

Menlo Park Notebook #143 [N-82-11-14]

This notebook covers the period November 1882-June 1883. The entries are by George Gibbs and Thomas P. Conant and relate primarily to chemical experiments. Included are notes and a few drawings concerning experiments to produce marks on paper, probably for an electric meter. There is also material pertaining to storage batteries, carbon filaments, cements for sockets, and mica insulation for dynamo brushes. The last half of the book is by Conant alone and relates to electric meter experiments. The book contains 284 numbered pages.

Blank pages not filmed: 1, 274-281.

Missing page numbers: 69-72.

Experiments with Oil of ³
Aniline. Nov. 14th / 12. J. J. J.

Failed to obtain a solution
 in Oxalic Acid (either
 in the hot- or cold) contain-
 ing perceptible traces of the
 oil.

No solution with Salicylic
Acid.

No solution with Boric Acid

Obtained a solution with
Sulphuric Acid and tried
 the following combinations
 with the excepts given below.

H_2SO_4 sol. alone - no mark.

+ KCl — " "

" + $Co(NO_3)_2$ — " "

H_2SO_4 sol. + Iodide of Ca " "

" Sesquichloride of Fe " "

" Cyanide of K " "

(over)

H_2SO_4 sol. + Acetate of Hg - no mark⁵
 " " + Protochloride of Fe " "
 above + $Co(NO_3)_2$ " "
 H_2SO_4 sol. + Carbonate of Mn " "
 above + NaCl " "
 H_2SO_4 sol. + MnCl " "
 above + $Co(NO_3)_2$ + $CuSO_4$ " "

Obtained a solution with
 Hydrochloric Acid, but
 could not get a mark
 on the paper. The follow-
 ing compounds were tried:
 HCl sol.

above + Bicarbonate of Sodium
 + chloride of cobalt
 NaCl + " "

Sesquioxide of Lead;
 Sesquichloride of Iron;
 Chloride of Copper.

Nov 15 / 42 J. P. C.

Acetic Acid Solution

formed slowly in the cold
easily upon application of
heat.

Current
derived from four quart
cells (bichromate) in series,

Solution alone gives fairly
distinct mark up to 2500
ohms.

With addition of salt
gives same mark up to
about 3000 ohms

With salt and chloride
of cobalt gives good
black mark up to about
3000 ohms

With Chloride of Cobalt 9

gives about same result
not so distinct however.

With Chloride of Cobalt and
Chlorate of Potash gives good
black mark up to 2500 ohms

With same plus salt mark
fairly black up to 2000 ohms

With Chlorate of Potash
gives fairly distinct mark
up to 2500 ohms.

Same plus salt gives about
same result.

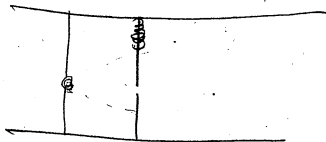
With Sulphate of Lead
gives fair mark up to
2500 ohms.

Milk Bromide of Sodium ¹¹
 X faint mark to 2000 ohms

X Red oxide of Lead gives
 good mark up to 2000 ohms

Same plus salt gives
 much darker mark up to
 2000 ohms.

- Tartrate of Soda	- no result
Bisulphite "	- " "
Hyposulphite "	- " "
sulphate of Potash	- " "
Borax "	- " "
Chromate "	- " "
Chromic oxide	- " "
Chloride of Mercury	- " "
acetate "	- " "



Sulphate of Iron - no result¹²
 Citrate of Iron & Ammonia - " "
 Chloride of Manganese - " "
 Protochloride of Tin - " "
 Phosphoric acid - " "
 Cobalt Nitrate x - " "
 Leerdine - " "
 Each of above + salt - " "

Carbonate of Copper gives
 black mark up to 2500 ohms
 and faint mark up to
 15000 ohms

Same plus salt gives
 much clearer results up
 to same figures

Plus salt and chloride of Cobalt
 gives better results (same resistance)

The marks obtained by use
of the acetic solution become
intensified by action of light
and the strips of paper
become somewhat yellow

Chromic oxide - good result
" + Salt "

Nov. 15th / 12 George Gibbs¹⁷
 Obtained no results with
 a solution in Pyrosulphuric
 acid,

Obtained a solution in Nitric
 acid, with the following
 results:—

NH_4O_3	sol.	none
"	" + Potassium K	"
"	" + Sodium K	"
"	" + Ferricyanide K	fair result
"	" Cyanide K	none
"	" NaCl	"
"	" + NaCl + Ferricyanide K	"
"	" Cyanide K	"
"	" Potassium Chloride	"
"	" + Bisulphate Na	"
"	" + Bismute Na	"
"	" + Ammonium Oxalate	"
"	" + $(NH_4)HS$	"
"	" + $(NH_4)Cl$	"
"	" + MgCl	"
"	" + HgCl	"
	(over)	

Nitric Acid Solution, (concluded) 19

HNO_3 Sol. + $PbSO_4$ none
 " " + $(NH_4)_2Cu(SO_4)_2$ "
 " " $CuSO_4$ "
 " " $ZnSO_4$ "

Solution in Tartaric Acid

(tried). —

Solution alone gives faint
 mark up to 3000 ohms, but
 fades rapidly on exposure to
 light.

Solution and $NaCl$; — about
 the same result — faint and
 worthless.

With Chloride of Cobalt. —
 faint up to 2000 ohms.
 Green.

With $KClO_3$ gives good
 green mark up to 3000.

With acetate lead gives
 faint green mark up to
 3000 ohms.

Gartner Acid Solution cont., 21

Solution of Ferricyanide of K. gives faint green marks, but with little contrast, the paper being green itself.

Carbonate of Copper gives green marks with whole resistance in (some 15000 turns).

Carbonate of Cu. and oxalate of Ammonium give same result.

Sulphate of Copper - same result.

Bisulphide of Iron gives a very faint mark on dark colored paper.

Perchloride of Van gives no mark.

All of the above fade rapidly upon exposure to light.

Lactic Acid Solution. 23

No results obtained, with
various combinations, through
15000 shms.

Experiments with Urolucina 25
No result with aqueous sol.
when treated with various
compounds.

Experiments with Nitro- 27
-Benzol Nov 16/42 J. P. C.

With acetic acid, no
solution.

With Sulphuric acid no
solution

With Hydrochloric Acid no
solution. —

Experiments with Barium
water & acid solution
gave no results whatever

Nov 16th 1892
 Experiments with Anthracene. 29

No solution the acids.

It was oxidized by a mixture of H_2SO_4 and potassium bichromate, but made no mark.

No mark with the above +
 $NaCl$, or $KClO_3$ or $CoCl$.

Nov 17 / 82 J. P. C. 31
 Paper soaked in starch
 and iodide of Potash
 gives good results which
 however are not permanent
 as the entire strip upon
 exposure becomes highly
 colored

The addition of a chloride
 prevents this but also has
 an injurious effect on
 the mark causing it to
 fade after a time

The best results are obtained
 by the addition of $KClO_3$

$NaCl$ - not permanent

KCl - " "

KNO_3 - good result ←

Solution of soda - not permanent

33
 tried HCl & indigo, but - could get -
 no marks. —

Acetate of Lead solution on paper
 gives dark mark, but - is slow and
 of high resistance. Nitrate of
 Lead solution is much better
 giving a fine black mark up to
 1500 ohms, but - is slow. —

Nitrate of lead and chloride of
 cobalt gives a faint mark of
 no practical use.

Acetate of lead + KI gives a
 mark which fades quickly.

PbCl_2 gives no mark, also
 bichromate, PbI_2 or PbS_2 . —

Bichromate of potassium; - no
 result; also Bichromate with
 CaCl_2 or with KClO_3 , or sesqui-
 chloride of iron. —

Failed to get CrCl_2 on paper,
 or CrO . —

No result with chlorides of Cobalt.

Failed to obtain cobaltic oxide
 (Co_2O_3) (black), on paper by liber-
 ating Cl with mixtures of cobalt
 salts.

dried cobalt salts ammonium
sulphide with strong acid,
chloride of tin and sulphate of
sodium is no good, also nitrate
of potassium.

Nitrate of Strontium, also plus
 $KClO_3$ (no mark.) Also Per-
oxide of Lead. Acetate of
mercury. Oxide of cobalt
+ with $KClO_3$. (O). Sulphate
of potassium + with
sodium chloride of iron.
Sulphate of lead in solution
in nitrate of ammonium.

Nov 20/4 - J. P. Q.
Furnace salt + $KClO_3$ when
oxidized gives red mark but not
permanent - the action is not improved
by addition of other salts.

Acetate of mercury and
sulphate of iron - no result
Optimonic acid alone +
with HCl - no result.

Potash chloride of iron alone
 nothing. 1 - with ferrocyanide
 of potassium - blue mark on
 pale blue paper

sulphate of iron - Nov. 21 / 82 J. P. L.
 - no result

" + $KClO_3$ - " "

" + HCl - " "

" + Pyrogallol acid - "

mixture of above

Nov 22 / 82 J. P. L.
 Nitric acid - no result

" + $FeSO_4$ - "

" + HCl - "

" + HCl + $KClO_3$ - "

" + " + " + $FeSO_4$ - "

+ sugar alcohol - "

" + " + $FeSO_4$ - "

" + $CoCl_2$ - "

+ " + sugar alcohol - "

4 Nov. 22nd / 12 ^{2.4} Ferricyanide of Potassium 39

$KClO_3$ gives quite good green
marks on white paper, up to
1500 hours or so, permanent.
This was the best green
mark obtained with various
oxidizing agents mentioned before.
The following also give green
marks:—

Ferricyanide of K + KCl

" " + NaCl

" " + KNO_3

" " + KNO_3 + $KClO_3$

" " Bromide Red.

And the following with results
given:—

Ferricyanide + KCl + $NaHO$. (none)

" " K_2SO_4 (")

" " $CaCl_2$ (")

" + $KClO_3$ + Hyposulphite K (fades)

" $KClO_3$ + Chromate K (poor)

" $BaCl_2$ (")

" $COCl_2$ (precipitate on
(blue paper) paper)

" HNO_3 (blue paper) paper

Nov 22 / 42 J.P.C. 41

aniline Purple

 H_2O solution + $CaCl_2$ - blue" " + NaH_2PO_4 - no change" " + KNO_3 - " "" " + NH_4NO_3 - " "

Black aniline - no results

Nov. 23rd / 82. — George L. 43
 Experiments with Aniline Purple.
 H_2O solution with $NaCl$ - faint
 green mark on purple paper when
 small quantity of solⁿ was used,
 but - no result when enough $NaCl$
 was used to make the solution.
 Aniline sol. and ferrocyanide of
 potassium gives green mark on
 purple paper up to 1000 times;
 but is slow and not very
 permanent.
 Dilute aniline solution with vary-
 ing proportions of ferric chloride
 - in all ten samples - obtained
 with small proportion of
 chloride a pale green mark on pur-
 ple paper. With large proportion of
 ferric chloride got green mark
 on green paper. All these marks
 fade after two or three hours
 exposure in sun.
 Sulphate of Iron precipitates
 the coloring matter from the
 aniline solutions.

Nov 23 7/2 J. P. C. 45
 H₂O sol blue flag - no result
 " " + KClO₃ - " "
 " " + " + NaCl - " "
 " " + KNO₃ - " "
 " " + oil of aniline - " "
 " " + Pyrogallol acid - faint

H₂O sol Brazil wood
 alone + reducing current - blue
 " + oxidizing " - white
 + NaCl - more sensitive
 + KClO₃ - " " ^{3rd}
 + KNO₃ - " " ^{1st}
 + NaCl + KClO₃ - " "
 + Kferrocyanide - faint blue
 + FeSO₄ - no result
 + " + NaCl - " "
 + Na₂CO₃ - " "

H₂O sol Brazil wood 47

" + CaI₂ - no result

acetate of Ca - " "

" + " + HCl₂H₂O₂ - " "

Decolorized with peroxide of
lead and tried to reshow
by current - no result

H₂O sol + alum - no result

" " + CuSO₄ - " "

" " + " + NaCl - " "

" " + Cu acetate - " "

" " + Cu salts + alum - " "

" " + ZnO - " "

Nov. 23rd/82 G. G.

Experiments with "Dye Wood".

Yield solution of dye-wood in H_2O alone and with Ferric chloride - no result. -

I find that "dye-wood" gives faint reactions, not as marked as with "Brazil-wood" but similar in color &c. —

A solution of acid dears! in H_2O when treated with HNO_3 and $KClO_3$ gives a fine pale yellow mark on red paper with oxidizing, i.e. faint platinum print, but the colors rapidly fade. —

Yield Oil of Organism with acetic acid, nitric, hydrochloric and sulphuric, but failed to get a complete solution or the faintest mark with HNO_3 or $KClO_3$ or $COCl_2$ &c. —

Yield Carbonate of this in H_2O - no result. —

Nov. 23rd G. G. —

Tried a solution of copper
sulfate and acetic acid then
potassium carbonate; — no
marks.

Also solution CuSO_4 and acetic
acid + NaHO — no result.

Nov 24/82 J. P. C.

H_2O sol Brazil wood
+ acetic of Al — no result
same + tartaric acid — " "

Naphthalin sol in H_2O + alcohol + salt
" " " + NaCl "
" " " + KClO_3 "
" " + NaCl + " — "
" " + KClO_3 + CoCl_2 — "
" " + Brazil wood — "

Nov. 24th/82. G. G.

Tried CuSO_4 with tartaric acid
than CaCO_3 - no result.

Tried cupric sulphate dissolved
in potassium cyanide - no mark.

Tried black oxide of copper
dissolved in HCl , or cupric
chloride; stain a black dot
where point was held on paper
for a moment (with no re-
sistance in) it faded out -
almost immediately. -

Tried hyperoxide of manganese
in H_2O . with reducing current -
obtained a black mass, but found
it very slow, as in the case of
black oxide of Cu above.

Tried acetate of manganese
in H_2O - a faint mark obtained
(n.g.) - also acetate of iron +
 NaCl - faint and not sensi-
tive.

Tried carbonate of iron in
water - no result.

Nov. 24th/92. George Gibbs. 55.
 Used Manganous Chloride in
 H_2O . got a fine mark on
 white paper up to 2000 ohms
 resistance. Both the mark &
 color of paper are permanent.
 Used above solution with
 $NaCl$ with about the same
 result also with $KClO_3$, the
 same. With Potassium nitrate -
 about the same - not more sensitive.
 With nitrate of ammonia - the
 same, with $(NH)_4NO_3 + NaCl$ -
 no perceptible difference, Last
 exp. + CCl_2 - no improvement.

Nov. 25th/92. - J. G.
 Used Bisulphate soda added to $MnCl_2$
 solution - no mark. -
 Sulphate of potassium + $MnCl_2$ sol.
 - no mark.
 $MnCl_2$ sol. + $(NH)_4SO_4$ - no mark.
 Sol. with $CuSO_4$ - increased sensi-
 tiveness, getting a faint mark through

Nov 25 / 22 ~~J. P. L.~~ J. J. 57

whole resistance. but - paper
it turned green and mark disap-
peared after a while.

Tried Sol. with Sulphate of Iron.
got a good mark (with low resist-
ance), but - it faded immediately.

Tried Sol. with Sulphate of Lime.
Got - a very good mark through
whole resistance. Perfectly
permanent - & on white paper.

Nov 27 / 82 J. P. C.

59

Brazil wood sol in H_2O &
 $HCl \cdot H_2O_2$ - no result
 same sol + $CaCl_2$ - " "

Tannate of Iron

Tartaric acid solution - 0

" " + $NaCl$ - 0

" " + $NaHClO_2$ - 0

" " $NaCl$ + " - 0

" " + $NaBr$ - 0

" " + " + $NaCl$ - 0

" " + Bisulfite Na - 0

" " + Pyrogallol acid - 0

" " + " + $NaCl$ - 0

" " + $NaHVO_2$ - 0

" " + K_2CrO_7 - red fumes

" " + " + Pyrogallol acid - "

" " + NH_4VO_3 - 0

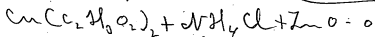
" " + acetic acid - 0

" " + $MgCl$ - 0

" " + Potassium Perm - 0

" " + $Ph(VO_3)_2$ - 0

Nov 28 / 82 3. P. 0 61

Fuchs H_2O Sol alone - 0" " " + NaCl - faint yellow" " " + " + alumin acet - "" " + alumn + Solium tart 0" " + " + Sn Cl_2 0Brazil wood H_2O Sol" " + Ferri Tannic + Sn Cl_2

gavared paper - blue streak, fading

chloride of Platinum - 0

" " + NaCl - 0" " + " + KClO_3 - 0" " + Na Br - 0

Nov 29 / 82 J. P. C. 63

$Mn(SO_4) \cdot H_2O$ sol-sat. concn
 " + H_2SO_4 - faint all
 " + $ZnSO_4$ - " "
 " + Bisulf Na- 0
 " + $NaCl$ - concn
 " + $KClO_3$ - 2500 "
 " + KNO_3 0
 " + $Pb(NO_3)_2$ - 2500
 " + $PbSO_4$ - "

The mabk from the $Pb(NO_3)_2$
 seems to turn darker with time
 that from the $PbSO_4$ not
 changing

Box 1 / 62 J.P.C

$\text{Mn}(\text{SO}_4)_2 \cdot \text{H}_2\text{O}$ - sat sol
with CuSO_4 - 2000 ohms

" $\text{Pb}(\text{NO}_3)_2$ and
some PbSO_4 which forms
on the paper - 3000 ohms
faint up to 10000 ohms.

+ ZnSO_4 - no result

+ BaSO_4 (formed on paper)
up to 1500 ohms

Dec. 2nd / 1882. Geo. Gibbs. 67

Experiments with Cement:-

Saturated solution of chloride of magnesium; and Magnesia (Mag O). —

I find that one part by weight to one part by volume is about the maximum quantity that will be absorbed. This forms a thick paste, and will set and become very hard in 12 hours. A less number of parts by weight may be used, but will require longer time in setting.

This cement will harden with from 15 to 20 times its own weight of water.

Dec 2 J. P. C.

Experiments on storage battery
Two plates of Cu in HCl sol
of J

also two Cu cylinders in
pans cups containing J sol
in Na_2CO_3 - cups being in
glass vessel containing
 Na_2CO_3 sol

Dec 4

J. P. C.

Made up sol of
acetic anhydride + NaCl +
KCl₃

also

Mon 10⁰⁴ for list
of paper in printer

Loc 5 J. P. C

Experiments on cements
 sat sat CaCl_2 + dissolved
 lime
 made test plates and
 also coated wires
 sat sat ZnCl_2 + ZnO
 as above

The difference is with
 them that they crack off
 when dry

Dec 8 J. P. C

Took the following solutions (cold)
and placed wires in them

NaOH - no coating

NaHPO_4 - " "

NaBa - " "

$\text{Co}(\text{NO}_3)_2$ - coating (not insulating)

Hg acetate - no coating

NH_4Cl - " "

oxalic acid - coating (not insulating)

I - " "

K_4FeC_6 - " "

$\text{K}_2\text{Cr}_2\text{O}_7$ - " "

MgCl_2 - coating partly insulating

CaCl_2 - " "

Leed J. P. C

The previous tests repeated
but with about same results

Tried to obtain coating by
electrolysis using same
solutions

The trouble is that the coatings
crack off on drying

The best result is from the
 CaCl_2 sat sol which
forms caustic hydroxide of lime
giving a good insulation
which however will peel
off on drying

(The CaOH forms on the cathode)

Dec 11 - J. P. C. 49, 83

Inert matings

This material is inert and
elastic

Good chloride of calcium
- no good - out of it -

The water glass does not
stand a red heat and
would not fuse in
the mine but instead
melted and cracked
off owing to burning of
the Na.

Dec 12 J. P. C 400 85

Wire insulated by self.
 Was soaked in tungplate
 of soda the object being
 to render said insulation
 fire proof. The result
 was unsatisfactory as the
 coating became charred
 and rubbed off.

Tried asbestos paint
 but could not dry it on
 the wire.

In attempting to dry by
 heat the oil would burn
 out leaving a coating of
 asbestos which although
 a good insulator, cracked
 off easily.

Dec 12th/12 P.P. — 87

Tried the following fluxes:—

1) Flint-Glass 10 lbs.
 White Arsenic 1 "
 Vine 1 "

2) Red Lead 1 "
 Flint-Glass 3 "

3) Red Lead 1 "

Ground B-max 1 1/2 "

Flint-Powder 2 "

Flint-Glass 6 "

These were fused and then powdered. A paste was made of the powder and the ware coated with this.

It did not succeed well, as the paste rubbed off, and if the ware was heated so as to fuse the paste, the temper was taken out.

Dec 13

S. P. C.

chromate of K gave by electrolysis a coating on the wire which did not insulate.

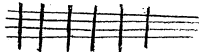
$(\text{NH}_4)_2\text{SO}_4$ = same result.

KNO₃ = no result.

oxide of K: good insulation
more or less elastic but
not capable of withstanding
a red heat

Dec 13th G.F. —

Grid mica insulation for brush
is as follows, —



A number of holes were punched
in mica plates, and wires
comprising brush pushed through
them as shown. —

Dec 15 /84 J.P.C. 93
cemented plates of
mica with Mg Cl_2
+ Mg O

Dec 19 / 42 J.P. 95

Made lamp socket
of my ch. sat sol
+ my o (good)

Dec 20 / 82 J.P.C.

Made up following
cements.

1 5 c.c. sat sol Mg Cl₂
1 gm Mg O
10 " chalk fine

2 5 c.c. sat sol Mg Cl₂
1 gm Mg O
15 " fine clay
(quartz)

3 5 c.c. sat sol Mg Cl₂
1 gm Mg O
17 " Feldspar
good but slow

Dec 20 (continued) / SL

J. P. C

4 5 c.c. sat sol Mg cl₂
 1 gm Mg O
 10 " ————— Pon. Koolin

5 5 c.c. sat sol Mg cl₂
 1 gm Mg O
 10 " ————— Toloin
 6 ————— slow - fair

5 c.c. sat sol Mg cl₂
 5 " Glue H₂O
 10 gm Mg O
 ————— Good

Dec 21 / 82

J. P. C

7 5 c.c. sat sol My ch
 2 gm My O
 10 " fair chalk

8 5 c.c. sat sol My ch
 2 gm My O
 15 " clay
 good

9 5 c.c. sat sol My ch
 2 gm slow gnt My O

Made Samp. socket
 20 c.c. - sat sol My ch
 10 gm good. My O.

Dec 21st / 42

J. P. C.

1/ 10 c.c. sat-sol MgCl_2 10 gm (good result) MgO 2/ 10 c.c. sat ($\frac{1}{2} \text{H}_2\text{O}$) MgCl_2 10 gm (good result) MgO 3/ 10 c.c. sat ($\frac{3}{4} \text{H}_2\text{O}$) MgCl_2 10 gm (good) MgO 4/ 10 c.c. sat ($\frac{2}{3} \text{H}_2\text{O}$) MgCl_2 10 gm (fair) MgO

Dec 21 cont. Ad₂ J. P. L
 5/10 c.c. sol ($\frac{1}{2}$ H₂O) MgCl₂
 10 gm (fair) MgO

6/10 c.c. sol ($\frac{3}{4}$ H₂O) MgCl₂
 10 gm (no good) MgO

7. 10 c.c. H₂O
 10 gm MgO
 (no good)

Dec. 22 / 82 J. P. C.

5 c.c. sat sol Mycl₂

3 gm Myo

7 " Tolon

good. slow5 c.c. sat sol Mycl₂

5 gm Myo

5 c.c. collodion
bad.5 c.c. sat sol Mycl₂

5 gm Myo

2 c.c. linseed oil
bad

Dec 22 / 82 ^{contd} J. P. C

5 c.c. sat sol. MgCl₂

2 gm MgO

5 " Phosphate lime
fair

Tried to form a cement
with mixture of slaked lime
This was a failure as the lime
would not mix in but
made the cement very
granular.

5 c.c. sat sol. MgCl₂

2 gm MgO

11 " " Builders' sand
good

Dec. 20/82 J. P. C.

5 c.c sat sol. Mg cl₂

4 gm Mg O

5 " good Solom

lamp socket-

20 c.c Mg cl₂

20 gm (good) Mg O

Dec. 20 /82

J. P. C.

cement of Mycl
+ Myo + gluten
(rough experiment) W. G.

Made experiment of
depositing carbon upon
carbon filament in
kerosene oil. by means
of spark from arc
carbon and by heating
to incandescence

Dec 27/82

J. P. C.

Lamp socket -

30 c.c. - $\text{MgCl}_2 (\frac{1}{2}) (\frac{1}{2})$ 10 gm - MgO

6 " Bismut alum

V. G.

Jan 2 / 83
3. P. C

Plug

30 c.c. sol. MgCl_2 ($\frac{1}{2} \text{H}_2\text{O}$)

8 gm MgO

5 " ZnO
has not hard

Cement

MgCl_2 ($\frac{1}{2} \text{H}_2\text{O}$) + MgO

+ CaCl_2

to test drying properties
of the chloride

— N. G

Jan 2 / 65

J. P. C.

Cement

10 c.c. $\text{MgCl}_2 (\frac{1}{2} \text{H}_2\text{O})$ 5 gm MgO

15-20 " babbler

set rapidly but
removed met on the
surfaceNote. This cement after
standing for several
weeks went all to
pieces.

Jan 3 / 40

J. P. C.

Cement

10 c. c. sat sol. w/ly cl.

5 gm

14 "

soapstone

F (a little soft)

Jan 4 / d3 5. P. e

10 c.c. salt sol Mg cl₂

7 gm Mg o

3/4 " F good Soapstone

10 c.c. salt sol Mg cl₂

5 gm Mg o

20 " Soapstone

x good

10 c.c. salt sol Mg cl₂

5 gm Mg o

22 gm Soapstone

good

10 c.c.
10 gram oxide mag

Jan 4 / 63

J.P.C.

10 q.c. sat sol MgCl
9 gm MgO
4 " Soapstone

///

(Very good)

10 c.c. sat sol MgCl₂
10 gm MgO
10 " Soapstone
15 " (good) Feldspar

10 c.c. sat sol MgCl₂
5 gm MgO
5 " Soapstone
5 " (poor) Kaolin #

Jan 4 / d3

3. P. P.

10 c.c. sub-std. w/ ch

6 gm

w/ o

5 "

soapskin

5 "

fields for

5 "

Kaolin

from

A

Jan 5 / 43

J. P. C.

10 c. c. ant sol MgCl₂

5 gm

Mg O

10 "

Ca CO₃good - slow

Jan 6 / 83

J. P. C.

sorted -

20 c.c. sol - solid dry cl

14 gm

May 02

16

" very good soapstone

Jan 8 / 80

J. P. C.

15 c.c. sat-sol MgCl₂7 gm

Mg O

11 "

scoop stone

P slow15 c.c. sat-sol MgCl₂5 gm

Mg O

20 "

scoop stone

/// slow15 c.c. sat-sol MgCl₂5 gm

Mg O

22 "

scoop stone

V

slow

Jan 9 / 83 y.p.c

20 c.c. sat sol Mg cl

7 gms Mg O

14 " soapstone

○ (good)

20 c.c. sat sol Mg cl

5 gms Mg O

20 " soapstone

✓ (good)

10 c.c. sat sol Mg cl

3 gms Mg O

20 " soapstone

10 " Feldspar

/// (good)

Jan 9/83

3, P. 6

10 c.c. sol ($\frac{1}{2}$ H₂O) Mycl₂

5 gms

My O

20 "

soapstone

A (slow)

Tracked-20 c.c. sat sol Mycl₂

10 gms

My O

20 "

CaCO₃

5 "

Soapstone

(good)

10 c.c. sat sol Mycl₂

2 gms

My O

12 "

Phos. P. urea

slow gills

Jan 10 / 43 J. D. C.

10 c.c. sat sol Mg cl₂
 5 gm Mg O
 1/4 " Plaster Paris
 1 fair

10 c.c. ~~sat~~
 sat 1/2 H₂O Mg cl₂
 5 gm Mg O
 15 " Plaster Paris
 fair

Phy
 25 c.c. sat 1/2 H₂O Mg cl₂
 10 gm Mg O
 2 " Plaster Paris

Jan 31 / 83

taken		result
2 c.c. conc H_2SO_4	—	partial
"	+ 1 c.c. H_2O	"
"	+ 2 " "	"
"	+ 3 " "	"
"	+ 6 " "	good (very)
"	+ 7 " "	partial
"	+ 9 " "	partial
"	+ 12 " "	partial
"	+ 4 " "	good
"	+ 5 " "	"

20 c.c. H_2SO_4 to (4 to 7) c.c. H_2O
 is best solution

Note, above was a kind of
 parchmentizing

J. P. Bonant

July 24 /50

Experiment to prevent
oxidation of zinc water
plates.

Standard sol.

$3\frac{1}{2}$ Hubs ZnSO_4 to

35 lbs dist H_2O

Tried the following
standard sol + 2 % glycine

" " + 5 " "

" " + 10 " "

" " Boiled

" " + 7% aspartic
S. P. Corbett

Feb 26 / 53

ppt + NH_4OH and redissolved
ppt in "

added $\text{HC}_2\text{H}_3\text{O}_2$ till slightly
acid

cryst of alum
200 c.c standard sol + 1 gm destine

" " + 2 "

" " + 4 "

" " + 1 gm of
Pyrogalllic acid.

Tried also alcoholic sol of
pyrogalllic but always
found a precipitation
adding to solution
- 3. P. Constant

Feb 27 / 80

2 cc. c. stan. sol. + 1 gm sugar

" " " + 4 " "

" " " + 10 " "

Placed copper turnings in
bottom of jar also pure
tin. ———

Feb 28

Boiled and covered
with olive oil h.

Impregnated. 2 castor oil
1 cubeb oil

Plated in on animal tin
and then removed. the

plate was then suspended
in sol

Troglonanth

alcohol

Brazil wood sol

sugar alcohol

sulphur ether

sulphate ethylamine

J. P. Corant

Feb 28 1/8/3

sol boiled and covered
with collodion

German silver turnings
placed in sol

Made comminute
of my cement

for water

J. P. Conant

Mon 1 / 9/3

Sol. boiled and covered
with oil of arganum

Tannic sol added

Naphthalin "

Chloral Hydrate "

J. P. Corant

Mon 2 / 8/3

Placed in sol a large
plate = 4 lines surface
of smaller

Pt Cl_2

C/S_2

$\text{H}_2 \text{K}_2 \text{Sb}_2 \text{O}_7$

Spongy lead placed
in bottle (not in contact)

~~some with~~
also antimony

Mar 2 /83 (continued) 157

Box bolted and covered
with oil canvas

also with oil canvas

J. P. Conant

Mar 3 /43 -

Experiment to determine loss
of weight of plate due to
action of

a. alum.

wt of plate = 42.419 gms

" " alum = 0.7625 "

300 c.c. standard sol

b. acetic acid

wt of plate = 45.6651 gms

acetic acid - 3 c.c

300 c.c. stan. sol

Sol boiled and covered with
oil soluble dyes.

NH_4Cl added

Mar 3 / 40 continued

added Cressate

sol. boiled & covered with
oil of Tansy

added NaCl

J. P. Cowart

Mon 5/80

Experiment to obtain a glass
from substances free from
alkali

Litharge — no good

J. P. C.

(over)

Mar 6 / 83

Sulphate Lead + SiO_2
works fairly

Silico fluoride Barium
alone + SiO_2 - good

Sulphate of Lead alone
+ SiO_2 - works well
but requires a high temp

Carbonate of Lead
works very well and
fuses in burner flame
T.D. Hunt

Mon 4 / 83

Metric Experimentsol prot acid + acetic acid

wt of plate = 85.694 gms.

3 cc c. c. atom sol

wt of plate - 82.478 gms

aluminum - 2 gms

Phosphoric acidKey = precipitates
oxalic acid "

J. P. Constant

Mar 10 / 43

Experiment having for its object
the coating of a carbon with
lime

The following solutions were tried
the electrodes being thin rods of
carbon.

calcic hydrate
" anhydride
" carbonate
" acetate
" chloride +
" sulphate
" succinate
" oxalate (in HCl)

J. P. Conant

Mar 12 / 83

(Miles)
wt of Plate = 45.64625 gm
solution rendered strongly
acid by acetic acid

For coating carbon.

Magnesium chloride	-	0
" Nitrate	-	0
" Sulphate	-	0
" acetate	-	0
" Citrate	-	0
" Calcium (ft. sugar sol)		0

Carbonic acid in water

Tartaric acid "

Citric acid "

Mar 12 / 83 continued⁷³
(Miles)

Borax = 1 ppt.

added Na_2SO_4

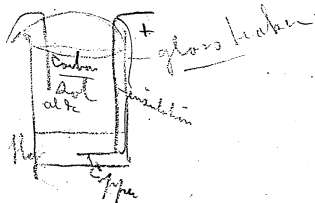
" Chromic acid

" Zn Cl_2 Very little

Thomas P. Grant

Mar 13 /83

For plating carbon;
sol of aluminium sulphate
+ NaCl -



also same with no
NaCl

also al sulph with
two carbon electrodes

Mar 13 / continued

acetate of aluminum
chloride " "

oxalate " barium in HNO_3

Coated inside front (clamp
wire etc) with thick solution
of gum tragacanth

Made strongly saturated
solution of ZnSO_4 to see if
plates would oxidize in this

J. P. Horant

Mar 14, /90

Determination of H_2O in $ZnSO_4$

wt cruc = 3.330 gms

" + $ZnSO_4$ = 5.633 "" + ~~Z~~ = 5.190 "

5.633	5.190	4.909	2.500
3.330	3.330	3.330	1.478
2.503	1.860	1.579	8.21

wt + ~~Z~~ = 4.909wt + ~~Z~~ = 4.915 N.G.

$$\begin{array}{r} 4.25000 \\ 1909' \\ \hline 13410 \\ 11515 \end{array} \quad \begin{array}{r} 2.500 \\ \hline 95\% H_2O \end{array}$$

J. P. C

Mar 14,

Plate from alum sol'd

Mar 4 = 42.4740 gms

net = 42.4645 gms

0.0135 gms

loss = 125 mg in 6 days
from 2 gms alum

013 182478

13.000000 182478

82478 .00015

475220

412390

62430

.015%

13.500000 182478

4247811 .000163

525220

494864

0.0163%

303520

247434

J. P. Constant

Mar 15 /42

covered clamps & nuts of
inside part with bollodion
and carbonized in linseed
oil (C.V.G.)

carbonized coating of
tupacanth prepared on the
13th as above

covered clamps &c with
thin leaf tupacanth, the leaf
being moistened and wound
on

considerable quantity of gum
is required as it conducts very
much on drying and heating

(over)

Mar 15 / 85

wt of Plate = 77.9435 gms

" " NH_4Cl = 0.500 "

300 c.c. sol

wt of Plate = 77.672 gms /

" " Na_2SO_4 = 0.500 "

300 c.c. Sol

Plated aluminum on
Carbon from al sulph

J. P. Bennett

17625:1116.4561 X

$$\begin{array}{r}
 6,456 \text{ cm} / 17625 \\
 \underline{610.00''} \quad 4.45'' + \\
 35600 \\
 30500 \\
 \hline
 51000
 \end{array}$$

Mar 16 / 80

Plate from alarm and of

Mar 3.

int Mar 3 = 92,419 gms

" " 15 = 92,405

1014 gms

$$\begin{array}{r}
 1014 \overline{) 13} \\
 \underline{12} \quad .001096 \\
 189 \\
 \underline{180} \quad .000456
 \end{array}$$

loss in 6 days = 6.57 gms | alarm
 " " " = 13.15 " | 2.00 "

$$\begin{array}{r}
 2 \overline{) 13.15} \\
 \underline{6.75}
 \end{array}$$

17625:1116.4561 X

$$\begin{array}{r}
 61000 \overline{) 17625}
 \end{array}$$

J. P. Conant

Mar 17 /80

Plots for Meter prepared
as follows.

amalgamated but and
rinsed in KOH but scraped
bright (turned jet black in
15 minutes)

amalgamated without acid
being washed in KOH and then
in H_2O (from result)

amalgamated by sol of
sulphate-nitrate & chloride of
 Hg (washed in KOH & H_2O)
(from result)

amalgated with acid but
washed with H_2O between
depos and also after
amalg. (cleaned + KOH
(medium))

Mar 17 / 93 continued 191

amalgamated ^{with acid} and washed
after amalgamation.

(Pm)

amalgamated with acid
and not washed at
all

(Pm)

Tried to carbonyl
triguanth in $ZnCl_2$ but
the carbon and gum
were simply eaten.

J. P. Jonant

Mar 19 / 43.

wt of Plate = 41.634 gms +

 $\text{Na}_2\text{SO}_4 = 0.200$ "

std. soln - 200 c.c

wt of Plate = 43.649 gms 0

 $\text{Na}_2\text{SO}_4 = 1.000$

std. soln 300 c.c

wt of Plate from Mar 8

wt (14) = 42.4645 gms

wt (19) = 42.434

0.0305 loss in 5 days

.0135 " " 6 days

.0175 " " 11 "

Loss = 44 Mgs in 11 days

(over)

Mar 19 / 80.

wt of Photo - 45.3375 gms

NH₄Cl = 1.000

slim. Ash. = 500 c.c

Photo from Arctic Mar 3,
Mar 5 = 45.6655 gms

" 19 = 45.3790 "

286.5

Loss = 286.5 Mgs in 16 days

286.5 gms / 16

16
126
112
145
144
10

17.90 mgs per day

1590
1200
390

(over)

Mar 19 / 83.

X 197

wt of Photo = 4.375 gms

NaCl = 1.000 g

Stom sol = 300 c.c.

wt of Photo = 5.6315 gms 2

NaCl = 0.500 g

Stom sol - 300 c.c.

The action of the alum sol.
seems more energetic when
only a small quantity of alum
is used, at first, but the strong
solution seems to have its
action intensified by time.

(over)

Mar 19 / 83

wt of Plate = 80.744 gms

chloro. caffeine - 0.200

stom. sol. 300 c.c

Narcotin opare ppt.

Wt. of Styrchaine = 0.200 gms

wt of Plate = 86.7435

stom. sol. 300 c.c

Narcotin opare ppt.

Weight of Plate = 78.004 gms

Stom. sol. - 300 c.c

To see if
the solution
attacks
the platePrepared polysilicate of ammonia to
try in meter

J. P. Conant.

Mar 20 /43

mt of Plate = 2.077 gms
Citric Coffee = 0.005 "
Stain sol. = 200 c.c

J. P. Conant

Mar 21 / 43

Prepared solgelated Polysiloxane
for use in Meter but it was
of no use as it pptd. Zn

J. P. Conant

Mon 22 / 8 / 3

Tried to plate aluminium
on brass using solution of
sulphate of al and
alum. result was
only partially good

Same in alkaline sol
and also alum alone
gave no result.

Prepared a solution as
follows

al sulph - 20 gms

alum - 10 gms

Water - 500 c.c.

J. P. Conant

Mar 23 / 8/3

mt of plate - 45, 15-3 gms

Pipette - trace

sd 0.00 c.c

Made experiment of
plating al on Cu.
(not very good result)

J. P. Conant

$$\begin{array}{r}
 1.1355000 \\
 1114000 \times 7 \\
 \hline
 21500 \\
 13925 \\
 \hline
 75750 \\
 69625 \\
 \hline
 \end{array}$$

11.3925
815

~~$$\begin{array}{r}
 1.1355000 \\
 1114000 \\
 \hline
 19500 \\
 13925 \\
 \hline
 55750 \\
 55700 \\
 \hline
 \end{array}$$

11.3925
814

82~~

Mar 24 / 83

Ergotin (alcoholic sol)

ppt Zn and is w.g. for
the meter

spg of alcohol.

wt in air = 11.6425

" " H_2O = 10.250" " H_2O = 10.489

11.6425

10.250

1.3925 wt H_2O

11.6425

10.489

1.1535 wt H_2O

Mar 24 /80 (Continued)²¹¹

Plate from N.H. cl 6

Mar 19 has lost nothing
in weight.

J. P. Conrad

Mar 26 / 83

wt of $\text{Hg Cl}_2 = 1 \text{ gm.}$

" of amalg lead plate = 64.1655 gm

distilled H_2O = 200 c.c.

The object of the above experiment is to determine whether or no a plate of lead amalgamated will either reduce mercury from or be oxidized by a solution of a salt of mercury, the aim being to obtain some metal which may be amalgamated, but which shall
(over)

Dec 24 / 83
 be reacted on by a solution²¹⁵
 of mercury or a salt of
 mercury, and also be
 reacted on by the acid
 radical set free by the
 decomposition of such
 salt - The plate in question
 to be used as a carrier of
 mercury in a meter in which
 the quantity of current shall
 be measured by the quantity
 of mercury removed from
 the one electrode or deposited
 on the other.

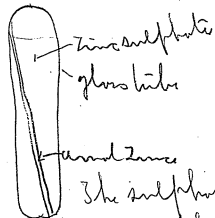
J. P. Conant

J. F. Ott

The hot solution caused the
mercury to crack up ~~destroying~~
the smooth surface.

Mar 26, /80

Prepared the following
experiment



The sulphate and
plate were placed in the
tube. The solution was then
boiled and the tube sealed
the object being to see if
the plate would oxidize under
these circumstances.

J. P. Conant

April -19- 83

Plate from Na_2SO_4 sol of

Mar 15.

wt Mar 15 = 77.8825

" Apr 19 = 77.742

gain .0705

wt of Plate + from Na_2SO_4

of Mar 19 = 84.634

wt Apr " = 84.710

gain .076

Plate 0 from Na_2SO_4 of

Mar 19 - 83.649

Apr 19 - 83.714

gain .065

J. H. Connors

April 20 - 1883.

Plate in N a c l + q M n 19

wt M n 19 = 44.875

" Apr 20 = 44.420

 gain = .045

Plate N a c l 2 M n 19

wt (19) = 45.6315

" Apr 20 = 45.6420

 gain .0505

Plate from chloride copper

wt M n 19 = 40.744

wt Apr 20 = 40.790

 gain .046

Apr 20 - 1970

Plots from *Strophomena* Niche
 of Mar 19 = \$6.7435
 net Apr 20 = \$6.8855

gain 1.1420

Plots from stem soil of
 Mar 19 = 78.004
 Apr 20 = 78.073

gain .069

Plots from *Citrus* surface
 of Mar 20 = 42.077
 net Apr 20 = 42.136

gain .059

Apr 20 1883

Photo from Reference of

Mar 23 = 45.153

Apr 20 = 45.204

 gain .051

 Amalgamated Lead

Mar 24 ant = 64.1655

Apr 20 " = 64.168

 loss .0025

Resumé of Meter Experiment

Boiling the solution and covering with oil does not help matters in the least as in all cases tried there seems to be a reaction between the oil and the solution, the result of which is a deposit upon the plate.

This has been tried with the following oils.

olive oil	white hypon oil
Caster "	Tansy "
Cubeb "	<u>Imperfume</u>
Lemongrass "	Solution also
Wormseed "	covered with
organum "	collodion which
	dried and cracked

The placing in the bath of 229
 other metals with a view to
 throwing the oxidation on to them,
 resulted in failure, for the
 metal was either unacted
 upon or else taken up by
 the solution and reduced
 on the plate.

acetic - tartaric - citric
 and phosphoric acids keep
 the plate bright but act
 upon it too strongly when
 present in sufficient quantity
 to be of service.

chromic acid is reduced by
 the Zinc

of all the other substances²³¹
 tried the only ones that
 promise but all are
~~not~~ NaCl Na_2SO_4 NaHCO_3
 NaCl - Na_2SO_4 -

White of egg - Bismuth,
 which seem to keep down
 the oxidation somewhat
 without attacking the plate.

It was hoped that among
 those substances which kept
 the plate bright, some might
 be found whose action
 would be constant but thus
 far all seem to be uncertain,
 the action being strengthened

The experiment of using different methods of amalgamation showed no particular result.

The best result so far as keeping the plate bright goes, is that obtained by boiling the solution containing the plate and sealing the vessel at once.

The plate of amalgam found in $HgCl_2$ lost but a small fraction of its weight but as it seems to be covered with

reduced mercury it²³⁵
would appear that the
~~oxidation~~ has taken place
at the expense of the lead
plate. although ordinary
tests do not show the presence
of Lead in the solution.

Thomas P. Bonart,

June 9 - 1943.

Experiment on the weighing of zinc
meter plates, the object being to
design a balance whose action
shall be extremely rapid and
which shall at the same time
weigh within a few say
5 to 10 mgs. of the correct weight

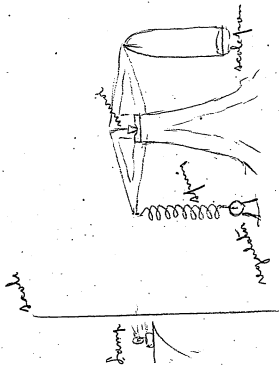
on Monday June 4 - 45 and
through the week the following
experiments have been performed:

The first idea was to
use instead of weights, the
tension of a spring and
to read the deflection of the
scale beam by means of a
reflected spot of light.

June 9 - cont.

upon a scale placed at any convenient distance.

The apparatus was put together as per sketch below.



June 9 cont.

The following springs of brass
were tried.

N^o 1 =

diam of wire = .030"

" " spring = $\frac{3}{4}$ "

length " = 2"

N^o 2 = same as above with
length = $2\frac{1}{2}$ "

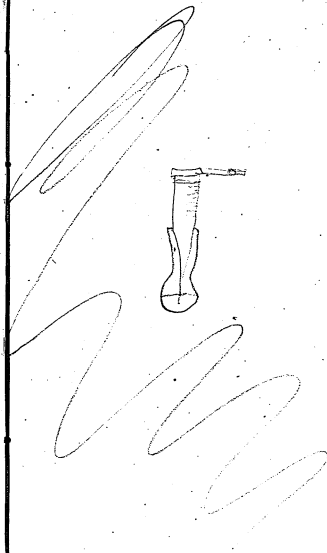
N^o 3 = ~~same as 1~~"

diam of wire = .034"

" " spring = $\frac{15}{16}$ "

length " = 5"

N^o 4 = same as 3 with
length = $6\frac{1}{2}$ "



June 9 - cont.

 $N = 5$

Diam of wire = .030"

" " spring = $2\frac{1}{2}$ "

Length " = 6"

The trouble with all of these is that of a spring is sensitive enough to indicate a small weight say 10 mgs. a weight of 40 gms on a 25 light plate, will pull it nearly straight while on the other hand if the spring will sustain a heavy weight, the light weight will not affect it.

The size of the spring seemed to make very slight difference and the only

fine 9 - cut

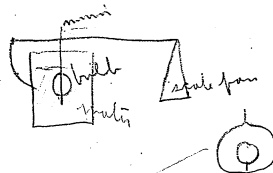
may to magnify the deflection
would appear to be by increasing
the distance from the scale to
the mirror.

after this passes say
three feet, it is difficult
from the weighing chain, to
see the scale.

With regard to weighing
by the hydrometer, the
same trouble occurs, that
of the ~~hydrometer~~ hydrometer will
show the effect of a light
weight, a heavy one will
push it out of sight.

June 9. cont.

The apparatus would have been as follows.



showing mode of connecting bulb to lever. The reason for getting under the bulb is that it is hard to guide it in any other way without an excessive amount of friction.

The idea would be to have the bulb closely balance the

June 9 - cont

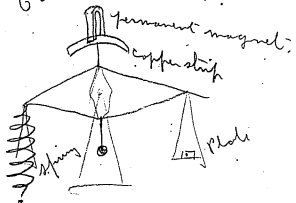
average weight of the plate and then ~~add~~ read from the scale by reflected light. the excess or deficiency with reference to the standard

The difficulty with this, by calculation may be proved to be that already mentioned as it would not be easy to ~~so~~ ~~the~~ calculate the average weight as to avoid obtain a set of plates which after use would not show wide differences

Thomas P. Leasant,

June 12 - 73.

Experiment to reduce oscillations
of balance beam.



The magnet used was
strong enough to lift a half
pound piece of iron.

The effect was nothing,
and the balance shook as badly
as ever.

J. N. L.,

June 12 - Cont.

Began the construction of a balance on following principle.

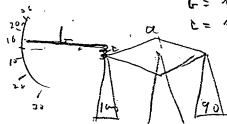
The weight to be suspended by a spring and the lever raised by hand there being an arrangement by which as soon as the scale pan leaves its support, the movement of the lever is arrested by an electric magnet.

June 14 - 43 -

Hanning noted the difficulty of using a spring between such wide limits as from 10 mgs. to say 100 gms. = 1 to 10000. It was determined to try the idea of throwing only a portion of the weight upon the spring.

In other words, to roughly balance the plate by weights and obtain the fine reading by the spring.

a = beam
b = lever
c = spring



June 14 - 93, cont.

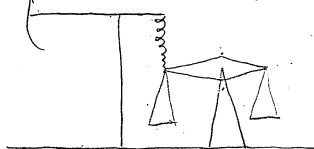
Thus in the preceding sketch, only the difference in weight will come upon the spring.

The experiment was tried and 10 mgs gave a readable deflection, the plate being balanced by weights to within 1 or 2 gms.

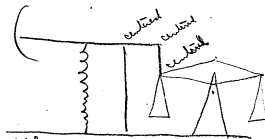
The experiment was repeated, using instead of a spring, a rigid connection between the beam and lever and if the plate be balanced to within 1 gm, the deflection indicates correctly the difference

June 14-93 - cont

The following sketches show
the various methods in which the
experiment was arranged

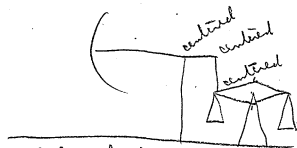


unsteady



(steady)

June 14 / 75 - cont.



(steady)

a counterpoise was added
to the ~~beam~~ to balance the
bridge between it and the
beam.

Thomas P. Conant.

June 21 - 90,

Tried springs of German
silver & bopper.

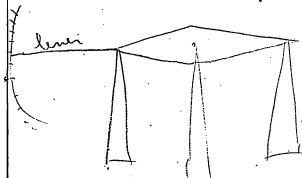
The German silver worked
well but was not sensitive
to small weights while the
bopper made a poor spring

a spring of german silver
wire 3" long and
having a diameter of $\frac{3}{4}$ "

gave with 20 gms a
deflection of 7" but would
show nothing short of 100
mgs.

June 21 cont.

Try the following arrangement-



In this we do away with all unnecessary friction, and the lever shaves from 1 gm to 10 mgs.. (lever 13" long), lever of course being completely rigid!

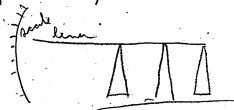
Thomas P. Leman

June 22 95/

Tried electric magnet to damp
oscillations of scale beam, using
a strip of copper as before,
but could notice no effect.

Thomas P. Garret

June 23 /40



Experiment repeated with
above balance.

Length of beam from fulcrum
= 17"

on the scale 1 gm gives a
deflection of 1" - from which
10 gms should give $\frac{1}{20}$ "

By test 10 mgs does just
this and hence the balance is
sensitive even to 1 mg

This is true up to a load of
40 to 50 gms but for 40-100

$$\frac{10}{100}$$

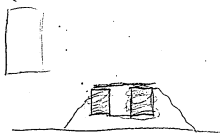
$$\frac{1}{100}$$

June 20 / 80 cont.

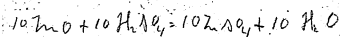
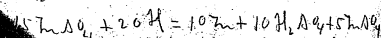
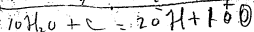
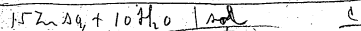
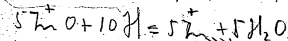
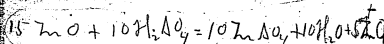
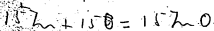
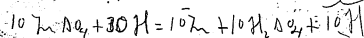
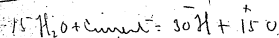
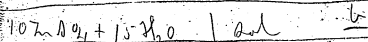
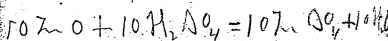
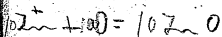
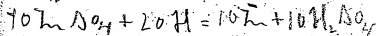
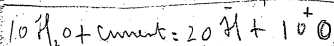
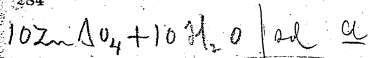
gives the deflection for a given difference is ~~quite~~ smaller

When loaded with
4 25- light-plates in each
pan, 1 gm. gives a deflection
of $2\frac{2}{4}$ "

J. P. Bonant



ref.	air	11,6506
"	H ₂ O	10,200
"	ΣH ₂ O	10,803-



with 15 of H_2O more oxide is formed on positive plate than can be taken up by H_2SO_4 formed

with 15 of ZnSO_4 the action seems to be all right

