HAROLD E. EDGERTON

PAPERS

MC 25

Series III

Laboratory Notebooks

Number 30

Dated Oct. 2, 1969 to Jan. 11, 1973

1.45

COOP COMPUTATION BOOK

NAME	NUMBER
HAROLD EDGERTON	30

Course STROBE LAB MIT 4-405

Used from OCT. 2 1969, to JAN 11 1973.

HARVARD COOPERATIVE SOCIETY
1400 MASS. AVE., CAMBRIDGE, MASS. 02138

TECH. COOP
84 MASS. AVE. CAMBRIDGE, MASS. 02139

Jan 11

Jack Kennebrock
Robt. Wiggs - Ohio State University.

Harold Edgerton
H-405 M.I.T.
Cambridge Mass.

Notebook # 30

Filming and Separation Record

____ unmounted photograph(s)

____ negative strip(s)

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

was/were filmed where originally located between page ____ and ____.
inside front cover

Item(s) now housed in accompanying folder.

EG&G INC.

APPLICATION NOTES

February, 1965

SD-100 PHOTODIODE

General

The EG&G SD-100 is a silicon surface barrier photodiode containing a p-n type junction on the semiconductor surface. It is a light sensitive device which features a wide spectral operating range, fast response time, high sensitivity and linearity, and simplicity of circuit design. With its unique combination of features, the SD-100 is well suited for a wide variety of light detecting applications. Among these are: receiving equipment for lasers and injection laser systems, measurements on modulated and pulsed light sources, measurements of light intensity and waveforms, detection of color changes, radiation detection systems, and navigation or guidance systems.

The Photo-Effect

When the junction of a semiconductor is illuminated and a connection is made to both sides of the junction, a current will be seen to flow during the period of illumination. This phenomenon is the well-known "photovoltaic" effect, which is the operating mechanism for solar cells. In this case, there is no external bias, the cell generates an e.m.f. when illuminated.

If an external bias is applied in the reverse direction at the p-n junction, current will also flow under illumination. The current generated is composed of photocurrent and dark (reverse leakage) current. The dark current will remain constant under fixed bias and temperature conditions. The photocurrent will vary linearly with the intensity of the incident light. The SD-100 is designed for operation under reverse bias, or in the commonly known "photoconductive" mode. The primary advantage of the photoconductive unit is that it offers a higher sensitivity than a photovoltaic cell of the same size.

In the photoconductive mode, the SD-100 acts as a current generator and, unlike the photovoltaic cell, will continue to deliver the same amount of current into any load for a fixed signal source of radiation, regardless of the ambient illumination up to full sunlight exposure. However, precautions should be taken to ensure that the diode has enough voltage across it to supply the current (i.e. V cell = I_L R_S + 10V or the voltage across the cell must exceed the voltage drop in the cell's internal series resistance by 10 volts or more).

SPECTRAL RANGE AND SENSITIVITY

Figure 1 shows a typical spectral response curve for the SD-100.

EDGERTON, GERMESHAUSEN & GRIER, INC.
160 BROOKLINE AVENUE, BOSTON 15, MASSACHUSETTS
TEL: 617-CO7-9700 TWX EG&G SALES BOS 617-262-9317

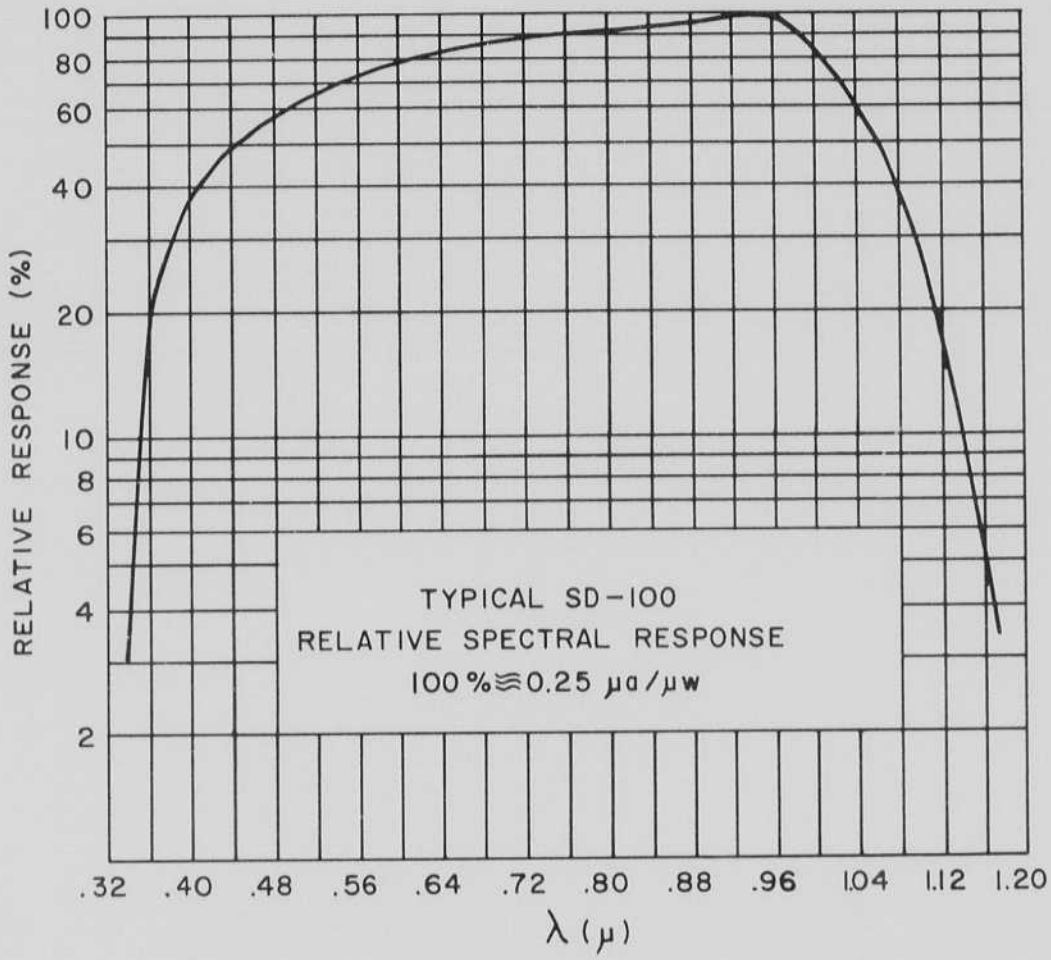


Fig. 1. Typical SD-100 relative spectral response 100% ≋ 0.25μa/μw.

The spectral range of the SD-100 Photodiode is from 0.35 to 1.13 microns, or from the near ultraviolet to the near infrared range (comparable to that of the S1 and S4 phototubes combined). The sensitivity of the SD-100 typically peaks at 0.9 microns, with a response of approximately 0.25 micro-amps per micro-watt. The sensitivity, or photocurrent output, remains linear within 5% over seven decades of incident light energy. Recent tests have actually demonstrated linearity on some diodes over a nine-decade range.

Figure 2 shows I-V characteristics of a typical SD-100 diode, plotted under pulsed filtered light conditions.

It should be noted from Figure 2 that, in order to achieve maximum sensitivity under high-energy, incident-light conditions, the diode should be biased by at least 90 volts and the load resistance should be less than 100 ohms.

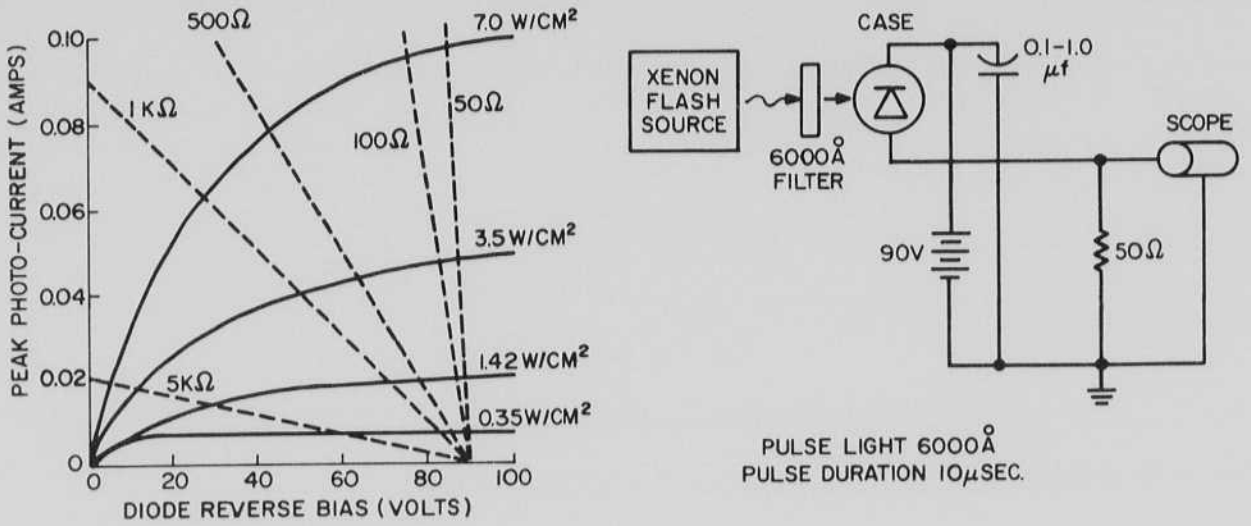


Fig. 2. Typical I-V characteristics of SD-100 photodiode.

Peak sensitivity and output will be achieved when the incident light source is normal to the junction or lens of the SD-100. Figure 3 is a normalized plot of the current output as a function of the angle of incidence of the light source.

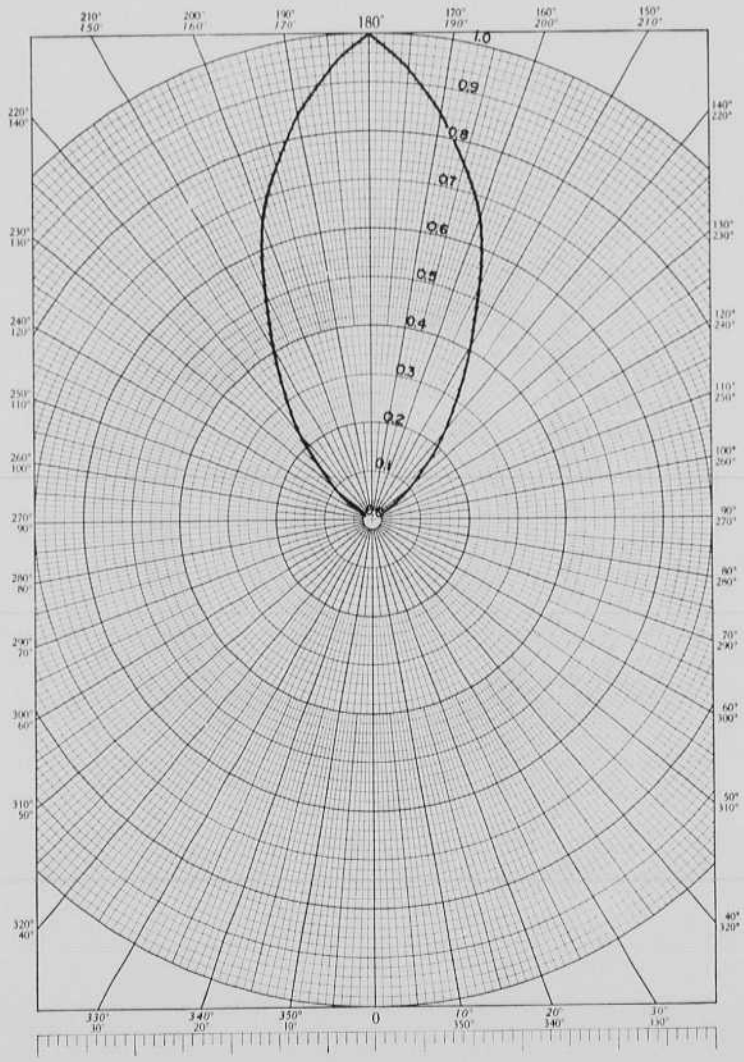


Fig. 3. Relative response vs. angular deviation from the direction of maximum response.

Uniform sensitivity and output can be achieved from a single SD-100 photodiode when the entire surface of the active area is illuminated. When a light source of less than 0.120 inches diameter is focused on the surface, there will be slight variations of output if the light beam is moved over various sections of the surface. The magnitude of these variations will be an inverse function of the beam diameter. Using a 0.6 millimeter diameter light probe, the mean deviation in dc output over the surface of the active area is 4%. Measurements with a 1.0 micron diameter probe demonstrate a mean deviation of 15% over the active device surface.

EQUIVALENT CIRCUIT AND GENERAL CHARACTERISTICS

The electrical equivalent circuit of the SD-100 is shown schematically in Figure 4.

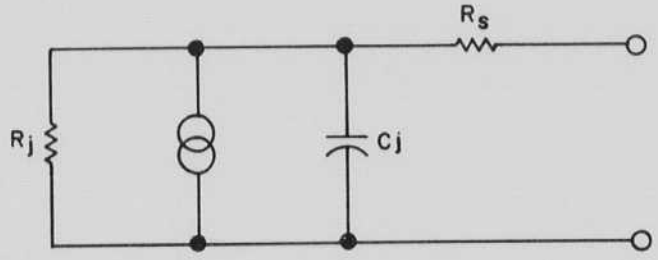


Fig. 4. Electrical equivalent circuit SD-100.

The barrier resistance (R_j) can be determined from the slope of the V-I curve in the non-saturated region. The barrier capacitance (C_j) is voltage dependent and decreases with increasing bias. Figure 5 is a graph of capacitance variation with reverse bias.

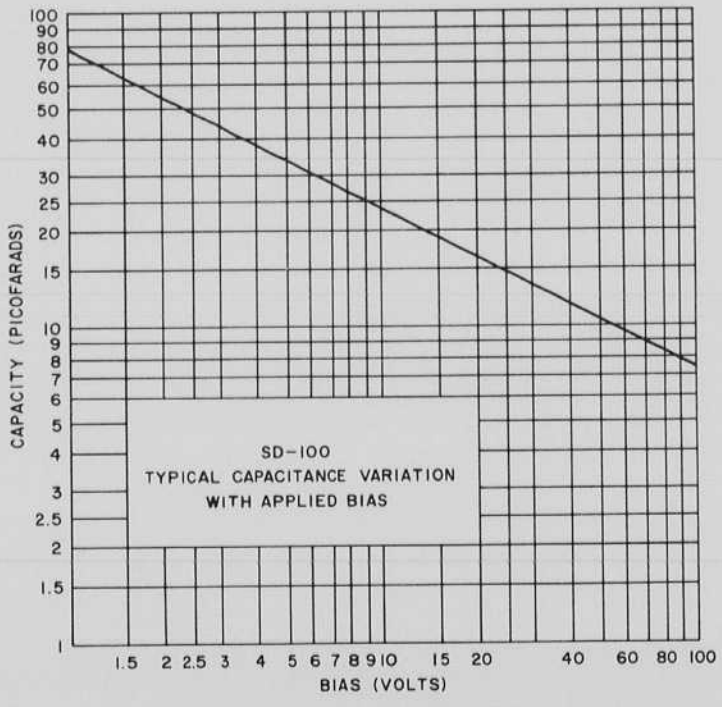


Fig. 5. SD-100 typical capacitance variation with applied bias.

R_S is the dynamic internal series resistance which is made up of contact, film, and bulk resistances, with the bulk resistance being the dominant factor.

Some additional typical parameter values for the SD-100 photodiode are listed below:

Rise Time:	t_r =	4×10^{-9} sec at -90v
Fall Time:	t_f =	15×10^{-9} sec at -90v
Sensitivity:	S =	0.25 $\mu a \mu w^{-1}$ at 0.9 micron
Luminous Response: (See Note (a))	=	3,500 μa per lumen or 0.27 μa per footcandle of 2870° K color temp.
		1,000 μa per lumen or 0.078 μa per footcandle of pulsed xenon illumination
Area:	A =	0.073 cm^2
Dark Current: (See Note (b))	I_o =	0.2 μa at 10 volts bias at 25° C
Junction Capacitance:	C_j =	30 pf at 10 volts bias (Refer to Fig. 5)
Series Resistance:	R_S =	200 ohms
Figure of Merit:	D* =	2.7×10^{11} cm $cps^{1/2}$ $watts^{-1}$ at Load Resistance R_L = 1 meg ohm

NOTE: (a) The luminous response of the SD-100, or any other detector of visible radiation, is dependent upon the integrated product of the spectral response of the detector and the spectral intensity of the radiation being measured. Accordingly, these values for the luminous response of the SD-100 to unfiltered radiation from the sources indicated are precise only for one particular diode. For diodes having a sensitivity within 25% of S = 0.25 $\mu a \mu w^{-1}$ at 0.9μ, the diode response in μa per lumen of 2870°K radiation will be within a tolerance of 20% after due allowance has been made for the difference in sensitivities at 0.9μ. The precision of extrapolation of the response to illumination from different xenon light sources is uncertain due to shifts in the spectral output of xenon tubes due to fill-pressure, electrode configuration, energy supplied to the tubes, etc.

(b) Dark current typically doubles for every 10°C rise in temperature.

Operational Photocurrent and Maximum Power Limits

The operational limit of the SD-100 is the maximum power that the photodiode can absorb before being destroyed. This power can be expressed in terms of either cell current or incident light power.

Under steady-state light, the incident light energy must not exceed that amount which would cause a steady state photocurrent of greater than 1.0 ma. If the incident light energy is in the form of a transient pulse of less than a few microseconds duration, the maximum allowable photocurrent is 120 ma. Higher currents have been observed, but the photocurrent is not necessarily linear, with respect to incident illumination, beyond this saturation current limit of 120 ma.

For monochromatic light of steady state, the light flux density must not be greater than 49.3mw per square centimeter. If the aperature of the SD-100 is taken into account, the steady state incident light power striking the active area of the cell must not exceed 3.6mw. For transient light pulses, the incident light flux density must be less than 5.9 watts per square centimeter, or 432mw of incident light power over the active area of the SD-100.

The above calculations and operational limits are for monochromatic light in the visible region. For chromatic light in the visible region, these same figures will apply, except that to be valid, the light must have a color temperature of greater than 2500° Kelvin.

The operational limits were calculated for the conditions of peak sensitivity on the spectral response curve. A typical sensitivity of 0.28μa/μw at 0.95 microns was used. The sensitivity is representative, and will provide a conservative rating that will protect the photodiode. At other wavelengths in the visible region, the sensitivity (or response) of the photodiode decreases, so that the SD-100 can safely withstand higher power levels. The steady state and transient pulse operational power limits for a typical unit are plotted against wavelength in Figure 6.

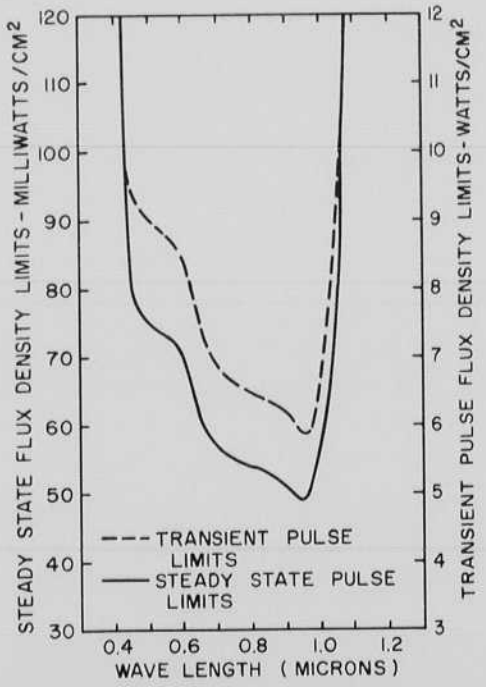


Fig. 6. Typical operational power limits for steady state and transient pulse source.

NOISE PERFORMANCE AND DETECTIVITY OF A TYPICAL PHOTO-DEVICE

At frequencies beyond the 1/f noise (a few hundred cycles), the two primary sources of noise arise from leakage currents and the thermal noise in the internal device resistance, R_S, and the load resistance, R_L.

The noise currents are random in nature and their mean square values may be defined as in (a) and (b) below.

(a) Shot Noise

$$\overline{i^2_{N_o}} = 2qI_o\Delta f \tag{1}$$

(b) Johnson Noise

$$\overline{i^2_{NR_S}} + \overline{i^2_{NR_L}} = \frac{4KT\Delta f}{R_T} \quad \text{where } R_T = R_S + R_L \tag{2}$$

The total r.m.s. noise current, I_N, is therefore:

$$I_N = \sqrt{2qI_o\Delta f + \frac{4KT\Delta f}{R_T}} \tag{3}$$

The predominate type of noise depends upon bandwidth, frequency of operation, leakage current, temperature, and internal and external resistances associated with the detector. The NEP of a detector is defined as the power necessary to generate a signal $I_S = I_N$. Since power (P watts cm^{-2}) times the sensitivity of the detector equals I_S, then equation (4) defines NEP.

$$(NEP)S = I_N$$

or

$$NEP = \frac{I_N}{S} \text{ watts} \tag{4}$$

The detectivity (D) of a detector is defined as

$$D = \frac{1}{NEP} = \frac{S}{I_N} \text{ watts}^{-1} \tag{5}$$

A more useful term than D would be one which was independent of bandwidth and of detector size. Jones[1] suggested the term D star (D*) which was defined as

$$D^* = D\sqrt{A\Delta f} = \frac{S\sqrt{A\Delta f}}{\sqrt{2qI_o\Delta f + \frac{4KT\Delta f}{R_T}}} \text{ cm cps}^{1/2}\text{watts}^{-1} \tag{6}$$

D* is a figure of merit expressing detector performance in terms of intrinsic material independent of detector area and bandwidth. Analysis of data indicates that the expression used in Equation (6) appears to perform this function satisfactorily[2], since it can be seen that leakage current I_o and series resistance R_S are both dependent upon area A and their noise currents components both contain the factor $\sqrt{A\Delta f}$.

It can be noted that D* can become limited from either of the two terms ($2qI_O\Delta f$, the mean square shot noise current, or $4KT\Delta f/R_T$, the mean square Johnson noise current) in the denominator of Equation 6.

At relatively low frequencies (5 to 15 kc), a load resistor in the order of 1×10^6 ohms can be used. In this case the Johnson noise is reduced to such a value that the shot noise becomes the predominate or limiting noise factor.

At high frequencies (1 - 100mc), small values of R_T must be used to keep from limiting the frequency response of the device. Therefore, the Johnson noise becomes the predominate term and the device can be considered thermally noise limited.

At intermediate frequencies both Johnson and shot noise contribute to D*.

Values of D* range from 10^{12} cm $cps^{1/2}$ $watt^{-1}$ at low frequencies to 10^9 cm $cps^{1/2}$ $watts^{-1}$ at high frequencies. A curve relating leakage current values, load resistance and D* is given in Figure 7.

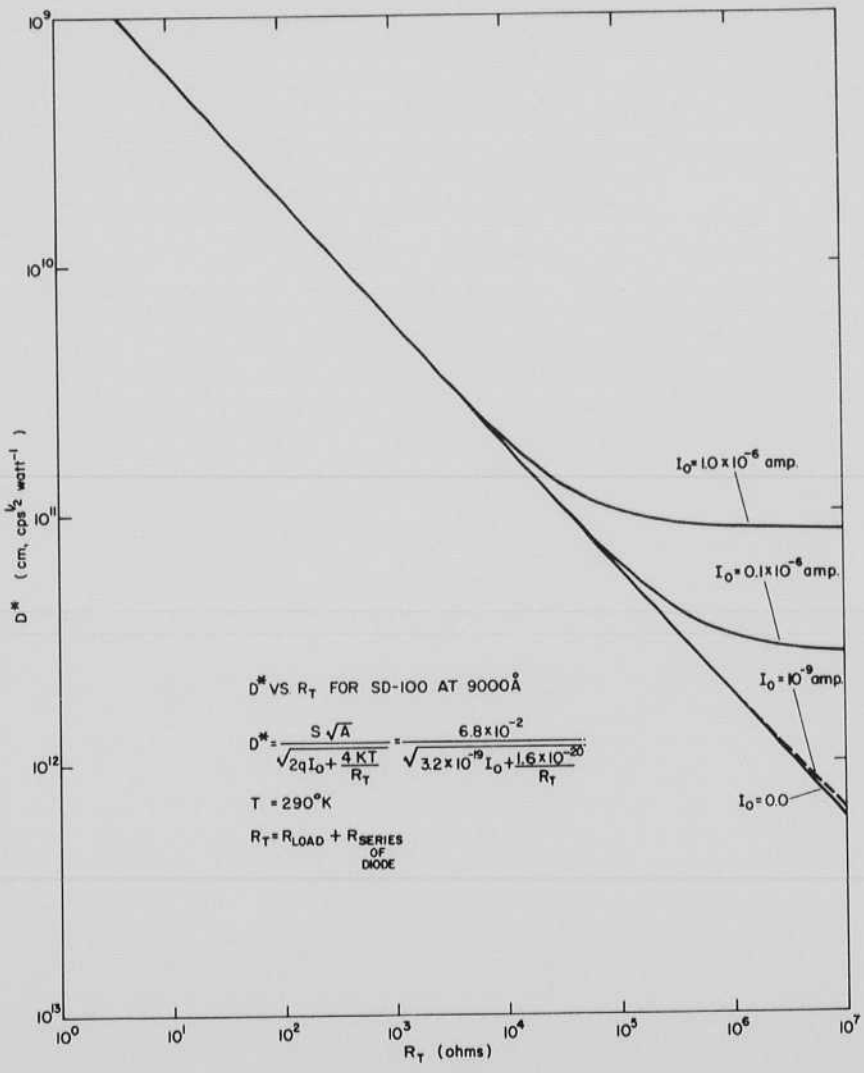


Fig. 7. D* vs. R_T for SD-100 at 9000Å.

FREQUENCY DEPENDENCE

If the high frequency cutoff of the device is defined as

$$f_h = \frac{1}{2\pi R_T C_T} \tag{7}$$

it can be seen that the cutoff frequency as well as D* is affected by R_T. In order to examine D* without side effects influencing the analysis, the device should be examined at frequencies below cutoff. Figure 8 is a graph of Equation 7 showing the relation of C_T and R_T for various values of f_h.

Note that in this discussion of D* the 1/f noise which appears at frequencies less than 500 cycles at low bias has been neglected. The 1/f noise increases and becomes significant at frequencies to a few thousand cycles or greater, as the diode bias becomes larger.

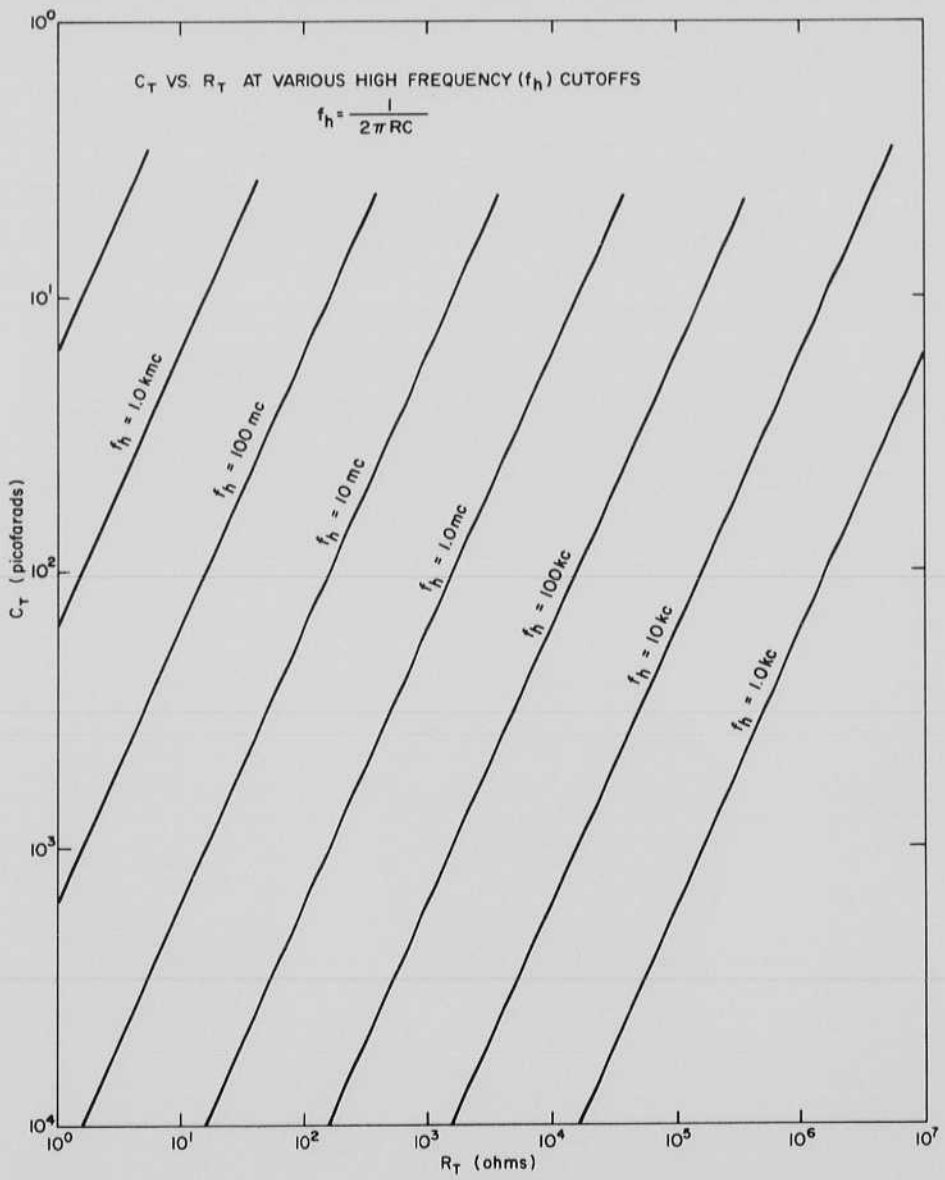


Fig. 8. C_T vs. R_T at various high frequency (f_h) cutoffs.

HIGH FREQUENCY RESPONSE

If high frequency response is desired, a low impedance load should be used. The device will then become frequency limited by the series resistance R_S and load resistance R_L. A frequency response to about 100 mc has been observed for highly biased SD-100's (bias = 90 volts, R_S = 150 ohms, R_L = 50 ohms, C_j = 8μμf) by photographs of fast-rising light pulses which show the SD-100 rise times to be about 3 nanoseconds.

PARAMETER DEPENDENCE ON ACTIVE AREA

The techniques utilized in the manufacture of silicon surface barrier photodiodes allow for the fabrication of devices with circular, square, or rectangular active areas with diameter or edge dimensions ranging from 0.02 to 1.0 inches. Parameter dependence on size of active area is as follows:

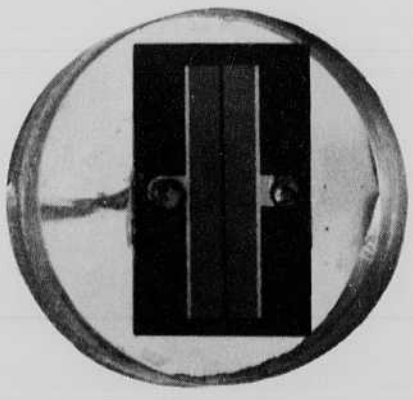
a. Sensitivity per unit area remains constant at 0.25 μA/μW typical at 0.9 microns. This represents a quantum efficiency of approximately 34%.

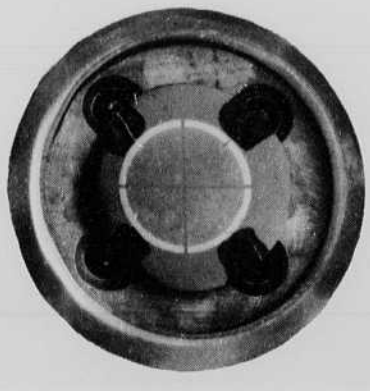
b. Spectral range and linearity of response are not affected by changes in active area.

c. Capacitance (determines speed of response), dark current (determines shot noise), and saturation photocurrent increase with increasing area.

d. Series resistance tends to decrease with increasing area.

Bi-cell, quadrature cells, and matrix arrays (see Fig. 9) have also been made with the surface barrier construction. In these multi-cell units, the cross-talk ratio between cells on a common substrate can approach 250:1, dependent upon distance of separation. Utilizing individual discrete substrates, the cross-talk ratio exceeds 1000:1.





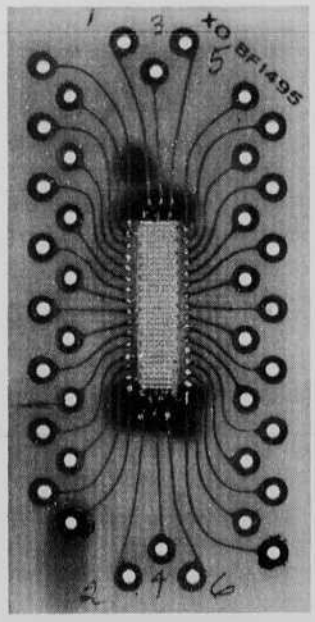


Fig. 9a. Bi-Cell 9b. Quadrature cell 9c. Matrix array

EG&G INC.

EG&G invites all inquiries relating to photodiodes or detection cells both for the standard SD-100 and any required modification thereof. For further information contact EDGERTON, GERMESHAUSEN & GRIER, INC., Products Department, 160 Brookline Avenue, Boston, Massachusetts, Tel. 617-267-9700.

REFERENCES

(1) R. C. Jones, J. Opt. Soc. Am. 50, 1058 (1960)
(2) S. Nudelman, Applied Optics 1, 627 (1962)

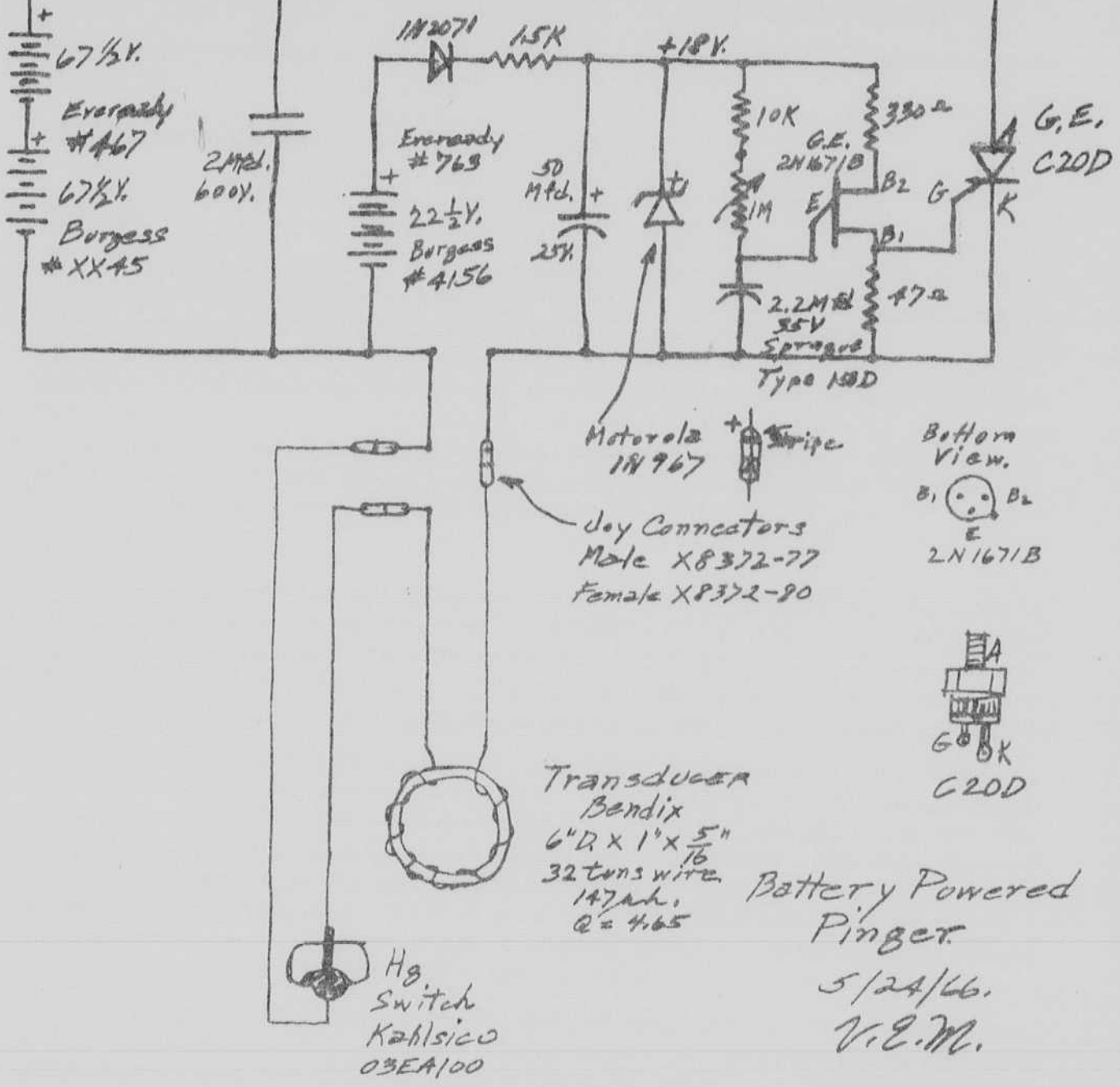
EDGERTON, GERMESHAUSEN & GRIER, INC.
160 BROOKLINE AVENUE, BOSTON 15, MASSACHUSETTS
TEL: 617-C07-9700 TWX EG&G SALES BOS 617-262-9317

PRINTED IN U. S. A.

Thordarson
20C63

IN2071

GOLF CLUB STUDIES.



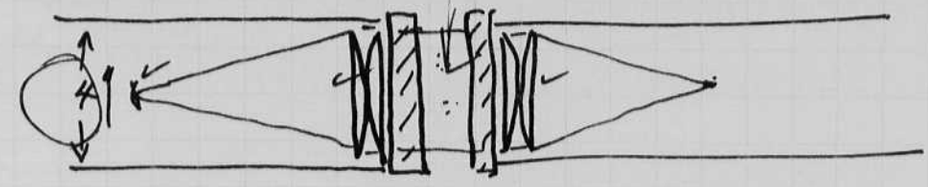
Battery Powered
Pinger

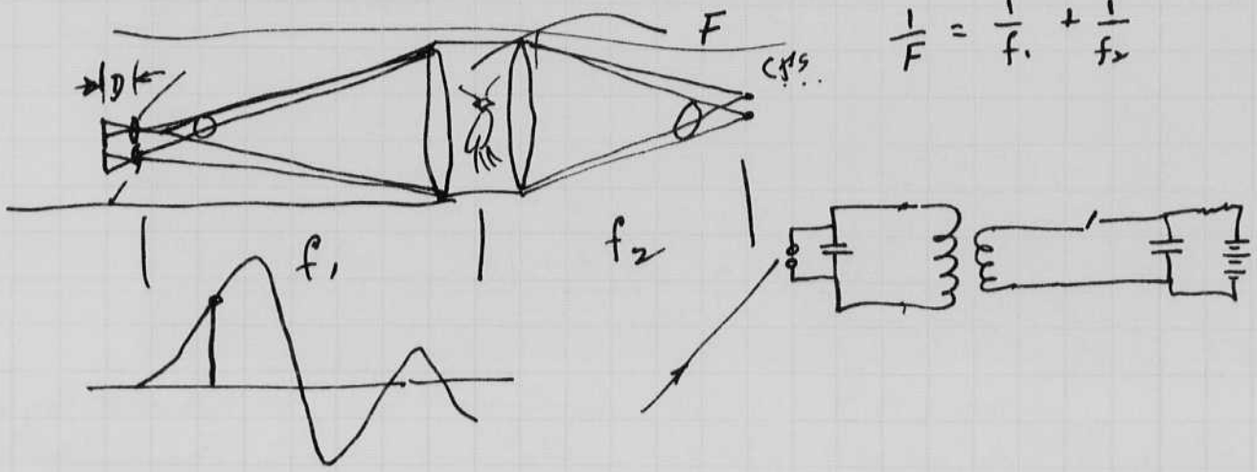
5/24/66.

V.E.M.

H. Edgerton Oct. 2, 1969
Robt. Baker.

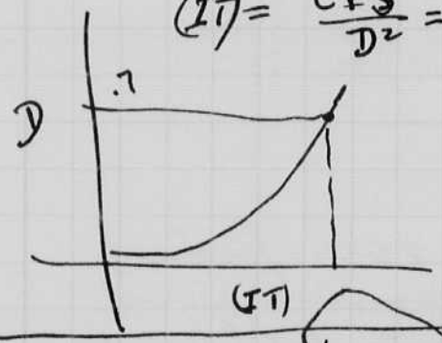
Dick Wallin. thesis Middleton to convert to stereo.

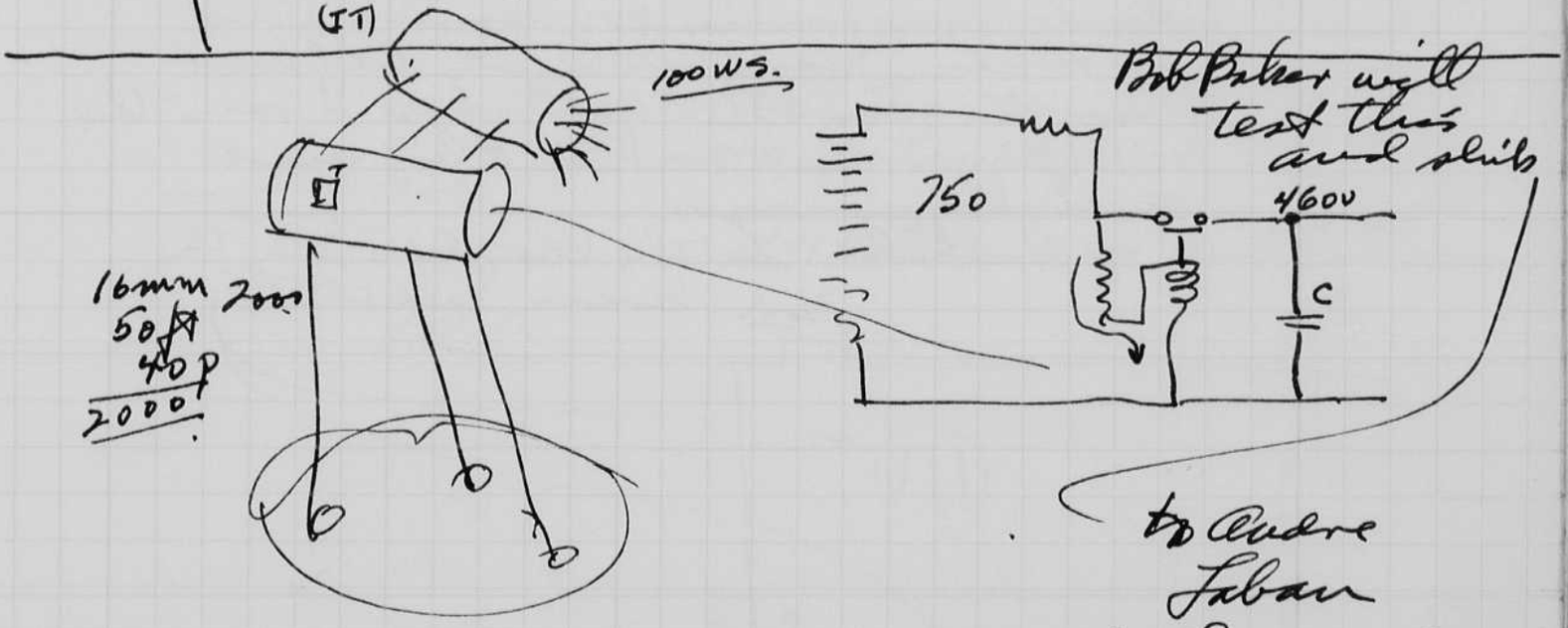




$\frac{1}{F} = \frac{1}{f_1} + \frac{1}{f_2}$

$(IT) = \frac{CPS}{D^2} =$





Bob Baker will test this and advise

to Andre Laban in Los Angeles Calif.

Asked by Carmichael Nat. Geo Society

Oct 2 1969 H.E. Egerton Last Summer Effort

July 15 to London with Mike Hobart. met Jim Sholer.
July 22 on board the akad. Kurchatov 6000 ton Russian Research Ship.
Chief Scientist Gleb. Udintsev.
Yuri Shekerator
Yevgid Dmitriev.
August July 10 Los Palmos Canary Islands Pasternich.
Aug. 14 Dakar Senegal Janet Hall consul from Chicago.
Sept 10 3pm arrival in Boston.

Sept 14 to athens - Ikra - Crete - athens
Sept 23 Retured to Boston
" 24 First Class at M.I.T.

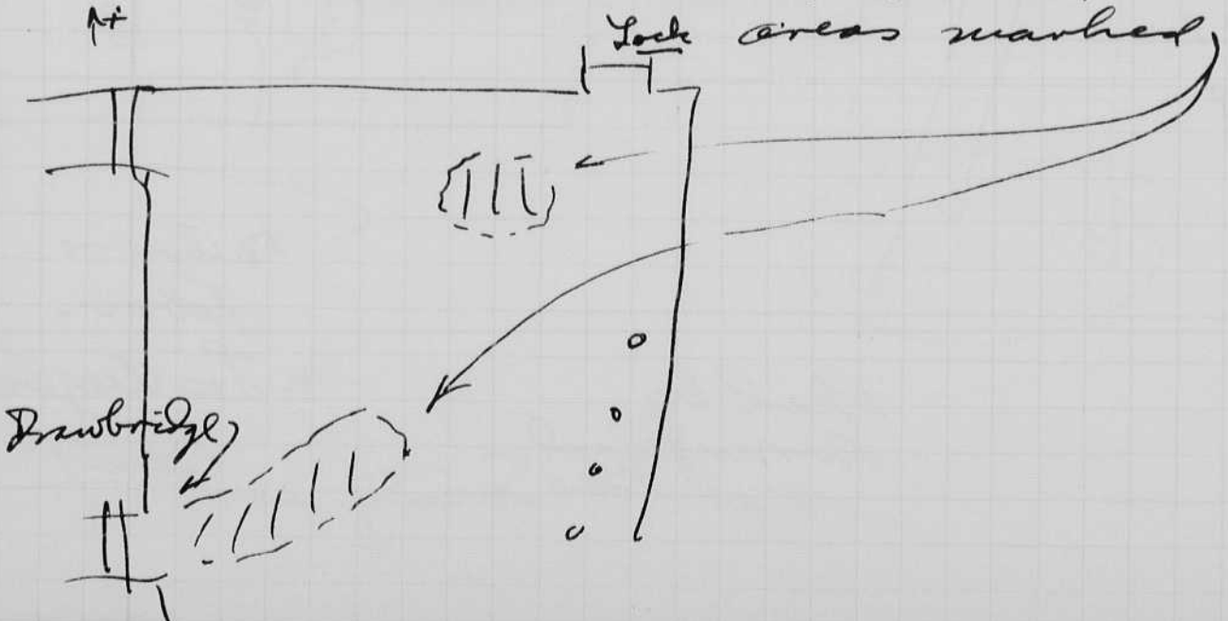
R. Delvers.

7.031	12
6.714	12
9.00T	9
21.03	9
21.10	6
~~11.01~~	~~6~~
8.23935	9.

First term.
Crab Nebula

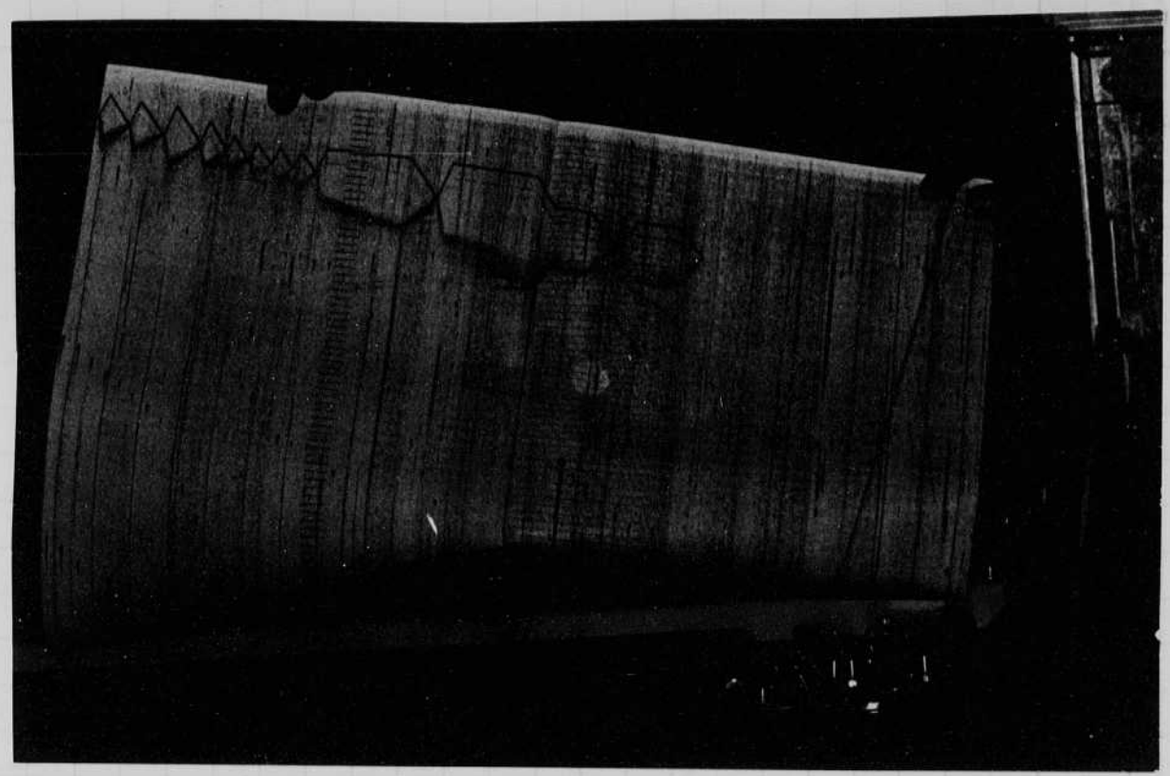
Oct. 13, 1969 H.E. Ran - 12 with 5khz and 5khz pickup in Charles River using 254 Recorder and new Honda. many students helped to run the recorder. Yesterday I ran the 20 KHz pinger that Martin Klein made several years ago.

Penetration in the Charles in the areas marked

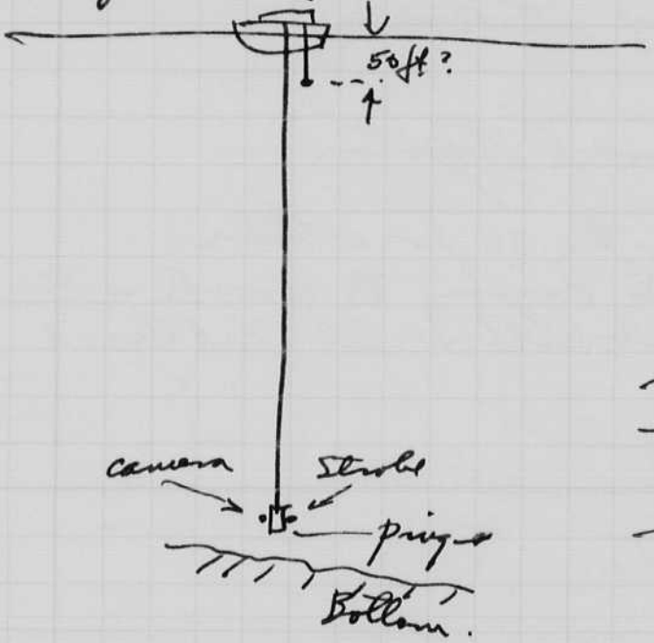


Oct. 13 '69 cont.

Bob Jarrett called to see me.



Record made on Ed Curley's EPC unit #1 on Rhodamin Kurdistan in the mid atlantic Rift Valley.



the pinger had a 10^{-6} accuracy & ping rate. the recorder also had a 10^{-6} sweep rate so the records are parallel if the position is constant.

note the variation of the bottom signal which carries in formation about the bottom and sub bottom.

2 Oct 2 1969 H.E. Egerton Last Summer Effort

July 15 to London with Mike Hobart. met Jim Sholer.

July 22 on board the akad. Kurchatov 6000 ton Russian Research Ship.

Chief Scientist ~~Gleb Udintsev~~ Boris Shekvatov Georgi Dmitriev.

~~August~~ July 10 Los Palmos Canary ~~Islands~~ Pasternich.

Aug. 14 Dakar Senegal Janet Hall consult from Chicago.

Sept 10 3pm arrive in Boston.

Sept 14 to athens - Thera - Crete - athens

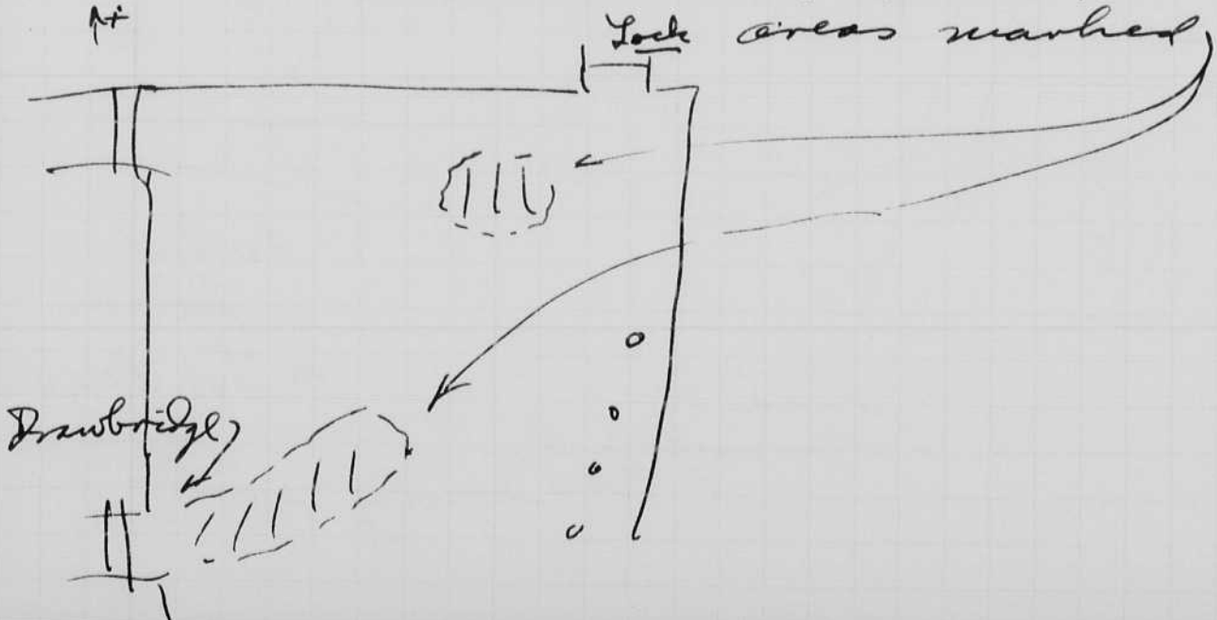
Sept 23 Retured to Boston

" 24 First Class at M.I.T.

R. Delvers. 7.031 12 First term.
6.714 12
9.00T 9
21.03 9
21.10 6
~~21.09~~ 6
8.23935 9 Prof's Nebula

Oct. 13, 1969 H.E. Jam - 12 with 5khz and 5khz pickup in Charles River using 254 Recorder and new Honda. Many students helped to run the recorder. Yesterday I ran the 20 KHz pinger that Martin Klein made several years ago.

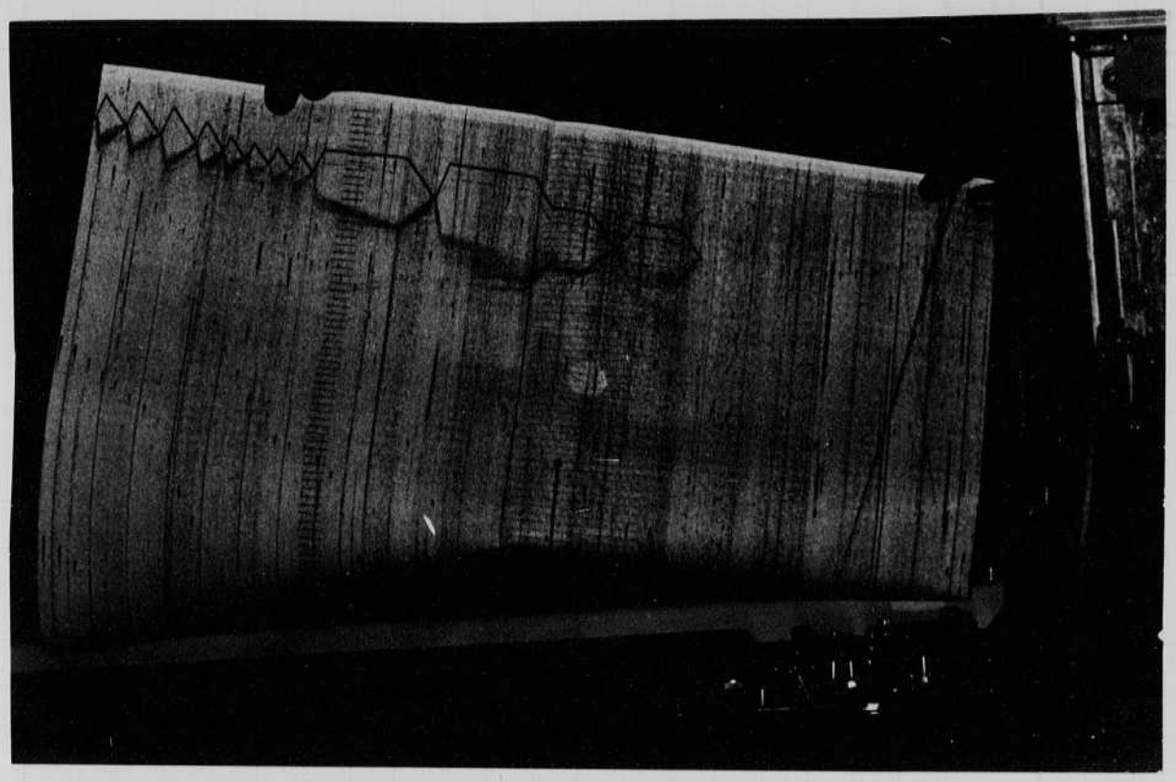
Penetration in the Charles in the Lock areas marked



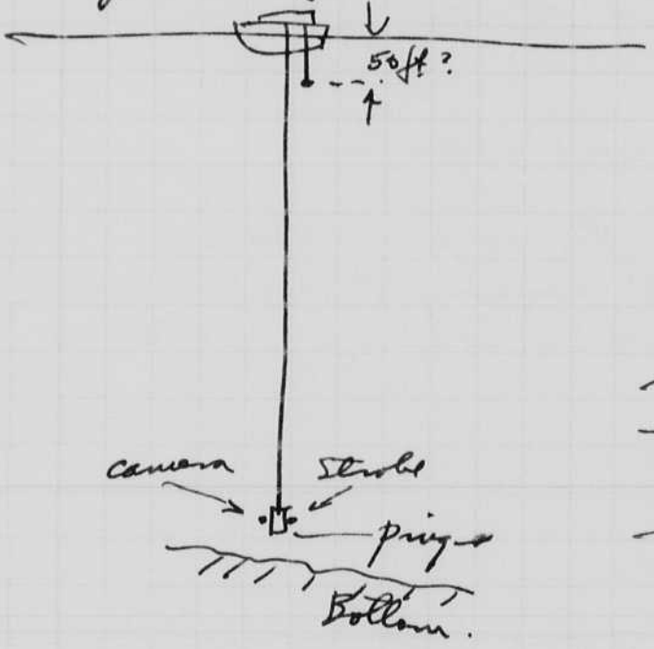
Aug. 13 '69 cont.

#3

Bob Jarrett called to see me.



Record made on Ed Curley's EPC unit #1 on Rodanich Recorder in the mid atlantic Rift Valley.



the pinger had a 10^{-6} accuracy & ping rate. the recorder also had a 10^{-6} sweep rate so the records are parallel if the position is constant.

note the variation of the bottom signal which carries information about the bottom and sub bottom.

4 Oct 23 1969
H. Edgerton

Showed a 5KC finger to Bob Henderson at Gerdy re mtg. It read 97 db. compared to 105 for the 12KC std type.

New finger features.

1. 5KC pulse with Manza 76 transducer
2. Lead battery.
3. Osc. control 10^{-6} sec.
4. Side clamp
5. S.C.R. IN 1612 Sil 50V 5 amps
   ~~ORCA~~ RCA CX27A
   or IR BF10 Sil 100 V 3 amps.
   in place of thyratron.

Oct. 29, 1969 Wednesday ~~Harold~~ Edgerton.

Scheduled to leave on the 30 for Athens via Paris with Fred ~~Fahl~~ Fayling to work with throckmorton on the sub-bottom of methone Porto Longo.

Returned Sunday. Athens Paris about 6 pm
Nov. 16
Champlain Hotel in with Paris
Visited Lucien Bull
14 Rue de Lestramant.
Paris at 11 am

Nov 17 Monday Left 13.15 for Boston Air France 029
arr 2.15 pm Boston. on schedule.

Class of Nov. 19 Wednesday Seminar 061 16 students.

Donald Menzel home Nov 21 7 mi for dinner Buttery Sergeant (colonel) Cabot

Nov 22 2 pm - Borkon & Zudanski conference
Dinner at 7 pm.

Nov 22 1969
Harold Edgerton

Camera 870 loaded 10 am Tri-X Kodachrome II
16 mm magazine

870 0° 5 sec camera
45° 17
180 47
max 64 1

Set for 15 second intervals
4 per minute 60/4
240 per hour.

50 ft x 40 pics = 2000 photos
240) 2000 (7.5 hours
1680
120.

240 240
1 8
1680 1120

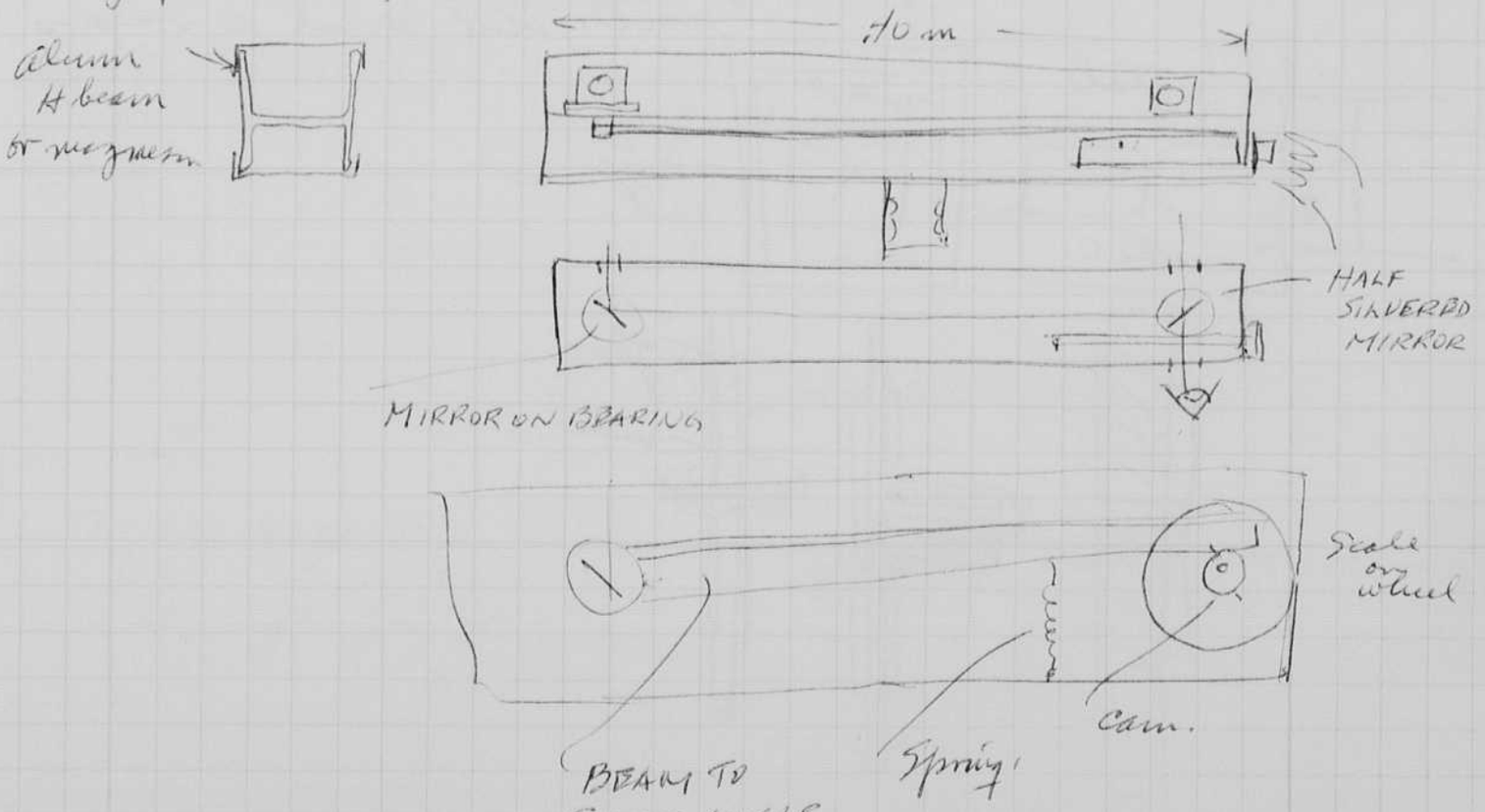
To Boston.
1130±

884 10.46 started. 10 Cambridge
15 sec.
1130. ±.

Dec 3, 1969 Camera # 884 Jumpy at 2 places in Roll.
One sprocket hole out

Camera # 870 Lower corner of frame obscured by slide shutter of cassette.

Range finder design



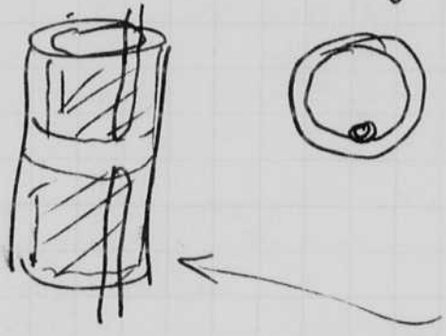
Jan. 6. Sat 1969

Harold Edgerton.

Short flash spark. The E&G. microflash point source is causing problems all the time. It is ready for a redesign.

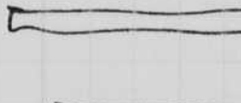
Ken Prosser is working on it Richard had several discussions but no experimentations yet.

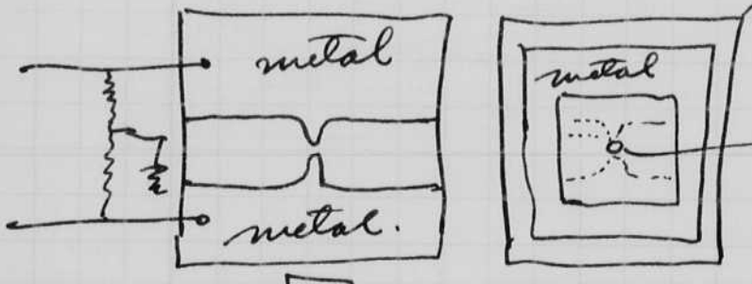
One idea is use the "spark over an insulator" scheme with obscured areas for after glow gases.

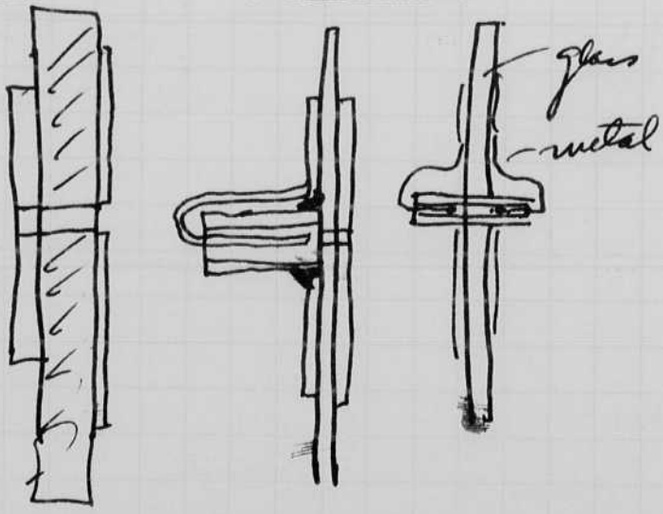


Quartz tube with electrodes.

Then cover tube with opaque material above and below the spark. This will make the after glow gases that expand into the end areas.







Dec 20, 1969. H. Edgerton.
Sat. Jim Jenkin

Movie Conference

Goal - HE. Revealing films of fast objects

KW-0336 1/ 10. Herz

Film of Jims Water with surge of sem. — f 16 - 24V 700 - 1100 1000 f.p.s.
comments ~~f2~~ Interesting patterns! 16 Daylight.
Try again at f 8 with ECO color ASA 25.

Speed K 205IR HYCAM

30 volts	5 sec	1100 fps
24 volts	6,75	700 "
18 volts	11	350 "

H. People at Mordonnum f 5.6 at ~~30~~ 30 volts ac
Underposed - Shows slow action.
Chance to study people.

J.L. Pigeons. — Sharp Tri X Black & white. f ~~5.6~~ ? 30 ? ac.
Too much action. f 4.
Camera moved.
Wing actions out of frame.

HE, Reel Head Speed. Jam
Golf. Book
Cat
Babble Redo.
Balloon - Bullet.

Pigeon.
Bulb with comment on.
Milk drops.

Splashes closer and slower.

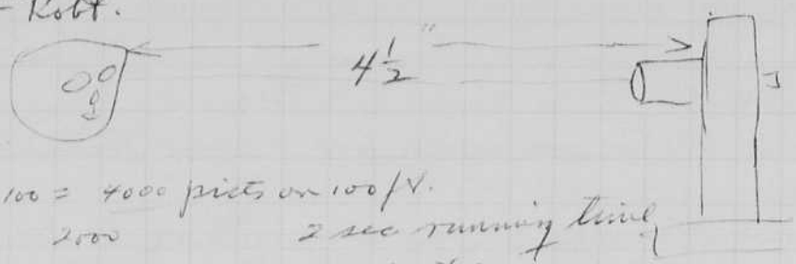
Jim wants
12 - 120 augenimx
f 2.
with angel finder.

8

Dec 20 1969 N Edgerton.
Films EF. 1E 125 Tungsten.

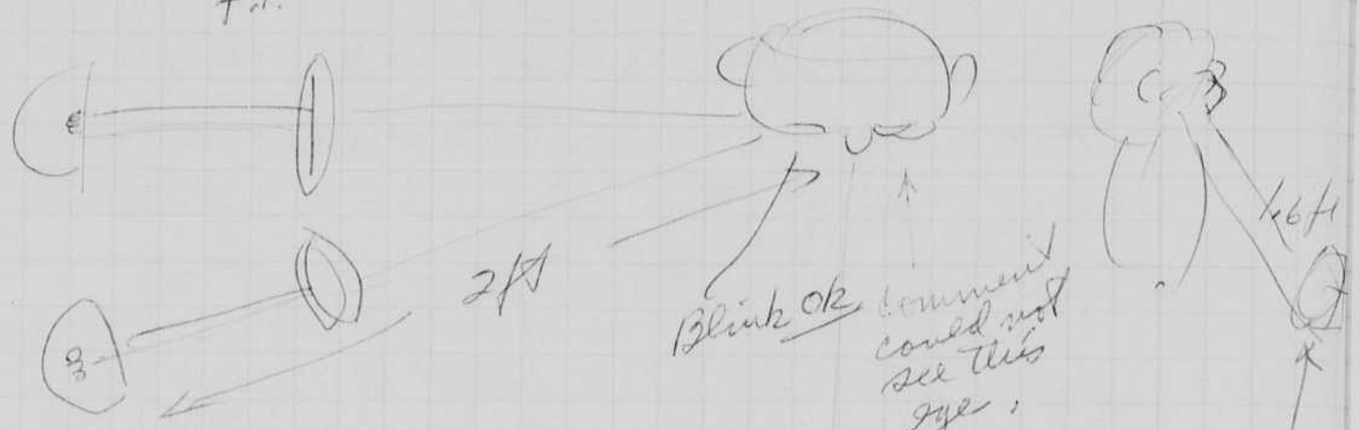
Red Tube

Weiner Robt.



40 x 100 = 4000 pictures on 100 ft.
200
2 sec running time.

~~80~~ volts
on Variac. — 2.8 sec running time.
f 4.



Object Flash Kodatron on face and watch dilate eye close

ASA 125 Tungsten.
f 4.5
60 running light.
Voltage 51.

Under-exposed.
Side light.
move closer to eye.

under 100 ASA Ektachrome
1/1000 sec f 8.

Dec 29 1969 monday
Thanks Edgerton

Work on report for summer trip on Aerial Kurakator.

Doc.

You're right about the film being under-exposed ... about 1½ stops from meter reading ...

① Also note static, horizontal streaking across the smaller of the two water rolls (the roll that was pushed...) Is this due to not grounding camera, too dry a day ... or non "High speed" stock ... or what?

② Also note the wavering color balance in the Wiener roll. Variation in exposure? (unsteady motor on AC current? It

Eg analyze 0 flash
¼ flash gone

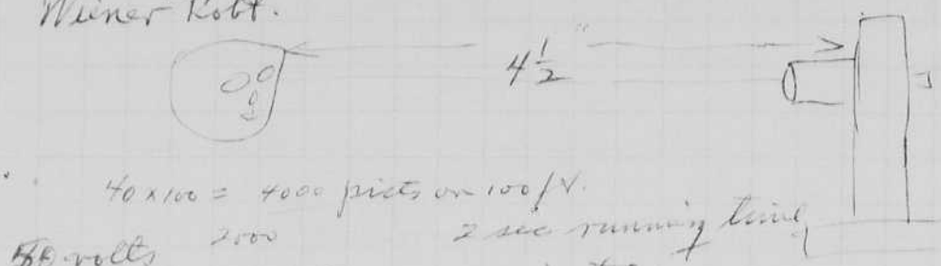
20	7cm	200	1.0	320	4.8		
50	7	210	1.5	330	4.9		
100	6.5	220	1.5	340	4.7		
110	6.2	230	1.0	350	4.7		
120	5.8	240	1.0	360	4.5		
130	6.8	250	1.5	370	4.9		
140	5.2	260	1.75	380	5.2		
150	4.5	270	1.5	390	5.3		
160	3.2	280	2.3	400	5.2		
170	1.5	290	3.6				
180	1.5	300	4.0				
190	1.0	310	4.2				

8

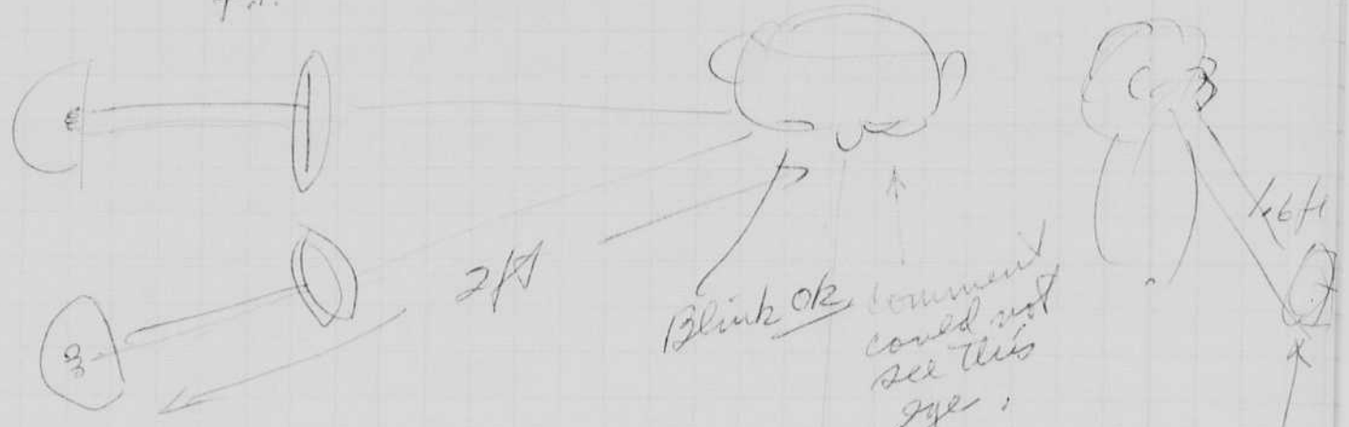
Dec 20 1969 H Edgerton.
Films EF. 1E 125 Tungsten.

Red Tabs

Wiener Robt.



40 x 100 = 4000 pics on 100 ft.
2000
88 volts 2 sec running time
on Variac. — 2.8 sec running time.
f 4.



ASA 125 Tungsten.
f 4.5
60 running light.
Voltage 51.

Under exposed.
Side light.
move closer to eye.

Outer 100 ASA Ektachrome
1/1000 sec f 8.

Dec 29 1969 monday
Thanks Edgerton

Work on report for summer trip on Ideal Kurvilator.

Doc.

You're right about the film being under-exposed ... about 1½ stops from meter reading ...

① Also note static, horizontal streaking across the smaller of the two water rolls (the roll that was pushed...) Is this due to not grounding camera, too dry a day ... or non "High speed" stock ... or what?

② Also note the wavering color balance in the Wiener roll. Variation in exposure? (unsteady motor on AC current? It

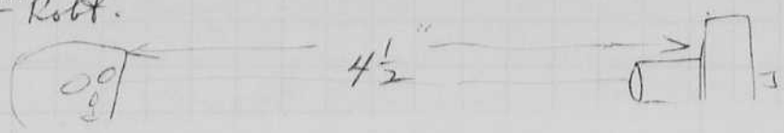
Eyeanalyze 0 flash
4 flash gone

20	7cm	200	1.0	320	4.8		
50	7	210	1.5	330	4.9		
✓ 100	6.5	220	1.5	340	4.7		
110	6.2	230	1.0	350	4.7		
120	5.8	240	1.0	360	4.5		
130	5.8	250	1.5	370	4.9		
140	5.2	260	1.75	380	5.2		
150	4.5	270	1.5	390	5.3		
160	3.2	280	2.3	400	5.2		
170	1.5	290	3.6				
180	1.5	300	4.0				
190	1.0	310	4.2				

Dec 20 1969 N Edgerton.
Films EF: IE 125 Tungsten.

Red Take

Weiner K Robt.



40 x 1.

BE volts on Variac

doesn't seem to occur on DC ...) I've seen it b
color film

③ Note the scratch that occasionally appea
down the middle of the frame ...

Thursday at 10AM

- Jim L.

Object J.
a

ASA

60

V.

Note, ... exposure
1/1000 sec f8.

Dec 29 1969 monday
Thank Edgerton

Work on report for summer trip on Aleak Kurakuro.

t before
no live she

bears

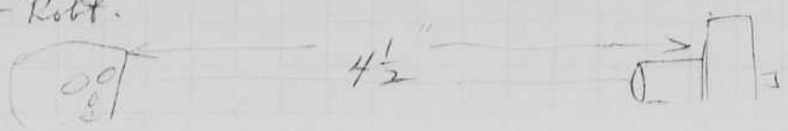
Eryonalyse 0 flash
4 flash gone

20	7cm	200	1.0	320	4.8		
50	7	210	1.5	330	4.9		
100	6.5	220	1.5	340	4.7		
110	6.2	230	1.0	350	4.7		
120	5.8	240	1.0	360	4.5		
130	5.8	250	1.5	370	4.9		
140	5.2	260	1.75	380	5.2		
150	4.5	270	1.5	390	5.3		
160	3.2	280	2.3	400	5.2		
170	1.5	290	3.6				
180	1.5	300	4.0				
190	1.0	310	4.2				

Dec 20 1969 X Edgerton.
Films EF: IE 125 Tungsten.

Red Tabs

Weiner Kodak.



40 x 1.

~~55~~ volts on Variac

doesn't seem to occur on DC ...) I've seen it l
color film

(3) Note the scratch that occasionally appe
down the middle of the frame ...

Thursday at 10AM

-Jim L.

Object

ASA

60

1/5

Auto, ... exposure

1/1000 sec f 8.

Dec 29 1969 monday
Thursday 2 Jan

Work on report for summer trip, on Glacial Kuroshio.

it before
lm live she

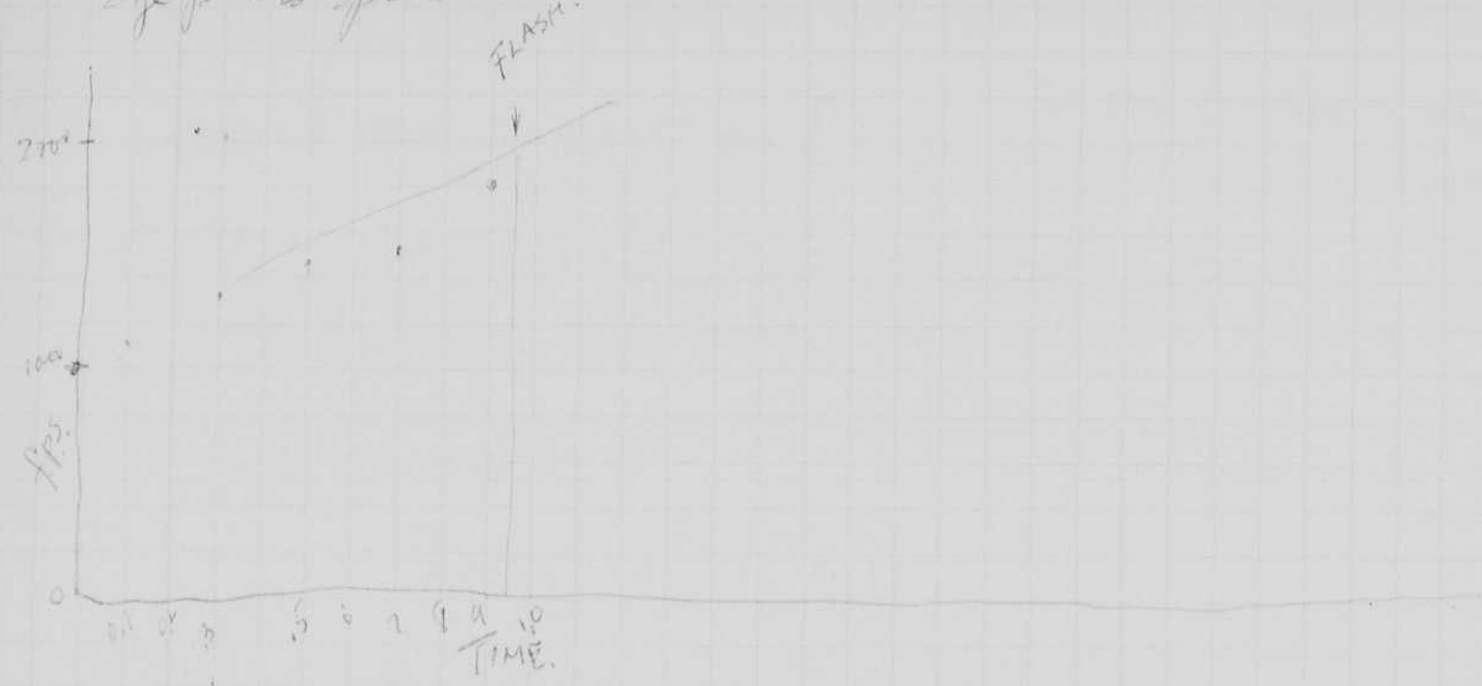
pears

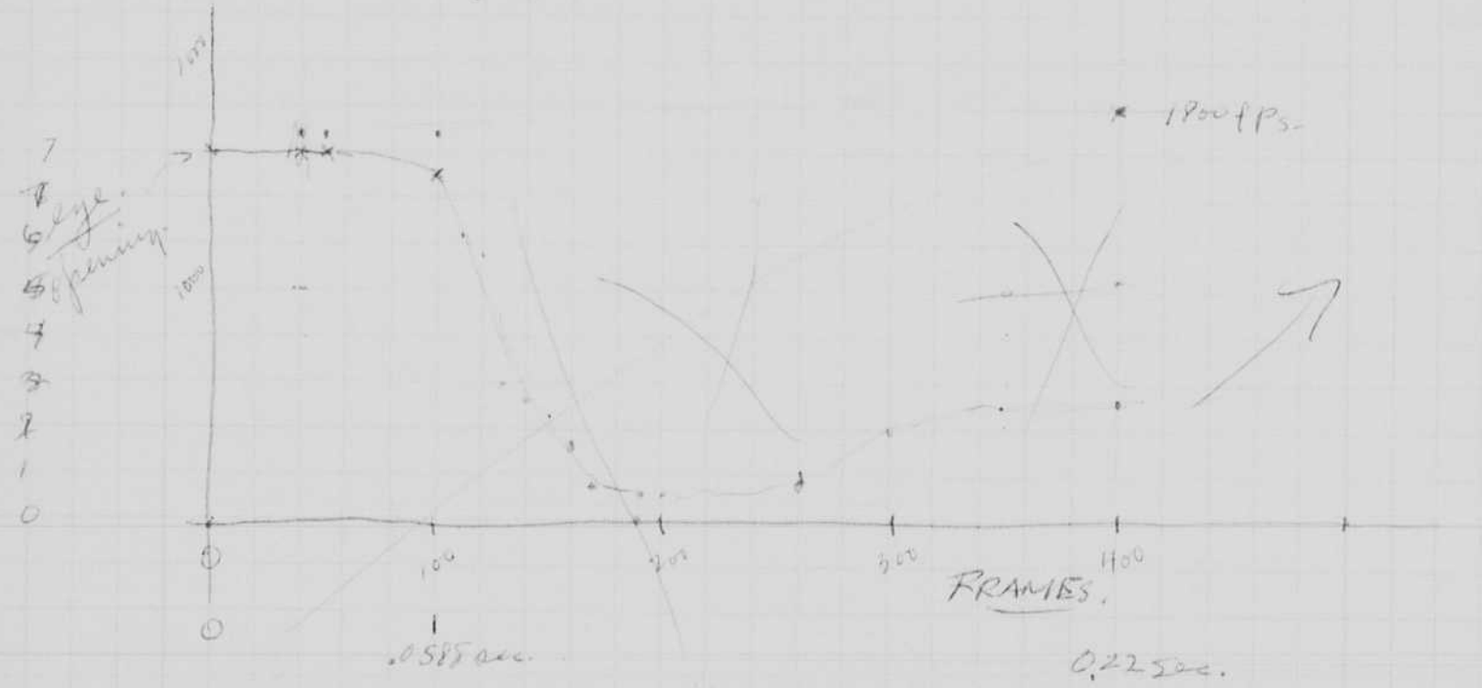
Eryanalyse 0 flash
4 flash gone

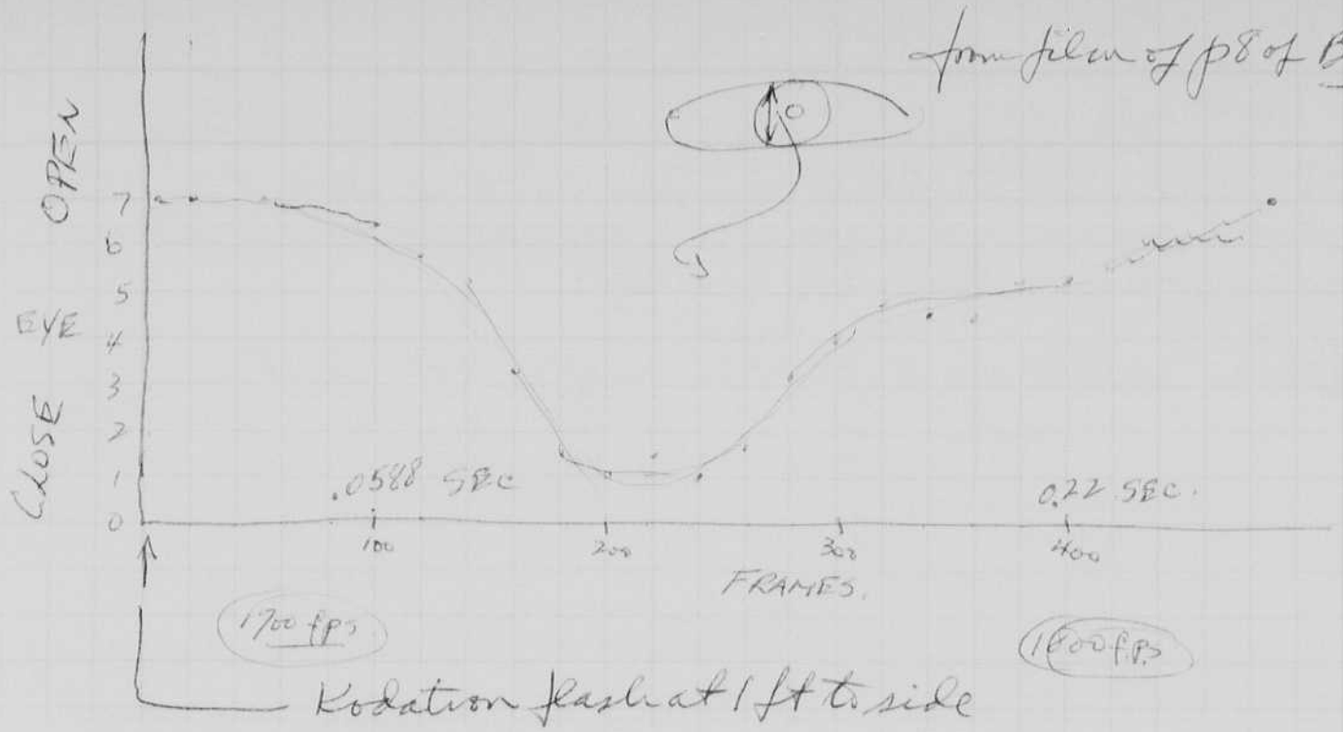
20	7cm	200	1.0	320	4.8		
50	7	210	1.5	330	4.9		
100	6.5	220	1.5	340	4.7		
110	6.2	230	1.0	350	4.7		
120	5.8	240	1.0	360	4.5		
130	5,8	250	1.5	370	4.9		
140	5,2	260	1.75	380	5.2		
150	4,5	270	1.5	390	5.3		
160	3.2	280	2.3	400	5.2		
170	1.5	290	3.6				
180	1.5	300	4.0				
190	1.0	310	4.2				

10 Jan 1. 1970
#2 Edgerton & Jim Jenkin.

#19 movies.
Eye photo speed Record.







Harold E. Edgerton

December 4, 1969

~~Dec. 4 (Thurs) Dr. Dyer (B.B.N.) Noon~~

~~" " " Student-Faculty~~ (E.E. Dept.) Happy hour, 10-280 (3-5pm)

" 5 (Fri.) Faculty Club (rm. # 3), Mr. Green, Dr. Killian and Prof. Smull in ?:30pm

" 29 (Mon.) Strobe Lab Open House, AAAS

Jan. 14 (Wed.) W.H.O.I. Trustees and Members meeting, 10am followed by lunch (Meeting to be held in Boston but place has not been set)

" 18 (Sun.) H.E.E. to lecture in 10-250, 3pm for Mrs. Herman Haus

Feb 12 Thurs Work Fair Ocean.

Feb. 13 (Fri.) Florida Institute of Technology, Melbourne, Sci. Adv. Bd. Meeting (J.E. Miller, V.P.)

Feb. 18 (Wed.) Franklin Inst. Philadelphia, evening lecture (Frank Netherly)

Mar. 7 (Sat.) New York Clinic, as per W. Feinberg

~~(Apr. 8 Wed., Apr. 9 (Thurs) or~~ May 11 (Mon.) possible dates for the New England Conference, H.E.E. to lecture (maybe) on experience in Russian-American Co-operation. (afternoon)

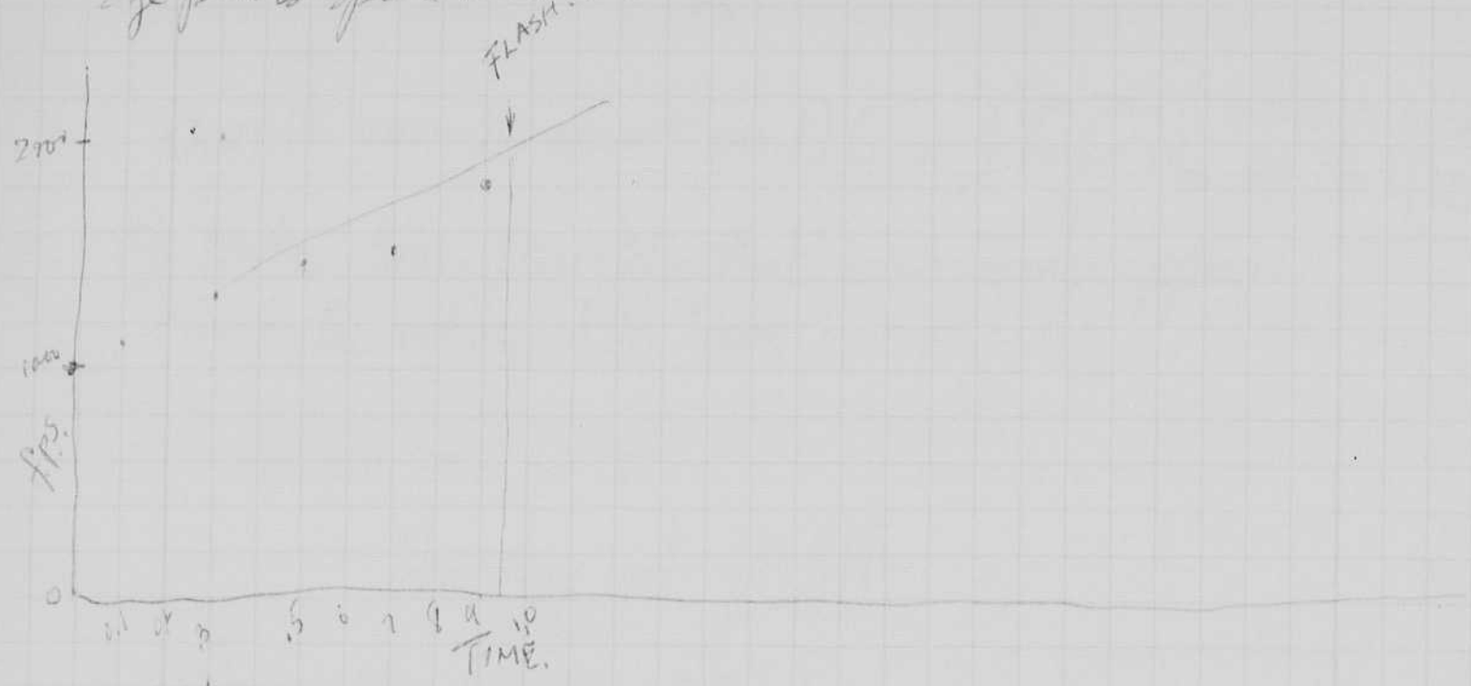
May 16 (Sat.) Boston Sea Rovers Clinic

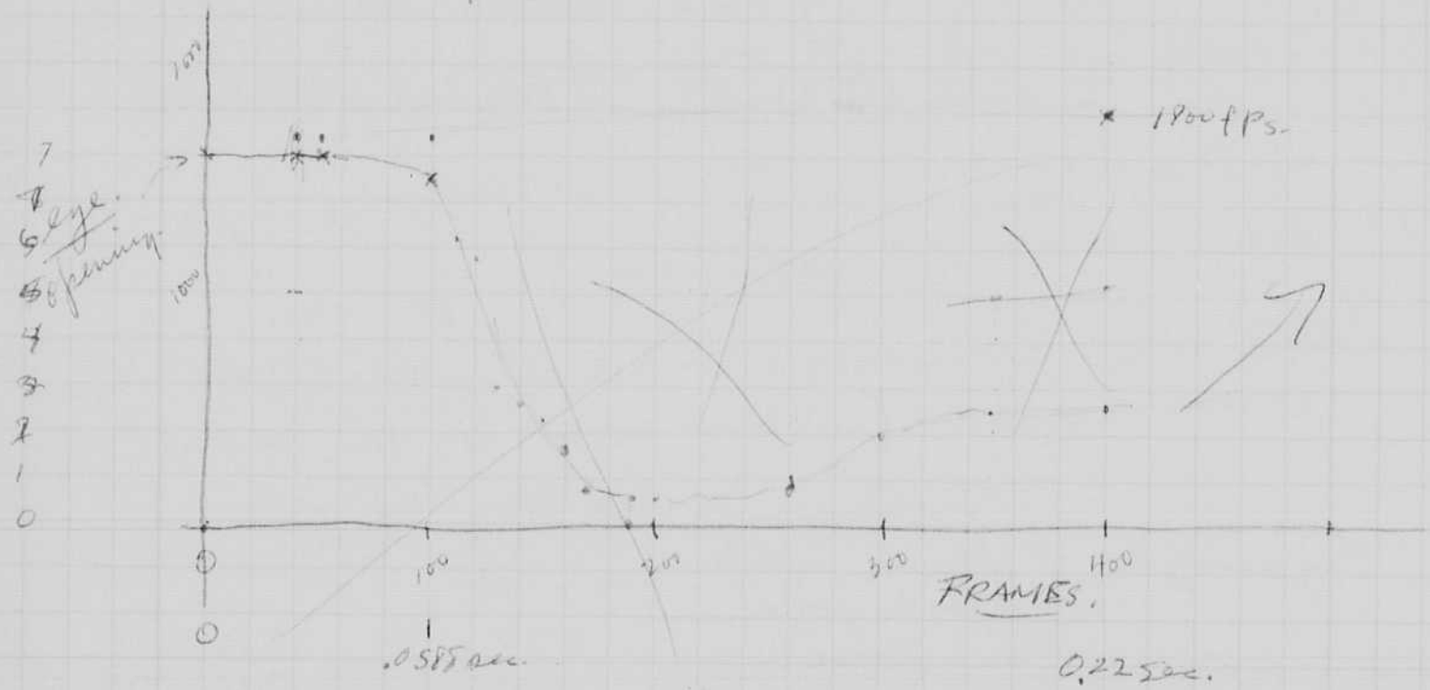
June 14 (Sun.) Fred Centanni's wedding)

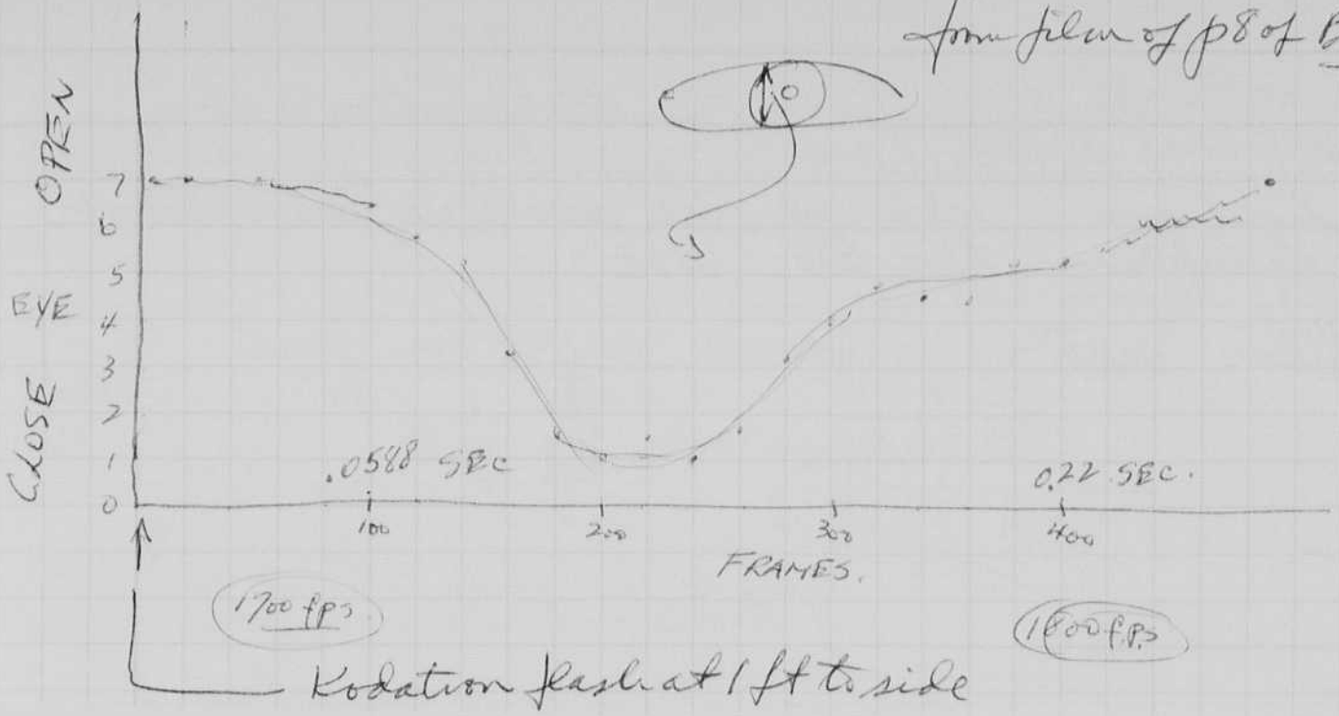
Grad Trip Mar.-Apr.

10 Jan 1. 1970
at Edgerton & Jim Jenkin.

H.S. Movies -
Eye photo-speed Record.







Harold E. Edgerton

December 4, 1969

~~Dec. 4 (Thurs) Dr. Dyer (B.B.N.) Noon~~

~~" " " Student-Faculty~~ (E.E. Dept.) Happy hour, 10-280 (3-5pm)

" 5 (Fri.) Faculty Club (rm. # 3), Mr. Green, Dr. Killian and Prof. Smullin 1:30pm

" 29 (Mon.) Strobe Lab Open house, AAAS

Jan. 14 (Wed.) W.H.O.I. Trustees and Members meeting, 10am followed by lunch (Meeting to be held in Boston but place has not been set)

" 18 (Sun.) H.E.E. to lecture in 10-250, 3pm for Mrs. Herman Haus

Feb 12 Thurs Woods Hole Ocean.

Feb. 13 (Fri.) Florida Institute of Technology, Melbourne, Sci. Adv. Bd. Meeting (J.E. Miller, V.P.)

Feb. 18 (Wed.) Franklin Inst. Philadelphia, evening lecture (Frank Netherly)

Mar. 7 (Sat.) New York Clinic, as per W. Feinberg

~~(Apr. 8 Wed., Apr. 9 (Thurs) or~~ May 11 (Mon.) possible dates for the New England Conference, H.E.E. to lecture (maybe) on experience in Russian-American Co-operation. (afternoon)

May 16 (Sat.) Boston Sea Rovers Clinic

June 14 (Sun.) Fred Centanni's wedding)

Greetings mar-apr.

1700 fps

Kodatron flash at 1 ft to side

1800 f.p.s

Harold E. Edgerton

December 4, 1969

~~Dec. 4 (Thurs) Dr. Dyer (B.B.N.) Noon~~

~~" " " Student-Faculty~~ (E.E. Dept.) Happy hour, 10-280 (3-5pm)

" 5 (Fri.) Faculty Club (rm. # 3), Mr. Green, Dr. Killian and Prof. Smullin, 12:30pm

" " " Minor White's photo show Carl Siembab Gallery, 133 Newbury St. Boston, 5 - 8 pm (Dec. 5 through Dec. 31)

" 6 (Sat.) Jerry Buckley, Boston Garden

" 7 (Sun.) The Boston Ballroom Studio Dinner Dance, Hotel Continental 7 - 11 pm,

" 8 (Mon.) Dyonics Stockholders meeting, 71 Pine St. Woburn, 10 am

" 9 (Tues.) Dr. Keil, Dr. Dyer and H. Edgerton, 9am, rm. 5-226

" " ——— Baker House dinner, Ivan Burns x 2116 or 3161

" 10 (Wed.) Faculty meeting

" " " Jim Lemkin, 5 pm, lecture at Carpenter Center, 8pm

" 11 (Thurs.) Bill McCrea & Bill Hyzer

" " " Prof. Craig Morris, Brandeis University to lecture on INCA STORAGE, 8 pm, room 52-143 (Sloan bldg.) 6:30 cocktails 7 pm dinner, Miss Linda Sayegh X 3721

" 12 (Fri.) H.E.E. WHDH-TV, Classroom 5, John Fitch, 9:30am

" " " N. E. Aquarium, Bd. of Gov. meeting, 12:30pm

" " " Number Six Club, Student-Faculty Cocktail Party, 4-6pm

" 13 (Sat.) EG&G's childrens Christmas Party at Bedford, 9-2pm, .50¢ H.E.E. to bring guitar if he goes, Mr. Suchecki x 4206

" 15 (Mon.) Carpenter Center, Jim Lemkin, 1 - 5:30pm

" 16 (Tues.) Christmas Convocation, 11-12, Kresge

16 Clinton or faculty club

" 17 (Wed.) Mus. of Science Exec. Com. meeting luncheon, 12:15 pm

" 19 (Frid.) Geodyne Christmas Party, Lexington Motar Inn, 6:30pm

Dec. 20-Jan. 4 Christmas ~~Christmas Vacation~~ Vacation

' 26-31 A.A.A.S. Meeting in Boston

" 29 (Mon.) Strobe Lab Open House, AAAS convention

Jan. 14 (Wed.) W.H.O.I. Trustees and Members meeting, 10am followed by lunch (Meeting to be held in Boston but place has not been set)

" 18 (Sun.) H.E.E. to lecture in 10-250, 3pm for Mrs. Herman Haus

Feb 12 Thurs World Trade Ocean.

Feb. 13 (Fri.) Florida Institute of Technology, Melbourne, Sci. Adv. Bd. Meeting (J.E. Miller, V.P.)

Feb. 18 (Wed.) Franklin Inst. Philadelphia, evening lecture (Frank Netherly)

Mar. 7 (Sat.) New York Clinic, as per W. Feinberg

(~~Apr. 8 Wed., Apr. 9 (Thurs) or~~ May 11 (Mon.) possible dates for the New England Conference, H.E.E. to lecture (maybe) on experience in Russian-American Co-operation. (afternoon)

May 16 (Sat.) Boston Sea Rovers Clinic

June 14 (Sun.) Fred Centanni's wedding)

Greetings mem-apr.

1700 f.p.? Kodatron flash at 1 ft to side (1600 f.p.?)

Harold E. Edgerton December 4, 1969

~~Dec. 4 (Thurs) Dr. Dyer (B.B.N.) Noon~~

~~" " " Student-Faculty~~ (E.E. Dept.) Happy hour, 10-280 (3-5pm)

" 5 (Fri.) Faculty Club (rm. # 3), Mr. Green, Dr. Killian and Prof. Smullin, 12:30pm

" " " Minor White's photo show Carl Siembab Gallery, 133 Newbury St. Boston, 5 - 8 pm (Dec. 5 through Dec. 31)

" 6 (Sat.) Jerry Buckley, Boston Garden

" 7 (Sun.) The Boston Ballroom Studio Dinner Dance, Hotel Continental 7 - 11 pm,

" 8 (Mon.) Dyonics Stockholders meeting, 71 Pine St. Woburn, 10 am

" 9 (Tues.) Dr. Keil, Dr. Dyer and H. Edgerton, 9am, rm. 5-226

" " —— Baker House dinner, Ivan Burns x 2116 or 3161.

" 10 (Wed.) Faculty meeting

" " " Jim Lemkin, 5 pm, lecture at Carpenter Center, 8pm

" 11 (Thurs.) Bill McCrea & Bill Hyzer

" " " Prof. Craig Morris, Brandeis University to lecture on INCA STORAGE, 8 pm, room 52-143 (Sloan bldg.) 6:30 cocktails 7 pm dinner, Miss Linda Sayegh X 3721

" 12 (Fri.) H.E.E. WHDH-TV, Classroom 5, John Fitch, 9:30am

" " " N. E. Aquarium, Bd. of Gov. meeting, 12:30pm

" " " Number Six Club, Student-Faculty Cocktail Party, 4-6pm

" 13 (Sat.) EG&G's childrens Christmas Party at Bedford, 9-2pm, .50¢ H.E.E. to bring guitar if he goes, Mr. Suchecki x 4206

" 15 (Mon.) Carpenter Center, Jim Lemkin, 1 - 5:30pm

" 16 (Tues.) Christmas Convocation, 11-12, Kresge

" 17 (Wed.) Mus. of Science Exec. Com. meeting luncheon, 12:15 pm

" 19 (Frid.) Geodyne Christmas Party, Lexington Motar Inn, 6:30pm

Dec. 20-Jan. 4 Christmas ~~Convocation~~ Vacation

' 26-31 A.A.A.S. Meeting in Boston

" 29 (Mon.) Strobe Lab Open House, AAAS

Jan. 14 (Wed.) W.H.O.I. Trustees and Members meeting, 10am followed by lunch (Meeting to be held in Boston but place has not been set)

" 18 (Sun.) H.E.E. to lecture in 10-250, 3pm for Mrs. Herman Haus

Feb. 13 (Fri.) Florida Institute of Technology, Melbourne, Sci. Adv. Bd. Meeting (J.E. Miller, V.P.)

Feb. 18 (Wed.) Franklin Inst. Philadelphia, evening lecture (Frank Netherly)

Mar. 7 (Sat.) New York Clinic, as per W. Feinberg

(~~Apr. 8 Wed., Apr. 9 (Thurs) or~~ May 11 (Mon.) possible dates for the New England Conference, H.E.E. to lecture (maybe) on experience in Russian-American Co-operation. (afternoon)

May 16 (Sat.) Boston Sea Rovers Clinic

June 14 (Sun.) Fred Centanni's wedding)

1700 fps — Kodatron flash at 1 ft to side — 1600 fps

Harold E. Edgerton

December 4, 1969

~~Dec. 4 (Thurs) Dr. Dyer (B.B.N.) Noon~~

~~" " "~~ ~~Student-Faculty~~ (E.E. Dept.) Happy hour, 10-280 (3-5pm)

" 5 (Fri.) Faculty Club (rm. # 3), Mr. Green, Dr. Killian and Prof. Smullin, 12:30pm

" " " Minor White's photo show Carl Siembab Gallery, 133 Newbury St. Boston, 5 - 8 pm (Dec. 5 through Dec. 31)

" 6 (Sat.) Jerry Buckley, Boston Garden

" 7 (Sun.) The Boston Ballroom Studio Dinner Dance, Hotel Continental 7 - 11 pm,

" 8 (Mon.) Dyonics Stockholders meeting, 71 Pine St. Woburn, 10 am

" 9 (Tues.) Dr. Keil, Dr. Dyer and H. Edgerton, 9am, rm. 5-226

" " Baker House dinner, Ivan Burns x 2116 or 3161

" 10 (Wed.) Faculty meeting

" " " Jim Lemkin, 5 pm, lecture at Carpenter Center, 8pm

" 11 (Thurs.) Bill McCrea & Bill Hyzer

" " " Prof. Craig Morris, Brandeis University to lecture on INCA STORAGE, 8 pm, room 52-143 (Sloan bldg.) 6:30 cocktails 7 pm dinner, Miss Linda Sayegh X 3721

" 12 (Fri.) H.E.E. WHDH-TV, Classroom 5, John Fitch, 9:30am

" " " N. E. Aquarium, Bd. of Gov. meeting, 12:30pm

" " " Number Six Club, Student-Faculty Cocktail Party, 4-6pm

" 13 (Sat.) EG&G's childrens Christmas Party at Bedford, 9-2pm, .50¢ H.E.E. to bring guitar if he goes, Mr. Suchecki x 4206

" 15 (Mon.) Carpenter Center, Jim Lemkin, 1 - 5:30pm

" 16 (Tues.) Christmas Convocation, 11-12, Kresge

" 17 (Wed.) Mus. of Science Exec. Com. meeting luncheon, 12:15 pm

" 19 (Frid.) Geodyne Christmas Party, Lexington Motar Inn, 6:30pm

Dec. 20-Jan. 4 Christmas Vacation

' 26-31 A.A.A.S. Meeting in Boston

" 29 (Mon.) Strobe Lab Open House, AAAS

Jan. 14 (Wed.) W.H.O.I. Trustees and Members meeting, 10am followed by lunch (Meeting to be held in Boston but place has not been set)

" 18 (Sun.) H.E.E. to lecture in 10-250, 3pm for Mrs. Herman Haus

Feb. 13 (Fri.) Florida Institute of Technology, Melbourne, Sci. Adv. Bd. Meeting (J.E. Miller, V.P.)

Feb. 18 (Wed.) Franklin Inst. Philadelphia, evening lecture (Frank Netherly)

Mar. 7 (Sat.) New York Clinic, as per W. Feinberg

(~~Apr. 8 Wed., Apr. 9 (Thurs) or~~ May 11 (Mon.) possible dates for the New England Conference, H.E.E. to lecture (maybe) on experience in Russian-American Co-operation. (afternoon)

May 16 (Sat.) Boston Sea Rovers Clinic

June 14 (Sun.) Fred Centanni's wedding)

~~Dec. 4 (Thurs) Dr. Dyer (B.B.N.) Noon~~

~~" " " Student-Faculty~~ (E.E. Dept.) Happy hour, 10-280 (3-5pm)

" 5 (Fri.) Faculty Club (rm. # 3), Mr. Green, Dr. Killian and Prof. Smullin, 12:30pm

" " " Minor White's photo show Carl Siembab Gallery, 133 Newbury St. Boston, 5 - 8 pm (Dec. 5 through Dec. 31)

" 6 (Sat.) Jerry Buckley, Boston Garden

" 7 (Sun.) The Boston Ballroom Studio Dinner Dance, Hotel Continental 7 - 11 pm,

" 8 (Mon.) Dyonics Stockholders meeting, 71 Pine St. Woburn, 10 am

" 9 (Tues.) Dr. Keil, Dr. Dyer and H. Edgerton, 9am, rm. 5-226

" " —— Baker House dinner, Ivan Burns x 2116 or 3161

" 10 (Wed.) Faculty meeting

" " " Jim Lemkin, 5 pm, lecture at Carpenter Center, 8pm

" 11 (Thurs.) Bill McCrea & Bill Hyzer

" " " Prof. Craig Morris, Brandeis University to lecture on INCA STORAGE, 8 pm, room 52-143 (Sloan bldg.) 6:30 cocktails 7 pm dinner, Miss Linda Sayegh X 3721

" 12 (Fri.) H.E.E. WHDH-TV, Classroom 5, John Fitch, 9:30am

" " " N. E. Aquarium, Bd. of Gov. meeting, 12:30pm

" " " Number Six Club, Student-Faculty Cocktail Party, 4-6pm

" 13 (Sat.) EG&G's childrens Christmas Party at Bedford, 9-2pm, .50¢ H.E.E. to bring guitar if he goes, Mr. Suchecki x 4206

" 15 (Mon.) Carpenter Center, Jim Lemkin, 1 - 5:30pm

" 16 (Tues.) Christmas Convocation, 11-12, Kresge

16 —— Clinton town or faculty club.

" 17 (Wed.) Mus. of Science Exec. Com. meeting luncheon, 12:15 pm

" 19 (Frid.) Geodyne Christmas Party, Lexington Motar Inn, 6:30pm

Dec. 20-Jan. 4 Christmas ~~Convention~~ Vacation

' 26-31 A.A.A.S. Meeting in Boston

" 29 (Mon.) Strobe Lab Open House, AAAS convention

Jan. 14 (Wed.) W.H.O.I. Trustees and Members meeting, 10am followed by lunch (Meeting to be held in Boston but place has not been set)

" 18 (Sun.) H.E.E. to lecture in 10-250, 3pm for Mrs. Herman Haus

Feb 12 Thurs Woods Hole. Ocean.

Feb. 13 (Fri.) Florida Institute of Technology, Melbourne, Sci. Adv. Bd. Meeting (J.E. Miller, V.P.)

Feb. 18 (Wed.) Franklin Inst. Philadelphia, evening lecture (Frank Netherly)

Mar. 7 (Sat.) New York Clinic, as per W. Feinberg

(~~Apr. 8 Wed., Apr. 9 (Thurs) or~~ May 11 (Mon.) possible dates for the New England Conference, H.E.E. to lecture (maybe) on experience in Russian-American Co-operation. (afternoon)

May 16 (Sat.) Boston Sea Rovers Clinic

June 14 (Sun.) Fred Centanni's wedding)

Greek trip mar-apr.

Harold E. Edgerton December 4, 1969

~~Dec. 4 (Thurs) Dr. Dyer (B.B.N.) Noon~~

~~" " "~~ ~~Student-Faculty~~ (E.E. Dept.) Happy hour, 10-280 (3-5pm)

" 5 (Fri.) Faculty Club (rm. # 3), Mr. Green, Dr. Killian and Prof. Smullin, 12:30pm

" " " Minor White's photo show Carl Siembab Gallery, 133 Newbury St. Boston, 5 - 8 pm (Dec. 5 through Dec. 31)

" 6 (Sat.) Jerry Buckley, Boston Garden

" 7 (Sun.) The Boston Ballroom Studio Dinner Dance, Hotel Continental 7 - 11 pm,

" 8 (Mon.) Dyonics Stockholders meeting, 71 Pine St. Woburn, 10 am

" 9 (Tues.) Dr. Keil, Dr. Dyer and H. Edgerton, 9am, rm. 5-226

" " Baker House dinner, Ivan Burns x 2116 or 3161

" 10 (Wed.) Faculty meeting

" " " Jim Lemkin, 5 pm, lecture at Carpenter Center, 8pm

" 11 (Thurs.) Bill McCrea & Bill Hyzer

" " " Prof. Craig Morris, Brandeis University to lecture on INCA STORAGE, 8 pm, room 52-143 (Sloan bldg.) 6:30 cocktails 7 pm dinner, Miss Linda Sayegh X 3721

" 12 (Fri.) H.E.E. WHDH-TV, Classroom 5, John Fitch, 9:30am

" " " N. E. Aquarium, Bd. of Gov. meeting, 12:30pm

" " " Number Six Club, Student-Faculty Cocktail Party, 4-6pm

" 13 (Sat.) EG&G's childrens Christmas Party at Bedford, 9-2pm, .50¢ H.E.E. to bring guitar if he goes, Mr. Suchecki x 4206

" 15 (Mon.) Carpenter Center, Jim Lemkin, 1 - 5:30pm

" 16 (Tues.) Christmas Convocation, 11-12, Kresge

" 17 (Wed.) Mus. of Science Exec. Com. meeting luncheon, 12:15 pm

" 19 (Frid.) Geodyne Christmas Party, Lexington Motar Inn, 6:30pm

Dec. 20-Jan. 4 Christmas ~~Convocation~~ Vacation

' 26-31 A.A.A.S. Meeting in Boston

" 29 (Mon.) Strobe Lab Open House, AAAS

Jan. 14 (Wed.) W.H.O.I. Trustees and Members meeting, 10am followed by lunch (Meeting to be held in Boston but place has not been set)

" 18 (Sun.) H.E.E. to lecture in 10-250, 3pm for Mrs. Herman Haus

Feb. 13 (Fri.) Florida Institute of Technology, Melbourne, Sci. Adv. Bd. Meeting (J.E. Miller, V.P.)

Feb. 18 (Wed.) Franklin Inst. Philadelphia, evening lecture (Frank Netherly)

Mar. 7 (Sat.) New York Clinic, as per W. Feinberg

(~~Apr. 8 Wed., Apr. 9 (Thurs) or~~ May 11 (Mon.) possible dates for the New England Conference, H.E.E. to lecture (maybe) on experience in Russian-American Co-operation. (afternoon)

May 16 (Sat.) Boston Sea Rovers Clinic

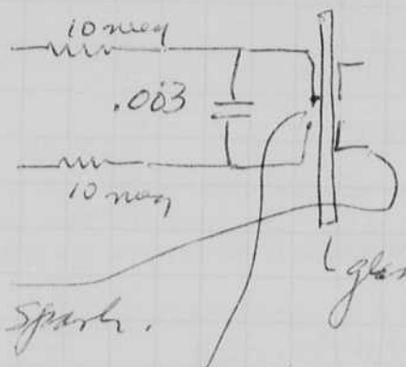
June 14 (Sun.) Fred Centanni's wedding)

Jan 31 1970
H. Edgerton

Spark Gap.

Spark gap for silhouette photography.
This is an attempt to improve the point light source as used with the Edgerton microflash equipment type 549. (549?)

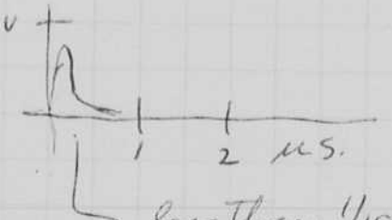
using Microflash early 549 system
Power supply #550 for 161 and Driver LP3 Serial No 2.



glass lantern slide 3 1/4 x 4 1/4

Gap was 1/2" but it sparked by itself. Increased to 3/4 – now ok even if corona on tips can be seen.

Output. Pickup # 4 54 surface 100 ohms.
Diana 2.16 meters 1 volt = 10^6 c.p.
Scope 2175 col for type 53/54K plug in Tech. 5334.
Tape 545 Serial no. 11920.



less than 1/10 us. peak 0.6 volts or $.6 \times 10^6$ c.p.

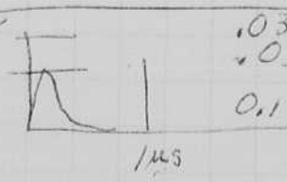
This is a 3/4" spark.

Output = $0.06 \times 10^6 \times 10^{-6}$ c.p.s. = $60,000 \times 10^{-6}$ c.p.s.
= .06 c.p.s.

a 1/8" spark will be 1/60 much.

1/8" pinch output = .01 c.p.s.

Old point light source



.03 volts =
$.03 \times 10^6$ cp
$0.1 \times 10^{-6} \times 0.03 \times 10^6 = 0.003$ cps

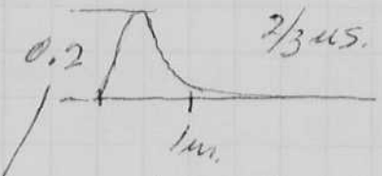
Jan 6 1970
Harold Edgerton & Bill MacRobert
Mess of Light.

Point Light Source
2305 Serial #1
BG 86. (about 1960).

Photo tube #4 Deiva 5-4. m filter
2.16 m - 1 volt 100 Ω gives 10^6 c.p.

Scope 545 # 081920 5354K plug in # 5339

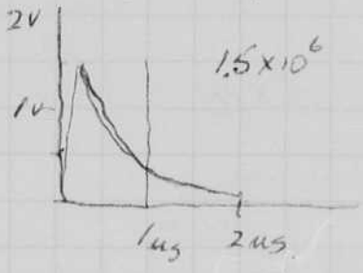
Strobotac 1538



peak is 200,000 c.p.

not peak due to reflector
Reamed now 0.5 volts - 500,000 c.p.

BG 86 2305 Output of Point Source 1.5×10^6 c.p. = 1.5 c.p.s.

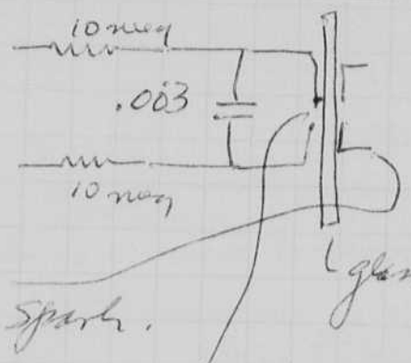


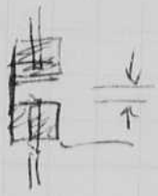
Jan 3 1970
H. Edgerton

Spark Gap.

Spark gap for silhouette photography. This is an attempt to improve the point light source as used with the Edg. micro-flash equipment type 549. (249?)

using Microflash early 549 system
Power supply #550 for 161 and driver LP3 for No 2.

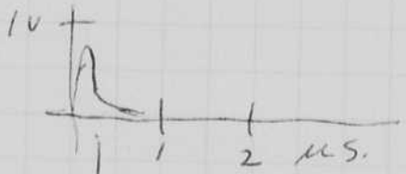




glass lantern slide 3 1/4 × 4 1/4

Gap was 1/2" but it sparked by itself. Increased to 3/4 – now ok even if corona or tips can be seen.

Output. Pickup # 4 84 surface 100 ohms.
Diana 2.16 meters 1 volt = 10^6 c.p.
Scope 2175 col for type 53/54K plug in Tech. Labs 5334.
Tape 545 serial no. 11920.



less than 1/10 μs. peak 0.6 volts or $.6 \times 10^6$ c.p.

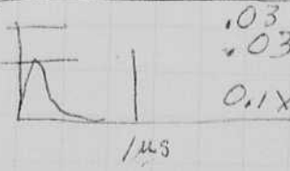
this is a 3/4" spark.

Output = $0.06 \times 10^6 \times 10^{-6}$ c.p.s. = $60{,}000 \times 10^{-6}$ c.p.s.
= .06 c.p.s.

a 1/8" spark will be 1/60 as much.

1/8" pinch output = .01 c.p.s.

Old point light source



.03 volts =
$.03 \times 10^6$ cp
$0.1 \times 10^{-6} \times 0.03 \times 10^6 = 0.003$ cps

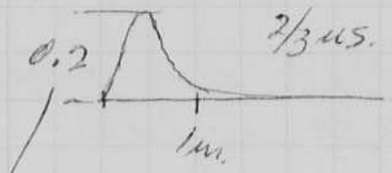
Jan 6 1970
Howard Edgerton & Bill MacRobert
Uses of Light.

Point Light Source
2305 Serial #1
Bk & Bk. (about 1960).

Photo tube # 4 Deiva 5-4. m/filter
2,16 m - 1 volt 100 ft gives 10^6 c.p.

Scope 545 # 01970 5354K plug in # 5339

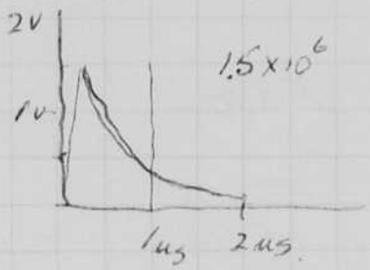
Strobotac 1538



peak is 200,000 c.p.

not peak due to reflector
Reduced now 0,5 volts - 50,000 c.p.

Bk & Bk 2305 output of Point Source 1.5×10^6 c.p. = 1,5 cps



Jan 8 1970
V.E.M.

Spark Gaps
Light Output

Improved point source for Microflash (Mark II) .05 .004
Old " " " " " 1.0
E&G. Co. POINT SOURCE Type 2305 Ser. 1

543 Tape Ser 7059 (Greenwald)
53/54 K Amp. Ser. 2907
Base 925 in battery box. 100 m cord. 4 Sol batt.
Shaffner pickup #4 Diana 929 no filter.

Flash Unit	Distance	Pickup.	Volts	P.C.P.	Duration
New Mark II for Microflash, at	130 cm.	Battery 929	0.15	64,000	~~0.1~~ 0.14 μsec.
Old Microflash Point Source .05	130 cm.	"	0.056 0.15 → usual	64000	(2 μsec low peak) — (½ μsec high peak)
E&G. 2305 0.12 1.3	130 cm.	"	3.5	1.5 X 10⁶	0.9 μsec
2305	216 meter	Shaffner's #4 (Diana)	1.5	1.5 X 10⁶	0.9 μsec.

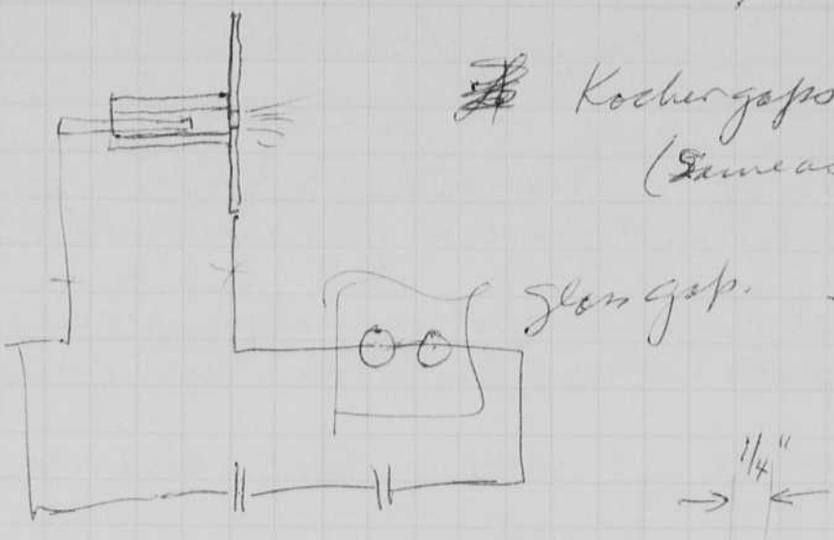
new spark gap. Is this enough light .64,000 x .14 x 10⁻⁶ = .009 ≅ .01 c.p.s.

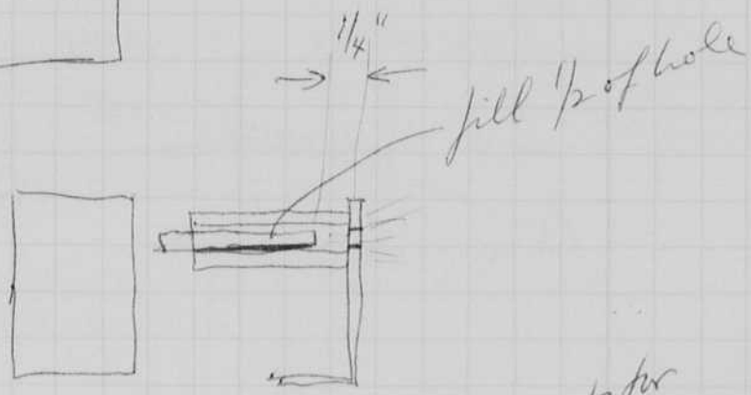
Jan 9 1970
HE & VE Mac.

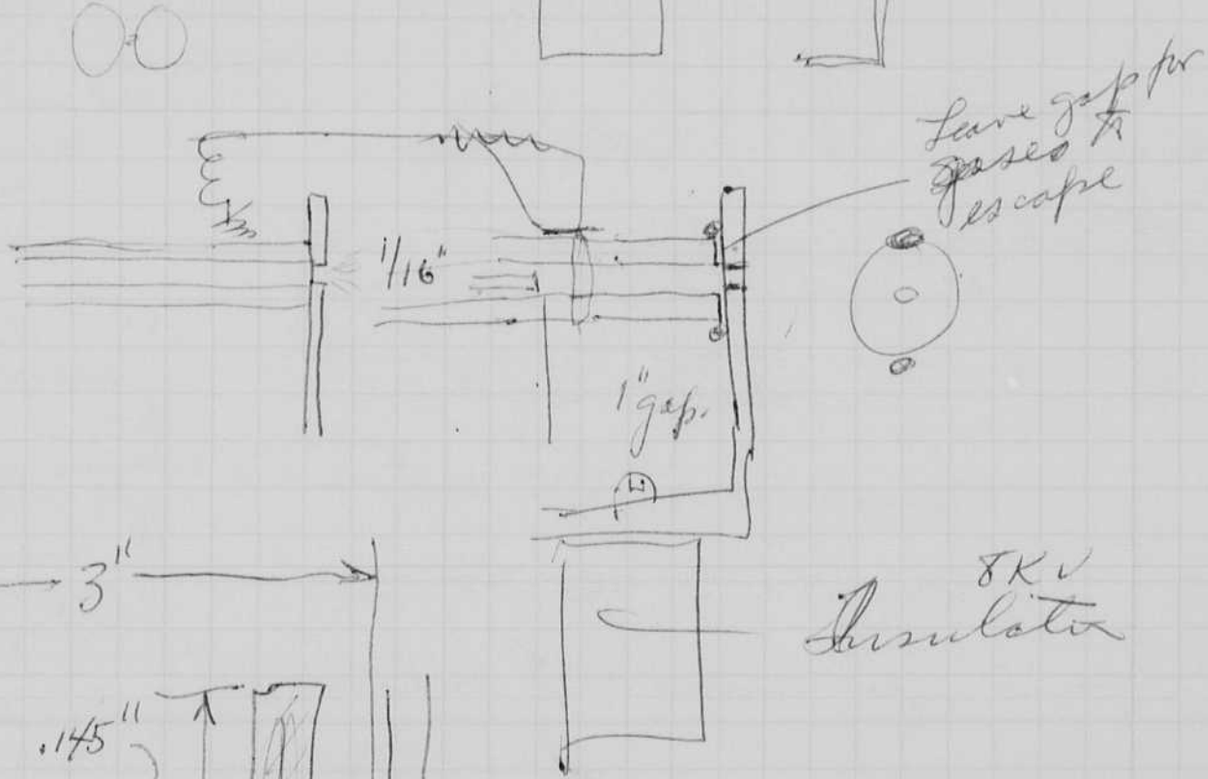
Sparks.

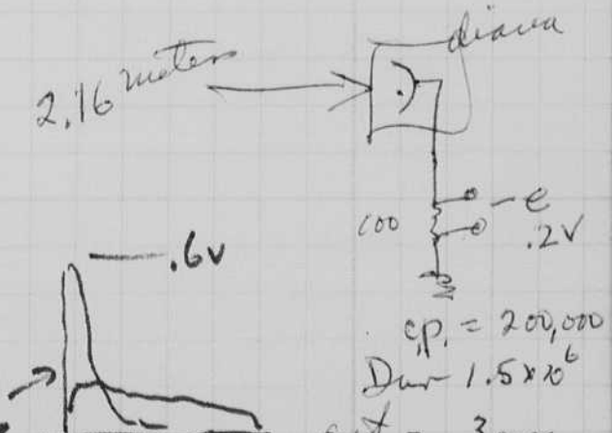
(1) Kocher gaps.
(Sameas 2305).

slow gap.









MODEL
MARK III
V. 2. M.

1 1/2" gap - about the same! } 2 types

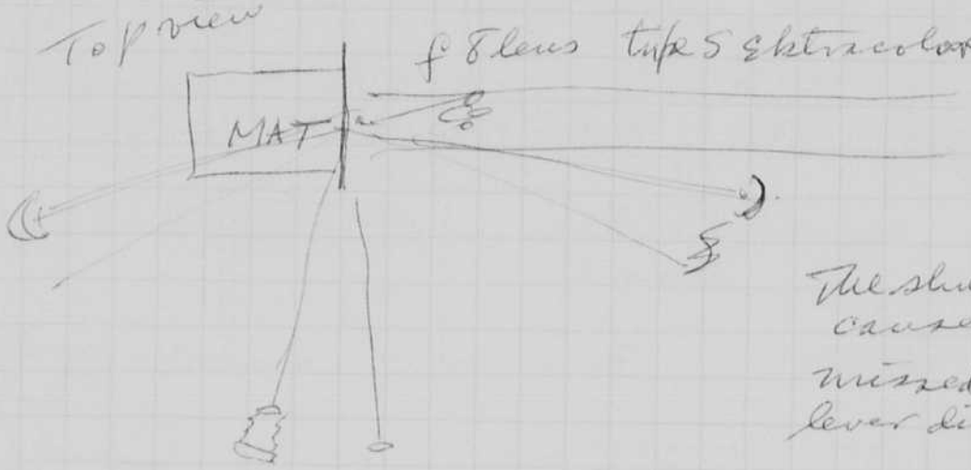
why.

Jan 12 1970
Harold Edgerton Dundee

Last night at Boston Garden Frank Petroli electrician.
To take photos of Pole vaulters,
Wilson
Tavares. Clin's } helpers.
Woulf. Gordon
The pole vault reached 16'6" South of SC.

FT-24 lamps in Spot reflectors · 25 mfd at 4000 v
2 sets with reflector aiming at 25 feet from sides

Top view



The shutter caused trouble! missed firing, the lever did not return.

Photo tube tips must be redesigned
1. Existing units too heavy!
2. They are below the reflector. They should be above
3. Directional sens is desirable.
4. Why not battery operated units?
5. 10 per second rate fast enough?

Jan 12 '70 Spark Source
V.E.M.

MARK III Spark source of page 15
altered by enlarging hole in brass disc.
to diameter of quartz capillary = 0.144 inch.
Designate MARK IIIA.

CAP.	Distance	Pickup	Volts	P.C.P. Duration
MARK IIIA	130 cm.	Battery 929	4±1	1.7×10^6 – 1.5 μsec.
" TURNED 30°	"	"	5	2.1×10^6 – .75 TO 1.0 μsec.
" TURNED 30° OPPOSITE WAY	"	"	<1 TO 5 EXTREMELY VARIABLE	.75 to 1.0 μsec.
" BLACK PAINT AROUND HOLE	"	"	<1 TO 5 MOSTLY LOW.	SOMETIMES < 0.5 μsec.
" ON AXIS WITH BLACK PAINT SOME WORN OFF	"	"	4±1 MOSTLY 4V.	1.5 μsec / 1.0 μsec WHEN 5V. } STEADIER

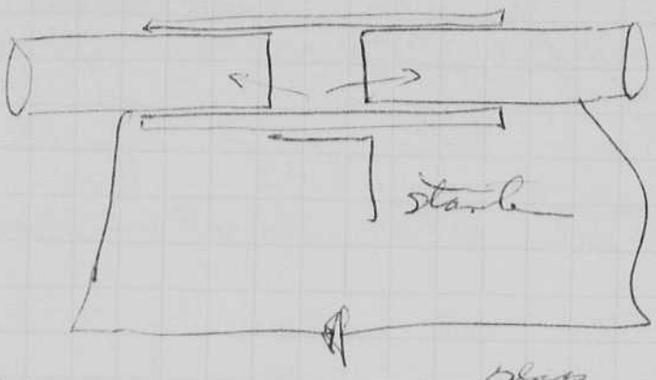
Jan 13 Batt
mark IIIA 130 929
Bare electrode wire
Dia. removed

3 sometimes 4.
1.5 M.S.

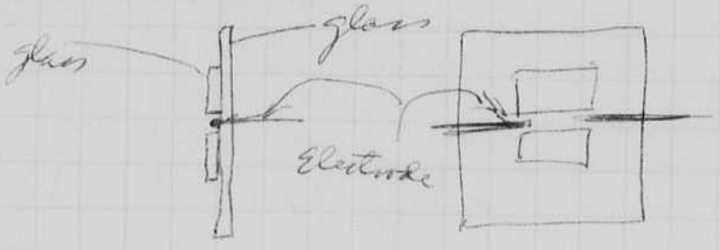
Spurred discharge path, see p. 18.
130 Batt. 929 0.17–0.18 usual // 0.14 μsec.

18 Jan 13 1970 H. Edgerton

Discussed gap lamps with Ken Crosser yesterday morning. He has some ideas about concentric arrangements where the afterglow blows away.

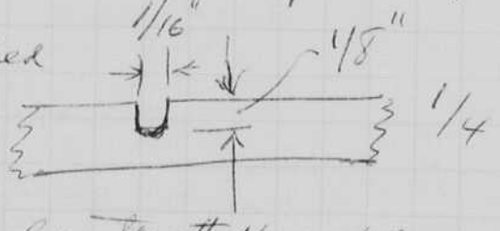


We considered the flat glass plate and that was used several days ago. Some designs that came up during discussion.



The glass ~~blew off~~ - broke due to forces from the spark.

Grooved glass tried



Gap = 3/4" of 1/16 - used with #16 copper wire.
Operation seems excellent with
.004 mfd at 16 KV

5:35 pm Bill just finished the groove for .05 mfd 16 KV.
Total miss flash

5/8" Gap #16 wire. 130 cm to
1/2 guide mark 1.2×10^6 c.p.

$1.2 \text{ volts} \cdot \frac{1.5 \times 10^6}{3.5 \text{ o}} \quad \frac{0.7 \mu\text{s duration}}{0.6 \mu\text{sec}}$

$= 500{,}000$ c.p.

3 cps

W 1/2 × 3/32 High Mask	0.4 V. = 170,000 CP 0.7 Duration	(Believe mask was placed too high)
W 1/2 × 3/16 High "	1.2 ± 2V. = 530,000 cp. - 0.6 μsec Duration	
1/2 × 3/32 " "	1.2 ± 0.2V = 500,000 c.p - 0.6 μsec Dur.	(Mark centered over arc)

Jan-14, '70
S. E. M.

Gaps. for 549 Microflash

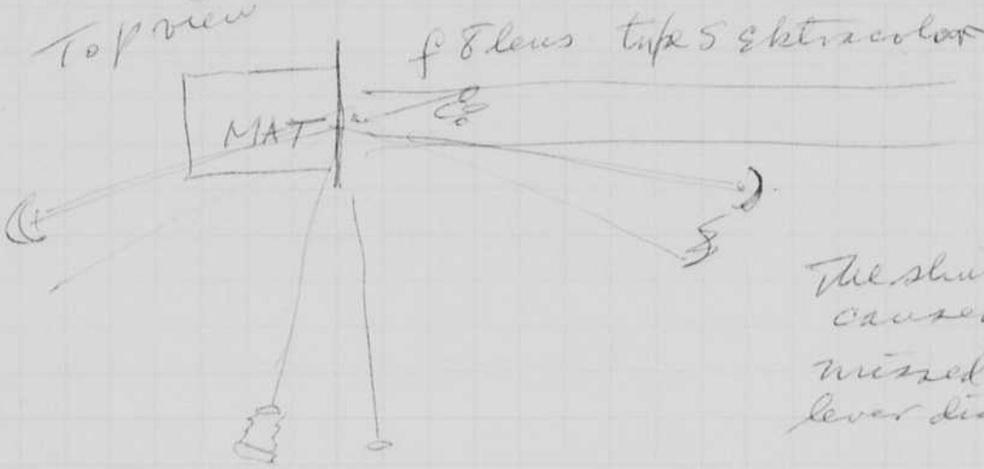
Source	Dist.	Pickup	Volts	P.C.P.	Duration	
Old style point source 0.062" Hole	130cm.	Batt. 929	0.2 to 1.7V. MOSTLY AT LOW END		1.5 μsec to 0.5 μsec.	
OLD STYLE 0.175" Hole	"	"	(0.7 to 1.2V. once over 5V.)		1.5 to 1.0 μsec	
Latest grooved source marked 3/32 H. x 1/8 W. as on p. 18.	"	"	0.7V to 1.0V. occasional 1.2-1.3V.		0.6 μsec,	using 9x11 cardboard shield with 1/2" Hole
"	"	"	MOSTLY 1.0 V.		0.6-0.7 μsec NO SHELD.	
Grooved source without Marking 5/8" gap.	"	"	4.4V.		0.7 μsec.	
Standard air gap flash tube for 549 15/16" gap. side wall no reflector	"	"	6.0 to 6.8V.		0.6-0.7 μsec.	
"	"	Haffner's #4 Diamalon	~~6 to 7V.~~ 10 V		photo tube saturating	
"	2.16m	"	5. to 7V.	5×10^6	0.4 μsec.	
Different gap tube 1" gap	"	"	4 to 8 V		0.4 μsec, ave.	
~~grooved~~ Grooved source no mask 5/8 gap	"	"	2V.	2×10^6	0.6 μsec.	
~~Air gap tube #1~~	"	Batt. 929	1.6-2.0V.		0.5-0.6 μsec.	
Air Gap Flash Tube 15/16 Gap.	"	"	1.6-2.0V		0.5 μsec.	
Grooved source Air gap tube	"	"	5 ave		0.4 μsec	
	"	#4 Diama	5-7.5V ave. 7V.		0.4 μsec	
	"	"	1.8-2.0V		0.6 μsec.	
	"	Batt. 929	5 ave			

Jan 12 1930
Harold Edgerton Sunday

Last night at Boston Garden Frank Petroli electrician.
To take photos of Pole vaulters.
Wilson
Torrance. Chris } helpers.
Woulf. Gordon
the pole vault reached 16'6" South of S.C.

F-1-24 lamps in Spot reflectors · 25 mfd at 4000 v
2 sets with reflector aiming at 25 feet from sides

Top view



The shutter caused trouble! missed firing. the lever did not return.

Photo tube trips must be redesigned
1. Existing units too heavy!
2. Rays are below the reflector. they should be above
3. Directional sens is desireable.
4. Why not battery operated units?
5. 10 per second rate fast enough?

Jan 12 '70 Spark source
V. E. M.

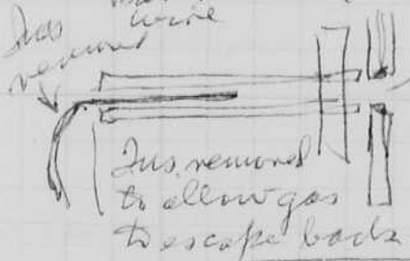
MARK III Spark source of page 15
altered by enlarging hole in brass disc.
to diameter of quartz capillary = 0.144 inch.
Designate MARK IIIA.

	Gap.	Distance	Pickup	Volts	RCP. Duration
MARK IIIA		130 cm.	Batt 929	4±1	1.7×10^6 – 1.5 μsec.
TURNED 30°	"	"	"	5	2.1×10^6 – .75 TO 1.0 μsec.
TURNED 30° OPPOSITE WAY	"	"	"	<1 TO 5 EXTREMELY VARIABLE	.75 to 1.0 μsec.
BLACK PAINT AROUND HOLE	"	"	"	<1 TO 5 MOSTLY LOW.	SOMETIMES < 0.5 μsec.
ON AXIS WITH BLACK PAINT SOME WORN OFF	"	"	"	4±1 MOSTLY 4V.	1.5 μsec / 1.0 μsec WHEN 5V. } STEADIER

Jan 13

mark IIIA 130 Batt 929

Bare electrode wire



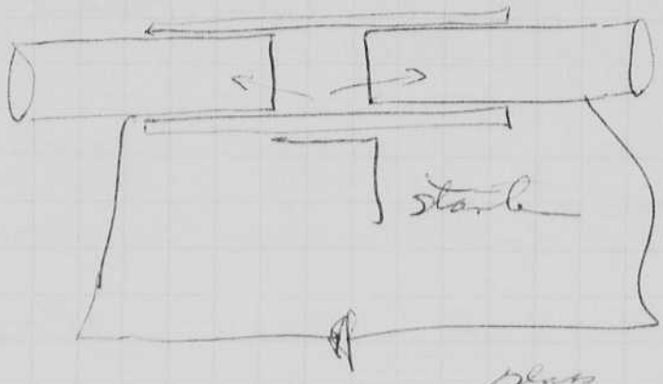
.144 diam Hole. 3 sometimes 4. 1.5 μs.

Spurred discharge path. See p. 18.

130 Batt. 929 0.17–0.18 usual 0.14 μsec.

18 Jan 13 1970 H. Edgerton

Discussed gap lamps with Ken Cramer yesterday morning. He has some ideas about concentric arrangements where the afterglow blows away.



We considered the flat plate glass unit that was used several days ago. New designs that came up during discussion.

The glass ~~blew out~~ - broke due to forces from the spark.

Bored glass tried

Gap = 3/4" of 1/16 - used with #16 copper wire.
Operation seems excellent with
.004 mfd at 16 KV

5:35 pm Bill just finished the groove for .05 mfd 16 KV.
Total misfires

5/8" Gap #16 wire. 130 cm to
1/2 widemark 1.2 X 10^6 cps.

1.2 volts · $\frac{1.5 \times 10^6}{3.5}$ $\frac{0.7\ \mu s \text{ duration}}{0.6\ \mu sec}$

= 500,000 cp.

.3 cps ↘

W
1/2 × 3/32 High Mask 0.4 V. = 170,000 cp. 0.7 Duration (Believe mark was placed too high)
W
1/2 × 3/16 High " 1.2 ± 2V. = 510,000 cp. - 0.6 μsec Duration
1/2 × 3/32 " " 1.2 ± 0.2V = 500,000 cp - 0.6 μsec Dur. (Mark centered over arc.)

Jan-14, '70
S. E. M.

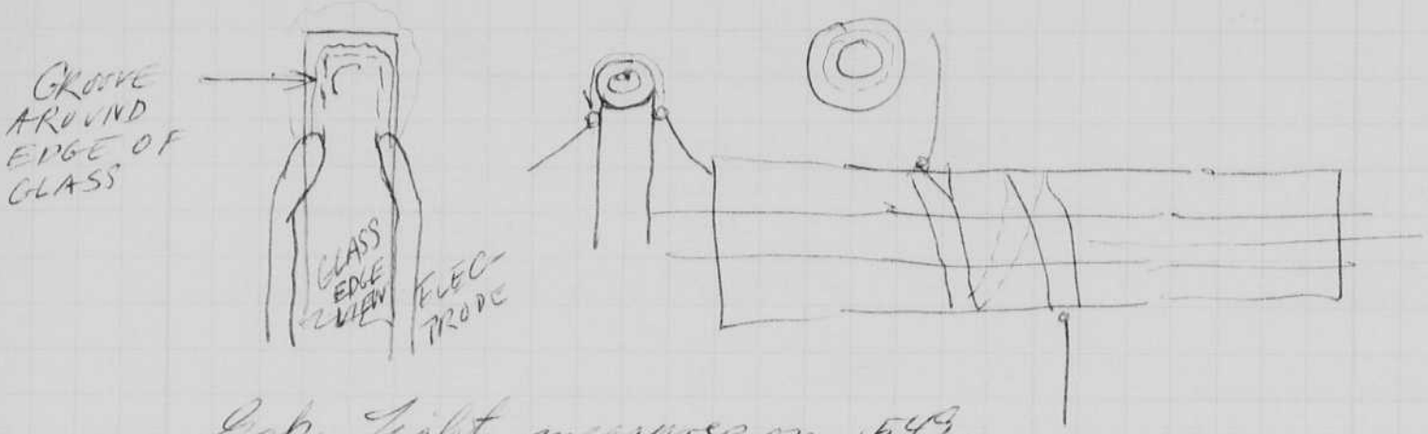
Gaps.
for 549 Microflash

Source	Dist.	Pickup	Volts	P.C.P.	Duration	
Old style point source 0.062" Hole	130cm.	Batt. 929	0.2 to 1.7V. MOSTLY AT LOW END		1.5 μsec to 0.5 μsec.	
OLD STYLE 0.145" Hole	"	"	(0.7 to 1.2V. once ave 5V.)		1.5 to 1.0 μsec	
Tallest grooved source marked 3/32 H. x 1/8 W. as on p. 18.	"	"	0.7V to 1.0V. occasional 1.2-1.3V.		0.6 μsec.	casing 9×11 cord guard shield with 1/2" Hole
"	"	"	MOSTLY 1.0V.		0.6-0.7 μsec	NO SHELD.
Grooved source without Marking 5/8" gap.	"	"	4.4V.		0.7 μsec.	
Standard air gap flashtube for 549 15/16" bap. sideways no reflector	"	"	6.0 to 6.8V.		0.6-0.7 μsec.	
"	"	Haffner's #4 Diana 100	~~5 to 7V.~~ 5 to 7V	—	photo tube saturating	
"	2.16m	"	5. to 7V.	5 to 7 × 10^6	0.4 μsec.	
Different gap tube 1" gap	"	"	4 to 8 V		0.4 μsec, ave.	
Grooved source no mask 5/8 gap	"	"	2V.	2 × 10^6	0.6 μsec.	
~~Air gap tube #1~~	"	~~Batt.~~ Batt. 929	~~1.6-2.0V.~~ 1.6-2.0V		0.5-0.6 μsec. 0.3 μsec.	
Air gap Flash Tube 15/16 gap.	"	"	5 ave		0.4 μsec	
Grooved source Air gap tube	"	#4 Diana " Batt. 929	5-7V ave. 7V. 1.6-2.0V 5 ave.		0.4 μsec 0.6 μsec.	

Jan 14 1970

V.E.M.

H.E.E. MacRobert's idea. How to start?

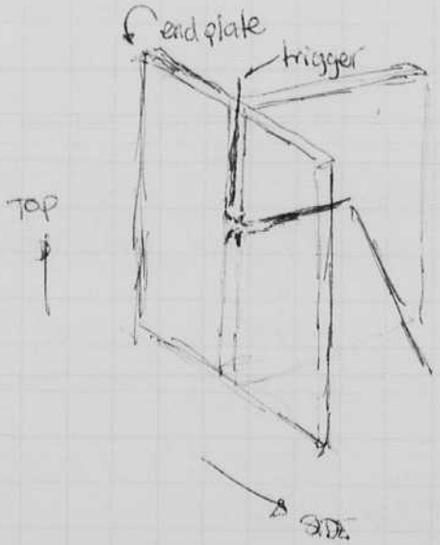


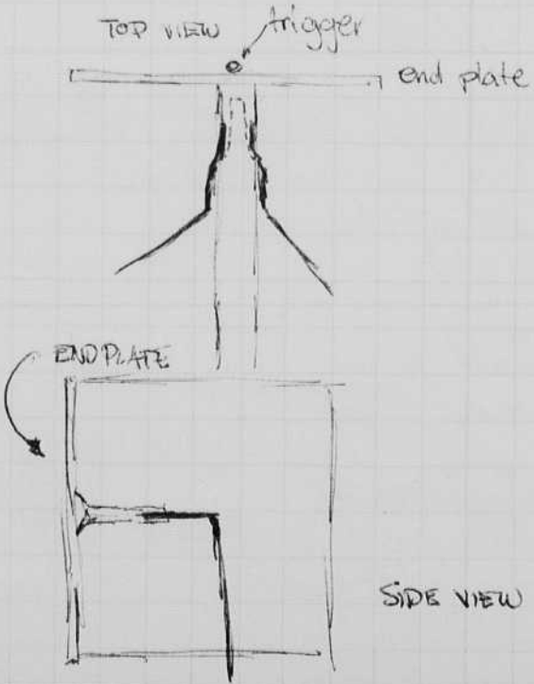
Gap. Light measurezon 549.

Source Dist. Pickup Volts P.C.P. Dur.

Standard gap tube sideways. 15/16" gap.	4 Meters	#4 DIANA	2.0-2.4 V. AVE 2.2V.		4 μsec.
"	4 meters	929 Batt.	1.8-2.2V AVE 2.0V.		4 μsec.

Jan 15 '70 V.E.M.	~~2.16~~ 2.16m	#4 DIANA	1.5V	.5 μsec	P.C.P. ~~new~~ end groove 1.5X10⁶ masked
H.E.E. MacRobertsen	2.16m	"	2.5 to 3.0V	.6 μsec	2.75X10⁶ unmasked



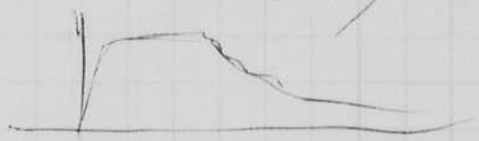


	Dist METERS	Pickup ~~#4 Diena~~	Volts	PCP	Dur
end groove masked	2.16	929 Bat	1.75V	1.75×10^6	.5psec
new groove masked	2.16	"	.4V	0.4×10^6	.6psec
end plate	2.16	929	1.5 to 2.0V	$1.5\text{-}2.0 \times 10^6$	1.0 psec
new groove unmasked	2.16	929	1.70V	1.7×10^6	.5 psec

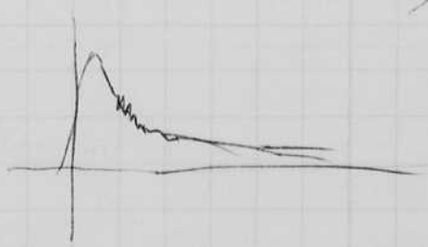
Jan 1650
V.L.M.

New box groove & model U groove Dep 5/64" Mark 3/16W x 3/64" H. @ 2.16m. 929 Bat 1.8V. 1.8×10^6 P.C.P. 0.6 μsec.

" Mark 1/16" x 5/64" centered over one electrode end " " 0.3V 0.5×10^6 P.C.P. 1.0 μsec.



Mark 1/16" x 5/64" Centered over middle of groove " " 0.6V 0.6×10^6 P.C.P. 0.6 μsec.



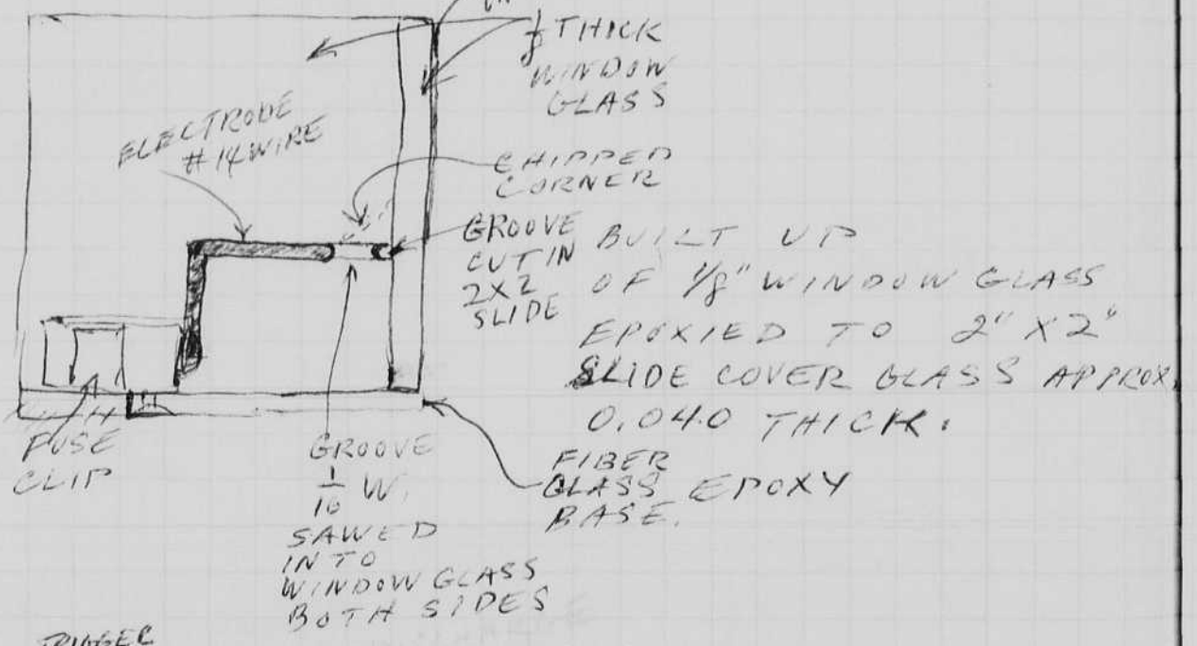
~~"~~ ~~"~~ ~~"~~

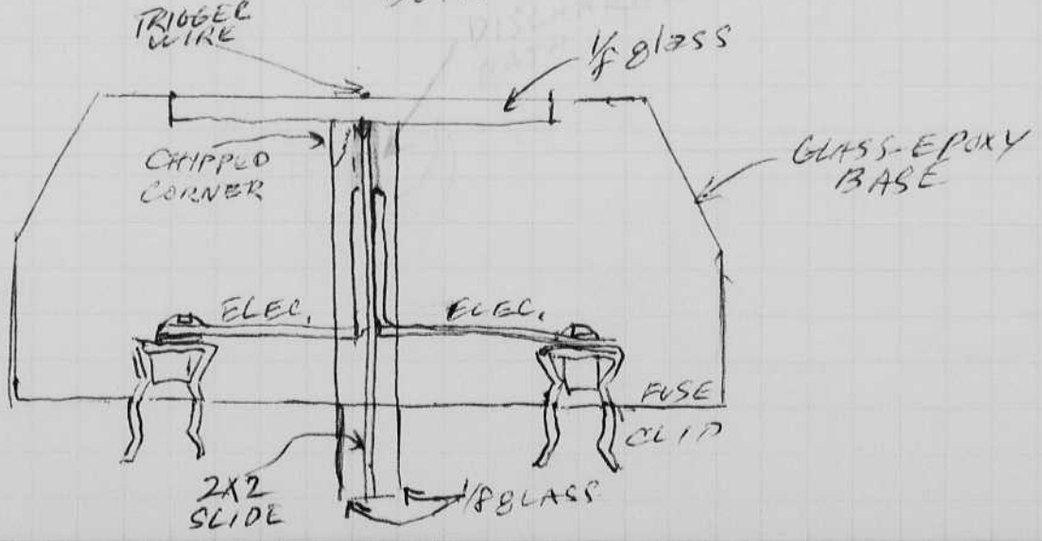
" Dep adjusted to 1" Misses sometimes " " 0.5V 0.5 μsec

Jan. 21 '70
V. G. M.

Spark Gap
point source.

Source. Dist.	Pick-up.	Volts	P. C. P.	Dam.
Box type 2.16m ground model of page 21 Mark 1/16" × 9/32" W. glass has deposits etched.	929 batt.	1.4-1.5	1.5×10^6	0.6 μsec.
New box type with cemented side plates. mark 1/16" H × 5/64" W.	2.16m batt 929	1.2-1.3 at first then 0.8 to 1.1	1.3×10^6 1.0×10^6	0.5 μsec.
Cut marked 1/16" H × 1/8" W. Glass now slightly etched one corner of groove chipped off	2.16m.	1.0-1.2	1.1×10^6 PCP	0.6 μsec





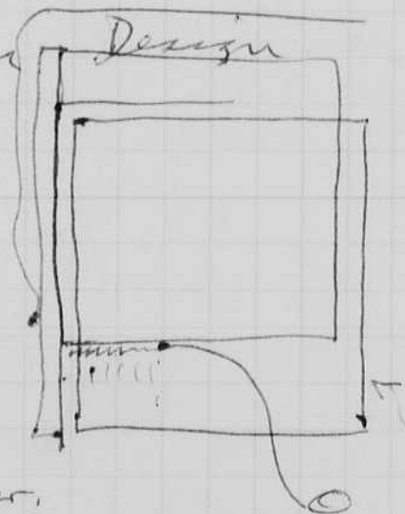
Jan 22 '70 — Spark gap
2.2 M — point source.

Source	Dist	Pick-up	Volts	P.C.P.	Dens.
1st box type grooved, page 21 Mask 1/16 × 1/16 Front glass slightly etched 5/8" arc.	2.16 m	929 batt	0.5 ~~0.52~~	0.55 × 10⁶	0.5 μsec.
2nd box type page 22. Front plate slightly etched corner groove chipped Mask 1/16 × 1/16, 9/16" arc.	2.16 m.	"	0.6 ~~0.7~~	0.66 × 10⁶	0.5 μsec.

Some weak flashes. Some self-flash.

Finally punched a hole thru the 2×2 cover glass middle piece and went into continuous arc. FINIS

Jan 22 1970
H. Edgerton



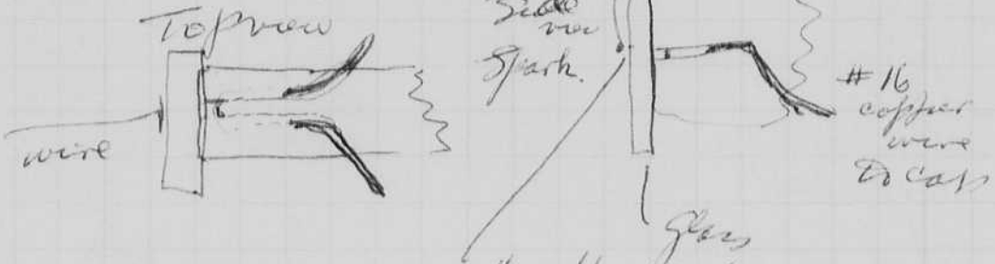
Single glass side to restrain the arc.

Built one of these. It blows upon first trial. We think because of air space between sandwiched plate. Not enough epoxy.

Straight arc grooved source marked 1/16 × 1/16	2.16 m.	batt. 929	0.14 to 0.2 usual 0.15	0.17 × 10⁶	0.5 - 0.6 μsec.
Old style point source 1/16 Dia Hole	2.16 m	"	0.03 - 0.04 usual occasional 0.15 - 0.18	— 0.04 × 10⁶	1.5 μsec. ~~1~~ 1 μsec or less

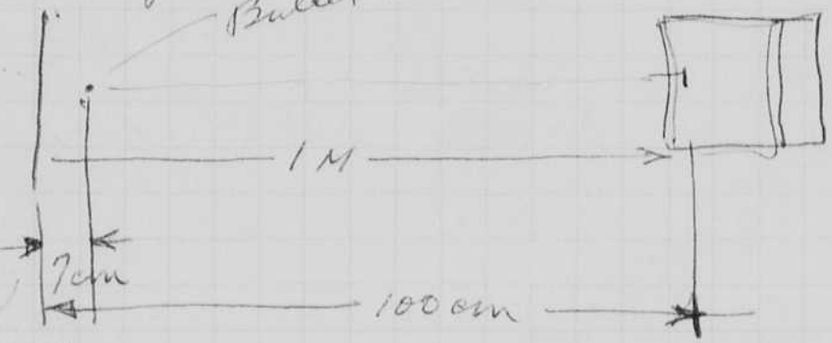
Jan 25 1970
Harold Edgerton

Test of 1/16" x 1/16" square or
Double groove spark source.
This is the 1/2" plate glass with a
Double ground groove



1/16 x 1/16 aperture.

Contrast process ortho film Estar base mar 1970



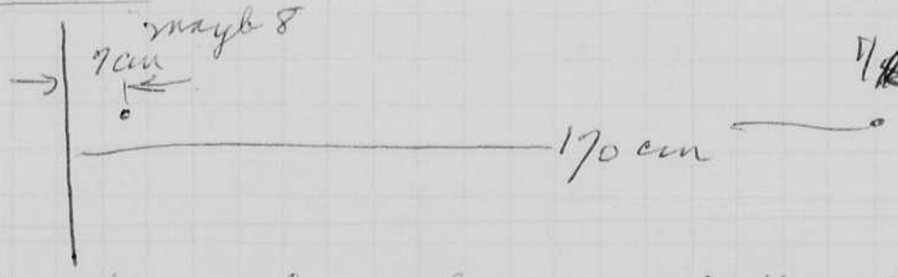
509 #10 microflash with adapter
0.05 mfd at 16 KV

maybe 8 cm

Dev is Dectol 1 to 4 for 5 min at 65°F (?)
Density about 1.1 on Quantity.
22 Long Rifle Some blur on whole

not sharp due to source size

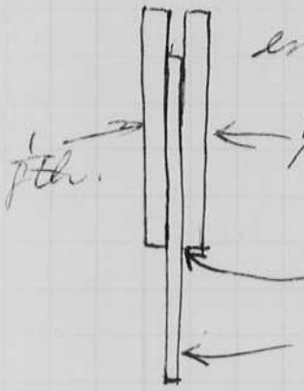
Second Example



Same film and developer neg with thin but image sharp.
Density about 0.3
A good print was made
See page 26

Jan 26 70 Spark Gap
N.E.M. Point source

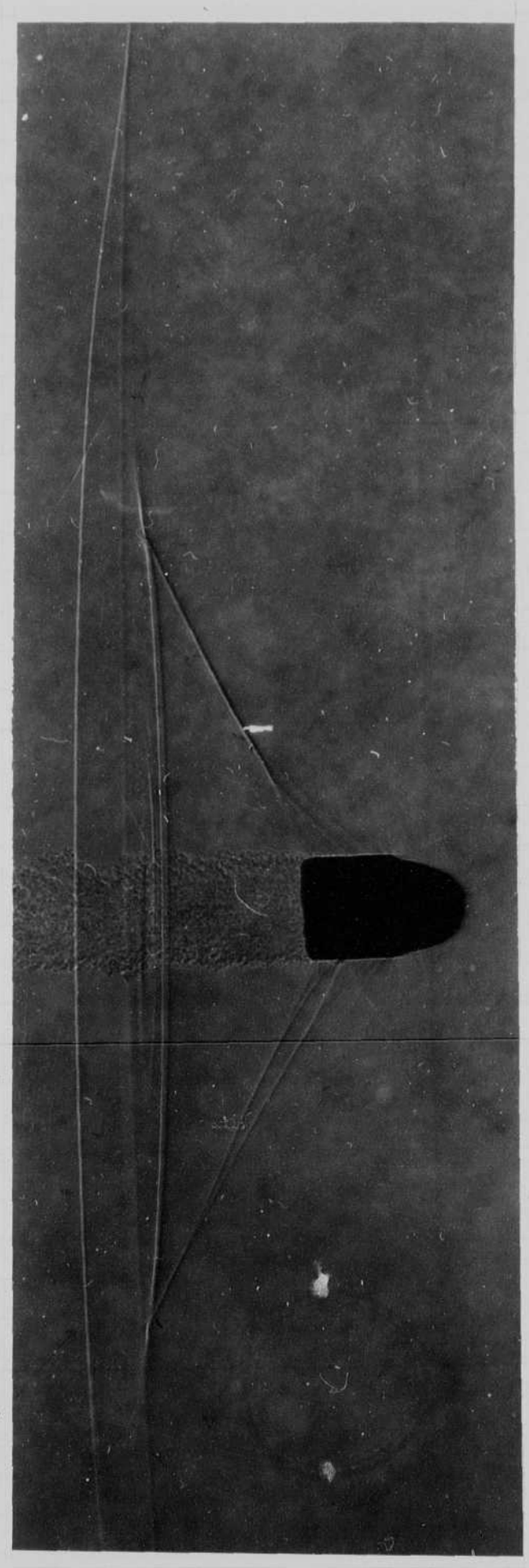
New spark gap. Arc in corner design (Edgerton page 23)



Source	Dist.	Pickup 929 Batt.	Volts	P.C.P.	Dur.	
Arc above only area above arc marked	2.16m		1.3-1.6	1.5×10^6	0.8 μsec.	Using a different Microflash than pp. 12-24.
1/16" X 1/16" mark	2.16m	"	0.4	0.44×10^6	0.5-0.6 μsec.	

Had some spark-over of trigger high-voltage back to electrodes. Found this high voltage power supply contains an especially potent spark coil (#26.22 TR-50). Will parallel PRIMARY with some resistance to reduce spark.

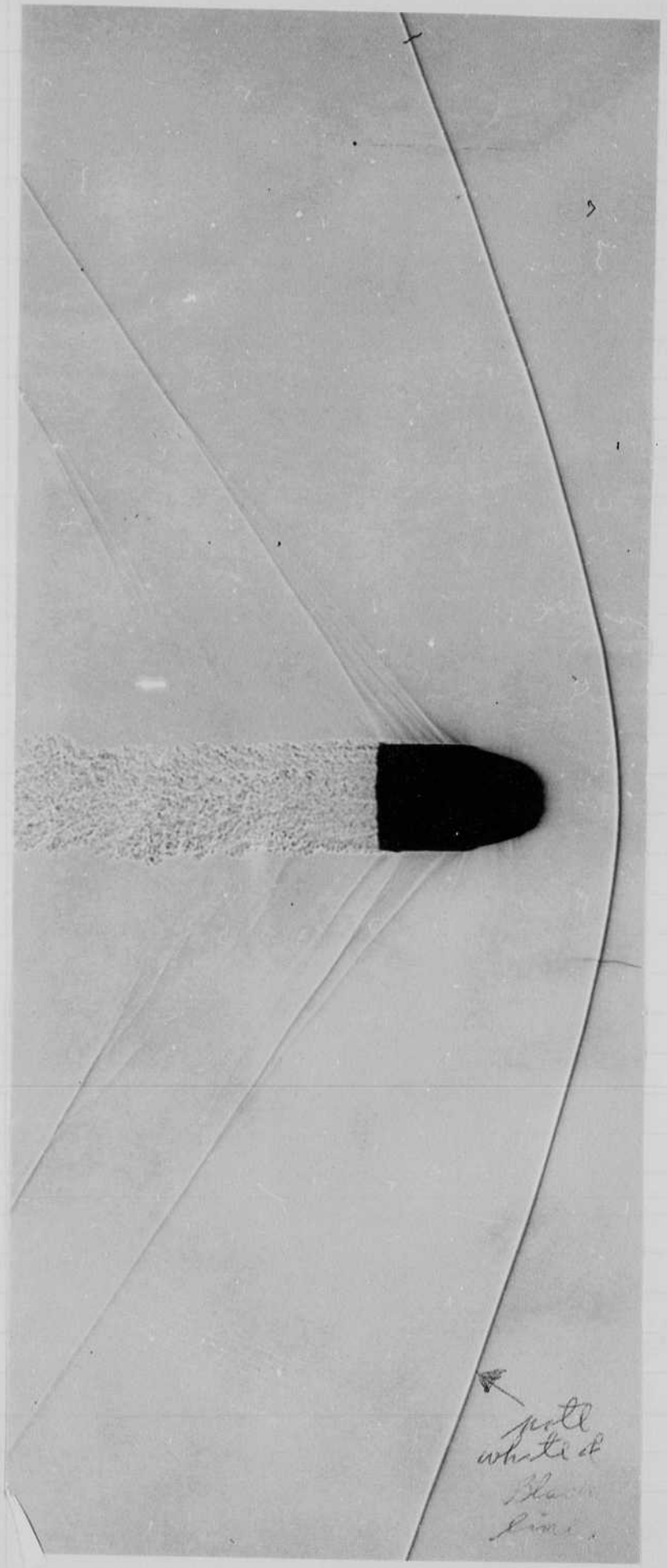
Jan 30 1970
H. Edgerton The point source of p 24 over a 1/16 x 1/16 aperture was used to take shadow photos of an air nozzle in the turbine lab for Art Rosales and Prof Tani (?) Ken Krozier developed the films.
Spark was 2 meters away.
Results excellent at 7½, 15, and 30 cm on Tri-X film. DK-50 at 10 min.



22 Short.

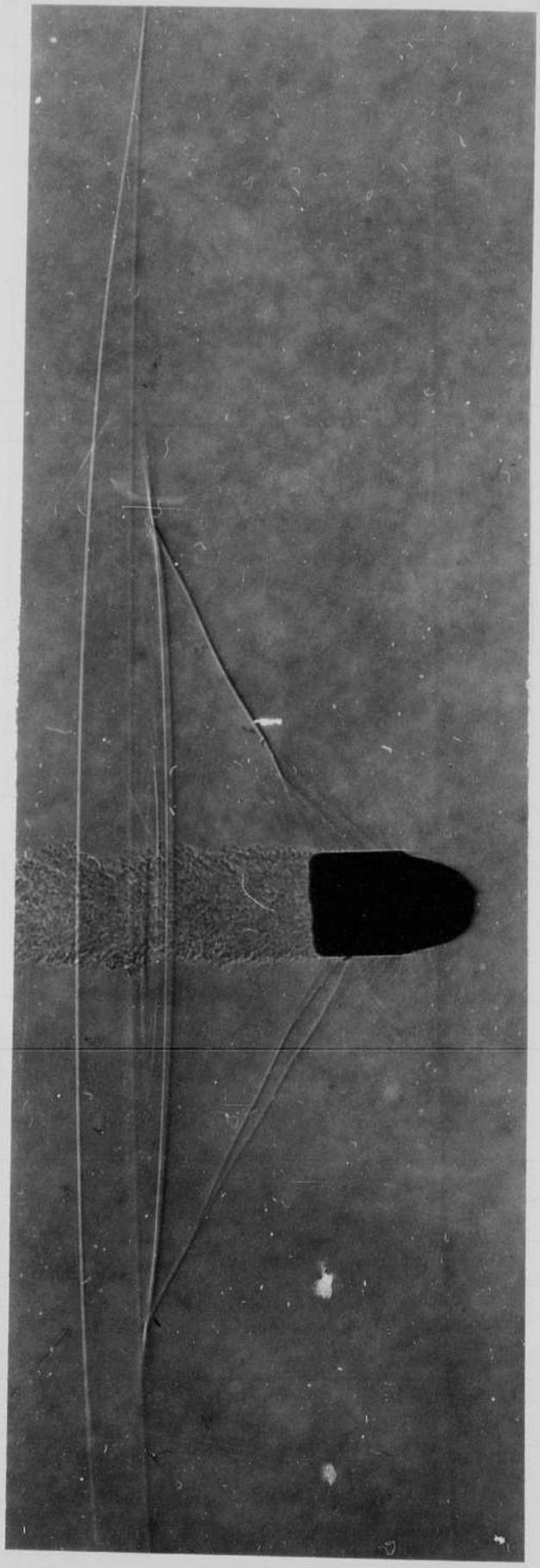
Less than the velocity of sound.

note isobaric line



22 Long Rifle.

Faster than the velocity of sound.

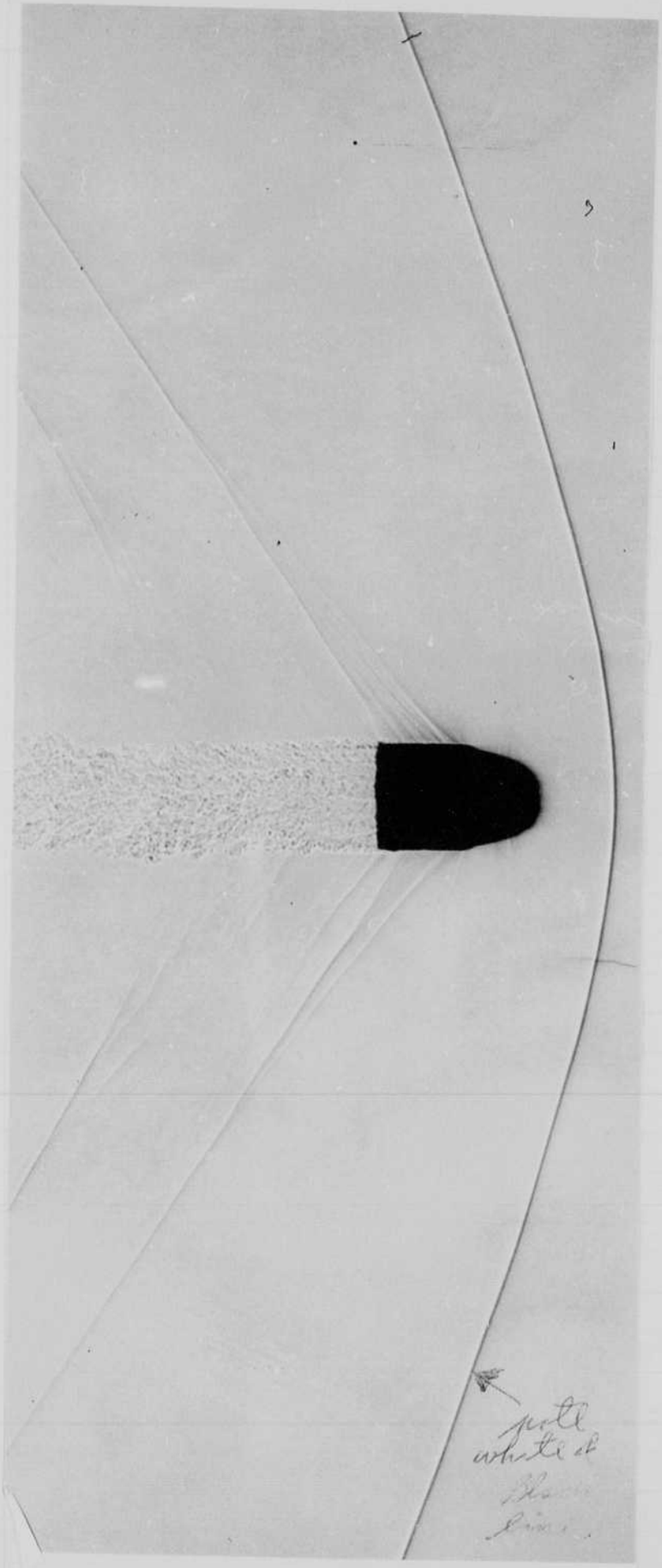


22 Short.

Less than the velocity of sound.

Rotating bullet

Line

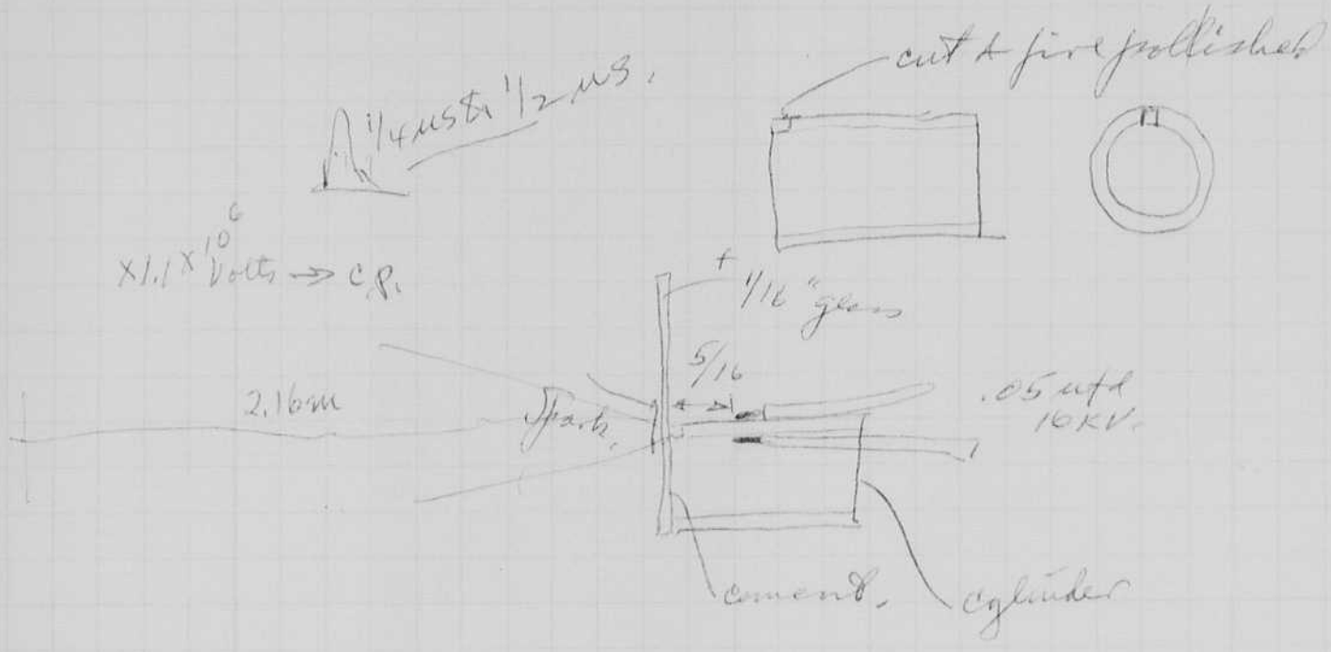


22 Long Rifle.

Faster than the velocity of sound.

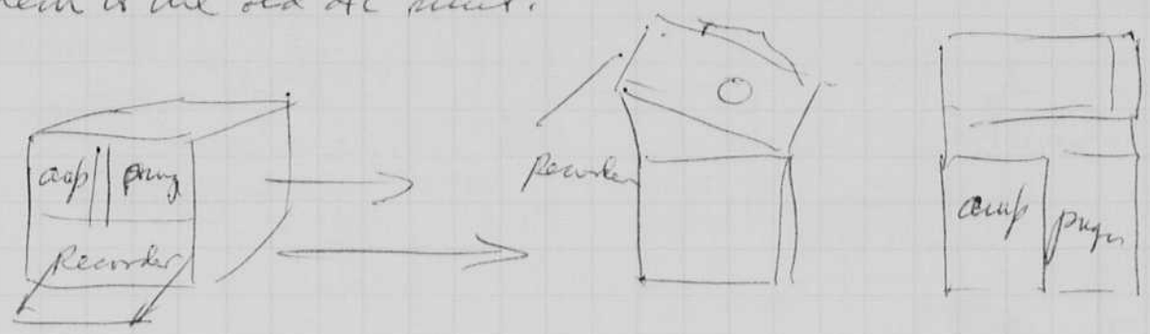
Jan 30 1970

N. Eggerton Spark designs tried today.



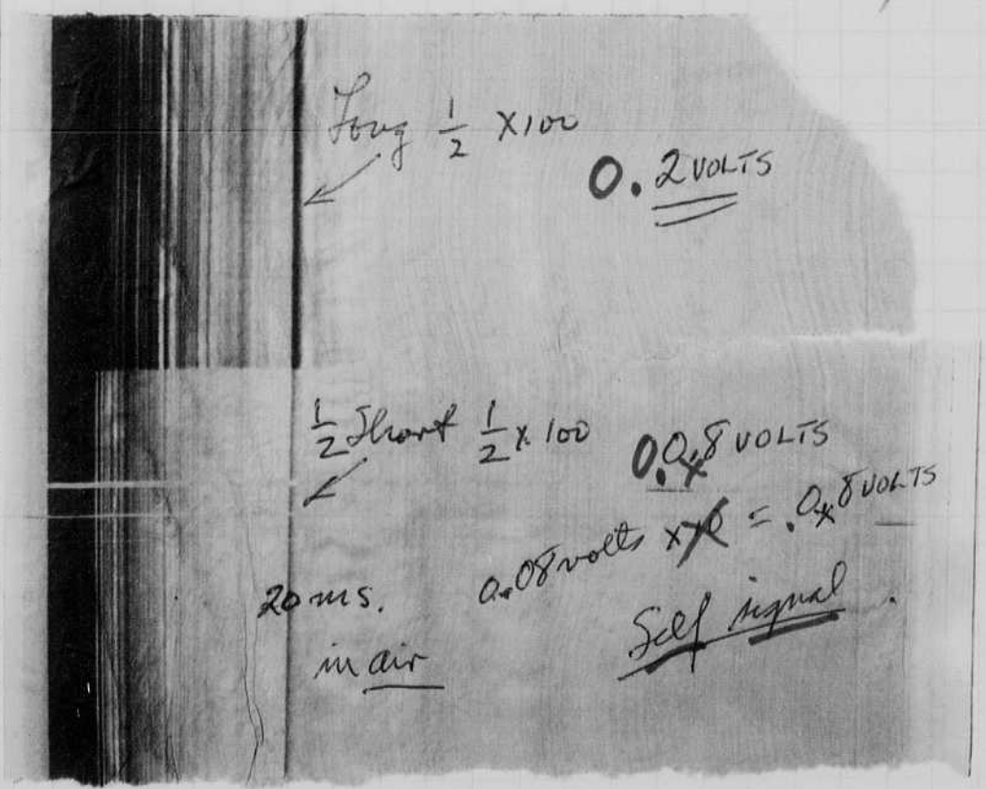
July 31 1950 monday Trimensof Mud Penetrator.

Paper was rather dry. 1 3/4 dry (5 1/4 wet). weather oh.
the mud Penetrator was reconverted from the Trieste system to the old AC unit.



Wood Box Echo with the #1 trailing transformer made of Bakelite.
50 ft cable to driver.
1/4+1/4+1/2+1 mfd. Long & Short.

Test on ceiling perforated tile.
Input 1/4+1/4 mfd at 900 RPM (160 feet scale)
short setting
Signal from ceiling comes at
20 ms.(-) } good mark on paper.
.08 volts. } (with probe) V = .08 volts.
with 1/2 long the voltage is 0.2 volts peak, (X10) probe. V = .2 volts

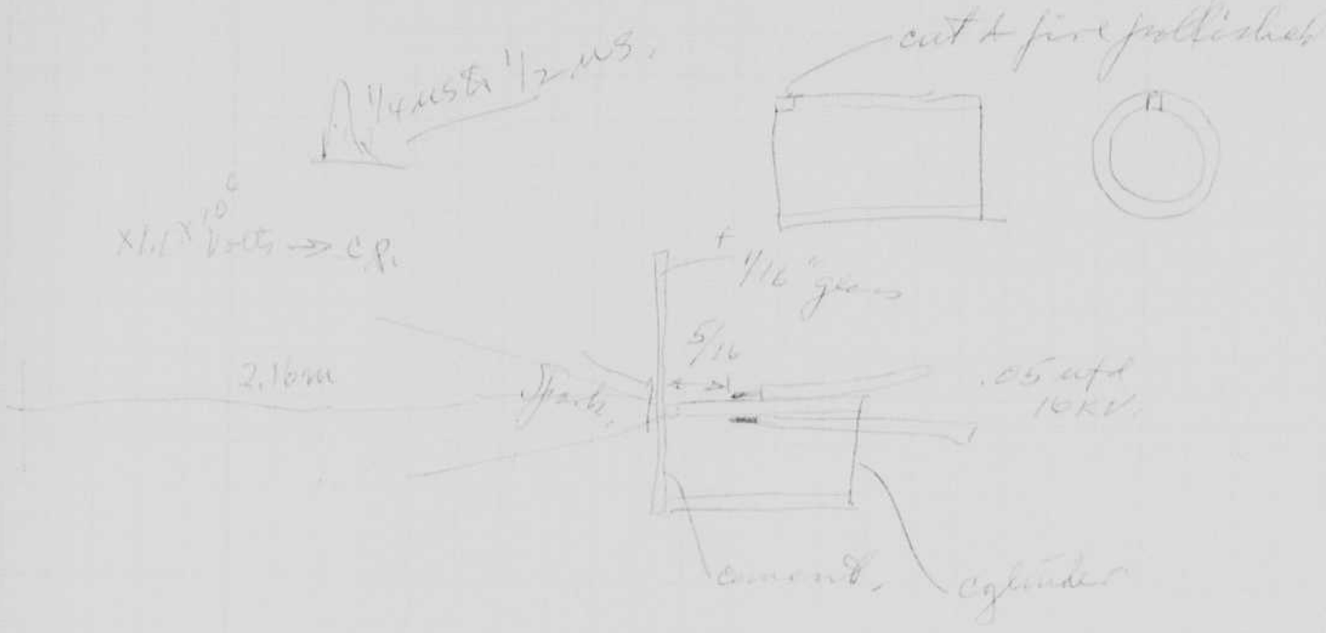


Read from Echo
387,962.42
(380,000) from L.S.
Sent to H.T.
200,000 to N&D.
650 to

1 Start 5" Alden with amp & 631 pinger Driver. 1/2 mfd 900 V

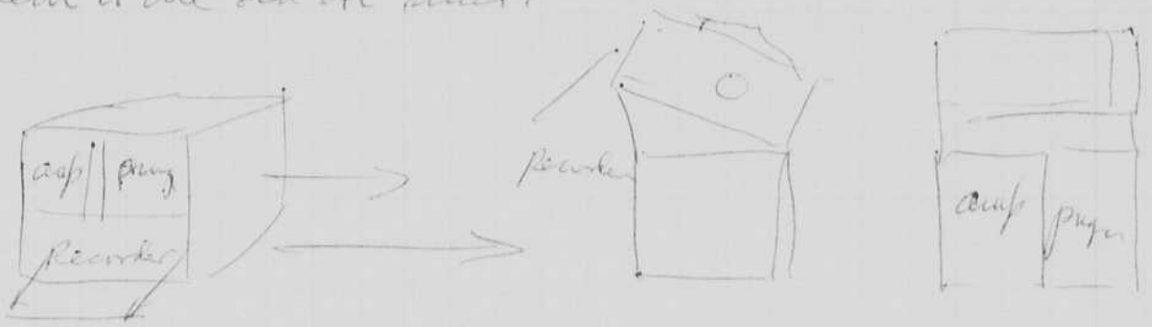
Jan 30 1970

H. Edgerton Spark designs tried today.



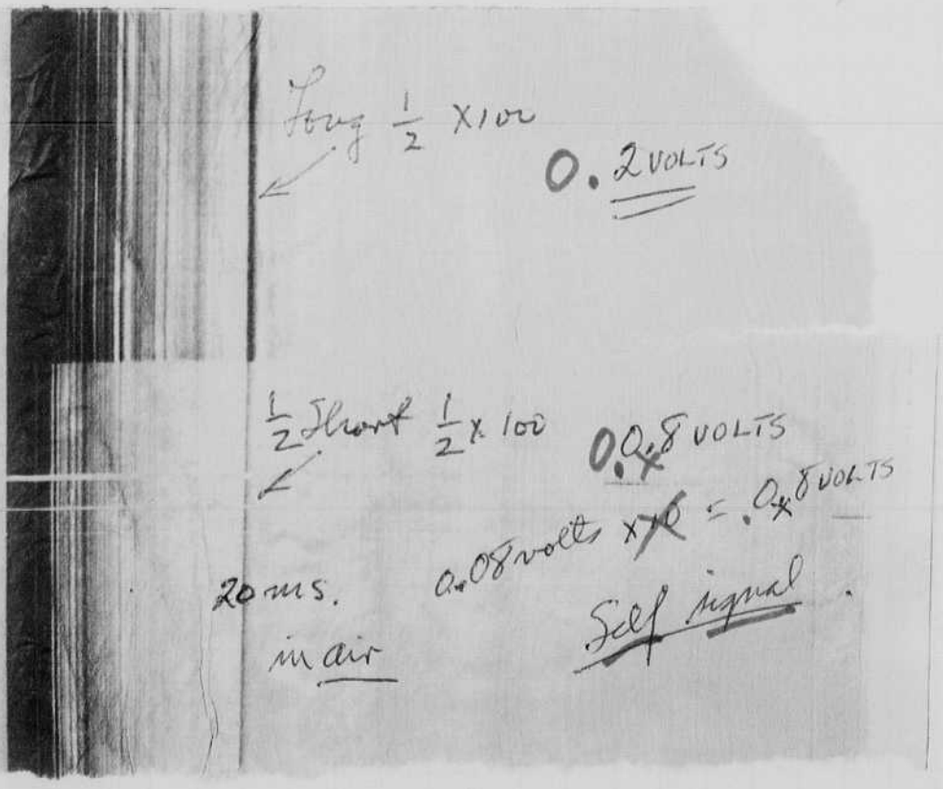
Feb 21 1970 Monday Turn up of Mud Penetrator.

Paper was rather dry. 1# 3/4 dry (5 1/4 wet), works ok.
The mud Penetrator was reconverted from the Trieste system to the old AC unit.



Wood Box Elo with the #1 trailing gain transformer made of Bakelite.
50 ft cable to driver.
1/4+1/4+1/2+1 mfd. Long & Short.

Test on ceiling perforated tile
Input 1/4+1/4 mfd at 900 RPM (160 feet scale)
short setting
Signal from ceiling convert
20 ms. (-) } good mark on paper.
.08 volts. } (with probe) V = .08 volts.
with 1/2 long the voltage is 0.2 volts probe. V = .2 volts
(X10) probe.

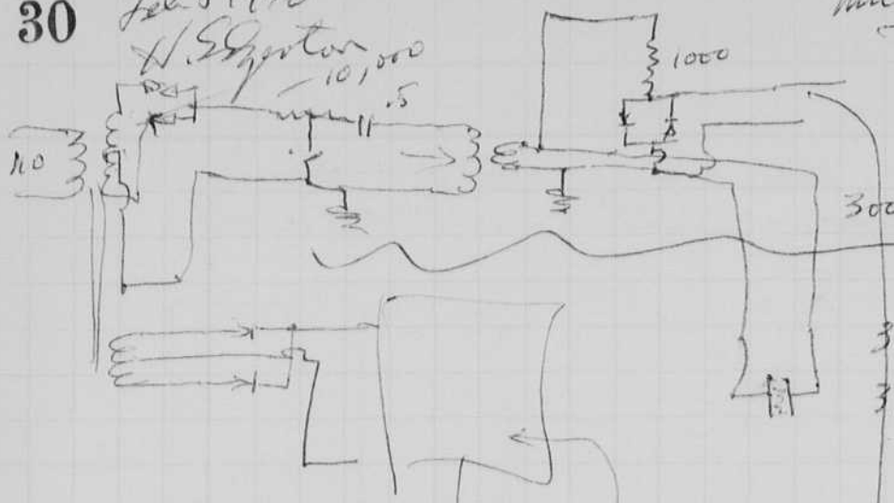


Read from Each
387,962.42
(380,000) from 63
Sent to H.T.
200,000 to N&D
150 to

1 Start 5" Alden with Amp & 63 pinger Driver. 1/2 mfd 900 V

Feb 5 1970

Mud Pen Design.



3000 volts, 5000 ~~ft~~ 1.5 cycles

3×10^{-9} farad

3.7×10^{-9} incl cab

.25 900 volts.

$RC = \frac{1}{100}$ sec

$R = \frac{1}{100} \times \frac{\cancel{5 \times 10^{6}}}{2 \times 10^{6}}$

$= 20{,}000$

$CE^2 = .5 \times 500^2 \times 10^{-6}$

$= .5 .25 = 125$ watts/sec

30

375 watts.

2

= 15 watts.

~~30 watt trans~~

marking circuit.

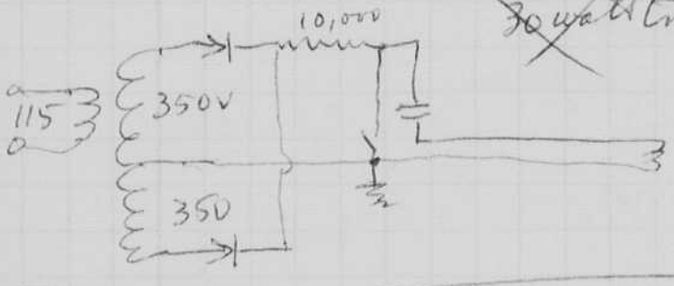
$.5 \times .5^2 \times 10^{-6} = 0.125$ with ~~.5~~ including Res

$P = 30 \times .125 = 4$ watts.

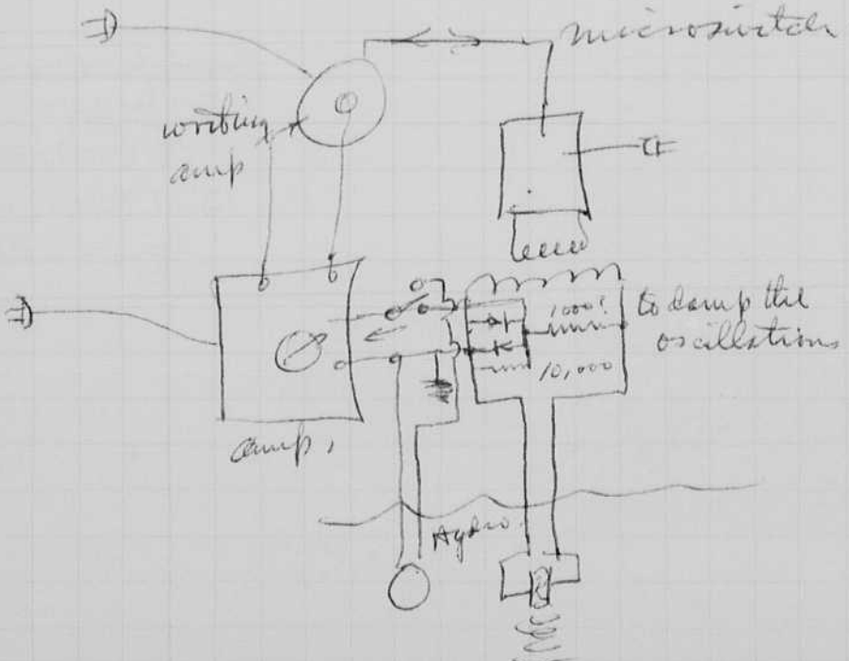
25 ~~4~~ Dmw.

2 mf ~~300~~ volts.

0.1 with sec.



Feb 5 1970 4pm John Alden & Mike Stewart was here for 2 hours with a 6" alden Recorder.

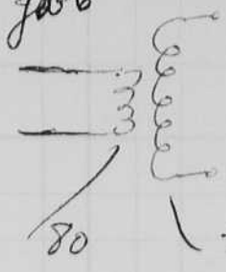


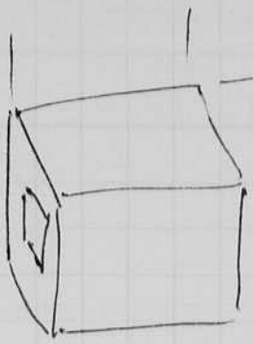
We will build the 5KC driver.

Alden will supply recorder with writing amplifier.

Feb-6

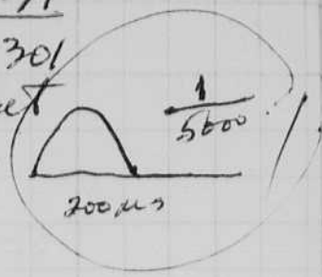
Driver for Massa → 29371 Receiver





magnet coil.

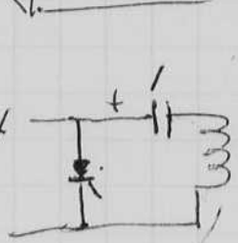
→ 30301 without trans.

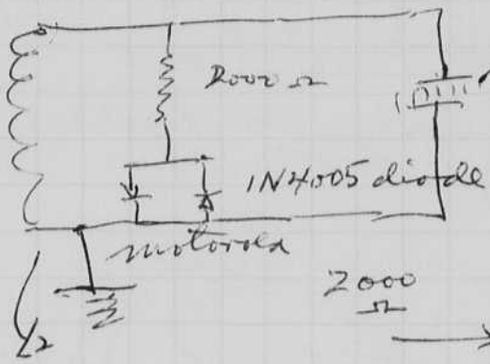


1.2 mh. 250 ohm.

$\frac{L_2}{L_1}$ = 200

$\frac{n_2}{n_1} = \sqrt{200} = 14$





$T = \sqrt{2\pi LC}$

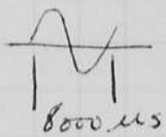
$= \sqrt{2\pi 1.2\times10^{-3}\ 1\times10^{-6}}$

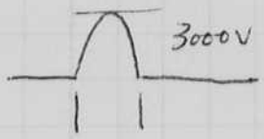
$= \sqrt{8.\times10^{-9}} = .008$

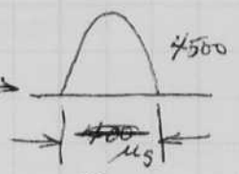
$= \sqrt{8\times10^{-10}}$

~~3 x 1~~

1.9×10^{-5} .000009 10 ms.



2000 Ω → 

4400 → 

40 μs.

1.2 mh
1×10^{-6} farads } f = 4000 cycles

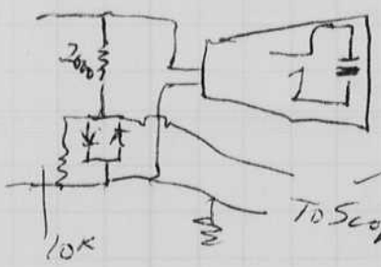
$\frac{1}{004000}$ = 250 μs.

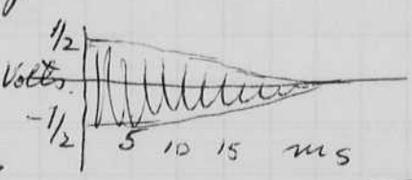
= $.25\times10^{-3}$ = 250.0 μs.

Iron out. goes to 30 μs pulse.

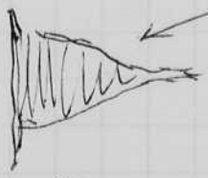
1/4 mfd 1/2 voltage 1/2 duration.

Feb 7, 1970 Continue tests of Massa transducer with transformer in driver circuit so damping can be introduced at the crystal.

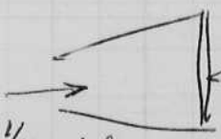




Input 2500 ohms across crystal.

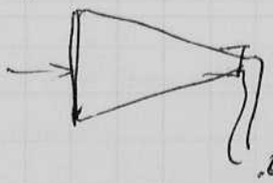


This excessive ringing of the crystal at low voltage output prevents the use of the system in shallow water. 10 ms is 25 feet!

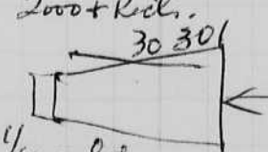


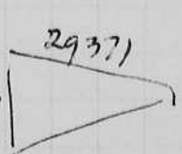
1/4 mfd

4.5 ft in air.



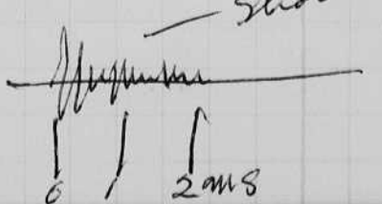
.06 pkpk volts



4.5 → 

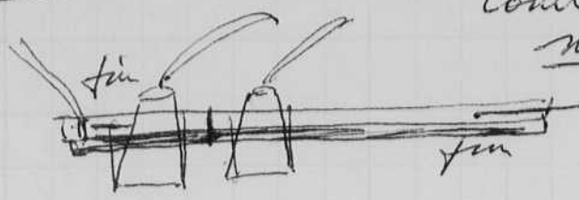
0.15 volts pkpk

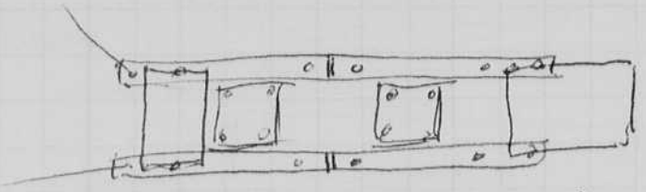
Shows beats



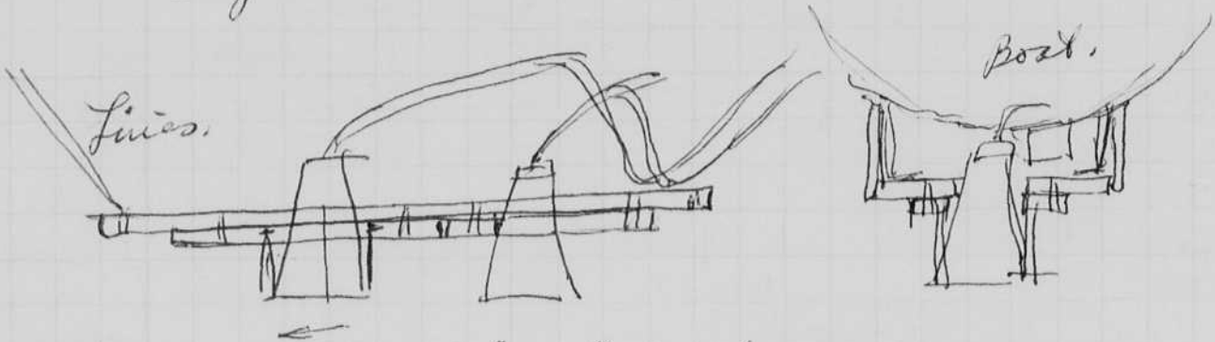
Continued

Combine into one cable?
no. use two and arrange holders so transducers can be separated.

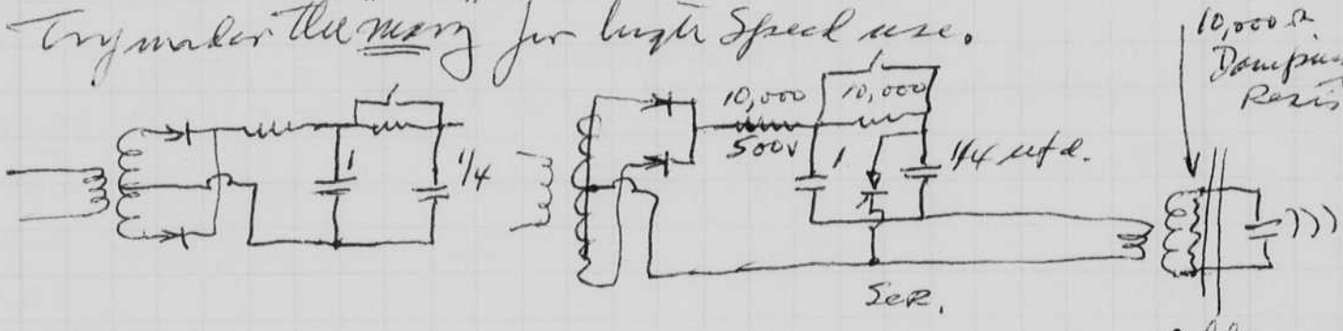




Arrange so system just floats and is symmetrical.



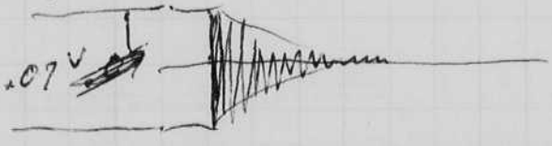
Try under the "mary" for light speed use.



Study of Damping

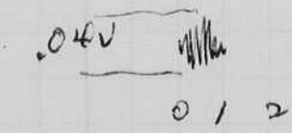
2500 Ω on trans gives 1/2 millisec pulse as measured with 8 Ball.

1/4 mfd at 400 volts with SCR (40 MS? current pulse). 8 Ball

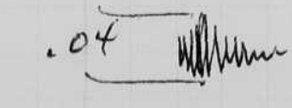


R=0

I say 10,000 looks best for 1/2 MS pulse.

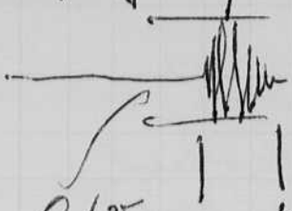


R= 10,000



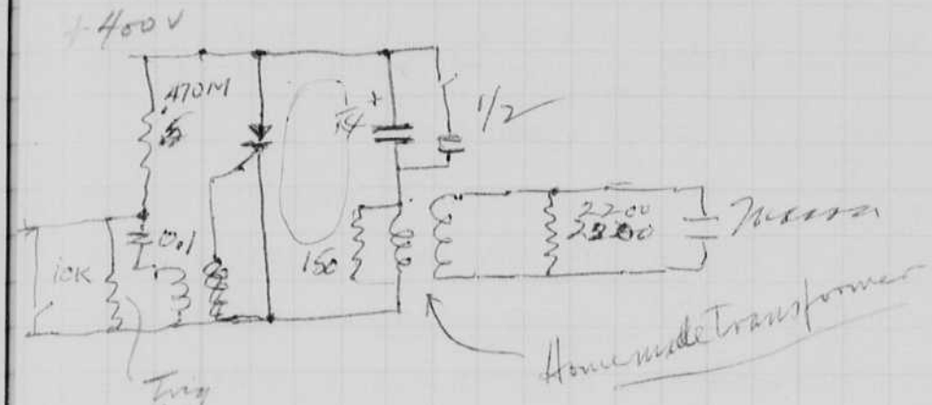
50,000

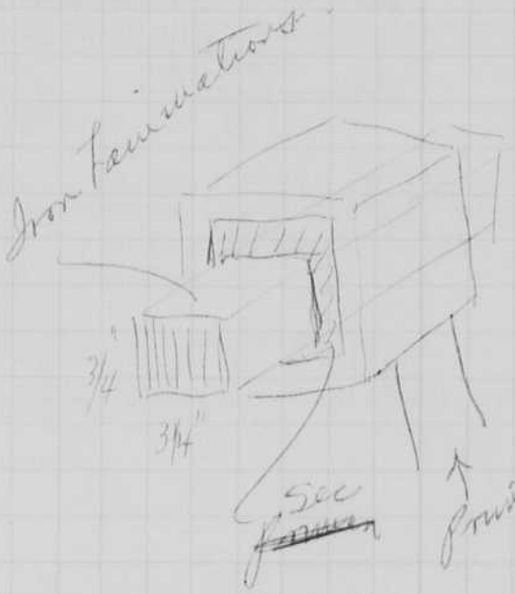
1 mfd input 400 volts 20,000 ohms chg.

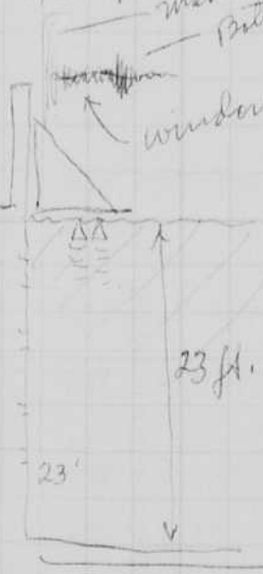


0.1 v
8 ball
at 1 meter
in Air.

1 ms
10,000 Ω across crystal.







Feb 21 1970 Aquarium Big Pool

4.7 x 2 ms to Bottom.

1.8 volts peak to peak. Duration about 1/2 ms

Inter changed Trans & Receiver
Signal about same 1.8 volts p to p.
4.7 x 2 = 9.4 ms.

10 ms = 25 ft

(23 ft)
is depth of
water in the
big tank.

Transducer, 1/4 mfd at 2 per second from the box of page 32 into a mass with out transformer. Masses without trans for Hydrophone

+ Harold Edgerton
John Mills. (England)

checked out PC46 Side Scan with the John Mills and Bill MacRoberts.

(1) 6 volt battery installed in Fish.
(2). crossover plug missing - built + connector.
(3). made up cable to fish of two parts.

The equipment seems to work OK on the ceiling of the lab.

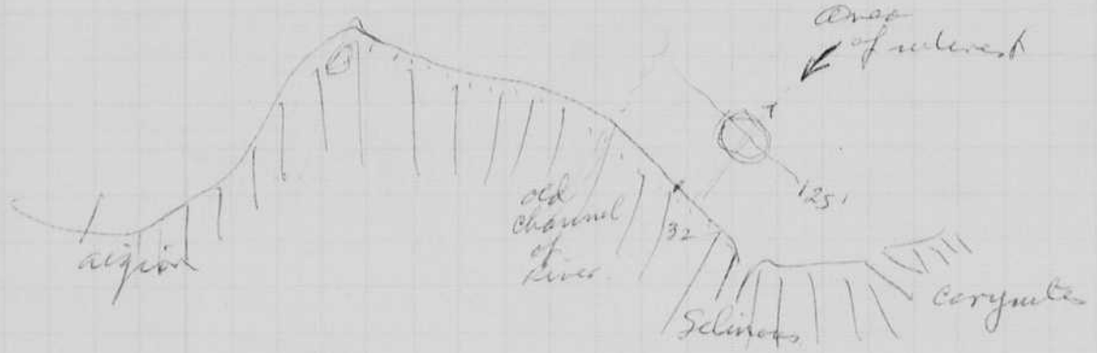
Ready for the water.

34 April 9 1970

Harold Edgerton

Returned Apr 6 from Greece where Fred Fegley and I worked with Peter Throckmorton for 2 weeks. We looked for Helice near Aigion ~~etc~~ in the bay of Corinth. Many side scan and 5kc penetrating records were made.

A report is being made which recommends investigation of a spot near the Selinous River



The target is about 1000 feet across.

See Report of ——— for position of the target.

Harold E. Edgerton Feb. 24, 1970

Feb. 24 (Tues.) Franklin Institute, Boston (Mr. Morris Miller & Students for tour of Strobe Lab, 2:30pm)

Feb. 25 (Wed.) Prof. Dan Smythe, ext. 6863 - to see H.E.E. in 4-405 at 2pm

Feb. 27 (Fri.) Bill McCrea (899-6664) conference (I do not have time or place)

Mar. 2 (Mon.) Prof. Minor White to see H.E.E. at 3pm in rm. 4-405

Mar. 3 (Tues.) Ken Read is showing his films at Harvard, 8pm in the Museum of Comp. Zoology, Oxford Street

Mar. 4 (Wed.) ARD annual meeting, John Hancock Bldg., 2pm

Mar. 8 (Sun.) Course VI-A tea, Sala de Puerto Rico, 3-5pm, Prof. Smullin
Mar. 11 (Wed.) Dr. Froelich Rainey's lecture, 5:30 cocktails, 6 dinner, etc.
Mar. 18 (Wed.) Dr. M. J. Aitken, lecture at Brandeis Univ. 5:30 cocktails, 6pm dinner, lecture in Schwartz Hall at 8pm

Mar. 19 (Thurs.) Bill McCrea (I have no information on time or place)

Mar. 20 (Fri.) Faculty Club, lecture to Matrons (Mrs. Buechner 648-5980) 6pm

Mar. 29 (Sun.) Easter Sunday

Mar. 26/Apr. 7 H.E.E. going to Greece

Mar. 30-Apr. 5 Spring Vacation (M.I.T.)

Apr. 15 (Wed.) Bob Marx's lecture at Brandeis Univ., 5:30 cocktails, 6pm dinner 8 pm lecture in Slosberg Recital hall

Apr. 16 (Thur) MTS lecture (H.E.E.) at Northeastern Univ. for Prof. Gordon, on AKADEMIK KURCHATOV, 5:30 pm cocktails, etc.

Apr. 20 (Mon.) Patriots Day - Holiday

Apr. 22 (Wed.) Ipswich Historical Society (Bob Weatherall) 6pm dinner, 8pm lecture on either Greece, Titicaca or Kurchatov
No class at Brandeis - Spring Vacation

~~May 9 (Sat.) Lecture at N.E. Aquarium for Wally Westphal 523-8531) 2pm~~

May 11 (Mon.) N.E. Exec. Conference, Kresge Aud. (afternoon lecture) AN EXPERIENCE IN RUSSIAN-AMERICAN CO-OPERATION

May 13 (Wed.) Brandeis University - Last Class

May 15-16 (Fri. & Sat.) Boston Sea Rovers

May 20 (Wed.) M.I.T. - Last Class

May 25 (Mon.) Memorial Day - Holiday

June 12 (Fri.) M.I.T. - Graduation

June 14 (Sun.) Fred Centanni's wedding

Aug. 2-7 9th Intnat'l. Cong. on High Speed Photo. Denver, Col.

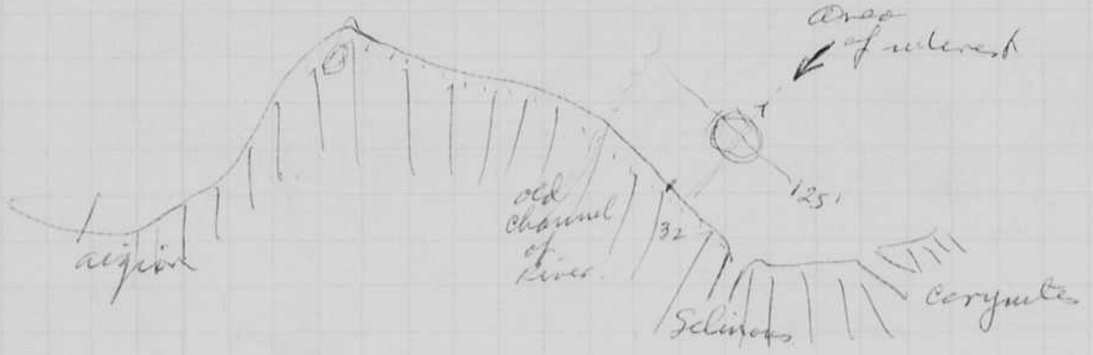
Aug. 16-29 (2 wks.) So. Africa for 4 lectures, Johannesburg, Cape Town, Port Elizabeth and Durban

34 April 9 1970

Harold Edgerton

Returned apr 6 from Greece where Fred Fegley and I worked with Peter Throckmorton for 2 weeks. We looked for Helice near Aigion ~~at~~ in the bay of Corinth. Many side scan and 5Ke penetrating records were made.

A report is being made which recommends investigation of a spot near the Seliunos River



The target is about 1000 feet across.

See Report of ——— for position of the target.

Oh~ 25 1970 Sat.

Harold E. Edgerton Feb. 24, 1970

Feb. 24 (Tues.) Franklin Institute, Boston (Mr. Morris Miller & Students for tour of Strobe Lab, 2:30pm)

Feb. 25 (Wed.) Prof. Dan Smythe, ext. 6863 - to see H.E.E. in 4-405 at 2pm

Feb. 27 (Fri.) Bill McCrea (899-6664) conference (I do not have time or place)

Mar. 2 (Mon.) Prof. Minor White to see H.E.E. at 3pm in rm. 4-405

Mar. 3 (Tues.) Ken Read is showing his films at Harvard, 8pm in the Museum of Comp. Zoology, Oxford Street

Mar. 4 (Wed.) ARD annual meeting, John Hancock Bldg., 2pm

Mar. 8 (Sun.) Course VI-A tea, Sala de Puerto Rico, 3-5pm, Prof. Smullin
Mar. 11 (Wed.) Dr. Froelich Rainey's lecture, 5:30 cocktails, 6 dinner, etc.
Mar. 18 (Wed.) Dr. M. J. Aitken, lecture at Brandeis Univ. 5:30 cocktails, 6pm dinner, lecture in Schwartz Hall at 8pm

Mar. 19 (Thurs.) Bill McCrea (I have no information on time or place)

Mar. 20 (Fri.) Faculty Club, lecture to Matrons (Mrs. Buechner 648-5980) 6pm

Mar. 29 (Sun.) Easter Sunday

Mar. 26/Apr. 7 H.E.E. going to Greece

Mar. 30-Apr. 5 Spring Vacation (M.I.T.)

Apr. 15 (Wed.) Bob Marx's lecture at Brandeis Univ., 5:30 cocktails, 6pm dinner 8 pm lecture in Slosberg Recital hall

Apr. 16 (Thur) MTS lecture (H.E.E.) at Northeastern Univ. for Prof. Gordon, on AKADEMIK KURCHATOV, 5:30 pm cocktails, etc.

Apr. 20 (Mon.) Patriots Day - Holiday

Apr. 22 (Wed.) Ipswich Historical Society (Bob Weatherall) 6pm dinner, 8pm lecture on either Greece, Titicaca or Kurchatov
No class at Brandeis - Spring Vacation

~~May 9 (Sat.) Lecture at N.E. Aquarium for Wally Westphal 523-8531) 2pm~~

May 11 (Mon.) N.E. Exec. Conference, Kresge Aud. (afternoon lecture) AN EXPERIENCE IN RUSSIAN-AMERICAN CO-OPERATION

May 13 (Wed.) Brandeis University - Last Class

May 15-16 (Fri. & Sat.) Boston Sea Rovers

May 20 (Wed.) M.I.T. - Last Class

May 25 (Mon.) Memorial Day - Holiday

June 12 (Fri.) M.I.T. - Graduation

June 14 (Sun.) Fred Centanni's wedding

Aug. 2-7 9th Intnat'l. Cong. on High Speed Photo. Denver, Col.

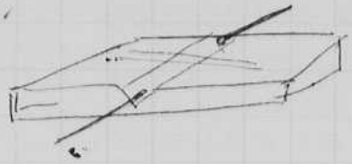
Aug. 16-29 (2 wks.) So. Africa for 4 lectures, Johannesburg, Cape Town, Port Elizabeth and Durban.

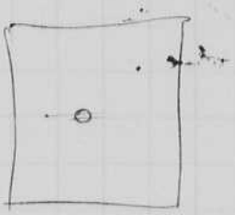
34 April 9 1970
Harold Edgerton
D.+

Apr 25 1970 Sat.
H. E. Edgerton
Ken Krosser.

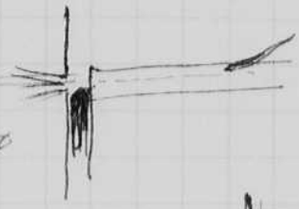
Spacial-time records of spark gaps.

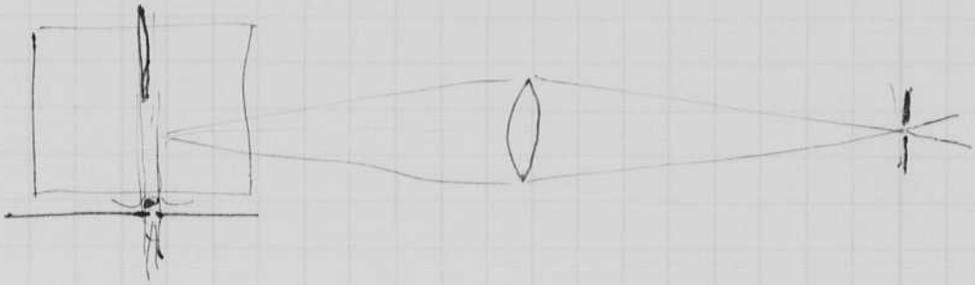
Dave Fisher.





Ben Rodis
Streak camera
two turns of
film.
130 volts.





Run #1 f16 Fine grain positive. arc ok. but no slit
Strobtac at 20,000 per min Did not Register

2. f11 Fine grain film
Strobtac at 3600 per min ok.
1/8" slit on arc.

3. f16 Slit on flash ~ .01"
3600 per min on Strob.
.01" slit on arc

ok. shows blur.

4. f16. Slit at right angles to arc
Strobe at 3600 per min.

April 28, 1970

I was in the River on Sunday with Doc Fisher testing his sonar mapping device. We used my new 2 mega transducers with out transformers. At 14 ft. the voltage was 3/4 volt from the bottom reflection.

Harold E. Edgerton April 6, 1970

Apr. 6 (Mon.) Charlie Wyckoff's lecture, in rom 10-275, 12noon to 1pm

Apr. 7 (Tues.) Prof./Dr. A. Biran (Dir. Gen of Antiquity, Israel) to lecture on the excavations of Dan - 4:30pm at the Harvard Div. Schoo.

Apr. 8 (Wed.) Prof. Gene Simmons lecture "The Moon - Old & New" tea in room 54-923 at 3:30, lecture in room 54-100 at 4:oopm
Apr. 13 (Mon.) Jack Leonard (Time-Life, Inc.), 1 pm
Apr. 13 (Mon.) Ralph Nadar to lecture in Kresge Aug, 1:30pm
Apr. 13 (Mon.) M.I.T. Press reception, Fac. Club Penthouse, 5:30pm-7:30pm
Apr. 15 (Wed.) Bob Marx's lecture at Brandeis Univ., 5:30 cocktails, 6pm dinner,, 8pm lecture in Slosberg Recital Hall
Apr. 16 (Thurs) Fac. Club #1, 12 noon luncheon (Mus. of Sci.) Dean Alberty
Apr. 16 (Thur.) HEE to Lecture at A.D. Little, Acorn Park, Cambridge (M.T.S.) for Prof. Gordon, Northeastern Univ., at 6pm (AKADEMIK KURCHATOV)

Apr. 17 (Fri.) "A" Ball, 6 pm

Apr. 20 (Mon.) PATRIOTS DAY - HOLIDAY

Apr. 21 (Tues.) EG&G Shareowners Meeting, Statler HIlton, Park Square, 10:30am

Apr. 22 (Wed.) HEE to lecture at the Ipswich Historical Soc. (Bob Weatherall), 6 pm dinner, 8 pm lecture (on either Greece, Titicaca or A.K.)

NO CLASS AT BRANDEIS - Spring Vacation
Apr. 23 (Thurs) 12 noon luncehon, Fac. Club Rm. #6, Dave Robbins, ext. 6291
Apr. 23 (Thurs) Electrical Eng. Dept. Steak Fry, Building 13, at 5:30 pm

Apr. 27 (Mon.) Tech Film meeting(?), 3 pm Faculty Club (Bill McCrea)
Apr. 28 (Tues.) Prof. C. Gordon, Brandeis Univ. 11:30am
Apr. 29 (Wed.) Perry Miles, Gore Estate, Waltham, 4:30 pm
Apr. 30 (Thurs.) Theses Oral Presentations, rm. 2-255, 9am-10:20am
May 1-2-3 PARENT's WEEKEND (M.I.T.)
May 2 (Sat.) Woods Hole with Brandeis students
May 5 & 6 (T&W) R.L.E. Annual meeting, Ralph Sayers, rm. 9-150

May 5 (Tues.) Dr. Wiesner' dinner at the Faculty Club, 6:30pm, rm. # 6
May 6 (Wed.) H. E. E. to teach Dr. Joe Blucher's class (3pm-4:30)
May 7 (Thur) Emeriti luncheon (HEE to lecture ?, if interested) for Prof. Foster 864-0130 or ext. 5052

May 9 (Sat.) H.E.E. to lecture at N.E. Aquarium for Wally Westphal, 2pm

May 10 (Sun.) MOTHER's DAY

May 11 (Mon.) N.E. Exec. Conference, Kresge Aud. (Afternoon lecture) AN EXPERIENCE IN RUSSIAN-AMERICAN CO-OPERATION, Dave Robbins

May 12 (Tues.) N.E. Aquarium Annual meeting

May ~~13~~ 14 (Wed.) HEE to see Dr. Point for Faculty exam in rm. 3-107, ~~10am~~ 11 AM.
" " BRANDEIS - LAST CLASS
May 13 " MACOM meeting, Reid Weedon, Rm. 1319, State Office Bldg., 100 Camb. St., Boston, 1:30PM)
May 15 & 16 (Fri. & Sat.) Boston Sea Rovers
May 14 (Thur) N.E. Aquarium Sci. Adv. Bd. meeting, 12:30 at the Aquarium
May 20 (Wed.) M.I.T. - LAST CLASS

May 21 (Thurs) Mrs. Francoise Rigby to arrive from N.Y.C. (Sarum Society)
May 22 (Fri.) Mrs. " " " to lecture
May 25 (Mon.) MEMORIAL DAY - HOLIDAY

June 12 (Fri.) M.I.T. - Graduation

June 14 (Sun.) Fred Centanni's wedding
June 16 (Tues.) Dr. E. T. Hall to lecture at M.I.T. Penthouse
Aug. 2-7 9th International Congress on High Speed Photography, Denver

Aug. 22 to H.E.E. to lecture in South Africa (Johannesburg, Cape Town,

Sept. 6 Port Elizabeth and Durban)

" 7 LABOR DAY - Holiday
~~Sept. 21 (Mon.) M.I.T. - Registration~~
Sept. 25-27 (Fri. & Sat.) Bob Pullin

May 5, 1970. Trip to WHOI on May 2 to take a 10:30 to 5:30 trip to the Vineyard Light ship site in Vineyard Sound.
Martin Klein had his side scan sonar and Kim Byrd his magnetometer aboard and working. We saw many signals
It was a windy day and therefore some of the people did not feel too good including me.
We had 25 degree fm Brandeis university aboard.

April 28, 1970

I was in the River on Sunday for Heath Bare Fisher testing his sonar mapping device. We used my new 2 mega transducers without transformers. At 14 ft. the voltage was 3/4 volt from the bottom reflection.

Harold E. Edgerton April 6, 1970

Apr. 6 (Mon.) Charlie Wyckoff's lecture, in rom 10-275, 12noon to 1pm

Apr. 7 (Tues.) Prof./Dr. A. Biran (Dir. Gen of Antiquity, Israel) to lecture on the excavations of Dan - 4:30pm at the Harvard Div. Schoo.

Apr. 8 (Wed.) Prof. Gene Simmons lecture "The Moon - Old & New" tea in room 54-923 at 3:30, lecture in room 54-100 at 4:oopm
Apr. 13 (Mon.) Jack Leonard (Time-Life, Inc.), 1 pm
Apr. 13 (Mon.) Ralph Nadar to lecture in Kresge Aug, 1:30pm
Apr. 13 (Mon.) M.I.T. Press reception, Fac. Club Penthouse, 5:30pm-7:30pm
Apr. 15 (Wed.) Bob Marx's lecture at Brandeis Univ., 5:30 cocktails, 6pm dinner, 8pm lecture in Slosberg Recital Hall
Apr. 16 (Thurs) Fac. Club #1, 12 noon luncheon (Mus. of Sci.) Dean Alberty
Apr. 16 (Thur.) HEE to Lecture at A.D. Little, Acorn Park, Cambridge (M.T.S.) for Prof. Gordon, Northeastern Univ., at 6pm (AKADEMIK KURCHATOV)

Apr. 17 (Fri.) "A" Ball, 6 pm

Apr. 20 (Mon.) PATRIOTS DAY - HOLIDAY

Apr. 21 (Tues.) EG&G Shareowners Meeting, Statler HIlton, Park Square, 10:30am

Apr. 22 (Wed.) HEE to lecture at the Ipswich Historical Soc. (Bob Weatherall), 6 pm dinner, 8 pm lecture (on either Greece, Titicaca or A.K.)

NO CLASS AT BRANDEIS - Spring Vacation
Apr. 23 (Thurs) 12 noon luncehon, Fac. Club Rm. #6, Dave Robbins, ext. 6291
Apr. 23 (Thurs) Electrical Eng. Dept. Steak Fry, Building 13, at 5:30 pm

Apr. 27 (Mon.) Tech Film meeting(?), 3 pm Faculty Club (Bill McCrea)
Apr. 28 (Tues.) Prof. C. Gordon, Brandeis Univ. 11:30am
Apr. 29 (Wed.) Perry Miles, Gore Estate, Waltham, 4:30 pm
Apr. 30 (Thurs.) Theses Oral Presentations, rm. 2-255, 9am-10:20am
May 1-2-3 PARENT's WEEKEND (M.I.T.)
May 2 (Sat.) Woods Hole with Brandeis students
May 5 & 6 (T&W) R.L.E. Annual meeting, Ralph Sayers, rm. 9-150

May 5 (Tues.) Dr. Wiesner' dinner at the Faculty Club, 6:30pm, rm. # 6
May 6 (Wed.) H. E. E. to teach Dr. Joe Blucher's class (3pm-4:30)
May 7 (Thur) Emeriti luncheon (HEE to lecture ?, if interested) for Prof. Foster 864-0130 or ext. 5052

May 9 (Sat.) H.E.E. to lecture at N.E. Aquarium for Wally Westphal, 2pm

May 10 (Sun.) MOTHER's DAY

May 11 (Mon.) N.E. Exec. Conference, Kresge Aud. (Afternoon lecture) AN EXPERIENCE IN RUSSIAN-AMERICAN CO-OPERATION, Dave Robbins

May 12 (Tues.) N.E. Aquarium Annual meeting

May ~~13~~ 14 (Wed.) HEE to see Dr. Point for Faculty exam in rm. 3-107, ~~10am~~ 11 AM.
" " BRANDEIS - LAST CLASS
May 13 " MACOM meeting, Reid Weedon, Rm. 1319, State Office Bldg., 100Camb. (St., Boston, 1:30PM)
May 15 & 16 (Fri. & Sat.) Boston Sea Rovers
May 14 (Thur) N.E. Aquarium Sci. Adv. Bd. meeting, 12:30 at the Aquarium
May 20 (Wed.) M.I.T. - LAST CLASS

May 21 (Thurs) Mrs. Francoise Rigby to arrive from N.Y.C. (Sarum Society)
May 22 (Fri.) Mrs. " " " to lecture
May 25 (Mon.) MEMORIAL DAY - HOLIDAY

June 12 (Fri.) M.I.T. - Graduation

June 14 (Sun.) Fred Centanni's wedding
June 16 (Tues.) Dr. E. T. Hall to lecture at M.I.T. Penthouse
Aug. 2-7 9th International Congress on High Speed Photography, Denver

Aug. 22 to H.E.E. to lecture in South Africa (Johannesburg, Cape Town,

Sept. 6 Port Elizabeth and Durban)

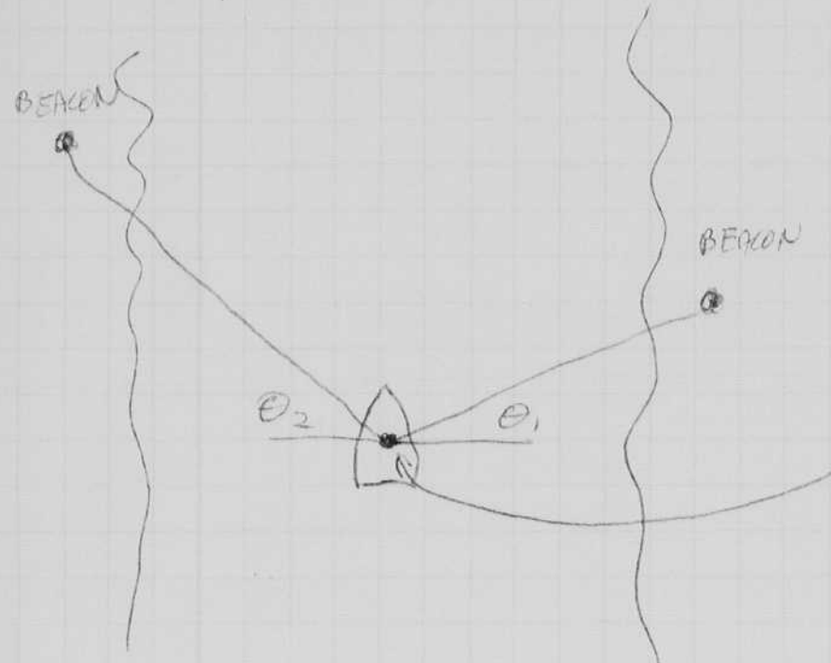
" 7 LABOR DAY - Holiday
~~Sept. 21 (Mon.) M.I.T. - Registration~~
Sept. 25-27 (Fri. & Sat.) Bob Pullin

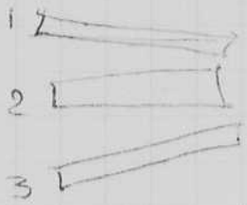
May 5, 1970. Trip to WHOI on May 2 to take a 10:30 to 5:30 trip to the Vineyard Light ship site in Vineyard Sound.
Martin Klein had his side scan sonar and Kim Byrd his magnetometer aboard and working. We saw many signals
It was a windy day and three fourths of the people did not feel too good including me.
We had 25 people for Brandeis university aboard.

38 May 8 1970
Harold Edgerton
Dave Fischer

Lambert
AB- 3254
AB 4922

RIVER

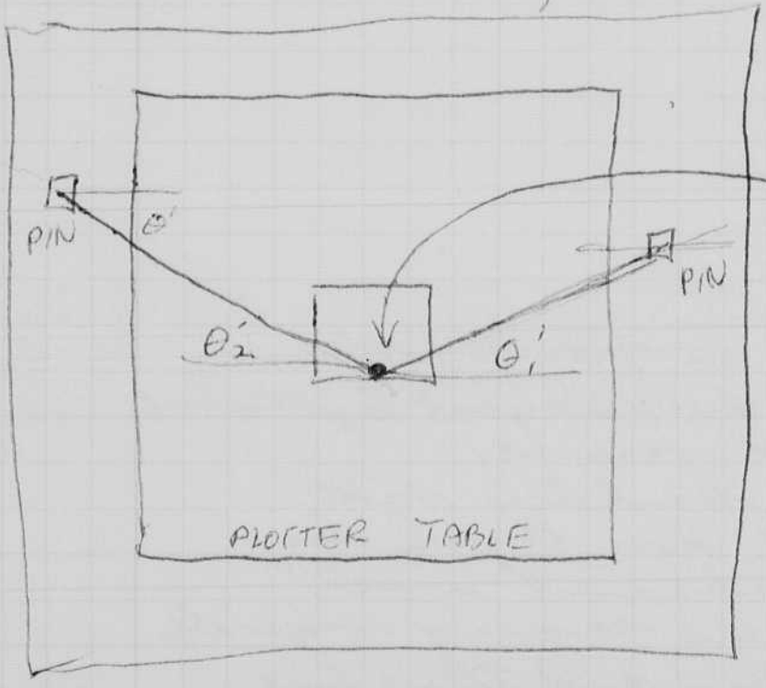




3 detectors

if 1 then move Right
if 3 then move left

automatic.
2 radio direction finders



2 Powermotor platform with pen

$\theta_1' = \theta_1$

$\theta_2' = \theta_2$

May 13, 1970 Wed.

Elisha's oral defense at Brandeis 9 am & 11
Class discussion about same.
(Fresh Seminar group).

" " 1 - 5pm Eta Kappa Nu - Open.

May 15 (Fri.) 8:00pm Boston Sea Rovers Castleton.

May 16 (Sat.) All day " " " , Boston University
" " 1:00pm Ruth Dugan, B. U., Sherman Union, rm. 312 (USLCOR)
" " 7:00pm Lincoln with the Crandells, Bolts and Sauterfields

May 17 (Sun.) Frank Scalli, 19 Linwood Place, Gloucester Brouwer
18 (Mon) CO Naval offices Reserve Glen Rem Fargo Bldg. — 274-7100 3261
May 20 (Wed.) 12:00pm M.I.T. - Last Class
5 WH01 Dr. Coles 5pm - 8 pm Tavern Club 4 Boylston Place
" " " 3 - 5pm Prof. Joe Blucher's Class (H.E.E. to lecture) x 3314

May 22 (Fri.) 8:00pm Mrs. Francoise Rigby to lecture in Bush Room

May 25 (Mon.) MEMORIAL DAY - Holiday

June 12 (Fri.) 9:30am M.I.T. Graduation

" 14 (Sun.) Fred Centanni's wedding

" 16 (Tues) 8:00pm Dr. E. T. Hall's lecture, Penthouse, Faculty Club

" 15 - 19 W.H.O.I. - 40th Anniversary week

" 21 (Sun.) All day FATHER's DAY

JUNE - JULY TRIP TO RUSSIA AND GREECE

Aug. 2 - 7 All Week 9th International Congress on High Speed Photography, Denver, Colo.

Aug. 22 - Sept. 6 Two weeks South Africa (Johannesburg, Cape Town, Port Elizabeth and Durban)

Sept. 7 (Mon.) LABOR DAY - Holiday

Sept. 21 (Mon) M.I.T. - Registration

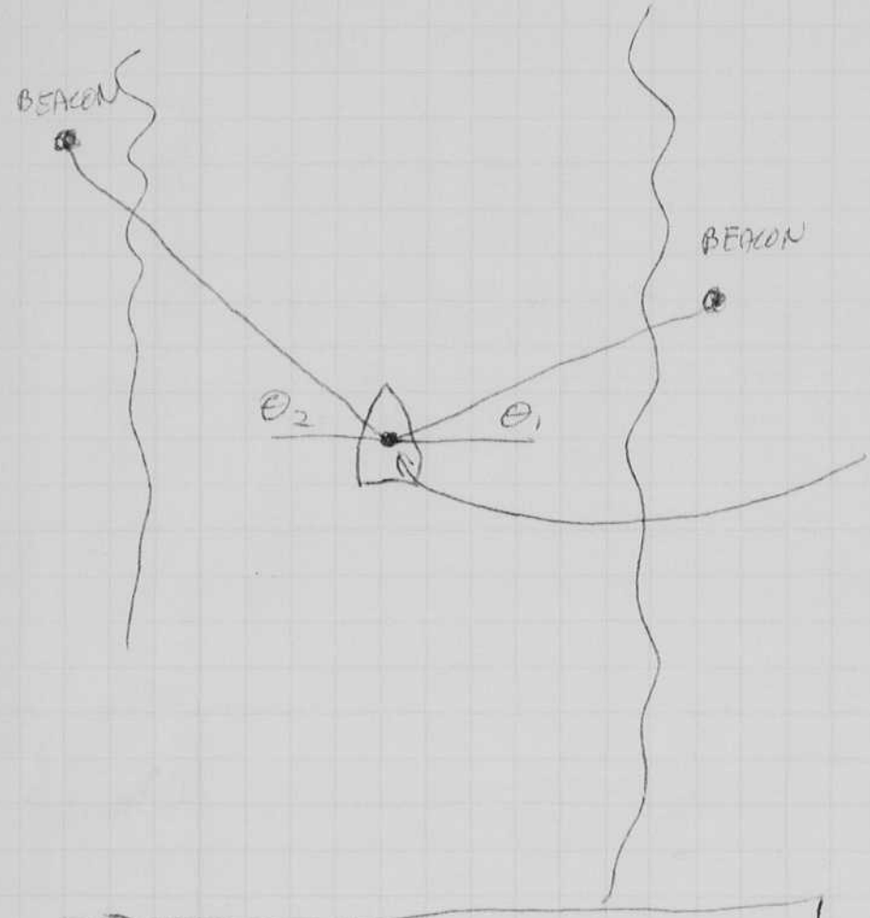
Sep. 25-27 (Fr.&Sat) Bob Pullin, Swampscott

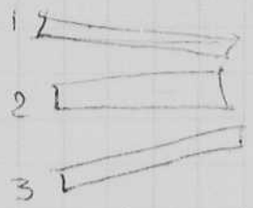
April 21 1971 Bermuda

38 May 8 1970
Harold Edgerton
Dave Fischer

Land Air 813-3254
266-4922

RIVER

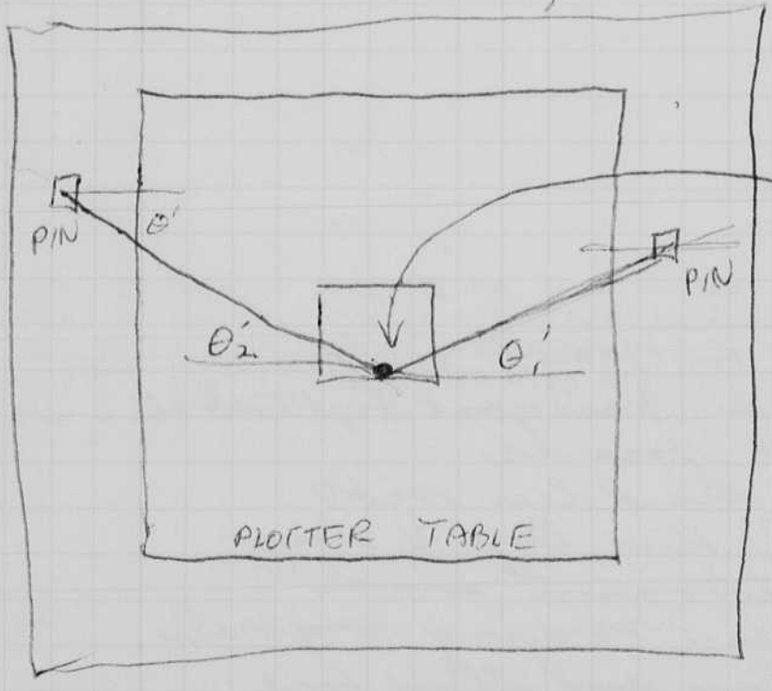




3 detectors

if 1 then move Right
if 3 then move left

automatic.
2 radio direction finders



2 Servomotor platform with pen

$\theta_1' = \theta_1$

$\theta_2' = \theta_2$

May 13, 1970 Wed.

Elisha's oral defense at Brandeis 9am & 11
Class discussion about same.
(Fresh Seminar group).

" " 1 - 5pm Eta Kappa Nu - Open.

May 15 (Fri.) 8:00pm Boston Sea Rovers Castle Roo.

May 16 (Sat.) All day " " " , Boston University
" " 1:00pm Ruth Dugan, B. U., Sherman Union, rm. 312 (USLCOR)
" " 7:00pm Lincoln with the Crandells, Bolts and Sauterfields

May 17 (Sun.) Frank Scalli, 19 Linwood Place, Gloucester Brownson
18 (Mon.) CO Naval officers Reserve Glen Room Fargo Bldg. — 274-7100 3261
May 20 (Wed.) 12:00pm M.I.T. - Last Class
5 WH01 Dr. Coles 5pm - 8pm Tavern Club 4 Boylston Place
" " " 3 - 5pm Prof. Joe Blucher's class (H.E.E. to lecture) x 3314

May 22 (Fri.) 8:00pm Mrs. Francoise Rigby to lecture in Bush Room

May 25 (Mon.) MEMORIAL DAY - Holiday

June 12 (Fri.) 9:30am M.I.T. Graduation

" 14 (Sun.) Fred Centanni's wedding

" 16 (Tues) 8:00pm Dr. E. T. Hall's lecture, Penthouse, Faculty Club

" 15 - 19 W.H.O.I. - 40th Anniversary week

" 21 (Sun.) All day FATHER's DAY

JUNE - JULY TRIP TO RUSSIA AND GREECE

Aug. 2 - 7 All Week 9th International Congress on High Speed Photography, Denver, Colo.

Aug. 22 - Sept. 6 Two weeks South Africa (Johannesburg, Cape Town, Port Elizabeth and Durban)

Sept. 7 (Mon.) LABOR DAY - Holiday

Sept. 21 (Mon) M.I.T. - Registration

Sep. 25-27 (Fr.&Sat) Bob Pullin, Swampscott

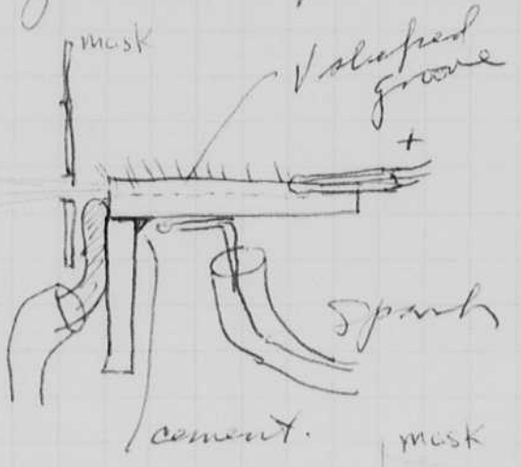
April 21 1971 Bermuda

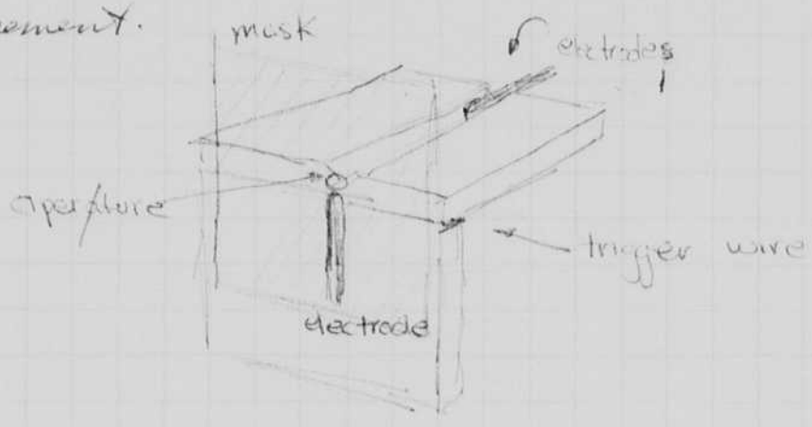
 May 15 1970

Harold Edgerton Ken Crosser

Max Roberts

Point light Source as developed by crosser for thesis.





Discussion with Caldwell about use by EG&G in microphone work

Discussed, read and understood by me on this 15th day of May, 1970

Ralph L. Caldwell

June 8 1970
Harold Edgerton
Bill Rae Roberts -
Chas Miller -

16
2½ movies of Jan
8 with smoke.
B&W f 5.6 ASA 320 on smoke.
G.R. 1540 strobe.
Electric fan at 24 ± f.p.s.
with TiCl4 smoke to show Vortices.
f 8 first half of film
f 4 second half.

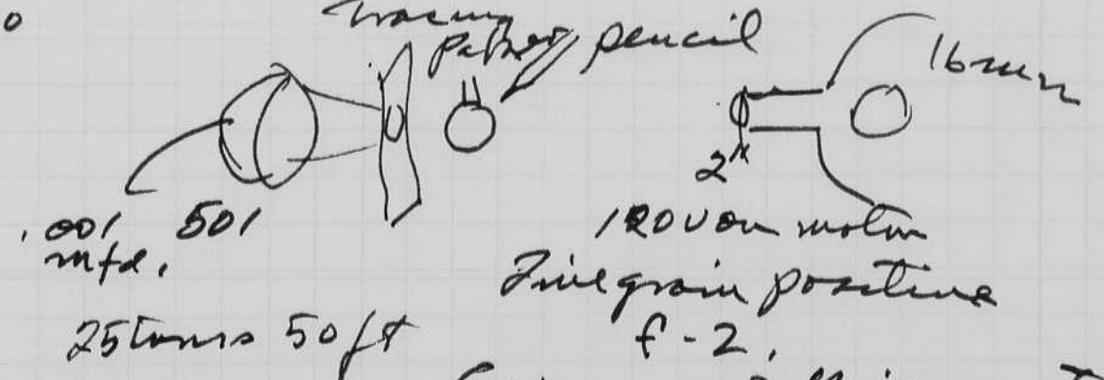
Water drops 1 ft side light f 16 1540 med & High.
on 7241 EF film.

B

June 16, 1970 Experiments made with
fish a week + ago at the U.S. Ogm
Transients effected fish.
Sudden start when field
applied.
Potential + or − made no difference.
Point or plane same way.

June 17, 1970

#1

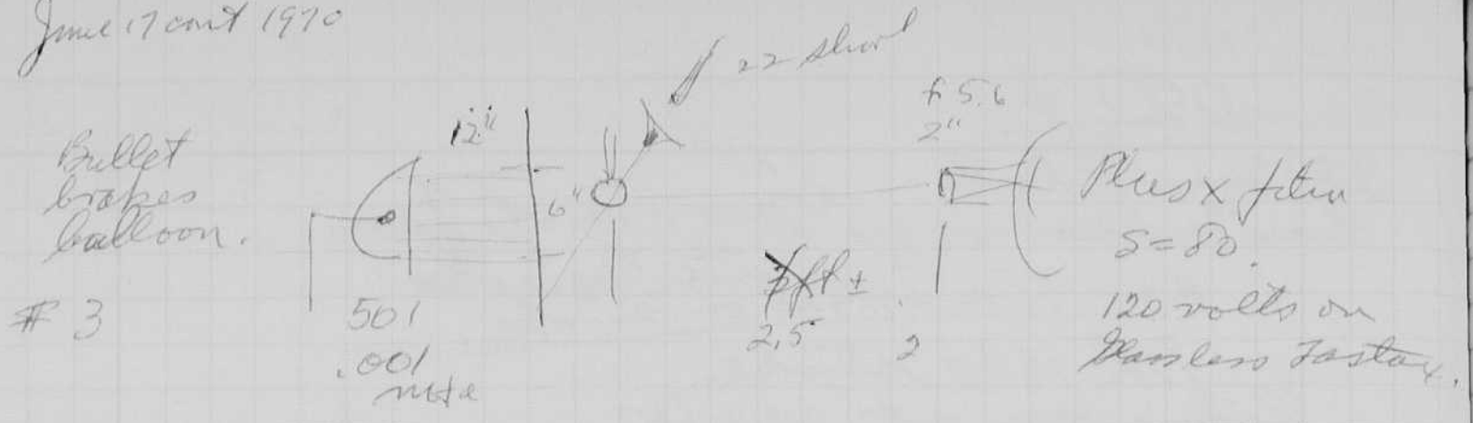


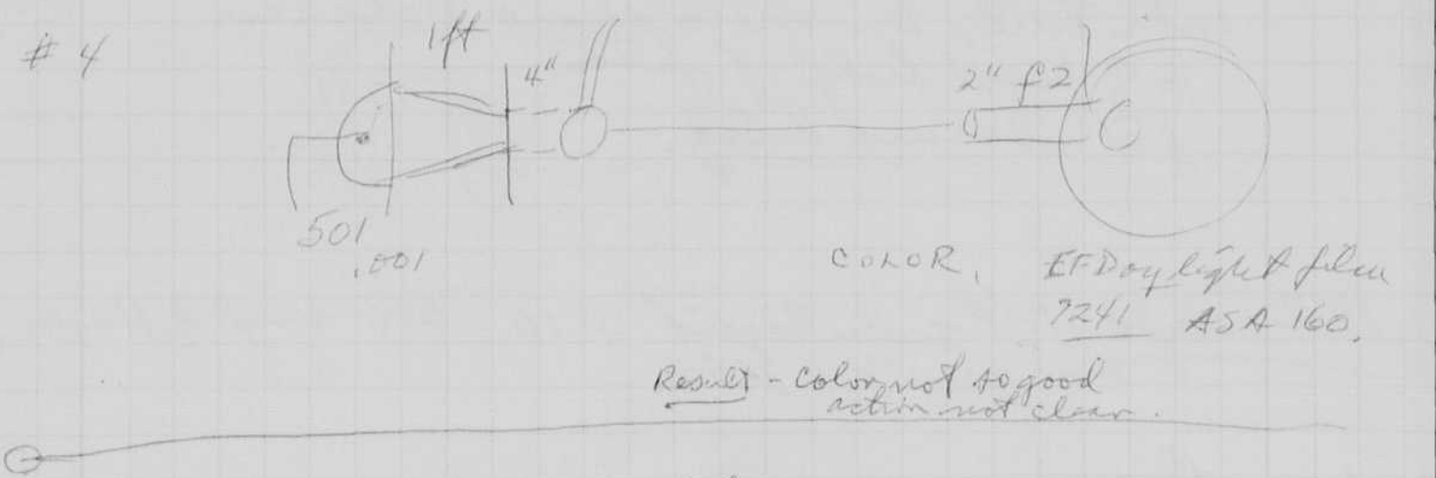
Exposure OK in center.

#2 Lamp focused to give even spread.
Plus × f 5.6 100 ft. motor 120 volts.
0.4 start }
0.4 run }.

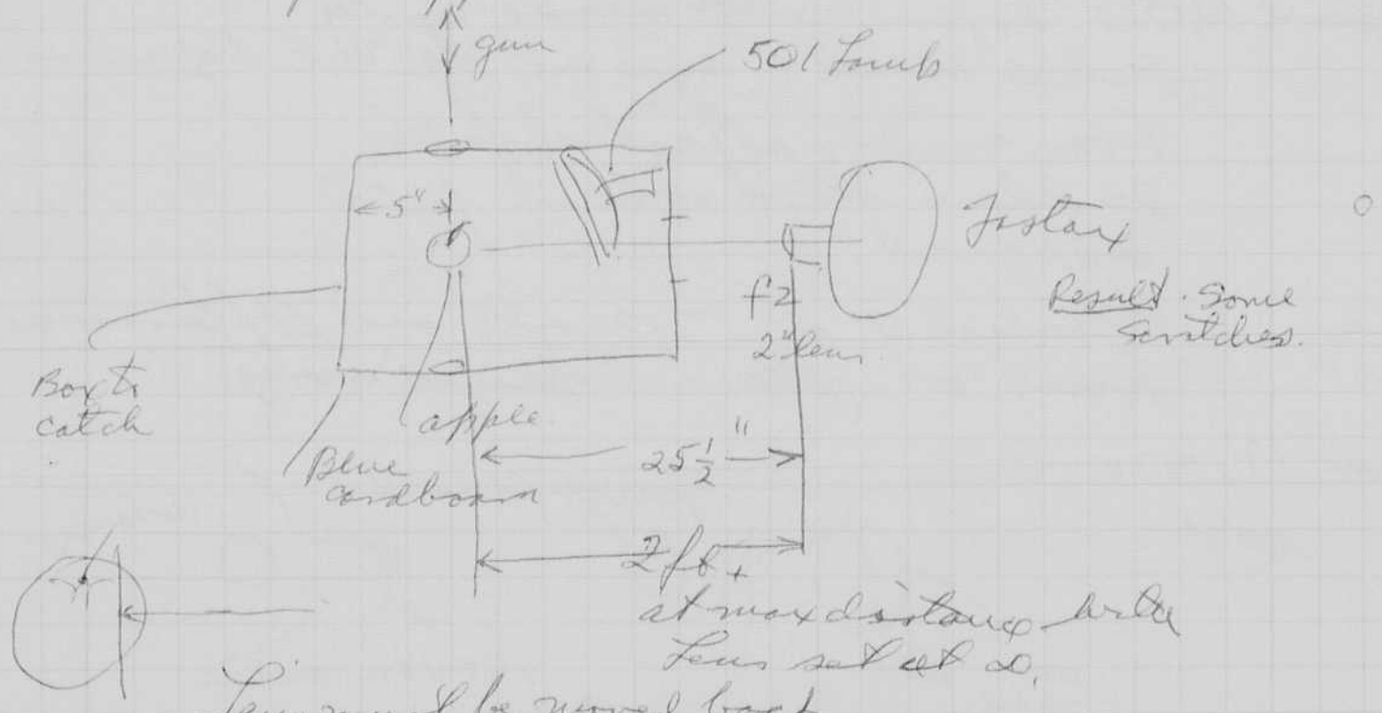
OK

 June 17 cont 1970





#5. Sample Apple Shot.



#6 f2 1ft-001 120 volts on Prismalen Jastar,
100ft 7241 EF

4:12 pm
#586
on same
reel.

0.4 sec 4 sec or mutiny
0.5 sec gun fire.
220 feet.

4:12
Apple blew up!

ULTIMA 310

June 17 1970

18 / 26 / 468 / 1/2 min.

A&A MacR. Long clamp. 1/2 min.

Lt.		(drug & Pellet)		BCPS	min	
1	1/2 min X2	10 sec	26 X 2 X 9		43	30 -5°
2	.5	4 sec	27	468	44	27.5 +5
3	.6	?	28		45	29 0
4	.5		28		46	27
5	.5	5	28		47	27.5
6	.5	6	27		48	27.5.
7		5	26		49	18. - 2.
8		5	26		50	24
9		5	26		51	23
10		5	26		52	23
11		6	27		53	23
12		—	26.5		54	24
13		6	27.		55	23
14		6	27		56	22.5
15		5.5	27		57	18+
16		7	26.5		58 .5	21.
17		6	27		59	21
18		7	29		60	20
19			26.		61	18
20		7	27		62	18
21		—	long 29		63	17.5
22			26.5		64	18
23		+	27		65 Jerker.	19
24		-	29		66	17
25			28		67	14
26		7	28.5		68	16.5
27		7	29		69	16.
28		7	29		70	15
29	.6	8	27			
30	.5		—			
31		4+?	29			
32		8	27			
33		8.	27			
34			27 0			
35			22 -10			
36			16-17 -20			
37			7.5 -30			
38			27 0			
39			24 +10			
40			17 +20			
41			5 +30			
42			31 0			

June 18. Rested overnight
clamps put on at 8:30 am.

9:20 Did not go

9:30 am 1 0° 32 3 ft x 2 (576) 32/18/256/32/576

2 1/2 min 33.

3. 32.5 5 sec

9:30+ clamps put on.

44 June 21 1970
H. Edgerton
Bill Vice Roberts.

22 SWIFT

Orange Movie
#1. 130 volts on motor of fastax
.001 mfd.

0.5 sec motor 0.4 sec strobe 0.6 sec event.
22 cal Swift.

f 2 2" Lens Ektrachrome
EF 7241 film.

Comment.

#2 Apple Red 22 SWIFT.

130 volts on motor Fastax without prism
.001 mfd
0.5 sec motor 0.4 sec strobe 0.6 sec event.
f 2 2" lens Ektrachrome 22 swift.
EF 7241 film.

Comment.

#3 Apple
130 volts on motor Fastax with out prism
.001
0.5 sec
0.4 sec strob
0.6 event.
22 bang into apple.

~~August~~ July 30 1970

~~Harold~~ Edgerton

Esther & I go to norvalo to Lincoln and Aurora Nebr. then I go to Denver Aug 2 - 7 for the N.S (High Speed) congress. Home on Aug 10. then to South African on the 15. with return by ~~Aug~~ Sept 7.

Russia June - July . See Page 46

Greece methone with Peter throckmorton p45

Home July 20 from Greece. Bill Dixon 13 years old met us in Athens and we sent him home on July 29 yesterday.

June 5, 1970

Harold Edgerton

Experiment with Guppies at NE aquarium.

A tank 2 ft × 1.5 × 1.5 approx had 20 ± Guppies (average length of 4 cm) A pair of stainless steel electrodes of single 1" × 6" strip (#14) the edge of the tank. Then a stainless steel wire with plastic coating was used as the other electrode.

It was observed that the fish gave a jump when the circuit was closed. Polarity seemed to have no effect. The fish seemed to stop when perpendicular to the field lines.

The fish always left when ever the wire end was brought close to them. A current of less than 0.1 ampere resulted from about 40 volts.

We then introduced some salt. If any thing the fish acting cooler than before. Perhaps the fish were tired from previous shocks and ~~to~~ influenced by the salt.

Other fishes are to be obtained next week.

Harold & Esther Edgerton
100 Memorial Drive, Apt. 11-7A
Cambridge, Mass. 02142
Tel: 1-617-864-4790

June 12, 1970

1970 SUMMER ITINERARY

June 22 (Mon.) Lv. Bos on Nat. flight #437 at 5:30pm
Ar. Ken. at 6:23pm

Lv. Ken. on PAA flight #44 at 8:15pm (Stop in Copenhagen)
June 23 (Tues) Ar. Moscow at 2:35pm (Sheremetyevo Airport)
(Visitor in Russia at the inviation of the Academy of Sciences, USSR - Dr. Y. V. Peive,)
Contact - Dr. Gleb Udintsev, Institute of Oceanology, Academy of Sciences, ul. Letnyaya 1, J-387, Lublino, Moscow, USSR)

July 7 (Tues) Lv. Moscow on Aus. flight #602 at 10:30am
Ar. Vienna at 11:20am

Lv. Vienna on Oly flight #775 at 4:20pm
Ar. Athens at 7:20pm (*Meet Bill Dixon)
(Two weeks at Methone, Greece)
Contact - Mr. Peter Throckmorton, Odos Minos, 12, Kastella, Piraeus, Greece, Tel. 477-682

July 21 (Tues) Lv. Athens on TWA flight #881 at 12:45pm
Ar. Ken. at 5:25pm

Lv. Lag. on Amer. flight #382 at 7:30pm
Ar. Bos. at 8:30pm

*Mr. William Dixon
855 20th Ave. Drive,NW
Hickory, N.C. 28601

July 7 (Tues) Lv. Charlotte on Eastern flight #356 at 4:35pm
Ar. Ken. at 6:12pm

Lv. Ken. on TWA flight #882 at 8:30pm
July 8 (Wed.) Ar. Athens at 1:20pm

July 21 (Tues) Lv. Athens on TWA flight #881 at 12:45pm
Ar. Ken. at 5:25pm

~~Lv. Laguardia on Eastern flight #357 at 8:10pm~~
~~Ar. Charlotte at 9:55pm~~
Bill came to Boston for a week
Then went to Hickory N.C.

Sept 8, 1962 70

Harold Edgerton.

Esther & I returned yesterday about 11 am from Rio de Janeiro where we stopped a day enroute from Johannesburg S.A. I was there from Aug 18 to deliver a series of lectures at Jo-burg, Capetown, Port Elizabeth and Durban. Also I met with the students at the Uni of Witwatersrand, Uni of Capetown, Uni of Stellenbosch, Uni of Natal. I guess that 500 or 600 people saw my pictures and demonstrations. I took a hydraulic drop maker which I ~~strobe~~ lit with a GR 1531 stroboscope. Also I had discs with patterns for demonstrating the strobe effects.

Aug 20 – ERPM mine at white trip
Aug 21-22-23-24 Kruger Park with Neville and Jenifer Cooke.
25. Wits uni · Prof Woeber.
W 26 A.F. Institution of Mech. Eng. 8 pm
Bozzani Vice chancellor of Witwatersrand uni
TH 27 Capetown uni Medical Prof. Shepherdson chairman.
F 28 Uni of Capetown – SA Inst of ME Dinner.
S 29 Table mountain.
Sun 30 Brien Haynes & Point of the cape
31 Stellenbosch Chris Berger.
1. Port Elizabeth Leat Jack Rust.
2 Durban Leat.
3 Uni of Natal.
. Return to Jo berg.
4 Kloof mine Fenton Hughes Whillier
5 930 am for Rio.
6 Rio Mac Leod. Carol & Barry.
7 Boston at 11 am
8 M.I.T.
9. B&L Board meeting.

Harold & Esther Edgerton
100 Memorial Drive, Apt. 11-7A
Cambridge, Mass. 02142
Tel: 1-617-864-4790

June 12, 1970

1970 SUMMER ITINERARY

June 22 (Mon.) Lv. Bos on Nat. flight #437 at 5:30pm
Ar. Ken. at 6:23pm

Lv. Ken. on PAA flight #44 at 8:15pm (Stop in Copenhagen)
June 23 (Tues) Ar. Moscow at 2:35pm (Sheremetyevo Airport)
(Visitor in Russia at the inviation of the
Academy of Sciences, USSR - Dr. Y. V. Peive,)
Contact - Dr. Gleb Udintsev, Institute of Oceanology,
Academy of Sciences, ul. Letnyaya 1, J-387, Lublino,
Moscow, USSR)

July 7 (Tues) Lv. Moscow on Aus. flight #602 at 10:30am
Ar. Vienna at 11:20am

Lv. Vienna on Oly flight #775 at 4:20pm
Ar. Athens at 7:20pm (*Meet Bill Dixon)
(Two weeks at Methone, Greece)
Contact - Mr. Peter Throckmorton, Odos Minos, 12,
Kastella, Piraeus, Greece, Tel. 477-682

July 21 (Tues) Lv. Athens on TWA flight #881 at 12:45pm
Ar. Ken. at 5:25pm

Lv. Lag. on Amer. flight #382 at 7:30pm
Ar. Bos. at 8:30pm

*Mr. William Dixon
855 20th Ave. Drive,NW
Hickory, N.C. 28601

July 7 (Tues) Lv. Charlotte on Eastern flight #356 at 4:35pm
Ar. Ken. at 6:12pm

Lv. Ken. on TWA flight #882 at 8:30pm
July 8 (Wed.) Ar. Athens at 1:20pm

July 21 (Tues) Lv. Athens on TWA flight #881 at 12:45pm
Ar. Ken. at 5:25pm

~~Lv. Laguardia on Eastern flight #357 at 8:10pm~~
~~Ar. Charlotte at 9:55pm~~
Bill came to Boston for a week
Then went to Hickory N.C.

Sept. 8, 1962 70

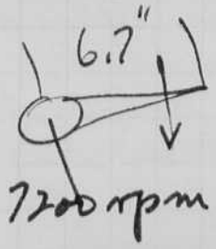
Harold Edgerton.

Esther & I returned yesterday about 11 am from Rio de Janeiro where we stopped a day enroute from Johannesburg S.A. I was there from Aug 18 to deliver a series of lectures at Jo-burg, Capetown, Port Elizabeth and Durban. Also I met with students at the Uni of Witwatersrand, Uni of Capetown, Uni of Stellenbosch, Uni of Natal. I guess that 500 or 600 people saw my pictures and demonstrations. I took a hydraulic drop maker which I ~~strobe~~ lit with a GR 1531 stroboscope. Also I had discs with patterns for demonstrating the strobe effects.

Aug 20 – ERPM mine all while trip
Aug 21-22-23-24 Kruger Park with
Neville and Jenifer Cooke.
25. Wits uni. Prof Wacher
W 26 A.F. Institution of Mech. Eng. 8 pm
Bozzani Vice chancellor of Witwatersrand uni
TH 27 Capetown uni Medical Prof. Shepherdson chairman.
F 28 Uni of Capetown – SA Inst of ME Dinner.
S 29 Table mountain.
Sun 30 Brian Haynes & Point of the cape
31 Stellenbosch Chris Berger.
1. Port Elizabeth Test Jack Frost.
2 Durban Test.
3 Uni of Natal.
Return to Joberg.
4 Kloof mine Doctor Hughes Whillier
5 930 am for Rio.
6 Rio MacLeod. Carol & Barry.
7 Boston at 11 am
8 M.I.T.
9. E&G Board meeting.

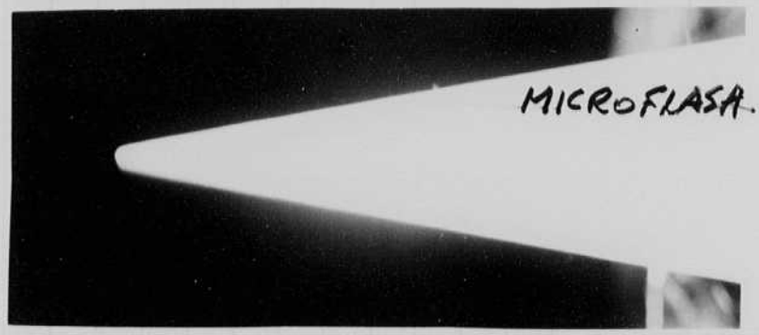
48 Monday Sept 21 1970
Harold Edgerton.

Term started a week ago.
Tests made on Sept 19 with Walter Stiehl



$6.7 \times \pi 2 \times 120 = 5050$"/sec. 420'/sec.

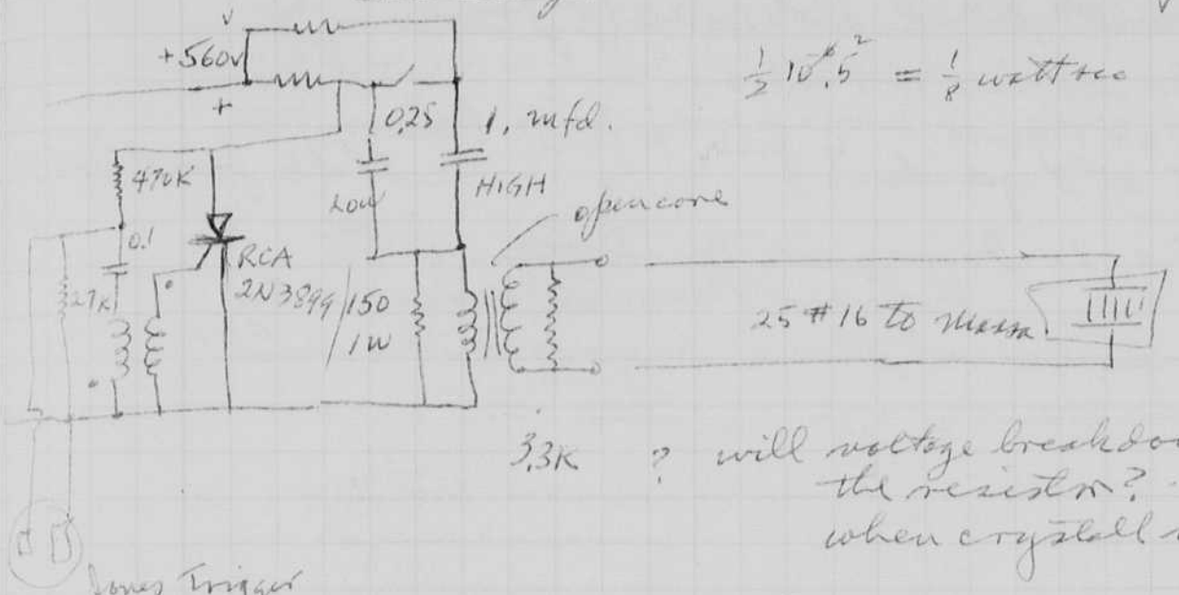
f 5.6



Seminar
40 freshmen 062
13. 6.417 course.

Oct. 11, 1970
Harold Edgerton.

Sonar tests for Krotser. Transformerless Massa 5kc transducers
See Mini Trigger Driver circuit Feb 20 70 of Bill MacRobert's.



$\frac{1}{2} 10^2 .5^2 = \frac{1}{8}$ watt +++

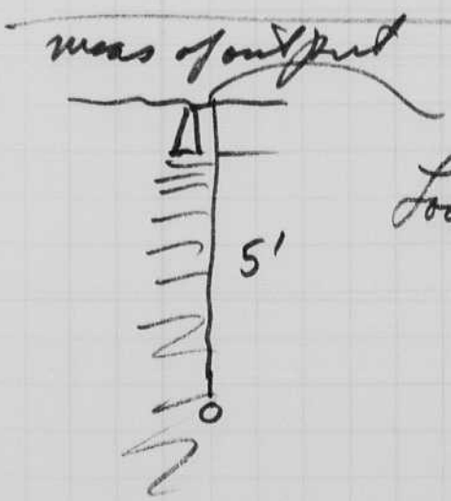
? will voltage breakdown the resistor? 3.5 kilovolts when crystall is attached.

? Will excess voltage breakdown resistor when the transducer is removed.

Don Krotser. came in at 9:30 am
20 D102 Tested in air 1 mfd 500v into sonar.
Ceiling in lab. max. X10 x 100 faintly seen at
80 2 watt 12 ft b.

at M.I.T Dock. 2 poles 1/4 mfd at 500v.
in Water. 80 x 1 x 100 strong signal
2nd pulse ok.

1.25 mfd. 1 mfd + 1/4 40 x 1 x 100 about same signals

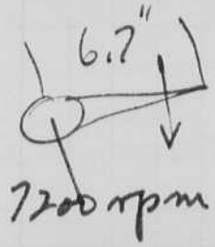


Voltage 0.4 volts p-p. | 0.2 peak volts.
on 8 ball.

Looks like 90 db. output of the transducer with 1 mfd at 500v

48 Monday Sept 21 1970
Harold Edgerton.

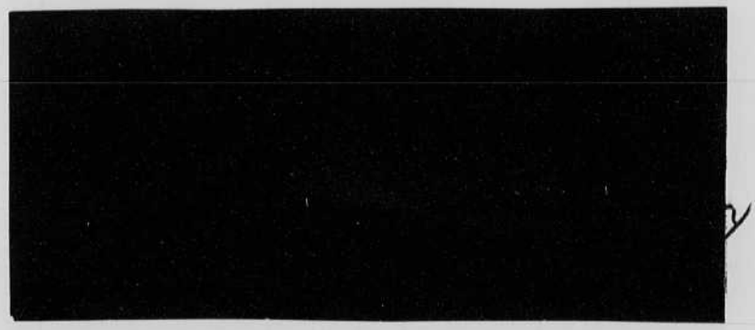
Term started a week ago.
Tests made on Sept 19 with Walter Stiehl



$6.7 \times \pi 2 \times 120 = 5050$"/sec. 420'/sec.

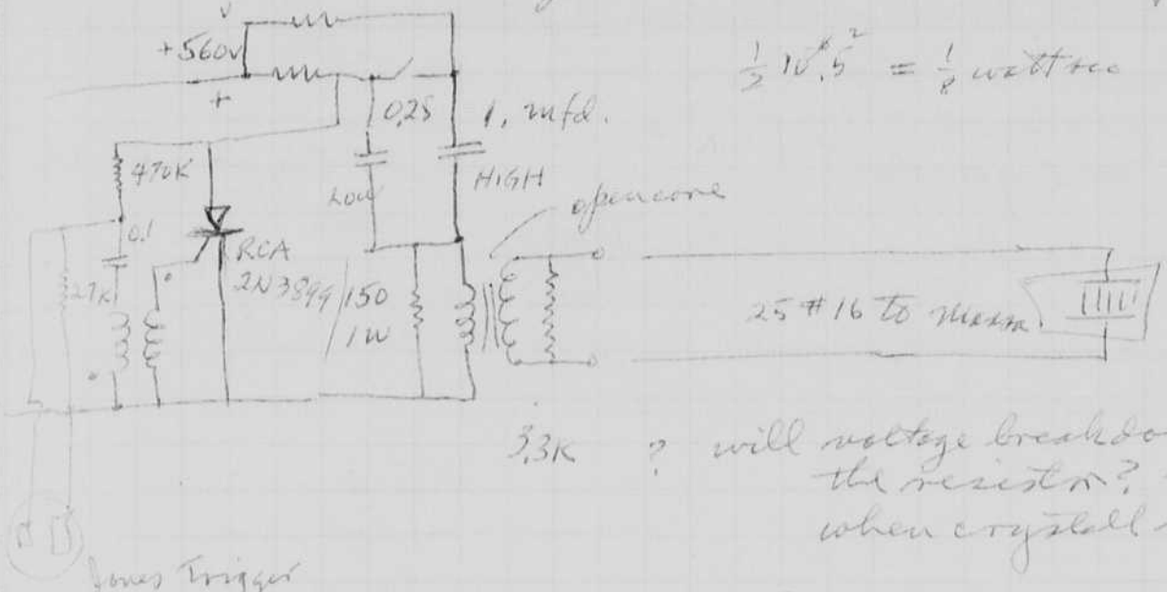
f 5.6

Seminar
40 freshmen 06?
13. 6.417 course.



Oct. 11. 1970
Harold Edgerton.

Sonar tests for Krotser. Transformerless Massa 5 kc transducer
See Mini Trigger Driver circuit Feb 20 70 of Bill MacRobert's.



$\frac{1}{2} 10^{\#}.5^{2} = \frac{1}{8}$ watt rec

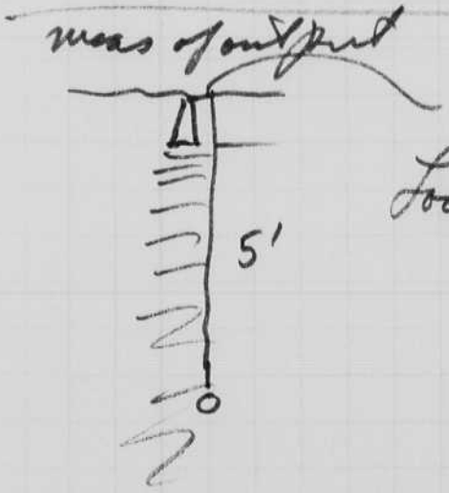
3.3K ? will voltage breakdown the resistor? 3.5 kilovolts when crystall is attached.

? Will excess voltage breakdown resistor when the transducer is removed.

Don Krotser. came in at 9:30 am
20 D102 Tested in air 1 mfd 500 v into sonar.
Ceiling in lab. max. X10 X100 faintly seen at
80 2 watt 12 ft b.

at M.I.T Dock. 2 cubes 1/4 mfd at 500 v.
in Water. 80 X 1 X 100 strong signal
2nd echo OK.

1.25 mfd. 1 mfd + 1/4 40 X 1 X 100 about same signals



Voltage 0.4 volts p-p. | 0.2 peak volts.
on 8 ball.

Looks like 90 db. output of the transducer with 1 mfd at 500 v

Test made in Charles and at the Tunnels. Boston Harbor.

conclusions.

1. Source has 90 db. Too weak!
   0.2 volt peak at 1 mile (5 ft away.)
   Should be 105 → 110
   3 V at 1 yard.
   1.5 at 2 yards. ? from 8 ball. (assuming 88 db. for 8 ball)

Suggestions 1. Driver in Mud Pen into K. Brass (Mass.) assembly

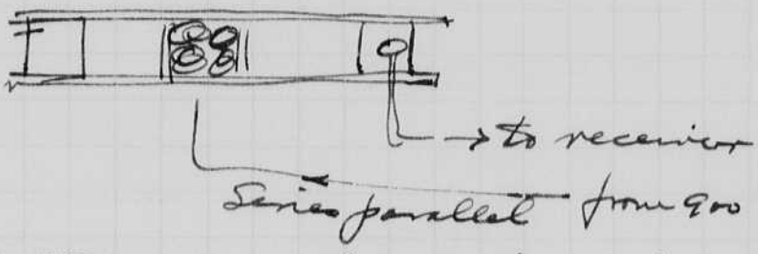
Records do not show layers in the mud!

To do

1. Repair driver rectifiers
2. Clean Generator carborator
3. More power from Mesa tram
   New transformer at transducer.
4. Put 2×4 on frame to protect wire.

Oct. 15, 1970
Harold Edgerton

Don Knutsen and I went to Lewis Wharf in Boston Harbor at 8 this morning to pick up the Sunit Massa unit for tests on the sed mud penetrator. Then we took it to M.I.T. and installed a mana transducer with out a transformer as a pickup.



A reflection was detected from the ceiling when min. cap was used (long - that is without a parallel resistance) The amplifier was x10 on its input.

The entire equipment was loaded in my Volkswagen for installation on the ship, STOCK, tomorrow morning.

Bruce Billings gave a talk at the Optical Society meeting tonight at Waltham Motor Inn He is at Taiwan island.

Oct 22 1970

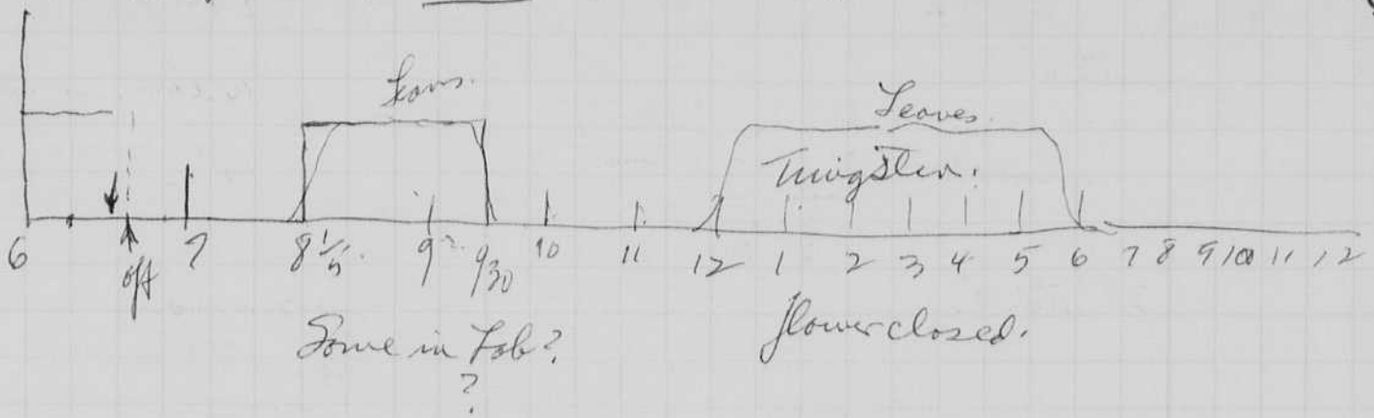
9/70

Sept.	9 (Wed.)	EG&G, Inc. Dir. Meeting, 9:30am, Bedford, Mass.
"	10 (Thur)	Tech Films, Watertown, 9:30am meeting with McCrea & Hyzer
"	" "	Real Time Geophysics, Inc. meeting with Warren Moon, 12 noon
"	11 (Fri.)	Ocean Technology, Inc. (Jerry Schroeder) meeting at Hale & Dorr, 10:30am (Board of Dir. Meeting)
"	14 (Mon.)	M.I.T. REGISTRATION for classes
"	15 (Tues)	1st Classes beging (Course 6.714 - 13 students) 12 noon Mr. Kilduff, 1pm Bob Schildkraut, 5pm
"	16 (Wed.)	N. E. Aquarium, Bd. of Gov. meeting, 12:30pm
"	" "	Faculty meeting - Kresge, 3:15pm
"	" "	N.E. Aquarium - "Aquafest", 7pm
"	17 (Thur)	Baird Atomic with Bruce DePalma
"	22 (Tues)	MACOM meeting, 100 Cambridge St., Boston (Reid Weedon) 9:30am
"	23 (Wed.)	S.P.S.E. Meeting at A.D. Little, Prof. Berg (Swiss) to lecture 6pm dinner and cocktails, 8pm lecture
"	24 (Thur)	Red Lake Labs, Mr. O. Farrell to visit Strobe Lab, 10am Visit EG&G, & B.J. O'Keefe for lunch
"	25 (Fri.)	Australian movie at B.U. (Dr. R. Stuart MacKay's invitation)9am
"	" "	Charles Francisco, Mgr. of EG&G, Waltham, 12 noon lunch & tour
"	" "	Dinner with the John Bullets
"	26 (Sat.)	Am. Radio meeting at the Statler Hilton (weekend) Don Pullin
"	28 (Mon.)	O.T.I. meeting at Hale & Dorr (Jerry Schroeder)
"	29 (Tues)	Tech Films Bd. of Dir. Meeting, 3pm
"	" "	Dinner at the B. J. O'Keefe's house, 6pm
"	30 (Wed.)	Phi Kappa Sigma for dinner, at 5:30pm (Marko Slusarczuk)
Oct.	1 (Thur)	Faculty Club (Prof. Ippen's group), 6pm
"	5 (Mon.)	Dr. Blasi, 9am
"	" "	Fred Gronberg, 2pm
"	" "	Prof. Bruno Rossi to lecture in Rm. 37-252, 4:15pm (seminar)
"	6 (Tues)	O.T.I. (Jerry Schroeder) meeting at Hale & Dorr, 2pm
"	9 (Fri.)	W.H.O.I. Woods Hole, Mass. 12 noon, H.E.E. to show Elapsed time movies
"	12 (Mon.)	COLUMBUS DAY - holiday
"	13 (Tues)	Meet Jerry Schroeder in late afternoon - go to Gloucester
"	14 (Wed.)	Meeting with Prof. Herb Woodson, Howard Barnes, & Tech Film in room 3-137 at 10am
"	" "	Lecture by Prof. Clarke (Yale) on African Rift Valley, 4pm
"	15 (Thur)	in room 54-100 (2 days)
"	" "	Dr. George Fulton, Boston Univ. at Strobe Lab, 3pm (Dr. MacKay)
"	" "	Museum of Science, Trustees Meeting, 5pm
"	16 (Fri.)	M.I.T., Earth Science Bldg. 54-425, Ed Curley to lecture,12 noon
"	" "	Dinner with Marty Klein (Loch Ness Investigation), 6pm $100 check for
"	17-18 (S&S)	Univ. of Maine, Orono to visit the Bob Edgerton Family
"	18 (Sun.)	Arlington Street Church - lecture & dinner, 8pm (Jo Fisher) Sheldon Swanthi
"	19 (Mon.)	Philip Sporn to lecture in Bush Room, 3pm
"	20 (Tues)	Phi Gamma Delta, 28 The Fenway, Boston (~~dinner~~) 5-7pm ✓ Tea
"	21 (Wed.)	N.E. Aquarium Bd. of Gov. Meeting, 12:30pm ✓
"	" "	M.I.T. Faculty meeting - Kresge ✓
"	22 (Thur)	Philip Sporn to lecture in Bush Room, 3pm
"	23 (Fri.)	E.E. Dept. (Prof. Smullin) dinner at Faculty Club, 5:45pm for cocktails, dinner will be served at 6:45pm (Chicken)
"	26 (Mon.)	Philip Sporn to lecture, Bush Room at 3pm
"	29-30(T&F)	Florida Inst. of Tech, Melbourne, Fla, Sci. Adv. Bd. Meeting Holiday Inn on Rt. 1, Melbourne (Jack Morelock)
"	30 (Fri.)	Geodyne Party (EG&G) Piety Cornors Garden, Lexington St., Waltham, 7-12midnight.

Oct 22 1970
H Edgerton.

TRU PAK moving & Storage
804649
7984 F N.C.
420
United Van Lines

Photos of Plant, Oxalis 40 seconds.



Nov.	3	(Tues)	ELECTION DAY
"	4	(Wed.)	Emeritus Luncheon, 12 noon
"	5	(Thur)	Jim Engles, Ohio State (Christ on the Campus group)
"	9	(Mon.)	Mr. John Wolters, 2pm to visit
"	10	(Tues)	Drs. Rice, Maehl & McLeod to lecture at M.I.T., 3pm (tea) Bush Room
"	"	"	Tech Film, Bill McCrea, 4pm
"	11	(Wed.)	VETERANS' DAY
"	"	"	EG&G Bd. of Director's meeting, 9:30am, Bedford, Mass.
"	13	(Fri.)	Tech Film Open House, Watertown 2-7pm
"	"	"	Children's Hospital, Boston (Dr. Chamberlain), 3pm
"	14	(Sat.)	Faculty Club, "Wild West Party" 7pm
"	16	(Mon.)	Tech Film (Eastman Kodak, Wellesley, Mass) Bill McCrea, 3pm
"	"	"	N.E. Aquariu, Trustees Meeting, 5:30 pm
"	"	"	M.I.T. Chapel - "Light Show", 8:30 pm
"	17	(Tues)	M.I.T. Bush Room, Dr. Stuart Mackay to lecture, 3-4pm
"	"	"	Hamilton Trust meeting, Algonquin Club, Boston
"	18	(Wed.)	Faculty Meeting - Kresge, 3:15 pm
"	19	(Thur)	M.I.T. Armory - to take multiflash photos, 2:30 pm
"	20	(Fri.)	Mr. Wm. Driver, Jr (Museum of Science, Boston) to visit, 12 noon
"	23	(Mon.)	Institute Professors' dinner, Faculty Club (Prof. Wiesner)
"	24	(Tues)	MACOM meeting, rm. 1319, 100 Camb. St., Boston, 1:30 pm
"	"	"	N.E. Aquarium (H.E.E. to lecture for Mr. Patterson) 7:30
"	26	(Thur)	THANKSGIVING DAY
Dec.	2	(Wed.)	Mr. Morris Miller's students to visit (Franklin Institute), 2PM
Dec.	3	(Thur)	Tech Film Open House "seminar", 222 Arsenal St., Watertown 9-5
"	"	"	Stu-Fac. Steak Fry, Bush Bldg., 6pm
"	4	(Fri.)	Bob Rines & Marty Klein (discuss trip to Israel) 10am
"	"	"	Prof. Javan's luncheon at Faculty Club, 12:15
"	6	(Sun.)	E.K.N. dinner at Joyce Chin's restaurant, 6pm
Dec.	7	(Mon.)	N.E. Aquarium Executives meeting, 11:30-5pm, Student Center
"	"	"	Lecture in Delaware (Mrs. Robinson), 6pm
"	8	(Tues)	Tech Film Bd. of Dir. meeting, Watertown, 3pm
"	9	(Wed.)	H.E.E. to lecture in Brookline High School (Donald Dixon)1:25pm
"	"	"	Mr. C. Greenewalt to lecture on High Speed bird photography,4pm
"	10	(Thur)	H.E.E. to visit M.I.T. MacGregor House (Mr. Demko) 5:30pm
"	11	(Fri.)	#6 Club, Stu-Fac. Eggnog Christmas party, 4-6pm
"	12	(Sat.)	Santa Claus at EG&G, Inc., Bedford, 9-1pm
"	14	(Mon.)	Dean Alberty's office (rm. 6-215) with Prof. Benedict
"	"	"	Prof. Averback to lecture to H.E.E.'s students, 12noon
"	15	(Tues)	Ron Gaumont (EG&G, INC.), 10am (layout for EGG INK)
"	"	"	Christmas Convocation at Kresge, 11am
"	"	"	Dr. Ganzu (Tel Aviv, Israel) to visit, 1pm
"	15	(Wed.)	N.E. Aquarium Bd. of Gov. meeting, 12:30pm
"	"	"	Faculty Meeting - Kresge, 3:15pm
"	"	"	Party at Niki Scoufopoulos, 35 Gorham St., Camb., 8pm

Oct 22 1970

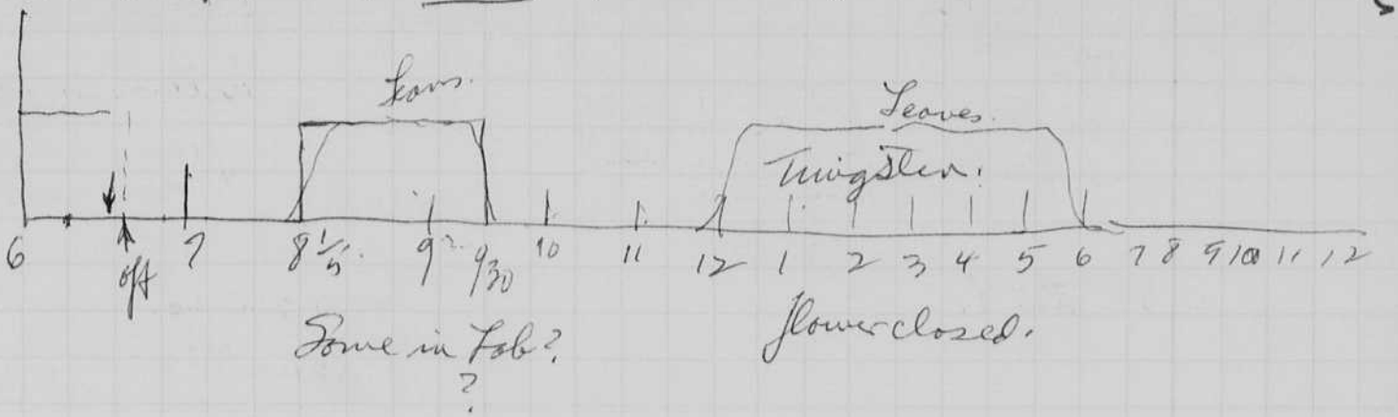
9/70

Sept.	9 (Wed.)	EG&G, Inc. Dir. Meeting, 9:30am, Bedford, Mass.
"	10 (Thur)	Tech Films, Watertown, 9:30am meeting with McCrea & Hyzer
"	" "	Real Time Geophysics, Inc. meeting with Warren Moon, 12 noon
"	11 (Fri.)	Ocean Technology, Inc. (Jerry Schroeder) meeting at Hale & Dorr, 10:30am (Board of Dir. Meeting)
"	14 (Mon.)	M.I.T. REGISTRATION for classes
"	15 (Tues)	1st Classes beging (Course 6.714 - 13 students) 12 noon Mr. Kilduff, 1pm Bob Schildkraut, 5pm
"	16 (Wed.)	N. E. Aquarium, Bd. of Gov. meeting, 12:30pm
"	" "	Faculty meeting - Kresge, 3:15pm
"	" "	N.E. Aquarium - "Aquafest", 7pm
"	17 (Thur)	Baird Atomic with Bruce DePalma
"	22 (Tues)	MACOM meeting, 100 Cambridge St., Boston (Reid Weedon) 9:30am
"	23 (Wed.)	S.P.S.E. Meeting at A.D. Little, Prof. Berg (Swiss) to lecture 6pm dinner and cocktails, 8pm lecture
"	24 (Thur)	Red Lake Labs, Mr. O. Farrell to visit Strobe Lab, 10am Visit EG&G, & B.J. O'Keefe for lunch
"	25 (Fri.)	Australian movie at B.U. (Dr. R. Stuart MacKay's invitation)9am
"	" "	Charles Francisco, Mgr. of EG&G, Waltham, 12 noon lunch & tour
"	" "	Dinner with the John Bullets
"	26 (Sat.)	Am. Radio meeting at the Statler Hilton (weekend) Don Pullin
"	28 (Mon.)	O.T.I. meeting at Hale & Dorr (Jerry Schroeder)
"	29 (Tues)	Tech Films Bd. of Dir. Meeting, 3pm
"	" "	Dinner at the B. J. O'Keefe's house, 6pm
"	30 (Wed.)	Phi Kappa Sigma for dinner, at 5:30pm (Marko Slusarczuk)
Oct.	1 (Thur)	Faculty Club (Prof. Ippen's group), 6pm
"	5 (Mon.)	Dr. Blasi, 9am
"	" "	Fred Gronberg, 2pm
"	" "	Prof. Bruno Rossi to lecture in Rm. 37-252, 4:15pm (seminar)
"	6 (Tues)	O.T.I. (Jerry Schroeder) meeting at Hale & Dorr, 2pm
"	9 (Fri.)	W.H.O.I. Woods Hole, Mass. 12 noon, H.E.E. to show Elapsed time movies
"	12 (Mon.)	COLUMBUS DAY - holiday
"	13 (Tues)	Meet Jerry Schroeder in late afternoon - go to Gloucester
"	14 (Wed.)	Meeting with Prof. Herb Woodson, Howard Barnes, & Tech Film in room 3-137 at 10am
"	" "	Lecture by Prof. Clarke (Yale) on African Rift Valley, 4pm
"	15 (Thur)	in room 54-100 (2 days)
"	" "	Dr. George Fulton, Boston Univ. at Strobe Lab, 3pm (Dr. MacKay)
"	" "	Museum of Science, Trustees Meeting, 5pm
"	16 (Fri.)	M.I.T., Earth Science Bldg. 54-425, Ed Curley to lecture, 12 noon
"	" "	Dinner with Marty Klein (Loch Ness Investigation), 6pm ✓ 100 needed for
"	17-18 (S&S)	Univ. of Maine, Orono to visit the Bob Edgerton Family
"	18 (Sun.)	Arlington Street Church - lecture & dinner, 8pm (Jo Fisher) Sheldon Swentzell
"	19 (Mon.)	Philip Sporn to lecture in Bush Room, 3pm
"	20 (Tues)	Phi Gamma Delta, 28 The Fenway, Boston (~~dinner~~) 5-7pm ✓ Tea
"	21 (Wed.)	N.E. Aquarium Bd. of Gov. Meeting, 12:30pm ✓
"	" "	M.I.T. Faculty meeting - Kresge ✓
"	22 (Thur)	Philip Sporn to lecture in Bush Room, 3pm
"	23 (Fri.)	E.E. Dept. (Prof. Smullin) dinner at Faculty Club, 5:45pm for cocktails, dinner will be served at 6:45pm (Chicken)
"	26 (Mon.)	Philip Sporn to lecture, Bush Room at 3pm
"	29-30(T&F)	Florida Inst. of Tech, Melbourne, Fla, Sci. Adv. Bd. Meeting Holiday Inn on Rt. 1, Melbourne (Jack Morelock)
"	30 (Fri.)	Geodyne Party (EG&G) Piety Cornors Garden, Lexington St., Waltham, 7-12midnight.

Oct 22 1970
H Edgerton.

TRU PAK moving & storage United Van Lines
804649
7984 F M.C
4/20

Rhodos of Florist. Oxalis 40 seconds.



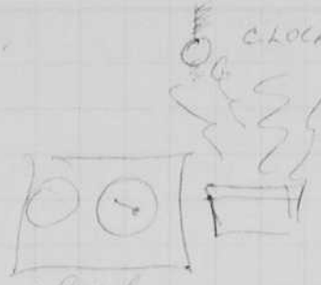
Nov.	3	(Tues)	ELECTION DAY
"	4	(Wed.)	Emeritus Luncheon, 12 noon
"	5	(Thur)	Jim Engles, Ohio State (Christ on the Campus group)
"	9	(Mon.)	Mr. John Wolters, 2pm to visit
"	10	(Tues)	Drs. Rice, Maehl & McLeod to lecture at M.I.T., 3pm (tea) Bush Room
"	"	"	Tech Film, Bill McCrea, 4pm
"	11	(Wed.)	VETERANS' DAY
"	"	"	EG&G Bd. of Director's meeting, 9:30am, Bedford, Mass.
"	13	(Fri.)	Tech Film Open House, Watertown 2-7pm
"	"	"	Children's Hospital, Boston (Dr. Chamberlain), 3pm
"	14	(Sat.)	Faculty Club, "Wild West Party" 7pm
"	16	(Mon.)	Tech Film (Eastman Kodak, Wellesley, Mass) Bill McCrea, 3pm
"	"	"	N.E. Aquariu, Trustees Meeting, 5:30 pm
"	"	"	M.I.T. Chapel - "Light Show", 8:30 pm
"	17	(Tues)	M.I.T. Bush Room, Dr. Stuart Mackay to lecture, 3-4pm
"	"	"	Hamilton Trust meeting, Algonquin Club, Boston
"	18	(Wed.)	Faculty Meeting - Kresge, 3:15 pm
"	19	(Thur)	M.I.T. Armory - to take multiflash photos, 2:30 pm
"	20	(Fri.)	Mr. Wm. Driver, Jr (Museum of Science, Boston) to visit, 12 noon
"	23	(Mon.)	Institute Professors' dinner, Faculty Club (Prof. Wiesner)
"	24	(Tues)	MACOM meeting, rm. 1319, 100 Camb. St., Boston, 1:30 pm
"	"	"	N.E. Aquarium (H.E.E. to lecture for Mr. Patterson) 7:30
"	26	(Thur)	THANKSGIVING DAY
Dec.	2	(Wed.)	Mr. Morris Miller's students to visit (Franklin Institute), 2PM
Dec.	3	(Thur)	Tech Film Open House "seminar", 222 Arsenal St., Watertown 9-5
"	"		Stu-Fac. Steak Fry, Bush Bldg., 6pm
"	4	(Fri.)	Bob Rines & Marty Klein (discuss trip to Israel) 10am
"	"		Prof. Javan's luncheon at Faculty Club, 12:15
"	6	(Sun.)	E.K.N. dinner at Joyce Chin's restaurant, 6pm
Dec.	7	(Mon.)	N.E. Aquarium Executives meeting, 11:30-5pm, Student Center
"	"	"	Lecture in Delaware (Mrs. Robinson), 6pm
"	8	(Tues)	Tech Film Bd. of Dir. meeting, Watertown, 3pm
"	9	(Wed.)	H.E.E. to lecture in Brookline High School (Donald Dixon)1:25pm
"	"	"	Mr. C. Greenewalt to lecture on High Speed bird photography,4pm
"	10	(Thur)	H.E.E. to visit M.I.T. MacGregor House (Mr. Demko) 5:30pm
"	11	(Fri.)	#6 Club, Stu-Fac. Eggnog Christmas party, 4-6pm
"	12	(Sat.)	Santa Claus at EG&G, Inc., Bedford, 9-1pm
"	14	(Mon.)	Dean Alberty's office (rm. 6-215) with Prof. Benedict
"	"	"	Prof. Averback to lecture to H.E.E.'s students, 12noon
"	15	(Tues)	Ron Gaumont (EG&G, INC.), 10am (layout for EGG INK)
"	"	"	Christmas Convocation at Kresge, 11am
"	"	"	Dr. Ganzu (Tel Aviv, Israel) to visit, 1pm
"	15	(Wed.)	N.E. Aquarium Bd. of Gov. meeting, 12:30pm
"	"	"	Faculty Meeting - Kresge, 3:15pm
"	"	"	Party at Niki Scoufopoulos, 35 Gorham St., Camb., 8pm

54 Oct 26 1920

Heliotropism of Mesembryanthemum. Oxalis stricta

2-5 watt bulbs. 1½ ft

meter 225 ft candles



Kodak II film f 16 or less 1/4 turn out for focus adjustment

10.38 started.

aurora 870 22 sec. 50 watt 20 c. 1.12 ft camera - Subject

10.55 Petals is 29 second flowers are open — leaves point to light.

12.35 Reversed the Plant. Mimosa 2 ft Par bulbs at 10 ft f 4 on Daylight film.

1.40 Lights off.

3.10 Lights on again.

5.10 Lights off

5.55 end of ~~time~~ picture Guess that fills 9/12 exposed.

Oct 28 1970
H. Edgerton

Elapsed time movies of Plant oxidizer made yesterday. Today Nussmeier entrance.

7.30 start — 15 pict f 5.6 5 sec. Film read 30 ft
7.45 16 " f 56 "
8.00 10 min f 56 "
8.10 off. Dead.
8.30 Start f 8 "

Watch ~~shadow~~ sun path on pavement as it goes across the street.

9 00 Sign on one frame & mark. Sun at edge of steps

9 30 Sign on one frame, still at f 8 5 sec

9.32 Lobect film — Read 5 ft. 5 x 40 = 200 frames
9 45 Removed from place and gave film to the coeds.

5 / 60 / 1000 seconds / 60 / 40 — 16 min.

The sun was not on the front of the Bldg! at 9.45 am.

The above shows M.I.T. during Vacation time.

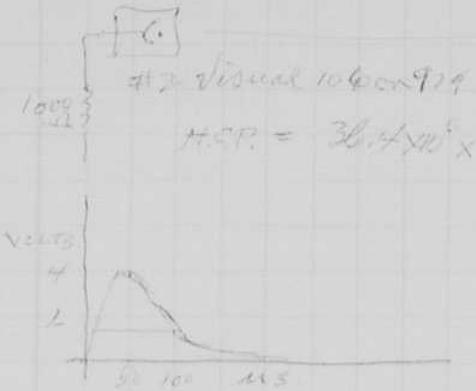
Try again next week 50' x 40 / 2000 frames / 60 / 10,000 seconds / 60 / 400 / 360 / 40

2 1/2 hours = 60 / 166 minutes / 120 / 46

Start at 7 30 — 15 frames
Start 8 00 / 9 / 10

56 Nov. 3, 1970
Rarly Studer
X Eglinton

Test of FT-17 in Reflector.



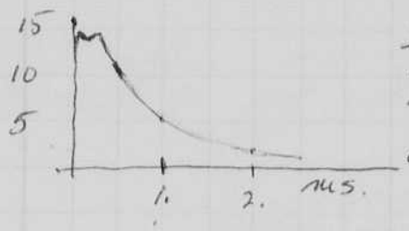
MCP = $36.4 \times 10^6 \times V \times \frac{900}{1000} = 32.7 \times 10^6$ V c.p.

$I_{peak} = 4 \times 32.7 \times 10^6 = 131 \times 10^6$

Duration 100 ms

output = $131 \times 10^6 \times 100 \times 10^{-3} = 13,100$

#1 Power Supply



$I_{peak} = 14 \times 32.7 \times 10^6 = 460 \times 10^6$ MCP.

Dur = 1.1×10^{-3} sec.

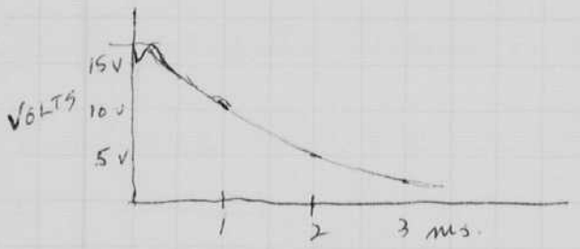
output = 510,000 M.C.P.S.

550 μf in #6 #1 Bank

$\frac{580}{25} = 23.$ [illegible]

$\frac{510}{13.1} = 39.$ Light

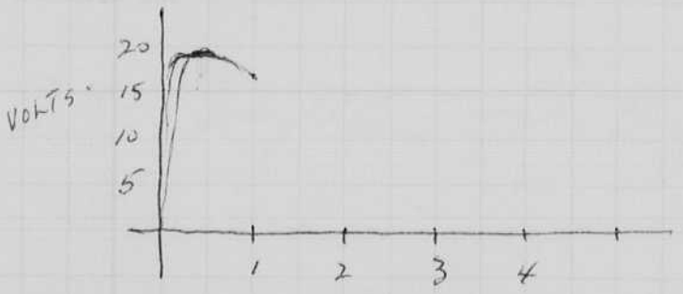
1040



$I_{peak} = 17 \times 32.7 \times 10^6$

Dur = 2 ms.

output = 1,110,000



1040
+ 1070

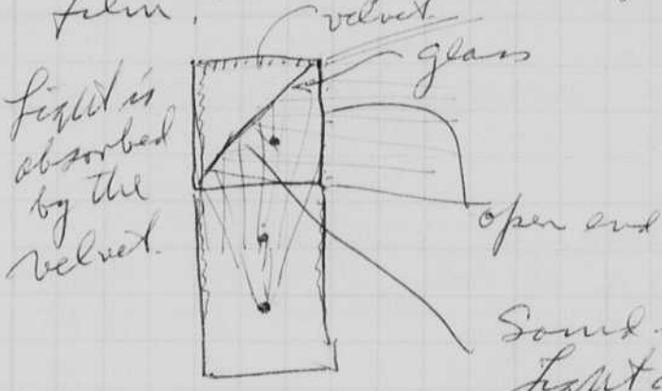
Sat Nov 21 1970
-Harold Edgerton

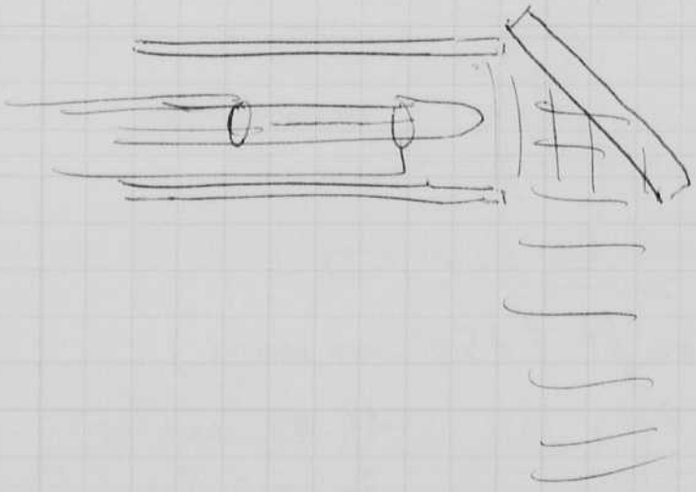
Silhouette photos are being made by the freshmen class (40 per sec)
A tank of Hydrogen was brought into the lab for
trial. Hydrogen bubbles go up. They cannot be made
larger than about 2½ or 3 inches before they pull up
into the air.

Spark source of sound. We need a
strong source of sound for photos of shockwaves etc.
I propose one of our old spark sources. Lets try it for
strength etc.

1. Try new gap. ~~[illegible]~~ 1" gap across the
0.05 mfd 16KV circuit.

note. The light from the spark gets on the
film.





58 Dec. 5, 1970. Sat.

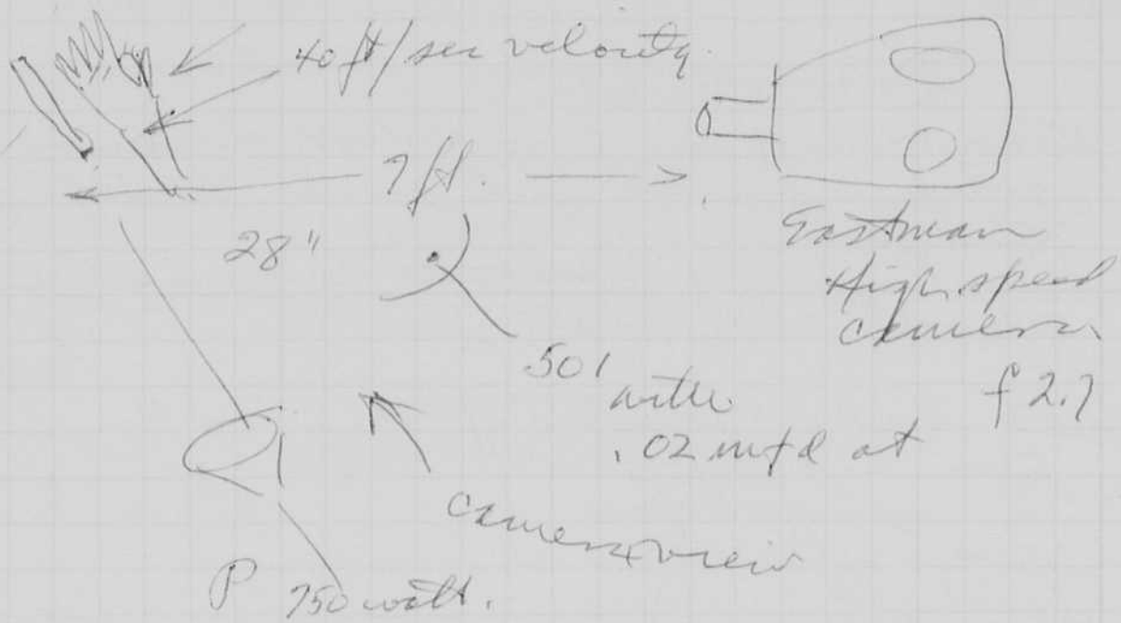
Harold Edgerton.

Safwan Bengellorun Moroc

9 am meeting scheduled (Safwan not here)

to label movies of Karate breaking of a board.

Roppell, James fresh from Florida West Palm Beach.



Dec. 10. 1970 Test of Variant flesh unit from Belgium.

Vidal, Zoltan Chaussee St Job 353

B-1180 Bruxelles Belgium.

unit 153050 cap lead Garland

Siemens cap B43405-50 757 951

750 mf 360 V 12/69

Video
+12
-12
+300
+150

10.15 output 5 ft 875 after several minutes

560 " "on" mean

10 - 4.016/100 ft.

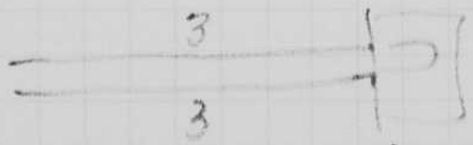
14 - 2.15/100 ft The unit is rated 56 as a guide factor

10.15/100 ft for Kod II

I say it should be 30 or maybe 40!

Strider test of lamps. 500 ft (250 two way).

#20.



50 ms neutral.

20 mc band pass.

3 amp - 2 V

R = 2V/3 = .6 ohms.

2V

100 watt
amp with 4?

Dec. 11, 1970 Saturday afternoon

Velocity of gases from Physics Handbook 1962

	0° c.	v/v_{air}
air	331,45 m/sec	1.0
He	970	2.930
ar	307.8	0.925
H_2	1269.5	3.83

Tostoshino

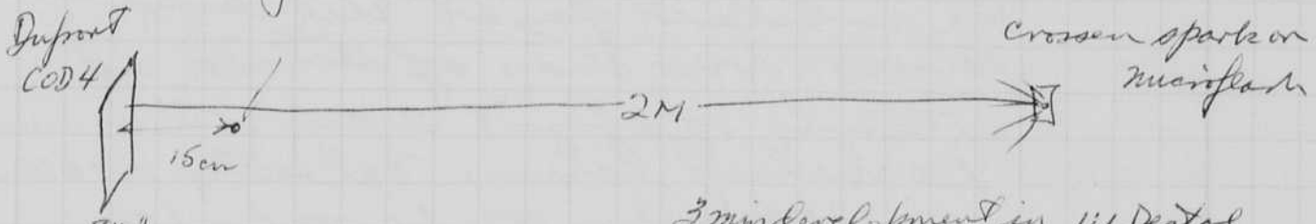
$\frac{v_{He}}{v_{air}} = 2.5$

Jim Mili was here on the 11 to attend a meeting at the home of Diana Cambridge. 19 Berkely St. Mili had copies of his new book on Picasso. Venture Press 1970. $4.27.

Mili may come to M.I.T. Jan 24-29 for a week seminar on strobe photography. We have a studio in DuPont (contemp) we have with multiflash strobes.

Dec 24 1970 H2 with Kwok C WONG. He brought in his note book 6.714 Mili noon.

Silhouette photos.

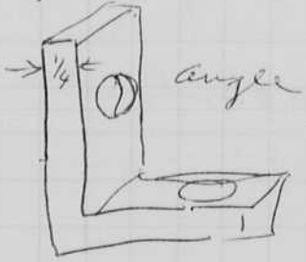


3 min development in 1:1 Dektol.

or Eastman 4154

22 longs
22 shorts for
velocity less than sound

~~Fast 2 pics~~



angle iron target for sound wave to hit.

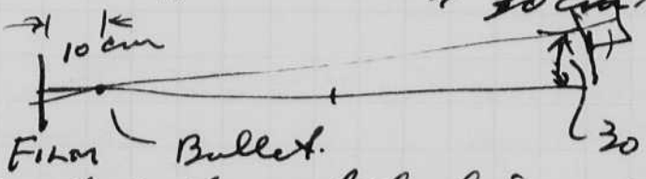
Fast 2 pics with film ☐ had a 30 cm distance to the bullet and a 2M to the spark.

60 Dec 25 7:30 pm #2.

Back to 10 cm to film 1 meter to film from bullet
Developed 5 min in 1:1 Dektol.

A 22 short. with lamp at ⊥ perpendicular

B. " " " " 30 cm to side.



this effects the white line It seems to be gone for the finest look!

C. Repeat — neg looks about the same

D. Film at 60 cm to Subject Lamp at 2 m
22 short.
Shows more deflection of light.

The turbulent gas at the end shows bunches of action at intervals of about 2 cm. This will be checked later. Velocity = 1000 ft/sec or 12,000 inches or 60,000 cm/sec.

$2\text{cm} = v \times t \quad t = \frac{2}{v} = \frac{2}{60,000} = \frac{1}{30,000}$ sec

$f = 30,000$ cycles/sec.

Film H154 continued

E. Back to 15 cm to Bullet. 22 short

F. " " " " " 22 long.

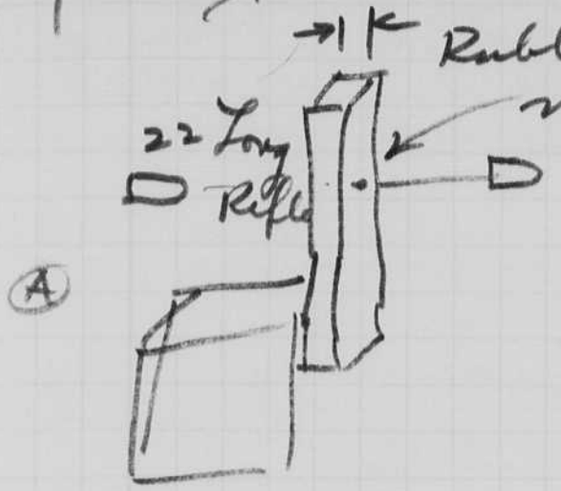
Dec 26, I went to Phil at 2 pm on allegheny to bring my mother to Boston at 4:55 — arrived at 6.05 pm.

Dec 27, Studied the pictures of the bullets. The mystery of the white line is still with us. I plan to work up the experiments and make a series of prints.

Dec 30 1970

~~4154~~
~~5154~~

Yesterday.



15 cm to Bullet to film
2 meters to spark.

B. Same.

Dec 30 1970 card.

10 cm to Bullet
2 m to card.

A.

4154 film — Double exposure since #1 did not hit the card.

B. Ditto but card further

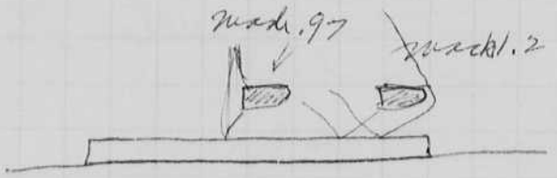
C Ditto but card closer.

Dec. 31, 1970

The "white line" mystery with the bullets that go slower than sound is still bothering me. Now I have a sequence of photos that show that the white line is real. But what is it.

Try a reflection method.

①

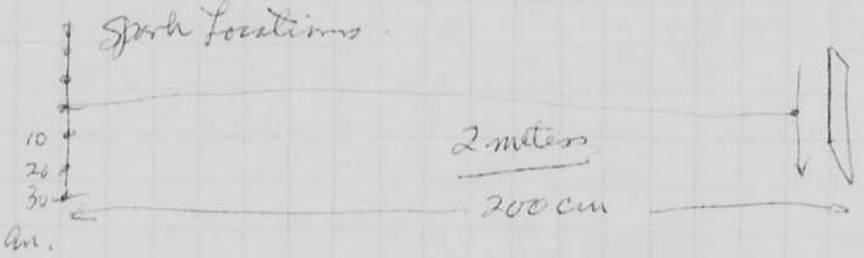


Jan. 1, 1971

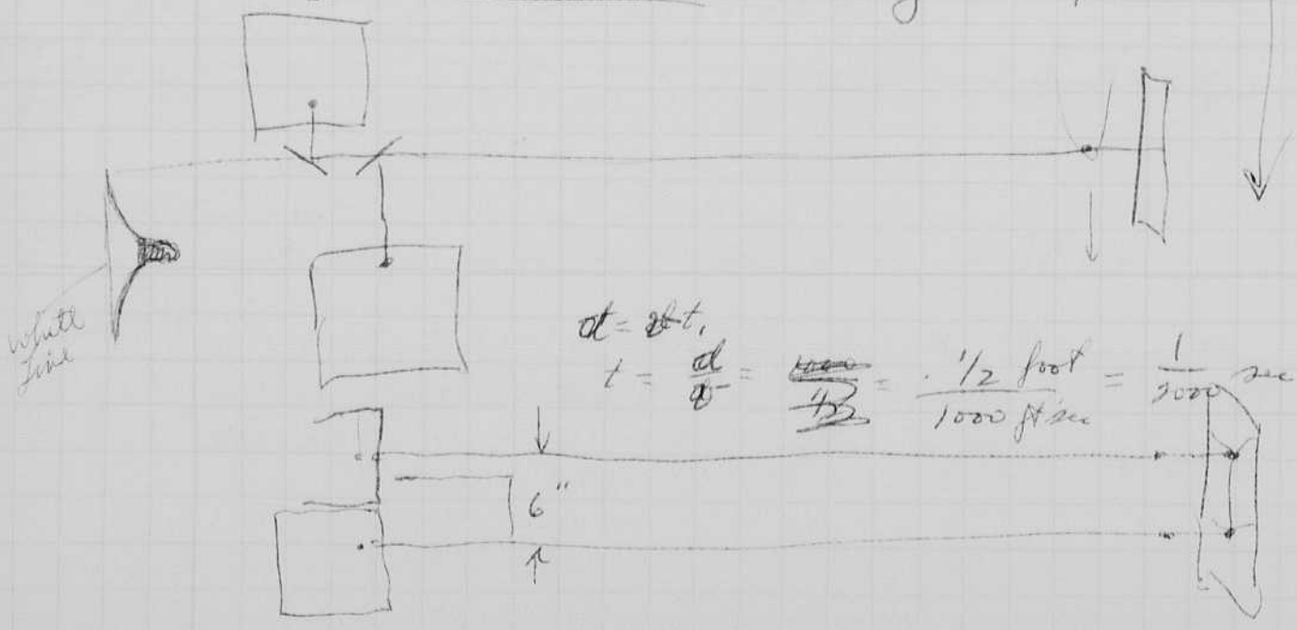
② why not shoot thru a film

Proposed experiment

③ Check the white line with several angles on the bullets. Take a series of photos.



④ Double exposure. At delay time of Δt.



$d = vt$,

$t = \frac{d}{v} = \frac{\text{½ foot}}{1000 \text{ ft/sec}} = \frac{1}{2000}$ sec $= 500\ \mu s$.

Jan 2 1971 Sat. 8:30 am
Experiments with bullets.
Silhouette.

Bullet-film Dist "
Film Targ Dist "

Jan 2 1971

4154 FILM Bullet
20 cm 10 cm 1.9 cm Quick Spark.
10 7 cm ±
200

A. ~~15 cm 200 cm~~ No Spark was triggered by gun-magnet pulse out

B. ✓ 15 cm 200 cm 22 Long
Shows shock waves and projectiles
Photo ok

C. ✓ 15 cm 200 cm 22 SHORT
Bullet coming down waves perpendicular

~~D 15 200 22 SHORT No.~~ Bullet exp no pistol due to pre firing of pistol by pickup of magnet pulse grounding of shield on microphone cable helped some. Do more. out

Bullet upward slope but rear wave is perpendicular to line of flight.

E. ✓ 15 200 22 SHORT .4 ms delay Trigger Double flash E Holder fell ✓

F. ✓ 15 200 22 SHORT .4 ms " " Photo is ok.
Bullet up some observe shock waves!
I note that the bullet is not going straight in E it is going down and in F it is going up!
Both have violent wakes behind the bullet.

G. ✓ 15 200 22 SHORT The obstruction was (0.4 ms?) removed to get a straight photo of a sub sonic bullet.
Strobes! otherwise ok.

1105 am
H. ✓ 15 200 Strobes but not serious. 22 short. .20 ms delay. or scale!

I 15 200 " " 60 ms " these look ok to be studied later

Excellent! Show 3 white lines also Waves ahead of Bullet!!

1170 J. 2 cm 200 - 13 22 " .4 ms delay. } same.
K. ✓ 2 cm 200 - 13 22 SHORT .4 ms " } Show rear violet waves.
Both ok but lines thinner due to Bullet-Film spacing.

Lunch at home
100 Memorial Drive apt 11-7A with
Esther and my mother from Aurora Nebraska
Monty Edgerton 10 and J St.

Washed dry mornings films. comments in red above.

Jan 21 1971 cont.
afternoon. H.E.E.

It appears that the wake of the subsonic bullet is variable in time. Also the flight of the bullet is variable in direction! Even so, the bullet hits the same spot on the target. So the variations tend to average up in the 20 feet of my range. The turbulence behind the bullet (sub sonic) had an irregularity to it of about 1.5 cm along its path.

Experiment. Double flash.

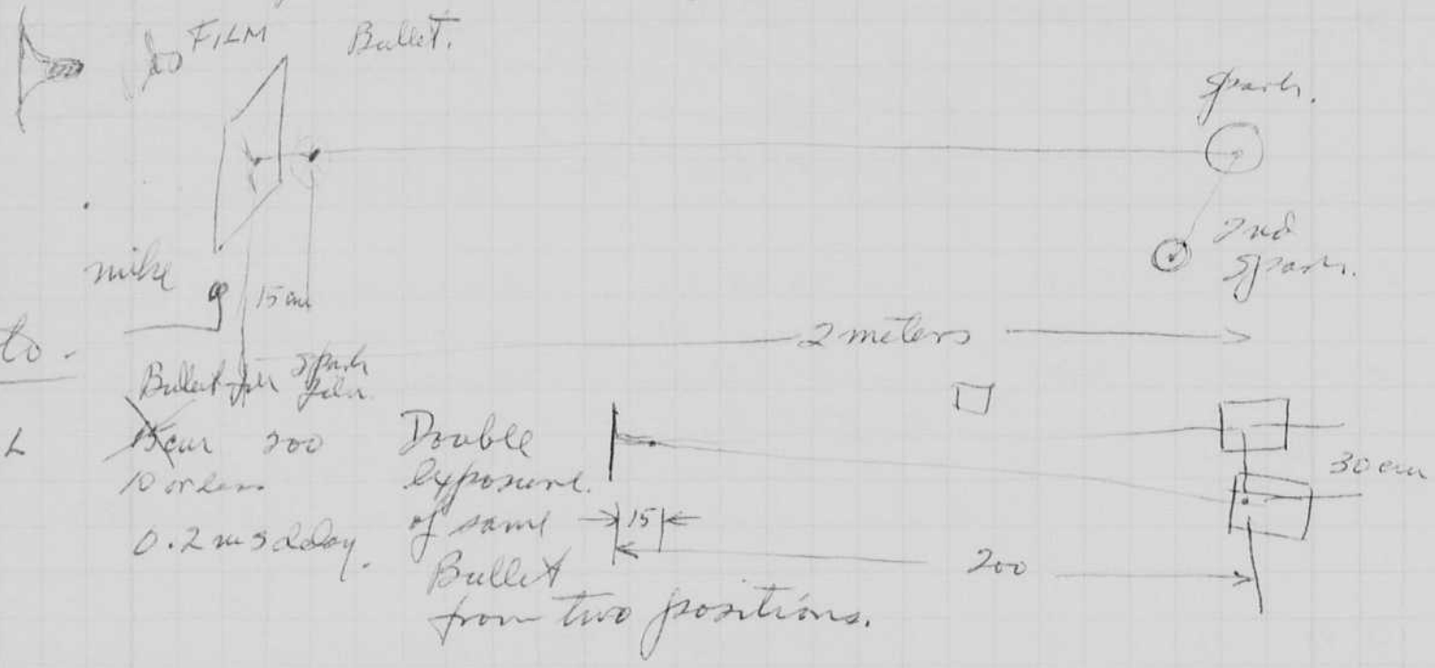


Photo.

L Kear 200 10 orders 0.2 ms 3 delay.

M. ✓ 15 200 0.2 ms. Title set up except moved the microphone about 4" toward bullet catcher to center the bullets on the negative. Photo is OK – shows 2 shadows.

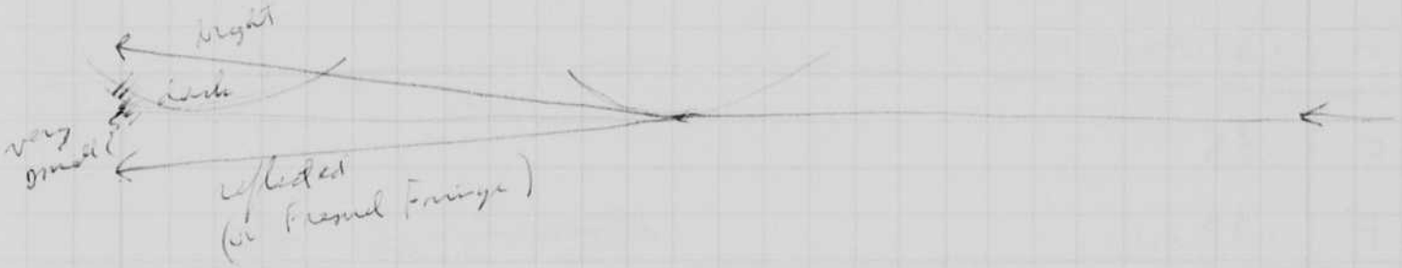
N. ✓

O

Jan 3 1971
Harold Edgerton
Robert

200 mm

• 1.6 mm diam.



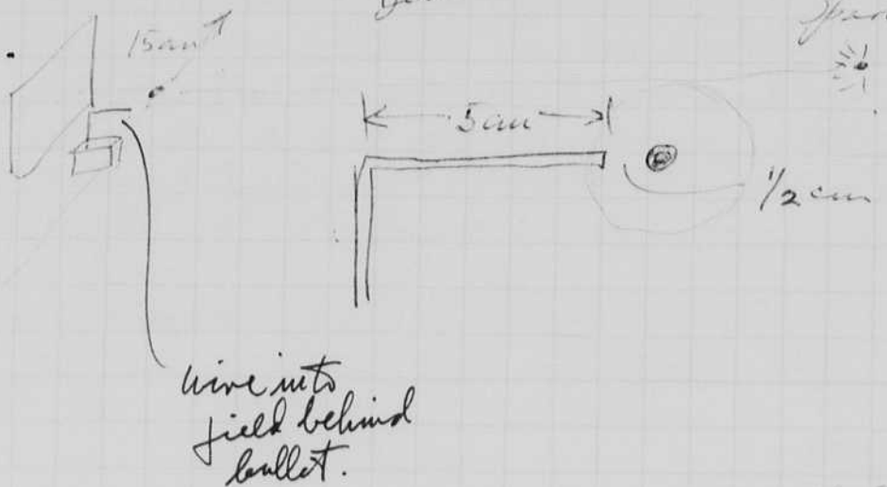
Jun 3 1971 H. Edgerton
Bob Edgerton

Bullet & film
15cm 200 cm

#195 film
Del Lab 1:1

(1/16")
1.6 mm dia
aperture
over spark.

A. 0.4 ms.



wire into field behind bullet.

B 0.5 ms

C .34 ms Too early. Shows bigwake! very interesting photo
Shows wave ahead of bullet!

D .36 ms. Too late

E .35 ok.

F .35 ~~Too early~~ ok.

G .34 ok,

H. .34 Too early

I Glass Bubble. 15cm to film 2 meters to spark.

Lamp at 4 meters.

J 15cm to film from Bullet.

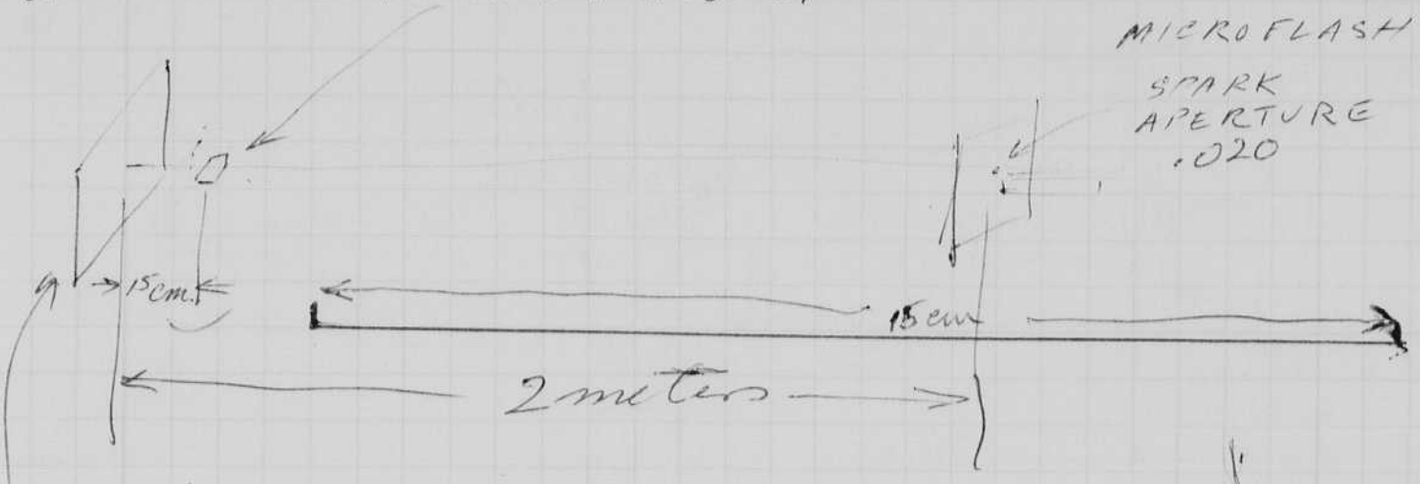
K 30 cm to film 4 meters to Lamp.

L	30? 15	4m 1/2 hole size with tabs
M	15	4m 1/4 " "
N	15	4m 1/4 " "

3 pm dinner at 100 men

Jan 7, 1971
V.E.M.

.22 short bullet

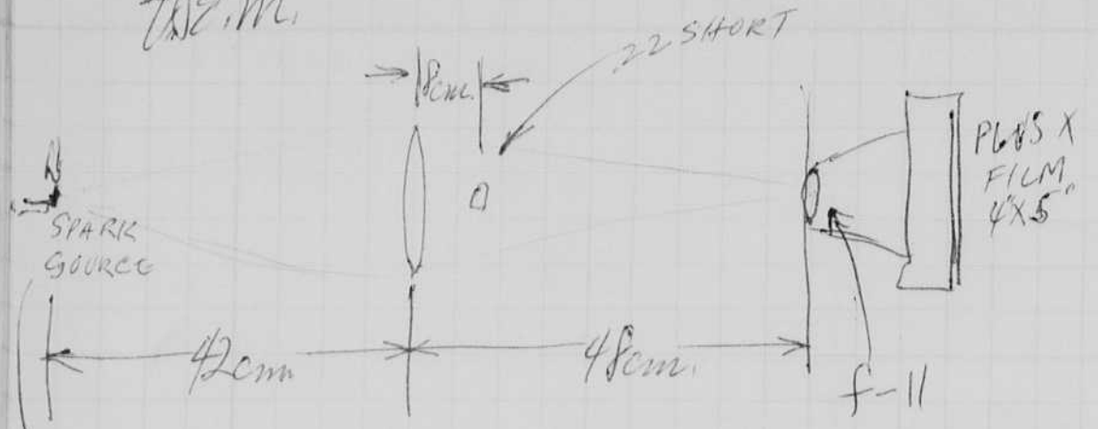


film - ortho P litho / .004 thickness
Cronar

1
2
3.
4
5.
6.

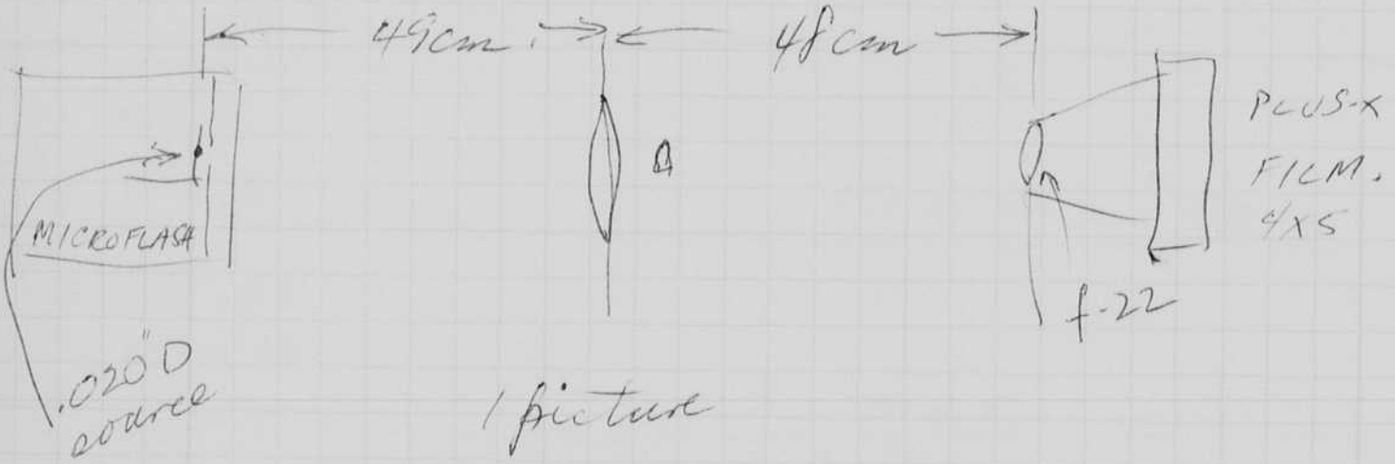
Jan 8, 1970
7:30 P.M.

.22 short bullets



1/10" long 167 pf on Microflash Trigger Unit.

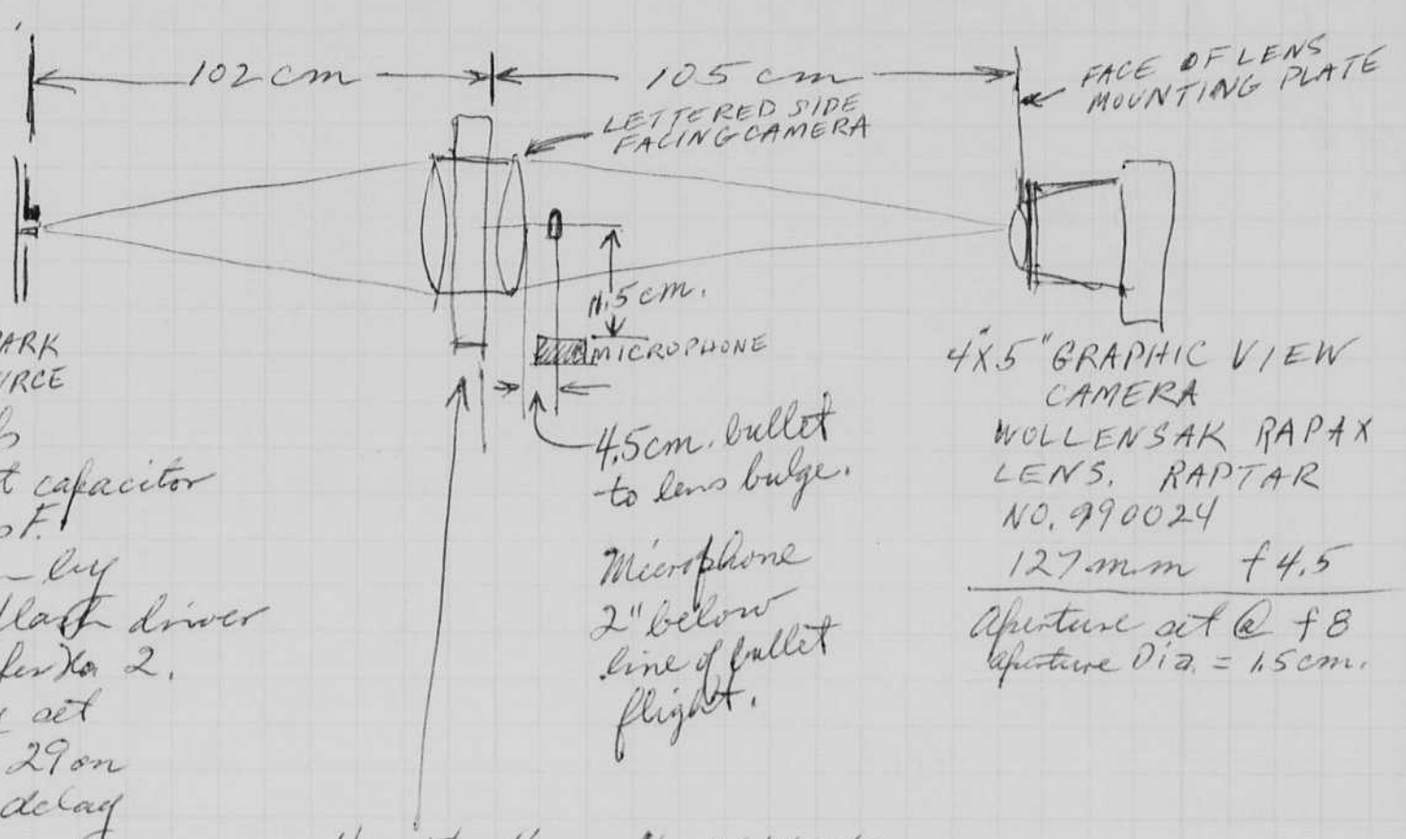
2 pictures



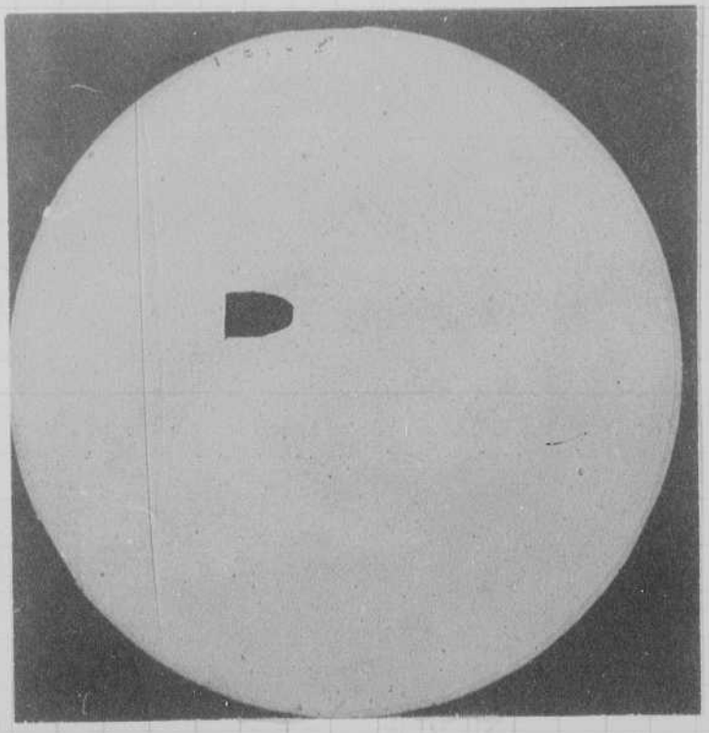
.020" D source

1 picture

Jan 12, 1971 .22 short bullets
V.E.M.
H.E.E.



2 - pictures 4"X5" SUPER PANCHRO PRESS.

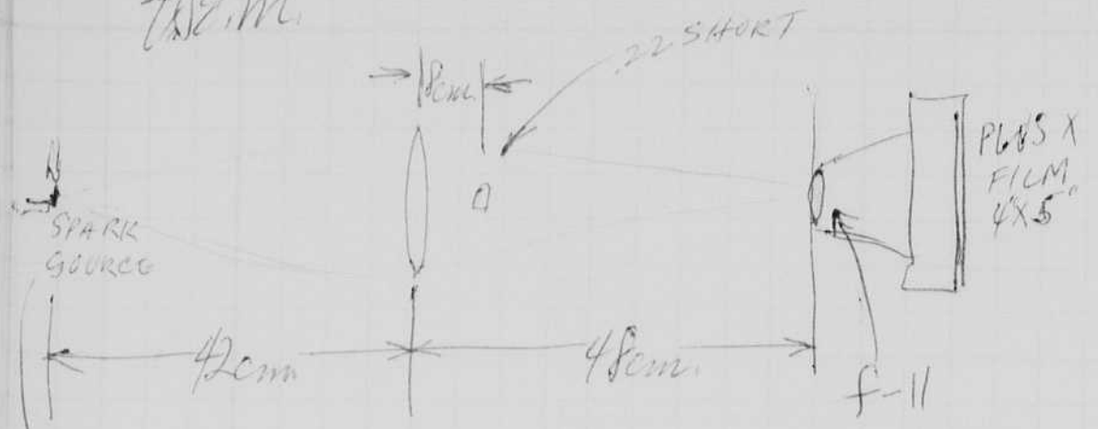


Copy sent to Bob Jan 14 71

Note that the vertical line is "black" on this photo!

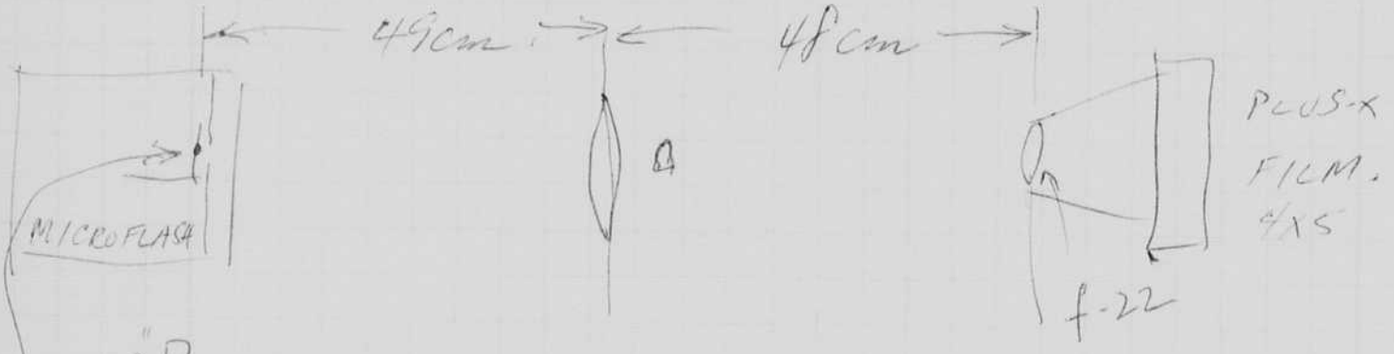
Jan 8, 1970
7:58 P.M.

.22 short bullets



11" long
1/10
167 pf
on Microflash
Trigger Unit.

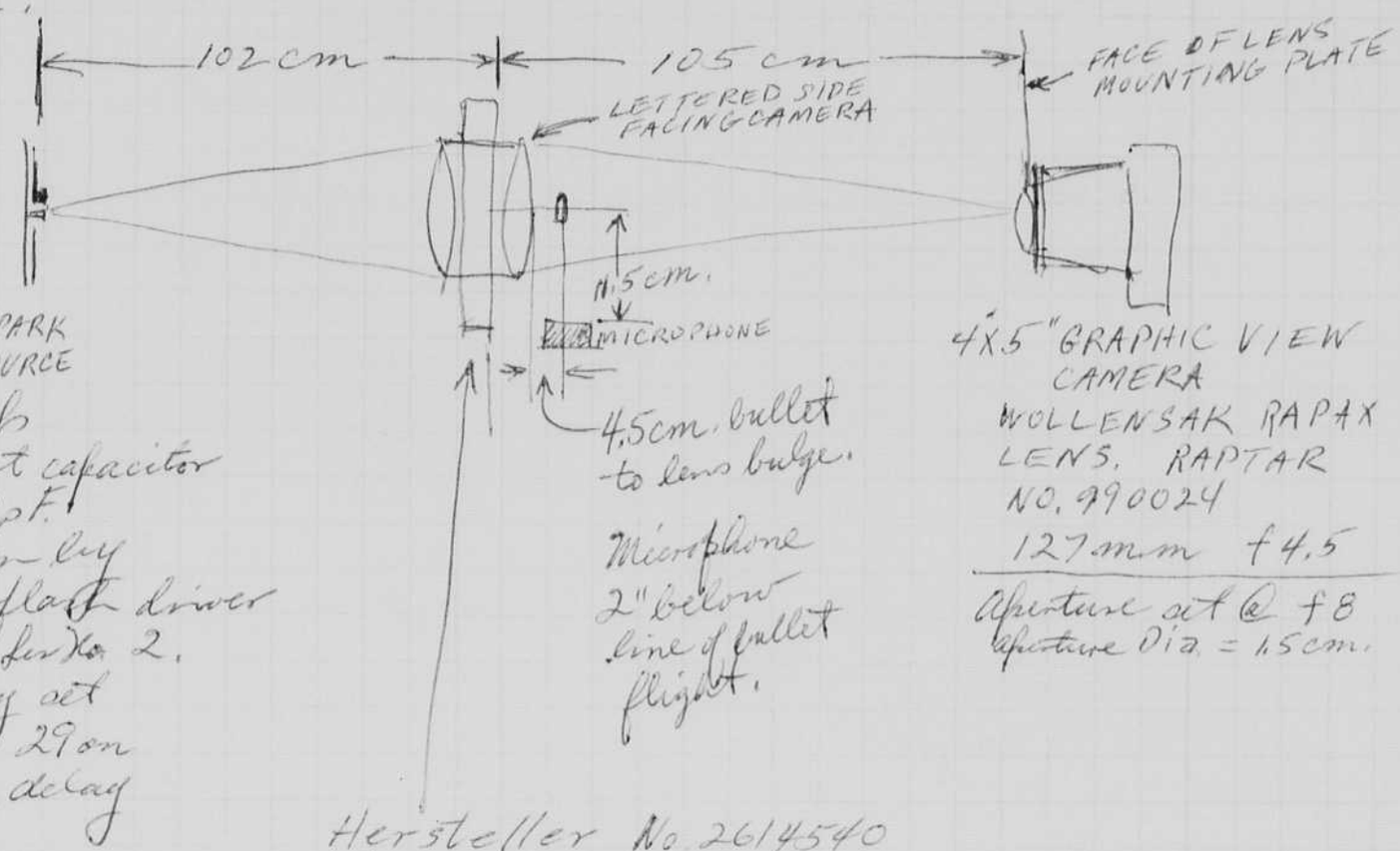
2 pictures



.020" D
source

1 picture

Jan 12, 1971 .22 short bullets
V.E.M.
H.E.E.



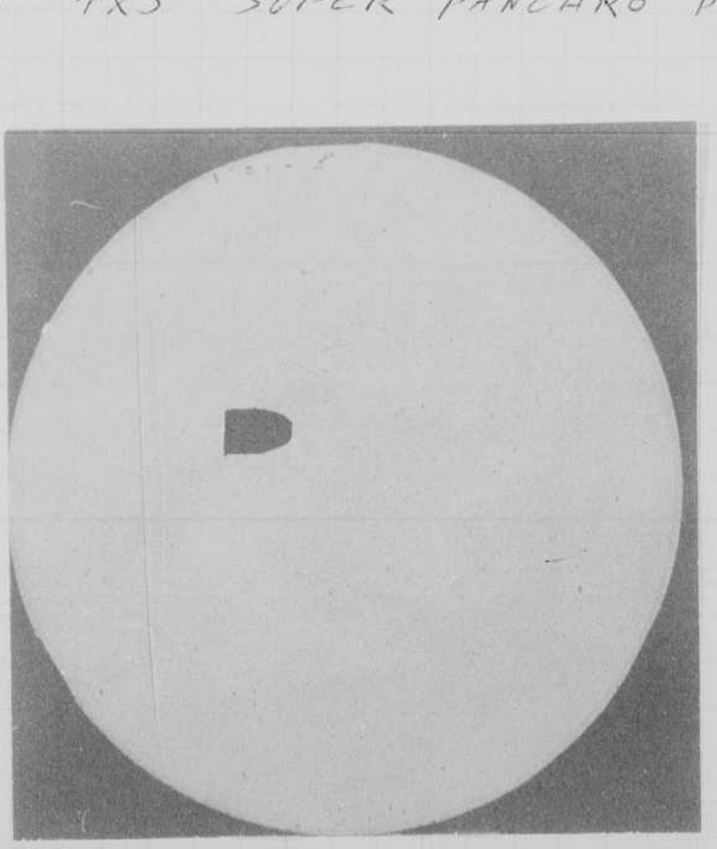
9/16" gap
.1 mfd capacitor
167 pf.
driven by
Microflash driver
LP-3 for No. 2.
Delay set
at 29 on
long delay

Aperture set @ f8
Aperture Dia. = 1.5 cm.

Microphone
2" below
line of bullet
flight.

Hersteller No. 2614540
(Bayart : bic)
f5, fl = 50 cm

2 - pictures 4"X5" SUPER PANCHRO PRESS.



copy sent to Bob Jan 14 71

note that the vertical line is "black" on this photo!

Jan 13, 51
L. E. M.

Armed Explorer .22 short bullet

End of bullet drilled 1/32 Dia. on axis for supporting wire.

Shows diffraction pattern over centered spot.

FILM 8"X10"
ORTHO "D" LITHO
CRONAR .004" thick

(CD) 4

Bullet stationary, held by wire.

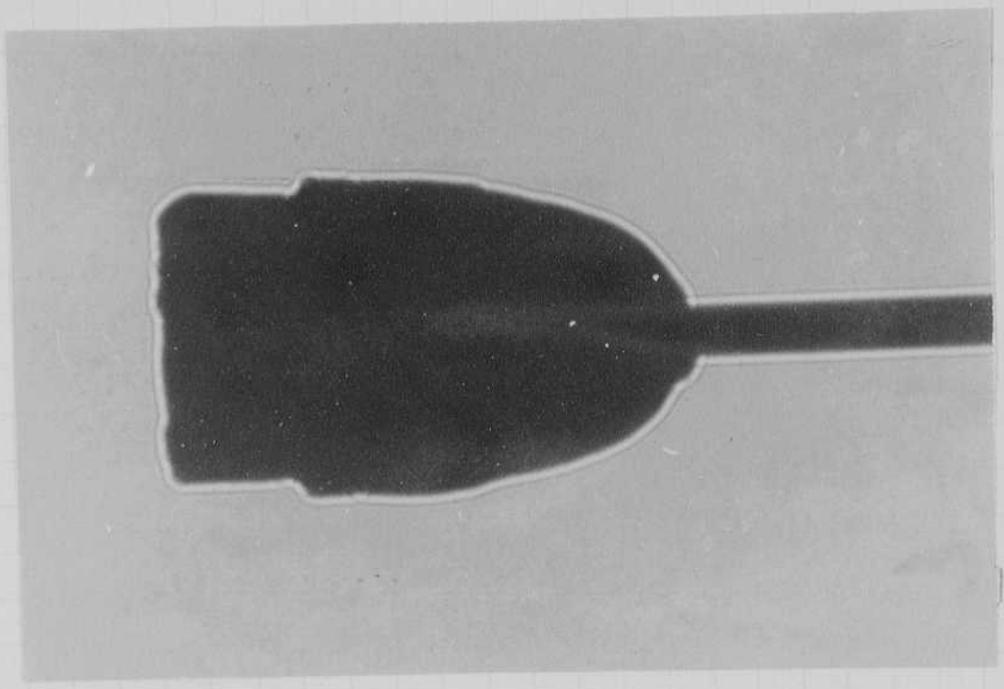
1- exposure D = 2 meters (OK)
1- exposure D = 4 meters (not enough exposure)
Film developed 5 min. in DEKTOL 1:1

Bullet shot from rifle.

2- exposures at D = 4 meters
(insufficient exposure.)

~~1-film~~ 1- film developed 5 min } DEKTOL
1- film developed 7 min } 1:1

copy sent to Bot. Jan. 14



Note Diffraction Aug 31 1975 AE

Jim Hom OSX 3227 VI grad 3 Bakington Douglas Jumps at 10 AE
Dish nestles

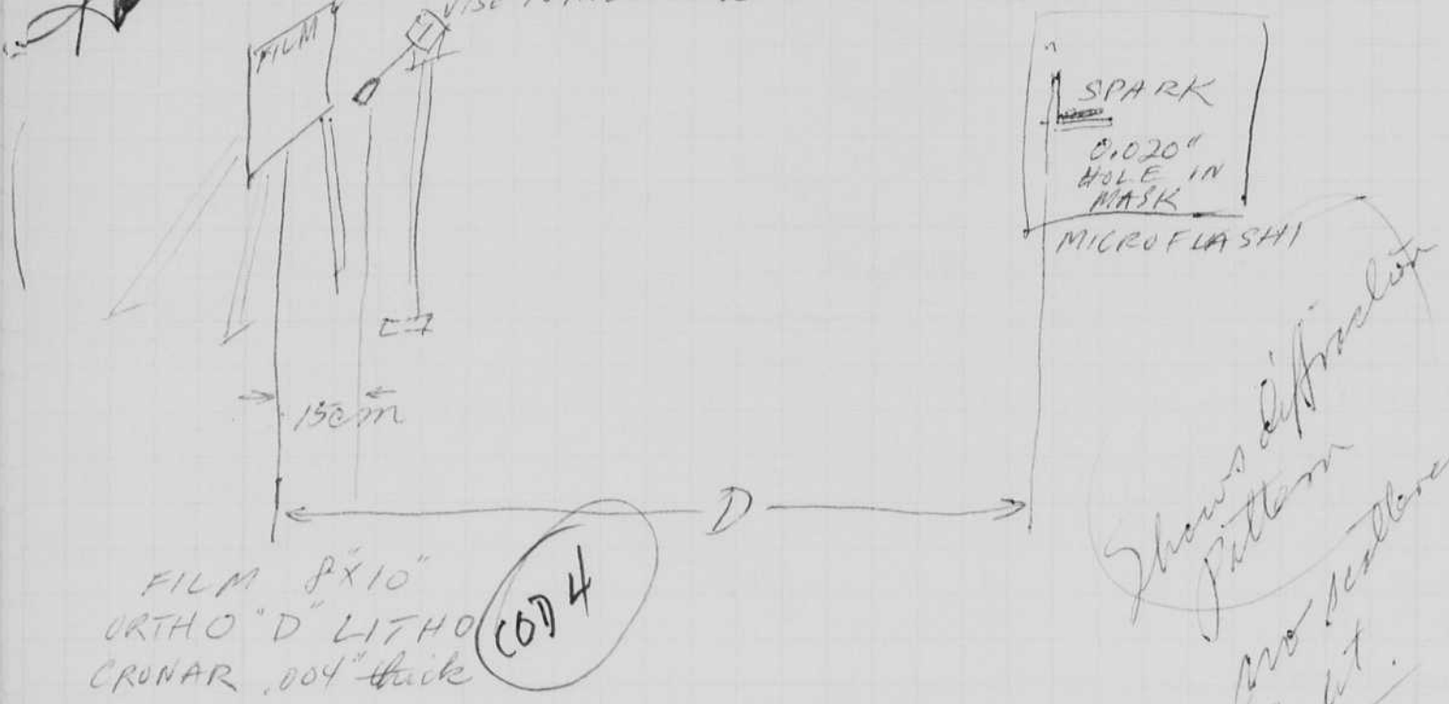
Dec.	16	(Thur)	Coffee at McCormick (Ann Bradley, ext. 5985), 5:30pm (guitar)
"	18	(Fri.)	E.E. Library Christmas party (in the dome), 3:30 - 5pm
"	22	(Tues)	Christmas Party Building 37-252 (Burt Smith) 5-8pm (guitar)
"	24 -	25	CHRISTMAS VACATION
"	30	(Wed.)	Chrles Miller, General Radio Co. to visit, 12noon
Jan.	4 -	29	INDEPENDENT ACTIVITIES PERIOD
Jan.	4	(Mon.)	Visit to Museum of Science for IAP, 10am (Dr. Washburn)
"	5	(Tues)	Mr. Sakane (Nieman Fellow at Harvard U.) from Japan, 4pm
"	6	(Wed.)	E.E. Dept. coffee (9-12) in Bush Room for I.A.P.
"	6	"	Prof. E. Roberts' I.A.P. lecture, 10:30am, rm. 10-275
"	6	"	**Room 10-250, 4pm**, H. Edgerton's I.A.P. lecture
"	7	(Thur)	E.E. Dept. coffee (9-12) in Bush Room for I.A.P.
"	7	"	Dr. Bush & Dr. Edgerton's I.A.P. lectures, 10:30, rm. 26-100
"	7	"	Dr. Jim Melcher
"	7	"	H.E.E.'s dancing lesson
"	9	(Sat.)	Dr. Rudy Zarudzki to arrive in Boston from Italy
"	11	(Mon.)	Meeting in Boston with Sam Raymond and bankers, 10am
"	11	"	Chinatown as guest of Kwok Wong (Hong Kong) 6.714 student
"	11	"	Museum of Science meeting, 4:30pm, dinner at 8pm
"	12	(Tues)	Mr. A. Snyder (VP, N.E. Merchants Nat'l. Bank) to lecture "Looking at Management", Rm. 10-275, 10:30am (I.A.P.)
"	12	(Tues)	Prof. Paul Gray's I.A.P. lecture, rm. 10-105, 4pm
"	13	(Wed.)	EG&G, Inc. Bd. of Dir. meeting, Bedford, Mass., 9:30am
"	13	"	Meeting with John Fitch - prepare for TV program, at 3pm
"	14	(Thur)	Lecture by H.E.E. to the Library group, 6-7pm, M.I.T. Student center, Mez., second floor
"	"	"	Dinner to honor Prof. Bruno Rossi, 6:30 cocktails, 7:45 dinner, Faculty Club
"	15	(Fri.)	Faculty Club - meeting with Mrs. Buechner (Killian party),11am

Jan 13, 71
V. E. M.

Harold Edgerton

.22 short bullet

End of bullet drilled 1/32 Dia. on axis for supporting wire.



Shows diffraction pattern

Axis considered right.

FILM 8"x10"
ORTHO "D" LITHO
CRONAR .004" thick

(COPY)

Bullet stationary, held by wire.

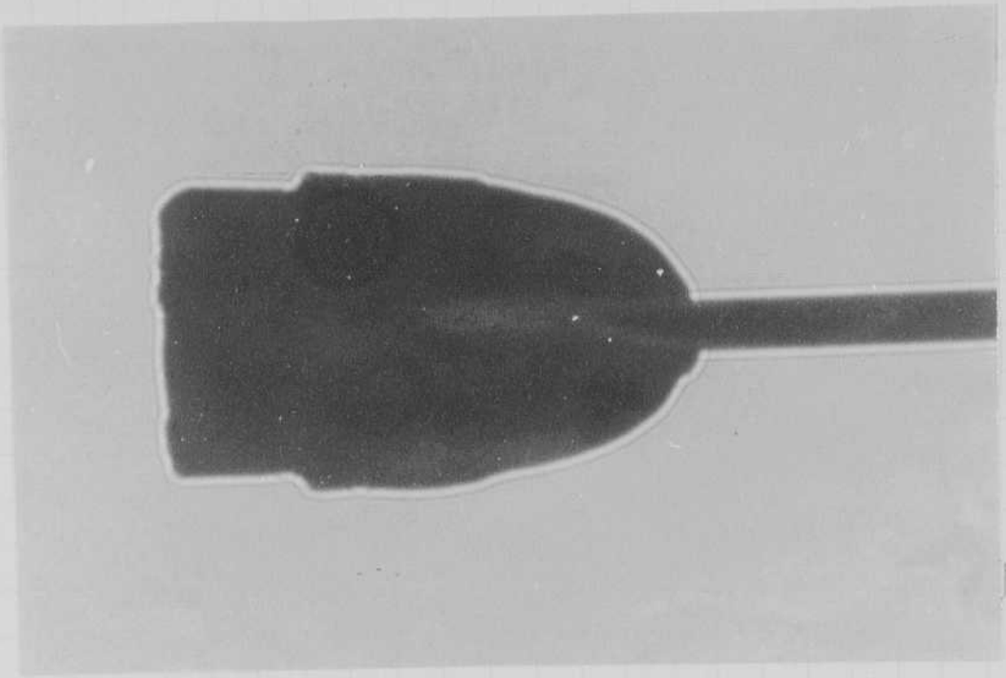
1 - exposure D = 2 meters (OK)
1 - exposure D = 4 meters (not enough exposure)
Film developed 5 min. in DEKTOL 1:1

Bullet shot from rifle.

2 - exposures at D = 4 meters
(insufficient exposure.)

~~1 - film~~ 1 - film developed 5 min } DEKTOL
1 - film developed 7 min } 1:1

copy sent to Bot. Jan. 14



Jim Hom OAX 3227 VI grad Bakington Douglas Jumps at 10 A.

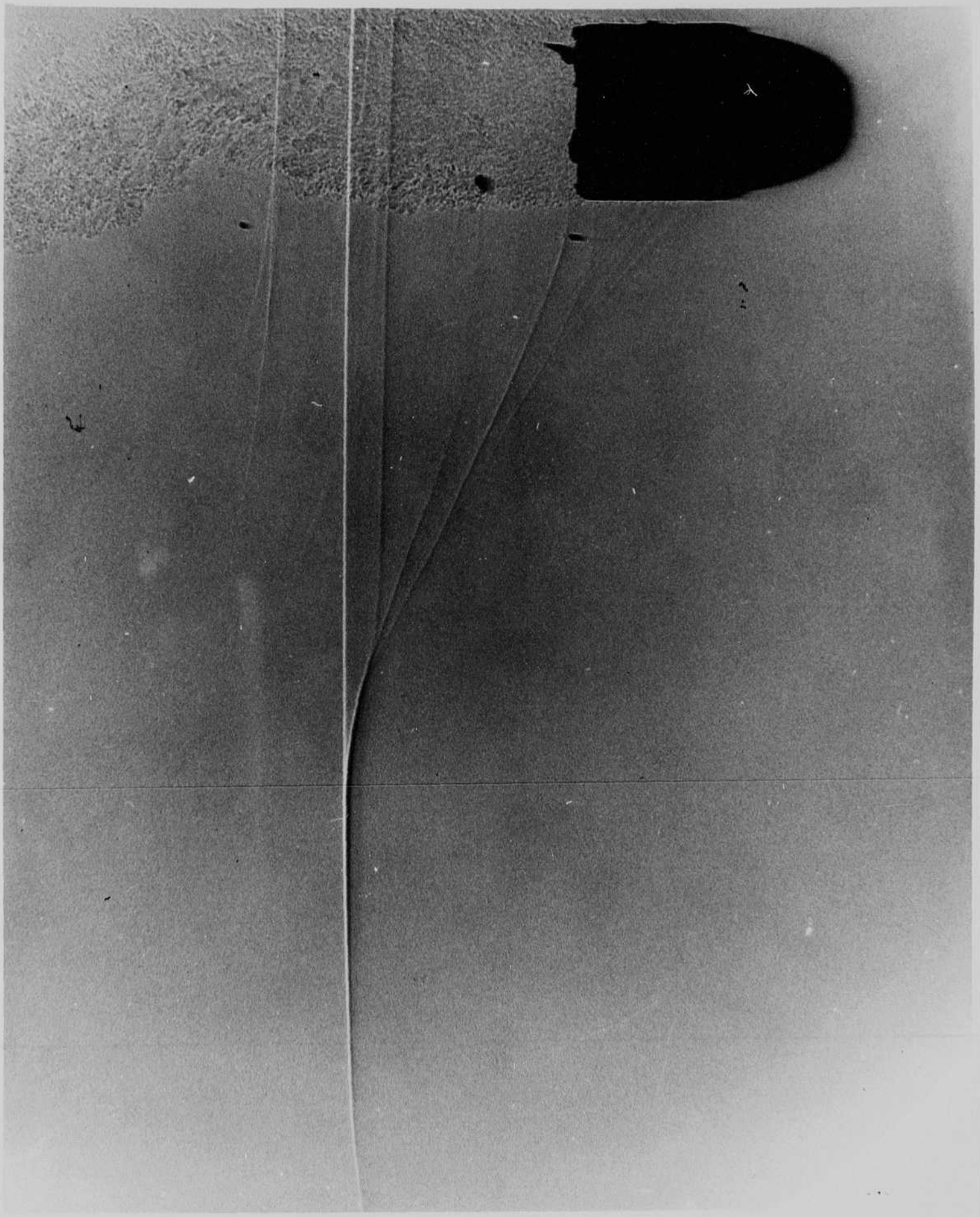
Dec.	16	(Thur)	Coffee at McCormick (Ann Bradley, ext. 5985), 5:30pm (guitar)
"	18	(Fri.)	E.E. Library Christmas party (in the dome), 3:30 - 5pm
"	22	(Tues)	Christmas Party Building 37-252 (Burt Smith) 5-8pm (guitar)
"	24	- 25	CHRISTMAS VACATION
"	30	(Wed.)	Chrles Miller, General Radio Co. to visit, 12noon
Jan.	4	- 29	INDEPENDENT ACTIVITIES PERIOD
Jan.	4	(Mon.)	Visit to Museum of Science for IAP, 10am (Dr. Washburn)
"	5	(Tues)	Mr. Sakane (Nieman Fellow at Harvard U.) from Japan, 4pm
"	6	(Wed.)	E.E. Dept. coffee (9-12) in Bush Room for I.A.P.
"	6	"	Prof. E. Roberts' I.A.P. lecture, 10:30am, rm. 10-275
"	6	"	**Room 10-250, 4pm**, H. Edgerton's I.A.P. lecture
"	7	(Thur)	E.E. Dept. coffee (9-12) in Bush Room for I.A.P.
"	7	"	Dr. Bush & Dr. Edgerton's I.A.P. lectures, 10:30, rm. 26-100
"	7	"	Dr. Jim Melcher
"	7	"	H.E.E.'s dancing lesson
"	9	(Sat.)	Dr. Rudy Zarudzki to arrive in Boston from Italy
"	11	(Mon.)	Meeting in Boston with Sam Raymond and bankers, 10am
"	11	"	Chinatown as guest of Kwok Wong (Hong Kong) 6.714 student
"	11	"	Museum of Science meeting, 4:30pm, dinner at 8pm
"	12	(Tues)	Mr. A. Snyder (VP, N.E. Merchants Nat'l. Bank) to lecture "Looking at Management", Rm. 10-275, 10:30am (I.A.P.)
"	12	(Tues)	Prof. Paul Gray's I.A.P. lecture, rm. 10-105, 4pm
"	13	(Wed.)	EG&G, Inc. Bd. of Dir. meeting, Bedford, Mass., 9:30am
"	13	"	Meeting with John Fitch - prepare for TV program, at 3pm
"	14	(Thur)	Lecture by H.E.E. to the Library group, 6-7pm, M.I.T. Student center, Mez., second floor
"	"	"	Dinner to honor Prof. Bruno Rossi, 6:30 cocktails, 7:45 dinner, Faculty Club
"	15	(Fri.)	Faculty Club - meeting with Mrs. Buechner (Killian party),11am

Jan 18 1971 More Bullet Photos.
H.E. Edgerton.
Water. Small Spark 0.020" diam. Hole.
Middlebrooks. 16 kv 0.05 mfd.
Bill MacRoberts

	Film to Bullet	Film to Spark.	
1.	2cm ±	2M.	hit the film ~~Holder~~ holder 22 Short
2	2+	2M	oh
3.	2±	2M	oh
4	5 cm	2M	Thin
5	5 cm	2M	
6	10	~~1.7~~ 1.7 m	
7.	10	1.7 m.	
8	10	1.7 m	

↓
22 Long Rifle

18P Students -
~~Jorge~~ Velazquez 734,8707
Kevin Tong. 4434
Alan Efronson 7347318
John Cooper 1473 McGregor 4314
Robt Dutton 536 1300
Tommy Ellis DL0365
Hyo Kim 492 4102
Walter Middlebrooks 391-8456
Jonathan Topper K92 6040 2866



Jan 18 1971 More Bullet Photos.

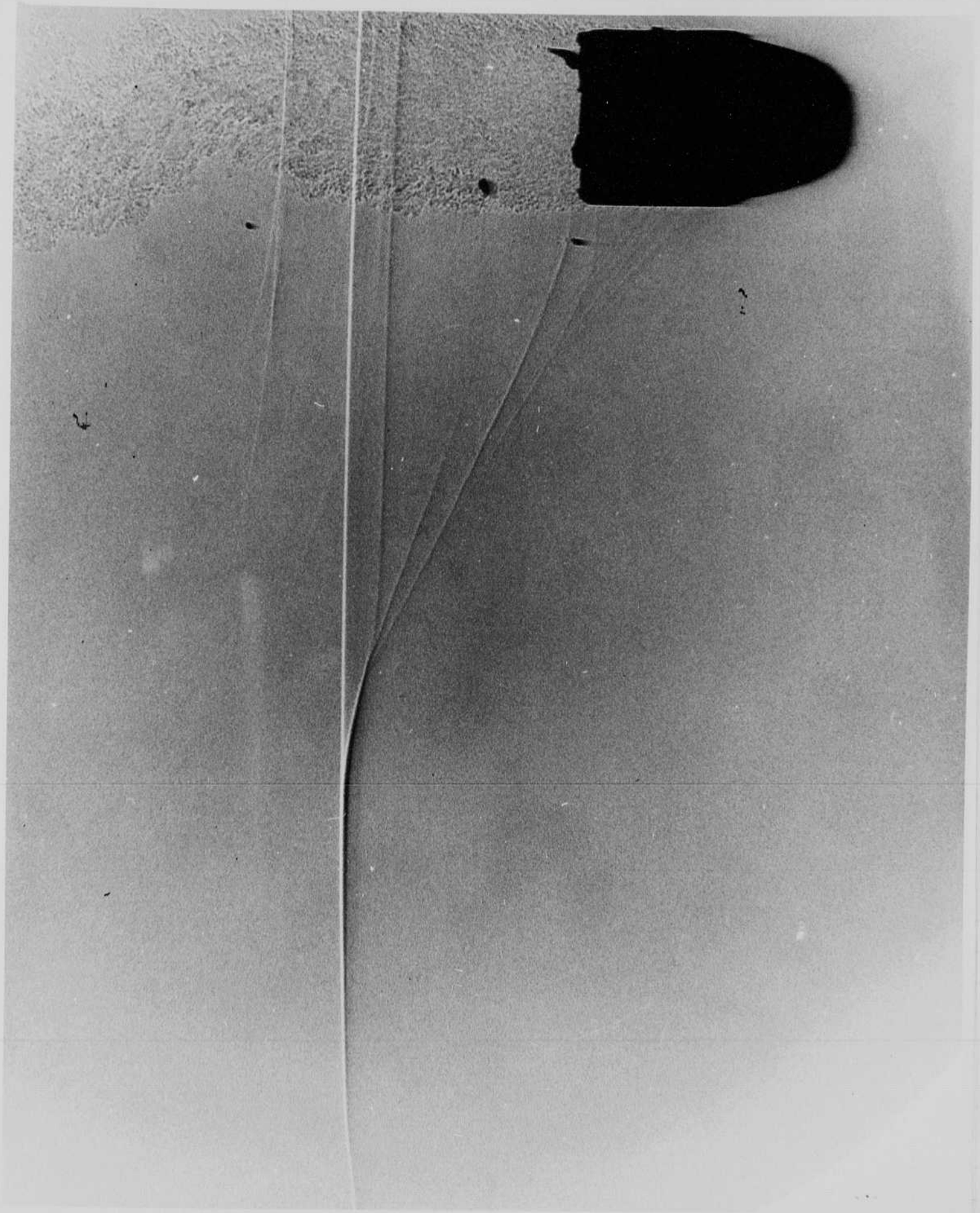
H.E. Edgerton.
Walter Small Spark 0.020" diam. Hole.
Middlebrooks. 16 kv 0.05 mfd.
Bill Jean Roberts.

	Film to Bullet	Film to Spark.	
1.	2cm-	2M.	hit the film ~~bot~~ breeder 22 Short
2	2+	2M	oh
3.	2±	2M	oh
4	5 cm	2M	Thin
5	5 cm	2M	
6	10	~~1.7~~ 1.7 m	
7.	10	1.7 m.	
8	10	1.7 m	

↓
22 Long Rifle

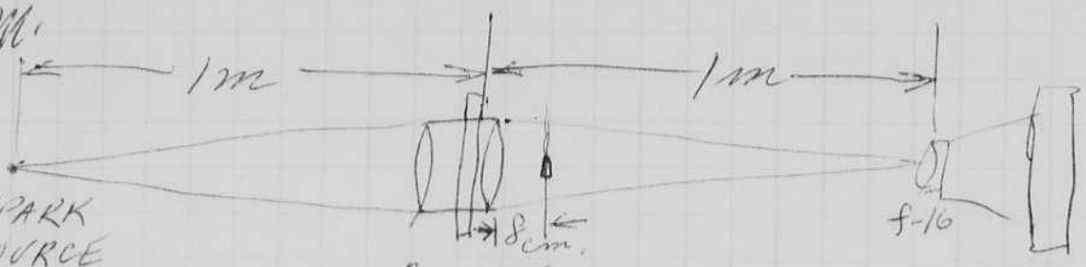
18P Students -

Jorge Velazquez 734,8707
Kevin Tong. 4434
Alan Efronson 7347318
John Cooper 1473 McGregor 7314
Robt Dutton 536 1300
Tommy Ellis DL0368
Hyo Kim 492 4102
Walter Middlebrooks 391-8456
Johnathan Topper K92 6040 2866



Bullets,
.22 short pictures

Jan. 19-20 1971
S.F.E.
V.P.M.



SPARK SOURCE
1/16" LONG VERTICAL IN 1/32 W. GROOVE IN GLASS.
300 pF.
DOORKNOB CAP.
DRIVEN BY MICROFLASH DRIVER.

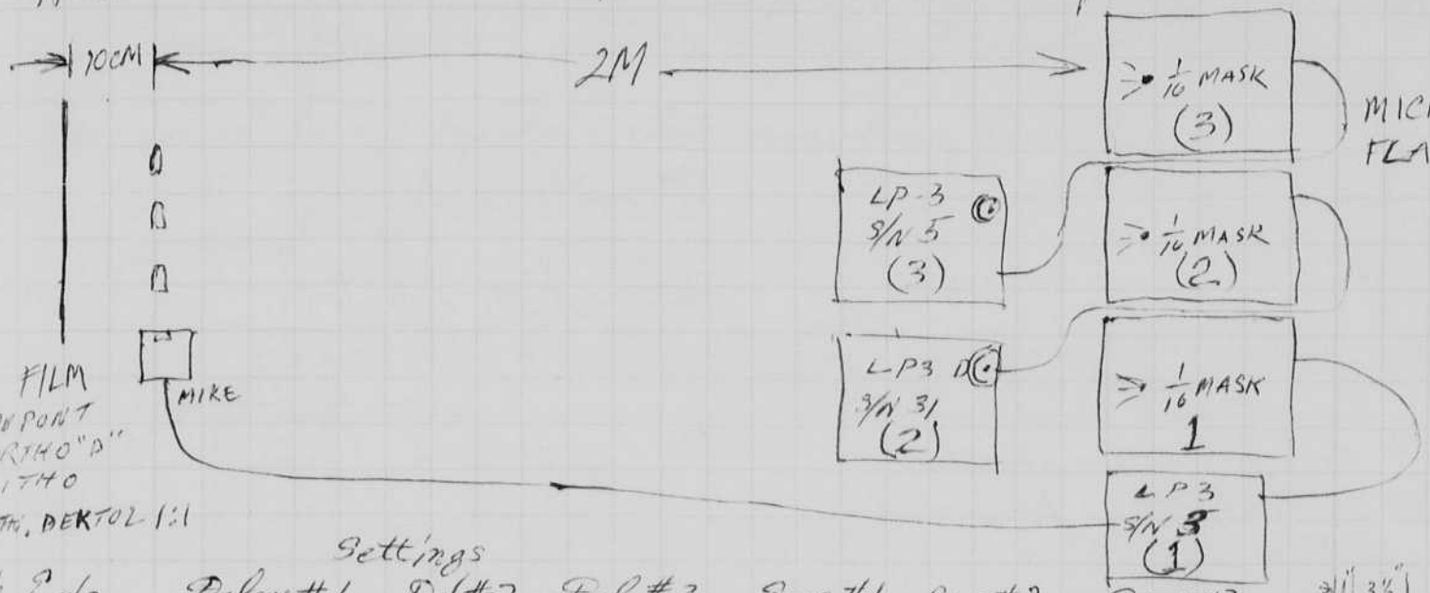
BAUART
50 cm
f 5

GRAPHIC
4X5
SCHNEIDER XENAR
f 4.7; 135 mm.
SUPER PANCHRO PRESS.

2 - exposures, developed 10 min in DK-50

Jan 26-27, '71 Bullets (.22 SHORT RIFLE)

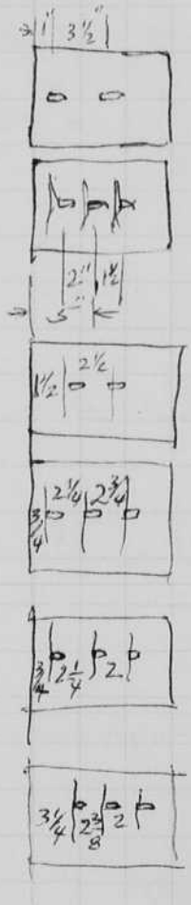
W.E.N. Attempt 3 exposures on one film.
H.E.E.



~~SATIN~~, DEKTOL 1:1

	Settings					
Det. & Exp.	Delay #1	Del #2	Del, #3.	Sens #1	Sens #2	Sens #3
5 min #1	12X10	20X10	~~44X10~~ 37X10	88	0	60
5 min #2	"	"	"	"	"	"
4 min #3	10X10	32X10	44X10	"	"	"
3 min #4	"	"	"	"	"	"
3 min #5	14X10	22X10	40X10			
4 min #6	14X10	22X10	4X10			

Moved microphone in toward center of picture 1 inch.



Last two exposures required 3 shots each before units fired.

Notebook # 30

Filming and Separation Record

___ unmounted photograph(s)

___ negative strip(s)

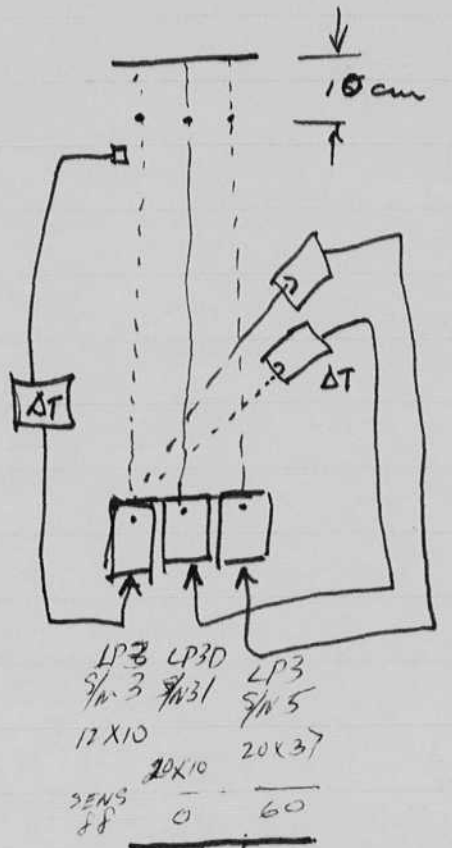
1 unmounted page(s)
(notes, drawings, letters, etc.)

was/were filmed where originally located between page 74 and 75.

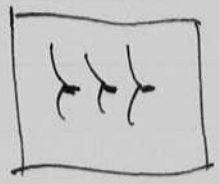
Item(s) now housed in accompanying folder.

Experiments to do.

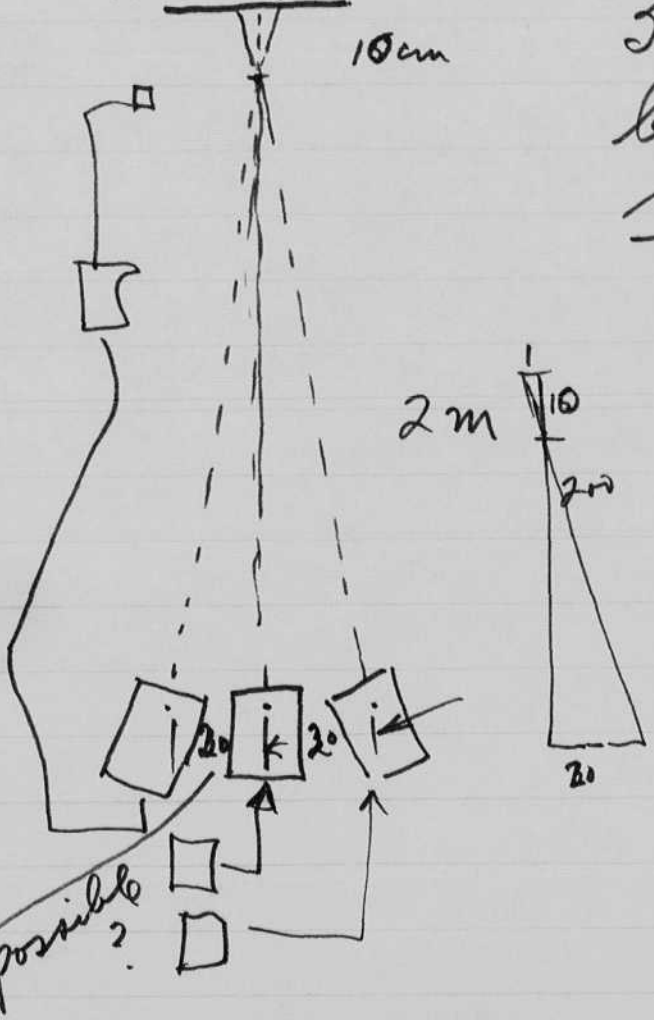
Bill.



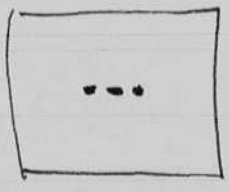
3 flash of Subsonic bullet.



1/16" hole.



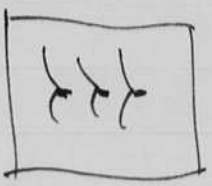
3 shadows of bullet on same shot at same time.

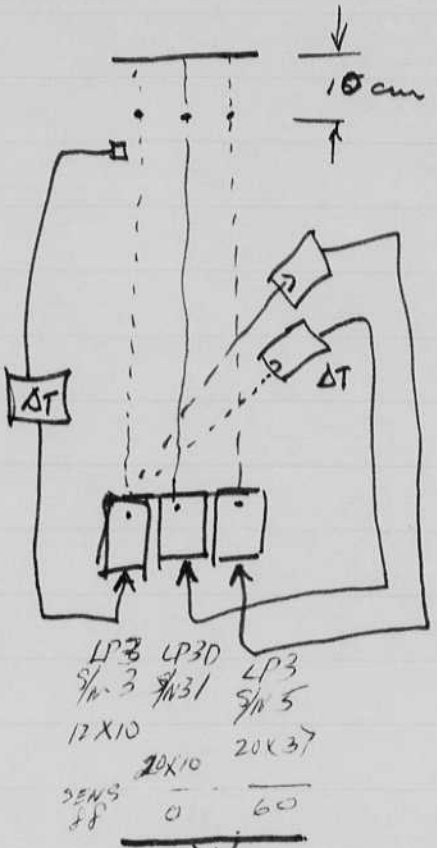


Experiments to do.

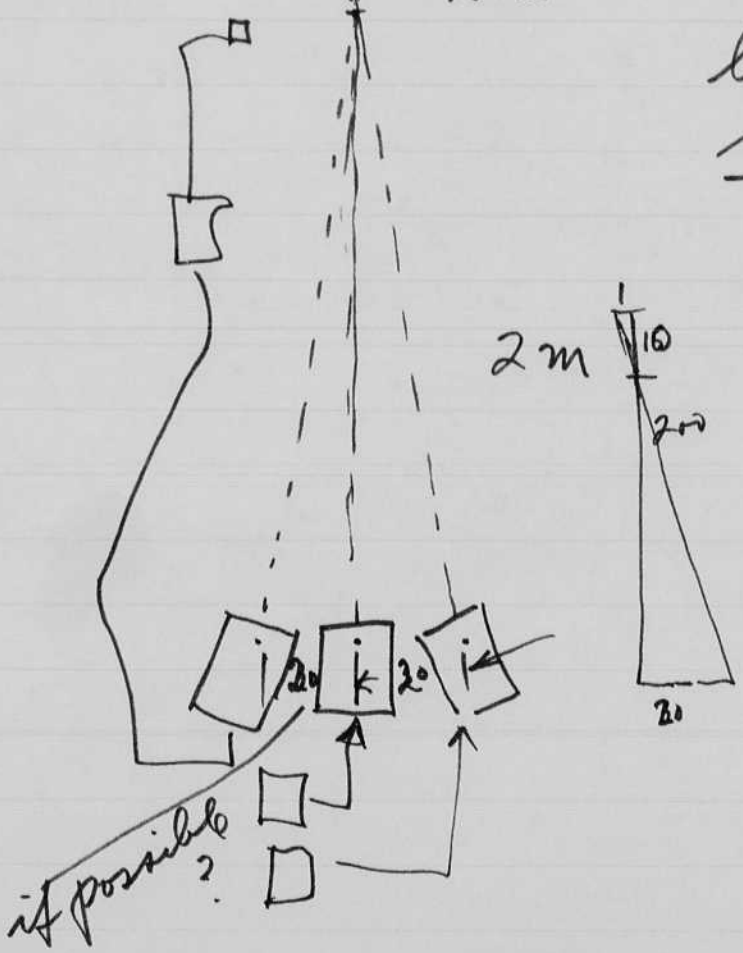
Bill.

3 flash of Subsonic bullet.



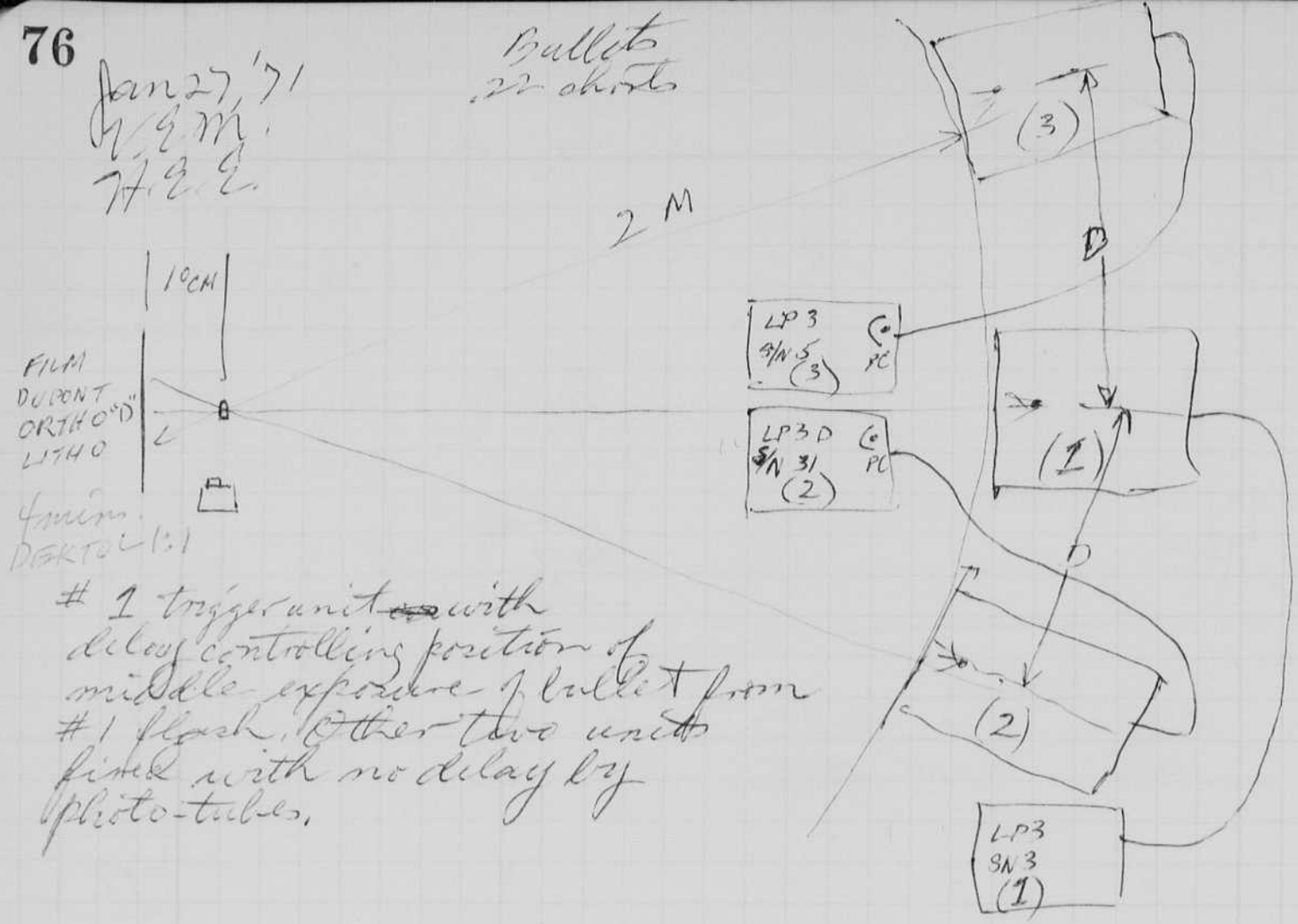


3 shadows of bullet on same shot at same time.



Jan 27, '71
4 P.M.
T.E.E.

Bullets
.22 shots



1 trigger unit ~~on~~ with delay controlling position of middle exposure of bullet from #1 flash. Other two units fired with no delay by photo-tubes.

Exp "A" Units spaced distance "D" = 30 inches apart

Exp "A" Two images of the bullet resulted.

Exp. "B" D = 20 inches

" Only one image of bullet at center of film?

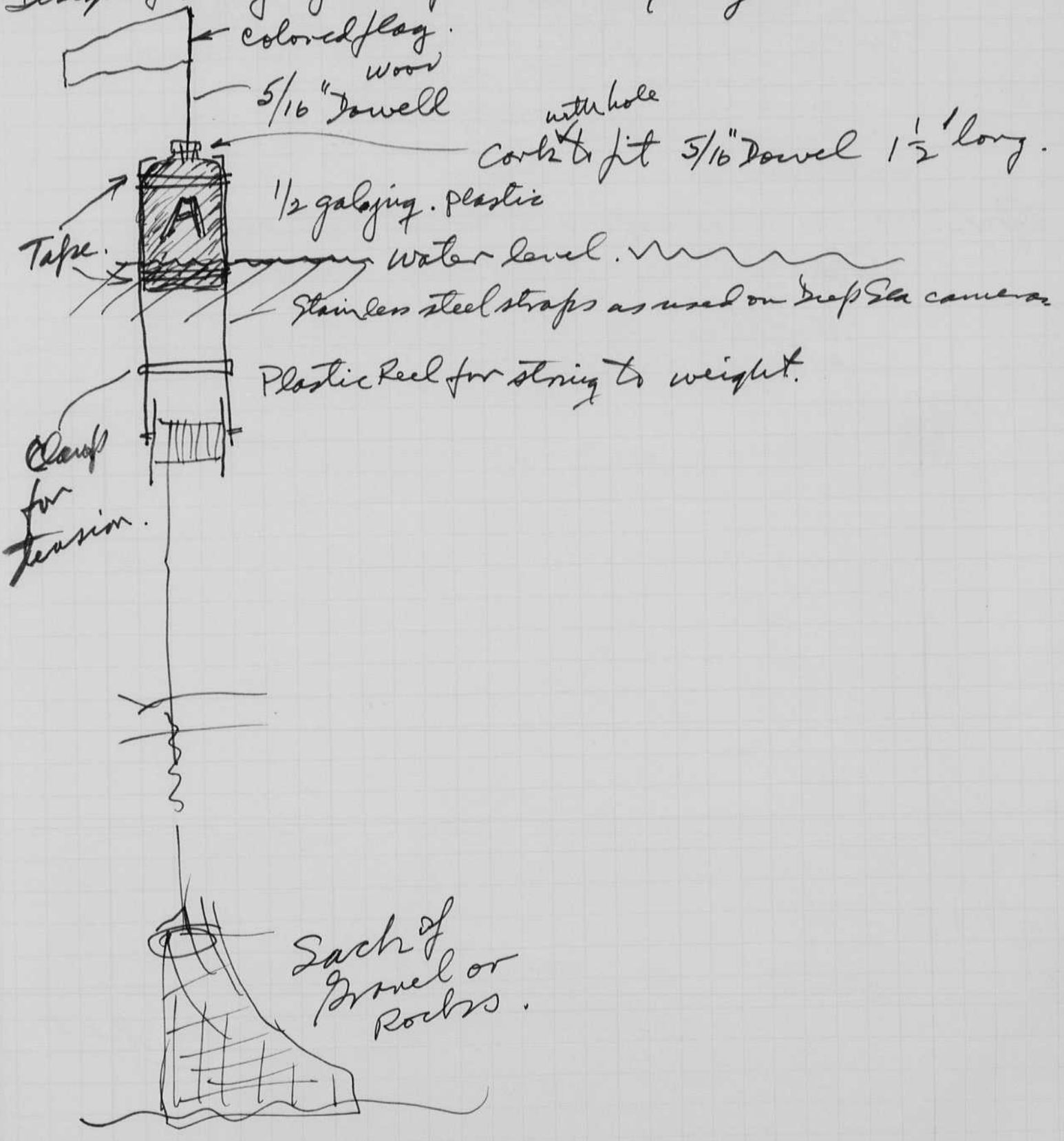
Jan 28

Exp "C" D = 20 inches
3 images on right hand 1/3 of film.

Exp "D" D = 20 inches
2 images on left half of film.

~~Howard Edgerton~~
Feb 20 1971 Sat.
Back a week from Eilat Gulf of Aqaqaba Israel
from Expedition with to Elisha Linder. Etc.

Design of Buoy system for marking targets.



78 March 23 1971

Herald Examiner

Retirement for Jim Killion & Fig last night at Mess of Sec. Geo Harrison in charge of Program. Constable Bradmer of Malvern's lined up the affair.

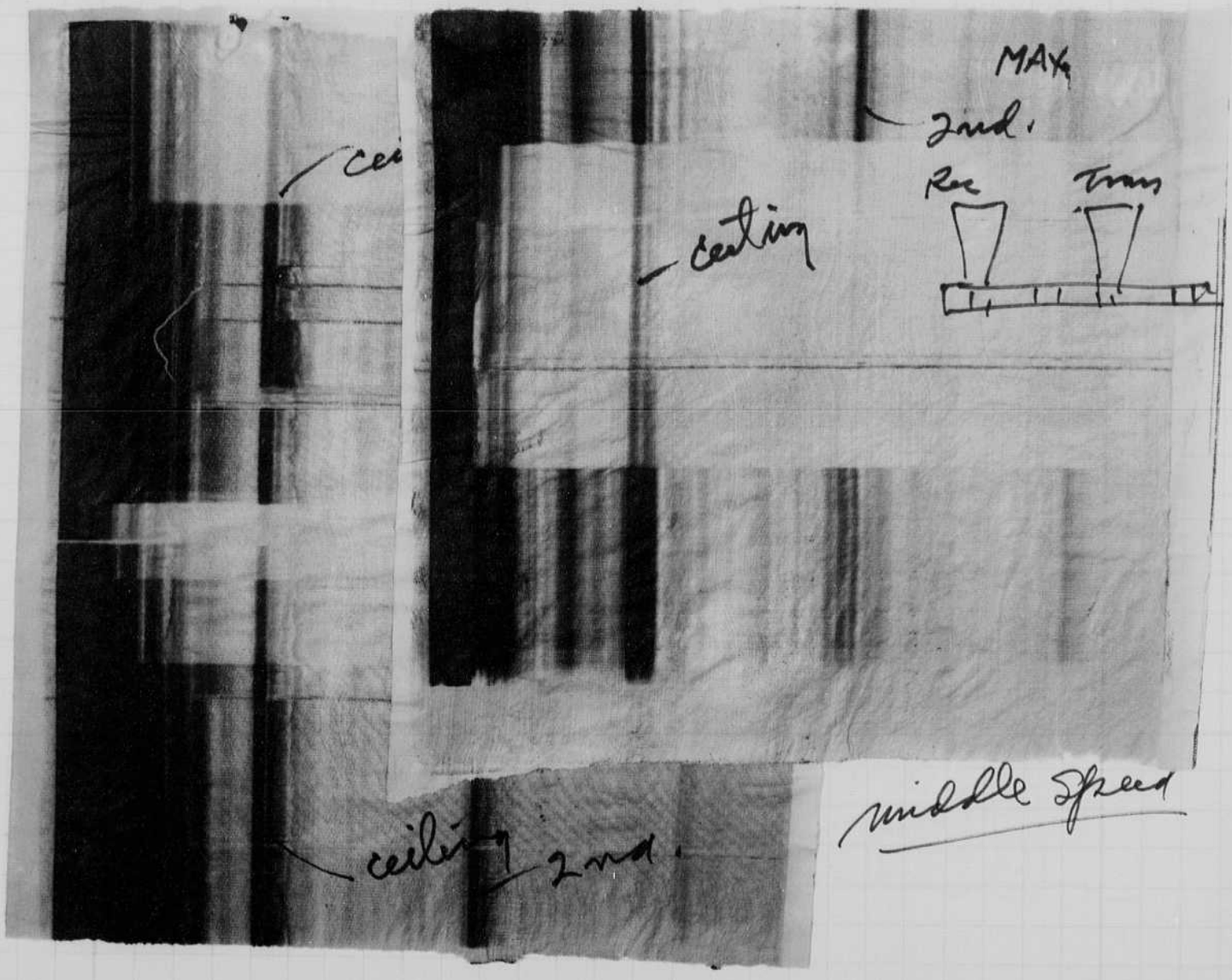
Mar 27 1971.

Tied Buoys at Lewis wharf in salt water at 2 pm. Strong East wind. All sun fine. Used the burlap bag idea for the bottom weight. This was learned in Israel at the Gulf of Aqaba.

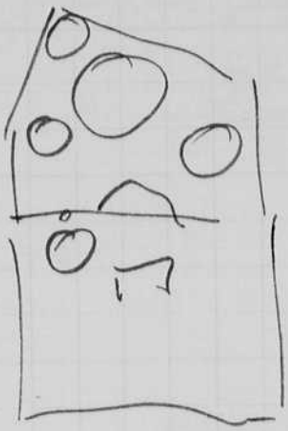
Took movies (10 sec interval) of the wrecking of a cold storage building just north of the Aquarium on Atlantic ave.

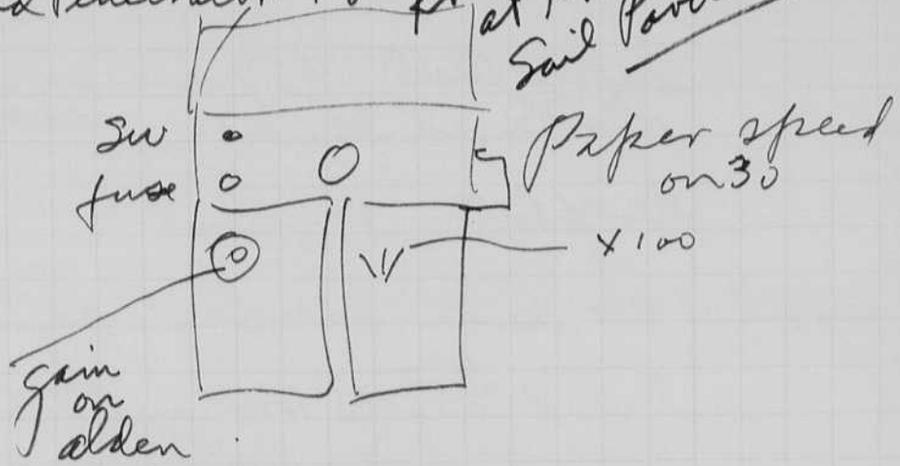
April 3 1971 M.I.T. Tests of old 5" Sonar Recorder.

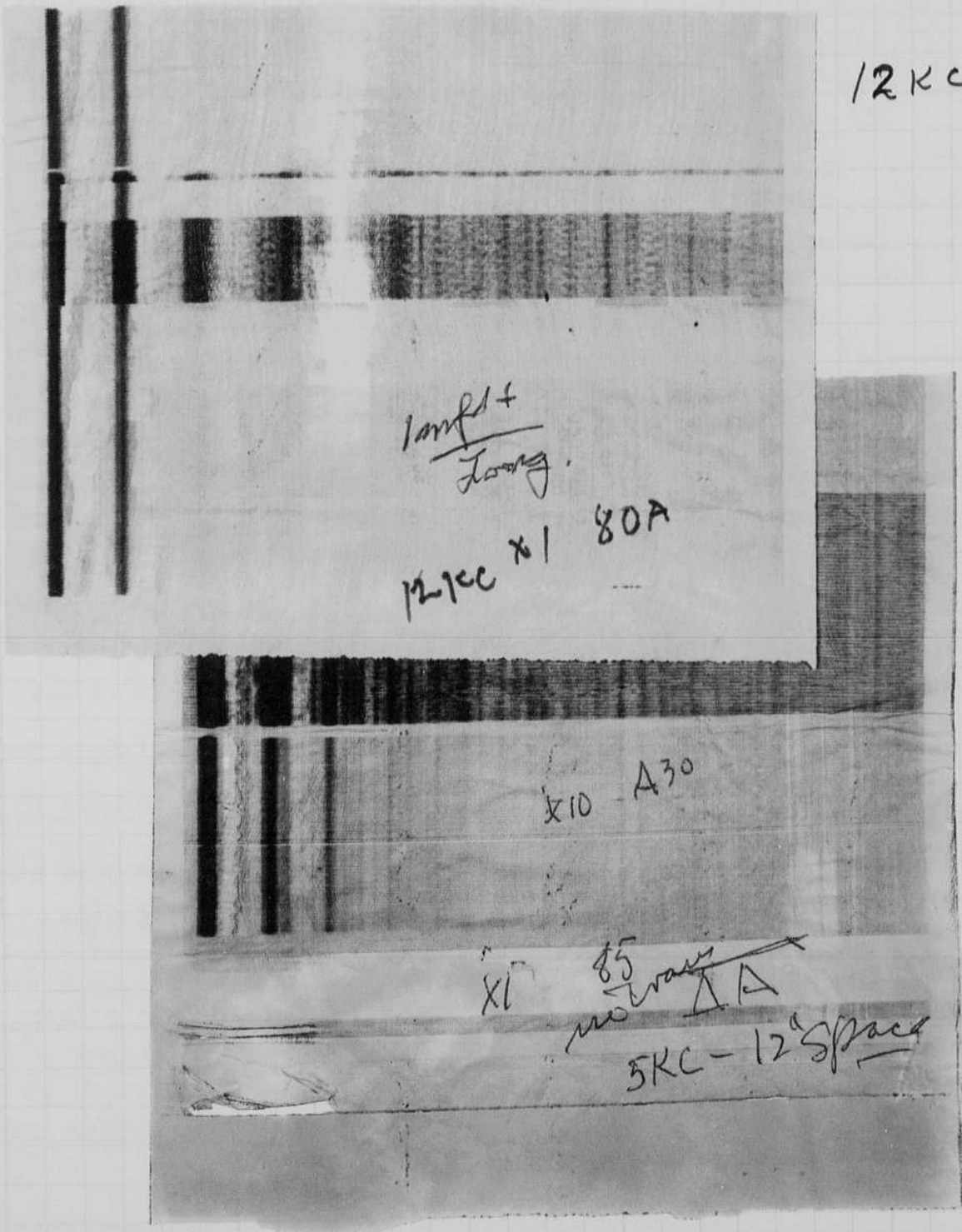
(Last night took photos at Lewis wharf with Jim Quigley in E6&6 205 – 206 camera shield Rig. Plus X film f 22? Lens extension Hopkins Lens.).



Old 5" alden Mud Penetrator with Donald Krotser at M.I.T. Sail Pavillion.







March 23 1971

Harold Edgerton

Retirement for Jim Killian & Fig last night at Inns of Court. Geo Harrison in charge of Program. Austin Bradner of Watsons kindaptte affair.

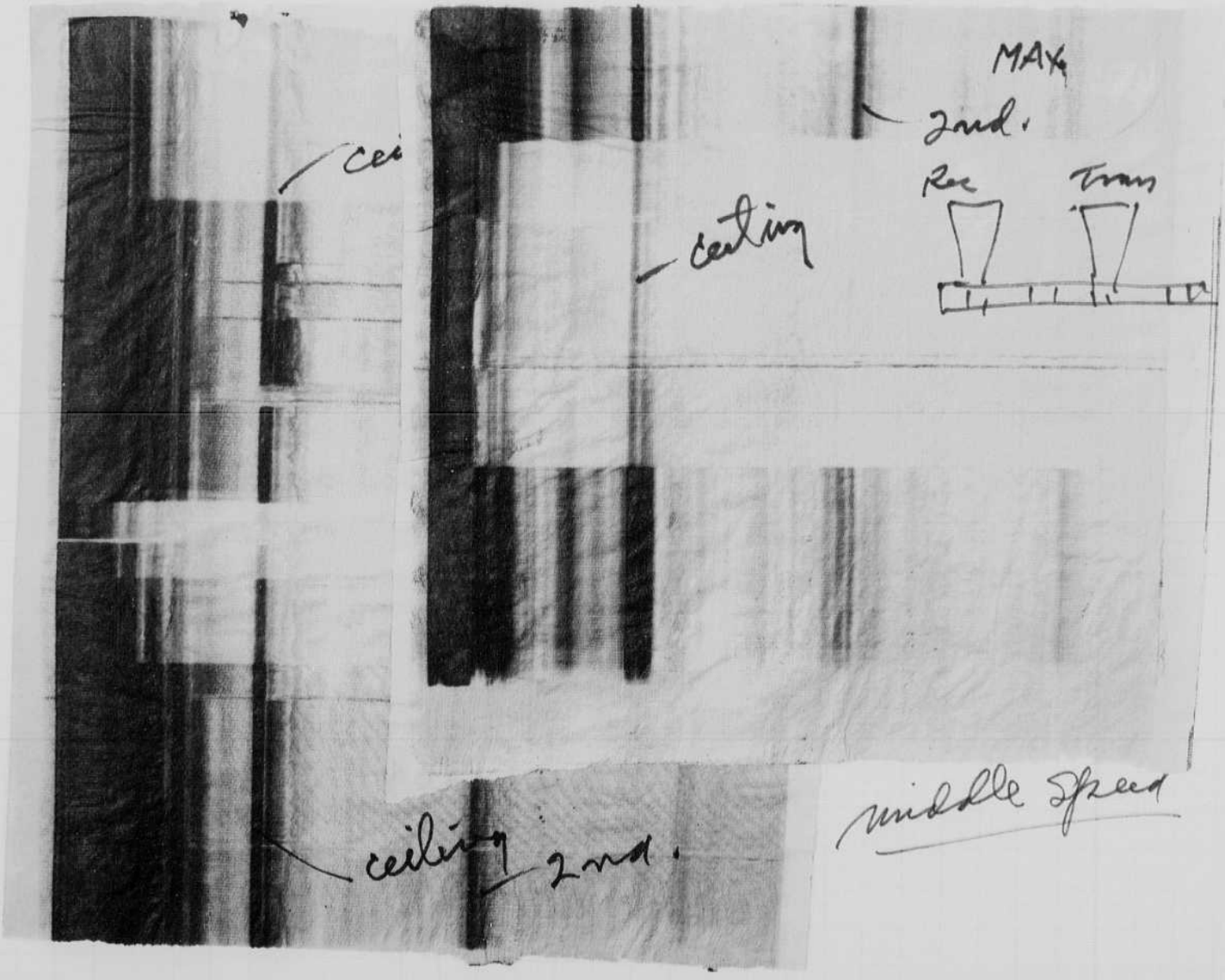
Mar 27 1971.

Took Buoys at Lewisburg in salt water at 2 pm. Strong East wind. All seems fine. Used burlap bag idea for the bottom weight. This was learned in Gulf of Aqaba.

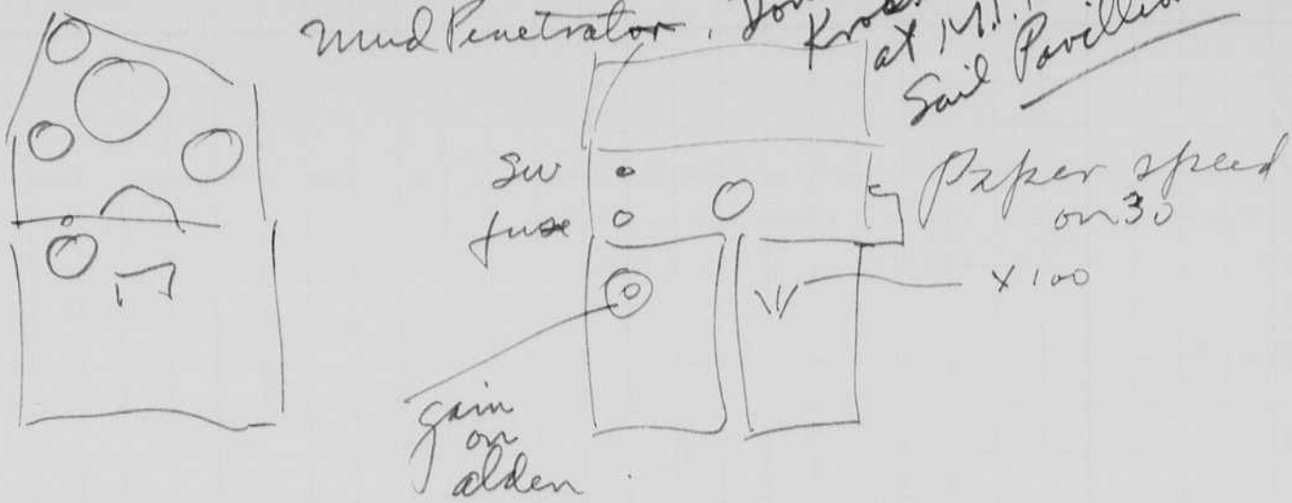
Took movies (10 sec intervals) of the wrecking of a cold storage building just north of the Aquarium on Atlantic ave.

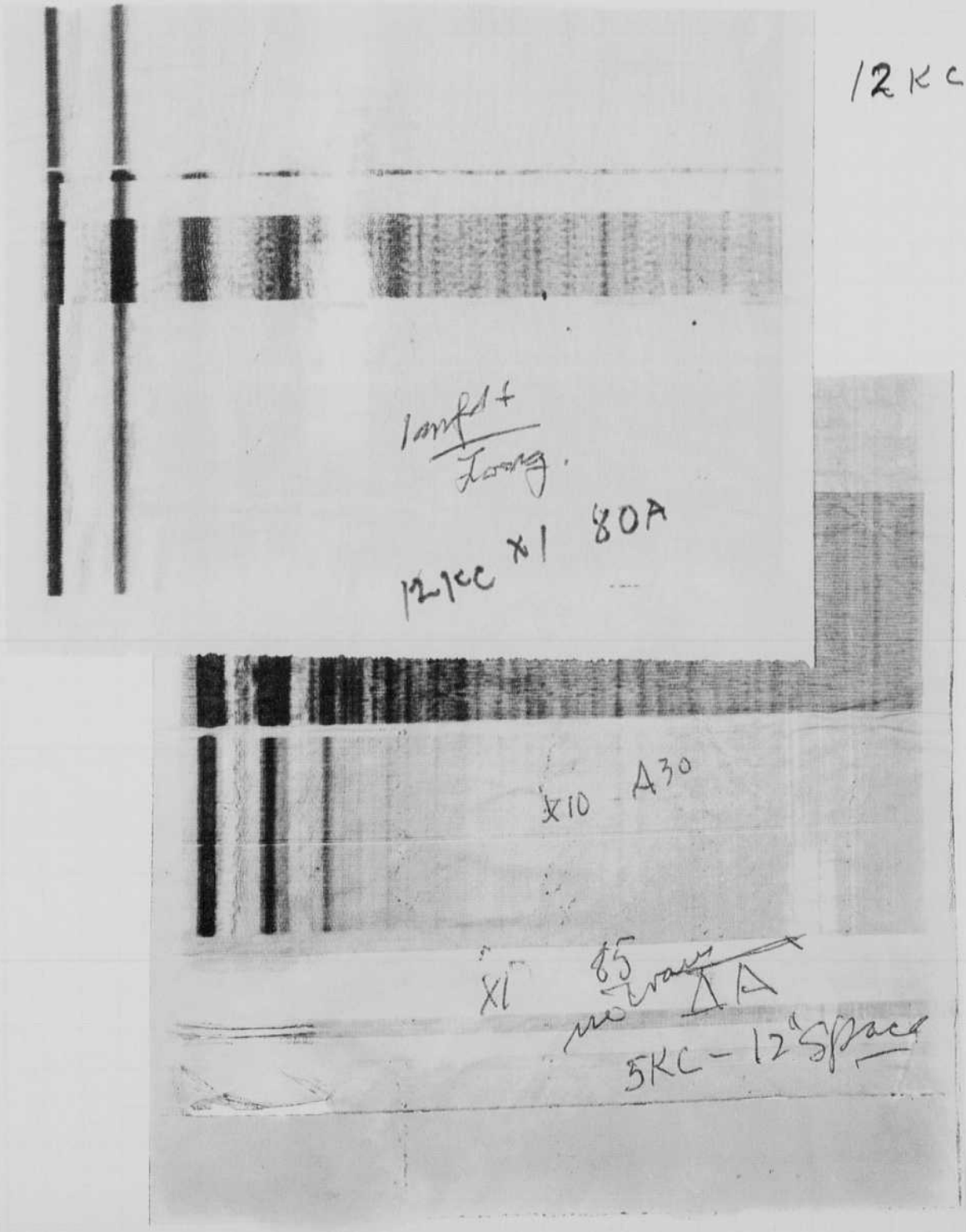
April 3 1971 M.I.T. Tests of old 5" Sonar Recorder.

(Last night took photos at Lewis wharf with Jim Quigley in E6&6 205 – 206 camera shield Rig. Rlus x film f 22? Lens extension Hopkins Lens.).



Old 5" alden Mud Penetrator. with Donald Knutsen at M.I.T. Sail Pavillion.





7 78 March 23 1971

Harold Edgerton

Retirement for Jim Killian & Liz last night at Mrs of 3 ex:
Geo Harrison in charge of Program. Austin Bradner of
Nelsons handled the affair.

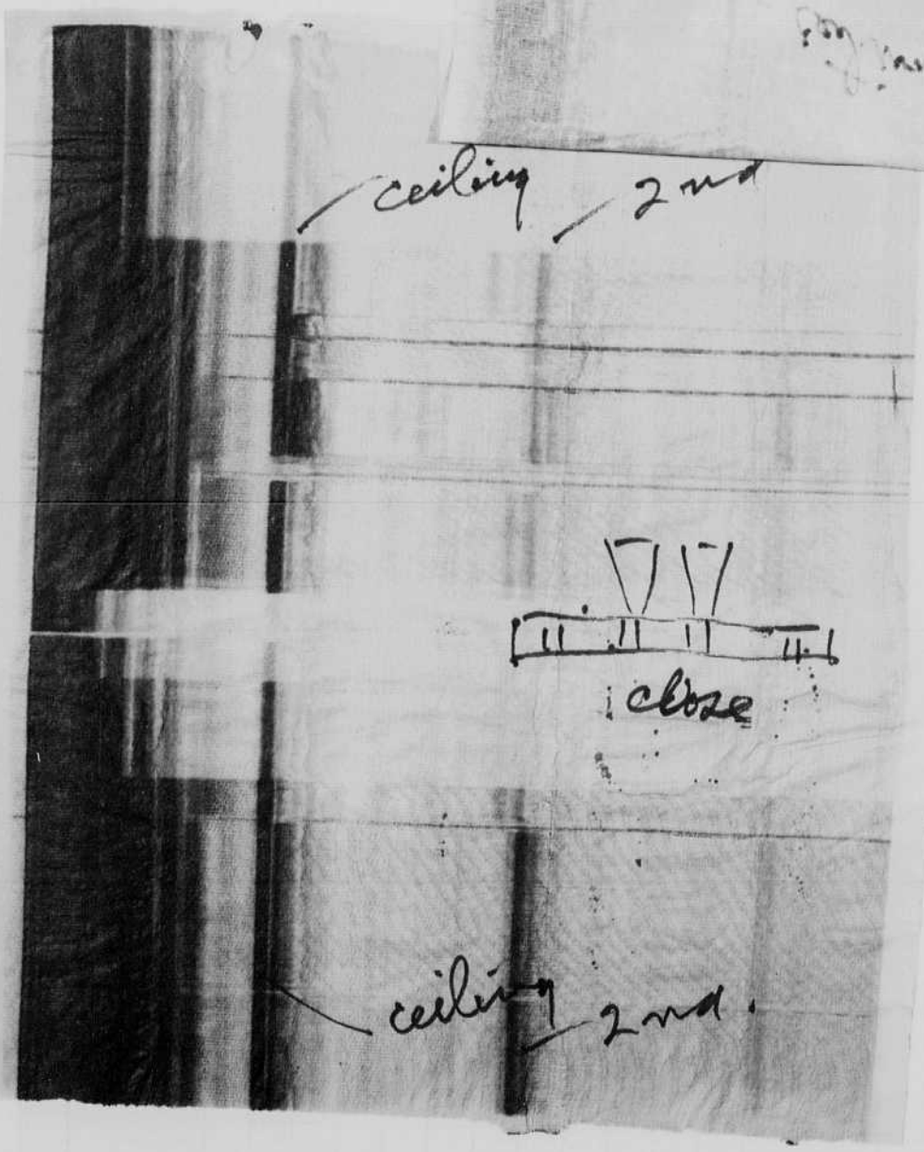
April 27 1971.

Tested Buoys a
2 pm. Strong Eas
burlap bag filled
leaned in Green

Took movies (
a cold storage ba
on Atlantic ave

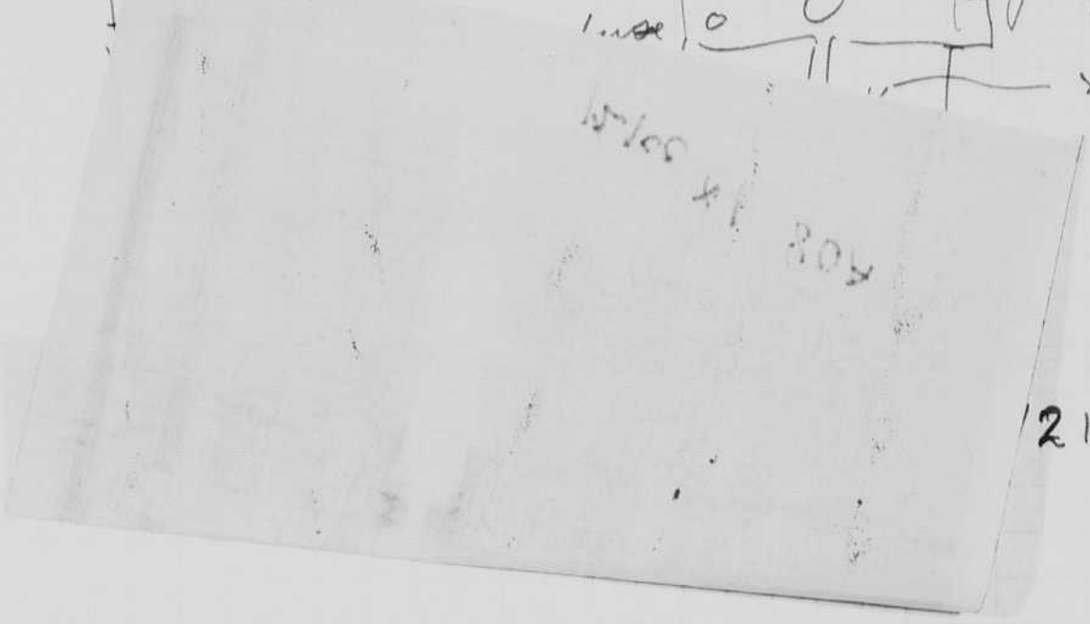
April 3 1971 M.I.T. Tests

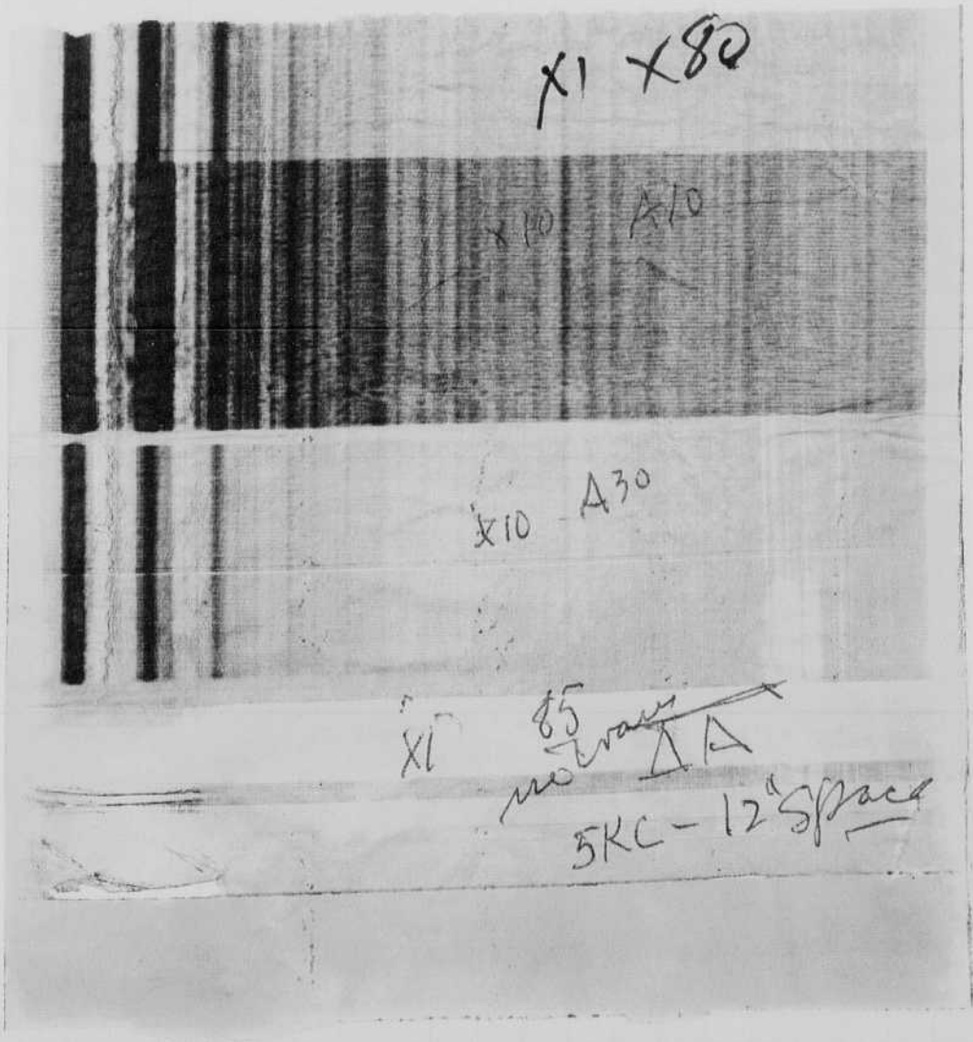
(Last night too
Jim Quigley &
Harold Eg.
extension



middle Speed

Old 5" alden Mud Penetrator with Donald Krotser at M.I.T. Sail Pavillion.





5KC

Single transducer massa no transformer

Massa Probe

April 7 1971 Edgerton Walter Steil. Multiflash of Balls Bouncing on steel plate.

Super Ball 4.86 4.87 cm in diameter 61.5 gr. 4.86 mm
plots at 30/sec. ~~61.90~~ 61.6

Golf ball. 44.9 grams 4.24 mm

April 11 1971 Easter Sunday. HE

I went into the Boston Harbor with Kaye and Don Krolser on Fri apr. 9. to get more 12 KC and 5 KC records. We went into the Chelsea creek and the river under the Mystic Bridge.

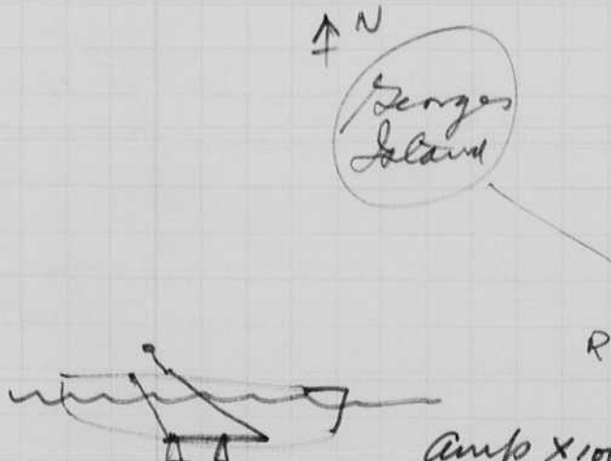
A very interesting wrinkle in the clay was found near the East side of the navy yard.

Several gremlins were located in the west side of the Mystic Bridge.

My new 5 KC. Transm and pickup caused problems due to heating of the SCR. on full load. It works ok at 1/2 power. We used the 5" Alden Recorder for these tests.

Kaye says he found a wreck as follows.

Lewis Wharf
Pelton Ed
(Lincoln Lab.)



2 wrecks
{Baker Island
{Yon Yon Ridge

coastguard & Dragger.

Amp x100 on amplifier
50 on alden amp.
5 KC 1/2 power.

Where is the New Hampshire.

Jan. 19 (Tues.) H.E.E. and John Fitch to film on Channel 5 at 9am
" 20 (Wed.) W.H.O.I. meeting at 45 Beacon Street, Boston, 10am
" " " N.E. Aquarium meeting at 12:30pm
" " " N.E. Aquarium - Mr. Smither's lecture, 5pm
" " " A. D. Little, cocktails, dinner and lecture by Prof. Donald Menzel, 6:30pm
" 21 (Thur.) Hamilton Club meeting, Pru. Center, 5:30pm
" 25 (Mon.) Gjon Mili - to visit all week for I.A.P.
" 27 (Wed.) H.E.E. to leave for Israel, BOAC, 9pm
Feb. 3 (Wed.) H.E.E. on channel 5-TV, 9:30am Fitch-Bathyscaphes.
" 6 (Sat.) EG&G's Winter Dance, Montvale Plaza, Stoneham, 7pm
" 13 (Sat.) H.E.E. returns from Israel/Greece (via Detroit, due to rain)
" 15 (Mon.) WASHINGTON's BIRTHDAY - Holiday
" 17 (Wed.) N.E. Aquarium Bd. of Gov. meeting, 12;30pm
" " " M.I.T. Faculty meeting, room 10-250, 3:15pm Kearney Nebraska!
" 18 (Thur.) Mr. David Richardson (Univ. of S. Carolina) to visit, 11am
" " " H.E.E. to lecture at Northeastern University, Mr. R. Wood, noon
" " " Mr. Bob Bender of WEEI (radio) to interview H.E.E., 2pm
" 19 (Fri.) Bill McCrea & Joe Strick to visit & lunch, 11:30am
" 21 (Sun.) Bob Edgerton in Maine
" 22 (Mon.) 12 noon class - stroboscope lecture by H.E.E. in 10-275
" " " Dean Geo. Harrison, 1:30pm
" 27 (Sat.) The Hazens, 6:30pm
Mar. 1 (Mon.) 12 noon class - electronic flash lecture by H.E.E. in 10-275
" 2 (Tues.) Mrs. Hankey (Librarian at Tufts Univ.) 11am
" " " Peter Throckmorton, 4pm
" " " Museum of Fine Arts - H.E.E. to lecture on Stonehenge, 7:30pm
" 3 (Wed.) American Res. & Dev. Corp meeting, John Hancock Bldg., 2pm
" 4 (Thur.) H.E.E. & Peter Throckmorton to lecture at Harvard Univ. (Dunster House, 8pm
" 5 (Fri.) Mr. Larry Frichkoff (M.I.T.) ext. 7810, 11am
" " " Kresge Aud. - Dr. Jerome Wiesner to be new M.I.T. President
" " " H.E.E. to lecture at Univ. of Mass, Boston, 4pm
" 6 (Sat.) Mary Ellen Pogue's house (mother's birthday party)
" 8 (Mon.) Mr. John Chapman (Beacon Society) to visit, 11:15am
" " " 12 noon class - High Speed Flash Photography
" " " Faculty Club, with Geo. Harrison, Mrs. Buechner (Killians party)
" 10 (Wed.) EG&G Board of Dir. meeting, Bedford, Ma., 9:30am
" 12 (Fri.) Adm. Rogers, Maine Maritime Academy, 11am
" 14 (Sun.) Concord Inn, Truman Gray - practice for Killians party
" 15 (Mon.) 12 noon class - H.E.E. lecture, Motion Pictures at High Speed
" " " Tech Film, Mr. Tom Minchin, 4:30pm
" 16 (Tues.) Faculty Club Luncheon with Mr. Bartle, ext. 2691 and Mr. McPherson
" " " John Tucker, Faculty Club, Course VI-A Banquet, 5:30pm
" " " H.E.E. to lecture for Tech Dames, Student Center, 8pm
" 17 (Wed.) N.E. Aquarium, Boad of Gov. meeting, 12:30pm
" " " Faculty meeting, 10-250, at 3:15pm
" 18 (Thur.) Dr. Ira Dwyer's Office for W. Pfingstag's thesis, 10:15am
" " " Geo. Harrison and Mrs. Buechner (Museum of Sci.) 11:30am
" 19 (Fri.) MACOM meeting, Museum of Science, 6:15pm, dinner, 7pm
" 22 (Mon.) Dr. & Mrs. Killian honored by the M.I.T. Matrons, 6:15pm Museum of Science
" 24 (Wed.) H.E.E. to lecture at Museum of Science, 6pm (Prof. Eagleson, ext. 7103) Boston Society of Civil Engineers
" 25 (Thur) H.E.E. to lecture at EG&G Supervisors meeting, Mary Sexton, 5pm
" 26 (Fri.) Bruce Newell (EG&G) to visit, 9:30am
" " " Mrs. Seifert to visit, 3pm
" 29 (Mon.) SPRING VACTION
" " " H.E.E. to lecture at Corning Glass Works, Corning, N.Y. Mr. Donald Keck, 8pm
" 31 (Wed.) H.E.E. to lecture at Bill Hyzer's seminar - Oshkosh, Wisc.

April 7 1971 Edgerton
H.E. Walter Steil. Multiflash of Balls Bouncing on steel plate.

Super Ball 4.86 4.87 mm in diameter 61.5 gr. 61.6 4.86 mm
plate at 30/sec.

Golf ball. 44.9 grams 4.24 mm

April 11 1971 Easter Sunday. HE

I went in to the Boston Harbor with Kage and Don Krolser on Fri after. 9. to get more 12 KC and 5 KC records. We went into the Chelsea creek and the river under the Mystic Bridge.

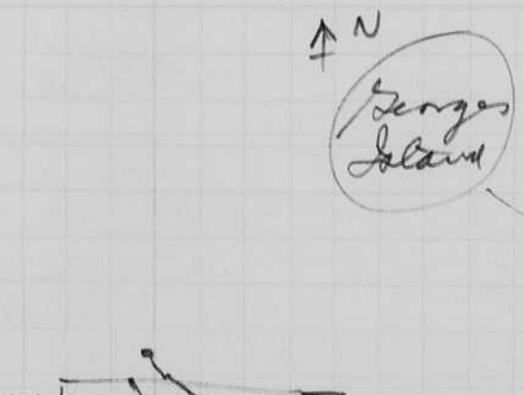
A very interesting wrinkle in the clay was found near the East side of the navy-yard.

Several gremlins were located in the west side of the Mystic Bridge.

My new 5 KC. Neons and pickups cause problems due to hardness of the SCR. on full load. It works ok at 1/2 power. We used the 5 Alden Recorder for these tests.

Kage says he found a wreck as follows.

Lewis wharf
Pelrine Ed
(Lincoln Lab.)



2 wrecks
{Baker Island
{Yon Yon Ridge
coastguard
& Dragger.

Amp X100 on amplifier
50 on alden amp.
5 KC 1/2 power.

Where is the New Hampshire.

Jan. 19 (Tues.) H.E.E. and John Fitch to film on Channel 5 at 9am
" 20 (Wed.) W.H.O.I. meeting at 45 Beacon Street, Boston, 10am
" " " N.E. Aquarium meeting at 12:30pm
" " " N.E. Aquarium - Mr. Smither's lecture, 5pm
" " " A. D. Little, cocktails, dinner and lecture by Prof. Donald Menzel, 6:30pm
" 21 (Thur.) Hamilton Club meeting, Pru. Center, 5:30pm
" 25 (Mon.) Gjon Mili - to visit all week for I.A.P.
" 27 (Wed.) H.E.E. to leave for Israel, BOAC, 9pm
Feb. 3 (Wed.) H.E.E. on channel 5-TV, 9:30am Fish-Bathyscaphes.
" 6 (Sat.) EG&G's Winter Dance, Montvale Plaza, Stoneham, 7pm
" 13 (Sat.) H.E.E. returns from Israel/Greece (via Detroit, due to rain)
" 15 (Mon.) WASHINGTON's BIRTHDAY - Holiday
" 17 (Wed.) N.E. Aquarium Bd. of Gov. meeting, 12;30pm
" " " M.I.T. Faculty meeting, room 10-250, 3:15pm Kearney Nebraska!
" 18 (Thur.) Mr. David Richardson (Univ. of S. Carolina) to visit, 11am
" " " H.E.E. to lecture at Northeastern University, Mr. R. Wood, noon
" " " Mr. Bob Bender of WEEI (radio) to interview H.E.E., 2pm
" 19 (Fri.) Bill McCrea & Joe Strick to visit & lunch, 11:30am
" 21 (Sun.) Bob Edgerton in Maine
" 22 (Mon.) 12 noon class - stroboscope lecture by H.E.E. in 10-275
" " " Dean Geo. Harrison, 1:30pm
" 27 (Sat.) The Hazens, 6:30pm
Mar. 1 (Mon.) 12 noon class - electronic flash lecture by H.E.E. in 10-275
" 2 (Tues.) Mrs. Hankey (Librarian at Tufts Univ.) 11am
" " " Peter Throckmorton, 4pm
" " " Museum of Fine Arts - H.E.E. to lecture on Stonehenge, 7:30pm
" 3 (Wed.) American Res. & Dev. Corp meeting, John Hancock Bldg., 2pm
" 4 (Thur.) H.E.E. & Peter Throckmorton to lecture at Harvard Univ. (Dunster House, 8pm
" 5 (Fri.) Mr. Larry Frichkoff (M.I.T.) ext. 7810, 11am
" " " Kresge Aud. - Dr. Jerome Wiesner to be new M.I.T. President
" " " H.E.E. to lecture at Univ. of Mass, Boston, 4pm
" 6 (Sat.) Mary Ellen Pogue's house (mother's birthday party)
" 8 (Mon.) Mr. John Chapman (Beacon Society) to visit, 11:15am
" " " 12 noon class - High Speed Flash Photography
" " " Faculty Club, with Geo. Harrison, Mrs. Buechner (Killians party)
" 10 (Wed.) EG&G Board of Dir. meeting, Bedford, Ma., 9:30am
" 12 (Fri.) Adm. Rogers, Maine Maritime Academy, 11am
" 14 (Sun.) Concord Inn, Truman Gray - practice for Killians party
" 15 (Mon.) 12 noon class - H.E.E. lecture, Motion Pictures at High Speed
" " " Tech Film, Mr. Tom Minchin, 4:30pm
" 16 (Tues.) Faculty Club Luncheon with Mr. Bartle, ext. 2691 and Mr. McPherson
" " " John Tucker, Faculty Club, Course VI-A Banquet, 5:30pm
" " " H.E.E. to lecture for Tech Dames, Student Center, 8pm
" 17 (Wed.) N.E. Aquarium, Boad of Gov. meeting, 12:30pm
" " " Faculty meeting, 10-250, at 3:15pm
" 18 (Thur.) Dr. Ira Dwyer's Office for W. Pfingstag's thesis, 10:15am
" " " Geo. Harrison and Mrs. Buechner (Museum of Sci.) 11:30am
" 19 (Fri.) MACOM meeting, Museum of Science, 6:15pm, dinner, 7pm
" 22 (Mon.) Dr. & Mrs. Killian honored by the M.I.T. Matrons, 6:15pm Museum of Science
" 24 (Wed.) H.E.E. to lecture at Museum of Science, 6pm (Prof. Eagleson, ext. 7103) Boston Society of Civil Engineers
" 25 (Thur) H.E.E. to lecture at EG&G Supervisors meeting, Mary Sexton, 5pm
" 26 (Fri.) Bruce Newell (EG&G) to visit, 9:30am
" " " Mrs. Seifert to visit, 3pm
" 29 (Mon.) SPRING VACTION
" " " H.E.E. to lecture at Corning Glass Works, Corning, N.Y. Mr. Donald Keck, 8pm
" 31 (Wed.) H.E.E. to lecture at Bill Hyzer's seminar - Oshkosh, Wisc.

82 April 17 1971

Harold Edgerton. Photography of the Loch Ness monster.

1 a minute

66. hours

60 | 4000.
360
40

1. Small camera adequate

2. Bottom switch.

3. Pictures at

Elapsed time camera.
16 mm. Kodachrome II

Tim Jinnsdale
R.A.I.nes – June, July in Loch Ness Scotland.
Res: 4/17 Blewbary Dr. Tilehurst. Reading.
Berks. England. Tel. Reading 27427

1/14/8 — Le B 1971
As Photographic Director.
Hdqrs. Loch Ness Investigation. Naiasite.
ACHNAHANNET.
Drumnadrochit. Tel. Drum' 355.
INVERNESS.
Scotland.

We looked at a short elapsed time movie at my apartment showing sand dollars, urchins, and star fish. These were made at 30 second intervals. 2 per min

2 | 4000 frames = 2000 minutes

120 per hour

33 hours.

60 | 2000
180
20

33 1/3 hours.

120 | 4000
360
40

166 = 166 per hour.

24 hour film 24 | 4000
24
160
144
160

166/60 = 2.76 per minute

60 sec / 2.76 = 21 seconds between pictures for a 24 hour film run.

May 5 1971
Harold Edgerton

Arrow into an apple this morning with Weinstein at the Bow
He was an excellent shot and had a good bow.

The old single channel side scan EG&G was tested ~~Last~~ weekend
in the charles. Now it is ready for more tests after
removing the pull down motor and other phases etc.
I hope to use it in Casine Maine on May 21 to look for
a lost sail boat.

CASTINE

Contamination Insulator

May 13 1971

Herb Woodson
Dave Jolly
T. E. Cheney → (5980)
H. Edgerton.

1000 f.p.s.
f 2.8
Film tri X
~~Double Dev.~~
50% over

~~Flashover may be stronger.~~

1005

Movies were ok on tri x at 35-40? on Versiac.

~~the~~ arc showed puff of smoke in the arc on each half cycle. We do not know if this is the anode or the cathode.

May 18. Tues. I took Dyers' class out to try the side scan in the Charles River basin. Three loads of seven students each. Each student made and took home a record of the river targets.

One showed the signal from a man in a skull. We could see the trail of the skull boat and the individual oar works when they hit the water.

April 3 (Sat.) H.E.E. to lecture for the Beacon Society of Boston at the Algonquin Club, 6:15pm reception and dinner (David T. Scott, Chm of program, First National Bank of Boston)

" 5 (Mon.) 12 noon class - "Underwater Photo With Strobe, room 10-275 by H. E. E.

" 6 (Tues) H.E.E.'s 86 BIRTHDAY (All Day)
11:30am Jack Christian
12 noon - class
12:30pm N.E. Aquarium Bd. of Gov. & Exec. Com. meeting
2:30pm " " " Sci. Adv. Com. meeting

" 8 (Thur) H.E.E. to pick up motor to boat ("MARY")
4:45pm Bill McCrea, Tech Film meeting
6:00pm Party at Harvard for Dr. Donald Menzel

" 9 (Fri.) Boston Harbor with Don Krotser and Mr. Kaye

" 10 (Sat.) Edgerton's house party for freshmen, 6:30pm

" 12 (Mon.) Visit by Lt. David Wyman (Maine Maritime Academy, Castine, Me.)
12 noon class - "Sonar for Underwater and Under-bottom" lecture by H.E.E.
3:15pm Faculty meeting, room 10-250

" 13 (Tues) H.E.E. to visit Bob Henderson at E.G.&G. Waltham, Ma., 8am
Visit by Mrs. Hankey of Tufts University Library, 11am
(Home Tel. 484-0076)
12 noon class

" 14 (Wed.) Boston Harbor (H..E.E.)
Museum of Science Trustees meeting, discuss budget and review new building plans, 4-6pm

" 15 (Thur) Mass. State Science Fair, M.I.T. Rockwell Cage (all day)
Dartmouth College, Wilder Hall, 4:30pm lecture and Sigma Xi Society lecture at the Hanover Inn, 8pm (Prof. Fred Manasse)

" 16 (Fri.) Dinner with Bob Rines at Fantasia's restaurant to meet Tim Dinsdale (Loch Ness monster), 7:30pm

" 18 (Sun.) Lecture at Temple Beth-Am, Rt. 28, Randolph, Ma. for Nate Lightman, 9am

" 19 (Mon.) VACATION - PATRIOT's DAY
Edgerton's house party for freshmen, 6:30pm

" 20 (Tues) E.G.&G. Stockholders meeting, 10am Statler Hotel, Boston
Dr. Artur Fabiunke (from Tech. Univ. of Berlin) to visit, 4:45

" 21 (Wed.) H.E.E. to take Medical exam with Dr. Point x7802
12 noon class
12:30pm N.E. Aquarium Bd. of Gov. meeting
3Pm Tech Film, Bd. of Dir. meeting
3:15pm Faculty meeting
7:30pm H.E.E. to lecture at the Richard MacLaurin Lodge for Mr. Dalyrmple, ext. 5332

" 22 (Thurs) Gerald Berkstein, 9am to pick up for Mrs. Hankey of Tufts Univ.

" 23 (Fri.) H.E.E. to lecture for the American Pediatric Surgical Assoc. (Dr. Robert Gross) on "Experiences With High Speed Photography at the Princess Hotel in Bermuda (RE-4-6000 ext. 2841)

" 23 - 26 Bermuda

" 26 (Mon.) Dr. Bruce Newell to lecture to H.E.E.'s 12 noon class

" 28 (Wed.) Bob Chin of Northeastern Univ. to visit, 2:30pm
Prof. Windnall of Aero Dept. to visit, 3pm
West Campus Students Study Break - McCormich Hall 8:30-10:30pm

" 29 (Thurs) H.E.E. to Mt. Auburn Hospital for X-ray, 9am
E.E. Department Steak Fry in Bldg. 13, 6pm

" 30 (Fri.) Lewis Wharf, 8:30am
Concourse Experiment - Given Rm, Bldge. 35 Lounge, 12noon - 2pm

Contamination Insulator

May 13 1971

Herb Woodson
Dave Jolly
T. C. Cheng → (5980)
H. Edgerton.

1000 f.p.s.
f 2.8
Film tri X
~~Double Dev.~~
50% over

~~Flashover may be stronger.~~

1005

Movies were ok on tri x at 35-40? on Versiac.

the arc showed puffs of smoke in the arc on each half cycle. We do not know if this is the anode or the cathode.

May 18. Tues. I took Dyers' class out to try the side scan in the Charles River basin. Three loads of seven students each. Each student made and took home a record of the river targets.

One showed the signals from a man in a skull. We could see the trail of the skull boat and the individual oar works when they hit the water.

April 3 (Sat.) H.E.E. to lecture for the Beacon Society of Boston at the Algonquin Club, 6:15pm reception and dinner (David T. Scott, Chm of program, First National Bank of Boston)

" 5 (Mon.) 12 noon class - "Underwater Photo With Strobe, room 10-275 by H. E. E.

" 6 (Tues) H.E.E.'s 86 BIRTHDAY (All Day)
11:30am Jack Christian
12 noon - class
12:30pm N.E. Aquarium Bd. of Gov. & Exec. Com. meeting
2:30pm " " " Sci. Adv. Com. meeting

" 8 (Thur) H.E.E. to pick up motor to boat ("MARY")
4:45pm Bill McCrea, Tech Film meeting
6:00pm Party at Harvard for Dr. Donald Menzel

" 9 (Fri.) Boston Harbor with Don Krotser and Mr. Kaye

" 10 (Sat.) Edgerton's house party for freshmen, 6:30pm

" 12 (Mon.) Visit by Lt. David Wyman (Maine Maritime Academy, Castine, Me.)
12 noon class - "Sonar for Underwater and Under-bottom" lecture by H.E.E.
3:15pm Faculty meeting, room 10-250

" 13 (Tues) H.E.E. to visit Bob Henderson at E.G.&G. Waltham, Ma., 8am
Visit by Mrs. Hankey of Tufts University Library, 11am
(Home Tel. 484-0076)
12 noon class

" 14 (Wed.) Boston Harbor (H..E.E.)
Museum of Science Trustees meeting, discuss budget and review new building plans, 4-6pm

" 15 (Thur) Mass. State Science Fair, M.I.T. Rockwell Cage (all day)
Dartmouth College, Wilder Hall, 4:30pm lecture and Sigma Xi Society lecture at the Hanover Inn, 8pm (Prof. Fred Manasse)

" 16 (Fri.) Dinner with Bob Rines at Fantasia's restaurant to meet Tim Dinsdale (Loch Ness monster), 7:30pm

" 18 (Sun.) Lecture at Temple Beth-Am, Rt. 28, Randolph, Ma. for Nate Lightman, 9am

" 19 (Mon.) VACATION - PATRIOT's DAY
Edgerton's house party for freshmen, 6:30pm

" 20 (Tues) E.G.&G. Stockholders meeting, 10am Statler Hotel, Boston
Dr. Artur Fabiunke (from Tech. Univ. of Berlin) to visit, 4:45

" 21 (Wed.) H.E.E. to take Medical exam with Dr. Point x7802
12 noon class
12:30pm N.E. Aquarium Bd. of Gov. meeting
3Pm Tech Film, Bd. of Dir. meeting
3:15pm Faculty meeting
7:30pm H.E.E. to lecture at the Richard MacLaurin Lodge for Mr. Dalyrmple, ext. 5332

" 22 (Thurs) Gerald Berkstein, 9am to pick up for Mrs. Hankey of Tufts Univ.

" 23 (Fri.) H.E.E. to lecture for the American Pediatric Surgical Assoc. (Dr. Robert Gross) on "Experiences With High Speed Photography at the Princess Hotel in Bermuda (RE-4-6000 ext. 2841)

" 23 - 26 Bermuda

" 26 (Mon.) Dr. Bruce Newell to lecture to H.E.E.'s 12 noon class

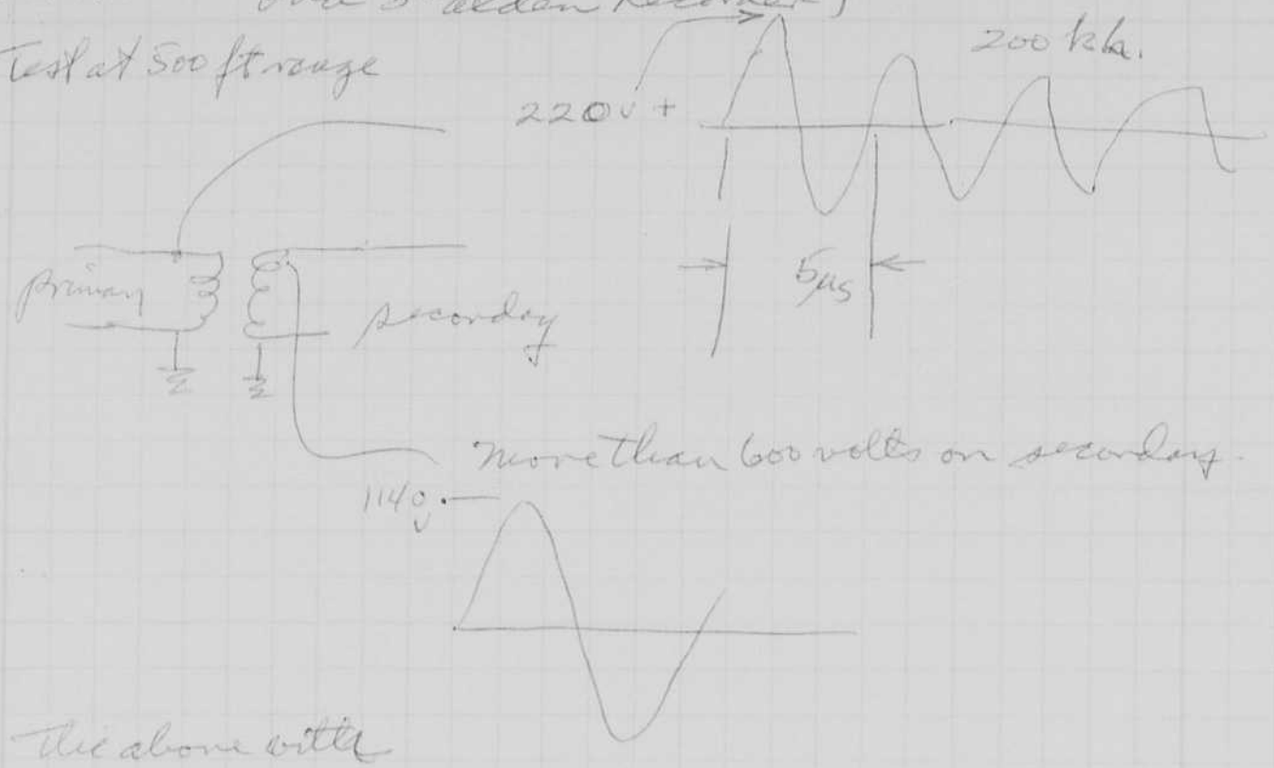
" 28 (Wed.) Bob Chin of Northeastern Univ. to visit, 2:30pm
Prof. Windnall of Aero Dept. to visit, 3pm
West Campus Students Study Break - McCormich Hall 8:30-10:30pm

" 29 (Thurs) H.E.E. to Mt. Auburn Hospital for X-ray, 9am
E.E. Department Steak Fry in Bldg. 13, 6pm

" 30 (Fri.) Lewis Wharf, 8:30am
Concourse Experiment - Given Rm, Bldge. 35 Lounge, 12noon - 2pm

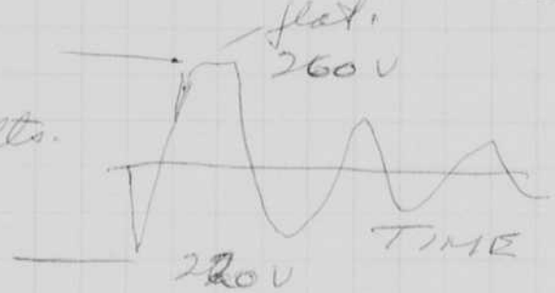
86 May 26 1921 Tests of Side Scan
H. Sobotka
V.E. MacRoberts (First model of 259 with one side
on a 5" Alden Recorder)

Test at 500 ft range



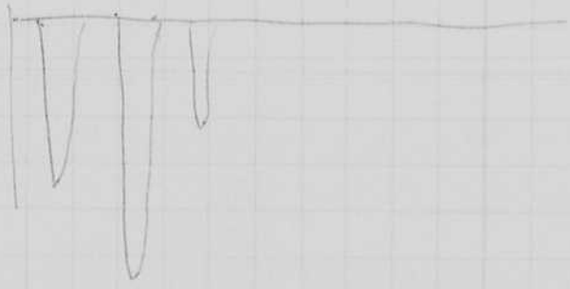
The above with
0.25 mfd

Input now 0.50 mfd
Primary 260 volts.



Secondary,
neg sig (1200+ volts)
guess 1400

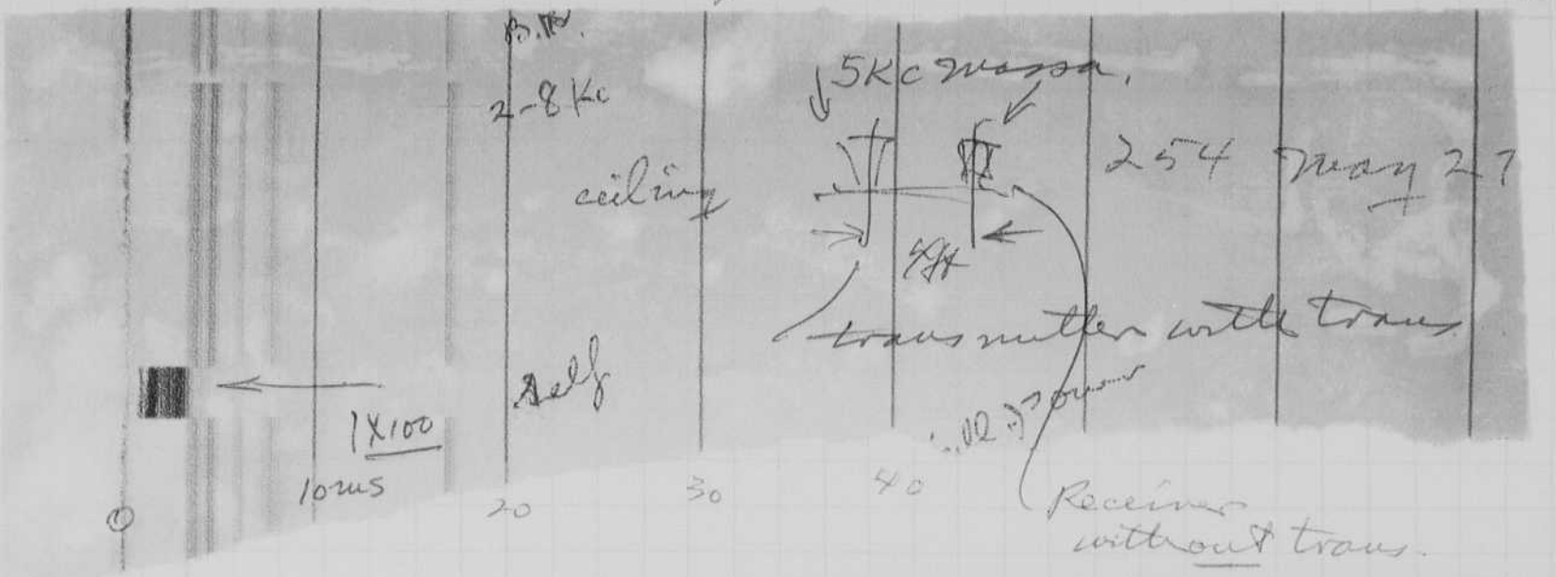
pos sig (off scale)
1400.

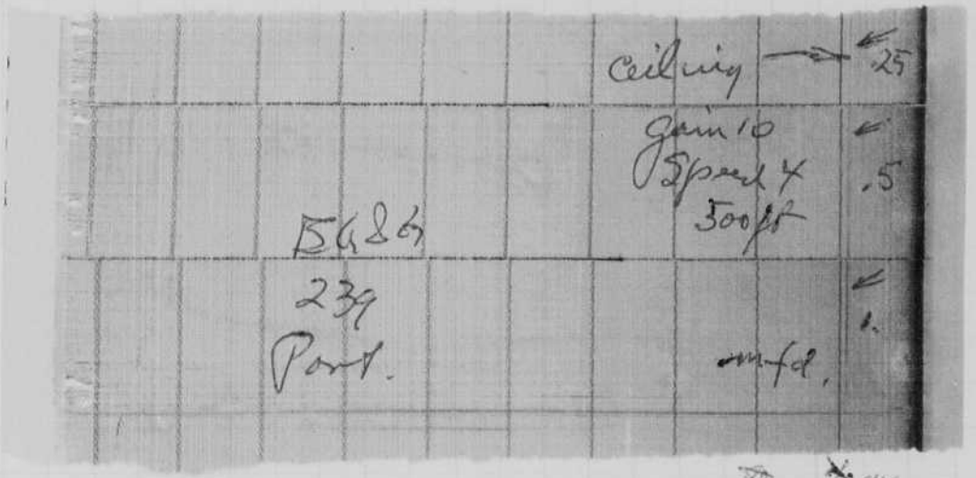


Input 1 mfd Primary 340 volts.

Flicker noted in 24 volt lights. Charging current
causes regulation.

254 Recorder test H. Edgerton





40 20 = 50 ft
m water

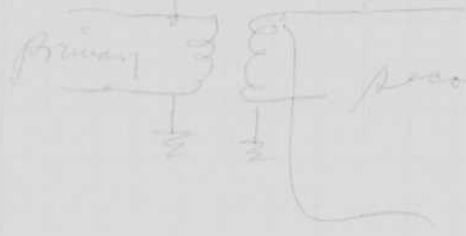
June 26 1921

Tests of Side Scan

A. Hoover
V.E. Hackleberts

(First model of 259 with one side over a 5" Alden Recorder)

Test at 500 ft range

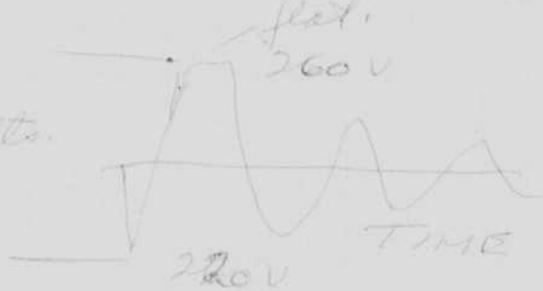


More than 600 volts on secondary.

The above with
0.25 mfd

Input now 0.50 mfd

Primary 260 volts.



neg sig

Secondary
(1200 + volts)
guess 1400

pos sig

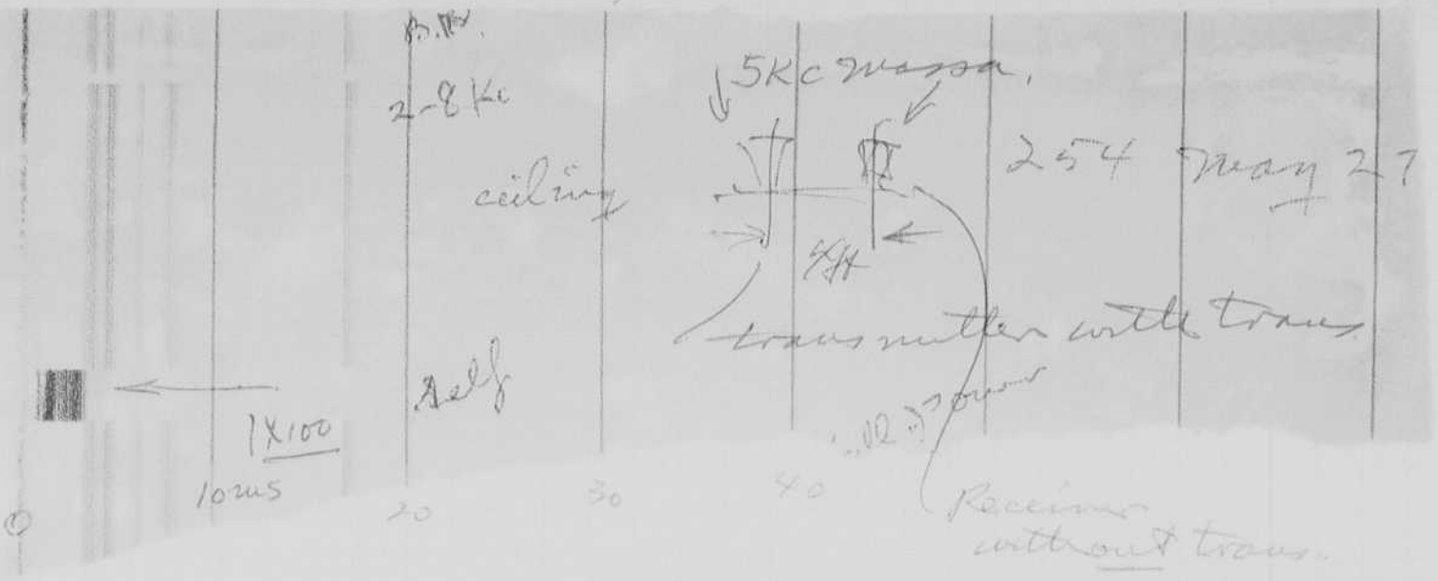
(Official)
1400.

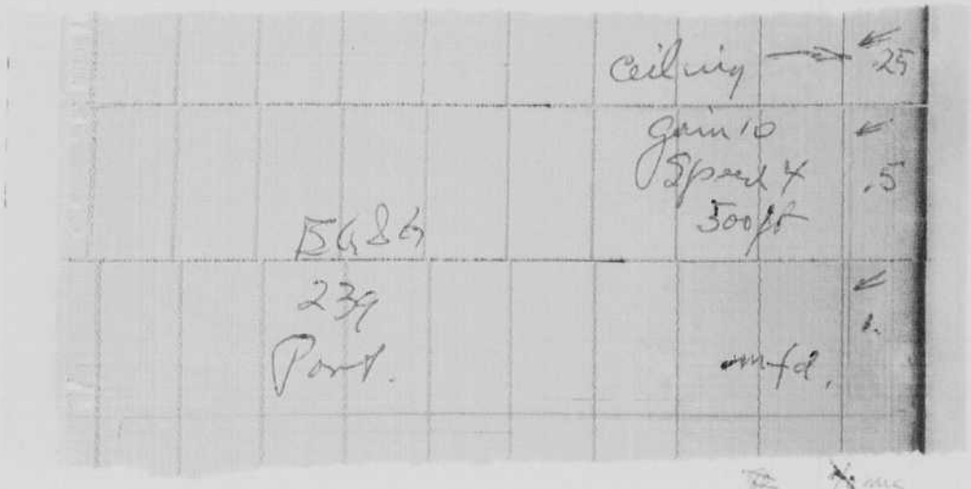
Input 1 mfd

Primary 340 volts.

Flicker noted in 24 volt lights. Charging current causes regulation.

254 Recorder Test H. Edgerton





To 40 X ms 20 = 50 ft in water

May 3 (Mon.) Wilson Lamb, Jr. to pick up equipment to take to Univ. of R.I. 9am
Retirement party for Prof. Truman Gray at the Lord Wakefield Rest. 7pm - mid-night
" 4 (Tues) R.L.E. Annual Research Review (Ralph Sayers)
Richard Jandl and wife to visit strobe lab (new Dir. for the N.E. Aquarium, 4pm, dinner at Faculty Club
" 5 (Wed.) R.L.E. Annual Research Review (Ralph Sayers)
Dr. Gilbert Rowe from W.H.O.I. to visit, 1pm
Picnic lunch with Misses Nina and Sylvia Edgerton, Kresge Plaza, M.I.T. (Peace marchers preparing to walk to Boston Common)
Pres. Howard Johnson's house (R.L.E.) 5:45pm - 6:45pm
" 6 (Thur) Three Thirty Beacon Street (330), 8:30am
H.E.E. to dentist, 11am
Leave for Norwood, Mass. at 12:30) to see lighting system with Dr. Martin Annis, Pres. of American Science & Eng., Cambridge, Ma.
" 7 (Fri.) Prof. KunMo Chung (V.P. Academic Affairs, Korea Advanced Institute of Science) to visit and discuss his new school, 11am
Prof. Liepmann, 2:30pm
Teck Talk interview by Linda Omohundro, ext. 2701
Dinner at Lucy Sloane, 7pm
Student Center to show films for KALEIDOSCOPE, 9:30pm
" 10 (Mon.) Prof. Ed. Monahan (Univ. of Michigan) to visit with 12 students, 10
12 noon class - "Special Underwater Photography & Sonar" by H.E.E.
New England Aquarium, Special Meeting of Bd. of Gov. and Trustees 6-7pm cocktails, 7-8pm dinner, 8pm meeting and announcement by David Stone, Chm. of the Board of the Dedication of the Harold E. Edgerton Research Laboratory
" 11 (Tues) M.I.T. Sailing Pavilion - Marty Klein
Mr. Eberhardt of I.T.T. (Ft. Wayne, Ind.) to lecture in Bush Room 2:30pm as a guest of H.E.E. ("Unusual Optical Detectors")
" 12 (Wed.) Emeriti luncheon, 1pm (Dr. Arthur Hardy visited)
" 13 (Thur) H.E.E.s to dancing class
" 14 (Fri.) H.E.E. to visit EG&G, Waltham, Ma.
Photograph with Bill Short (Room 7-005 Prof. Herb Woodson)
H.E.E. to lecture in room 5-317, 4pm for Mike Vetter
" 15 (Sat.) Boston Harbor with Mr. Kaye, 8am
111 Bay St. Road (Sandra Yulke and Sherry Grobstein) dinner, 6pm
" 16 (Sun.) Endicott House, Dedham, Mass. E.E. Department, 3pm
" 17 (Mon.) Teck Film, 2pm
Museum of Science, 3:30pm
" 18 (Tues) M.I.T. Sailing Pavilion - Dr. Ira Dyer's class, 8:30-11am
" 19 (Wed.) 12 noon class (last for this semester)
Faculty Meeting, room 10-250, 3:15pm
Lecture for Mrs. Finn in the Emma Rogers Room, 5:30pm
" 20-24 Maine Maritime Academy, Castine, Me. (search for lost boat in Penobscot Bay) Lt. David Wyman
" 25 (Tues) Pres. Howard Johnson's house - "The Friends of the Arts at M.I.T." 2pm, cocktails and dinner at the Faculty club, 5:30pm, etc.
" 26 (Wed.) Carl Peterson (Physical Plant) retirement party, Faculty Club, 5:30
" 27 (Thur) Lewis Wharf - "Shrock" with Sam Raymond, Mr. Kaye, Fred Feyling and Donald Krotser, and H.E.E. to test 254 recorder and corer
" 28 (Fri.) Boston Sea Rovers - Pre-Clinic Reception at the B.U. Castle, 225 Bay State Road, Boston, 7pm
" 29 (Sat.) U.S.L.C.O.R. Inc. meeting (Sherman Union, rm. 312, at 1:30pm (Ruth Dugan) at Boston University

August 25 1971 Sat.
Ready to go to Frankfurt tonight to attend Seismic Congress at Heidelberg (Germany), then on to Athens on Sept 2 to work with Marineton & Associates on Papoutsi Site.

June 1 (Tues) E.E. Dept. Faculty Meeting, Bush Room, 3:30pm
" 2 (Wed.) Space Center (M.I.T.) visit Tim Barrows (multiflash) 10am
" Faculty Meeting, room 10-250 at 4pm
" 3 (Thur) Dr. Ira Dyer at the Sailing Pavilion
Julian Bond to lecture at Kresge, 3pm
Graduation Eve celebration, 8:30pm
" 4 (Fri.) Graduation
Party for Herb Woodson (going to Texas) Fac. Club, 6:30pm
" 5 (Sat.) Aurora, Nebraska
" 7 (Mon.) Alumni Day (Dike Arnold)
Sam Raymond, 8am
Kresge Aud., Reception for Dr. Killian, 4:45pm
Alumni dinner, The Algonquin Club, Boston, 7:30pm
" 8 (Tues) Ship equipment to Greece
Louie LeTourneau at Lewis Wharf, 1pm
MACOM meeting at the Fargo Bldg. 8th floor, 2pm
" 9 (Wed.) Mr. V. Woodworth, of Hale & Dorr, 3pm
" 10 (Thur) Tech Film, Watertown, 3pm (Board meeting)
" 12 (Sat.) H.E.E. to depart for Athens (via London) TWA at 8:15pm
to work at Lepanto & Helice sites
July 1 (Thur) Depart Patras with Mrs. Edgerton & Mary Anne Dixon for Sicily
Via boat to Brindisi then Reggio, Marsala (Motya Island off
the coast of Sicily to work with Prof. Isserlin, University
Of Leeds, England) Palermo, Brindisi (via boat to Patras, Greece)
July 15 (Thur) Gytheion, Lepanto, Athens, Greece
Aug. 4-6 Oceanographique Institut, Monaco (Visit Olivier Leenhardt
and Jacques Cousteau)
" 10 (Tues) EG&G, Waltham to visit Jack McCarthy, 9am
" M.I.T., Building 54, John Southard, ext. 3397 with samples
Hamilton Trust meeting (ballgame Fenway Park), 5:30pm
" 11 (Wed.) Tech Film Bd. of Dir. Meeting, Watertown, 9:30am
Ed Curley's new plant in Beverly (visit)
" 12 (Thur) Joe Cohen to see H.E.E., 10am
H.E. Edgerton's (film) party, 6:30pm
" 16 (Mon.) H.E. E. to visit Sam Raymond in Falmouth
" 17 (Tues) MTS Convention, Washington, D. C.
" 18 (Wed.) Fix light on Prudential Building, Boston
Mr. Burns (U.S. Customs Dept. Logan) & 4 kids for tour of lab,11am
New England Aquarium Bd. of Gov. Meeting, 12:30pm
" 19 (Thur) "How Deep Is The Ocean?", WHDH-Tv, Classroom 5, 9:30am (repeat)
" Dr. Dyer & Prof. Cummons, M.I.T., 2pm to visit
" 20 (Fri.) Dr. Blazi (dentist), 10am
Dr. Gilbert Rowe, W.H.O.I., 11am (to see camera)
Dr. Ernie Blase to visit, 12noon
" 21-25 Aurora, Nebraska, & Bloomfield Hills, Michigan to visit
Mother and son Robert
" 26 (Thur) Tech Film meeting, 1pm
" 28 (Sat.) H.E.E. to leave for Heidelberg, Germany
(To attend International Congress on Sedimentology, Aug. 30 -
September 1 and deliver a paper)
Sept. 2 (Thur) H.E.E. to leave Germany for Athens, Greece to work with Peter
Throckmorton & Prof. Marinatos at the Lepanto Battle site
(side trip to Istanbul, Turkey to get Teddy Hall's equipment)
" 17 (Fri.) H.E.E. to arrive from Athens, Greece
" 20 (Mon.) David Burmaster (M.I.T., ext. 4849) to visit, 9:30am
" " Tom Mullen & Norman Baggett to visit, 10am
" Class - 12noon - 1pm (Freshmen)

May 3 (Mon.) Wilson Lamb, Jr. to pick up equipment to take to Univ. of R.I. 9am
Retirement party for Prof. Truman Gray at the Lord Wakefield Rest. 7pm - mid-night
" 4 (Tues) R.L.E. Annual Research Review (Ralph Sayers)
Richard Jandl and wife to visit strobe lab (new Dir. for the N.E. Aquarium, 4pm, dinner at Faculty Club
" 5 (Wed.) R.L.E. Annual Research Review (Ralph Sayers)
Dr. Gilbert Rowe from W.H.O.I. to visit, 1pm
Picnic lunch with Misses Nina and Sylvia Edgerton, Kresge Plaza, M.I.T. (Peace marchers preparing to walk to Boston Common)
Pres. Howard Johnson's house (R.L.E.) 5:45pm - 6:45pm
" 6 (Thur) Three Thirty Beacon Street (330), 8:30am
H.E.E. to dentist, 11am
Leave for Norwood, Mass. at 12:30) to see lighting system with Dr. Martin Annis, Pres. of American Science & Eng., Cambridge, Ma.
" 7 (Fri.) Prof. KunMo Chung (V.P. Academic Affairs, Korea Advanced Institute of Science) to visit and discuss his new school, 11am
Prof. Liepmann, 2:30pm
Teck Talk interview by Linda Omohundro, ext. 2701
Dinner at Lucy Sloane, 7pm
Student Center to show films for KALEIDOSCOPE, 9:30pm
" 10 (Mon.) Prof. Ed. Monahan (Univ. of Michigan) to visit with 12 students, 10
12 noon class - "Special Underwater Photography & Sonar" by H.E.E.
New England Aquarium, Special Meeting of Bd. of Gov. and Trustees 6-7pm cocktails, 7-8pm dinner, 8pm meeting and announcement by David Stone, Chm. of the Board of the Dedication of the Harold E. Edgerton Research Laboratory
" 11 (Tues) M.I.T. Sailing Pavilion - Marty Klein
Mr. Eberhardt of I.T.T. (Ft. Wayne, Ind.) to lecture in Bush Room 2:30pm as a guest of H.E.E. ("Unusual Optical Detectors")
" 12 (Wed.) Emeriti luncheon, 1pm (Dr. Arthur Hardy visited)
" 13 (Thur) H.E.E.s to dancing class
" 14 (Fri.) H.E.E. to visit EG&G, Waltham, Ma.
Photograph with Bill Short (Room 7-005 Prof. Herb Woodson)
H.E.E. to lecture in room 5-317, 4pm for Mike Vetter
" 15 (Sat.) Boston Harbor with Mr. Kaye, 8am
111 Bay St. Road (Sandra Yulke and Sherry Grobstein) dinner, 6pm
" 16 (Sun.) Endicott House, Dedham, Mass. E.E. Department, 3pm
" 17 (Mon.) Teck Film, 2pm
Museum of Science, 3:30pm
" 18 (Tues) M.I.T. Sailing Pavilion - Dr. Ira Dyer's class, 8:30-11am
" 19 (Wed.) 12 noon class (last for this semester)
Faculty Meeting, room 10-250, 3:15pm
Lecture for Mrs. Finn in the Emma Rogers Room, 5:30pm
" 20-24 Maine Maritime Academy, Castine, Me. (search for lost boat in Penobscot Bay) Lt. David Wyman
" 25 (Tues) Pres. Howard Johnson's house - "The Friends of the Arts at M.I.T." 2pm, cocktails and dinner at the Faculty club, 5:30pm, etc.
" 26 (Wed.) Carl Peterson (Physical Plant) retirement party, Faculty Club, 5:30
" 27 (Thur) Lewis Wharf - "Shrock" with Sam Raymond, Mr. Kaye, Fred Feyling and Donald Krotser, and H.E.E. to test 254 recorder and corer
" 28 (Fri.) Boston Sea Rovers - Pre-Clinic Reception at the B.U. Castle, 225 Bay State Road, Boston, 7pm
" 29 (Sat.) U.S.L.C.O.R. Inc. meeting (Sherman Union, rm. 312, at 1:30pm (Ruth Dugan) at Boston University

August 25 1971 Sat.
Ready to go to Frankfurt tonight to attend Sekundo Congress at Heidelberg (Germany), then on to Athens on Sept 2 to work with Mavrantos & Alexakis on Lafonia Site.

June 1 (Tues) E.E. Dept. Faculty Meeting, Bush Room, 3:30pm
" 2 (Wed.) Space Center (M.I.T.) visit Tim Barrows (multiflash) 10am
" Faculty Meeting, room 10-250 at 4pm
" 3 (Thur) Dr. Ira Dyer at the Sailing Pavilion
Julian Bond to lecture at Kresge, 3pm
Graduation Eve celebration, 8:30pm
" 4 (Fri.) Graduation
Party for Herb Woodson (going to Texas) Fac. Club, 6:30pm
" 5 (Sat.) Aurora, Nebraska
" 7 (Mon.) Alumni Day (Dike Arnold)
Sam Raymond, 8am
Kresge Aud., Reception for Dr. Killian, 4:45pm
Alumni dinner, The Algonquin Club, Boston, 7:30pm
" 8 (Tues) Ship equipment to Greece
Louie LeTourneau at Lewis Wharf, 1pm
MACOM meeting at the Fargo Bldg. 8th floor, 2pm
" 9 (Wed.) Mr. V. Woodworth, of Hale & Dorr, 3pm
" 10 (Thur) Tech Film, Watertown, 3pm (Board meeting)
" 12 (Sat.) H.E.E. to depart for Athens (via London) TWA at 8:15pm
to work at Lepanto & Helice sites
July 1 (Thur) Depart Patras with Mrs. Edgerton & Mary Anne Dixon for Sicily
Via boat to Brindisi then Reggio, Marsala (Motya Island off
the coast of Sicily to work with Prof. Isserlin, University
Of Leeds, England) Palermo, Brindisi (via boat to Patras, Greece)
July 15 (Thur) Gytheion, Lepanto, Athens, Greece
Aug. 4-6 Oceanographique Institut, Monaco (Visit Olivier Leenhardt
and Jacques Cousteau)
" 10 (Tues) EG&G, Waltham to visit Jack McCarthy, 9am
" M.I.T., Building 54, John Southard, ext. 3397 with samples
Hamilton Trust meeting (ballgame Fenway Park), 5:30pm
" 11 (Wed.) Tech Film Bd. of Dir. Meeting, Watertown, 9:30am
Ed Curley's new plant in Beverly (visit)
" 12 (Thur) Joe Cohen to see H.E.E., 10am
H.E. Edgerton's (film) party, 6:30pm
" 16 (Mon.) H.E. E. to visit Sam Raymond in Falmouth
" 17 (Tues) MTS Convention, Washington, D. C.
" 18 (Wed.) Fix light on Prudential Building, Boston
Mr. Burns (U.S. Customs Dept. Logan) & 4 kids for tour of lab,11am
New England Aquarium Bd. of Gov. Meeting, 12:30pm
" 19 (Thur) "How Deep Is The Ocean?", WHDH-Tv, Classroom 5, 9:30am (repeat)
" Dr. Dyer & Prof. Cummons, M.I.T., 2pm to visit
" 20 (Fri.) Dr. Blazi (dentist), 10am
Dr. Gilbert Rowe, W.H.O.I., 11am (to see camera)
Dr. Ernie Blase to visit, 12noon
" 21-25 Aurora, Nebraska, & Bloomfield Hills, Michigan to visit
Mother and son Robert
" 26 (Thur) Tech Film meeting, 1pm
" 28 (Sat.) H.E.E. to leave for Heidelberg, Germany
(To attend International Congress on Sedimentology, Aug. 30 -
September 1 and deliver a paper)
Sept. 2 (Thur) H.E.E. to leave Germany for Athens, Greece to work with Peter
Throckmorton & Prof. Marinatos at the Lepanto Battle site
(side trip to Istanbul, Turkey to get Teddy Hall's equipment)
" 17 (Fri.) H.E.E. to arrive from Athens, Greece
" 20 (Mon.) David Burmaster (M.I.T., ext. 4849) to visit, 9:30am
" " Tom Mullen & Norman Baggett to visit, 10am
" Class - 12noon - 1pm (Freshmen)

90 Oct. 2, 1971 Harold Edgerton

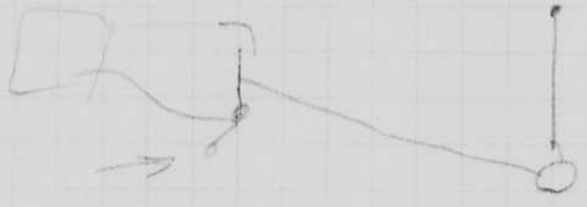
I returned from Athens on Sept 17 Friday and got into the teaching at once, one week fall. Dave Richardson is my assistant this year. Bill MacRoberts and Miss Jean Mooney complete the staff.

There are about 15 in the freshman seminar groups and 22± in the 6.114 lab. This is enough to keep the place busy.

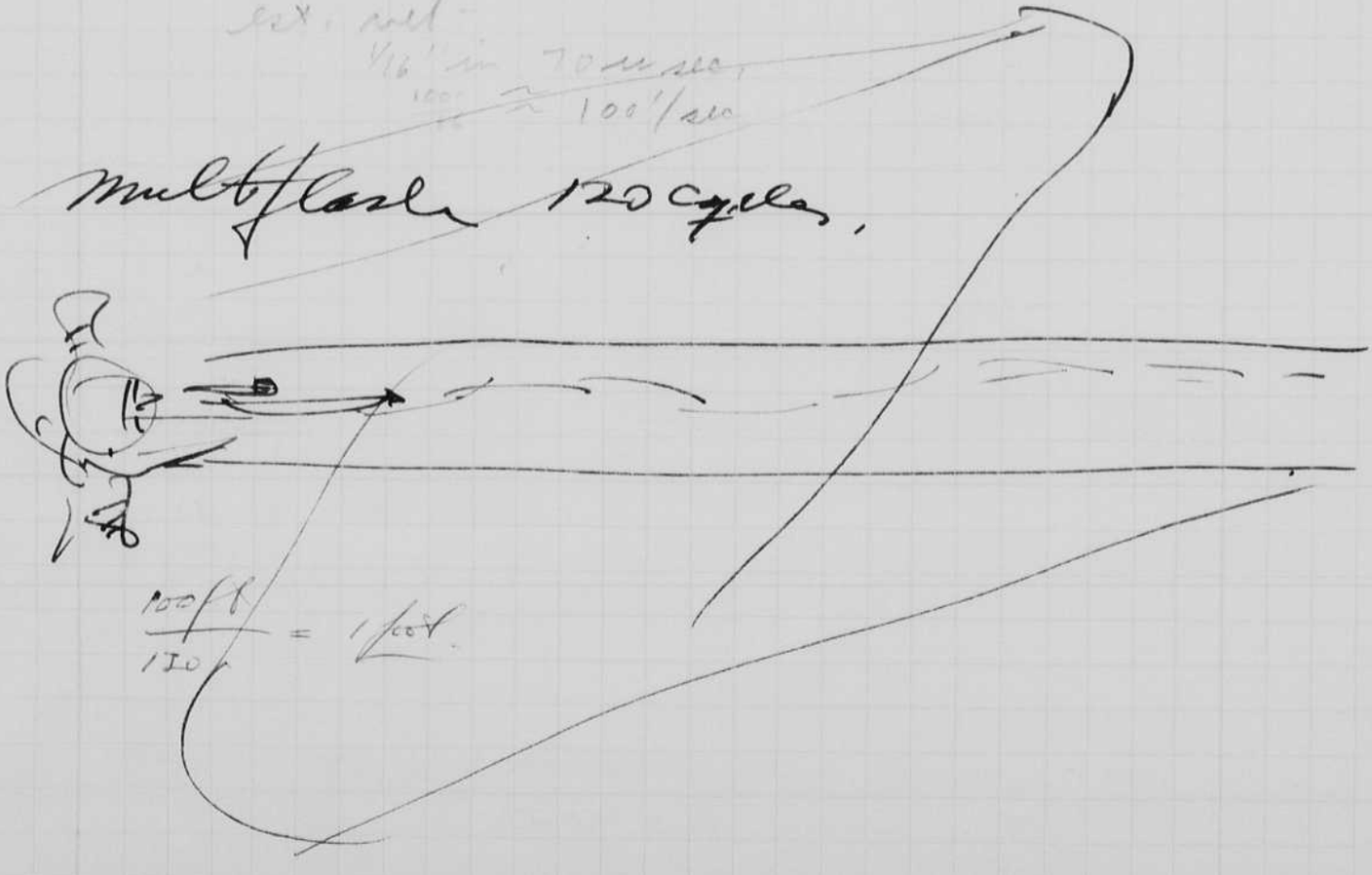
I hope to get my sides away back from Greece soon. The output transformers blasted out. I hope to make it more powerful.

My 5 Kc sonar is still in Athens with Bloodsworth on the STORMIE SEAS.

Oct 4, 71 Steve Weinstein 232-3258



ext. rel
1/16" in 70 m sec
100 ≈ 100'/sec



Oct 9 11

Tests of Wheeler-Muchenberg tungar set yesterday with Bill MacRobert

Obs at 300 ft in hall with mast head 6800 c.p.

Tests of Circuit A 2D21 thyratron.

Oscillator at 9.1

Set at 9. 3×22 ft mast ant $\frac{6800}{9\times 22^2} = 1.57$ lumen/sq ft

Circuit D (F.B. & W.K. 6/8/66) 3 ft. $\frac{6800}{9} = 755.$ "/sq ft.

Circuit B. Osc at 9.2 Set at 9.1 3×26 ft. 78' $\frac{6800}{78^2} = 1.11$ lumen/sq ft

Circuit C. 33×3 ft $\frac{6800}{99^2} = 0.694$ "

Dial	Dist	D^2	$\frac{6800}{D^2}$ lumen/sq ft.
1	8 ft.	64	106.
3	10	100	68.
5	12	144	47.2
7	15'	225	30.2
9	49'	2400	2.83
9.1	26×3=75'	6100	1.11

Wheeler-Muchenberg Circ.

Dial	Dist	D^2	Max dial	$\frac{6800}{D^2}$
7	18 ft.	290	8.55	23.4
Max at 8.55	66 ft.	4350		1.57
"	70 + 11½ out with mirror			1.40
8.	39'	1520		4.47
8.5	66'	4350		1.57
4.3	10'	100		68.

These tests made with and the Tungar.

Note that max dial limits both apparatus to about 70 feet. This is probably due to the 120 cycle in the fluorescent lamps

Max setting on W-M circuit is 9.35 turns

Harold Edgerton — MIT 4-405 Strobe Lab.

Oct 9, 1972

Nov 26 1971

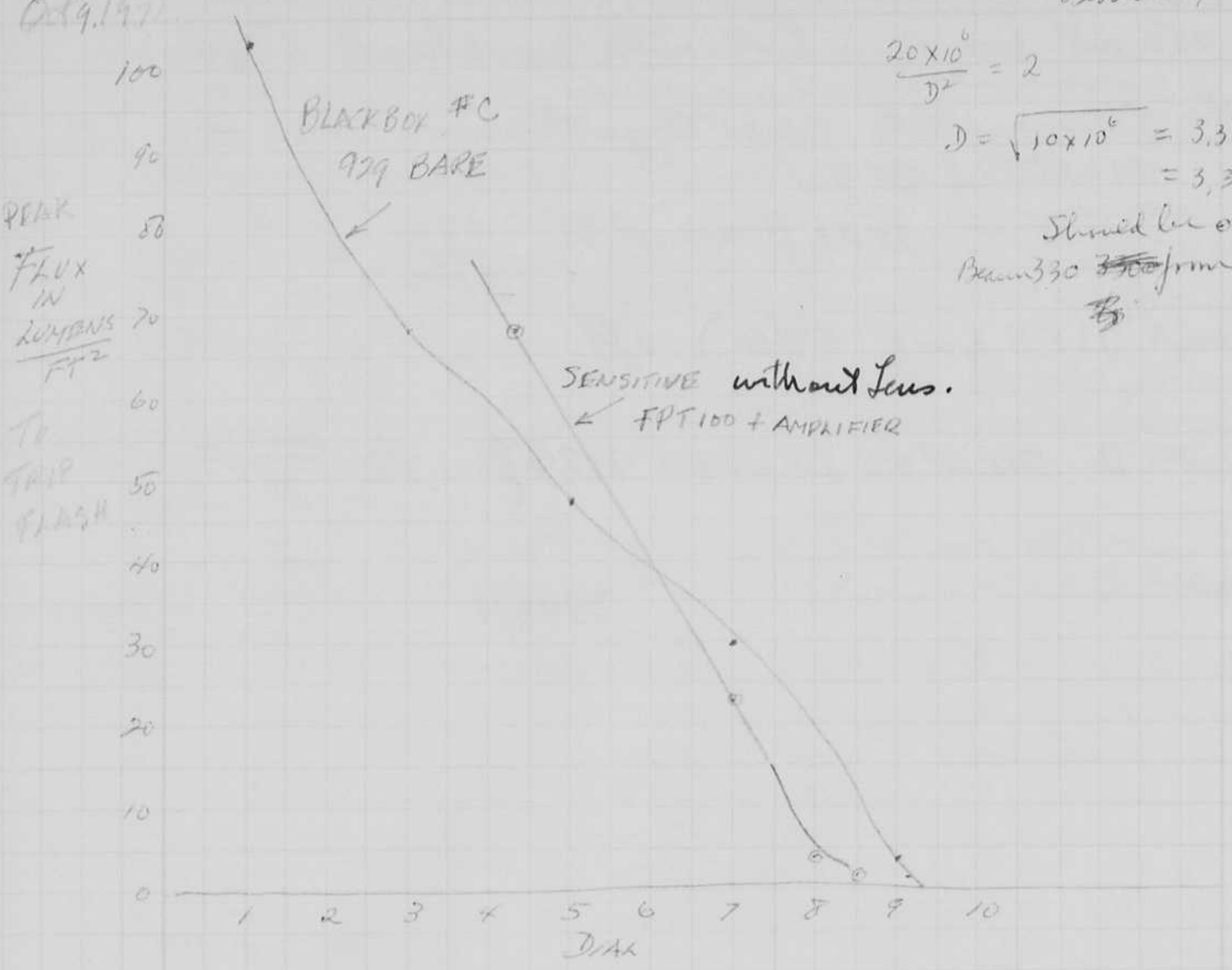
Black Box

$\frac{20 \times 10^6}{D^2} = 2$

$D = \sqrt{10 \times 10^6} = 3.3 \times 10^3$ feet

$= 3,300$ feet.

Should be ok for Beam 330 from Pond.



Suppose a sensitivity of 2 lumens/sq ft is practical for self-trigger

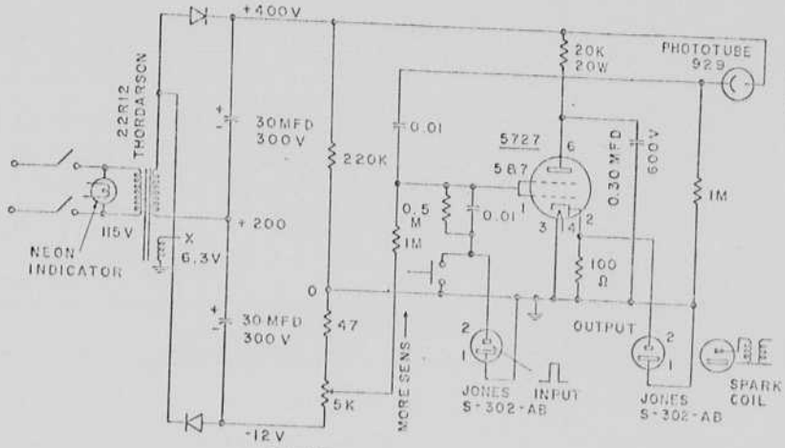
How far will trip operate for 20×10^6 C.P.? Black Box or FPT-100

$2 = \frac{20 \times 10^6}{D^2}$ $D^2 = 10 \times 10^6$ or $D = 3.1 \times 10^3 = 3100$ feet.

This should be tried at night out doors where the noise from street lights is negligible.

* Bug flash in spherical reflector. 80 μf duration and 27 B.C.P.S.

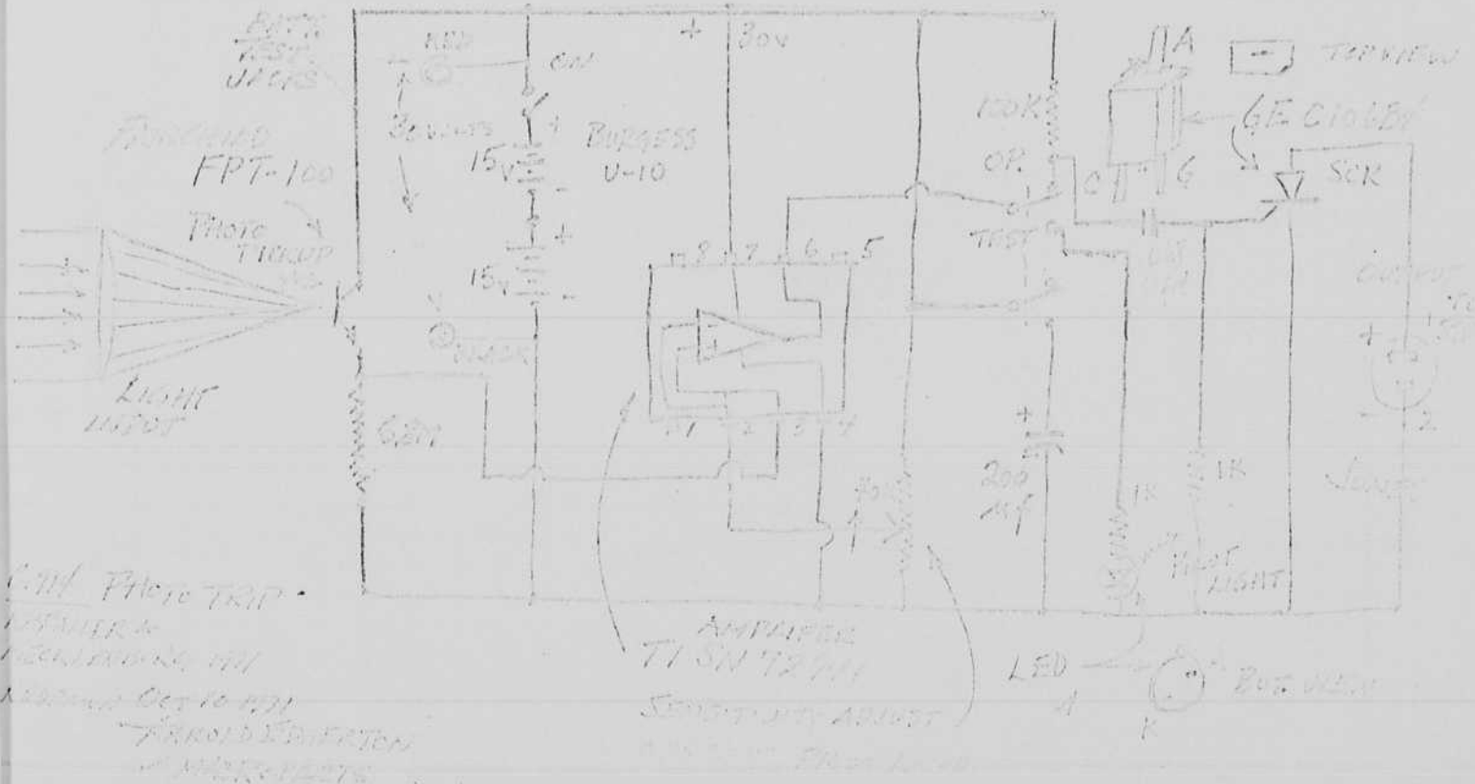
Maxsens = 2 lumens/sq ft.



FAST TRIGGER CIRCUIT FOR MULTIFLASH

BLACK BOX TRIGGER

H. E. EDGERTON
M.I.T. STROBE LAB.
JANUARY 1964



Harold Edgerton MIT 4-405 Strobe Lab.

Oct 9, 1971

Nov 25 1971

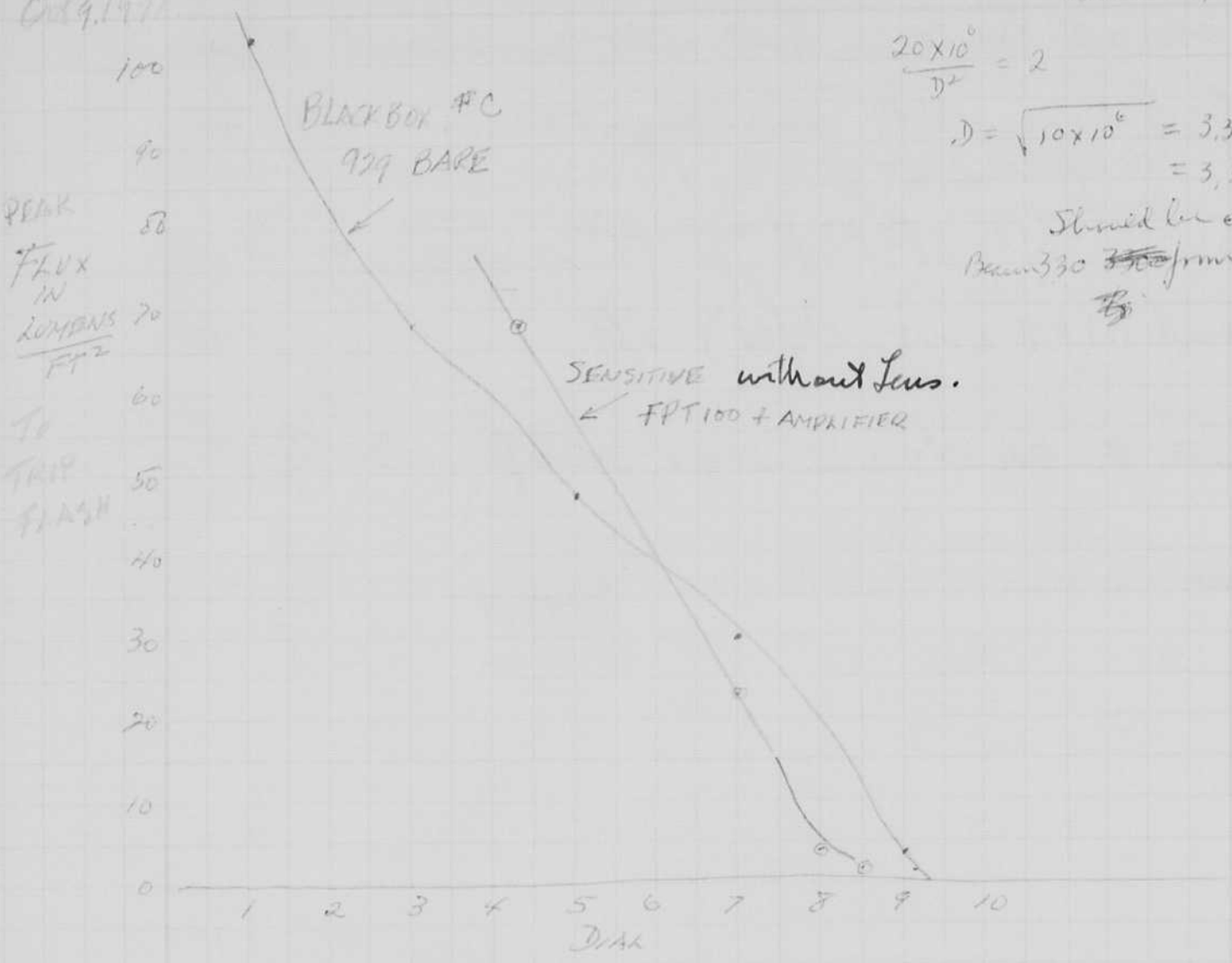
Black Box

$\frac{20 \times 10^6}{D^2} = 2$

$D = \sqrt{10 \times 10^6} = 3.3 \times 10^3$ feet
$= 3,300$ feet.

Should look for Beam 330 ~~330~~ from Pond.

~~By~~



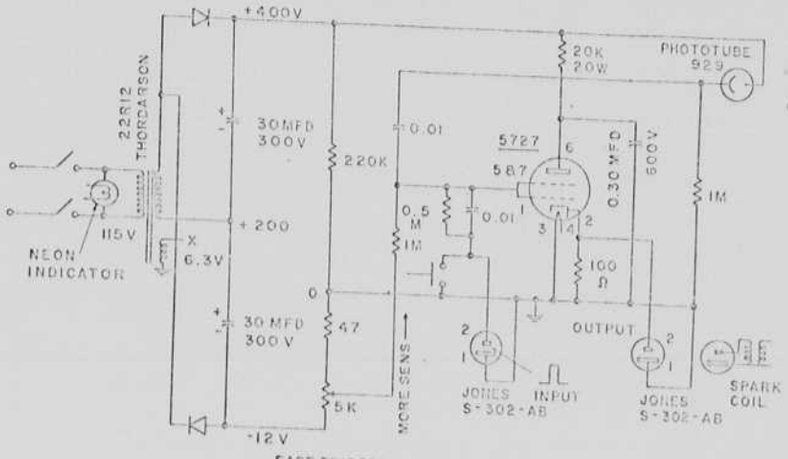
Suppose a gen trigger setting of 2 lumens/sq ft is practical
How far will trip operate for 20×10^6 C.P.? Black Box or FPT-100

$2 = \frac{20 \times 10^6}{D^2}$ $D^2 = 10 \times 10^6$ or $D = 3.1 \times 10^3 = 3100$ feet.

This should be tried at night out doors where the noise from street lights is negligible.

* Berg flash in specular reflector. 80 mf duration and 27 B.C.P.S.

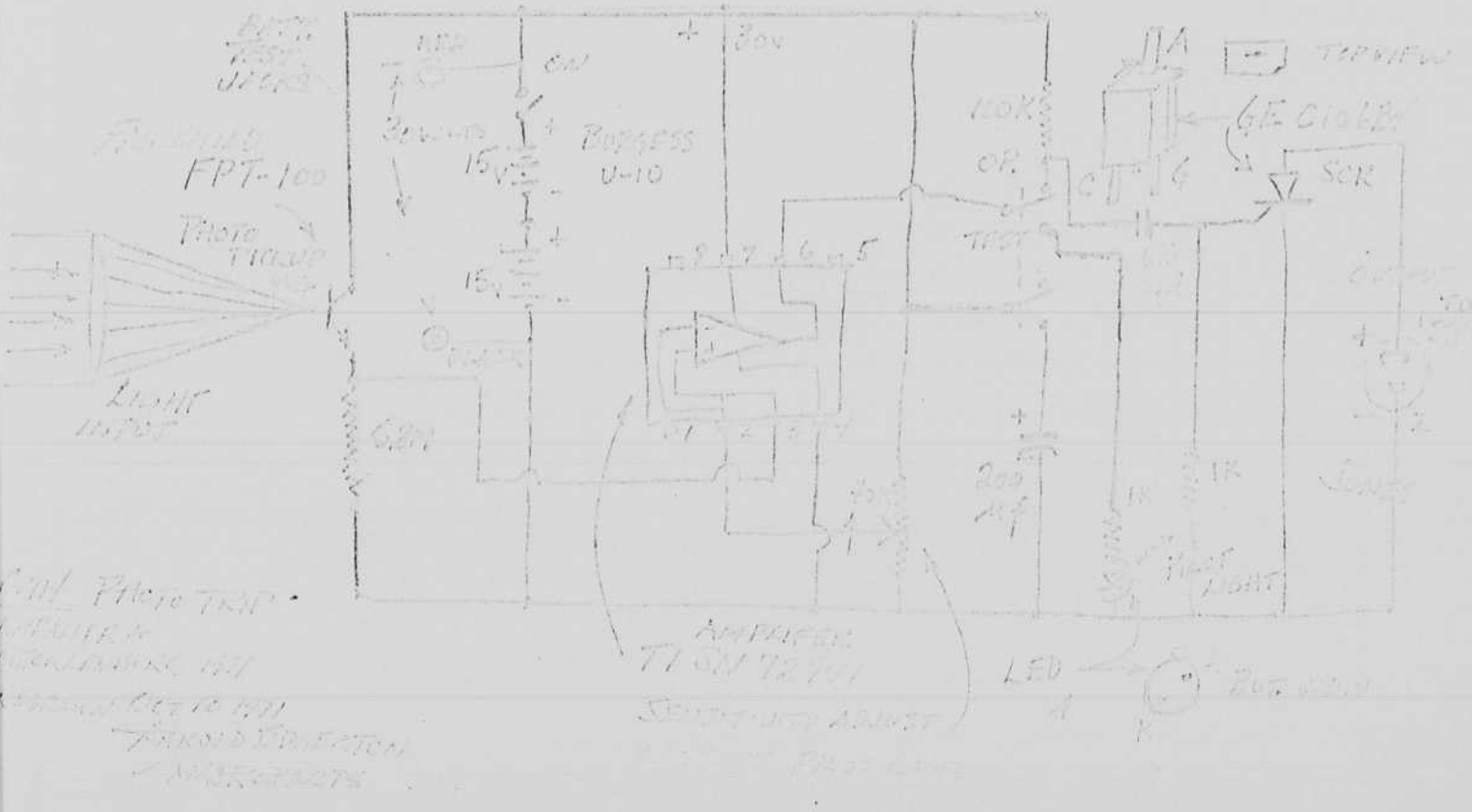
Max sens = 2 lumens/sq ft.



FAST TRIGGER CIRCUIT FOR MULTIFLASH

Basic Box Trigger

H.E. EDGERTON
M.I.T. STROBE LAB.
JANUARY 1964



Harold Edgerton

Jeff Coleman
Joe Cohen
Sat night
at 330
Beacon
N Boston
Oct 9/71

M.I.T. Strobe Lab 4-405

6.714 Project Lab Oct.--Nov. 1971

Photograph of MIT at Night from Boston

With a Large Flash Unit

Description of Lamps. Two systems are used consisting of a 30" diameter specular reflector with a FT 617 (General Electric Co.) flash lamp. The electrical conditions are

Capacitance C = 3000 microfarads

Voltage E = 4000 volts

Stored Energy $\frac{CE^2}{2}$ = 24,000 watt seconds

Lamp A Bank 1 (BCPS) = 2,340,000 candela sec.
(4 minute charge)
2,140,000 candela sec.
(2 minute charge)
1,560,000 candela sec.
(1 minute charge)

Lamp B Bank 2 (BCPS) = 1,880,000 candela sec.
(4 minute charge)
1,820,000 candela sec.
(2 minute charge)
1,300,000 candela sec.
(1 minute charge)

Total output for 4 minute charge

BCPS = 4,220,000 candela sec.

The Guide Factor is then

$$DA = \sqrt{(BCPS)\ \frac{s}{c}}$$

Introducing numbers BCPS = 4.22×10^6 candela sec.

s = 125 (plus x film)

c = 15

DA = 5900

Therefore at 1500 ft.

A = f4 aperture of camera.

Use of f 4.7
absorption of light
due to atmosphere

6 & 15 1977

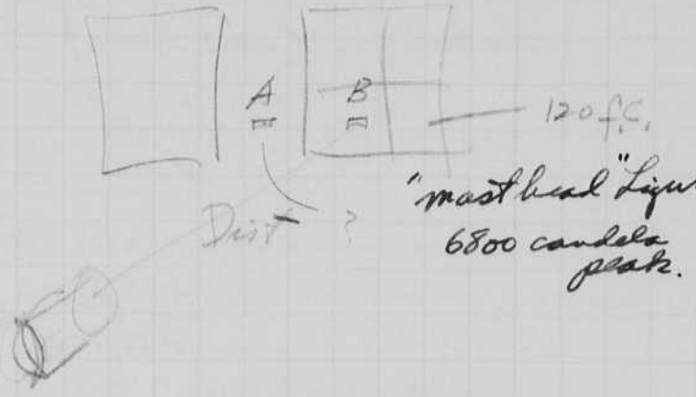
Harold E. Edgerton
Joe Cohen Jim Kirsch.

Bug flash
17 BCPS duration 80 μs

Photo field (793 Tower)

Dist. feet	Setting* max	min	Position
165	8+7	13	A
384	672	302	A
384	188	127.	B

* for indication on small red lamp on the sensitive preamp



T Bug flash.

HCP	0.2×10^6	Bare
BCP	20×10^6	Reflector
R 5°	8×10^6	
L 5°	20×10^6	
L 10	15×10^6	
R 10	5×10^6	

M = 100 grain

Oct 19

Tests of this equipment were made sunday night oct 17 from apartment 11-7A to the 330 Beacon St roof.

The "bug flash" in a specular reflector gave a peak output of 20×10^6 candela.
Assume distance = 1500 feet. then $\frac{20 \times 10^6}{(1.500)} = 7$ lumens/sq ft.

Triggering of the "sensitive" unit were otz from 100 → 20.
Operation was negative for 10.

Photographs from Prudential Lamps on 330 Beacon on Oct 20.
Julia Tepper Student Senior Harvard 354-6308 helped.

1	4.7	1/60 sec	plus X 8 min DK50	all were thin!
2	"	1/30	new DK50 15 min	
3	4.7	1/60		
4	8	1/60		
5	8	1/60		
6	4.7	1	Shutter stuck open! until strobe was inserted	

? Does the pollution absorb the light?

Beinart, Julian — M.I.T. Arch. Dept
Wachman, Avraham — Technion Haifa Israel } visitors

Harold Edgerton

Joe Cohen
Sat night
at 330
Beacon
Boston
Bar Harbor
Oct 9 1971

M.I.T. Strobe Lab 4-405

6.714 Project Lab Oct.--Nov. 1971

Photograph of MIT at Night from Boston

With a Large Flash Unit

Description of Lamps. Two systems are used consisting of a 30" diameter specular reflector with a FT 617 (General Electric Co.) flash lamp. The electrical conditions are

Capacitance C = 3000 microfarads

Voltage E = 4000 volts

Stored Energy $\frac{CE^2}{2}$ = 24,000 watt seconds

Lamp A Bank 1 (BCPS) = 2,340,000 candela sec.
(4 minute charge)
2,140,000 candela sec.
(2 minute charge)
1,560,000 candela sec.
(1 minute charge)

Lamp B Bank 2 (BCPS) = 1,880,000 candela sec.
(4 minute charge)
1,820,000 candela sec.
(2 minute charge)
1,300,000 candela sec.
(1 minute charge)

Total output for 4 minute charge

BCPS = 4,220,000 candela sec.

The Guide Factor is then

$$DA = \sqrt{(BCPS)\ \frac{s}{c}}$$

Introducing numbers BCPS = 4.22×10^6 candela sec.

s = 125 (plus x film)

c = 15

DA = 5900

Therefore at 1500 ft.

A = f4 aperture of camera.

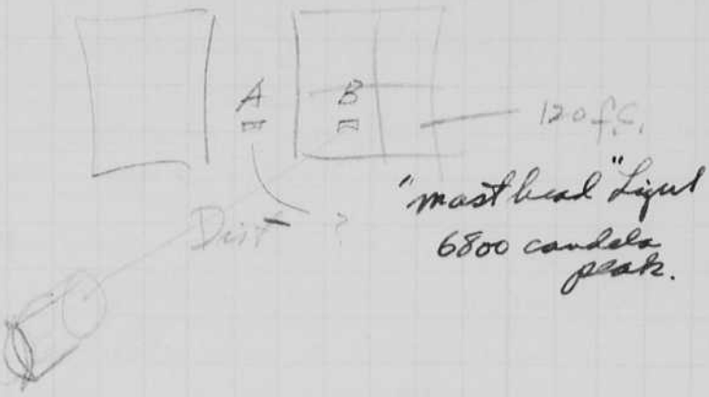
Should be f4.7 allowing for light absorption due to atmosphere

Oct 15 1977
Harold E. Edgerton
Joe Cohen John Kirkey.

Bugflash
17 BCPS duration 80 ms

Photofinish (793 Tower)

Dist. feet	Setting* max	min	Position
165	8+7	13	A
384	672	302	A
384	188	127.	B



* for indication on small red lamp on the sensitive package

T Bug flash.

HCP	0.2×10^6	Bare	
BCP	~~70~~ $\times 10^6$	Reflector	M = 100 gain
R 5°	8×10^6		
L 5°	20×10^6		
L 10	15×10^6		
R 10	5×10^6		

Oct 19

Tests of this equipment were made sunday night Oct 17 from apartment 11-7A to the 330 Beacon St roof.

The "bugflash" in a specular reflector gave a peak output of 20×10^6 candela.
Assume distance = 1500 feet. then $\frac{20 \times 10^6}{(1.500)} = 7$ lumens/sq ft.

Triggering of the "sensitive" unit were otc from 700 → 20.
Operation was negative for 10.

Photographs from Prudential Lamps on 330 Beacon on Oct 20.
John Tepper Student Senior Thesis 354-6308 helped.

1	4.7	1/60 sec	plus X 8 min DK50	all were thin!
2	"	1/30	new DK50 15 min	
3	4.7	1/60		? Does the polyester absorb the light?
4	8	1/60		
5	8	1/60		
6	4.7	1	Shutter stuck open! until Strobe was inserted	

Bimart, Julian M.I.T. audio Dept
Wachman, Abraham Technion Haifa Israel } visited

Oct 22 1971
Harold Edgerton.

Lamp on 330 beacon 4×10^6 BCPS (in two lamps).
Kodatron (oakbox) 8,000 BCPS.

$$\frac{4 \times 10^6}{8000} = 500 \text{ ratio.}$$

$$\sqrt{500} = 22.5 \text{ distance}$$

$$\frac{1500 \text{ ft}}{22.5} = 67 \text{ feet.}$$

Plus x film $DA = \sqrt{8000 \frac{125}{15}} = \sqrt{8000\ 8.35} = \sqrt{67,000} = 258.$

$A = \frac{258}{67} = 3.86$ ~~feet~~. aperture
$= f4.$ for Plus x film.

Guide factor for other films Panatomic 250

$\sqrt{2} = 1.41$ 67 → 95 feet.

258 or $DA = 1.41 \times 258 = 366.$

$\frac{366}{67} = 5.46$ aperture

2.40/sec test in 4-410 with 8300 BCPS Wood box Kod. at 50 & 60 feet.

f 4.7 Plus x ASA 125

f. 4.7 Panatomic Prem ASA 250 1/30 sec.

DK50 at 20 minutes development

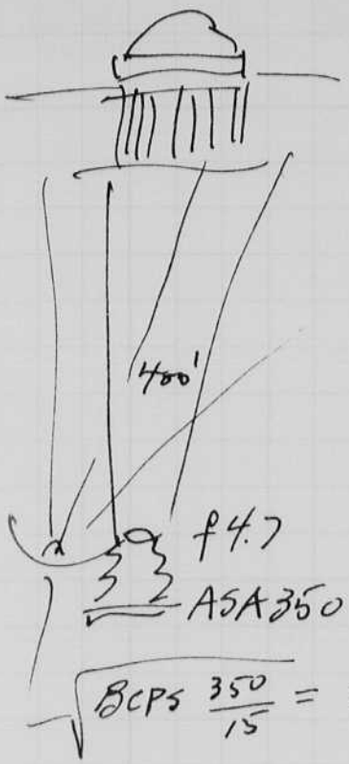
Oct 30 1971 Sat. now trying xxx film in DK 76 10 min 70°.

2 Lamps at 330 Beacon tended by Bob. Reiter 32 Hereford St Chi Phi? Baltimore.

2 photos made at 450 Beacon Aaron Kupperschmitt? Steve Slagen.
f 4.7 at ∞

4 photos at Prad on 51 floor level outside
f 4.7 at ∞

Note Exposure looks ok DK 76 at 10 min 70°
but lighting is uneven in the main court.
It will be better when the leaves are gone and we have a large skylight in the main court shining on the columns. 300' or 400 ft.



Illumination for Main Court with electronic flash.

Absorption of light in the air causes a difference in the Guide factor.

Thus the exposure on the Dome is less ~~than~~ when exposed from the Prudential building than when exposed on Beacon street.

$\sqrt{BCPS \frac{350}{15}} = 4.7 \times 400 = 2000.$

BCPS = 200,000 candela sec.

P.S. My Microbus 1964 ⓦ which was ~~stolen~~ from Beacon ~~street~~ near 330 is still gone. Mass ~~#~~ 356-015. Vehicle 1315371 Rust color Polished Hub caps.

Oct 1971

Oct 1971

STROBE LAB, Room 4-405 (ext. 4629) Classrooms 8-419, 10-275

Oct. 1971

LABORATORY PERSONNEL:
Edgerton, Harold, 100 Memorial Drive, Cambridge 864-4790
Delvers, Ed, Burton House, Tel. 547-1939 or dorm line 810-8170
MacRoberts, Bill, 105 Whidden Ave., Whitman 1-447-4172
Mooney, Jean, 27 Birch Road, Watertown, Ma. 924-7124
Richardson, Dave, 88 Beacon St., Apt. 23, Somerville, Ma. 02143, Tel. 661-0857

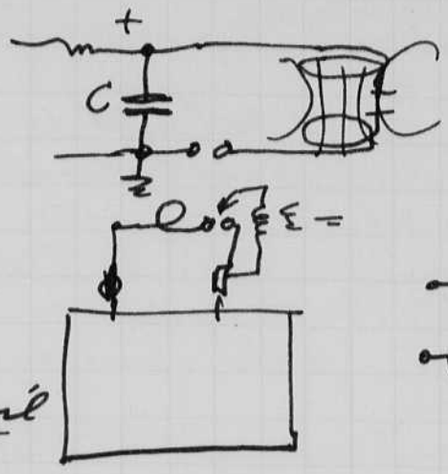
FRESHMAN SEMINAR
Bass, Lawrence, A-311, MacGregor, dorm ext. 810-9666 or ext. 1461
Blumenthal, Steve, 155 Bay State Rd, Boston, ext. 3205 or 267-8574
Cantor, Cliff, Baker House, ext. 3161
Coleman, Jeff, Rm. 404, 4 Ames St., ext. 3192
Eidinger, John, 155 Bay State Rd., Boston, ext. 3205 or 267-8574
Fenning, Fred, 253 Comm. Ave., Boston
Ferguson, Ed, 69 Chesnut St., Cambridge, ext. 1726
Kalin, Ed, 333-C Burton House, ext. 810-8611 or ext. 3261
Lieberman, Paul, 407 Bexley Hall, dorm line 810-9647 or ext. 3744
Lipschutz, Dave, Baker House, 311 dorm line 810-8311 or ext. 3161
Nadelson, Jay, 229 Com. Ave., Boston, 262-8967 or ext. 3175
Neuhausen, Mark, 155 Bay State Rd., Boston, ext. 3205 or 627-8895
Raila, Paul, 155 Bay State Rd., Boston ext. 3205 or 267-8574
Sadock, Bob, 450 Beacon St., Boston, ext. 3625 or 247-7775
Vaca, Ken, 34 The Fenway, Boston, ext. 3202 or 247-9528

6.714
Biedrzycki, Dennis, 42 Tupelo Rd, Swampscott 247-9102
Butin, Charles, Rm. 125-C, MacGregor House, ext. 1461 or dorm line 810-9515
Cohen, Joe, 34 Gurney St., Cambridge 661-3216
Evans, Dave, 137 Clark St, apt. #2, Cambridge 492-3404
Evans, Bob, 253 Comm. Ave., Boston, 247-8581
Glazer, Steve, 450 Beacon St., Boston, ext. 3625 or 247-7775
Greenberg, Harvey, 103 School St., Cambridge 661-9698
Hansen, Victor, A-223 MacGregor, Cambridge, dorm line 810-9665 or ext. 1461
King, Richard, Apt. 12, 1379 Com. Ave. Allston, 783-3049
Kirksey, Jim, 528 Beacon St., Boston, ext. 3265 or 247-7790
Kuppersmith, Aron, 450 Beacon St., Boston 267-5270 or ext. 3625
Leemon, Daniel, 14 Parkman St., Apt. #3, Brookline 731-4052
Merhar, Milan, 530 Beacon St., Boston, ext. 3785 or 266-2968
Reiter, Bob, 32 Hereford St., Boston, ext. 2955 or 247-8355
Ritter, Alan, Baker House, ext. 3161
Roppel, Jim MacGregor A-122, dorm line 810-9652 or ext. 1461
Rudd, Wayne, 168 Elm St., Cambridge 492-7364
Sharp, John, MacGregor House, D-213 Dorm line 810-9465 or ext. 1461
Stingel, Scott, 518 Beacon St., Boston 536-1300
Sullivan, Kevin, 111 Bay State Rd, Boston, ext. 3157 or 536-2497
Trachtman, Dick, 450 Beacon St., Boston ext. 3625 or 247-7775

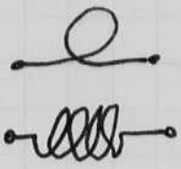
6.855 and 6.852 (UNDER)
Gibney, Tom, 12B Cottage St, Newton, 969-3478
Short, Bill, 215 Baker House, dorm line 810-8215 or ext.3161

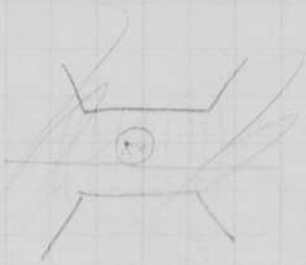
Chester NJ ~~Berlin~~ Brooklyn VI ~~&~~ XI 1972. Nov. 1, 1971

Magnetic Field.



Optics. Phots.
Streak.
High Speed Movie





November 7 1971 Sunday.

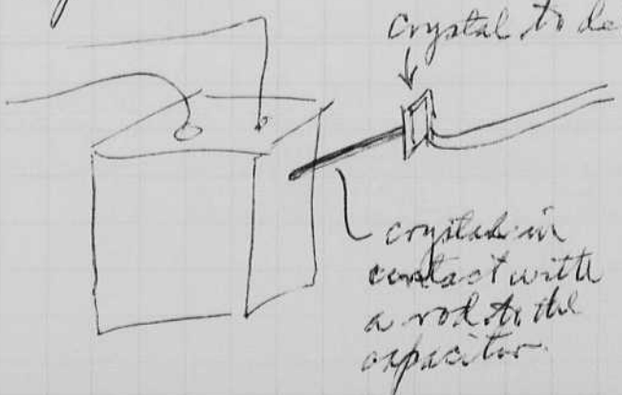
Read and understood
Nov 15, 1971. V.E. MacRoberts.

I disclosed to Cadwallader at ~~EG&G~~ inc Bedford a method of finding capacitors that were going to fail due to internal sparking at the lead-foil connection.

The idea is to use a sonic detector such as a crystal to listen for the noise from the spark. One way is to display on an oscilloscope. Another is to read the peak noise as a function of the peak current through the capacitor.

There have been capacitors recently that have failed on long-time beacon service due to arcing at the terminals.

this system will be able to find this defect early in the game - and remove the capacitors.



Oct 1971

Oct 1971

STROBE LAB, Room 4-405 (ext. 4629) Classrooms 8-419, 10-275

Oct. 1971

LABORATORY PERSONNEL:
Edgerton, Harold, 100 Memorial Drive, Cambridge 864-4790
Delvers, Ed, Burton House, Tel. 547-1939 or dorm line 810-8170
MacRoberts, Bill, 105 Whidden Ave., Whitman 1-447-4172
Mooney, Jean, 27 Birch Road, Watertown, Ma. 924-7124
Richardson, Dave, 88 Beacon St., Apt. 23, Somerville, Ma. 02143, Tel. 661-0857

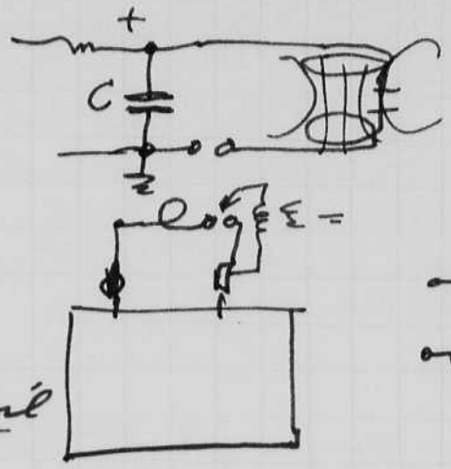
FRESHMAN SEMINAR
Bass, Lawrence, A-311, MacGregor, dorm ext. 810-9666 or ext. 1461
Blumenthal, Steve, 155 Bay State Rd, Boston, ext. 3205 or 267-8574
Cantor, Cliff, Baker House, ext. 3161
Coleman, Jeff, Rm. 404, 4 Ames St., ext. 3192
Eidinger, John, 155 Bay State Rd., Boston, ext. 3205 or 267-8574
Fenning, Fred, 253 Comm. Ave., Boston
Ferguson, Ed, 69 Chesnut St., Cambridge, ext. 1726
Kalin, Ed, 333-C Burton House, ext. 810-8611 or ext. 3261
Lieberman, Paul, 407 Bexley Hall, dorm line 810-9647 or ext. 3744
Lipschutz, Dave, Baker House, 311 dorm line 810-8311 or ext. 3161
Nadelson, Jay, 229 Com. Ave., Boston, 262-8967 or ext. 3175
Neuhausen, Mark, 155 Bay State Rd., Boston, ext. 3205 or 627-8895
Raila, Paul, 155 Bay State Rd., Boston ext. 3205 or 267-8574
Sadock, Bob, 450 Beacon St., Boston, ext. 3625 or 247-7775
Vaca, Ken, 34 The Fenway, Boston, ext. 3202 or 247-9528

6.714
Biedrzycki, Dennis, 42 Tupelo Rd, Swampscott 247-9102
Butin, Charles, Rm. 125-C, MacGregor House, ext. 1461 or dorm line 810-9515
Cohen, Joe, 34 Gurney St., Cambridge 661-3216
Evans, Dave, 137 Clark St, apt. #2, Cambridge 492-3404
Evans, Bob, 253 Comm. Ave., Boston, 247-8581
Glazer, Steve, 450 Beacon St., Boston, ext. 3625 or 247-7775
Greenberg, Harvey, 103 School St., Cambridge 661-9698
Hansen, Victor, A-223 MacGregor, Cambridge, dorm line 810-9665 or ext. 1461
King, Richard, Apt. 12, 1379 Com. Ave. Allston, 783-3049
Kirksey, Jim, 528 Beacon St., Boston, ext. 3265 or 247-7790
Kuppersmith, Aron, 450 Beacon St., Boston 267-5270 or ext. 3625
Leemon, Daniel, 14 Parkman St., Apt. #3, Brookline 731-4052
Merhar, Milan, 530 Beacon St., Boston, ext. 3785 or 266-2968
Reiter, Bob, 32 Hereford St., Boston, ext. 2955 or 247-8355
Ritter, Alan, Baker House, ext. 3161
Roppel, Jim MacGregor A-122, dorm line 810-9652 or ext. 1461
Rudd, Wayne, 168 Elm St., Cambridge 492-7364
Sharp, John, MacGregor House, D-213 Dorm line 810-9465 or ext. 1461
Stingel, Scott, 518 Beacon St., Boston 536-1300
Sullivan, Kevin, 111 Bay State Rd, Boston, ext. 3157 or 536-2497
Trachtman, Dick, 450 Beacon St., Boston ext. 3625 or 247-7775

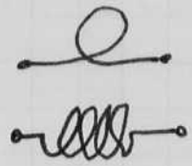
6.855 and 6.852 (UNDER)
Gibney, Tom, 12B Cottage St, Newton, 969-3478
Short, Bill, 215 Baker House, dorm line 810-8215 or ext.3161

Chester NJ ~~Berlin~~ Brooklyn VI ~~&~~ XI 1972. Nov. 1, 1971

Magnetic Field.



Optics. Photo.
Streak.
High Speed Movie



November 7 1971 Sunday.

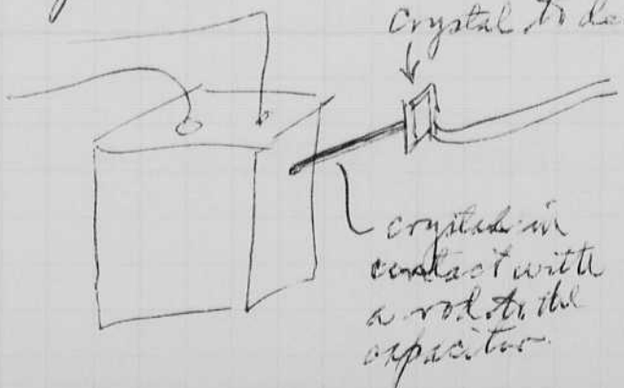
Read and understood Nov 15, 1971. V.L. MacRoberts.

I disclosed to Cadwallader at ~~EG&G~~ inc Bedford a method of finding capacitors that were going to fail due to internal sparking at the lead-foil connection.

The idea is to use a sonic detector such as a crystal to listen for the noise from the sparks. One way is to display on an oscilloscope. Another is to read the peak noise as a function of the peak current through the capacitor.

There have been capacitors recently that have failed on long-time beacon service due to arcing at the terminals.

this system will be able to find this defect early in the game - and remove the capacitors.



Nov 8 1971

Harold Edgerton

Party last night at apt #7A 100 memorial drive for 6 MIT students and girl friends. Some 19 came for a roast beef dinner.

Photos were made last night at 6 or 7 pm with the Sunlight equipment. 3 condenser banks total about 1000 mfd at 4000 volts uses FT-617 lamp in a 30" reflector. We took photos near Bldg 13. It started to rain so we quit. One of the photos shows the rain drops.

Dave Richardson reports that the unit has 600,000 BCPS output with 3 capacitors. Beam spread is 40° to half light.

I plan to use this with main camera at 300 ft from the Dome. The camera will be on the Prudential building. Another flash will be on 330 beacon st. It has 5x10⁶ B.C.P.S. and is feet from the Main Dome.

Nov. 24, 1971. Photos of M.I.T. made last night from Prudential. Test of lamps in main camera.

Lamp in Bldg #1 classroom.

FT-617 with 1000 mfd and 100 ft of cable in 3 banks of 330 mfd each

200,000 B.C.P.S.

Beam	Dia	Watts
Full	2750	1070
1/2	772	504

Cords.	Output BCPS	% Down
0	.278 x 10⁶	0
50 ft	.245	11.9
100	.225	19.1
150	.206	26

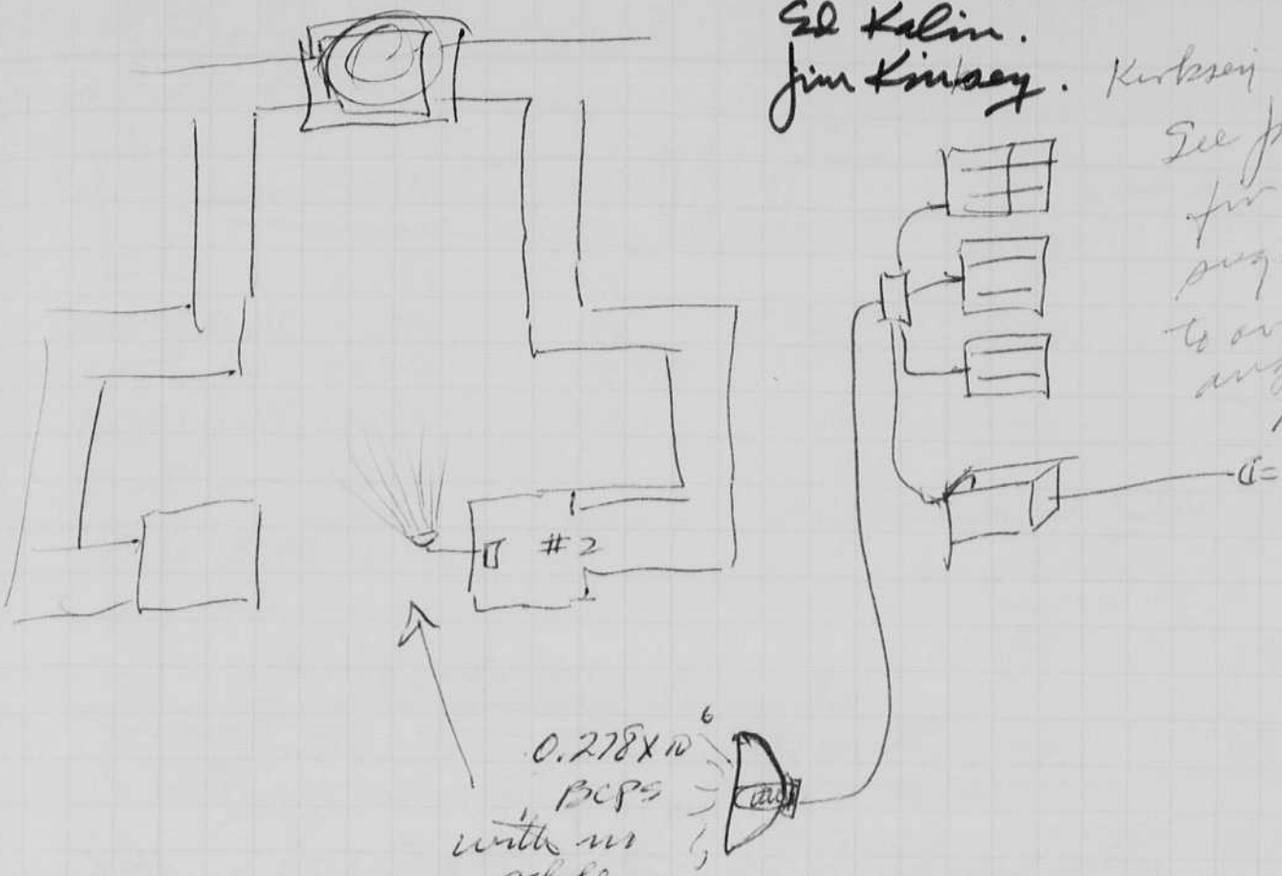
FT-215 in 6" spot

Full	10,000 BCPS	2450
1/2		

Sent to Brenwald. (1) 2 Photos from Courtyard on XXX f4.7. Looks OK. over exposed

(2) 2 Photos from 330 beacon Roof. Out of focus due stop pin being out of setting. I must check on this fixture when I use the camera!

David Bluso.
Mehar. Marvin.
Ed Kalin.
Jim Kirksey. Kirksey



See page 92 for trigger suggestion! To avoid narrow angle of receiver

Cabo Rivo

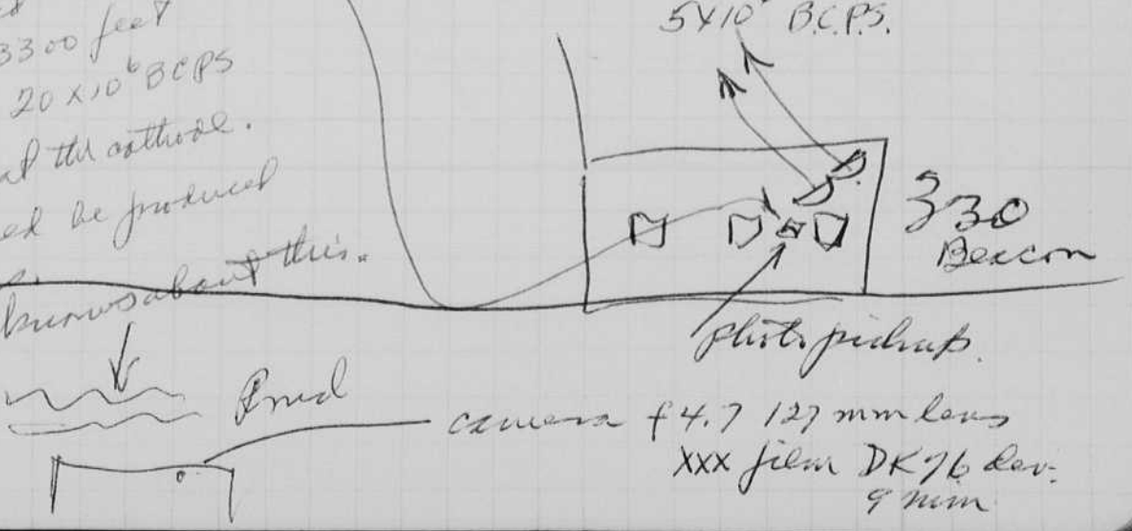
Nov. 25 1971

#3 Camera on 51st floor of Prud. The beg light was used to synch to 330 Beacon. Did not flash on 60 changed to 400. Flashed on flashlight from the Prud! also flashed from outside. Wind caused variation of angle. Suggest wider beam ~~receiver~~ for the next try, or a solider tripod for the photo pickup.

Hello. Problem with the sensitive flash receiver on Beg 330 Beacon was experienced due to wind blowing the tripod.

note one holder gave out of focus photo!!! check

Suggest Beach box instead solid shroud trigger at 3300 feet from the Beg flash 20 x 10⁶ BCPS with a lumens/sq ft at the asthode. Further sens could be produced with a pressed beam. Jim Kirksey knows about this.



Nov. 26 1911 Motor test.
Hawk Repulsion 10-409
Bill Mac Alloots

VA 6165
coil on motor

VL 1.500 1008
115/60/1 CCW

No Load CORK

↑ motor number

3550 → 3600

110 V	3370	
80	3360	
70	3300	
60	3040	3020
40	1370	1360
30	840	
15	2520	
30	very slow.	

Spot. Disc

3560 - 3600 Diam = ? 8 1/8" disc

110 V	3040
100	2960
90	2820
80	2620
70	2230
60	1440
50	1050
40	720
0	0

15 5/8" Disc

600 R.P.M. on 110 volts
Too heavy a load!

Suggest 230 volt 60 ~ motor run on 115 volts.

250Ω in series
110 V 2800
60 on Resistor
90 on motor
124 Line.

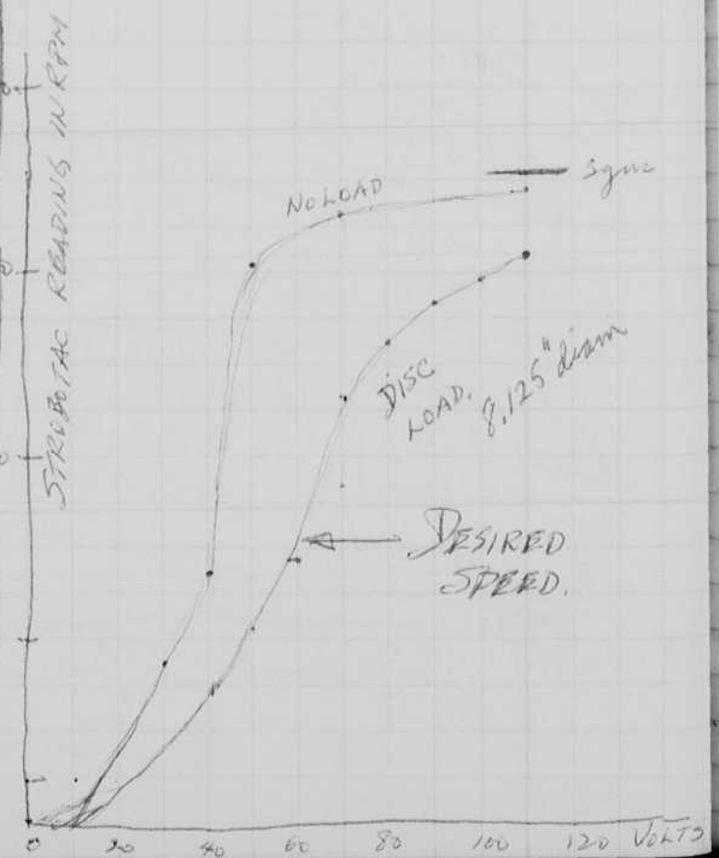
500Ω 73 Resistor 1800
73 motor
124 Line.

500 80 Res. 1380.
60 on Motor
124 Line.

25 watt
120 volt
Lamp
in
Series

1400 Rpm ✓

Start up Lamp 1020 → 1080

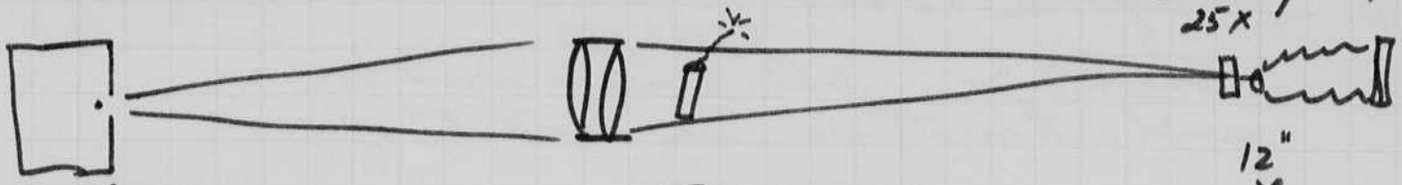


26

Nov 25 1971 Friday

Field Lens Photography.

Harold Edgerton
Dave Richardson.



Microflash
0.05 mfd
16 KV water
point source.
0.6 BCPS.
0.5 μs

FIRE CRACKER.

exposure on film

$$= \frac{0.6}{25} \times \frac{1}{1^2} \equiv .02 \ \frac{\text{lumen sec}}{\text{sq foot}}.$$

The flame from the
fire cracker does not
expose badly at f 11 with
1.4 density filter and Plus X film.

Dec 10, 1971
Harold Edgerton

Dick Scott is now back from Greece. He came in on 3 of Dec on T.W.A. #129. 3:?.

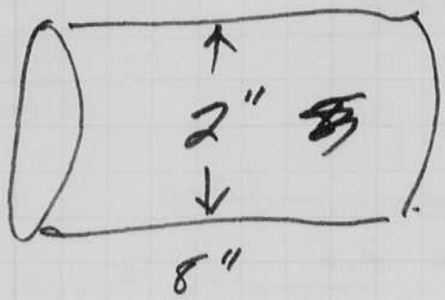
Dec 13. 71 → I go to California tomorrow at 9 am on American Airlines.

I attended the opening of the exhibit on (Dec 10) the Queen Mary (a large ship) in San Diego Harbor. Capt J. Y. Cousteau has made a museum of part of her. It was a big affair with 3000 plus people attending.

104 Dec 30? 29, 1971 H. Edgerton Bill MacRoberts.

Analysis of core taken at Halicl Aegean Greece in Summer.

Core #22 .050" screen used to sort out material in last 8" of core.



→ 30 grams of Shells and organic Broyoids.

→ 3 grams of Stones. Some Round. Some Sharp Various colors.

Dec 31 1971

Photographed above after sorting etc. The remaining mud and fine sand that went through the screen (.050" holes) was dried in a pan on the radiator.

30 grams of shells Broyoids
3 grams of gravel.

Jan. 3, 1972 ~~Harold Edgerton~~
Bill MacRoberts.

Test of 14 spark gaps for Eb & Eg. These fit the 550 549 Serial #8 ~~#2~~ white no 3 rear switch. These are the end on view gaps with a 1/16" hole ($\frac{25.4}{16}$ mm.).

Reference # 8 gap from previous lot Measured on page 100 Book VII V.E.M.

1 x 10^6 peak H.C.P. – 0.7 μsec.

Today 0.78 x 10^6 peak H.C.P. – 0.8 μsec.

929 P.C. Battery 490 v. @ 79 Bench.

1/3/72

Light Output Point Sources

V.E.M. December '71 production lot.

Gap. No.	H.C.P. PEAK	DURATION msec.	
7	0.76×10^6	0.76	
8	0.76	0.76	
9	0.7	0.7	
10	0.85	0.76	
11	.60	0.60	Flat top.
12	.80	0.7	Shows short peak.
13	.7	.75	Flat top.
7	.7	.75	" "
8	.75	.8	" "
1	.8	.8	Peak.
2	.8	.7	Flat.
3	.8	.8	Peak.
4	.7	.7	Flat
5	.7	.7	Flat.
6	.8	.8	Peak
14	.7	.7	Flat top.

Spark units 1 to 12 to be sent to Salem EG&G.

13 & 14 stay here.

(549-11) and (549-21) Dewar. high voltage.

Developed in DK76 for 15 min.

Jan 7 1972. Test of Dewar for Red Falcon. 5750. 87C

1. Lab. Bill at 50' 1/125 sec.
2. " HE at Sign/Billboard no flash.
3. " " " " (Bill Brd no flash?
4. " Bill at bend 50' no flash?
5. " Test of flash ok.
6. " HE at 25' no flash
7. " Bill at 50' ok
8. " 1/8 sec no flash/lights on Synchrotest.
9. " 1/125 f 2.5 Bill 50' HE 25'
10. miss? why.
11. miss? why.
12. changed to 1/60 from 1/125 shutter speed
13, 14, 15 chronometer tests with 1/60 1/125 are ok.
16. 1/125 sec miss!!!
17. 1/60 sec ok f/lab. No flash
18. 1/60 sec HE at 25' flash 21'
19. miss?
20. miss why.

Jan 8 72 HE

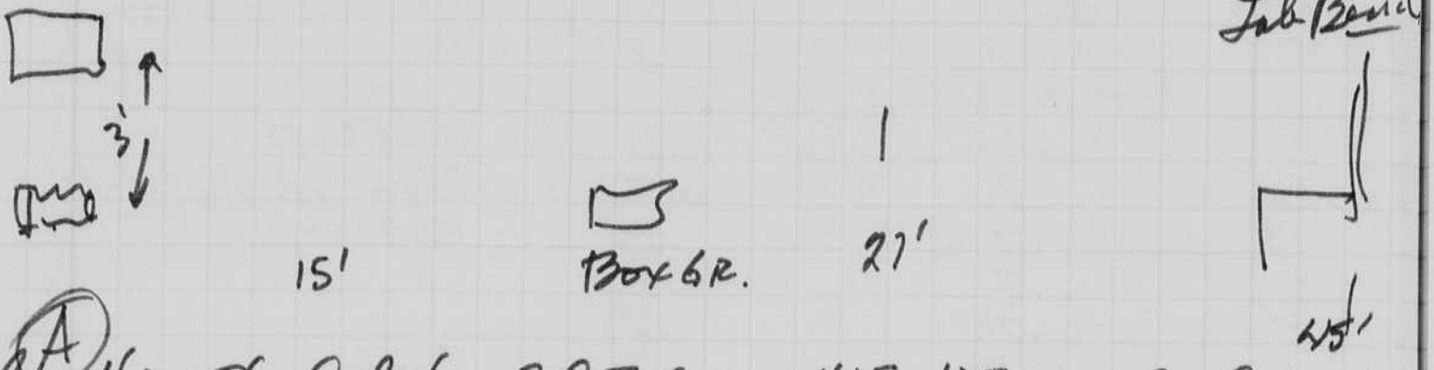
Exposure looks good at 40 feet.

Doors is very bad. Note the camera was set at 20 m not 20 ft!!

106 Jan 8 1972
Harold Edgerton

Test of Infra Red Film with Strobe.

5750 BCPS with 87C (Densetyk0) Infra Red follow
Nikomat NIKKORMAT FT 3508887 from N.G. Soc.
Lens NIKKOR P # 1652763 f 2.5 105 mm



(A)
Film High Speed Infra Red Film HIE 135-20 Eastman Kod

12:35	1.	1/125 sec	20'	~~Room light~~ with lamps off		No Strobe
	2	"	20'	Room Lamps on		"
	3	1/15 "	"	"		"
	4	1 sec	"	"	"	"
	5	1/125	20'	focus at 23' infinity	"	5750 + 87C
	6	1/125	15'	1.22 out of focus scale ok		
	7	1/125	20'	#2 in focus at 23' Exp good.		
	8	1/125	30'	#3 out Bad Underok		
	9	1/125	40+	Everything out of focus		
	10	"	"			

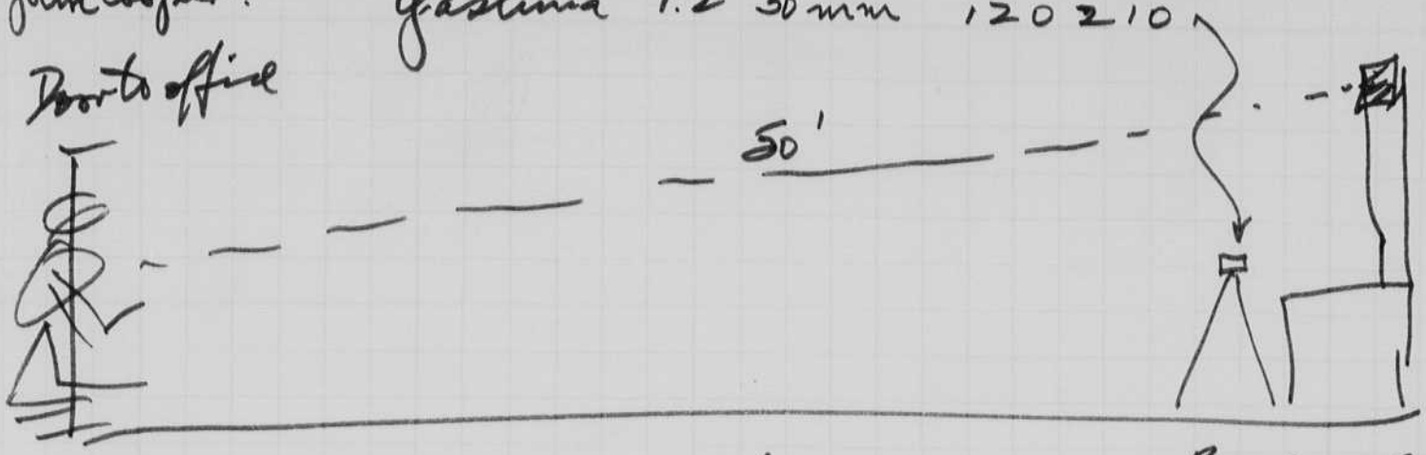
Developed in DK50 for 11 minutes

The

Jan 9 72
H.E. Egerton
John Cooper.

Coastline test with Yashica

Yashica 1:2 50 mm 120 210



High Speed Infra Red film.

	T.	f	Light		
#1.	1/15	2.8	Room light	I.R. focus on H.E. no filter.	ok
2.	1/30	2.	" "	Normal focus no filter	ok
3	1/30	2	NO LIGHTS	I.R. focus	nothing
4			Blank.		
5	1/30	2.	Strobe 3750 with 87C filter (Dark).	I.R.	(25' on scale) ok
6	1/30	2.8	"	"	" ok?
7.	1/30	4.	"	"	" Thin
8			Blank		
9	1/30	2.	"	Door Closed.	IR. Bad 25' on scale
10	1/30	2	"	" " Watch in Hand.	.30 ± "
11	1/30	2	"	" " "	.35 ± "
12	1/30	2	"	" HE near Black Board.	WUTAY .40 "
13			Blank.		
14	1/30	2	"	" HE.	IR focus. (25' on scale)
15	1/30	2.	"	" John Cooper	
16	1/30	16	10 ft HE closeup		Thin
17	1/30	16	10 ft " "		Thin
18	1/30	16	10 ft John Cooper		Thin
19	1/30	11	" " "		Good.
20			" "		

Focus looks ok for first look in dark room.

The I.R. mark on the Lens does check out ok.

Developed in DK 50 for 14 minutes.

Notebook # 30

Filming and Separation Record

____ unmounted photograph(s)

3 negative strip(s) (infra-red tests) inside loose packet

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

was/were filmed where originally located between page 106 and 107.

Item(s) now housed in accompanying folder.

PAGE 107

Jan 8 1972

H Edgerton

John Cooper

Infra Red

tests.

1A

5

5A

6

6A

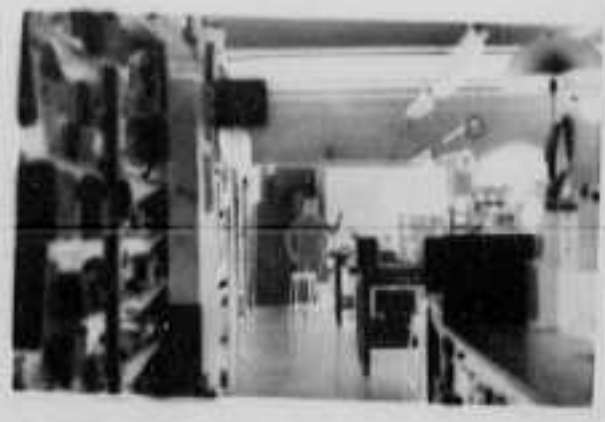
7

14

14A

15

15A



Notebook # 30

Filming and Separation Record

2 unmounted photograph(s)

____ negative strip(s)

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

was/were filmed where originally located between page 108 and 109.

Item(s) now housed in accompanying folder.

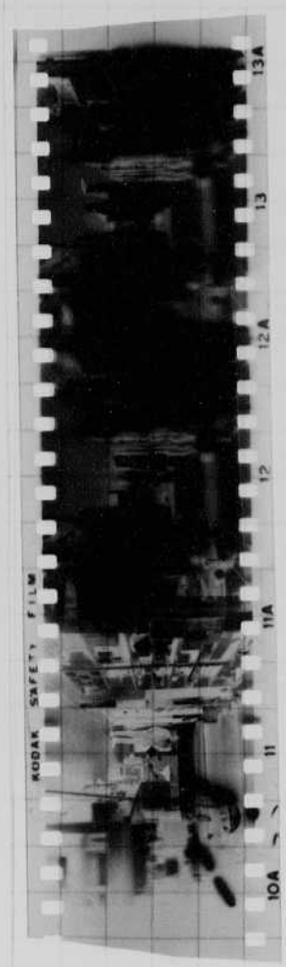
#5 JAN. 8, 1972 5750 BCPS 87C IN
Harold Edgerton

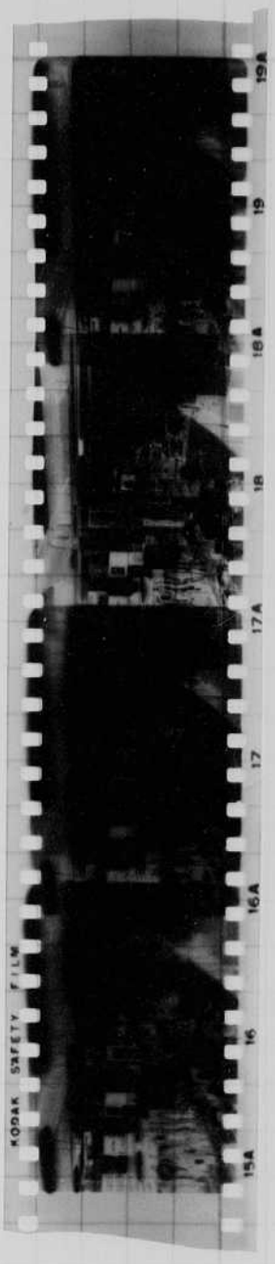
Note. The writing on the blackboard does not show up! A
Also a washoff color print is featureless at 8

Bill completed the 100 ft-film-capacity camera and it was tested Friday Jan 21 in lab at 50 ft distance & the lens is f 2.5 It was focused in air at 5 feet with visual light.

Photos were made with room light "on" and with room light "off": Infra red from a 150 W.S strobe took the picture when the lights were "off." note 1970 pm shadows in the photos.
Jan 23. Reloaded film IR f 2.8 focus 5 ft. on Door at 4-409.
#1 Blank.
#2 Room + IR. Good about 1/2 second
#3 Door only Room lights on
#4 Door + IR
5. IR only Door
6

FRA RED FILTER f2.
50'





#5 JAN. 8, 1972 5750 BCPS 87C IN
Harold Edgerton

Note. The writing on the blackboard does not show up! A
Also a washoff color print is featureless at 8

Bill completed the 100 ft-film-capacity camera and it was tested Friday Jan 21 in lab at 50 ft distance & the lens is f 2.8 It was focussed in air at 5 feet with visual light.

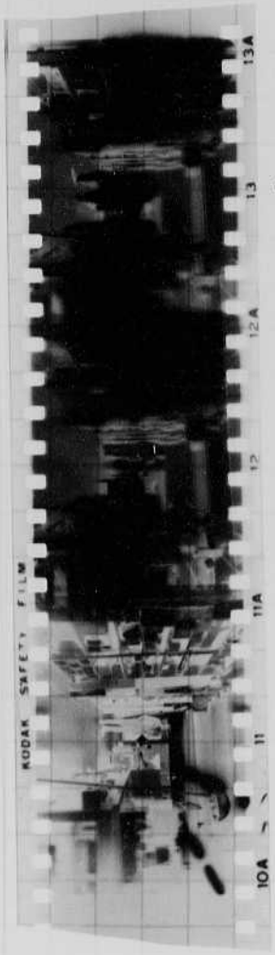
Photos were made with room light on" and with room light "off". Infra red from a 150 WS strobe took the picture when the lights were "off." note shadows in the photos.

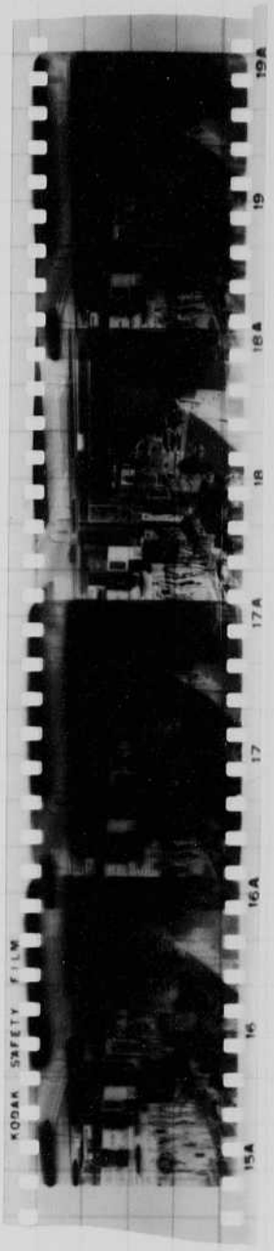
4:30 pm 1972

Jan 23. Reloaded film IR f 2.8 focus 5 ft. on Door at 4-409.

#1 Blank.
#2 Room + IR. Ghost of clock in mirror
#3. Door only Post lights on
#4 Room + IR
5. IR only Door
6

FRA RED FILTER f2.
50'





#5 JAN. 8, 1972 5750 BCPS 87C IN
Harold Edgerton

Note. The writing on the blackboard does not show up! A
Also a washoff color print is featureless at 8

Bill completed the 100 ft-film-capacity camera and it was tested Friday Jan 21 in lab at 50 ft distance & the lens is f 2.8. It was focussed in air at 5 feet with visual light.

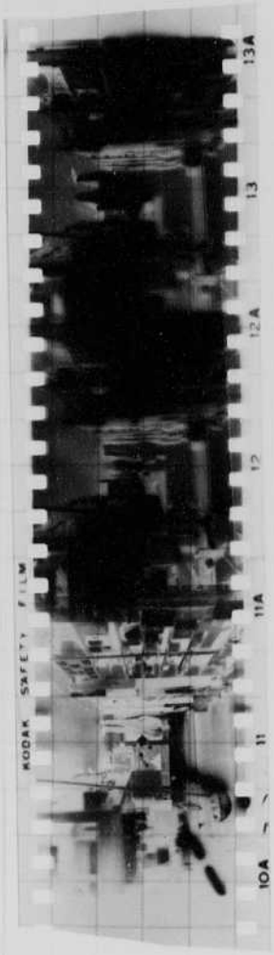
Photos were made with room light on" and with room light "off". Infra red from a 150 WS strobe took the picture when the lights were "off." note 1970 1972 shadows in the photos.

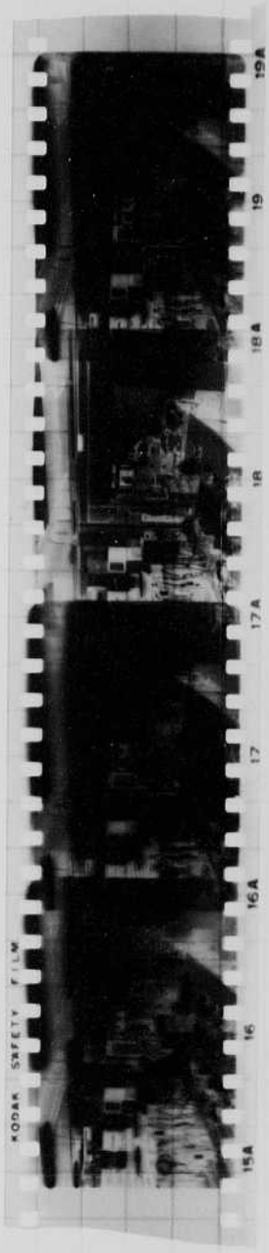
Jan 23. Reloaded film 1R f2.8 focus 5 ft. on Door at 4-409.

#1 Blank.
#2 Room + IR. Strobe shutter
#3. Door at Room lights on
#4 Room + IR
5. IR only Door

16

FRA RED FILTER f2.
50'





DEPARTMENT OF ELECTRICAL ENGINEERING
Room 4-405, ext. 4629
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
CAMBRIDGE, MASSACHUSETTS 02139

SPEAKERS FOR INDEPENDENT ACTIVITIES PERIOD (I.A.P.)
January 5 to 28, 1972
Room 10-275; 11-12 noon

Prof. H. E. Edgerton
Mr. Dave Richardson
Mr. Bill MacRoberts

Jan. 5, Wed. Prof. H. Edgerton "Electronic Flash"

" 6, Thu. Mr. Charles Miller "Uses of Stroboscopes"

" 7, Fri. Prof. B. L. Averback, "High Speed Photography in Golf"

" 10, Mon. 

" 11, Tue. Mr. Robert Watson "Xenon Flash Tubes as Precision Pulsed Light Sources"

" 12, Wed.

" 13, Thu. Dr. David Kocher "The Cranz-Schardin System of High Speed Photography"

" 14, Fri. Dr. Searle Rees "Studies of Small Blood Flow"

" 17, Mon. Dr. David Donaldson "A Stereo Camera For Closeup Photography, Especially Eyes"

" 18, Tue. Dr. Roe Wells "Photography of Blood Flow in Man"

" 19, Wed. Mr. Gjon Mili "Experiences With High Speed Photography"

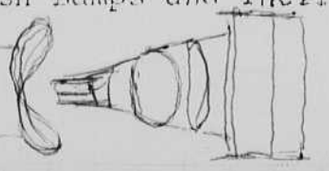
" 20, Thu. " " " Studio Demonstrations with Multiflash

" 21, Fri. " " " Photography DINNER AT MIT FACULTY CLUB 6:30 PM

" 24, Mon. Dr. Kenneth R. H. Read "Underwater Still & Elapsed Time Photography"

" 25, Tue. Dr. Robert Rines "Experiences With Elapsed Time Photography In Lochness"

" 26, Wed. Dr. Bruce Newell "Electronic Flash Lamps and Their Uses"



Jan 24, 1972 7.40 am. 6918 6921.
Harold E Edgerton

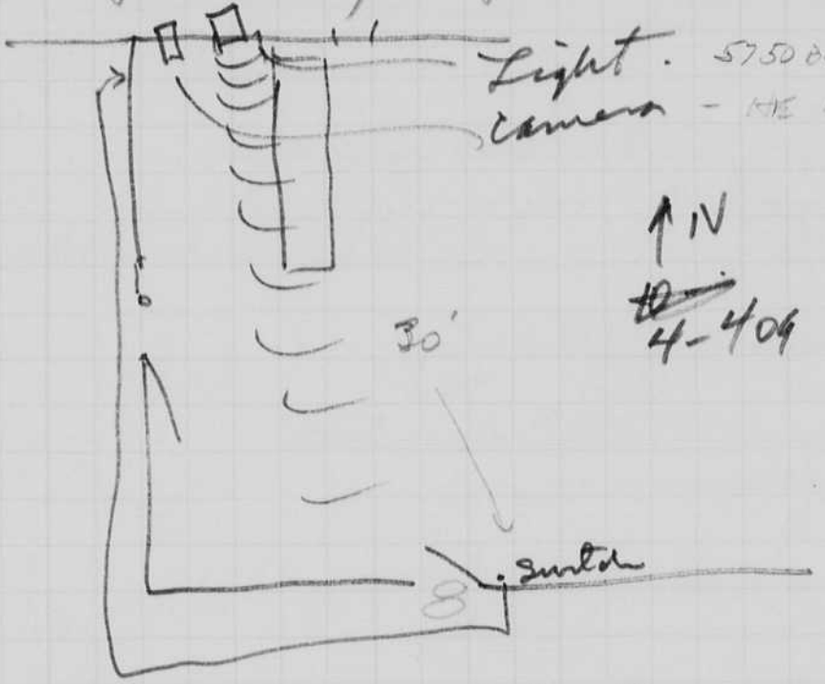
an Infrared lamp 150WS (5100 BCPS 87C filter) and high speed IR film (Eastman) HIE 135-20 was set up in an automatic camera. Aperture f. 2.8 focus at 5 ft (visual).

a switch on the door of 4-409 triggered the shutter and the flash.

camera loaded 6966. Jan 23 at .
check and left 6986 " " 5.45? See clock.
morning 7016 Jan 24 at 7.45

7016
6966
50

Unfortunately the film would only expose about 15 pictures



plates at night.

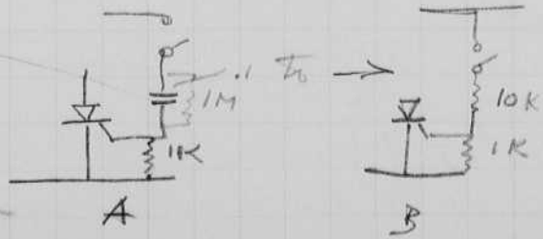
Jan 24 72 7016 before Power. counter.
#1 HE. Pushes Switch. no lights in Feb.
#2 " " "
#3 HE & Jean Leaving
#4 Jean & NE coming in.

7057
7016
39 operations

Jan 25 8.30 7057

The operation of the camera was faulty due to the SCR which picks up transients from the line. We tested with a vacuum cleaner motor. It was plugged in and out. The "out" always caused the motor to recycle.

Circuit was changed from A to B. Now works ok except motor keeps going when trip is closed for lighting.



DEPARTMENT OF ELECTRICAL ENGINEERING
Room 4-405, ext. 4629
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
CAMBRIDGE, MASSACHUSETTS 02139

SPEAKERS FOR INDEPENDENT ACTIVITIES PERIOD (I.A.P.)
January 5 to 28, 1972
Room 10-275; 11-12 noon

Prof. H. E. Edgerton
Mr. Dave Richardson
Mr. Bill MacRoberts

Jan. 5, Wed. Prof. H. Edgerton "Electronic Flash"

" 6, Thu. Mr. Charles Miller "Uses of Stroboscopes"

" 7, Fri. Prof. B. L. Averback, "High Speed Photography in Golf"

" 10, Mon. 

" 11, Tue. Mr. Robert Watson "Xenon Flash Tubes as Precision Pulsed Light Sources"

" 12, Wed.

" 13, Thu. Dr. David Kocher "The Cranz-Schardin System of High Speed Photography"

" 14, Fri. Dr. Searle Rees "Studies of Small Blood Flow"

" 17, Mon. Dr. David Donaldson "A Stereo Camera For Closeup Photography, Especially Eyes"

" 18, Tue. Dr. Roe Wells "Photography of Blood Flow in Man"

" 19, Wed. Mr. Gjon Mili "Experiences With High Speed Photography"

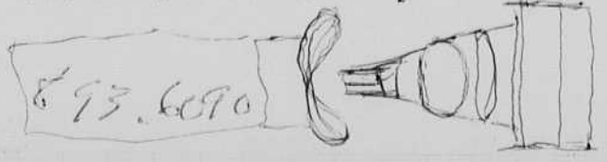
" 20, Thu. " " " Studio Demonstrations with Multiflash

" 21, Fri. " " " Photography DINNER AT MIT FACULTY CLUB 6:30 PM

" 24, Mon. Dr. Kenneth R. H. Read "Underwater Still & Elapsed Time Photography"

" 25, Tue. Dr. Robert Rines "Experiences With Elapsed Time Photography In Lochness"

" 26, Wed. Dr. Bruce Newell "Electronic Flash Lamps and Their Uses"



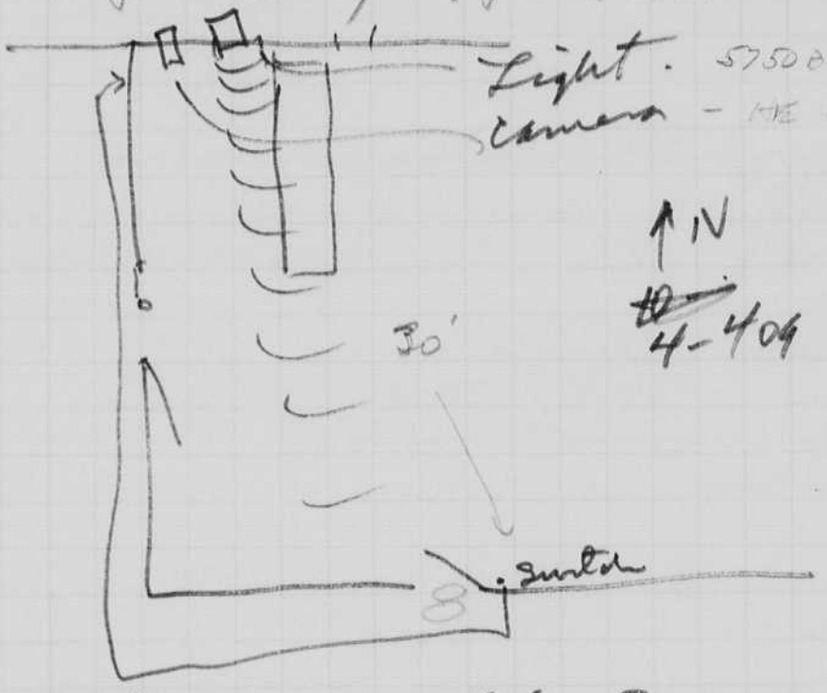
Jan 24, 1972 7.40 am. 6918 6921.
Harold Edgerton

an Infaled Lamp 150WS (6700 BCPS 87C filter) and high speed IR Film (Eastman) HIE 135-20 was set up in an automatic camera. Aperture f. 2.8 focus at 5 ft (visual).
a switch on the door of 4-409 triggered the shutter and the flash.
camera loaded 6966. Jan 23 at .
Check and left 6986 " " 5:45? See clock.
morning 7016 Jan 24 at 7.45
Unfortunately the film would only expose about 15 pictures

7016
6966
50

Light. 5750 BCPS 87C filter
camera - HE 135 film.

photos at night.



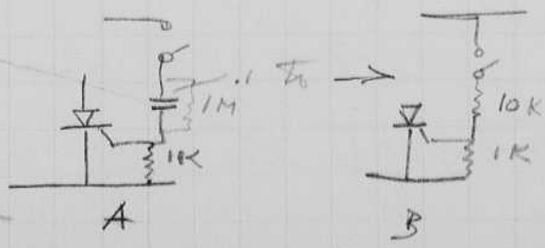
↑N
~~10~~ 4-409

Jan 25 72 7016 before Power. counter.
#1 HE. Pushes Switch. no lights in Lab.
#2 " " "
#3 HE & Jean Leaving
#4 Jean & NE coming in.
Jan 25 8.30 7057

7057
7016
39 operations

The operation of the camera was faulty due to the SCR which picks up transients from the line. We tested with a vacuum cleaner motor. It was plugged in and out. The "out" always caused the motor to recycle.

Circuit was changed from A to B. Now works ok except motor keeps going when trip is closed for long time.



Notebook # 30

Filming and Separation Record

1 unmounted photograph(s)

____ negative strip(s)

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

was/were filmed where originally located between page 110 and 111.

Item(s) now housed in accompanying folder.

Flash Exposures: To obtain the lens opening for electronic flash or flashbulbs, divide the guide number by the distance in feet from flash to subject.

Electronic Flash Guide Numbers: Use with a KODAK WRATTEN Filter No. 87 over the camera lens.

Output of Unit (BCPS or ECPS)	500	700	1000	1400	2000	2800	4000	5600
Guide Number for Trial	40	45	55	65	80	95	110	130

Flashbulb Guide Numbers: The following numbers apply for the clear flashbulbs indicated when a KODAK WRATTEN Filter No. 25, No. 29, No. 70, or No. 89B is used over the camera lens.

Between-Lens Shutter Speed	Synchronization	AG-1*	M2†	M3† 5‡ 25‡	11§ 40§	2§ 22§	Focal-Plane Shutter Speed	6 26‡
Open, 1/30	X or F	190	200	290	320	390	1/30	300
1/30	M	140	NR	280	290	360	1/60	210
1/60	M	140	NR	250	270	340	1/125	150
1/125	M	110	NR	210	230	290	1/250	105
1/250	M	90	NR	170	180	220	1/500	75
1/500	M	70	NR	120	130	170	1/1000	50

Bowl-Shaped Polished Reflectors: *2-inch; †3-inch; ‡4- to 5-inch; §6- to 7-inch. If shallow cylindrical reflectors are used, divide these guide numbers by 2. For intermediate-shaped reflectors, divide the numbers by 1.4.
NR = Not Recommended.

Caution: Bulbs may shatter when flashed. Use a flashguard over the reflector. Do not flash bulbs in an explosive atmosphere.

PROCESSING PROCEDURE

1. Develop: Times given are for development in a tank with agitation at 1-minute intervals.

KODAK Developer	Approximate Developing Time (in Minutes)				
	65 F 18 C	68 F 20 C	70 F 21 C	72 F 22 C	75 F 24 C
D-76 (Normal Contrast)	14	12	11	10	9
D-19 (High Contrast)	9	8	7½	7	6½

2. Rinse: At 65 to 75 F (18–24 C) with agitation.
KODAK Indicator Stop Bath—30 seconds
or KODAK Stop Bath SB-5 —30 seconds

A running-water rinse can be used if an acid rinse bath is not available.

3. Fix: At 65 to 75 F (18–24 C). Agitate films frequently during fixing.
KODAK Rapid Fixer —2 to 4 minutes
or KODAK Fixer —5 to 10 minutes
or KODAK Fixing Bath F-5—5 to 10 minutes

4. Wash: For 20 to 30 minutes in running water at 65 to 75 F (18–24 C). To minimize drying marks, treat in KODAK PHOTO-FLO Solution after washing, or wipe surfaces carefully with a KODAK Photo Chamois or a soft, wet viscose sponge. To save time and conserve water, use KODAK Hypo Clearing Agent.

5. Dry in a dust-free place.

Storage: Keep unprocessed film at 50 F (10 C) or lower in the original can. To avoid moisture condensation on film which has been refrigerated, allow film to stand at room temperature for at least 4 hours before use.

For more information, see Kodak Publication No. M-28, *Applied Infrared Photography*, and Kodak Publication No. N-1, *Medical Infrared Photography*.

Notice: This film will be replaced if defective in manufacture, labeling, or packaging, even though caused by our negligence or other fault. Except for such replacement, the sale or any subsequent handling of this film is without other warranty or liability.

EASTMAN KODAK COMPANY • Rochester, N.Y. 14650

KPϕ 63317 4-71 Printed in the United States of America

6966 6986 7016

KODAK HIGH SPEED INFRARED FILM

135 magazines and 35mm x 50′ rolls

Note: Total darkness is required for opening film can, for loading and unloading camera, and for processing.

- A high-speed, infrared-sensitive black-and-white film on dimensionally stable .004-inch ESTAR Base.
- Suitable for distant haze penetration and special effects.
- Used in scientific, medical, biological, and questioned-document photography.

Handling: Handle only in total darkness.

For 135 magazines, total darkness is required for taking the magazine out of the film can and for all handling while the magazine is outside of the can. After the last exposure has been made, rewind the film into the magazine and return it to the film can in total darkness.

Filters: For most applications, a filter must be used over the lens (or light source) to absorb the blue light to which the film is sensitive. For general photography, a KODAK WRATTEN Filter No. 25 is recommended for this purpose.

EXPOSURE

Exact speed recommendations are not possible because the ratio of infrared to visible radiation is variable and because photoelectric meters are calibrated only for visible radiation. Use a hand-held meter rather than a through-the-lens type.

It is recommended that trial exposures be made to determine proper exposure for the conditions under which photographs will be made. Under average conditions, the following speeds can be used as a basis for determining exposures when meters marked for ASA speeds or exposure indexes are used.

Speeds—for recommended development in KODAK Developer D-76:

KODAK WRATTEN Filters	Daylight	Tungsten
No. 25, 29, 70, or 89B	50	125
No. 87 or 88A	25	64
No. 87C	10	25
Without a Filter	80	200

Focusing: For best definition, take all infrared pictures at the smallest lens opening that conditions permit. If large apertures must be used and the lens has no auxiliary focusing mark, establish a focusing correction by photographic focusing tests. A basis for trial is the extension of the lens by ¼ of 1 percent of the focal length of the lens.

Daylight Exposures—for subjects in bright or hazy sunlight (distinct shadows):

Exposed through KODAK WRATTEN Filter No. 25		No Filter
Distant Scenes	Nearby Scenes	Distant Scenes
1/125 sec at *f*/11	1/30 sec at *f*/11	1/125 sec at *f*/16

Photolamp Exposure Table: For use with a KODAK WRATTEN Filter No. 25 over the camera lens. Use two 500-watt reflector-type photolamps or two No. 2 photolamps in 12-inch reflectors giving comparable light output. Place one lamp on each side of the camera at an angle of 45° to the camera-subject axis.

Lamp-to-Subject Distance	3 feet	4½ feet	6½ feet
Lens Opening at 1/30 Second	*f*/11	*f*/8	*f*/5.6

(over)

Jan 25, 1972
Found Explorer.

Tests of Photo cell trigger for Prudential Bldg.
to 330 Beacon Store set up.
The equipment for the last tests was
too sensitive in angle. The wind would
blow the detector out of line. See page 101
Bot of page 93 for circuit.
Yesterday we removed the large Canon and plants
put in a smaller one
7155.
Infrared camera tests. Many openings of the camera
were made last night Tests in 4-409.

after 7156 Jan Light off
after 7157 Jan went out Lights on.
5.07 Jan Lights off Jan had cold and scarf.
5.08- Jan went out Lights off.
5.11 HE In Lights out.
5.12 HE Out. " " ?.
5.13 HE Lights on In. ? Did it go?.
5.13.5 7160 " " " Jan went. Test.
I was seen to be in Hall
005 Shots Jan return in.

NEW FILM

6:12 7160 Lights on Bill
6:13 Lights off Bill.

Jan 26 7163 8.28 Lights off Daylight HE & Aerial & Sundeck.
7164 8.30 " " " Cool off.
65 8.32 " on
Jan 26 70 8.36. " " HE in Door
71 5, Foco Block Sign 26

Film Pulled off. Store.
Re-open.

Jan 26 72 5.30 " on HE. Spiral Dot Disc
" 73 5.31 Light off HE Squares Disc
Jan 27. ~~8.00 am~~ 8.15 HE Hoton and Radio no lights Daylight
7175 count.
Jan 27. 818 " Back view no lights Daylight

Photos of Jan on Explorer 12.15 Leave 12.30
Focus could be forward. Suggest small motion of lens.

Test of Photostrigger

Mechanism mocked with 2" lens

$\frac{6000}{.5^2} = 24{,}000$ lumens/sq ft.

Lamp = 6000 c.p. peak Nosthead.

$\frac{6.}{.5^2} = \frac{6000}{2500} = 2 \times 10^{-3}$ lumens/sq ft.

ND 1	.70	
ND 3	3.60	
3	7.6	with backlight reduced.
3.	8 ±	Holdover of SCR.
0.	34	Begin glow on lamp Back Shielded.
0	.14	
1.	2.3	
2.	7.20	

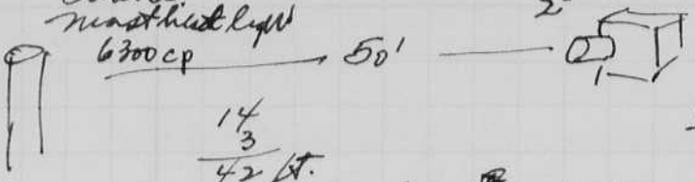
Backlight $\frac{20 \times 10^6}{1000^2} = 20.$

Jan 27, 72 I.R. Camera

4 P.M. Camera and door switch reworked to produce one operation per door opening, regardless of continued switch closure.

Counter	7177	Door operated flash, did not hear camera rewind.	Approx 6 P.M.
	7178	" " " " " " "	
New pictures	7179	Push button at camera operated. Lamp flashed camera rewound.	
	7180	Door operated, leaving lab. Flash and camera worked.	
Jan 28, 72 9.10 A.M. →	7188	Door operated. Lamp flashed. Did not hear camera. Turned off.	
	7189	Turned on at 6.00 P.M. (No film advance)	
	7190	Leaving lab. Light flashed camera cycled.	
Jan 31, 72.	7195	Edgerton entering.	

114 Feb. 2, 1972. Test of Phototrip for Prudential test.



Min = 12 on scale of 1,000.

$\frac{14}{3}$ 42 ft.

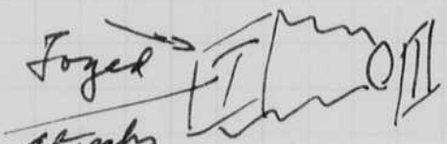
$\frac{6300}{42^2}$ = lumens/sq ft.

$\frac{20\times10^6}{D^2} = \frac{6300}{42^2}$ $D = 42\sqrt{\frac{20\times10^6}{6300}} = 42\sqrt{3.\times\sqrt{10^3}}$

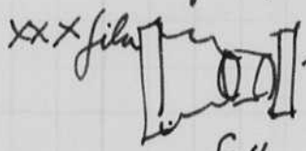
This should be sensitive enough. $= 70 \times 33. = 2100$ ft.

Feb. 4, 1972 Test of 4×5 camera with a f2.5 lens from aerial camera #

a German Flap shutter was mounted in front of the lens. Tests have showed light leaks as streaks. Yesterday a test of the camera with out the new lens was light light. also Blocking of the lens back of the shutter showed no leaks.



Today I am trying a 100 watt lamp 1.5 ft from the front of the shutter.



This negative badly fogged in streaks etc.
The Flap shutter must be leaking.

7197

Infrared tests 8.45 pm Lights out. Feb. 4, 1972 H.Z. in from Hall.
a 35mm cassette was loaded from a 150' roll.
High Speed 2481 HIE 417 Emulsion 5.
All set for operation on door of 4-409.

7215 am 8.15 7199 after. Light out H.Z.S. with Tab Russian Hat.
" 1025 7200 on HE with cup into Tab.

HZ is working on Deep Sea Photos taken in 1968 in the Kermadec 30 N 47.40 W

Feb 7 858 7200 HZ with HZX Coat Nikon
900 7200 HZ no hat. test no light counter stuck.
money in
HZ out
7206

Feb 7 72 7605 5.49 HE. IR Test no lights Timer strengthened.
Shorted Chg. Res. Shorter arm.
" 7606 6.43
7
8
9
9
10

Feb 8 72 7611 8.45 am HE with Hat.
12 Blank no flash.
13 HE. Lights on.
14. Lights off

The motor has been causing problems with the SCR circuit. The current goes to zero between brushes and the motor stops — causing several short stops without re-winding the film.
a 500 ohm resistor was placed across the motor.

Feb 8 72 7614 5.45 HE Lights on
7615 6.46 HE " "
6 HE
7
8
9
7620

Feb 9 72 7630 HE Jan Bill Dave. came in

Feb 10 1972 Test of 120 KC Side Scan
(L M) C = .015 (H J) C = .0134
= 10% = 10%
Amplifier shot 100 KC NG at 12 see darkening of Record.

Feb 10 72 7691 at 4.30 pm.

Feb 11 72 7663 at 8.10 am HE after opening door in Dark (10) on roll

Feb 12 7678 at 9.1 am HE in Jay-Lab. Lights on

Feb 12 1972

Howell Operation 4-405 M.I.T.

10:10 am Test of 9 photo tube # 7.

Strobotac at 4.7 ft with no Reflector Shield gave

1535A $\frac{14,000 \text{ cp}}{D^2}$ = 10,000 lumens/sq ft.

Scope 581A Tektronix with Hyge wide Tunes amp. type B.

250 V f 4.7 1/250 sec 4 exposures (one too strong?)

50 V

20 V XX film DK 50 developer 10 min.

Scale kept on "full"

Exposure was thin! this scope had a green screen.

---

545 Scope with Blue Screen.

Repeat 200 V 10,000 lumen/sq ft peak.

50 V XX film f 4.5

20 V DK 50 2 ms/div Strobe set for 1/125 sec for 3 exposures no good line but I set it on the bottom line of the scale.

Photo tube 929

7

0.26 volts for 10,000 lumens/sq ft

Repeat 200 V

50

20

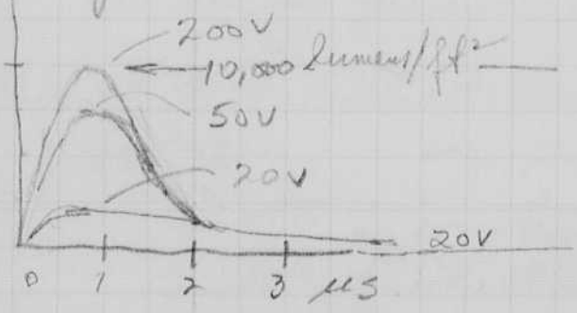
Light blocked from Strobe to 10,000 lumens/ft² R, Screen

Photo tube 929 Set for full scale

7. 1 ms per division

---

adjusted gain to give 4 units deflection



(A) Scale took to be exposed 0½

Curves look fine

1.5 division = 100 milli-volts

= 0.1 volts,

The gain control was set to give

$\frac{100 \text{ mV}}{1.5}$ / division

Cal seal was $\frac{100}{2}$ = 50 mV/div.

6686/00A Sil photodetector.

visitors Refer wipes for Steel Slayer.?

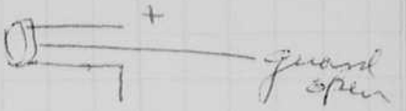
across detector

10 VOLTS. Reflector on Strobotac to increase the flux density.

4
2
(B) 1
.5

I think it is the same as for osc A!

What is on stage res.??



Light reads 0.8 volts with 929 Reflector large.
Bare lamp reads 0.3 volts

Light on Sil = 10,000 × 8.00/3 = 26,666.
Reflector.

Peak light = 26,666 lumens/sq ft.

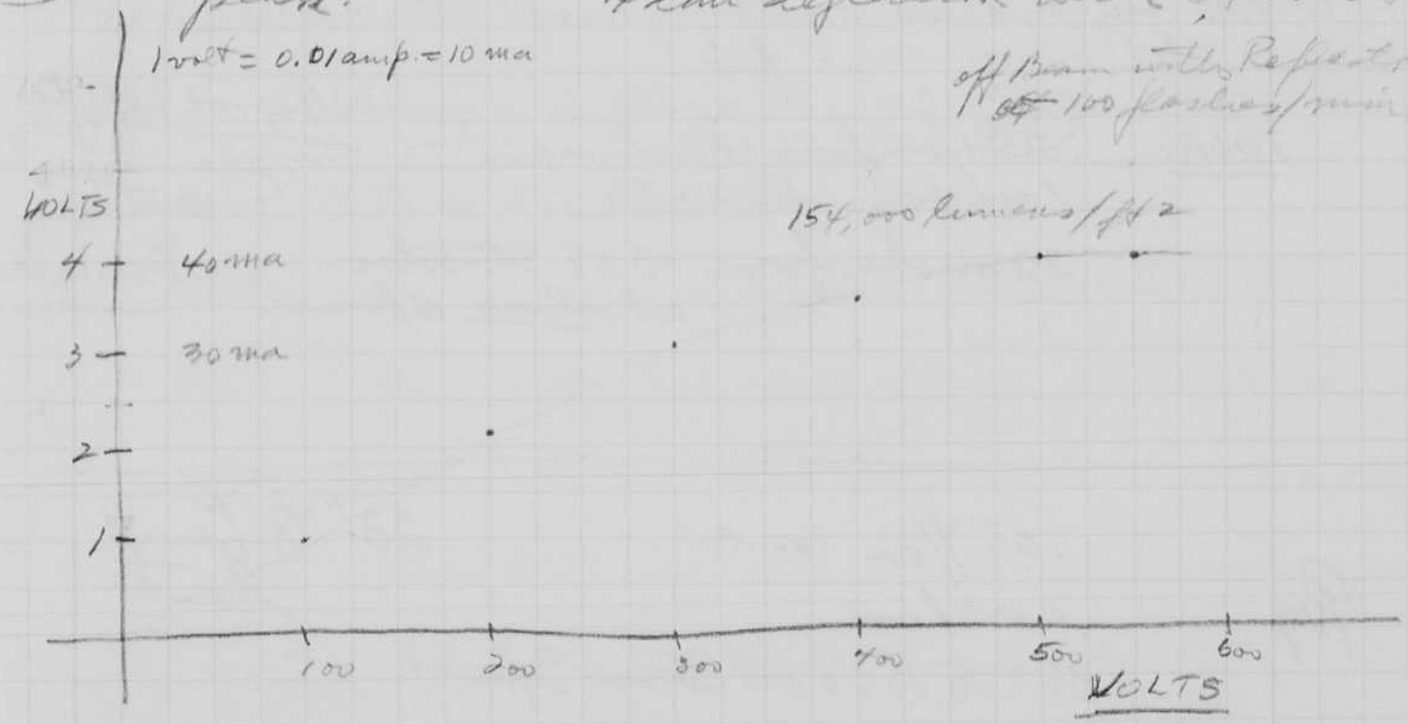
3 | 80,000 → 26.66.
6
20
18
2

True Scale 1 ms = 1 div

929 Increase light peaks.

1 volt per cm vers.
4 cm deflection with 540 volts

off Beam with Reflector
~~off~~ 100 flashes/min.



K Volts = lumens/ft² (100 Ω Res) 927 #7

K = lumens/ft² / volts. = 10,000 / .26 = 38,500.

then 4 volts × 38,500 = 154,000 lumens/sq ft. to give 40 ma

1 lumen | lumens = 154,000 × .42 / 144 = 450 lumens

40,000 μa / 450 = 88 μa/lumen.

1510
4
2
1
0

Notebook # 30

Filming and Separation Record

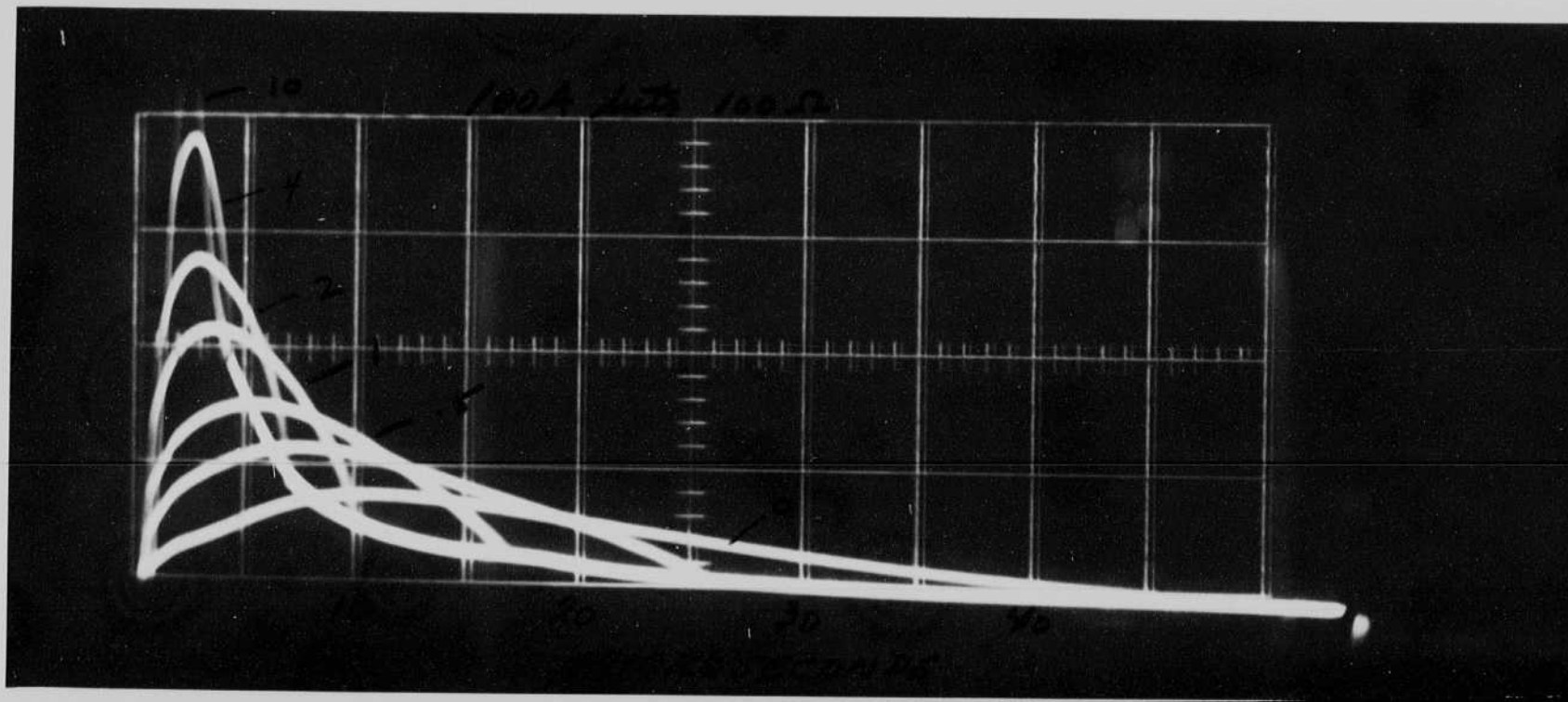
3 unmounted photograph(s)

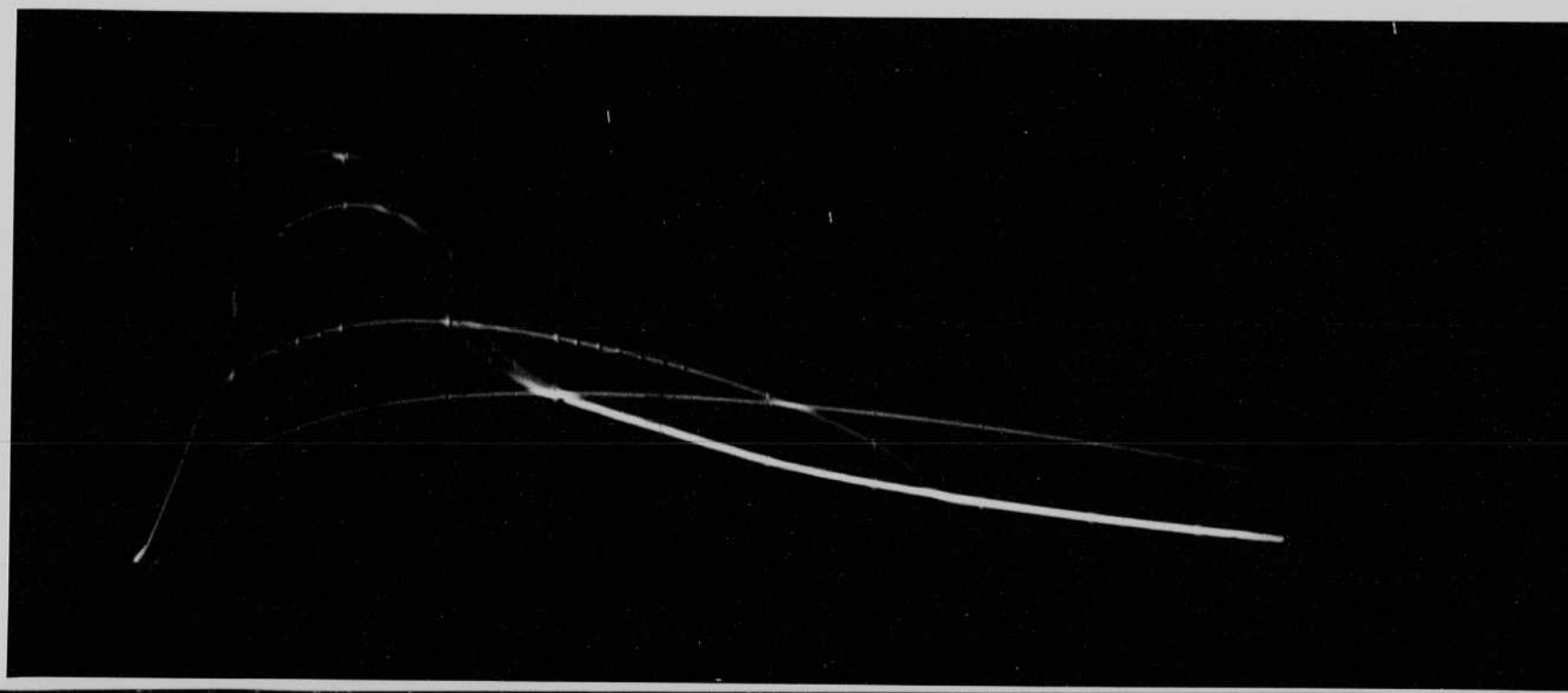
____ negative strip(s)

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

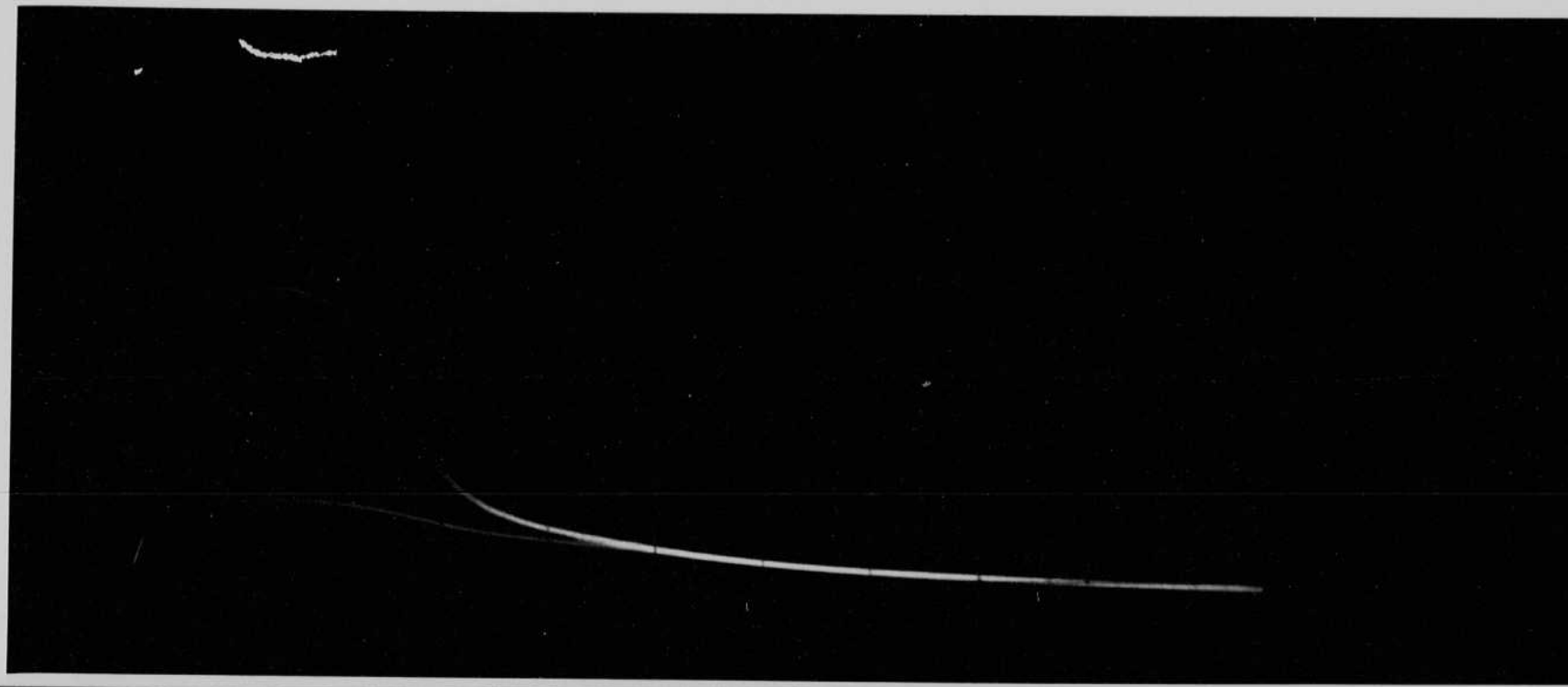
was/were filmed where originally located between page 116 and 117.

Item(s) now housed in accompanying folder.


10
4
2
1
.5
.2
40
30
20



Si Diode
5100



continued

100 A EG&G Sil Diode Photo Pickup

Light 154,000 lumens/ft² incident from Strobotac at slow speed max flash. Sil Diode Detector 100A.

R = 100 ohms. Full line on full
0.2 volts/cm 1/100 sec on shutter
5 μs per cm. XXX f 4.7.

$\frac{.2 \times 1000}{100} = 2.0$ ma/div. →

Blue Scope 545 Tektronix #11920

15, 10, 6, 4, 2, 1, 0, volts on Diode.

Photo seems not to be sharp. sharp in focus
Exposure is ok.

Photo 122 in light on oscilloscope of 929 and 100A on the same film.

100A. 0.1
.05 V/cm from 100 ohms. 140,000 CP peak according to data.
1 μs/cm sweep.
22 inches from 1538 Strobolac at slow speed. Bare lamp

---

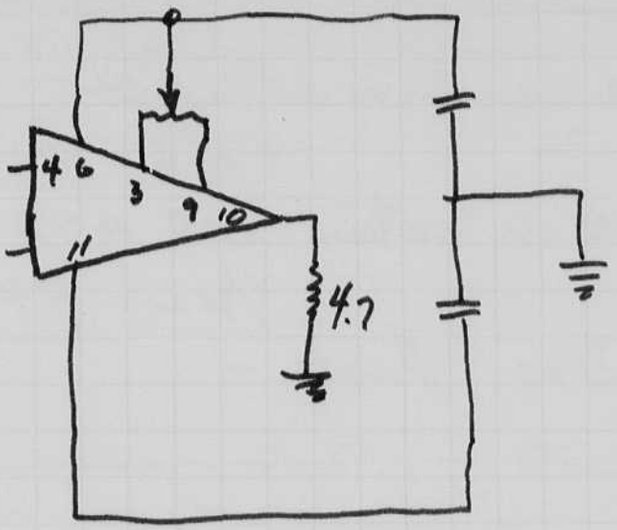
929 .05 V/cm 100Ω 23" to Lamp bore
1 μs/cm.
35" to 1538 at Slow Speed

To do! Get filter and repeat this test to the infrared output may be the problem!

Feb 17 1972
Hz 2
Bill was R.

Amp for Sonar

741 Integrated circuit.



Feb 22.72. Returned from Aurora mtr. yesterday with Esther. We took my mother Mary to the Ham. County Manor. She will be 97 on Mar 2.

Bill is making a 2 stage amplifier for the small 5" Side scan. I plan to convert it to a 5Kc Penetrator type.

Feb 24 72 Photos made last night from Prudential Bldg.

1/250 f5.6. XXX 4X5 tlmx. 10 min DK50

Color 1/60 f3.5 High Speed Ektachrome ASA 160

? ? " Snowing

The courtyard lamp did not fire except for the first test. I can't figure it out! The thyristor test has ample sensitivity!

Before - we had holdover trouble. I thought this was finished.

Solution (1) try coil to fire unit

(2) raise RC. so tree will not be in line.

3 check check check ✓

120 Feb 26 1972
H. Edgerton copy of Elapsed time movie
Projector LW at 5 ft & while carboard
Pathe camera at 16/sec.
f 4.8 on EF 7242

INTERDEPARTMENTAL

MASSACHUSETTS INSTITUTE OF TECHNOLOGY CAMBRIDGE, MASS. 02139

Work

from the office of Prof. H. E. Edgerton March 15, 1972

TO: Prof. H. E. Edgerton

Elapsed

Left Boston (N.E. Airlines) on March 13, 1972 for Ft. Lauderdale.
Joined SEA PROBE at TRACORMAS shipyard.
Bascom, Marx and Issacs arrived about 2pm. Bill Sherwood (ALCO.)
Ship not ready to go. New air motor being installed on pipe derrick.

March 14 left for Miami, University of Miami, Walton Smith not there.
Saw Art Myrberg about sharks
Saw John Gifford about Little Bahama Banks
Saw C. Newman about geology, sea level vs. time
Lunch with Stewart of NOAH.
Geo. Keller wants deep elapsed time camera, 3000m, steel case

Bill to make an estimate for immediate sale. He has a problem and funds.
Genevieve Alla is at Miami for 6 months. Invited her to Boston when she returns to France.
Bob Dietz is at NOAH.

March 15. The ship should be ready to go tonight! (9am prediction)

"Tin Can on A Shingle"by Wm. White
"Grave Yard of the Atlantic" by David Stick, Univ. of N.C. Pub.
These are about the MONITOR at Cape Hateras.
Visit Newport News Naut. Museum, Newport News.
Virginia Pilot Newspaper, Norfolk, Va. Stories on salvage, etc.
Write to Sam Townsend, Raleight, N. C. State wreck representative.
The plans are very uncertain. I may get off at Freeport and fly home Monday or Tuesday. Tell Charlie to be ready in case I cannot get off this ship. Tell Frank Schmidt I am trying.

Mar. 28, 19

I left a 400 ft. reel of movies of the elapsed time of starfish, at the end there is a sequence of Eric Newman with Dr. Letvin and Eric's experiment. Then comes 4 scen each repeated 3 times. Charlie can run this if he wants too, but I say let him use his own slides.

Movie

Keep everything busy and going!

March 27 1972

Howard Eggeler.

Returned from Cocoa Beach Florida on Mar 25 at 1 am after being on ALCOA SEAROBE from the 13 of March (Monday). There were problems with the pipe handling equipment until the 17. We left for a spot to the north. It was in the Gulf Stream 4 knots. Difficulties are apparent in such a place. Our buoy string broke due to the current.

Then we went further north for other trials. The class speak power was used at 1200 feet range for search. Targets were observed and an effort made to hit them with T.V. and with a camera (Bibb with strobe).

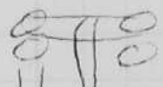
Willard Bascom and Robt Marx were in charge of the expedition. Schelley 111 Twin oaks Drive Pittsburg 15237

Bill Sherwood and Geo Skelly of Alcoa were operating the ship. 1400 tons.

Mar-30 1972

I saw Otto Piena and Peter Benoit 547 7792 - 23 Wood St. Cambr.
yesterday at Eldon
Mr Brenner's office

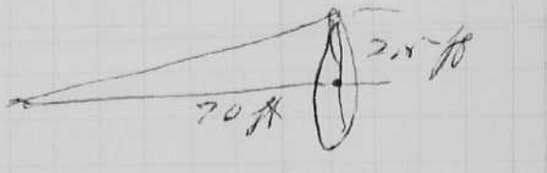
Jerry Kaufman was there too Mr Cloud also came in
explain the proposed use of a 2 KW flash
lamp. This is a 2 turn light spiral
with a center post. It is used
in satellites.



This is a very special lamp $ 750 ?. Tops is
not known ? ? etc.

Piena wants a 5° beam. This means a
long focus mirror.

at 70 feet away and a 1" diameter the focal
length needed for a 5° circle



5° Tan
5° .0875
2° .035

target = $\frac{2.50}{70} = .035$

Angle = 2°

mounting a 40" reflector of f1. $D = \frac{3}{3} \times \frac{70}{1} 1" = 240" = 10 ft.$

1/2" lamp gives a 5 ft spot.

120 Feb 26 1972
H. Edgerton copy of Elapsed Time movie,
Projector LW at 5 ft & white cardboard,
Bell camera at 16/sec.
f 4.8 on EF 7247

INTERDEPARTMENTAL

MASSACHUSETTS INSTITUTE OF TECHNOLOGY CAMBRIDGE, MASS. 02139

Work

from the office of Prof. H. E. Edgerton March 15, 1972

TO: Prof. H. E. Edgerton

Left Boston (N.E. Airlines) on March 13, 1972 for Ft. Lauderdale.
Joined SEA PROBE at TRACORMAS shipyard.
Bascom, Marx and Issacs arrived about 2pm. Bill Sherwood (ALCO ?)
Ship not ready to go. New air motor being installed on pipe derrick.

March 14 left for Miami, University of Miami, Walton Smith not there.
Saw Art Myrberg about sharks
Saw John Gifford about Little Bahama Banks
Saw C. Newman about geology, sea level vs. time
Lunch with Stewart of NOAH.
Geo. Keller wants deep elapsed time camera, 3000m, steel case

Bill to make an estimate for immediate sale. He has a problem and funds.
Genevieve Alla is at Miami for 6 months. Invited her to Boston when she returns to France.
Bob Dietz is at NOAH.

March 15. The ship should be ready to go tonight! (9am prediction)

"Tin Can on A Shingle"by Wm. White
"Grave Yard of the Atlantic" by David Stick, Univ. of N.C. Pub.
These are about the MONITOR at Cape Hateras.
Visit Newport News Naut. Museum, Newport News.
Virginia Pilot Newspaper, Norfolk, Va. Stories on salvage, etc.
Write to Sam Townsend, Raleight, N. C. State wreck representative.
The plans are very uncertain. I may get off at Freeport and fly home Monday or Tuesday. Tell Charlie to be ready in case I cannot get off this ship. Tell Frank Schmidt I am trying.

Mar. 28, 19

I left a 400 ft. reel of movies of the elapsed time of starfish, at the end there is a sequence of Eric Newman with Dr. Letvin and Eric's experiment. Then comes 4 scen each repeated 3 times. Charlie can run this if he wants too, but I say let him use his own slides.

Movie

Keep everything busy and going!

March 27 1972

Harold Edgerton.

Returned from Cocoa Beach Florida on Mar 25 at 1 am after being on ALCOA SEAPROBE from the 13 of march (Monday). There were problems with the pipe handling equipment until the 17. We left for a spot to the north. It was in the Gulf Stream 4 knots. Difficulties are apparent in such a place. Our buoy string broke due to the current.

Then we went further north for other trials. The chesapeake sonar was used at 1200 feet range for search. Targets were observed and an effort made to see them with T.V. and with a camera (both with strobe).

Willard Bascom and Robt Marx were in charge of the expedition. Schelley 111 Twin oaks Drive Pittsburg

Bill Sherwood and Geo Skelly of alcoa 15237
were operating the ship. 1400 tons.

Mar-30 1972

Louis Otto Pecora and Victor Benoff 547 3792 -
yesterday at Edo's 22 Wood St Cambridge.
in Brenner's office

Jerry Kerr was there too Mr Woodcock was in

explained the proposed use of a 25 KW flash lamp. This is a 2 turn light spiral with a center post. It is mounted in plastic.

This is a very expensive lamp $750?. Tape is not known ?? etc

Prina wants a 5° beam. This means a long focus mirror.

at 70 feet away and a 1" diameter the focal length needed for a 5° circle

5° Tan .0875 — Tangent = $\frac{2.50}{70} = .035$

2° .035 — Angle = 2°

showing a 40" reflector of f1. $D = \frac{70}{1/3} \times 1" = 210" = 18 ft$.

1/2' lamp gives a 5 ft spot.

120 Feb 26 1972

A. Shorten copy of Elapsed time movie,
Projector LW at 5 ft & while cardboard,
Pathe camera at 16/sec.
f 4.5 on EF 7247
Rod on meter 125 ASA.
1/30 at f 4.
Tolsters - Pistol -

Words of comments - Photos were dashed, flicker,
The camera should have been
operated at 8 frames/sec to
avoid shutter flicker.

Elapsed time of St Bulkley,
60 per minute rate of 16. 10 mm lens.
Kodachrome II 1/30 sec (?) magazine of
elapsed time movie.
60 per minute (10 sec) 56 ft x 40 pictures = 2000 frames
60 min per hour.
3600 per hour (exposures).
Start: 7.30 am - 7.50 stop.
noon Pete movie belts 6 x 3 = 18 per minute
11.52 - 12.10 at 2 frames.

Mar. 28, 1972 Peine wasin to discuss his
affair at the munich olympic affair
movie 11.50 → 12.05 at f11 on II film Kodachrome.
15 ft. 4.20 → off 4.35 ± f 8

March 7, 1972
Harold Edgerton.

Returned from Cocoa Beach Florida on Mar 26/25 at 1 am after being on ALCOA SEAPROBE from the 13 of March (Monday). There were problems with the pipe handling equipment until the 17. We left for a spot to the south. It was in the Gulf Stream 4 knots. Difficulties are apparent in such a place. Our buoy string broke due to the current.

V. Hollomon for other trials.

Image for Herb

e

e
in works Drive
Pittsburgh
Alcoa $53.27

547 7792-
Coast.

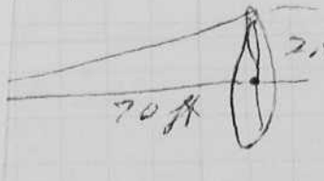
Loud abrasive sounds in

a
el

Tape is

means

a focal



240" = 10. ft.

Sat.

March 2 1912 - Harvard & Edgerton

Blue off -

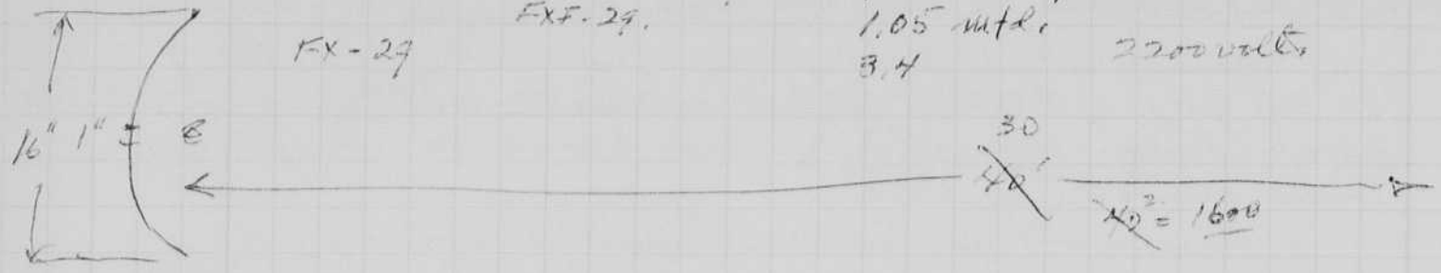
Aurora Zeber Photo turn off 6.5 ft candles off.

FX-29

FXF-29.

1.05 mfd.
3.4

2200 volts.



4" mirror focal length.

Pickup #2 Visual $Hefd = \frac{36.4 \times 10^6 \times K \times D^2}{R_L}$ 10 per second.

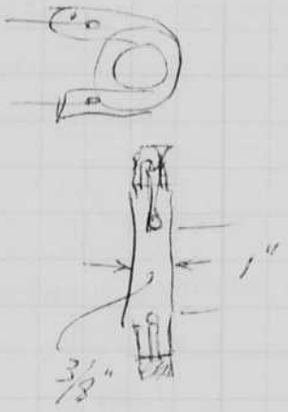
$\frac{32.6 \times D^2 \times V}{R_L \times 10^6} = CP.$

$\frac{32.6 \times 900 \times V}{1233\frac{1}{3} \times 10^6} = 33 \times 10^6 V$ Speech Input C.P.

$R_L = 1K$

$33\frac{1}{3} \times 1000$

	C	V	D.	C.	Time/mfd.	BCPS
Lamp FXF-29.	1.05	2200	10 ms	6.5	49500 $\times 10^6$	495
	1.05	2200	10 ms	4 beloped		
	3.4	2200	12.	12		



~~FX133~~

FX113C1

1.05 2200 10 4-6-8

Large mirror 10" V. 24½ diam

FXF29 1.05 2200 10 5-6.
3.4 " 12+ 20.
3.4 " 20 15

16" mirror 4" focus

FX113C1 ~~1000~~

8	1000.	20	2.8
16	1000	35	7.8
4	1000	10	2.
4	1000	20	2.5
4	1000	20	3.5
4	1000	15	4

2000 - 1
1000 - 4

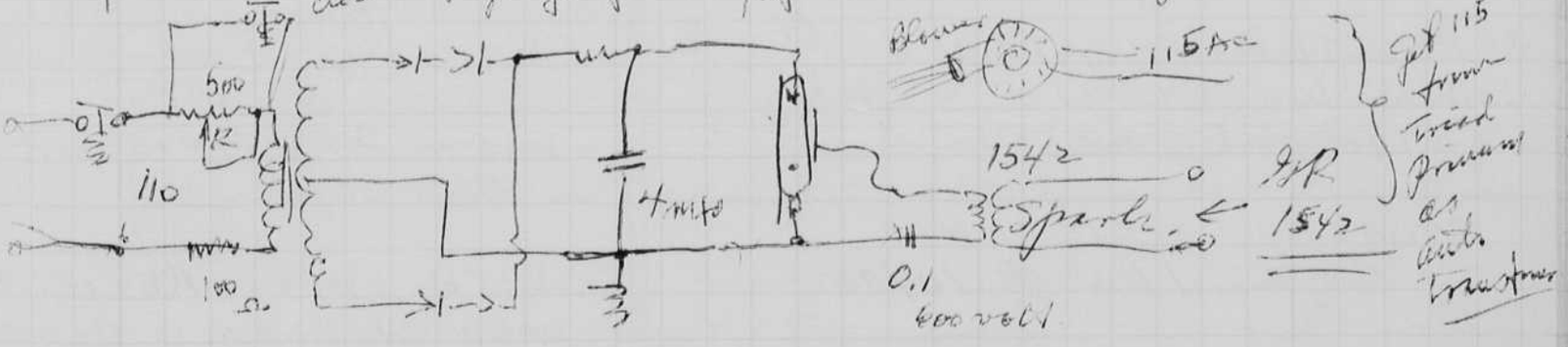
35. 49 F 1319

.6 Oac paper mfd capacitor.

16" Reflector 4" focus with 1" hole in back.

Lamp	C.	V.	Dur.	Base.		
FX113C1	4	4000	15.	6	DSC	Peshaft capacitor 582767 Sprague 4000 volt type
"	4	1000	15	6 to?	"	Sprague Magnetoplex cap. Y 8781.
"	4	1000	15	4	"	9½. 60 cycle #9 F 1314.
"	8	1000	15	10	"	198x10⁶ 2 Sprague magneto plex aluminum type
"	4	1000	15	6	"	198x10⁶ 1 Sprague " " " "
"	4	1500	15.	13/17	"	" " " " "

Transformer triad P-25: 215A 110-220 50/60 cycle.
clear relays give full power. 1/3 power when open (or adjustable).



Candlepower = $(33\frac{1}{3} \times 10^6 \times 6) = 198 \times 10^6 \times 15 = 3{,}000{,}000$ BCPS. $I = \text{Light} = \frac{3000}{(900)} = 33 \text{ lumens/sq ft} = 3.3$

3,000 BCPS

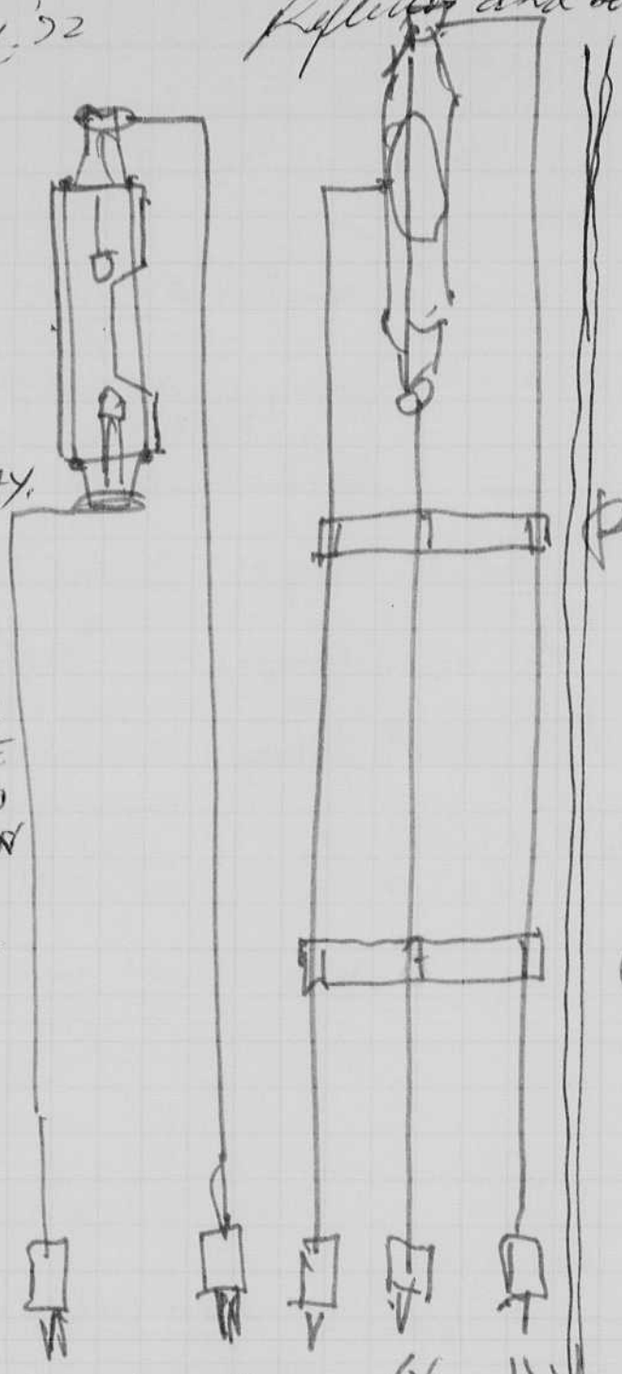
with 4 mfd 1000 volts into FX 113C1

March 31, '72
V.E.M.
T.E.E.

Reflector and shield for FX-113C-1

XX-113-C1
LAMP USED
ON PAGES
122 and 123
HAS RUN
MOST OF TODAY.
AT 10/SEC.
1000 V. 4 μF.

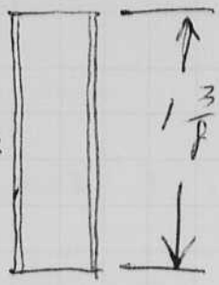
OPERATED
ABOUT 1 HOUR
WITH REVERSE
POLARITY TO
CHECK ROTATION
OF ALZAK
REFLECTOR.
DIRTIED
LAMP AND
BECAME
ERRATIC.
O.K. WHEN
CHANGED TO
CORRECT
POLARITY.



REFLECTOR ROTATED
SAME DIRECTION
EITHER POLARITY.

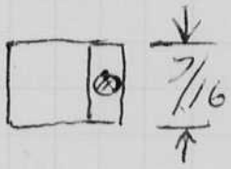
PRIMARY RESISTANCE
TO GET 1KV @ 10/SEC
92 Ω.

.025"
ALZAK
REFLECTOR
SHEET



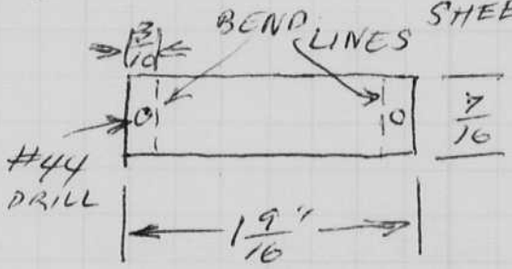
Plaster

CURVATURE
TO FIT
FX-113C-1
AND CLAMP ON.



TWO
SHIELDS
AND
CLAMPS
0.010"
INVAR
SHEET

Plastic



BEFORE BENDING

NEW (NUMBED ETCHED ON CATHODE FX-113C-1 END)
STARTS @ 380V
WITH 8 K.V. TRIGGER
"PE" COIL

WITH ABOVE REFLECTOR
AND SHIELDING CLAMPS
INSTALLED IN 16" REF.
FLASHING 10/SEC
1000V, 4 μF.
WITH BLOWER

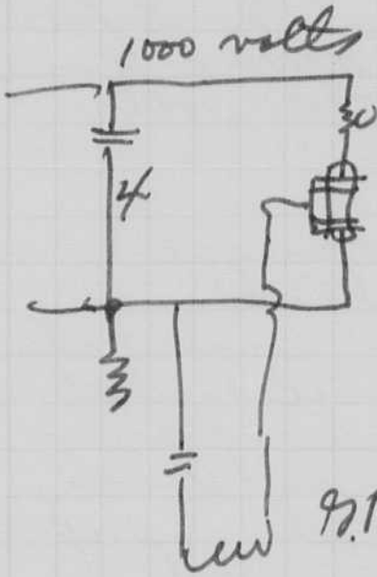
STARTED AT 5 P.M.
MAR. 31, 72.
LEFT ON.

Apr. 2, 1912 #3 Sunday. Erie Edgerton Bell Edgerton
Lamp out at 8.30 Apr. 2. Very Black Light down to 1/10 est.
was polarity wrong?

new lamp FX-113C1 installed with 1/2 ohm air + sidl. Started at 9.15.

Oscillogram shows smaller peaked peaks with 1/2 ohm. Should be smaller?

Light down by 1/2 estimated



Left on at 9.15 am

Apr 3 H.E. Tried reducing 1/2 Ω to 1/4 Ω but current went negative.

V. & M. Tried 1/3 ohm. Current goes to 0. Peak current is about 600 Amps, duration 1/10 sec. Voltage swings about 50 volts ~~below~~ negative reaching 0 volts in about 1 millisec.

Occasionally current swings negative for 1/10 sec. about 15 amps.

Apr 3 '72
V.R.M.

FX-1136C-1 lamps.
Cleaning by heavy discharge.

Lamp removed 4/2/72 was treated by flashing with 200 w.s. - 525 μf @ 900 V. electrolytic capacitors. Bombing 20 flashes. Blew black sputtering back into bends. Starting voltage was 700 to 800 volts. Reduced to 350 volts with 8 K.V. spark.

Lamp which was removed March 31, 72 was also processed at 200 w.s. 900 volts. First flash attempt at 600 volts caused lamp to go into continuous conduction thru surface deposits. Second flash at 900 volts blew back much of the deposit. About 20 flashes cleaned up the lamp quite well. Then flashed at 250 volts with 8 K.V. trigger.

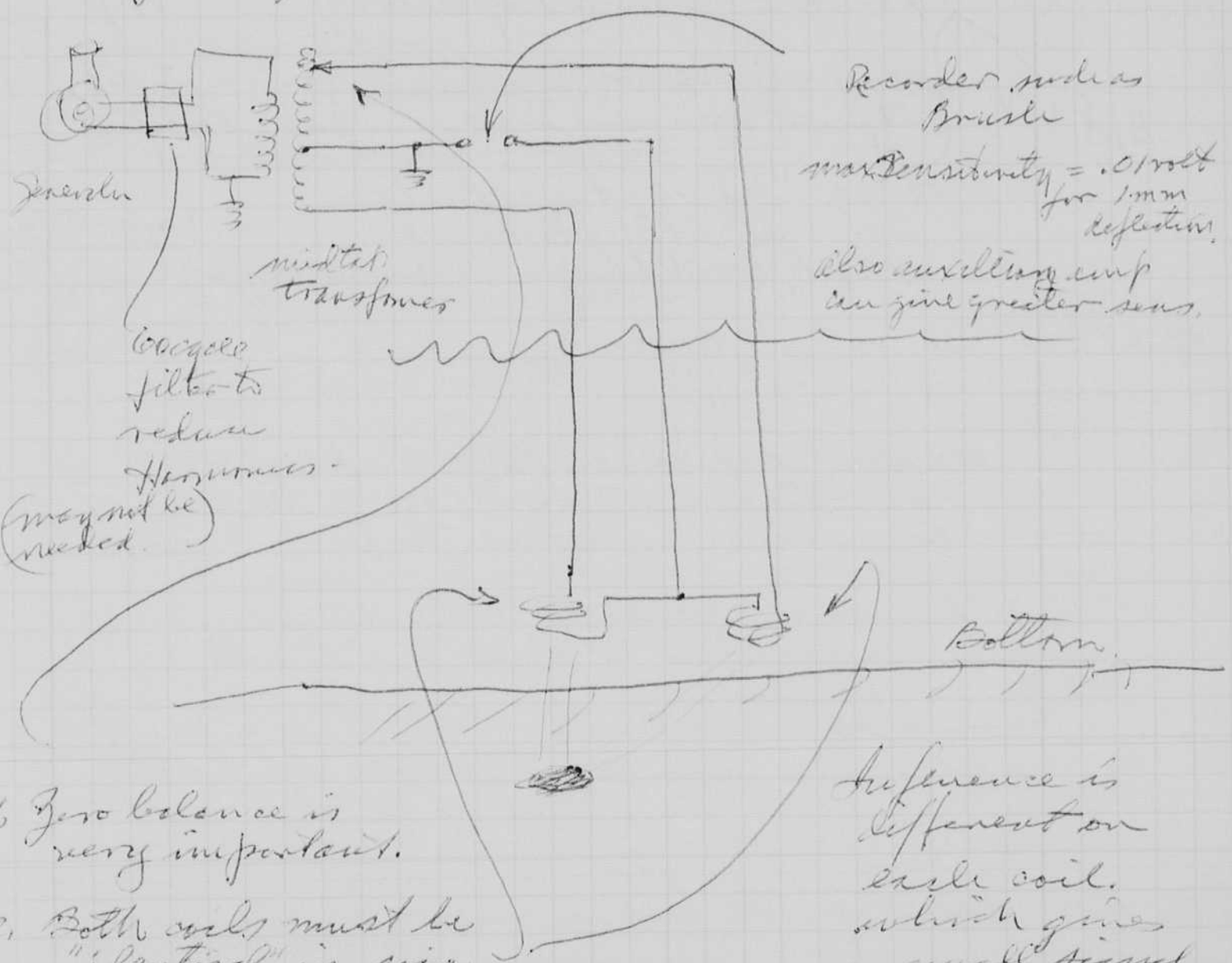
The 525 μf consisted of four Sprague 525 μf 450 V. capacitors connected in series parallel. At one time connected 30 μf paper capacitor in parallel, but believed this caused sputtering to appear on the surface that had already been cleaned with the electrolytic capacitors

April 5. Lamp shows slight darkening at the cathode end after 2 3/4 days of operation.

April 7 1927 69 Yesterday
Placed Egitor.

Magnetic detector.

Two coils in bridge circuit with 60 cycle voltage. A graphic detector (such as the Gould) will be used to measure the residual voltage. A metal in magnetic coupling to the coils in a non symmetrical way will give an indication.



Apr. 6 '32

16" mirror for Keene

Pickup #3 @ 1K Ω (DOLLY) VISUAL @ 38 ft.

N.E.C.
V.E.M.
A. Mist.

A { FX-113-C1 used since Apr. 2 with reflector and marks 1/2" 0.7V. 16 μsec.

FX-113-C1 used (same bmp) reflector and marks removed. 2.2V. < 10 μsec

Calibration
10^6 P.C.P
@ 63" 1KΩ

FX-113-C1 new (no reflector) 3.0V. 8 μsec.

4 μf. 1KV.

FX-113 C1 new (no reflector with marks) 3.5V. 8 μsec.
at first was very erratic in peak light output.

FX-113 new but mod has been slightly blackened. 1V. 20 μsec
12 μf, 600V. (requires powerful trigger)

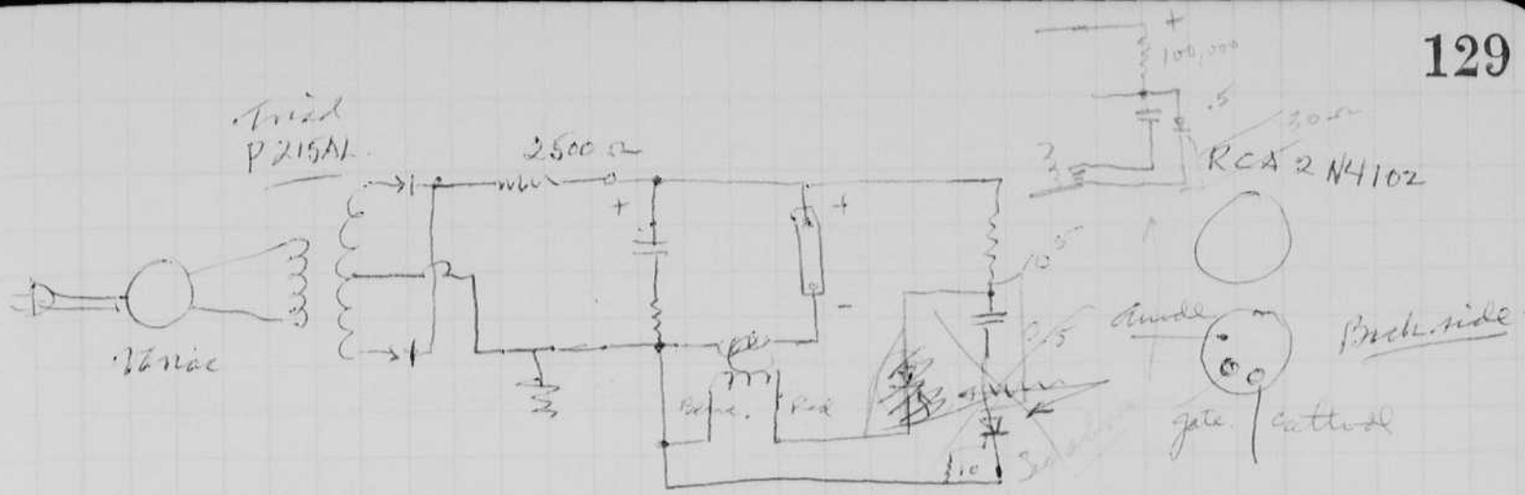
April 8 1932 Conclusions after afternoon session with Alex McLeod Bill MacRoberts and me.

1. A resistor should be used to operate at 400 volts and 25 mfd (±) to keep down the reverse currents in the flash lamps.

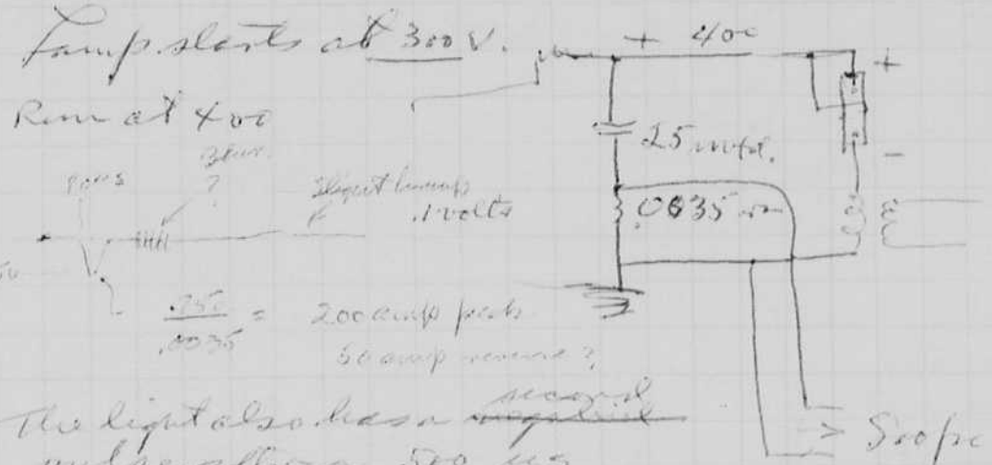
2. The series resistor should be eliminated if possible to aid efficiency.

3. A series injection circuit should be used to get reliable starting at low voltage.

FX113C1 no reflector cleaned tube .3V 50 ms.
plus small peak at 600 ms
25 mfd at 400 V. Light about half ? more Double



If am fair + tests with
max Roberts bipolar with the series mode.

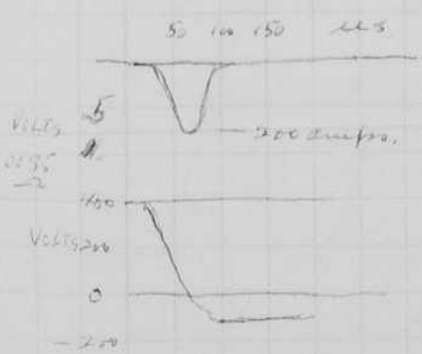


afternoon Put in SCR 2N 4102
0.5 mfd

Now the circuit works ok with no back current
Voltage goes negative on swing.

Current peak = $\frac{0.7}{.0035}$ = 200 amps with 50 μs half cycle.

The arc hugs the wall towards the reflector.



Light. Volts $CP = \frac{K V D^2}{R} = V \frac{4.77 \times 10^6 \times 38^2}{1000} = V \times 6.8 \times 10^6 = 272 \times 10^6$

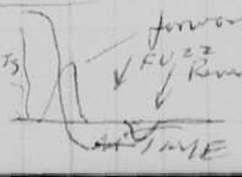
Duration = 60 μs

Peak light × Dur = 163 ~~CPS~~ CPS

Capacitance increased by 8 mfd to 25 + 8 = 33 mfd

$0.45 V \times 6.8 \times 10^6 = 3.06 \times 10^6$

$90 \times 3.06 = 275$ BCPS



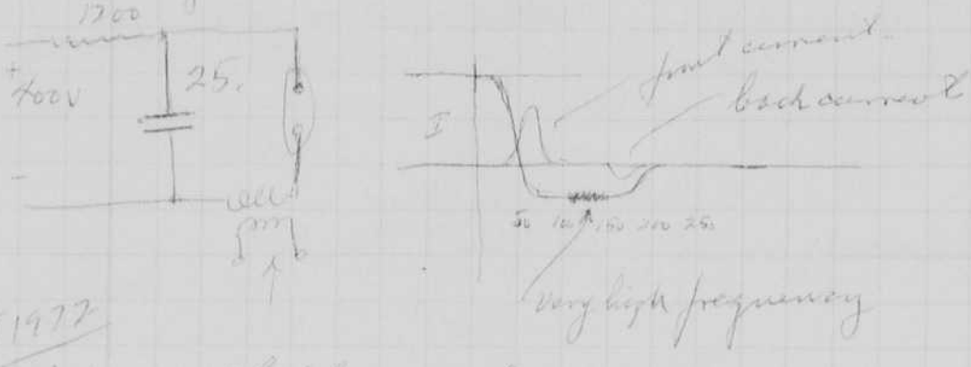
If voltage is above 400 the back current may occur.

Post Apr 1922

Operation at 400 volts (2518) 33 mfd now show a current reversal.

Several other flash lamps make as the lamps that had darkened were tried, all show reverse current. The darkened lamps have been "cleaned" by discharging from 500 mfd 200 volts, electrolytic capacitors.

Changed back to 25 mfd. Still shows current reversal after 400 m.s.



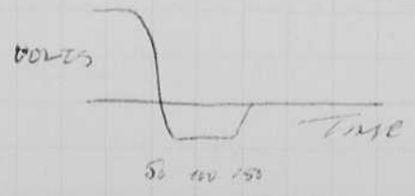
Apr 1922

440 pm Left on with
25 mfd
400 volts.
no reflector or starting wire or lamp

Sunday April 10, 1922 Lamp shows darkening removed and marked 130 (page) on the tag. This lamp had been used on pages 122 123 124
It had been treated with 20 flashes from 325 mfd 400 V to expose the tungsten to the leads.
The anode shows melting.
Cathode also, maybe the barium is all gone!
There was some back flashing

Another clean tube put in circuit
Misses now occur
Also the back voltage goes to zero
showing back conduction.

Left skipping at 1/sec
6.10 pm.



8.20 am April 10 Monday.

Tungsten not damaged from overnight burn. Sharpening is required!

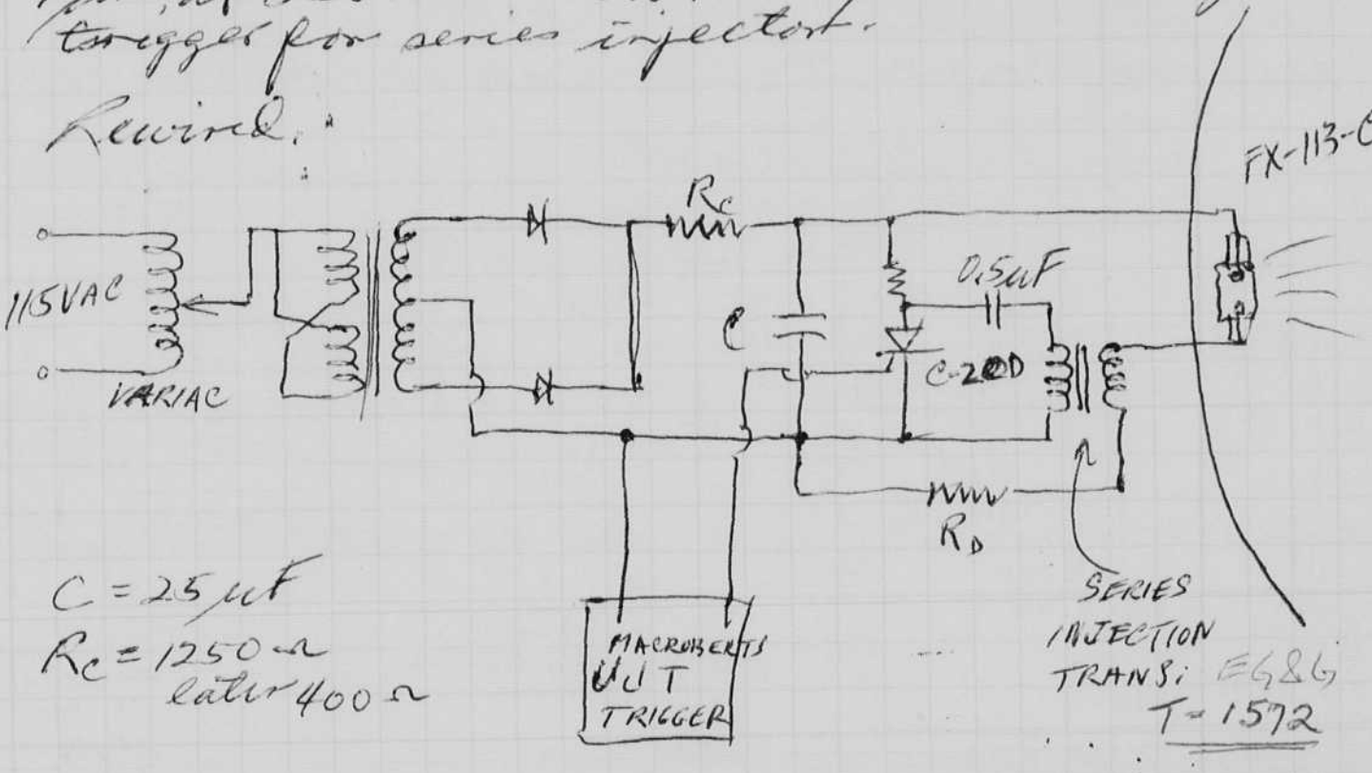
Bill fine Resistance wire voltage goes to -.100 (at most goes to -150 or 200) !

V.E.W.

Missing due to 2N4102 SCR not firing.

Connected bread board UJT circuit to fire 2N4102. Then worked O.K. Increasing rate to 10/sec. resulted in blown fuse (1 Amp in Variac) Replaced fuse and tried again. Triggered O.K. but SCR shorted after a while (RCA-2N4102) Tried MacRoberts trigger circuit with 1 μF, at 350 volts but not quite enough to trigger for series injector.

Rewired.



C = 25 μF

R_c = 1250 Ω later 400 Ω

This works @ 10/sec with V_c = 240 V. to 400 V.

Negative voltage swing @ 400 V = 120 V. when $R_D \cong 0$

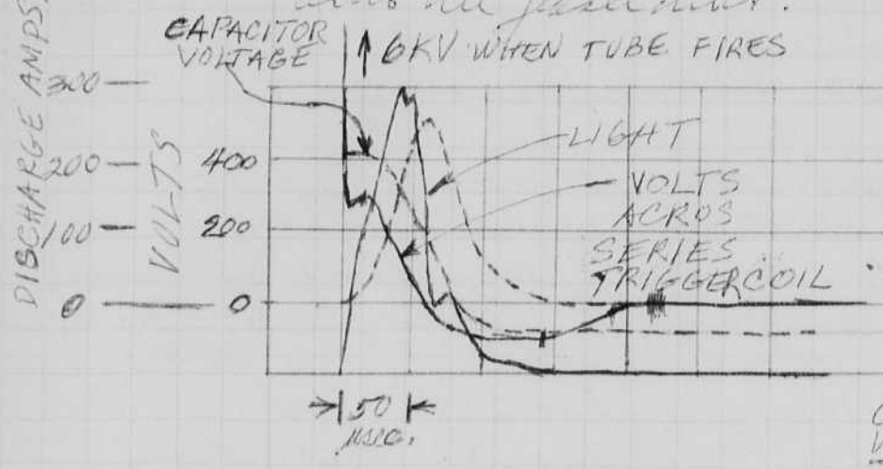
Light output @ 37 ft. Pickup # 3, R_l = 1K (10^6 P.C.P @ 63" = 1 V.)

$\left(\frac{37}{5.25}\right)^2 = 49.4$

	Surge volts	Duration	B.C.P.S.
With R_D = 0	0.28	70 μsec.	970
" $R_D \cong$ 0.2 Ω	0.23	75 μsec.	850

April 11 '72 Visited Hunter. **Rebuilt 400V Flash Unit**

Apr 12, '72 Showed Ted at 93. also Brenner. Ray will have a
Apr 13, '72 V.E.M. component about the Print job. Jean trying to
get Benoff for trio of the panels in daylight.
with the flash unit.



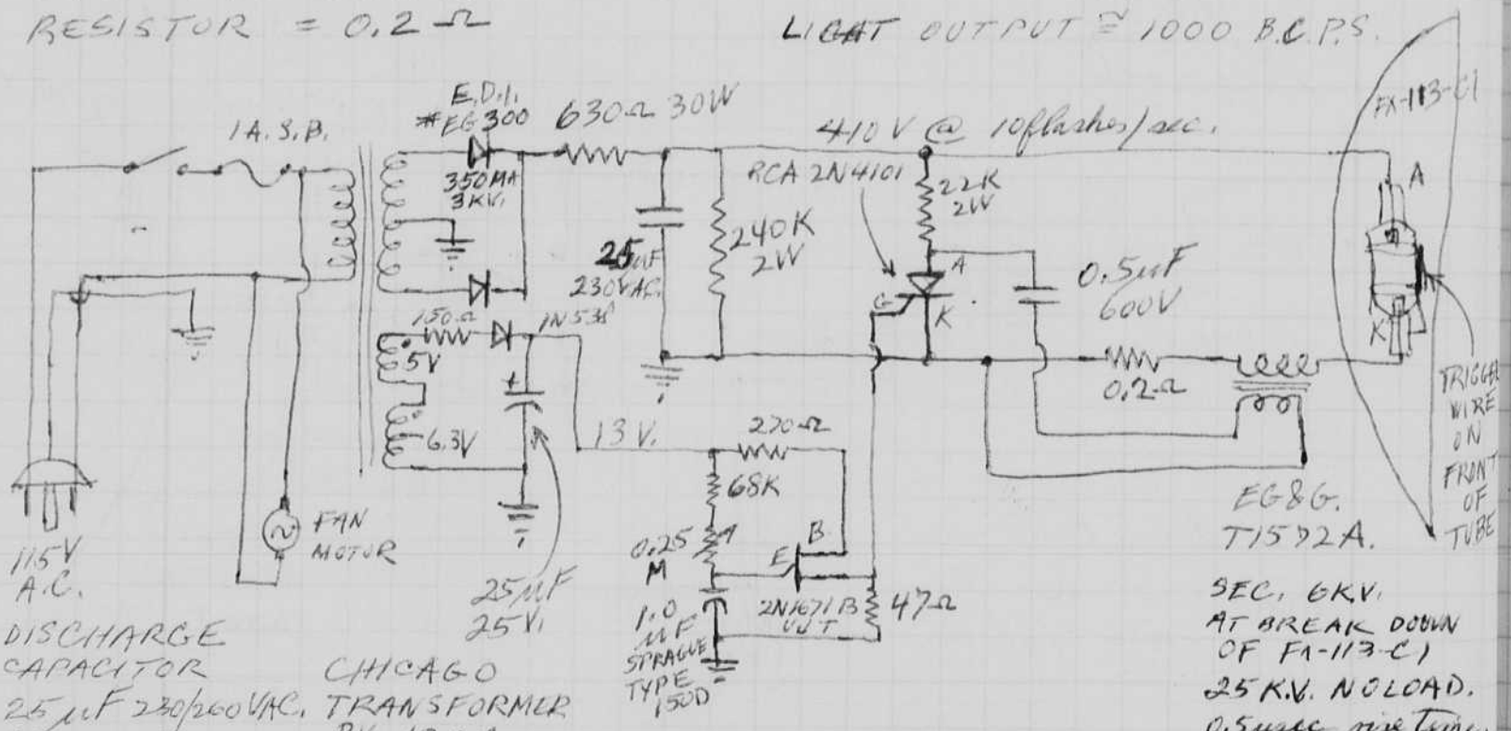
0.4 = 20×10^6
0.3 = 15×10^6
0.2 = 10×10^6
0.1 = 5×10^6
0 =

P.C.P. FX-113C1 THAT HAD BEEN BLACKENED AND THEN CLEANED - BY LARGE DISCHARGES.

CRO @ APPROX. 37 FT.
VOLTS / LIGHT
PICKUP #3
$R_L = 1K$

LAMP SERIES DAMPING RESISTOR = 0.2Ω

LIGHT OUTPUT ≅ 1000 B.C.P.S.



EG&G. T1592A.

SEC. 6K.V. AT BREAK DOWN OF FX-113-C1
25 K.V. NO LOAD.
0.5μsec rise time.

DISCHARGE CAPACITOR
25 μF 220/200 VAC.
SPRAGUE CHLORINOL OV2250

CHICAGO TRANSFORMER
PV-120A
PRI 117V 50/60 cy.
SEC. 350-0-350V AC. 120MA. D.C.
SEC 5V. 3A.
SEC 6.3V. 4.5A.

This circuit operates with only 42 V.A.C input flashing at approx 10/sec. rate.
Capacitor reaches 160-170 volts.
At 50 V.A.C. in reaches 190 capacitor volts.

May 8 1972

Harold E. Egerton.

A strobe beacon of 10 c.p.s. was taken to Aurora Nebraska on May 1 and installed on the west side of the court house. The other beacons all leak. I put new silicon plate triggers in them, replacing the conduction type.

I leave tonight for Athens to work with Peter Throckmorton on a survey of the Lesbos area.

July 30 1972 Harold E. Egerton. Returned from Greece about 1 week ago where I spent 6 weeks on Skomie Seas with Peter Throckmorton We surveyed 10 x 5 mile area SW from Mesolongi to locate Battle of St Paulo Site. See report to Marinitos of area in 170 ft of water due south of the Forge Pump house near Tapiami mountain. This area shows many small targets. It is 700 meters east of a modern wreck. Pump House Wreck.

Wreck. Orca lighthouse 346° PUMP HOUSE
Orca Peak 313°
Kentsélario 333°
Pumphouse 8°
Acadian (Palos) 110°

Plans for Eclipse, expedition to Quebec for July 10 1972 - 57° 4'

1. Photocell experiment

Lens 5¾" 15cm 12" focal length.
30"

Arrive at window, to clouds
15 ~~cm~~ foot candles on front.
1 watt arc at
10° ohms
deflection 4.2 divisions (large)
(10 in full scale)

~~1.5 f.c.~~ —
.15 —
.015 moonlight

again ~~35~~ f.c. to clouds.
1 watt on meter
10° ohms def = ~~4.2~~ (out of 10)
35 f.c. 4.5

Shielded cord put on to reduce pickup in 10° ohm circuit. Now ok at 0.001 volts/division.

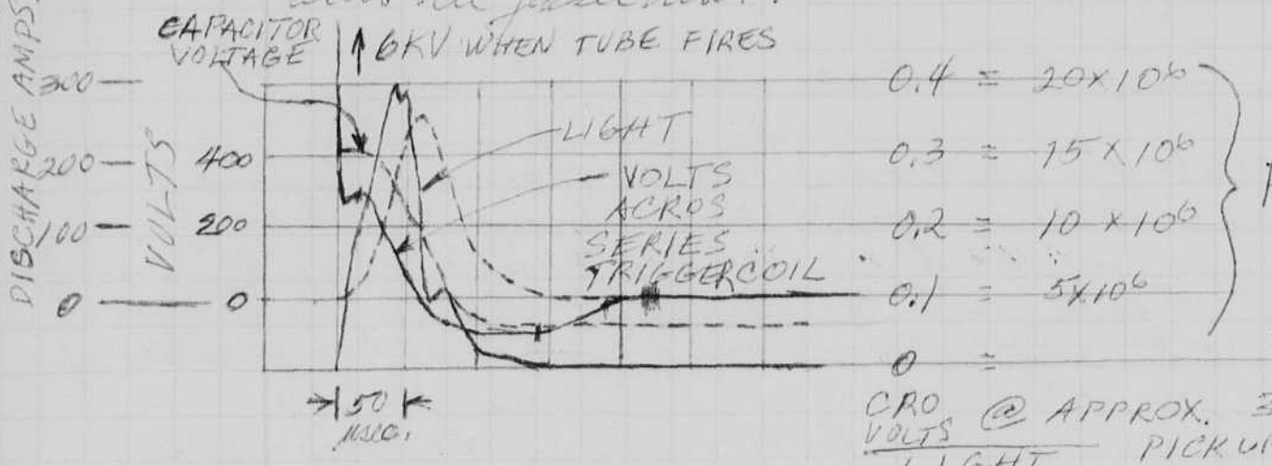
April 11 '72

Rebuilt 400V Flash Unit

Owned by Peyton:

Apr 12, '72 Showed Mr. Ford at 3:35, also Brenner. Ray will have a conference about the Print job.

Apr 13, '72 V.P.M. Leon trying to find Bench for Trio of the panel lit daylights, with the flash unit.



CRO @ APPROX. 37 FT.

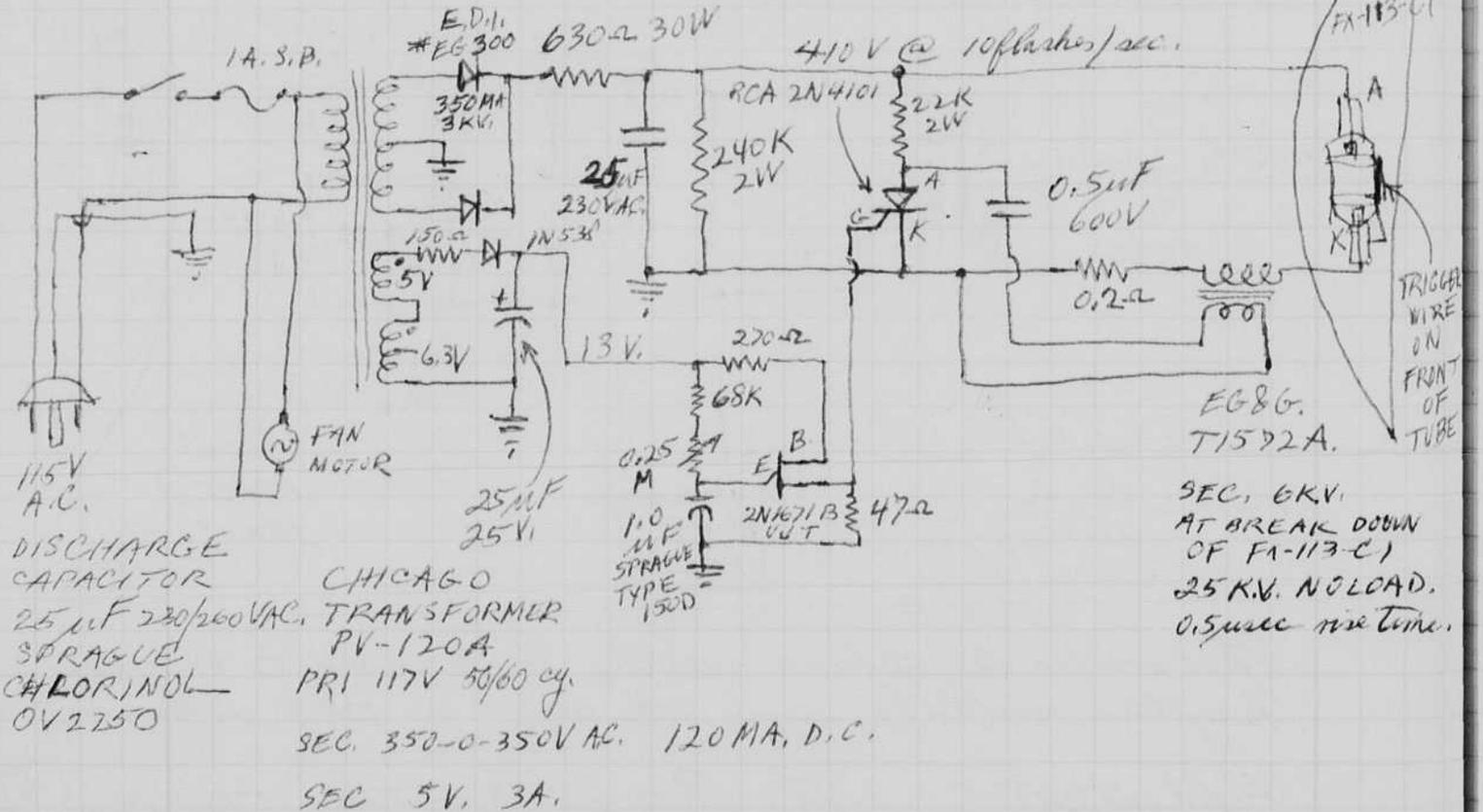
VOLTS / LIGHT

PICK UP #3

R_L = 1K

LIGHT OUTPUT ≅ 1000 B.C.P.S.

LAMP SERIES DAMPING RESISTOR = 0.2 Ω



DISCHARGE CAPACITOR
25 μF 230/260 VAC.
SPRAGUE CHLORINOL—
OV2250

CHICAGO TRANSFORMER
PV-120A
PRI 117V 50/60 cy.
SEC. 350-0-350 V A.C. 120 MA. D.C.
SEC 5V. 3A.
SEC 6.3V. 4.5A.

This circuit operates with only 42 V.A.C input flashing at approx 10/sec. rate.
Capacitor reaches 160-170 volts.
At 50 V.A.C. in reaches 190 capacitor volts.

May 8 1972

Harold Edgerton.

A strobe beacon of 10 c.p.s. was taken to Aurora Nebraska on May 1 and installed on the west side of the court house. The other beacons all leak. I put new silicon photo triggers in them, replacing the conductive type.

I leave tonight for Athens to work with Peter Throckmorton on 12 days mission Kastilla on a survey of the LePanto area.

July 30 1972 Harold E. Edgerton. Returned from Greece about 1 week ago where I spent 6 weeks on Skoutie Bay with Peter Throckmorton We surveyed 10 x 5 mile area SW from Messolongi to locate Battle of LePanto site. See report to Mariotos of area in 170 ft of water due south of the large Pump house near Tapiarin mountain. This area shows many small targets. It is 700 meters east of a modern wreck. Pump House Wreck.

wreck		PUMP HOUSE
Orin light house	246°	
Orin peak	313°	
Kastellano	333°	
Pumphouse	8°	
elevation (Peter)	110°	

Plans for Eclipse expedition to Quebec for July 10 1972 5700 ft

1. Photocell experiment

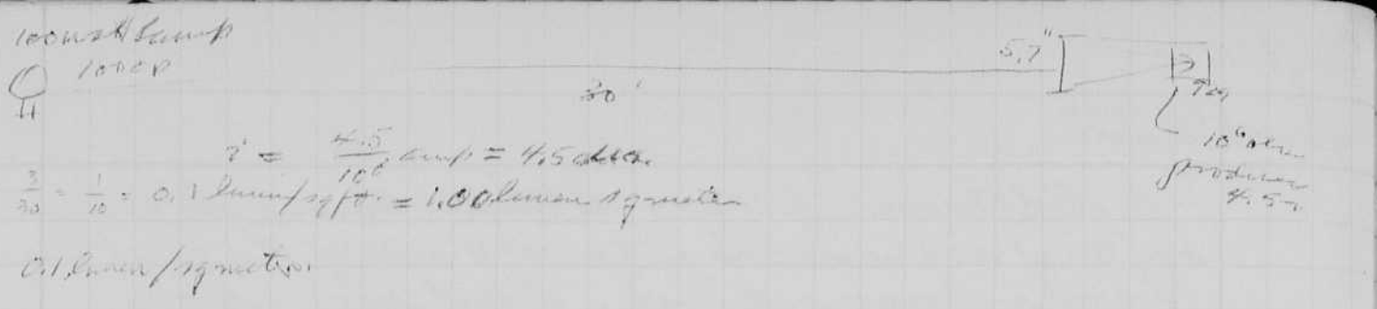
Lens 5¾" 15cm 12" focal length.
30"

Aerial out of window to clouds
15 ~~cable~~ foot cables on front.
1 watt amp after
10⁶ ohms
deflection 4.2 divisions (large)
(10 is full scale)

~~35~~ f.c. to clouds.
again 35 f.c.
1 watt on meter
10⁶ ohms deflection = ~~4.2~~ (scale of 10).
35 f.c. 4.5

1.5 f.c. —
.15 —
.015 moonlight

Shielded cord put on to reduce pickup in 10⁶ ohm circuit. Noise at 0.001 volts/division.



$i = \frac{4.5}{100}$ amp = 45 ma

$\frac{100}{30^2} = \frac{3}{30} = \frac{1}{10} = 0.1$ lumen/sq ft = 100 lumen sq meter

$\frac{10}{100} = 0.1$ lumen/sq meter

July 18, 1972. The site at St Anne des Monts was cloudy but I did take a light time record on the Brush Recorder 220. It showed a minimum of less than 0.1 lumen/sq ft

Today I go to W.H.O.I. with a side scan sonar and a lecture on strobe etc for students etc at the plan. I will be there two nights (today) Wed and Thursday. Back home Friday for appointment with Ballentine from Oak Island

July 30, 1972. Paper on photographing at the mid atlantic rift valley with underwater instruments W.H.O.I. last week.

Also I gave Dave Johnson a core from Helice and a write up about it.

Ybarra sent a paper which is being revised to send to England to some journal of Marine archeology.

I had a conference with Donald Menzel at Harvard on Friday at July 27 about what can be done in Africa at the Eclipse.

He would like to get photometry information of the corona as a function of

1. Distance from the sun
2. Polarization
3. Spectral output.

Menzel did not warm up to my proposal to only measure total light on an oscillograph.

Some funds are available from U.S. Foundation of Jaffrey Line.

August 10 1972
Herold Edgerton.

Preparing for a trip to Northern Greece to work with Niki Scoufopoulous. Esther and I go tomorrow at 330 on Delta to N.Y. Then to Athens on TWA 880. Arrive at 10 am.

Many fun and family week here last week and we all went to Bar Harbor together for a 2 day trip.

August 29 Tues 1972.
Arrived from Athens with Esther on Aug 26. O. Lambert was visiting from Monaco. Aug 27 - unpacked and rested Aug 28. visited McCarthy at IAEC Waltham Environmental div, Ed Cirey at Beverly, and Morey. Geo Sci. Co Burlington also saw Art Brake at U.S. and Kevin? Campbell about Iceland expedition to look for a ship.

John Carson & wife and Byers were visitors from Rochester. All the above and Jean Mooney & George were guests for dinner at the faculty club.

Lambert's Ben. Alba went to NH01 Tetley on the bus line

Sept. 4, 1972 Prepared yesterday for lecture tour to Albuquerque Los Angeles then in Oct ~~or~~ Minneapolis Rochester and New York for the SPSE society. Slides - movies - Water drops strobes etc.

Sept. 15 1972 H.E. Edgerton. Chas. Miller. #752 surface.

Out front of Strobotac 1 ft from Pickup $R_L = 100\ \Omega$.

$v = 2.3 \times .05 = .115$ volts. $cp = \frac{KVD^2}{R_L} = \frac{15.3 \times 10^6\ 0.115\ 1}{100}$

Strobotac 1538

$= 17{,}600$ candlepower

Strobotac 1531 from Tab. Pickup #7.5-1

$.2 \times 3.8 \div 2 = .76$

$cp. = \frac{0.76 \times 15[illegible] \times 10^6}{1000 \times 1.99} = \frac{15{,}100}{[illegible]} = [illegible]$

$3.9 \times .2 \div 2 = .78$ volts

$cp. = \frac{.78 \times 1.99 \times 10^6}{1000} = 15{,}500$

Room 13.1150 2.25' to Bare Tampon LS10 B Serial #6(13354/8)

$2 \times 1 on = 2$ volts. $cp. = \frac{2 \times 1.99 \times 10^6}{100} = 40{,}000$

Increased capacitance from .03 to .06

Peak light increased 50% and duration was slightly longer. Estimate the light is down that the pretty change.

Peak $cp = \frac{3 \times 1.99 \times 10^6}{100} \cong 60{,}000.$

Duration $= 2 \times 10^{-6}$

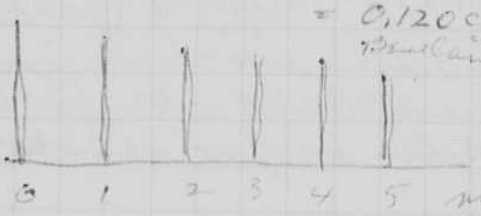
$cps = 60{,}000 \times 2 \times 10^{-6} = 120{,}000 \times 10^{-6}$

$= 0.120$ cps. Peak cp.

$DA = \sqrt{0.120 \times \frac{160}{25}} = \sqrt{1.6} = 2.5$

Ref [10] ... for f 2. Tamp at 1.25 feet.

$DA = \sqrt{1. \frac{160}{25}} = \sqrt{5} \cong 2.5$



Sept. 17 1972 8.30 am Chas Miller & H.E. Edgerton

Golf plates Polaroid ASA 400 type 52

Linhoff camera, f 4.5 lens 150 mm.

Light set for 8" diameter at 23.5".

Contacts on golf ball for sync.

#1 f 4.5 3 plates ?! Overexp

2 f 8 7 plates ok. Point light to right

3 f 8 6 plates Exp ok Topped ball. Lens - Sub 26"

Light - Subject 23" from front of rapid lens.

Color.

#1 no filter. ~~f4~~ f5. Ektachrome Hi-Speed A34160 35mm

2 CC15 filter f5 " "

3 " " " Chas

4 " " Blank, Chas no hit

5 " " "

6 CC50 yellow f5. " H2 Topped.

7 " " " H2 "

8 " " No Hit Fighter overhead H2

9 " " Hit mast. no ball H2

10 " " ~~Hit no~~ Blank H2

11 " " Hit mast, ball wood H2

12 " " Hit mast Chas

13 " " Topped Chas.

14 ~~Start~~ CC15 filter " ok? Chas

15 " " ok? Chas.

16 " " ok? Chas

17 " " Hit mast Chas

18 " Blank end front H2

19. " topped ~~H~~

20 " Sounded ok H2

Sept 20 1972 H2 & C.M. H2 prefers the CC15 filter f5 (to ~~f5.6~~).
C.M. " the CC

Notebook # 30

Filming and Separation Record

2 unmounted photograph(s)

____ negative strip(s)

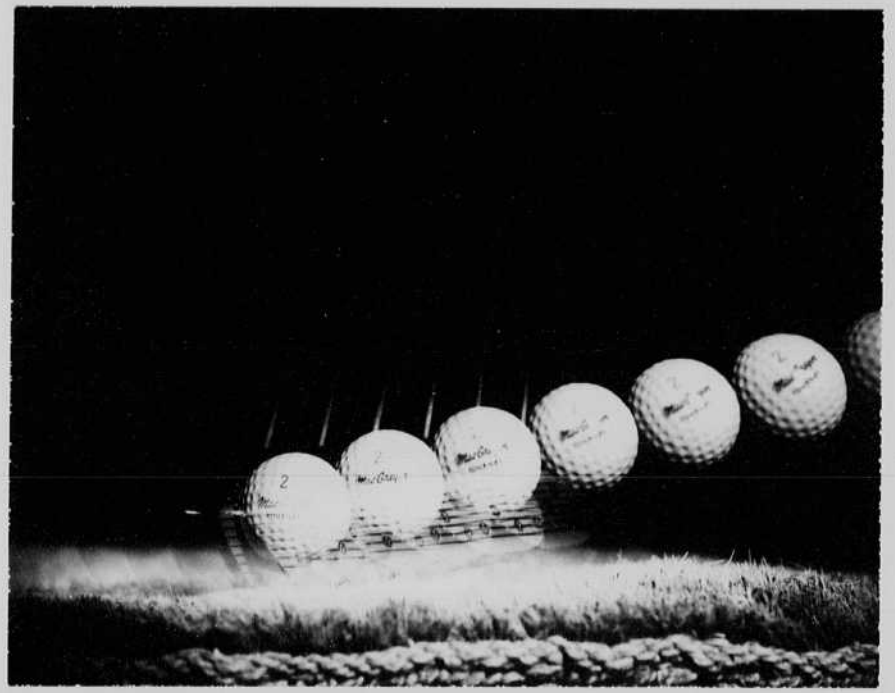
____ unmounted page(s)
(notes, drawings, letters, etc.)

was/were filmed where originally located between page 136 and 137.

Item(s) now housed in accompanying folder.

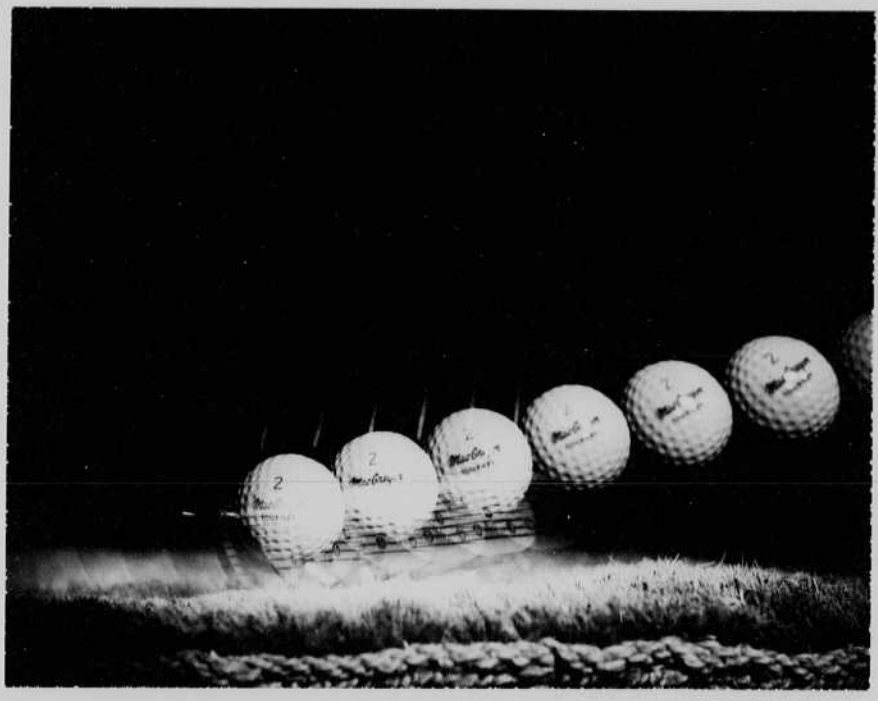
#2

#8

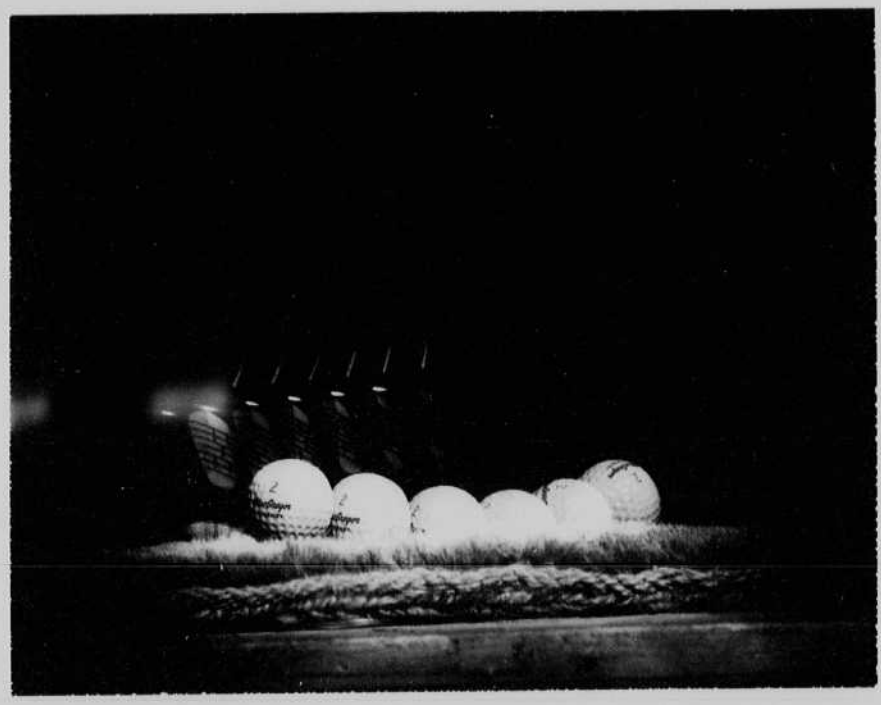


#12

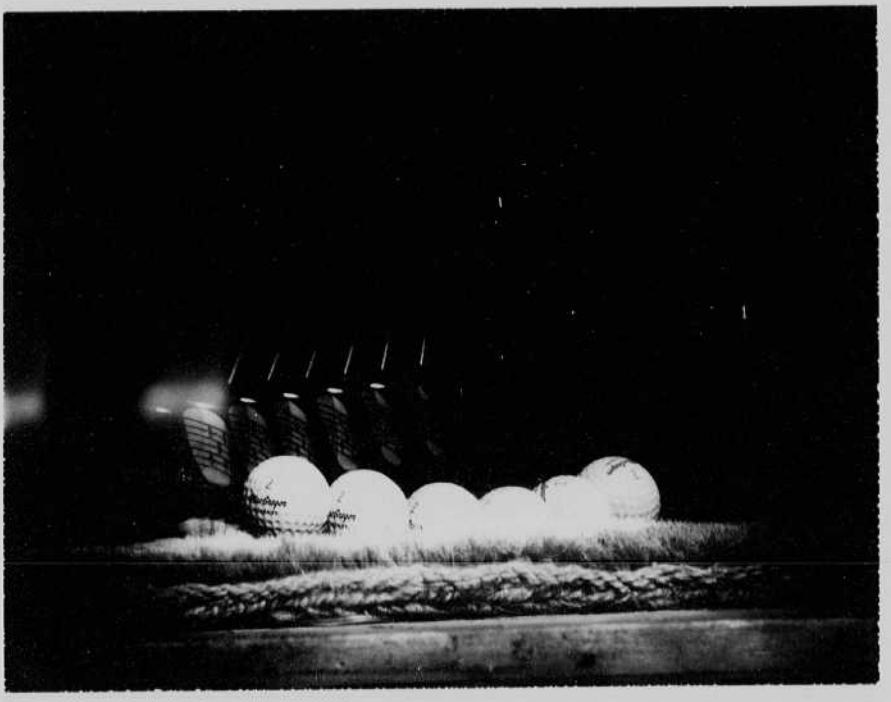
$8



#3
f8



#3
#8



138 Sept 25 1972
Harold Edgerton

Photos at a 1000 per second rate were made of averbach on last Friday. See data in Chas. Miller's books?

Sept 28 1972 Camera last. Nikkormat Camera Lens #1992179 55 mm f 3.5.

		f.	Dist Lens at	
	~~Blank~~ Blank.			
Bad	1500 BCPS ~~5 ft~~ 52"	3.5	52"	4.2 ft. Plus X film
Portable	"	5.6		
		8.0		
10 sec repeat		11.		
		16.		
		~~22.~~		

8300 BCPS at 30 ft. 3.5 Flash Reduced on Bu

8300 at 30 ft 3.5
8
11

8300 at 45° 3.5
Lamps at angle

Variable Distance to clock lamps.

5 x 12 = 60'
4.8
4.6
4.4
4.2
4. = 48"

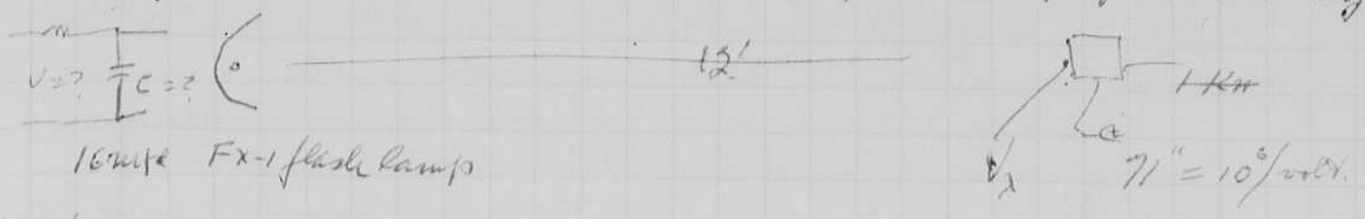
Sept 30 1972
Harold Edgerton
Stanley Kremner
Thad Byrd
Paul Balian
Kevin Loftness
John Pearson

Chestnut Side Scan and Bru, Sonar. 25°

1. 250 ft fot scale 21.5

Sidl Scan worked ok
Strong wind made navigation difficult.

Oct 4 1972
Harold Edgerton Bill Mac Roberts Beams from Indicator removed from Roof of CMIT Bldg 4.



16 mfd FX-1 flash lamp

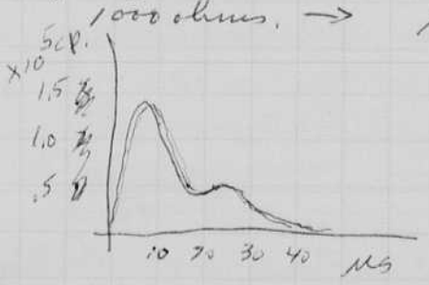
2100 V
(maybe 2000)
15 volts
17.5 mils 1000 ohms.
4. x 10⁶ c.p. x 17.5 40 ms.

output = 70 x 10⁶ x 40 x 10⁻⁶ = 2800 B.C.P.S.

Lamp self starts when hot.
Starting bar reduced to 2/3
Then some misses!
Starting action and self flash too critical.
Second lamp completed - new FX-1 put into Lamp House.

Oct 17 1972. I was in the Boston Harbor on Spectacle Island with Kaye yesterday. We used the SHROCK capt Dave Mitchell.
5 KC Mass with 5" alden recorder. 258.

Beam of Spotlight. 30° reflector
7 feet pick #4. S-4 2.7 div x .5 = 1.35 volts
1000 ohms. → 1.35 volts = 0.135 x 10⁶ candle power.
25 ms duration. Rods.



16 x 3 feet 4 reflector 39 Lat.
3 div x 2 = 6 volts 100 ohms. 6 x 10⁶ P.C.P.

$\left(\frac{39}{7}\right)^2 \times 6. \times 10^6 =$

$\frac{39}{7} = 5.55$

$5.55^2 = 31.$

$\frac{6}{186. \times 10^6}$

$M = \frac{186}{.135} = 1370$

Oct. 23, 1972
Harold Elgerton.

Walter Crowe showed me some dead birds near the library & main Bldg corridor. These birds fly into the windows, thinking they can get through.

6 enlargements of owls and 9 drawings of owls were put up in the windows on the south side yesterday and today. We will see if this prevents the slaughter of migrant birds.

Esther and I had 9 students out for dinner at our apartment, 120 Mear Drive 11-7 last night.

Jean my boat, Mary, this morning and put some floatation under it.

November 27 1972 Harold Elgerton.

Esther and I spent the weekend of Oct 28 in Wilmington with Margaret and Bob Robinson at their new house.

We also left at 11 am for Aurora Nebraska on Nov 3 to spend the weekend in Aurora & see my mother Mary Elgerton who was at the Hem Co. Manor, then we left for New Orleans and Houma La to work with C.A. Christ on the words for the V-166 Hyman seismograph which was reportedly sunk as described below. We took a rented car to Lincoln, and caught a Frontier plane from Lincoln to Kansas city, & Braniff plane was then taken to New Orleans, Christ took us from New Orleans to Houma in a 4 place Cessna. Nov 6 was spent primarily for going to sea, Nov 7 was spent 27 miles south of Cocodrie on an aluminum crew boat.

A phone call from Mary Eller in Washington brought news of mothers death on Nov 7 at about 9 pm. I checked out Christ and Adams on the operation of the E&G Brown recorder 25 Nov. Then we left for Omaha arriving in Aurora about 7:30 pm. Margaret was already there at 1003 F St, the family home. Mary Eller came in the next day also her husband Welch Pogue, her sons Richard Pogue and Billy. Bob Robinson Margaret's husband also arrived and ~~Esther~~ Robert Elgerton, my son with his son Eric and my daughter Mary Jane Dixon. Jean Dixon and Caroline Coe came from Woodbine Iowa for the funeral on Nov 11.

There was a 6" snow (wet) storm on the 13 of Nov. It caused some traffic problems. I left for La from Omaha on the 16 arriving in New Orleans about 11 am.

Ordered to Morgan city to pick up a crew boat for the
expedition on the 17th. Joan and Bill Bennett n.Mex 58
New Orleans went along. Alice Bourg ~~Bourg~~ as diner
also went. The weather was bad, 4 ft waves, St Mudcat
we out. Even so we did cover a lot of area
and checked the one target, which is supposed
to be a tanker named Parker. I say to dive on
it again for more positive identification.
The 18th of Nov was a very wet day with
big winds and lots of rain.
The Nov 19 was also big winds so we did not go out. Drove to New Orleans to see Bennetts.
An expedition was made on the 20 with
Nov 20 Christ and Adams. Many sonar records were
made and left in Houma. They must do more diving
there later.

German Submarine U-166 capt K.G. Kuhlmann
740 ton class 5-1-42 action by 1942 action from coast Guard plane.
Henry C. White U.S.C.G. Report
Aug 1 1942 28°31'N 90° 45'W

1 mark XV 11 mod I depth charge release at 250 ft.

Nov 20 Bus to New Orleans at 6:45 – Hilton Hotel at airport.

Nov 21 Eastern 142 at 6:55 to at Wanita and Boston

This submarine was 45 feet high. The water
was only 60 feet deep at this place. I think the
sub was demolished to prevent it being a
navigation hazard.

Mystery; the navy says the Parker (tanker)
and the U-166 are at exactly the same position.
Could they both be there and demolished in a
mine?

Dec 2 1972 M.I.T. Room 4-405 4-409.

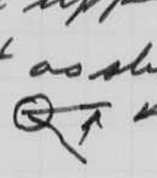
Harold Edgerton Test of Elapsed Time movie camera to be sent to NOAH at miami Fla as requested by Leo Keller.

at 7:35 I took out the first film Kod II 2 ft f16 of a plant growing (2 hours). The equipment was started by Bill MacRoberts last night about at a 45 second delay.

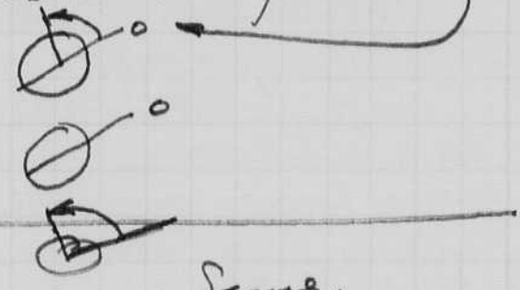
There are three resistors to adjust the time interval. The small single resistor was set at 45 seconds)

Adjustment for 110 seconds by turning the upper 10 meg to a vert position.

This was set as shown



100 sec



Increased 10° more.

Same.

115 seconds (about 2 min.)

$DA = \frac{BCPS\,\theta}{C}$

$T = \frac{A^2 G}{\pi S} = \frac{256 \times 45}{400 \times 2}$

Dec 2 1972			flashes	
Camera Set.	8.25 pm —	46651	Start.	about 2 min (115 sec.)
	8:27	46652	first flash.	
	8:40	46658		
	9:02	46669.	18	400 ft candles Tungsten
Dec 3. Sunday	1.36 pm	47160	0509	"
	1:48	Cup of water given to plant.		" hand.
Dec 4. Monday	9.15 am	47736	1085	"
	4.45	47916	1265	Light off.
	5:14 PM	47919		120 sec. interval saw flash miss at 47920 and 47922
	5:44 PM	47928		9 flashes in 30 min.
	5:45	off for checking		3 trigger caps. 190 volts (SCR)
	6.05	on 47929		3 fired every time out of housing. missed first time in housing (Camera ran)
		Turned off		
	6.11 on again	47930	1st flash O.K.	2ND missed 3RD O.K. 4TH O.K.

Dec 5 1972 2.00 am 48298
Tues

1647 flashes.

9.48 48322

1201 48384 1733

48384
48651
1733

Barney Walden
Hubert Fowe
12000 ft alt in
Falmouth Foreside
(Tyng.

Film Removed 5/ft left on reels. taken to Coop for processing at noon. 1200 Tues.

EVE
CHEE
9.30

Film from Dec 2. Dec 3 received at coop at noon Dec 5.
(1) There were some misses - all occurred at night
(2) Exposure was weak at 2 ft f16 (Should have been f 11)
(or 1 ft at f16).

(12-13-72 7.2.m.
Looked at Dec 2 film again
Started at

Film Dec 2 - 3.45 analyzed on Dec 7 1972
many ships! most at dayline.
on Dec ~~4~~ afternoon.

Analysis of DEC 2, 3, 4, & 5 film.

DEC 2 SAT	DEC 3 ~~SUN~~	DEC 4 MON	~~DEC 5~~ ~~TUES~~	
START 8.28 P.M.				
~~MISS 12.40~~	MISS 12.40 A.M.	MISS 2.34 A.M.		
	" 6.14 "	4.16	2.00 P.M.	3.42 P.M
	" 8.04 "	5.15	2.06	3.50
	" 11.50 "	8.28	2.14	3.54 5.38
	" 11.52 "	12.16 P.M.	2.22	4.02 3.42
	" 12.20 P.M.	12.18	2.26	4.04 ~~5.40~~ 5.46 OFF
	" 9.15 "	12.24	2.38	4.10 ~~5.44~~
	" 10.32 "	12.34	2.42	4.12 ~~5.50~~
	10.48	12.38	2.44	4.18 ~~5.52~~
	10.56	12.52	2.46	4.22 ~~5.54~~
	10.00	12.58	2.52	4.28 ~~5.56~~
	11.05	1.02	2.54	4.36 ~~5.58~~
	11.10	1.04	2.58	4.44 ~~6.00~~
	11.50	1.08	3.00	~~4.50~~ ~~6.02~~
		1.18	3.04	~~4.58~~ 6.14 6.100N MISS
		1.20	3.10	~~5.00~~ 6.20 "
		1.30	3.15	5.10 6.36
		1.32	3.25	5.12
		1.34	3.27	5.18
		1.38	3.31	5.22
		1.52	3.33	5.28
		1.56	3.38	5.34

 Dec 8, 1972 10:45

Why does the deep-sea equipment miss some pictures?

Questions. (1). Does the metal or glass of the container have any effect?

(2) How about low voltage on the batteries. (a) camera
(b) Strobe.

(3) In case of "Dark" or lamp firing Bill says there is no effect.

4. Are we sure of the camera cycle. Does the signal voltage come at the "right" time.

5. Does there occur a spark due to explosion across the terminals of the lamp. (a) Shorting the spark energy or (b) discharging the

6. Should we put in an oxygen absorber.

7. Does glass cover of lamps accumulate a charge?

Fuse for Honda Lamp 2.6 cm x .6 cm.
125th Hand Generators cleaned and checked
Spark plugs cleaned and adjusted.
New rubber feet made for new model.
Frequency adjustment changed on old Honda.

Camera Test f11 at 2 ft on ~~Kern~~ Kern 10mm Switar f1.6 Serial 1115218 Harold Edgerton Bill Mac R

~~11.~~ Started 11.25 am 44 sec. interval NOAH camera for Deep Ocean.

12.30 M Have been watching SCR anode voltage, now 182 V. to ground. No shifts.

12.40 P.M. OFF

COUNTER

5.15 P.M START 43.5 - 44 second interval

New camera batteries 23.5 V. with 50 Ω load.

New strobe batteries

f-11 @ 2 FT.

4855 Dec 9-

0 4f 423 6.00 P.M. O.K. so far.

12 midnight 1 2 3 4 5 6 7 8

Dec 8 49600 8.20 am — Difference = 1177 clocks out ok.

8.30 Yellow paper with Date put in pasture.

8.32 Tungsten lamps directly overhead 1½ feet.

— 10.0 m Tungsten lamps off for short time.

49749 11.25 Note the counter is running due to

49751 11.25 counter moving shake from the leaves of the plant

49753 11.29

~~(Stop at 6 pm tonight. 43 sec → 23.83 hours for 2000 pictures)~~

49832 12.28 Still going ok.

49246 5.31 pm Tungsten lamp off

5.36 ± " " on for few flashes.

5.42 camera off.

49246
48823
1423 pictures

Camera Battery shows ~~20~~ 22 volts.

all 225 volt Bats were on REPLACE

(180 200 180 volts on ~~tripler~~ with no load)

Red +

Black -

NEW FILM.

Put in new Strob. batts. all in "Useful" range. Interval 115 sec.

			adjusted		Exposures	
Dec 9. 1972	50264	6.10 pm	Zero.			~~Start~~
"	50265	after 6.15	1	1		Start
?	641	617				
Dec 9.	50451	12.05 midnight		186		
DEC 10	50838	12.02 Noon.		574	114 sec interval	12.10 (170 calc 540 / 114 — 569. ✓)
		1 cup of water added. →				
		12.23			→ Lamp put at 1.5 ft. 150 w.	
	50927	2.59 pm. (89)				
Dec 11	51498	8.56 am	Light off (tungsten).			

over

contd. test of NCAR Dept Sea Elapsed time Strobe camera
H. Edgerton.

Date	Time	Elapsed Hours	(6107 Dec 9) counter	(50264) Elapcounts	counts/min.	min/counts.	Comments
Dec 11	9.00 am.	38 hr 50 mm (2330 min)	51500	1236		~~1.87~~ 1.87	112 sec. Looks ok.
					.535	1.87	112

767 counts to go. x 112 sec/60 = 410 minutes or 6.83 hours.
~~Film should be done at 4 pm today.~~ No Chem - 50 min

Dec 11	2.49 pm	51,685	185	1421	
"	4.08	724	41		
"	5.27	51766	42	1502	
"	9.13	51886	120	1622	586 counts = .526 / 733 min; 1/.526 = 1.9 min/ct = 114 sec
"	9.18	cup of water will show in frame - into pot.			
"	9.25	200 watt Tungsten lamp 15 ft [illegible]			
DEC 12	9:00	52260		1996	3710 min / 1996 = 1.89 min = 113 sec
	9:08	52464			

all 2254 batteries say "Replace" on our meter. Even the
4-6 volt batts good at 22 volts on open air.

Bad News Dec 9 film has been processed. The camera puts through 2 pictures instead of 1. No flash on the second one. This cleared up about 1/4 of the way through the film.

Looking at shutter of camera on bench, with no film, camera ~~cycles and~~ shutter opens only once.

Dec. 12, 1972 Microphone tests

old type of crystal in square alum housing.

Out put when I was 4" below the line of the bullet and 6" from muzzle.

#1 2 ~~0.5~~ volt peak. 1 ms duration

Unimorph on Brass disc. 0.5 volts.

B12? Disc less than 0.5 volts.

These new elements are many much weaker than our old bimorph crystals.

Dec 13, 72
2 PM. NOAH Elapsed time camera.
Obtained new set of Burgess F4 BP batteries
Open circuit voltage of each 3 were 6.4 volts
1 was 6.3 volts
With 10 ohm load 2 - 5.8 volts
2 - 3.5 volts

4 batteries in series open circuit 25.75 volts
With a 50Ω load 23.75 volts.

Operating camera (no film) looking at shutter and 240 sync pulse on scope. All OK.

Sutton old camera 11.5V pulling 4.5V Drop out.

note, 12 ohms in series with the SCR GE C20B causes double operation every time.

Dec 13. 72
After many experiments we now end up with a .1 mfd cap across the relay coil that turns on the strobe. This seems to solve the double expose problem.
C106 is the SCR that energizes the circuit. the cap now make the SCR go off. However the trip circuit is held up with a diode so it will be up when the capacitor says "go". We are loading the camera with Kodak II film at f 11 for 2 feet. A clock is our subject. Time set at 1/15 sec.

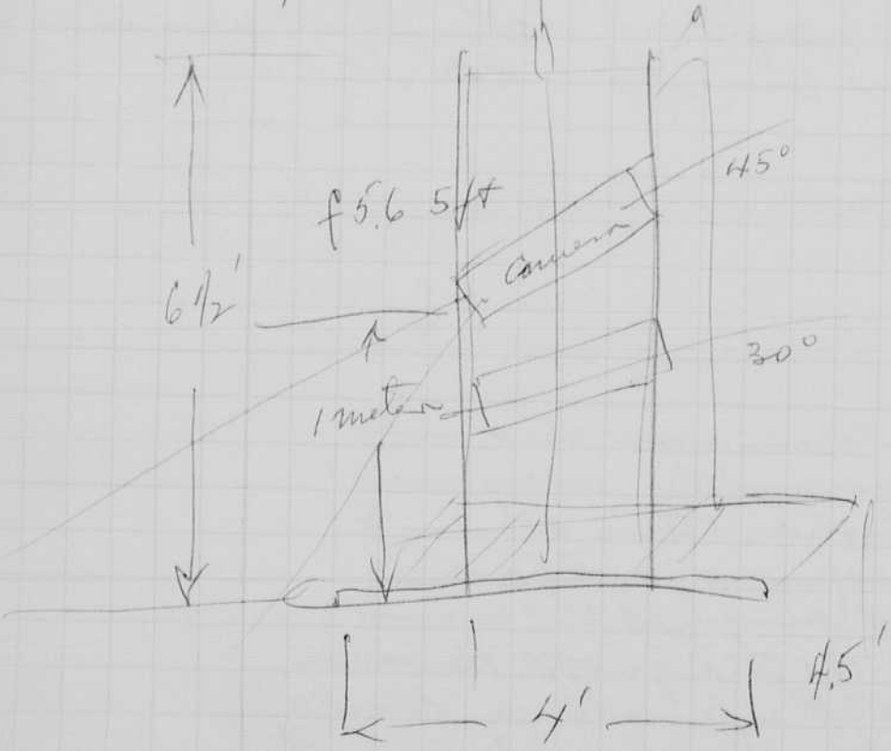
6:30 pm

148 KE Bill mac R.

Time	Time	Elapsed time count.	Elap Time	Counter Reading.	Flashes.
Dec 13 1972	6.45	Hours.	Min.		
"	6.45 Start	47.5 sec. 47.5.		52269	after the flash.
Dec 14	8.58			53.340	1071 / 47.8 sec/flash.
	1125	f 5.6 at 6 ft lab on camera scale Tamper 4' to floor. Camera Tamp angle changed slightly. Clock at 4.5 ft.			
	11:27			53524.	

1215 off. 20 ft Lab 53586 53586 52269 1317

Dec 15 1972 Bill and I are trying to finishing the NOAA Deep Sea Elapsed time camera and Strobe. The film should be back today and we hope it is ok. a small aperture (1 mfd) across the pin magnet seemed to be the cure of the double picture problem.



We plan to ship it to Miami Florida on Dec 18 or 19. I plan to be there on Dec 27 or 28 to time it up.

Dec. 18 1972
A. Edgerton

Finishing elapsed time Starlac for 7000 p.s.i. (14,000 ft) for NOAA.

The last example has not been returned from processing. We are waiting for the final check.

Dec 20 72

The camera was given to the EG&G ~~to~~ at Environmental services Waltham to Pack & Ship to NOAA in Miami.
via Carolina. 595 pounds in 4 packages.
I plan to be in Miami on Dec 26 27 28 to help set it up.

Jan. 2. 1973

Harold E. Edgerton:

I was in Miami on Dec. 26, 27, 28, to help Dr. Geo Keller and Geo Lapaine Jr set up a large deep sea ~~multiflash~~ elapsed time movie camera. This was built by Bill MacRobert's starting in July + with a $10,000 grant.

We had a problem with skipping which was apparently solved by reversing the leads to the spark coil.

Jan 3, 1973. Tests of point light Source for EG&G manufacturers. These were made at MIT by Bill MacRobert's.

Photocell pickup Copperbox with 510 volts and 929. 77½" photocell to lamp.

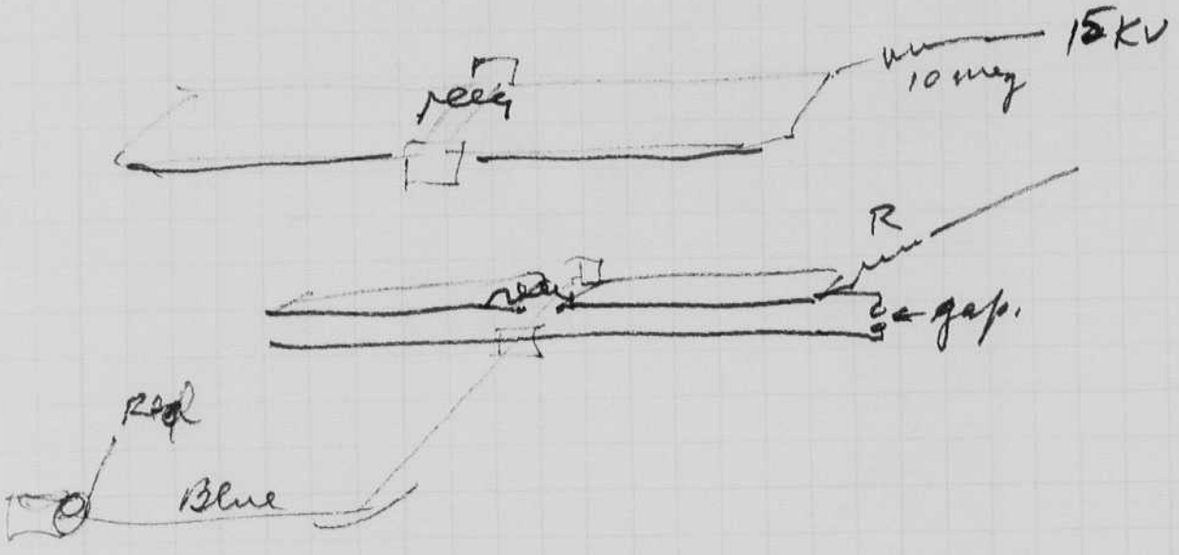
# 13	1 volt	0.6	4 flashes		
# 14	1 volt	0.6 us.	4 "		
# 15	1 "	0.6 us.	4 flashes		
# 16	.9	.6	6		
# 17	1.0	.6	5		
# 18	1.0	.6	6		
?? # 19			misses, N.G. Sparks over (wire out?)		
# 20	1.0	.6	6		
# 21	1.	.6	6		
# 22	1.0	.6	6		
→ 19	1.0	.6	10	now O.K. probly the spark was not connected?	
→ # 24	1.	.6	6	one miss	
# 25	1.	.6	6	ok.	
# 26	1.	.6	6	ok	
27					
→ 28	.9	.6	6	2 misses	
29	1.	.6	6	ok	
30	1.	.6	6	ok	
31	1.	.6	6	Several misses	
27	1	.6	4	ok	
32					

Retest

24	1.	0.6	6	1st skip then all ok.
28	1.	0.6	10	3 skips.
31	1	0.6	8	no skips ok.
24	1	0.6	8	now ok ✓

all seem to be ok. I think the lamp was not put in correct. the pins were not both in the outlets.

Jan 9 1973 Small in Javan's lab showed me a blank light laser from a spark gap source, a parallel line resonator as a laser gas (nitrogen).



I gave a lecture in 3-440 at 11 today about multiflash and strobe in general. for the I.A.P.

FEB, 25, 1972 lower right on the Charles, [illegible]

Photos by David Tenenbaum

FEB. 25, 1972 lower right on the Charles, [illegible]

Photos by David Tenenbaum