danger of "livering" and discoloration. The application of aluminum paint with a spray gun is recommended because this method results in a smoother surface than can be obtained with a brush or by dipping in the paint.

When applying aluminum paint on any galvanized surface which has not weathered for some time, it should be given a treatment of pickling solution, consisting of five per cent acetic acid or vinegar, and allowed to dry, after which it should be dusted off with a dry rag or brush. A primer grey should then be applied, thus insuring a good bond between the metal and the finishing coat. On any other types of material surface, providing it is clean and free from rust scales and grease, the aluminum paint may be applied directly, although it is preferable, if the surface is exposed to the weather, to apply a primer grey coat to the metal, and then give it a finishing coat of aluminum paint.

Lamp Failure Hazards

"On large interlockings with complicated track layouts, and using dwarf signals of the searchlight type, what practices are followed to reduce hazards which might be caused by lamp failures?" ures?"

Frequent Inspection

J. H. Craig
Atchison, Kan.

The best method of eliminating lamp failures is by rigid and frequent lamp testing and inspection. To insure long life, the lamps should be operated at the proper voltage, and never above their marked rating. The lamp voltage should be tested frequently to determine the actual voltage. If the operating voltage is above the required rating of the lamp, there is danger of an immediate failure, and, in all cases, the life of the lamp will be much shorter. The lamps may be operated at voltages as much as 10 per cent lower than the required rating, yet the deficiency in candle power is slightly noticeable. The life of the lamps will be prolonged, and there is much less danger of a lamp failure. Lamps should not be used beyond their time limit of the guaranteed maximum hours when operated at their voltage rating. However, more hours of service may be obtained if the lamp is operated slightly below the voltage at which it is rated.

As a lamp nears the end of its period of usefulness, the glass will become dark. Any lamp that has the slightest discoloration should be removed, as the remainder of its period of usefulness is of short duration and it will fail soon.

The lamp socket should be checked carefully being sure that all points of contact are clean and bright. The connections should be tested carefully and should be tight. A loose connection or a defective socket may often be the cause of a lamp failure. The lamp should be removed from the socket and the spring contact tested carefully, occasionally the spring will break, or the top of the plunger that makes contact with the bottom of the lamp will become corroded or dusty. The lamp should be secure in its socket. Vibration of a loose lamp or a loose connection is always detrimental to the filament.

Double-filament lamps are now being used in some types of signals. When a lamp is found with one filament gone, that lamp should be replaced. If signals are watched closely from the ground it is possible to determine a lamp with one filament burned out, because of the dimmer intensity of the light. Signal lamps should not only be tested and inspected carefully each time a lamp is renewed, but as often as may be deemed necessary in order to insure perfect operation without interruption caused by a lamp failure.

At one time, a light-indication relay was used to indicate to the towerman when a lamp was burned out. Although its use has long since been discontinued, I still think it was a good idea, and I can recall several delays which would have been avoided if such a scheme had been in service.

Track Model Lamps

"What are the advantages and disadvantages of normally-lighted illuminated track model lamps as compared with normally-extingiushed lamps?"

Detection, Costs and Human Reaction

W. R. Smith
Signal Maintainer, Michigan Central
Windsor, Ont., Canada

The advantages of the use of normally-lighted illuminated track model indication lamps include the fact that a sagging relay may be detected where there are no lock indication lights in service on interlocking machines to provide this indication, and a burnt out model lamp is more readily observed than if the lamp were normally extinguished.

As compared with these few advantages, there are disadvantages that make the use of normally-extinguished lamps more favorable. The cost of lamp replacements and the electrical power consumption is higher. This may not seem like a great saving, but numerous small savings such as these over the entire system amount to a considerable item during the course of a year. One of the most outstanding advantages of normally extinguished lamps is the human reaction caused by the changing condition of the eyes. With the track diagram lights continuously burning, a light going out will not be particularly noticed, because there will be very little change in the amount of light entering the eyes. However, when the diagram indication lights are normally dark, and the eyes adjust themselves to this condition, a light, showing up on the diagram, will immediately affect the eyes, therefore, conveying quickly to the mind a change in condition of the diagram, even though the leverman is not looking directly at it. If a train runs by a signal, the quick reaction of a leverman may enable him to take steps to prevent an accident. As far as burnt out lamps are concerned, these lamps do not burn out very frequently when they are periodically lighted. I have seen such lamps last as long as ten years where there is even a considerable amount of traffic.