SKYWRITING—AND HOW IT IS DONE! ✣ A DAY IN THE U. S. NAVY AIR CORPS!

15¢

MODEL AIRPLANE NEWS

AND JUNIOR MECHANICS

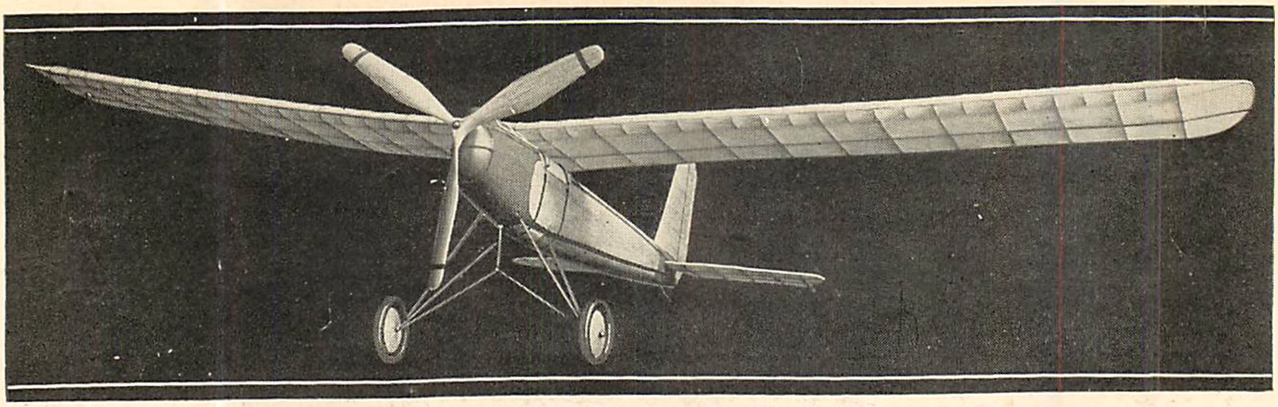
Convertible Mono-Biplane Plans

A Wind Tunnel Substitute

Airplane Designing

MAY, 1931

A Caproni Bomber (Wartime) Fighting Off a Squadron of Pfalz Scouts



THE COUNTRY CLUB FLYING FOOL

63″ Wing Span — 5¼ Oz. — 32″ Length.

A DREAM COME TRUE

The most cleverly designed, consistant flying, best landing, realistic appearing, sensational performing, fuselage model airplane ever offered the Flyers and Builders of Model Airplanes in America.

EASY TO ASSEMBLE — A PLEASURE TO FLY — LASTS FOR YEARS

EQUIPPED WITH NU-HI POWER-THREE GEARED RUBBER MOTORS

Specifications: Tapered (hand moulded) oval, all balsa fuselage, all surfaces adjustable, shock absorbing landing gear, 3″ celluloid wheels, 14″ Propeller, removable nose block, hinged opening tail assembly, dummy motor and exhaust pipes, duraluminum gear mechanism, and all necessary parts and material to complete kit.

Performance: R. O. G. eight feet. Duration with one motor, one to two minutes; two motors, two to five minutes; three motors, five to eight minutes. Ceiling two hundred feet. Distance up to two miles. Speed 20 M. P. H.

Semi-constructed kit postpaid in U. S. A., including all necessary parts, large full blue print 43″ x 30″, and complete instructions. $12.50. Canada and Hawaii, $13.00.

A bulletin describing this remarkable plane is yours for the asking. Merely send us a stamped envelope bearing your correct return address.

COMPARE THESE DELIVERED U. S. A. PRICES.

CELLULOID SPECIALTIES
Nine cylinder double impression dummy motors drilled for 1/8″ shaft 35c. Single impression 25c. 3″ black celluloid cowlings 25c. Black celluloid pants to fit our 1 7/8″ or 1 3/4″ wheels 17c each. Light weight sheet celluloid 50 sq. in. 8c.

CELLULOID WHEELS
We stock a complete line of black celluloid wheels in all sizes. The 1 3/8″ and the 1 7/8″ wheels are furnished with a small eyelet bearing. Check these prices —3/4″ 4c each—1″ 4c each—1-3/8″ 6c each—1-7/8″ 9c each—3″ 15c each.

ALUMINUM WHEELS
Aluminum wheels with balloon tires. 1-1/2″ 10c each. 1-3/4″ 11c each. 2″ 12c each.

COVERING MATERIALS
Large sheets of 21″x31″ Japanese Mino silk or White Hakone 4c each or 40c per dozen. Smaller sheets of Superfine or Red Hakone furnished for the same price. 20″x30″ sheets of Wood Veneer paper 15c each. Imported white china silk $1.20 per yard.

AMBROID CEMENT
Genuine Ambroid either colored or colorless. One oz. 13c, two oz. 20c, four oz. 38c.

BAMBOO
Straight grained selected bamboo averaging 1/16″x1/4″ furnished in either 12″ or 15″ lengths for 1c per strip. 12″ lengths 8c per dozen, 15″ lengths 9c per dozen. Shredded bamboo averaging 1/32″x1/16″x12″ 7c per doz.

CLEAR AND COLORED DOPES
Clear nitrate dope—our special mix. One oz. 8c, two oz. 14c, four oz. 26c. Colored Pigmented dopes any color you wish, one oz. 12c, two oz. 20c, four oz. 36c. Reduced prices on two and four oz. cans do not apply on one oz. assorted color orders.

MUSIC WIRE
All of our music wire has been tinned to prevent rusting. Six sizes to select from at these bargain prices, .016, .022, .026—three feet per cent; .033, .039, .045—two feet per cent.

CONTEST RUBBER
Country Club Contest Rubber is noted for its long life and greater number of turns. The rubber motor is the heart of your plane. We invite you to test this rubber for breakage against any other strand at any price. 3/16″ flat, two ft. per cent. 1/8″ flat, 1/16″, or 1/32″ sq. three ft. per cent. Full skeins contain about 225 ft. at the following reduced prices. 3/16″ flat 95c. 1/8″ flat 70c. 1/16″ square 65c. 1/32″ square 60c.

RUBBER LUBRICANT
Our Country Club Twister Rubber Lubricant will increase the number of turns from any rubber motor. One oz. 20c; two oz. 32c.

DOWELS
1/16″ White Birch Dowels 24″ long, 20c per dozen.

WASHERS
5/32″ Brass Washers with .041″ hole or 1/4″ Copper Washers with .062″ hole, 3c per dozen.

THRUST BEARINGS
Strong half-round bearings with either .025″ or .035″ hole 3c each or 25c per dozen.

ACETONE, BANANA OIL, OR SHELLAC
Best quality Acetone, Banana Oil or Shellac 8c per oz. Two oz. 14c, four oz. 26c.

BALSA WOOD SKIS
Genuine Balsa Wood Skis, ready to attach to your plane, per pair, 6″, 40c; 8″, 50c; 12″, 60c.

BALSASHINE
A liquid filler for Balsa wood which strengthens the wood but adds very little weight. Two oz. 22c, four oz. 40c.

BALSA WOOD
Try a piece of our selected Grade A-1 Balsa Wood. One large piece about 6″x2″x36″ long for only $1.10.

WINDERS
Strong Single Winders, 5 to 1 ratio, 50c each. These may be used on large outdoor planes. Aluminum Beauty Double Winders 90c.

COMPRESSED AIR MOTORS
3 Cylinder compressed air motors, ready to use, $3.75; Four Cylinder, $4.75. 30″ Compressed Air Tanks 3″ in diameter, assembled, $4.50.

RUBBER OR FIBRE TUBING
1/8″ O. D. Rubber Tubing or 3/32″ O. D. Fibre Tubing, 1c per inch, or 10c per ft.

UNITITE CEMENT
A large 2 oz. can of colorless Unitite Cement 25c. This glue was designed for model airplane use.

ALUMINUM
1/8″ Aluminum Tubing 15c. for 3 ft. length. 3/16″—18c. 1/4″—20c. Sheet Aluminum .006″, .010″ or .016″—25c. per sq. ft.

ALUMINUM OR GOLD POWDER
Aluminum or gold powder for mixing with clear dope or banana oil, 10c. per package.

PARACHUTES
Daredevil Airman parachutes made of Japanese tissue to which a small leaden man is suspended, 25c.

BALSA SPLITTING KNIFE
Use one of these knives once, and you will throw away your razor blades. The best value we have ever offered for 35c.

Our new 1931 catalog is just completed. It contains hundreds of bargains similar to the above, our complete price list of Balsa Wood, and a brief description of the Flying Fool. Send five one cent stamps for it, or better still send us a 50c trial order and the catalog will be included free.

COUNTRY CLUB AERO SUPPLY CO.

MAIL ORDER DEPT. 5821 HOLMES STREET — KANSAS CITY, MO.

Kansas City Retail Shops, 1103 East 59th Street and 221 West 47th Street.

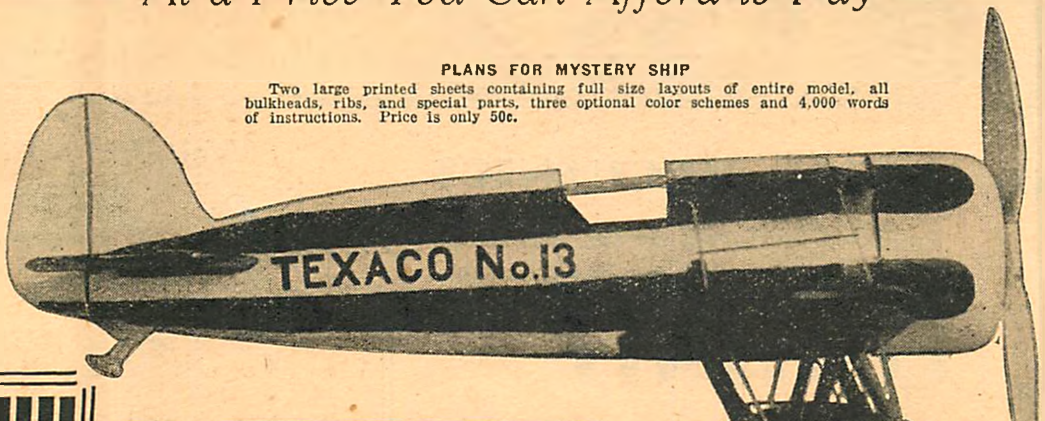
"Where your dollar has more cents."

The Finest KITS You Ever Saw

At a Price You Can Afford to Pay

PLANS FOR MYSTERY SHIP

Two large printed sheets containing full size layouts of entire model, all bulkheads, ribs, and special parts, three optional color schemes and 4,000 words of instructions. Price is only 50c.



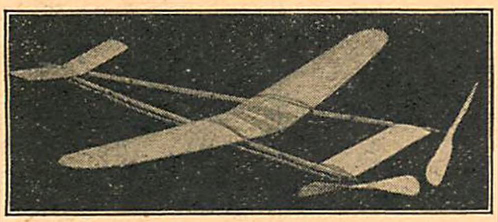
TRAVEL-AIR MYSTERY SHIP

The most realistic flying model ever built!

Kit contains full size plans and instructions, Aluminum N. A. C. A. cowling, stamped ribs, stamped bulkheads, large tube cement, 2 oz. can red dope, 1 oz. bottle white dope, veneer fuselage covering, pair celluloid wheels, easy to form wheel pants, and many other features which make this kit the greatest bargain in the country at only........ **$2.50**

When ordered separately add 10c for postage.

Picture above is an actual photo of our 24 inch model.

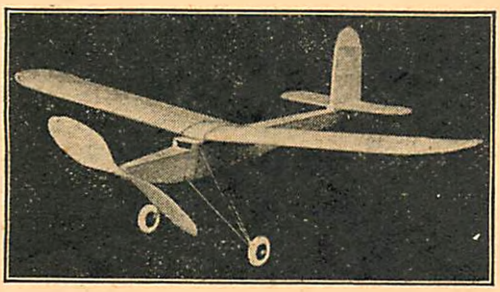


THE TWIN PUSHER

A twin pusher that has actually flown over 12 minutes, not once—but several times!! This plane has many features which cannot be found elsewhere. It has a 40 inch "A" frame that is a marvel for lightness and strength, 36 inch, high cambered, tapered wing, and two 12 inch, high pitch props, powered by 68 feet of 1/8 flat rubber. The kit contains plans, instructions, stamped ribs, and more than enough materials for the construction of this record breaker.

When ordered separately add 10c for postage.

$1.50



OUTDOOR CABIN TRACTOR.

$1.50

One of the snappiest flying models in its class! Proper engineering and all balsa construction does it! This plane has a double surfaced, high lift wing, 30 in. span, all balsa triangular fuselage, extra strong landing gear to withstand the shocks of outdoor flying, and a large, wide bladed prop to keep it up for long duration flights. Kit contains plans, instructions, stamped ribs, large tube cement, 2 oz. can dope, pair celluloid wheels, and all materials needed to complete this wonderful model. When ordered separately add 10c for postage.

FREE! Plans for R.O.G., Endurance R. O. G., 11 Minute Tractor if you write for our complete price list.

ALUMINUM N. A. C. A. COWLING

50c

An N. A. C. A. cowling that is taking the country by storm! Here's the reason for its tremendous popularity among expert model builders.

It is the **only** cowling on the market which contains a dummy motor and thrust bearing. It is made of aluminum and looks exactly like the ones used on big ships. Don't let another day go by without getting one. Size of cowling, 2" deep, 3" diameter. Packed in cardboard box with mounting instructions, 50c.

If ordered separately add 5c for packing and postage.

FAMOUS 3 IN 1 KIT

Here are those flying stick models you've been wanting to build for a long time. No matter how many of these you've built already, you're sure to get a kick out of these light, high performance models. This kit contains plans and instructions and all materials necessary to build a **high performance** R.O.G., a senior R.O.G. and a new 11 minute **indoor tractor**. The price for these three models is **less** than some companies are asking for the last plane alone. When ordering separately add 10c for postage.

$1

WHY PAY MORE WHEN YOU CAN GET THE "BEST" OF QUALITY AND THE "LOWEST" OF PRICES FROM MADISON MODEL AIRPLANES, INC.

BALSA WOOD

Our Balsa is the lightest and best balsa to be had.

36" STRIPS

1/16 x 1/16	.01
1/8 x 1/8	.01½
1/8 x 3/16	.02

SHEET BALSA

1/32 x 2 x 36	.06
1/16 x 2 x 36	.07
1/8 x 2 x 36	.08

BALSA PROPELLER BLOCKS

1/2 x 3/4 x 6	.02
5/8 x 1 x 7	2 for .05
5/8 x 1 x 8	.03

CLEAR DOPE

2 oz. can	.14

COLORED DOPE

2 oz. can	.17

ACETONE

4 oz. can	.25

AMBROID

2 oz. can	.20

COLORLESS CEMENT

2 oz. can	.20

MADISON "ACE" RUBBER

.045 square	3 ft. for .01
1/8 flat	5 ft. for .02
3/16 flat	3 ft. for .02

THRUST BEARINGS

.035 hole. Each	.03
Small size, .025 hole. Each	.03

WASHERS

1/8 O. D. per doz.	.02
1/4 O. D. per doz.	.02

MUSIC WIRE

Sizes .014, .020, .028, .034, 5 ft. packages	.02

MADISON MODEL AIRPLANES, Inc., 134 Livingston St., Brooklyn, N. Y.

Dealers and Clubs write for Special Price List

Model Airplane News

AND JUNIOR MECHANICS

Published by Harold Hersey
Edited by Capt. H. J. Loftus-Price

Vol. IV. No. 5

CONTENTS

MAY, 1931

In Our Next Issue

Can you read this?:
•— : :—: •• •— :—•• x •—•
•——•• :• ———

Would you like to be able to read it, and send it over the air to your chum nearby?

Then don't fail to delve into the wonderfully interesting and educational course in "*Aerial Radio*" which starts in our next (June) issue.

Remember, the successful pilot or pilot-navigator of today and the future is the one who knows not only his plane, but all its adjuncts. Radio is one of the most important of these, and the man who knows his dots and dashes to perfection is the man who gets first call!

The author of this wonder-course is none other than Captain Leslie S. Potter, late Royal Air Force, and one of the outstanding pilot-navigators in the world today. His experience in France during the War, Serbia, and the Near East amply fit him to teach you all there is to know about flying. His course in "Aerial Navigation," published in Model Airplane News, bears ample testimony to his merits as an author-instructor. 'Nuff said for the moment.

This is but a sample of what the next issue has in store for you. In addition there is an automatic switch for rubber motors; a spiffy Tractor model by Prof. T. N. de Bobrovsky; and thumb-nail sketches of the outstanding daredevils of the war—Baron von Richthofen, German ace, and Col. William Bishop, Britain's greatest living ace, by Orville H. Kneen.

Don't forget—Model Airplane News, the wonder magazine of the air! On all newsstands, May 23, only 15c. a copy!

Published Monthly by GOOD STORY MAGAZINE COMPANY, INC., Myrick Bldg., Springfield, Mass.
Editorial and General Offices, 25 West 43rd Street, New York City
Harold Hersey, President Pauline Sandberg, Treasurer Frank Moran, Secretary
J. W. LeBaron, Advertising Manager, Graybar Building, 420 Lexington Ave., New York, N. Y.
Entered as second-class matter June 5, 1929, at the Post Office at Springfield, Mass., under the Act of March, 3, 1879.
Additional Entry at New York, N. Y.

Price 15c a copy in U. S. and in Canada. Subscription price $1.50 a year in the United States and its possessions; also Canada, Cuba, Mexico and Panama.
All other countries $2.00 per year.
Chicago Advertising Office: 333 North Michigan Ave., C. H. Shattuck, Manager.
London Agents: Atlas Publishing & Distributing Co., Ltd., 18 Bride Lane, London, E. C.

"Everybody's Talking"

"I hear so much about your Company, your model planes, and your new catalog that I just have to send for a copy. Everybody's talking of your great values and your planes. Enclosed is 25c." *(From a model enthusiast in Hawthorne, New Jersey.)*

Pleased With T. A. M. S.

"I received the Travel Air Mystery Ship kit all right and am very pleased with it. Six months ago I bought your fine kit of the Great Lakes Sport Trainer. I had no trouble building it because of the marvelous drawings, and it is a beauty." *Massachusetts.*

AN OPEN LETTER

to Model Airplane Builders Everywhere

Equal Never Seen

"Have just completed your Boeing Fighter CB-1C, and Travel Air Mystery Ship SF-2C, and their appearance and performance are truly remarkable. In eight years of model building I have never seen their equal. The enclosed money order is for your Amphibion FL-301, and the balsa kit for the Ford Trimotor FL-302." *San Carlos, Calif.*

Reflects Quality

"Your new catalog is printed in a way to reflect the quality of your products. I hope to interest a few of the upper grade boys in model making." *(From the Principal of a New York state school who has purchased kits of materials for his own use from us many times.)*

> "They copied all they could follow,
> But they couldn't copy my mind,
> And I left 'em sweating and stealing—
> . . . A year and a half behind."
>
> —*Kipling.*

BACK in March, 1930, we made a prediction. Said the time was ripe for a great improvement in model airplanes—their appearance—their flying qualities. With our Great Lakes Sport Trainer we set out to blaze the trail—entirely disregarding old standards of model building. New models followed in rapid succession.

Today we find ourselves flattered to the extent that many concerns have imitated us in every way—*as far as they dare;* others, to protect their own interests, openly deny that scale realism and excellent flying qualities go hand in hand—*but any up-to-date model builder can show them where they're wrong in that opinion.*

Long before "Cleveland" develops a new model, first hand information on what aeromodelists want is procured not only through the mail but from our own retail store. Then we conduct exhaustive experiments—design and redesign—until we have perfected a model worthy of the "Cleveland-Designed" name—a name which means far more than "just an ordinary model," and has inspired unusual customer confidence. So much so, in fact, that model builders write us: "After building a scientific 'Cleveland-Designed' model, it's a waste of time and money to go back to ordinary model building."

Some of the outstanding model aircraft developments which have won this high praise for "Cleveland" are:—The 3/4" scale Great Lakes Sport Trainer—which established an unofficial flight record of 3,608 feet; the rocket-like Travel Air Mystery Ship—a true scale model that attains 30 m.p.h. in long distance flights; the Cleveland Trimotor—world's first successful tractor trimotor; the Cleveland Amphibion—simple to build and takes off water easier than any other model airplane; the sensational FL-100 beginner's line; with the new big outdoor Cleveland Robin—that almost laughs at winds and would rather stay up in the air than come down; and, lastly—the new phenomenal line of World War planes, headed by Col. Rickenbacker's all-conquering Spad.

Best of all, "Cleveland-Designed" models are extremely simple to build because everything is drawn full size, in complete detail—*an exclusive "Cleveland" feature.* These easy-to-follow instructions, quality parts and good engineering have quickly earned for "Cleveland-Designed" models the title of "America's Finest Model Airplanes." The line is the largest for fine models in the world today, and there are prices for any pocketbook.

Be Sure to Build COL. RICKENBACKER'S Famous SPAD, and these other keen models!

The Spad was reputed to be the most efficient war plane the Allies had. 3/4" Cleveland-Designed model has a span of 19-3/4", and length of 15-1/4". Yellow wings and tail surfaces, green fuselage; wing circles, stars for the wheels and Hat-in-the-Ring insignia. Kit includes full size detailed drawings, easy-to-understand instructions—and everything needed. Order Kit CB-2, only $4, postfree.

FOKKER D-7 BIPLANE

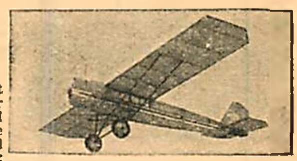
(German, 1918) ..

The wizard of the German "Flying Circus". Realistically duplicated in Cleveland-Designed 22" span, 16-3/4" length model. Dark green wings and tail surfaces, orange fuselage and struts. Maltese Crosses, full size detailed drawings, easy-to-understand instructions, and everything needed, included in kit. Order Kit CB-3, only $4, postfree.

COL. RICKENBACKER
AMERICA'S ACE OF ACES

CLEVELAND ROBIN

(Something New!)



Premier announcement on this new big outdoor profile fuselage model with 33" span. Just the thing for Spring and Summer flying. Rugged; outrides the wind, easily attains duration of one minute, and distance of 500 feet. Exceptional value. Very easy to build from full size drawings, easy-to-understand instructions and more-than-enough material. Order Kit FL-201, only $2.20 postfree.

ALBATROSS C-3

(German, 1917)

Nicknamed the German "Spad". The "hell-diver" of its time. This Cleveland-Designed model is beautifully streamlined like the original, with a span of 22", and 18-3/4" length. Orange wings; light blue fuselage, tail and struts. Complete with full size drawings, easy-to-understand instructions—and everything! Order Kit CB-5, only $4. postfree.

NIEUPORT SCOUT

(French, 1917)

Loved and flown by practically all Allied pilots. The clever little Cleveland-Designed model has a span of 20-1/4", and 13" length; brilliant yellow wings and tail; black fuselage and struts. Completely detailed, machine guns, etc.; full size drawings, easy-to-understand instructions and everything else needed. Order Kit CB-4, only $4, postfree.

Get Your Notebook-Catalog NOW!

Needed by every aeromodelist. Lists 18 other models in colors; and complete stock of Blue Diamond Engineered supplies. (Inserts for new warline and later planes mailed later to all catalog holders.) Don't delay having this great Notebook-Catalog—send 25c at once, and we'll rush your coopy to you. (No Free Copies.)

Ask your leading store for Cleveland-Designed Models; find out if there's an N. A. M. E. Chapter in your town, too.

CLEVELAND MODEL & SUPPLY CO.

1866N West 57th St. *Model Aircraft Engineers Since* 1919 Cleveland, Ohio, U. S. A.

"Cleveland Blue Diamond" is the symbol of honest quality, reasonable price and speedy 6-hour service

SKYWRITING!

By
Newell Struck

BACK in 1910, Major Jack Savage of London, England, conceived the idea of writing inscriptions in the sky, using an airplane for a pen or brush, and smoke as the ink. The World War interrupted the complete development of this idea, so that it was not until after the war that patents were granted Maj. Savage in practically every civilized country. The scope of Maj. Savage's patents cover all means whereby intermittent or continuous smoke trails can be released from an airplane in flight.

The first public demonstration of skywriting was given in England on May 30, 1922, by Capt. Cyril Turner, a fighting ace pilot in the British Royal Air Force. Capt. Turner performed the skywriting while a championship football match was being played and, needless to say, no one watched the football game. From that time on skywriting was the talk of a nation.

The requirements for successful skywriting are a high-powered, very maneuverable airplane with a cruising speed of 125 to 130 miles per hour at 10,000 feet altitude, and the ability to climb very rapidly. The SE5 combat plane that made Britain and the Allies supreme in the air is the one that has been used for skywriting.

Ideal weather conditions for skywriting are a clear, blue sky with few cloud banks, sunshine and a steady wind. A gusty wind is not favorable as it tends to break up the smoke stream. However, skywriting has been successfully accomplished in steady winds of fifty-five to sixty miles per hour.

The smoke producing apparatus is built into the fuselage of the plane and consist of a tank to hold the smoke producing chemicals under pressure, a wind-driven pressure pump, pipe lines and a series of control levers.

Writing "fluid" is controllable white smoke formed by a secret combination of chemicals called by the pilots, "Gubbins." It is doubtful if more than a few people could pronounce the chemical name so "Gubbins" it is.

"Gubbins" is a dark thick mixture that resembles crude oil. The smoke generated for skywriting could not be spread as a protecting screen in naval operations because our smoke is different from that used by the navy. Their chemical is heavier than the prevailing atmosphere and settles, forming a vertical curtain. That would not do for skywriting as the letters must hang in the air as long as possible. Therefore the smoke must be as near as possible the same weight as the prevailing atmosphere at 10,000 feet.

WHEN the pilot wishes to write he squeezes the "Bowdin Control" which is placed near the top of the "joy stick." This control is the same as that used as a trigger for firing machine guns on a fighting plane during the war, except that instead of firing a burst of bullets a stream of "Gubbins" is injected into the hot exhaust pipes at the cylinder heads of the motor.

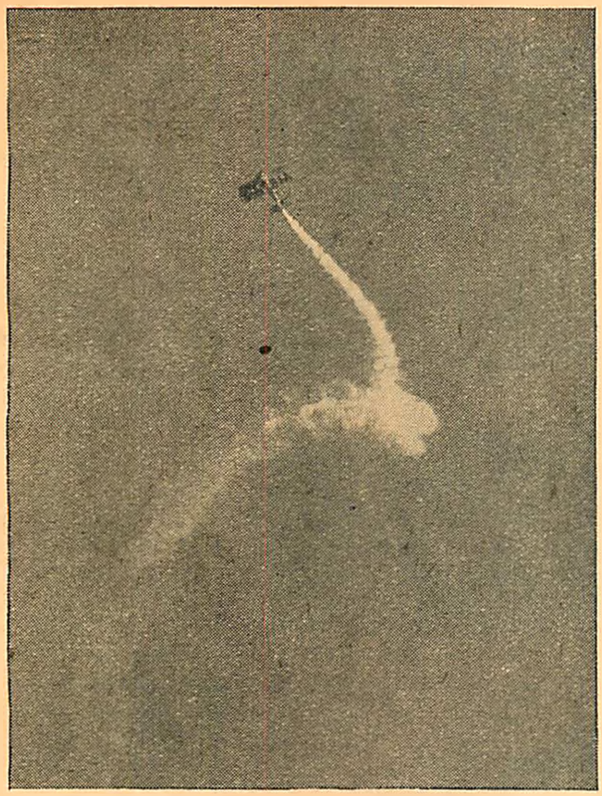
On coming into contact with the hot exhaust this "Gubbins" forms a very dense, white vapor or smoke and is emitted into the air from the exhaust pipe outlet at the tail of the plane. In a short time this stream of smoke expands into a column approximately fifty feet in diameter to form gigantic letters that can be seen for many miles.

Each second the trigger valve is open 250,000 cubic feet of smoke is generated. It requires from 7,000,000 to 8,000,000 cubic feet of smoke to form a single letter so, if you are very fond of arithmetic you may figure out how many cubic feet of smoke it would require to skywrite your name.

Skywriting is usually done at 10,000 to 12,000 feet altitude as the wind at that height is steadier, its direction less affected by the earth's heat and uneven surface and a greater number

An S.E.5 (above) testing the smoke on the take-off, and (below) off like a streak to do some smoke writing

The A. B. C. of this Amazing Art of Aerial Penmanship With Smoke



of people can see it from the ground.

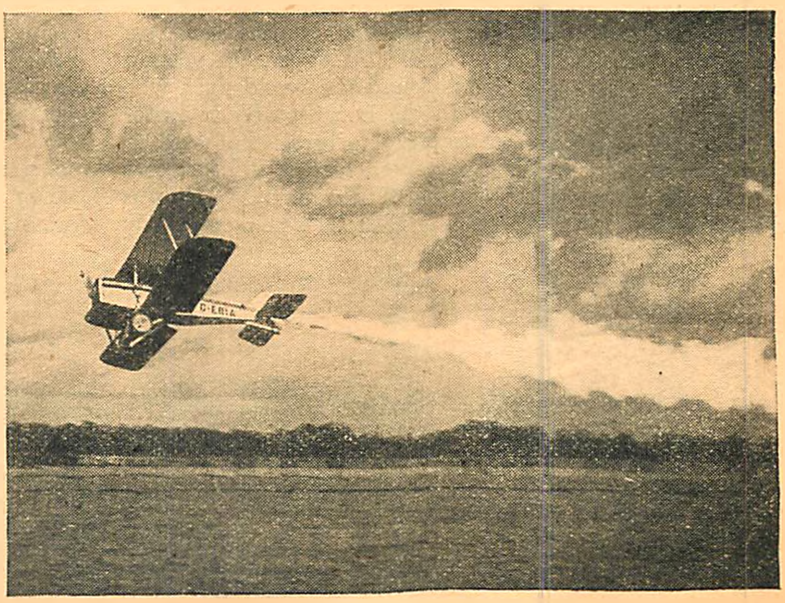
Capital letters and loops are usually made about one mile from top to bottom, small letters about a half mile. So you see, a line of seven or eight letters is about five miles long, which can easily be seen by everyone on the ground over an area of thirty square miles. A rather large sign you must admit! Can you imagine a signboard on the ground a mile high and five miles long?

MANY people think that skywriting letters are made vertical in relation to the earth. My goodness, if that could be done we should have planes that would climb straight up at the rate of 125 miles an hour. Oh, Boy! what a plane that would be.

All you would need with such a plane would be a few weeks of spare time, plenty of gas and you'd be looking for a landing field on Mars. And if you fellows have been following aviation news of rocket driven plane experiments you'll not say such a plane isn't possible.

Getting back to actualities again, I want to tell you that skywriting letters are formed flat or in a horizontal plane with the earth, the same as you'd write on a wet pavement by making a bicycle travel in the directions necessary to form a letter with the tire tracks. In fact, in the early days of skywriting, some of the pilots used to practice the backward system of writing on bicycles, using wet tires on the concrete in front of the Hendon airdrome, outside London. But, even though they made an impression on the concrete they could not do a vertical bank on a bicycle.

In skywriting, a pilot writes backwards or from right to left instead of from left to right so that those on the ground will see the word in its proper position without having to stand on their heads. To get the thing clear in your mind try this.



A Skywriting plane telling the world about it, 10,000 feet up. (Below) a side view at the take-off

Take a fairly thin piece of writing paper and print on it "T H A T." Now below it print it this way, starting with the T at the right or end and printing toward the left "T A H T." Turn the paper over so that the blank side is toward you and hold it in front of you so that the light shows through the paper, making the printing on the side away from you visible. Now what do you see? The "T A H T" looks and is correct and the first one you printed is backwards. Incidentally, we hold a patent on writing backward in the sky.

Can you imagine an experienced skywriter going up and writing backwards? Well, Pilot McMullin did and he certainly had the ears kidded off him. But he had it coming to him. When New York City was celebrating its 300th birthday with a jubilee the streets were draped with bunting, flags were flying from ever available pole and tower and up went McMullin, an Englishman, to skywrite about it.

At 10,000 feet he levelled off and started writing. Crowds in the streets below stopped to watch him and gasped. Apparently he'd gone crazy, for he was tracing the following message:

He never knew it. At least he didn't realize it when he landed afterwards at the hangar. "How'd it go?" someone there asked him, not knowing what had happened.

"All right. Air's a bit bumpy, but a nice blue sky. Guess I'll call up the boss."

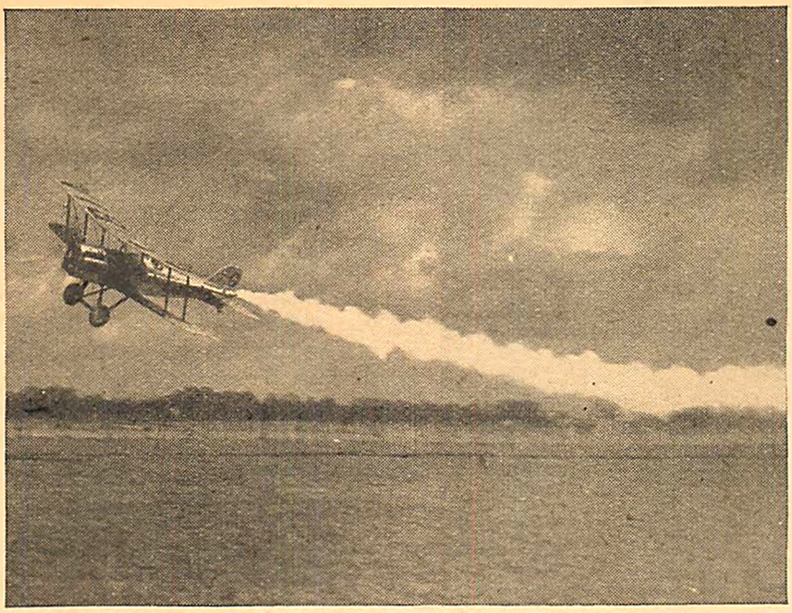
The "boss" is Allan J. Cameron, President of The Skywriting Corporation of America, which holds the skywriting patents for the U. S. A.

"Hello, 'Cam,' how did you like the show?"

No one heard what Mr. Cameron said, but the telephone receiver was making peculiar rattling noises it does when someone at the other end is talking in a very emphatic manner. McMullin came back with the reddest face you ever saw on a man. Then the story came out — and we never have let him forget it.

A successful sky-writing pilot must be an able flyer. He must at all times know almost instinctively his position and the direction in which his plane is travelling regardless of how many twists and turns he has made since starting a letter. A river, a long street or a railroad track on the ground below is used as a bearing for his base line. Or the position of the shadow of a strut or wire on the wing of the plane is used to guide him in keeping his base line straight.

No two skywriters write alike in the sky any more than they do when writing with a pen and paper. In fact, it is quite easy to stand on the ground and tell who is writing without being told his name if you are familiar with his writing.



Major Jack Savage (circle), inventor of Skywriting, and (above) another view of an S.E.5 doing things

And don't forget this. Don't make a mistake in spelling, because you have no eraser. "Collie," Capt. C. B. D. Collyer, the veteran army and air mail pilot and 'round the world flyer who crashed with Harry Tucker in the Lockheed Vega monoplane "Yankee Doodle" attempting to break the West to East transcontinental U. S. A. speed record, did just that over San Francisco while writing "Lucky Strike." He was on the fourth letter of the word Lucky when everybody on the ground began to snicker and nudge his neighbor.

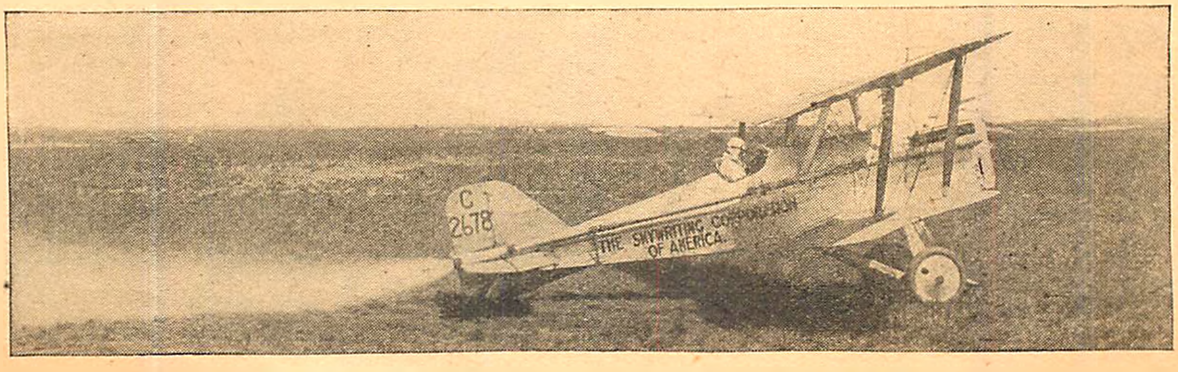
"Collie" was spelling "Lucky" with two "k's." Undismayed, he finished the word and then went back and crossed out the extra "k" with a trail of smoke. Only a few knew he had done it purposely, so the "kidding" he received from the newspapers was very good publicity.

Of course it is possible for a skywriter to miss-spell a word accidentally, but hardly likely because he has a diagram of what he is skywriting on the instrument panel before him at all times.

Skywriting is not as easy to do as it may appear to people on the ground watching it. It is quite tricky to control the smoke so that letters are formed properly with smoke streams of even diameter, of the same size and in a straight line. Many fine pilots never get the knack of controlling the smoke properly. The plane is, of course, flown in the same direction as the letters to be made are written with a pen—by manoeuvering the plane, just as we did in wartime, when the idea was to dodge enemy machine gun bullets, instead of skywriting.

All you have to do is to fly your plane in the necessary direction to form the lines of the letters you are writing, operate the mechanism that releases the smoke so that the resulting column or line is of even diameter, keep the letters straight—and write backwards.

You must also allow enough distance between each line forming a letter and each (*Continued on page* 37)



An S.E.5 Skywriting plane, showing the smoke apparatus being tested

THE LOG OF FLYING SAILOR

By
**Lt. (jg) H. B. Miller
U. S. N. A. C.**

A HUGE shape plunges its nose into the rolling swells of the Pacific. Occasionally a whitecap is to be seen as an ambitious wave overdoes itself and climbs higher than the rest, only to fall with a wasted fury of spume and foam. The sun had just risen over an horizon of red.

Aboard this onward rushing mass of steel, the U.S.S. *Saratoga*, reveille has just sounded its clear but unwelcome notes. The Boatswain's Mates pass along the hammock-swung passageways stirring up sleepy bluejackets, "Up you come, sailors!" "Bear a hand!" "Shake a leg!" "All hands!"

The compartments begin to stir with life. The narrow strips of canvas known as hammocks are rolled up tightly, secured with lashings, and stowed away for the day. The men assigned to the aircraft squadrons begin to work their way topsides to the Flight Deck.

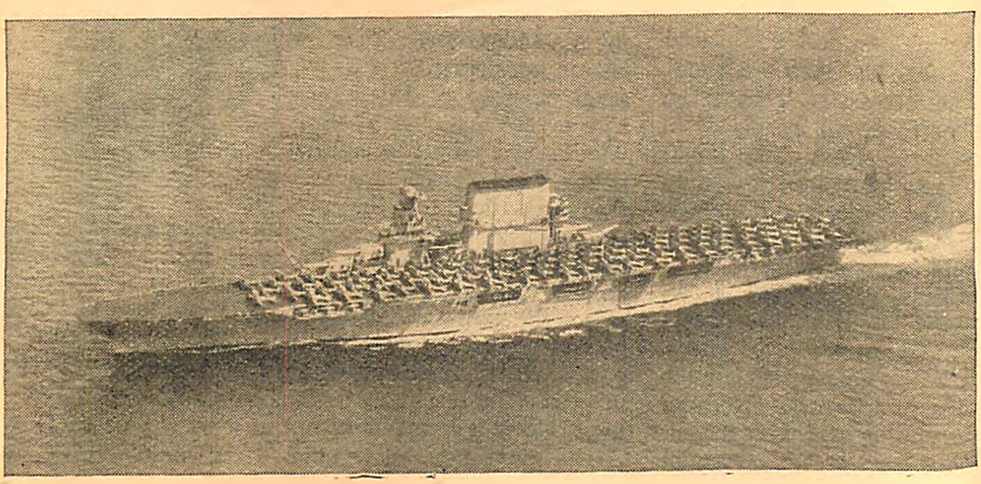
The trim little fighting planes are there just as they left them the preceding day. Heavy canvas covers house the engines and cockpits, thus keeping out the moisture which saturates everything aboard a ship at sea. If a long, rainy spell has set in, it often becomes necessary to place an electric light inside the covers in order to keep the engines dry.

Small beads of dew on the ignition leads are sufficient to cause a great deal of difficulty in starting because this water may short circuit the spark plugs and cause them to miss fire. As a precaution all plugs are generally thoroughly wiped off as the first step of starting the engines. This saves many a weary cranking of a balky, cold power plant.

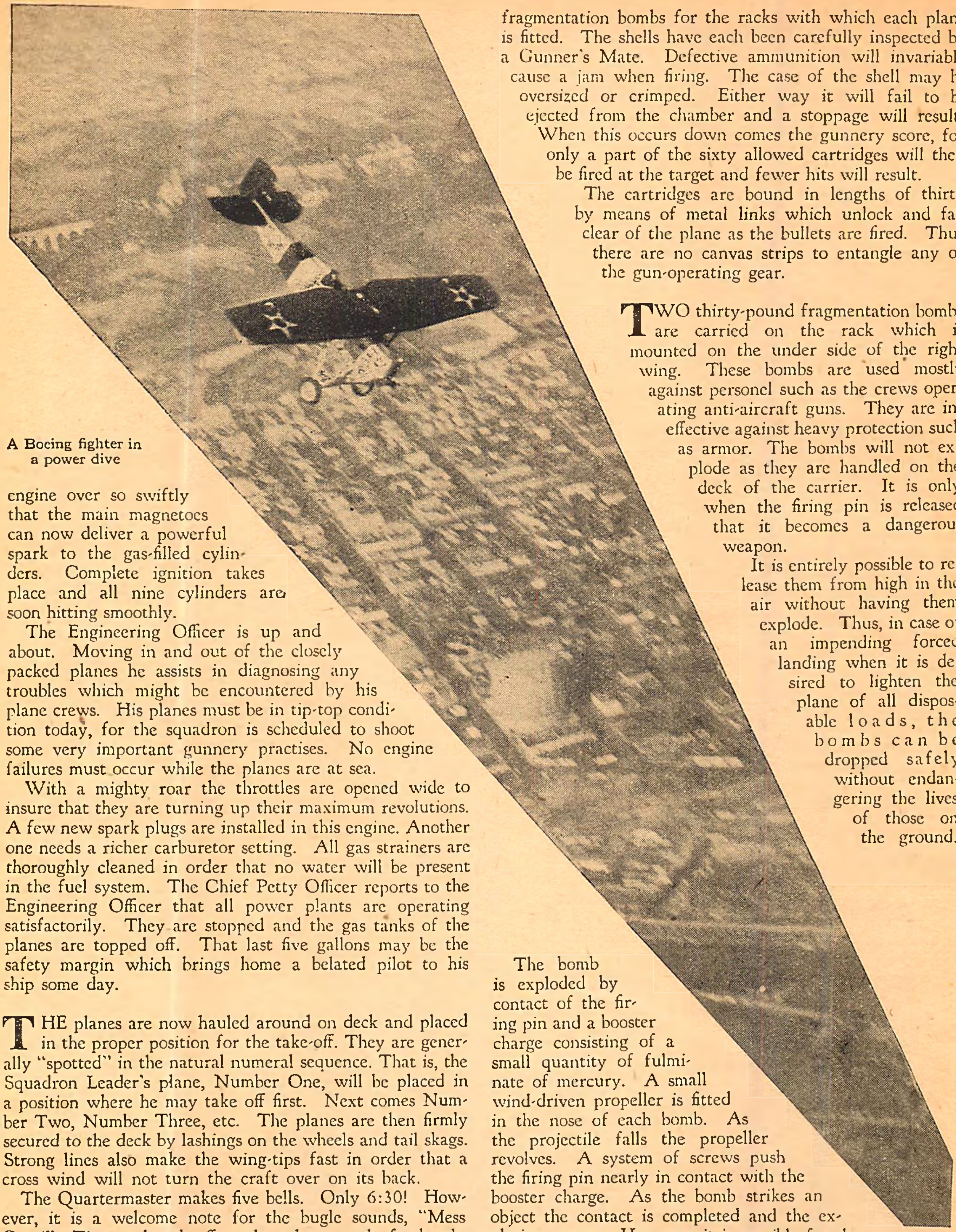
A mechanic climbs into each cockpit where he sets the fuel valves, throttle, and spark advance levers. A few strokes with the priming pump and he has injected a charge of raw gasoline into the three top cylinders of the air-cooled Wasp. A second sailor breaks out the cranking handle and begins to turn over the inertia starter.

After a cold night the lubricating oil has become stiff and sluggish. It lends resistance to the natural inertia of the starter. As a result it takes considerable strength to turn over the crank. At last it is whining and whirling at a terrific rate of speed and the starting clutch is engaged with the engine.

Sufficient energy has been stored up in this revolving four-pound weight to turn the large power plant over rapidly several times. With luck it will start at the first cranking. With a poofh and a bang, one cylinder fires as if in protest. This kicks the



Above—Nine "eyes" of the fleet in formation flying above the mother ship, *U. S. S. Saratoga*



A Boeing fighter in a power dive

engine over so swiftly that the main magnetoes can now deliver a powerful spark to the gas-filled cylinders. Complete ignition takes place and all nine cylinders are soon hitting smoothly.

The Engineering Officer is up and about. Moving in and out of the closely packed planes he assists in diagnosing any troubles which might be encountered by his plane crews. His planes must be in tip-top condition today, for the squadron is scheduled to shoot some very important gunnery practises. No engine failures must occur while the planes are at sea.

With a mighty roar the throttles are opened wide to insure that they are turning up their maximum revolutions. A few new spark plugs are installed in this engine. Another one needs a richer carburetor setting. All gas strainers are thoroughly cleaned in order that no water will be present in the fuel system. The Chief Petty Officer reports to the Engineering Officer that all power plants are operating satisfactorily. They are stopped and the gas tanks of the planes are topped off. That last five gallons may be the safety margin which brings home a belated pilot to his ship some day.

THE planes are now hauled around on deck and placed in the proper position for the take-off. They are generally "spotted" in the natural numeral sequence. That is, the Squadron Leader's plane, Number One, will be placed in a position where he may take off first. Next comes Number Two, Number Three, etc. The planes are then firmly secured to the deck by lashings on the wheels and tail skags. Strong lines also make the wing-tips fast in order that a cross wind will not turn the craft over on its back.

The Quartermaster makes five bells. Only 6:30! However, it is a welcome note for the bugle sounds, "Mess Gear!" Time to knock off work and get ready for breakfast. After the morning's work in the bracing salt air the men are equipped with most capable appetites. Nothing can satisfy this better than a dish running over with golden, brown beans banked with delicious corn bread. Over all this a rich layer of tomato catsup more commonly known in the Navy as "red eye."

Then back to work on the planes. The Gunner's gang is busy issuing ammunition for the machine guns and fragmentation bombs for the racks with which each plane is fitted. The shells have each been carefully inspected by a Gunner's Mate. Defective ammunition will invariably cause a jam when firing. The case of the shell may be oversized or crimped. Either way it will fail to be ejected from the chamber and a stoppage will result. When this occurs down comes the gunnery score, for only a part of the sixty allowed cartridges will then be fired at the target and fewer hits will result.

The cartridges are bound in lengths of thirty by means of metal links which unlock and fall clear of the plane as the bullets are fired. Thus there are no canvas strips to entangle any of the gun-operating gear.

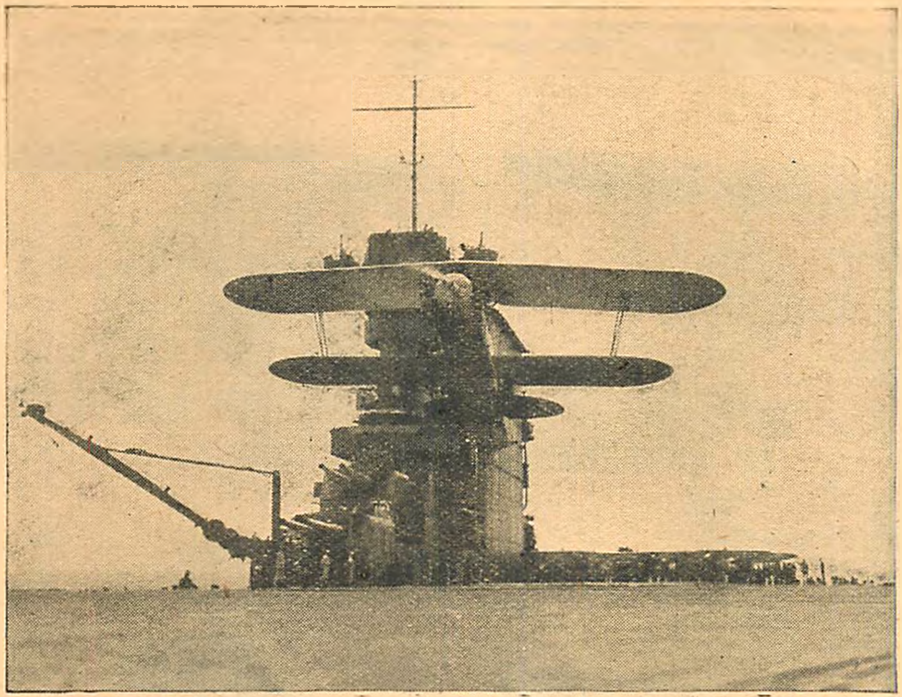
TWO thirty-pound fragmentation bombs are carried on the rack which is mounted on the under side of the right wing. These bombs are used mostly against personel such as the crews operating anti-aircraft guns. They are ineffective against heavy protection such as armor. The bombs will not explode as they are handled on the deck of the carrier. It is only when the firing pin is released that it becomes a dangerous weapon.

It is entirely possible to release them from high in the air without having them explode. Thus, in case of an impending forced landing when it is desired to lighten the plane of all disposable loads, the bombs can be dropped safely without endangering the lives of those on the ground.

The bomb is exploded by contact of the firing pin and a booster charge consisting of a small quantity of fulminate of mercury. A small wind-driven propeller is fitted in the nose of each bomb. As the projectile falls the propeller revolves. A system of screws push the firing pin nearly in contact with the booster charge. As the bomb strikes an object the contact is completed and the explosion occurs. However, it is possible for the pilot to release the bomb with the propeller locked in place. In this case, the bomb is unable to arm itself and it is harmless except as a falling weight.

The pilots now come upon deck, warmly dressed as a protection against the intense cold of the higher altitudes. Warm leather jackets serve as wind-breakers while silken scarfs keep the wind from slipping down their backs. Goggles are wiped dry and clean. No oil spot is to be permitted to blurr their visions during their terrific dives on the target.

They go carefully over their planes, inspecting each fitting no matter how small. The control wires must have no broken strands. Are the control surface hinge pins in place and secured with safety wire? Does the control stick move freely and easily? The tires must be pumped up evenly in order to prevent a possible ground-loop during a landing. Is the cowling all secured in place?



A remarkable view (above) of a fighter leaving the deck of the *Saratoga*
Navy fighters lined up on the tarmac for inspection (below)

A bugle sounds out loud and clear. Bong, bong, bong go the alarm bells! Flight Quarters! Operations are about to begin. All pilots hurry to the "Ready Room" for a conference and last minute instructions. The Commanding Officer reads and explains the operations order which is to control their movements for the day. Each pilot must understand clearly just what is to be done, its timing, and its sequence.

The order, "Man your planes" comes down from the bridge. The pilots pull tight their helmets, draw on their gloves and head for the door. Reaching it, they carefully set their course through the maze of wings and engines that crowd the flight deck. Climbing into their planes they adjust their parachutes. These must be snug, for if a jump is made with a loose parachute, it is liable to bruise the wearer.

A throbbing and roaring noise sounds throughout the mighty vessel as the powerful engines are tuned up and tested. Each pilot runs his engine on both the main and reserve tanks to make sure no obstruction exists in the fuel lines. The lubricating oil is brought up to a safe operating temperature. All eighteen planes are now ready to take the air.

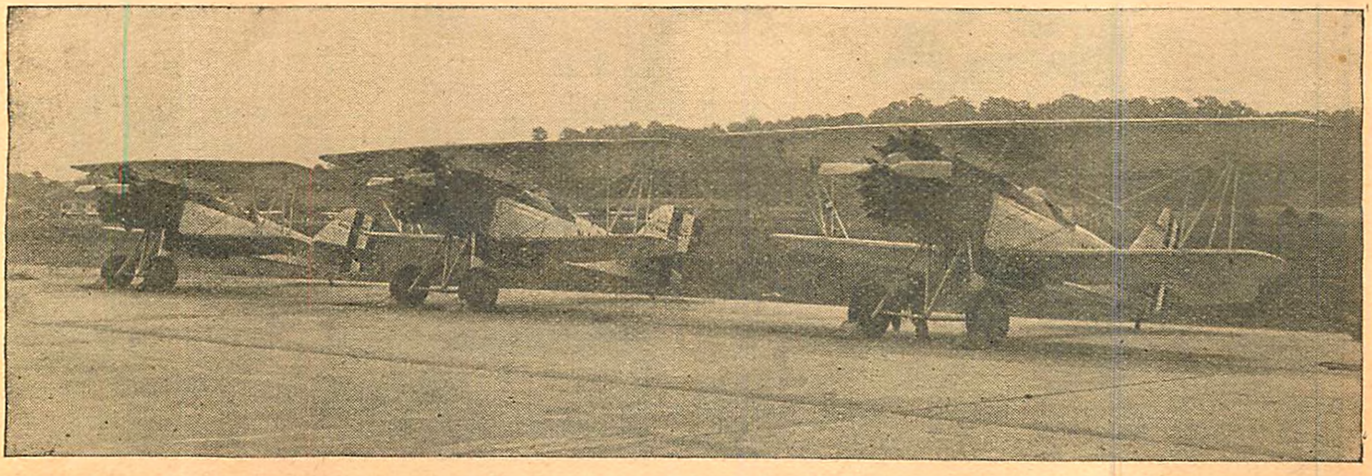
The carrier is swung around and headed into the wind. This added airspeed aids in lifting the heavily-burdened planes once they are released. The whistle and siren blows. All set. The chocks are removed from the wheels of the first plane in line. The Squadron Leader nods his readiness and the men on each wing turn loose. Opening wide his throttle and holding his control stick forward, his plane quickly lifts its tail clear and begins to roll down the long deck.

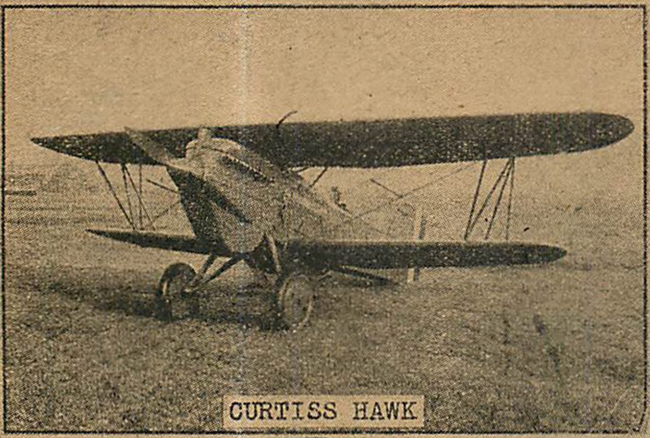
He now throttles down in order that he will not lift off the deck too far aft of the bow. Otherwise a cross-current of air might sweep him into the forward turrets on the starboard side of the ship. Rapidly gaining speed, the plane is now rolling swiftly forward on its wheels. The throttle is opened wider, the wheels lift clear of the deck. Air-borne at last, the plane is in its native element where there is room to maneuver.

ONE by one these fighting cocks lift up their tails and with a roar roll swiftly down the deck. On clearing the bow they mount quickly to the appointed rendezvous where the leader is awaiting them. As each plane reaches the prearranged locality he falls into his proper position in the formation.

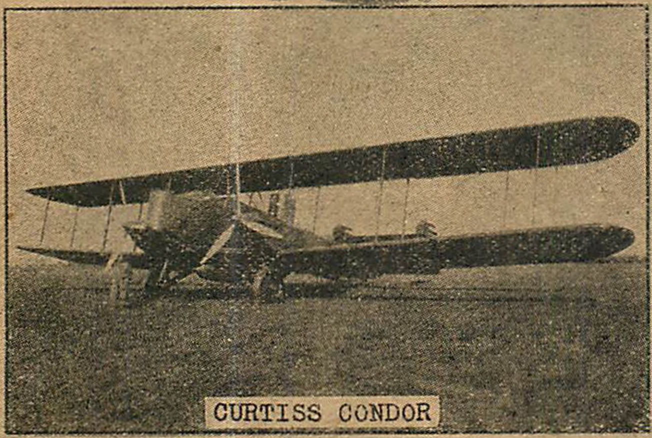
The target towing planes now leave the deck with their six-hundred feet tow-line. At the end of this is a strongly-sewn cloth sleeve twelve feet long. The width at the leading edge is four feet. It gradually tapers smaller to the trailing edge. A metal ring holds the front diameter open. The wind passing through keeps it inflated and full-blown. The projected area of this target simulates the critical area of an enemy plane. That is, the space occupied by the pilot, gas tank, and engine. A towing plane and target is provided for every six ships of the firing squadron.

Climbing, climbing, climbing. Ten thousand, fifteen thousand feet. Slower now (*Continued on page 45*)



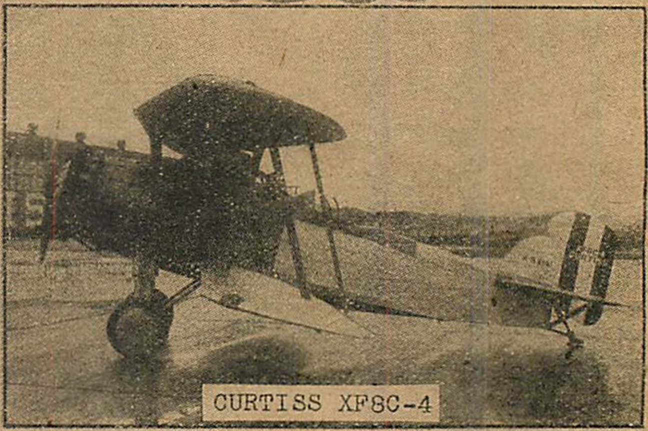

CURTISS HAWK


CURTISS FALCON

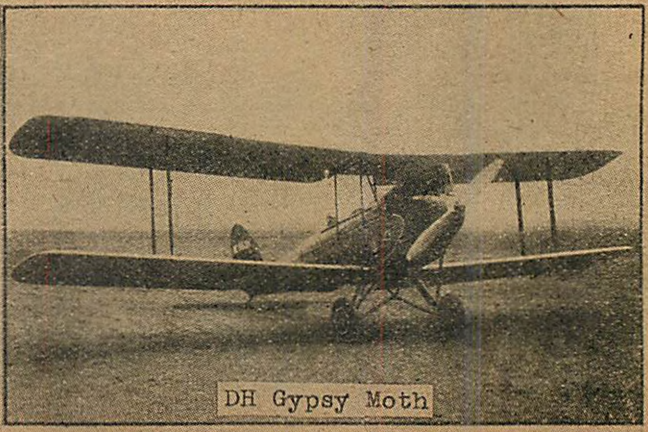

CURTISS CONDOR


KEYSTONE BOMBER


KEYSTONE TRAINER


CURTISS XF8C-4


CURTISS TANAGER


DH Gypsy Moth

How to Build

A Convertible Mono-Biplane

By Prof. T. N. de Bobrovsky

GATHER round, you model builders, for here is a novelty to gladden the hearts of all aviation enthusiasts—a peach of a flying model that can be used as a high-wing monoplane, or a low-wing monoplane, or a biplane.

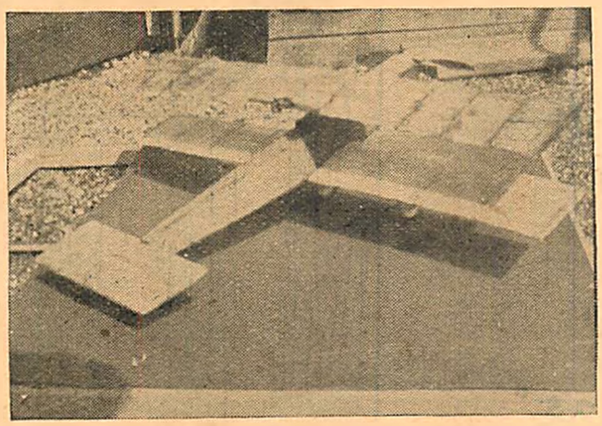
In general this model somewhat resembles the Belgian R. S. V. training plane.

From your work on this model you will be able to learn much about the different flying qualities of the various types of planes embodied in the one model. It is easy to construct and at the same time inexpensive.

Now, as an additional surprise, a parachute device for experiments is incorporated in the model. A little careful study and manipulation will enable you to release the parachute at varying heights in turns, spins, etc.

Another feature to be noticed is that it is equipped with neither fin nor rudder. If one were to build an actual plane of this type the front fin and rudder could be replaced by some patented rudder placed on the wings. If this could be worked out it would be an excellent thing for military purposes, giving, as it would, an unobstructed view over the tail for gunnery purposes. Now, as regards the type of parachute being used, the idea is to eliminate the necessity of jumping out of the plane and of risking one's life, as would be the case in a low jump.

The type of parachute you will build for this model makes it possible to jump very near to the ground. By use of the unlocking device, the parachute comes in a position by which the airflow caused by the propeller and the momentum in general opens it. The pilot is then gently lifted from the cockpit. The resistance of the parachute in question is such as to enable the pilot to leave his plane at about 100 feet above the ground.

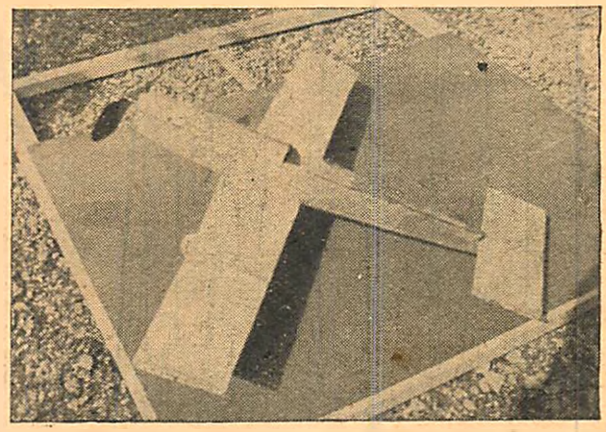


You will be amazed at the simplicity of construction of this model, and particularly in the differences of the methods used in America, and the European methods, which have been adopted—as for instance, the fuselage. It does not contain a motor-stick, but holds the rubber itself—a European idea. Both are equal in weight, nevertheless the European method has two advantages over the American. First, the model is stronger and does not alter its shape, and secondly, the model flies a straight course invariably, which is not assured by the easily moved motor-sticks as in the American types. The motor can be changed or wound up just as easily as in the ordinary type.

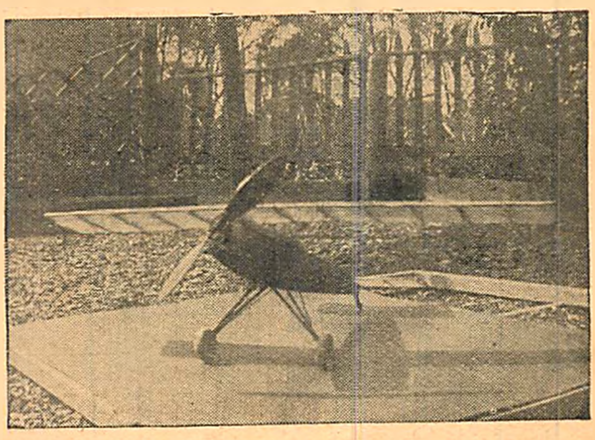
If the rubber breaks, do not be afraid that it will damage the model, as would be the case in an ordinary paper-covered and motor-stick mounted fuselage.

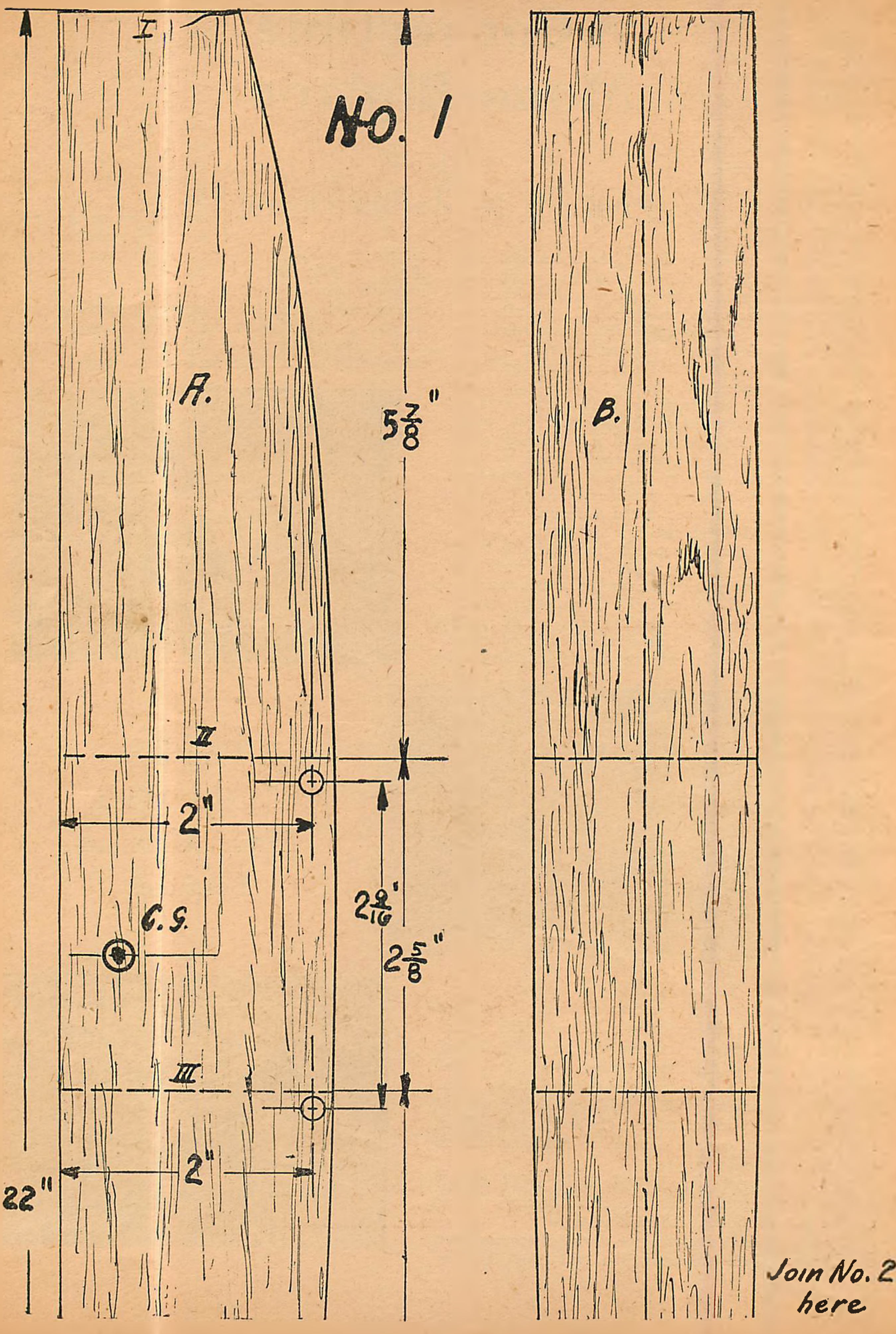
Drawings 1 and 2 show the side A and the bottom B of the fuselage. These are made from 1/32" thick, hard or medium balsa. Make two sides A and cut two holes of 3/16" diameter near the bulkheads II and III, as shown in the drawing.

The lower wings are attached by two tubes, shown in drawing 6; these are indicated by the number 16. These tubes are to be fastened in the two holes mentioned in the preceding paragraph. Make two tubes. Only one piece (B) is needed for the bottom of the fuselage. Near bulkhead 5 cut out No. 1, as shown, and from 1/32" balsa cut 2 pieces of No. 2, and fix them in the space cut out. Do not throw away the piece cut out from No. 1, as it is through the opening in No. 1 we fix or change the rubber motor, and the piece cut out fits as a cover. It is advisable to fix this cover in place by means of little threads of paper which can be easily torn off when necessary to change the rubber.

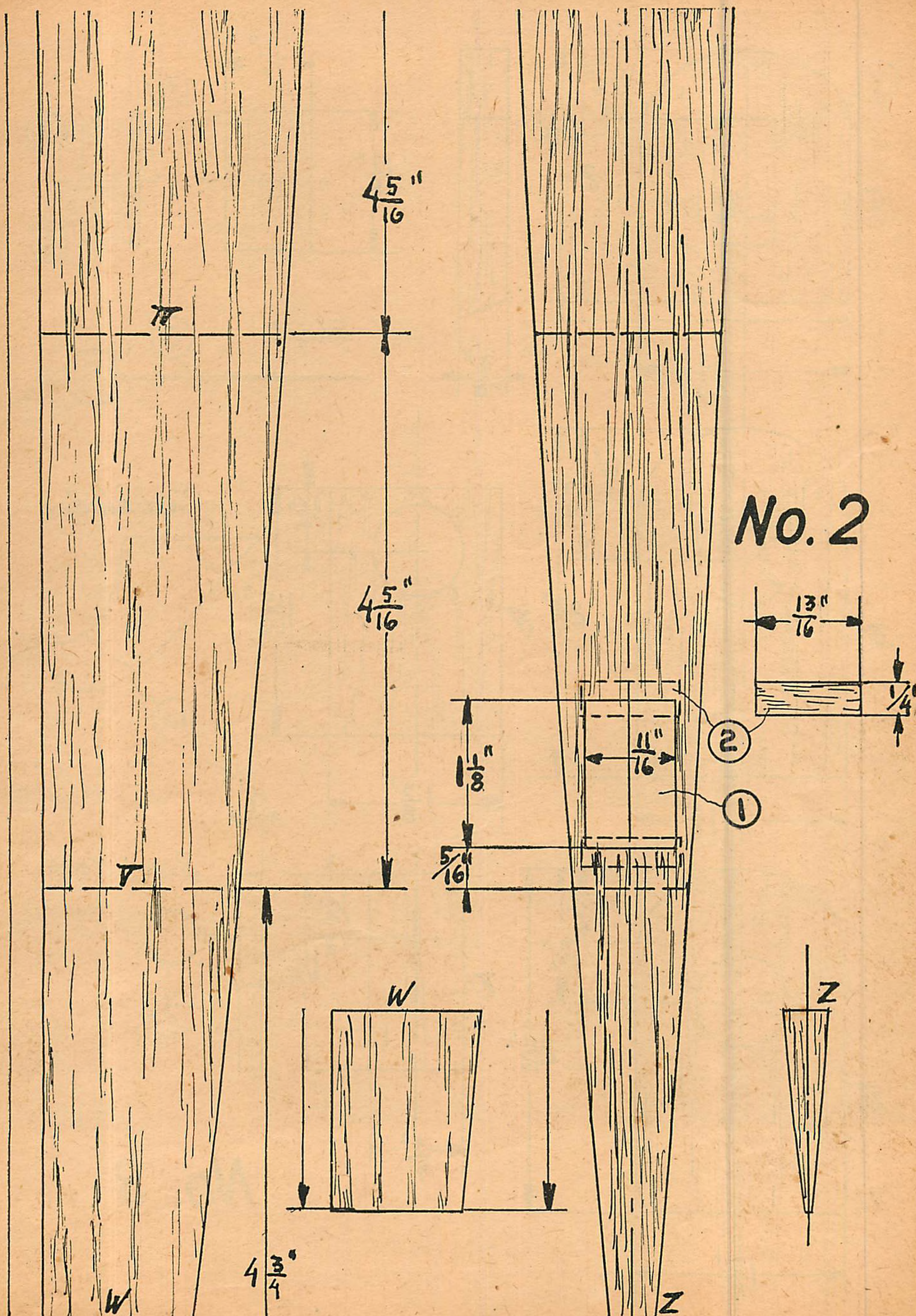


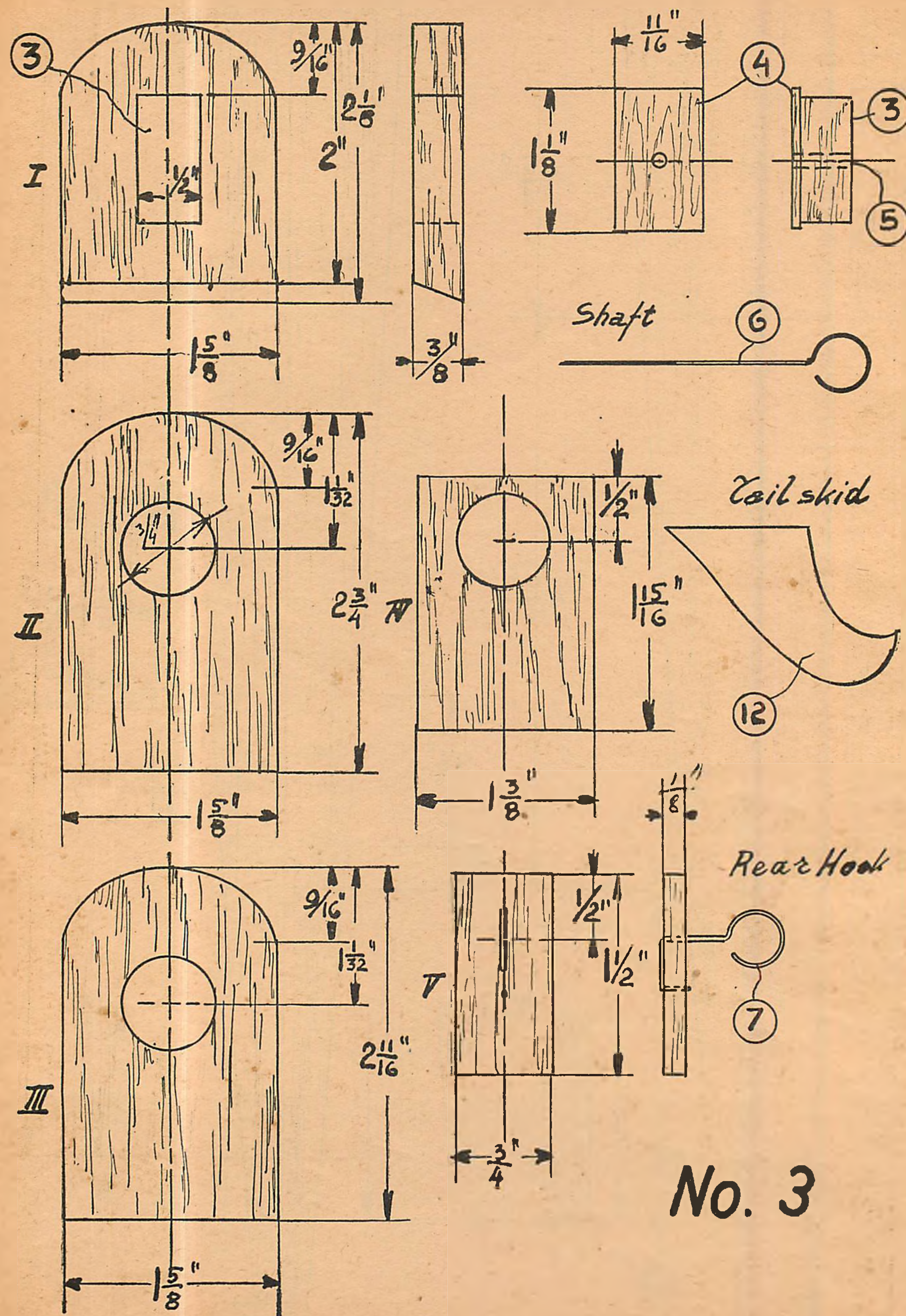
A Cantilever Model With Many Unusual Features



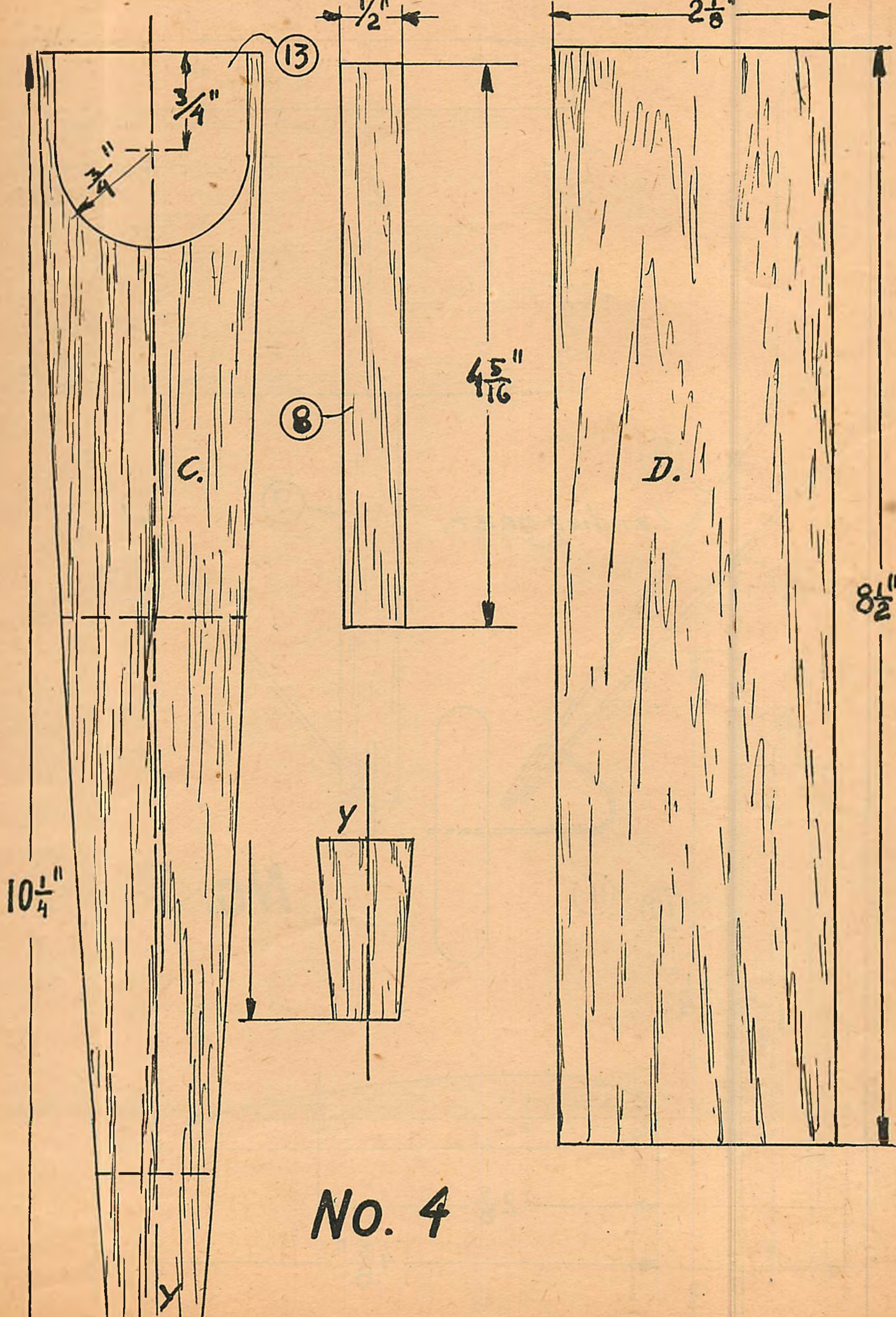


No. 1
I
A.
5 7/8"
B.
II
2"
C.G.
2 9/16"
2 5/8"
III
2"
22"
Join No. 2 here

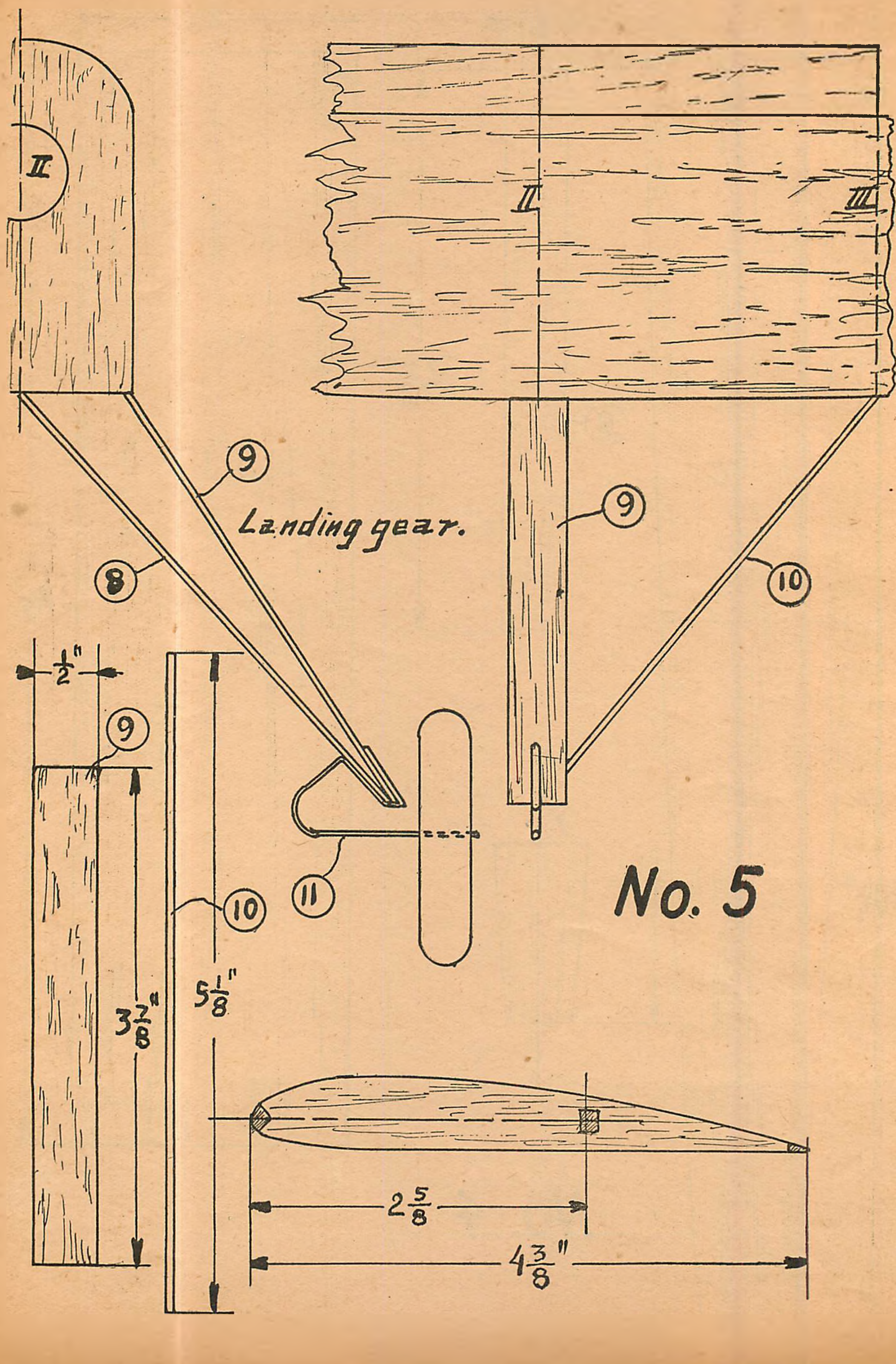

No. 2
4 5/16"
4 5/16"
4 3/4"
1 1/8"
5/16"
11/16"
13/16"
1/4"
W
Z
W
Z
1
2

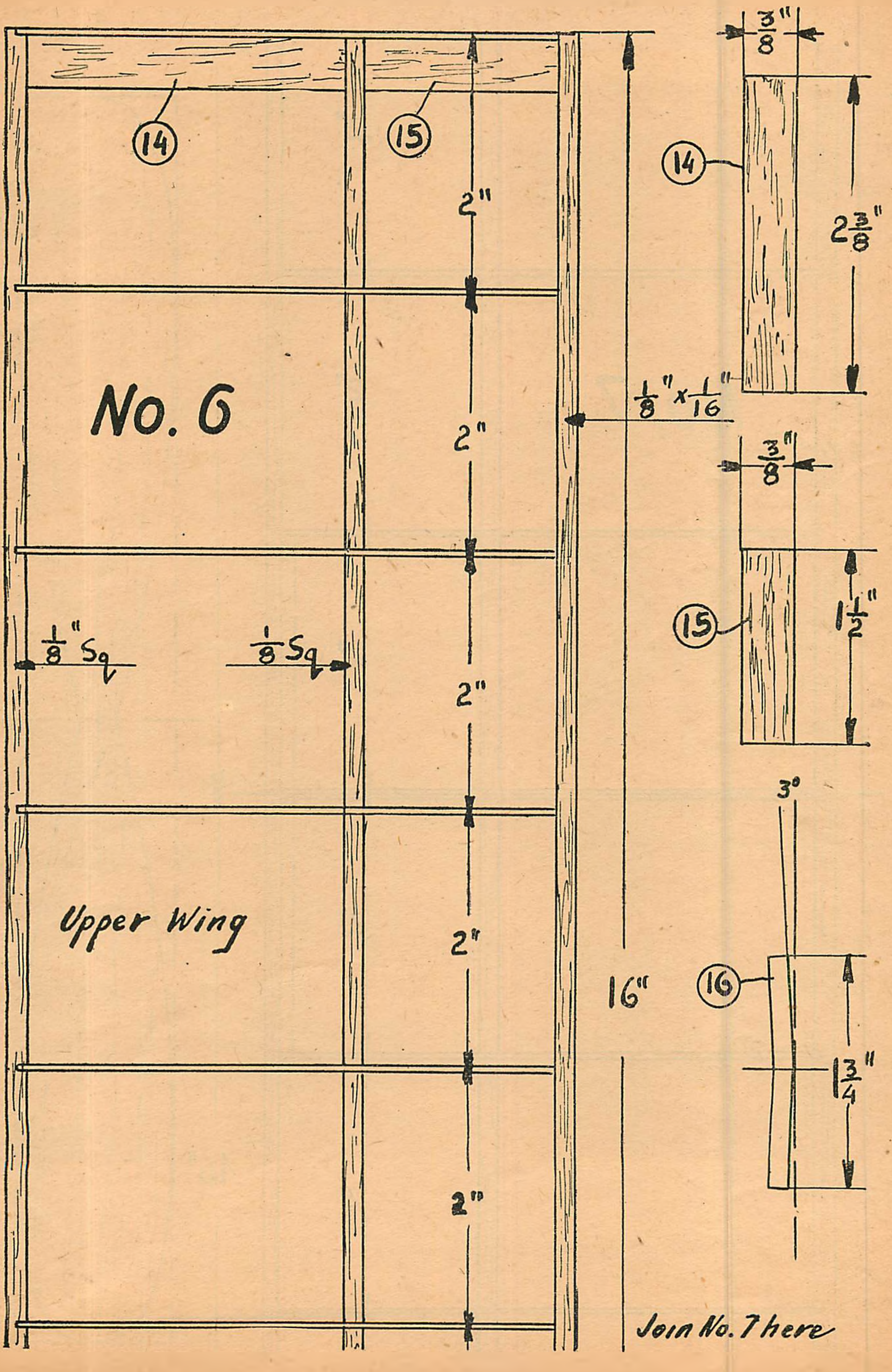

I
II
III
IV
V
3
4
5
6
7
12
9/16"
2 1/8"
2"
1/2"
1 5/8"
3/8"
11/16"
1 1/8"
Shaft
1 1/32"
3/4"
2 3/4"
1/2"
1 15/16"
Tail skid
1 3/8"
1/8"
Rear Hook
1 1/2"
2 11/16"
3/4"

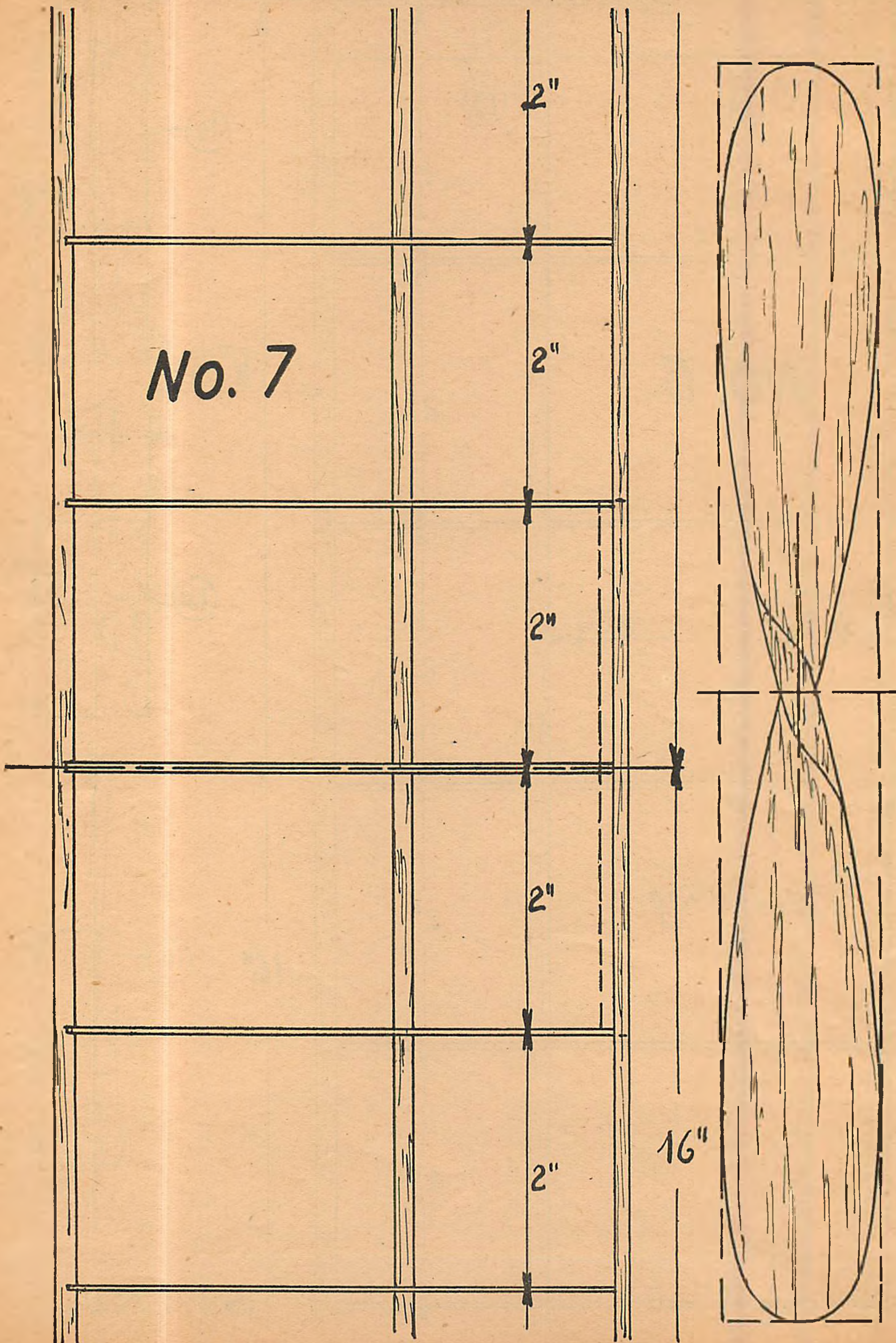
No. 3

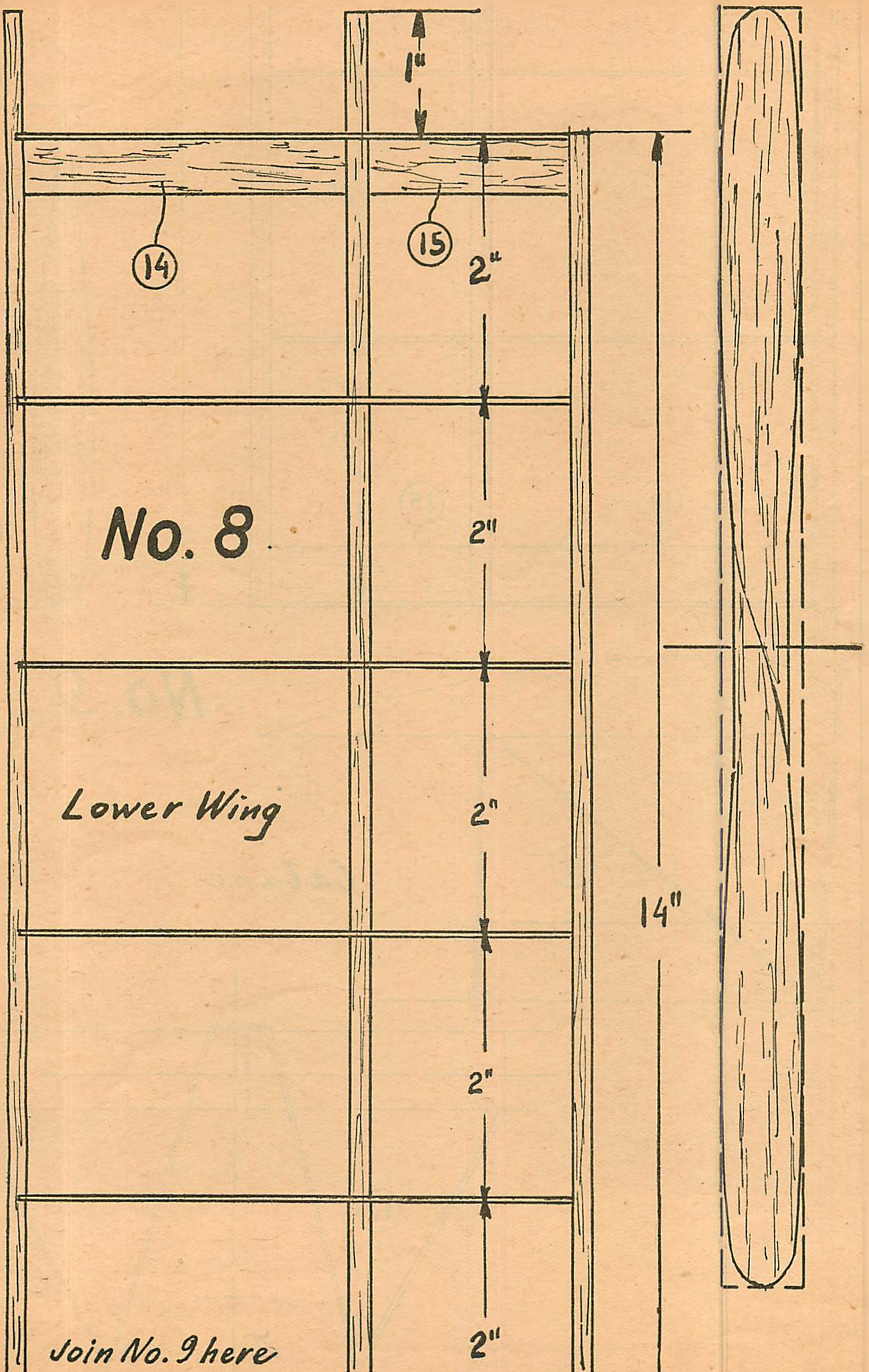


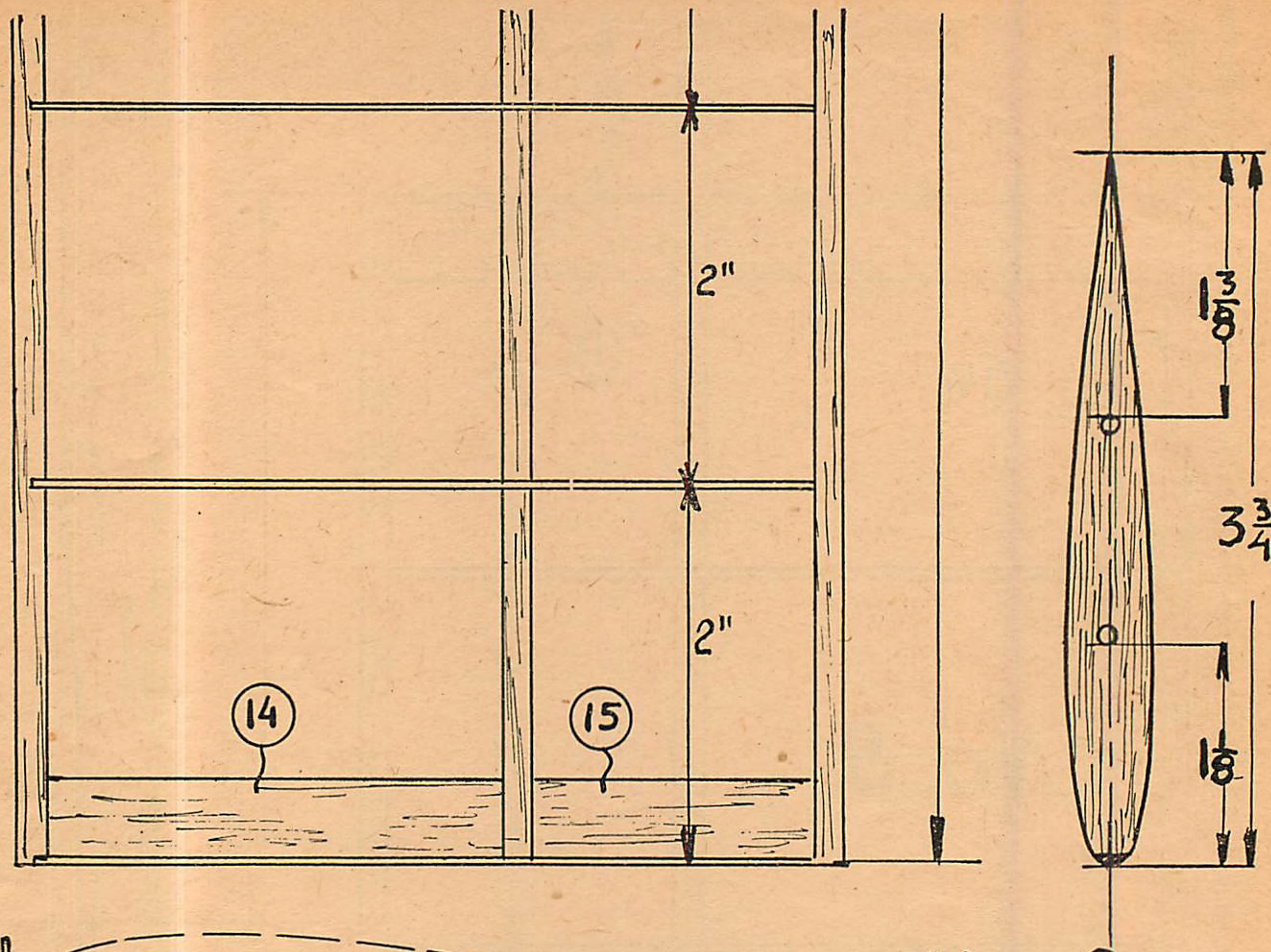
NO. 4


II
II
III
9
Landing gear.
9
8
10
1/2"
9
11
10
No. 5
3 2/8"
5 1/8"
2 5/8
4 3/8"

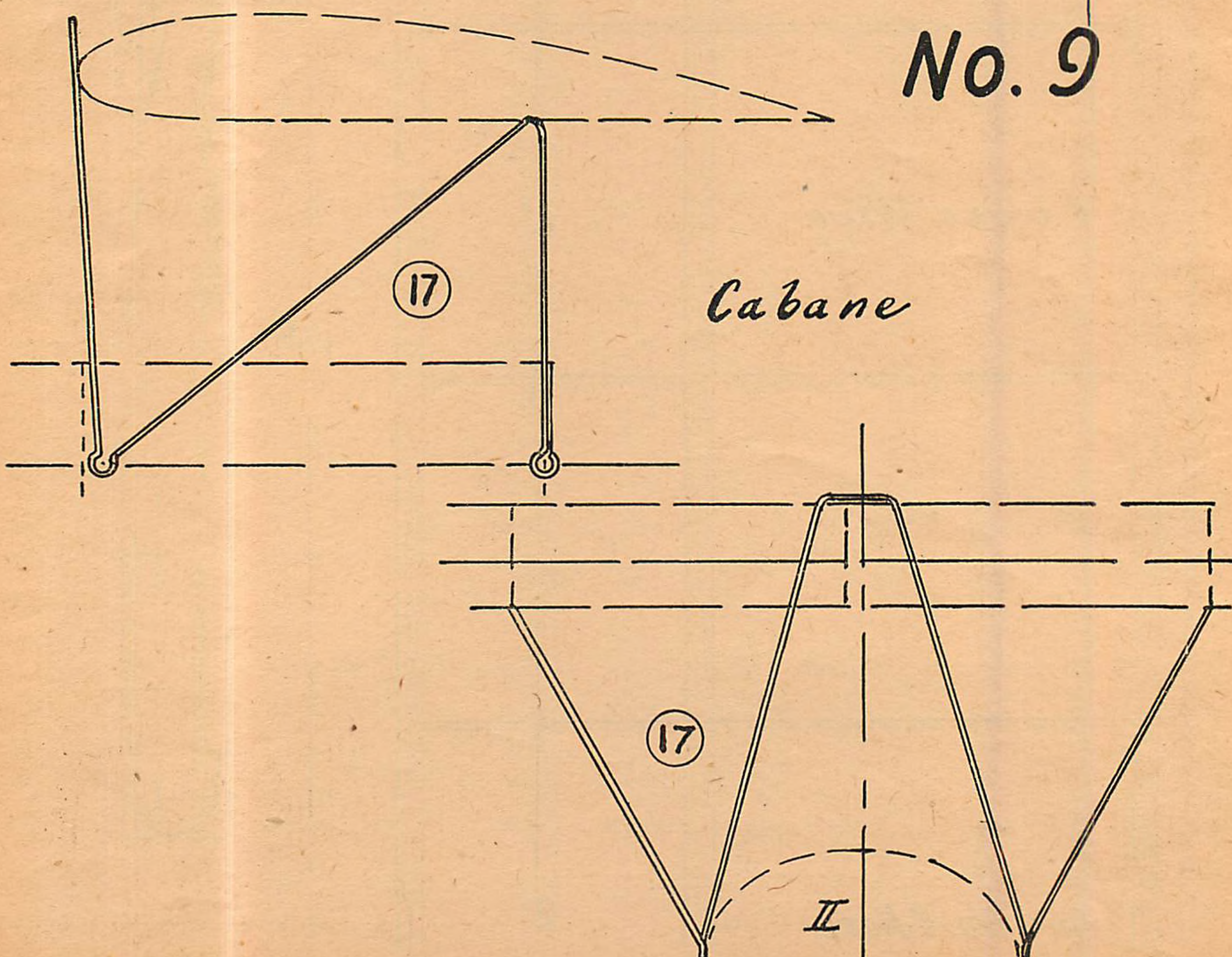

14
15
2"
No. 6
2"
1/8" Sq
1/8 Sq
2"
Upper Wing
2"
2"
16"
1/8" x 1/16"
3/8"
14
2 3/8"
3/8"
15
1 1/2"
3°
16
1 3/4"
Join No. 7 here


No. 7
2"
2"
2"
2"
2"
16"

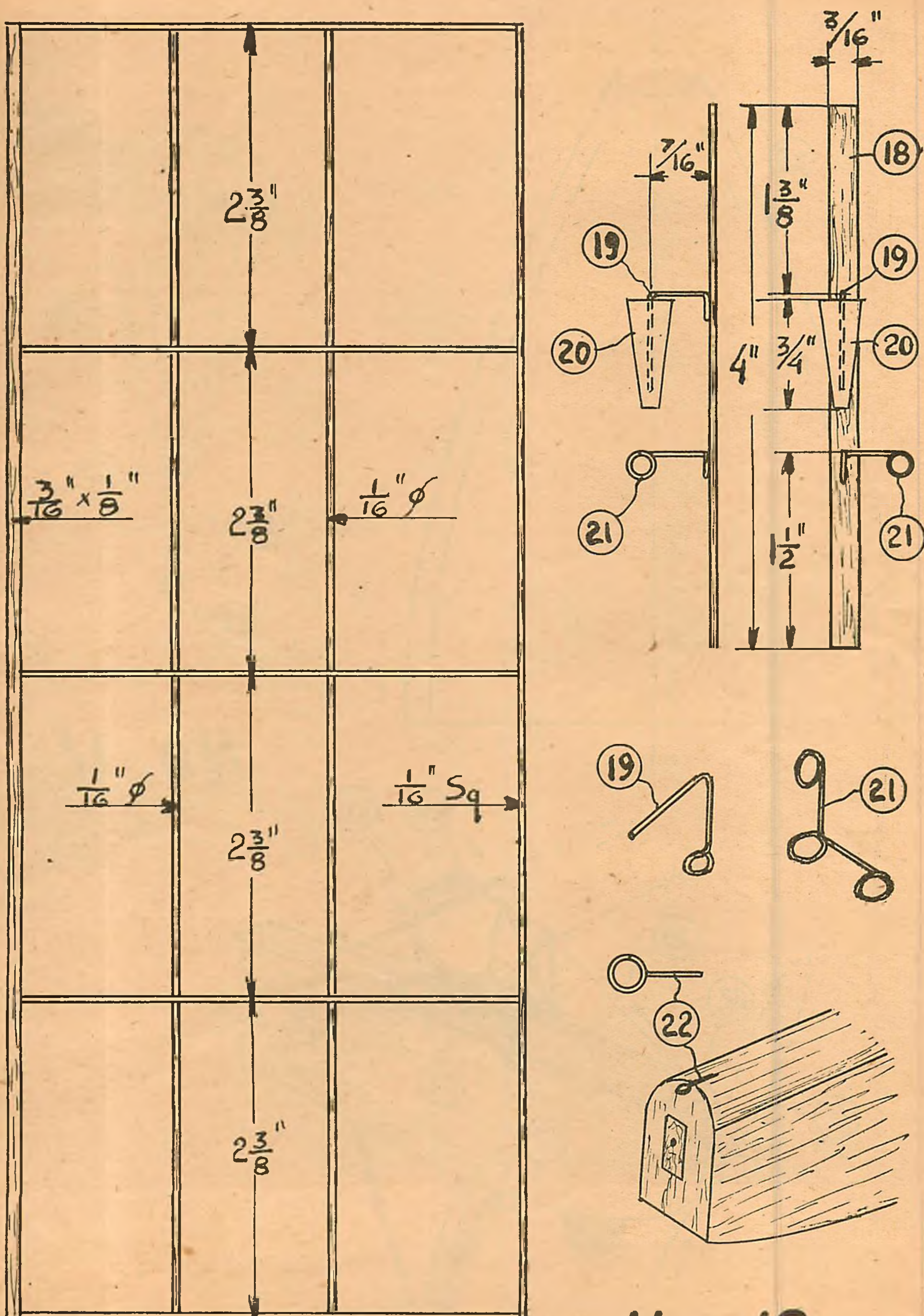

1"
14
15
2"
No. 8
2"
Lower Wing
2"
14"
2"
Join No. 9 here
2"



No. 9

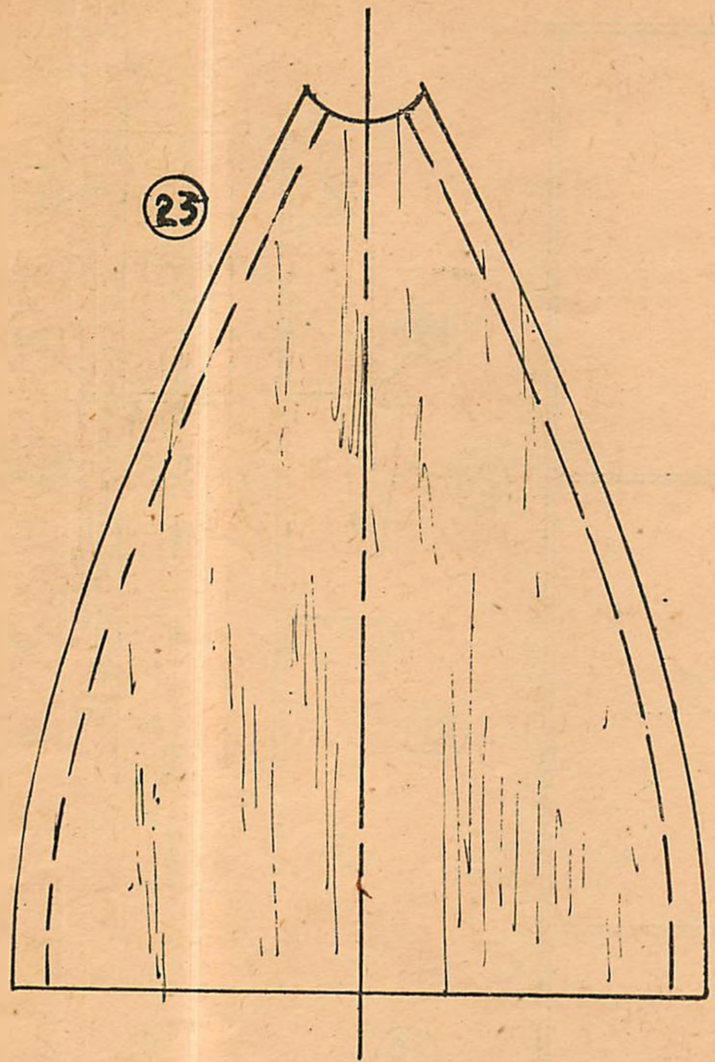


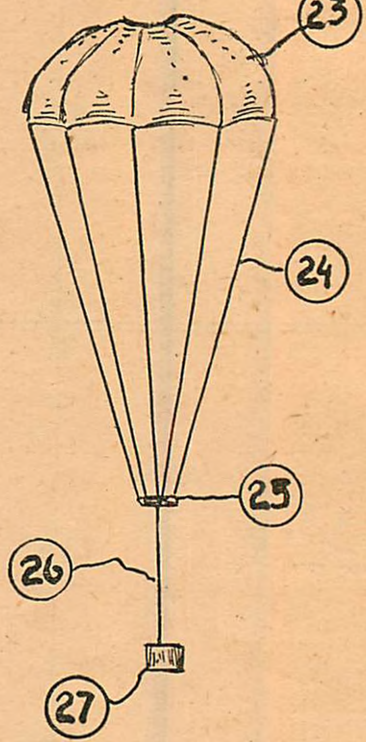
Cabane



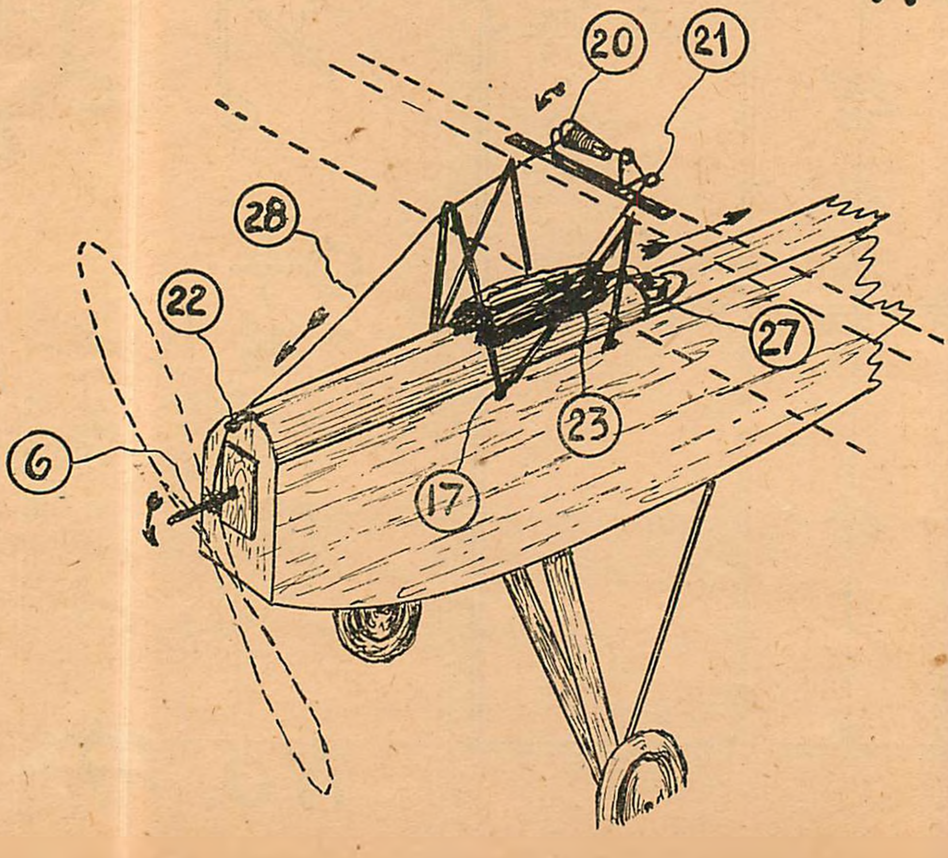
2 3/8"
3/16" x 1/8"
2 3/8"
1/16" ϕ
1/16" ϕ
1/16" Sq
2 3/8"
2 3/8"
3/16"
7/16"
18
1 3/8"
19
19
20
20
4"
3/4"
21
21
1 1/2"
19
21
22

No. 10





No. 11

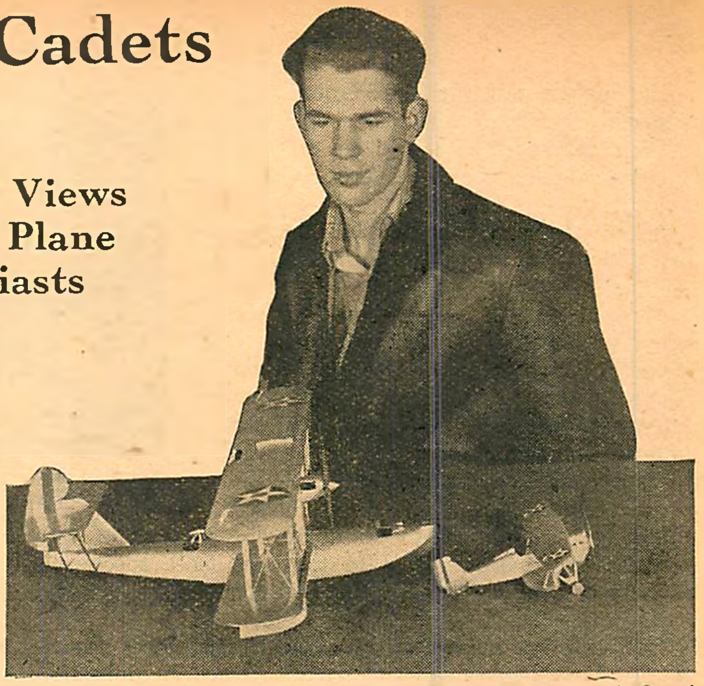


The American Sky Cadets

News and Views of Model Plane Enthusiasts

THE Junior High School Aviation Club of the American Sky Cadets at Summit, N. J., has, under the leadership of Mr. Furth, Manuel Training instructor, obtained a strong position among the activities of the school.

Classes of instruction in model building and aviation are held twice a week immediately after school hours. Many excellent models have been built by members and great keenness has been shown by the boys during the course of instruction. The scrap books have assumed large proportions and there are few cases where the boys are unable to name the type of plane shown on a photograph.



Othello Dickert and his scale models of a Boeing Navy flying boat and a Boeing single-seater fighter

Mr. Furth has inaugurated a series of discussions on famous flights. These discussions go below the surface, seek out not the spectacular part of an expedition, but the reasons for it. Those expeditions which have been successful owe their success in very small measure to luck, and mostly to careful preparation, courage in overcoming difficulties, keen work by the members whether there be two or twenty and the will to succeed in an undertaking which must have for its purpose a definite object for good. This object may be purely scientific, the advancement of aviation, relief of suffering or exploration.

Admiral Byrd's South Pole Expedition was one of the finest examples of such success. His work has been thoroughly analysed and studied by the Summit club members.

The system used by Mr. Furth might, with advantage, be studied by other clubs, especially those in schools which are using aviation as part of their activities. They realize that this study is not merely a game, but possesses great educational advantages if organized and run on lines similar to those in use at Summit Junior High.

Members of American Sky Cadets club at Y.M.C.A., Jersey City, N. J.

The new course has now started and Summit boys are all out to be winners in some of the contests scheduled to take place during the year. In any case there is no doubt that apart from contests the members of this club will derive the greatest benefit from an educational point of view.

Jersey City Y. M. C. A.

THE model airplane club of the Y. M. C. A. in Jersey City has been active since 1925. Each year the club has held a model airplane contest and exhibit of models, which always attracts considerable attention.

In 1930 this club, under the dirtction of Mr. Ledlie, was affiliated with the American Sky Cadets and shortly after some of the members successfully took part in the State contest held in Elizabeth.

Later in the year a contest and exhibit were held in the gymnasium, at which some excellent models were flown and exhibited. The 1931 session of the club has recently started, with more than thirty members, under the leadership of W. L. Espenchied and Arthur Davis.

As the conduct of the club will be in the hands of men who are themselves aviators and expert model builders, members are looking forward to a year of special interest.

Contests will be held and visits made to airports and aeroplane factories. Efforts also are being made to persuade some well known aviators to address the club.

Elizabeth Model Club

ORGANIZED three years ago by Mr. Irving Levy, of Levy Bros., the Elizabeth, N. J., model airplane club has a limited membership of twenty. Competition to join the club is keen, particularly as the members enjoy special privileges, and have a high standing among the model builders in New Jersey.

Meetings are held each Saturday at the Elizabeth Armory when planes are tested and new designs are discussed. Members have built an autogiro and some success has been obtained with the Rotor type of model. After each meeting members visit the Newark Metropolitan Airport and study the different types of planes to be found there.

The club has a large library of aviation books and magazines for the use of its members.

Membership is divided into three grades, as follows:

Upon joining, a member becomes a cadet.

A pilot's wings are obtained after passing various tests in aerodynamics and successfully building and flying certain types of models.

The highest test for "Ace" necessitates passing further tests.

The club emblem is a gold pin on which is engraved the names of the club and sponsor.

Within the past year the club has more than doubled its flying records, which now stand as follows:

Indoor endurance	4 min.	40 secs.
Indoor commercial	2 min.	32 secs.
Indoor R. O. G.	2 min.	34 secs.
Indoor glider		15 secs.
Outdoor endurance	17 min.	20 secs.
Outdoor commercial	2 min.	5 secs.
Outdoor hand launched glider		39 secs.

Garfield Edwards, Wheeling, W. Va. and one of his planes

Each year, in order to stimulate the interest of the members, Levy Bros., offer to the two most successful members a free trip to the National Contest at Detroit.

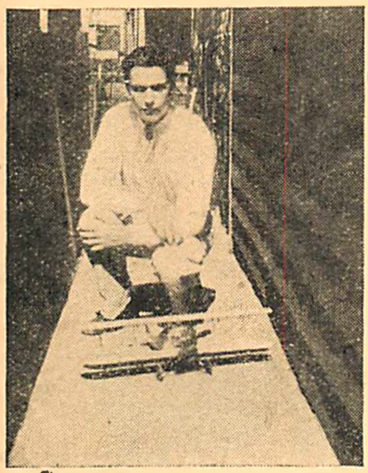
THE club has at various times challenged other model clubs in New Jersey and so far retains an unbeaten record.

The present officers are: president, Henry C. Runkel; vice-president, Henry Cox and secretary-treasurer, Welcome Bender, Jr.

A. S. C. HEADQUARTERS, NEW YORK

Well, there's another surprise in store for the American Cadets in New York and adjacent territory, and that is that by the time you read this, our headquarters group will have been formed in the Aviation Department at Stern Brothers' huge New York Department Store.

A large space is being partitioned off on the sixth floor, where work benches, a library and an instructor will be installed. Members of the club will be allowed to work at the benches, read and refer to all library books, and also will be given instruction in matters pertaining to aeronautics.



William Grieff, Jersey City, N. J., holding one of his models

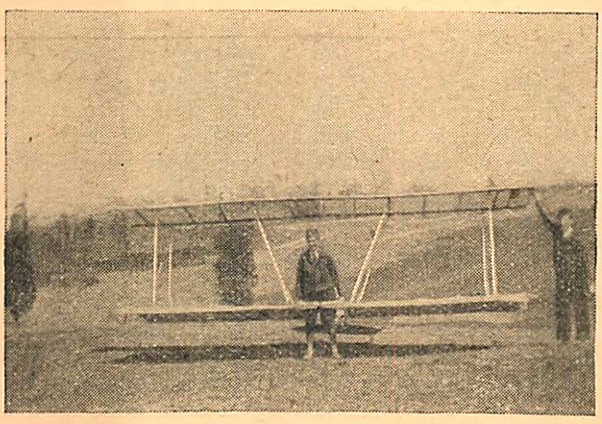
Efforts have been made to persuade Clarence Chamberlain, the famous transatlantic flier, and Miss Amelia Earhart, America's outstanding woman flier, to become officers of the club.

Ben Shereshaw, one of New York's noted model builders, and an experienced wind-tunnel worker, is the instructor at the Club, and will be there to answer all questions and help in building and designing your models.

What better meeting place could you wish for than a Club such as this—so why not make your password, "Meet me at Stern's Sky Cadet Club."

—:oo:—

Another note of interest to all model makers comes from Professor T. N. de Bobrovsky, the famous aeronautical research expert, who has taken under his tutorship eight selected students from the Dickinson High School, Jersey City, all pupils of Miss Mary Reynolds, to do research work in his laboratory in their spare time.



Carlton Schaub, Hawthorne, N. J., in his home-made hang glider

Everything that goes with the work of an Aeronautical Research Laboratory, such as that owned by Professor de Bobrovsky, at Secaucus, N. J., will be undertaken by the boys, including a series on flight methods, calculation, building and testing systems, and designing of aircrafts and models.

This is the first time that anything of this nature has been undertaken, particularly in the matter of the professor himself providing the material and instruments with which the boys work, and sparing the time to direct their research.

—:oo:—

Philip M. O'Hara, Honorary National Contender of the A. S. C. and leader of the *Detroit Daily* Sky Cadet Club, has just submitted a report of recent activities, from which it is gathered that the club is making monstrous strides, and pleasing everybody. In his letter to Capt. H. J. Loftus-Price, Administrator of the American Sky Cadets, Mr. O'Hara writes:

"Things have been humming in our club within the last two months. Something new has been turning up nearly every day.

"We are having regular monthly meetings on the second Friday of each month. At the last meeting, held February 13, we staged a model contest in connection with it and had 150 entries in the contest. The big prize was a $25 silver cup, a beautiful thing, which was presented to the winner of the endurance contest by one of Detroit's councilmen.

"We have organized the *Detroit Daily* Junior Aviation club band (40 pieces) and one unit of the band, named in honor of a popular radio entertainer, Miss Betty (Aunt Betty) Schmult, the director, will go on the air over a local radio station within a few weeks, we believe. They are known as, "Betty's Sky Cadets." It's an 11-piece orchestra. All boys over 17 years of age. They're pretty good, too. Have been practising twice a week.

"Got a club song, *Happy Landings*, taken from George White's musical comedy, *Flying High*. We're using *Happy Landings* to sign off with at the bottom of the column in the *Daily* and it fits in nicely as a club song.

"Planning now on a big membership contest with a large downtown theatre cooperating with free tickets to the moving picture *Dirigible*, coming in about three weeks. Should bring in hundreds of new members.

"Had a model airplane supply company to open up a downtown retail store near where we hold our meetings and besides advertising with the *Daily* three days a week they're giving a 10% discount to club, members."

A Wind Tunnel Substitute for Model Planes

By

DICK COLE

NO doubt every builder of flying model airplanes has wished he could test his creation in a wind tunnel. The wish probably has prompted him to try out his model in the breeze from an ordinary electric fan. However, the result was no doubt very disappointing; the model weaved from side to side and careened crazily, and the test proved nothing at all.

The chief reason for this is that the blast from the electric fan is a maze of whirling air currents—a miniature tornado, as it were. If, however, the air from the fan had first been directed through pigeonholing, somewhat similar to the core of an automobile radiator, the whirling eddies would have been straightened out, and the test would have proved more satisfactory.

Even so, one fan will not provide sufficient cross-section area to the air flow to test adequately the average-sized model. Three or four fans placed side by side would supply the necessary area. Usually a number of electric fans are not available, so I shall tell how to build a suitable substitute for a wind tunnel with the use of four fan assemblies from old model T Fords, and of 1/4 or 1/2 H. P. electric motor—the motor "borrowed" from the family washing machine, for instance.

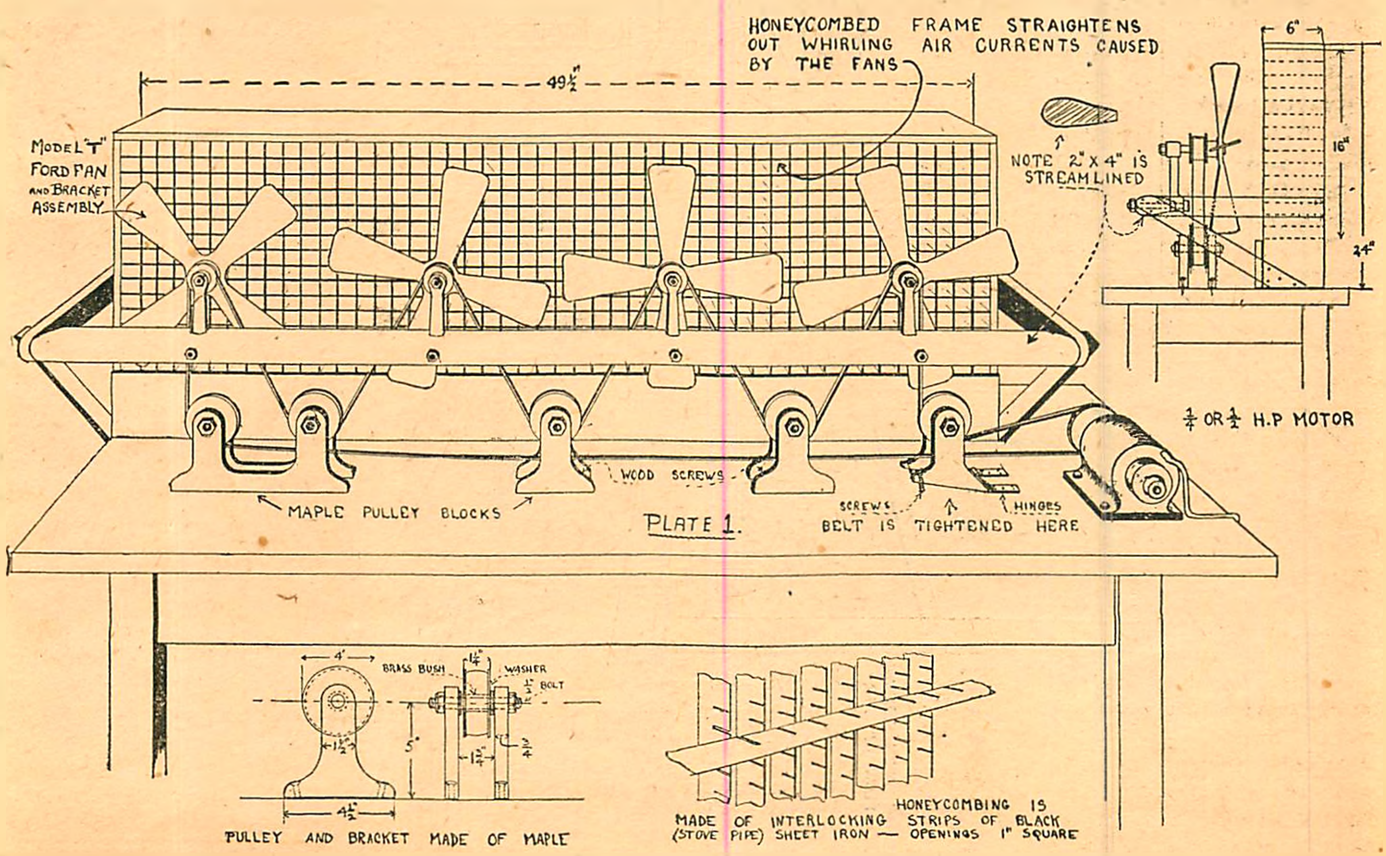
Build It and Test Your Flyers Scientifically

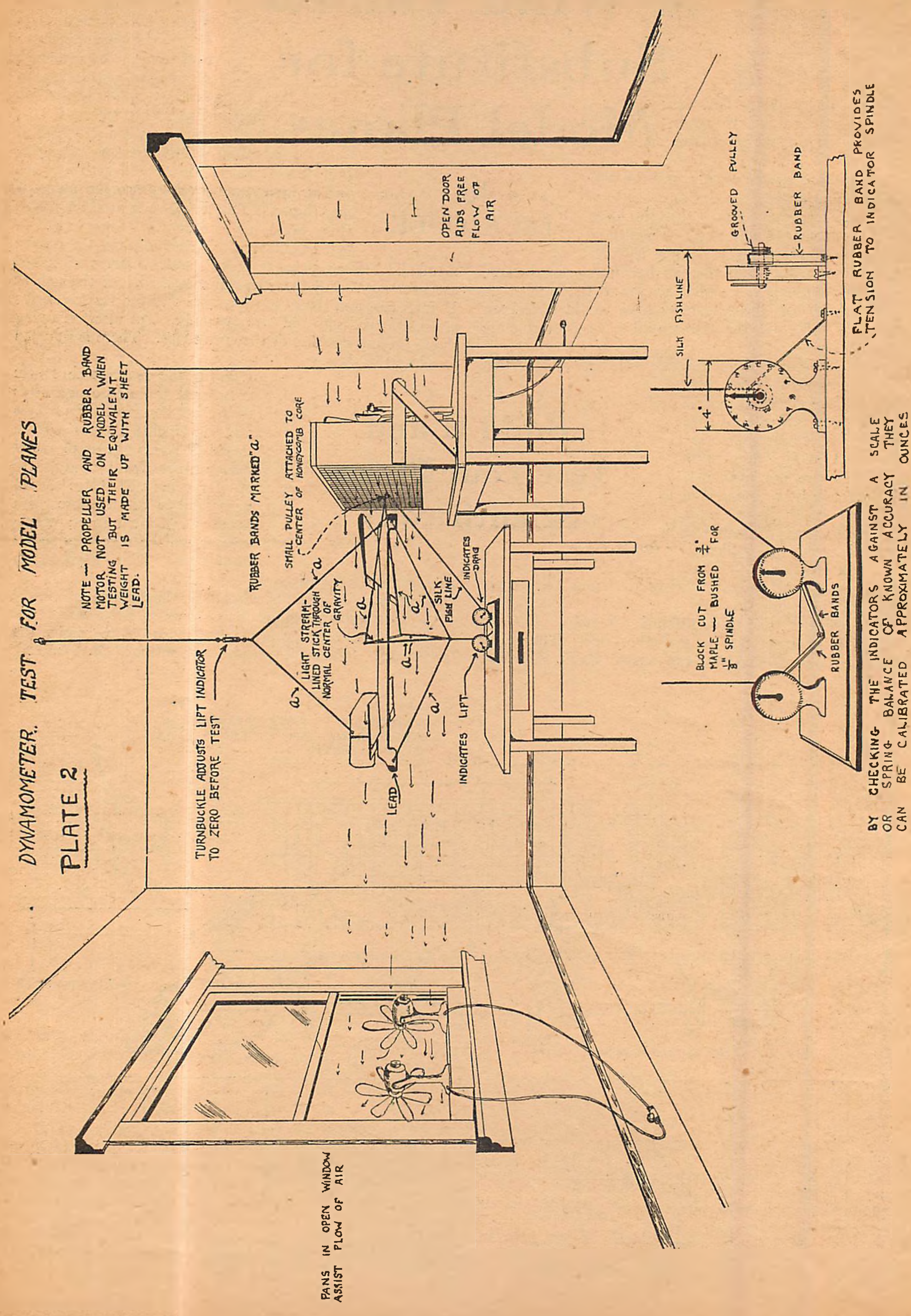
Plate I visualizes the wind machine assembly. The first operation is to make the honeycomb frame. The frame proper can be made of any cheap lumber about 3/4" thick. The outside dimensions of the frame are 6" x 24" x 49½". Thus the lengthwise inside dimension is 48", which permits the installation of 48 openings 1" square, openings to each longitudinal row. The inside height of the honeycombing is 16", which permits sixteen 1" vertical openings. Of the extreme lower section of the frame 8" is covered with a board.

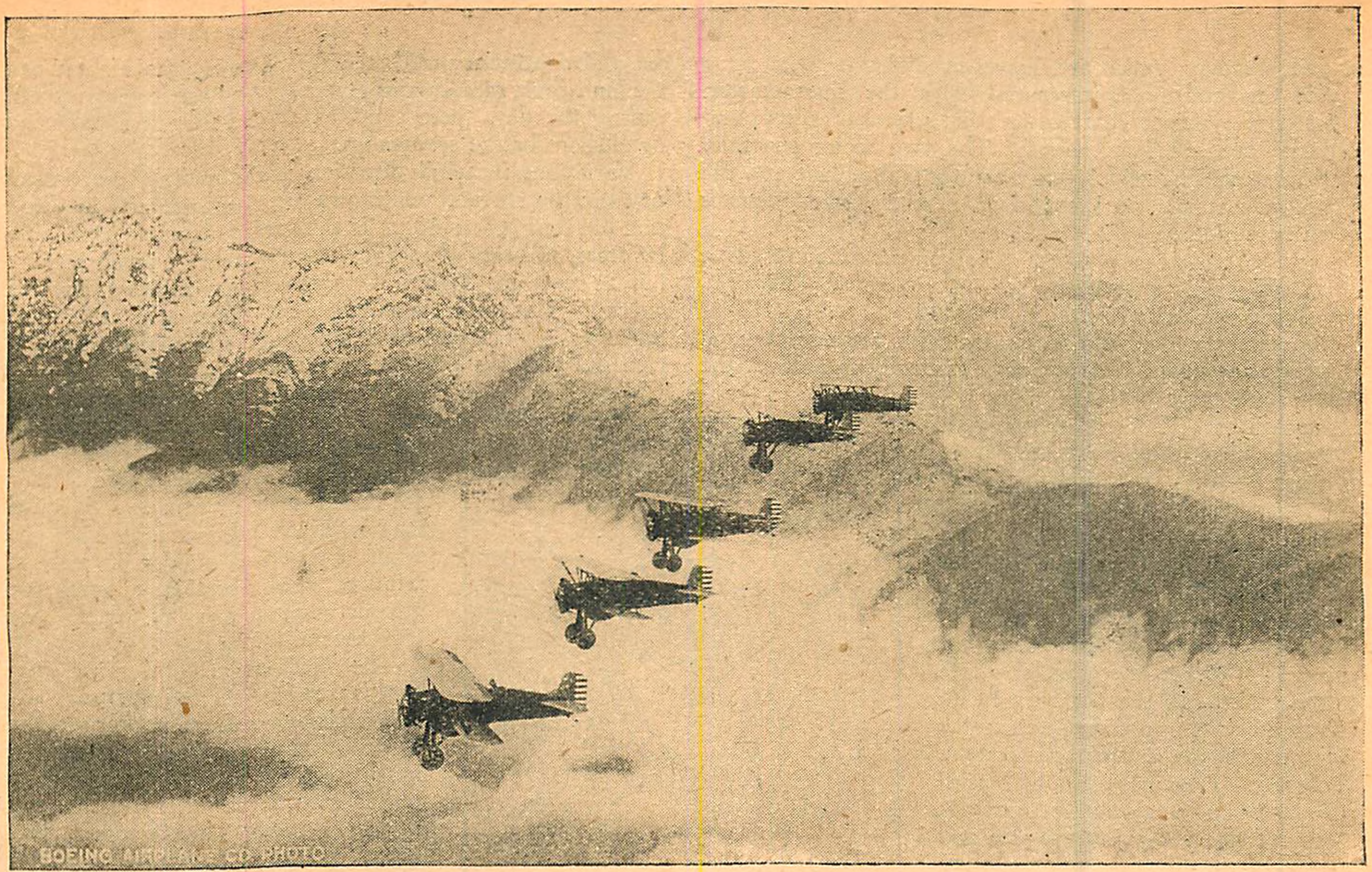
The honeycombing itself can be made of any thin, rigid material, such as sheet metal, thin wood, or cardboard. Sheet metal—galvanized iron or common tin—is recommended. Fifteen strips 6" x 48" and 47 strips 6" x 16" are necessary. All the strips are notched half through at 1" intervals, and then the horizontal and the vertical strips are interlocked into the core assembly. An insert drawing shows the interlocking of the core strips. There is no need to solder the joins.

With the honeycomb frame completed, the next operation is to set up the fans. Four fans and fan bracket assemblies from model T Fords are used. Any auto junk yard will supply these at fifty cents up. Care should be taken to select those with good fan shaft bushes; otherwise it will be necessary to rebush them. This, however, is an easy and inexpensive job.

Next, take a piece of straight-grained "two by four" 49½" long and streamline it as shown in the insert drawing. The trailing edge is notched in for 1" to receive the fan bracket. These are bolted (*Continued on page 39*)




DYNAMOMETER TEST FOR MODEL PLANES
PLATE 2
NOTE — PROPELLER AND RUBBER BAND MOTOR NOT USED ON MODEL WHEN TESTING BUT THEIR EQUIVALENT WEIGHT IS MADE UP WITH SHEET LEAD.
TURNBUCKLE ADJUSTS LIFT INDICATOR TO ZERO BEFORE TEST
RUBBER BANDS MARKED "a"
SMALL PULLEY ATTACHED TO CENTER OF HONEYCOMB CORE
LIGHT STREAM-LINED STICK THROUGH NORMAL CENTER OF GRAVITY
SILK FISH LINE
INDICATES DRAG
INDICATES LIFT
LEAD
OPEN DOOR AIDS FREE FLOW OF AIR
PANS IN OPEN WINDOW ASSIST FLOW OF AIR
BLOCK CUT FROM 3/4" MAPLE — BUSHED FOR 1/8" SPINDLE
RUBBER BANDS
SILK FISHLINE
GROOVED PULLEY
RUBBER BAND
4"
FLAT RUBBER BAND PROVIDES TENSION TO INDICATOR SPINDLE
BY CHECKING THE INDICATORS AGAINST A SCALE OR SPRING BALANCE OF KNOWN ACCURACY THEY CAN BE CALIBRATED APPROXIMATELY IN OUNCES



Boeing Fighters in a formation flight above the clouds

Special Course in Air Navigation

By

Capt. Leslie S. Potter

THIS is a science, the study of which is purely the work of a specialist, and one which is obviously outside the scope of a short chapter included in a course of air navigation. Fortunately, a thorough knowledge is not essential to the air navigator, but the main characteristics of the air and its ways must be understood in order that he may be able to intelligently read and understand the synoptic charts prepared and issued by the United States Weather Bureau, and to interpret the general significance of the forecasts issued for the territory in which he is interested. For a thorough knowledge of this subject the reader cannot do better than study the text book "Aeronautical Meteorology" prepared by Willis Ray Gregg, A.B., of the U. S. Weather Bureau.

A synoptic chart is a map of the area under consideration, showing the distribution of various meteorological elements such as wind, pressure, temperature and the like over that period at a given time.

The atmosphere around the earth is composed mainly of nitrogen and oxygen, which form approximately from 98% to 99% of its constituents. The belt of air in the U. S. and Europe, up to an average height of 35,000 feet, is called the troposphere. Above this it is called the stratosphere, but the latter has little bearing on the aeronautics of today.

Capt. Potter Discusses Meteorology in This Month's Instalment of his Series

The two factors which have most bearing on our weather conditions are air pressure and temperature.

Air pressure is probably of primary importance because all the other weather elements depend on it or its changes. As you know, the presence of air exercises a definite pressure which is measured by an instrument known as the barometer. The mercury and the aneroid barometer are the two kinds of instruments most commonly used. Pressure is measured either in lbs. per square inch or millibars (expressed mb.) per square centimetre. In northern U. S. and Canada the normal limits of pressure at sea-level are 940 mb. and 1060 mb.—a pressure of over 1025 mb. is considered high, and a pressure below 990 mb. is considered low.

On synoptic charts, places where equal pressure occurs are connected by lines called isobars, and for the purpose of easy comparison these pressures are reduced to sea level. Pressure tends to increase with drops in temperature and decrease with altitude, but it has its regular (diurnal) or daily changes, which are, however, slight.

Air temperature is measured with the thermometer. Lines on a synoptic chart connecting places of equal temperature are called isotherms. The two scales generally used in measuring temperature are the Fahrenheit and the Centigrade scales. A comparison of their graduations is given hereunder:

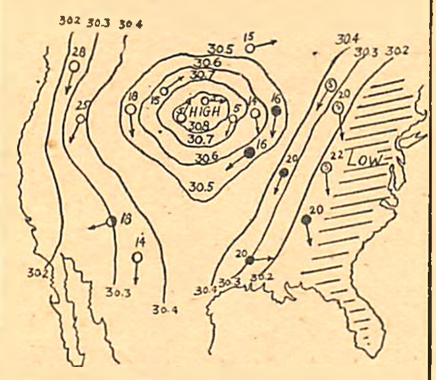
	Fahrenheit	*Centigrade*
Boiling point of water........	212°	100°
Freezing point of water......	32°	0°

Temperature normally decreases with altitude, though this does not invariably happen. Normally in still air the temperature will decrease about 3° Fahrenheit or 2° Centigrade for every 1000 feet of altitude, but temperature also has its seasonal and daily (diurnal) changes.

WIND is the air in motion. Air flows from areas of high pressure to areas of low pressure, but owing to the earth's rotation it does not travel in a direct line from one area to the other. In the northern hemisphere air streams are deflected to the right, and in the southern hemisphere to the left. The air leaves a high pressure area in a clockwise rotation, flows towards a low pressure area and enters this in an anti-clockwise rotation. The strength of the wind depends on the pressure gradient. If the isobars lie close together; or in other words, if the changes in air pressure over a certain region are rapid, the winds will be strong; if the isobars lie far apart they will be light.

FIGURE III

SYNOPTIC CHART SHOWING HIGH



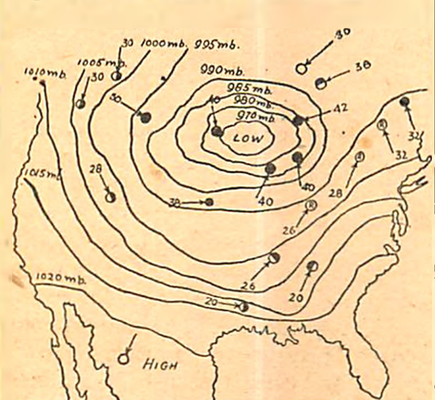
STRAIGHT LINES REPRESENT ISOBARS PRESSURE IN INCHES
ARROWS REPRESENT WIND DIRECTION
FIGURES REPRESENT WIND SPEED
CLEAR WEATHER
CLOUDY
PARTLY CLOUDY
SNOW

Winds are classified into different forces by the Beaufort Wind Scale (see figure 1) and this is often used by meteorologists in referring to wind velocity. Areas of high and low pressure in the United States move in approximately a west to east direction, finishing up generally in the New England States. The speed with which they move will depend on the wind velocity but a distance of 500 to 600 miles will be a normal distance of travel in a day.

The effect of temperature and air pressure in producing winds is characterized in the land and sea breezes common to most sea coasts during the summer. The land which is more easily and rapidly heated than the water becomes abnormally heated by day and produces a low pressure. Heated air, as is illustrated by the hot air balloon, becomes rarified and rises. A breeze, therefore, blows in from the sea and continues until evening. During the night when the land cools rapidly and gives up the heat it has acquired during the day, these conditions are reversed and a land or offshore breeze springs up.

FIGURE II

SYNOPTIC CHART SHOWING LOW



STRAIGHT LINES REPRESENT ISOBARS DRAWN FOR INTERVALS-5mb
ARROWS REPRESENT WIND DIRECTION.
FIGURES REPRESENT WIND SPEED
CLEAR WEATHER
CLOUDY
PARTLY CLOUDY
RAIN

Variations in wind direction are caused by friction at or near the surface which produces divergencies in direction of from 20° to 30°. If the surface is much broken up by trees, hills and buildings it may vary as much as 50°; but as you get higher it more or less assumes its true course. This is represented most accurately at around 2,000 to 3,000 feet. Still higher up the changes in temperature will cause further variations.

The wind is never perfectly steady but is a perpetual succession of changes in velocity. When these changes are more pronounced they are called gusts or squalls. A squall may be described as a large gust, but while a gust is a sudden increase of wind of short duration, a squall is a greater increase in wind velocity and lasts several minutes.

The effect of a squall on a plane that is turning will be unpleasant and will probably cause temporary loss of control. A line squall does not last much longer than an ordinary squall but it may be as much as 200 miles wide. A long line of dark cloud ahead preceded by rain or hail is often an indication of a line squall. Since owing to its breadth it is generally impossible to fly round, a landing should always be made if possible.

BUMPINESS is another state of air turbulence caused by ascending and descending currents. One often reads of colossal bumps being experienced in the air, but imagination often plays a larger part in these descriptions than do actual weather conditions. Generally speaking, bumps will not be experienced over 3,000 feet. They are more common over the land than the sea and reach higher altitudes in tropical countries where they are also more violent; but on the hottest day, they may usually be avoided at a height of 7,000 feet.

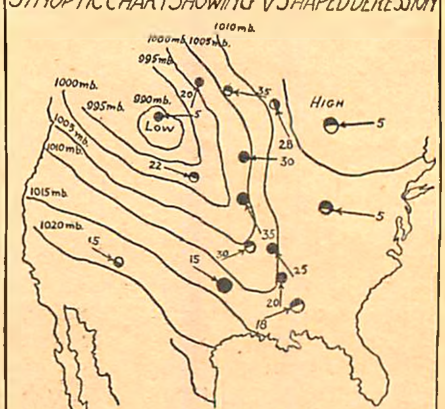
The upward and downward currents are due to the unequal heating of the earth's surface and to its irregularities. Thus in a broken up country with many hills, bumps are more likely to be experienced than in flat unbroken regions.

Cyclones, sometimes called depressions or lows, are areas of low barometric pressure with more or less circular isobars, though in some cases these also assume "V" and wedge shapes

(*Continued on page 40*)

FIGURE IV

SYNOPTIC CHART SHOWING "V" SHAPED DEPRESSION



STRAIGHT LINES REPRESENT ISOBARS DRAWN FOR INTERVALS-OF 5MB.
ARROWS REPRESENT WIND DIRECTION.
FIGURES REPRESENT WIND SPEED
CLEAR WEATHER
CLOUDY
PARTLY CLOUDY

Conducted by Capt. H. J. Loftus-Price

AVIATION ADVISORY BOARD

HERE'S another pleasant surprise for model builders and aviation enthusiasts in general!

For some time now I have been receiving insistent demands for data concerning war-time planes, and after some extensive research work, I am enabled to publish for you the following details.

We are still working on the subject, and hope for some future issue to obtain data relating to more types of war-time planes.

However, here goes!

BRITISH

F.E. 2b: Beardmore engine of 120 h.p. Fore-runner of the Rolls engined type, which it resembles in general design. This machine, with slight modifications and a 160 h.p. Beardmore engine, was still in use at the end of the war, as a night-bombing machine.

B.E. 2e: The original B.E. was designed by and built under supervision of Mr. Geoffrey de Havilland, later Captain R.F.C. and chief designer for the Aircraft Mfg. Co., Ltd. A later type of the same general design was numbered B.E. 2. Developments of this type were the B.E. 2b, B.E. 2d and B.E. 2e, the two last being built in very large quantities.

GERMAN

Gotha: The standard type of two-engined Gotha is a pusher, the appearance of which is characterized by the backward sweep of the main planes, which are also set at a lateral dihedral angle. The set back of the plane is 4 deg. and the dihedral approximately 2 deg.

Maximum span, 77 ft.
Span of lower plane, 71 ft. 9 in.
Gap, 7 ft.
Maximum chord, 7 ft. 6 in.
Minimum chord, 7 ft. 2½ in.
Over-all length, 41 ft.
Area of top plane, 521.6 sq. ft.
Area of bottom plane, 464 sq. ft.
Total area, 985 sq. ft.
Area of upper aileron, 32 sq. ft.
Area of balance of aileron, 3.2 sq. ft.
Area of bottom aileron, 22.4 sq. ft.
Span of tail planes, 13 ft. 6 in.
Area of tail planes, 45 sq. ft.
Area of rudder, 16 sq. ft.
Area of rudder balance, 3.2 sq. ft.
Area of elevators, 19.2 sq. ft.
Area of fin, 11.2 sq. ft.
Area of body in horizontal plane, 96 sq. ft.
Area of body in vertical plane, 107 sq. ft.
Weight empty, 6,039 lbs.
Useful load, 2,722 lbs.
Total weight fully loaded, 8,763 lbs.
Loading per sq. ft., 8.9 lbs.
Two 260 h.p. Mercedes engines:
Engine centres, 14 ft.
Airscrew diameter, 10 ft. 2 in.
Track of main landing wheels, 3 ft. 2½in.
Track of auxiliary landing wheels, 2 ft. 7½ in.

The speed of this machine at 12,000 ft. was estimated at 72 miles per hour.

—:oo:—

Fokker D.7 (Single-Seater Biplane):

Span, 29 ft. 3½ in.
Chord (upper wing), 5 ft. 2½ in.
Chord (lower wing), 3 ft. 11¼ in.
Overall length, 22 ft. 11½ in.
Gap, 4 ft. 2 in.
Area of upper wings (with ailerons), 140.7 sq. ft.
Area of lower wings, 78.3 sq. ft.
Area of aileron (one only), 5.7 sq. ft.
Area of balance of aileron, .5 sq. ft.
Area of horizontal tail plane, 21.1 sq. ft.
Area of elevators, 15.2 sq. ft.
Area of balance of elevator, 1.1 sq. ft.
Area of fin, 2.8 sq. ft.
Area of rudder, 5.9 sq. ft.
Area of horizontal area of body, 35.6 sq. ft.
Area of vertical area of body, 58.6 sq. ft.
Area of plane, between wheels, 12.4 sq. ft.

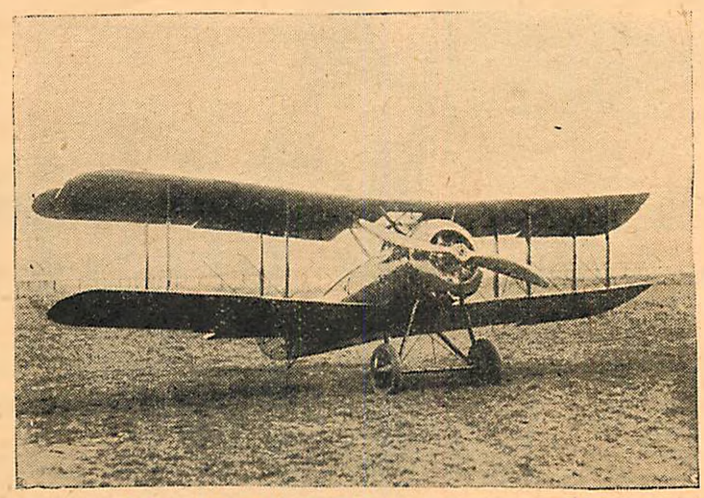
—:oo:—

Albatros D III:

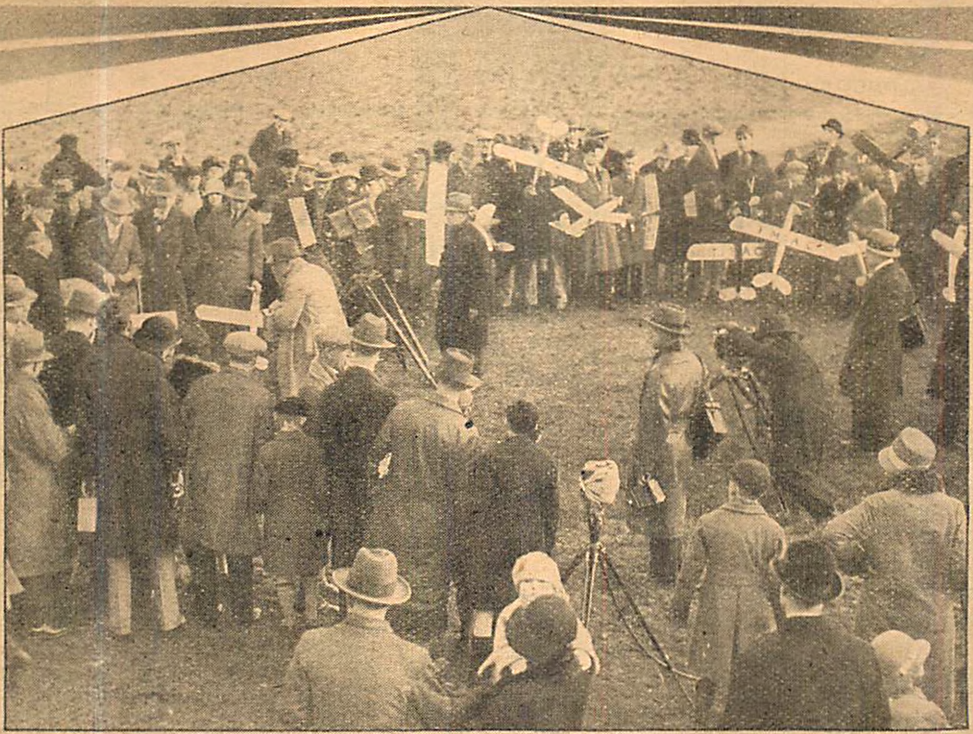
Span (upper wing), 30 ft.
Span (lower wing), 29 ft.
Chord (upper wing), 4 ft. 11 in.
Gap, 4 ft. 11 in.
Stagger, 9 in.

Upper and lower span almost equal. Projecting ailerons. Dihedral to lower plane only. Rudder and fin entirely above fuselage. Tiny fin below fuselage. Solid elevator with balanced projections, rounded fuselage, with pot on propeller. Motor—Fixed Mercedes, 175 h.p.

(*Continued on page* 47)



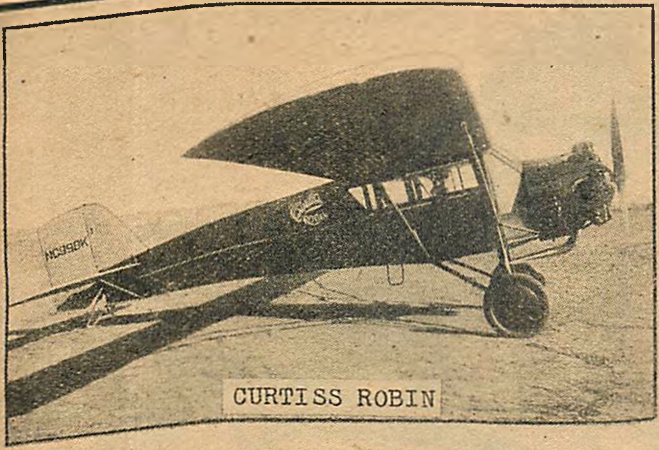
A Sopwith "Snipe" (British war time fighter)
—Courtesy A. D. C. Aircraft Co.



A MEETING of the Wimbledon Model Aeroplane Club on Wimbledon Common England (above) during which a petrol-driven model was flown, causing great, excitement and interest both in flight and on the ground
Wide World

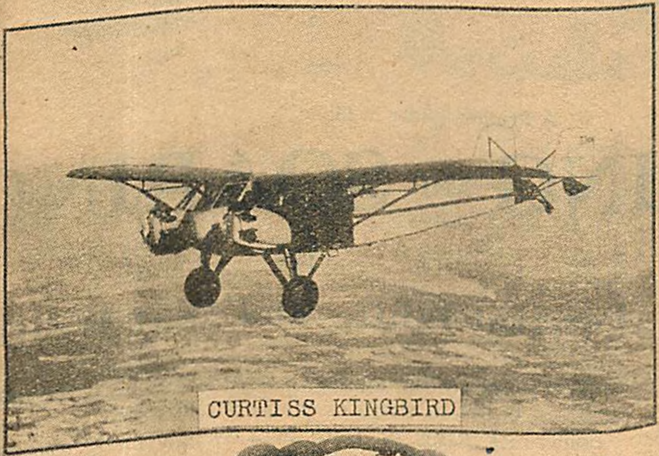
TO the left is a view of the same meet showing the competitors lined up with their models of all sizes and types. The diversity of these aroused the keen interest of the crowd of spectators
Wide World

ANOTHER view (right) of the miniature "flying meeting." Notice the exaggerated dihedral angle of the wings on the monoplane PHMAC-26 in the foreground
Wide World

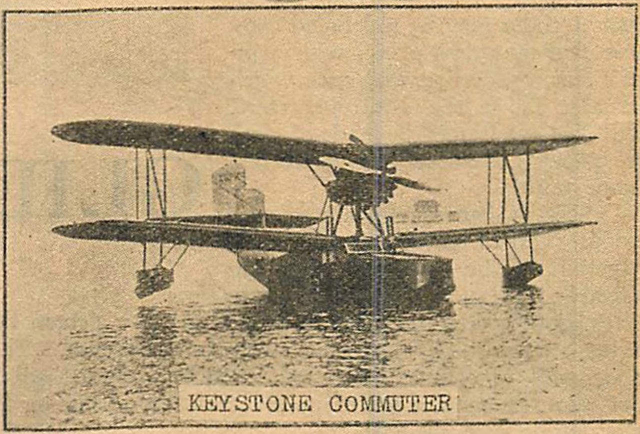


CURTISS ROBIN

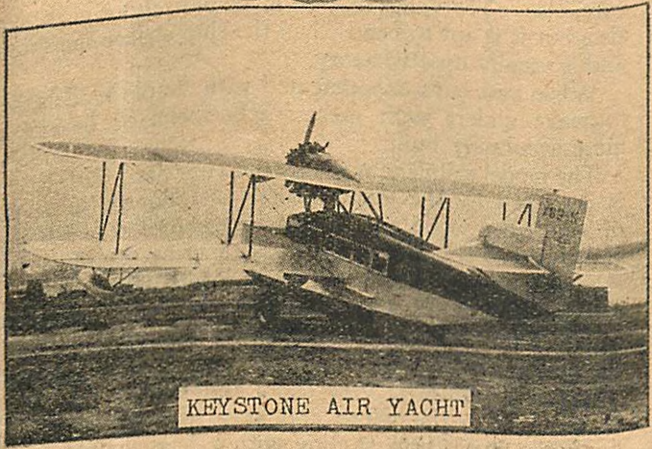
TRAVEL AIR MYSTERY S



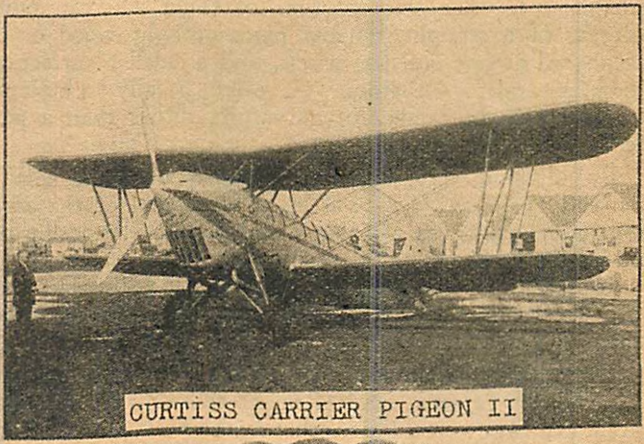
CURTISS KINGBIRD



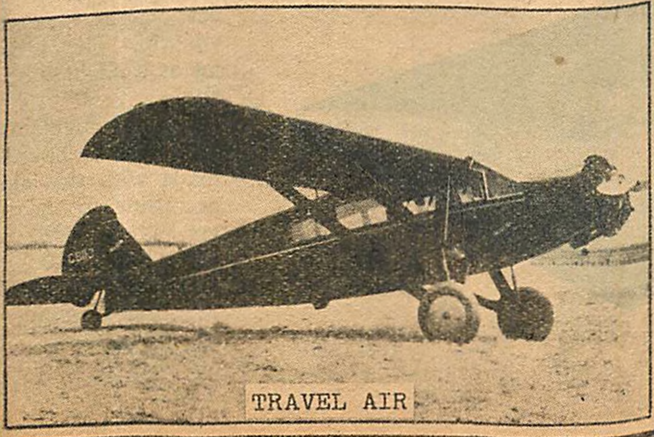
KEYSTONE COMMUTER



KEYSTONE AIR YACHT



CURTISS CARRIER PIGEON II



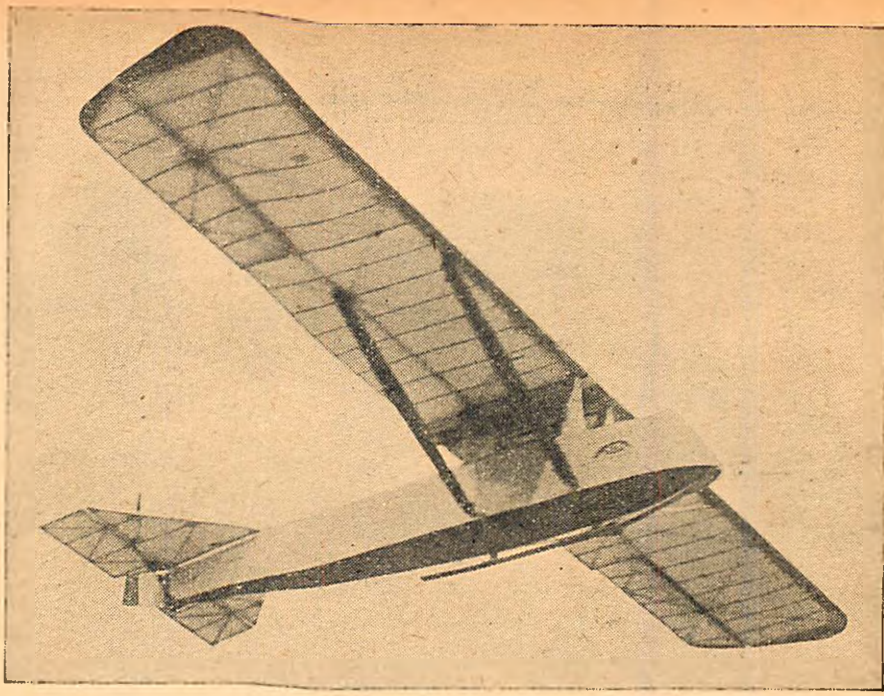
TRAVEL AIR

CURTISS-BLEECKER HELICOPTER

GLIDING AND SOARING

By

Percival White and Mat White



A Prufling glider in flight

YOU can learn a good deal about gliding by building and flying model gliders. Construction of models teaches you much concerning the parts of a glider and the aerodynamic qualities which allow the glider to stay in the air. Model building is not for amateur flyers alone; airplane designers test their plans on a small scale before they invest time and money in building a full-size ship. Moreover, models are sometimes used in testing the winds prior to soaring flight.

Model Gliders Made for Purposes of Construction. There are in general two types of model gliders; those made to show construction or form, and those intended to fly. One derives the same sort of pleasure from building the first type of glider as from rigging a clipper ship model. Such a glider may be a detailed copy of a real motorless plane, with a pilot's seat, rudder-bar and stick which actually move the control-surfaces, etc. The wings may be made of cloth or paper, stretched over wooden frame-work.

Others, of course, are made of solid wood. Thread may be used to simulate wire if the parts are made immovable. In such a model you can use various accessories, such as tiny buckles to tighten the wires, since additional weight makes no difference. This glider will, of course, not fly, and is only to be looked at, but you will gain a lot of constructional information by working on such a model.

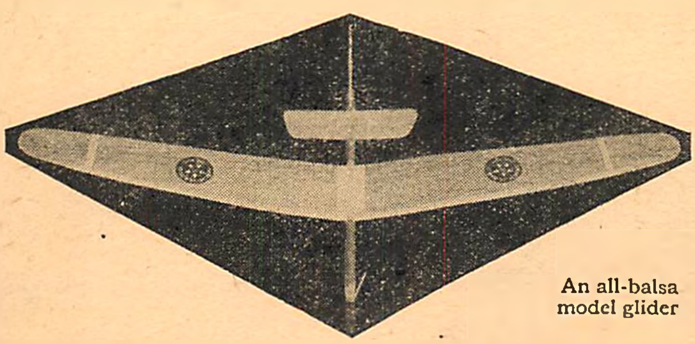
Model Gliders Made for Flight Purposes. Glider models intended actually to fly vary from the simplest to the most complicated. The simplest type of thing you can build consists of a straight, narrow piece of light wood or of cardboard at one end for wings, and a smaller surface at the other end for elevators. These will usually be built up to have a slight camber or curvature, rather than a perfectly flat under-surface.

By adjusting these supporting planes until the ship is perfectly balanced, you will learn something of the aerodynamical principles of balance and of the relationship between the center of pressure and the center of gravity.

In order that the planes may be easily adjustable, they may be fastened to the fuselage with rubber bands, rather than nails or glue.

Directionable stability is, of course, impossible without the addition of some kind of fin or rudder. Some models are flown in reverse fashion; that is, the fin is placed behind the wing and the stabilizer in front of it so that the model is put into the air with the stabilizer in front. This is a rather common type.

Simple glider models may be made of heavy paper strengthened by thin strips of wood, may be covered with light weight cloth, or made entirely of wood. Any wood may be used for this but soft wood is preferable. Balsa wood is probably the lightest known and is ideal for model purposes, either in strips or whole surfaces.



An all-balsa model glider

Sometimes strips of thin, light weight metal are used. Aluminum is available in thin sheets, as is magnesium. The latter is extraordinarily light and comes in various sizes of wire, also. The wings may be made entirely of such metal, also, but it is apt to bend when the ship strikes the ground, and is usually unsatisfactory.

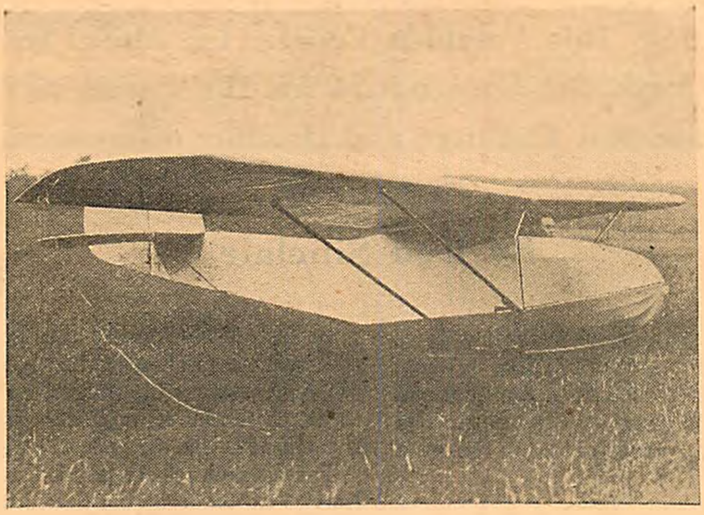
When you have experimented with simple models, begin to make gliders with greater refinement of design, and more accurately built.

The model sailplane made by the American Sailplane Co. is described by the manufacturer as follows: "It is made of solid balsa wood and has a wing span of 6 feet 8 inches and chord of 8 inches at the body tapering slightly towards the wing tips. The overall body length is 30 inches and the complete model weighs 3 lbs., with a wing surface of 4 square feet. The center of gravity is well forward and the nose is loaded with lead. The body is well streamlined. The tail structure is very short and light. The elevator is set close to the wings and at a negative angle. The wings are swept back slightly with a deep camber near the body which gradually washes out into a thin, flat, light, negative wingtip. They are also set at a slight dihedral angle.

Several flights of a mile or more have been made with this model, according to the makers, when flown from an elevation and launched into a moderate rising wind, the model retaining its balance perfectly and soaring like an eagle. It has been made to hover motionless over one spot several seconds at a time under favorable conditions.

The model assumes the correct soaring angle, adjusts itself to different air currents very quickly, banks correctly in turning and possesses almost perfect inherent stability in flight.

The principles of stability and soaring ability embodied are results of several years of experiments with different types of models of sailplanes with the idea in mind of applying these principles to a full-size, man-carrying sailplane which would be efficient, easily controlled, inherently stable, and simple and cheap to construct."



America's famous Franklin P.S.2 glider

How to Fly Models. The types of model gliders intended to be flown, may be used either inside the house or outdoors. There are several ways in which a glider may be launched. Of these, the simplest is to hurl it from the hand like a javelin. Another method of launching the model is to hook its nose to the elastic of a sling shot. By pulling the ship backward, then suddenly letting go, you can send it into the air exactly as you would a stone.

Another way is to hold the glider in your right hand; with your left hand, take one end of a short, flexible hickory stick. Place the other end of the stick against a small block of wood glued to the side of the fuselage, and bend the stick. When you suddenly let go of the glider with your right hand, the stick will unbend, shooting the ship into the air.

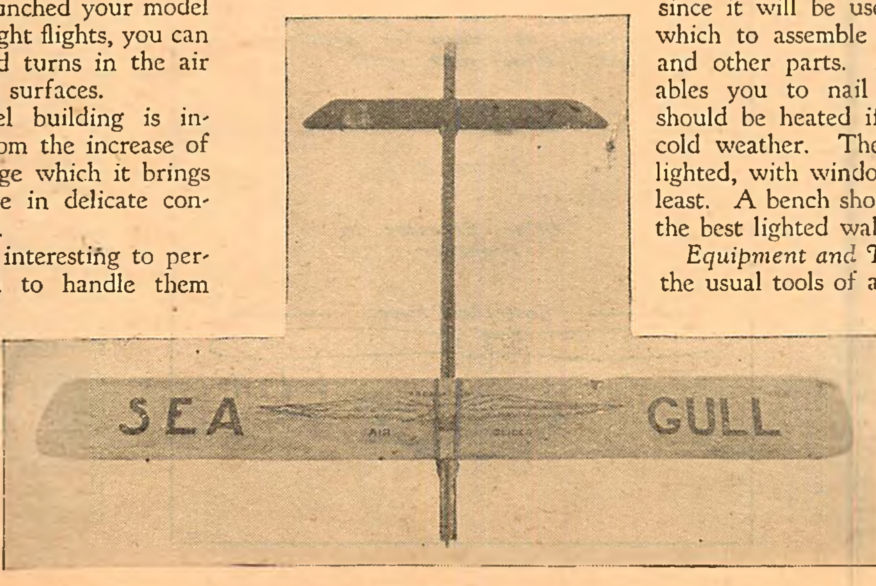
There are model gliders built so that they may be flown like kites. Such a ship can be sent to a great altitude on the end of a string, and then, if let loose from the line, will glide down. The best way to free the model in the air is to atach the line to the glider by a hook which you can release from the ground by pulling a second string. These glider-kites are made of paper alone, or of paper stretched over bent reed.

When you have launched your model glider for several straight flights, you can make it do tricks and turns in the air by setting the control surfaces.

Conclusion. Model building is instructive; not only from the increase of aerodynamic knowledge which it brings but from the practice in delicate construction that it gives.

It is also intensely interesting to perfect them and learn to handle them until, if correctly designed and built, you can make them carry your wishes in the air.

It is a real pleasure to see a tiny air ship actually flying under its own control.



Another noted all-balsa model glider

Building a Real Glider

The least expensive way to procure a glider is to build it yourself, or with some friends who will help share the expense. Moreover, glider construction will teach you a great deal about aerodynamics and design. Most ground schools offer opportunities for some actual constructional work, although not usually on gliders.

Before you start to build you must choose the design, and become familiar with the essential parts of the structure of a glider.

The Dangers of Glider Construction. Most of the accidents which happened to the first gliders were the result of faulty construction. A glider is an airplane and it must be built not only strongly but according to the principles of aerodynamics. No amateur should attempt, unaided, to build a glider. Unless you have a real knowledge of construction, engineering, aerodynamics, and gliders which have been made previously, you should work under the direction and, if possible, the supervision of an expert.

An expert in airplane construction will, of course, be of real assistance to you, if he does not try to change the design. A man experienced only in building powerful ships is apt not to understand that gliders do not have to bear the strain that airplanes do. Such experts can be found nowadays in almost every large community. However, be sure they *are* experts.

The Shop. This should be preferably thirty or thirty-five feet long, to give room for the construction of the wings, and at least ten feet wide, so that a wing can be set up flatways, and so that there will be room for the storage of other parts while the wings are being built. Exit from the shop should be sufficient and convenient for the finished, assembled, ship to pass through.

The shop should have a good floor, since it will be used as the surface on which to assemble the fuselage, wings, and other parts. A wooden floor enables you to nail your supports and should be heated if it is to be used in cold weather. The shop must be well lighted, with windows along one side at least. A bench should be placed against the best lighted wall of the shop.

Equipment and Tools. You will need the usual tools of an amateur carpenter, such as a claw hammer, a small tack hammer, chisels, saws, planes, draw knife, spoke shave, etc. In addition, it will greatly facilitate the work if you (*Continued on page* 43)

A Course in Airplane Designing

By Mastering This Valuable Course, the Model Builder of Today Lays the Cornerstone for His Career as the Aeronautical Engineer and Designer of Tomorrow

By Ken Sinclair

IN presenting this course, MODEL AIRPLANE NEWS *wishes to stress the fact that model building is more than a mere sport. If the builder of model airplanes learns the fundamental principles underlying airplane flight and design, he prepares himself for a future career in the most profitable phase of aviation.*

The policy of MODEL AIRPLANE NEWS *is not to encourage or teach its readers to become pilots, but rather to become aeronautical engineers, designers, salesmen, manufacturers, or equip themselves for many other positions which require the training of the specialist or executive. Study this course from month to month, master it in every detail and you will gain a fundamental knowledge of the how and why of airplane design which will be second to none.*

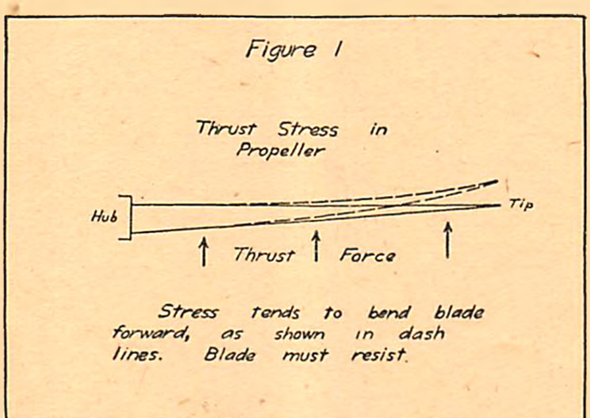
THE EDITOR.

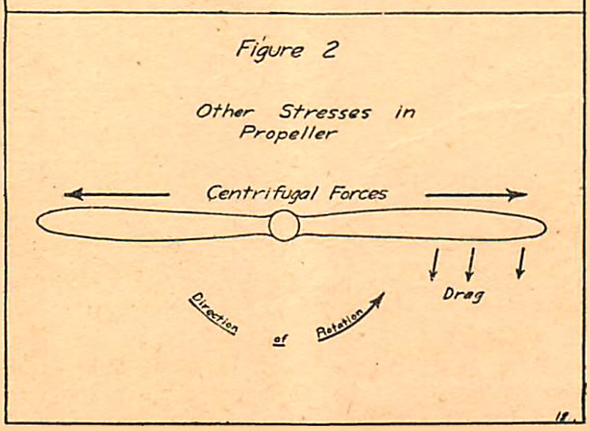
LAST month we discussed the propeller, learning something about the theory and operation of this important part of the airplane. Now we will go on with that topic and try to clear up any points that may have been left over from last time.

We have said that the pitch, or distance that the propeller moves forward during each revolution, is dependent on the blade angle. At low altitudes, where the air is thick, the most efficient propeller is one having a comparatively small pitch; while at high altitudes, where the air is thin, the efficiency of the low-pitch propeller drops rapidly.

For flying at high altitudes we need a high-pitch propeller that will move a lot of the rarefied air and obtain sufficient thrust to move the ship. Thus it is that we usually see, on the high-altitude ships, a large propeller of higher pitch than normal.

This matter of pitch has received quite a bit of attention, since high-altitude flying for long rapid trips seems to be the coming thing. It is obvious that a propeller which will be efficient near the ground will fail to meet the requirements of high-altitude work. On the other hand, were we to make a propeller for high-altitude flying, it might be so inefficient near the ground that it would not deliver enough thrust to take the ship off.





So far no solution has been generally adopted, but of late the variable pitch propeller has been developed to a state where it seems practical. The variable pitch prop is one in which the blade angle can be changed by the pilot while the ship is in the air with the propeller turning over.

For example, were a pilot to be taking off with a very heavy load to fly across the continent at a high altitude, he would set his propeller at a low pitch before he left the ground, then gradually increase the pitch as the ship climbed skyward, thus keeping the blades operating at their most efficient angle at all times.

It is surprising how much power is wasted through the failure of the ordinary propeller to operate efficiently at all altitudes. The motor of a plan loses power as the ship gains height, and this, combined with the loss of propeller thrust, has made high-altitude flying impractical on a commercial basis until the present time.

With the variable pitch propeller, however, the larger part of the difficulty is removed. The loss of motor power can be made up by the use of a supercharger, which is a device that supplies large quantities of the rarefied air to the motor under pressure, thus making up for the loss due to the rarefied air and the reduced air pressure. The variable pitch propeller does its part by enabling the prop to make the fullest use of the power supplied by the motor at any altitude.

This type of propeller is not as complicated as it may seem at first glance. The basic idea is a propeller having blades that may be turned while the ship is flying, changing their pitch angle. The present type makes use of gears on the propeller shaft, which are in turn handled from the cockpit. Another type has been flown in which the changes in prop pitch are brought about by alternately throttling and speeding up the motor.

IN the former type, however, we have the added advantage of ability to stop the ship quickly in landing. For example, the pilot would approach the field in the normal way and level out. When the wheels touched, however, he would reverse the propeller blades and open the motor. The thrust

(*Continued on page* 38)

A Novelty for The Home Carpenter

IN THE past, the floor of Mother's closet was good enough for her shoes, but in this day of modern efficiency, it has become passe along with hoop skirts and kerosene lamps.

Now the proper thing is this simple but handy shoe and stocking box, where there is a place for everything and everything can be found easily. Twelve separate compartments hold her stockings, while six larger compartments each hold a pair of shoes. At the bottom is a larger space for her overshoes, etc., which is lined with oilcloth and which permits Mother to deposit her rubbers in it when wet.

No dirt or dust can reach her things, as a door and cover for the stocking compartment guards against this trouble.

So let's get busy. Build this handy box for Mother and everytime she changes her shoes, she'll praise the thoughtful boy who built it for her.

The same tools which were necessary for the smoking stand are needed for this box, and the lumber used in its construction is yellow pine. The partitions of the stocking compartment can be best made from cigar box wood, so collect enough cigar boxes to make these. The following lumber is needed:

- 2 pcs.—½" thick x 12" wide x 30" long for sides.
- 3 pcs.—½" thick x 6" wide x 11 ½" long for shelf partitions.
- 5 pcs.—½" thick x 11½" wide x 12½" long for shelves.
- 1 pc.—½" thick x 12½" wide x 30" long for back.
- 1 pc.—½" thick x 11½" wide x 12½" long for front.
- 1 pc.—½" thick x 12" wide x 12 ½" long for cover.
- 1 pc.—½" thick x 13½" wide x 30" long for door.

(Note that all the above material is ½" stock.)

- 3 pcs.—⅛" thick x 3" wide x 12 ½" long for partition boards.
- 4 pcs.—⅛" thick x 3" wide x 2 11/16" long for partitions.
- 4 pcs.—⅛" thick x 3" wide x 2 ⅝" long for partitions.

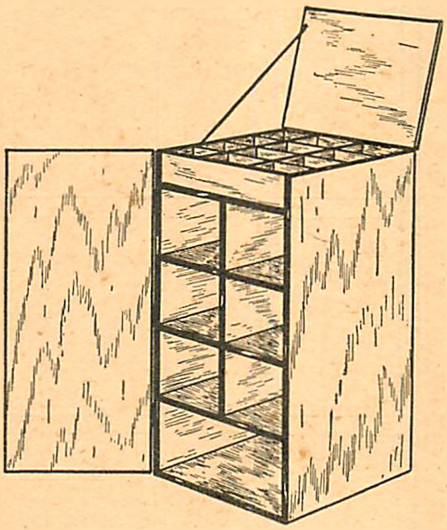
The ½" lumber can be easily found in scrap packing boxes, while cigar box lumber, though it may not be ⅛" thick can readily be used. The last two items on the above list need your special attention. As these pieces fit between the long partition boards, it would be best not to cut them to size until after the long partition boards are attached in place, so that a perfect fit can be assured.

Cut each of the necessary fourteen pieces of ½" stock to the exact size called for in the above list. Test each with your try-square to insure squared corners. Plane each board on both its faces and along all its edges for smoothness and then sandpaper completely.

At this time the ⅛" cigar box wood is not cut, as this is used for partitions only, and is assembled after the main box is erected. When each piece of the ½" stock has been finished, as instructed above, a careful check on all measurements should be made. When this has been done we are ready to assemble the box.

Hot carpenter's glue and 1" small-head brads are used for this purpose. The following instructions should be carefully followed in the order given, as trouble may be experienced in the assembling if another procedure is followed in this work. The shelves and the shelf partitions are first assembled together, leaving the bottom shelf board, which also acts as a base for the box, until later. Take the remaining four shelf boards and draw a line through the center of each and parallel to the end edge of each. These lines should be drawn completely around the board, so that they appear on the top and bottom of each board. Use your try-square to do this.

THE shelf partition boards divide each shelf in two equal lengths, so they must be attached in place on their respective shelf boards in the exact center of each of these drawn lines.



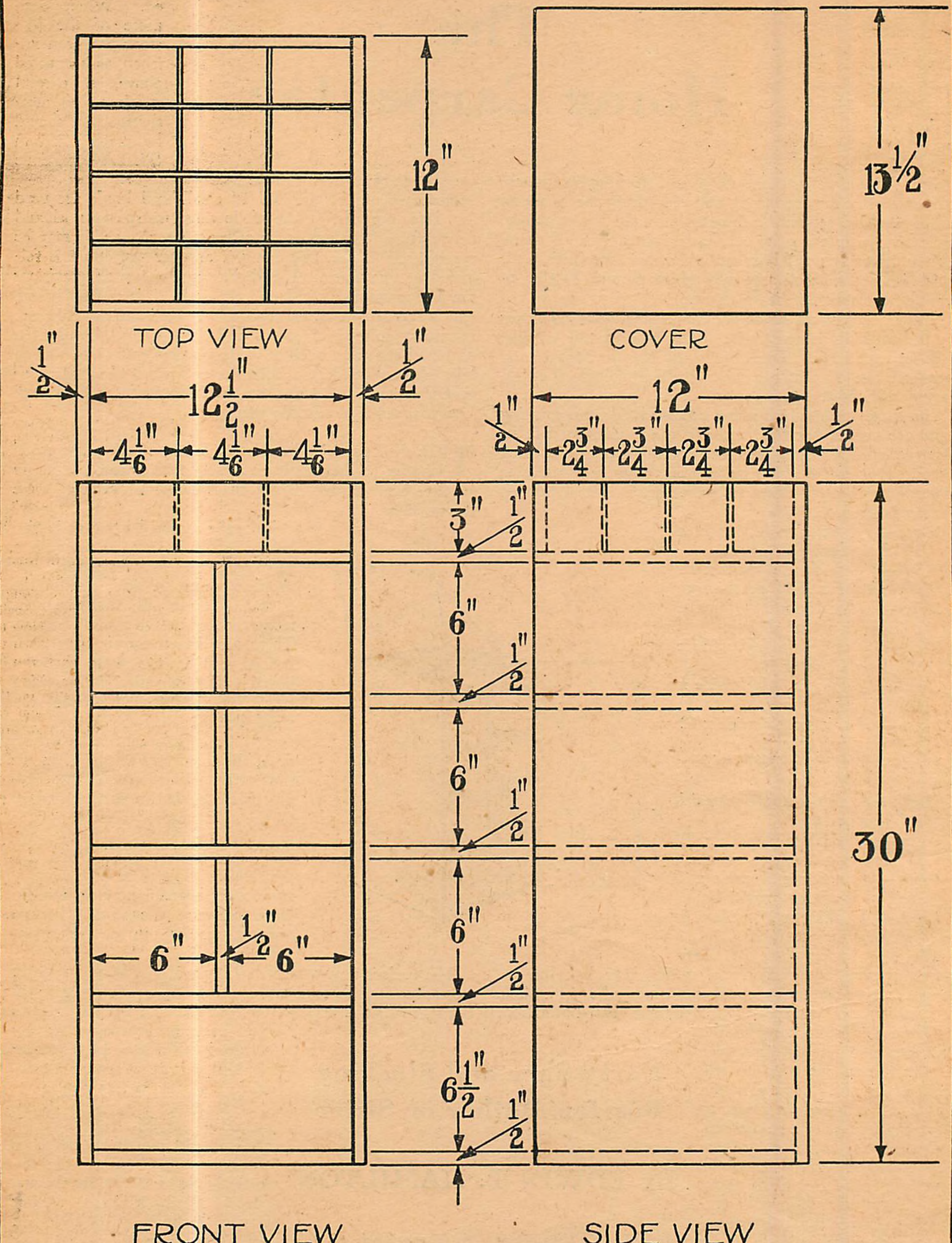
Take the second bottom and third bottom shelf boards, and attach a shelf partition board between them. Apply glue to the side edges of the partition board and drive the nails along the line drawn about 1" apart. These are driven through the shelf boards and in the shelf partition board. The second shelf partition board is now attached between the third bottom shelf board and the fourth. As nails cannot be driven from the third bottom shelf, due to the partition board already attached, glue alone holds this partition board to the third shelf. However, nails are driven through the fourth bottom board in the second shelf partition board. The third and last partition shelf board is now attached in place between the fourth bottom and the top shelf in the same manner.

The back is now attached. Draw a line down its center parallel to its side edge and continue this around the entire board, so that it appears on both faces of the back. The shelf partition boards are centered along this line and the first assembled part of the box is attached to the back in this position.

If the lines have been drawn correctly the two ends of each shelf should match the sides of the back. The top of the top shelf should be 3" below the top edge of the back board. Apply glue to both the parts and then drive the brads 1" apart along the drawn line on the back of the back board and into the shelves and shelf partition boards. Brads should also be (*Continued on page* 38)

Natty Shoe and Stocking Box for Mother or Sister

By EDWIN T. HAMILTON



SHOE AND STOCKING BOX

SKYWRITING

(*Continued from page 6*)

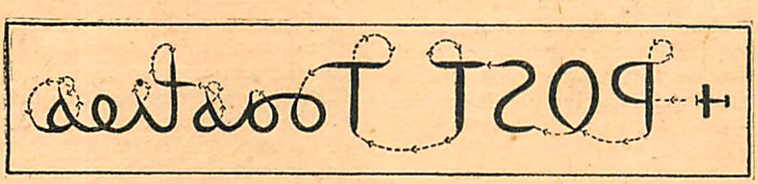
separate letter so that the wind does not blow them together, making the word illegible. If the wind is very strong you must write quite a distance towards the direction from which the wind is blowing, and away from the place you wish your finished writing to be. It is sometimes necessary to start writing from five to six miles to windward of the area you wish the finished inscription to be.

Altogether you have not more than five things to do at the same time.

Suppose you come along on a skywriting job so that you will, in imagination, be doing the skywriting yourself. First of all you have to decide what you are going to write and write it out on a piece of paper with a pencil, the same as you are going to fly it. Let's do one that we did a while ago. A name that you all know. "POST TOASTIES."

We'll do the first word in capital letters and the second one in script, keeping in mind that the less flying you have to do with your smoke cut off the better the inscription will appear when finished.

Now that we have the diagram illustrated below finished we'll fasten it to the instrument board of our S.E.5 with good stout clips and get going.



We'll leave Roosevelt Field at Garden City, L. I., and write over New York City where a few million people can see what we're doing.

We'll make sure that our parachutes are adjusted properly and the safety belt fastened O.K. Now we'll taxi over to the north-eastern end of the field so that we can take off into the wind, which is blowing from the south-west. Now that we're far enough away so that we can safely clear the hangars we'll swing around and head into the wind. Let's go.

As we've been climbing steadily, we are about high enough now. The altimeter says "11,000" feet and just ahead and down under us is the East River and New York City. Looks as though you could pick up both the East River and the Hudson River with one hand doesn't it?

Now take a look at the sun. It's about a quarter down in the sky, and from where we are it seems hanging over New Jersey. That means we can do our writing right over the city and the people can see it without having the sun shine in their eyes. But we're going to have to start writing at about over 42nd St., so that when we're finished the inscription will be hanging over Central Park—that little small, thin line of trees and a couple of ponds here and there.

First we'll let out a small burst of smoke to see how it hangs together in this breeze, so give the trigger a good short squeeze. There it is away behind us already, and looks like a good big ball of cotton.

Now that we're just over the center of the city, head towards South Ferry, and start your smoke. Keep flying towards the Hudson River in a nice easy bank so that when you can see the Hudson almost directly down and a little ahead we'll be flying parallel to the river and headed north. When you see that little building with the ferryboats near it directly down and over your left shoulder cut your smoke and do a good tight vertical bank turn until we're headed towards the East River.

Now just miss that smoke column you've just made and head a little to the left of that other bank of smoke about a half mile away. There's the smoke we just now finished. Squeeze that trigger. Now when you see the East River directly under us cut your smoke and hard over to the right for a 90° turn and you'll be headed south with the river.

When you see that smoke cloud over your right shoulder and to the back of you, go into a nice easy right turn of about 15° and start your smoke for the "O." Keep the plane in an easy turn until you see the Hudson under you again and then tighten your right turn until you're headed straight for the East River again. Don't let go that trigger until you've finished this letter. Now when you get to where you started the "O" head directly for it and pull your stick back a bit so that you don't go into your smoke column but instead go over it about 100 feet else you'll scatter it.

Let go of the trigger as soon as you're over the smoke, head south along the river for a few seconds and then into an easy right turn and start your "S." When you're headed straight for your "O" that you just made, go into an easy left turn. Just as soon as you see the smoke you've

Allan J. Cameron
(Pres. Skywriting Corp. of America)

Newell Struck
(Noted Skywriter and author of this article)

just now made directly in line over your left shoulder, cut your smoke and level off.

Count ten and start your smoke for the top of the "T." Count off twenty seconds and cut your smoke. Now a climbing right turn and head for the East River again, but keep the nose of the plane up so that you go about 100 feet over the top of the "T" you just made. When the smoke is under you start your smoke and don't let go the trigger until you're back to the East River.

Now you follow the diagram in front of you and write the next word yourself. I'll give you a little advice as you go along.

First your "T", then the rest are smaller and in script. Attaboy, not bad. Now the "o" is a steady bank to the left. Then the "a" is the same thing except when you finish it do a climbing turn with smoke off until you start east. Climb a little on this so that when you finish the "a" you can nose down and do a tight three-quarter right turn to start your "s." When you finish the first stroke of the "s" do a loop with a little right rudder and when you're in your dive after the loop, do a half roll and finish the "s" at a little higher altitude than you started it.

Now cross the "t" before you start the long stroke on which you should climb a bit so that you can nose down on the tight right turn to finish the "t" and start the "i". Keep the nose down a bit to get some speed for a tight right climbing turn at the top of the "i" and don't forget to dot the "i". Just a short quick burst of smoke. Climb as much as you can on the down stroke of the "i" so that you can nose down a bit for the "e". It's a tight turn and you should hold your speed to keep your altitude. Now the "s". Just the same as the other one you made.

Now stand off and look at what you've done. What, you can't see anything but a lot of smoke clouds? Well, in that event all we can do is head back to the hangar at Roosevelt Field. When we get there you can 'phone the office and ask Mr. Cameron, "How was the show?" If you leave the 'phone with a smile on your dirty, oil spotted face I'll know we did a good job and I'll do my best to get "Mac," our Scotch hangar foreman, to buy the ice cream sodas.

Well, how do you like skywriting? Want to go again? All right, see you soon.

Cheerio.

The Home Carpenter

(Continued from page 35)

driven through the back board and into the shelves.

The two side boards are now attached in the same manner, brads being driven through them into the back board, as well as into the ends of each shelf board. These should be spaced about 1" apart. Now attach the bottom shelf board in place in the same manner.

THE front board is now attached between the two side boards and on top of the top shelf. The ends of the side boards, the back board and the side of this front board should all be flush with each other. The assembly of the main box is now complete, as the door and the stocking compartment cover are not attached at this time.

We are now ready to assemble the stocking compartment. Cut the three long partition boards to size. Cigar boxes do not come this long, so if they are used, two boards must be assembled to obtain this length. See that the break between the two boards comes as a point of intersection between these long partition boards and the short dividing boards. Slight grooves 1/8" deep and the exact width of the partition boards you use should be cut along the top shelf. Glue is applied to these three grooves and the three partition boards, and they are then pushed in place. See that these partition boards form right angles to the top shelf board at this time, and allow them to dry before proceeding with the work. When the glue has become hard, the nine short dividing boards are glued in place. Make these fit tightly between the long partition boards. If this is done, the glue will hold them permanently.

The cover is now attached to the stocking compartment by two 2" hinges, while the door has 3" hinges. Scrape away all excess glue and use a nail set on all nails, countersinking them about 1/16" deep. Fill all nail set holes, joints and wood blemishes with plastic wood, and finish smooth with sandpaper.

Many such boxes are painted, and if this is decided on, it is recommended that lacquer be used. Do not paint the inside of the box. Give the stocking and the shoe compartment three coats of clear white varnish. The bottom compartment is lined with oilcloth, which can be purchased at any "Five and Ten Cent" store. This is attached with hot carpenter's glue. Be sure to pull it tightly over the surface and iron out any creases. Trim the edges smooth.

An attractive and novel way of covering the outside of the box, instead of paint, is to cover it with wallpaper. Pick out some flowered design and glue the paper over the entire box. Allow the glue to harden and then give the paper two coats of varnish. It makes an attractive finish and allows Mother to keep it dustproof and clean by simply running a damp rag over it occasionally.

Airplane Designing

(Continued from page 34)

would be reversed, with the propeller acting as the ideal brake, and there would be no danger of nosing over. It should be possible to stop a ship in a very short distance by this method.

The disadvantages of the variable pitch prop are its weight and the complication brought about by the necessary gears. These points, however, are being overcome, and beyond all doubt the variable pitch propeller will find a place for itself, and a valuable one, because it is the logical thing.

When I speak of a variable pitch propeller I mean one that may be adjusted *in flight*. The steel propeller now in general use may be adjusted to some extent while the ship is on the ground with the motor stopped, but this does not allow for the changes that are necessary in high-altitude work; namely, changes in pitch while the ship climbs.

In model work it is interesting to experiment with propellers whose pitch is adjustable while the plane is at rest. The difficulty lies in making a hub that will grip the blades and yet allow for adjustment, for our props are usually made of rather soft wood, such as balsa, and this is obviously impractical for an adjustable hub.

The blades, too, have an exasperating tendency to squash under the pressure of the hub necessary to hold them at the proper angle. Metal propellers for models solve this difficulty and permit the model builder to change the pitch of the propeller until he finds just the right angle for the utmost speed, the right angle for duration, etc.

It is an extremely interesting and valuable experience for the model builder. I have no doubt that, if handled properly, (perhaps treated) wood propellers could be made satisfactory in an adjustable pitch arrangement.

Another difficulty with the adjustable pitch prop for models is its weight. It must be admitted that this type of propeller weighs more than the ordinary kind, and is harder to build; but at the same time it is easy to see its advantages for experimental work.

A model builder may have been making propellers with too little pitch for years, and wondering why his props "raced" and why his ships flew so poorly; and an adjustable pitch propeller may clear up the whole difficulty for him. It's worth the work, fellows, to build at least one adjustable pitch propeller. It is worth the work not only in the interesting experiment it affords, but also in the determination of the proper pitch angle for a given ship.

In the designing and building of propellers the weight of the finished product is, of course, of great importance. We must make the prop strong enough, with a margin of safety, for all uses; but there is no need for making it excessively heavy. To this end we must know a little about the stresses that occur in a propeller.

Obviously, there is a lifting stress that is brought about by the action of the blades on the air, which produces the thrust. This stress is precisely the same as that in a cantilever (unbraced) wing, and must be provided for. It is shown in Figure 1.

However, this is not the only stress with which we have to deal in the designing of the airplane propeller. There are centrifugal stresses, caused by the tendency of the rotating propeller to tear its blades away from the hub. Swing a pencil or some other small object on the end of a string fairly rapidly, in a circle, and you will see that this centrifugal stress is not to be disregarded. It must be provided for, especially in full-size ships, because of the high rate of rotation of the propeller.

Still another stress is that set up by the drag. Each blade of the propeller is in effect a wing, and, naturally, there is a drag force present. These last two are shown in Figure 2.

Still another set of stresses are set up in the propeller by gyroscopic action. We have all seen a gyroscope at some time or other. A wheel, when set spinning, exhibits surprising resistance to a change in the direction of its plane of rotation.

Take a bicycle wheel on an axle and spin it very rapidly, holding the ends of the axle. Hold the wheel vertical at first, and then, when it is spinning, try to turn it until it is level with the ground. It resists with some little force. The same is true of the airplane propeller.

When an airplane prop, weighing anywhere from thirty to a hundred or so pounds, is turning up to eighteen hundred R.P.M., powerful stresses are set up in the blades during sudden changes of direction of the ship, such as snap rolls, quick turns, or sudden recovery from power dives.

In the early days of flying it was a common thing to have a propeller tear itself to pieces in the air, and in many cases no explanation could be found. Later on, however, more was learned about the true nature of the stresses and their causes, and due precautions were taken to make the prop able to withstand those stresses, with the result that, today, a case of propeller failure is practically unheard-of.

Still another important factor of propeller design, and one to which no real answer has yet been found, is noise. When the average person hears an airplane roaring along, he is prone to lay the blame entirely on the motor. However, the motor is not altogether at fault. Motors are noisy, it is true, but only because a suitable muffler has not yet been developed.

Mufflers for airplanes have proven themselves too heavy, and, more important, they set up a back pressure of exhaust gases that causes the motor to lose power and overheat. On automobiles this loss of power can be afforded, as can the excess weight, but in airplane design we need every ounce of power and just as little weight as we can get. Thus it is that, as yet, no successful muffler has been introduced.

As the propeller is such an important and intricate subject, the author has taken pains to cover it in great detail from every angle. It should be studied slowly and carefully so that all points are clear before going ahead. Next month's instalment will contain some more valuable information which definitely clears up the propeller problem for those who want to know the how and why of airplane design.

(*Continued from page 25*)

tightly to the trailing edge. The brackets are spaced so that the adjacent fan tips clear each other by 1/4". Braces to the sides of the honeycomb frame hold the battery of fans in place.

Idler pulleys and blocks must be made next. Cheap pulleys about 4" in diameter and with an 1 1/4" face can be bought at any machinery supply house. If one has a lathe, suitable pulleys also can be turned from maple. In that case, they should be fitted with a brass bush. The construction of the pulley bracket should be quite obvious from the drawing. Note that the pulley on the extreme left is 1" lower than the others to allow the return of the belt, and that the pulley bracket on the extreme right is hinged to permit tightening of the belt.

The manner of running the belt over the pulleys is clearly shown. A thin, pliable belt 1" wide should be used. Rawhide will serve the purpose, but it stretches readily and requires frequent adjusting. However, the use of the wind machine is so intermittant that a rawhide belt will serve satisfactorily. Cotton webbing treated with yellow soap and resin will also serve as a belt.

The application of the motor is obvious. As stated before, the washing machine motor can be "borrowed" to operate the wind machine. To obtain the best results, it probably will be found necessary to change the pitch on the fan blades. This can best be determined by experimentation. A 1/4 H.P.

Wind Tunnel Substitute

motor will operate the machine satisfactorily. A 1/2 H.P. will create a miniature hurricane.

In operating the wind machine in a room, it should be located between two openings, such as a door and a window. An electric fan placed on the window sill and blowing outward will speed up the flow of air. Plate II illustrates the set-up of the wind machine.

Experimenting with a model plane in a wind tunnel affords the experimenter more actual aeronautical knowledge than does the flight of a model plane. Plate II shows how a model plane can be suspended so that all of its characteristics and properties can be studied.

The first essential to this experimenting is two indicators to register lift and drag. An insert drawing (Plate II) shows how a pair of simple indicators can be made. Note that strips of rubber cut from an old inner tube replace the usual tension springs. By checking the indicators against a scale of known accuracy, the dials can be calibrated fairly accurately in ounces.

Before suspending the model, its normal center of gravity—center of balance—is determined by balancing the model on an edge, such as a blunt knife-edge. A balsa wood stick about 15" long is attached across the model at its center of gravity. Light rubber bands—their tension depending on the size of the model to be tested—are attached to the ends of the stick and led to the points shown in the drawing. Silk fish-line leads to and around the drums of the indicators.

The whole is suspended from a screw-eye in the ceiling. A turn-buckle is inserted in the suspension cord and can be adjusted to bring the lift indicator to zero before testing. The drag indicator will always be at zero when the wind machine is idle.

When the wind machine is started, the lift and drag are immediately registered. The rudder, tail, and ailerons can be set at different positions and the results studied visibly. The primary object of the wind machine is to find the point where the model has the maximum lift with the minimum drag, and at the same time has longitudinal balance.

In testing a plane before the wind machine, the propeller and rubber band motor can be left off, but the center of gravity should be determined with these in place. In testing the model, their weight is replaced with small pieces of lead foil.

Any model plane experimenter will find this wind tunnel substitute a valuable asset in his experimental work. Its use will save many prized models from partial or total wrecking, as might be the case if they were launched on their initial flight with the controls set by guesswork.

Course in Air Navigation

(Continued from page 28)

(Figs. 2 and 4). The wind follows the isobars inward in an anti-clockwise direction, and will vary in strength with the pressure gradient, but will increase towards the center. Cyclones are generally associated with strong winds and dull rainy weather and their diameters will vary from 300 to 2,000 miles, but the average in the United States is between 1,000 and 1,500 miles.

Anti-cyclones, (see Figure III), sometimes also called highs, are areas of high barometric pressure. An anti-cyclonic area is more stable than a cyclonic and generally the pressure gradient is less. The winds follow the isobars outwards in a clockwise direction, and contrary to the cyclone, the center of an anti-cyclonic area is usually a region of calms or light winds, which, however, increase in intensity as they blow outwards. Generally speaking, the temperature will be less than that which accompanies cyclones and the conditions will be favorable to fog formation.

Fogs are due to condensation of water vapor in the air, which may be caused by the cooling of the air by radiation, or by its mixing with an inflow of cooler air. Fog will generally follow the drifting of warm humid air over a cool surface. A typical example is the fog which abounds round the Newfoundland Bank during summer. The warm, moisture-laden air blowing over the gulf stream meets the cold air as it blows over the Labrador Current and produces the resultant fogs.

There are a variety of conditions responsible for fogs in different localities, but light winds or calm, and a cool, clear night are conditions likely to influence fogs in coastal areas. Further inland they are seen but seldom and are generally local over low lying, marshy ground or river beds. The difference between a fog and a mist is mainly one of density.

Humidity. At all times air contains a certain amount of water and the proportion will vary with the condition of the air. The actual amount of water in the air is called the "absolute humidity" of that air, and the ratio of the actual amount of water vapor it bears to the amount it would hold if saturated, is called the "relative humidity," and is usually shown in a percentage. When the percentage reaches 100, the air is said to be at saturation point or more usually "dew point."

Clouds. When humid air rises owing to a lower barometric pressure than exists in surrounding areas, it expands owing to the lower temperatures through which it is passing, and eventually the water vapor it contains condenses and presents the appearance known as clouds. If the water vapor condenses very rapidly it is precipitated in the form of rain, hail, sleet or snow, depending on the temperatures through which it passes.

Different types of clouds are given different titles, but to recognize them readily under their various names the reader should make a study of appropriate photographs and compare them with actual weather conditions. They mostly fall under four heads and their variations, Cirrus, Stratus, Cumulus and Nimbus; the last two being generally the rain bearing type.

Thunderstorms offer weather conditions particularly hazardous to pilots. The danger from lightning is perhaps the greatest hazard, though the risks of squalls in landing and the bad visibility occasioned by the heavy rain are equally important. There is only one rule for a pilot whose course takes him in the path of a thunderstorm which extends over too large an area to avoid, and that is to land. No other course is possible compatible with safety.

The distance of a thunderstorm from an observer may be calculated roughly by noting the number of seconds that elapse between seeing a flash of lightning and hearing the thunder, remembering that sight is almost instantaneous and sound travels 1,100 feet per second.

A detailed description of other conditions such as snowstorms, sandstorms or ice accumulation on wings is beyond the scope of this article. It must suffice to say that flying under any conditions such as these is dangerous and should be avoided at all costs. The conditions leading up to these elements are usually sufficiently obvious to give the pilot enough time to avoid them.

An intelligent study of a synoptic chart will enable an observer to ascertain the existence of any high or low pressure areas in the district over which he proposes to fly, the direction and rate of their progress, the visibility that exists along his course, the winds and the prospect of any rapid changes occurring.

A trough or an area of low pressure between two areas of high pressure will be neither narrow or wide. Seen on a chart it will indicate storm centers at its northern and southern extremities if it is of the former type. If it is a wide trough with comparatively high temperatures, the development of an extensive storm area will probably follow.

Any drops in barometric pressure will indicate changes of weather. The questions of wind direction, temperature and the rapidity of the drop will indicate the conditions that are likely to follow and whether rain, storms, snow or gales are to be expected.

In the absence of other information a study of the clouds will inform an observer of impending weather changes. A long line of low, dark clouds often indicates the approaching squall and rain; high clouds moving at high velocities from the south also indicate rain. A northerly wind with the heavy, dark, patchy Strato-cumulus clouds which lay below 7,000 feet almost invariaby precede gales.

Cyclones almost always follow dark lines of converging Alto-stratus and Cirro-stratus clouds. The former generally start in dark patches between 10,000 and 25,000 feet and these are followed by thick layers. The Cirro-stratus will appear at greater heights, probably about 30,000 feet and will have a whitish appearance. Each layer will be well defined and the converging of the two sets of clouds will be definite. The Alto-stratus will gradually thicken as it approaches.

The high, feathery Cirrus clouds moving at a high speed are generally an index to the changeableness of the weather. On the

(*Continued on page* 45)

FIGURE I.

Beaufort Number	General Description of Wind	Specification of Beaufort Scale		Limits of Velocity in Miles per Hour at about 30 ft. above Level Ground
		For Coast Use	For Use Inland	
0	Calm	Calm	Smoke rises vertically	Less than 1
1	Light Air	Fishing smack just has steering way	Wind direction shown by smoke drift but not by wind vanes	1–3
2	Slight breeze	Winds fill the sails of smacks which then move at about 1–2 miles per hour	Wind felt on face; leaves rustle; ordinary vane moved by wind	4–7
3	Gentle breeze	Smacks begin to careen and travel about 3–4 miles per hour	Leaves and small twigs in constant motion; wind extends light flag	8–12
4	Moderate breeze	Good working breeze; smacks carry all cnavas with good list	Raises dust and loose paper; small branches are moved	13–18
5	Fresh breeze	Smacks shorten sail	Small trees in leaf begin to sway	19–24
6	Strong breeze	Smacks have double reef in main sail	Large branches in motion; whistling in telegraph wires	25–31
7	High wind	Smacks at sea lie to	Whole trees in motion	32–38
8	Gale	All smacks make for harbor	Breaks twigs off trees; generally impedes progress	39–46
9	Strong gale	....	Slight structural damage occurs; chimney pots off	47–54
10	Whole gale	....	Trees uprooted; considerable structural damage	55–63
11	Storm	....	Very rarely experienced; widespread damage	64–75
12	Hurricane	....	....	Above 75

Mono-Biplane Plans

(*Continued from page 11*)

Now prepare the five bulkheads shown in drawing 3. Bulkhead No. 1 is made of 3/8" thick, balsa. Then from 1/16" plywood make piece No. 4 and join it to piece No. 3, as shown. Bore a hole in it and insert piece of copper tubing 1/16" diameter in the dimensions shown in the drawing. This is the shaft-bearing. The pull of the rubber motor will keep it in place.

Shaft No. 6 is made in the usual way. The remaining three bulkheads should be cut from 1/16" thick ply balsa veneer—the measurements given in the drawing. Ply balsa veneer can be made by yourself out of 1/32" balsa sheeting. Ambroid the two sheets together so that the grain of the balsa of one sheet is at right angles to the grain of the other. Then place them under a press.

Now make rear hook No. 7 and ambroid it to the 1/8" thick, hard balsa bulkhead No. 5, as shown in the drawing. When the bulkheads are ready, ambroid them to the side pieces A. When these have dried, attach bottom of bulkhead (B).

Drawing 4 shows the front cowling (D). Use 1/32" thick soft balsa for this. The same drawing shows the proportions of piece C made out of 1/32" thick hard balsa. Ambroid a thin celluloid plate (13) to the round opening which indicates the cockpit through which the rubber can be reached. Now fix pieces B & D in their proper places, secure them with ambroid, and your fuselage is finished.

The tailskid (12) shown in drawing 3 is made from 1/32" thick fibre, and ambroided in place. Now make pieces No. 8, 9 and 10—shown in drawings 4 and 5. Pieces 8 and 9 are made from 1/16" hard balsa, and No. 10 of 1/16" hard wood. Make two of each. The landing gear and its assembly—dimensions being full size—are shown in drawing 5. Make two axles (11) of steel wire, and attach 2" celluloid wheels to them, as shown in drawing.

Drawing 5 shows the outline of the ribs, of which seventeen are needed for the upper wing, and sixteen for the two lower wings. The upper wing is shown in drawings 6 and 7. Make the front spar from 32" x 1/8" x 1/8" hard balsa, and use 1/8" square medium balsa for the rear spar. The trailing edge is made of 1/8" x 1/16" medium balsa. The spars on the lower wings are of the same dimensions, but are made of hard balsa.

Make the upper wing in one piece, placing the ribs 2" apart. Pieces 14 and 15 are made of 1/16" thick soft balsa, and are ambroided to the last top ribs in order to increase the rigidity. Cover the wings on both sides with Japanese silk paper, and dope them in the usual manner.

Drawings 8 and 9 show the lower wings, of which we need a right and a left. Construct these and cover them in the same manner as the upper wing. The cabane, shown in drawing 9, is made of steel wire and is ambroided to the upper wing and the fuselage. The upper wing is set at an angle of zero degrees. The lower wings are simply set in place. The tubes (16) as set secure 3 degrees dihedral for the lower wings.

Five tailribs as shown in drawing 9 are needed and are made from 1/16" hard balsa. The structure of the tail is shown in drawing 10, and when finished is covered with Japanese silk paper and fastened to the fuselage. The angle of attack is zero degrees.

Drawing 7 shows the front, and drawing 9 the side view of the 9 1/2" diameter propeller, which is made of bent balsa. Insert the shaft No. 6, bend it properly, and ambroid it in place, using the necessary washes, etc. The rubber motor consists of ten strands of 3/32" flat rubber. When assembled, the model is ready for flight.

If you desire to use it as a low-wing monoplane, do not glue the cabane to the fuselage but fasten it by means of four wooden screws, which will enable you to remove it together with the top wings. The point of the center of pressure is shown in figure 1. The model will be stable, and will be found to be a good flying model in each of the three types for which you use it. As a biplane, it has good endurance, and also for use as a high-wing monoplane, taking off speedily. As a low-wing monoplane it shows great speed.

The parts shown in No. 10 and 11 are to be used with the model for the parachute experiments. Hook 22 is pasted to bulkhead 1 in position as shown. Piece 18 is made of 1/16" hard balsa. Pieces 19 and 21 are made of steel wire and ambroided to piece 18, as shown in the drawing. The cone (20) is made of hard balsa and mounted on axle 19. Let it revolve easily, as it can not slide down because hook 21 would check it. This structure is ambroided to the upper wing as shown in drawings 7 and 11. The parachute is made by following drawing 23.

The material used for the parachute is Japanese silk paper, from which six pieces are cut out exactly as shown. Paste them together on the dotted lines, and also paste a piece of silk thread (24) 12" long to each joint. The threads are fastened to a celluloid ring (25), and must be equal in length. Tie a small weight (27) to the ring by means of a piece of string (26) 6" long, and the parachute is ready.

Fold up the parachute and place in the folds one end of a piece of silk thread 30" long, so arranged that a slight pull on the thread will open the parachute. You will learn how to do this after a little practice.

Place the folded parachute between cabane 17, as shown in drawing 2, and the weight 27 on the cockpit. Lead the rope 28 through the double hook 21, wind it round 20 but keep the end free. This free end is led through the upper curve of the cabane and hook 22 to the shaft of the propeller. Wind up the propeller and tie the thread to the shaft. The revolving axle pulls the rope, which, when wound up, releases the parachute. The strong air current throws back the parachute, opens it up and it in turn floats away with the weight 27. The model continues in flight while the parachute descends slowly.

Gliding and Soaring

(*Continued from page 33*)

have a band saw and a circular saw, although these machines are not absolutely necessary. A band saw is useful for making profiles and moulds for wings and other parts which have irregular shapes. Unless you have these saws, you will be obliged to have a good many parts got out at a mill. C-clamps are also necessary to hold the parts together while the glider is being assembled.

Materials and Accessories. The most important of these materials is wood—metal is sometimes used as a wing or fuselage covering, but it is harder to work, more expensive, as easily destructible as wood, and far more difficult to repair. Steel tubing is sometimes used in place of wood in the frame work. One make of glider which can be bought with parts ready to put together is made entirely of this. However, it is probably more difficult for the amateur to work with.

It is essential that the wood used be of the best quality. A poor grade of wood is neither durable nor strong, and much may be too knotty to be used at all. Airplane lumber yards, which exist in most large cities, sell wood of excellent quality. Spruce is commonly considered the best material for gliders. Oregon pine may be used, although it is heavier, because it is as strong and less expensive. Combinations of these woods may be used in building a glider, to ensure lightness, strength, and durability. Some kind of hardwood, preferably ash or hickory, should be used for the runner, and one-eighth-inch plywood is necessary for gussets, the box skid, and other purposes.

Often airplane factories have "seconds" that will qualify as glider "firsts;" e. g., a span, defective in one end, may be sound enough for a glider span. Such "seconds" should not be used, however, unless an expert builder recommends them.

It will save time to have the stock sawed and planed as far as possible at a mill before it is sent to you. Until you get ready to use the wood, it should be kept so that the air can circulate around it, and so that it will not get out of shape. This is done by piling up the lumber on the floor, or on some other flat surface, and by "sticking;" i.e., by putting small strips of wood of equal thickness between each two boards to separate them. Long, thin strips can be "stuck" and fastened together with cord, so that they will not twist out of shape. Spruce is much given to twisting.

Glue. All wooden joints should be glued. Casein glue is the best glue for glider construction because it is waterproof. It comes in a powder and should be mixed with cold water; use equal parts of glue and water by weight; or twice as much water as glue by volume. Mix only as much glue as you expect to use immediately; it becomes too old to be useful after it has stood a day.

Nails. Since nails add considerably to the weight of the glider, you should use as few of them as possible. They are necessary chiefly as additional safety in case the glue should give way, and to secure the joints while the glue is drying. Cement-covered brass airplane nails are preferred by some; but iron nails are commonly used. So-called cigar-box nails are slim and light.

You must decide on the size of the nails in accordance with the thickness of the wood which you are using. If you are nailing a thin piece of wood onto a thick one, the nails should be about three times as long as the thickness of the thinner piece. If you are fastening two thin pieces of wood together, it is advisable that the nails be long enough to be clinched on the under side.

Bolts. All good plans specify the dimensions of material bolts. It is usually better to use two or three small bolts than one large one. Both three-sixteenths-inch bolts and quarter-inch bolts will probably be necessary. Steel bolts are the best, but ordinary iron ones can be used.

Metal fittings. Sixteen or eighten gauge brass or galvanized iron may be used for many of the fittings, and can be procured at any tin shop. Pieces of steel tubing are also useful for fastening the struts to the fuselage, and to the wings. Such fittings add only to the strength of the glider and to the ease with which it can be assembled and taken apart. Some fittings can be bought ready-made from large hardware stores or from mail-order houses which specialize in airplane supplies. If you have no metal working tools, fittings which cannot be bought can be made up to order at a machine shop.

Wing Covering. The wing covering of gliders consists of some fairly good grade of cotton cloth, such as unbleached muslin or cambric usually, although regular airplane fabric may be used. Heavy cotton or linen thread, and straightway tape about an inch wide, (either torn from the cloth or bought in a piece, and sold regularly for this purpose) are necessary for covering the seams in the cloth.

Dope. "Dope" (cellulose acetate or nitrate) can be bought at hardware stores or from mail-order and aeronautical supply houses. It is better than paint because it shrinks the cloth, making it fit tightly over the framework, and because it is lighter than paint (four coats of dope add only about three ounces of weight per square yard). Consequently, ordinary paint should never be used. At least three coats of dope should be given to the wings. Dope is best put on by means of a paint sprayer, although it can be done with a brush. Doping adds greatly to the strength and rigidity of the wings and fuselage.

If it is mixed with some sort of pigment, dope excludes the light, and light has an adverse effect on dope. For this reason, dry aluminum powder is often added to the last two coats of dope which are applied. The aluminum gives the cloth a silver appearance. Soarers are sometimes tinted red or orange, so that the official observers may follow them easily.

If the fuselage is not covered with cloth, it must be protected in some other way from the weather. Although any ordinary paint may be used, lacquer adds the least weight. If the fuselage is painted in colors, it gives the glider a cheery aspect and can be seen further.

Wire. Fourteen-gauge tinned airplane wire is suitable to be used in the construction of parts of the ship. Where excessive strain is put on the wire, two strands of it may be twisted together.

Choosing the Design for the Glider. You should choose the design with the advice of someone who has good knowledge of the subject. It is a great advantage, of course, for construction experts to make their own designs; the best gliders which have so far been built may be still more improved on.

Selection of a design should be made with reference to the purpose which the glider is to serve. Primary training gliders, for instance, are easy to handle and, accordingly, serve admirably to train novices. On the other hand, a student soon masters the operation of the primary training glider, and demands a more efficient machine. There are a number of well-tried designs for these elementary ships. Many secondary training gliders are too sensitive to be flown by most beginners; but, since they will soar, they have a greater field of usefulness and some are easily handled by a clever student.

Comparatively few soarers have been built in this country, and until recently only a few pilots here were qualified to fly them. Plans for soarers are difficult to obtain, and only experts should attempt to design or build them.

Enlarging the Plan. When you have chosen the design for the glider and obtained the plans, they should be thoroughly studied so that you are familiar with all the parts and how they fit together. Usually the plans given in the blue prints are small and must be enlarged. In this event, full-sized drawings should be made of such parts as joints, intersections, portions of the wing at its tip and base, etc. These enlargements must be made to scale, using the dimensions given on the blue prints.

The profile of the wing must be drawn full size. This drawing is necessary, partly because a form has to be built in the shape of the profile over which to form the ribs, and partly because the wing must be made exactly as the plan specified in order to function properly. The laying out of a wing profile is a very delicate process, its various characteristics and dimensions are chosen for any given wing in order that it may best serve its special purposes. All wing designs in common use today are numbered and catalogued. The catalogues, giving figures for the enlargement of each wing design, can be procured from the National Advisory Committee for Aeronautics, in Washington.

The wings of a glider of high performance are almost always tapered. Tapered wings are more difficult to construct than straight ones. In a tapered wing, the wing profile becomes gradually smaller from the root to the tip. Therefore a separate pattern has to be drawn for each rib.

Some plans of light gliders give directions for changing the length of the fuselage or the position of the seat in accordance with the weight of the pilot who is to use the glider. You should look for such directions when you are enlarging the plans. There are some companies which make gliders and sell the parts ready for assembly. This is probably slightly more expensive but certainly less trouble than to make all the parts yourself. On the other hand, it is not so instructive and you lose a great deal of the pleasure of carrying your building from the beginning to end.

Course in Air Navigation

(*Continued from page 41*)

other hand, if they are seen to be stationary or moving very slowly, no change need be expected for a day or two. The banking up of thunder clouds is too familiar to need description.

Remembering these points, especially in relation to squalls, cyclones and thunderstorms, may be of inestimable use to a pilot flying in uncertain weather. In connection with the diagrams of synoptic charts, it is pointed out that these do not represent any particular daily weather state in the U. S.; they are merely illustrations of how highs, lows, etc., would be depicted on a chart.

ANSWERS TO LAST MONTH'S QUESTIONS

1. Maintain a steady course and check this by reference to the compass. Watch until a prominent object appears directly ahead, and still maintaining the same cours observe under which point on the leading or trailing edges it appears to pass. The essential conditions to be observed are:

   1. That the plane is maintained on a constant course.
   2. That the pilot keeps his head in the correct position.
   3. That the mean of several readings is taken.

2. A tail bearing over the sea could be obtained by flying on a constant course over a stationary object, such as a lightship; or dropping a flare into the water, and then by observing, either with bearing compass, bearing plate or tailplane drift markings, the direction of the track or the angle of drift. The same method could be adopted over the land except that flares would be unnecessary.

3. Method V is the system of taking bearings on a single object at equal time intervals. The plane is kept on a constant course and at equal intervals of time, bearings are taken on the object—a minimum of four is essential. The bearings are then plotted with reference to any straight line and an equal number of convenient distances marked off on the ruler. This is then placed on the bearings, drawn so that the points on it coincide with points on the bearings. A straight line drawn in this direction, and there can only be one direction if the bearings are accurate, will indicate your track. This method would be used when flying in conditions such as fog and when only one unrecognized object is visible.

THIS MONTH'S QUESTIONS

1. What is the direction of wind with respect to high and low pressure areas?
2. What is the general direction of travel of highs and lows in the United States?
3. Name two kinds of barometers. What is meant by a falling barometer and what types of weather will be indicated?
4. What causes bumps?
5. What particular weather conditions should be avoided?

Log of a Flying Sailor

(*Continued from page 9*)

as they reach the region of rarified air. The towing planes have had a hard pull for the resistance of the targets is tremendous. The firing planes nose even further upward and come to level flight only after reaching an altitude of 18,000 feet.

The squadron now breaks up into three divisions of six planes each and the Division Commanders lead their flying mates apart, each division seeking out its designated target plane. Flying several hundred yards ahead of his target, each leader takes a proper lateral distance from it. The point of starting is of utmost importance in order to standardize the firing runs.

The leader waves "good-luck" and swings away towards the now tiny sleeve in a well-banked wingover. Taking careful notice that he is approaching the target at the desired angle, he places his eyes to his telescopic sight. Now, the target appears larger. The plane gains more and more speed in its dive. The target begins to fill the entire eyepiece. The gun triggers which are attached to the control stick are fingered confidently.

The plane must now be maneuvered entirely by the appearance of the sleeve through the small telescope. If the pilot allows his plane to continue on this path too long he will fly into the target. Now is the time to shoot. It is impossible to miss. Squeezing the triggers to the stick his alert eye sees holes being dotted in the white cloth of the target. His ears are filled with the din of the roaring engine, but above that comes the rat-tat-tat of the machine guns sounding like the steady, persistent roll of a snare drum.

The sleeve now looms up directly in front of the plane and it appears as if the whirling propeller will surely slash it into bits. At the last instant the pilot gives the stick a downward shove and the plane ducks under, missing the bullet-riddled cloth by the closest of margins.

Diving now to get clear of the second plane which is already approaching, the leader pulls off to one side to observe the work of his division mates. The towing pilot is flying a steady course which is favorable for firing. He might well be excused for weaving in and out, however, for the towing plane has frequently come down rewarded with bullet holes in its fabric and framework.

One by one the fighters dive down at a terrific speed to pierce the moving target with steel projectiles, which travel on downward to fall harmlessly into the open sea. Joining up in formation the planes fly slowly past the target to see the results of their practice. The towing pilot goes back to the carrier, where he drops the target on the deck and then proceeds to land aboard. The sleeve is gathered up by the gunnery observers who officially count the hits.

The divisions now proceed to an area in which three destroyers are steaming along at twenty knots with a raft in tow. This raft is designed to throw up a spray in order that it will be visible from the air. An eight hundred foot tow line is used, for the average error in bombing is much greater than that of machine guns.

Gliding down to an altitude of 6,000 feet the divisions begin their bombing runs on the raft. The target is the imposed area of a destroyer projected around the raft as a center. Photographs are taken of every bomb that lands and its distance relative to the simulated ship is determined.

The planes open up the distance between one another in order to have some freedom of movement. This will give each pilot a small amount of leeway in his approach to the target when over the destroyer. The leader's plane suddenly tilts downward at a sharp angle. By the time he reaches his releasing altitude the raft will have moved nearly under him.

Steeper and steeper becomes the dive until he is vertical. Faster he goes until the wires of his strong fighter are screaming. The second pilot repeats the performance and places his plane in the same vertical dive. The succeeding planes do likewise and at last a vertical line of screaming, howling fighting planes are to be seen diving on their target.

In the meantime the leader is using his telescopic sight. Estimating the forward movement of the target and the natural lag in the trajectory of the bomb, he takes careful aim and pulls the release toggle. Allowing a fraction of a second for the bomb to fall clear, he pulls vigorously back on his control stick and gets clear of the next plane in line. If he is quick, he will be able to catch sight of his bomb as it is falling and follow it down until it explodes in the sea alongside the raft.

As the Division Leader gets clear he climbs quickly for altitude and hurries back forward of the towing destroyer. As the last plane in line drops his first projectile, the leader dives down again followed by his mates, who have stuck close on his tail. The second bomb is released during this maneuver.

Zooming upward the planes are again closed in and the three divisions join up in squadron formation. The squadron leader now resumes command and lays a course back towards the carrier which has been lying to in the distance. Upon seeing their return the mother ship gets under way and steams ahead into the wind, ready to take them aboard. Breaking up into six sections of three planes each, the planes now circle overhead. The first section dives down. Each pilot lowers his landing hook which will later engage in the arresting gear spread out on the deck.

Opening out to a distance of about two hundred yards the planes slow down and approach the deck at just above stalling speed. Following the directions of the signalman aboard ship the pilot knows whether to increase the speed of his craft or whether to slow it down still more. Further, this signalman indicates to the pilot the proper height. If too high he must follow instructions to throttle down and drop lower. When in the proper position the signalman indicates to the pilot that he must close his throttle entirely and land.

As the plane stops it is surrounded by a crew of men who hurriedly push it out of the arresting gear in order that the next in line will have a clear area on which to land. If the space is not cleared in time it will be necessary for the next plane to go around the landing circle again.

Occasionally a landing plane will fly so close that the signalman is forced to jump down onto a small protected platform built expressly for such an event. Other times a plane will land quite hard and blow out a tire. Perhaps the landing gear will give way, but it causes no loss of time for the craft is hauled clear by hand nearly as quickly as if its wheels were intact.

When all planes are aboard the pilots meet in the Ready Room to talk over the day's work. Any mistakes made are noted and discussed in order that a reoccurence will be prevented. The squadron's score is tallied and ways of improving it are talked over. The Engineering Officer collects complaints, if any, regarding the operation of the engines.

After lunch the mechanics again tackle the planes and engines. Change oil, if necessary, gas up the tanks, wipe down the loose oil which has sprayed the plane during the long dives. Magneto breaker points are checked, spark plugs are cleaned up, and in general the aircraft are put in shipshape order.

While this is going on the pilots are attending school. They are practising semaphore and radio, studying tactics, engineering, and gunnery.

An hour's exercise up on deck works up a healthy appetite and keeps the flyers toned up to the good physical condition which is so necessary for an aviator. Once a week they take a physical examination in order that the Flight Surgeons can keep in touch with the well-being of the officers assigned to them for conditioning.

After dinner every night a motion picture program is held topside on the deck. A new show is scheduled each night. The library of crash reels are often shown. Slow motion pictures are taken of every landing that begins and ends badly. As a result every crash is recorded. The pilot thus has no alibis and the movie audience has many a laugh over the frailties of men.

After the show the pilots may listen to the radio with which all Navy ships are equipped or they may read from a well stocked library. The flying, however, combined with the hard work of the afternoon brings on an early urge to sleep. The enlisted men are weary, too, after the long day and they are apt to turn in early.

A long drawn-out bugle call sounds over the water. It has a plaintive note, but it is comforting, too, for it is Taps. All lights out. The day is done. The running lights burning bright and clear with an occasional white light are all that can be seen as the huge monster pushes its way through the swells of the Pacific. Aboard her are the sleeping men whose presence offers protection to those who stay ashore and on the ground. They are the barrier —the first line of defense.

Aviation Advisory Board

(*Continued from page 29*)

Halberstadt (Two-seater Fighter).

Span of upper plane, 35 ft. 3¼ in.
Span of lower plane, 34 ft. 11 in.
Chord of upper plane, 5 ft. 3¼ in.
Chord of lower plane, 4 ft. 3½ in.
Gap, maximum, 4 ft.
Gap, minimum, 3 ft. 8½ in.
Dihedral angle of lower plane, 2 deg.
Horizontal dihedral of main planes, 4 deg.
Total area of main planes, 310 sq. ft.
Area of each aileron, 11.6 sq. ft.
Area of aileron balance, 2.0 sq. ft.
Load per sq. ft., 8.2 lbs.
Area of tail planes, 13.6 sq. ft.
Area of elevator, 12.4 sq. ft.
Area of fin, 6.4 sq. ft.
Area of rudder, 7.9 sq. ft.
Area of rudder balance, 1.0 sq. ft.
Maximum cross section of body, 8.8 sq. ft.
Horizontal area of body, 44.0 sq. ft.
Vertical area of body, 52.8 sq. ft.
Length over all, 24 ft.
Engine, 180 h.p. Mercedes.
Weight per h.p. (180), 14.07 lbs.
Capacity of petrol tanks, 34 gallons.
Capacity of oil tanks, 4 gallons.
Crew, Two.
Guns, 1 fixed and 1 movable.
Military load on test, 545 lbs.
Total load on test, 2,532 lbs.

Performance:

Speed at 10,000 ft., 97 m.p.h., 1,385 r.p.m.

	Min.	Sec.	Rate of Climb in Ft. Min.	Indicated Air Speed
Climb to 5,000 ft.	9	25	440	69
Climb to 10,000 ft.	24	30	240	64
Climb to 14,000 ft.	51	55	80	58

Service ceiling (height at which climb is 100 ft. per minute) 13,500 ft.
Estimated Absolute Ceiling, 16,000 ft.
Greatest height reached, 14,800 ft. in 64 min. 40 sec.
Rate of Climb at this height, 50 ft. per min.

—:oo:—

Hannoveraner Biplane:

Weight empty, 1,732 lbs.
Total weight, 2,572 lbs.
Area of upper wings, 217.6 sq. ft.
Area of lower wings, 142.4 sq. ft.
Total area of wings, 360.0 sq. ft.
Loading per sq. ft. of wing surface, 7.29 lbs.
Area of aileron, each, 16.4 sq. ft.
Area of balance of aileron, 1.6 sq. ft.
Area of top plane of tail, 10.0 sq. ft.
Area of bottom plane of tail, 19.2 sq. ft.
Total area of tail plane, 29.2 sq. ft.
Area of fin, 6.5 sq. ft. approx.
Area of rudder, 6.4 sq. ft.
Area of elevators, 22.0 sq. ft.
Horizontal area of body, 53.2 sq. ft.
Vertical area of body, 91.6 sq. ft.
Total weight per h.p., 14.3 lbs. per h.p.
Crew, pilot and observer.
Armament, 1 Spandau firing through propeller, 1 Parabellum on ring mounting.
Engine, Opel Argus, 180 h.p.
Petrol capacity, 37¼ gallons.
Oil capacity, 3 gallons.

Performance:

(a) Climb to 5,000 ft., 7 min.
Rate of climb in ft. per min., 590.
Indicated air speed, 68.
Revolutions of engine, 1,495.

(b) Climb to 10,000 ft., 18 min.
Rate of climb in ft. per min., 340.
Revolutions of engine, 1,475.
Indicated air speed, 65.

(c) Climb to 13,000 ft., 29 min. 45 sec.
Rate of climb in ft. per min., 190.
Indicated air speed, 62.
Revolutions of engine, 1,445.

Aerial Radio and Airplane Engine Courses For YOU ! !

Well, we're still sticking the odd nose up, and going places!

Adhering to its policy of endeavoring to obtain for you everything that will help you to form a firm foundation for a successful career in aviation. MODEL AIRPLANE NEWS announces with pride and pleasure the start in an early issue of two courses—

"Aerial Radio," by Captain L. S. Potter
and
"Airplane Engines," by Lieut. H. B. Miller.

No need to tell you how much these courses will supplement those already published in MODEL AIRPLANE NEWS. Just think—

"Air Navigation," by Captain Potter

"Airplane Designing," by Ken Sinclair

"Gliding and Soaring," by P. and M. White, and now two more courses.

Where else in the world could you or your friends (have you told them, by the way?) obtain such ground schooling in aviation for only 15c a month?

Stick by M. A. N. and succeed in aviation!

THE EDITOR.

Speed:

At 10,000 ft. 96 miles an hour; Revolutions 1,565.

At 13,000, 89½ miles an hour; Revolutions 1,520.

Service ceiling at which rate of climb is 100 ft. per min. 15,000.

Estimated absolute ceiling, 16,500.

Greatest height reached, 14,400 in 39 min. 10 sec.

Rate of climb at this height, 120 ft. per min.

Air endurance—about 2½ hrs. at full speed at 10,000 ft. including climb to this height.

Military load, 545 lbs.

Rumpler (Two-seater Biplane) Type C. V. —260 h.p. Mercedes engine.

Weight empty (but with water), 2,439 lbs.

Weight, fully loaded, 3,439 lbs.

Total military load, 545 lbs.

Span (upper), 41 ft. 6 in.

Span (lower), 40 ft.

Chord (upper), 5 ft. 8 in.

Chord (lower), 4 ft. 4 in.

Sweep back, 3 deg.

Dihedral, 2½ deg.

Area of upper wings (with ailerons), 217.6 sq. ft.

Area of lower wings, 146 sq. ft.

Area of ailerons (each), 15.3 sq. ft.

Total area of main planes, 363.6 sq. ft.

Loading per sq. ft. of wing surface, 9.5 lbs.

Area of tail plane, 22 sq. ft.

Area of fin, 4 sq. ft.

Area of elevators, 20.8 sq. ft.

Area of rudder, 6 sq. ft.

Total weight per h.p., 13.2 lbs.

Petrol capacity, 59 gallons.

Oil capacity, 3 gallons.

Water capacity, 10 gallons.

Endurance, about 4 hours.

Performance:

	ft.	m.p.h.	revs.
Speed at	10,000	100.5	1,510
Speed at	15,000	87	1,390

	ft.	m.s.	min.	revs.
Climb to	10,000	16.0	400	1,375

Service ceiling, 15,500 ft. (estimated).

Greatest height reached, 15,300 ft. in 38 min. 25 sec.

Rate of climb at this height is 125 ft. per min.

Controversies arising between Rumpler and Etrich, the latter dropped the German patent rights, which led to the general adoption of the "Taube" type by almost every aircraft works in Germany.

Hirth left, and Rumpler lost much in influence. Linnekogel put up further altitude records on the new Rumpler monoplane, of modified "Taube" design, in that the plane underbridge was abandoned and the back-swept elastic wing tips replaced by usual ailerons of same shape.

The same body, canvas covered over steel tubes, was employed in the first Rumpler biplane, on which Basser performed his 18 hours' duration record and the passenger overland flight, Berlin—Budapest—Sofia—Constantinople non-stop, excepting the three capitals.

During the war this biplane has been produced as a seaplane, earlier efforts in this field being the Rumpler flying boat, an intermediate between the Curtiss and F. B. A. types and the ordinary "Taube" design, only with a two-floats landing gear.

ASTOUNDING VALUES

LOWEST PRICES ON BALSA WOOD ANYWHERE!

PROMPT SERVICE! FINEST QUALITY! BEST KITS OBTAINABLE!

Official A. M. L. A. Kits Now Obtainable. We now carry the official Model Airplane League of America Model Airplane Kits. All prices on kits and planes are postpaid. Order one of the wonderful complete kits now and be ready for full enjoyment of model flying this season.

Other A.M.L.A. Kits are listed below. Each kit contains full instructions and sufficient materials for building.

A.M.L.A. Soaring Gilder No. 19. .25c.

New Endurance Tractor Kit, A.M.L.A. Indoor Kit No. 21

This plane holds the official record of 11 minutes. Each kit contains an instruction book telling how to build seven championship indoor ships, any one of which may be built from the material included in this kit. Full drawings and instructions.

Kit Complete, Postpaid..................$1.25

* * *

Indoor Endurance Fuselage Model

This is the famous C-4 cabin job. A beauty and an excellent flier. Suitable for entrance in indoor fuselage contests.

Complete Kit, Postpaid..................$1.50

* * *

Outdoor Duration Monoplane A.M.L.A. Kit No. 5

This is a low wing job especially designed to fulfill the requirements for the Stout and Wakefield Cup Contests. An official average of 90 seconds was made under all weather conditions.

Complete Kit, Postpaid..................$2.00

* * *

Official A.M.L.A. Scale Model Plans

The A.M.L.A. has prepared a series of 24″ scale model drawings. Each drawing shows full detail of the plane and is on a sheet approximately 34″ x 44″. Boeing P-12, Vought Corsair, Fokker F-10, Lockheed Vega, Stinson Lycoming, Waco Taper Wing, Lockheed Sirius. Any one of the above planes for 20c., postpaid.

* * *

Realistic Celluloid Products

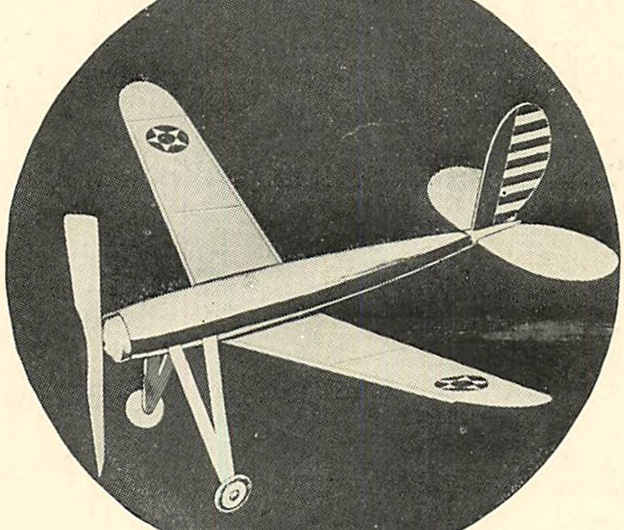
Wheels in red, white, or black. 2″ size, per pair, 20c.; 1 3-8″ size, per pair, 12c.; 1″ size, per pair, 8c.; 3-4″ size, per pair, 7c. Dummy Radial Motor (black celluloid), 40c. each. N.A.C.A. Cowling (black celluloid), 25c. each. Wheel pants (streamline coverings for 2″ wheels), 30c. per pair. Wheels and pants assembled, 50c. per pair.

* * *

Rubber! Best Grade Para at Lowest Prices Yet

The popular 1-8″ flat size 3 ft. for one cent. 210 ft. skein SPECIAL 60c. FRESH STOCK ALWAYS.

A special size for small indoor models .045 sq., 3 ft. for 1c. 210 ft. skein 50c.



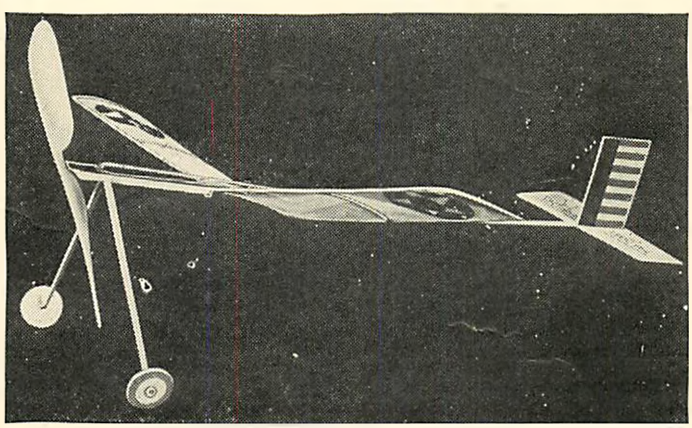
A.M.L.A. Fuselage Model No. 22

Number 22 is a model we are proud of. This little plane, with its gayly decorated streamline fuselage and graceful tapered wings, has all the appearance of the well-known Lockheed Sirius. The kit contains the formed fuselage halves ready to assemble, and the carved propeller together with all the other parts necessary for building the plane including full instructions. Complete Kit, postpaid...........75c.

CAMP DIRECTORS ATTENTION!

We will be glad to furnish you with an outline of a course in model airplane construction for use at your camp. Full information about the camp should accompany this request.

We also have a special offer for schools, clubs and Y.M.C.A.'s. Use your letterhead when requesting such prices.



A.M.L.A. Three-in-One Baby R.O.G. Kit No. 20

This kit contains enough material to construct any one of three different types of planes including the improved R.O.G., Baby Biplane, and the famous cambered wing Endurance R.O.G. A carved propeller, full instructions, and plenty of material are included in this kit. Compete Kit, postpaid.....50c.

IMPORTED TISSUES. BEST MATERIALS FOR COVERING

Hakone, a white rice paper, 5c. per sheet, size 21″ x 31″.

Japanese Tissue, a cream-colored strong tissue suitable for outdoor planes. 5c. per sheet, size 21″ x 31″.

Six sheets of either or mixed SPECIAL 25c., postpaid.

VERITHIN TISSUE. A light glazed tissue, only .0003″ thick! Six sheets, 4 x 36″ in package, only....................................25c.

WINDERS. Strong Aluminum geared double winders. Best Buy in this line. Special $1.00 each.

Split bamboo, 15″ lengths, 2c. each or 15c. per dozen.

BALSA WOOD

We offer the finest grade of BALSA WOOD that can be bought. It is purchased from selected stock and smoothly cut to size by especially designed equipment. We guarantee it to be of the best quality and free from worm holes.

Size	Price per Piece	Size	Price per Piece
1/16 x 1/16 x 36″	$.01	1/8 x 3/16 x 36″	$.02
1/16 x 1/8 x 36″	.01	1/8 x 1/4 x 36″	.02
1/16 x 1/4 x 36″	.02	3/16 x 1/4 x 36″	.02
1/8 x 1/8 x 36″	.015	1/4 x 1/4 x 36″	.02

SHEET BALSA

Size	Price per Piece	Size	Price per Piece
1/32 x 2 x 36″	$.06	1/16 x 2 x 36″	$.07
1/20 x 2 x 36″	.07	1/8 x 2 x 36″	08

PLANK BALSA

Size	Price per Piece	Size	Price per Piece
1 x 3 x 36″	$.40	2 x 3 x 36″	$1.00
1 x 6 x 36″	.70	2 x 6 x 36″	1.25

Note—A 10c. packing charge must accompany any order for balsa wood.

SELECTED BALSA PROPELLER BLOCKS

Size	Quan.	Price	Size	Quan.	Price
3/8 x 1/2 x 5″	1	$.02	1 x 1-1/2 x 10″	1	$.09
3/8 x 3/4 x 6″	1	.02	Special twin pusher size:		
1/2 x 5/8 x 6″	1	.02	1 x 1-1/2 x 12″	1	10c

LIQUIDS

SMASCO GLU—The best model airplane cement obtainable. This new cement is colorless, producing a much neater job; stronger, giving a more permanent joint, and quicker drying, making possible a prompt assembly. Obtainable only from us, in the following sizes, 1 oz., 12c.; 2 ozs., 20c.

BANANA OIL—This is a high grade banana oil which will really stick paper to the frame, and waterproof propellers and pontoons. It is also excellent for strengthening balsa spars. 1 oz., 10c.; 2 ozs., 15c.

WING DOPE—This medium dope is prepared by us from our own formula, and is suitable for the wings and fuselages of strong indoor models and all outdoor models. It is a good all around dope. Obtainable in the following sizes: 1 oz., 10c.; 2 ozs., 15c.

ACETONE—Chemically pure acetone is offered as a solvent or thinner for cements, or for mixing your own dopes or cements. 1 oz., 10c.; 2 ozs., 15c.

* * *

ORDERING INSTRUCTIONS

1—**No C.O.D. orders will be filled.** No orders for less than 50c. worth of balsa will be accepted.

2—Send money by postal money order if possible.

3—**Do not include postage. We pay all postage unless otherwise stated. All orders containing balsa wood or liquids must include a packing charge of 10c.**

4—Orders from Canada must include an extra 10c handling charge.

5—We do not accept responsibility for orders lost or broken in the mail. Include 5c. for insurance if desired.

6—**Service. All orders will be shipped within 12 hours after receipt.**

7—We reserve the right to refuse the whole or part of any order.

8—**Include your full name and address with each order.**

SOUTHERN MODEL AIRPLANE SUPPLY CO.

Post Office Box 149 — Atlanta, Georgia