UNIVERSAL MODEL AIRPLANE NEWS

NOV. 20¢

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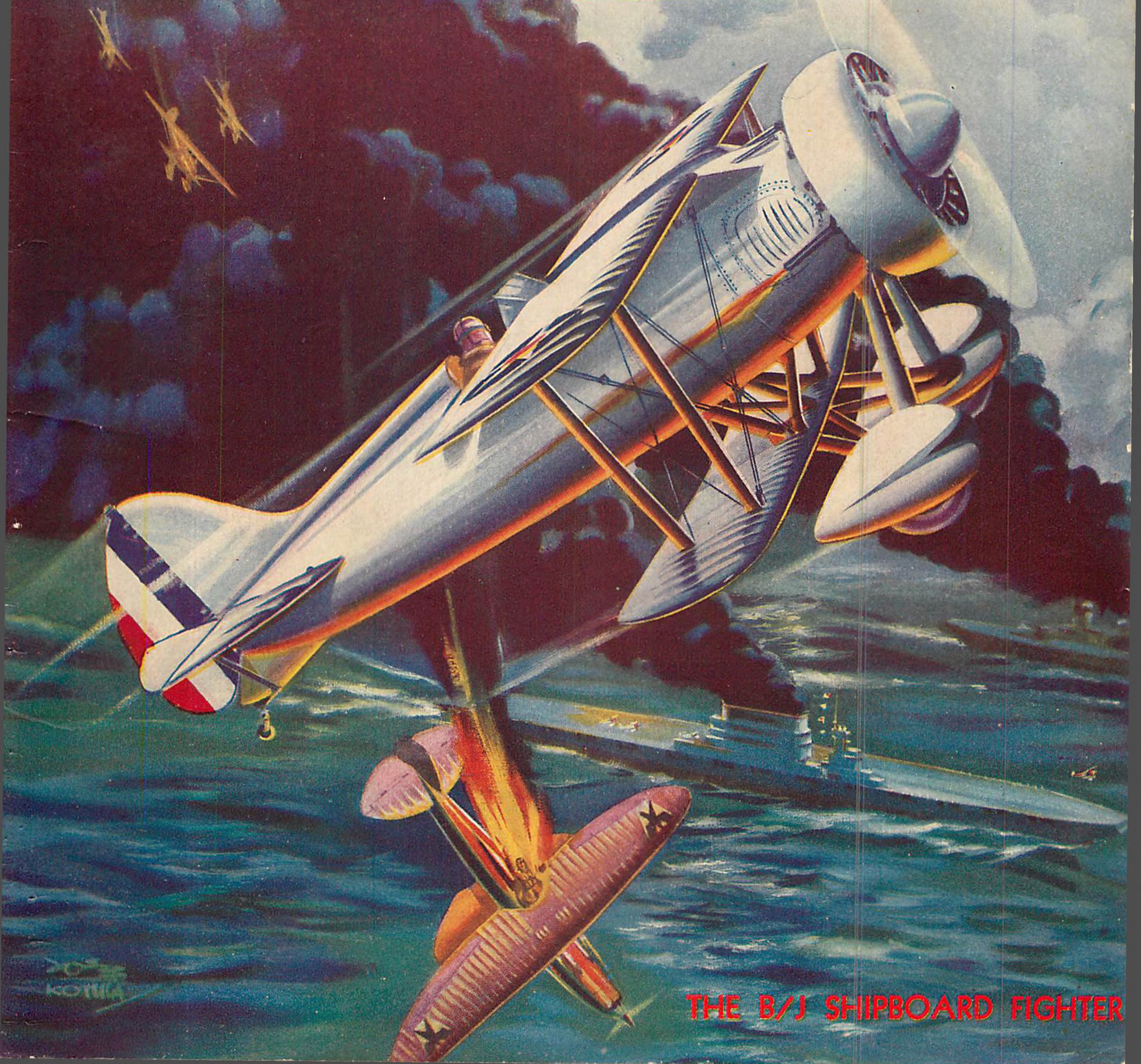

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1/16 x 1/16	3 for 2c
1/16 x 3/32	3 for 2c
1/16 x 1/8	3 for 4c
1/16 x 3/16	3 for 4c
1/16 x 1/4	3 for 6c
1/16 x 1/2	3 for 8c
3/32 x 3/32	3 for 4c
1/8 x 1/8	3 for 6c
1/8 x 3/16	3 for 6c
1/8 x 1/4	3 for 8c
1/8 x 1/2	3 for 10c
3/16 x 3/16	3 for 10c
3/16 x 5/16	3 for 12c
1/4 x 1/4	3 for 12c
1/4 x 1/2	3 for 16c
5/16 x 5/16	3 for 14c
1/2 x 1/2	3 for 20c
1 x 1	1 for 16c

SHEETS

24 inch lengths

1/100 x 2	7c each
1/64 x 2	6c each
1/32 x 2	3 for 14c
1/16 x 2	3 for 18c
3/32 x 2	3 for 18c
1/8 x 2	3 for 20c
3/16 x 2	3 for 24c
1/4 x 2	3 for 30c

PARA RUBBER

		50 ft.
1/32 sq.	1 ft. 1c	25c
3/64 flat	1 ft. 1c	45c
1/16 flat	2 ft. 3c	50c
1/8 flat	2 ft. 3c	50c
3/16 flat	2 ft. 4c	75c

DRAG RINGS

1½" diam.	20c
1¾" diam.	23c
2" diam.	25c
2½" diam.	28c
3" diam.	30c

COWLINGS

Open and Closed

1½" diam.	20c
1¾" diam.	23c
2" diam.	25c
2½" diam.	30c
3" diam.	35c

CEMENT

Small Bottle	5c
Large 6" tube	16c
4 oz. bottle	40c

DOPE

Colored and Plain

Small Bottle	5c
1 oz. Bottle	10c
4 oz. Bottle	40c
Brushes	5c each
1/16 O.D. Brass rod	6c ft.
1/16 I.D. Brass tube	18c ft.

THRUST BEARINGS

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Small	2c each

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2" x 6" .... 1 for 4c

WASHERS

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Large	5c doz.
Medium	3c doz.

CELLULOID WHEELS

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1" diam.	12c pair
1¼" diam.	15c pair
1⅞" diam.	25c pair

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for 2" motor	10c
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1/16 diam.	5 ft. 5c
1/8 diam.	4 ft. 6c

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1/8 O.D.	15c ft.
3/16 O.D.	18c ft.

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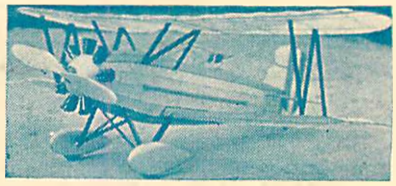

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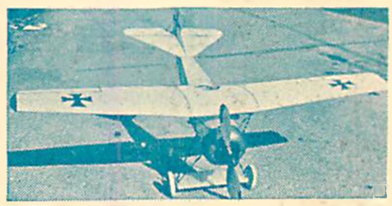

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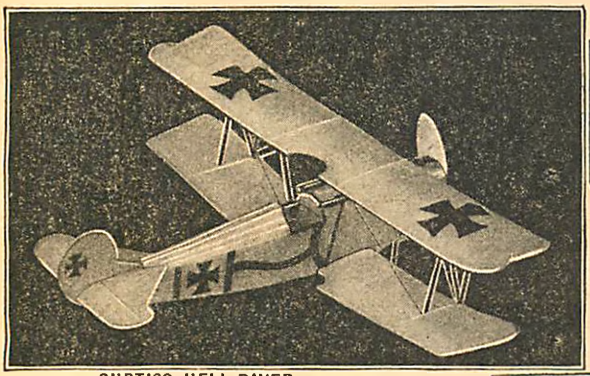

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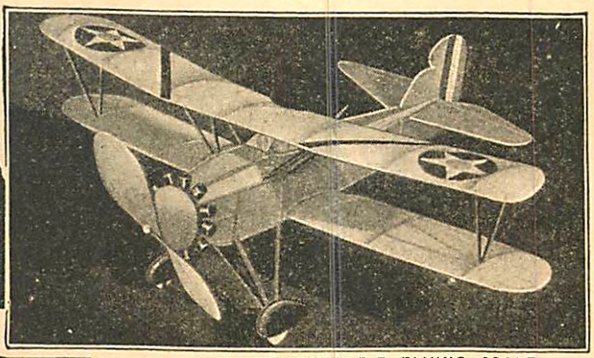

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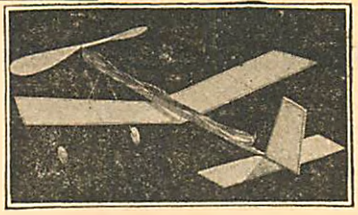
Here's a humdinger! A beauty to look at—a thrill to fly! ________ **35¢** post paid



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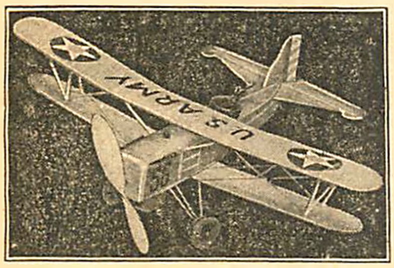

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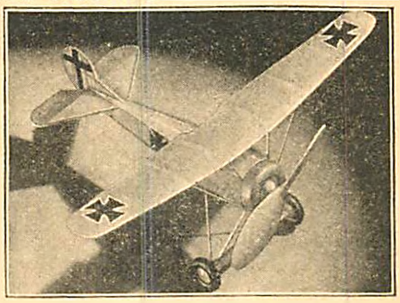

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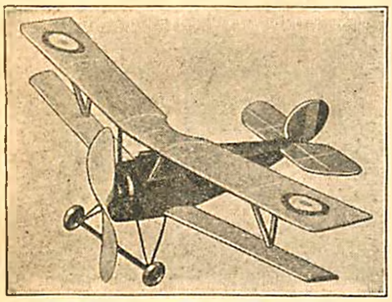
It's a whiz! ________ **35¢** post paid



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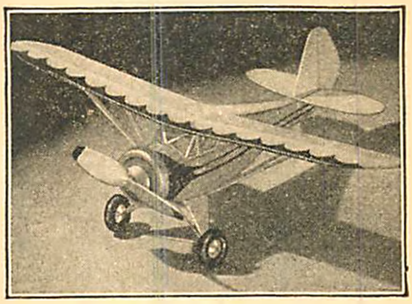

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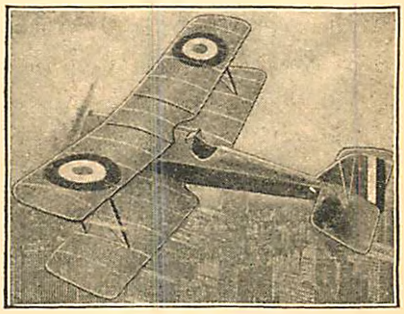

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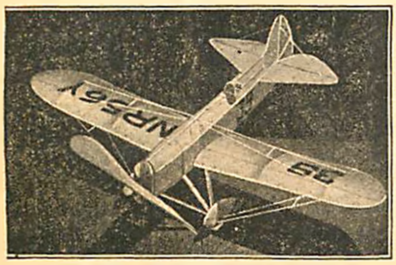

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UNIVERSAL

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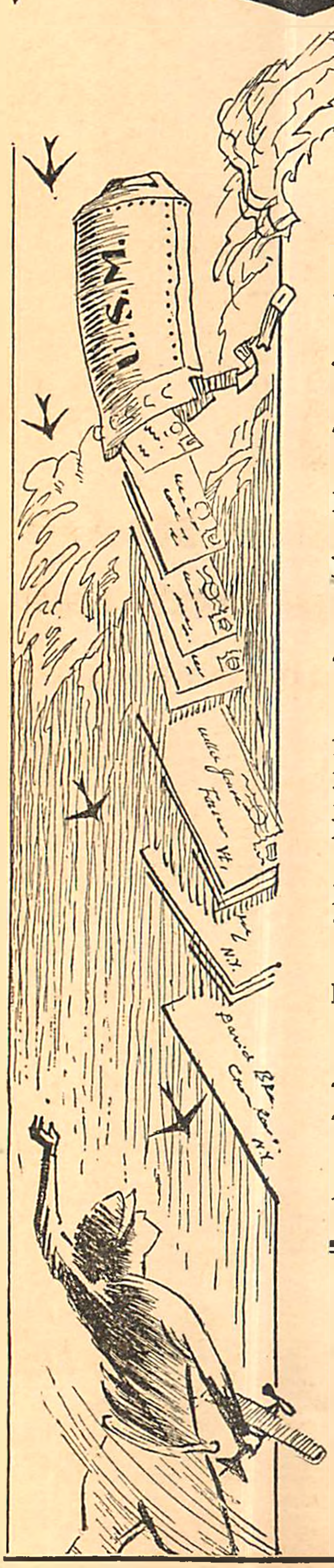
Edited by Charles Hampson Grant



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In Our Next Issue

Our old friend Lt. H. B. Miller, draws from his personal experiences to tell you intimate details of how airplanes "Hook On" to their Mother Ships while in flight, in "Hitch Hikers of the Sky."

Joe Battaglia brings you a set of fine plans to build an unusual scale model, in "The Northrop 'Sky Chief' in Detail."

Complete instructions and plans to build one of the best flying scale models ever appearing in the magazine, "Building the De-Havilland Gipsy Moth," by Elmer Pilzer.

Carl Goldberg tells you of pertinent advances made in model building and flying in "Keeping Pace With Model Science."

Also plans to build a simple tailless plane that will afford you much recreation in "How to Build a Tailless Plane," by Marshall Mulvany.

Also our regular interesting and instructive serials. Of course Air Ways will bring you more news and our Advisory Board will answer some important questions. Several three view drawings will add to the great value of this issue. Don't miss it!

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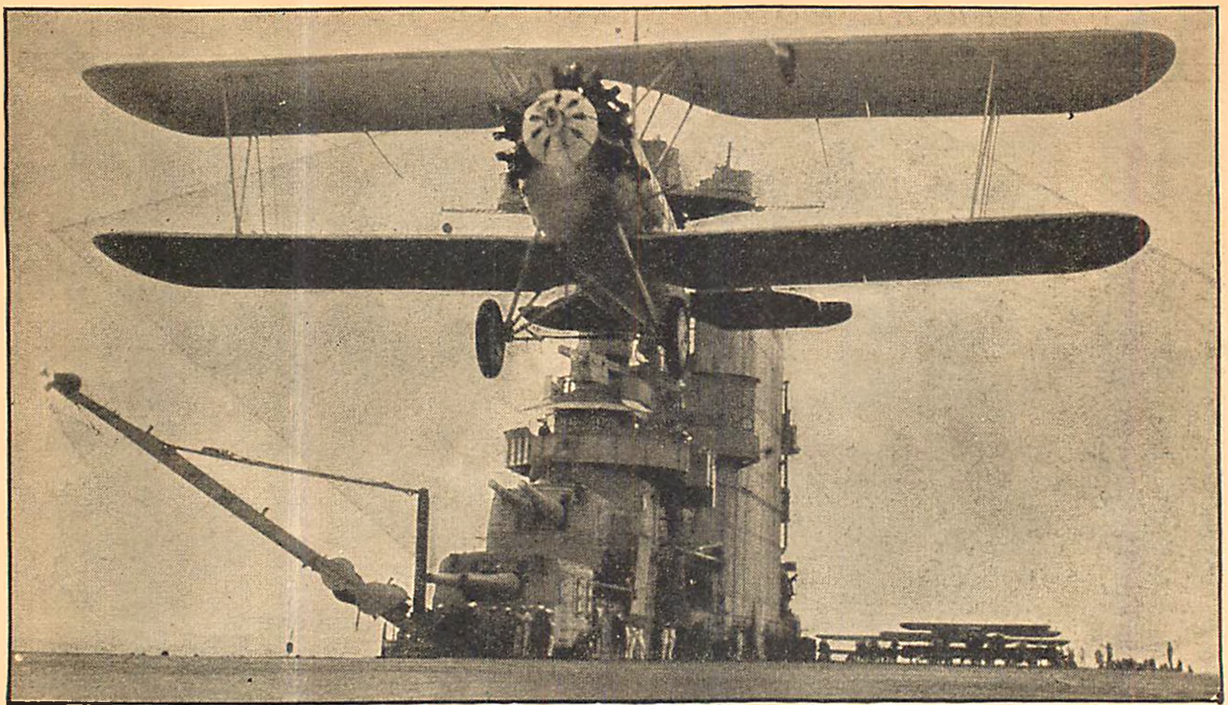


A Vought Corsair leaving the deck of its carrier. This is one of the Navy's most rugged planes.

Wings of the Navy

How Our Navy Airplanes Make Themselves Indispensable to the Fleet and How You Can Tell Their Function By Their Markings

By H. LATANE LEWIS II

WHEN Uncle Sam sends his airplanes out with the fleet, there are a lot of different jobs he expects them to do. Just as the submarine, the destroyer, and the battleship have different missions to perform, so it is with the wings of the Navy. Each mission requires a highly specialized type in order that it may be carried out with the maximum of efficiency.

Naval airplanes operate from carriers, cruisers, battleships, and shore bases. Those operating from carriers are known as offensive aircraft; those operating from light cruisers and battleships, as service types; and those operating from shore bases are known as local defense machines.

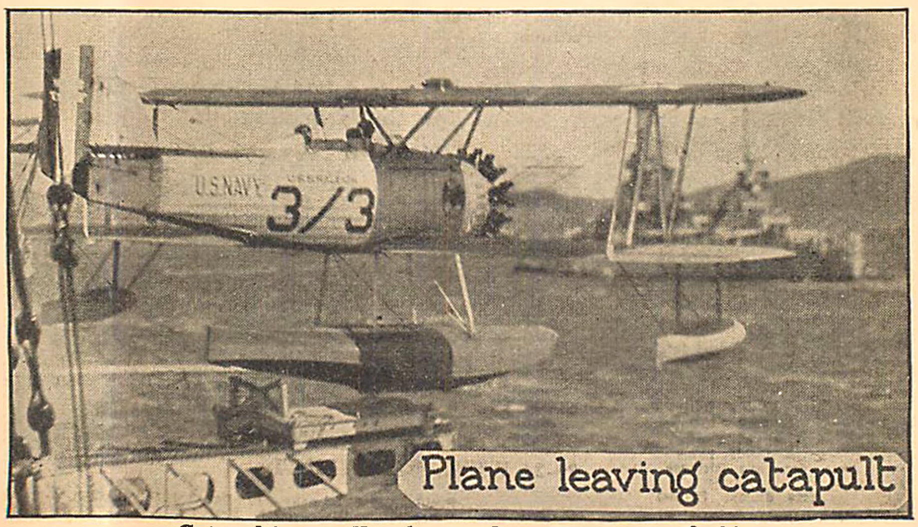
The tactical squadrons comprising these units are classified as Fighting, Torpedo, Dive Bombing, Scouting, Observation and Patrol.

The fighting squadron corresponds to the pursuit squadron in the Army. Its duty is to maintain mastery of the air and to protect friendly aircraft, permitting it to carry out its work un*molested*. The fighters also harass exposed personnel on deck or shore with machine guns and bombs.

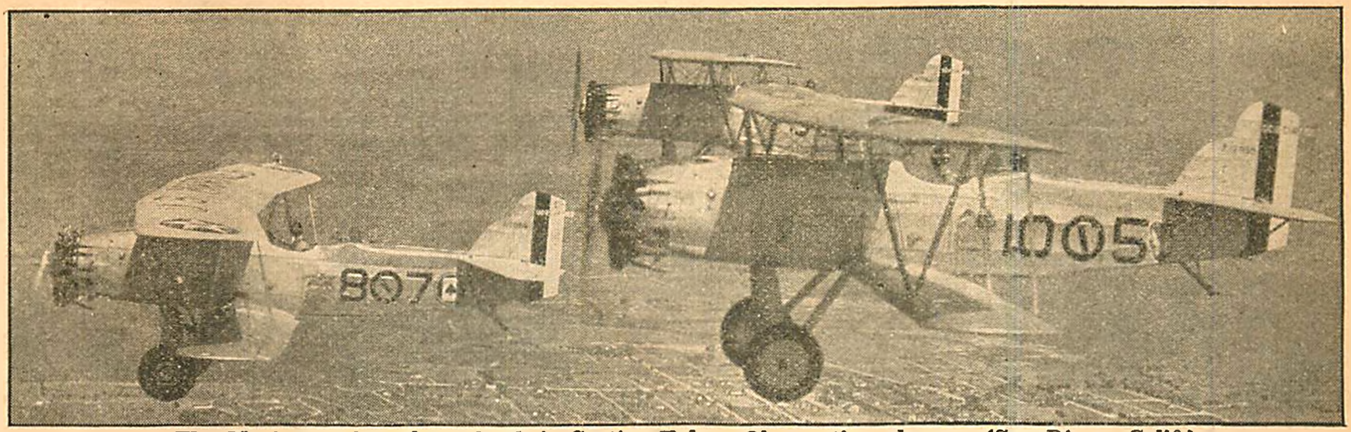
All of the fighting planes operate from aircraft carriers. They must be fast and able to deliver a telling blow and return to the carrier in a short time. Excellent performance and maneuverability at high altitudes are essential characteristics of this type.

Standard fighting planes in the Navy are all single-seaters. The type chiefly in use is the Boeing F4B-4, a biplane with a top speed close to the 200-miles-an-hour mark and a service ceiling slightly in excess of 26,000 feet.

A new type of fighter has recently made its appearance in the form of an "airship-board" fighter, carried on the dirigible Macon and formerly carried on the ill-fated Akron The planes are carried within a hangar built inside the hull of the airship and are lowered by a special trapeze arrangement below the airship's keel for the take-off. After the engine has been warmed up, the pilot trips a lock and falls clear. In returning to the airship, the pilot comes in from astern at a



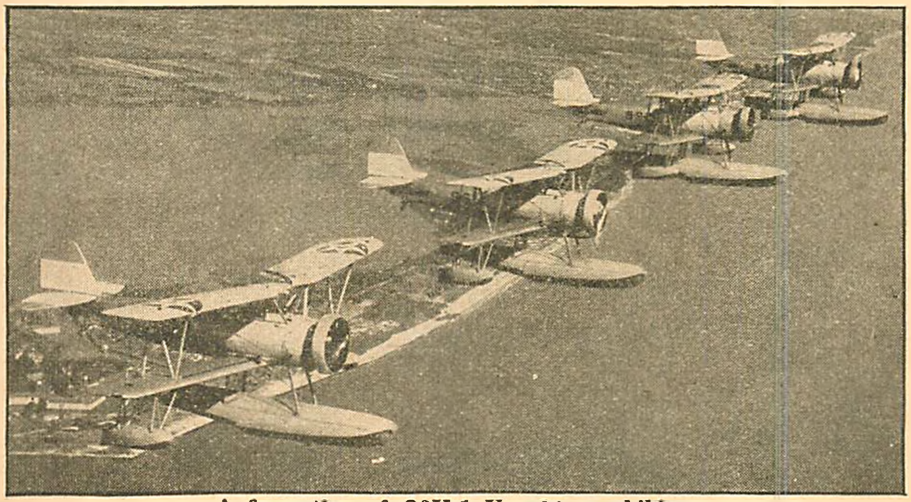
Catapulting a Vought seaplane from a battleship.



The Marines going places in their Curtiss Falcon Observation planes. (San Diego, Calif.)

speed just a little greater than that of the airship. As he moves slowly forward under the belly of the big ship, he threads the bar carried on the upper wing of his plane on to the cross bar of the trapeze, where it is automatically locked.

THE little ships which are biplanes, are built by Curtiss and are known as the F9C-2 model. The fuselage is of all-metal monocoque construction. The wings are metal with fabric covering, being of the gull-type, faired directly into the fuselage. The tail assembly is all metal. Power is furnished by a Wright Whirlwind 420 horsepower engine. The overall length of the plane is only 19 feet, with a wing span of 25½ feet. The top speed is 180 miles per hour and it climbs at 1,800 feet per minute.


A formation of O3U-1 Vought amphibians.

The torpedo squadron is the Navy's counterpart of the Bombardment squadron in the army. Its mission is to destroy enemy ships and shore bases, such as ammunition dumps, transportation lines, airdromes, forts, bridges, etc.

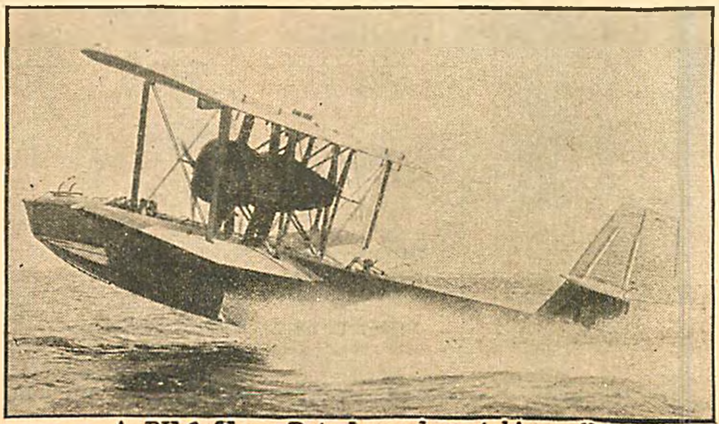
Equipped with wheels, the torpedo planes operate from carrier decks. As seaplanes, with twin floats, they are based on tenders and operate against enemy vessels or strategic points ashore. Additional gasoline may be carried instead of the bomb load and the torpedo plane operated as a long distance scout.

These planes approach their objective flying very high so as to avoid being seen by the enemy. When possible, they hide behind clouds. A squadron of fighting planes is usually hovering overhead to protect them against attack from hostile aircraft. When they have sighted their target, they descend and "lay their eggs", while the fighters stay above to ward off enemy interference.

The type used in the Navy for this work is the Martin T4M-1, an open-cockpit biplane powered with a Hornet 525 h.p. engine. It is manned by a crew of three and carries half a ton of high explosives.

Another class of bombing plane that is just making its appearance is the dive bomber. These machines dive vertically on their targets, sighting the bombs by pointing the whole plane. They come roaring down from tremendous heights in a long, screaming dive, taking the enemy by surprise. After releasing their bombs, they pull up in a rocket-like zoom.

Dive bombing is probably the most effective form of bombardment. In horizontal bombing, the missile is carried in a horizontal position and after being released from the plane continues to travel in the path of the plane for some time. Not until the momentum imparted by the plane is spent does it fall vertically. Unless it is dropped from a considerable altitude, the bomb may strike the ground on its side and fail to explode. This disadvantage is not present in the dive bombing attack. Greater accuracy of hits can also be obtained.


A PK-1 Navy Patrol seaplane taking off.

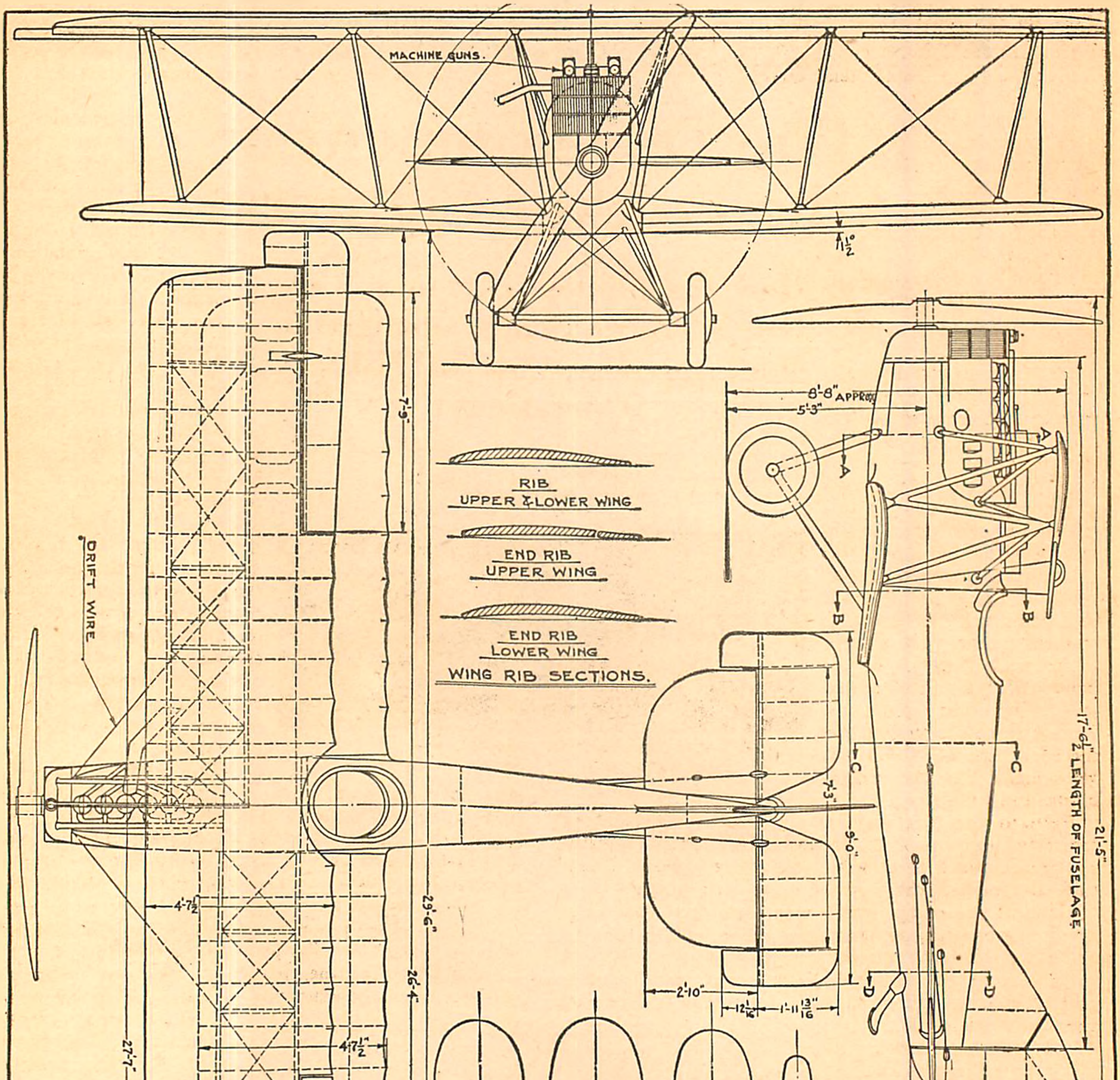
THIS dive-and-zoom maneuver puts a tremendous strain on every part of the structure of the plane and it must be built to "take a lot of punishment". For dive bombing, the Navy is using the Martin BM-1, a two-place biplane. The ship has a speed of 113 miles per hour, a service

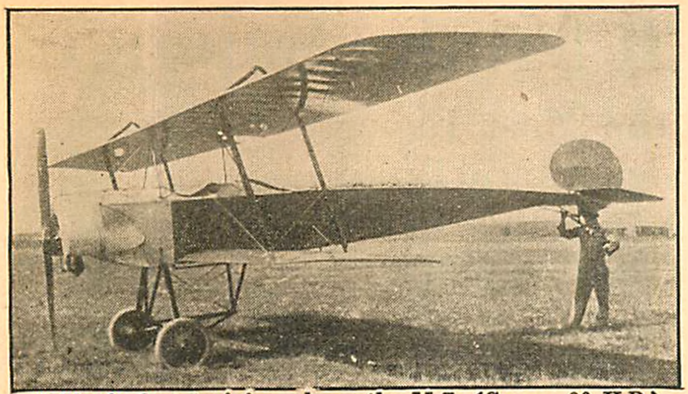
(*Continued on page* 41)

The Pfalz Scout D. 12

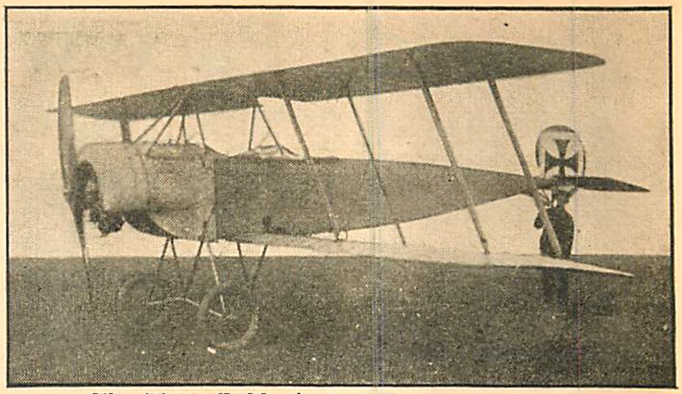
THIS ship was the type in use at the end of the war. It had a speed of approximately 105 m.p.h. The general construction was sturdy, a monocoque body of 3 ply veneer and wings with 2 bays on each side. The lower wings were faired into the body. A deep car type radiator was mounted in the nose, above the propeller shaft and immediately in front of its 180 h.p. Mercedes six cylinder engine.

A flying or solid scale model may be made from the plans below. A little ingenuity is all that is necessary to modify it for either type of construction. Sheet balsa may be used to make the monocoque body, cross sections of which are given. Four longerons should run the length of the body to stiffen it. Use bulkheads at regular intervals.





Fokker's first training plane, the M-7. (Gnome 80 H.P.)



The M-10, Fokker's second trainer (1914).

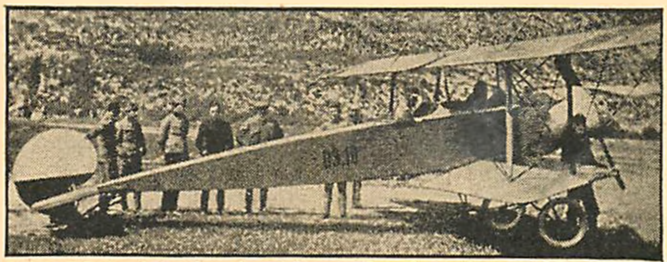
The Development of the Fokker Fighters

How the Fokker Biplanes Were Originated and Later Changed to Meet the Demands of Military Operations

By ROBERT C. HARE

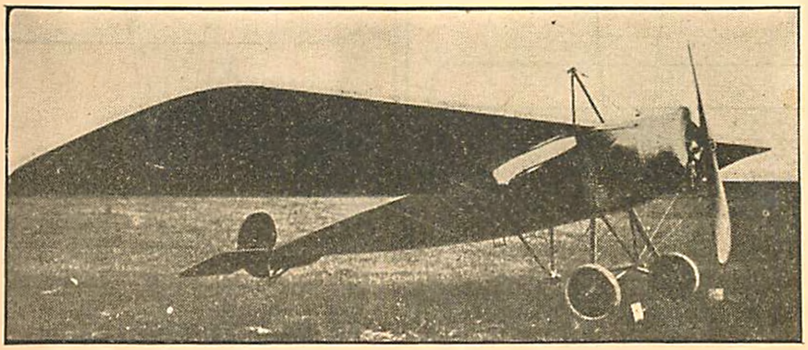
PART No. 3

AFTER succeeding in building and flying several types of aeroplanes to the satisfaction of the German Government, Fokker opened a flying school in conjunction with his airworks at Schwerin and began training men for the German Army. He also took in a number of wealthy sportsmen who had become tired of automobiles, boats and horses. Not being able to obtain any of the old L.V.G. and D.F.W. biplanes then in general use in training, Fokker set himself to designing a suitable training plane that proved to be much superior to the planes of his contemporaries. The first effort of Fokker in this direction was the M-7 biplane which was very much like the monoplanes built before.



An M-7 with the Austrians, showing that Fokker two place ships were used during "The War".

Perhaps the fuselage was the most reminiscent of the earlier monoplanes. It was built entirely of welded steel tubes braced with steel wire. Four longitudinals formed the body outline and finished in a horizontal knife edge which was popular at that time. Being a much larger plane than those built heretofore and since it would receive quite some mistreatment in the hands of his students, Fokker put on a landing gear of considerable strength. The carriage type was essentially the same as illustrated last issue. It was made up of streamlined steel instead of plain round tubes faired with wood as used on previous planes. A long nose was needed to balance the tail of the M-7. This allowed considerable freedom and comfort for the occupants since tanks and necessary equipment could be stored in the forward compartments. The conventional turtle deck was fitted from the end of the cowling to the rear of the last cockpit while aluminum was used exclusively in covering the front of the plane. A headrest was not included. From the landing gear aft, the body was fabric-covered. The usual tripod tail skid protected conventional tail planes.



The M-8, designed as a sport plane but used as a scout at the start of "The War".

IT IS often true that the shape and disposition of the wings of an aeroplane have a great deal to do with its final appearance. That this fact is true can be gathered from the photograph of the M-7 shown here. A typical Fokker airfoil section was used.

Wing construction consisted of two main spars, the first about seven inches behind the leading edge and the rear spar about two-thirds the chord distance from the leading edge. Thirty-two ribs in the upper wing and twelve ribs in each lower wing panel were further strengthened by tubes, wires, and other auxiliary bracing inside the wing. The upper wing was not of the one piece type, however, but was joined in the middle to a very narrow center cabane, much in the same manner as was used on the Rumpler biplanes later on in the War. Two struts for the front spar and two for the rear spar were welded at their base to the upper longitudinal member. Their top ends were joined in a forward and rear group to which wing attachment fittings were welded. Guy wires for added strength were run from the wing fittings to the

(*Continued on p. 38*)

Keeping Pace with Model Science

In Which One of the Most Experienced of Model Designers and Builders Discloses Some of the Latest Developments in Outdoor Ships

By CARL GOLDBERG

ARTICLE NO. ONE

MODEL builders always show a marked improvement in their work immediately after attending the various contests held from time to time. The reason for this improvement seems to be in the new ideas and instructive material which they pick up. Therefore, this article is written with the purpose of bringing up to date the store of information possessed by the average builder of flying models, who for some reason, has not been able to attend the various outdoor competitions.

Joe Ehrhardt with his National Championship Twin Pusher. (Courtesy Edward S. Booth.)

The author caught during a pensive moment while watching the flight of a model.

Donald Burnham's 4 motored tractor pusher which flew for 202 sec. (Courtesy Edw. S. Booth.)

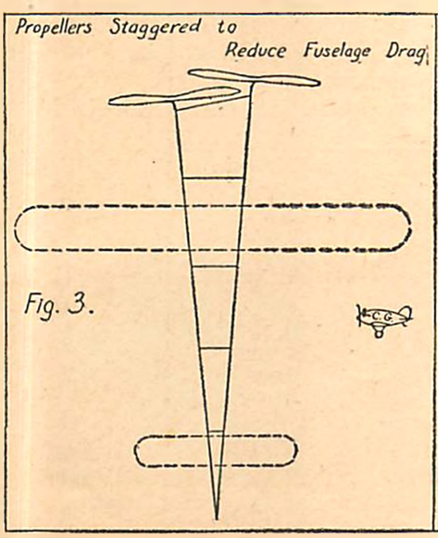
At the National Meet this year and at the New York City Model Derby, it was to be observed that the most popular of outdoor duration models still are of the good old twin pusher type. August Ruggeri, the sunny-smiling, red haired little builder who has done some of the best outdoor workmanship around New York, again came through with a beautifully-built, fine flying twin pusher of the tail plane type. The weight of the complete ship minus motors was one ounce! The motors weighed enough more to bring the ship up to weight requirements; that is, they were about one and one-half ounces. A sketch showing the general outline of this ship is shown in fig. 1. Covering material was superfine tissue, which after being water-sprayed and allowed to dry, produced a fine appearance.

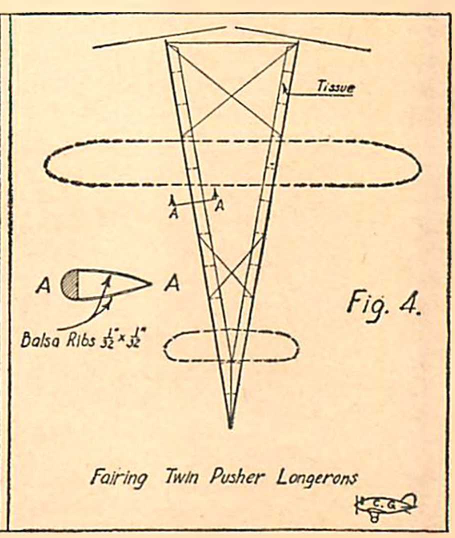
Several twin tractors made their appearance, notably that of Laurence Smithline, whose small light model was a consistent performer in the New York Derby. Almost all of the ships had free-wheeling devices on the propellers which accounted undoubtedly for the unusual number of ships that went out of sight.

However, this cannot account for gliders. Smithline, several months ago, launched his 16" span glider in Van Cortlandt Park, New York City and lay down on the grass to watch it soar in the currents. One hour and seven minutes after the launching, the ship passed from sight. Several weeks later, Francis Schaider of White Plains, N. Y., took his newly finished glider outside, adjusted it, launched it and lost sight of it in 10 minutes, 22 seconds, as it passed over a large ridge. On a trial flight at the New York City Derby, Allan Penn of New York lost his ship, which stayed in sight for 5½ minutes. John Young, New York glider expert, originated this design which is shown in fig. 2.

RETURNING again to the National Meet, we now take up peculiarities of construction. The Zaic brothers, John and Frank, of New York, tried out some interesting all-balsa fuselage models. They used 1/64" sheet balsa for covering wings, tails and bodies. This is very strong, durable construction, your editor being the first builder to produce a long flying ship of this type. Frank also tried a twin pusher with five foot longerons, high aspect ratio wing of 65" span and high aspect ratio elevator of 30" span. Props were 12"x1"x2", slightly toothpicked.

Such props on a normal ship would probably give a very sweet climb. Indeed the prevalent opinion of model experts today seems to favor the use of low pitch props and high-powered motors. The idea is that this combination will give a steep, continued climb for about two minutes, and even without currents the glide should be from one to two minutes because of the great altitude obtained. And of course the chances of getting the ship into a "riser" are greater at high altitudes.





The twin pusher that I flew at the National Meet had a habit of gliding into the wind. This was always a source of annoyance to me as it ruined the chances of getting much benefit out of risers because the model soon glided out of the rising area. However, this feature was at least a mixed blessing at the Nationals for I lost sight of the ship on one flight at the 2½ minute mark, but saw her again at about 3½ minutes. She had glided out of the riser and was coming straight towards me, into the wind. 4:45 was her total flight, taking eighth place.

This model of which a picture is shown, has unusually simple construction and uses thin airfoil sections to reduce drag. (Editor's Note: Thin sections also reduce lift.) A drawing of it is shown in fig. 5. The rear spar is made from sheet balsa ⅛"x1", 28" long. Leading edge is pine ¼"x⅛"x28". Ribs are 1/16" sheet balsa. The elevator has two spars made from 3/16"x1/16" pine, with ribs of 1/16" sheet balsa. All round tips are 1/16"x 1/16" bamboo. Corners of the longerons are rounded off and the fuselage braces are from 1/16" thick bamboo, streamlined. The elevator has 3¼" dihedral in each side of the landing edge, 3" in each side of the trailing edge. The motors are each eight strands of ⅛ brown rubber. Longerons are ¼"x 5/16"x40". Propellers carved from blocks 1x1¾x12.

Some builders like to stagger the props on their twin pushers and twin tractors. An example of the arrangement for twin pushers is shown in fig. 3. This is to reduce drag, improving performance. However, many builders have not yet swung over to this idea because they believe it not worth the loss in efficiency of the props. At any rate, it is an interesting experiment that may or may not be valuable. Another method of reducing twin pusher drag is employed by some builders who "fair off" the longerons with a built-up fairing about three-quarters of an inch wide, paper covered. This would appear to be well worth the while of those who go in extensively for outdoor flying. Fig. 4 represents this idea.

THE field of outdoor commercials has stimulated much original work as almost everyone has different ideas about what such a ship should be like. Gordon Light, winner of last year's Wakefield event, appeared at the 1933 Nationals with sev-

(*Continued on page 44*)

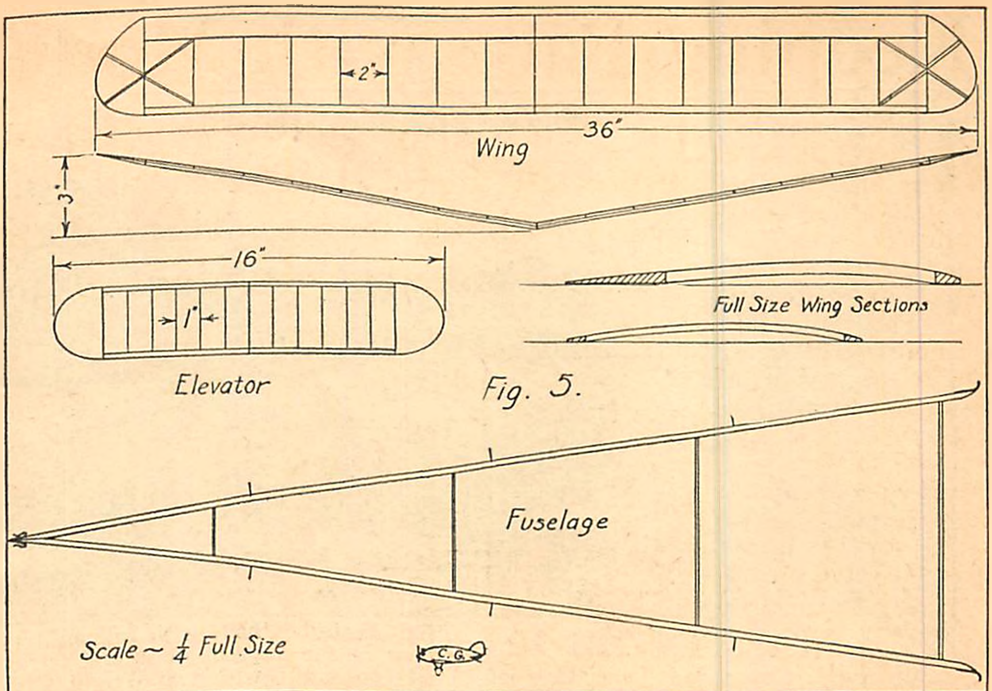


Fig. 5.

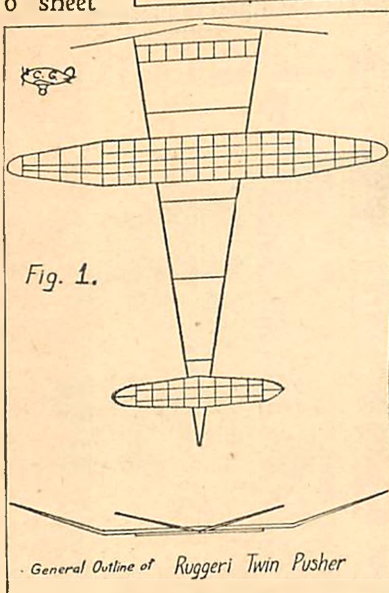


Fig. 1.
General Outline of Ruggeri Twin Pusher

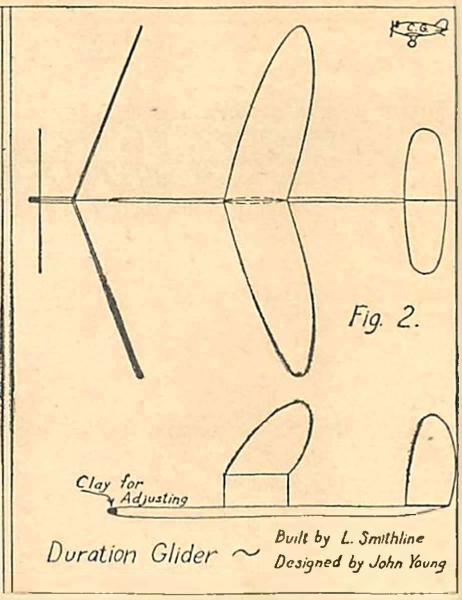


Fig. 2.
Duration Glider ~ Built by L. Smithline Designed by John Young

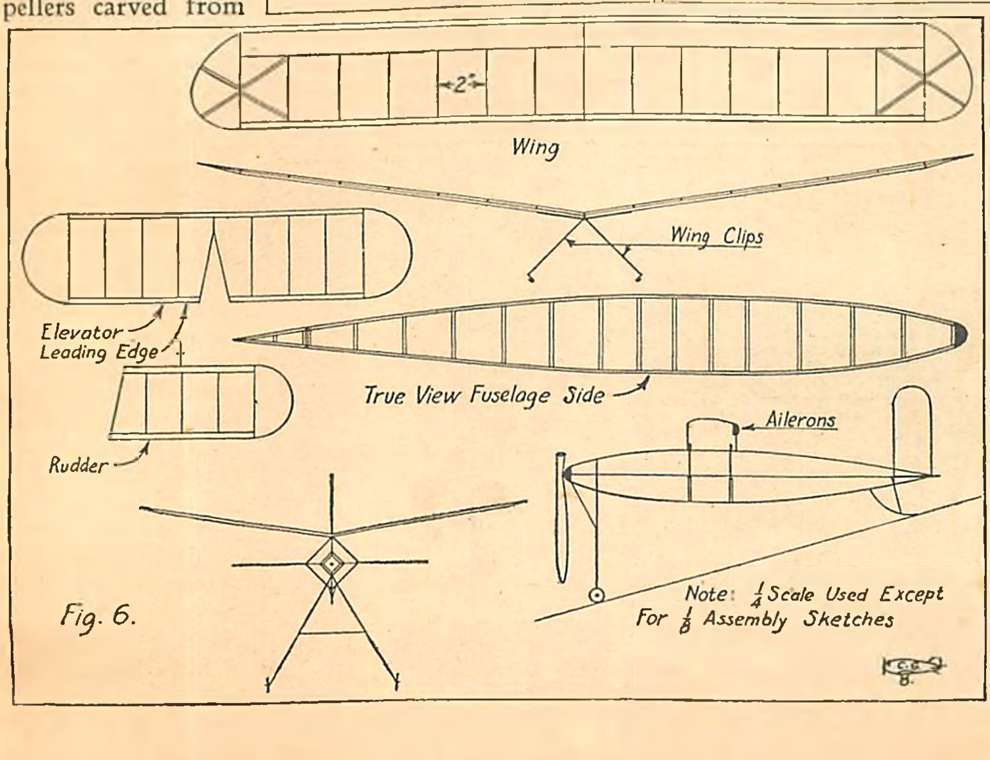
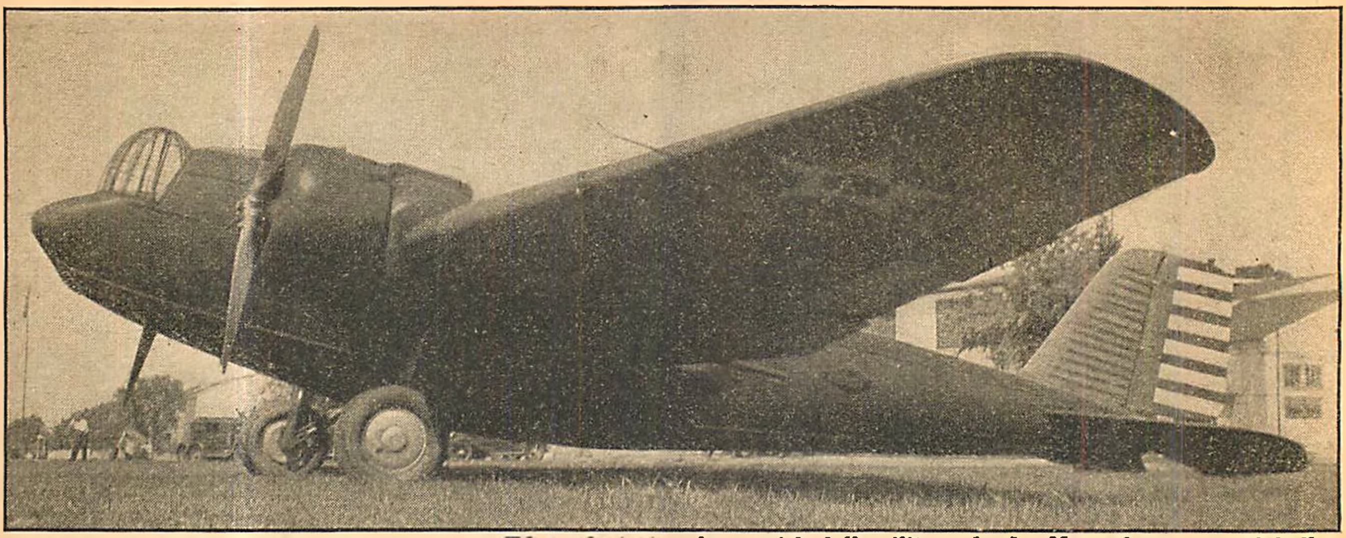
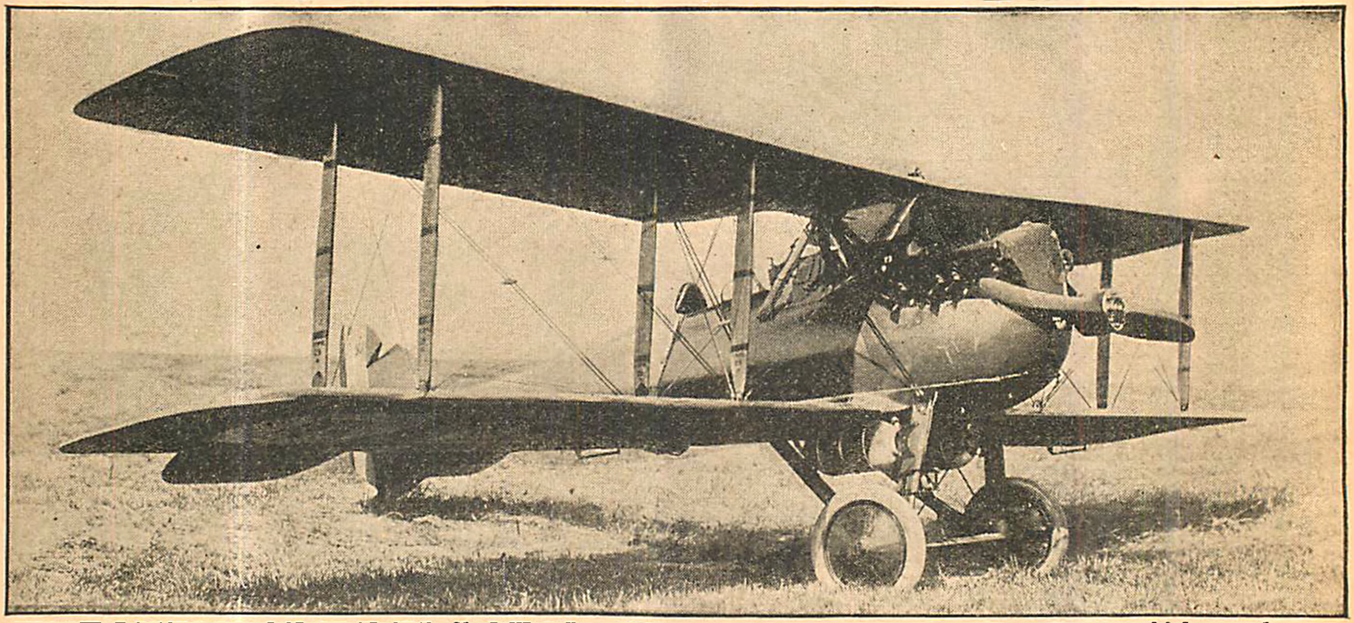


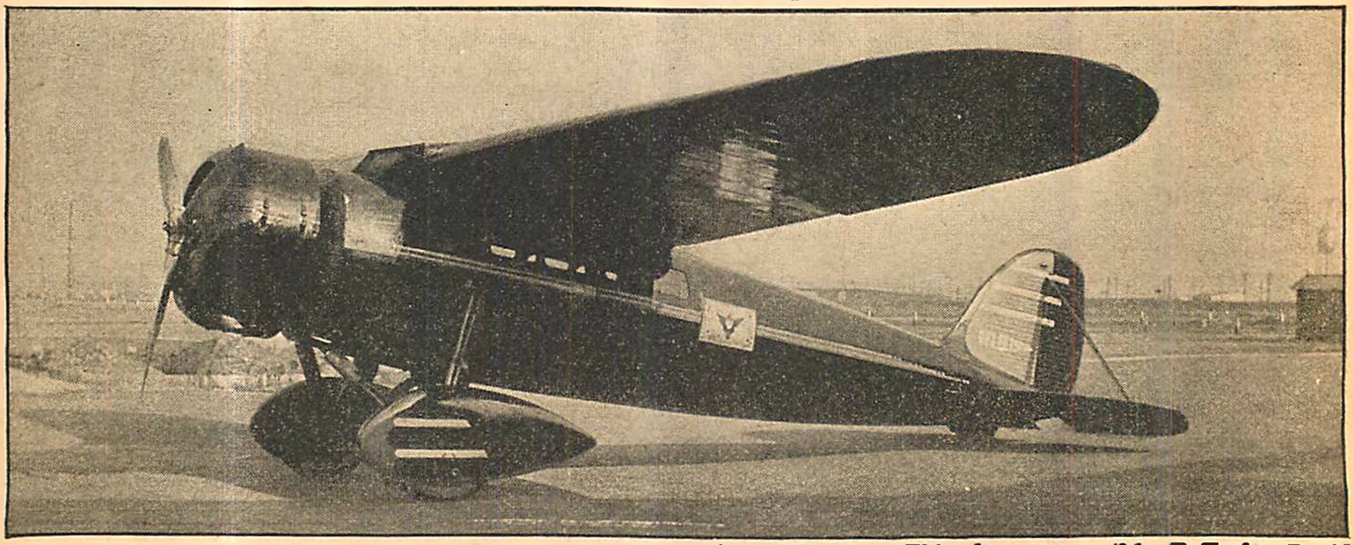
Fig. 6.



THE MARTIN XB-10. The fastest bombing plane in the world. This ship is faster than most of the present day pursuit ships. Its speed is well over 200 miles per hour with full military load. Note the turret of bullet-proof glass and retractable landing gear. It is powered with two Wright Cyclone engines developing 700 horse-power each and manned by a crew of four men.

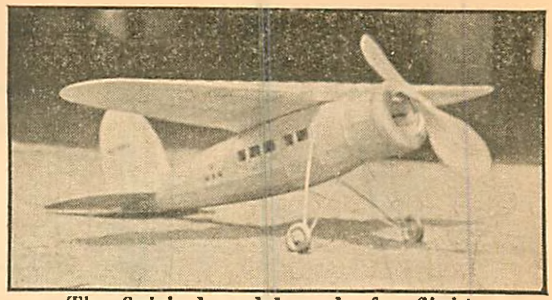


THE NIEUPORT DELAGE No. 29
This is one of the late war developments of the Nieuport Co. It possessed several unusual features, i.e., a mono-coque body and two Lamblin radiators which may be seen just below the lower wing and between the landing gear struts. It was powered with a 180 horse-power Hispano-Suiza engine.



THE CONSOLIDATED YIC-22. Army Fleetster. This plane was used by F. Trubee Davidson of the army. It is all metal and is powered with a Wright Cyclone 575 horse-power engine.

Build A Flying Scale Model of Wiley Post's Lockheed Vega

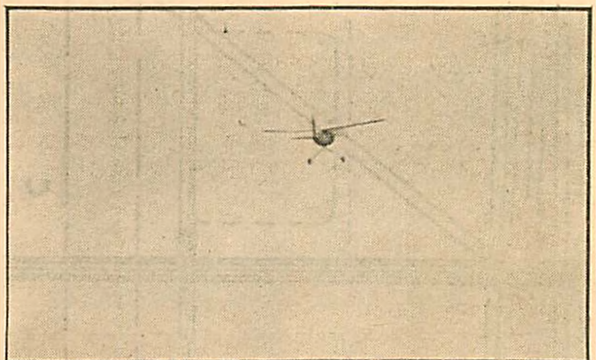


The finished model ready for flight.

By J. D. BUNCH

A Scale Model That Will Give Some of the Most Remarkable Flights You Have Ever Seen

THE very first word the name Lockheed "Vega" calls to mind is efficiency, and the flying scale model Lockheed "Vega" inherits the efficiency of the full size ship. The writer believes that the "Vega" design makes about the best flying scale that can be built at the present time, and certainly many builders will want a good model of this beautiful ship.



The Lockheed has just taken off and is gaining altitude quickly.

After assembling the drawings, start construction by building the internal fuselage. The structural balsa specified is medium grade. The propeller and nose piece if turned nose is used is of a medium light grade. Cut the longerons, struts and diagonals from 1/16" square stock and assemble over the drawing in the usual manner, using pins to form a jig. Use good model airplane cement.

When both sides are finished, install the horizontal struts from station E forward. Next install the rear struts at K. Put these in, one at a time, with the fuselage pinned over the drawing. While the cement at the rear is still slightly flexible, install the remaining struts.

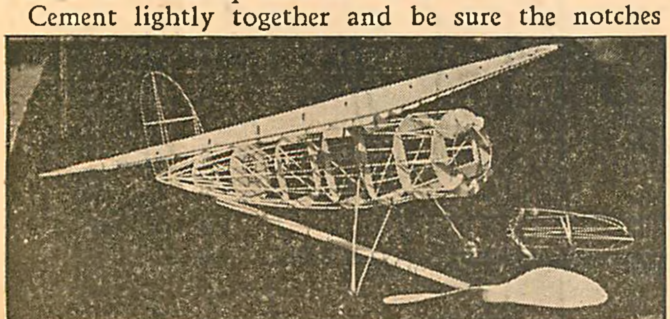
Cut all formers from 1/32" sheet balsa. .Former AB means—former for station A and that it goes on the bottom of the fuselage. AT means former is for station A and that it goes on the top of the fuselage. Formers AS are for the sides. As the formers are cemented in place, they should be matched up with the side view drawing to make certain they are right side up, otherwise the stringers will not run correctly. Also the formers must be trimmed slightly to fit where the diagonals meet the longerons. Note the formers at CT and DT are doubled. Formers at CS, CB and DB are four in thickness. Where formers fit against a strut, the inside lip must be cut off.

Cement lightly together and be sure the notches line up. Also note 1/16"x 1/32" bamboo reenforcement inside side center stringers between station C and D and on bottom center stringer between stations C and D. The bottom reenforcing bamboo, should run ⅜" to rear of station D. These reenforcements take and distribute concentrated loads from the wings and undercarriage. Install the NACA cowl formers and stringers and then to the rear side of vertical struts at A, install a 1/16"x3/16" reenforcement. To the lower A horizontal strut a 1/16"x⅛" strip, then a ⅛"x¼" strip as shown. This structure makes the front motor support bulkhead. Cement the .020 wire motor clip to the bulkhead and then a strip of 1/32" sheet against the front of the clip to finish it off securely in place.

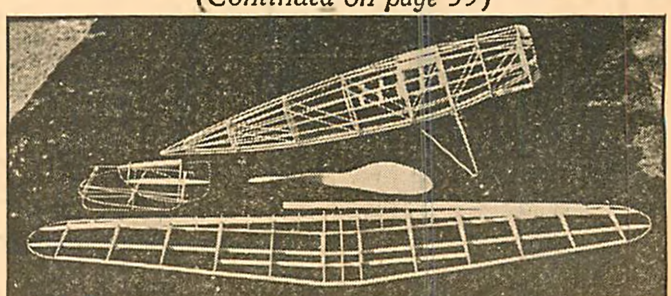
The nose of the cowl may be finished with built-up formers and covered with tissue or a light balsa nose piece can be cut for it. Turning on a lathe is simplest, but it can be easily carved. Work carefully on this fuselage as an accurate fuselage is a major requirement for a good model. A standard hook fitting is shown in the drawing. Install these with cement and thread. Do not install hooks which hold the wing until later as a small variation in the wing will call for a slight adjustment of these hooks. All hooks are made of .026 wire. The windows are cut in a sheet of 1/32" balsa and cemented in place. Panes may be made of cellophane but the windows look better if just left open. The rear motor support bulkhead is cemented in place after station F. Cut it from 1/32" sheet balsa.

THE wing is self-explanatory. The dihedral is formed by the taper in airfoil section and the main

(*Continued on page* 39)



The construction resembles a full scale plane.



The framework of the parts is finished.

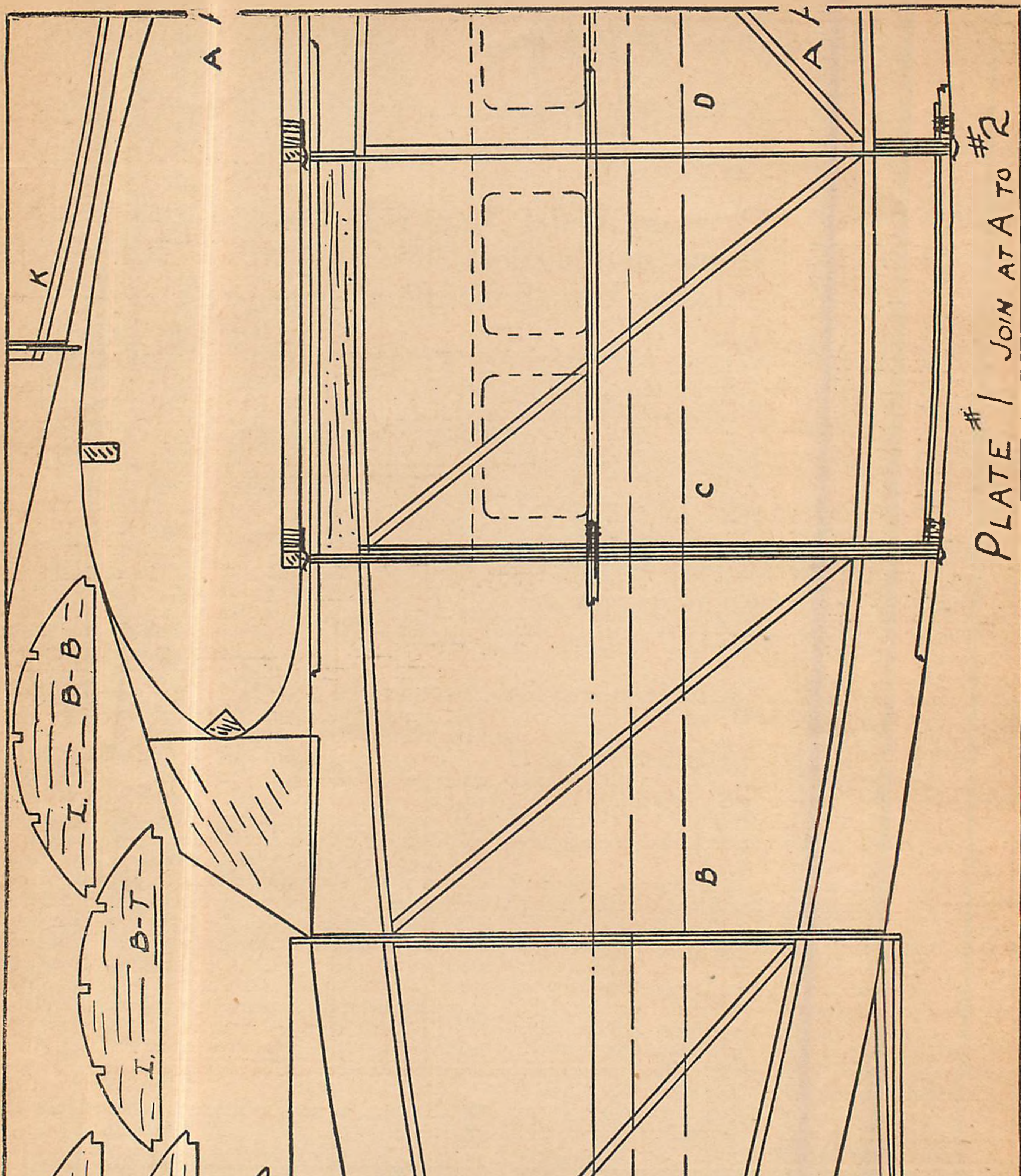


PLATE #1 | JOIN AT A TO #2
A
A
B
C
D
K
A-T
A-B
A-S
B-B
B-T
I.
II.

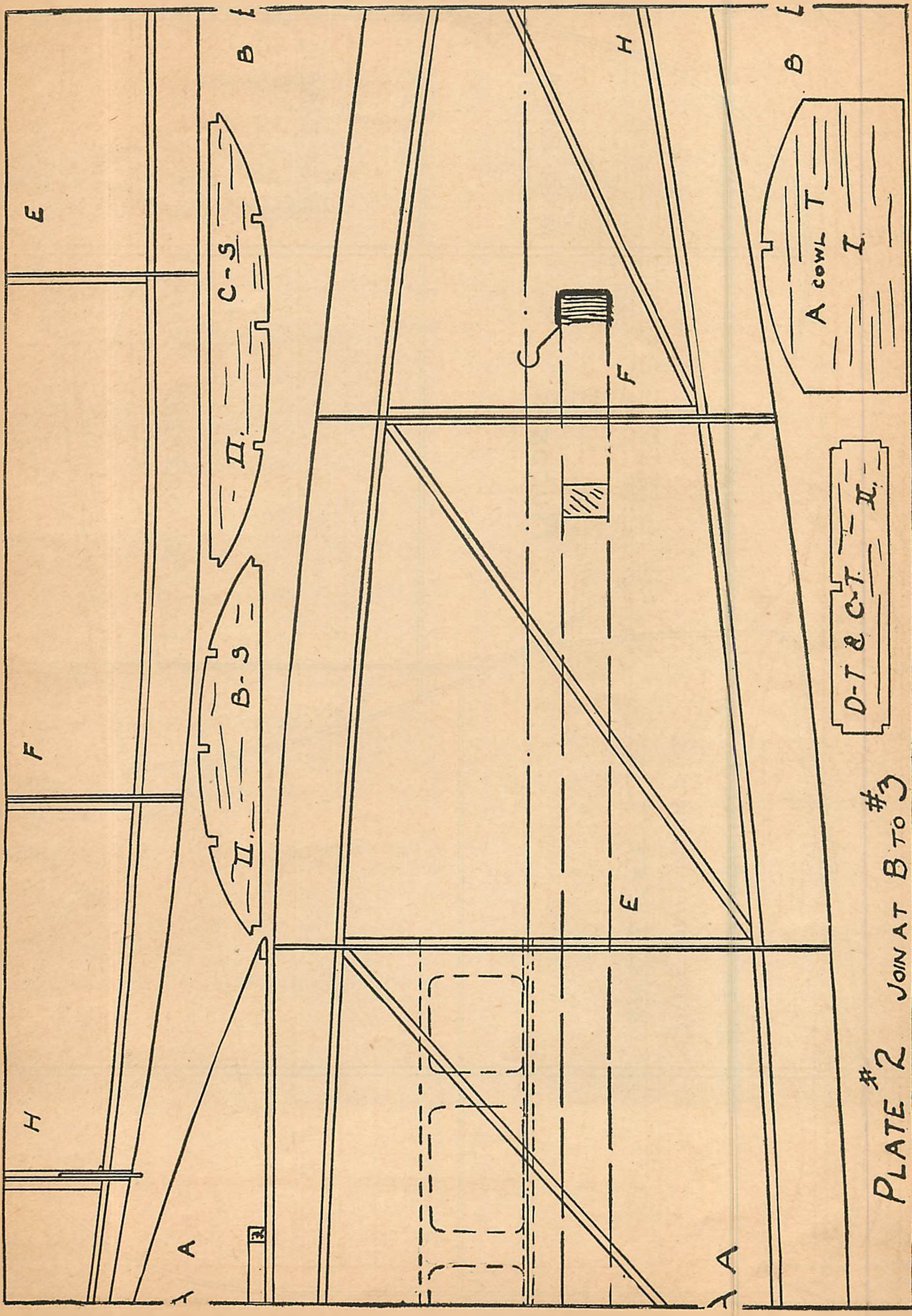
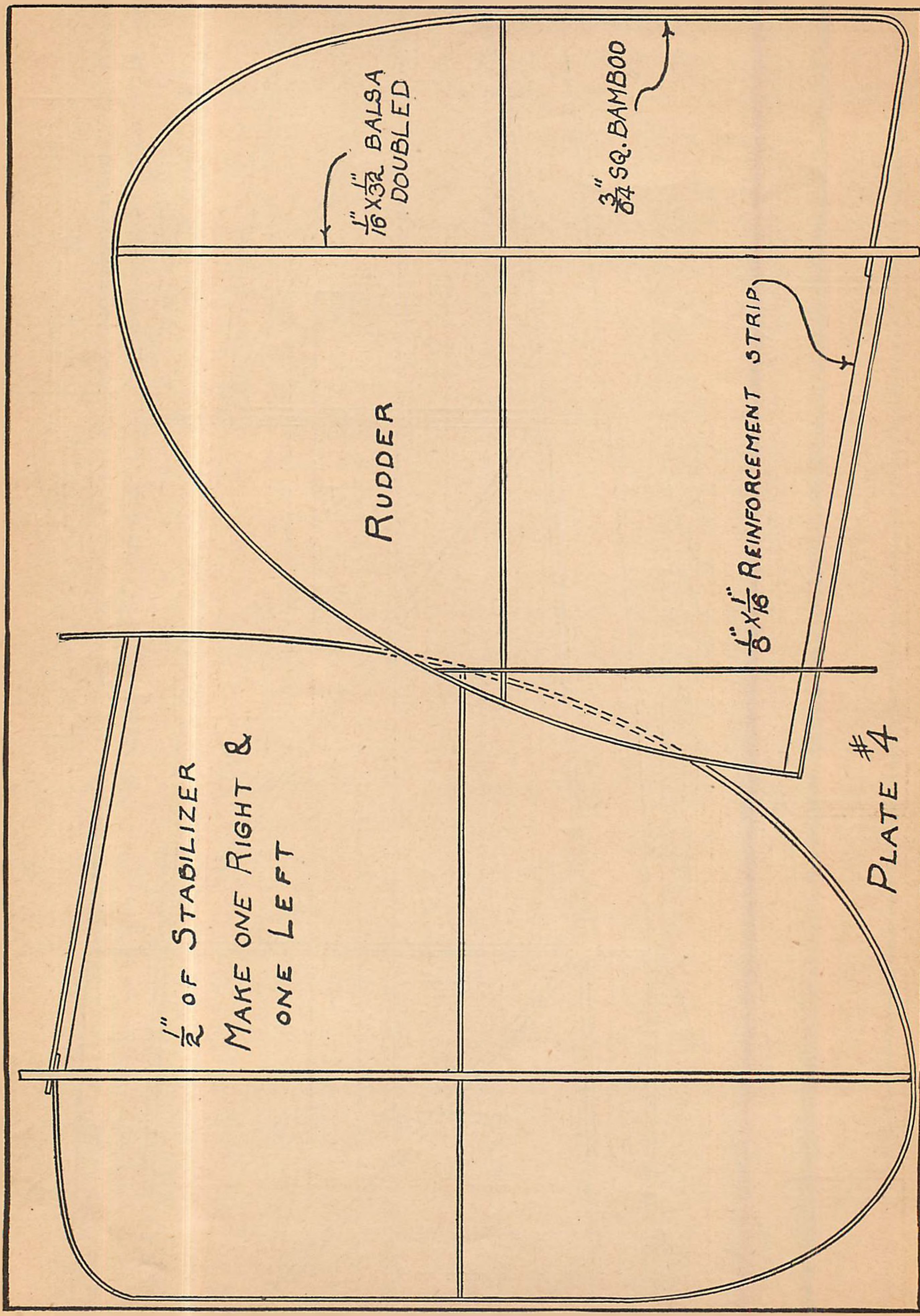
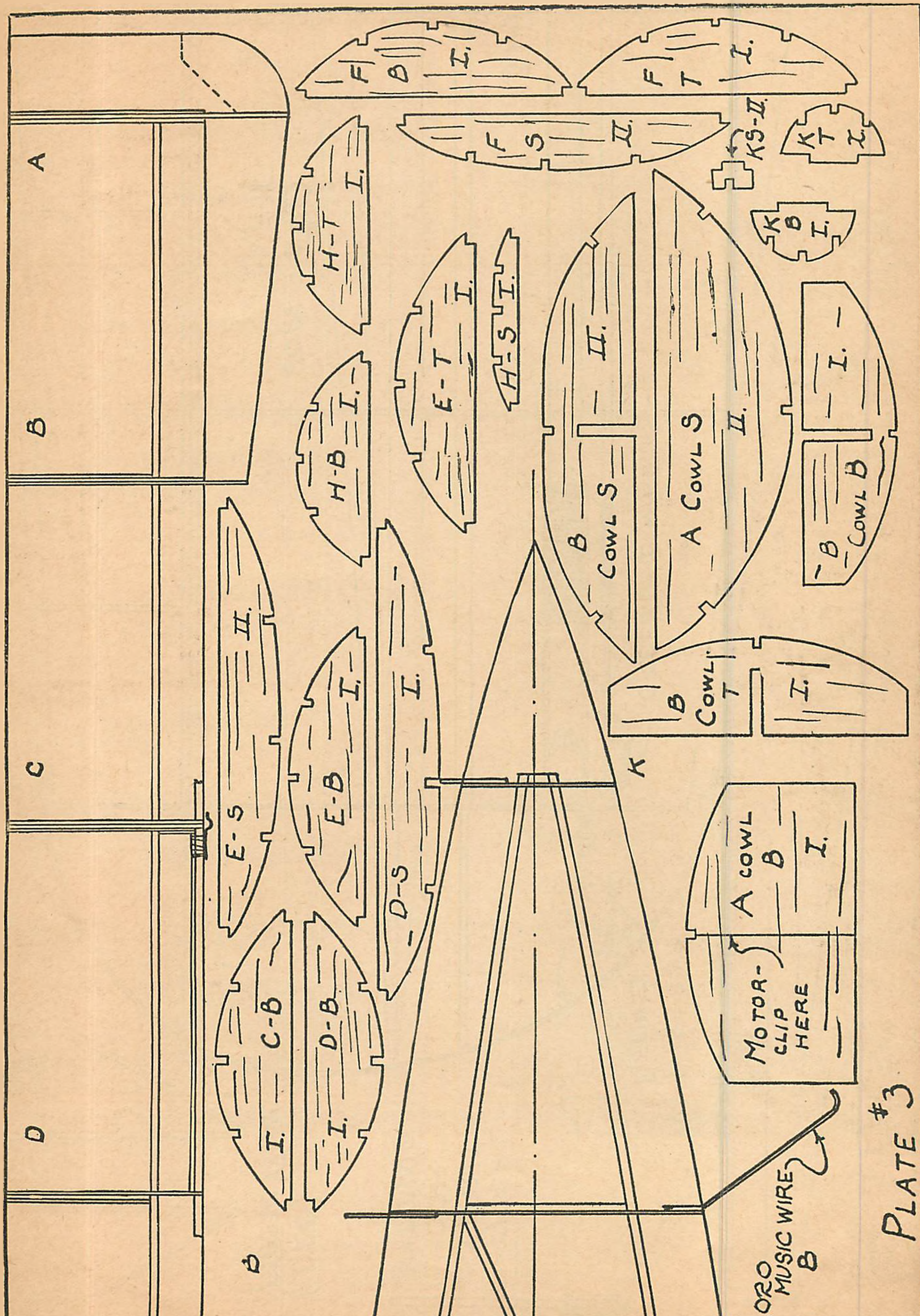


PLATE #2 JOIN AT B TO #3
A COWL I
D-T & C-T II
C-S II
B-S II
A
B
E
F
H



1/16" X 1/32" BALSA
DOUBLED
3/64" SQ. BAMBOO
RUDDER
1/8" X 1/16" REINFORCEMENT STRIP
1/2" OF STABILIZER
MAKE ONE RIGHT &
ONE LEFT
PLATE #4


A
B
C
D
H-T I.
H-B I.
E-T I.
H-S I.
E-S II.
E-B I.
D-S I.
C-B I.
D-B I.
F B I.
F T I.
F S II.
KS-II.
K T I.
K B I.
B COWL S II.
A COWL S II.
B COWL B I.
B COWL T I.
A COWL B I.
MOTOR-CLIP HERE
K
.020 MUSIC WIRE B
PLATE #3

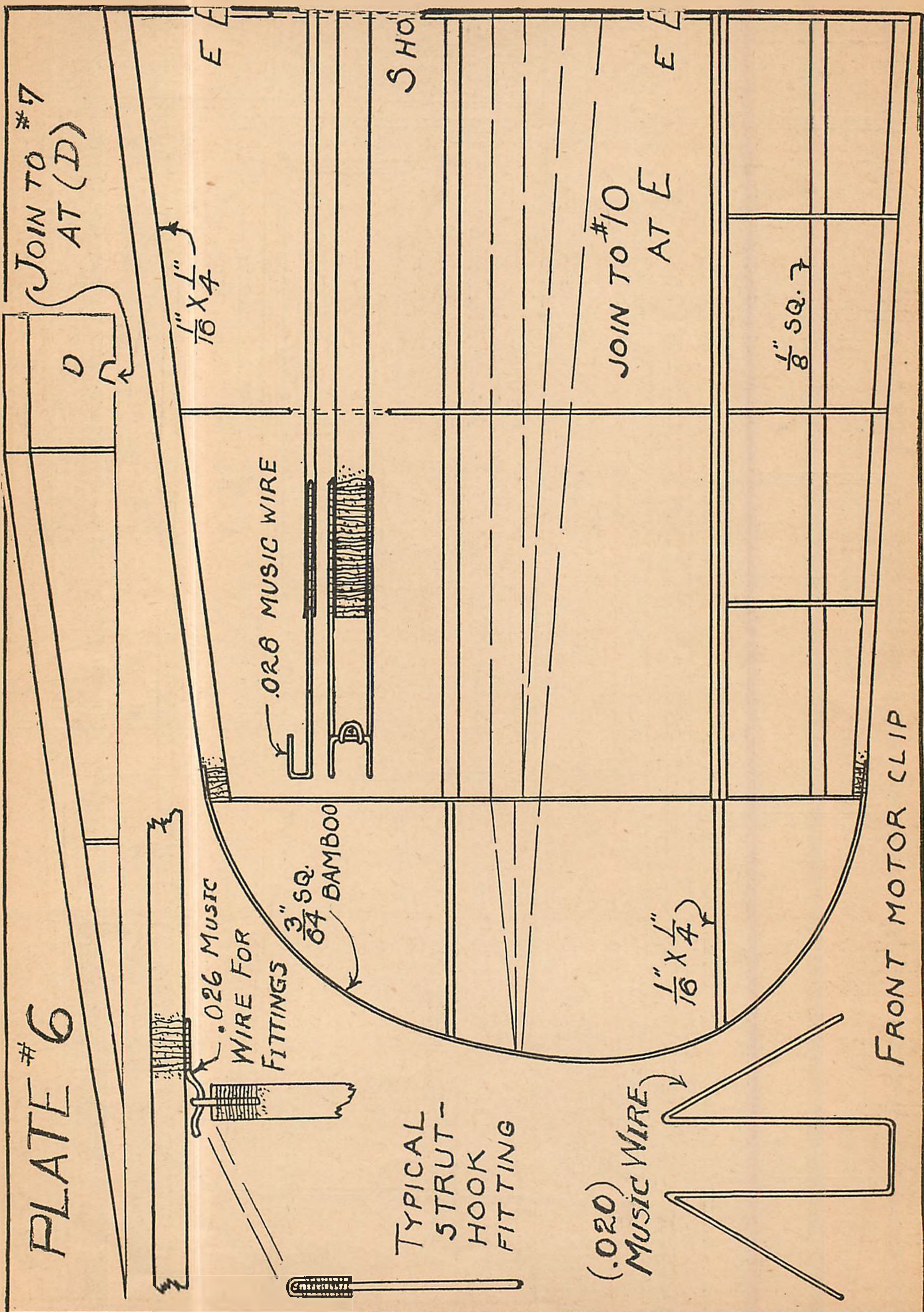
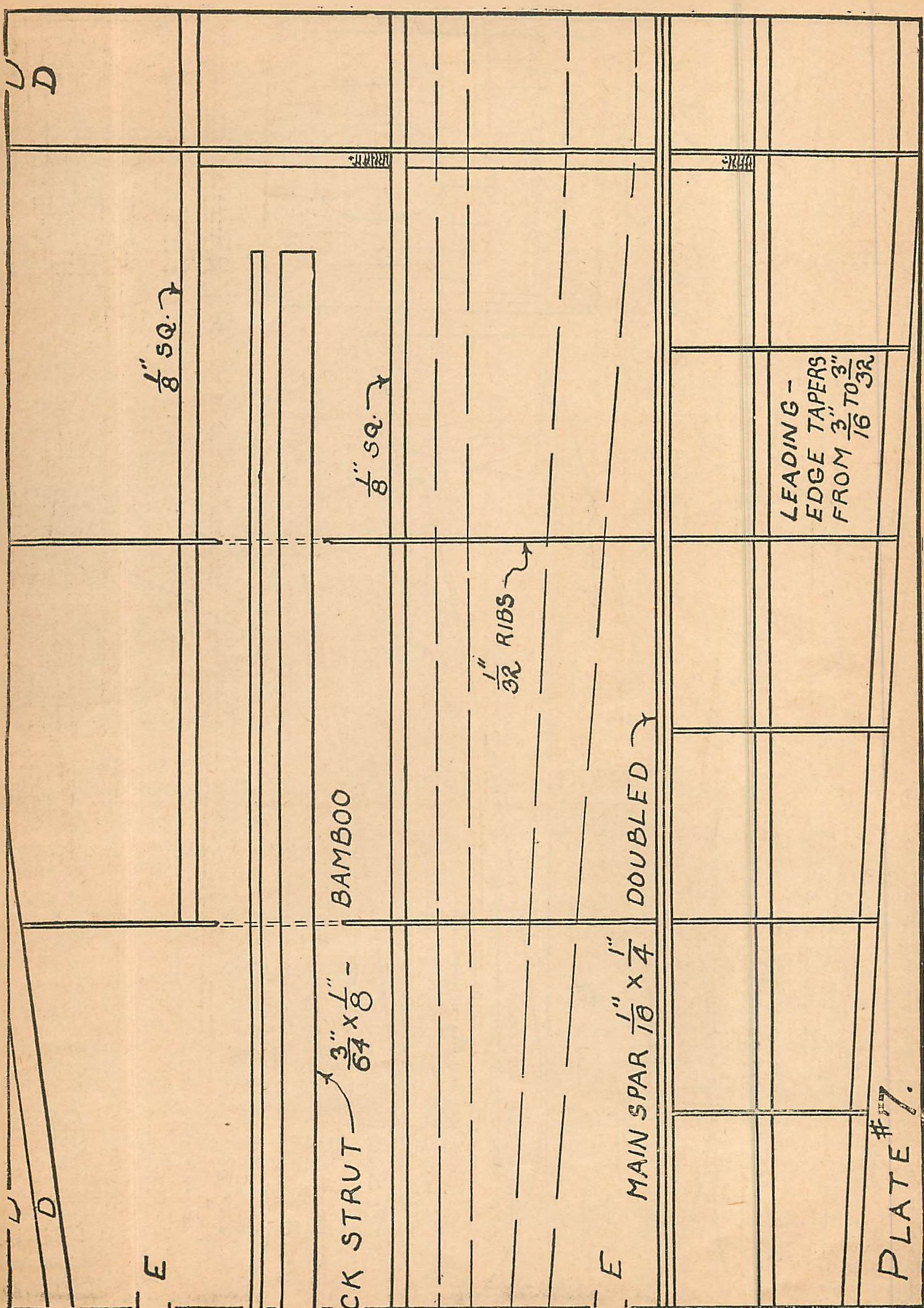


PLATE #6
JOIN TO #7 AT (D)
D
1/16" X 1/4"
E
SHO
JOIN TO #10 AT E
1/8" SQ.
.026 MUSIC WIRE
3/64" SQ. BAMBOO
.026 MUSIC WIRE FOR FITTINGS
1/16" X 1/4"
TYPICAL STRUT-HOOK FITTING
(.020) MUSIC WIRE
FRONT MOTOR CLIP


D
1/8" SQ.
1/8" SQ.
BAMBOO
CK STRUT 3/64" x 1/8" -
1/32" RIBS
DOUBLED
MAIN SPAR 1/16" x 1/4"
LEADING - EDGE TAPERS FROM 3/16" TO 3/32"
D
E
E
PLATE #7.

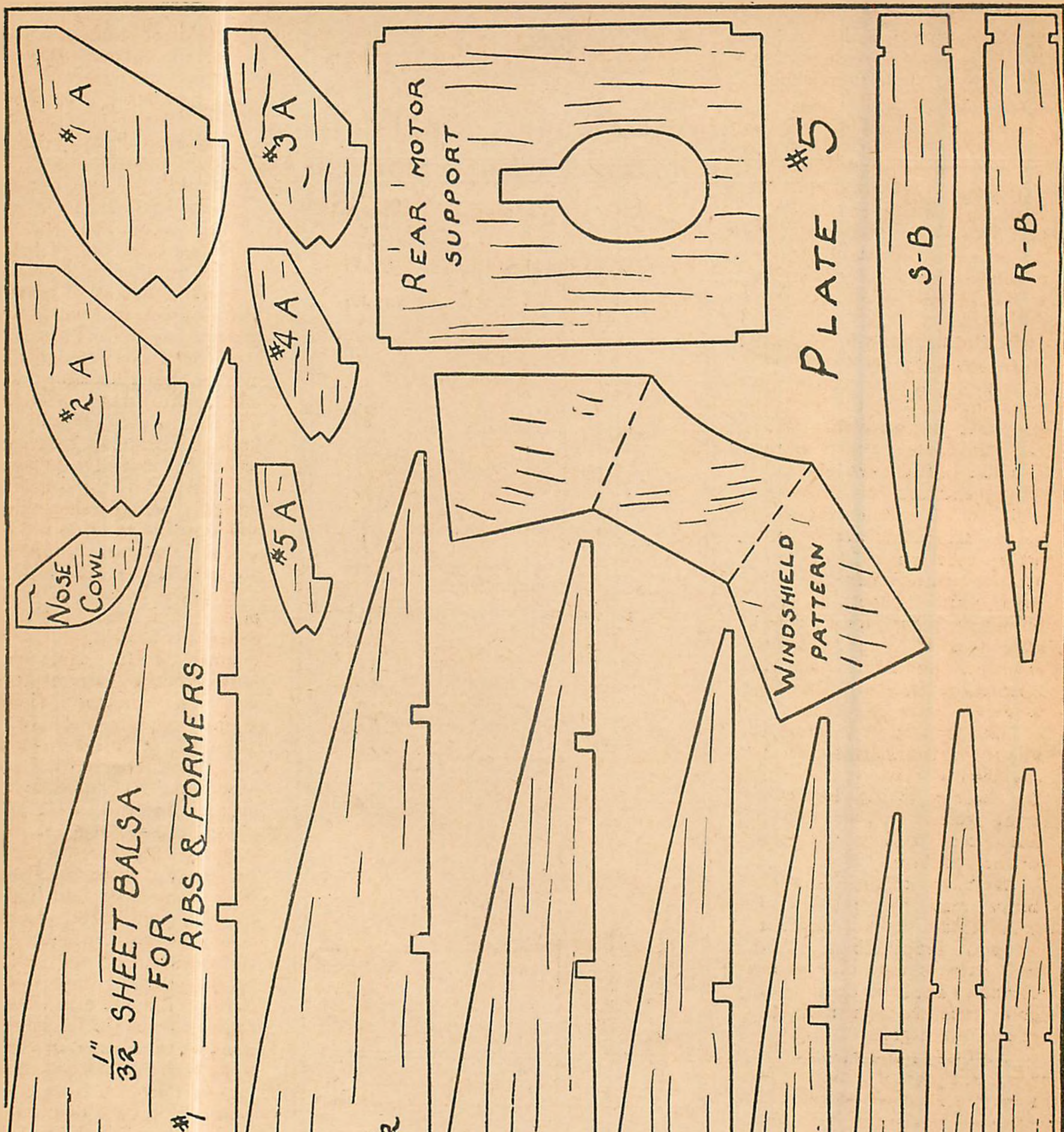


PLATE #5
1/32" SHEET BALSA FOR RIBS & FORMERS
REAR MOTOR SUPPORT
WINDSHIELD PATTERN
NOSE COWL
#1 A
#2 A
#3 A
#4 A
#5 A
#1
#2
#3
#4
#5
#6
S-B
R-B
R-R
S-R

The Aerodynamic Design of the Model Plane

Stability Theory. The Center of Gravity and the Importance of Its Position to Lateral Stability.

By **CHARLES HAMPSON GRANT**

ARTICLE No. 21 — CHAPTER No. 3

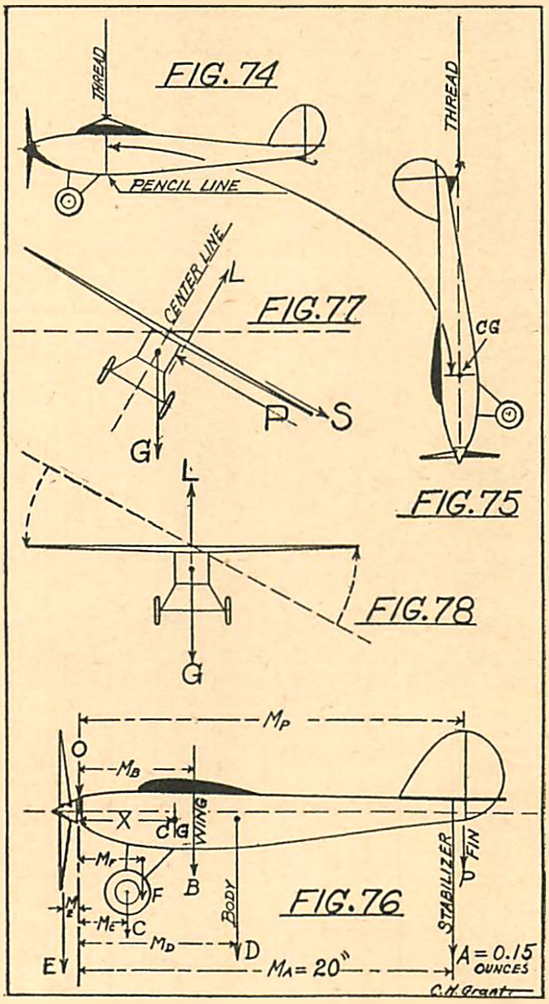
IT IS very desirable to know *what* is necessary in order to accomplish a result but it is more advisable to know *why* it is necessary. The airplane mechanic knows how an airplane is constructed and what to do in order to repair a damage, but the engineer knows in detail the underlying reasons for any particular manner of construction and design.

In the first part of chapter three, an effort was made to give you practical knowledge regarding what to do in order to create model planes (and large airplanes) which would be stable in flight without subjecting the hopeful builder to a display of uncalled for rolls, loops, tailspins, crashes and other gyrations. Such unnecessary antics tend to give the proud "parent" heart-failure or cause that absent stare peculiar to model builders when pondering over the reasons for the actions of their wayward brain children.

Now it is time to promote you from the mechanical to the engineering class and explain the theories, giving the underlying reasons that prompt the advice tendered in the first part of chapter three.

We have explained how stability may be divided into three phases, lateral, directional and longitudinal. Also, we have given the proper means to apply in order to insure these characteristics to a reasonable degree.

To *understand* the underlying principles of stability and how it is attained, involves the study of mechanics. One must have a clear conception of the forces acting upon an airplane and how they change with any deviation of the plane from its normal flight position. For instance, some of the forces acting upon your plane when in flight are, the lift on the wings, the weight of the plane or gravity, the thrust or pull of the propeller, the resistance of the air which tends to push back or hold the ship from moving forward, and the pressure upwards or downwards upon the stabilizer.



Part	Weight of Part	Distance of Part from (0)	Moment of Part Inch Oz.
A	0.2	20	4.0
B	0.6	5	3.0
C	0.25	M_C	$M_C \times 0.25$
D	0.75	M_D	$M_D \times 0.75$
E	0.35	M_E	$M_E \times 0.35$
F	0.25	M_F	$M_F \times 0.25$
P	0.1	M_P	$M_P \times 0.1$
Total	2.5	———	(Sum of) (Moments)
C of G	2.5	X	———

$$X = \frac{\text{Sum of Moments}}{\text{Total Weight}}$$

All of these forces must be in balance when the plane is in normal flight. If they were in balance also after the plane had been displaced from a normal flight position, there would be no corrective tendency. In fact, when this occurs we wish the forces to be out of balance and to be of such a character and magnitude as to cause the plane to seek its regular flying position again. This is the problem of every designer. He must so create his ship that no matter into what position it may be thrown, it will right itself. This may be accomplished by carefully analyzing the action of the forces involved when the ship assumes any possible position.

For instance, suppose a plane keels over on its side at a 45 degree angle. What happens? The pull of the propeller is still acting in the same manner at the same point. However, the center of gravity acts in another direction *relative to the plane.* In normal flight it pulled down parallel with the vertical axis; now it pulls at an angle of 45 degrees to this axis. This change causes the plane to slip sideways, therefore the air does not strike it from the front as in the normal straight flight of the plane, but slightly from the side. This last condition causes the position of the pressures on the wing, tail and body to change. The lift usually moves slightly from the center of the wing span to a point on the wing which has drooped, tending to raise the lowest wing, which action is a desirable one. Also, a pressure on the side of the fuselage, vertical tail surfaces and other parts of the structure develops due to air striking the plane from the side. The problem is to arrange the surfaces and weights of our plane so that these forces will act relative to one another, to right it.

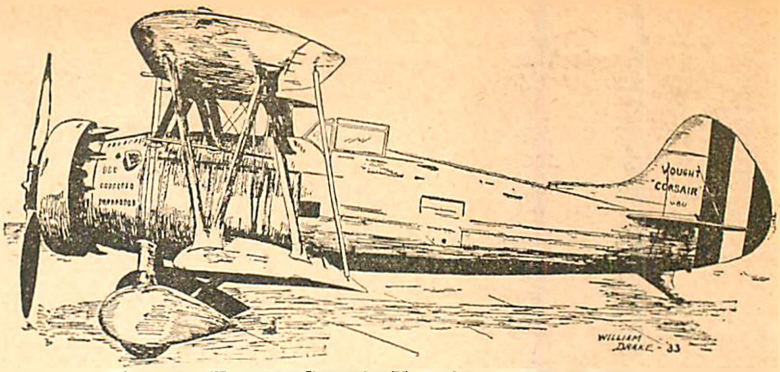
IT HAS been stated that lateral stability may be secured by proper use of the low center of gravity, sweptback

(*Continued on page* 46)

AIR WAYS

Here and There

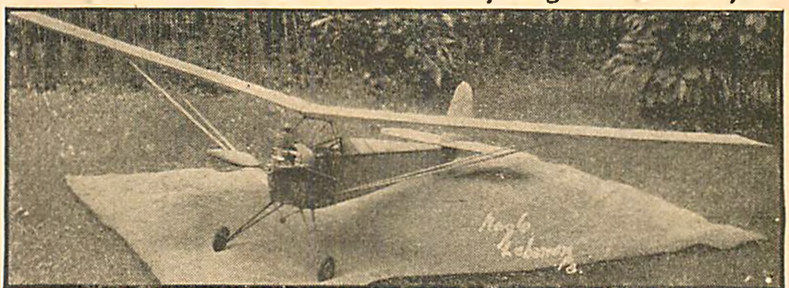
What Readers Are Doing to Increase Their Knowledge of Aviation. "Air Your Ways" Also



The new Vought Corsair V-80 by William Drake.

ANOTHER budding young artist has come to the fore. Mr. William C. Drake of 123 Clifton Street, Malden, Mass., has supplied us with the very fine drawing of the Vought Corsair which decorates the head of this page.

There have been a great many of our readers who have submitted drawings and I hope that they will not feel that they are not appreciated if their drawings do not appear in print. We have very little space in which to get all of our copy for Air Ways. Therefore, we are unable to select more than one drawing a month for publication.



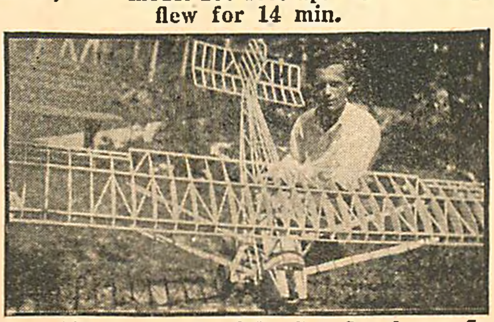
Pict. No. 1. The latest creation of Harry E. Moyer, an eight foot "gas" model.

Pict. No. 2. A new successful gas model by Kovel, Brown and Grant.

Most of our model builders are of such natures that they are continually looking for something new and interesting. Possibly this explains the great interest which has been shown lately in gas engine model planes. From all reports it is getting to be quite the rage. The only thing which is holding it back is the high price of the engine. It stops many of our enthusiasts before they have even started. However, as more builders of gas planes enter the field and the demand for engines increases, there will be unquestionably a great reduction in price. At present the average gas engine for a model costs $25.00.

Possibly many of our readers know that this craze was given its impetus by two young men of Philadelphia, William Brown and Maxwell Bassett. Bill Brown has been working on a gasoline engine for five years and it was he who designed and built one of the most reliable engines, the one which flew Bassett's model plane in the 1933 Nationals. As you know, this model ran away with most of the first places.

Pict. No. 3. The above gas model 200 feet up. It flew for 14 min.

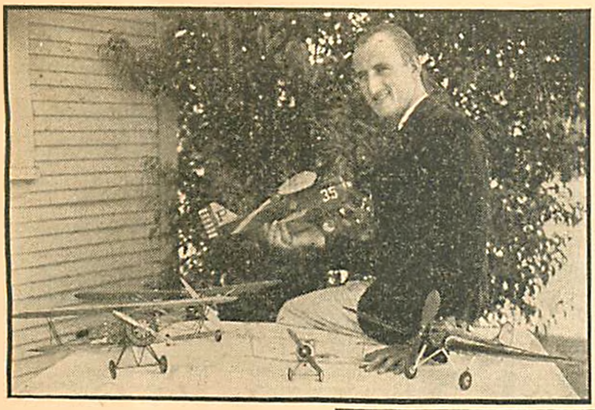


Pict. No. 4. A gas job by Geo. Lambrose, Jr.

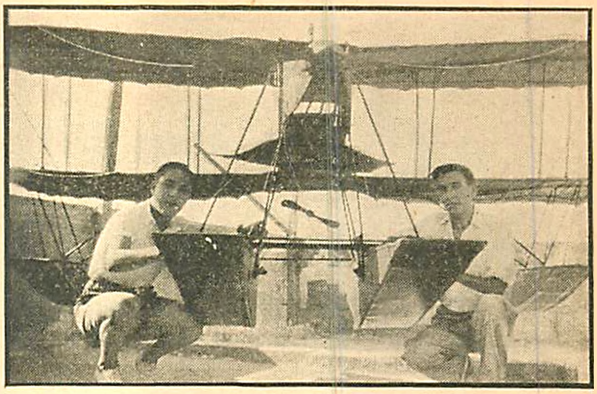
Bassett's success has stimulated other builders to try their hand in this field. One of these young men is Henry E. Moyer of 612 Walnut Street, Lebanon, Pa. Picture No. 1 shows a gas model with an eight foot wing span which he has recently completed. He is to be commended that he has not copied Bassett's design but has worked along original lines. By such methods he will unquestionably master the fundamental principles of gas model operation more quickly than if he built a model similar to the Brown-Bassett model. Probably it will require a greater amount of experimenting.

THIS gas model bug has seemed to have bitten your editor also. Last May when it was learned that Bassett was going to fly his model at the National Competition, he felt that it was a shame not to have some other model of similar design which would give Bassett a run for his money. With this idea in mind, he proceeded to design a ship, staying up till the wee hours of the morning. The design was finally completed to satisfaction. Whereupon his good friend, Joe Kovel of 1932 Championship fame, offered to construct the model. Poor Joe worked night and day to have it finished in time for the Nationals. In fact, he lost 11 pounds in the process, due to lack of sleep.

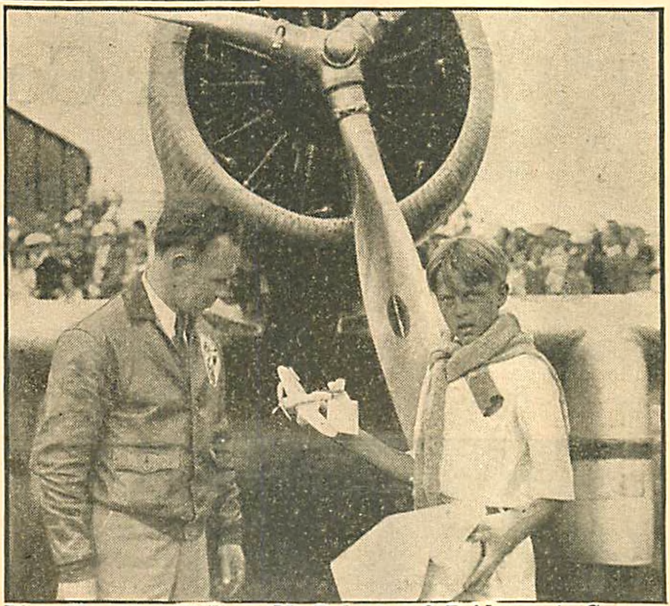
At five o'clock in the morning of the day of the competition, the model was completed but sad to relate, the engine which had been selected for the ship had never turned over a revolution. It was hoped that it would function easily and efficiently upon its arrival at the field. However, other than one or two slight coughs, the motor never showed any signs of life and Joe after his month's work,



Pict. No. 7. Joe Nieto, war picture expert and some of his pets



Pict. No. 11. Joe Axisa and his brother with their kite glider "Mayfly".



Pict. No. 10. William M. Roberts of Bridgeport, Conn., presents Capt. Frank Hawks with an all-balsa flying "Sky Chief".

was confronted with disappointment.

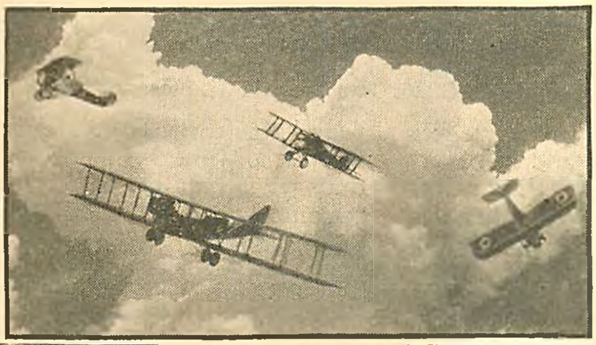
Being a true aeronaut, he did not let this stop him. The model was shipped to a secluded place in Vermont for further testing and the extermination of many of the bugs which developed. Another month of intensive work resulted in the installation of one of Bill Brown's engines. Finally, the machine was declared to be in A - 1 shape for flight and was taken to a suitable place for testing. Three flights were made before the proper adjustment was established.

On the fourth flight, the ship got away to a good start. It climbed evenly and steadily, making one circle after another and attained a heighth of approximately 600 feet. Those who have flown their first ship of any special design will realize the excitement that prevailed among the three contributors, Bill Brown, Joe Kovel and your editor. The fact that the model was fast disappearing from sight over a distant ridge stimulated its proud parents into action and a wild ride in a rickety Ford ensued. The model was trailed for two miles over back roads and from a cleared space it was seen to land one-third of a mile further on in the middle of a dense maple wood, after a flight of 14 minutes. The ship flew under power 10 minutes and glided for 4 minutes. It was found after a ten minute search and believe it or not, it was resting upon its wheels and tail skid in the middle of a forest, without a scratch on it. (All skeptics may see me at my office or write for further detail. Editor.)

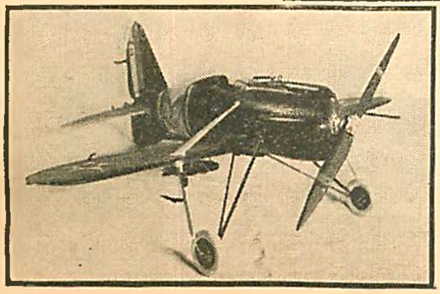
Picture No. 2 shows the model as it appeared after the flight. Picture No. 3, though not very distinct, gives a faint idea of how the ship looked silhouetted against the sky at 200 feet altitude. (Actual flight picture.)

Another young New York model builder is showing progress with his gas model. He is Leo Weiss. He has made several flights at Van Cortlandt Park which have been quite successful. As yet he has not favored us with a (*Continued on p.* 37)

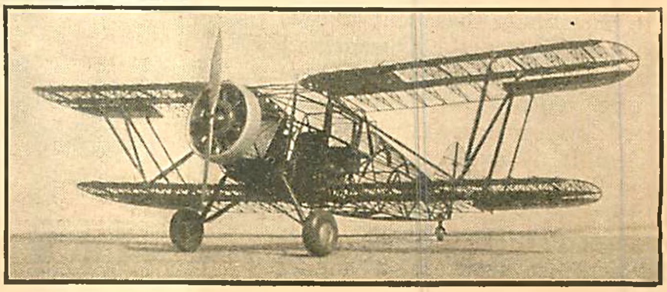
Pict. No. 9. Here is a neat little Monocoupe by Glen Courtwright. It is a fine flier.



Pict. No. 6. A model dog fight staged by E. C. Patterson Jr., with the help of a little trick photography. A Camel, S.E.5 and a Dolphin attack a Friedrichshafen Bomber.



Pict. No. 8. A unique low-wing racer by Harold S. Dion.

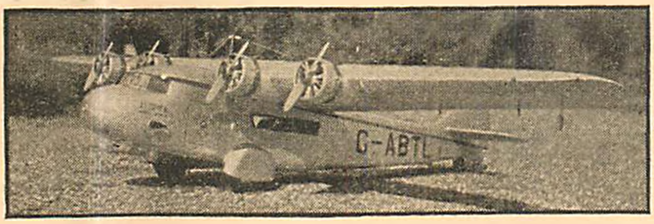


Pict. No. 5. A detail scale model Waco cabin plane by Frank Distler. There even are handles on the doors.

Picture No. 1. Geaf McCallum's "Pike" makes a pretty "take off" at a recent meet in Queensland, Australia.

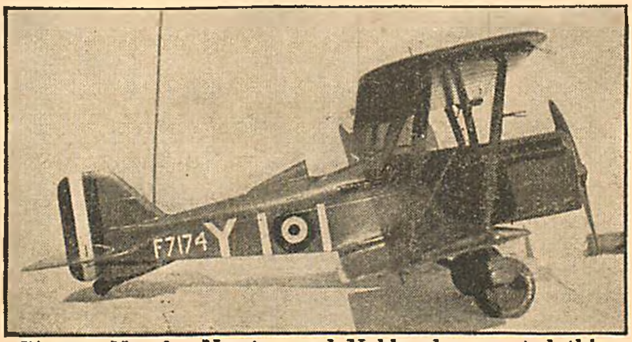
Picture No. 2. Boys of Brisbane turn out for a contest. The cross is above J. D. Berry, president of the club.

Model News From Other Countries



Picture No. 5. A 48 in. Armstrong Whitworth Atalanta built by Newton and Noble, both expert builders of Brisbane.

OUR Australian friends are progressing with leaps and bounds in model airplane activities, if we are to judge by the amount and variety of material sent to us by our good friend, Mr. Ivor Freshman, general secretary of the Model Flying Club of Australia. He has flooded us with so much material and such a quantity of pictures that we have found it necessary to increase the space allotted to the activities of this club. However, we feel this is well worth while for the pictures and information he has sent is extremely interesting. Personally we feel that the young men of America will note a decided advance in the last year in model design and construction on the part of the Australians.



Picture No. 6. Newton and Noble also created this beautifully made S.E.5. Its span is 48 inches.

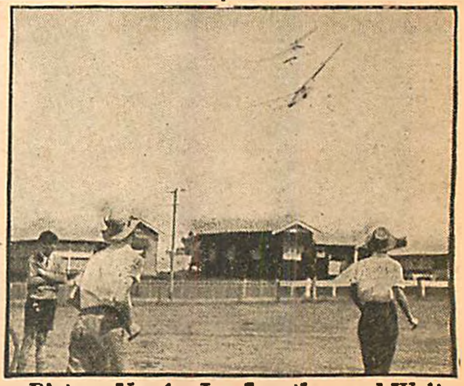
A group of the pictures which Mr. Freshman has sent shows the activities of the Queensland branch of the club. These young fellows have not been heard from in some time. Nevertheless it is evident that they have been busy.

Picture No. 1 shows great activity on the part of the model builders as well as a model plane which is taking off. This ship is Geaf McCallum's "Pike". This picture was taken at a recent contest in Queensland, Australia.

J. D. Berry, president of the City Model Airplane Club of Brisbane, sends us picture No. 2, showing a group at a recent meet. Berry is holding a model called a "Kinglet." He is the figure over which there is an X.

Here is another picture of boys who are active in Queensland. No. 3 shows W. Saunders and G. Lambert. Saunders calls his red fuselage ship a "Sky Rover" and Lambert has named his the "Adastra." It is interesting to note that the Australians make a practice of naming their various models. This indeed is quite appropriate as a model in many respects is a thing of life and has a personality. Like people, some are cranky and others are always adapting themselves to situations. Our mode builders, I am sure, have found this to be true. Some models perform beautifully at all times while others simply refuse to do their duty when required to. Naturally a model reflects the personality and

Picture No. 3. W. Saunders and G. Lambert of Queensland, exhibit two fine flying models.

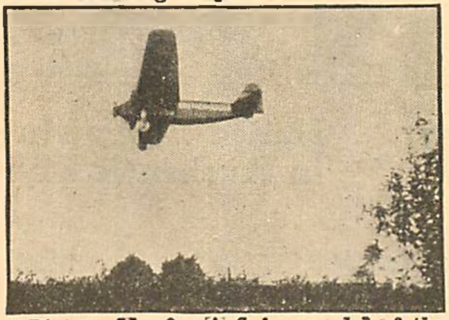


Picture No. 4. Jay Lowther and Weitzig stage a game of tag with their models.

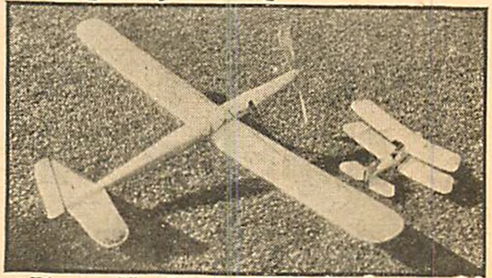
Picture No. 12. Model builders of Moscow, Russia, have an eye for the future. Model building is part of their education.

Picture No. 13. Russian boys at Koctebel show originality of design.

ability of its builder. Picture No. 4 shows Lowther's "Tabata" and Weitzig's 2FC in flight. It rather looks as if a game of "tag" were in the process of developing.



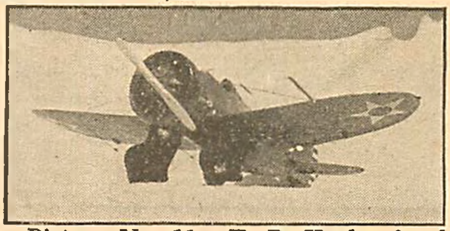
Picture No. 9. A flying model of the "Southern Cross" built by S. Stringfellow of Auckland, N. Z.



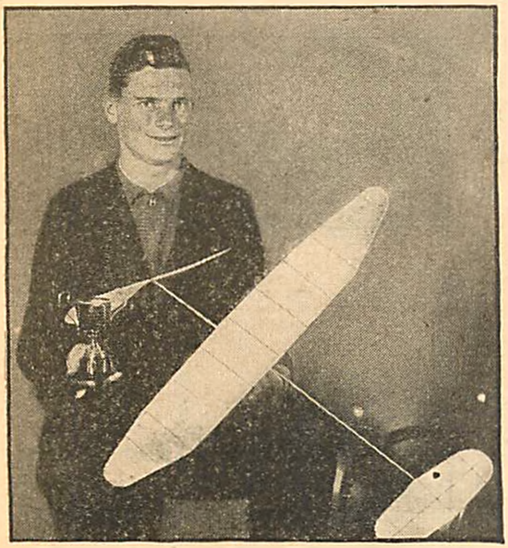
Picture No. 8. A 48 inch fuselage model of unusual design, built by J. Kinsela of Kogarak.

IN pictures No. 5 and 6 are shown two models built by Newton and Noble. These two young men work together to supply scale models for all purposes. They have worked up a nice little business along this line. They belong to the Kingston branch of the M.F.C.A. These two models are the Armstrong Whitworth Atalanta with four Armstrong Siddeley Double Mongoose radial engines and an S.E.5. Both the machines have a span of 38 inches. They were sold to the Technological Museum.

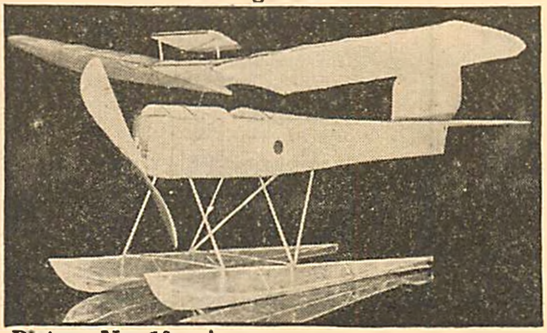
On Sunday, the 23rd of July, five picked members of the M.F.C.A. made an attempt to break the Australian indoor record with the result that the previous time established by J. Lowther of Brisbane, was eclipsed. Lowther had put up a flight of 5 min. 32-2/5 sec. and on Sunday, Jack Finneran, 19 years old, flew his machine for 7 min. 17-2/5 sec. This is a new Australian record. Finneran was presented with a silver cup suitably inscribed. Mr. C. J. A. Moses, who presented the cup, promised that a similar cup would be awarded each six months for an attack on the present (*Continued on page* 45)



Picture No. 11. E. P. Heybrock of Fort Hope, Canada, built this detail scale Boeing P-26.



Picture No. 7. Jack Finneran and his indoor model which established an Australian record of 7 min. 17-2/5 sec.



Picture No. 10. A fine flying seaplane built by the Balmain Rozelle experimental squadron.

New N. A. A. Model Plane Records

SEVERAL noteworthy records were established during the New York-New Jersey indoor Model Airplane Meet, held Saturday, Sept. 9, 1933, in the 258th Field Artillery Regiment Armory, New York City.

This meet was held under N.A.A. sanction, so it is expected that the new records will be officially recognized.

The winners:

Baby R.O.G. (Stick models, R.O.G. Class A): Carl Goldberg, 20, Purchase, N. Y., 9 min. 34-4/5 sec.

Glider, Hand-launched, Class A: John Zaic, 19, New York City, 19 seconds.

Glider, Hand-launched, Class B: John Young, 18, New York City, 29-4/5 seconds.

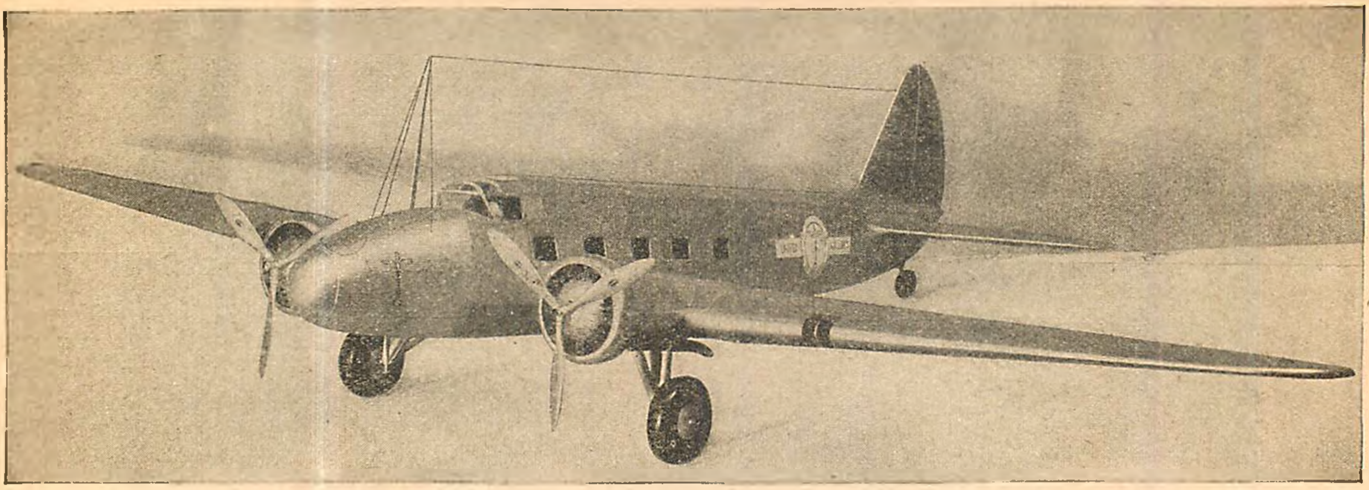
Glider, Hand-launched, Class C: Stanley Congdon, 15, Glen Ridge, New Jersey, 17 seconds.

Fuselage Model, Class D: Allan Penn, 17, New York City, 10 min. 05 sec.

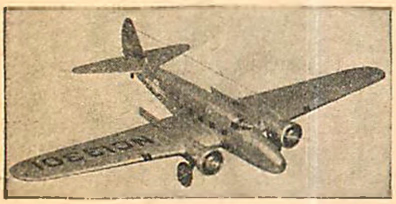
Stick Model, Class D: Carl Goldberg, Purchase, N. Y., 16 min. 51 sec.

Al the above, except the last, are new records.

This will be a Model Airplane building winter—get a h



C-D BOEING 247 - Hailed Everywhere as a Masterpiece in Authentic Flying Model Aircraft



Everywhere you hear modelbuilders talking about this sensationally realistic ¾" scale model with its big 55⅝ inch span, 38⅝" length and 16 oz. weight. It's a startling all silver beauty—and like all C-D models, puts on a real show when flying. It's capable of exceptionally good flights, for flights of over 250 feet were quite easily obtained with the same model pictured here. We were about as surprised after testing this ship as we were after the Laird Super-Solution was designed. Honestly, we did not think much about its flying ability, although we did know it would make some flights, but after testing it, it flew beyond all expectation. In many cases it reached an altitude of 40 feet, looking just like the big ship itself, only for the fact that the wheels do not retract (which is impossible because of the rubber motors being so low in the wing).

Powered with rubber strands, and made in the orthodox C-D manner (except for the larger structural members such as wing beams which are of the girder type) and generally of balsa, paper, music wire, and furnished with a large quantity of standard Cleveland dopes and cements. Motor sticks are removable, so when displayed, it looks like an exhibition model, just the thing for the Popular Aviation Contest.

The Kit comes complete for a flying or exhibition model with all materials necessary, including partly finished nose block, ready furnished cowls, completed "bronze bushed" wheels, stout axle material to withstand the severe landing shocks, all the dopes necessary and extra heavy covering paper.

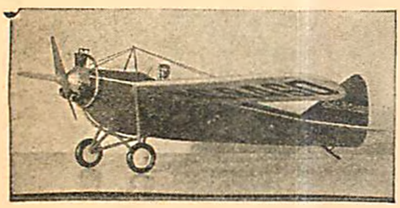
Complete Kit SF-35, as described above and including two sides of full size, completely detailed, copyrighted drawings (4 panels 17" x 44"), containing every bit of information necessary for building the model, shipped anywhere in the U. S. by express in a strong wooden box 4 x 7¼ x 40", (contains a large quantity of special materials, dope, cements, etc.), shipping charges "collect" (wt. 9 lbs.)—for only **$6.50**

(Drawings alone not sold. To foreign customers, SF-35 Kits 25% extra, but inquire of steamship companies rates of delivery to your city—we are not responsible for expenses of mis-shipping and must act accordingly.)

Two New Hits!
(with printed out wood)

LINCOLN SPORTPLANE

Just what light plane enthusiasts have been wishing for. ¾" scale, and flies beautifully. Span 15", length 12⅛", weight 1 oz. Colored cream and black tail, details and trimming. Complete Kit SF-36 (with everything including printed out wood parts except pilot, but you can easily carve one out of balsa) at dealers, or postfree **$1.50**



BUHL BULL-PUP

The picture doesn't do this keen little model justice. She's keen in looks—keen in flights. ¾" scale. Span 22½", length 15", weight 1.9 oz. Colored standard yellow wings and tail, balance blue, details black. Kit SF-38 (with everything needed, including printed out wood parts—but without pilot) at dealers, or postfree, only **$1.75**

Our 7-Point Guarantee

1. Everything guaranteed to be as represented or your money refunded. (Return nothing, however, until receiving our written permission first.) For the return of Kits either because of customer's dissatisfaction or error, a 50c charge is made; west of the Mississippi and Canada and all foreign countries, 75c. This refund is made only if Kits are returned in first-class condition. Any damaged or broken parts will be charged to the customer.
2. Anything misrepresented, our own errors or defective materials corrected without charge—but advise us before returning, please.
3. Credit cards sent for overpayment on orders. Foreign customers might send additional amounts to avoid delay because of varying daily exchange rates.
4. Kits and materials are sold at a price far below their high value. They are shipped postfree everywhere, except Kit SF-35.
5. Honest, rapid and intelligent service given all orders.
6. Complete wheels, nose turnings, etc., contained in many kits. Some contain only simple parts for the builders to cut out and make himself by hand—but no machine work is required.
7. Kits are entirely complete, even to thread for brace wires and black for details, motors, tires, etc.

BUT PLEASE REMEMBER, THESE ARE KITS OF MATERIAL, NOT KNOCK-DOWN KITS OR COMPLETE PLANES, FOR WE SELL NO FINISHED MODELS.

F

1. Model Jap motore assemb
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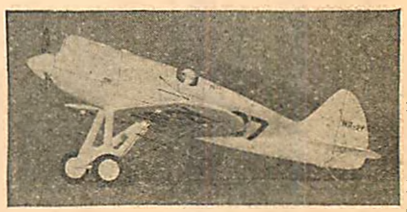
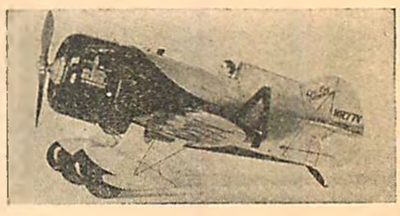
(with Printed Out Wood)



Re-Designe HOWAR RACER

All Howard enthu will want this finer, classier r signed model. In all model lovers get a thrill bui this printed-out Beginners will fi simple to build—e will thrill at its tail, and realism. ¾" scale. Colored all white, black details. 15", length 13¼", weight 1.5 oz. Complete Kit SF-18B (everything including printed out balsa, except pilot) at dealers, or postfree **$1.5**



Re-Designe BAYLE'S GEE-BE

There's absolutely comparison betwee and our original B Gee-Bee. Everyt beginning to rave it. Be sure to —as you'll prize it highly for your li of Thompson T winners. ¾" Colored yellow and black. Span 17½", length 12", weight 2 oz. Complete Kit SF-17B (with everything including printed out balsa, but without pilot, at dealers, or postfree... **$1.**

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Please co-operate with us by asking your dealer for these Kits before ordering them direct. If he hasnt them, he'll be glad to get them or any other Cleveland-Designed models for you. But do not accept a substitute, for "the just as good" item is never just as good as Cleveland's. Ask him to do this for you and your friends who want to purchase authentic models right there in your town.

(If ordering direct, please remember Special Delivery is 15c extra per order. Also send 5c extra for insurance, as we are not responsible for orders lost in the mail. Send no stamps or loose change—use money orders or checks. C.O.D. orders accepted.)

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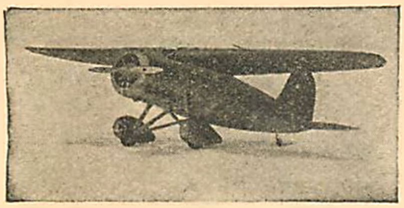
ALERS: C-D models the country in popu- not get your profit on in your town. Write your letterhead) for

The Five Kits immediately below all come equipped with printed out wood and new Enamel dopes. You'll enjoy more than ever building these realistic-appearing, and beautiful flying authentic miniatures of big planes.

FOKKER D-8

The big airplane, of which this is an authentic ¾" scale model, was designed just about the close of the war. No more than three of them saw actual fighting service—but if the war had continued, they would have made it "plenty hot" for the Allies, because of their high efficiency. Its span is 20¾", its length is 14½", weighs 2.5 oz. It is colored blue fuselage, wheels and struts, cream wings, tail surfaces, nose and axle wing, details black. Kit includes authentic drawing, complete parts for making the entire machine, including material for making up rotary motor which actually revolves with the propeller, completely printed out wood, cements, dopes, complete straight type German cross insignia and red and white identification stripes around the rear of the fuselage. Complete Kit SF-31, only $2.00



1932 LOCKHEED VEGA

First time this authentic Cleveland-Designed model was put on display, our engineers were told it was one of the most beautiful scale models ever designed. For flights this Cee-Dee is a wonder. Span is 30¾"; length 21"; weight 3.7 oz. Colored brilliant red wings; tail surfaces and wheel shoes; everything else cream except black details. Kit contains new enamel dopes and printed and numbered balsa same as A-8 Attack Kit. Complete Kit SF-24 $3.25

1932 Boeing P-26

Formerly XP926. Span 21¼"; length 17⅞"; weight 2.5 oz. Yellow and olive drab. Kit SF-23 $2.00

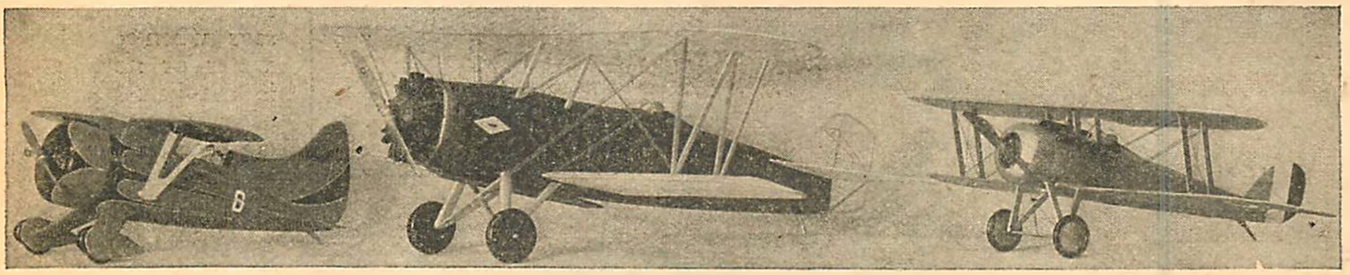
1932 Curtiss F9C-2

Known as Akron Fighter. Span 19⅛"; length 15⅛"; weight 2.2 oz. Silver and blue. Kit SF-22 $2.00

1931 CURTISS A-8 ATTACK

All the flying zip, extreme maneuverability, and death-dealing accoutrements of America's new "terror of the sky" are packed in this master model job in true Cleveland-Designed thoroughness—detailed to the last feature—machine guns, windows, gas tank, wing flaps, dummy motor incidentals, venturi, and pitot tubes, etc., etc. This Kit, as all Cleveland-Designed Kits, contains everything needed. Also includes the new Cleveland enamel dopes, which give it that new finish everyone is talking about. Authentic ¾" scale. Span is 33"; length 21"; weight 4.7 oz. Colored Army yellow and olive drab. Complete Kit SF-25, postfree $3.25

Here are 6 popular "N" type Supply Kits. Remember they come WITHOUT DRAWINGS (drawings for them come as FREE Supplements with Issues of CLEVELAND MODELMAKING NEWS). Description under each Kit below gives correct Issue to order—enclose 25c for each issue.



The first group of "C-D" models ever to be lined up to show (comparatively) differences in sizes, etc. Each new design has more and more detail and seems to be getting easier and easier to make—note especially the realism the men's heads add.

HALL RACER

Also known as "Springfield Bull-dog". Authentic ¾" scale—with one of C-D's latest features, which you may make, ¾" scale balsa pilot—see him! A beauty in appearance; fast, keen flights. Red and black. Span 19½"; length 14"; weight 2.8 oz. Kit N-6 (with everything except drawing and China White—get drawings FREE with Issue No. 3) $1.50

BOEING 95 MAIL

Said to be the prettiest of all mail planes. Authentic ¾" scale—extremely realistic, even to ¾" scale mail pilot, which you may make, one of our latest features! Extra big, and surprisingly easy, even for beginners, to build, and what a flyer? Colored blue and natural tissue. Span 33¼"; length 24¼"; weight 3.5 oz. Complete Kit N-7 (without drawings—get drawings FREE with Issue No. 3) $1.50

NIEUPORT 28

Famous war fighter, used by French and Americans. Authentic ¾" scale. Many features—including ¾" scale balsa pilot, and ROTARY motor, all of which you make yourself—our newest features! Colored gleaming silver. Span 20¾"; length 16¼"; weight 2.8 oz. Complete Kit N-5 (without drawings—get drawings FREE with Issue No. 3) $1.50

GEE-BEE SUPERSPORTSTER

One of the most beautiful Cleveland-Designed models ever offered. Authentic ¾" scale of Doolittle's "super" racer. Span 18¾"; length 13⅜"; weight 2.7 oz. Colored red and white. A model you will always be proud of. Complete Kit N-2 (without drawing) at your dealer's, or postfree, only $1.50

MONOCOUPE and ⅜" SCALE SOARING GLIDER

This, we believe, is more authentic than any Monocoupe yet offered. Very pretty performer. Span 24"; length 15⅝"; weight 2.2 oz. Colored cream and orange. Kit also includes all material for building the JSF-2 Glider. Complete Kit N-3 (without drawings) at your dealer's, or postfree, only $1.50

BOEING F4B-3

One of the Navy's most modern airplanes. Exciting to build—capable of fairly long flights. Embodies surprising amount of details. Span 22½"; length 15½"; weight 3.2 oz. Colored silver, yellow and red. Complete Kit N-4 (without drawing) at your dealer's, or postfree, only $1.50

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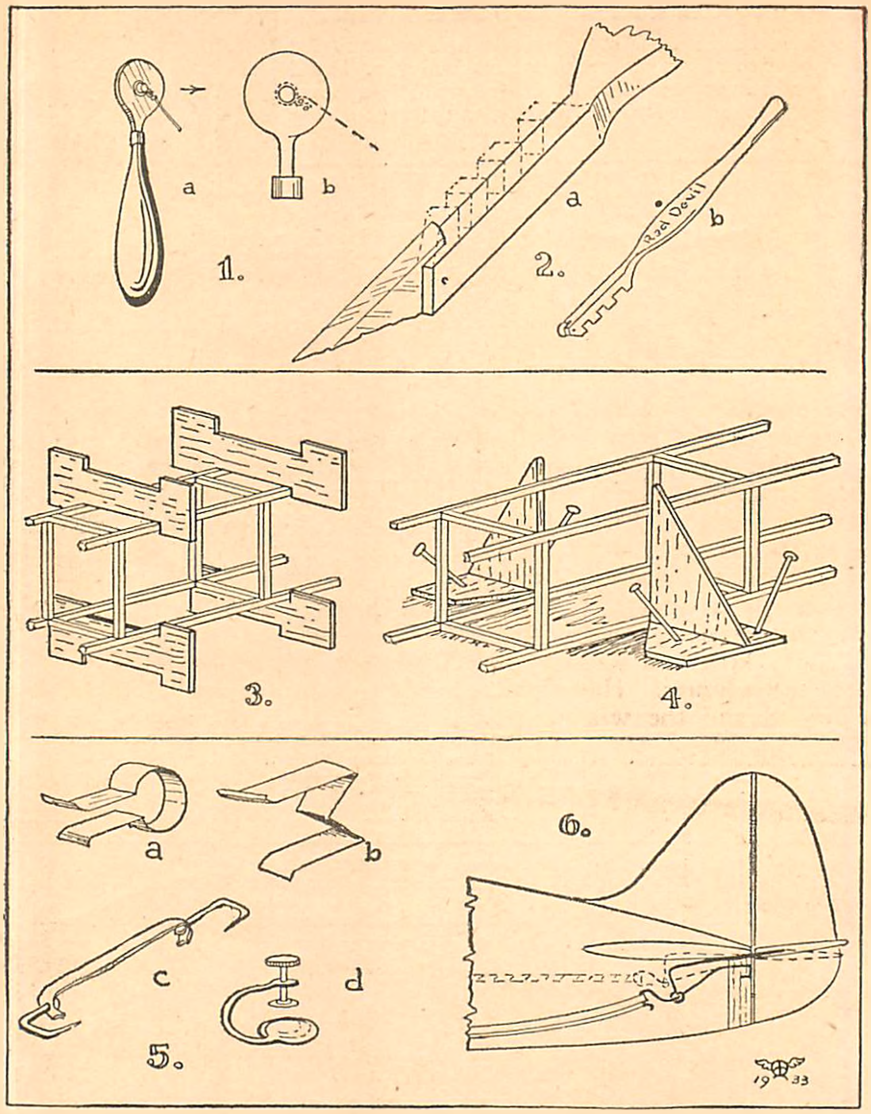
Helpful Hints for the Model Builder

By ALAN D. BOOTON



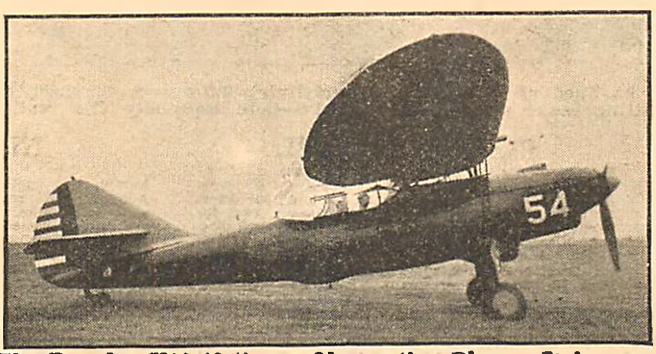
THE Helpful Hints this month are very useful and should find a place in any model builders workshop.

(a) in fig. 1 is a simple hook-bending tool of improved design. It is easy to make on the head of a ½" machine bolt by drilling a large hole in the center and two small holes to one side as (b) shows. Large and small nails are used as pegs and are to be driven into the holes very tightly. The dotted line in (b) represents the hook being bent.

(a) in fig. 2 is a sharp curve balsa cutter improvised from a worn-out glass cutter. To make this tool, grind the slot part off and remove the wheel. Then tin the end of the cutter and sweat a wedge-shaped piece of razor blade into the wheel slot with an iron barely hot enough to sweat with.

Fig. 3 shows how the sides of a rectangular section fuselage can be spaced in hand by using slotted clamps, made from 1/16" scrap sheet balsa. A set of these ranging from ½" to 2½" is sufficient for the ordinary fuselage. Warping can be corrected by turning the clamp diagonally to the fuselage, one way or the other where the warp occurs.

Fig. 4 shows an accurate method of fitting the spacers between the sides with the aid of brackets made from 1/6" sheet balsa. The brackets are pinned to the board around the top view tracing, between where the spacers will be. The two fuselage sides are placed in this prepared jig and fitted with spacers. With the aid of blocks under curved portions of the fuselage, warping is eliminated.

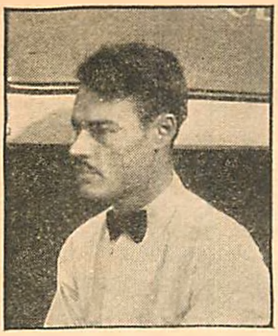


The Douglas Y10-43 Army Observation Plane. It is powered with a Curtiss 650 h.p. engine. This ship has a speed of about 200 miles per hour. It is the latest model of this type of ship. (An I.A.A.P.E. photo.)

THE four items in fig. 5 have varied uses in model building; more than can be named now. (a) and (b) are two clamps made from coffee can metal. The metal is cut in strips, in lengths to suit and then bent to the desired sizes. An assortment of these clamps are indispensable in sheet balsa work. (c) is simply two pins pushed through a length of rubber and bent as shown. The original use for this was to draw longerons against spacers in order to cement them properly during repairs, but other uses such as drawing brace threads taut before cementing, crop up. Since twisted thread sags when doped, water or nothing is the best policy after the threads are installed. (d) is merely an old ear bob with the lobe taken off. It makes a very good small screw clamp.

For those who have ships that need elevator regulation in flight, fig. 6 shows the simplest solution of that condition. Of course the elevators must be movable to install this device . Notice in the figure how the rear hook is made and installed. It is made longer and set higher than the average hook and has a decided bend downward when the motor is not wound. A single piece of spring wire is looped around the hook shaft, then bent as shown and run back along an elevator rib, being cemented to the rib only. When the motor is wound the rear hook is raised by the strain, bringing the elevator to a slight climb position. Adjust to suit the flying condition of the model. This device can be used for rudder control also, or both elevator and rudder control.

Albert R. Cline of Derry, Pa., winner of the February contest



W. O. Watkins of Tucson, Ariz., winner of March contest

Roger F. Parkhill of Minneapolis, Minn., winner of April contest

David Setzer of Lakeland, Fla., winner of May contest

Winner of August contest, Cedric E. Galloway of Austin, Minn.

Maneuver Contest Winners

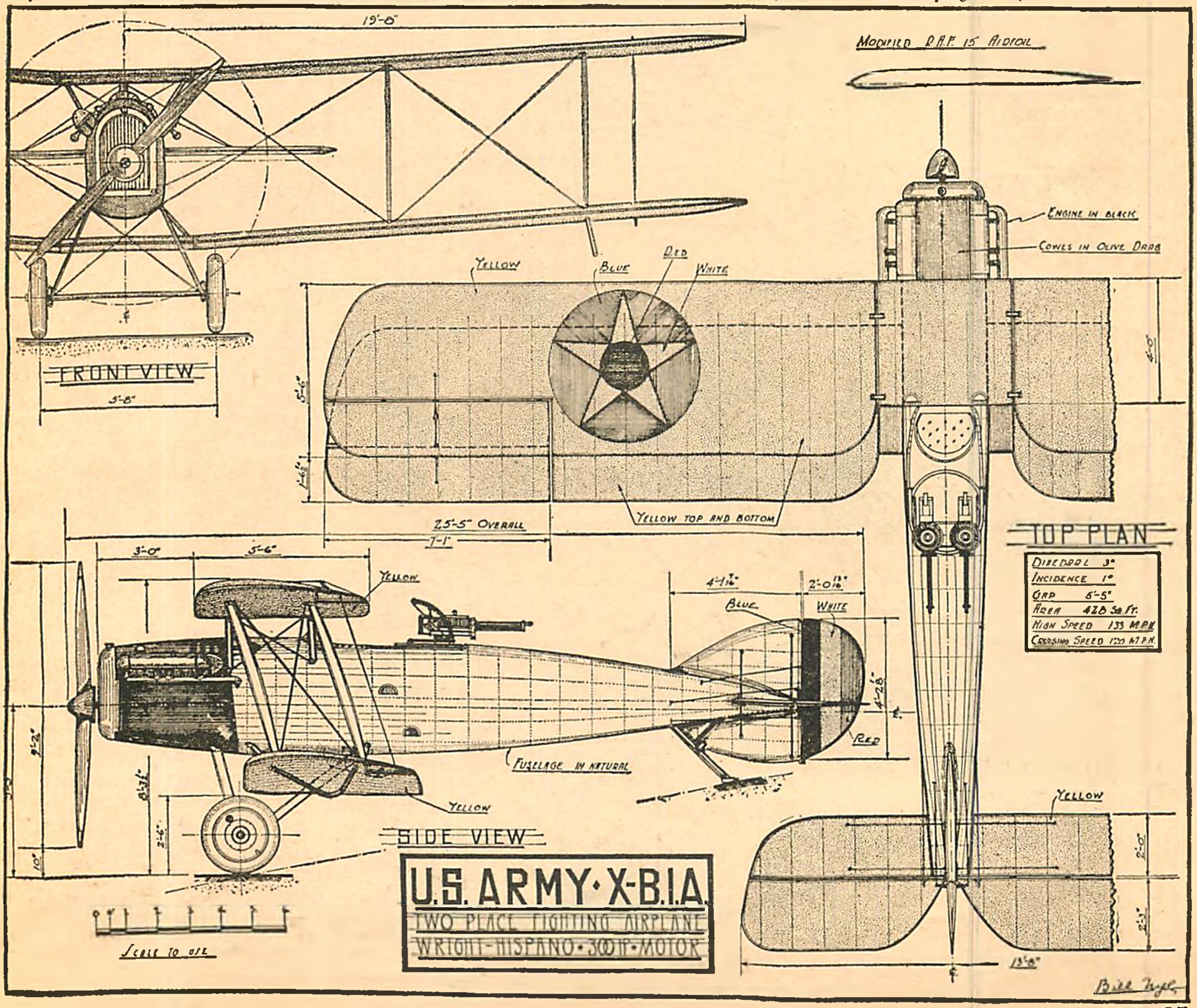
Ike L. Kibbe of Austin, Texas, winner of the June contest

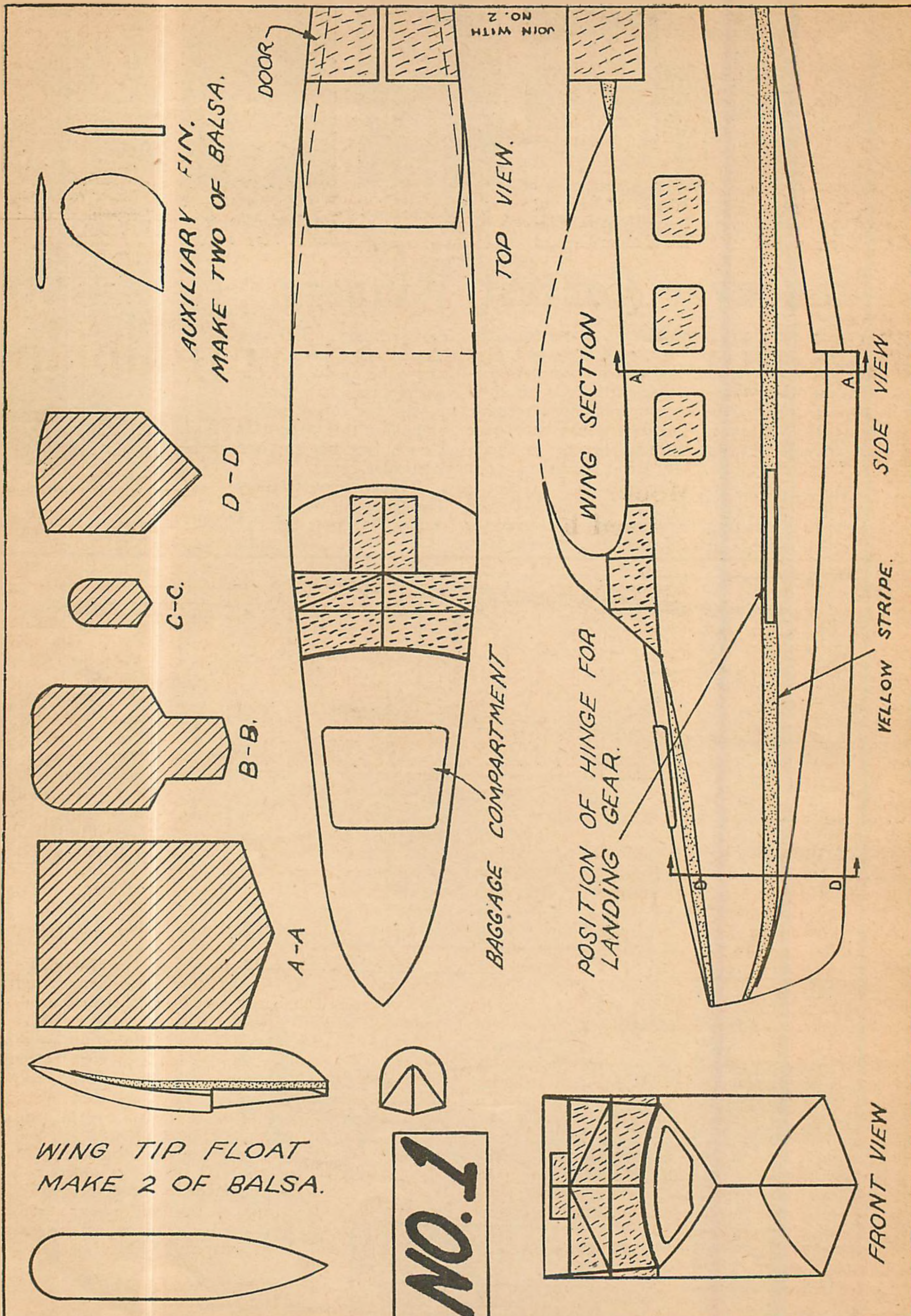
FOR over six months model enthusiasts throughout the country have been very busy pounding their typewriters, making carefully drawn diagrams and in other ways, putting forth every effort to make their entries to the Maneuver Contest accurate and attractive. Many of the contestants have gone to great trouble but not without benefit to themselves. Unquestionably they have learned a great deal concerning airplane maneuvers.

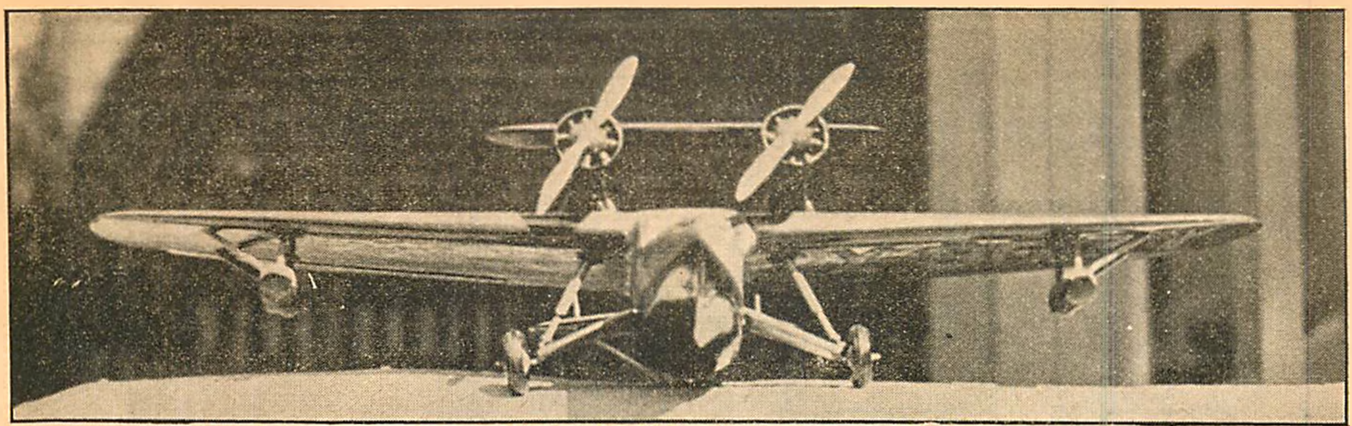
Competition has been very keen and we have had quite a problem selecting the winners. However the day of reckoning has arrived and the winners have been chosen. Those chosen have been rated upon the quality of the answers they have sent in to the six covers which embodied this Maneuver Contest and not any one particular cover.

Those of you who are familiar with the contest know that more than $100.00 in prizes is being given

(*Continued on page* 40)




AUXILIARY FIN.
MAKE TWO OF BALSA.
DOOR
JOIN WITH NO. 2
TOP VIEW.
WING SECTION
SIDE VIEW
D-D
C-C.
B-B.
A-A
BAGGAGE COMPARTMENT
POSITION OF HINGE FOR LANDING GEAR.
YELLOW STRIPE.
A
D
WING TIP FLOAT
MAKE 2 OF BALSA.
NO. 1
FRONT VIEW



Front view of the completed model. Note the landing gear which is retractable.

How You Can Build A Solid Scale Douglas Amphibian

Complete Instructions and Plans from Which You Can Build A Model of the 160 M.P.H. Plane Used by President Roosevelt

By BURTON KEMP

THE Douglas "Dolphin" Amphibian is one of the most efficient of the present day land and water planes and is approved by the U. S. Army. Other users besides the Army Air Corps are the U. S. Navy and the Coast Guard. The "Dolphin" has found its way into the private and commercial fields and just recently one has been placed at the disposal of President Franklin D. Roosevelt.

It is a rather large plane having a wing span of 60 feet and a length of 42 feet 2⅝ inches. It can be powered either with 2 Wright J-6's or with a pair of Wasp Jrs., each developing 420 hp. By using two of the new P&W Wasp TIDI motors, the total hp. is raised to 1000 and the 9 foot metal propellers spin at the rate of 2100 rpm. to propel this 4½ ton craft at a 158 mph. top speed.

Other performance figures with this power plant are as follows: cruising speed, 132 mph.; landing speed, 65 mph.; rate of climb, 1,155 ft./min.; and service ceiling, 17,900 ft. With 180 gallons of gasoline the endurance of this plane is 3½ hours and its range 460 miles. Its passenger load with this amount of fuel is 1485 lbs.

Reducing drag by abolishing the wheeled landing gear and using the plane exclusively as a flying boat, the high speed is raised to 170 mph., an increase of 12 mph., and the other performances are raised accordingly.

Now for our model of this outstanding plane. The best part to start on is the hull. As all drawings are full size, the plan can be traced directly on the work by means of carbon paper. Although the hull is of intricate design, it can easily be carved out of balsa with a sharp knife or razor blade. The underside of the hull is shown in the top view of Nos. 1 and 2 by dotted lines, and the cross sections at various points are also helpful. Notice that a portion of the hull is cut out to accommodate the wing and is of the same shape as the center wing section. The positions of the windshields, windows, door, and baggage compartment are shown and should be added later as a finishing touch to the model. The tail wheel should be glued to the hull at the place shown.

When carefully built, this plane is very impressive looking, because of its unique design.

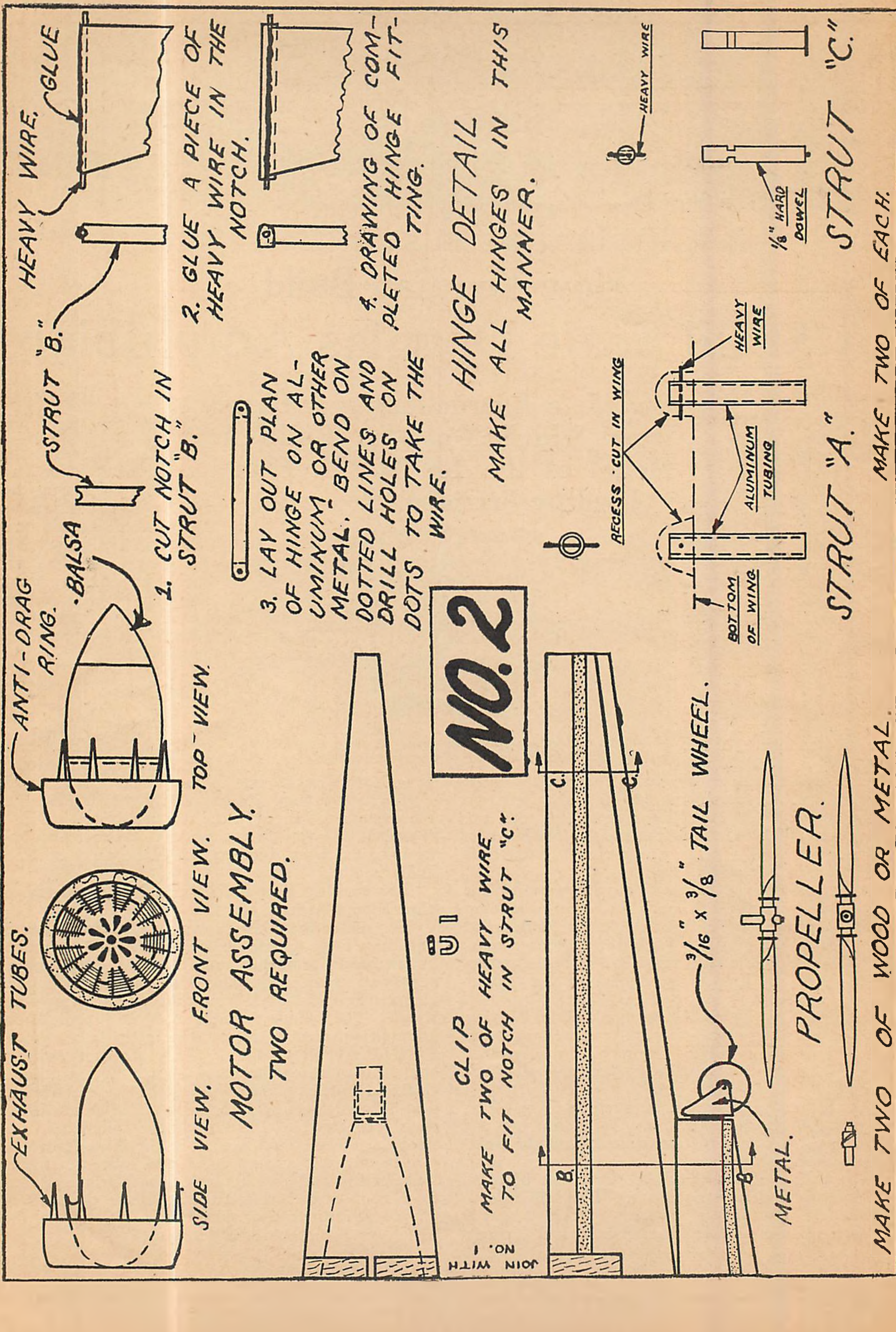
THE wing, shown in Nos. 3 and 4, is of the full cantilever type and is without external bracing. The top of the wing is perfectly straight, but the bottom tapers to almost nothing at the wing tips to give a slight dihedral. The ailerons can be hinged in the manner shown in No. 2 if desired. If you do not prefer to do this, they can be indicated by a thin strip of black paper or black India ink.

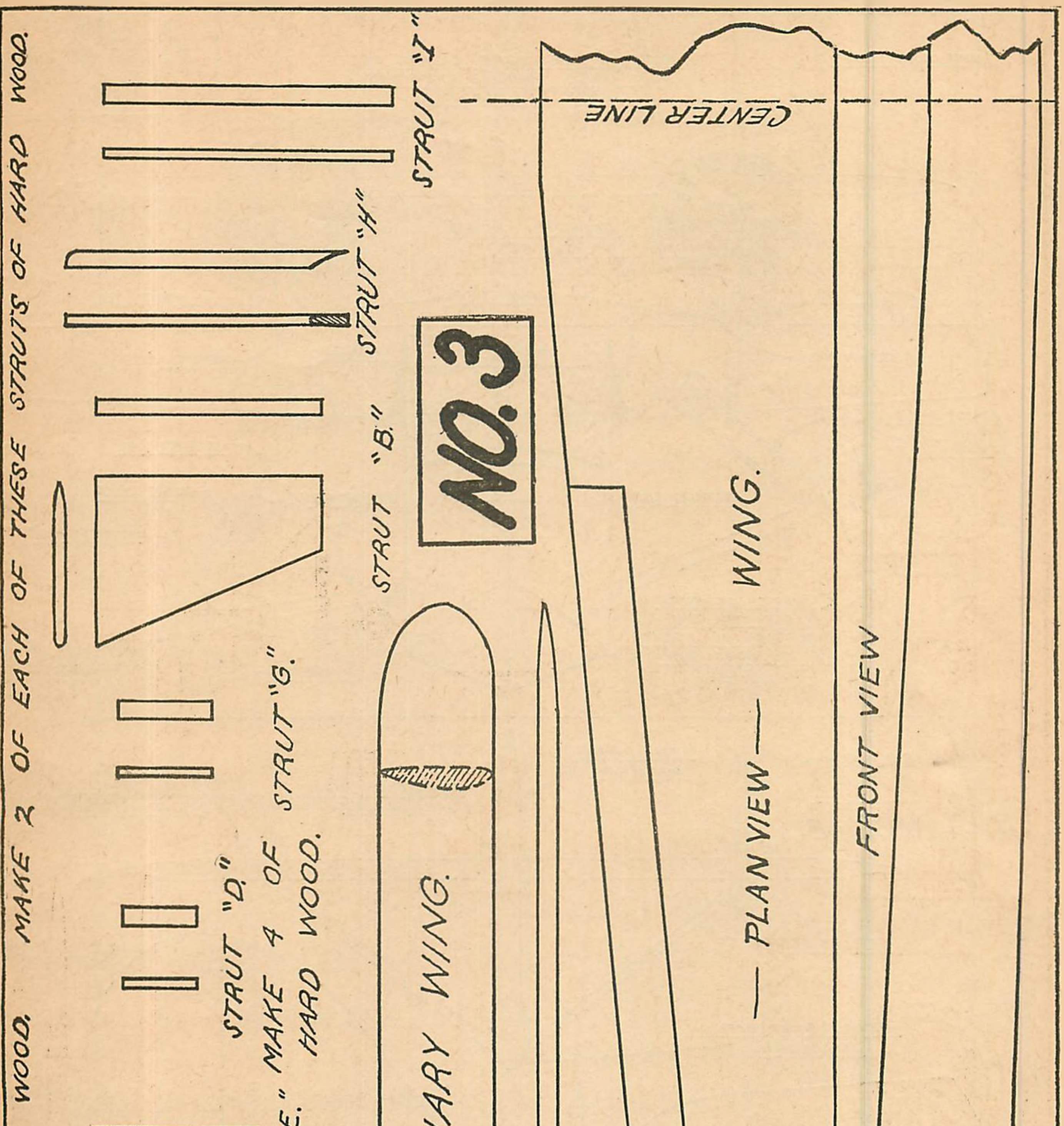
The wing tip float is shown in No. 1 and two of them should be made of balsa.

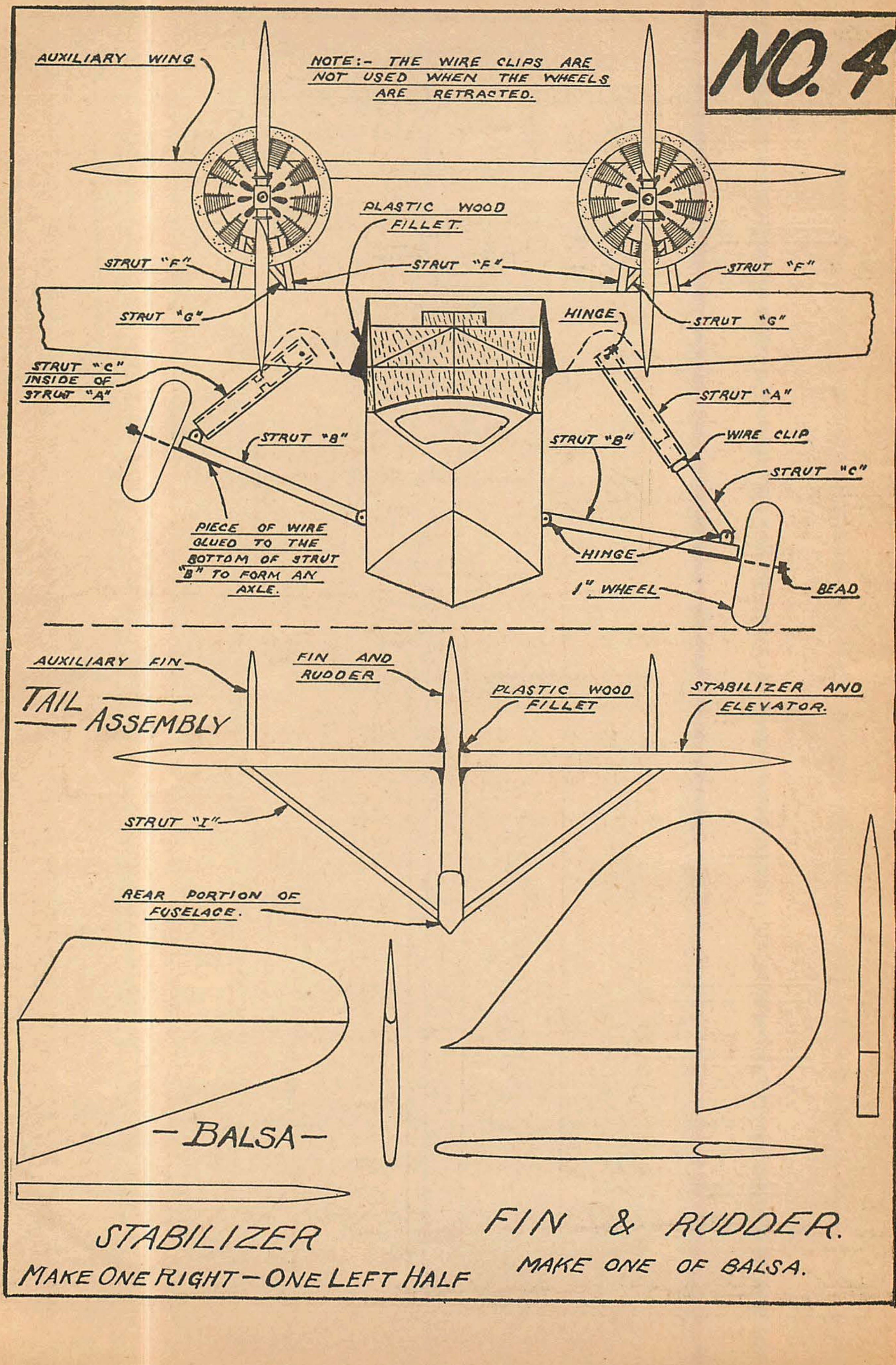
The motor assembly shown in No. 2 consists of anti-drag ring, nacelle, exhaust tubes and cylinders. A few model companies now have anti-drag rings of this small size in stock, but if they cannot be obtained they can be easily made from thin aluminum or other metal. The cylinders can be made of cork or balsa, having two pieces of sturdy wire in the front, shown by the heavy black lines. They are then wrapped with thin wire or thread, as shown by the thinner lines. The exhaust tubes should be made of reed or round balsa, tapering to a point at the rear. These should be glued to the rear of the cylinders. The nacelle is of balsa and is made in the shape shown.

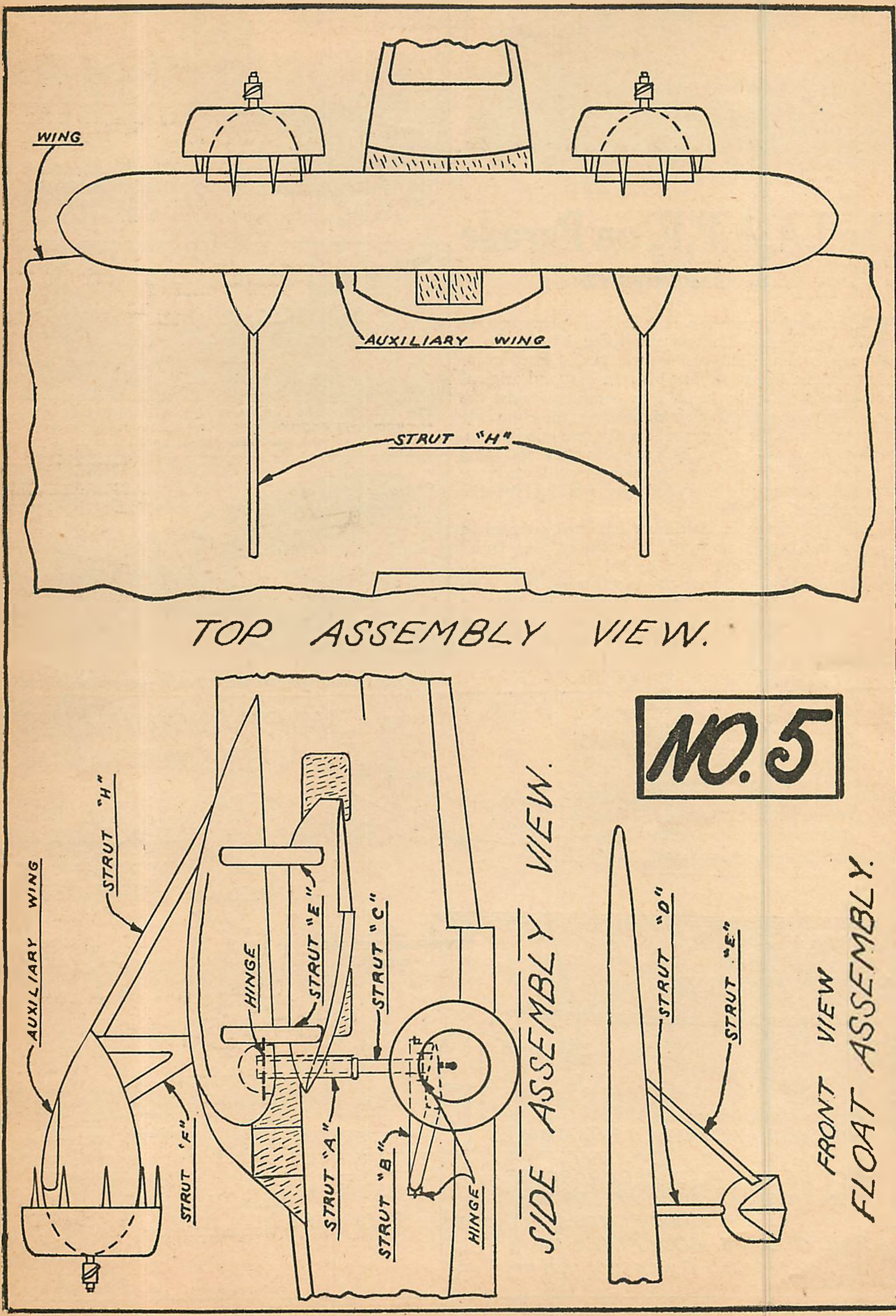
The tail unit consists of fin and rudder, stabilizer and elevator, and two auxiliary fins, which are shown in Nos. 5 and 2 respectively. These can also be hinged, as in the case of the ailerons.

(Continued on page 44)

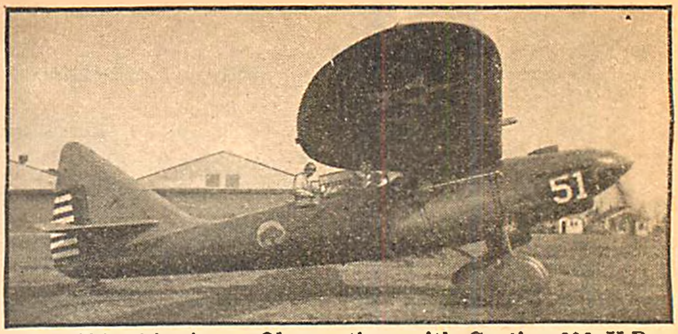

EXHAUST TUBES.
ANTI-DRAG RING.
BALSA
SIDE VIEW.
FRONT VIEW.
TOP VIEW.
MOTOR ASSEMBLY.
TWO REQUIRED.
HEAVY WIRE.
GLUE
STRUT "B."
1. CUT NOTCH IN STRUT "B."
2. GLUE A PIECE OF HEAVY WIRE IN THE NOTCH.
3. LAY OUT PLAN OF HINGE ON ALUMINUM OR OTHER METAL. BEND ON DOTTED LINES AND DRILL HOLES ON DOTS TO TAKE THE WIRE.
4. DRAWING OF COMPLETED HINGE FITTING.
HINGE DETAIL
MAKE ALL HINGES IN THIS MANNER.
NO. 2
CLIP
MAKE TWO OF HEAVY WIRE TO FIT NOTCH IN STRUT "C".
JOIN WITH NO. 1
C.
C.
B.
B.
RECESS CUT IN WING
HEAVY WIRE
BOTTOM OF WING
ALUMINUM TUBING
HEAVY WIRE
1/8" HARD DOWEL
STRUT "A."
STRUT "C."
3/16" x 3/8" TAIL WHEEL.
METAL.
PROPELLER.
MAKE TWO OF WOOD OR METAL.
MAKE TWO OF EACH.


HARD WOOD.
HARD WOOD.
MAKE 2 OF EACH OF THESE STRUTS OF HARD WOOD.
STRUT "F" MAKE 4
STRUT "E." MAKE 4
STRUT "D" MAKE 4 OF HARD WOOD.
STRUT "G."
STRUT "B."
STRUT "H"
STRUT "I"
NO. 3
AUXILIARY WING.
— PLAN VIEW —
FRONT VIEW
WING.
CENTER LINE


NO. 4
AUXILIARY WING
NOTE:- THE WIRE CLIPS ARE NOT USED WHEN THE WHEELS ARE RETRACTED.
PLASTIC WOOD FILLET.
STRUT "F"
STRUT "F"
STRUT "F"
STRUT "G"
HINGE
STRUT "G"
STRUT "C" INSIDE OF STRUT "A"
STRUT "A"
STRUT "B"
STRUT "B"
WIRE CLIP
STRUT "C"
PIECE OF WIRE GLUED TO THE BOTTOM OF STRUT "B" TO FORM AN AXLE.
HINGE
1" WHEEL
BEAD
AUXILIARY FIN
FIN AND RUDDER
PLASTIC WOOD FILLET
STABILIZER AND ELEVATOR.
TAIL ASSEMBLY
STRUT "I"
REAR PORTION OF FUSELAGE.
- BALSA -
STABILIZER
MAKE ONE RIGHT — ONE LEFT HALF
FIN & RUDDER.
MAKE ONE OF BALSA.


WING
AUXILIARY WING
STRUT "H"
TOP ASSEMBLY VIEW.
NO. 5
AUXILIARY WING
STRUT "H"
STRUT 'F'
HINGE
STRUT "E"
STRUT "C"
STRUT "A"
STRUT "B"
HINGE
SIDE ASSEMBLY VIEW.
STRUT "D"
STRUT "E"
FRONT VIEW
FLOAT ASSEMBLY.

The Douglas YO-31, the first model of this type. Note corrugated metal body.



The YO-31A, Army Observation, with Curtiss 600 H.P. Conqueror. Note the sliding hatches, gull wings, smooth metal fuselage, prop spinner, wheel pants and improved rudder and fin.

The I.A.A.P.E. on Parade

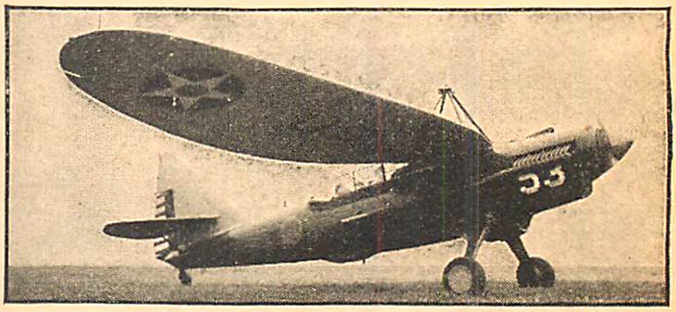
By "BARON FRITZ"

THE members of the I.A.A.P.E. are preparing for a big Photo Contest sponsored by the Bamberger Aero Club of Newark, N. J. Each member has been asked to submit his four best and original photographs taken by himself to compete against the rest. There is a high spirit running in the club over this contest and the winner will really be a good photographer. I myself pity the judges as they are going to have a tough time, but the winner will surely be surprised himself as everybody is waiting for the "other fellow" to win.

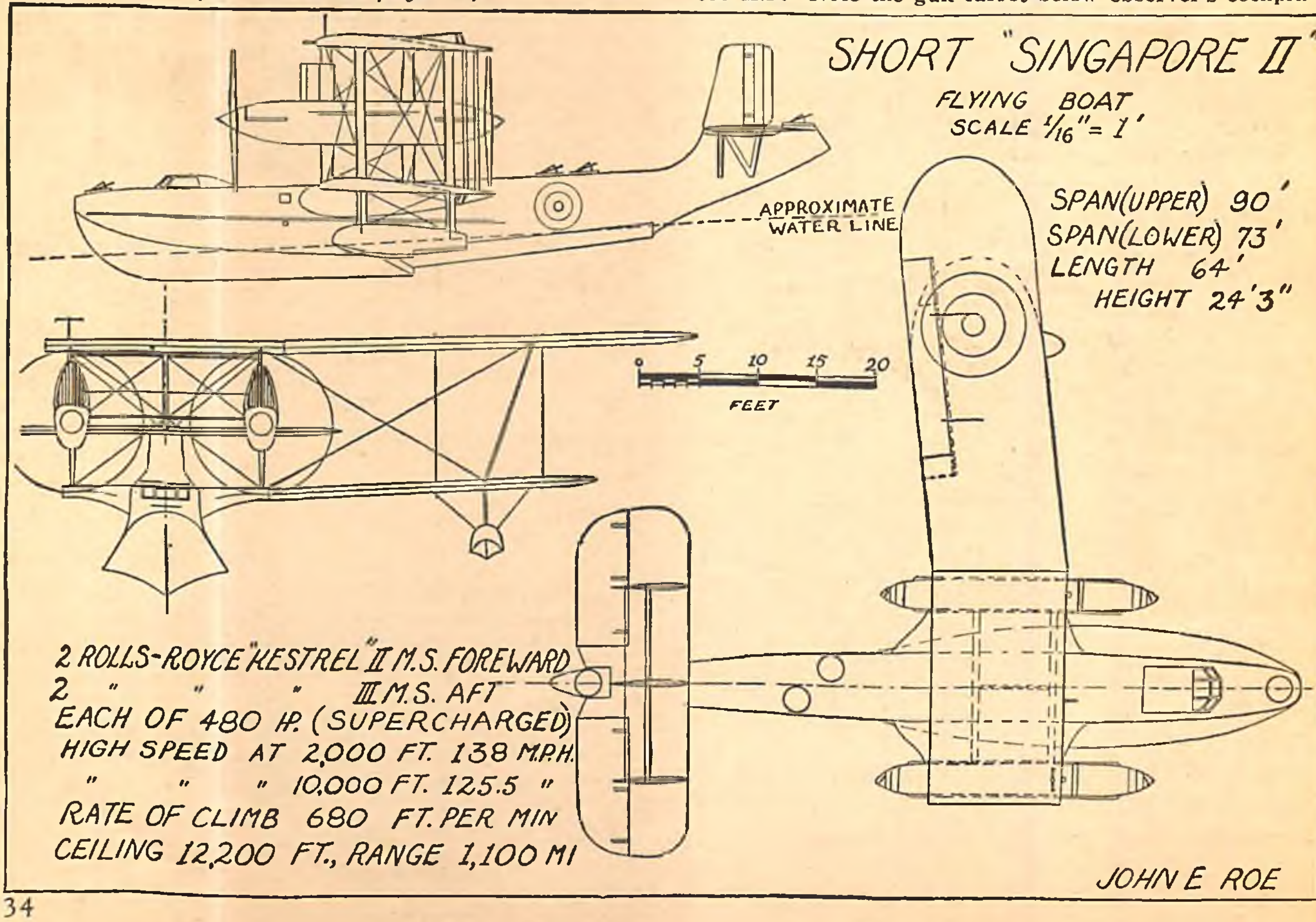
"Clif" Kaufman of Baltimore has been accepted in the club and is now an accredited member, also "Jim" Hawkins, who should have been listed last month. The Three Musketeers of the Northwest, Bob Attwood, Ollie Phillips, and Gordy Williams are holding up well and are sending in photos of rare and unusual interest. Bob Hare from California, who is writing a series of articles in the Magazine UNIVERSAL MOD-

(*Continued on page* 44)

The YO-31B. The sliding hatches have been fared into the body and fin to reduce resistance. It is a modified YO-31A.



The YO-31C. The engine power has been increased to 650 H.P. Note the gun turret below observer's cockpit.



Aviation Advisory Board

Conducted by
CHARLES HAMPSON GRANT
Chairman of the Board
Formerly of
The Technical Section, Air Service, U. S. Army

WE HOPE that the many readers who have written to the advisory Board asking questions, are not thinking too harshly of us for not answering many of their letters. Frankly we have been swamped with questions. Time and space allows us to answer only a few of these each month in the magazine. So it is usually our practice to answer the questions which are puzzling the majority of our readers.

We will start off this month with a simple one. Edward Duke of 28 Duke Street, St. Catharine, Ontario, Canada, asks:

Question: What is chord and how do you measure it?

Answer: The chord is the distance from the leading edge to the trailing edge of a wing. This distance is measured perpendicular to the wing span which is a line drawn from the tip of one wing to a corresponding point on the tip of the other.

Question: How is the pitch in a propeller measured? It is measured in degrees or inches?

Answer: The prop pitch is never measured in degrees. It is the distance the prop screws itself through the air forward in one revolution. This is the actual pitch which allows for slip. If no allowances are made for slip, it is called the theoretical pitch. The pitch of a prop can be determined by the following formula: $P = \frac{(\pi D)\, d.}{w}$ (P) is equal to pitch. (D) is equal to diameter. (d) is equal to the depth of the block from which the prop is cut and (w) is equal to the width of the prop.

If your prop is made, the pitch may be found by measuring the angle of the blade with a perpendicular drawn to the shaft. This gives you the blade angle. In order to find the pitch, multiply the distance from the shaft to the point on the blade at which you measure its angle, by 2η. (Best point about 2/3 out from the hub tip). Lay out this distance on the line which is perpendicular to the shaft and mark this distance with the point on the line. At this point draw a perpendicular. Now draw out the angle of the prop blade continuing the line of the blade until it intersects the perpendicular which was drawn last. The distance from this intersection to the line which was drawn perpendicular to the prop shaft is the pitch. I suggest that Mr. Duke look up the detailed answer to this question in the course which has been running in the magazine and which is entitled the Aerodynamic Design of the Model Plane. The subject of propellers started with the June 1933 issue.

HERE is a question, the answer of which will please many boys, I am sure. Robert E. Hellers of 105-10 Union Hall Street, Jamaica, New York, asks:

Question: What simple chemical compound will produce smoke enough for a smoke screen for a flying model plane?

Answer: A smoke screen cartridge that is very successful may be easily made by packing an ordinary soda straw with the following mixture: 2 parts potassium nitrate, 2 parts powdered sulphur, 1 part powdered charcoal. This mixture should not just be poured into the soda straw but packed in tightly otherwise very little smoke will result. Usually this cartridge is inserted in an aluminum tube closed at one end. The cartridge should protrude slightly from the rear end of the tube in order that it may be easily lighted with a match.

Paul K. Smith of 421 Douglas Street, Chattanooga, Tenn., asks:

Question: What is the size of the wing spars in a Great Lakes Sport Trainer?

Answer: Obviously it is impossible to give an intelligent answer to the questions on sizes of airplane parts as too much time is involved in research necessary to answer such questions. This information also is not always available. We would suggest that those readers who wish to have such questions answered, write to the manufacturer and obtain the plans of the plane they desire.

Question: Do adjustable pitch props have a helical pitch or a straight pitch?

Answer: Adjustable props have a helical pitch. However, this pitch is not a true helix for all angles of the blades. The helical pitch must be built into the blade for one particular blade adjustment which usually is the average adjustment. Any variation from this will then create a minimum loss of efficiency.

Edward W. Radtke of 3731 North 24th Place, Milwaukee, Wisc., asks the following questions:

Question: I am making a compressed air motored Fokker Super-Universal, plans of which appeared in the February and March 1930 issues of Model Airplane News. What is the correct propeller block dimension for it?

Answer: We suggest that Mr. Radtke read the articles on the Aerodynamic Design of the Model Plane and calculate this for himself. Otherwise, we will be getting the practice and knowledge and not he. Every minute of our time could be taken in designing planes for young men in the Advisory Board but in this event, thousands of our readers would be disappointed because Universal Model Airplane News would not appear on the newsstand at the scheduled date each month.

Air Ways—Here and There

(*Continued from page 21*)

picture so you will have to be patient until another issue appears.

IN picture No. 4 we see George Lambrose Jr., of 1 Pretoria Street, Passaic, N. J., with his gasoline job. This is a model of a Pietenpol Air Camper and has a wing span of seven feet. It is powered with a 3/8 horse-power, two cylinder, air-cooled engine. The weight of the plane alone is 1½ pounds. The motor weighs 18 ounces. We would say that this is extremely light. Lambrose has evidently done an excellent job in order to keep the weight down to this degree. It is hoped that he will send us complete information regarding the success he attains with it.

Frank Distler of 130 Trenton Avenue, Fort Thomas, Kentucky, winner of the 1932 National Scale Model Contest, has been at it again, as is shown by picture No. 5, of his Waco cabin scale model. It has a wing spread of 24 inches and there are 56 ribs containing 16 pieces each. In fact, the details of this ship are complete in every respect, even to the working door latch and the glass covered instruments.

E. C. Patterson, Jr., of Chattanooga, Tenn., Box 316, is an enthusiast in still another field of the model airplane game. He enjoys and learns much from taking pictures of his models with suitable backgrounds. He is responsible for picture No. 6 which shows a Camel, an S.E.5 and a Dolphin attacking a Friedrichshafen Bomber. It is hard to realize that these are not actually large ships, especially when we note the background of clouds. Patterson tells us that this is a trick. The models were photographed with a 5x7 camera against a dead white background, each model being supported by a piano wire. After a negative is exposed and developed it is combined with another negative of clouds. Then the two are printed as one. Patterson says that this process is difficult but the results are well worth while. He was assisted in making the models and photographs by John Phelps, Edgar Heron and Walter Cline. Cline was the photographer.

We have a very good friend who lives at 2021 S. Hackberry Street, San Antonio, Texas. His name is Joe Nieto. He is shown in picture No. 7 with a group of his very fine models. Joe is a collector of wartime pictures and data as well as a model builder. Many of you picture hounds will be glad to hear about him. I am sure. He is holding a Curtiss P1B. It is detailed down to the crankshaft of the motor. Nieto is surrounded by a group of planes consisting of a Boeing P12C, a Fairchild which flew for 69 seconds, a Nieuport 17 and a Mohawk Pinto.

A PICTURE of an interesting ship has been sent to us by Harold S. Dion of 321 Merritt Street, Turlock, Calif. He does not state whether or not this is a scale model of any particular ship. However, it is of unusual design and is very striking looking. Note the six bombs carried in the racks under the wings.

Our old friend Glen Courtwright of Lincoln, Illinois has submitted a picture of another very fine model, his Monocoupe

(*Continued on page 47*)

The Development of the Fokker Fighters

(*Continued from page 7*)

top of the engine plate.

Each wing bay had one pair of struts made up of steel tubes with wood fairings. The strut fittings on the spars of the upper wings were carried through the top surface to engage two cabanes attached above each set of struts. These cabanes carried bracing wires on the upper surface of the wing in order to strengthen and support the large overhang of that plane. For the same reason two wires were run from the lower strut fittings to the third rib from the tip in the upper plane. Lateral control was achieved by wing warping.

One of the illustrations shows an M-7 biplane in the service of the Austrians, proving the much denied statement that Fokker built no two place biplanes during the War. This photo also gives an excellent example of the Austrian aeroplane markings.

WHEN Fokker had finished training a number of his students, those who were quite wealthy desired to continue the sport of flying and to this end Fokker aimed to please. He promptly trotted out his drafting instruments and after considerable pencil pushing a new design was finished. This was the next in the series and was called the Fokker M-8.

As can be seen from the picture, the M-8 appears to be more substantial and practical than its predecessors. Originally designed and used as a single seater sporting plane, it gave good service until late in 1914 when war was declared. Immediately the German Army commandered all ships of this type in construction and in service. These were made over into two seaters for reconnaisance.

The fuselage was of conventional design made up of four steel tube longerons with welded uprights. Steel wire bracings were run through quadrants welded to the uprights and longerons. Aluminum was used to cover the front portion of the fuselage to a point about thirty-six inches from the nose. A large, roomy, square cornered cockpit was fitted with low sides to improve downward vision. The comforts of such a seating arrangement are doubtful but many pits were so built. A regular Fokker landing gear with a tread of lm. 70 and the conventional tail assembly of Fokker's ships was employed. A headrest was still unthought of, while the fuselage retained the horizontal knife edge feature.

In order to provide maximum safety for his buyers, Fokker took every precaution in the designing of the M-8. In order to provide a slow landing speed and long glide in case of forced landings, which were common, plenty of wing surface was included with the plane. With a span of twelve meters and a chord of lm. 75, it can be reasoned that the M-8 was lightly loaded, but that the power loading might have been excessive. Two main spars and twenty-six ribs made up the wing structure. Each panel was attached to fittings welded to the upper longeron. Three sets of flying wires and the same number of pairs of landing wires were the sole reason that the wings did not collapse since the fittings alone would not even hold the wings up on the ground. Lateral control was still accomplished by the use of wing warping.

ALTHOUGH the M-8 was never fitted with machine-guns, many reports are on record which describe the observer as carrying a rifle, a pistol, or even a load of bricks to throw at an enemy. Air fighting was really in its infancy then.

When fitted with an 80 HP Gnome motor, the M-8 was capable of a top speed of 70 MPH, a ceiling of little more than 6000 feet, and carried fuel for about 2 hours. Planes of this type saw considerable service in 1914 and when faster and better planes made their appearance on the front, the M-8s were relegated to the rear for training. Anthony Fokker's first order from the German Government was for forty monoplanes of the M-8 type.

A second biplane training machine was built by Fokker late in 1914 to succeed the M-7. The result was the M-10 which was built in two types, one with two pairs of struts to each wing bay, and the other with only one pair of struts to each panel. The former, called the "M-10 Zweistlg" by virtue of its double strutting, will be discussed first.

If the M-10 Z could be examined at close range, the most striking feature one would find would be the curious wiring arrangement of the wings. To begin with, only one wire is connected directly between two struts, these being the front ties in each wing panel. One wire runs from the upper connection of the tip strut to the lower fitting of the inner strut.

Two other wires running from upper connections of each of the rear struts are connected to the lower longerons. The three above mentioned cables are the only flying wires in the whole cellule.

Landing wires run from the front and rear "center section" cabane fittings to the lower fittings of each of the tip struts, crossing each other on the way. Two other wires begin at the same point in the cabane but run to the lower extremities of the inner struts and do not cross themselves. By comparing the men in the photographs of the M-7 and M-10 it will be seen that the M-10 Z is much smaller than its predecessor.

THE fuselage of the M-10 Z is correspondingly shorter and considerably deeper. Steel tubing was used throughout in the construction. Conventional front end coverings of aluminum were employed but with the features of removable side cowl plate and hinged upper cowl to allow access to the fuel tank and vital parts of the motor. Seats were much roomier and equipped with more safety padding than before. Instrument boards consisted of fuel and ignition switches and a pressure gauge. A regular Fokker landing carriage and monoplane type of tail assembly was used.

Both planes were of equal span and were divided into four panels. Two upper panels joined a center cabane in the same manner used on the M-7 while lower wing fittings were welded to the lower longeron. Since there was no overhang, upper surface bracing was dispensed with. Struts were steel tubes streamlined with wood.

A Gnome motor of 80 HP furnished the power. Performance was essentially that of a school machine and for obvious reasons the top speed was not more than 65 MPH. However the efficiency of the M-10 Z must have been above the average because of it being redesigned and called the "M-10 Einstlg", or one strutted version.

Next month will bring a description and photograph of this plane as well as another much denied Fokker aeroplane, the K-1, Fokker's only bombing plane.

Build a Flying Scale Model of Wiley Post's Lockheed Vega

(*Continued from page* 11)

spar at the top runs flat. Build the wing in halves and then butt joint the short spar lengths for the center part with liberal use of cement. The leading edge is 3/16" sq. tapered to 3/32" sq. The front, rear, and auxiliary spars are 1/8" sq. The trailing edge 1/16" x 3/16" and the main top spar is built up of 2 strips 1/16" x 3/16" and the main top spar is built up of 2 strips 1/16" x 1/4". The tips are bamboo 1/32" sq. Make the wing hooks of .026 wire. The tips of the rear hooks should be 1/8" longer than the front hooks. This will make the wing easier to snap into place. Bind and cement these hooks in place on 1/8" sq. strips and then cut, fit and cement to the wing as shown. When this is finished, measure carefully and install the standard hooks to the top of fuselage formers CT and DT with thread and cement. This part of the work will call for one or two check measurements as the hooks must engage properly and hold the wing in correct alignment.

All ribs are cut from 1/32" sheet balsa. The undercarriage struts are all 1"32/ x 1/8" bamboo. The front struts of the Vees are 5 3/4" long. The rear struts are 6 1/2" long. Make 4 Us of .020 wire 1/32" wide and 5/16" long, binding and cementing these to each upper strut end. The top of the loops should extend 1/16" beyond the strut end. The axles are .033 wire. Bend one end into a light loop 3/16" long to fit flat against the lower end of the front Vee struts and bend the other end out parallel to the ground to hold the wheels. Bind and cement the axles to the front Vee struts.

Allow an axle length of 3/8" more than the wheel hub, so there will be room for the shock cord, which is one loop of ,045 sq., rubber and the wheel retainer. Bind and cement the lower ends of the Vee struts together. The tops should be just far enough apart so the loops will engage the bottom hook fittings. It is best to measure this distance accurately and pin the struts to a board while drying. The shock strut is shown in the drawing. The axle guide fitting is made of .026 wire and fastened securely to the strut with thread and cement. Bind a loop fitting to the top end to engage the hook fitting installed on center stringer at station C.

To set up the undercarriage, snap the tops of the struts in place and slip the axle through the shock strut guide. Tie the shock cord in place and install the

(*Continued on page* 40)

Build A Flying Scale Model Of Wiley Post's Lockheed Vega

(*Contined from page* 39)

wheels. $1\frac{7}{8}''$ celluloid wheels are all right. The hubs should be reenforced by cementing washers to them. The wheels can be securely retained with a small washer and binding the end of the axle with thread and cement. A light piece of soft wire should be twisted across the lower inset of the axle guide to keep the shock cord from slipping out. The tail skid is made of .020 wire. Bind a flat loop to cement against former HB. The lower end should curve upward so the skid will slide smoothly.

The stabilizer spars are double $1/16'' \times 1/32''$ bamboo. The tips are lightly bound together and the inside ends spread to take the main rib and the base rib. These parts should be assembled over the drawing. The outline pieces are $1/32''$ sq. bamboo. The base ribs are reenforced with a $1/16'' \times \frac{1}{8}''$ strip set on edge. The ribs are $1/32''$ sheet. The rudder is constructed in the same manner, but has a double front spar also. The rear main spars are $1/16'' \times 1/32''$. The front spars are $1/32''$ sq. This type of tail is a little more difficult to build, but is very strong for its weight and will not be cracked up in collisions or by weeds.

THE motor stick is $\frac{1}{4}'' \times \frac{3}{8}'' \times 18''$. Bind and cement a strong bearing in place. Run the binding back on the stick $1\frac{3}{4}''$ to form a good gripping surface for the motor clip. The rear hook is .033 wire and raised above the stick, so the rubber line is parallel to the stick. The "S" hook is .033 wire. The propeller is carved in the regular straight blade method but has a wide blade. The diameter is $12''$ and the block should be $1\frac{1}{4}'' \times 2\frac{1}{2}''$. The hub when finished should be $\frac{1}{2}''$ wide and $\frac{3}{4}''$ deep. Cement washers to the center hole and install an .033 shaft. Reenforce the hub with cement and give the propeller and motor stick three coats of banana oil.

Cover the model with Japanese tissue. It is best to proceed in this manner. Make a small, strong frame of scrap and cover it with tissue, then spray with water. Use this pre-shrunk tissue to cover the tail group. Do not pull the paper very tightly on the tail as the paper cement will cause some shrinking. The tail covering should, if anything, be slightly loose. Next cover the fuselage between stations H and K. Just in front of formers at station H from side center stringers, cement a $1/16'' \times 1/32''$ bamboo strip across the fuselage to carry the front of the stabilizer.

Cement the stabilizer in place at an *angle of attack* of 2° and with a slight dihedral angle. Cement the rudder in place with the spars astride the top center stringer. Set front spars even over the center stringer and the rear spars over to give the model right rudder to counteract torque When the tail group has dried in place cover the remainder of the fuselage, a section at a time. The wing is covered top side first. The tips should be covered last. Give the covering a light water spray to shrink the paper, which will tighten up about all the frame can stand without serious distortion. Due care of course, must be observed to keep all water spray off the tail group.

The writer's test model is finished in silver, the finish used by the trans-continental Air Express Corporation. The finish was applied with a spray gun using one part banana oil and two parts thinner. Use the smallest amount possible of silver or aluminum powder. The finished model should be just barely covered with the pigment. For hand brush finishing, the dope should be 1 part banana oil and 3 parts thinner. Brush lightly with a soft brush.

License numbers and decorations are best cut out and pasted on the covering with mucilage. The windshield should be cut from celluloid and cemented to the fuselage, the lower front part against the back of the cowling. The top of the windshield may be made of celluloid or sheet balsa. When installing the windshield, make certain it does not interfere with the wing's movement into its hooks.

Power the model with six strands of $1/32'' \times 3/16''$ rubber or ten strands of $1/32'' \times \frac{1}{8}''$ rubber.

Far better flights can be made by using a good rubber lubricant. Launch the model in level flight. Only very slight balance adjustments will be required, if the drawings are closely followed and these can be made with a small alteration in the length of the motor stick.

Maneuver Contest Winners

(*Continued from page* 27)

away. Without keeping you in further suspense, we are listing the winners below in their correct order.

1st Place: Albert Richard Cline, Third Avenue, Derry, Pa. $25.00.
2nd Place: Ike L. Kibbe, 1105 San Jacinto St., Austin, Tex. $15.00.
3rd Place: Philip Chandler, Peabody Manor Apts., Nashville, Tenn. $10.00.
4th Place: John Alfirevic, 3000 S. Homan Ave., Chicago, Ill. $5.00.
5th Place: Ogden Whitney, 3504 Hull Ave., Bronx, N. Y. $5.00.
6th Place: William C. Drake, 123 Clifton St., Malden, Mass. $5.00.
7th Place: Alvin J. Brault, 103 E. Cook St., New London, Wisc. $5.00.
8th Place: Jean S. Chadwick, 110 Merriman Ave., Syracuse, N. Y. $2.50.
9th Place: Frank S. McDonald, Hardin, Illinois. $2.50.
10th Place: L. H. Tarbox, 33-25 Union S., Flushing, L. I., N. Y. $2.50.
11th Place: Roger F. Parkhill, 501 East 27th St., Minneapolis, Minn. $2.50.
12th Place: Arnold Gregerson, 1210 4th St. S.W., Mason City, Iowa. $2.50.
13th Place: John J. McLaughlin, 1311 LaBrosse St., Detroit, Mich. $2.50.
14th Place: James Ryan, 37 Austice St., Oyster Bay, N. Y. $2.50.
15th Place: Cedric E. Galloway, 610 S. 4th St., Austin, Minn. $2.50.
16th Place: Don Alexander, 3520 Mooney Ave., Hyde Park, Cincinnati, Ohio, $2.50.
17th Place: Manuel A. De Sa, 402 Sawyer St., New Bedford, Mass. $2.50.
18th Place: John A. Lambert, 6 Lunt St., Newburyport. Mass. $2.50.
19th Place: Peter Weik, 518 East 138th St., Bronx, N. Y. $2.50.

Wings of the Navy

(Continued from page 5)

ceiling of a little over 10,000 feet and carries a bomb load of 1480 pounds. A remarkable characteristic of this plane is its maneuverability. It is able to perform pursuit acrobatics carrying a bomb load! Such is the advance in military airplanes. A few years ago, any attempt at stunting a bomber was considered a prelude to soft music and flowers.

The scouting squadron has for its primary mission just what its name implies—scouting—and it is usually operated from carrier decks. It searches out and furnishes information of enemy movements, so that a fleet may form a counter position and be ready to attack or to defend itself. The scouts may also attack with bombs, small ships or personnel on deck.

While these planes operate chiefly as landplanes from the carriers, squadrons are also attached to battleships and cruisers, where they are equipped as seaplanes. They are literally shot into the air by a catapult, which gives them a speed of 60 miles per hour in the space of a few feet. Upon returning, they land on the leeward side of the vessel and are picked up by a sling, or derrick.

This type must have a long cruising radius, speed, and must carry adequate armament to defend itself. Complete radio equipment must be carried to enable it to communicate with the carrier to which it is attached. The Vought Corsair SU-2, is the principal type in service. This is a two-place biplane powered with a Hornet engine. As the carrier scouting plane is a comparatively recent development in the Navy, an observation type is utilized.

Observation squadrons spot for the big guns. They hover over the ship and wireless corrections, making possible a high degree of accuracy even though the target is completely obscured by fog or smoke. The Vought Corsair is also used for this work. Another model being extensively employed is the Curtiss "Helldiver" O2C-1. This is a two-seater biplane, powered with a Wasp engine.

Patrol squadrons are based either on tenders or at strategic points along the shore. The planes are the "big boats" of the Naval air service, operating at great distances over the sea. They are flying fortresses, bristling with machine-guns and able to protect themselves, for they operate far out of the range of the fighters. Their job is to gather information on enemy operations.

They are multi-engined and carry a crew of several men. Most of the patrol types are biplane flying boats with a wingspread of about 75 feet. Air-cooled engines are the most popular for this type and they are usually carried in nacelles supported by struts between the wings, just above and on either side of the fuselage. The cockpit arrangement generally consists of a gunner riding forward in the bow, with two pilot's cockpits, side by side, behind him. In the rear is a radio operator's compartment and behind it another gunner's cockpit.

The boats are capable of staying in the air for long periods of time and with this in mind they are designed to be as comfortable and habitable as possible.

DON'T MISS THESE THIRTEEN ARTICLES
—— COMING IN OUR DECEMBER ISSUE

For the Christmas number of UNIVERSAL MODEL AIRPLANE NEWS the Editor has made a special effort to bring our readers better plans, articles, and news features than ever before. To make absolutely sure you get this important Christmas issue answer at once our offer on page 42 or reserve your copy now at your nearest newsstand.

Keeping Pace With Model Science
Aerodesign of Model Aircraft
Tailless Plane Plans
Advisory Board
Model News of the World
The Fokker Fighters
Detail Plans for Northrop Sky Chief
D. H. Moth Plans
Hitch-Hikers of The Sky
Air Ways
Three 3-View Drawings of Military, Commercial and Wartime Planes

Wings of the Navy

(*Continued from page* 41)

THE types in general use are the Douglas PD-1, the Keystone PK-1, the Hall PH, the Martin PM-1, PM-2 and P3M.

The latest patrol boat is the XP2M-1, built by Martin. It is powered with three Wright Cyclone engines, giving a total output of 1,800 horsepower. The boat is of all-metal construction and is extremely rugged.

Another development in Naval aviation is the use of the rigid airship for long distance scouting and reconnaisance work. The dirigible is invaluable for anti-submarine partrols, for searching for mine fields, and for seeking out enemy ships and aircraft. The carrying of fighting planes gives the airship greater self-protection and increases its area of operation. The airship can stay in the air for days at a time and cover distances far beyond the range of heavier-than-air craft. Airship tenders with mooring masts projecting from the deck, are provided for basing the big bags while at sea.

How Army and Navy Airplanes Are Designated

THE combination of letters and numbers used to designate each plane in the Army and Navy has a special meaning. It tells the purpose for which the plane was built, the type or model, any improvements that have been made since the original design, and whether or not it has passed the experimental or service test stage.

In the Army Air Corps there are eight different general types of airplanes, each designed to perform some specialized work. These types are as follows:

	Designation
Pursuit planes	P
Observation planes	O
Attack planes	A
Transport, and Cargo	C
Bombardment planes	B
Primary Training planes	PT
Basic Training planes	BT
Photographic planes	F

Thus it is easy to tell to what class an airplane belongs. The number following the class letter indicates the model and the last letter, if any, indicates some modification of the model. Thus the "A-3" is an attack airplane, the numeral "3" designating it as a Curtiss Falcon. The A-3B is the same Curtiss Falcon, but the "B" indicates that it has been modified by Frieze ailerons, oleo landing gear, new gun synchronizer and new gun installation.

In addition to these letters, "X" and "Y" are used to designate airplanes under experiment or service test. When a new airplane is developed, it is sent to the Air Corps Material Division at Wright Field, Ohio, for tests. While on this status, the letter "X" is prefixed to its designation. Thus, if the A-3 were in this stage it would be known as the XA-3. If a ship passes the preliminary experiments it is sent to a regular Air Corps squadron for a service test to determine how well it is suited to carry on under actual operating conditions, the work for which it was designed. While undergoing this service test the letter "Y" is substituted for "X". Thus if the A-3 were on this status it would become the YA-3.

EXAMPLES of airplanes in use in the Air Corps are as follows:

P-12E—Boeing single-seater biplane, equipped with Pratt and Whitney 525 horsepower air-cooled engine. The "E" indicates that the original model has been replaced with a metal monocoque fuselage.

P-6E—Curtiss Hawk single-seater biplane, powered with Curtiss Conqueror 600 horsepower engine. This engine is of the V type and is cooled by a liquid substance known as Prestone. A three-bladed propeller is used. The "E" in this case indicates that provision has been made for the installation of side-type supercharger, giving the ship higher speed and a higher ceiling.

P-16—Berliner-Joyce two-seater gull-wing biplane with a Prestone-cooled 600 h.p. Conqueror engine.

P-26—Boeing all-metal low-wing monoplane, powered with P & W Wasp engine. The fuselage is of monocoque construction, with a covering of smooth metal skin.

XP-934—Curtiss low-wing monoplane, powered with Conqueror engine and equipped with slots and flaps to give very low landing speed. This plane is in the experimental stage.

A-8—Curtiss low-wing monoplane, powered with 600 h.p. engine. Carries 6 machine-guns and 20 small bombs. Crew consists of pilot and gunner.

A-3—Curtiss Falcon. D-12 420 h.p. engine.

XA-9—Lockheed low-wing all-metal two-seater monoplane.

O-19E—Thomas Morse biplane, all-metal except for wing, elevator and fin covering. Wasp engine.

O-25C—Douglas biplane with Conqueror engine.

O-38B—Same as O-25 except that it is powered with 525 h.p. Hornet air-cooled engine.

O-39—Curtiss Falcon, with wheel pants and Conqueror engine. Has high speed of 173 m.p.h.

O-31—Douglas gull-wing monoplane with a smooth skin covering; Curtiss Conqueror engine.

B-2—Curtiss "Condor" Bomber, two geared 600 h.p. Curtiss engines; 4,000 pound bomb capacity.

B-3A—Keystone, single rudder, two 525 h.p. Hornet engines.

B-7—Douglas gull-wing monoplane. Two conqueror engines. Metal monocoque fuselage. Carries a crew of three in tandem.

C-1—Douglas transport, one direct-drive Liberty 400 h.p. engine.

C-3—Ford tri-motor, Wright Whirlwind engines.

C-6—Sikorsky Amphibian, two Wasp engines.

C-7—Fokker tri-motor, with J-6 engines.

PT-1—Consolidated Primary Training Plane, 180 h.p. Wright V-type model E engine.

BT-1—Douglas observation plane with Liberty engine, but no military equipment and supplied with dual controls.

F-1—Fairchild monoplane.

In the Navy and Marine Corps, airplanes are also divided into classes in accordance with the mission to be performed. As the requirements of Naval aviation vary greatly from those incidental to operating over land, the classification is somewhat different. The ten general types are as follows:

	Letter designation
Bombing	B
Fighting	F
Ambulance	H
General Utility	J
Training	N
Observation	O
Patrol	P
Transport	R
Scouting	S
Torpedo	T

In the model designation, the first letter designates the class to which the airplane belongs, the following number indicates the model, the next letter indicates the manufacturer, which is followed by a hyphen and a number indicating the modification of the model. Thus O2C-1 is an observation plane, the second observation design to be adopted by the Navy, built by Curtiss, and the following numeral "1" indicates certain modifications that have been made. However, with a first model the numeral "1" is not written. An example of this is the first diving bomber built by Martin. Instead of being written B1M-1, it is simply designated BM-1.

The designation of manufacturers for the Navy is as follows:

A—Fokker Aircraft
B—Boeing Aircraft Company
C—Curtiss
D—Douglas
E—Bellanca
F—Grumman
G—Great Lakes
H—Hall Aluminum Aircraft Company
J—Berliner-Joyce
K—Keystone
L—Loening
M—Glenn L. Martin
N—Naval Aircraft Factory
O—Detroit Aircraft Corp.
P—Pitcairn
Q—Fairchild
R—Ford Motor Company
S—Sikorsky
T—New Standard Aircraft Corp.
U—Vought
W—Wright
X—Experimental
Y—Consolidated Aircraft Corp.

Following are some of the airplanes of the various classes being used in the Navy and Marine Corps:

F4B-4—Boeing single-seater fighter, powered with Wasp engine. This is practically the same as the P-12 of the Air Corps.
F7C-1—Curtiss Hawk with Wasp engine.
BM-1—Martin Diving Bomber, Wright Cyclone 525 h.p. engine.
O2C-1—Curtiss "Helldiver", two-seater, with Wasp engine.
O3U-2—Vought two-seater biplane; Hornet engine.
PK-1—Keystone flying boat, powered with 2 Cyclone engines. Carries a crew of five men.

(Continued on page 44)

Wings of the Navy

(*Continued from page* 43)

OL-9—Loening Amphibian with Wasp engine. Used as utility plane.
NY-1—Consolidated training plane, with Wasp engine.
RE-5—Monoplane transport, 5 passengers, powered with Wasp engine.
SU-2—Vought Corsair, two-place scouting plane.
T4M-1—Martin torpedo plane, one Hornet engine, carrying a 3 man crew and bomb load of 1480 pounds. Speed, 113 m.p.h. Service ceiling 10,150 feet.

How You Can Build A Solid Scale Douglas Amphibian

(*Continued from page* 29)

As this is an amphibian and has a retractable landing gear, a hinge is needed. Model hinges can be purchased at small cost, but the hinge described in No. 2 will serve the purpose and is easy to make. This hinge can be used to hinge controls, as has been previously suggested.

The auxiliary wing which connects the motor nacelles is pictured in No. 3 and should be made of balsa.

The various struts needed in the construction of this model are shown in Nos. 3, 4 and 5. They should be made of hardwood as balsa in such small sizes breaks easily. In the case of strut "A," shown in No. 5 and made of aluminum tubing, a hole is bored through about 1/16" from one end, and a piece of wire of slightly smaller dimension is inserted, so as to turn freely. A recess is cut in the bottom of the wing as shown, and the protruding ends of the wire are glued in place, and then plastic wood is used to fill up the rest of the hole. Thus the piece of tubing now swings, while the wire is stationary.

THE wire clip in No. 5 can easily be bent to shape with pliers and it is used to keep the wheels in a position for landing.

The propeller shown in No. 5 is a modern steel propeller. If desired, a simpler type can be used.

Nos. 6 and 7 show assembly views, which should be referred to when all parts are completed and the assembly is begun.

As this plane is approved and in use by the Army Air Corps, it can be painted in regulation Army colors, as follows: hull, floats, struts, nacelles, and wheels, olive drab; wing, auxiliary wing, fins, and elevator, orange. The Army stripes are used on the rudder and the Army stars on the wing. The words, U. S. ARMY, are lettered on the bottom of the wing in black.

One of the color schemes used on commercial models is as follows: the wing, auxiliary wing, fins, rudder, stabilizer, nacelles, elevator and struts "F," "G" and "H" are yellow. The top of the wing tip floats, the wheels, the center portion of the hull and the rest of the struts are dark blue. The top and bottom of the hull, the bottom of the wing tip floats, the anti-drag rings and the exhaust tubes are red. The propellers, windshields, windows and door are silver.

The stripes on hull and floats are yellow. The best way to put them on is to paint them on paper and then paste on the paper. The hull stripes are 1/8" wide and those on the floats are of 1/16" width. The tires and outlines of the ailerons, rudder, and elevator, providing they are not hinged, are black. The license number, NC-967Y, is put on the right side of the top of the wing, as we look to the front and on the left side of the bottom of the wing. The word DOUGLAS and the license number are placed on each side of the rudder.

The I.A.A.P.E. On Parade

(*Continued from page* 34)

PLANE NEWS on the "Development of the Fokker Fighters" is doing a very fine piece of work and is hereby to be complimented by his fellow members. Ned Moore, the Fair Haired Texas Lad (six feet six in his stocking feet) is still one of the "Aces" in the club . . . his photographs are some of the finest that have been taken and yet . . . . our old friend from Oakland, Art Whitmer, shows promise to be a "Dark Horse" in the Bamberger Photo Contest.

Harold Martin or affectionately known as "Marty" (Bless the little darlin') deserves the compliments of the other lads. He ACTUALLY gets up at 4.30 on a SATURDAY to visit some of the fields. (Ye scribe also goes with him so if anybody is tossing flowers, save a little one anyhow for ye Baron). But seriously, he takes his work to heart and has truly a great collection. Again I say "bless Him." Chuck Kossack from Chicago, has been consistently turning out fine stuff, so it is not necessary to say more about him. Ben Heinowitz, who has been our guiding spirit, is hereby praised for his work up to present and let us hope that he will not get lax and forget his camera, in place of his typewriter.

If you like news of this nature, write in and tell the writer so it will be stopped or continued, as you prefer. Before signing off . . . . Let me thank Mr. Charles Grant, Editor of Universal Model Airplane News, for his most gracious attitude toward the I.A.A.P.E. and for this, he rates a good handshake from each of the boys. Be seein' you anon.

Keeping Pace With Model Science

(*Continued from page* 9)

eral nice models (similar to the one he used so successfully) but had stalling trouble. He streamlined the wheels with solid balsa pants which reduced drag and helped lower the center of gravity.

Notice that in a model using the Bellanca type of fuselage, such as Light's, the rubber motor is further below the wing than in ordinary ships. This helps to stabilize them by lowering the center of gravity. Some commercials used moderate sweepback with dihedral, an arrangement that works well. Others employed a wire clip system which held the wing about two inches above the fuselage. In my experience this has a beneficial effect on stability but many who use it then proceed to lose its benefits by reducing the dihedral. They want more lift and forget stability.

Some builders, notably Johnny Zaic of New York, like to use stabilizers running as much as two-thirds the wing area. Others, like John Romanowski of Jersey City and Joe Kovel of Brooklyn, use thick balsa wheels into which are inserted lead and other copper weights. Both of these features make a ship good for windy flying as they are very "anti-stalling."

My weight rule commercial possessed two unusual features. The wing had a very thin airfoil section and the fuselage of square cross section was set on one corner of the square. The wing was attached by means of heavy wire clips to the top "corner," having the double advantage of all the area being available for lift and less interference between the fuselage and wing. This also lowers the center of gravity by about three quarters of an inch in this model. The model made some beautiful flights which caused me to regret that it wasn't done in time for the Nationals.

The prop was curved from a block 13/16"x1⅞"x18". Wing section and wing construction are the same as for my twin pusher, excepting the difference in span. Wing clips are attached to the front and rear spars, and made fast to the fuselage with rubber bands. Rudder and elevator spars were ¼"x1/16" balsa with rounded edges. Their ribs were straight pieces of 1/16"x1/16" balsa and the round tips 1/16"x1/16" bamboo. The tail was mounted on the rear of the fuselage which was detachable to permit winding the motor. The tail skid was bamboo and the landing gear struts heavy music wire bent and glued right around the fuselage and thread-braced. The fuselage longerons and stations were ⅛" square balsa. Motor was 11 to 12 strands of ⅛ brown rubber. Note the thin aluminum sheet ailerons used to trim the ship's flying balance. Fig. 6.

PRACTICALLY all commercials used zero or very little incidence in the wing or tail as this condition helps produce good glide. Also, most circled from right to left, although quite a number circled the other way, from left to right. This method seems to be very unstable once the ship stalls. This was spectacularly demonstrated by one beautiful model just as I was arriving at Roosevelt Field. The model had taken off and climbed nicely until fifty feet high, when for some reason it stalled and continued stalling right down to the ground.

Emmanuel Enderlein of Philadelphia had to undergo one of the toughest breaks of the Meet. His fine red commercial won first in the eliminations for the Moffett contest, by going out of sight thousands of feet high, after some 22 minutes. However, since the ship was not seen again and "Manny" had no other to use, he was unable to compete in the finals of the event for which he was so well qualified.

To sum up, here are the best bits and bets. On twin pushers, use low pitch props (with wide blades), staggered if you wish (or faired longerons) with free-wheeling and high powered motors. The whole model should be light and strong—as rigid as possible—but with most of the weight going into the motors. Drag should be reduced everywhere possible. The whole point is, try to get your ship as high as possible, with a good glide afterwards, instead of using a model that floats close to the ground for three minutes or so. A high climbing, good gliding ship, with two minute prop run is better than a non-climbing floater with three minute prop run.

The same goes for commercials, only more so. Use a long low pitch prop and an excess of power. Make your tail surfaces very large and your landing gear heavy. Use enough dihedral in the wing to make the ship stable. Streamline everything especially the few inches around the hub, so that you will not have to carve a new one every time the fool crate takes a notion to land with the tail directly *above* the nose, instead of *behind* it.

Model News from Other Countries

(*Continued from page* 23)

record.

This flight was staged in the Capitol Theatre through the courtesy of Mr. A. Gillespie of Greater Union Theatres Ltd. This is the largest building of its kind in this State. The big men of Australia are getting behind the model airplane activity among the boys of that country as they realize that it is an extreme benefit to aviation in general and to themselves in particular.

Picture No. 7 shows Jack Finneran and his machine which put up the winning flight.

Picture No. 8 shows a very beautiful model constructed by J. Kinsela who is president of the Kogarak branch of the M.F.C.A. It has a wing span of 44 inches and a hollow shell balsa fuselage. This ship makes flights of two minutes duration consistently, without the aid of thermal currents or updrafts.

In picture No. 9 we see a flying scale model of Kingsford Smith's Southern Cross. It seems to be going somewhere. This, as you know, is the three motored Fokker in which Smith flew to Australia from the United States. This model was built by S. Stringfellow of Auckland, N. Z.

Picture No. 10 shows an unusual seaplane built by the Balmain Rozelle Experimental Squadron. This ship is purely an experimental machine and lacks certain refinements of construction. However, it is very unusual in its performance. An exceptional glide is attained through the use of the small auxiliary wing above the center section. It seems that this wing has a decided effect.

Readers will also note that the main airfoil surface is placed well forward. Unquestionably the center of gravity is to the rear of the center of lift of the wing. This is very unusual but is a practice which brings exceptional longitudinal stability. This has been ascertained decisively through experiments made by your editor. With this arrangement perfect balance is attained by a positive angle stabilizer or, in other words, a line of thrust which is depressed relative to the wing and stabilizer surface. The floats of this machine are covered with Jap tissue. Several coats of shellac make them watertight.

(*Continued on page* 46)

The Aerodynamic Design of the Model Plane

(Continued from page 19)

wings, the dihedral angle or a proper combination of all these. However, before we determine the effect upon the lateral stability of our plane while in various possible flight positions when it is designed with a low center of gravity, let us learn what the center of gravity really is and how its position may be calculated. We may define the center of gravity of an airplane as its center of weight or the point at which the airplane will balance and remain in any position when it is suspended from it.

How to Find the Center of Gravity

It is a very simple matter to determine the center of gravity of a model after it is constructed. Simply proceed as follows: Attach a thread to the model at a point above the approximate point of balance of the plane, for instance, at the center of the leading edge, directly over the body; or to some part of the wing center section. Now suspend the model by the thread until it comes to rest in a stationary position. By drawing a pencil line, continue the line of the thread (Fig. 74) downwards across the fuselage, or if it is a stick frame plane, attach a straight wire to the frame so that the wire becomes a continuation of the thread line, when the model is at rest. Now suspend the model by the thread from another point, such as some part of the axle or the propeller bearing. Continue the line of the thread downwards until it intersects the first line or the wire. The center of gravity will be at the intersection of the two lines. (Fig. 75.)

The difficult problem is to find the center of gravity or better, calculate its position before the model is built and is merely in the drafting board stage of creation. This feat is worthy of a real engineer. In fact, few designers of large planes can calculate its position with accuracy before the ship is constructed, though they rigorously deny their inability to do so.

Some model builders can estimate its position fairly accurately, but not without considerable experience as a background. Fairly accurate results may be obtained from a rough estimate of weights and of the position of the center of gravity. This method is recommended to all those who do not wish to go into great detail. After you have built your model, if you find that the center of gravity is not located where you wanted it to be, move the wing so that the center of gravity is located in the proper position relative to it. In such cases, the plane must be designed with this idea in mind.

HOWEVER, if you cannot or do not wish to move the wing, the only recourse is to balance the plane properly by adding weight to the nose or to the tail, which ever procedure may be required.

The only certain way to determine the center of gravity is by the method of moments. This method necessitates the calculation of the weight of every part that goes into the plane. Of course if you definitely know the weight of any assembly of parts such as the stabilizer or the wing, then this known weight of the assembly of parts may be used. Otherwise, it is necessary to calculate the weight of certain units such as the stabilizer, the wings, the wheels, fin, etc., by first calculating the weights of each separate part that goes to make up the assembly of any one of these units. The total weight of the parts then is equal to the weight of the unit.

In order to understand the problem and its solution clearly, let us take a practical example.

We have the side elevation of our model laid out on the drafting board as shown in Fig. No. 76. The problem is to find the distance (X) of the center of gravity (G) from the front of the propeller bearing (O). The location of the center of gravity as shown in the figure has been chosen as the approximate position in order to work out our problem. Now we proceed to calculate the weight of the parts in each unit of the airplane's structure in order to obtain its moment about the point (O). Any point may be chosen about which to take moments but (O) has been selected as it is most convenient. (A moment of a force about any point is the product of the force times the perpendicular distance from the force to the point.) If you desire extreme accuracy, you can figure the moment of each separate part about the point (O).

The system we shall follow here is quite accurate and takes much less time. First

(Continued on page 48)

Model News from Other Countries

(Continued from page 45)

Canada

FROM Port Hope, Canada, E. P. Heybrock sends us picture No. 11 showing a built-up scale model of a Boeing P-26 which he has recently built.

Russia

If any of our readers think that the young men of Russia are ignorant regarding aviation matters, let them take note of pictures No. 1' and No. 13. Picture No. 12 shows model builders at the Moscow Airdrome. It is evidenced by the type of models used that these young men are not merely after records but are seeking information regarding the performance of various types of ships, which ideas may be used in the design of large aircraft. I believe it would be more beneficial to our model builders and to their future welfare in aviation if less emphasis were put upon prizes and more thought were given to experimental work.

Model builders who are familiar with young men interested in this activity around New York, probably know two young men named John and Frank Zaic. Personally, I believe that these builders deserve great credit for appearing at the National Meet with some unusual and "different" designs of models. This indicates a spirit of investigation which is commendable and which could be practiced to great advantage by fellow builders.

Picture No. 13 shows several young Russian model builders ready to launch their ships at the Koctebel Airport. In Russia model building is used to train young men in the art of aviation. It might be well for some of our supposedly advanced educators to follow the example of these modest people.

Air Ways—Here and There

(Continued from page 37)

shown in picture No. 9. He says that the two patches on the right wing were necessitated by a landing in a tree, which goes to prove that this ship is a fine flyer unless on this occasion, it was thrown out of a third story window.

In picture No. 10 we see our good friend, Captain Frank Hawks who is extremely interested in an all-balsa flying model of his ship, the Northrop Gamma "Sky Chief." This picture was taken at the dedication of the Mollison Airport at Stratford, Conn. William M. Roberts of 36 Washington Terrace, Bridgeport, Conn., shown in the picture, was the builder of the model. In appreciation of Roberts' gift, Captain Hawks showed him through the interior of his ship, letting him in on many of the secrets which are little known to the public.

Sometime ago we published a picture of the large fourteen foot model glider built by Joe Axisa and his brother, both of 3, Sda. S. Giuseppe, Sliema, Malta, Europe. He has made further tests which have been successful. Picture No. 12 shows the two brothers and their ship. He promises to send us pictures of the machine in flight for future publication.

Bamberger Aero Club

The Bamberger Aero Club has been active as usual. It is the exception when at least one of the members is not coming into the limelight with a record flight or some unusual performance.

On Tuesday, August 22nd, Joe Battaglia, an Aero Club member, and the foremost scale model builder in the east, gave a talk on the construction and finish of scale models. He exhibited a model of the "Sky Chief" which he built to order for Captain Hawks.

Leo Weiss of New York brought his gas engine plane to the meeting and told of his interesting experiences while building and flying his ship. His ship is very similar to the successful Brown-Bassett model. Weiss is the second boy in this vicinity to experiment with gas motors in flying models, Joe Kovel having gotten the jump on him about two months ago.

CORRESPONDENTS

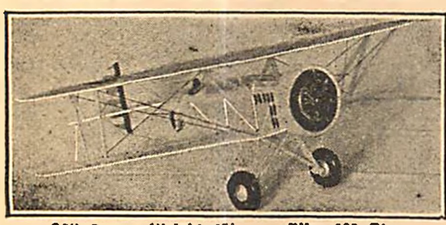
THE following young men would like to correspond with other model builders.

Victor Bender of 141 South Park Avenue, Alliance, Ohio has been an enthusiastic model builder since 1925.

Philip Plattner, 2103 East 22nd Street, Brooklyn, New York tells us that he is merely a beginner but would like to correspond with experienced model builders in order to increase his store of information. Will someone help him out?

D. Southwell of St. Andrew's Cathedral, George Street, Sydney, Australia, says that he is writing in behalf of a number of boys. They wish to make contact with other builders who have scale model plans to exchange for other plans and Australian aeronautical publications. He says that he will guarantee to answer all letters. Possibly he does not know what is is letting himself in for.

Until next month, happy landings.



The Aerodynamic Design of the Model Plane

(Continued from page 46)

we will start with the stabilizer. Calculate the weight of every piece of material that is to compose its structure. In order to determine the weight of the various materials used, it is best to weigh pieces of known volume, or area as in the case of the material with which the stabilizer is covered. A very delicate apothecary's scale is the best weighing device to use. If it is possible for you to estimate the weight of the unit accurately from long experience, the calculation of the weight of each separate part may not be necessary. When the weight of *all* the material has been figured, record its weight in the first space of the second column, headed "Weight of part," as shown in the accompanying table.

In the present case we have found unit (A) stabilizer, to weigh (0.2) ounces. The letter (A), representing the part, should be in front of this quantity in column one. Next, you proceed to calculate the weight of another unit, the wings for instance. Letter this (B) and when its weight is determined, put the numerical value in ounces in the second space of the second column. The letter (B) should be in front of it in the first column. In this example, we will say the wing weighs (0.6) ounces.

ALL the other units of the plane are treated in the same manner, the fin, the wheels, the landing gear struts, the motor and the fuselage. Each is given a designating letter and its weight is recorded in column two.

In calculating the weight of the fuselage or body, do not record it as a unit unless you can accurately tell where its center of gravity will be. Usually it is about 2/5 of its length from the nose. It is wiser to record the weight of each separate part composing its structure.

Now, after some tedious work, we have all of our weights recorded. It is required next to record the distance of the center of weight of each part from point (O), in column number three. For instance, the center of the stabilizer is very close to being its center of weight, so we draw line (A) down from the mid point of the stabilizer, on our diagram. The distance from point (O) to this line, taken parallel to the line of thrust is the value we record in the third column of our table, on the same line as (A). The distance of unit or part (B) from (O) is recorded on the (B) line in column three, and so on for every part.

In column four of the table, we put the moment of each part about point (O). The moment of any part is equal to its weight given in the second column times its moment arm given in the third column. For instance, the moment of (B) is $(0.6) \times (5) = 3$ ounce inches. All these moments are positive except the propeller which is minus as it lies to the left of point (O).

Our next step is to add up all of the moments and record their sum at the foot of the column. Add up all the weights of parts recorded in the second column in a similar manner. This gives the total weight of the machine.

Now the distance (X) may be determined simply by dividing the total weight of the plane into the sum of the moments.

This tells us only half the story however, for we do not know the location of the center of gravity in a vertical sense. In order to secure this information we must follow the same procedure as when we were determining its horizontal disposition by taking moments about some other point. The moment arm to be recorded in the third column now is the distance of the part from this point measured *perpendicularly* to the line of thrust. Record the values in table form and calculate the distance of the center of gravity from the point. By the time you have done all of this, I am sure you will see that algebra and mechanics have some practical use after all.

The Action of a Low Center of Gravity

WE have stated that a low center of gravity aids lateral stability. Now that we have found out how to calculate its position, let us see what stabilizing action it may have. When it is below the center of lift or point at which the resultant of the lift forces of the wing act, it has a tendency to keep the plane from tipping over sideways. To demonstrate this, suppose we have an imaginary airplane shown in Fig. No. 77, which has been tipped over sideways. The arrow (L) represents the resultant lift force on the wing acting on the wing at point (L) in the direction shown by the arow. The force of gravity is represented by arrow (G) acting vertically downward from the center of gravity (G). The lift in this case no longer opposes and balances the force of gravity (G) tending to draw the plane downward. It moves over to the low side for the lower wing creates greater lift due to the air striking it more fully and piling up underneath it when the plane slides down sideways in direction (S), due to the combined downward pull of (G) and slightly sideways of (L). As the plane passes through the air in direction (S), the air strikes the various parts of the plane causing a pressure opposite to (S) and acting at a point (P) as shown by arrow (P). Now we have forces (L), (G) and (P) acting on our plane. It can be seen that the combined effect of (G) and (P) and of (G) and (L) is to rock the plane back into the normal position as shown in Fig. No. 78, in which there is no force (P). In this position the forces (L) and (G) are equal and opposite, causing a state of balance.

In simple words the center of gravity acts like a pendulum when it is below the center of pressure. It can readily be seen also that the lower it is, the greater pendulum action and righting effect it will have.

You will note that a plane with straight wings has been used as an example here. The low center of gravity used in combination with dihedral wings will be considered under that heading later.

Next month we will see why sweptback wings and a dihedral angle is an aid to lateral stability.

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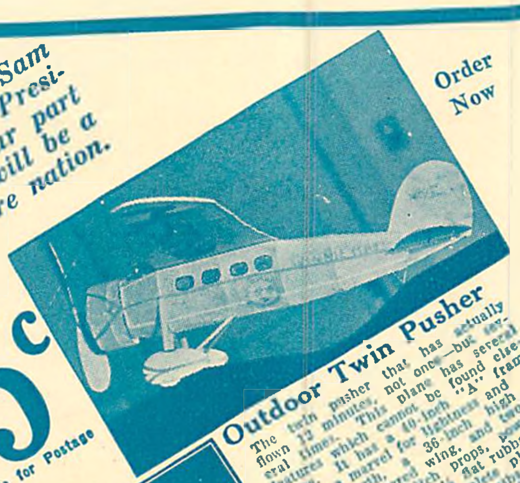

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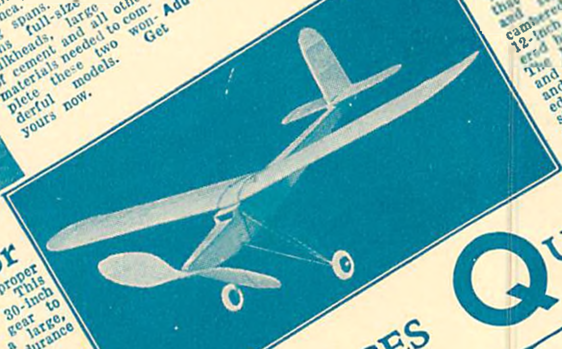

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1/8 x 1/4 — 24 for 48c
3/16 x 3/16 — 10 for 25c
3/16 x 1/4 — 10 for 25c
1/4 x 1/4 — 10 for 30c
1/4 x 3/8 — 6 for 21c
1/4 x 1/2 — 6 for 24c
3/8 x 3/8 — 6 for 24c
3/8 x 1/2 — 6 for 24c
1/2 x 1/2 — 4 for 20c
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¾ x 1⅛ x 10 — 1 for 7c
¾ x 1⅛ x 11 — 1 for 7c
⅞ x 1½ x 11 — 1 for 8c
⅝ x 1¼ x 12 — 1 for 8c
⅞ x 1½ x 12 — 1 for 10c
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1¼" wheels — 15c
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1 ft. lengths—straight
.014, .020, .028, .034
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3" diam. — 45c

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3/32 flat — 50 ft. for 50c
1/8 flat — 50 ft. for 50c
3/16 flat — 50 ft. for 70c

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Large size, ¼ O.D.
Dozen, 3c; Per 100, 10c
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Dozen, 3c; Per 100, 15c

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The fastest drying, lightest and strongest cement on the market. Try some now. You'll be amazed at its marvelous properties.
1 oz. tubes — .10
2 oz. tubes — .20
4 oz. cans — .40

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Just suited for the model user's requirements.
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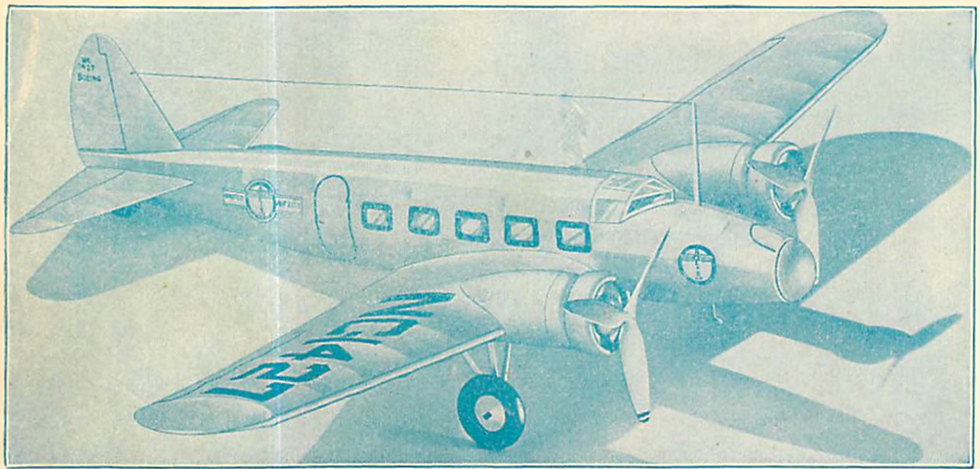

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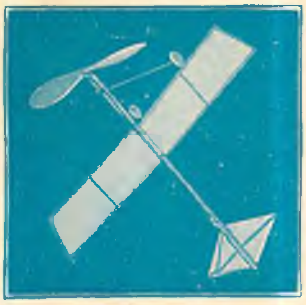

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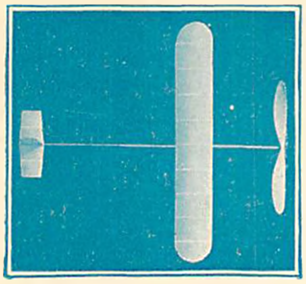

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