CHAPTER 27

HAND-LAUNCHED TWIN PUSHER

PRACTICALLY every endurance record made at outdoor meets has been won by this popular type of model airplane. The twin pusher has become the standard for endurance competition throughout the world and at every meet it wins the greatest amount of awards.

The model given here is a record breaker for endurance flights, being an improved composite of various championship models of the past three years. With a forty-inch A-frame and a thirty-four-inch wing, it lends itself to speed as well as endurance flying. The wing camber and dihedral given in the plans are the result of over a hundred flying tests. The builder should take every precaution to make these as perfect as possible, for the flying ability of the model depends on these main dimensions.

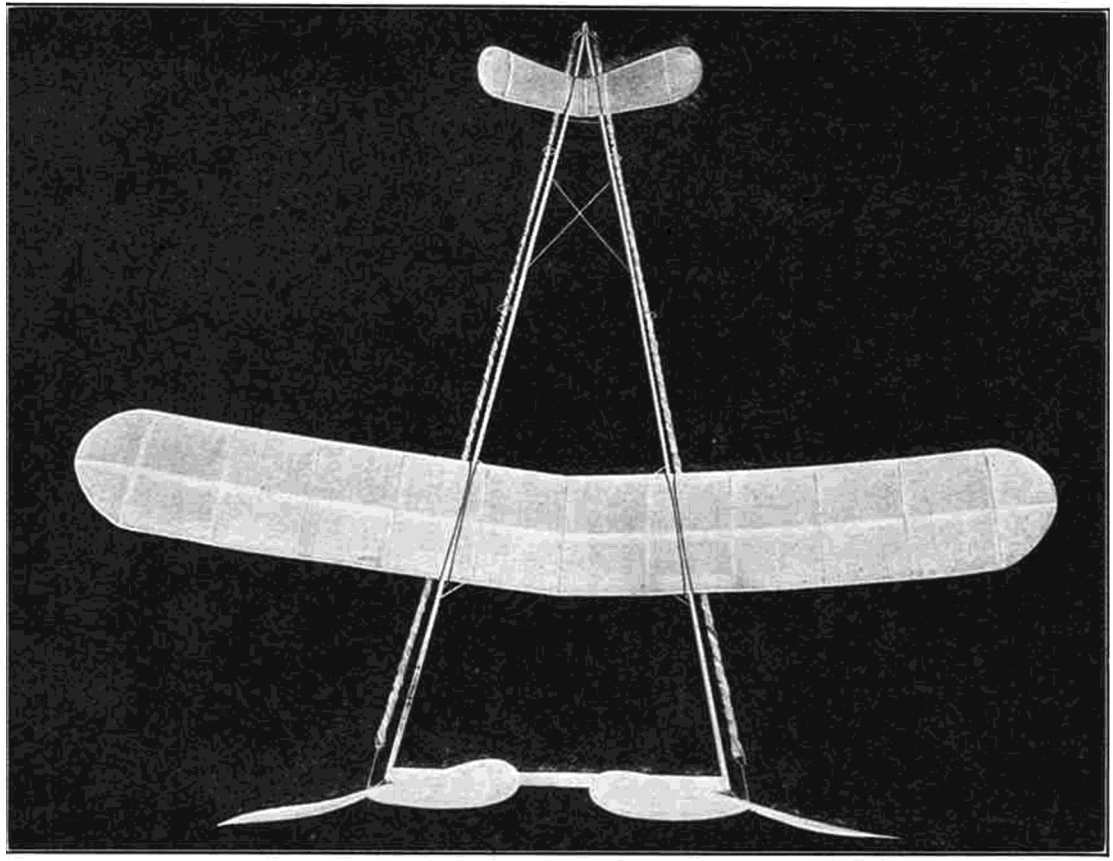
FUSELAGE. The fuselage of such a model is known as the "A-frame," and consists of two long sticks strengthened by various cross bracing. For this model, the following material will be needed:

2 pcs.—3/16" x 3/8" x 40" —Balsa
1 pc. —3/16" x 3/8" x 9 3/8"—Balsa
4 pcs.—1/32" —Split bamboo

If balsa cannot be obtained long enough for the long twin sticks, two pieces should be spliced together, firmly cemented, and bound with silk thread, to make the necessary 40" length. If this is necessary, the splices should be made as near to the front end as possible. As this model is a pusher, the front end is the one equipped with the nose hook, as shown in the plans.

After these pieces have been cut to proper size and sandpapered smooth, they should be equipped with all metal parts before being assembled. A standard propeller bearing is attached to the outer side of each stick at the rear, as shown in the plans. (See Chapter 6, "Propeller Bearings.")

When these are cemented in place, silk thread should be wound around them for added strength. Six can hooks are shaped from No. 12 piano wire. These are used to hold the rubber in position along the fuselage. Each stick is equipped with three of these hooks. They should be placed 10"



HAND-LAUNCHED TWIN PUSHER

apart on the outer side of the sticks and held with cement and thread bindings. (See Chapter 6, "Can Hooks.")

The sticks are now joined together. Taper the front ends of the sticks on their inner sides so that when matched together the propeller bearing holes will be spread 11" apart, as shown in the plan. From No. 12 piano wire, a nose hook is formed, as shown. (See Chapter 6, "Nose Hooks.") This hook not only serves to hold the "S" hooks, but also forms a strong binding for the joint at the front end of the fuselage.

The front joint is cemented together, the nose hook cemented over it, and the entire joint bound tightly with silk thread, as shown in the plan. The 3/16" x 3/8" x 9 3/8" long balsa rear brace is cut and sandpapered smooth. Its ends are notched and the ends of the fuselage sticks are also cut to form a half lap joint. When completed, the brace is cemented in place. This is followed by the inner bamboo bracing. Small holes are cut on the inner side of the sticks to hold this bracing. From 1/32" split bamboo, the braces are cut to proper length and cemented in place. At their intersection, a drop of cement should be applied to hold them together.

WING. From the plan of the wing rib, cut a paper template to exact size. The rounded part, shown in white at the front, is left off the template as this form is gained by the leading edge spar. From 1/16" sheet balsa, cut out eleven of these ribs. Remove their inner excess material by cutting the small circles in them, as shown. Give them a careful sandpapering for smoothness. The leading edge spar is now cut to length and then shaped, as shown by the plan of the rib. This is made from 5/16" square balsa and should be 30 1/2" long. The inner wing spar is made from 1/16" x 1/4" x 34" long balsa, while the trailing edge spar is 1/32" x 1/16" x 30" long balsa.

The small holes in the ribs for the inner wing spar are now cut, and the ribs are properly spaced on this spar and held with cement. Allow this assembly to dry thoroughly. To the blunt front end of each rib, the leading edge spar is cemented. Note that this spar extends only 1/4" beyond the outer rib on each end. The trailing edge spar is cemented in place, and the structure set aside to dry.

The wing tip can be bent to shape while the wing structure is drying. When completed, the ends of the leading and trailing edge spars are tapered to accommodate the 1/32" split bamboo wing tips, which are cemented in place.

To obtain the 1 7/8" dihedral angle, carefully snap the leading and trailing edge spars between the thumb and finger. Lay one side of the wing flat on a table and lift the other end up until it is 3 3/4" above the table top. A drop of cement at the joint of these spars will hold the wing in this posi-

tion. The wing is covered on both sides with Japanese tissue, and steamed or water-sprayed to tighten the covering. (See Chapter 7, "Wing Covering.") The wing of this model is held to the A-frame with rubber bands, so no clips will be needed.

ELEVATOR. On twin-stick pushers, the elevator is often called the "nose wing," because of its position on the fuselage. This elevator is constructed of $\frac{1}{32}$" x $\frac{1}{16}$" split bamboo throughout. Cut five ribs, slightly camber them, and then attach them between the leading and trailing edge spars, which are constructed of one length of bamboo. When the cement is thoroughly dry, snap the leading and trailing edge spars in their centers to obtain the necessary dihedral. Note that both these spars have different dihedral angles. The leading edge has a $1\frac{1}{2}$" dihedral, while the trailing edge has one only $\frac{3}{4}$" high, as shown in the plan. Obtain these dihedrals in the same manner as for the main wing and hold with cement. (See Chapter 7, "Wing Assembly.")

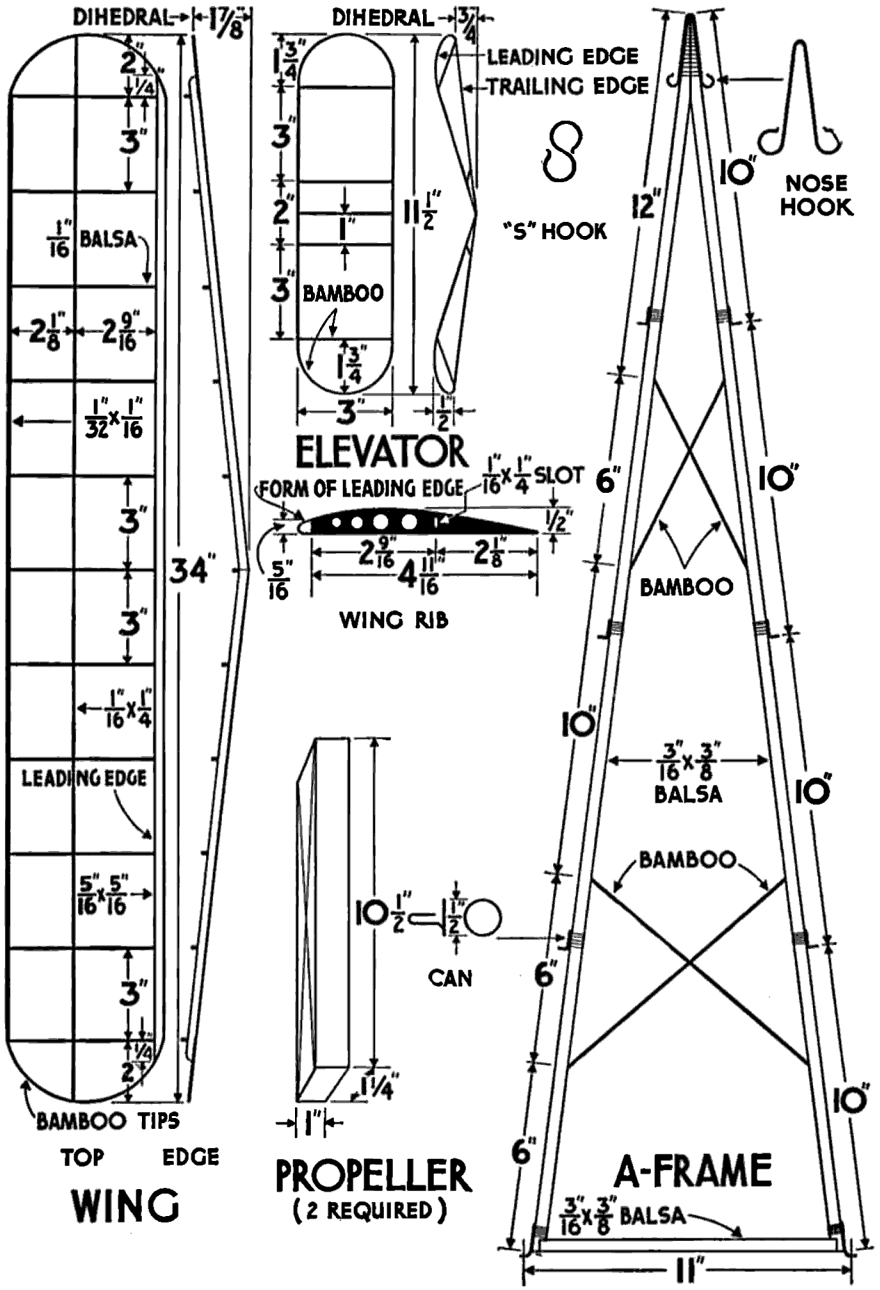
The elevator is covered on one side only with Japanese tissue, which can then be water-sprayed or steamed to tighten the paper. (See Chapter 7, "Wing Covering.") This part is also held on with rubber bands, and therefore requires no metal clips.

PROPELLERS. Twin-pushers obtain their name through the fact that they have two or "twin" pusher propellers. These are cut from 1" x $1\frac{1}{4}$" x $10\frac{1}{2}$" balsa propeller blocks. Remember that they must be left hand and right hand propellers, so carving must start on opposite edges. (See Chapter 9, "Right and Left Hand Propellers.") As they are pusher propellers, their shafts must be inserted so that their hooks are on the convex side of the propellers. Bend two propeller shafts from No. 12 piano wire, insert them through the hubs of the propellers, bend their ends over, and cement in place. Two washers should be provided for each shaft. When complete, thread them through the holes in the propeller bearings.

MOTIVE POWER. The motor of this model consists of eight strands of $\frac{1}{8}$" flat pure Para rubber for each propeller. Obtain a fifty-four-foot length of this rubber, cut it into two twenty-seven-foot lengths, and tie the ends of each piece together to form two loops.

These are then ready for assembly. Form two "S" hooks from No. 12 piano wire, as shown. (See Chapter 6, " 'S' Hooks.") Attach these hooks to the nose hook, and then make eight equally long strands of the rubber by looping it between the propeller hooks and the "S" hooks.

ASSEMBLY. To attach the wing and elevator, strong rubber bands will be required. (See Chapter 28, "Assembly.") After these parts have been assembled, the model must be glided to test for their proper location. If the



HAND-LAUNCHED TWIN PUSHER PLAN

model dives, the wing should be pushed forward on the fuselage. If it stalls, the wing should be brought back. The nose wing, or elevator, should be attached about 3″ to 5″ from the nose hook. After the location of the wing has been determined, an egg-beater winder should be used to wind the motors. For the proper method of launching, see Chapter 16, "Correct Launching of Endurance Twin Pushers."

CHAPTER 28

R.O.W. TWIN-STICK PUSHER

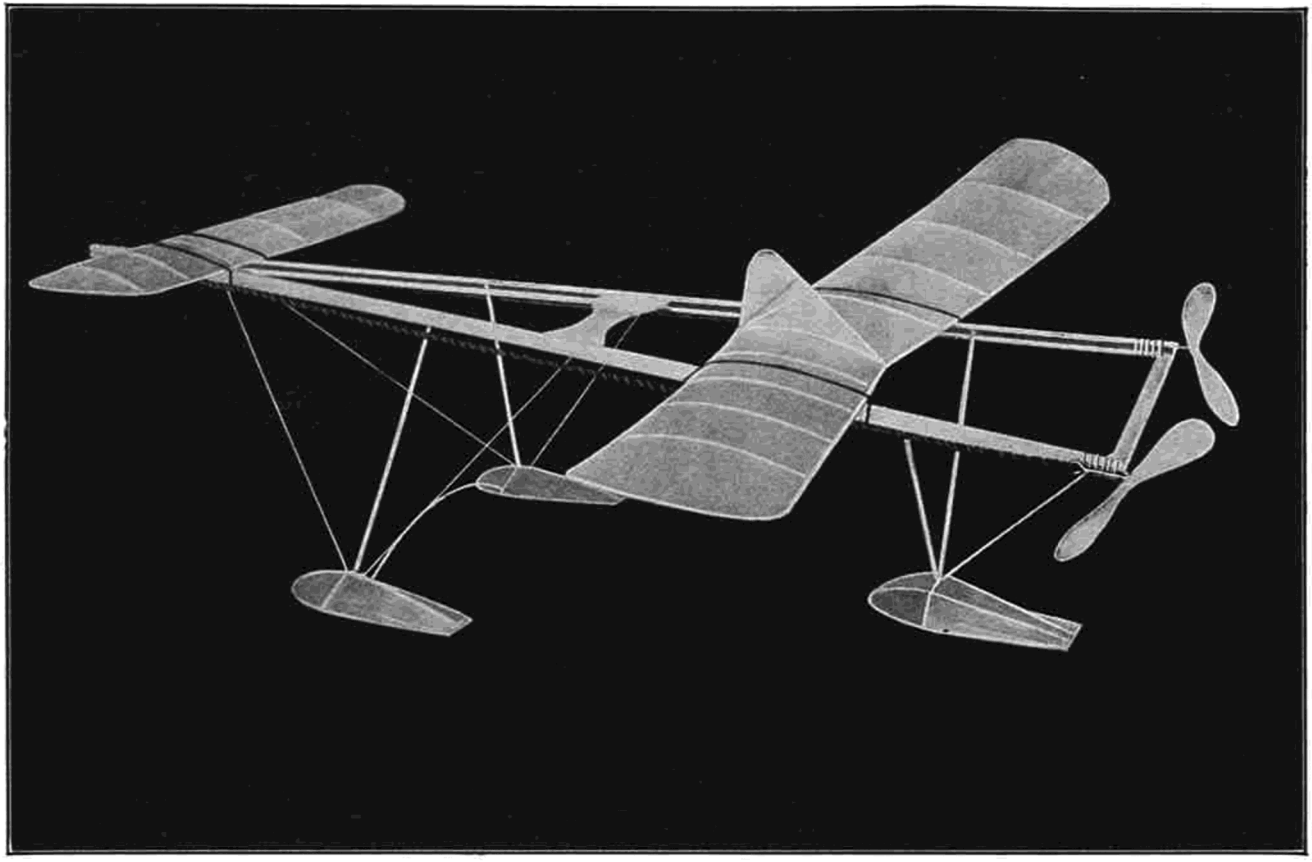
ONE of the most interesting performers of all the stick model group is the rise-off-water (R.O.W.) twin-stick pusher. It is a splendid endurance flyer and possesses a natural grace seldom found in model airplanes. Its ability to take off from the water and its attractive flying qualities make it a model well worth building.

It is a model for the advanced builder rather than for the beginner, as its construction is considerably more difficult than ordinary stick airplanes. However, if the amateur will carefully follow the plans and instructions, doing the work step by step, he should experience little trouble.

FUSELAGE. The fuselage of a twin-stick pusher is known as the "A-frame" because its general form often resembles a large letter "A." Two lengths of 1/4" x 3/8" balsa wood "U" beam are used for our fuselage, with the opening of the "U" on the inside. In case "U" beam cannot be obtained, solid pieces of balsa wood may be used. These should be 30" long. At one end the "U" beams are held apart by a 1/16" x 5/16" x 8 3/4" balsa length, known as a "spreader." The ends of the two beams are notched to allow the ends of the spreader to fit into them, as shown in Plan 1.

A piece of 1/16" sheet balsa wood is used as a center brace between the two beams. It is 2" wide and is cut out as shown to eliminate weight. As the openings of the "U" beams are wider than the thickness of this center brace, small wedges are placed between the sides of the beams and the brace. Cement the brace and these wedges in place between the beams, after the front ends of the beams have been tapered and brought together to fit. Note that the ends of the center brace must be tapered to fit the slant of the "U" beams. When this is in place, cement the ends of the beams together.

A nose hook is bent from No. 11 piano wire. This is sometimes called the "yoke," as it serves a double purpose by holding the front end of the frame together and also as a means for fastening the front ends of the rubber motor. (See Chapter 6, "Nose Hooks.") This is attached over the ends of the beams with cement and silk thread, as shown. Two propeller bearings are purchased or made. (See Chapter 6, "Propeller Bearings.") These are



R.O.W. TWIN-STICK PUSHER

cemented and bound with silk thread to the outer side of the "U" beams at their rear ends.

Two small elevator blocks are now cut from balsa wood as shown in Plan 1. These are cemented to the upper side of the beams 2" from their front ends. The thick part of these blocks should be facing toward the nose of the frame.

ELEVATOR. As the elevator has a sweepback of 1¾", it must be built in two parts, or halves. The leading edge spar is ⅛" x ⅛" x 15" long, and is cut from balsa wood. When this piece has been shaped, as shown under "Elevator Rib," it must be cut into two 7½" lengths. The trailing edge of the elevator consists of two lengths of balsa wood. Cut these two pieces 1/16" x ⅛" x 6" long. Five sheet balsa ribs are now provided. Cut these from 1/32" sheet balsa in the form shown in Plan 1 under "Elevator Rib."

The inner elevator spar is 1/16" x ⅛" x 15" long balsa. As the wing must be built by halves, this spar must be cut into two equal lengths of 7½" each. Make a full-size drawing of the elevator, and place each part in its proper location on your plan. Cement the inner elevator spar of one half to its two ribs, leaving the center rib until later. Notch the front end of the ribs and cement the leading edge spar to them, which should be followed by cementing the trailing edge spar. Bend two 1/32" split bamboo elevator tips over a flame, as shown in the plans. Complete one half of the elevator by cementing one of the tips to the ends of the spars.

The second half of the elevator is assembled in the same manner. The elevator is given its 1" dihedral angle. Place the two halves together on a flat table. Holding them to the table at their joints, lift the tip of one of the halves off the table 2", and while in this position, cement the joints together. (See Chapter 7, "Wing Assembly.") The center rib is now attached.

The elevator is covered on both sides with Japanese tissue. Coat the under side of all ribs, spars, and wing tips with clear dope or banana oil, and press the paper in place. Follow this by covering the top in the same manner. (See Chapter 7, "Wing Covering.") The elevator should be water-sprayed or steamed to tighten the paper.

WING. The wing is constructed much in the same manner as the elevator. As it, too, has a sweepback, it must be built one half at a time. Cut the leading edge spar from balsa wood measuring ⅛" x ⅛" x 30½" long. An inner wing spar is cut from the same wood 1/16" x ⅛" x 30½" long. Cut these into two equal lengths of 15¼". Shape the leading edge spar, as shown in Plan 1 under "Wing Section." From 1/16" sheet balsa, cut the nine wing ribs to proper shape and size, as shown under "Wing Rib." Remove excess

material from the center of each to reduce weight. Notch their front ends to fit the form of the leading edge spar.

Draw a full-size copy of the top view of the wing, as shown in Plan 1. Lay each piece in its proper place on the drawing. Building one half at a time, the various pieces are now assembled. Space the ribs on the inner wing spar at their correct positions and cement in place. Do not cement the center rib at this time.

The leading edge spar is attached to the front ends of the ribs with cement. A 1/16" x 1/8" x 25" long balsa trailing edge spar is now cut. While this requires no shaping, it must be cut into two equal lengths of 11½" each. When completed, cement one half to the trailing ends of the ribs of the half wing on which you are now working.

Two 1/32" x 1/32" split bamboo wing tips are formed by heating over a flame. (See Chapter 3, "Bamboo.") When completed, one of these tips should be cemented in place on the wing half you are assembling by cementing its ends to the ends of the leading and trailing edge spars.

When one half of the wing has been completed, the other half should be assembled in the same manner. The structure should now fit the full-size drawing of the plan when placed on it. When in this position, the necessary wing dihedral is obtained. (See Chapter 7, "Wing Assembly.") The center rib is now cemented in place. Cover the wing on both sides with Japanese tissue. Spray the covering with water and when dry, give it a thin coat of dope or banana oil. A wing stabilizer is bent from 1/16" split bamboo and attached to the center rib of the wing. Cement one end to the trailing edge spar at the trailing end of the center rib. Bring the bamboo forward and up to a point 2" above the leading edge spar, bend it sharply, and bring it down to this spar at the leading end of the center rib, where it is cemented in place.

A small 1/16" split bamboo brace is inserted with cement between the bamboo outline and the leading edge spar, as shown in Plan 1. Cover the stabilizer with Japanese tissue on one side only. Note this in the plans under "Stabilizer." This completes the wing, which requires no clips as it is held with rubber bands. (See "Assembly.")

PROPELLERS. Two propellers are necessary for this model. They are carved from 1" x 1¼" x 9" propeller blocks of balsa wood, as shown under "Propeller." One of these is a right hand, while the other is a left hand propeller. (See Chapter 9, "Right and Left Hand Propellers.")

When viewed from the rear, as shown in Fig. 48 in Chapter 9, the right hand propeller turns clockwise, while the left hand turns counter-clockwise.

In other words, both propellers turn up and out, when viewed from the rear of the model.

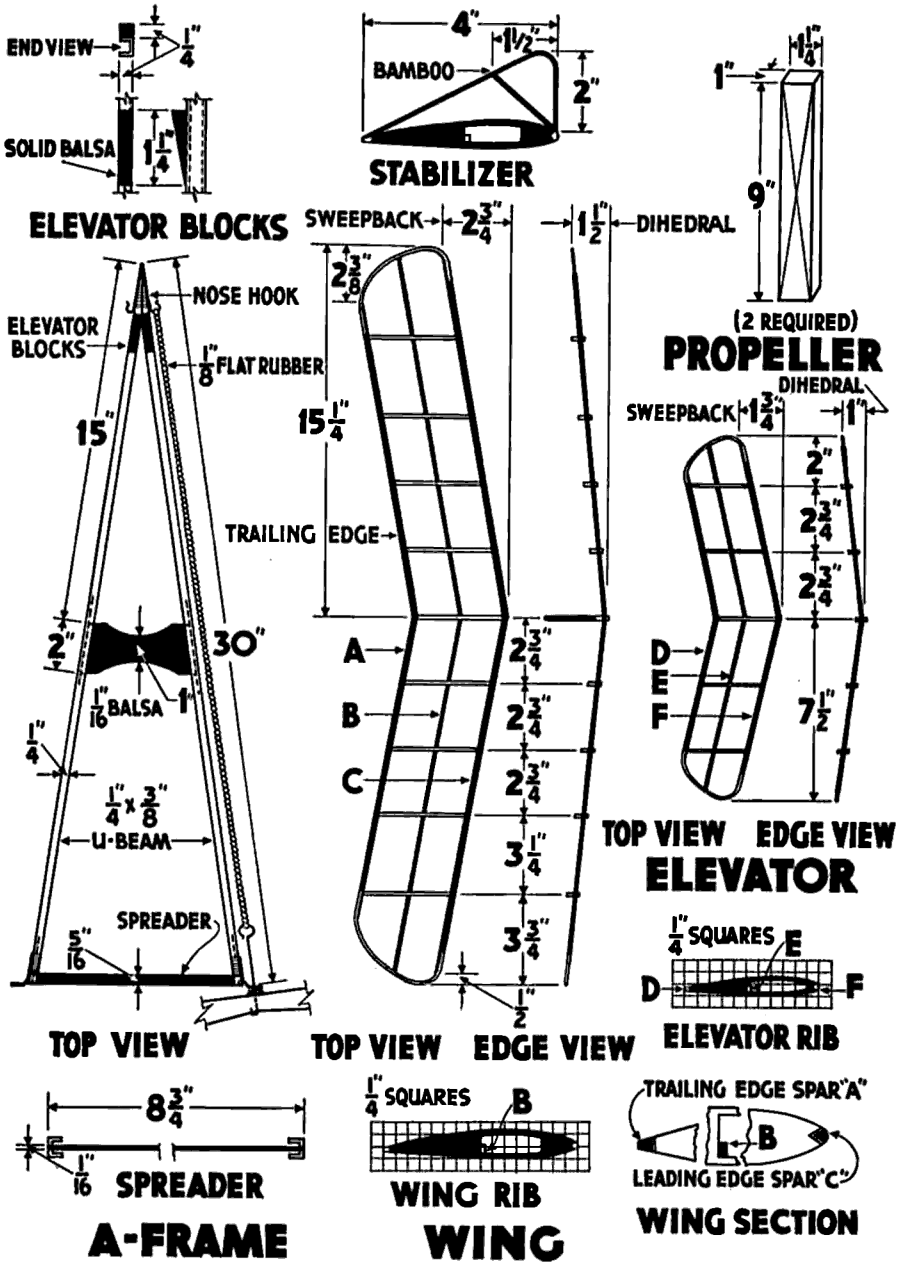
When the carving has been completed, propeller shafts are bent from No. 14 piano wire. (See Chapter 6, "Propeller Shafts.") As these are pusher propellers, the shafts should be inserted through the hubs of the propellers so that the hooks of the shafts are on the convex side of the blades. Remember that the convex side of the blade always leads on both tractor and pusher models.

LANDING GEAR. The floats are extremely important on any rise-off-water model. Those shown for this model have been designed to give the least resistance in the water, a minimum of weight, and quick rising. Floats should be large enough to displace water weighing at least three times the weight of the model, when they are fully submerged. When this is done, they will carry the model while riding high on the water. If the floats are smaller, the weight of the model will sink them deeper into the water, which will retard forward motion, making the take-off difficult if not impossible. The "V" bottom form also assists the floats to cut through the water much in the manner of a boat, giving rapid rising, keeping the course of the model in a straight line, and assisting in landing.

Their construction is simple, but the beginner should carefully follow these directions when making his first floats. The trailing end of the model has a single float, while the leading end is equipped with a duplicate pair. The single float is necessarily larger than the front floats, but the construction is practically the same.

The rear float is made first. For this the builder will require one 1/16" sheet balsa former, one balsa rear brace, and three lengths of 1/16" square bamboo. Draw a full-size plan of the former on a sheet of paper, which has been ruled with 1/4" squares. See Plan 2. Trace this drawing on a piece of 1/16" thick sheet balsa. Cut the former from the balsa sheet, remove excess material from its center, and cut the five necessary 1/16" x 1/16" notches to accommodate the split bamboo lengths. The second balsa piece required in the construction is 1/16" x 1/4" x 1 3/4" long. Four notches should be cut on the top of this length to accommodate the top bamboo stringers, while one is cut on the bottom to fit the bottom, center, bamboo stringer.

Study the plan of the rear float. Three bamboo lengths, marked 1, 2, and 3, are required to complete the necessary materials for this job. The longest stringer (2) starts at one end of the rear balsa brace, where it is cemented into the notch cut for it. From this point it extends 3 1/4" forward to the side of the balsa former, where it is cemented into the side notch of the former. It is then bent in a wide curve 1 3/4" in front of the former,



R.O.W. TWIN-STICK PUSHER PLAN 1

brought around, cemented to the opposite side notch of the former, and back to the opposite end notch of the rear balsa brace. The second stringer is attached in the same manner, although its forward bend is a sharper one than the first stringer. When in place, this second stringer is cemented to the first at the point of their curves where they meet. Note that while the first stringer attached (2) remains straight, as shown in the side view, the second stringer (1) must be bent in a curve from the rear brace to the top of the former, and then down again to meet the first stringer at its forward point.

The third stringer (3) is a single length running in a curve from the forward point of contact of the first two stringers, through the bottom notch of the former, and on back to the bottom notch of the rear brace. When fully assembled, the float is covered with Japanese tissue, water-sprayed, and then given a single coat of dope. The struts used to attach this float to the model are of $\frac{1}{16}$" square bamboo. Three are used. These struts can be cemented to the float and the A-frame, or they can be attached by using $\frac{1}{16}$" diameter bushing eyelets, which can be purchased at any model supply house.

For builders carrying their models some distance the latter is recommended, as the floats can then be removed and the entire model carried as easily as any hand-launched type. If bushings are used, care must be taken when cementing them to the former of the float. Small notches are cut in the top of the former, directly over the stringer 3. These three notches are then coated with cement and the three eyelets set in them at their required angles. The middle one points to the spreader of the A-frame, while the two outer ones point toward the A-frame beams. When these are set in position and the first cement has dried, additional cement should be applied to bind them in one coating of cement. Allow an hour for drying.

Three eyelets are also used on the A-frame into which fit the other ends of the struts. One of these is located in the center of the spreader, while the two others fit into the beams of the A-frame 5" from their trailing ends. To do this, make holes in the under side of the "U" beams, insert the eyelets into them, and apply cement. The ends of the struts should be tapered to allow them to enter the eyelets, but only enough to give a tight fit.

The duplicate pair of floats for the front of the model are made in the same manner as the rear one. Only two lengths of bamboo are necessary for each of these. The former and trailing edge have the same dimensions as the large rear float. Note, however, that the dimensions of these floats are smaller than the overall dimensions of the rear float. When completed, they are joined together by a $\frac{1}{16}$" square split bamboo length, as shown in

the front view of the model in Plan 2. This piece is bent with a 1″ arch and is cut long enough to spread the floats 9¼″ apart. Each of these floats has one 1/16″ square bamboo strut running from the float former directly over the No. 1 stringer to a point on the "U" beam 12″ from the nose of the A-frame. They can be cemented or fitted with bushing eyelets, in the manner already described. A length of silk thread is used to strengthen this assembly on each side. Small hooks are bent from No. 6 piano wire and tied to each end of the thread, as shown. Before this is done, however, the thread should be passed through the tissue, around the top portion of the former, and out the other side. This can be done with a bent pin. At the points where the thread comes through the tissue, cement is applied to hold the thread in position. The hooks are then tied in place. One end of the thread is attached to the A-frame 5″ from the nose, while its other end is attached 16″ from the nose, as shown. The connection at the A-frame is made by similar hooks cemented in place on the beams. Both sides are connected in the same manner.

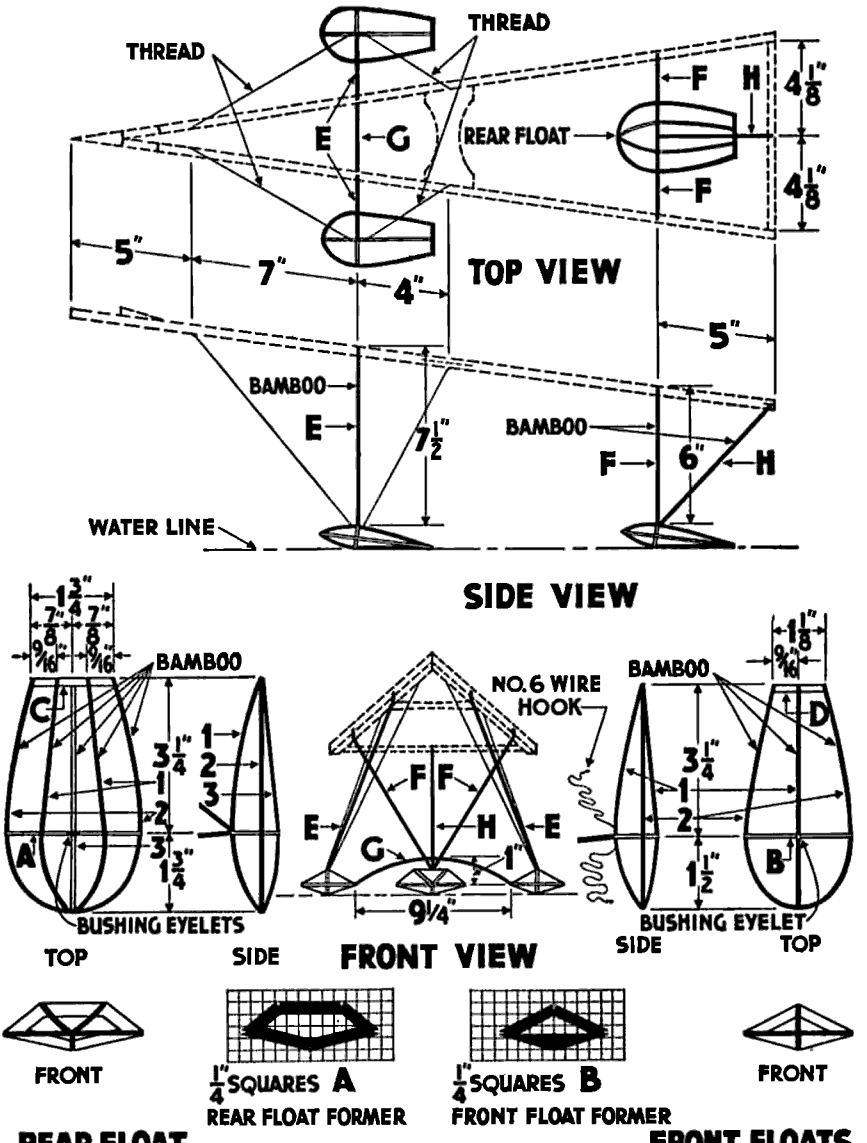
WATERPROOFING. As such models are bound to get wet, they should be thoroughly waterproofed before being flown. As the average dope is too thin for good waterproofing, a small quantity of cement should be mixed with the dope to give it thickness. The propellers should be given five coats of this mixture. After each coat has become thoroughly dry, the propellers should be carefully sandpapered, leaving the last coat untouched.

The entire A-frame should be treated in the same manner. The wing and elevator should not be treated with this mixture, as sandpaper cannot be used on these parts. Give each from three to five coats of clear banana oil to make them watertight. The floats should be given the same treatment, and tests must be made to see that these are especially waterproof.

ASSEMBLY. The wing and elevator are held with rubber bands. The leading edge of the elevator fits on the top of the small triangular blocks attached to the "U" beams near the nose, while the wing is located near the propellers. The elevator adjustment is practically stationary, but the wing must be adjusted by gliding tests before the motors are used.

One rubber band holds the elevator in place. Slip the band over the nose of the model and work the loop along the "U" beams to the point where the trailing edge of the elevator crosses them. Place the elevator in position on the "U" beams, bring the rubber band loop over the top of the elevator, and then slip the loop under the nose of the model. This will hold the elevator in place and at the same time allow it to be moved forward or backward as the flyer adjusts his model.

The main wing requires two rubber bands, both of which must be



R.O.W. LANDING GEAR

R.O.W. TWIN-STICK PUSHER PLAN 2

broken inasmuch as the closed ends of the A-frame prevent the bands from being passed over each beam. Break one of the bands, pass one end under the "U" beam, and bring the ends of the band together over the frame. Place the wing on the A-frame, bring the band strands over the top of the wing and under the "U" beam, where they are tied together. The other band is attached in the same manner.

The propellers are now assembled. Two small washers, which can be purchased at any model supply store, are placed on each propeller shaft. They are then passed through the holes in the propeller bearings, and the rubber motors are attached. For this model, six strands of 1/8" flat rubber are used on each propeller. As considerable slack is desirable, 180" of rubber should be applied in six strands for each motor. From No. 14 piano wire, bend two "S" hooks. (See Chapter 6, "'S' Hooks.") One end of these hooks is attached to the nose hook, while the loops of the rubber motor are passed over the other.

FLYING. Before winding the motors, glide the model to determine the best wing location. As the floats are delicate, this should be done over shallow water or deep grass, so that the landing will not harm them.

If the model stalls, the wing should be moved back on the A-frame, or if its glide takes the form of a dive, move the wing forward. Continue these gliding tests until a long, smooth, and gradual glide has been obtained. On the "U" beams, mark the wing location, so that when the model has been taken apart, it can be assembled again without the necessity of tests.

The motor should be wound with an egg-beater winder to about four hundred turns. Remember that each propeller must be wound in opposite directions, or down, out, and up, when viewed from the rear of the model. For the proper method of launching, see Chapter 16, "Correct Launching of R.O.G. Model," as this method also applies to R.O.W. types.

CHAPTER 29

TAILLESS TRACTOR

ALL experienced model airplane builders enjoy attempting the construction of new types of aircraft. The "tailless" tractor is presented here—not so much to show how it can be done as to prove it possible, and in the hope that the reader will experiment with it in an effort to develop this type of model. Simplicity is the main advantage of the model, as it is a single-stick tractor without the usual elevator, the lack of which is corrected through the specially designed wing.

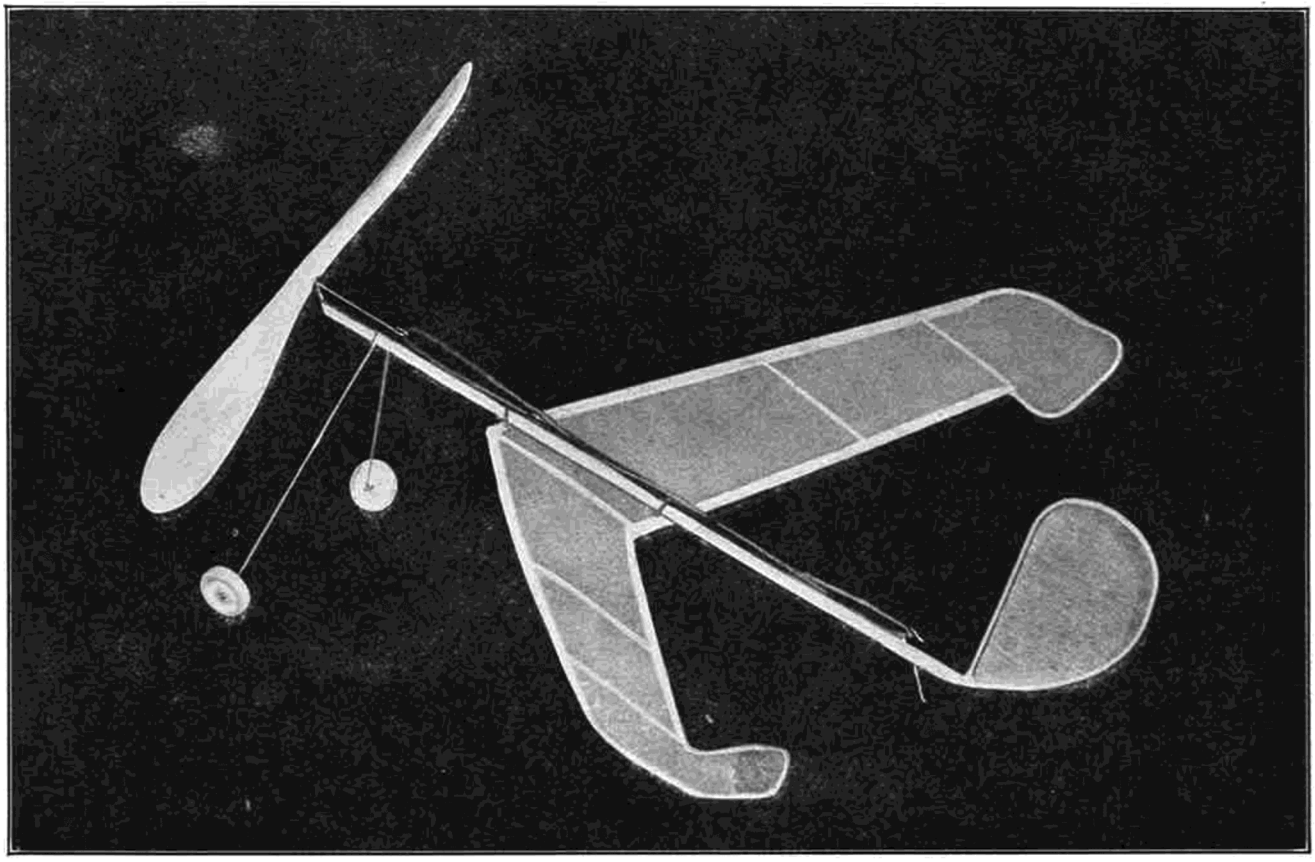
MOTOR STICK. This consists of a balsa stick 1/16" x 1/8" x 8" long. Its rear end is left square, while the front or nose of the stick has a 1/8" bevel, as shown. A lightweight propeller bearing is cemented on the 1/16" top edge of the motor stick at its front end, while a rear or end hook is attached in the same way at the rear end. These fittings may be bent from No. 8 piano wire. (See Chapter 6, "End Hooks" and "Propeller Bearings.")

RUDDER. One piece of 1/32" split bamboo forms the outline edge of the rudder. This is bent to proper shape by heating. (See Chapter 3, "Bamboo.") Cement the ends together. Cover the structure with Japanese tissue on one side only, holding it tightly with dope. (See Chapter 7, "Wing Covering.")

LANDING GEAR. This consists of one length of No. 8 piano wire bent to shape, as shown in the plans under "Landing Gear." Two wheels are cut from 1/32" sheet balsa. These should be 3/4" in diameter. After they are threaded on the axles, the axles are bent up to keep them in place.

PROPELLER. The propeller is carved from a 1/2" x 3/4" x 6" balsa propeller blank. (See Chapter 9, "Carved Propellers.") A propeller shaft of No. 8 piano wire is bent to form and inserted through the center of the hub. It should then be bent over, and a drop of cement applied on the bend to hold the shaft in position.

MOTOR. The motive power is obtained through a length of 3/16" flat rubber. This should be long enough to allow a slack of 1/2" between the hook of the propeller shaft and the rear hook. The rubber is held in place by piercing the ends with the hooks.



TAILLESS TRACTOR

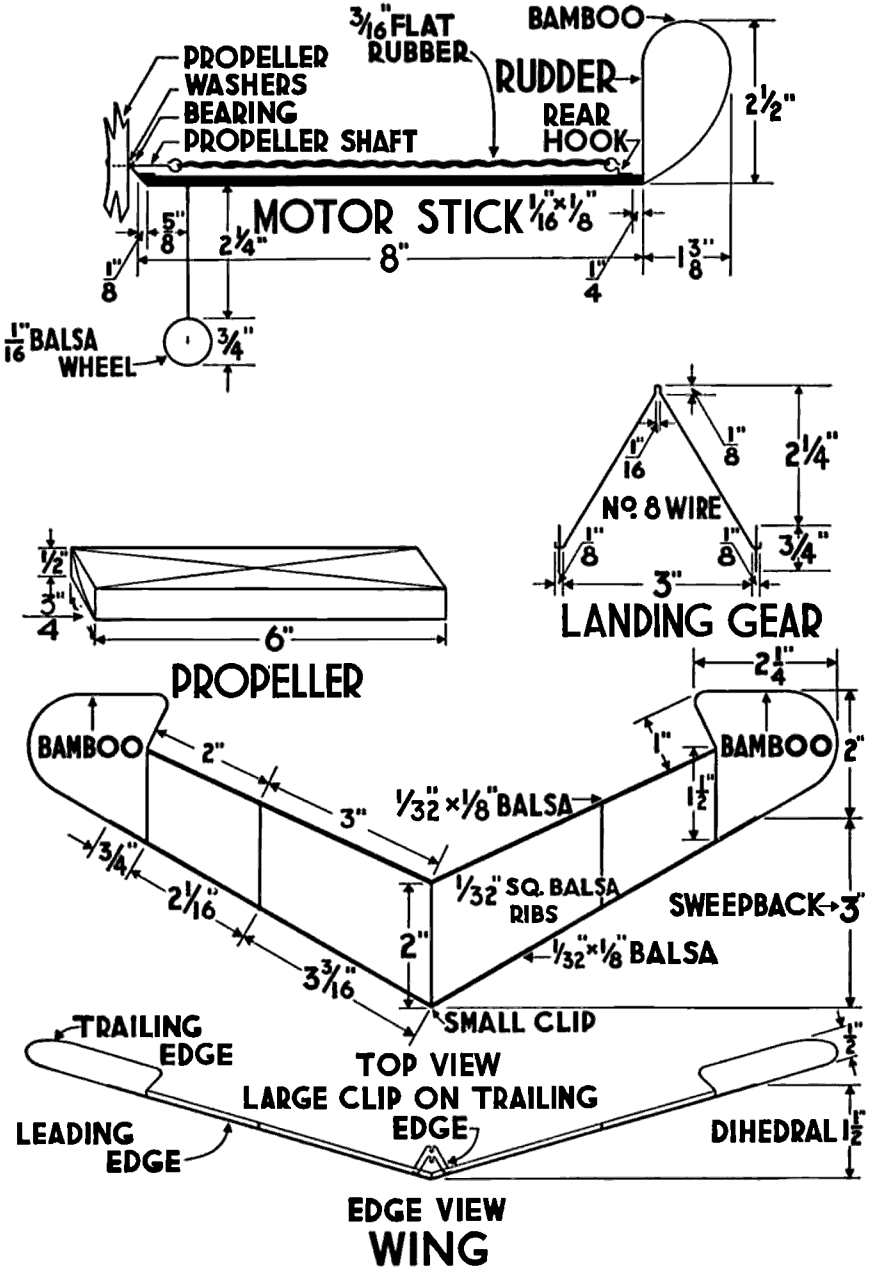
WING. The leading edge spar of each half of the wing is constructed from a 1/32" x 1/8" x 6" long piece of balsa, while the trailing edge spars are 1/32" x 1/8" x 5" long. The five ribs are of 1/32" square balsa wood and are given a slight curve, as shown.

Draw a full-size working layout of one half of the wing exactly as given in the plans. Bend a length of 1/32" split bamboo over a flame to the form shown for the tip. Cut out the leading and trailing edge spars and the ribs. This half of the wing is now assembled on the layout drawing by placing each part of it in its proper position.

Cement the ribs and tip to the balsa spars. When attaching the tip, see that the bamboo length, which is attached to the trailing spar, is at right angles to it. At this point, construct the other half of the wing by following the same directions and using the same full-size layout drawing.

The sweepback of the wing is gained through the difference in length of the leading and trailing edge spars, so that when the two halves of the wing are cemented together, they give the desired shape. The wing has a 1½" dihedral angle, which is obtained by cementing the two halves together. (See Chapter 7, "Wing Assembly.") The structure is now covered. Cut out a pattern of the wing from Japanese tissue, allowing about ¼" surplus material around all sides in order that the paper can be wrapped over the edges of the wing structure. Cover the wing on one side only—the top—and hold the covering in place with dope or banana oil. A close study of the plan, as well as the photograph, will show that the tips of the wing are turned up. This is now done. As shown in the plan, the trailing edges of the tips are ½" higher than the leading edges. This is done by heating the bamboo framework, but be careful not to burn the paper. When completed, the wing is fitted with the usual wing clips, as shown in the plans. These are bent from No. 8 piano wire. The large clip is cemented to the center top of the wing on the trailing edge spar, while the small one is fastened to the leading edge spar. (See Chapter 6, "Clips.") The wing can now be water-sprayed or steamed. As it is of delicate construction, spray one half at a time, allowing it to dry thoroughly under weight before proceeding with the other half.

ASSEMBLY. Cement the rudder to the end of the motor stick, as shown in the plans. The landing gear is cemented or pressed in position on the motor stick ¾" from the front end of the stick, as shown. Slip the propeller shaft through the propeller bearing, and attach the rubber motor, as already instructed. The wing is attached in position to the under side of the motor stick, as shown in the photograph. Glide the model to obtain the correct



TAILLESS TRACTOR PLAN

position of the wing. If the glide results in a stall, move the wing slightly back, or if the model dives, move the wing forward. Test until a long even glide is obtained, and then wind the motor and send your "tailless" model on its maiden voyage. For the proper method of launching, see Chapter 16, "Correct Launching of R.O.G. Model."