

HAROLD E. EDGERTON

PAPERS

MC 25

Series III

Laboratory Notebooks

Number

Dated 16 April 1935 to 23 January 1937

Morton Co.

University

SCHOOL SERIES

Composition Book

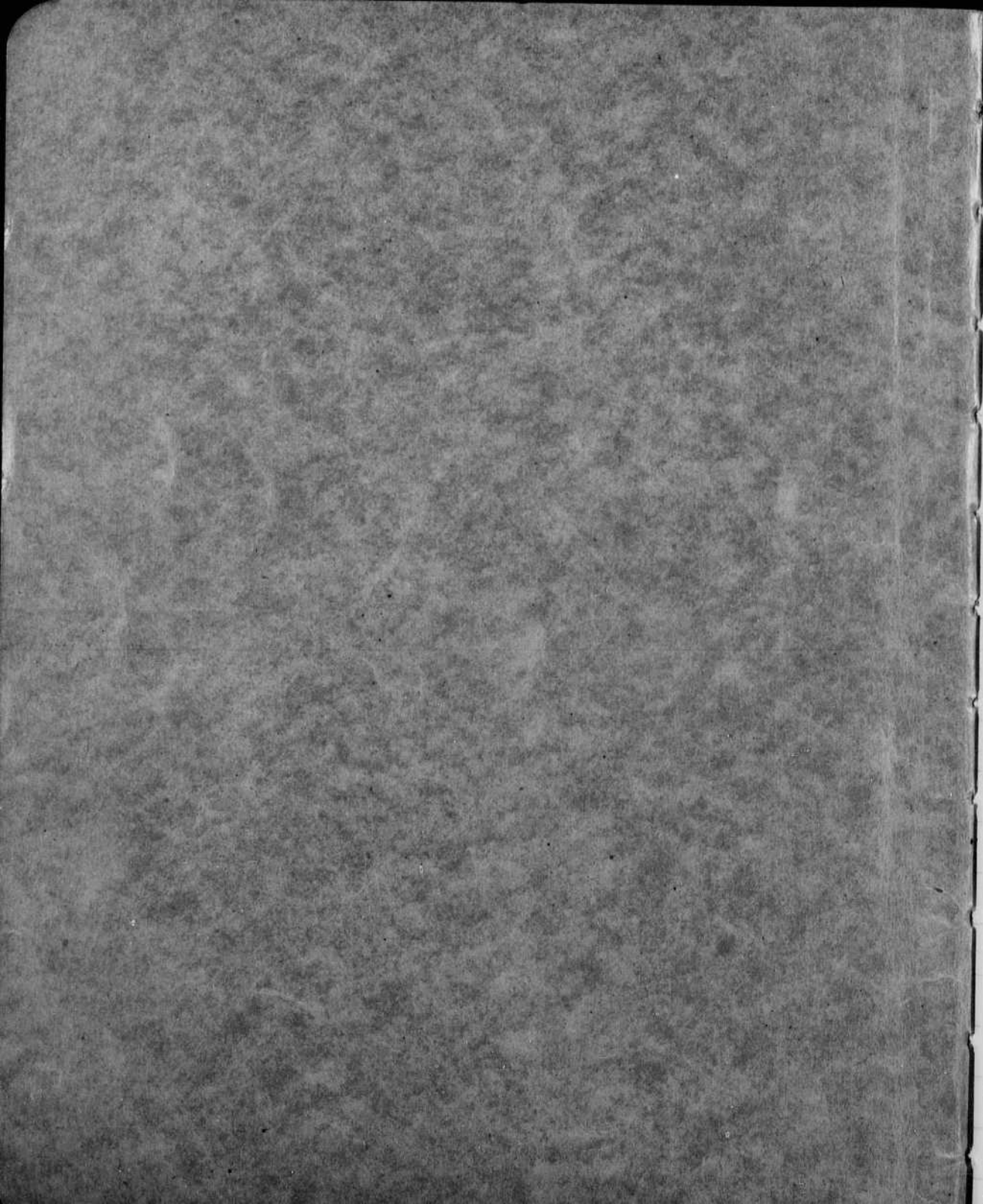
Grinding Wheels.



Harold E. Edgerton

NAME _____ GRADE _____

B580



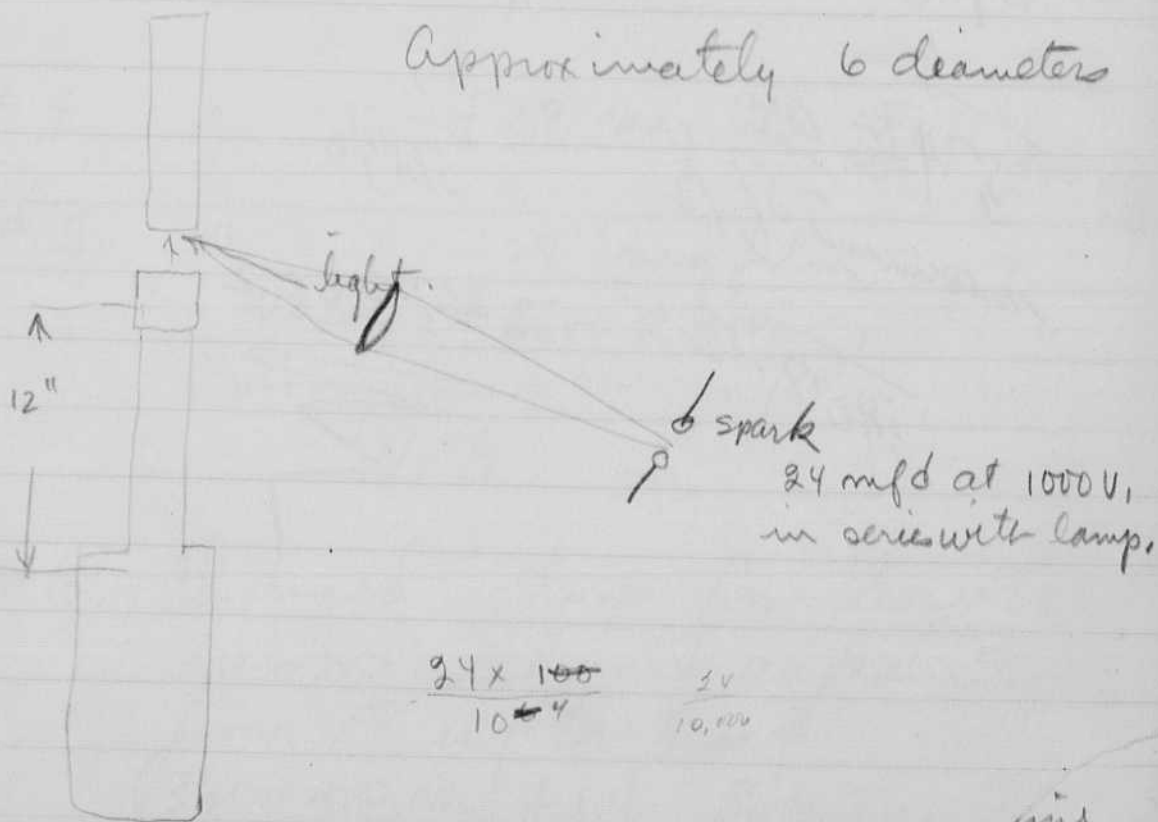
Beecher
Hudson
brought two
wheels.

Apr. 16 - 1935

Preliminary set up -

Wheel not running.
Wheel $6 \times 1 \times \frac{1}{2}$ # 1936 J. (Aluminum ^{Fine grit.})

Approximately 6 diameters



$$\frac{24 \times 100}{10 \rightarrow 4}$$

$$\frac{5V}{10,000}$$

and
h.

60 PFS

18" Cu

2 $\frac{60}{90}$ sec

6

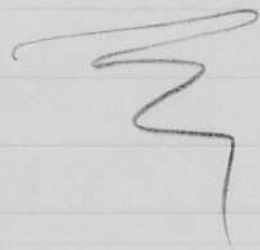
$\frac{540}{6}$ sec

movement of $\frac{1}{8}$ "

$\frac{1}{540 \times 8 \times 12}$

=

.000002



8x2

96

540

3840

480

51840

$\frac{1}{51840}$

#1 - Lens set at $f 1.4$
Positive film.
thin.

#2. Lens at $f 2.8$ Positive, old
developer.

#3 " " $f 1.4$ " M. Q. Dev.

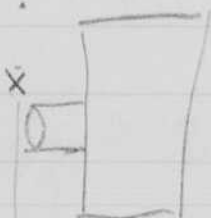
#4 " " $f 2.8$. Neg film, 48 uf, " $1200 v?$

#5. " " $f 2.8$ neg film
wheel at 3600 R.P.M. "
Long blur $1/8$ " on film.
N. G.

#6. Changed set up from lens to
mirror. Reduced capacity
from 48 uf to 5 uf.
3600 r.p.m. $f 1.4$ Exposure time
shorter but not quite enough.

Set up of April 17,

Spark.



spark source
of light

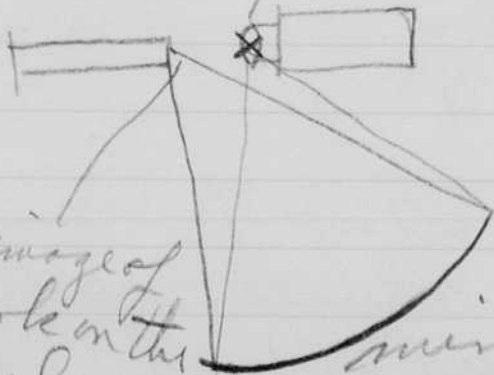


image of
spark on the
wheel.

mirror.

April 17 1935
H. E. Edgerton
H. E. Grier,

Grier changed the setup during the day again using the large mirror but placing the spark close to the object in order to also get light to it by reflected light directly from the spark. Magnification reduced to about 2 instead of 4 as used yesterday.

7 Wheel stationary Regular neg film f 1.4. 3 uf 1200 volts. Developed in fresh M Q developer 5 minutes, ok.

8 Wheel rotating 3600 RPM Panchromatic film f 1.4 3 uf M Q developer 7 minutes

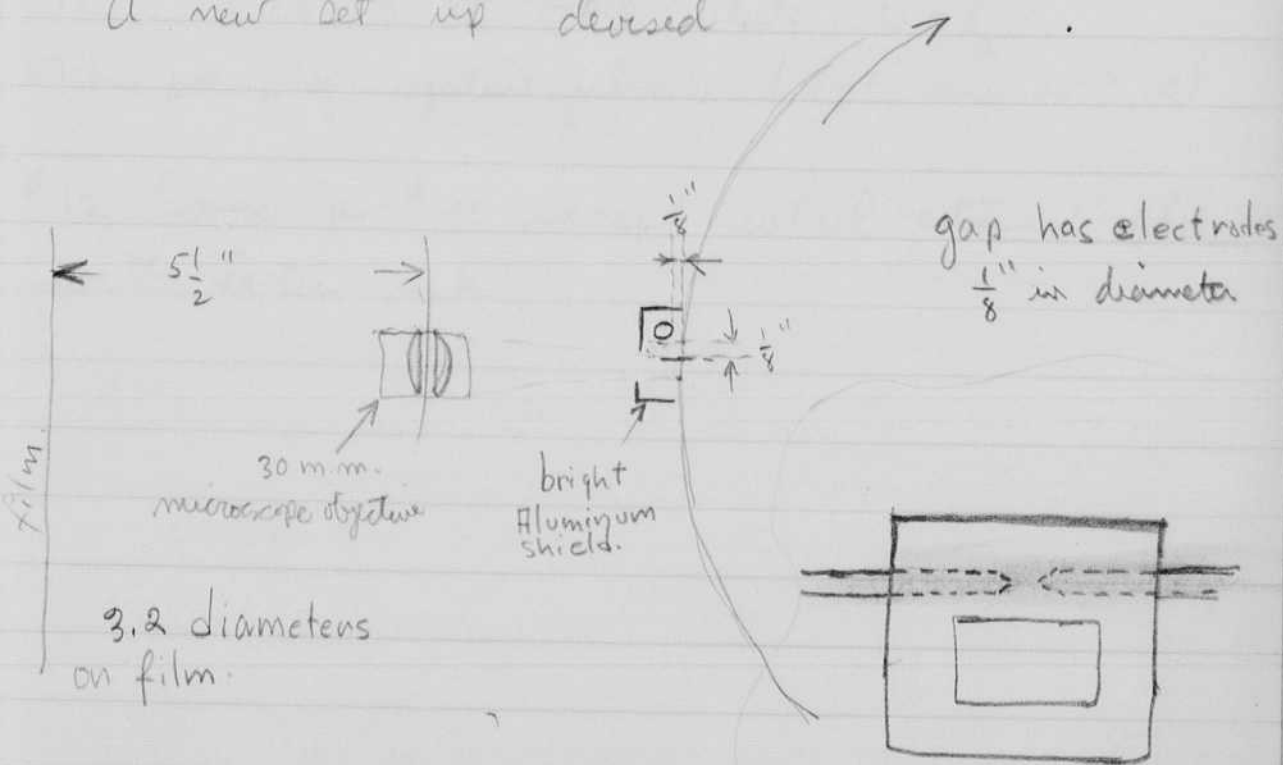
#9. Ditto as No 8 except
Sound Recording ~~negative~~
positive film was used.

June 1, 1935

Germeshausen

Difficulty so far has been 1. insufficient light, 2. trailer, 3. Lack of contrast.

A new set up devised



Gap power = 1 mfd at 1000 volts
in series with standard 12" lamp (20 m.m.)

Light circuit changed to reduce
inductance - twisted pair lamp cord
used for connections.

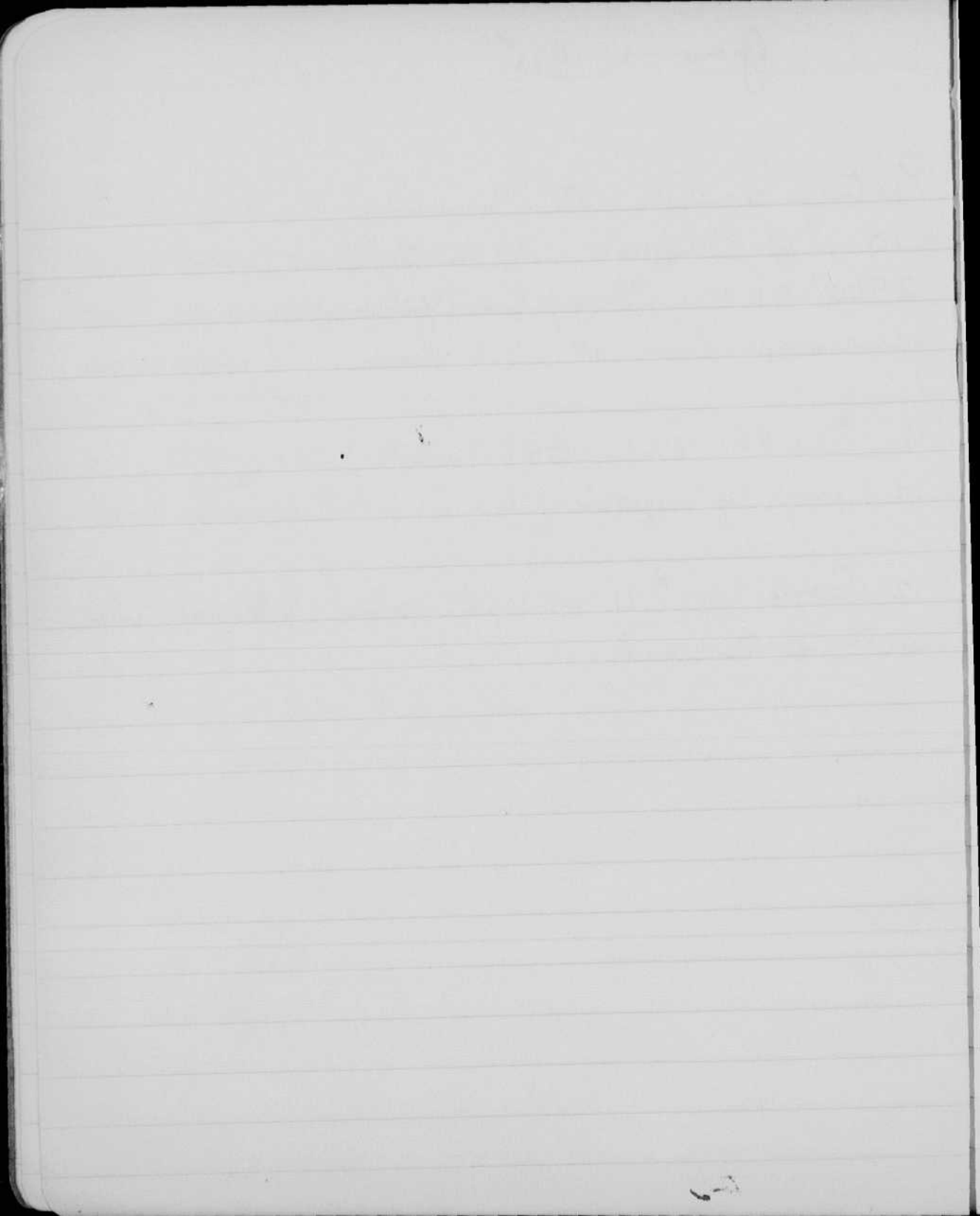
June 1, 1935

Pictures -

#10 #19 Alchum 1936-J (brown) 6×1
2500 r.p.m., ^{neg} negative film, 30mm.
microscope lens at 3.2 diam. (imp'd 1000 v.)

#11 #38 Al 3836-G8B (white) $6 \times \frac{1}{2}$
2700 r.p.m., neg negative film, (Rest same as #10)

#12 Same as #11 except wheel stained blue
with katers ink.



June 12 1935

Estimate of time and materials
used to date.

Film expense. \$ 25 - 30
time 3 weeks. ±. \$ 400.00

June 12. 1935. Edgerton left for
Worcester at 10 am returned
at 6 p.m. Discussed program
for advanced work with Mr.
Chas J. Hudson, Mr Beecher, etc.
Samuelson, Wagner. Estimate of
program \$2000 for summer.

June 13. Sent Bill for \$150 as per
order of March.

Set up wheel 20 Q about
1:1 on film with f1.4 1" lens.
Aperture at f4 for picture.
(30kw) 4 mf. Gap $\frac{3}{4}$ " directly above
#13

section of wheel which was being
photographed. 6 hrs spent today
A.S.H.

June 14, 1935. Speed of wheel 3300 R.P.M.
Tried some more pictures

14. 20 @ wheel 1" lens f8 4uf

15 " " " f4 "

16 " " 32 mm microscope lens
4uf. spark close
as possible.

July 16

Arranged to have "Taylor and Jewin"
grinder brought over from the machine
tool lab about July 1.

a Saeed casting was ordered
which will serve as a mount for
the camera.

Filming and Separation Record

___ unmounted photograph(s)

___ negative strip(s)

 1 unmounted page(s)
(notes, drawings, letters, etc.)

was/were filmed where originally located between page ___ and ___

page labeled Ju

Item(s) now housed in accompanying folder.

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A.S.H.

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page labeled J

Item(s) now housed in accompanying folder.

June 12

#cc

R.F.G.

Emi.

1 day

1

1

1

3

1

5

2

15

35
15
175
35
<u>525</u>

35
15
175
35

\$ 525.

R.P.M.

Film estimated

\$ 20.00

Printing

20.00

Labor

Ben 8.00.

Shop. 30.00.

Karlson 2.00

40.00

Grinder

13.00

Steel for frame

~~13.00~~

as
lose

Mr. Hudson and Mr. Whitcomb were here last week and brought a wheel which did not fit the grinder - Another will be made and will get here in about two weeks.

Sketches have been made of the camera support and Mr. Kershaw has been engaged on his own time to build it for us.

Harry Lawrence made the computations and balanced the wheel.

August 29, 1935
H. E. Egerton.

The Taylor and Ferner Grinder has been adapted to take the camera etc. A commutator has been placed on the shaft and the spark light arranged to be close to the wheel. A 32 mm lens (Bausch and Lomb microscope) is used as a lens and the magnification about 1:1 on the film.

Two pictures were taken yesterday. One a sample shot to see if the focus was satisfactory and the second a picture of grinding ($\frac{1}{2}$ " drill rod).

- # 17 test strip
- # 18. Grinding $\frac{1}{2}$ " drill rod.

August 27 1957
H. H. H. H.

The paper on the
has been reported to
concern the
has been placed on the
and the
to be close to the
is on the
mainly
for
about 10
the
up to
the
a
Hill
#1
#2

Aug 30 1935

H. Edgerton

Mr. Hudson and his son
George were here this morning.
We took two movies of the
grinding wheel.

19. Aluminum

20 Soft Iron or steel.

The wheel was taken off
and balanced.

Prints from # 18 were given
to Mr. Hudson.

Page 30
1900

The doctor and his
group were here this morning.
He took two measures of the
grounding water.
#11

30 Effluent water

The water was taken off
and cleaned.

Drinking water # 11 was given
11

Aug 31. Negs. 19 and 20 Developed.

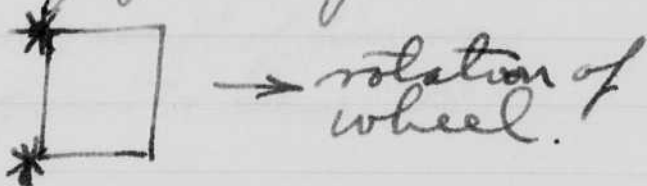
~~Aug~~ Sept 1. neg 19 printed frame by
frame by. HEE & K.J. S.
8.30 - 4.00
also planned use of the
other camera Universal.

Sept. 2. Started work on Universal
mounting.
Lens tube,
Flexible drive 1:1.

Sept. 3. Finished nearly

Sept. 4. Finished setup.
21. trial shot for focus
22 first 50 ft al.
Second 50 .. from drill
rod.

23. Iron strap. 60 ft \pm
f 5.6. Gap at either
side of photograph.



These films 22 and 23 were
taken to L. Withwell in the
evening and a print made
for projection.

Sept. 5, 1935.

The projected movies are
jumpy. This needs to be
fixed.

23. Jan 23rd 1935
+ C.E. Dept of Geology
+ Dept of Geology



These lines 25 and 23 were
taken to E. Michael in the
evening and a print made
for projection.

Sept. 2, 1935

The projected numbers are
given. This number to be
fixed.

Sept. 6, 1935, Mr. Hudson and Mr. Beecher were here this morning and saw the movies that have been taken to date. About 300 ft of film was ~~sent to~~ given to them to study.

Nov 13 1935. Mr. Hudson sent a large grinder about a month ago and it is now installed in the student shop. I made a trip to Worcester to see it before it was sent in order to arrange holes etc in the cover. Mr. Hudson came over after we had received it from them to help true up the wheel. This was the day that Gens & Grier were at the Foster machine Co plant.

On no

On Nov 11 the camera was mounted
and lined up with the wheel. Harry
Lawrence and Joe Gohmes are doing
the shop work on overtime.

- try 1" lens 1:1 on film.
- 1000 volts 2 w.f. capacity
- 2 gaps in series.
- Super speed panchromatic film.
- D76 developer. 1 Picture per rev.

Nov. 23. — Nov. 18-23

Have spent this past week
getting the grinder going. The
motor was badly unbalanced,
so it was balanced and the
camera supports braced. The
belt ~~is~~ makes an erratic vibration
that swings the camera on the
order of $\frac{1}{16}$ inch so we are going

The first thing I noticed
was that the water was
so clear and blue. I
had never seen anything
like it before.

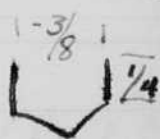
The water was so
clear and blue. I
had never seen anything
like it before.

The water was so
clear and blue. I
had never seen anything
like it before.

to put in a V belt drive.
Spent yesterday afternoon
getting this going have
ordered a drive from Hinds
and Coon over town.

Data on Motor Unbalancing

Static unbalance 4.7 inch ounces
Dynamic unbalance 8 inch² ounces
drill

Metal removed in $\frac{3}{8}$ " hole 
 $\frac{1}{4}$ " deep (excluding tip depth)

Volume removed in 1 hole = 0.001 in³

Volume to be removed statically = 0.33 in³

Volume to be removed dynamically = 0.07 in³
each side of couple.

To put in a V belt drive
I need a pulley of diameter
getting 1/2 inch larger than
the pulley it drives. This
will give a 2% increase in
speed.

I like to use water pump
impellers for pulleys. They
are available in 1/2 inch
increments.

Water pump impellers are
available in 1/2 inch
increments.

Water pump impellers are
available in 1/2 inch
increments.

∴ for static we drilled 9 holes
and for dynamic 2 holes left front
and 2 holes rt. rear.

(arms = 4" and 6.5")

We checked it roughly,
may have to rebalance it for final
adjustment.

~~Nov 23 Dec~~

Nov 24 - 29 - waiting for V belt
drive.

Nov 29. - Dec 10.

Installed V belt drive.

1. for about 1000 ft. below

level for specimens a basin

about 2 miles in diameter

(see map p. 10)

the level of the

may be due to the

adjustments

the level

has been found to be

about

1000 ft. below

level of the

bolted machine to the floor,
and rebuilt the camera
stand.

Sat Dec 7 made the first
test with the new machine.

~~#~~
Shot #1 - 35' - grinding galv. Iron Pipe
a little jumpy with bad
traces of sparks

Put in a baffle plate and
put a ~~glass~~ cover glass under
the lens.

Dec 9.

Shot #2 - 80' - grinding 2" \square machine steel
SS pan - F3-5
3mf - approx 1000v

1900

Received from the
of the

of the

of the

of the

of the

Worked Monday night. Dec 9.

Tues. Dec 10.

Beecher came in from Horton
and we took 200' movies.

approx 1/2 min grinding flat on Mach Steel
" " " grinding on edge " " "
rest of that group grinding flat
on machine steel.

rest of 200' grinding cold rolled
2" round stock. Start flat
then come up on edge.

Expenses from 9-1-35 to Dec 10 Inc,

9-1-35	160' Neg	\$ 6.40
	Print 5/160'	5.00
	V drive	35.40
	Steel	1.90
12-7-35	150' 55 pm	6.00
12-10-35	Shop approx 20 hours	20.00
	Materials approx \$10	10.00
		\$4.70

Mech. work + materials

20.35.40
~~1.90~~
 1.90
 34.40
 56.30

film, materials

5.00
 6.40
 6.00
 8.00
 10.00
 35.40

Bill.

on Sept 11, 1935

Norton co billed as follows
work during July + August \$525

Mechanical work \$53

Photo Materials + Expenses \$40

\$618

N.E.E. K.J.G. N.E.G.

9-1-35

1

1

9-2-35

1/2

9-3-35

1/2

9-(4+5)-35

1

9-6-35

1

11-13-35

2

11(19-23)35

5

$$\begin{array}{r} 35 \\ 35 \\ \hline 385 \end{array}$$

time continued

(11-29)-(12-7)-35
(12-7)-(12-10) 35

H.E. 9-5
H.E. 3

H.E.S. & K.L.G. 8 days

H.E. 13 days

↳ Since 10 of these days are ordinary mechanical work they should go in at \$8 per day.

$$\begin{array}{r} 11 \times 35 = 385 \\ 10 \times 8 \quad 80 \\ \hline \$465 \end{array}$$

time from Sept 1 to Dec 10 Inc.

= \$465

Mech work & V belt drive

= \$6.30

Bill dated Dec 10

for work Sept 1 to Dec 10 Inc.

work on problem D-38 \$465

Mechanical work + Drive \$56

film + materials \$35

\$556

film and materials

~~465.00~~
~~56.30~~
~~35.70~~

~~\$556.70~~
618

total Expenditure = \$1174

total appropriation \$2000

1174

Money Left

\$826

[Faint, illegible handwriting at the top of the page]

[Faint, illegible handwriting in the upper middle section]

[Faint, illegible handwriting in the middle section]

~~1 day~~

[Faint, illegible handwriting in the lower middle section]

12-24-35

H. Grier

The film taken on the 10th was developed and found to be jumpy. The 17th was spent by Grier in eliminating the jumps to a large extent. This was done by putting a battery bias on the thyatron to kick it off (45 volts) also the gap was reground and lined up.

On the 18th Grier took 200' feet of movies repeating the action of the last one - namely - Machine steel - 50' flat - 50' on edge and cold rolled steel on edge. This picture was all right.

12-11 - 12-24-35

~~100~~
time

H.E.P. - 3 days on machine

H.E.P. 1 day talking to men

Expenses

200' film

developing

Printing

Reel

Print 200'

from the standpoint of ~~technical~~ ^{technique}
but there was not very much
action. The men from Boston
were down the 23rd and viewed
the pictures several times.
They are going to send a
wheel of 12 grit and bring
down some metals to grind.
We will fit a pressure bar
to the grinder and go to town.

The bar. + sparks deflector #1
are on
and the 12 grain wheel #2
is on.

time.

12-28-35

1 day

N.S. 9

12-30-35 1/2 day

N.S. 5.

1 day

N.S. 9.

Processing + tests

1 day

N.S. 9.

12-30-35

T. E. Grier

200' Ascolory steel
60' stainless steel;
~~100'~~ same A 60' Brass

Mr. Whitcomb.

Mr. Emston?

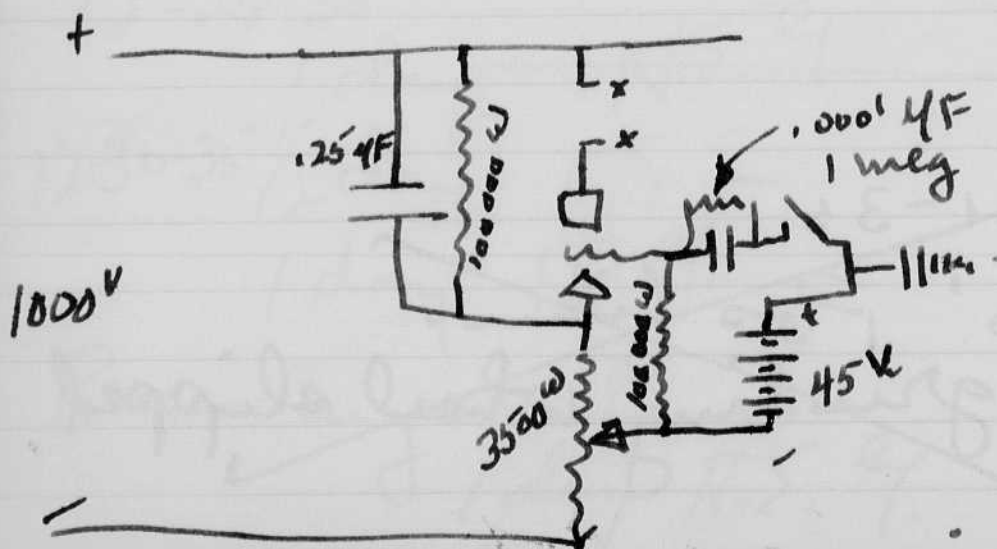
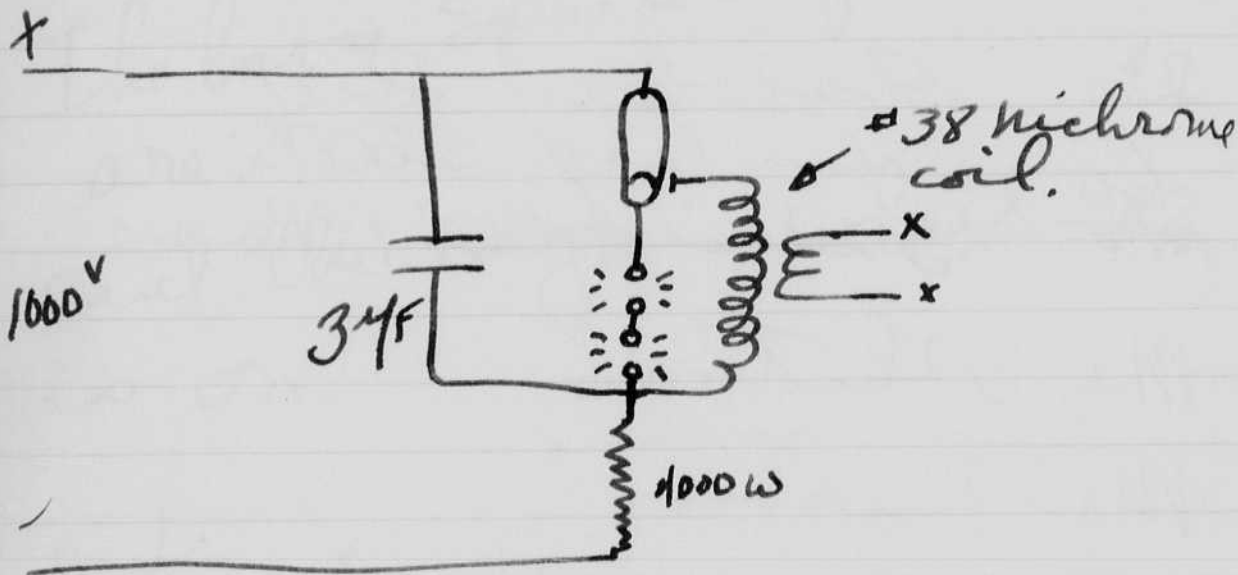
grinding with pressure bar
corium

~~12-31-35~~

~~50' Pos film.~~

~~grinding wheel slipped~~

Latest circuit



1-2-36

H.S. Gier

Spent all day tuning up
the grinder took pictures in
the evening

#3 - 200' Aescoloy Steel
Medium Pressure

#4 - 200' Brass
Medium Pressure

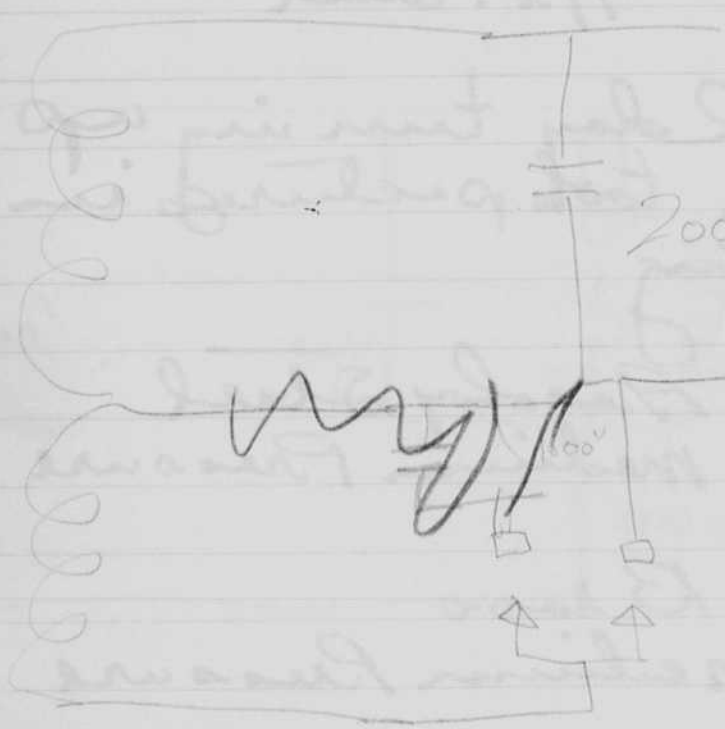
time

H.S. G - 1 day

H.S. S. $\frac{1}{2}$ day

the bosch coil introduced
a time lag that was erratic
this coil does not.

1-2-52



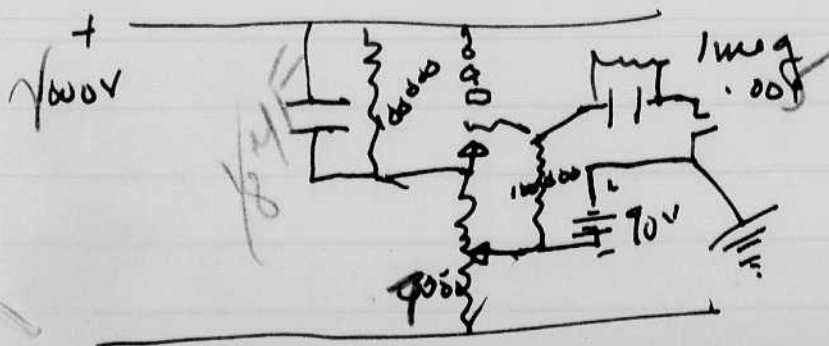
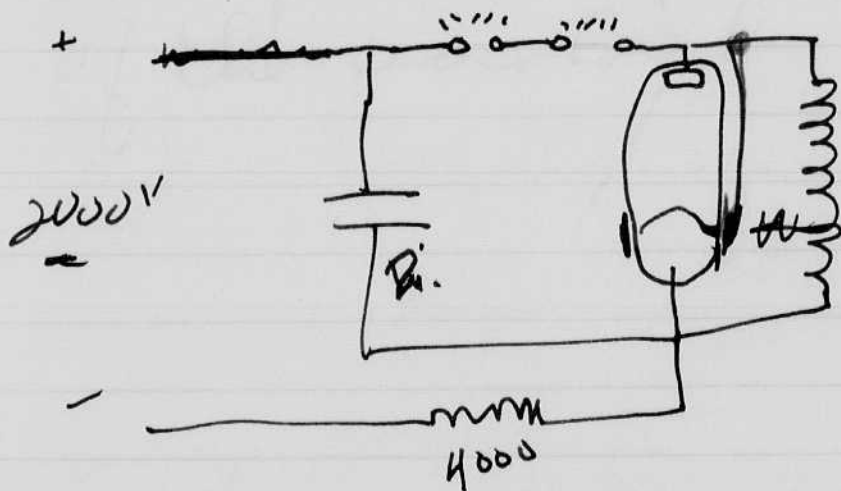
2000V

100V

3-17-36

A.S. Klein

going to rebuild circuit putting 2000 volts
on power supply - the specs to
remain on 1000 volts - 70v tripping
.001 condenser for trip also change
position of trip coil



200' pneumatic

2 1/2 days H.S. 9.

1/2 day Gerns hausen.

3-11-36

H. E. Geier

Spent 2 days working bugs
out of setup this evening
Gerrits and myself took
#5 200' panatomic film f 6.3
of the ascology.

3-16-36

A.E. Grier

Bill from 12-12-35 to 3-15-36

Time
Grier 8½ days

Edg 2 days

Stevens ½ day

11 day \$35

\$385

Film 200' + extra print (154 ft)
260'
400' 104 ft
200'

Mechanical work (lens mount) \$8.00

Lens. Wollensak 35x2" \$11.00

$$\begin{array}{r}
 385 \\
 30 \\
 26 \\
 40 \\
 20 \\
 8 \\
 \hline
 11 \\
 \hline
 \$520
 \end{array}$$

$$\begin{array}{r}
 116 \\
 127 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 385 \\
 8 \\
 127 \\
 \hline
 520
 \end{array}$$

Left 12-11-36 \$826

$$\begin{array}{r}
 520 \\
 \$306 \rightarrow \text{left for further work}
 \end{array}$$

3-10-36
tools¹ no good 5.6

tools² good 5.6

#3 good 5.6

#4 ship in middle (3.5)

#5 camera journal

4-9-36

H.E. Grier

Spent Morning assembling rig.

Mr England and Mr Whitman
came down and we proceeded
to grind.

Ran the rig visually for
about 10 min but you can not
see anything.

#6 not very good. f 6 Panatomic

#7 good f 6

#8 good f 6

#9 " ship in middle f 3.5

~~#10 camera jammed~~

all above shots 200' long.

Must Raise the Power supply

N.E. Green
because the iron dust and
chips make it hold over - must
effectively short the contactor leads

Camera jammed and was rebuilt.

July 8, 1936

H.E. Edgerton

Grier and I took 200 ft
of film (Eastman Par speed.)
Soft grinding wheel #(?).
Argon lamp. 3mm x 1 1/2" at 30 cm
pressure.

We took about 100 ft a
week or so ago which was
very good.

July 11 1936.

Reviewed the 300 ft of film
that is described above.

Estimate of expenses and time from 3-15 -36 to July 11, 1936

Film 1300 ft negative plus
processing & print \$ 130.

H. E. Grier 6 days @ 35 210.

H. S. Edgerton 2 days @ 35 70.
\$ 410.

9-3-36

H.E. Gries

Set up and took some test film
No grinding

20 frames $f+1$

20 frames $f 5.6$

20 frames $f 8$

} Slow Rotation
D76

3

5' running $f 8$ D.72.

need higher magnification better focus

9-4-36

Some more test shots

increased magnification to about 1:1
took 2 shots 20' long. first one camera
jammed

second, #32 1/2, taken at $f 8$. $M=1$ cover
glass over lens, argon tube (Germeshauser
shape - once had 10-12 argons
developed in D-76

Notebook # 16 April 1935 - 23 January 1937

Filming and Separation Record

___ unmounted photograph(s)

2 negative strip(s) (film in mounted envelope) pg ^{dated} 9-3-36

___ unmounted page(s)
(notes, drawings, letters, etc.)

was/were filmed where originally located between page ___ and ___.
dated 9-3-36

Item(s) now housed in accompanying folder.

9-3-36

H.S. Gries

Set up and took some test film
No grinding

20 frames $f+1$ } Slow Rotation
2 frames $f 5.6$ } D76
20 frames $f8$ }

3

5' running $f8$ D.72.

need higher magnification better focus

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H.S. Gries

9-3-36

Set up and took some test film
No grinding

20 frames $f=1$

20 frames $f=5.6$

20 frames $f=8$

} Slow Rotation
D76

3

5' running $f=8$ D.72.

need higher magnification better focus

9-11-36

Some more test shots

increased magnification to about 1:1
took 2 shots 20' long. first one camera
jammed

second, #32 1/2, taken at $f=8$, $M=1$ cover
glass over lens, arizon tube (Germeshausen
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9-3-36

H.S. Gies

Set up and took some test film
No grinding

20 frames f^{+1}

20 frames $f^{5.6}$

20 frames f^8

} Slow Rotation
D76

3

5' running f^8 D.72.

need higher magnification better focus

9-4-36

Some more test shots

increased magnification to about 1:1
took 2 shots 20' long. first one camera
jammed

second, $\#32\frac{1}{2}$, taken at f^8 . $M=1$ cover
glass over lens, argon tube (Germeshausen
shape - once had 10-12 argons
developed in D-76

Notebook # 16 April 1935 - 23 January 1937

Filming and Separation Record

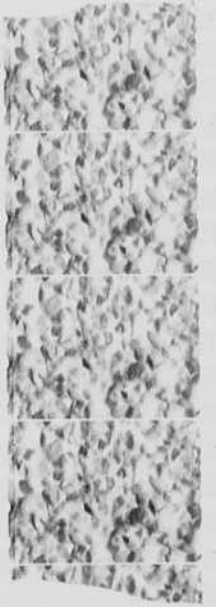
___ unmounted photograph(s)

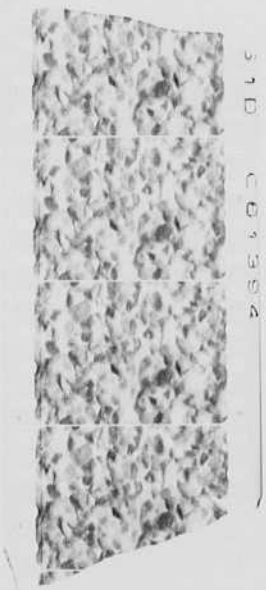
2 ~~negative strip(s)~~ (film in mounted envelope) pg ^{dated} 9-3-36

___ unmounted page(s)
(notes, drawings, letters, etc.)

was/were filmed where originally located between page ___ and ___.
dated 9-3-36

Item(s) now housed in accompanying folder.





510 C09384

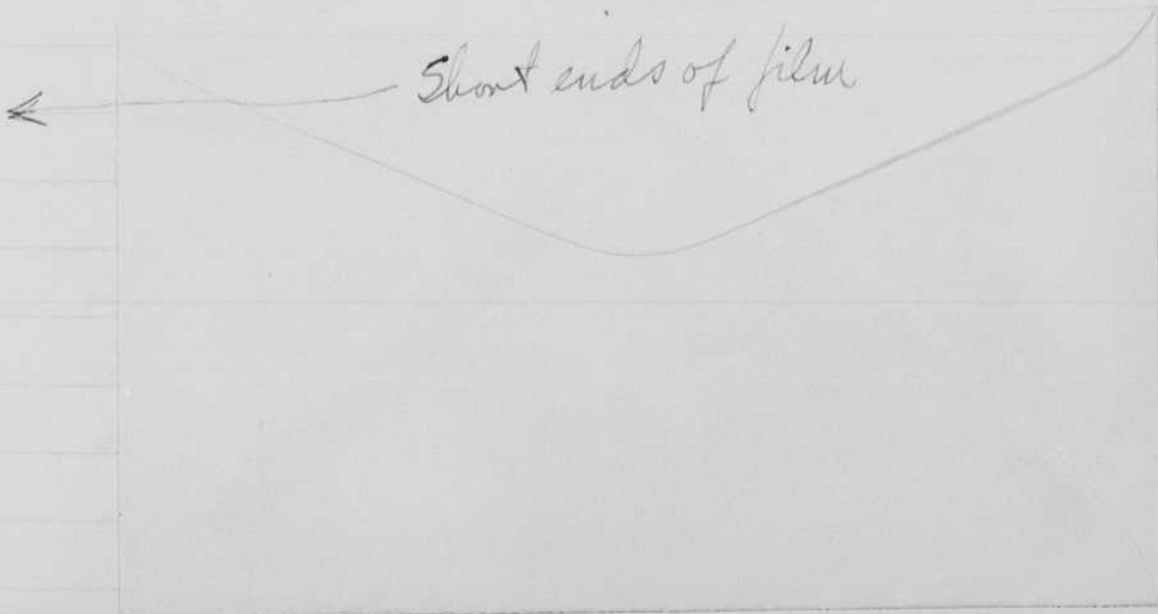


the camera was pre-focused before
being mounted.

The lamp skipped - was suggested
that it was gassy. Film valuable
for exposure data.

D-76 - 72° - 15'

Looks pretty good but lamp
skipped. Edgerston is going to repump
it.



9-6-1936

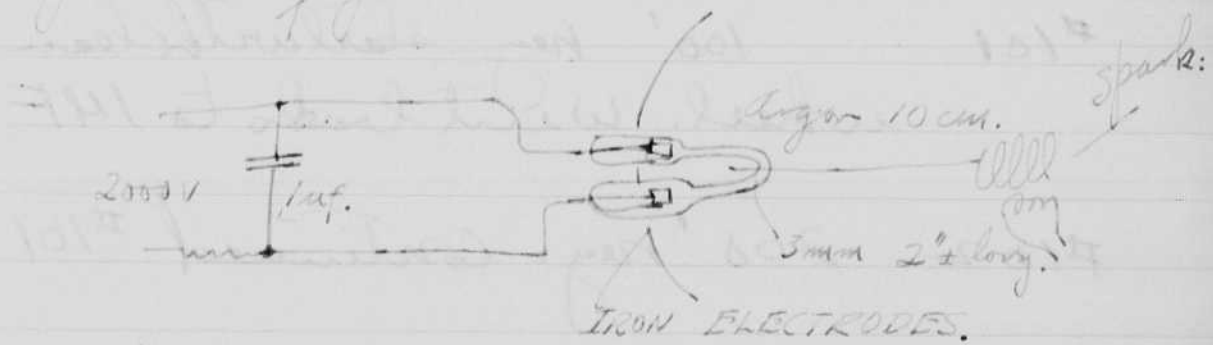
H. E. E. E. E.

Enlargements were made from film in previous page and from the film of the last lot. for comparison. The latest film with the repaired lens is the better one. The focus is still slightly high.

I lowered the camera and lens about $\frac{1}{16}$ of an inch and took another picture. # The argon tube was re-pumped today and filled with 10 cm argon. It was tried and missed the same as yesterday. I took out the Mercury lamp tube and tried another one. This change remedied the trouble. The operation is jumpy, slightly but objectionable.

This last negative is not as good as the one before. The density is not very good and it has more grain. I think the camera is better when at the upper setting that is $\frac{1}{16}$ inch higher than used for this last picture.

I reconnected the circuit to the following for trial.



It works ok but the jumpy firing is about the same. The wheel appears to be about $\frac{1}{16}$ or $\frac{1}{32}$ of an inch ahead about 1 flash in 6, showing early firing.

I plan to try a tube with an oxide cathode instead of the plain iron.

9-11-36

N.S. Line

9-10-36

test for filter

120'

9-11-36

Wagner - Witcomb - England
came from Norton Co. OK'd set-
up on previous page + we took
300' film

#101

100' neg. start with clean
wheel. Went back to 14F

#102

200' neg. continued #101

9-16-36

Expenses 8-11-36 to 9-16-36

500 ft. req @ 10¢ =	50.00
5 days @ \$35	<u>\$ 185.00</u>
	\$ 225.00

1875/1876

1875/1876

1875/1876

1875/1876

1875/1876

1875/1876

1875/1876

1875/1876

1875/1876

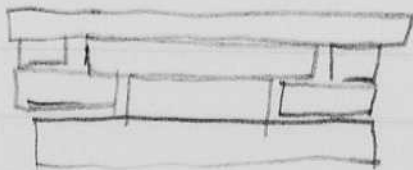
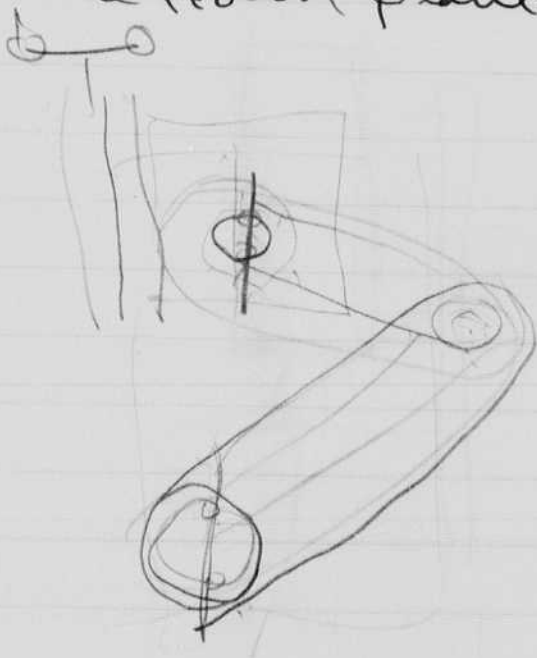
1875/1876

1-23-37

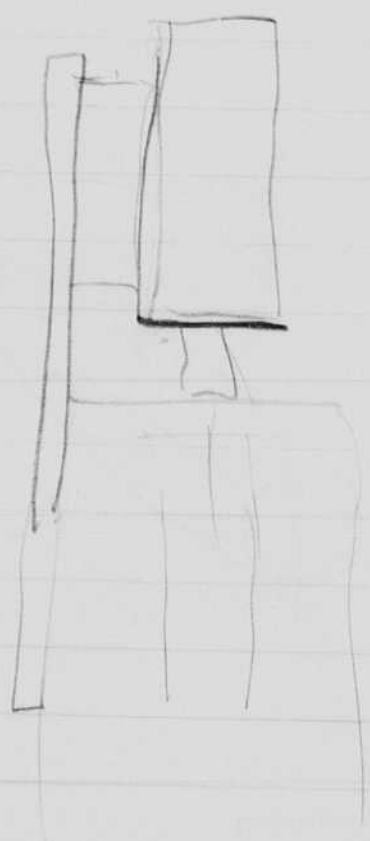
N.S. Green

Horton Co.

Design of Machinery for taking
Pictures at the Horton plant.



1874
18-10-11
The
The
The





Time

Apr. 16 1935 HSE 9. 5 hrs HEE 5 hrs KSG 2 hrs

Apr 17 30 HSE 9 4 hrs HEE 2 1/2 hrs

Aug 29 K.D.D. 2 hrs. HEE 6 hours.



My Safety Comes First

I'll Always Remember to:

See that the way is clear before crossing the street.

ObeY the traffic officer at all times.

Cross at the intersection on the cross-walk.

Play in the school-yard, play-ground or quiet street.

Look after young children and see that they have a fair chance.

Discourage hitching, it is dangerous.

Avoid running into the street, especially from behind parked cars.

Remember "Safety for everyone."

I'll Stop

I'll Look

I'll Listen