

are shown in Figs. 8 and 9. Fig. 8 shows a section of each step of a Hurter and Driffield test strip whose D -log E curve is given in Fig. 10. The developer in this case was pyro-soda. The density gradient in each case is somewhat surprisingly shallow.

Fig. 9 shows the developing stages of equal exposures after varying times of development. Many of the fine grains at the lower edge of the image are no doubt parts of large crystals whose development was arrested.

In conclusion I wish to express my indebtedness to Mr. L. A. Jones and Dr. S. E. Sheppard for numerous helpful suggestions given during the course of this investigation.

ROCHESTER, N. Y., September, 1917.

The Elimination of Grade Crossings in Cities. S. T. WAGNER. (*Transactions of the Wagner Free Institute of Science of Philadelphia*, vol. viii, July, 1917.)—A grade crossing is generally understood to mean the crossing of a railroad by a highway when both are at the same level. The same term is applied to the crossing of one railroad by another at the same level. The existence of grade crossings is a necessary evil. When railroads were first constructed in places where the grade crossing is now in existence, there was no other way in which many of these could have been built. At the time the railroads were built, neither the railroads nor the communities which have grown into towns and finally into cities would have been able to bear the expense of construction which would have avoided the crossings at grade, and their existence was therefore an economic necessity.

The history of the work of systematic elimination of grade crossings possibly extends back to about the year 1880, although it did not begin to be considered an important subject until within the past twenty years. During the past fifteen years progress has been steady, and the movement toward the elimination of the most dangerous ones has been rapid on the part of the cities and the railroads. Probably the most extensive work of that kind has been done in the city of Chicago, where, on account of the level character of the ground and the large number of railroads, the conditions are worse than in almost any of the large cities of the United States. It is stated that the elimination of 780 grade crossings had been arranged for in Chicago up to 1911. Philadelphia is credited with the next largest number, namely, 120, and Buffalo third, with 94 to its credit.

In general there are six methods by which a grade crossing can be abolished: (1) Raising the street over the railroad; (2) lowering the street under the railroad; (3) lowering the street and raising the railroad; (4) raising the street and lowering the railroad; (5) rais-

ing the railroad over the street; (6) lowering the railroad under the street. In all these cases it is evident that either the street or the railroad must increase its rate of grade, and this single point is generally the most difficult one to deal with in any particular case: the increase in the rate of a grade of a railroad is always accompanied by loss of revenue. On a street it is difficult to calculate actual money loss by increasing the grade. Unfortunately the elimination of such crossings is not profitable to either the city or the railroad from a financial standpoint. Neither can expect to receive any financial return for the large amounts which must be expended.

The Gowlland Multifocal Spectacle Lens. H. O. GOWLLAND. (*Gowlland Optical Company, Limited*, Montreal, Canada.)—Bifocal spectacle lenses for near and distant vision have been known and used since the time of Franklin, and within recent years, particularly since the introduction of "invisible" bifocals, their use has become widespread. Although these lenses obviate the need of two pairs of glasses, the wearer often experiences the discomfort of the "blind zone," or an area within which the distance part of the lens is of too long focus and the near part of too short focus for satisfactory vision. If this blind zone is to be eliminated, a compromise must be made in the powers of the two lenses and the user must be content with less than the maximum possible clearness of vision. A lens of continuously varying curvature within the required limits would evidently provide the necessary conditions for distinct vision at all distances. Such a lens, not having a spherical surface, entails a departure from the usual methods employed in the production of spectacle lenses.

The Multifocal lens embodies this continuous variation of focal length, the difficulties incident to a departure from a truly spherical surface having been successfully overcome. In the manufacture of these lenses the usual system of working has been reversed. The master tool first grinds the curve to a certain degree of fineness, and after that the lens surface itself controls the smoothing and polishing, the surface retaining its ground curve. The finished lens is a clear piece of glass with constantly changing curvature, whose rate of change is governed by the extreme values of the curvature.

While the line of contact between the distance and near parts in the so-called invisible bifocals is quite discernible, the Multifocal lens is free from this characteristic. It is undoubtedly true that the field of view at any given focal value is theoretically limited to points equally distant from the vertex of the curve, but practically, with the relatively small curvatures of spectacle lenses, vision is clear over a considerable zone and an adequate field of view is obtained. The user is thus provided with a lens that responds to the varying requirements of close work and is free from the disconcerting visual jar of an accidental use of the wrong power of the bifocal lens when moving about in an uncertain light.