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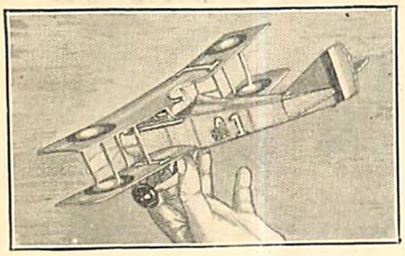

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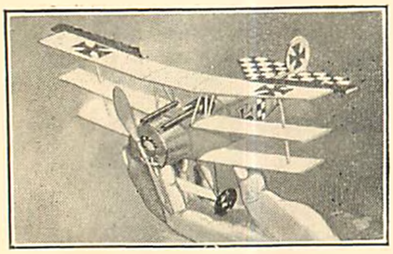

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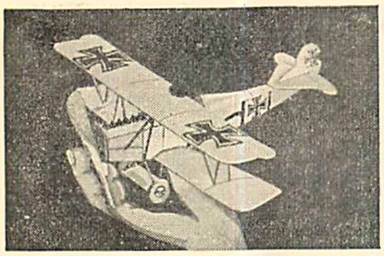

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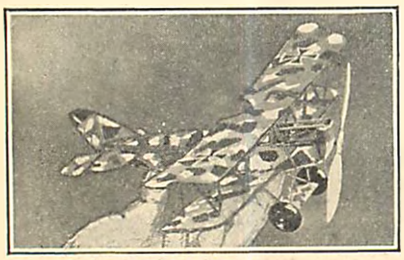

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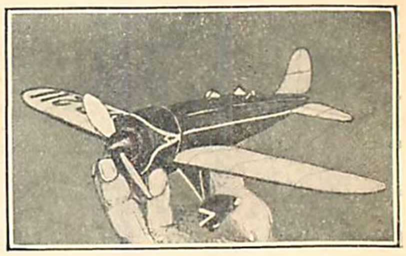

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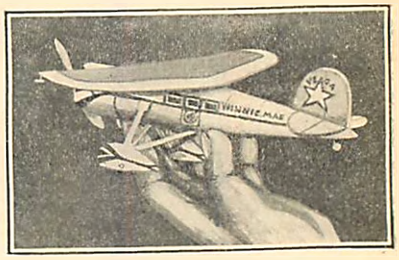

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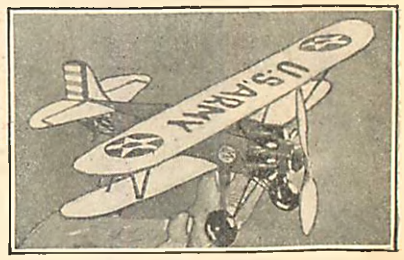

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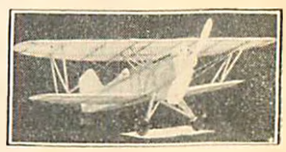

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Model Airplane News

and JUNIOR MECHANICS

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

Vol. V No. 6

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In Our Next Issue

How did you like the *Gee-Bee Supersporster?* That was a nice little surprise for you, wasn't it?

Well, here's another one. Jesse Davidson, whose Curtiss *Condor* solid scale model bomber proved to be one of the most popular models last year, has scaled for you a Consolidated *Commodore*—you know, one of the giant passenger flying boats which ply between New York and Buenos Aires. It's a pip of a model—solid—and you'll enjoy making it.

Our second model will be a flying scale model of a Buhl *Pup,* one of America's outstanding light planes. This is a natty little model and worth adding to your collection.

Of course, we are continuing with our famous courses; Lieut. H. B. Miller giving you some more inside dope on what makes an airplane engine go round, Capt. L. S. Potter sparking all over the place with his dots and dashes about radio, and Ken Sinclair taking you further into the mysteries of airplane designing and production.

Our War "Ace" series continues with another artistic sketch by L. Elsen, and also there will be another three-view layout of a wartime plane.

Owing to lack of space we regretfully are compelled to hold over the third article of "Super Light-Wing" until the January issue.

Don't forget—Model Airplane News, January issue, on all news stands, December 23 next. Watch for it. Make your reservation now with your news dealer. Only 15 cents a copy—and worth double the price.

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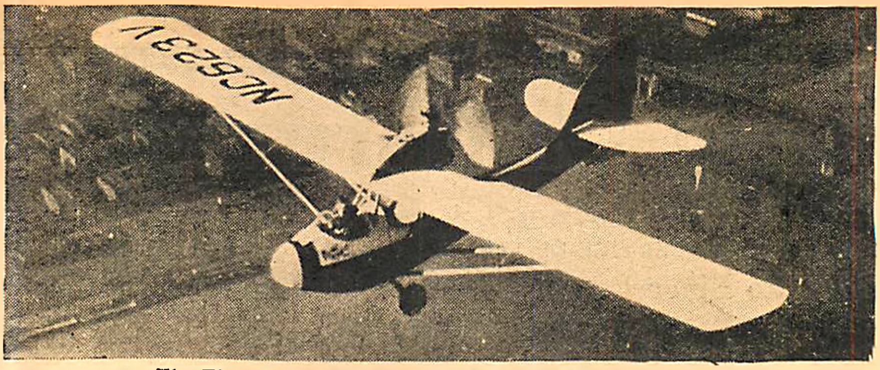

The First Prize training plane, a Curtiss-Wright *Junior*

"Scrambled Picture" Contest

Judges Prepare for Rush of Entries-Will Yours Be There?

SO that's that! Our Monster *Scrambled Picture* Contest entry date has passed, and the work of assembling and judging your efforts is under way.

First and foremost of the things to be done now is for you to see that all your pictures, pieced together and the planes completely identified, are sent here to reach this office not later than midnight of December 23 next. This gives you one month in which to get everything ready.

Don't forget what we said about *neatness* and *accuracy.*

We have had one or two comments concerning the first two photographs being hard to distinguish. Probably because we're so close to them we do not agree that this was the case, but working on the principle that the reader is always right (except when he's wrong) we're going to make full allowance for any difficulties which might arise from the point raised.

Now we'd like to stress the "*no correspondence*" rule again. This rule will apply during the judging of the contest.

Starting Monday, December 28 next, Mr. Harold Hersey, publisher, and Capt. H. J. Loftus-Price, editor MODEL AIRPLANE NEWS, the judges, and Mr. C. S. (Casey) Jones, *Curtiss-Wright Flying Service,* the referee, will start judging. Immediately this work has been finished the winners of the prizes offered in this monster contest will be announced in the first issue of MODEL AIRPLANE NEWS available at the time.

Just to spur you on, we're going to repeat the prizes offered by MODEL AIRPLANE NEWS to the winners in this *Scrambled Picture* Contest.

First Prize is a 10-hours Flying Course, or to be more exact—sufficient flying time to enable you to sit for a Private Pilot's license. Remember, we do not guarantee you a license. We couldn't do that no matter how much we'd like to. Only YOU can obtain that license.

Second Prize consists of a Complete Ground Course.

Third Prize is a 200 miles Cross-country flight with Mr. C. S. (Casey) Jones as your host-pilot.

Both the Flying Course and the Complete Ground Course will be taken at flying schools conducted by the *Curtiss - Wright Flying Service,* in our opinion one of the outstanding institutions of its kind in America today. The time and place for courses also will be arranged to suit the convenience of the school in question and the winners of the prizes.

THE cross-country flight will be made at the convenience of Mr. Jones.

Now a word to our feminine readers. We have received several entries from the fair sex, but not as many as we hoped. What's wrong? Don't you think you're as good as men these days? How about Amelia Earhardt, Ruth Nichols, Amy Johnson, Elinor Smith and others? They had to start by being taught, and why not get your start without cost to yourself?

However . . .

Here's to you all, and may the best man (or woman) win. Keep your eyes on these columns and watch for another contest that'll make your hair stand on end with anticipation!

Much as we'd like to go into details now, we'd rather work it out to its finest points before announcing it. If this contest becomes a reality, and there is every indication that we'll be able to arrange all the things we want, it will be the finest opportunity ever offered to the air-minded public.

So be patient while we work behind the scenes and get the props ready.

Incidentally, don't forget to answer the questionnaire on this page. It's meant for YOU. We want to know what YOUR reactions are. We'll be looking for them in the mail every day.

Cheerio.

S. O. S! S. O. S! S. O. S!

HELP US TO HELP YOU BY ANSWERING THESE QUESTIONS

In order to maintain its position as leader in the field, MODEL AIRPLANE NEWS, the Wonder Magazine of the Air, from time to time has published a questionnaire so that we are continually informed of what you want.

All right — here's another questionnaire. Please fill it in and mail it to The Editor.

DO YOU LIKE—

The Covers ________ The Pictures ________
The Plans ________ The Radio Course ________
The Engine Course ________ The Designing Course ________
The Advisory Board ________ The Sky Cadets ________
The 3-View Layouts ________ The War Ace Series ________
The Various Articles ________

DO YOU WANT—

Fiction ________ Junior Mechanics ________
More General Aviation News ________

WHAT ELSE DO YOU WANT?

____
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____
____

Major Raoul Lufbery seated in his *Nieuport*

Lufbery of America

Wanderlust . . . . . Fame . . . . . Glory . . . . . the End of the Road . . . . .

By L. Elsen

THE story of Raoul Lufbery, America's spectacular ace during the World War, is a recital of a strange pilgrimage over the face of this earth in search of that intangible something that beckons to those people who are never free from wanderlust. It took him from his home in the United States to Europe, to the Far East, and brought him back to France, his birthplace, where "finis" was written to a brave and gallant career.

Born in France in 1886 of a French mother and an American father, Lufbery was brought to the United States by his parents at an early age. His boyhood was spent in Wallingford, Connecticut, but the small, rural town soon palled on him and at the age of seventeen, he ran away from home to see what the world had to offer in the way of adventure.

For three years he roamed through France, earning his way at any odd job that could be picked up. Then he went on to Algiers, then Tunis, Egypt, the Balkans, Germany, South America, and at last the year 1906 found the wanderer paying a visit to his former home in Connecticut. A year went by and the old call of the road asserted itself. This time the road led to New Orleans and enlistment in the U. S. Army. From 1907 to 1909 Lufbery was in the Philippine Islands serving his recruiting period and creating a reputation as the best marksman in his regiment.

At last he was free again and it pleased him to see if there were more nooks and crannies in the world which he had overlooked. Off he journeyed to China and Japan, finally turning up in India, and from there going on to Saigon, Cochin-China. Here in 1910 was the turning point of his life. A new acquaintance, a new force was to cross his path and divert him into other channels. . . .

There is a small crowd of natives gathered around an indistinguishable object. Lufbery ambles by and stops to gape, too. At last, with the customary assurance of one who knows his way about, he manages to edge closer in and reach the cause of the excitement. There he sees his first airplane and learns that the pilot has lost his mechanic and is vainly searching for a volunteer among the natives.

In a moment Lufbery has struck up a conversation with the distraught flyer—and the sum total of the chance meeting is that Lufbery, with no knowledge whatsoever of the inner workings of any mechanism, has been hired on the strength of his engaging personality to be mechanic to Marc Pourpe, a French stunt flyer. . . .

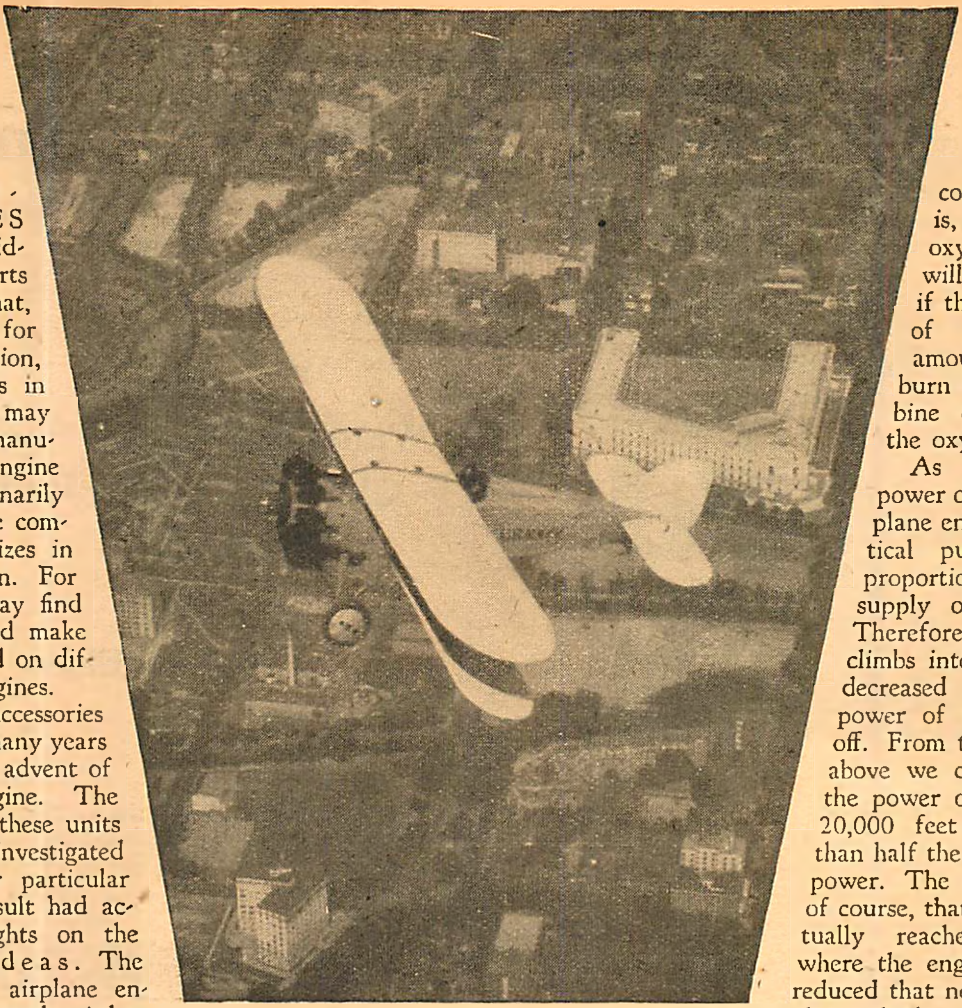
Lufbery learned quickly and before long he had proven himself an invaluable assistant to Pourpe on his exhibition tour of the Far East. For several years their association continued and the American was now firmly entrenched in the affections of Pourpe, not only for his amazing grasp of mechanics but his unfailing good humor and keen memory, which once grasping a detail always retained it.

So for some time the aerial exhibitionist, Pourpe, and his short, well-built aid with the cheerful grin, were a familiar sight to the inhabitants of the Far East who flocked to watch the startling aerial maneuvers they displayed.

Three years were spent travelling over several countries until the summer of 1914 found the two men in France inspecting a new airplane. Before their errand was accomplished, the World War had broken out and Pourpe immediately offered the services of himself and his airplane to his country.

FOR the first time in years the two friends found themselves faced with the prospect of separation. Pourpe went at once to the valleys of Luxemburg for observation duty. Meanwhile, Lufbery tried in vain to enlist in the services of France but the laws of that country forbade the acceptance of a foreigner in the regular army. So he was forced to go through the customary ritual of enlisting with the Foreign Legion, after which, in accordance with his desires, he was promptly shifted to Escadrille M.S.23 as mechanic to his patron and friend, Pourpe.

On December 2, 1914, the association was ended abruptly and tragically when Pourpe was killed in action. Then Lufbery was fired with the desire to take his place. Pourpe must be avenged! The mechanic must now become pilot and killer! It was a happy day (*Continued on page 45*)



Lt. Apollo Soucek "going upstairs"

The Airplane Engine

By Lt. (jg) H. B. Miller, U.S.N.

Superchargers and Propellers

(CHAPTER 7)

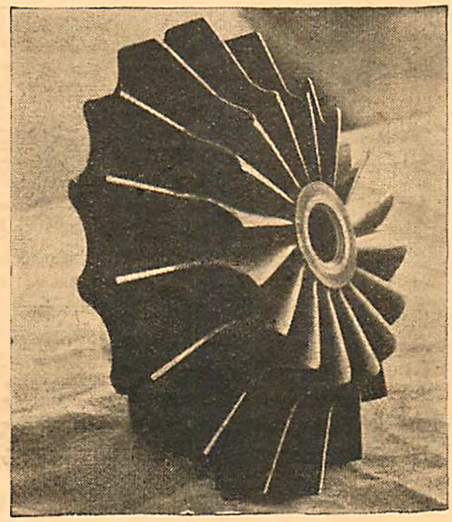
ACCESSORIES are considered to be those parts of an engine that, while necessary for successful operation, are separate units in themselves. They may or may not be manufactured by the engine builder, but ordinarily are made by some company that specializes in that line of design. For this reason we may find the same type and make of accessories used on different airplane engines.

Most of the accessories have been in use many years —long before the advent of the airplane engine. The manufacturers of these units had thoroughly investigated the field in their particular lines and as a result had acquired patent rights on the most successful ideas. The manufacturers of airplane engines have shown much wisdom by adopting already developed accessories rather than experimenting in a field that already has been thoroughly covered. One of the most important of these units is the supercharger.

It is well known that the density of the atmosphere decreases the further a person climbs above the sea-level surface of the earth. This is best demonstrated, perhaps, by the shortness of breath experienced by mountain climbers aside from that caused by the unusual exertions involved. In other words, there is actually a rarefied condition of air, or a shortage of oxygen, at altitudes.

A thick blanket of air exists around the entire surface of the earth. A single column of this air, one inch square, reaching from its extreme outer limit to sea level, weighs 14.7 pounds, and is known as atmospheric pressure. Naturally, as we ascend the column of air becomes shorter. Consequently, it weighs less. As a matter of fact, the density of the air at 20,000 feet is slightly less than half that at the earth's surface.

We know that the heat generated within the cylinder of an internal combustion engine depends on the amount of oxygen that is involved in the combustion. That is, if there is excess oxygen all the fuel will burn. However, if there is a shortage of air only that amount of the fuel will burn which will combine chemically with the oxygen present.



Wasp induction blower

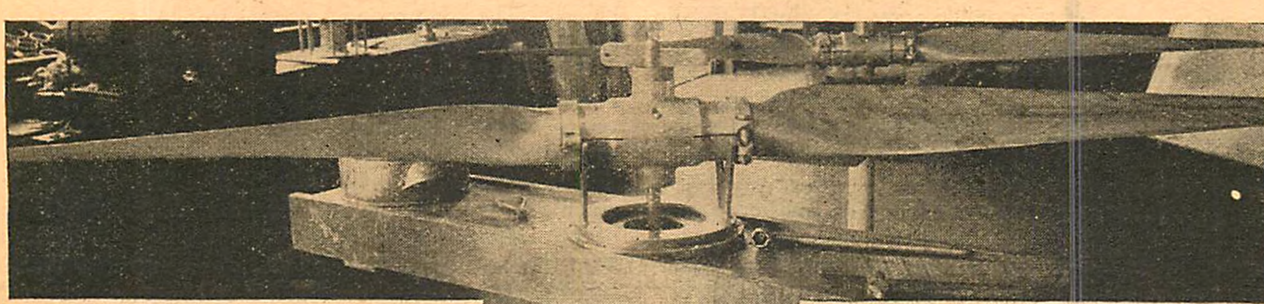
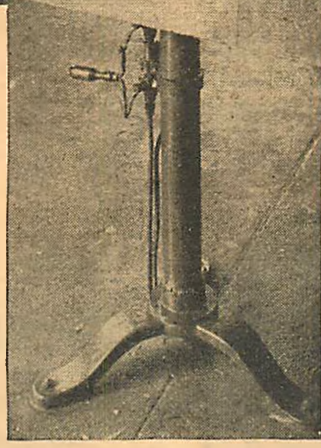
As a result, the power output of the airplane engine is for practical purposes directly proportional to the supply of air available. Therefore, as the plane climbs into the regions of decreased air density the power of the engine falls off. From the figures given above we can deduce that the power of the engine at 20,000 feet would be less than half the normal sea-level power. The result of this is, of course, that the plane eventually reaches an altitude where the engine power is so reduced that no longer will the plane climb. This altitude is called the absolute ceiling of that particular plane.

Not only is the ceiling of the plane limited but the speed is greatly restricted as well. Since the density of the air is so much less at that altitude a proportional decrease of head resistance is offered to the aircraft. If the full power of the engine were available, abnormally increased speeds at high altitudes would be made possible.

It is obvious that if full power could be maintained by the aviation powerplant at all times, aircraft would be able to climb to altitudes of decreased resistance and once there make enormous speeds. The application of this to express and passenger transport lines as well as military planes is readily apparent.

There are two ways in which this problem may be solved. The first method is quite simple, though inefficient. Suppose it were desired to have a powerplant capable of developing 400 horsepower at 20,000 feet. Since, the normal power is approximately halved at that altitude, the operator would merely install an 800 horsepower engine in the aircraft.

While it would probably be impossible to open the throttle wide at sea level because of detonation within

Adjusting propeller pitch

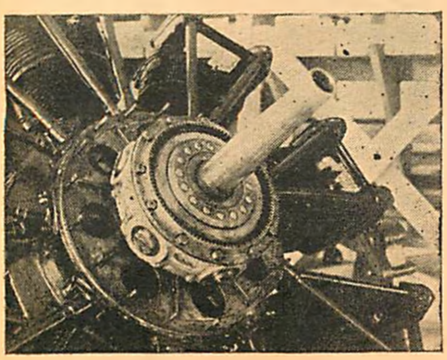
the cylinders, as altitude was gained the throttle could be opened more and more. At last at 20,000 feet the engine would be operating with wide-open throttle and delivering half its rated power to the propeller. Thus, the desired 400 horsepower would be available at the specified height.

WHILE this method of gaining power at altitude is perfectly feasible, it calls for the carrying of needless weight, which at lower altitudes is not producing any useful power. Consequently, this plan for gaining power at altitudes has not been generally favored or adopted.

A second method to boost the power of an engine lost by decreased air density is to use a supercharger. This mechanical device supplies the cylinders with a greater volume of charge than would be drawn in under atmospheric conditions at that altitude. In other words, it is a device for compressing the air to a higher density and forcing it into the cylinders in order to obtain more oxygen for combustion.

Two different types of superchargers have been most highly developed for use in aircraft powerplants. The first is the positive displacement type as exemplified by the Root's supercharger. This is quite similar to a gear pump used to maintain high oil or fuel pressure, except, of course, much larger. Two figure-eight aluminum impellers are pivoted so that they mesh closely together. As these are turned by direct gearing to the engine, air is entrapped through the intake side of the apparatus and carried around to the opposite side. Here the impellers mesh together and force the air out through the carbureter under considerable pressure.

This supercharger delivers large quantities of air at slow speeds. Since it is geared only from two to four times engine speed, its centrifugal stresses are not great. Moreover, it is comparatively simple to install. However, it is very difficult to maintain the minute clearances between the rotors and sidewalls which are necessary if air pressure is to be built up. Small steel tips are placed on the rotors for this purpose. Also, there is considerable bulk and weight involved in this installation.



Epicyclic gear train

It is apparent that the maximum pressure will occur at the instant the propellers are meshing together. At other times in the rotation the compression will be nearly zero. Consequently, the pressure delivered by this type of supercharger is of a pulsating nature. If these pulsations can be synchronized to occur when a cylinder is drawing in a charge, the installation is very good. This, however, is most difficult to do and frequently impossible. If a cylinder were on an intake stroke during a moment of low pressure, it would obviously not get a full charge. The result would be an extremely rough and unsatisfactory performance.

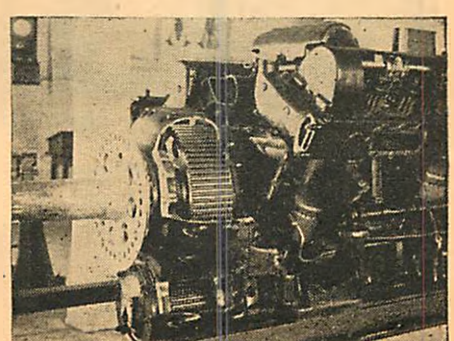
To eliminate this disadvantage a large space or receiver is placed on the discharge side of the Root supercharger. Here the air pressure will tend to equalize and the pulsations will be damped out. Hence a smooth flow of air will pass to the cylinders

Control of this supercharger is given to the pilot by means of the regular throttle arm. Up to wide-open throttle the engine operates in a normal fashion. Further movement of the throttle, however, closes an air valve and the air is forced to travel to the carbuertor via the supercharger where it is compressed.

The second method of supercharging which has gained favor is the centrifugal type. Here a small bladed rotor or fan is rotated at high speeds. Air is taken in at the center of the blower and is thrown outward tangentially at a high rate of speed. This velocity is converted into pressure which aids in filling the cylinders to capacity with the fuel mixture.

THIS system is simple and compact. Only a small rotor is required to give the desired amount of supercharging and no pulsations can occur. However, it is necessary that the blower rotate at enormous speeds. Frequently 28,000 revolutions per minute will be reached. Naturally, this calls for the strongest possible construction and the finest materials if structural failures are to be avoided. A certain amount of excess weight must be used in order to withstand the excessive stresses.

When the blower is operated directly by the engine, the gears form an important element of strength. If the supercharger is to be used on a fighting plane where the throttle is likely to be varied rapidly from time to time, the sudden acceleration or de-acceleration may easily strip the driving gears. To avoid this, plate clutches are now being installed with the mechanism.



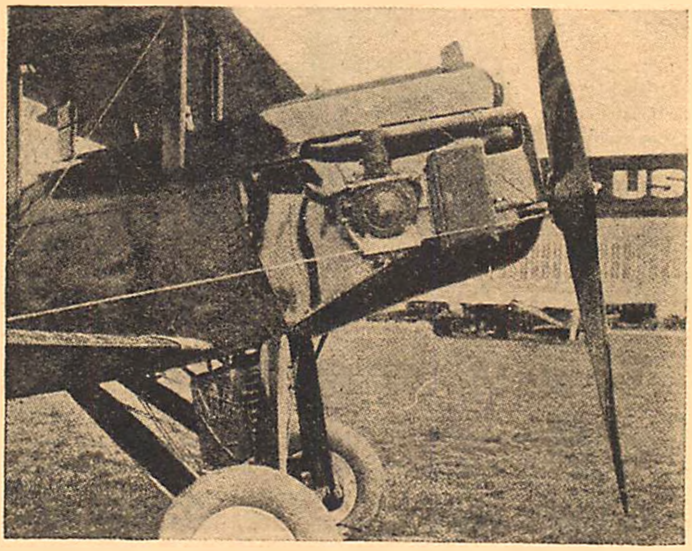
Packard engine gear

Thus, sudden acceleration will cause the clutch to slip rather than to carry away the teeth of the gear.

Nor must the gyroscopic effect of the high-speed rotating supercharger be overlooked. It is well known that any symmetrical wheel rotating at high speed becomes a gyroscope. Queerly enough, when one attempts to turn the wheel in a plane ninety degrees from rotation, the wheel will resist. Instead, it will move in the third plane of rotation ninety degrees from the other two. This phonemenon is termed precession. In a similar fashion the fast revolving supercharger fan will appreciably restrict the maneuverability of a plane.

Nearly all radial engines are now equipped with a blower or impeller. This is merely a small fan rotated by gears and located between the carburetor and the engine. Air is drawn in through the carburetor where it is mixed with fuel. The blower further mixes the gas and insures that a completely vaporized charge is taken in by each cylinder. The thorough mixing combined with the increased volumetric efficiency because of some pressure built up by the blower insures increased engine efficiency.

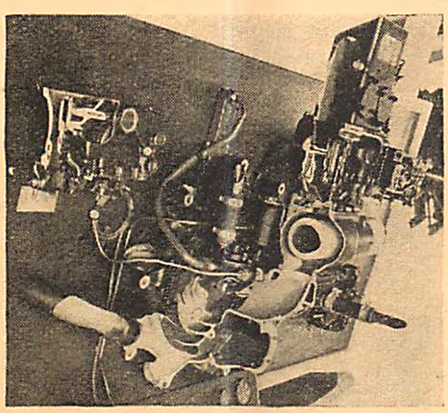
The blower was originally built into the engine in order to obtain good mixture. We have seen, however, that a small amount of supercharging effect resulted as well. Since the early design advantage has been taken of this fact and the speed of the blower has been stepped up until it serves the specific purpose of a supercharger. Its speed is often from ten to fourteen times that of the crankshaft.



Turbo-type supercharger on a *De. H.*

It is seen that the speed of this impeller can not be controlled except through the throttle; that is, the blower will speed up as the engine revolutions are increased. If the impeller is geared up higher than about 7:1 it may provide so much compression that when the engine is speeded up at sea-level, detonation of the fuel will occur. In this case it will be necessary to restrict the throttle opening until an altitude is reached where the decreased air density will permit the full blower action to be used.

The other centrifugal supercharger that has received active attention is the turbo-driven type. Here the exhaust gases are collected in a manifold and led to a nozzle which directs them into the buckets of a turbine wheel. The energy of the moving gases turns the turbine which has a common shaft with a supercharger blower. The compressed air from this blower is led to the carburetor and thence to the various cylinders.



Wasp induction system

This type of supercharger is by far the simplest in construction and operation. On the other hand, it is called on to withstand probably the most strain of any of the three accepted types. The terrific heat of the exhaust gases combined with the high rotational speeds which often reach 25,000 r.p.m., require the turbine blading to be made of the strongest possible material. Also, it is difficult to keep the exhaust gases from leaking before they reach the turbine. Moreover, the manifold is bulky and can not be housed within the engine cowling. Consequently, it prevents perfect streamlining of the plane.

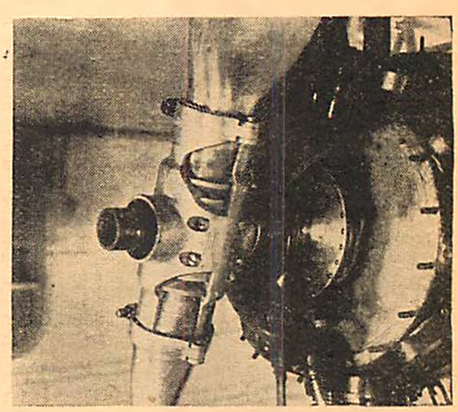
On the other hand, the turbine is actuated by the energy contained within the exhaust gases which would otherwise be wasted to the atmosphere. The increased power, then, that is obtained by this method of supercharging is gained at little expense to the actual engine power. The engine does lose a small amount of power because of the restriction to the free flow of the escaping exhaust gases; that is, the exhaust gases are backed up in the manifold from the turbine and cannot so readily escape from the cylinder. Consequently, some of the burnt gas will be left within the cylinder, resulting in lowered volumetric efficiency on the next intake stroke of the piston.

Nevertheless, the turbo type is more efficient than the geared centrifugal supercharger, for the latter absorbs power directly from the engine. At the same time it still permits the energy of the exhaust gases to be lost to the atmosphere.

The speed of the turbo-driven supercharger is well under control of the pilot. A valve is fitted to the exhaust manifold which will permit all or any part of the gas to either escape or to drive the turbine. The pilot, therefore, can supercharge his engine at any altitude to any degree within the capacity of the blower.

Probably a combination of the two distinct types of superchargers would give the most ideal results. This was done in the *Wasp* engine of the *Apache* landplane which was flown to a world's altitude record by Lieutenant Soucek of the U. S. Navy.

In this case, the Root's supercharger is not used until the latter period of the climb, as its large capacity makes it ideal for use in thin air. The air is (*Continued on page* 44)

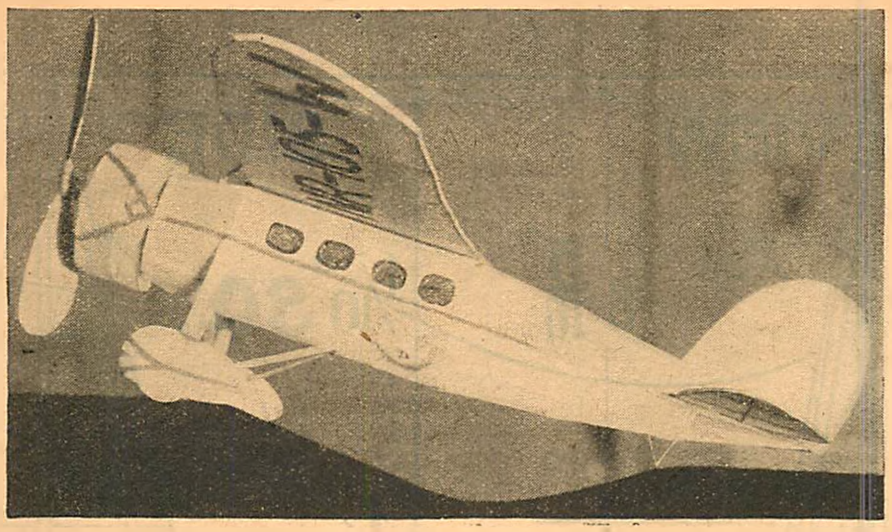


Propeller securing method

A "Winnie Mae" Flying Model

Half-Ounce Replica of Post and Gatty's Famous Plane

By Edwin T. Hamilton



The finished model

WHEN Post and Gatty broke all round-the-world flight records, they not only brought fame to themselves but also to the trim, white monoplane which carried them through. No sooner had they set their wheels on Roosevelt Field, than Captain Price, editor of MODEL AIRPLANE NEWS, always on the lookout for the best for his readers, wired the writer for the "best model of the Lockheed-Vega, round-the-world plane that can be made."

This model is the result of careful aerodynamic study and long labor. It was built by Pierce Au Werter, an expert model builder and an American Sky Cadet. When it was finally completed, it not only proved to be a splendid replica of Post and Gatty's plane, but also gave a remarkable flight performance. Its weight, with motor, is only seven drams (sixteen drams equal one ounce).

Build this ship, and assure yourself of winning the scale model event at your next meet!

Fuselage

Six fuselage formers are cut, as shown in drawing 3, from 1/16" sheet balsa. Note that formers 3, 4 and 5 are exact duplicates. While they have eight 1/16" sq. notches cut in them to accommodate the longerons, the smallest former (No. 1) has only six notches, as the bottom side longerons extend only to this former. This is done so that the fingers can easily reach the rear hook, and this space is not covered with tissue. Cut and am broid the longerons in place on the formers.

The cowling of the model consists of four cowling formers, as shown on drawing 2 of the plans. These are ambroided in place to former 6, as shown. Light music wire is used to form the circle. Four bands are required. Use No. 4 wire for these. A front motor stick clip is ambroided to the two side cowling formers and to the bottom cowling former. The rear clip is ambroided to fuselage former 1. Both clips are bent from No. 8 music wire.

Elevator

This is constructed in two parts, as shown in drawing 4. A 1/16" sq. balsa brace is cemented between the two side longerons in line with the main spar of the elevator, when it is in place on the fuselage. Cover with Japanese tissue on both sides.

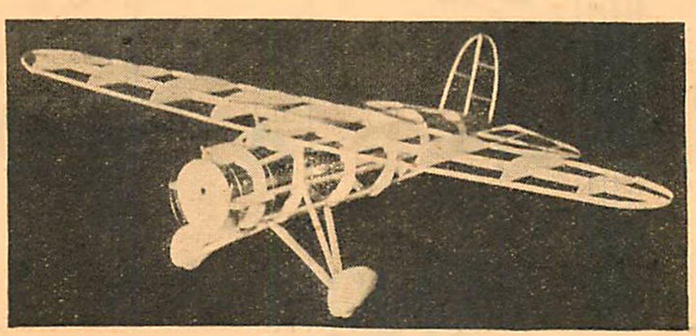
Rudder

This is made of 1/16" sq. balsa, as shown on drawing 4. It is cemented in place on the top center longeron, as shown, and covered on both sides.

Landing Gear

This is constructed of six pieces of balsa, as shown in drawing 5. Carefully streamline each piece. These are cemented in place, as shown in drawing 6. The pants for the wheels are constructed of three pieces of sheet balsa. The center piece has a cutout as shown, and is made from 3/16" sheet balsa, while the two side pieces are exact duplicates, except that they have no cutout and are made of 1/16" sheet balsa. These are cemented on each side of the 3/16" piece and when hard, the entire block is sanded to a streamline form, as shown.

The wheels are cut from ⅛" sheet balsa, are ⅞" in diameter, and should be sanded round on their tread. These are inserted into the pants until they extend below the pants 3/16". They are held in place with a pin, which is thrust through their centers, ambroided in place, and cut off. This pin should go through the sides of the pants and into the landing gear struts. Do not ambroid the pin to the wheel but only to the side pieces of the pants. Test to see that each wheel moves freely.

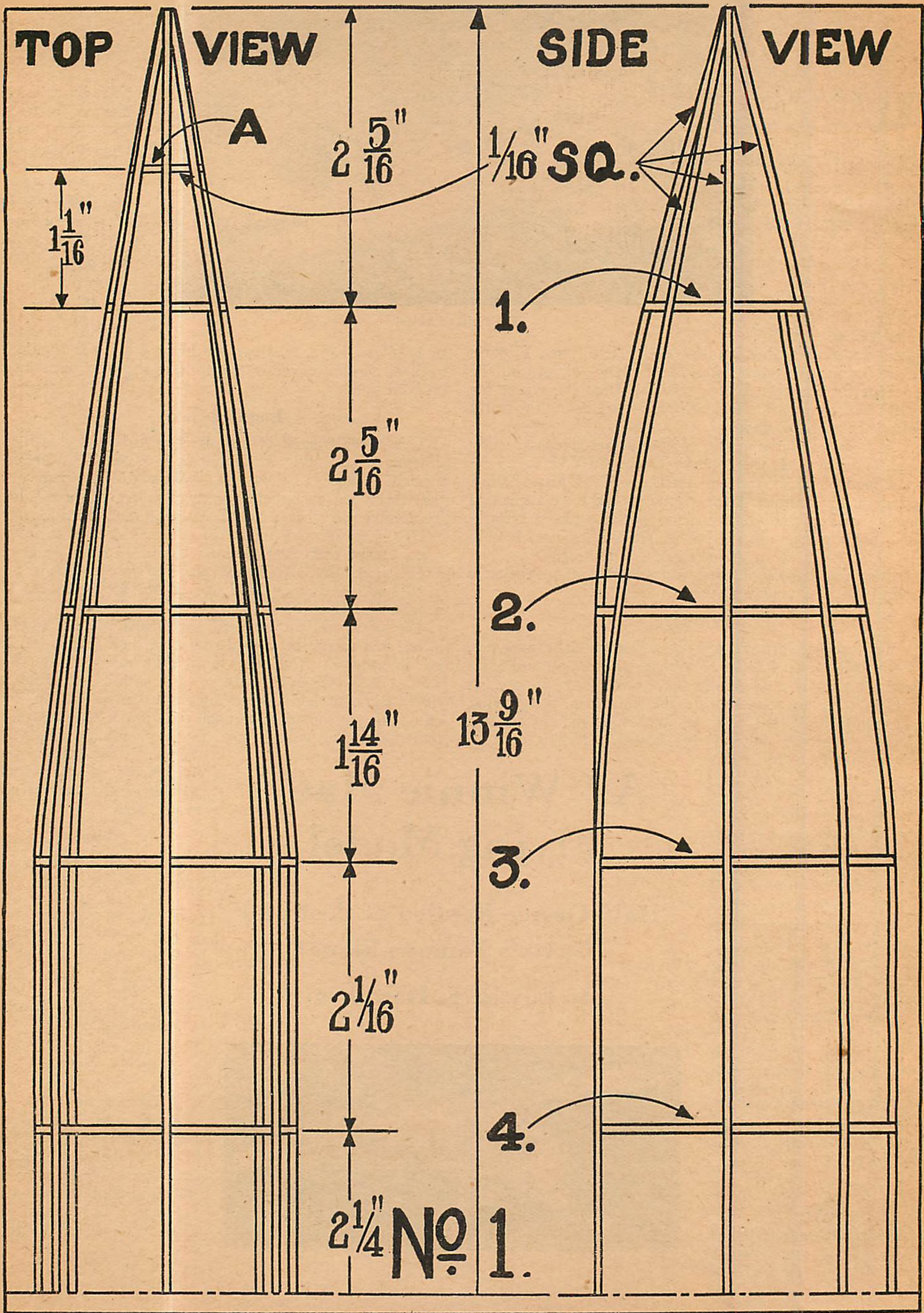


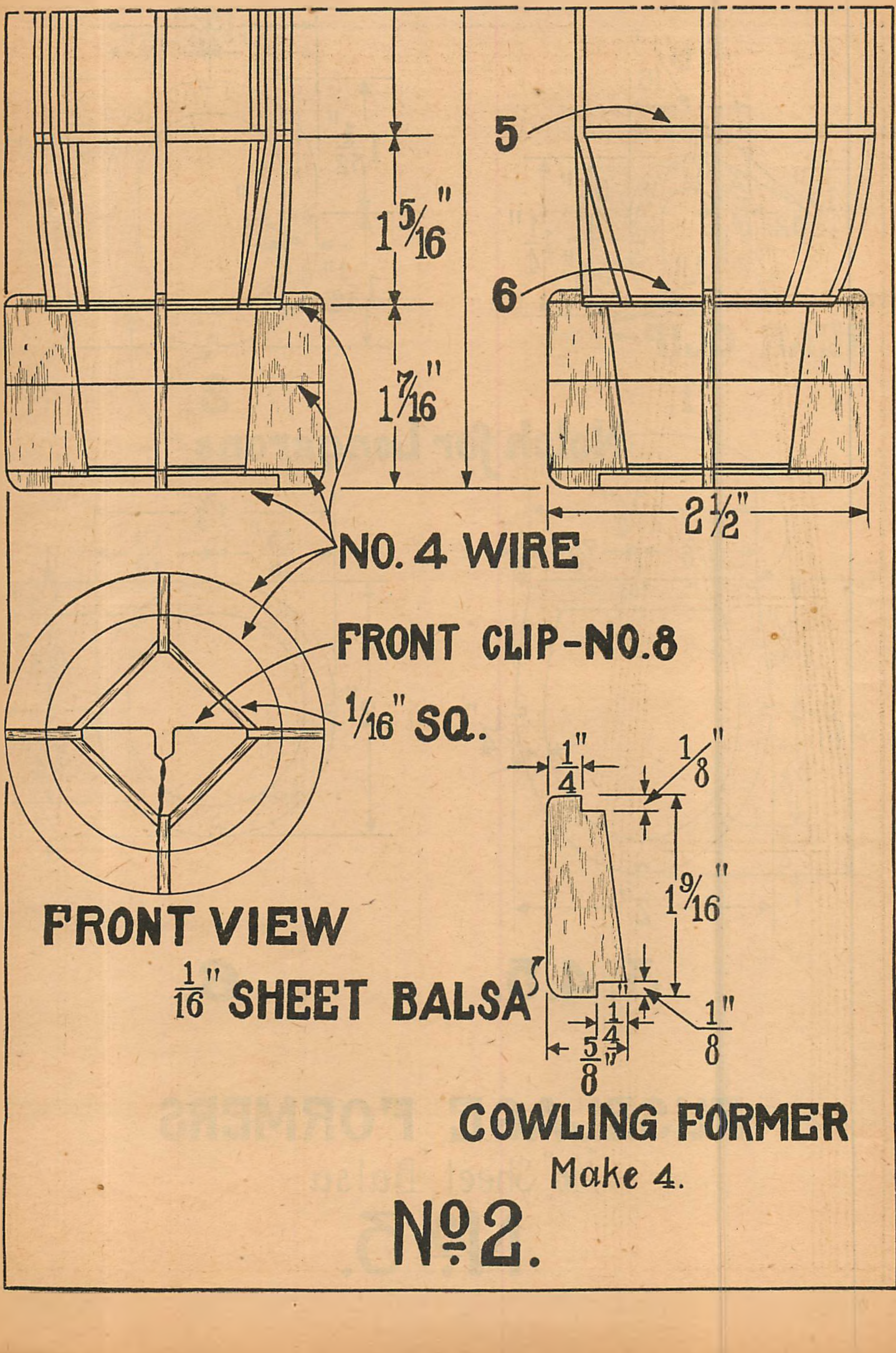
The balsa skeleton

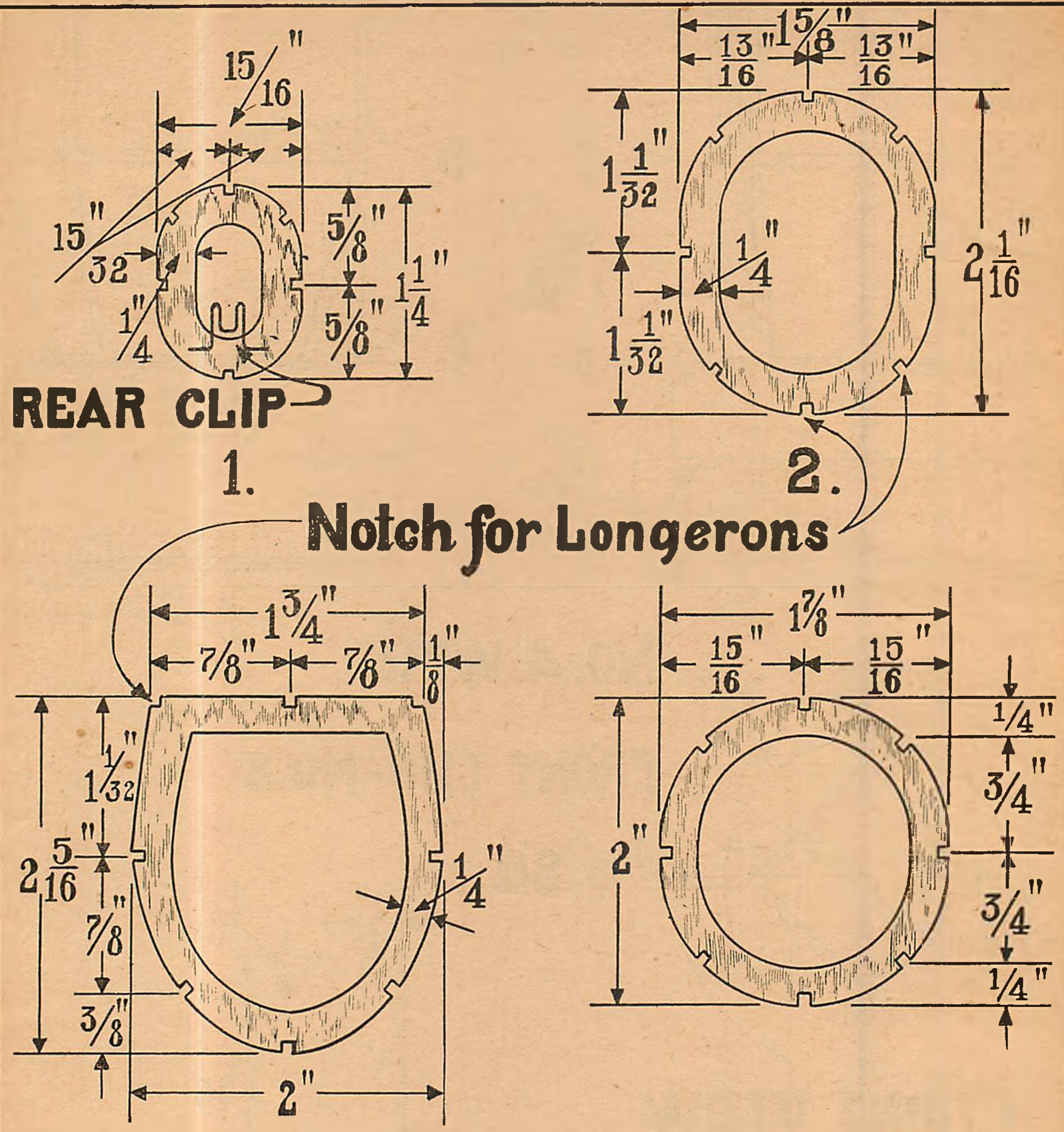
Wing

Five different ribs are necessary for this wing. In drawing 9 these are shown as V, W, X, Y, Z. Rib V is the center rib, so only one is required, while all others require two being made. The center rib V is cut from 1/16" sheet balsa, while all others are from 1/32" sheeting. The wing is built in one part, as shown on drawings 7 and 8. Balsa wood construction is used throughout. Note the 1/16" sq. balsa brace ½" behind the leading edge. Cover on both sides and apply a thin coat of dope. Note that the wing is given a ¼" dihedral.

(*Continued on page* 40)


TOP VIEW
SIDE VIEW
A
2 5/16"
1/16" SQ.
1 1/16"
1.
2 5/16"
2.
1 14/16"
13 9/16"
3.
2 1/16"
4.
2 1/4"
No. 1.

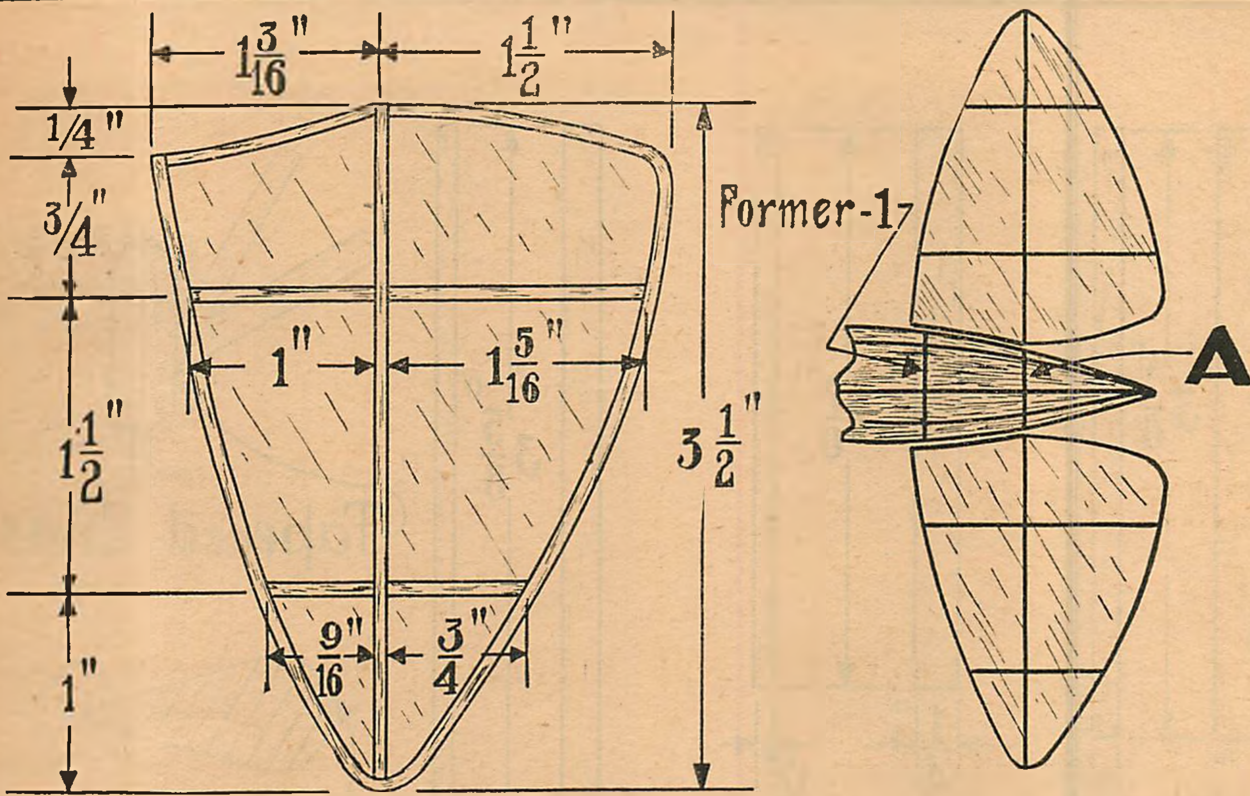

5
6
1 5/16"
1 7/16"
2 1/2"
NO. 4 WIRE
FRONT CLIP-NO.8
1/16" SQ.
FRONT VIEW
1/16" SHEET BALSA
1/4"
1/8"
1 9/16"
1/4"
1/8"
5/8"
COWLING FORMER
Make 4.
№ 2.



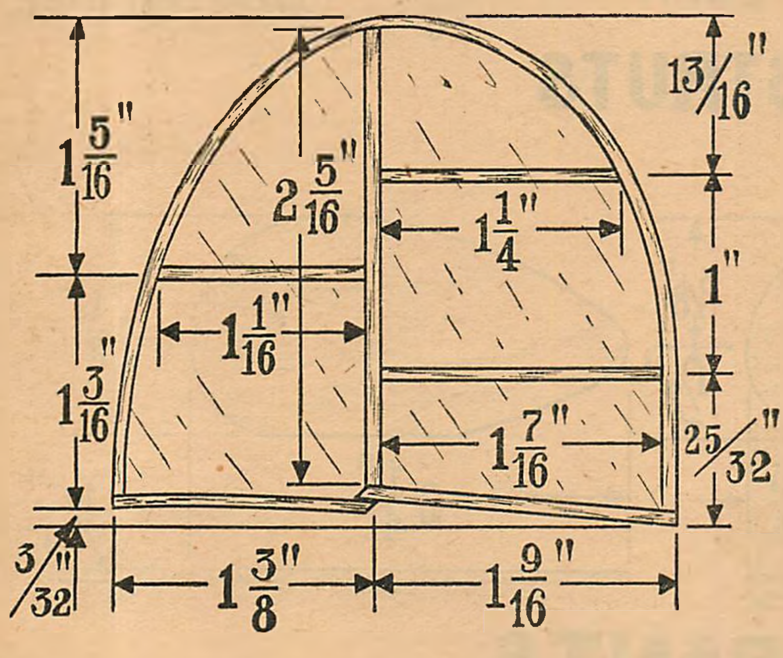
FUSELAGE FORMERS

1/16" Sheet Balsa

№ 3.

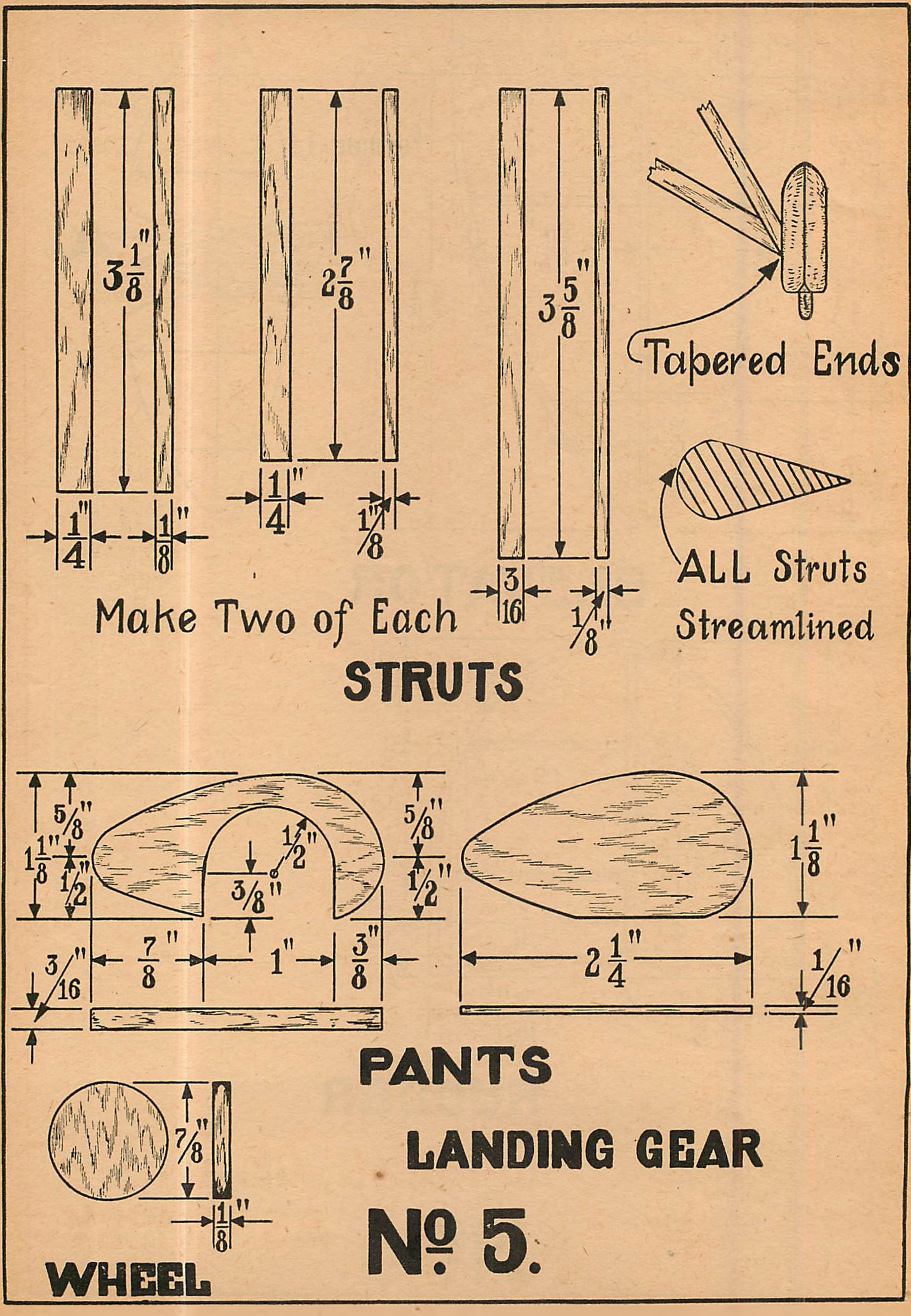


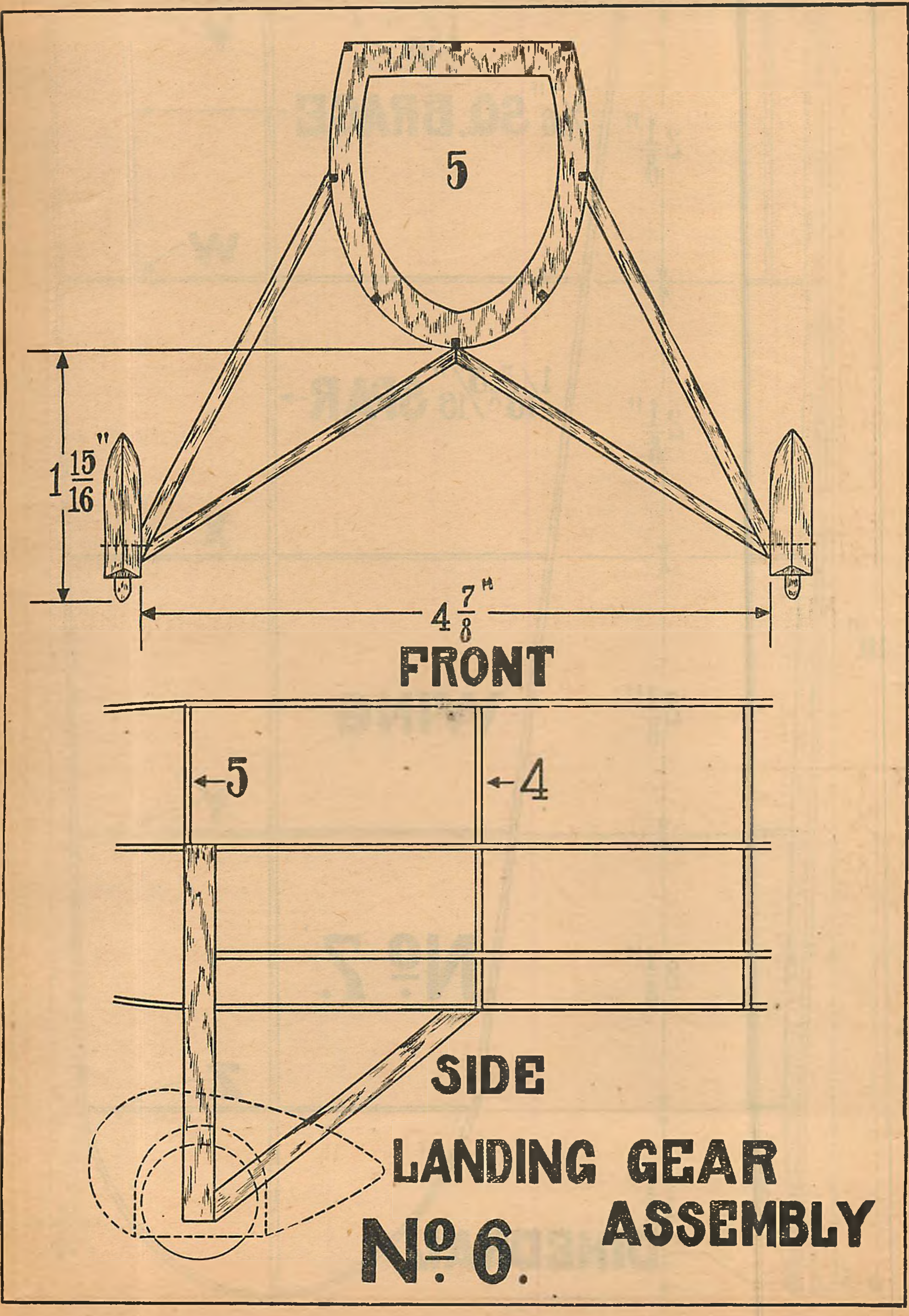
ELEVATOR

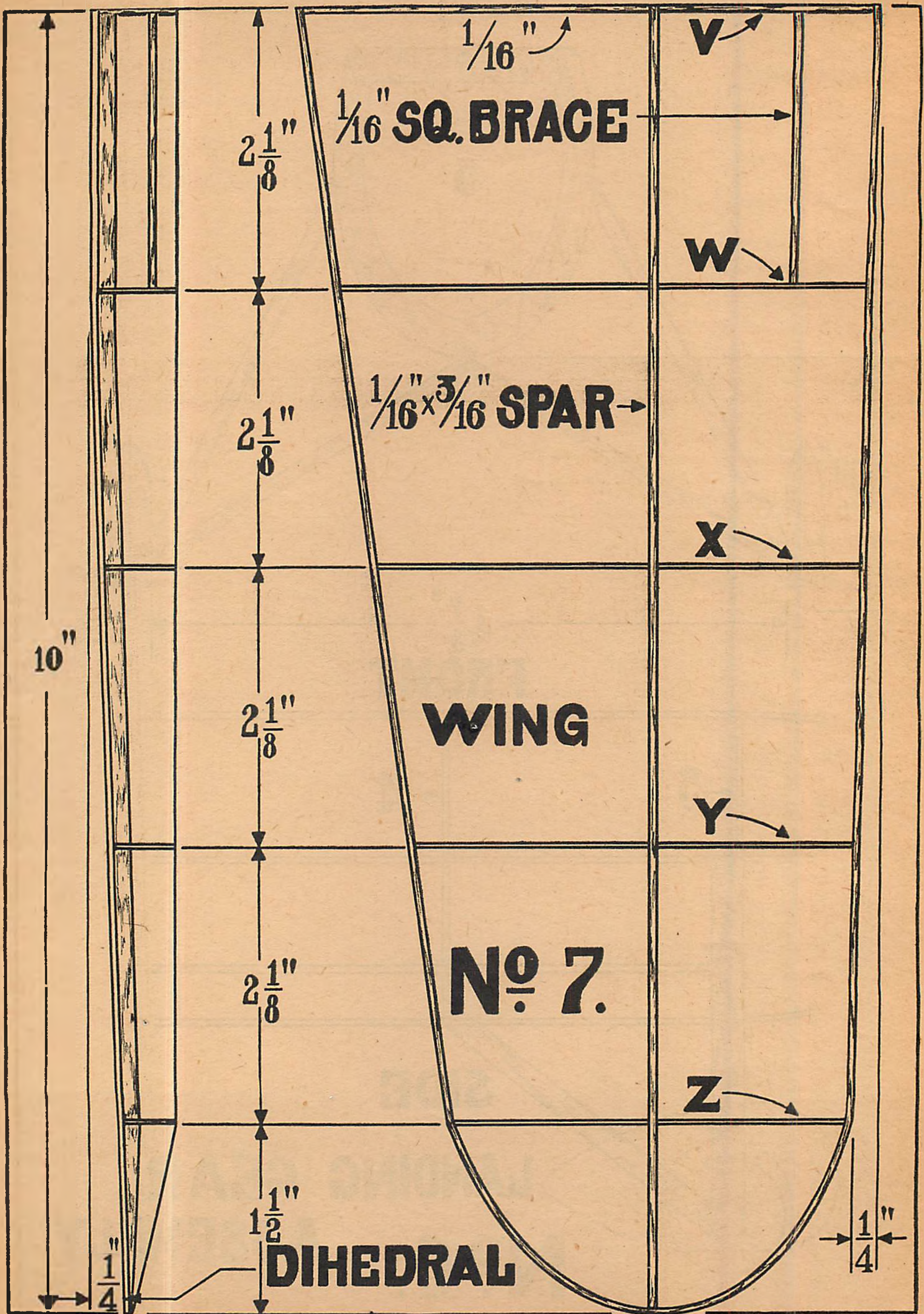


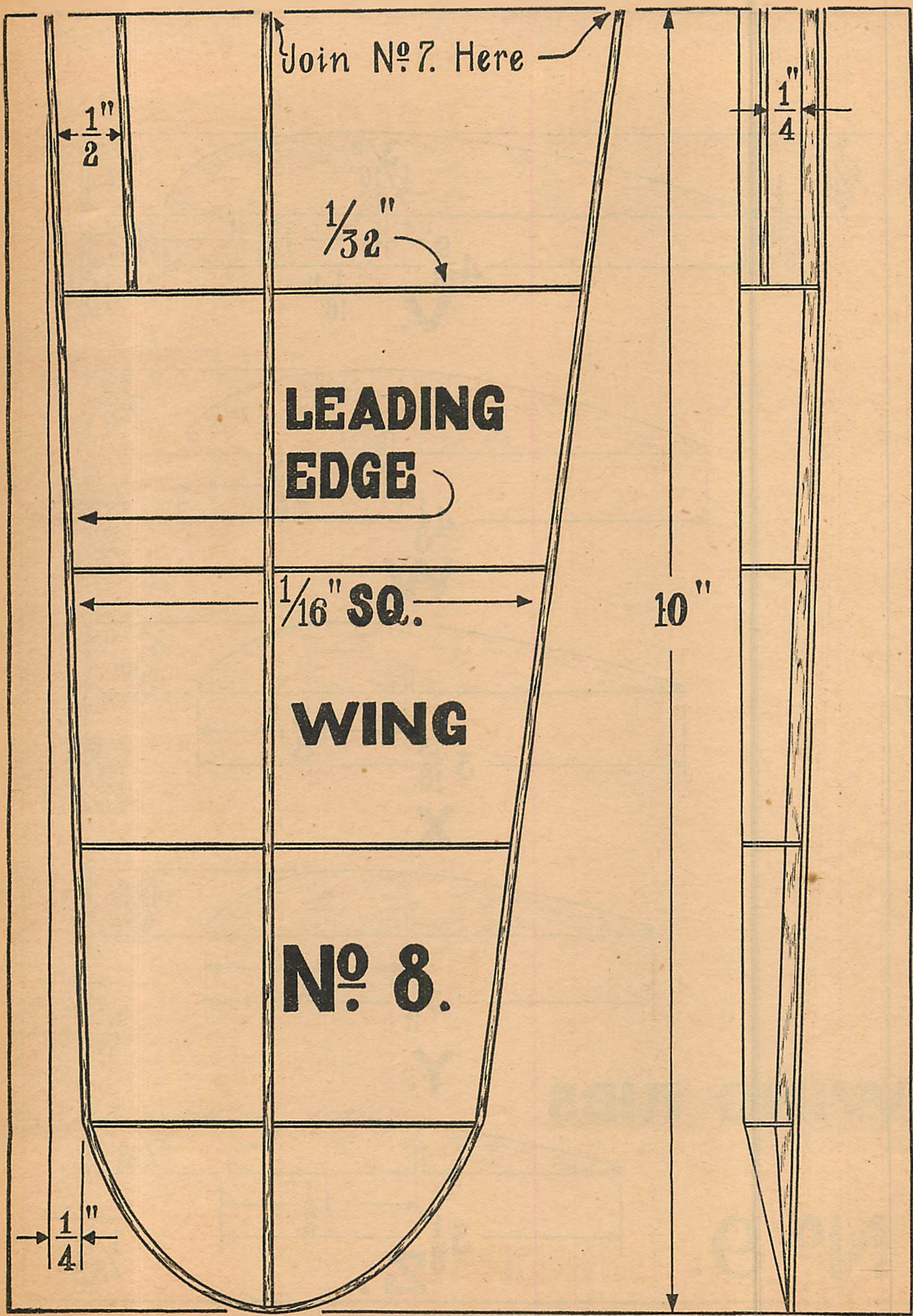
RUDDER

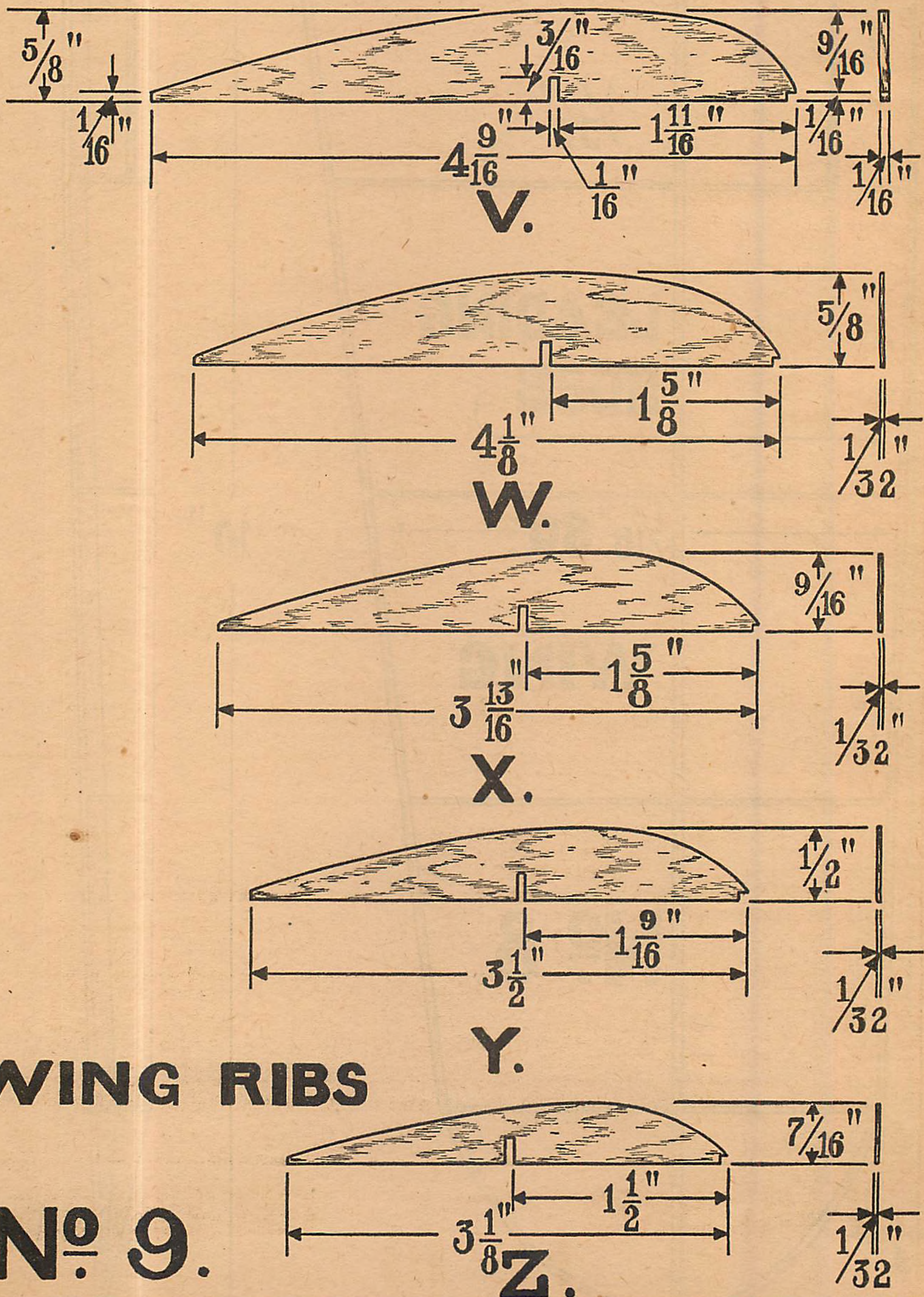
№ 4.


3 1/8"
2 7/8"
3 5/8"
1/4"
1/8"
3/16
Tapered Ends
ALL Struts Streamlined
Make Two of Each
STRUTS
5/8"
1 1/8"
1/2"
3/8"
7/8"
1"
3/8"
3/16"
2 1/4"
1/16"
PANTS
7/8"
WHEEL
LANDING GEAR
№ 5.


5
$1\frac{15}{16}$"
$4\frac{7}{8}$"
FRONT
5
4
SIDE
LANDING GEAR ASSEMBLY
Nº 6.

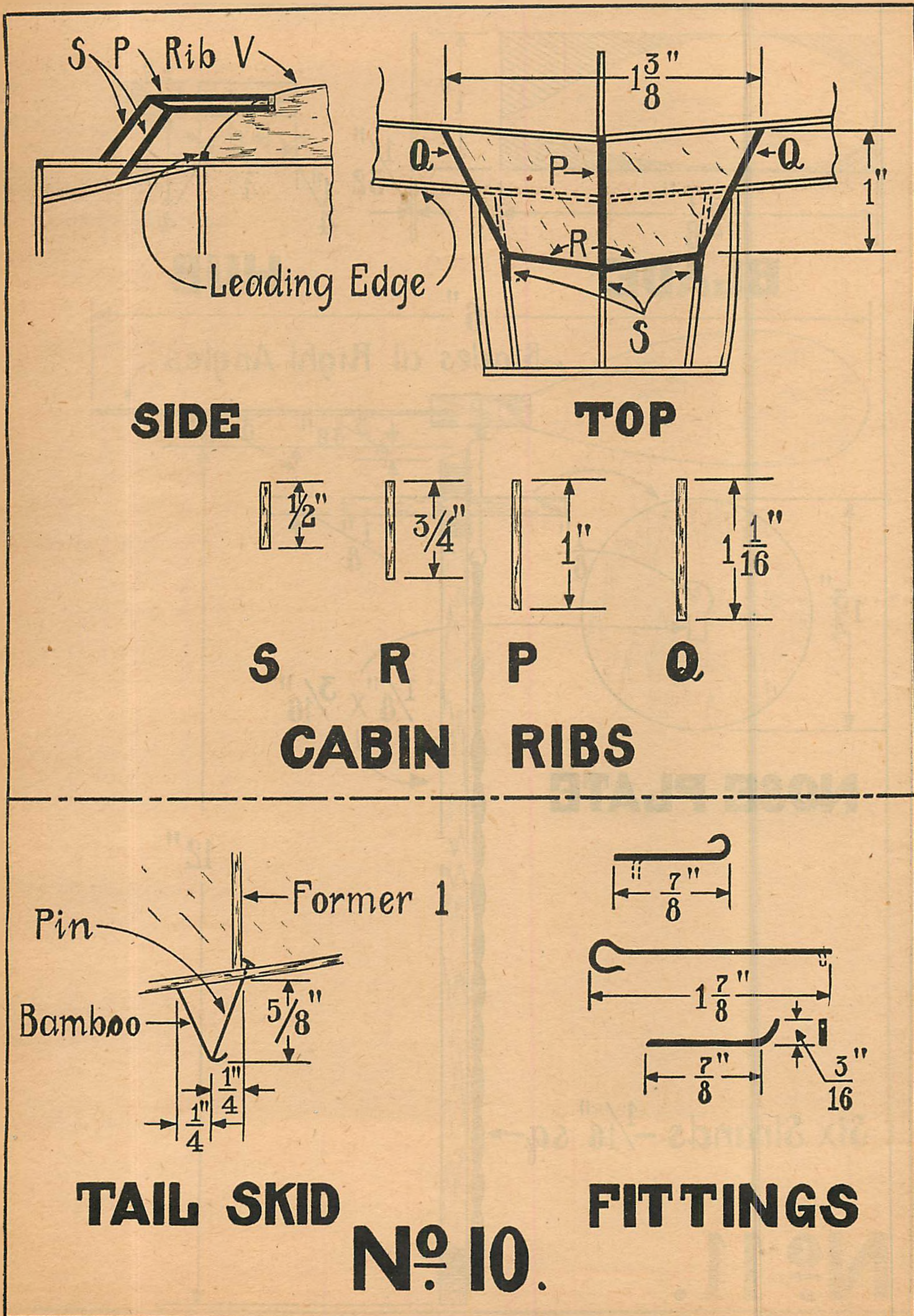

1/16"
V
1/16" SQ. BRACE
W
1/16" x 3/16" SPAR
X
WING
Y
Nº 7.
Z
10"
2 1/8"
2 1/8"
2 1/8"
2 1/8"
1 1/2"
DIHEDRAL
1/4"
1/4"

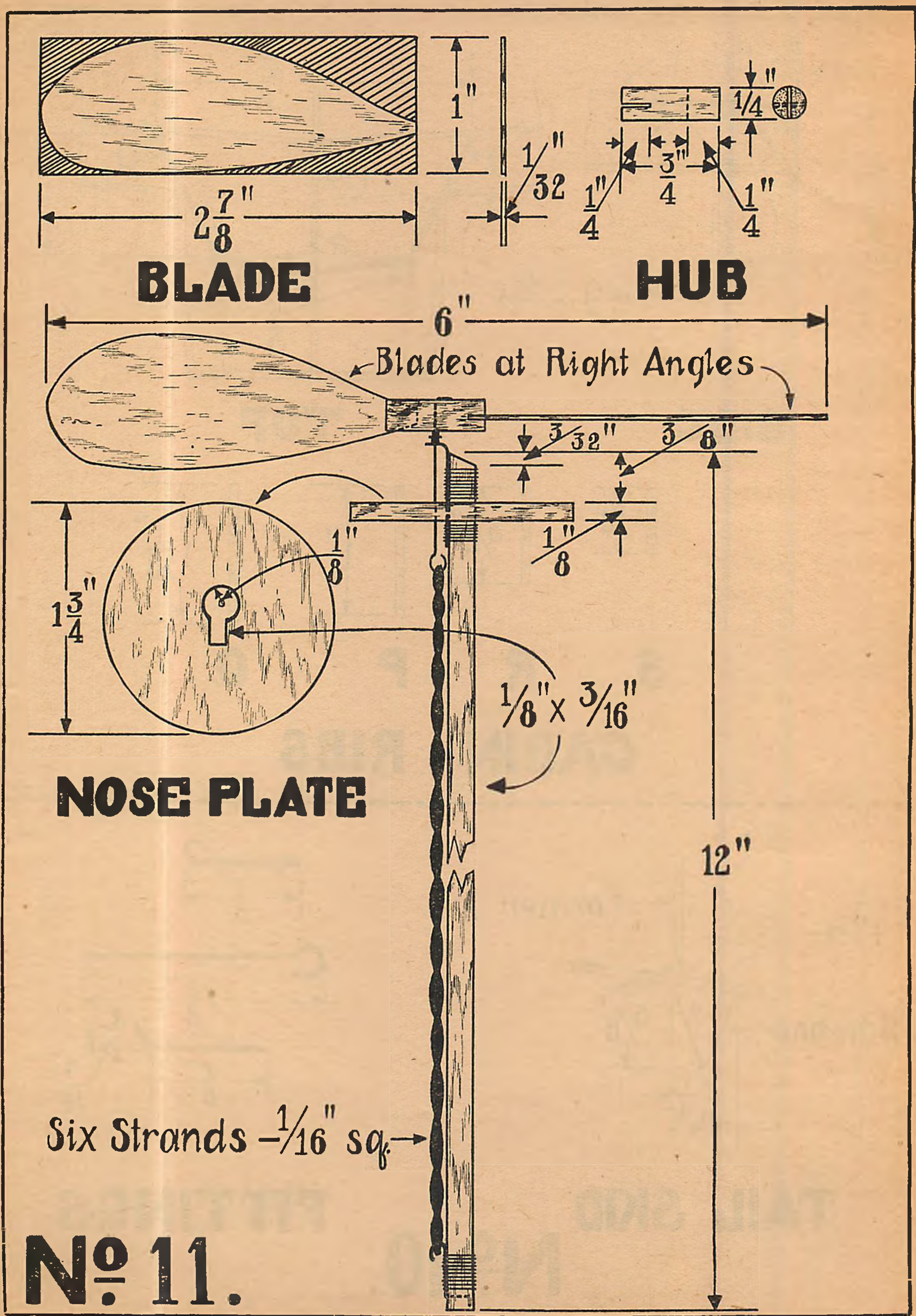

Join №7. Here
1/2"
1/4"
1/32"
LEADING EDGE
1/16" SQ.
10"
WING
№ 8.
1/4"



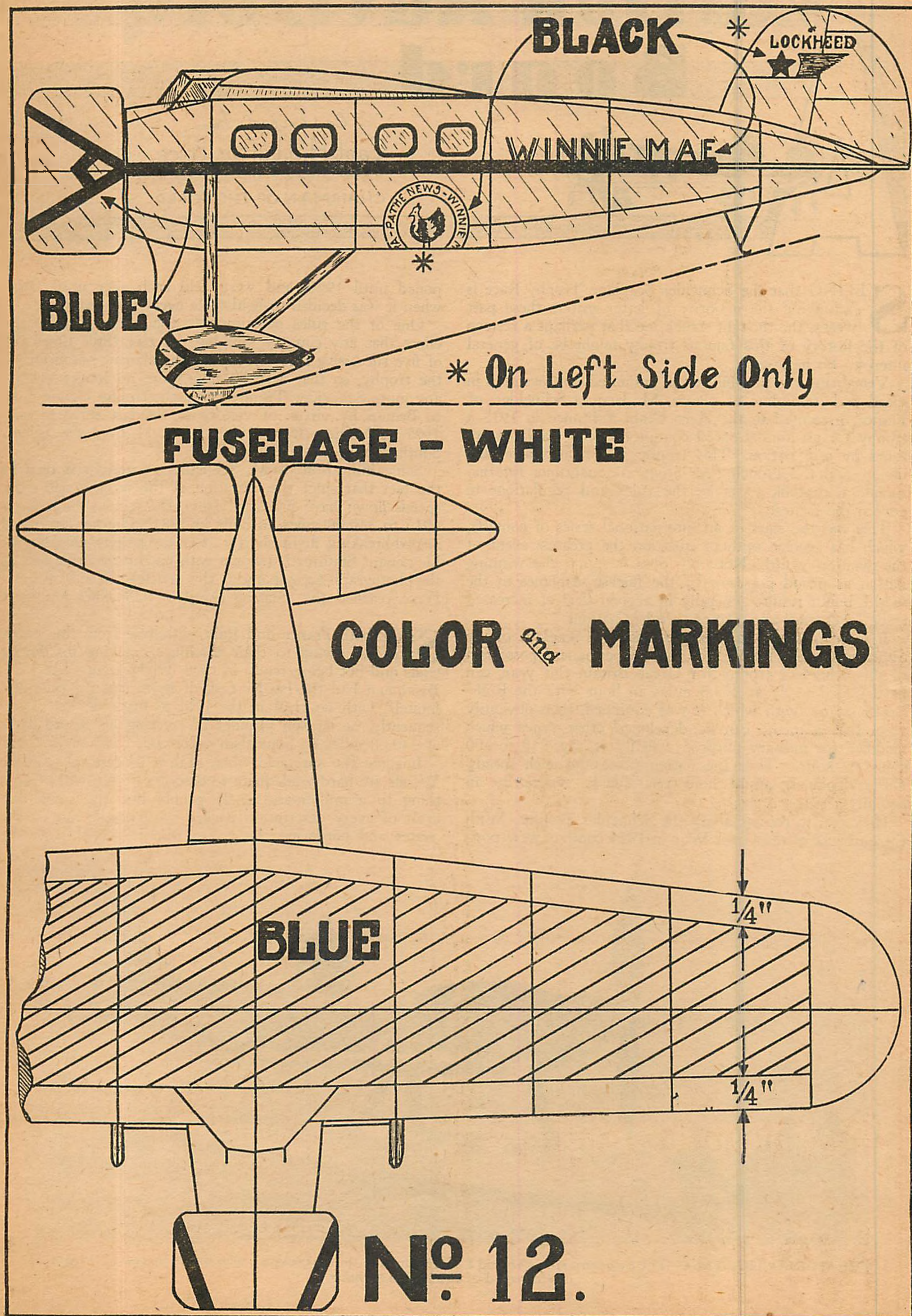
WING RIBS

Nº 9.

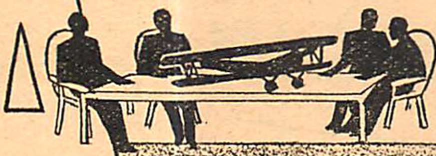

S
P
Rib V
Leading Edge
SIDE
$1\frac{3}{8}$"
Q
P
Q
1"
R
S
TOP
½"
¾"
1"
$1\frac{1}{16}$"
S R P Q
CABIN RIBS
Pin
Former 1
Bamboo
5/8"
$\frac{1}{4}$"
$\frac{1}{4}$"
TAIL SKID
$\frac{7}{8}$"
$1\frac{7}{8}$"
$\frac{7}{8}$"
$\frac{3}{16}$"
FITTINGS
Nº 10.



1"
1/32
2 7/8"
BLADE
1/4"
1/4"
3/4"
1/4"
HUB
6"
Blades at Right Angles
3/32"
3/8"
1/8"
1/8"
1 3/4"
1/8" x 3/16"
NOSE PLATE
12"
Six Strands – 1/16" sq.
№ 11.


BLACK
LOCKHEED
WINNIE MAE
PATHE NEWS - WINNIE MAE
BLUE
* On Left Side Only
FUSELAGE - WHITE
COLOR and MARKINGS
BLUE
1/4"
1/4"
№ 12.

Aviation Advisory Board



Conducted by
Capt. H. J. Loftus-Price
EX-ROYAL AIR FORCE
CHAIRMAN OF THE BOARD

SEEING that the Schneider Seaplane Trophy Race is occupying the majority of letter-writers these past weeks, the thought struck me that perhaps a resume of the history of this famous trophy might be of general interest. So here goes:

Visualizing the possibilities of unlimited improvement in speed and streamline of planes, M. Jacques Schneider, of France, presented to the Aero Club of France in 1913 a trophy for an annual speed contest between seaplanes entered by any nation. This trophy was named after the donor, and the French *Federation Aeronautique Internationale* undertook to make the rules and regulations to govern the contest.

This was the start of an international series of contests, which has become without question the greatest event of the aviation world. Not only does it stamp the winning nation as proud possessor of the fastest seaplanes in the world, but it results generally in a great deal of increased trade in engines and planes to other nations.

It is not generally appreciated that if a seaplane of the *Supermarine Sob* series, such as won permanent possession of the Schneider trophy for Great Britain this year, can be designed to fly at 404.8 miles an hour with the Rolls-Royce engine with which it was equipped, then obviously from that seaplane can be developed other types which modified for military purposes will fly at, say, 250 to 300 miles an hour. Thus the nation possessing such speedy military planes would hold unassailable superiority in the air!

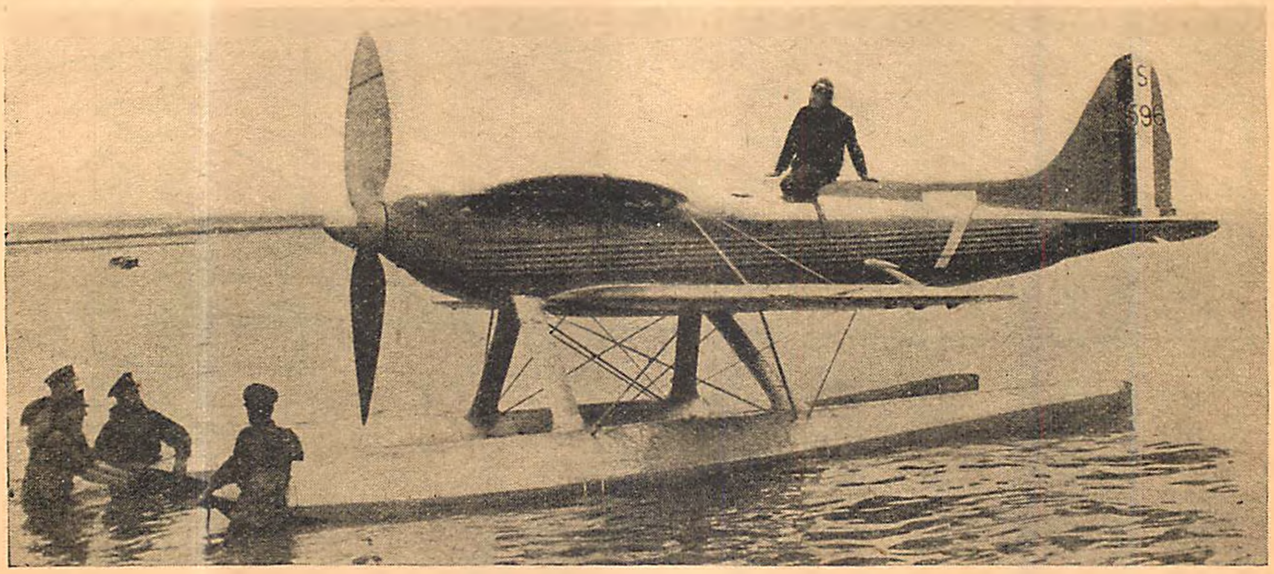
However, to resume about the Schneider Trophy. With the outbreak of the Great War in 1914 contests were postponed until 1920, and were held each year until 1927, when it was decided to hold them every two years.

One of the rules pertaining to the contest was to the effect that any country winning the race three times out of five successive races would win permanent possession of the trophy, so that actually now there no longer will be any more Schneider Trophy races, the trophy having gone to Britain by virtue of victory in the last three races—1927 at Venice, Italy, 1929 and 1931 over the Solent, Southampton, England.

Some indication of M. Schneider's foresight is seen in the fact that since the inception of the races in 1913 the speeds flown have increased from 45.75 miles an hour in 1913 to 340.08 miles an hour in 1931! On one lap of his record-breaking flight shortly after the trophy race, Flight-Lieutenant Stainforth (shown with his *Supermarine S6b* in the photograph accompanying this article) of the Royal Air Force reached the amazing speed of 415 miles an hour!

SINCE both France and Italy withdrew from this year's contest owing to their machines cracking up during trials and not being ready in time, Flight-Lieutenant J. N Boothman had the harder task of flying against time and himself, with no rival in the field to urge him on. Consequently, he is even prouder of creating his record flight of 340.08 miles an hour than otherwise.

Imagine the spectacle when such a contest takes place. Words are hardly adequate to describe it. Crowds of anything to a million-and-a-half people line the shore and craft of every description packed with people out on the water and bordering the (*Continued on page* 47)

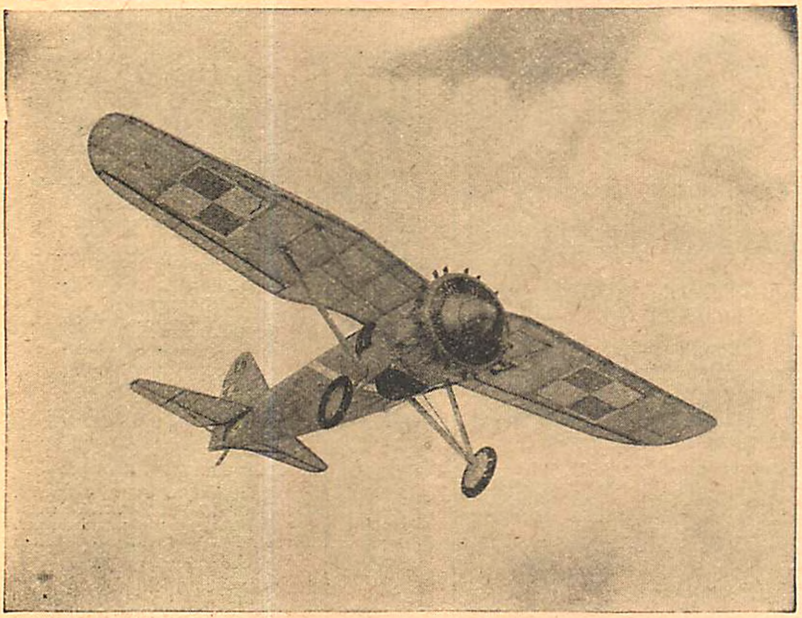


THE WORLD'S FASTEST—The *Supermarine S6b* and F/Lt. Stainforth (in the cockpit), who together created the world's speed record of 404.8 miles an hour

Read this Great Christmas Message from

Big news just in time for Christmas, fellows! New low prices due to factory expansion and greater production—many thanks to our loyal customers. Quality still remains "the talk of the country." Only redicut ribs eliminated. Nine **brand new** ¾" scale all-balsa flying models of the world's most popular and historic airplanes. In addition, our regular line of twenty-seven internationally known kits—making in all 36 Cleveland-Designed Models—the largest line of authentic model aircraft on the globe. Prices to suit all pocketbooks. All photos on this page are of actual Cleveland-Designed models, just as you will make them from our kits, details, color and all, some superimposed on backgrounds for realism. We make no finished airplanes—only kits. But what kits they are! Every Cleveland-Designed Kit includes large, full-size, super-detailed drawings to cut up for patterns, etc.—photographs and complete instructions—all necessary material to make

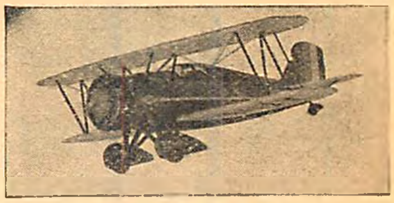
Look at these New Low Prices on Cleveland-Designed Models—acknowledged the World's Best



THE POLISH P. 6. FIGHTER

THIS famous airplane, the Cleveland-Designed model of which is realistically pictured here super-imposed on a cloud background, is the one Capt. Boleslaw Orlinski, Poland's famous airman, flew for the crowds at the National Air Races this year, giving them an example of the exceptional manouverability of this extremely beautiful ship. It has been said that this design of airplane, 200 of which are now in use in Poland, has the highest performance of any military plane. Model flies beautifully at high speed, has a span of 25⅛"; length 17½"; weight 2.7 oz. Colored entirely yellow, details black, red and white. Polish insignia and fuselage bands supplied. Turned hollowed out balsa engine end ring supplied. Kit SF-6. $2.95, postfree. Special delivery, 15c extra.

Capt. Holden C. Richardson our Director of Engineering was formerly Chief of Design Section, Bureau of Aeronautics, United States Navy.

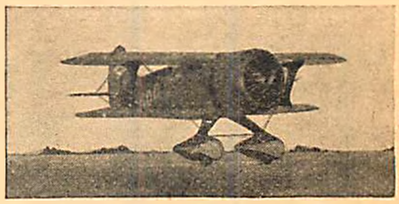


CURTISS HELLDIVER

(Executive Transport)

NOWN practically everywhere, for it is flown by David S. Ingalls, Asst. Sec'y of the Navy for Aeronautics. This design of ship, it is known, will power dive 10,000 feet, and pull out sharply without losing its bomb. Model of this famous plane has a 23⅞" span, 16½" length, 2.9 oz. weight. Colored (representing silver) natural wings and horizontal tail; blue fuselage, struts, fin, rudder and wheel shoes; black details. Kit SF-7, complete with turned balsa engine ring, $3.50, postfree. (Special Delivery 15c extra).

Major "Jimmy" Doolittle's Bendix Prize Winner.



LAIRD SUPER-SOLUTION

FAMOUS ship he flew across the continent in 11 hours, 15 minutes—218.718 M.P.H., average. First to cross continent in less than half day, winning Bendix prize of $7,500 to Cleveland and $2,500 for breaking Transcontinental speed record. In qualifying for the Thompson Trophy Race, he averaged 255.345 m.p.h., or 1 mile in 14.14 sec. Cleveland-Designed model pictured here taking off (superimposed on a field background) has flown beautifully over 500 ft. about 35 m.p.h., breaking our fondest expectations. It has 15½" span, 13¼" length, 1.7 oz. weight. Colored yellow wings, stabilizer and elevators; green fuselage, fin, rudder and struts; black details. Wheel shoes characteristically touched with the yellow design. Kit SF-5, only $2.50 postfree. (Special Delivery, 15c extra). Comes complete with turned balsa cowl front. Kit SF-5, only $2.50 postfree. (Special Delivery, 15c extra).

The Inexpensive FL-100 Airline Model Kits

PROFILE—Fuselage models, small enough for indoor flying yet big enough to give you all the thrill of scale model flying. Spans 10" to 18¾"—all to ⅜" scale. All colored.

FL-101—Primary Glider and advanced Soarer (2 in 1)
FL-102—Great Lakes Trainer.
FL-103—Fleetster High Wing Monoplane.
FL-104—Boeing Fighter (biplane above).
FL-105—Eaglerock Bullet.
FL-106—Curtiss Hawk.
FL-107—Travel Air Mystery Ship.
FL-108—Boeing Mail Plane.
FL-109—Curtiss Robin.
FL-110—Vought Corsair.
FL-111—Lockheed Sirius (monoplane above).
FL-112—Curtiss Falcon.

Price, 85c each Kit, postfree. (Special Delivery 15c extra, two or more, 25c extra)

GREAT LAKES SPORT TRAINER

A MODEL of the famous ship that astounded the world when piloted by "Tex" Rankin to 31 consecutive outside loops, 19 of which were official. Model simple to build, and excellent flyer. Span 20"; length 15¼"; weight 1.2 oz. Colored orange wings; black tail surfaces, scalloped with orange; black fuselage with orange panels; black details. Kit SF-1, $2.50 post free. (Special Delivery, 15c extra).

CLEVELAND TRIMOTOR FL-302

Semi-profile type, flies with all 3 propellers actually pulling. ⅜" scale. Span 29"; length 19"; weight 1.1 oz.

Colored natural white (representing aluminum) trimmed with blue; black details. Kit FL-302, now only $2.50 postfree. (Special Delivery, 15c extra).

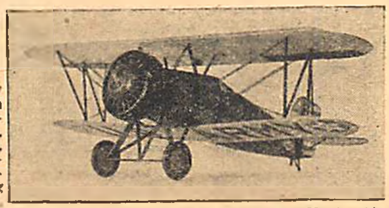
TRAVEL AIR MYSTERY SHIP

First American airplane to outperform military aircraft in a free-for-all race—piloted by "Doug" Davis in the 1929 Cleveland National Air Races. Model has 22" span; 15⅝" length; 2.2 oz. weight. Colored like the real original Mystery Ship—a brilliant red with much black scalloping and details (patterns supplied). Kit complete with turned balsa cowl and ring. Kit SF-2,

$3.50

postfree. (Special Delivery, 25c extra).

Cleveland's New BOEING FIGHTER



Much improved over the old exposed engine design. Completely changed with the new engine endring, wings, tail, movable controls, fuselage, landing gear, etc.

The prototype is now being widely used in the U. S. Air Services, and is sometimes called Boeing's Helldiver. Model kit comes complete with turned balsa end ring. 22⅜" span; 14¼" length; 2.2 oz. wt. Colored yellow wings and tail, green fuselage and struts, black ailerons, motor cowl and details. Kit SF-8, $2.95, postfree. (Special Delivery 15c extra).

CLEVELAND AMPHIBION FL-301

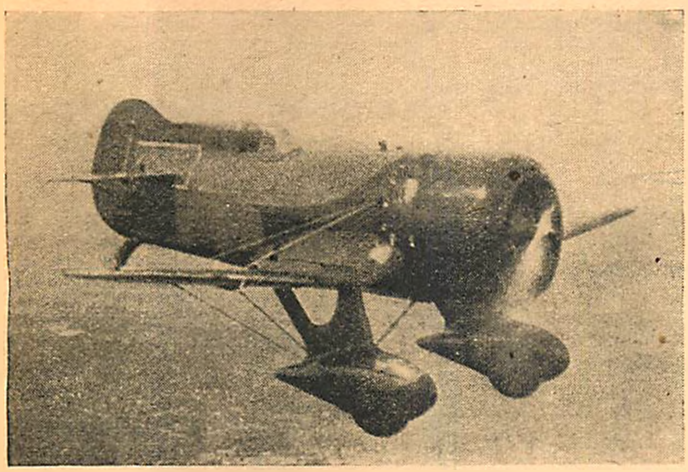
Semi-profile type, will R. O. G. or R. O. W. ⅜" scale. Span 27"; length 16½"; weight 1.2 oz. Colored yellow wings and tail surfaces, blue hull and details. Kit FL-301, now only $2.50 postfree. (Special Delivery, 15c extra).

CLEVELAND MODEL & SUPPLY CO.

1866N West 57th St.
Cleveland, Ohio, U.S.A.

Cleveland Diamond—Symbol of Honest Quality.
Reasonable Price and Immediate Service

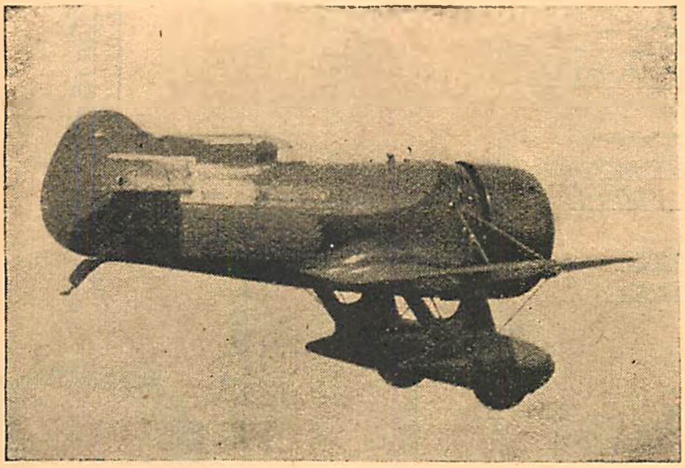
Save these 2 pages



How to Build The Gee-Bee Supersportster

Scale Plans for a Replica of America's 286 m. p. h. "Flying Milk Bottle"

By Gus Anderson



Two views of the real *Gee-Bee* in flight

THIS is the plane that won the Thompson Trophy at this year's Cleveland Air Races. Its short and stubby structure gives it the appearance of a "flying milk-bottle." In looking over the various characteristics you will notice an extremely wide fuselage near the fin (side view) giving it unusual stability and maneuverability in flight.

Comparing it with some of the more standard size planes you will notice that the fuselage being only fifteen feet it is therefore eleven feet shorter than the Lockheed *Vega* "Winnie Mae" of around-the-world fame, and five feet (plus) less than the "*Texaco* 13," Captain Hawk's plane. Wings are much shorter—in fact it is more of a flying engine than any ship constructed heretofore.

There are two ways to construct this model and I have purposely shown the internal structure of it so that any one wishing to make a built-up model can do so. For simplicity's sake I will tell you how to make a solid wood model.

Several points I want to call to your attention are, the drawings shown are full size as to the dimensions shown. So if you wish to construct a larger model, say twice the size shown, all you have to do is to double the dimensions. Airfoil sections shown are not 1/10 size as specified, because the original drawings were reduced by photostatic process. As they stand now they are approximately 1/20. Also the various sections—A, B, C, D and E—are different, having also been reduced.

Before actually starting let me call your attention to the necessity of careful and accurate work. Don't be hasty, as that spoils the whole attempt to build good models. Check your drawings with your photographs and vice-versa. Have a sharp knife or razor blade, as a dull knife tears through balsa wood instead of cutting clean.

The following are the various tools, materials and paint you will need. Remember — get the best material you can buy. It pays in the long run.

For the fuselage get a piece of Balsa 1¾ x 1¾ x 5½".

For the wing get a piece of Balsa ¼ x 2¼ x 10".

For the stabilizer and elevator get a piece of Balsa 1/16 x 1¼ x 3⅜".

For the fin and rudder get a piece of balsa 1/16" x 1 7/16" x 1¾".

For the pants, 2 pieces balsa ⅜" x ⅞" x 2¼".

For the wheels, 2 pieces balsa ¼" x ⅞" x ⅞".

For the tail-skid, 1 piece of balsa 3/16" x 3/16" x ⅝".

For the propeller get a piece of balsa ¼" x ¼" x 3½".

For the struts on pants, 2 pieces of balsa ⅛" x 1½" x 1".

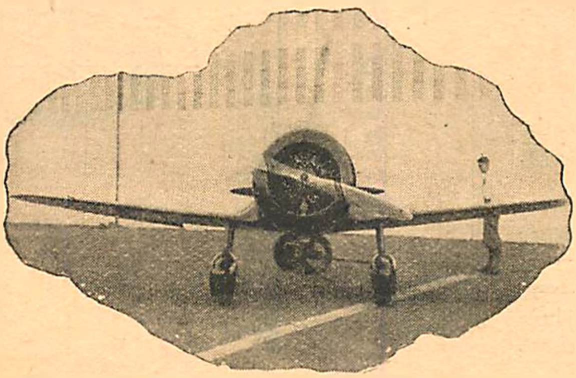
For the struts on stabilizer, 2 pieces of balsa 1/16" x 3/32" x 1½".

For the cowling, 1 piece of balsa 1⅝" x 1⅝" x 1".

For the cylinders get 1 piece balsa ¼" x ¼" x 3¾".

IN ADDITION, you will need some colorless cement (a small tube will do), a small sheet of celluloid, about ½" x 2", for the cockpit. You will need a piece of .034 guage aluminum about 2" x 5" for the aluminum fillet from butt of wing to fuselage; about four dozen small ribbon pins ⅜" long or shorter if you can get them; a spool of white thread for wires; sandpaper — rough, medium and fine; and about three dozen ordinary length pins to attach various parts such as the wing to fuselage, etc.

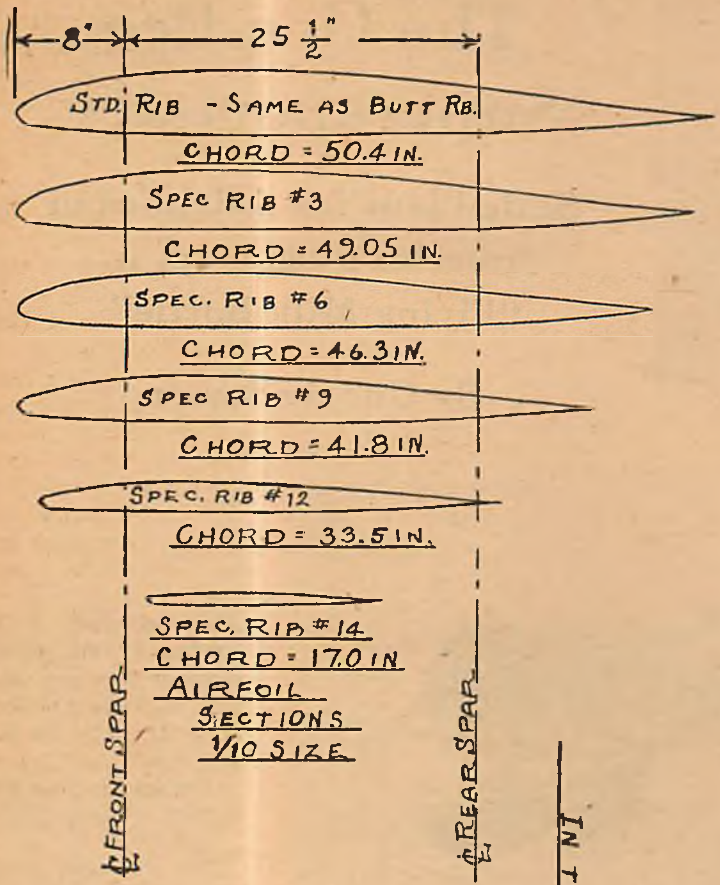
Two camel's hair brushes and a little acetone to clean your paint brushes; a two-ounce can of plain dope and two small cans of lacquer, one cream and one maroon. Also get a tube of plastic wood.

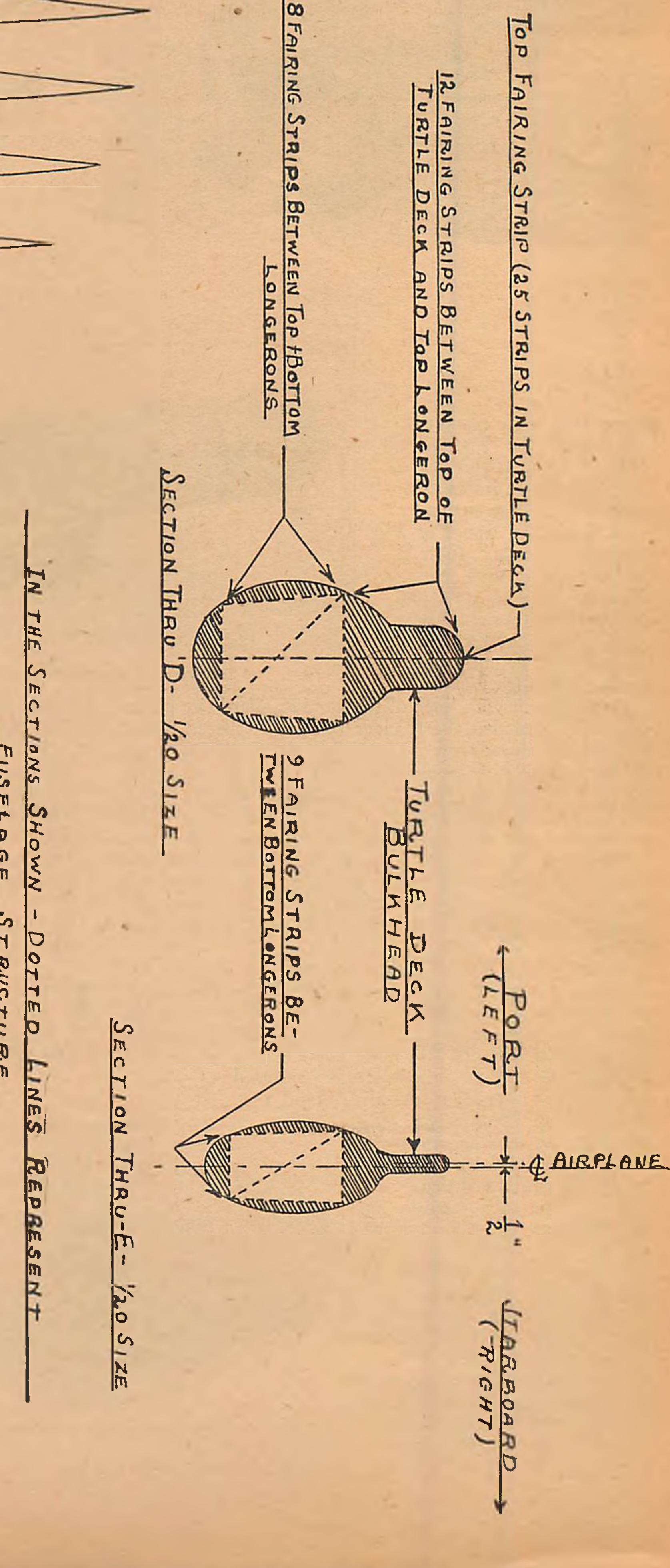


A front view of the real *Gee-Bee*

Fuselage

Select the piece of balsa 1¾"





x 1¾" x 5½" and shape it to the form of the fuselage as shown in the illustration. After roughly shaping it; then sandpaper it to a smooth finish, and then give it three coats of plain dope. Allow each coat to dry separately.

Wings

Shape these as shown in the illustration from your balsa wood ¼" x 2¼" x 10". Give them a smooth finish with the sandpaper—using rough sandpaper first—then medium—and finally the fine paper. Apply three separate coats of plain dope.

The stabilizer and elevator are made in one piece from the balsa 1/16" x 1¼" x 3⅜". Follow the design shown —sandpaper it smooth and apply three coats of plain dope. This also applies to the fin and rudder. Only the dimensions are different.

Wheels

Lay out on the piece of balsa—the design of a wheel—¼" x ⅞" x ⅞". Of course if you can purchase wheels that size so much the better. Make a ⅞" circle and cut it out. Sandpaper it all around. Paint artificial tires on from black ink—if by chance—you haven't any black paint, drill a hole through the center. Dope three times and lay aside to dry.

The pants are ⅜" x ⅞" x 2¼" so lay out the design and carve the shape. Sandpaper them till smooth. Do not dope—yet. From underneath carve carefully the space for the wheels. Then give pants three coats of plain dope.

Struts for the pants are sanded to a streamline shape and doped *only once.* Doping more than once warps them. Lay them aside to dry.

From a piece 3/16" x 3/16" x ⅝" shape the tail skid as illustrated and dope it three times.

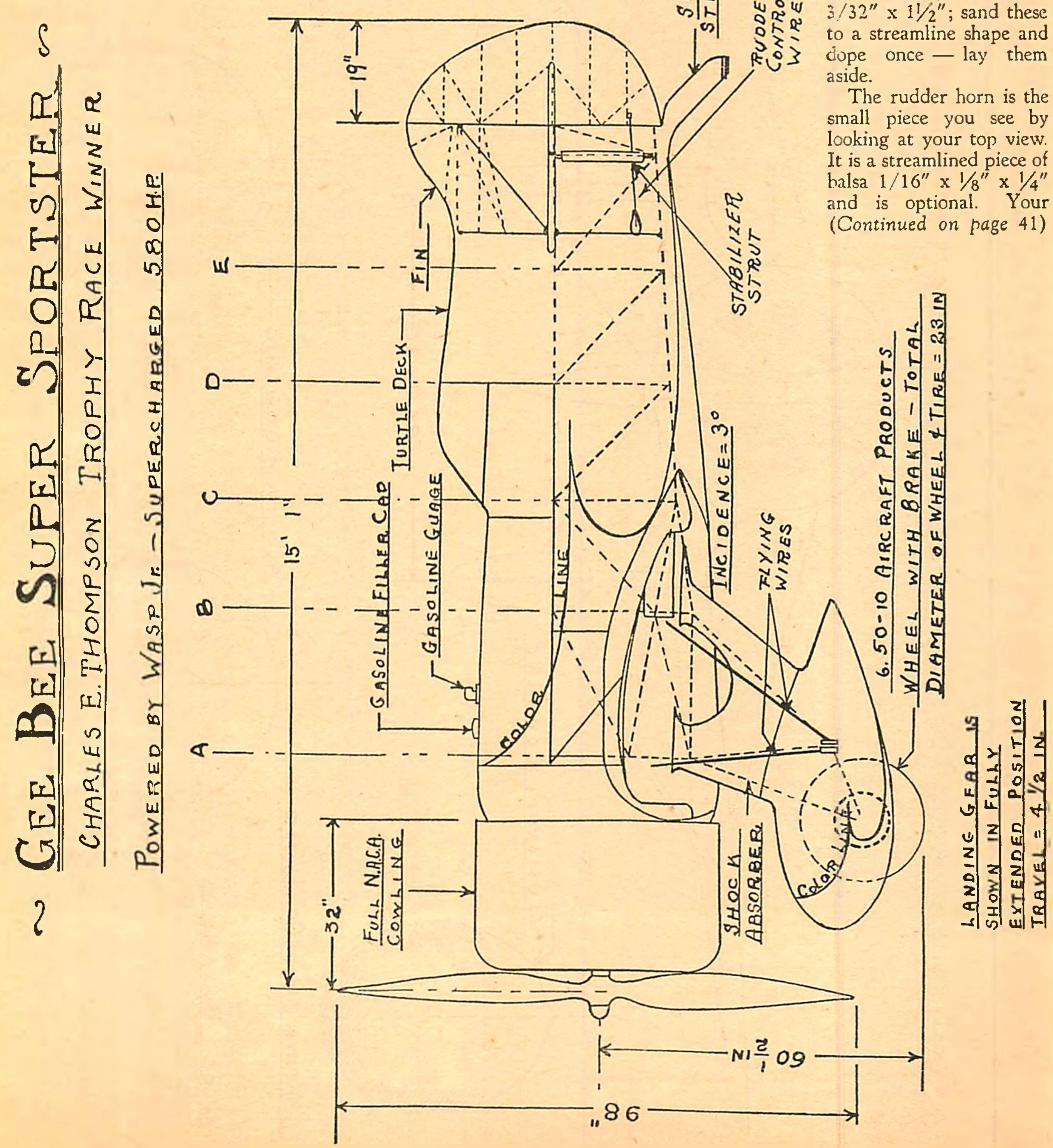
The propeller is made from a piece ¼" x ¼" x 3½" in one piece. For a good model builder this is easy but we'll make it an easier way. Get a piece of balsa wood 3/16" x 3/16" x ¼" and round it as shown for a hub. Sand it smooth. Now get two pieces for the blades and shape them *opposite* to each other. Now dig out a small hole the size of the bottom of the blade and cement them in firmly. Give the propeller *one* coat of dope only.

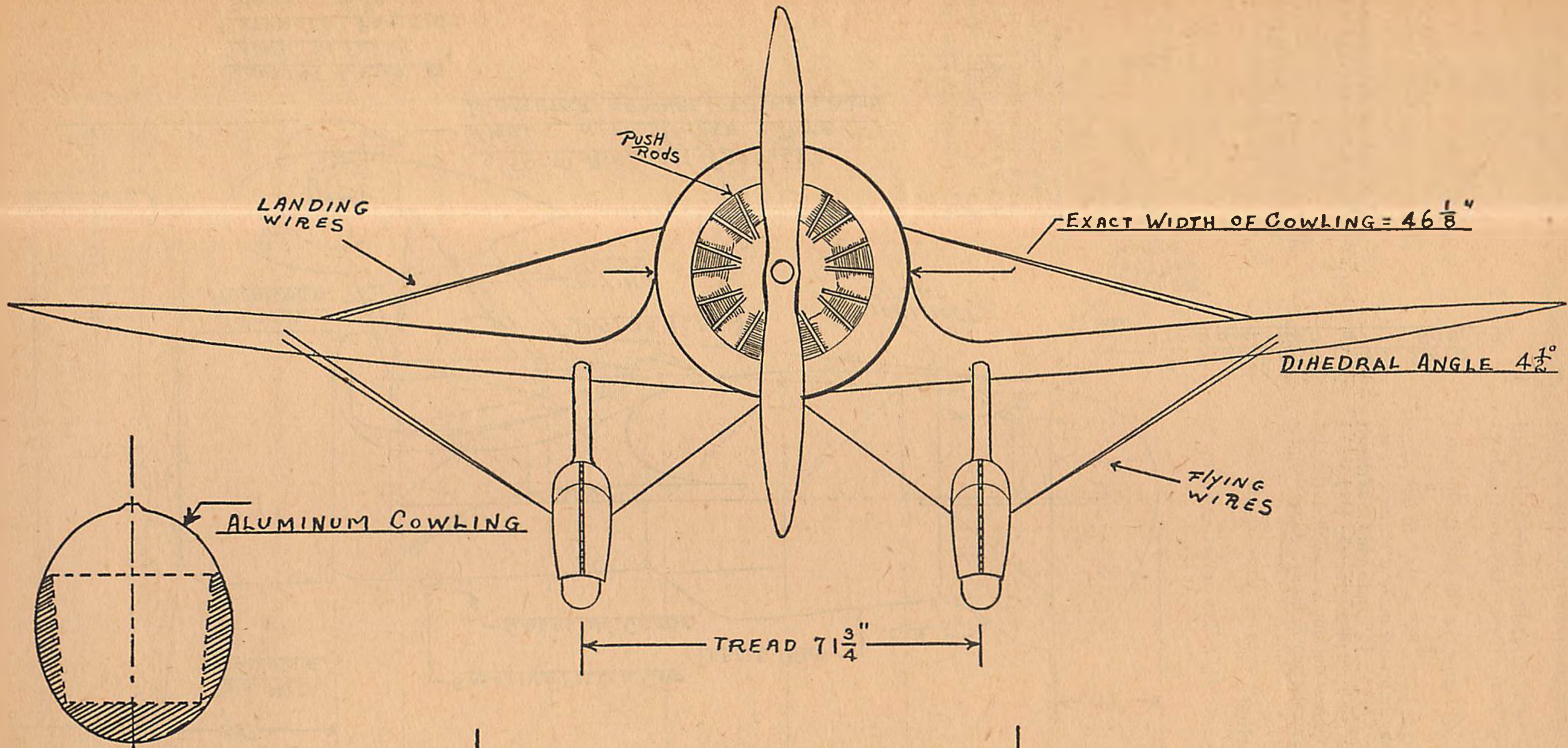
Cowling

Take the piece of balsa 1" x 1⅝" x 1⅝". Lay it flat and draw a circle from the center 1⅝" in diameter. Shape it down to 1/16" of the size shown. Starting from the front—dig out as illustrated on the front view to allow for the cylinders on the motor. Care is essential in this operation so that the cowling doesn't split. After you have hollowed this piece out and sandpapered it to a smooth finish give it three coats of plain dope and allow to dry.

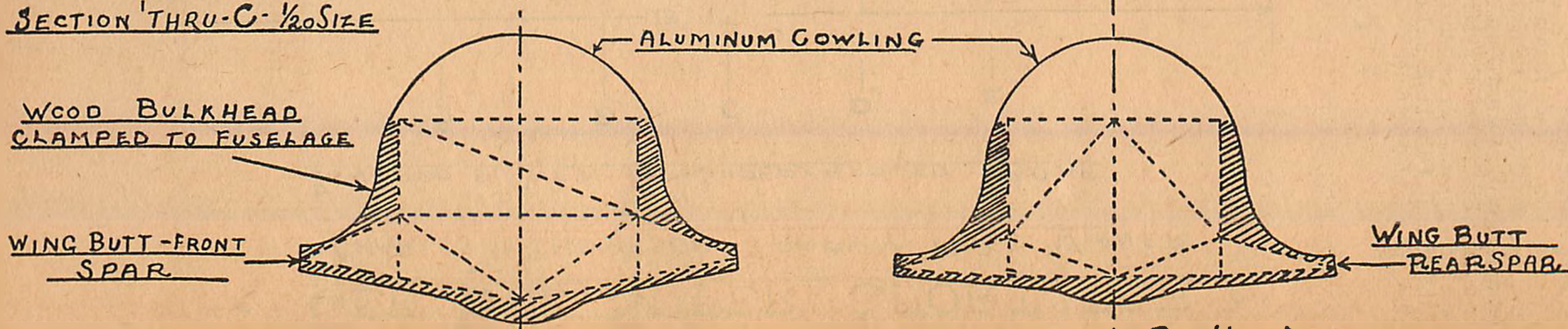
Two stabilizer struts are needed, 1/16" x 3/32" x 1½"; sand these to a streamline shape and dope once — lay them aside.

The rudder horn is the small piece you see by looking at your top view. It is a streamlined piece of balsa 1/16" x ⅛" x ¼" and is optional. Your (*Continued on page* 41)



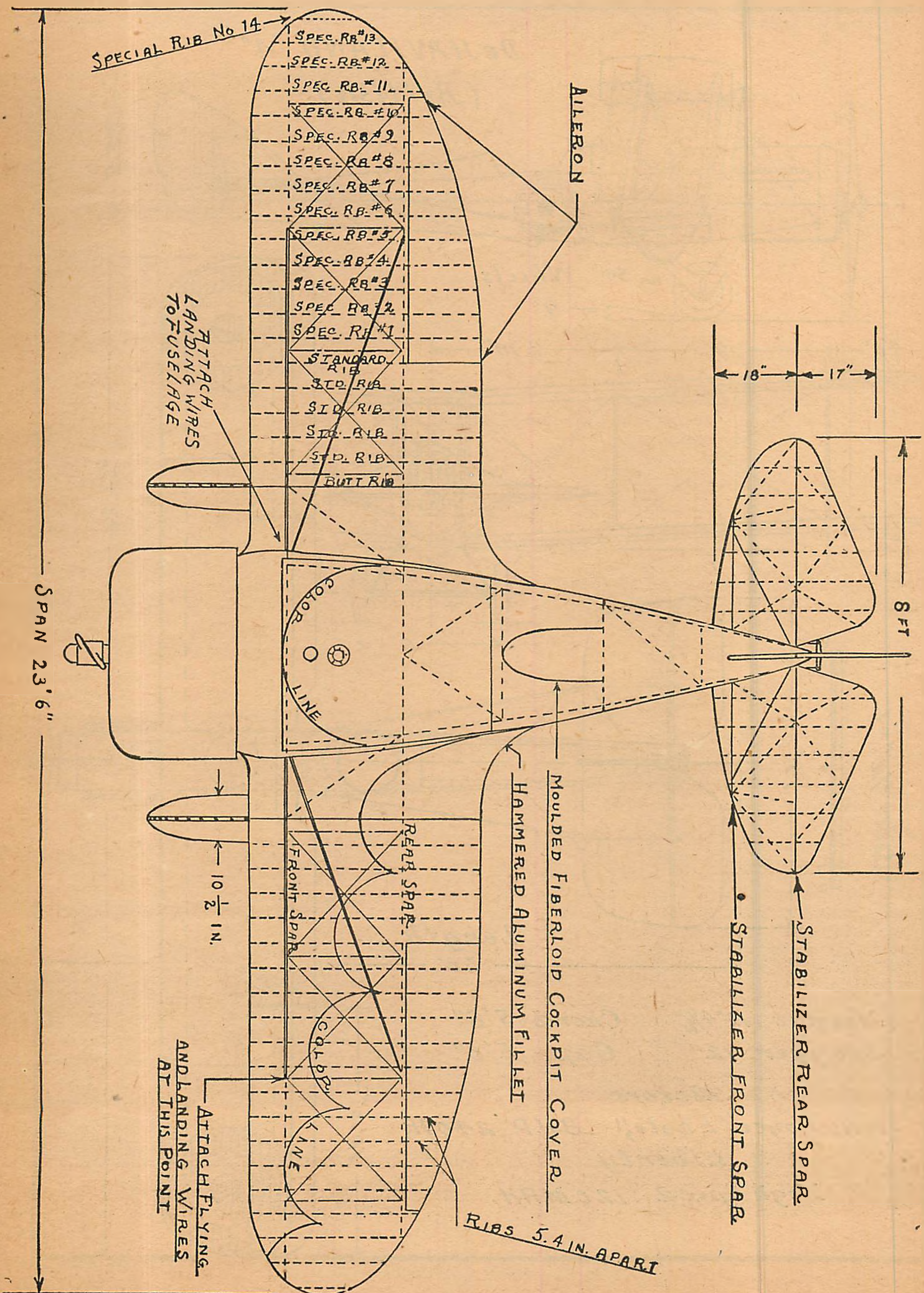


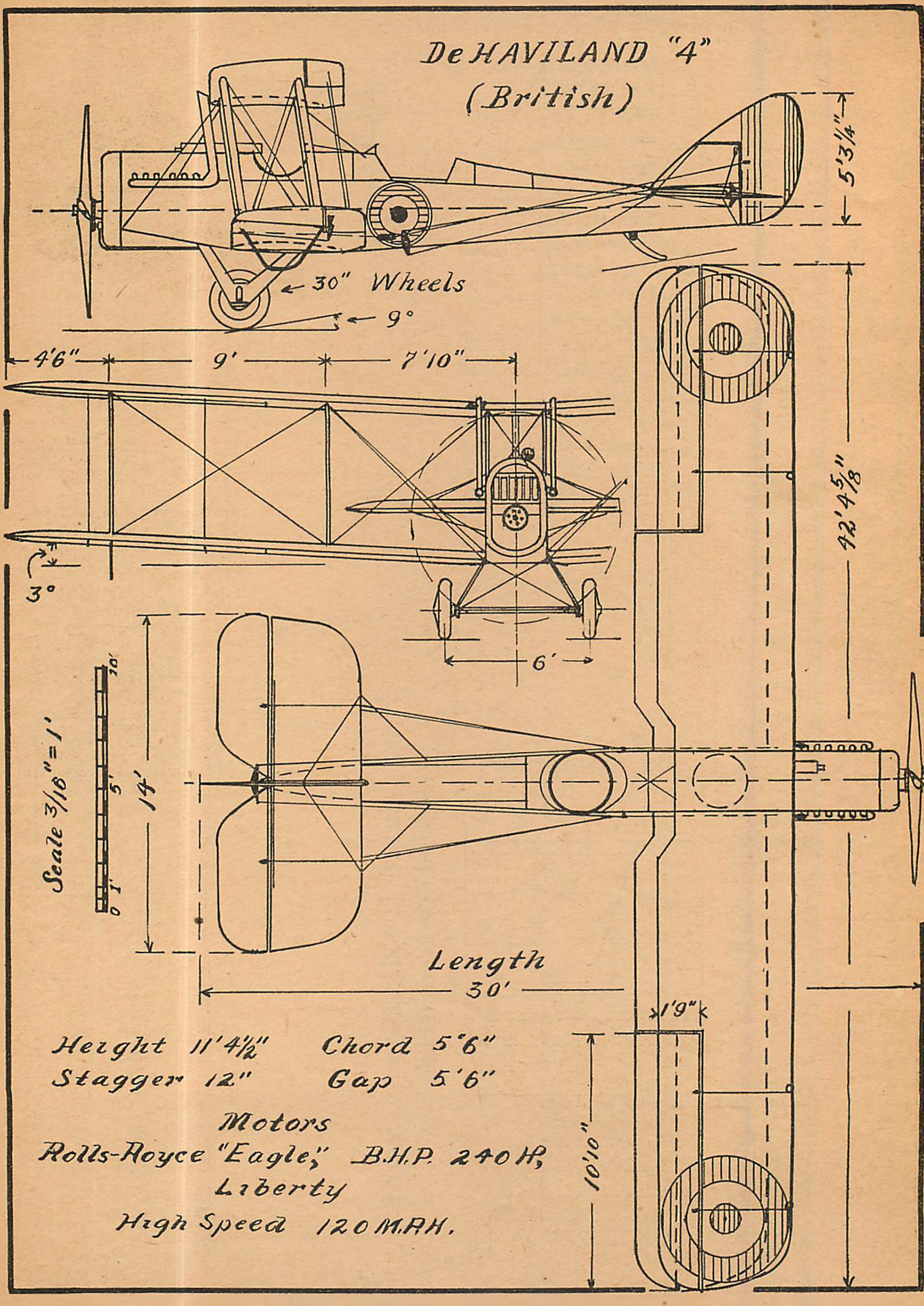
SECTION THRU-C- 1/20 SIZE



SECTION THRU -A- 1/20 SIZE

SECTION THRU B- 1/20 SIZE


SPECIAL RIB No 14
SPEC. RB #13
SPEC. RB #12
SPEC. RB #11
SPEC. RB #10
SPEC. RB #9
SPEC. RB #8
SPEC. RB #7
SPEC. RB #6
SPEC. RB #5
SPEC. RB #4
SPEC. RB #3
SPEC. RB #2
SPEC. RB #1
STANDARD RIB
STD. RIB
STD. RIB
STD. RIB
STD. RIB
BUTT RIB
AILERON
ATTACH LANDING WIRES TO FUSELAGE
SPAN 23'6"
10 1/2 IN.
COLOR LINE
REAR SPAR
FRONT SPAR
COLOR LINE
ATTACH FLYING AND LANDING WIRES AT THIS POINT
RIBS 5.4 IN. APART
HAMMERED ALUMINUM FILLET
MOULDED FIBERLOID COCKPIT COVER
18"
17"
8 FT
STABILIZER FRONT SPAR
STABILIZER REAR SPAR


De HAVILAND "4"
(British)
5'3 1/4"
30" Wheels
9°
4'6"
9'
7'10"
42'4 5/8"
3°
6'
Scale 3/16" = 1'
0 1' 5' 10'
14'
Length
30'
1'9"
10'10"
Height 11'4½"
Chord 5'6"
Stagger 12"
Gap 5'6"
Motors
Rolls-Royce "Eagle," B.H.P. 240 H.P.
Liberty
High Speed 120 M.P.H.

Special Course in Aerial Radio

By Capt. L. S. Potter

Fig. 2. Western Electric helmet telephone set

Reception and Sound Waves

(*CHAPTER 7*)

BEFORE we can go very deeply into the subject of reception, we must understand something of the nature of sound waves. Most people know that sound is produced by the vibrations of some object which cause corresponding vibrations in the substance round it—air, water or the like. These vibrations reach the delicate organism of the ear, and are recorded on our hearing in a manner depending on the nature of the vibrations themselves.

This sounds rather involved so let us take an example, the piano. If you strike a note on the piano, the hammer striking the piano wire causes it to vibrate, and these vibrations are communicated to the surrounding atmosphere, and spread in widening circles till they reach the organism of the ear.

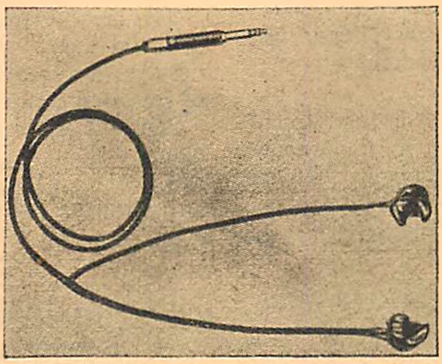


Fig. 3. Aerial headphones

If the note struck is a low one, vibrations will be created on a heavy piece of piano wire which vibrates comparatively slowly. If the note struck is a high one, the vibrations will be created on a very much finer piece of wire which vibrates much more rapidly. Thus we find that the more rapid the vibrations, the higher will be the pitch of the note.

The fact that it is these vibrations passed on through the atmosphere that causes the sounds we hear can be easily proved by ringing a hand bell and then placing a hand on it. If the bell is clasped firmly, the sound will cease abruptly because the pressure of the hand is stopping the vibrations of the meta which are being passed on through the atmosphere. Sometimes after a loud note is struck on the piano, glass objects in other parts of the room will commence to rattle. It is the sound vibrations impinging themselves on the articles that causes this.

If the vibrations are too rapid, the pitch of the note will be too high for the human ear to detect. The highest note that the average person can hear has a frequency of approximately 20,000 vibrations a second, but ordinary telephone receivers will not respond to frequencies higher than 10,000 per second.

Certain animals can hear sounds of a much higher pitch than human beings, in proof of which a German some time ago produced a whistle which, when blown, emitted apparently no sound. The frequency of the vibrations created were too rapid for the human ear to record, but the actions of several police dogs who responded to the whistle proved that they had been able to hear it.

Speed of Sound

Sound, contrary to sight which is almost instantaneous, travels comparatively slowly. The thunderstorm is a typical example of this. Several seconds will often elapse between seeing a flash of lightning and hearing a clap of thunder, yet the two occur simultaneously.

A MORE unusual example was witnessed, or rather heard, by the author at the Schneider Cup race near the Isle of Wight in 1929. The sound of a motor boat passing up the Solent could be heard for a long time before the boat appeared, but the roar of aero engines racing overhead, and the appearance of the planes travelling at nearly six miles per minute seemed to come simultaneously.

Fig. 9. R.C.A. receiving room WSC, Tuckerton

This could not have actually been so, since sound travels at approximately twelve miles per minute, but it is not improbable that one day a plane will appear which will travel faster than sound, in which case it would have passed overhead before the noise of its motor reached the ears of a listener.

The strength of a note depends on the force with which it is created. A piano key heavily struck sounds louder than when struck lightly. Aside from the strength of a note and the pitch of a note, there is also the quality of a note. One voice is distinct from another by reason of its quality. The difference between a note played on the piccolo and the same note played on a cornet is the difference of quality.

This difference of quality is carried along by smaller waves which accompany the main sound waves, and which so modify them that we can distinguish voices without seeing the speakers. Sound waves, however, do not travel very far, and in order to carry the human voice rapidly to great distances, electric waves must be propelled at high frequencies which will produce sound vibrations on some material object at the receiving station.

Telephone Receivers

The material object in this case will be the diaphragm of the telephone receiver. Credit for the discovery of the telephone receiver has been finally given to Alexander Graham Bell after a period of litigation that lasted several years.

THE fundamental principles of the telephone may be explained simply as follows: Electromagnetic waves transmitted from a distant station impinge themselves on a receiving antenna and this energy, passing through various circuits, causes a current to flow through a solenoid wound round a magnet inside the telephone receiver.

A solenoid is the name given to a coil of wire through which a current is passed, which is wound round a piece of metal. This current increases and decreases the magnetism of the metal inside the solenoid, causing it to attract and release a thin metal disc, known as a diaphragm, which rests lightly on it. The vibrations of this diaphragm produce sound waves which we hear as speech, music or signals.

You are probably asking yourself how it is that electromagnetic waves intercepted and passed on by the antenna become sound waves in the receiving telephone. To explain this we will take the case of a transmitting telephone known as the microphone or, more familiarly, as the "mike." The microphone has a similar diaphragm to the one in the telephone. The sound waves caused by anyone speaking into the instrument cause the diaphragm to vibrate.

To the back of the diaphragm is attached a small carbon button which vibrates with it, and impresses its vibrations on quantities of carbon granules which rest in the microphone behind the diaphragm, and between two electrodes, usually also of carbon. Through these granules is passing the high frequency current necessary to radio transmission.

Now, with every different word, every change of inflection, change of tone, different vibrations will be caused on the diaphragm and impressed on the granules behind, every one of which forms a distinct contact. In this manner, the sound waves are superimposed on the carrier waves which thus become moulded into sound waves.

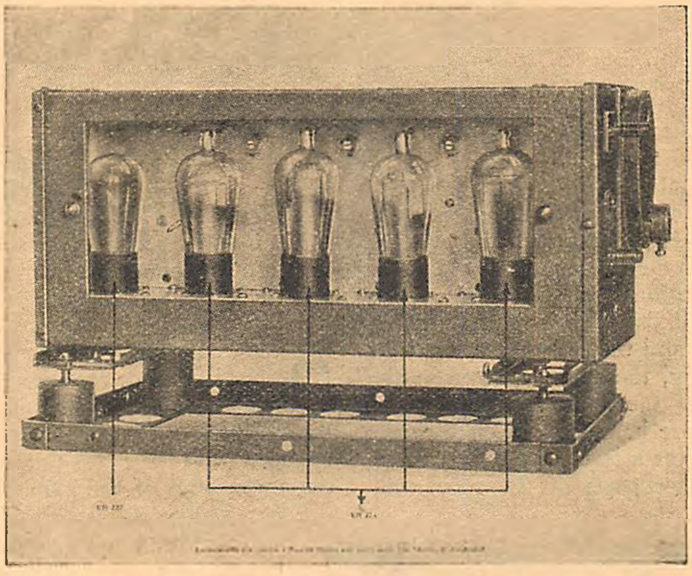


Fig. 10. Western Electric receiving tubes

Expressed briefly, the electromagnetic waves may be said to have lost none of their individual qualities, but rather to have gained, in addition, all the characteristics of the sound waves imposed on them. The oscillations rise and fall with the voice inflections, and when they reach the receiving diaphragm, exactly the same vibrations are created as were created on the microphone diaphragm.

Loud Speaker

Fig. 4. "Silencer" plane transmitter and (right) ground microphone

The loud speaker embodies precisely the same principles as the telephone receiver. Since sound waves are created by the vibration of a diaphragm, if we wish to increase their volume we can either increase the size of the diaphragm so that a similar amount of vibration, being spread over a larger area, will cause correspondingly larger vibrations in the atmosphere, or we can keep the diaphragm more or less the same size but increase the extent of its to and fro vibrations.

The first system is the cone type of loud speaker which is found less frequently today, and the second system is the dynamic speaker which has become popular on account of its more convenient size.

Figure 2 is a telephone set specially designed for pilots, Figure 3 shows a set of headphones encased in hard rubber earpieces, and Figure 4 illustrates two types of microphones in use today. All of these are made by the Western Electric Company.

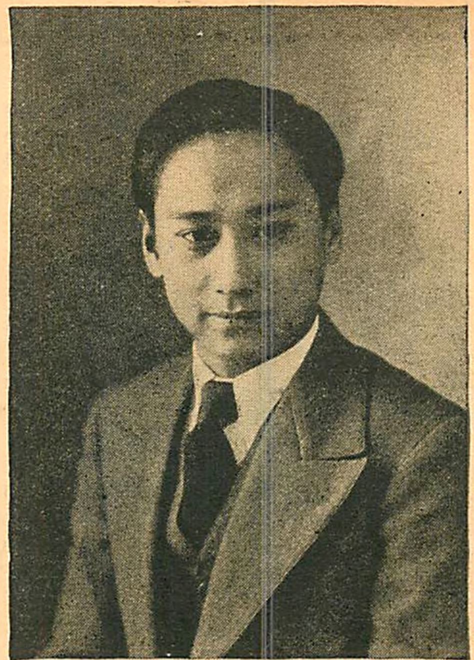
Detectors

Since the diaphragm of a receiving telephone does not respond satisfactorily to an oscillating current, the energy picked up by a receiving antenna has to be changed into a one-way pulsating current before it can be passed on to the receivers. In other words, the current being received must be rectified, and to do this we must use a rectifier, or detector, as it is more usually called, though the first name more properly describes its functions. For practical use there are only two types of detectors used in present-day receiving sets, the Crystal Detector and the Vacuum Detector.

There are a variety of minerals which may be used as crystals, and these have further been given such a wide range of trade names that it would be impossible to discuss them all in any detail. The majority of crystals are made of Galena, Iron Pyrites, Carborandum or Silicon, and these minerals are produced in various manners.

Most crystals have certain spots in them which are more sensitive than others, and these must be found to secure the best results. In order to find them, a piece of phosphor bronze wire (the "cat's whisker") is fixed to a handle that is movable in any direction, so that the whole surface of the crystal may be explored (*Continued on page 42*)

The American Sky Cadets



Gaudencio A. Orden, 39 Point Road, Shanghai, China, an ardent model builder who would like to correspond with other enthusiasts

Pacific Coast Miniature Aircraft League Records and Fourth Annual Tournament Reports

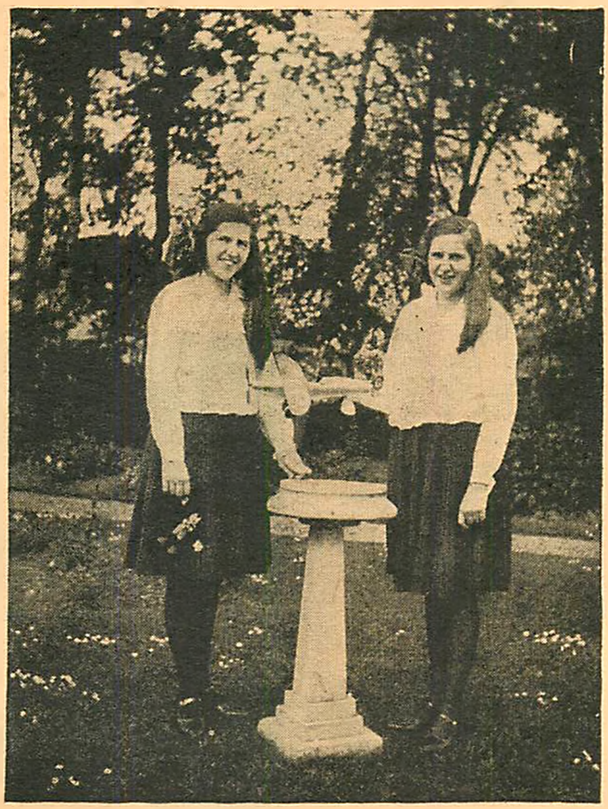
THE question of model airplane records of all kinds has been one of much dispute from time immemorial, and the situation has been greatly aggravated by the fact that so many model airplane clubs claim flights made by their members as "*world's records.*"

MODEL AIRPLANE NEWS, the only magazine of its kind in the country devoted solely to model airplane activities, takes this opportunity of inviting all model airplane clubs to submit for publication all records held by their members. In this way it is hoped to arrive at a definite set of records which honestly can be referred to and challenged as "*World's Records.*"

To start the ball rolling, MODEL AIRPLANE NEWS this month takes great pleasure in publishing a full report received from the *Pacific Coast Miniature Aircraft League*, an organization which long has held the esteem of this magazine, and which always has been in the forefront of model airplane activities throughout the country.

We are indebted to Mr. John C. Henderson, of Los Angeles, Calif., for submitting the report, which is as follows:

"The following are the results of the Fourth Annual Pacific Coast Miniature Aircraft Tournament, sponsored by the *Pacific Coast Miniature Aircraft League* and the Los Angeles Department of Playgrounds and Recreation. Announcements of this meet were sent to one hundred and sixty-two cities in the entire district west of the Mississippi, and the championships announced will, therefore, cover this same area. While replies were received from twenty-seven cities, the meet settled down to a dual contest between San Francisco and Los Angeles. The final results of the meet were as follows:



Mabel and Sheila Glass, two A.S.C. members from Scotland

INDOOR EVENTS

Stick Models, Hand Launched—1, Walter Powell, San Francisco, 9 min. 45 sec.; 2, Tamotsu Shimazaki, San Francisco, 8 min. 42 sec.; 3, John Berg, Los Angeles, 8 min.

Fuselage Models, R. O. G.—1, John Berg, Los Angeles, 6 min. 52 2/5 sec.; 2, Donald Donahue, Los Angeles, 5 min. 56 sec.; 3, Huston Hager, Los Angeles, 5 min. 56 sec.

OUTDOOR EVENTS

Stick Models, Hand Launched—1, Donald Donahue, Los Angeles, 9 min. 9 1/5 sec.; 2, Thomas Scully, Los Angeles, 8 min. 9 sec.; 3, John Berg, Los Angeles, 7 min. 57 sec.

Fuselage Models, R. O. G.—1, Donald Donahue, Los Angeles, 22 min. 22 1/5 sec.; 2, Howard Broughton, Los Angeles, 21 min.; 3, L. A. Pratt, Los Angeles, 13 min. 28 sec.

Los Angeles—28 Points.
San Francisco—8 Points.

Individual Champion—Donald Donahue, Los Angeles, 13 Points.

"The list of events was considerably curtailed this year and the contest was run under practically open rules, pending the results of the Miniature Aircraft Conference at Toronto in October, at which time it was hoped that a standard national plan could be worked out.

"The present officers of the league are:

President, John C. Henderson, Los Angeles.

Secretary, Louis Orsatti, Los Angeles.

Board of Directors, Donald Ashbaugh, Glendale; Al Rohland, Hollydale; William Kuring, San Francisco, and Leon Fletcher, Santa Monica.

"Election of officers for the year ending June 30, 1932, is now in progress. Following is a list of the member cities and

Robert Meier, Louisberg, Kansas, and his prize winning model

the official representatives:

Byron Wesner and Don Ashbaugh, Glendale; Al Rohland and Harry Johnson, Hollydale; Roland Fitten and Clarence W. Hickok, Lindsay; Fred A. Wright and Carl E. Slatt, Long Beach; Louis Orsatti and John C. Henderson, Los Angeles; A. B. Drake and Allan Nutter, Redlands; C. L. Burns and Chester Van Dusen, San Diego; Veda B. Young and William Kuring, San Francisco; H. H. Cochrun and Leon Fletcher, Santa Monica; Ernest J. Neilsen, Selma (second representative not yet appointed); Willis Downs and C. W. Hipplar, Pasadena.

"In addition to the official representatives appointed, the following names have been certified by the League as officials competent to conduct miniature aircraft meets and to certify results therefrom:

Emory Bronto, San Francisco; W. A. Kearns, San Diego; Charles Burr, Lindsay; Raymond S. Kimball, San Francisco; Chas. W. Brown, Long Beach; Esten B. Koger, Long Beach; E. V. Chandlee, Los Angeles; Walter A. Lacy, Whittier State School; Fred H. Clark, Redlands; E. W. Davies, San Francisco; D. Webster Lott, Los Angeles; A. Milton Fish, Long Beach; Louis McCreery, Long Beach; Frank Flynn, San Francisco; Roy S. Melvin, San Bernardino; Capt. Roy N. Francis, San Francisco; L. R. Miller, Pasadena; Albert Hooflich, San Francisco; C. C. Moseley, Los Angeles; George A. Irvin, Los Angeles; Capt. Stanford Moses, San Francisco; Melbourne Jenrey, Lindsay; R. E. Munsey, Santa Monica; Edward F. Jewett, Fort Bragg; John W. Norviel, Glendale; Walter Scott, Long Beach; J. C. Beniwell, Long Beach; Earl Vivell, Oakland; C. A. Price, Los Angeles; C. M. Brown, Bakersfield; Josephine D. Randall, San Francisco; Dr. Geo. F. McClelland, Fullerton; W. H. Orion, Santa Barbara; C. Nisewanger, Santa Ana; John Ness, Los Angeles, and Capt. H. J. Loftus-Price, New York City.

Honorary Members—Mrs. Helen A. French, Los Angeles; Tom Rivers, New York City, and Major Luke Christopher, Washington, D. C."

(*The Miniature Aircraft records are given at the end of this article.*—EDITOR.)

Joseph Warren, Hartford, Conn., Aero Model Club

IT ISN'T often that the fine workmanship of the model airplane completely fools judges in the scale model contests — but this is exactly what happened at the Model Airplane Meet held in New Haven recently in connection with the dedication of the New Haven airport.

The model in question is a *Boeing* 12-B pursuit plane made by Matthew Mozick, who is a member of the Hartford Aero Model Club of the Hartford Y.M.C.A. This fine model took sixth place honors in the Fourth National Contest conducted this spring at Dayton, Ohio, under the auspices of the *Airplane Model League of America.*

So when the judges submitted their selections and the model in question did not receive even honorary mention the maker protested and after explaining to the judges the manner in which he actually constructed his plane they reconsidered and allowed him to share first place honors with the winner already selected.

Mozick's plane was made to scale one-fifteenth as large as the regular ship. The motor was reproduced with remarkable skill and was made of lead from a plaster-of-paris cast prepared by the builder and is an exact reproducation even to the details of showing the metal fins. This scale model has a 24-inch wing span, its propeller is made of metal and is 7 13/64 inches long.

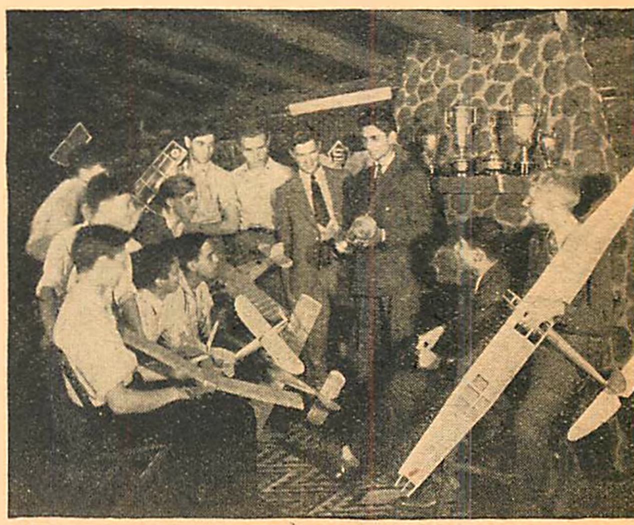
The over-all length from propeller to rudder is 16 3/64 inches. Incidentally the wings are built up and have the same number of ribs as are found on the regular outdoor ship. Even the metal surfaces are corrugated and made of brass shin stock.

At the same meet, which was the first outdoor meet that the Hartford Model Aero Club has participated in, Joseph Warren, another member of the club, won first place honors in the hand-launched duration contest. His model was one of seventy-five entered and owing to the high wind it was impossible to keep the ships in the air very long. Warren's plane won first honors by remaining aloft 2 minutes and 44 seconds.

THE plane itself was of Warren's own design, similar to an indoor model, with a built-up balsa motor stick 45 inches in length. The propeller, carved from balsa, was 15 inches long from tip to tip and its wing spread was 40 inches. All told, the ship weighed a trifle more than two ounces.

In the same contest Matthew Mozick placed third and John Tyskewicz placed fourth. Both young men are members of the Hartford Model Aero Club.

(*Continued on page 44*)

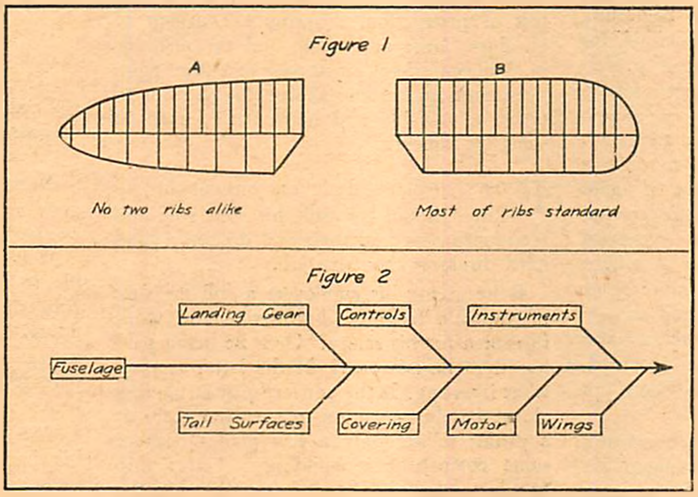


A group of Stern's Sky Cadets and their trophies

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



More on Light Planes and Production

STABILITY, of course, must be designed into the ship. Clever balancing of the centers of gravity, drag, and lift goes a long way toward solving the problem.

We can build a plane that will be perfectly stable at three-quarters throttle and yet it will be practically impossible to handle, and actually dangerous as soon as the motor is opened wide. Freak things like this bob up every now and then, and the designer must know the game thoroughly to dodge them. Also, there is the matter of "bugs" to be considered. If you heard a man say, "That crate is full of bugs," you might think the chap a bit daffy; but you would be wrong. Bugs, in the airplane designer's lingo, are the small defects of stability and control that nearly always show up during the first test flights of a new type of ship.

Certain details, usually, have to be altered slightly to iron them out. Control surfaces may be changed a bit, perhaps the motor shifted slightly, or little refinements made in the outward design of the fuselage. Every bug must be corrected, and here again the designer's skill and knowledge comes in handy.

Light planes especially are now designed against tail-spins. Nearly all of them have ample vertical area toward the rear, and powerful rudders. All of this helps against the spin.

With regard to the control of the ship, the designer spends quite a bit of time and energy. A private flyer, buying a ship for sport and recreational use, will hardly consider a job that is cranky on the controls, that skids to one side or drops a wing in landing, or that swerves into a ground loop whenever the inexperienced pilot lets her nose off a bit to one side while rolling along the ground. For this reason the designer must proportion his control *surfaces skilfully.*

Most successful light planes have rather large rudder areas. Elevators are usually large too, but the designer takes great care to keep his ship from being "touchy" on the flippers. That is to say, he designs a ship that does not move with startling violence when the stick is moved forward or backward a bit, because he knows that the private flyer is bound to overcontrol quite generously anyway; and to build a ship with over-sensitive controls would be to make the poor chap pursue a course that would resemble that of a bucking bronco with a burr under the saddle! As said before in this course, a reasonably long fuselage, with well-placed centers of weight and well-designed controls, generally means a ship that will handle quite comfortably and yet not sluggishly.

A matter of utmost importance is visibility. The private pilot, being none too experienced at the stick and flying as he does only at intervals, must be given every chance to do his best. For this reason he must be given an excellent view of the ground blow and in front of his ship. He has not the skill that enables a transport pilot to set a ship down without a jar, even with a huge motor cutting off his vision; he must be able to see just what is happening at all times. So the light plane must be built with a maximum of visibility.

THIS visibility problem has been argued and threshed out over many a drafting board. Take a look at Figure 2. Here we have, first, a parasol monoplane with the pilot seated below the wing. He has a good range of vision downward and to the sides and forward—looking over the motor or to one side of it—but he can see very little above.

This shaded region above, in which the pilot can see nothing, is called a "blind spot." It is the object of every designer to cut blind spots to a minimum. Why? Because another ship might approach in that area, and (it has happened many times) a crash ensue because neither pilot could see the other.

Some designers of parasol monoplanes overcome this blind spot by using transparent wing covering in the center sections, or by leaving these sections entirely uncovered. This helps.

Now look at the center-wing job, also in Figure 2. Here we have a bad blind spot below and ahead of the plane. Landing a ship like this would be mainly guesswork, unless some provision were made by the designer to overcome the difficulty. The position of the pilot might be changed by moving his pit up forward, or perhaps transparent wing sections at the roots could be used as in the parasol monoplane job. Then, too, some designers argue that a pilot should not look directly down when landing anyway, and the center-wing ship makes him keep his eyes where they belong—on the ground a good distance ahead of the ship.

At any rate, it is a good idea to remember that blind spots are bad business, and that every effort should be made to do away with them.

The comparatively slow speed of the light plane is a big point in favor of smooth flying and stability combined with easy control, but, on the other hand, the ship must be maneuverable enough to do any reasonable stunt at the will of the pilot.

Comfort of the passengers is a big point, and one that designers are just beginning to consider. When space is provided for two persons, side-by-side seating is preferable, although a bit hard to design into a small ship. Dual controls, of course, should be fitted, and ample leg room is a necessity.

We cannot design a ship that only a contortionist can get into and out of again and expect to sell that ship to the general public. Doors must be provided—although it is hard indeed to design a door in a light plane fuselage—and these doors must be of sufficient size for easy entrance and exit.

Seats, of course, must be spacious and comfortable. Cushions must be provided, with space for parachute packs if they are used.

Many of these things are just beginning to engage the attention of light plane designers but it is certain that, in the near future, they will be very important points. Therefore, the chap who would become a light airplane designer will do well indeed to consider them carefully.

Nor are these all the problems encountered by the man who designs the light plane. He must provide comfort and convenience and easy repair and safety and ease of control and so on—but he must do all these things *cheaply!*

Simplicity, as said before, is a big factor in lightness and ease of construction and ease of repair. And the problem of simplicity rests on the designer alone.

SIMPLICITY is essential. The sooner the designer learns that the better. The automotive engineers have learned it. Production methods, with ships designed so that they may be assembled rapidly, is the secret of the cheap airplane. Production methods bring in savings that enable ships to be sold for lower prices. Lower prices, in turn, mean more sales.

Here we have a wide and fertile field for new ideas. The man who can work out new light plane designs, ships that will combine all of the qualities we have mentioned with ease and speed of manufacture will probably be able to name his own salary!

Here, too, is a big chance for the clever model airplane designer who has the itch for experimenting with new and novel ideas. The model airplane is the ideal flying laboratory. Models can be built resembling light planes in weight and area proportions. Everything can be scaled out. Then new ideas may be tried in actual flying conditions and improved, accepted, or rejected as impractical. There is no expensive and inaccurate wind tunnel to bother with. All you need is a pair of sharp eyes, a few deft fingers, and a keen mind. Moreover, such experimenting develops these sharp eyes and deft fingers and keen minds; and it's great sport too. There is an excellent chance that some model designer will hit upon something new, experiment with it and work it out on practical flying models, and then have something that will make him a fortune.

So you see, an engineer's job is not a simple one. He may know all about aerodynamics and stresses; and yet, if he fails to consider the consumer and the problems of production, he will meet with very little success. He must be a business man as well as an engineer.

This applies to all airplane designers, and it is applying more forcibly every day. Next month, then, we will go deeper into the subject of production, covering the design of all ships, large and small; and the methods of building them, methods that the engineer must understand thoroughly if he is to prove a valuable and high-salaried man to some big concern.

EVERY airplane designer, present or future, should lay aside his slide rule and tee-square now and then and do some good hard thinking about his job.

Is he giving his employers a full measure of valuable technical knowledge and work in return for his salary? Or is he being paid less than he is worth? If the latter is true, what is wrong? Is the concern just struggling along, barely managing to turn out ships at a profit; selling only a few planes because some competitor is building a better ship at a lower price? If that is so, what can the engineer do to pull the company out of the rut, make himself a more valuable man—and, incidentally, fix things so that he can be given a deserved increase in pay.

To anyone who looks around in the aeronautical industry today it is plain that something is wrong. Ships are too expensive. Most manufacturing concerns are struggling along against overwhelming competition, selling anything from three to twenty ships a year and making very little money on them. Many concerns, indeed, are losing money.

The engineer's job is in many cases precarious. He is hired by a small manufacturing concern with more hope than money to make a design for a ship that is to do a certain thing in a certain way. He toils over his drafting table, pouring his specialized knowledge into his latest masterpiece. The work at last is done. The ship is then built.

The day of the test flight rolls around. The designer, feeling a bit wobbly in the knees and rather cold in the throat, stands by the hangar door and watches the test pilot strap on four or five parachutes and climb into the cockpit. The motor is warmed. Someone catches a wing-tip and helps the pilot nose into the wind, and the brave gentleman, with a last look at the instruments, opens her up and sits tight.

She's off! The designer is breathing—but not easily. His eyes are gleaming with pride, however, as the test pilot after half an hour of straight flying and perhaps some stunts comes down and says:

"She's sweet. Got a few bugs in a power dive, and seems a little right wing heavy, but that can be ironed out. Congratulations."

The engineer accepts the congratulations, plus a reasonable fee for his work.

However, what then?

The concern, remember, is a small one. It won't make much money, probably, during the first year. The ship is designed; the engineer's work is done, so it seems; and therefore he is released, and spends the next six months and all of his money looking for another job.

That is precisely the condition that is rather prevalent today, barring of course the few larger concerns that keep a permanent engineering staff.

What's the answer? What are we designers going to do about it?

The answer—and this applies in the large concerns, too, for the man who wants to get ahead—is this; the designer must make himself so valuable to his employers that they cannot afford to let him go to some competing outfit.

Now a person gifted in the gentle art of jumping to conclusions might say:

"Oh, I see. You mean he should stick right at his drawing board, turning out good designs by the hundred and burning up midnight electricity."

Not so. He should go home and get a good night's sleep so that he will be wide awake for the work of the morrow.

However, he should make himself valuable to his concern by helping to get that concern out of the rut that is holding it down. He should delve into the practical side of airplane building and find out just why it is that so many small aircraft factories are losing money.

This does not mean that he should spend his time snooping around the factory, trying to catch some hapless workman taking ten seconds off to tie his shoe lace. Nothing will be accomplished by such tactics. Nothing will be gained except ill-will; and, presently, a blue envelope for Mr. Engineer who has incurred the generous hatred of every man in the plant.

No. What is needed is cooperation—cooperation of every man in the factory, from the engineer to the flying salesman who sells the finished product.

There is your answer. The engineer, in order to make himself indispensable to his employers and to build up the concern—and to insure a fat pay check for himself—must find a way to exchange inefficiency and chaos for efficiency and close cooperation in this business of building airplanes.

Now just what does the aeronautical manufacturing industry need? The answer is in these two words: *Production methods.* Production methods, logically, are the work of the designing engineer, if he cares to make himself valuable to the concern.

AS WE have said, most small aircraft factories of today are just struggling along. With each factory building and selling but a few ships, prices are kept high. A few factories with plenty of money at their disposal have managed to bring in semi-production methods; and these have reduced sales prices so that the smaller fry make very little profit if they sell their ships at competitive prices.

What can the designing engineer do about this condition? He can study the factory facilities and bring about production savings. He can design the product so that it may be produced rapidly and cheaply—yet with adequate strength and performance and beauty. He can, by a happy combination of common sense and ingenuity, design a ship that can be built with a minimum of slow, expensive, unsatisfactory hand work.

Then he can plan the production of that ship. After that he can make himself still more valuable to his concern by bringing about conservative changes and improvements in the ship and the methods of building it that will make production still more systematic and efficient. By so doing he will enable his employers to build better ships at lower cost; and the expansion that is sure to come when that is attained will mean advancement for the engineer.

The basis of modern production method is standardization. Think this over: Is it better for a tablemaker to make one table of oak to one plan; another of mahogany to another plan; another of cedar to still another plan, and so on; or to concentrate on the production of one model of table, using one kind of material?

OBVIOUSLY, standardization is the thing. It will enable him to save time by having each of his machines set to do one particular bit of the work and to do it rapidly. It will enable him to save money by buying one kind of wood in large quantities. It will mean better tables because each of his workmen will become accustomed to doing one type of work with one kind of wood and will hence produce better tables.

The same is true of the aircraft industry. Standardization is what we need.

Just as an illustration of this idea, in Figure 1 (A) we see a stabilizer and flipper. This is a fairly well-designed job with regard to outlines, but is that *all* we have to consider?

Think now of the internal structure of that stabilizer and flipper unit. How are we going to build it?

Using duralumin construction, we would perhaps have several metal ribs. These ribs might be stamped from sheet duralumin. However, the design shown in Figure 1 (A) entails sixteen different sizes of stabilizer ribs.

That may seem all right at first glance. Consider, however, that those ribs are stamped by an expensive machine. To make sixteen different sizes of the ribs in rapid production we have our choice of using sixteen different expensive machines, which means a whole lot of money tied up, or we can use one or two machines and fit different dies to them for making the different ribs. This latter method, though, means time, and hence money, wasted in large quantity, because it takes a good workman anywhere from half an hour to an hour or more to change a die on a machine of this type, true things up, and start turning out good ribs again.

In Figure 1 (B) we see a stabilizer-flipper design that is very little less efficient, aerodynamically, than the other; yet all but three of its ribs are of the same size and can be stamped by one machine working continuously.

That's just an example. Standardization can be extended into every part of airplane building. It is being done, and it will be done to a much greater extent in the future.

Another advantage of standardization lies in simplicity and ease of repair. If a pilot makes a forced landing up in the middle of the Rockies, ground-loops to avoid striking something and crumples a wing-tip, his plane is likely to remain right where it is for some time. He walks miles, finds a telephone, and puts through a long-distance call to a dealer or an airport, telling them that he wants a couple of wing ribs, some covering and dope, and a wingtip outline channel for his particular plane in a hurry.

The dealer looks around into his stock and finds that the plane in question has fourteen different sizes of wingtip channels, and no standard covering specified. He is in a jam. Probably he cannot get in touch with the unfortunate flyer again. If he goes out with the wrong parts, making an expensive trip for nothing, he is sure to incur the wrath of the pilot. If he takes his whole stock along his ship will be so heavily loaded that he can't get over the mountains safely.

As a result, the flyer comes down from the mountains several weeks later, afoot, possessed of a murderous temper and an inflexible resolution never to buy another plane of that particular make.

Now let's get at production methods as applied to the aircraft industry itself.

First we will take a stroll through a typical small aircraft plant as it is operated today. The production is unplanned. Ships are built as they are ordered. Fifty men are employed this week to rush out four orders; five men are employed next week because there are no more orders to fill for a while. The men who were discharged seek other jobs. When the orders pick up again the management of the plant hires other men; and loses plenty of money and time, to say nothing of wasted material, breaking the new men in at their jobs.

Worse yet is the scene within the plant. Men are welding compression struts today and sewing wing covering tomorrow. Ten men are working on each ship, each doing a different job and each getting in the way of everyone else. Time is wasted, and time, in a factory, is money. If you don't believe it, look at this:

Suppose we have one hundred men working. They are more or less skilled workmen, drawing, let us say, a dollar an hour and up for their services. Through poor methods, getting in each other's way, and wasted time and effort as each man switches jobs from day to day and wanders around trying to find materials and instructions, we can estimate a waste of two hours a day per man.

IT IS not the man's fault. It is the fault of the method. However, this little matter of two hours a day per man counts up into a little matter of two hundred dollars a day, or twelve hundred dollars in a week, wasted. That alone is quite sufficient to wipe the profits off the books and send the owners into an orgy of firing; and the engineer, who is probably considered to be more or less of an expensive ornament once his designs have been completed, is the first to go.

Is it any wonder that these small aircraft factories are managing only to keep their noses above water? What can an engineer do to save his job? He can plan production, stimulate cooperation between departments, and see to it that things move efficiently. In short, he can combine designing engineering knowledge with production engineering knowledge—and he can draw a pay check commensurate with his combined knowledge and capability.

To see just how this can be done we will inspect another aircraft factory, one that is building good ships rapidly and cheaply; and is, in consequence, expanding and forcing its competitors either to close up or to adopt production methods. This factory, unfortunately, is merely imaginary today. Some are approaching this condition of production efficiency, but few have come fully to realize what is yet to be done.

In this hypothetical plant we have planned production. Everything moves smoothly and without waste. Each man does one job and does it well. One man stamps tail-surface ribs; another takes these ribs and welds them to the outline tubes. Another picks up the finished tail-surface and attaches it to the fuselage.

In this way each man is doing a job that he knows. Good work is done. Little time is lost. Hence, production goes on efficiently and cheaply.

The designing engineer wants to bring about this condition in his plant. How does he go about it?

In the first place, he can design his ships so that as far as possible, they may be easy to build. He can cut complication down to a minimum.

ENGINEERS are just beginning to pay attention to the problem of simplicity in aircraft design. The welded steel fuselage, of course, is light and strong and durable; but a welded steel fuselage brings in a lot of expensive hand labor in the building. This hand labor increases the cost of the ship enormously. Moreover, it decreases the speed of the production.

A few builders are using the monocoque fuselage, built of wood or duralumin, with success. One large concern, for example, builds a wood monocoque fuselage which is formed in a concrete mold. This saves a great deal of time and hand work.

A highly-successful builder of light airplanes uses a duralumin monocoque fuselage. Incidentally, the entry of this builder into the light plane field forced almost all of the other light plane concerns to reduce their prices.

It seems certain that greater simplicity of structure is to come. It must come, because prices must and will be reduced. Not only in fuselage building, but also in the construction of wings and other parts is there an opportunity for simplification.

Once the ship is designed, the next problem is the actual production method. Here we can borrow a leaf from the automobile builder's book, and make use of his production line. Instead of having four or five ships sitting here and there on the factory floor, why not begin at some definite point, say the fuselage jig, and move the fuselage along, producing other parts in separate departments and assembling the ship on the line?

That is done in automobile building. The frame of the car is placed in a moving, endless chain. As it moves along, it passes from the hands of the men who install the motor to the man who puts on the tail light and finally to the man who turns the switch, starts her up, and runs her off the chain at the end.

So far, the application of this method to airplane building has been rather sketchy. This is due, probably, to a complication of airplane structure, small factories with limited finances, necessity for highly-skilled workmanship, etc. It is going to come, however. It has to.

For continuous airplane production the assembly line method might be used something as shown in the sketch, Figure 2. Here we have a simple production plan, not com-

(*Continued on page* 47)

The "Winnie Mae"

(*Continued from page 9*)

Mount the wing on the fuselage with the leading edge at fuselage former 5, with rib V on the center top longeron. Cement in place. The eight 1/16″ sq. cabin ribs are now cut and assembled on the top of the fuselage at the leading edge of the wing, as shown on page 10 of the plans. Cover the top with Japanese tissue and the sides with celluloid.

This is constructed of 1/32″ strip bamboo and a pin. The pin is carefully thrust through the bottom center longeron at fuselage former 1, and cut off at the point of contact with the bamboo, which is bent as shown. A drop of ambroid at both ends holds the pin in place.

Motor Stick and Propeller

A 1/8 x 3/16 x 12″ motor stick is used. It is fitted with the usual rear hook and propeller bearing, which can be bent from No. 8 music wire, as shown on page 10. The propeller is made in three pieces, a hub and two blades. Cut the blades from 1/32″ sheet balsa. A ¾″ length of ¼″ dowel is cut, and a ¼″ deep groove cut in each end at right angles to each other.

The blades are inserted in these grooves and ambroid is applied to hold them in place. Insert and ambroid in place a propeller hook, which is made of No. 8 music wire, as shown in drawing 10.

A nose plate is now cut from ⅛″ sheet balsa. At its center, a 3/16 x ⅛″ slot is cut with a ¼″ diameter hole at its top. This is now placed on the motor stick, so that the stick fits into the slot, and is then ambroided ⅜″ from the stick's end. When the motor stick is in place in the fuselage, this plate fits just inside the first wire loop on the cowling.

Six strands of 1/16″ sq. rubber, each about 11″ long, are used for motive power.

Color

The body color of both fuselage and wing is white. On the upper side of the wing between the two ribs Z, and ¼″ back of the leading edge and ¼″ in front of the trailing edge, the wing is painted a solid blue. A blue stripe runs from the leading edge of the elevator along the center side longeron, where it branches into two stripes at the cowling, as shown in drawing 12. This strip is duplicated on both sides and should be ⅛″ wide. It was found that the ordinary colored dope, which was used on the wing, could not be used for striping, as it "ran" on the tissue. This was corrected by cutting out strips of blue tissue paper and attaching them in place with clear dope.

The stripes on the pants were made in the same way, as the dope also "ran" on the balsa. The words "Winnie Mae" were printed with a hard lead pencil. These letters are about 5/16″ high, and appear on both sides of the fuselage.

The rudder lettering was also applied with pencil, as was the Pathe News circle. Both these signs appear only on the left side of the plane. The letters "Lockheed" are ⅛″ high. The circles of the Pathe News sign were made with a half dollar and a quarter. A rooster was drawn in the center, and the lettering around it reads "Pathe News—Winnie Mae—Round-the-World Flight."

(Continued from page 29)
rudder control wires are attached to it.

Cylinders

You need nine pieces—to be cut from the piece of balsa 1/4" x 1/4" x 3 3/4". Cut these 3/8" long. After you have cut nine then shape each one round and paint black. No dope is necessary.

Assembly

This is the most difficult part of your work so go slowly. Take the fuselage and measure from the front a distance of 1 1/8". Put a pencil mark there. From that mark measure 2 1/4" (or the width of the wing). Start to carve out this section so that the upper part of the wing will fit snugly. Pick up your wing occasionally and fit it. Do not attach the wing yet.

Still holding the fuselage, cut a slot 3/4" from bottom and 3/4" deep for the stabilizer and "flippers" (elevators). This slot is 1/16" thick or thickness of the stabilizer.

Now let's assemble the tail unit. Apply a little cement to both sides of this slot and insert carefully the stabilizer and elevator. Take the fin and rudder and cement that to the top of the fuselage. Here is where you use two small pins. Push one in all the way on each side of the fin and two more—one on each side of the rudder. Take the stabilizer struts and cement the end that you attach to the underside of the stabilizer. Cut off the required length so that bottom is attached to fuselage 1/4" from bottom. Do this on each side. Before cement dries, carefully push in a pin to hold strut in place. Next attach the tail skid. Cement and pin. Push the heads of pins into the wood so they are hidden.

Now put on the wing. Get the cement

The "Gee-Bee" Plans

and five long pins. Measure half your wing (five inches) and draw a center line. Do the same on the fuselage so that you attach the wing in the middle. Put cement on and push in the five pins. One in the center and the other four in each corner. Hold it level with the eye to align it with the stabilizer and allow at least a half hour or more to dry thoroughly.

Next is the motor—draw a line around the front part of the fuselage 3/16" in for nine cylinders. Take nine long pins and cement. Attach the first cylinder on top of the fuselage directly in center. Push one pin all the way in. (See front view drawing.) On bottom of fuselage—an equal distance from center-line — place two more cylinders and so on all the way round. Next take eighteen straight pins and bend over the heads as shown on side view drawing. Pain these black. These are the push rods. Insert them at an angle and cement to tops of cylinders.

Landing gear can now be placed in position. Refer constantly to your drawings and photos. That helps a lot in overcoming errors. Measure from center line on lower side or underside of wing a distance of 1 5/16" and draw a straight line from entering edge to trailing edge. Do likewise on opposite side of wing. Measure from entering edge 1/4" and make a mark. Make another mark 5/16" from trailing edge. Take both struts and cement them in place. Push in four pins on each side (two to a side) and allow to dry.

While that is drying get the tube of plastic wood and squeeze out enough to make a fairing (see front view). Smooth it with your fingers. When dry sand paper it smooth.

The hammered aluminum fillet can be cut from .034 gauge aluminum and pinned in place.

Cut off bottoms of pins that protrude. Or if you wish you can make it with plastic wood. One is as easy as the other.

Get your pants and cement them on to struts.

Push in several pins and let dry. Attach cowling by pushing through three pins, one on top and one on each side. Align it and see that it fits all around. Take a long pin and attach propeller by pushing the pin into nose of fuselage.

Landing, flying, and landing-gear wires are attached with pins. Also stabilizer wires. Measure on drawings the proper location and you will see where they fit.

Cock-pit cover or cowling is made from the celluloid. Notice in photographs how the pilot is entirely enclosed.

Painting the model is exacting work and a well constructed model can be spoiled by poor paint work and a poor model can be made to appear realistic if the paint is put on carefully.

Look at your drawings and you will see the color lines. Of course you may paint it some other colors but the original plane is maroon and cream, the light portions seen in the photographs being cream, and the dark areas maroon.

Radio Course

(*Continued from page* 34)

for the most sensitive spot. As most crystals deteriorate if left exposed to the air, or allowed to collect dirt or dust, or if handled to any extent with bare fingers, the usual detector set has the crystal mounted in a glass frame. A crystal may be cleaned by scraping it lightly with a knife or washing it in alcohol or ether. Figure 5 shows a typical crystal detector.

Oscillations of the high frequency alternating current surge through the circuit until they reach the detector. The crystal, however, will pass on a current in one direction only, so that the current energizing the magnets in the receiving telephones, although still pulsating, is a one-way current only.

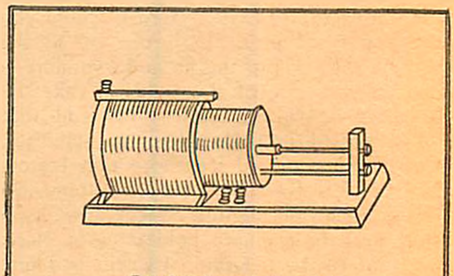


FIG 8 - LOOSE COUPLER

Figure 6 is a wiring diagram of a simple receiving set with a two-slide receiving coil. This has a moderate range and a fair selectivity. So long as the method of wiring shown is followed, the actual positions may be varied to suit circumstances. The headphones should be of 2,000 to 3,000 ohms resistance.

Double Slide Tuning Coil

The double-slide tuning coil has four terminals, two at the base and two on the side. One of these base terminals (whichever is more convenient) is left unconnected. Although the fixed condenser between the headphones may be dispensed with, greater volume will be obtained if it is included.

Assembling a Simple Receiving Set

The first step, having decided on your base, is to mount the binding posts A and B, the detector and the tuning coil. (See figure 6.) One terminal of the detector is connected to post B, and the other to slide terminal D of the tuning coil. The other slide terminal C is connected to the aerial or to the lightning switch if this is being used.

Now connect the base terminal E of the tuning coil with the water pipe, if this is what you have selected as your ground, and to this wire should be soldered a wire leading to binding post A. Next, between the binding posts A and B, connect the fixed condenser, plug in the headphones as shown, and you are ready to test your set.

A loose coupled tuning coil is shown in Figure 8. A set of this sort will give you very much more selective tuning than the one first described. In neither of these diagrams has a lightning switch been shown, the method of installing this was shown in last month's MODEL AIRPLANE NEWS, and reference should be made back if necessary.

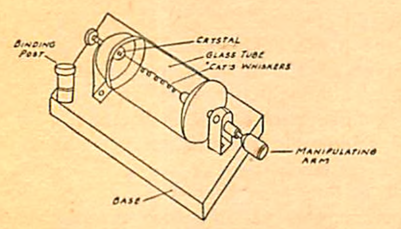


FIG 5- CRYSTAL DETECTOR

Strictly speaking, the inclusion of these diagrams and descriptions of receiving set assemblies is not necessary for the radio operator's examination, though the knowledge gained will not be amiss. The diagrams may, however, be of assistance to amateurs who are experimenting along these lines.

Vacuum Tube Detector

For short distance reception the vacuum tube detector has no advantage over the crystal detector; in fact the latter will often give a more faithful reproduction, but for long distances the vacuum tube set must be used because, when properly connected, it is also an amplifier of the signals received.

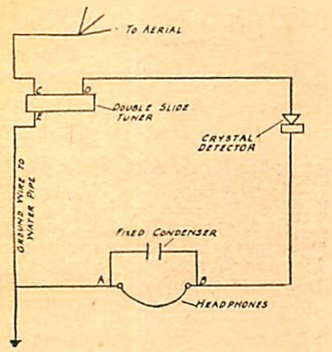


FIG 6- DIAGRAM OF SIMPLE RECEIVING SET WITH DOUBLE SLIDE TUNER

A full description of tubes and the theory of their operation has been given in an earlier article. Tubes are obtainable for many purposes and in many sizes. The local dealer will advise you as to the particular type most suited to your set.

Batteries are necessary to light the filament and energize the plate, and the type of battery will also depend on the type of tube being used. The battery used for lighting the filament is called the A battery; in England, the low tension battery, and this may be a storage battery or one or more dry cells of appropriate voltage. A battery of higher voltage is needed for the plate circuit and this is called the B battery; the high tension battery in England. If a third battery is used with a three electrode tube, this is called the C battery.

The subject of batteries, their care and maintenance will be dealt with next month.

The Airplane Engine

(*Continued from page 8*)

drawn in by the Root device and passed to the carbureter after which it goes to the impeller before reaching the cylinders. Thus, advantage is taken of the supercharging effect given by both devices and the impeller smooths out the pulsations given by the Root's. A volumetric efficiency well over a 100% can be gained by this method.

The increased temperatures of the compressed air must not be overlooked. This will often amount to a rise of as much as 400° F. between the supercharger and the carbureter. Naturally the expansion of this air will prevent a full charge of fuel from entering the cylinder. Consequently, an intercooler must be placed in the system in order to reduce these temperatures.

Moreover, the increase in the power output will raise the operating temperature of the engine. This may mean that a large radiator will have to be provided in the case of the water-cooled engine. In spite of the normal drop in temperature as altitude is gained, it must be remembered that the air density also is reduced. Because of this the air will not absorb so much heat as it does at lower altitudes. Thus, there is a distinct tendency for an engine to run hot during an altitude climb

By critical altitude is meant the maximum altitude at which the supercharged engine will produce sea-level power. In other words a loss of power will occur above that altitude. Critical altitudes of from 10,000 to 15,000 feet are common in military planes of today, while this level in Lieutenant Soucek's *Apache* was 27,000 feet. It is interesting to note that a supercharged engine will permit a plane to climb to 20,000 feet in about one-half the time required with the usual engine.

The solution for this problem is to use a variable pitch propeller. This is one in which the pilot can change the pitch while the plane is flying. This scheme has been worked on for years but it is only recently that they have proved practical.

Up to now they have been not only heavy, often twice as heavy as the normal propeller, but extremely complex and bulky. The weight has been a necessity, however, for the centrifugal load on individual propeller blades often reaches twenty-five tons. It has been exceedingly difficult to support this load on a moving surface. As a result, the blade bearings would wear unevenly and the pitch of the two blades would vary, causing vibration.

Attempts have been made to design a propeller which would automatically maintain the engine speed constant. This idea generally incorporates a hydraulic pump controlled by a governor. This construction becomes very complicated and, moreover, removes the control from the pilot—an undesirable feature in most cases.

One of the newest type of variable pitch propeller is controlled by a small electric motor and can be set as the pilot desires. A great deal of simplicity has been gained in this design and it weighs but thirty per cent more than the normal propeller.

Suppose a pilot were to set his propeller with no pitch. If he were to turn his engine over with wide open throttle under these conditions, there would be no resistance offered and no load would be placed on the engine.

Consequently, the engine would race and would undoubtedly disintegrate within a few seconds. The propeller blades would be thrown far and wide. Accordingly, it is essential that an interlocking connection be attached to the pitch-adjusting control. This will prevent a dangerously small pitch to be placed on the propeller at high engine speeds.

The variable pitch propeller need not be restricted to high altitude planes. They offer a splendid means of obtaining a short take-off run and at the same time permit the pilot to get good efficiency at cruising speeds. The less the pitch, the faster the engine will turn over. Therefore, for taking off a smaller pitch is used, as this permits the engine to build up its maximum power in the shortest time. As a result the plane will take off after the least possible run.

For cruising speeds, however, efficiency is desirable. Maximum propeller efficiency is obtained at speeds of around 1,500 revolutions. Therefore, if the pitch of the propeller is increased rather than throttling down the engine when the plane is once in the air, the propeller speed will be reduced and higher efficiency will result. It has been estimated that the range of the Do-X would be increased from 1,760 to 1,840 miles by the use of variable pitched propellers.

If an altitude climb is attempted and a variable pitch propeller is not available, as was the case of Lieutenant Soucek, a propeller is used which would give its maximum efficiency somewhere near the expected ceiling of the plane. The pilot is willing to lose efficiency at low altitudes for he has sufficient power to pull him through this space. It is the climb during the last 5,000 feet that determines whether or not a new record will be established.

Most propellers are set at such a pitch that they will give a plane maximum speed at sea level. Obviously, this reduces their performance at altitudes, but on the other hand, a compromise in this case will not give full efficiency nor will it give a good high speed. It is thus seen that the need for a variable pitch propeller is acute. Better climb, high ceiling, more economy, and a shorter take-off run will result from its use.

Adjustable pitch propellers are used almost entirely today. These are the built-up propellers and consist of the hub and two blades. They are generally made of an aluminum allow, although this material is sometimes erroneously called steel. However, they may be made of some patented material such as bakelite or micarta. The value of this type is that the blades can be adjusted to any desired pitch, even though it must be torn down in order to make this adjustment.

We have seen that the greatest propeller efficiency is to be had at a speed of from 1,200 to 1,500 revolutions. On the other hand, the best engine efficiency is had at higher speeds. There is but one way in which advantage can be taken of both these desirable factors. That is by means of the reduction gear in which the engine is permitted to turn up to its best speed while at the same time the propeller revolves at its most favorable speed.

The greater the diameter of a propeller the higher is its efficiency for it operates in a space which is not interfered with by the fuselage and tail surfaces. By means of the reduction gear the engine will be enabled to rotate this larger propeller. Because of the increased efficiency the plane will take off with a heavier load and will fly it more economically, besides requiring less run to take off.

The installation of the reduction gear will add close to 100 pounds to the weight of the plane. This would be a large percentage of the total weight of a fighting plane, although it would be insignificant in a huge patrol plane. Because of this one seldom finds reduction gears in other than extremely large planes.

It is thus seen that devices such as the super-charger, variable-pitch propeller, and reduction gears, can be used to permit an engine to develop increased power; or, advantage can be taken of these to gain efficiency and economy. It must be remembered, however, that only in particular cases do their inherent advantages stand out and for this reason they are not necessarily applicable in all airplane powerplant installations.

The next article will discuss the various engine instruments that are essential to the pilot if he is to know what his powerplant is doing at all times. The instrument board of the modern airplane looks quite as complicated as a power house distribution panel. Astually, it is rather simple due to the ingenuity shown in locating the various instruments.

American Sky Cadets

(*Continued from page 36*)

Miniature Aircraft Records

Indoor Events

(Not under N. A. A. Classifications)

Stick Model—Duration—Western, Walter Powell, San Francisco, 1931, 9 min. 45 sec.; National, Ray Thompson, Detroit, 1931, 11 min. 47 sec.

Fuselage Model—Duration—Western and National, John Berg, Los Angeles, 1931, 6 min. 52 2/5 sec.

Rising Off Water Model — Duration — Western, Bangs Tapscott, Los Angeles, 1931, 4 min. 13 2/5 sec.; National, Ernest Marcouiller, Chicago, 1929, 4 min. 21 3/5 sec.

Gliders — Duration — Western, Harold Zimmer, Los Angeles, 1929, 12 4/5 sec.; National, Donald Lockwood, Chicago, 1928, 14 3/5 sec.

Outdoor Events

(Not under N. A. A. Classifications)

Stick Model — Duration — Western and National, Lynn Sullivan, Los Angeles, 1929, 36 min. 33 2/5 sec.

Fuselage Model—Duration—Western and National, Ralph Marzullo, Los Angeles, 1931, 42 min. 23 2/5 sec. (This record under N. A. A. regulations.)

Rising Off Water Model — Duration — Western, Clarence Heier, Long Beach, 1931, 7 min. 46 sec.; National, Tudor Morris, Peru, Ind., 1929, 12 min. 30 sec.

Power Other than Rubber Model—Duration—Western and National, Arthur Johnson, San Francisco, 1930, 38 sec.

Speed — Western and National, Robert Siler, Los Angeles, 1928, 7 sec. (100 yds.).

Lufbery!

(*Continued from page 5*)

for Lufbery when he was notified that he had been accepted as student-pilot in the air service of France. A few weeks of training to supplement the valuable knowledge he had gained with Pourpe was all that was needed for his quick, retentive mind to earn his flying certificate. The name of Raoul Lufbery, American, so soon to come into lasting fame, was immediately added to the list of members of the brilliant Escadrille of Bombardment, the V. 102, and his life as a flyer began.

A natural willingness to learn and the capacity for thinking clearly in emergency soon brought Lufbery to prominence in his squadron. His rank became that of Sergeant, and he was now taking off daily in his 140 h.p. Voisin to penetrate far into enemy territory on observation and bombing expeditions. It was hazardous work but the conclusion of each raid found him returning cheerfully to his airdrome with no personal injuries, though oftimes his machine was spattered with innumerable bullet holes.

Six months of this life and then Lufbery found himself drawn into the newly formed Lafayette Escadrille with promotion to Major. This squadron had been organized by two Americans, Norman Prince and William Thaw, both American-trained flyers who had entered the French Air Service but were determined at this stage of the game to found an all-American flying corps. When they heard of the mounting fame of an American named Raoul Lufbery in the bombardment division, they invited him to join them. So he became a member of that famous American fighting unit.

Lufbery was jubilant. The dream of every daring flyer at that time was to pilot the celebrated Nieuport fighter, which was gradually wresting acknowledged superiority in the air from the more sturdy but less maneuverable German Fokker (a single-seater with synchronized machine guns firing through the propellers).

Accordingly, Lufbery went to the Bar-le-Duc airdrome to join the N. 124, which was close by the famous Storks (Cigognes) Squadron, the N. 3. The enemy was now launching a terrific attack against Verdun and the French aerial forces were bracing themselves for the struggle. The American Escadrille, comprised of fifteen men, was now fighting hand-in-hand with such famous aces of the Storks Squadron as Guynemer, Heurteaux, Dorme, and others.

July 30, 1916, brought Lufbery his first victory. It was a decisive battle over Etain and was followed by another on August 4, when he vanquished another of the enemy, this time with Adjutant Sayaret as companion. For these accomplishments the French Government cited the young American for bravery. His response to the distinction was another victory four days later, and still another in four more days. He was then awarded the rank of Adjutant for such consistent prowess in the air.

Then early in October he set out on a little matter of bombing the munition factories at Karlsruhe. On the way he encountered a large three seater Aviatik and it was a matter of minutes before the enemy was down in flames under Lufbery's fire. Number five on his growing list of official victories; he was an ace!

Then the escadrille was sent from Verdun to the Somme. It was in this sector, so rife with daily combats in the air, that on December 27, Lufbery shot down two of the enemy, only one victory, however, being conceded to him. It was on this day that he returned to his airdrome with his flying coat shredded with bullet holes. The Legion of Honor was the next decoration bestowed on him, and then came in rapid succession the Military Medal and from England, the British Military Cross.

On the occasion of Lufbery's tenth victory he was cruising alone at an altitude of 18,000 ft. when he spied in the distance a formation of enemy planes. In spite of their number—two two-seater observation and five escort machines he decided to try his luck. He flew high up in the sky in such a position that the sun was between himself and his prey. Then he waited for one of the planes to disengage himself from the compact formation.

At last one machine was cut off from the others. This was his cue. He dived on the lone machine, firing repeatedly. Imagine his consternation when he found that his gun had jammed after twenty or thirty shots! Luckily, it had been enough—for the German plane staggered and crashed crazily into the enemy trenches, losing both wings in the descent.

Accounts of Lufbery's individual achievements are almost monotonous in their systematic precision—the careful patience with which he examined every component of his plane before going aloft, the cool manner in which he surveyed the skies for possible marauders, his crafty maneuvering for position, his uncanny marksmanship, a heritage of his U. S. Army days, and his modest mien despite his reputation.

In the World War days, the average pilot was about twenty or twenty-two years of age, and it was inevitable that the thirty-one year old "Luf" should receive his squadron's hero-worship and admiration. He was older and more worldly—the man was a veritable encyclopedia in his knowledge of everything—and a natural leader in an unassuming way.

Despite the fact that his rank and seniority could naturally preclude the necessity of his going out on routine patrols and reconnaissance, Lufbery never missed the chance to fly in all kinds of weather, notwithstanding a painful rheumatic condition which troubled him exceedingly. It is interesting to note that all Lufbery's victories, eighteen enemy planes downed, were gained in enemy territory—a great tribute to his courage and daring.

But the end was in sight. On Sunday morning, May 19, 1918, it was reported that a German observation plane was rapidly approaching the airdrome. The only pilot to take off was a Lieu. Gude, who went immediately to the attack. However, after firing repeatedly from an impossible range, he was forced to withdraw when his supply of ammunition was exhausted. As he landed the American batteries took up the battle but with no effect. The two-seater Albatros continued provokingly on its way in the direction of Nancy.

Lufbery had been among the spectators at the airdrome. His perfectly human desire to "do his stuff" before his comrades on their own territory, so to speak, triumphed over caution. He dashed to a motorcycle standing in the road and headed for the hangars. Since his own machine was temporarily disabled, he jumped into another Nieuport standing on the field and went to the attack. It was unfortunate. He knew nothing of the individual peculiarities or the armament of the plane he was flying.

The Nieuport had the advantage over the weightier Albatros, and in approximately five minutes Lufbery was at an altitude of 2,000 ft and within range of his quarry. All eyes were on the two machines. Lufbery dived and fired. Suddenly he swerved away and the watchers saw him working over his gun, which evidently had jammed. They sighed with relief as he circled over them again, the trouble apparently righted.

Again he blazed at the enemy from the rear, his favorite point of attack, and suddenly those below caught their breath. . . . Lufbery's machine had burst into a mass of flames! It passed the German plane and flew at a speed of 120 miles per hour on a straight course. Three or four seconds passed and the plane was at an altitude of 200 ft.

Suddenly a form was seen hurtling from the blazing mass down to earth. Lufbery had preferred to jump to certain death without a parachute than be burned to a crisp. A hopeless but brave attempt to live.

Curiously enough, only a few days before, the subject of what one should do when faced with the prospect of catching fire in the air had been discussed by Lufbery and several of his command. He had been emphatic in the opinion that to stay with one's machine and try to side-slip down in such manner that the flames could be fanned away from the pilot and the wings was best. Yet when the time came for just such a decision, he took the other course. Later it was contended that in choosing to jump he had hoped to strike a small stream which was about 100 yards away from the spot where he fell.

Unfortunately, he had missed and fallen in the garden of a small house in the town of Maron, just north of Nancy. By the time his comrades had arrived there, Lufbery's burned body had been taken by the peasant folk of the town to their town hall and covered with simple offerings of flowers from neighboring gardens. The plane had been burned to ashes. It was found that the pilot's only wound was a bullet through the hand, and it was conjectured that this same bullet had richocheted off the control-stick and into the gasoline tank, causing it to explode.

On the following day, May 20, Raoul Lufbery was buried with full military honors in the "Airman's Cemetery" on a hill behind the American lines, which already held the remains of six Escadrille who had sacrificed their lives in the struggle for supremacy of the air.

America's then Ace of Aces had come to the end of the road.

Aviation Advisory Board

(*Continued from page* 22)

course, which is triangular in shape and 31.07 miles long. This course has to be covered seven times, a total of 217.49 miles, and the speed is so terrific that oftimes the spectators do not hear the roar of the engines until the planes are out of sight.

The following is a short history of the races from the first.

In 1913 M. Prevost, piloting a *Deperdussin* (100 h.p. Gnome engine) won the race for France over a course of 150 miles at Monaco, France, with a speed of 45.75 miles per hour.

The next year Great Britain took the prize at Monaco with a speed of 86.8 miles per hour over the same distance. The *Sopwith* (100 h.p. Monosoupape engine) was piloted by C. Howard Pixton.

For four years after there were no contests because of the World War.

Then when the contest was resumed, Italy represented by Luigi Bologna took the trophy at Venice, Italy in 1920 with a speed of 107 miles per hour established in a *Savoia* S.19 (550 h.p. Ansaldo) over a distance of 202 nautical miles.

The next year G. Le Briganti flying a *Macchi VII* (flying boat), powered with a 200 h.p. Isotta Fraschini engine, won the prize again for Italy over a 200 nautical miles course at Venice by establishing the record of 111 miles per hour.

In 1922 Great Britain asserted her right to the trophy at Naples, Italy. Captain H. C. Biard, piloting a *Supermarine Sea-Lion* (flying boat) equipped with a 450 h.p. Napier *Lion* engine, created the record of 145.7 miles per hour over a 200.2 nautical miles course.

In 1923 the United States won the prize for the first time at Cowes, Isle of Wight, over a distance of 186 nautical miles. It was Lt. D. Rittenhouse who accomplished the great feat of flying 177.38 miles per hour in a Curtiss *Navy Racer* C. R. 3 (465 h.p. Curtiss D.12 engine).

There was no contest in 1924.

In 1925 the United States again won the trophy at Baltimore, Md., over a distance of 188.86 nautical miles. The pilot was Lt. J. Doolittle in a Curtiss *Army Racer* R.3.C.2. (Curtiss V.1400 engine) and the speed record was raised to 232.57 miles per hour.

The next year Italy took the lead at Newport Roads, U.S.A., with a speed of 246.496 miles per hour. This was attained by Major M. de Bernardi in a *Macchi* M.39 monoplane (Fiat 800 h.p. engine) over a distance of 188.86 nautical miles.

Great Britain in 1927 was winner with a speed of 281.656 miles per hour over a course of 188.86 nautical miles at Lido, Venice. The record-maker was Flight-Lieutenant S. N. Webster, R.A.F., in a *Supermarine-Napier* S.5 (Napier *Lion VIIC* 900 h.p. engine).

Then, since the winner of the preceding year's race has the choice of determining the place where the next race is to be held, Great Britain chose to hold the contest at Ryde, Isle of Wight, in 1929. Again Britain won over the course of 188.86 nautical miles, when Flying-Officer H. R. D. Waghorn, A.F.C., R.A.F., attained a speed of 328.63 miles per hour in his *Supermarine* S.6, equipped with a Rolls Royce "R" 1900 h.p. engine.

The next race was held this year in September at Calshot, Southampton, England. Flight-Lieutenant J. N. Boothman won permanent possession of the trophy for Great Britain by attaining an average speed of 340.08 miles an hour flying on a 31.7 miles triangular course seven times. His first two laps, made at an average speed of 342.9 miles an hour, created a new record for 62.1 miles (100 kilometers).

Designing Course

(*Continued from page* 39)

plete by any means, but sufficient to show the general idea.

We start with the fuselage. It moves slowly along the chain. The landing gear, made up in a separate department, is attached. Then the tail surfaces, the controls, etc. The motor is installed. Last of all, because they take up so much space when attached, come the wings.

This is purely imaginary. For some particular plant it might be impractical, and another order might be adopted. The idea remains the same, however; smooth, efficient work, done at a set pace by men who have one job, and one only, apiece.

The engineers work doesn't stop when he has a ship that is easy to build and has the production planned nicely. The next problem is twofold; to keep things moving, and to bring about constant improvements in method and product.

As to smoothness of plant operation. Take another look at Figure 2. Suppose a man in the landing gear department were to get off his pace. As a result, we get fifteen landing gears for twenty ships. Five ships must struggle along without landing gears.

That won't work. Landing gears are highly valuable things to an airplane. So we must slow down production from twenty ships to fifteen a day—and lose out on five orders per day and hence something like one to three thousand dollars profit, depending, of course, on the size of ships we are building.

Perhaps we can let the five ships go by without landing gears and hope to catch up tomorrow. This plan is not so good. It tangles things up. The landing gears are, by production plan, to go on at a certain time. To put them on later means men getting in the way of, say, the wing attachment workmen; and this brings in the wasted time and money that production methods seek to eliminate.

Faulty production in one department then, may gum up the whole works. However, the matter may be overcome by having the whole production plan flexible enough to permit slight changes from day to day. An extra man might be shifted from some similar work to help those in the landing gear department; or the plant could—and should—be run with a slight surplus of parts always waiting at the assembly line. This slight surplus would be enough to smooth out any irregularities in the separate departments and keep things moving. Carried to extremes, however, it means a lot of expensive material—and therefore money—tied up doing nothing but using floor space.

There is a personal angle, too, for the engineer to study. Men's work changes pace. We all know that. We work well today and not so well tomorrow. A man may weld a landing gear strut in two minutes today and six minutes tomorrow. Who is to say how long it will take him? How are we to plan production unless we know?

We can't; so we make a time schedule of every operation. This may seem, perhaps, like a lot of wasted time and energy over nothing; but it has been proven time and again and still again that a complete—but not too rigid—time schedule of operations is a sure method of getting smooth production without halts or piling-up.

Timing each man as he reaches for a piece of steel tubing, places it in a jig, reaches for another, and welds the two of them together is denounced by some as a diabolic method of making machines out of flesh-and-blood human beings. It isn't, if handled correctly.

The making of a time schedule by a person lacking in tact and common sense may start hard feeling among the workmen against the engineering department. On the other hand, if it is handled with tact, it will lead to a close cooperation between men and engineers that will be one of the most valuable assets of the plant.

Now about cooperation. Suppose we have a plant wherein a straight-laced engineer insists upon men doing *their* jobs in *his* way in a certain length of time specified by him. There will be, as mentioned before, hard feelings. Each man is entitled to an opportunity to do his best. He has a right to do his job in his own way, as long as he does good work. If his method is inefficient, a common sense talk, man to man, between workman and engineer, will clear things up. Vice versa, if a workman develops a new method of doing a job, whereby time and money is saved, he should be given full credit, both financially and morally.

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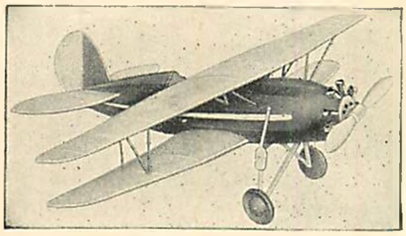

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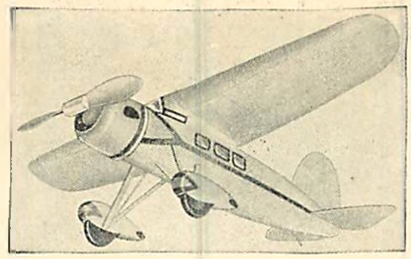

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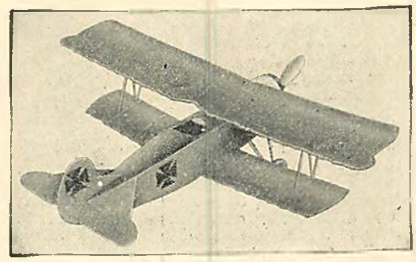

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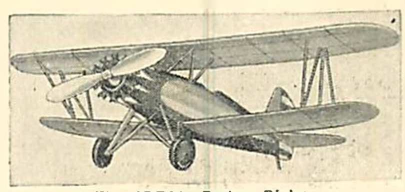

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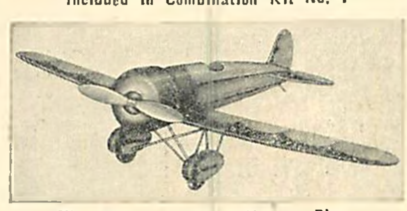

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