THE LIGHTING OF TEXTILE MILLS.

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Skylights. The remarks as to protecting windows apply with equal force to skylights, for these, wired-glass in metal frame work is desirable. As most textile mills have more than one story, skylights will seldom be a necessity unless the floor space is of considerable area, then the skylights can be combined to advantage with light shafts, if the mill be more than one story high. In locating skylights, they should be placed so as to have a northern exposure and to admit diffused light instead of direct sunlight. The so-called "saw-tooth" form of construction is the best, since the openings in these can be arranged so as to admit diffused light instead of sunlight. It must be remembered that if flat skylights be used, their effect will be to transform the room underneath into a sort of hot-house, even if direct sunlight be shut out by awnings, shades, etc., or by using opaque glass. Therefore, the saw-tooth skylight, whose light opening is perpendicular, or nearly so, is the best, and here again Luxfer Prism glass can be used to great advantage for diffusing the light. Skylights must be ventilated to obviate condensation of moisture inside, and should be made watertight and be well drained into a near-by gutter.

General Data. The finish of the inside of a room has a great influence on its illumination. If the walls be covered with dark paint, paper or wood-work, the room will appear ill-lighted, even though well provided with windows or artificial light, and also a dark floor or carpet will darken a room. To obtain the maximum effect of light from any source, the walls of a room should be smooth, and painted or covered with a light color, and the floor likewise should have a light-colored covering. In textile mills, all the exposed interior surfaces, walls, ceilings, partitions, columns, etc., should be a light color, the best results being secured when white is the prevailing covering. White paint of good quality is the best to use, and the finish should be dull rather than glossy to avoid painful reflections affecting the eyes of operatives, although there will be a slight loss in the amount of light reflected. For the same reason, a pearl gray or cream tint will be found less fatiguing on the eyes. If all exposed surfaces are thus treated, there will be little absorption of the light that enters the room, as most of it will be reflected and diffused. The extra amount of illumination caused by painting the interior light-colored will amply repay the cost of the paint, especially where artificial lighting is employed.

Machinery absorbs a vast amount of light when painted dark, and therefore, wherever possible, it will be of benefit to paint machines some light tint, one that can be easily cleaned off and with a paint that will resist oil, grease, etc.

The following data showing the comparative amount of light reflected by walls of various colors is given as a guide for the selection of colors for painting indoor surfaces. A *white* wall will reflect from 70% to 80% of the light falling on it, a *yellow* wall reflects 35% to 45%, *emerald green* reflects about 18%, *deep blue* reflects only about 3%, *dark red* about 10% to 15%, and a *dead black* surface will reflect less than 1% of the light received.

Shafting, belting, etc., should be arranged so as to obstruct light from windows, etc., as little as possible, and so as not to throw dark shadows on the working parts of machines. The overhead system of shafting, etc., should be above the general line of illumination, lamps or windows. Columns also should not be placed in front of windows, especially a line of columns.

It is not good economy to use whitewash, kalsomine, etc., in place of paint, for the interior surfaces of rooms where machinery is operated. In addition to the defect that whitewash soils easily and cannot be cleaned, and therefore requires frequent renewal, the jarring and vibration of the machinery will loosen fine particles, or even flakes, which will fill the air and settle on the cloth or yarn, causing spotting, etc., in later operations. Because of the tendency of lead paint to darken, from sulphur, etc., in the air, a good zinc-oxide paint is the best to use, and this should be put on evenly and thoroughly. The paint should stand washing, as this will be necessary at intervals. Walls will require painting oftener than ceilings.

While dark floors will absorb light to a marked extent, it is hardly practicable to do anything with them. However, an attempt should be made to keep them as clean and light colored as is possible. White tiling would be the ideal floor if the cost were not so high. A cement floor will cost less than a wood floor. In building a mill of fire-proof construction, of course a light-colored concrete floor can be laid at less cost than in an old mill, and at less cost than a wood floor. In laying a new floor, if wood is used, it will be found economical in the end to specify a floor of some light-colored hard wood like maple. The added first cost will be repaid by the better wearing qualities, lessened repairs and less liability to fire, in which qualities it is superior to pine flooring.

Artificial Lighting. The previous remarks apply to the mill under ordinary conditions of daylight operation. If the mill is properly designed and constructed, is in a good location, and suitable means are provided for utilizing natural light in all interior spaces, no artificial illumination during daylight working hours will be necessary, except on very dark days or when running after sunset in the short days of winter. However, as many mills are run both night and day, and as there are many mills so constructed that they must have artificial light during the daytime, the installation of some system of artificial lighting is a necessity. The question then becomes, which is the best and most efficient system of artificial lighting for textile mills, the question of cost being given second importance, because the most efficient lighting system is always the cheapest in the end. It may cost more to install, but when results are considered and the running costs are compared, the system that seems cheapest in first cost will be found to be the dearest in maintenance.

Whatever system of lighting should be decided on, the first consideration of the mill owner should be plenty of light everywhere that it is needed. It is the poorest kind of economy to stint the lighting of a textile mill, as has been said before, and you can't have proper lighting if you do not put in enough light sources, be they electric lamps or gas burners. Data as to the amount of illumination required in various parts of mills and how to obtain the best results from light sources will be given later in this article, and the practical application of the principles there explained is suggested to every person having charge of mill lighting.

A second consideration is the reliability of the lighting system. Due regard must be given to this question to safeguard the mill against shut downs because of failure of its lighting system. If necessary, provide duplicate plants.

Choice of Lighting Systems. Practically, there are but two systems of artificial lighting adapted to textile mills, gas lighting and electric lighting, oil lamps being out of the question. The two systems, however, are applicable in several ways, thus we have various types of arc and incandescent electric lamps, and gas burners, with and without mantles, and also acetylene gas, and each of these has its advantages and disadvantages. These will be discussed later, to furnish data for those interested.

Of the two systems, gas lighting and electric lighting, the latter is in every respect the best for textile mills. In fact, electric lighting is the only artificial system of illumination that should be used in textile mills for very many reasons, and wherever it is practicable to replace gas by electricity, it should be done. Gas lighting has the following fatal objections: danger from fire; great heat production and contamination of the air, these seriously affecting the temperature and humidity of the mill; necessity for increased ventilation, *i. e.*, more power required; lack of flexibility and extension; impossible for use in many places, cannot be procured in many localities, etc., etc. Electricity for lighting can now be bought almost in every town or city, or it can be generated by the mill itself; electric lamps do not affect the atmosphere and cause little heat and can be used anywhere.

When electricity is used, the choice may be either arc lamps or incandescent lamps, or the recently perfected "vapor lamps" can be used. The comparative cost and efficiency of each will be given later. As a general proposition, it is recommended that a combination of enclosed arc lamps and incandescent lamps be used, or the enclosed arc alone, or high candle power incandescent lamps can be used. It does not pay to use the common 16 candle-power lamp by itself.