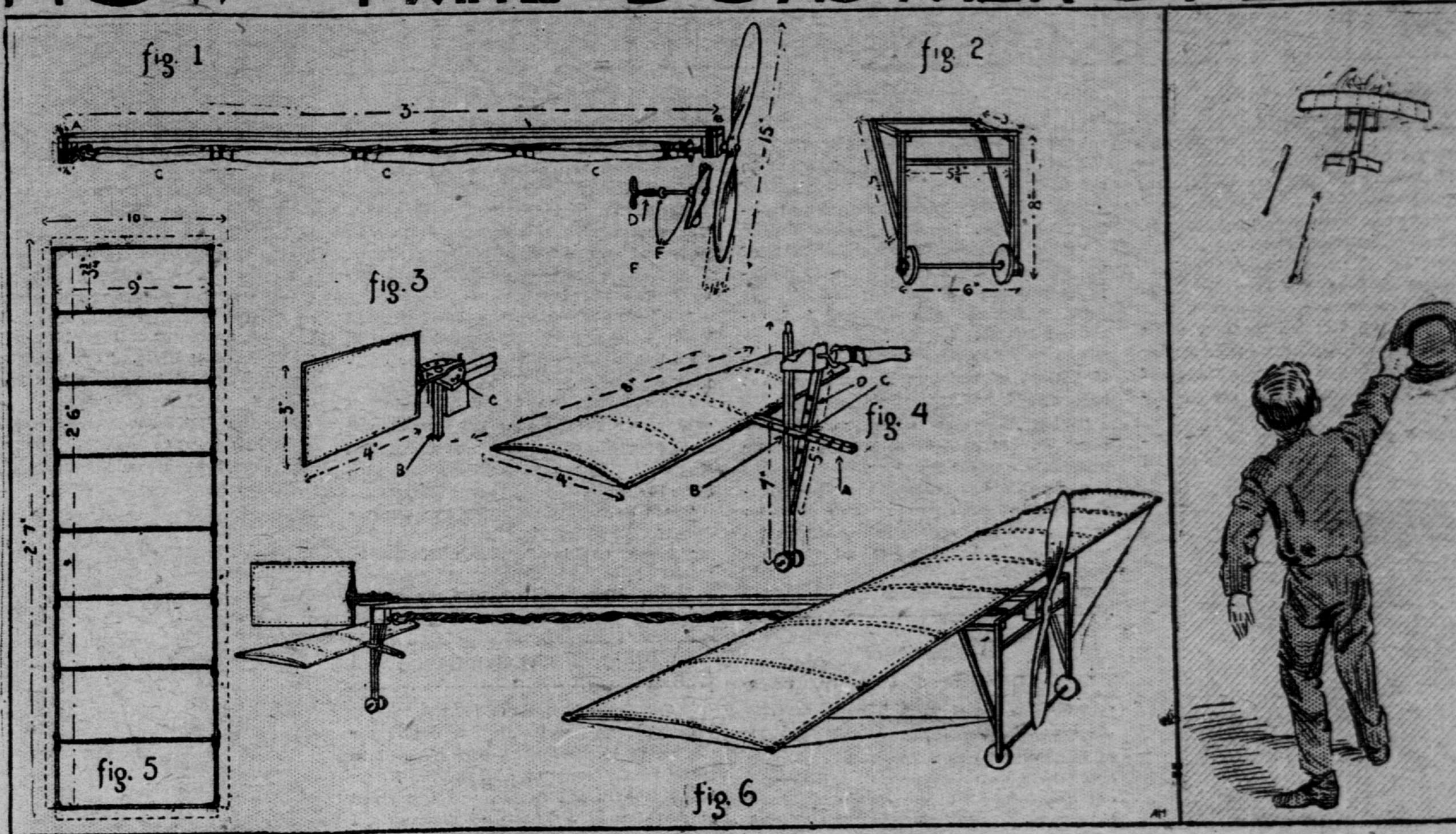
HOW TO MAKE A BOY'S AEROPLANE



By ARTHUR M. LANGWORTHY

MOST every boy with a mechanical "streak" knows that the aeroplane is usually either a biplane or a monoplane. A biplane has two sets of large main planes, as in the Wrights' machines, and it is extremely difficult for any but a trained mechanician to build. The monoplane, having but one set of main planes, is much easier to construct, and it flies every bit as well.

First prepare the "backbone" of the monoplane. A three foot rattan stick three-eighths of an inch square is best and lightest, but white wood or pine will do. Then cut the two end braces (A-B, Fig. 1) each one inch high by half an inch wide by a quarter of an inch thick. First attach the end brace (A, Fig. 1) to end as shown. Use fish glue and then wire firmly in place as shown. A couple of very thin small wire nails are now driven into the top to reinforce. Don't drive directly in center. If the wiring is good and tight all danger of splitting from the nail is prevented. Having got the principal frame work, the next problem is the motive power. This is supplied by the "rubber band motor" (C-C-C, Fig. 1) and is the easiest part of the whole construction. First insert the screweye into the end brace (A, Fig. 1). The screweye must be in so tight that it is immovable and no amount of pressure can turn it.

Then bore a hole through the end brace (B, Fig. 1). The best way to do this without splitting is to heat a wire red hot and burn it through. It is now ready for the propeller "shaft" to be inserted. The hole should be a trifle larger than the long wire nail (D, Fig. 1), which is the shaft. This brings us to the propeller.

You can fashion it of very thin tin and solder to the shaft, or whittle it out from a thin pine slab. The best way is to find a two bladed toy boat propeller and copy that as your model. It should be 15 inches long and an inch and a half wide in its widest part.

Now drive the shaft nail through the hub so the propeller is firm and immovably fixed upon it and then put on the "bearing" (E, Fig. 1). The bearing may consist of any small button or bead with a hole pierced in it. Then insert the shaft through the end brace (B, Fig. 1) and slip on the other bearing.

Then with a pair of strong pliers bend the end as shown, after which wire the section (F, Fig. 1) so the shaft will not slip forward through the shaft hole. Then attach the end brace in place (B, Fig. 1) by the same means used in placing the end brace.

Procure the long, heavy rubber bands (C-C-C, Fig 1), cutting each so its ends may be attached to the other bands as shown. Smaller rubber straps or string may be used to fasten the bands together. A large number of smaller bands may be also strung together to serve if you can't find the big bands, so long as the winding up principle can be carried out.

That is why the shaft end with the propeller revolves while the other end is fixed and immovable. The propeller is turned round and round by hand until the bands are all twisted as tight as possible (see Fig. 6). The second the propeller is released the bands begin to relax, which operation unwinds them, thus turning the shaft at high speed, and there is your "rubber band motor."

Fig. 2 shows the landing braces, which you can make of pine strips an eighth of an inch square and cut to the sizes marked. In fastening together fish glue reinforced by fine wire at the joints will give the proper stability. Fig. 6 shows the braces in position.

Fig. 3 is an enlarged view of the rudder and mechanism. One and a sixteenth inch bamboo strips are the best for the rudder frame, though pine will do. The best way to fasten this light bamboo together is to first glue the joints and then bind with shoemaker's thread. Don't try to use tacks. This method should be employed in all light framework.

The tiller (A, Fig. 3) turns on the tack pivot of the sternpost (B, Fig. 3) and is fixed at the angle wanted by the movable pin in the different holes of the semicircular base (C, Fig. 3).

The rear or "lighting plane" is shown in the enlarged view of Fig 4. Construct the framework of the plane of one and a sixteenth inch bamboo strips cut to sizes marked, fastening together with glue and shoemaker's thread as in the rudder frame.

The lifting plane governs the height of an aeroplane's flight. For instance, if you want the airship to make a long, level flight the planes should be set horizontally. A gradual upward flight means a slight dip of the plane downward. Here the same principle of the steering gear is used, only up and down instead.

The projection (A, Fig. 4) is cut of two thin tin strips, the ends of which are bent to and firmly wired to the plane framework. The projection is pivoted on the rudder post at B, Fig. 4, by a small wire nail, and can be tilted into any position by removing the pin (C, Fig. 4) and inserting same in the other holes of the diagonal support (D, Fig. 4). The rudder post is three-sixteenths of an inch square and the diagonal supporter three-sixteenths of an inch wide by an eighth of an inch thick.

The large "main" plane is shown in Fig. 5. First construct the framework in the same way you did the framework for the lifting plane. Cut the strips to the sizes marked in Fig. 5. The two long strips should be an eighth of an inch wide by a sixteenth of an inch thick, but the nine small strips should be a sixteenth of an inch square. When the framework is bound together firmly the "canvas" is ready to be stretched upon it.

The method employed applies to the "clothing" of the rudder and the lifting plane also.

Chinese silk is the lightest, strongest and best material, but every boy can not get it, so white cambric, muslin or any very light cloth will do. Cut the cloth out, leaving a half inch margin for the flaps all around, with the notching at the four corners, as shown by the dotted lines of Fig. 5. Then brush glue along the flaps and turn them over the framework, gluing down firmly all along the edges.

After the plane is thoroughly dry you may curve it (also the lifting plane) by wiring the ends, as shown by A, Fig. 6. Fasten it firmly to the "backbone" by brads, and further steady it by wiring it further, as shown.

And now as to flying the completed aeroplane. No airship is liable to "behave" on the first trials. Your rubber bands may not be adjusted exactly right to give most power; your lifting planes may not be tilted right; the wind may be too strong or a dozen little things may annoy you, or maybe you don't know how to launch properly.

Don't give any strong initial push, but simply let the airship fly out of your hands with as little exertion on your part as possible when the propeller is released, for in flying a model aeroplane proper launching is half the secret of a long, successful flight.

ABOUT COMMON THINGS

BEGINNING OF THE RUBBER INDUSTRY

By GUSSIE P. DUBOIS

OUR great-grandfathers knew rubber only as a curiosity and a substance for erasing pencil marks. In 1770 it was still so scarce an article that a piece containing half a cubic inch was sold in London for 75 cents. It is, however, one of the articles of which nature has provided a vast supply, and greater quantities soon found their way into the commerce of the world, until in the year 1820 it was frequently brought over in ships as ballast. So people began making experiments with a view to rendering it useful, and it was found to be a valuable ingredient of blacking in varnish.

In England, Mackintosh invented his still celebrated waterproof coats made with a paste of indiarubber between two cloths. In 1820 a pair of rubber shoes were seen for the first time in the United States. They were shaped like a Chinese shoes, were covered with gilding, and were handed about as a curiosity. Two or three years later a ship from South America brought to Boston 500 pairs of rubber shoes, thick, heavy and ill shaped. They sold rapidly, others were imported, and indiarubber shoes became articles of common use. The manner of making them was very crude. The sap was gathered from the trees, clay lasts were dipped 20 or 30 times into the liquid, each layer being smoked a little; then the shoes were hung up to harden for a few days, after which the clay was removed and the shoes were stored for several months to harden them still more.

The Yankees thought they could do all this better than South American Indians, and cheaper, for a pair of shoes brought from $3 to $5, while the raw gum sold in Boston for 5 cents a pound; indeed, so much of it was brought in vessels that there were large quantities of which no use was made. So the Roxbury rubber company was formed, and it made an amazing progress, its capital speedily increasing from $30,000 to $400,000. Some one invented a rubber cloth which this company manufactured, making coats, caps, wagon curtains and such articles. Other factories were started, and there was a regular indiarubber mania. When the business was at its height Charles Goodyear first had his attention directed to the material being manufactured. He saw some life preservers, examined them carefully, and, being a Yankee, bought one and took it home to see if he could improve on it.

In the meantime something wholly unexpected occurred. The quantities of cloth and shoes had been manufactured during the cool months of 1834 and 1835 and when the warm weather came the larger part of them melted. Twenty thousand dollars' worth of garments were returned, and, not only were they reduced to the consistency of common gum, but so offensive was their odor that they were forced to bury them. In some cases the shoes bore the heat of one summer, but melted the next, while wagon covers became sticky in the sun and stiff in the cold.

Mr. Goodyear made his improvement on the life preserver and returned to New York to sell it to the company. They confided in him that, although they could not buy his life preserver, there was scarcely anything they would not give him for the secret, if he could only discover how to make indiarubber stand the summer's heat. And now, you should know a little of this man, Charles Goodyear.

From his childhood he had always been interested in indiarubber. When he walked through the streets of New Haven, a schoolboy, he had an abiding faith that he was "called" to the study of this peculiar substance. But, at the time when he was asked by the Roxbury company to investigate this subject, he was a man grown, with a family on his hands, was struggling hard against imprisonment for debt, and had already failed in business. He melted his first pound of rubber inside prison limits. After his release he worked patiently under great difficulties. Think of this strong, earnest soul melting five cents' worth of the gum at a time over the kitchen fire, kneading it himself and rolling it with his wife's rolling pin. After a time he succeeded in making some cloth which bade fair to stand the test; then a friend advanced him money to make several hundred pairs of shoes, but he stored them until summer, and alas! they were all reduced to that same ill smelling paste. But don't you think for one moment that he gave up. He obtained some barrels of the sap still liquid, and began to experiment with different substances, and at last discovered that the great agent which had eluded him so long was sulphur. Then came a weary time trying to find out how to mix it in the mass, and at the right temperature. The last discovery came by accident. He stood talking with a friend one day holding in his hands a lump of rubber which he kneaded as they talked. In a careless gesture he hit the rubber against the red hot stove. Instead of melting, it became hardened, but was still elastic or springy. Then he knew that he had found the secret of vulcanizing indiarubber, the secret which has made it one of the most useful substances in the world.

The greatest rubber market in the world is Para, in Brazil, which supplies more than a fourth of all the crude rubber used.