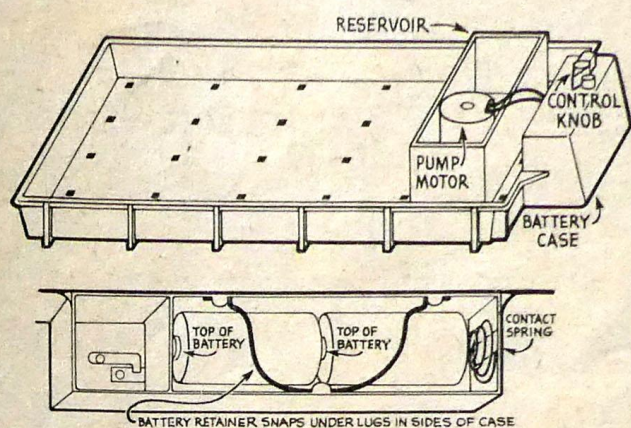


BASIC INSTRUCTIONS for using all the parts in CHAD VALLEY HYDRO-DYNAMIC Building Sets No. 11 and No. 12

These basic instructions will introduce you to all the different parts in your set and show how they fit together. The instructions are divided into five sections. If you follow them step by step, you will quickly know exactly how to use each part to build the structures pictured in the Hydro-Dynamic PROJECT BOOK or to create your own original projects.

SECTION A • The TRAY BASE with PUMP AND BATTERY UNIT



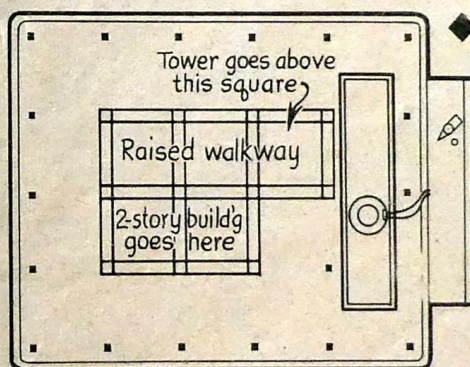
First remove the large plastic tray from the box; this will be the base for everything that follows. The water reservoir and the electric pump are built into the tray. The covered compartment with the control knob on top is the battery case; turn the tray upside down and insert 2 flashlight batteries, size "U2" (see diagram). After inserting the batteries, switch on the motor for a moment to be sure the batteries are in contact, but do not allow the motor to continue to run at this time as the high speed pump should not be run unless there is water in the reservoir.

After you have completed a structure, you can fill the reservoir with one-and-one-half ($1\frac{1}{2}$) cups of water.

[Shown here is the tray base for Set No. 11. The tray in the larger Set No. 12 is the same except that it has two water reservoirs, two pumps and two battery compartments, one of which has electrical connections on the top—these are explained at the end of the instructions.]

PUMP MAINTENANCE: You will be the "maintenance engineer" for your Hydro-Dynamic plants. If dirt or other foreign matter gets into and clogs the pump, you can remove the pump to clean it. Take out the

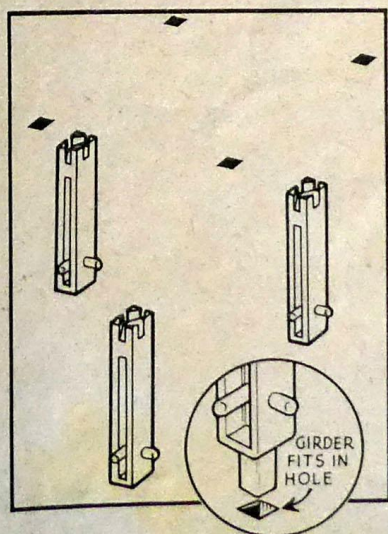
four screws that hold the pump in the reservoir, then lift out the pump unit. Clean the 4-bladed impeller, the sump, and the outlet nozzle. In replacing the unit, tighten the screws just enough to hold snugly.



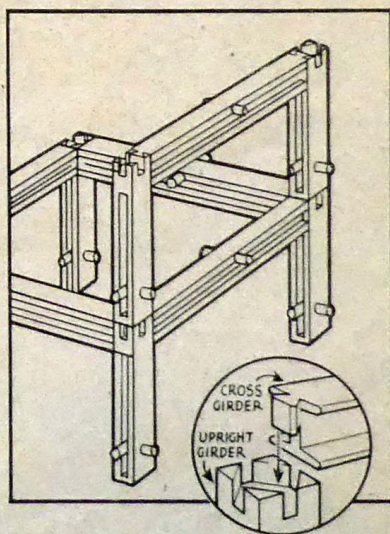
SECTION B • How to use the GIRDERS, PANELS, BRACES and other structural parts for building framework

NOTE: If you have used Chad Valley GIRDER & PANEL Building Sets or BRIDGE & ROADWAY Building Sets, most of this Section B will be familiar to you. You should, however, look through it carefully to be sure you know all of the ways to use these parts.

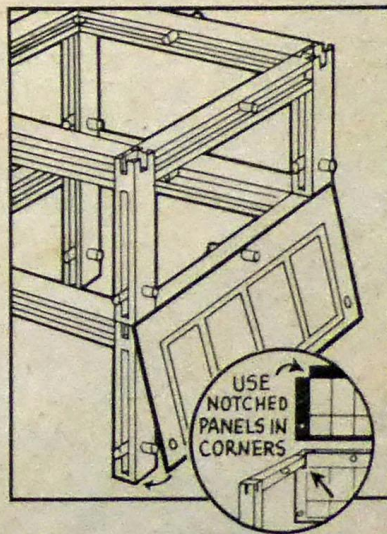
1 • First decide on the shape of the structure you are going to build and how it will fit in the tray base. Here, as an example, is the base plan of the tall structure shown at the top of page 2 in the Project Book. This diagram shows the lower row of girders in place.



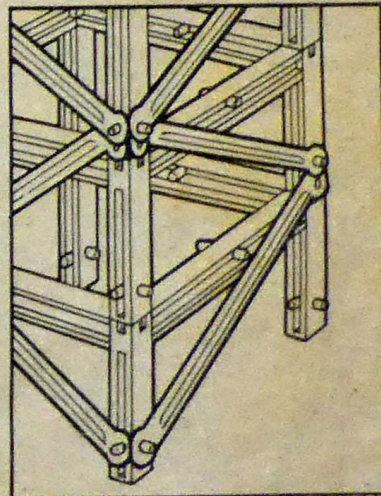
2 • Upright girders, known as **COLUMNS**, fit in the square holes in the tray base. There are four slots in the top of each column; the cross girders anchor into these slots.



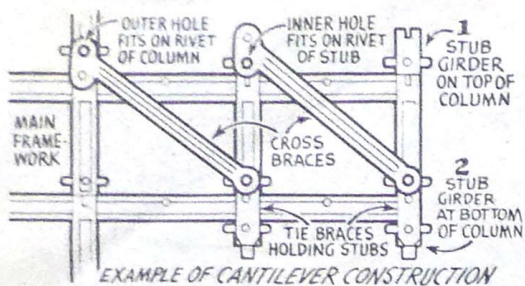
3 • Cross Girders, known as **BEAMS**, fit into and level with the tops of the columns. The next row of columns will fit on top of these and so on as high as the structure is to go.



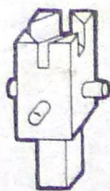
4 • **WALL PANELS** are used to enclose parts of the framework. The upper (center) hole snaps onto the beam rivet and the two lower holes onto the rivets on the columns.



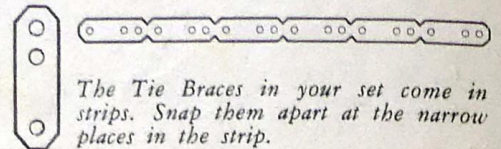
5 • **CROSS BRACES** are used to strengthen the framework. The hole in the narrow end goes onto a column rivet; the outer hole in the wide end goes onto the rivet on opposite column of the next level, as in diagram on next page . . .



6 • **STUB GIRDERS** are used for two main purposes: 1) at the *top* of columns to anchor beams and to provide a place to fasten cross braces; 2) at the *bottom* of columns in cantilever or bridge spans to hold up the lower beams. Stubs are held to the bottom of columns with **TIE BRACES**.

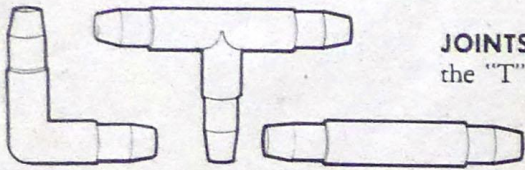


Stubs are used also for fastening down **ROADWAYS**. For uses of Roadways and Footings see photos on the cover and on pages 4 and 5 of Project Book.



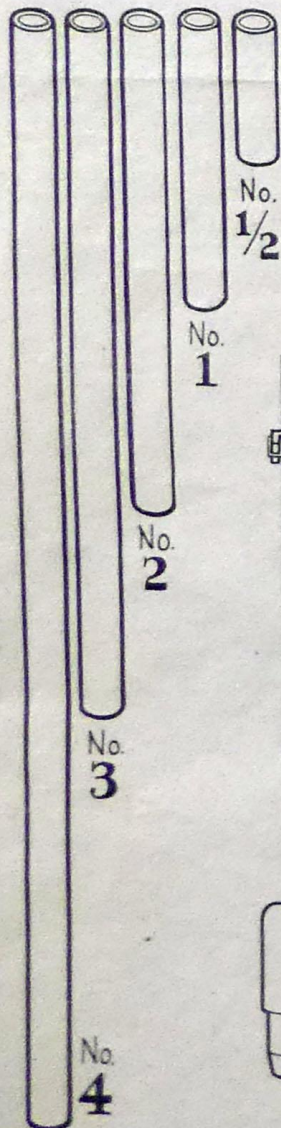
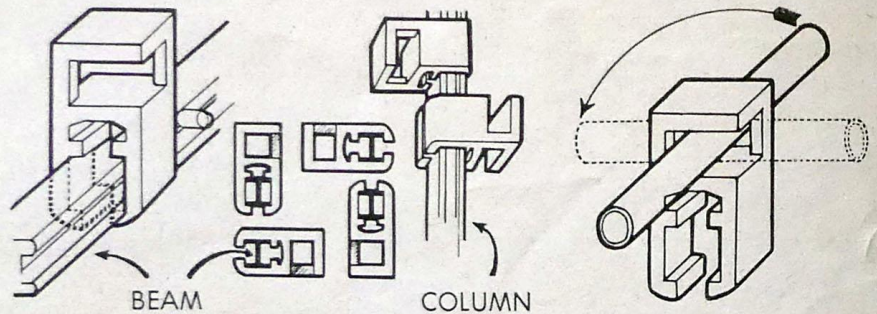
SECTION C • PIPES, JOINTS, PIPE HANGERS, CONTROL VALVES

These are the small parts that are so important in making Hydro-Dynamic structures that look neat and work properly. All the sizes and spacings have been carefully worked out to fit the spacings of the framework as explained in the diagrams below.

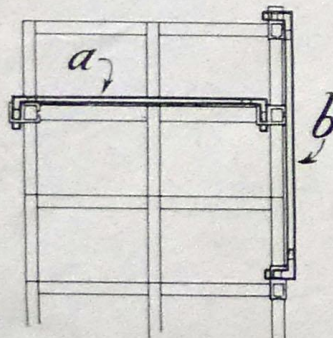


JOINTS • There are three types of joints, shown here actual size: the "L" is for turning corners; the "T" is for joining one pipe into another; the "Straight" is for joining lengths of pipe together.

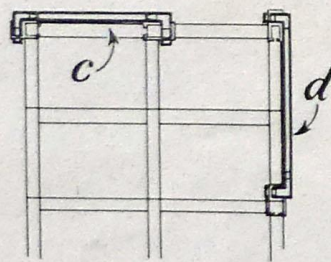
PIPE HANGERS can be slipped or snapped onto columns or beams so as to extend upward or down or to either side, as shown in the drawings at the right. The drawing at the far right shows how the pipe can pass through a hanger either parallel or at right angle to the girder or at any angle in between.



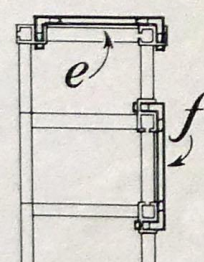
HOW TO MAKE NEAT PIPE CONNECTIONS • Pipe is supplied in five different pre-cut lengths. The actual size drawing at the left is a guide for selecting the correct pieces from your set. (There is also a long piece that you may cut to any length needed for long runs of pipe.) The pre-cut pieces will fit with "L" or "T" joints to make the correct lengths to fit into the girder structure as shown in the diagram below:



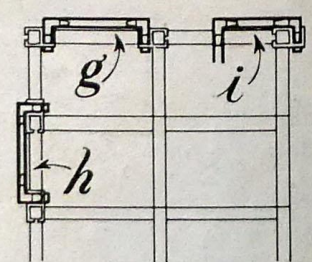
No. 4 makes a length that will span the width of 2 beams (a) or the height of 3 columns (b).



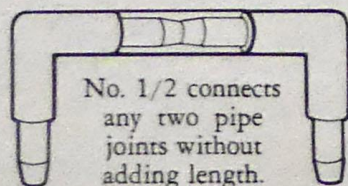
No. 3 will span from the *outside to outside* of one beam width (c) or the height of 2 columns (d).



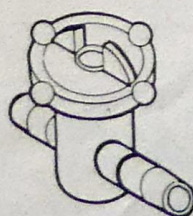
No. 2 spans the width of one beam (e) or *outside top to bottom* height of one column (f).



No. 1 fits *inside* the width of one beam (g) or the height of one column (h) or from *outside to center* of a beam (i).

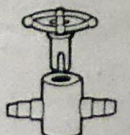


No. 1/2 connects any two pipe joints without adding length.



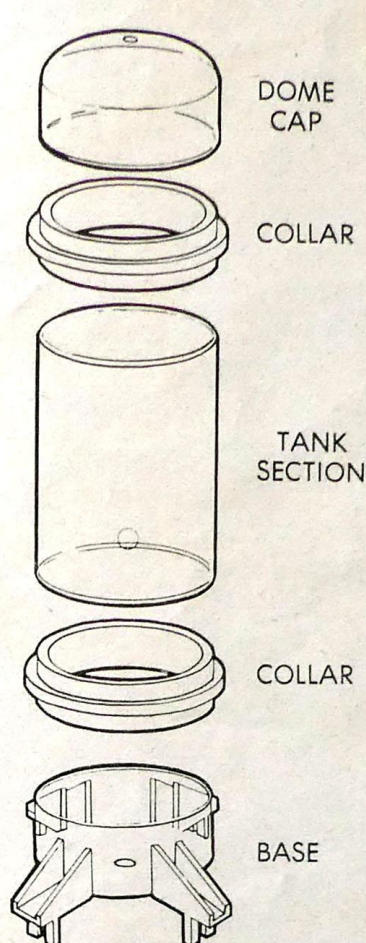
CONTROL VALVES are used to shut off or slow down the flow through the pipes. When the ridges on top of the valve are in line with the pipe (as in drawing at left) the valve is open for liquid to flow through; when turned at right angle it is closed, and when in-between it is partly open.

(Note: The valves come as two separate parts — the Valve Body and the Valve Stem. Slip the stem into the body and press hard; they will snap together into a permanent leak-proof unit.)

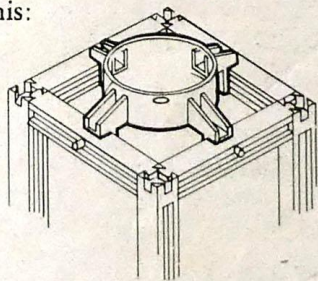


SECTION D • TANKS, FITTINGS AND CONNECTORS

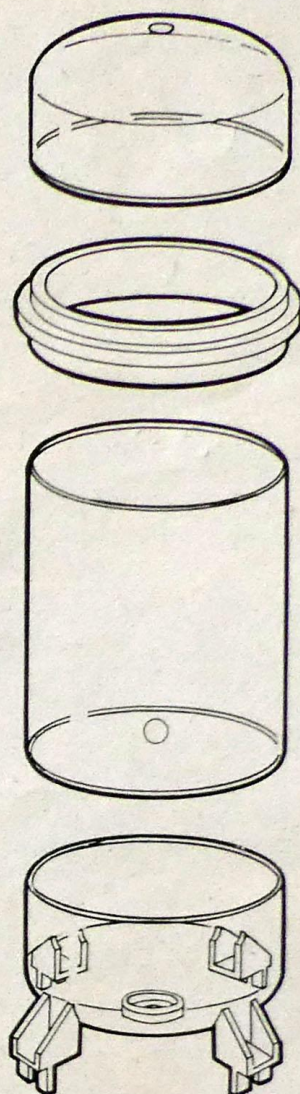
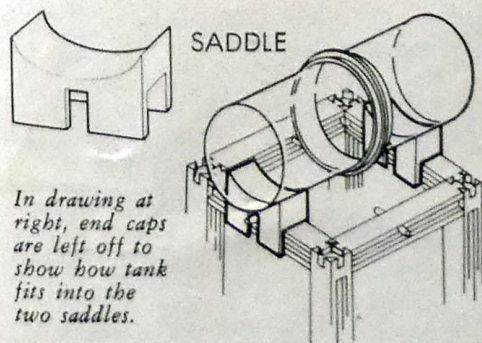
Hydro-Dynamic sets contain an assortment of tank parts that you can assemble into a variety of shapes and sizes, using the tank collars to fasten them together. The tank parts are all clear, hard plastic; the collars are green soft plastic which will make water-tight joints between tank sections. Here are the various parts, with instructions for using them:



These are the parts for the small round tanks. The base has feet that fit over four beams, to hold the tank upright, like this:



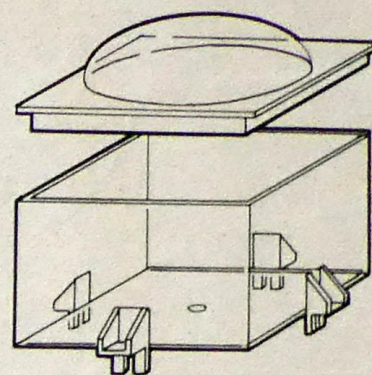
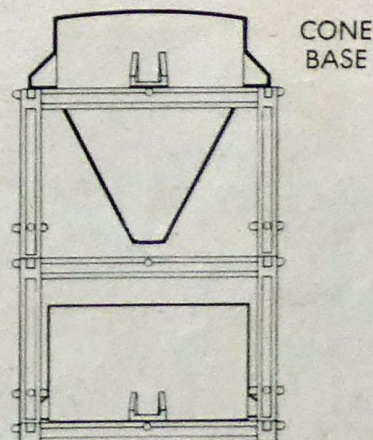
Tanks can be one or several sections tall, and can be either left open at the top or closed with a dome cap. Also, instead of using the base, you can put dome caps on both ends and place the tank horizontally across two beams, using the saddles to hold it in position.



These are the parts for large round tanks. They are assembled just like the small tank parts.

(Note that the large round base has a raised rim inside around the hole. This is needed in conjunction with the Float Valve described on the next page but does not affect other uses for this part.)

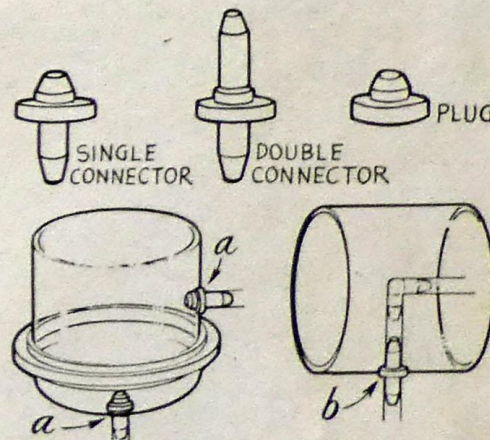
The cone base is used like the round base except that it projects some distance below the beams on which it rests:



The square tank rests on four beams just like the base parts of the round tanks. It may be used without the cover as a catch basin for liquid flowing from above, but when used with the aerator spray the cover is needed to prevent splashing.

TANK CONNECTIONS

There are two kinds of tank connectors, plus tank plugs. The *single connectors* are used to connect pipes to a tank to either fill it or drain it (see *a*). The *double connectors* are for connecting a pipe through the tank wall (see *b*). The *plugs* are simply to close the holes where no pipe connections are used.



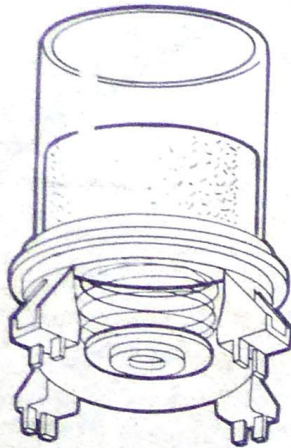
CONSTRUCTION NOTE • When building any Hydro-Dynamic structure it is better to build tanks and fittings into the girder framework as you go, rather than to install them later. This is particularly true of the larger tank parts and tank bases, which cannot be added later without partially dismantling the framework.



USE OF COLOR TABLETS

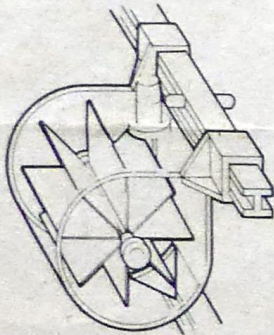
Drop a color tablet into the reservoir to color the water. Or place a tablet in one of the tanks so you can pump clear water in and have colored liquid flow out. An interesting variation, using three tanks, is to place a tablet of one color (for instance, yellow) in one tank, another color (blue) in another tank. Your piping should be arranged so they both flow into the third tank where the colors will mix (resulting, in this case, in green).

SECTION E • SPECIAL HYDRO-DYNAMIC EFFECTS

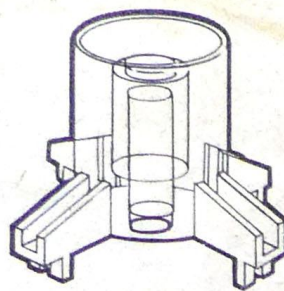
**FLOAT VALVE**

For use only with the large round tank and round base.

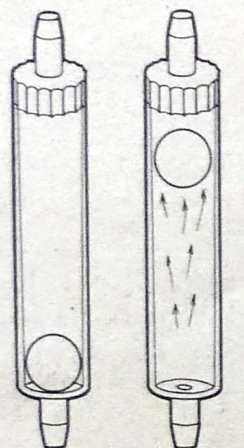
Underneath the float, the disc rests on the rim that encircles the hole in the base and keeps liquid from running out. As the height of liquid rises in the tank, the float rises with it until the spring pulls the disc up, letting the liquid run out. The float then settles to the bottom, again closing the hole, and the action repeats. *Don't put any connection in the outlet when using the float valve as it will slow down the flow.*

**TURBINE VELOCITY METER**

Liquid piped into the chamber from above flows out at the bottom, on its way through spinning the paddle wheel. The speed at which the wheel turns indicates how fast the liquid is flowing. You can control its speed by placing a valve in the pipe leading to the meter. *Don't connect to the outlet!*

**SIPHON TANK**

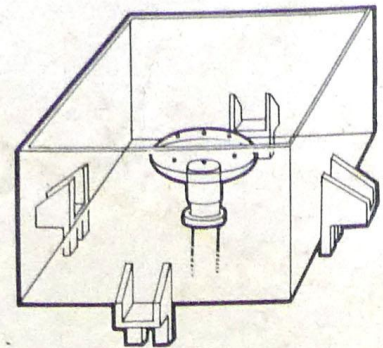
This is a mysterious effect that drains and refills without any mechanical action. Liquid is piped in from above. The level rises until it seems about to overflow, then it suddenly runs out through the bottom opening. The tank then refills and again empties, continuing the cycle as long as liquid keeps flowing into it.



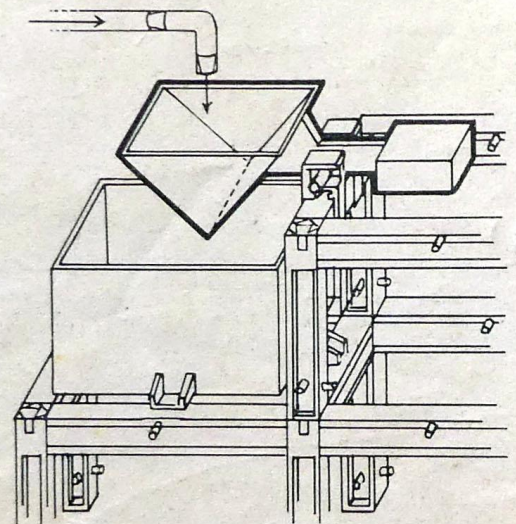
NO FLOW FAST FLOW

BALL FLOW METER

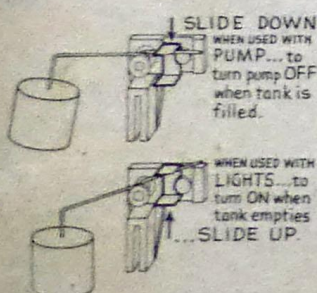
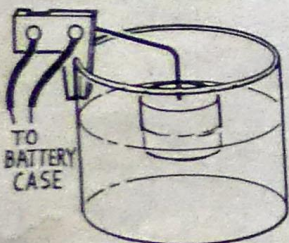
Liquid is piped into the flow meter at the bottom. It flows out at the top, raising up the ball as it passes through. The greater the pressure, the higher the ball rises. It is important that this meter be installed with the outlet, indicated by ridges, at the top. This also acts as a "check valve" as the liquid cannot flow back down past the ball when the pressure is turned off.

**AERATOR SPRAY**

The spray head is attached with a double connector through the bottom of the square tank, giving a fountain effect. It can also be used facing downward into a round tank, by attaching it either through the dome cap or to a pipe above the tank if the tank is open at the top (see examples on pages 5 and 6 in the Project Book).

**TILTING SCALE**

This novel device measures liquid by weighing it. Liquid is run into the scoop from the pipe above. As the scoop fills it overbalances the counterweight so the scale tilts, letting the liquid run into a receiving tank below. The scale then returns to level and repeats the action.



FOR SET No. 12 only • The larger set contains, in addition to all the preceding parts, **ELECTRIC LIGHTS** and an **AUTOMATIC FLOAT SWITCH** which will operate either the lights or the pump. The Float Switch can be used on either the square tank or a large round tank or on the reservoir. The level of liquid in the tank actuates the switch, which has a slide contact for adjusting the point at which it switches on or off (see drawings at left).

One of the battery cases is equipped with three connecting posts. The diagrams at the right show how to connect the lights and float switch to this battery case. Note that two of the posts are joined by a short brass strip called a "jumper." When you attach the lights or float switch, loosen the jumper and swing it aside—this disconnects the pump from the control knob. The lights can then be operated manually by means of the knob (diagram 1) or automatically by the float switch (2). In (2) and (3) the automatic action can be stopped by turning the control knob to "OFF" position.

