

another two months. Under the present system a man is required to light and extinguish the lamps at dusk and dawn respectively, and this duty represents an appreciable item in the wages bill. Upon foreign and colonial railways, where the labour problem is somewhat acute, the flashing system, apart from its other advantages, offers a complete solution of a very difficult question.

When the system was first taken up in Sweden, the question of the duration of the light and dark periods and the number of flashes per minute demanded solution, so as to secure the most perfect results from the driver's point of view. An elaborate series of tests were carried out to this end, and a mass of interesting data was collected. When this detail was resolved the following points were established:

(1) That a comparatively short light period gives the most characteristic signal. (2) That the dark period should not exceed 0.9 or one second, because the driver is apt to lose his bearings, develop feelings of uneasiness, or be mistaken if the period of darkness is longer. (3) That the duration of the light period, within certain limits, is of secondary importance, a flash of 0.1 second duration scarcely being distinguishable from one twice the length. (4) That about 60 flashes per minute form a first-class all-round standard. If the number is increased, say, to 120 flashes per minute an extremely nervous effect is produced upon the driver, while if fewer than forty flashes in the same interval are given the driver becomes uneasy. But in very high speed express work it was found that the number of flashes might be raised to seventy or eighty per minute with advantage. (5) That a long light and a short dark period does not give a satisfactory characteristic signal. (6) That two flashing signals must not be placed too closely together. A stationary light must be placed between the two to eliminate all feelings of uncertainty and confusion. This defect

becomes particularly noticeable if the two flashing lights are mounted upon one post. Yet the disadvantage may be eliminated if the two signals are given divergent flash characters, that is to say, different proportions between the light and the dark periods, making one to give, say, fifty, and the other ninety, flashes per minute. Then no difficulty is experienced in reading the signal correctly, owing to the wide variation in the character of the flashes.



THE AGA FLASHING APPARATUS FOR RAILWAY SIGNALS

But the number of flashes per minute must depend to a great extent upon the local conditions and the character of the traffic to be protected by the signals. The driver must receive a sufficient number of impressions between the moment he first sights the light, and when he is at a point affording him ample space in which to pull up easily before reaching the signal. When a train is travelling at sixty miles an hour from three to five flashes are necessary to convince him on this point, and at sixty flashes a minute the train will have travelled from 264 to 440 feet during this period. If the flash is very short, experience has proved that a somewhat greater number of flashes are requisite to convey an unmistakable impression. In Sweden, where the flashlight has been