.







Bad news for the enemy. The Consolidated B-24, many of which are going to England, has speed of 300 m.p.h., range of 3,000 mi., weighs over 40,000 lbs.

cerned it is just like the case of a man operating an adding machine. He knows which buttons to press to get his answer, but he couldn't take a machine apart or build one if his life depended upon it. Like as not, he couldn't so much as tell the principle of the thing.

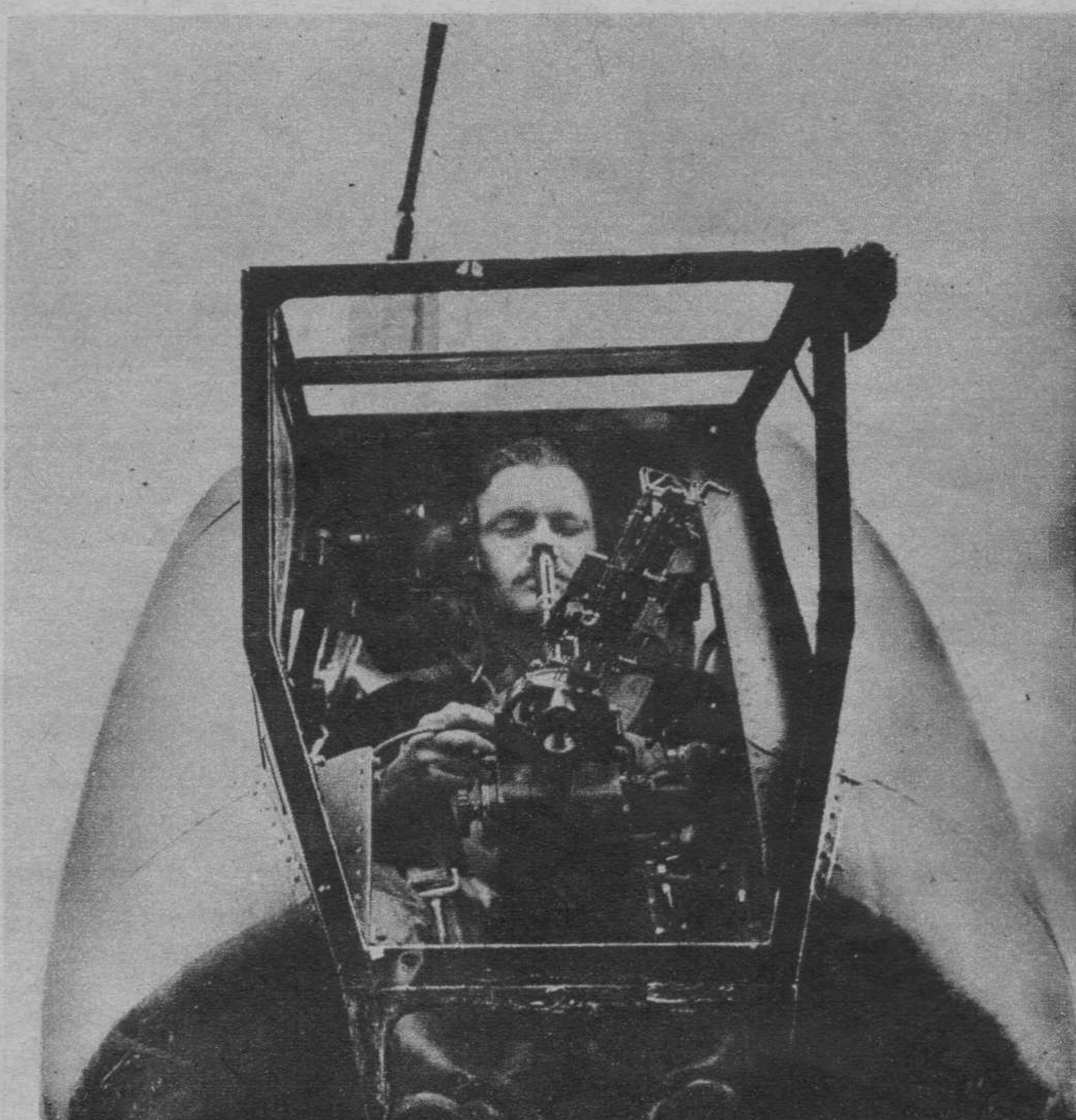
The principle of operating a bomb sight is easily described—but first, let's take an actual example of a sight in operation. In the first place, it is never used in dive bombers, such as the Stuka; it is primarily for horizontal bombers that fly level, carry huge 1,000 to 2,000-pound bombs. In the second place, it is usually used in high-altitude bombers, because antiaircraft can hit a plane flying at low altitude, and because a plane at low altitude can get good hits using the ordinary drift-sight type of aiming device. (In fact, the foreign nations claim the accuracy of these is satisfactory, and like the fox and the grapes, wouldn't want the American sight anyhow. But if this is the case, why do they keep their agents busy trying to beg, borrow or steal the sight?)

In operation the pilot gets lined up on his target, and the higher he can fly the better. As soon as the plane is within a moderate distance of the objective, the man at the bomb sight, the bombardier, takes over. From then on he directs the operation of the plane, puts certain data into the sight, and starts it going. The sight computes the time to drop the bomb so that the combined speeds—wind, plane and target (in case of a ship at sea)—will be properly compensated for. And, as is well known, a 1,000-pound bomb can be dropped into the funnel of a ship by this method.

Pilots know that a salvo of 1,000-pound bombs could literally lift a battleship out of the water. The difficulty lies in putting the salvo on or around the ship, because at low altitude the anti-aircraft fire is terrific—and at high altitude the target looks to be the size of a toy. In actual appearance the ship seems to lie motionless on the surface of a rounded, endless ocean, and the plane seems to hover about it. There is positively no sensation of speed in spite of the plane's 300-miles-per-hour capabilities and the stiff winds always encountered in the stratosphere.

From 30,000 feet a pilot is unable to determine exactly when he is precisely above an object. Obviously the farther one is from an object, the more difficult it becomes to estimate the position of it. To illustrate this point, try an experiment some day while driving past a prominent hill or mountain. Select a road about 30,000 feet away, a road that will take you past the promontory, not toward it. As you drive past, try to determine the exact moment that you could fire a shot that would strike the peak, making proper allowance for the speed of the automobile. This moment, you will agree, is very hard to determine.

It is even more difficult to determine such a position when flying over a target, with a speed of 300 miles per hour. But this problem is simple compared with the real conditions that exist. In actual bombing conditions the plane would be crabbing to one side due to a cross wind, and the target would be going in (*Turn to page 62*)

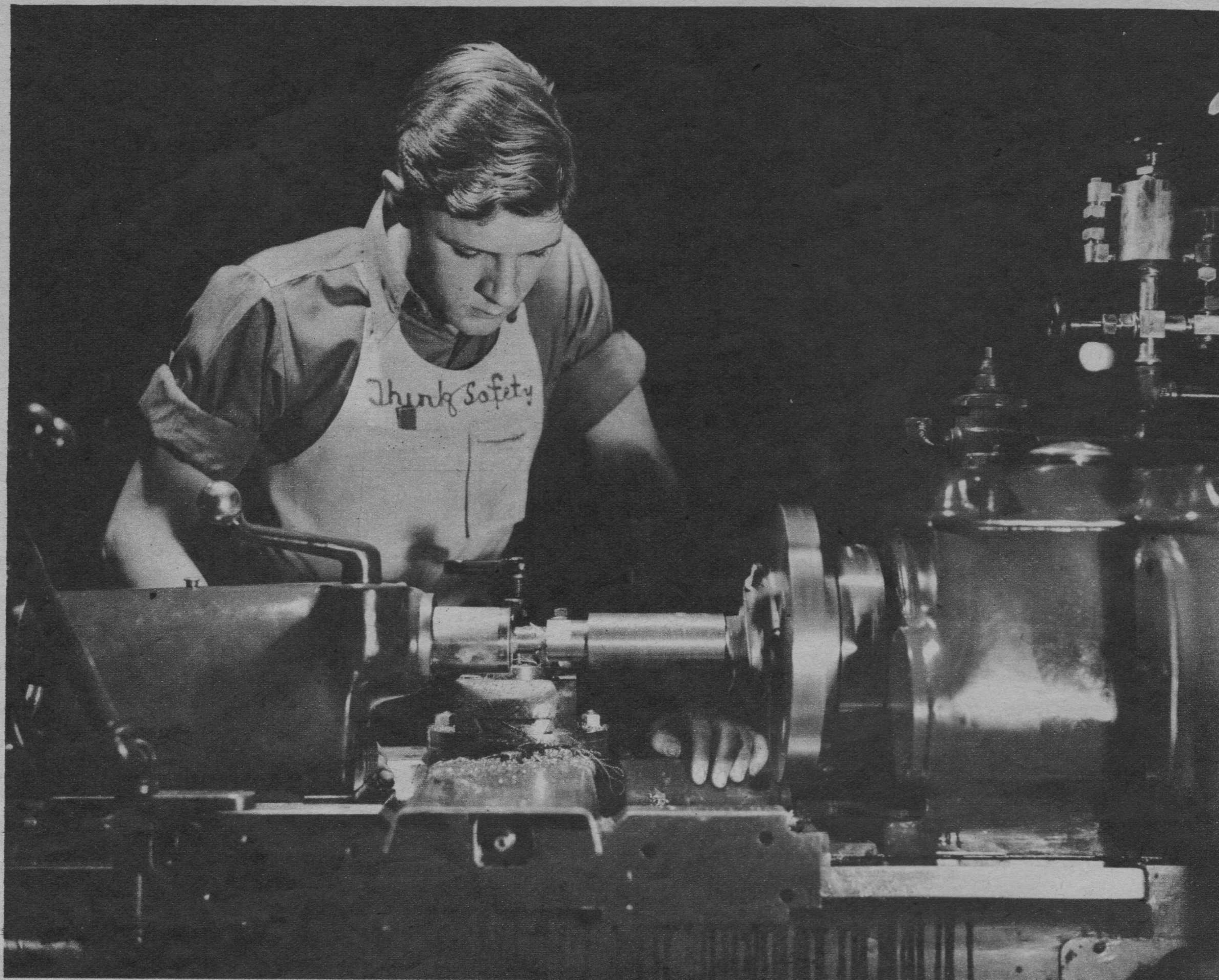


Secret? The British apparently don't mind your seeing their sight. They are said to have an American sight, too, for service testing.



Checking a British bomb sight in this testing apparatus keeps it accurate, at least in theory. After all, results are what count.





# STUDENT GETS JOB

Here are tips on just what to do when you apply for that job. They'll help!

BY EDWARD N. WHITTINGTON

Supt. Aviation Division, The Delehanty Inst.

**W**HERE do we go from here? This question is paramount in the minds of all aviation trade school students on graduation day.

Sure, it's bewildering. For months you've looked forward to the day you can go out and take your place in the great industry chosen as a career. You have planned just how to go about getting that job, how to pass all requirements and start the next day at a job that will lead to great things. Now that the day has arrived, however, you have a case of job-hunt jitters.

Just relax, mister. Thousands of others have been on the same spot and lived to punch a time clock. First of all let's realize what we are up against and then act accordingly.

Practically every reputable aviation trade school maintains placement bureaus or contacting representatives who keep in touch with the industry in order that graduates may know who needs what in the way of new employees. Even so, the student is pretty much on his own as far as the actual application and preparation for an interview are concerned. It's this phase we're going to talk about.

The first thing to do is obtain an employment application from the company selected or recommended. This may be obtained either by mail or in person. Every company has its own set of questions, but basically they are the same. Many questions will seem peculiar to you and out of place. For example, "Do you expect to make your home here?" Not so silly when you consider that workers who continually shift about looking for "something better" seldom find it or a good job, either. "What are your hobbies?" will give an insight into your other interests, and from this they may learn about your patience, physical skill and ability to work with others. But no matter how the questions strike you, be sure to answer every one—don't just check them.

You will note that your Social Security number is requested. If you do not already have it, get it at once. Your number may be had from your nearest office of the Social Security Board. Information regarding this may be also obtained from your postmaster. Proof of your citizenship in the United States is of the greatest importance and *must* be available for inspection by your future employer. This may consist of such identification as passports, "seaman's passports" furnished to American sailors, birth certificates and the like. In case you haven't a birth certificate, your parents may make a sworn statement giving the facts and this will be accepted. If (Turn to page 55)





# CHUTE CONTROL

Like to try it? These parachute soldiers at Ft. Benning show you the tricks they've learned.



For water landing. L. to R. Unbuckle crotch straps and sit in seat straps. Unfasten chest straps and fold arms until just over water. Raise arms and drop free.



After landing, 'chute may be collapsed by running around it or into it. If another person is there to help, have him grab pilot 'chute and run opposite way, upwind.



Pulling right shroud lines will cause 'chute to drift to left.



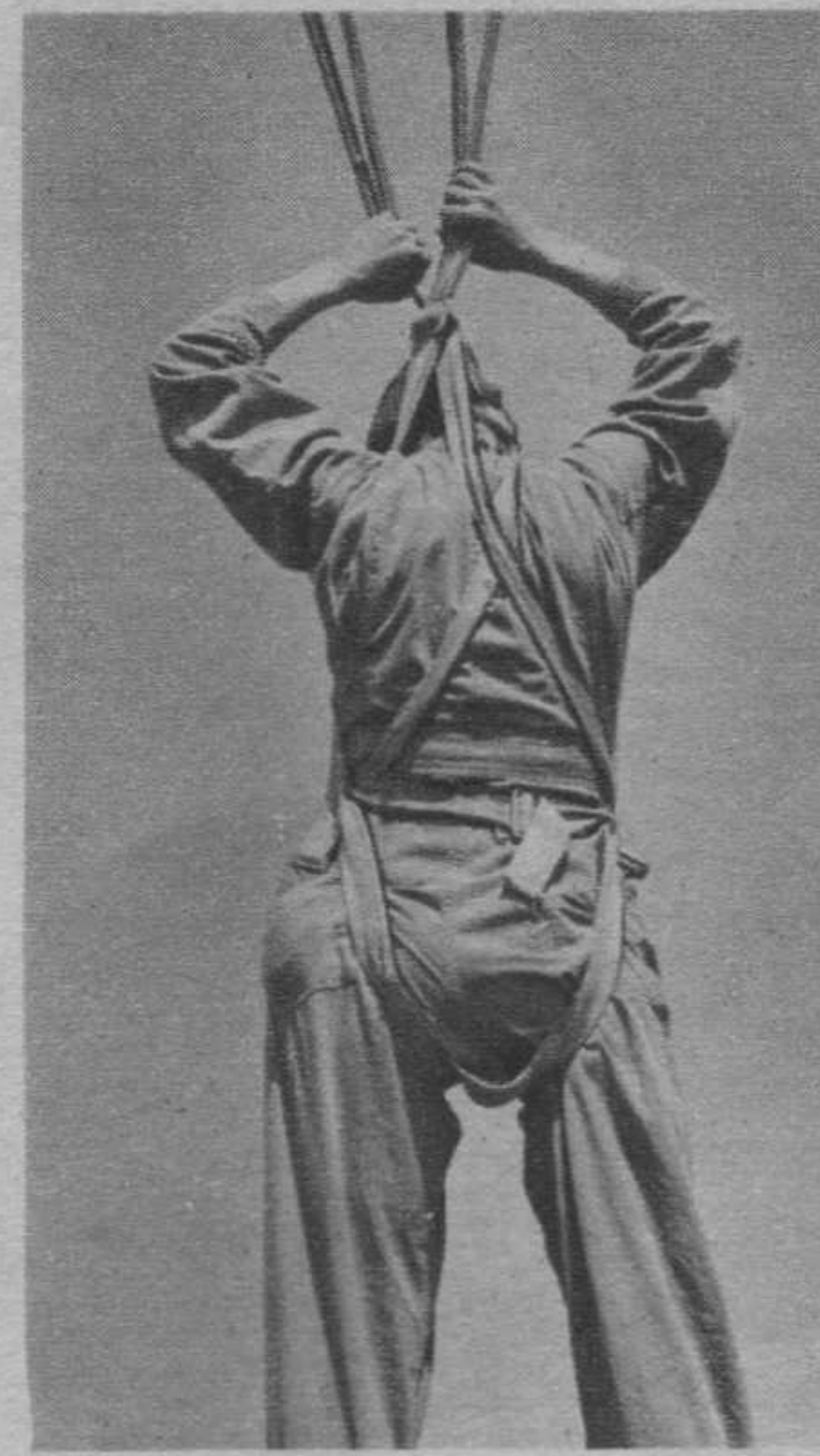
Pulling left-hand shroud lines will make 'chute swing to right.



To turn to right, pull front right and the left rear shroud lines.



To turn 'chute to left, pull rear right and the left front lines.



To turn completely around pull shroud lines crosswise behind.



As you land, grab front lines to spill 'chute as soon as possible.



To spill 'chute upon landing, if unable to run around or into it, pull front lines, now on bottom, spilling air from top of 'chute.



# YOU CAN STILL GET IT FREE

BY ALEXIS  
DAWYDOFF

Don't be alarmed about  
budget cuts in that free  
C. P. T. P. flight training.



In such planes as this Ryan PT-20A the advanced students get their secondary course of flight training.

**Y**OU can, if you're one of those guys who counted on the Civilian Pilot Training Program to make you a pilot, uncross your fingers about reports of the government curtailing this free training. Congress set next year's C. P. T. P. funds at \$25,000,000—\$7,000,000 more than the Budget Bureau's estimate and only \$12,000,000 less than this year's appropriation.

The Budget Bureau's estimate would have halved available funds. The C. P. T. P. would have had either to reduce its training centers by one third—there are approximately 900—or to have abandoned next summer's course and operate two instead of three programs in 1942. But breathe freely. You can still get it free!

Uncle Sam is still willing to realize this "pipe dream" of yours. He may even make you into a military aviator. By March 1, 1941, more than 4,800 trainees had entered the armed services. Twenty-two percent of the army's air cadets came from the C. P. T. P. Can you imagine yourself behind the stick of a P-40 or at the "Dep wheel" of a Flying Fortress? Thanks to the National Air Training Association, Grove Webster, the N. A. A., air-minded congressmen, and aviation

people who fought for adequate C. P. T. P. funds, you can do more than dream about it.

Suppose you take pen in hand and write to the Department of Commerce, Civil Aeronautics Authority, Washington, D. C., for information on how to become a pilot free of charge. In due time you are informed that you must be a citizen of the U. S. between the ages of eighteen and twenty-six, that the training program is divided into two stages, primary and secondary. You learn that the Civil Pilots Training Program is both for college and noncollege people, that there are approximately 900 training centers, 709 colleges and 211 noncollege units being engaged in giving these courses.

This is how it works. The government issues a quota of so many trainees per State. This quota is divided among some of the colleges in the State, a small percentage going toward the training of noncollege men and women. The college which has the contract for this program appoints a fixed-base flight operator to train the students. This operator must have one airplane of no less than 50 h.p., one rated instructor and two parachutes for each (*Continued on page 60*)

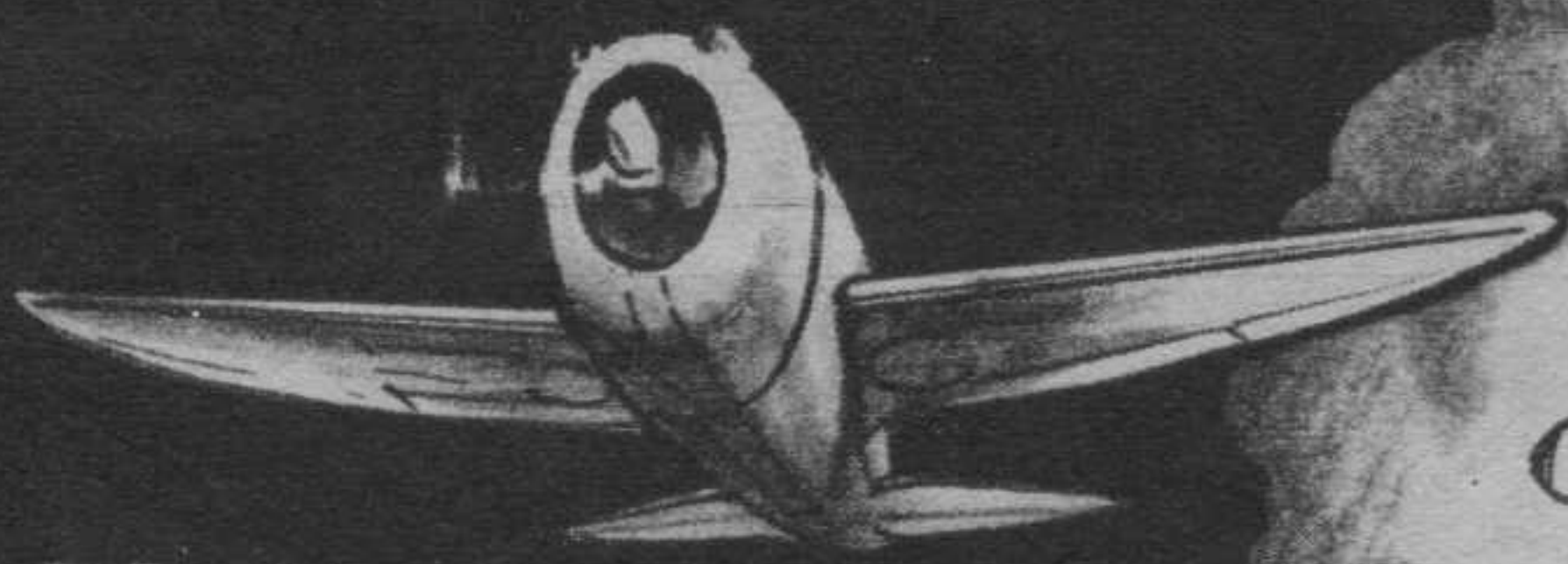
Rugged and easy-to-fly light planes such as these have turned out thousands of potential military pilots.





# THE ANATOMY OF AIR

BY ERIC SLOANE



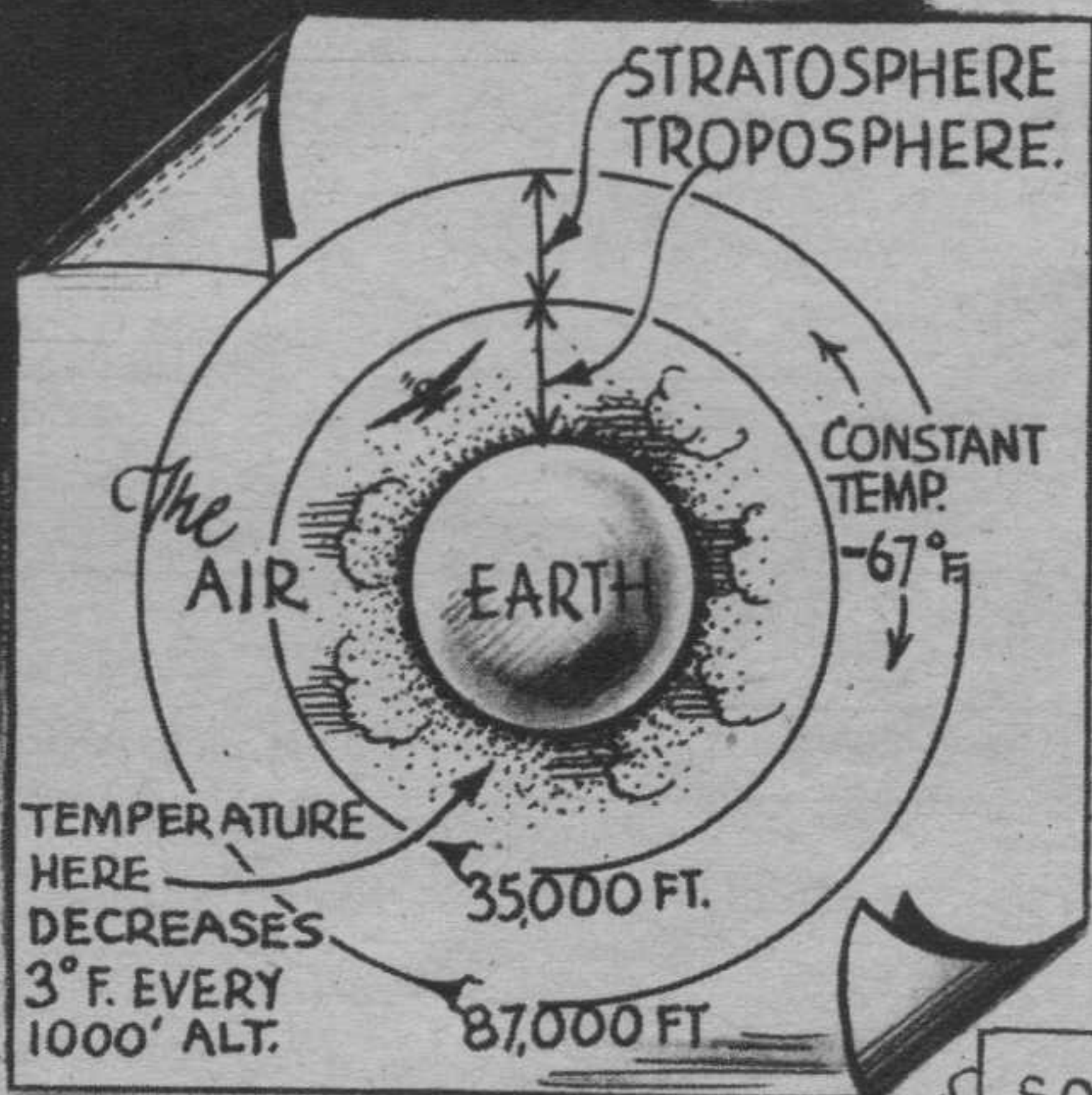
*The* **AIR** IS LIKE AN OCEAN THAT EXTENDS NEARLY TWO HUNDRED MILES ABOVE *the* EARTH'S SURFACE. WE LIVE ON THIS "OCEAN BOTTOM" WHERE *the* PRESSURE IS GREATEST. ONE HALF OF THE WEIGHT OF ALL AIR IS BELOW 18,000 FEET ALTITUDE.

FORCED - **OXYGEN** BECOMES NECESSARY AT 15,000 FT. ALTITUDE OR OVER.



DANGER - STAY AWAY FROM MR. THUNDERHEAD!

*Air disturbance in and near these clouds.*



HERE'S WHERE I GET ALTITUDE!

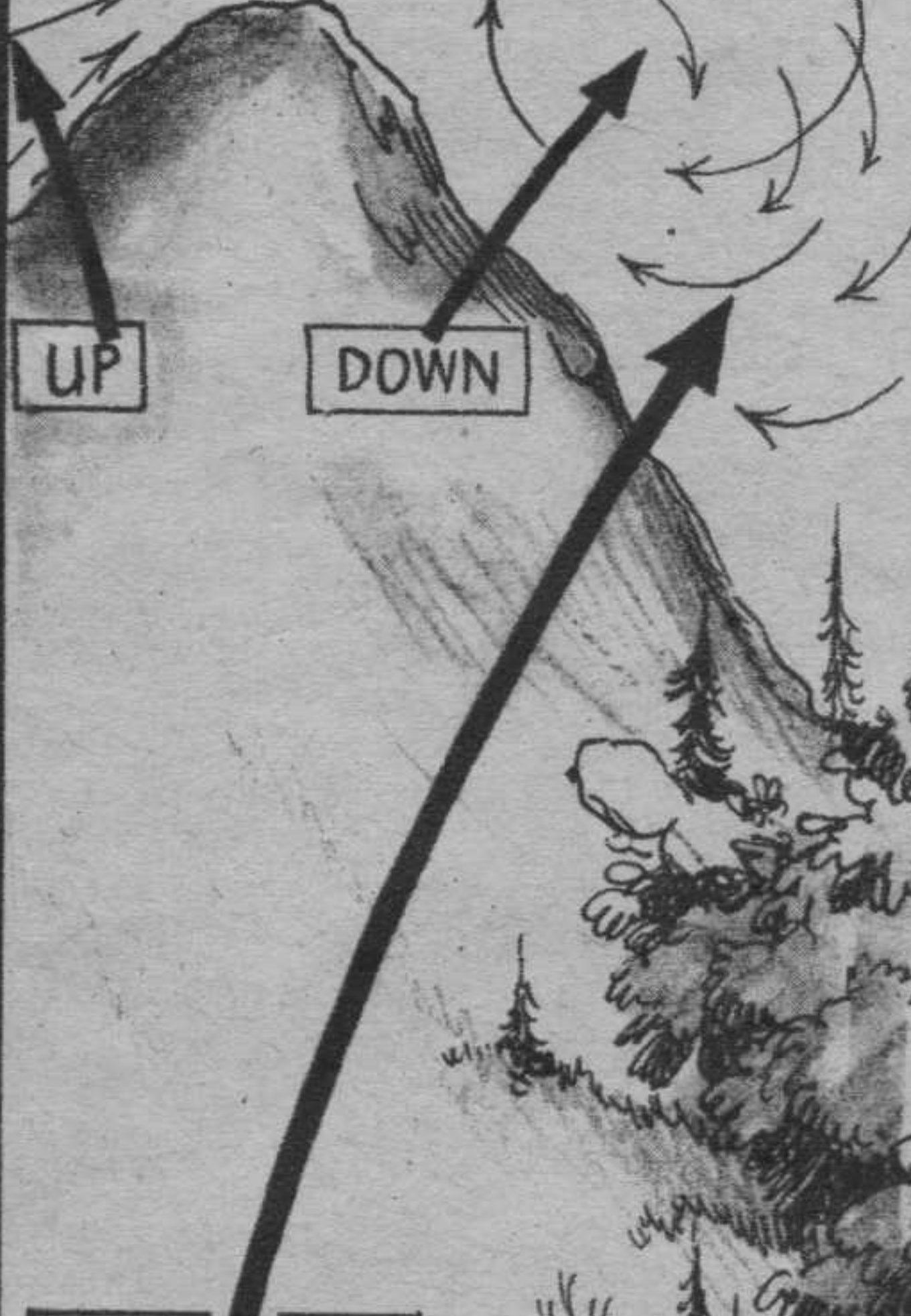
SO CALLED "AIR POCKETS" are ONLY *the* PLANE HITTING UNEVEN CURRENTS

*bumpy* air



WIND FOLLOWS EARTH CONTOUR.

UPDRAFT *under* CUMULUS CLOUDS.



**HILLS**

Disturbed air or "bubbles" are on lee side of a hill. As wind follows the earth's contours there is UPDRAFT on windy side & DOWNDRAFT on lee.

SWAMPS & COOL  
**WOODS**  
DOWNDRAFT

NIGHT AIR is smoother to fly in but above chart is reversed

WATER CITY

DRY DESERTS &  
**FIELDS**  
RISING HEAT.

Always  
**WATER**  
DOWNDRAFT

Always  
**CITY**  
UPDRAFT

*Beaufort*  
wind scale

1	1 to 3 M.P.H.	✓	LIGHT
2	4 to 7 M.P.H.	✓	LIGHT
3	8 to 12 " "	✓	GENTLE
4	13 to 18 " "	✓	MODERATE
5	19 to 24 " "	✓	FRESH
6	25 to 31 " "	✓	STRONG

Water does not give up its heat as soon as air or earth.

7	32 to 38 MPH	////	STRONG
8	39 to 46 " "	////	GALE
9	46 to 54 " "	////	GALE
10	55 to 63 " "	////	WHOLE GALE
11	64 to 75 " "	////	WHOLE GALE
12	over 75 " "	////	HURRICANE





This Great Lakes BG-1 belongs to the marines. Note squadron insignia on the fin.



This navy ship, a Bellanca XRE-1, bears the markings of an experimental aircraft.



This placing of words "U. S. Navy" and marks means naval reserve air base use.



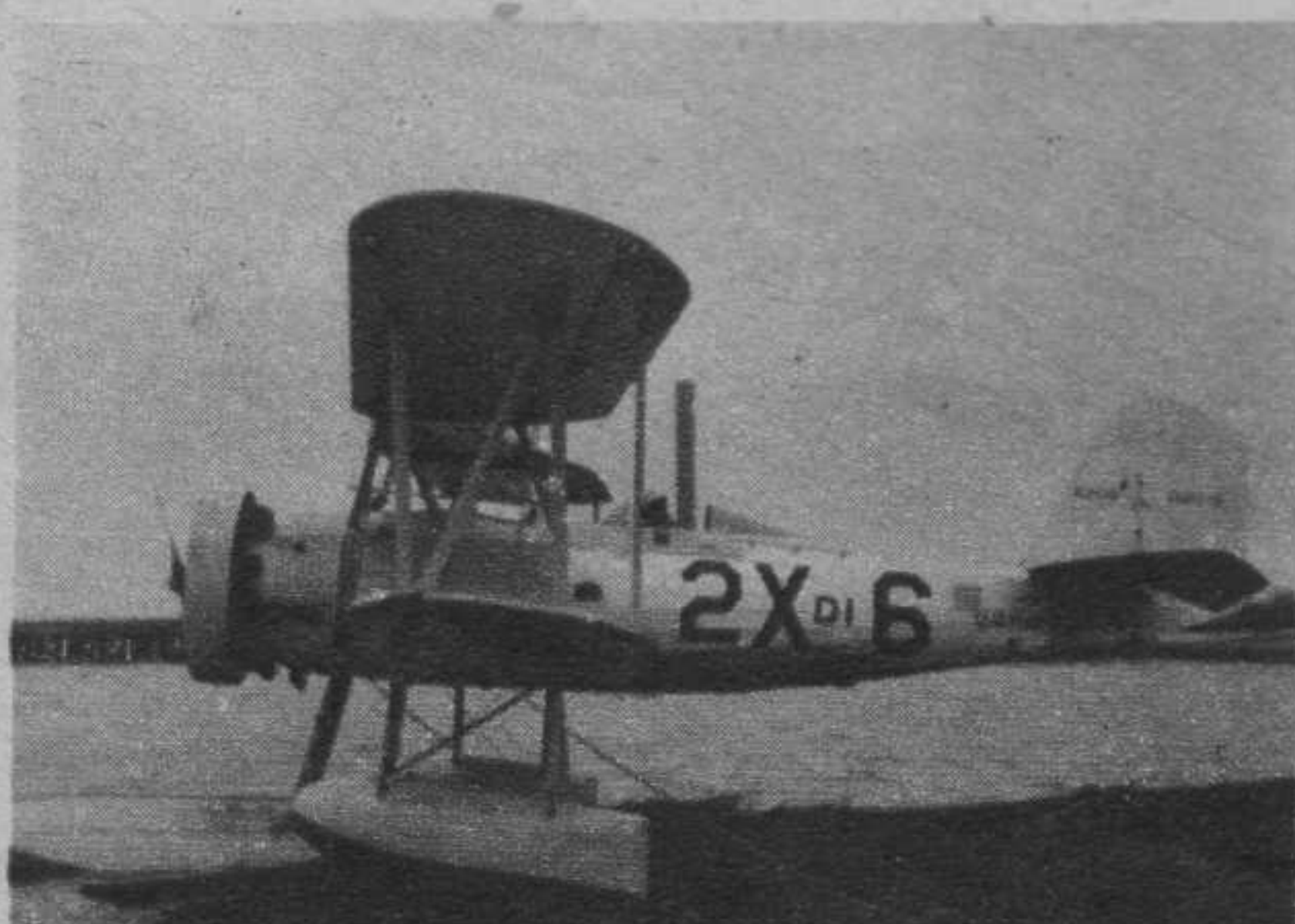
The Chief's ship. Painted all blue with silver wings and tail is true of Command ships.



Another type of Command ship bears division markings on side. A Curtiss SOC-1.



This SOC-1 shows carrier insignia. "E" is for gunning and bombing excellency.



Another type of experimental marking is on this Vought O2U-3 seaplane.



Seldom seen, we find the squadron mark "Miscellaneous" on this Vought SU-1.



This Command plane, blue and silver as usual, merely bears U. S. navy marking.

# NAVY MARKINGS

BY WILLIAM LARKINS

Associate, U. S. Naval Institute

Do you know the meaning of all the insignia, colors and numbers on naval aircraft? Test yourself with this complete summary.

**A**LTHOUGH naval aircraft markings constitute one of the most interesting phases of naval nomenclature, no one complete treatise has ever been written on the subject. Therefore this article is not presented as a complete work on naval markings, but rather as a summary of all the available data for what is undoubtedly the most complete outline available.

## Carrier-based Aircraft

By means of the diagram at the right we will explain the standard markings for carrier-based aircraft. These are the normal markings, and the many other variations will be taken up later.

(1) This is the squadron number. Each carrier squadron in the navy is assigned a number, starting with two and (at present) running to eight. Squadrons One (of all types) were stationed aboard the carrier *Langley* (CV-1) which was converted into a seaplane tender in 1937; the squadrons were disorganized and have not been reorganized. Each carrier in the navy is assigned a serial number, and this is used by all the squadrons operating from it. Following are these numbers: CV-2—*Lexington*; CV-3—*Saratoga*; CV-4—*Ranger*; CV-5—*Yorktown*; CV-6—*Enterprise*; CV-7—*Wasp*; CV-8—*Hornet*.

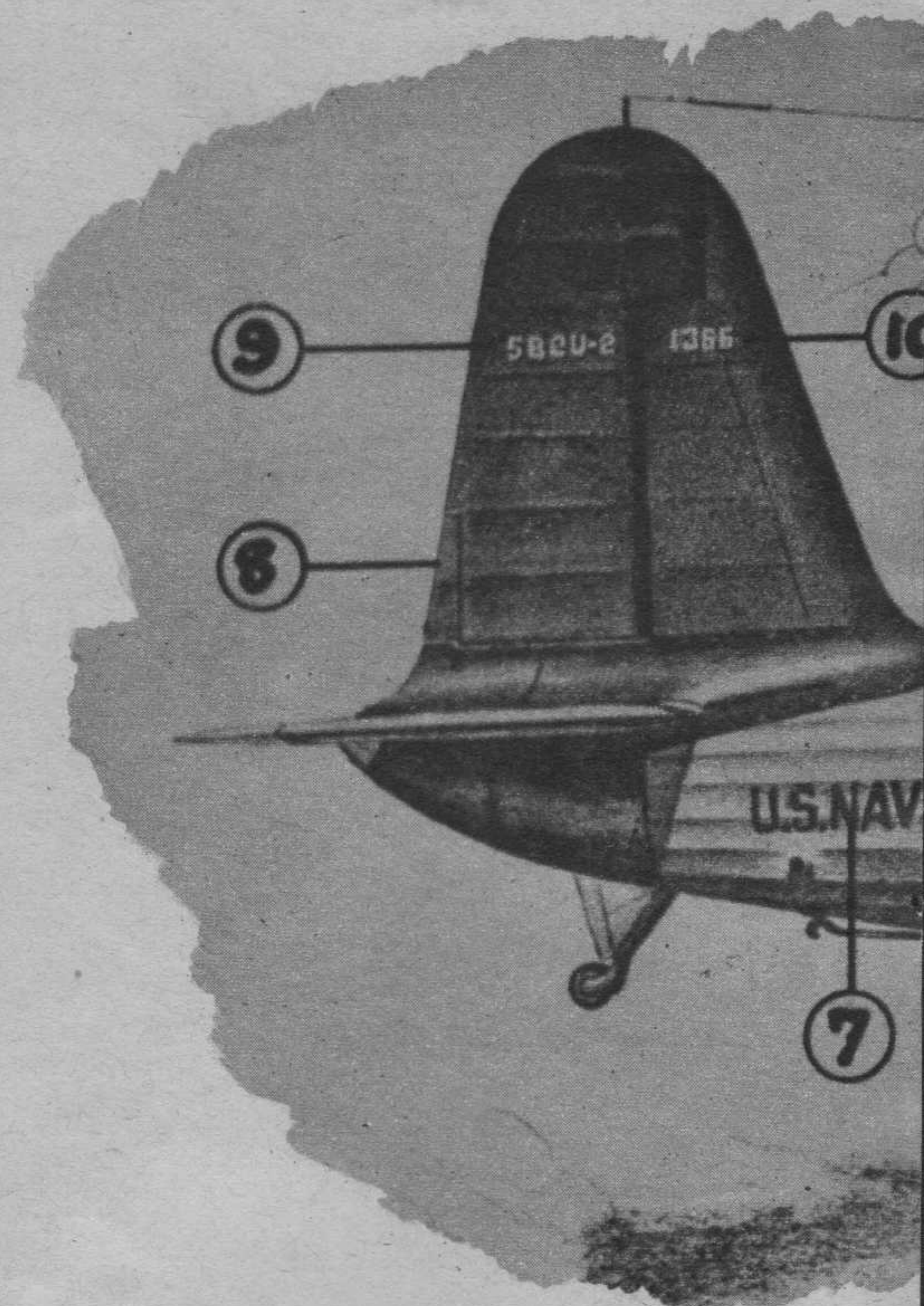
Therefore, Scouting Squadron Seven operates from the carrier *Wasp*. However, on the *Ranger* and *Wasp* (the two smallest

carriers in commission) the scouting complement is divided into two sections, and the torpedo squadrons are not operated. Therefore, on CV-4 and CV-7 the scouting squadrons were doubled, and so read 41, 42, and 71, 72. Actually, this means Squadron Seven, section one and two, but because of the absence of the expected dash many people are confused by what seems to be an apparent Squadron Seventy-two.

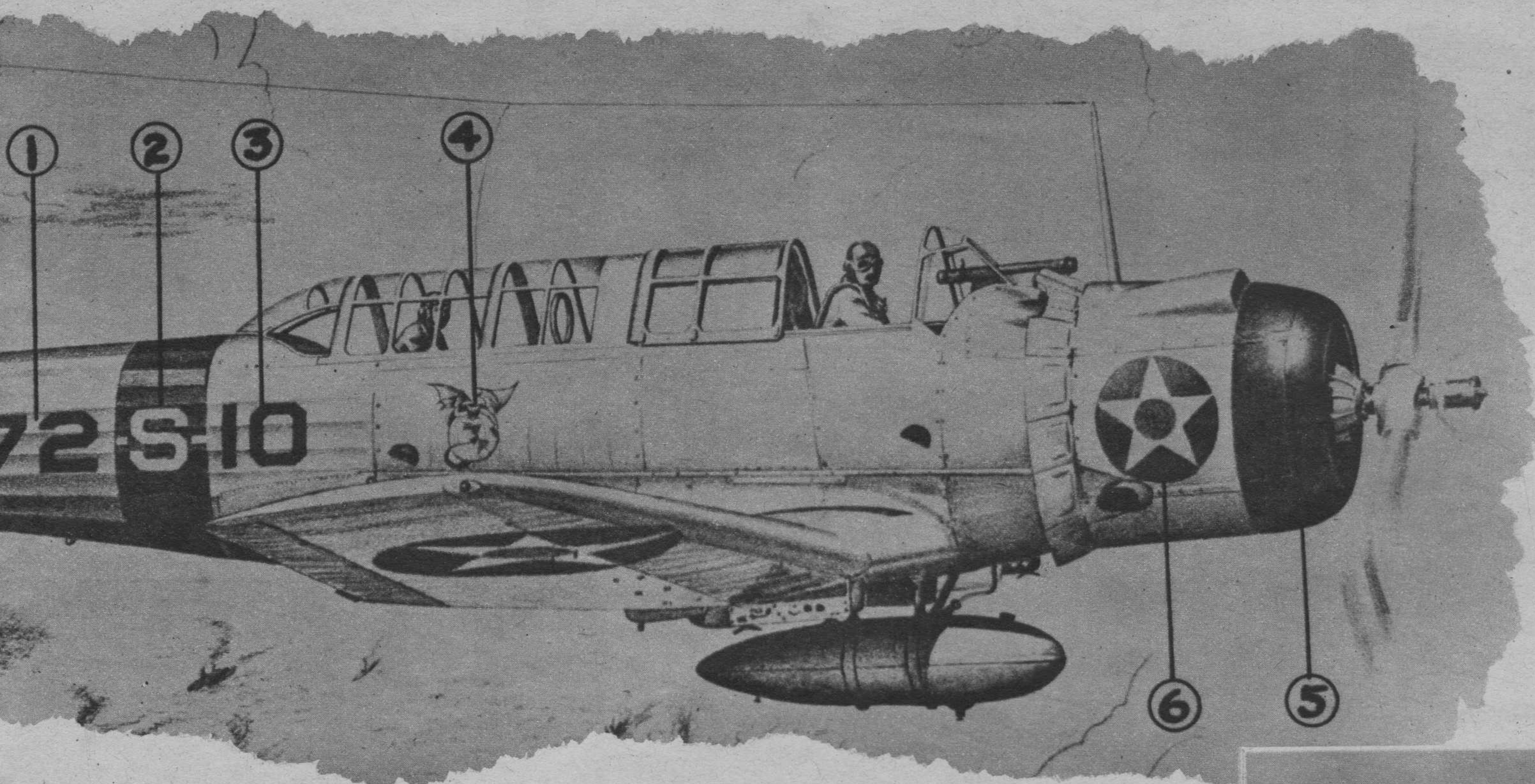
However, on the first of January, 1941, the *Ranger's* squadrons were reorganized. The "High Hats" VB-4 became VS-41. (The outfit carrying the High Hat squadron insignia has been VF-1, VB-2, VB-3, VB-4, and is now VS-41!) The former VS-41 will become VF-42 and Fighting Four will become VF-41. In other words, the *Ranger's* fighting complement will be doubled at the expense of the bombing squadron.

(2) a. This letter designates the squadron mission. In this case the S denotes a scouting squadron. The other types of missions follow: F—fighting; B—bombing; P—patrol; N—training; J—utility; T—torpedo; O—observation; M—miscellaneous; G—transport (single-engine); R—transport (multi-engine).

These missions are often combined as patrol-bombing, scout-observation, torpedo-bombing, bombing-fighting, scout-bombing and other types. Also, many planes may be manufactured under one designation and serve in another type of squadron, or one







Where to look! In this drawing by H. Clark the locations of various markings on naval aircraft are indicated. (1) Squadron number. (2) Squadron mission letter and leader's band. (3) Plane's number. (4) Squadron insignia. (5) Section color. (6) Neutrality star. (7) U. S. navy mark. (8) Carrier color. (9) Model designation number. (10) Individual serial number of plane. Top of wing is yellow—to aid in spotting the plane in case of a forced sea landing—and both sides bear the U. S. star.

that operates in a dual capacity.

b. This colored stripe is the section leader's designation. Each squadron is composed of six sections of three planes each. The leader of each section carries a full-colored band or stripe around the fuselage of the plane, and a full-colored cowling of the same color. These section colors are: Section 1—red; Section 2—white; Section 3—blue; Section 4—black; Section 5—green; Section 6—yellow.

(3) The individual aircraft number. This runs from one to eighteen in the bombing, scouting, and torpedo squadrons. Each fighting unit is assigned one VSB auxiliary, and this plane is No. 19. Patrol squadrons are composed of either six or twelve planes per squadron.

(4) The squadron insignia. This design is usually placed under or near the cockpits, but may be found in various positions throughout the many different branches of the service. The two best known are perhaps the "High Hat" and "Felix the Cat" insignia.

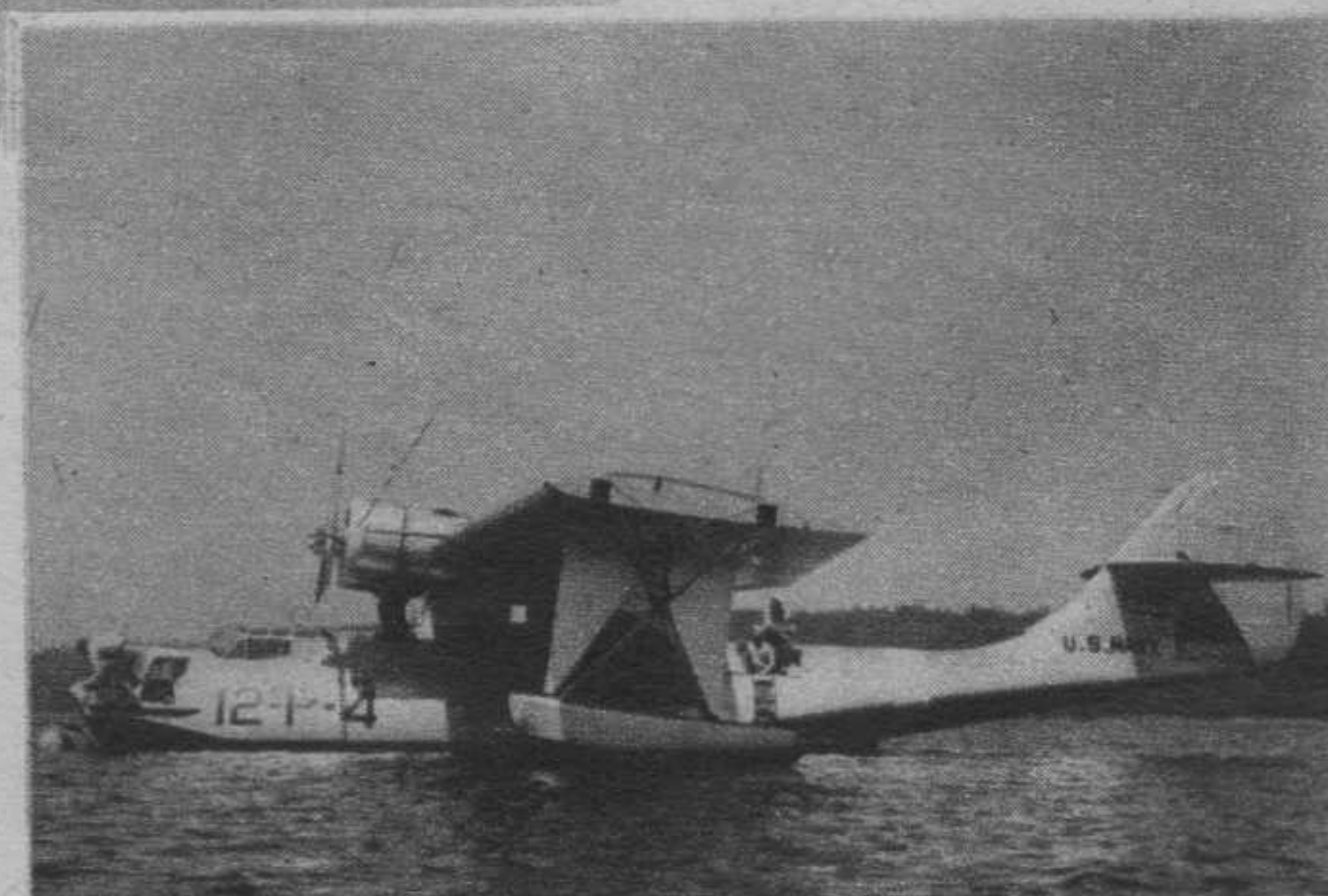
(5) The section color as placed on the

cowling. The leaders of each section, bearing full cowls, are planes No. 1-4-7-10-13-18. Planes No. 2-5-8-11-14-17 have the top half of their cowls painted with their respective colors. The remainder have the lower half painted. Plane No. 19 in the fighting squadron does not have the cowling painted.

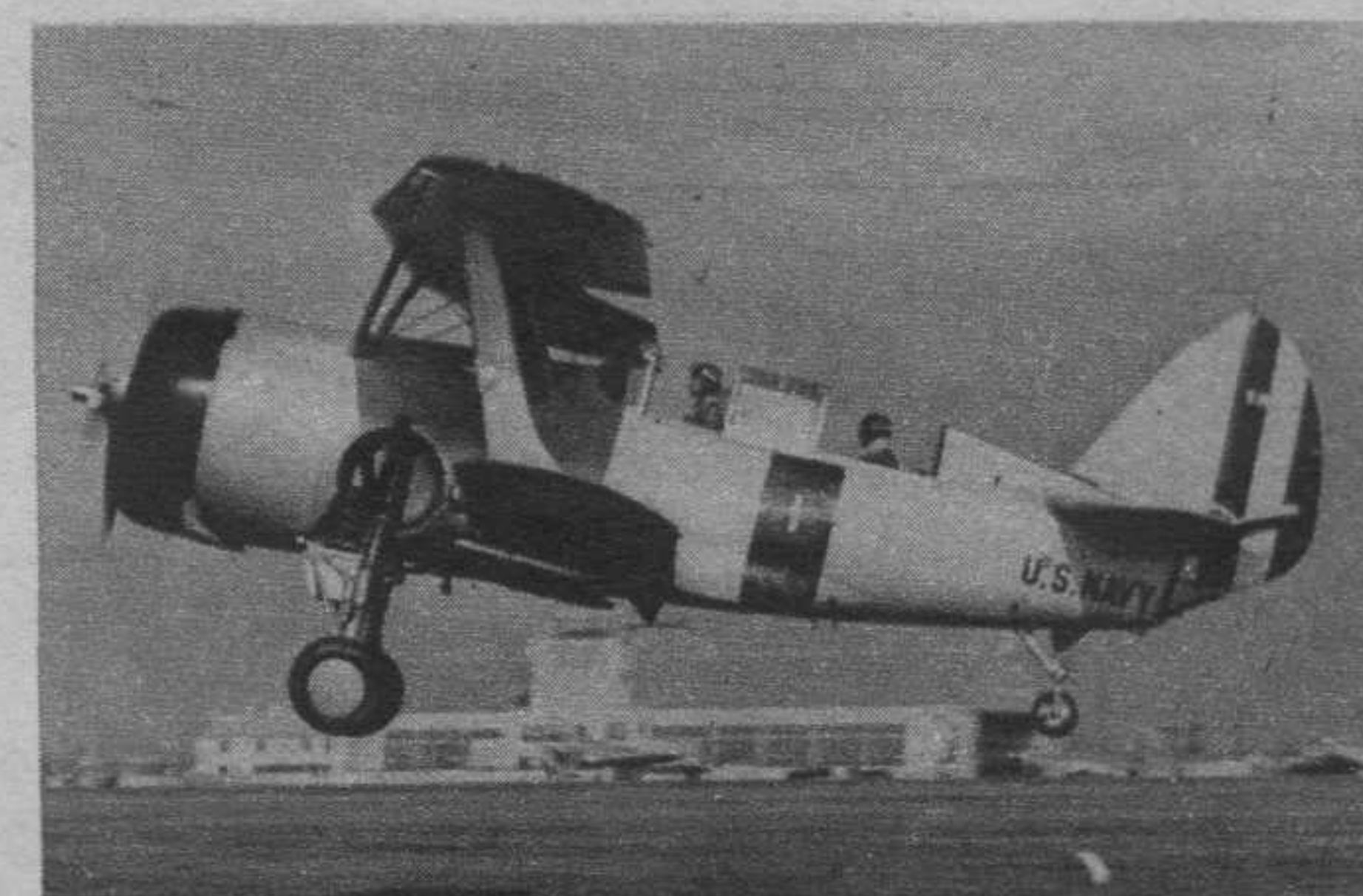
This section color is also painted in a V on the top portion of the upper wing, with the apex of the V toward the nose of the plane. When on the upper section of a biplane, the number of the plane is placed on the inside of the V.

(6) The Neutrality Star, an innovation in use since the beginning of World War II. All planes on the East coast and in the Philippines carry these Neutrality Stars on the nose.

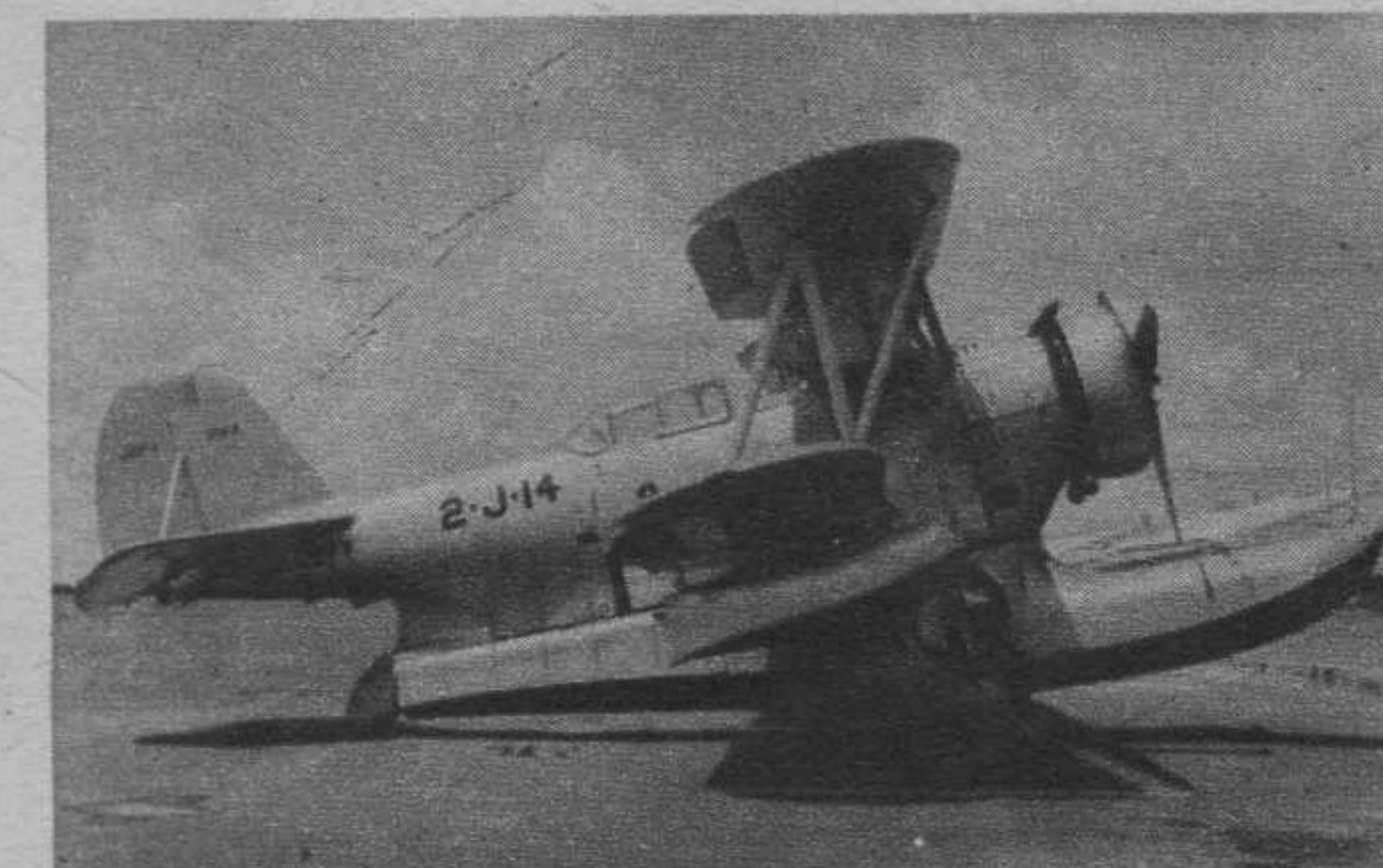
(7) The name U. S. Navy is placed on all naval aircraft starting directly beneath the elevators. Some of the older aircraft have this on the side of the fuselage on a line parallel with the elevators. The name U. S. marines is placed in the same position, but the U. S. coast (Turn to page 59)



In large flying boats such as this PBV-1 the section stripe is placed about rear of hull.



Note colored cowlings and marks; usual reserve-base method of ship identification.



This Grumman J2F-1 bears Utility Unit markings. No section stripe or cowling color.



This SOC-3 shows the type of marking that's in use by catapult seaplanes.



Note Command stripe on this SB2U-1, and new neutrality star on cowling.

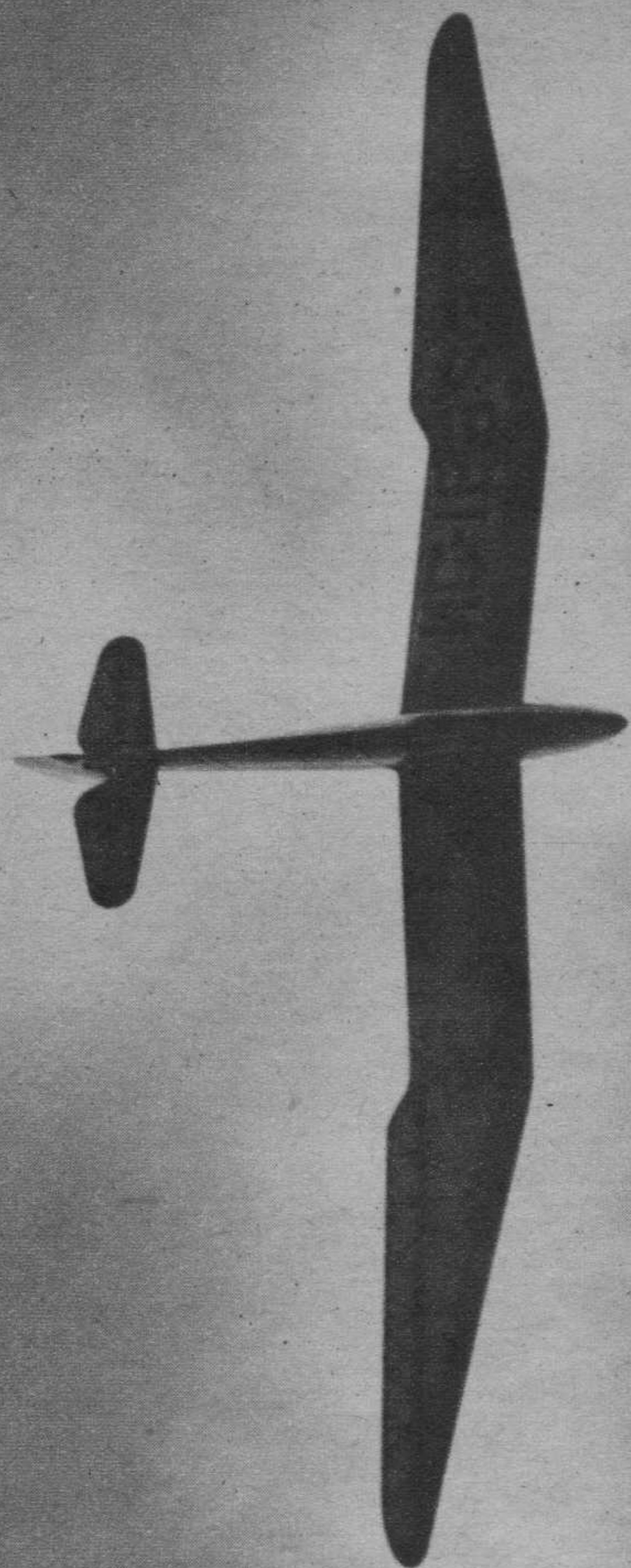


N. A. F. stands for Naval Aircraft Factory on this Vought SU-2 landplane.



This BT-1 shows half of section V on right wing. 2 is the plane number.





World's distance record holder for men. Russian GN-7 was flown 405 miles by Pilot Rastorgoueff, May, 1937. Left, Minimoa type in which Decker set U. S. distance-and-return record, 40 mi., in 1939.

# R E C O R D F L I G H T S

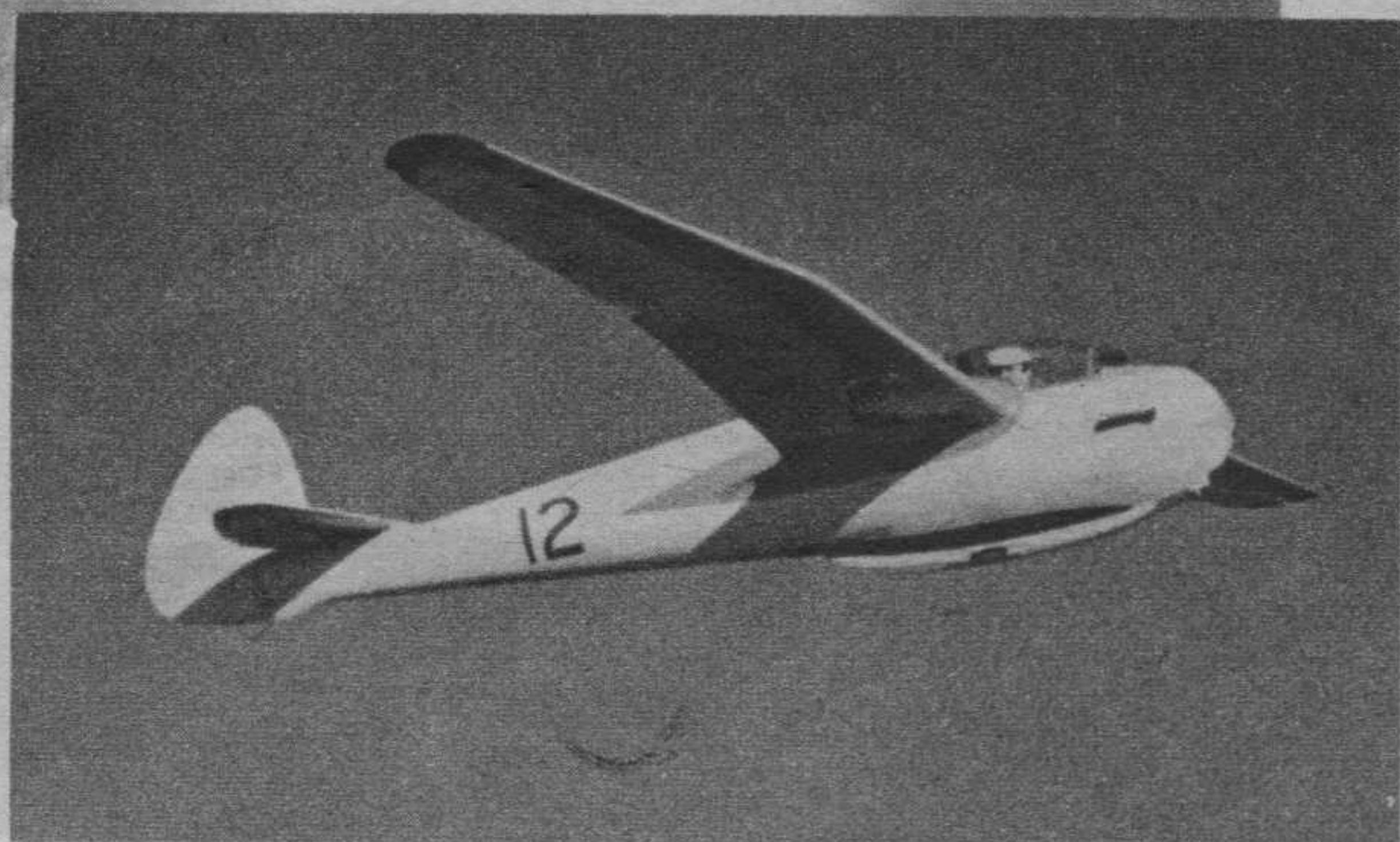
Sailplanes have set sensational marks. Will these be bettered at this year's National meet?

BY ALEXIS DAWYDOFF

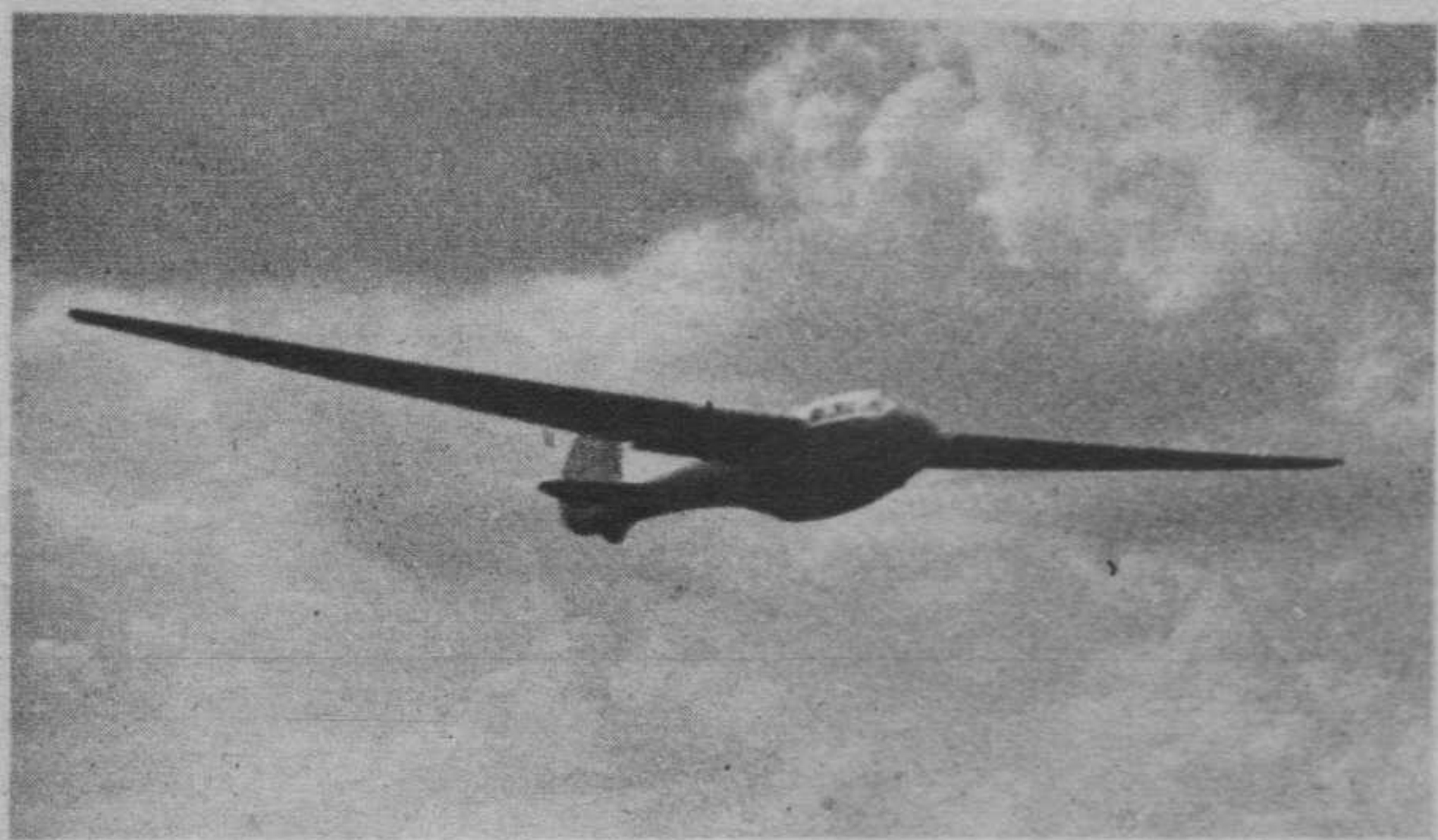
WITH the Twelfth National Soaring Contest taking place from June 28th to July 13th at Elmira, N. Y., and anticipating that more American if not international records will be broken, we thought it timely to say a few words about the present achievements in the realm of motorless flight.

One of the hardest records to establish is that of altitude because, invariably, it means flying inside the clouds, necessitating experience in instrument flying and a sailplane built strong enough to withstand extremely turbulent air currents frequently encountered inside such clouds. The present world altitude record was made by a German pilot, Erwin Ziller, at Grunau, Germany, on November 21, 1938. Pilot Ziller attained a height of 22,434 feet through the help of a "Moazagotl" cloud, which, with its peculiar upcurrent zones, permits ascension to well over 20,000 feet. He took off by airplane tow from Hartau Airport shortly after 11 a. m. in his Kranich sailplane, equipped with oxygen-breathing apparatus. At an altitude of 4,000 feet he released his tow rope and climbed to an altitude of 6,560 feet in a rather poor upcurrent. Soon after reaching this height the Kranich was caught in a powerful updraft. At 12,000 feet Ziller entered a cloud, his instruments iced up and he was obliged to fly blind for a long time. Inside this cloud he climbed to an altitude of 21,300 feet, but in attempting to get out of it got caught in a strong downdraft which brought him to 7,500 feet.

Flying in a southerly direction he reached the border of the Moazagotl and climbed smoothly to 26,400 feet. At altitudes of 19,800, 24,000 and 26,000 feet he was obliged to fly through ice clouds (Turn to page 51)



The famous Ross RS-1, Zanoia flown by John Robinson to a new national distance record of 290 miles in 1940.



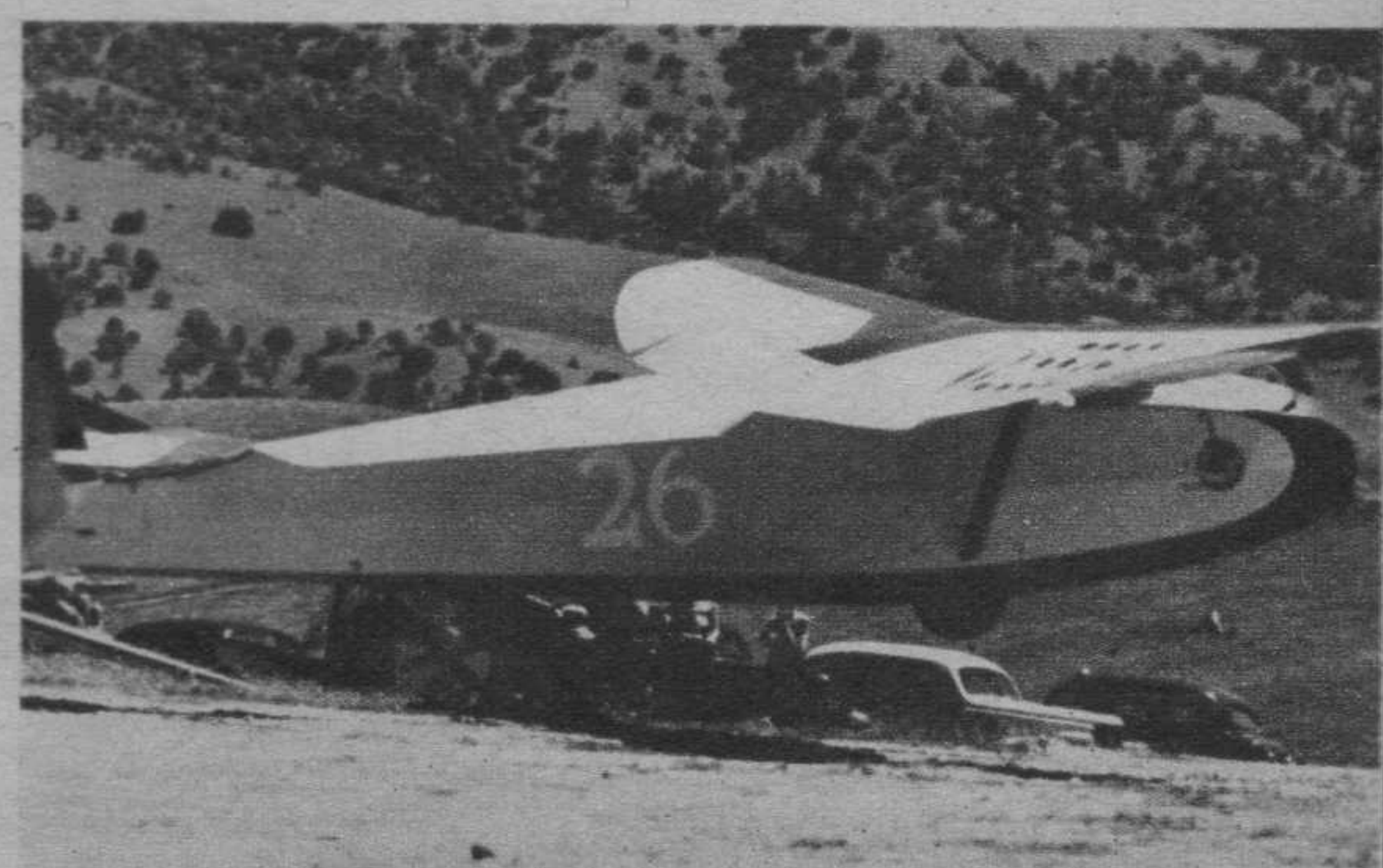
Russian Rot-Front 7 sailplane, holder of the world's distance record of 465 miles set by Olga Klepikova in 1939.



Holder of the single-place altitude record. The Kranich type shown reached 22,434 feet in Germany in 1938.



This Schweizer two-place, piloted by Lewin Barringer, reached 14,100 feet with passenger, August, 1940.



U. S. altitude record holder. Redesigned Baby Grunau which Stiglmeier flew to over 19,000 feet, 1941.



# I MEET BALDY

BY A CO-PILOT

**This amazing experience has become history among the Atlantic ferry pilots.**

**A**LTHOUGH I'd piled up 8,000 air hours and been captain of an airliner for two years, I got an unexplainable urge to do something about this war in Europe. I had no folks and my only love was flying, so against all advice I chucked my job with the air line and went to Canada to see about this job of flying bombers across the Atlantic.

I got the job, but for all my logged time and flying certificates, I had to go on as a copilot. I found those birds didn't trust anyone until they were proven. It sort of took the starch out of me at first, especially when they put me on as copilot with a guy old enough to be my daddy—anyway, he looked that old with his scarred face and bald head. I'd heard of this pilot; most of you'd know him if I could give his name, but I didn't believe half of what I'd heard. To me it sounded like the tremendous build-up all pilots got when the game was young and all fliers heroes. Anyway, keep your eye on Baldy, as everybody called him. He gave me the surprise of my life.

Baldy had done just about everything in the flying game from barnstorming and transport piloting to flying freight in China, at least according to the stories. I know I got the jim-jams pretty bad when he took me up for a check ride because he had a bottle in his pocket and kept taking stiff drinks. But he did things with that bomber that no pilot should have ever done, not seeming to realize it wasn't a stunt ship. He passed me all O. K., but I felt he did it because he just couldn't find anything wrong with my flying, not because he liked me.

When we got back to the office he signed a paper and said to the flight officer, as serious as could be, "The

Professor'll do all right after he's had a flight or two to get his backbone loosened up a bit."

"Right," said the chief. "There's a lot hopping off tomorrow night, so you can take the Professor along as your copilot."

I wasn't sure but it sounded to me as though Baldy groaned, and yet I couldn't figure out why, for as a flier I held higher ratings than he did—in everything except hours. Baldy'd done so much time in the air he'd quit putting it down in a log book.

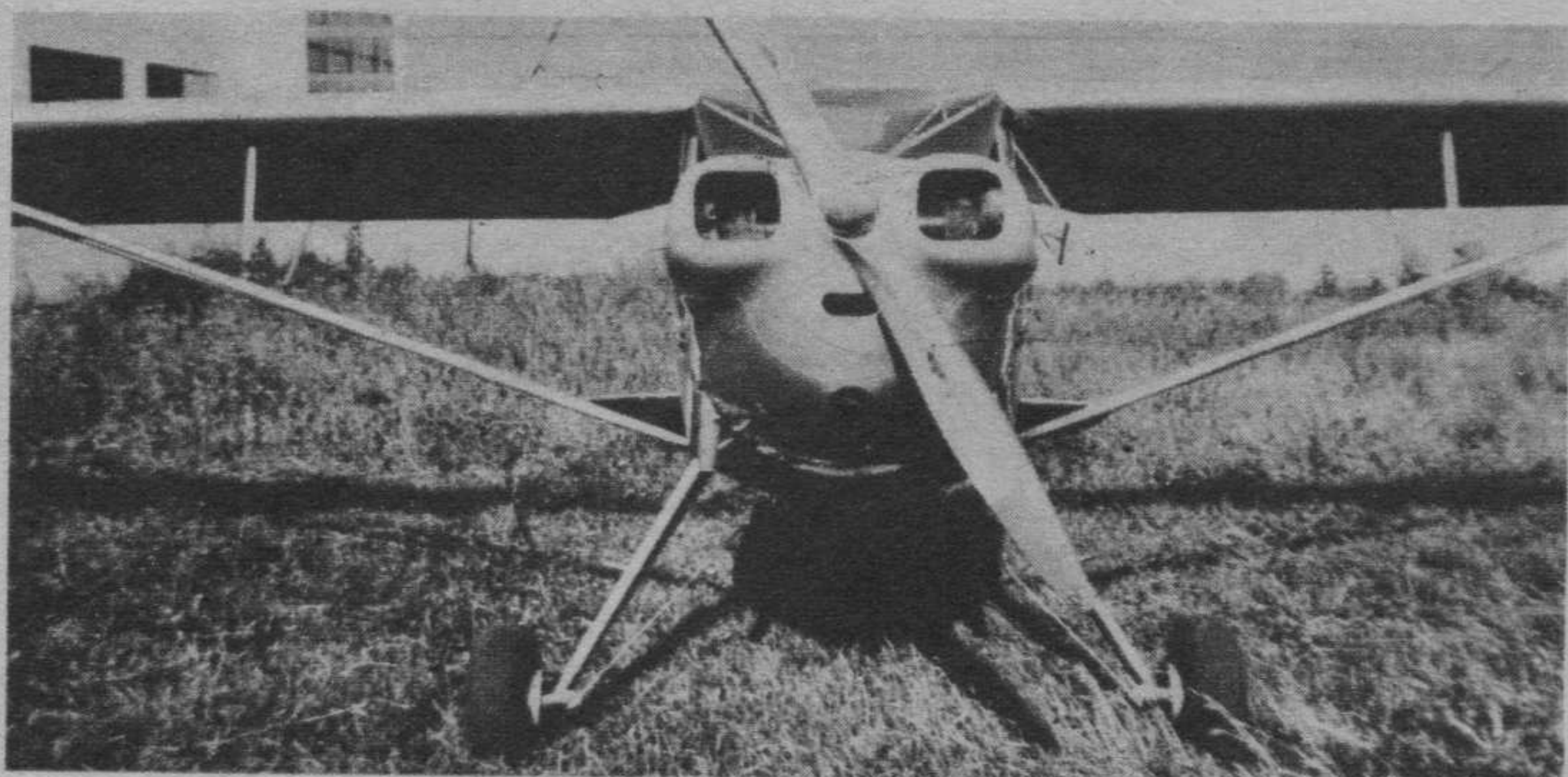
The gang at the hotel where most of the fliers were staying welcomed the news that I was going over on my first flight, but it took the starch out of me because they all called me Professor. The name Baldy had given me seemed to stick and I never heard anything else. It made me a little sore.

The pilots all gathered in one room to talk things over and drink the inevitable Scotch and soda. They didn't seem surprised that I did not drink. As one of them put it, "Professors don't drink, now do they, or do they?" I didn't mind that. It just happens I don't think drinking has any place in the flying game. The rest of them didn't seem to agree with me, and I'll admit that none of them showed any effect from the liquor.

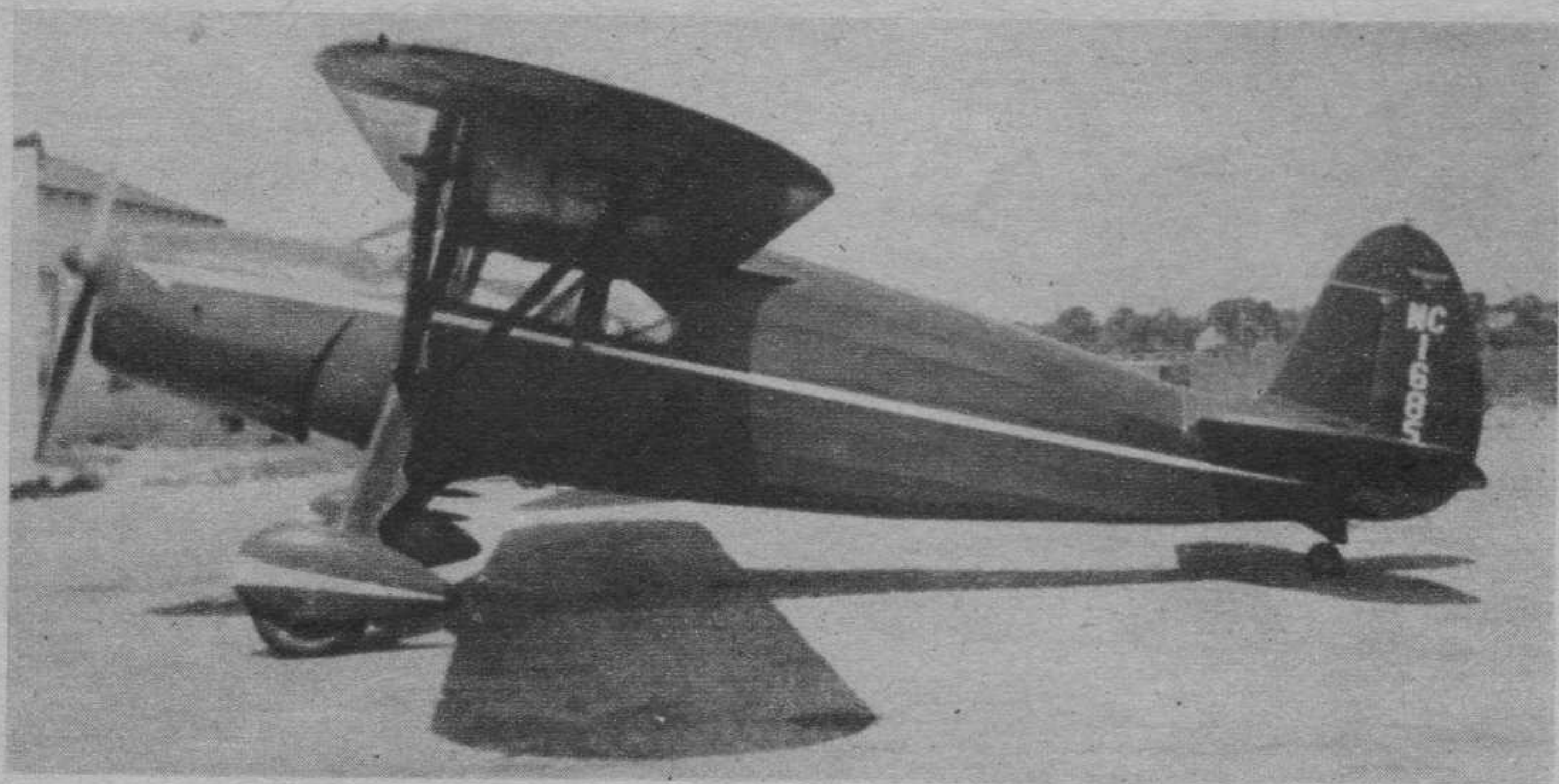
After I had listened to their talk through the evening I realized that flying a bomber across the Atlantic was not everything in their job. Added to the dangers of a forced landing on the ocean or meeting with German air raiders was the fact that they were in the war zone as soon as they landed in England, or wherever it was they landed, for they were mighty close-mouthed when it came to mentioning names of places or dates.

I heard stories of forced landings, (Turn to page 53)





This cheerful face belongs to a Luscombe 50 light plane and was taken by Adventurer Fred Steffens, who hails from Palatina, Ohio.



Warren Anderson of Worcester, Mass., took this excellent photo of a Fairchild 24K while on a vacation up in Maine. Nice ship, nice shot.



Wing shot. This interesting photo by George Goss, Air Adventurer of Burlington, Vt., shows the view from a Canadian-Colonial Airways DC-3.



Everybody wants to look 'em over. This crowd crane their necks for a better look at the O47-A. Shot taken by George Ranta, of Fitchburg, Mass.



## A club for all those interested in aviation.

GREETINGS, Air Adventurers!

We feel good today. We feel part of things. We feel that we, too, are doing something useful in this national defense business, not because we've merely written about it, but because—well, we've just received a letter. It comes from Air Adventurer Robert Valimont, of the Air Corps Technical School, Lowry Field, Denver, Col. We need only publish the main paragraphs to explain why we feel so exalted:

"I have enlisted for a three-year period in the army air corps. Quite by chance two years ago, while still in high school, I bought a copy of Air Trails at a newsstand. I liked the material in it very much. Then I saw the application blank for membership into Air Adventurers. I quickly filled it out and was admitted to the organization.

"I had no idea of entering aviation at that time, but due to Air Trails and especially the Air Adventurers column, I have been won over. I can truthfully say that it was chiefly through this that I signed up for the army air corps. I have now completed my recruit drill period and have been assigned to a clerical position which I will hold down for experience until I am sent to another school.

"I wish you would again start your little 'message' each month to Air Adventurers. I liked it very much and have missed it since you discontinued it for news of the members only."

Thanks, Robert, and we all wish you the finest of success in the air corps. Keep in touch with us and we'll try to induce some of our members to drop you a line now and then.

Well, we know all about Tulsa Airport. We have a grand layout drawing of it from James A. Cavanaugh of the Spartan School of Aeronautics out there. It has full details and explanation all carefully lettered on it, and, of course, we have to send Jimmy his Topographer award for a swell job. "This drawing," explains Cavanaugh, "was made from an aerial photograph taken from 5,000 feet. Due to the increased activity here at the airport, it is impossible to include all the new hangars and other improvements under construction. At the present time a national guard hangar and a new army hangar are under construction."

Thanks, Cavanaugh, for the news, and we want to use your letter as a warning to other Air Adventurers not to attempt anything in the way of photography or drawings which in any way might be contrary to the many necessary precautions the government has to take to assure national safety. (Turn to page 65)





Meet the gang! The famous Skyscrapers of Brooklyn. Sal Taibi, fourth from right; Howie Beechman, right, rear; Maurice Schoenbrun, left; Joe Raspante, fourth from right; C. K. Moon, second from right, front. This crowd likes to establish records.

# Model matters



Birth of a Super Cyclone. Bearings are installed, foreground, cylinders, center, and motors are completed at far end of bench.

Gordon Light's Dope Can, Moon's On The Field, reports on contests. Send in your photos.

**THE DOPE CAN.** (By Gordon Light.) Do you remember when practically all model builders used Ambroid for stick-sticking? Models with bright spots showing through the wing and fuselage covering were usual stuff. Then came colorless cements and spotty models disappeared—which was a boon to sloppy builders.

In the days when cement was plenty expensive the local supply man encouraged us to bring our own bottle for filling to cut down this item of overhead. One young sprout came in to do his marketing. He bought a few cents' worth of assorted items and then asked for five cents' worth of cement. When asked for a bottle he produced one about pint size. Five cents' worth of cement would have been lost in it. The size of the pill bottle he carried home must have been disillusioning.

Henry Struck, champion modeler and Air Trails contributor, bought an automobile and during the first day's driving he unhappily participated in two accidents. Hey, bum, how did you get your license?

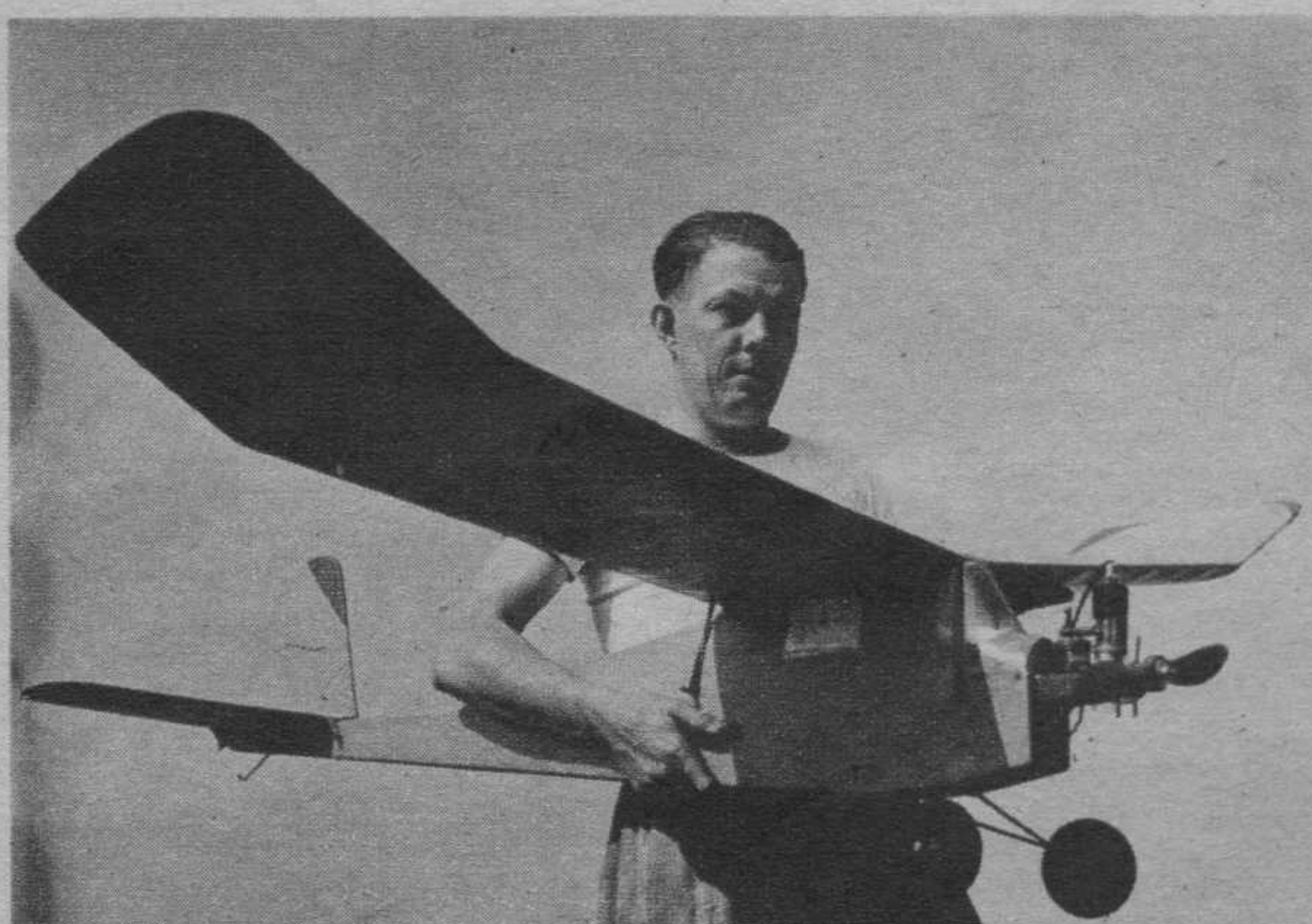
Married versus single men was a new type contest held recently by the Hampton Roads (Virginia) Model Club. No side has a monopoly on good builders. The married men boosted their stock when Dick Everett joined their ranks a few months back. Recently the ten-cent kit was glorified in a novel contest. Entries were limited to models built from ten-cent kits. Don't laugh yet because Leonard Purdy flew his job 52 seconds for first place. And twenty-six other

model makers from the N. A. C. A. laboratories did almost as well flying under the thirty-three-foot ceiling of the Structures Laboratory. Indoor meets are held regularly in this lab and records are slowly being pushed into respectable brackets. Indooring in Virginia is on the upgrade.

Last August Fred Weimann of Milford, Conn., lost his Sailplane after 18 seconds' power run. He found it seven months later. During that time the model had been exposed to the weather. It's a credit to the Silkspar covering that it was only slightly faded and that after being flown showed little evidence of having wintered outdoors.

But things happen differently in Bungo-Bungo. Hugo says that his friend Lootweller went flying one afternoon last spring. His model came back home two hours later, but Lootweller didn't show up for days. He said he got caught in a man-carrying thermal. Hugo says he must have been exposed to more than the weather since he was pretty badly faded.

One of the fairer members of the model-building clan, Mary Walker, of Elizabeth, N. J., reminds us that the 1940 New Jersey State Rubber Championship Meet slipped by last year without proper mention in the Dope Can. If we don't make good this year she threatens to expose us and blow the lid off the Dope Can. We're fearless, we'll not be intimidated, we have nothing to hide. But please note, boys and girls, that there will be a (Turn to page 56)



On the field with "On the Field" Moon goes C. K.'s trusty Buzzard Bombshell. Note the built-in headwind.

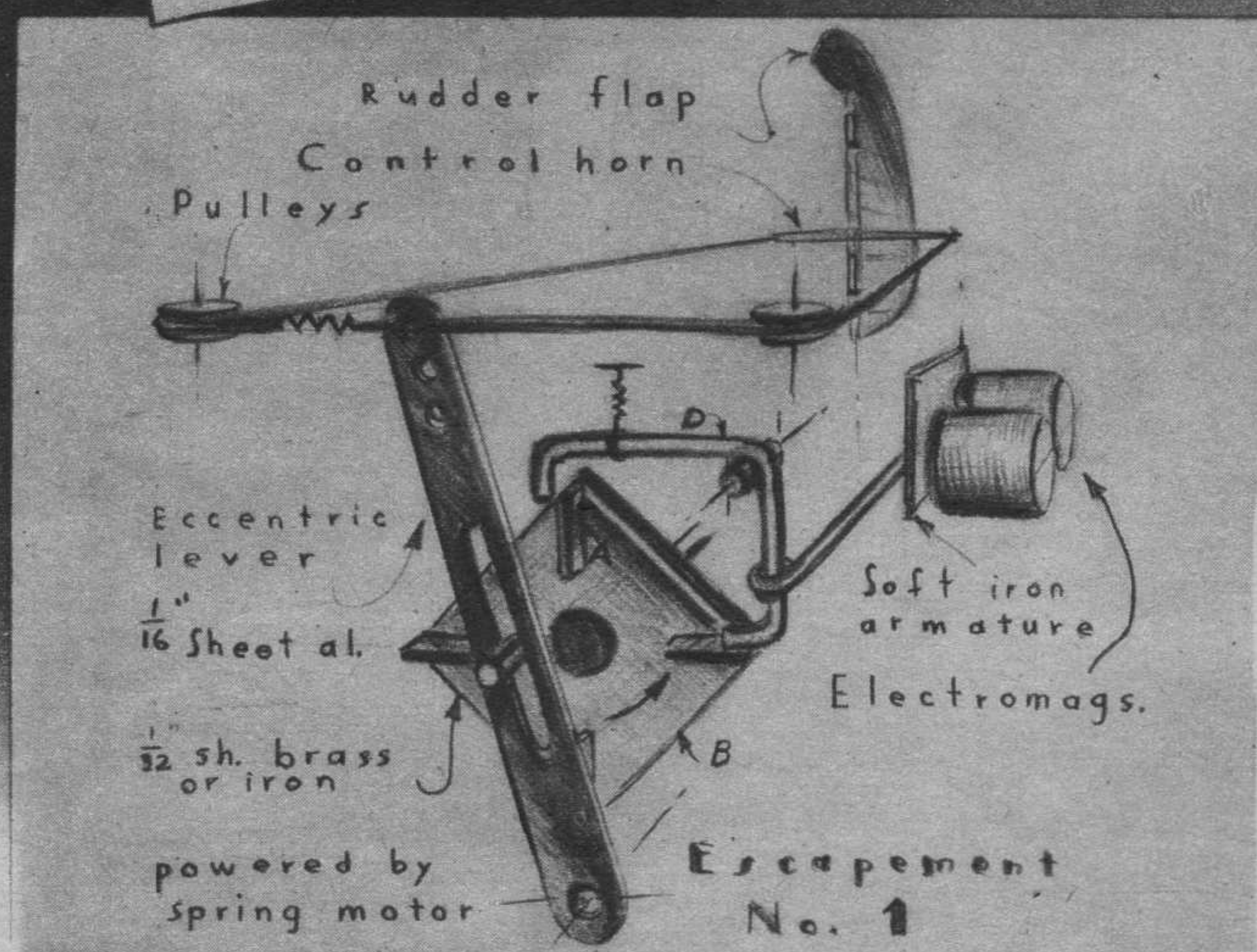
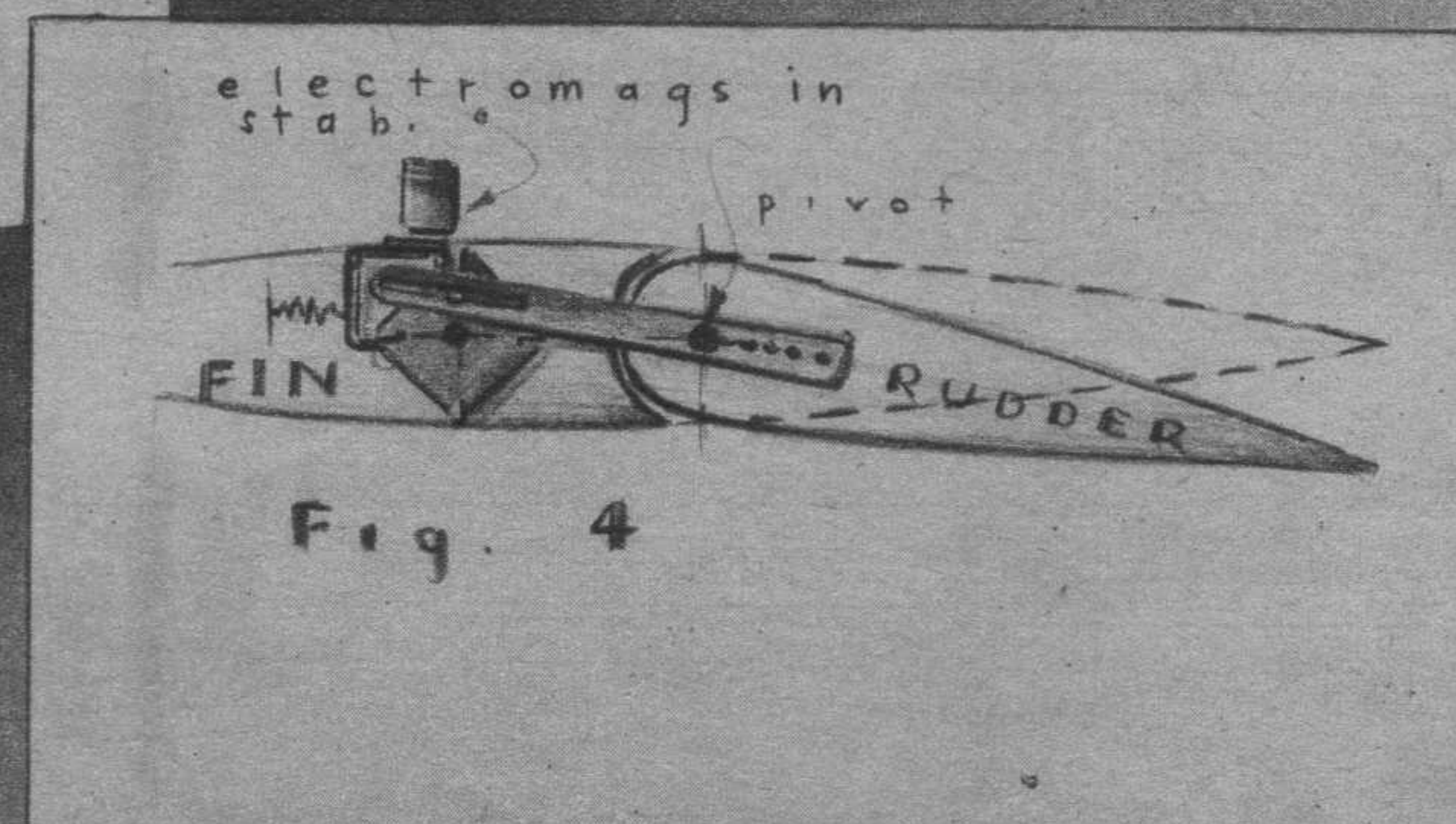
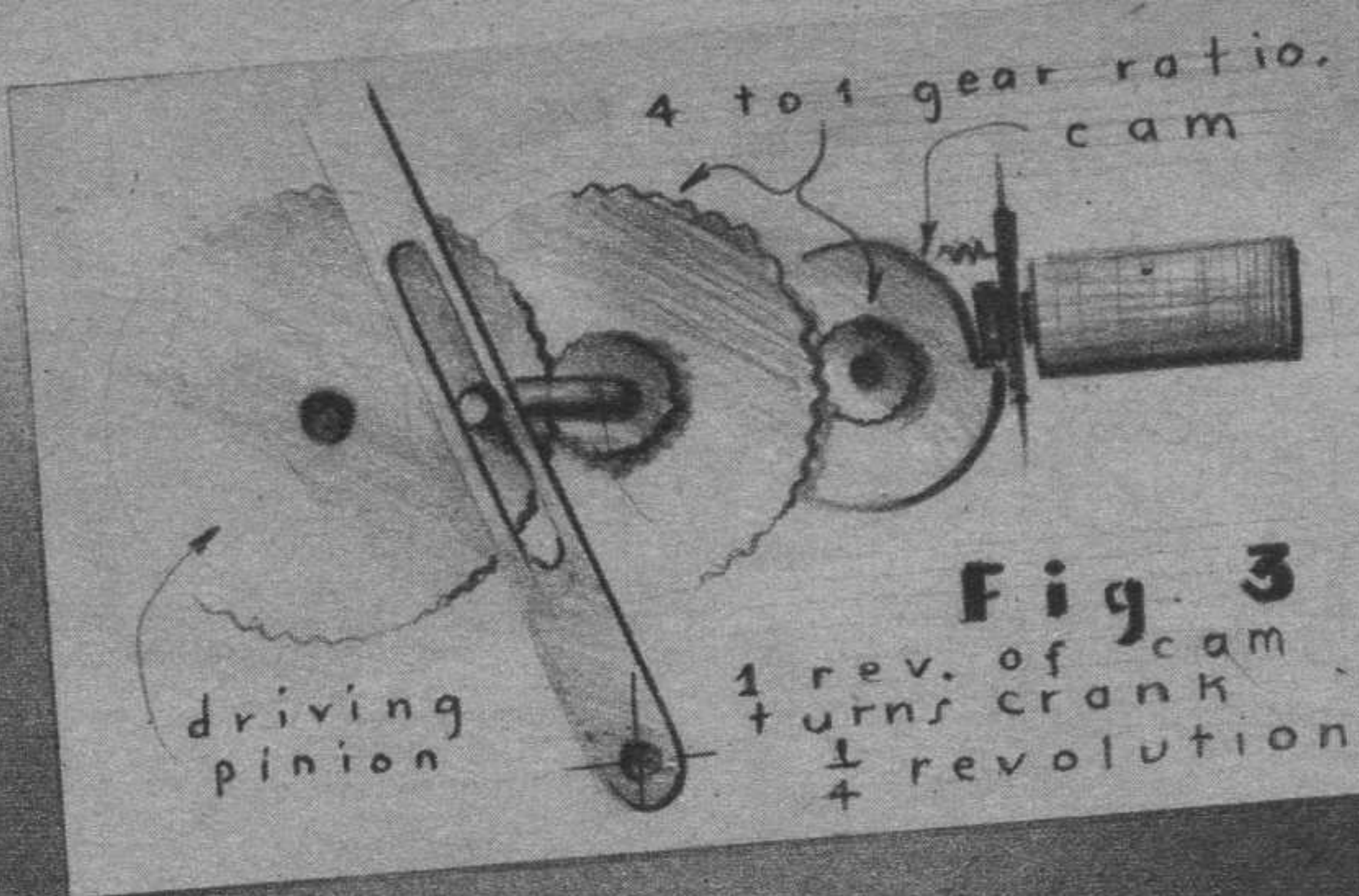


Army New Ruler. By Private F. Mangold, now at Camp Beauregard, La.



Edwin H. Frazer, Pasadena, Calif., and his Tomahawk, designed by Schoenbrun. Plans in August, 1940, issue.





Electric or rubber power moves controls as radio impulse releases "escapements." Practical ways to put radio signal to work.

# RADIO CONTROL GADGETS

**R**UBE GOLDBERG, the famous comic-strip wit, has been responsible for many ingenious devices to make various gadgets work. And while, so far as we know, he has not yet applied his nimble brain to model airplanes, the following mechanisms for radio control, although devoid of the Goldberg impracticality, nevertheless employ all his imagination and inventiveness.

These mechanisms have been developed by the author and others and have been put to practical use. They serve to acquaint both the initiated and the novice with the various mechanical devices that can be used to actuate the various controls, also to point out that radio-controlled model airplanes no longer possess the simplicity and amateur quality of bygone twin-pusher days, but now delve deeply into the sciences of mechanics, radio and aerodynamics.

In Fig. 1 we see the conventional type of ninety-degree intermittent escapement. Note that merely one electrical impulse is required to actuate the mechanism through a ninety-degree movement to produce instantaneous right, left or neutral rudder. The operation is as follows: The closing of the radio relay completes the circuit and causes the batteries to energize the electromagnets. The latter in turn act on the armature bar, moving link D to the right. This releases ratchet B, whose direction

of rotation can be seen as counterclockwise, but which will move only a short distance because the opposite end of link D has come into contact with tab A. When the electromagnets are de-energized, the spring will pull link D back to its original position, allowing tab A to "escape." Thus one impulse will produce a quarter turn of ratchet B. The mechanism can be driven by rubber bands, but a spring motor is preferable. It is constructed from thin sheet brass, aluminum and wire.

The device shown in Fig. 2 is known as the Geneva stop. It is widely used in industry, especially in moving-picture work and wherever smooth-acting intermittent motion is required. Although it seems more complicated than Fig. 1, if properly constructed there should be no need for extreme care in setting it up, or for painstaking adjustment, and it will provide a relatively foolproof and easy-working mechanism.

The cut-away pulley B is driven by a mechanism which gives it one complete revolution when it receives one impulse from the transmitter. As pulley B commences to rotate, crank A will engage the clover-shaped pulley E and cause it to rotate one quarter turn. Here, then, is a second method of obtaining ninety-degree intermittent motion.

Both the Geneva stop and the mechanism shown in Fig. 1, as well as most tail devices used for radio control, have in-



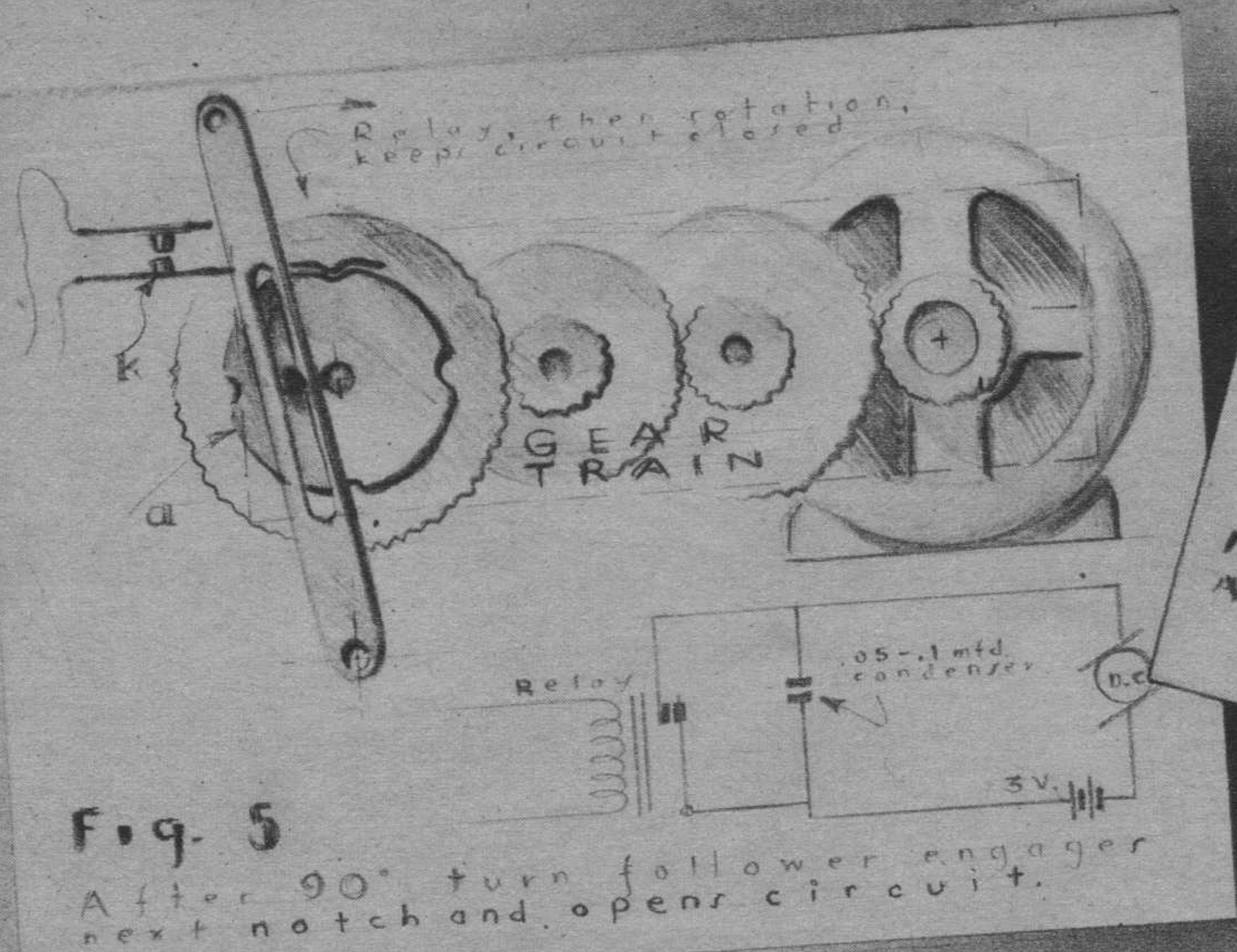


Fig. 5

After 90° turn follower engages next notch and opens circuit.

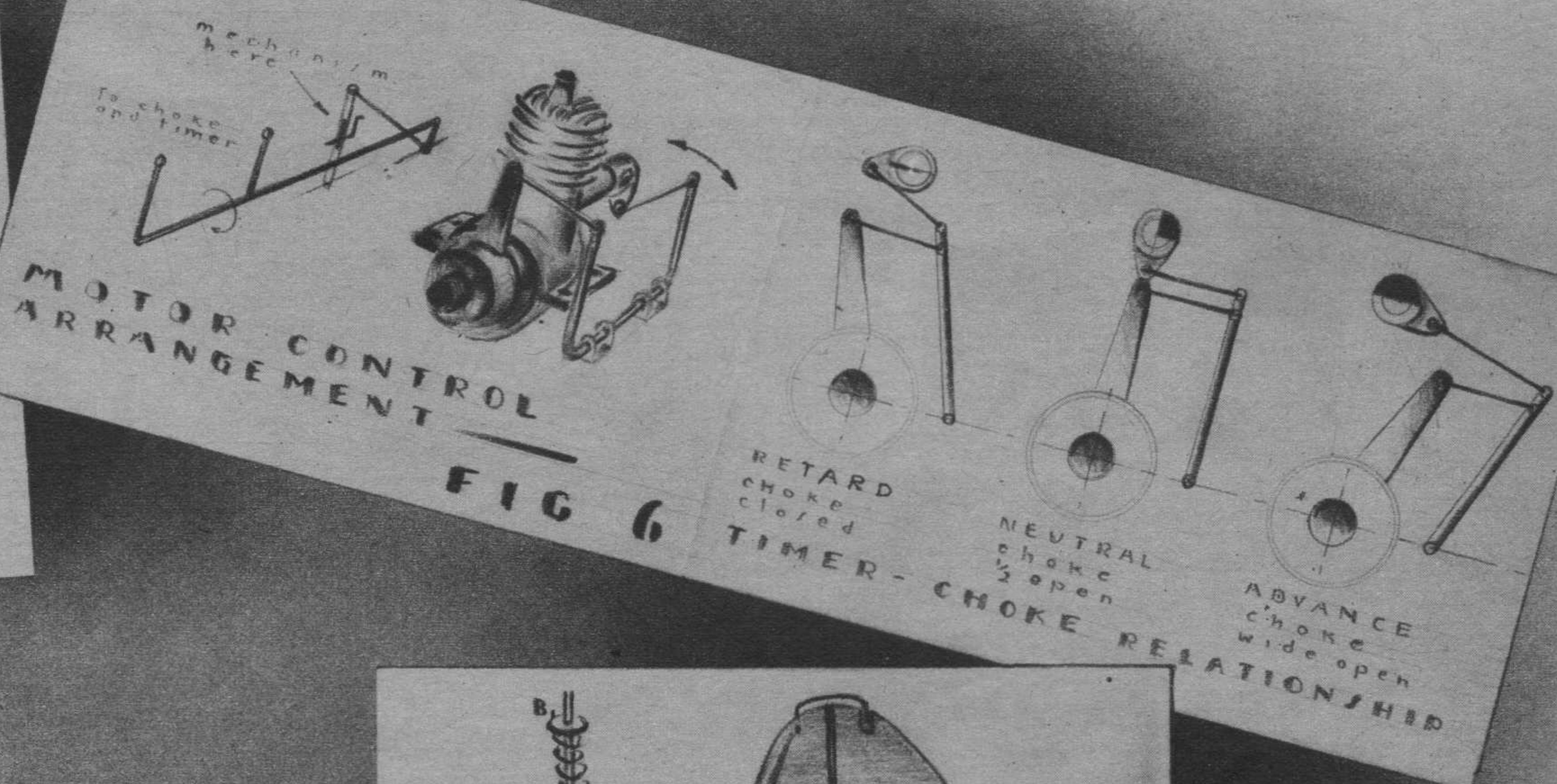


FIG 6

RETARD  
choke  
closed

NEUTRAL  
choke  
open

ADVANCE  
choke  
wide open

TIMER-CHOKE RELATIONSHIP

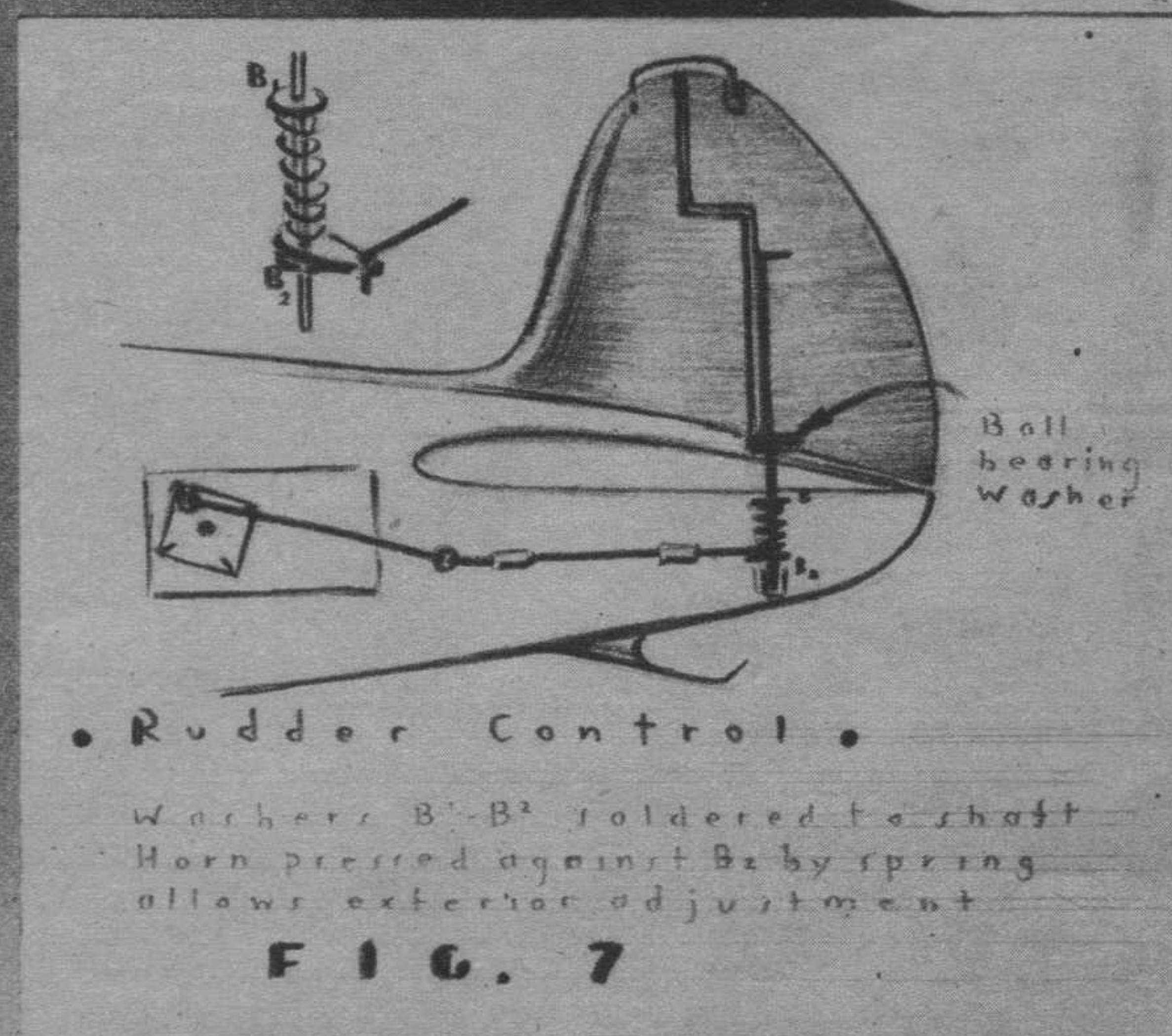


FIG. 7

the contact points and completing the circuit again. By allowing the signal on the receiver to be shut off, thus opening the relay, the motor will keep on running until the follower reaches the next notch, which will break the circuit. The process can be repeated after the mechanism has itself stopped. Two or more rapidly transmitted impulses will have no effect on the mechanism, as is obvious.

The above methods are but a few of the possible arrangements for tail control. A little mechanical ingenuity on the model builder's part ought to produce any number of interesting devices.

For really flexible control of flight, control of the rudder alone is not sufficient. We must have at least two variable elements to control. Controlling the motor in combination with the rudder will provide the desired flexibility.

There are many possible methods of varying the output of a gas motor. We may change the needle-valve adjustment, the timing of the spark, or combine the effect of the two. Each alone will cause a variation in motor speed, but in changing any one alone, we are open to susceptible motor conking, certainly an undesirable feature. If we can vary the timing of the spark in synchronization with the carburetor adjustment, we may then obtain complete control of the motor throughout a wide range of speeds with the assurance that the motor will not cut on us; this is what we desire.

Fig. 6 shows the solution of this problem. By mechanical links arranged as shown in the sketch, control of the motor is obtained. This method, utilizing the electrical motor, has to its credit many advantageous factors over previous methods of motor control as the motor speed may be changed gradually, thereby preventing any possible conking. The principle is clearly illustrated.

Fig. 7 shows the tail-control arrangement of the Super Dolphin radio-controlled plane. This arrangement is unique as it provides adjustment of the rudder without necessitating any change in the control mechanism. It is also a safety (Turn to page 63)

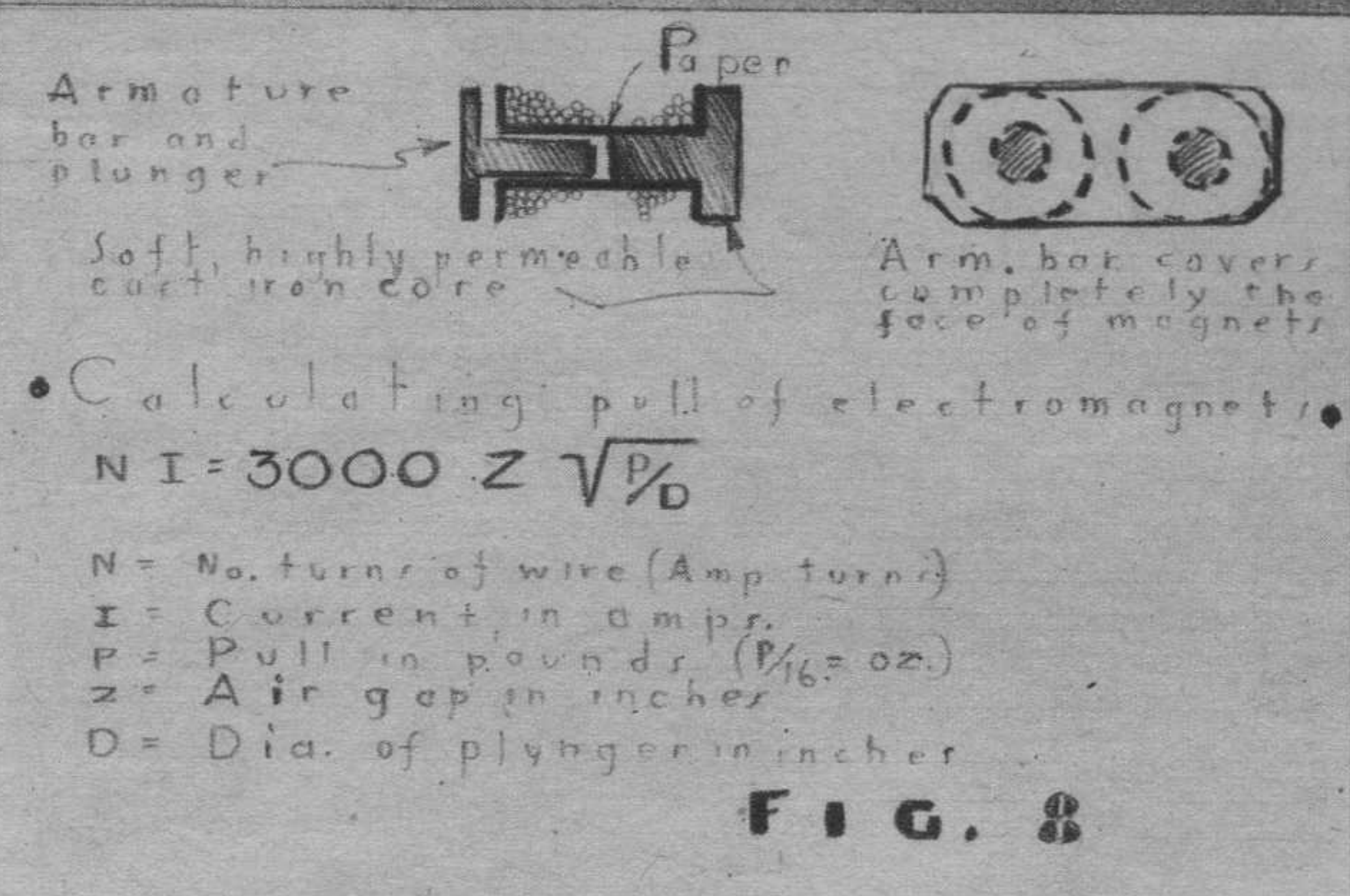


FIG. 8

Calculating pull of electromagnet:  
 $NI = 3000 Z \sqrt{P/D}$

N = No. turns of wire (Amp. turns)  
I = Current in amperes  
P = Pull in pounds (P/16 = oz.)  
Z = Air gap in inches  
D = Dia. of plunger in inches

## BY THRACY PETRIDES

cluded in their design a lever which translates the ninety-degree rotary motion into a to-and-fro oscillatory motion. The method of doing this is to have a vertical lever or pillar, pivoted at its lower end, with its upper end oscillating back and forth under the influence of the rotating crank.

Fig. 3 shows one of the simplest and most foolproof mechanisms yet devised. Here all we need to produce ninety-degree motion is two gears with the ratio of 4:1, a driving device, a cam and two electromagnets. The arrangement is clearly shown in the drawing. One impulse causes the cam to move one complete revolution, which in turn produces a quarter turn of the crank. The device is easy to build and works perfectly.

Fig. 4 is a gadget similar to Fig. 1, but smaller in size and mounted directly in the rudder and stabilizer. Its operation is also similar to that of Fig. 1, with the difference that the lever is swiveled about a center point rather than at its base. This direct hook-up of the rudder provides a simple and accurate tail control. At the same time it eliminates the necessity of hooking up the rudder with fish cord or other "play" producing materials.

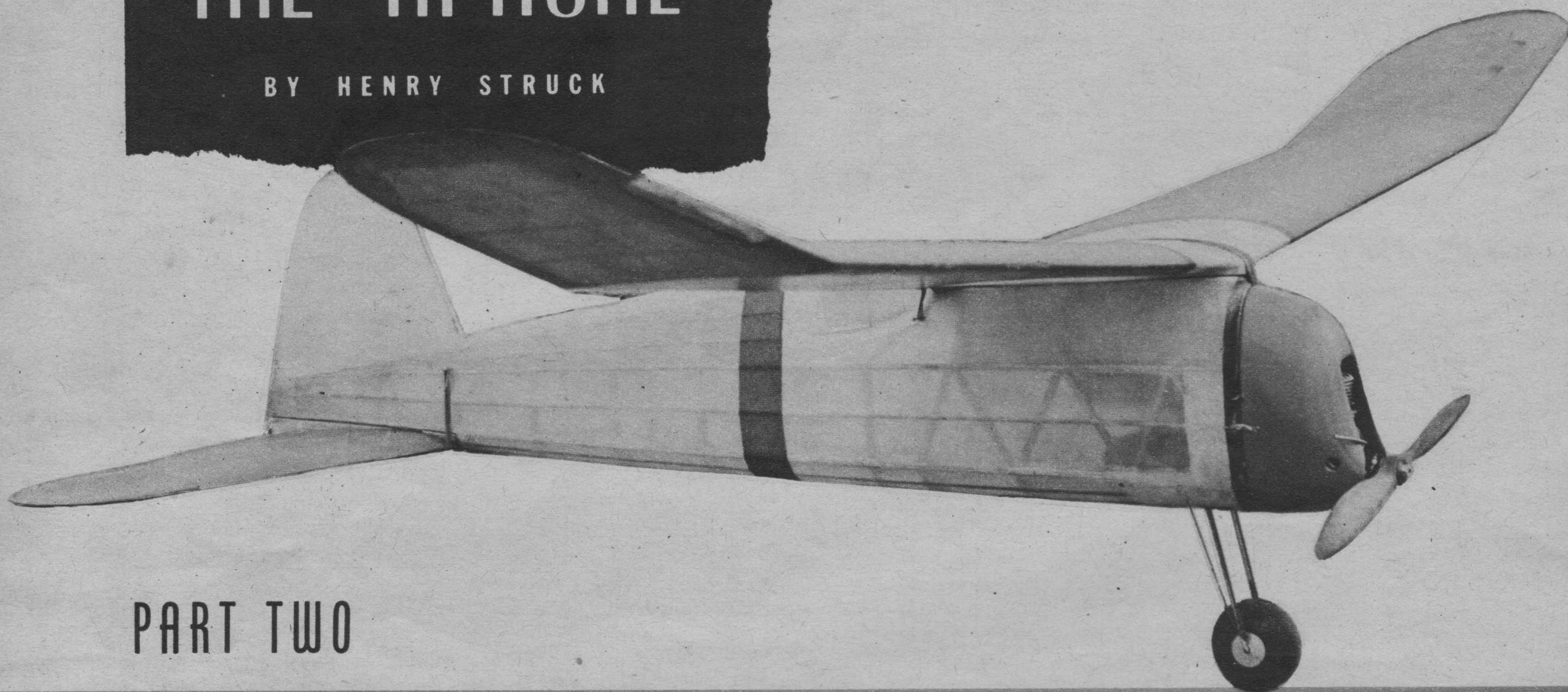
Up to this point we have mentioned only spring or rubber-powered mechanisms. Fig. 5 shows a device driven by a small electric motor. Here again is an ingenious but quite simple way of obtaining ninety-degree motion. Closing the radio relay completes the circuit for the DC motor. Gear A will start to rotate. When this happens, follower K will move up, closing



# THE APACHE

BY HENRY STRUCK

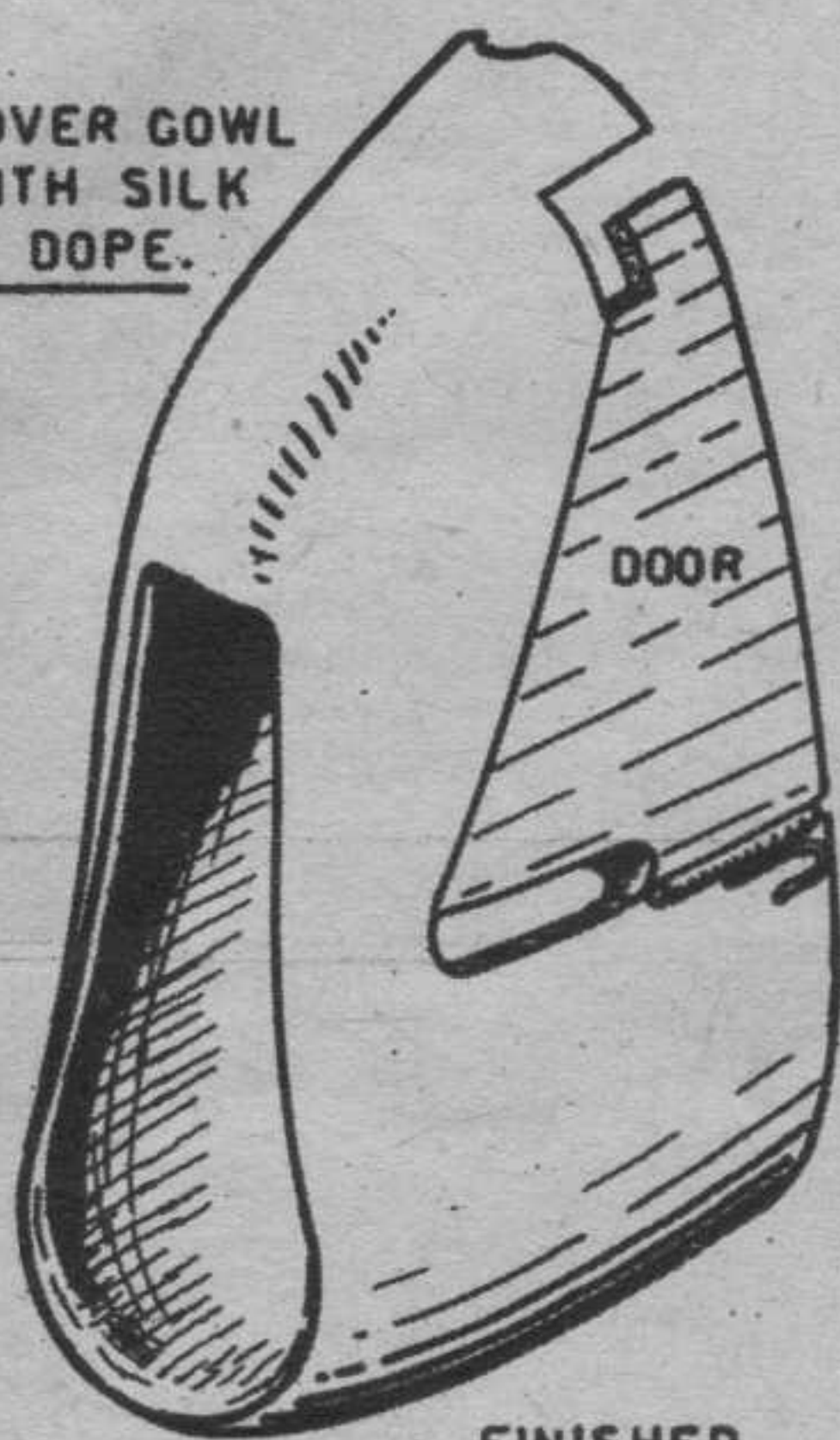
Wing tip floats give Apache a super climb. Automatic sailplane spoilers prevent those undesired out-of-sight flights.



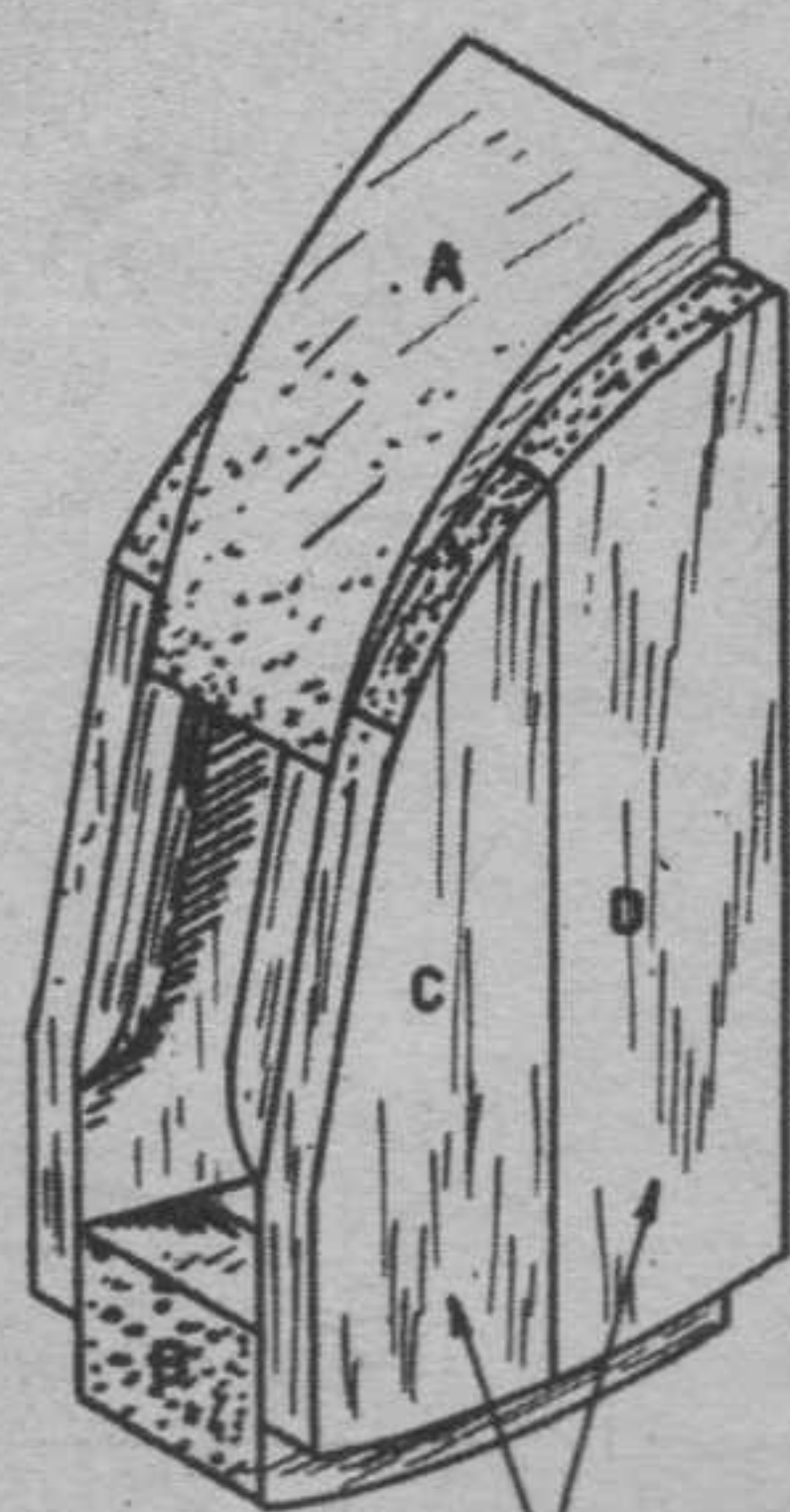
## PART TWO

### PLATE VI

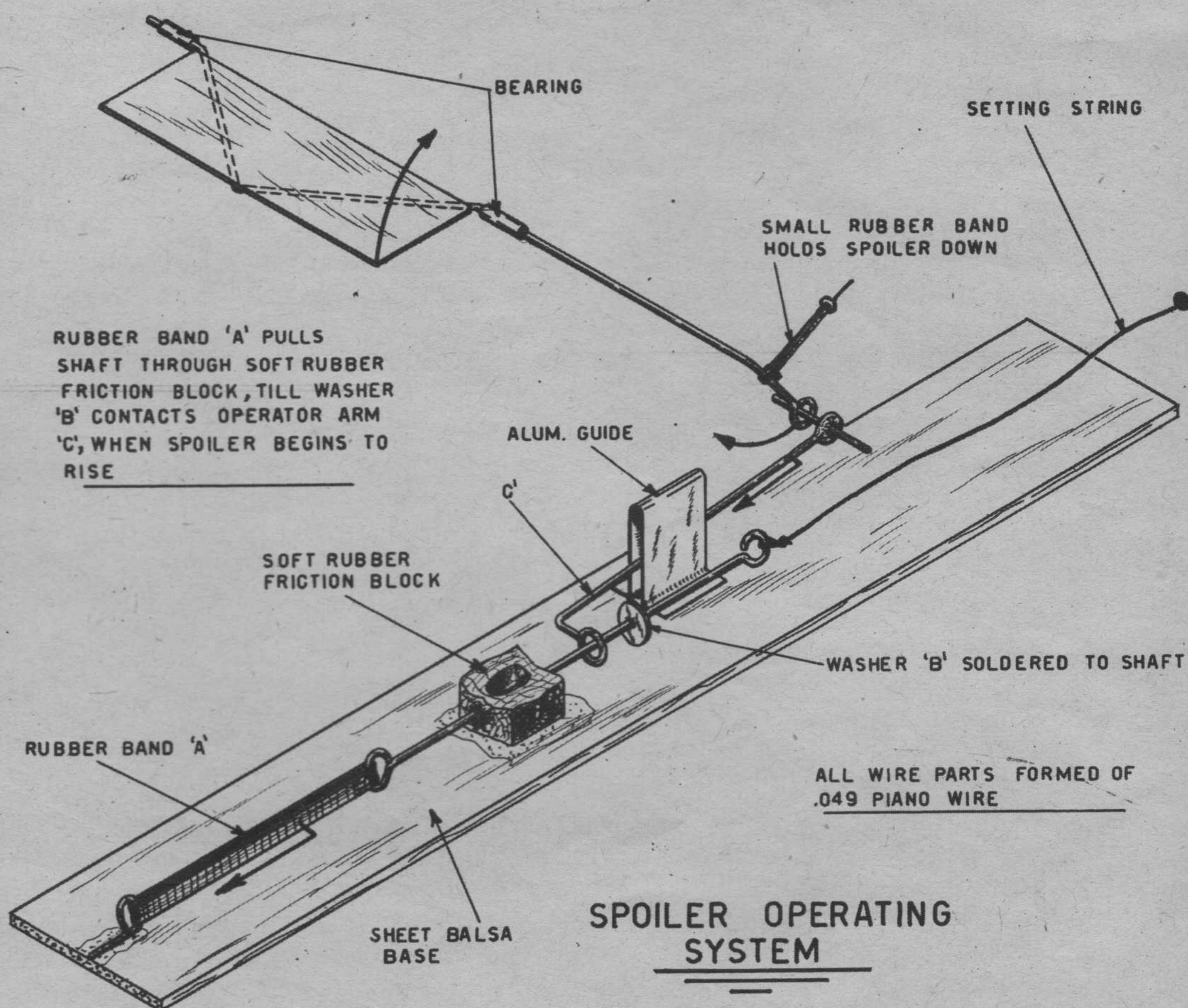
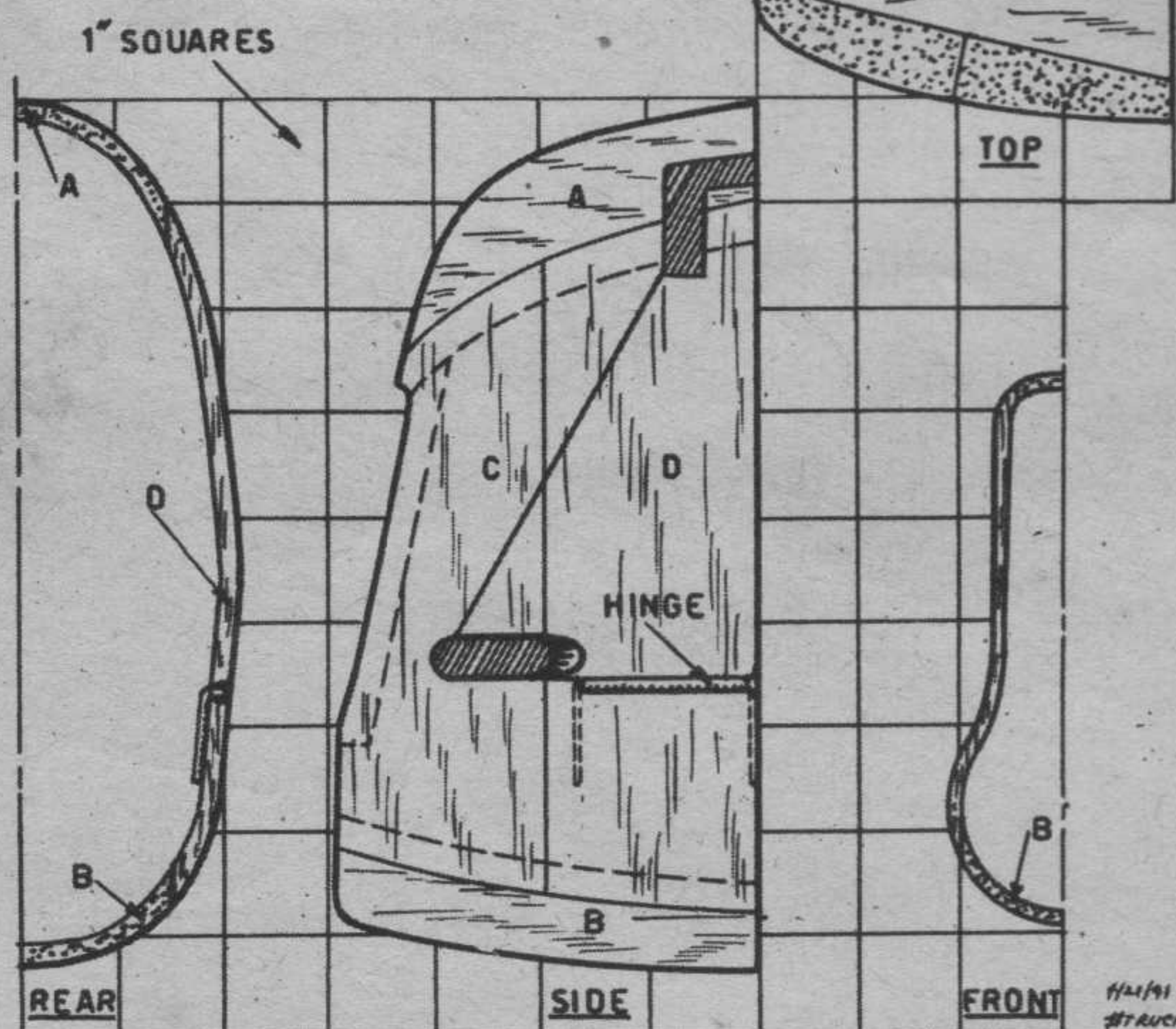
COVER GOWL  
WITH SILK  
& DOPE.



FINISHED  
COWL



$\frac{3}{4} \times 2$ "  
BLOCK  
ASSEMBLY



9/21/41 HENRY STRUCK



**L**AST month we described the construction of the fuselage and motor unit in detail. It is advisable for those who wish to begin this ship now to secure a copy of this issue and catch up with the job.

## WING AND TAIL CONSTRUCTION

As the wing and tail are identical in construction they will be described together. Make full-size layouts on which to work, using the scale given on Plate IV. Trace the shape of the tips from your plan onto  $\frac{1}{4}$ " sheet balsa and cement the sections together. Carve the trailing edges to a triangular cross section and finish with sandpaper. Cut  $\frac{1}{16}$ "-deep notches in them to locate the ribs. Pin the leading and trailing edges to the plan to establish the outline. Trace the full-size ribs from Plate V onto  $\frac{1}{16}$ " sheet balsa. Cement the ribs in place, setting them  $\frac{1}{16}$ " from the top and bottom of the trailing edge to permit the cap strips to fit flush.

When dry remove the frame from the plans and rejoin the panels at the correct dihedral angles, reinforcing the corners with gussets of  $\frac{1}{4}$ " sheet. Insert the spars and reinforce their joints with gussets of  $\frac{1}{8}$ " sheet. Trim the protruding corners of the leading edge flush with the ribs. Apply a liberal coating of cement to the front spar and pin the  $\frac{1}{16}$ " sheet leading edge cover to it. Bend the wood over the ribs, moistening the surface slightly to facilitate bending, and glue it to the ribs and leading edge. Cover one panel at a time, straightening out any warps before the cement has set.

Cement the cap strips in place and trim excess material from the leading edge. Smooth the framework with successively finer grades of sandpaper to remove any bumps that may spoil the finished surfaces.

Trace the outline of the top of your fuselage onto  $\frac{1}{4}$ " sheet balsa and cut out the wing base. Carve out the front of the wing base to fit the camber of the leading edge and cement in



Tough warrior. The author's many years of intensive competition are your guarantee of a sturdy, flable design with all "bugs" eliminated.

place. Install an auxiliary spar of  $\frac{1}{4}$ " sheet at the rear wing spar, to support the wing base. Set the wing in place on the fuselage and check the alignment, sanding with rough sandpaper to give a true, solid fit. Insert short prongs in the large-face bushings cemented on the fuselage top and force the wing down on them. This will locate the position of the bushings to be cemented in the wing base.

The stabilizer may be altered to take twin rudders by extending it to the outline indicated by the broken lines. The original ship was flown with both arrangements without a noticeable difference in performance.

The wing slots can be easily installed. Cut across the top leading edge cover between W-11 and W-13 and drag this material down to meet the bottom cover. Cement a new sheet to the leading edge, adjusting its width to get an exit gap of about  $\frac{1}{8}$ ". Fair the underside of the slot with  $\frac{1}{32}$ " sheet.

The spoilers have been introduced into the Apache's design

to eliminate the danger of losing your ship on a test flight. They are operated by a timer, either of the friction type illustrated, or by an air timer. By setting the timer they can be raised just as the motor cuts—or perhaps a minute later, allowing some time to observe the glide unhampered. The spoilers when extended cause the airflow to break away from the wing, destroying the lift of the area for quite some distance around them.

## COVERING

The center section of the wing may be covered with silk to withstand rough handling. Cut a piece of ample size, wet it and dope it to the frame. Apply extra coats of dope to the undercamber when the wood is dry. The rest of the surfaces are covered with red double tissue. Use fresh tissue to do a quick job and avoid wrinkles. Apply the first coat with the grain running chordwise. Cover the bottom of the wing first, taking care to dope the tissue to every rib to maintain the true airfoil shape. Spray the surfaces with water and apply a second coat of tissue when dry, with the grain running spanwise. Water again and apply three coats of dope, checking any tendency to warp. Polish between each coat with 10.0 sandpaper.

## COWL CONSTRUCTION

Cement sheets of  $\frac{1}{4} \times 2$ " balsa to the top and bottom blocks, A and B. These are  $2 \times 4 \times 4$ ", but can be glued up from any scraps you may have around. Allow the block assembly to dry thoroughly. Square up the back face and trace the shape of the fuselage front on it. Carve the outside to rough shape, being careful not to take too much off at the front and bottom. Dig out the inside to fit over the motor unit. A small gouge will do this well. Leave the walls about  $\frac{1}{4}$ " thick. Finish the outside with fine sandpaper and cover with silk. Cut openings for the exhaust and the timer arm. Make a cut between them and hinge the resulting door with aluminum tubing and wire. Install a small rubber band in the cowl to snap the door shut after the engine has been adjusted. Glue a couple of small hooks to the cowl sides and a corresponding set at the sides of the fuselage, around which small rubber bands may be wound to retain the cowl. Color-dope the outside of the cowl and shellac the inside.

## ADJUSTMENT AND FLYING

Attach the stabilizer by a couple of loops of  $\frac{1}{4}$ " rubber and slip the motor unit in place. Balance the model by shifting the batteries until the center of gravity is located about  $6\frac{1}{2}$ " from the front of the wing rest. Mount the wing with about four strands of  $\frac{1}{4}$ " rubber. Glide the ship to get the "feel" of it. Adjust the rudder till the model glides straight or makes a very slight turn to the left.

Start the engine and get it running smoothly. Set the timer for about ten seconds and hand-launch. The Apache will climb steeply in a right circle. Now check the glide, bending the rudder to circle the ship in left circles of 100-foot diameter. Increase the negative angle of the stabilizer if the glide is a bit steep, or decrease it to correct stalling. Increase the engine speed, adding downthrust if the ship tends to climb too steeply and then "swoop" under the extra power. The Apache can withstand all kinds of misadjustment, guaranteeing ultimate perfect adjustment.

## BILL OF MATERIALS

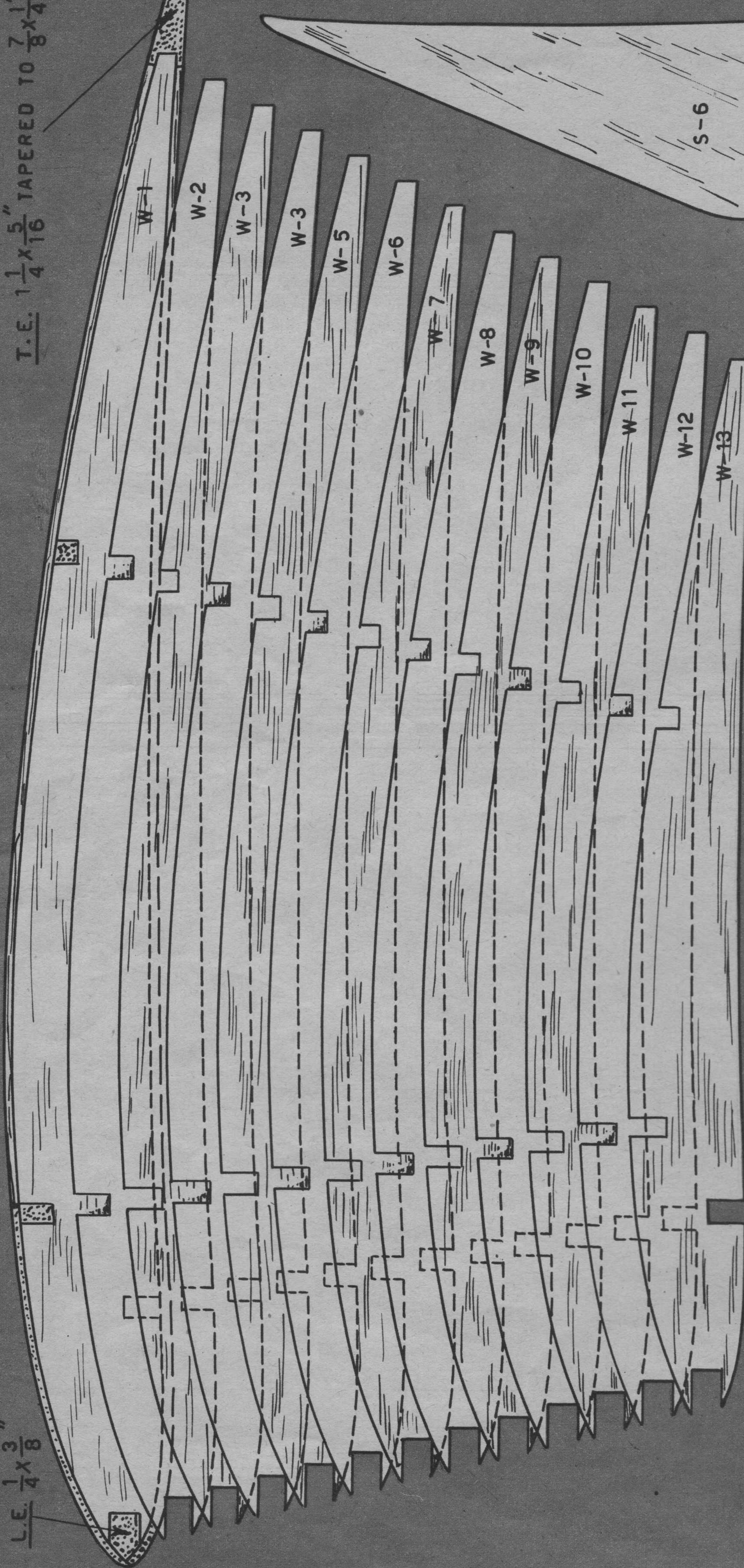
(Strip balsa should be hard and straight grained, sheet balsa soft and quarter grained.)

2 $\frac{1}{4} \times \frac{3}{8} \times 48$ " wing leading edge	1 $\frac{1}{4} \times 3 \times 36$ " tips, wing base
1 $\frac{3}{16} \times \frac{1}{4} \times 36$ " stab. leading edge	12 $\frac{1}{16} \times \frac{3}{16} \times 36$ " cap strips
2 $\frac{5}{16} \times 1\frac{1}{4} \times 48$ " wing trailing edge	1 $\frac{3}{4} \times 2 \times 36$ " cowl sides
1 $\frac{1}{4} \times 1\frac{1}{8} \times 36$ " stab. trailing edge	1 $2 \times 4 \times 8$ " cowl tops and bottom
7 $\frac{1}{8} \times \frac{1}{4} \times 36$ " spars	18 sheets tissue covering
3 $\frac{1}{8}$ " sq. $\times 36$ " spars	1 .049 $\times 36$ " piano wire spoiler mechanism
8 $\frac{1}{16} \times 3 \times 36$ " leading edge covers and ribs	4 large face bushings; keys
	$\frac{1}{2}$ pint each cement and clear dope



T.E.  $1\frac{1}{4} \times \frac{5}{16}$  TAPERED TO  $\frac{7}{8} \times \frac{1}{4}$

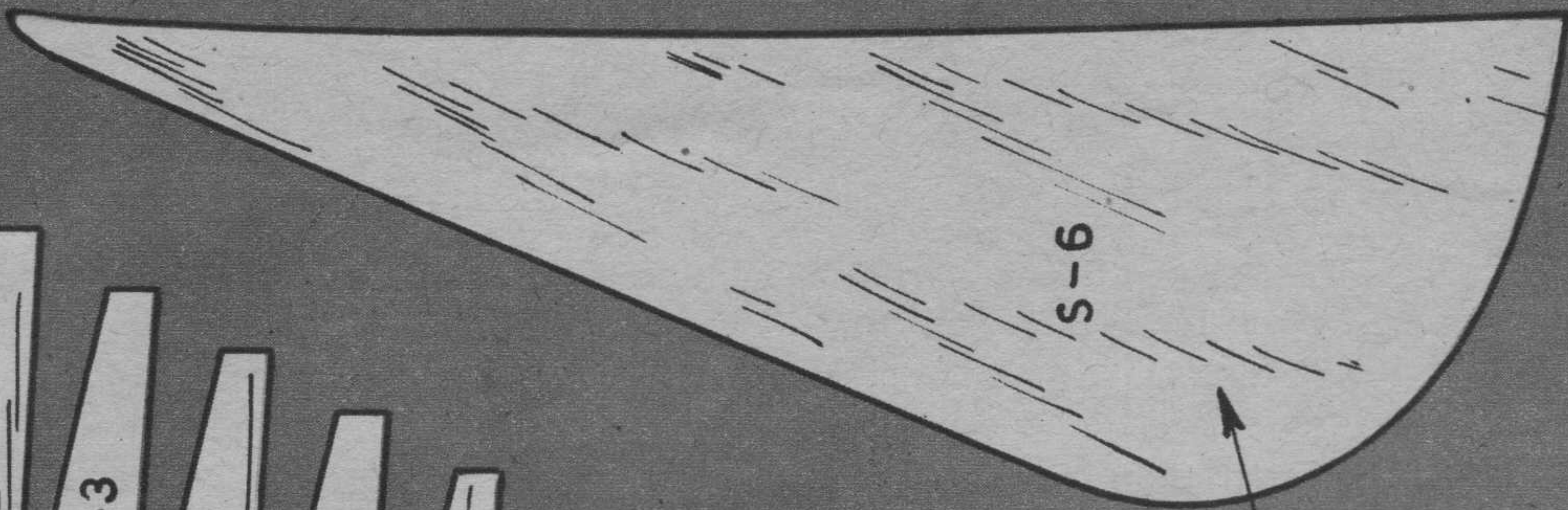
L.E.  $1\frac{3}{4} \times \frac{3}{8}$



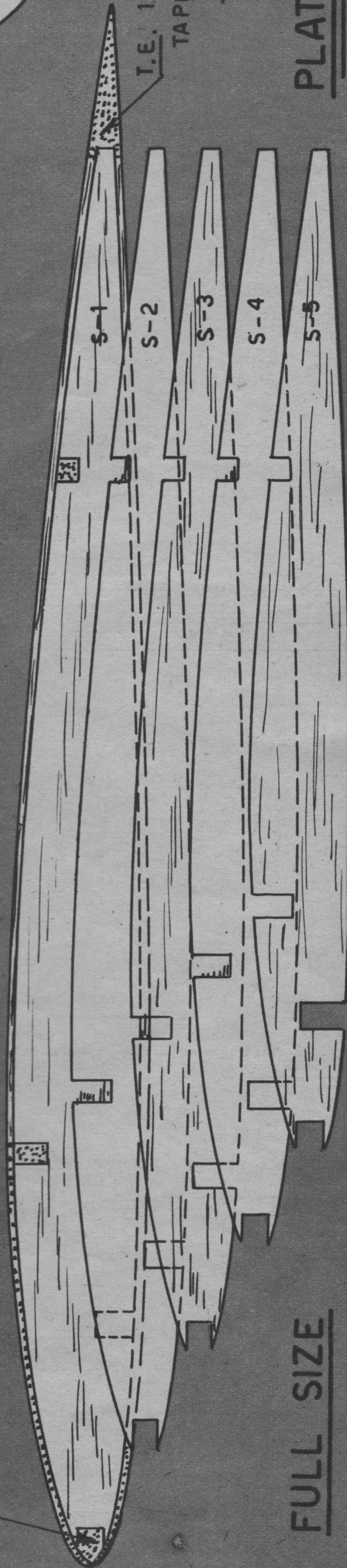
ALL RIBS  $\frac{1}{16}$  SHEET, 2 OF EACH REQUIRED

L.E.  $\frac{3}{16} \times \frac{1}{4}$

$\frac{1}{4}$  SHEET



T.E.  $1\frac{1}{8} \times \frac{1}{4}$   
TAPERED TO  
 $\frac{5}{8} \times \frac{7}{32}$



FULL SIZE

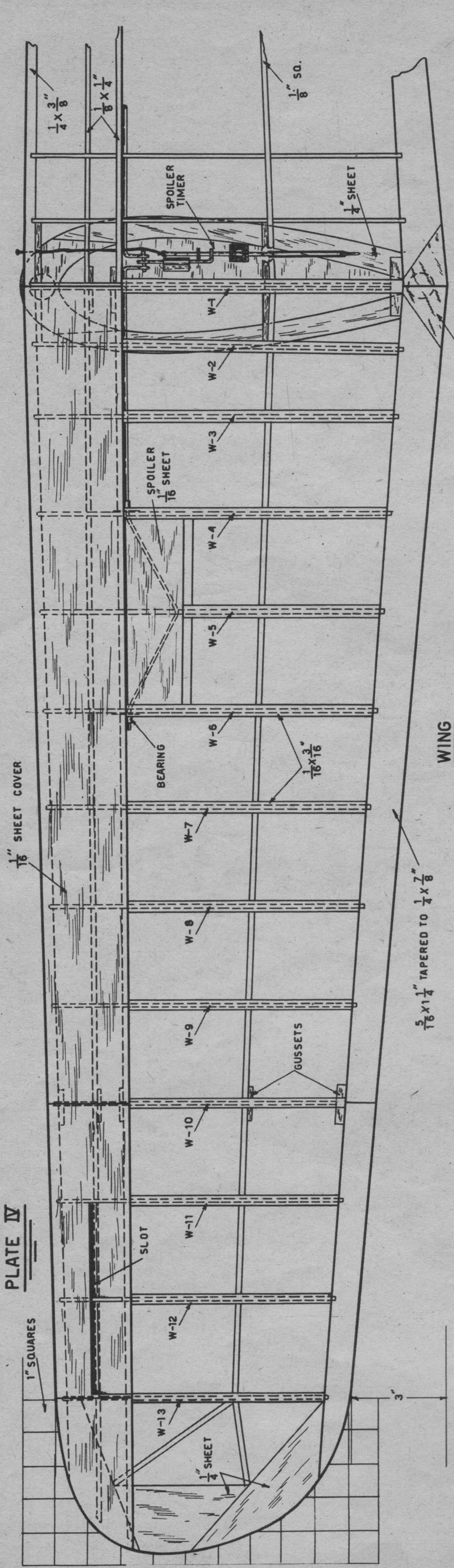
PLATE V

9/2/41

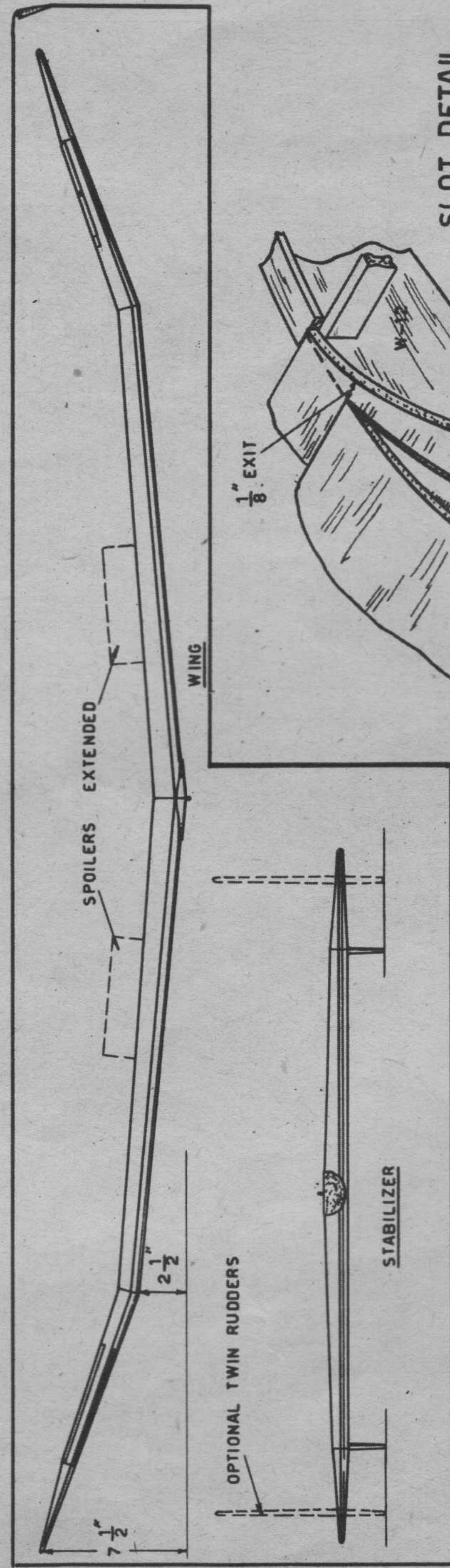
W/REV



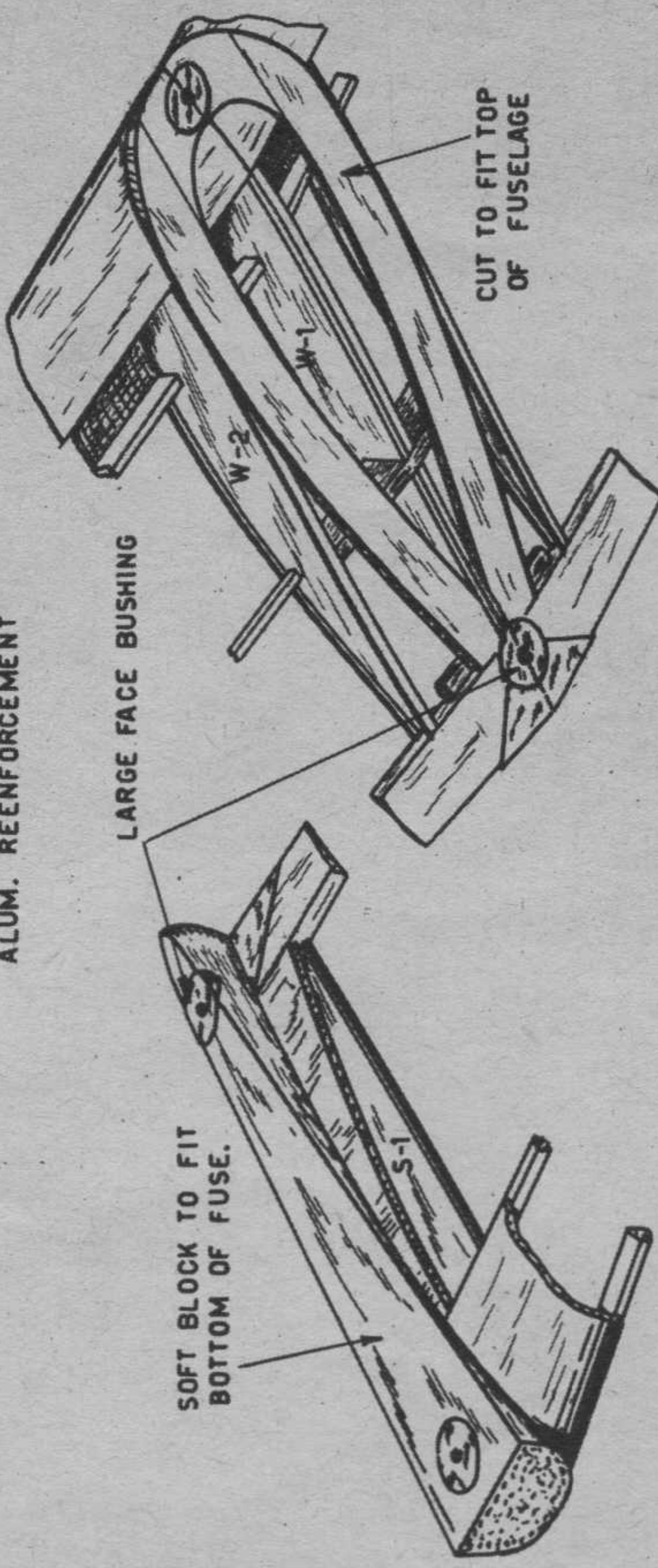
# PLATE IV



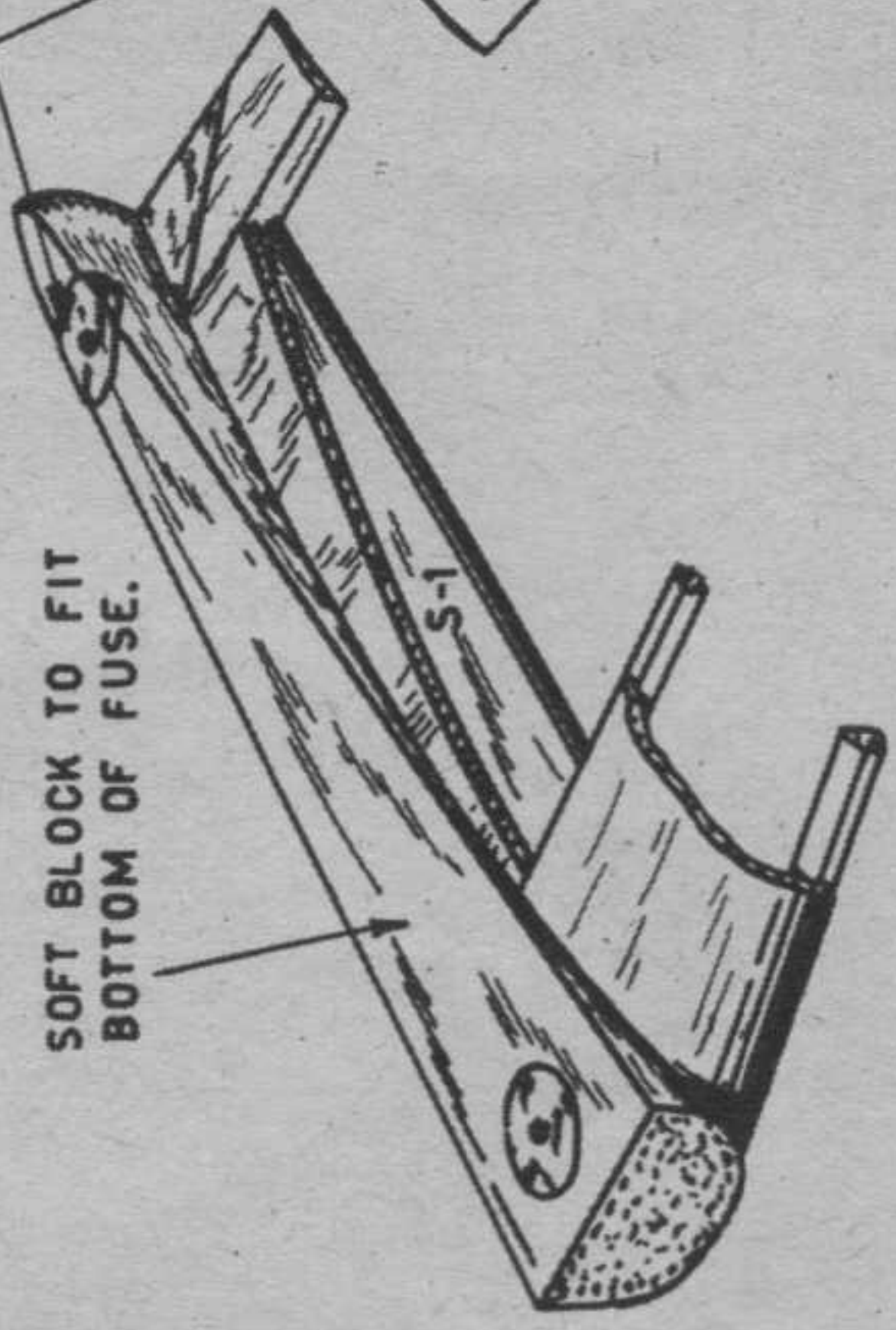
## WING



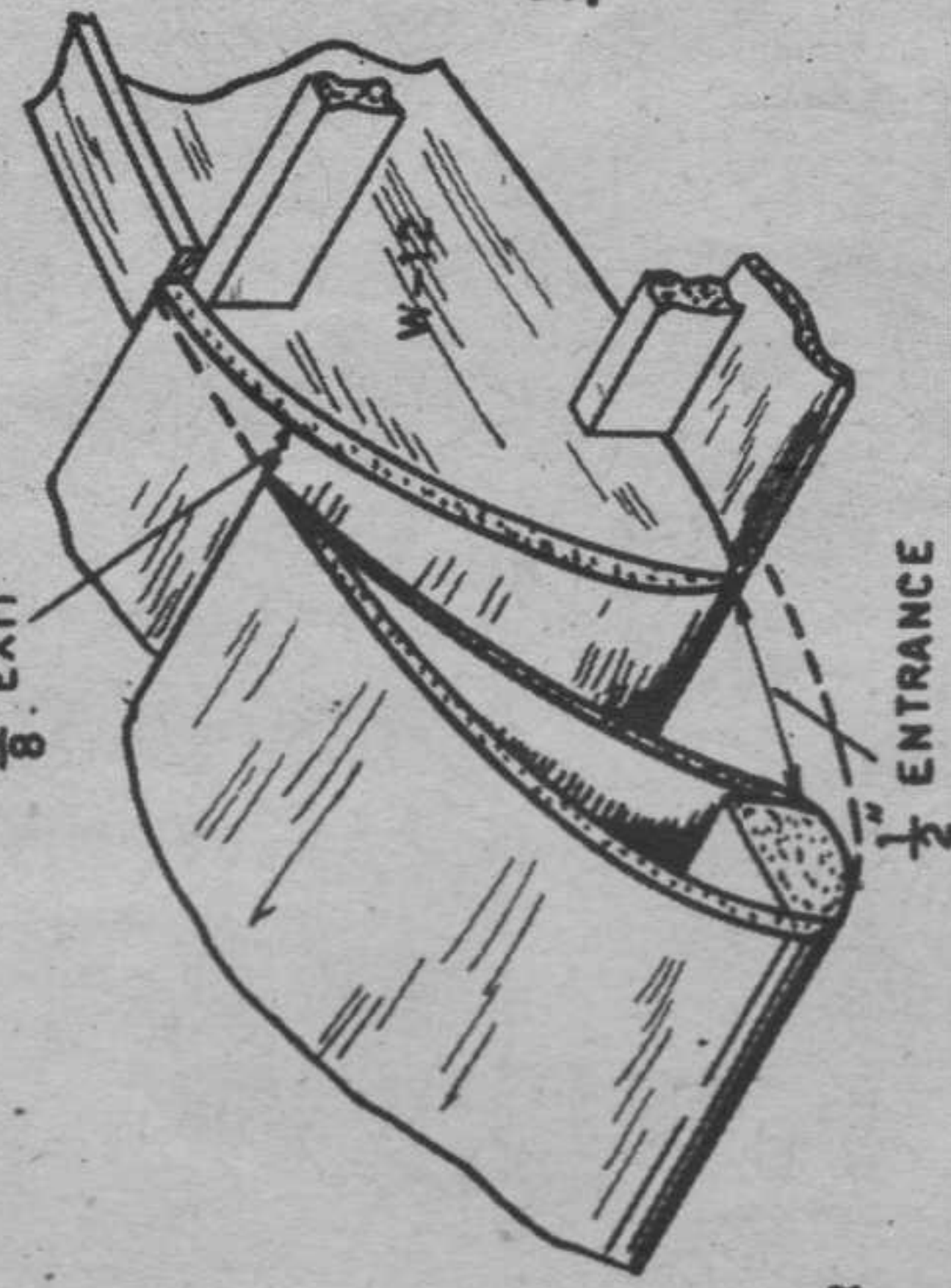
**WING BASE**



TAIL BASE

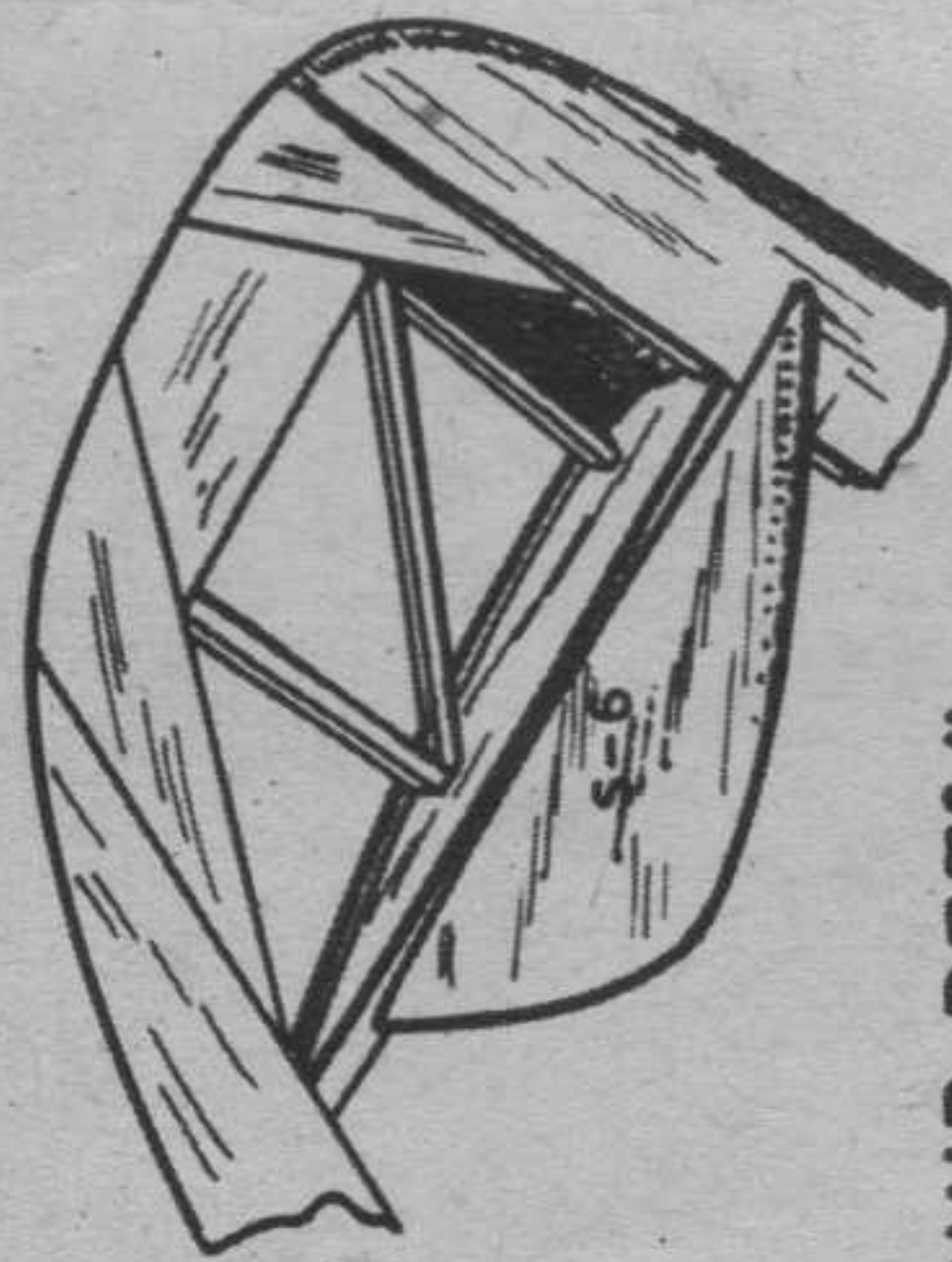


### SLOT DETAIL

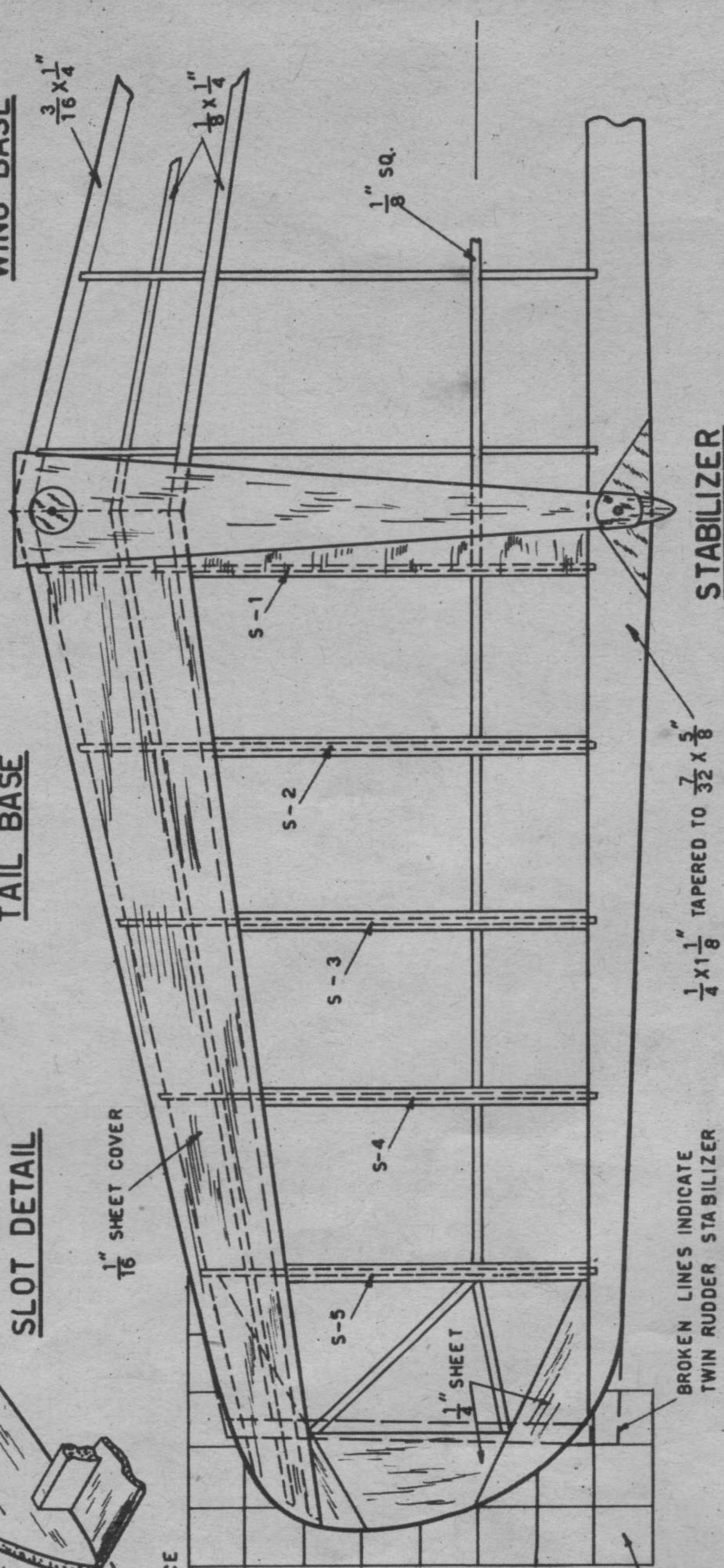


CUT AWAY W-12, PULL  
ORIGINAL BALSA COVER  
DOWN TO BOTTOM.  
CONSTRUCT SLAT ON  
LEADING EDGE SPAR

## SKID DETAIL



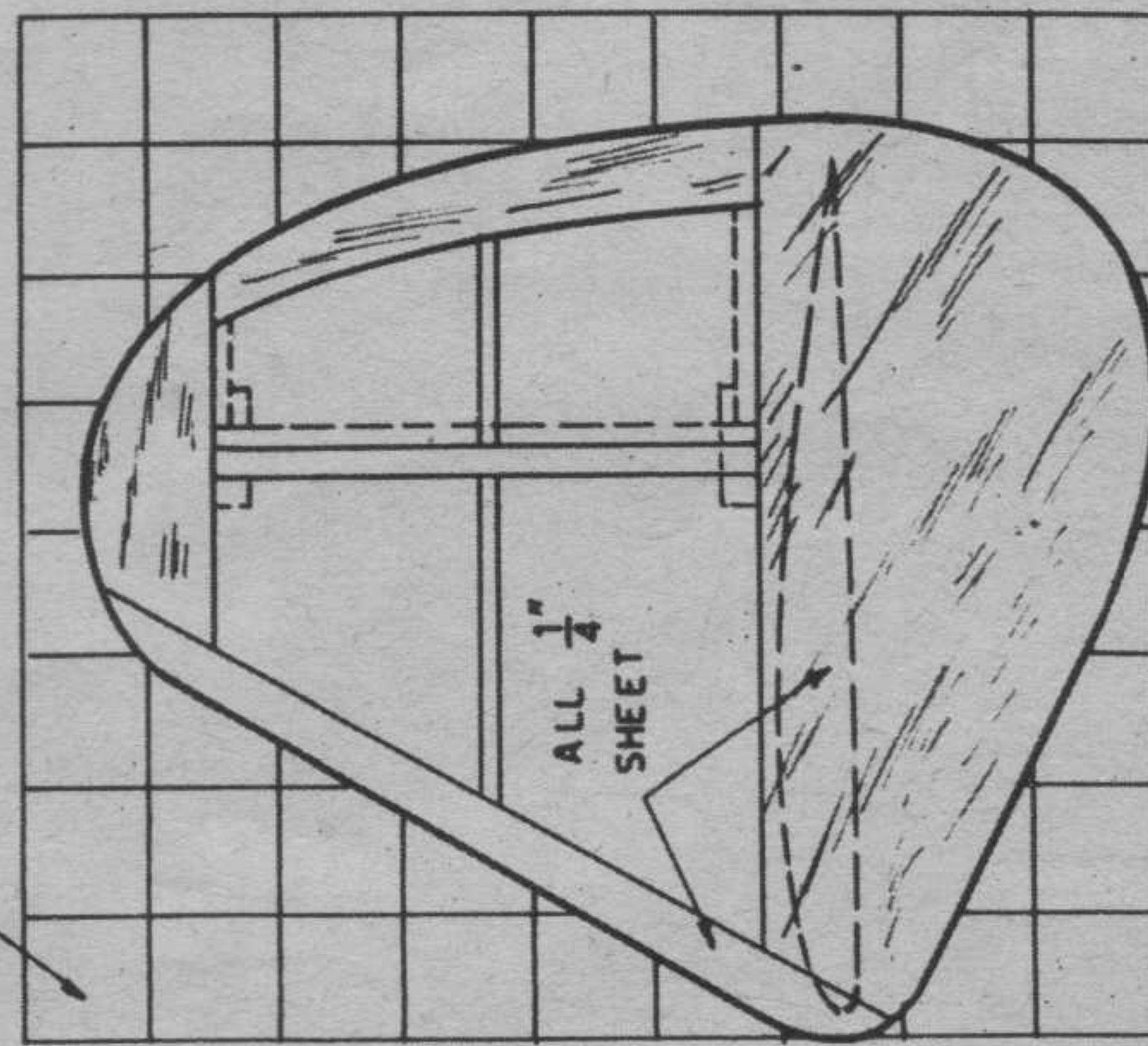
## STABILIZER



**BROKEN LINES INDICATE  
TWIN RUDDER STABILIZER**

$1\frac{1}{4} \times 1\frac{1}{8}$  TAPERED TO  $\frac{7}{32} \times \frac{5}{8}$

**OPTIONAL TWIN RUDDER**



A vertical scale with major tick marks at 0, 1, 2, 3, and 4. The word "SCALE" is written vertically along the right side of the scale.





# MEET THE PBM-1

This striking close-up of the twenty-nominal range and tremendous fir





Martin PBM-1 long-range patrol bomber gives a good idea of its size. This giant navy bomber has a phenomenal power from its six gun turrets, huge bomb load and two torpedoes slung beneath its 1,350 h.p. engines.