Automatic turn-on

Mechanical switches have a way of failing at the most inconvenient moments. Here's a fool-proof switch with no moving parts that runs your sump pump. Water turns it on.

By Jules H. Gilder

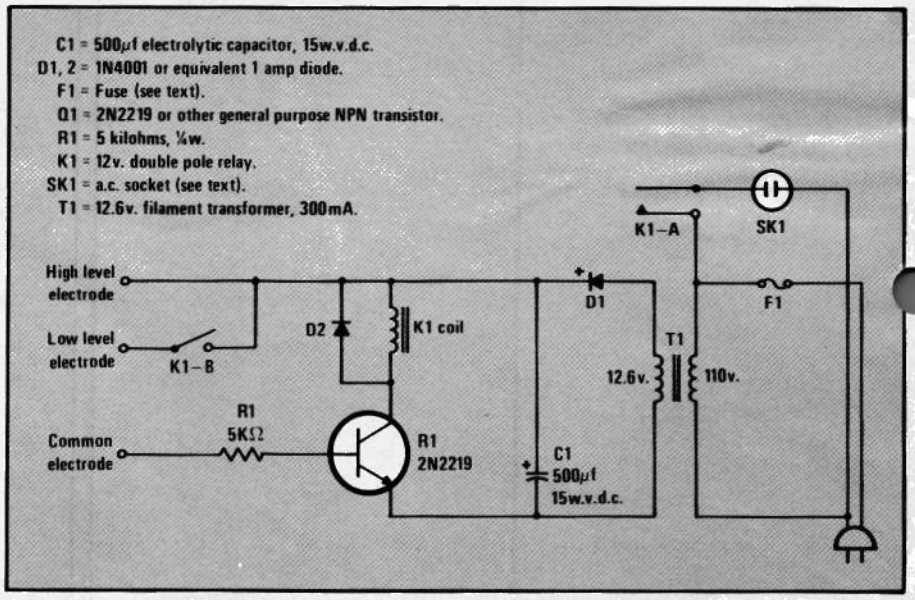
With the storm season upon us it's not uncommon to wake up in the morning and find that you have an unexpected pool in your basement. Wouldn't it be nice to have an automatic sentry that would turn on an electric pump whenever water started to accumulate?

You can build this simple water-operated switch for less than $10 or you can go out and buy a special float switch for $25 or $30.

The circuit for the water switch is very simple. The heart of it is the NPN transistor, which is used here as an electronic switch. A characteristic of the transistor is that when a positive voltage is applied to its base, it switches on the relay K1 which starts the pump by feeding power to it.

To detect the presence of water, and thus cause the transistor to energize the relay, we make use of the fact that the water contains impurities and will act as a conductor of electricity. Distilled water, however, does not conduct electricity. When water is present and it touches both the high water level electrode and the common electrode, a current flows and a voltage is applied to the base of the transistor, which in turn closes the relay and starts the pump motor.

If this were all there was to the circuit the motor would run until the level of the water fell below the electrode. As soon as the electrode was clear the pump would stop.Then, a few minutes or seconds later it would turn on again when the water level rose once more. Continually cycling this way would soon wear out the relay contacts, and probably shorten the life of the pump. To prevent this from happening, another set of relay contacts (K1B) is used to switch in a third element, the low water level electrode. With this electrode located at a lower level the pump turns on only when the high level is reached and stays on until the pump removes enough water to reach the low level. Then it shuts off and doesn't cycle on until the water level is once again high. This difference between turn-on and turn-off is called *hysteresis* and can be adjusted by simply increasing or decreasing the height of the two electrodes.



A convenient way of arranging the electrodes is to tape three wires to a plastic rod. Make sure that at least the lower inch of wire has its insulation removed and that none of the three wires touch each other. Now, make the wire that will be deepest in the water the common electrode and the one that will be shallowest in the water the high water level electrode. The third wire thus becomes the low water level electrode. This entire assembly is then simply placed in the water in an area whose level will fall as the pump eliminates the water.

Power for the unit is supplied by a little supply consisting of a 12.6 V filament transformer, a capacitor and diode D1. This produces about 15 V DC for the transistor circuit. Diode D2 is used to protect the transistor from turn-off voltages generated by the relay.

The entire unit can be built into a 3"x3"x6" aluminum mini-box. *Danger:* Since the device is connected to 110 VAC, be sure to check and see that no electrical connection is made to the box itself and that the box is located well away from the water. The electrode leads can be made as long as necessary, so this should pose no problem. Make provision for a socket to be mounted on the box. This is where the pump is plugged in. Don't forget to include a fuse in the pump power circuit. The fuse rating will vary with the pump used, so check the motor plate for the maximum current required.