

HENRY DRAPER MEMORIAL

*General Formulæ,
Receipts &c.*

1654phae.proj.26550

Cyanine Plates.

Hasselberg's Formula. — Copied from Wilson's Quarter Century in Photography Page 507.

From C to wave-length 5600. Cyanin, alcoholic solution (1:400), 2 parts; ammonia 1 part; distilled water, 100 parts.

Erythrosine & Cyanine Plates

Fred. E. Ives' Formula 1 — Copied from article on Chlorophyl and Gelatine-Bromide Plates in Photographic Times for June 22, 1888.

Flow with alcoholic solution of erythrosine (Eryth, 1 grain; alcohol, 4 oz.) Then dry and wash or soak in water. Use Cyanine in same way.

Erythrosine Plates

Prof. Trowbridge's formula.

Bathe plate two minutes in a one per-cent solution of strong ammonia in absolute darkness. (or solution is 2 dr. of NH_4OH to 24 oz H_2O .)

Stock solution: One gramme Erythrosine to 1000 grammes H_2O ; of this solution take 1 oz. Add one oz. of a ten-per-cent solution of NH_4OH and then 8 oz. of H_2O . Keep plate in this 2 minutes rock and drain. Expose when dry.

amin plates Prof. Trowbridge's formula.

Place a 20 c.c. porcelain dish over a high 15 c.c. beaker $\frac{1}{2}$ full of water (i.e. a water bath). Place whole over a Bunsen burner. In the dish place a 1 gramme bottle of cyanin, $\frac{1}{2}$ oz. chloral hydrate and 4 oz. H₂O. Stew for 25^m. over a moderate flame, frequently stirring & removing bottle to loosen cyanin deposit. Then add carefully 1 oz. of strong HCl & H₂O. Leave tranquil for about 5^m.

Meanwhile dissolve 120 grains of Quinine sulphate in a few ounces of methylated spirits (90% alcohol, 10% wood spirits) by gentle heat over water bath. Then decant the liquor from the former dish and the cyanin will be found deposited on the sides of the vessel. Now add 8 oz. methylated spirits and quinine mentioned above. The cyanin will readily dissolve. Keep in a light tight bottle.

The above seems to be necessary in order that the cyanin may penetrate the films.

on glass. Martin's silvering process as used for the 28 inch. Draper telescope. Receipt given by

Wm. Draper

1. 30 grammes nitrate of silver in 750^{c.c.} of water.
2. 45 " nitrate of ammonia 750^{c.c.}
3. 75 " caustic potash 750^{c.c.}
4. 37½ sugar in 375^{c.c.} water. Add to this 4½ grammes tartaric acid and boil ten minutes: When cool add 75^{c.c.} alcohol. Add enough water to make 750^{c.c.}

add 1 to 2, then 3 to 4, then mix the compound solutions.

Clean the glass with tartaric acid, then with potash, next with alcohol and last with water. c.c. = 1 oz.

The silver should begin to deposit in 1½ minutes and the silvering should be complete in 35 minutes.

Hydroquinon
Developer.

From.

Mons. Leon Vidal, editor of the Moniteur de la Photographie, recommends the Hydroquinone developer as given by Viscount de la Tour du Pin, viz:

Hydroquinone	- - -	1 grain
Sulphite of Soda	- - -	2 "
Carbonate of Soda	- - -	10 "
Water	- - -	67 "

Total - - - 80 gr.

It goes without saying that this developer is not absolute. Each operator can vary it to suit his plate and circumstances. For instantaneous work he advises to use the formula as given above; but for negatives which have been given time more water can be added, which will weaken the solution, and consequently a negative with more vigor will be the result.

"The Eye"

Erythrosine Plates Vogel's formula.

1:1000 Silver Nitrate.

25 parts of above.

1:1000 Erythrosine.

25 parts eryth.

50 parts H_2O .

Erythrosine Plates Eder's formula.

Solution of Erythrosine in H_2O 1:500

of above 2 parts.

Strong ammonia 1 part.

Water 200 parts.

Registering Ink Formula from Naval Observatory @ Washington D.C.

Water 4 fluid ounces.

alcohol 2 " "

Concentrated glycerine 1 fluid drachm.

Crystallized aniline blue 40 grains

($\frac{1}{4}$ teaspoonful Navy blue Diamond dye)

Blue Print Formula in use at NCO. for Sun Shine Recorders.

Dissolve in 5 oz. H_2O

1 oz Ammonia Iron Citrate.

Dissolve in 4 oz. H_2O

1 oz Red Prussiate Potash. (recrystallized)

In mixing dissolve the prussiate (after grinding) and add the iron last.

Dew preventative "Burning Fluid" from Ogden W. Rood.

a solution of Spts Turpentine in Alcohol. Upon evaporation deposit of resin left on glass not attracting dew. Common Commercial spirits should be used as the fresh pure article contains little or no resin.

Developer - Formula in use at observatory.

Soda Solution Dissolve in 384 oz. H_2O .

24 oz. Carbonate Sodium.

24 oz. Sulphate Sodium.

Add to above -

3 oz. Salicylic Acid dissolved in

$16\frac{1}{2}$ oz. C_2H_6O .

Silvering in glass Formula obtained from Alvan Clark & Sons

Take from 5 to 10 grains Troy of Silver Nitrate (crystals) for each oz. of water required to properly cover surface of mirror when placed in position in silvering dish.

Dissolve the silver in a sufficient quantity of water. (exact amount not important)

add ammonia ^m water carefully till a precipitate forms and continue adding till this precipitate is dissolved and no more.

add a sufficient amount of caustic soda solution to make the weight of solid caustic Soda $\frac{1}{2}$ to $\frac{3}{4}$ the weight of solid nitrate of silver used

another precipitate is formed. Carefully add just enough ammonia water to dissolve precipitate, being careful to avoid an excess.

add enough water to make the whole unit sufficient to properly cover mirror, as determined in the first step of the process. In determining this unit it is well to allow for the precipitating solution to be added later. This solution should be about $\frac{1}{6}$ of the entire bulk of the liquid when ready to receive the mirror.

The bath is now ready for the addition of the precipitating solution. after which the mirror should be quickly put in place as the silver at once begins to deposit. The precipitating solution should therefore be reserved until everything is in perfect readiness, so that no time may be lost in getting the mirror into place in the bath.

From 10 to 30 minutes are required for the silver to deposit properly.

The mirror should be placed face downward in the bath, a space of $\frac{1}{2}$ to $\frac{3}{4}$ inch being allowed between the face of the mirror and the bottom of the dish for

circulation. There should be just enough of the solution to cover the face of the mirror without being enough to cover the back. A wooden block may be cemented to the back of the mirror by means of pitch or some similar substance, to serve as a handle during the process of silvering. Any air-bubbles adhering to the face of the mirror should be removed at the start by tipping the dish. The bath should be thoroughly stirred with a clean glass rod after the precipitating solution has been added to insure a uniform deposit of silver.

After the silver has deposited, the mirror should be thoroughly rinsed with distilled water and allowed to dry after which it may be polished with fine rouge applied with a piece of chamois skin.

Distilled water should be used for all solutions employed in this process. All glasses & dishes used should be carefully rinsed with the same. The presence of any dirt or animal matter is often the cause of a failure.

much depends upon cleanliness of the mirror. All old silver should be removed with nitric acid and the mirror rinsed with distilled water. The surface to be coated should then be cleaned with a solution of caustic soda, being gently rubbed with a tuft of soft cotton to remove all dirt. After another rinsing it should be placed in a weak solution of caustic soda, face downward, and allowed to stand while the other preparations are being made for silvering. When all is ready it should be transferred directly to the silver bath without farther rinsing or rubbing.



CAUTION! after silvering, all glasses and dishes used in the process should be thoroughly washed, for if allowed to stand and dry without cleaning, a fulminate will form and an explosion would be a consequence probable. The caustic soda solution made for convenience with 100 grains to one ounce of water. The weight of solid caustic soda may then be easily determined by the no. of liquid ounces of the solution used.

Precipitating Solution.

3 qts. distilled water.

1680 grs (Troy) Sugar

78 grs Nitric Acid

26 drams Alcohol.

This solution improves with age.
as a substitute for distilled water
melted ice may be used; In this

Convenient Proportions for Mixing Brasher Solution

No 1 : 3 $\frac{1}{3}$ pints of water.

3 drs. 16 grains of Nitrate of Silver

3 drs. 16 grains of Rochelle Salts

4 pints of water.

No 2 : 13 drs. 8 grains of Silver Nitrate.

$\frac{1}{2}$ to 1 pt. Sulphuric Acid according to
energy of action desired.

A small quantity of nitric acid added
to the solution increases the constancy of the
battery.

Crystalline

Chronic A
Battery 2

3 qts. distilled water.

1680 gr. (Troy) Sugar.

78 gr. " Nitric Acid.

26 dracms. Alcohol.

This solution improves with age. As a substitute for distilled water melted ice may be used; In this case the water should be filtered through a cloth to remove any sediment which may be present.

Erythrinic Beate Formula given by Prof. Townbridge, Feb. 6, 1889.
 Solution of Eryth. $\frac{1}{1000}$ ——— 25 c.c.
 Nitrate of Silver $\frac{1}{1000}$ ——— 25 c.c.
 Distilled water ——— 50 c.c.

The smaller proportion of water makes the difference.

Chronic Acid
Battery Solution

Formula given by J. W. Queen & Co.

1 gal. Water

1 lb. Bichromate of Potash.

$\frac{1}{2}$ to 1 pt. Sulphuric Acid according to energy of action desired.

A small quantity of nitric acid added to the solution increases the constancy of the battery.

Developer

Regular Pyrogallie Acid Developer used at
H.C.O. Laboratory May 17. 1892.

In 384 of Water, Dissolve 12 oz. Carbonate of Soda
and 12 oz Sulphite of Soda.

In 16 1/2 oz. Alcohol dissolve 3 oz. Salicylic Acid
and add to the first solution. Shake or stir
until thoroughly mixed. This forms the liquid
portion of the developer and may be kept in -
definitely, being drawn off and used without
dilution.

When ready to develop draw off the required
amount of the solution and add pyrogallie acid
in the dry form in the proportion of about 1 gramme
acid to every 4 liq. oz. of the solution.

Developer for silvering

Silvering Solution

14 oz. Potash salts dissolved in 5 parts
water. Add slowly 1/4 oz. of nitrate of silver and
boil for 10 minutes.
Filter and let stand at least 12 hours before
using.

No. 2. Silvering Solution

Dissolve 1 oz. of Nitrate of silver in 6
parts of water.

Take out one quarter of it and add concen-
trated Ammonia in ^(the 3/4) until it goes clear
up.

Then add the 1/4 which you have reserved

slowly stirring all the time.
 Let stand 10 hours or so ^{and filter} before using.

To silver, use equal quantities.

These can always be kept on hand without danger of explosion.

This method answers best on top i.e. flowing the solution on top and rocking the mirror to and fro.

Meteorological
 Lab.

Formula given by S.P. Fergusson.

Dissolve $\frac{1}{2}$ of a package of "Diamond Dye" in 3 oz of water, and then add 3 oz of glycerine and stir well.

Hypo Solution
 for
 Bruce Plates.

Hypo
 Alum
 water

Hypo Solution for Bruce Plates (Oct 22 1894)
 32 $\frac{1}{2}$ lbs. or 5 Pyro Cans (1 lb) full

1 $\frac{1}{4}$ oz

104 lbs.

2 { Tank filled to within 3 in of top.
 after the Hypo & Alum are in.

Developer.

Regular Pyro Developer as used for Bruce plates
Nov. 25 1894

In 576 oz of water dissolve 18 oz Sulphate of Soda
and 9 oz of Carbonate of Soda (Granulated).

To this solution add $4\frac{1}{2}$ oz of Salicylic Acid
previously dissolved in 25 oz of Alcohol.

This forms the liquid portion of the developer.

In use, 32 oz of the above with 8 ^{grams} (by weight) of Pyro
are taken for 14x17 plates. Temperature about 70°.

Charge for
Samson
Battery.

Dissolve 6 oz of Sal Ammoniac for each
cell of battery.

Each cell should be filled to the height of
 $\frac{3}{4}$ inches, with warm water and then the
above amount of Sal Ammoniac put in
and the mixture stirred until dissolved.

Developer
for
Mr. Montgomery.
Formula for Developer given by Mr. Montgomery
Dec 5 1894

Formula to give best results with Seed 26x & 3 1/2 x 2 1/2

Solution A	Carbonate Potassium	2 oz
	Water	20 oz

Solution B	Hot Water	45 oz
	Sulphate Soda Crystals	1 1/2 oz
	Eikonogen	1/2 oz

To develop take of Solution A	1 oz
of Solution B	2 1/2 oz

Developer during the dark weather and cold months should not be below 60 degrees Fahrenheit. Always filter before using. Photographers who prefer Pyro can use from 1/2 to one quarter the amount called for in the usual formula and from 1/4 to 1/3 more Alkali.

Carbonate of Potassium is a better Alkali for Seed Plates than the common Carbonate of Soda.

metol &
Hydrochinon
Developer.

Metol & Hydrochinon Developer.
Formula furnished by J. J. Montgomery of Seed Co.

Water 1 - oz.

Carb. Soda 7 grains

Sulphite .. Cryst 20 grains

Bromide Potass. 1 "

Metol 2 "

Hydrochinon 1 "

Dissolve each in the water before adding another substance. (i.e. do not mix the various chemicals undissolved but dissolve them one at a time)

Developer in use at Harvard College
Observatory March 6 1896

In 384 oz. Water, dissolve 12 oz. Sulphite of Soda and 12 oz. Carbonate of Soda (Use 6 oz. of Carbonate when the so-called Granular Carbonate is used)

In 16½ oz Alcohol dissolve 3 oz. Salicylic Acid, and add to the first solution. Shake or stir until thoroughly mixed. This forms the liquid portion of the developer, and may be kept indefinitely, being drawn off and used without dilution.

When ready to develop, draw off the required amount of solution and add pyrogallie acid in

the dry form in the proportion of about 1 gramme to every 4 liq. oz. of solution.

Developer.

Podinal was adopted ~~on~~ on June 5, 1896. as regular developer for telescope plates.

It may be used either in the proportion of 2 drams to 8 oz. of solution or of 4 drams to 8 oz. of solution, the diluting agent being water. The first proportion will be known as 1:32
 " second " " " " " " 1:16

Solution 1:32 will develop 3 plates
 " 1:16 " " " 6 "

In both cases care must be taken that the quantity of developer is not much reduced. If this occurs it is best to add sufficient fresh developer to make it good. the loss.

What remains ^{-after development} may be used again if an equal amount of fresh developer is added.

Solution 1:16 is best adapted to slow plates when contrast is desired.

Development may run from 4 to 6 minutes or even longer if necessary for quick plates. For slow plates the time will depend on the appearance of the plate & in many cases will not exceed 2 minutes. A dense background should begin to appear after 6^s.

Johns Hopkins Univ. Dec.

H Hydrochloric 1 g
Sulphate Soda 5 "
distilled water 25 "
alcohol $\frac{1}{4}$ " ±

Hypo solution
Sulphate Soda 1
Hypo 5
water 25

P Potassium carbonate 1
dist water 6

F Potassium Ferro 1
dist water 6

b Potassium bromide 1
water 10

Normal (hard scope work) $75^a H + (12\frac{1}{2}^a P + 12\frac{1}{2}^a F) + 10^a b$

delicate thin negatives leave out b (sometimes unnecessary by developing alcohol)

vary amount of b according to results you are after

very great contrast ~~75^a H~~ $75^a H + 10^a P + 10^a F + 10^a b$

don't use iron trays. don't use slow in hypo

DIRECTIONS FOR USING Albuma Paper.

COMBINED TONING AND FIXING BATH.

Hot Water.....	66 ounces.
Hypo	16 ounces.
Sulpho Cyanide Ammonia.....	2 ounces.
Acetate Lead.....	$\frac{1}{2}$ ounce.
Nitrate Lead.....	$\frac{1}{2}$ ounce.
Citric Acid.....	$\frac{1}{2}$ ounce.
Chloride of Gold (in solution).....	4 grains.

Mix at least 24 hours before using. Allow to settle, and use clear portion only. Use 20 ounces of bath for toning 75 prints (cabinets or equivalent). After each 25 prints are toned, add $\frac{1}{2}$ ounce of a saturated solution of hypo, as it is absolutely necessary that there should be a large excess of hypo in the combined bath. When 75 prints are toned in this way, throw away three-quarters of the bath and add 16 ounces of fresh bath. Then tone 75 prints more in the same manner.

Place prints without previous washing in the above solution. Tone a shade warmer than desired in the finished print. This bath gives best results when used at 55° Fahr.

Wash in running water 1 hour, or in 12 or 15 changes of water, transferring prints singly from tray to tray. Mount and dry as usual. Burnish with hot burnisher. Use castile soap as lubricator.

DON'T OVERWORK YOUR COMBINED BATH.

Directions for Charging Fire Extinguisher

Fill Extinguisher with cold water to projection on inside of copper tank.

Put in $1\frac{1}{2}$ lbs. Bi-carbonate of Soda and stir thoroughly with soft pine stick. Put 4 fluid oz. of Commercial Sulphuric Acid into bottle (Regular 8 oz. size)

Place stopple in bottle, and put bottle in proper position in cage. Insert top and screw down tight.

N.B. When wholly or partly discharged, thoroughly reuse Extinguisher and hose, and then Recharge.

Protect from freezing

Silvering Solutions used by Professor Sanger.

I. 10 grams. Nitrate of Silver dissolved in 1000 cu. cm. water. Ammonia added until precipitate ^{just} dissolves.

II. 2 g Nitrate of Silver & 1.66 gms. Rochelle salts dissolved in 1000 cu. cm. hot water.

Filter both solutions, and use equal parts in silvering.

Benzine or naphtha, suggested to clean mirror after HNO_3 has been used.

Chronograph Ink.

1 fl. oz. "Slate" Diamond Dye dissolved in 1 pint of boiling water.

So 3 fluid ounces of the above solution add 1 fluid ounce of alcohol and $\frac{1}{2}$ drachm of glycerine.

Meteorological Ink.

used formula given by Yergesson, dissolving $\frac{1}{2}$ fl. oz. Diamond Dye in 3 oz. boiling water & adding 3 oz. glycerine.

(pages 21 & 22 were blanks)

Silvering Solutions (Formaldehyde) (Used by Mr. Sandis)

Silver Solution: 5 grains nitrate of silver
for each ounce of water: add
ammonia until solution just clears.
Set stand 15 to 20 hours and filter
before using.

16 oz. of this solution is plenty for a 24" flat
mirror.

Reducing Solution: 10 minims formaldehyde
for each oz. of silver solution.

For a 24" flat mirror, therefore, use
160 minims diluted in 8 oz of water
to prevent local chemical action.

Mix just before using as formaldehyde is unstable.

Clean mirror with nitric acid, then use
bichromate of potash dissolved in an excess of
sulphuric acid. Wash thoroughly with
distilled water.

Messrs. Sandis prefer using cloth such as
ordinary ~~to~~ surgeons' bandages to absorbent cotton
for cleaning.

They also build a dam around mirror using
ordinary Manila wrapping paper
soaked in beeswax.

With above proportions used 2 parts silver
solution (liquid measure) to 1 part reducing
solution. Strength of latter may vary. This

determined by experiment only.

Also sealed formaldehyde bottle with
beeswax when not in use.

Silvering
Metals

Myetron f. 475. 10 parts nitrate of Silver,
10 parts common salt, 30 parts cream of tartar. Moisten
the powder with water when ready to apply.

Silvering
brass.

Take 1 part chloride of Silver and 10 parts of cream of
tartar, and rub the brass with a moistened piece of
cork dipped in the powder.

To obtain the chloride of silver, drop common salt
into solution of nitrate of silver.

~~With fresh metal first with dilute ^(sulfuric acid) H₂SO₄, rid of all dirt.~~

FORMALIN

Extrad from Photographic Monthly Feb. 1909, Vol. 16 #182. p. 40.

"Formalin is said to be a 40 percent solution of
formaldehyde gas. — "Being a gas held in solution, the
gas is liberated gradually and this gas does the mischief
mentioned; and on account of its volatile nature it should
be kept tightly corked and returned to the stock bottle
immediately after use for economy's sake."

"Most photographers of my acquaintance seem to be
afraid of formalin."

"Their works of reference tell them that it, or rather
the gas that is liberated, attacks the tissues of the nose,
and does a lot of other damage to other organs, and these
facts are generally enough to dissuade them from experimenting."

I find that it does effect the above mischief, if one exposes
oneself to its influences but as this is generally unnecessary, the evil

Silvering Solution. (Formaldehyde)

25

Oct 27, 1908

Silver Solution:- 5 grain nitrate of silver for each ounce of ^{distilled} water. Add ammonia until solution just clears. (This is accomplished most readily by removing about one quart of the solution as reserve and adding the ammonia to the remainder. Then add the reserve.)
Set stand 12 hours or so, and filter before using.

{ 13 DWT 82 grains
in 2 quarts water

{ Equivalent in metric system
11 grms nitrate of silver
per litre distilled water
1 liter = 1.056 qts.

Reducing solution:- 10 minims formaldehyde per ounce of silvering solution.

Mix silver and reducing solutions just before pouring onto the mirror, using dam of paraffined paper.

Clean mirror with nitric acid. Wash thoroughly with running water (i.e. go over mirror thoroughly three or four times using fresh absorbent cotton repeatedly.) Finish washing by using distilled water and rinsing thoroughly.

The temperature of the silvering room seems to be very important, as regards to the result.

The best results have so far been obtained when the room temperature ^{was} at 60° F

Sept 30, 1909 By Lindber's suggestion we now double the amount of nitrate of silver and the formaldehyde.

L.C.

superseded
see next page

Silvering solution (Formaldehyde)

Silver solution: -

Dissolve 10 grains Silver Nitrate, to each oz of Distilled Water. = 21 grains ^{Sol. Nit.}, to 32.4 g. water. Add Ammonia and then clear.

Reducing solution: -

20 mm. of Formaldehyde & in 5 times its volume of distilled water for each g. of silver solution used.
= $\frac{2}{3}$ g Formaldehyde and $3\frac{1}{3}$ g Water to 16 g Sol Nit.
Mix just before using.

$$\frac{3}{2} \times \frac{9}{32} = \frac{27}{64}$$

Clean mirror

1st top water

2nd Nitric acid (swabbed with cotton)

3rd top water

4th Distilled water (swabbed)

5th Mixture of Tin (2 g tin mixture in 19 g H₂O.)

6th Distilled water.

If water recedes from mirror on the sixth process, mirror not clean it repeat 5th and 6th processes.

Place paraffined dam about mirror then apply solution faintly, rocking mirror till solution turns decidedly dark, then tear off dam.

February 16, 1910.

L. Campbell.

$$\frac{2}{3} \times \frac{1}{6} = \frac{2}{3} \times \frac{1}{2} = \frac{1}{3}$$

$$\frac{3}{2} \times \frac{9}{3} = \frac{9}{2} = 4\frac{1}{2}$$

$$\frac{3}{2} \times \frac{1}{2} = \frac{3}{4}$$

$$\begin{array}{r} 1 \\ 24 \overline{) 160} \\ \underline{16} \\ 0 \end{array}$$

Directions for ~~Re~~ Silvering Mirrors

Being the method used by Mr. Lunden on ^{H.C.O.} our mirror with the greatest success of any previous methods used here.

- ① Clean off old deposit with aid of Nitric acid and tap water, being careful not to allow hands to come in contact with mirror.
- ② Cleanse with a solution of Muriate of Tin (2 oz Muriate of Tin to 1 qt H_2O) using absorbent cotton and swabbing mirror well.
- ③ Thoroughly cleanse mirror of the Muriate of Tin with tap water and place a paraffined paper dam around edge of mirror, and keep mirror well covered with water until actually ready to apply silver solution.
- ④ Prepare silver solution by dissolving 10 grains Silver Nitrate to each oz H_2O (distilled water not being necessary). 24 oz solution enough for a 24 inch mirror. Add small quantity of concentrated ammonia and then add more in smaller quantities until solution just clears. (Do not filter) or allow to stand long before use.
- ⑤ Add just before applying solution to the mirror 20 minims of formaldehyde to each in 5 times its volume of water, to each oz of solution used.

- ⑥ Pour ~~Remove~~ water from mirror and apply rubbing solution. Rock mirror gently, allowing solution to move over the entire surface. Keep solution on mirror until no further deposit seems to take place, or until solution becomes quite dark.
- ⑦. Pour off solution and scrub with top water and cotton removing all free sediment.
- ⑧. Stand mirror on edge, allowing same to drain and when thoroughly dry, some polishing may be done with roughed chamois.

Leon Campbell

Dec. 5, 1910

24 grains = 1 part
 20 part = 1 oz. = 480 grains
 12 oz = 1 lb.
 60 min = 1 hour
 8 drachms = 1 ounce = 480 minims

10

Directions for Resilvering Mirrors.

1. Clean off old deposit with Nitric Acid ~~and tap wa~~ being careful not to allow hands to come in contact with mirror.
2. Cleanse with water and absorbent cotton
3. " " solution of Muriate of Tin (2 oz. Muriate of Tin to 1 qt H_2O) using absorbent cotton and swabbing mirror
4. Cleanse mirror of Muriate of Tin with tap water.
5. Place a paraffined dam around edge of mirror and keep covered with water until ready to apply silver solution
6. Prepare silver solution by dissolving 16 grains Silver Nitrate to each oz. of H_2O (24 gr oz enough for a 24 inch mirror. Clear with concentrated ammonia (add a few drop and each time a smaller amount until it clears)
7. Add. just before applying to mirror 20 minims of formaldehyde in 5 times its volume in water to each oz of solution used
8. Pour water from mirror and apply silvering solution. Rock mirror gently taking care that the solution cover the entire. Keep solution on until it become quite black. Swab
- Pour off solution and apply tap water and swab. stand on edge to drain and it may be polished when dry by using rough face shamoon

24 grain = 1 part
 20 part = 1 oz
 12 oz = 1 lb.

60 min = 1 dram
 8 dram = 1 oz.

H_2O H₂OH₂O

Plan of Switch Board Connections.
Board in Mr. Gerrish's room in N.W. College.

8 in Bache Telescope.

Focus:- Unscrew lens tube through $3\frac{1}{2}$ of the spaces between screw heads on lens tube.

Shed clock pendulum for sidereal rate; bob adjusted so that bottom surface of stop under bob will be 33 mm. above tip of point on the bottom of pendulum rod.

11 in Draper Telescope.

Focus for Telescope (photographic lens on) without prisms.

Focus for outer prism Red 6.0 Blue ~~5.7~~ ^{5.2}

Focus for " and inner prisms.

" " " " double " 5.0

" " all four prisms. 6.7

(Foci expressed in terms of scale on draw tube.)

Deviation of outer prism. 8°.8

" " " and inner prisms

" " " double "

" " all four prisms " 32°.5

Angle of Prisms B & C combined = 24°, determined by protractor Jan. 8. 1891.

Change of 1 gm in load on clock gives change in rate of about 10.5 ~~per year~~ per hr.

8 in. Drafer Telescope.

11 in Draper Telescope.Rates of control clock.

<u>Date.</u>	<u>Load.</u>	<u>Run.</u>	<u>Error.</u>	<u>Error per hr.</u>	<u>Observer.</u>
Oct. 8, '89	0	61 ^m	# 5 ⁵ .4	- 5 ⁵ .4	W.P.G.
" 10.	0	60 ^m	- 3.0	- 3.0	W.H.A.
" "	1/2 g.	60	+ 22.2	+ 22.2	W.H.A.
" "	1/2	60	+ 20.4	+ 20.4	W.P.G.
" "	0	60	± 0	0	W.P.G.
" 14 90	0	60	- 57.8 ²	- 57.8 ²	W.H.A.
" "	5 g	65	+ 1.6	+ 1.47	W.H.A.
Jan. 10 91	3	65	- 4.0	- 3.6+	W.H.A.

DateRemarks.

Draher 11 in Telescope.Determinations of Focus.

<u>Date:</u>	<u>Prisms:</u>	<u>Focus</u>	<u>Date:</u>	<u>Prisms:</u>	<u>Focus:</u>
Oct. 10, 1889.	A ^{ABC} BCD	5.0 P.C. 2162			
" " "	A ^{BC} BCD	5.5 P.C. 2163			
Nov. 6 "	A	6.0 (Red) C 2209			
" " "	A	5.2 (Blue) C 2209			
Sep. 23, 1890	O	6.4 C 2946			
	D	7.4 C 4448			

Instruments built at H.C.O. Shop.

C.O. No.

#

- | | |
|-----|---|
| 1. | Pole star Recorder Completed Jan. 30. 1891. |
| 2. | " " " |
| 3. | Small Equatorial Mounting. Comp. Nov. 1890 |
| 4. | " " " |
| 5. | Transit Photometer Comp. Mar. 5. 1891 |
| 6 | Magnetic Break Circuit. |
| 7 | " " " |
| 8 | " " " |
| 9 | " " " Comp. Mar. 1891 |
| 10 | " " " " April " |
| 11. | " " " " " " |

Sent to Blue Hill Observatory.

Sent to Peru with Expedition.

Mounted at H.C.O.

In use at H.C.O. for 8 in Drafer tel.

Sent to Peru with expedition for use with 13 in.

" " " after " "
Used with 15 in ^{refl.} and Boyden Mtg. at H.C.O.

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