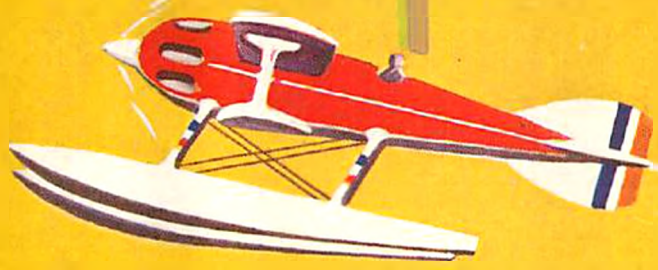
JUNIOR MECHANICS
AND
MODEL AIRPLANE NEWS

DECEMBER 1930



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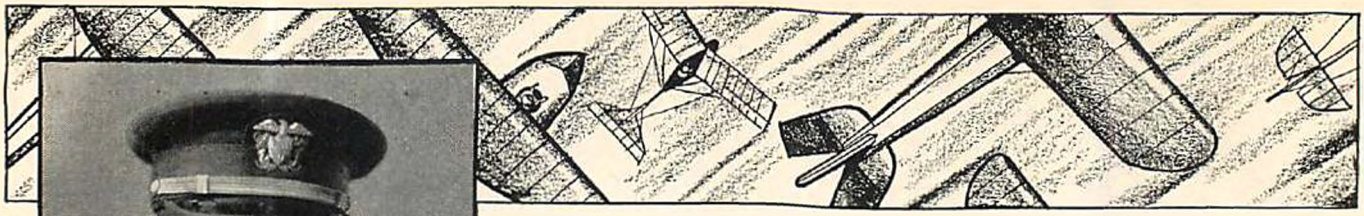

LIEUT. RALPH S. BARNABY

In 1911, Lieut. Barnaby qualified for the Early Birds' Association by his self-instructed gliding flights. In August, 1929, he soared for 15 minutes and 6 seconds at South Wellfleet, Mass., thus becoming the first person in this country to qualify as a first-class glider pilot. For this flight he received from the National Aeronautic Association (F.A.I.), First-Class Glider Pilot Certificate No. 1. It was Lieut. Barnaby in January of this year, who launched his glider from the airship Los Angeles in flight over Lakehurst, reaching the landing field 3,000 feet below over 12 minutes later.

Lieut. Barnaby's official duties as Chief of the Specifications Group, Scientific Section, Bureau of Aeronautics, U. S. Navy, are an indication of his ability to give expert help on construction details, materials, etc., etc.

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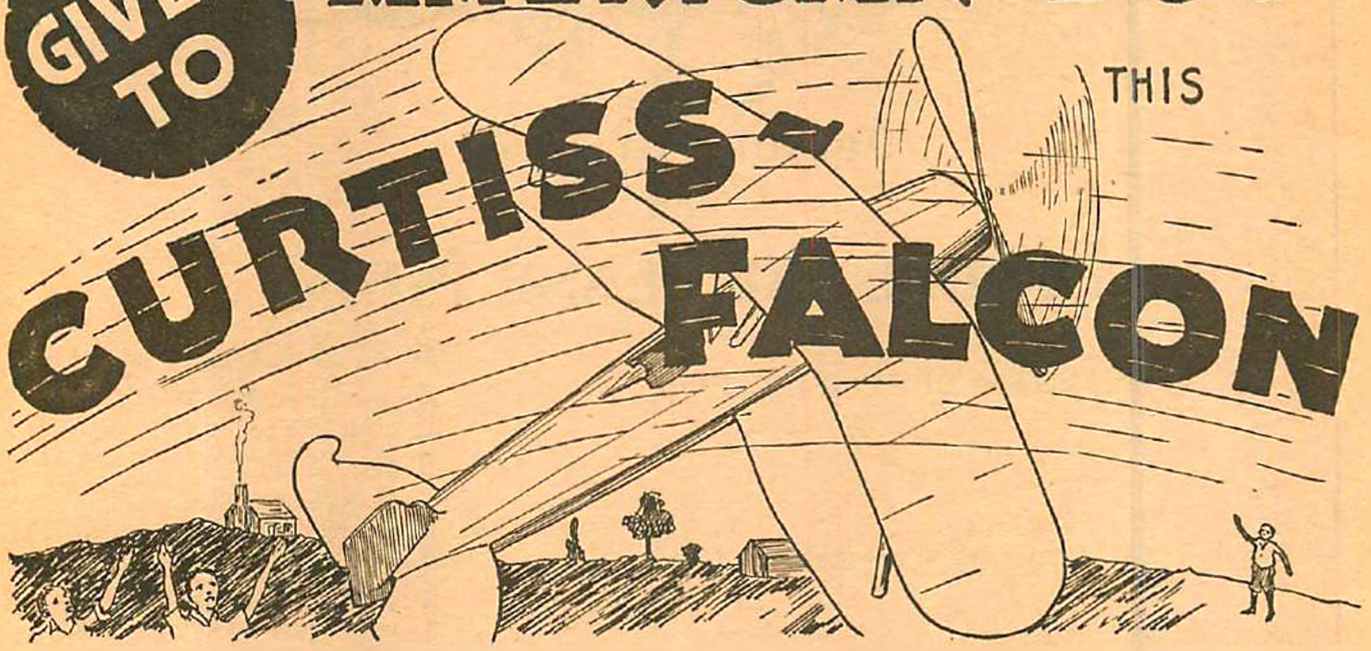

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Vol. III No. 6

JUNIOR MECHANICS and MODEL AIRPLANE NEWS

CONTENTS, DECEMBER, 1930

Cover design by Ray Creena—drawn by Norman E. Jennett

In Our Next Issue

Something that every model airplane enthusiast has been wanting to know for ages—"*How to Stunt Your Models by Automatic Control!*"

In this article, Professor T. N. de Bobrovsky, the noted aeronautical expert, gives you a few wrinkles in model airplane flying that will make you the envy of all your rivals.

That's one surprise for our readers in the January issue of MODEL AIRPLANE NEWS.

—o—

Then there is the "*Arrow Model*" Perfect plans for something novel in the way of model airplane construction, from which you will learn more about aerodynamics. Also, there are full-size plans for a perfect model of a Stinson *Junior* monoplane, equipped with a Lycoming engine.

—o—

Furthermore, our next issue brings back the *Macfadden Aviation Advisory Board*, in which Captain H. J. Loftus-Price, the Chairman, answers the questions set by Washington as a basis for a pilot's examination.

All this in addition to more articles on *Gliding and Soaring, Aerial Navigation*, and *Airplane Designing!*

Don't forget—the January issue of MODEL AIRPLANE NEWS.

On all news stands December 23 next, and only 15c a copy.

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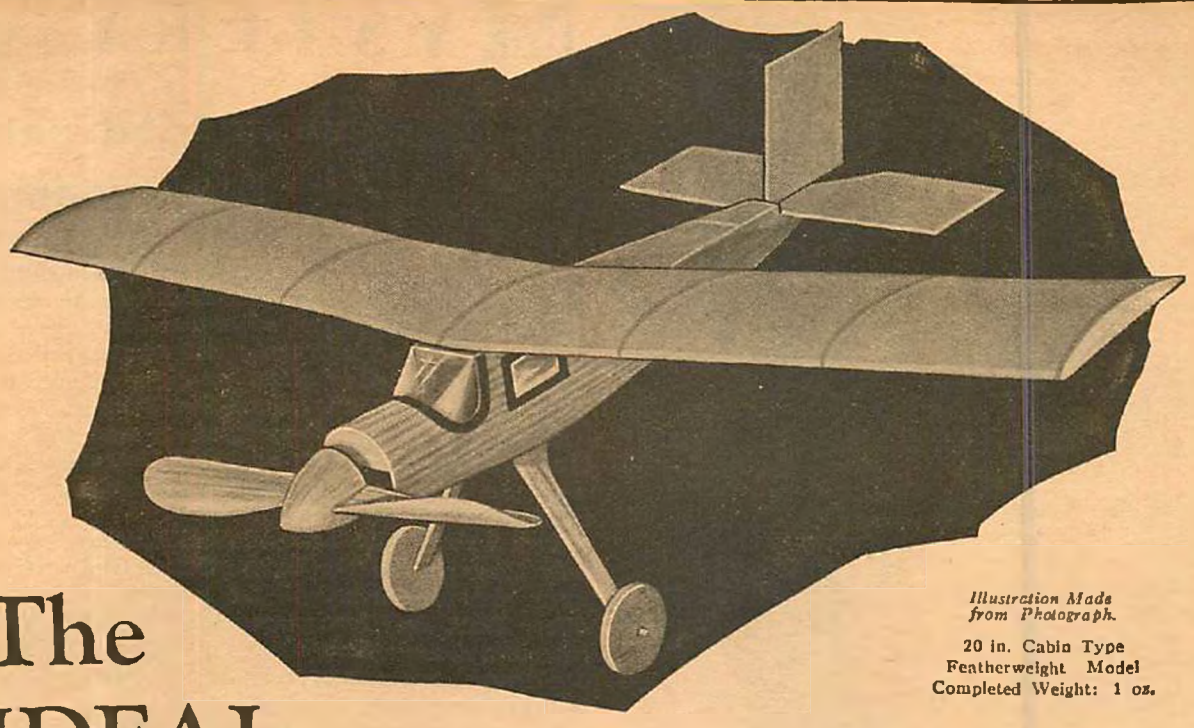

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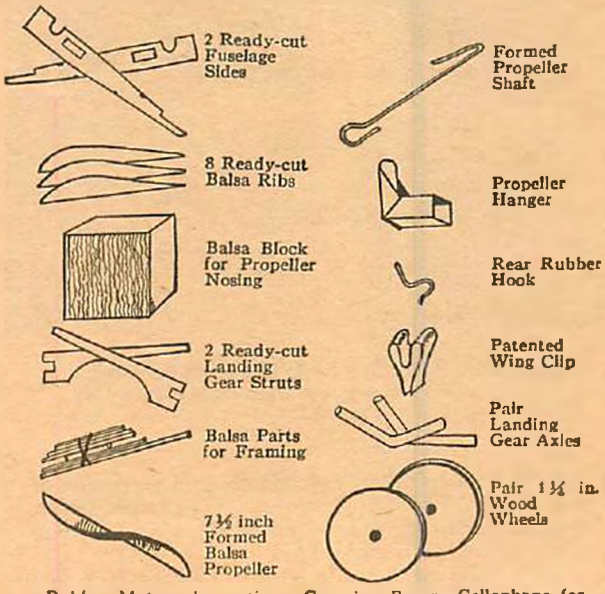

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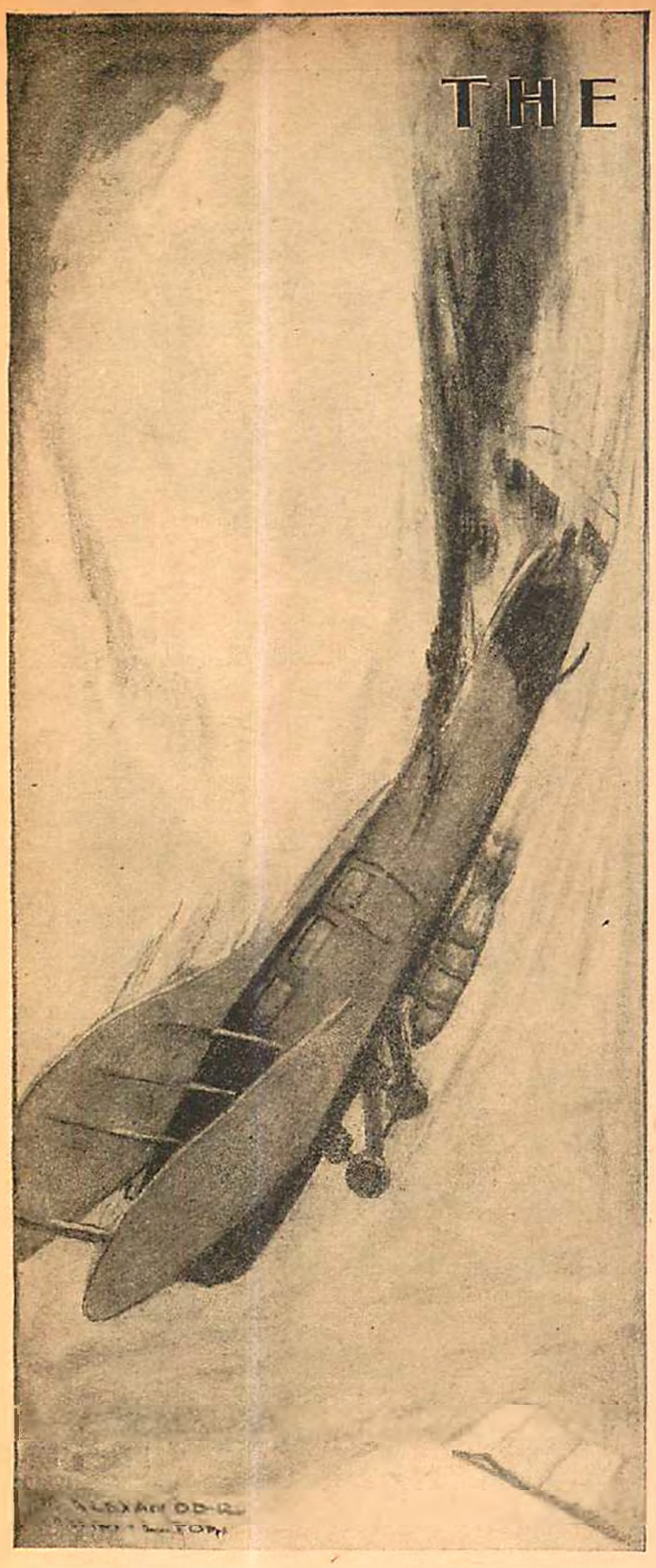
All parts, fittings and materials needed to construct the complete model are included in this Set; the builder need supply only glue and such coloring material as may be desired to dress the model in the color scheme wanted.



"Well, there was nothing to do but bring her down, so I put her into a sideslip that nearly tore the wings off"

THE MYSTERY of

Intrigue and Adventure Background of

UNLESS the *Silver Dart* is found or, if in possession of unauthorized persons destroyed beyond recognition, the Board of Air Strategy will find itself regretfully compelled to call for your resignation.

"The loss of this plane to America will set us back to a point beyond recovery in matters concerning aviation. . . ."

Rear-Admiral Franklin J. Beecham, Chief of the Investigation Department of the United States Naval Air Ministry, sat slumped in his chair at his desk in Washington. His attitude indicated only too well how crushed were his spirits.

Chin on chest, he sat staring vacantly at a solid silver model of an airplane on his desk. As he stared, so through his mind flashed a thousand and one thoughts of the real plane which the model represented. A plane which, when tested in secret, as are all planes built to government specification, more than fulfilled the wildest dreams of its designers—speed at sea-level, full military load, 350 miles an hour; at 30,000 feet, same load, 300 miles an hour; climb 20,000 feet in two and a half minutes.

That was not all. Rear-Admiral Beecham was one of only three men in the United States Government who knew the real secret of the super-secret plane, the *Silver Dart*. Any foreign government might call on designers and from them obtain plans for a plane which could equal, perhaps even better, the performance with military load of the *Silver Dart;* but—

No other government ever could solve the mystery of the "dead man" radio control with which the *Silver Dart* was equipped. Many governments had experimented with and brought to nearly perfection the gyroscopic system of automatic control, and, also, the "Metal Mike" pilot, which, too, was based on gyroscopic methods.

WITH the perfection of the "dead man" radio control system, however, America had jumped at least twenty years ahead of her nearest competitor in military and naval aviation, both from a tactical and economic point of view. In all wars in which airplanes had been a part of the fighting arm, every government participating had been faced with the serious problem of replacing planes that had been washed-out either in combat or through being crashed.

At last, America had solved this problem to the extent that no plane, unless destroyed by a direct hit from anti-aircraft guns or deliberately crashed by the pilot was lost. It was the "dead man" control that held this secret. Immediately a pilot was hit and killed or disabled, the radio control came into effect, a secret call signal was sent out to the ground station and, as if drawn by a monster magnet, the plane was maneuvered into a gentle glide, brought back to its own landing field and landed as if by human agency. Thus the government did not lose a valuable plane, the secret did not fall into enemy hands and the pilot, if alive, could be taken to hospital for treatment for his wounds.

Admiral Beecham was one of only three men who knew of this secret. He, too, knew how secretly the plane had been built—one wing at a factory in one part of America, another wing in another factory, an elevator here, an aileron there; and how these separate parts had been shipped equally secretly to an uninhabited island in the Philippines and there assembled and the finished plane tested.

Beecham also knew, and he shuddered as he thought of it, how the three riggers who had been taken to the island to assemble the plane had mysteriously disappeared after the tests.

The admiral nearly jumped from his chair as the telephone on his desk jingled compellingly. He lifted the receiver and stammered, "Hello, what's it all about? . . . Hello, er . . . er . . ."

"Lieutenant Ian Potter, U. S. Army Air Corps,

the SILVER DART

Against the Vibrant the Secret Service

By
RAY CREENA

He arrived over the field at 5,000 feet and looped three times

wishes to see you on important business," replied the operator at the switchboard.

"All right, send him in," said the admiral, endeavoring hard to bring himself back to normal after the shock of reading the letter from Headquarters concerning the loss of the *Silver Dart.*

Once again he looked at the model. "To think of it," he mused, "nearly sixty years in the service of the country . . . six campaigns to my credit . . . medals . . . and now this. . . ."

The door opened. Admiral Beecham turned to greet Lieutenant Potter and, as their hands met, the admiral's jaw dropped. . . .

* * *

Ian Potter had not been born the son of Lieutenant Eric Potter, one of America's outstanding aces during the Great War, for nothing. Ian was only seven years old when the tragic news of his father's death had been brought to their little home near Boston, Mass. It was not for two or three years after that that Ian had fully realized the honor and glory that had surrounded his father's death.

THE citation accompanying the posthumous Medal for Valor, which Ian had read through time and again, had read in part:

> ". . . . completely oblivious to the virtually unbelievable dangers to his own life and, in the face of a barrage of anti-aircraft and machine-gun fire from the ground, he carried out his duties to the fullest extent, destroying the enemy airship shed containing two dirigibles, and a hangar in which were four planes . . . during the return flight to his own lines, Lieutenant Potter was attacked by two enemy aircraft and succeeded in bringing one of them down before he, himself, was shot down in flames. . . ."

Ian was now nearly nineteen, and what he didn't know about flying and aviation in general wasn't worth knowing. For several years, thanks to a generous government, he and his mother had been quartered near the Washington naval airplane base and there, amidst the drone of airplane engines he had grown to manhood.

His own sporting nature, his father's reputation and that esprit de corps which binds all who are of the air, soon caused Ian to become a favorite among the veterans at the air base. Shortly after he had celebrated his twelfth birthday, Ian had been taken for his first flight in an airplane and his pilot was none other than Captain Gene Yubanks, another American ace who had served in the same squadron in France with Ian's father.

The boy's memories of "Aladdin and the Wonderful Lamp" gave him the inspiration to nickname Captain Yubanks "Genii," for such he was. Ian had but to mention a wish and it was fulfilled.

First, it had been a wireless key sending and receiving set. What fun Ian had derived from this! Nor was it a toy. With Genii's aid the set was erected as a secret station. The aerial was hidden in the V joints of the rafters in the attic of Ian's home; the aerial lead running down the window frame to a switch hidden behind a picture. The set, itself, had been fixed to the base of a foot-power sewing machine and, when covered, of course, was hidden from sight.

The Genii knew what he was doing. By adding the interest of mystery to the set, he had whetted Ian's appetite for studying it. The results were astounding. At the air base there was not a man who could send or read faster than Ian at fourteen. His sending set had been limited to one-half mile—to the home of his buddy,

Spug Elsen. The receiving set, however, was not limited and it was Ian's delight to pick up messages from Key West, Florida naval station and from the British naval station at Bowden, Jamaica, in the West Indies.

IT was this set, incidentally, which led to the enhancement of Ian's hero worship of the Genii, for the lad was listening in the evening that Captain Yubanks wrote his name in the history of aviation by bringing down a giant twin-engined bombing plane in flames. In doing so, he saved the lives of four of the crew, escaped himself and prevented hundreds of thousands of dollars' damage to civilian property, and the possible loss of many other lives.

The Genii had been one of a flight detailed to go up on what was known as a "live bomb" practice flight. The monster plane, somewhat similar in design to the famous Curtiss *Condor* eighteen-passenger plane, had been taken from the hangar and a giant 2,000-pound aerial torpedo fixed in the rack under the fuselage.

When the engines had been idled time enough to allow them to warm up properly, the Genii taxied the plane to the far end of the field, turned into the wind and then gave both engines the gun. Slowly at first, the great plane lumbered across the airdrome. The Genii held the stick forward to "keep her nose down," as he put it, until he felt the plane trying to lift itself from the ground.

Then, gently, he pulled back on the control stick and the giant bomber took off and lumberingly began to climb. They had reached about 3,000 feet when the Genii heard one of the engines sputtering. He didn't like the sound but decided to see if the sputter would work itself out. He had hardly given expression to the thought when there was a sudden burst of flame from one of the exhaust pipes and before it takes to tell it, the fabric on the fuselage near the elevators caught fire.

Well, if you think it is any fun to be 3,000 feet in the air in a plane on fire, to say nothing of carrying a live bomb filled with almost 2,000 pounds of high explosive, ask the Genii.

That's what Ian did.

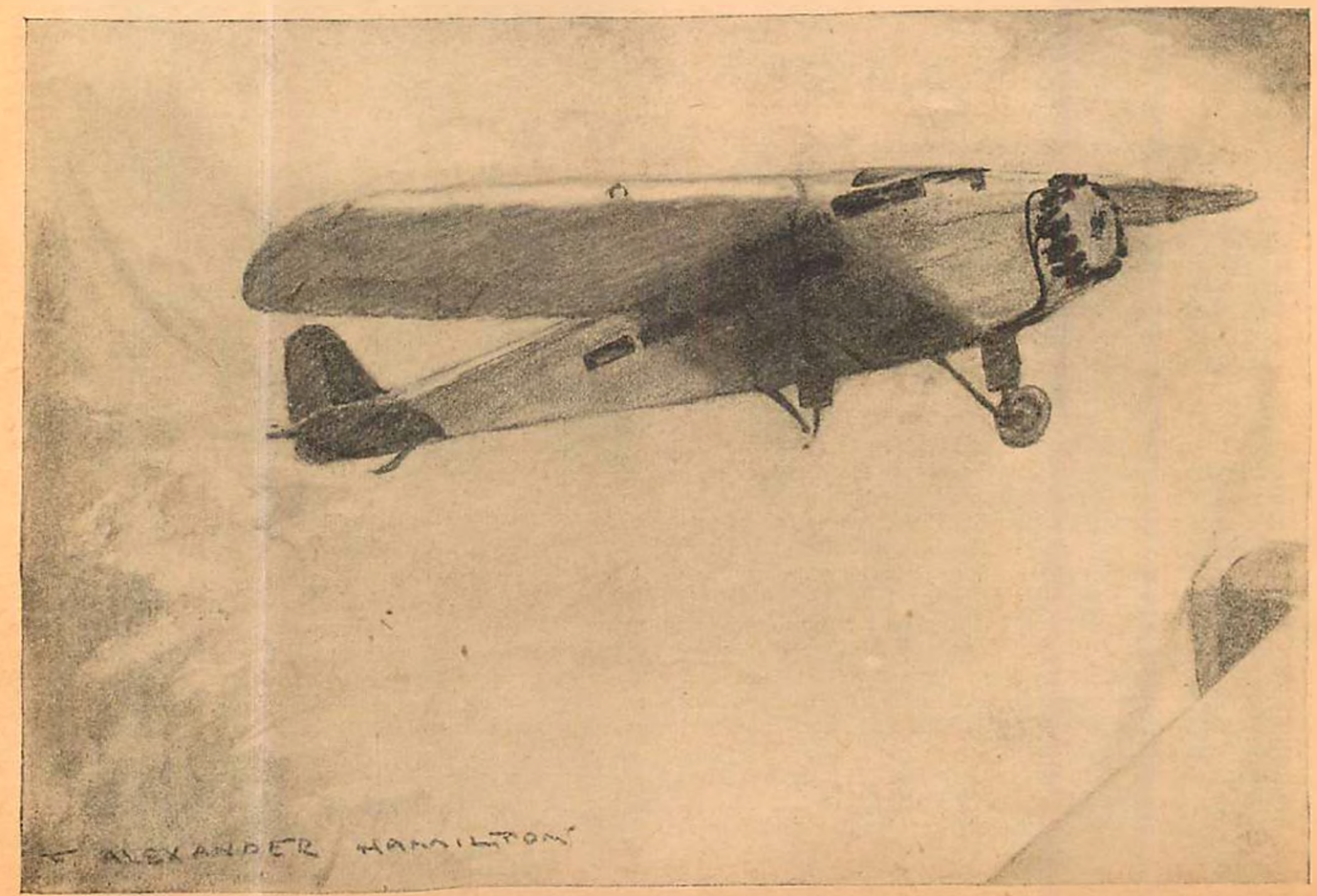
"It was no fun, young fellow," said the Genii, "far from it. For a moment I had no other thought but to give the signal for the crew to take the short route home —by parachute—and go with them. But I happened to remember that we were over a town and that if the plane landed among the houses and the *torpedo* exploded, heaven knows how many people might be killed and how much damage done to property.

"I gave the crew the signal to 'chute but the goofy gang," as he said this, he gulped in tribute to their loyalty and bravery, "decided to stick by the old crate.

"Well, there was nothing to do but bring her down, so I put her into a sideslip that nearly tore the wings off. I landed her at the far end of the field, which was a bit swampy, brought her to a stop, and the crew jumped out and scuttled away like rabbits, as I had instructed them to do.

"THEN I released the torpedo, which fell to the soft ground and could not explode, of course, as the vanes in the end had not time to revolve and thus release the striker, which when free is forced against a fulminate of mercury cap to create the first explosion that sets off the T.N.T.

After releasing the torpedo I gave the engines the gun again and taxied about two hundred yards away from the torpedo, and thus to safety. And did I bolt from the plane when she stopped and I switched off! When I had gone about a hundred yards, however, there was a terrific explosion—the flames had reached the gas tanks—and I was knocked flat on my face. That's all, Ian, but let me tell you it was the greatest



lesson I've ever had in quick thinking and quick action at one and the same time."

Is it any wonder that to Ian the Genii was everything that meant anything in the way of heroes of the air?

Two years had passed since this incident, and during that time the Genii had inculcated in Ian everything that a youth of his age could assimilate and retain concerning matters aerial. An intensive course of model airplane building had been the medium of Ian's study of aerodynamics, the practical side of his education in aviation had been gained from and in the Genii's own two-seater *DH-Moth* biplane, and at seventeen Ian could tootle around the skies like a veteran.

Then came the greatest day in the lad's life. He had been notified that his known qualities and ability in piloting, although officially he had not even been granted a pilot's license, and the fact that he was the son of a former U. S. Army airman, had caused special dispensation in his case and he had been granted permission to attend the U. S. Army Air Corps Flying Cadet School at Kelly Field, Texas.

Ian's joy knew no bounds and even his mother, behind her tears in memory of his father's tragic but glorious end, smiled her pleasure at the news. She knew her son and knew there was no need to preach a sermon before he left for Texas, but throughout his life Ian remembered her parting words never to forget that he was the son of Eric Potter; to play the game always and be considerate of others. That was all she had said, but it stuck!

Too quickly passed those great and glorious days at Kelly Field; days during which every minute was a revelation to Ian of how much his boyhood training in resourcefulness stood him in good stead. His wireless set formed the basis of his success in the wireless class—his home mechanics the basis of his success at rigging and assembling planes, and he was well versed.

And now a year later we find our young hero back at Washington naval air base. His transfer to his home stamping ground was a coincidence, but a happy one, and he celebrated it by being "grounded" for three days the moment he stepped out of his plane.

On being graduated from Kelly Field he had asked to be allowed to join a pursuit squadron. This was permitted and he was told to ferry a Curtiss PI-B to Washington. This news, of course, was more than Ian could bear (but you should have seen him smile when he told of it). Needless to say, Ian must announce his arrival in no uncertain manner.

HE arrived over the field at 5,000 feet, looped three times, put his PI-B into a vertical dive and held her there for 2,000 feet, pulled out and rolled on to his back, and then flew across the landing field upside-down. Then he dived in for a landing, side-slipped from 500 to 50 feet, leveled off and came down to about 5 feet.

Those on the airdrome who saw Ian arrive watched with bated breaths; those in the barracks, huts and houses who did not see him knew by the changing drone of the engine that something was happening and came out to see, and the consternation of all as Ian gave his plane the gun and headed straight for the operations office at 165 miles an hour five feet from the ground is best left to the imagination.

About twenty feet from the operations office Ian put his plane into a vertical spiral and climbed to 1,000 before leveling off.

"That'll give 'em something to remember me by," he chuckled to himself as he came in and landed in approved three-point manner.

Too well "they" decided to remember him! Ian stepped from his plane and sauntered across to the operations office to report in. He was grinning broadly.

"Lieutenant Ian Potter reporting from Kelly Field, sir," he said to the officer in charge.

"Quite so," this worthy replied. "Just step into the inner office. The Big Chief wants to see you."

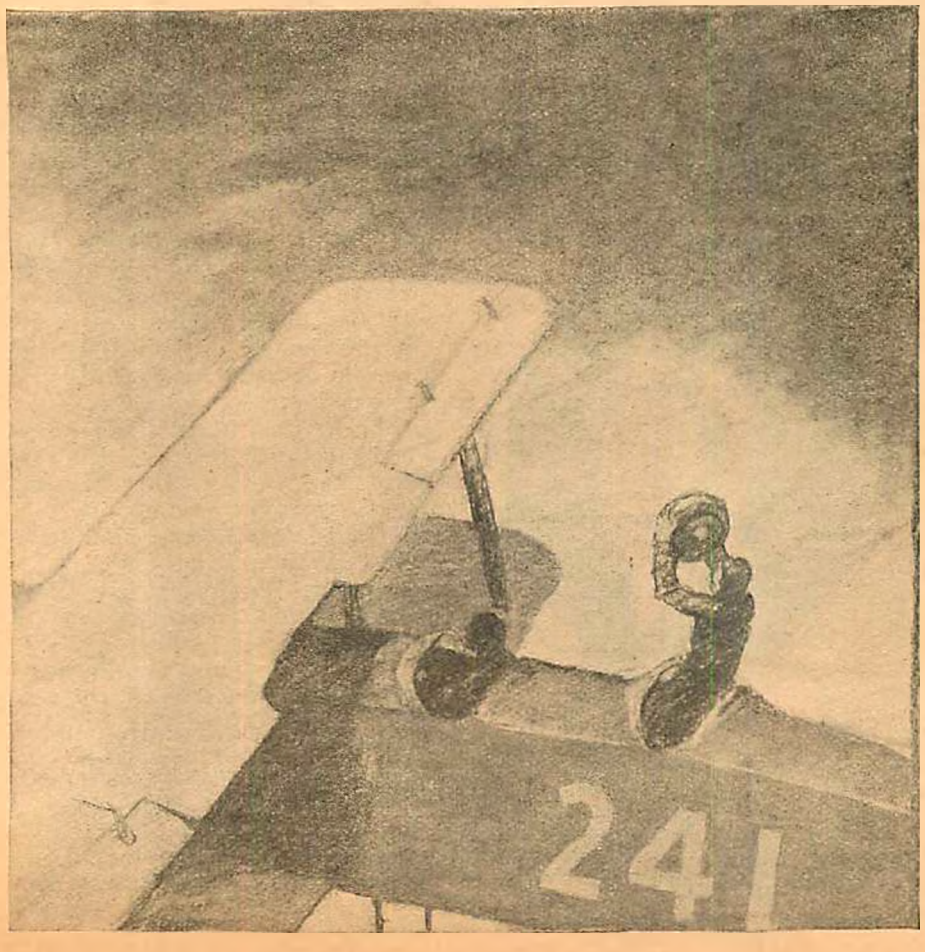
Ian's grin left his face and he walked somberly into the inner office.

"Oh, so you're the young scatter-brain, are you?" was the greeting he received. "What's your name, where are you from, what the blazes do you mean by coming in like that?"

The questions were popped at Ian like bullets from a machine-gun. He stood smartly at attention and answered.

"So?" said the Big Chief, his eyes twinkling in admiration of Ian's daring, in spite of his serious mien. "Well, young man," he continued, "you can cool your heels on the ground for three days. You may go."

Ian saluted and withdrew. "That's a heck of a fine start," he said to himself as he walked out to the airdrome. "Wonder what (*Continued on page 48*)



A mechanic stood up in the gunner's cockpit, holding out the wheel and pointing to the Fokker's undercarriage

The American Sky Cadets

Major-General J. H. MacBrien, president of the Aviation League of Canada, Ottawa (above) congratulating Arnold Rose of Toronto, whose outdoor tractor made a new record of 18 minutes and 49 seconds at Ottawa

J. Ross Farquharson of Vancouver, B. C., (above) who won the trip to England and the Wakefield trophy at the first Canadian championship model aircraft meet at Ottawa. (Below) a scene at the meet

FORTY youthful competitors, representing cities and towns from Vancouver, B. C., to Montreal, took part in the first National championship meet of the Model Aircraft League of Canada at Ottawa, the Canadian capital. The program comprised a two-day meet, with the outdoor contests at Uplands Flying Field and the indoor championships at the Ottawa Auditorium, writes W. M. Gladish, of Ottawa.

Perfect weather conditions were encountered with the result that winners in the outdoor flying stick event established what is claimed to be world's records. The tractors and pushers were able to climb into an "air chimney" which carried many of the machines to the clouds. The rules of the competition provided that the timers were to clock a flight when a machine disappeared from view.

With this in mind, Walter Allder, of Vancouver, B. C., was credited with a flight of 18 minutes 49 2/5 seconds when his model airplane disappeared in the clouds almost directly overhead.

Arnold Rose, of Toronto, won second place in the senior class when his tractor disappeared in 18 minutes, 49 seconds.

Ross Farquharson, of Vancouver, B. C., took third place with 16 minutes 10 2/5 seconds.

Mr. Chas. H. Grant, New Hampshire State Commander of the American Sky Cadets. A flyer himself during the War, he later became a lecturer on the theory of aerodynamics. In 1918 he worked in the field of military aeronautics at the Massachusetts Institute of Technology. Later he was detailed to the technical aviation sections at Washington and then McCook Field, Dayton, Ohio. He is vice-president of the Grant Aircraft Co. and consulting engineer for the Kingsbury Aircraft Co.

These times were official but it is interesting to note that *one of the winning planes returned almost to the starting point in 41 minutes*, but it had been out of sight for a considerable portion of this period and the whole time, therefore, could not be counted.

When it was seen that the tiny craft were climbing and continued to make altitude with dead props, a member of the Ottawa Flying Club took off in a real airplane to search for the tiny craft. On returning to the field, this pilot reported he had seen one of the models at 2,800 feet. Which one it was, he could not say.

Various machines were entirely lost and the local newspapers carried the unique announcement that runaway model aircraft might be found some miles from the Canadian capital and that information regarding any lost plane would be appreciated by the Model Aircraft League.

The outstanding achievement of the indoor meet was a flight of 5 minutes flat which was made by Ross Farquharson, of Vancouver, B. C., with an endurance tractor. This established a new Canadian record, the old Canadian mark being 4 minutes, 5 and 2/5 seconds, made by J. A. Chamberlain, of Toronto, at the Toronto Coliseum last April.

Flashes from Canada, Australia, Ireland and the United States

The outstanding award of the Canadian championship meet was the valuable trophy and the free trip to England presented by Lord Wakefield of Hythe. This was captured by J. R. Farquharson, of Vancouver, who won the grand aggregate with 17 points out of possible 25. J. A. Chamberlain, of Toronto, a junior entrant, was second with 13 points; while another junior, George Richardson, of Montreal, was third with 12 points.

Next in order were Albert Levy, Toronto, a senior competitor, who earned 11 points; Leigh Begg, Vancouver, junior, and Arnold Rose, Toronto, senior, 9 each; Ralph Silverstone, Montreal, and Richard Hiscocks, Toronto, 7 each; George Ryckman, Hamilton, Evan Briggs, Toronto, Victor Hill, Vancouver, George Reed, Toronto, and Walter Allder, Vancouver, all with 5 points each.

There were eight other prize winners; these being from Ottawa, Winnipeg, Calgary, Wainfleet, Edmonton, Hamilton and Weston, thus showing how honors were divided among the cities. Toronto competitors gathered in 50 points; Vancouver boys earned 31 points, while Montreal was third with 19, and Hamilton fourth with 7 points.

A feature of the championships was the scale model contest and scale model exhibition, which attracted more than thirty competitors from many Canadian centers. The winner of the senior scale model championship was Victor Hill of Vancouver, whose entry was a Moth model. Second prize went to Branson St. John of Winnipeg, Man., who entered a tri-motored Fokker. The junior scale model title went to George Richardson of Montreal, who exhibited a Boeing Fighter.

William Mallon, of New York City, holding a model Lockheed "Sirius" which he whittled from match sticks

Members of American Sky Cadets Club of Westtown School, Westtown, Pa. Reading left to right: standing, Henry Speer, instructor, Thornton Brown, Albert Stratton, Henry Worthing, George Wise, Harry Bell, Francis Spickler, Edward Classens. Front row, kneeling, Howard Darnell, Gordon Coale, Robert Hinshaw

Baldwin Model Airplane Club. Left to right, Elden Hazard, Herbert Senne, Douglas Fink, Walter Calhoun, George Frost, Robert Calhoun, Jerome Sheffield. Willard Bixby took the picture

Frank Loughlin, (circle, right) Woodhaven, L. I., with his 1st prize scale model Curtiss *Robin*. Edward O. McDonnell, Jr. (circle, left), Mill Neck, L. I., is shown with one of his flying models

Members of the Wallington Junior Aero Club of American Sky Cadets. (Left to right), Edward Yaschur, John Van Ess, George Van Ess, Emil Horoschak. Center, Andrew Seyschak, Teddy Galka, Mike Hicswa, Stephen Miskuff. Bottom row, John Miskuff, George Yaschur

AUSTRALIA AND IRELAND

IN CASE any of you fellows had an idea model airplane building and tournaments were confined to the United States, news received from several members in Australia will soon dispel this idea.

All over that vast continent these correspondents tell us that boys and girls have taken up this ever-growing sportsman's hobby. Model airplane building and flying has been given a tremendous impetus following the amazingly successful flight of Wing Commander Charles Kingsford-Smith from Oakland to Australia two years ago, and his equally amazing flight from Europe to Harbor Grace, Newfoundland, recently.

His feat served more than one purpose, for Australian model builders, who up to that time had become more or less disgusted with the apparent lack of interest taken in their activities, have now taken a new lease on life and are going ahead strongly.

Where hitherto, one or no model airplane supply stores have been, to-

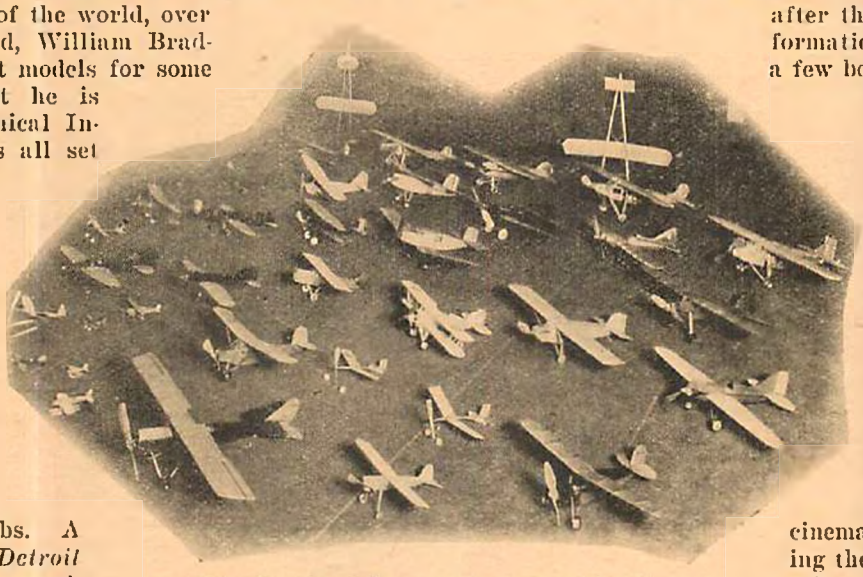
day they are springing up all over the place and as a result the proprietors themselves are taking a greater interest in model plane tournaments.

Mr. A. H. Gamble writing from Sydney, New South Wales, tells us that there they have the finest airplane club in the world—that's the spirit that makes for success—and three air lines. However, the model building game is fairly new there, but coming along nicely.

H. Ashton and R. Hynch both write from Queensland that there is great interest in model planes there and that they are starting clubs.

Fraser Smith from Melbourne, Victoria, writes to say that he is starting up his club immediately. The club is to be known as American Sky Cadets, Australian Branch No. 2. His cousin over at the other end of Victoria has started a branch to be known as No. 1.

At the other end of the world, over in Limerick, Ireland, William Bradshaw, who has built models for some time, tells us that he is attending the Technical Institute there and is all set for joining the British Royal Air Force at the end of this year.



Models entered for contest sponsored by the American Sky Cadets of the Hamilton, Ohio, Y. M. C. A.

DETROIT, MICH.

DETROIT evidently is not going to let any other town show them how to run model airplane clubs. A few weeks ago the *Detroit Daily* sponsored a squadron of American Sky Cadets. In no time they had nearly 200 members, and all just as keen as could be.

Mr. F. D. Van Luven, leader of this club, is proud of the results of his efforts and there is very little doubt that this will develop into one of the largest clubs in the country.

Detroit is already air-minded and the boys and girls are all set on making the city the center of aviation in the future. "Sky Riding," the column edited by Mr. Van Luven in the *Detroit Daily* for American Sky Cadets, contains not only club news, but interesting items relating to aviation in general.

Although the club has been going only a short time, a contest already has been run off and arrangements are being made for the formation of a real glider club among the older members of this enterprising group.

Model building, gliding and flying now follow in a natural sequence, so that the air-minded boy of around ten or twelve years of age can be certain of finding plenty to interest him in his special hobby for the years between his first attempt at model building and his final triumph when he makes his first solo flight.

Not only boys, but also girls are joining the *Detroit Daily* squadron and it is gratifying to see girls taking such an interest.

NEW YORK CITY

JUST a year ago, the *New York Evening Graphic* decided to organize a club. This club was put into the able hands of Mr. Lawrence Shaw. Today, shortly after the anniversary of the formation of this club with a few boys, the Junior Aviation Club of the *Graphic* has a membership of nearly 20,000 and is by far the largest individual club in the world.

Many interesting events have taken place during the last year. Contests have been run, invitations have been given the members by theatres and cinemas, and finally, during the past summer, a certain number of fortunate members were the winners of a free week's most enjoyable holiday at Pinewald, N. J.

This club has now become affiliated with the international organization of American Sky Cadets, and will in future be known as *Graphic* Junior Aviation Club of American Sky Cadets.

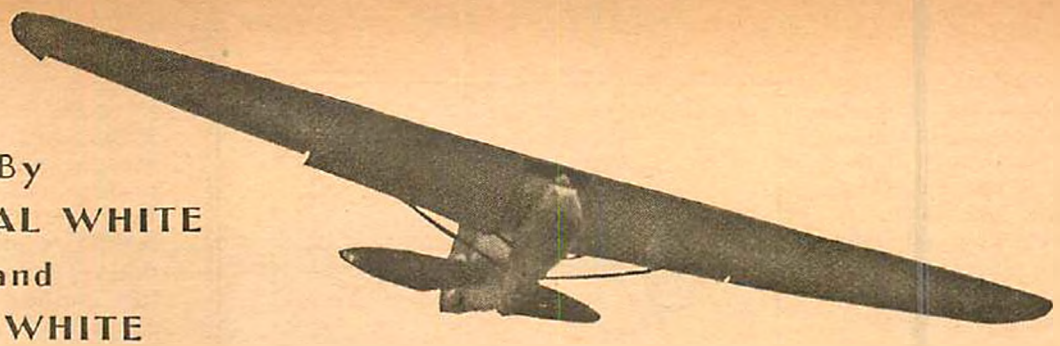
By special arrangement between the headquarters of the Sky Cadets and the *Graphic* club, every member of the latter automatically becomes a Sky Cadet.

In the new season just started, the *Graphic* club is out to reach the 20,000 membership mark by Christmas.

COLORADO GLIDER CLUB

The Flying Troop of Boy (*Continued on page 59*)

Boy Scouts Troop 25, Elizabeth, N. J. at their Aviation Booth at the Merit Exhibition of Union County held at the Elizabeth Armory. Left to right, Niel Koopman, William Evans, Harry Latour, James Cornish, Valentine G. Holzapfel, Charles Arthur Hurt, Fredrick Senkowsky, Aulder Meckler, Bruce Endendyk, Alvin McClelland, Gilbert Grew, Edgar Titus. Back center is V. Holzapfel



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 sixth instalment of the long-heralded series on Gliders and Gliding.*

The authors have obtained the material for these articles from all the most authoritative and up-to-date sources.

Percival White is well known as a writer. He has brought out many books on technical and semi-technical subjects, (such as "How to Fly an Airplane", published by Harper and Brothers), Mat White, the co-author, has collaborated with Percival White in the writing of some of his previous works on aerial subjects.

STRAIGHT FLIGHT

AFTER the take-off, the pilot's object is to keep a primary glider in the air as long as possible. He usually does this by flying in a straight line. Straight flying is more difficult than one might expect.

Recovering from the Take-Off. When you are off the ground and have cut loose from the tow line or shock cord, hold the stick in neutral. If you hold the stick back, the ship will climb and will soon lose flying speed. When a glider stalls in a climbing position there is a tendency for it to fall over on one wing. Until you know from experience how to handle the elevators, it is better to keep the stick in neutral during the take-off. The best position of the stick depends on the ship and on conditions.

Keeping a Straight Course. Keep your eyes fixed on the point on the horizon which you have already chosen for a sight, in order that you may not deviate from your intended course. You keep the glider headed straight by left or right rudder, as the case warrants. Your first few flights will, of necessity, be short ones and you will have little trouble in preventing yawing. You will, however, have to be sure that your wings remain level or your landing will injure the plane.

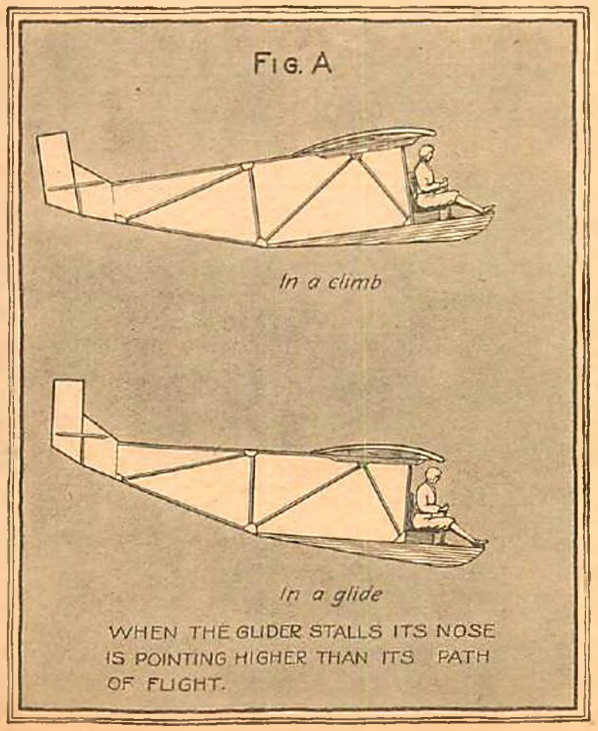
When your flights become extended, however, and you are able to stay in the air nearly thirty seconds, you will find all the controls more necessary. Whenever one wing drops, the plane will normally swerve to that side. To counteract this, apply up aileron and opposite rudder; e. g., if the left wing drops and the nose turns to the left, move the stick gently to the right and push forward the right end of the rudder-bar. Always use rudder and aileron proportionately. A secondary training glider is usually more sensitive than the primary training glider and the movements will be accentuated in it.

In spite of the temptation to look at the wings to see whether or not they are level, the best plan is to keep your attention concentrated on the sight chosen in front of you.

You will soon get the "feel" of the plane, so that you will know instinctively whenever one wing drops below the other.

Angle of Glide. The angle of glide is the angle which the glider's path of flight forms with the horizontal. A very sharp angle of glide is called a dive, and makes the glider go towards the ground at a high speed.

A very flat angle of glide, in which the ship's path of flight is almost parallel to the horizontal, slows up the speed and tends to result in a stall. The most effective angle of glide is between a dive and the stalling point, when the glider loses altitude at the minimum rate.



Several factors affect the angle of glide. When the glider's airspeed is high, the ship will not stall at even a comparatively flat angle. The proper angle of glide varies with different gliders. The primary training glider is heavy in proportion to its span, and therefore, its angle of glide is much steeper than that of a soarer. The amount of wind is, of course, one of the most important of these factors.

After the take-off, the plane will begin to lose speed gradually, and the angle of glide must be made relatively sharper in order to maintain your airspeed. During the take-off you have kept the stick in neutral. It is now necessary to put it in such a position that the ship will assume the correct angle of glide. This position is, in most gliders, a little

ahead of neutral. Do not push it ahead too far—too steep a glide will give you insufficient time to pull out of it and keep the glider from landing nose down.

In your first few take-offs, you will be obliged to push the stick forward quite soon. Later, however, you will be launched into the air at a greater speed, and the impetus from the take-off will be more lasting. It will then be possible to hold the stick in neutral for a longer time before pushing it ahead for the glide.

You can learn only by experience what is the most effective angle of glide, and when to push the stick ahead of neutral.

Handling the Controls in Straight Flight. The promptness with which the glider responds to control movements depends upon the ship's airspeed. At a high speed, for instance, the pressure on lowered elevators is greater than it is at a low speed. Immediately after the take-off, the controls are sensitive and only slight movements are needed. But, as the ship loses momentum, the controls become less effective. Thus, near the end of the flight, only a broad sweep of the stick to the side will bring up a lowered wing.

Nevertheless, the tendency of beginners is to over—rather than to under—control. Unless your control movements are steady, the movements of the ship will be jerky. You may imagine that the stick is a rigid lever fixed to the glider, and that you must press the ship in the right direction with this locked lever. In order to make control movements smoothly, try to sit in a relaxed position.

Bumps. "Bumps" are atmospheric disturbances caused by conflicting currents of air. When the glider strikes a bump, it rises and drops again suddenly, or careens, as a ship does when it encounters an unusually large wave. Bumps are very common whenever the wind is high. If you strike a bump, do not think the irregularity of your flight is due to your poor manoeuvering. No loss of control will result from a bump so long as flying speed is maintained.

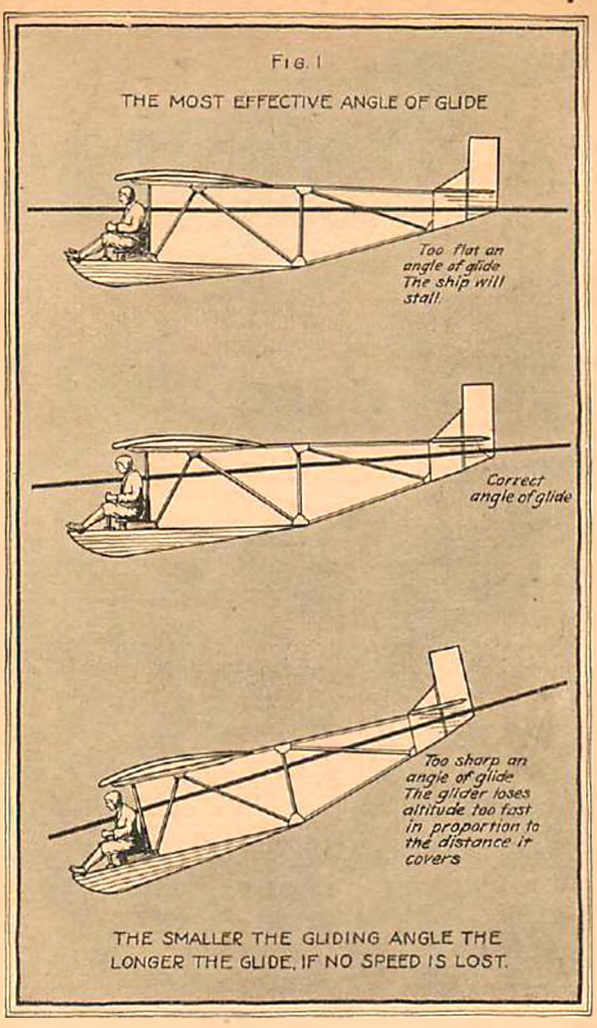


FIG. 1
THE MOST EFFECTIVE ANGLE OF GLIDE
THE SMALLER THE GLIDING ANGLE THE LONGER THE GLIDE, IF NO SPEED IS LOST.

Path of Flight. Just as the plane's airspeed is an entirely different thing from its groundspeed, so its path of flight is independent of its progress over the ground. Path of flight means the course which the ship takes through the air. The boat going across the river does not point its bow in the direction in which it is actually going over the ground. It heads to the windward of the point it wishes to reach, and thus makes "leeway".

In the same way, the glider, if it turns from its original course directly into the wind, must allow for "drift" in order to maintain straight flight. Thus, if the pilot wishes to fly toward a tree on the horizon and the wind is coming from his right, he must head slightly to the right of the tree. The glider will appear, from the ground, to be going sideways, or "crabbing".

It is dangerous to attempt to glide across the wind, however, and you will have no occasion to do so at first. If a take-off is poor, so that you are not going straight into the wind, you must turn until you are doing so.

How to Avoid Obstacles. If you do not follow the course originally planned, or if you glide farther than you expected, you may encounter obstacles. In this event, it may be possible to turn aside to avoid the obstruction. Frequently, you may be able to dive slightly and land before you reach it. You must use good judgment. If you find it necessary to climb over the obstacle, remember one thing: Speed is necessary in order to climb.

Whether you attempt to climb or not will depend on the height you are above the ground and the chance you have of diving first, for to gain speed you must dive. If you pull the stick back and climb too soon, you may be obliged to dive a second time, in this way losing your impetus and being unable to fly clear. Therefore, it is im-

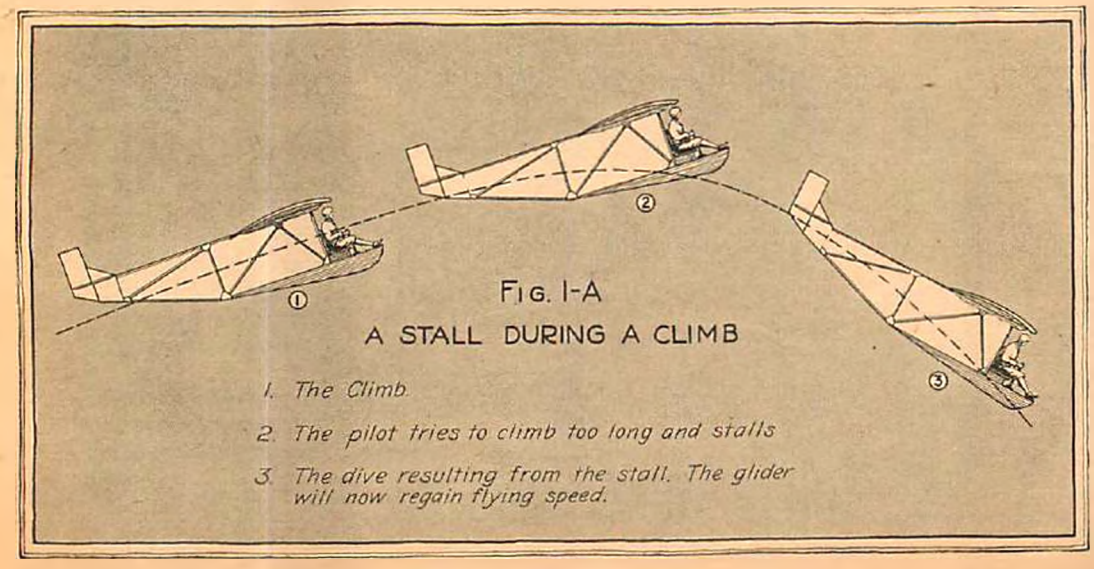
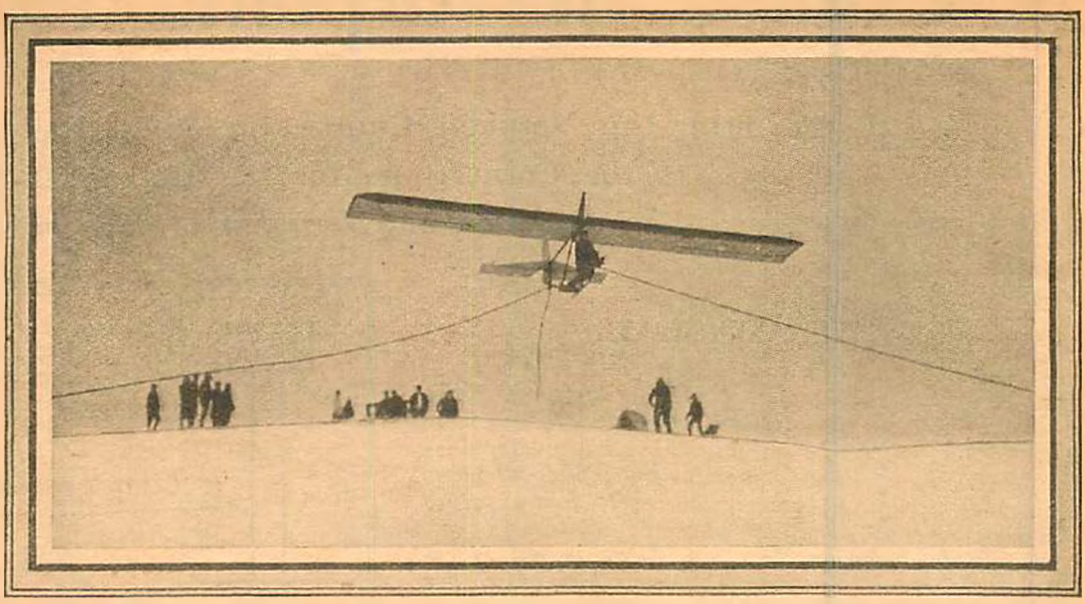


FIG. 1-A
A STALL DURING A CLIMB
1. The Climb
2. The pilot tries to climb too long and stalls
3. The dive resulting from the stall. The glider will now regain flying speed.



perative not to pull the stick back until you are almost upon the obstruction.

Gliders Flown as Kites. Gliders are not always cut loose from their tow lines. In this case, the automobile, motor boat, or airplane simply continues to move ahead with the glider in tow. The tow rope is sometimes carried on a reel and let out gradually, sometimes to lengths of 1200 feet. The glider when towed by boat or car is usually able to attain an altitude half as great as the length of the line. However, this method of flight is comparatively difficult, since the speed of the towing machine must be very regular, and since the tow line is apt to slacken and then suddenly become taut again. The shock of the sudden tightening of the line may be partly offset, if the glider's pilot dives for a moment to gain speed.

Towing by airplanes, except for the purpose of launching the glider, has been forbidden by the Department of Commerce. By special dispensation, however, Captain Hawks made a record towed flight from coast to coast behind a Waco-10 biplane.

Conclusion. Straight flight is easy in theory but it becomes more and more difficult in practice as flights grow longer. To be proficient, even at straight flight, experience is necessary.

FIVE THINGS TO REMEMBER ABOUT STRAIGHT FLIGHT

1. Primary training gliders are comparatively stable. If you do not do anything violent it will probably land you correctly.
2. Keep your eyes on the chosen site on the horizon.
3. Don't pull the stick back too soon when about to climb over an obstacle.
4. Keep your gliding angle such that you have control of your ship but are not wasting altitude.
5. Keep flying speed!

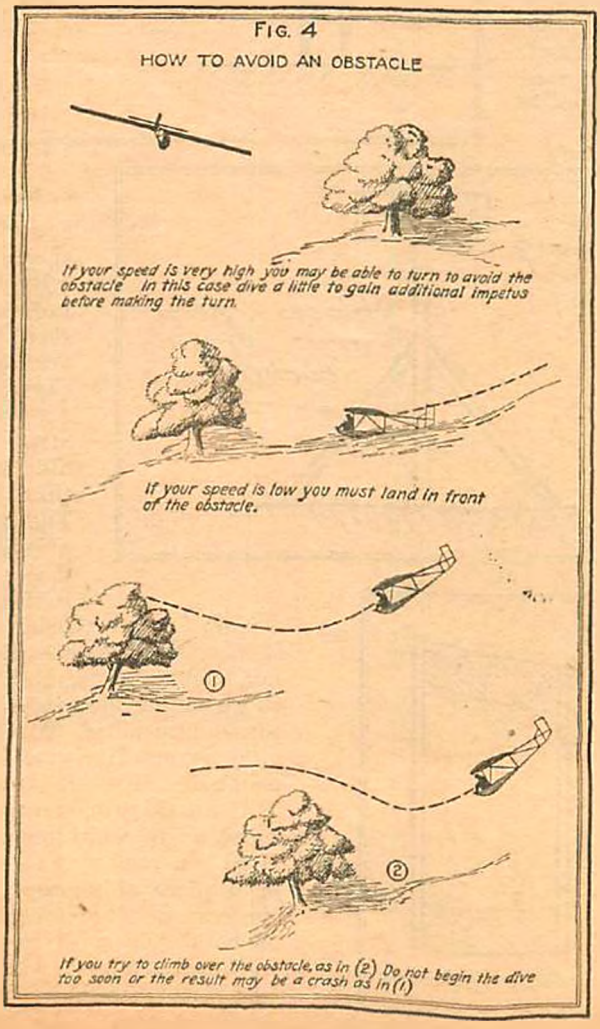
CAUTIONS TO MOTORED GLIDER PILOTS

1. Don't try to climb. You can't "give her the gun."
2. Don't dive too steeply. Gliders are not built like pursuit ships.

STALLS

A stall is the condition resulting from the loss of flying speed. When the glider stalls, the controls become ineffective. Stalls should be avoided, since loss of flying speed causes the ship to settle earthwards, while the maintenance of sufficient height above the ground is one of the main objects of the pilot. However, a stall is normally effected in making the glider drop gently to the earth for a landing, and you should understand about them both as to when to use them and how to avoid them.

When the glider loses flying speed, the force of gravity overcomes the lifting force. When this occurs the ship "stalls" and starts to fall. At the moment of stalling, the glider's nose is always pointed higher than the path of flight. Although the ship may stall and start to fall in almost any altitude (whether it is climbing, gliding, or turning), it always assumes a diving position eventually. It does not dive sharply, however, since the glider is light. The nose, containing the pilot's weight, is the heaviest part of the plane, and is the first to fall. When the glider dives, it gathers momentum, until flying speed is regained.



Danger of Stalls. When a motored plane stalls, the result may be serious, often disastrous. This is because an airplane is heavy, has high flying speed, and small wing area, so that it sometimes does not have time to regain flying speed before it crashes on the ground. A glider, on the other hand, is light and if properly handled, can usually be brought out of a stall after a drop of no more than twelve to fifteen feet. Even if the glider stalls too close to the ground to be able to recover, the crash would probably not injure the pilot, although the ship itself (*Continued on page* 40)

A Course in Airplane Designing

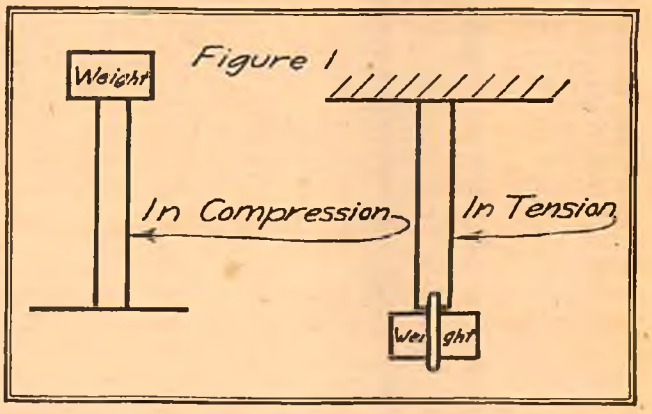
By Mastering this Valuable Course, the Model Builder of Today Lays the Cornerstone for His Career as the Aeronautical Engineer and Designer of Tomorrow

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.*

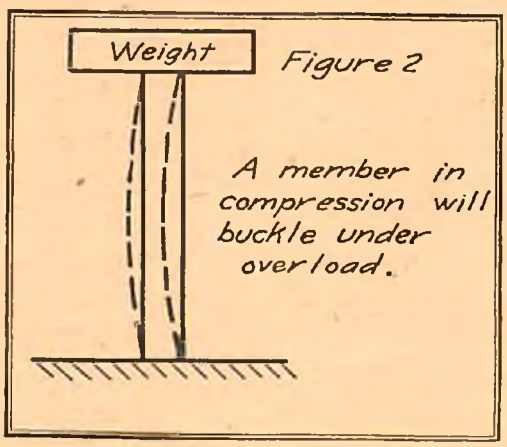
The policy of MODEL AIRPLANE NEWS *is not to encourage or teach its readers to become pilots, but rather to become aeronautical engineers, designers, salesmen, manufacturers, or equip themselves for any other positions which require the training of the specialist or executive. Study this course from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

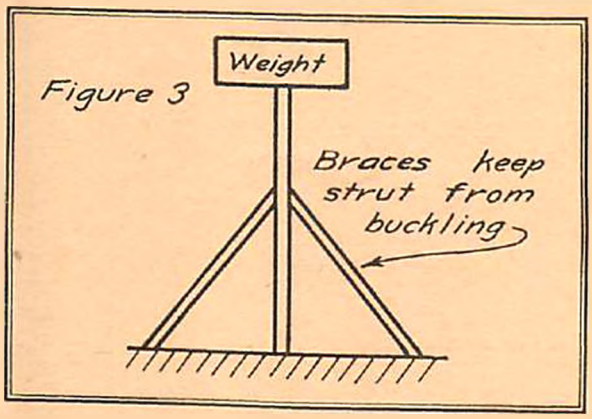
THE EDITOR.



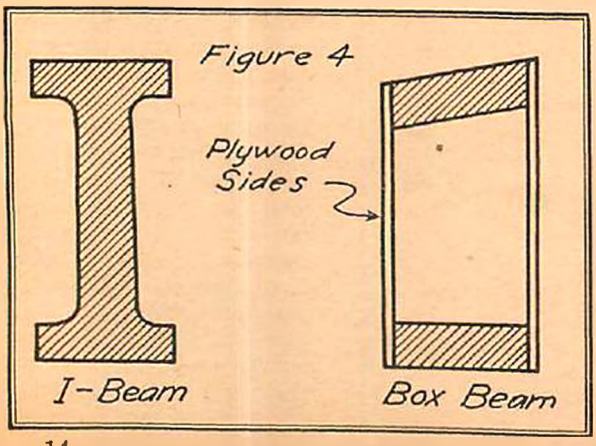
IN the last article we learned that a strut or other member in direct stress may be either in tension or compression. Tension, we found, is the condition in which the forces applied to a member try to stretch it out, to lengthen it. Conversely, compression is the case in which the applied forces tend to compress, or shorten, the member.

Figure 1 shows a strut in compression, and also one in tension. Let's take a good look at the member that is in compression. If we make the load large enough, it is certain that the strut will fail at some time when the load gets too heavy for it to support. However, just how is it going to fail? From practical experience one would immediately say that it would buckle and bend outward, as shown in Figure 2. That is quite true. Since members in compression fail by bending outward, it is not advisable to make them very long, because the longer a member is, the easier it will bend and buckle.



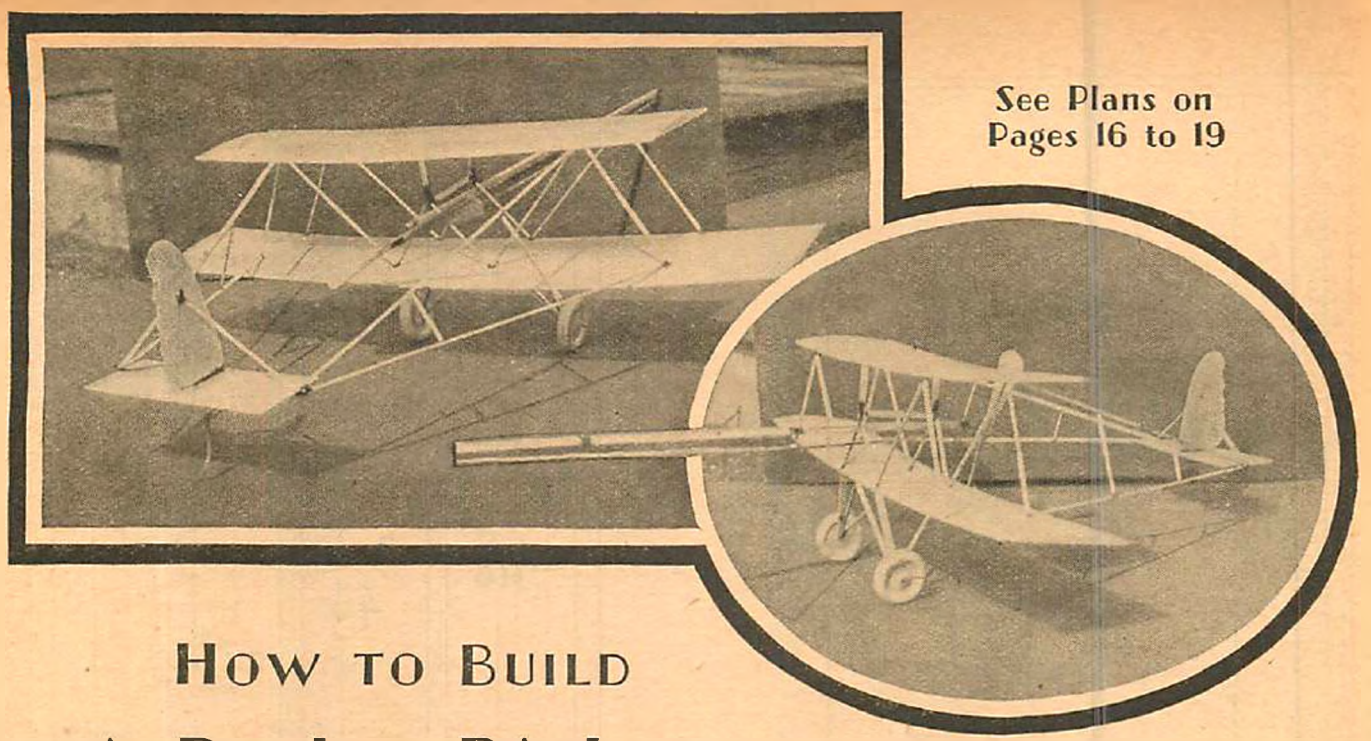


Suppose we have to use a long compression member. What shall we do then? We can help matters a great deal by bracing the member so that it cannot bend outward, as shown in Figure 3. This bracing holds the strut in its position, and it will be able to withstand a much greater load than it would if it were unbraced. The case of the long member in compression does not occur very often, but it is a good idea to know how to brace it if one has to do it.



Now for our tension member. What will happen to it if too much load is placed upon it? Certainly, it will not buckle. A member in tension can only pull apart, so we cannot help it by bracing as we did with the compression member. A tension member, if it is in tension *only*, is not likely to be weaker if made longer than usual, because tension does not buckle the member.

About this time many readers will be pretty well confused as to what tension and compression *really* are. Here is a good way to remember it. Take a small chain or a piece of string. Pull on both ends, away from the center. The string is in tension. Now try to push on both ends, pushing toward the center. That doesn't work. Therefore, whenever confused about the two, just remember that a chain or (*Continued on page* 52)



See Plans on Pages 16 to 19

How to Build
A Pusher Biplane

An Unusual Model Along Scientific Lines

By Prof. T. N. de Bobrovsky

IT will be of interest to the readers of the Model News to start with the building of a pusher type of biplane that is somewhat different from the conventional type of biplanes. This is not actually an entirely new type of plane as many biplanes of this type were built in the year 1909. Now unusual models are not seen so often but these had an especially good record before and during the period of the World War in the German flying model contests. They were built of materials whose specific weights were higher than those made of balsa. They were excellent flyers and hardly breakable.

The lower wing of our model, as can be seen from the drawings, has two feet of wing spread. As shown in the picture, a long motor stick is mounted on the model. Finished, it weighs .140 of an ounce. By starting from ground the biplane model takes off after one-foot run, flies slowly and is an excellent model for long distance and altitude flying. It is not seldom that it reaches an altitude as high as 150 feet.

The main differences between this type and other types of planes are that like the Italian Fiat and Caproni planes, the upper wing is much shorter and the wing struts have the same kind of structure as the old German type of plane, the Albatross (1910). The model mounted with small pontoons is the best hydroplane and takes off just as easily as a landplane. The structure is simple enough for anybody to build. That is *the best type of plane for model contests where the models have to carry useful loads.* Even loaded with 15% of useful load the performance of the model would not change.

Let us start to make the wing ribs first. All the wing ribs as shown in Figure 2 are made of 1/16" thick medium balsa wood. The two wings have 16 ribs; seven for the upper and nine for the lower wing.

The upper wing is depicted in Fig. 3. After we finish the ribs we get two 17" x 1/8" x 1/16" medium balsa pieces. One is the leading edge and one is the trailing edge. We have to ambroid the ribs to the spars exactly on the points as is marked on the drawing. The finished wing skeleton is to be covered right after drying with Japanese silk Hackone tissue paper. Now the upper wing is finished.

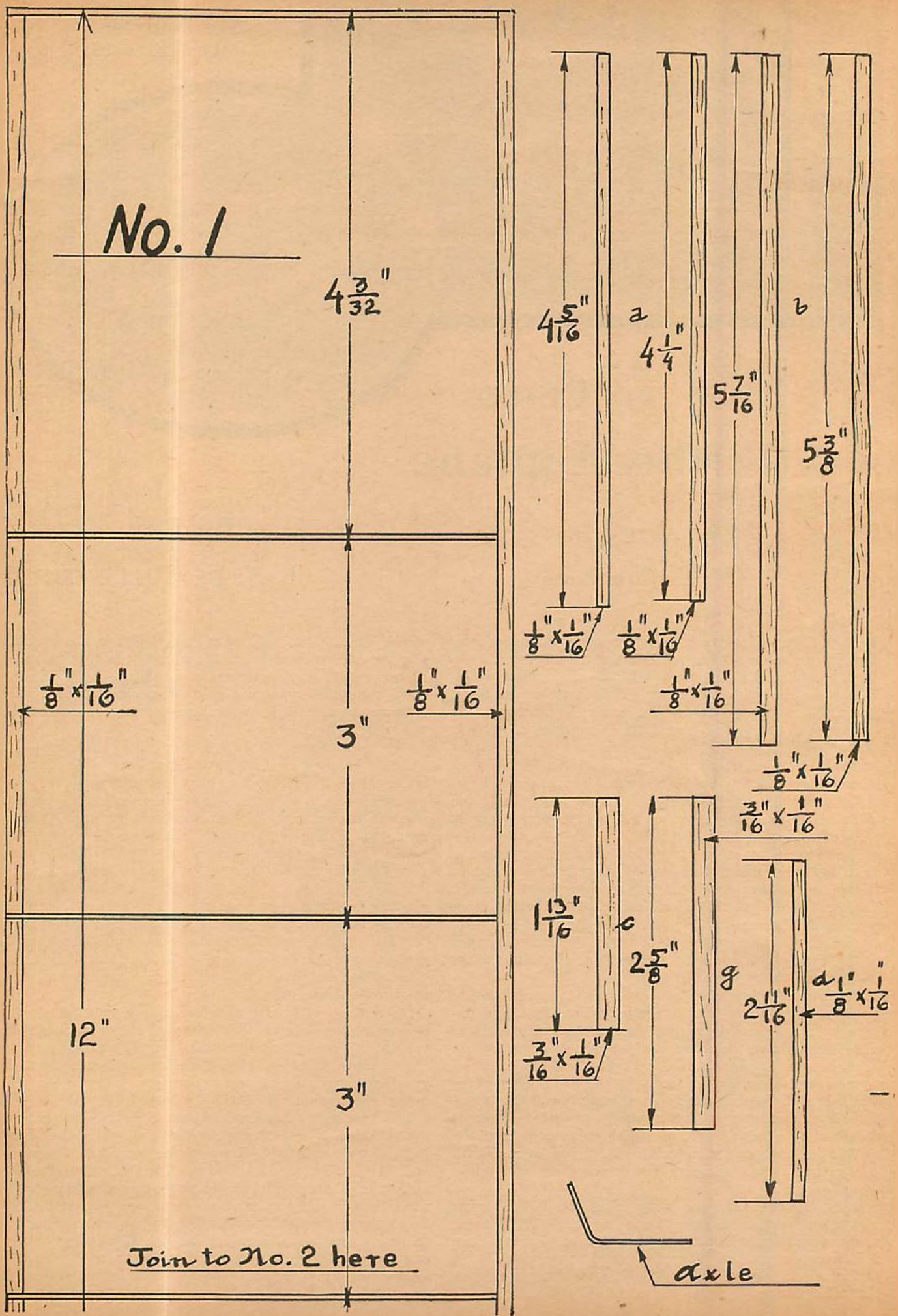
Cut two pieces of 24" x 1/8" x 1/16" medium balsa wood to be used as leading and trailing edges for the lower wing. Just the same way as in the upper wing, we ambroid the nine ribs to the leading and trailing edges in the same manner as shown in Figures 1 and 2. After the entire wing frame has been assembled, the whole wing has to be covered.

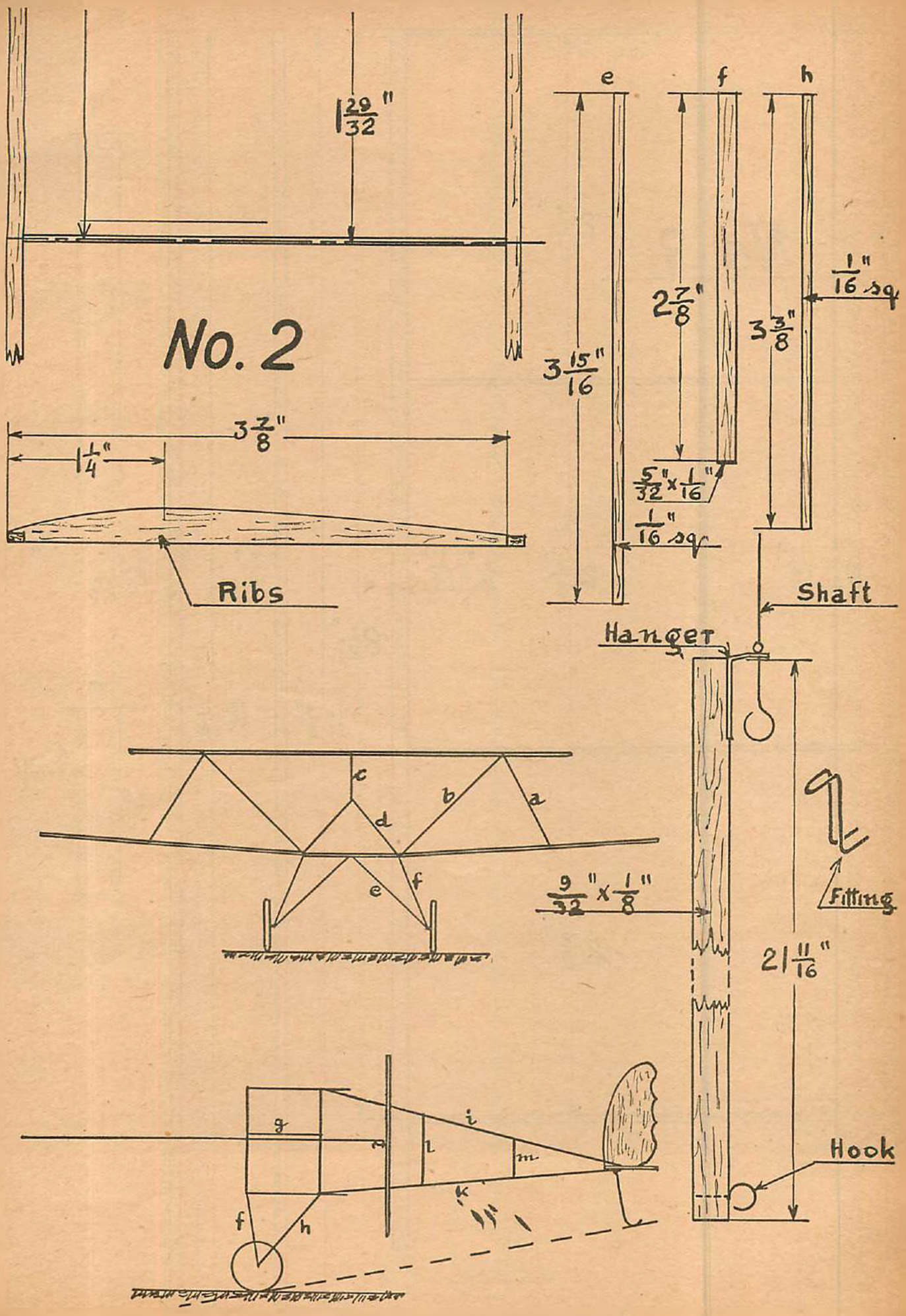
On the picture No. 1 are shown the "a", "b", "c", "d", and "g" balsa wood pieces. Of "a" and "b" we have two kinds; the longer ones are the front, the shorter ones the rear struts. Next cut two pieces of each of "d" and "c" the same length. It is a very good practice to sandpaper all pieces except "g" on streamline form. The reason for this is to keep the air resistance down as much as possible.

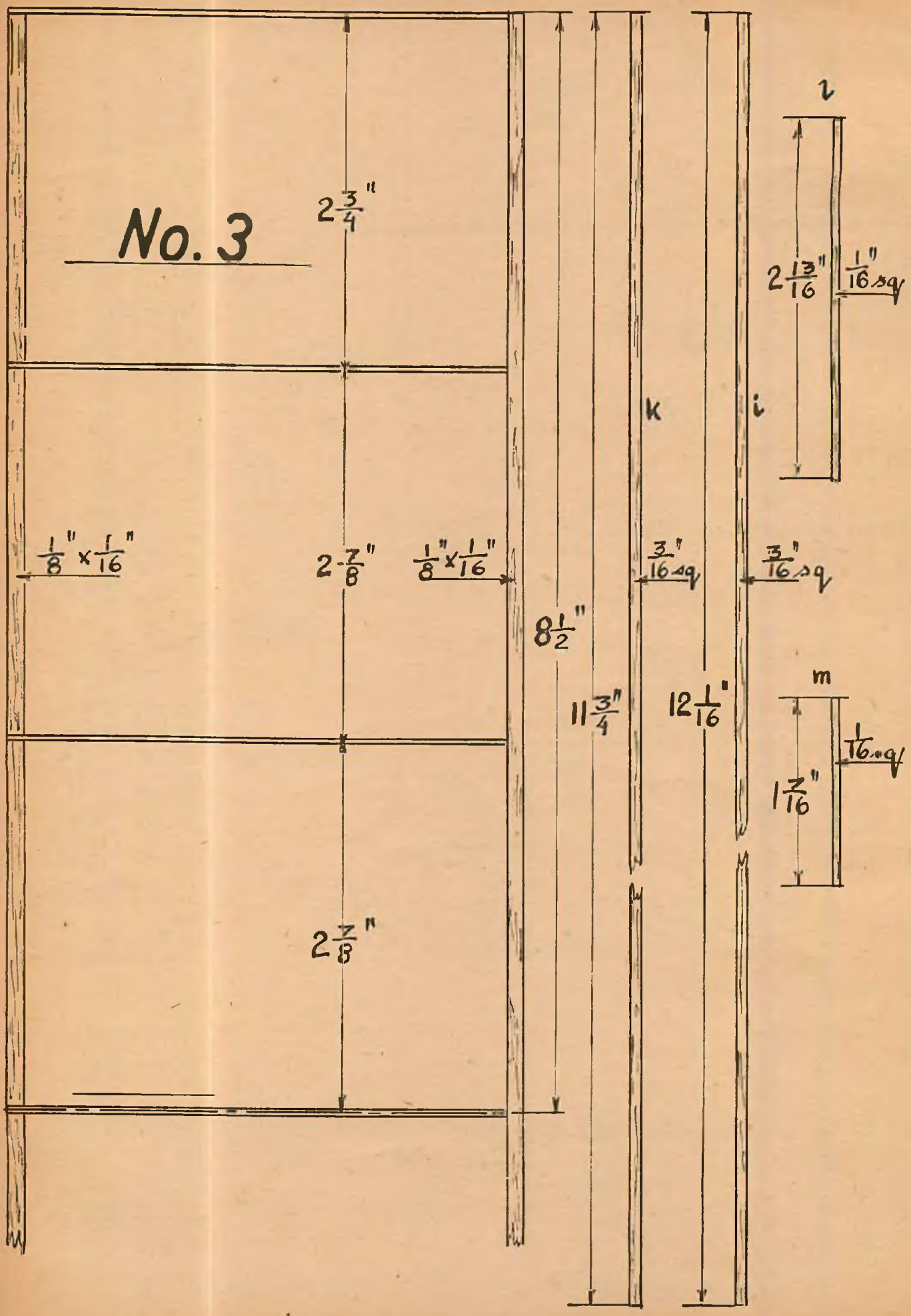
On the assembly drawing No. 2 are marked the locations of the different wing struts. First assemble the "a" and "b" struts, and as a last manipulation, put the center pieces in place. This makes a rigid structure. If you look your wing structure over you will see that the lower wing has a dihedral.

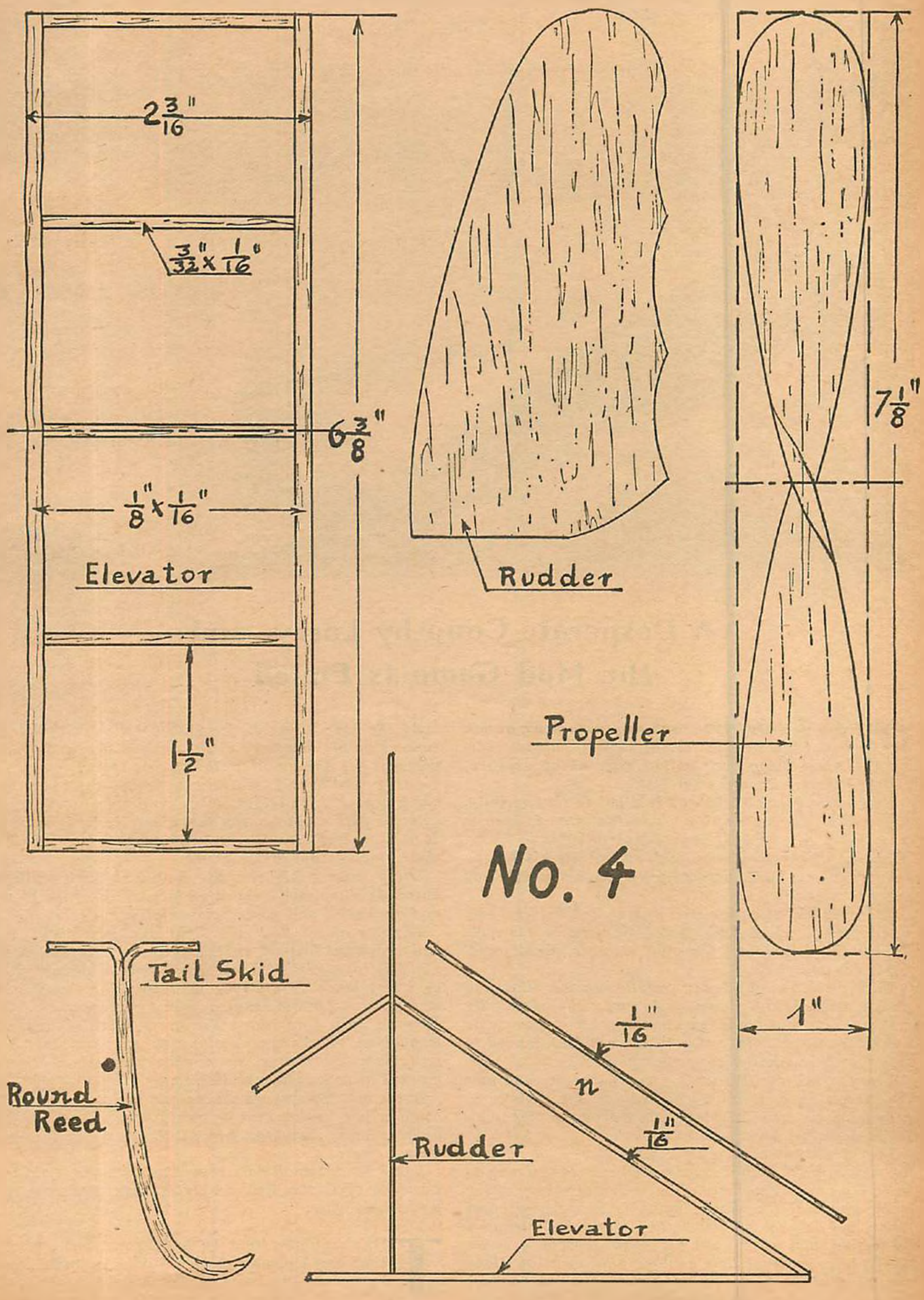
The outriggers are depicted on Fig. 3. We prepare two of each of the outriggers "k" and "i", using hard balsa wood and two pieces of the vertical struts "l" and "m", using medium balsa. The last ones can be made round. The finished pieces we have to glue to the wings in the same manner as shown on Figure 2. Ambroid the "i" and "k" outriggers to the wings and the outer ends to each other. In the same time the elevator can be made according to the dimensions on Fig. 4.

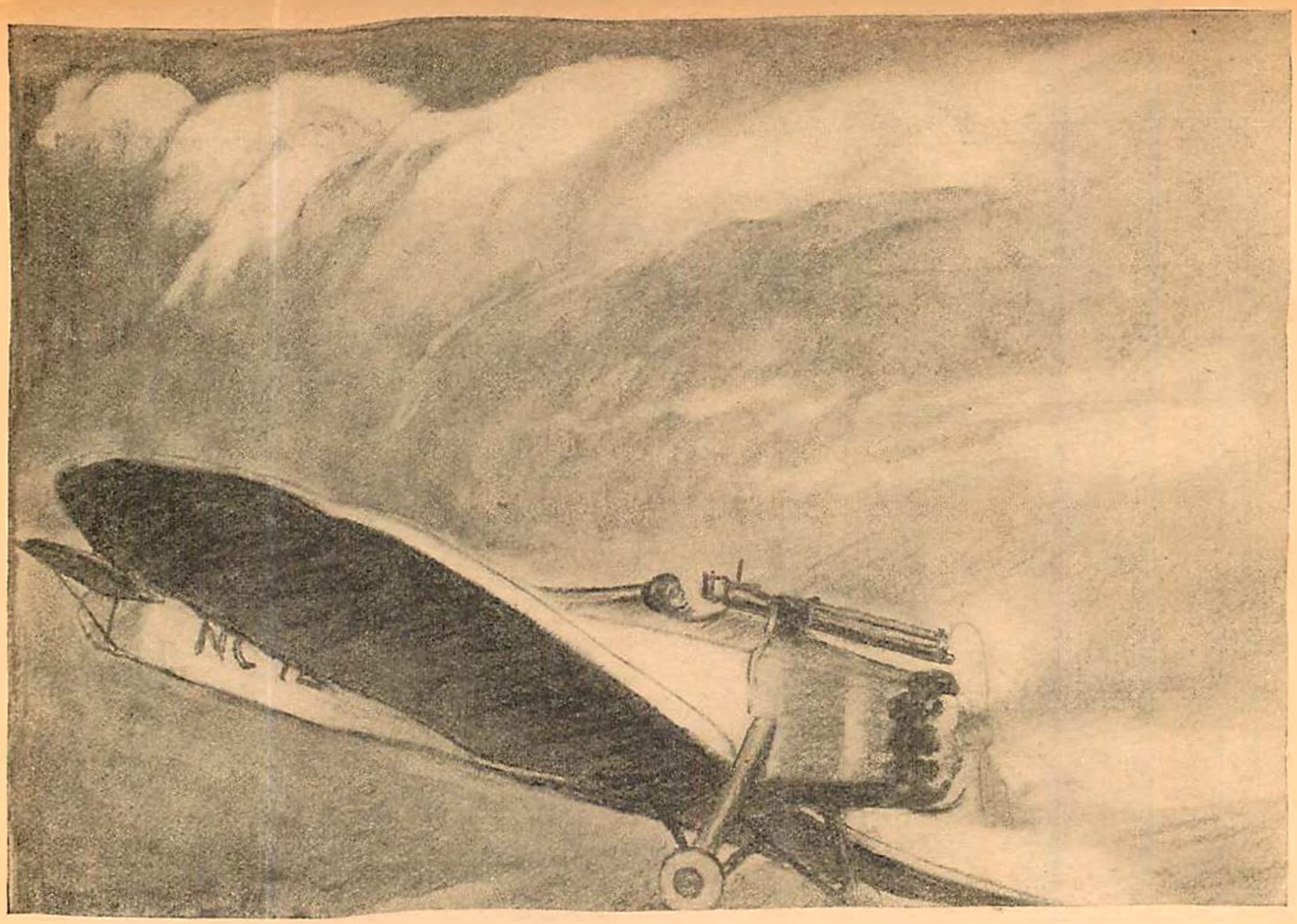
The ribs are not streamlined but it is best to sandpaper the leading and trailing (*Continued on page* 58)


No. 1
4 3/32"
1/8" x 1/16"
1/8" x 1/16"
3"
12"
3"
Join to No. 2 here
4 5/16"
a
4 1/4"
5 7/16"
b
5 3/8"
1/8" x 1/16"
1/8" x 1/16"
1/8" x 1/16"
1/8" x 1/16"
3/16" x 1/16"
1 13/16"
c
2 5/8"
g
2 11/16"
d 1/8" x 1/16"
3/16" x 1/16"
axle


1 29/32"
No. 2
3 7/8"
1 1/4"
Ribs
e
f
h
3 15/16"
2 7/8"
3 3/8"
1/16 sq
5/32" x 1/16"
1/16 sq
Shaft
Hanger
c
b
a
d
e
f
9/32" x 1/8"
Fitting
21 11/16"
g
i
l
m
k
f
h
Hook


No. 3
2 3/4"
1/8" x 1/16"
2 7/8"
1/8" x 1/16"
2 7/8"
8 1/2"
11 3/4"
k
3/16 sq
12 1/16"
i
3/16 sq
l
2 13/16"
1/16 sq
m
1 7/16"
1/16 sq


2 3/16"
3/32" x 1/16"
6 3/8"
1/8" x 1/16"
Elevator
1 1/2"
Rudder
7 1/8"
Propeller
NO. 4
Tail Skid
Round Reed
1/16"
n
1/16"
Rudder
Elevator
1"



A Desperate Coup by Larry—and the Mad Game Is Ended

ONE day as Larry Price was returning home on his bicycle, he noticed a formation of airplanes overhead. Larry, being very enthusiastic about aviation, watched them with great interest.

Ever since Plank Field was laid out in that vicinity, Larry had had one ambition, and that was to become an aviator. However, it seemed unattainable to an orphan lad of eighteen, who had worked all his life on the farm of his foster parents, with whom he really had never been happy.

Suddenly his attention was drawn to the last plane in the group, which had started to sideslip. Its cockpit was in flames, and the pilot was already descending in his parachute.

With all his might Larry pedalled to the pilot, and finally located him dangerously near the river. He dragged him away and was making him comfortable when the other pilots, aware of the accident, landed to look for their missing comrade.

Larry left Major Riddle, a famous war ace and now superintendent of Plank Field to them, and assisted in examining the wrecked plane. He discovered three bullet holes in the tank.

The pilots took Larry back with them and he was taken on a flight by Heinze, who had seemed to Larry to be acting in a strange manner over the discovery of the bullet holes. Heinze knew that this was Larry's first flight, and he did not know that Larry had strapped himself in, and yet he put his plane through a series of stunts so perilous that another pilot drew up along and shouted at him. Larry, however, tried to save Heinze when they landed by saying that Heinze was only trying to scare him a little.

At the aid station Major Riddle talked with Larry concerning his discovery of the bullet holes, and of his personal life and ambition to become a flyer.

Larry went back to the farm and almost got over the excitement of the accident when an airplane dropped a cylinder with a note on the field where he was working. It was from Major Riddle, who wanted Larry to become his assistant at the field.

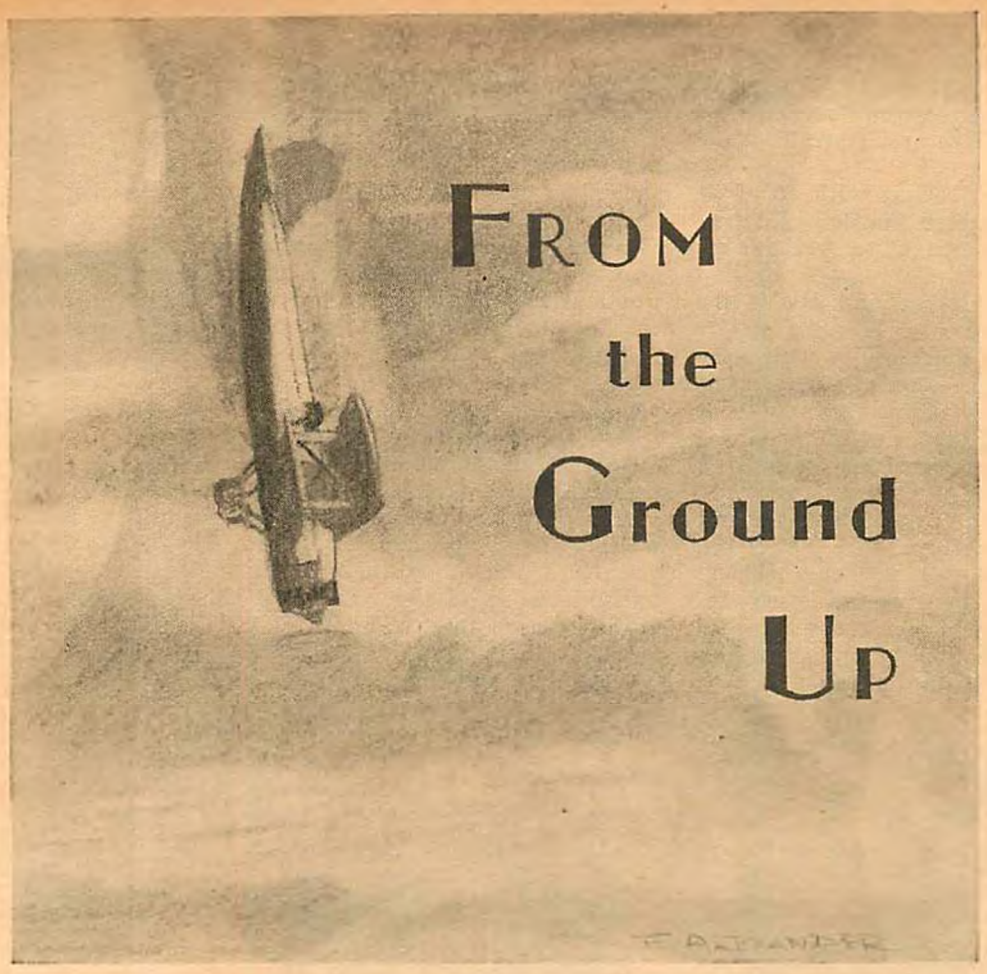
Larry entered his new life on Plank Field with a burning enthusiasm, learned all he could from the pilots and mechanics and pored over aviation books at night.

The day of his first solo flight went gloriously. He had acquitted himself well, and every ship on Plank Field acted as escort to welcome him in. However, just as Larry made as pretty a landing as he hoped, and was waiting for his landing gear to scrape the earth, Heinze's ship tore along the ground behind Larry's monoplane. There was nothing to do but throw his monoplane off course, or wreck each other. Larry cracked his plane to save Heinze.

But when Heinze came over and taunted him with being yellow, saying that he would have missed him by a yard, Larry sprang at him. With hatred in his eyes Heinze rushed to meet him.

But here Major Riddle separated the two, ordering Larry to go to the first aid station, and Heinze to report to his office.

THE happiness that he had known but a short time ago had entirely left him. An awful rage burned in his heart as he thought of the mad flying of Heinze. His triumph had been short lived. Heinze with his distorted mind—his pleasure in



From the Ground Up

By Frank Pierce

Illustrations by F. Alexander

A ripping thread of fire shricked from the synchronized Browning that was mounted in the biplane's cockpit

hurting others—had ruined the glory of this whole day.

Furthermore, deep in his heart, he was afraid that perhaps the reckless pilot's words were true. Possibly he would have missed him by a yard. Whatever else the vices of Heinze, he was a first rate pilot. Only the Major was his equal at the controls. Perhaps Larry had cracked up the monoplane unnecessarily. But he knew within him that he had not been actuated by fear but rather by a desire to save Heinze as well as himself. He had honestly believed the other's ship had gotten out of control.

THE iodine that was applied to his wounds stung bitterly, but he didn't mind. The ache in his heart transcended all physical pain. He made his way to his quarters, carefully avoiding the mechanics as he walked across the field.

A soft Texas night flung a cooling blanket over the flying field. A pall of silence hung over the hangars and the paint-chipped buildings that flanked the broad expanse of Plank Field. There was no sign of life, save for the occasional gleam of the night watchman's lantern as he made his rounds. Then a thin shaft of yellow appeared on the road that lead to the superintendent's office and a moment later Larry Price parked his bicycle against the building and walked slowly toward the hangar.

The Major was to take out the big biplane the next day with a special shipment which had to be delivered to Oklahoma City. He was scheduled to leave at dawn and Larry was following his usual custom of stocking up Riddle's ship with sandwiches and coffee before the takeoff.

He was much earlier than usual. Dawn was still two hours away. But somehow his normal sleep had not come. Thoughts of the day's crack-up kept running through his mind, and back of it all was a picture of Allan Heinze with his scarred, mocking face. Larry felt that some inexplicable mystery was connected with the man—some sinister thing in the past that had made him a misanthropic madman. Suddenly he remembered the bullet holes that he had found in the Major's ship three months ago, and he was thoughtful as he trudged across the field.

The watchman's light showed him to be at the far end of the field. Larry swung back the heavy hangar door, and entered the building. His hand reached out for the light switch which he knew was on the wall by the doorway. Then he stood stock still in the darkness, every nerve alert. For there came to him through the blackness of the hangar a faint clanking sound. Tensely he listened. Louder and louder came the familiar noise of metal rasping upon metal.

As his eyes became used to the dimness, he could make out the bending figure of a man on the opposite side. The glow of a small flashlight pierced the darkness from time to time as the man, whoever he was, focused a shaft of light on the fuselage of the ship on which he was evidently working.

LARRY'S pent-up emotions caused by the strain of the day made him spring to action without reckoning the consequences. His hand groped along the wall and found the light switch. In another moment, the hangar was flooded with brilliant light. A vicious oath shattered the stillness of the night. A bent figure straightened up, and Larry found himself gazing in the blazing eyes of Allan Heinze.

For a moment they stood regarding each other in utter silence—a silence that was fraught with tension. Finally, Heinze spoke. His tone was quiet—ominously so, and he clipped each word off as though it were a missile.

"What do you want here?"

Larry eyed him calmly. "I might ask the same question of you," he retorted. "What are you doing here at this hour in the dark. Honest men aren't afraid of the light."

Again Heinze glared at him. It was with an effort that he found his voice. "Whatever I'm doing," he replied, "is my business. I've got a right to overhaul my own ship."

Larry's gaze went beyond the other, and saw in the background the familiar outlines of Heinze's speedy biplane. As he looked at the machine on which the other had been working, an expression of utter amazement came into his eyes. For protruding from the front of the cockpit, between the still blades of the prop was a black, gaping cylinder. Larry excitedly pointed a finger at it.

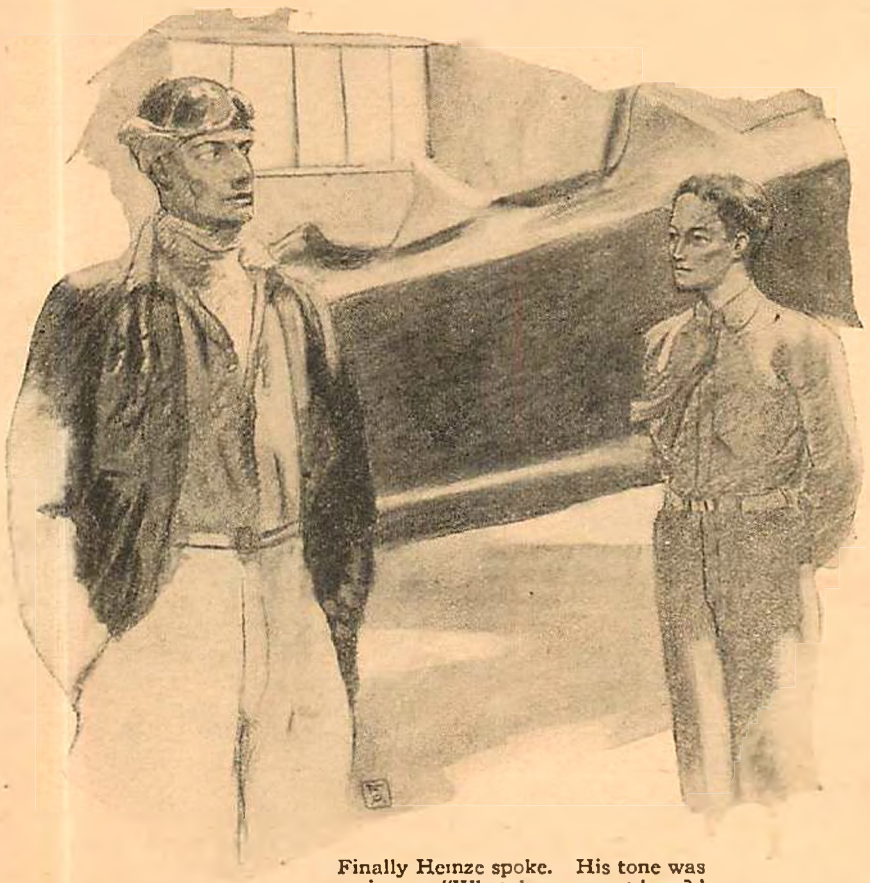
"What's that?" he asked, his voice tense and vibrant.

Heinze's eyes followed his gesture, then he turned and again looked at the boy before him. For a moment he said nothing. Then a slow, mocking smile crawled over his face. With a swift gesture his hand flashed to his hip pocket, and when he spoke, it was from behind the threatening muzzle of an automatic.

"Don't move," he said, "or I'll drill you. Now since you want to know things, I'll tell you. That thing that I've just attached to my ship is a machine gun."

Larry gazed at him steadily. Despite the silent threat of the weapon, he had not flinched. His throat was dry, but when he spoke his voice was steady enough.

"What's the machine gun for?" he asked.



Finally Heinze spoke. His tone was ominous. "What do you want here?"

HEINZE laughed—and that laugh caused Larry's blood to run cold. It was an hysterical, fiendish laugh, and his eyes gleamed evilly at Larry over the muzzle of the automatic, which he pointed unwaveringly at him.

"Why?" cackled Heinze. "I'll tell you why. To kill with—to murder with. To slay the swine that killed my brother."

Larry's brain functioned on all its mental cylinders. He was convinced that he was dealing with a madman. The reckless eccentricities of Heinze had at last developed into a definite insanity. He decided to temporize, to humor this maniac until he saw a chance to leap for the gun.

"Why, Allan," he said easily, "who killed your brother? You've made a mistake somewhere. No one here has harmed your brother."

"No?" said Heinze, and his lips contorted in hate as he spoke. "It was Riddle. He shot my younger brother down in a flaming crate over the front line twelve years ago. I've been trying to get him for years. Oh, I know I could have killed him a hundred times on the ground, but I want him to die as my brother died. I want to shoot him down in a flaming plane. And I'm going to do it today."

Larry's heart almost skipped a beat. True, he was dealing with a lunatic, but a lunatic whose obsession was murder—murder of Larry's best friend. An awful cunning lurked behind the wild, bestial gleam in Heinze's eyes.

"WHAT are you going to do?" he asked, as coolly as his pounding heart would permit.

Again Heinze laughed the cracked, shrill laugh of a madman.

"I'm taking off before dawn," he replied. "And I'm waiting along the route for Riddle. Then I'm going to get him. I almost got him once, but he jumped and you pulled him out of the river. But this time you won't have a chance to save him. No," he chuckled. "You'll be safely tied up, and locked in the tool room."

Slowly he advanced toward Larry, the automatic held firmly in his hand. As he approached he picked up some loose rope that was lying over the wing of a Curtiss H4. His purpose was written unmistakably on his face. Larry watched him come and tensed his muscles for a supreme effort. It was now or never. He waited until the other was almost on him. A fragment of his grammar school history flashed through his mind. *"Wait till you see the whites of their eyes."* He waited, his gaze centered on the advancing madman's gleaming eyeballs. Then muttering a silent prayer, he leaped.

Heinze undoubtedly had expected no such move. He was taken by complete surprise. Even before his finger could press the trigger, Larry's hand gripped his wrist. Heinze swore volubly under his breath, and exerting all his strength, flung his free arm around Larry's neck in a headlock. A thousand devils of agony crawled through Larry's head, as the other tightened his grip. He did not dare release the other's gun hand. Silently and viciously they struggled in the deserted hangar.

Even as they fought, a ray of hope flashed through Larry's mind. If only he could last long enough the night watchman would be back on his rounds. Apparently Heinze had thought of the same thing, for he renewed his efforts. The grip about the lad's neck tightened more and more.

Larry could hear his adver- (*Continued on page* 61)

Special Course in Air Navigation

RADIO

Its Uses and Limitations as an Aid to Air Navigation

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.

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.

THE EDITOR.

AFTER some experience it is possible, by merely looking over the side, to gauge approximately the angle of drift and the wind-speed; or the wings may be marked with lines drawn from leading edge to trailing edge at varying angles, say from 5° to 25° in each direction. Sometimes, owing to obstructed vision on one wing, it is necessary to mark both sets of lines; the converging and the diverging sets, both on the same wing, or, alternatively they may be painted on the tail plane. The question of where they are to be is mainly one of the convenience of the pilot.

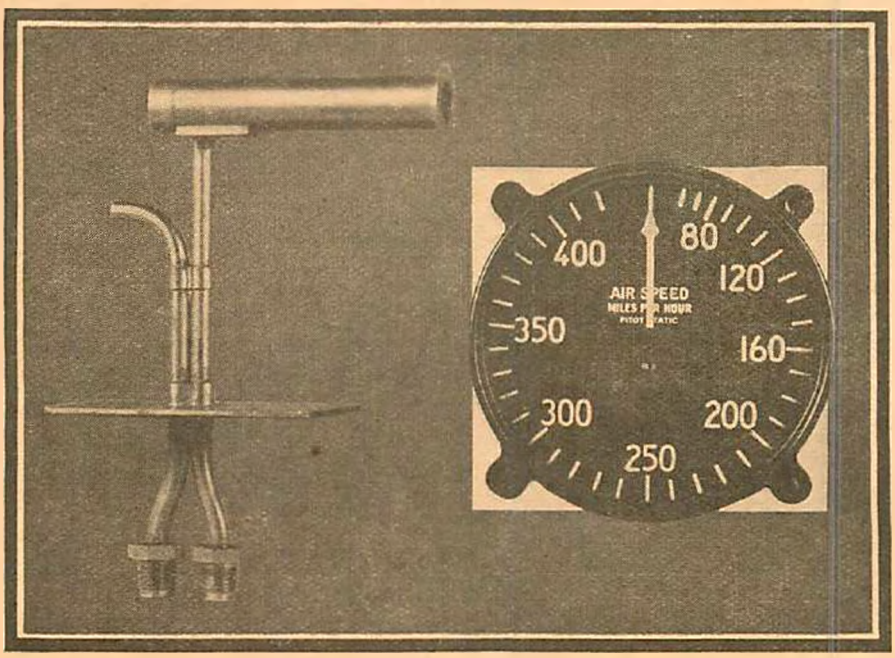
However, wherever they are a certain care has to be observed in their marking. The line for example, that would indicate a drift of 5 degrees to the right would be painted from the right leading edge at an angle of 5 degrees to the POSITION FROM WHICH THE PILOT WOULD NORMALLY BE LOOKING. The pilot steers a steady course and observes under which line objects are passing.

With a little practice a fair degree of accuracy can be obtained by this method. It is sometimes of help in cases where the pilot is his own navigator and there is no co-pilot, as it is not always easy for a pilot to maintain an absolutely unwavering course while sighting along a drift wire.

Protractor. There are many types of protractors. One is square and made of transparent celluloid, another is semi-circular, but whichever type is used, the method is the same. The north and south line of the protractor must be parallel with the meridian of longitude running through or near your starting point.

In the case of the square protractor, for example, there being many parallel lines running up and across, it is easy to align it on a meridian. There is a piece of string running through a hole in the middle and this hole is placed over your point of departure (not forgetting to keep the north and south line on it parallel with the nearest meridian). Hold the protractor firm and extend the string until it passes over your destination on the map.

Now read off the number of degrees on the edge of the protractor over which the string passes and you will have the *true* bearing of one place to the other. If you placed the center of the protractor over New York and extended the string across the map to Boston, you would obtain the bearing of Boston from New York; roughly 53°.



When Lieutenant A. J. Williams, the U. S. Navy's ace speed flyer, was preparing his machine for competition in the Schneider Seaplane Trophy races last year, it was found necessary to manufacture a special air speed indicator. This is seen above at right. Note that it is graduated up to more than 400 miles an hour. The Pitot tube for the air speed indicator is seen at left

* * *

IN this chapter we will not deal with wireless telegraphy or telephony as such—that does not fall within the scope of navigation—but with it merely so far as it affects direction finding in the air. There is no doubt that the radio is becoming an increasingly important factor in the science of aerial navigation, and the day is not far

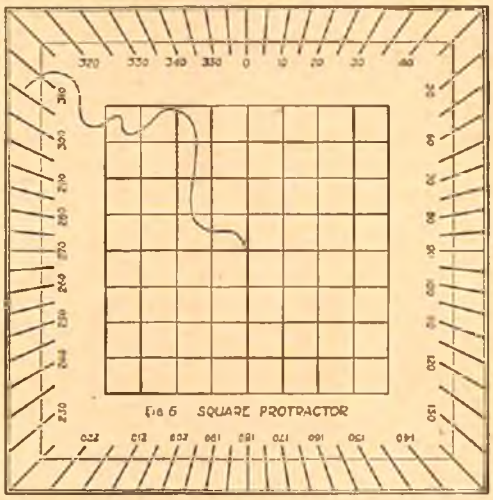
distant when it will probably become the guiding feature. Some knowledge of the various methods in existence and the principles involved is essential for their intelligent use and in order to understand just how far their aid may be relied on.

A wireless aerial transmits waves through the air along lines of great circles over the earth's surface, and these waves set up reactions known as voltages in all conductors or receiving stations that lie in the path of any such waves. Two vertical aerials joined together at the top and bottom form a loop aerial.

If you set up a loop aerial in the path of a wireless wave with one of its aerials immediately in front of the other, the one in front will receive a slightly stronger reaction or voltage than the one behind.

Now, when in an electric circuit such as is formed by this loop aerial, one portion of it receives a higher voltage than the other, an electric current is set up which flows from the point of higher to the point of lower voltage.

If you turn the aerial around 90 degrees so that in magnitude and direction the same current is received by both aerials, no difference of voltage will exist and no current will flow between the two. It is this current passing around the circuit of a loop aerial that sets up the signals heard in the headphones.



If you think a moment you will understand the great importance that attaches itself to these peculiarities of the aerial. When turned so that it is pointing directly towards the sending station, the strongest signals will be heard; when it is at an angle of 90 degrees from the station, the weakest signals will be heard. You will think the rest is very simple, that you need only tune in to a station and keep flying in the direction from which the signals sound strongest to be able to arrive safely. Unfortunately, as soon as this important factor was realized and experiments made, it was found to be impossible to tell exactly when the signals were strongest and when they were weakest.

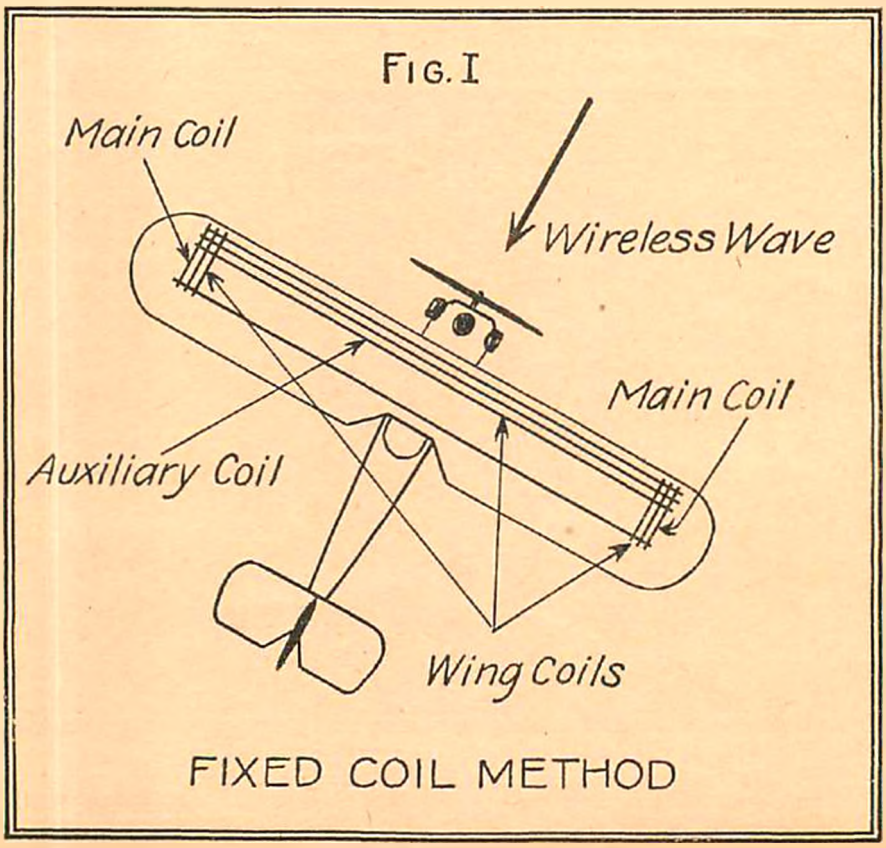
There was so little difference between the power of a strong signal and the strongest signal that, especially with the noise of the motor, it was impossible to tell within an angle of about 15 degrees which was the strongest signal, and this of course was not accurate enough for navigational purposes.

FIXED COIL METHOD

Experiments were continued and a system of two coils fixed on the wings of the plane was tried with some success. The coils were doped on the wings and the main coil would be in a line parallel with the fore and aft line of the plane, while the auxiliary coil would lie athwartships. The two are connected to the headphones by means of a two-way switch.

If you are heading on a course direct to the radio station, your main coil will receive a maximum current and the auxiliary coil, being at a 90-degree angle to the station, will receive no current; and whichever way you move your change-over switch, the same volume will be heard.

If you were slightly off the direct course, however, by the old method it would have been impossible to judge any difference in the strength of the signals. However, by this method the auxiliary coil will start recording some of the signals, and when you move the two-way switch, the volume of the tone will be changed either increasing or decreasing according to which way the switch is moved, and you will know you are not on the direct course. Only when there is no change in the strength of the signals as you move the switch over, will you know you are steering in the right direction. This is important.



As soon as you receive the maximum signals with no changes in strength, a glance at the compass will indicate your compass course to the station and this, when you have made the necessary allowances for variation and deviation, may be plotted on the map as a true bearing.

This method has its advantages for the pilot who has to do his navigating while at the controls when he cannot easily plot out bearings on a map. He gets (*Continued on page 42*)

See Plan on Page 26

A MORRIS CHAIR for Your Den

Make One Yourself—It's Easy and Economical

By E. F. FURTH

Necessary Materials

2 front posts	1¾" x 3"	x 2' 1½"
2 rear posts	1¾" x 3"	x 2' ½"
2 front and back rails	1"	x 5½" x 27¼"
2 side rails	1"	x 5½" x 26¼"
2 arm pieces	1"	x 5½" x 3' 0"
7 slats	½"	x 2" x 2' 0"
2 cleats	1"	x 1" x 1' 10"
2 back stiles	1"	x 2½" x 2' 0"
2 back rails	1"	x 2" x 1' 5½"
3 back slats	⅜"	x 1½" x 1' 7"
1 back support	1"	x 1" x 2' 3"
2 support rests	1"	x 1½" x 8"
2 dowels	½" diameter; 6" long	

NOTE: All these dimensions are exact lengths, widths and thicknesses. Be sure that all ends and edges are worked square.

ONE of the most useful projects that a boy can make for his own personal use is a Morris chair. It is always welcome in a boy's room. Designed and built in the sturdy Mission or Craftsman style, it is typical of the sturdiness required of it and the atmosphere surrounding it. After it is old enough to be retired, one still keeps it, thinking of the associations connected with it. A chair for a boy's room might be designed along more classic lines but to the average boy it will not appeal as does the old Morris chair.

First take the two front posts. From the top measure down 1 3/8". Take your square and square this mark around the four sides. From the left side of the 3" face, measure 1 3/4" off on the top edge. Draw a line on both front and rear so that on the top it shows a space 1 3/4" square. This is the tenon that extends through the arm. Take your hack saw and, sawing just clear of the lines, remove the excess material. This makes a tenon 1 3/4" square and 1 3/8" high. Bevel the top corners 1/2" each way so as not to leave any sharp points. Repeat this operation on the other legs.

Take the two front legs and place them so that the edges with tenons on them are alongside of each other. From the extreme top measure down this line 8 7/8" in each piece. From this line measure down 4" and square this line or mark around the legs. Between these lines draw a line with the marking gauge 7/16" from the inside edge. Draw another line with the marking gauge the thickness of your side rail from this. This gives you the location of the mortise through which the side rail passes.

Draw the location of this mortise on the opposite side of the leg. Check yourself to see if the mortise when cut through will be correct or not. Repeat this operation on all the other legs. Watch your plan to see if you are laying out one long leg for the front right side and the other for the front left side, as they are different. Repeat this caution for the rear legs.

Take a 5/8" or No. 10 bit and drill a number of holes within the mortise layout, boring halfway through from each side. Remove balance of material with a good sharp 1" chisel on the sides and a 1/2" chisel at the ends. Keep all mortises square and exact for size. Do these operations on the other legs.

Take a front leg. Turn the edge with the tenon on it toward you. Measure down from the extreme top of the tenon 11", and square this mark around the legs. Measure down from this 4 1/2" and square this mark around. Set your marking gauge to 7/16" and draw a line parallel to the front edge between these two marks. Draw another line 7/8" from this. This gives the location of the mortises for the front rail. Repeat this operation on both edges of all four legs. Check your dimensions and location with the plan. Remove the material by the same operations as the other mortises.

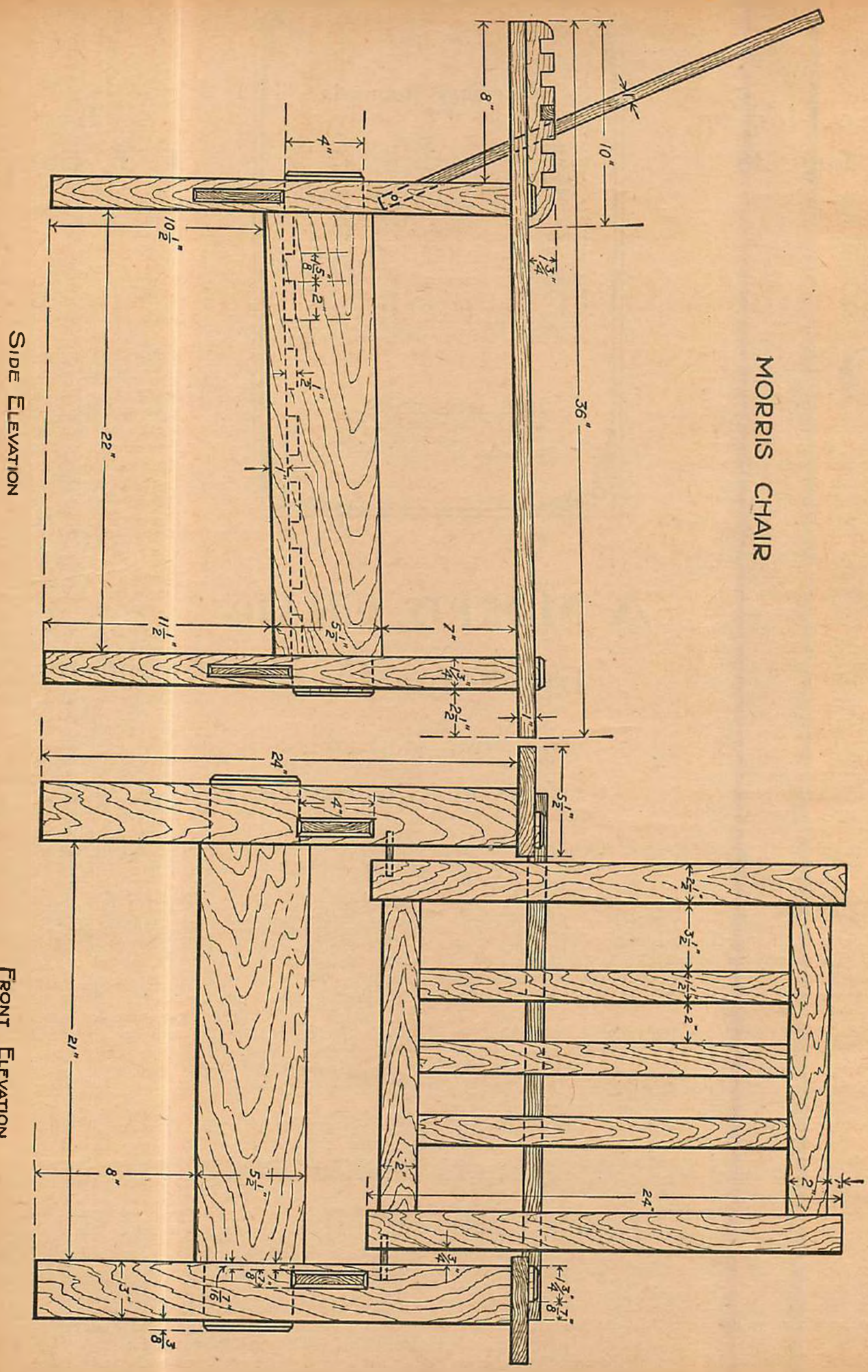
Take the two 7/8" x 5 1/2" x 27 1/4" pieces for the front and back rails. Find the center of the long edge of the boards. Measure 10 1/2" each way from this mark and square the new mark around the board on each end. This is the distance between the front legs. Select the top edge. From the top edge down, the marks just squared around the piece measure down 1/2". Draw a line parallel to the top edge and toward the end of the piece. Draw another line parallel to this and 4" away from it. This is the tenon that goes through the mortises in the edges of the front and back legs.

CHECK your layout with the plan. Remove excess material. Be sure to keep your dimensions exact and square. Cutting beyond lines spoils your work. Try your tenons in the mortises to see if they fit as they should.

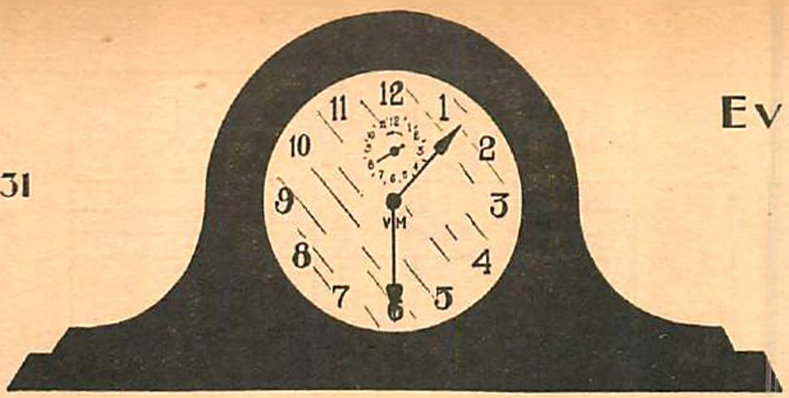
Take your two 1" x 5 1/2" x 26 1/4". Repeat the operations as for the front and back rails, except that it is 22" between shoulders, and the tenons are 4 1/2" wide instead of 4". Check all dimensions with plan before cutting.

Before inserting the side rails in the legs permanently, attach the cleats (1" x 1" x 1' 10") to the inside bottom edge with 1 1/2" round-head screws.

In the center of the inside edge of the back legs, bore a hole 1/2" in diameter, the (*Continued on page 63*)


MORRIS CHAIR
SIDE ELEVATION
FRONT ELEVATION
8"
10"
4"
36"
22"
24"
21"

See Plans on Pages 28 to 31



By EVERETT T. OYEN

Christmas Gifts from the Home Workshop

Make Something for Mother and Dad

CHRISTMAS! What a thrill—and just a short time away! Have you got your stocking ready? Take a tip from me and borrow Mother's. It holds a lot more!

What a list! A thousand and one things that one wants so badly. Here's hoping you get them all, but wait! Isn't there another list we have forgotten about? How about us? What are we going to give?

We can't ask Dad for the money to pay for his own gift. That would never do! Christmas and not enough money! There's a situation "when a fella needs a friend", if ever there was one.

Cheer up! You've got just that friend in MODEL AIRPLANE NEWS! The Editor, realizing that a lot of boys would be a little short about this time, has solved the problem for all.

Even a well-equipped tool chest will not be necessary, and the few tools needed can be purchased in any "Five and Ten Cent" store.

The cost of the lumber, too, will be nothing as it can be found wherever old boxes are stored and, indeed, just that type of lumber is recommended for use.

And here's a tip to those lucky boys who have money with which to purchase the folks gifts. No matter how much you may pay, the family will not appreciate a bought gift as much as one which you yourself have made for them. That's the big thing that counts. It is the thought behind the gift and not the gift itself, and when they realize that you have made their gift yourself, love or money could not part them from it.

Furthermore, if instructions are carefully followed in the making of these gifts, money can buy none finer.

DRESSING UP DAD'S ALARM CLOCK

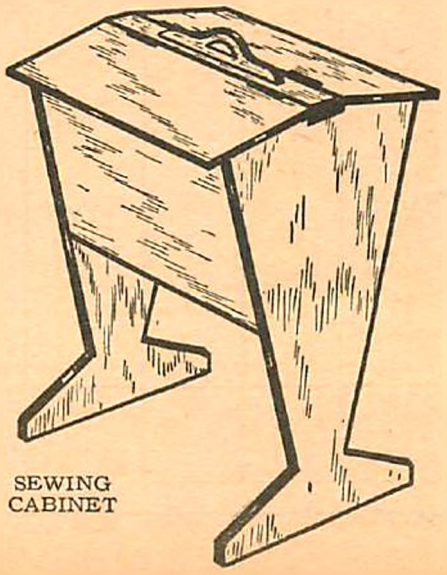
INSTEAD of the usual smoking stand gift for Dad, we have another gift which he will find of real value. Most dads find a steady use for an alarm clock, whether it gets them up every morning for work or merely for that early session of golf or fishing.

Ask Mother, however, what she thinks of them and she'll tell you that they are a necessary evil and something to be hidden away when company uses her bedroom. We can't blame her for that, as most of them are not things of beauty. So we have decided to dress up Dad's alarm clock, so that Mother will be proud of it, as she would be of any beautiful clock.

It is just possible that Dad hasn't one but this need not worry you, as they can be purchased for a dollar or less. A cheap clock is often a good time-keeper, and we can dress one up in quite as fine clothes as we can an expensive one.

So get busy. You are a dressmaker now, though you handle wood in place of cloth. Most alarm clocks are about the same size, though the writer finds that one of the most popular makes on the market today is slightly larger in diameter than its brothers. While this clock is popular, it is also the most expensive, so it is not being used as an illustration in this article, as we are keeping down costs for the boys who are a "little short."

Due to the fact of this slight variation in over all size, the builder may find that some of the dimensions in the accompanying plans will have to be changed to suit his clock and this must be done when in process of construction. If, however, he does not wish to make these changes he can easily obtain a clock of the dimensions given, for a dollar or less.



SEWING CABINET

These plans have been drawn for a clock with a diameter of 4" and a thickness of a little over 2 1/4".

The latter dimension will be found correct for all clocks, while the diameter may be changed to suit that of any clock by simply making the center circle larger or smaller, as the case may be.

Before starting actual work take careful measurements of the clock with which you are going to work. The same tools used for the smoking stand are needed for this, with the addition of a compass and a compass saw. A brace and bit will be found useful but are not a necessity.

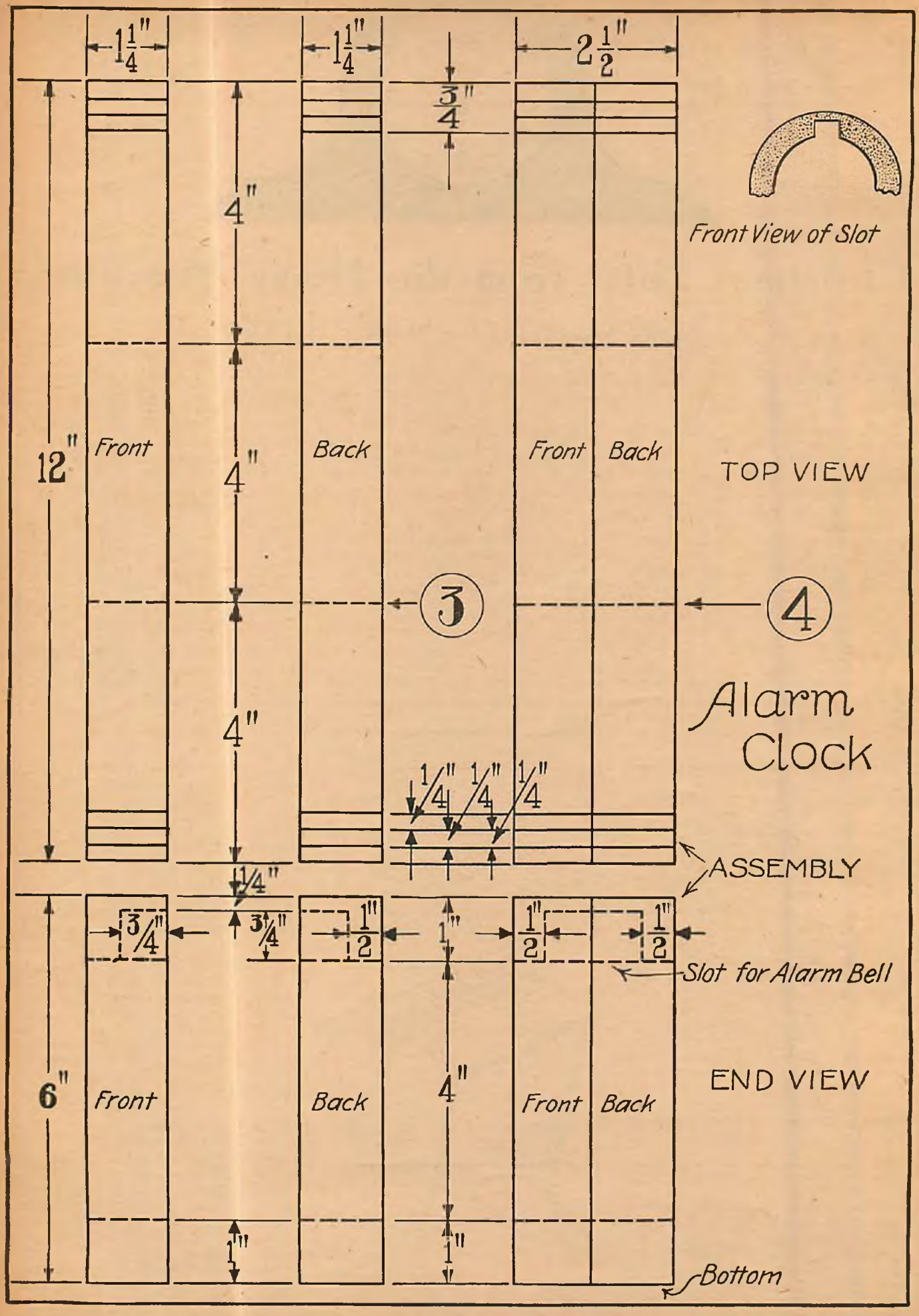
ONLY one piece of lumber is necessary for this work. If you wish to keep all expenses at a minimum, use yellow pine, but if you can afford it obtain mahogany, as it will be found splendid for this type of woodcraft. The piece must be 1 1/4" thick, 6" wide and 24" long.

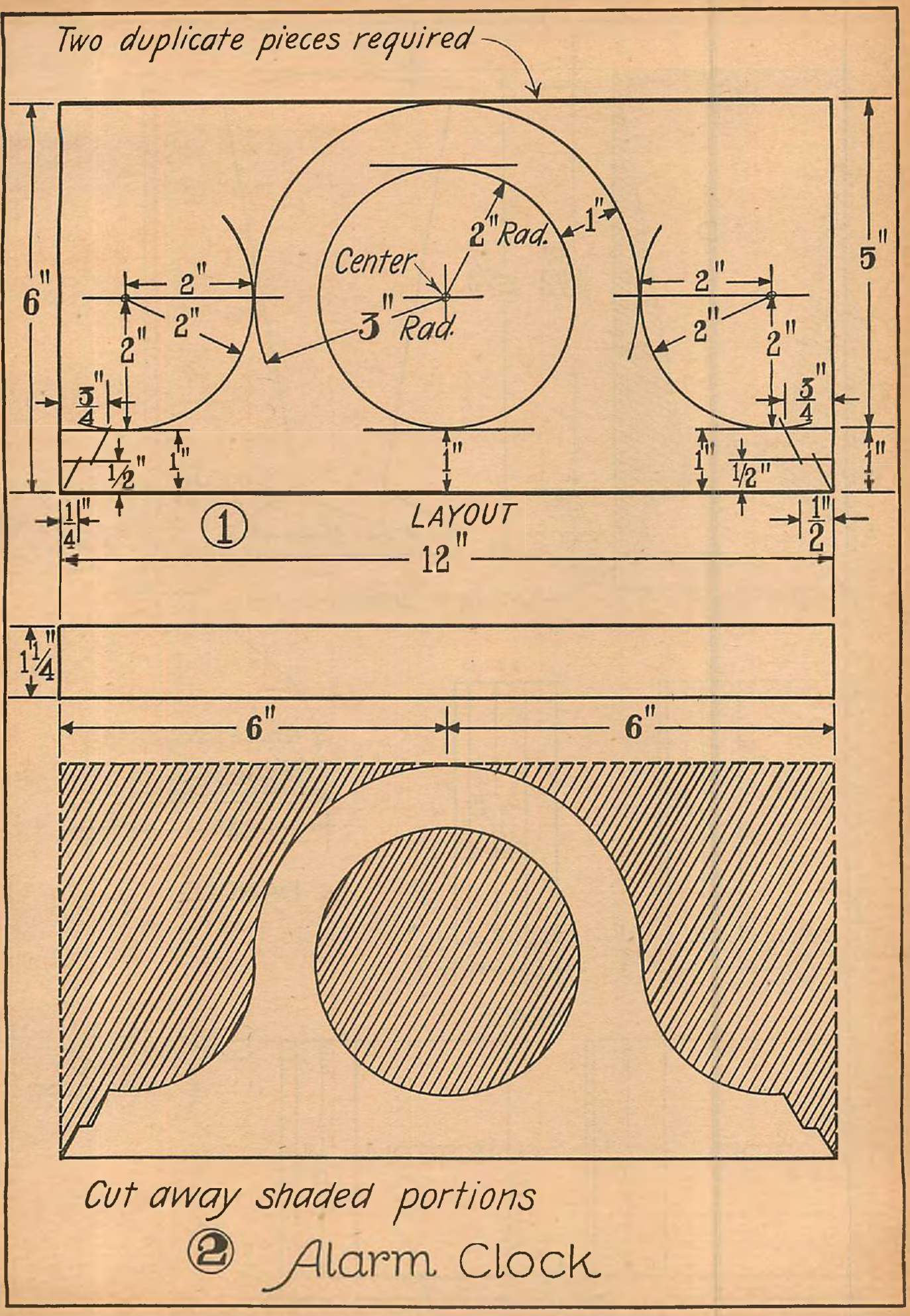
If the clock you are using has legs remove them if possible. These are usually short steel pegs which are screwed into the bottom of the clock and can be removed without causing any damage.

If the clock has a base, allowance must be made for it when the builder begins Step 3, which will be explained at that time.

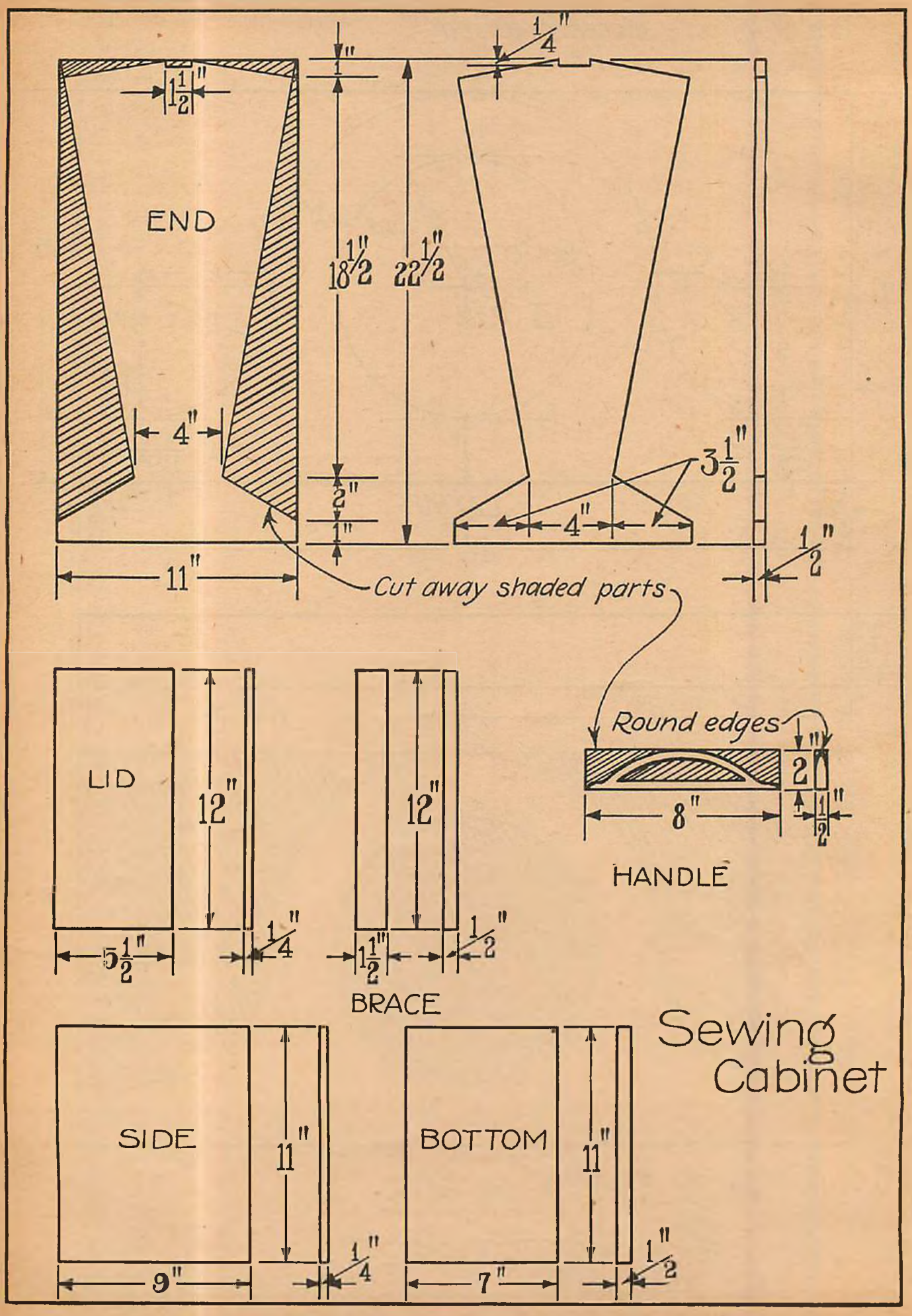
Plane your piece of stock on both its faces and square it up by planing the edges and testing with your try-square. Now saw the board into two equal lengths of 12" each. For the convenience of the builder each step of the work has been shown in the plans and is designated by a number; such as Step 1, Step 2, etc. Step 1 shows the way the work is first laid out. This operation is done on only one of your two pieces of stock.

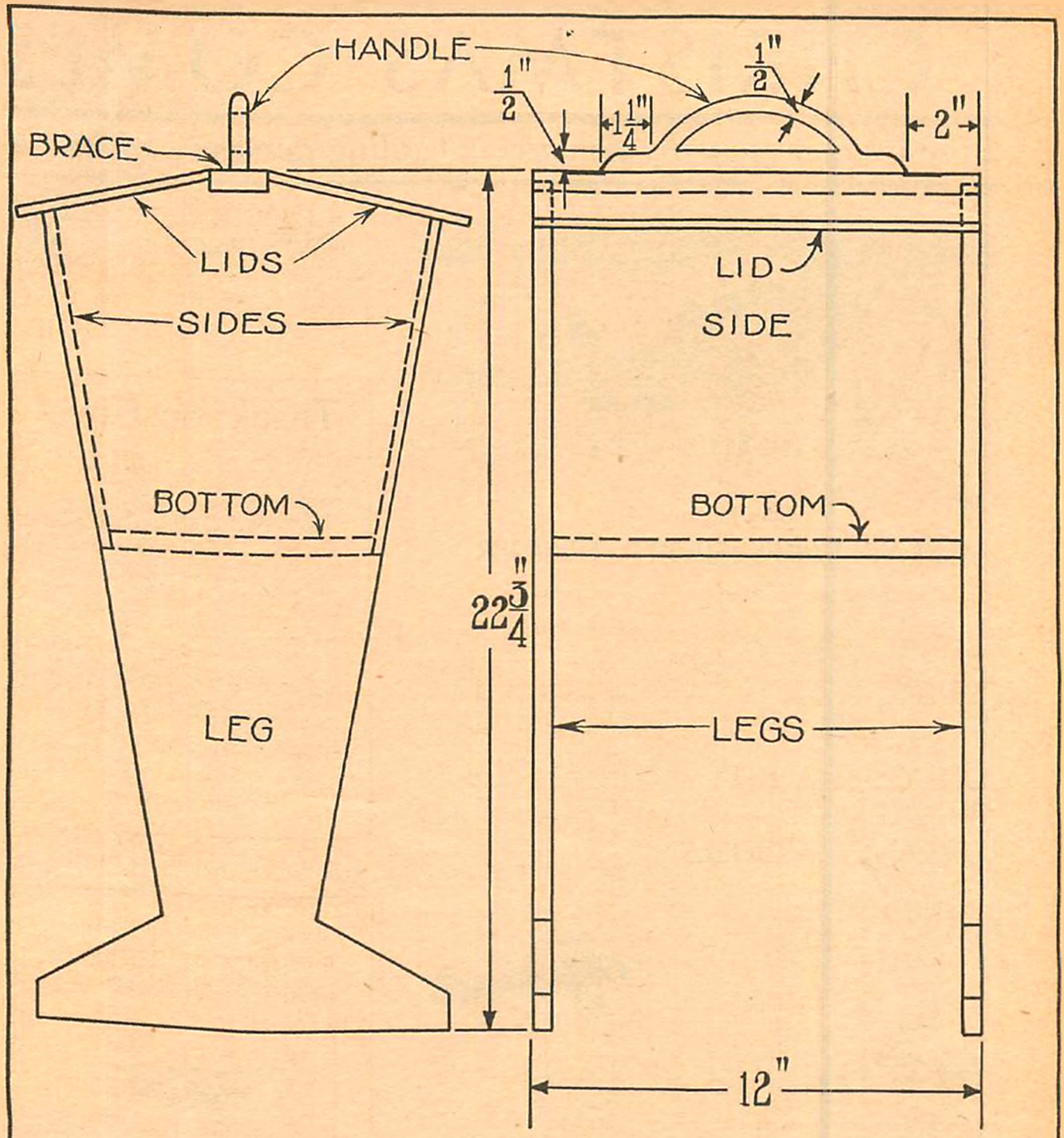
Find the exact center of your board and draw a line along its length through the center, and parallel to its edge. Take your pencil compass and separate the pencil and the (*Continued on page 49*)


1 1/4"
1 1/4"
2 1/2"
3/4"
4"
4"
4"
12"
Front
Back
Front
Back
TOP VIEW
3
4
Front View of Slot
Alarm Clock
1/4" 1/4" 1/4"
ASSEMBLY
1/4"
3/4"
3/4"
1/2"
1"
1"
1/2"
1/2"
Slot for Alarm Bell
6"
Front
Back
4"
Front
Back
END VIEW
1"
1"
Bottom



② Alarm Clock


END
1½"
4"
18½"
22½"
2"
1"
¼"
3½"
4"
11"
½"
Cut away shaded parts
LID
12"
5½"
¼"
12"
1½"
½"
BRACE
Round edges
2"
8"
½"
HANDLE
SIDE
11"
9"
¼"
BOTTOM
11"
7"
½"
Sewing Cabinet

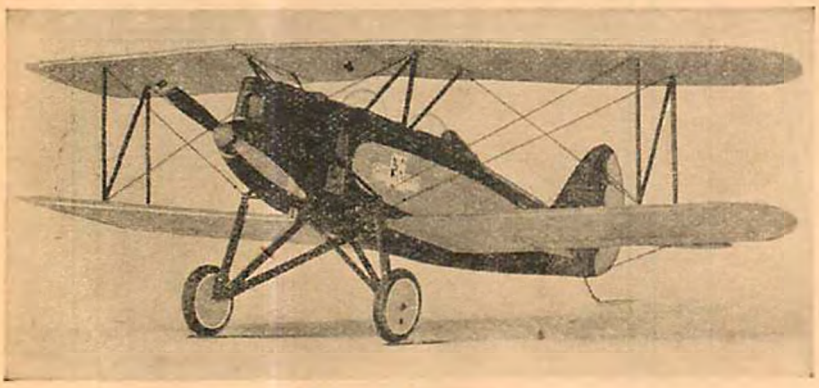


ASSEMBLY

Sewing Cabinet

CHRISTMAS COMES

And these suggestions by America's leading designers of Model



New Improved

GREAT LAKES SPORT TRAINER

The kit that has taken the country by storm

HERE is the most popular scale model airplane in the United States. The span of this model is 20" to the standard ¾" scale. Colored a flashing orange and black like its real life prototype, holder of the record of 34 outside loops. This great Kit includes partly finished nose blocks (simple for you to complete), turned balsa wheels, stamped ribs and propeller blades, completed spinners and many other features. A model made from a Kit just like this has established an unofficial world's record flight of 3,608 feet R.O.G. for a scale model. Kit No. SF-1E, complete, $5.50.

ONLY 98c A KIT!

for these Cleveland-Designed

FREE LANCE MODELS

This complete FL-100 Air Line of Profile Fuselage models is extremely easy to build. Each plane has a perfectly proportioned profile in relation to the others (just like the big planes themselves) so the entire set is very realistic. Each model colored as near like its original as possible. Each Kit, only 98c.

No. FL-101

PRIMARY GLIDER and ADVANCED SOARER. Combination Kit No. FL-101. Spans 13⅝" and 18¾". Lengths 7" and 7½". Colored: Red, White and Blue.

GREAT LAKES TRAINER. Model FL-102. Span 10"; length 7¾". Orange and Black. Prototype has a *Record of 34 Outside Loops.*

No. FL-103

FLEETSER HIGH WING MONOPLANE. Model FL - 103. Span 16⅞"; length 12⅜". Green. *One of fastest commercial cabin planes.*

No. FL-104

BOEING FIGHTER. Model FL-104. Span 11¼"; length 7⅝". Silver and Blue. *Latest Fighter in U. S. Air Forces.*

EAGLEROCK BULLET. Model FL-105. Span 14⅜"; length 8⅛". Blue and Red. *Winner of Phila. to Cleveland Air Derby.*

CURTISS HAWK. Model FL-106. Span 11¼"; length 8⅛". Yellow and Olive Drab. *Well known Army Fighter.*

TRAVEL AIR MYSTERY SHIP. Model FL-107. Span 10⅜"; length 7¾". Red and Black. *Capt. Hawk's Record Transcontinental Plane.*

No. FL-108

BOEING MAIL PLANE. Model FL-108. Span 16½"; length 12⅛". Silver and Blue. *Used on many Air Lines.*

CURTISS ROBIN. Model FL-109. Span 15⅜"; length 10". Yellow and Orange. *World's Endurance Record Holder.*

VOUGHT CORSAIR. Model FL-110. Span 13⅛"; length 9⅝". Silver and Blue. *Popular Navy and Marine Airplane.*

LOCKHEED SIRIUS. Model FL-111. Span 16⅛"; length 10⅜". Orange and Black. *Lindbergh's Famous Ship.*

CURTISS FALCON. Model FL-112. Span 14⅛"; length 10⅛". Yellow and Olive Drab. *Army Observation Plane.*

No. FL-111

A FAMOUS U. S. NAVY DESIGNER

heads our Engineering department. He is Capt. Holden C. Richardson, formerly Chief of Design Section, Bureau of Aeronautics, United States Navy.

Thank you, Craig!

(Editor's Note: *Here is an unsolicited letter from one of our customers. He is 14 years old, and has had 3 years' model experience.*)

"When I received your Kit for your Cleveland-Designed Great Lakes Sport Trainer, I cannot tell you how surprised I was to see such a *practical* kit in such a neat, plain box. I have built several planes from kits before this, but I never had so much accuracy, light weight, good looks, or as much interesting work sold to me for anywhere near this amount.

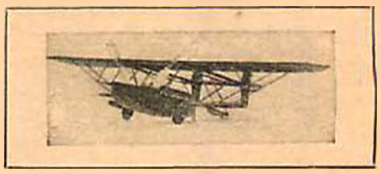
"Most kits come in highly decorative boxes containing wood parts, such as birch dowels, *spruce* ribs and longerons, *bamboo* ribs, struts and wing tips, and an excessive amount of wire parts. All these things are for so-called *strength*. This also shows the inability of a designer to use Balsa, which when used plentifully in trusses and bracings, will produce an exceedingly strong and light model.

"I am not afraid to say that the Cleveland-Designed Great Lakes Sport Trainer is the best fuselage model in the country, and practically the only one for which false claims are never made."

(Signed) CRAIG O. BURT, JR.,
Stowe, Vermont

Have You Our New Notebook-Catalog?

Sikorsky's internationally-famed Land-and-Water Ship was the model for this Cleveland-Designed



AMPHIBION

This new FL-301 model Kit builds a 27" Amphibion which will take off the ground and make flights of about 400 feet R.O.G., or with the wheels retracted will take off water and fly at least 300 feet. Very technical in appearance, but as easy to build as the Sport Trainer. Striking yellow and blue color combination. Kit No. FL-301 complete, $3.30.

CLEVELAND MODEL & SUPPLY CO., INC.

1866N WEST 57th St., *Model Engineers* CLEVELAND, OHIO, U. S. A.

BUT ONCE A YEAR

Airplane Kits will help you make this the happiest one of all

TRAVEL AIR MYSTERY SHIP

The Cleveland-Designed Kit that surprised the whole Model industry

THIS has been the big surprise of the year, not only to thousands of boys who had been told the Mystery Ship was impossible to model, but also to those who told them.

And what a Model this is!—an actual model of the original mystery ship that mystified the populace at the Cleveland Air Races—yet actually easier to build than our famous Sport Trainer. A full 22" span (to the ¾" standard scale). Brilliant red and black colorings. Flies at 30 m.p.h. to a height of 30 or more feet, and for a distance of approximately 500 feet or over. The Kit contains turned balsa cowl and cowl ring, turned balsa wheels, stamped balsa ribs and fibre propeller blades, finished propeller hubs, new type bearing, simple-to-build wheel shoes and many other features. Instead of the $6.60 we originally estimated in our announcements the price of Kit No. SF-2C Complete is now $5.50.

EVERY KIT LISTED ON THESE TWO PAGES *(except the Wasp)* CONTAINS:

Completely detailed full-size drawing and pattern sheet which may be used for cutting out patterns and also used as a layout jig for assembling the models. You simply can't go wrong with Cleveland-Designed, easy-to-understand drawings, for you cut your material to length right on the drawing, cement it together, then cover it and color it.

Complete materials for building any model described here are contained in a Hobby-Tube or Hobby-Kit, containing Balsa Wood cut to size, Japanese paper, wire, rubber, propeller hubs or spinners (Cleveland-designed propellers are simple to make, and very efficient as exhaustive tests have shown), cement, banana oil, colored dopes, and all other necessary materials.

Complete Drawing and Instructions supplied with each Kit allowing you to easily build the model step by step with the instructions right by your side.

HOLIDAY SPECIAL

24 SE Outline Drawings, 6C Drawings (drawings are successful stick models) and our latest Notebook-Catalog immediately mailed anywhere as a Christmas Gift, only

$2.50

Offer expires Christmas Eve.

DRAWINGS that thrill the heart of even the hardest boiled AIR ENTHUSIAST

We are listing here 24 of the finest collection of Scale Outline drawings in the world. These SE drawings give the complete specifications of the full-size airplane with scales to which you may build your models. Printed on sheets which fit our Notebook-Catalog.

24 SCALE EXHIBITION DRAWINGS

SE-1: Great Lakes Sport Trainer. SE-2: Waco Taper Wing. SE-3: Mohawk Pinto. SE-4: Fokker Super-Trimotor F-10-A. SE-5: Fokker F-32. SE-6: Sikorsky Amphibion S-38. SE-7: Curtiss Hawk. SE-8: Curtiss Falcon. SE-9: Curtiss Condor Bomber B-2. SE-10: Lockheed Sirius. SE-11: Ryan Brougham. SE-12: Travel Air Mystery Ship. SE-13: Boeing Mail. SE-14: Boeing Fighter and Sport. SE-15: Loening Amphibion. SE-16: Keystone Patrician. SE-17: Eaglerock Bullet. SE-18: Eaglerock Biplane. SE-19: Curtiss Robin Challenger. SE-20: Fokker Amphibion SE-21: Ogden Osprey Light Trimotor. SE-22: Barling Monoplane. SE-23: Vought Corsair. SE-24: Ford Trimotor.

Mailed anywhere, 15c each; any 6 for 75c; any 12 for $1.25; complete set, $2.50.

FL-100 AIR LINE DRAWINGS

The Cleveland-Designed Free Lance Drawings are now offered at 50c each, or the entire set of 12 with one Instruction Sheet for $5. All full size drawings. Select the ones you wish from the list accompanying the FL-100 photos on this page. FL-100 Air Line Instruction Sheet, 15c.

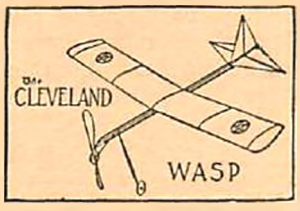
FL-300 AIR LINE DRAWING

This drawing for the Cleveland Amphibion is now offered for $1. Everything drawn full size with complete detailed instructions on one large sheet.

Drawings for Cleveland-Designed Accurate Scale Flying Models

We now have two SF 34 x 44 full size super-detailed Drawings with photographs to build the Great Lakes Sport Trainer SF-1E and the Travel Air [Mystery Ship] SF-2C. The demand for these Drawings is so great that we have been able to cut our original price of $4 exactly in half. Now $2 each.

Cleveland WASP Hobby-Tube



This simple R.O.G. model is very simple to build and flies consistently up to 120 seconds. This kit is especially recommended to beginners who wish to build our Free Lance models, and those who have had no previous model airplane experience. Complete Kit of material with drawing, only..... 49c

NEW NOTEBOOK-CATALOG

containing complete line of our Cleveland-Designed Models and "Blue Diamond" materials. Many prices reduced. Send 25c for your copy. *(Those who have paid for theirs previously will regularly receive new fillers to keep it up-to-date.)*

IMPORTANT All orders sent postfree. You pay just the amount listed under each item. *No C. O. D. orders accepted.* Use model numbers whenever possible. Order early to avoid disappointment, as this year's Christmas rush will be heavier than ever before.

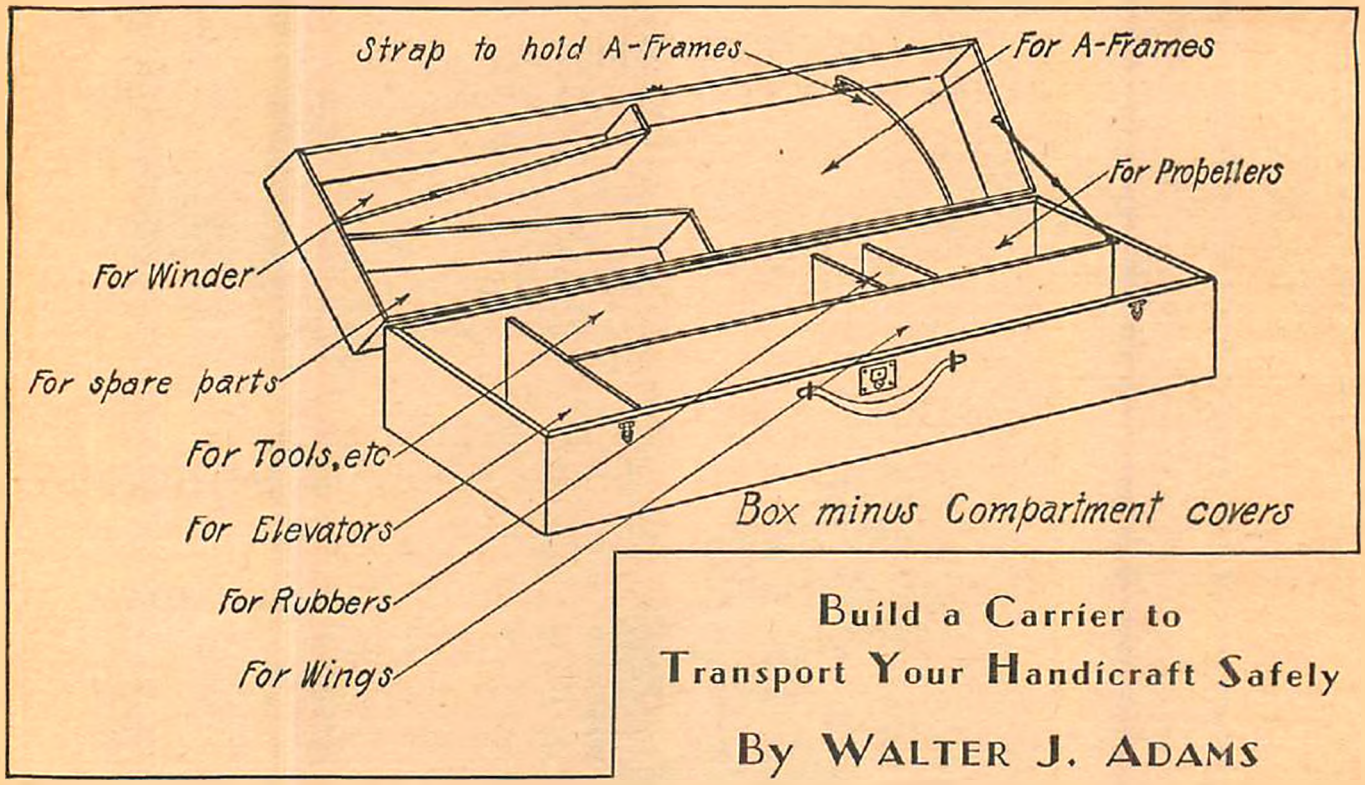
Cleveland Model Car

Here is the Cleveland Model Car now being driven about the country bringing many new recruits, both men and boys, to the ranks of Cleveland Model Aircraft Engineering. It is one of the new small Austins, upon the roof of which is mounted a double size stock model of our Mystery Ship. Have you seen it? It asks, "Have You a Hobby? Why not build Model Airplanes?"

"Cleveland Blue Diamond"—Symbol of honest quality, reasonable price, and speedy 6-hour service

(Tear out these two pages, and save them—hang them in your room)

ATTEND
the Next Model Airplane Meet
in Good Style



Build a Carrier to Transport Your Handicraft Safely

By WALTER J. ADAMS

A CARRYING-CASE for the model builder is quite as important to him as a brief-case is to the lawyer. Any well made airplane model is a delicate affair at best, due to the fact that the lightest of woods are used in their construction and their wings are usually covered with Japanese tissue. Each part is so fragile that great care must be exercised in handling them, especially in transportation.

Here is a box designed for just that purpose, and yet so simple in construction, so handy to carry, so cheap in cost, and so useful that no first-class model builder can afford to be without one.

It has been designed in such a way as to be carried as any ordinary suitcase of generous size, and yet will be found to be commodious enough to hold ten stick models dismantled, all extra parts, the necessary tools for repairs and a winder.

Inside will be found eight compartments, each so designed as to hold the specific thing for which it was built. Small tools and expensive parts may be locked away from prying eyes, even though the box is left open, for covers are specified for the compartments holding these.

If built according to these plans and building instructions, the box will be perfectly waterproof, as it is covered with oil cloth and its joints so made as to allow no moisture to seep through. This feature is most important, as the case is often placed on the ground during outdoor meets, when dampness, due to rain or dew, may ruin weeks of work and many dollars worth of material.

Play safe and build this box! It is better to be safe than sorry!

HOW TO CONSTRUCT THE MODEL AIRPLANE BOX

Before starting actual construction, first examine the accompanying plans carefully and then read these instructions thoroughly, making sure that you understand each step as it is presented.

For the convenience of the builder, we have divided the work of building in four main parts: The bottom of the box; the top or lid of the box; the partitions and cover for the bottom of the box; and the partitions and cover for the lid of the box.

Each piece under these four main parts will be cut and finished first and then the box will be assembled, followed by general finishing.

BOTTOM

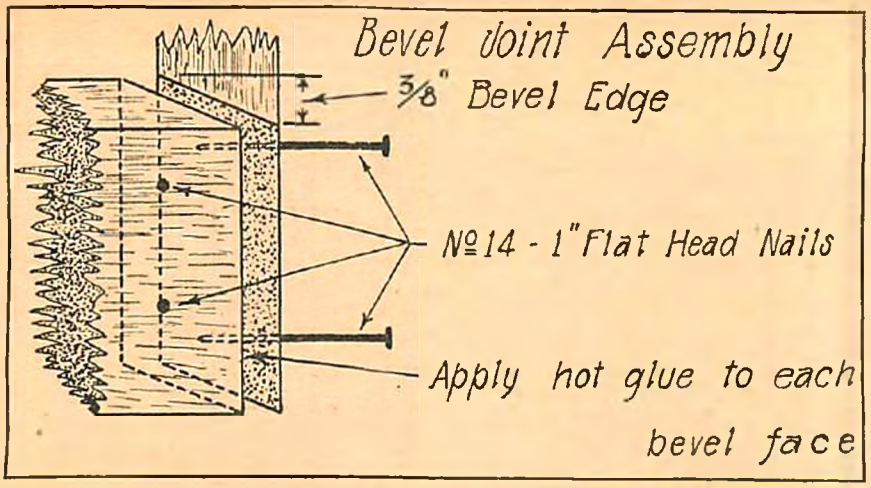
THE bottom of the box is constructed of five pieces of 3/8″ white pine. They are the bottom piece, the two side pieces and the two ends.

The bottom measures 12″ wide and 42″ long. First cut the board to this size, leaving 1/8″ surplus material on all sides, so that it may be planed down to exact size. When the board has been sawed, plane along one edge until perfectly straight and smooth. Now mark in pencil, with the use of a try-square, the two ends and plane these to the lines.

Measure 12″ from the first planed side, use your try-square to insure squared sides and mark in pencil a line along these measurements the length of the board. Plane the board down to this line. If the board is rough on its two faces, plane smooth at this time. Sandpaper both faces and its four edges until perfectly

smooth. The board now measures exactly 12" x 42".

Choose the best side of the board for the inside and locate in pencil the four necessary grooves. These are now cut 1/8" wide and 1/8" deep. A 1/8" square-blade gouge is excellent for this work, but great care must be taken not to cut too widely, nor too deeply, as the partition boards must fit in these grooves snugly. When the grooves are finished, sandpaper lightly to remove any excess cuttings along the face of the board.



We are now ready to cut the necessary bevel on all four sides of the bottom board. Measure 3/8" in from all four edges and draw a line around the board. This must be on the same side of the board as the grooves were cut. Now plane down the four edges until the bevel is obtained.

Give the entire board a thorough sanding with light sandpaper and put aside for future use.

We are now ready to cut the sides for the bottom. At this point, these instructions should be followed carefully, as the fitting of the lid on the bottom of the box depends on this work. The sides and ends of both the bottom and the lid are cut from one board. In other words, the left side of the bottom and the left side of the lid are cut from the same board, so that the cut edge will be the edge of both the lid and the bottom, and will, in this way, insure a perfect fit when the box is closed.

As both sides are of the same dimensions, cut two boards 9" wide and 42" long. Plane the four edges of each down to exact size, as in the case of the bottom board, and use a try-square to insure squared sides.

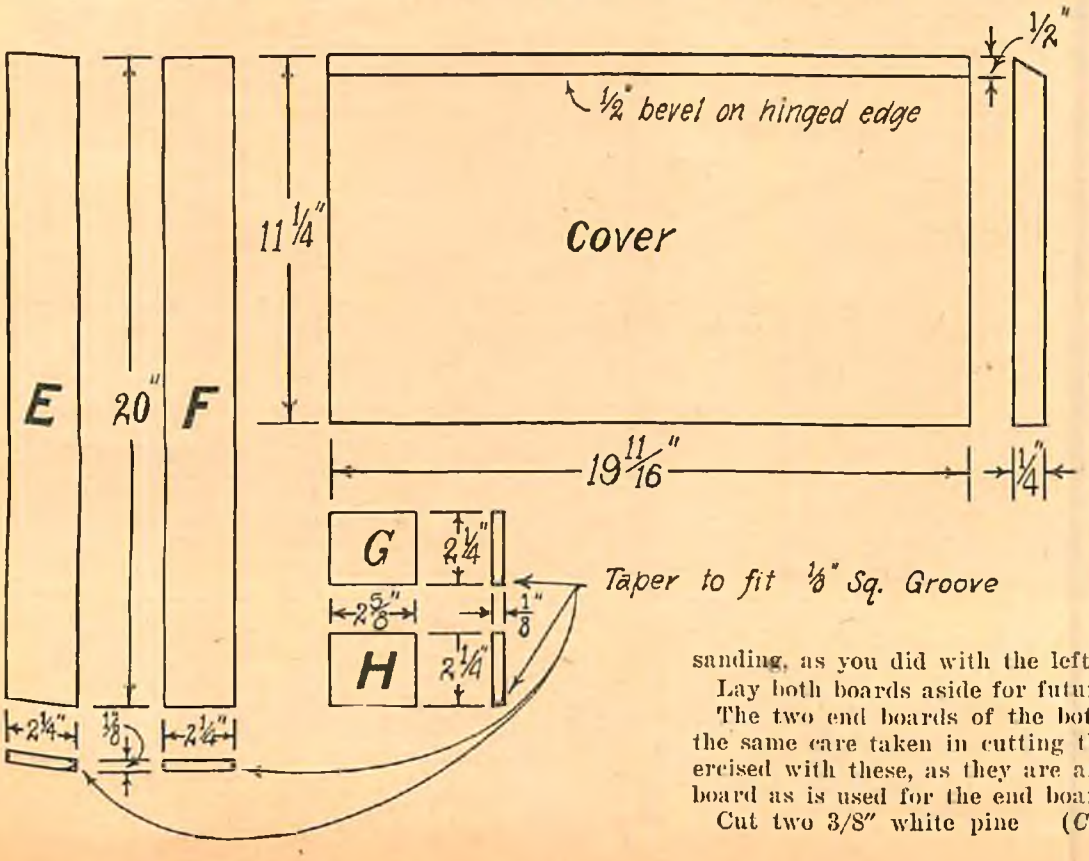
Now take a rip saw and cut the two boards in two pieces. One of these must be 6" wide and the other 3" wide. Be sure to cut straight along a penciled line. If instructions have been followed, you now have four boards; two of which measure 6" wide and 42" long, and two 3" wide and 42" long. Make a mark with a pencil on the sawed edge of each of the four boards and then lay the two 3" wide boards aside for future use, as they are for the sides of the lid.

Do not cut, plane or sandpaper any of the four sawed edges of these boards at any time! They must be left just as they are cut.

Now take the two 6" wide boards and cut a 3/8" bevel along their ends. The same sized bevel is now cut along the edge opposite the sawed edge on each of the boards. Both boards now have 3/8" bevels along three edges and the fourth edge is a sawed edge. Note drawing of "Bottom".

NOW mark one board "Left" and the other "Right". The board marked "Left" goes on the left side of the bottom board and the one marked "Right" goes on its right side.

Take the left side board, mark in pencil the location of the three 1/8" grooves and cut each, as instructed for the cutting of the grooves in the bottom board. Note that these extend from the beveled edge of the board to within 1" of the sawed edge. Sandpaper lightly over the cut grooves, as instructed above. Now give the entire board a thorough sanding to obtain smooth finish.

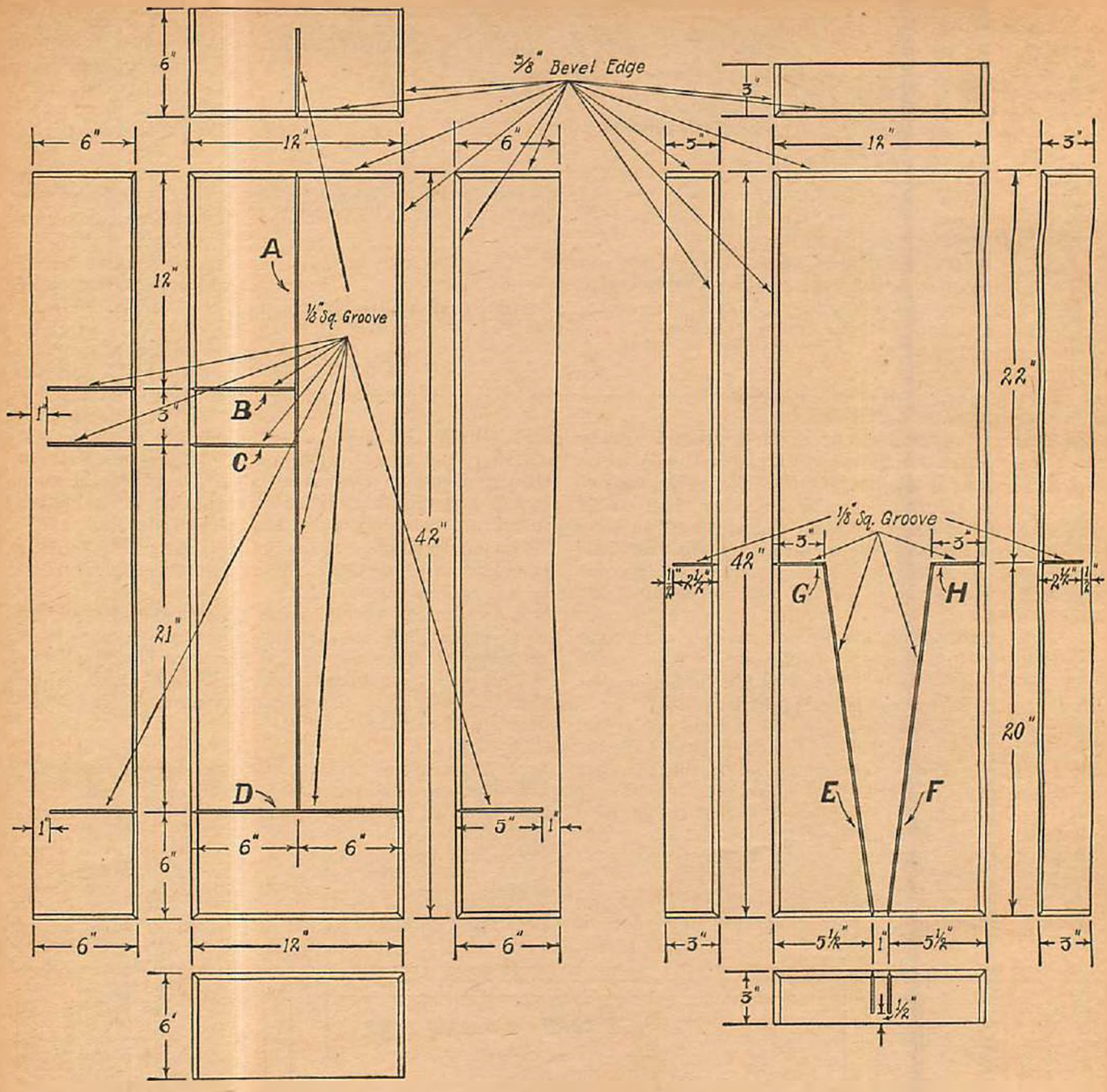


Next, take the side board marked "Right", and locate with pencil the position of its single 1/8" groove. Note that this also extends from the beveled edge to within 1" of its sawed edge. Cut in the usual manner and finish by sanding lightly. Now give this side board a thorough sanding, as you did with the left side board.

Lay both boards aside for future use.

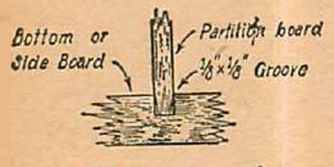
The two end boards of the bottom are now cut and the same care taken in cutting the sides should be exercised with these, as they are also cut from the same board as is used for the end boards of the lid.

Cut two 3/8" white pine (*Continued on page* 54)



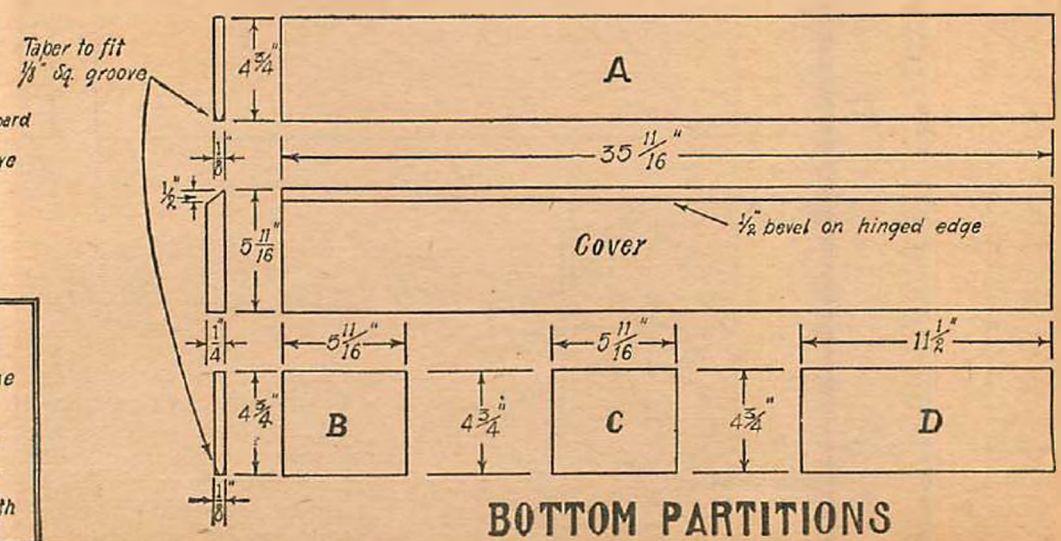
BOTTOM

LID



Partition Assembly

SPECIFICATIONS	
Bottom	3/8" White Pine
Lid	" " "
Partitions	1/8" " "
Inside Covers	1/4" " "
Covering	Black Oil Cloth



BOTTOM PARTITIONS

EVERY BOY
Will Want to Make This Box Trap

It's Simple and Practical—and Humane, Too!

By STUART PALMER

TRAPPING is great fun. However, you don't need to be left out of it because you live thousands of miles from the few spots where foxes, beaver and musk-rats still are found. One specimen of wild life is always with us. Even in many of our large cities, you will find tell-tale tracks in the snow when morning comes as evidence that the everlasting rabbit has been nibbling and foraging in your yard.

Here is a simple and practical box-trap that any boy can make in a few hours. It is based on the old figure-four principle, which has nothing to get out of order and which can be used over and over again. Best of all, this trap is absolutely humane, in contrast to the cruel steel trap which mangles and tortures the trapped animal.

Apple growers use this trap to save their young trees from the sharp teeth of the hungry rabbits when snow has hidden their usual sources of food. Boys who are fond of pets and would like to try catching and taming their own, use this trap because it neither maims nor frightens the rabbit. And this trap is a godsend to anyone who relishes a change of diet and has discovered how delectable rabbit-pie can be.

You will need light pine wood for this trap, not more than an inch in thickness, for since you will have to carry the trap to the place where you set it, weight is a consideration. About ten feet of lumber will be required, besides some scraps.

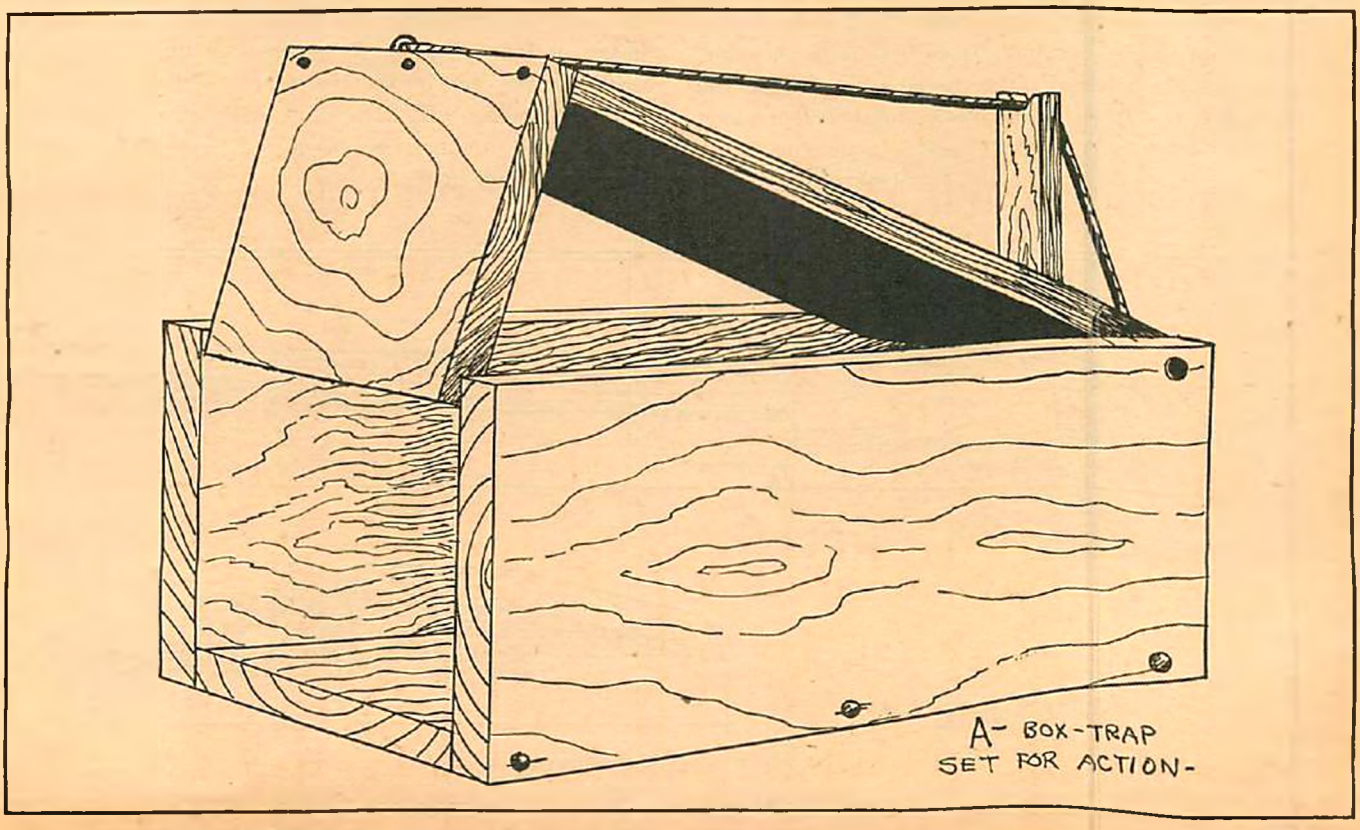
First cut the bottom, which is twelve inches wide by thirty inches long. Then make the two sides which are each thirty-one inches by twelve inches. Nail these securely to the bottom so that they fit outside. Now cut the rear end, which is twelve inches square. When this is nailed in place, it will fit against the end of the bottom board and inside the two sides. No special pains need to be taken in fitting these, so long as everything is stout and well fastened together.

Next come the top and front ends, which form the lid of the trap. These are nailed together, as shown in diagram A. The end piece is twelve inches by eleven, and the top is twenty-nine inches by twelve. This allows it to swing up and down freely at the fastened end. These two pieces, when nailed together, form an L. They should fit tightly, but not so as to bind, when in place. Fasten them with a nail driven in through each side board, so that the entire L piece lifts up and down as if on a hinge.

WORK this lid up and down, noticing if any place catches. If this is slow in dropping when the trap is sprung, your rabbit will be out before he's caught.

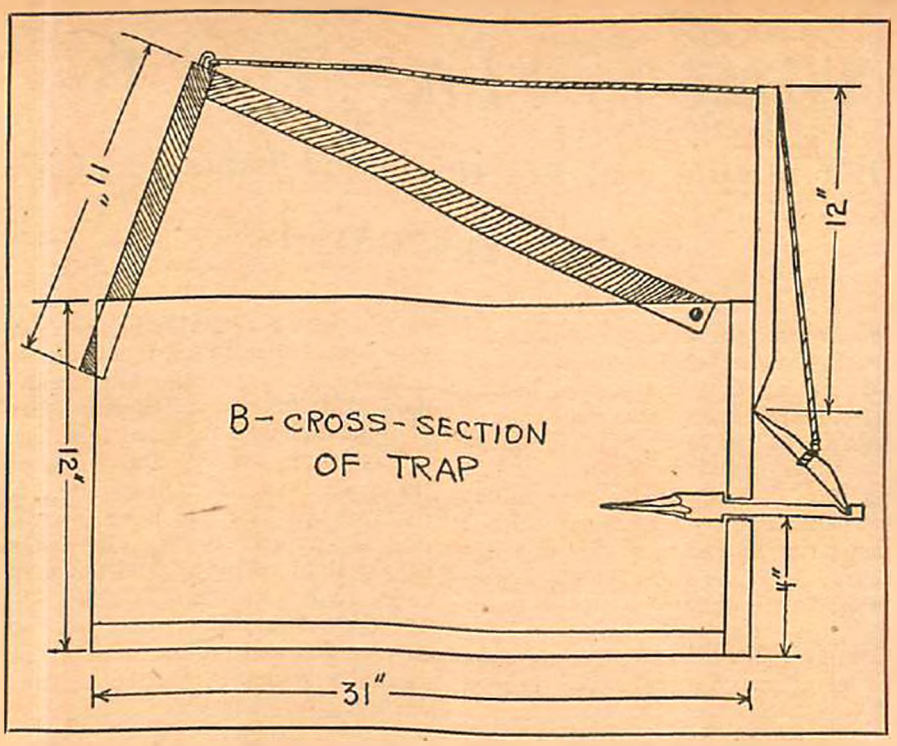
Next comes the upright, which is of any convenient piece of wood, about a foot long and notched at the top for the cord. Do not make the notch deep and narrow, or the cord may catch as it flies through, but just round it off.

Now you are ready to make the trigger parts, which are the only tricky part of the trap and which you must experiment with. First make the spear-shaped piece, which is about nine inches long. Whittle this down so that half of it will slide smoothly through a three-quarter inch hole bored through the end board. A half inch is about right. Leave the rest of this piece at least



one inch in diameter, so that it will hold against the hole, and sharpen off the end for the bait to stick on. Do not notch the end until you have made the remaining piece.

This is approximately six inches long, and is slanted off at each end and notched in the middle to hold the cord firmly. Fit the long piece in the hole which you have bored in the rear end of the trap and then find the exact place to make the notch by placing the smaller piece against it, slanting up to the bottom of the upright, which gives it leverage. Now make the notch, not deep enough to weaken the wood.



Now get a piece of strong cord and fasten one end of it to a staple driven in the top of the front end. Lift the trap in position, with the lid at an angle of about sixty degrees from the perpendicular, so that there is plenty of room for a rabbit to walk in the entrance.

Now run the cord back through the notch and down to the small trigger-piece, tying it tightly to the notch in the middle. The trap is finished.

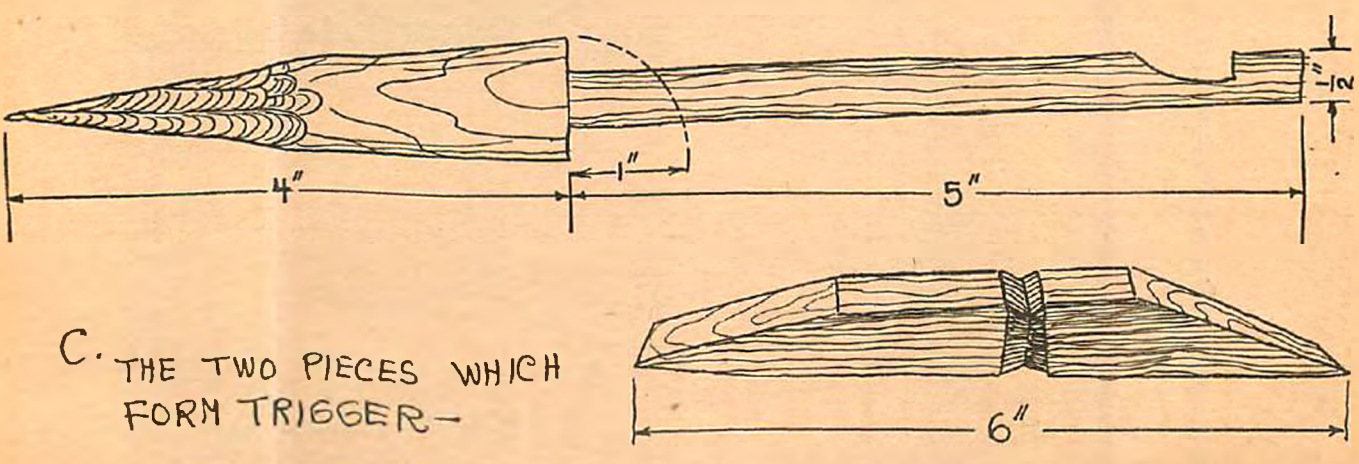
Take it to a place where rabbit tracks abound in the snow or, if it is not winter, to a thicket or brush-pile. A sweet apple, cut in half to dissipate its odor, or a bit of an ear of corn, make the best baits. Put the bait firmly on the sharp point of the long trigger-piece, so that the rabbit will have difficulty in pulling it off. Set the trap, just resting the small trigger-piece in the notch enough to hold the weight of the lid. Put your arm in the trap and wiggle the bait. It should spring the trap at the first light touch.

When it is set to your satisfaction, go home and leave it overnight. You are practically sure to find a rabbit there in the morning. If it is near the house, you will hear during the night a "thump" which means that the lid has fallen.

One of the best things about this box-trap is that it does not frighten the rabbit, as does a snare or pitfall. He will almost always be found to have eaten up the bait while he was waiting in the trap. Also, other rabbits are not frightened of the contraption but will return the next night to try it themselves.

REMEMBER that rabbits, like all other game, are not good to eat in the late spring and summer. If you are trapping them to eat, do not clean them near the trap for fear of frightening others away from the spot. Remember to wear rubber gloves on account of a rare disease said to affect human beings who touch a rabbit carrying it.

If you are trapping the rabbits with the idea of taming and keeping them, be sure to dust them with insect powder, for in their wild state they often have fleas. This trap will also work with other small wild animals, and you may be surprised to find a partridge or even a skunk in it.



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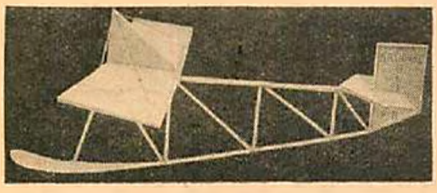
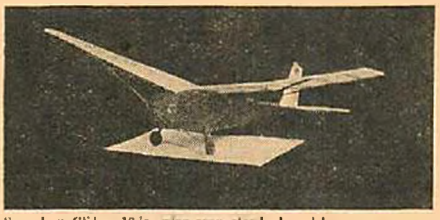
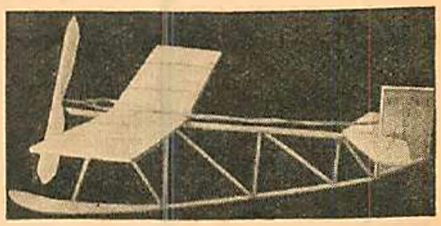


Primary Glider—12 in. model of standard design. Made of light weight colored balsa, with tissue printed wings. Complete with full size drawings and instructions. Price..... **.50**



Secondary Glider—18 in. wing span, standard model for the more advanced model builders. Complete with full size drawings and instructions. Price.. **$1.00**



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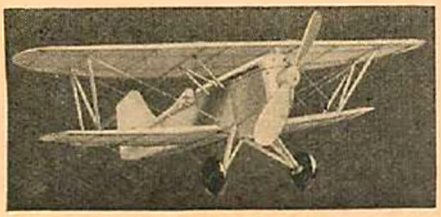

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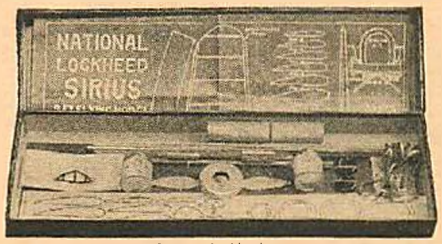
Savoia Marchetti—2 ft. flying scale model, with realistic pontoons, two propellers—remarkable flying ability—weighs less than 1 oz. Complete with full size blueprints and instructions. Price..... **$2.50**



This picture shows the National Lockheed Sirius construction set as it reaches you, everything complete, full scale blueprint and instructions, ready to assemble. You will find all other construction sets equally as complete. Can you ask for any finer Xmas gift?

Sikorsky Amphibian—2 ft. flying scale model that will R. O. G. with a fine climb and fly a good distance. Weighs about 1 oz. Complete with full size blueprints and instructions. Price..... **$2.75**

SUPPLY KIT No. 10

1 piece Balsa 1/16 x 2 x 24
5 pieces Balsa 1/16 x 1/8 x 24
2 pieces Balsa 1/8 x 1/8 x 24
2 pieces Balsa 1/8 x 1/4 x 24
1 piece Balsa 3/8 x 5/8 x 24
1 Bottle Cement
1 Bottle Banana Oil
2 bearings
1 package wire washers and fibre wheels
2 sheets 21 x 24 Jap. Tissue paper
20 ft. 1/32 x 1/16 Flat Rubber
Post paid **$1.10**

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2 pieces Balsa 1/16 x 2 x 24
10 pieces Balsa 1/16 x 1/8 x 24
6 pieces Balsa 1/8 x 1/8 x 24
2 pieces Balsa 1/8 x 1/4 x 24
2 pieces Balsa 1/2 x 1 x 24
1 Can Cement
1 Can Banana Oil
2 bearings, 2 shafts, 2 rear hooks
2 front clips, 2 rear clips
12 washers
3 sheets of Tissue
20 ft. 1/8 flat rubber
} No. 14
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SUPPLY KIT No. 30

3 pieces Balsa 3/16 x 1/4 x 24
2 pieces Balsa 1/16 x 2 x 24
2 pieces Balsa 1/16 x 3 x 24
10 pieces Balsa 1/16 x 1/8 x 24
10 pieces Balsa 1/8 x 1/8 x 24
3 pieces Balsa 1/8 x 1/4 x 24
3 pieces Balsa 1/2 x 1 x 24
6 pieces Bamboo 1/16 x 1/4 x 15
1 Can Cement
1 Can Banana Oil
4 Tissue Jap
2 bearings, 2 shafts, 4 hooks
2 rear clips, 2 front clips, 2 doz. washers
30 ft. of 1/8 flat rubber
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Gliding and Soaring

(*Continued from page 13*)

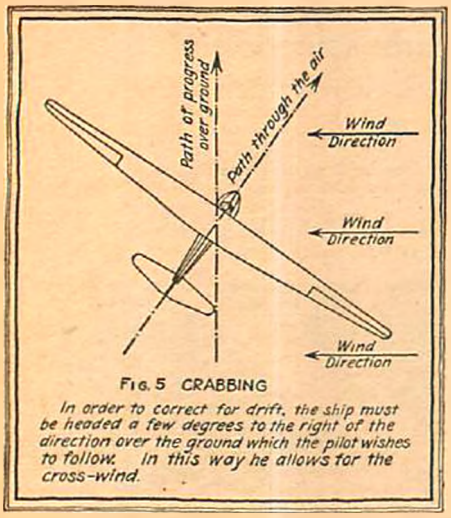


FIG. 5 CRABBING

In order to correct for drift, the ship must be headed a few degrees to the right of the direction over the ground which the pilot wishes to follow. In this way he allows for the cross-wind.

might be damaged in most cases.

Spins. The stalling of a motored plane is dangerous, moreover, because, unless checked, it may result in a spin. A spin is the rotation, about an axis almost perpendicular to the earth, of a stalled plane which is falling nose downward. Spins, however, do not often occur in gliders. Further information about spins is given in a later instalment.

Causes of Stalls. Stalls may result from several conditions, which can be summarized in the following way:

1. In Climbing. A glider stalls if it tries to climb longer than its forward impetus warrants. As a matter of fact, primary gliders rarely climb at all. You will do no climbing except, possibly, during the take-off. It was to avoid the danger of stalls that you were told that it was better not to climb at all during the take-off, but to hold the stick in neutral when being launched into the air.

2. In Gliding. If the ship's angle of glide is too flat, the downward speed will not be sufficient to maintain flying speed. Most gliders have enough lift so that it would be difficult for them to stall during a glide.

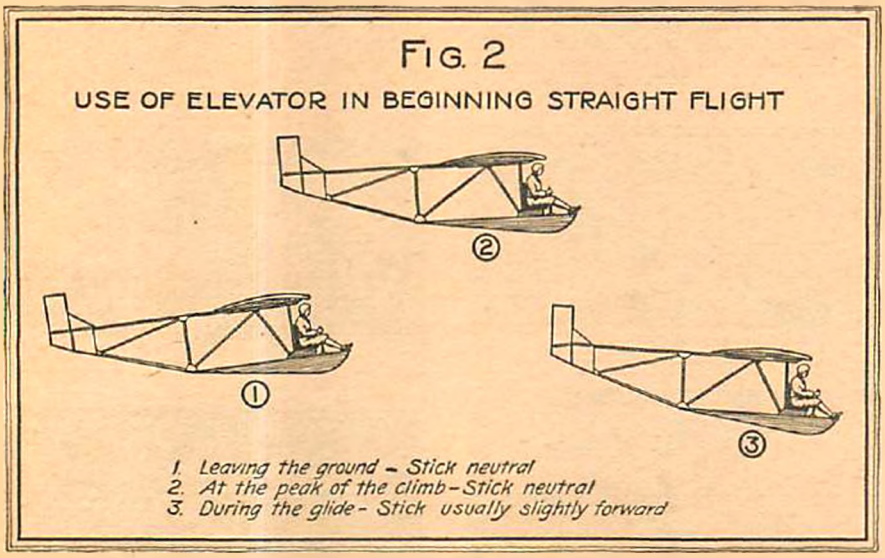
3. In Turns. If a glider has skidded on a turn this increases the glider's drag, and consequently decreases its speed, which may result in a stall.

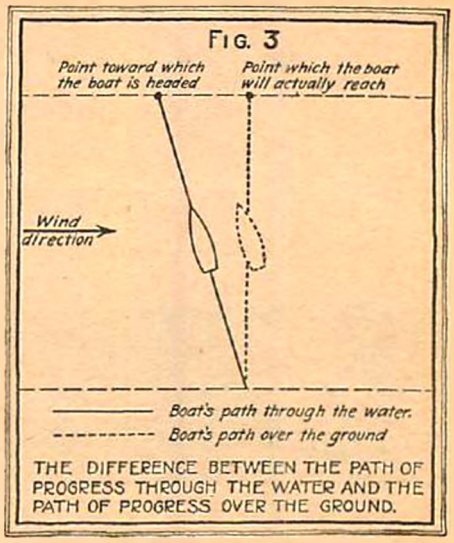
It is obvious that when the glider stalls, its nose is pointing above its path of flight.

How to Recover from Stalls. As soon as a stall is evidenced by the inefficiency of the controls, push the stick forward. When flying speed is lost, it can be regained only by diving the glider. As soon as the nose of the ship begins of its own accord to drop, the lowered elevators will become increasingly effective, forcing the plane into a steeper dive. When the glider has gathered speed, pull the stick gradually back to neutral.

When the ship is climbing, stalls are the most dangerous: The glider, having lost its speed while in a climbing position, tends to slide backwards. This tendency is, however, offset almost immediately by the weight of the nose, which changes the ship's angle of attack. A vigorous take-off launches the glider into the air high enough so that recovery from a stall is possible.

A stall due to too flat an angle of glide can be corrected almost immediately by pushing the stick forward.





When a glider stalls during a turn, one wing is lower than the other. This is an incipient spin. To right the ship, push the stick way over toward the high wing, moving it forward at the same time. The ailerons will take effect as soon as some forward speed is acquired.

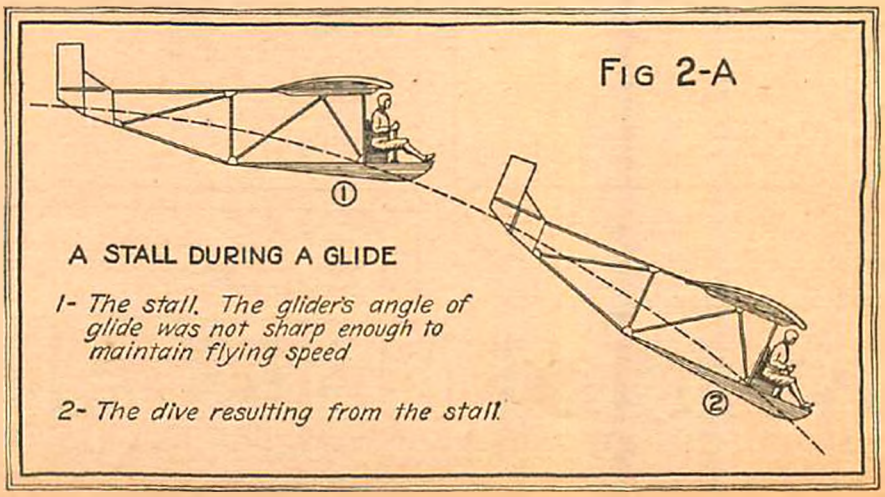
Conclusion. It is important that a pilot know how to act in case of a stall. However, when he has once experienced the moment when the controls are inefficient and has pushed the stick forward to recover, he will be prepared for later emergencies.

THREE THINGS TO REMEMBER ABOUT STALLS

1. When the controls begin to feel "soft" (i.e. when the ship's response to control movements is slow), push the stick forward.
2. Stalls always threaten to result in spins. Therefore, keep your nose down, and beware of the stall.
3. In order to avoid stalls—keep flying speed!

CAUTION TO MOTORED GLIDER PILOTS

1. Learn to recognize the moment when it is imperative to dive. The controls of a glider are comparatively "soft" most of the time.



Special Course in Air Navigation

(*Continued from page 24*)

his maximum signal and knows without any calculations that if he keeps on the same compass course it will bring him to the station. This however, will only be the case when it is dead calm and no wind. When there is a wind this course alone will not help him (unless the wind is dead ahead or dead astern) and he will have to keep on getting his maximum signals and adjusting his course about every quarter of an hour. His course would probably be similar to that shown in Figure 2.

This method has certain advantages over others, inasmuch as signals can be received in any direction from the transmitting station, as many planes as wish can use it at the same time without interfering with each other, and in time of war it does not disclose the plane's position.

THE BELLINI-TOSI METHOD

This is a method simple from the pilot's point of view, but is not without its limitations. The pilot has no work to do or calculations to make whatever; all this is done on the ground. A signal is simply sent from the air to the nearest control station asking, "what is my position?" and then you wait for an answer.

What happens is this: There are two stations on the ground connected with each other, either by a special land wire or by radio, in which case they would use a different wave length of their own. One of these stations is the control station. When you send a message down to the control station asking for your position, this station calls up the other one and tells it to get ready to obtain a bearing. There may be more than two stations doing this but only one is the control station, which then sends you a signal telling you to transmit your call-sign for 30 to 60 seconds.

While you are doing this, the stations are getting bearings on you by the same loop aerial method as has already been described. The control station then obtains your bearings from the other station or stations and with the aid of its own bearing, plots out your position on a chart. In from one-and-a-half to two minutes it will call you up and give you your position.

It is extremely necessary that your watch should be synchronized with the control station time, and that you note very carefully the length and direction of your run from the time you send out your signal until the time you get your position, which will be your position as it was when you sent your signal.

This method has been employed for some time with considerable accuracy and has been invaluable in cases of forced landings at sea or in the desert, where the airplane has had the necessary facilities for setting up a ground station. It has simply had to send out a message reporting its forced-landing, and its exact position could be ascertained by the control station. Furthermore, no special apparatus has to be carried on the plane beyond the ordinary receiving and transmitting set and no calculations have to be made in the air.

The disadvantages are, though, that an extensive and generally an expensive ground organization has to be maintained, and that some delay may be caused if there are several airplanes calling for positions at once, and that, of course, in wartime your position would be disclosed.

THE ROTATING BEACON METHOD

This method is the latest one in use today and in my opinion is far and away the best system of direction finding by wireless that has yet been evolved; at any rate for pilots who are able to leave their controls long enough to plot out on the map the bearings they receive.

This again employs the principles of the loop aerial. It is a large frame which is rotated by mechanical means at an exactly uniform rate of one complete revolution a minute. As it rotates it sends out a continuous signal and this, as has already been explained, will gradually increase and fade away according to the position of the airplane from the station. A minimum signal will be heard every 30 seconds.

In this system the strongest signals will be heard when the receiving plane is at an angle of 90 degrees from the beacon and these will gradually fade away until nothing is heard, when the plane will be in a direct line.

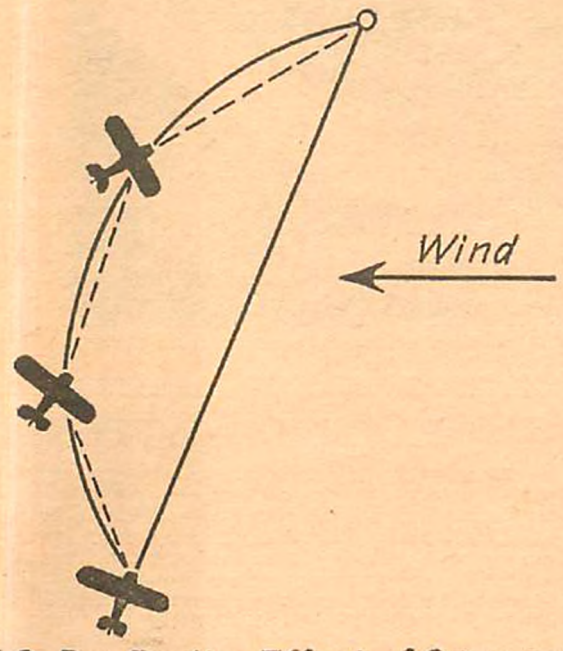
This method is also known as the Rotating Wireless Beam. When the beam is pointed TRUE north, it sends out a Morse signal. Similarly when it points TRUE East, this is necessary because if you were in a line north or south of the beam you would not hear it signal from north. Since it makes one complete revolution of 360 degrees each minute, it follows that it rotates over an angle of 6 degrees every second.

The method of operation is easy to follow. You tune in to the proper wave length for whichever beam you want and wait with a stop-watch in your hand. You will know roughly where you are in relation to the beam; you will at least know whether you are north, south, east, or west of it.

WE will suppose for this example that you are south-west of it. You hear the north signal given and know that this is sent out immediately before the beam is directed to true north. You set your stop watch and you hear the buzz in your ears through the headphones getting louder and then fading away until it gets softer and softer and then stops. At this moment you stop your stop-watch, for the moment the signal stops is when the wireless beam is pointing directly at you or directly away from you.

(*Continued on page 44*)

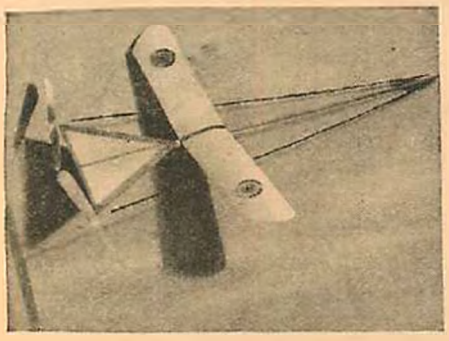
FIG. II



HOMING By Radio. *Effect of Cross wind.*

MOSKITO'S CHRISTMAS PRESENT

to their model making friends is the wonderful bargains shown in the Holiday Prices below:



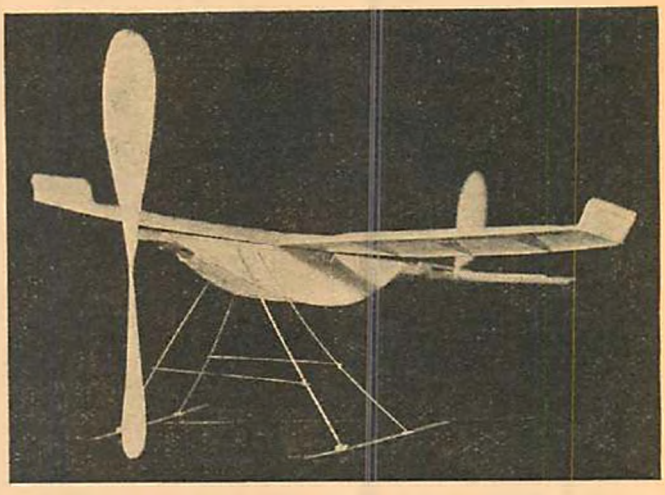
TWIN PUSHER

$2.00 *Postpaid*

Flies 10 minutes and many hundred feet. All balsa construction. Wing spread 30". Weight 2-3/4 oz.—can be lightened. You can be as sure the Moskito Twin Pusher will outfly any other model as you are that there will be a flame when you strike a match.

Most complete kit on market. Two blank balsa propellers—right and left—with kit. Free winder, dope, cement. Wire fitting all formed. Wing ribs cut to fit and wing curve proven. You'll get a $100 worth of fun out of this $2.00 model. Easy and simple to construct with full size layout sheet. If you want fun, this is your model.

MOSKITO SKIPLANE TANAGER—$.85 P. P.



This safety model, first flown at Buffalo Air Show is R.O.G., R.O.W., and will rise off snow or ice when properly equipped with wheels or pontoons. Can tow Baby R.O.G. (shown below). Duration of 1½ minutes has been attained with this model. Will *not* dive, tailspin or ground loop because it uses newly discovered safety principles. Complete kit contains bentwood prop, extra propeller blank, all wood cut to fit, cement, dope, fittings already made, etc. Also full size blueprints. Everything to make this amazingly stable, long flying, safety model, the best plane you ever built.

Read these Startling Christmas Prices

Orders less than $.50 not filled. All prices postpaid

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2 oz. bottles Aero Dope		.15 "
2 oz. bottles thinner		.15 "
Cement in Cans—2 oz		.25 "
Sheets Japanese Tissue Paper	21 x 25"	.05 "
Sheets Japanese Bamboo Paper	24 x 36"	.14 "
Sheets Cellophane	12 x 24"	.12 "
Sheets Three Ply Veneer	12 x 24"	.25 "

Following strips of rubber in lengths of 25 and 100 feet—

1/16 x 1/32"	.01 per foot
1/16 x 1/16"	.01 " "
1/8 x 1/8"	.01½ per "
1/8" flat	.01 per "
3/16 " flat	.01 " "
Pcs. Flat Bamboo each 15" long	.02 " "

Fittings—Envelopes containing the following—
1 propeller hanger, 1 shaft, 1 small wing clip
1 large wing clip, 1 wire can, 1 rear hook, two washers, two bearings ..... 10 per pkg.
Winders ..... $0.30 each
Packages Aluminum Powder ..... .10 "
Propeller Blocks (Shaped) 6" long ..... .08 "
2c per additional inch of length up to 12" length. For instance, 7" prop. 10c, 8" prop. 12c. etc., 16" prop. 28c. No 13", 14" or 15" lengths.
Bentwood Propellers 6" long ..... 12c each
2c per additional inch of length up to 12" length. 16" prop. 32c. No 13", 14", 15" lengths.

CABIN TRANSPORT—$2.50 p. p.

This model has flown 1,200 ft. Wing spread, 36". Fuselage, 20". Weight, 3 oz. or less. All balsa wood construction. Fuselage sides already made and all wood cut to size. 12" carved propellers. Extra blank free. New type landing gear, shock absorbing and unbreakable. All fittings ready to use. 4 oz. real airplane dope. 2 oz. of waterproof cement which dries white. Ribs cut and shaped ready to use, with wing curve tried and proven.

Our Moskito Baby Cabin Transport is half size brother of big plane shown below, but has many improvements and special features. Flew for 2 minutes at recent airshow. Kit costs only 75c.

MOSKITO FLIER—75c *Postpaid*

Record Endurance model. Five minute flights or more easy with our special propeller and new kind of wing construction. Kit absolutely complete. Full sized layout. Free extra propeller. Wire fittings bent ready to use. Aero dope and cement. Balso construction throughout. Adjustable for height or distance. Flies in small room or out of doors. Own a Moskito Flier.

Be sure to get the Baby R. O. G. model, exact half size replica of large Moskito Flier below. Has flown 3 minutes—45c postpaid. Or Baby and Moskito Flier $1.10 p.p.

Use Coupon Below

Prices on this ad for Christmas only. No orders for kits shown here accepted at prices given unless this coupon is used.

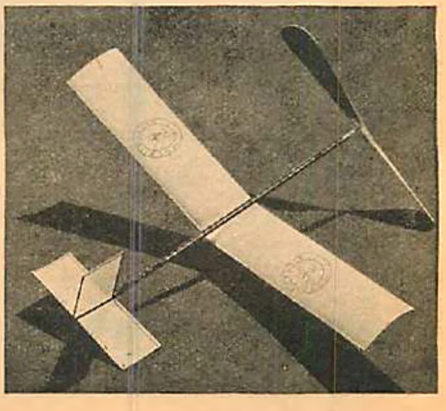
MOSKITO FLYER CO.
11 West 42nd Street, New York City

Gentlemen:
Send me today: (mark article by X) Money Order enclosed.
☐ Baby R. O. G., $0.45 ☐ Moskito Flier $0.75
☐ Baby R. O. G. and Moskito Flier together $1.10. ☐ Moskito Tanager $0.85. ☐ Twin-pusher $2.00. ☐ Cabin Transport $2.50.
☐ Baby Transport $0.75.

Name.....

Address.....

City and State.....



(*Continued from page 42*)

Look at the watch and see the number of seconds recorded; in this case 12.5 seconds, for example. It took that beam 12.5 seconds to revolve from north to you and turning at the rate of 6 degrees for every second, this means it has turned an angle of 12.5 x 6=75 degrees, or 75+180=255 degrees, if the beam was pointing away from you when its signals ceased. You always know whether you are east or west of it, though, and in this case you are west, so that your bearing from the beam station is 255 degrees TRUE.

Suppose you were in a north or south line from the station and you had not heard the north signal but had heard the east signal. You had then started the stop watch, and the time taken for the signal to die away was 14.2 seconds. In this time the beam has revolved 85.2 degrees. However, since you started the watch after the east signal, that is to say, after it had already turned 90 degrees, you must add this amount to the 85.2. This makes your bearing from the beam to be 175 degrees if you know you are south of it, or 175+180=355 degrees if you know you are north of it. It is a good idea to take two or three readings to make sure you are correct.

HAVING found out your bearing from one station, you tune in to another and repeat the process. Then on your map you draw a line from the site of the first station at the bearing you obtained from it and another line from the second station at the bearing you obtained from it, and where those two lines cross on the map is your position. It possibly sounds a little complicated as you read it here, but the writer has tried it out a large number of times during the daytime with astonishing success. The average error has been about 2 degrees, while many of the results were considerably less. These were mostly obtained at distances of about two hundred miles; but accurate results have been obtained from it up to six hundred miles, and it is only in its experimental state yet.

When you obtain a wireless bearing you must not forget it is a great circle bearing. If you are using maps it is all right to plot this bearing directly on to the map, for you will remember that a straight line on the map is approximately a great circle bearing. However, if you are using charts of the Mercator's Projection type—you will only be using these normally if you are flying over the sea—you will have to convert your great circle bearing, that you have obtained from the wireless beam, to a Rhumb line bearing.

You will remember that a straight line on a Mercator's Projection is a Rhumb line, but as direction finding by radio over areas of water has not yet been attempted, the question of converting these bearings need not be dealt with here.

ANSWERS TO OCTOBER'S QUESTIONS

1. In the compass readings given the deviation on north was +10° and on south —4°, on east it was —5° and on west +12°. For north and south deviation calculate as follows:

$$\frac{+10 \quad -4}{2} = \frac{+10 \quad +4}{2} = \frac{14}{2} = +7°$$

For east and west calculate as follows:

$$\frac{-5 \quad +12}{2} = \frac{-5 \quad -12}{2} = \frac{17}{2} = -8\frac{1}{2}°$$

You would adjust for +7° on north or south, and for —8½° on east or west.

2. To correct for a deviation of +7° on north or south, you would insert a magnet in one of the left-right holes in the corrector-box with the red pole to the right.

To correct for —8½° on east or west, insert a magnet in one of the fore and aft holes with its blue pole forward.

3. In selecting the site for a compass base you would see that it was free from local magnetic disturbances, not too far from the hangars and not in the way of airplanes landing or taking off.

4. If the lubber-line was not true with or parallel to the fore and aft line of a plane, a deviation would be caused on all the points of the compass. The amount of the deviation would have to be ascertained by swinging the compass, which should then be turned the necessary number of degrees in a clockwise direction if the deviation is plus, and in an anti-clockwise direction if the deviation is minus.

5. The principal points in the care and maintenance of compasses are as follows:

(a) Compass to be swung each month.

(b) Particulars to be entered in compass log book.

(c) Compass to be tested for sticky pivot.

(d) Any bubbles in compass bowl to be removed.

(e) Compass to be examined periodically for broken springs, washers, pads, etc.

NOVEMBER'S QUESTIONS

1. What points would you look out for in the inspection of an airspeed indicator?

2. What are the limitations of an aneroid altimeter?

3. How would you find the wind-speed and direction?

4. How would you find the bearing of one place from another on a map?

5. Your air-speed according to the instrument is 90 m.p.h., your height is 6000 feet. What is your true air-speed?

ANSWERS TO NOVEMBER'S QUESTIONS

1. See that the rubber joints were not perished, that the metal tubing was undented and that both the pressure head and the perforations in the static head were free from obstructions.

2. It will only record heights above the height of the point of departure and not above sea-level, and is liable to be affected by changes of weather and vary its reading even while a constant height is being maintained.

3. Maintain your plane on a steady course, look down the eye-piece on your drift indicator on to the drift-bar, and then turn the instrument

by the handle at the side, until objects on the ground appear to be passing straight down the drift bar. The indicator on the side of the instrument will show you your angle of drift. From this in conjunction with your airspeed, you can obtain the windspeed by reference to a table. To find your wind direction, you keep your drift indicator set at zero and keep turning the plane into the direction from which you are drifting, until looking through the eyepiece down the drift-bar you once more see objects passing straight down it. A glance at your compass will now show you the direction from which the wind is blowing.

4. Set your protractor (if a square type) with the hole in the middle over your point of departure and with its north and south line parallel with any meridian near the place. Extend the string until it passes over your place of destination and the bearing can be read off the graduation on the edge over which it passes.

5. Your speed increases 1¾% of the amount shown on the indicator for every 1,000 feet of height. In this case the answer would be:

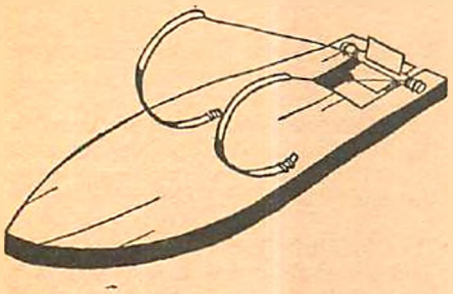
$$\frac{1\frac{3}{4}}{100} \times \frac{90}{1} \times \frac{6}{1} = \frac{7 \times 90 \times 6}{400} = \frac{189}{20} = 9 \text{ approx.}$$

Your correct speed would be an increase of 9 m.p.h. or 99 m.p.h.

DECEMBER'S QUESTIONS.

1. How would you know whether you were heading on a direct course for a transmitting station by the fixed coil method, and why?
2. What are the advantages of the Bellini-Tosi method?
3. What is a loop aerial; explain its principles.
4. What is a rotating wireless beacon?
5. Explain how you would obtain a bearing from a rotating beacon.

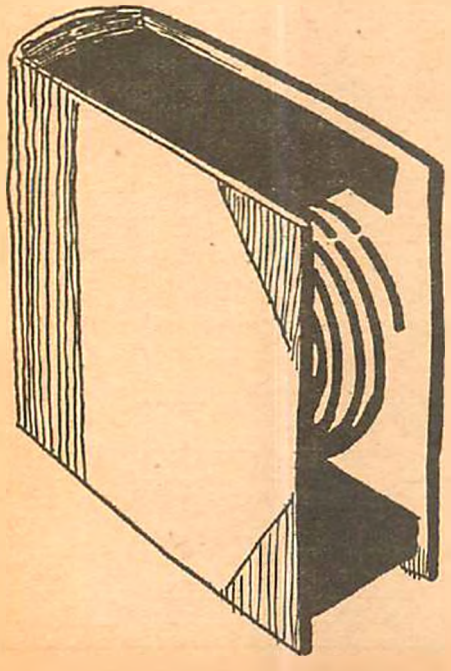
A Few Handicraft Hints



A NEW TOY BOAT

THIS little flatboat is spring-driven, and made of a piece of ordinary board. A square is cut out of the stern of the boat for the propeller, which is made of four blades of tin inserted in a wood axle, which in turn is held in position by staples.

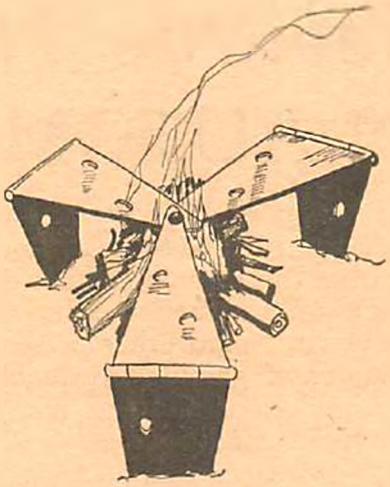
Two corset steels or old hacksaw blades are the motor, and their ends are fastened to stout strings wound around the propeller axle. This boat will make more than twice the speed of the ordinary rubber-band type.



A DEEP ONE

EVER notice that the books on your shelf have a way of tipping over when you take out one or two? Here is an automatic refill that will extend as you need it, and fold up when you return the other books.

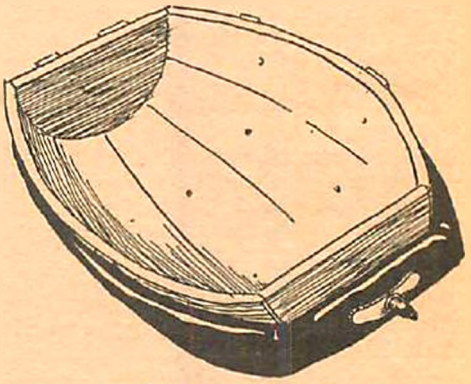
It is made of the covers of an old book, with a large spring between. Black cloth is pasted at top and bottom to hold the covers straight. Besides serving as a fill-in, this device offers a handy place to hide something out of sight.



A RED-HOT IDEA

THIS camp stove is red-hot in more ways than one. It can be put together in five minutes out of three old hinges and a stove bolt, and it will be worth its weight in gold when you're in a hurry for grub. The thing folds up easily into a parcel that you can carry in your pocket, and the long narrow hinge points will stick in the ground almost anywhere.

When grub time is over, if you're in a hurry to mush along the trail and the "hinge-stove" is too hot to pack, simply put it next to the moist ground for a few moments if there's no water handy.

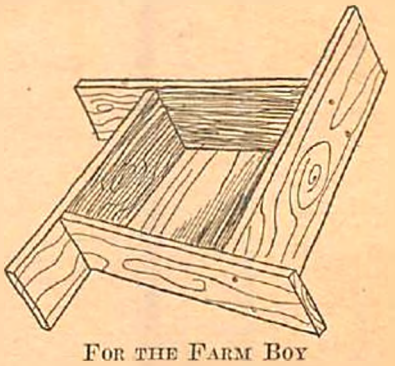


FOR THE BEACH

THIS little boat is more than a toy, for it will hold any person. It is made of half a barrel, cut lengthwise. Before cutting the barrel, carefully nail or screw each stave to its hoops. Cleat the ends and cork the air vents, if any. Then bend over all nails on the inside.

Around the outside, about four inches below the sawed line, place an old inner tube and inflate.

Besides the fun that this improvised boat will bring, it may be the means of saving several lives, for it is absolutely unsinkable.



FOR THE FARM BOY

DOES this look simple to you? Maybe it's new as an idea for a feeding trough, but this odd design is based on the oldest good luck sign in the world, called by some the swastika. And the best of the good luck it brings is the fact that no calf or pig can tip it over!

METAL DIVIDERS

WHERE is the man or boy who hasn't looked around the workshop for a pair of dividers in a hurry . . . and then had to use a compass? Here is a simple and quick method of providing yourself with a cheap and useful pair. Take an old pair of scissors, file off the handles as close as possible, and tighten up the set-screw so that the legs do not move easily back and forth.

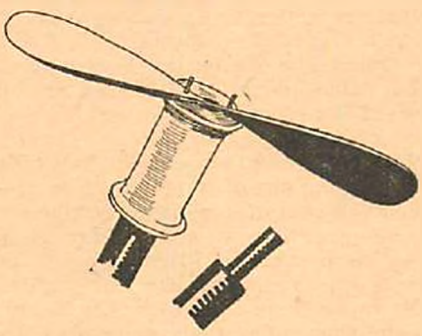
File the legs down to a sharp point and the operation is completed. If it happens that one blade breaks, it is not very difficult to file the other one down shorter to match it. You'll find that this is better steel than is used in most commercial dividers.

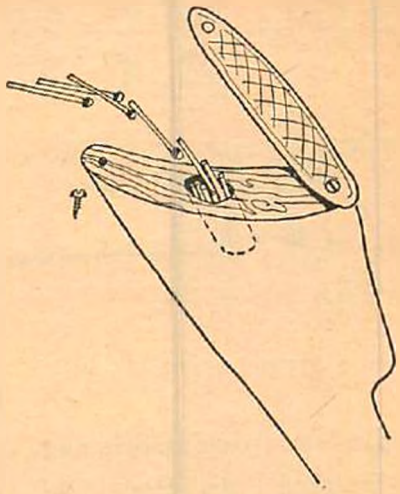
THE BASIC HELICOPTER

HERE is the simplest helicopter in the world, and yet one that will fly surprisingly well for even the younger boy. All the materials required are a piece of tin, two brads, a spool and a stick of wood. Clip the heads off the brads and drive them in the spool as shown, so that they project about three-quarters of an inch.

The whirler or propeller is made of tin, bent to shape, and with two nail holes to fit over the brads in the spool. Now cut a shoulder in your stick so that the spool will not slide down too far, but will turn easily. Wrap about four feet of twine around the spool and the propeller will rise many feet in the air.

(If it doesn't, simply turn your propeller over as you are whirling it the wrong way.)





A REAL LIFESAVER

THEY'VE learned the value of this kink out West but it may be new to a lot of you. You may need dry matches on a hunting trip only once in your life, but that once is the time when fire may save your life.

Remove one screw of the shoulder plate of your gun and slide the plate aside. Drill a hole about an inch in diameter and 2 1/4 inches deep in the stock. Fill it with matches. They'll stay dry through the hardest rain that ever fell, and they may mean warmth and a cheery fire when you're lost and chilled and your ordinary matchbox is soaked.

The Mystery of the Silver Dart

(*Continued from page 7*)

mother and the Genii will say when they hear the news?"

However, youth being youth, he soon got over his chagrin, dashed to the officers' mess and told the waiter to make arrangements for his baggage to be taken to his quarters. Ian then made straight for home and his mother. His welcome there does not concern us.

Time sped by and before Ian realized it, he had been in Washington a month. His all-around reputation as a sportsman and aviator soon gained him a place as a favorite among all officers and men at the airdrome. Hence, it was cause for no surprise when orders were posted stating that he had been appointed special aide to Commander William G. Stevens, chief of the U. S. Naval Aeronautical Designing Department, a department which included a special test flight section. The Designing Department also came under the direction of the Naval Board of Air Strategy.

THREE months passed by with nothing out of the common to disturb the everyday routine at the air base—and then came the day that was to prove the turning point in Ian's career and gain for him eventually more fame even than Lindbergh—and those of you who remember the fame brought upon himself by the Lone Eagle after his famous New York to Paris non-stop flight can appreciate Ian's glory.

It started like this:

An annual Field Day was in progress at the Washington airdrome. Representatives from every squadron of the U. S. Army and Navy Air Corps were on hand with their planes to participate in the various aerobatic events, formation flying and intersquadron air races.

Thousands of spectators were on hand for the aerial fête and had been thrilled and astounded by the amazing flying demonstrated by the crack pilots of the U. S. Army and Navy. Every maneuver known to the world of aviation was gone through by the pilots — loops, spins, Immelmann turns, outside loops, falling leaf, inverted falling leaf (a heritage from Lieutenant Alford J. Williams, once the Navy's ace of aces stunt and speed pilot), and other stunts.

If you think this type of flying thrilled the spectators, you should have been on hand to hear them gasp when flights of three planes and then squadrons of nine planes went through these same maneuvers simultaneously.

Then came Ian's turn. He had just finished causing the crowd to shudder in amazement as he trundled his P-6 (a Curtiss *Hawk* pursuit plane fitted with a Curtiss 600-horsepower motor) on to the field, gave her the gun and looped straight from the take-off and landed again straight from the loop. He did this three times before the spectators fully realized the amazing stunt he had pulled off.

By this time the field was becoming deserted, as many of the squadrons had taken off for their own airdromes, and joy-riding became the order. It was then that Commander Stevens, accompanied by his wife and their two children, walked across the field to meet Ian.

"Potter," said the commander, "my kiddies are keen to be taken for a flight and my wife can think of no one more capable than yourself with whom to trust them. Would you mind taking them up?"

Ian, bowing to Mrs. Stevens, said that he would be delighted. They all walked to a Fokker J-5, in which sat a mechanic tuning up the engine, and settled themselves comfortably inside. The commander and his wife stepped aside and Ian gave the Fokker the gun. The plane quickly gathered speed for the take-off.

There was a gasp of horror from the crowd. Commander Stevens and his wife stood rooted to the ground with fear in their hearts, for just as the Fokker was about to leave the ground the wheels struck a small rut and then, as the plane started to climb, one wheel fell off, struck the ground and bounded away across the field!

Immediately there was a rush of mechanics and pilots from all sides. Speed was essential as no one knew how long Ian would stay up, and whether he realized that a wheel had fallen off.

Men ran from hangars bringing with them spare wheels and holding them above their heads with the hope that Ian might glance down and understand that they were trying to signal to him. Four others, two pilots and two mechanics carrying a spare wheel each, dashed to two 02-C's (Douglas observation) planes. Without even bothering to notice the wind direction, the pilots gave the planes the gun and virtually pulled them into a steep climb.

The greater speed and climbing qualities of the 02-C's enabled the pilots to overtake Ian quickly and they circled around as near as possible without endangering the Fokker. The mechanics stood up in the gunner's cockpits, holding out the wheels and pointing to the Fokker's undercarriage.

QUICKLY Ian grasped the meaning of what had first seemed a funny display of aerobatics. Sliding open a panel in his cockpit, he at once waved his arm to signal that he had read their message. The two observation planes landed quickly and the field was cleared to allow Ian to bring the Fokker in.

Everything and everybody was stilled. Nothing seemed to happen for ages. Those on the ground waited with bated breath. Ian was seen to take the Fokker about five miles

from the field and then turn to come in. He put the plane in a gentle glide and held it there. Slowly the plane approached the field, nearer and nearer it glided in.

Ian's own mechanic stood near the door of the operations office, and those who saw his face were given a more than adequate insight to what is meant by the anxiety of loyalty and confidence.

NOW the Fokker was near the far end of the field and about fifty feet up. The crowd gasped as it was seen to clear some telegraph wires by about two feet, and were given further cause for anxiety when Ian banked his plane to the left; it was the right wheel which had fallen off, and only those who "knew their planes" realized that Ian's banking to the left was the correct thing to do.

This maneuver fully indicated to the officers and men on the ground that Ian would attempt to land the Fokker on one wheel and keep the plane on that wheel until the forward speed of the machine on the ground had slowed to practically nothing. Then, with the loss of lift, the plane would settle over and stop without crashing or turning over on its back.

Virtually all the spectators did not know this, of course.

At last the Fokker was about to land, its left wing tip only about five feet from the ground. Eyelids refused to close and people stared at the plane as if transfixed by hypnotic power. There was a sudden puff of wind. The Fokker's tail wobbled.

"Holy Cats!" said the Officer of the Day through clenched teeth. "That's . . ."

There was a bump and a jarring, crunchy sound . . .

What sinister influence is bearing down on Ian? Is his career to be blighted before he has chance to prove himself? Will he escape from what appears to be imminent disaster? Read the January issue of MODEL AIRPLANE NEWS *for further thrilling moments in our young hero's life. On sale at all news stands December 23 next—and only 15c a copy!*

Christmas Gifts from the Home Workshop

(Continued from page 27)

needle half the distance of the diameter of your clock. This measurement is called the radius of the circle. This distance on the clock being used for illustration is 2" inasmuch as its diameter is 4".

Place the needle of your compass on the point where the center of the board was located and draw the circle, as shown in the plans. Extend the pencil of your compass 1" and, with the needle in the same location, draw another circle, as shown. This circle need not be complete, as it is only used for half the width of the board. Measure along the center line in both directions 2" from the circle just drawn.

Place the needle of the compass on this point, spread the compass 2" and draw another circle. If the circle is completed, it will go beyond the length of the board, and as only a quarter of it is used, draw as shown. Repeat on the other end of the board.

Before proceeding with the layout, check to see that the measurements on your board coincide with those given in the plans. Is the bottom of your small center circle exactly 1" from the edge of the board? Are the two quarter circles you just finished drawing exactly 1" from the bottom of the board, and do they just touch the large circle? In this manner, check each operation with the plans.

Lay your rule across the board so that its edge touches the bottom of the smaller center circle and the bottoms of the two quarter circles. Draw a line across your board. From each end edge of the board measure 3/4" and mark points. Measure 1/2" down from the bottom of the quarter circles and draw two short lines as shown.

Along this last line measure 1/4" in from each end edge and mark a point. Now join these points with straight lines as shown.

The laying out of the work is finished.

If you have a brace and bit, bore a hole any place along the edge of the smaller center circle.

Place the end of your saw in the hole and start sawing toward the circle line. In this way, circles are sawed. You will experience no difficulty in sawing the circle completely around, as shown in Step 2.

Next saw around the larger circle and continue around the two smaller end circles. The small steps at each end can also be cut with the compass saw, due to their shortness, though any straight sawing of any length should be done with the usual hand saw.

Complete Step 2 by sanding the entire board, especially smoothing the sawed edges. The finished piece can now be laid on the second piece, the design traced with pencil and the same operation repeated. Another way this can be accomplished where a vise is handy is to square up the two boards together, clamp them tightly in the vise and cut the two pieces in one operation. This method is not recommended for beginners, however, as considerable skill is required in handling a compass saw properly, and the added thickness of the extra board might prove difficult.

Finish the second board as you did with the first. The main work is now

finished and we are ready to assemble the work, except for a simple operation of cutting, which takes us to Step 3. Study the end view of this operation, as shown in the plans. Is there a bell on the top of your clock? If so, we must make the cut, as shown in the end view of Step 3, so that the pieces will fit over the clock completely. Many clocks have a small handle on the top, and if you find that this is the case with your clock, the cut need not be as large as that which is shown. You must, however, make a cut large enough to take care of it.

An ordinary pen-knife will do this work nicely. If the cut is being made to accommodate an alarm bell, be sure to make it large enough so that the wood will not touch the bell at any spot, thus deadening the sound. Dad won't thank you for an alarm clock he can't hear.

Before making the cuts, choose the best face of each board, and then make the cut on their opposite faces. Be sure that the cuts come together when the boards are assembled, as shown in Step 4.

We are now ready to assemble the clock. The next step is a test, and a very important one, so follow these instructions carefully. Choose the best of the two faces on the boards. This will be the front of the clock. Place the clock through the front board and test for a snug fit. The clock should fit in the center of the circle, so that it will not shift around. Now place the back board in place over the clock and tight against the front board. See that these two boards go together tightly.

RING the alarm. See that it is allowed to ring clearly. Small wedges may be necessary to hold the clock firmly. Before using them, however, the wood must be finished. Remove the back board and the clock. If mahogany has been used, a wax finish is all that is required. If yellow or white pine has been chosen, give the two boards two coats of mahogany stain. When thoroughly dry, rub wax over the surface, allow it to stay on two hours and then rub the surface down with a flannel cloth.

Hot carpenter's glue and 2" small-head brads are used for assembling. Apply the glue to both joining surfaces and drive the nails through the back and in the front board. When thoroughly hard scrape away all excess glue, especially in the hole. Use a nail set on all nails, fill all blemishes, nail set holes and joints with plastic wood and retouch any marred spots.

Insert the clock in its hole. Use small wood wedges to hold it in proper position, first seeing that the clock is straight and that the numbers twelve and six on its face are at right angles to the base.

This finishes the gift we have decided to make for Dad. When working on his gift, we must keep in mind the fact that Dad takes more interest in our carpentry work than any other member of the family so our best is none too good for him. Mother will love anything we make for her simply because we made it, but Dad will study the finished product and then decide whether we are good carpenters or not.

—o—

A SEWING CABINET

WE have a gift which you can make for Mother and which she will find a useful and convenient article to have in her room. It is a sewing cabinet, in which she may keep her sewing or any other articles. A handle is conveniently attached, so that the cabinet can easily be carried from place to place.

The same tools which are needed for the other things given in this article are used to make this one and the lumber can also be yellow pine box lumber.

The following material is necessary:

2 pcs.—1/2" thick x 11" wide x 18 1/2" long for ends.
1 pc.—1/2" thick x 1 1/2" wide x 12" long for top brace.
1 pc.—1/2" thick x 7" wide x 11" long for bottom of compartment.
2 pcs.—1/4" thick x 5 1/2" wide x 12" long for lids of compartment.
2 pcs.—1/4" thick x 9" wide x 11" long for sides of compartment.
1 pc.—1/2" thick x 2" wide x 8" long for handle of cabinet.

Cut the above pieces of stock to proper size, plane both faces, as well as edges, and give each a thorough sanding. Mark in pencil on each piece what it is for, such as "Side", "Lid", etc. When finished, check each board for correct size and set aside for future use.

Some bright man once suggested doing the hardest job first and then all the others would be easy, so we'll follow his advice and do the hardest job first. This is the proper cutting and laying out for cutting of the end pieces.

Take one of these pieces and draw a line along its full length, through its exact center, and parallel to its side edge. Pencil in on this board the design, as shown in the plans, and when finished check each measurement.

As there are no curves, all sawing is done with your hand saw. Follow the outlined design but do not cut right up to the edge, leaving about 1/8" surplus stock on all sides. When the sawing is finished, the 1/8" surplus is planed off, thus allowing you to obtain a straight, smooth edge all around the work. Finish by sanding all the edges.

When this end is completed, lay it on your second duplicate board and trace in pencil the design of the first

on it. Proceed to saw and plane to a finish this board. When complete, lay both boards together and check to see that they are a perfect match on every side.

The design of the handle is now traced on the 1/2″ x 2″ x 8″ board, as shown in the plans, with your compass and rule. This can be cut out easily with your compass saw, or, if you have none, a hand saw will cut away considerable surplus stock, while the curve may be rounded with a knife. Round all edges which come in contact with the hand with sandpaper and give the entire handle a thorough sanding. Set aside for future use.

As the other pieces of stock have already been cut to size, we are ready to assemble the cabinet. This is done with hot carpenter's glue and 1″ small-head brads. The two ends are first attached to the 1/2″ x 1 1/2″ x 12″ brace, which fits in the slot cut at the top of each end piece. Apply hot carpenter's glue to these slots, as well as to the two ends of the brace which come in contact with the slots.

Lay one of the side boards flat on the floor, which can serve as a temporary spreader, stand each leg on the floor pressing against the ends of the side board and then insert the top brace in the slots. Drive the 1″ brads through the brace into the end pieces. Two nails on each end will be sufficient.

When the glue has hardened, the spreader may be removed. Such a spreader is used to insure having the end pieces spread their correct distance apart, while the glue is hardening. As the side pieces fit between these end pieces, it makes an excellent spreader, being exactly the necessary length.

THE sides are now attached. Coat both ends of each side board with hot carpenter's glue and place in position between the two end pieces. Drive the nails through the end pieces and into the side boards. When doing this work, lay the assembly on one of the end boards while the opposite side is being nailed. Both side boards are placed in position, so that the force exerted on the one edge while nailing, will not throw the assembled parts out of line. Repeat for the other side board. Use a nail set on all nails.

The bottom board is now attached in position. This fits between the two side boards and the two ends. It is also attached with hot carpenter's glue and 1″ brads. The brads should be driven through the end boards into the bottom and through the side boards into the bottom. Use a nail set on all these nails.

Great care must be exercised while driving these brads in, as a width of 1/4″ does not leave a great amount of stock for error, and the brads must not be allowed to split through the wood.

The lids are now assembled. Before attaching them to the cabinet, grooves must be cut in their edges for

the hinges. Small 1" long hinges are used and they are set 2" in from each end of the lid. The brace edge should also be grooved to fit these, so that the edge of the brace and the edge of the lid will come together flush. Use 1/2" long wood screws for these hinges. See that the ends of each lid and the ends of the brace match.

When the lids have been attached, the handle is our next consideration. This is attached with hot carpenter's glue and 2" wood screws. The screws are screwed through the brace and into the handle. To do this, the work is turned upside down on the bench.

Set the entire work aside for twenty-four hours, first testing with your try-square for right angle corners, etc. When thoroughly hard, carefully scrape away all excess glue, fill all nail set holes, joints and wood blemishes with plastic wood, and then give the entire cabinet a thorough sanding, bringing the surface to a satin finish.

The question of finish is largely a question of the finish of Mother's bedroom furniture, as it would be well to match that in every detail. If her furniture is mahogany, two coats of mahogany should be applied all over, including the inside of the cabinet. Follow this by waxing thoroughly, and after the wax has been on the surface for two hours, bring to a high polish by rubbing briskly with a cloth.

Today, many bedrooms have painted furniture and if you find that this is the case, obtain lacquer of the same color, or combination of colors, and give the cabinet three coats throughout. Allow plenty of time to dry between coats, see that your brush is perfectly clean and watch out for the occasional hair on the surface from your brush.

This finishes the gifts we have chosen for Dad and Mother. Remember that the greatest fun at Christmas is the surprise of the gift, so don't let them know that you are making anything for them.

A Course in Airplane Designing

(*Continued from page* 14)

a string can *only* be in tension, *never* in compression.

Take a good look at the fuselage of any large airplane. Notice the patterns made by the bracing struts inside the fuselage. Nearly all triangles, aren't they? Why? Is this merely a convenient method of building a ship, or is there some structural reason? The answer is that the triangle has a very decided advantage over the square or other figure because, in this form, all of the stresses are taken by the members themselves, while if we use a four or more sided figure, the joints are subjected to twisting stresses as well. The triangular structure can be made perfectly rigid with hinged joints: It is only necessary that the joints hold the members together. However, if we make a four-sided figure with hinged joints, it will collapse immediately.

A practical illustration of this fact is easy to find. Anyone who has tried to sit on a box in which the corners are rather loose has found that the box has a decided tendency to wobble, or even to collapse entirely. But if one were to use a triangular box, while it might not make a very comfortable seat, it would be rigid, even though the joints were hinged.

The triangular structure is used in airplanes, then, because it relieves the joints of twisting loads and is more rigid. If the four-sided figure were used the joints would have to be large and well-braced. This would entail a lot of excess weight, so it is avoided as much as possible.

It is necessary, of course, to make the fuselage of a passenger-carrying airplane square or rectangular in cross section, to have enough space for cargo and occupants. Nevertheless the bracing in the sides and the top and bottom is nearly always of the triangular pattern. Quite a few ships, notably light planes that do not need much space for passengers, have been built with a triangular cross section in the fuselage. They have been found to be light and, at the same time, rigid.

THAT'S the way it goes. The airplane designer and builder, (especially he who builds models), fights a continual battle of wits and ingenuity to make his ships strong and yet light. The lighter a ship can be made, the better it will fly, on less power, but at the same time the ship must be sufficiently strong to do its job with safety.

There are many little kinks by which a model builder can cut down the weight of his ships without loss of strength. I have mentioned a few, from time to time such as tapered wing spars, wing spars that are deep and comparatively thin, and the cutting out of needless material. There are many others.

One of these other kinks helps to cut down the weight of the fuselage. In the usual type of fuselage, where do the greatest stresses come? Let us reason it out. What condition of flight or landing imposes the greatest stress on the model airplane fuselage, and where does this stress come?

I would say, from sad experience, that a good hard landing puts just about the worst stress on a model fuselage. I have found that nearly all of the crashes of models are

caused by hard landings, landings in which the ship noses into the ground at full speed, pancake landings being the worst offenders. Naturally, we classify crashes in which the ship runs into trees, fences, etc., or in which the ship spins in, under the head of accidents, and few builders try to make their ships strong to withstand abuse of this sort.

Having decided that the hard landing is the condition in which the fuselage is most likely to fail, let us see if we can decide just what parts of the fuselage will be affected to the greatest degree. Unless the ship comes down tail first, a condition that would come under the heading of a crash, the landing gear will strike the ground first. The weight of the ship is trying to go right on down, but the landing gear is stopped by the ground and tries to push itself up through the fuselage. Then we can easily see that the greatest stresses will come at the points of landing gear attachment.

It has been mentioned before in this course that the thing to do is to brace the fuselage well near the landing gear attachment, or to make the longerons heavier near these points, but that it is *not* necessary to brace the entire fuselage for stresses that occur only in one portion of it. Back toward the rear of the ship the fuselage needs only to be rigid enough to withstand the stresses imposed by the tail surfaces and the tail skid.

WHEN beams are used, we can cut down their weight in several ways. We have discussed one, putting the beam on edge, in which position it can take greater loads; but there are other ways of making beams lighter and yet not sacrificing needed strength.

One of these is the use of the I-beam. As shown in Figure 4, an I-beam is nothing more than a normal beam with channels cut out of the sides. It has been found that a beam made up in this manner is strong when subjected to bending stresses, and at the same time it is lighter than a plain beam, since quite a bit of material has been cut away. The wing spars of many of the larger airplanes are modified I-beams, being cut out, or routed as it is called, in several places along the length of the beam.

Figure 4 also shows another type of beam that is popular in the building of man-carrying airplanes, and is used to some extent in model work. It is called the box beam. The view shown is a cross-section of the front spar of a three passenger monoplane. As we see in the sketch, there are two wood beams; one at the top and the other at the bottom of the spar, held together by plywood faces on the sides. This method of construction is easily accomplished. It makes a very strong and light spar.

The cross-sectional shape of a strut used in compression or tension

has no effect on its strength. There is, then, no object in making a compression strut out of I-beam. A member in compression has to have so much material to stand a certain stress, and the material has to be there, no matter what the shape of the beam in cross section.

There might be, however, some reason for making a strut from I-beam material if it were just strong enough to carry its load, since the shape of the beam would tend to keep the beam from buckling when it began to fail. When a beam buckles a part of the stress changes from compression to bending, however, and it can no longer be said to be in direct stress. It is not advisable to design struts so closely that they are expected to fail, so this removes the advantage of the I-beam for this particular use.

We have not learned a great deal about how one should go about finding the necessary sizes of material for any given part of a ship. That is entirely beyond the scope of this course. It can be done, and is being done every day by aircraft engineers, who must find the stress in every member of an airplane's structure before the ship can be licensed, but it is a complicated and difficult process.

The model builder has to learn by experience. He must continually try to save weight, and, in time, he will learn to judge the sizes of materials needed for the various parts with surprising accuracy. He wants to know, in case of a crash, just what member failed first and why it *did* fail. He observes every action of his ship while it is in the air or landing, and makes a mental note of the various design improvements that occur to him, so that he may make use of them at some future time. That is the spirit that makes a model builder bring home the bacon—and the cups.

QUESTIONNAIRE

1. What are the two kinds of direct stress?
2. Why is it better to use a triangular bracing pattern than to use one made up of squares?
3. Name three methods of making wing spars light and yet strong.
4. Make a sketch of an I-beam; of a box beam.

Attend the Next Model Airplane Meet

(Continued from page 35)

boards 9″ wide and 12″ long. Plane both faces and edges of each and smooth with sandpaper. Now saw each board in two widths, 6″ and 3″. Mark, as before, the sawed edges. Lay aside the 3″ wide boards. Now cut a 3/8″ bevel on three sides of each, leaving the sawed edge square. One of these boards has a 1/8″ square groove, which extends from the beveled edge to within 1″ of the sawed edge. Cut this and finish by sanding lightly. The other board having no groove, is finished. Give both boards a thorough sanding to obtain a finish.

The five boards of the bottom of the box are now finished and are ready for assembling. They should be carefully laid aside until you are ready to do this work.

LID

If instructions have been followed, the builder should have two sides and two ends for the lid. Take the two side pieces, which should measure 3″ wide and 42″ long, and plane both faces of each, finishing with sandpaper. Now mark a line, 3/8″ from the edge, along the two ends and the side opposite to the marked, sawed edge. Cut the bevel along these three edges of each piece. Be sure not to cut along the sawed edge in any way!

Locate in pencil the position of the one groove, which each of the side boards has, and cut as directed for those of the bottom of the box. Note that these grooves extend from the beveled edge of each board to within 1/2″ of their sawed edges. Finish with a light sanding and set aside for future use.

The end pieces should already measure 3″ wide and 12″ long. See that they do before proceeding with the work. Now mark with pencil the 3/8″ bevel line along the two ends and the side opposite to the sawed edge and cut the bevel, as before directed. Finish smooth by sandpapering lightly. One of these two end pieces is now finished, as it has no grooves in it. Lay aside for future use.

Take the other and locate the two grooves with pencil. Note that these extend from the beveled edge to within 1/2″ of the sawed edge. Now cut these two grooves, which should be 1/8″ deep and 1/8″ wide in the same manner recommended above. Finish by sanding lightly and put aside for future use.

The sides and ends of the lid are now finished and only the top board remains. This is of 3/8″ white pine and measures 12″ wide and 42″ long. Cut the board 12 1/4″ wide and 42 1/4″ long and then plane along each edge 1/8″ deep. Use a try-square to obtain squared corners. When the planing has been finished, the board will measure exactly 12″ x 42″. If the two faces of the board appear rough, plane smooth and then finish by sandpapering. Now choose the best face for the inside of the box and draw a line 3/8″ from its four edges. Cut the bevel along this line with a plane.

Locate the correct positions of the four grooves and mark with pencil.

These are 1/8" wide and 1/8" deep, as were all the others. Cut in the usual manner. Finish by sanding lightly. Note that the two short grooves extend from the beveled edge of each side 3" in toward the center of the board. The five pieces, comprising the lid, are now finished and may be laid aside, until you are ready to start assembling.

BOTTOM PARTITIONS AND COVER

There are four partition boards for the bottom of the box and one cover. These are shown in the plans and are designated as A, B, C, D. All the partition boards are of 1/8" material, while the cover is made of 1/4" stock. Partition board A is 4 3/4" wide and 35 11/16" long. Plane a board down to exactly this size, using a try-square to insure squared angles at corners. Sandpaper the entire board for smooth finish.

Slightly bevel along one of its long edges to obtain a slight entering edge, where the board is driven in its groove. Do this with sandpaper, as shown in the end view of the board under "Bottom Partitions" in the plans. Set aside for future use.

The other three partition boards are of the same width as the first large one, being 4 3/4" wide. B is 5 11/16" long; C is the same size as B, while D is 11 1/2" long. Cut each of these boards to its proper size, plane smooth and sandpaper for correct finish. B and C boards are slightly beveled along one of their 5 11/16" sides, while D is beveled along one of its 11 1/2" sides. All these bevels are quite slight, as shown in the plans, and are made from both faces of the various boards.

The partition boards are now finished. The partition cover is made of 1/4" stock, being 5 11/16" wide and 35 11/16" long. Cut the board to exactly this size, plane smooth and sandpaper for finish. A 1/2" bevel is now cut on one face of the board, so as to allow the cover to swing back when opening the compartment. Note this bevel on the end view of the cover in the plans under "Bottom Partitions".

Now set this cover aside with the other bottom partition boards, until ready for assembling work, as they are all completed.

LID PARTITIONS

There are four lid partitions and one partition cover. Note that the partition boards are designated by the letters E, F, G and H. The partition boards are made from 1/8" stock, while the cover for them is of 1/4" material.

Partition boards E and F are exact duplicates in size, both being 2 1/4" wide and 20" long. Cut these to size, leaving 1/8" around all edges, so that the boards may be

both planed and sandpapered without becoming undersized. Finish each with a light sandpapering, and then obtain the slight bevel along the 20" length, as shown in the end view of the plans, under "Lid Partitions". Now set aside for future use.

The partition boards G and H are also duplicates, each being 2 1/4" wide and 2 5/8" long. Cut as instructed above and then bring to a finish by planing and sandpapering. Now, with sandpaper, shape their slight bevels along one side of their 2 5/8" length and lay aside with the other partition boards of the lid.

The cover measures 11 1/4" wide and 19 11/16" long. Cut the board in the above recommended manner and finish with planing and sandpapering. A 1/2" bevel is now cut along one of the 19 11/16" edges. Do this work with a small hand plane, as before, and then finish with a careful sanding, making sure that the edges are not spoiled.

If instructions have been carefully followed, all material for the building of the model box should be finished, and in three piles.

You should have five bottom boards; five lid boards, five bottom partition boards and five lid partition boards.

Before proceeding further with the work, carefully check each of these piles. Examine and measure each board to see that it meets with the required measurements and shape. When this has been done, you are ready to assemble the box.

ASSEMBLY

In assembling the box, the work is done in the same manner as the actual building of it was accomplished. We will first assemble the bottom of the box.

Bottom—The bottom of the box is held together with 1/2" small-head brads and hot carpenter's glue. Before starting actual assembly, test the sides and ends by placing them together in their proper positions, and seeing that the beveled edges match perfectly. It may be necessary to shape them further to accomplish this. If so, do the work with sandpaper.

Now test the partition boards to see that each fits snugly in its proper groove. If they stick and refuse to go into the grooves, sandpaper the partition boards, but do not attempt to reshape the grooves.

Lay the side boards flat on a bench. Drive the brads through the board until their points just show through the opposite side. These are driven from the opposite side to that on which the bevel is cut and should pierce the bevel exactly in its center. Note the layout, shown in the plans under "Bevel Joint Assembly".

Space the nails about every four inches. In the side boards, there would be about ten nails to a side. Do the same along the sides and bottom edges of the end boards. Be sure that the nails just show through the boards. If the nails are driven too far through the board, difficulty will be had in matching the boards together when actually assembling.

First attach the left side board. If instructions were followed, this board is marked "Left". It is the one having three grooves cut in it. Place your glue in a pot and heat over a flame. Now brush a *coat of it* along the bevel of the bottom board and also along the bevel of the side board. Match the two ends of the bottom board with the two ends of the side board and drive the nails in carefully, making sure that they enter straight.

TAKE a nail set and countersink the nails about 1/8" deep, before the glue hardens. Test with a try-square to see that the side board forms a right angle with the bottom board. Coat the grooves of both the bottom and side boards at this time and slip partition boards B, C, and D in them. Do this before the glue along the bevels has begun to set. Do not coat partition groove A at this time.

Again test with a try-square to see that the three partition boards form right angles with the bottom board. Also make sure that each partition board has entered the full depth of its particular groove. This may be accomplished by placing a flat board along the top of each partition board and slightly tapping it into place.

Allow the glue to set. Lay the assembled parts out of the way for at least an hour. Now coat partition groove A with hot carpenter's glue and slip partition board A in place. Coat with glue the parts of B, C and D, which meet partition board A. Tap in position A, as explained above. Now lay the box on its left side board and place a slight weight on partition board A, so that it will press against the ends of partition boards B and C. This will insure a solid joining of these boards when the glue has hardened.

At the same time, make sure that the end of A board is in contact with the center side of D board. Allow these joints to thoroughly harden. Two hours should be ample time for this.

The next step in assembly is to coat the bevel joints of the two end boards and the remaining side boards and nail them in place. Use a nail set on all nails and test the ends and side boards with a try-square to make sure that they form right angles with the bottom board.

Make sure that the board A and the board D fit perfectly in their respective grooves in the end and side boards.

The bottom of the box is now completely assembled, and should be set carefully aside to insure thorough drying and hardening of the glue. Do not touch for twenty-four hours.

Lid—the assembling of the lid is accomplished in the same way as the bottom was done. Small-head 1/2" brads and hot carpenter's glue are

used. Nails are first driven in, as in the case of the bottom, and then the glue applied.

First, coat the grooves in the bottom board with the glue and then slip the partition boards E, F, G and H in their respective grooves. Tap, as before explained, to insure them being forced to the full depth of the grooves and then use a try-square to see that they are perpendicular to the bottom board. Next, apply the side boards to the bottom board, making sure that the ends of boards G and H fit into their respective grooves in the side boards. Use a nail set on all nails.

The end boards are now attached in the same manner to the bottom board. One of these has no grooves, as no partition boards meet it, but the other end board has two grooves for partition boards, and great care should be taken to see that the boards fit snugly into these grooves.

See that all boards which meet others are thoroughly coated with glue at these joints and that, when drying, they are firmly together. Allow the lid to set for twenty-four hours, insuring complete hardening of the glue.

The box is now fully assembled and ready for finishing.

FINISHING

Scrape away all excess glue from the joints, taking care not to cut in the wood in the process. Now fill all nail holes, left from the nail set, with plastic wood. If the inside of the box has any blemishes, seams or cracks, fill these also with plastic wood.

Now give the entire box a good sandpapering, using a light sandpaper to insure a smooth finish. It is recommended that the inside of the box be painted white, as this will give a clean look, and, if applied properly, can be easily washed when necessary.

Paint the inside with one coat of flat white and then finish with two coats of white enamel, allowing twenty-four hours between coats for drying. This will give a hard finish, which lends itself to soap and water for cleansing purposes when necessary.

When the inside of the box has been finished and is perfectly hard, the outside of the box is finished. This is done by covering the box with oil cloth. Black is recommended, as it will not show dirt and gives an appearance of neatness. This can be obtained at any "Five and Ten Cent" store for 20c a yard. Cut a piece large enough to cover the bottom board of the bottom of the box, with enough to allow an overlap of three inches on all sides.

Coat the bottom with a thin layer of hot carpenter's glue, and apply the oil cloth, pulling it tightly over the surface. Rubbing an iron over the surface will help to obtain a smooth surface. The overlap is now glued in the same manner to the side

and end boards. Now cut one piece to fit around the two ends and the two sides of the box and apply in the same way. An overlap of three inches is allowed, so that the cloth can be fitted over the joint and to the bottom board. The corners should be cut so that a tight fit can be had. Allow to dry thoroughly.

Apply the oil cloth to the lid of the box in the same manner. When thoroughly dry, see that all the corners of the cloth are glued tightly in place.

Now apply two coats of Valspar varnish to the cloth, as well as to the white enamel surface of the interior, allowing twenty-four hours between coats. This will make the box perfectly weatherproof in every respect.

Small 1 1/2″ hinges are recommended for the inside covers of the box. These should be applied after the covers have been painted, enameled and varnished. A small clasp for padlock purposes is now placed on the top of each cover. See that each of the covers will swing on its hinges perfectly easily.

A suitcase strap, with any good buckle, is now attached across the open and large end of the A-frame compartment, as shown.

Three 3″ hinges are now applied to hold the lid to the bottom of the box. Three are used, as the length of the box makes two such hinges impractical. If obtainable, a suitcase lock and key is best, such as is shown in the drawing of the finished box. Two suitcase side-locks are used to insure perfect locking. If such is not obtainable, any good hasp and padlock may be used. The box should have a suitcase handle, as is shown, for it is carried in this manner.

The model box is now ready for use.

PACKING

Note that the compartment for wings is built in such a way as to allow wings to be stored in exactly the same manner as they are stored in hangars. This is on their leading edges, for such storage causes less wing damage and allows a maximum number to be stored in a minimum of space.

A-frames are placed with their pointed ends under the cover of the lid compartments and their other open ends are held with the suitcase strap.

Elevators are also stored on their leading edges, as are the wings. Soft tissue paper will be found best for packing rubbers and propellers. Place the rubbers and propellers in their compartments and then stuff the tissue paper over them. The compartment cover will hold the paper, and the paper will prevent the rubbers from tangling and the propellers from becoming nicked.

How to Build a Pusher Biplane

(*Continued from page* 15)

edges round. After drying, cover the whole elevator. The outriggers will carry the elevator and rudder. The angle of attack of the elevator and wings must be exactly 0°. After that operation ambroid the vertical struts "l" and "m" in place, as shown in Fig. 2.

For rudder use 1/32″ thick medium balsa wood. Use the drawing No. 4. Scale all the dimensions. Round off all edges. After the elevator has dried, ambroid the rudder to the middle of the elevator and ambroid left and right to the elevator and rudder the pieces "n". The picture shows this.

In Fig. 4 we can find the tail skid. It is formed of round reed and is glued to the lower part of the center rib of the elevator. With this we have finished the whole tail structure.

The next is the landing gear. The photo and Figure 2 show that the wheel carriers are fixed to the lower wing. The length of the "e", "f" and "h" streamlined pieces is shown in Fig. 2. Make two of each. Fasten to "f" the axle which carries the wheel. The axle consists of steel wire and should bend as shown on Fig. 1. Use ready-made 1 1/2″ or 2″ diameter celluloid wheels.

In Fig. 2 are shown the dimensions of the motor stick. Use 21 11/16″ x 9/32″ x 1/8″ hard balsa wood. The way to assemble the hanger and hook is shown in the picture.

The propeller is fixed as usual but in the form of a pusher to the shaft. The propeller turns between the four outriggers, as shown on the photo. A small fitting made of steel wire has been used to fix the motor stick to the "c" and "g" struts. This fitting makes it possible by test flights to move the motor stick back and forth to get the right balance. Put six strands of .045 square rubber bands between the shaft and hook.

Now the model is finished and we can begin with the test flights. As usual, we first glide the model and regulate it by pushing the motor stick back or forth. When the model glides well, put one drop of oil on the shaft and now we can also try it by motor power. For altitude flying we just push back the motor stick about 3/16″.

If we exchange motor stick and use one 12″ in length we can try now to use four strands of 1/8″ flat rubber for motor power. It doubles the speed of the plane, rises from smooth ground quickly after a four or five inch run and climbs steeply. When the motor stops it glides down slowly in a flat angle. We can easily transform our plane into a tractor type by reversing the motor stick and propeller but the performance is not as good as that of a pusher model.

The American Sky Cadets

(*Continued from page* 10)

Scouts, the glider club or school which has a glider, all need a hangar for the ship.

The manual training class of the Cheyenne Mountain Consolidated School, south of Colorado Springs, Colorado, built their own hangar for the school's glider under the direction of their instructor, Mr. Spencer, states C. A. Scheinert, of Colorado Springs.

Mr. Spencer was an aviator in the World War and has the glider class, composed of both boys and girls from the ninth grade up, under his supervision. Lloyd Shaw, the superintendent of the school, takes part with the pupils and has experienced some laughable times while learning to fly the glider.

SASKATOON (CANADA) MEET

THE following report of the model airplane contest held at Saskatoon, Sask., Canada, was taken from an article in the *Saskatoon Star* and was sent to us by Bill Mountford, one of the contestants who not only ran away with the contest, but as a special reward was delegated to send us a report of the meet. The article is as follows:

"Bill Mountford of Regina, took chief honors at the recent Model Aircraft Meet, a meet in which more than fifty exhibitors from all parts of Saskatchewan took part. The Regina exhibitors took prizes in most of the classes, captured the cup donated by the Young Men's Section of the Saskatoon Board of Trade and came through the meet with the best time in the flying models, with the endurance marks of one minute and forty-two seconds in the indoor contest and two minutes in the outdoor tests.

"Most of the exhibitors put in three or four machines. Although no records were broken, the class of entry was said to have been of such caliber that next year the boys will be in the first flight of exhibitors in Canada.

RESULTS

"Following are the winners in the different classes:

Class A—Section 1
1st—Arthur Eley, Colonsay
2nd—Henry Loates, Regina

Class A—Section 2
1st—Bill Mountford, Regina

Class A—Section 3
1st—Duncan Matheson, Regina

Class A—Section 4
1st—Bill Mountford, Regina

Class B—Section 1
1st—Arthur Eley, Colonsay
2nd—Archie Storie, Saskatoon

Class B—Section 2
1st—Bill Mountford, Regina
2nd—Norman Eley, Colonsay

Class B—Section 3
No contest

Class B—Section 4
1st—Bill Mountford

Class C—Section 1
1st—George Christie, Saskatoon
2nd—Duncan Matheson, Regina

Class C—Section 2
1st—Pailstrom, Watrous

Free-for-all, Scale Models
1st—H. R. Oakman, Saskatoon
2nd—Harold Cooey, Saskatoon"

One of the finest models in this class was a de Haviland *Moth*, equipped with floats and folding wings. Other fine models included a Tri-Motor Ford, a realistic monosport, a Douglas mail plane and a speedy looking Curtiss *Hawk*.

That model building in the district is going to hold great interest is proved by the following from Bill's letter:

"It would not be right to comment on the cup-winner, Bill Mountford, because I happen to be that person. I might add that the splendid cup which I proudly possess will do much to build up competition among model builders of the province, that is, if my luck fails me.

"Of course, I will try my very best to win the cup twice more that it might become my own. I know right now that I am the envy of fellow members of the Y. M. C. A. Model Aircraft of Regina, which is a member of your association and I will receive keen competition."

WESTCHESTER TOURNAMENT

WESTCHESTER County's first miniature aircraft meet, held at the County Center, White Plains, N. Y., recently, has been voted a great success. The meet which is planned as an annual event by the Westchester County Recreation Commission was participated in by boys and girls from all sections of Westchester County, all of them winners in the local elimination contests conducted by their clubs or playgrounds.

F. L. Lobdell, director of the Recreation Commission's Miniature Aircraft work, conducted the meet with Arthur Nelson of Yonkers Community Service as Head Judge, George F. Graff, Mamaroneck, and H. Harold Axworthy as judges and Joseph Regan as Clerk of the Course. William L. Foley, James Gilmartin and William Allen acted as timers; George Kapp, as Recorder; Orrin Cross as Assistant Recorder; J. Kinsella Driscoll, Miss Doris Russell and W. Edward Swezey as Inspectors; Ina Scott as Chief Clerk, and Roland H. Spaulding as Honorary Referee.

RESULTS

1.—Indoor Glider—Girls
1st—Alberta Sherwood, Ossining
2nd—Helen Consula, Tarrytown
3rd—Gloria Taxter, Tarrytown

Boys Junior
1st—William Carpenter—Eastchester
2nd—George Redway—Ossining
3rd—Charles Gaylord, Port Chester

2.—R. O. G. (outdoor) Boys Jr.
1st—James Mercer, White Plains, 26 1/5 sec.
2nd—Harold Martin, Tarrytown
3rd—Charles Gaylord, Port Chester

3.—R. O. G. (indoor) Boys Jr.
1st—Jack Brown, Ossining, 1 min. 13 1/5 sec.
2nd—Adolph Lanstrom

Boys Senior
1st—Robert Mercer, White Plains
2nd—Wilmont Merrow, Mt. Vernon

4.—R. O. W.—no entries

5.—Hand-launched (indoors)—Girls
1st—Helen Taxter, Tarrytown, 12 sec.
2nd—Gloria Taxter, Tarrytown

Boys Junior
1st—Francis Schraider, White Plains, 4 min. and 25 sec. (Considered very good.)
2nd—Harry Bronkhurst, White Plains

Boys Senior
1st—Robert Mercer, White Plains, 48 3/5 sec.
2nd—Wilmont Merrow, Mt. Vernon

6.—Fuselage Model (Indoor) Junior Boys
1st—Harold Martin, Tarrytown, 5 1/5 sec.

Senior Boys
1st—Wilmont Merrow, Mt. Vernon, 14 3/5 sec.

7.—Scale Model—Junior Boys
1st—Charles Timmers, White Plains
2nd—Jack Brown, Ossining
3rd—Harvey Merrill, Bronxville

Senior Boys
1st—Wilmont Merrow, Mt. Vernon
2nd—Donald Gilbert, Mt. Vernon

8.—Glider Duration (outdoor)
Girls
1st—Alberta Sherwood, Ossining, 5 1/5 secs.
2nd—Sussie Copp, Tarrytown, 2 3/5 secs.
3rd—Gloria Taxter, Tarrytown, 2 secs.

Junior Boys
1st—Harold Martin, Tarrytown, 4 4/5 secs.
2nd—Harvey Merrill, Eastchester
3rd—Thos. Mitchell, Eastchester

9.—Glider Distance (outdoor)
Girls
1st—Sussie Copp, Tarrytown, 28' 7". (Considered very good.)
2nd—Alberta Sherwood, Ossining
3rd—Gloria Taxter, Tarrytown

Boys Junior
1st—Thos. Mitchell, Bronxville, 63' (Considered excellent.)
2nd—Carl Erickson, Tarrytown
3rd—Harvey Merrill, Bronxville

10.—Tractor or Pusher—no entries

11.—R. O. G. (outdoor)—no entries

12.—Hand-launched (outdoor)—Girls
1st—Helen Taxter, Tarrytown
2nd—Gloria Taxter, Tarrytown

Junior Boys
1st—Carl Erickson, Tarrytown
2nd—Harold Martin, Tarrytown
3rd—O. Drummond, Tarrytown

Senior Boys
1st—Wilmont Merrow, Mt. Vernon

13.—Fuselage Model—Junior Boys
1st—Harold Martin, Tarrytown

14.—Rise off water—Senior Boys
1st—Nano Sacchi, Tuckahoe

A silver cup for the playground or club registering the largest number of prize winners was awarded to Tarrytown Playground, of which Miss Mildred Oliver is Director. Wilmont Merrow, of Mt. Vernon, won the glider scholarship offered by the Westchester Glider School, Valhalla, to the senior entrant who made the best record.

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 therefore 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.

From the Ground Up

(*Continued from page 22*)

sary panting hoarsely as he bent every ounce of energy to break the hold. He could feel himself weakening. A prayer ran through his mind, but yet he clutched the madman's gun hand with whatever waning strength was left to him. Then something seemed to go limp inside. A rushing blackness overwhelmed him. He gave vent to a sobbing gasp as the older and stronger man overcame him. Then he was unconscious.

He awoke slowly. A smell of grease and oil rushed to his nostrils. He blinked his eyes uncertainly, and accustomed them to the daylight which filtered through the small, grated window of the tool locker. Outside in the hangar he heard the noise of clanking tools, and men's voices as they worked. For a moment he could not quite orient himself, then memory flooded back upon him, and an awful fear clutched at his breast.

HIS hands and feet were bound and aching terribly, but he thanked his luck that Heinze had neglected to gag him. He rolled across the floor to the wall nearest the hangar, and putting his lips to a chink in the plaster, he shouted at the top of his lungs.

The clanking outside stopped abruptly. Again he shouted madly. Then came a voice: "Who's there? What is it?"

"It's Larry! Help! Quick!"

He heard the scuffle of many feet on the concrete floor of the hangar, and a moment later the door of the tool room swung open. Half a dozen mechanics stood framed in the entrance, regarding him with amazed eyes.

"Hurry!" he cried at them. "Untie me!"

Willing hands went into action and in a minute Larry stood up, stretching his cramped and aching muscles.

"Where's the Major?" he shot at them.

"Left about an hour ago," was the reply.

"And where's Heinze?"

A man in greasy overalls shrugged. "Dunno. Haven't seen him all morning."

For a moment, Larry stood still, his heart pounding wildly and his brain working at top speed. The Major, the man to whom he owed all his good fortune, was even now flying into the West totally oblivious of the sinister peril that rode over his tail. He turned his head, and as his eyes swept the tarmac outside, he saw the answer to his problem. For there, glittering in the fresh early morning sun, stood the speediest monoplane that the field boasted. And in her cockpit, thrusting its black nose threateningly through the prop blades, was a Lewis Gun. It was the ship that the Plank company used for valuable shipments. This morning she was being overhauled and cleaned up by half a dozen grease monkeys. Larry hesitated no longer.

He raced to the tarmac and sprang in the cockpit of the waiting plane. The mechanics stared at him as if he had suddenly gone mad. He forestalled any objection that might be made to his taking the best armed plane of the outfit, as he shouted: "Don't stop me! I'm acting under the Major's orders. His life's in danger! *Contact!*"

The familiar word caused the mechanics to act automatically. One of them spun the prop, as Larry switched on the ignition. In a moment the powerful engine leaped to a roaring life. He wasted no time warming her up, but almost immediately started his taxi down the field. The plane jerked her nose up into the heavens as he pulled back the stick. He zoomed until the hand on his altimeter indicated 1500 feet, then he flattened her out and threw the throttle wide open.

Over the sandy Texas soil he winged his way. Below, the terrain was a flat white expanse shimmering in the heat of the morning. Above, the sky was an inverted turquoise bowl. And the sun, a golden chandelier.

Never had he flown so fast. With a slight tail wind behind him, and the steady 1800 R. P. M. of his singing prop, his ground speed was well over 150 miles an hour. The air which had been so still and tranquil below, roared a veritable hurricane in his face.

On and on he raced, his hand steady on the stick and his heart heavy with apprehension for his friend, who flew somewhere in that vast blue field, death gaining on him with each spin of the prop. Like a thundering, vengeful eagle he swooped over the state line and entered Oklahoma. His keen blue eyes swept the horizon in all directions. Then he started!

FOR over to the north, were two black specks in the blue. His heart pounded but in a moment he had himself under control. He turned to the grim business in hand. He jammed down on the rudder bar and swung the stick over. Gracefully the plane banked and bore down at top speed on the pair in the distance. Larry's hand wrapped itself about the trigger of the Lewis. Back came the cocking handle. He pressed the trigger tentatively and the gun sang a rattling crescendo.

He rotated the magazine, pulled back the handle once more, and with his mouth set in a thin red line ploughed through the heavens on his errand of rescue.

As he came on them, Heinze's plane was already seeking a position of vantage over the tail of the other ship. The Major half turned in his seat, and looked in puzzlement at the other ship. Thus far neither of them was aware of Larry's presence. The

Major, recognizing the other pilot, waved him a friendly greeting, and banked his ship slightly to permit Heinze to come up alongside. But the madman wasted no time in formalities.

A ripping thread of fire shrieked from the synchronized Browning that was mounted in his cockpit. Larry saw the sheer amazement in the Major's eyes. For a single second his hands left the controls as he was taken by utter surprise. Again the Browning screamed its crackling threnody down on the other ship. Then the pilot in the Major functioned. Still in the grip of a paralyzing astonishment, he worked instinctively.

Down went his stick, over the ailerons, and in a moment he was diving clear out of the path of the murderous lead slugs that whined through his struts. Heinze, an evil grin of triumph on his insanely contorted face, thrust his stick forward and dove after him. Then it was Heinze's turn to be amazed.

FOR directly over his tail, ready for the kill, was a slim gray plane. A small black cylinder suddenly belched flame, smoke and steel down on the Curtiss as Larry pressed the trigger of the Lewis. A whining slug ate its way avidly through a strut. Heinze turned a startled face upward. Larry held his fire, and signaled the other to land.

But this act of clemency almost proved his own undoing. Heinze swung his stick around with the deftness of an expert flyer. The Curtiss responded and achieved a swift Immelmann, coming out of it high over Larry's tail. Then he dove, his Browning unleashing a burning thread of death as he did so. It was Larry's turn to escape a crashing leaden doom that sang through his struts with a moan like a banshee's wail.

Larry threw his plane into a sideslip, and Heinze came charging down after him, the Browning spitting a hail of steel before it. Below, the Major had flattened out and was slowly returning to the battle, waving his automatic futilely. Larry saw him and waved him back. Of what use was Riddle's meager weapon against the machine gun of the maniac above?

Down, down they went. Something crashed up against Larry's instrument board. There was a tinkle of smashing glass, as the Browning sprayed its venomous jet of missiles in the cockpit. Larry felt a sudden sting on his forearm. Blood dripped slowly down upon the controls. Still the madman came on!

As his eye gauged the distance to the earth, he realized that he must crash or turn to face the certain death that awaited him above. Crash he would not; if he must die he would go down fighting. Then he did a desperate thing. With all the force of his strong young arms, he pulled back the stick. The plane groaned protestingly at the awful strain that was put on her. For a moment it seemed that she would *not obey her* controls. She hung suspended in midair, then slowly she came up.

As Larry looked up, he saw Heinze. His face was contorted with an insane grin, and his finger was jammed tightly up against the trigger of his gun. The Browning sprayed the plane with a vicious crimson stream of fire. Still Larry held his stick full back. Up went the nose of his ship. Up and up, she zoomed, almost perpendicular. Still he tugged back on the controls. Back she came, far back. Then for a fleeting moment she hung in a stall. For that one fleeting moment the muzzle of her Lewis was trained dead on the blindspot of the Curtiss that spewed a leaden poison on her from above.

Muttering a silent prayer, Larry closed his eyes, and pulled the trigger. For a moment the brace of raging guns were dead on. The Browning streamed its macabre song, and the Lewis roared a devastating reply. Whatever the failings of Allan Heinze, cowardice was not one of them.

Then the Lewis found its mark. Heinze suddenly jerked back in the cockpit. His hands left the controls and grabbed frantically at his throat. The mad pilot half rose to his feet, then fell back, an inert crumpled figure on the bottom of his cockpit. The unmanned Curtiss plunged onward, down toward the earth. Her Browning was silent, but her engine roared a pounding threnody, and her prop blades sang a swan song, as she fell like a plummet toward her last landing place.

WITH a terrific effort Larry levelled his ship out. His head pounded madly, and there was a dark red stain on his flying tunic. Through blurred eyes, he saw the Major's ship beside him. The latter shouted to him, and Larry killed his engine for a moment.

"Can you make it to Oklahoma City? It's only twenty miles?"

Larry nodded as he switched on the ignition again. He felt weary, but deep in his heart was a paean of happiness. The Major clasped his hands over his head and shook them in a token of friendship. Larry waved a gauntleted hand to him.

Together, two valorous Vikings of the sky, they flew toward the West. . . .

Watch MODEL AIRPLANE NEWS for the Helicopter flying model plans. They're worth waiting for.

A Morris Chair for Your Den

(Continued from page 25)

center of which is 8 1/8" from the top of the tenon. This is to receive the tenon on which the back swings.

Take the two 1" x 5 1/2" x 3' 0" arm pieces. Select the top inside edges. Lay them alongside of each other. From the front corner measure back 2 1/2" along this edge. Square this mark around each board. Measure 1 3/4" further along. Square this mark around the board. Between these two marks draw a line with the marking gauge 1/2" from the inside edge. Draw another 1 3/4" further in. Repeat this operation on the underside. Check locations to see if they are directly under the top marks. This is the location of the mortise through which the leg tenon extends.

From the front corner on the inside edge, measure back 26 1/4". Square this mark around the board. Measure 1 3/4" further along and square this mark around. Draw a line parallel to the inside edge between these two lines 1/2" from the inside edge, and another 1 3/4" from that. This is the location of the mortise for the back leg tenons. There should be a space of 22" between mortises. Remove excess material as before. Be very careful in this case as this is directly on top, where all mistakes will show.

Assemble all these parts. Clamping all parts up tightly while glue is setting. Check all corners to see if they are square. You will notice that the rear of the chair is one inch lower than the front. This is to give it the proper incline for comfort when seated.

Attach the seven 1/2" x 2" x 2' 0" slats to bottom cleats with screws. Be sure to bore and countersink for screws.

Take the two 1" x 2" x 1' 5 1/2" back rails. Locate the center of the long top edge. Measure 7 3/4" each way toward the ends and square the mark around the board. Turn the board on edge. If the board is 7/8" thick, draw a line 1/4" from the edge and parallel to it from the mark towards the end of the board with a marking gauge. Draw another line 3/8" from this. Do this on each end of the two boards. This is the thickness of the tenon. Remove the excess material with a saw, keeping outside of the marks so that the shoulders are square and the tenon exactly 3/8" thick.

Measure down from the top edge of the tenon 1/2" and draw a line parallel to the edge towards the end. Parallel to this draw another 1" away from it. Cut away the excess material. This gives a tenon on each end of the back rest rails 3/8" thick 1" wide and 1" long.

Take the two 1" x 2 1/2" x 2' 0" back stiles. Measure along the inside edge 1 1/2" from the top and 1" from the bottom, and square these marks only across the inside edges. Measure 1" further along toward the center and square these marks across the inside edge. Locate the mortise 3/8" wide in the center for the tenons of the top and bottom rails between these two lines. Cut mortise 1" deep.

Take top and bottom rail and in the inside edge, plough a groove 3/8" wide to receive the back slats.

Assemble the back, clamping tight and squaring corners after you have bored the hole for the dowel and placed the frame in the bottom section of the chair.

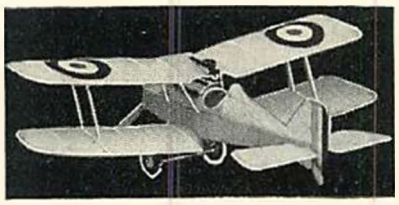
Cut out the two support rests, according to the plan, and attach them to arm rests with flat-head screws from the underside of arm rests. Be sure to bore and countersink the arm rests for these screws.

Clean up all joints and sandpaper smooth. Then finish according to taste.

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 featherweight 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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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

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6 Blocks 5/8" x 1 1/8" x 7"	$ .24
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Hawk Model Aeroplanes

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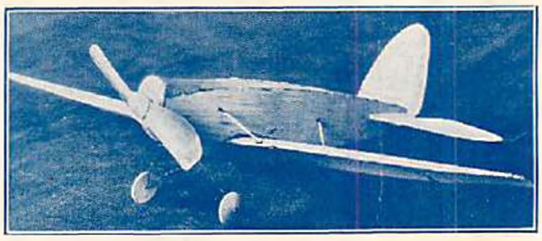
Complete set, with all material and full building and flying directions, postpaid in the United States and Canada..... **$2.00**



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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.

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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