Ideas for Radio C

Beauty of radio control is realism of the model in the air. This job is built like a real ship, has hardwood longerons, plywood nose covering, is assembled with screws and nails.

THE purpose of this series on the basic elements of the radio-control system is primarily to present an idea or two for you to think about. It is well known that one idea begets another. Through the presentation of these ideas we hope to start you thinking—thinking along lines of improvement, or perhaps on an entirely new tangent.

This time we're going to talk about selectors. No other element of the radio-control system offers wider scope for ingenuity or a greater variation in method. Numerous concepts have been advanced at one time or another—some brilliantly simple, others fiendishly complex. Because of weight, bulk or other considerations, however, only a fraction of these are applicable to model control.

The function of the selector is to sort out the various control operations in accordance with instructions picked up by the receiver and to call the appropriate driving circuit into play. There are several kinds of selectivity. Some are in practical use at the present time; others offer interesting possibilities for speculation. Among the former are frequency, amplitude and pulse selection. Included in the latter are time (speed) and phase selection.

Parenthetically, in this discussion "selectivity" is limited to selection between operations, rather than the manipulation of an individual control by means of a selective element. That comes under the head of control drives, which are a separate subject.

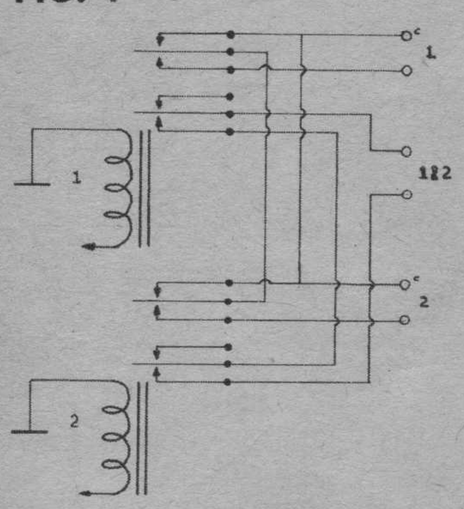
The simplest kind of selection—and at present the most common—is the use of a separate radio-frequency channel for every control operation. Everyone should know how the basic system works by now, for it has been described often enough.

There's nothing much new that can be said about the basic method, but Fig. 1 shows how two r. f. channels can be used to control three operations. For simplicity, the relay circuits alone are shown. Double-pole relays are required (or two single-pole relays in series in each plate circuit—total resistance not more than 12,000 ohms for RK-62s). When either relay alone is closed, the corresponding control operates. The third control is accomplished by closing both relays simultaneously. Still more controls can be obtained by adding additional channels. Because of the common connections, care must be used in selecting the circuits to be used with each channel.

Of course, the transmitting equipment must be arranged so that two signals can be transmitted simultaneously, with the power supply capable of handling both units at once.

Another way of using r. f. selectivity is shown in Figs. 2 and 3. This is a variable-frequency method. It is actually a receiver with a motor-driven tuning unit that automatically tunes itself to a transmitter anywhere within the band. The receiver is mounted on a small d. c. motor and reduction gear train assembly, to the shaft of which is coupled (a) a rotary selector switch and (b) a small variable condenser in parallel with the receiver-tuned circuit. The relay on the receiver

FIG. 1



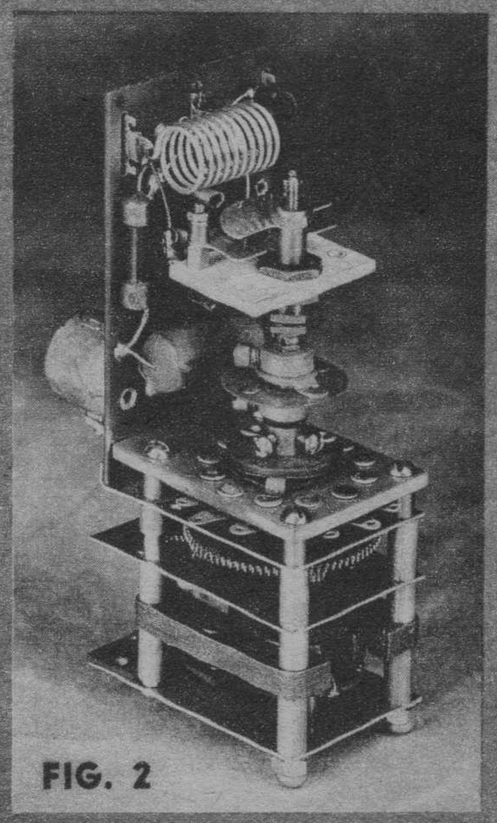


FIG. 2

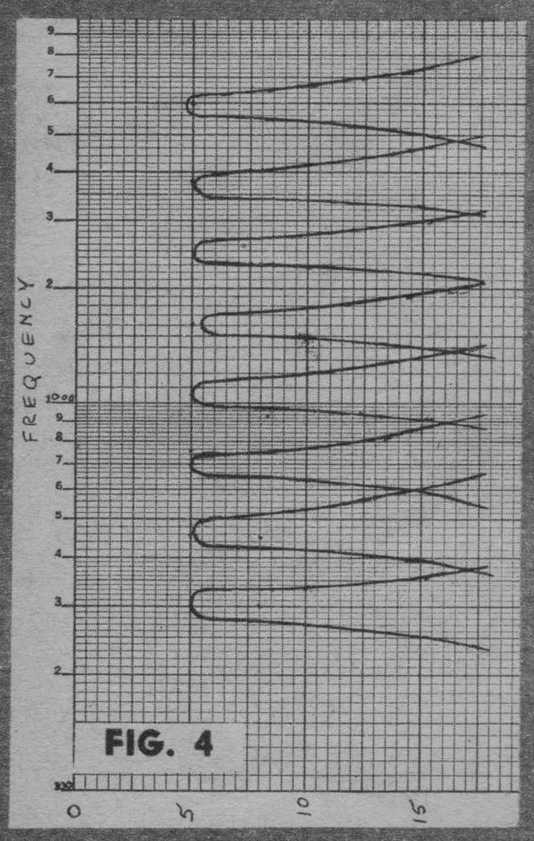


FIG. 4

FIG. 3

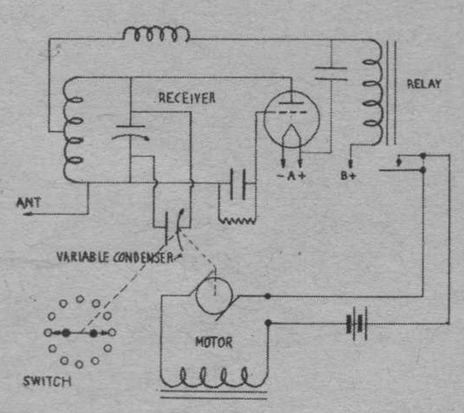
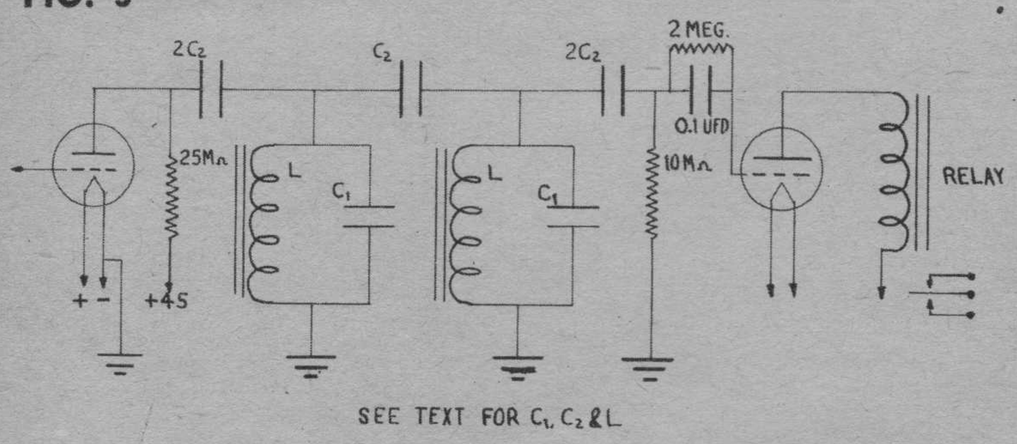


FIG. 5



SEE TEXT FOR C_1, C_2 & L

Fig. 1—Three controls with two channels for "doubling up." Fig. 2—Self-tuning retunes automatically to transmitter frequency. At the same time sets a selector switch. Fig. 3—Circuit of variable-frequency selector. Fig. 4—Response curve of multichannel filter for audio selector. Fig. 5—Band-pass audio-filter diagram.

ontrol-Selectors

BY CLINTON B. DESOTO

Though radio control is out for the duration, you'll find this series of authoritative articles a fine reference for the future.

closes the motor circuit whenever the tube's plate current is high; i. e., when no signal is being received. This causes both the variable condenser and the switch arm to rotate slowly. When the condenser reaches a point where the receiver is in tune with the transmitted signal the plate current drops, the relay opens and the motor stops.

By providing several selectable transmitting frequencies and arranging the switch arm with respect to the motor-condenser drive so that the contacts close at the equivalent receiver tuning positions, multiple-circuit selection can be accomplished with only one transmitter and receiver.

A number of applications of this device have been made. In the model shown, a standard manufactured receiver as well as motor and gear train were used. The variable condenser is a Cardwell ZR-10-AS with one stator plate removed and the rotor plate spaced away from the remaining stator until it just tunes the 50-60 megacycle band. An insulated flexible coupling connects the condenser and gear train shaft. The selector switch is of the bridging type, the circuit between any two contacts 180° apart being completed by a double wiper arm. Small tinned rivets (not eyelets) were used for contacts, spaced 30° apart on a 1¼" circle around a piece of 1" bakelite.

AUDIO SELECTION

Up to now audio selection has been pretty well confined to full-scale work or to models other than aircraft where the extra weight involved is unimportant. Recent developments in ultralight transformers and inductances by such manufacturers as U. T. C. and Inca have brought renewed interest in the tuned-filter method of a. f. selection, however. One simple system was described as a complete two-channel receiver in the first article of this series, last month.

When more than two channels are used, more elaborate filters are required. Experimental units using two-section top-coupled tuned circuits have been built with from five to nine channels, having adjacent-channel discrimination varying between 10 and 25 db. For ordinary work, with the input to the filter held reasonably constant, 10 db skirts are adequate.

Fig. 4 shows the performance of a typical experimental filter of this type using special inductances. (Commercial units should give comparable performance, however.) The total weight was slightly over one pound.

The basic circuit is shown in Fig. 5. The fixed values shown are based on the use of a standard triode such as the 1G4GT for the coupling (input) tube. As shown, the tube is operated without external bias other than that supplied by the filament. A high-mf. tube could be used with an increase in sensitivity, but this would require more inductance in the filter, increasing its weight. (Con- *(Turn to page 60)*

FIG. 6

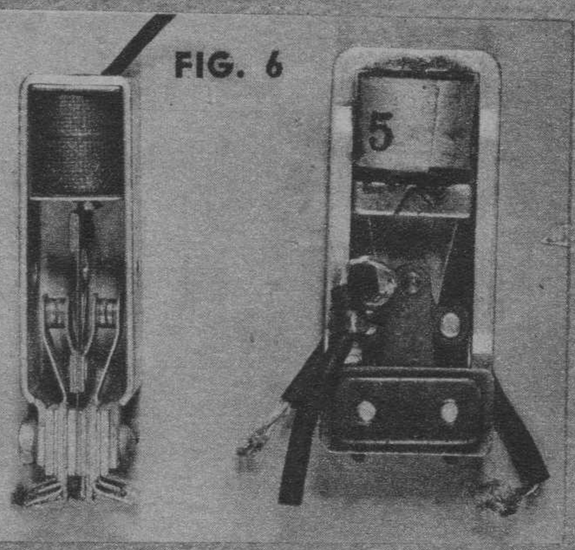


FIG. 7

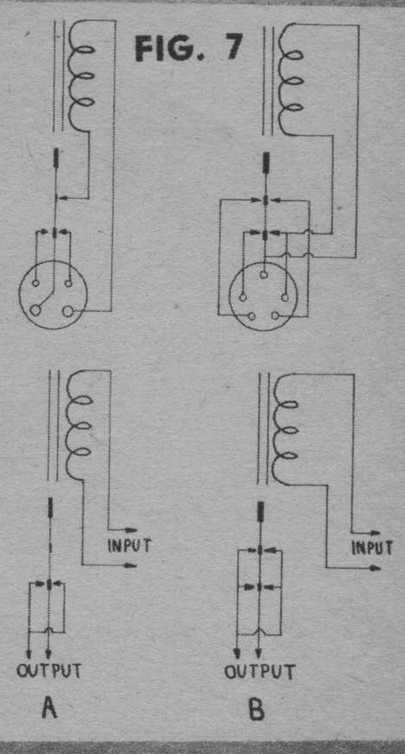
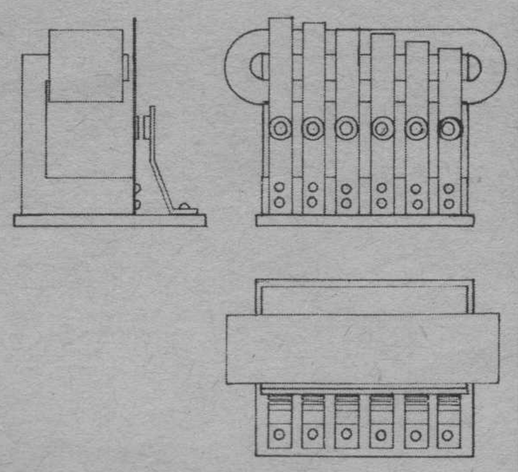


FIG. 8



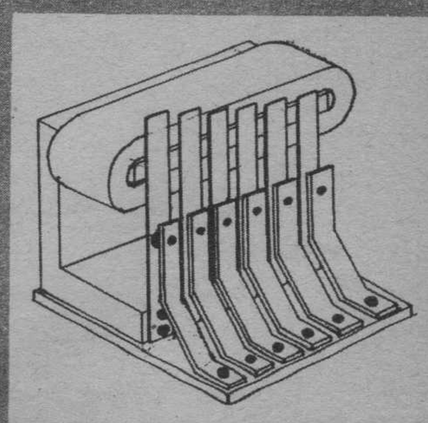


FIG. 9

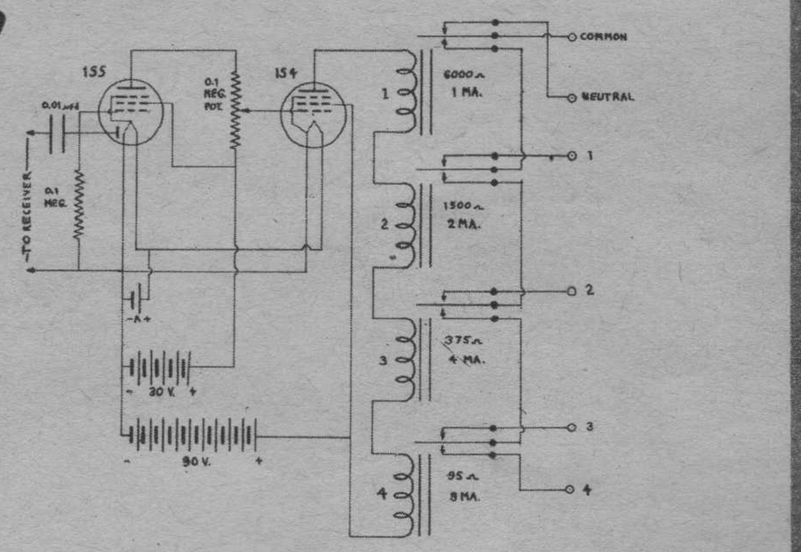
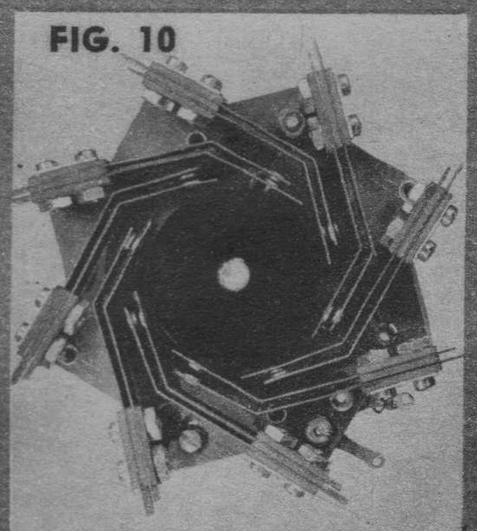


FIG. 10



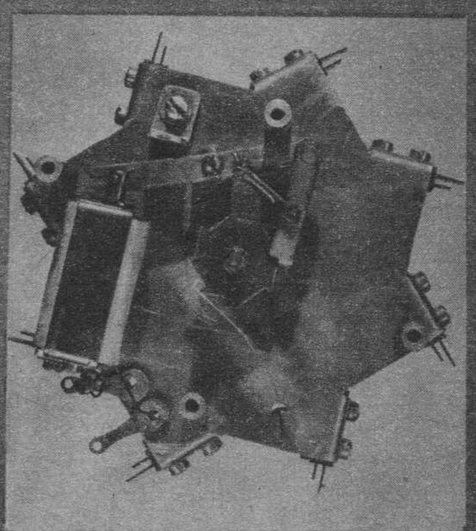


FIG. 11

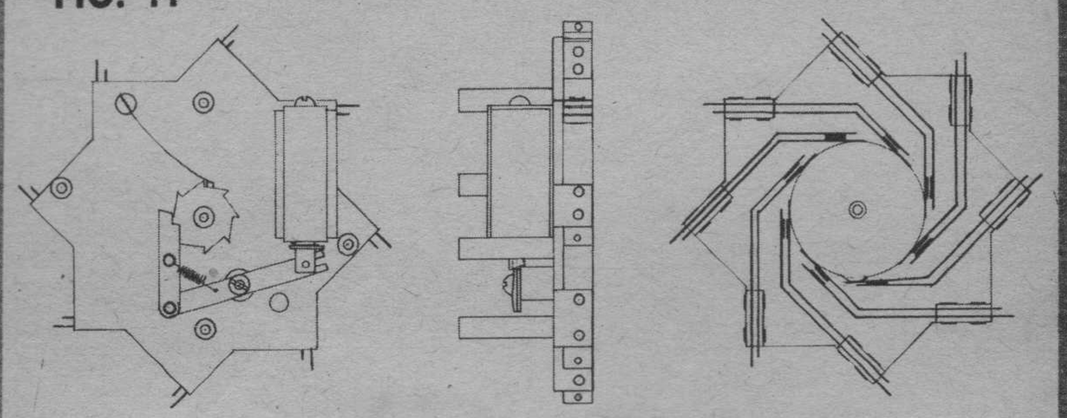
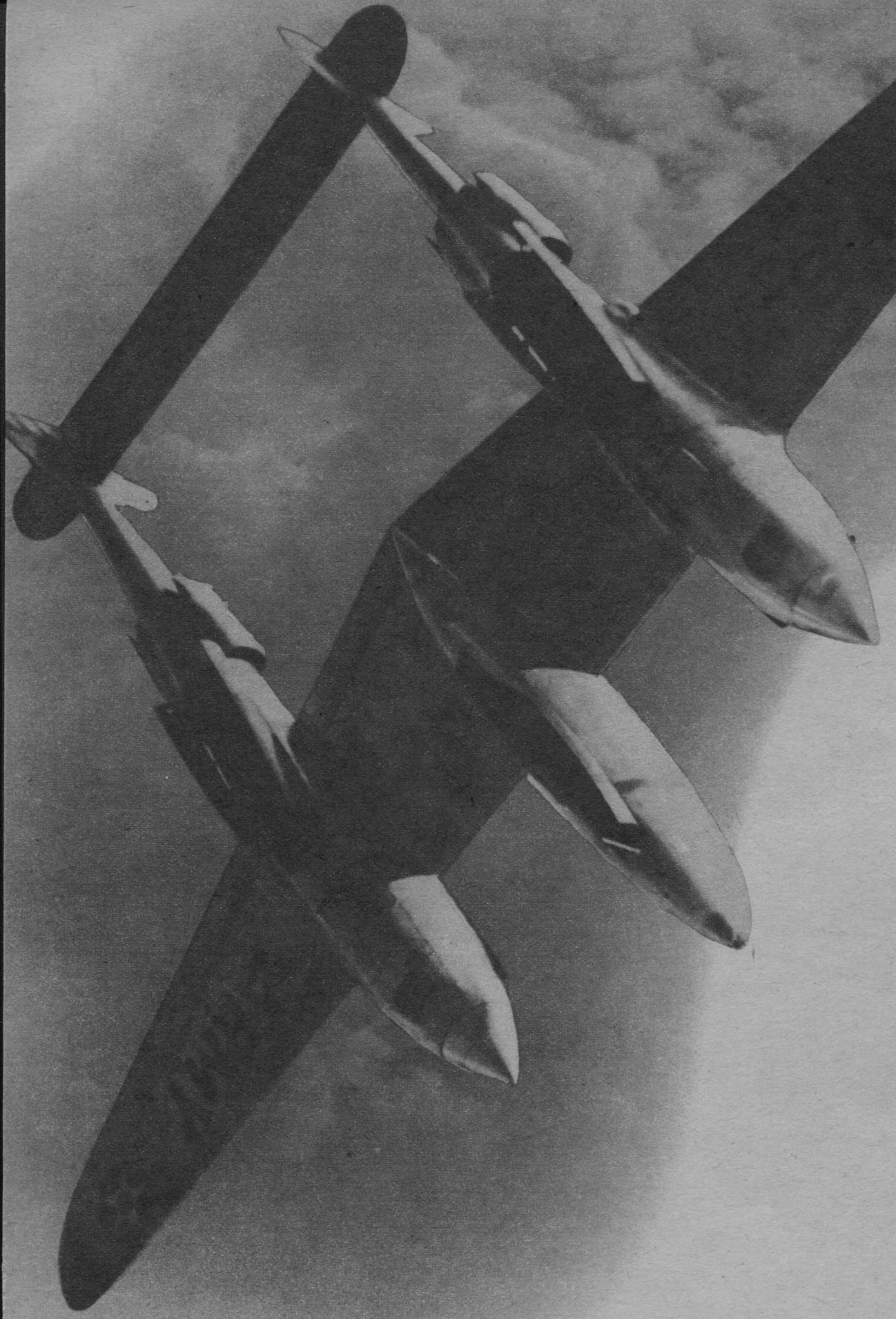


Fig. 6—Tuned-reed filters are converted auto-radio vibrators. Fig. 7—Connections for converted vibrators. Top, vibrator; bottom, filter. Fig. 8—Arrangement of multichannel tuned-reed filter. Fig. 9—Amplitude-type selector. Fig. 10—Rotary switch. Contacts, left; rear view, ratchet, right. Fig. 11—Rotary selector switch.

Carve This



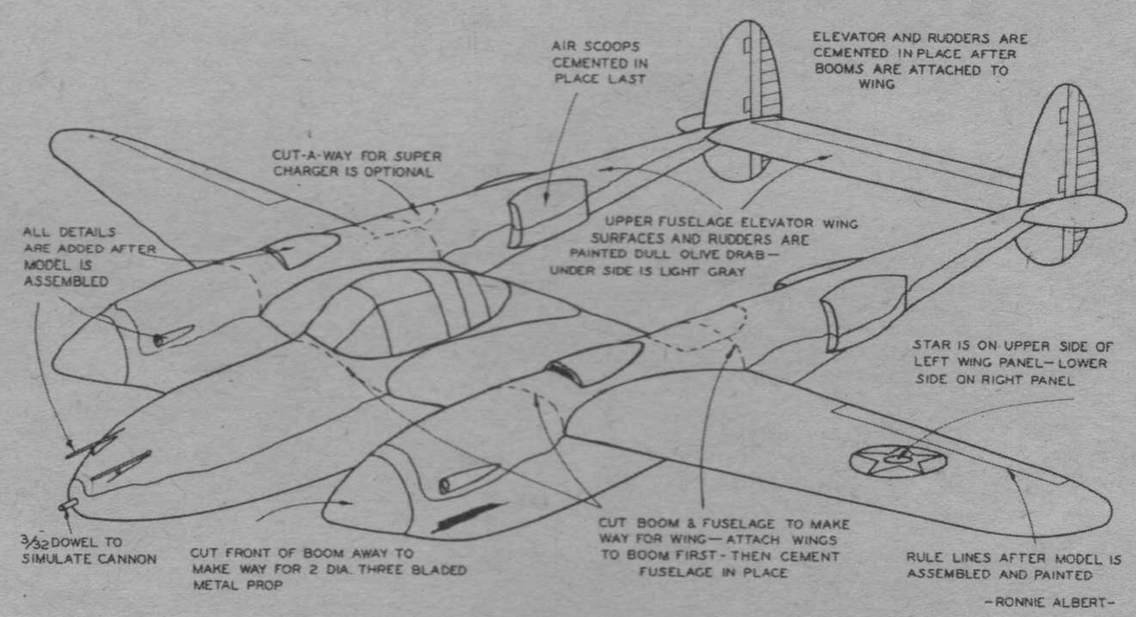
BY RONNIE ALBERT

Don't let shortages of rubber, or even cement or balsa, spoil your fun. Make this famous warplane your first solid scale model. Balsa or pine will do.

THIS solid scale model is an eleven-inch replica of the army's most highly powered and heavily armed fighter now pushing the enemy around at the battle fronts—the P-38, known to the British as the Lockheed Lightning. The two Allison engines are supercharged for high-altitude work and turn out slightly over 2,700 horsepower—which to you and me means a speed of well over 400 m. p. h.

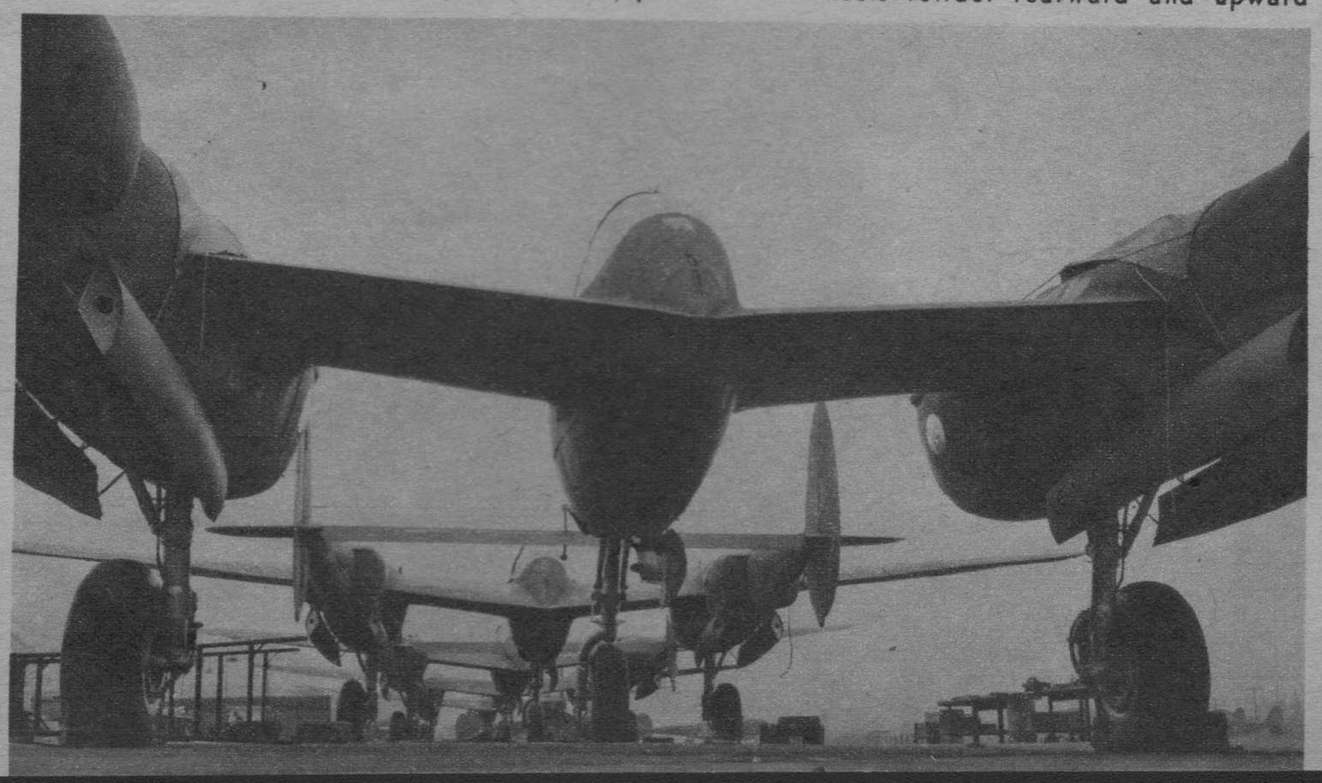
Because of the unusual construction characteristics—that is, the two booms—this model will present a more difficult problem in construction than is true with most single-seater fighter scale jobs. Start the construction with the carving of the two booms. Since the plans are reproduced full size, merely trace the side view of the boom on the correct size block of medium-grade balsa—obtain all dimensions by direct measurements from the plans—and proceed to cut out the boom by sawing along the lines with a coping saw. If you haven't a saw of this type a knife can be used, but make certain that you leave at least a $^{3}/_{32}$" margin. After the side view is carved, trace the top of the fuselage on the block and cut out in the same manner as the side.

In shaping the boom, first cut out the boom templates from two-ply Bristol board, making certain that the curves are absolutely smooth and not bumpy. After you have your templates, start carving the fuselage roughly with a sharp knife, cutting off small slivers at a time. When you feel the boom *(Turn to page 57)*



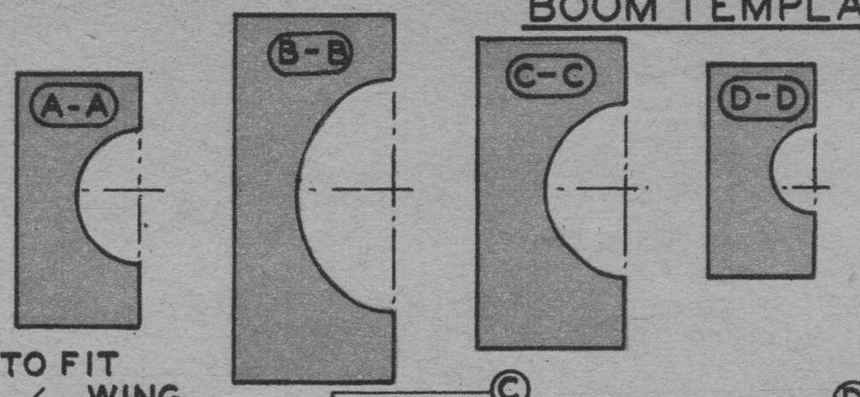
Lethal tricycles. No need to synchronize four machine guns, cannon, in nose.

For better detail, study this photo carefully. All the wheels retract rearward and upward

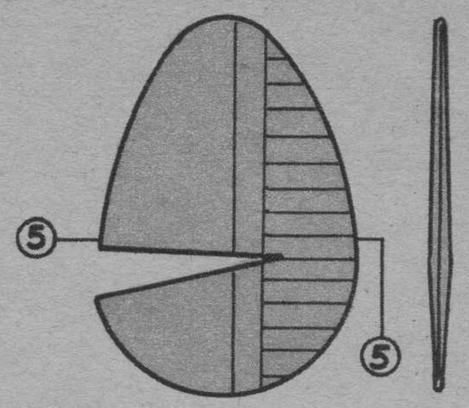


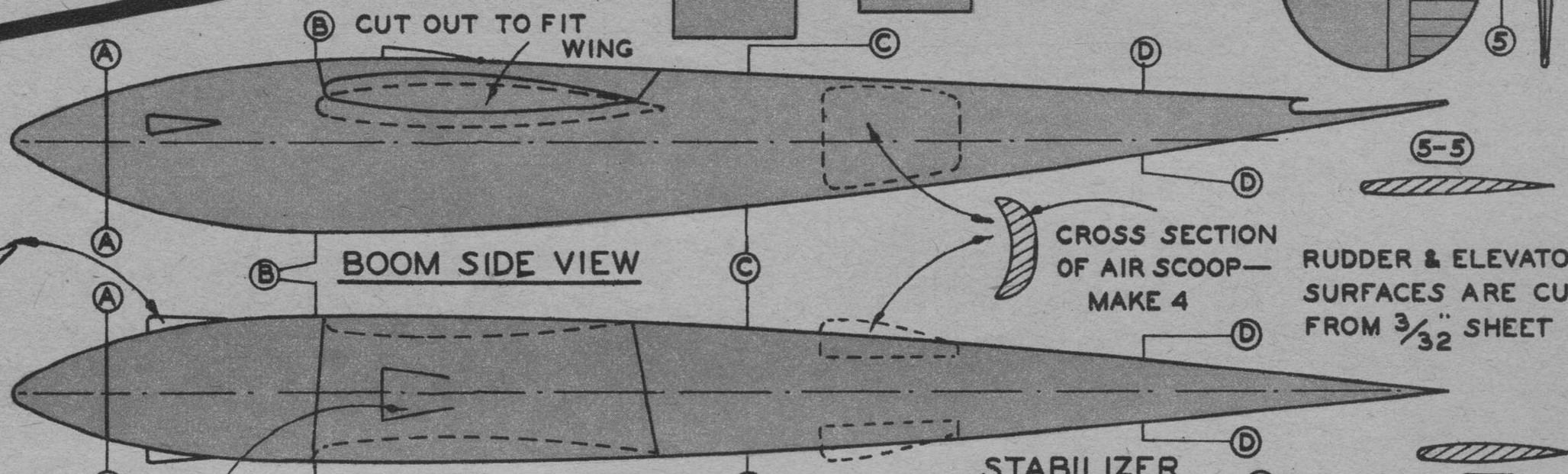
P-38

BOOM TEMPLATES



RUDDER MAKE 2





BOOM SIDE VIEW

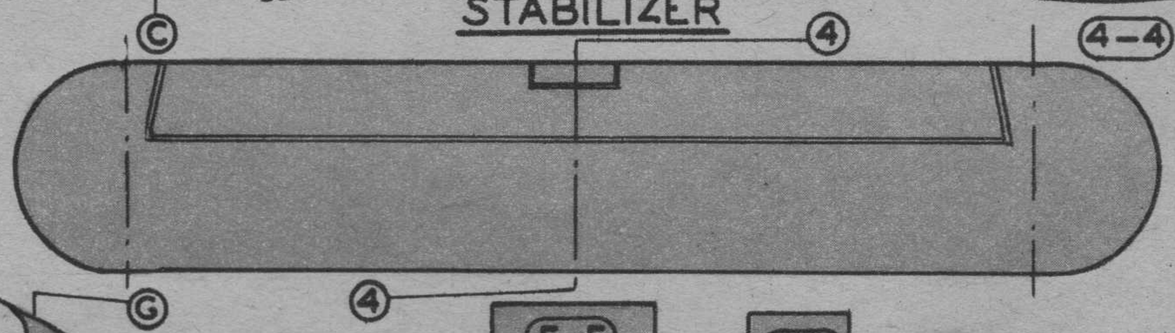
CROSS SECTION OF AIR SCOOP— MAKE 4

RUDDER & ELEVATOR SURFACES ARE CUT FROM 3/32" SHEET

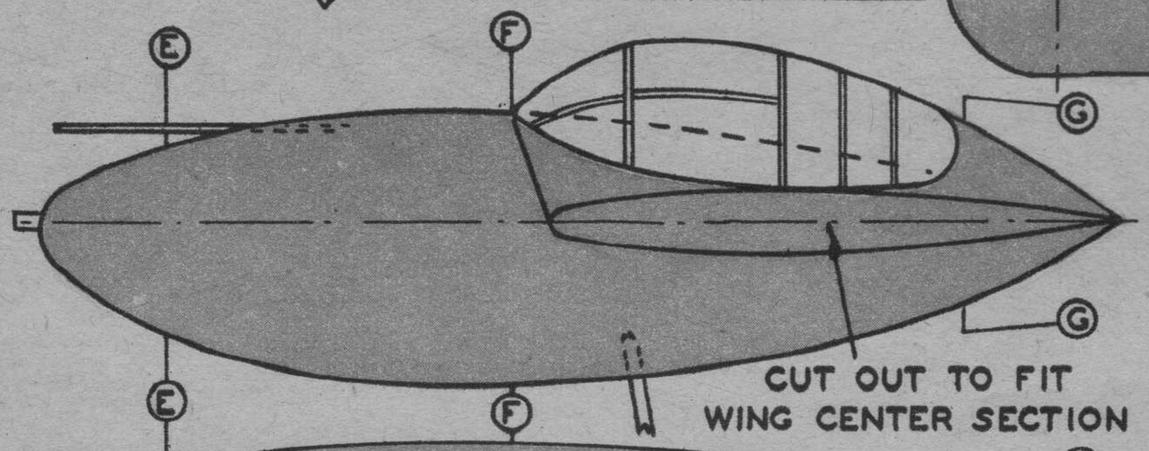
BOOM TOP VIEW

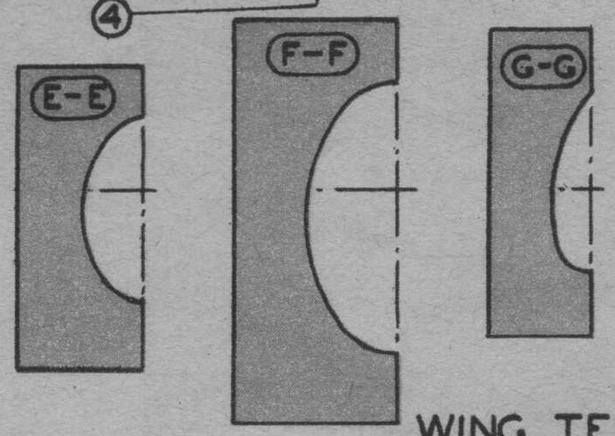
AIR INTAKE CUT FROM SOFT BALSA

STABILIZER



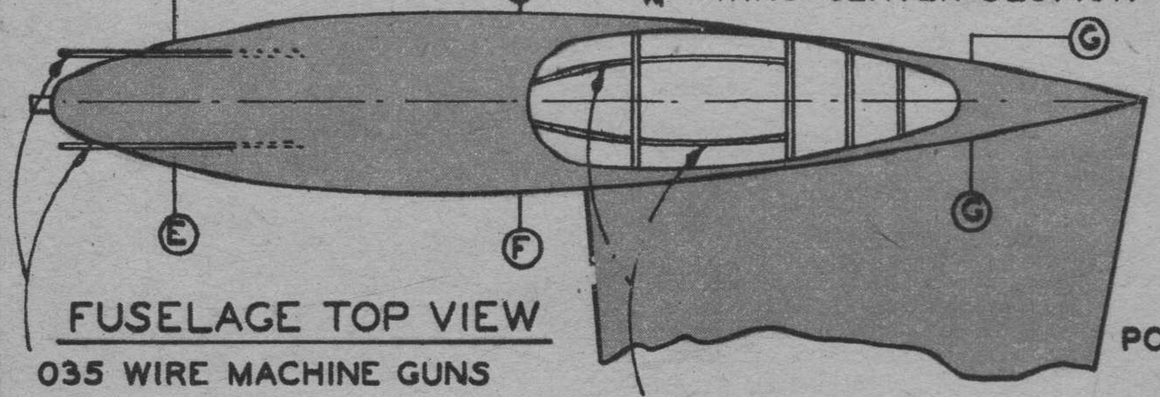
FUSELAGE SIDE VIEW





FUSELAGE TEMPLATES

CUT ALL TEMPLATES FROM 2 PLY BRISTOL BOARD

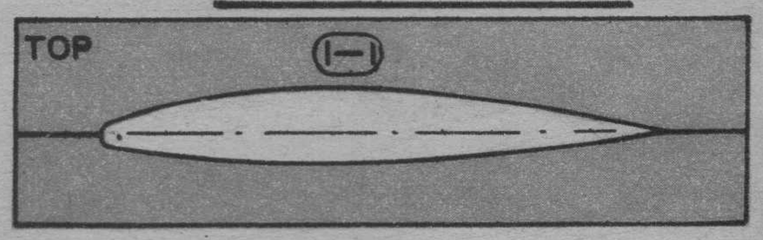


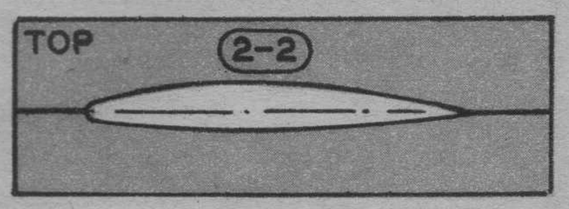
FUSELAGE TOP VIEW

035 WIRE MACHINE GUNS

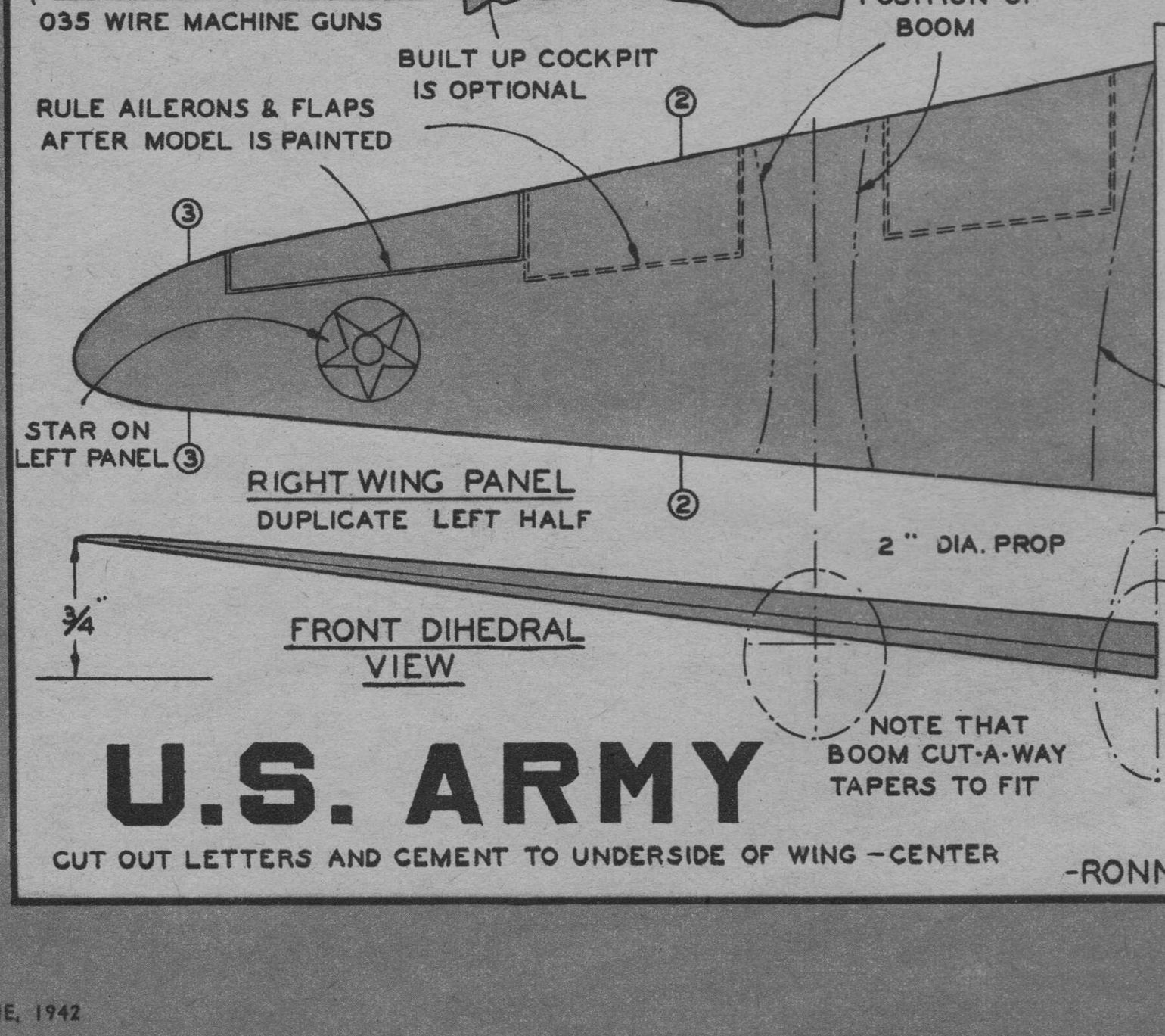
BUILT UP COCKPIT IS OPTIONAL

WING TEMPLATES



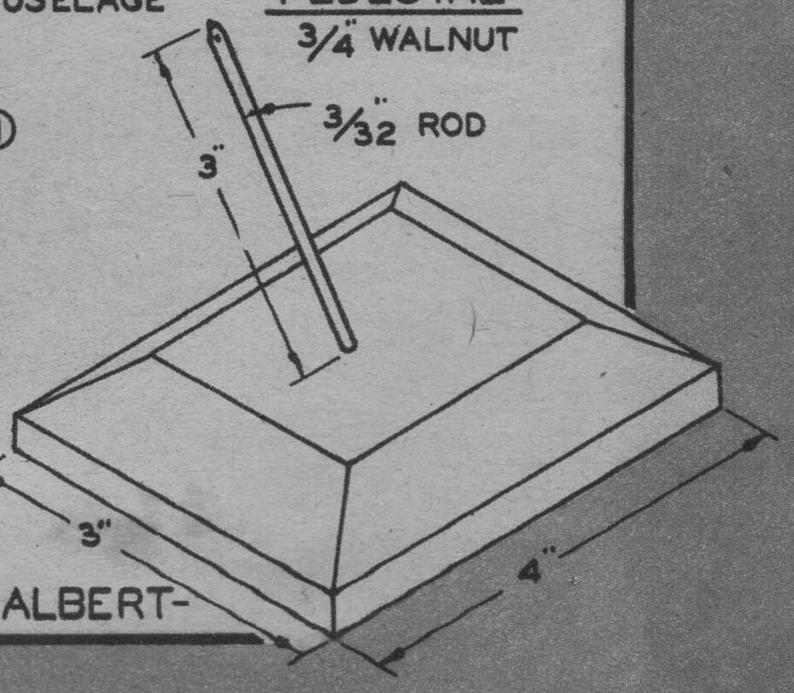


-FULL SIZE DRAWING-



PEDESTAL

3/4" WALNUT

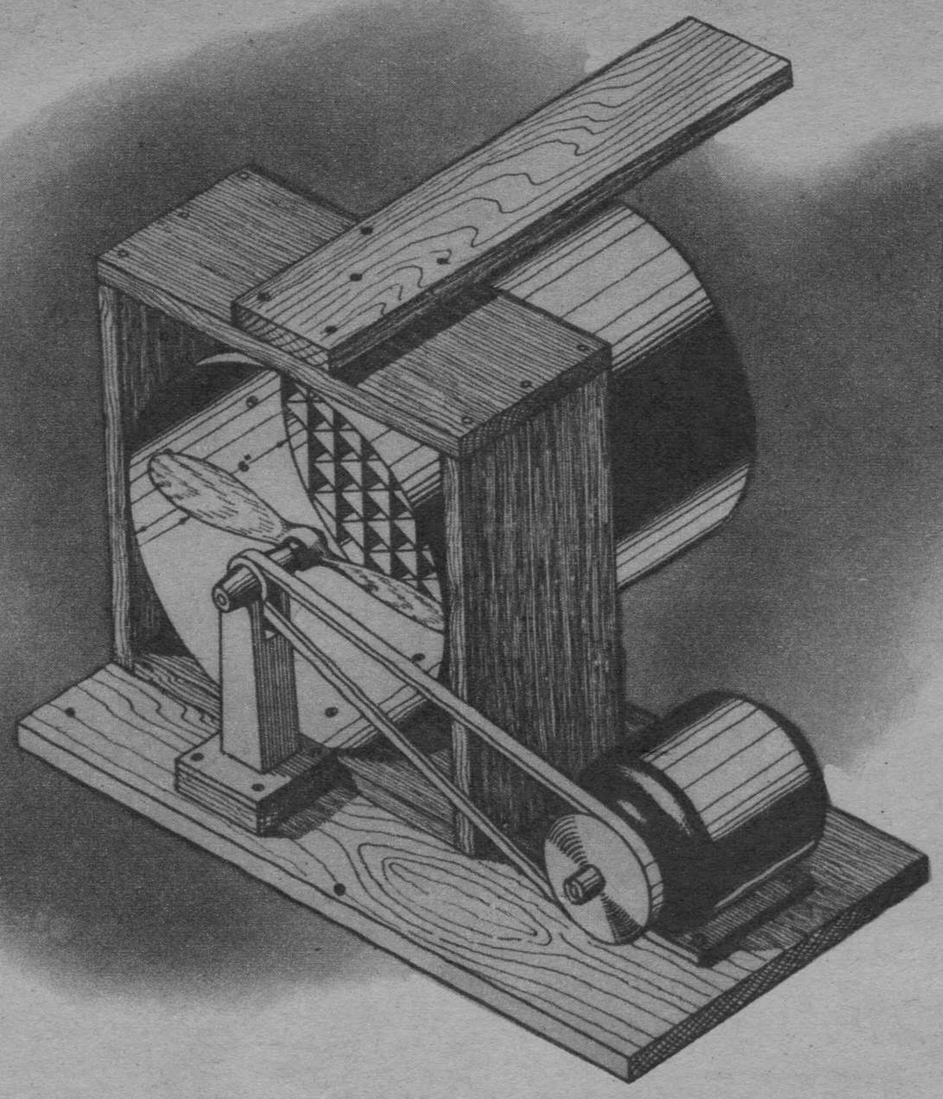


U.S. ARMY

CUT OUT LETTERS AND CEMENT TO UNDERSIDE OF WING — CENTER

-RONNIE ALBERT-

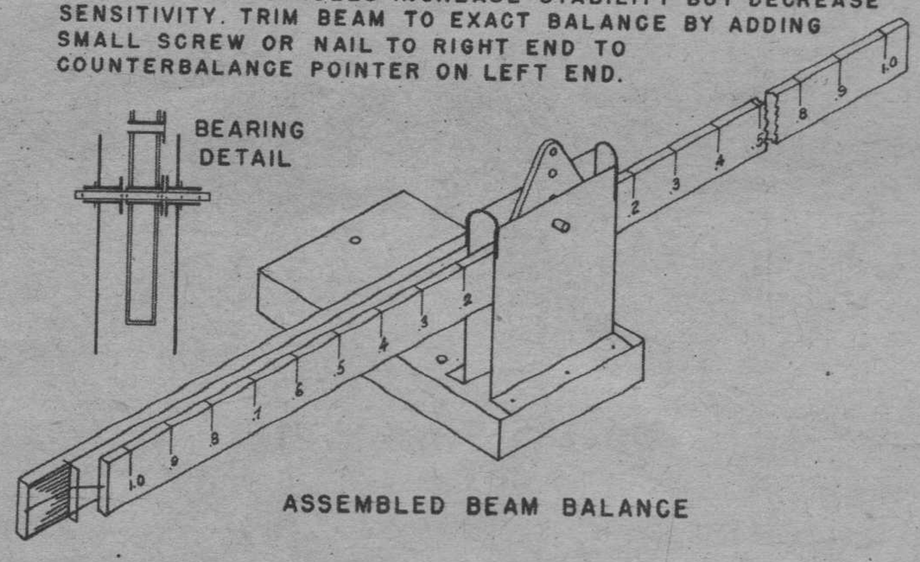
Home-Made

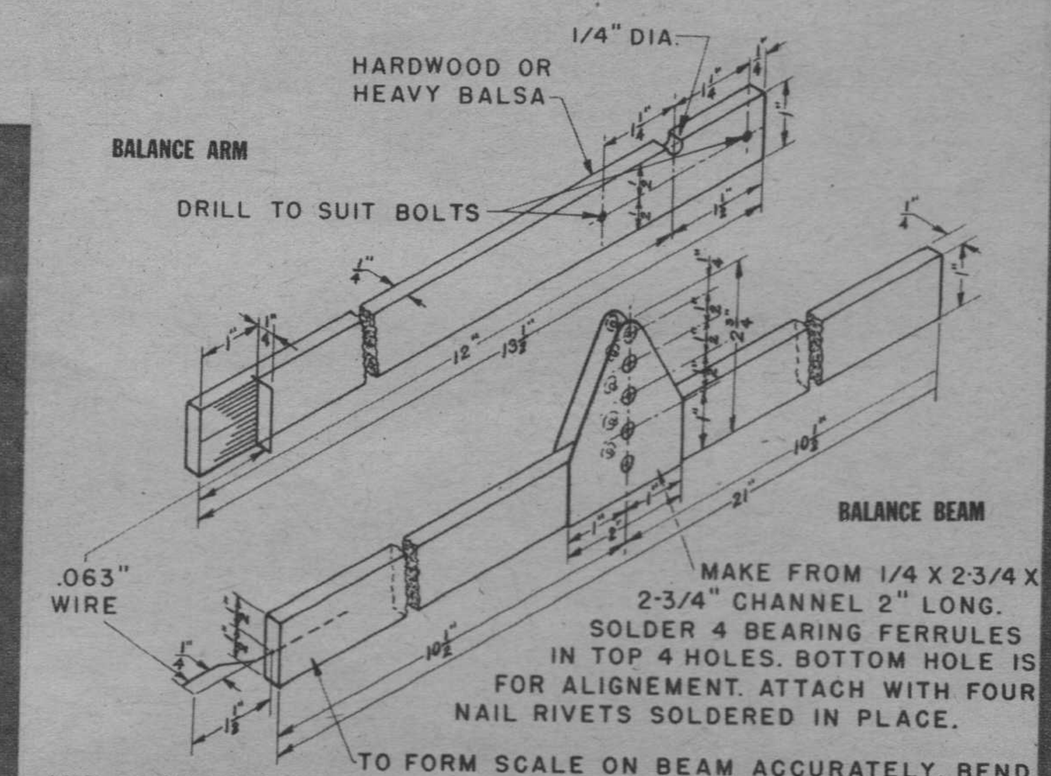


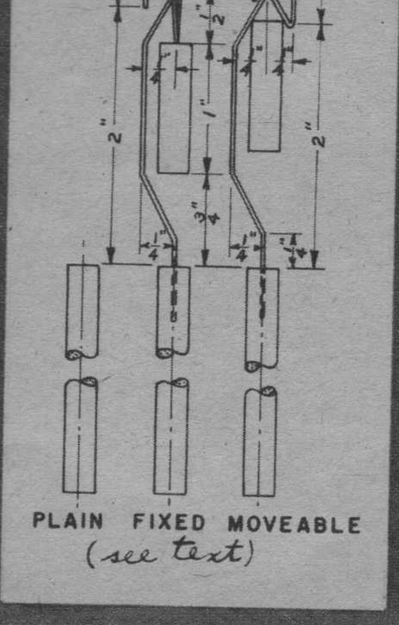
Last month the author presented plans of a practical wind tunnel. Now he provides the beam balance and drag balance for testing of parts and models. The second article of a series.

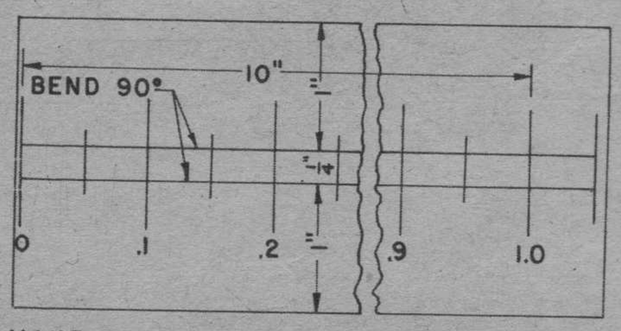
A WEIGHING balance is required for use with the tunnel air balances. If one is not available, the simple beam balance shown is easy to make and ideal for wind-tunnel work. As most chemical balances weigh in terms or grains or grams instead of decimal parts of an ounce, the beam balance will be found more convenient to use than any pan-type balance that might be available.

A set of sixteen one-ounce weights is necessary to give results at one-ounce intervals, and the beam balance is used to get the decimal part of the weights. The ten inches of graph paper having twenty divisions per inch will give 200 divisions, each representing $^1/_{200}$ ounce, or .005 ounce. A table is provided which gives the length of various shapes of steel bars that weigh one ounce. The material should be cut slightly long. The co-operation of a high-school chemistry teacher, a high-school physics teacher, or a druggist is necessary to get the use of a pan-type balance to finish the steel weights accurately down to one ounce in weight. A one-ounce laboratory weight is placed on the right pan of a chemical balance and the left pan is filled with weights until the balance is accurately trimmed. Then the laboratory weight is replaced with a steel weight and its excess weight is filed off until the pans are again in balance. Repeat for all the steel weights. If, when through, the one-ounce laboratory weight can be replaced on a "balanced" balance with









Wind Tunnel

BY R. C. CLIFFORD

each of the steel weights without changing the trim of the balance, then the steel weights are just as accurate as the laboratory weight plus or minus the sensitivity of the balance. The sensitivity of a balance is the largest weight that can be added to the pan without changing the trim. It is negligible for a commercial chemical balance designed for weighing up to one pound. When weights are provided with a wire handle, the weight of the whole assembly must be one ounce.

The beam swing scale is a small piece of heavy drawing paper with parallel inked lines accurately spaced $\frac{1}{8}$" apart, as shown, and glued on the end of the balance arm. The lines provide a convenient means for observing when the beam is in balance and swinging equally on both sides of the long horizontal center line.

Bearings in the balance beam bearing channel are ferrules $\frac{3}{32}$" in diameter by $\frac{5}{16}$" long soldered in holes drilled on a vertical center line. The channel is attached on the beam after the paper scales have been glued on and allowed to dry thoroughly. The center line of the bearing channel must line up accurately on the zero line of the scale as observed through the bottom hole on the channel. After final assembly, the beam must be balanced by adding weight to the light end (in the form of small nails or screws) or by cutting off some material from the heavy end.

The two bearing ferrules in the base angles should be soldered in place after final assembly of the base while they are held in line with a straight, tight-fitting wire threaded through the holes. Allow about $\frac{1}{64}$" for end play over the width of the bearings on the beam. Use a bearing wire for final assembly that is a loose fit in the ferrules. Upon completion, the beam should oscillate freely when balanced. All friction caused by tight bearings, no bearing end play, poor bearing line-up, et cetera, must be eliminated. A drop of fine oil will help matters.

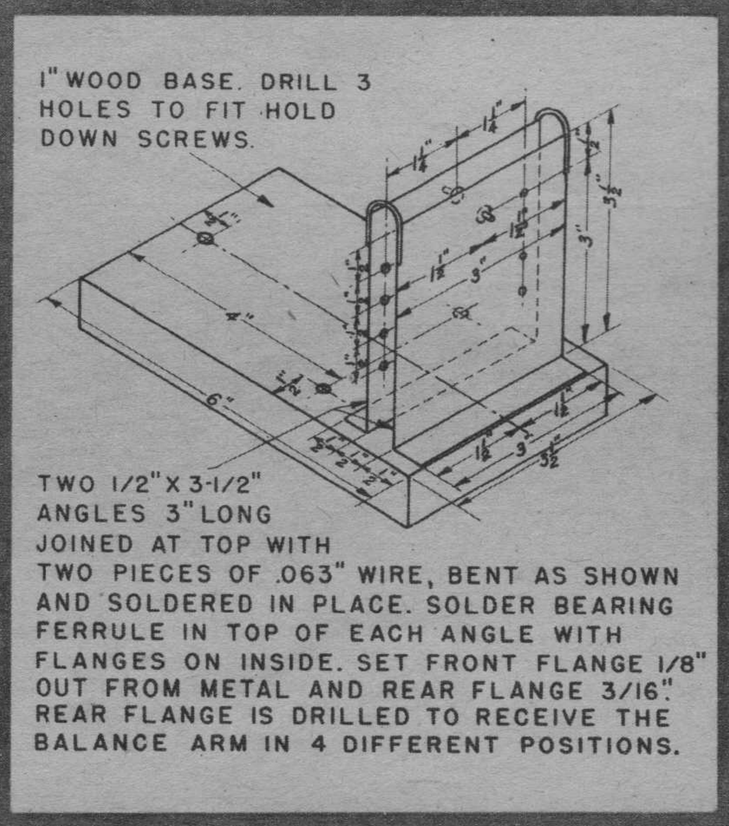
The beam balance is shown assembled in its most sensitive position. The stability of the beam will be increased and its sensitivity will be decreased slightly by using the higher bearing holes. Beam must be trimmed to balance without load. (The wire pointer in the left end of the beam will need a small screw or nail in the right end to balance the beam.)

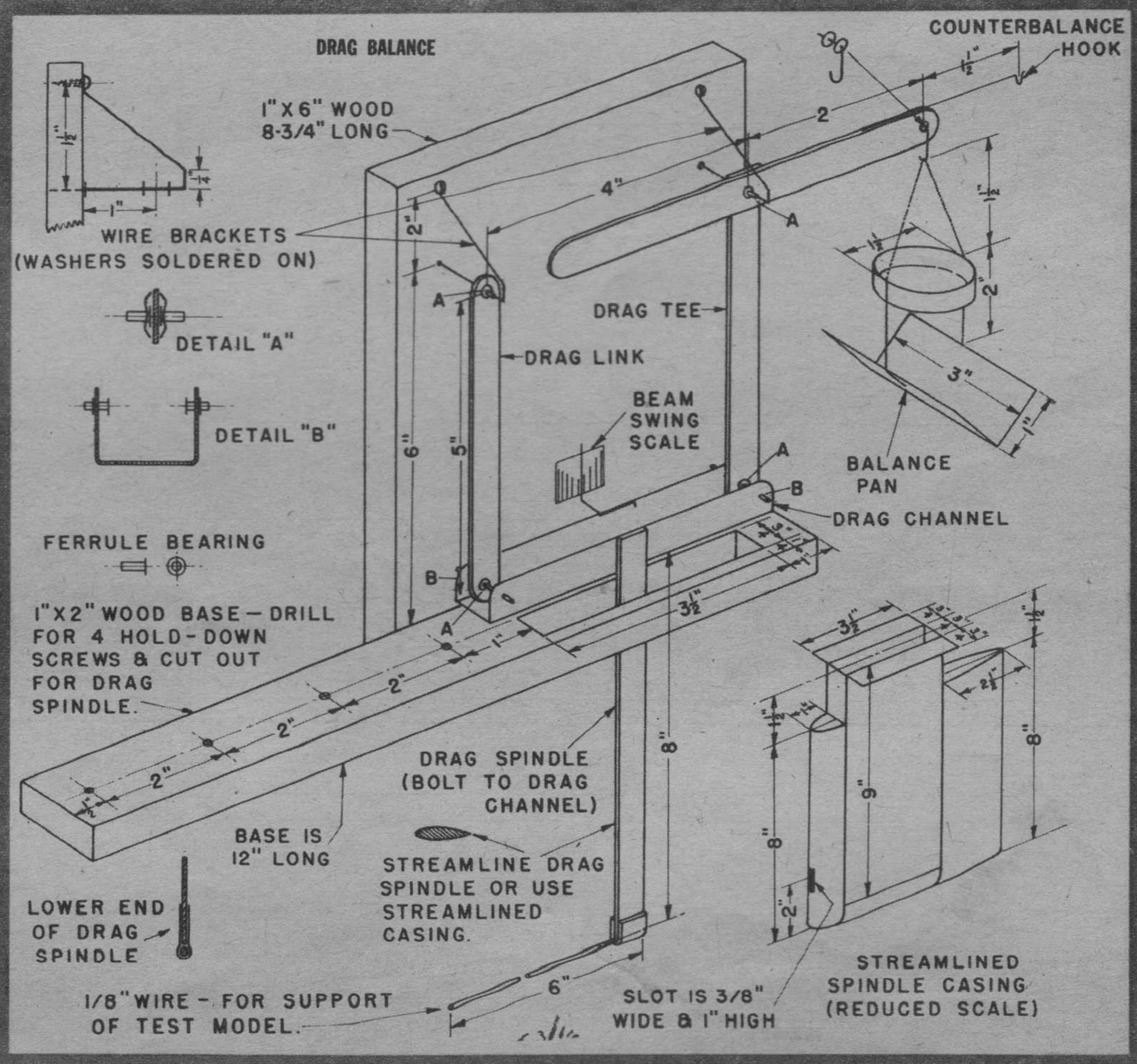
DRAG BALANCE

The drag balance is a fairly simple affair. The horizontal base consists of a 1" board 2" wide and 12" long. Four holes are drilled to receive hold-down screws and a rectangular hole ¾" wide by 3½" long is cut to receive the streamlined drag spindle casings. If the casing is not used, the hole should be made ½" wide by 1½" long. The vertical board of 1 x 6" wood 8¾" long is attached to the side of the horizontal base as shown with three long woodscrews. To keep the wood from splitting, pilot holes should be drilled to receive the wood screws. After assembly, a line is marked accurately on the vertical board 6.00" above the horizontal base (dimensions given in hundredths should be accurately maintained). Two holes $\frac{5}{32}$" in diameter should be drilled on the line 4.00" apart to receive the ends of the wire brackets.

The bearings of the balance are made of brass ferrules $\frac{3}{32}$" in diameter and ¼" long soldered in place. The partially closed end of the ferrule must be filed off or opened up by forcing it on a $\frac{3}{32}$" rod and sliding it up and down on the rod until it can be moved without friction.

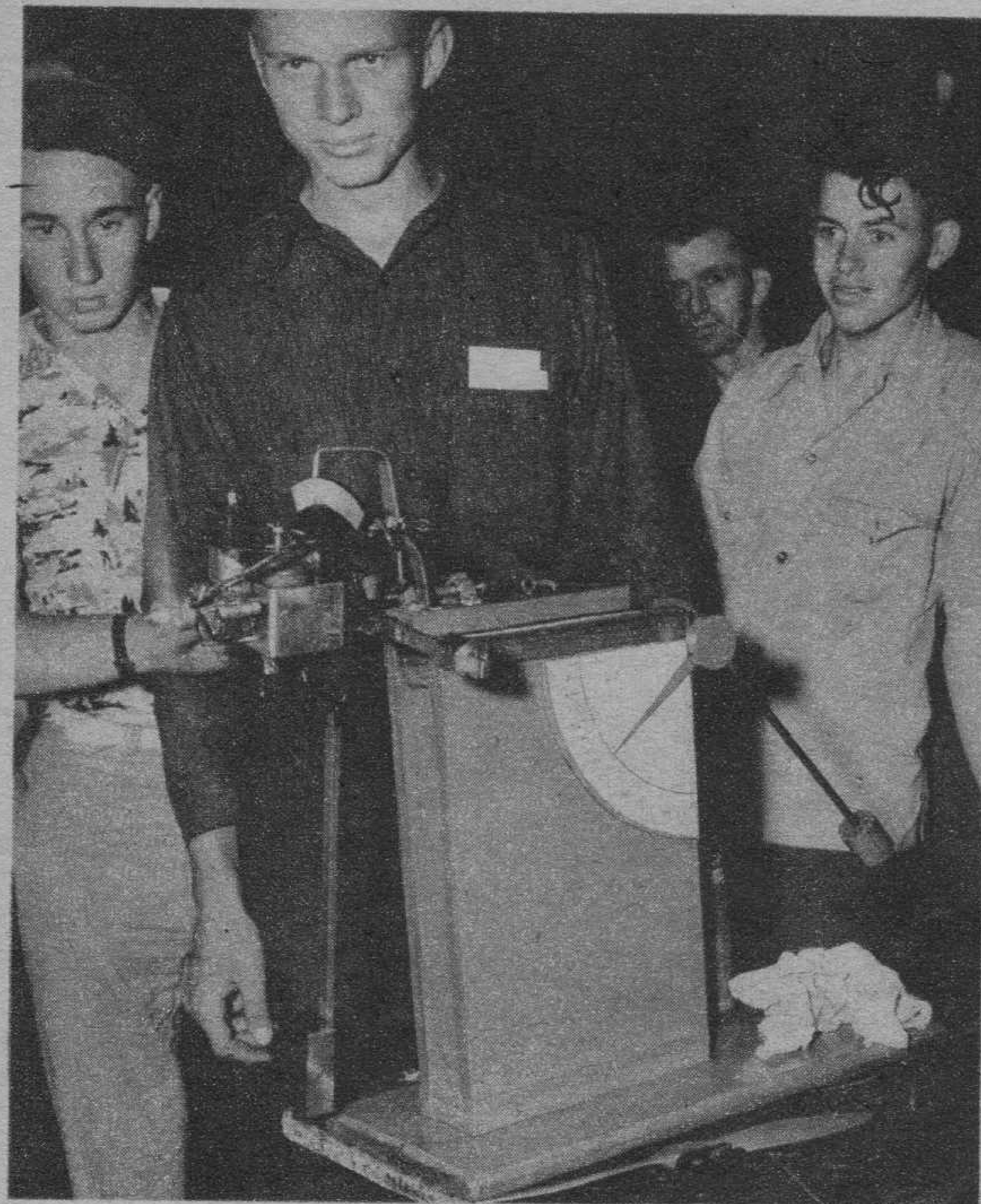
The front drag link is a piece of iron bar $\frac{1}{16}$" thick, ½" wide, and 5½" long with two $\frac{3}{32}$" holes drilled accurately 5.00" apart on the centerline of the bar. The ends are rounded off with a *(Turn to page 49)*





The Traveling Salesman

Your favorite "don't quote me" coverage of the model industry, new products and developments. Dealers, this is your page!



Wild-and-woolly motor claims are showed up by thrust and torque indicator made by Bill Halper, Flo-Torque.

THE best attended Eastern meetings of the Model Industry Association were held in New York during the recently held Toy Fair. The board of directors named the following nominating committee: Jay P. Cleveland, chairman; Richard W. Mair, Nathan Polk, Clyde Austin, Wm. K. Walthers. This committee has nominated the following members for election for a term of three years: Gordon Varney, Varney Railways, Chicago, Ill.; Paul Guillow, Paul K. Guillow Co., Wakefield, Mass.; E. B. Miller, Eastern Mgr., Comet, New York City; Harvey Johnson, Hobbycraft Model Supply, Detroit, Mich.; William Walthers, William K. Walthers, Inc., Milwaukee, Wis.; Fred Megow, Megow's, Philadelphia, Pa.; Robert Mercer, Brooklyn Novelty, Brooklyn, N. Y.; Niles Testor, Testor Chemical, Rockford, Ill.; Pat Morrissey, Ace Model Airplane, St. Louis, Mo.; J. F. Strombeck, Strombeck-Becker Mfg Co., Moline, Ill.

Only five are to be elected from the above list for the three-year term. Independent nominations for the office of director may be made from the floor at the annual meeting in Chicago, July 28th-August 1st.

Also nominated for a one-year term were Dan Frisoli, Scientific Model, Newark, N. J., and Fred Van De Pitte, Airco Model, Detroit, Mich. Irwin Ohlsson of Ohlsson & Rice, Los Angeles, and Charles Brebeck, O. K. Motors, Herkimer, N. Y., were nominated for two-year terms. Two of the four nominees are to be elected.

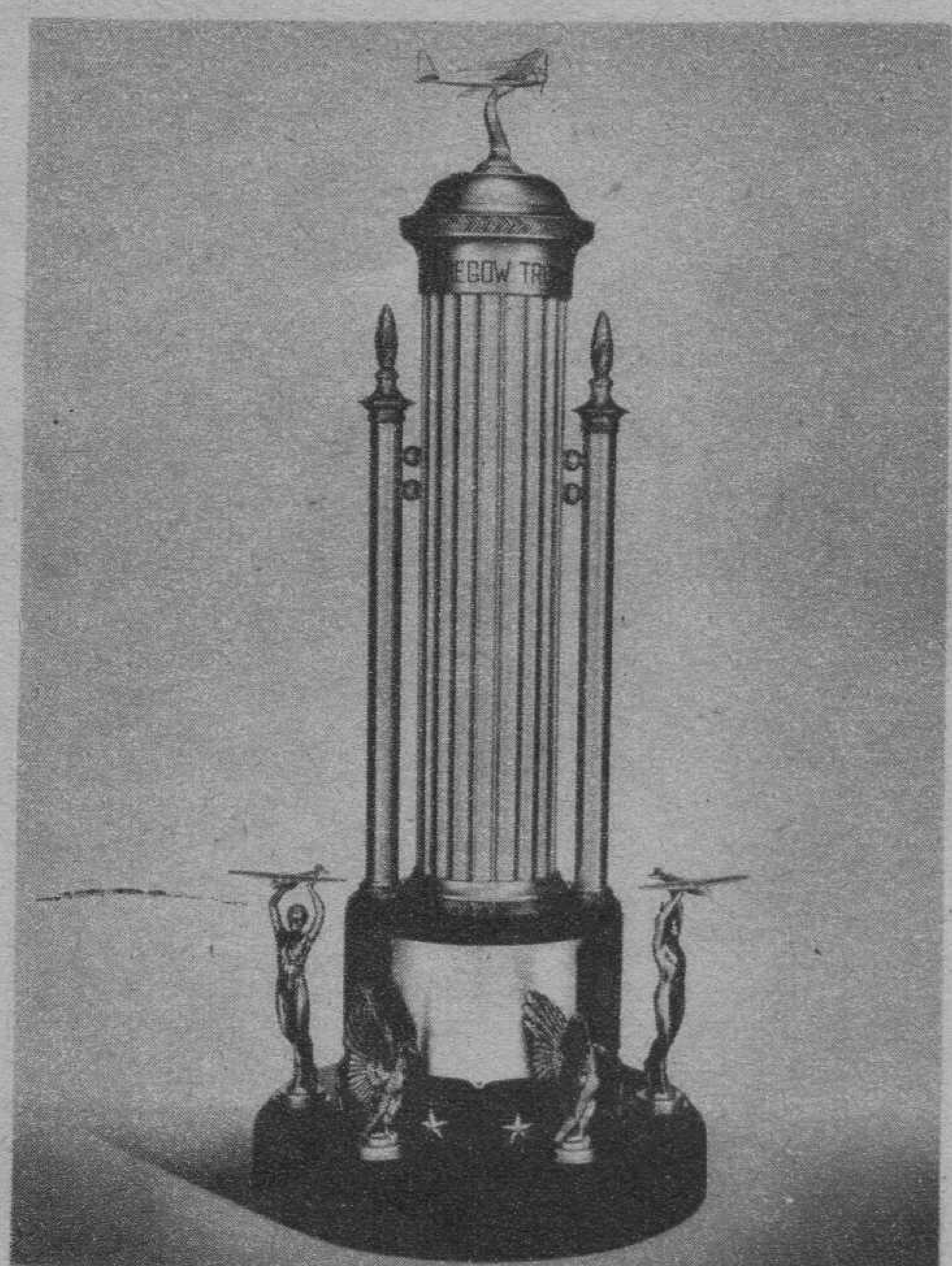
With the list of nominees thus made available early by the Traveling Salesman, opportunities for lively political campaigns become possible and it is hoped that members will rally behind their favorite candidates and come in full strength to the Chicago convention to vote.

Welcomed into the association fold among many others were "The Three Holdouts," Dave Newmark of Ideal, Ward Harman of Marine and Lewis Barnett of International Models. We look for a great deal of activity from this trio!

In order to conserve present and unreplaceable stocks of parts, Atom engine repairs and replacement parts will be obtainable only direct from the factory for the "duration." Atom owners are asked first to contact their local dealers, since many of them have sufficient stocks of parts to last for several months.

We hear that the CAA will receive a $15,000,000 appropriation for instituting aviation courses in the nation's high schools. Natu- *(Turn to page 62)*

★ ★



Clubs compete for Megow trophy at Nats., awarded on point basis and distance traveled.

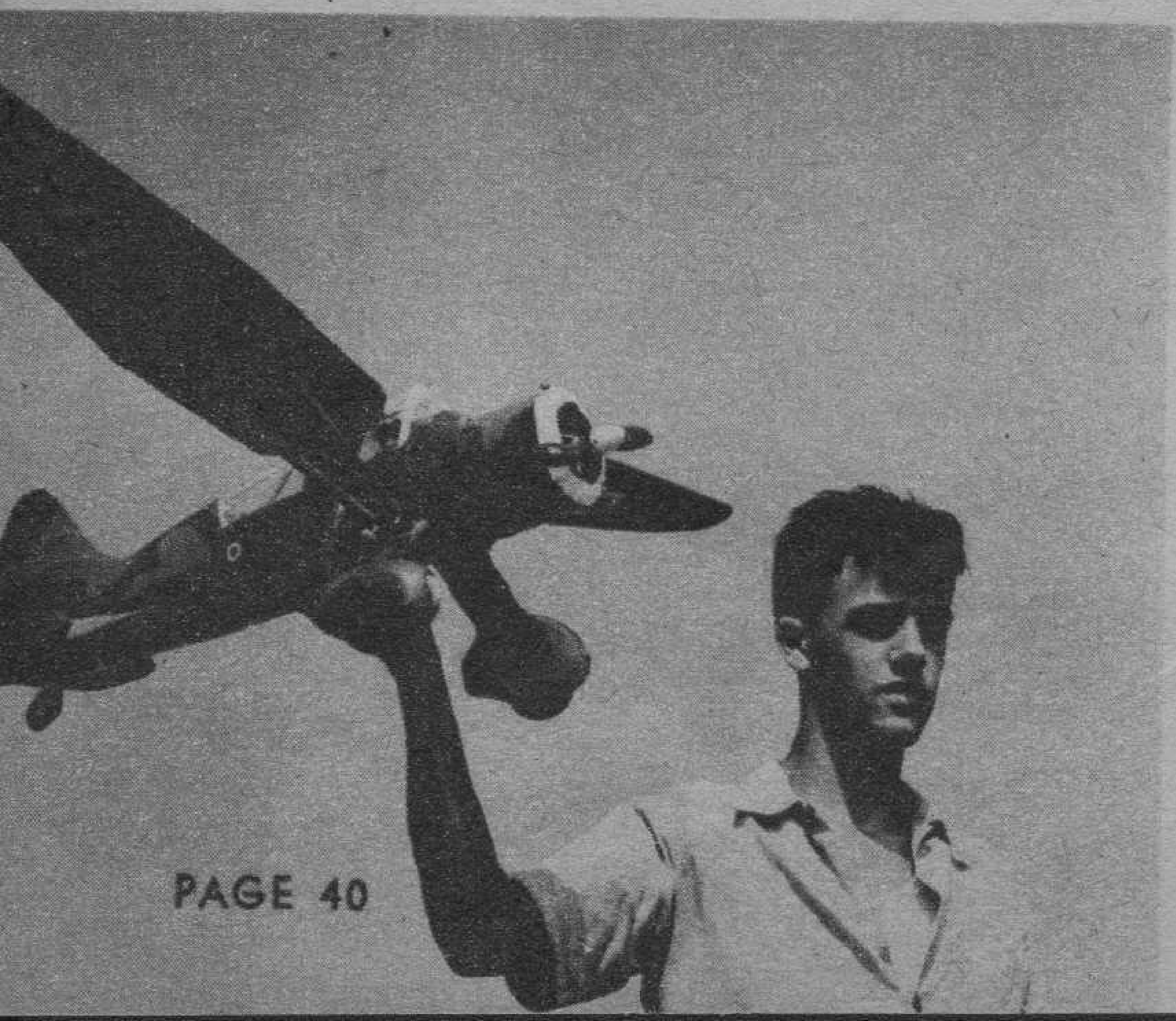
The Dope Can

BY GORDON S. LIGHT

MODELERS suffering from balsa shortage, take a deep breath, close your eyes and imagine a place where balsa is so common it's used as firewood. This isn't modeler's Valhalla, but the mountains of Peru. Balsa grows freely, and the natives consider it worthless. That's where Arnaldo Yipmantin of Lima gets his wood. He's a member of the Jorge Chavez Club—the pioneer model club of Peru. Membership is sixty-eight. There's no national organization, but other successful Peruvian clubs are in Huacho City, Lima (Relampago Club), and Huancayo (Students Model Club). There was an intercity meet February 1st between Lima and Huancayo for rubber-powered fuselage models. G. Aleman of the Jorge Chavez Club was first with 4:38. Arnaldo was fourth, flying a Korda Wakefield design for 2:37½.

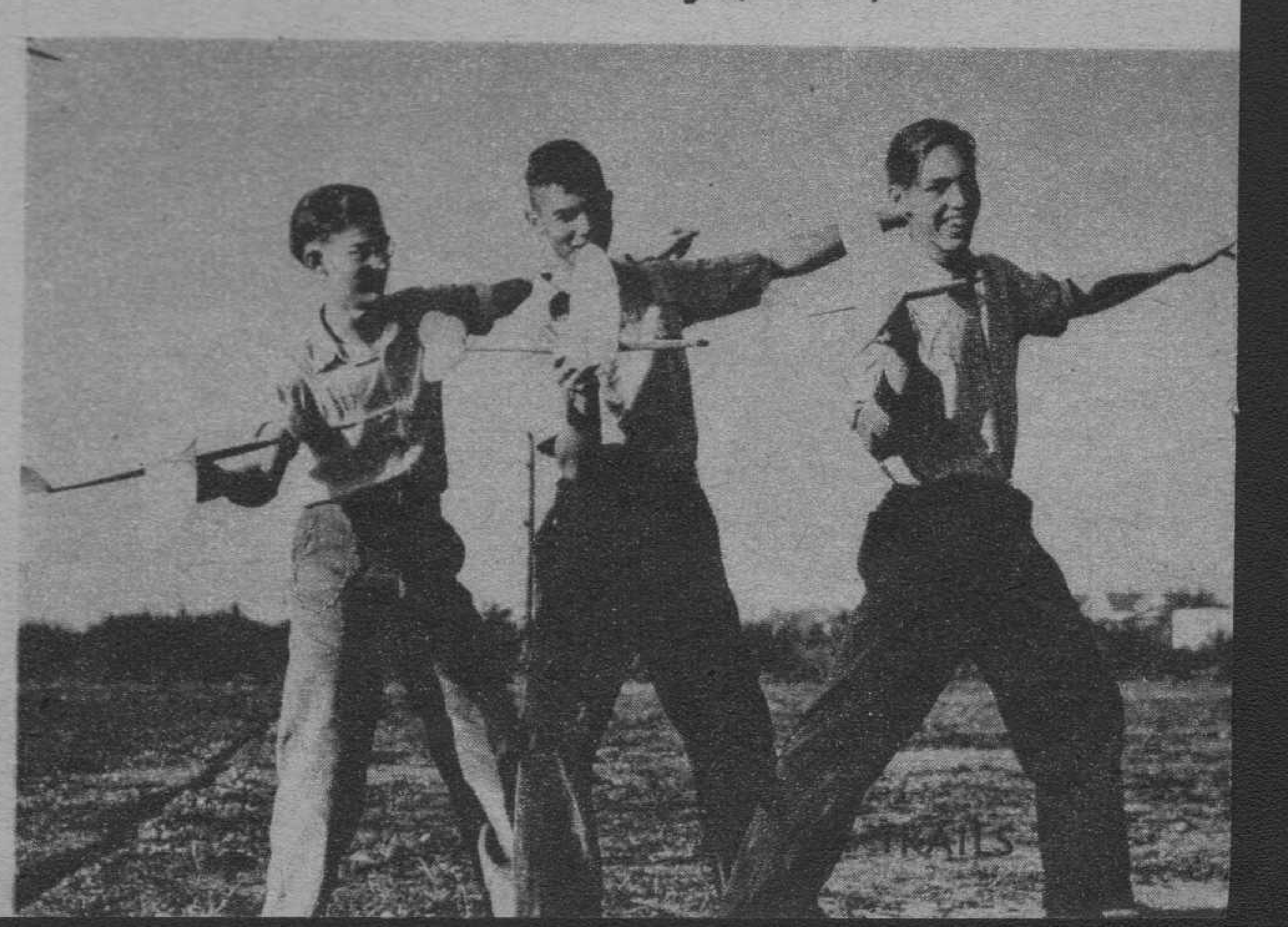
Caption underneath a photo of Frank Hernandez and his model autogiro in the April issue was incorrect. Frank works at Kellett, and *not* Pitcairn. Frank's model 'giro has a six-foot rotor diameter, twenty-eight inches' length, and is powered with a Mighty Midget. First trial flights ended in crack-ups. Trouble seemed to be in the rotor head. But Kellett engineers were sufficiently interested to help design a new one. With *(Turn to page 53)*

Bill Salmon's Ohlsson 23 Lysander. You can conserve materials by spending time on detailed jobs like this.



Steel City Model Manglers: front—Elliott, Oglesby, Frey; rear—Piper, Morgan, Wetzel, Burrus, McClusky.

This dignified portrait shows three presidents, past and present, Tacoma Air Screws. Engle, Cole, Sather.



The Airplane Industry Wants

Model Builders *and* Model Builders Want

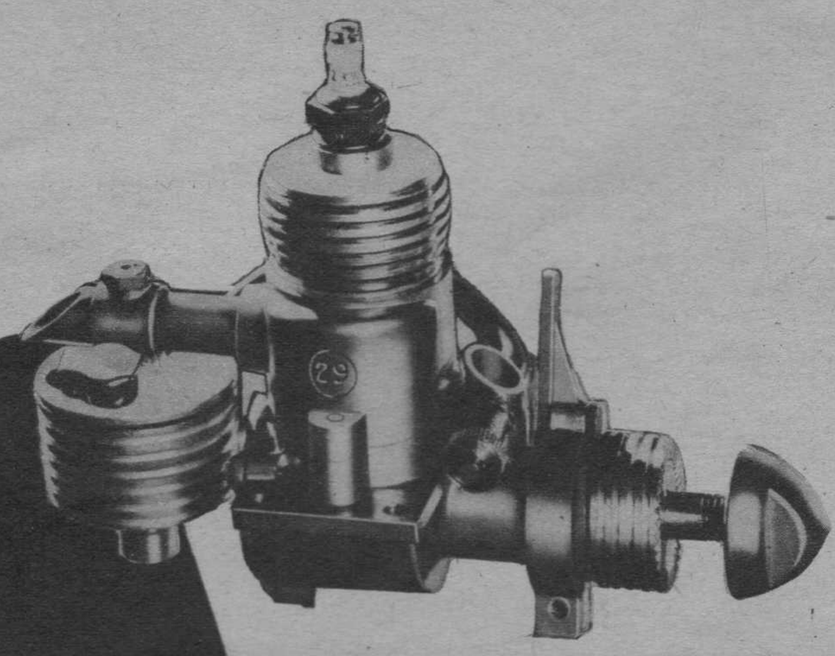
Rogers *Motors*

Experienced model builders by the hundreds have been going into the big airplane plants and into the technical services of the Nation. In building and flying airplane models—*gas* models—they have gained skill and basic aeronautical knowledge that starts them right in the great industry of today and the future.

In training the youth of America, Rogers Motors fit into the master plan of defense. In working with these motors, you learn the principles of the internal combustion motor—timing, ignition, heat conductivity—and in the power flight studies which they provide, the principles of aeronautics. The boy or young man with a Rogers Motor is fitting himself to serve his Country—and to make himself a technical expert.

Produced in America's largest miniature motor plant, these motors combine light weight and durability with amazing power, speed and sure-fire starting.

THE ROGERS-29
Class B. Factory block tested ready to run. Displ. .292. Wt. only 4¾ oz. Rotary valve, dual charge carburetion. Complete with Coil and Condenser. $14.00



OTHER FAMOUS ROGERS MOTORS

ROGERS KD-29 . . . Class B	$5.95
ROGERS RMC-2 . . . Class B	9.75
ROGERS Air Youth KD-29 . . . Class B .	7.95
ROGERS 35 . . . Class C	14.50

Rogers MOTOR CO.

START 'EM FLYING WITH A ROGERS!

PHILADELPHIA • PENNSYLVANIA

CANADIAN DISTRIBUTION:

ONTARIO MODEL AIRCRAFT CO., 56 ESPLANADE, TORONTO, CAN.

Orville Wright Today

(Continued from page 10)

He is a peace-loving man who lives alone in a big white house atop a hill in the peaceful village of Oakwood, three miles south of Dayton, Ohio, where in a small bicycle shop forty years ago he and his brother, Wilbur, pieced together the first successful power-driven flying machine. They meant it to bring harm to no one. The experiment was a sport. They put their own money into it just as a man spends his money for golf. They little realized that it would ever bring them a fortune and often thought of giving up their experiments because of the high cost. So it is that when you talk of the war, Orville Wright will turn away, sad and hurt.

"Although we thought of the military application of the airplane," he told me once at a banquet, "we believed that it would be used in the main for scouting over enemy territory. If planes were to be utilized for warfare, we felt they would bring the fear of war to the very back yards of the warring nations by bringing the actual combat closer to home. In this way we believed the airplane would tend to bring about a lasting peace by creating a terrible fear in the hearts of all peoples."

That same night I walked to his car with him. With us was Griffith Brewer of the British Royal Aeronautical Society and Orville Wright's first English pupil. At the banquet we had seen a motion picture entitled "Conquering the Air."

"Interesting picture, wasn't it?" I queried.

"Very entertaining," replied Mr. Wright.

He turned to his friend, Griffith. "Griff, they've certainly made great progress with the movies since the early days, haven't they?"

"Yes, indeed," Mr. Brewer answered, "and with the airplane, too."

"I wonder," murmured Orville Wright, climbing into his car.

On the nineteenth day of this August the inventor will begin his seventy-first year. His hair is a silver-gray and there are deep wrinkles in his hands and face. When he laughs there are several gold teeth which are very obvious. Quite often he has to lie down to rest. He is troubled with rheumatism. Those seventy years are catching up.

But this aviation pioneer is still active. Almost every day he drives down to his office on North Broadway Street, which is only a stone's throw from the spot where the old bicycle shop was located before it was moved to Henry Ford's Greenfield Village museum. His quarters in this office building are a simple affair and serve as a laboratory for the inventor. What he does here is a secret and only a select few know, although there are many varied guesses. Mostly it's just "puttering around." But his creative mind is still turning out new and useful things.

Last year he made several toys for his late brother Lorin, who was in the toy business before his death. One of these interesting playthings is a toy airplane, which after a short flight releases itself from a wire and descends by a parachute. Another is a tiny doll which is shot out of a small cannon and lands with perfect synchronization atop a trapeze wire. This gadget particularly is indicative of the same precision ingenuity that helped make possible the first airplane. Moreover, Orville Wright has designed small machines for turning these toys out in mass production.

There are mechanical things about his home, too, and in his summer camp at Georgian Bay in Canada where he goes every year there is not even a telephone to keep him in touch with the outside world. In his home, for instance, is a unique phonograph machine which Orville Wright rigged up with an automatic record turner long before the modern juke boxes came into being. It is crude but it works. He also invented an electric toaster which probably was one of the first to come into use. At the camp there are trick windows and doors, even a movable roof on one of the houses.

Many evenings he spends alone reading. For this he has made a special pair of horn-rimmed glasses. There is only a single loop to the frame which hooks over one ear. He reads many scientific journals and is especially interested in foreign books. But, strange as it seems, if you ask him what he thinks about aviation today he will reply: "Truthfully, I'm much too far away from it all."

"We didn't foresee the great planes of today because of the dangers of motor failure at that time," he says. "Nor did we believe that landings at night ever would be possible. . . . It has been said that the airplane evolved because of the progress in motor design, but this is not true."

There are three distinct phases in aviation that account for its rapid growth, he points out: 1. The importance of pioneering in the science of aerodynamics which dictated the design of the first plane and all to follow. 2. The motor and structural improvement and navigation aids. 3. The revival of aerodynamic experiments and their practical application.

"Right now experimenters are seeking to eliminate surface eddies to avoid any slight project that hinders the airflow," he explains. "Even a protruding obstacle of hairline slimness causes a major waste of power." According to Mr. Wright, the future application of this method of eliminating all obstacles from the airflow of the plane will aid in attaining unbelievable speeds. "We didn't worry much about streamlining in the early days," he says with a chuckle. "Our only problem along this line was lying down instead of sitting up against the ocean gales."

He firmly believes that the radio echo device which enables the pilot to determine his actual height from the earth's surface at all times is one of the outstanding aeronautical developments of recent years.

Orville Wright doesn't fly. He has made only a few flights since he was so seriously injured at Fort Myer in 1908 when Lieutenant Selfridge was killed. One of these was in the big Barling bomber in 1925, and the latest was aboard the Douglas DC-4 in 1939 when it was flown around the country on a tour of various cities. Mr. Wright flew in it over Dayton, and when he came down made the remark: "It's a wonderful airplane. I can't believe that there is so much money wrapped up in a plane of this size—more than $2,000,000."

He is splendidly co-operative in civic functions. Once he went out to the municipal airport at Dayton to dedicate the inauguration of TWA's east-west service. He posed for a picture with a pretty hostess and grinned as he told newspapermen: "We always hoped that the airplane would be used as a great commercial transport and help bring the peoples of the world closer together. This is a great step toward that goal."

The inventor has many friends, but only a few are real intimates, these being his neighbors. There are Colonel E. A. Deeds, president of the big National Cash Register Co.; Charles F. Kettering, vice president in charge of General Motors research; former governor of Ohio and the 1920 Democratic presidential candidate, James M. Cox, newspaper owner and publisher; Griffith Brewer and a host of others.

Orville Wright tells this one on Governor Cox. It seems that the governor was toastmaster at a banquet being held in honor of Mr. Wright and related some interesting facts about the early trials at Fort Myer when the Wrights were testing their military airplane built for Uncle Sam.

"I believe I can safely say that I am the only one present here tonight who saw that memorable flight," he said proudly.

A man seated next to him tugged his coat tails. "Governor, I was there."

"Where were you?" came the reply.

"I was in the airplane."

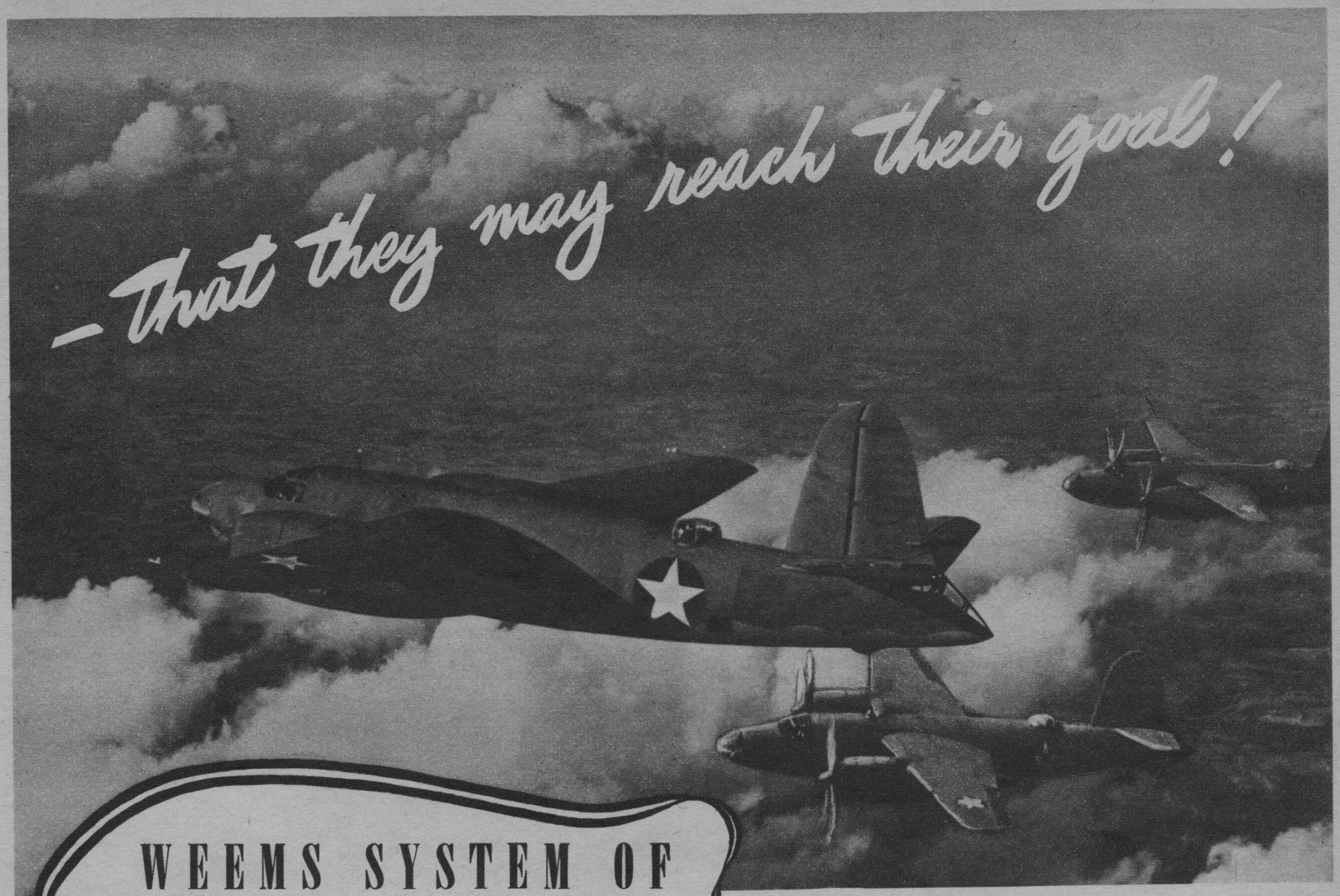
That man was General Folois, one of the first army officers to fly.

"That's the first time I believe I ever saw the governor get flustered," laughs Orville Wright.

Another time, with Big Bill Knudsen (Lieutenant General William S. Knudsen today), while they were inspecting the great Wright engine plant at Cincinnati, Orville Wright remarked: "If we had been able to get one of those powerful engines we'd probably have done a better job." He got a big kick out of the remark. So did everyone else.

But to understand him today you have to go back to the early days of his life. The Wrights lived a simple life and a secluded one. Their father was a United Brethren bishop and a kindly soul. He never forgot to bring his four sons—Orville, Lorin, Reuchlin and Wilbur—some little gift after each day's work was done. One night he came home with a small gyroscopic top and gave it to Orville

(Turn to page 44)



WEEMS SYSTEM OF NAVIGATION

Air Navigators are urgently needed to fly American planes to all corners of the world and to man the Nation's expanding Air Force.

NAVIGATION EQUIPMENT

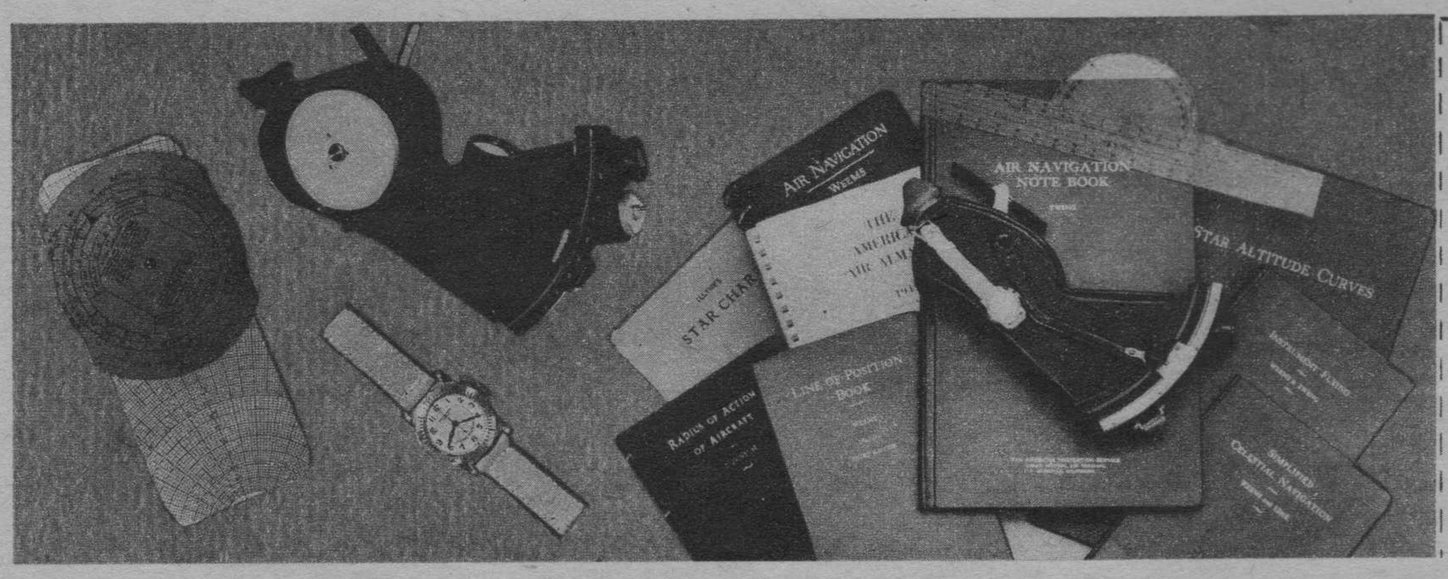
AIR NAVIGATION OUTLINE, Prof. F. W. Keator	$ 2.50
STUDENT PILOTS' TRAINING PRIMER, Col. Hugh J. Knerr	2.00
SIMPLIFIED THEORY OF FLIGHT, Gillmer & Nietsch	2.00
PILOTS' METEOROLOGY, Halpine	2.50
LYON COMPUTER, U. S. Coast & Geodetic Survey Type	3.00
LINK AVERAGING BUBBLE SEXTANT	262.00
AIR NAVIGATION, Weems	5.00
INSTRUMENT FLYING, Weems & Zweng	4.00
RADIUS OF ACTION OF AIRCRAFT, Tornich	3.00
SIMPLIFIED CELESTIAL NAVIGATION, Weems & Link	3.00
LINE OF POSITION BOOK, Weems	2.00
STAR ALTITUDE CURVES, Weems, per 10° Lat. Band	5.00
NAVIGATION NOTE BOOK & PLOTTER, Weems	3.60
AIRCRAFT PLOTTER, MARK II	2.00
WARNER PLOTTER	2.50
ILLYNE STAR CHART, with booklet	1.00
BROWNELL-WEEMS STAR FINDER	5.00
WSN COURSE AND DISTANCE PROTRACTOR	5.00
DALTON COMPUTERS, MARK VII OR E-1A	7.50
SECOND-SETTING WATCHES	$55.00 $60.00 $80.00
SEA AND AIR RESIDENCE AND HOME STUDY COURSES	Various

LEARN all phases of air navigation by studying the Weems System of Navigation which is now used extensively by the United States and other governments, by commercial airlines, and sportsmen pilots.

Prepare now for one of the better positions which will be available in an expanding commercial aviation.

You may avail yourself of the Weems System either through our home study course or through our individual or class instruction which is now provided in the following cities: Annapolis, Baltimore, Boston, Denver, Los Angeles, Miami, New Orleans, New York, Philadelphia, San Diego, San Francisco, Seattle, Springfield, Washington, D. C.

You who wish to further your present knowledge of navigation will find many of the texts and instruments used in the Weems System invaluable and may purchase these separately without necessarily taking the full air navigation course.



WEEMS SYSTEM OF NAVIGATION
AT-6, ANNAPOLIS, MARYLAND

Please send me descriptive literature on navigation course. I am interested in Marine Navigation ☐; in Air Navigation ☐. Enclosed find $..... for which please send to me the following Books or Equipment.

.....

.....

.....

NAME .....

ADDRESS .....

CITY ..... STATE .....

Orville Wright Today

(Continued from page 42)

and Wilbur. There was a little metal propeller on it, and Orville cut himself many times until finally he and Wilbur fashioned a small wooden propeller for the device and found that worked much better. They sold their own toy to neighboring kids. This was the beginning of their mechanical activity. Later they made large kites and became so adept at it that all their chums in the neighborhood came to them to have kites built. They flew their kites from atop Hawthorne Hill in Dayton, and even as youngsters learned many helpful facts about the various wind currents.

Bishop Wright published a small church weekly newspaper. Orville and Wilbur were in charge of the folding and distribution of the papers. Every Friday night they had to work long hours getting the papers ready to be delivered to the members of the congregation. One evening Orville got the idea that it would be easier to design a machine that would fold the papers, and he told Wilbur about it. The older Wilbur (he was sixteen then) saw merit in the idea, and together they invented a folding machine that won recognition from even professional printers who came to their shop to see it.

With a neighboring chum they started a weekly newspaper and a small print shop. The paper was called the *West Side News* and was highly successful until they tried to turn it into a daily, which proved a complete financial failure and caused them to give up the newspaper business for the bicycle trade. The Wrights were both famous for their bike riding in the early days of their careers. Wilbur was an expert stunt rider and thrilled many of his townsfolk at picnics and outdoor gatherings, while Orville went in for speed and entered the many bike races held in various parts of the State, on some occasions matching his prowess against some of the best riders in the country.

Tired of just riding other people's bicycle designs, the Wrights thought they knew enough about the two-wheelers to design one themselves, so they started their bicycle manufacturing and repair business. Two of their models, the Van Cleve and the Wright Flier, became nationally known. Today they are so valuable that Henry Ford—before the war—offered to give anyone a new Ford car for one of the Wright originals.

It was during this period that they became ardent followers of Lilienthal and Chanute, and they read all the data then published about the gliding experiments of both these aviation pioneers. Gliding, they thought, would be an interesting sport. They studied carefully the various methods that had been in use, then devised one of their own which proved highly successful and much better than any of the previous methods. Lilienthal and Chanute had guided and balanced their gliders by moving the operator's body from place to place on the craft as required. The Wrights tried a new system of warping the wings, which probably was the first introduction of the aileron and ultimately led to their success.

After many experiments with gliding they decided they could put a motor on their glider and make it fly under its own power. They wrote to many automobile and motor manufacturers seeking a motor that would develop about "eight brake horsepower with a weight, complete, not exceeding 200 pounds." Unfortunately they didn't find what they desired. However, Orville Wright says today that they could have used some of the engines, but decided that they would rather build one of their own design.

"As a matter of fact," he points out, "once we had solved the aerodynamic principles of flight and had decided upon our methods of control for the airplane, we believed the plane might have flown successfully even with a steam engine."

The most difficult task, according to the inventor, was creating the propellers. Here they ran into many troubles. At first they tried contacting all the boat builders to see if they couldn't design a propeller for the airplane. They found the boat builders had no set formula for their propellers, but had created them by trial and error. This was a good method, but the Wrights went to work on paper and after long and tedious hours that grew into days and weeks of mathematical computations, they evolved the right propeller for their machine. There was a violent argument between them as to whether the first machine was to have one or two propellers. The double-propeller idea won out because they decided, logically, that it would be too hard to offset the torque of a single propeller.

The rest of the story is history. How they went to Kitty Hawk, assembled their flying machine and waited for favorable weather in which to fly it. How they tossed a coin to see who would be first to fly and how Orville won. Then the history-making flight which lasted for twelve seconds and saw the airplane rise off the ground of its own accord and land on a point that was as high as that from which it started. The flight covered forty feet in all, but there were more that day, and in the late afternoon Orville made a flight that lasted fifty-nine seconds and covered approximately 870 feet. Actually this was not the first time they had flown, this day of December 17, 1903; once before Wilbur had piloted the plane and it had risen into the air for about two feet and skimmed along over the ground for several yards distance. But the Wrights never counted this as an actual flight and it is seldom mentioned. It is true, however, and applicable to the records of flight.

If you ask Orville Wright today if making that first flight was the greatest thrill of his life, the answer will surprise you:

"I believe the greatest thrill was lying in bed the night before and thinking about how wonderful it would be when it actually happened."

"I attribute a great part of my 90% average in my Course here at Randolph Field to Building and Flying Model Aircraft"

writes an Instructor in the Air Corps at "The West Point of the Air."

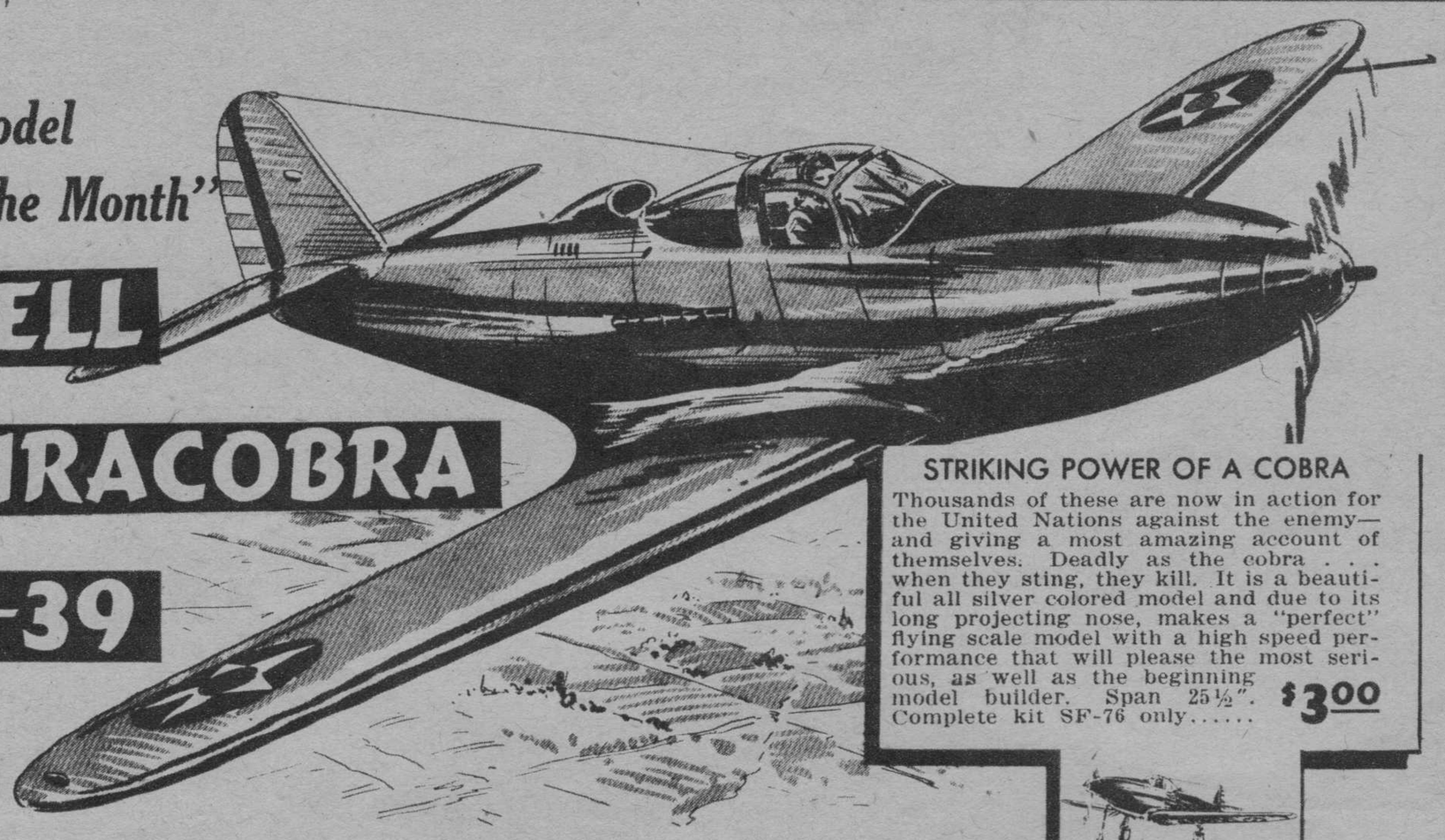
★

Continuing, he says:

"Especially during the time I was studying theory of flight and aero-dynamics did I appreciate the hours I had spent 'doping out' the tricks of one of my 'midgets.'"

"Model of the Month"

BELL AIRACOBRA P-39



STRIKING POWER OF A COBRA

Thousands of these are now in action for the United Nations against the enemy—and giving a most amazing account of themselves. Deadly as the cobra . . . when they sting, they kill. It is a beautiful all silver colored model and due to its long projecting nose, makes a "perfect" flying scale model with a high speed performance that will please the most serious, as well as the beginning model builder. Span 25½". Complete kit SF-76 only..... **$3.00**

That's why we say . . . Get the Most Out of Your Precious Model-building Time by Building

CLEVELAND MODELS

"THE MODELS THE MEN IN THE AIR FORCES BUILD"

Build this Huge 82½" Radio-Controlled Cleveland Gas Model

C-D STINSON RELIANT

It's America's most popular Radio controlled design—has already flown 5 lb. loads, cameras, etc. A large scale job (2 in. to the foot) that builds up and flies like a full size ship. Fuselage has spacious interior for experimental equipment. Wing panels are removable for transporting. Complete Kit GP-66 (except power unit)..... **$12.50**

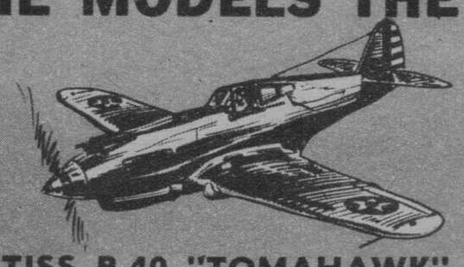
Cleveland's Contest-Winning "Supercharged" PLAYBOYS

★ America's Most Famous Trio of Winners

PLAYBOY SR. Class C Gas. Huge 80" span. Breaking records everywhere. 800 sq. in. Kit GP-5017 (except motor unit)..... **$4.95**

PLAYBOY JR. Class B Gas. Span 54½" (360 sq. in.) Kit GP-5006 (e.m.u.)..... **$2.95**

BABY PLAYBOY Class A Gas. Span 33". Biggest gas value on market. Kit GP-5008 (e.m.u.)..... **$1.00**

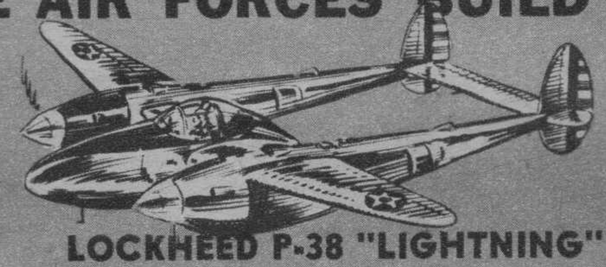


CURTISS P-40 "TOMAHAWK"

The plane the British christened "Tomahawk" because of its deadly swiftness, accuracy and fighting efficiency. Reputed to equal or better the famous English Spitfire. Long, projecting nose makes this 28⅛" authentic scale model a flying beauty. Instructions for camouflaging included. Master Kit SF-77.... **$3.00**

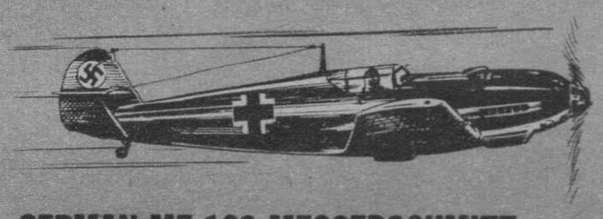
AN AVIATION MILESTONE • C-D • DESIGN

Cleveland's Newly Adopted Emblem for Master Scale Models



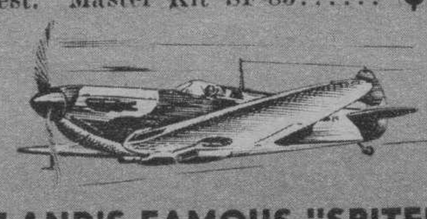
LOCKHEED P-38 "LIGHTNING"

The world's fastest fighter, so fast that you don't hear it, they claim, till it's past you, beautifully modeled. Span 38¾". A super-powered twin motor model that's speedy, realistic and an absolute "must" among model builders who want the newest and best. Master Kit SF-85..... **$4.00**



GERMAN ME-109 MESSERSCHMITT

Sleek 24½" model of the Nazi's mass production fighter. Capable of good, fast flights. Master Kit SF-74.. **$3.00**



ENGLAND'S FAMOUS "SPITFIRE"

This realistic Cleveland model of the famous R. A. F. fighter is the pride of any builder. Beautiful 27⅝" model of England's popular interceptor fighter. Large wing area makes this an excellent flyer. Speedy. Master Kit SF-73..... **$3.00**

★ **GRUMMAN SKYROCKET**

Beautiful 31½" authentic scale model of America's new twin motor 450-mile-per-hour "Terror of the Skies." It's fast. It's spectacular! It's the envy of every model-builder! Both motors pull—and how! Its popularity has been instantaneous, so don't delay building it. Strikingly colored silver and yellow. Master Kit SF-75, only **$3.50** ★

Biggest $1 Model in the U. S.

CLEVELAND CONDOR Soaring Glider. Span 84". Class D or E. Soars for hours. Kit E-5019..... **$1.00**

CLEVELAND EAGLET Soaring Glider. Span 48". Class C. Kit E-5018..... **50c**

ORDERING INSTRUCTIONS

If your dealer can't supply you, send check or money order—cash at your own risk. Minimum order $1.00. Shipments outside U. S. add 10% for U. S. Poss. and foreign bases, Mexico, South America, Canada and England; 20% all other countries. (Remittances must equal U. S. funds.) For P.P. Special Delivery in U. S. only, add 25c. (Ohio residents only, add 3% sales tax.) All kit contents and prices subject to change or cancellation without notice.

DEALERS: We employ no salesmen—take advantage of better values by ordering direct. Be assured of the best model service in the industry today. Send for attractive dealer proposition immediately. (Legitimate dealers only.)

Latest Cleveland Catalog "America's First Line of Models," 5c—None Free

Cleveland Model & Supply Company, Inc.

"High Quality. Reliability. Lightning Service"—Since 1919

4508B51 Lorain Avenue, Cleveland, Ohio, U. S. A.

Reviewing Stand

(Continued from page 6)

with tundra and mastodon bones, the author of this highly entertaining book of adventure and flight takes you with her and her partner to the more or less wild but always different acreage of Alaska. Thanks to a sense of humor, good equipment and a reliable plane (convoyed by a fleet of horseshoes) these two feminine Marco Polos get away with feats that will amaze you. Highlighted with wild tales by sourdoughs, tall tales, and ghost stories—as if the adventures themselves were not enough—it makes highly entertaining reading.

Wings of Defense. By Capt. Burr W. Leyson. (E. P. Dutton & Co., Inc., 300 Fourth Ave., New York City, $2.50.) This book has done an admirable job of presenting the total picture of America's warplanes and their uses. From the author's wide experience and intimate knowledge of aviation he has drawn material to give added interest. The chapters cover such planes as fighters, bombers, naval aircraft and their uses, bombing, paratroops, training, anti-aircraft defenses and civil air defense. The latter chapter will be especially interesting to those interested in defense against air raids.

Clouds, Air and Wind. By Eric Sloane. (The Devin-Adair Co., 23 East 26th St., New York City, $2.50.) Mr. Sloane's work is well known to readers of *Air Trails* through his Anatomy of a Summer Storm, Cloud Chart, and Anatomy of Winter Skies, which have appeared in the past. This book, a collection of similar charts, cloudscapes and brief text, should be entertaining and informative to all interested in meteorolgy and air travel. The many full-page illustrations show various types of aircraft in action amid the various types of cloud formations, making the book doubly interesting.

Needed—Women in Aviation. By Dickey Meyer. (Robert M. McBride & Co., 116 East 16th St., New York City, $2.) With the aviation industry accepting more and more women in its ranks, not only to replace men who have joined the armed forces, but for the excellence of their work, this book should point the way to many would-be recruits. It is written by one who has been familiar with the industry for years and has counseled thousands of the fair sex regarding opportunities in this field. The many chapters and pictures explain the various positions and trades to be found open to women and describe with wit and understanding the things a woman will most want to know.

Aircraft Handbook. By Fred H. Colvin. (McGraw-Hill Book Co., Inc., 330 West 42nd St., New York City, $5.) The title of this book is familiar to thousands of old-time aviation mechanics, for it first appeared in 1917. This, the fifth edition, has been brought up to date and expanded to cover all modern equipment. Designed to aid the engine-maintenance mechanic, the book covers all modern engines, propellers and kindred subjects. A "must" addition to technical libraries and for student mechanics.

Ask Balsa Butch

(Continued from page 31)

When used on wings, they either make a wing lift or tend to depress. Of course, only one is needed on the whole wing. It stands to reason if the left side of the wing goes down the other half will go up. On large planes the trim tabs are needed to compensate for such things as the lessening of weight due to fuel consumption, or the changing of angle of attack of the elevator due to the peculiar flight characteristics of the plane. That is, if a plane flies better with the elevator in a slightly diving (negative) position, and does better landings with the tail positive, the pilot so sets the trimmer tabs.

Peter Shawinsky, Stamford, Conn.—Pete, there are about seven million "favorite" ways to get a high gloss on a model, and here is one of them. After covering, water-dope the ship and let dry thoroughly. Then give it a coat of clear dope. Next, when this is dry, sand the ship with 10/0 wet or dry sandpaper. Give it another coat of dope, sand it again, then still a third coat of clear dope. After still another sanding, apply a coat of color dope, sand down, another coat of color dope, sand down, and finish with a coat of clear lacquer. That gives a shine like nobody's business. Clear lacquer is also called liquid celluloid, and is really a superclear spar varnish. Some modelers go even further, Simonizing the entire ship when the last coat is applied. As to your gas, sometimes gas gets stale, despite the chortles of experts. However, you may have a dusty workshop and in between the times you were looking for gas your motor took in some dust, particularly at the needle valve. Wash the entire assembly with clear gas. Clean the points, and if there is still trouble, take your condenser to your nearest garage and ask the mechanic to check it on his analyzer.

Jack Crum, Raleigh, N. C.—You may obtain the plans (and kit) of the Super B Zomby from Megow, Philadelphia, Pa., for $1.95. There is, as yet, no kit for the C Zomby. Perhaps you could "scale up" the Class B plans.

James M. Cob, Chilhowie, Va.—There are no plans for the 61½"

(Turn to page 48)

DON'T STOP FLYING

ENGINES

Despite increasing constriction of availability, POLK'S reserve stock is proving adequate for needs-to-date! 'A', 'B' or 'C', whatever your preference be, your 'best bet' is to try us first!

Atom	$15.50	Forster '29'	$18.75
Elf Twin	34.50	Tiger Aero	18.50
Rogers '19'	11.00	'O.K.' Tornado	24.00
Rogers RMC-2	9.75	KD-29 (Kit, less coil)	5.95
Rogers '29'	14.00	Cannon 'C'	19.75
Rogers '35'	14.50	Sky Chief	7.95
'O.K.' Twin	45.00	Hurleman	16.50
'O.K.' Special	17.50	Cannon 'B'	18.50
Ohlsson '19'	16.00	'O.K.' DeLuxe	19.50
Ohlsson '23'	18.00	AYA-29 (Kit with coil)	7.95
Ohlsson Spec.	20.00		

REPAIRS—TRADE-INS

Original factory replacement parts for all gas engines. Liberal cash value allowance for present motor (regardless of condition) towards purchase of new one. Bring or mail for generous appraisal. Promptly returned if not 100% delighted.

BACK!

The most famous, respected gas engine of all—back to serve you now, as of yore!

HURLEMAN

By special inducements, we have persuaded the manufacturer to restore regular production! NO PISTON RINGS, weighs 6½ ozs., Bore ⅞", stroke 13/16", Displ. .488 cu. in., Class 'C'. **16.50**

HURLEMAN ACCESSORIES

HURLEMAN TIMER, adj. tung. breaker points $2.50
(Cam for above timer 50c)
SPARK PLUG, 2 pc. measures ⅜" x 24 thd. 50c
LGE. CARBURETOR with 1¼ oz. tank $3.50
MED. Carburetor with ¾ oz. tank $3.00

Wise Buys

REPLACEMENT TANK FOR 1940-41 ATOM $1.00 POST PAID

Transparent plastic with automatic SWIVELTOP Springless Refueler (leakproof) for instantaneous refueling without removing tank. Fits all OLD model ATOMS.

NUTS-in-TECHNICOLOR for A, B & C engines.....ea. 20c
SKYWAY UTILITY KNIFE, all metal, 2 ex. blades.....20c
SPARK PLUG WRENCH for V-, V-2 & V-3, choice.....25c
RITZ Folding Props, Reduces drag, 9", 10" or 11".....$1.00
STRAT-o-CLOCK, Sessions Electric, aero design. 18" prop width $7.95
X-ACTO KNIFE SETS, delicate or heavy duty,.....ea. 50c
Complete, deluxe modellers set, wood chest outfit.....$3.50
WRIGHT-DAYTON CATAPULT plane, redi-bilt, assembly only..20c
SILKSPAN, white,
Gas Model, 24"x36", per sheet 10c
'00' Rubber models, 19"x24" 5c
Minimum mail order 50c

Race Cars

Polk's Pit is center for 'Hot Iron' enthusiasts. Complete stock all leading race cars, parts, accessories, etc. HILLER STARTER $4.50; CENTERPOST $4.00 — visitors always welcome

DOOLING STREAMLINER $29.50

TRADE-INS ACCEPTED

OFFICIAL Identification Models

Scale 1 to 72
BASSWOOD

Consolidated PB24-3	75c	Vought-Sikorsky OS2U-1	20c
Consolidated PBY-5	50c	Douglas TBD-1	20c
Boeing B-17E	50c	Baku Geki Ki-99	20c
Douglas A-20A	35c	Brewster F2A-3	15c
Douglas DC-3	35c	Grumman F4F-4	15c
Heinkel 111	35c	Bell P-39D	15c
Mitsubishi-96	35c	Curtiss P-40E	15c
Wellington	35c	Northrop A-17A	15c
Douglas SB.D-3	20c	Messerschmitt Me-109	15c
Sento Ki-001	15c	Spitfire	15c

BY MAIL add 5c postage for each kit (Minimum mail order 50c!)

Ott-O-Former KITS

22-inch wingspan battleplanes. With famous OTT-O-FORMER Construction makes better, sturdier ships. Saves half the building time. 1/3rd assembly time. Choice of Airabonita, Stuka, Hurricane, Spitfire, Vought-Sikorsky and Curtiss. 15c each (by mail 20c) or all 6, postpaid for $1.00.
By mail: Add 5c postage or 6 for $1 postpaid.

15c EA.

C-Z SOLIDS

Metal Cover, Moulded Fuselages

Startlingly real, detailed down to rivets-in-scale! Kit contains moulded fuselage, die cast parts, metal foil for covering, simplified construction plans.

BOEING Stratoliner (21") $4; REPUBLIC Guardsman (13¼") $2.50; VULTEE Vanguard (13½") $2; CURTISS HAWK (13¼") $2; LOCKHEED P-38 (12") $2; SPARTAN Executive (12⅛") $1.50; CONSOLIDATED PB2A (12") $1; GRUMMAN F4F3 (9½") 75c; BELL P39 Pursuit (10") 75c; NORTHROP A17A (9") 50c; LUSCOMBE SILVAIRE (7½") 50c; FAIRCHILD (9") 50c; RYAN ST3 (7½") 50c.

BY MAIL add 15c postage, 2 or more, 10c ea.

NEW BERKELEY MODELS

30" American Ace & 31" THUNDERBOLT, ea. $1.00

VISIT

The best-known, best-stocked N. Y. C. Model Center.

Planes, Engines, Accessories—it's the center of things! Rarely a need we can't fill, and if you're "stuck" with a model problem—this is the place for friendly, helpful assistance! As noted below, complete catalogs published for each field—get one for your guidance of "what's new"—profusely illustrated!

GAS ENGINE AIRPLANE CATALOG 10c

Latest 'news' of engines, kits, parts, accessories. Fully illustrated. 10c coin or stamps.

MAIL-ORDERS

If you cannot visit the store, your mail orders receive prompt, careful attention to assure satisfaction.

A TIMELY SPECIAL

40" RUBBER POWERED PIONEER

ALL SHEET BALSA FUSELAGE

COMPLETE Including CONTEST RUBBER **$1.95** Regular $2.20 VALUE

Only a limited quantity remain, no more when these are gone! PIONEER, ideal duration model, regular $1.50 if purchased alone! We add 70c in standard items for 1 special $1.95 combination. 50 ft. CONTEST RUBBER, Ball bearing washer and Rubber-lube (10c ea.)

Super Streamlined MONOCOQUE

BURKARD SOLIDS

Famous 'ENGINEERED KITS' with FULL SIZE PLANS and PHOTOGRAPHIC CONSTRUCTION CHART! Super-detailed down to gunners blisters, retractable landing gears, camouflage, etc. Cut to outline shape fuselage, tail surfaces, aluminum cowls (where specified) wheels, liquid, insignias. They're big, they're realistic, they're interesting! **$1.50 EA.**

CHOICE OF 12 FIGHTERS — BOMBERS

RYAN STM-2 18"
GRUMMAN F3F2 15½"
NORTH AMERICAN 20½"
CURTISS HAWK 17¼"
BREWSTER-BERMUDA 17"
MESSERSCHMITT 16¼"
AIRACOBRA XP39 18¼"
STUKA DIVE BOMBER 23"
SUPERMARINE SPITFIRE 18¼"
HAWKER HURRICANE 18¼"
GLOSTER GAUNTLET 16⅜"
BOULTON PAUL DEFIANT 20"

METAL COVERED RYAN

$2.50

Most luxurious kit of its kind! Complete to ingenious tool for recreating rivet detail. Build Army or Navy version (floats included) FULL SIZE BLUE PRINT PLANS.

CAPITOL FLYING MODELS

RYAN STM	32½" long, 48" span	
SPITFIRE	32¼" long, 40" span	
N. A. APACHE MONOCOUPE 90-A	30" long, 48" span	
CURTISS P-40 STINSON GULLWING	28½" long, 48" span	
TAYLORCRAFT	30¾" long, 50" span	

$1.25 By Mail Add 15c postage

NEW FLYING MODELS

Rubber-powered SPITFIRE North Amer APACHE **65c** By mail add 5c

PIPER CUB COUPE GAS

26" long, 40" wingspan. Kit includes semi-planked fuselage, rubber wheels, metal motor mounts, removable motor seat, detachable wings, silkspan covering, balsa leading edge, all accessories. Full size plans. Ideal for ATOM engine. **$1.95**

The PENNANT - WINNING Design featured in a recent issue of AIR TRAILS! 1st at both SKYSCRAPER & TRI-CITY Meets.

BROOKLYN **"DODGER"** **$3.95** Incl. Wheels

Sal Taibi's design innovations in this striking model permits even beginners to build gas-jobs quickly, beautifully! Streamlined, high wing delivers tremendous performance. Complete kit includes Detailed, FULL SIZE PLANS, SILKSPAN COVERING, FINISHED PROP, FINISHED LANDING GEAR, PRINTED WOOD, LIQUIDS, DOPES & CEMENT. $2.95—STREAM-LITE WHEELS $1.00 additional.

WAR TANKS

4 for $1.00 POST PAID

¼" to ½" SCALE

NEW! DETAILED SCALE MODEL

New models, choice of 8 fighter-types: U. S. Williams, Amsco or Liberty; British Whippet, Anzac Hornet, Canadian Vickers, Greek Carden-Loyd (Amphibian), Swiss Reggi-Ansaldo. Semi-finished bodies, cement, color, etc. Any 4 $1.00 (individually 30c ea.)

NEW 128 Page, Illustrated Catalog **25c**

REFUND COUPON in each book, 25c value with 1st purchase, in person or by mail!

NEW! 128 PAGE BOAT BOOK

FEATURES ALL LEADING

KITS FITTINGS ACCESSORIES

25c BOAT KITS WITH SHAPED BALSA HULLS

Very little finishing necessary to complete these fighting ships, faithful in every detail. Clean white, shaped balsa hulls, easy to carve and sand. Colored dopes included. Build a fleet!!!

K7—CRUISER—U. S. S. Indianapolis—Flagship of Scouting Force.
K8—PT-9—Uncle Sam's famous 'SUICIDE BOAT'—deadly speedster.
K9—DESTROYER—U. S. S. Gridley, famed 'lightly armored' TINCAN.
K10—BATTLESHIP—U. S. S. TEXAS. Formerly Fleet's Flagship.
K11—AIRCRAFT CARRIER—U. S. S. SARATOGA, converted battle cruiser.
K12—SUBMARINE—U. S. S. PERCH. Authentic model of deep sea raider.

National WHOLESALE Service

SAVE BY CONSOLIDATING ORDERS!

Polk's is a central supply source for Engines, Planes, Trains, Ships, Cars. Consolidating orders results in substantial shipping economies! First such experience will convince you! Prompt shipments from adequate stocks. Top Factory discount schedule. WHAT DO YOU NEED? Inquire on letterhead.

POLK'S MODEL CRAFT HOBBIES

DEPT. AT-6 **429 7th Avenue, New York, N. Y.**

Diagonally Opposite Pennsylvania and L. I. Station

Ask Balsa Butch

(Continued from page 46)

Zomby, as far as we know. You might enlarge the plans for the 44-inch job, which is put out in kit form by Megow, Philadelphia, Pa.

Sidney Miller, Kingsport, Tenn.—You might write to Aircraft Plan Co., Box 115, Steinway Ave. Station, Long Island City, N. Y. They may have the plans for the ships you list.

Jack Schneller, Fort Worth, Tex.—The only concern making and marketing a Class B amphibian kit (as far as we know) is Burkard Model Engineering Co., 3079 Third Ave., New York. Write them and ask for details.

Francis Bivens, Lenox, Ia.—Fran, we sympathize with you. A lot of our first models didn't fly, either. However, we found a few secrets which made our ships hit for the blue sky, and they were so simple we laughed at ourselves. In the first place, you can learn more principles of flight from an ordinary glider than any built-up ship. Build not one but several of them. Study their characteristics, and you'll learn more about the big ships you have built or are building. First, however, get this straight. Just about the hardest ships to fly are scale models. Those beautiful North Americans which look so swell are distinctly *not* good fliers in the real flying sense. They flutter around, and maybe glide a bit, but ordinarily they are poor performers. Pick a contest ship—a Korda type, for example. Follow the designs in this and you'll get better results. Models should balance at a point one third of the distance back of the leading edge of the wing. That is, if the wing has a 6-inch chord (depth from leading to trailing edge) the ship should balance at a point 2 inches back from the leading edge. The wings should be balanced. Hold the wing on your finger and check to see that it is not heavier on one side. Bill Winter's book, "Model Aircraft Handbook," would answer most of your questions. The rest is just experimentation. Don't make your ships too heavy, and don't expect rubber models to take off like a big ship. Most of them have to be hand-launched.

R. E. W., Detroit, Mich.—For information on the Rogers motors, we suggest you write direct to Rogers Motor Co., Philadelphia, Pa. We have never heard of a Rogers P-40, but recent Rogers ads have noted that a "big motor" will shortly be marketed. Write them and ask about it.

Martin Bernard, Bronx, N. Y.—Class A motors are few and far between, these days. However, we believe one of the new Super-Atoms is readily obtainable. We might also recommend a Marvin. Either one will fit the ship very well. As for second-hand motors—well, there just aren't any in the small-engine field. You might shop around among your friends, or inquire at Polk's in New York City.

Harold Lowe, Bloomsburg, Pa.—For information on microfilm, write Model Research Lab., 3531 North Western Ave., Chicago, Ill., or Junior Aeronautical Supply Co., 100 E. 10th St., New York City. They'll give you the answers.

Howard Buehler, Belleville, Ill.—You can easily compute the cost of building the Vultee Vengeance. Look over the plan, estimate the amount of material you will need, and check with any one of the many supply advertisements.

Roger Newton, Conrad, Ia.—Perhaps the first thing you had better get is some experience on gas motors and models, and no kidding. Honestly, we advise your study of mags a long time, absorbing the lore of the hobby, then when you feel you've absorbed enough, consult the ads in Air Trails. Don't pick a superstreamlined or involved ship for your first attempt; rather, take a boxlike type. Get a good, substantial motor in the ten or twelve-dollar class. Study your ship carefully, your motor carefully, and consult a good builder for information regarding first flights. Best of luck to you when you get rolling.

Home-made Wind Tunnel

(Continued from page 39)

file to a radius of 1/4" centered on the drilled holes. Two ferrules are soldered on each end of the link as shown in Detail A. A 3/32" wire should be threaded through the ferrules when soldering to assure proper alignment.

The top bar of the drag tee is made exactly like the drag link. The vertical bar is also similar to the drag link, except that the top of the bar is left square. The vertical bar is soldered to the middle of the top bar at right angles to it as shown. Drill a 3/32" hole through both bars at the intersection of their centerlines. Drill a 3/32" hole on the centerline of the vertical bar 5.00" below the first hole. Drill a 3/32" hole on the centerline of the right arm of the top bar 2.50" from the first hole. Solder two ferrules on each end of the vertical bar as shown in Detail A. Make a balance pan hook for the third hole as shown by the detail. The washers should be soldered on the 1/16" wire hook to give about 1/32" of end play over the thickness of the bar.

The drag link and drag tee are supported by two wire brackets. One end of the wire is a force fit into the drilled holes on the top of vertical board base. The other end of each bracket fits around a wood screw. One washer is soldered on each bracket to bear up against the wood and hold the wire in position. Two other washers are soldered on each bracket to locate the drag link and drag tee 1" away from the wood. The distance between the washers should allow the top bearings of the drag link and the drag tee 1/32" of end play. Use the largest size of wire for the brackets that will give a free, frictionless fit in the bearing ferrules.

The drag channel is made from light gauge tin as obtained from a five-gallon oil can. It is made 3/4" high, 3/4" wide, and 4 1/2" long. Two holes 7/64" in diameter are drilled in each side 1/2" from the back of the channel and 4.00" apart. To drill them opposite, locate the holes on a line at each end that is scribed around the three sides of the channel with the aid of a square. Solder a bearing ferrule in each hole with the flanges toward each other as shown in Detail B. The distance between flanges should be 1/32" more than the width of the bottom bearings on the drag link and the drag tee. Have a 3/32" wire through opposite ferrules when soldering them to keep them lined up. Solder a 1/16" wire pointer on the rear side of the drag channel as shown so that the vertical end is about 1/16" in front of the balance swing scale. The swing scale is a piece of heavy drawing paper about 1" square with vertical lines 1/8" apart drawn as illustrated. It is glued to the vertical board to show when the forces on the drag channel have been balanced. With lines marked as shown, it is easy to tell when the channel is in balance and swinging an equal distance each side of center.

The vertical drag spindle is a piece of steel bar 1/16" thick, 1/2" wide, and 8 3/4" long. It is bolted to the middle of the outside leg of the drag channel by four small model bolts. A piece of tin 1/2" wide and 1 1/2" long is bent as shown and soldered to the bottom of the spindle to give a tight-slip fit over the 1/8" diameter wire that extends 6" forward to support the models being tested. If the drag spindle is not inclosed in a streamlined housing, it should be filed to a streamlined cross section as shown in one of the detail sections.

The basic part of the streamlined housing is a metal channel 3/4" wide, 3 1/2" deep, and 9" high, with two 3/4" legs on top bent over at an angle of 90°. After slipping the channel into the rectangular hole in the horizontal base and attaching it with wood screws to the base, the bottom of the channel is plugged with a piece of wood 3/4" wide, 1" high, and 3" long with its bottom end rounded off to form a cylindrical surface 3/4" in diameter. The nose piece is shaped to a streamlined form from a wood block 3/4" thick, 1" wide, and 8" long. The bottom of the nose piece has a vertical slot 3/8" wide by 1" high (channel has similar slot) for the 1/8" wire which projects forward through the slot to support the test models. The tail piece completes the streamline form and is made from a block of wood 3/4" thick, 2 1/2" wide, and 8" long. The bottom of the nose piece and tail piece are rounded off to streamline into the bottom piece of wood. Use wood screws to attach the nose, tail and bottom pieces to the channel. The tail piece should be easily removable.

A counterbalance hook is soldered on the top of the drag tee as shown. Make it of 1/16" wire.

The drag pan is made of a light gauge angle 1 x 1 x 3", a light tin pan about 1 1/2" in diameter and 1/2" deep, and some 1/16" wire bent as shown and soldered to the pan and the angle.

When completed, the balance must oscillate freely when in balance. Any friction caused by pressure on the ends of any bearing, by any tight-fitting bearing, or by poor alignment and binding of any bearing must be corrected by reworking or by making new parts.

MOVABLE WEIGHTS FOR BALANCES

Make sixteen plain 1-ounce weights; a 1/4, 1/2, and a 1-ounce movable-type weight; a 1/4, 1/2, and a 1-ounce fixed-type weight.

Length of Cold Rolled Steel Stock Weighing One Ounce

Size	Rd.	Sq.	Size	Length
1/4"	2.49"	3.52"	1/4 x 1/2"	1.76"
5/16"	2.88"	2.26"	1/2 x 1/2"	0.38"
3/8"	1.99"	1.57"	1/2 x 3/4"	0.585"
1/2"	1.12"	0.88"	1/2 x 1"	0.441"
5/8"	0.72"	0.565"	1 x 1"	0.22"
3/4"	0.50"	0.392"		
1"	0.28"	0.22"		

Stretch That Rubber

(Continued from page 30)

flights—it is a good idea to make a few test flights the day before the next contest to sort of loosen up the motor in order to get top efficiency from it the next day. Never put your rubber into your ship at home and transport it for any *long* distance to a contest. It will be exposed to too much grit, sunlight and heat on the way. Rather, carry it in a can and install just before flying. *Always* carry an extra motor and never take a chance on one that becomes full of cuts or grit; change it and save the cut one for repairing when you get home.

To repair a cut motor, first wash it free of all lube and grit in warm water; then tie each cut together with two knots which should be pulled close together. Then wrap thread *between* the knots and *around* the *outside* knot; do this with two separate pieces of thread. If done properly, this knot will not come loose even if wound to capacity.

This method of repairing rubber was used as far back as 1939 when all the new rubber I took to the Wakefield event was shearing, but these motors all were held on a doorknob when they broke, so the only damage done was to Frank Zaic's beauty rest. Frank was sleeping in an easy-chair and the only convenient doorknob was about two feet from his nose. After the third motor broke, he partially woke up and murmured something about getting good rubber at Jasco.

The forty-three-minute flight was made with an old motor with a *dozen* thread-tied knots in it.

One other weak spot that rubber has is its tendency to lose power and get weak when wound to capacity too soon during breaking in or during very hot weather at a contest. Then is when an extra motor may mean the difference between winning and losing.

After summing up the whole situation as it stands, the most likely answer is that the next summer and especially the summer of 1943 will see models drop to the 100-150 square inch variety. These smaller models use only one third to one half the rubber required of the bigger 200 to 300-inch planes, and will not fly out of sight so easily under the new weight rules.

Another step in preserving rubber is the use of a dethermalizer to bring the plane down out of a thermal when it is headed for an out-of-sight flight.

It's hard to describe the kind of feeling a builder gets when he follows his plane several miles and knows it is well out of the timer's sight, and yet refuses to land and is usually lost for good. But it sure is a swell feeling to have the dethermalizer kick in and bring both plane and rubber to earth.

Axis Bombers—U. S. Bound!

(Continued from page 19)

The Focke-Wulf Kurier is an example of the conversion from transport to bomber. The newest version, the FW-200K2, is said to be somewhat longer-winded than the FW-200K that gained note through the long-distance raiding of American and British convoys in the Atlantic. The FW-200K had a wing span of 108.3 feet, was 78.2 feet long, and carried a 6,000-pound bomb load. The ship was powered by four 1,000 h. p. B. M. W. radial motors that afforded a 265-mile-per-hour top speed. The new modification may be slightly faster. Depending on the load, range is from 1,180 to 3,490 miles.

The Heinkel He. 116 is a four-motored, long-range plane of which little is known. No data are available. Heinkel's other four-motored bomber, the He. 177, is not so secret. The ship is 103 feet in wing span and is 74 feet long. Gross weight is approximately 45,000 pounds, which should afford a generous bomb and fuel load. It is powered by four 1,325 h. p. Daimler-Benz engines, has a top speed of 340 m. p. h. and a service ceiling of 36,000 feet. Its range with reduced bomb load is about 3,500 miles, contrary to earlier reports.

The Blohm & Voss 142K is a military conversion of the BV-142 troop transport that has been widely used—and abused by the Red airmen—on the Russian front. This heavy bomber has a wing span of 97 feet and is 63.11 feet long with a gross weight of 35,993 pounds. Powered by four 880 h. p. B. M. W. radial motors, it has a top speed of 248 m. p. h. and a 2,732-mile range with full war load. With reduced bomb load, it should have a range of almost 3,300 miles. Crew: six men.

The Nazi bombers are notable for the clever design which permits excellent load disposibility. It is fairly certain that, in the cases of all six of these mentioned bombers, the range can be extended at the expense of bomb load. Four other landplane bombers may be available in quantity. These are the Italian Piaggio P-23R, Savoia-Marchetti SM-82, and Cant Z-1007 and the Vichy French Bloch 162-B5.

The Piaggio bomber has a wing span of 95.1 feet and is 77.1 feet in length. Its gross weight is 42,345 pounds and useful load 15,435 pounds. The three 1,000 h. p. Piaggio radial motors afford a 272-mile-per-hour top speed and a range of 2,360 miles. Its ceiling is 23,626 feet and a crew of five is accommodated.

The Cant Z-1007 is also powered by three 1,000 h. p. Piaggio radials and has a speed of 280 m. p. h., a service ceiling of 31,000 feet, and a 3,100-mile range. The ship's gross weight is 28,260 pounds and its useful load, including a five-man crew, is 9,260 pounds.

The better known Savoia-Marchetti 82 is slower and shorter-winded, having a speed of 230 m. p. h. and a range of 2,480 miles. It has a wing span of 97.6 feet and is 73.6 feet long with a gross weight of 38,000 pounds and a useful load of 16,000 pounds. With three Ala Romeo 950 h. p. radial motors, the monoplane carries a generous bomb load and a crew of six.

How might these craft be used to bomb us? Let's look at the distances. From Nazi-held Brest to New York, it is 3,425 miles flying a great-circle course; the distance from Brest to Boston is some 200 miles shorter. According to the figures of the bomber ranges, which are believed to be reasonably accurate, New York and Southern points are within the range of three German craft which are known to be in large-scale production. The Heinkel He. 116 may or may not be capable of the trip. The Junkers Ju. 96 and Blohm & Voss 142 ships could make it to Boston, possibly to New York with reduced bomb load.

What would happen once these craft reached and bombed our Northern Atlantic cities? Such raids might be one-way-ticket affairs; this method would prove expensive in planes and flying crews, and whether they could do damage commensurate with loss of men and machines is conjectural. This, mistakenly, has been referred to as a "suicide method" because the planes would be out of fuel by the time they had reached and finished bombing their objectives. It is no such thing, although it would mean the loss of the planes which are mighty valuable to Adolf just now. The majority of the venturesome Axis airmen—those who survived our interceptors and antiaircraft—would simply make forced landings on the flat country of Long Island or New Jersey, and, if surrounded, step out of the cabins of their planes with hands upraised in surrender. Under international law—which we Americans practice more conscientiously than the Axis gangsters—the flight crews would be treated as prisoners of war and interned with perhaps more comforts than were available where they came from.

According to reliable reports, however, the one-way, one-punch raids may not be the method of attack, for the very good reason that a means might have been found whereby the planes can make the round trip. This wrinkle is strategically probable and tactically sound, and it has almost revolutionary implications for the Allies as well as the Axis. As is now well known, Germany has been building very large gliders in quantity for some time. One of these types is known to have been adapted to carry large fuel tanks instead of armed troops—it is, literally, an aërial tank car. (Our air forces have a similar tank glider under development at Wright Field, and Russia is known to have tested a craft of this sort.) The German tank glider is said to be almost as large as a four-motored bomber; it would have to be, since the highest efficient wing loading for a glider of this design would be about eleven pounds per square foot.

Such a glider could conceivably

carry as much as 1,900 gallons of fuel and oil; this amount, in addition to that already carried in the bomber's tanks, would be sufficient for the round trip with enough to spare for some margin of safety. The tank glider is, of course, towed by a cable and there is also a hose running between the bomber and the glider's tank outlets through which the required fuel or oil may be pumped into the bomber's tanks. The tactics to be followed in a raid of this sort would probably be for the bomber to draw fuel from the tank glider periodically—as its own supply diminished 100 gallons or so—so that by the time that the American coast was being approached, the glider would be emptied and the bomber's tanks full. The now-useless glider could be cut away and dropped, and the bomber could go on unhampered and free to maneuver to drop its bombs and reach occupied France.

It has been said that only sporadic raids could be carried out against the U. S. because of the great distance, and this is true except for this glider method. The tank glider attack could be conducted by large numbers of craft, and operations could be sustained sufficiently to do any amount of damage to life, industry and private property.

There are other ways in which the U. S. coasts can be attacked. One of the most probable methods is the use of the Axis' long-range flying boats such as the Blohm & Voss 139, Dornier 24, Dornier 18K and 26, or the Cant Z-508. Craft such as these might take off from a French, Spanish, or Portuguese coastal port and make rendezvous with one or two refueling vessels or submarines waiting at strategic spots along the way. Such spots might be a remote inlet of the Azores, the Bahamas, or other West Indies isles; or, taking the northern route, along the rough coasts of Greenland, Labrador, or on one of the many lakes in northern Quebec province. The flying boats could refuel on the way over and on the way back. Of course, this method of attack is dependent upon the element of surprise and good fortune, and sustained operations could hardly be carried out.

Of these boats, the military version Dornier Do.26 is capable of flying a longer distance nonstop than any of the others, or even any known Axis land-plane bombers. The ship has a 5,600-mile range, has a useful load of 21,590 pounds, and a gross weight of 44,040 pounds. The wing span is 98.6 feet and the overall length 80.6 feet. Powered by four Junkers Jumo 600 h. p. motors, the plane carries a five-man crew at a top speed of 208 m. p. h. The gull-wing boat should accommodate a bomb load of several tons.

The Dornier 18K is smaller and slower, but has a generous range. Powered by two 600 h. p. Junkers Jumo motors, it has a top speed of but 161 m. p. h., but the range is 3,220 miles. A newer model, the Do.18K2, uses two 850 h. p. B. M. W. radial engines and is probably faster.

The Blohm & Voss 139 B is powered by four 510 h. p. Junkers Jumo motors, has a 202-mile-per-hour top speed, and a range of 3,230 miles. Wing span is 96.9 feet and length is 64.6 feet. The ship's gross weight is 38,610 pounds.

In addition to the overwater flights with stops for fuel, these boats could be used for another method of attack. Catapult ships have been in use by the Nazis for several years; they reportedly have five in operation now, but there may be more plus converted vessels that can be used for this purpose. The vessels that launched the famous *Nordwind* and *Nordmeer* can accommodate planes weighing 40,000 pounds or more. Ships of this sort could release their deadly brood 200 miles or so from the coast, and those successful in getting through our protective screen of air and naval craft could carry sufficient war load to do damage aplenty.

There is the probability of attack launched from aircraft carriers. This method, too, would depend upon surprise and elusiveness in order to escape detection, but it might well be carried out successfully under cover of darkness. Germany is known to have available at least two heavily armed carriers capable of handling from forty to sixty planes. The Japs have at least eight—two have been sunk at this writing—carriers, several converted merchantmen-carriers, and several seaplane tenders and carriers. The Nazis would probably employ the fast Junkers Ju.88 Stukas, if they could be adapted for off-deck operations, which should not be difficult.

The one method of attack that is improbable, but within the realm of possibility, is that delivered by small seaplanes that are stowed aboard submarines. Under concealment of darkness, subs could sneak up to within a mile or two of the coastal cities to release their charges. The limitations are that of a plane small enough to be borne by even the largest sub cannot carry much war load. A whole flotilla of plane-carrying subs would be necessary if the raids were to be worth the risk and effort.

Perhaps the most risky method, but one of the best, is the outright seizure and occupation of insular bases or Latin American territories which could be used—temporarily, of course—as bases of operation against the U. S. in general and the Panama Canal and Atlantic seaboard in particular. It is technically and strategically possible for an Axis "commando" force to establish itself and move in the necessary supplies, et cetera, by air transport with long-range flying boats. Such a force would, we hope, be smoked out within a week or two, if not sooner, but within this time the base might be kept in operation, at least in part—meaning an airdrome from which heavily laden bombers could be launched.

Whatever the method of attack, success will depend upon our defenses and our people's reaction and the material damage to our war effort that can be accomplished. Our defenses are far from being airtight, as the air forces and naval air service men are the first to admit. But our planes, pilots, and antiaircraft quality makes up what is lacking in the way of quantity. To what *extent* they make up for this discrepancy will determine for Adolf whether it will be too expensive for his Luftwaffe.

Ersatz Model

(Continued from page 28)

with paper gussets. Pine or bass stringers, longerons, and spars, reduced to slightly more than half the cross section of the balsa parts they replace, have adequate strength except for a greater tendency to sag between points of reinforcement. This can be easily remedied by more closely spacing ribs and crosspieces.

By endeavoring to utilize ordinary materials instead of always relying on those which have been developed or imported especially for model airplane construction, we can make the hobby more interesting and even more instructive. Advanced modelers will find the design and construction of a nonbalsa model to be a challenge to their ability, and will also bring about a fuller appreciation of some of the problems which concern the designers of real aircraft.

The Dope Can

(Continued from page 40)

this background it's reasonable to expect a successful model 'giro. Hernandez has promised to publicize his work in Air Trails just as soon as the bugs are removed. There are three respectable indoor autogiro records of several minutes each. Outdoor rubber-power 'giro records are crummy—27, 11 and 4 seconds. There are no gas-powered records, so the first successful gas 'giro will make model history.

The last gas contest at Hampton (Virginia) was the sixth consecutive event won by Curt Martin. His average ratio (total flight to engine run) of 19.4 to 1 was unusually high. Motor run was limited to 10 seconds, and no ships were lost. Corser and Parmenter spread their ships over the field in a high-speed midair collision with both engines wide open. The club has been flying indoors in a glorified match box with a thirty-by-fifty foot floor space and a twenty-foot ceiling. Even so they're doing well over seven minutes, with Dick Everett, Hewitt Phillips, and Dave Call battling for first. Modelers at the NACA are making gas models for coast artillery targets. Extra-large tanks will be used to keep the Ohlsson 60 turning in long flights—bringing back the memory of the unlimited fuel days in the early '30s.

Assembly-line production methods for making 5,000 (half of the State's quota) models for military identification purposes is the goal of the Minneapolis Model Aero Club. Public-spirited citizens provide the material, school-age boys do the work under supervision of qualified adults. Schedule provides for two weekday shifts of 4 to 6 p. m. and 6:30 to 9 p. m.; Saturday's shifts are 9 to 12 a. m. and 1 to 5 p. m. Workers punch clocks, wear identification badges, and are graded on efficiency and ability with promotions to more responsible jobs based on these marks. Work is broken down into layout, cutting, shaping, assembly and finishing, and inspection. It will be interesting to follow the quantity of work turned out by this program.

The boys in Forrest City, Arkansas, fly box kites when the wind is too rowdy for models. Their designs have about 900 square inches area with No. 8 thread for a line. Modelers shouldn't be too dignified to try their hand at this sport. You can always launch a glider from a kite if straight flying proves too dull. But above all, make sure you're away from all military and civil airways before you fill the air with high-flying kites.

1941 marked a revival of model building in Ireland. Activities had been rather haphazard, with no organized control. The first Irish National Model Aeroplane Contest was held in 1941. It's scheduled again for 1942. Much of the model activity originates in the Dublin Model Flying Club, Dublin Aero Modellers Club, Irish Junior Aviation Club, Ulster Model Aeroplane Club, and the National Agricultural and Industrial Developments Association. From all signs, 1942 should be even better for model aviation in Eire, with greatly improved design and performance.

Tri-State Association Model Airplane Clubs (western Pennsylvania, West Virginia and Ohio) start the 1942 season with a chip on their shoulder. The association is determined to use the 1941 rules intact except for a reduced motor run of 15 seconds in the gas events. They'll have none of the 3-minute maximum-flight idea even if they're tossed out of the Academy. They hold that pure duration is the greatest factor of advancement in model aviation, and that model fliers shall make the changes in the rules in person. And so the rat race goes on—proving that no rules please all the modelers any of the time.

Balsa being scarce, it's more than likely new model builders will grow up as they did twenty years ago—on a diet of hardwood exclusively. . . . Another bouncing Baby Buzzard Bombshell is the one George H. Loeb, Jr., of Norfolk built from his AT kit. The BBB is an exceptional model—large or small scale. . . . With only a 6-second motor run, Emmitt Sherron of Raleigh, N. C., logged a 42-minute flight with his Ohlsson-powered Sailplane early in March. (He lost the model.) . . . Jim Braddy of Hampton (Virginia) now refers to rubber as "flexible gold." More flights on fewer motors should be the goal of all rubber modelers. . . . Don't forget to give Defense Stamps instead of cash at all contests this season. . . . Note from Ray J. Embick, Jr., of Lebanon, Pennsylvania: "We haven't been chased off the Indiantown Gap Military Reservation, but fly there Wednesday evenings and Sunday afternoons. Your information in the April issue was incorrect."

CLASSIFIED DIRECTORY

Boyd Anderson and Leo Koenig organized the Greeley (Colorado) Propbusters last September. All the members are experienced fliers. The problem is to get new members as fast as the army takes the old ones. Winters are long and cold, and the club did its winter flying on a nearby lake. Koenig's address is 1206 7th St., Greeley, Colorado.

The second Annual Northwest Ohio Model Aviation Meet is set for May 17th at the Telegraph Airport north of Toledo. Five events will be Class A, B and C gas; flying and solid scale. The Toledo chapter of the AMA is sponsoring the meet. More than seventy-five prizes will be awarded.

Chicago leads the nation with twenty recognized records. Philadelphia boys have only ten—all indoor records. A newcomer is Oakland, California, with eleven—six of which are hydro records. Individual record-holding honors belong to Paul MacCready, Jr., of New Haven, Connecticut. He holds six junior records. Proof that he is a capable builder was his performance at the 1941 National meet. Flying in the junior division, he won firsts in the flying scale and outdoor stick, third in indoor cabin, eighth in outdoor.

Warren Finch is the covering genius of Rapid City, South Dakota. Albert Hansle is the one-blade prop specialist (gas and rubber models) and stunt king. (His Cloudster did ten consecutive loops for a local record.) Robert Johnson is the glider and scale-model authority. Blaine Nash specializes in bad luck. He wrecked a Baby Cyclone when his Red Zephyr piled into a hangar. He rebuilt the model and promptly tried to fly it between the cab and body of a dump truck. Eventually the model did some good for itself with a 10-minute flight during a rain on 30 seconds' engine run.

Tether flying should stimulate speed contests. National records should include this category. Contest results we've heard about indicate speeds about 60 m. p. h. for Class C —about 35 for Class B with Class A a few miles per hour lower. Stories of 100 m. p. h. speeds are hard to believe. Seattle Guide Liners have been holding regular contests.

In England, R. T. P. (Round The Pole) flying is popular. All types from indoor microfilm jobs to Wakefield designs are flown round the pole. The model is anchored with a single line—there's no elevator control as in most of the tether flying done in this country.

The San Diego Aeroneers held a gas contest recently on Kearny Mesa, in which top honors were taken by Dennis Davis, with a total of 21:34. His ship, a Comet Sailplane with an Ohlsson 60, was easily the top performer of the day. Bill Noonan was first in the A-B Class, using a ship of his own design powered by a Forster 29. Whitey Glines won the Flying Macs trophy for the highest score attained in six months of model competition. Davis, who was our reporter for the meet, reports that his Class B (Phantom P-30) ship of 54" span was lost at the contest after doing over an hour on a 15-second engine run.

The Nightmare

(Continued from page 32)

Rubber bands and small model-making pins will help to hold them till dry. Little difficulty should be encountered if the balsa planking is rather soft.

Put in 1/16" square canopy framing strips. Finish covering this upper structure with 1/16" x 1/2" planking. Cut out rear windows. Carve a pilot from balsa or soap and color realistically. Install seat back, instrument panel, throttle, overturning structure, and head pad. The cockpit interior, as well as the whole plane, is painted black on Dale's model. Paint your model to suit your own taste.

Begin lower fuselage construction by cutting out the two 1/16" main side pieces. Cut them at least 1/16" to 1/8" longer than shown in the side view. To be perfectly accurate, bend a strip around the contour of the side piece in the *top view*. Mark the position of Former No. 1, No. 11, and the end point. This gives you the true length to use in laying the piece out on the balsa sheet. The lower line of this piece was made straight from No. 1 to No. 11 to simplify layout.

Cut the 3/16" square crosspieces which brace the top of the side piece. Pin the two side pieces on edge over the top view. Glue and pin the 3/16" square crosspieces into position. Mark all lower formers as to how deep they fit between the side pieces. Before these dry thoroughly, place this partial assembly in position to insert the bottom keel. Use small model-making pins to secure till dry. Before laying this aside, check the structure for proper alignment.

Remove structure from over the top view and glue in plywood firewall and bulkhead, No. 1 and No. 2. Before inserting these last two pieces don't forget to drill one hole for the three wires, the ignition, breaker-points, and ground-wire leads; also, another hole for the gas-intake pipe. Pin bulkheads securely and apply glue generously. When dry, slide in engine bearers and add gussets. Bend wire landing struts as per drawing. Bend copper or tin holding plates and drill for small bolts. Install the 1/4" flat pieces which are grooved to strengthen the landing gear and also act as a seat for the bell crank.

Put in the battery tray, coil, condenser, timer, switch, and boosters. Brackets, bolts, and glue secure these solidly. Experience has shown that a simple booster made by soldering the wires to two short bolts stuck through at right angles to the fuselage side piece is best. Clamps are used to connect the booster to these bolts. They have been found to make a better contact than any other method. Glue and pin in place the 1/8" plywood seat for the bell crank. Use a wood screw to hold the bell crank.

Carve and sand the horizontal stabilizer to shape. Install the strip leading edge in the elevator. Glue in place the control mast. Assemble the two parts, using the cloth hinges as shown. Fit this unit to the lower side of the fuselage side pieces, and glue solidly in place. Pierce the fuselage side at the position shown near the rear and insert the piano-wire control rod. Drill the side of the fuselage for the control cords and strengthen them with a plate or preferably a grommet or a regular shoelace eyelet.

Complete planking the entire fuselage with 1/16 x 1/2" planks except between Bulkheads No. 1 and 2 around the upper section. Do not cover this till after engine is installed. Only two sheets should be used here, from the side up to the upper keel, on each side. Alternate the remaining planking, first on one side and then on the other to keep the fuselage from warping. Notch or pierce planks where the landing gear protrudes. Carefully fill in any holes around this point. Slip a washer on the landing-gear wire and glue to planking. This will help to keep the balsa from tearing during a hard

landing. It is advisable to cut a small door between Bulkheads No. 1 and No. 2, have the upper side removable, or install the engine, gas tank, and supercharger before covering with sheet.

Bolt the engine lightly in place until the cowling is carved. This may be carved in two pieces, the upper and lower half; or in three pieces, the bottom made from two blocks glued together, and the upper half made from one block. Cut the lower-half blocks wide enough to include material from which to carve the louvers to let out the hot air. Efficient circulation is very necessary to a high-speed racer. Cut the blocks to side and top view; use a template for the circular front, and the shape of the firewall for the rear template. Leave the block flat at the point where the front cooling aperture is to be cut. This does not look streamlined while carving, but looks swell when finished, giving a perfectly contoured side view without the cupping appearance often seen.

Hollow out with a cupped chisel or carving tool. Make cut-outs for timer arm and drain, and test-fit over engine. Sand smooth, dope, install pegs to attach upper half, and glue dress snaps in place. These latter are best secured by roughing the surface slightly, covering with one coat of glue, leaving until fairly dry, and then gluing in place with a generous coat.

Bolt the engine solidly to the mounts. Solder up a rectangular gas tank (to increase capacity), including some simple L mounting brackets, and bolt to Bulkheads No. 1 and No. 2. Use an oilproof rubber intake tube bent to the right inside of the tank. Solder in place the leads to the ground and breaker points.

Carve and install the lower tail block. The upper tail block is made in three pieces, the center $^3/_{16}$" flat piece which is also the fin, and the two blocks on each side which are carved to fillet the fin into the fuselage. Cut the rudder loose, hinge with sheet metal, and glue the whole joint solid again. Adjust by bending and breathing on joint. Streamline the *upper* fin before gluing into position on the fuselage. Leave the base rectangular where it fits between the two side blocks. Carve out notch in rudder to clear elevator strip. When these three pieces are glued securely and dry, carefully carve to shape, sand smooth, and clear-dope to a finish.

Solder a wire extension to the needle valve. Slip a rubber tube on the rear of the intake tube and bend in a circle so as to come out through a hole cut in the left side or, if you like, in the right side. Let this extend ¼" beyond the funnel-shaped block which catches the air, directing it into the tube. This hops up your engine. The rear of the block is streamlined as shown, and a front piece with only a small hole in its front should cover this funnel except when a record run is desired. Otherwise your engine would get too hot, and be ruined in a short time. Keep the front plug from falling out by using dress snaps, rubber bands and hook-and-eye hooks, or short dowels. Cover the canopy with celluloid, gluing black paper strips along the edges and joints.

Begin wing construction by sliding ribs into notches on main spar. Notch in the trailing edge, line up with your eye or pin to table top with the assistance of small balsa blocks (jig blocks). Glue on the leading edge, taking care that there is material for trimming. Don't undercut the leading or trailing edges. Carve, plane, and sand carefully to shape. Slip in the ⅛" square spars. Center the edges of the $^1/_{32}$" sheet covering on these spars. The solid tips are shaped before the wing is covered with sheet. Secure the control-line plate to Rib E on the left wing. Cut a slot in the sheet covering to let the plate protrude. Don't forget the center-section piece (short spar) that fits against Bulkhead No. 2 on the ship.

Roughly carve the spinner to shape, not coming near the final dimensions. Drill a hole in the end, attach to a motor shaft with glue, and leave to dry thoroughly. Turn on the motor, bring to shape with a chisel, knife, and sandpaper. Remove from shaft and carve out inside to fit a Tiger Fireball propeller, nut, and lock screw. Glue on dress snaps and dope to a finish.

Hook up about a thirty-five-pound fish line to the bell crank; pull through eyelets. Secure wing in position. Pass the control lines through the guide plate on the wing, attach to the two fishing-tackle swivel joints, and finally to the hooks illustrated. Be sure to make one lead about three inches longer than the other to keep them from interfering with each other. Four of these wire hooks are needed. Two are for the long lines which go to the control handle. Length of line varies from 25 to 50 feet.

Balance the model by shifting or adding weights. There can be no test glide with this ship. It can't be thrown fast enough to attain flying speed. Start with a power flight, hang on to your hat, and before your hair turns gray you will experience the "whirl-dizzy" performance that made us decide on the name Nightmare.

BILL OF MATERIALS

$^1/_{32}$" sheet, wing covering
⅛" plywood, firewall and bulkhead
⅛" flat balsa, formers, keels, trailing edge, ribs
$^1/_{16}$" flat balsa, formers, side pieces, planking, piece Z, ribs
⅜ x ½" hardwood engine bearers
Cowl blocks, supercharger block, tail blocks, spinner, pilot block
¼" flat tail surfaces, wing tips, main spar
$^7/_{16}$ x ¼" tapered leading edge
Clear dope, glue, and black dope
$^1/_5$ h. p. engine (preferred)
Celluloid, fishline, tin, fiber bell crank, soft wire, piano wire, swivel joints, dress snaps, bolts, cloth hinges, rubber bands, hardwood dowels, timer, booster batteries, switch, flashlight cells, wood screw, eyelets, battery tray, propeller, booster clamps, hardwood handle, and wheels.

Pinch-hit Materials

(Continued from page 28)

fringes were trimmed with a razor blade. (Sounds familiar.) Anyway, this chap—er, authority—stood the model out in the sun to dry. Ten minutes later the covering had all but disappeared. He had used linseed oil by mistake and the heat of the sun had burned off the paper. Ah, those were the days!

But we bet these old-timers have many a valuable tip we could put to work if hardwood becomes the vogue. Carving balsa props is a cinch. Not so with hardwood, even pine. Most trouble comes with the sanding of a hardwood prop. A favorite trick, which could be put to use again, was to break a discarded china cup. Odd-shaped fragments made excellent tools for scraping and simultaneously smoothing camber.

Wheels should be no trouble at all. Even the rubber-tired ones. We heard of at least one manufacturer who has enough rubber-tired wheels on hand to last for the next two years. Even so, wood wheels are plenty good enough. Hardwood wheels are better than balsa ones, in our opinion, especially on gas models. The bearing holes on hard wheels are less apt to become elongated and wabble. We hear that Victor Stanzel, for one, is now including nicely streamlined hardwood wheels.

When it comes to substituting other materials for sheet-balsa wing tips, stabilizer and rudder outlines, the picture isn't quite so favorable. Trouble is that we need substitutes for the substitutes. The nasty dwarfs from Nippon have cut off bamboo and reed from Malaya and China. But we don't see why curved pieces can't be cut from white pine sheet with a coping saw, jig saw, or what-have-you. Instead of making the curved segment one half inch wide, for example, make it one quarter or even less. Pine will be rigid when pared down.

Steel wire will be increasingly difficult to obtain. The Salesman's phone calls got two kinds of answers to his queries on wire. A: There isn't any. B: There is plenty. Suppose we assume it will be scarce. That looks logical, with tanks and ships being built faster than you can shake a stick. But do we need steel wire? We wonder. There are all sorts of softer wire that could be used in a pinch. Double-strut landing gear would again be the vogue, and each flight might mean a bent chassis. We are sure gas modelers won't mind in the least having to twist the landing gear straight. There is plenty of old wire of all descriptions a-wasting around the country. If you find an old piano, though, better hide it in your attic.

Well, men, now that we've looked at the dark side of things, let's keep the brighter side in mind. As we said, we still have the regular materials. But while we are hacking away at balsa we should be mighty careful of both rubber and gas engines. We don't know offhand just how many engines there are in the field, but we'd guess several hundred thousand. Given the proper care, the old mill should give us many a flight.

Older model builders will call this sissy stuff. Considering the troubles they had, we can't say we blame them. We remember one "expert" who hit on an improvement over the old flour-paste covering technique—see, we knew you never heard of that. (Incidentally, it isn't a substitute.) The boys used to lay a sheet of white tissue, from the ten-cent store, flat on the table and then coat it quickly with flour paste, then "wrap" the paper around the wing and tuck in the loose edges. Oh, boy, and when it dried! Wings were as stiff as a board—unless the weather got damp, with obvious results. If you made the paste too thick, you watched your nice wing curl up like an autumn leaf. Anyway, this chap was too impatient to wait for moist covering to dry. He put it in the oven. . . . And this is where we came in.

Carve This P-38

(Continued from page 37)

is taking shape, check the contour by setting the templates in their respective places. After the boom is shaped, sandpaper the surface with No. ½ sandpaper. Since our model has two booms, make the other in exactly the same fashion, and after completion check each against the other.

Set both booms aside and start carving the fuselage. This is carved in exactly the same manner as the booms. The cockpit of the original model was built up from pieces of $^1/_{32}$" square bamboo slivers, but this proved a bit difficult, so it is recommended that you leave the cockpit solid and mark off the panels with black lines against a gray background.

Carving the wings is next. Since lack of space prevented our presenting both wing panels, it will be necessary for you to trace the right panel on the correct size balsa, and then duplicate the left half. After the top outlines are traced, cut along the lines, leaving a $^3/_{32}$" margin which should later be sandpapered down. With reference to the front dihedral view, shape the wing taper, with the aid of a small plane, wood rasp or knife. After you have the taper, cut the wing templates from Bristol board and proceed to form the airfoil. Check the contours by placing the templates in place frequently and finish off the surface with No. ½ sandpaper. Both rudders and the stabilizer are cut from $^3/_{32}$" medium-grade balsa and sandpapered so the airfoil is symmetrical. When sand-

papering these surfaces take extreme care, else the edges will become too thin and warp when the model is painted.

Now that you have all major sections, you are ready for the assembly steps. Before assembling the surfaces, dope each section with three coats of thin clear dope, sandpapering between each application. Since balsa is very porous, and a good finish is what "makes" any solid scale model, provisions must be made to fill the pores. We have found through actual experimentation that the best method of insuring a good finish is to cover the surfaces with ordinary tissue paper, the kind used in rubber-powered construction. Soak the surface with clear dope and apply the tissue as if you were working on a rubber-powered model. After the dope is sufficiently dry the surface should be sandpapered with 00 sandpaper and doped a few times with very thin dope.

Now you are ready for the actual assembly steps. With the aid of the dihedral view, cement both wing halves together and reinforce the center joint with plenty of cement. After the dihedral joint is dry, the booms should be cemented in place. You will note that the top of each boom is cut to make way for the wing. When cutting out these sections take extreme care, since the success of your model is directly dependent on how accurately these cuts are made. (An error of even $^1/_{16}$" will be very obvious when the tail surfaces are added.) You will note that the cutaway in both booms tapers to fit the dihedral angle of the wing. Thus a left and right boom are required.

After you have both booms accurately cut and checked, cement the wing in place, and while the cement is still dry attach the stabilizer to the ends of both booms. Next add the top removable sections of the booms and then cement the rudders in place.

The fuselage is now glued to the center of the wing. In exactly the same fashion as the booms were cut to make way for the wing, cut the fuselage. Cement the main section in place and after the cement is dry attach the top portion representing the cockpit. Now that our model is assembled, apply another coat of clear dope and sandpaper the joints carefully. Next cut from medium balsa the air-intake units and cement in place on the fuselage. Add the machine guns, which are merely sections of piano wire rammed into the fuselage nose. The "cannon" is represented by a section of $^3/_{32}$" dowel, or preferably a length of tubing with the same diameter.

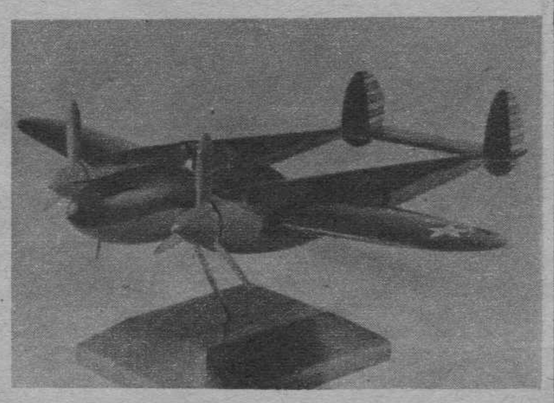
Like tires on an automobile, a model wouldn't be complete without the propellers. Both props are commercial products, since experience taught us that making small three-bladed units is too difficult when you can take a jaunt down to your favorite model hobby shop and purchase an accurate unit for a few cents. (Haven't you heard? Hobby shop owners also must eat!) A two-inch-diameter metal prop will serve our purpose, but should you be unable to obtain this size a slightly larger diameter air screw can be adapted by

cutting the tips down. When doing this don't forget to shave the blades proportionately. The prototype P-38 has the propellers revolving in opposite directions, which calls for a left- and right-handed unit. To make way for the propellers, cut the front portions of both booms away and cement the hub to the spinner section. Of course, you must cut into the spinner slightly, but make certain that the joint between the blades and the surface is not noticeable. If a few cracks do appear, a sliver or two of balsa plus a bit of cement will do the trick in filling up the crevices.

Both propellers are cemented to the booms, and the model then is ready for its war paint. The undersides of the wing, fuselage and stabilizer are painted light gray. The upper sides of these sections and both rudder sides are painted olive drab. All colors are dull and usually labeled on your hobby dealer's shelves as "sand and spinach." If you can't get these colors, dark green and light gray will pass, but the surfaces should be rubbed down with pumice to remove the gloss. Three coats of each color will result in a nice finish.

To obtain the effect of ailerons and flaps borrow a draftsman's ruling pen and practice drawing a few lines before you attempt to rule in your sections. The ailerons and flaps should be ruled off on the wing, and the elevator separation and rudder ruled off on the tail surfaces. Since our model has its wheels tucked away (to make building simpler), the bottom of the booms directly beneath the wing should be ruled off and the front portion of the fuselage given the same treatment.

With no wheels to rest on, we must mount the job on a pedestal. Making a pedestal is simplicity itself. Merely borrow a section of walnut or similar hardwood and cut as the perspective view shows. The post is a $^3/_{32}$" diameter section of wire, lollypop stick or what-have-you cemented in place. Insert the post in the fuselage, as shown in the side view of the fuselage, making certain that the model is mounted level or in a slightly upward position. Gee—it's finished!



Submarine Aircraft Carriers

(Continued from page 18)

Erie and Ontario, and reach nearly two hundred miles into Canada. Just think of the targets within *that* area. Every defense plant and supply base of the Eastern coast would be inside the deadly circle with the exception of a few in South Carolina, Georgia, and Florida, and, by moving the launching point a few hundred miles southward to miss the less important targets in Maine, these, too, could be reached.

With a fleet of giant mother ships hovering at sea or in unknown harbors to replenish the sub carriers with fuel, bomb load and bombers, these invaders could be a constant and terrible menace, for their losses would be replaced at once. How would these bombers return to their carriers? Perhaps they wouldn't. There might be empty sub carriers at an entirely different place along the coast, waiting to pick them up. A duplicate set of carriers might work in unison, furnishing bases for a nightly shuttle service of bombers across the target area, each flight originating from and terminating at an entirely new rendezvous each time.

These raids might be staged in a variety of ways, and with Hitler's penchant for the sensational and blitz tactics, we could be sure they would come in a variety of patterns, never the same.

Let us look at another way in which these sub-borne bombers might be used. Visualize a ship convoy with its protecting escort of destroyers and armed smaller craft. Could not one of these sub carriers be detailed to attack such a convoy? Thus, fast convoys too speedy for the usual submarines might be overhauled by torpedo-carrying planes from these sub carriers while smaller fighter planes from the same submersible acted as their protection. Even the blimp, successful hunter of submarines, might be easy prey for a few fighter seaplanes launched from over the horizon from a sub carrier.

Ideas For Radio Control—Selectors

(Continued from page 35)

densers are lighter than iron-core coils!) The relay (output) tube can also be a triode, but a beam tetrode or pentode such as the 1Q5GT or 1S4 will give better sensitivity.

The values of L, C_1 and C_2 will depend on the frequencies to be passed. After selecting the approximate frequencies to be used, the values can be calculated as follows:

$$L = \frac{160}{f}$$

$$C_1 = \frac{32}{0.2\,f}$$

$$C_2 = \frac{2\,f}{0.125\,f^2}$$

where L is in henries, C is in mmfd. and f is in cycles.

The values derived with these simplified formulas are only approximate. However, they will be sufficiently close to enable selection of the nearest commercially available values. It is best to consider the design frequencies as only approximate in any case, and adjust the frequency of the tone-generating source at the transmitter for maximum amplitude through the completed filter. A further adjustment can be made by replacing the 10,000-ohm output resistor with a variable of slightly higher value and setting for maximum selectivity under operating conditions.

In constructing such a filter, use only high-grade *oil-filled* paper or mica condensers of good Q. Powdered-iron-core r. f. chokes can be used as inductances above about 1,200 cycles (125-millihenries and smaller). Mount the chokes and condensers so as to avoid mutual coupling.

TUNED-REED SYSTEMS

Another interesting possibility in audio-frequency selection is the use of electromechanical filters. The simplest form is the tuned vibrating reed, used as a selective switch. Its use in full-scale work is rather common, but so far as is known no one has yet successfully applied reed selectors to model control, although a few experimenters have made the attempt.

In the tuned-reed system a thin vibrating reed is mounted near a small electromagnet. The reed is of steel or a special magnetic alloy; in some cases it is made of nonmagnetic spring material with a small piece of soft iron attached to the free end. When an alternating current is passed through the magnet coil, the alternating magnetic field that is set up causes the reed to oscillate at a rate corresponding to the frequency of the current. The vibration attains its maximum amplitude at the natural resonant frequency of the reed, determined by its length and stiffness. The reed is provided with an electrical contact, and opposite it another contact is mounted on a bracket. The spacing between the two contacts is made such that they touch only when the reed is vibrating near its maximum amplitude. Thus if several reeds, each having a different natural resonant frequency, are connected to the output of an audio amplifier receiving various audio tones from the control source, each reed will vibrate when its matching tone is transmitted, closing the control circuit assigned to it.

In the past it has been a hard job to find suitable reeds. There is a logical source of supply that has been little exploited, however, and that is the defunct auto-radio vibrators to be had from auto-radio servicemen. If not burned out, a vibrator unit provides not only the reed and con-

tacts but the electromagnetic coil and core as well.

There are dozens of different types of vibrators—in fact, over a hundred—so many that no single method of procedure can be used in converting them. The best thing to do is collect a quantity of them from the repair shops—especially the older types, for the frequencies were not standardized then and units resonant at various frequencies, such as 60, 85, 115, 130, 165 cycles, et cetera, were used. Now most vibrators operate at 115 cycles, and it is necessary to alter one considerably to change its frequency. Of course, as many different frequencies must be used as there are channels.

The easiest way to check the vibrators for this job is with a calibrated audio beat-frequency oscillator, if one is available or can be borrowed. First of all, check the coil to make sure it isn't burned out; if so, it must be rewound, using the same size wire. Then connect the coil across the secondary of a 200-ohm output winding (using a tube-to-line step-down transformer if necessary). About 2 or 3 watts of audio should be available. By varying the frequency of the oscillator, the point of maximum vibration amplitude can easily be found.

Fig. 6 shows a pair of typical vibrators, one of which operates at 85 cycles and the other at 165. In use the vibrator is, of course, removed from its container and stripped of all excess weight. The construction of individual units will determine exact procedure. When installing use a cushion mounting to avoid transmitting vibration.

The internal connections must also be changed and the contacts adjusted. Keeping the air gap small, separate the center and outside contacts on both sides. Determine the most sensitive location for the free end with respect to the electromagnet core. The vibrator contacts must be rewired to separate the coil from the contact points. Fig. 7 shows typical connections. At (A) is shown a non-synchronous vibrator with series-connected coil, and at (B) a synchronous unit with shunt-connected coil. The bottom diagrams show how they should be wired for filter use. The coil is disconnected from the contacts and separate leads brought out. All outside contacts are connected in parallel, to reduce contact resistance.

Even with paralleled contacts the apparent contact resistance as measured on an ohmmeter will be high, however, because current is actually being passed only a fraction of the time. This "resistance" can be reduced by connecting a condenser across the output to store energy between pulses. The optimum value of this condenser will depend on the nature of the circuit being controlled and must be determined experimentally; for low-voltage circuits use high-capacity low-voltage electrolytics of 10 to 50 mfd. (observing polarity).

By careful adjustment the sensitivity of the vibrating reeds can be boosted considerably, but even so appreciable power is required to operate a bank of them. A Class B stage using a 1G6G or similar tube is probably the most logical source for this power. The output transformer should have a 50 to 500-ohm output winding (depending on the characteristics of the electromagnet, number of units, et cetera).

A suggested arrangement for a multichannel tuned-reed filter is shown in Fig. 8.—This assembly would actuate six reeds from a single electromagnet, the coil of which could be wound to match the output of the driving tube directly. The core could be a U of soft iron, although the performance would be better if it were laminated. The mounting of the reeds should have great mechanical stiffness with respect to transmitting vibration to the coil and core.

AMPLITUDE SELECTION

You've heard of frequency modulation versus amplitude modulation in broadcasting. Well, so far we've been talking about *frequency selection*, both radio and audio, but now here's a system of *amplitude* selection.

Take a look at Fig. 9. You see four relays connected in series in the plate circuit of the relay tube. These relays each have the same power sensitivity, but since the resistances are different, a different value of current is required to close each relay. These values are shown in the diagram.

In operation the transmitter carrier is modulated (the frequency doesn't matter much), and the resulting modulation in turn rectified in the receiver by the diode of the 1S5. The d. c. component is used to bias the 1S4 relay tube through the pentode section of the 1S5 which serves as a d. c. amplifier, its idling plate current creating a bias voltage sufficient nearly to cut off the plate current of the 1S4. When the modulated signal is received this bias decreases and the relay current rises. By varying the percentage of modulation it becomes possible to vary the plate current of the relay tube, therefore, and thus to select the desired circuit by means of the relay closure characteristics.

The percentage of modulation on the carrier can be controlled by a four-point switch and a fixed voltage divider in the modulator. Successful use of this system requires a reasonably constant carrier level. This is best achieved through automatic volume control at the receiver, of course. A superregenerative receiver has an inherent automatic leveling action that serves to compensate for moderate field strength variations.

As shown, four relays are used, based on the assumption of a 50 percent drop-out ratio. If relays having a drop-out ratio of 75 percent or better are used, six or even seven channels are feasible; e. g., individual relays could be set to close at 1, 1.5, 2.25, 3, 4.5, 6 and 8 ma. It will be seen that the circuits are so arranged that no succeeding "work" circuit can close until the preceding one has opened, and vice versa. Only one circuit is operative at any one time.

A system of this sort is particularly useful for an operation like throttle control, where a multiple step-by-step control is required with no particular need of accurate index-

ing or synchronizing with the ground control.

PULSE SELECTION

The greatest remote-control system devised by man—the automatic telephone exchange—is a fruitful source of ideas. The type of selection used almost exclusively in telephone work is pulse selection, and it is also popular among advanced radio-control builders. In fact, where instantaneous operation is not an essential, the use of pulse-operated stepping or sequence relays has become standard practice. The pulse-operated rotary switch is probably the lightest and least cumbersome type of multicircuit selector.

Construction of a suitable stepping relay is an intricate task, however. Suitable devices are available commercially, and it is always possible to copy or adapt telephone equipment, but this often represents prohibitive cost or requires materials or equipment not readily available.

A type of rotary stepping switch that can be built quite readily by the experimenter with ordinary materials and tools is shown in Figs. 10 and 11. Leaf-spring contacts operated by an insulated cam cut from $^1/_{16}$" bakelite sheet require a minimum of power in comparison to wiping contactors of the usual kind. The springs are made of .010" phosphor bronze, with bakelite-strip pile-up insulators. Silver contacts $^3/_{16}$" in diameter are provided to handle the high current required to run motors and power solenoids.

On the other side of the .032" sheet aluminum (17S-T) mounting plate the driving mechanism is mounted. A plunger-type solenoid works a rocker arm on the end of which is a pawl that operates a ratchet wheel. As shown, eight teeth are provided in this wheel, corresponding with the eight contact assemblies. This number could be fewer or greater, as required. Light coil springs are used to return the solenoid plunger following each pulse and to keep the pawl engaged with the ratchet. A light spring detent also assists in locating the ratchet accurately—although the design is such that a locating error of 5 to 10° will not interfere with operation.

The solenoid contains a $^3/_{16}$" diameter soft-iron plunger sliding in a polished bakelite cylinder which forms part of the coil form. The coil is wound with approximately 300 turns of No. 20 enamel-covered wire.

In common with some of the other types of selectors, the pulse-operated rotary selector requires special circuits or auxiliary devices to keep the "work" circuit open until the desired position has been reached. There are a number of such devices and circuits —so many, in fact, that they will have to go over until another article.

For that matter, selectors alone are a big enough subject to spark ideas for a long time to come. Here's hoping those you get will be good ones!

The Traveling Salesman

(Continued from page 40)

rally, model aircraft building and flying will provide the elementary knowledge, since there's nothing like model building to teach the principles of aëronautics in an interesting and understanding manner. We fear, however, that many teachers with no knowledge of aëromodeling might endeavor to pass over this phase of air education because of their own lack of understanding of the field. Seems you can't teach aëromodeling from a book! Therefore model builders who are in the schools now must come to the fore and act as junior instructors or assist their teachers in the instruction of building and flying model aircraft.

"I cannot too strongly emphasize the importance of this training for our future fliers," stated Canadian Air Minister C. G. Power when he announced that the Royal Canadian Air Force would assume administration and supervision of the Air Cadets of Canada. "It is my sincere hope and fervent prayer that they may fly the airways of peace. But I know, too, that if the time comes when they must take the places of their fathers and their brothers in defense of the cause of freedom, they will be staunchly true to the traditions which those fathers and brothers are daily establishing in the sky."

Aëromodeling is an important phase of the Canadian Air Cadet program. If and when our own air cadet organization gets going, we must be sure that model building plays an important part in its activities!

The crying need is for trained model aircraft instructors. Air Youth division of the NAA can do nothing more important than to prepare and give two-week courses in model-airplane building and flying instructions in State normal schools and for manual arts and other grade and high-school teachers. Why not get together a few of our mental giants such as Hewitt Philips, Herb Weiss, Carl Goldberg, Frank Nekimken, Art Vhay and a committee from the U. S. Office of Education, lock them all up in a hotel room for a week, and we'll wager that the best possible teachers' course for aëromodeling will be forthcoming. This course could also be used in training scout masters and interested civilians, club leaders and social workers.

This column has repeatedly urged action on the matter of teacher instruction. Time's a-wasting. Let's go, AYA!

The humorous highlight of the MIA New York convention was the periscope gag. A few days prior to the meetings, Polk's Model Craft Hobbies started getting inquiries for Polk's periscopes. Thinking that some error in one of their advertisements accounted for the inquiries, the Polk brothers disregarded them, since

nothing could be more remote from models than periscopes. When the Toy Fair opened, practically everybody in the business made inquiries about periscopes from the Polk boys. Out-of-town visitors and buyers kept pressing them for details. Periscope patter was bandied at meetings and throughout the Hotel McAlpin, the convention headquarters. The climax came at the annual dinner when the astonished Polks received from the master of ceremonies a catalogue-booklet featuring Polk's periscopes described in humorous rhyme. The entire gag was perpetrated by Richard Mair, Rogers' Motors' Midwest salesman, who in his travels East got everyone hopped up on the farce.

But the pay-off came when Polks sent invoices and phony bills of lading to several of the jokesters who had placed orders. Imagine their chagrin when these were received and they thought huge shipments of periscopes were on the way! And did Dick Mair find himself on the spot when his fellow pranksters got after him to help dispose of the coming periscopes and the expensive freight bills!

Jaco-Lac Decal Corp. of Chicago has placed on the market brightly colored squadron insignia. The one-inch kind sell six pairs for 10 cents, and the one and a half inch, 15 cents. . . . Ohlsson & Rice have discontinued the manufacture of the Custom 60. The Ohlsson 60 Special turned out so good it neatly filled the shoes of the more expensive job! . . . The Burkard Engineering Co., under new management and in greatly increased quarters, has just enlarged their productive capacity by expending real money to get additional equipment that will guarantee their position in the field for a long time to come. The present line of $1.50 half-inch-scale solids with cut-out parts will continue in production. Balsa wood, should it get scarcer, may be replaced with pine. A super deluxe series with ready-carved fuselages and shaped parts, including metal foil covering, is being readied and will sell for $2.95.

Are Aircraft or Hawk, the manufacturers who had the solid-scale field to themselves for many years, going to produce identification models? How about some of the other scale-model manufacturers? There ought to be sufficient business for the models the navy wants to warrant greater interest by many model manufacturers besides Comet. . . . Scientific is about to launch three new gas-model kits for spring and summer flying. . . . The X-acto Crescent Co. has a new pocket knife which sells with two blades for $1. . . . One of the Midwest model firms is about to announce a line of model jeeps—we wondered how long it would be before someone woke up! . . . The Hurleman line of gas engines and accessories is back in production. The .48 cu. in. displacement Aristocrat which was a deluxe engine at $21.50 now becomes available for $16.50, complete with coil and condenser and Hurleman style carburetor.

E. B. Miller, chairman of the MIA recognition and conservation committee, certainly deserves a lot of credit for the Gargantuan task he and his committee have been performing. Of late he has been shuttling between New York and Washington at such a pace that about the only sleep he gets is on the plane. The MIA nomination committee took cognizance of his ability in nominating him as director. If he is elected to the board, many feel that he would make good presidential timber. . . . Master Model Craft is moving to larger quarters.

Some model builders are screaming their heads off about the new gas-model rules. In talking sensibly to adult and more sober modelers we find that sane regulations, considering the times, even though they may work some hardships, are necessary, and these modelers welcomed the new rules. Some fliers don't realize that unless such rules are adopted and inforced, model flying may be banned altogether! . . . What troubles the model industry more than the lack of rubber for powering models is the shortage of balsa wood. For quite a while there was none available, and now the navy uses most of what arrives for life rafts. The big difficulty is that due to war precautions we never know when a ship bearing balsa leaves for the States and can never tell when it will arrive. Planning production under such conditions is pretty difficult.

The greater increased demand for Master Modelcraft kits is resulting in this firm moving to a new and much larger plant which will facilitate increased production. . . . Sol Toubin's Midtown Model Airplane Shop, New York City, has organized a club, and new members are welcome. . . . Here is good news for the gas builders. A well-known Eastern manufacturer has taken over the Perky engine and we can look forward to having the new Perky in a few months. . . . Raymond Barnett, son of Louis Barnett of International Models, was accepted by the U. S. air corps due to his knowledge of aviation gained through building of model airplanes.

Had an interesting chat recently with Frank Lucas and Ray Smith of Ontario Model Aircraft. From a total production of 1,500 kits in 1928, they're banging out 90,000 monthly now. The boys tell us that German prisoners at a certain great camp in Canada are taking their imprisonment especially hard. The reason? They're model builders and want material! Incidentally, Canadian dealers, drop a card to Ontario Models for information about the Skyway knife they're handling. . . . Ontario has a great new gas kit named the Commando.

The Scientific Model Airplane Co. announces that it is working on a new series of flying scale models of America's most popular pursuits and bombers. It will be called the "Victory Squadron," is being introduced in June. Also in work is a new gas model, suitable for either Class A or B, which is understood to be revolutionary in design and ease of construction. This model also is being introduced in June.

Down The Runway

(Continued from page 31)

The Cheyenne Gas Model Club, way out there in Wyoming, is never fazed by a record snowfall. If they can't fly their models, at least they can run their engines. And that, they decided, was basis enough for a contest. According to George Beaudry, the friendly little fracas is started off by "the boys bringing the fuselages of their ships down to a club meeting. Each fuselage is just as if it were all set to take off, with the exception of having no wing. Then we appoint an official timer and the boys get their batteries ready to hook up to the ship, and stand up to let the timer know when they are ready.

"At the command, 'Go,' the contestants hook the batteries up and start their motors as quickly as possible. To be official, the engine has to run at least five seconds. The record to date is eight seconds. We think this is a national mark, and would like to hear of anybody doing better."

★ ★ ★

Elveron Hoyt of Tuckahoe, N. Y., thought he was just another gasoleer until his interest began leading him to think more and more of flying. Mr. Hoyt ended up with private license No. 69782 and his own light plane, a Luscombe "50."

He is not the only one, either, and to prove the point, the Academy has compiled a brief showing the defense value of aëromodeling. It has been circulated widely among the government and aviation officials and through the co-operation of various publications, including Air Trails, carried much factual data showing that many ex-aëromodelers are now in key positions in the aviation industry and the air crews of the army and navy.

★ ★ ★

Every once in a while we get a little down in the mouth because we are not always able to do everything we want to, but a chap like Bob Kesler of Quincy, Ill., can make us feel good when he writes, "I wish to say that I think the Academy is the best thing that ever happened for model building. The majority of us will do our best to support the Academy."

Thanks, Bob! A little praise goes a long way with us.

★ ★ ★

There are always a few folks who are ever ready to criticize everything and who can see no good in anyone.

Take the matter of model airplane dealers. On the whole, they are a grand bunch of guys. Yet some alarmists feel that dealers are commercializing the hobby. To those we would like to say, "Not a bit of it." A dealer acting as a center of distribution for model merchandise and plans, information, and news is an asset to any air-minded community.

Sometimes the dealers themselves are rather hesitant of participating in local activities, for fear someone will think they are trying to wring the last penny out of the youngsters. This was exemplified in Columbia, Pa. There a club of model builders were so desperate for assistance and sponsorship they asked the Academy headquarters to write the local dealer to hold some contests.

Maybe it is all the other way—maybe the dealers are afraid that they will be accused of commercializing the activity if they lend a helping hand to the enthusiasts.

★ ★ ★

Ever since the Academy got set up on its own two feet with headquarters in Washington, people have been urging that the head office set up some sort of a file for lost motors and planes. In many instances, headquarters has been instrumental in having lost ships returned to their rightful owners. Donald R. Lewis of Greenville, Iowa, was one of the many who have written in this connection.

It remained for Harry Vogler, Jr., of Pittsburgh, to get the jump on headquarters and set up his own motor registry. Harry's plan calls for enthusiasts to register their motors with him in an effort to show ownership in case said motors were lost and turned up somewhere else later on.

Long a leader in aëromodeling activities in the tri-State area (western Pennsylvania, eastern Ohio, and northern West Virginia), Harry set up the service at no cost to the modelers of his area. AMA has been urged to do the same in a national manner, and will probably utilize penny post cards which will be filled out by licensed modelers and sent to headquarters for the official file.

★ ★ ★

Most of the modelers down West Virginia way know Carl Hopkins quite well. In addition to being AMA vice president for District III, Carl is State organizer for model aviation under a unique plan originated by the Works Projects Administration.

Last fall, Carl ran a training school for prospective aëromodeling leaders which is still being talked about and which has been providing much food for official thought in Washington. Held at Jackson's Mills, West Virginia, the training conference was a week-long affair and schooled the "students" rather thoroughly not only in the art and science of building and flying model airplanes, but also in running contests and conducting clubs. In order to graduate, the recreation leaders enrolled in the school, the first State-wide one in the country, had to conduct a regular meet themselves which was well attended by aëromodelers.

In Milwaukee, Jim Custin, a member of the AMA contest board for District VII, has been conducting similar city-wide training classes under the sponsorship of the Milwaukee Model Airplane Council.

What's Your Question?

(Continued from page 6)

In the B-18A the gunner is located below and the bombardier is above him, while in the B-18 the bombardier acts as a gunner.

Question: What is the horsepower of the Junker Ju.87, the Focke-Wulf 198, and the Nakajima 96, the Junkers Ju.88-A-1? Is the Curtiss P-37 still used by the army? Could you tell me where could I enter a Class E model sailplane in a contest? What is the name of the fastest racer in the world? R. W., Youngstown, Ohio.

Answer: The Ju.87 is powered by a 1,000 h. p. Junkers Jumo 211, twelve-cylinder liquid-cooled engine; the Focke-Wulf 198 by a 1,500 h. p. Daimler-Benz DB-603 inverted twelve-cylinder liquid-cooled engine; the Ju.88-A-1 by two 1,200 h. p. Jumo 211-B engines. We do not know what engines are used in the Japanese ships. Regarding the entry of your Class E sailplane, write to Al Lewis, c/o Academy of Model Aeronautics, 718 Jackson Place, N. W., Washington, D. C. The German Messerschmitt 109 R in which the last world's speed record of 469 m. p. h. was established, could be considered the fastest racing plane in the world, although it was not built for the sole purpose of racing.

Question: Would you please give me the span, length and the height of the Gregor fighter? Where can I obtain photos of it? J. E. W., Buffalo, N. Y.

Answer: The ship was an equal-span biplane, upper and lower wings being 28 ft. long each. The overall length was 21 ft., height 9 ft. 4 in., the wing area 194 sq. ft. You may possibly obtain photos of the ship from Rudy Arnold, P. O. Box 60, Sheepshead Bay Station, Brooklyn, N. Y.

Question: What are the specifications of the Focke-Wulf FW-198? Where can I get a picture of it? J. P., Poughkeepsie, N. Y.

Answer: The FW-198 has a span of 41 ft., length 31 ft. 6 in., weight empty 4,696 lbs., fully loaded 7,188 lbs. It has a top speed of 324 m. p. h. You may obtain photos of this ship from Airpix, Box 195A, Toronto, Canada.

Question: What is the span and overall length of the Grumman Skyrocket? A. N. K., Hicksville, N. Y.

Answer: The span of the ship is 42 feet, overall length 28 ft. 6 in.

Question: Can you tell me from the inclosed picture what type of plane is shown on it and how many engines it has? It's supposed to be an Allied plane shot down in combat at Hongkong. C. P. R., Curtiss Field, Brady, Texas.

Answer: Judging by what is left of the airplane, we would guess that the ship was a trimotored Junkers Ju.52, which type has been used as a passenger plane in the Far East. We doubt that the ship was shot

down—it looks more as though it had been hit by a bomb while standing on the ground.

Question: After reading about the Davis airfoil in the January issue of Air Trails, I began to wonder if it would be more efficient on a utility sailplane than the modified Goettingen the plans call for. Also, from information given, is it possible to make a full-size wing using this airfoil? M. B., Picton, Ontario, Can.

Answer: We would not suggest changing the airfoil section as it would require pretty complete re-engineering of the glider. Besides, with this airfoil the landing speed of the ship will be some twenty percent higher. Information printed in our magazine is sufficient to build the wing.

Question: Could you tell me the price of the book called "Aerodynamics of the Airplane," and the address of its publishers, John Wiley & Sons, Inc.? E. P. M., Philadelphia, Pa.

Answer: Sorry, we do not know the price of the book. John Wiley & Sons, Inc., are located at 440 Fourth Ave., New York City.

Question: Will you please tell me the specifications of the Brewster F2A-2? Do the British have any of these planes? If so, what do they call them? B. N., Greensport, N. Y.

Answer: The span of the ship is 35 ft., overall length 25 ft., speed in excess of 300 m. p. h. All other data on the ship is restricted. The British have a number of them; they are called Brewster Buffalos.

Question: Would you please name all the colleges in New York State which offer aëronautical engineering courses? Which one is considered the best? J. La R., Bronx, N. Y.

Answer: One of the best in the country is New York University. Other colleges offering engineering courses are Polytechnic Institute of Brooklyn, Brooklyn, N. Y., and the Rensselaer Polytechnic Institute, Troy, N. Y.

Photo Credit List

The following list shows the sources from which credited photos were obtained. Abbreviations: Bot., bottom; T., top; U.L., upper left; U.R., upper right; L.C., left center; R.C., right center; L.L., lower left; L.R., lower right; Cen., center; T.C., top center; B.C., bottom center.

Page 6—Fletcher—"PIC."

Page 10—Top, International; Cent., International; Bot., Official photo U. S. Army Air Corps.

Page 12—All by Robert Yarnall Richie.

Page 18—Top, International; Bot., International.

Page 19—Both by International.

Page 20—All by International.

Page 21—All by International.

Page 22—TopL., U. S. Navy photo; rest by Harold Kulick.

Page 23—All by Harold Kulick.

Page 24—All by Harold Kulick.

Page 25—British-Combine.

Page 26—TopL., Harold Kulick; TopR., Sovfoto.

Page 27—Top, Harold Kulick. TopR., British-Combine.

Air Trails Advertisers June 1942

SCHOOLS

MODEL AIRPLANE KITS, MOTORS and SUPPLIES

MISCELLANEOUS

While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.

COMET is FIRST...again!

First to bring you *Official IDENTIFICATION MODEL KITS —at your DEALER'S Now!

DEPEND on Comet—and your Comet dealer—to bring you the important things FIRST! Right NOW—at your dealer's—you'll find all the *Official Identification Models that have been released to date—in handy kit form, complete with wood, cement, two grades of sandpaper, template sheet and assembly chart—in five price groups according to size! The U. S. Office of Education-Navy has asked for a half-million Identification Models. Comet was proud to devote its designing facilities to the task of furnishing the official plans. And we are proud to turn our production facilities to the bigger job of assembling these *Official Identification Model Kits! Whether you work through your school, local model-building club or other organization—get the Comet Identification Model Kits you want from your Comet dealer—and help give Uncle Sam the models he wants!

●

All Identification Models are 1/72 scale. Models released to date include planes of the United States, English, German and Japanese Air Forces. *Identical with those used in the High School Building Program of the U. S. Office of Education, sponsored by the U. S. Navy, Bureau of Aeronautics.

START 'EM FLYING * KEEP 'EM FLYING

15c MODELS: 1A-1—Brewster F2A-3; 1A-2—Grumman F4F-4; 1A-8—Bell P-39D; 1A-9—Curtiss P-40E; 1A-10—Northrop A-17A; 1A-14—Messerschmitt ME-109; 1A-16—Sento Ki-001; 1A-19—Spitfire; **20c MODELS:** 1A-3—Douglas SBD-3; 1A-4—Vought Sikorsky OS2U-1; 1A-5—Douglas TBD-1; 1A-17—Baku Geki Ki-99; **35c MODELS:** 1A-11—Douglas A-20A; 1A-13—Douglas DC-3; 1A-15—Heinkel 111; 1A-18—Mitsubishi-96; 1A-20—Wellington; **50c MODELS:** 1A-6—Consolidated PBY-5; 1A-12—Boeing B-17E; **75c MODELS:** 1A-7—Consolidated PB2Y-3.

COMET MODEL AIRPLANE & SUPPLY COMPANY

129 W. 29th St., CHICAGO • 559 Sixth Ave., NEW YORK

To the Aviation-Minded Man . . .

FIGHT

with your
KNOWLEDGE
ABILITY
TALENTS
TRAINING

KNOWLEDGE . . . ABILITY . . . TALENTS . . . TRAINING—*fighting words* these days! And the *aviation-minded* man has the greatest patriotic duty of *all* men to throw those personal qualifications into our great *Battle of Production.*

YOU are *the aviation-minded man* . . . the man who can fit best into aviation's *key jobs*—helping design our fighting planes . . . performing the more important mechanical and technical duties . . . or supervising work of others. Whether your talents, inclinations, and ambitions are creative or mechanical, there is work for YOU to do . . . *important* work!

Getting the aviation training you need is *a matter of patriotism* NOW! And you can train for both *patriotism today* . . . and *personal progress tomorrow*. If this is the way you feel . . . if this is what you want . . . then we want you here at Aero Industries Technical Institute.

The aviation industry looks to *Aero Tech* for more and more men trained for the key jobs of wartime production . . . and for the supervisory and executive posts of the great peacetime industry ahead. Here we will give you the superior training to take your place alongside the 4000 *Aero Tech* trained mechanics and engineers already in responsible posts with 200 leading aviation firms. Here you will have the priceless advantages of aeronautical training supervised by top-ranking aircraft plant executives.

Be a KEY MAN in our great "Battle of Aircraft Production"

AERONAUTICAL ENGINEERING

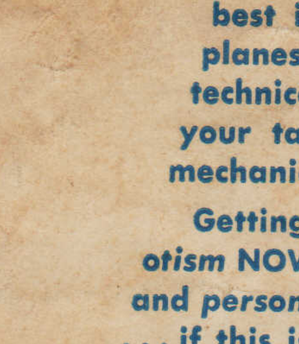
AIRCRAFT PRODUCTION

AIRPLANE and ENGINE MAINTENANCE

TO 1942 HIGH SCHOOL GRADUATES

You are too young for military service . . . but you CAN join the great and vital army of aeronautical engineers and aircraft mechanics. NOW you have a *never-again* opportunity to build an enviable career on training of vital importance to both you and your country. You can start *Aero Tech* training *immediately* after graduation from high school . . . and—depending on the course you choose—start your aviation career 2 to 3½ years ahead of the time you would complete the usual college education. Send coupon for complete details.

Get this FREE booklet



It answers the many questions bound to be in your mind about how to serve your country best, and still plan a secure, successful lifetime career in aviation. For your free copy—and complete information on the type of aviation training and career that interests you most—send the coupon NOW.

AIRMAIL This Coupon NOW

Aero Industries Technical Institute, 5257 W. San Fernando Rd., Los Angeles, Calif.

Please send my free copy of the booklet and complete information on training for a career in aviation. I am interested in ☐ Aeronautical Engineering, ☐ Aircraft or Engine Mechanics (Aircraft Plant), ☐ Airplane and Engine Maintenance (Airline or Civil Service).

Name_____ Age_____

Address_____

City_____ State_____ a-54-T

Executive Management Board

ROBERT E. GROSS
President, Lockheed Aircraft Corporation

JOHN K. NORTHROP
President
Northrop Aircraft, Inc.

C. A. VAN DUSEN
Formerly First Vice President
Consolidated Aircraft Corp.

These leading aviation industry executives control and direct the entire operation and training programs of Aero Industries Technical Institute.

AERO INDUSTRIES TECHNICAL INSTITUTE

5257 West San Fernando Road, Los Angeles, California

5 Career Courses In AIRCRAFT MECHANICS and AERONAUTICAL ENGINEERING — Including 12 Month Aircraft Mechanics Course Approved by U.S. Civil Aeronautics Administration