tate formed; Fig. 6, the same electrode on which 0.1508 gram of cadmium was deposited from an electrolyte containing 2 grams of potassium hydroxide and 6 grams of potassium cyanide in 75 cc. of solution with a current of 5 amperes; and Fig. 7, a section of the larger electrode upon which 0.1812 gram of cadmium had been deposited under the same conditions as the deposit shown in Fig. 5.

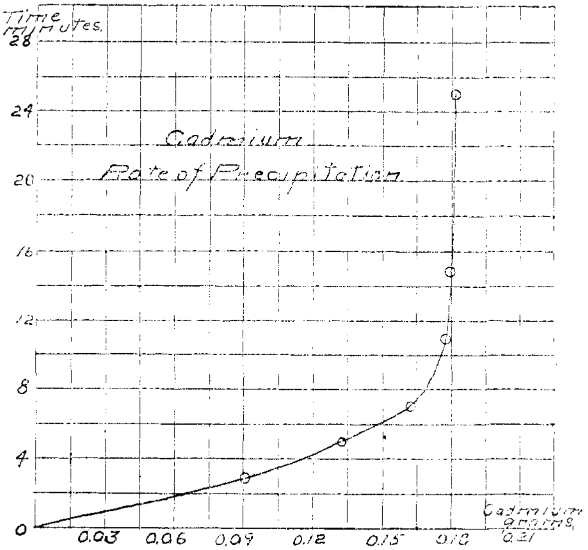

Fig. 8.

In addition to the experiments with potassium cyanide many others were made with other electrolytes, with the same negative results, as mentioned in the case of silver.

The anodes were weighed at the end of a number of consecutive electrolyses of both silver and cadmium in which the cyanide electrolyte was used to determin to what extent they decreased in weight. This appeared to be very slight, amounting to 0.1–0.2 mg. on an average for an electrolysis running from 20 to 30 minutes. The cathodes decreased in weight at about the same rate.

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A MODIFIED COLORIMETER AND SOME TESTS OF ITS ACCURACY.

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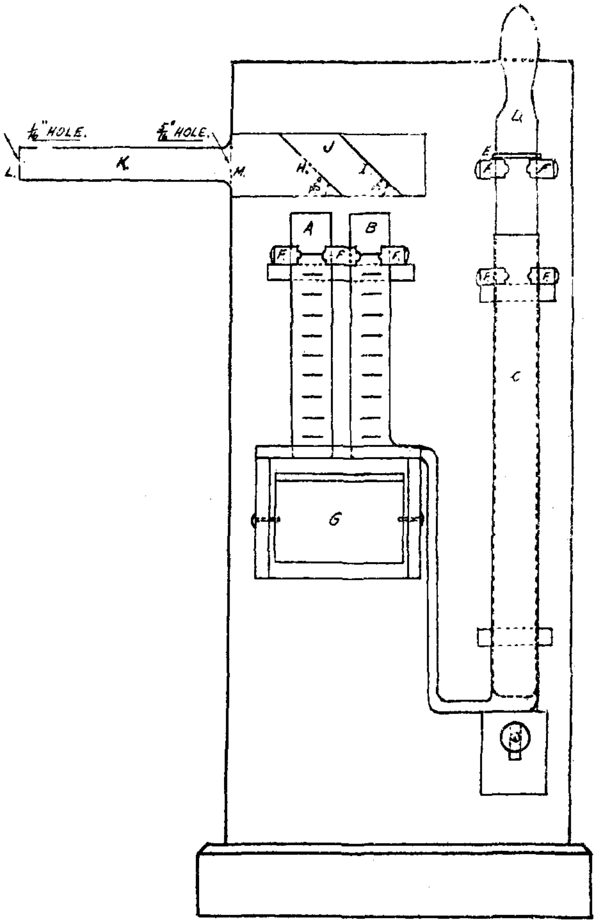
In a colorimeter for general use, simplicity in construction and operation, and accuracy in reading are the principal features to be sought.

In the colorimeter described below the means of observing the colors is in principle the same as that employed in the colorimeter described by W. G. Smeaton in THIS JOURNAL, 28, 1433, although the construction has been simplified by using two half-mirrors permanently fixed at an angle of 45° instead of mirrors adjusted by springs.

The tubes for holding the solutions to be compared are those of one of the well-known colorimeters in which the unknown solution is placed in the left-hand tube while the color is matched by raising or lowering the level of a standard solution in the right-hand tube by means of a glass plunger working in an attached reservoir.



The accompanying diagram shows the essential features of construction of the colorimeter employed in the tests described below. The unknown solution is placed in the left-hand tube *A* which is 19 cm. long, 3 cm. in diameter, and graduated for 15 cm. The standard solution is placed in the right-hand tube *B* which is the same size as *A*, the graduated portion being divided into 100 divisions of 1.5 mm. each. The tube *B* is permanently connected by a glass tube with the reservoir *C* in which the glass plunger *D* works, so that the level of the liquid in *B* can be readily controlled by raising or lowering the plunger. As the tube *B* and reservoir *C* are made in one piece, the liquid used for the standard solution comes in contact with glass only, thus preventing any possibility of chemical change due to contact with the container. The plunger is provided with a rubber collar, *E*, so placed as to prevent the plunger from accidentally striking and breaking the bottom of the reservoir. The tubes *A* and *B*, with the connecting reservoir, rest on wooden supports, the one under *A* and *B* being provided with holes for the passage of the light, and are held in position by spring clips, *F*, *F*. This arrangement allows the glass parts to be readily removed for cleaning and filling. The light for illuminating the solution is reflected upward through the tubes *A* and *B* by means of the adjustable mirror *G*. The best results are obtained by facing the colorimeter toward a north window in order to get reflected skylight through the tubes, care being taken to avoid light reflected from adjacent objects. The black wooden back of the colorimeter serves the double purpose of a support for the parts of the instrument and of a screen, as it is interposed between the color tubes and the source of light.

The light passing upward through the tubes, *A* and *B* impinges on the two mirrors *H* and *I* cemented to brass plates sliding in grooves cut at an angle of 45° in the sides of the wooden box *J*. This box is supplied with a loose-fitting cover, thus allowing easy access for the purpose of removing and cleaning the mirrors. The mirror *H* is cut vertically and cemented in such a position as to reflect one-half of the circular field of light coming through the tube *A*. The light passing upward through *B* is reflected horizontally by the mirror *I*, through a hole in the brass plate supporting the mirror *H*. One-half of the circular field of light from the tube *B* is cut off by the mirror *H*, the vertical edge of which acts as a dividing line between the two halves of the circular field. The image of one-half of the tube *B* is then observed in juxtaposition to the opposite half of the image of the tube *A*.

The juxtaposed images are observed through a tube, *K*, 2.5 cm. in diameter and 16 cm. long, lined with black felt and provided with an eye-piece having a hole 1.5 mm. in diameter. At the point *M* in the tube *K* is placed a diaphragm having an aperture 8 mm. in diameter. All parts inside the box *J* except the mirrors are painted black so that no light except that coming through the tubes *A* and *B* passes through the tube *K*. By having the apertures in the eye-piece and diaphragm properly proportioned only the image of the bottoms of the tubes *A* and *B* can be seen, thus preventing interference of light reflected from the vertical sides of the tubes *A* and *B*.

A person looking through the eye-piece observes a single circular field divided vertically by an almost imperceptible line when the two solutions are of the same intensity. By manipulating the plunger *D*, the level of the liquid in *B* can be easily raised or lowered, thus causing the right half of the image to assume a darker or lighter shade at will. In matching colors with an ascending column in *B*, that is, gradually deepening the color of the right half of the field, the usual tendency is to stop a little below the true reading while in a comparison with a descending column the opposite is the case.

In an article entitled "Sensitiveness of the Colorimetric Estimation of Titanium" in THIS JOURNAL, **33**, 504 (1911), Roger C. Wells describes a method for the determination of the sensitiveness of the colorimeter devised by George Steiger, of the U. S. Geological Survey, and described by him in THIS JOURNAL, 30, 215 (1908). In order to determine the sensitiveness of the colorimetric estimation of titanium by means of the colorimeter described above, solutions similar to those employed by Wells were prepared. After the color produced by the action of hydrogen peroxide on each titanium solution had been developed, the tube *A* was filled to a depth of about 9 cm. with a portion of this solution. The remainder of the solution was placed in the tube *B* and reservoir *C*. The exact level of solution in tube *A* was then noted and ten readings, five on an ascending column and five on a descending column, were made. The results of these comparisons are given in the subjoined table:

				R. H. column B.				
Exp No.	Conc. $MgTiO_2$ in 100 cc.	Color seen through column 9 cm. deep.	Setting of L. H. Col'n. A.	Max. read.	Min. read.	Av. of 10 read.	Per cent. max. variation.	Per cent. error of avs.
1	0.30	Very slight	61.0	62.0	51.0	57.1	9.6	6.80
2	0.60	Light straw	60.0	64.0	57.0	60.05	5.8	0.08
3	1.00	Good straw	60.0	61.0	57.0	59.35	3.4	1.25
4	1.30	Pale lemon	60.3	61.0	59.0	59.90	1.7	0.66
5	1.6	Pale lemon	60.0	62.0	59.0	60.30	2.5	0.50
6	2.5	Lemon	60.5	62.0	58.0	60.30	3.3	0.33
7	4.0	Yellow	60.5	62.5	58.0	60.00	3.75	0.83
8	5.0	Yellow	61.0	63.0	58.5	60.90	3.7	0.16
9	8.4	Dark yellow	60.5	63.0	60.0	61.70	2.4	1.98
10	10.0	Dark yellow	60.0	61.0	58.0	60.00	2.5	0.00
11	11.2	Dark yellow	59.5	61.0	58.5	60.15	2.08	1.09
12	15.0	Good orange	60.0	62.5	59.0	60.30	2.9	0.50
13	20.0	Dark orange	60.0	62.0	58.0	60.15	3.3	0.25

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NOTES.

Analysis of Aboriginal Copper Objects from Mexico and Yucatan.—The following analyses were made at the request of Professor F. W. Putnam, of the Peabody Museum of American Archaeology and Ethnology of Harvard University.

The objects to be analyzed were four small copper bells, about 3.5 cm. long, and about 2 cm. in diameter, weighing in the neighborhood of 5 grams. Owing to their weathered condition and the thinness of the metal, it was impossible to obtain a fair sample of the metal without some oxide, but nevertheless the analyses show that the original metal must have been very pure. Any impurities in the original metal would have appeared in the analyses, because weathering would not have removed them to an appreciable extent. The bell designated as C was in the best condition, and it is probable that a clean sample of the metal