

ready to learn more? Let's take a look at something called **Effects and Natural Phenomena.**

# Chapter 3

## Effects & Natural Phenomena

Drawing with:  
Fluidity & Flow

Form

Texture

Timing

Hope you enjoyed the flip animation section. Let's move on and learn the fundamentals of another important element in animation: Effects and Natural Phenomena.

An overall concept generally used for effects is the idea of "flow."

Most effects you can think of, such as fire, smoke, water, wind and rain, would not be possible without "flow."

So, how do water, flame and smoke actually move?



## Effects - Flow -

Figure 85 Smoke emerging from a chimney

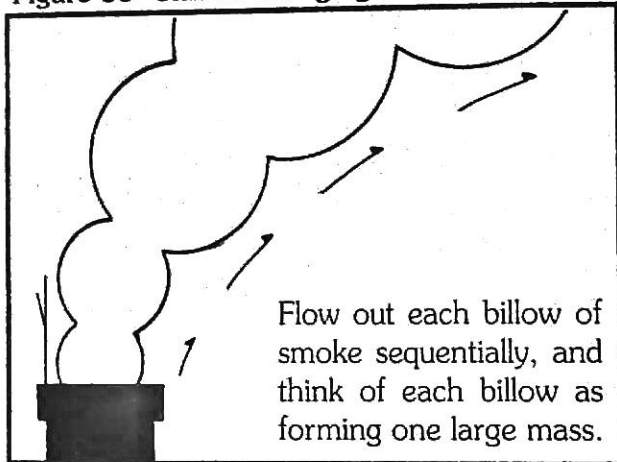


Figure 86 Flowing out a column of smoke sequentially

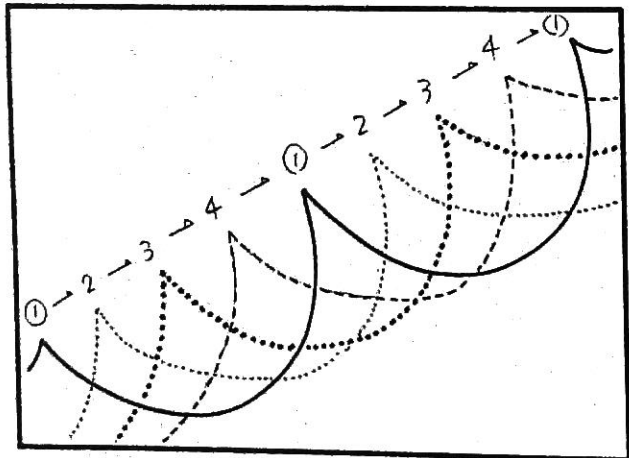
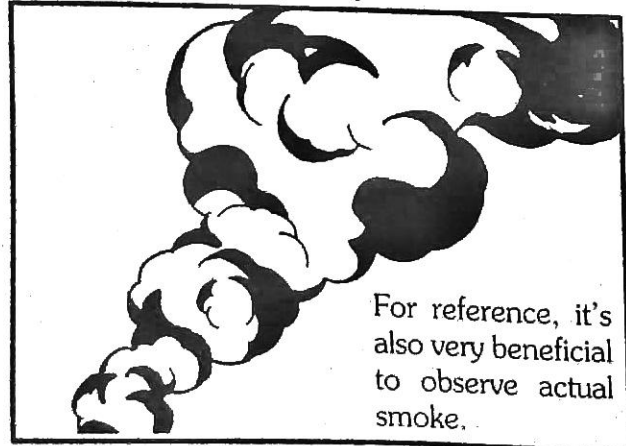


Figure 87 Realistic portrayal



### Basic flow

- Let's use the example to the left of smoke coming out of a chimney to explain this principle.

- This kind of movement is depicted by using a fixed pattern, which is then repeated.

- Think of one billow of smoke as a single pattern, with three intermediate positions per billow. Flow it out as in the above pattern.

- (1) → 2 → 3 → (4) → (1)  
Break down the three positions at equally-spaced intervals.

- In this way, by flowing out the repeating patterns, one by one, you can create smoke movement.

- If you make the repeating pattern and its design more complex, you can depict smoke that is even more realistic.

## Effects - Flame -

Fire occurs when an object reaches its ignition temperature, causing molecular decomposition, which produces a gas that burns. The flame moves constantly upwards, rising on hot air currents.

The speed of the flame's ascent slows as it goes higher, with the tips of the flame constantly splitting, breaking off, and then continuing to rise. There sure are many complex movements involved.



Figure 88 The pattern of a moving flame

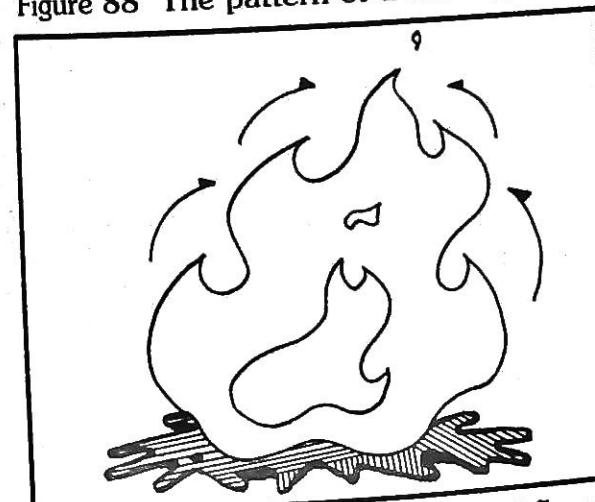
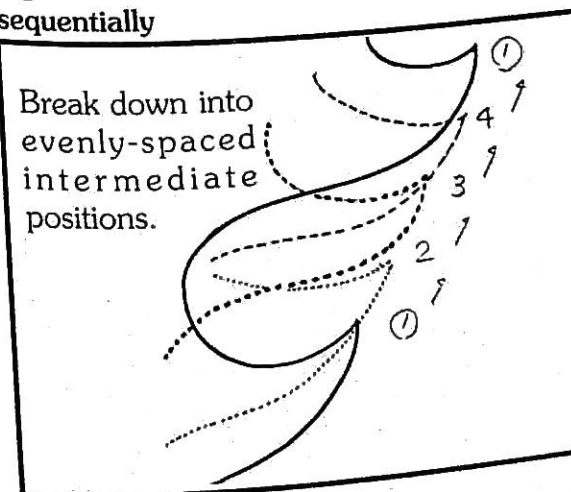


Figure 89 Flowing out a pillar of flame, sequentially



- In most animation, a pillar of flame is generally created through the repetition of a fixed pattern.

- In this case, the concept of "flow" is also applied.

- Like the flame in Figure 89, flow out the pillar of flame sequentially from the bottom, one 'wave' at a time, as you would with smoke.

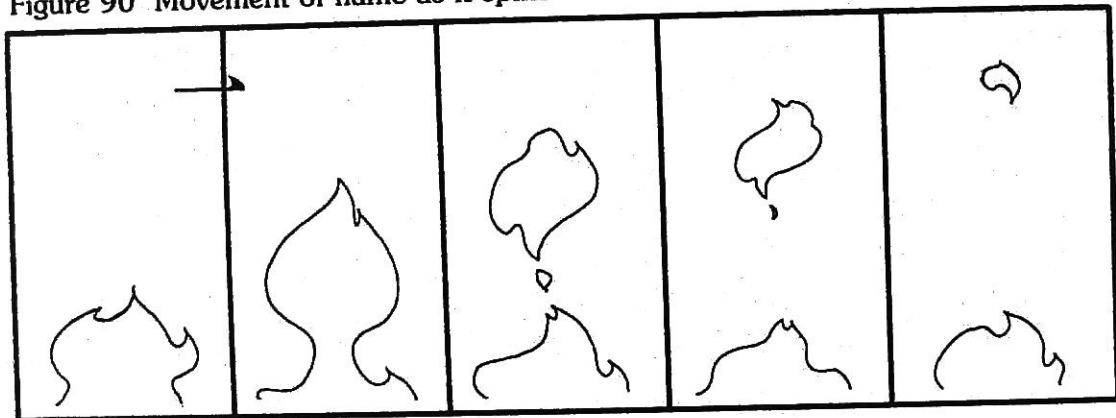
- If you create this kind of repetition cycle, you'll be able to make a patterned flame movement.

- These are the fundamentals of flame movement, so make sure to learn them well.



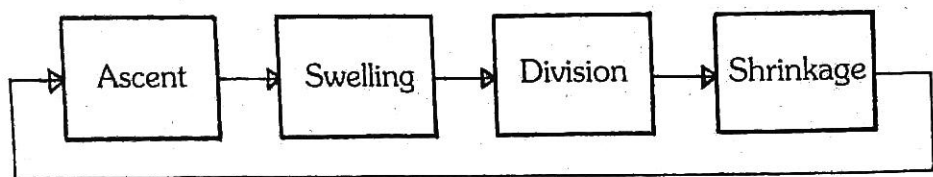
• Let's try to draw a slightly more realistic flame. Due to interference from the surrounding air, which has a lower temperature, the tongues of the flame split, break off, ascend, and finally extinguish themselves (as if vanishing into thin air). Let's take a look at the flame's series of movements as it splits off.

Figure 90 Movement of flame as it splits



• When drawing a flame splitting off, try making an ellipse with a gentle S-shaped curve.

• Flame-splitting is made up of the following cycle:



• So, when you animate fire, you basically flow out the flame from the bottom, moving upwards. But in reality, that's not the only way flame moves. There are portions that may not burn completely or materials that are reluctant to burn; or there may be times when the flame falls to the side, or suddenly burns out.

• Animating flame is basically the same in most cases, but differs according to the nature and size of the object that is burning. Animating a candle flame, a kindling flame, or a blaze requires different approaches.

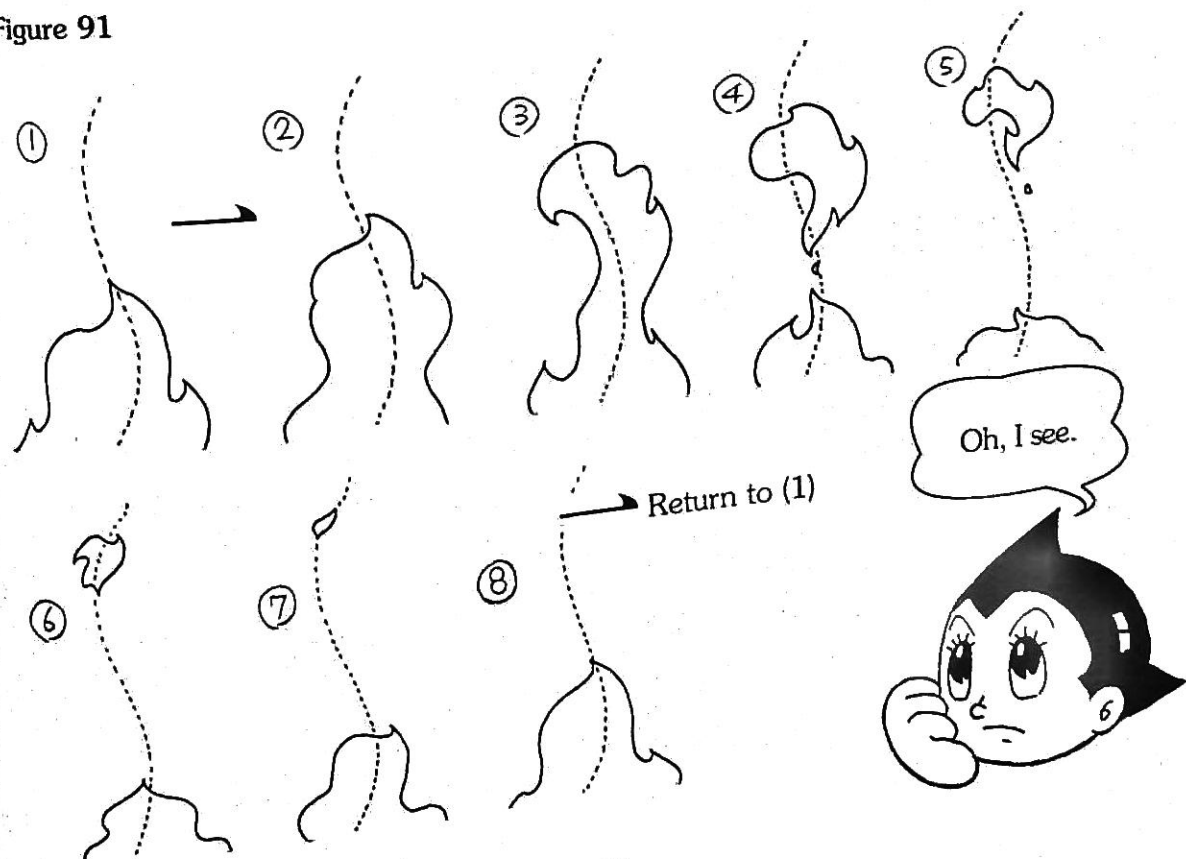
• The larger a fire becomes, the more complex its movement and form become. It may be necessary for the length of the repetition to continue for tens of drawings.

• For kindling flame and torch flame, a repetition cycle of six to eight drawings is common.

• Make sure that the final product looks, as little as possible, like a repetition is being used in the movement.

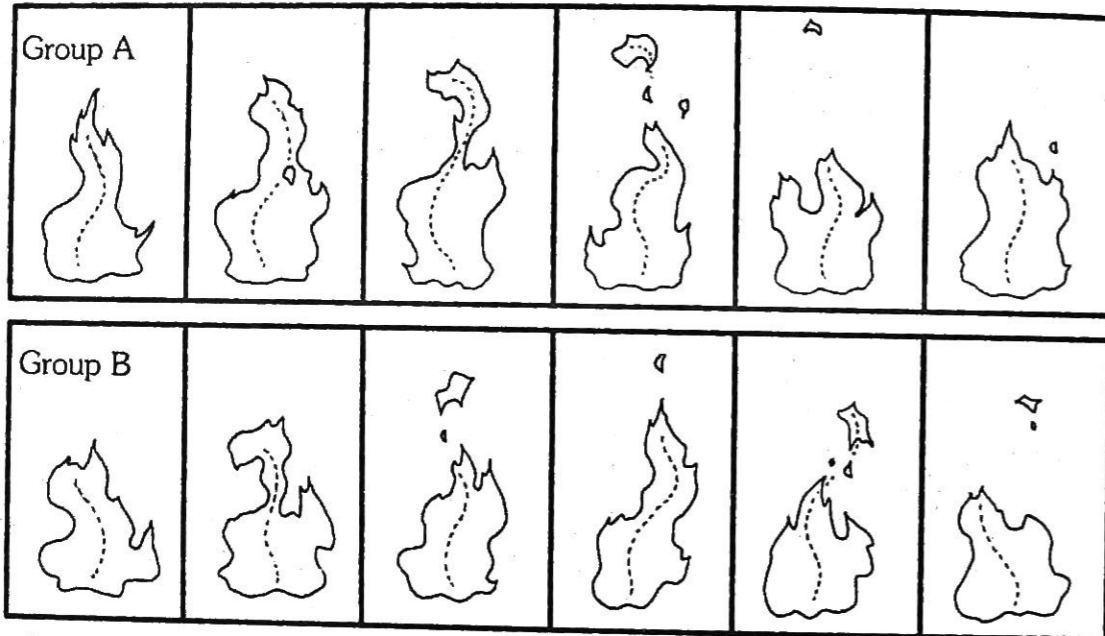
• To do so, the picture should give the impression that all eight drawings are uniform (so that the style is consistent). If there's one drawing that stands out, you'd be able to tell that it's a repetition.

Figure 91



We have explained the repetition of flame in general, but what about drawing a slightly more elaborate simulation of flame?

Figure 92 Intricate flame



• In order to create the repetition of a more intricate blaze, please refer to the two types of cycles above. By combining A-A-B-A-B-B on the exposure sheet, it will become a more complex movement. Be sure to make a smooth transition when moving from (A) to (B). If you think of (A) as the basic cycle, then (B) is the "custom" cycle. If you make additional custom cycles, like a (C) and a (D), you'll really be able to create flame that doesn't look like it's merely repeating.

Figure 93 Flame design



Even though the basic form is the same, by adding a core to the fire or by putting in other stylistic touches, you can come up with all different kinds of flames.

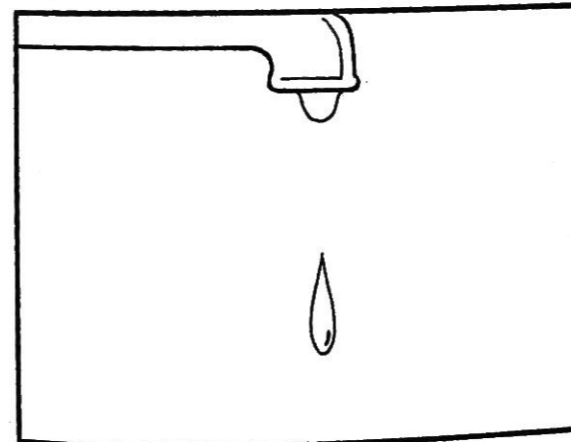


## Effects - Water -

In animation, when drawing water, it's necessary to be familiar with the qualities of liquid and water. You have to accurately convey its smooth cohesiveness and fluidity. You also need to naturally evoke the sense of an irregular form that is always changing. You may think that anyone can draw water, but conveying its water-like essence realistically is not easy.



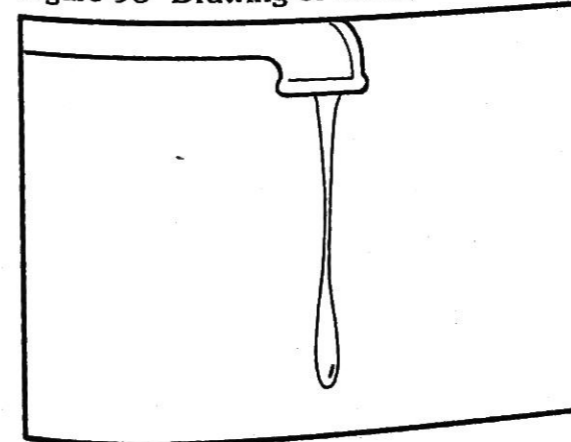
Figure 94 Water leaking from a faucet



Water that builds up in a faucet, will split off at a certain point (when the surface tension has reached its limit), due to its own weight, to gravity, and to the air pressure, becoming a droplet (also due to surface tension) and then falling down.

If you actually observe when the droplet falls, you'll see how fast it moves.

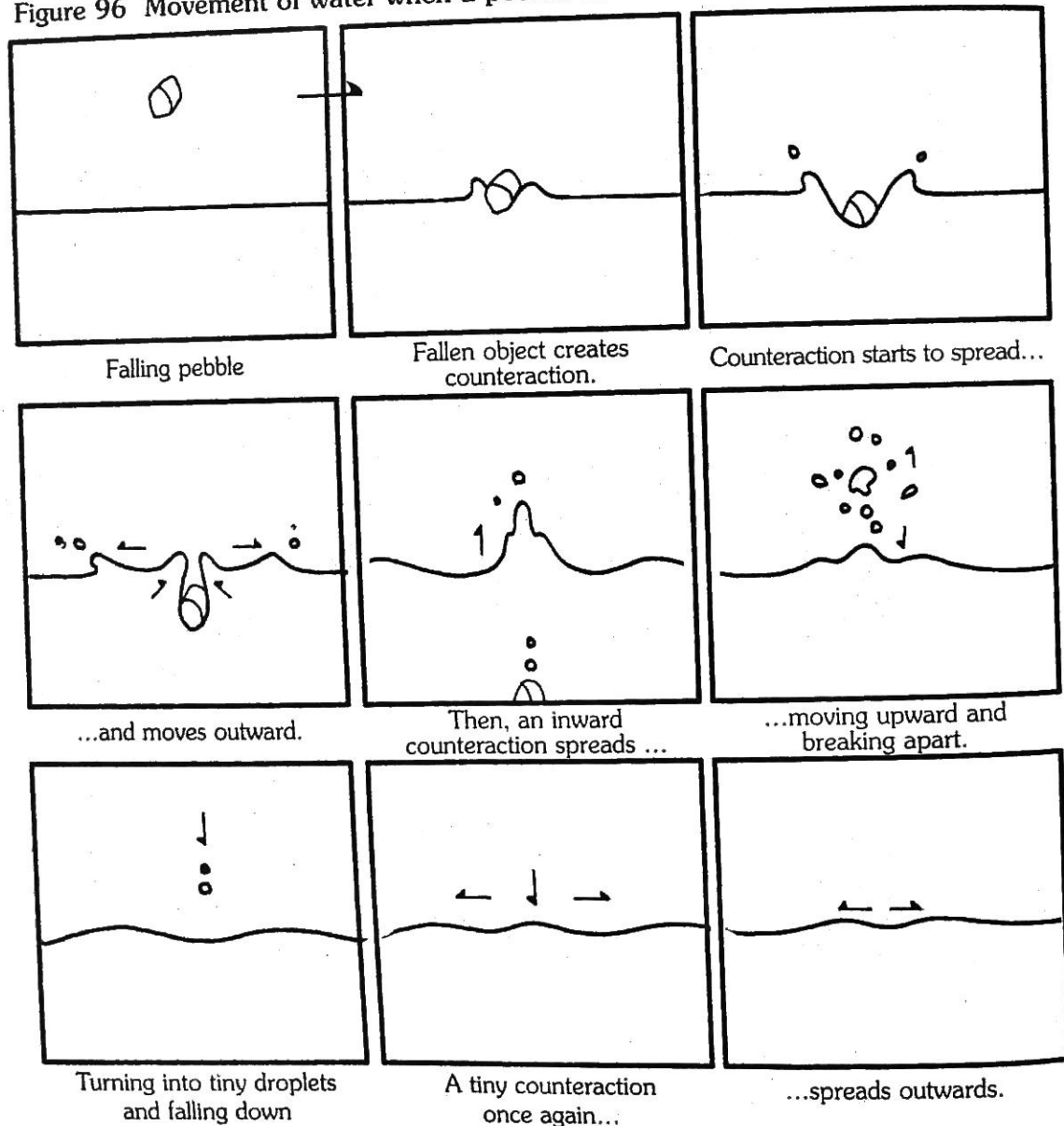
Figure 95 Drawing of water, bad example



The drawing in Figure 95 does not look like water. This drawing looks more like another material, such as oil, or something with stronger viscosity. Make sure that it really looks like water when you draw it.

When you drop a pebble on the surface of water, the water splashes, and creates a water column. The water column finally becomes a ripple and then disappears. Let's study the mechanics of this movement cycle in order to gain a further understanding of the attributes of water.

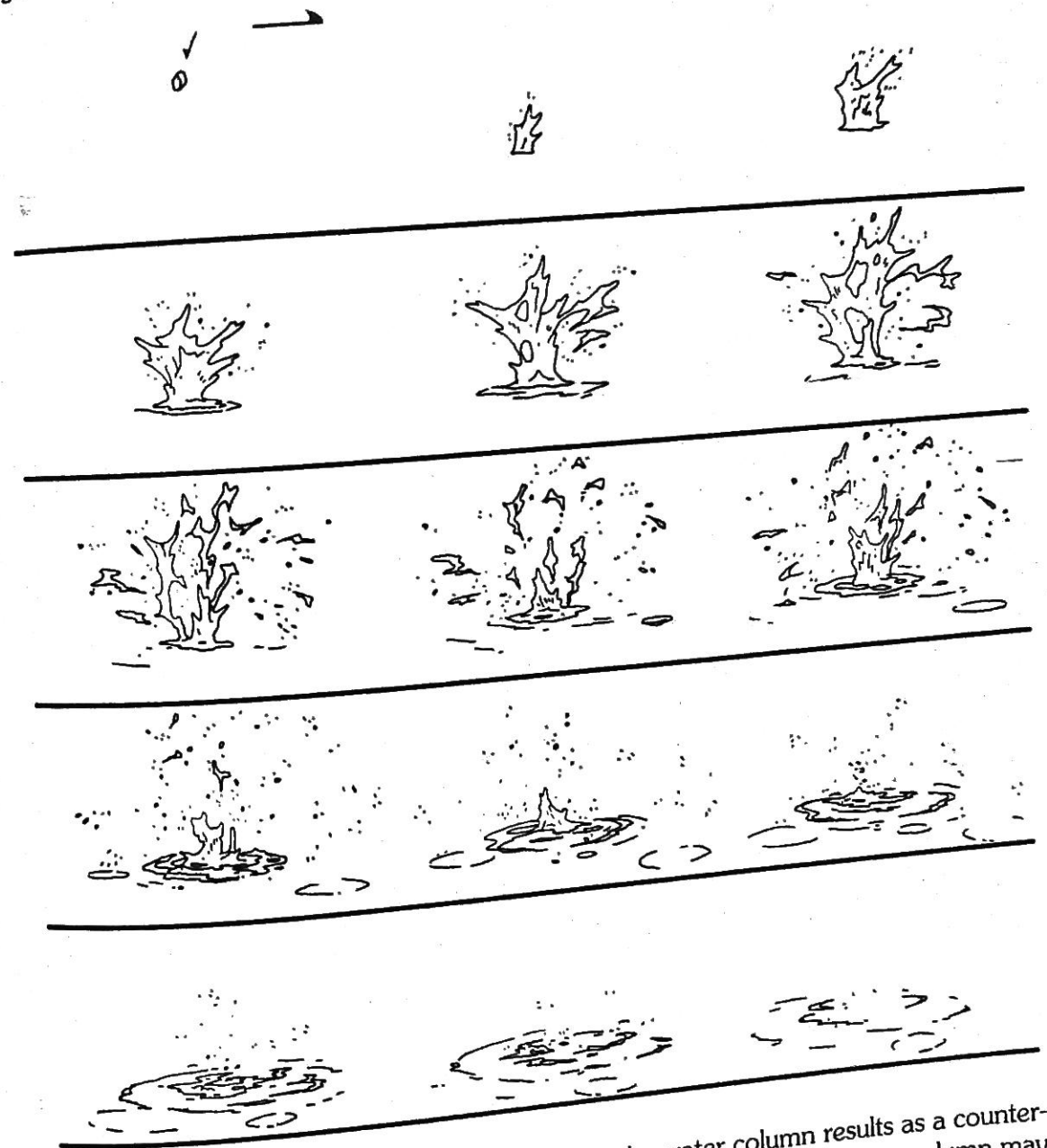
Figure 96 Movement of water when a pebble falls on its surface



When drawing water, it's necessary to understand water's liquid nature. Even when a large object drops into water, the resulting movement should be based on the figure above.

On this page, we illustrate a specific example of water movement, as shown in Figure 97.

Figure 97 Pebble falling into water



At first, a splash occurs when the pebble falls, and a water column results as a counteraction. Depending on the angle of the falling object, the splash and water column may occur at roughly the same time.

Figure 98 Animating reflections (from the shore)

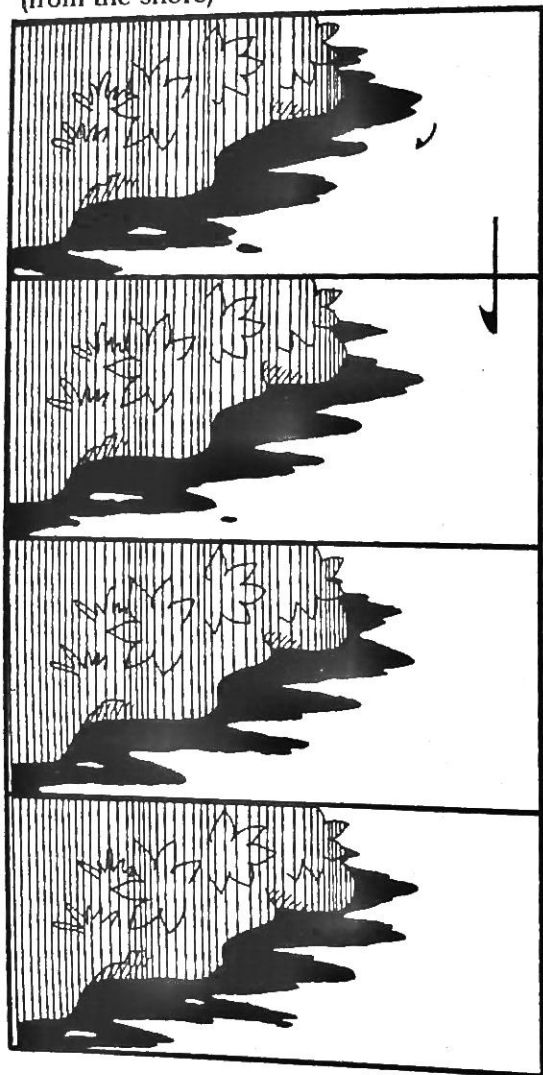
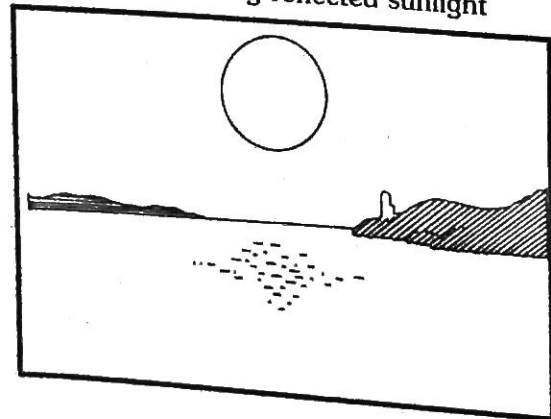


Figure 99 Showing reflected sunlight



**(1) Animating reflections (from the shore)**

To convey water at the shoreline, Figure 98 shows moving shadows that are reflections from land.

The reflected shapes move gradually downward, depicting a gentle current of water.

Or, when there is no current, as in ponds or lakes, you can flicker the reflections in place without flowing them out.

Either of these patterns can be repeated.

**(2) Animating reflected sunlight.**

Figure 99 depicts the water surface using the reflected sunlight.

Stylistically, it is common to use transparent light, drawing it in so that it glitters randomly.

There are various ways to convey the movement of the surface of the water. Here are a number of specific techniques.

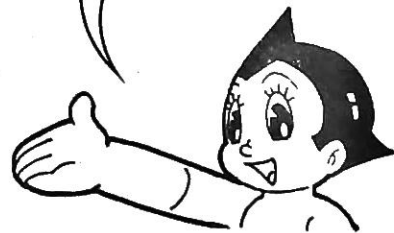
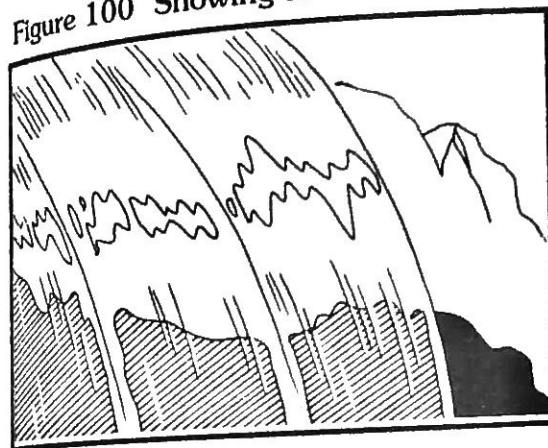


Figure 100 Showing reflected sunlight



• Draw white foam on the surface of the water to depict water realistically. Conveying the flowing quality of water through foam alone is an exercise that requires much skill.

Foam occurs when the water contains air and becomes frothy, appearing white.

Figure 100 shows how to convey the transparent quality of water. Flicker the part where the reflected light hits the strongest.

The water itself should be a solid color shot in double exposure, leaving the scenery within the water still visible.

Figure 101 Animating white foam

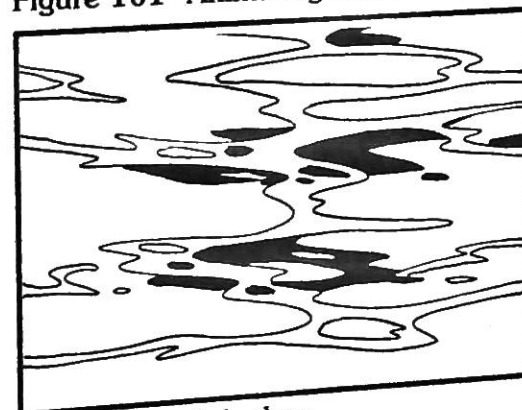
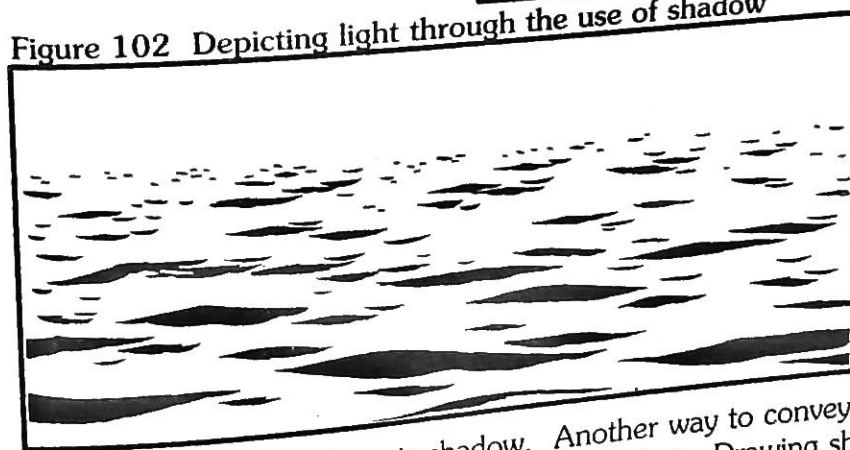


Figure 102 Depicting light through the use of shadow



In all things, where there is light there is shadow. Another way to convey a sense of movement of the water surface is through the use of shadow. Drawing shadows can also be thought of as drawing in light, since it is the dark water surface that is reflecting light, and not the other way around.

The general technique is to flow out large masses of shadow as they change in appearance.

To put it plainly, there is an endless variety of ways to draw water. The manner of drawing water may vary according to the characters and the style of a work.

Let's take a look at the fundamentals common to all methods of drawing water.

Figure 103 Variations in pattern

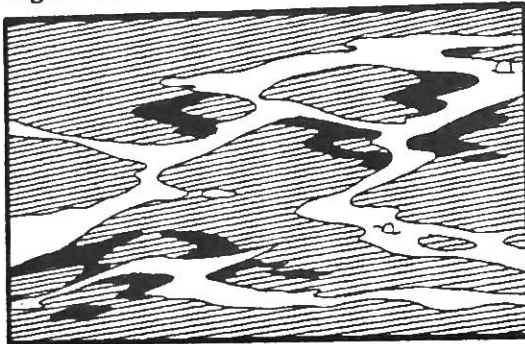
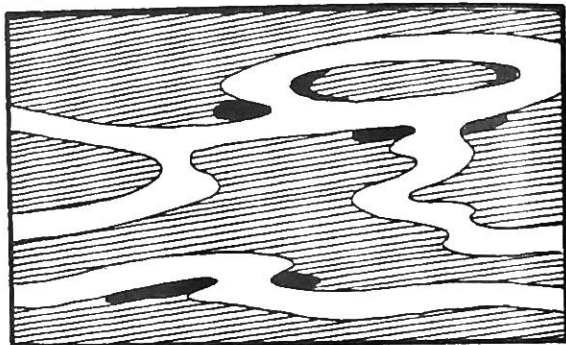


Figure 104 Remains the same



Figures 103 and 104 depict the same body of water. Figure 103 shows fluctuations in the foam and in the overall appearance, and the shadows also vary. In comparison, Figure 104 has an unchanging and mechanical appearance, and the foam has a thread-like look. You may see the style in Figure 104 in certain works, but it's pretty obvious at a glance which is the more realistic of the two.

Figure 105

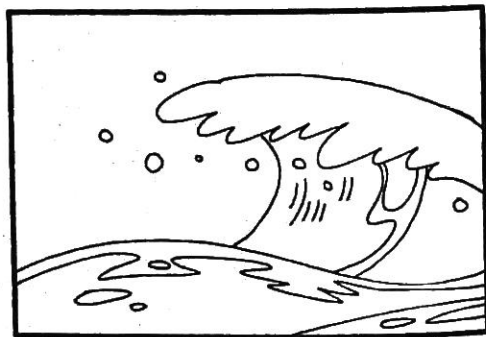
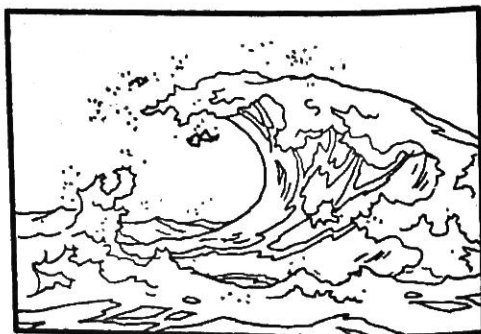


Figure 106

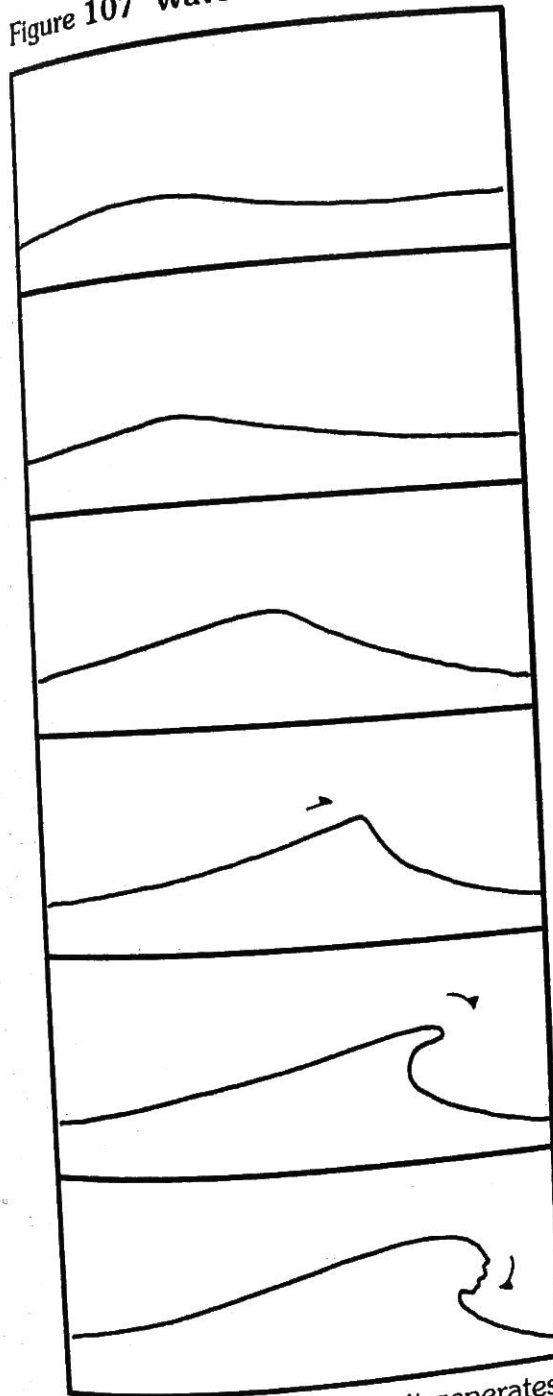


You can make it look more realistic depending on the style you use.

For example, you should probably draw effects such as waves differently depending on whether your work contains cartoonish characters with 2:1 proportions or more realistic and dramatic characters with 8:1 proportions.

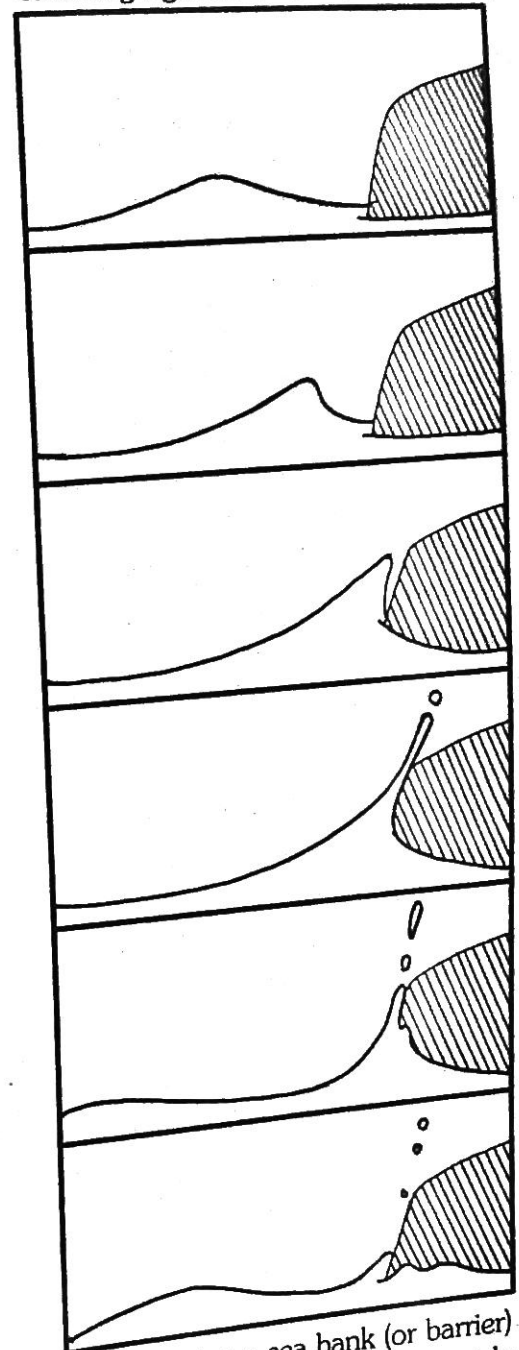


Figure 107 Wave motion



As the swell gets bigger, it generates whitecaps, then goes on to finally engulf its own whitecaps.

Figure 108 Swells hitting and crashing against a sea bank

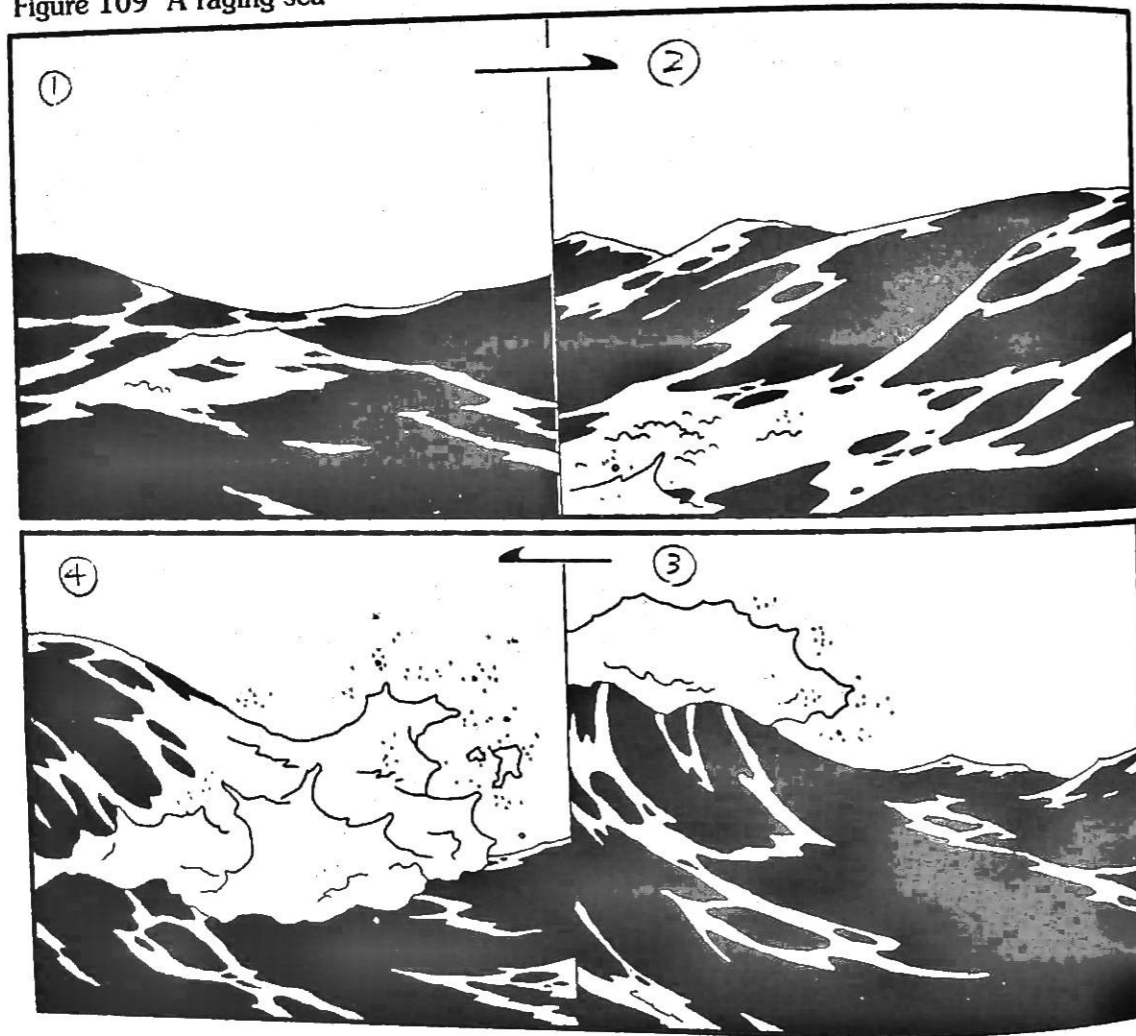


Waves hitting a sea bank (or barrier) try to continue moving but ultimately collapse. And a new wave comes along soon after.

You won't be able to depict a certain degree of realism unless you are well-acquainted with the movement and properties of water. It requires much effort and the timing can be difficult to grasp, so this is a good way to test your chops.

As an example, illustrated below are the main aspects of the movement of a raging sea.

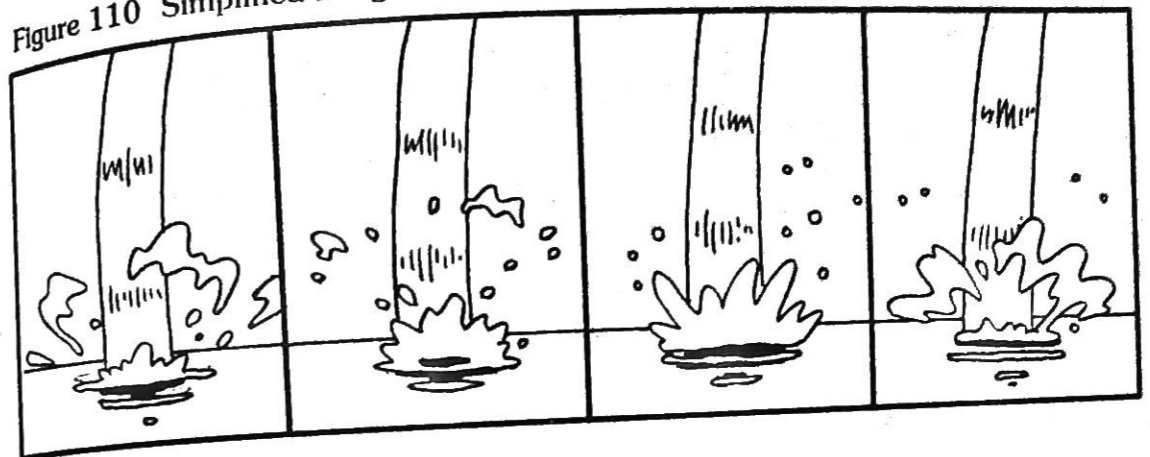
Figure 109 A raging sea



In Figure 109, drawings (1) to (4) are all key positions. Between each one, about five to seven positions would have to be added.

When you draw the middle positions you have to calculate what goes where, and how it connects to the whole, being aware of how the body of water continues to change.

Figure 110 Simplified image of a waterfall basin



The movement of water in a waterfall basin (1) splashes (2) diffuses (creating foam and mixing with air) (3) and disperses (at the surface tension limit), turning into spray and falling down.



This cycle repeats without interruption. Figure 110 illustrates this principle in a very simple manner.

Figure 111 A more realistic waterfall basin

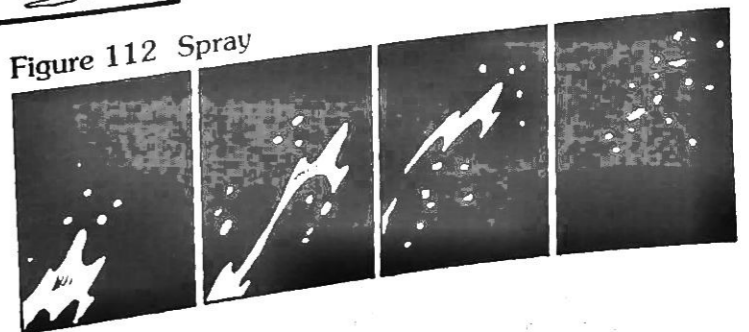


Figure 111 depicts a style with a repetition cycle of about eight to ten drawings.

As a rule:

- The amount of splashing water should always be the same.
- Make sure as much as possible that it doesn't look like it's repeating.

Figure 112 Spray



This is what it looks like when spray droplets are dispersed. Even after becoming separate droplets, try to think of them as a single clump.



What are the specific techniques for making inbetween drawings for water?



Water is a liquid that moves according to a fixed principle. Its form is not constant and it continues to alter. How do you depict something like water, with these kinds of properties?

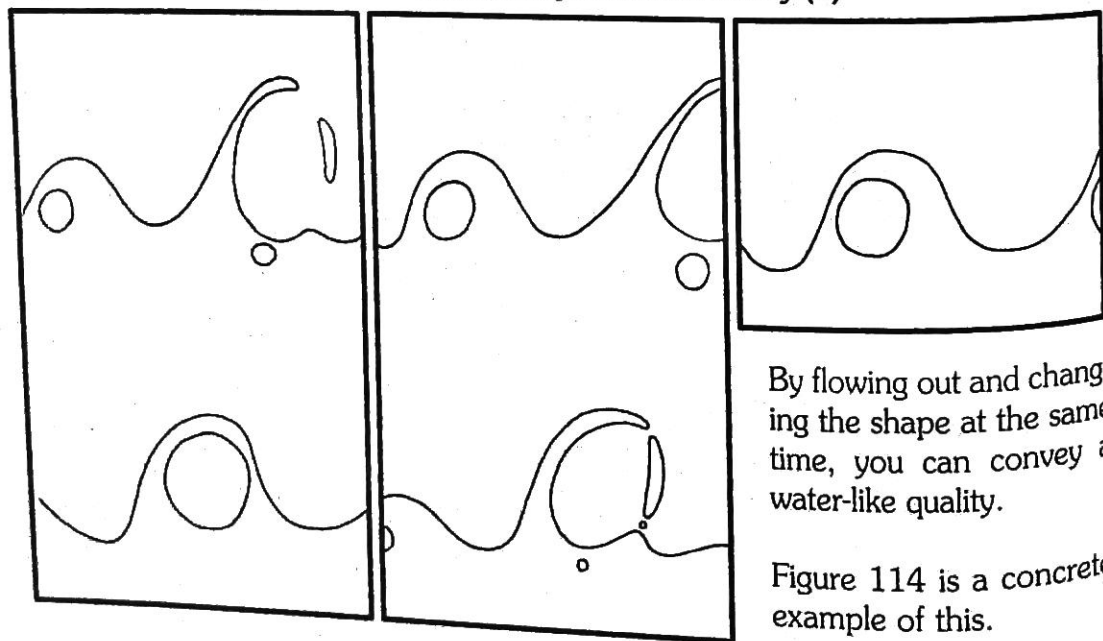
Figure 113 Flowing out water while altering it



Figure 113 shows foam in the trail of a boat that has passed along the surface of the water.

The shape continues to change as the boat trail extends, losing its form and finally disappearing completely.

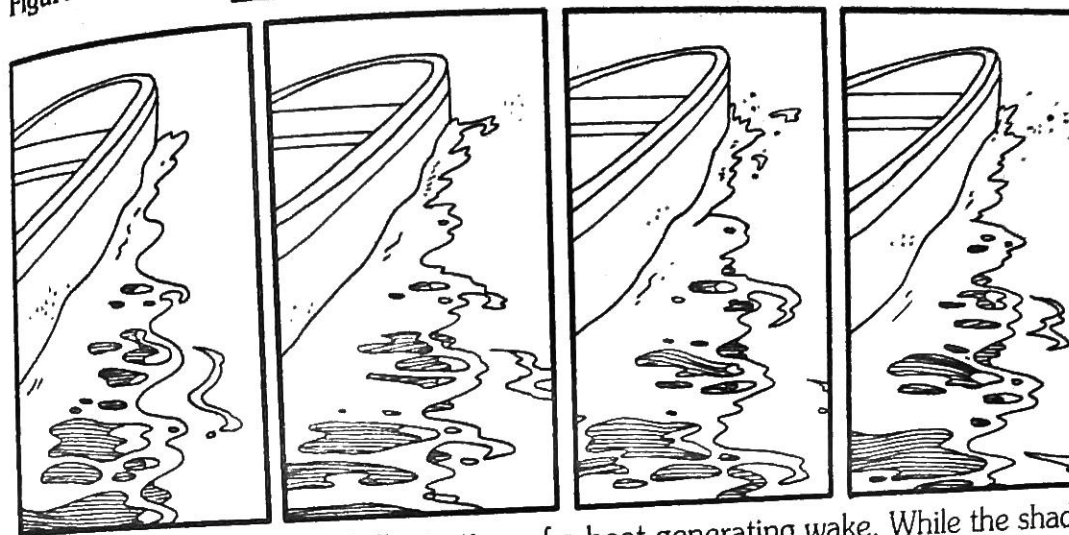
Figure 114 Flowing out and changing shape simultaneously (1)



By flowing out and changing the shape at the same time, you can convey a water-like quality.

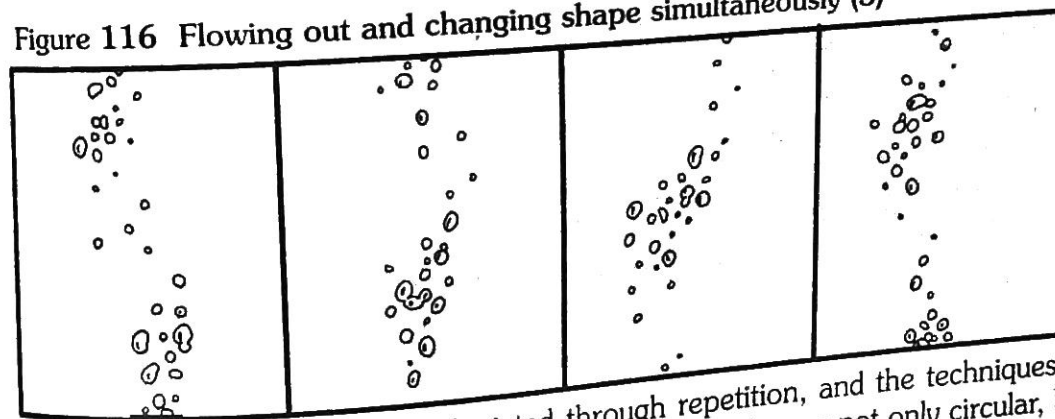
Figure 114 is a concrete example of this.

Figure 115 Flowing out and changing shape simultaneously (2)



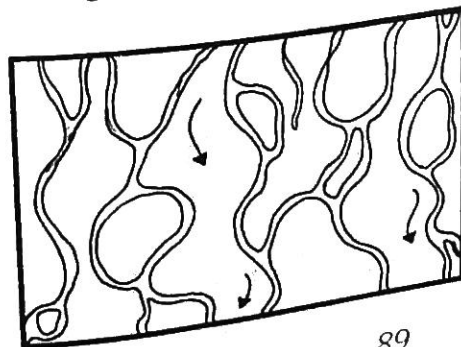
Here's a slightly exaggerated illustration of a boat generating wake. While the shadows from the boat itself flicker, they are flowed out and continue to change shape as they move behind.

Figure 116 Flowing out and changing shape simultaneously (3)



A scene of bubbles rising is also depicted through repetition, and the techniques of flow and shape-changing should also be employed. Bubbles are not only circular, but actually they can also be flat or oval-shaped, and sometimes two or three of them are temporarily stuck together.

Figure 117 Rain flowing down a glass window



For rainwater streaming down a window, you can also use flow and shape-changing movement.

