

Apr 1

Mr. Flanagan and Mr. Kaula

Reads gray	F	K
	48.5	50.
	48.5	50.
	51.	49.
	<u>49.3</u>	<u>49.6</u>

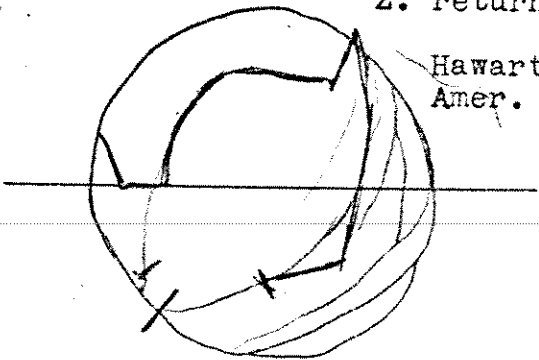
reads red

by gray and black marks - corrects his high red - finds the intense hue - excites the sense of value unduly - Arrive by gradually strengthening the red - find first reading always high - but averaged by a lower reading later - 3 or 4.

Prof. Clifford on train-thinks "intensity" should be confined to light - not for color -

Z. returned No. 7 with No. 4 cal. refitted. (2700 1000)

Hawarth & Watson - Lowell
Amer. Paper Tube Co. - 60 State

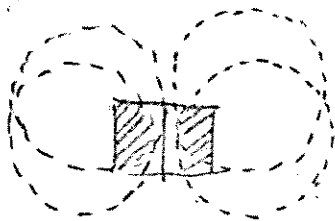
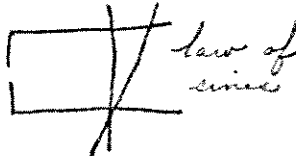


36a.

Apr 5

Rec. note from Prof. Cross asking for the photometer. Visit him, and he discusses the diaphragm for standardizing a 50 gray.

A cone or pyramid of light- first perpendicular- then included. Calls up Prof. Clifford who suggests reading a set of values with 2 or 3 added diffusers.



Is surprised to learn that black velvet reflects $4\frac{1}{2}\%$ and black pigment reflects $15\frac{1}{2}\%$ - formerly called 1-5% (Explains latter as grains of black imbedded in prismatic way.)

Would find out "by experiment" what happened in each case.

Prof. Cross says he feels green - when white and black are mixed on rotation machine!

Apr 10

Discovered in experiments with standard red disk that - by making two templates and sliding one by the other - a new ratio is established.



-5							2	1/2 in	1/3 in
		- .333							
	50.		66.6				51.2	102.25	100.
	25.		44.4				25.6	68.17	75.
	12.5		29.6				12.8	45.45	56.25
	6.75		19.5				6.4	30.3	42.19
	3.125		13.				3.2	20.2	31.55
	1.5625		8.6				1.6	13.5	23.67
	.78125		5.7	50	48	43	.8	9.	17.75
	.39065		3.8	25	24	21	.4	6.	12.31
	.1953125		2.5	12.5	12	10	.2	4.	9.23
	.09765		1.6	6.25	6.	5.3	.1	2.6	6.93
	<u>100.38</u>			3.12	3.	2.6	<u>10L 3</u>	1.5	5.20
				1.56	1.5	1.3			
				<u>98.43</u>	<u>94.5</u>	<u>86.2</u>			

"Intensity of stimulus" p.785
 " " " illumination"

Twice says "Intensity of illumination*" p.786

Says a color is (1) "more intense" (yellow rest) p.792
 (2) " " saturated(" fatigue)

 Bowditch's Sense of Vision - p. 786 -

"Although our power of distinguishing absolute differences of luminosity diminishes as the intensity of illumination increases, yet with regard to the relative difference no such difference exists.

On the contrary, it is found that within pretty wide limits, whatever be the intensity of illumination, it must be increased by a certain constant fraction of its total amount - in order to produce a perceptible difference in sensation.

This is only a special case of a general law of sensation known as Weber's law, which has been formulated as follows by Foster: "The smallest change in the magnitude of a stimulus which can be appreciated through a change in our sensation, - always bears the same proportion to the whole magnitude of the stimulus."

Apr 11 Chas. Hall at studio and house 4-10
 Saw Slipper design
 " Photometer and Charts -- Reads red and green
 " glass
 After image - left eye 11 sec. right eye 7 sec.

Apr 14

Prof. W. H. Pickering at studio 3-4:30
Sees photometer and charts - reads middle
gray 49.50 .51 - Sees rotary sphere -
after-image 6 sec.
Says he will speak to his brother about the
system. Speaks of the polarizing photometer -
reads 1/60 - (60-59)

38.

15 Rec. nos. 2, 3, and 11 from Mr. Hall - but have
to write him that the slides are not on center -
so that circles do not register- Also all three
have new scars. Ask if he cannot give his personal
attention to having the remaining ones delivered
in perfect condition.

17 Prof. Cross at lunch -
refers to Prof. Langley's Color and Vision
Brucke Des Couleurs
Helmholtz-VonBezold - Should accept Rood's
terms willingly.

Discuss Color Constants - (Questions chroma as
strange)

V	light scale - or luminosity of colors
C	strength " " saturation " " (purity, freedom from white light)
H	mixture " " hue " " (wave length)

Should avoid "Intensity" because it serves two or
three meanings. Says I may use his name in
asking Dr. Bigelow if "Schaefer's Physiology is
in the Tech library.

Also offers me use of Langley's pamphlet. (Miss
Merrill lib.)

Does not object to chroma - except that it is
unfamiliar.

Apr 17

12-2 Dr. House - Physiologist (John Hopkins)
Sees Photometer - sphere and charts.
Says physicist is busy with spectral hues. -
but physiologist like the painter - is busy with
the sensation. Takes my scheme to study - and
will report soon on "intensity".

39.

(V	light-scale	its extremes are white and black
(C	strength "	" " " strong color and
(neutrality
(H	mixture "	has no extremes - is a circuit

Agrees that this should include all color sensation -
Believes Herring's theory of six fundamental "

Apr 21
25

Send Nos 6 - 9 to Ziegler (ret. 26)
Deliver No. 3.cal. "

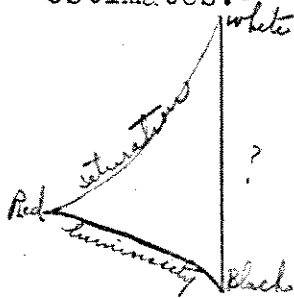
Apr 26 See Mr. Filene at XX Cent. Club
He reiterates commercial need of standard colors -
for contracts - for telegraphing abroad
for choosing harmonious combinations

28 11-12:30 With Dr. Cleghorn at Harvard Laboratory 40.
(physiological) He thinks the L. gives an im-
partial measure of the stimulation - Needs a
more rapid means of changing sample - (Suggests
wheel or roll) These 24 readings consume 30
minutes.

30 3-5 Dr. Cleghorn at studio.
Sees sphere - charts - discs, etc.
Discusses "Intensity or brightness -
Thinks wire or celluloid model of color curves
would be a great help -
*— The idea that saturation of each color occurs
at a different level in the scale of light is
not familiar.

May 1 J. A. Macy (Helen's editor) at studio

2 See Dr. Bowditch (and Dr. Cleghorn)
Thinks it may be necessary to find agreement between
physical terms and those of the painter, - since
the mystery of color-sensation has only found a
working theory - and is ignorant of the processes.
Believes my scheme valuable educationally - and
to the painter. Feels himself partially color-
blind and would hesitate to accept his own color
estimates.



This is his notion of
saturation and luminosity

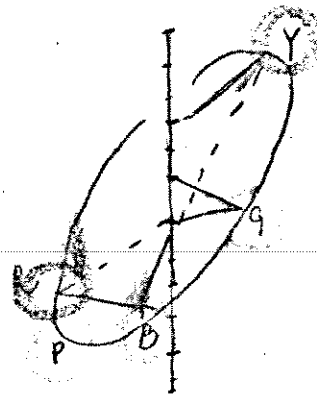
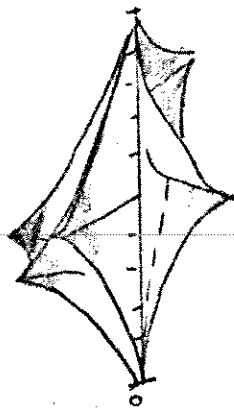
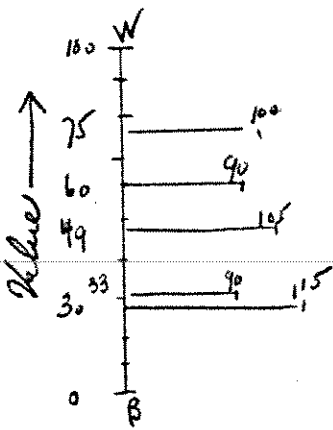
40a.

- | | |
|----|---|
| 9 | obscure |
| 12 | value - warm & cool |
| 13 | chroma ?
value & hue |
| 14 | intensity read saturation |
| 15 | need of definition of
weak, strong, warm, cool |
| 17 | distance
luminosity - intensity?
i.e. saturation (see p.14)
purity |
| 18 | Hue - color wavelength
value - saturation |

- 19 color triangle
- 19a explain contradiction by absorption and transmission
- 30c measure color blindness?
- 52 difficulty of permanent pigments

Dr. Bowditch's notes

41.



May 6 Show models to Mr. Pritchard and Miss Evarts at Everett School - and try its explanation to a 13 yr. pupil - Estelle Wilcox.

1. Colors arranged between white and black-light scale
2. " " in circle of balanced opposites-hue "
3. " removed from gray in order of strength-strength sc.

May 6

Area Value Chroma

18 ^v	75	107 ^v
20 ^v	60	97 ^v
21	49	95
22 ^v	27	87 ^v
17	30	112 ^v

Prof. C. E. Peabody - 5-6

"It seems to me very beautiful"

Suggests magazine article first-

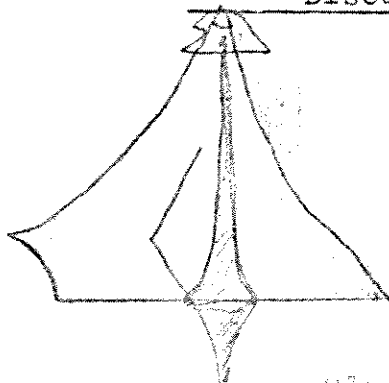
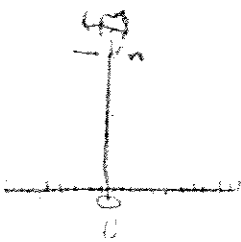
then book - Suggests patent

protection for "Process of Identification of Color"

Discusses color-printing.

Adjustable color slides in a top - to prevent any gradation of color mixture and grays. -

disc divided for measures a quantitative color-mixers



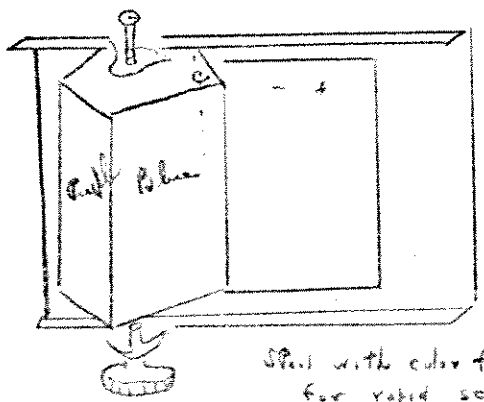
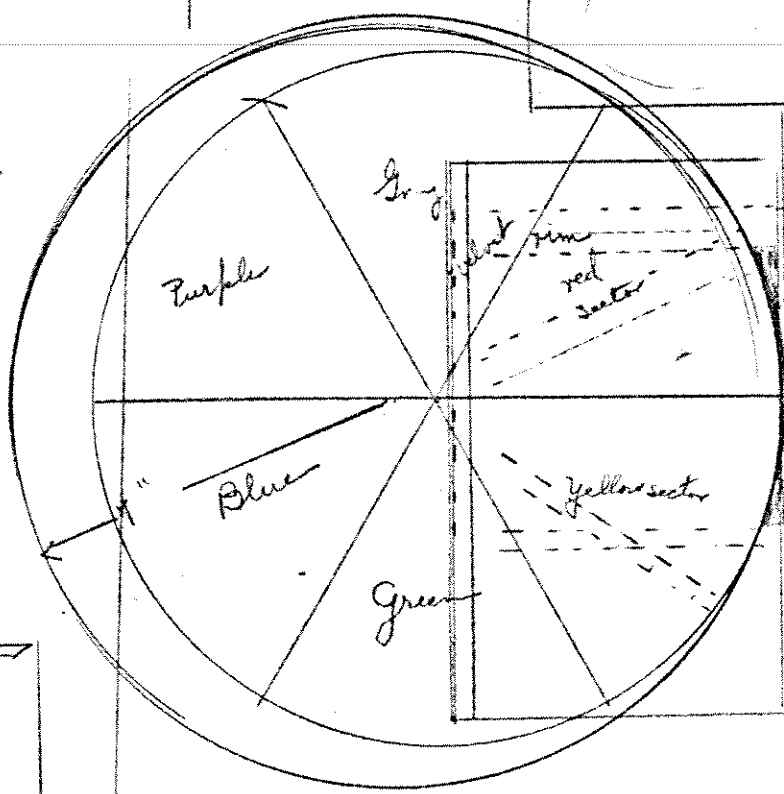
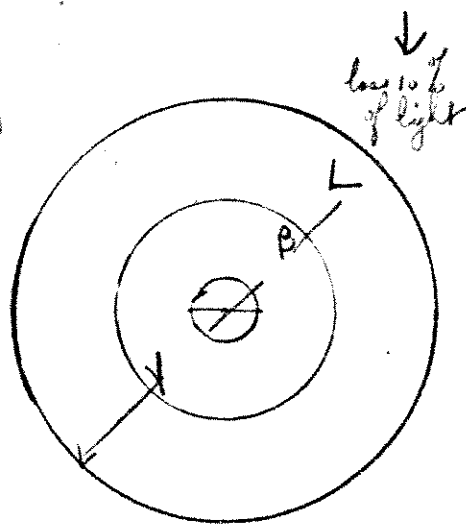
1	R	58	42	38	23	36	61	47	41	31	36	83	77
	L	-	+	-	-					34	38	82	70
2	R	-	-	-	-					47	27	81.5	25
	L	-	-	-	-					45	45	76	26
3	R	-	+	+	+					51	33	46	42.5
	L	+	+	+	+					49	35	37	38.5
4	R	+	+	+	-					47	33	85	72
	L	+	+							49	37	80	76
										$\frac{353}{44}$	$\frac{214}{22}$	77	77

Four students at
H.M.S.
all Red-green blind by
the Gurn test

4000

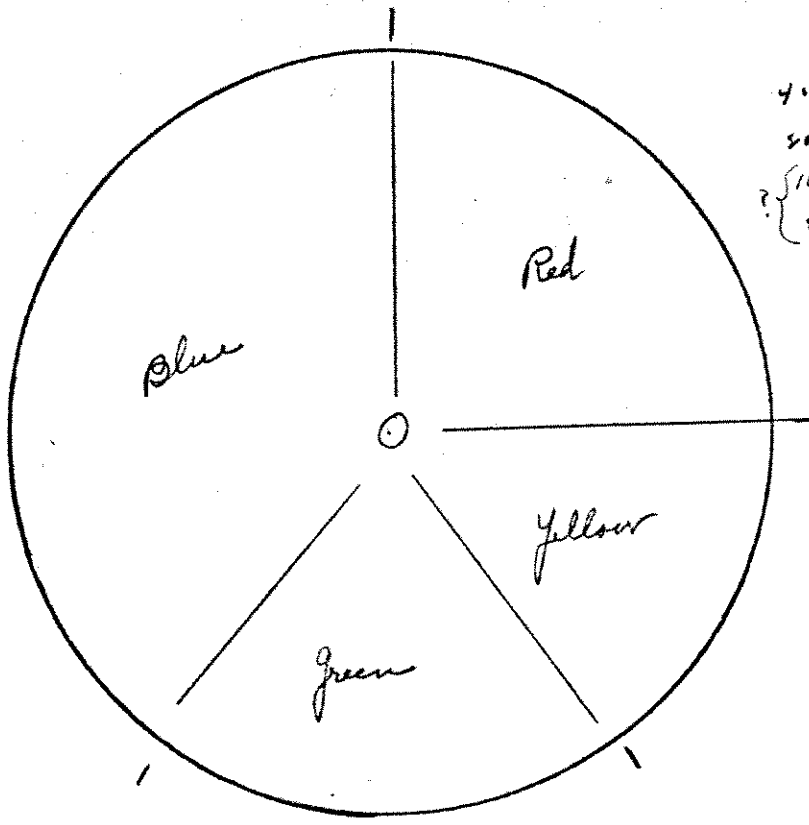
avg. 80 74 avg.

1902



Sp. with color facets
for rapid setting

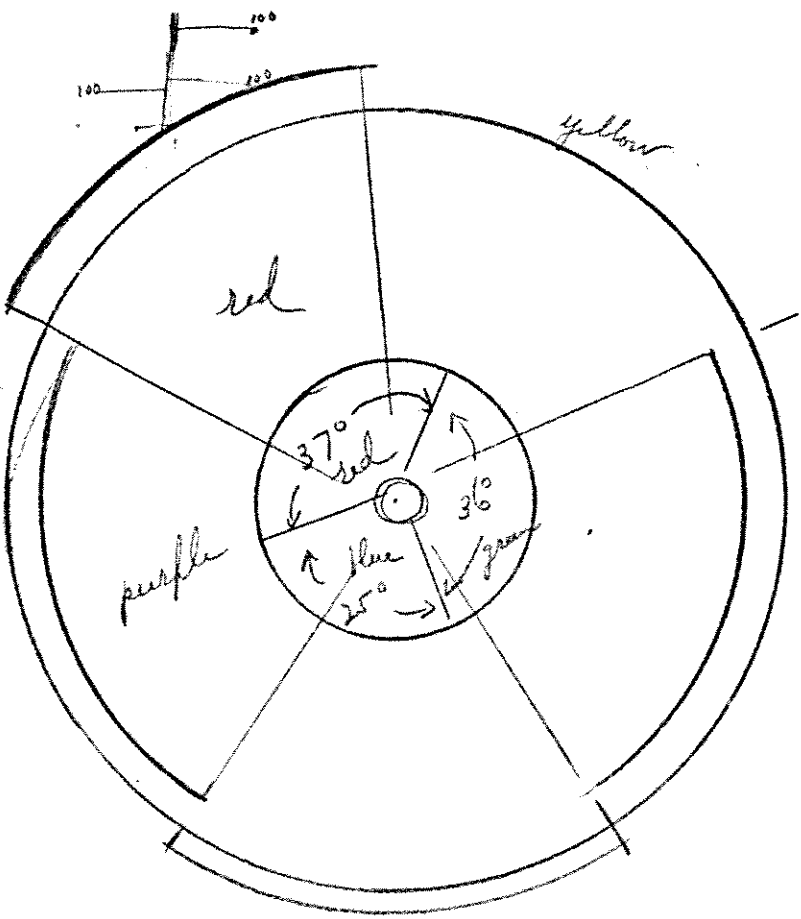
Rotating disc for rapid reading
also could serve for test of chroma
See Vol. I - p. 49 (Apr. 1901)



	disc area	Phot values
40 blue	40	54
20 green	20	65
16 yellow	20	81
24 red	20	35

H.A.

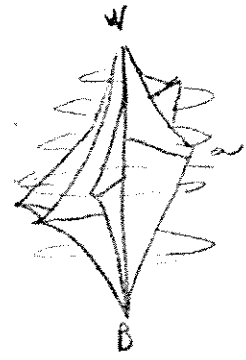
Five colored papers from
Storck Bismut & Co.
May 2 - 1902

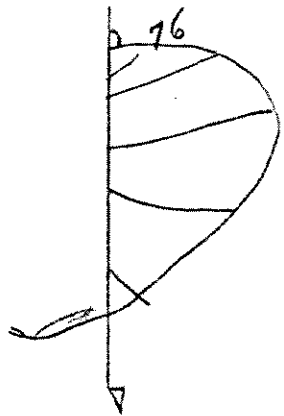


May 2
Area Value
Yellow 100 75
Green 90 60
Blue 105 49
Purple 90 33
Red 115 80

*See attached
with 100
or 200*

*See attached
with 100
or 200*

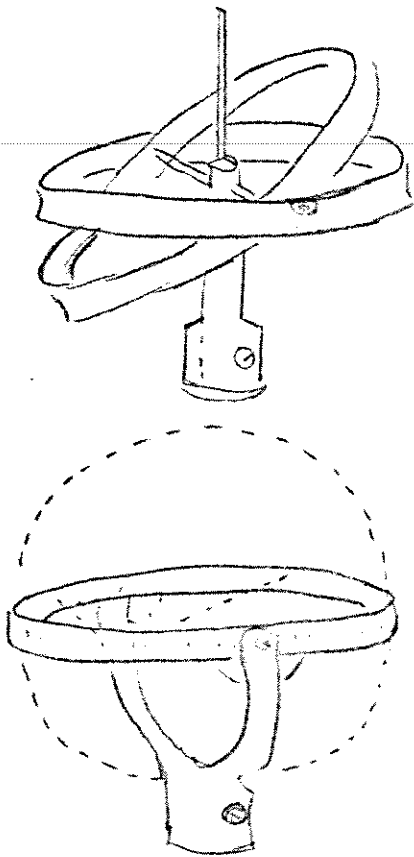




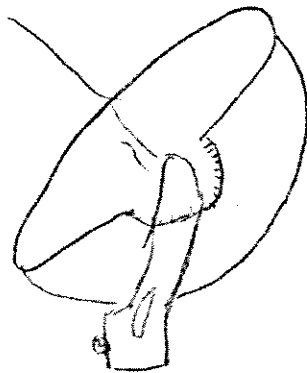
Wave lengths

May radiate from a centre
of disturbance - as in water

42a.



To display color mixtures
in various vertical planes



hemisphere in aluminium
with set screw to adjust angle and dial.

May 10
1902

10:30-11:45 Prof. A. E. Dolbear of Tufts.
Says photometer will measure physiological condition of the visual judgement- fatigue of retina, etc.
Measure amount of light reflected from, or transmitted through any substance.
Should write to Bausch & Lomb. describing it and its uses-

42.

Measures red glass ¹⁹19 yellow glass ⁶³63 window glass ⁴⁹49
$$\begin{array}{r} 19 \\ 21 \\ \hline 3)60 \\ 20 \end{array}$$
 ^{88%}88%

Says of the charts that they are very beautiful- and this would be true even if they did not have an additional significance - because based on physical tests.

May 14

4:30-5:30 Mr. Perkins
Sees new color instrument and charts - Admires photometer - "a perfected instrument"
Considers the patent for both the toy and the "art or process of identifying colors"
← Reads green paper (only varies 1% either side of orange) - Reads green glass -33 - (same by elec. bulb)

51
51
49
2 15
50.6

May 15

Dr. Bowditch at lecture in Med. School -
The sensation of red requires 16 times as much light (Photometric) as blue i.e. rapid vibrations are felt in feeble intensities of light. slower vibrations (red) require greater intensities of light.
This is the 2nd quantitative - Intensity (brilliancy or luminosity) energy of vibration $(\frac{m v^2}{2})$ - it is light without color

The 3rd quantitative - Saturation - is amount of gray or white light added to a color (complexity)

May 17

Aluminum hemispheres hung in crotch - to revolve at any angle and carry color templates in any plane.

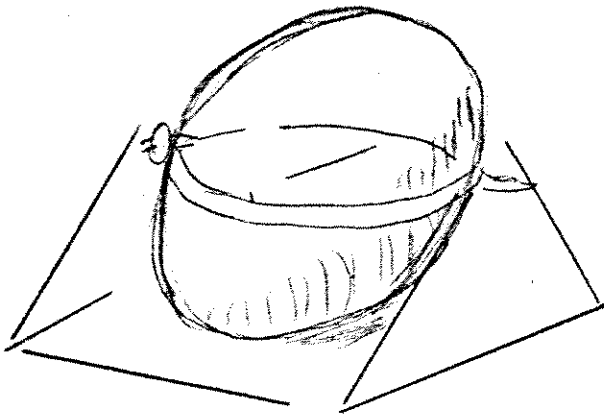
43.

19

3:30-4 Showed Mr. Perkins hand-top and claims - He discusses "An art by which one person conveys to another the precise image of a given color-reference being had to a chart or charts produced by certain color-measurements." Thinks the color-top new, and capable of broad claim.

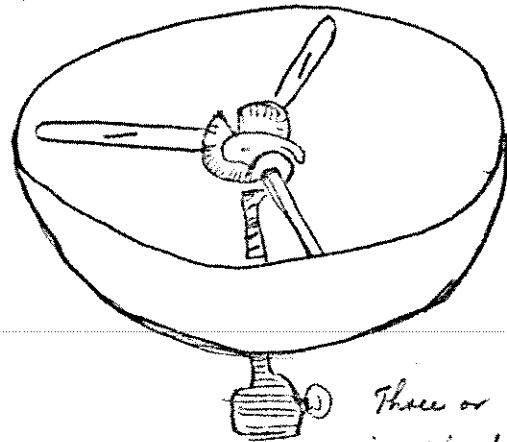
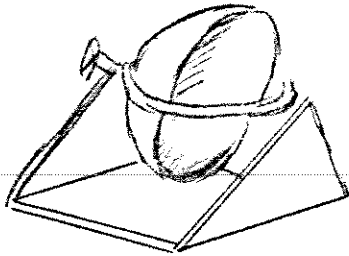
21

At Robinson Hall - Lawrence Scientific School-Harvard - Tell Hall, Sargent, and others that I think I have "touched the core of the color problem". As amusing to the child who loves to play with colors - as to the scientist who looks

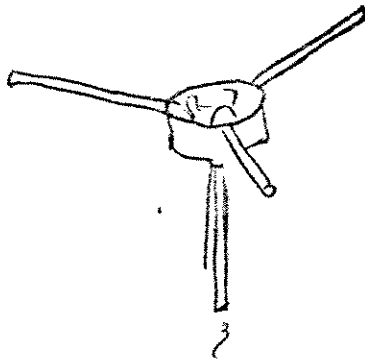


hemisphere - hung in circle
to be revolved

430.



① Three or more
equidistant radii
of circles -
to a central
slott - to mingle colors
by rotation.



for a logical system.

(Meet Prof. Peabody on street - who calls it
"a method with apparatus" - says spinning of
colors is old - but that spinning of colors
to establish a color scale is new. If exist-
ing apparatus would do this, carry the problem
farther so that it and its tools may be pro-
tected by patent. Then describe it so that
others versed in the art - can construct the
apparatus and do the work.)

May 26 Guest at Mr. Godfrey L. Cabot's - 16 Highland St.-
Cam. with the M. P. Club.

Mr. W. H. Downes of the Trans. gives me "Color
Problems" to review - (Is it original
(Are there errors
? (What is its value
(Who would use it

May 29 Delivered Mr. Clifford's Lumenometer (No. 1) at 44.
Tech. Saw Prof. Cross - and described aerial
color effect of my new top - He said "I can conceive
the effect you describe - but do not remember to
have seen it anywhere"

May 28 Patent applied for - Color Top

June 3 Asked to have electric service discontinued for
summer.

June 7 9:30-11 Profs. Cross, Clifford, Derr, Goodwin
and Wendell test Lumenometers at Institute of
Technology.

Black velvet reads 3.9 4. 4.5 etc. average 4.35

Yellow " 72)

Red 46) "very satisfactory, very

Blue 30) perfect - new"

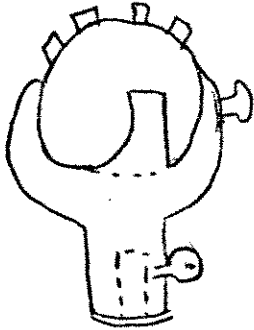
"Stands the test perfectly."

Prof. Cross says he would mention it to the
Sec. of the Soc. of Arts, for a meeting next
winter. Also call the attention of Dr. Williams
(oculist) to it. Thinks it a valuable instrument.
Wishes to see new color top which I describe.
Thinks Prof. Cattell should refer to the older
use of some instrument when he says the principle
"is not new". Would ask him for a reference.
Certainly here are five or six physicists who
find it new and interesting. Why not send it
to "Nature" - but in the fall when those interested
will be back from vacation."

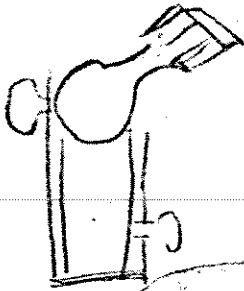
"Here are several of us who find it newer than
much of what appears in "Science" (Prof. C's
witticism on Prof. Kettell.

Claw foot - holding adjustable ball with clips
to retain color-cards at any angle-
to be clamped to motor shaft. -

44a.



Short pipe with ball and socket joint
to clampon motor spindle.



When blue falls back, centre
loses blue and becomes intense
red (gains by omission of green)



When yellow falls back - a yellow ground
gives sp. circuit (blue field)



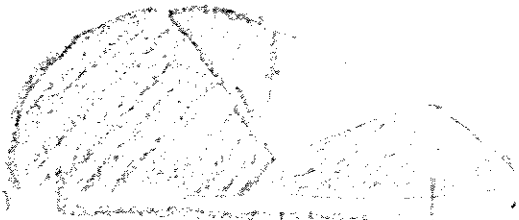
Spectrum circuit (blue field)



Excellent spectrum - if slightly
inclined forward



Spectrum circuit - "
(purple field)



June 14 4-5 At Mr. Perkins office - discussed a new patent for the system of charts - I ask what it would protect more than is already covered by the copyrights and patents.

Mr. Skinner (architect) inquires about amount of illumination to be obtained by a hooded skylight - and I suggest that the Lumenometer be used to plot the degrees of illumination at certain regularly spaced intervals of a given floor space - and then be compared with other rooms.

45.

July 18 Talk over skeleton of color-triangle with
23 Miss Hall and then dictate a chapter on its construction.

Sept. 30 Mr. Jepson brings to studio - Mr. Arthur Briggs of Jamestown, N.Y., N. S. A. (Hamilton & McGlinn-256 Church St., Agts. in N. Y. of Hall & Co.) pupil of Mr. Alfred Barker (in charge of textile dept. class in color) - Bradford Technical College - Yorkshire, Eng.
Show Photometer - Charts, sphere -
Mr. A. B. reads red 39.5)
purple 35.) within 1% of my readings-
gray 50.) Mr. J. reads higher -

Met Denman Ross at restaurant (oak ---) and discussed value and "intensity" of color. Said he might have to use one of my Lumenometers - as Prof. Sabine's was large and expensive-

Oct 1 Mr. Perkins at his office from 4:40-5:50
Discussed new claim for color-top - "combination" - also patent for charts - but I said his form of claim for the charts could not stand as it would include the color cards long in use.

18 Mr. Macy and Mr. Seaver at studio to photograph medallion of Helen Keller. Loaned former eight of her letters to me.

46.

21 Mr. Frederick Andrew introduces Mr. W. D'A Ryan at General Electric station in West Lynn. I describe and sketch the light-meter (find he has a copyrighted Lumenometer) which interests him very much. He sees its value as measuring color-curves of artificial light in terms of daylight. (comparison of various lamps) - acetylene, Nietch, Welsbach, Incandescent, etc. Also total illumination of any point in a given room or street. (Where is another lamp needed?)

Also disturbance of colors by change of illumination.

Also curve of light for a day.

Makes appointment to see it at my studio, Tuesday, Oct. 28, at 11 a.m.

Asks me to dinner of Am. Institute of Electrical Engineers - Oct. 24 - Marlboro Hall Hotel, N.Y.

Oct 22 Heard Mr. Ryan's lecture at 45 W. 26th St. (Edison LightCo)

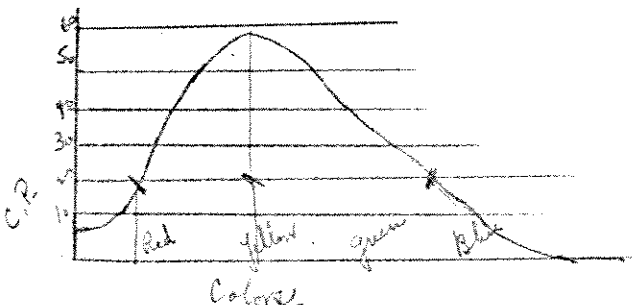
23 Dined with his assistant - Mr. Stickney) and then with Mr. Ryan went to meeting of A. I. Elec. Engineers - hearing three (4) papers on photometry - with demonstration by Prof. Matthews. Imitation of daylight - and means of measuring other light in terms of daylight imperative for color comparisons. Take Mr. Ryan to lunch at Nat. Arts Club - and then spend two hours at the Met. Art Museum - studying old masters.

Oct 28 Appointment at studio to test Munsell photometer - 11 a.m. Mr. Ryan inspects the instrument - approves its scale and fitting. Reads R. Y. G. and B. in daylight and in electric bulb (36 c.p. reflector). Reads velvet and middle gray - black paper and two reds (6" apart) Show him my plates for color identification. Will see special committee tomorrow P. M. to discuss:

- A. Apparatus from a theoretical point of view - as to possible errors - etc.
- B. Consider its practical commercial value -
 - 1 In obtaining information for publication with respect to various lights and their effect on colors
 - 2 Practicability of using it directly to demonstrate the values of different lights.

He finds it astatic, accurate, and remarkably well worked out. Queries if it cannot be used to measure the flux of light in any room, by mirrors set at various points so as to focus into it - Giving a mean reading of the flux.

Discusses curves of intensity, through the colors, for various lamps - Intends to set up arc lamp, gas and Welsbach and Nernst and Weld as incandescent in the studio - and testing the instrument.



Need of system admitted - and its practical advantages.

46a.

What are its weak points?

1. Fading and chemical changes of pigments.
2. Variable light and
" sensitiveness of the retina.

Oct 30 Mr. W. H. Downes - of the Transcript - sees Photometer and charts of new system. Also sphere and models - (send description of P. to "Nature")

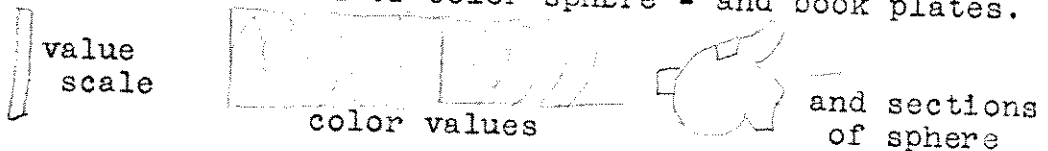
31 Interview with Mr. Perkins at his office, on rejection of claim for top. He will try combination of rotated discs or color cards, with a color field - which is seen through the color mist.

Nov 10 Commander Murdock comes to studio - 10:30-11:15 Sees rotating discs and approximations of a "middle gray" by average estimates - and by curve of sensation (Fechner)

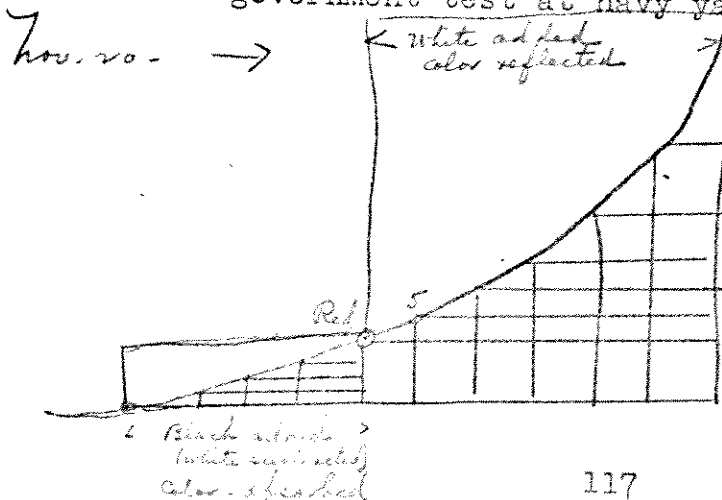
48.

Reads same on Photometer (see opposite) easily and accurately - remarks on readings of the eye to "fool us" and need of considering these estimates physiologically - Knows that his right eye decides the sensation - Discusses the Bunsen - its grease spot - difficulties of color comparisons - Is struck by ease in comparing daylight readings with those of any artificial source. Suggests that the government should have it at the N. Y. navy yard - for signal glass tests. Would like to use it on some people whom he believes to be totally color blind. Also sees model of color sphere - and book plates.

227



Will send memoranda so that I can submit it for government test at navy yard.



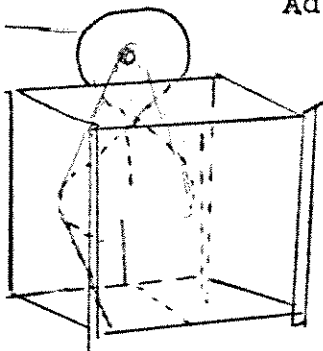
Query:
Is there a plus, and a minus in color sensations?

measure of CHROMA

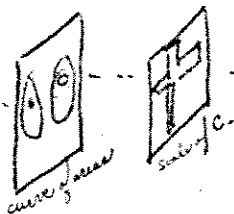
NOV 7

describes C of any Hues whose V^S have been equalized.

driven by motor



Adjustable cabinet with rotating discs to replace the fixed cards of photometer - Illumination value equalized to measure difference of chroma.



dim. radius for weaker C.

{ in. Vol. I p. 49. Apr. 1901 }
 { " " II to May 1902 }

(48a)

Gray	Corrected	Blue	Red	Red glass
54	53	47	40	32
58	53.5	47	37.5	33
54	54	48.5	38.15	32.5
3166	3160.5	39	50	40
55.3	53.5			

} daylight - Am. Murdoch
 electric bulb.

A. made v.3 lower.

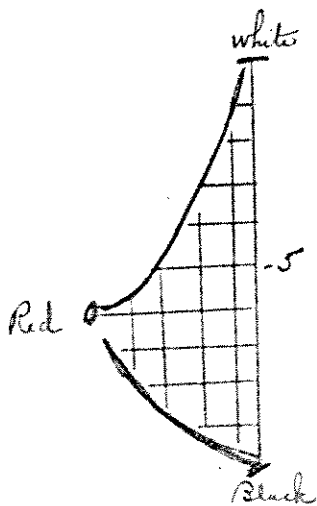
PIGMENT CURVE

describes combined C & V or any Hue

Set of templates grading any color to W & B by 10 equal steps

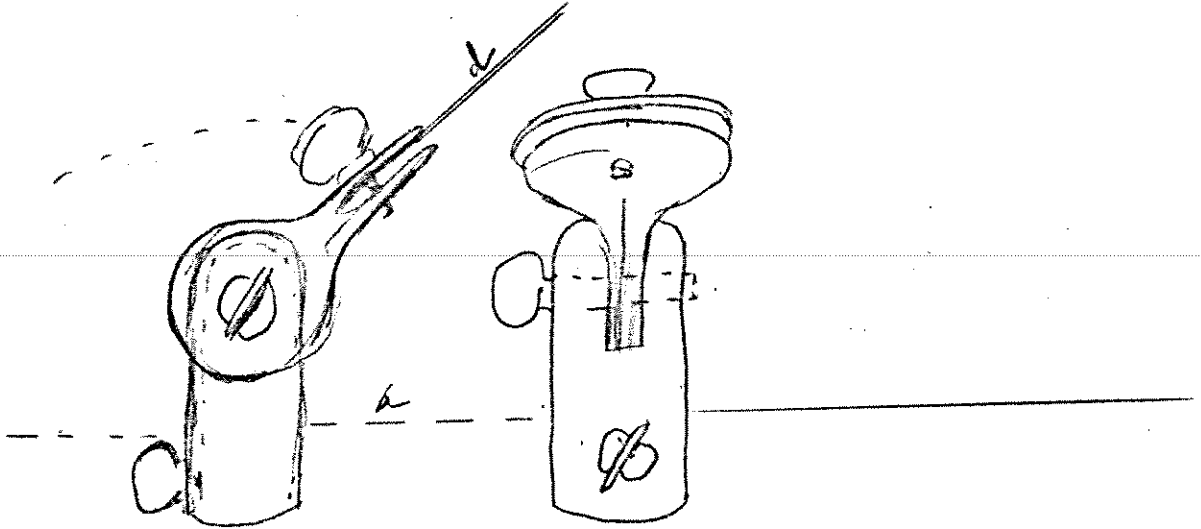
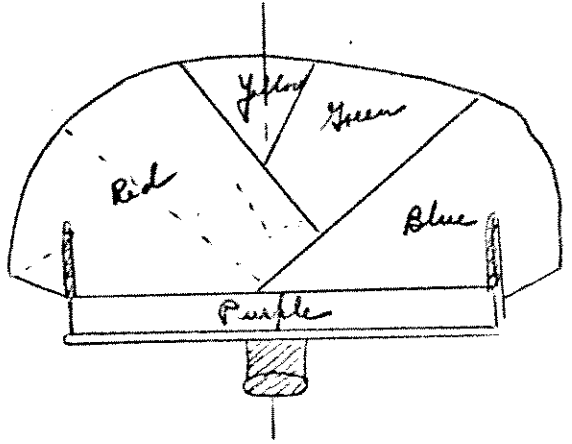
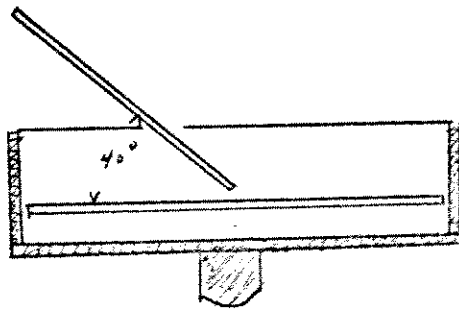


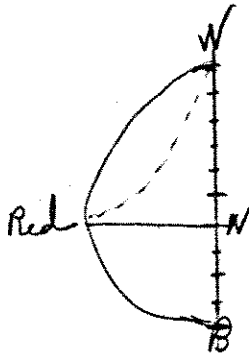
- Given, the strongest sensation of Red
1. to grade it to white)
 2. " " " " black) by equal
 3. " " " " gray) sensations



Experiments show that

1. Equal loss of chroma requires unequal steps of value.
2. Unequal steps of chroma will permit equal steps of value.





Finds the change most marked at the extremes.

49a.

Dec 4
1902

Mr. Gilman at studio 8:45-9:30.

49.

Show discs for gradation to W. B. and N.

red)
yellow) He finds the steps nearest the extremes
green) seem greatest. Query? Does Fechner's
blue) law hold in the extremes of sensation.
purple)

It was brought about by these same means - and as an offspring cannot supercede its parent. Says I am getting beyond him in this search: - a thing sure to happen when one enters really original research - Speaks of getting so far into the woods - that no one can hear our voice.

Kepler's answer when told no one would read his work. "If God had waited 5000 years - he could well wait 100" - Refers to the few real readers, who can go along with the thought of Plato.

Finds the purple scale "smoothest" easiest to the eye? Feels necessity of only attempting short intervals of these estimations, with eye fully reposed - shielded by black velvet - free from all disturbing elements. A very fatiguing exercise.

Show him the plates worked out quantitatively in color. "They are very illuminating - cannot fail to leave a permanent impress of color relations. Should think a set of lectures on color, illustrated by these plates - and published as a monograph - would be referred to by scientists.

Dec 8

Tel. from Mr. Perkins that the color top is allowed.

11

Mr. Vose - of Silver Burdett & Co. at studio 3:30-4 Show him color top and color charts. He asks if this would not soon give a child a clear estimate of color-values. Does not know of any way of deciding what colors are pleasant together - yet supposes there must be some law. Speaks of the difficulty and disappointments of color-printing. His house only undertakes what there is a "very strong demand for". A child's edition of this color-system might interest them.