CHAPTER 8

FUSELAGES

THE proper construction of the fuselage is of utmost importance. It must have the structural strength to support the motor, motor stick, wings, elevator, rudder, landing gear, tail skid, and propeller; and, on the other hand, being the second largest unit of a model, it must be designed for lightness.

FUSELAGE FORMS. For built-up, non-flying scale models, flying scale models, and commercial models, there are six common shapes given to fuselages which are shown in Fig. 41. The first one is triangular shaped, often found in commercial models. (See Chapter 35.) It consists of three longerons, or stringers, separated by upright struts and cross braces. No motor stick is used in this form of fuselage, as its strength is sufficient to hold the motor alone.

The second is a half-round and square-shaped fuselage, which is a common one among real planes. The one shown here is taken from the S.E.5 in Chapter 49. It has a number of formers along the upper portion of the fuselage, which are connected by stringers. The lower portion is made of stringers connected by upright struts and horizontal braces.

A rectangular shaped fuselage is shown by 3. Because of its squared corners, no formers are required to give it shape. It consists of four longerons, connected by upright struts and horizontal cross braces. Such fuselages are seldom found in a real plane of today, but War models often had them. Portions of modern fuselages have this form, such as the Curtiss-Wright Junior in Chapter 46. While the front of this plane is rounded, the rear is rectangular.

The square fuselage, shown by 4, is of the same construction as the rectangular one, 3, except that diagonal braces have been added for strength. This is a popular commercial shape, but is seldom found in real planes.

5 shows the oval fuselage, which is a popular form of fuselage in real planes of today. Note the Curtiss Shrike YA-8 Attack in Chapter 52 and the Waco Taper Wing in Chapter 47. The oval form is obtained through the use of oval formers connected by stringers, as shown.

The round fuselage, shown by 6, is another shape popular in real planes,

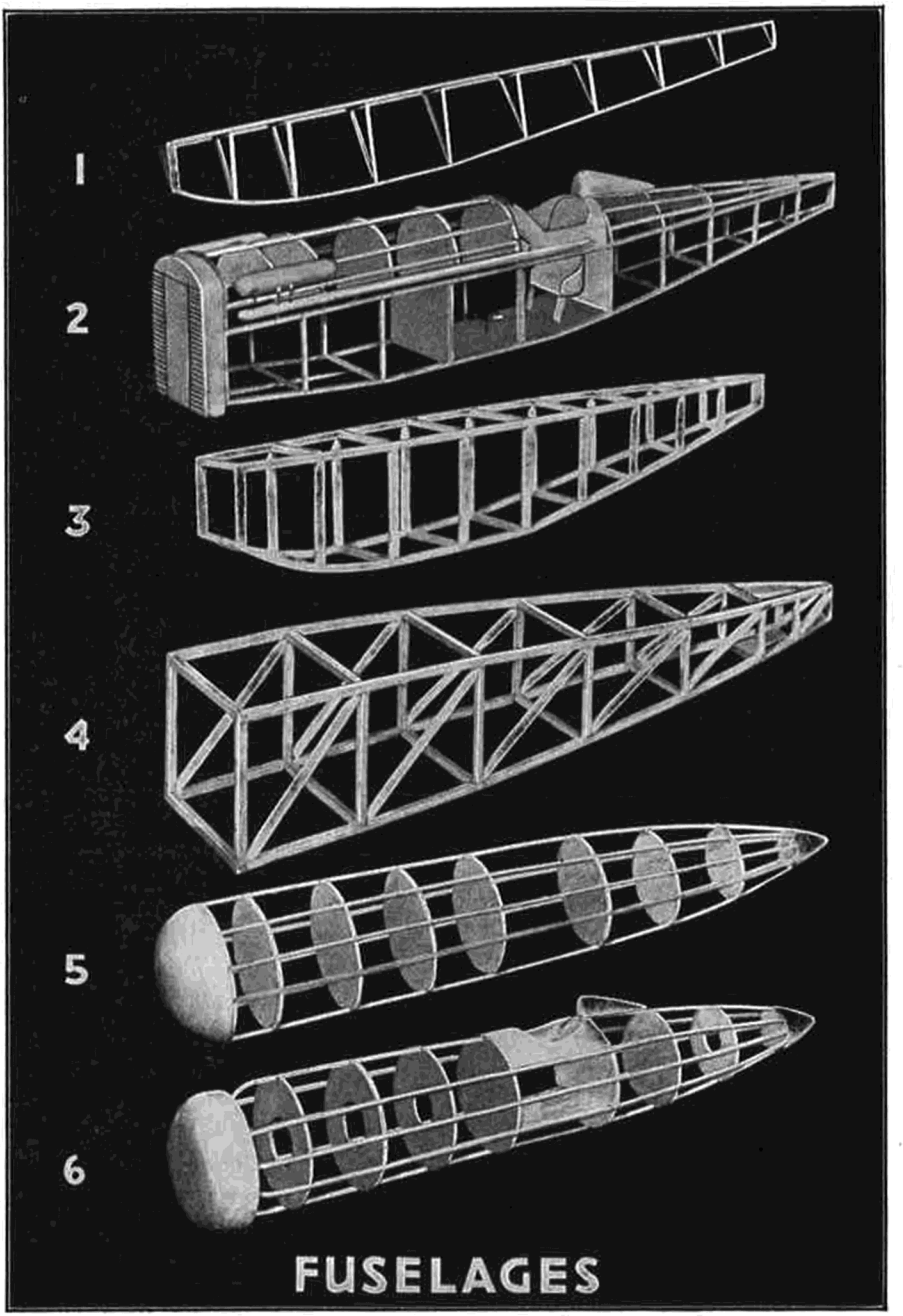


FIGURE 41

although few are perfectly round as in Chapter 48. This is made of formers connected with stringers running the full length of the fuselage.

All these fuselages can be made to carry motor sticks, or carry motors without motor sticks, or they can be made as non-flying models. In 6, a few of the formers have been cut out to show their construction for flying scale models, while in 5 they are left solid for exhibition models.

In the last two the formers must be full height to give the bottom of the fuselage its shape as well as the top. In 2, however, the formers give the fuselage its shape only on the top, so these need only be half-round forms, as shown.

FUSELAGE CONSTRUCTION WITHOUT FORMERS. Fuselages can best be made without formers when their shapes are square, triangular, or rectangular throughout. If they have rounded or curved portions, however, formers should be used.

There are many ways of making fuselages, but the three steps given here will be found practically foolproof, if followed correctly. These are layout, cutting, and assembly. Fig. 42 shows these steps.

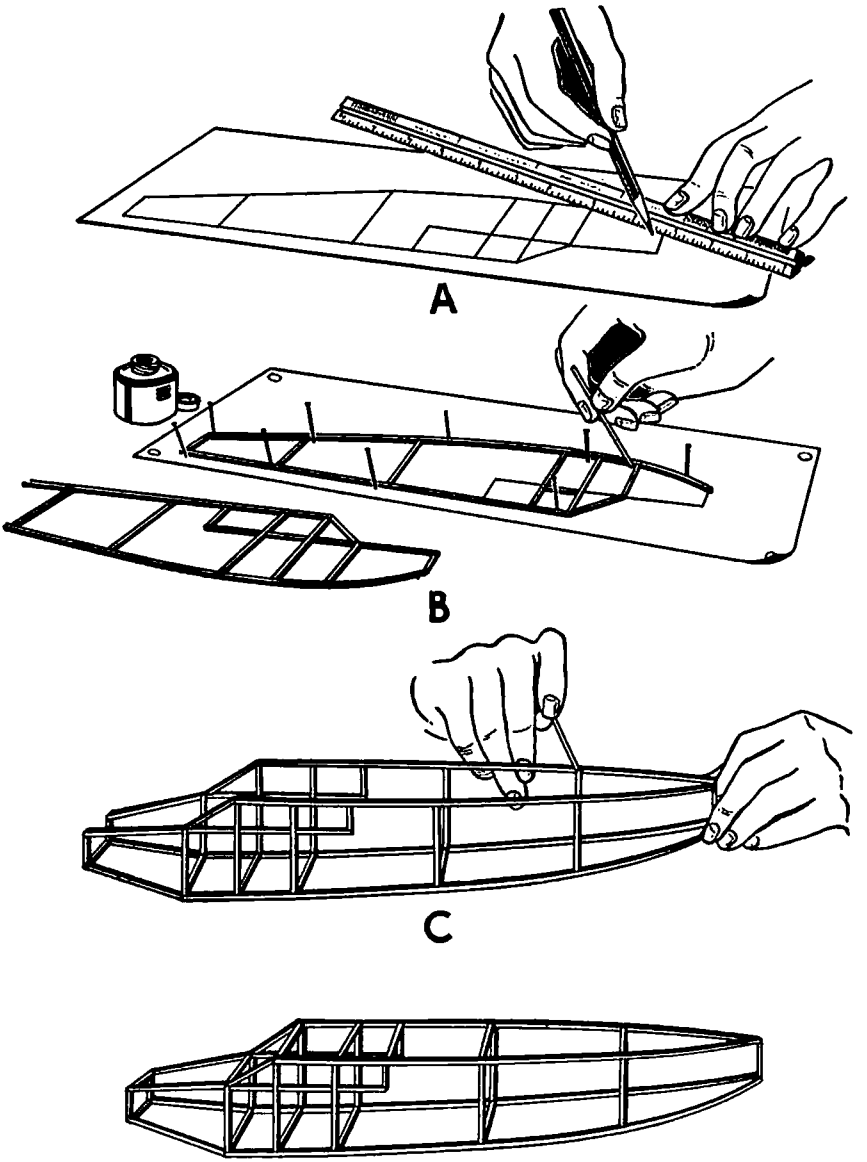
A shows the making of the *layout*. This is a full-size copy of the plan from which the fuselage is being constructed. The best view is the side of the fuselage, as both sides of any fuselage are alike. Care must be taken to insure correct dimensions because actual construction is done on this layout sheet.

When completed, the longerons, struts, and cross braces are cut to proper length and size. (See Chapter 3, "Balsa Wood.") Complete all *cutting* before assembly starts. The parts for each side, top, and bottom should be in separate piles for quick identification.

Fig. 42 B shows the *assembly*. One side of the fuselage is assembled at a time. Lay each part in its proper position on the layout sheet. Hold the longerons in place with model pins, as shown, while the struts are slipped between them. To make sure that each part fits perfectly, assemble the entire side on the sheet before doing any cementing.

While the longerons are held with pins, cement all struts and braces between them, as in B. Allow the structure to dry while in this position. A duplicate side is made in the same manner on the layout sheet.

When both sides are dry, the top and bottom cross braces are cemented in place, as shown in C. Though the sides of the fuselage may have a slight fore-and-aft bend in them, they should be assembled on a flat surface, and, when the top and bottom cross braces are ready to be applied, they are then bent.



FUSELAGE CONSTRUCTION
WITHOUT FORMERS

FIGURE 42

The completed fuselage is shown in D. These illustrations show the fuselage of a Stinson-Detroiter.

FUSELAGE CONSTRUCTION WITH FORMERS. When the shape of the fuselage is round, oval, half-round and square, or any other curved form, its construction will require the use of formers. These are usually cut from sheet balsa and take the place of struts and cross braces on square or rectangular fuselages.

It is obviously impossible to illustrate the constructional steps for every curved form of fuselage, so the Curtiss Shrike in Chapter 52 is used for illustration purposes. It has oval, round, and flat-round shaped formers, which are the most commonly used former shapes.

The necessary four steps are shown in Fig. 43. These are cutting of stringers and formers, two bending operations, and assembly.

Fig. 43 A shows the first step. All stringers must be cut to proper size with their lengths slightly longer than necessary. All formers should be redrawn full size from the original plan, and traced on the sheet balsa, as shown. These are then cut out.

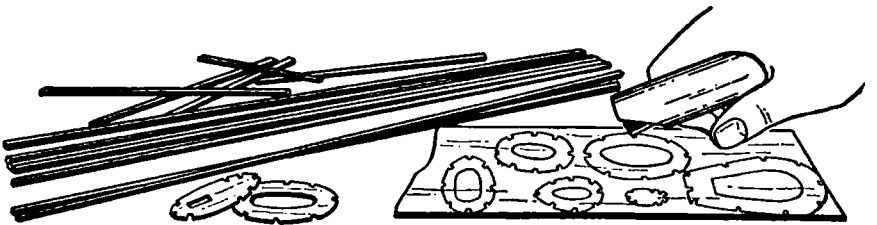
The next step is bending the stringers. On most curved fuselages, these will require two bends—the shape from side-to-side and the one from top to bottom. For this bending, full-size views of the top and side of the fuselage are drawn from the plans.

Draw a full-size plan of the side view of the fuselage, as in Fig. 43 B. The stringers are now bent. (See Chapter 3, "Balsa Wood" and "Bamboo.") Bend the stringers until each fits its particular line on the side-view plan. If balsa has been used for these, place the wet balsa in position on the plan and hold with pins until dry.

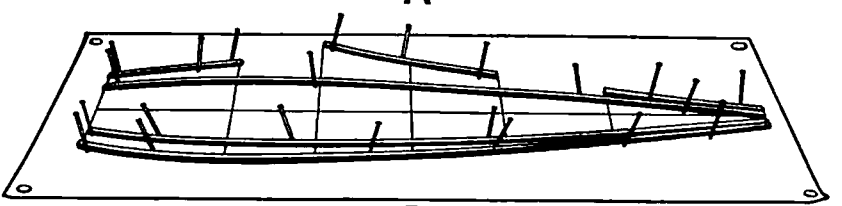
A full-size plan of the top view of the fuselage is drawn from the original plan, or laid out by the builder himself, and the various stringers again bent to conform to their side shapes, as in Fig. 43 C. Care must be taken when doing this, as the second preparation for bending the wood makes it pliable again and it might lose its original bend. Many builders, for this reason, make only one bend in their stringers, depending on force, carefully applied, to bring the stringers into position along the second curve.

When the stringers are bent and the formers cut, the fuselage is assembled.

D shows the assembling of the fuselage. One stringer, preferably the bottom one, is cemented into each of the formers. If this stringer has been bent perfectly, the position of the formers will be exactly as desired when the other stringers are added. E shows the finished fuselage. The three top stringers are cut to form the front and rear cockpits. These should be



A



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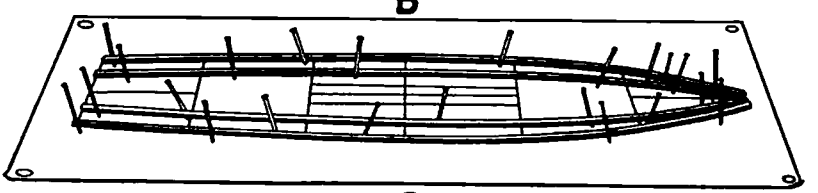

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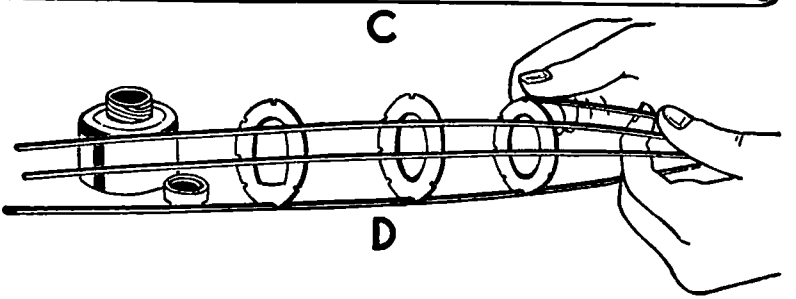
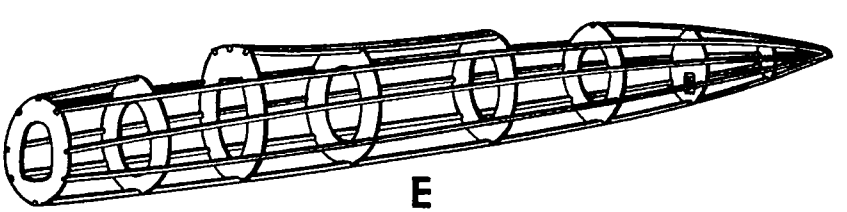


D



E

FUSELAGE CONSTRUCTION
WITH FORMERS

FIGURE 43

attached whole, and then cut between the formers after the cement has dried.

SOLID FUSELAGE CONSTRUCTION. The carving of a solid fuselage is done in six steps, shown in Fig. 44. Some builders use pine for this, but balsa is recommended because of the ease with which it can be carved. The block of wood is first squared up. It should be as long as the fuselage, as wide as its widest part, and as thick as its height. If the cowling is to be carved from the same block, the length of the block must include it.

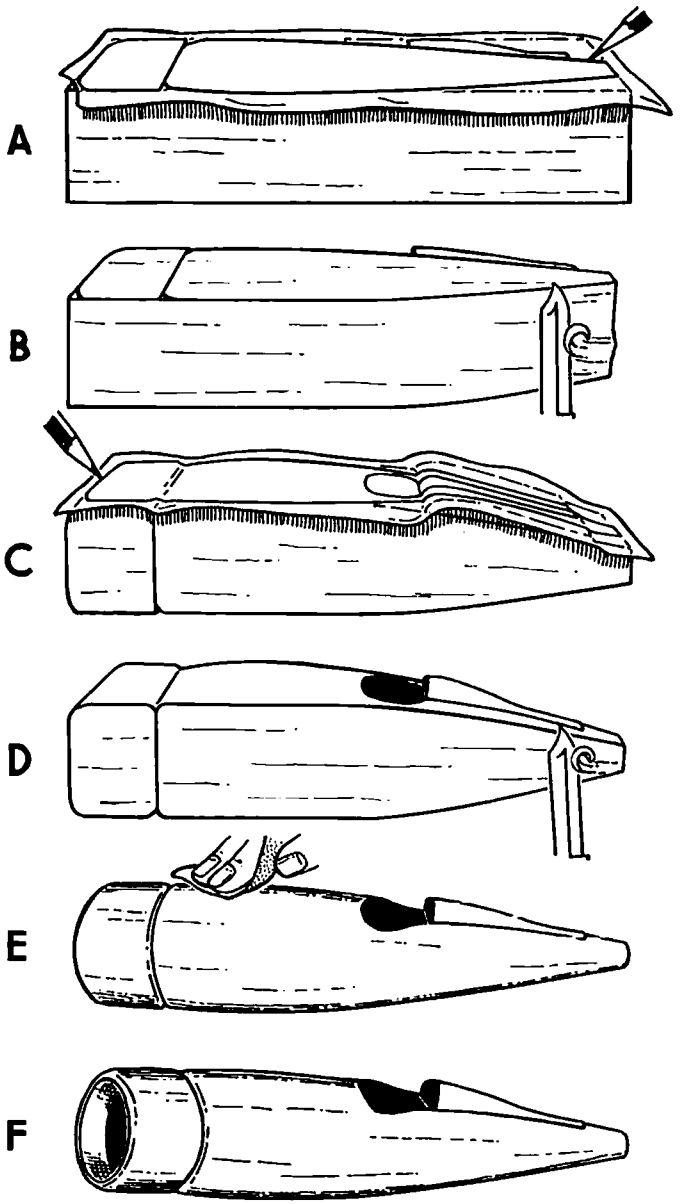
Make a full-size drawing of the side view of the fuselage. This is then traced on the side of the block, as shown in Fig. 44 A. When completed, the block is cut along this outline, as in B. A full-size drawing of the top view of the fuselage is made, and traced on the top of the block, as in C. The block is cut along this outline, as in D. The block has the general lines of the fuselage at this time, but not its proper shape.

This is obtained with sandpaper, as shown in E. Here the builder must follow cross-section views given in the plans, descriptions in the text, or photographs of a like model or the real ship. While the three-view plans given for solid scale models in this book do not carry cross-section views, the general shape of the fuselage is given in the text, and a photograph of the completed model is shown. From these two sources, the builder will experience little trouble in finishing the fuselage to its proper form.

When the fuselage has been carved and finished smooth, its cockpit should be cut out and equipped, as described in Chapter 15, "Cockpits." If an engine is to be added, the cowling requires hollowing out, as in F, to accommodate it. If this is not done, it is left solid and later painted with a black circle to represent the engine. (See Chapter 11, "Engines.")

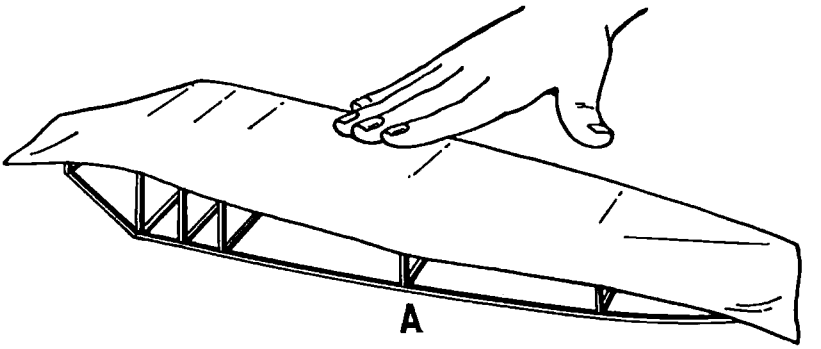
BUILT-UP FUSELAGE COVERING. The proper covering of a fuselage is a more difficult job than the covering of the average wing, as its curves, various bends, and open spaces for cockpits present a task requiring careful handling. The same covering used on the wing of a model should also be used on its fuselage. (See Chapter 3, "Covering Materials.")

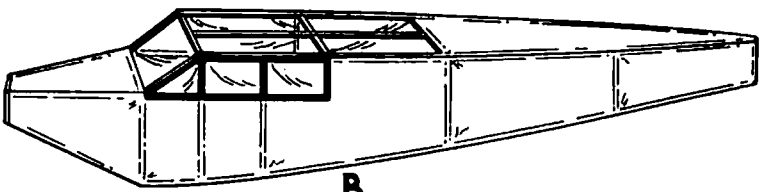
For square, rectangular, or triangular fuselages, the covering is done as shown in Fig. 45, "Built-up Fuselage Covering." One side at a time is covered on such models, as in A. Coat the structure with clear dope or banana oil, and, cutting the covering to approximate size, press it in position on the side. If tissue is used, it should be ironed free of wrinkles before being applied. When dry, the overlapping material is trimmed away. Nail scissors are best for this work, as small curves can be easily cut with them. Each of the sides is covered in the same manner. When completed, the material should be water-sprayed. (See Chapter 7, "Wing Covering.") This will re-



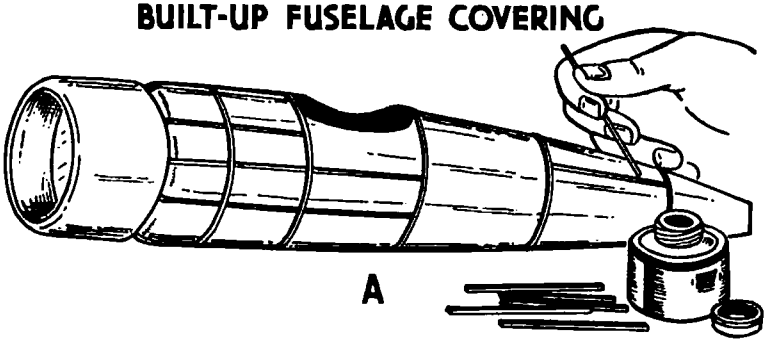
SOLID FUSELAGE CONSTRUCTION

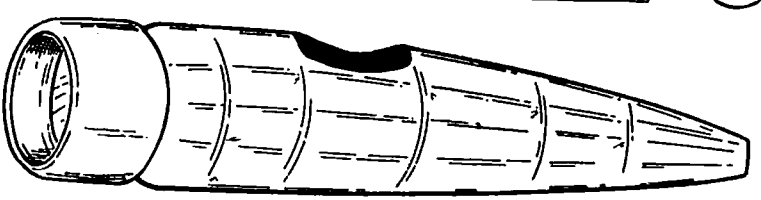
FIGURE 44





BUILT-UP FUSELAGE COVERING





SOLID FUSELAGE COVERING

FUSELAGE COVERING

FIGURE 45

move any sagging, or wrinkles. For a drum-like tightness, the material must be doped. Give tissue a coat of clear dope, but if silk is the covering material, clear banana oil should be used.

The method of covering round, oval, or half-round fuselages is the same, except that the covering material should be cut into strips before being applied. These strips run the entire length of the fuselage and are wide enough to cover the space between three or four stringers. Each must be carefully trimmed before the next strip is applied. The fuselage is then finished in the same manner as the square one.

SOLID FUSELAGE COVERING. Solid scale models can be covered in such a manner as to look like built-up planes. The model is completed, but not assembled. Before this is done, $\frac{1}{64}$" or $\frac{1}{32}$" square balsa strips are cemented to the solid surface to represent formers, struts, and cross braces, as in Fig. 45, "Solid Fuselage Covering." Ordinary string is sometimes used to build up solid fuselages.

When all outline strips have been cemented in place on the fuselage, it is covered with a heavy-grade tissue or a very fine grade of silk. The process is the same as covering the built-up fuselage. The covering is water-sprayed and doped in the same manner as any covering. When this construction is used, the builder must remember that not only the fuselage must be outlined with the strips, but also the wing, elevator, and rudder, so that the entire model will look like a built-up job. The completed fuselage is shown in Fig. 45 B under "Solid Fuselage Covering."