JUNIOR MECHANICS AND

September

MODEL AIRPLANE NEWS

FULL-SIZE PLANS: NORTHROP "FLYING WING" AND BELLANCA SEAPLANE

MACFADDEN PUBLICATION PRICE 15 CENTS

ALL ABOUT WIND TUNNELS

PLANS FOR 32" MODEL RACING YACHT

Starting in this issue
"FROM THE GROUND UP"
New Aerial Thriller

ALL BALSA—AMERICA'S MOST EASILY CONSTRUCTED MODELS!

A new, all-balsa construction makes these Midland models superior to anything you have ever seen. Lighter—about two-thirds the weight of an ordinary model of the same size. Stronger—practically crash-proof. Better-looking and more realistic—smooth, sheet-balsa surfaces instead of wrinkled tissue sagging between ribs and longerons. Easier to build, because so much simpler. A job you can do in a couple of hours instead of a week. And *you* can do it. We've eliminated the question of skill.

Midland's all-balsa construction makes use of sheet balsa 1/32 of an inch thick for the wings and the sides of the fuselage. Balsa—almost as light as the paper it replaces, and infinitely stronger! The only paper is that used to cover the top and bottom of the fuselage and the tail.

No fragile, tedious, built-up framework. Nothing to draw. Nothing to measure off. No nails to drive, no holes to drill. A ready-made, die-stamped aluminum propeller to save you the work of carving one and to prevent the failures due to poorly-made propellers. Struts of spruce and bamboo. Celluloid wheels, light and good-looking. A shock-absorbing landing gear. Colorless, quick-drying model cement—the fastest-drying known Rubber 10% more powerful. Landing wheels well forward to protect the propeller. Wings at a high angle of incidence for fast climb and minimum center of pressure travel. Tips "washed out" to reduce losses. Scores of other aerodynamic refinements seldom found in models.

You will find these models much easier to build, and, after you have built them, much more satisfactory to fly. Fewer trial adjustments; longer, steadier flights.

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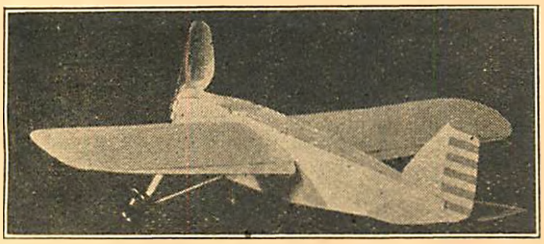
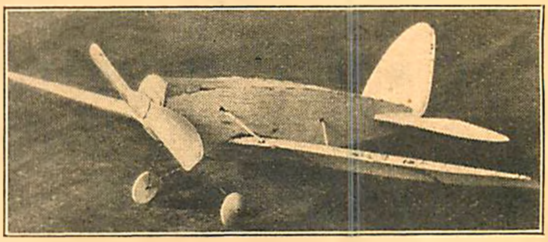
Complete set, with all material and full building and flying directions, postpaid in the United States and Canada...................... **$2.00**





MIDLAND BABY BULLET

Wing span 15 inches. Weight 3/8 ounce. Flight range 140 feet or more.

A simple, easily-constructed r. o. g. model of a one-place low-wing sport plane. The propeller is only one-fourth as long as the wings, and much closer to true scale than in ordinary models. Propeller blades deeply curved for slow revolution and unusual duration.

Complete set, with all material and full building and flying directions, postpaid in the United States and Canada, only **$1.00**

Midland Army Biplane in Flight

Unretouched photograph

1 OUT of 10

Probably not one model airplane in ten ever gives its purchaser a satisfactory flight. Some failures are due to careless construction. Some are due to careless *design*—a carelessness sometimes so great that the model can not be made to fly under any conditions. But the majority of failures are due to the tremendous difficulty encountered in building many models.

The average model would be entirely satisfactory if it could be constructed with less skill, but it may be a sad disappointment to the ordinary model builder, who often finds that he has wasted both his money and his time on a set which only an expert can put together.

A simple and easy construction is the key-note of Midland design. We do not pretend that Midland models are *exact scale* reproductions, for such *models* are hard to build, unsatisfactory to fly. We do not claim that these models will break records, for record-breaking models are too delicate to build, too fragile to last. All that we say is that these models are pleasingly realistic, that they will fly well time after time, and that the average boy can build them. Why risk disappointment by purchasing a model advertised with extravagant claims of exact scale design and almost unbelievable flying ability? Buy a Midland model and get what you expect, and what you are entitled to have.

You are doubly safe in ordering Midland sets because nothing but actual, unretouched photographs are used to advertise them. Remember that any photograph of a Midland model shows it as you will get it—not merely as you would like to have it.

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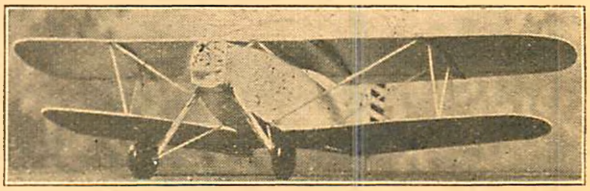
The wing spread is 20 inches, the weight exactly 1 ounce. The flight distance is close to 200 feet Because of its greater wing area the Army Biplane gains a great deal of altitude. The average limit is about 50 feet, but we have photographed it when almost three times that high!

The top wing is in advance of the lower one, and at a larger angle of incidence. This results in the center of pressure of both wings being shifted *forward* when the model dives, *back* when it climbs. This is the exact opposite of the usual movement, and gives the model unequaled stability. By far the best rough-weather flyer we have seen.

Harder to build than the monoplanes, but still much easier than any conventional built-up model. Complete set, with all material and full building and flying directions, postpaid in the United States and Canada ... **$2.50**



ORDER NOW—USE THIS COUPON

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Gentlemen:

Enclosed find $.......... for which send me your construction set for ( ) BABY BULLET ( ) COMBAT MONOPLANE ( ) ARMY BIPLANE. I understand that these sets will be sent postpaid in the United States and Canada, and that you will refund the purchase price of any model which fails to satisfy me after I have constructed it.

(Check or money order safer than cash. We cannot accept stamps or fill C O D's. No catalogue, except with set.)

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Vol. III No. 3

JUNIOR MECHANICS
and
MODEL AIRPLANE NEWS

CONTENTS, SEPTEMBER, 1930

In Our Next Issue

Feeling that our readers needed more appetizers for their mechanically inclined minds, we are broadening this field in "JUNIOR MECHANICS AND MODEL AIRPLANE NEWS" to an amazingly attractive degree.

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Just glance at the titles below—

"*Miniature Railways*"—a scientific and instructive hobby.

"*How to Build a Work Bench*"—something that every boy would like to have.

"*How to Build a Water Bike*"—the thrilling new water sport brought home.

"*How to Build a Dog Kennel*"—winter quarters for your pet.

"*Handicraft Hints*"—a score of things that every boy can make.

—o—

Then there are five pages of pictures of the latest developments in the mechanical and scientific fields.

—o—

Could you wish for anything better?

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These are in addition to full size plans for a model German Fokker D-7 plane, and further instalments in our *Gliding and Soaring*, *Aerial Navigation* and *Airplane Designing* courses for model airplane enthusiasts.

Published Monthly by MODEL AIRPLANE NEWS PUBLISHING CORP., Washington and South Aves., Dunellen, N. J.
Editorial and General Offices, Macfadden Building, 1926 Broadway, N. Y.
James E. Williamson, *President* Irene T. Kennedy, *Treasurer* Wesley F. Pape, *Secretary*
J. W. LeBaron, *Advertising Manager*, Graybar Building, 420 Lexington Ave., New York, N. Y.
Entered as second-class matter June 5th, 1929, at the Post Office at Dunellen, N. J., under the Act of March 3rd, 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 Office: 333 North Michigan Ave., C. H. Shattuck, Manager.
London Agents: Atlas Publishing & Distributing Co., Ltd., 18 Bride Lane, London, E. C.
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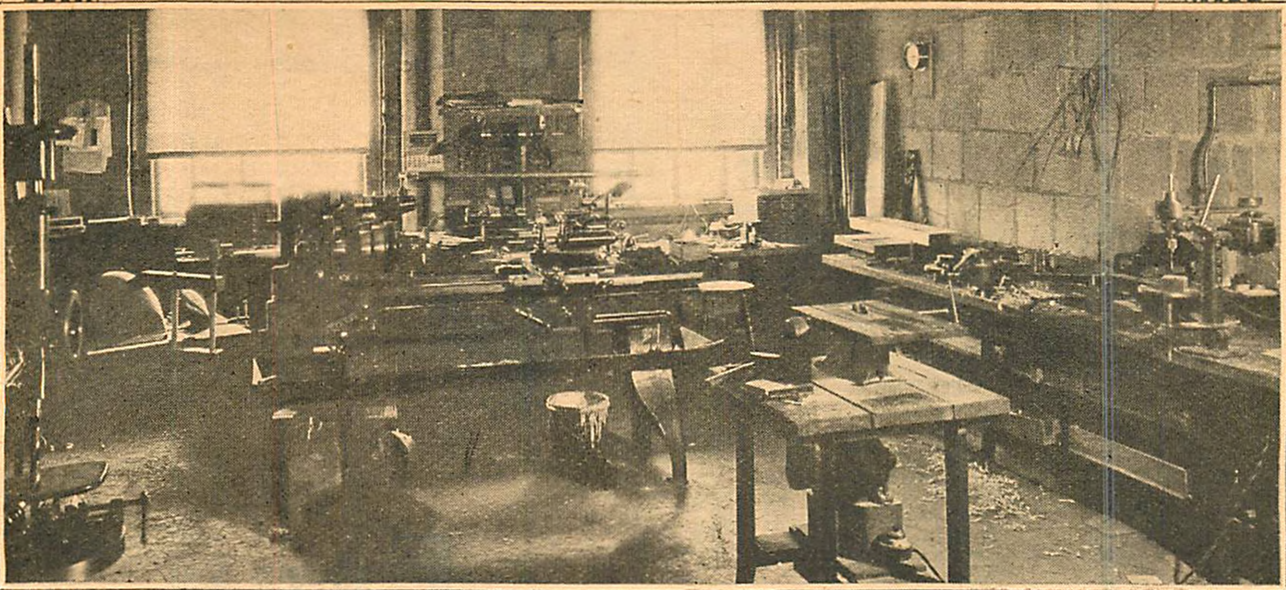


Henry Sihler

WIND-TUNNELS

What They Are and Why

By

STUART PALMER

THE best way to test a plane is to fly it. The same thing applies to a model, but to make a model plane that will fly under its own power requires a motor which only approximates real conditions, and also makes scientific testing impossible. So engineers have got around the difficulty rather neatly. They have the model stand still . . . and the air move!

The principle of the thing is not new. Wilbur and Orville Wright used it in their laboratory a generation ago in testing plane wing angles and fan blades. They learned many fundamental things from their little current of artificially hurrying air, but I wonder what they would think today if they could see the wind tunnel at New York University and hear the blast of air as it shoots down the tube at one hundred miles an hour?

The Daniel Guggenheim School of Aeronautics, sponsored by the copper magnate and air enthusiast, is located at University Heights, New York City. There new air principles are studied, tested, discussed and taught. There the new models and developments are brought to be tested.

The building in which the two wind-tunnels stand is built in the rear of the school building itself. Here is a power plant and an extensive shop for the making of perfect scale models, which are later tested in the tunnels.

The larger tunnel, nine feet across its working chamber, was designed by Professor Alexander Klemin, and consists of an octagonal air chamber which curves out at one end to thirteen feet to fit the propeller, and at the other about the same because of the "wind-straightener". The propeller sucks the air through the tunnel at one hundred miles an hour. The current passes through the propeller, back along each side of the tunnel, and through the straightener to be used again, all its kinks and eddies taken out by the flat honeycomb of the straightener. A powerful two hundred and fifty horsepower motor turns the eight-bladed propeller.

The double return principle was decided on after months of testing. Many small models of the tunnel were built before a decision could be made. It was discovered that an octagonal working section was best. The remaining problem was how to shoot the air most efficiently back along the returns toward the straightener. Many types of curves were studied and tested, but the Gottingen system of deflecting air by means of vanes was found best . . . in theory. In practice, a Witnoczski streamline bend was found to be most efficient, because otherwise the vanes slowed down the air.

The actual wind-tunnel in its entirety is a hundred and five feet long by forty seven feet wide. There is a concrete floor and the walls are of special plaster. The experimental chamber itself is made of hardened wood in a spruce frame.

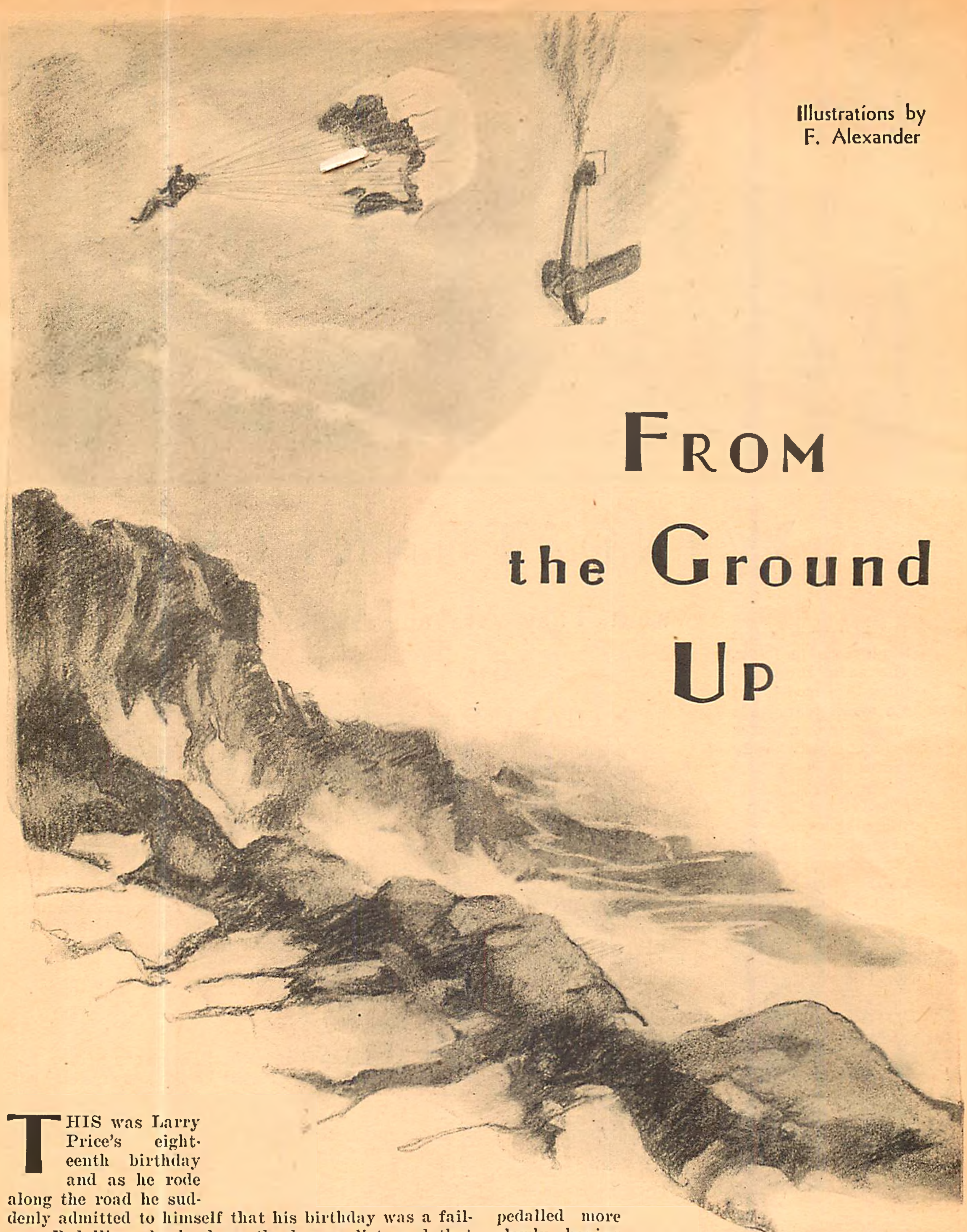
THIS is the method of testing: Let us say that an inventor has discovered what he thinks is a new and valuable contribution to aviation in the form of a new wing angle for monoplanes. He has backing to build his plane but first wants to test its principles and so calls on the Daniel Guggenheim School.

If he has a perfect scale model, the test is begun, but if his model is, like most of them, only approximately right, the laboratory is called on. Trained model makers, using highly specialized tools and machinery, turn out a model in heavy mahogany that is absolutely perfect and to scale down to the thousandth of an inch.

The model is suspended in the experimental chamber of the air tunnel, held rigid by means of wires as shown in the illustration. Each of the supporting wires connects with a sensitive balance scale, so that every fraction of an ounce of stress on the model is registered on the dials of the control chamber, just above.

When the model is hung just right, the (*Continued on page 42*)

View of the shop at New York University in which all models to be tested in the wind-tunnels are constructed



Illustrations by
F. Alexander

FROM the Ground UP

THIS was Larry Price's eighteenth birthday and as he rode along the road he suddenly admitted to himself that his birthday was a failure. Pedalling slowly down the brown dirt road that led to the house, three miles ahead of him, that he called home, his hands laxly held the handle-bars of his brand new, shiny black bicycle. He had bought it that morning with money that he had saved penny by penny for years, and now, as the morning sun slanted down on him, he felt bitterly disappointed. He didn't want it, after all.

Far off to his right, in the direction of Plank Field, he saw a group of four or five dots that he knew to be civilian planes out for their daily spins. Little by little they were coming his way and unconsciously he pedalled more slowly, hoping they would pass directly over him, so that he could get a chance to see them at close range.

Plank Field was an air mail stop, but dozens of men kept their planes of all types and styles out there in the several big hangars. Larry used to go over to the field, just to stand around and watch, whenever he could get away from the farm long enough—and that wasn't as often as he would have liked.

He squinted over the rolling Texas country at

Chance and Pluck Turn a Farm Boy Into a Flying Hero

By Frank Pierce

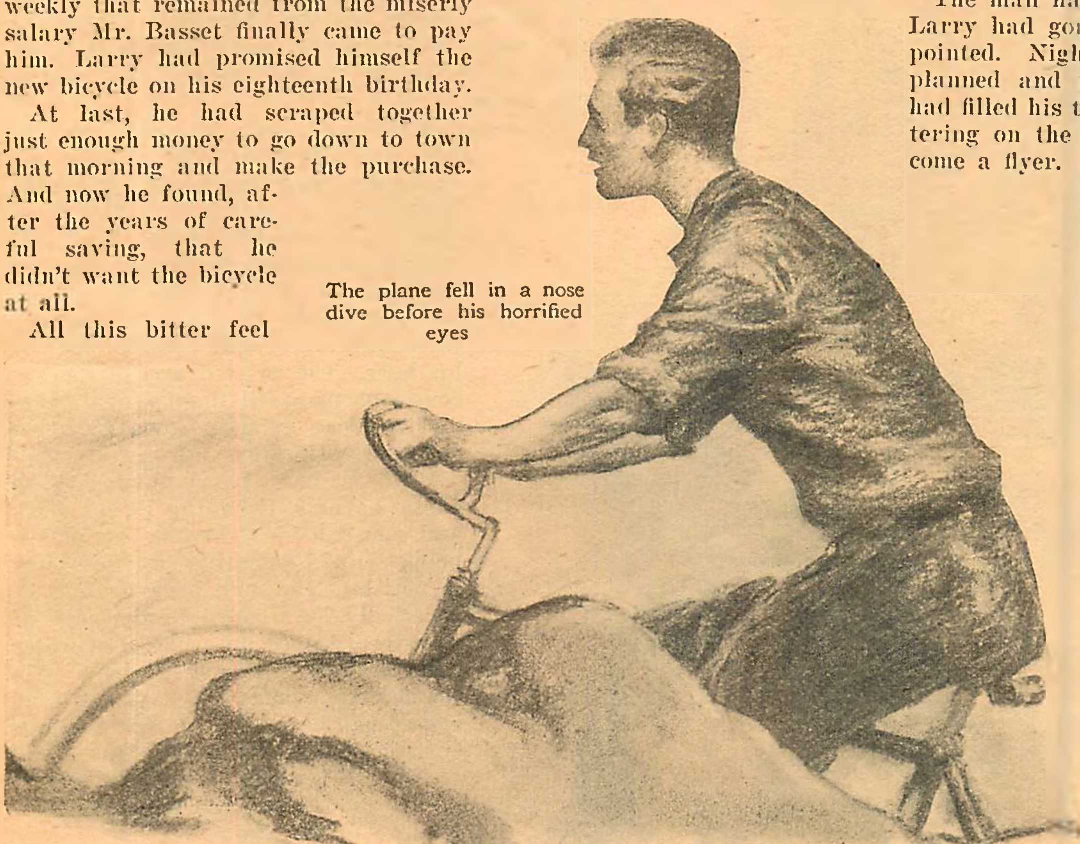
the five growing dots, and then resolutely turned his gaze away again.

Larry was an orphan, had been as far back as he could recall, and he never had known any other parents but Mr. and Mrs. Bassett, who had taken him in. Otherwise he would have gone to the county orphan asylum. But at the earliest possible age they had put him to work around the house and the meager farm. Larry's first clear memories were of rising at four-thirty in the morning and trudging, hungry and cold, to the barn for the first chores of the day.

As he had grown bigger and stronger, they had made him work more and harder. Larry didn't mind the work and grew tall and wiry. Deep within him however, he missed the care that other boys got from their parents. Always he was left alone, and when he idled around the house, Mrs. Bassett was sure to find some small and oftimes unnecessary thing for him to do.

When he was about fourteen he had wanted a bicycle. Timidly he had gone to Mr. Bassett and asked for one. He never forgot the darkening anger on the man's face. So secretly Larry had begun to save the few cents weekly that remained from the miserly salary Mr. Basset finally came to pay him. Larry had promised himself the new bicycle on his eighteenth birthday.

At last, he had scraped together just enough money to go down to town that morning and make the purchase. And now he found, after the years of careful saving, that he didn't want the bicycle at all.


The plane fell in a nose dive before his horrified eyes

All this bitter feeling ran through Larry's mind as he slowly neared his own house. Again he looked off to his right and saw that four of the planes were almost on top of him, and that one lagged somewhat behind. Soon they would cross the Las Vegas stream a mile to Larry's left, circle over the range of low hills to the east and swoop back to the field. Unconsciously, in the excitement of watching the gray painted birds of the sky coming toward him, Larry accelerated his own pace.

WHAT Larry wanted was to fly. Airplanes filled his thoughts now; had for the last year, ever since Plank Field had been opened for the mail service. Sometimes, after his afternoon chores, Larry would go over to the field and revel in the happiness of watching the planes come and go, of watching them take off in rising speed, or swoop down to graceful landings and taxi to a standstill. In awed admiration he would stand silently by while the men, in their brown flying suits, passed him in groups, laughing and talking.

Once he had gotten up courage to ask how a fellow could learn flying or maybe get a job on the field. The man had looked down at him kindly and smiled.

"Flying's the greatest game in the world, sonny, but I don't know that there's anything for you to do around here. What can you do?"

Miserably Larry had confessed that he knew very little about planes, except from reading about them.

The man had shaken his head and Larry had gone home bitterly disappointed. Night after night he had planned and planned; wild schemes had filled his tormented brain, all centering on the problem of how to become a flyer. Failing that, he longed to get something to do on the field, something to do with planes, so that he could be one of the men who tended the trim eagles of the air.

Again he looked above him and found the five planes past him. To be exact, four were already over the river, he judged, and the last one was just winging its silver way above him, perhaps nearly a mile up. The sun glinted on the wings and the drone of the motor floated down through the still, peaceful air to Larry's eager ears.

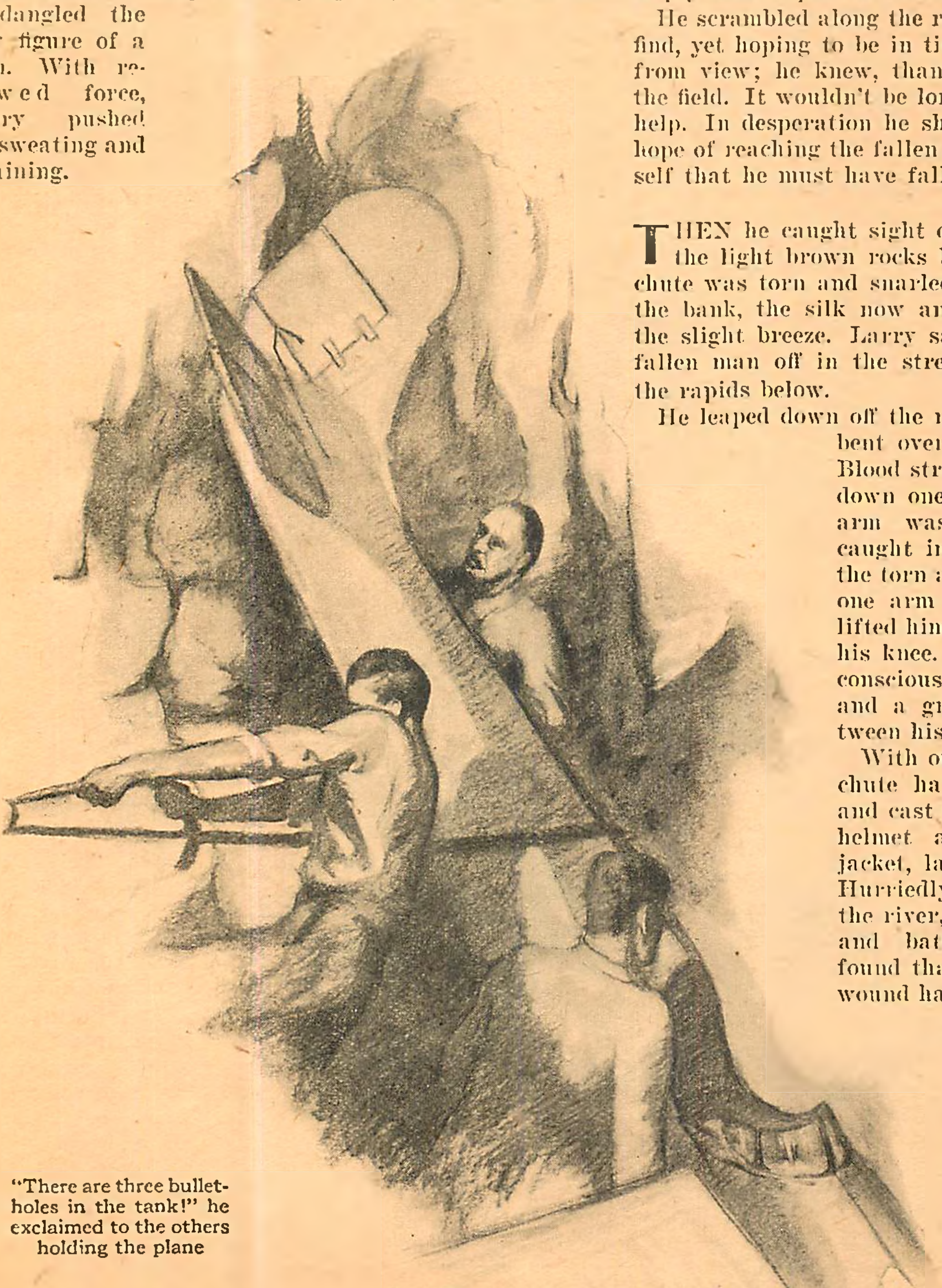
As he watched, something hapened. The plane dipped and bumped. Horror surged in Larry's throat in premonition as he watched the monoplane sideslip drunkenly. Then he saw a burst of dark red flame whip out from the cowling. A thin, snakelike tongue of crimson bit into the blue that silhouetted the plane, followed in a split second by a puff of black smoke.

A cry broke from Larry and he pedalled furiously.

Above him the burning plane reeled; the darting flames licked along the cowling and seemed to envelop the cockpit in a dense cloud of sinister black. Larry realized in a flash that the plane, staggering its way toward the Las Vegas, would crash on the bank, or might even land right in the dangerous waters of the river. He stood up on his pedals; the dirt of the road spurted under his wheels.

HE thought of the doomed pilot above him, caught in a trap from which there was no escape. Perhaps the man was dead already.

As he watched with burning eyes, the plane suddenly fell in a nose dive, and with a huge plume of gray-black smoke pouring from the fuselage, whipped down toward the ground. Larry strained his eyes and saw a sight that caused a glad shout to break from his lips. The plane had fallen out of sight, but not far above the ground, the sun gleamed on the spreading umbrella of a parachute settling its swaying way to earth. From it dangled the tiny figure of a man. With renewed force, Larry pushed on, sweating and straining.



"There are three bullet-holes in the tank!" he exclaimed to the others holding the plane

Almost at the bank of the river, he knew the road would bring him out at the point where he judged the ship had fallen, and where the pilot had landed with the chute. With a final burst of speed Larry whirred round a bend in the road and saw the narrow, swift river before him, its banks lined with jagged rocks. Larry's heart pounded in his throat as he sighted the flaming wreck of the plane, crumpled pitifully on a mass of brown rocks on the opposite side of the river, submerged more than half in the water. But the pilot? Where was he?

He could not be far away, Larry thought, as he jumped off his bicycle, which fell against a clump of bushes. With frantic speed he ran further along a path right by the bank, his eyes seeking everywhere. Anxiously he scanned the stream, probing carefully the broken rocks that edged the current. Nothing. He cast a glance toward the sky and saw that the other four planes had circled over the hills and were now turned his way. They came on swiftly, nosing down gently in search of a landing place. Larry hoped they would find the big empty field a quarter of a mile up the river.

He scrambled along the road, afraid of what he might find, yet hoping to be in time. The planes disappeared from view; he knew, thankfully, that they had found the field. It wouldn't be long now before he would have help. In desperation he shouted, long and loud, in the hope of reaching the fallen pilot's ears. Larry told himself that he must have fallen almost at this spot.

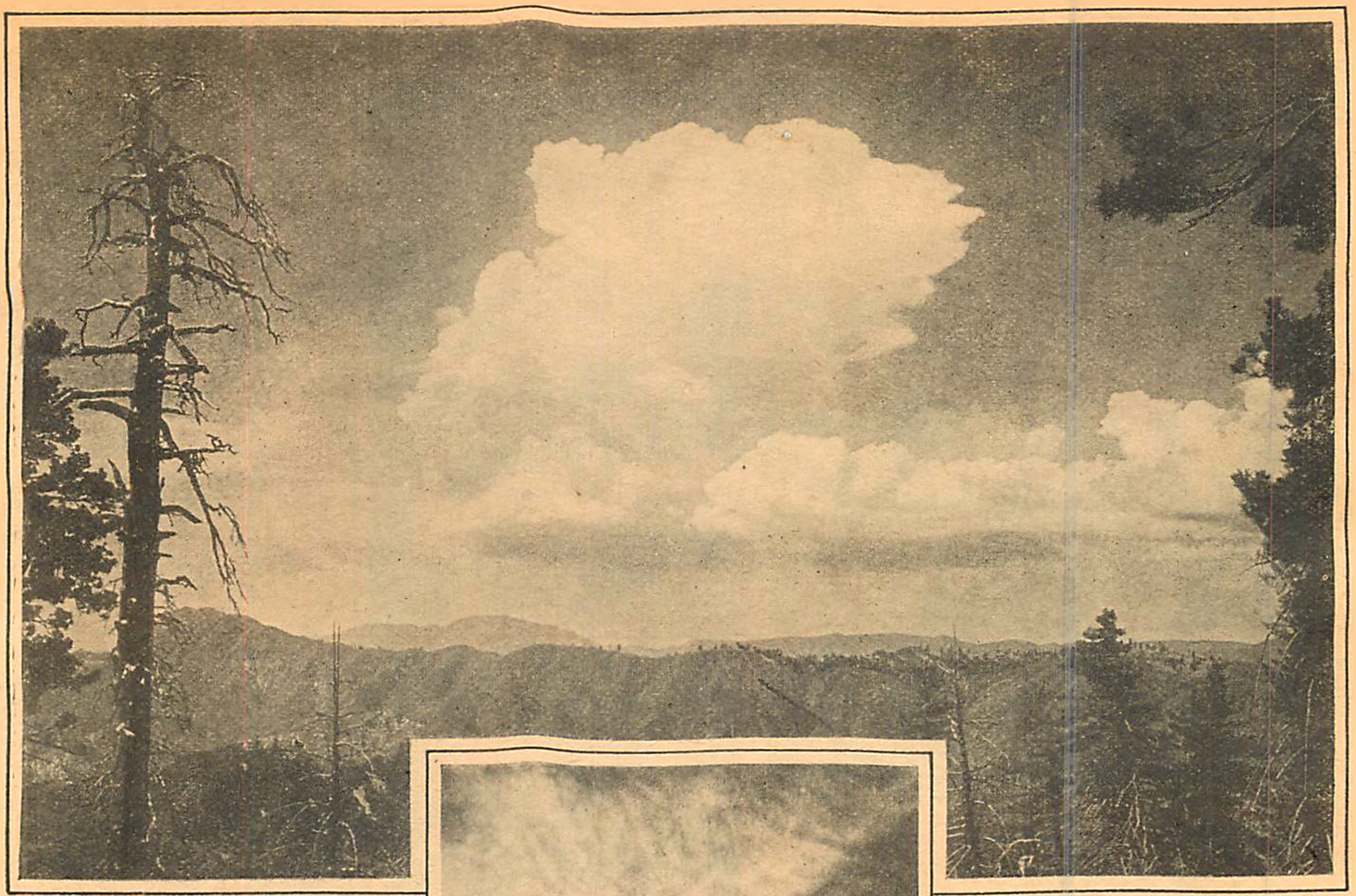
THEN he caught sight of a darker brown blotch on the light brown rocks below him. The mesh of the chute was torn and snarled among the jagged edges of the bank, the silk now and then moving restlessly in the slight breeze. Larry saw it was about to pull the fallen man off in the stream to certain death among the rapids below.

He leaped down off the road, over the rocks, until he bent over the inert body of the man. Blood streamed from under his helmet down one side of his face. His right arm was twisted under him and caught in the snarled guide ropes of the torn and tattered chute. Larry got one arm under the man's torso and lifted him to a sitting position against his knee. The twisted arm of the unconscious man fell limply to his side and a groan of pain came from between his gray lips.

With one hand Larry unbuckled the chute harness from the pilot's back and cast it aside. Then he tore off the helmet and, bundling up his own jacket, laid the man back against it. Hurriedly he stepped to the edge of the river, dipped up a hatful of water and bathed the man's face. He found that a jagged, though not deep, wound had been inflicted on the pilot's forehead. With his handkerchief Larry bound up the cut and tried to find if the limp arm had been damaged. He was afraid of causing pain, and he was now desperately anxious for the other flyers to arrive and help get this man back to the field for medical attention.

He heard a shout behind

(*Continued on page 45*)



Above, a distinct view of the cumulo-nimbus clouds, the "thunder heads" from which showers fall. They are a combination of a cumulus top with a nimbus base. Another photograph of the same kind of clouds is shown below. This formation usually is known as a "mackerel sky"

U. S. Weather Bureau

By
PERCIVAL WHITE
and
MAT WHITE

GLIDING and SOARING

A Manual of Motorless Flight

IN this issue the editor of MODEL AIRPLANE NEWS *presents the third instalment of the long-heralded series on Gliders and Gliding.*

THE WIND AND THE WEATHER

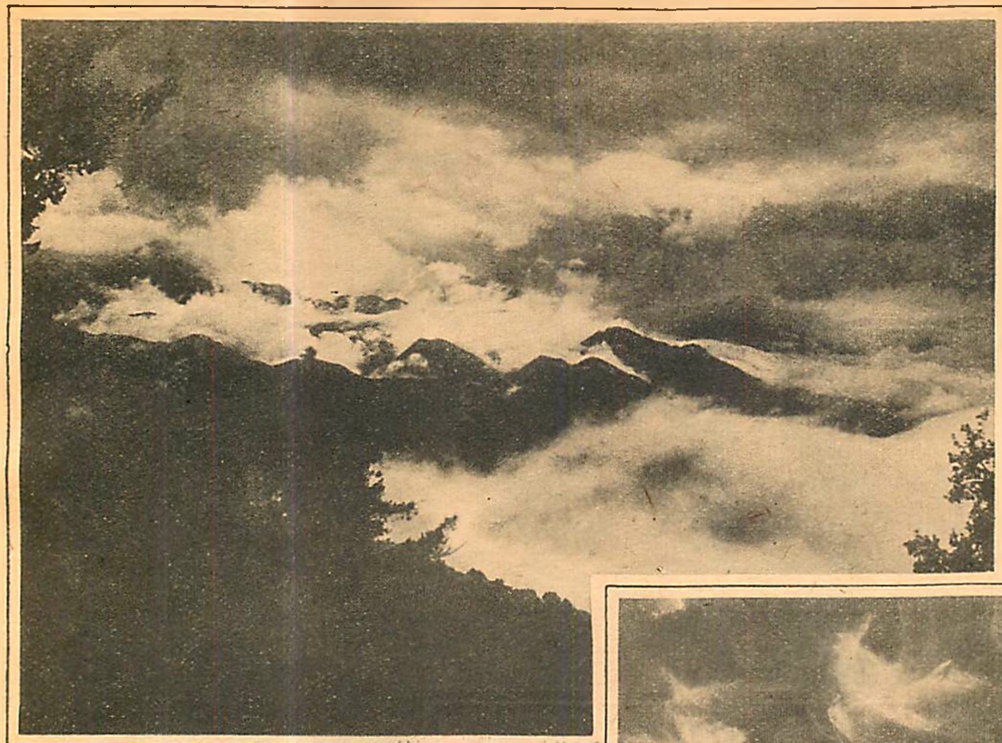
BEFORE you venture into the air in a glider you must learn why and how it flies. If a skilled pilot teaches you to glide, he will doubtless give you some ground instruction in the wind, the weather, and the reasons why the glider stays in the air.

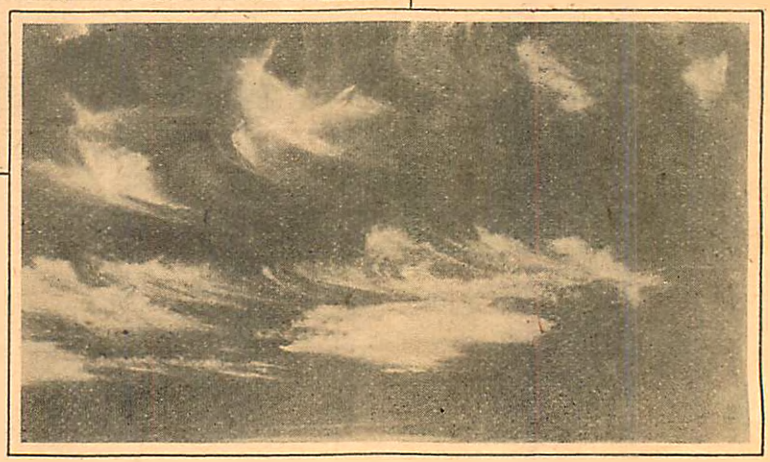
Any person who intends to learn to glide or who is already taking gliding lessons, should become thoroughly acquainted with these subjects.

In order to understand why a glider flies, you must first learn something about the atmosphere. Wind, or the continued movement of the air, and weather, or the various heat and moisture conditions of the air, are matters of vital importance to the pilot.

Atmospheric Pressure. The air, or atmosphere, is a sea of gas surrounding the earth. With increasing altitude, the atmosphere becomes lighter, until finally it becomes too thin for man to breathe.

Just as the sea of water is heavy and presses down on the sand in its bed, so the air is heavy and presses down on the surface of the earth. Air has no form, but has the tendency to fill all available space. The weight of the atmosphere is normally about fourteen





Nimbus clouds (at top) portend rain and usually mean that the weather is unsuitable for gliding. Nearly white in color and usually detached are the cirrus clouds (bottom), which appear in various feather-like forms

U. S. Weather Bureau

pounds on every square inch of the earth, of your body, and of all the other things with which air comes in contact.

You do not notice the pressure on you, because your body is also filled with air, counterbalancing this pressure. The pressure of the atmosphere, however, is not always uniform. Warm air is thinner than cold air, and therefore exerts less pressure. Dry air is not so heavy as air which is loaded with moisture.

How Atmosphere Is Measured. Since knowledge of the amount of atmospheric pressure aids the pilot in predicting weather conditions, he must know how to read a barometer. A barometer is an instrument which measures the pressure of the air.

How to Make a Barometer. A rough sort of barometer may be made by filling a glass tube, closed at one end, and a little over thirty inches in length with mercury (quicksilver).

Invert the open end, without admitting air, and place it in a cup containing more mercury. (See Figure 1.) The mercury starts to run down from the tube into the cup; but the pressure of the atmosphere on the surface of the mercury in the cup holds the mercury up in the tube.

Therefore, when the weight of the mercury in the tube is equal to the pressure of the atmosphere, no more mercury runs down out of the tube. If the atmospheric pressure is high, the mercury will stand near the top of the tube; if low, the mercury will fall.

The tubes of barometers have to be made accurately. They are graduated to show how high the mercury column will stand at the various amounts of pressure.

Barometers must be used in airplanes to measure altitude. As the airplane climbs higher, the air becomes thinner and the atmospheric pressure less. Since a barometer containing mercury would be useless in an unstable airship, because it is too unhandy, airplanes are equipped with aneroid, or nonfluid, barometers.

In barometers of this type, the expansion and contraction of air confined in a metal box, varying with the atmospheric pressure, moves its thin walls. This movement is used to actuate a pointer or hand, like that of a clock.

Winds. The atmosphere never remains still. It moves about over the surface of the earth. This movement of the atmosphere is due, in part, to its varying temperatures. Heavy, colder air, of greater density, is always moving to displace light, warmer air, of lesser density. It is this moving air which is called the wind.

Far above the trees and the mountains, the wind blows almost steadily in certain general directions. The atmospheric pressure at the equator is rather low, because of the intense heat there, and the cold air from the north and south poles blows continually toward this light air. In North America, these winds do not blow directly north to south, however, but are deflected in an easterly direction, due to the rotation of the earth.

At low altitudes, the winds are diverted from their general courses by irregularities in the surface of the earth. Just as rocks cause eddies in a river, mountains cause whirlpools in the air. (See Figue 2). Moreover, the fact that earth changes temperature more rapidly than water causes regular land and sea breezes.

During the daytime, the land is warmed by the sun, and the winds blow from the water across the land. At night, the earth cools more rapidly than the water, and the breezes blow toward the sea.

TO MEASURE WIND VELOCITY

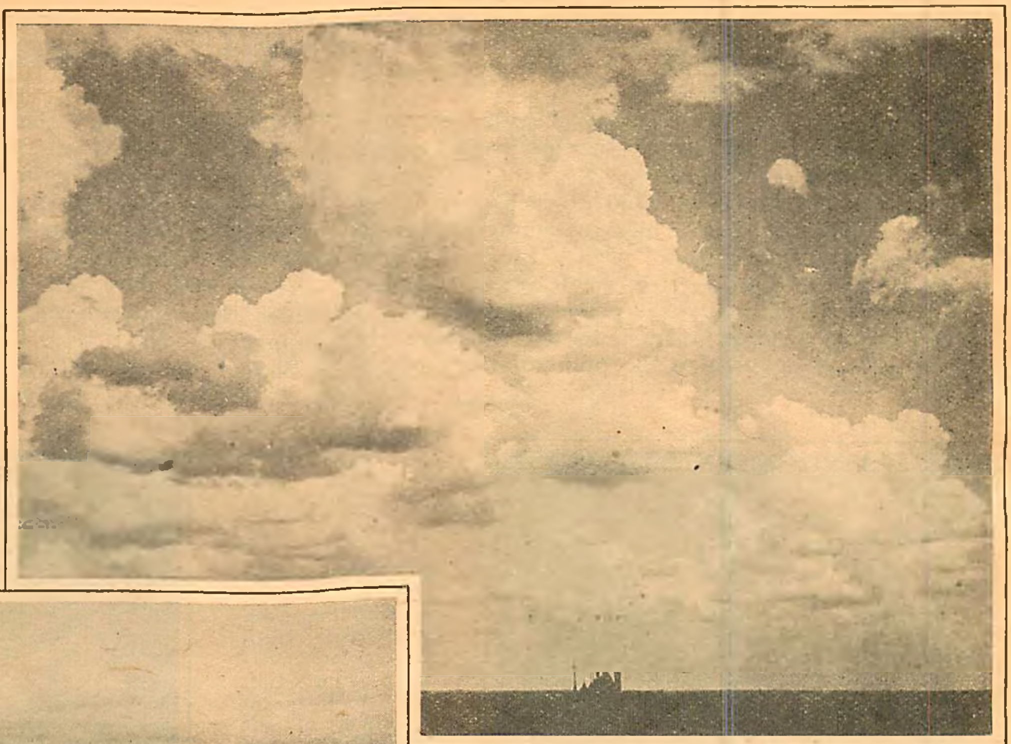
Since the wind is one of the essential factors in glider flight, it is necessary to have some means of calculating its velocity. The speed of the local winds which are near the earth can be measured by what is called an anemometer.

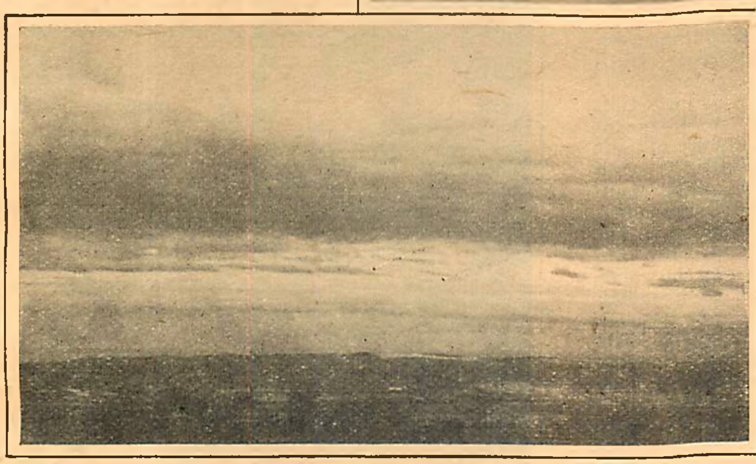
An anemometer consists of hollow cups projecting from an axis which revolves when the wind catches the cups. The speed of rotation of the axis is recorded on a dial. The speed of the high air ("winds aloft") is measured from weather stations by small balloons, the drift of which is measured.

The pilot who has no instruments can judge the velocity of the wind with some exactness by watching the effect of the wind on trees, grass, etc.

Humidity. Humidity is the moisture content of the air. When the temperature of the air is so lowered that the air is holding all the moisture it can, it is said to be at the "dew point". Any lowering of the temperature will result in dew. The "dew point" means fair weather for the air pilot.

When the earth's surface is cooled enough to





Every glider pilot should learn to recognize cumulus clouds (above). They are indicative of upward air currents which may be useful to the soarer. At bottom is a formation of stratus clouds. This is not the only form in which they appear: they may be torn to shreds by the wind or rent by mountain tops

U. S. Weather Bureau

condense the moisture in the air, fog is formed.

Cloud Formation. The study of cloud forms is very useful to the pilot, since it will give him valuable information about the kind of weather he may expect, and because of the cooling off of ascending warm air. There the soarer.

Clouds consist of water vapor which has condensed because of the cooling off of ascending warm air. There are several types of cloud formation.

Cumulus. Cumulus clouds are the most important to the glider pilot because they indicate upward currents of air. They are thick; the upper surface being usually dome-shaped and the base horizontal.

They are formed by the condensation of rising currents of warm air. The ascending air below cumulus clouds has great lifting power and soarers have been able to travel to considerable heights by means of its energy.

Cirrus. Cirrus clouds are composed of ice crystals and are of delicate appearance, fibrous structure and feather-like form. They take the most varied shapes, such as branch filaments in feather form, straight or curved filaments ending in tufts, etc. They usually presage good weather.

Nimbus. Nimbus clouds usually form a dense layer of dark, shapeless cloud with ragged edges. They are usually characterized by steady fall of rain or snow.

Stratus. Stratus clouds are uniform layers of foglike cloud. They hang low, but do not lie on the ground. The cloud layers of stratus are always very low, and they differ from other cloud masses in their lack of structural detail.

Cloud Combinations. There are many clouds we see that are combinations of several cloud forms, such as cirre-cumulus, cirrus-stratus, etc. The most important of these, however, is the cumulo-nimbus, the thunder storm or shower cloud.

In this formation, great masses of cloud rise in the form of turrets or mountains. They usually have a veil or screen of fibrous texture at the base and top. From the base local rain or snow is precipitated. Sometimes the upper margins have the compact cumulus shape—sometimes they are arranged like cirrus clouds.

Weather Predicted by Clouds. When clouds at sunset are red, the weather will probably be fine. If there is a yellow sunset it will probably rain or be windy. Gray clouds at sunrise mean sunny weather and red clouds wind and rain.

Sharply defined clouds mean wind; soft ragged ones, rain; increasing cloudiness, bad weather; small white clouds high in the air, fine weather.

By watching the clouds, too, the pilot can tell which way the wind is about to blow, for when a high cloud is moving in a different direction from the surface wind, the wind is very apt to change to the direction in which that cloud is moving.

Precipitation. Rain is made by the same process of condensation, carried to a greater extent, which produces clouds. The moisture in the clouds becomes too heavy for the atmosphere to support. If the temperature is low, the moisture will condense into snow or hail instead of rain drops.

Ice barnacles, or ice on the wings of a plane or glider, may also be a result of this low temperature. It is dangerous for the pilot to fly with an ice-encrusted machine. The ice barnacles add greatly to the weight of the glider.

Weather Maps. Since it is a difficult matter to forecast the weather, weather maps are extremely helpful. Trained observers forecast the weather, and the Weather

Bureau publishes this information daily in the form of Weather Maps.

These maps show the state of the atmosphere during the previous twenty-four hours.

Solid lines connect all the points having the same atmospheric pressure, and dotted lines go through points having the same temperature.

The direction of the local wind at each government weather or airline station is designated by an arrow. Symbols show whether there was clear or stormy weather, areas where rain or snow fell are shaded, and the location of "high" and "low" pressure areas.

Official government weather maps and wind charts give valuable information to the pilot and may be obtained without difficulty from meteorological offices.

Weather Forecasts. Exact forecasting requires experience and equipment, but the average man can form a rough estimate of what the weather for the next ten or twelve hours will be, by observing the clouds, the winds, the barometer, and the thermometer.

A falling barometer indicates stormy weather. If the thermometer drops suddenly, fog may result. The formation of dew is a sign of fair weather. A "mackerel sky" indicates rain. Bold white clouds, wind; and feathery clouds, good weather. These signs are not, of course, infallible.

A red sky at sunset is usually indicative of fair weather, and a yellow sky of wind or rain.

Glider pilots should be able to make good use of air currents of all sorts.

The atmosphere itself is the best laboratory for meteorologists, and the glider the most sensitive instrument for experiment, more sensitive and more delicate, perhaps, than anything thus far designed by man.

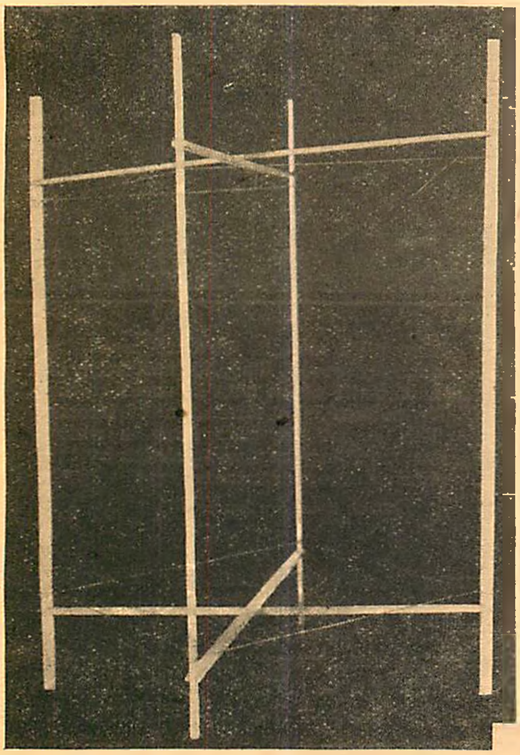
KITES—AND GLIDING

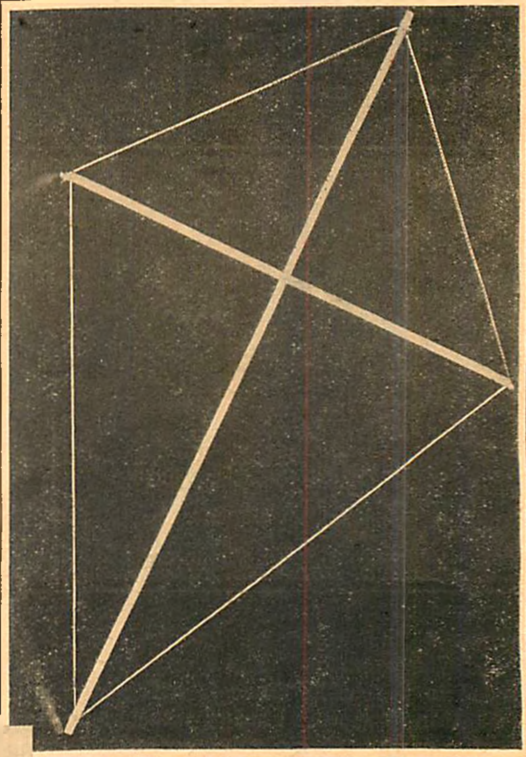
Kites and gliders, although they differ in appearance, work on somewhat similar principles. Building and flying kites helps one to learn about the atmosphere and why the glider flies.

Points to Remember in Building a Kite. There are five things which you must remember in building a kite.

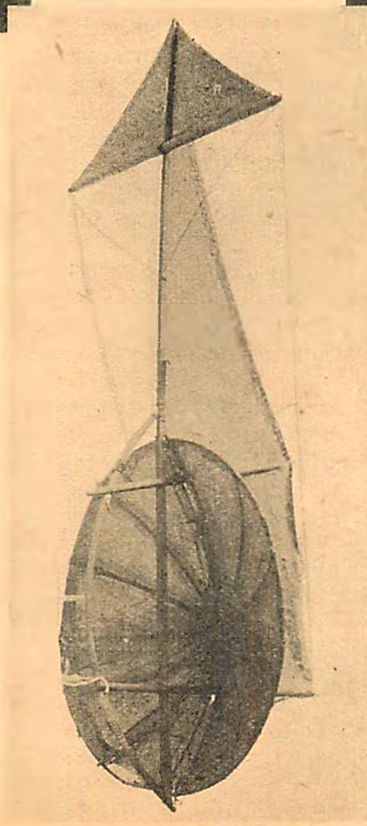
In the first place, your kite must have a broad surface which the wind can get hold of in order that it may supply sufficient lift.

Second, the kite must be made of light materials, so that the force of gravity will not exceed the lift resulting from the wind, and pull the kite down to the ground.





At the left is shown the completed wooden framework of a box kite without the cloth covering. In practice, the cross braces usually are not put in until the cloth strips have been glued to the corner sticks of wood. The method of constructing the framework of a tailless kite can be seen at the right. This may be covered with paper or cloth. At the bottom is a dome kite built by Chanute in 1895



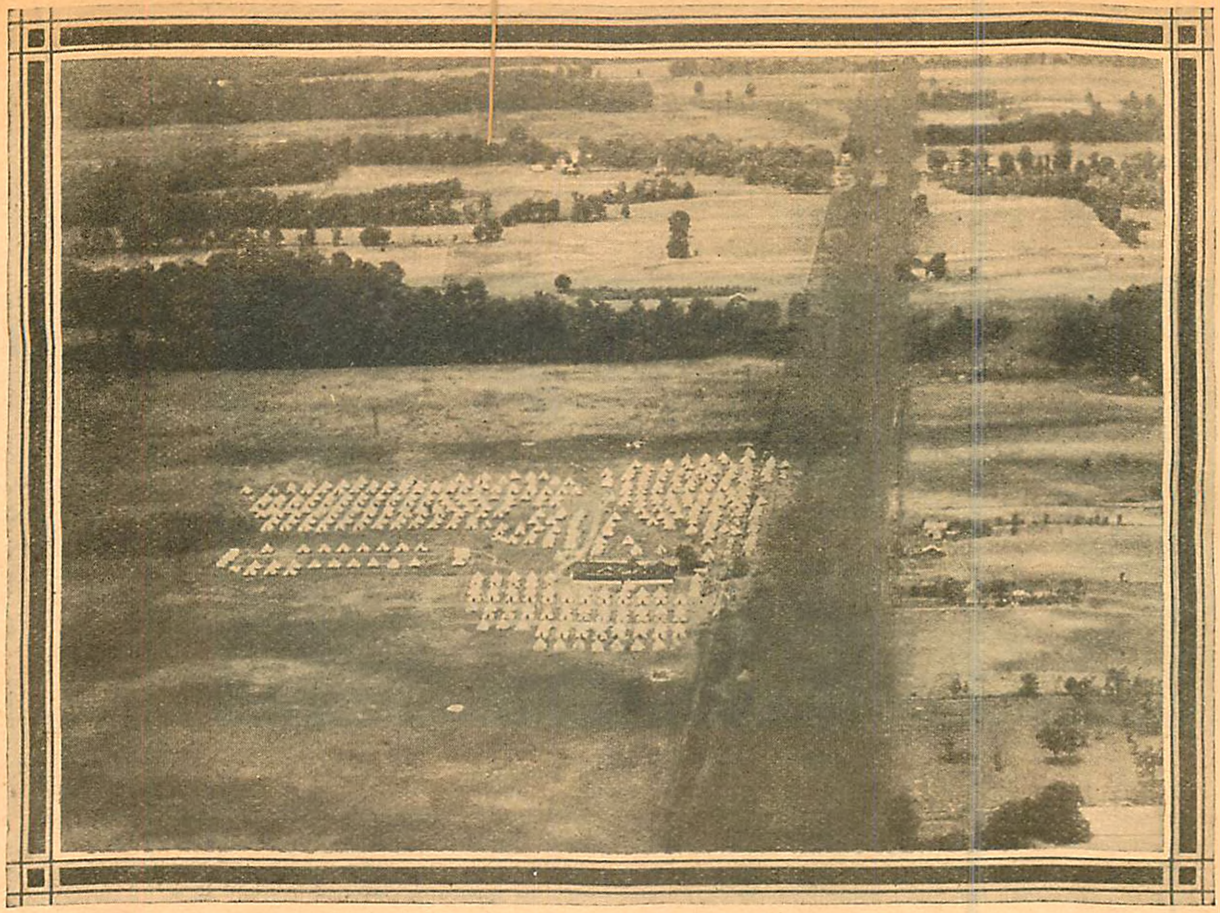
Third, the kite must be firmly bound together, so that it will not come apart in the air.

Fourth, the kite must be bisymmetrical, that is, the resistance to the wind on one side of it should exactly balance that on the other side, so that the wind will not be able to push more strongly on one side than on the other.

Fifth, you must have some means of guiding the kite, so that it will not be blown about at the mercy of the wind, and finally, perhaps, lost altogether.

How to Build a Box Kite. There are several kinds of kites, all of which are instructive to the student pilot; but the best sort of kite to build is a box kite, since, although it requires considerable wind to fly it, it will ascend at a steeper angle than an ordinary kite.

To make a box kite of a good size, eight sticks (*Continued on page* 54)



The Marine camp at San Ramon

PRISONER of the AIR

With a Gun at His Back, Blimp Side-Slips Out of His Plight

By

Lieut. H. B. Miller

"BLIMP" RYAN, air pilot with the American forces in Nicaragua, brought his plane down on the marine field at San Ramon in a panic. As a result of a serious crash in his plane back in his student days at Pensacola, Blimp was seized with a violent nightmare of terror at unexpected moments in the air. He finally succeeded in gaining his composure and reported to the field in fairly calm condition.

With the assignment to Nicaragua, Blimp had hoped to overcome his secret terror, but the intense heat and the monotony of patrol work in the jungle, together with the fact that Sandino's rebels practiced sniping at the expense of the American airmen, did not help greatly.

Captain Allby, in command of the marines, gathered all the flyers in conference and informed them that Headquarters had issued orders that Sandino's men must be found and cleaned out. He asked them to go out the following day, each in a different direction, to cover the surrounding country on observation.

With Sergeant Capper, his plane mate, Blimp flew over the mountains within gun range of the enemy. He spotted what seemed to be the rebel encampment and flew low to make certain. At once he was fired on but his return fire was of no avail through the heavy foliage.

Suddenly the oil feed line of his machine was punctured and the motor began to fail. With no alternative but to attempt a landing in that single clearing, he was forced to land in the midst of the rebels. Immediately, they attacked the Americans. Capper, in charge of the plane's machine gun, suddenly slumped in his seat and was still. Blimp's fury was aroused and he fought savagely. Suddenly all went black for him and a shout of victory rose from the rebels.

WHEN Blimp came to, he was lying on the dirt floor of a hut. There was a bump on his head the size of an egg and his arms were tightly bound to his sides. It took him some time to recall his forced landing in the secret canyon and the fight which followed. Slowly, as a curtain lifting, he remembered what had happened, including his companion's death and his own last furious struggle to avenge it. Where he was now, or what his fate would be, were dark, unanswered questions.

At first Blimp thought he was completely alone, deserted in the jungle. Perhaps it was their idea of a good joke. Having escaped a crash against their infernal canyon walls and subsequently failing to stop one of their bullets, perhaps the bandits had left him bound and helpless to be the prey of jungle animals and murderous insects.

Then, as his eyes began to focus better, he noticed a dark patch against one of the slatted walls of the hut. The patch had a stick protruding from it. Presently the patch and the stick became clearer to Blimp's senses. He saw that it was a guard leaning against the entrance, holding in his hand a sawed-off shotgun. So he was being guarded, after all!

Presently from a distance he caught the sound of voices speaking in low undertones—evidently the rest of the bandits. Through the dense green screen of the jungle he caught occasional glimpses of bright blue. Evidently he was not so far from the river. This must be a secret encampment on the side of the canyon. His suspicions about the renegades' stronghold had been right. Blimp bemoaned the luck which made it impossible to report this vital information to Captain Allby.

He moved his head slightly and groaned with the pain of it. He wiggled toes and fingers cautiously. Evidently he was sound and whole, outside of the bump on his head. What were they going to do to him?

His mouth felt dry and his lips caked and swollen. What wouldn't he give for a drink of water! This gave him an idea. Anything was better than lying here speculating on what sort of a party they were planning for him. Better to start something himself, and have it over with. Raising his voice slightly, so that it would not penetrate beyond the hut, he called, "Aqua—aqua."

The guard, a mere ragged youngster, came to the opening in the wall—it could hardly be called a door—and looked down on his prisoner. He grinned in a stupid manner and shook his head. It was evident that he understood the request but had been told not to communicate with the Americano.

Blimp tried again. He cajoled, he tried to bribe, he reasoned so far as his knowledge of Spanish would allow but the guard merely showed his gleaming row of white teeth and shook his head. Exhausted, at last, with his head aching and his arms beginning to throb from the tight cords about them, Blimp gave up.

It was quite dark when finally the sound of voices drawing toward the hut came to the prisoner on the floor. By this time, between his aching head, his dry tongue and swollen arms, Blimp was in misery. With the coming of darkness, too, had come great discouragement. He gave up straining his ears for the sound of a plane. It was a forlorn hope at best but he could not help praying that some other marine plane might find its way to the canyon and see his ship parked where he had landed it.

But he knew now that he would not be missed back at the base camp until the afternoon patrol was over. They could not start searching for him until the next morning. And by then—if legends he had heard about the rebel bandits were true—there was every probability that it would be too late.

The approaching voices reached the infinitesimal clearing about the hut. Two men reached the guard, gave a countersign in Spanish, and all three entered the hut. One held a flashlight which Blimp, even in his misery, recognized as one taken from his plane. They unbound him and one of the men, a huge, grisly ruffian, gave him a drink of tepid, unsavory water.

A Boeing all-metal fighter

"*El capitan*," said this tattered vagabond, "is waiting to hold a reception for the flying gringo."

Blimp was rather stiff for walking but he managed to make his way between his two escorts without much stumbling. They came down to the clearing by the creek. Here, evidently sure of the security of their hide-out, the bandits had built a huge bonfire which lighted up the entire area.

As they came out of the jungle, Blimp was amazed and inwardly furious to see that a half-dozen of the little dark men were drawing his plane in the circle of the firelight. They handled it with extreme care as if the strange gringo creation might explode at any moment, or start into the air taking them with it. They worked under the direction of a tall, military-looking man who ordered them in broken, sibilant Spanish.

DAZED as he was by the sudden light and his own weakened physical condition, Blimp concentrated his attention on this man. Clearly he knew what he was doing and had handled planes before! What was his purpose? He was obviously not a Nicaraguan. As Blimp speculated, one member of the odd "plane crew" swung the tail about too roughly. The mysterious foreman swore at him in a gutteral tongue. Blimp remembered that he had heard that same voice uttering the same language just before he went under. The man was a Russian! A renegade, no doubt.

The "escort" behind Blimp gave him a shove in the direction of the fire, reminding him that he was on his way to *el capitan*. Regretfully, Blimp was forced to turn his eyes away from his beloved plane and the tall alien who had taken charge of her.

El capitan was sitting on a folding deck chair obviously purloined from some American or English hacienda. To add to the effect this swarthy leader had found for himself a dilapidated tent, evidently the cast-off of some engineering or scientific expedition. With considerable dignity he had arranged himself before the tent opening, garbed in a costume that was a weird mixture of comfort and military grandeur.

A wave of anger surged over Blimp as he recognized Sergeant Capper's leather flying jacket. To the shoulders of this, had been added huge and somewhat tarnished golden epaulets. Blimp realized that they must have been put on in a hurry since the afternoon, doubtless for his benefit.

There were no shoes on the dignitary's feet. His trousers may have been white duck at one time but no one would ever know now. However, his coffee-colored face was shrewd and determined, his black eyes sharp and bright. Blimp didn't make the mistake of underestimating either *el capitan's* enterprise or his courage.

The leader looked his prisoner over coolly and then asked with exaggerated politeness in florid Spanish, "Would the lieutenant feel quite well enough to fly in the morning?"

Blimp's heart skipped a beat at the idea of getting his hands on the good old controls of his plane again. But he stifled any impulse of joy, knowing the tricky nature of Nicaraguan desperadoes too well. There was something behind this!

"I always feel well enough to fly," he answered cautiously.

"Could you get your plane out of this canyon without doing what you call the crack-up?"

"Possibly," said Blimp. He felt that he must be careful—but not too careful. If he could he would find out what they had under their coffee-colored skins, then maybe, just maybe, he'd get a break and be able to get away with his information.

"Tomorrow, then, the brave Americano will have the chance to show us how well he flies."

"What do you mean?"

"Tomorrow you shall fly back to your brave brothers-in-arms on a little errand for us. You shall drop on them some tokens of our regard. Little iron tokens loaded with dynamite."

Blimp did not answer for a moment, stunned by the revelation! Then he threw back his head and laughed.

"That plane can't leave the ground. It has a broken oil line and not two ounces of oil in it. Sorry, but I'm afraid your flight is off."

The little dark leader wasn't worried. He permitted a polite smile to break over his face, but his black eyes narrowed. "It is most kind of the lieutenant to think of that. Fortunately, we have a Russian gentleman in our forces who understands all about such things. We have also picked up a little oil exactly the same kind as you use in your planes. Such a lucky coincidence!"

BLIMP swore under his breath. So that was the man who had charge of his plane. And the oil! He knew quite well how they had "picked up" that oil. Somewhere along the road to Bodega they had jumped a marine pack train, outnumbering it four to one and cutting it off from its escort. He answered *el capitan* in no uncertain terms.

"Listen, you little shrimp, I'm not going to fly that plane anywhere for you."

The desperado chief permitted a long and calculated pause to ensue before he answered his prisoner.

"It is going to be a very long night. The lieutenant Americano can think it over. If you are wise, you will fly—if not—" the little bandit finished with a gesture that was at once significant and terrible. He motioned to Blimp's two guards and they started him back to the jungle.

As they passed his plane, Blimp saw that *el capitan* had been right. The Russian was hard at work on the oil line of his beloved Corsair. Even in the glimpse he had, Blimp realized that the man was going about it in a business-like way which showed that he had done it before.

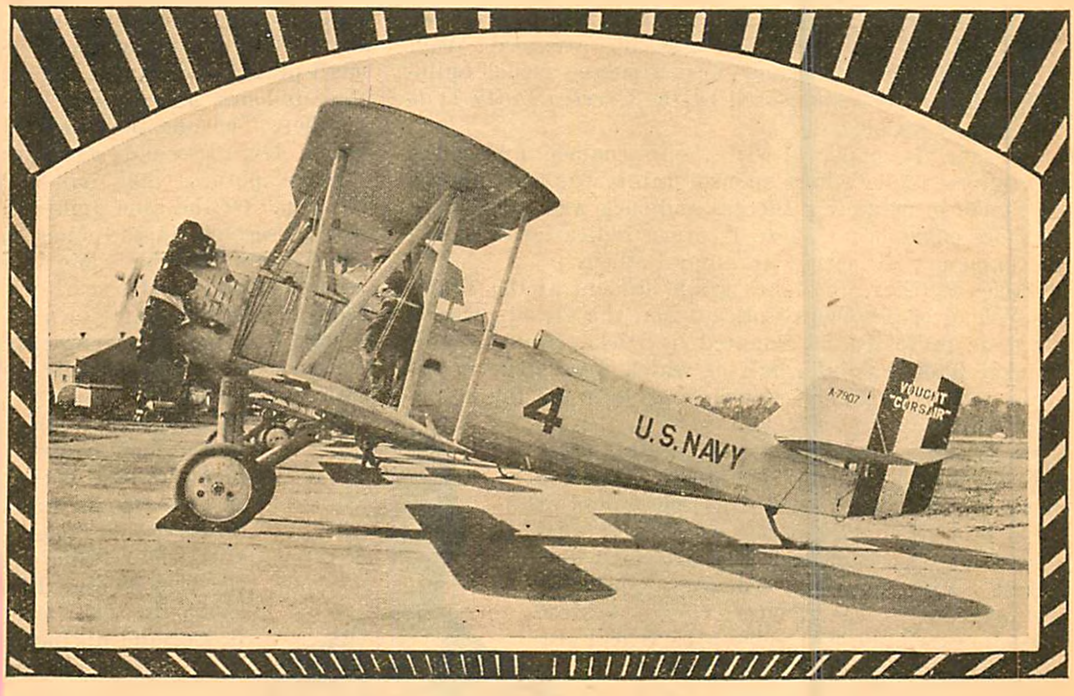
Standing in the shadows were several drums of oil bearing the sign "U. S. Marines." As the little procession passed by, the Russian straightened up from his work. He hailed Blimp with a broad grin on his rakish countenance, jovially calling out to him.

"Have the big sleep, comrade. Tomorrow we fly!"

THE marine acquired an immediate and intense hatred for this shaggy mechanic who had thrown his lot with the followers of Sandino. Who knew from what crimes he had escaped to take part in this comic-opera war, which wasn't so very comic for Blimp at this particular moment.

He was taken back to the hut, and though he was bound a little more lightly, his guard was doubled and a pitch flare put in the hut which threw him in the light at all times. All hope of escape vanished. They brought in a rusty can of water and a few grubby-looking beans. Blimp ate these without examining them too closely. He might need all his strength for the morning.

Indeed, he soon found that there wasn't much else to do but take the *capitan's* advice, to "think over the situation." And any way he might view it, it looked pretty bad. Most assuredly he wasn't going to fly over the unsuspecting marine encampment while the Russian in the back cockpit dropped bombs on the camp.



A Vought "Corsair" Navy fighter

At the same time, if he backed out and flatly refused to go, they would kill him but they would still have a perfectly good Corsair, to say nothing of a machine gun, in their possession.

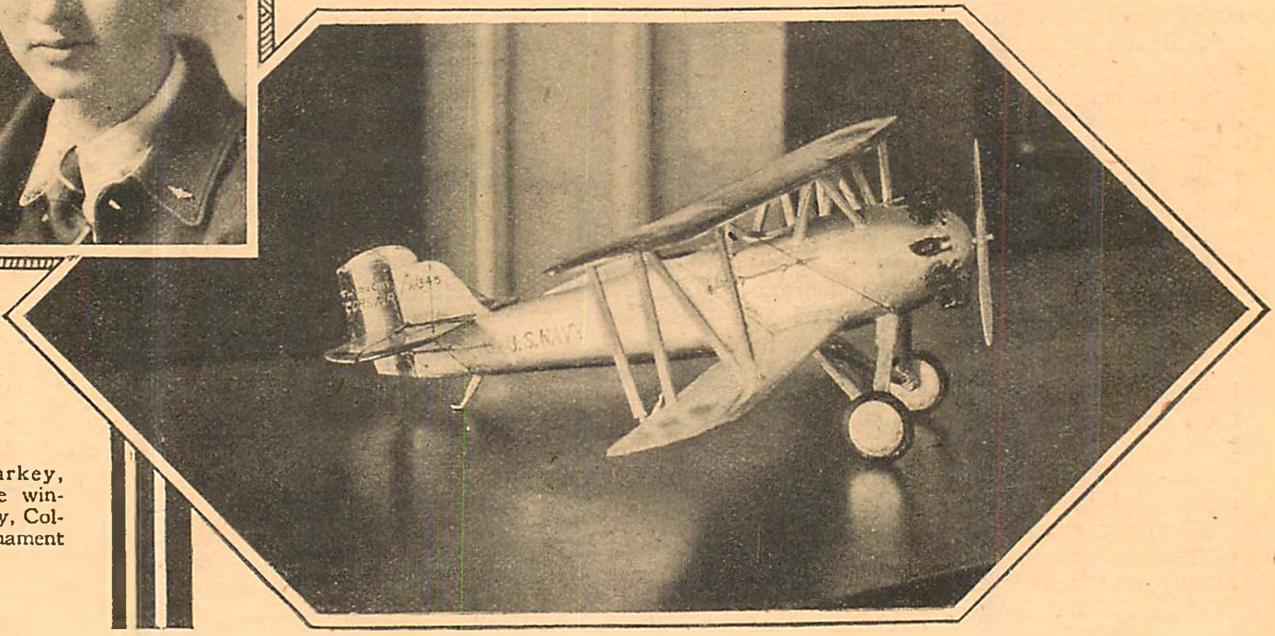
Evidently the Russian couldn't pilot a plane but, sooner or later, this bright little leader, or even Sandino himself, would get hold of a pilot somewhere. A lot of damage would be done before the marine planes could rise and put them out of business.

Blimp didn't catch much sleep, spending most of the night tossing about on the floor (*Continued on page 50*)

The American

Full Report of Greeley, Colorado Tournament

James Starkey, grand prize winner, Greeley, Colorado Tournament



SUCCESS in every respect, and for which congratulations are still pouring in, attended Weld County's (Colorado) first airplane model building contest sponsored by the *Greeley Daily Tribune*, Greeley, Colorado.

The officials connected with the tournament and of the newspaper, under whose sponsorship it was held, spared no efforts to make it a success and such was the reward of their efforts that there is every indication that the tournament will become an annual affair.

James Starkey, an eighth grade student at the Training School of Teachers College, won the grand prize, a Majestic radio No. 90, donated by Dickey-Sanders, Inc. Starkey had 50 points, half of which were made in the scale model building contest and half in the flying competition.

Starkey also received a gold medal, properly engraved, awarded by MODEL AIRPLANE NEWS, as the first youthful air champion of Weld County. All prizes were later presented at the Sterling Theatre, to which tickets were furnished all competitors by the manager of the theater, Harry Ashton.

Walter Calland, a Greeley high school student, won the second grand prize with 40 points. The reward was a wrist watch donated by Thomas Helpin, Greeley high school graduate and now an executive of the All-Metal Aircraft Co. of Cincinnati, Ohio. Calland took this prize when four boys, not attending schools in Greeley and who had won points in the scale model building contest, failed either to compete in or to win points in the flying contests, thus making them ineligible for any grand prize.

Starkey won the grand prize although he was beaten in the junior high and elementary outdoor flying contest by Reginald Templin. The contest was held in gusty weather. The small planes of Templin, the same he used to win second place indoors, flew as well in windy weather as in still weather. The one that flew 30 seconds indoors to win second flew 29 seconds outdoors to win first.

Three planes, the limit allowed, were entered by Templin. Of the nine flights allowed, five of them were over 20 seconds in the wind, or better than any of his competitors. Starkey's big twin pusher flew 16 seconds for second place. His smaller planes, much lighter than Templin's, which had flown 75 and 79 seconds indoors to win him the flying sweepstakes, could not weather the gusty air. Fred Sackett was next best in this class with 10 seconds.

Walter Calland, with a specially built outdoor model, had no luck in the wind. In a test for adjustment he flew his single propeller tractor 50 seconds, but in an officially timed trial, failed to better the record time. Luckily he had no stiff competition, as 2 seconds in the air was the best Adolph Lorenz could do in the gale. When the wind twisted the wing as he held it, Calland did not take his last flight.

American Sky Cadet R. C. Robertson, Syracuse, N. Y.

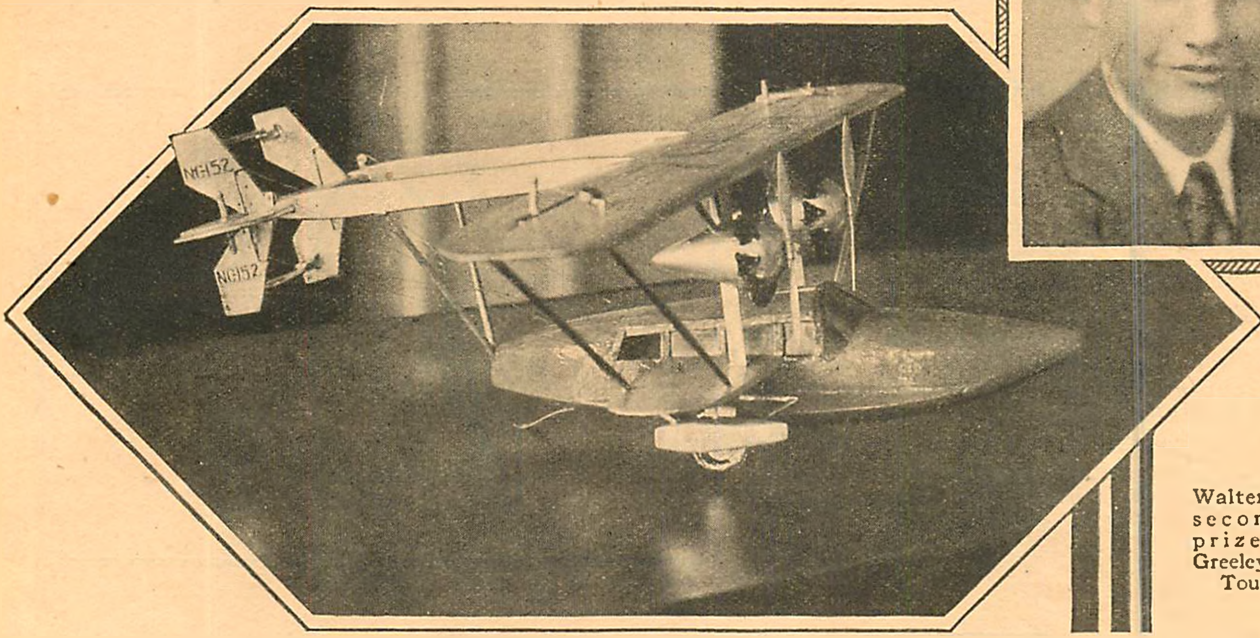
Starkey got 15 points for first in the junior high school scale model event, 10 points for scale model sweepstakes, 10 points for junior high indoor flying, 5 points for the same outdoors, and 10 points for flying sweepstakes; that is, for the longest flight either indoors or out—total 50.

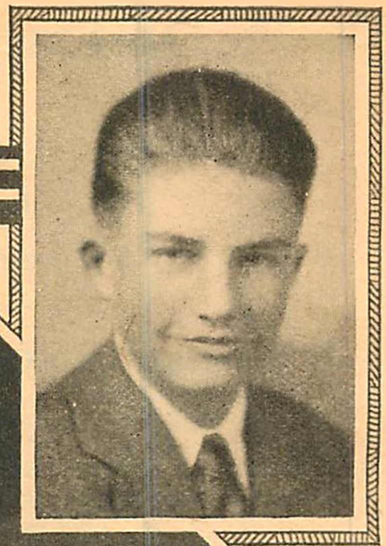
Calland got his points as follows: first in senior high scale model, 15; second in scale model sweepstakes, 5; first in indoor flying, senior high, 10; first outdoor flying, senior high, 10.

The complete list of airplane model building contest winners follows:

Sky Cadets

Corsair and Sikorsky Win Grand Prizes





Walter Calland, second grand prize winner, Greeley, Colorado Tournament

Grand prize: James Starkey, first; Walter Calland, second.

FLYING

Sweepstakes: Starkey, first; Reginald Templin, second.

OUTDOOR FLYING

Senior high: Walter Calland, first; Adolph Lorenz, second.

All others: Templin, first; Starkey, second.

INDOOR FLYING

Senior high: Calland, first; Lorenz, second.

All others: Starkey, first; Templin, second.

SCALE MODEL

Sweepstakes: Starkey, first; Calland, second.

High school: Calland, first; Jim Cazer, Windsor, second; Lorenz, third.

Junior high: Starkey, first; Robert Meyer, Big Bend, second; Fay Woods, Ault, third.

Grade school: Glen Cullor, Eaton, first; Gale Rosling, second; Warren Caldwell, Gill, third.

Since the grand prize winners were eligible for no regular prizes, all competitors were moved up. Consequently, competitors won prizes who did not win points in events. In the scale model contest, points went with only two places.

A complete list of prize winners, grand prizes excepted, and donors of prizes follows:

SCALE MODELS

Best scale model not winning grand prize: Robert Meyer, Big Bend, a tool chest and tools, donated by McArthur Hardware Co. Starkey's model made 48 points, Calland's 45 and Meyer's 42.

High school: Jim Cazer, Windsor, best quality Ingersoll wrist watch, donated by J. C. Nelson, jeweler; Adolph Lorenz, year's subscription to *Aero Digest,* furnished by the magazine; Dale Gordon, year's subscription to MODEL AIRPLANE NEWS, furnished by the magazine.

Junior high: Robert Meyer, Big Bend, drill press donated by Cummings Hardware Store; Fay Woods, Ault, *Aero Digest* subscription; Willie Weber, Gilcrest, MODEL AIRPLANE NEWS subscription; Ray Ginther, Gilcrest, *Aero Digest* subscription.

Grade school: Glen Cullor, Eaton, adjustable square and level, Greeley Hardware and Implement Co.; Gale Rosling, *Aero Digest* subscription; Warren Caldwell, MODEL AIRPLANE NEWS subscription.

American Sky Cadet Roger Vore of Merriam, Kan.

FLYING PRIZES

Second in flying sweepstakes: Reginald Templin, saw and plane donated by Lee Bros. Hardware Co.

INDOOR

High school: Adolph Lorenz, water proof pup tent, donated by the Greeley Army Store.

All others: Templin, Spaulding bathing suit donated by P. C. Mann Sporting Goods Store; Robert Meyer, Big Bend, MODEL AIRPLANE NEWS subscription.

OUTDOOR

High school: Adolph Lorenz, Jantzen bathing suit, donated by Hibbs Clothing Co. (*Continued on page* 46)

A Course in Airplane Designing

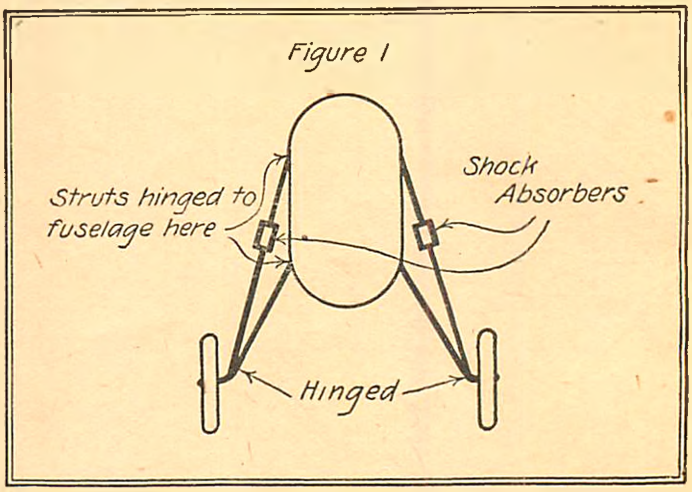
By Mastering This Valuable Course, the Model Builder of Today Lays the Cornerstone for His Career as the Aeronautical Engineer and Designer of Tomorrow

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.*

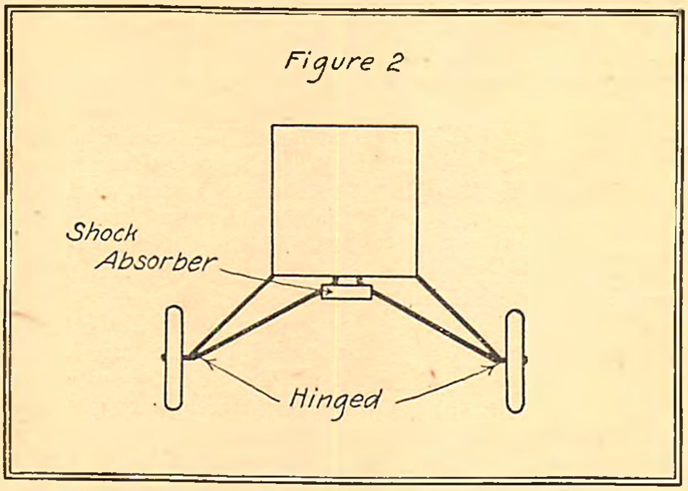
The policy of MODEL AIRPLANE NEWS *is not to encourage or teach its readers to become pilots, but rather to become aeronautical engineers, designers, salesmen, manufacturers, or equip themselves for any other positions which require the training of the specialist or executive. Study this course from 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.



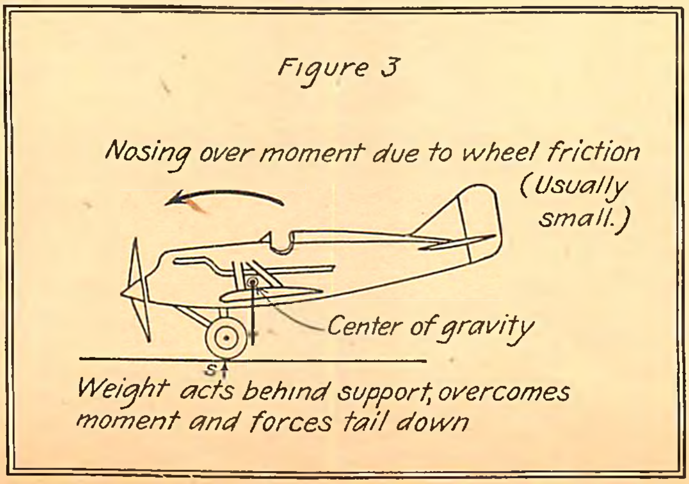
WHILE an airplane is essentially a vehicle of the air, it must also be a vehicle of the ground during the time in which it is landing and taking off. For this reason we equip an airplane with a landing gear that enables it to roll over the ground or to float on the water. Sometimes a combination of the two is used, making the ship an amphibian.

In this article we shall consider only the land type of undercarriage. Pontoons and floats will be discussed later.



The conventional landing gear consists of two wheels and a tail skid, with a third wheel sometimes substituted for the skid. The structure of the landing gear must be sufficiently strong to withstand the shocks of all ordinary landings, yet it must be light in weight, and it must have as little drag as possible. For these reasons a sturdy, simple structure, with all members well streamlined, will be found best.

The older landing gears usually employed a straight axle with four struts leading to the fuselage, two to each lower longeron. As airplanes became more practical, however, it was found that a split axle undercarriage, of the type shown in Figures 1 and 2, made landing and taking off possible on rough ground, as well as in high grass. The split axle type has now come into general use, and may been seen in several varieties at any airport.

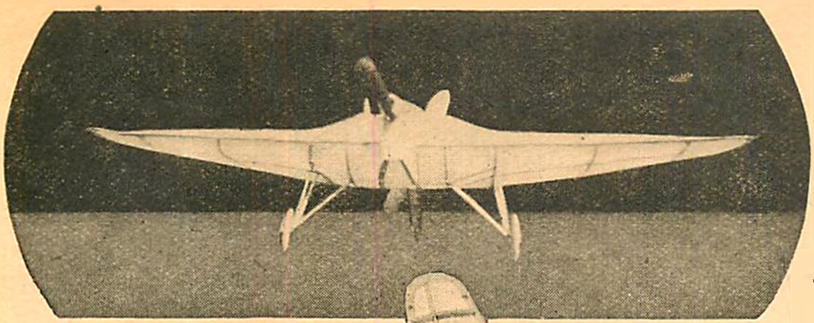


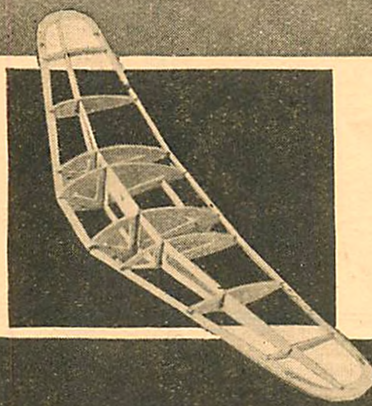
SHOCK ABSORBING

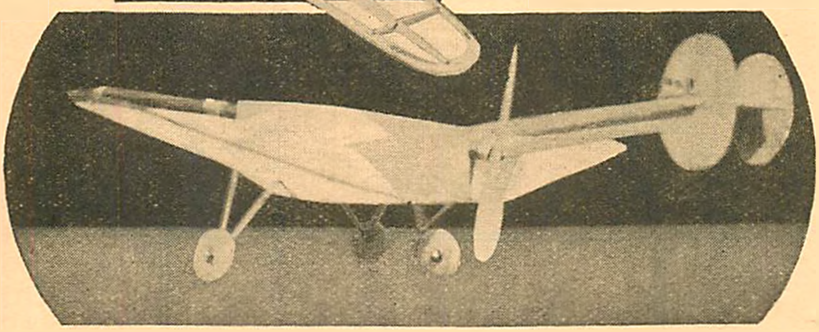
In order that the shocks of landing may be largely taken up before they reach the fuselage structure, it is best to provide some shock absorbing device. This may be rubber cords, steel springs, oil, or rubber in compression. Of these, rubber cords are most widely used and are by far the most popular with model builders.

The shock absorbers are placed on the landing gear in various ways. The old plain (straight axle) landing gear used shock cord wound around the axle and spreader bar near each wheel.

In the newer (split axle) type, the shock absorbers are usually placed either in the strut leading to the top longeron, as in Figure (*Continued on page 48*)







How to Build the Northrop "Flying Wing"

See Plans on Pages 18 to 24

By
Prof. T. N. de BOBROVSKY

Noted Aeronautical Research Expert

America's Outstanding Aerial Innovation in Model Form for You

THE Northrop "Flying Wing" is a type of airplane model which has a double use as a pusher or tractor and as an indoor or outdoor model. This novel idea of a "flying wing" as applied to a real plane caused well-earned surprise among people connected with airplane manufacturing and designing.

W. K. Jay and J. K. Northrop (former chief engineer of the Lockheed Aircraft Corp.), the designers, experimented with their first "Flying Wing" at the United Airport, Burbank, Calif., with astonishingly good results. The plane proved to be an original and practical flying instrument, rising immediately off the ground.

The name originated in the construction, which shows the extraordinary development of the wing as compared with the tail surfaces; *i. e.*, the latter is in comparison smaller than the usual tail surface used to be. Well tapered wings like these possess an extraordinary quality.

The center of pressure travel is very low, while the gliding angle is good and the loading forces have a better concentration. The drag is also minimized. The idea of the flying wing is not entirely new in the history of aviation. The original model was constructed by Prof. Hugo Junkers, of Germany, who obtained a patent in 1910.

However, that model did not possess the true attributes of the flying wing theory and the experts would not name it "flying wing", though the Junkers idea was almost a "flying wing".

In reviewing all the machines which have tail surfaces fixed by outriggers to the wings, carrying the entire load—motor, gasoline tank, landing gear, pilot, etc.—it is well to name the successful monoplane designed in 1909 by Alexander Pfitzer (in 1910 chief engineer for Glenn H. Curtis) a "flying wing".

The Savoia-Marchetti machines, the *Santa Maria* and the *S-64*, especially the last named, deserve the designation of "flying wing".

Naturally, the Northrop "Flying Wing" is the further developed design of this group of airplanes.

This design introduces numerous new features into the previously existing system and proves to be the best model for study of construction of such types.

The machine has no fuselage. The photograph and drawings show the front and top view of the wing. The wing has eight ribs and one beam, trailing edge and leading edge. The tips of the wing are rounded. The parts are made one by one. The leading edge consists of 1/16" x 3/16" medium balsa wood, the length of which is measured on the drawing. The trailing edge also is of balsa, the size being 1/16" x 1/8" x 19".

WING TIPS

As seen in drawings, we cut the pieces of 1/16" hard balsa wood. We have to be careful that the grain of the wood follows the drawing. It is best to dope them right after finishing to prevent warping.

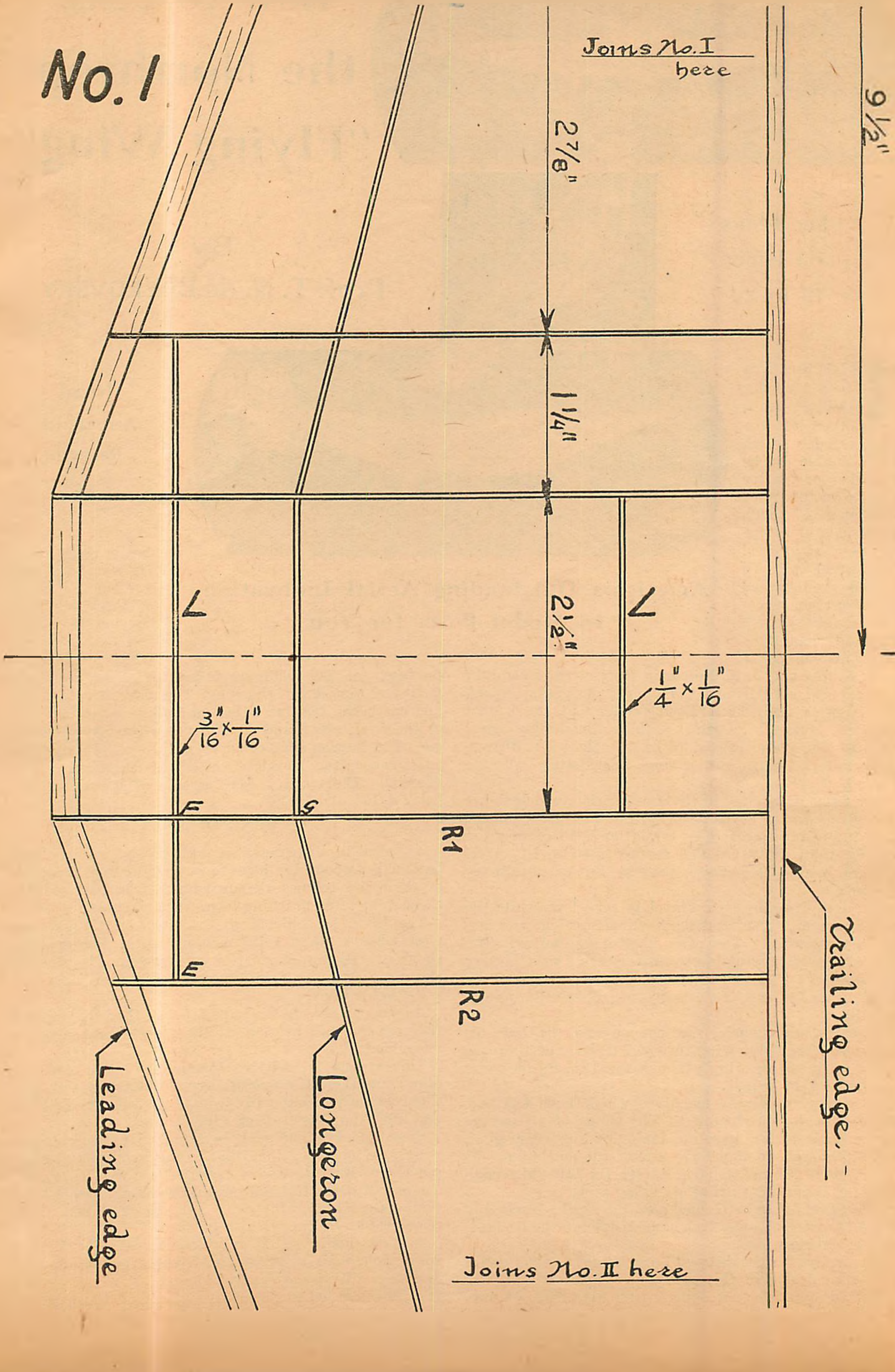
The beam is depicted in drawings in the original size and is made of 1/16" medium balsa. The drawing shows exactly how it must be constructed. The ribs are shown in drawing 6. They are made from the same 1/16" balsa wood.

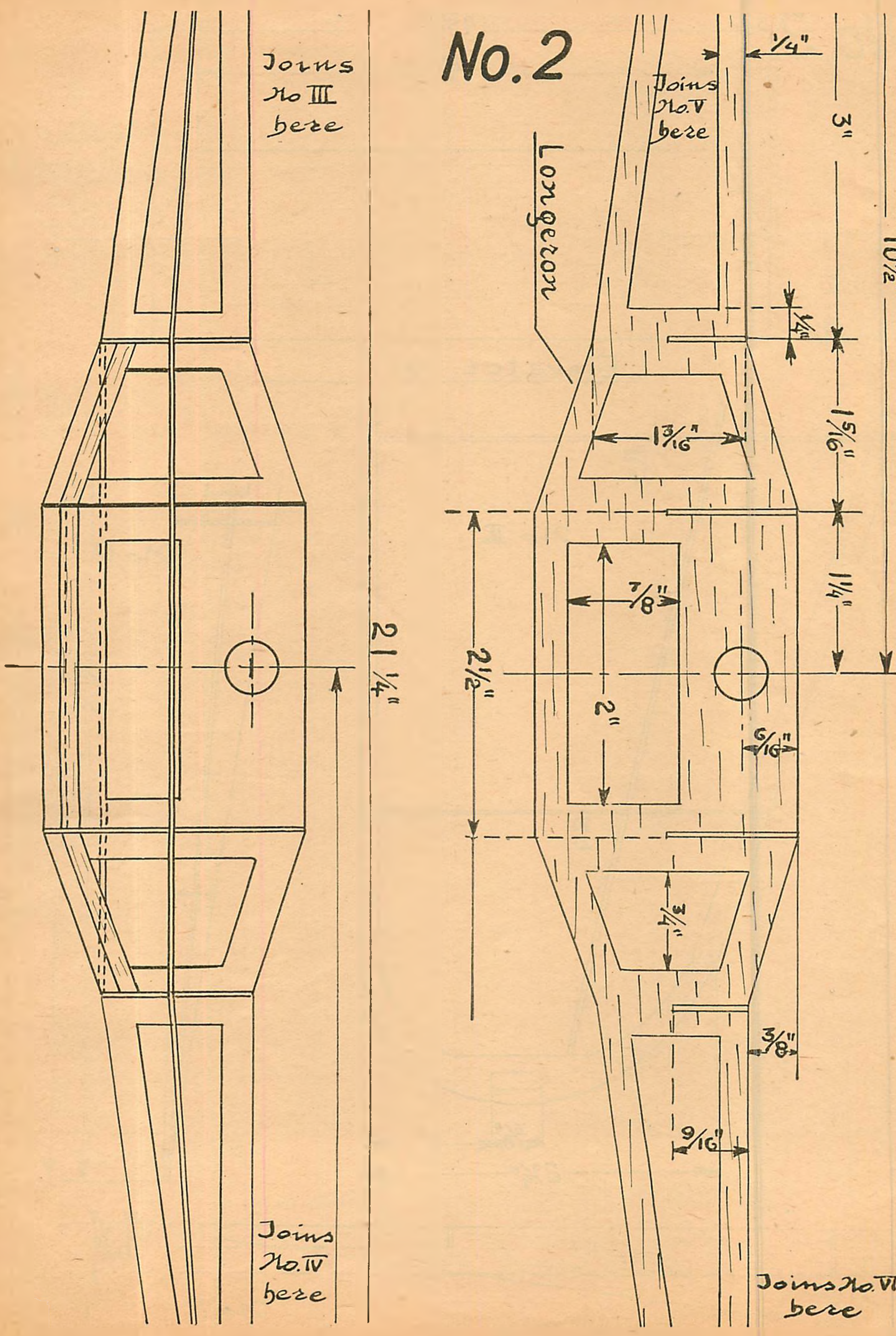
As you can see, the ribs are fitted in the beam and for that reason both are cut at the place where they are assembled.

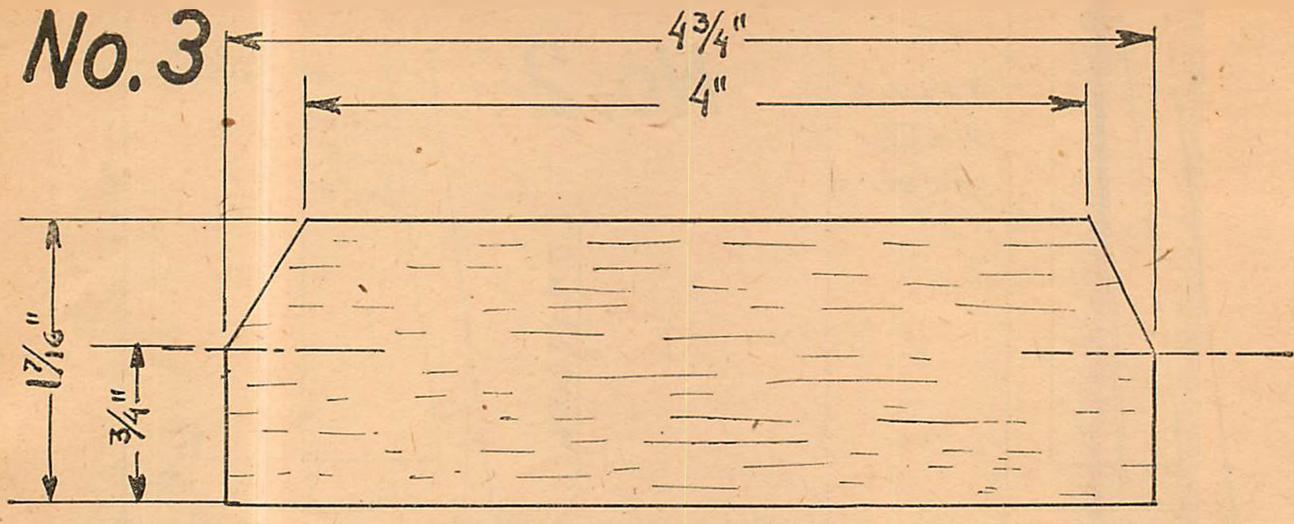
This system is stronger and more elastic than the others and there is no possibility of deforming the wing. The best way for assembly is to fit the ribs to the beam and after that the trailing edge.

Since the landing gear is attached entirely to the wings, we have to attach that to the wood pieces as depicted in drawing and designated by the letter "L". These will carry the landing gear system. Now cut the four main ribs for the same purpose as shown in the photograph. So the wing is finished.

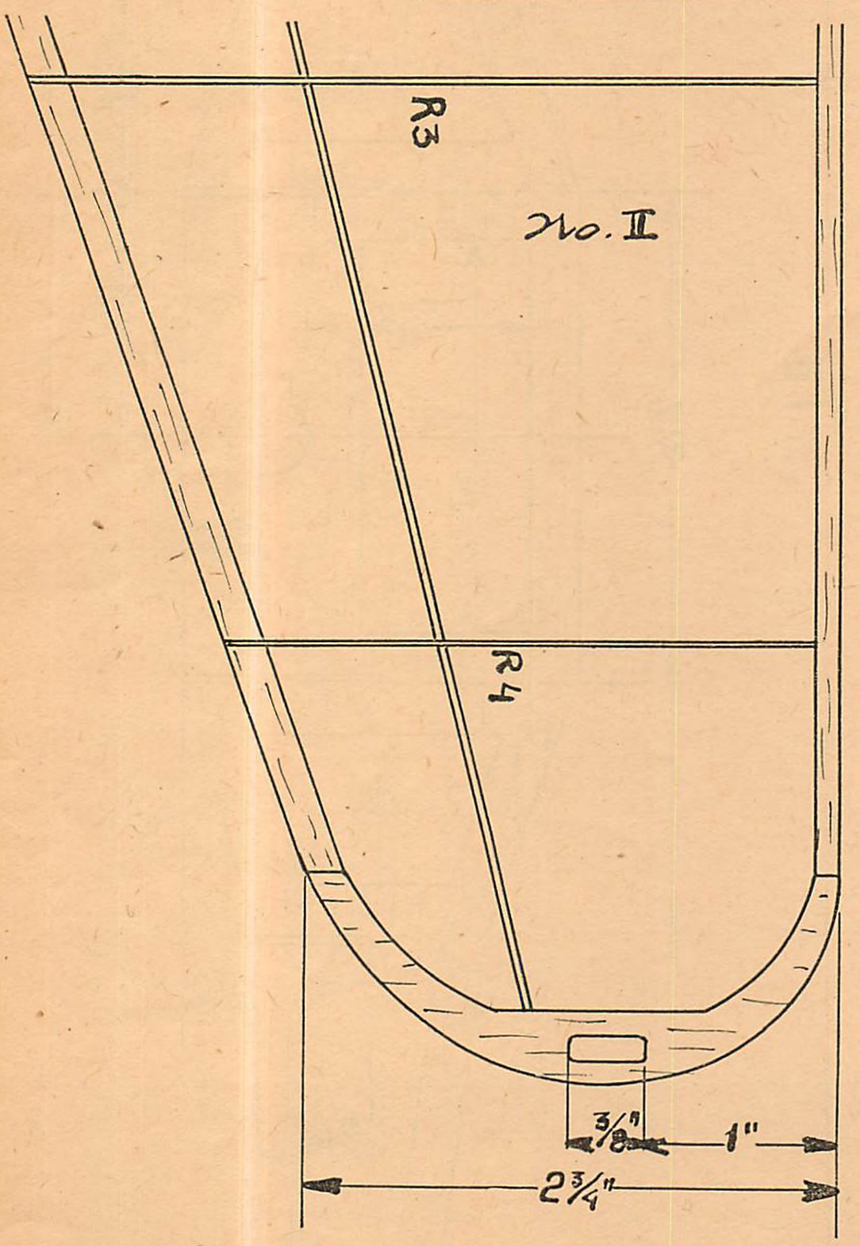
It now should weigh only .245 ounce. The finished wing skeleton is to be covered right after drying with Japanese silk tissue paper. The weight of the covered wing is increased to .315 ounce. (*Continued on page 56*)

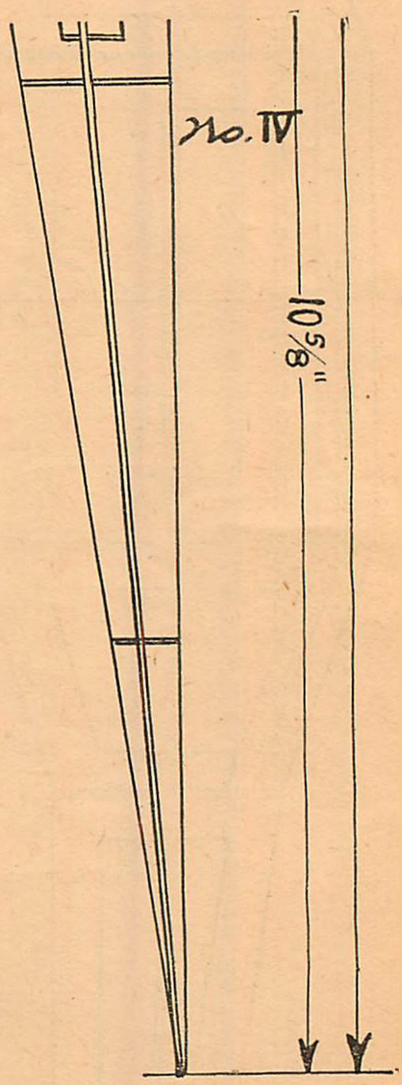

No. 1
Joins No. I here
2 7/8"
1 1/4"
2 1/2"
9 1/2"
1/4" x 1/16"
3/16" x 1/16"
F
G
E
R1
R2
Leading edge
Longeron
Trailing edge.
Joins No. II here

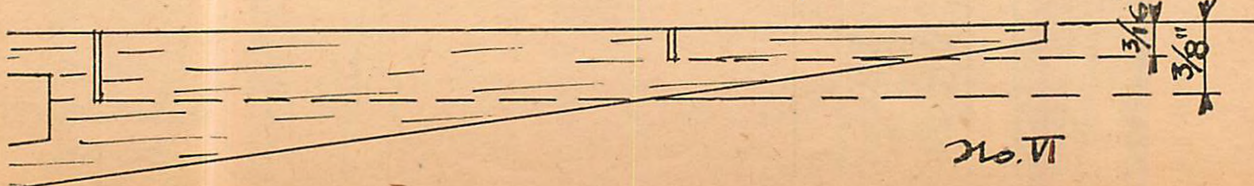

No. 2
Joins No III here
Joins No. V here
Longeron
¼"
3"
10½"
¼"
1⁵⁄₁₆"
1³⁄₁₆"
⅞"
1¼"
2½"
2"
21 ¼"
6/16"
¾"
3/8"
9/16"
Joins No. IV here
Joins No. VI here

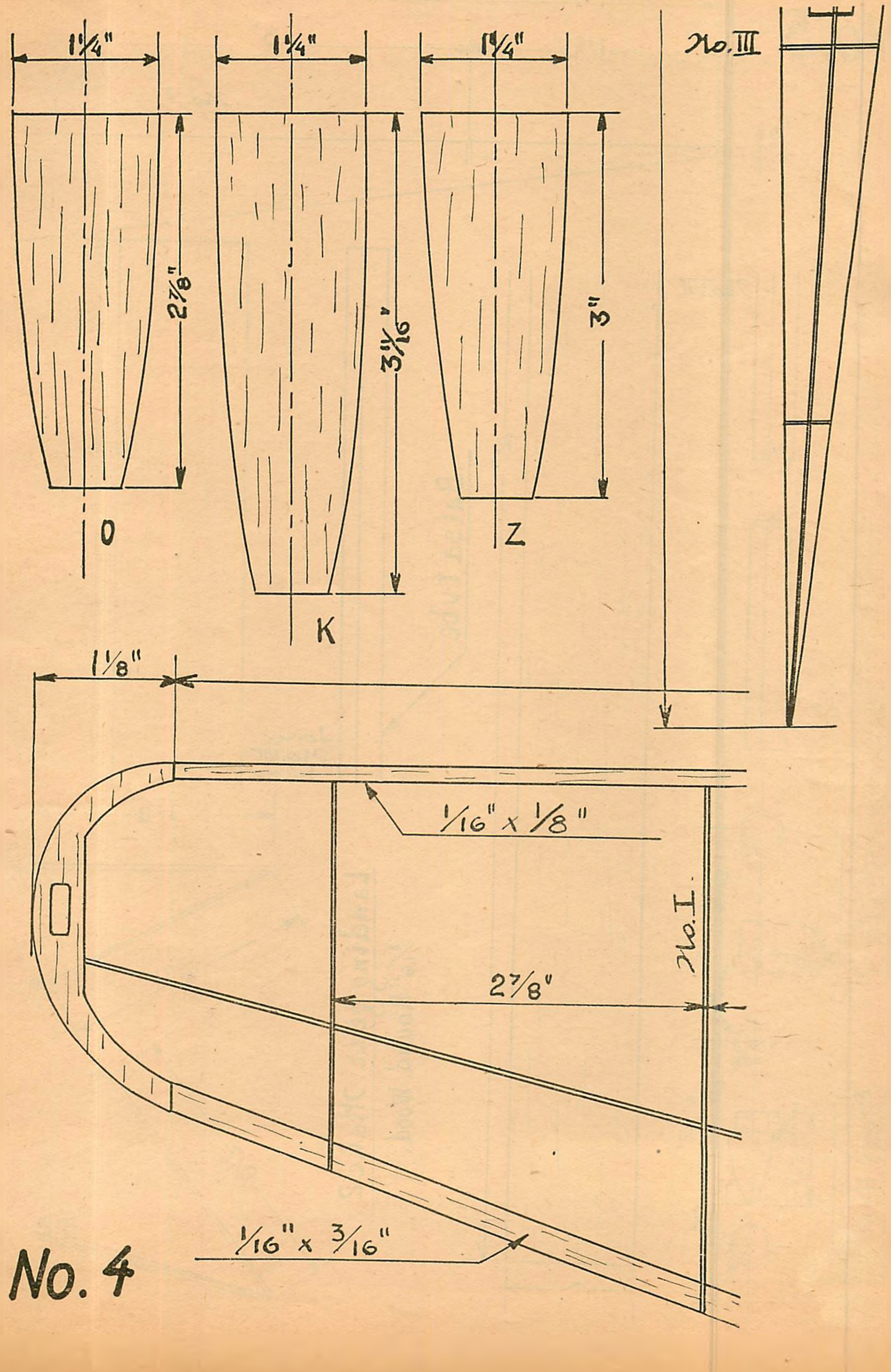


Elevator. 1/32"

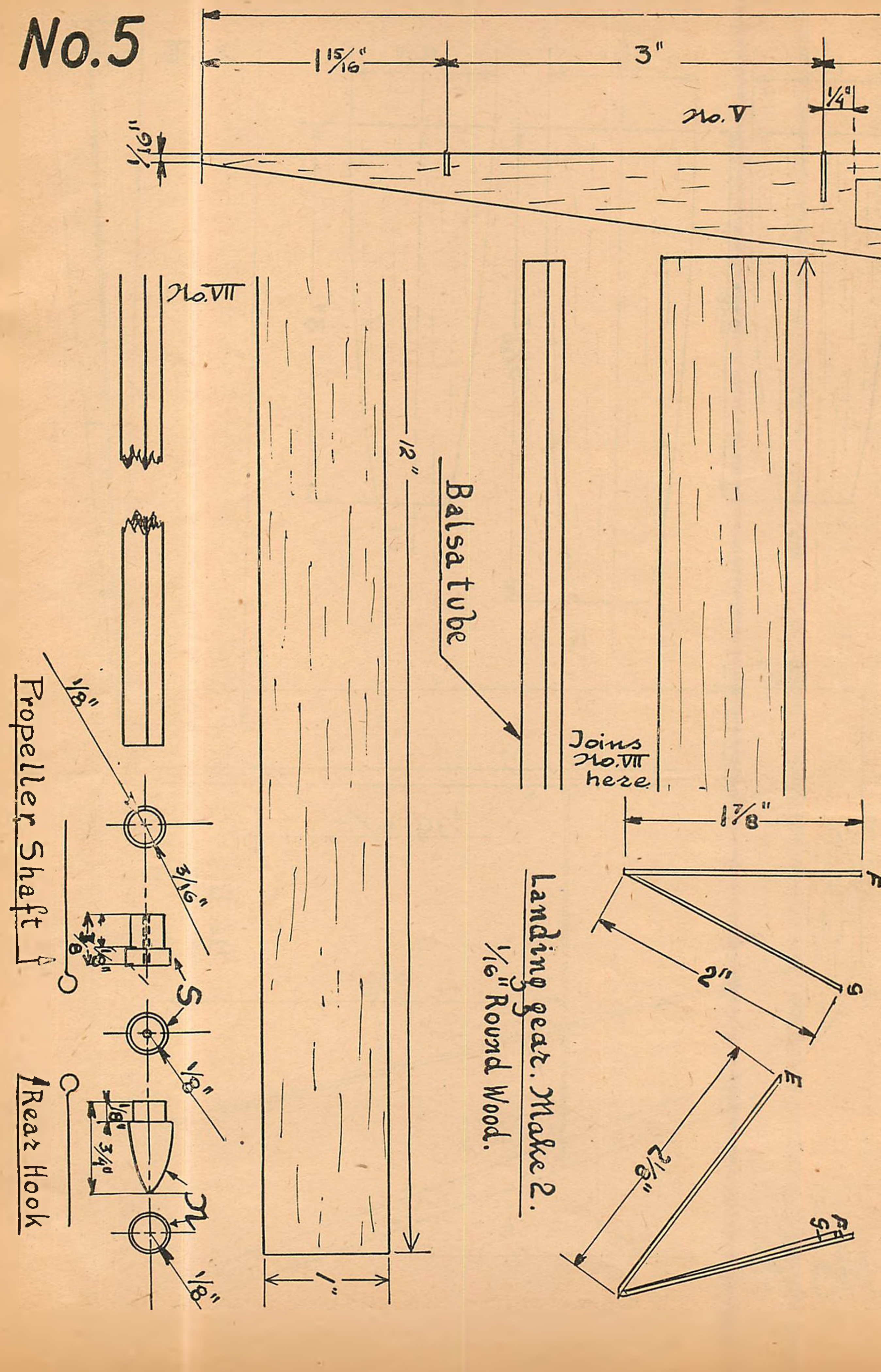




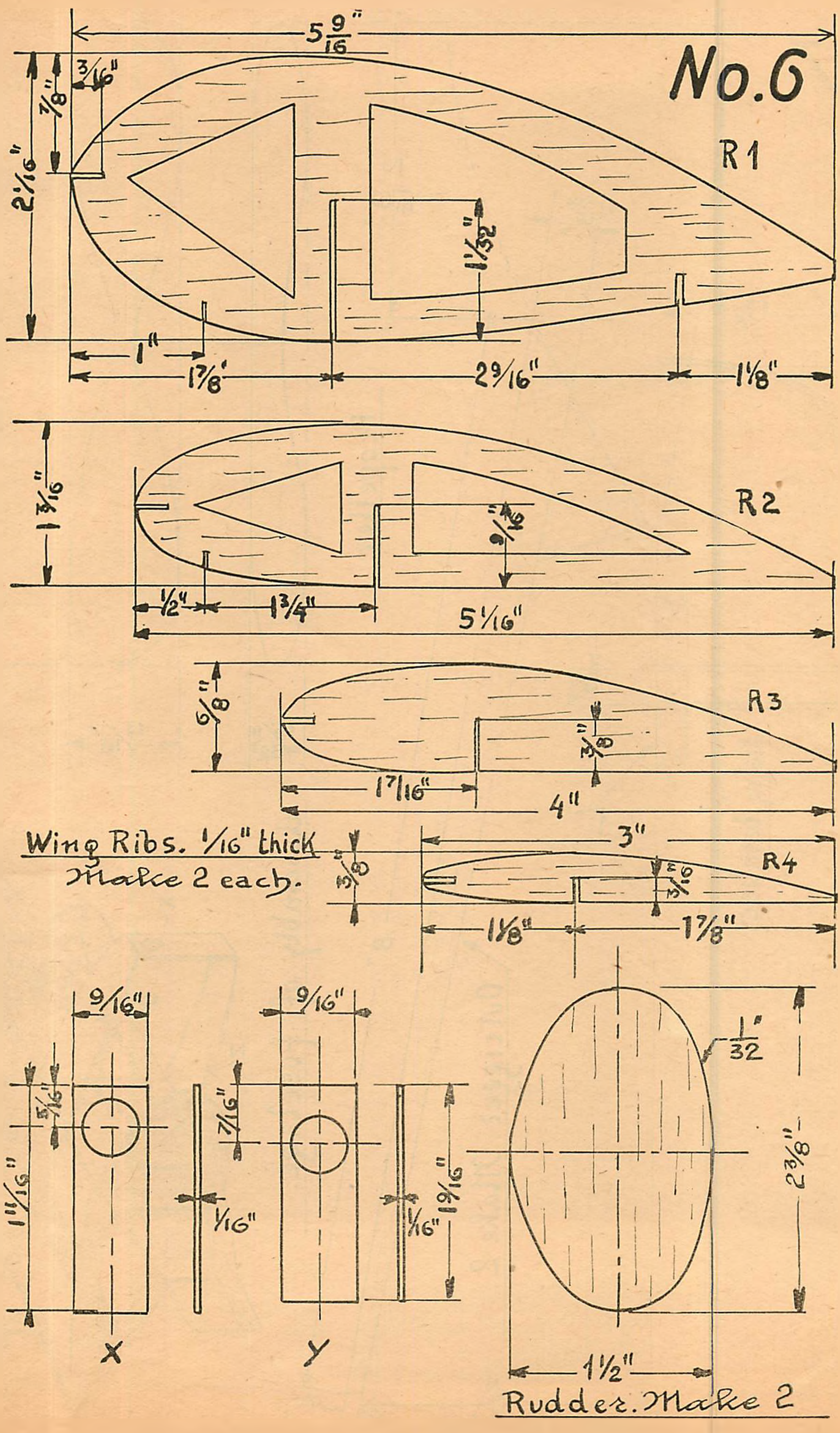



1¼"
2⅞"
O
1¼"
3 1/16"
K
1¼"
3"
Z
No. III
1⅛"
1/16" x 1/8"
No. I
2⅞"
1/16" x 3/16"
No. 4

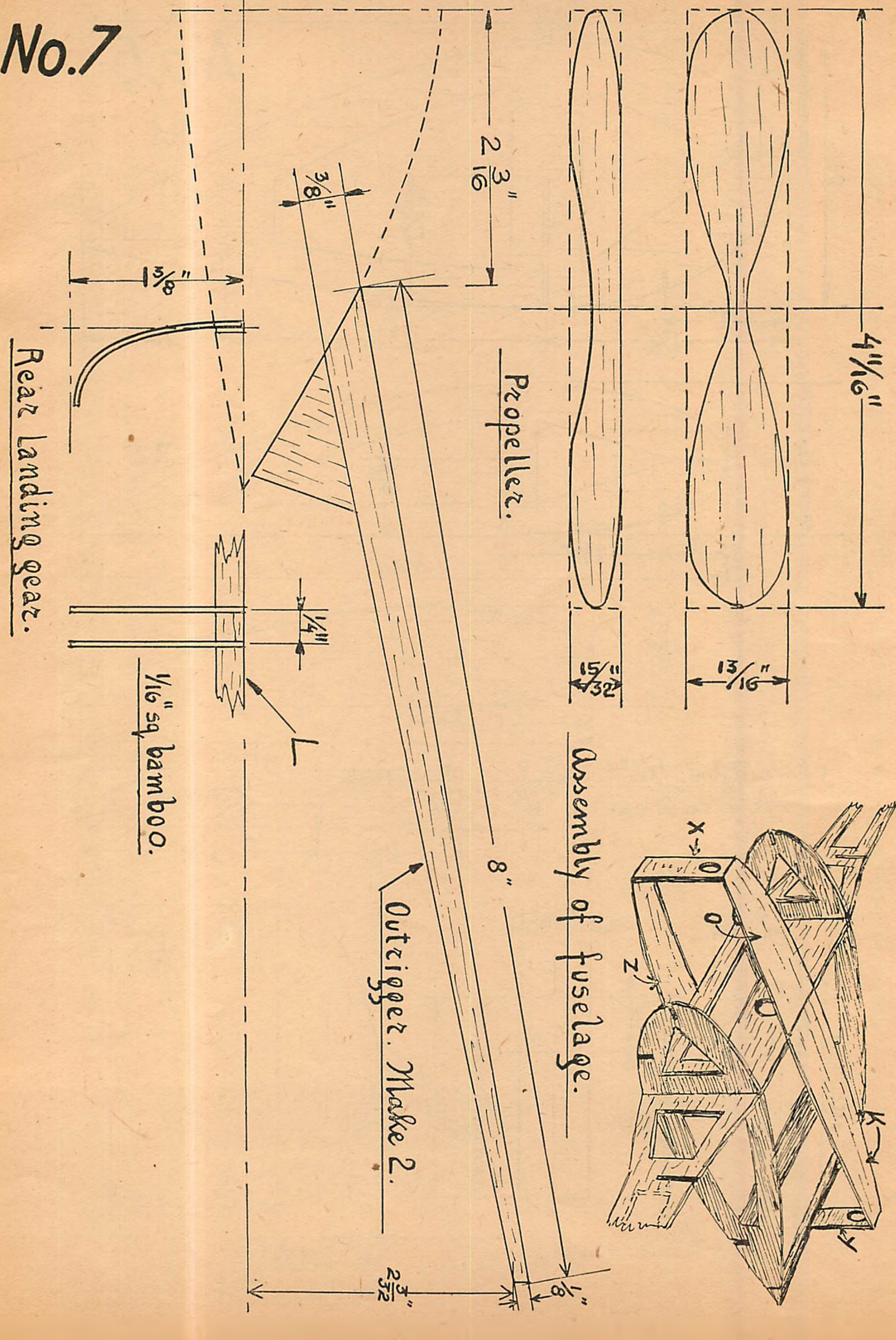
No.5



1 15/16"
3"
No. V
1/4"
1/16"
No. VII
12"
Balsa tube
Joins No. VII here
1"
1 7/8"
Propeller Shaft
Rear Hook
Landing gear. Make 2.
1/16" Round Wood.
2"
2 1/8"
3/16"
1/8"
S
N
F
G
E


No. 6
R1
5 9/16"
3/16"
7/8"
2 1/16"
1 1/32"
1"
1 7/8"
2 9/16"
1 1/8"
R2
1 3/16"
9/16"
1/2"
1 3/4"
5 1/16"
R3
6/8"
3/8"
1 7/16"
4"
Wing Ribs. 1/16" thick
Make 2 each.
R4
3"
3/8"
3/16"
1 1/8"
1 7/8"
9/16"
5/16"
1 11/16"
1/16"
X
9/16"
7/16"
1 9/16"
1/16"
Y
1/32"
2 3/8"
1 1/2"
Rudder. Make 2

No.7



Rear Landing gear.
1 3/8"
1/16" sq bamboo.
L
1/4"
3/8"
2 3/16"
Propeller.
4 11/16"
15/32"
13/16"
Outrigger. Make 2.
8"
2 3/32"
1/8"
Assembly of fuselage.
X
O
Z
K
Y

Special Course in Air Navigation

The Mainstay of Successful Piloting

By Captain LESLIE S. POTTER

IN this series of articles, the author has endeavored to set out as clearly as possible, and in as simple words as possible, the art of navigation in the air.

Your interest in these will depend on your interest in flying, and whether you will consider yourself a pilot when you have learned to take a plane off the ground and bring it down again without breaking anything.

To those who do, these articles will be valueless, but to those who aspire to be more than fair weather pilots, to be able to fly from place to place without sole recourse to roads and railways, to be able to fly above the clouds with safety if they are too low to admit of safe flying beneath them, an intelligent interest in these articles will be of incalculable value.

Air navigation is not *a complicated subject, an intense knowledge of mathematics and trigonometry is* not *necessary, merely the average person's powers of common-sense reasoning. The whys and wherefores of all the facts will only be given where they are necessary to understand the facts, as it is considered that in a short course too many of these would be confusing and apt to mislead the reader.*

If some of the points seem too elementary, do not pass them by, there is a reason for their inclusion; if some points do not seem clear, be patient, you will generally find some information further on, that will clear them up as you proceed. Answer the questions at the end of each article and wait for their solutions in the next issue, and should you find any points requiring further explanation, send a letter with a stamped addressed envelope to the editor, setting out your problems, and a reply will be sent you explaining the points raised.

Keep all your copies of MODEL AIRPLANE NEWS *for future reference, you will probably need them to refer to as you go on.*

THE EDITOR

HAVING dealt with the causes of variation and deviation and the allowance to be made for them in calculating the course to be steered to make good a known track, we now come to the instrument used to indicate the course; the airplane compass, the most important of all navigation instruments. But before we deal with this, some knowledge of magnetism is essential in order that you may understand something of the forces acting on an airplane compass.

ELEMENTARY MAGNETISM

The earth itself is a magnet possessing all the usual peculiarities of one, and many of the substances in it have magnetic properties; as for example, iron, nickel, cobalt, aluminum, water, copper and bismuth, but the first three are vastly more magnetic than the others. Since in an airplane it is only iron (including steel) that will call for any serious consideration, this substance *only* will be dealt with here.

There are two kinds of magnets, Natural and Artificial. The former is found in the form of lodestone and is never used in compasses, therefore it will not be considered in these articles. The latter is subdivided into permanent or hard iron magnets and temporary or soft iron magnets. The terms hard and soft have no bearing on the temper of the metal, its brittleness or malleability—a hard iron magnet is one that is not easily magnetized but which retains its magnetism over a longer period than the soft iron magnet which is easily magnetized. Even a permanent magnet, however, loses its magnetism in time.

Dip a bar magnet in some iron filings and it will come out as shown in Figure 1 with the filings adhering to the ends and the middle left bare. These ends are called poles. Magnetism is strongest at the poles, although it extends down the whole length of the magnet, diminishing in strength as it approaches the middle where its strength is not great enough to counteract the forces of the poles or ends.

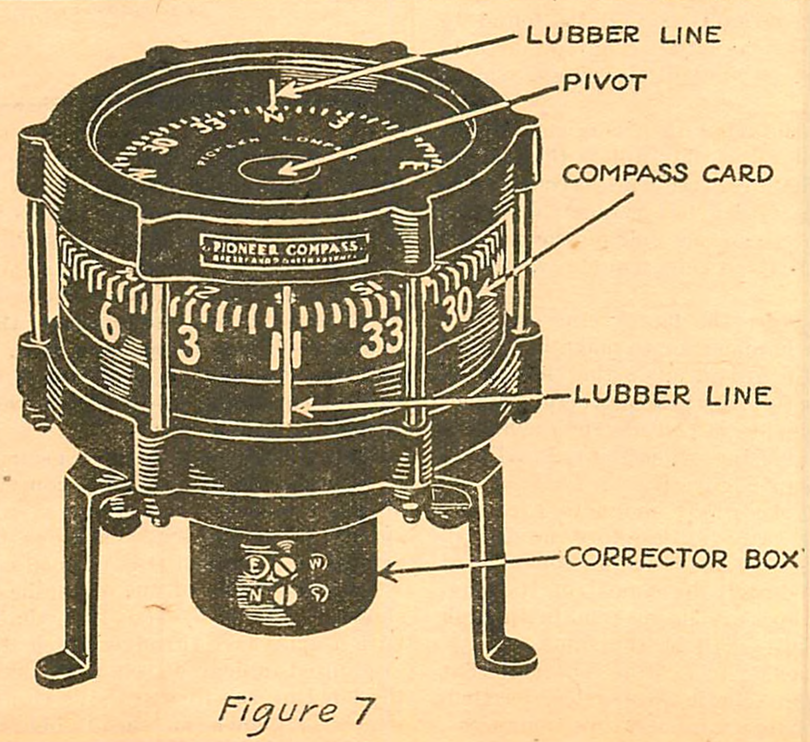


Figure 7

Now tie this magnet with a piece of string and allow it to hang freely. One end will always point approximately to the north and cannot be made to point in any other direction. This end will be the north seeking or red pole, and the other end will be the south seeking or blue pole.

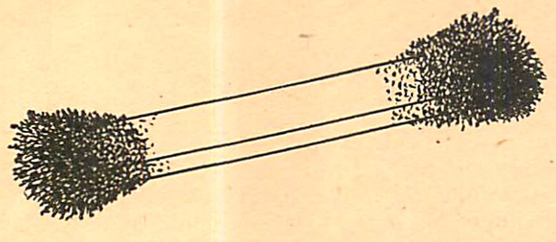


Figure 1

Filings adhering to bar magnet

All bar magnets supplied with compasses have their ends painted blue and red, or marked north and south. The necessity for this will be apparent when we deal with the correction of compasses.

Red poles repel each other, blue poles repel each other; but a blue and a red pole attract each other. This may be expressed by saying that like poles repel and unlike poles attract. Hence the red pole is the one attracted to the north pole, which must, therefore, be a blue pole.

Try it for yourself with two bar magnets. You will see that certain ends will repel each other and other ends attract each other.

It has been proved that you cannot have a red pole without a corresponding blue one; that is to say, two ends of a bar magnet cannot be alike. There is a theory that any substance capable of being magnetized is composed of minute magnets which lie in disorder in all directions until the substance becomes magnetized, when they all lie in one direction as shown in Figures 2 and 3.

ARTIFICIAL magnets are made in various ways. A temporary magnet is made as a piece of iron is attracted by some magnet when some of the magnetic properties of the latter will enter it, (Figure 4) but will leave it immediately it is detached from the magnet. If steel is used instead of iron, it will be found to be not nearly so strongly magnetized; but on detachment it will retain longer what little magnetism it has gained.

A steel bar placed in contact with a magnet will become magnetized although only feebly unless the magnet is a strong one; but if the steel bar were stroked from end to end for some time with a bar magnet, the same direction of stroking and the same end of the magnet always being used, a fairly strong magnet would be produced. (Figure 5.)

Other methods are to place the bar on the end of a magnet and tap it with a hammer, or to make it red hot and let it cool, pointing towards, and in the vicinity of, a magnet; but the only way to make a powerful magnet is to place a steel bar inside a coil through which a strong electric current is passing, when the red and blue poles would be as shown in Figure 6.

It must not be overlooked that magnets are very easily demagnetized and care is therefore needed in the handling of them. Drop a bar magnet on a hard surface and it will immediately lose most of its magnetism. Allow it to rust or corrode or remain in high temperatures and the results will be the same.

As may be well imagined, much of the material that goes in an airplane has magnetic properties, particularly the following: ammeters, generators, magnetos, headphones, and oil or gasoline tanks. Such movable parts as control columns and rudder-bars are usually made of non-magnetic material, but it is as well in correcting a compass to hold the control in the central position it would occupy in normal flight.

Strong magnetism is set in by the operation of all electrical appliances, and electrical conductors are generally arranged to overcome this. As may be imagined, the ideal position for a compass would be where no magnetism other than the earth's could influence it, but, unfortunately, this is impossible owing to the limited space in an airplane, so it should be generally realized that even in the best circumstances a compass, of necessity, functions under adverse conditions.

AIRPLANE COMPASSES

There are three distinct types of compasses:

The Magnetic Compass with which we are mainly concerned and which is the compass used mostly by the airplanes of today. This is directed by the earth's magnetism.

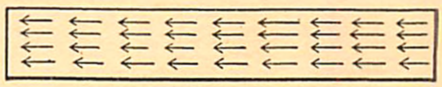
The Earth Inductor Compass which is a recent development and not yet popularized, has a pointer operated by electricity produced by reaction with the earth's magnetic field.

The Gyroscopic Compass we are not concerned with. It is too heavy for installation in the airplane of today. It indicates direction under the influence of the earth's rotation.

Figure 2

UNMAGNETIZED IRON BAR

Figure 3



MAGNETIZED IRON BAR

The Magnetic Compass. It is as essential for a pilot to understand the limitations of his compass as it is for him to understand its possibilities. Near either of the magnetic poles it would be difficult to use a magnetic compass with any degree of accuracy and there are certain other regions where its movements are said to be erratic, but, fortunately, these are few and are in areas unlikely to be flown over. The compass will not indicate the correct direction during steep turns, nor when it is being subjected to violent increases or decreases in speed.

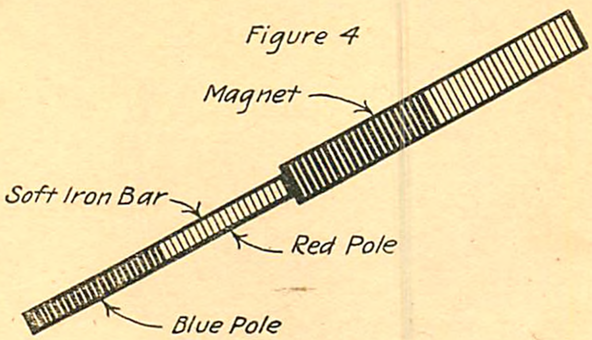
We will not go into the reasons for this, however, as in practice the pilot is only concerned with the reading of the compass when flying straight and at constant speeds; under which conditions it may always be depended on, provided it is in good condition.

An illustration of one of the best known compasses is shown in Figure 7. It is seen that it consists of a bowl with a glass face through which the markings on a card graduated in degree from 0° to 360° can be seen. Inside the bowl on the forward side can be seen a white mark which is known as the Lubber Line and it is absolutely essential that this line should be exactly parallel to the fore and aft axis of the plane. Failing this, all the readings of the compass will be inaccurate.

Underneath and attached to the graduated card are two or more magnets with their red or north seeking ends pointing in the same direction as the north mark or the 0° mark on the card, which is mounted in such a way on a central pivot as to allow it freedom to rotate in a horizontal direction.

The bowl is filled with an alcohol solution which hampers the movement of the card and keeps it from revolving violently on the slightest movement of the plane.

Figure 4

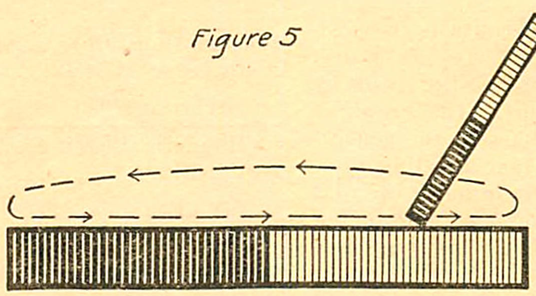


MAGNETIZATION OF SOFT IRON BAR

NOW follow this carefully a moment and you will see exactly what happens. The lubber line in the compass bowl is exactly parallel to the fore and aft line of the ship, so that whenever you turn, the compass being made fast to the ship turns with it, and the lubber line will always be pointing in the direction you are heading.

However, the card, being controlled by the magnets underneath, will always remain steady, the point marked North on the card will always be pointing to the magnetic north. With the turn of the plane then the lubber line will in effect move round the graduations on the card until the plane is flying straight once more, when the graduation then indicated will be the magnetic course on which it is now headed.

Figure 5



MAGNETIZATION OF STEEL BAR

Under the compass is the corrector box fitted with holes for the insertion of any magnets to correct any deviation in the compass.

Such is, briefly, a description of a magnetic compass. In dealing with its repair and maintenance it must be at once pointed out that with a highly sensitive instrument like a compass, even the simplest internal repair is a job for trained workmen and should under *no circumstances* be attempted by a pilot.

There are various little points to be noted in connection with its care and maintenance.

Bubbles sometimes occur in the bowl through the liquid evaporating. The bowl should then be removed and placed in a position with the filling cap uppermost, and a sufficient quantity of alcohol poured in until it overflows. A steady compass depends, among other things, on a filled bowl and nothing is more trying to a pilot than attempting to steer a course with a violently oscillating compass.

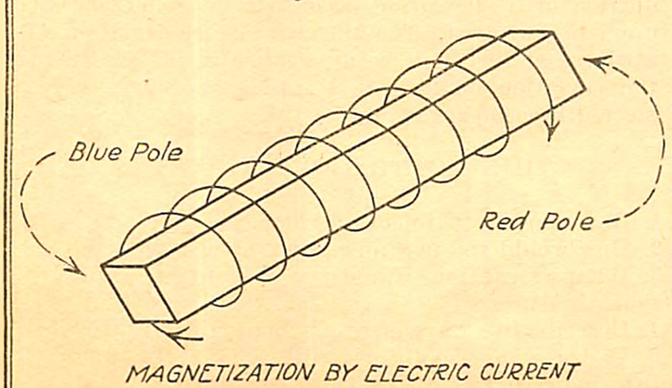
The card is generallly supported on a pivot of agate or iridium which rests in a cup generally of sapphire. Constant vibration or heavy landings may wear the polish off this jewel and cause the card to stick. You can test for this by placing a magnetic needle on the bowl and deflecting the card 5°.

If on removal of the magnet the card returns to its original position, the compass is O. K.; if not it must be returned to the makers for overhaul.

Sometimes when the card comes to rest slightly away from its original position, the bowl should be tapped with the finger. This will generally allow the magnet system to find its original resting place. If this happens the compass can be considered serviceable, for in actual flight the vibration of the motor will serve the same purpose as did the finger tapping.

The liquid in the compass bowl generally discolors after a period and should be changed when it reaches a point of discoloration when the compass can no longer be read easily.

Figure 6



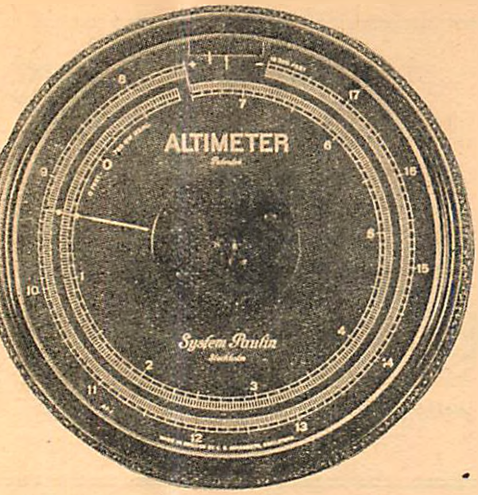
MAGNETIZATION BY ELECTRIC CURRENT

The only other point to watch out for in your compass is to see that none of the devices used to protect it against the vibration of the plane get broken or worn. Springs sometimes break or rubber pads sometimes get worn. These should be replaced before further damage results.

The Earth Inductor Compass. As has already been stated, this instrument is not in general use today, but since several notable flights have been accomplished with its aid, a summary idea of the principles under which it works should be understood.

It is composed of three major units; a generator, a controller and an indicator.

The generator is connected by a flexible shaft with the controller, and by an electric cable with the indicator. The generator is the same in principle as any other and is driven by a wind vane secured to an exposed part of the plane. It has the usual arma-



An altimeter with a range of 18,800 feet

ture, commutator and a pair of brushes. The brushes in this case are supported by a vertical axis on which they can be turned, and are connected by electric cables to the indicator in the pilot's cockpit.

The indicator is a galvanometer with an ordinary dial with graduations left and right. The pointer in the middle of the indicator shows whether you are to the left or right of your course, and is electrically connected to the brushes.

The controller is so called because it controls the positions of the brushes in the generator. It has a dial marked with the points of the compass and a crank by which it may be turned to any point. The crank is mechanically connected with the brushes in the generator and any rotation of it causes a corresponding rotation of the brushes; that is to say, if you move the dial ten degrees, you also move the brushes an angle of ten degrees in relation to the fore and aft line of the plane.

NOW you all know from your car generator that by moving the brushes in certain positions a maximum and minimum current is obtained, and so it is with this generator. A maximum output is obtained when the brushes are lying magnetic north and south and a minimum output (zero) when they are lying magnetic east and west.

Imagine that you want to steer due east. You turn the controller until 90° is showing on the lubber line and then turn the plane until the pointer on the indicator is at zero. The brushes are turned in two ways; either by cranking the dial round or when the ship itself is turned, in which case, if course, they turn with it.

When you turned the dial to 90°, you turned the brushes magnetic east and west, and so long as the plane is on an easterly course the brushes will remain in that position, no electricity will be generated and the indicator pointer will remain at zero.

Should you turn off this course, the brushes turn with you and electricity is generated. If you are off your course to the south the pointer will move to the right to an extent, depending on how much you are off your course. You then turn the ship to the left until the pointer comes back to zero.

Now suppose you are going to change your course to 65°; that is, 25° to the left of east where you have just been steering. You turn the controller dial round to the new course and this will alter the position of the brushes 25° *to the right* of the east and west line.

Now when you turn the ship 25° *to the left* onto the new course, the brushes turning now with the ship are once more brought to an east and west position.

It sounds complicated but try it out yourself on paper and it will soon become clear. The main point to remember is that by turning the brushes off an east and west line by turning the control dial, you are immediately generating electricity, which is communicated to the pointer on the indicator and only ceases when you turn the ship on to a correct course and thus place the brushes in an east and west position again.

The advantages claimed for this compass is that it is easier to steer by than the magnetic type and that the generator can be installed anywhere on the plane from any local magnetic influences.

Do not forget that your compass is the most important instrument in the plane, that your personal safety may depend on its accuracy and intelligent handling, and that your prestige as a pilot and navigator certainly will. Next month we will see how to calculate and adjust our compass errors.

ANSWERS TO LAST MONTH'S QUESTIONS:

1.

Variation 1915	24° 15′ W.
Decrease (9 × 15)	2° 15′
Variation 1930	22° 00′ W.
True Bearing	180° 00′
Variation	22° 00′ W.
Magnetic Bearing	202° 00′
Deviation	6° 00′ W.
Compass Course	208° 00′

2.

Variation 1918	12° 10′ E.
Increase 11 × 12	2° 12′ E.
Variation 1930	14° 22′ E.
Magnetic Bearing	225° 00′
Variation	14° 22′ E.
True Bearing	239° 22′

3.

Compass Course	38° 00′
Deviation	5° 00′ E.
Magnetic Course	43° 00′
Variation	18° 15′ W.
True Course	24° 45′

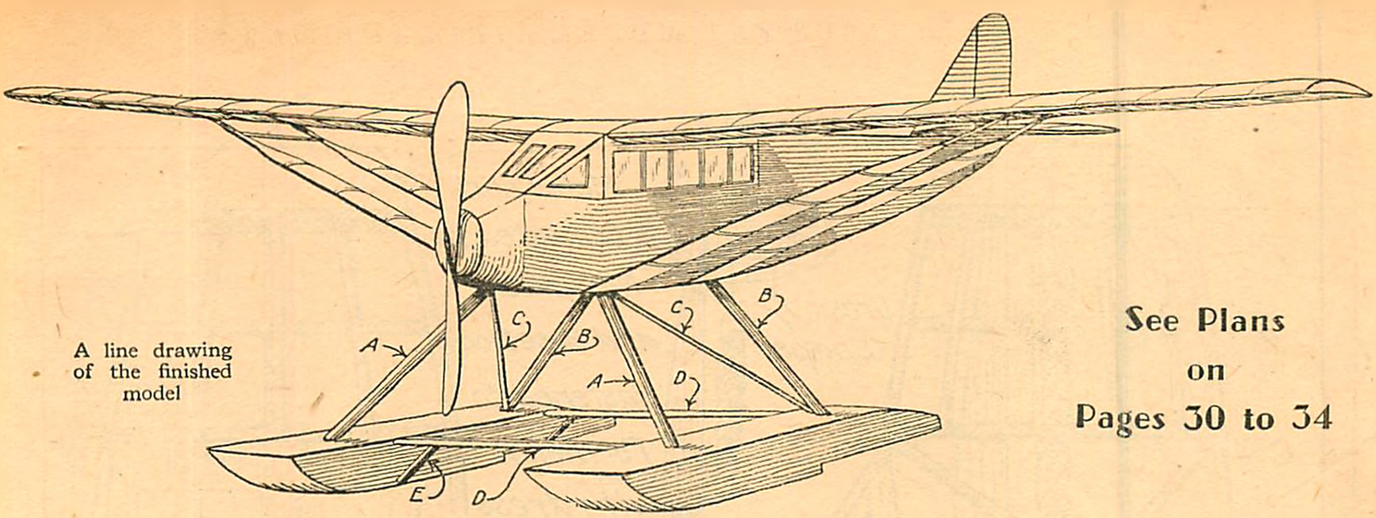
4. Compass error is the net adjustment made to your true course for variation and deviation. In Answer 3 above, 13° 15′ W.

The true bearing you obtain from a map or chart with the aid of a protractor will have to be converted to a magnetic bearing to arrive at the course to be steered on your compass. If you wish to plot a position line on your map from a bearing obtained in the air with a compass, you will first have to convert it to a true bearing.

5. Between 90° and 135° is a gap of 45° over which a reduction of 3° deviation occurs, or 1° reduction for every 15° involved. The difference in the deviation on a course of 108° will be approximately 1° less than the deviation on 90° + 4°, and the course to be steered by compass would be 104°.

THIS MONTH'S QUESTIONS:

1. How would you remove a compass bubble?
2. How would you test for a sticking of needle?
3. What precautions would you observe in the care of magnets?
4. Describe two ways of producing artificial magnets?
5. Under what conditions will a magnetic compass fail to indicate true direction?



A line drawing of the finished model

See Plans on Pages 30 to 34

How to Build A Bellanca Seaplane Model

A 2 ft. Flying Replica of the Pacemaker

THE Bellanca "Pacemaker" is that organization's latest creation. It is powered with a 300 h. p. Whirlwind motor, has the Standard Edo floats, and makes an ideal sport seaplane.

The model, if built according to plans and instructions, will give you lots of fun as well as educational data on seaplanes. The Bellanca model pictured here has flown for more than 50 seconds in twelve consecutive flights and weighs only 2-3/4 ounces.

FUSELAGE

First familiarize yourself with the plans and instructions. You will notice that the entire fuselage is made of 1/16″ square balsa. The bracings add considerably to its strength and also prevent warping of the fuselage under the strain of the motor.

After both sides are properly constructed, they are joined together at the top and bottom by cross braces. Model making pins will help you retain the streamline shape of the fuselage.

The nose is made with four formers, as shown in drawing. The two front formers are ambroided together cross-grained to insure strength.

On former A ambroid two dress snaps, one on top and one on bottom, as shown in drawing. The clasps are fastened to the nose piece as illustrated in the drawings. To the nose piece is also fastened the motor stick. Square balsa, 1/16″ x 1/16″, is used for stringers on the nose.

A piece of flat balsa 1/16″ thick is glued just above the windows to serve as a wing mount. Glue another wing mount to the other side of the fuselage. Celluloid is used for the windows. Cut in squares to fit frames and ambroid neatly.

The fuselage may be set aside for the time being while work is begun on the wings.

WINGS

The wing ribs are made of 1/32″ balsa. For your center spar use balsa 1/8″ square cut to the proper length. The leading edge is made from 1/8″ square balsa and the trailing edge from 1/32″ bamboo. The wings are simple to make and should cause no difficulty.

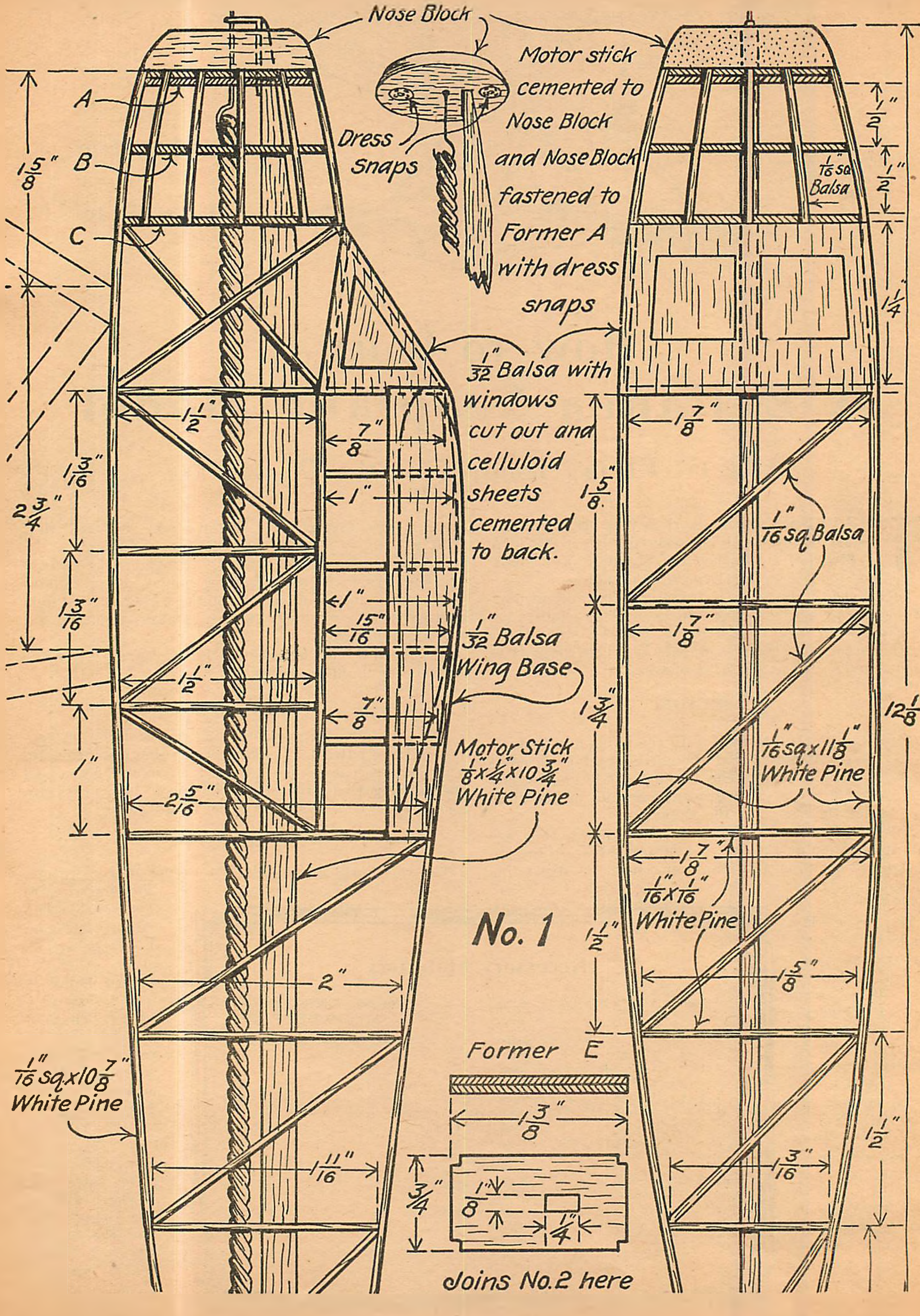
TAIL SURFACES

The tail surfaces include the rudder and elevators. These parts are not movable. The ribs are cut from 1/32″ balsa. A strip of 1/16″ square balsa is used for the spar running through the elevators. Bamboo bent to shape over a candle flame and glued to the ribs of the elevators and rudder completes this.

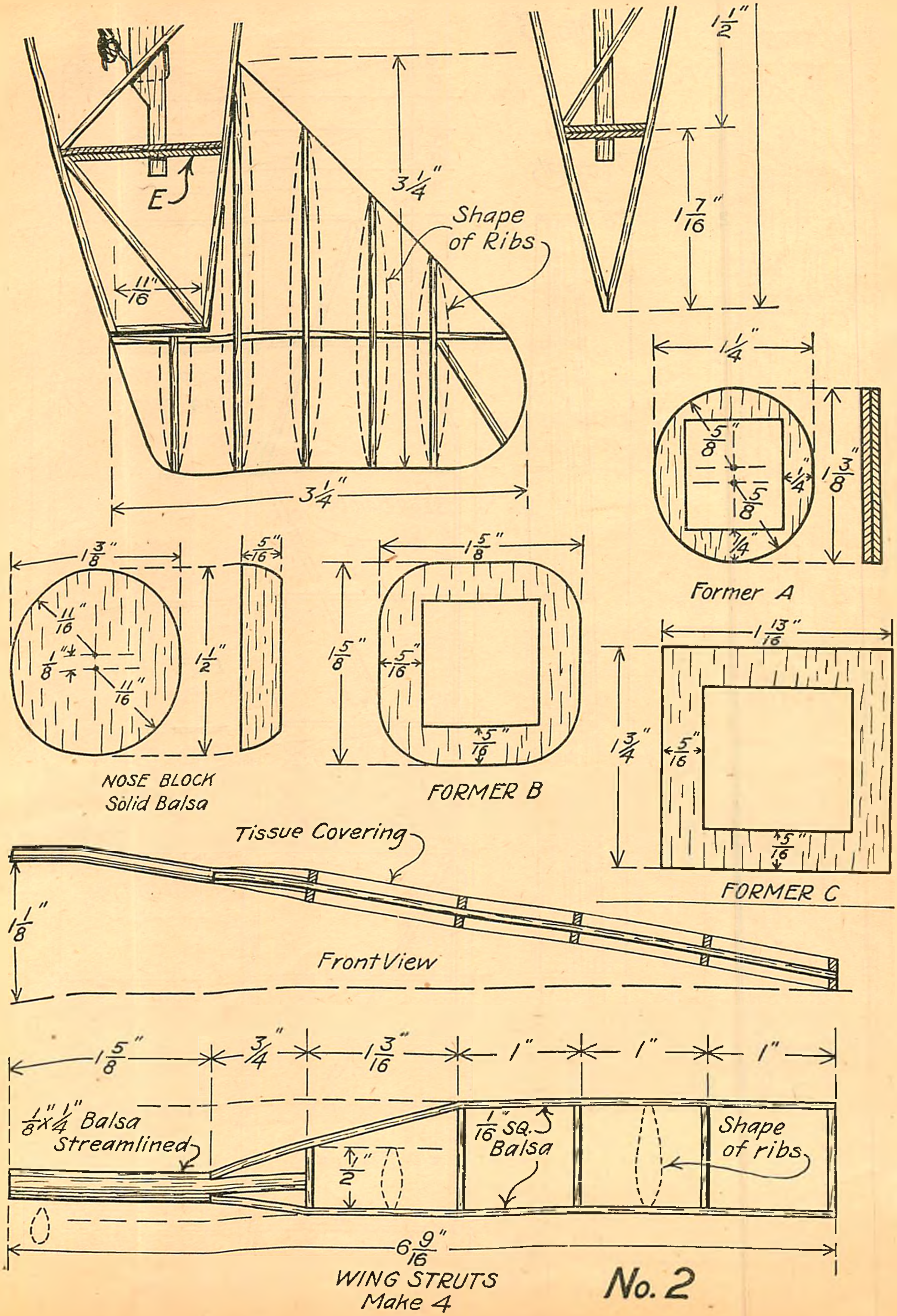
The streamline wing ribs for the struts are cut from 1/32″ balsa. (*Continued on page* 47)

Necessary Materials

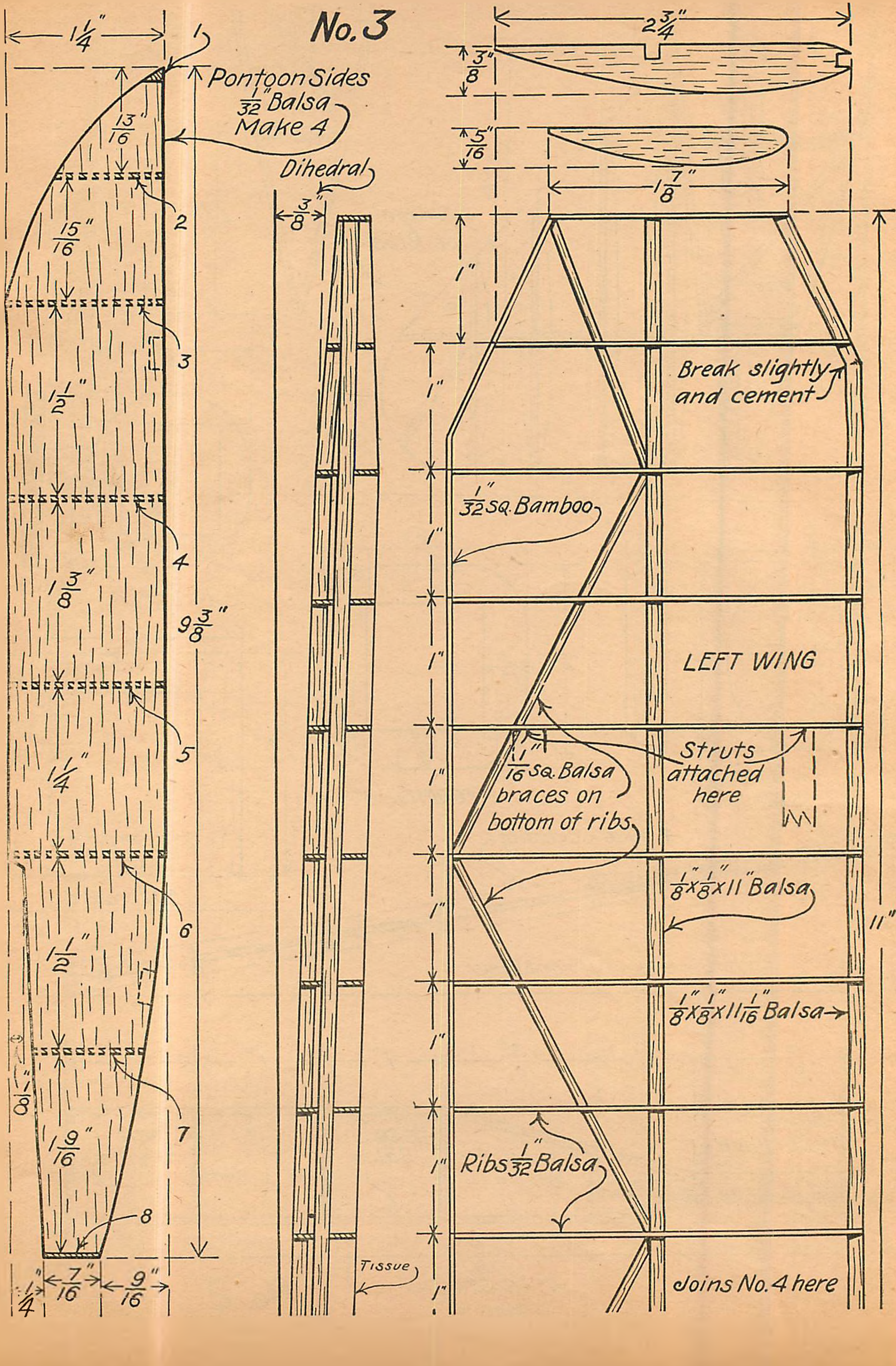
3 strips	1/32" x 2" x 36"	balsa	wing ribs, rudder and elevator ribs, struts, pontoon sides and bulkheads
5 strips	1/16" x 1/16" x 18"	balsa	fuselage longerons and braces
2 strips	15" long	bamboo	
2 strips	1/8" x 1/8" x 36"	balsa	wing spars
1 block	1/2" x 2" square	balsa	nose piece
1 block	3/4" x 1-1/2" x 7"	white pine	propeller
1 strip	1/8" x 1/4" x 12"	white pine	motor stick
1 package		model making pins	
1	2 ounce can white	ambroid	
7 feet	1/8" flat	Championship rubber	
2 sheets	fine	Japanese tissue	
1		thrust bearing	
2		copper washers	
2	2 ounce cans	banana oil	
1 foot	No. 14	music wire	fittings
1 piece	1" x 10" long	celluloid	

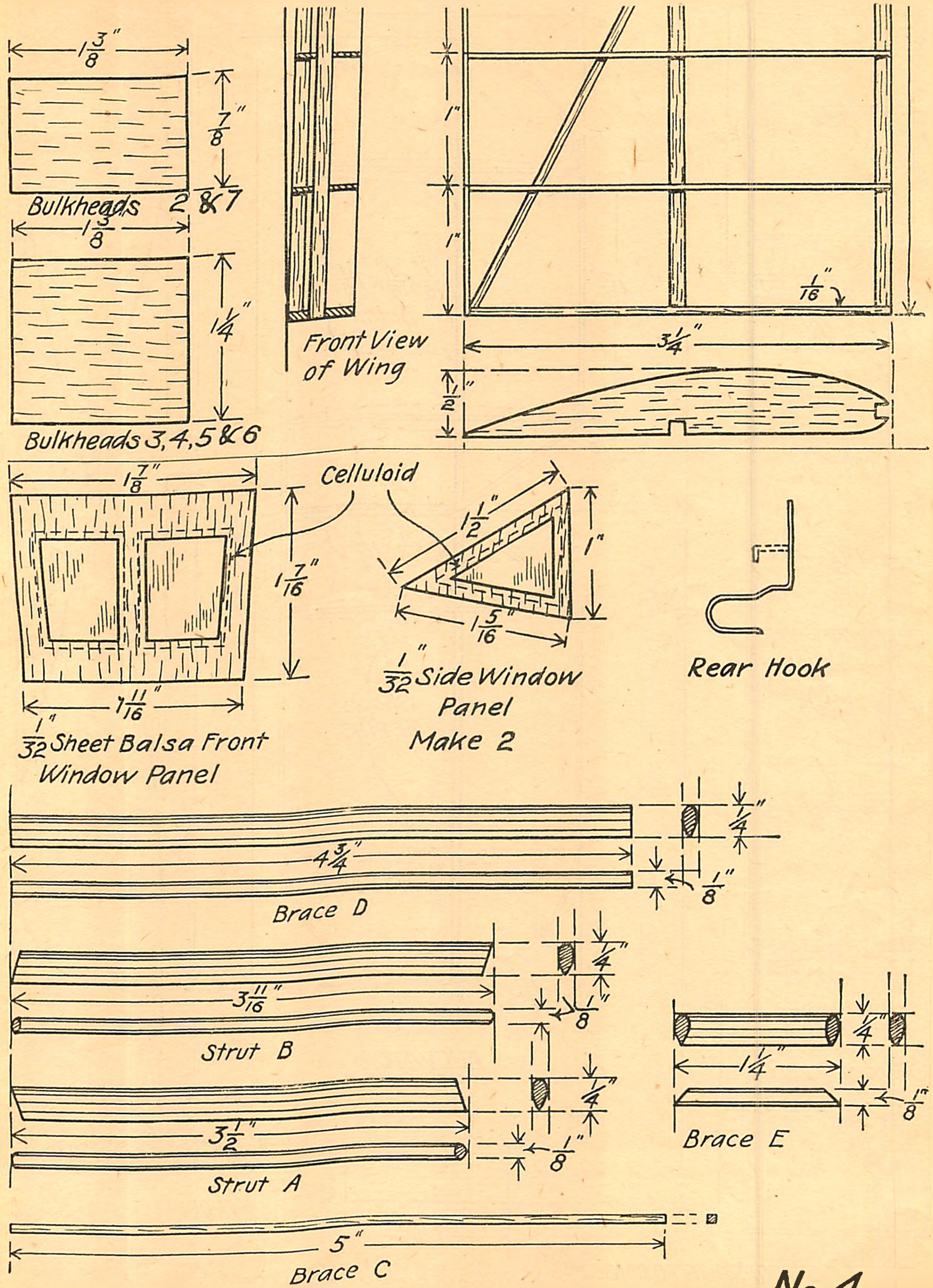


Nose Block
Motor stick cemented to Nose Block and Nose Block fastened to Former A with dress snaps
Dress Snaps
A
B
C
1/32" Balsa with windows cut out and celluloid sheets cemented to back.
1/32" Balsa Wing Base
Motor Stick 1/8"x1/4"x10 3/4" White Pine
1/16" sq. Balsa
1/16" sq x 11/8" White Pine
1/16" x 1/16" White Pine
1/16" sq. x 10 7/8" White Pine
No. 1
Former E
Joins No. 2 here

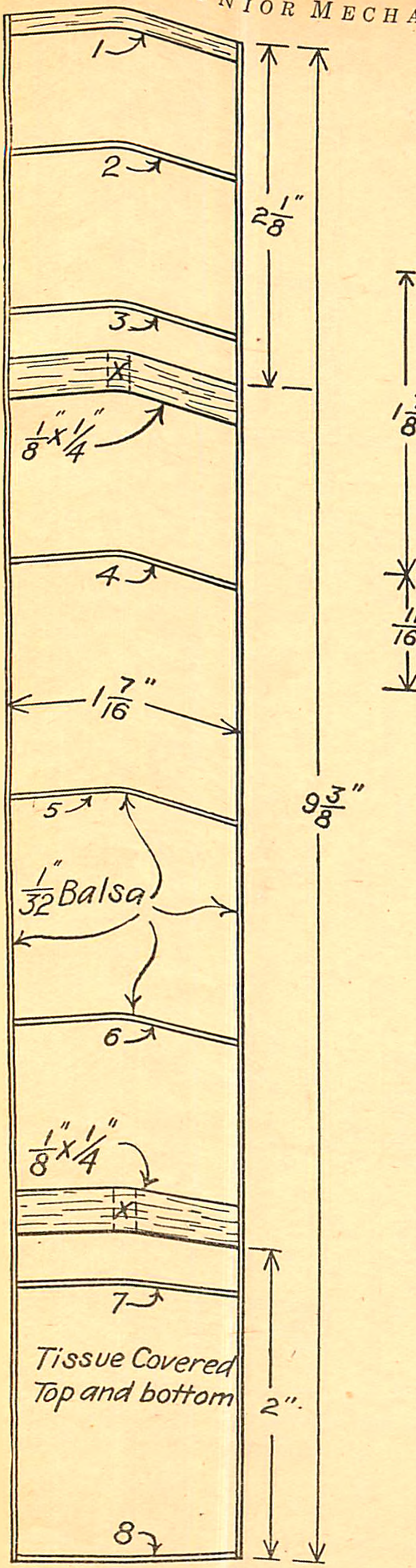

E
3 1/4"
Shape of Ribs
11/16"
1 1/2"
1 7/16"
3 1/4"
1 1/4"
5/8"
1/4"
5/8"
1/4"
1 3/8"
Former A
1 3/8"
5/16"
11/16"
1/8"
11/16"
1 1/2"
NOSE BLOCK
Solid Balsa
1 5/8"
1 5/8"
5/16"
5/16"
FORMER B
1 13/16"
1 3/4"
5/16"
5/16"
FORMER C
Tissue Covering
1 1/8"
Front View
1 5/8"
3/4"
1 3/16"
1"
1"
1"
1/8" x 1/4" Balsa
Streamlined
1/2"
1/16" SQ.
Balsa
Shape of ribs
6 9/16"
WING STRUTS
Make 4

No. 2

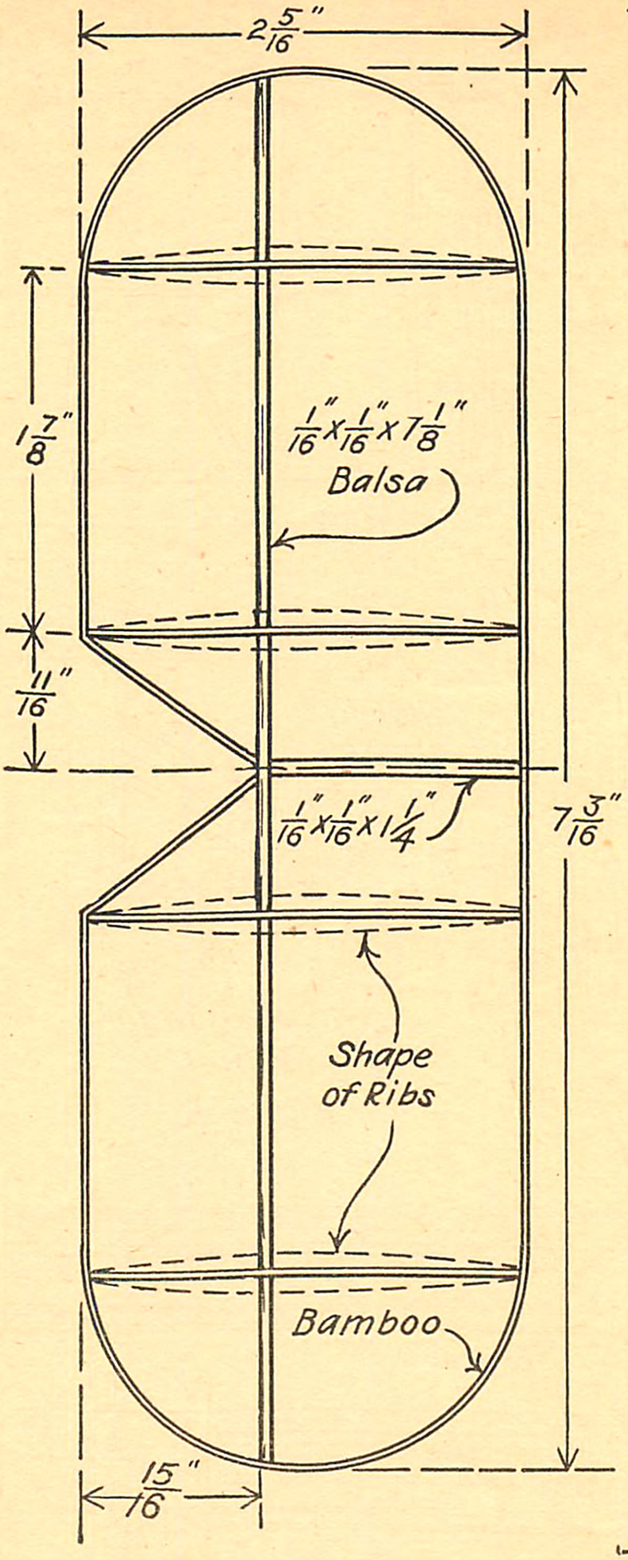

No. 3
1 1/4"
Pontoon Sides 1/32" Balsa Make 4
13/16"
15/16"
1 1/2"
1 3/8"
9 3/8"
1 1/4"
1 1/2"
1/8"
1 9/16"
1/4"
7/16"
9/16"
1
2
3
4
5
6
7
8
Dihedral
3/8"
Tissue
2 3/4"
3/8"
5/16"
1 7/8"
1"
Break slightly and cement
1/32 sq. Bamboo
LEFT WING
1/16" sq. Balsa braces on bottom of ribs
Struts attached here
1/8"x1/8"x11" Balsa
1/8"x1/8"x11 1/16" Balsa
11"
Ribs 1/32" Balsa
Joins No. 4 here


1 3/8"
7/8"
Bulkheads 2 & 7
1 3/8"
1 1/4"
Bulkheads 3, 4, 5 & 6
Front View of Wing
1"
1"
1/16"
3 1/4"
1/2"
Celluloid
1 7/8"
1 7/16"
1 11/16"
1/32" Sheet Balsa Front Window Panel
1 1/2"
1"
1 5/16"
1/32" Side Window Panel
Make 2
Rear Hook
4 3/4"
1/4"
1/8"
Brace D
3 11/16"
1/4"
1/8"
Strut B
3 1/2"
1/4"
1/8"
Strut A
1 1/4"
1/4"
1/8"
Brace E
5"
Brace C

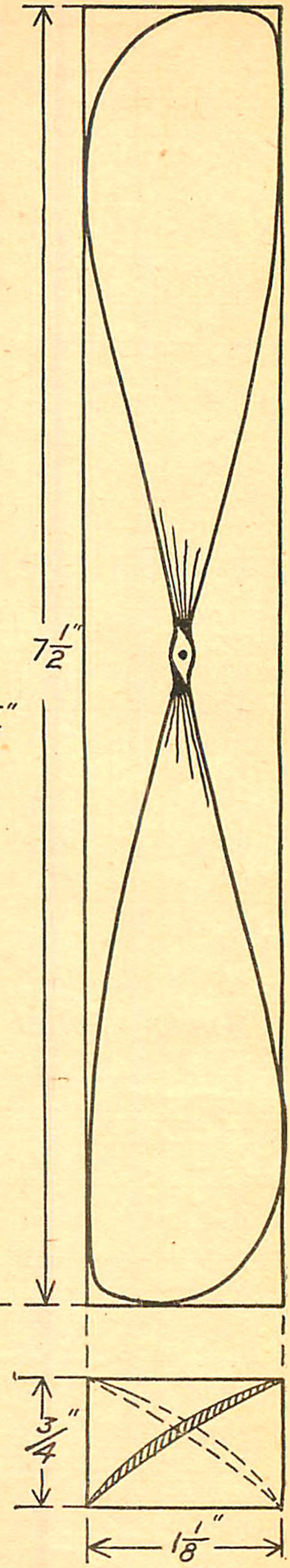
No. 4



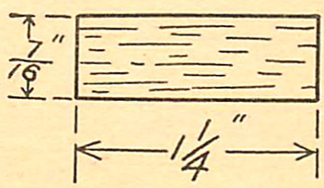
TOP VIEW OF PONTOONS
Struts attached at X



ELEVATOR

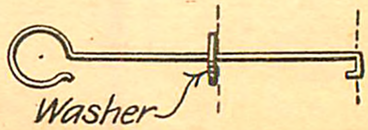


PROPELLER AND BLOCK



PONTOON BULKHEAD 8

No. 5

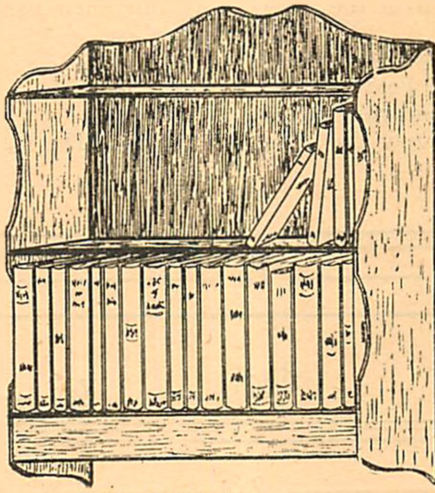


PROPELLER SHAFT

The Mysterious Bookcase

By EDWIN T. HAMILTON

Here's a Crackerjack Novelty for Every Boy to Build



The Finished Bookcase

EVERY boy needs a bookcase, especially one of this type, as it hangs on the wall and therefore takes up no valuable floor space. It is, however large enough to hold a first-class collection of books.

Its greatest feature, however, is a mysteriously hidden drawer, which can not be opened unless its secret is known. Here is a real hiding place for all the many articles one may wish to keep from prying eyes. Show it to your friends and laugh while they hunt for hidden keys, secret buttons, pins, or panels, for they will find none of these usual things so often used. Why? Because there are none! Not a button; not a pin; not a key or panel!

How does it open? What is the secret? How they'll search and how you'll laugh at them. It will be great fun, for they can never guess it, unless you tell them yourself. The secret drawer can only be opened by removing a certain book from the bookcase. Which book? Only the builder knows that. If he wishes, he can so construct his drawer that the removal of two books will be necessary.

Does all this sound very difficult to build? It isn't, and any boy, handy with a saw, hammer and screwdriver, can construct it. Remember, this is not a crude piece of work, which the family will object to having in the house, but a finely finished piece of furniture, which any member of the family can well be proud of in the home.

It can be built cheaply, as its materials are not costly, and takes but little time, as its construction is most simple.

Build step by step, as given here, and no trouble will be had.

BACK

We first build the back of the bookcase. This is made of yellow pine. Use this wood on all parts, if available, or if not, any soft wood of like nature can be substituted. The back should be of 1/2″ stock and in one piece, if obtainable in this size. It should measure 28″ square.

If a board this size cannot be had, two 14″ x 28″ pieces should be used. Glue these together with hot carpenter's glue, and nail two cross cleats for strength across them. Plane on both faces, test with a tri-square to see that the finished board is perfectly square, and smooth with sandpaper. Place the finished board on a flat table or bench, mark the design in pencil on its top edge, and cut out with a coping saw.

Finish this new cut smooth with sandpaper. Now mark with a pencil the three shelf grooves, which are 1/2″ wide, and cut each out. They should each be 1/4″ deep. Finish with sandpaper. The back is now finished and should be set aside for future use.

SIDES

The two sides of the case are exact duplicates, both being 1/2″ stock, and constructed from yellow pine, as was the back. Square up two duplicate boards 8 1/2″ wide and 31″ long. Lay one of the boards on a flat table or bench, mark in pencil along one side the required design, and cut out with a coping saw.

Finish smooth by planing both faces and edges, and then sandpapering.

Now place the finished side on the duplicate board and trace the design on it from the one cut in the finished board.

When doing this, make sure that the two straight edges of the boards are perfectly matched. Cut the design with a coping saw, as was the other and finish in the same manner.

Each of these duplicate side boards have three 1/2″ x 1/4″ grooves cut in them. Mark these out in pencil on one of the boards and cut them out.

Note that these grooves do not extend the full width of the side boards, as they did in the case of the back piece.

When the three grooves have been cut in one of the side boards, obtain the measurements for its duplicate side board by placing the unfinished board on top of the finished board, making sure that the top and bottom edges of both boards match perfectly. Now mark with pencil on the unfinished board the exact location of the three grooves. Cut these 1/2″ wide and 1/4″ deep, as in the case of the first side board. Finish both boards with sandpaper.

Now cut two runners of 1/2″ square material, each 7 1/2″ long. These are now attached to the two side boards by nails and hot carpenter's glue. Each is placed 2 1/2″ from the bottom of the side boards, as shown in the plans. Before proceeding with the work, make this test. Lay the back board on a level surface. Now place the two side boards on each side of the back board, so that the runners are level with the bottom of the back board.

When in this position, the three grooves cut in the back and the two sides should meet in a straight line. This is important for the shelves of the bookcase fit into these grooves, which would be impossible, if they did not properly meet.

SHELVES

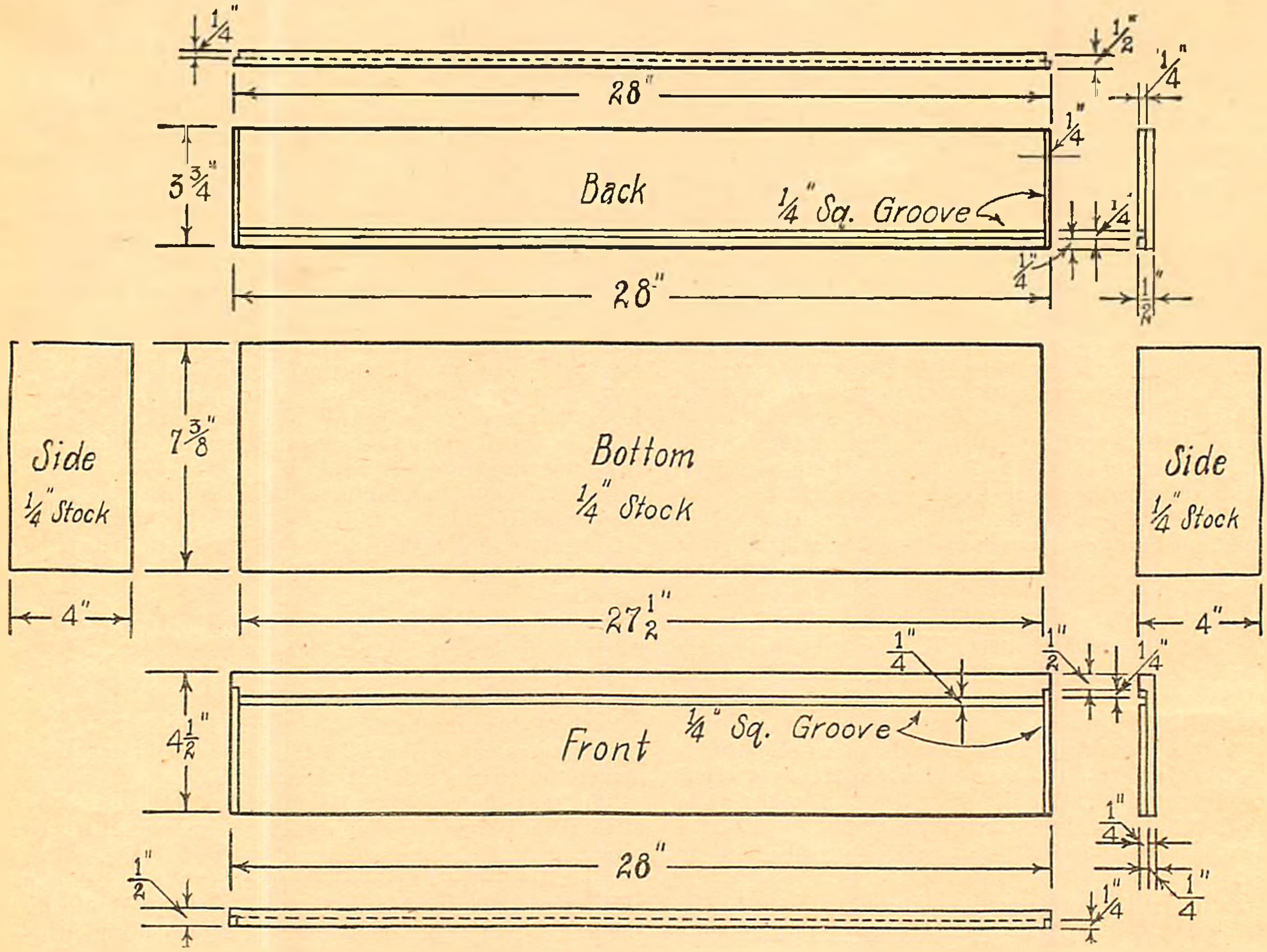
All three shelves are duplicates in size, being constructed from 1/2" stock, and measuring 8" x 28 1/2". Cut the three shelves to these measurements, using a tri-square to make sure that their sides are squared. The upper outside edge of each shelf is slightly rounded, as shown in the plans. This can easily be done with a plane and then finished smooth with sandpaper. Also sandpaper both faces of each shelf. Two of these are now finished and should be laid aside with the other finished parts.

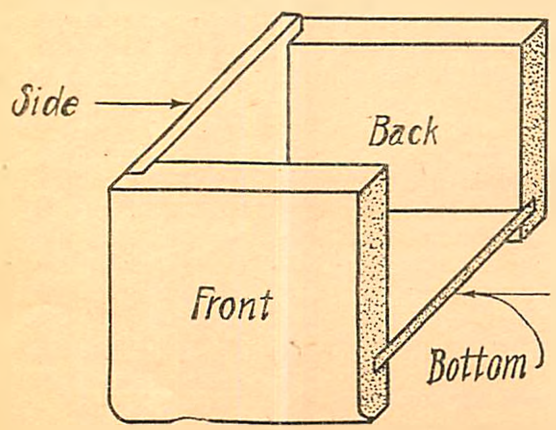
The third shelf is the one through which the drawer lock works. A slot is cut in this shelf board, which measures 1/2" x 4". It is 3" from the front edge of the board and 1" from the back edge. Sandpaper the inner edge of the slot, so that they are perfectly smooth.

In locating the position of this slot, the builder must keep in mind the fact that it must be in such a position as to allow a book when in place in the bookcase, to rest directly over it. Any place along the shelf may be used. A good way to determine this position would be to take a number of books (as many as is needed to fill the lower shelf), lay them along the shelf board, and mark with a pencil the location of the chosen key book. Between these points, cut the slot, and finish as directed above. Lay this shelf aside with the other finished parts for future use.

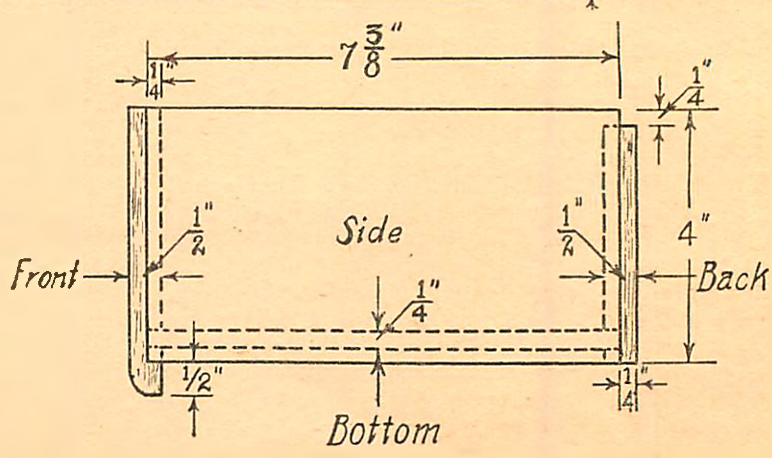
DRAWER

Bottom: The bottom of the (*Continued on page* 43)

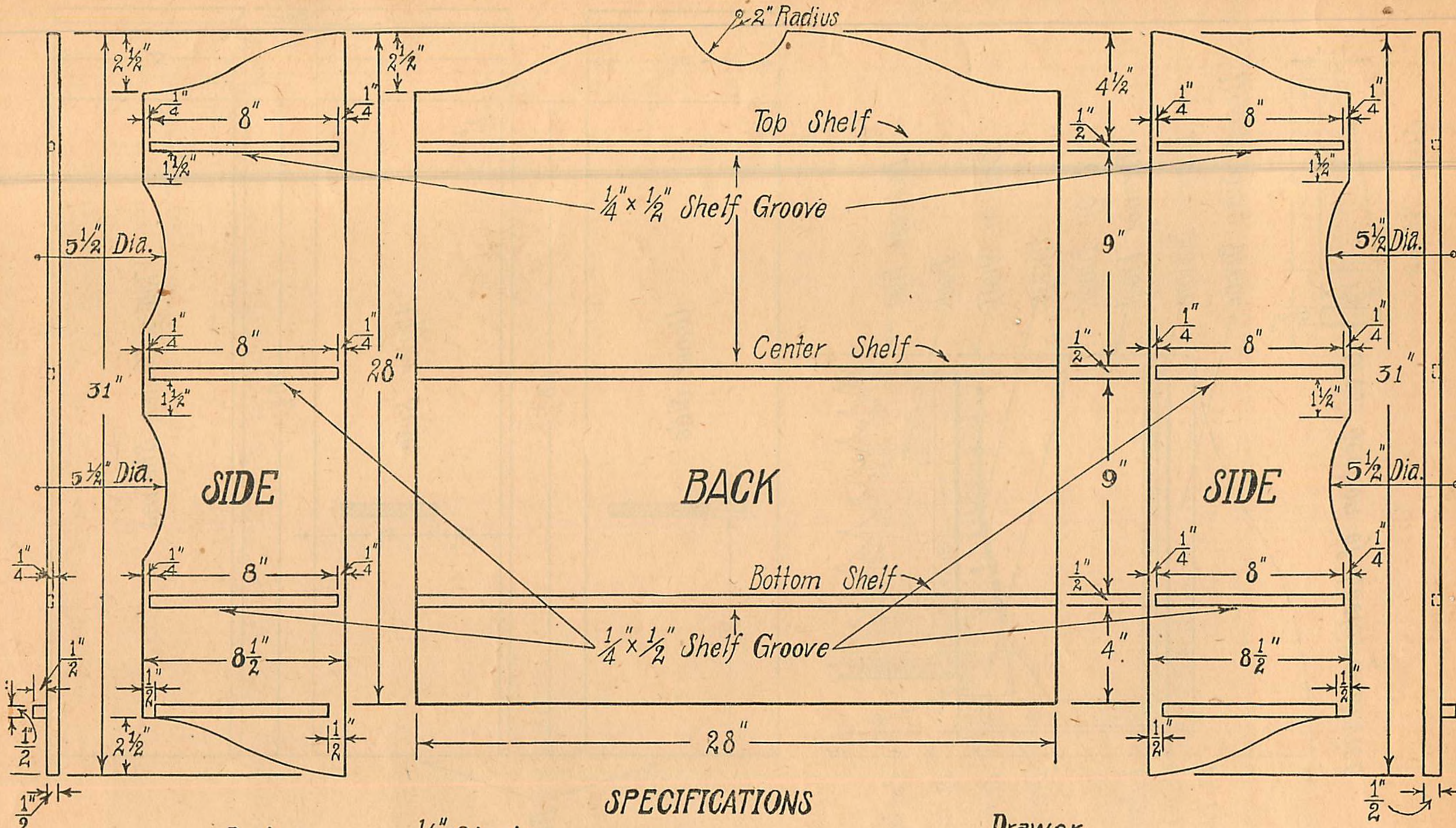




DRAWER



Drawer Assembly



SPECIFICATIONS

Back.................... 1/2" Stock

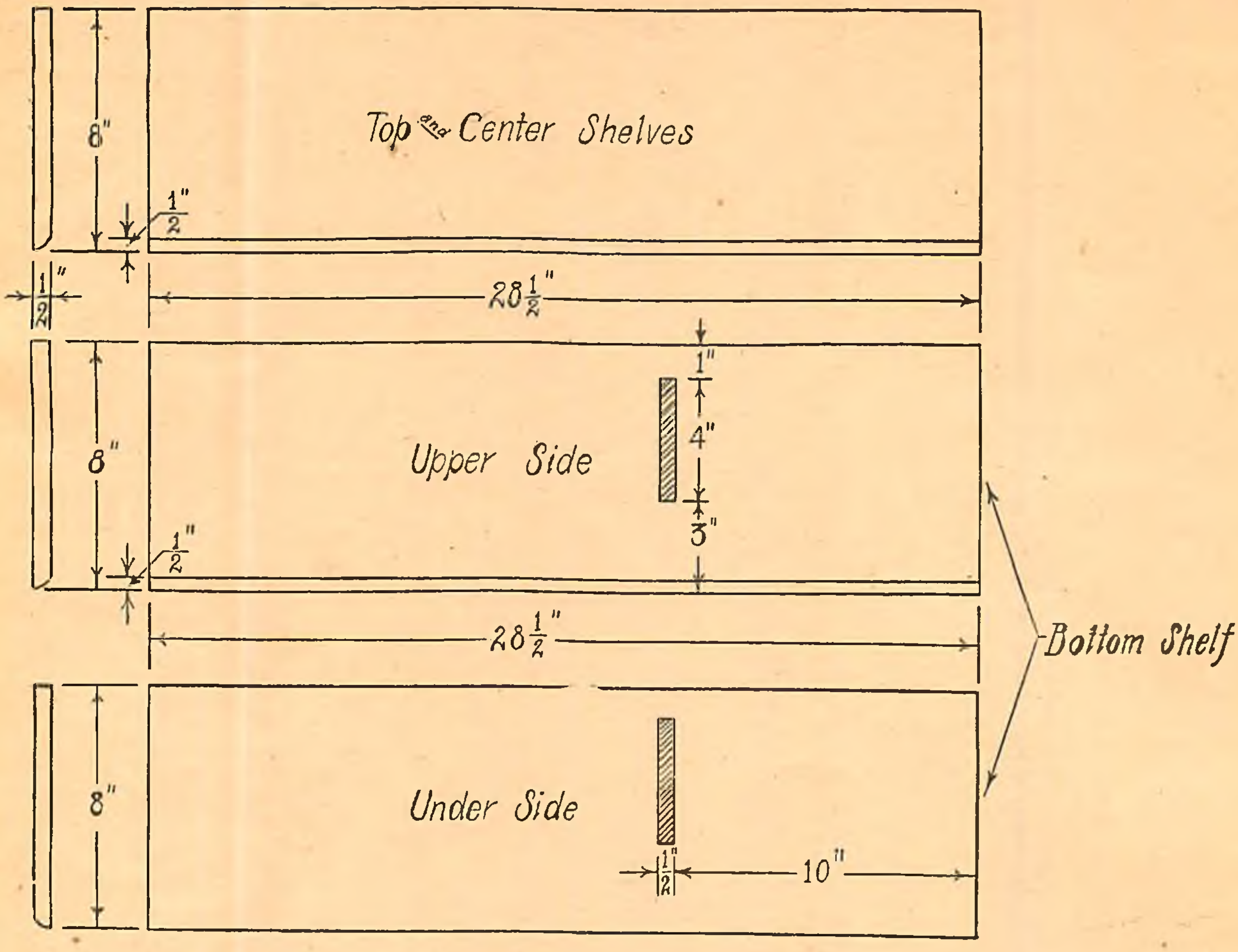
Sides.................. " "

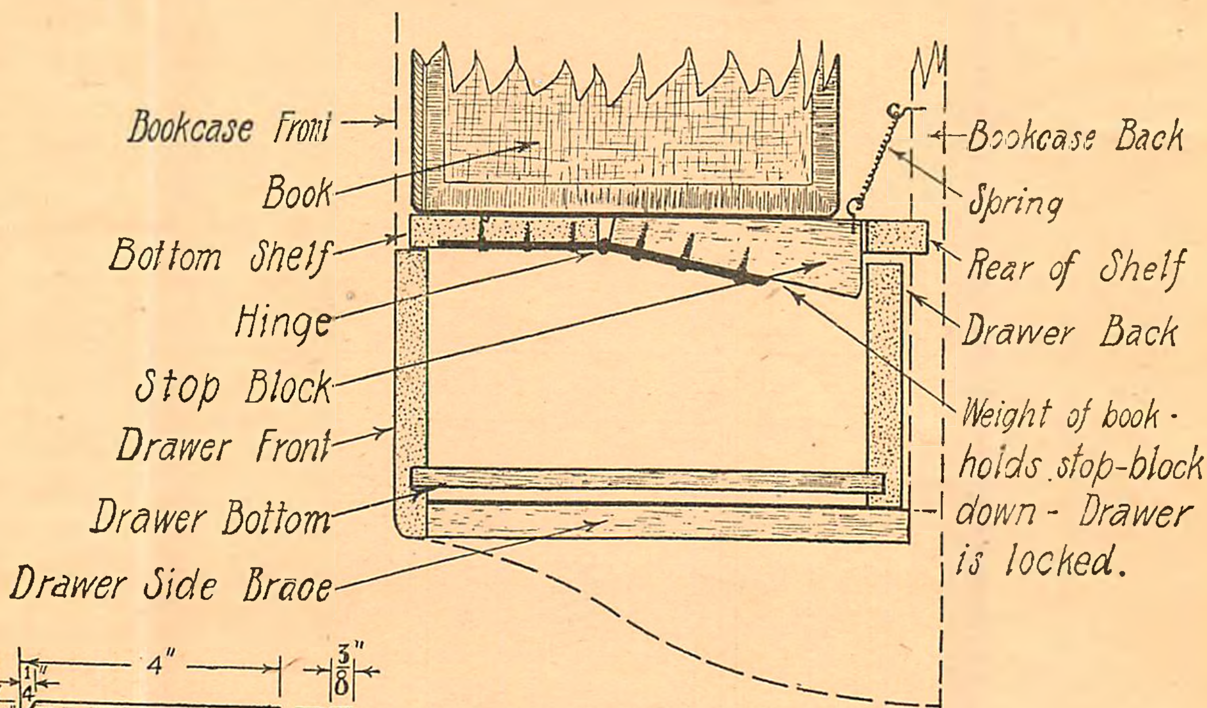
Shelves............ " "

Drawer

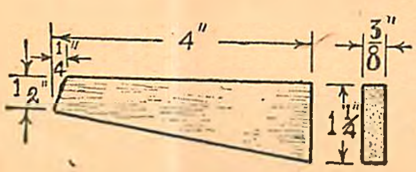
Sides and Bottom...... 1/4" Stock

Front and Back........ 1/2" "





Cross Section of Locking Device



Stop Block

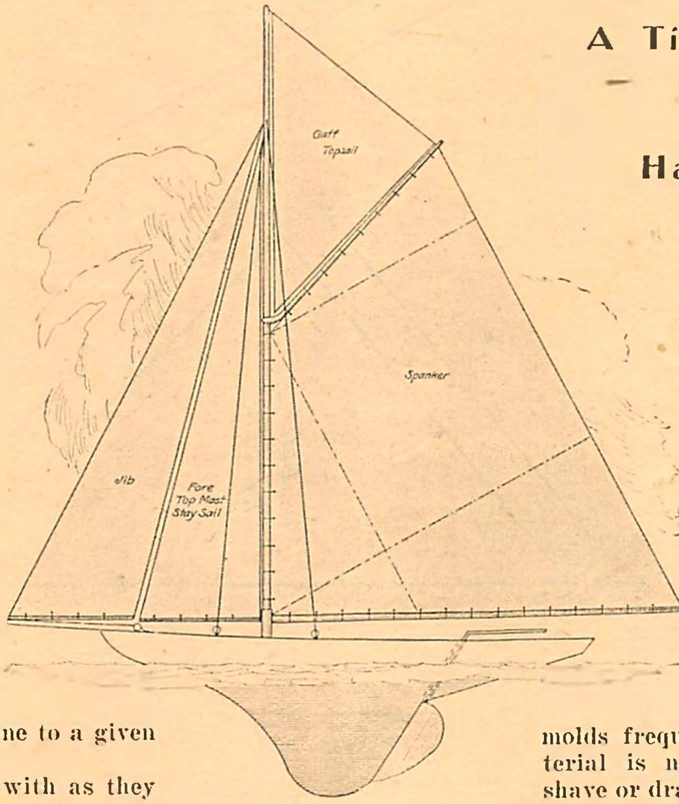
HOW TO BUILD

A 32" Model Racing Yacht

By
E. F. FURTH

A Timely Challenge to the Handy Builder

See Plans on Pages 40 and 41



IN modern times much is said and written about power boats of various kinds. Yet nothing can take away the romance connected with a sail boat, where one does not deal with man-made or man-developed engines to furnish motive power to take one to a given destination.

Situations must be dealt with as they arise and must be turned to advantage by the person in control. Though the wind may be blowing in an opposite direction to the course set, one gets there just the same.

At intervals great interest is renewed in sail boats by races between Sir Thomas Lipton's challengers and the best that America can produce for the great America's Cup. Boys want to join in the spirit with their own model boats, so here is a set of plans for a 32" model.

As is true with large boats, each model boat is a development of type, rig and the location of the various parts, the changing of shape, proportions of the rig, probably setting the mast in a different position, and so on.

Here is a set of plans for a model boat that the builder may use as a basis, yet may alter to get more speed, perhaps, or greater ease in handling, etc. This he will do with any boat.

First, select a piece of white pine free from knots, checks or any other imperfection. It should be well seasoned in order that checking will not begin after the carving of the hull has been started. Its size should be 7" x 7" x 33".

Choose the surface for the deck. Lay out the center line and from this, lay out the construction lines as indicated in the deck plan.

Next lay out the hull lines according to the plan and lay out and cut to shape the required molds for the sections A, B, C, D and E.

If a handsaw is accessible, cut the deck lines first. Tack these waste pieces back again with finishing nails so that the hull lines may be cut. After this has been cut, remove all waste material and start to shape the hull. Apply the molds frequently so that too much material is not removed with the spoke shave or drawing knife.

After all excess material has been removed, the outside of the boat can be finished with a medium coarse wood file and Number 1-1/2 sandpaper until every tool mark has disappeared.

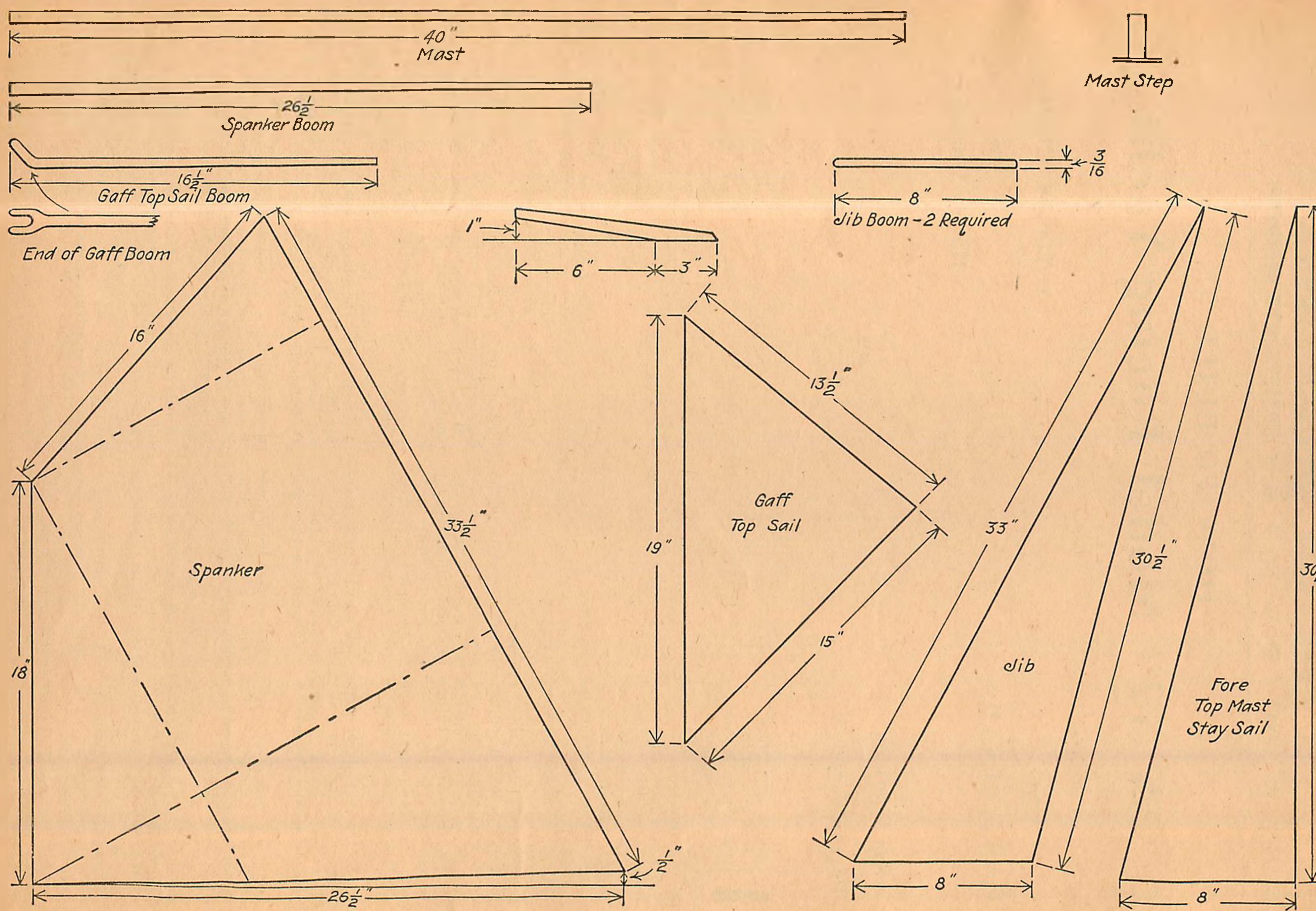
When the rough work on the outside of the hull has been done, the material on the inside may be removed with chisel and gauge. As much of this should be removed as can be done without endangering the strength of the hull.

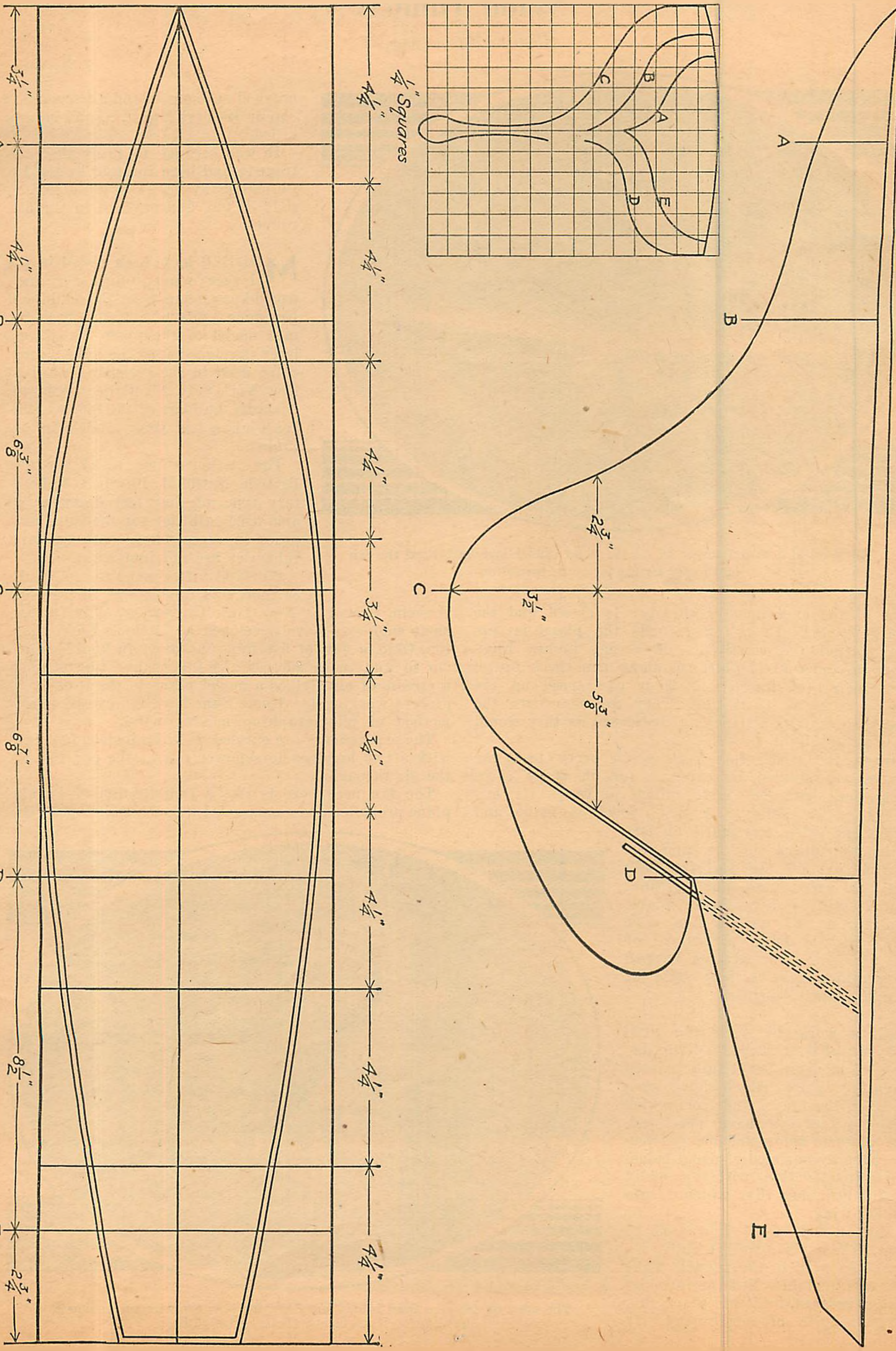
Two deck beams are necessary. These should be placed at about the place where the rudder post goes through the hull and where the mast goes. This will give material to which to screw the deck, as well as strengthen the hull for the 40" long mast.

THE deck beams having been placed, the inside should now be painted. Two heavy coats of white lead paint should be applied to prevent the water from soaking through and causing the hull to become water-soaked and heavy.

Treat the underside of the deck, which is of 1/8" white wood, in the same manner. Nail on the deck with 1/2" Number 20 brads. Then the hull and deck can be sandpapered with Number 1/2 or Number 0 sandpaper until perfectly smooth. Apply the outside finish in the desired color, using a water-line of red or green. Sand each color lightly and finish with two coats of spar varnish.

Finish the deck in a natural color by applying one or two coats of shellac sanded (*Continued on page 44*)

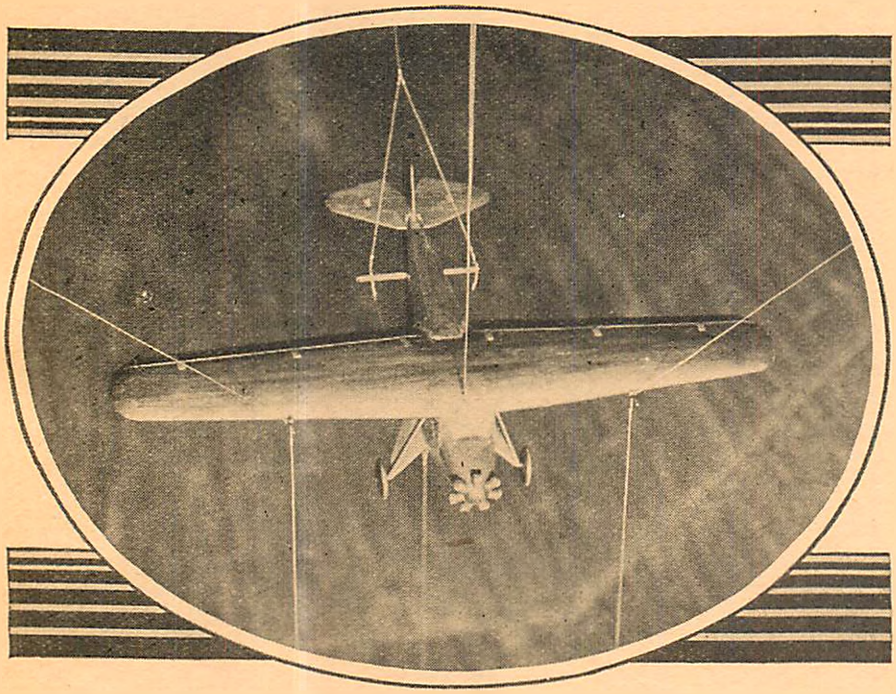

40"
Mast
Mast Step
26 1/2
Spanker Boom
16 1/2"
Gaff Top Sail Boom
End of Gaff Boom
1"
6"
3"
3/16
8"
Jib Boom - 2 Required
16"
33 1/2"
Spanker
18"
26 1/2"
1/2"
13 1/2"
Gaff
Top Sail
19"
15"
33"
30 1/2"
Jib
8"
30 1/2"
Fore
Top Mast
Stay Sail
8"



1/4" Squares
A
B
C
D
E
3 1/4"
4 1/4"
6 3/8"
6 7/8"
8 1/2"
2 3/4"
3 1/4"
2 3/4"
3 1/2"
5 3/8"

Wind Tunnels

(*Continued from page 3*)



Close-up of a model suspended in the wind tunnel, looking toward the fan and ready for the air to be turned on

door of the experimental chamber is closed and the motor started. In a few seconds the plane is approximating the conditions of actual flight. Engineers on the control platform above can check up on every detail of its action. They can speed up the air or decrease its motion. They can maneuver the model, so that its stresses are increased as they would be in actual flight.

When the model has been given every test, the figures are studied by experts, and in many cases suggestions can be made which increase its efficiency or its safety. A new model is made and tested the same way until at last it is pronounced perfect, and the construction of the full-size ship can be started with the certainty that it will be a workable plane. The testing of models has done away with a large percentage of the accidents that always happen when pilots take a new style or "freak" plane in the air.

ON a worktable near the wind tunnel door stands a little display of models; beautifully carved mahogany ships which have been tested in the tunnel and from which larger prototypes have developed. One of them interested me particularly, for it consisted of usual monoplane construction with an oddly streamlined nose that widened into another wing.

"How did it fly?" I wanted to know. The experts smiled sadly.

"Not so well, in the tunnel. That nose was unstable. But the inventor went ahead and built his plane this way, in spite of our report. It crashed on Long Island a few months ago on its first flight . . . and he was killed."

It was strange to think that the tragedy had been foretold by the little mahogany model in my hand . . . that it, too, had crashed in the air-tunnel.

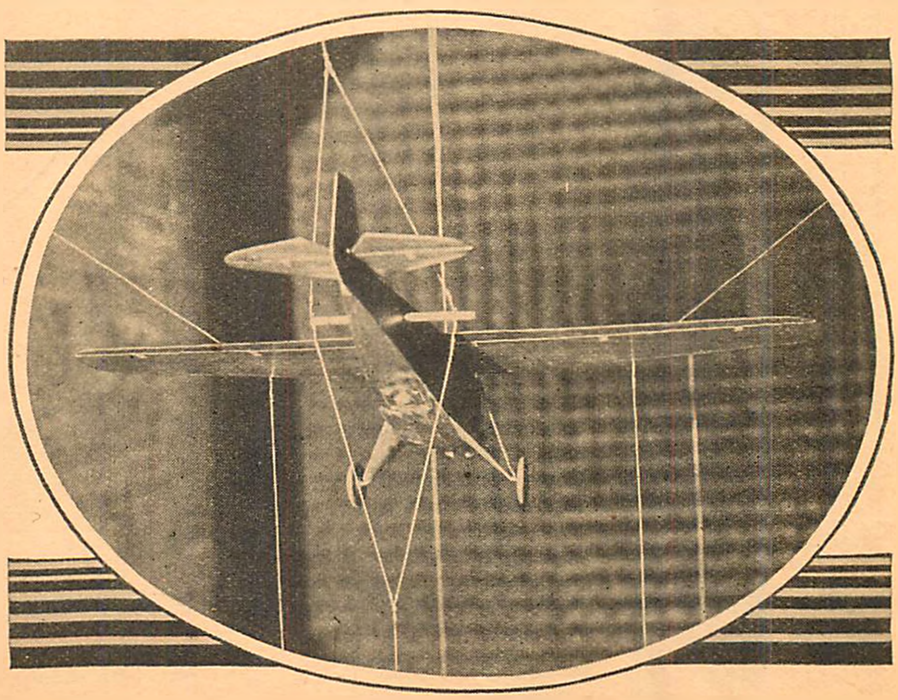
MODELS have been tested in the larger wind tunnel for such world-known outfits as Fairchild and Keystone. Sikorsky tested here the first model of the plane which was later developed into the fighting machine used in the recently organized New York City Air Police. Atlantic Aircraft, builders of the famous Fokker planes, test their models in the tunnel.

The smaller tunnel, which is of the British National Physical Laboratory type, of four feet diameter, is also used full-time for the same purposes in cases where extreme wind velocities are not important.

Working with a wind tunnel smaller than this famous one in the Guggenheim School at New York University, War Department engineers have developed at McCook Field, Dayton, Ohio, a flow of five hundred miles an hour! In order to study more successfully just what happens when a stream of air strikes a model plane in the tunnel, engineers working for Uncle Sam have discovered a new method of photographing moving wind.

The experiments are carried on in a nineteen-foot tube with a two hundred-horsepower fan at the end to suck the air through.

The fan used here is like a combination of an airplane propeller and commercial (*Continued on page 50*)



The same model, seen from below, and depicting how the wire suspension is achieved. It is facing the air straightener

The Mysterious Bookcase

(Continued from page 36)

drawer is made of one piece of 1/4" stock, measuring 7-3/8" wide and 27 1/2" long. Plane both faces smooth and finish with sandpaper.

Sides: Both side boards of the drawers are duplicates, each being constructed from 1/4" stock, and measuring 4" high and 7-3/8" long. Both faces of each and all edges should be smoothed with sandpaper for a good finish.

Front: The front of the drawer should be constructed of 1/2" stock. It is 4-1/2" high and 28" long. Square up the board to these dimensions, and either plane or sandpaper to a smooth finish. Three grooves are now cut in it.

One groove runs its full length, being 1/4" wide and 1/4" deep, and is located 3/4" from its bottom edge. Two grooves of the same size are now cut along each side, extending from its top edge to within 1/2" of the bottom edge, as shown in the plans. The long groove holds the bottom board of the drawer, while the two side grooves hold the side boards. Finish smooth with sandpaper.

Back: The back of the drawer is made of 1/2" stock and is 3-3/4" high and 28" long. Finish as you did with the front board. Three grooves are now cut in the back board. One runs the full length of the board. It is 1/4" wide and 1/4" deep, and is located 1/4" from the bottom edge of the board. The two shorter grooves run the full height of the board along each side and are the same size. Cut these three grooves and sandpaper smooth. All parts of the drawer are now finished and ready to assemble.

DRAWER ASSEMBLY

In the work of assembling the drawer hot carpenter's glue and small-head brads, 3/4" long, are used. First fit all parts together carefully, see that all joints are correct, and then drive the nails through the various parts until they just show through the wood. Next, coat each joint with hot carpenter's glue, place the joints together and drive the nails home. Use a nail set on all nails.

When thoroughly dry, scrape all excess glue away and finish with sandpaper, after filling all nail holes and wood blemishes with plastic wood.

Owing to lack of space, we are compelled to leave out the Macfadden Aviation Advisory Board article for the September issue.

LOCKING DEVICE

This lock is simple to construct, if the builder will follow these instructions carefully. First, study the detailed drawing of it given under "Cross Section of Locking Device" in the plans.

Cut a small block of any hard wood, as shown under "Stop Block" in the plans. This block should be of 3/8" stock. It is 1/2" high at one end; 1-1/4" high at the opposite end, and 4" long. A bevel of 1/4" is made at the 1/2" end, as shown. Sandpaper all over until perfectly smooth.

A hinge, such as shown in the plans under "Cross Section of Locking Device", is now screwed into place on the underside of the bottom shelf. The second flange of the hinge is now screwed into the stop block, as shown. Test to see that the stop block moves freely through the shelf slot, when attached to the hinge. The bookcase is now ready to assemble.

BOOKCASE ASSEMBLY

The bookcase is assembled with nails and hot carpenter's glue. Before starting actual assembly, however, the stop block assembly should be finished. Screw a staple or screw-eye into the top of the stop block, at its large end, as shown. Obtain a short but strong spring, and attach one end of it to the screw-eye.

Now slip the shelf into its groove in the back board of the case, pull the block up until its hinge is perfectly straight, and hold the spring up against the back of the case. Mark the place with a pencil, and apply another screw-eye at that point.

Now place the sides and other shelves in their correct positions, and set the drawer in place. Test to see if the stop block properly locks the drawer when in place with a book over it. Remove the book and see that the spring pulls the block up out of the track of the drawer, thus releasing it. When adjusted correctly, actual assembly may be undertaken.

Drive small-head 3/4″ brads at intervals along the joints, until their points just show through the wood. When finished, coat the joints with hot carpenter's glue, drive the nails home and use a nail set on each.

Apply a tri-square to all corners before the glue sets, making sure that all corners are perfectly square. Allow four hours for thorough drying at least, and twenty-four for hardening. When hard, scrape all traces of excess glue away, and finish with a thorough sanding. Use a coarse paper to start and a fine sandpaper for the finish. Now apply plastic wood to all nail holes, wood blemishes, etc., and then give the entire bookcase a complete sandpapering.

Stand the bookcase up against a wall and insert its drawer. See that the drawer moves in and out freely. Fill the bottom shelf with books. Push the drawer into place and try to pull it out without removing the key book. The drawer should remain locked. Now remove the key book from the shelf and test the drawer again. It should come out easily now.

FINISHING

Before applying any finish, the method of hanging should be decided. Two good methods can be used. The first, and the one the designer recommends, is to bore two 1/4″ holes through the back of the bookcase, just above the top shelf. Then attach the case to strong hooks screwed into the wall. The second method is to nail the bookcase in place on the wall. In this method, care must be taken to apply very strong nails, and at least four should be used—two above the top shelf and two just above the bottom shelf.

In hanging the bookcase, it must be remembered that such a case weighs considerable, especially when filled with books, and therefore requires strong fastenings.

IN finishing the bookcase, color should be chosen from the color scheme prevailing in the room in which the case is to be hung. A good lacquer will be found best, as it is easily applied, dries quickly, and leaves a clear, smooth finish. Two-tone colors are in favor for such pieces, and will be found most pleasing. The drawer should be finished in clear white enamel on the inside, but care must be taken that its front is finished in the same color as the other front parts of the case, as it is a "hidden" drawer.

Do not paint the runners on their tops, nor the bottom edges of the drawer sides, as these must run over each other smoothly, when opening or closing the drawer, and paint is liable to cause sticking.

Be sure your brush is thoroughly clean. If purchasing a brush, ask for a one-inch size, as it will be plenty large enough for the work.

Allow the paint forty-eight hours to thoroughly harden, before hanging the case to the wall. No drawer handle is needed, as the drawer can be easily opened by grasping it from the bottom edge. It is purposely left off to enable the drawer to be better hidden.

Get busy! Build this mysterious bookcase—show it to your friends, and the fun begins.

How to Build a 32″ Model Racing Yacht

(*Continued from page 39*)

and two coats of spar varnish. An effective finish can be made by laying off the deck in lines 1/4″ apart, which gives the appearance of planking.

The lead weight for the keel should be cast and fastened to the hull before painting.

To make the mast strut or step, take a piece of sheet brass of Number 20 gauge and solder it to a piece of 5/8″ brass tubing. Drill holes in the plate for screws.

The rudder port or tubing for the rudder post to pass through the hull is made of 3/16″ brass tubing soldered to a square brass deck plate. Allow the tube to project above the plate about 3/16″ through the deck.

The rudder post is of 1/8″ brass rod soldered to the rudder of galvanized iron.

Material for the sails should be long cloth of good quality.

First quality, straight grained white pine free from imperfections is used for the mast and spars.

A dozen brass screw-eyes are needed. The cleats can be made of 1/4″ brass rod 1″ long. Care should be taken to leave 1/4″ in the middle where the hole is bored for the screws. The rest can be filed to shape with a fine, flat file.

From the Ground Up

(*Continued from page 6*)

him. He turned and waved to the six figures running toward him. Then he turned his attention back to the man with him, who had moved slightly.

The man's eyes opened and stared at the boy. A faint grin creased the pale cheeks of the man.

"Well, what happened?"

Excitedly Larry questioned, "Are you hurt much?"

The pilot frowned and muttered, "Forehead." He tried to move and a spasm of agony twisted his lips, "The arm is busted, I guess."

"The others are right here," Larry told him. "They can take you back to the field."

He heard footsteps.

"How'd you find me?" asked the flyer.

"I saw the plane fall," Larry explained. "And then I saw you jump. I came over as fast as I could. I was afraid of these rocks."

The man smiled again. "Good kid," he murmured. Suddenly they were surrounded by six men, all in their flying equipment, their faces staring anxiously from beneath their close-fitting helmets.

"Very bad, Billy?" One of them leaned down by Larry's side and peered into the injured airman's pale face.

"No, but get me back to the field. This arm begins to hurt—" He stopped abruptly as a spasm of pain shot through him. Then he went on, "The kid here found me right away. Good thing I didn't wait for you." He smiled. Larry experienced a sudden tightening of the throat as he realized that for the first time he was being considered as one of them.

"FINE," said one of the men back of Larry. "But what happened?"

In a few words Billy explained. (Already Larry thought of him as Billy. He determined to ask the man's name the first second he had a chance.) "When we took off, I noticed she was very sluggish. I thought first I wouldn't get her up at all. But finally we got away, and then I found she wasn't hitting properly. As far as I could see, the feed line was choked but I couldn't understand that because I had just given her a thorough overhaul before we came up. Then she got on fire and down we came."

"Very strange," muttered another man whom Larry judged to be a mechanic.

"Meantime," said the man called Billy, "let's get back to the field. But why don't a couple of you take a look at the ship? I can wait, if you give me a drink of water."

"Okay. Come on, Sam." The tall man back of Larry and the mechanic started away from the group. Larry got up quickly.

He asked timidly, "Can I go with them and look? I'd like to."

"Sure, kid, come on," invited the tall man. Larry hurried up to them and together the three picked their way carefully across the narrow stream where tumbled rocks made a natural if unsafe bridge across the muddy current.

Scarcely one hundred yards away was the wreck of the small *gray* monoplane, now a torn and twisted mass of metal and charred embers. It had fallen halfway in a deep pool, and the cowling covering the engine, where the fire had begun, was submerged in the water. It had not burned any more, except that the wings were smashed and charred beyond recognition.

They went to it and closely examined the wreckage. The fuselage was wedged between two big rocks, so that it was possible for one of them to climb down toward the cockpit. But when the tall man tried it, the wreck teetered and slipped, and almost plunged completely in the river.

"Let me try it, sir!" Larry begged eagerly. "I'm lighter, and you can hold on in case she starts to go."

"No, let it go," objected the mechanic. "What's the difference. You won't be able to find anything."

The tall pilot turned to Larry. "Think you can do it? We don't want any more accidents today."

"You just watch me," Larry responded swiftly. He clambered past the upturned rudder, and slid down slowly and precariously until he had found a foothold near the cockpit. His eyes roved among the unfamiliar instruments on the board, all badly smashed, in an effort to discover a clue to the sudden disaster. Meanwhile the others held the plane in position.

"No use looking there, sonny. That won't tell you anything," Larry heard the tall pilot say. "Look ahead of you."

"I can't get under there to see," Larry pointed out. "It's all messed up."

"Look at the gas tank," directed the mechanic. The two men rested their hands on the fuselage, ready to take hold if the light plane showed any sudden tendency to slide off in the water. As Larry watched, another of the men who had landed, one he had not noticed closely before, came across the stream and joined them.

"What do you find?" he asked.

"Nothing yet, Heinze," replied the tall flier. He turned to Larry. "Can you see anything, sonny?" he called.

Only by force of will could Larry address himself to his task again. The man they called Heinze had made instantaneously a peculiar impression on him. Perhaps it was the way he looked at Larry, or his strange eyes. Just as Larry turned away, he caught the mechanic winking at him.

Reassured, Larry dismissed Heinze from his mind and returned to his work.

He found the gas tank, and peered closely at it.

"Say!" he shouted.

"What?" All three men on the bank pressed forward. Larry turned and found Heinze's queer gaze riveted on him.

"Well?" snapped the tall pilot impatiently.

"There are three bullet-holes in the tank!"

Mingled exclamations arose from the lips of the tall pilot and the mechanic. Heinze glared angrily, turned and left them. He hurriedly joined the group around Riddle, the injured man.

"Major Riddle," the mechanic jerked his head toward the others, "will be glad to know about this."

What is the riddle of the three bullet holes? What caused the crash? Follow Larry's exciting path to fame in the next instalment of "From the Ground Up" in the October issue of MODEL AIRPLANE NEWS. *On all news stands September 23d.*

The American Sky Cadets

(*Continued from page* 15)

All others: Templin, Disston saw furnished by W. & F. Hardware Co.; Fred Slockett, MODEL AIRPLANE NEWS subscription.

Special event: rise off the ground, the plane taking off and landing, the winner getting no points and only the winner counted: James Starkey, Cadet System of instruction books, four volumes, donated by the Platte Valley Airways. His rise off the ground time was 22 seconds.

No girls competed for the special prize offered by Greeley Dry Goods Co.

BOY SCOUT TROOP

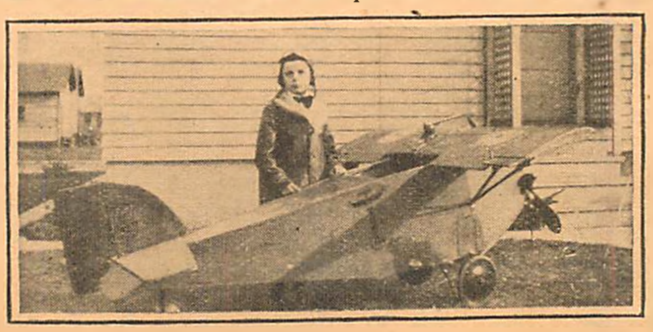
Boy Scout Troop Number 2, Greeley, of which Jack Allison is scoutmaster, won the special troop prize through the efforts of two of its troop members, Reginald Templin and Fred Slockett. The troop was presented a Bauer & Black first aid kit, the gift of Gilbert-Bishop Drug Company.

Manager Harry Ashton of the Sterling Theatre, who was host to the competitors in the contest at a free theatre party, presented the gifts on behalf of the *Tribune*.

Troop 2 of the Boy Scouts was the only one to enter two of its members in the contest.

Now—a word or two about the chief prize winners:

James Starkey, winner of the contest, is an eighth grade student at Training School of Colorado State Teachers College. He built, for the non-flying model contest, a Vought Corsair which was given 48 points out of a possible 50 by three judges. In addition to second place in the outdoor flying contest, he won the indoor flying contest, one plane re-



Due to an oversight on our part, this photo was published as that of Tommy Hilton. In reality it is Winfield Tatro of Portland, Ore. and his model plane maining in the air for 79 seconds. He also won the sweestakes prize for non-flying planes and the sweepstakes prize for flying planes, awarded for the longest flight either indoors or out. He had a total of 50 points.

Starkey's parents have a cottage camp near the Greeley municipal airport and his interest in planes is very keen. He spends most of his time, out of school, at the airport.

His Vought Corsair was a single-motored biplane mounting two machine guns and has movable controls. It was built from blueprints.

Walter Calland, junior at Greeley high school, was winner of the second grand prize with a total of 40 points; winner of first in senior high school scale model; second in the scale model sweepstakes; first in the outdoor flying for senior high school and first for outdoor senior high.

Calland's plane was a Sikorsky twin-motored amphibian, the most unusual in appearance of those entered in the contest. He built it from a picture of the airplane.

It has a glass-enclosed boat cabin, double tail assembly and folding wheels.

A special prize, not included in the point awards, was won by James Starkey, who built a plane with a motor other than elastic to take off the ground. It took off the floor of the gymnasium, remained in the air for 2 seconds, and made a splendid landing. He was given the set of ground work instruction books donated by the local airplane company.

Outdoor flying tests were on the municipal airplane field, Greeley. Indoor tests were at Gunter Hall, the large gymnasium of Colorado State Teachers College. Boys from all parts of the county entered the contest.

Although several girls made entry in the non-flying plane contest, none entered planes.

How to Build a Bellanca Seaplane Model

(*Continued from page 29*)

Balsa 1/16″ square is used for the leading and trailing edges. Sandpaper down smoothly after all are completely dry. Refer to the drawings in making the struts. To eliminate intricate work, the small horizontal part of the struts where they join the fuselage has not been incorporated.

PONTOONS

The pontoons are easy to make. The sides are traced and cut from 1/32″ thick balsa. Ambroid the bulkheads, which are cut from 1/32″ balsa, in their proper places. Set aside to dry.

PROPELLER

The propeller is cut from white pine 3/4″ x 1-1/2″ x 7″ long. Cut out to shape and smooth all roughness. Before inserting the shaft, balance properly.

COVERING

Japanese tissue is used for covering. Banana oil is best to use for gluing. Pull gently on the paper to remove all wrinkles. The pontoons are covered on top and bottom only. Give two coats of plain banana oil, which will make them absolutely waterproof. One coat of banana oil is given to the wings, struts, tail surfaces and fuselage.

ASSEMBLING

First attach the wings to the sides of the fuselage. Small model making pins will help hold the wings in their proper places. The dihedral angle is 3/8″. Allow a few hours to dry.

The next to be attached are the struts. Glue in proper places as shown in drawings. Place the model upside down when in the process of drying. The tip ends of the struts rest directly on the seventh rib from the fuselage. Pins will help hold the struts securely.

The tail assembly is glued on next. First put on the stabilizer. Have it pointing slightly downward so that the plane will climb easily. Now the rudder is glued in position. Allow ample time to dry.

The pontoons are next to be assembled. Balsa wood 1/8″ x 1/4″ streamlined and cut to proper length, as shown in drawing, is used for struts. The first two are ambroided directly underneath the first wing struts and to its base on the pontoons.

The rear struts are glued underneath the rear wing struts and to the base on the pontoons. Use model making pins and set tightly. Be sure to have the tail up in flying position. Set aside to dry for a few hours.

Use seven feet of 1/8″ flat rubber for motive power.

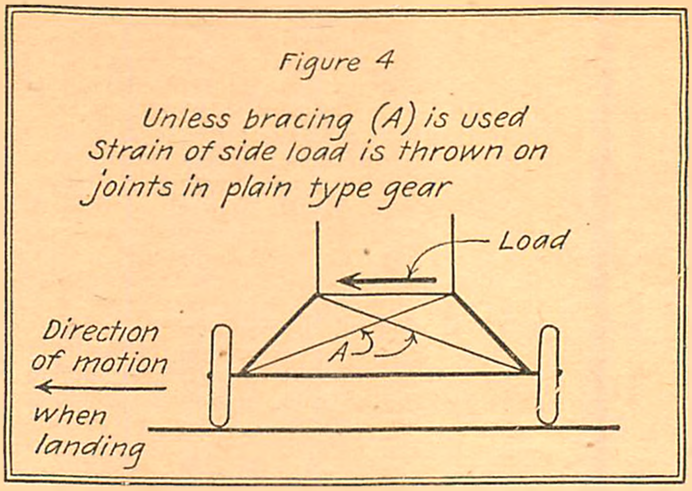
FLYING

Your model is about ready to fly. Hold it about five feet above the ground and launch. It should glide to a smooth landing. If a lake or pond is nearby, take it there for a test. Wind it about fifty times for a taxi run. It will probably jump clear of the water and land soon after.

Now wind the motor about one-hundred and fifty or two hundred times. Give the plane a slight push, heading it into the wind. Longer flights may be obtained by launching it by hand.

A Course in Airplane Designing

(*Continued from page 16*)



1, or at the center of the gear, as in Figure 2.

The tail skid is usually equipped with shock cord, but on some ships the skid itself is made of a steel spring, which serves the double purpose of a skid and a spring. On full-size ships the tail skids are often turnable; that is, they are installed so that they can turn through a certain arc to facilitate the maneuvering of the ship when on the ground.

On models, however, this practise is rarely advisable because the model airplane is seldom called upon to turn in taxi-ing, and especially because this type of tail skid may cause the ship to ground loop.

A ground loop is a comparatively sharp turn made by an airplane on the ground, usually out of control of the pilot after a certain stage, because the slipstream does not strike the rudder, hence depriving the pilot of rudder control.

When models ground loop they often do some damage, such as a broken wing tip. A fixed tail skid will do much to prevent this damage.

PLACEMENT OF LANDING GEAR

In the old days of flying, before three-point landings were even thought of, it was a common practise to put a long skid on the landing gear, projecting out under and in front of the propeller, to prevent damage to the prop in landing.

Now, with all of the larger ships landing in stalled position, they have no use for a skid such as mentioned above, but our models still land out of the glide with the nose down and are susceptible to nosing over.

Propeller damage is quite common and props are certainly not the easiest part of the model airplane to make. Skids, however, are unsightly and out of date. Therefore, the best course left open for the model builder is to move his landing gear forward.

As shown in Figure 3, an airplane landing in gliding position will need to have the landing gear far enough ahead to insure safety from nosing over. It should be noted here that man-carrying airplanes would never be landed in this position intentionally, as a great bounce and probable damage to the ship would result.

Models, however, are light and fly slowly, and for this reason they rarely bounce very high when landing in this way.

As we see in the sketch, the friction of the wheels on the ground (increased by any obstruction they may strike) exerts a movement tending to nose the ship over. Likewise, if the center of gravity is not behind the support when the ship strikes, the ship will nose over.

The solution is, then, to place the landing gear far enough forward that the weight will overcome all tendency toward nosing over. But here we must use common sense. If the undercarriage is placed too far forward, the ship will exhibit an exasperating tendency to ground loop.

If the ship has the center of gravity well forward, place the landing gear well forward; if the center of gravity is toward the rear, move the landing gear back.

A safe rule is to place the landing gear so that when the ship is in its steepest gliding angle, the center of gravity is an inch or so behind the axle; that is, so that a line dropped straight down from the center of gravity will pass behind the wheel.

It is obvious that the propeller must have sufficient clearance to avoid contact with the ground under the ordinary conditions of landing.

LANDING LOADS

Since the model airplane very rarely makes a three-point landing, we will consider only the "tail-high" landing, the "pancake" landing and the side-load landing.

In a tail-high landing, shown in Figure 3, the loads imposed upon the landing gear and transmitted to the fuselage structure are comparatively great. The ship is losing altitude quite rapidly and, as it strikes the ground, its vertical velocity (speed of drop) is suddenly reduced to zero.

With the weight of the ship stopped in its vertical descent, a large load is thrown on the landing gear. For this reason the parts of the undercarriage should be strong enough to stand a load of many times the ship's own weight.

For the tail-high landing, it should be understood that the ship, while it is moving forward, is dropping at the same time.

The two velocities (horizontal and vertical) combine when the ship is gliding down at an angle but when it strikes the ground, the vertical velocity vanishes and the horizontal velocity is left.

We shall discuss this matter a little later on and try to clear it up more than is possible in this article.

In a "pancake" landing the ship drops to the ground in nearly level position. The loads imposed in this type of landing are mainly vertical, *acting to push* the landing gear up into the fuselage.

PROVIDING we have a strong landing gear, we should be careful to strengthen the fuselage members near the points of attachment to the gear, because the strains transmitted to the fuselage may cause failure in a longeron, which makes a difficult repair job.

A side-load landing sometimes occurs in model flying. In this landing, the ship may be either side-slipping as it strikes the ground, or it may be landing cross wind. In either case, a strain will be imposed tending to shear off the landing gear, as shown in Figure 4.

With most split axle gears this strain is taken directly by one of the struts but in the older plain gear, some means of bracing must be provided, such as wires, as shown in the sketch. It will be easy for the model builder to design these wires or struts to suit his particular case.

QUESTIONNAIRE

1. Why should shock absorbers be used on an airplane?
2. Explain a ground loop.
3. Should the center of gravity be behind the wheels at all times? Why?
4. Why should the fuselage members be strengthened near points of landing gear attachment?

Plagiarism

Stories have been submitted to MODEL AIRPLANE NEWS *which are copies of stories that have appeared in other magazines.*

Anyone submitting a plagiarized story through the mail and receiving and accepting remuneration therefor, is guilty of a Federal offense in using the mails to defraud.

The publishers of MODEL AIRPLANE NEWS *are anxious—as are all reputable publishers—to stamp out this form of theft and piracy and are advising all magazines from which such stories have been copied of such plagiarism, and are offering to cooperate with the publishers thereof to punish the guilty persons.*

Notice is hereby given to all who have submitted or who submit stories that the same must be ORIGINAL.

Wind Tunnels

(*Continued from page 42*)

fan combined, and is of a five-foot diameter, with twenty-four blades. The model to be tested is supported on strong cross rods attached to a measuring balance, for, of course, wires such as those described previously would not be strong enough in a five-hundred-mile-an-hour flow. Even with the rods, sometimes models get loose and fly into the propeller blades, wrecking themselves and the fan.

The models are tested just as at New York University, except that while the test is going on and the air is rushing past the little plane, the temperature of the room is lowered to the dew point, and the air of the tunnel is moistened. The dust and water content of the air makes it look like fog, and its vortexes and eddies may be easily seen through windows and photographed.

An unusual system of lighting has been developed, which will show up the condensation clearly, and the air can be seen whirling and deflecting where it hits the model. In this way new principles of streamlining planes are worked out, and slowly the eddies and other wastes of efficiency are cut down.

Other air tunnels are in use throughout the country, but these will suffice as typical examples of their successful use in airplane engineering and development. Indeed, experts point out the fact that tomorrow air tunnels may be built of a size which will permit testing a full-size plane, just as Professor Klemin tests the little mahogany models.

It is only a question of working out measuring instruments, balance wheels and arms capable of recording the stress, and of securing power enough to send a blast of air one hundred feet wide instead of nine feet wide. It seems impossible with present propellers but who knows what may be developed in the future? It was only fifty years ago that Santos Dumont, great Brazilian aviator, seriously attempted to give motion to a balloon by means of a paddle wheel turned by hand!

The next time you see Lindbergh's new Lockheed "Sirius", black and streamlined, think of the twelve-inch mahogany model which inspired its novel shape. Think of the months of testing, designing, testing again . . . until finally a shape is evolved which conforms to known principles of safety, which gives that added step forward of stability, of efficiency, or of required speed.

Model building is fun, yes. But remember that it can be a whole lot more. Remember that the greatest inventors, the greatest builders of commercial planes today, are also model-builders. Remember that there are hundreds of highly paid technicians today who do nothing but make models to scale.

Remember that every time a new plane appears at the shows and in the air, it represents hours, days and perhaps months of model-building and model-testing. Without models, modern aviation could not be where it is, nor could it go ahead.

Prisoner of the Air

(*Continued from page 13*)

of the hut. Finally, just about daylight, he dozed off.

The next thing he knew he felt a tremendous upheaval. The floor of the hut was shaking beneath him, it seemed. Then he realized that he himself was being shaken violently. One of his guards was standing over him, a steaming cup of coffee in one hand, his helmet and goggles in the other, while the second guard was doing the shaking.

At sight of his helmet and goggles, which he had never expected to see again, a thrill shot through Blimp. Perhaps this crazy scheme of the bandit leader's was *his* lucky break.

Once in his plane some thing might occur to give him the upper hand. Blimp, in the excitement of the last twelve hours, had completely forgotten his previous crash complex. He had been too busy thinking of other things.

He swallowed the bitter, strong coffee, put on his helmet with the goggles over his forehead and followed one of his guards down to the clearing by the river. As they approached the edge of the jungle Blimp caught the sound of his engine being warmed up, for all the world as if it were safe on the marine warming-up platform at Quantico or Norfolk. So the Russian wasn't so dumb after all! Something like a chill of apprehension chased itself down the American's spine.

They were all waiting for him to arrive, and when the little brown men caught sight of the helmet he had put on, they started chattering amongst themselves in great excitement. Their leader and the Russian, with one or two others, stood apart, doubtless waiting for him.

Their elation was ill-concealed. The sight of Blimp wearing his headgear was evident proof to them that the "gringo" had seen the light.

"*Buenos dias, senor,*" greeted the bandit leader, "It is to be hoped that the young lieutenant passed a most restful evening?"

Evidently not expecting an answer in return to his sarcastic pleasantry, he continued, "You will now listen to our plans for your future. We think a great deal of you, Americano, and it is you who is to decide whether or not your future is to be prosperous and happy."

During this harangue Blimp was more and more mystified until he chanced to observe two scantily clad underlings carrying short lengths of piping over to his plane. The gingerly manner in which they carried their burdens and the respectful distance kept by the remainder of the other ruffians indicated clearly that the objects were bombs.

So these were the "love tokens". They were to be hurled down on his comrades while he sat aloft with a pistol at his back! Not by a long shot—they would finish him first!

"You will observe," said the suave commander, "the bouquet of forget-me-nots to deliver to your friends. You will be the pilot for Senor Ivdoski, who will distribute them impartially."

They were pressing around him now, watching him carefully, furtively. If he made one break—Blimp thought quickly. Anything was better than slow death which surely awaited him in this hidden valley. If he could stall off the ultimate destination and plan, he might be able to think of some way out—some clever maneuver to throw the Russian off guard. After all, the Russian was one—the Nicaraguans many. Besides, his adopted element, the air, had a way of clearing his mind of everything but bare essentials.

THE chief led the group to the waiting plane and issued his final instructions, "Fly low over the devil-dogs' camp at San Ramon. Then go around and do this over again. After that fly back to us. If successful, we shall welcome you, if not—"

A shrug of the narrow shoulders implied more than words could have said.

As Blimp climbed in the forward cockpit, he patted his ship affectionately and thought of Sergeant Capper who would polish and shine his beloved plane no more. Some day he would come back to this nest of rascals and wipe them out in the Capper's name! But first he would have to work out the problems of the present. Very pressing problems, they were, too.

His ruminations were interrupted by the muzzle of a revolver against his back. "You know your orders, comrade," leered the Russian. "I dislike shooting anyone in the back —but if I must—"

It felt good to be sitting at the stick of his ship listening to the smooth hum of his engine. Even the pistol seemed less potent than his reliable Wasp which throbbed in its eagerness to get more gas and be gone.

Weighing the possibilities of getting out of this small field and valley brought back a momentary vision of his ghost memory. But it did not last. Too many important matters burdened him now. What was the difference if he did crack up, after all? Twenty seconds of mad spinning —and another aviator would be crossed off the files in Washington.

Opening wide the throttle, Blimp uttered a prayer. Up came the tail as the Corsair began to gather momentum. Rapidly picking up speed, the ship reached the point where Blimp had either to cut the switch and turn back or continue in the hopes of getting off. A gentle pull back on the stick put her in the air, only to drop her back on her wheels.

"She'll do it," muttered Blimp grimly as he pulled back slowly a second time. The faithful Corsair pulled off with the wheels idly rolling as if they were on invisible ground. With the canyon walls rapidly closing in on them, it was impossible to turn.

BLIMP held her nose low. The whistle of the wires as the plane moved faster and faster was music to his ears. The air speed indicator's arm moved further around the dial and crossed the one-hundred-and-thirty mark.

"Now or never—!" thought Blimp as he pulled straight back on the stick. Up and up rose the nose of the Corsair until she was on the top of a loop. Here Blimp half-rolled with his ailerons and a kick of the rudder. Turning around, the American observed a broad smile of approval on his passenger's face. Any person who has ever been connected with aviation must in spite of everything take off his hat to a perfectly executed Immelmann.

It was good to be back in the air again—back where he had freedom, if only relatively. Blimp breathed deeply and sent up a prayer for some sort of inspiration to get him out of this fix. The Corsair rapidly pulled them up over the mountain wall that surrounded the secret field. It was almost as if he and Capper were returning from a patrol. For a moment the events of the last twenty-four hours seemed like a nightmare.

The thought of the pistol, however, was sufficient to keep the marine's mind on his business. They were a half hour from San Ramon and plans began to filter through Blimp's head.

Suddenly a great light dawned on him. He had wondered about their chances to escape the rain of bullets from the American machine guns after they had bombed the field on their first pass. It was so plain now! His passenger was not going to drop bombs the first time around. Upon seeing the missing Corsair approach the field, the entire detachment of officers and men would collect on the landing field! They would be entirely wiped out on the second trip!

In his excitement over such a realization, Blimp made a slight change in their course. He immediately received a jab in the back from his guardian's firearm. The Russian was on the job! There remained for

Blimp but one solution. He must crash the ship and take his chances.

San Ramon was just ahead in the next valley. Blimp's mind was in a turmoil and his thoughts were a condemnation of himself. He was a coward! Why hadn't he resigned from the Flying Corps when he lost his nerve after his Pensacola crash? He had kept his secret but soon they'd know he was yellow. Not only yellow, but treacherous—allowing himself to be forced to fly for the rebels!

THERE was the field! It appeared quite large compared to the patch from which he had just come. If he had another chance, he thought, he could get in and out of the San Ramon field without any worry.

A severe punch in the back meant only one thing—to fly low over the field. Blimp reluctantly obeyed. The sound of the engine had been sufficient to arouse the marine detachment and as the plane passed over the approach end of the field at one hundred feet, he saw Captain Allby hurrying to the field with Cassidy, Andrews and Tuttle. Everyone on the ground was evidently aroused over the sight of the belated arrival.

"Murder, murder, murder!" ran through Blimp's mind as the length of the field rolled rapidly under him. The crafty native captain had planned well! On the next pass at the field the marines would be wiped out!

Something snapped in Blimp's head. He found that it was literally possible for a man to see red. Did the sneering *el capitan* actually take him to be as much of a yellow puppy as the plan indicated? Well, here was where one marine threw a monkey wrench into that dark gentleman's plans!

As the far side of the field was reached, he cut his gun, pulled the nose of his plane up and gave full left aileron. A vicious kick on the high rudder sent the unfortunate Corsair downward in a violent side slip.

The Russian, too startled to make any objections, was helpless. The jungle came up so fast! To Blimp it resembled the water rising up to him in his first crash. Gritting his teeth, however, he held on to the right rudder.

For what seemed to be an infinite period of time they fell helplessly sideward. In reality, it was only a few seconds until the left wing struck the matted jungle growths. The wings folded up like a receding wave to help absorb the shock of the crash. The ship cart-wheeled wing over wing and after due quivering and shaking settled down at last.

Objects went black to Blimp. The noise of the crash scarcely reached his ears as he slumped downward to one side of the cockpit.

* * *

It sounded very much like Captain Allby speaking. He was saying, "Doctor, what chance has the lad got to pull through? Will he make it?"

A distant voice answered, "He was knocked about pretty badly but with any sort of luck we can pull him out of the fire."

The fog around Blimp cleared somewhat. Evidently these voices were discussing him. Why, he was all right! He'd tell them so. He'd sit up and ask them what it was all about. Opening his eyes he endeavored to sit up but the effort caused him to groan and slump back instead.

"Blimp!" exclaimed the skipper of the squadron.

Before the sun's long shadows had merged in the blackness of the tropical night, Blimp heard the remainder of the story from Captain Allby.

He had been knocked unconscious when the center-section struts collapsed during the crash. The sturdy construction of the fuselage was all that saved him.

El Senor Ivdoski had been thrown from the cockpit and so escaped serious injury. The crash had so unnerved him, however, that only a little urging was necessary to get him to tell the entire story.

Two planes had been made ready for flight immediately. One, a Fokker transport, was to take Blimp to the Naval Hospital at Managua and the other, with its ladened bomb rack and machine guns, to imitate Blimp's return to the rebels. Sergeant Capper would be avenged, after all!

"If you think you're in a bad way, you ought to see your poor old plane," remarked the Captain. There was a sympathetic twinkle in his eye. "Seriously speaking, though, Blimp, you're a fool for luck. Why those dynamite bombs didn't go off when you crashed, I don't know. You took a big chance—and you did some good work. We have the very band of guerillas we were looking for!"

Blimp felt quite embarrassed—though inwardly he was thrilled and very happy. He was thrilled at the Captain's words—happy because he knew he had won not one but two victories. By taking that mad, impossible chance he had conquered the fear within himself. He knew that his "crash ghost" was gone—never to return.

Gliding and Soaring

(*Continued from page* 10)

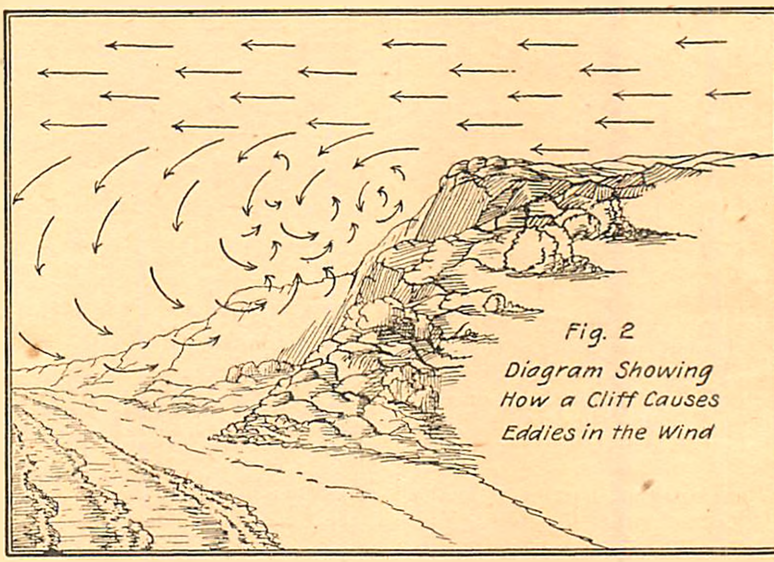


Fig. 2

Diagram Showing How a Cliff Causes Eddies in the Wind

of one-quarter inch by one-half inch spruce or pine, and two strips of cambric ten inches by sixty-five inches, are necessary.

Four of the sticks form the frame of the kite, and the others serve as braces. The strips of cloth are wrapped about each end of the frame, leaving a vent between them so that the wind can catch the kite more easily.

FASTEN the ends of each band of cambric together, lapping the edges an inch and securing them with glue and by stitching. The two resulting tubes of cloth must then be fastened to the four sticks which form the framework of the kite. Cut each of these sticks thirty-five inches long.

Put glue along one of the one-quarter-inch sides of two of these sticks, and put them through both tubes of cloth, pulling the cloth taut between them. When the glue is dry, fasten, in the same manner, two other sticks of the same length to the cloth midway between the other two sticks.

The braces must now be inserted to hold the kite open. Cut four sticks, about twenty-two inches long for this purpose. The braces should be long enough to stretch the cloth very tight over the framework. Notch each brace at either end, so that it will fit over the corner stick.

It is well to wind the brace above the notch with strong cord in order to prevent the wood from splitting. Put the braces in diagonally, across the ends of the kite.

The braces may be removed, and the kite folded up, when it is not in use.

The kite string should be very long, and can be more easily handled if it is wound on a reel. In order to have the maximum control over the kite when it is in the air, the string should not be attached directly to the kite, but should be attached to it by a harness. This consists of two short strings of equal length, fastened to one corner stick of the kite, and to the kite rope.

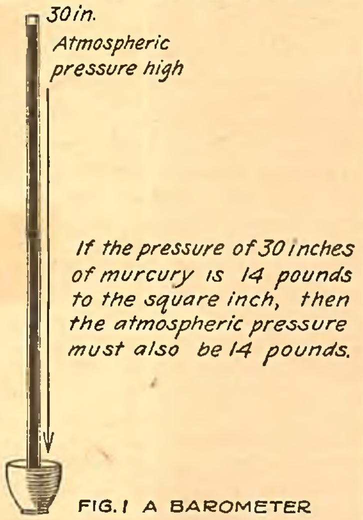


FIG. 1 A BAROMETER

How to Fly the Kite. Every boy knows how to fly a kite. It is a good idea to send up the kite from a hill, or from open ground where the wind is strong. You will notice that the kite flies readily in a high wind. If the wind is light, however, you will be obliged to run against it, in order to start the kite upward. The strength of the wind increases with altitude, and the kite will normally stay up when it has once gained height.

What the Kite Teaches About Gliding. One of the primary principles of gliding is taught by kite-flying: that is, that a glider, like a kite, will stay in the air as long as it has sufficient "flying speed". Speed in this case does not mean speed over the ground, but speed through the air.

You have noticed that, if the wind is low, you have to run with the kite to make it fly. If, however, the wind is strong, the kite will be moving through the air fast enough to stay up, even when you are holding it still over the ground with the string.

In order to understand why the kite has speed through the air when it is making no progress over the ground, compare the kite with a swimmer.

If the swimmer is going against the current of a river, he may have to swim very fast through the water in order that he may not fall behind the point on the bank where he started.

There are a good many other points of similarity between a kite and a glider. In the construction of a glider, the same principles of broad lifting surface, light weight, strength, symmetry, and control must be remembered.

The glider is to some extent the outgrowth of the man-bearing kite. When you have built and flown a kite, you will be receptive to the idea that a glider flies when it has air speed, that it must be light and have broad lifting surfaces, and that there must be some means by which it can be controlled.

Another absorbing instalment of Gliding and Soaring will appear in next month's issue of MODEL AIRPLANE NEWS, *on all news stands September 23.*

Don't fail to order your copy now—you can't afford to miss it!

How to Build a Northrop "Flying Wing"

(*Continued from page 17*)

As seen in drawing and designated by the letters "O", "K" and "Z", marked fuselage pieces are cut from 1/32" hard balsa, and likewise "X" and "Y" marked motor carrying wood pieces from 1/16" balsa.

They are attached to the covered wing as depicted in drawing. Note that the longerons on the "X" and "Y" wood pieces carry a round cut in which the motor stick is to be pushed, so we have to be careful that they are in line.

After you have finished constructing the fuselage, take a piece of round wood about 1/4" diameter and push it carefully through the three holes in the covered wing. After that cover the fuselage as shown in the photographs. The weight of the wing is now .350 ounce.

Now test the wing by gliding it. You will find that it automatically is stable. Turned over, it glides in the same easy manner.

OUTRIGGERS, ELEVATOR AND RUDDERS

Prepare two pieces for the outriggers as depicted in drawing of 1/16" thick, hard balsa wood and attach them to the wing, as shown in the drawings. These outriggers will carry the rudders, which are made from 1/32" balsa wood, as shown in drawing. The elevator is made from 1/32" balsa, as shown in drawing.

LANDING GEAR

All three wheel carriers are fixed to the wing. Drawing shows the front landing gear pieces and how to assemble them. Where the landing gear strut ends are to be fixed is also shown in drawing. The 1-1/4" diameter wheels are to be fixed as usual. The third 1-1/4" diameter wheel is attached as shown in drawing, being fixed in a bamboo fork. The photograph shows the same. The wheels are made from 1/8" thick balsa wood.

The weight of the model now should be only .490 ounce.

PROPELLER AND MOTOR STICK

The propeller has to be made exactly as shown in drawing. The propeller revolves between the outriggers and so the diameter is much smaller than any others.

While the usual wingspread model has a 6" or sometimes an 8" diameter propeller, in the present case this is reduced to 4-11/16", so that it is necessary to use a specially constructed propeller with a different pitch from the ordinary.

With the rubber motor we can use an ordinary motor stick if necessary, but this is not advised because the drag is much greater. With a little skill a special "tube" motor mount, 12" long, 1" wide and 1/32" thick balsa wood, can be made. See drawing.

It is necessary that the balsa should be soaked for about ten minutes in water, care being taken that the wood is entirely submerged. Then take a piece of 1/4" diameter round hard wood about 15" long and bend it carefully over the soaked balsa, as seen in drawing.

Cover both ends and center part carefully with about 1/4" paper band temporarily. The overlying ends and the middle are smeared with ambroid. After drying, take off the paper rings and smear thinly with ambroid the place the rings covered.

After drying, paint with dope. The motor carrier tube should weigh about .035 ounce.

We form axle holder "S" from balsa as shown in drawing and one rear hook holder "N". These we attach to the ends of the above prepared wood tube.

The propeller is fixed as usual, but as a "pusher", to the shaft. Four strands of .045 sq. rubber bands are sufficient.

Push the tube through the fuselage and the model is finished. The total weight is now .5775 ounces.

TEST FLIGHT

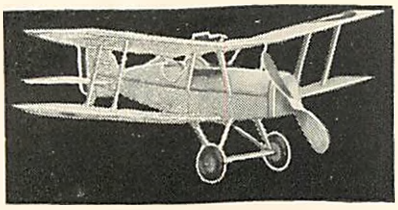
Oil the shaft properly. In general it is advised to apply after every fifth trial flight one small drop of oil on the axle. First glide the model and regulate it by moving the motor forward and backward.

Then test it with motor power, too. The maximum number of windings should be between 350 and 400. By applying glycerine you can increase the winding to about 700.

The model rises from smooth ground quickly. If you make a tractor propeller as shown in drawing and another shaft holder "S", you can easily transform the "pusher" model to a "tractor" model. The model as in the photograph made a flight of two minutes at the first test.

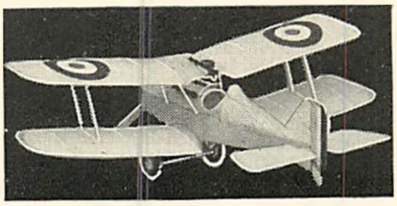
RECORD HOLDING SCALE MODEL

Famous World War Plane



THE S. E. 5 "A"

24" Wingspan



The construction set for this plane contains all the necessary parts and material: ribs cut, formers made, celluloid wheels, full size layout exact scale blue prints and instructions. All wood parts are of feather weight BALSA. The S. E. 5 "A" is easy to construct and is by far the best flying scale model that can be built, holding the present record of 48 seconds. The S. E. 5 "A" has a gliding angle of 12 to 1, a ceiling of 60 feet—nothing like it has yet been produced in kit sets.

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6 sheets	1/8" x 2" x 36"	1.00
3 sheets	1/8" x 2" x 36"	.60
5 sheets	1/16" x 6" x 18"	1.00
3 sheets	1/16" x 6" x 24"	.90
10 sheets	1/16" x 1" x 20"	.40
20 sheets	1/16" x 2" x 12"	.50
25 sticks	1/4" x 1/4" x 36"	1.10
25 sticks	1/8" x 1/4" x 36"	1.00
12 sticks	1/8" x 1/4" x 36"	.50
25 sticks	1/8" x 1/8" x 36"	.60
25 sticks	1/8" x 1/8" x 20"	.45
50 sticks	1/16" x 1/16" x 20"	.50

PROP. BLOCKS

6 Blocks	5/8" x 1 1/8" x 7"	$ .24
6 Blocks	3/4" x 1 1/4" x 8"	.30
6 Blocks	1" x 1 1/4" x 10"	.45
6 Blocks	1" x 1 1/2" x 12"	.60

Postage 15c Extra

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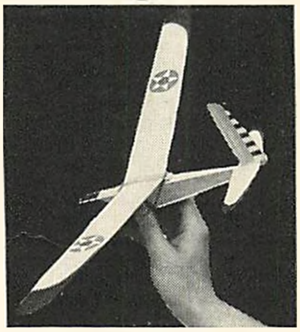
HAWK

Soaring Glider



This 24" glider can be assembled in 30 seconds. All parts cut to size and shape. Cement and insignias and instructions are furnished. Has recorded flight of one minute. PRICE FOR KIT $0.75, postpaid.

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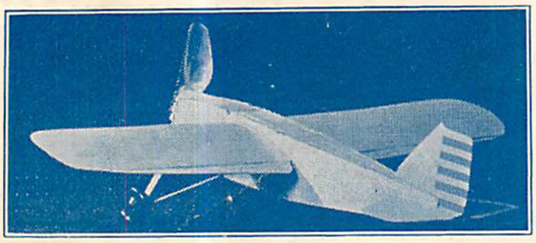

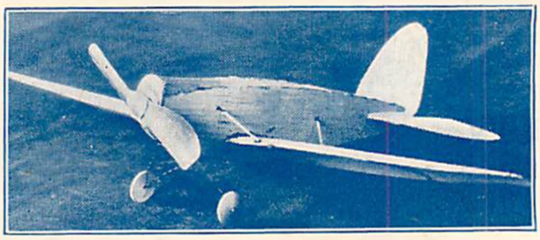

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Midland Army Biplane in Flight

Unretouched photograph

1 OUT of 10

Probably not one model airplane in ten ever gives its purchaser a satisfactory flight. Some failures are due to careless construction. Some are due to careless *design*—a carelessness sometimes so great that the model can not be made to fly under any conditions. But the majority of failures are due to the tremendous difficulty encountered in building many models.

The average model would be entirely satisfactory if it could be constructed with less skill, but it may be a sad disappointment to the ordinary model builder, who often finds that he has wasted both his money and his time on a set which only an expert can put together.

A simple and easy construction is the key-note of Midland design. We do not pretend that Midland models are *exact scale* reproductions, for such models are hard to build, unsatisfactory to fly. We do not claim that these models will break records, for record-breaking models are too delicate to build, too fragile to last. All that we say is that these models are pleasingly realistic, that they will fly well time after time, and that the average boy can build them. Why risk disappointment by purchasing a model advertised with extravagant claims of exact scale design and almost unbelievable flying ability? Buy a Midland model and get what you expect, and what you are entitled to have.

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The wing spread is 20 inches, the weight exactly 1 ounce. The flight distance is close to 200 feet. Because of its greater wing area the Army Biplane gains a great deal of altitude. The average limit is about 50 feet, but we have photographed it when almost three times that high!

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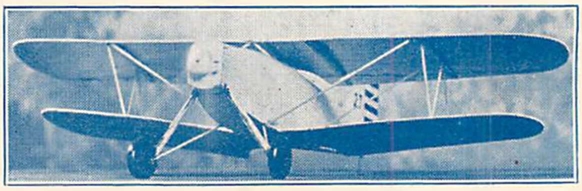
Harder to build than the monoplanes, but still much easier than any conventional built-up model. Complete set, with all material and full building and flying directions, postpaid in the United States and Canada... **$2.50**



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