

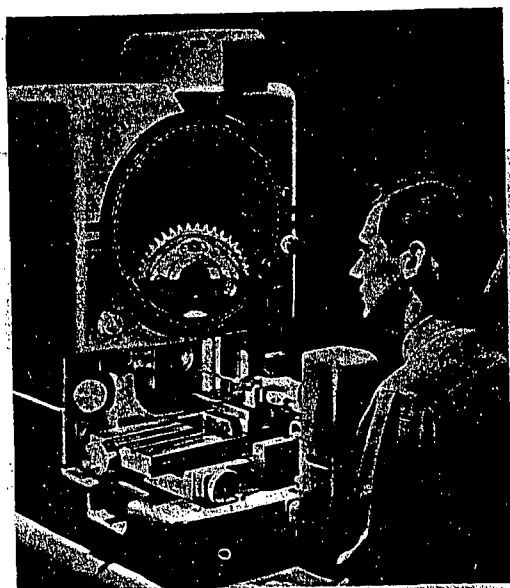


Figure 39. An example of a large amount of magnification coupled with projection onto screen. Slight defects can be easily detected.

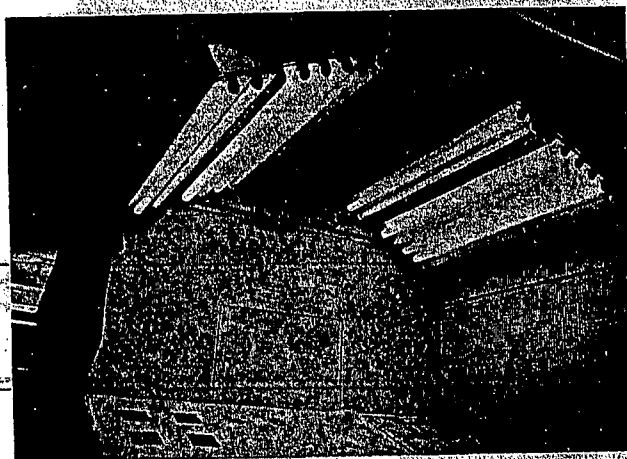


Figure 40. Colored light used for inspecting color proofs in the printing industry. Light of a color complementary to the printing ink makes the ink appear dark grey against the light background; for example, using blue light on yellow proofs.

colored proof viewed under light of a complementary color has a greater contrast with its background.

These illustrations serve to give some idea of the many places where supplementary lighting for inspection of difficult seeing tasks helps insure easy accurate seeing. In general, the technique for a certain job is developed after careful study of the problem. The application of fundamental principles in the control, color quality, and quantity of illumination contributes a great deal to the elimination of the seeing "bottlenecks" that, in many cases, are the most troublesome features of manufacturing processes.

XI. Infrared Radiation

The actual amount of infrared radiation from sources of artificial light in typical lighting installations is far below the levels that will have harmful effects upon human beings. At worst, it produces discomfort and annoyance because of its heating effects. No significant differences in visual functions were found when most of the infrared radiation was filtered out of light from tungsten filament lamps.²⁹ If the general heating effects are objectionable or undesirable, fluorescent lighting can be used to provide hundreds of footcandles before such effects are noticeable on the skin.³⁰

Some industrial processes involve high-energy levels of infrared radiation. Long-wave infrared radiation is readily absorbed by the surface tissues of the body. Therefore, these rays cannot inflict deep injuries. Overexposure produces some immediate discomfort, which generally provides adequate warning. However, the eyes may suffer from continual exposures to infrared that is below the level that causes general discomfort. There is some evidence that this may result in cataract. Eyes should be protected by suitable glasses from intense direct radiation. Fortunately, in most situations where overexposure of the eyes to radiation may occur, visible radiation also is so intense as to require protective goggles.

XII. Ultraviolet Radiation

Since ultraviolet radiation is readily absorbed in human tissue, it produces superficial injuries, chiefly to the skin and eyes. However, most lamps used for general lighting purposes emit little or no ultraviolet radiation so that in typical lighting installations there are no harmful effects.³¹ On the other hand, there are certain special-purpose lamps that are designed to emit shorter-wave radiation. Some industrial processes, such as welding, also produce considerable amounts of such radiation. In these cases it is necessary to take certain precaution.

The effects of exposure to ultraviolet radiation are similar to sunburn. Since

²⁹ M. Luckiesh and F. K. Moss, Infrared radiation and visual function, *J. Opt. Soc. Amer.*, 27, 69 (1937).

³⁰ Effect of fluorescent lighting on the eyes, *J. Am. Med. Assoc.*, 124, 608 (1944).