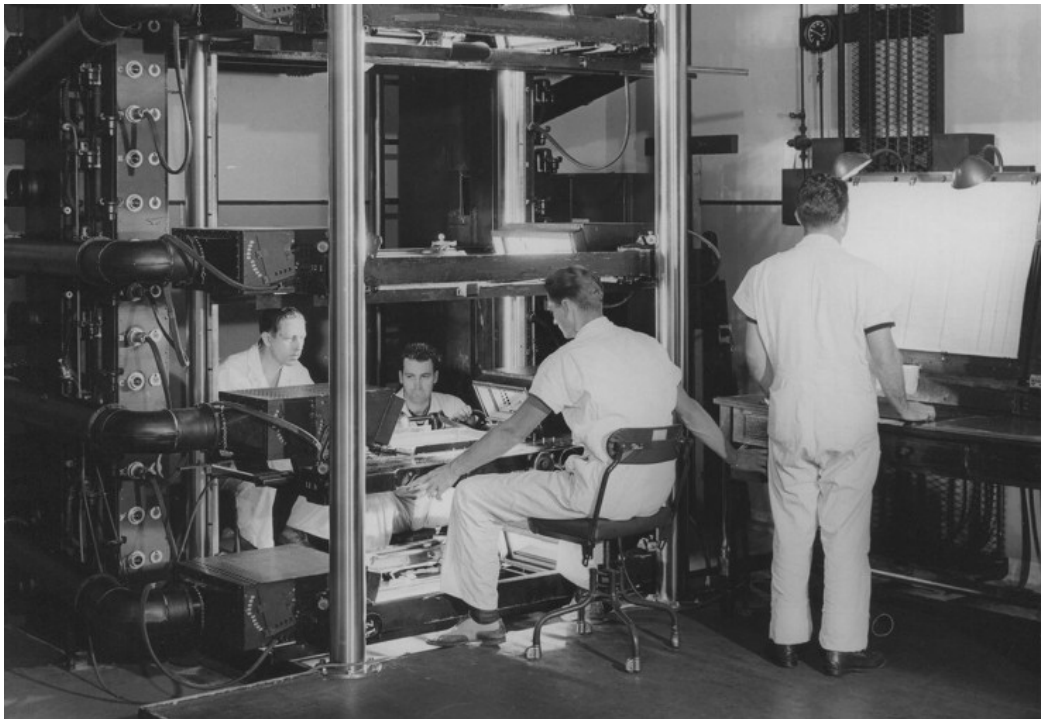


## Walt Disney Classified: The Layout Manual, Part 6—Camera Ops

By David A. Bossert



(Camera operators working on the iconic Walt Disney Animation Studios multiplane camera. This camera was capable of doing sophisticated movements using multiple focal planes and camera exposures.)

I can tell you from personal experience that one of the more fun aspects of creating visual effects animation, outside of actually animating, is enhancing that animation using camera operations. These operations can involve a simple double-exposure in which the film is exposed twice, usually creating a transparency effect for one element, or it can include many exposures on the same piece of film using different filters. The art of this, aside from the actual artwork, is the creativity in coming up with the right combination of operations to create the desired effect on the film.

The LAYOUT MANUAL starts with a fundamental explanation of photographic exposure, which is “the process of lightening an area of dark film. The unexposed film, when printed, produces a completely black print.”<sup>i</sup> So, if the film is unexposed, it creates a black print, then

fully exposed film creates an evident clear frame if light or a white card is photographed. The text continues, “as more and more light, or exposure is allowed to strike various parts of the film, the silver content of the emulsion becomes progressively less, upon printing, in those areas where more light is added, and consequently, the print becomes progressively lighter. In other words, light can be added but not subtracted; the film can be made lighter but not darker.”<sup>ii</sup> Simply put, you start with black, 100% emulsion on the film, and can lighten areas to 100% exposed film or no emulsion left on the film, which creates an apparent clear area on the film. So, you have 100% of the emulsion to “play” with to achieve various effects on film.



(*Dumbo* used shadows for the clown animation above as a way to keep costs down yet still make for a dynamic scene. The animators could work quickly by only drawing the silhouette of the characters. Then each level of animation was double-exposed, allowing for different densities to separate the overlapping shadows.)

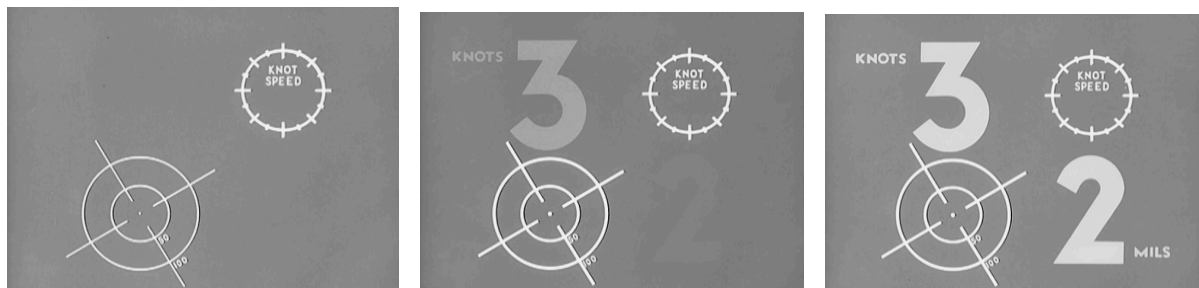
One of the most fundamental effects is a double-exposure. This effect is where a scene would be exposed twice on film at different percentages for each of the two passes or exposures. For instance, if you want to create a transparent shadow on the ground under a character. The scene elements would consist of a painted background, the character animation painted on the cel, and the shadow animation painted as an opaque black shape on cel as well. The entire scene (background, character animation, and shadow) is filmed say at 40% exposure for the first pass. Then the film is rewound in the camera back to frame one, and then the scene is reshot, the second pass, at 60% without the shadow element. That makes the full scene exposed at 100%—40% plus 60%— with the shadow element transparent since it is only exposed at 40%. This effect is evident in countless films such as the clown shadows on the tent in *Dumbo* (1941), which uses several different exposure percentages to achieve different transparent shadow densities, as in the example above.



(An example of double-exposed steam with a diffusion filter for a scene in *The New Spirit* (1942), note the use of different exposures to achieve varying densities.)

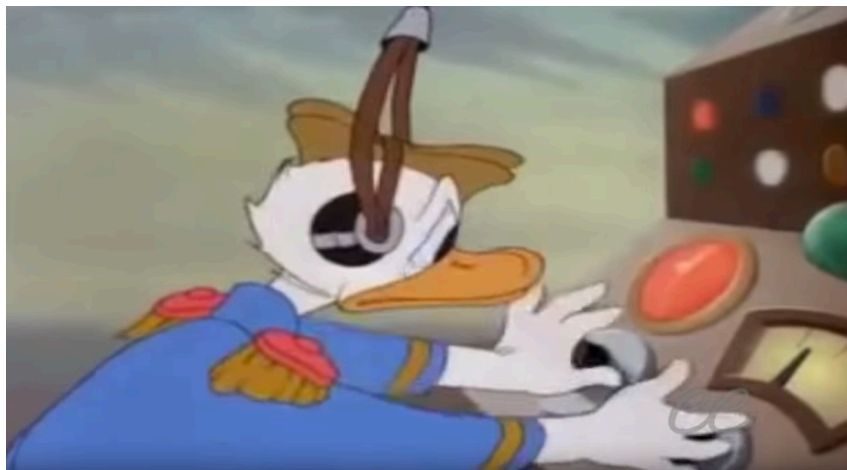
The manual does point out that “the process of doubling-in shadows, although using two exposures, is not true double exposure, so when we speak of “double exposed shadows,” we are actually at fault. They are UNDEREXPOSED areas of the background, even though they must be introduced into the scene by means of two exposures.”<sup>iii</sup> Think of it in terms of the opaque shadow on a cel, which acts as a mask over the background that is exposed at 40%. The cameraman rewinds the film to frame one of the scene, and then the background exposed again without the black shadow cel. The result is the area where the shadow was in the first exposure hid the background, thereby “underexposing” that one area making the background darker in that spot after the second pass. The terminology “underexposed” may be accurate. Still, over the years, the nomenclature of double-exposure, or “DX” for short, concerning shadows and other effects, has become the norm in communicating such camera instructions.

As a side note, in the early 1930s, there was a transparent paint used to create shadows on cels, but it proved to be problematic. The transparent paint lacked control and consistency in its density appearance and tended to “crawl” or “boil” when viewed at film speed. Creating shadows under the camera using opaque black painted shapes on the cel and then exposing it at a percentage gave a more uniform consistency to the shadow. It also afforded control over the density or level of transparency desired. Double-exposure became the standard for doing shadows at Disney even though other processes came and went over the years.<sup>iv</sup>



(Another example of double-exposure is for the numbers 3 and 2, this could also be done as a burn-in effect as well, in this scene from the Disney produced WWII training film *The Illuminated Sight in Fixed Gunnery* (Prod. 2648; 1943). The film was initially made under the code name the *Jacksonville Project*.<sup>v)</sup>

The LAYOUT MANUAL gives a clear definition of what film exposure is, stating that “100% exposure is considered as being that exposure of the negative which will produce a print where the various tones from black to white most faithfully reproduce those of the original subject.” At that time, there was not a photographic process that reproduced the exact tones and values of the original artwork. Often, dark color values merged or “flattened out in contrast and come closer in value” becoming indistinguishable on film.<sup>vi</sup> The same goes for “other end of the scale, in the region of whites, the values also tend to flatten out and lose contrast.” In an exposure of 100%, white accentually produces a transparent print that transmits 100% of light when projected. The manual points out that “it is impossible to transmit more” than 100% of light. But if exposures of 200% or 300% are made, then a “flare around whites as well as background fog will result.” The effect is referred to as a “burn-in” and maybe the desired or not depending on the effect that the scene requires.



(Donald Duck is operating a radio in this scene from *Home Defense* (1943), which is an excellent example of using burn in to illuminate lights to bring the radio to life. It’s best viewed in motion to get the full effect.)

A burn-in of an effect is when there is up to 100% exposure of white light, or a white card is “burned in over any other value or color whenever desired.” The manual uses the example of a double-exposing of a white title over any other artwork. Typically this is best achieved over darker artwork. Say the background is in the darker value range, then burning in a white title will create greater contrast between the lettering of the title and the background art making for more readability of the title. At a 100% exposure, there is no more emulsion on the film; it is clear in the area of the lettering, making them white. As explained, the exposure can be higher than 100% but then flaring, and potential fogging on the background will begin to occur around the lettering.



( An example of ripple glass use from *The Old Mill* (1937) to distort the reflection of the mill on the pond water surface. It was an effective way to distort the artwork. It's best viewed in motion.)



(In *Pinocchio* (1939), the ripple glass is used sparingly but effectively in the underwater sequence. In this scene, as the tuna rush by, the ripple glass introduces just the right amount of distortion to enhance the watery environment. It's best observed in motion.)

Armed with the knowledge of double exposures and burn-ins, the only limitation is that of one's imagination and vision for a scene. Both of these techniques can be used separately or in combination plus any number of an array of filters, ground optical ripple glass, and color gels to enhance and create special visual effects. The filters range from light to heavy diffusion to add softness to an effect; star filters, multi-image filters, and even custom made filters. The ripple glass, in the camera department, consists of special patterns ground into the optically clear glass to create underwater effects like those used in numerous WWII films as well as many of the animated feature films over nearly fifty years. Examples are plentiful for using ripple

glass or other distortion techniques to create the underwater sequence in *Pinocchio* (1939) to the distorted reflections in the water of *The Old Mill* (1937) to the smoldering smoke in a scene at the end of *The New Spirit* (1942).

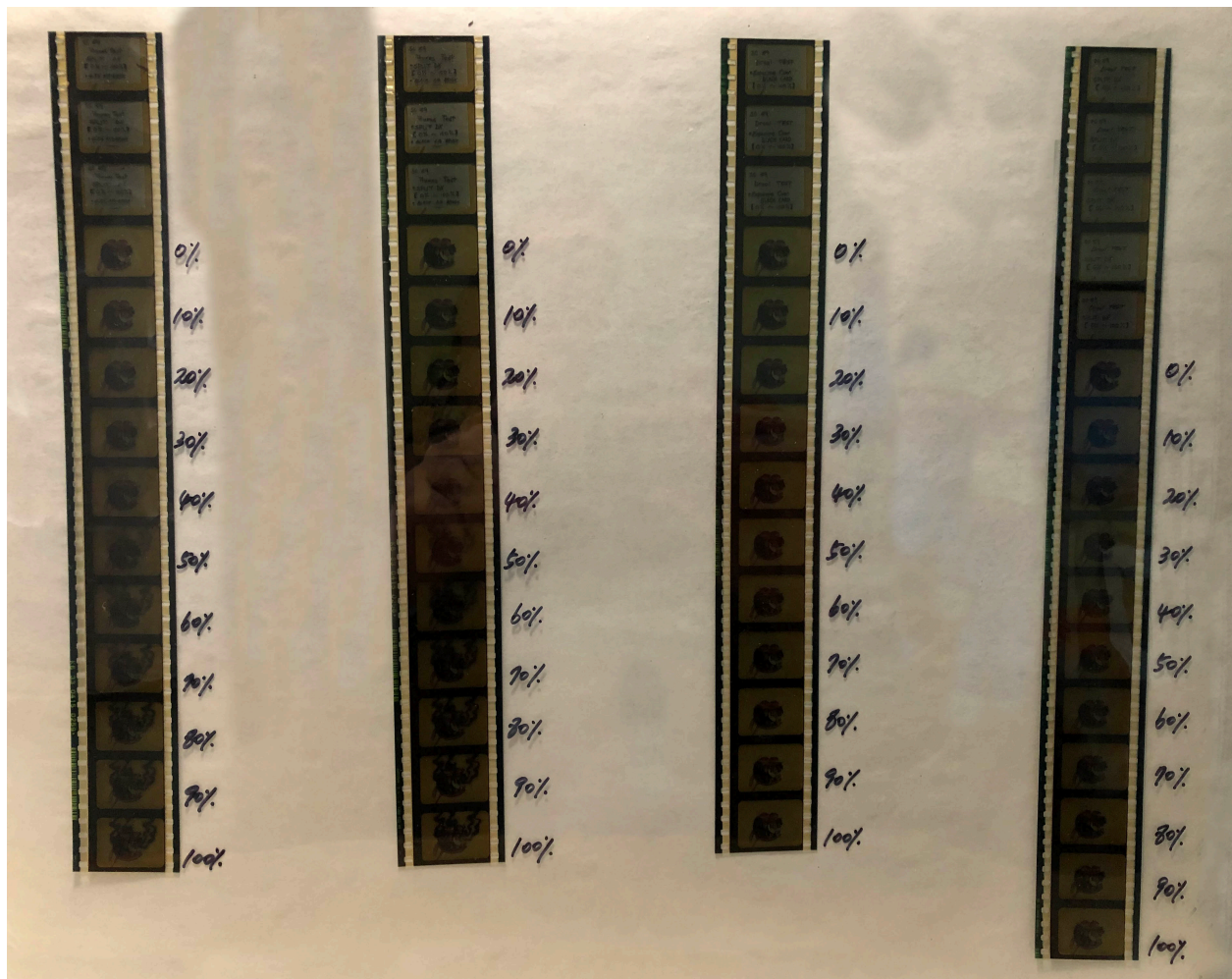


(At the end of *The New Spirit* (1942), this scene made up of static artwork gained movement with a camera truck and the use of ripple glass on the columns of smoke. The combination of both camera move and the distortion for the smoke brought life to the scene. It's best viewed in motion.)

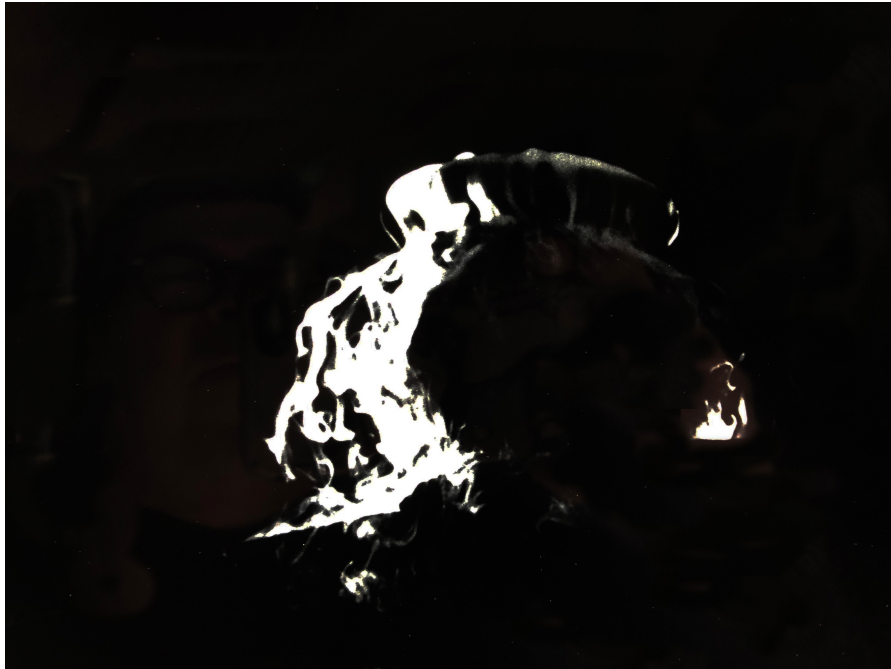
Although the camera department created a set of “density cels, photographically correct, which makes things very simple” for the layout artist and the effects animators as well, they also supplied “a WHITE PERCENTAGE stick, graduated from Black to White in steps of 10%. By matching to this stick, the percentage of white in any gray can be determined.” The density cels and white percentage stick were useful references, but often the effects artists would have a “wedge test” shot by the camera department for more accurate information when planning out the effects in a scene. A wedge test is a series of film frames that have incremental differences in exposure, filters, and color that are used for choosing the final look for an



element or the entire frame.<sup>vii</sup> More often than not, a special effects animator would run multiple tests at once and get back a series of film strips from the camera department. Those film strips would then be looked at frame by frame, either with a loop on a lightbox or projected using a filmstrip projector. Yes, like the one you remember from elementary school. The test film allowed the effects animator to choose which exposures, filters, color gels, and ripple glass to use for a particular scene. If done correctly, the scene could be shot in camera once with the desired results.



(An example of what a wedge test looks like when it comes back from the camera department. This one was for testing split exposures of “fumes” using different airbrush and paint elements.<sup>viii</sup>)



(This is an example of a backlight element from *The Black Cauldron* (1985) that burned in the ectoplasm that was emanating from the cauldron. Think of it as a negative, the white area is clear and often is used in conjunction with color and diffusion filters on the camera.)



(A more elaborate burn-in of the effects shooting out of the cauldron in this scene from *The Black Cauldron* (1985). You can see that this effect is near 100% with little emulsion left on the film.)

The use of a wedge test was especially important when using live-action effects elements such as rain or snow to an animation scene. The studio had filmed live-action effects on one of the sound stages and built up a stock library over the years. Live-action effects elements were used in features like *Bambi* (1942) and *Pinocchio* (1940) to enhance the “illusion of life” further. These elements continued to be used decades afterward and can be viewed in a number of the WWII films and even features like *The Little Mermaid* (1989), *Beauty and the Beast* (1991), and *Pocahontas* (1995). The rain or snow was filmed against a black card, creating black and white contrast of the effect against the black background.



(An example of live-action rain being used in *Bambi* (1942) for the Little April Shower sequence.)



(Another example of the live-action rain filmed during production on *Bambi* (1942) being double-exposed into this scene from *Victory Through Air Power* (1943). The Bambi rain effects continued to be used up until the early 2000s at The Walt Disney Animation Studios.)

All of these camera techniques in the hands of an experienced layout or effects artist can produce efficient, often low cost and high-quality enhancements to animated scenes. But, it can also do the opposite in the hands of an inexperienced artist, causing wasted time and expense. Layout, Effects, and the Camera department working together, especially during the WWII era at the Disney Studios, created propaganda and much-needed training films for the war effort. It was through internal publications like the LAYOUT MANUAL that many of these techniques were documented for new artists and technicians to learn and reference to keep productions following smoothly and swiftly. Many of the methods were also passed down from

artist to artist, expanded and refined over time. Sadly if not for the documents like the LAYOUT MANUAL and other surviving notebooks, many of these techniques have been lost to time.

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<sup>i</sup> The Double-Exposure pages, Layout Manual, Walt Disney Productions, 1943; authors copy, pg. 52.

<sup>ii</sup> The Double-Exposure pages, Layout Manual, Walt Disney Productions, 1943; authors copy, pg. 53.

<sup>iii</sup> The Double-Exposure pages, Layout Manual, Walt Disney Productions, 1943; authors copy, pg.54.

<sup>iv</sup> Author's personal knowledge and experience at the Walt Disney Animation Studios.

<sup>v</sup> From the film *The Illuminated Sight in Fixed Gunnery* (Prod. 2648; 1943), additional reference from Shale, Richard Allen, *Donald Duck Joins Up: The Walt Disney Studios During World War II*, The University of Michigan, Ph.D., 1976, Appendix C, page 292.

<sup>vi</sup> The Double-Exposure pages, Layout Manual, Walt Disney Productions, 1943; authors copy. Pg. 53.

<sup>vii</sup> Visual Effects' Glossary, the Rebel Alliance Network Knowledge Bank Index.

<sup>viii</sup> Wedge Tests created by author for an episode of *The Ren & Stimpy Show* (1991—1995).