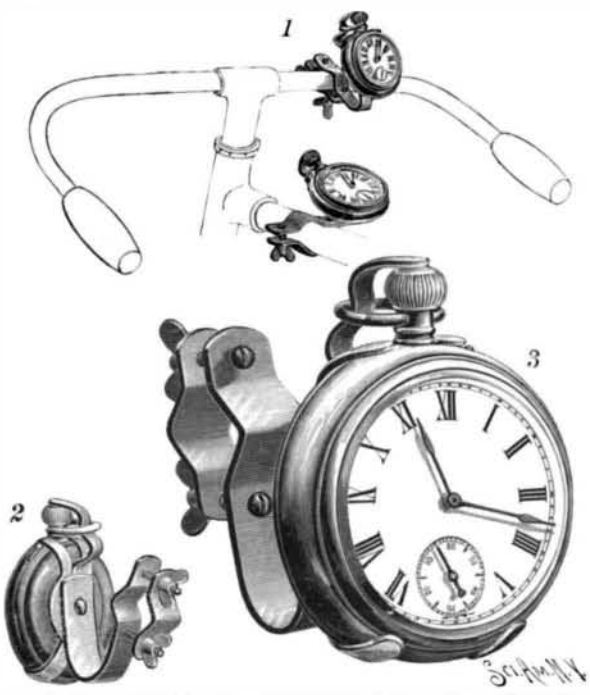
THE "CLIMAX" BICYCLE WATCH AND HOLDER.

Whether one is "making time" on a wheel or leisurely following where fancy may lead over new paths, the convenience of having the correct time always at hand, to be noted without the trouble of taking a watch out of the pocket, or taking the hands from the handle bars, cannot but be appreciated by all bicyclists. The improvements which have made this possible have, therefore, at once sprung into great popularity. The illustration represents a time-telling



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outfit of this kind manufactured by Messrs. Robt. H. Ingersoll & Brother, of No. 65 Cortlandt Street, New York, and which consists of an excellent low-priced watch and a simple, light and easily applied holder. The watch is without fine adjustments, heavy wheels and fine pivots, being designed to stand any amount of banging and shaking without losing or gaining a minute a day. By means of the holder it may be attached in a moment to either the frame or the handle bar, as shown in Fig. 1, Fig. 2 representing a back view and Fig. 3 a face view of the watch clamped in the holder. As will be seen, the watch is held by spring fingers, an upper finger engaged by the watch ring straddling the stem and holding the watch firmly in the clutch of the lower fingers. By releasing the ring the watch is readily removed. With a pair of pliers this holder may be fitted to any case.

AN ARTIFICIAL SPECTRUM.

That the different colors of the spectrum may be reunited so as to produce white light has been known for a long time, but the method of obtaining all the colors of the spectrum without the use of any other optical apparatus than the eye itself and its faculty of accommodation is recent and not so well known, and is worthy of notice.

According to Engineering, it was Mr. Charles E. Benham, of Colchester, England, who was the first to obtain the artificial spectrum of which physicists have, for the last five months, sought with more or less success a satisfactory explanation. Such explanation seems to have been quite recently furnished by Mr. Macfarlane Gray.

The artificial spectrum is obtained by means of a very simple device, a teetotum, a top, or any arrangement capable of communicating a rotary motion, around an axis at right angles with its plane, to a disk of white cardboard one or two inches in diameter upon which fractions of concentric circumferences have been drawn in black, one of the halves of the disk being completely black, as shown in Fig. 1. As we show in Fig. 2, this disk may also be mounted upon Newton's classical apparatus and the experiment be performed in a continuous manner. Upon giving the disk a rotary motion whose angular velocity depends upon the age, visual acuteness, and especially the faculty of accommodation of the observer, it will appear to be covered with circumferences or fractions of concentric circumferences assuming all the colors of the rainbow, very faint, but sometimes appearing with a richness of tone that depends both upon the illumination of the disk and the spectral richness of the light that it receives.

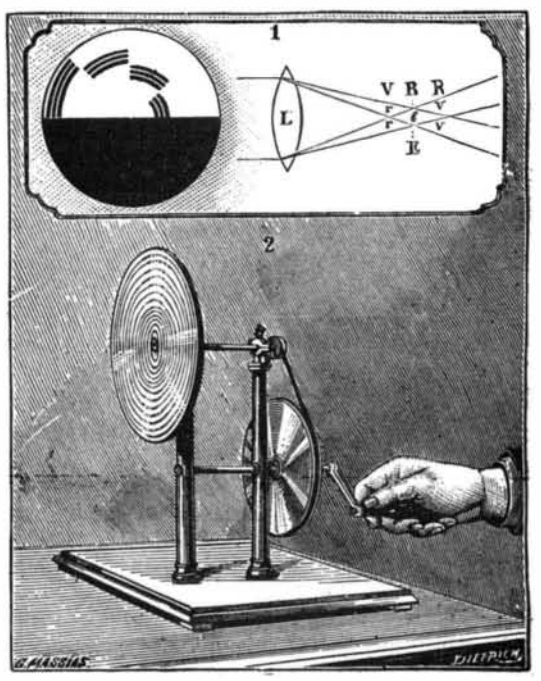
Mr. Macfarlane Gray explains the phenomenon as follows: Let L (Fig. 1) be the lens formed by the eye, the straight lines representing to an exaggerated degree (in order to facilitate the explanation) rays of different refrangibility. Let us suppose that the violet rays have their focus at V, and the red ones at R, and let us place the screen, E, at a constant distance from the lens. In order to obtain a sharp image of a violet colored object upon a black ground, it is necessary to diminish the convexity of the lens, to flatten it, so to speak, in order to bring to E the intersection of the violet rays occurring at V. Conversely, for the red rays the convexity of the lens must be increased in order to bring to E the red rays that cross each other at R.

White light may be divided into two groups of rays occupying the extremities of the visible spectrum, the red and the violet, and, supposing their refrangibility to be uniform, they will intersect each other respectively at the foci, R and V. The red and violet alone do not give white, but a combination of their respective groups does, and this suffices for the validity of the subsequent reasoning.

If the reader will please imagine that these rays are red and violet transparent screens producing white by their superposition, he will see that the screen will appear white at B, in the center of the lozenge formed by the rays. He will thus see that white light has not a definite focus like red and violet. The image of a white object upon a black ground will always extend beyond its real geometrical image to a degree equal to half the height of the lozenge at B. A white point upon a black ground will therefore occupy a wider surface upon the screen than a black point would occupy upon a white ground. This is the well known phenomenon of irradiation. When the violet is focused upon the screen, the violet objects are sharply defined without any marginal extension, but if at this instant a white point be substituted therefor, it will appear violet at the center and as if surrounded by a red aureola. In Fig. 1 the surfaces marked r are the red marginal rays and those marked v are the violet ones. The central lozenge intersected by the two groups is marked b. Here the light is white, and pure white at the center of the section. The network of lines may be assimilated to the well known toy soldiers mounted upon jointed strips of wood, but here the maneuvering is effected by a peculiar physiological action that the English call the "eye demon," but which we designate in France as the faculty of accommodation. It is this faculty that alters the convexity of the lens for producing upon the screen an image as perfect as the imperfect lens at its disposal permits.

This set forth, let us return to our top and call the two halves of the disk respectively the black half and the light half.

When the top spins, the accommodation is effected



ARTIFICIAL SPECTRUM.

FIG. 1.—Disk for obtaining the artificial spectrum, with explanatory diagram. FIG. 2.—Method of performing the experiment.

successively for the light and the black. After the black has been before the eye for a time, and this time is about a tenth of a second, seeing the rapidity of action of the accommodation, the joint of the network will be at E, the focus of the black. As the disk revolves in a direction contrary to that of the hands of a watch, the most peripheric white circular arcs will form their image with red margins resting upon the black lines and making them appear red. The accommodation acts, but with so much rapidity and energy that it exceeds the mark. After a rotation of 45 degrees, new white lines appear with yellow margins covering the black lines and making them appear yellow. After a new rotation of 45 degrees, the margins are greenish and the black lines appear green. After a rotation of 45 degrees, the margins are blue or violet and the black lines blue. The various colorations appearing upon the disk are due, as a last analysis, to the slowness or the haste of the accommodation in its endeavor to put the eye in focus at every instant. It is a semi-objective phenomenon. When the velocity of rotation of the disk is adapted to a given eye and synchronous with the speed of accommodation, the colors are well defined, but they become confused if the top spins too swiftly, the focusing not being effected quickly enough. The colors which disappear for a fatigued eye are still brilliant for a younger eye of which the accommodation is better. The apparatus, then, might, in a certain measure, let us remark by the way, play the role of an "accommodometer"

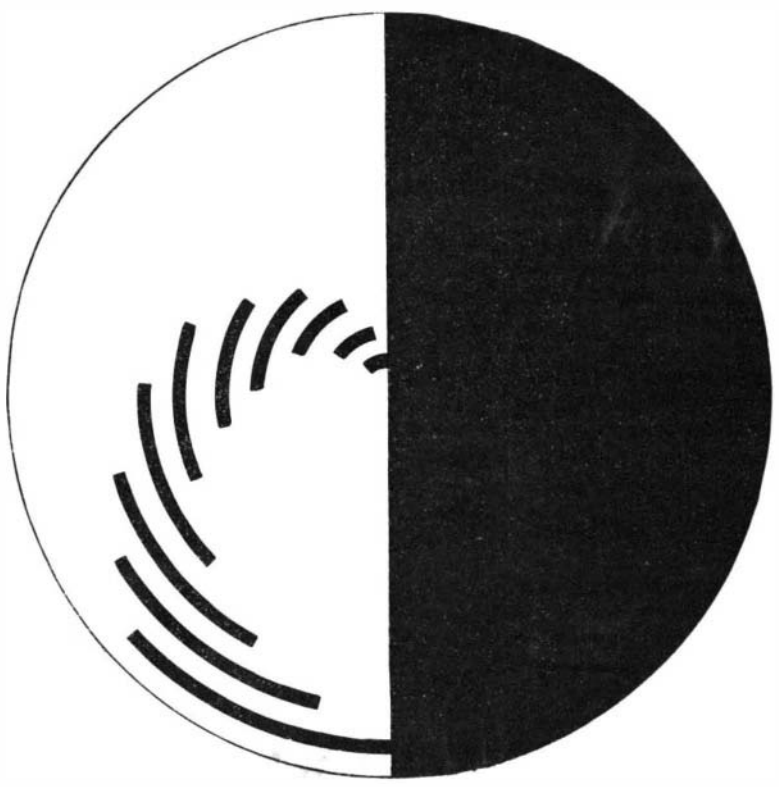


Fig. 3.

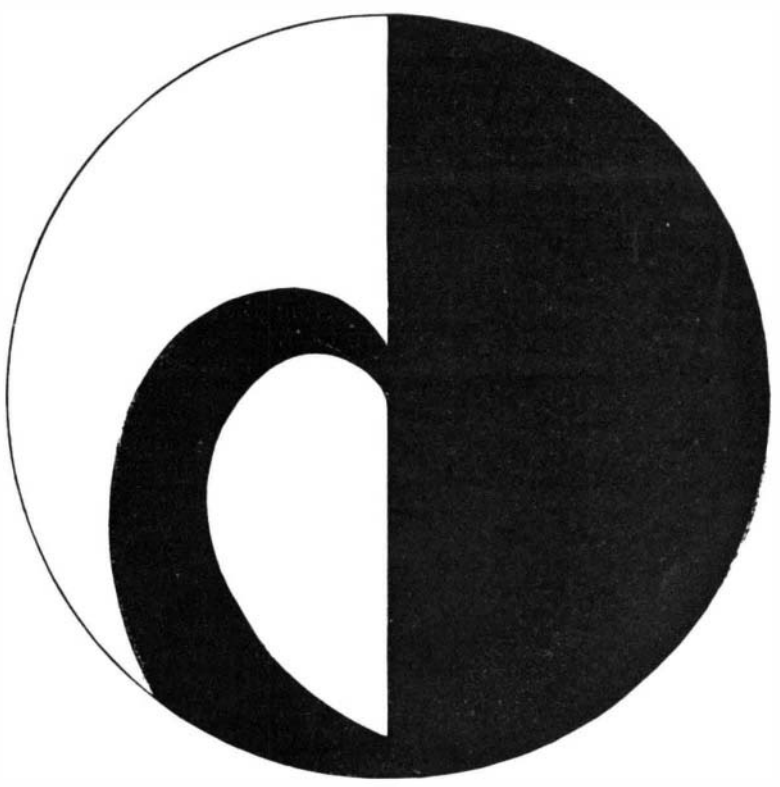


Fig. 4.