Anticipation

One of the tricks whieh an animator has to learn is how to attract the attention of the audience to the right part of the screen at the right moment. This is of great importance to prevent the audience missing some vital action and so the thread of the story. Although the audience is a group of individuals, the human brain works in a predictable way in these circumstances and it is possible to rely fairly confidently on reflex audience reaction.

If there are a number of static objects on the screen with the attention equally divided between them and suddenly one of the objects moves, all eyes go to the moving object about ⅕ second later. Movement is, in effect, a signal to attract attention. If, therefore, a preliminary movement is made before the main movement, such as drawing back the foot before a kick, the attention of the audience can be attracted to the foot. This ensures that they will see the kick when it comes.

The amount of antieipation used considerably affects the speed of the action which follows it. If the audience can be led to expect something to happen then the action, when it does take place, can be very fast indeed without them losing the thread of what is going an. If the audience is not prepared for something which happens **very** quickly, they may miss it. In this case the action has to he slower.

In an extreme case, if the anticipation is properly done, the action itself needs only to he suggested for the audience to accept it **(see** page 50).For instance, if a character is to zip off screen it is enough for him to draw back in preparation, followed by perhaps one or two drawings to start the forward movement. A few drybrush speed lines or a puff of dust can then imply that he has gone. These lines or dust should he made to disperse fairly slowly—probably in not less than twelve frames.

Since movement attracts the attention of the audience, their attention will be focused where motion takes place.

A Simple anticipation of a grab. This can be more or less exaggerated according to circumstances. The character moves from rest into the anticipation at **2**, then into the grab position at **3**.

B A more violent movement needing stronger anticipation. This is on 2, before the main action on 3.

Follow through

The animation of an extremity, such as a coat tail or a feather in the hat, is difficult to key at the same time as the character to which it belongs. Objects of this nature move to some extent independently of the character they are attached to. It is, therefore, difficult to predict where they will be a few frames ahead without following their movement drawing by drawing. The movement of an extremity depends on:

1. The action of the character.
2. The extremity's own weight and degree of flexibility.
3. Air resistance.

Imagine a dog with floppy ears which hang vertically when the dog is still: When the dog accelerates away the ears tend to stay behind but are pulled forward. As long as the dog does not slow down, the ears trail out behind, with a wave motion if the dog's head goes up and down. If the dog slaws down and stops, the ears try to continue forward, and may stretch forwards before swinging backwards again and finally coming to rest. An attempt to key this movement with the dog is almost certain to fail. For instance, the ear may be moving at its fastest as the dog is coming to rest. Similarly, a cloak of heavy cloth moves independently as a result of the movement of the character's shoulders. It is important for the fluidity of the animation that the cloak is allowed to continue with its own speed and direction when the shoulders change their speed and direction. As a cloak is a large area, air resistance may be important too, particularly if the cloth is light. The movement of a gauze veil, for example, is governed almost entirely by air resistance, trailing behind the character and drifting slowly to rest after the character does.

To maintain fluid animation it is essential to treat **the weight of a body** differently **from its** accessories **or** extremities.

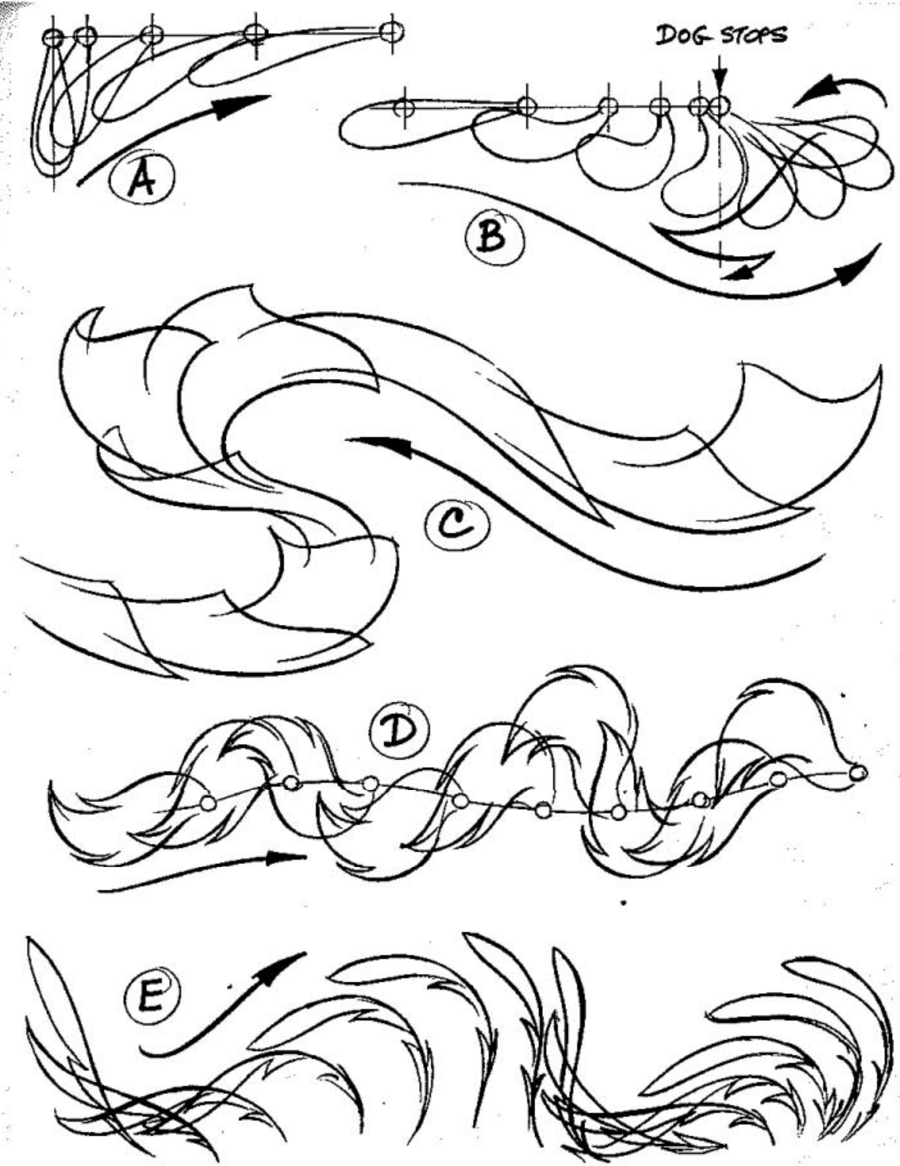
A A simplified dog's ear and its attachment to the dog. As the dog accelerates away the ear trails **behind.**

B When the dog stops, the ear tends to continue forwards at **the same speed before swinging to** rest

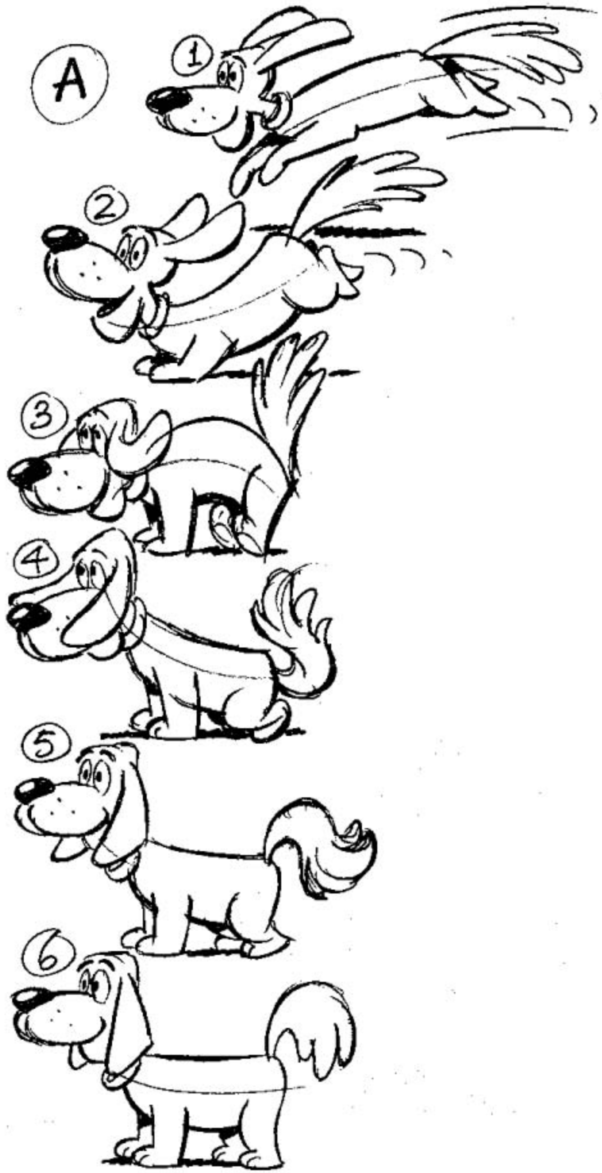
C Cloth trails in a way which combines the effects of its weigh and the air resistance.

D A **horse's** tail

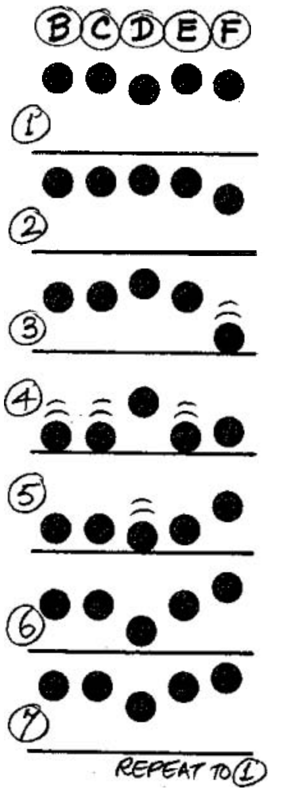
E A feather, **which is moresprinqy than the** other **examples**



A A dog jumps in and stops. The front legs squash on 2 and the back legs on 4. The head and front legs are static on 5, although the back legs, tail and ears are still moving.



B–F Five balls bouncing. B, C and E are together: D is overlapped one frame late and F one frame early.



Overlapping action

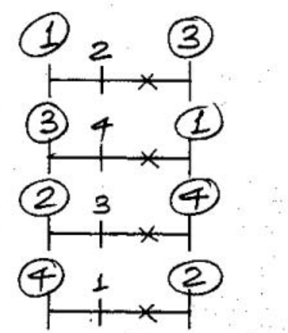
It is usually a good idea in animation to have a time lag b t een the movements different parts of the figure. his is d overlapping action. In a slow, gentle action this may not he necessary, but in a more violent movement it helps to give fluidity.

If several characters *are* dancing in unison on the screen, that is, using the same animation traced off several times, their movements look much more alive and fluid with an overlap of one or two frames on some of the characters. The result is that these characters are just out of sync with the others, which appears less mechanical than having them exactly in unison. Rained soldiers marching, when the effect should be rather machine-like, should of course be timed exactly together. For a squad of new recruits, however, a four frame overlap an some of them may not be enough to give a ragged look to their marching.

Imagine a dog running along and coming to a stop. The first thing to stop are probably his front feet, then his back legs and feet come up behind. As he has gone into a 'squash' onto the front feet at first, once all four feet are firmly on the ground he comes out of this and might even go up too high and settle hack into the final pose. If he has floppy ears, these are probably the last things to come to rest.

The principle on which overlapping action is based, is really only that of momentum, inertia and action through a flexible joint as discussed on page 40. The reason it works so well in animation is that the natural tendencies of movement work in this way and these are picked up and exaggerated.

G A loosely rattling car can be built up, for example, in four drawings. The bonnet and the door can be keyed on the top scale, two wheels and one mudguard on the second scale, the steering wheel and the front bumper on the third scale, and soon. in this way the movement of each part of the car can be made to overlap with the part next to it as far as possible. The amount of movement depends on the circumstances.



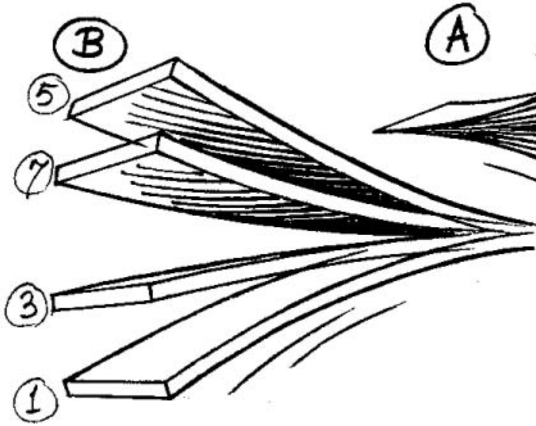
Timing an oscillating movement

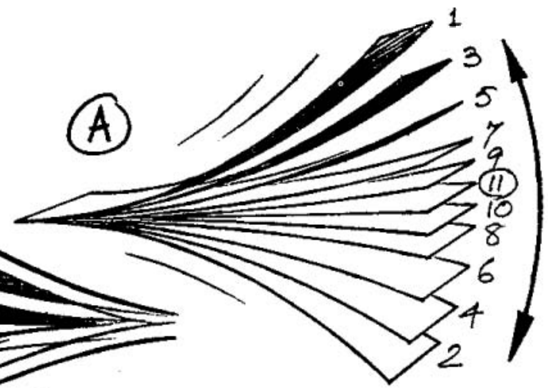
A fast vibrating movement, such as a spring twanging, can be done as shown in Fig. A. The movement between the. extremes is so fast that no in-between drawings are necessary. It is only necessary to show the extreme positions of the spring getting gradually closer to the rest position. The motion of a larger and heavier object, such as a springboard just after a diver has left it, is timed more slowly, taking perhaps four frames to go from the bottom of the movement to the top. In any action in which the direction of movement reverses at an extreme, it tends to come out of the extreme more slowly than going into it. This gives more 'snap' to the movement. Cycles of less than six frames may look mechanical and it may be worth doubling the length of the cycle with two different variations of the movement or. instead of using a repeat of four frames. use a double near-repeat of seven or nine frames, so that the same positions do not appear on two consecutive repeats.

The other type of inanimate repeat is discussed on page 82, in which the force of the wind causes a wave to move along a flag. A similar movement takes place when an animal wags its tail. The tail-wagging muscles can be considered as acting directly on the part of the tail next to the animal's body causing the lower section of the tail to move fram side to side. As the tail is flexible this movement is transmitted to the next, higher section with a slight time lag. The movement of this second section is then passed on with another time lag, and so on to the end.

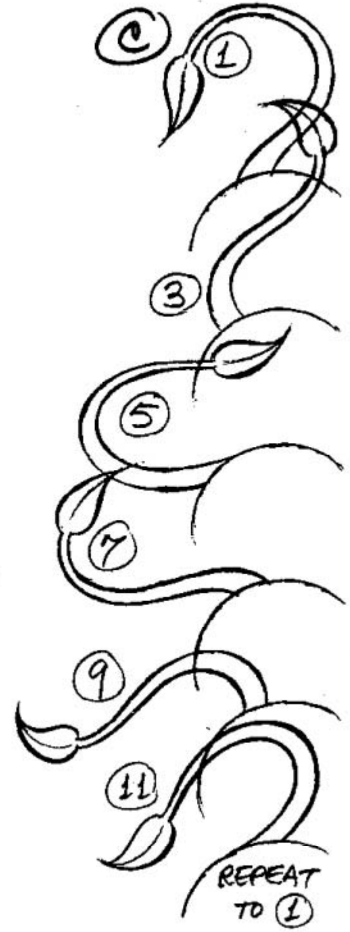
A A vibrating spring, animated on single frames.

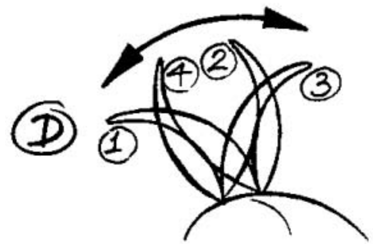
B The slower vibration of a springboard.





C A repeat cycle of an animal's tail wagging.





D The quicker wag of a dog's tail. on double frames.

E A surprised reaction can be achieved by inbetweening the character fram 1 to 13 on odd numbers and fram 2 to 13 on even numbers. If the drawings are shot consecutively a vibrating movement is achieved, coming to rest on 13.

Timing to suggest weight and force—1

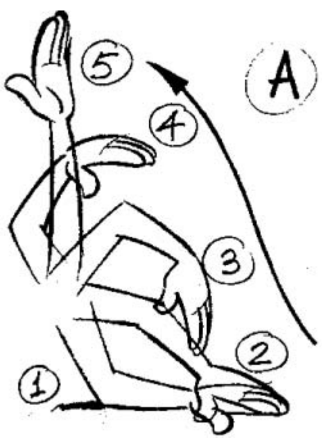
Each part of the body moves as a result of the action of muscles, or as a result of the movement of another part of the body to which it is attached. For instance in Fia. A, when the arm is raised, the upper arm tends to be raised first by the shoulder muscles. As the elbow is a flexible joint, there is a time lag before the forearm starts to move and similarly another time lag before the hand moves.

In a walk, the knee is a hinge joint and the ankle acts almost like a ball and socket joint. If the angle between the shin and the foot is kept the same, the ankle joint appears to be rigid, so this angle must vary. In Fig. B the foot starts on the ground (position 1) and is lifted forward for the step. The knee is raised, but the foot tends to hang back and so comes up heel first. The toe trails downwards until the top of the movement (position 4), but as the leg straightens the foot tends to keep going up and so, as the heel goes down, the foot rotates until the heel hits the ground (positions 5 and 6). The foot now tends to continue its downward movement but as it is stopped by the ground it quickly slaps down flat.

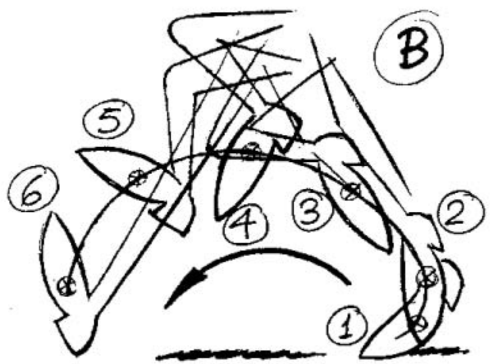
If, as in Fig. C, a character is to give a strong pull on a rope, the first part of the body to move is probably the hips, followed by the shoulders, the arms and finally by the rope. The amount of movement depends on the strength of the character, the weight on the other end of the rope and the mood of the scene, hut the order in which different parts of the movement take place is the same.

If, in the same situation, the character is being pulled by a force at the other end of the rope, as in Fig. D, then the order of events is reversed. First the rope moves, then the arm, the shoulders and the hips. The first part of the pull takes up the slack in the rope, and if the movement is fast, the shoulders do not move until the rope and the arms have been pulled into a straight line. At this point the shoulders jerk forward and the character tends to pull out into a straight line as he goes out of screen. In a slow, steady pull the character may have time to react and try to resist

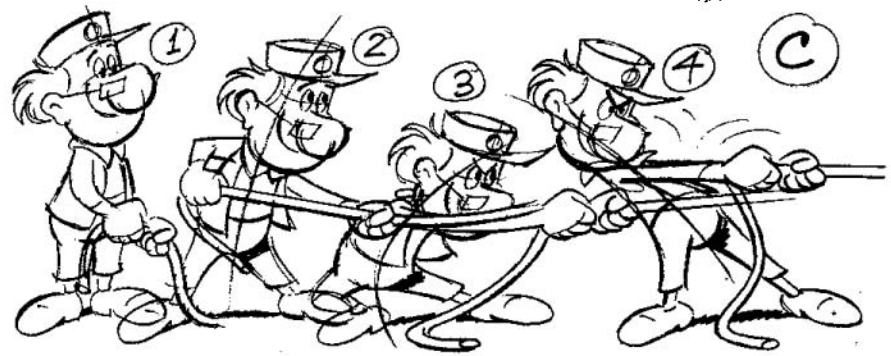
A Raising an aim, showing effect of flexible joints



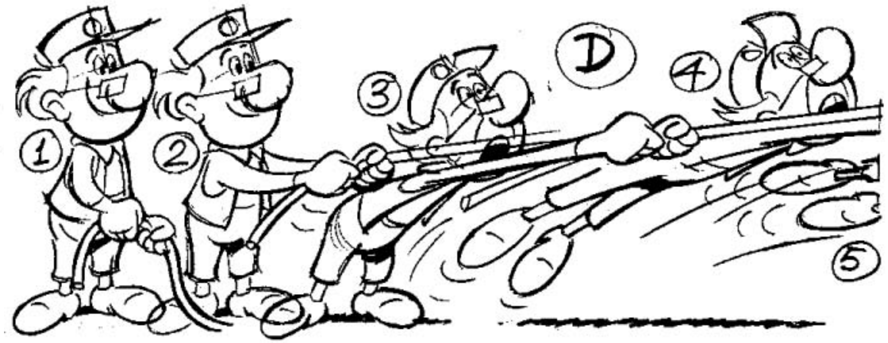
B in a walk the flexible ankle joint results **in the foot** trailing downwards as the **ankle goes up on drawings 2 and 3, and** trailing upwards as the **ankle** goes down on drawings 5 **and6**



C The sequence of events when **a man** pulls **on a rope** On drawing **2** he takes up the slack **on 3 he** starts to **move** his body weight **backwards and on 4 he leans back** on **the rope**



D When the rope itself is jerked, the man's arms are drawn forwards until **they are in a straight line with** the rope At **this** point **h s** shoulders **are pulled forward** in drawing **3 and** in 4 **and 5** his **whole body is dragged away**

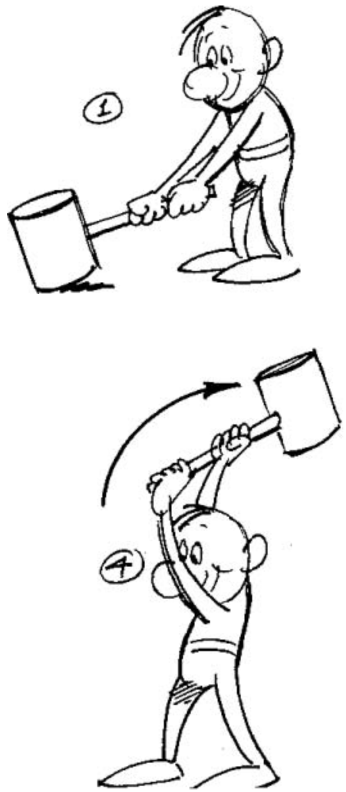


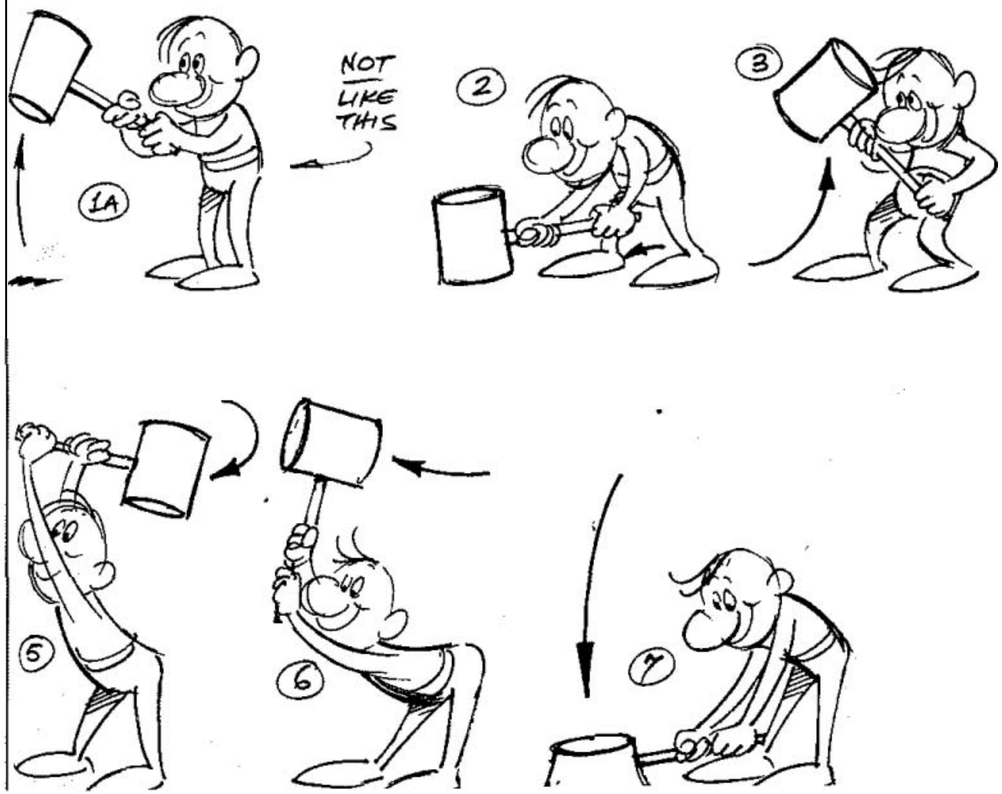
Timing to suggest weight and force—2

To **give** the impression that a character is wielding a heavy hammer it is important to time the movement carefully.

The start position **is** as Fig. 1. The man is relaxed with the **hammer** head resting on the peg which he is **going** to hit. To start the movement he lifts the hammer. If it is heavy, he cannot **do** this in the position **shown** in Fig. 1A as he would then be off-balance and would topple over. In order to transfer the weight of the hammer over his feet so that he is balanced, he must step forward and grasp the hammer near its head (**Fig.** 2). He can now slide the hammer towards himself and lift it above his widely-spaced feet (Fig. 3). As the head of the hammer rises above shoulder level, he starts to **move** its weight backwards in preparation for the **forward** action. However he cannot let it go **too** far behind him or he would overbalance backwards (Fig. 4). So he starts to move his body weight **forward,** and this eventually starts the hammer head moving forward (Fig. 5). He jerks his body **forwards** and downwards to give a forward impetus (Fig. 6) and the job is done. Now he need only step back and the hammer will fall and hit the peg. This position links up to Fig. 1 or at least Fig. 2.

To make the hammer look heavy **the man must keep the** weight **of the** hammer **head** more or **less balanced above his feet until he** hits **the ground** with it **Only alight** hammer could **be lifted as** in **1A** without **the man fallingaver**



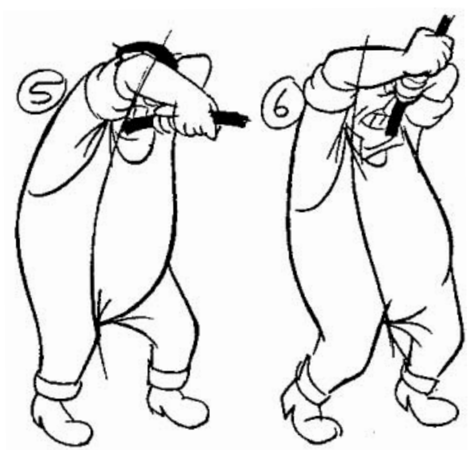


Timing to suggest weight and force 3

In an energetic, repeated movement, far example, a man hitting something with a pitchfork, the different parts of the figure move in a particular way to give the maximum feeling of effort.

Drawing 1 shows the impact of the pitchfork with the ground. The end of the pitchfork remains in contact with the ground for drawings 2–4, whilst the body begins to move out of the extreme position in readiness for the next stroke. The shoulders arrive at their furthest backward position in drawing 7 and begin to move forwards again in drawing 8, although the head of the pitchfork is still moving backwards. In drawing 9, the hips move quickly backwards as the shoulders and arms come forward and downwards, leaving a big gap between the position of the pitchfork in this drawing and that in drawing 1 to give a final impact to the movement. Note how the curvature of the body changes from convex to concave by means of 'S' curves on drawings 2 and 7.

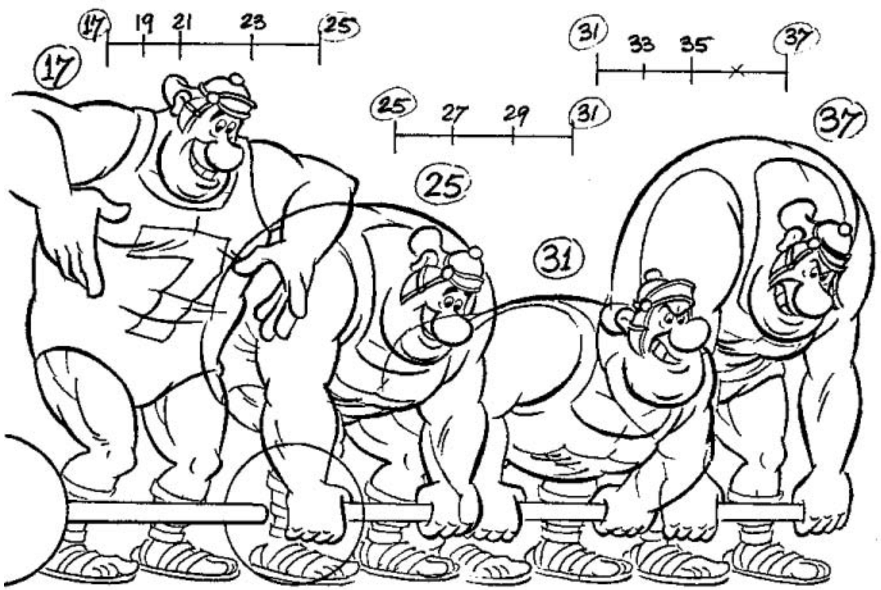
The man is repeatedly hitting something on the ground with a pitchfork Note how the weight of the body is manoeuvred to get the maximum effort into the impact on drawing 1

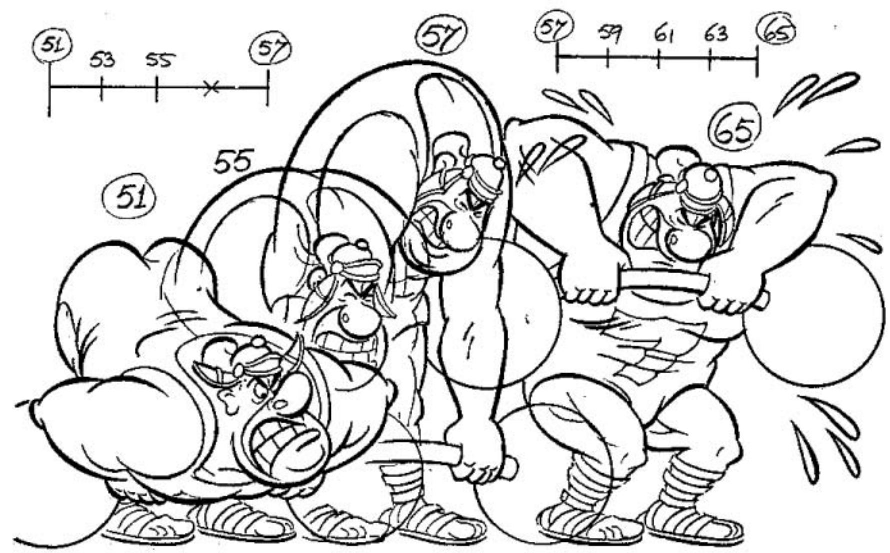


Timing to suggest weight and force – 4

An athlete is going to lift the heavy bar bell. He **starts** confidently, and in drawing 17 is anticipating grabbing the **bar**. He grabs the bar on 25, and **31** is the anticipation to the first attempted lift. He is **still** confident but grits his teeth somewhat as he makes the effort, as shown in drawing **37.** The bar bell does not move. After **37** he **comes** to a puzzled hold **as** he **realises** he has a **more** difficult pmblem than he thought. In drawing **57** he makes a much bigger jerk after making a mare **determined** and annoyed **anticipation** in drawing 51. **After** this jerk he manages to lift the bar bell with great difficulty. A few frames after drawing 65 he collapses out of screen under the weight.

On drawing 17 the athlete confidently prepares to lift the heavy bar bell. Heanticipates on drawing 31 and tries to lift on drawing 37. The weight does not move so he makes a much bigger anticipation on drawing 51 and a big jerk on drawing 57, which enables him to get the weight up in the air on drawing 65, before collapsing with exhaustion.

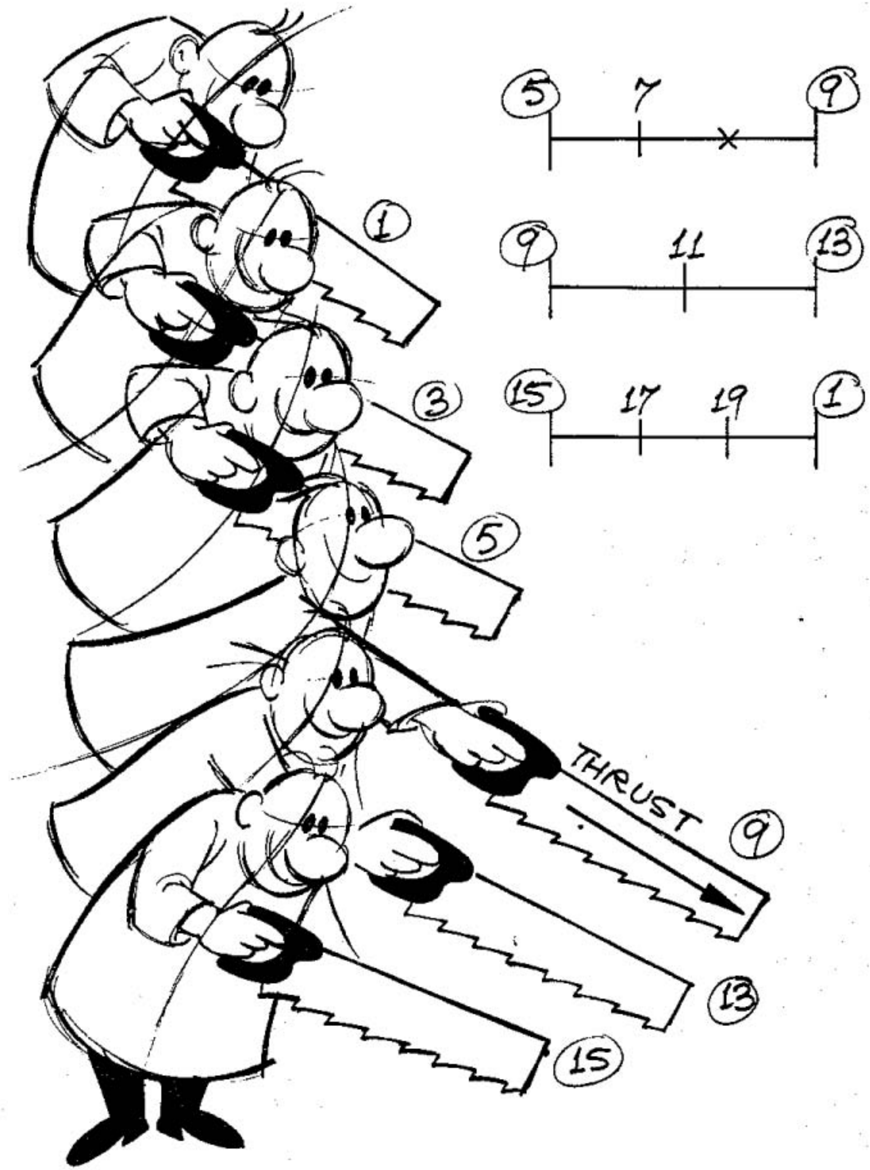




Timing to suggest force: repeat action

In a repetitive to and fro action such as sawing, it is not sufficient to draw the forward and backward extremes and then inbetween them. To convey the feeling of effort being put into the action it is necessary to analyse the relationship in time between the movement of the body weight, the muscles of the arm, and the action of the saw. This can be done by actual or mental miming. If a lot of effort is needed to push the saw through the wood, this cannot be supplied by the arm muscles alone, as straightening and bending the arm would move the shoulder back and forth as well as the saw. Immediately before straightening the arm, the whole body weight must be moved forward, so that when the arm does straighten it does so against the forward momentum of the body weight and so the thrust is applied to the saw. The thrust is increased by rotating the shoulders at the same time.

When sawing with the right hand the right shoulder is held back during the beginning of the forward body movement, then it is quickly brought forward, followed immediately by the straightening of the right arm, which puts the full effort of the movement into the action of the saw. On the return stroke, little effort is required in the movement of the saw, which cuts only on the forward stroke and so the sequence of events is less complicated. Some time lag between the backward movement of the body and the saw makes the animation more fluid, but otherwise straightforward inbetween drawings are sufficient.



In a repeated movement such as sawing, the action is basically forward and backward between 1 and 9 However, to give a feeling of effort, Intermediate keys, 5 and 9, are also needed Of these 5 is more important, as the weight of the body comes forward before the final thrust is given to the right arm.