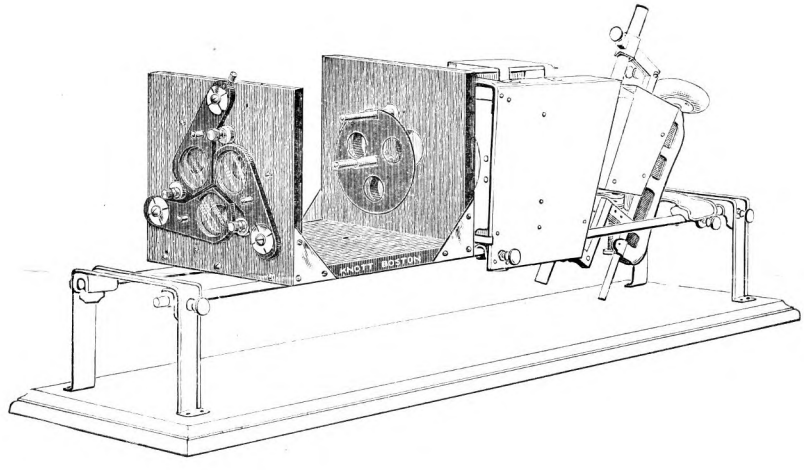
Form 219.

THE

VON NARDROFF COLOR APPARATUS

A NEW ATTACHMENT FOR THE PROJECTION LANTERN FOR THE STUDY OF

COLOR PHENOMENA



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BROOKLYN, N. Y.

AT THE

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SAINT LOUIS

1904

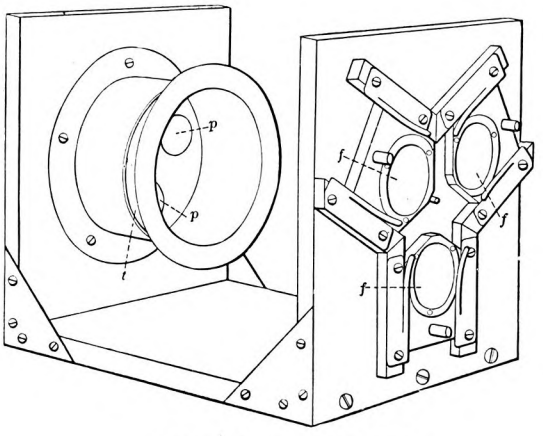


DIAGRAM OF FRONT VIEW.

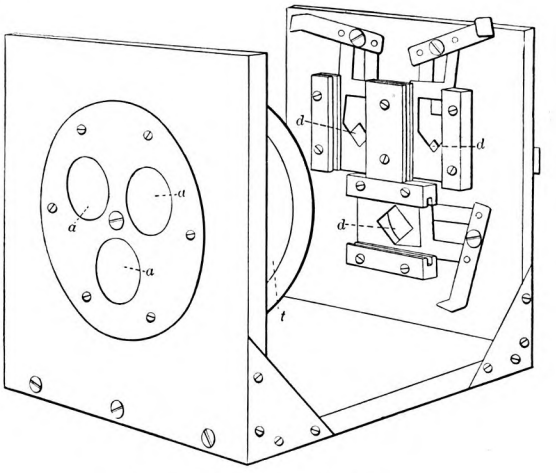
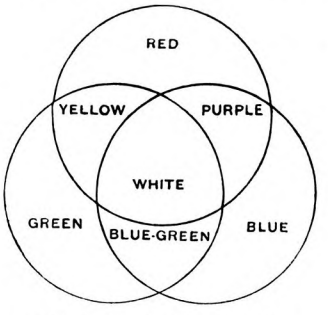


DIAGRAM OF REAR VIEW.

VON NARDROFF COLOR APPARATUS.

This apparatus is virtually an attachment that converts an ordinary projection lantern into a triple lantern in which the three beams are independent as to intensity and direction.

The apparatus consists of a mahogany base supporting two uprights, to which are attached lenses, slide-holders and diaphragms. The lenses at the back act as auxiliary condensers, and produce images of the illuminant in the plane of the adjustable diaphragms. The focusing lenses are mounted in slides. By shifting these, the circles on the screen are shifted. The experimenter may thus obtain any desirable amount of overlap or separation. The accurate focusing of the apertures is accomplished by sliding in or out the brass disk which carries them. Slide-holders are provided for the reception of colored glasses collodion or gelatin films, or glass cells containing colored liquids.



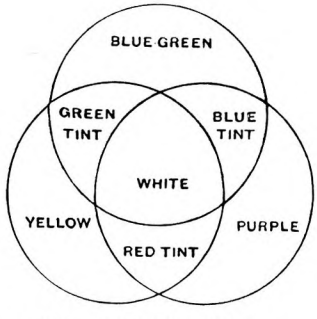
MAXWELL'S PRIMARY HUES.

Fig. 1.

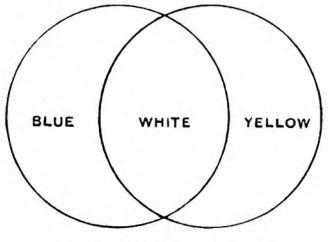
In using the apparatus the beam from the lantern is first rendered "parallel," either by pushing forward the illuminant, or, better, by removing the front lens of the condenser. Next, the regular focusing lens of the lantern is to be removed, and in the path of the parallel beam is to be placed the apparatus, preferably as near the condenser as possible.

EXPERIMENTS TO BE TRIED WITH THE APPARATUS.

Primaries and Secondaries. ⁂ ⁂ ⁂ Inserting in the slide-holders the special red, green and blue glasses provided, and adjusting the front slides for a perfect overlap on the screen, there is obtained a uniformly illuminated disk, probably tinted with some hue. This residual hue varies, depending on whether the lime-light, the electric arc, or sunlight be used as the illuminant. It, however, may be entirely removed by means of the adjustable diaphragms, and an absolutely pure white always obtained. The intensity of this white is also very great, because it is equal to the sum of the intensities of the components instead of to their average, as with rotating colored disks. If now the disks forming the compound white be partially separated in triangular form (see Fig. 1), the resulting figure will display the result of mixing the primaries in pairs. This mixing may be further developed by cutting off, say, the red and the blue by closing their diaphragms, leaving only the green. Then, by turning on the red gradually, and when full, by turning off the green, the overlap will pass through all gradations of hue from green, through yellow, to red. The same kind of thing can, of course, be done with the other pairs of primaries.



FALSE PRIMARY HUES.
Fig. 2.

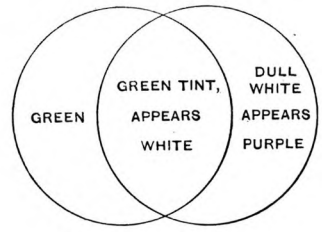


COMPLEMENTARY HUES.
Fig. 3.

False Primaries. ⁂ Instead of starting with red, green, and blue, one may start with purple, yellow, and blue-green, and still, by proper use of the diaphragms, obtain all possible hues as well as white (Fig. 2).

Complementary Hues (Fig. 3), may be illustrated by using carefully chosen pairs of colored media, or else by reference to the preceding experiments. There it is evident that each initial hue is complementary to the opposite compound hue.

The "Green Question" may be nicely illustrated by first superposing the yellow and blue glasses in a single slide-holder of the apparatus, thus getting a fine green. Then by inserting the *same* glasses in separate slide-holders, and *adding* the beams by overlapping on the *screen*, a pure white is obtained.



CONTRAST EFFECTS.
Fig. 4.

Contrast Effects (Fig. 4), are strikingly presented when some saturated color, as green for example, is projected, and then a white disk previously arranged to partially overlap is turned on. The overlap, which is really a tint, appears nearly white, while the remaining white appears strongly colored of the complementary hue. If the order of projection be reversed—the white first and then the color,—the sudden appearance of the white is very impressive.

Tints may be obtained to any strength by adding to a white beam, a colored beam adjusted for intensity.

Other Interesting Experiments can be tried with the apparatus. For instance, if three equally bright beams are made to partially overlap, the various parts of the resulting figure will present intensities exactly in the ratio of one, two and three. Again, if when the compound white is projected on the screen, an opaque body be held in the path of the rays, a very remarkable shadow will be produced.

The following is a list of some of the Institutions using the VON NARDROFF COLOR APPARATUS:

Central High School, St. Louis, Mo.
High School, Ann Arbor, Mich.
Worcester Polytechnic Institute, Worcester, Mass.
University of Virginia, Charlottesville, Va.
Washington and Lee University, Lexington, Va.
Adelbert College, Cleveland, Ohio.
Columbia University, New York City.
Adelphi College, Brooklyn.
Stevens Institute of Technology, Hoboken, N. J.
Harvard Medical School, Boston, Mass.
High Schools at Detroit, Mich., Tarrytown, N. Y., Troy, N. Y., Springfield, Mass., New Haven, Conn., Binghamton, N. Y., Normal School, Potsdam, N. Y.

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