CHAPTER VII

AN AUTOMATIC FOUNTAIN

For the Home

The sight of thousands of glistening drops of water lightly tossed into the hot summer air, and the soothing "splish, splash" as they descend to unite once again, cannot fail to exert a cooling and refreshing effect upon the most indifferent onlooker. Yet very few realize that, with a little pleasant labor, we may provide ourselves with such an interesting addition to the home.

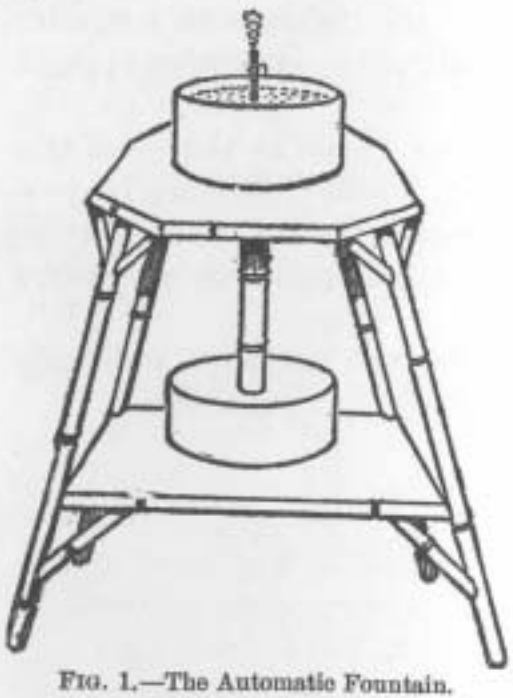

Fig. 1.—The Automatic Fountain.

The object of the next few pages is, therefore, to describe the most practical way of making a small fountain, Fig. 1, suitable for use in drawing-room or conservatory.

At first sight the article when finished appears to be an artistic flower-stand and fish-bowl combined, but the turning of a tap sets the fountain in motion, causing a small jet of sparkling water to rise to a height of 15 in., and then, breaking into countless drops, to descend into a bowl of gold fish surrounded by cool-looking ferns.

Since the construction of such a fountain may be divided into two distinct parts, the materials required naturally fall under two heads, *viz.*, those necessary for the stand and those required for the making and fitting of two cylindrical zinc tanks which form the fountain proper. The stand consists chiefly of wood

and bamboo, of which the following quantities will be required.

WOOD.—1 board, 6 in. by 9 in. by 1 in.

BAMBOO (in the form of rods) —

2 rods of 1½ in. diameter.
2 rods of 1¼ in. diameter.
1 rod of 2 in. diameter
(or smaller piece, say 2 in. if possible).
2 rods of ½ in. diameter.

In the case of the tanks, the materials are more numerous and somewhat more costly, although not beyond the reach of the average boy's pocket-money. The first purchase must be the zinc, and much time and trouble will be avoided by buying the metal cut to the required shapes and sizes. For this reason you must obtain four circular discs, each of 10-in. diameter, together with two rectangular strips each measuring 32 in. by 8 in.

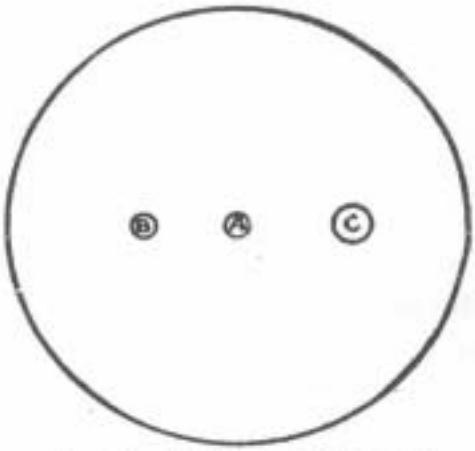

FIG. 2.—The Holes in the Upper Disc.

With regard to the discs, it is necessary to have holes punched in three of them, and thus the reader must obtain a clear idea as to the position and purpose of these holes.

FIG. 3.—Method of Punching Lower Disc.

A glance at Fig. 2, which illustrates the top disc of the upper tank, shows that there must be a central hole, A, of ½ in. diameter, with a similar hole, B, 1 in. to the left, to take the overflow pipe. Then, 2½ in. to the right of the central hole, must be punched one of ⅜ in. diameter, capable of taking the filler, which will be soldered into it later.

Now, since the holes in the bottom of the upper tank correspond in size and position to those in the top of the lower tank, it is only necessary to describe the punching of one of these discs.

Two holes of ½ in. diameter, placed ½ in. apart, are all that are needed, since one will take the overflow pipe, whilst the other serves for the air pipe. The fourth disc, forming the bottom of the lower tank, for the present needs no holes whatever.

Lead piping of ½ in. diameter will also be necessary, and 5 feet of this should prove sufficient.

A small tap, suitable for drawing off water, must also be purchased.

The purchases are not yet complete, for you have now to provide yourself with a jet capable of being turned on or off. The hole of this jet should be as fine as possible; indeed, it should be capable of just taking a thin needle. Such jets are often to be seen in tobacconists, where they are used to supply a tiny flame for the convenience of matchless customers. Although, of course, they cannot be obtained from this source, the reader will be able to form an idea of the kind of jet required, and obtain one from a gas fitter or plumber.

Nothing more remains to be obtained but ½ in. of brass filler with screw cap. This must be soldered into 1½ in. of brass tube of ⅜ in. diameter, so that the total length of the filler is just 2 in.

With the above-mentioned materials at hand, you are now in a position to commence the more interesting work of construction, the first step in which is the making of the stand.

The Stand

The stand, 2 ft. 9 in. high, consists simply of an overlapping top supported by four stout bamboo legs in which is fixed, 9 in. from the floor, a shelf; the whole being decorated where required with bamboo.

The top of the stand is the first part to be made, and consists of a square formed by battening together two boards, each 18 in. by 9 in. It should be here stated that considerable importance is attached to the shape of the battens, which must be similar in

shape, dimension, and position, to those shown by the dotted lines in Fig. 4.

It now becomes necessary to pencil several guiding lines on the top thus made. Starting from the corners, after drawing the diagonals, points should be made 4 in. from each, and joined. By sawing off the corners thus marked, AB, Fig. 4, the top becomes octagonal in shape, presenting a better appearance than if it had been left square.

Placing the point of a compass at the intersection of the diagonals, C, describe a circle of 5-in. radius, thus indicating the position which the tank will take later.

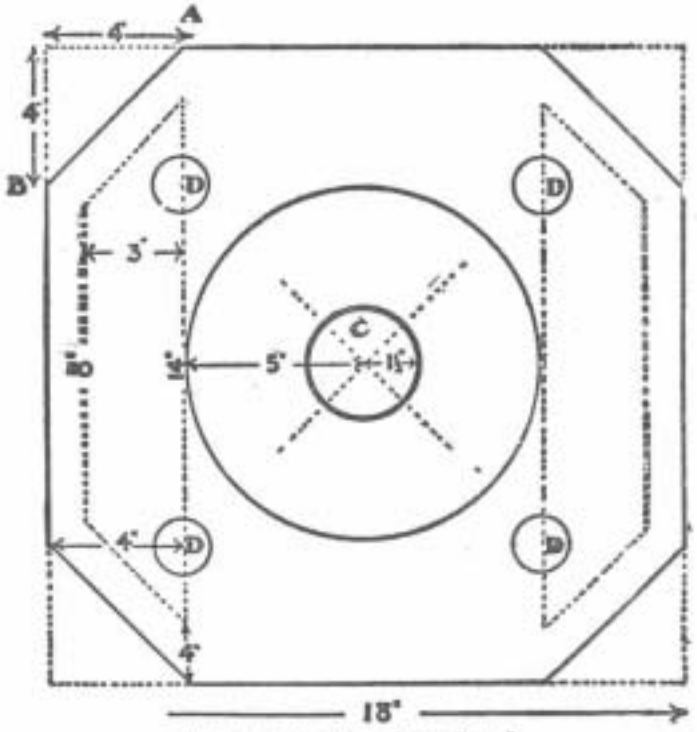

FIG. 4.—The Top of the Stand.

Holes to receive the legs of the stand may now be bored, and since their exact position is of some importance, a study of Fig. 4, where they are shown at DDDD, should be made. In boring these holes, they should be allowed to slope gently outwards, thereby allowing for the spreading of the legs.

Having accounted for these four holes, next bore in the centre of the pencilled circle a hole of 1½-in. radius, the purpose of

this becoming apparent later. The cutting and fixing of the four legs might now claim your attention, and as each is a 2 ft. 9 in. rod of bamboo, you should be able to cut two from each 6-foot rod. Having ascertained that they are all of the correct length, fix them in the four holes made to receive them. When sure that they are just flush with the top, permanently fix them

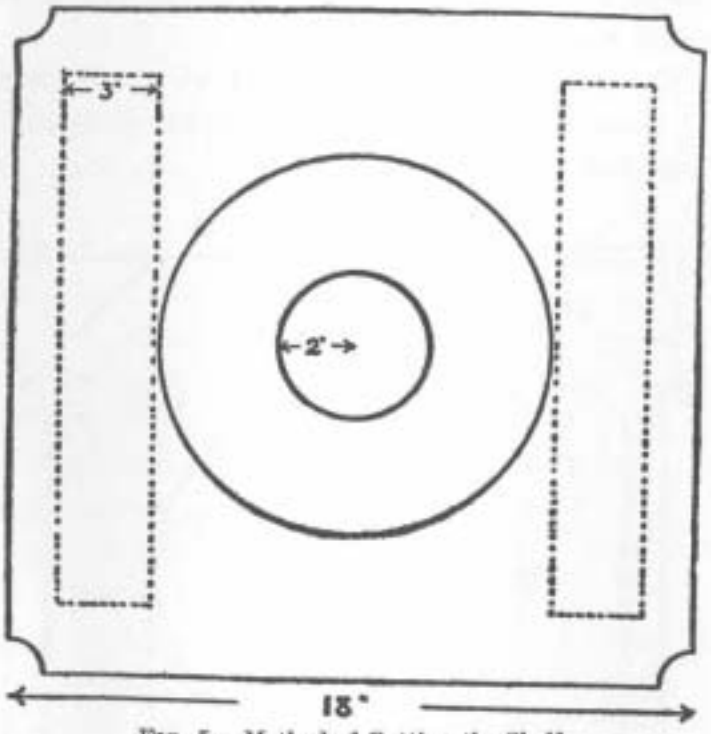

FIG. 5.—Method of Cutting the Shelf.

with glue. A 2½-in. nail, driven from underneath, through each leg into the batten ensures rigidity, and having filled the open bamboo ends with 2-in. wooden plugs well glued in, you may turn your attention to the shelf.

The shelf, unlike the top, is a square obtained by battening together two boards, each 18 in. by 9 in. by 1 in. In this case the battens are of no particular shape, the only restriction being that they are to be set back at least 1 in. from all edges.

It is next necessary to mark off from each corner a quadrant of a circle of ¾-in. radius, Fig. 5, thus enabling the legs, when these pieces have been removed, to fit flatly against the shelf when it is fixed in position. Before doing this, however, you

must pencil from the centre two circles, one of 5 in. and the other of 2-in. radius. The smaller circle must then be cut out by means of a keyhole saw; the pencilled circle being left as a guide for the placing of the tank.

This shelf must first be put in position between the legs, 9 in. from the ground, and then firmly secured by two nails driven through each leg into its edges. With the stand thus completed, attention must be turned to

The Cylindrical Tanks

Since it is proposed to utilize the upper of these tanks for the double purpose of a fish-bowl and water-tank, its construction differs slightly from that of the lower vessel.

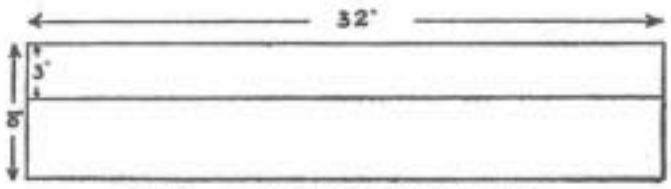

Fig. 6.—Method of Marking the Zinc.

Taking the wider metal strip, 32 in. by 8 in., lightly pencil a line parallel with its top edge, and 3 in. away from it, Fig. 6. Then, with this as the inner side, curl the strip round in the manner depicted in Fig. 7, letting one end overlap until the circles formed are just capable of taking the discs which are to form the top and bottom of the tank.

Having thoroughly soldered the overlapping parts, take one of the discs and press it up from underneath until it is level with the pencilled line, when it may also be soldered to the encircling band. Next fit in the bottom disc flush with the bottom of the band, and, having ascertained that the hole for the overflow pipe is in line with the corresponding hole in the top disc, fix it permanently with solder.

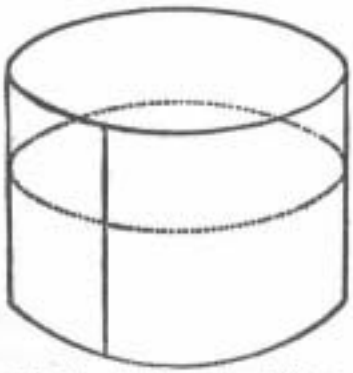

Fig. 7.—Tank made of Zinc.

You have thus made a perfectly air-tight tank surmounted by a suitable fish-bowl, so that the easier work of providing a second tank may now be commenced. This work is very similar to the last, consisting only of curling

and fastening the remaining zinc strip, and then soldering the top and bottom discs in their places just inside the rim.

These tanks have now to be placed in their respective positions on the stand made to receive them. For this purpose the two pencilled circles on the top and on the shelf will serve as guides.

If the tanks be placed over these circles, they may be kept stationary by nailing to the woodwork of the stand pliable pieces of thin cane closely fitted round the tanks.

The Piping

All is now ready for the piping which is to connect the top with the bottom tank. A glance at Fig. 8 shows that two such pipes have to be arranged; one, AB, being termed the overflow pipe, whilst the other, CD, may be called the air pipe. Since holes have already been made to carry these pipes through the tanks, very little difficulty should be experienced in getting them into position. The overflow pipe must be fixed first, by pushing the five-foot length of tubing through the proper holes in the upper tank until it reaches the lower vessel, which it must enter by the proper opening until it is within one inch of the bottom. The piping, A, should then be cut off 1½ in. above the upper tank, and soldered at each hole through which it has passed.

The remaining length of piping will be used for the air pipe, CD, which is pushed from underneath the upper tank until it touches its top. It is then cut so that it is just long enough to touch the bottom tank, after which a point is marked ¼ in. from the lower end. The piece must then be drawn down until ¼ in. of piping has entered the lower tank, in which position the pipe can be carefully soldered at all the points of entry.

In soldering to the top tank it will become necessary to raise the metal work a little above the stand, thus affording easy access to the part to be soldered. There yet remains to be fixed a pipe, EF, capable of taking the jet for the fountain. This is provided by placing the remainder of the piping through the central hole, G, in the top tank, and, having pushed it to the bottom of

this tank, marking the point of entrance. This done, draw it up a distance of ¼ in., and, having allowed another 2 in. to project above the top of the tank, solder the tube in position. It is the work of a few moments to fix the jet firmly into the open end.

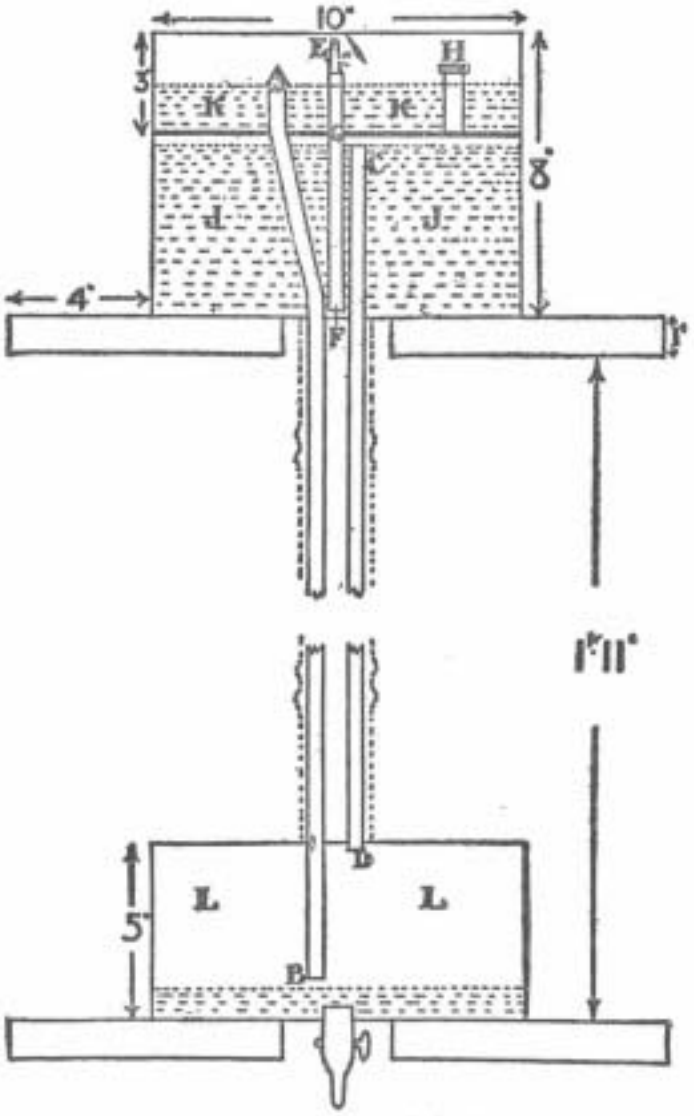

FIG. 8.—A Sectional View of the Fountain.

Yet another hole in the top tank remains to be explained. This was made to take the filler, a piece of brass tubing 2 in. long, ⅜ in. in diameter, surmounted by a screw cap, H, Fig. 8. When this has been soldered in, you must fix a tap into the lower tank in order that it may be emptied when necessary.

For this purpose, it will be recalled, a circular hole of 2-in. radius was made in the shelf. By cutting in the bottom of the lower tank a hole large enough to take the tap, this last addition may be soldered into place, thus completing, for the time being, the tanks and piping.

Decoration

Attention may now be turned to the final step in the construction—the decoration. The edges of the top and shelf present a very bare and unfinished appearance, and this defect may be remedied by enclosing them in pieces of bamboo. Thus, in dealing with the top you have to cut from your rods of 1½-in. bamboo eight pieces, which, when their ends have been mitred, will just fit the eight edges of the top. You must then split from each of these, after the manner described in Chapter XXI, page 190, the one-third required to make them fit over the edges.

When all are ready, fix them on their respective sides and firmly nail them into position.

After treating the shelf in a similar manner, set to work on the brackets which do so much to strengthen and ornament the article. For this purpose cut sixteen 6-in. lengths from the ½-in. bamboos, and, having bevelled their ends to fit nicely across the corners, fix them by nails driven through their extremities.

It will probably have occurred to the reader that the lead pipes which form the connection between the two tanks, being in such a conspicuous position, not only detract from the artistic appearance of the fountain, but also reveal to uninitiated eyes the secrets of its working, and for these reasons it would be advisable to adopt some means of hiding them. Doubtless many methods of overcoming this difficulty will suggest themselves, but for those who can contrive no better plan, the following is suggested.

From your rod of 2-in. bamboo cut a length just sufficient to cover the offending pipes. This length must then be carefully split down the middle, and all joints removed by means of a sharp chisel.

Then, taking the two halves, fit them together over the pipes, and, having assured yourself that they fit quite tightly, glue them together. In this manner, besides concealing the pipes, the bamboo rod gives the appearance of a strong central support.

In spite of the decorative appearance of the bamboo, there are still parts of the fountain which offend the eye by reason of their unfinished appearance, and for this cause it would be advisable to paint, not only all bare woodwork, but also the zinc of the tanks. This will prove of great advantage, for not only will it render the fountain more in keeping with other articles of furniture, but it also preserves the woodwork from the effects of the water which, from time to time, is sure to be spilled over it.

In choosing the paint you would do well to select a shade of brown to tone with the color of the bamboo. When the paint is dry, the whole article should receive a coat of varnish, thus enabling it to be cleaned when occasion requires.

How to Make the Fountain Work

The first care must be to ascertain that the taps of both the jet and the outlet are turned off. Having assured yourself that this is so, unscrew the filler top, and, by means of a small funnel, pour water into the upper tank. The liquid will rise, of course, until it reaches the top of the air pipe, CD, Fig. 8, and will then begin to flow down this pipe into the tank below. Directly the sound of trickling water is heard in the lower tank, it is time to cease pouring and to screw on the filler top very tight.

The upper tank is now almost full of water, above which is a layer of air. Leaving the tank thus, pour water into the fish-bowl. Here the water will rise until it reaches the top of the overflow pipe, AB, when, passing down this pipe, it will enter the lower tank. The entrance of this water from above has the effect of compressing the air in the lower vessel, and water should be poured into the fish-bowl until the air is thus compressed, and will allow no more water to enter the lower tank.

When this becomes apparent, you know that all is ready for the fountain to play. By turning on the jet tap, you cause a small column of sparkling water to be thrown into the air.

Provided the instructions here given have been carefully carried out, the fountain should play continuously for at least two hours before it needs refilling. When undertaking this latter operation, a large bowl must be placed beneath the shelf, and then, by turning the tap, the water can be run off which has been transferred from the upper to the lower vessel.

Why the Fountain Works

How are you going to account for this automatic action? The whole secret is explained if it be remembered that the water from the upper tank and fish-bowls is used to compress the air in the lower tank. Let us see exactly how this is brought about. A glance at Fig. 8 once more will serve to explain the mystery.

You already know that the water, entering the upper tank by the filler, at last reaches the top of the air pipe, and there stops, thus allowing for a layer of air above its surface. Then, when the liquid is poured into the fish-bowl, it rises until, reaching the overflow pipe, it finds its way into the lower tank, where the air at last becomes so compressed that no more water can enter. At the same time increased pressure is exerted on the air in the tube, CD, and also on the air above the water in the upper tank. This air, in turn, increases the pressure on the water, and, as its only outlet is by the jet EF, the liquid is ready, directly the tap is turned on, to issue forth as a tiny column. After reaching a height of about 15 in., the column breaks into countless drops, descending into the fish-bowl. Here the extra water is carried away by the overflow pipe into the lower tank, thus keeping the air in that vessel compressed. In this way the action is continued until all the water in the upper tank has been replaced by air from the lower, and then it is that the fountain ceases to play.

Before the fountain can again be set in motion, it is necessary to empty the lower tank, fill the upper, and proceed as pre-

viously described. It can easily be seen that, provided the work of construction has been accurately carried out, such an article not only affords considerable amusement, but may be utilized as an admirable means of displaying ferns and flowers to the best advantage.