Mechanical time delay synchronizer for splash photography

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One is sometimes called upon to make a photograph of a subject that is difficult to photograph because the event happens too quickly and the precise instant at which it should be made is beyond the ability of human reaction time to decide exactly.

One such case is the photography of splashes. We will deal in this case with one specific manifestation of such photography and that is the photography of splashes generated by objects falling into liquids.

One of the well-known pioneers for controlled splash photography is Harold Edgerton who made superb photographs of countless splashes of milk and other liquids relying on his background as an electrical engineer. Edgerton devised the electronic detection and triggering devices that caused a short duration flash to happen at a predetermined instant in time after the falling drop of liquid interrupted a light beam. This caused a timing circuit to turn on that delayed the burst of light from the flash for the time required for the drop to reach the impact zone and develop into a desired shape.

These days there are several commercially available synchronization devices that provide this capability to photographers. Unfortunately they are beyond the range of most amateurs. There are also electronic circuits available in various magazines and publications that describe how such electronic synchronization circuits work and how to make one at reasonable cost. Unfortunately not everyone is equipped with the electronic background to assemble even the simplest such device.

It is my objective here to pay homage to another, less well known, pioneer of splash photography and to expand on a solution that he introduced late in the 1800's for the controlled photography of splashes. This is A.M. Worthington and someone I recognize as a true giant of photo-instrumentation. His is a solution based on mechanics instead of electronics. In a pinch such a solution should be readily within the means of most photographers to set-up and to experiment with.

The basis on which splash photography is accomplished successfully is to recognize and to solve two particular factors associated with the photographic problems posed by splash photography. One of them is to achieve a short duration exposure to make sharp photographs of what are often truly high-speed events. The other is to make sure the exposure happened at the desired instant in time, when the splash has the desired visual characteristics.
The solution to the first requirement is to use an electronic flash to control exposure. An electronic flash that delivers a short enough exposure to ‘freeze’ the splash in motion. Many electronic flashes lend themselves for this purpose. Especially those that provide automatic exposure or that have built into them a variable power control feature. In the latter case one selects the lowest (or less than full power) power level as the flash setting with which the photograph will be made. If only an automatic exposure flash is available then a small piece of white, reflective, paper is installed near and in front of the flash head so as to direct the burst of light from the flash into the automatic sensor of the flash.

In either case the effective duration of the flash can be made to be as short as 1/20,000 second or even less. This is quite adequate to ensure that the splash is rendered sharply in most cases.

But there remains the need to fire the flash at the correct instant. As mentioned above this can be accomplished with a time delay synchronizer set to detect the passage of an object or a drop on its way to an impact zone as it passes a light beam and then the delay synchronizer allows a predetermined, adjustable, time delay to elapse before firing the flash. This is all very neat and convenient. But what if there is not such delay synchronizer readily available?

This is where the work of Worthington merits review. The synchronizer that is described following solutions he pioneered is one based on mechanics ... and gravity. As seen in the attached illustration.

Let us assume that for the sake of simplicity we decide to photograph an ice cube falling into a glass filled with water (or possibly cherries falling into a cocktail!). The synchronization scheme or device will consist of a means for releasing not one but two ice cubes at the same time from a given drop "zone" as illustrated in the attached drawing.

One of the cubes is dropped from a slightly different location as the other. One of the two cubes will be the one we use to make the splash with. The other one will fire the flash when it hits a mechanical contactor or switch to which the sync cord of the electronic flash is connected. The position of the contactor can be raised or lowered in comparison to the location of the impact surface which is kept fixed.

The "contactor" switch is nothing more complicated than possibly two pieces of aluminum foil each connected to one of the two wires that can be found when one strips away the outer plastic coating of a sync cord. These pieces of foil are normally slightly separated from each other (touching them to each other causes the flash to fire) but placed in the drop-path of one of the ice cubes as explained below.

To make sure that the two ice cubes are dropped simultaneously one needs to make a trough or holder with a movable bottom with holes in it such that the bottom holding up
both cubes opens simultaneously under the cubes. Once this process is started both cubes
fall at the same rate and should arrive at a given distance from the drop zone
simultaneously.

To make a photograph the camera needs to have its
shutter opened on "B" and held there until such time as
the light from the flash illuminates the scene. Because of
this requirement it must be possible to darken the
environment in which the photographs will be made.
Then, previous to opening the camera shutter the room is
darkened, the sliding bottom of the trough holding the
cubes is quickly moved over to allow the ice cubes to fall
and after the flash fires the camera shutter is closed.
Finally the initial conditions are reset and one is ready to
make the next photograph.

The time at which the flash is triggered is controlled by how much further the "timing
cube" is allowed to fall compared to the time at which the "photo cube" makes contact
with the surface that will exhibit the splash that is being photographed. The further the
timing cube is allowed to fall before firing the flash the more developed the splash will
be.

Invariably there will be slight departures from exact timing using this simple, mechanical,
synchronization scheme but the appearance of any given splash is also something that is
not totally under control so these small variations should simply be allowed for as yet
another unpredictable factor on splash photography that makes each individual
photograph a unique and never to be exactly duplicated representation of a transient
effect.

If you have any questions or comments about this project feel free to write to me at:

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