Factors to be Considered in

Selecting Glass

*For Signal Lenses**

[A review of the technical aspects of glass manufacture for signaling purposes]

By Henry P. Gage

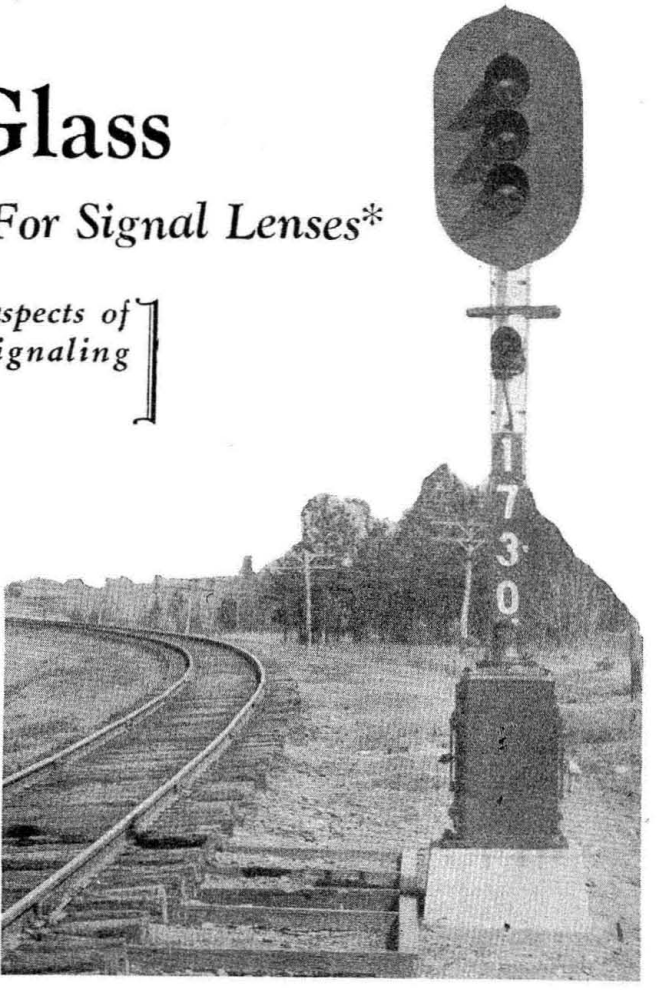
Chief of the Optical Division, Corning Glass Works, Corning, N. Y.

IN the selection of glasses for a signal system many practical as well as theoretical factors must be considered before standards can be adopted. In writing a specification defining these standards and setting forth limits of tolerance, the general workability of all possible forms of specification must be carefully weighed and balanced. As examples of workable specifications of enormous practical significance, we may cite those adopted by the Railway Signal Association for lenses, roundels, and lantern globes. The Railway Signal Association, now known as the Signal Section of the American Railway Association, has a definite set of specifications for lenses, lantern globes and colors now in use by the majority of railways in the United States and Canada. The form of these specifications was adopted in 1908 and revised in 1918 to take care of improvements in the art. Having prepared the series of samples which were submitted to the Sub-committee of the A. R. A. and having cooperated in describing in specification form those pieces selected for standards and limits, I can perhaps explain the methods used in assuring to the railroads a uniform supply of colored glassware for use in their signal systems.

Kinds of Signal Glass

For signaling, railways use lantern globes, both clear and colored, lenses either clear or colored, and colored roundels are used in connection with clear lenses.

Hand lanterns are used for special signals which can not be controlled by the automatic signal system. They are used by trainmen in signaling to the locomotive engineman the desired train movement in switching operations, etc.; for signaling other trains in case of emergency and in numberless other ways. One important use of the hand lantern is the placing of a lantern equipped with a blue lantern globe at the end of cars when, on account of inspection or repairs, it is necessary for men to work around and under a string of cars. Upon the reliability of these somewhat irregular but most important hand signals depends the safety of train operation and human life. The railway experience, therefore, demands that hand lanterns be made as free as possible from the danger of being extinguished by high wind or by swinging the lantern around when signaling. Not only must the design of the draft system of the lantern be suitable but the lantern globe must be so accurately finished that a flame can not be blown out by air entering between the globe and the metal parts. Correct design and rugged construction of all metal parts is insisted upon and glassware is chosen which is as less liable to failure as any other part of the lantern.



An accurately designed lens in conjunction with a small light source produces an efficient signal beam

Formerly the most frequent cause of failure in lantern globes was breakage due to the heat of the flame particularly when followed by the shock of a dash of rain, sleet or snow. Glass having the greatest heat resistance was therefore developed and has been employed for making hand lantern globes, thereby practically eliminating breakages due to heat shock. Breakages due to mechanical abuses are reduced by improvements in lantern design and manufacture and by the careful attention of the glass manufacturer to workmanship and finish, particularly with regard to grinding the ends of the lantern globe. In order to insure their ability to withstand mechanical abuse, extensive dropping tests were employed to establish the most suitable shape and weight for lantern globes. The great bulk of hand lantern globes are made of clear heat resisting glass but large numbers are also used in the colors red, yellow, green and blue. A description of these colors will be found along with the other railway signal colors.

The specifications for hand lantern globes as employed by the inspection department at the plant of the manufacturer, describes photometric tests to establish the suitability of the colored globes and describes chilling tests to determine their ability to withstand heat shock.

*From a paper presented at the International Congress on Illumination, held at Saranac Inn, N. Y.