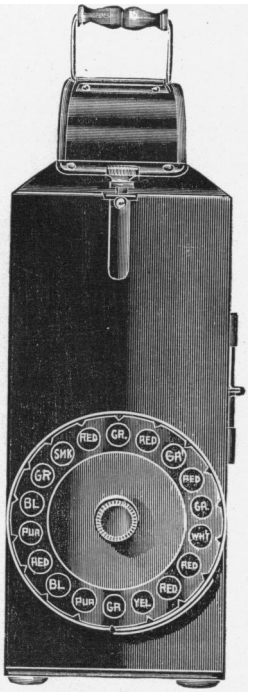
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AN IMPROVED LANTERN FOR TESTING COLOR PERCEPTION.

BY CHARLES H. WILLIAMS, M.D.,
BOSTON, MASS.

Further experience with a lantern as a means of testing the color sense, especially when the tests are to be made by railway officials, has shown that the simpler the lantern, without lessening its efficiency, the better will be the results obtained.

In a former paper before this Society, a lantern was described with two discs, the lower carrying thirteen colors and the upper disc having three empty spaces and five modifying colors, to be used in combination with the colors of the lower disc. In practice, usually only the colors in the lower disc were used, and the upper disc added an additional expense and complication to the lantern.

This year when some lanterns were ordered for use on the Northern Pacific, and the Canadian Pacific roads, a new model was made, which seems to be better than the old. The cut shows the front of this model, with one disc carrying eighteen colors, seven shades of red, five of green, two of blue, and one each of yellow, smoke, purple, and colorless glass. Under each color is an illuminated number, screened from the man examined, but easily seen by the examiner, by means of which the record of the examination can be easily made as it proceeds. Inside the lantern is a shutter which can be moved vertically so as to show either two or one colored light at a time, and with either the full opening, the medium sized, or the smallest opening, representing lights at different distances from the observer. In case an electric current is available, the electric lamp with two lights and a small rheostat in its base, by which the intensity of the lights can be regulated (as described in the report of 1901), gives the best results, but where this cannot be had, an oil lamp with two burners does very well.

More extended use of the lantern test is showing a larger number of cases where the worsted test has been passed satisfactorily, but who fail with the lantern, or when tried with distant signal lights. The rule, first adopted on the Dutch railways, providing that in every case the test for color perception is to be made both with the colored worsteds and with the lantern, is the only safe one to follow.*

DISCUSSION.

DR. HUBBELL. — I have been in the habit of using the worsteds in the examination of railroad employees and have never used the lantern, my theory being that while the lantern may serve the purpose for which it is designed, yet the worsteds answer every practical purpose so far as the necessity of the railroad is concerned. If the candidate fails to match the worsteds properly he is rejected, and I would like to ask if that is not sufficient.

DR. WILLIAMS. — In answer to that question, the lantern is designated to be used in addition to the worsted test. The latter gives you in some respects more information than the lantern; you get more confusion colors and can find out whether there is a greater loss of color-sense for red or for green; but the worsted test does not give you an absolute answer to the question whether the man is a safe one, or not, for the service; he may pass the worsted test and yet fail on the lantern test, and when tested with signal lights may fail to recognize the difference between a red and a green light. The men recognize the fact that this lantern test is more like the conditions under which they work in reading distant signals, and they make less objection to it on this account.

DR. PERCY FRIDENBERG. — I would like, in this connection, to show you a little hand apparatus for testing the central color perception. It is arranged like the ophthalmoscope and gives the patient but a small area for perception, and this may be shown or covered quickly. It often detects a central color defect when the patient would pass the worsted test because the area covered by the examination is so much larger.

DR. RANDALL. — I have used a similar arrangement, that of Dr. Noyes, for the past fifteen years and find it exceedingly valu-

*The Southern Pacific Company has recently ordered twenty of these improved lanterns for testing the color sense of the railway employees of that company on its different divisions; in addition to the tagged Holmgren worsteds.

able; it differs in mechanism but not in theory. It certainly seems possible that we shall by the lantern test detect some of these cases which would be extremely dangerous if allowed to go on the basis of the worsted test alone. I have spoken before of a point that was brought out by Dr. Thomson many years ago, of making the color examinations in the presence of a group of men so that the rest act as a jury to see how the man makes his mistakes. It is an easy method of securing the support of the employees themselves, and when they see a fellow engineer, for instance, trying to match wrong colors they are very firm in their own minds that he is not a safe man to run an engine.

REPORT OF THE COMMITTEE ON STANDARD TEST-TYPES, AND ON READING-TESTS.

Your committee beg leave to submit:

1. That the standard of normal acuteness of vision assumed by Snellen, namely, the ability to recognize isolated capital letters whose height subtends a visual angle of five minutes (5′) and the width of whose component lines subtends an angle of one minute (1′), also Snellen's notation embodied in the formula, $V=\frac{d}{D}$, as used by him to record the observed acuteness of vision, ought to be definitively retained.

2. That a gradation of the several sizes of test-letters in geometrical progression, conserving as many as may be of the numbers included in Snellen's series, is to be preferred to the sequence of unequal ratios adopted by him and still in general use. Two geometrical series, based on the common ratios, $1 : \sqrt{2}$ and $1 : \sqrt[3]{2}$, respectively, as explained in detail in an appendix to this report, are recommended.

3. That the simplified form of capital letters known to American printers and sign-painters as "Gothic" is to be preferred to the "block-letter" employed by Snellen.

4. That for reading-tests (following Jaeger) ordinary print