The Hobby Annual
TWIN-SCREW RACING MONOPLANE
You Can Make It For 3/6!

The model aeroplane described here is an exact copy of one which won a Challenge Cup a short while ago. It is a beautiful flyer.

HERE is a model which will fly 400 yards at the height of 40 ft. after rising from the ground. A few years ago it won the Challenge Cup presented by Sir Charles Wakefield for models rising from the ground under their own power. And you can make it at a total cost of 3s. 6d.!

As will be seen from the side, plan and front views (Figs 1, 2 and 3) it does not in the least resemble a full-sized aeroplane. It differs chiefly in that it flies with its small plane in front, that is to say, with the propellers behind. For a reason which I need not enter into here models of this type are much better flyers than those which have their propellers in front.

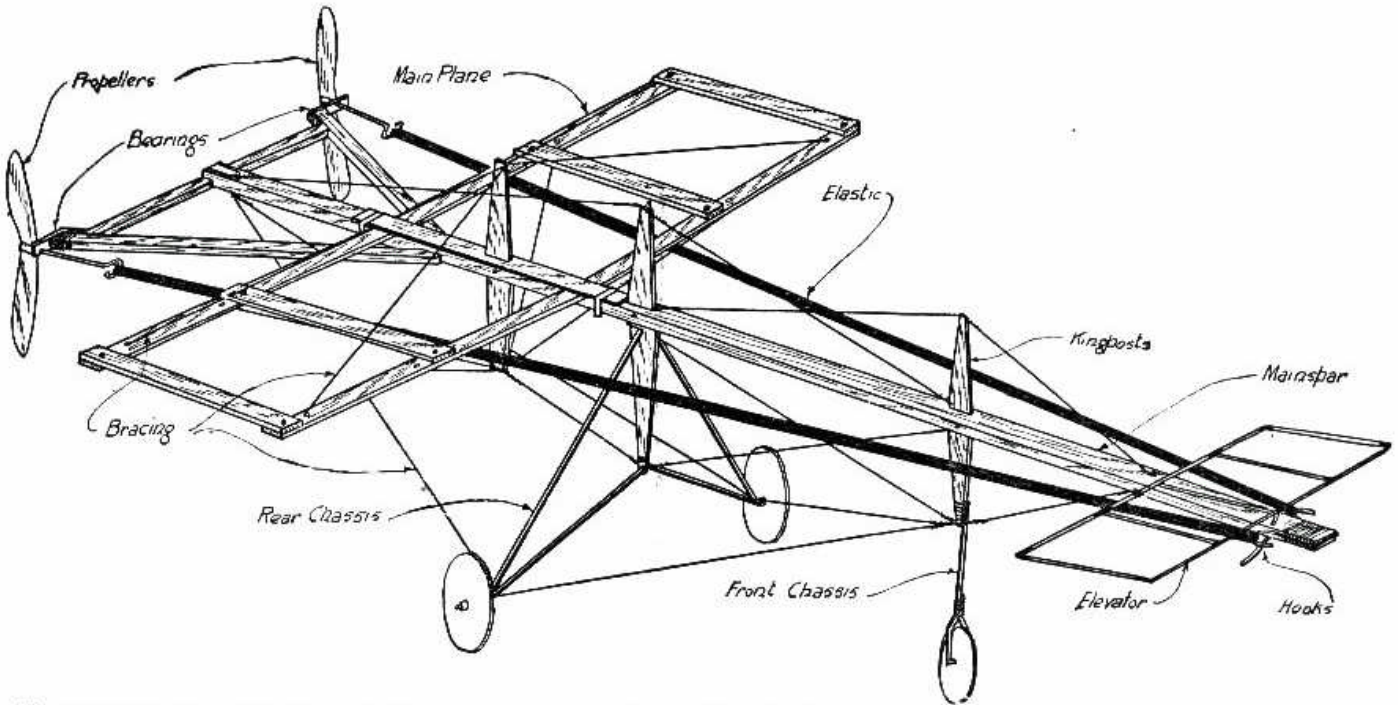
They are simpler in the hands of a beginner, require very little adjustment, and are immensely strong.

The fuselage is the first part to prepare. Get a piece of birch $\frac{1}{4}$ in. deep by $\frac{1}{2}$ in. wide and $41\frac{3}{4}$ ins. long, and pierce it with a fine chisel to receive the two kingposts which carry the front and rear wheels, and also to take the kingpost to which the main plane is braced. These kingposts are $5\frac{1}{4}$ ins. and $6\frac{3}{4}$ ins. long, $\frac{5}{16}$ in. wide, and $\frac{1}{16}$ in. thick. The side elevation (Fig. 1) of the machine shows the positions of these slots. (See also Fig. 4.)

A propeller bar and two stays (all are 8 ins. long) are fixed at the rear end of the model to brace the spar against the strain placed upon it when the elastic is wound, and they are attached in the manner shown at Fig. 5.

To each end of the propeller bar a brass bearing (Fig. 6) is secured; this is best cut from brass $\frac{3}{16}$ in. wide and $\frac{5}{8}$ in. long, and a fine hole is drilled in the end of each bearing to take the propeller shafts.

The propeller bar and stays are made from birch, $\frac{1}{4}$ in. wide and $\frac{3}{16}$ in. deep. The propeller bar, it will be seen, is pinned and glued in a slot cut in the main spar and over it is bound a strip of tin (Fig. 7) to take the bracing wires. See that this propeller bar is placed quite centrally in the slot.



The completed monoplane, but without the tail and wing coverings. It is fitted with pusher-type air screws, and therefore flies tail first.

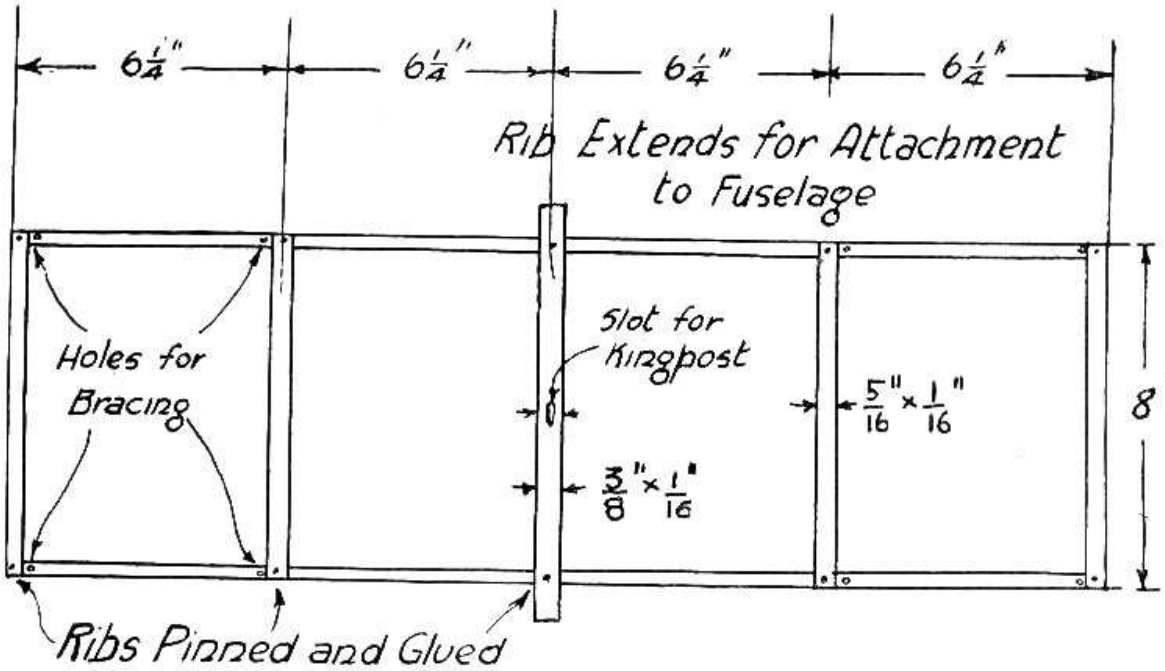


Fig. 12.—This diagram of the mainplane gives you the measurements you need for its construction.

The diagonal supports which brace the bar against the tension of the elastic meet the main spar at a point 7 in. from its end. Cut the angles on the ends of them accurately, so that they butt on to the spar quite truly. These members must be neatly glued, pinned and bound in position.

To the front end of the fuselage are bound the hooks which engage with the elastic. These are formed from one length of wire in the manner shown at Fig. 8. But before the hooks and kingposts are fixed, two tin sockets, with which to secure the mainplane, must be made and passed over the spar.

Figs. 9 and 10 show details of the mainplane adjustment, from which it will be clear that these sockets are forced over an extension of the centre rib of the mainplane, as will be seen later on. These sockets can be made from a strip of tin cut from a cigarette tin, and are ¼ in. wide and wrapped round the spar with the mainplane held in position.

Now comes the making of the front chassis, which is shown at Fig. 11. A small wheel is assembled on to a piece of 20-gauge piano wire in the manner shown, and later will be lashed to the first, or front kingpost. This front chassis really acts as a shock absorber, because it is flexible and will bend as the model lands. (See B, Fig. 1.)

The rear chassis, the form of which is shown at Fig. 11, is also made of 20-gauge piano wire; it is soldered together and bound to the second, or middle kingpost (A, Fig. 1), and carries a wheel at either extremity. These wheels can be obtained from most model dealers. See that the chassis is bound firmly and that the wheels are in track with one another.

Oil them so that they run quite freely, and thus enable the model to rise with a minimum loss of power.

The next job is the bracing of the model. Fine piano wire of 35-gauge is used; it is attached to tiny notches cut in the kingpost in the positions shown at Figs. 1, 2, and 3 and in greater detail at Fig. 4.

The rear bracing which passes over the mainplane should be attached to a small hook made of 20-gauge piano wire, so that it can be detached when it is desired to attach or detach the mainplane. (See Fig. 7).

The framework of the mainplane is cut from silver spruce $\frac{1}{16}$ in. thick and $\frac{5}{16}$ in. wide, excepting the centre rib, which is cut from birch $\frac{1}{16}$ in. thick and $\frac{3}{8}$ in. wide. This centre rib has a slot cut in it through which the kingpost passes, as will be seen from Fig. 9. The centre rib also extends over the leading and trailing (front and back) edges of the plane, as in Fig. 10, so that the tin sockets previously passed on the spar can hold it down firmly to the fuselage.

The best method to adopt in making the mainplane (the dimensions of which are shown in Fig. 12) is to mark it out full size on the bench, lay the spars and ribs on this, and pin and glue the framework together, leaving the ribs and spars slightly longer than the required measurements for trimming off when the glue is set.

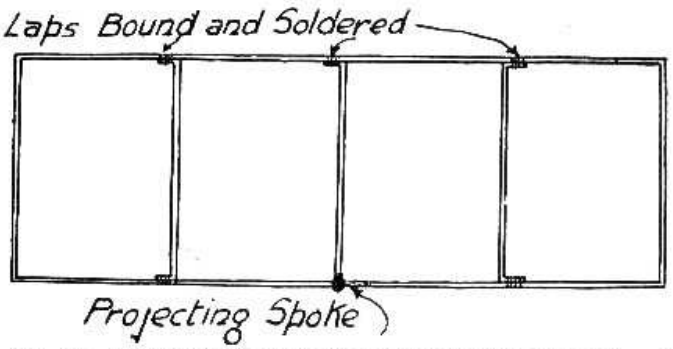


Fig. 13.—The elevator is made from 20 gauge piano wire bent and soldered to this shape.

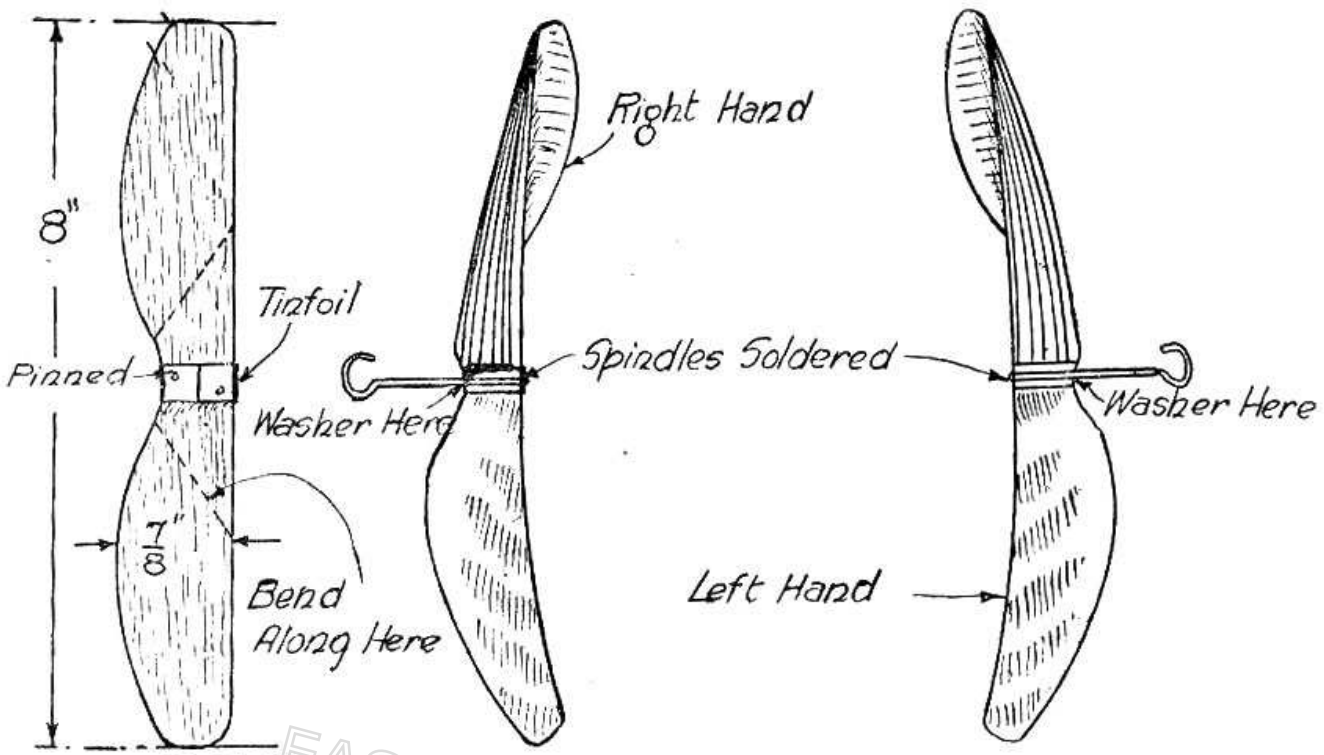


Fig. 14.—The propellers are cut from birchwood blanks to the shape shown, and then steamed and bent.

The pins may be driven through into the bench, to hold the framework true, and the plane so left until the glue is dry, when it may be prised up with the blade of a pocket-knife, and the pins clinched over.

Proofed silk is used for covering the plane; it should be stretched from end to end first, and glued on the underneath edges of the ribs and spars. Let the glue (Seccotine or Croid is best) get quite tacky before attempting to attach the fabric, and work it over the ribs and spars so that all the wrinkles are taken out. Stretch it on tautly and put the mainplane aside to dry.

The elevator (Fig. 13) is made from 20-gauge piano wire bent and soldered to the shape and dimensions shown in the plan view. The centre rib is left longer at the front, and is bent downwards and back to pass through a hole in the spar, as at Fig. 8. By bending it back in this manner the trailing edge of the plane is caused to bind on the spar and thus allows the elevator to swivel should the model strike a wall or tree and so prevent damage to it.

The fabric is stitched with an "over-and-over" stitch to the wire framework of the elevator. The mainplane should now be passed over the kingpost and braced up with carpet thread as at Fig. 3. See that both edges are parallel with each other, and that the plane sits quite firmly on the fuselage.

The propellers are cut from birchwood blanks 1 in. wide, 8 ins. long, and $\frac{1}{16}$ in. thick. They are cut as at Fig. 14, and carefully bent in a jet of steam. See that they are made of opposite pitch as shown, and identical in every way. The tip angles should all be the same, and they should be carefully cut to the same shape. A strip of thin tin $\frac{3}{8}$ in. wide is now wrapped round the centres, and the 20-gauge propeller shafts are bent round and soldered to these.

For elastic, use 12 yards of $\frac{1}{4}$-in. strip elastic made into two skeins of six strands each. Pass valve tubing over the hooks so that when the elastic is fully wound they do not cut through, and lubricate the elastic with soft soap and oil the propeller bearings. You are now ready to make a trial flight.

To fly the model it is merely necessary to set the elevator at a slight angle, and wind the two propellers about 400 times each in opposite directions.

Then, when unwinding, each screw drives the air away from the model. When the model is placed on the ground it will run along, rise off and fly gracefully away.

You should gradually increase the turns to 1,000 for each screw. This would be a tedious operation but for the piece of mechanism shown at Fig. 15. This is made from a wheel and pinion out of an old clock, and is forced in the ground.

Each propeller is placed in the slotted chuck and the handle is turned, thus speeding up the operation of winding the propellers very considerably.

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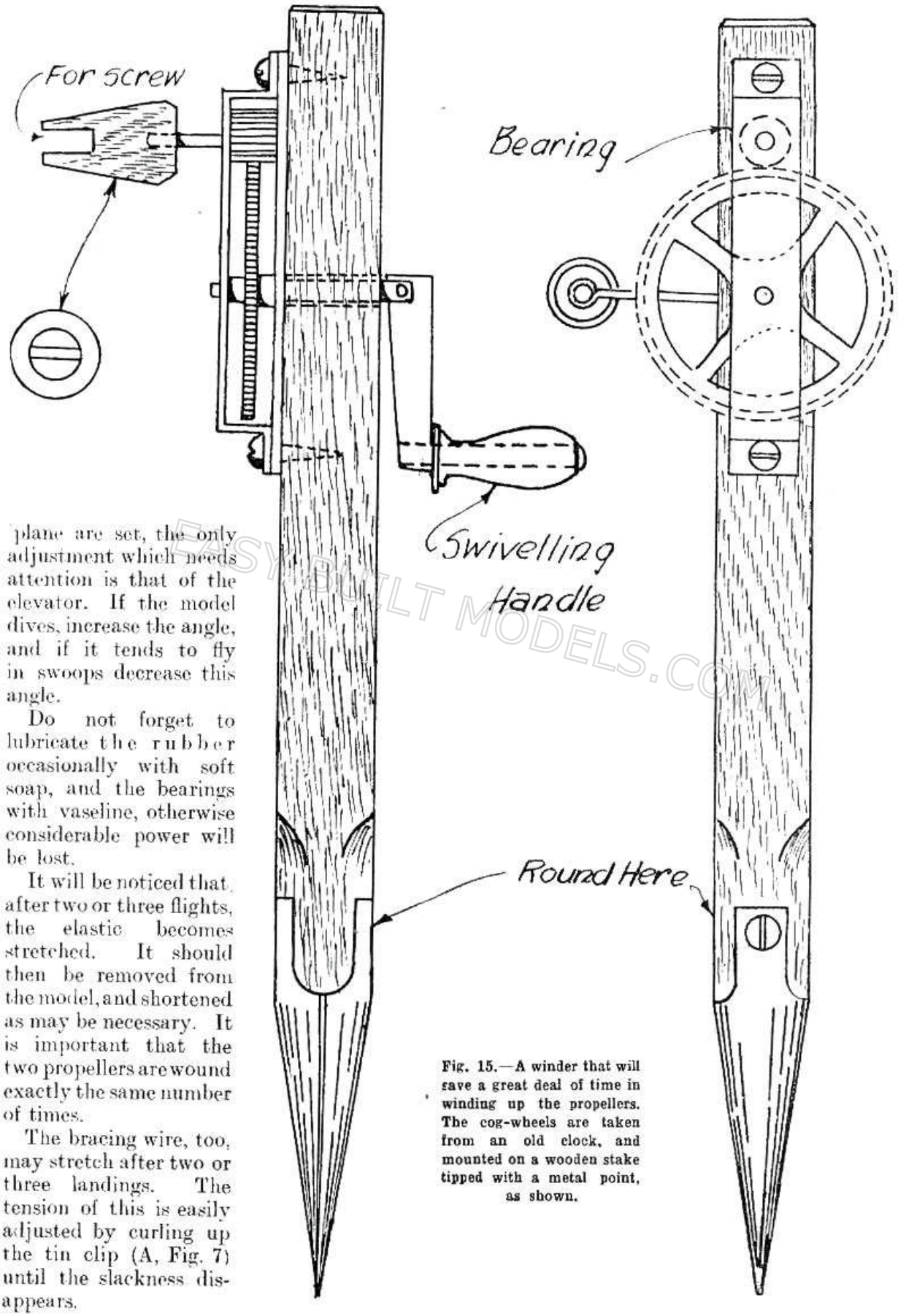

plane are set, the only adjustment which needs attention is that of the elevator. If the model dives, increase the angle, and if it tends to fly in swoops decrease this angle.

Do not forget to lubricate the rubber occasionally with soft soap, and the bearings with vaseline, otherwise considerable power will be lost.

It will be noticed that, after two or three flights, the elastic becomes stretched. It should then be removed from the model, and shortened as may be necessary. It is important that the two propellers are wound exactly the same number of times.

The bracing wire, too, may stretch after two or three landings. The tension of this is easily adjusted by curling up the tin clip (A, Fig. 7) until the slackness disappears.

Fig. 15.—A winder that will save a great deal of time in winding up the propellers. The cog-wheels are taken from an old clock, and mounted on a wooden stake tipped with a metal point, as shown.

A TWIN SCREW RACING MONOPLANE
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Here are working details for you to follow in the making of this clever Model Racing Monoplane. Other diagrams, and Figs. 12, 13, 14 and 15 are on pages 127-180.

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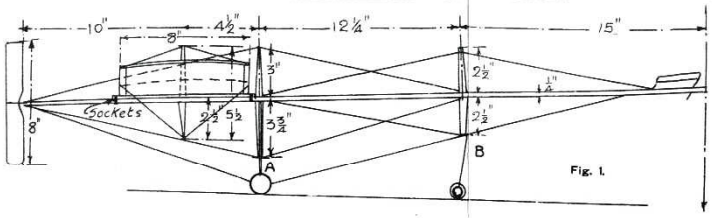


Fig. 1.

Fig. 1 (left).—Side view of the completed monoplane. This sketch and Figs. 2 and 3 show where to fix the bracing wires and kingposts.

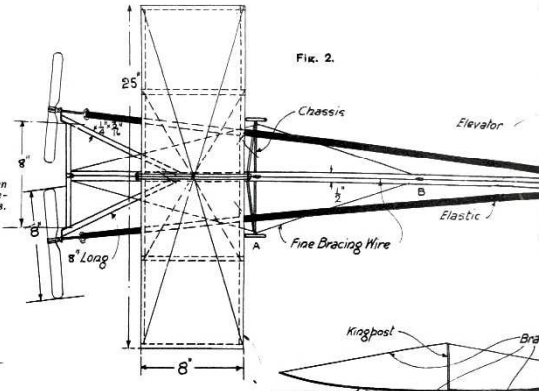


Fig. 2.

Fig. 2 (right).—The model, seen from overhead, showing arrangement of the twin propellers.

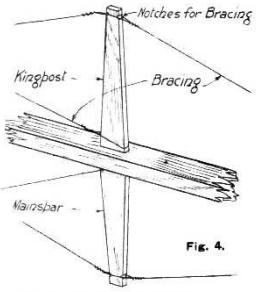


Fig. 4.

Fig. 4.—The kingposts, which are supports for the bracing wires and chassis, are fitted into slots cut in the fuselage (mainspar).

Fig. 11 (right).—The main, or rear, chassis, made from stout wire bent to this shape, is bound to the mainspar with thread. The smaller diagram shows the front chassis, which consists of a wheel and a piece of wire, bound to the front kingpost.

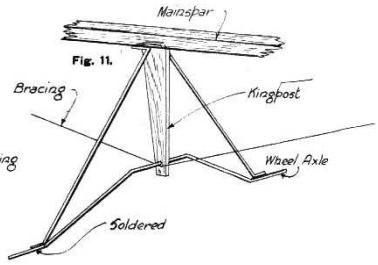
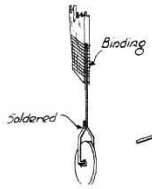


Fig. 11.



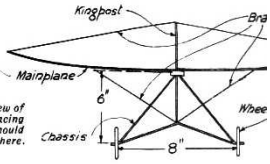


Fig. 3 (right).—Rear view of the monoplane. In bracing up the mainplane you should copy the curve shown here.

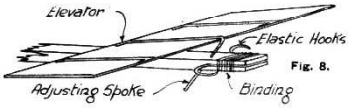


Fig. 8.

Fig. 8.—A piece of wire, bent to shape and bound to the nose of the fuselage, forms the hooks to which the ends of the elastic are attached.

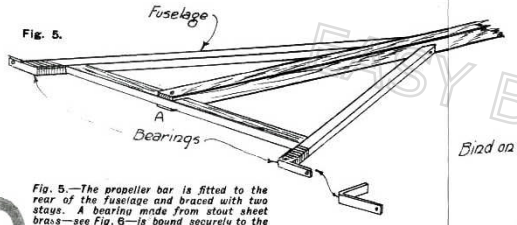


Fig. 5.

Fig. 5.—The propeller bar is fitted to the rear of the fuselage and braced with two stays. A bearing made from stout sheet brass—see Fig. 6—is bound securely to the end of each stay.

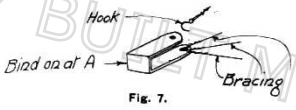


Fig. 7.

Fig. 7.—A strip of tin is to be cut to this shape and bound over the spot where the propeller joins the fuselage (A, Fig. 5). The bracing is then hooked in the little holes bored at each end.

Fig. 9 (right).—Tin sockets forced over the centre rib hold the mainplane securely to the fuselage.

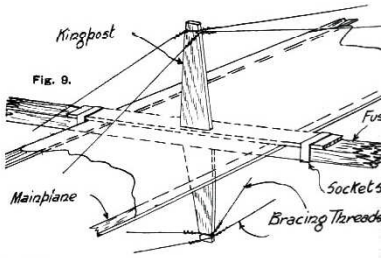


Fig. 9.

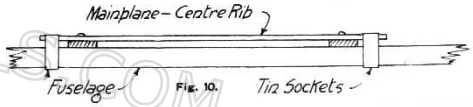


Fig. 10.

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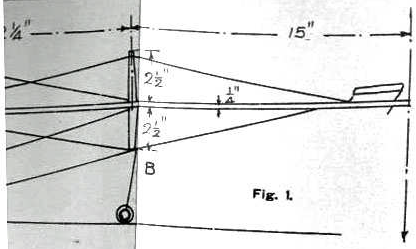
This model 'plane is a faithful copy of one which held the world's record for duration of flight (68 seconds), stability, and shortness of run before rising, for models rising from the ground under their own power.



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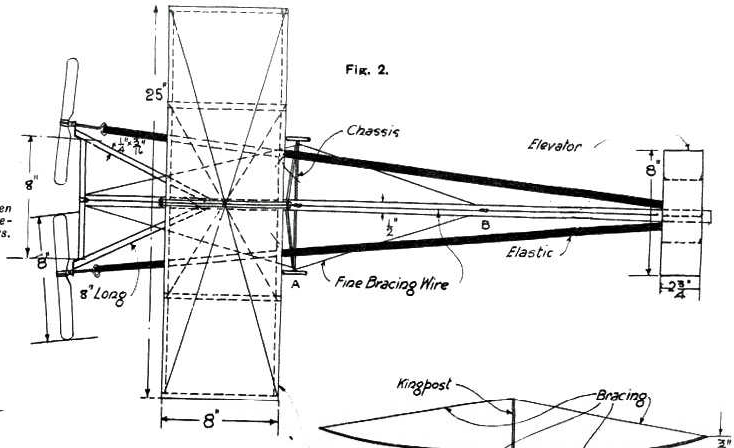

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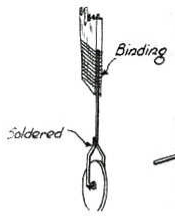


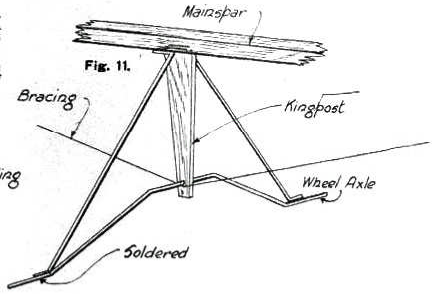


Fig. 11.

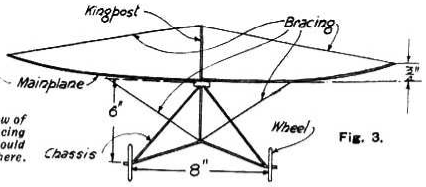
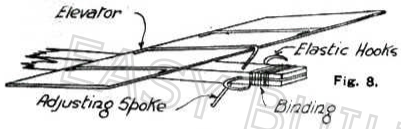


Fig. 3.

Fig. 3 (right).—Rear view of the monoplane. In bracing up the mainplane you should copy the curve shown here.



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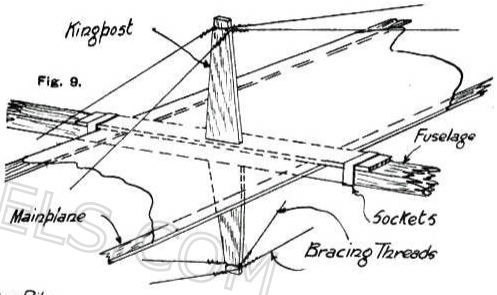
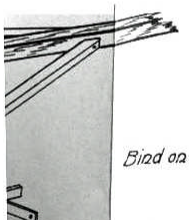
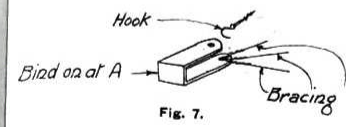


Fig. 9.

Fig. 9 (right).—Tin sockets forced over the centre rib hold the mainplane securely to the fuselage.





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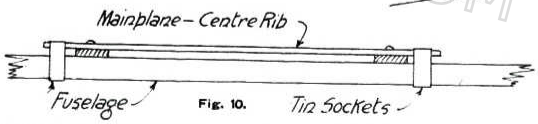

Fig. 10.

Fig. 10 (left).—This sketch, compared with Fig. 9, makes the method of fixing the mainplane to the fuselage perfectly clear.