HAROLD E. EDGERTON

PAPERS

MC 25

Series III

Laboratory Notebooks

Number 29

Dated May 30, 1965 to July 11, 1969

Massachusetts Institute of Technology

COMPUTATION BOOK

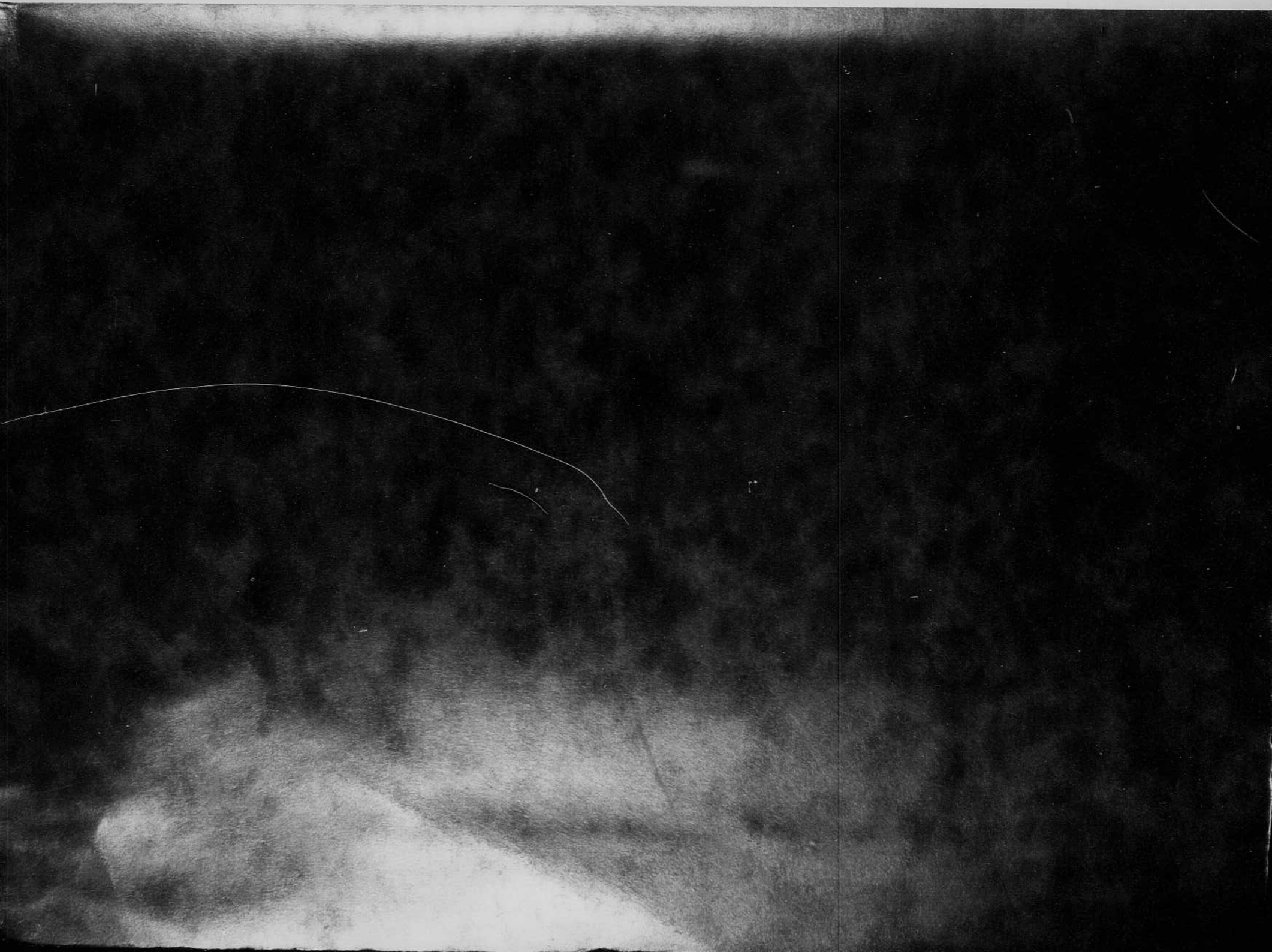
NAME	Number
HAROLD E EDGERTON	29

ROOM 4-405 PHONE KI 76063

Course M.I.T. STROBE LAB.

Used from MAY 30 1965, to JULY 11 1969.

Book No. 29



Harold E. Edgerton
4-405
M.I.T.
Cambridge. Mass.

8 ball Hydroplane calib. See page 66.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

COMPUTATION BOOK

GENERAL INSTRUCTIONS

In all work in which *accuracy* and *ease of reference* are important, much depends upon carrying out the computation in a systematic manner. The following instructions, taken from the *Engineering Department Figuring Book of the Allis-Chalmers Co., serve as a guide in this matter.*

"All computations, of whatever kind, are to be made in these books, except in cases where special blanks may be provided for specific kinds of computation. Computations may be made in ink or pencil, whichever may be more convenient. Pencil figuring should be done with a soft pencil. All the work of computation should be done in these books, including all detail figuring."

"Each subject should begin on a new page, no matter how much space may be left on the previous page. The subject, with the date of beginning it, should be plainly written at the top of the first page of the subject."

"Work should be done systematically, and as neatly as consistent with rapidity. The books are, however, intended for convenience, and no unnecessary work should be done for sake of appearance only. Errors should be crossed off instead of erased, except where the latter will facilitate the work. Work should not be crowded. Paper costs less than the time which would be expended in attempting to economize space in making erasures."

"Where curves drawn on section paper (or sketches) are necessary parts of a computation, they should be pasted in the book, except where specifically otherwise provided for."

"Computations should be indexed, in the back of the book, by the person using the book."

* * * * * * * *"

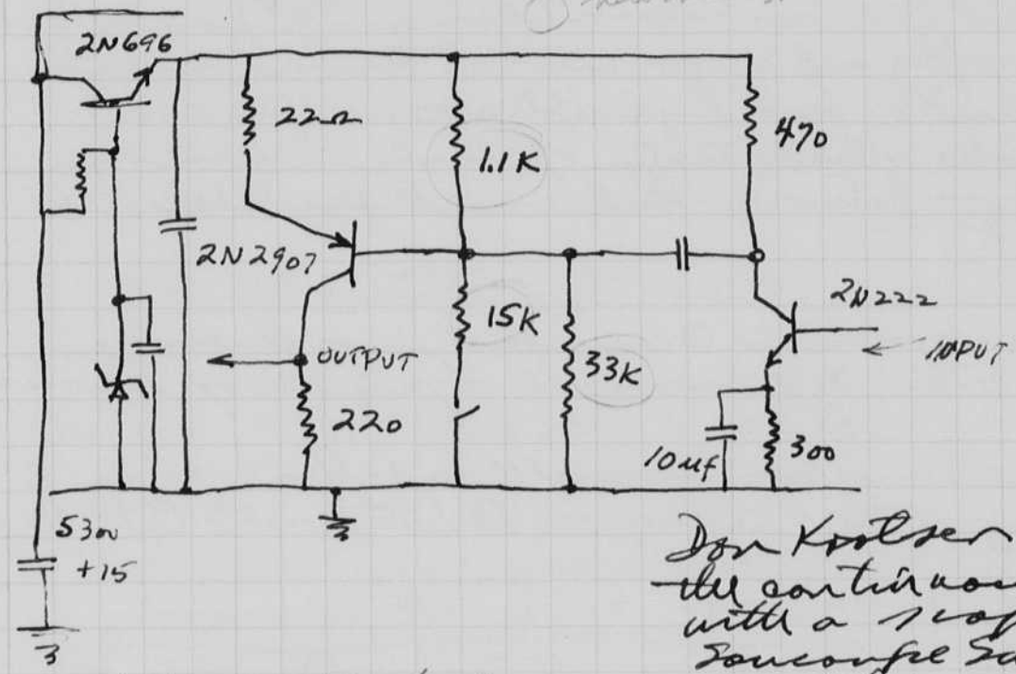
TECHNOLOGY STORE
HARVARD COOPERATIVE SOCIETY, Inc.
40 Massachusetts Ave., Cambridge 39, Massachusetts

$1.45

June 3 1965
Harold Edgerton.

Further experiments with Ed Carey yesterday on the Sonacope sonar device. Our goal was to increase the "pinning" control on the amplifier to increase the level of signal at which marking occured.

Circuit now is



Don Koolser is testing the continuous plan camera with a scope using Sonacope sonar air date

June 4. 1965 Trip to Harbor in Mary with 6KC transducer in streamlined sleeve. Results were not very good. I must try the 30" cone again since this is the area where I got such good results last november.

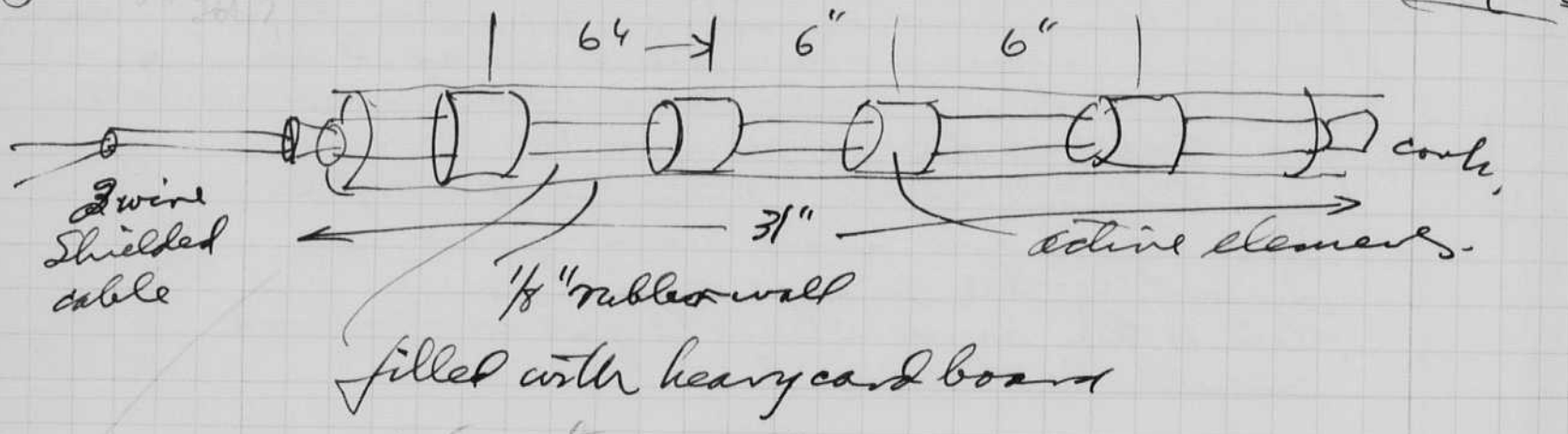
June 6 1965
Harold Edgerton

Expedition June 5 with John Yules and Don Kroltser to Boston Harbor to locate Mount M.I.T. under the bottom just outside Red #2, to Deer Island light. Several fixes were made and a sketch drawn so the area could be spotted again for the Weston explosive tests.

June 18 1965. Excellent 6 KC Records were taken on Sat June 11 in the Harbor via Murphy and 2 men were at the harbor with dynamite and hydrophones on June 16 or 17? to make velocity test of mudline cover in Harbor between Red 2 and Deer Island light.

June 23 1965. Summer course in Oceanography in full swing June 21-25. Rained 7/8. Excellent program of speakers.

June 25, 1965 Summer course over. Designed 4 hydrophone pickup for use with 4 KC Boomer. Don Stewart. Bill Mac Robert



0.005 volts peak to peak into 200,000 Ω.

#1 Deer .1 2 ms 10^5 x 2
#2 Deer .1 2 ms.
#3 Shell .05 2 ms 10^5 x 2
#4 Shell .05 2 ms.
5 Hong .002 2 ms 10^5 x 2
6 Hong " "
7 Depth 17A .1 2 ms R = 10^6 x 1 hydro
8 " " .1 "

9 navy .05V 2 ms
10 navy .05V 2 ms R = 200,000 Double.

11 LC57#69 0.1 2 ms R = 10^6 single ended } AT 5 marks
12 LC57 69 0.1 2 ms. on Scope.

13. Bands.

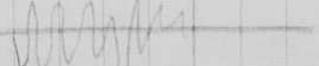
June 27 1965 Sunday.

Reconnected Crystal Barium titanate type in parallel without the 100 K resistor. M.T. Saljanillian - water inside under the ideals on west side of 450 and 60 ~ .005 volts peak to peak into 202,000 ohms. with one side grounded.

With differential input noise is less than .001 volts Looks very good.

Boomer 24 mfd 4KV at 10 ms away (50 ft).
5 ms p to p using plus 4 M/M 5 mv with jigs.
above observation M since one end of iconnector was open? also as a fresh water sparker in series with the coil!

Boomer 24 mfd 4KV .007 mv p to p.



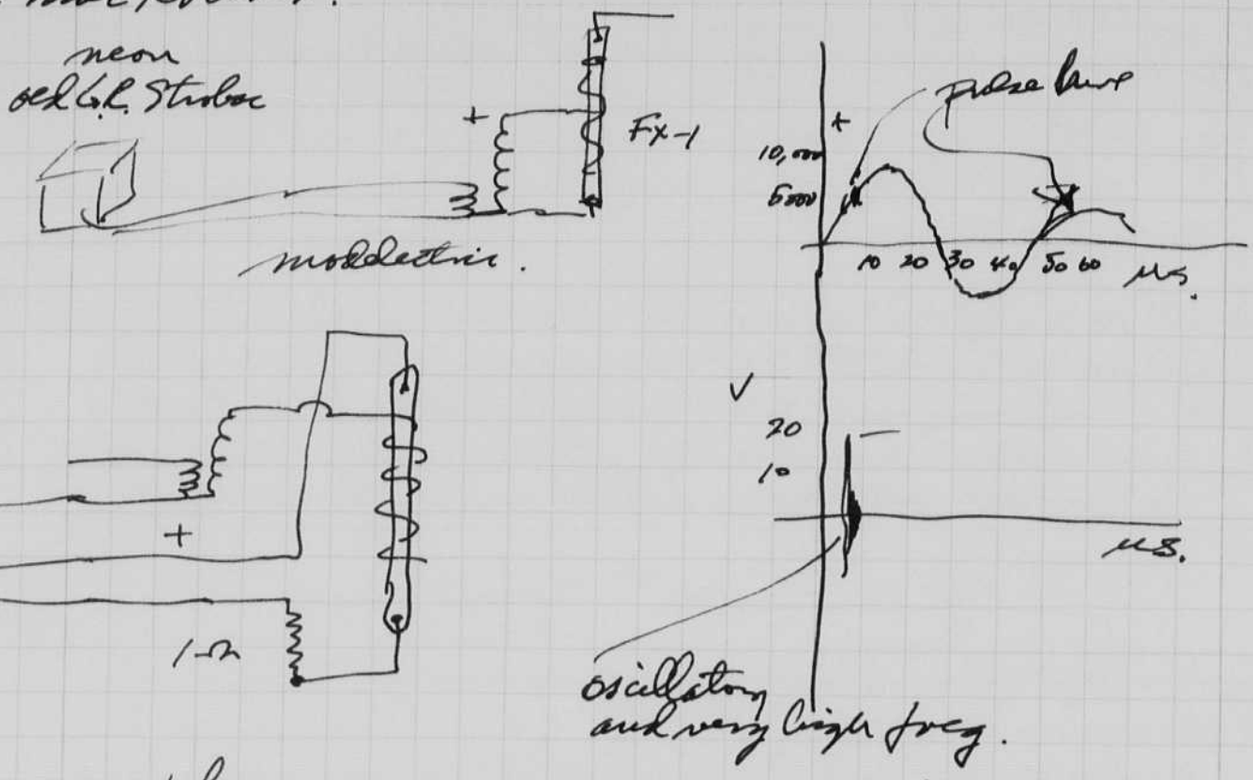
14. LC57#69 0.1 2ms. R=10^6 single ended

15. Hungary 0.01 2 ms. R=10^6 Differential.

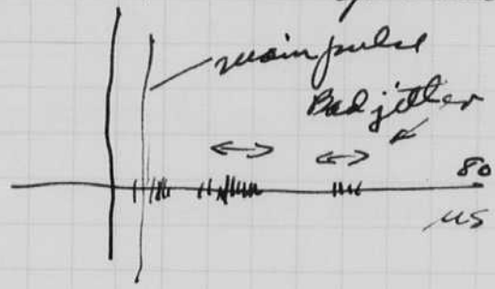
16 8 ball 0.1 2 ms. R=10^6 open ended.

17 Navy Tape .02 2 ms. R=10^6 " "
TR 127 from Navy. (King Cooper.)

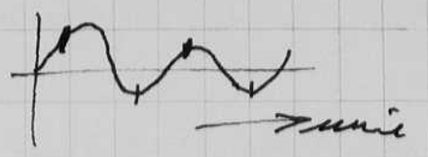
4 June 29 1965 Study of Xenon Starting circuit.
H E Edgerton
Bill MacRoberts.



When sen is increased to 1 volt/cm then we see many pulses of about .1 volt amplitude



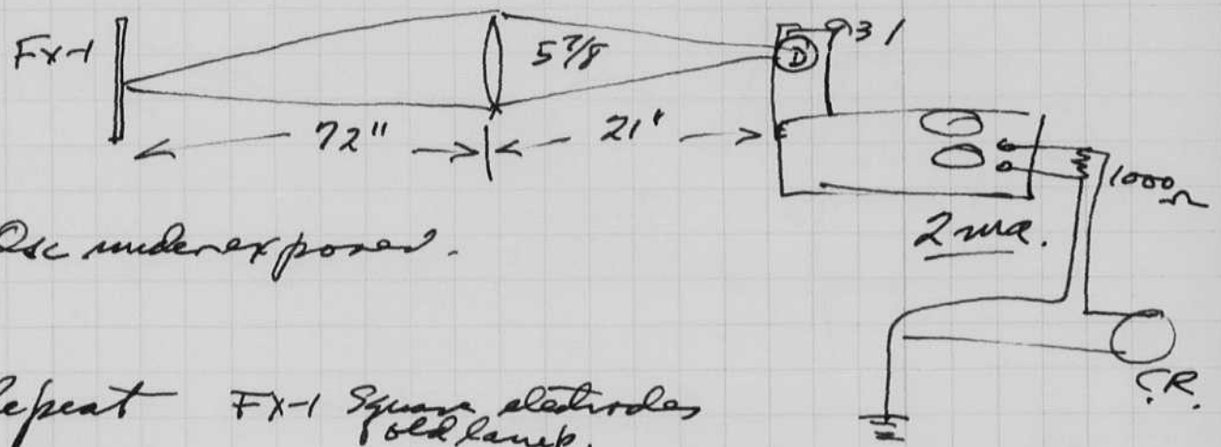
Osc. 1 Sparks, 10000 V/cm 10 μs/cm.
2 " "
3 " "



4 } Current in spark 1,500 ohms.
5 } 5 V/cm 10 μs. Spark current
6 }

7 } 1 V/cm 10 μs. Spark current
8 }
9 }

10 } 150 V/cm 10 μs. Light from FX-1 sparks.
11 }
12 }

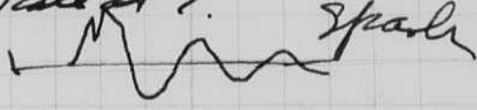


Osc underexposed.

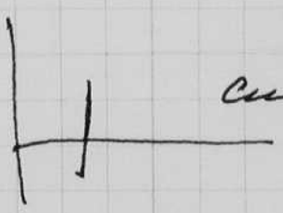
July 1 1905. Repeat FX-1 Square electrodes old lamp.

Osc 1 Sparks. 10,000 V/cm 10 μs/cm Model electric coil from Hobart or "High" contactor operation.
2
3
4
5
6 } Just 5 Scale at 5.
7. }

Intensity of 7 Scale at 7.



			Just	Scale	
8. Circuit 1.5 Ω	5 V/cm	10 μs/cm.	7-	7	
9			7-	5	
10	Current:		7+	5	
11 12?			7+	5.	
13 14 15.	1 V/cm	10 μs	7+	5	Current.
16 17	Spark 5 V/cm	10 μs	7+	5	Cap pickup 1.
18 – 2.	0.1 V 2 V/cm	10 cm	7+	5	P.M. 1000 Ω 2.5 ma. center of FX-1.
???	0.5	10	7+	5	" " Cathode end.
Blanks					
Another FX-1	.2 V	10 μs.	7+	5.	1000 Ω 2.5 ma cathode end.
4 sweeps or 5?					
5±	.5 V/cm.	10 μs.	7+	5.	1000 Ω 2.5 ma cathode end



Shows start of main flash from .0015 Mfd 1500 volts.

~~Blank~~ X

	V/cm	MS
X-1	1	10
X-2	1	10
3	.3	10
4	.3	10
5.	.3	10

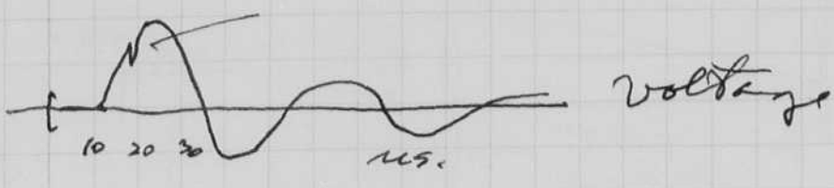
Ref line

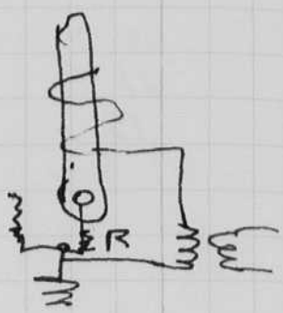
PM. 1000 ~ 2.5 ma. .0015 mfd 1500 V. no filter

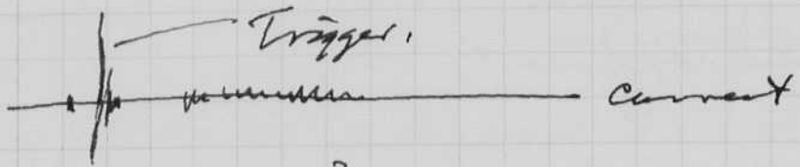
FX-1 dead.

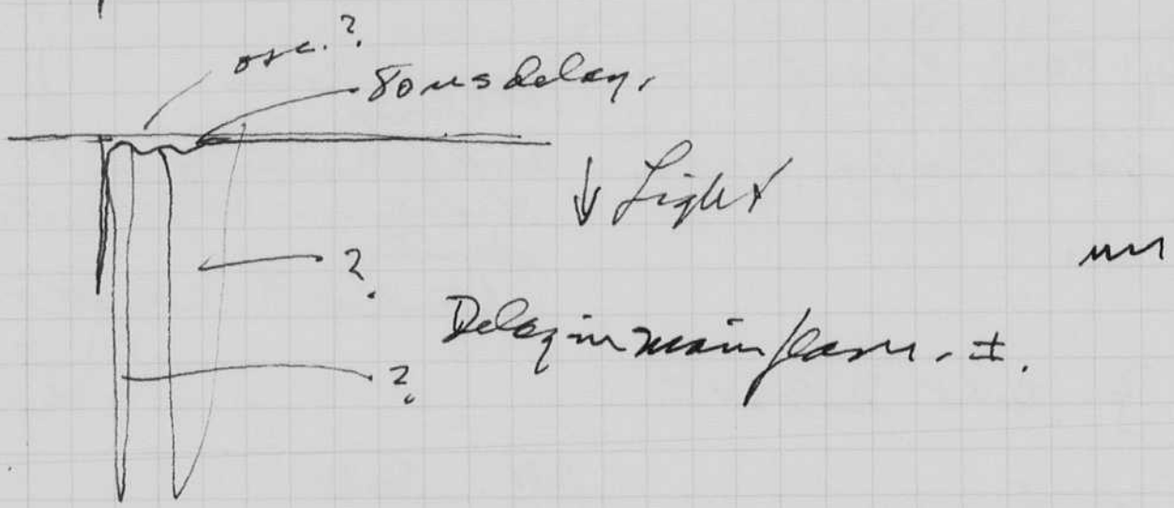
— — Good shot. 1000 volts, .0015 mfd. Tare.

(Tom scale seems to be best.
Tom Ref intensity " " " ".







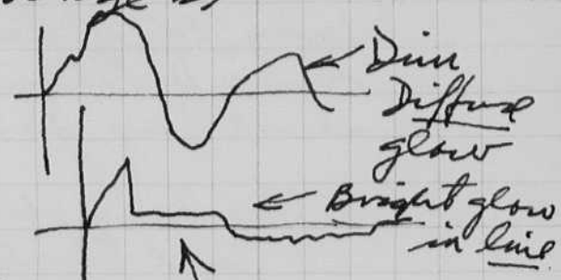


mm

R. H. Miller
9.R.

July 2 1965 6 7 4.5 2. Repeat of tests with FX-33 1½" gap
Scope # 4217 # 518A Tech. f/4.5. plus X. Bulb 1/2 sec. 4 mm LD. Xenon.

Sec.	V/cm	ms/cm	
1-6	5000	10.	Spark from Model electric coil into 3 turn outside wire. When discharge shows line discharge with full spark, the spark voltage is almost shunted



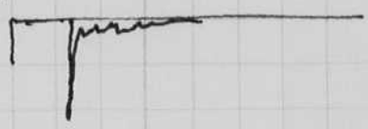
NOTE. This is due to a spark over the outside of the lamp!!

?	50V	10.	1.5 ohm	cathode return in spark lead.
Blank.				
	50V	10	1.5. ohm.	Line spark
	2V	10MS	1.5 ohm	" "

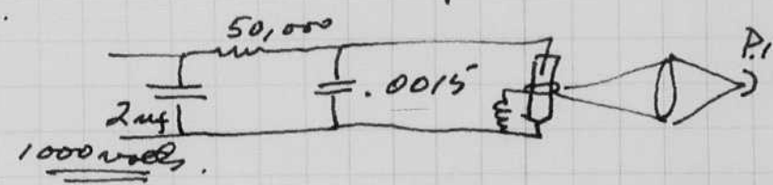
Light from P.M. Lens setup

	2V	10 ms	1000 Ω	2.5 ma.	P.M.
	.5V	10 ms.	"	"	
Blank?					
H Shot	2V	10 ms.	1000 Ω	2.5 ma.	

No spark over



Shows buildup of ~~Light~~



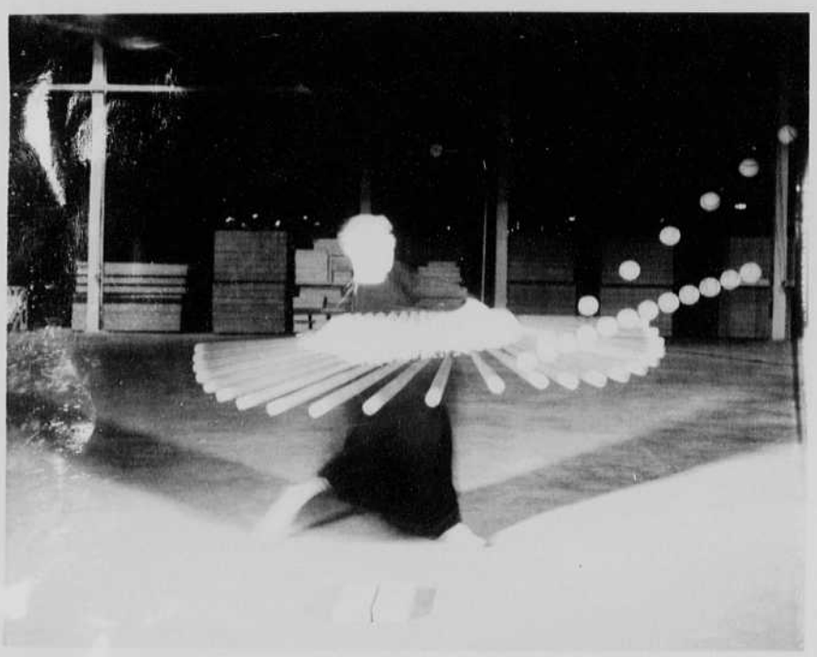
June 19 1965
L. Edgerton

Multiflash Photos

Many have been made during the past weeks. I now have a large velvet backdrop (10x14)x2 on the north wall of the Cage.

Photos of a whip snap were made on July 14 of Rex Trainer with help of Bruce DePalma. Anne Wedon Norway was here as well as Jan Bill and Mary Anne Dixon.

July 25 1965 Many photos at 1/20/sec were made of golf and baseball.



John
1/20/sec

The equipment is now at the north end of the cage with a 14x20 velvet screen I also have a mirror above the batter to show the top view.

Taken with no sync.

Bruce DePalma
1/20/sec.

July 25 1965
H E Dyerlein.

FX-33 Slat Trigger.

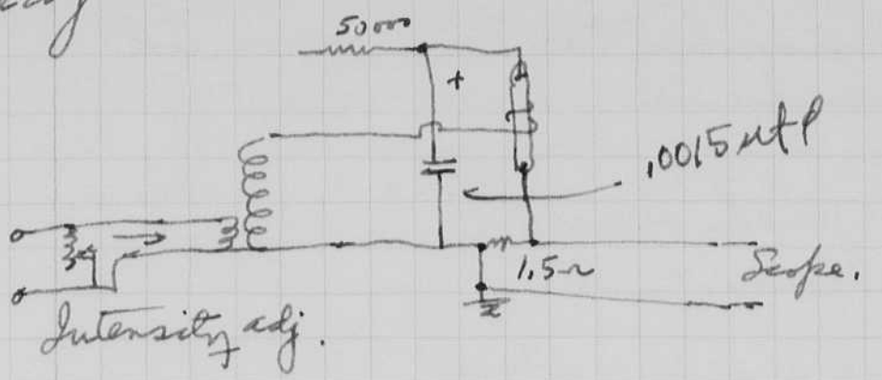
P.M. cal. 9x3. 9

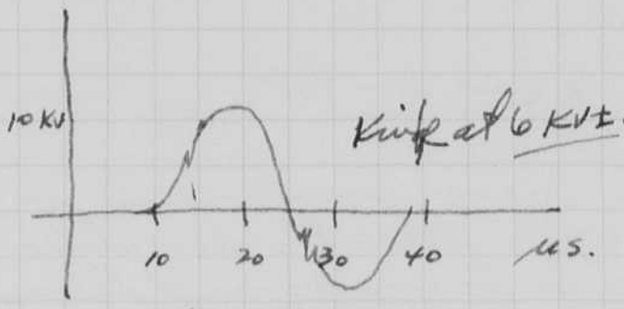
4000 f.p.m. Stylotac with out Ref.

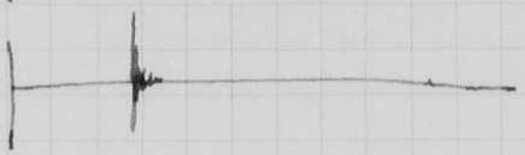
2 ma on P.M. 10,000 Ω

~~ft~~ ft. 27 ft.

8 volts peak.







? ground or cathode.

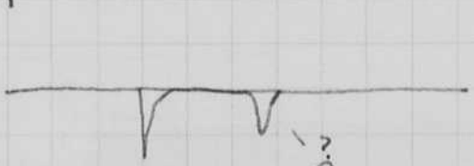
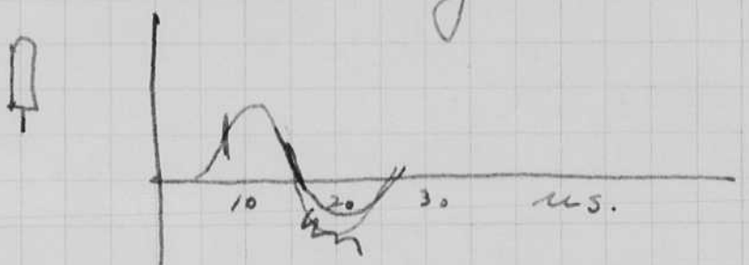
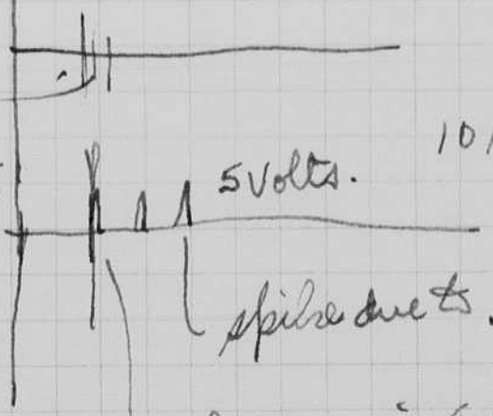


Diagram above wrong. the cathode was grounded.





5 μs jitter in Strobotac

10 μs delay or more!

5 volts.

spike due to .0015 mfd. 2 μs flash

have one in a while.

G.R. near Strobotac

Peaks at 1500 = 10-30 V. → 5/10

→ ← jitter

Same at 1000 and 1500 V.

8

Aug. 1965
L. Edgerton

Multiflash Photos

Many have been made during the past weeks. I now have a large velvet backdrop (10x14)x2 on the north wall of the cage.

Photos of a whip snap were made on July 14 of Rex Trainer with help of Bruce DePalma. Anne Wedon Norway was here as well as Jan Bill and Mary Anne Dixon.

July 25 1965 Many photos at 120/sec were made of golf and baseball.

John
120/sec

The equipment is now at the north end of the cage with a 14x20 velvet screen I also have a mirror above the batter to show the top view.

Valerie
walk or no
810.

Bruce
DePalma
120/sec.

July 25 1965
H.E. Dyatlov.

FX-33 Slat trigger.

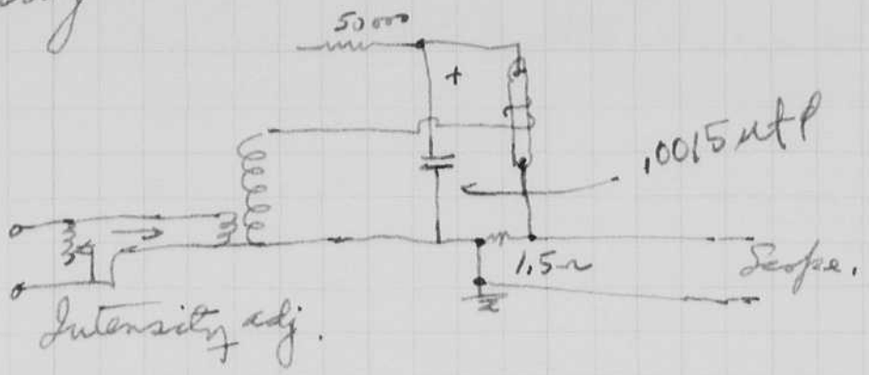
P.M. cal. 9x3. 9

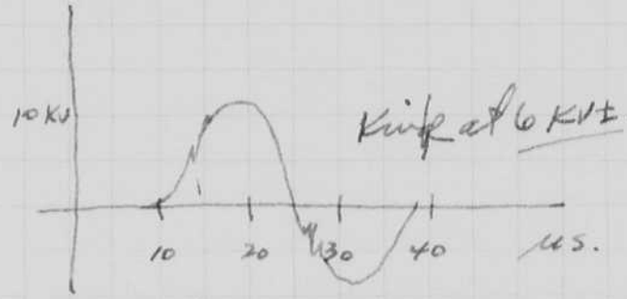
4000 f.p.m. Strobotac with ext Ref.

2 ma on P.M. 10,000 Ω

~~9~~ ft. 27 ft.

8 volts peak.





? deadground or cathode.

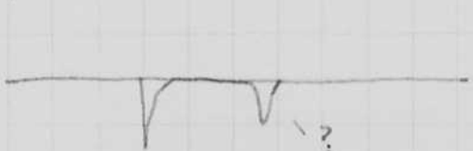
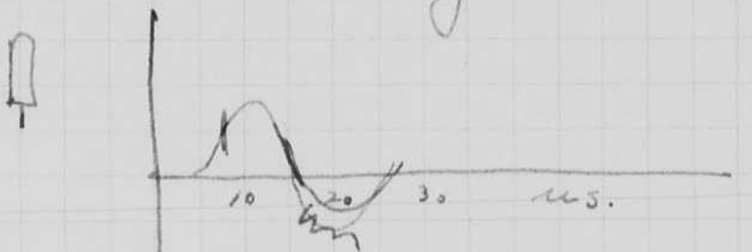


Diagram above wrong. the cathode was grounded.



5 μs jitter in Strobotac

10 μs delay or more!

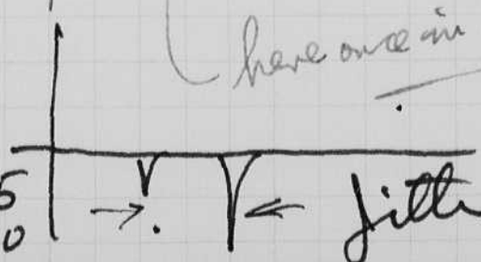
GR. neon Strobotac

5 volts.

spike due to .0015 mfd.

2 μs flash

have one in a while.

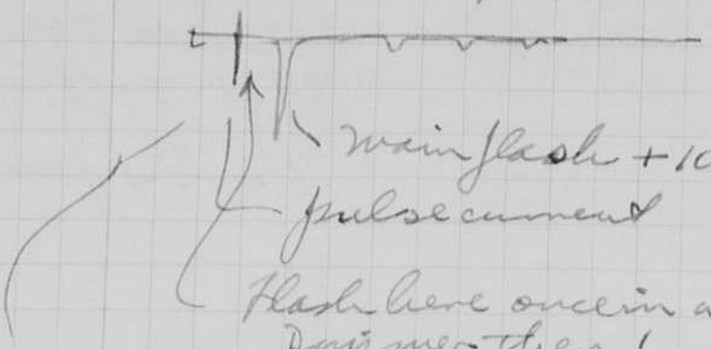


Peaks at 1500 = 10-30 V. → 5/10

jitter.

Same at 1000 and 1500 V.

at 1700 volts on FX-33 - Self firing at 40 ms+.
Small bumps sometimes several!



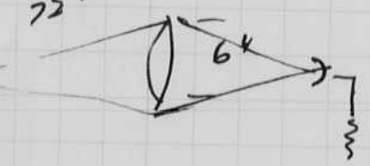
30 volts or 10K Resistor 2 ma on P.M.

Similar experiments were performed on the FX-1 and the FX 47B. Results similar there was about a 10 microsecond delay in the main flash from the starting surge. the jitter was very pronounced.

Calibration calc. of Scope.

$E_{sec.} = \frac{e}{R}\frac{D^2}{(C.P.)A_1}$

Area of lens
$A_2 = \pi\left(\frac{6}{2}\right)^2 = 28.2$ sq in.



$\frac{A_2}{A_1} = \frac{0.3}{28.2} = .0106$

with diode $\frac{(C.P.)_2}{D_2^2}\left(\frac{\pi d^2}{4}\right)$

$\left(\frac{D_2}{D_s}\right)^2 = \left(\frac{72"}{27\times12}\right)^2 = (.223)^2 = .0497 \cong .05$

$E_2 = K\frac{(C.P.)_2}{D_2^2}\frac{\pi d^2}{4}\frac{e_s}{R}\frac{D_s^2}{(CP_s)A}$

$(C.P._s) = 11{,}000$ G.E. book p4 $\quad C.P. = \frac{e_2}{e_s}(C.P.)_s\frac{A}{\frac{\pi d^2}{4}}\left(\frac{D_2}{D_s}\right)^2$

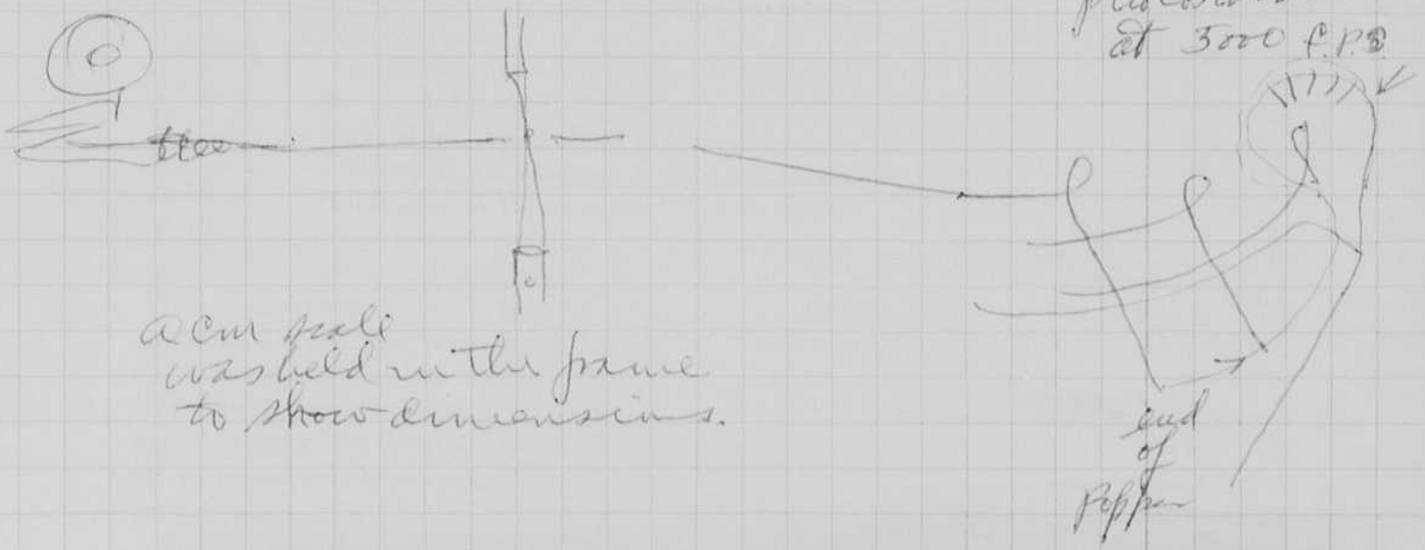
$= \left(\frac{10}{8}\right) 11{,}000 \cdot 0106 \cdot .05$

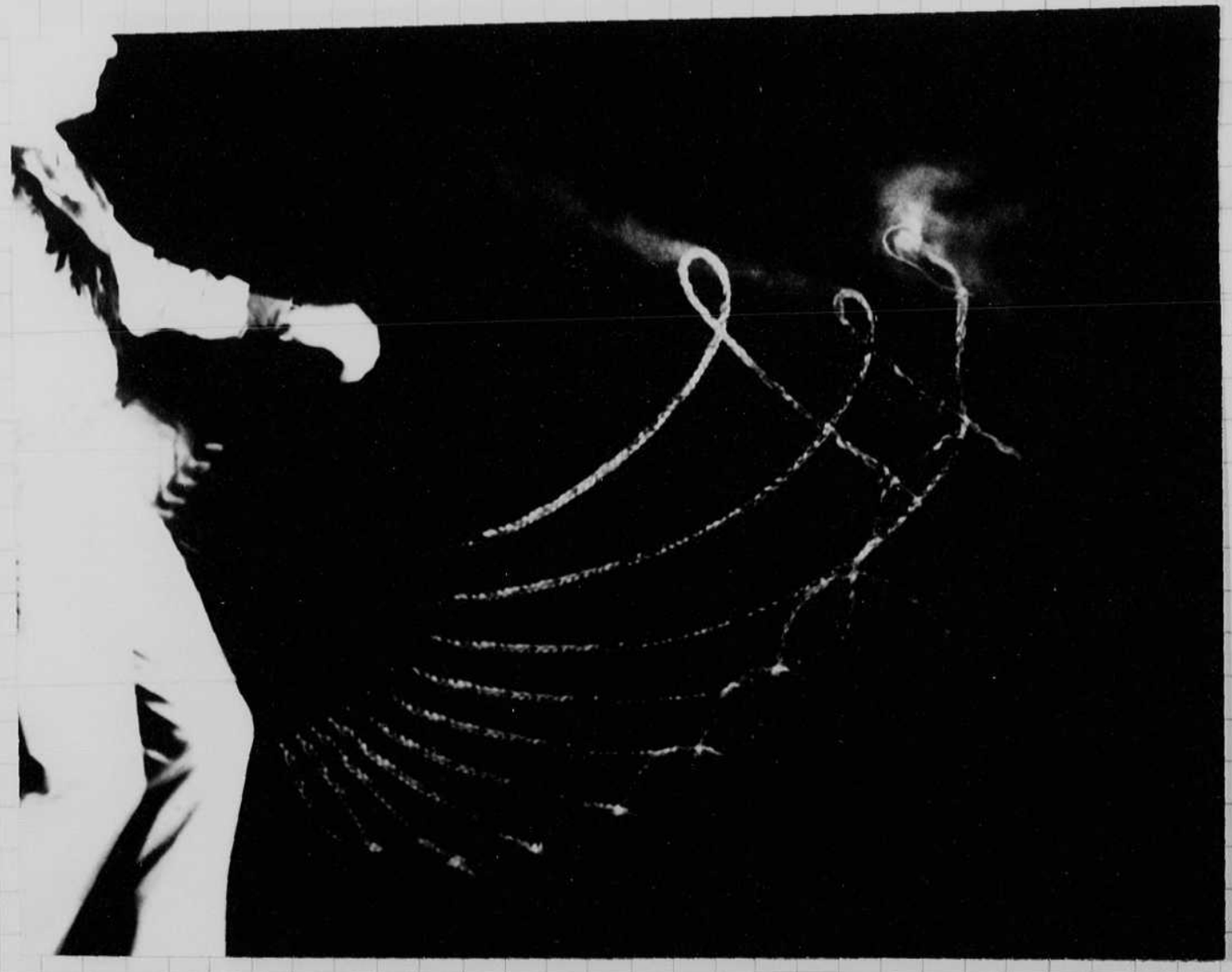
$= \therefore 5.82$ candle power.

$= 7.3$ C.P. per cm.

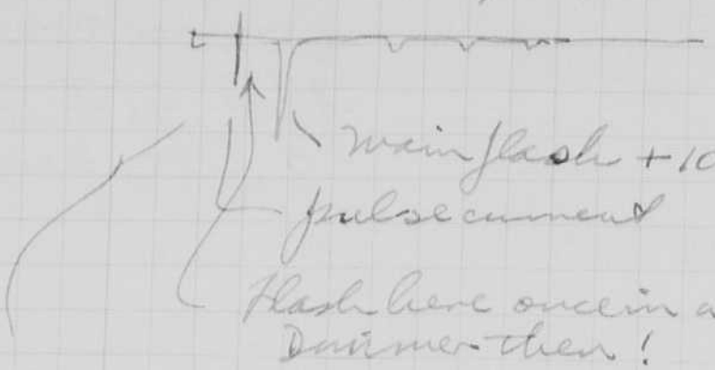
July 28 1965
Harold Edgerton

Ray Traider was here this afternoon to photograph the tip of a whip. We used a 100 silicon photo diode and a beam of light to trigger the multiple microflash.
Camera Tri-X Ektar f 8 at 3 ft away





at 1700 volts on FX-33 - Self firing at 40 usec.
Small bumps sometimes several!



30 volts or 10K Resistor 2 ma on P.M.

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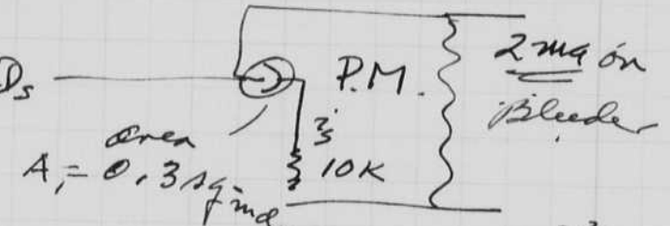
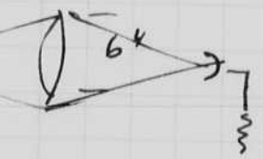
Calibration calc. of Scope.



$$\text{Illum.} = \frac{e}{R}\frac{D^2}{(C.P.)A_1}$$

Area of lens
$A_2 = \pi\left(\frac{6}{2}\right)^2 = 28.2$ sq in.



$$\frac{A_2}{A_1} = \frac{0.3}{28.2} = .0106$$

with diode $\frac{(C.P.)_2}{D_2^2}\left(\frac{\pi d^2}{4}\right)$

$$\left(\frac{D_2}{D_s}\right)^2 = \left(\frac{72"}{27\times 12}\right)^2 = (.223)^2 = .0497 \cong .05$$

$$e_2 = R\,\frac{(C.P.)_2}{D_2^2}\,\frac{\pi d^2}{4}\,\frac{e_s}{R}\,\frac{D_s^2}{(C.P_s)A}$$

$(C.P._s) = 11{,}000$ D.R. book p4

$$C.P. = \frac{e_2}{e_s}(C.P.)_s\,\frac{A}{\frac{\pi d^2}{4}}\left(\frac{D_2}{D_s}\right)^2$$

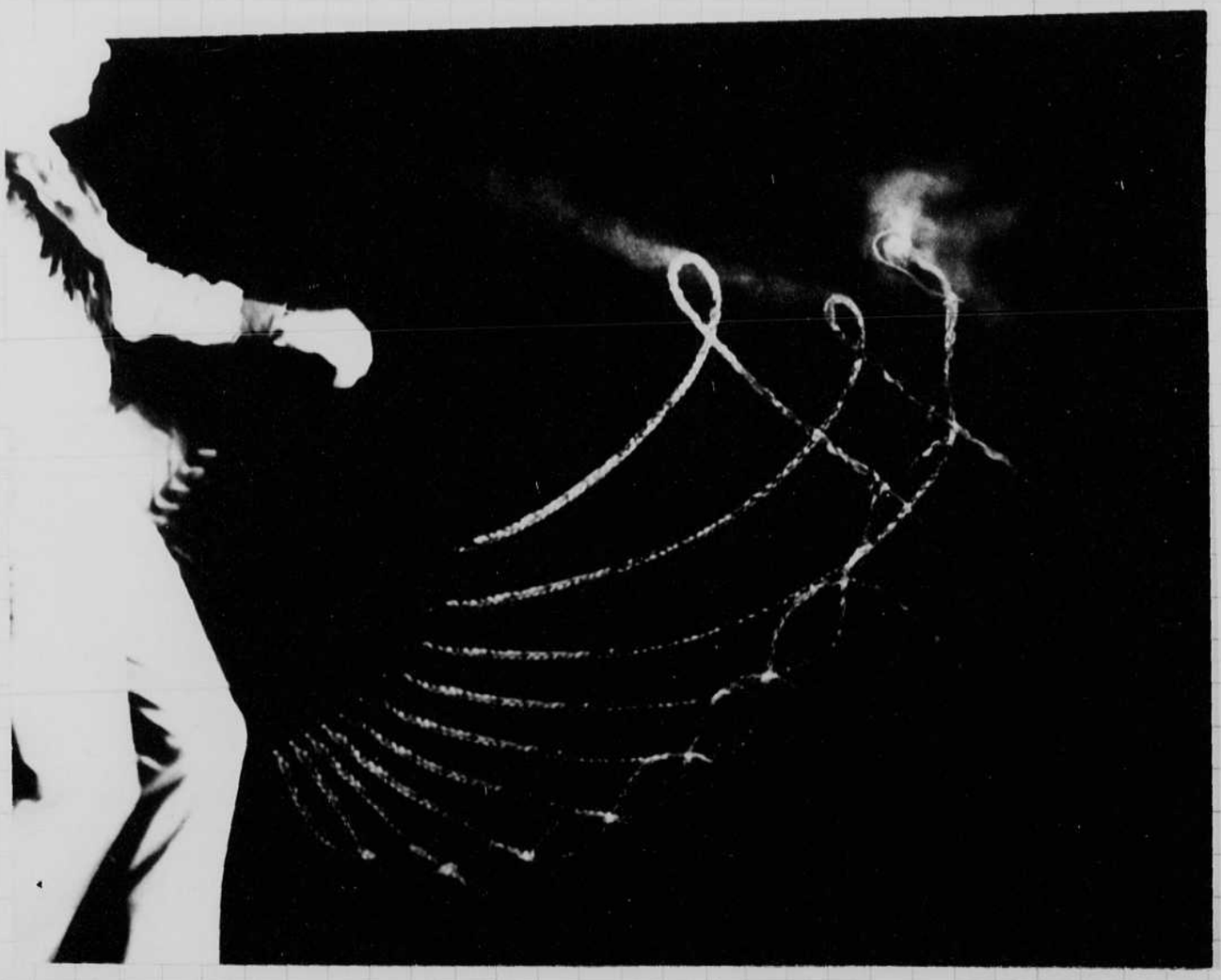
$$= \left(\frac{10}{5}\right) 11{,}000 \cdot .0106 \cdot .05$$

$$= .. 5.82 \text{ candle power.}$$

$$= 7.3 \text{ C.P. per cm.}$$

July 28 1965
Harold Edgerton

Ray Traider was here this afternoon to photograph the tip of a whip. We used a pin stem photo diode and a beam of light to trigger the multiple microflash.
camera 4×5 Linex film at f 8 at 3 ft away



Technical Papers Programme
Monday 13 September

Session I		Chairmen: P. L. Clemens, K. Vollrath Vice-Chairmen: G.H. Lunn, O. Sesini
		Light Sources
11.00		General Lecture: Prof. Dr. *H. E. Edgerton,* USA Applications of Xenon Flash.
11.45	**1**	*W. Thorwart, J. F. Suarez, H. G. Patzke,* Deutschland Eine Cranz-Schardin-Anordnung kontinuierlich einstellbarer Funkenfrequenz mit zwei auswechselbaren Funkenköpfen.
12.00	**2**	*F. Früngel, G. Röder,* Deutschland Regenerierbare Hochdruck-Blitzlampen für 10–1000 Joule, Schaltungs- und Anwendungsbeispiele.
12.15	**3**	*R. M. H. Wyatt, E. L. Kendren,* United Kingdom Special Detonators for Photographic Use.
14.00		Film
Session II		Chairmen: P. Fayolle, E. F. Topfer
		Light Sources
14.30	**4**	*H. Conrads, P. Bogen,* Deutschland Ein getriggerter Gleitfunken hoher Intensität.
14.45	**5**	*H. E. Edgerton, U. E. MacRoberts,* USA Multiflash Strobe
		Cameras
15.00	**6**	*H. Herbrich,* Deutschland Die getriebelose Hochfrequenzkamera – eine Möglichkeit zur Verbesserung der Aufnahmequalität.

First Author's Name = Speaker

The numbers of the papers correspond with the numbering of the pages in the book of preprints.

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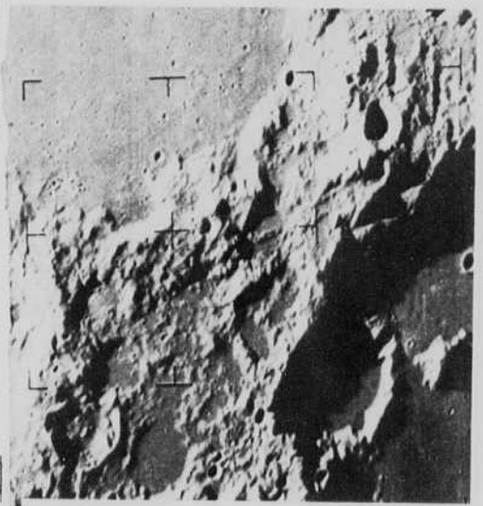
Die Nummern der Vorträge entsprechen den Seitenzahlen im Büchlein der Kurzfassungen.



Composite photograph detailing the crater Alphonsus was taken by Ranger 9 nine minutes, 18 seconds before impact. Same moon area outlined on preceding page is typical of the best pre-Ranger photographic studies.

Sept 23 1965

Received yesterday.

Retd from Zurich Switzerland Sept 19 after
taking measurements Aug 1st for effect with Sonic cup
sonar and small boomer with constant.

Sept 24 1965 N. Shapiro 4:40 - R&L. monochromator KL 452

New Tungsten lamp 6 volt 18 amp. Volts M 44 7081

Tube work

.04 amps / watt 340v

934 #	Lamp.	Slits	λ	?
10	6V	3mm 3mm	.5	14.4×10^{-6}
	6V	1.5 1.5	.5	2.64×10^{-6}
?	6.	1.5 1.5	.5	3.6×10^{-6}.

~~.95~~ .95 watt/sq cm.

Leakage .5V in 22 sec. .02?

? 6, 3 3 .34 $\frac{.65}{.1} \times .3 \times 10^{-6}$

$.195 \times 10^{-6}$ amp.

$\frac{.195 \times 10^{-6}}{.05} = .039 \times 10^{-4} =$ .0039 ok.

6 Volts

amps/watt/cm²

	λ	Current	Watts	S
6V	.4 μ	$.87 \times 10^{-6}$	$.41 \times 10^{-3}$	2.1×10^{-3}
6V	.45 μ	~~$.15 \times 10^{-6}$~~	.52	
6V		$3 \times .49 \times 10^{-6}$	~~.95~~	2.94×10^{-3}
6V	.5 μ	$3 \times .56 \times 10^{-6}$	.95	1.77×10^{-3}
6V	.55 μ	$3 \times .415 \times 10^{-6}$	1.5	$.83 \times 10^{-3}$
6V	.60 μ	$1 \times .38 \times 10^{-6}$	1.74	$.218 \times 10^{-3}$
6V	.65 μ	$.1 \times .415 \times 10^{-6}$	1.91	$.218 \times 10^{-4}$
6V	.65 μ	$1 \times .415 \times 10^{-7}$	1.91	$.218 \times 10^{-4}$
6V	.70 μ	~~.165~~	2.04	
6V		$1 \times .170 \times 10^{-7}$		
6V	.75 μ	$1 \times .21 \times 10^{-7}$		
	.80 μ	$.33 \times 1 \times 10^{-7}$		

Sample Calculation $S = \frac{.87 \times 10^{-6}}{.41 \times 10^{-3}} = 2.1 \times 10^{-3}$

$\frac{.415}{1.91} \times 10^{-7}$

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Multiflash Strobe

Cameras

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Die getriebelose Hochfrequenzkamera – eine Möglichkeit zur Verbesserung der Aufnahmequalität.

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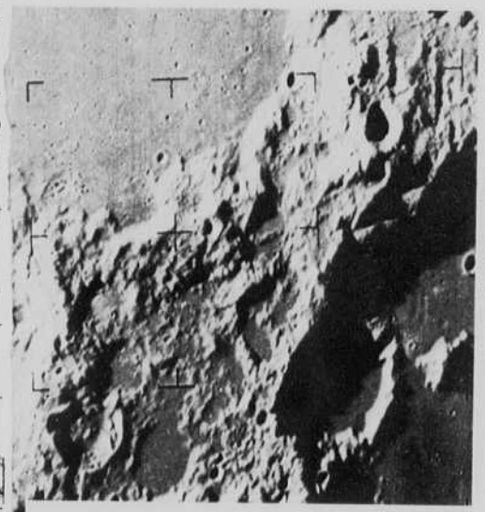

Composite photograph detailing the crater Alphonsus was taken by Ranger 9 nine minutes, 18 seconds before impact. Same moon area outlined on preceding page is typical of the best pre-Ranger photographic studies.

Sept 23 1965

Heard Engelhardt.

Retd from Zurich Switzerland Sept 19 a/br
Lufthansa Aug 12 for assist with Sonocaps
sonar and swath scanner with consteam.

Sept 24 1965 H. Engelhardt 4409 - B&L. monochrometer XL 452

New Tungsten lamp 6 volt 18 amp. Volts M 447081

Tubelook

.04 amps/watt 340v

934 #	Lamp.	Slits	λ	i
10	6V	3mm 3m	.5	14.4×10^{-6}
	6V	1.5 1.5	.5	2.64×10^{-6}
?	6.	1.5 1.5	.5	3.6×10^{-6}.

~~435~~ .95 watt/again.

Leakage .5V in 22 sec. .02?

? 6, 3 3 .34 $\frac{.65}{.3} \times .3 \times 10^{-6}$ $.195 \times 10^{-6}$ amp.

$\frac{.1 \times 195 \times 10^{-6}}{.05} = .039 \times 10^{-4} =$ .0039 ok.

6 Volts

amps/watt/cm²

	λ	Current	Watts	S
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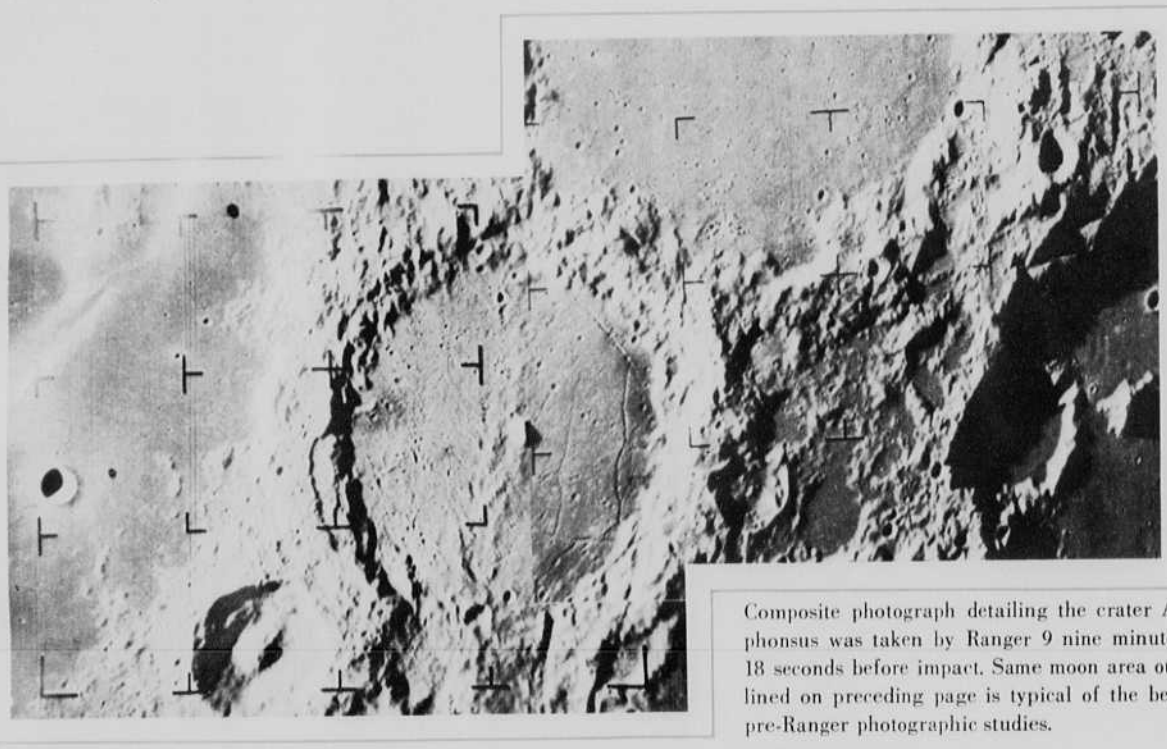

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Exhibition

The Congress will be connected with an exhibition located in the Vestibule of the Congress Building. It will provide a good cross-section of available instruments and materials needed for High-Speed Photography and Cinematography and other apparatus relating to the various subjects treated during the Congress.

Friday	17 September 1965
08.30–09.00	Film
09.00–09.30	Fifth general lecture
09.45–12.30	Lectures
14.00–16.00	Lectures
16.45	Departure by coach for a Farewell Party at the castle of Lenzburg
Saturday	**18 September 1965**
08.30–10.30	Lectures
10.45	Congress closes, cocktails

Sept 23 1965

~~Aerodynamics~~

Ret'd from Zurich Switzerland Sept 19 after
interesting trip to attend meeting Soc. aerospace
space and nuclear with conclean.

Sept 24 1965 W. Degenhardt 4409 - B&L. monochromator KL 452

New Tungsten lamp 6 volt 18 amp. Volts M 447081

Tubelock

.04 amps 3400 watt

934 #	Lamp.	Slits	λ	i
10	6V	3mm 3m	.5	14.4×10^{-6}
	6V	1.5 1.5	.5	2.64×10^{-6}
?	6.	1.5 1.5	.5	3.6×10^{-6}.

~~435~~ .95 watt/sqcm.

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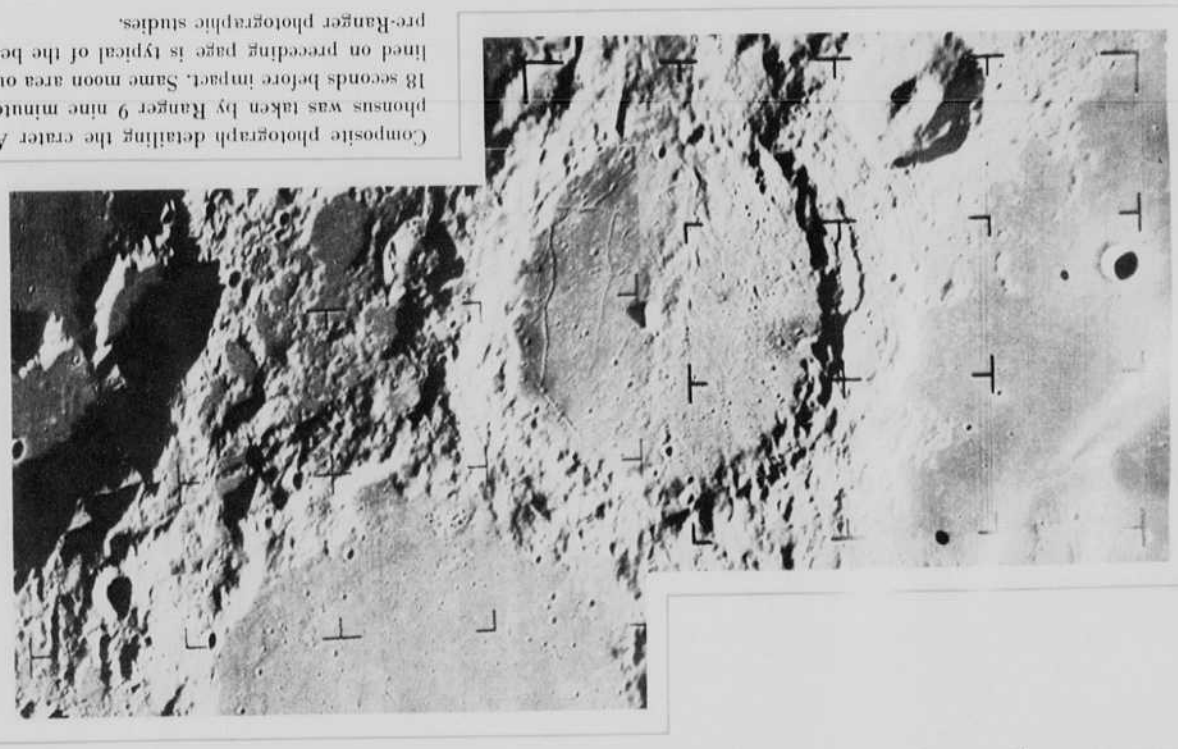

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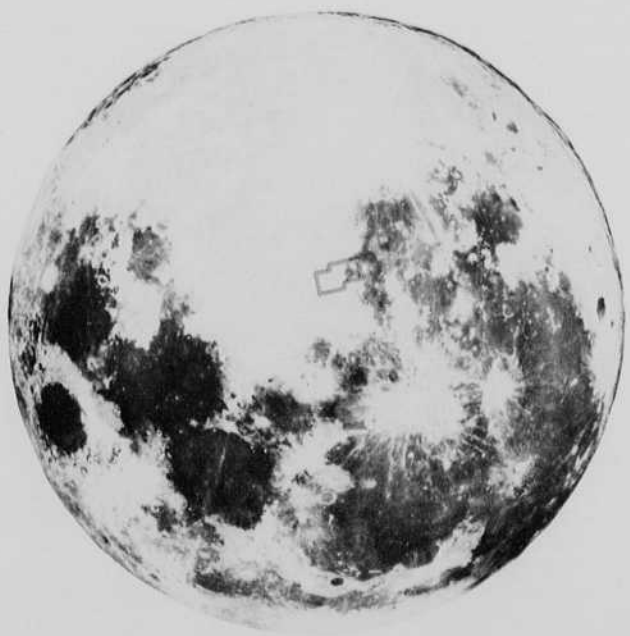

Sept 23 1965

Received Zeiss.

Rec'd from Zurich Switzerland Sept 19 a/br
Info Brennan Aug 1st for effect with Sonocaps
sonar and small Loomer with constant.

Sept 24 1965 N. Sogetsu 4409 - B&L. monochromator KL 452

New Tungsten lamp 6 volt 18 amp. Volts M 447081

Tubelworth

.04 amps/watt 340

934 ft	Lamps.	Slits		λ	i
10	6V	3mm	3mm	.5	17.4×10^{-6}
	6V	1.5	1.5	.5	2.64×10^{-6}
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amps/watt/cm²

6 Volts

	λ	Current	Watts	S
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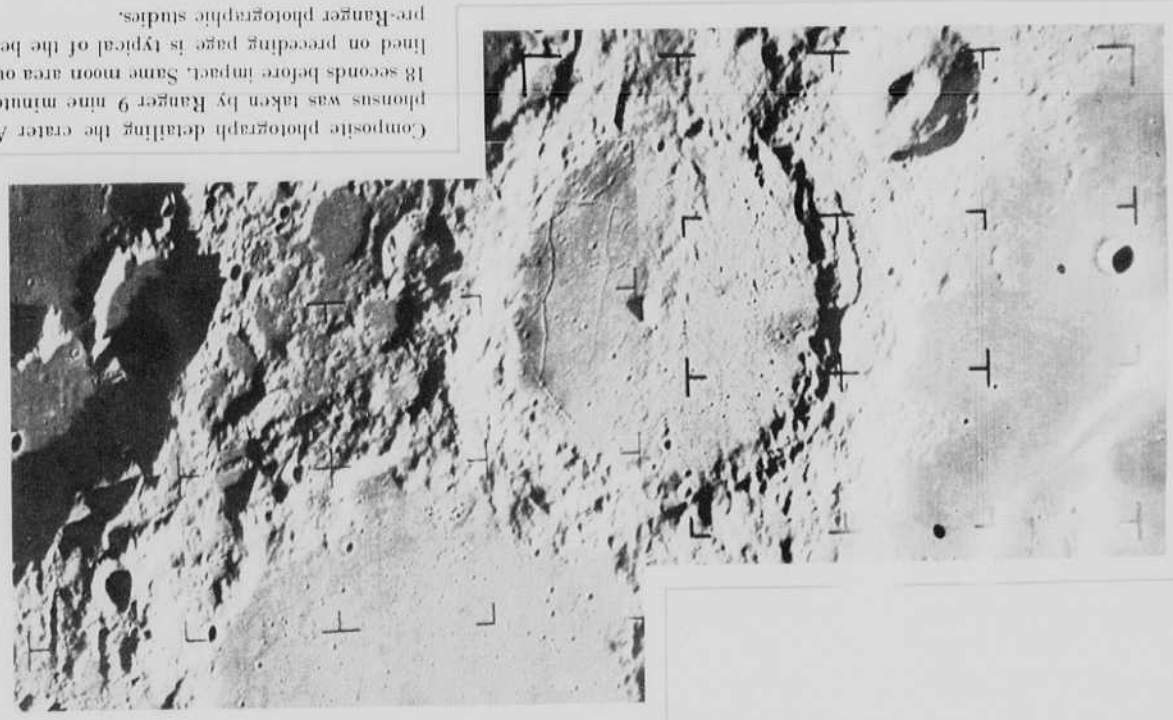

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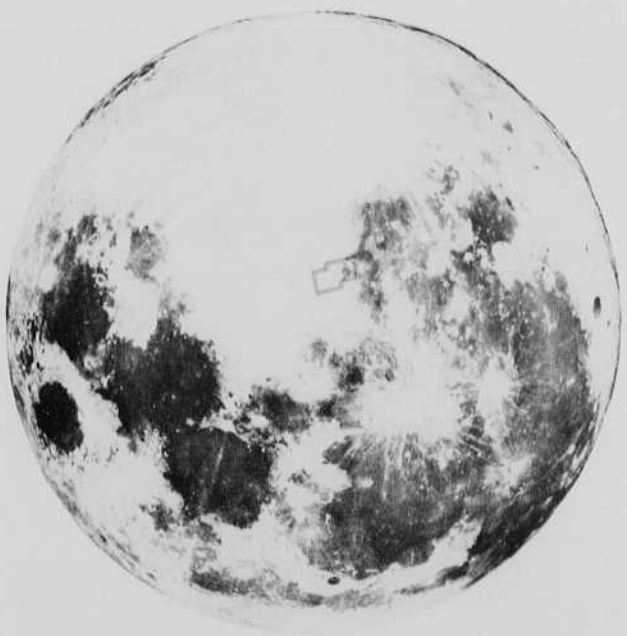

Sept 23 1965
Aerodynamics.

Rode from Zurich Swirlmeter Sept 19 after
lunch Hermann Arg 1:1 for effort with Dave Coupe
Jonathan and Mark Loomis with constean.

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New Tungsten lamp 6 volt 18 amp. Volts M 447081

934 ft	Lamps	Slits	λ	i
10	6V	3mm 3m	.5	17.4×10^{-6}
	6V	1.5 1.5	.5	2.64×10^{-6}
?	6.	1.5 1.5	.5	3.6×10^{-6}

Leakage .5V in 22 sec. .02?

? 6, 3 3 .34 $\frac{.65}{1.1} \times .3 \times 10^{-6}$
$.195 \times 10^{-6}$ amp.

$\frac{.195 \times 10^{-6}}{.05} = .039 \times 10^{-4} =$ .0039 atz.

Tubebrook
.04 amps/watt 3400

.95 watt/sq cm.

amps/watt/cm²

6 Volts

	λ	Current	Watts	S
6V	.4 μ	$.87 \times 10^{-6}$	$.41 \times 10^{-3}$	2.1×10^{-3}
6V	.45 μ	~~1.5×10^{-6}~~	.52	
6V		$3 \times .49 \times 10^{-6}$	~~.95~~	2.94×10^{-3}
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λ	S
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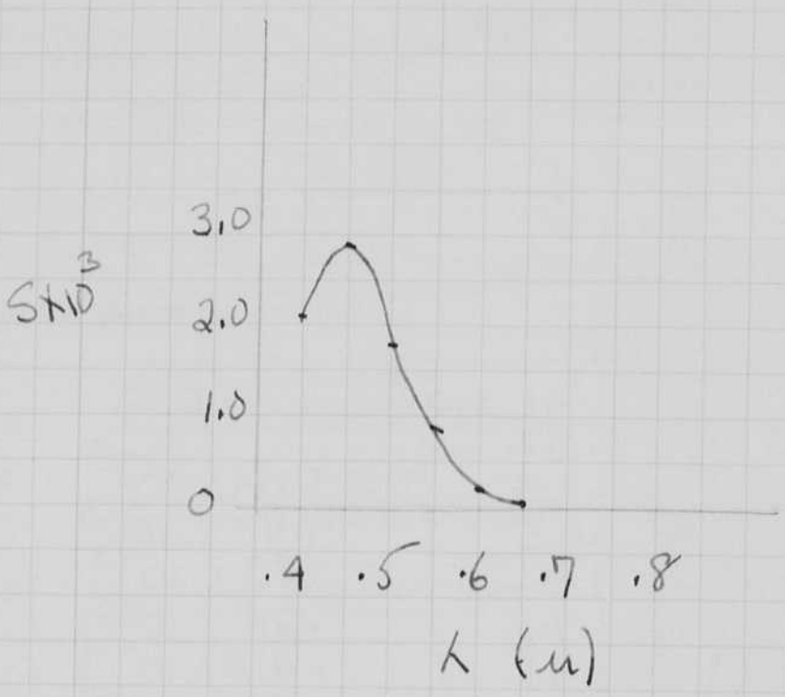
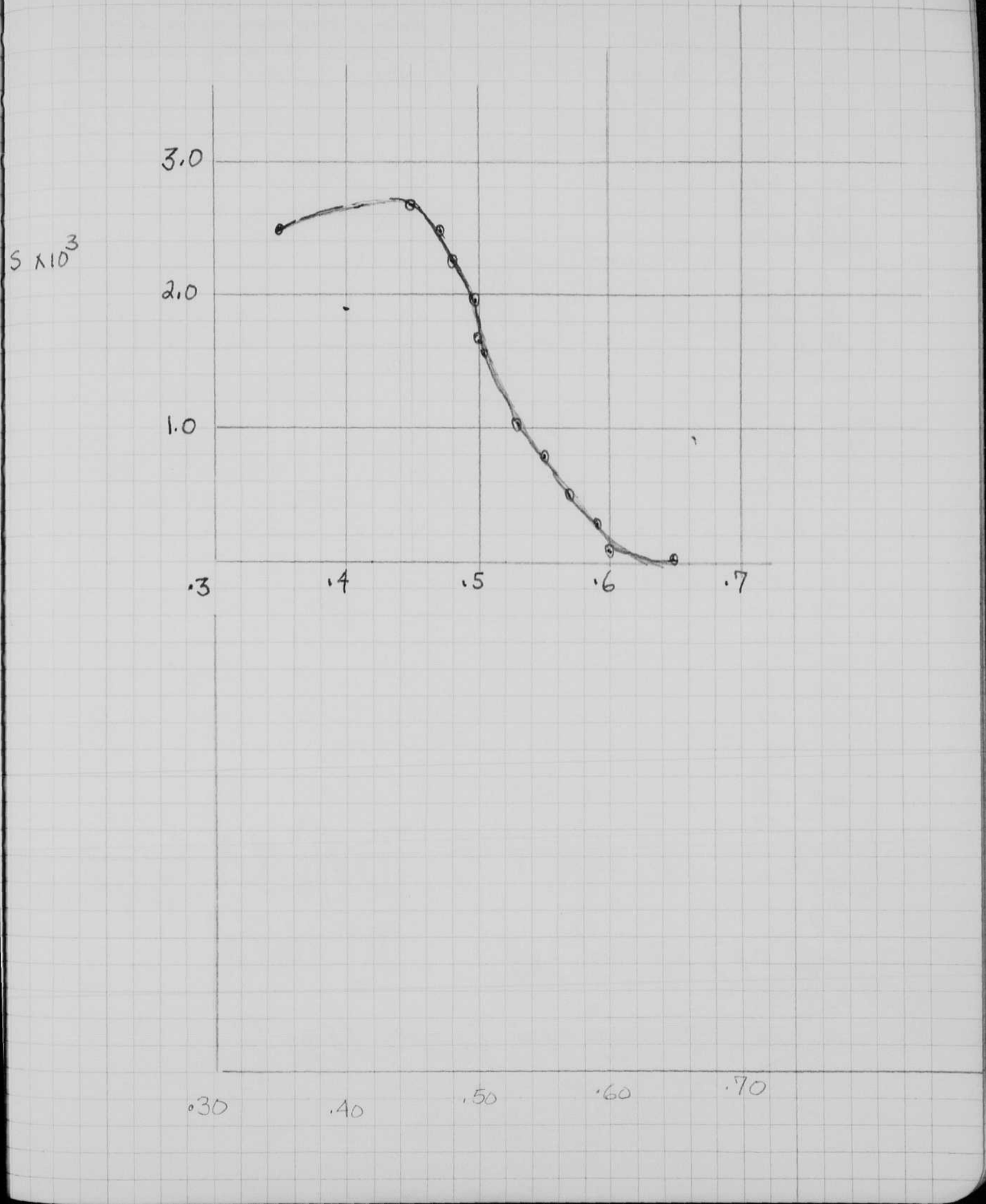



S x10^3
3.0
2.0
1.0
.3
.4
.5
.6
.7
.30
.40
.50
.60
.70

CdX5765

Hg Spectra.

FX-33 in GE Ediphone
drive 500 mfd capacitors
in series to make 250 mfd.
at 900 volts.

λ	V.107 X10	Slits	
.3	.5 X10⁻¹	.50	.50
.4	3.4		
.5	1.7		
.45	3.1		
.4	3.4		
.35	2.5		
.38	3.2		

Slit in mm

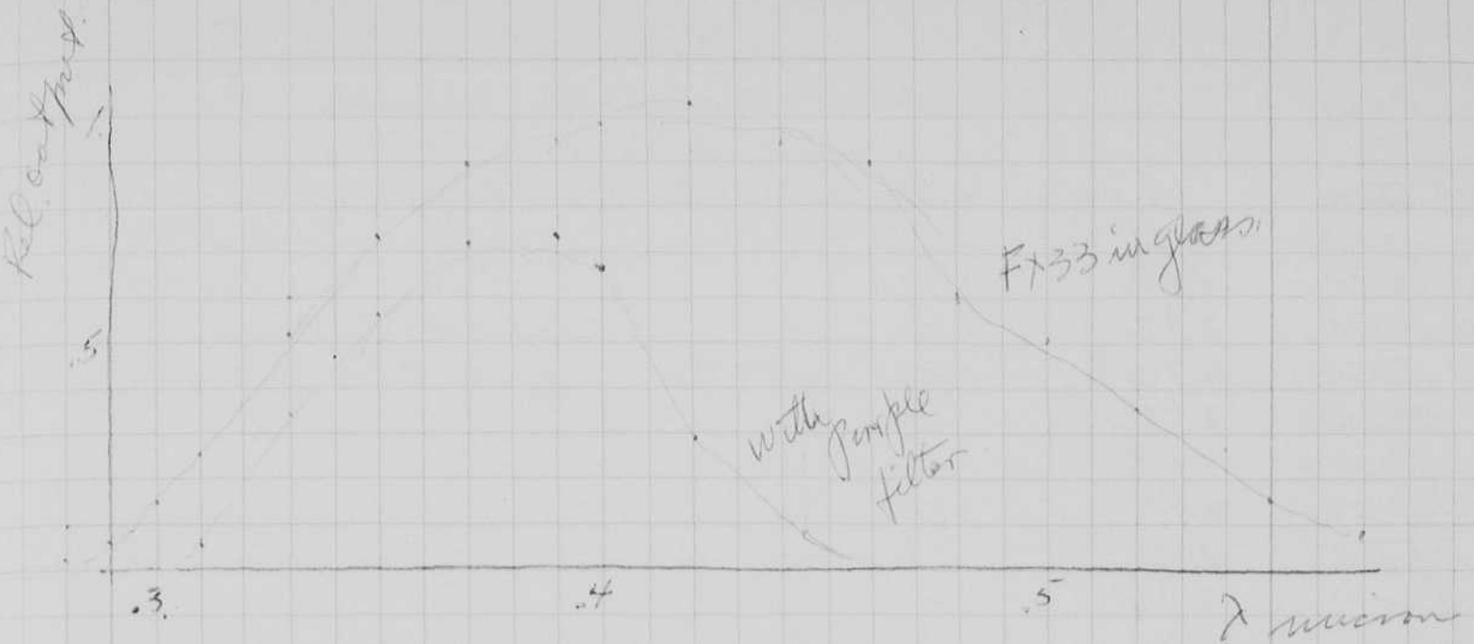
		1.0	1.0 mm
.3	.6x1	1	1
.35	2.68		
.4	19.8		
.45	10.5		
	5.5		

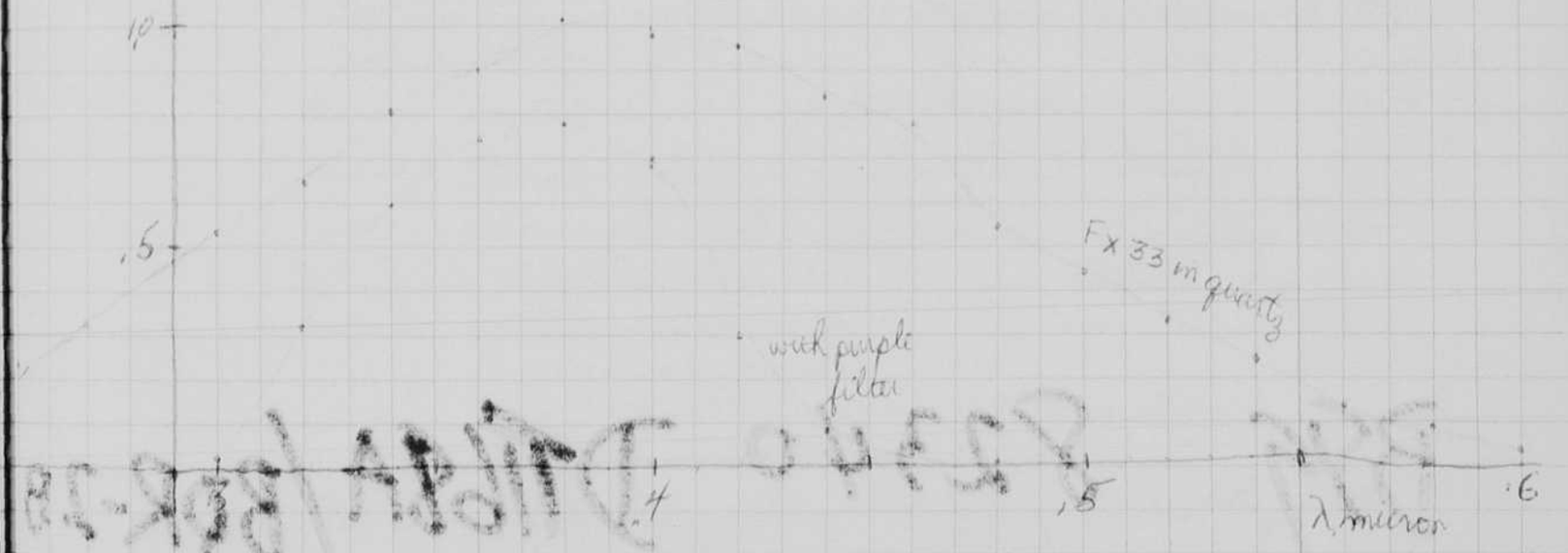
.4	4x	.6	.6
.4	.8x	.7	.7
.4	.8x2	.7	.7

.4	1.27	.7	.6	
.4	.78	.6	.6	.45
.4	.999	.65	.65	.67
.39	.96			.73
.37	.89			.72
.35	.73			.56
.33	.52			.33
.31	.27			.06
.30	.15			.1
.28	.02			.78
.29	.06			.74
.4	.97			.66
.42	1.02			.29
.44	.94			.08
.46	.9			.03
.48	.6			.02
.50	.5			0
.52	.35			0
.54	.27			0
.56	.15			0
.58	.09			0

Mostly
filler

2.0





Came ~~travel~~ copied
Oct 5 1965 in
evening.

H. Edgerton
Oct 8 1965

Bill MacRobert

Hydrophone Navy DT-70 - BQR-3A. Serial 144.

FREQ.	L	Q	
700 C ~~KC~~	3.9 MH.	0.75	Red and white pair.
10 KC	3.85	0.72	
1.2 KC ~~KC~~.	3.83	0.70	
1.5 KC ~~KC~~.	3.82	0.67	
1.8 KC ~~KC~~.	3.73?	0.62	
2.2 KC. ~~KC~~.	3.82	.59	
2 KC ~~KC~~	3.83	.62	
1.8 C ~~KC~~.	3.83	.63	
~~500~~ C.	4.04	.78	
300 C	4.04	.79	
500 C	4.03	.77	
1 KC	4.00	.73	
10 K.C.	2.07	.13	
15 K.C.	2.04	.077	
20 K.C.	1.56	.05	
25 K.C	1.59	.047	
	~~1.57~~	~~.045~~	
30 K.C.	1.42	.039	
40 K.C.	1.24	.029	
50 K.C.	1.15	.024	

Transducer. 15,600 mmf Serial B51 BT 168 A - BQR 2B
.005 D Hydrophone 2 wire

BSG 82340 DT168A/BQR-2B

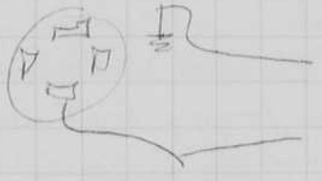
NOBSR 87714 DT 168A

C = 15,600 MMF

D = .005

Oct 10 1965 MIT Sail Pavilion
H.E. Edgerton
Don Kirtser — Small Boomer tests
Shock amount & half cycle .5 ms.
Pressure 1 cycle in 0.5 ms.
16, 32, 48, mfd with and without 5.0 ohms
1/8" Plate Bolted 2 Spring for especially firm
1/8" free
1/8" Round - Flat - Spring
1/2" Round. Flat - Spring — all about the same

Prig tests 6 KC in air
450 pm. Wire on plug.



Nov. 5. 1965

Bearings broken on "Wavy" by lack of oil. Repaired today.
50 ft Boat R.R. Shrock is going fine. I have had it out three times with Donald Kirtser to help with the 300 watt second boomer
Vacuum system set up for Freshmen
now & Student Faculty banquet Bldg 10
Observation of 10 ms. strobe on Big Blue Hill
2 ft Aluminum on green Bldg.
93 A. 1100 volts
100 ms flash
15 volts across 1K resistor.
Kebabian Caldway ? . . . .
Dr. Boris Shekkvatov Russian Geophysicists came to visit on November 4.
Nov 6 1965 - Univ of R. I. Malfetano to talk to Oceanographic students.

Countess and wife, ~~some~~ went in Boston Sunday and Monday last week for Lecture Sunday in Fresno and Mus of Science meeting on Monday.

nov. 11 1965
Harold Edgerton

6:30 party at 100 memorial Drive last night. Gary Mather is the assistant this year for 6.302. Roast beef dinner - wonderful!

The 50 ft ship from the navy has been out 3 times for sonar work in the sea. The small Boomer was used.

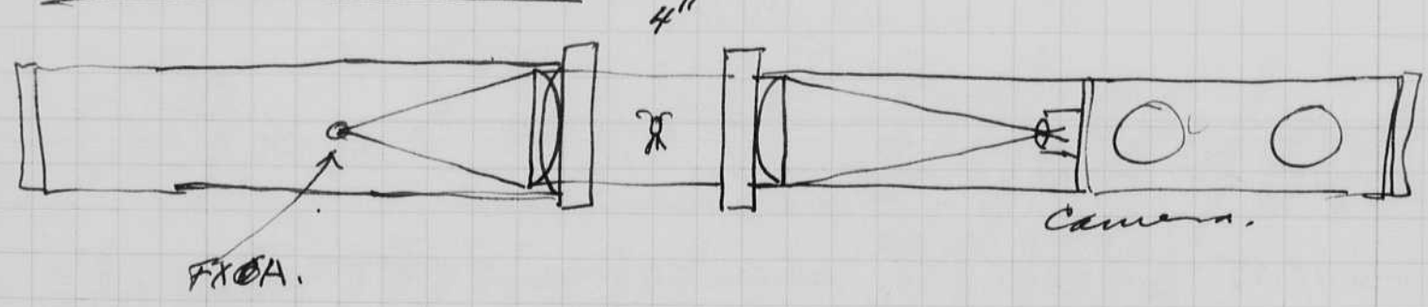
I now have a 2 ball hydroplane on a cable and weight for the pickup. This is similar to the one I used in Monaco last summer.

Nov. 15. 1965. Krotser and Lovett out in the 50 ft Ship RR STROCK on Sat 13. It was foggy but we went as far as Castle Island and did some survey work. We also tried to lower a hydroplane, on the 14 we went out to Thaves Ledge - Bad Wind - Jim Hahn & Krotser were along.

Nov. 17 1965 Bill Patton at the Prudential Bldg called yesterday about the strobe 500 WS 40 per min on the top of the Pru. Bldg. The light bothers the people in the Skyline Restaurant on the 52 floor.

Bill Mac Roberts and I put a time clock that works from 5 to 1 pm. It turns the lamps off at this time 5 to 1 pm.

Silhouette underwater camera



Nov 25 1965

Harold Edgerton

Left with Esther noon nov 19 for Madison Wisc. gave talk to Uni Extension group on high speed photography at Lakeside Hotel in evening.

Left for Minneapolis at 8.55 am – met by Bob and Eric. Saw Nina for the first time – now is 6 months old.

Then to Omaha and Aurora. Left Aurora via Grand Island at 2.30 for Boston nov 22.

Today working on book of Strobe.

Photos of new FX-33 lamps.

~~#1 Plus x film f8 (4x5) Spark only 2 per sec for 1 min.~~ Integrated light of spark only, 9 min dev DK50 or Blue NG.

~~#2 Dots but 1/2 minute plus flash of 60 watt~~ 1/4 sec ± lamp at 6" in crude reflector. Black patch on wall to outline tube. "

#3 f11 2 sec Lamp pulled way to 12" for flatter lighting no spark.

#4 f11 2 sec Lamp as #3 but with
{1 min at f11 spark only} spark light
{1/2 " at f4.5 " " } was at 2 per sec. Dim!

5 f11 0.5 mfd at 650/700 volts 2 flashes.
6 f11 " " 1 flash but Double tungsten!

7 f11 4 mfd 900V

~~8 f11 2 mfd 1500V~~ Shows Volt meter leads!

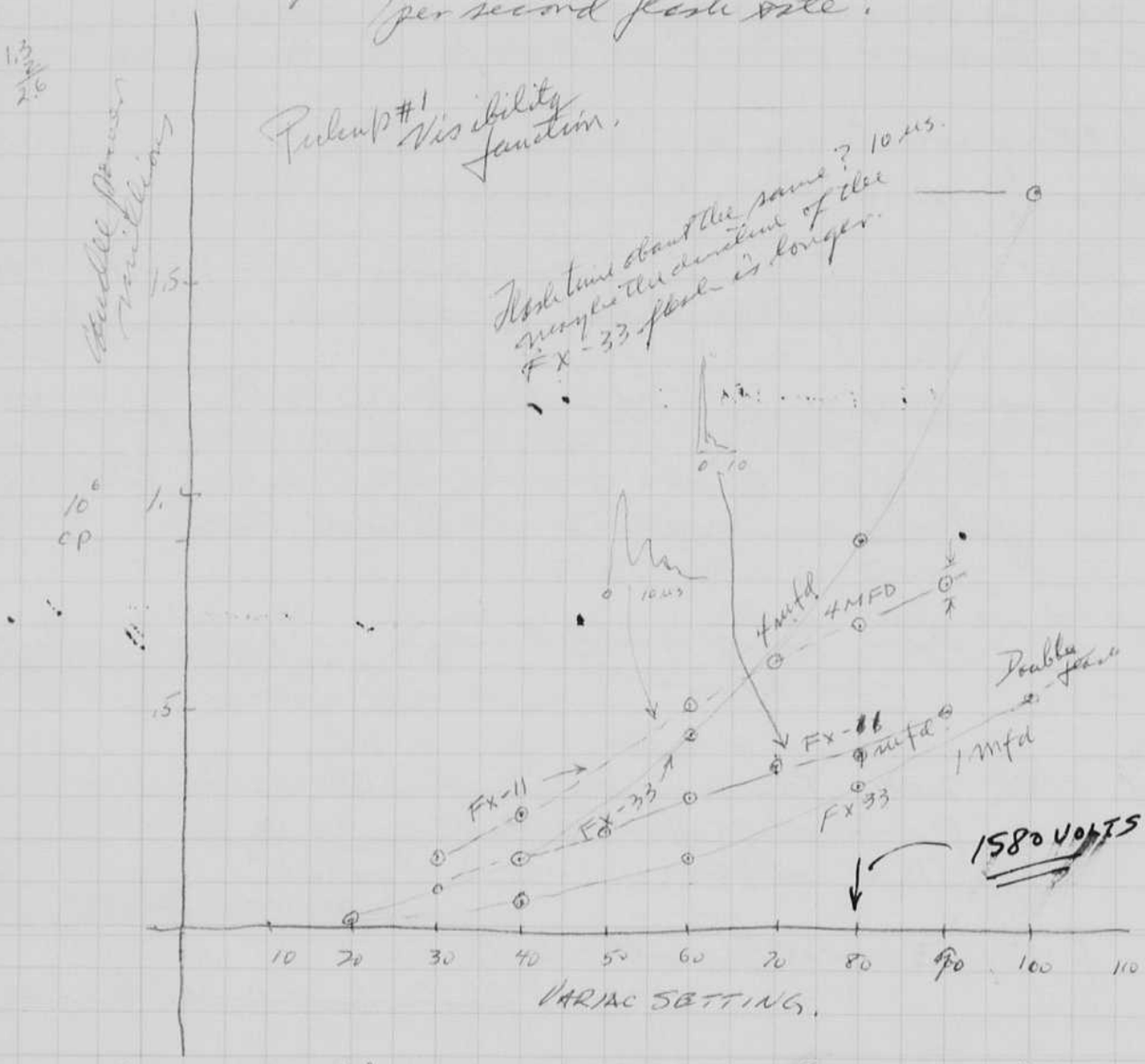
9 f11 2 " 1500 no leads!

10 f11 Spark only 600 shots f4.7.

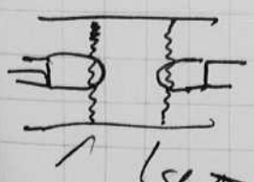
Dec 3 1965

Left nov 26 for Washington
nov 27 Hickory N.C. arrive 10 am
nov 28 " Left Charlotte for Charlestown S.C.
nov 29 Charlestown S.C. Navy Yd – Mine Conference
Al Foulks, Bennett, McKay, Bradner
nov 30 Comb. Again.

Tests of FX-33. in holder for searchlight at Breen Bldg
1/per second flash rate.



This shows that the FX-11 produces more flux than the FX-33 except for 4 mfd above 67 on variac.
In the search light the FX-11 will be much more effective since the arc length is 1/8" instead of 1.5" Factor of 12 maybe if optics are good in the search light.



the FX-11 lamp 1/8" Gap split from end to end with 1 mfd at 1580 volts fine pass test after after several hours of operation. there was some darkening around the electrode but the gap seemed clear

Dec 17 1965
Harold Edgerton.

The FX-11 was put in the 24" Searchlite on the roof of the Green Bldg a few weeks ago and operated at 1 per second from a 1/2 mfd at 1400 volts. Again as on FX-22 it was too much for the lamp. It split showing apparently self flash and heating problems.

Then I put an FX-33 in the thing and ran it at 1 mfd at 1400 volts 1 per second. The search light was just aimed at the sky. Then on Dec. 16 I aimed it at the Prudential tower observation walk.

It was running ok today. I could see it from the south end of the bridge at 4:30 pm but not the north End.

The water dropper experiment is a big success. We had it in Bldg 7 lobby this afternoon - Red and Green lights were used in two streams. It was beautiful.

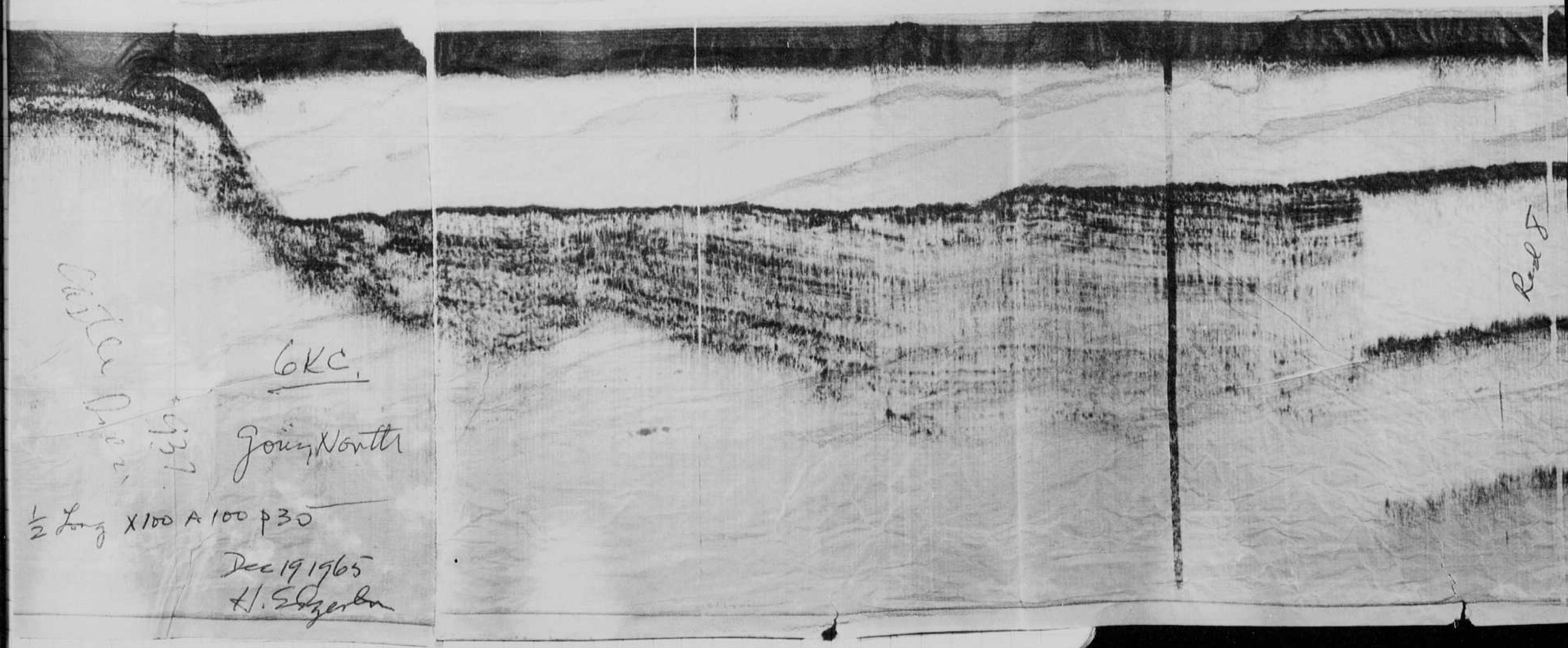
Dec 17 1965
Harold E Edgerton.

The FX-11 was put in the 24" Searchlite on the roof of the Green Bldg a few weeks ago and operated at 1 per second from a 1/2 mfd at 1400 volts. Again as on 922 it was too much for the lamp. It split showing apparently self flash and heating problems.

Then I put an FX-33 in the thing and ran it at 1 mfd at 1400 volts 1 per second. The search light was first aimed at the sky. Then on Dec. 16 I aimed it at the Prudential tower observation walk.

It was raining ole today. I could see it from the south end of the bridge at 430 pm but not the north End.

The water dropper experiment is a big success. We had it in Bldg 7 lobby this after noon - Red and Green liquids were used in two streams. It was beautiful.



Dec 3 1965

Left Nov 26 for Washington
Nov 27 Hickory N.C. arrive 10 am
Nov 28 " Left Charlotte for Charlestown S.C.
Nov 29 Charlestown S.C. Navy yd – Mine conference
Al Faulks, Bennett, Mallory Brodner
Nov 30 Comb. Again.

Tests of FX-33. in holder for searchlight at Green Bldg
/per second flash rate.

Pulse #1 Visibility function.

Visible Power Candlepower

10^6 cp

1.5

1.4

.5

10 20 30

Took test about the same? 10 ms.
except the duration of the
FX-33 flash is longer.

0 10

0 10 ms

4 mfd

4 MFD

Double flash

This shows that the FX-11
except for 4 mfd abov
In the search light th
since the arc length
if optics are good in t

The FX-11 lam
end with 1 m
after after a
there was go
electrode bec

Sputtered metal.

Dec 17 1965
Harold Edgerton.

The FX-11 was put in the 24" Searchlite on the top of the Green Bldg a few weeks ago and operated at 1 per second from a 1/2 mfd at 1400 volts. Again as on FX-22 it was too much for the lamp, it split showing apparently self flash and heating problems.

Then I put an FX-33 in the thing and ran it at 1 mfd at 1400 volts 1 per second. The search light was first aimed at the sky. Then on Dec. 16 I aimed it at the Prudential tower observation walk.

It was raining ole today. I could see it from the south end of the bridge at 4:30 pm but not the north End.

The water dropper experiment is a big success. We had it in Bldg 7 lobby this afternoon - Red and Green liquids were used in two streams. It was beautiful.

Record made Dec 17 1965
Castle Island to Red #5

Dec 23 1965
Harold Edgerton.

Fletcher, a student came into talk about sonar. He is going to the navy ord lab. While at the naval ord lab. Maryland next term

Dec 30 1965. Rothman from David Taylor model Basin was in at EdgG to talk photography under water.

10 ft below water line on a destroyer.
Object - look for Bubbles along skin.
They have two cameras which operate at 200 f.p.s. 16 mm.

I proposed two 120 cycle strobes to operate at windows. 4" in bore reflectors

These could be taken by one of the EdgG men on the ship out of Fort Lauderdale.

If it works they might like to obtain their own equipment.

Beam in 24" Searchlite on Green Bldg
4 mfd 1 per second into FX-33 lamps
It has been since Dec 17, 1400 volts.

The lamp showed a brown deposit.
Lamp put on 100 mfd paper at 1400 volts. No or small change in brown deposit.

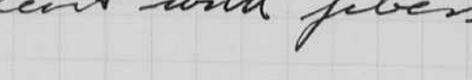
Increased to 1200 - 1400 volts. - Dramatic effect; the brown was evaporated and went to the ends! Some anode melting shows!

The spark coil was burned and melted by the image of the sun. Bill is going to move the coil down.

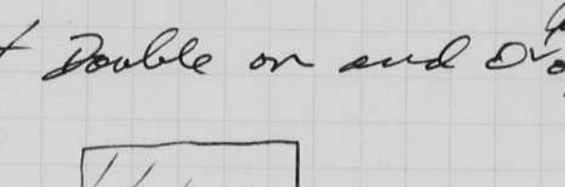
I plan to put the unit back again with the cleaned lamp to see if the brown deposit is again observed.

Jan 15 1966.

Visit from Robt D. Allen 5 months.
2 Lago Road Cambridge England.
Dept of Zool. Uni of Camb.
Normally at Dept of Biology Princeton N.J.
Discussed microscope photography.
Mercury HBO 200 watts.
Xenon 150 - 450 Lamps.
Showed movies of cell division
excellent with fibers etc.

Light 
5 sec intervals.
camera closed
1/2 time.

Suggest Double or and D of light time.

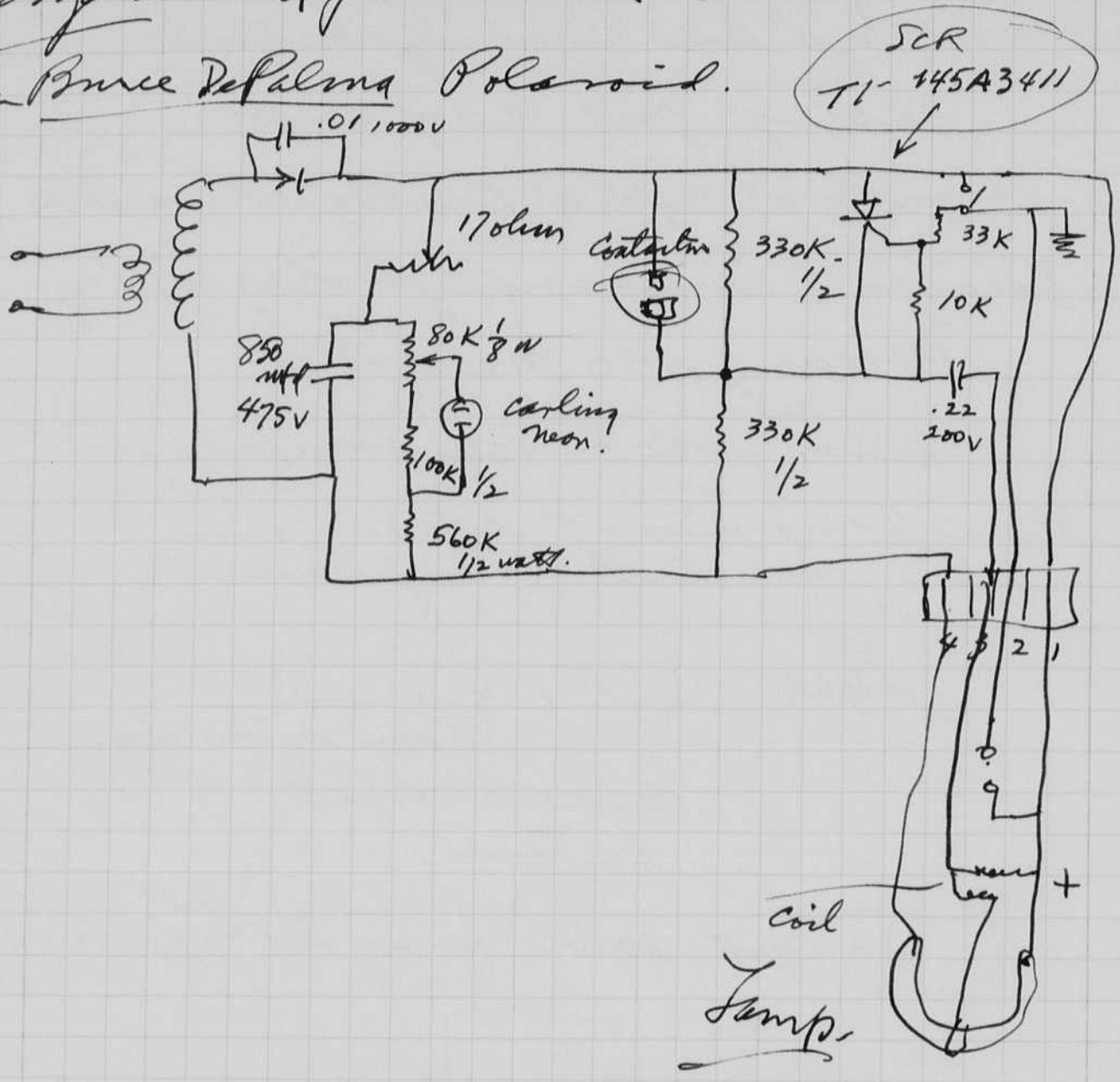


Methods.

1. Mercury pool switch. 60 cycle.
2. Stop-go ignition circuit
3. Variable supply for dim run
and strong for exposure.

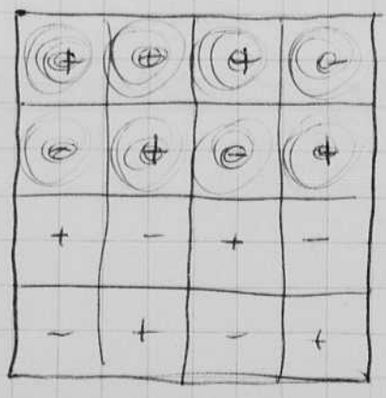
Allen may request money for development.

Jan 19, 1966. Last Classes yesterday
H. Edgerton at pier & Term 6.202. Sem 11.
from Bruce DePalma Polaroid.

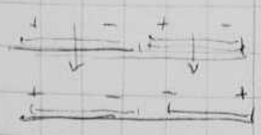


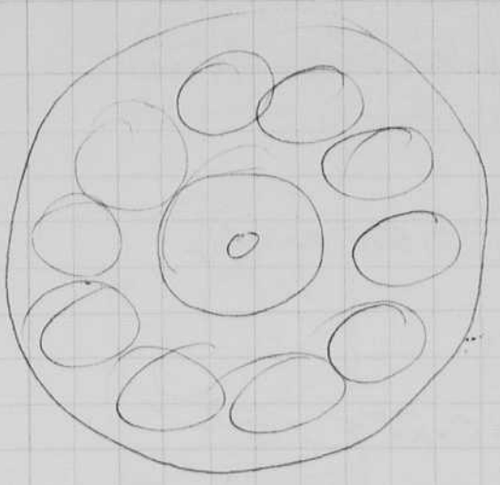
Jan. 22, 1966. Term ended Jan. 19. 6.202 - 11 Students?
Sem 11. 11 Students

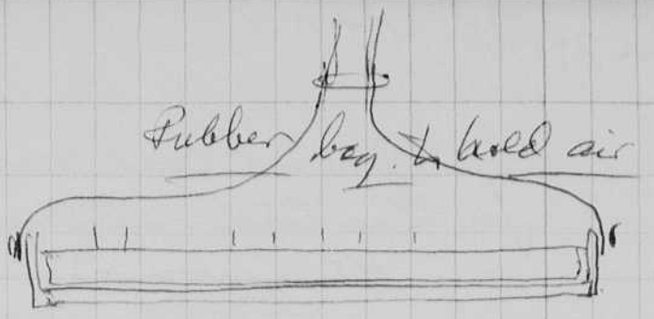
Krolser working on seismic profiling
Ed Carley came in Tues? Part 18 to talk
about transducers. He plans to make
one 1 meter square



16 coils with 2" hole
in center.
all in parallel







ft × 6 = 24

Movie Lamps Portable unit 190 ft candles at 6 ft.

Guide factor = 25
24 frames/sec.

$6^2 \times 190 =$ 36 / 190 / 3240 / 36 / 6840

190 / 36 / 114 / 57 / 6840.

Beam C.P. = 6840 Bal 6480

A.C. Lamps. 6 ft (550) lumens/sq ft.

36 / 330 / 165 / 19800

AC Job. Sylvan 19,800.

AC unit 24 f.p.s. Type B Eklograsome. f8 560 ft candles incident
6 ft.
48. Guide factor 50

28 Jan. 29 1966. M.I.T. 4-405
Harold Edgerton

Special coil made by John Lacadonis for Knotzer and me.

40 Turns.

3 parallel wires 1/4" x 0.50" each.

18" Outside diam.

4" Inside diam.

Open Q = 22 L = 0.285 x 10^{-3}

1/4 al. Disc in contact. Q = 1.5 L. = .045 x 10^{-3}

$T = \pi\sqrt{LC} = \pi\sqrt{.045 \times 16 \times 10^{-6} \times 10^{-3}}$

$\pi\sqrt{.45 \times 16 \times 10^{-10}} =$

$\pi\sqrt{7.2 \times 10^{-5}}$

~~23~~ 2.7×10^{-5}

8.5×10^{-5} seconds.

85×10^{-6} seconds.

.016 Cable

1 cycle = 170×10^{-6} ms.

$f = \frac{1}{170 \times 10^{-6}} = 5900.$

8 mfd = 8300 cycles.

4 mfd = 11,800. cycles.

32 = 4200.

64 = 2900

40" - 1.03"

9 coils.

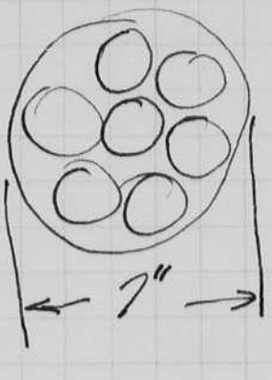
Books

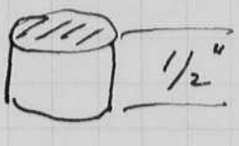
Discussion with Marty Klein.

Electro ceramics

EC 64 - Clevite PZT-4 Lead Zirconate

Adaprene plastic.





100,000 kc.

More gain can be used at high freqs.
Find less noise.
12 Kc has noise problem.

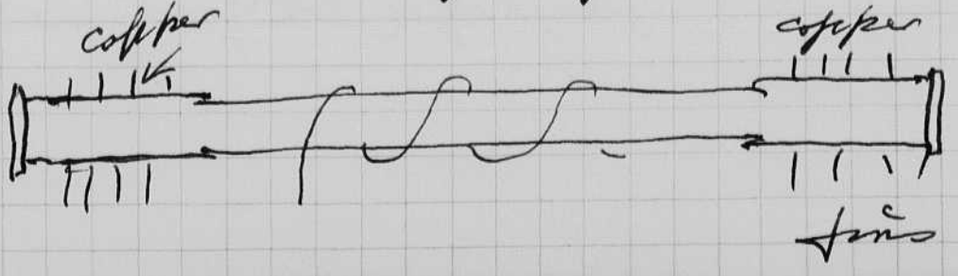
Feb. 1, 1966

I saw a continuous flow laser of the Perkin Elmer Co at the Physics show last week in New York at the N.Y. Hilton Hotel. The gas was a mixture with CO_2.

The flow is for cooling and because the gas breaks down. The efficiency is about 10%. Straight 60 cycle operation is used. 10.6 μ

This could be a pulsed operation at a frequency depending upon the surge of the gas in the lamp. I think it would be a very good way to operate. Then some gas, that does not break down should be used such as the rare gases.

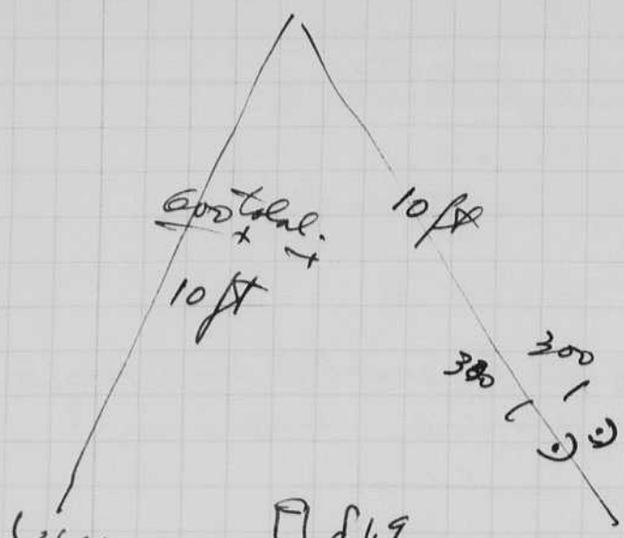
I met Bullinger of P. E. Co in Medford.

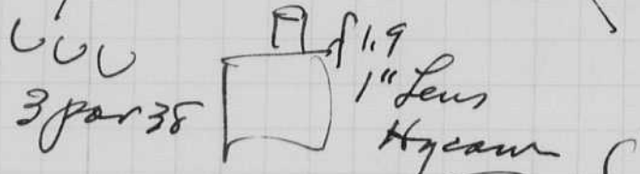


30 Feb 4 1966
MIT 4-405.

Lens test 63 White Pigeons
Dish Sheffield 85 R1 21 x 10

Velvet f5.6 with





58 volts 1st reel female
50 volts 2nd reel male.

Movies
Kodak E K Film type B
7200 Speed 125
Photoflood 100
Daylight 80

Also shot with multiflash units at 10/sec
tri x at f16 20/sec
Lamps at 7 ft and 10 ft.
Color type Daylight Kodachrome x 80 speed
Guide factor 35.

Also Stereo photos of same on
Daylight Ektachrome x.

Feb-6 1966
HE Edgerton U.W. cameras oked by Nat. Geo. Society

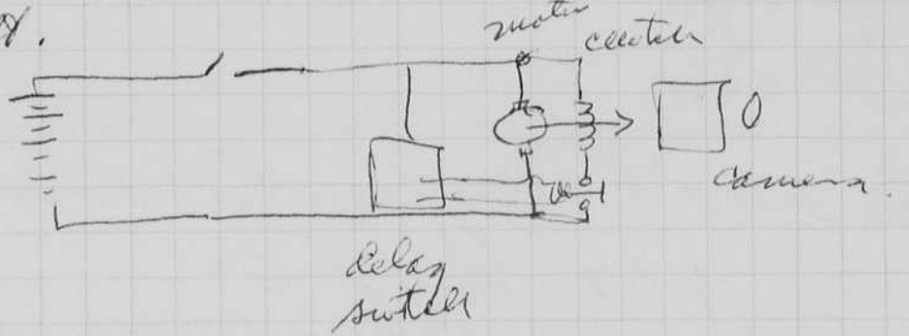
(1) Silhouette type for shadow
(2) Elapsed time for shallow studies.

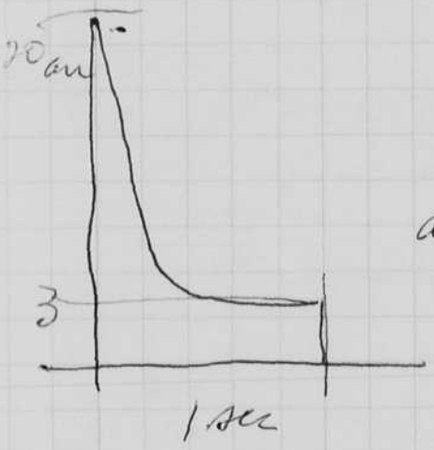
Start with 16 mm 50 ft cassette
1 picture every 1/2 hour.
50 × 40 per ft = 2000 pictures
2000 / 48 pics/day = 40 days. 1 month.

Set gears for 5/sec rate.

24 or ~~115~~ volt?

24 volt.



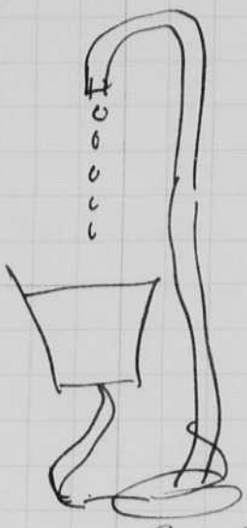


amp sec. = 5 × 1 = 5 amp sec.

3600 / 10,000 amp sec.
2000

3 amp hours.

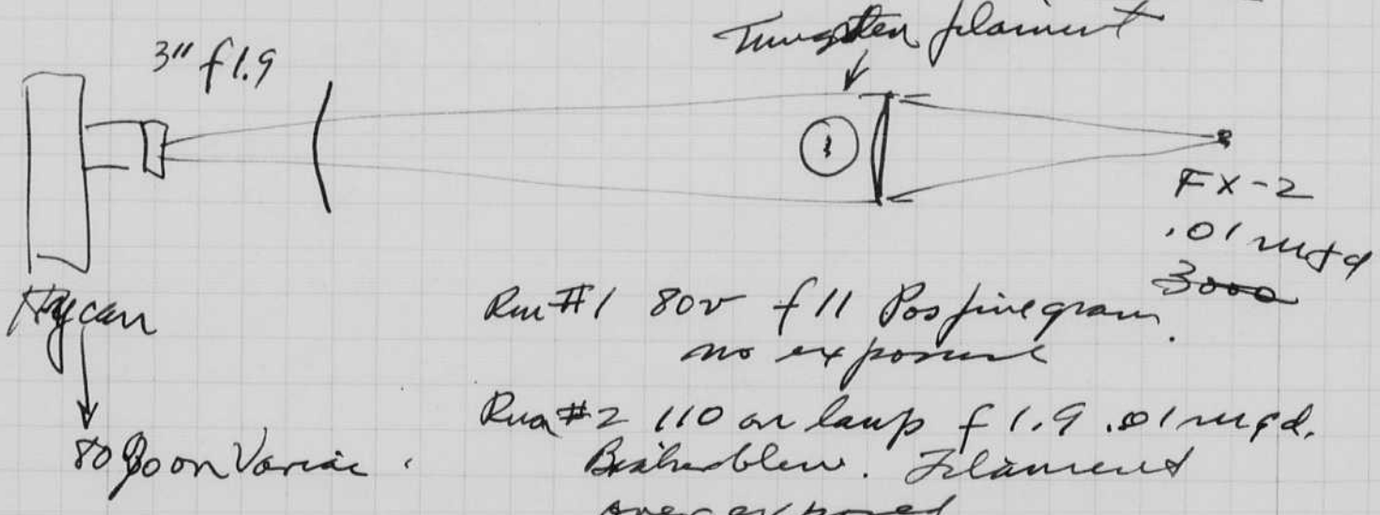
Feb 13 1966
Harold Edgerton
MIT 4-405. Strobe Lab.



Speed on Hycam camera
80 volts
f 4
Lamp at 1 ft. .02 Mfd or
FX-2.
What White card background
16 mm Tri-X Reversal

Pump
60 cycle

Ditto Subject Daylight II Kodachrome
f 1.9 Lamp 6"
.02 Mfd 80 volts
on Variac.



Run #1 80v f11 Positive gram.
no exposure

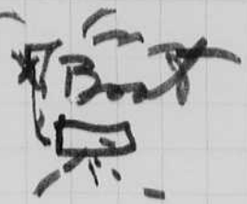
Run #2 110 on lamp f 1.9 .01 Mfd.
Basically blew. Filament
over exposed

Run 3. 70 v on lamp (no number).
f 1.9 .01 about right Stop

Run 4

Howard Mike
Feb 15, 1966

Navigation system Discussion



Sender on the ship.

Slave

Both Acoustic Slaves. No Radio links.

Master

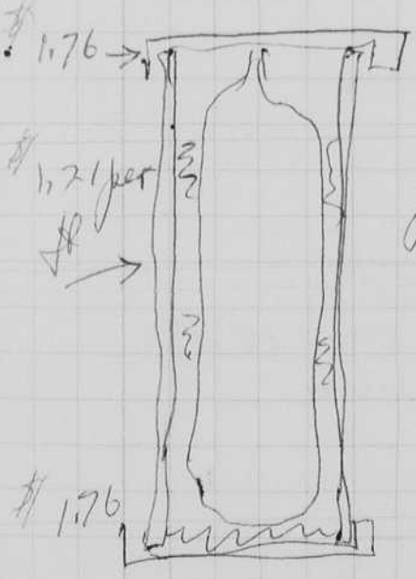
Theodossiades

NICKOLAS. From Greece M.I.T. student oceanographic dept.

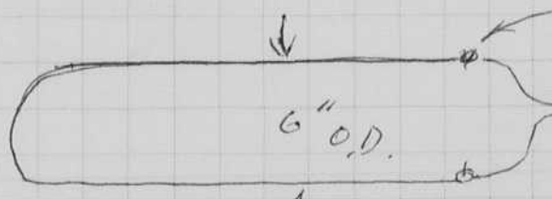
Howard is to do a thesis on navigation with Darnell.

Feb 19 1966

Time Capsule for the Green Building to be installed when the statue (Sail) is scheduled to be dedicated.



Transite Pipe
7" I.D. 5 feet long
with End caps.
Joe H. McPherson Co
KI 7 1884
Norfolk St Cambridge.



fine after filling with records.

Exhaust and fill with argon gas.

Pyrex glass

Prof Bob Schrock will prepare the contents.

Properties

Feb 19 '66 12.15 am 9984 on Berkley Counter
Harris transducer driven by 2 mfd at 300 volts
at 1 per second.

12.22	9994	
1.07	10014	
1:10	10012	into ICE Water
1.12	10009	
1:17	10011	
1:19	100098	
1:29	9982	
1.56	9966	See almost doubled.
2.10	9959	
3.45	9953	
4.40	9960	off.

? Did temp have anything to do with the freq drift ? ? maybe battery drift is the problem.

Feb 22 1966

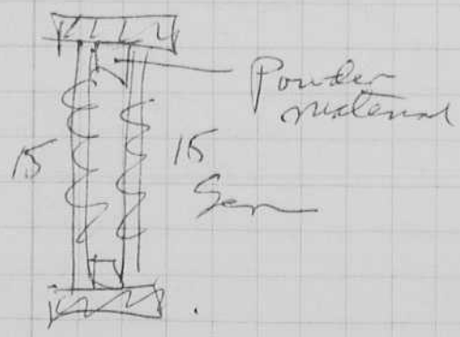
9.24am.	9535.	on
9.35	9504	
9.45	9511	
10.14	9590.	
11.26	10087	
12 + 4.02	10026	
5.15	10030	
5.25	10020	off.

Counter may be slow ??

Feb 23, 8.50am 9982 on start
9.10 10008
10.04 10020

Coil ($L = 0.19$ mh, $Q = 9$)

15 turns each leg in series on Harris transducer LM-12 with spacer.

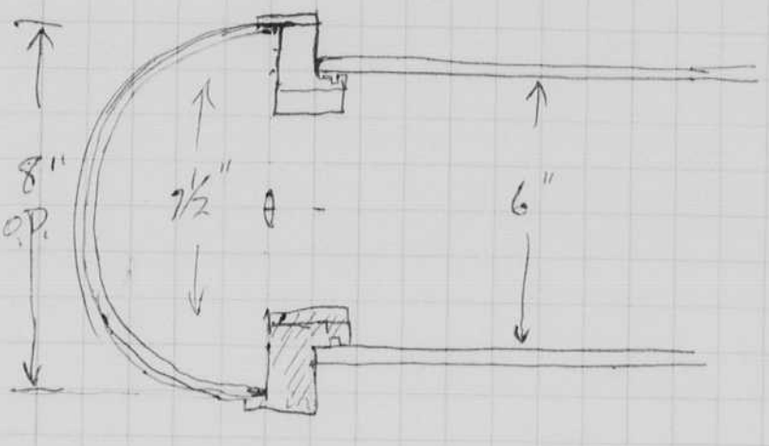


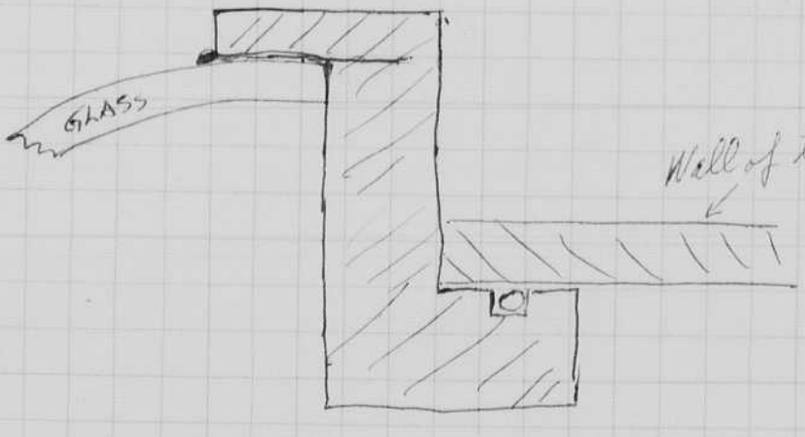
Spherical Windows from Sam Raguenet (Feb. 15 letter).

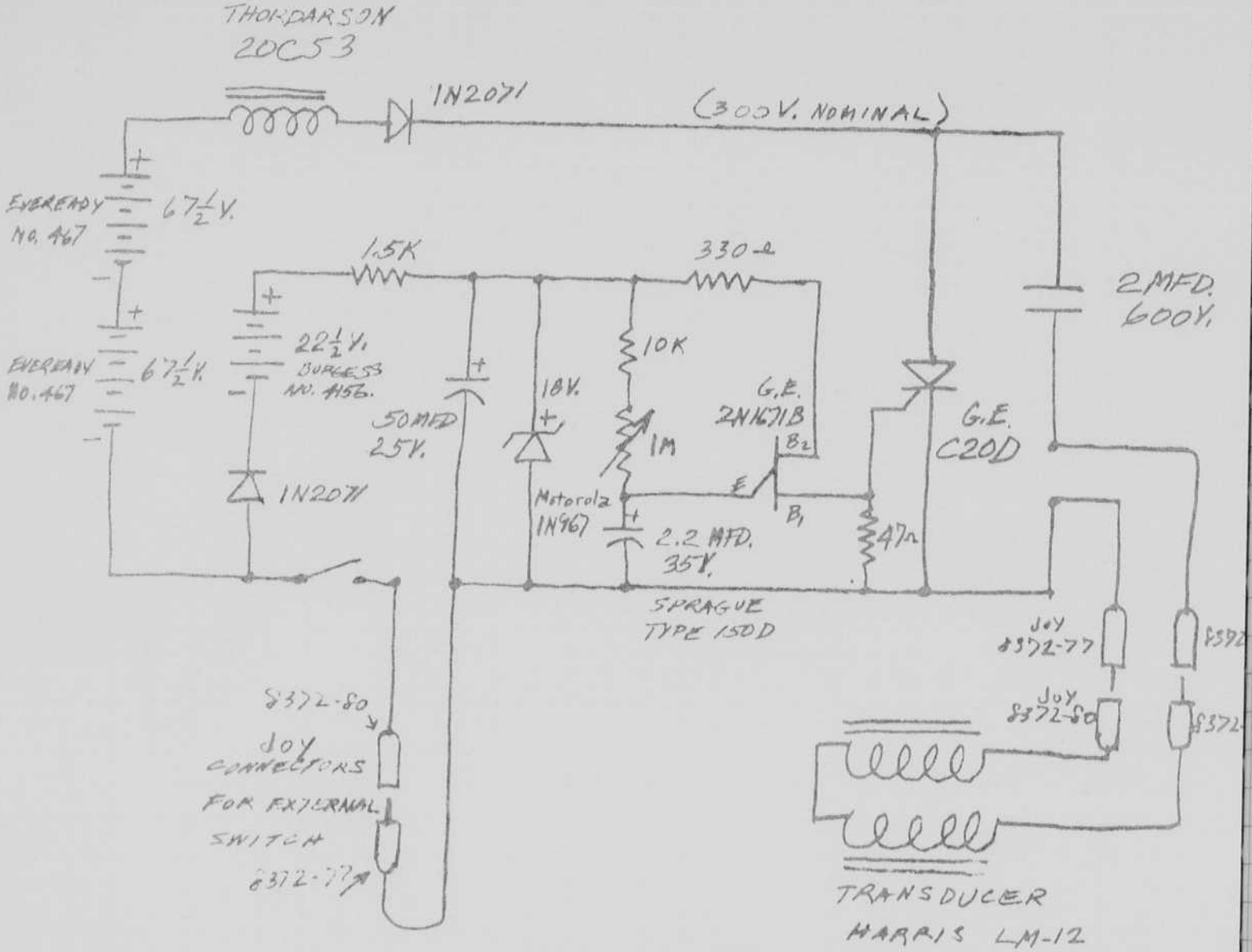
t	O.D.	I.D.
1/4	8	7 1/2
3/8	9 1/4	8 1/2
1/4	10	9 1/2
3/8	10	9 1/4
1/2	16	15.

Design for elapsed time camera.

Fabins = 7 1/2"







SELF CONTAINED
PINGER.

2/21/66

Feb. 26, 1966

Motor tests for Pinger

Elect Motor Corp Racine Wisc

5pm 37771 24V DC

24V DC – 0 Jeld R amps 2400 RPM

75 Ω " .5 amps 3200 "

12V DC 0 Jeld R .5 amps 1900 "

75 Ω " " .5 " 2400 " "

Conversion D.C. motor 12 volt.

Inverter 12 - 110 voltac. to operate the amplifier and pinger driver.

When accomplished the 12 volt battery will operate the entire pinger.

Objectives – 1) Make a time pulse delay circuit and feed it into the Marine amplifier for calibration. Try 10 meters.

or. 30 feet 5 fathoms

5 fathoms = 30 ft.

$\frac{d}{t}$ = vel. $\frac{5000}{1} = \frac{30}{t}$ $t = \frac{5000}{30} = \frac{1}{16.6}$

16.6

30 | 5000 | 1006

30 | 500 | 30,000

200 | 30,000

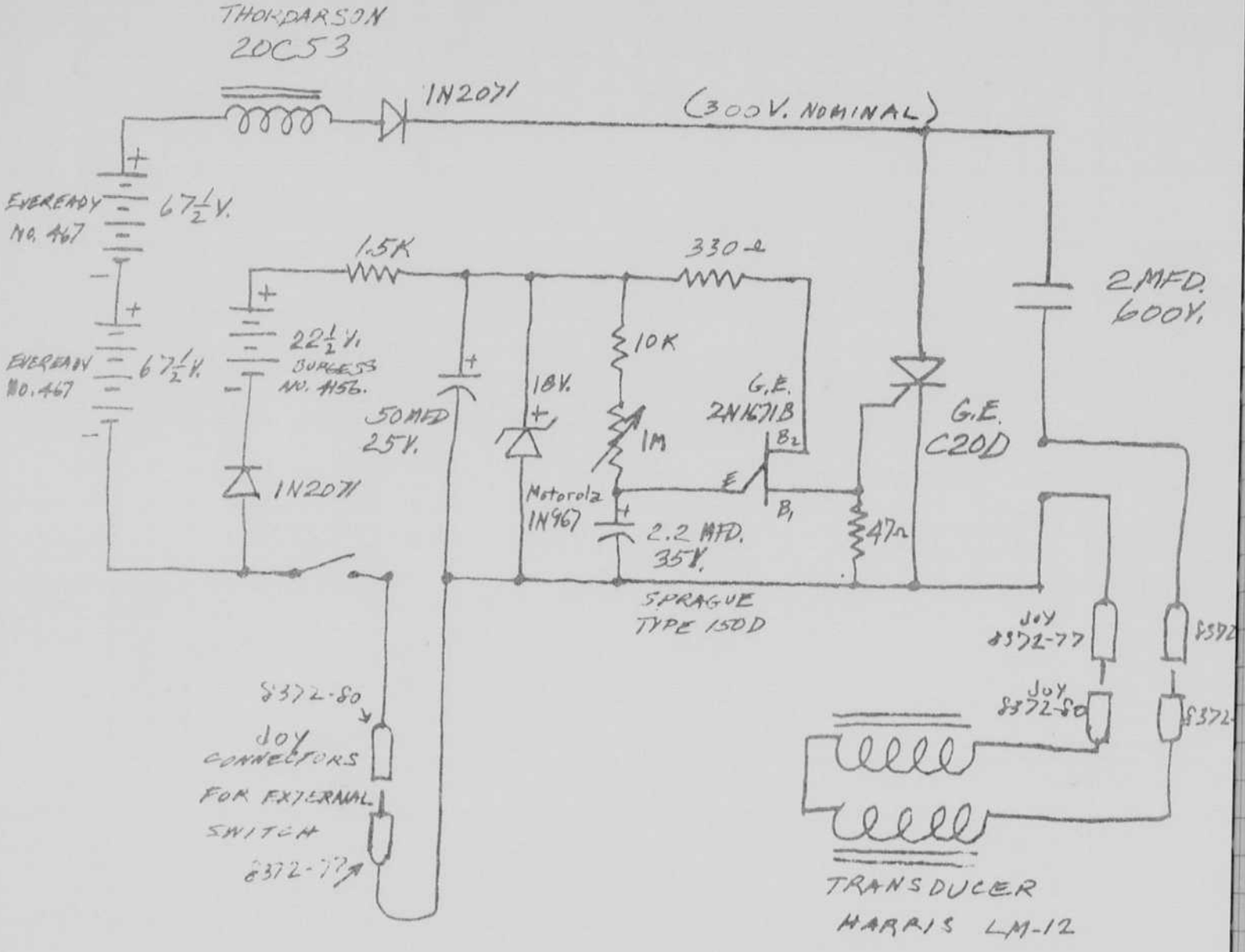
180

200

= 6 milliseconds. half travel.

(5 fathoms) t = 12 milliseconds.

(2) overhaul the amplifier so the inputs is available for the bottom echo from the bottom.



SELF CONTAINED
PINGER.

2/21/66

Feb. 26, 1966

Motor tests for Pinger

Elect Motor Corp Racine Wisc

spm 37771 24V DC

24V DC – 0 field & amps 2400 RPM

75 Ω " .5 amps 3200 "

12V DC 0 field R .5 amps 1900 "

75 Ω " " .5 " 2400 " "

Conversion D.C. motor 12 volt.

Inverter 12 - 110 voltac. to operate the amplifier and pinger driver.

When accomplished the 12 volt battery will operate the entire pinger.

Objectives – 1) Make a time pulse delay circuit and feed it into the marking amplifier for calibration. Try 10 meters.

or. 30 feet 5 fathoms

5 fathoms = 30 ft.

$\frac{d}{t}$ = vel. $\frac{5000}{1} = \frac{30\text{ ft}}{t}$. $t = \frac{5000}{30} = \frac{1}{16.6}$

16.6

30 / 5000 30 200 180 200

500 / 30,000 30,000

1006

= 6 milliseconds. half travel.

(5 fathoms) t = 12 milliseconds.

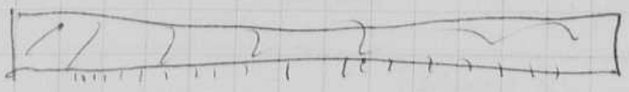
(2) overhaul the amplifier so the inputs are available for the borner echo from the bottom.

H/E Boerton Don Kratzer.
March 7 1966

Lecture at M.G., Sun Mar 3. 8:30 pm Constitution Hall
4 5 and 8:30 "

Don Kratzer – tests of Double Coil 18"
40 turns on each 3 wires in parallel
.05 x 1/4"

conference – Ind of each coil = 280 each nh.
60 nh series



Short coil.
measure other L = 60 nh.

Driver with 32 mfd with 5 ohms in parallel.

LC 57 hydrophone gave 0.6 volts at 18 ft
trans – 3" and 2 ft. Same result.

Time scale 100 ns/cm.)
.2 volt/cm.

Conclusions 1. The problem is acoustic
Larger face.

2. Two kinds of negative pulse
(a) Force – plate backwards?
should be zero
with present design
unless – short circuits,
(b) Low freq are radiated
from the trans ~~like~~ as a point
source? so the
area is important.

The full area is better since the force may be uniform over the face preventing distortion and ~~center~~ cavitation at the center.

Cavitation elimination is important!

Conclusion air backed plate will be used as before (1) full area coil
(2) air backed.

(A old 2 coil with al plate glued
B new full area coil with plate glued.

Expt - Stop boat.

Trans at 6" deep on side of ship,

Hydro at 12 ft deep ± under keel
(Second reflection should be small).

Dynamite caps are out

Notebook # 29

Filming and Separation Record

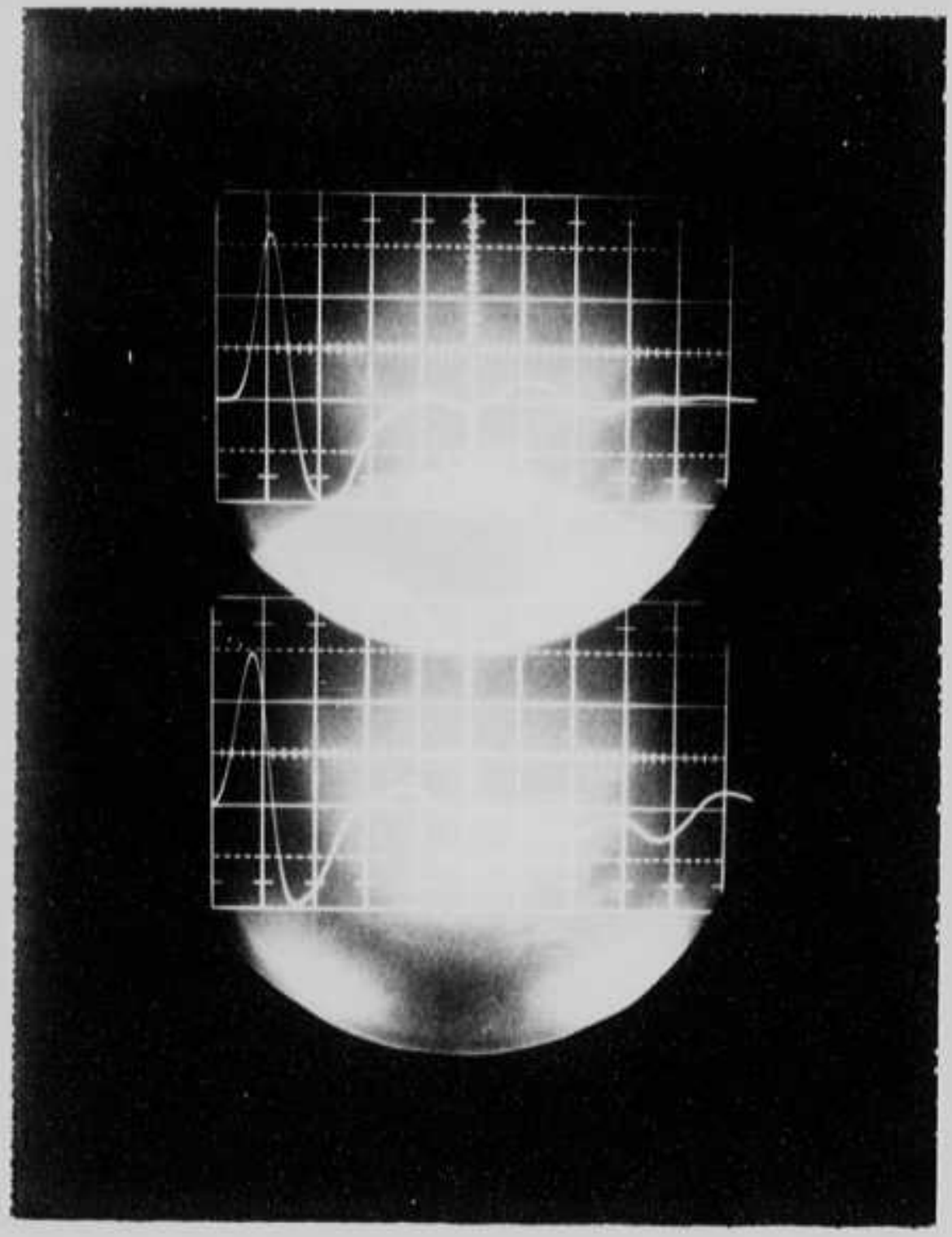
1 unmounted photograph(s)

____ negative strip(s)

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

was/were filmed where originally located between page 38 and 39.

Item(s) now housed in accompanying folder.



2 × 1.98 Gy

100 kVp/cm

0.2 mA/cm

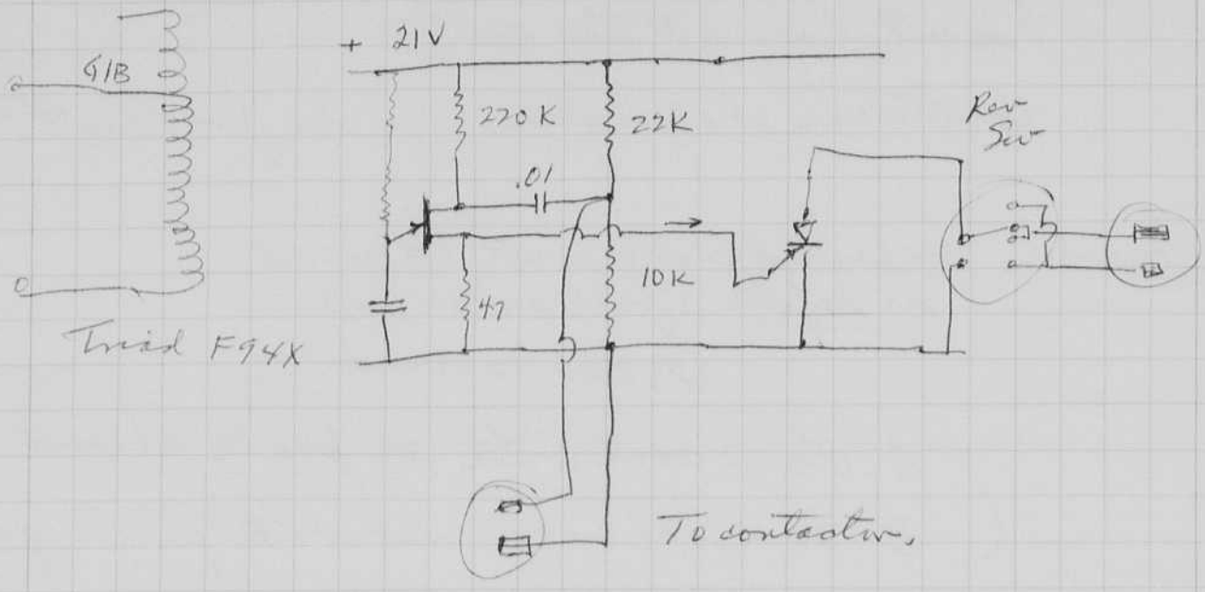
2 of 6 in series

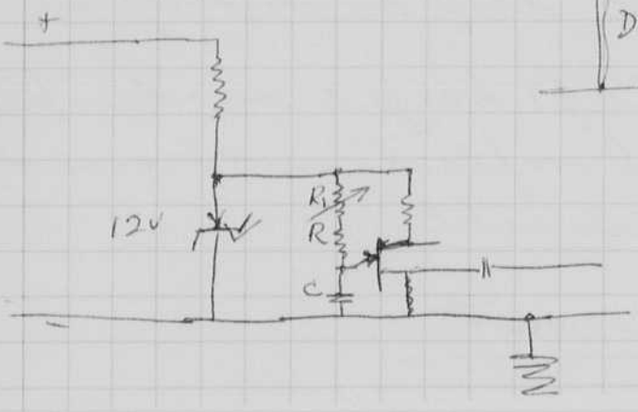
at surface and

at 2' deep.

40 March 13 1966
Harold Edgerton

Step Down key for Boomer from Contactor or 5" Alden Recorder.



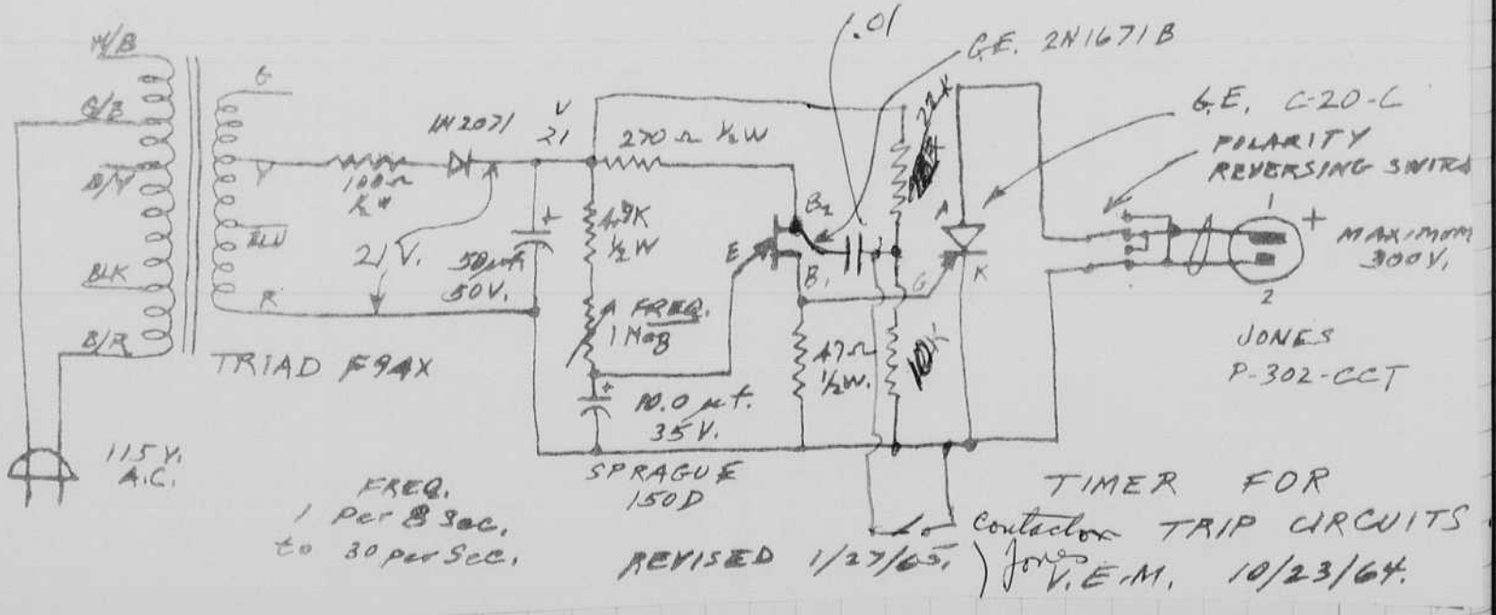


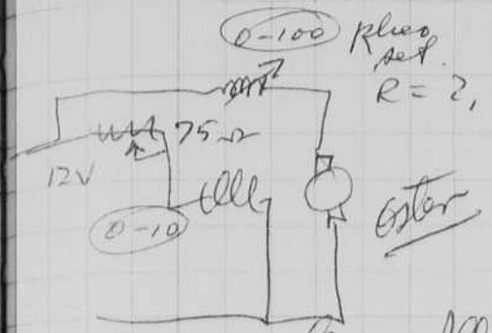
~~2D/T = vel = 5000 ft/sec.~~

$T = \frac{50 \times 2}{50{,}000} = .5 \text{ ms.}$

$\frac{50 \text{ ft} \times 2}{T} = 5000 \text{ ft/sec}$

$T = \frac{100}{5{,}000} = 20 \text{ ms.}$

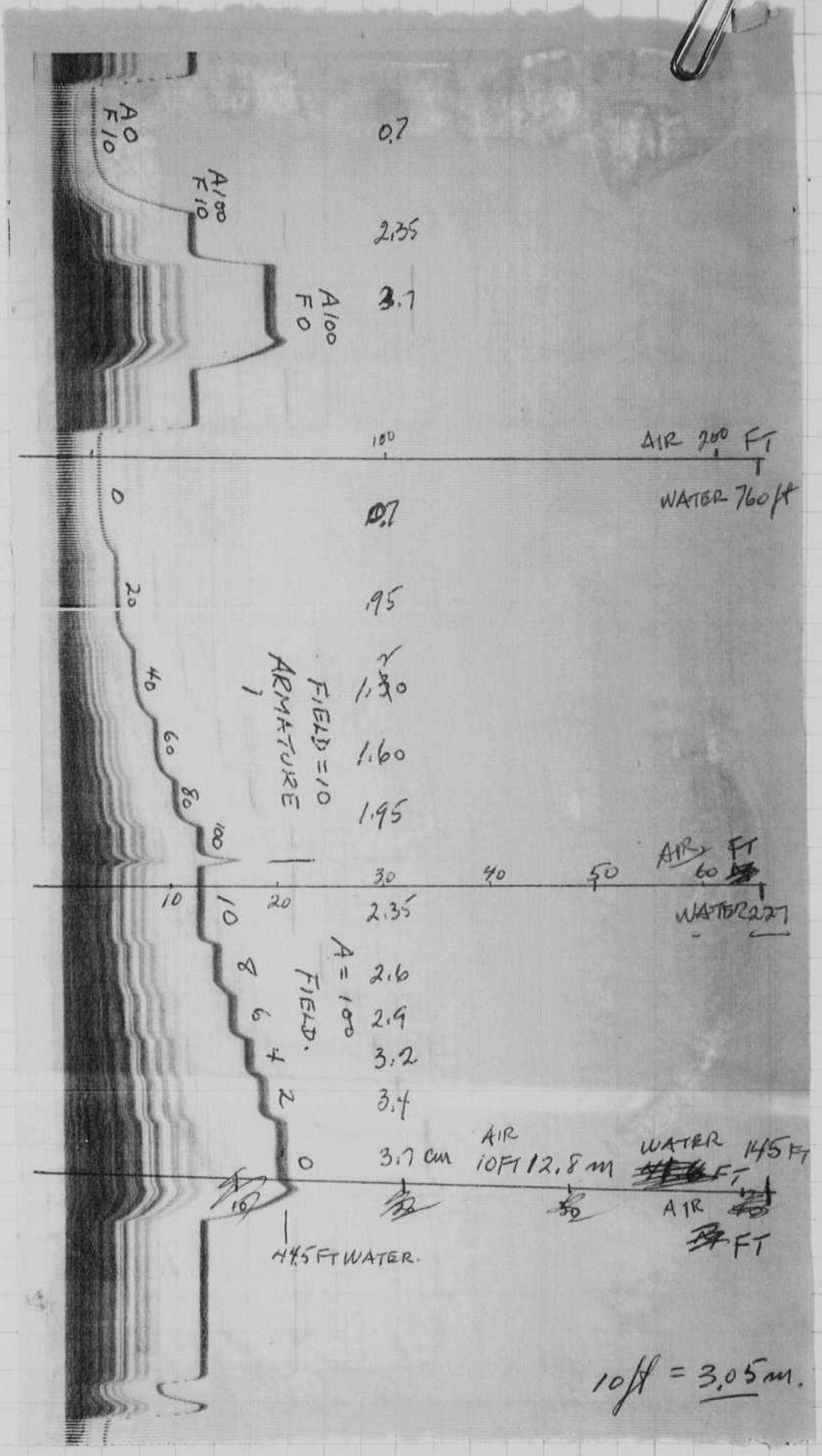




Genco Dd
Type ET-5 27.5V
3650 Rpm.
Ser No 919 (Spare)
Date 9/44
Shunt.
1/20 HP.
Also 978 (Spare)

#1164 on the 5" Recorder,

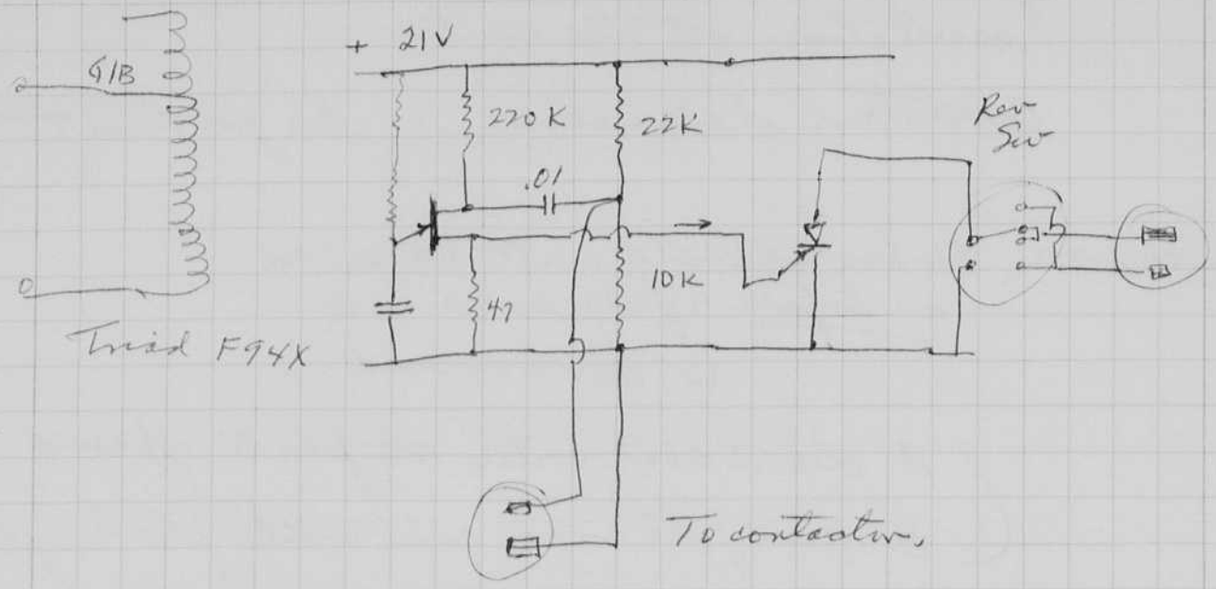
Tachemp 13 volt
Hansen with
gear box (?)
Series R
Adjustable R.

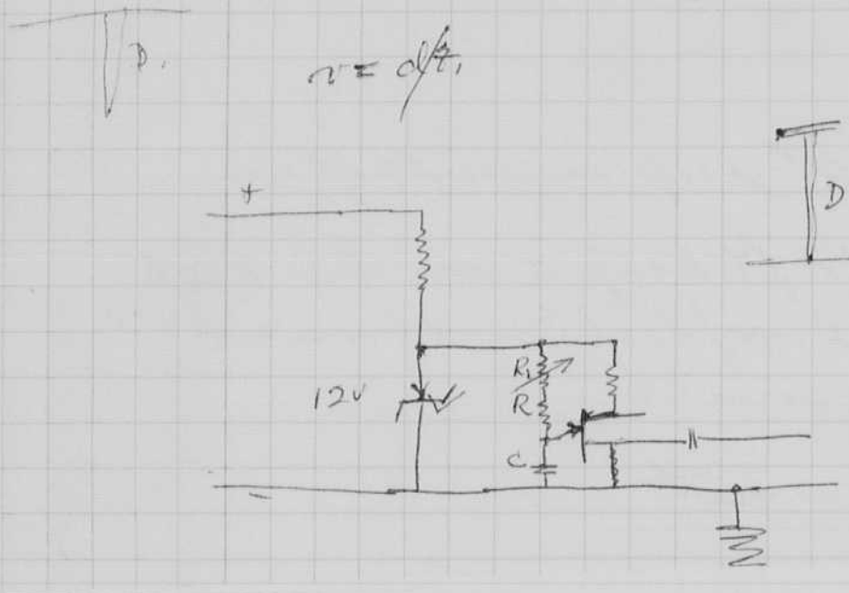


10ft = 3.05 m.

40 March 13 1966
Harold Edgerton

Step Down Relay for Boomer from Contactor or 5" Alden Recorder.



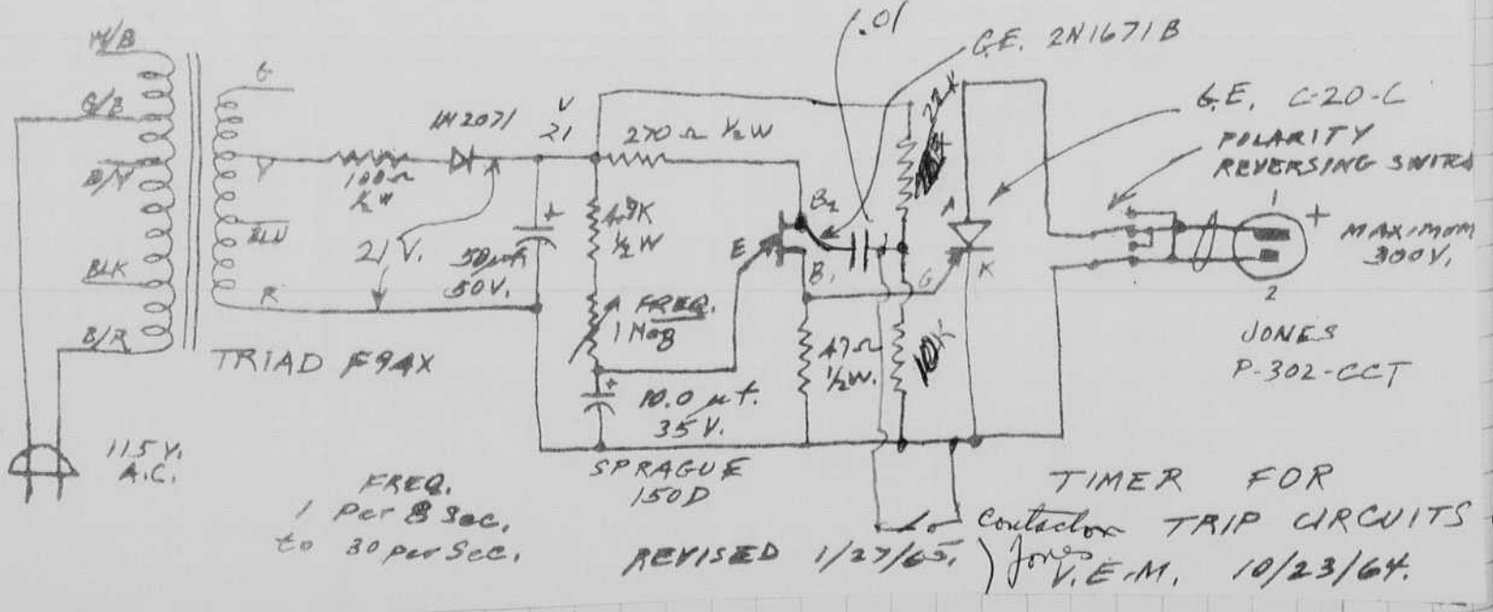


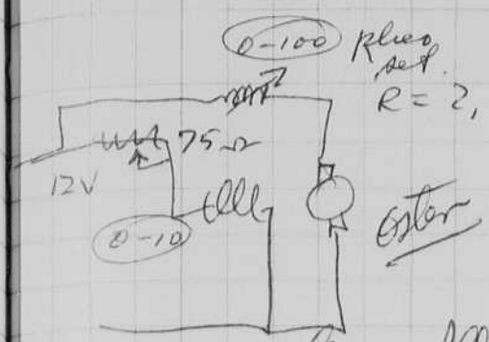
$2D/T = vel = 5000$ ft/sec,

$T = \frac{50 \times 2}{50{,}000} = .5$ ms.

$\frac{50 \times 2}{T} = 5000$ ft/sec

$T = \frac{100}{5{,}000} = 20$ ms.

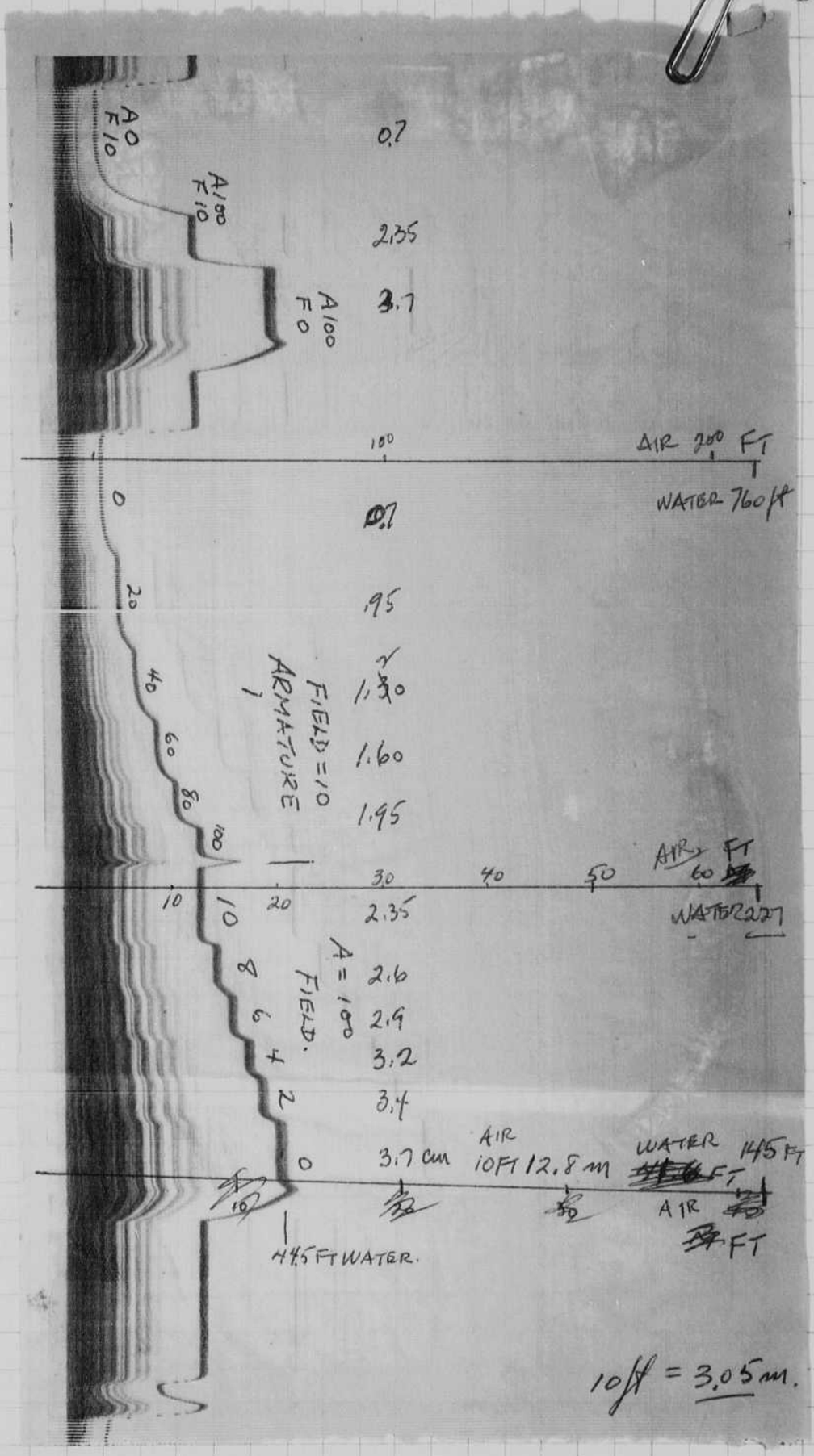




Genco Dd
Type E7-5 27.5V
3650 Rpm.
Ser No 9179 (Spare)
Date 9/44
Shunt.
1/20 HP.
also 9178 (Spare)

#1164 on the 5" Recorder,

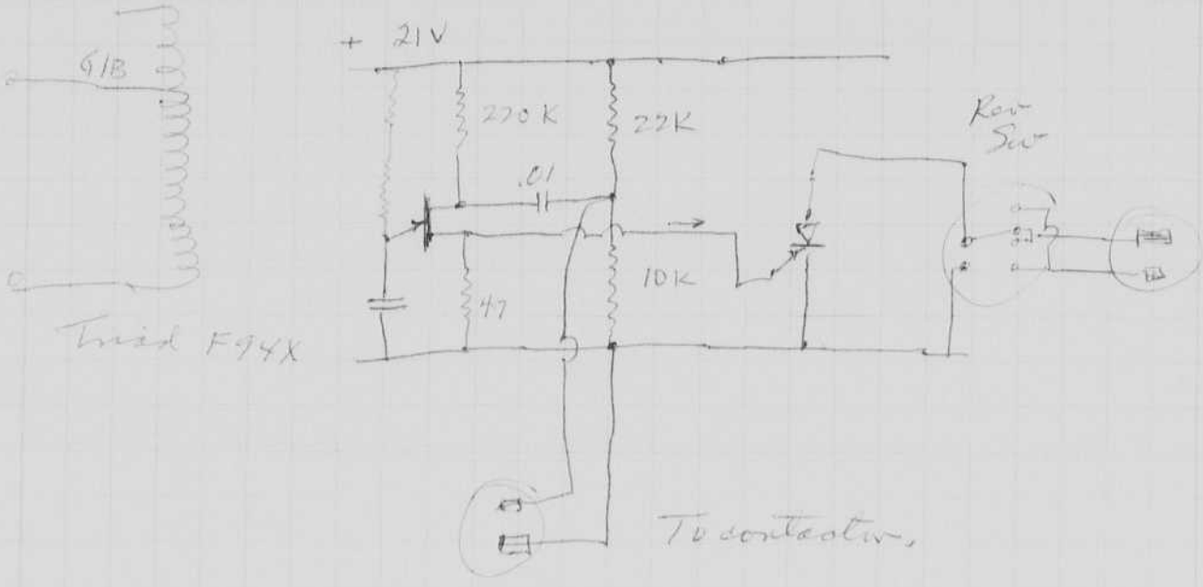
Tehenp 13volt
Hansen with
gear box (?)
Series R
Adjustable R.

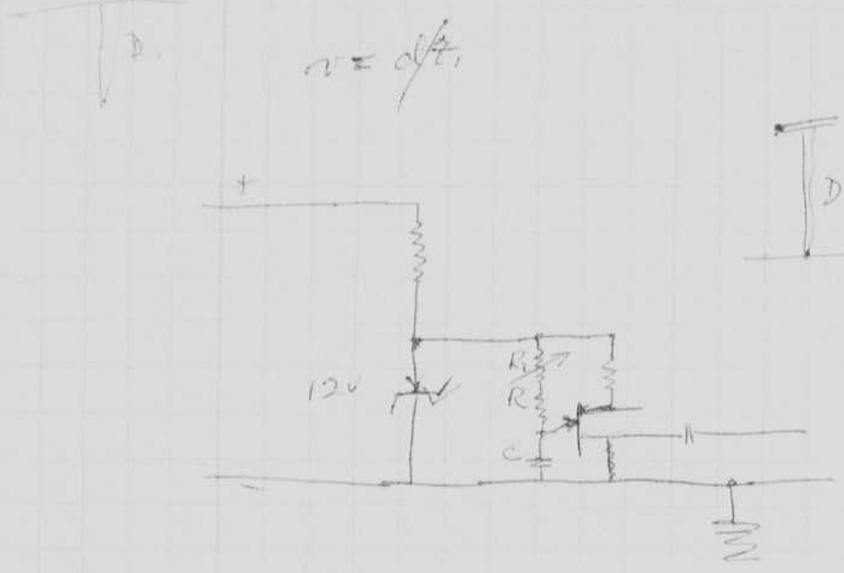


10ft = 3.05m.

3 40 Nov. 13 1966
Harold Edgerton

Step Down Relay for Boomer from Contactor or 5" Alden Recorder.



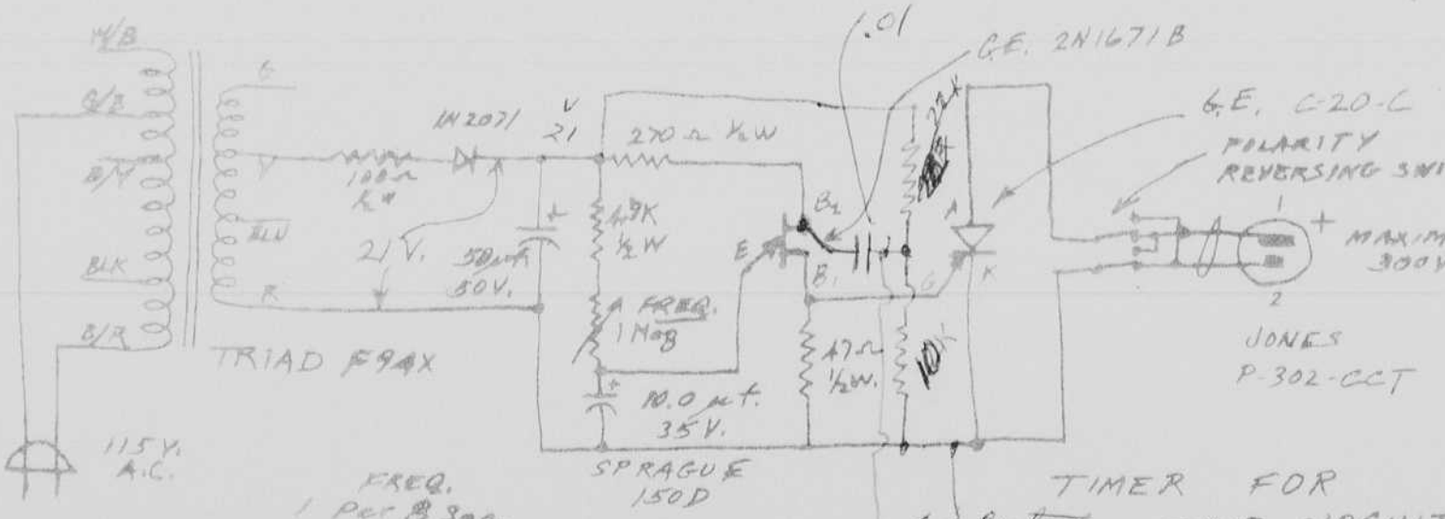


$2D/T = 2\pi r = 5000$ ft/sec.

$T = \frac{.50 \times 2}{5000} = .5$ ms.

$\frac{.50 \times 2}{T} = 5000$ ft/sec

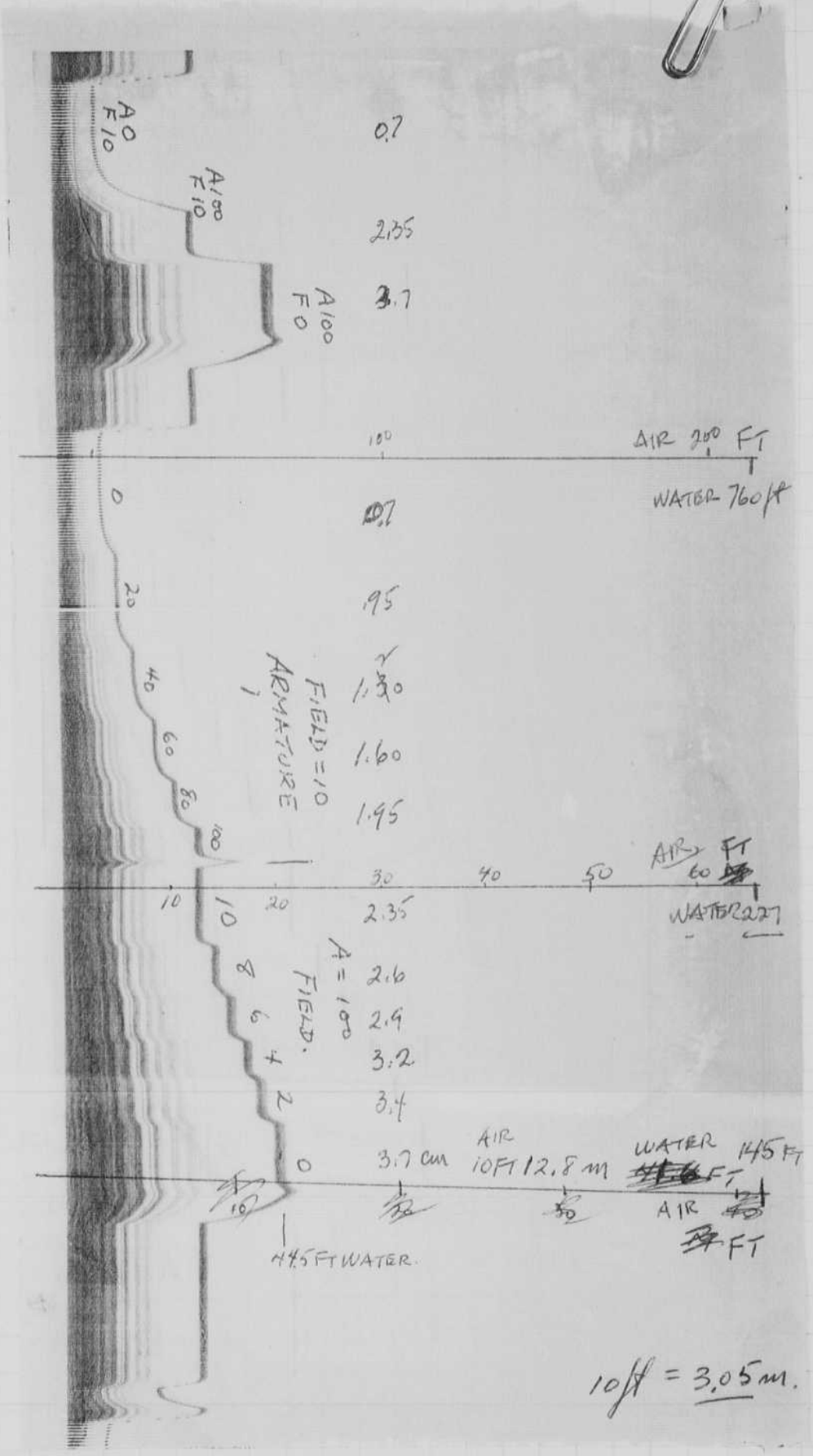
$T = \frac{100}{5000} = 20$ ms.



Genco Ltd
Type E7-5 27.5V
3650 Rpm.
Ser No 919 (Spare)
Date 9/44
Shunt.
1/20 HP.
Also 975 (Spare)

#1164 on the 5" Recorder.

Tachemp 12 volt
Hansen with
gearbox (?)
Series R
Adjustable R.



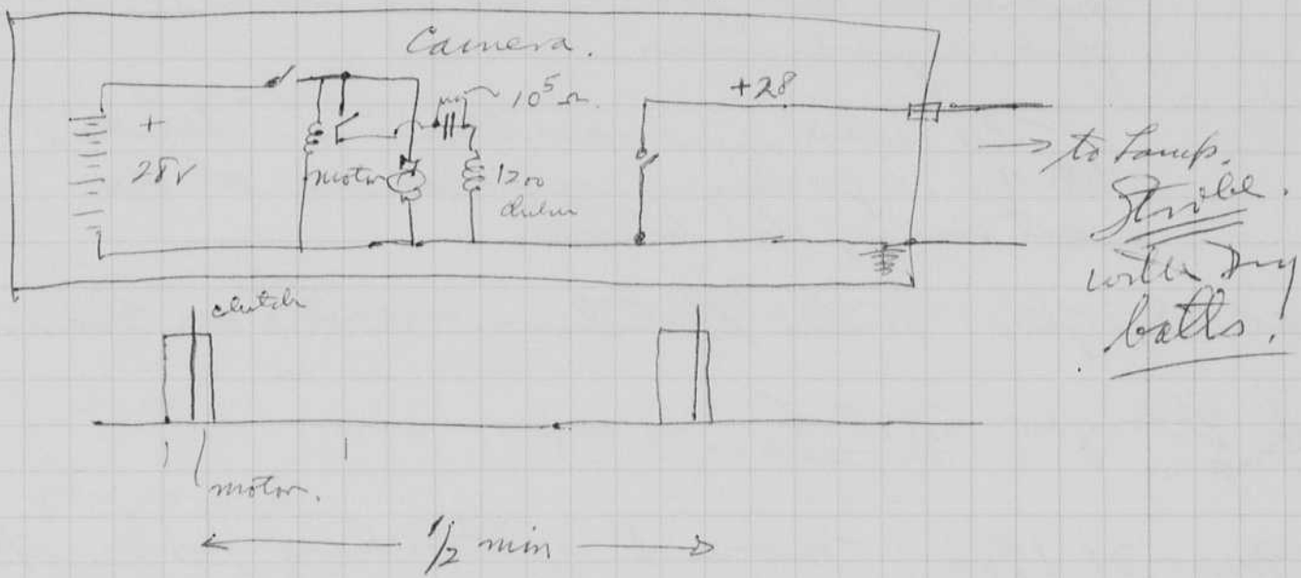
10 ft = 3.05 m.

Scale for 12 cm in feet in water.	Field Rheostat	Arm Rheostat.
~~Feet~~		
120	0	100
130	2	↓
139	4	↓
152	6	↓
172	8	↓
185	10	↓
230		80
280		60
370		40
470		20
635		0

March 18 1966
U. Eugenios

Elapsed time system for
under ocean
Diamond Sea Corp Model III B SN 760
28 V motor # 760
72° shutter.
10 FPS change gears
20
40

Seems to work O.K. on 24 volts Marginal on 12 clutch was not positive.

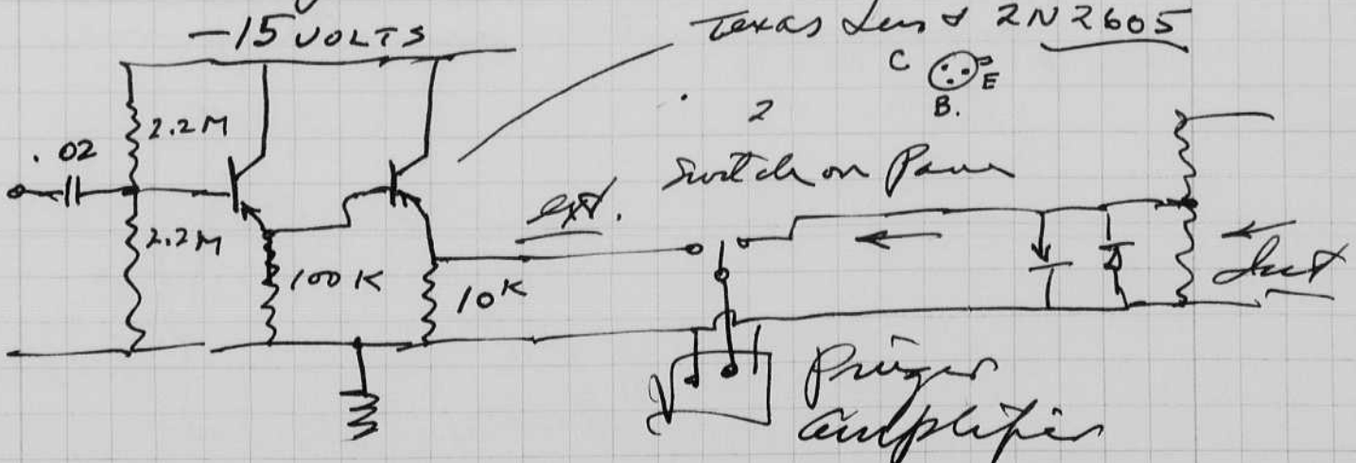


RC = .01 sec.

$C = \frac{.01}{1200} = 10^{-5}$ farads $= 10 \times 10^{-6}$ farads.

.00001

Mar 19 1966 Amplifier from Klein put into mud penetrator.



Notebook # 29

Filming and Separation Record

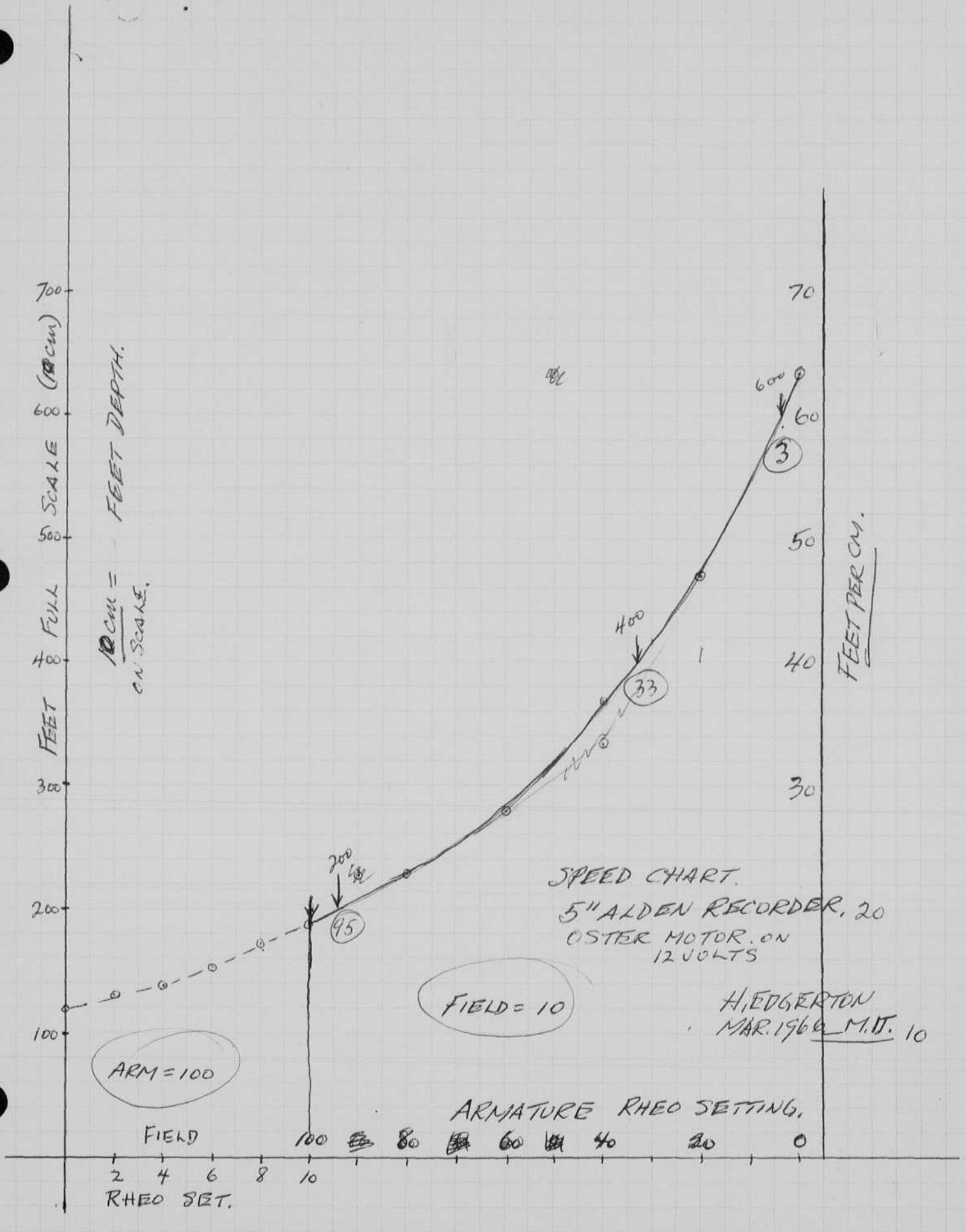
____ unmounted photograph(s)

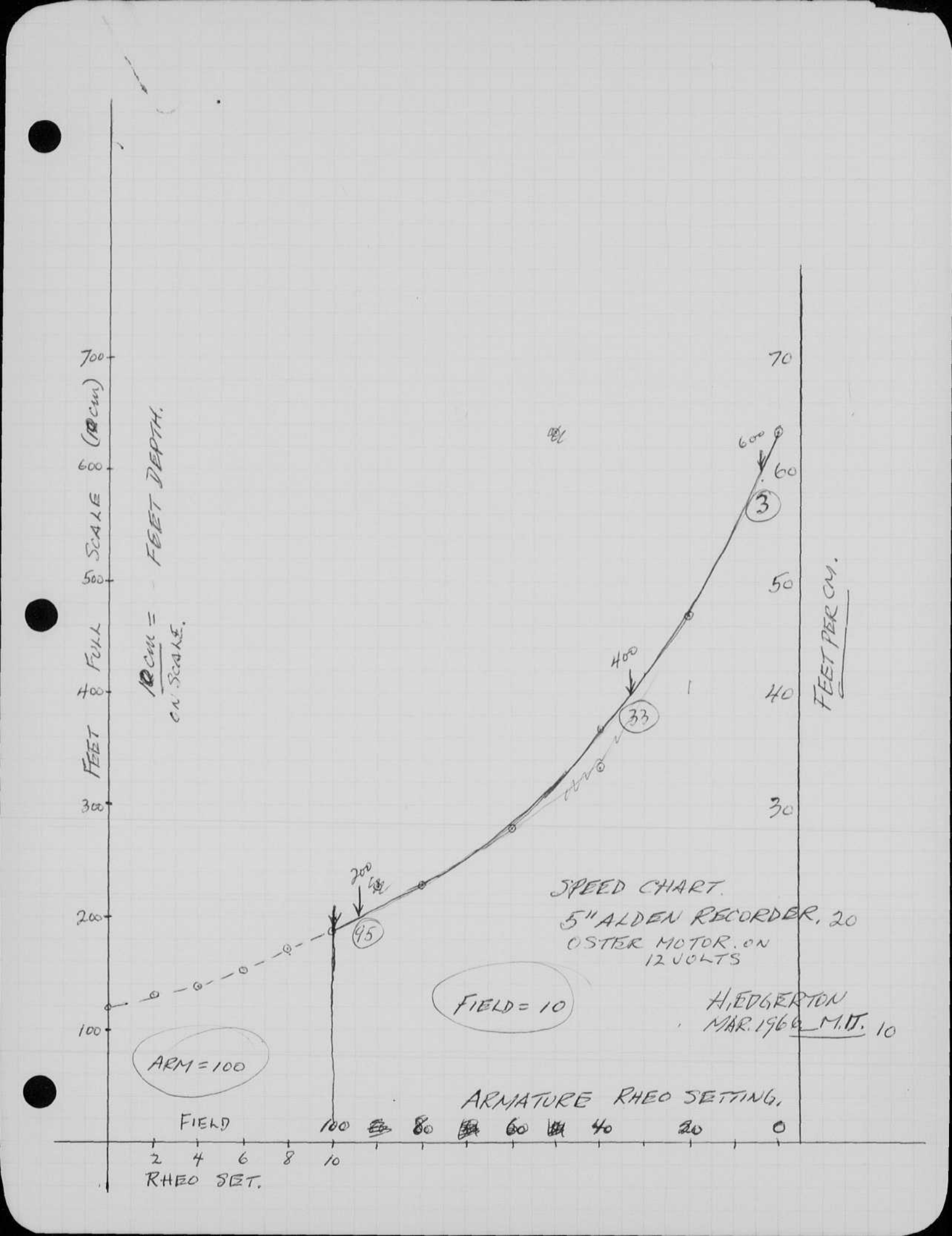
____ negative strip(s)

__1__ unmounted page(s)
(notes, drawings, letters, etc.)

was/were filmed where originally located between page 42 and 43.

Item(s) now housed in accompanying folder.


FEET FULL SCALE (10 cm)
700
600
500
400
300
200
100
10 cm = FEET DEPTH.
ON SCALE.
70
60
50
40
30
FEET PER CM.
600
400
200
3
33
95
SPEED CHART.
5" ALDEN RECORDER. 20
OSTER MOTOR. ON
12 VOLTS
H. EDGERTON
MAR. 1966 M.I.T. 10
FIELD = 10
ARM = 100
ARMATURE RHEO SETTING.
FIELD
100
80
60
40
20
0
2
4
6
8
10
RHEO SET.


FEET FULL SCALE (12 cm)
700
600
500
400
300
200
100
12 cm = FEET DEPTH.
CH. SCALE.
70
60
50
40
30
FEET PER CH.
600
400
200
3
33
95
SPEED CHART.
5" ALDEN RECORDER. 20
OSTER MOTOR. ON
12 VOLTS
H. EDGERTON
MAR. 1966 M.I.T. 10
FIELD = 10
ARM = 100
ARMATURE RHEO SETTING.
FIELD
100
80
60
40
20
0
2
4
6
8
10
RHEO SET.

Mar. 19 Continued

I made a trip around the Charles Basin with the Piper.

There is a "salt layer" at 11 feet in some of the basin. The layer in the Lagoon is about 5 feet deep.

The layer in the main River could not always be found but the Lagoon layer was very clear. The lagoon layer has some thin spots. Perhaps there is material that floats at this interface that gives a good echo.

The west wind was blowing. Noted that the 11 ft layer was clearer at the east end of the bottom.

Mar. 25, 1966 Mike Fletcher - wants to see Shannon.

Herman Ellingson N.O.L. is supervisor.

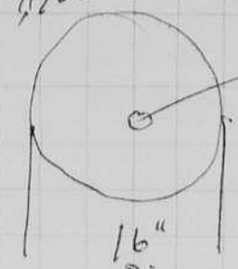
Mar 31 1966 moved yesterday from apt 83 A to (11-6A and 11-7A) combined in 100 memorial Drive Camb. Mass

tested 4" Johns Manville with Plexiglass ends.

590 p.s.i. Failure of plexiglass end Pipe looks ok. Must try more pressure with an improved end.

Inductance
April 1966

+1. Objective

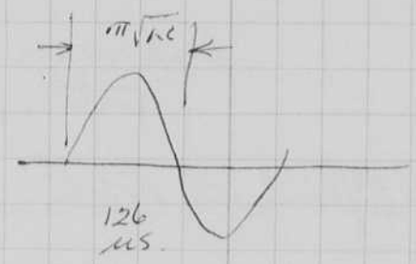


1/8 x 50 thousandths Copper DCC.

open 0.00415 h. Q = 42

Al plate .000315 Q = 1.2
in contact.

$6 \times 10^{-6} \times \frac{315 \times 10^{-6}}{6} = \frac{1}{1890 \times 10^{-12}}$ (LC).



$\sqrt{LC} = 42 \times 10^{-6}$

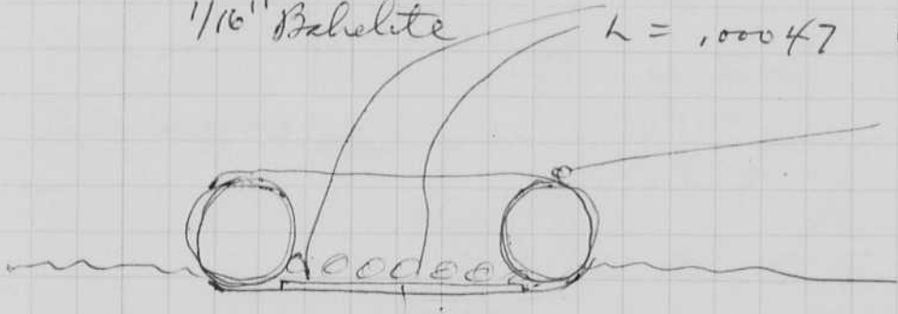
$\sqrt{LC}\,\pi = 126 \times 10^{-6} =$ 126 μs

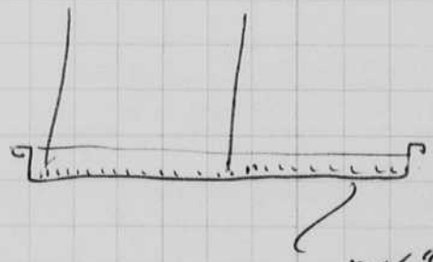
$\frac{1}{12{,}000 \times} =$ 80 μs.

½ $\frac{1}{24{,}000} =$ 40 μs.

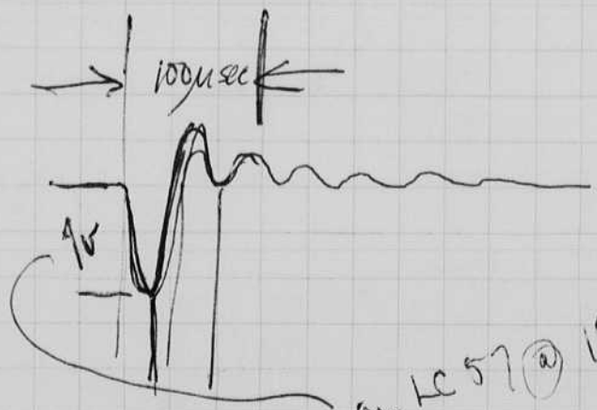
16" ~~Soft~~ Al Disc L = .00032 Q = 1.7

1/16" Bakelite L = .00047 Q = 1.9





April 10, 1966 Finished Pan job
Tried off Schenck in Harbor.



Q = 0.7
L = 0.28 mh
= 280 μh.

on LC 57 @ 18' = 107 db

The Pizza pan Boomer was opened there were some short circuits & the front. My plastic insulation had some holes.

Reassembled -

Vinylguard Etched	.005	
" " "	.005	
3 layers	.0015	.0045
		.0145 insulation.

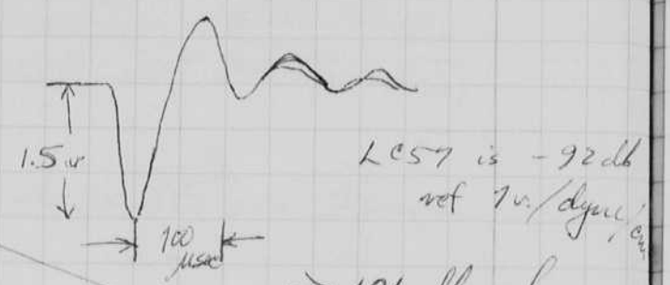
Coil reassembled in the pan and sealed with G.E. Clear Rubber-plastic.

April 12 1966 M.I.T Swim Pool.

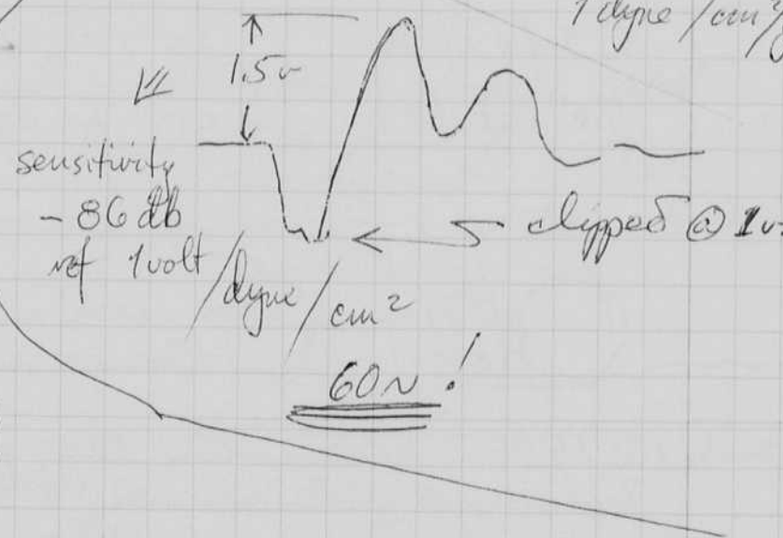
LC57 Hydrophone. @ 6 ft.

Watch case

8 ball on chain.



⇒ 101 db ref 1 dyne/cm²/cps.



sensitivity either 1/3 or 1/5 that of LC57 also weak high frequency response.

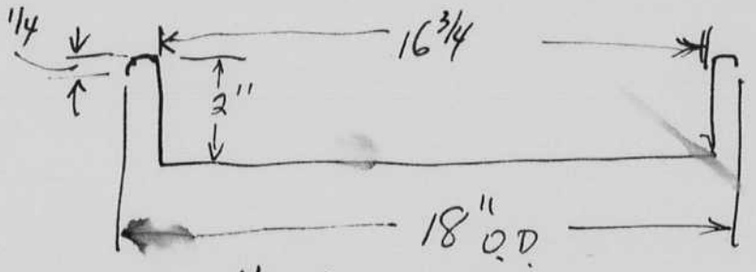
Peter A. Frasse & Co., Inc.

UNIVERSITY 4-2460 • 87 RINDGE AVE., EXT. • CAMBRIDGE, MASS. 02140

STAINLESS, ALLOY AND CARBON STEELS — ALUMINUM

BARS • RODS • FORGINGS • PLATES • SHEETS • STRIP • WIRE
TUBING • HOLOBAR • PIPE • VALVES • FITTINGS • TOOL AND JIG PLATE

The accompanying mat'l is the cut-out scraps from the previous spinning in which the mat'l alloy was in question.
V. C. Bryner



1/16" 1100 al O Temper.

April 13 1966
#2 Edgerton.

4500 volts/mil
5
25,000.

Coil # - 10 dram 14X ; copper collar covered.

condition	L	Q	
on 1/16" plate -	310 mh	0.9	.005 mylar disc between coil and plate
"	300	0.85	mylar out
no plate,	4100	39.00	open coil on bench.

$T = \pi\sqrt{LC} = 3.14\sqrt{310\times10^{-6} \times 6\times10^{-6}} = 43\times10^{-6}$ seconds = 129 μs.

$\sqrt{1861}$ ×3.14 = 129.

R=

The Pizza pan Boomer was opened there were some short circuits & the front. My plastic insulation lead some holes.

Reassembled -

Vasqueen Ethyl	.005	
" " "	.005	
3 layers	.0015	.0045
		.0145 insulation.

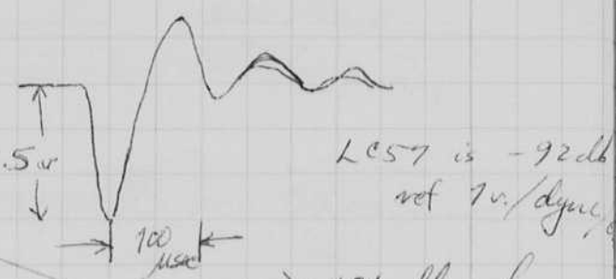
Coil reassembled in the pan and sealed with G.E. Clear Rubber-plastic.

April 12 1966 M.I.T Swim Pool.

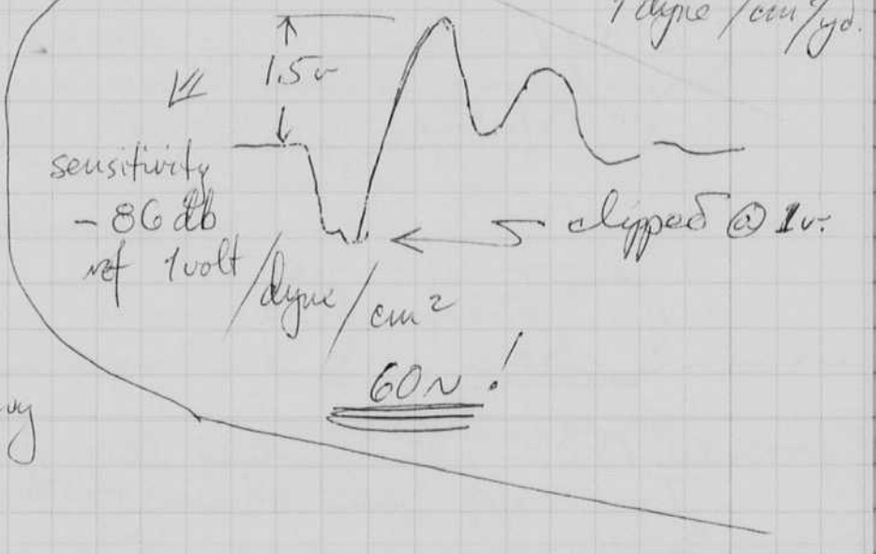
LC57 Hydrophone @ 6 ft.

Watch case

8 ball on chain.



⇒ 101 db ref 1 dyne/cm²/yd.



sensitivity either 1/3 or 1/5 that of LC57 also weak high frequency response.

April 13 1966
#2 Edgerton.

4500 volts/mil
5
25,000.

1½" I.D. .031" 1/32" thick

Coil #2 16" diam 1/4 x ? Co/per Collin covered.

condition	L	Q	
In 7/16" plate -	310 uh	0.9	.005 mylar disc between coil and plate
"	300	0.85	mylar out
no plate.	4100	39.00	open coil on bench.

$T = \pi\sqrt{LC} = 3.14\sqrt{310\times10^{-6}\times 6\times10^{-6}} = 43\times10^{-6}$ second = 129 μs.

$\frac{6}{186}$ $\times 3.14$ $\frac{}{129.}$

R=

The Pizza pan Boomer was opened there were some short circuits & the front. My plastic insulation lead some holes.

Reassembled -

Vinylpaper	Ethyl	.005
"	"	.005
3 layers	.0015	.0045
		.0145 insulation.

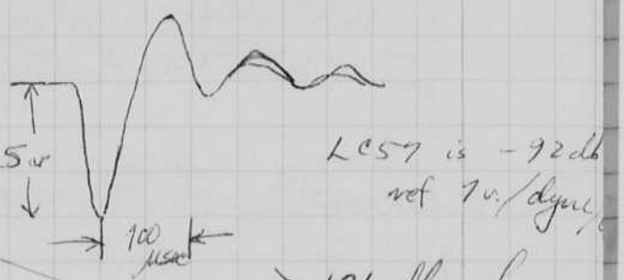
Coil reassembled in the pan and sealed with G.E. Clear Rubber plastic.

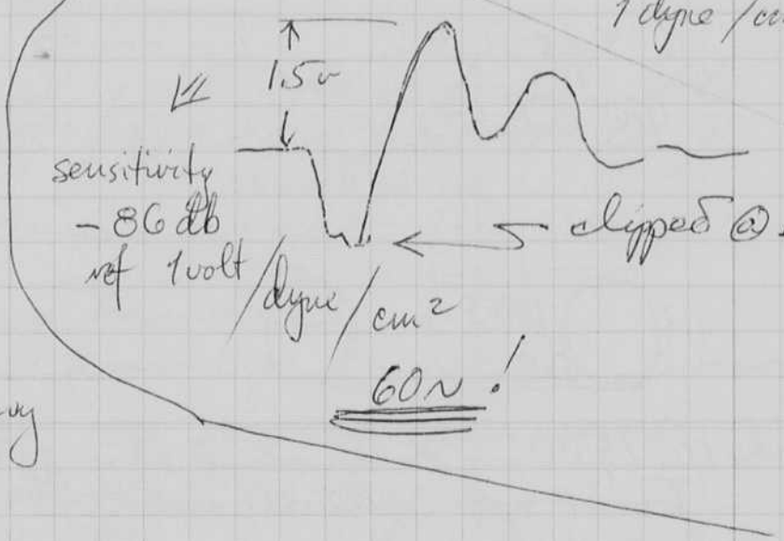
April 12 1966 M.I.T Swim Pool.

LC57 Hydrophone @ 6 ft.

Watch case

8 ball on chain.





sensitivity either 1/3 or 1/5 that of LC57 also weak high frequency response.

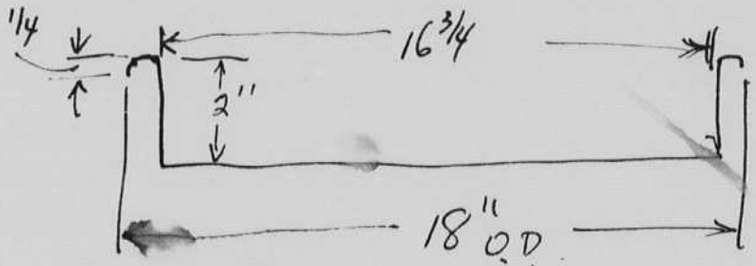
Peter A. Frasse & Co., Inc.

UNIVERSITY 4-2460 • 87 RINDGE AVE., EXT. • CAMBRIDGE, MASS. 02140

STAINLESS, ALLOY AND CARBON STEELS — ALUMINUM

BARS • RODS • FORGINGS • PLATES • SHEETS • STRIP • WIRE
TUBING • HOLOBAR • PIPE • VALVES • FITTINGS • TOOL AND JIG PLATE

The accompanying mat'l is the cutout scraps from the previous spinning in which the mat'l alloy was in question.
V. C. Bragner



1/16" 1100 al O Temper.

April 13 1966
H. E. Edgerton.

4500 volts/mil
5
25,000.

Coil # - 10 diam 14 X ; copper collar covered.

condition	L	Q	
On 1/16" plate -	310 uh.	0.9	.005 mylar disc between coil and plate
"	300	0.85	mylar out
No plate,	4100	39.00	open coil on bench.

$T = \pi\sqrt{LC} = 3.14\sqrt{310\times10^{-6}\times 6\times10^{-6}} = 43\times10^{-6}$ seconds = 129 μs.

6
1861

×3.14
129.

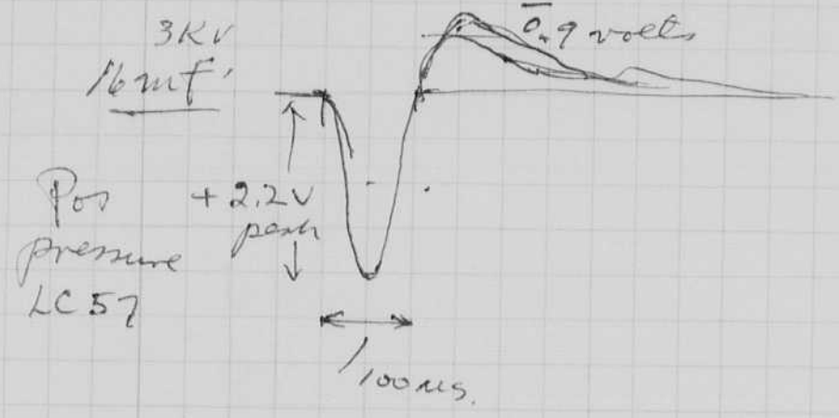
R=

April 16 1966 MIT Swim Pool
AS Elgert 12 noon.
Don Kirsten
Dick Ely

tests of Pizza Pan Boomer.

4 mfd 3KV
12 mf 3kV
16 mfd 3kv into coil with 17" diam
18" plate 1/16"
.005 mylar.
wire 0.20" x (1/32)"?

Depth about 6" ± of Diving board in 13 ft of water.



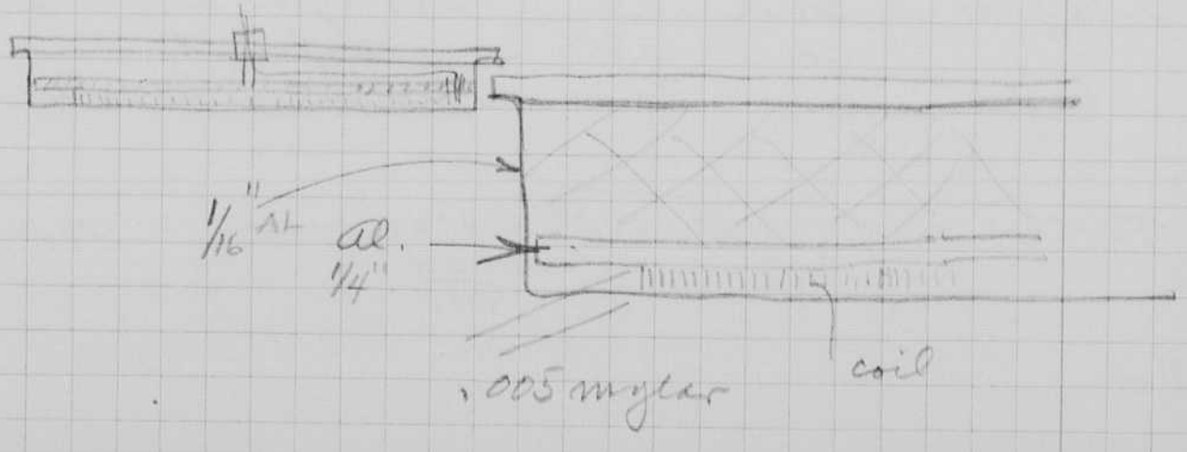
A coil full area with 1/8" plate. square type.

+ 1.2 volts. 16 mfd 3000 volts.
Dur. ~~70~~ -.
70 ms.

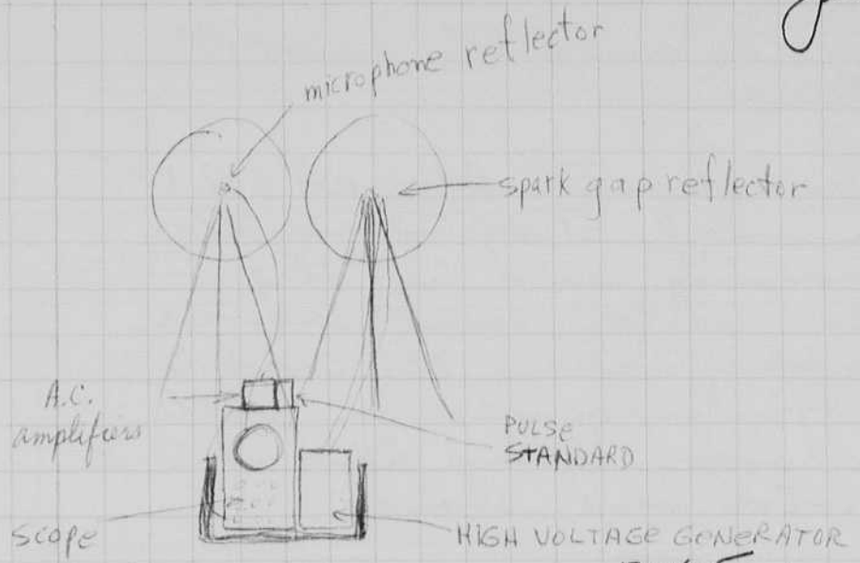
Increase of pressure of air
cause decreased
signal with more oscillations

Sucking air causes
signal to decrease to 0.8 from 1 volt

Packard
1000 US
power
coil with
plate.



Jack Wrights' thesis arrangement for sonic distance measurement..



April 24 1966 AE

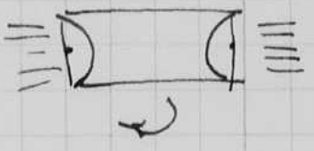
30415.

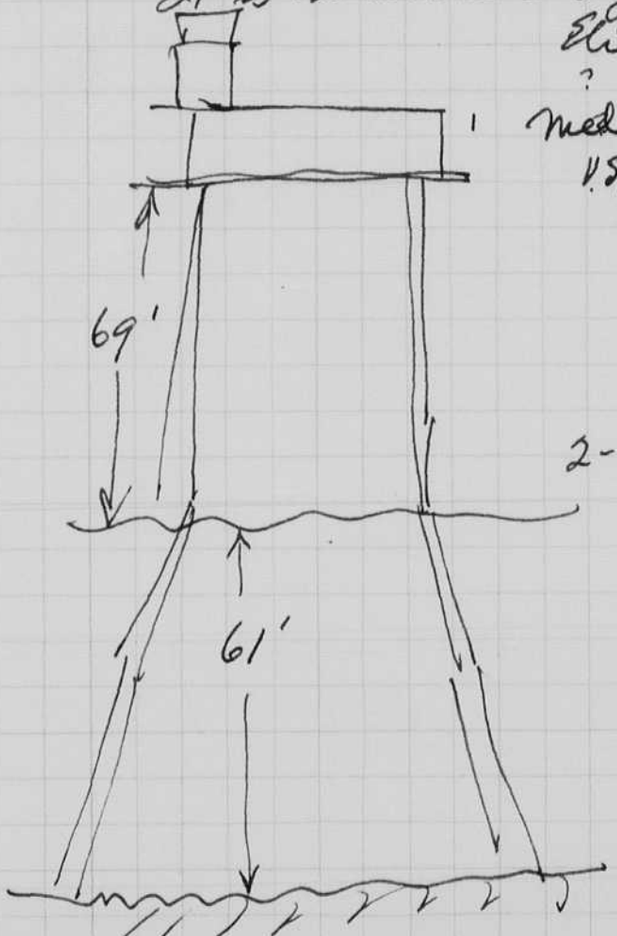
On Monday april 18, I went to WHOI at the coast guard Station. There I went by small boat to the Buzzards tower light house. It is manned by 6 men.

Eli Flemming Amecom Div Litton Systems Inc.
11140 East-West Highway Silver Spring Md
301 · 588 · 7273
? Barnes.

1 Red Light.
U.S.C.G. Wash
Ocean Depl.

8' 20" diam of Light house with the xenon lamps. Hg type. 2500 watt.





John W. Blake (Ph.D. MIT)
Wm F Clapp.
Battelle Mem. Inst.
Washington St
Duxbury Mass.
617 934 · 5683
934-2501

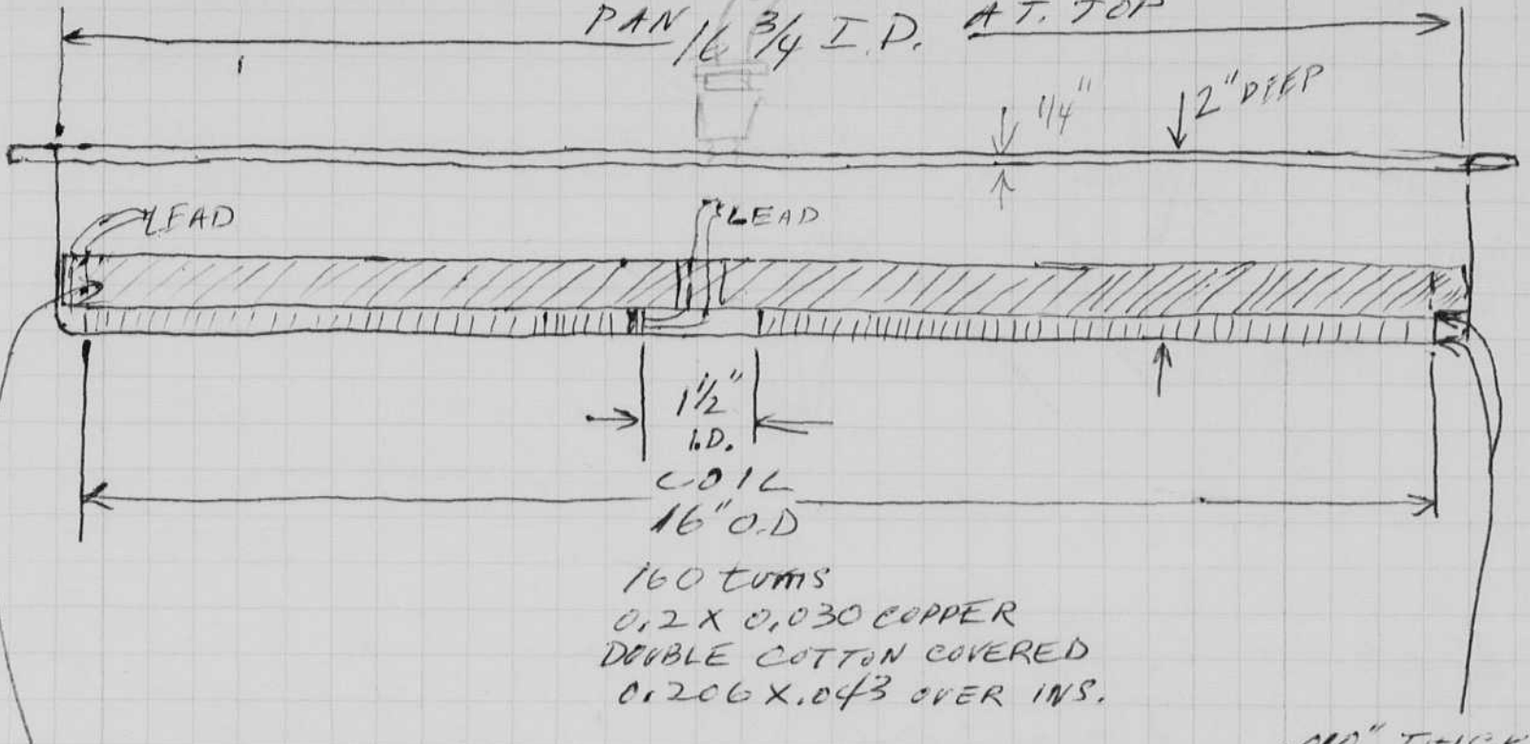
I saw Dave Owen and told him my plans about the elapsed camera on Monday afternoon. Dave showed Mole Christiansen / Kaily and a student a roll of elapsed time pictures

that were taken many years ago on a double frame 35 mm camera. The rate was too fast for the currents except near the ~~slow~~ time.

Yesterday we had Parent's Day at M.I.T. the place was crowded. I showed the strobe in the morning and in the afternoon again with some movies. The afternoon display was in the Compton Hall 26-100. Movies were shown with some of the ~~filmed down~~ sound film at 32 x. Many bat photos were shown.

4/27/66
V.F.M.
H.E.E.

PIZZA PAN
BOOMER #2

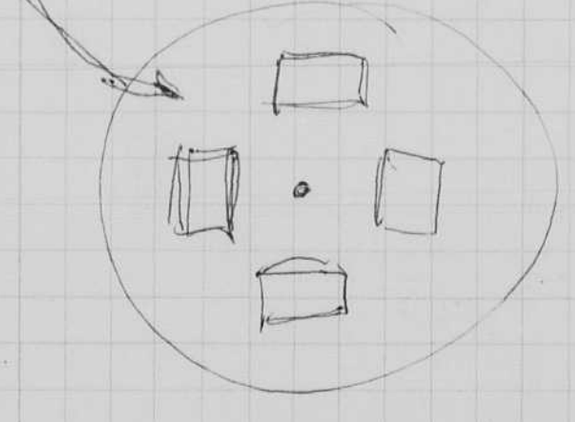


160 turns
0.2 X 0.030 COPPER
DOUBLE COTTON COVERED
0.206 X .043 OVER INS.

6061-T6
ALUM. BACK UP
PLATE 1/2" TH.
X 16 11/16 O.D.

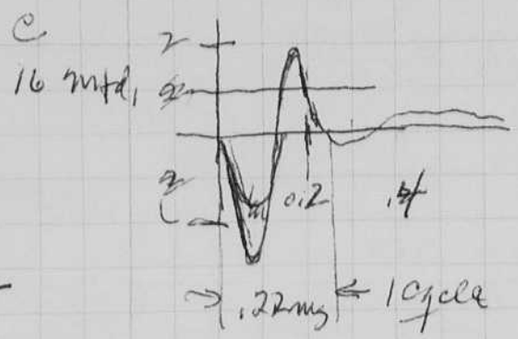
.010" THICK
MYLAR
BETWEEN
COIL AND
PAN;
AND COIL AND
BACK UP PLATE

4 Pcs of Hair Packing 3"x4"



52 April 30 1966
H. E. Edgerton

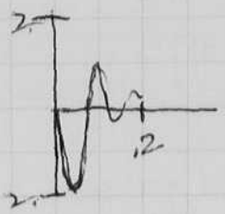
Boomer Pizzaran Boomer # A



at 1 boom per sec.
0.005 mylar
1/16" pan
no Backing plate.
LC57

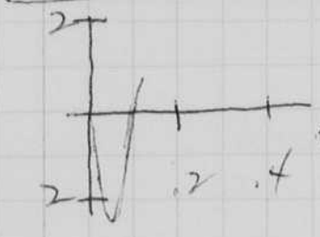
3 VOLTS

4 mfd

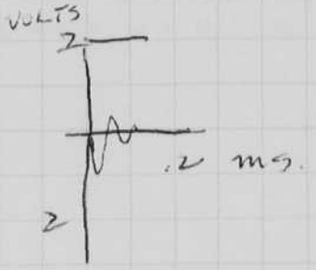


Boomer with Backing Plate

LC57

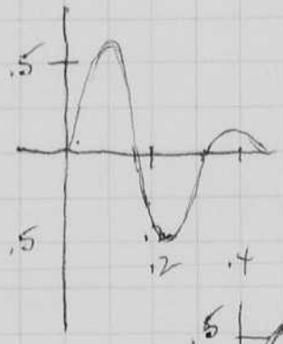


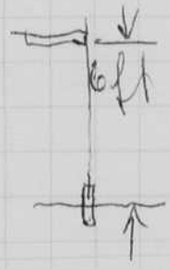
2.5 VOLTS



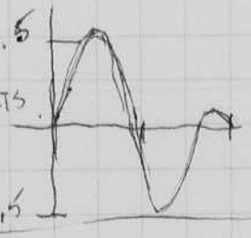
Boomer A

16 mfd

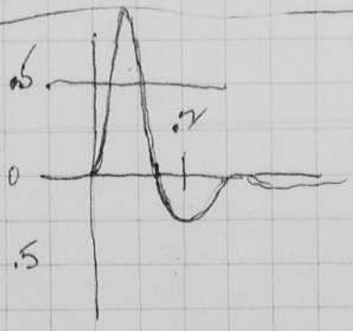




Mary Hydroplane.



Mary Hydroplane with Tag.



Comparison of LC57 and Electrotek.

LC57 at 4.5 ms from 16 mfd type A Boomer, at Sanford KB7 was 6 ft deep.
0.2 volts peak to peak first arrival.

Electrotek. .07 volts peak to peak (about 1/3)!

Wald Case HEE 0.4 volts peak to peak.

8 ball head job 0.1 volts p to p.

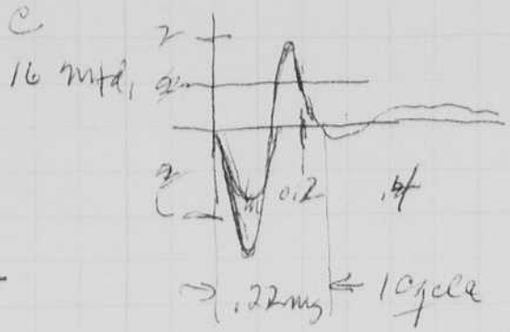
LC-30 old EG&G. 0.02 volts p to p

LC-30 Bahamas pick. 0.015 volts p to p

May 1, 1966. Marblehead Harbor on "SEALEGS". Hendricks.?
Tests of Raytheon PFR 193, writes right to left!
Dijit GDR-1 recorder. Eagle lines always same when speed is changed.

Both synch systems inadequate
Raytheon too weak.
Dijit gives negative pulse 50V.

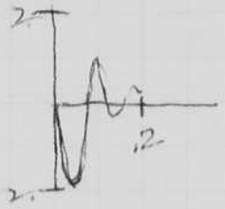
52 April 30 1966 Boomer Pizzaplan Boomer # A
H. E. Explorer



at 1 boom per sec.
0.005 nigler
1/16" pan
no Backing plate.
KC57

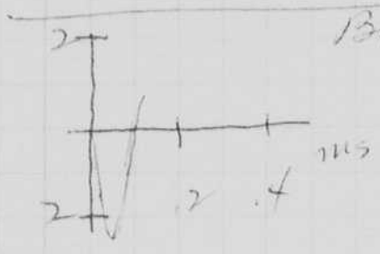
3 VOLTS

4 mfd

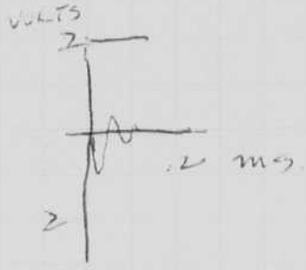


Boomer with Backing

KC57

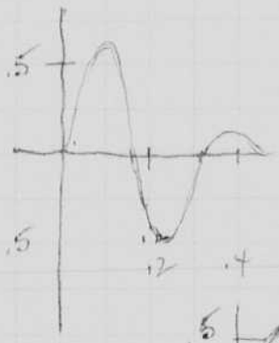


2.5 VOLTS

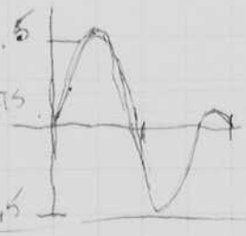


Boomer A

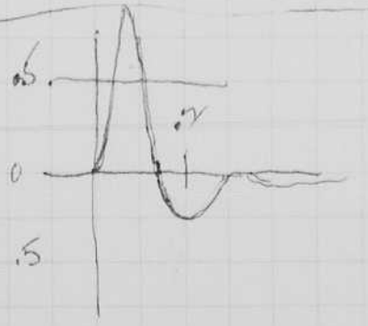
16 mfd



Navy Hydrophone



Navy Hydrophone with Tag.



Comparison of LC57 and Electrotek.

LC57 at 4.5 mis from 16 mfd type A Boomer, at Surf. LC57 was 6 ft deep.
0.2 volts peak to peak first arrival.

Electrotek. .07 volts peak to peak (about 1/3)!

Wald Case #EE 0.4 volts peak to peak.

8 ball test job 0.1 volts plop.

LC-30 old EG&G. 0.02 with flip

LC-30 Bananna pack. 0.015 volts plop

May 1, 1966. Marblehead Harbor on "SEALEGS." Hendricks, ?
Tests of Raytheon PTR 193, writes right to left!
Reft GDR-1 recorder. Eagle lines always same when speed is changed.

Both synch systems inadequate
Raytheon too weak.
Reft gives negative pulse 50V.

Comparison of LC57 and Elictrotek.

LC57 at 4.5 ms/m 16 mfd type A Boomer, at 5m/p.m. KB7 was 6 ft deep.
0.2 volts peak to peak first arrival.

Elictrotek. .07 volts peak to peak (about 1/3)!

Waldo Case #EE 0.4 volts peak to peak.

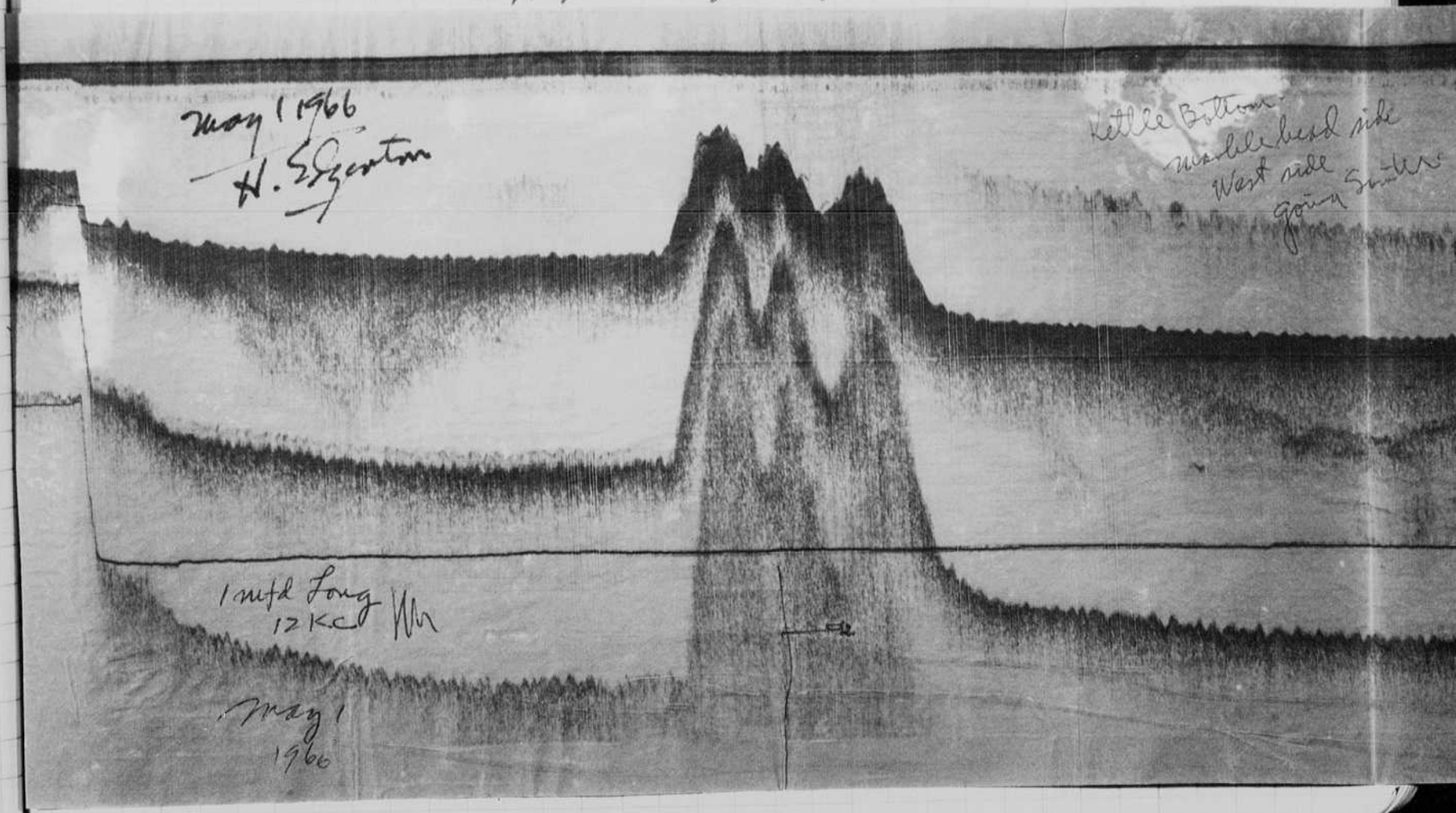
8 ball head 900 0.1 volts p to p.

LC30 old EG&G. 0.02 volts p to p

LC-30 Bonasawa pack. 0.015 volts p to p

May 1, 1966. Marblehead Harbor on "SEALEGS." Hendricks.?
Tests of Raytheon PTR 193, writes right to left!
Jeff GDR-1 recorder. Eagle lines always same when speed is changed.

Both synch systems inadequate
Raytheon too weak.
Jeff gives negative pulse 50V.



May 1, 1966
H. Edgerton

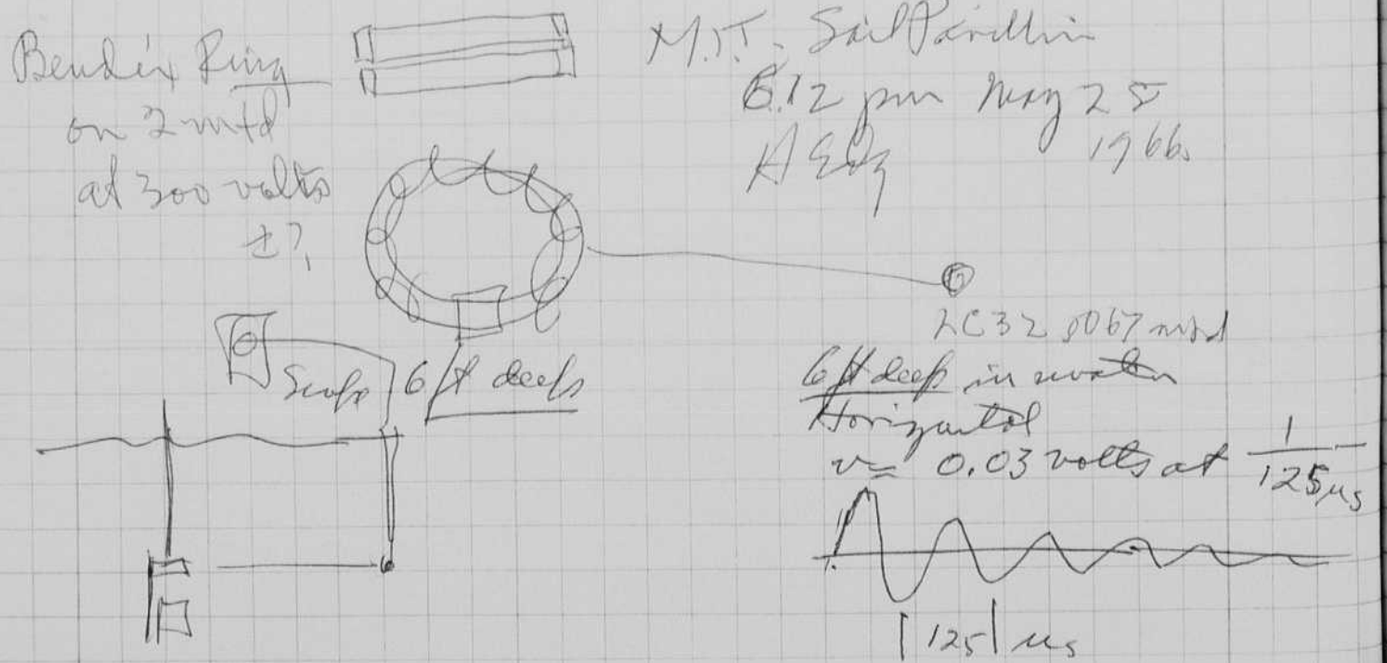
Boomer -

Idea - Heat tungsten wire with a capacitor discharge.
Immerse the wire in Hydrogen gas so that it will heat quickly and produce a pressure wave through a rubber hose into the water.
The hose should be behind the slit to give a linear array of sound. A similar line of hydrophones opposite the side of the slit will give secondbottom absorption.

May 27, 1966. The term is over as of May 24 for last classes. This has been my busiest term. The Strobe lab has been very active.

Hydrophones were tested on the 25th at the Sailing Pavillion. The Clevite Watchcase hydrophone seems to be the most sensitive one around. It is twice as sensitive as the 2 ball.

The Pizzajan Boomer appears to have an output of 101 db. 16 mfd at 1/sec rate. The half cycle is 120 μs.



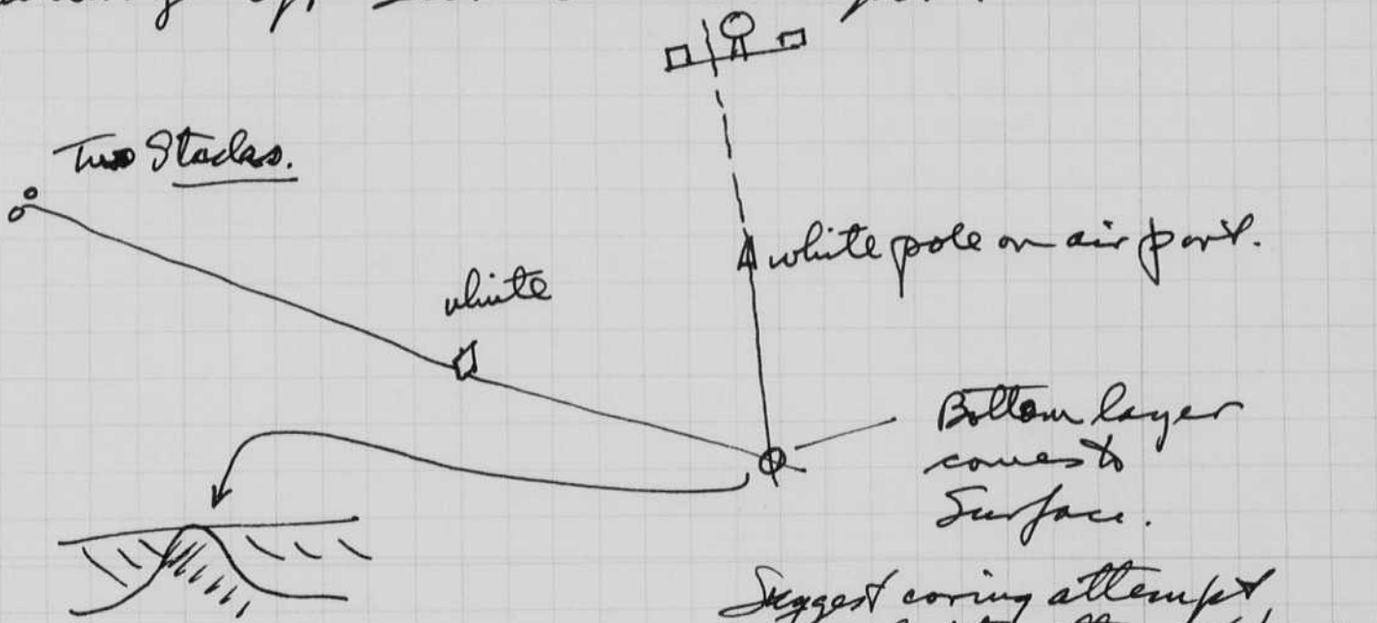
May 30 1966

Harold Edgerton' Sonar tests in Boston Harbor.

I left the MIT Sailing Dock at 7.50 am with the Mesa 5 KC and the Pinya Pan Boomer system. There was no wind and the day was very clear.

Records were made which may be put into this book later. Both systems give penetration to 50 feet max in a few places but the performance is not as good as with the 12 KC mud or the 6 KC 30" cone.

I spotted the peak of the mountain in the anchorage off Deer island light.



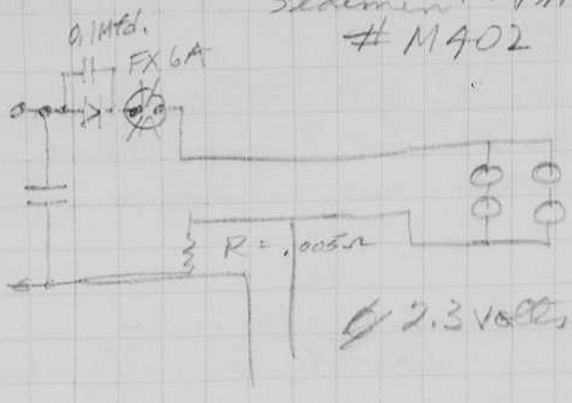
Suggest coring attempt at velocity attempt here.

Jim Walton – Tugboat Jane WALTON on May 22 1966 to Boones legget to Light Ship Pinger search for German submarine that was sunk at the end of the war. 1945 ±. We found some 15 foot bumps but do not believe we found the sub. Hope to try again.

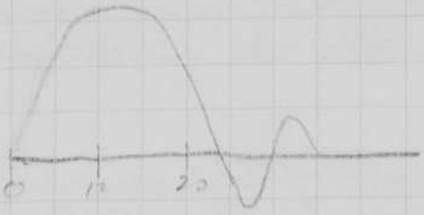
Vince LeBlanc
Donald Henroy
Gordon Winrow.

June 9 1966 Hollywood Bill MacRoberts.

Sediment - Probe
#M402



23 volts × 0.1 = 2.3 volts = 46 Amp
.23V @ 0.4 Joule
.25V. @ 0.8 Joule
= 50 Amp.



Capacitor
800 Volts.

4 mesa transducers - type TR-47 element
10662
10792
11421
4922

5Kc
Part
D40429-501

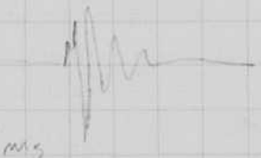
R = 1.5 ohms.
Series parallel L = 2.92 mh. at 1000 cycles.

$T = \pi\sqrt{LC} = \pi \cdot \sqrt{2.92 \times 10^{-3} \cdot .25 \times 10^{-6}}$

$= \sqrt{.75 \times 10^{-9}}$

100 ~

1000 at Pool Sid Pardun Hz Bill Mack Tony Thornton
Martin Klein.



1/4 mile
+ Rocks.

1/4	1.5 × .2 V =	.3 volts. on 8 ball at
1/2	2.0	= .4 1.5 ms
1	2.5	= .5 (6 Pt.)
2.	2.	= .4

Polarity reversed

+ white

1/4	1.3
1/2	1.6
1	2.5
2	3.5

IC-30 / 2 volts / grade.

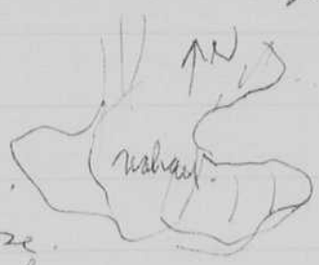
June 12 1966 Schools.
Sunday.

945 left munnel yard. 2200 R.P.M.

1025 end side of D.I. Light.
6 KC Klein mittelsat.
12 KC
Bomer prim. P.P. type obstandmarge.

1125. Divers finished.

H. Edgerton
Don Krotser.
Malin Klein
Lloyd Lewis.
Polly Bradley
John Ryder
John C. Van Leer
Fred Leahy
Chris Johnson
Peter Roy.
Linda VanVeer
Ruth D. Turner



202 ~~Start~~ P.P. Bomer.

240 Still on East course.
from mbant and marge.
negative into 254 seems best
10 X 300

330 pm Now towards Bomer light in line with Tower 220°

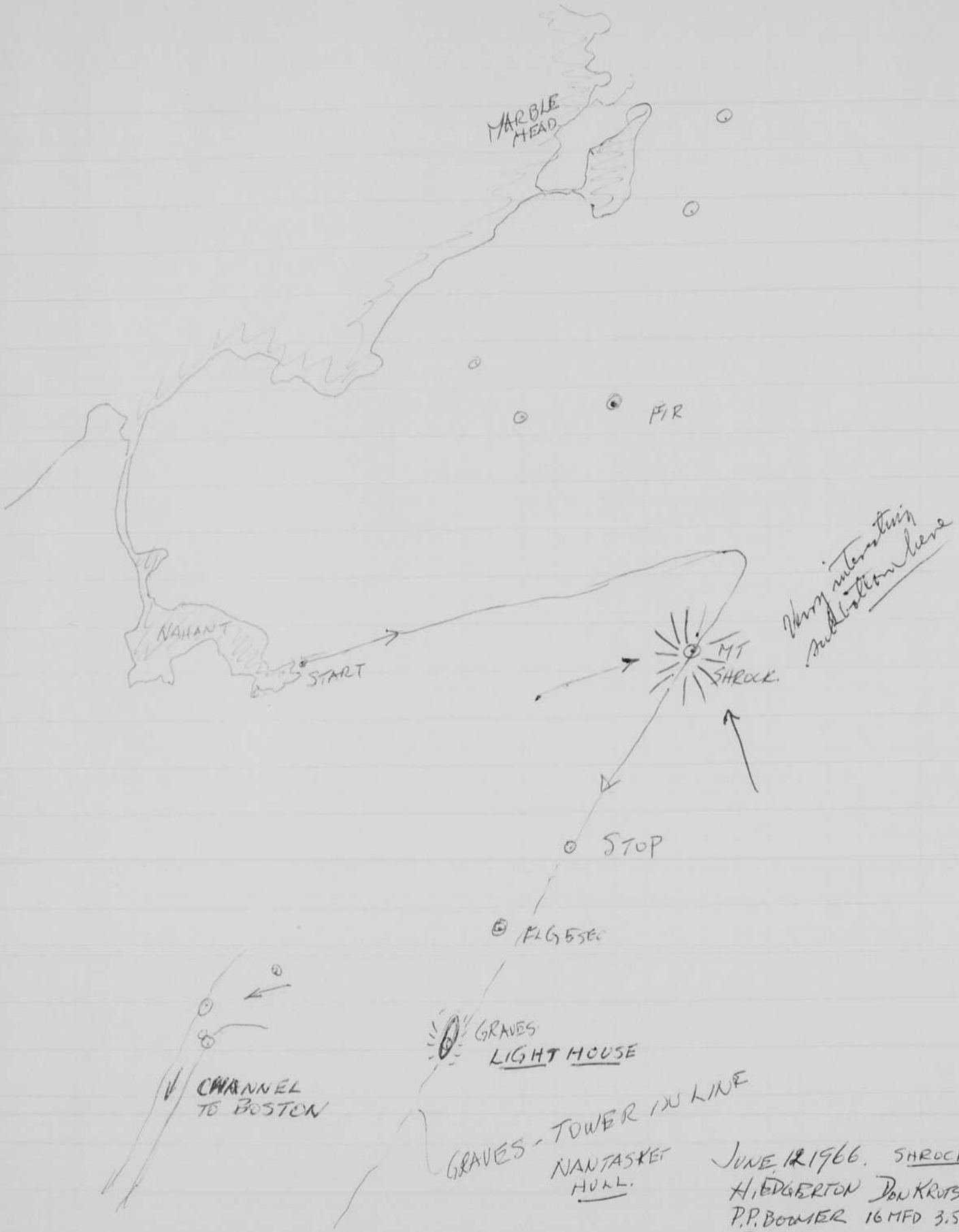
1445. 1520 } Iran coordinates of peak.

1446 ~~Stopped~~ H3- 3497 c Bomer.

5.03 pm President Rhodes for Lloyd's mud vel meas.
anchored.

5.30

6.00± Munroe Dock.



JUNE 12 1966. SHROCK
H. EDGERTON DON KRUSER
P.P. BOMER 16 MFD 3.5KV.
8 BALL.

July 7 1966
W. Boston.

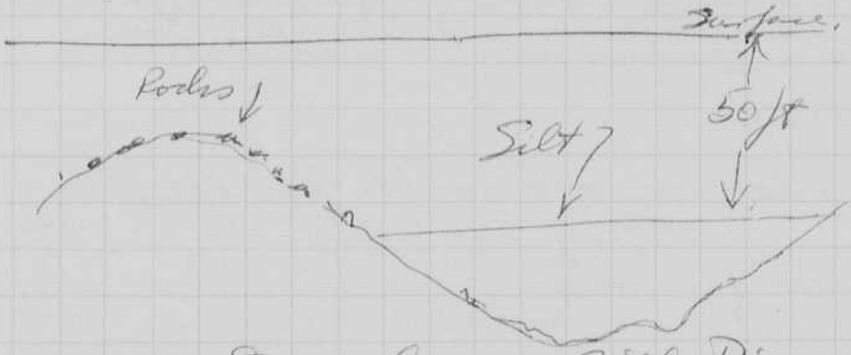
June ? Thursday to Halifax to work with Pete Beamish at Frog Island near Oak Island. with 12 KC and 5 KC pinger system. Pete had about 40 boys from Prep schools at the Island on a combined camping and treasure hunting expedition.

We worked July 1, 2, and 3 out of a small boat in the Oak Island - area. Some 9 targets were spotted and buoys were used. They will dive on these later.

I used a 10 ohm resistor across the input to the 4 mesa units - 2 series 2 parallel to damp out the oscillations of the transformers.

A dental hydrophone was used to pick up the signals from the bottom.

The subbottom down to 75 feet in some places was observed.

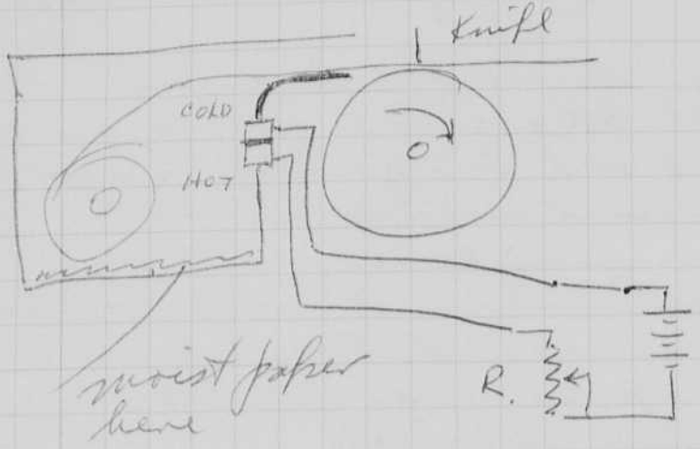


My Grandson Bill Dixon went with me on this trip. He is nine years old. We returned July 4 at 2pm in Boston. My equipment weighted 370 pounds.

July 14 1966

N. Edgerton:

Last week it occured to me that the drying problem on the Alden Recorder could be cured partially by the use of a cooling system on the sheff where the paper comes in to the drum



The cold plate would condense moisture from the evaporated reservoir below thus keeping the paper wet as it enters the working area.

This was discussed with Mr Carthy and with at Salem who sells the cold junctions.

(Tentative Program - as of July 18, 1966)

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Cambridge, Massachusetts

TECHNIQUES IN HIGH-SPEED PHOTOGRAPHY

Stroboscopic Light Laboratory - Room 4-405, Bush Room 10-105
July 25-29, 1966

MONDAY - July 25

Morning		Bush Room, 10-105	
9:00 -	9:20	General Considerations Regarding High-Speed Photography	W. Hyzer
9:20 -	10:30	Theory of Electronic Flash	H. Edgerton
10:30 -	10:40	BREAK	
10:40 -	11:00	Theory of Electronic Flash (Continued)	
11:00 -	11:30	Radiometer for Evaluating Electronic Flash	V. Gates
11:30 -	12:00	Sympathic Detonation of Explosives	M. Sultanoff
Afternoon		Bush Room, 10-105	
1:30 -	2:00	Discussion & Scheduling of Lab Experiences	H. Edgerton
		Demonstration of Polaroid Equipment	C. Sieburth
2:00 -	5:00	Lab Sessions I, II, III - 1 hour each Coffee break at 3 p.m. in Strobe Lab 4-409	
Evening		M.I.T. FACULTY CLUB PENTHOUSE (50 Memorial Dr.)	
6:00		Informal social hour as guests of MIT - Wives invited	
7:00		Buffet dinner in Dining Room at participants expense	
8:00		"History of High Speed Photography" (Penthouse) 7th floor of Faculty Club	D. Eisendrath

TUESDAY - July 26

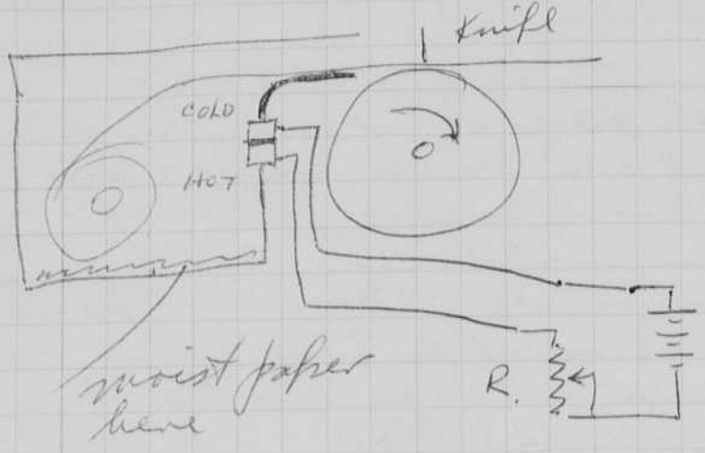
Morning		Bush Room, 10-105	
9:00 -	9:20	Short-Duration Flash Equipment	J. Tredwell
9:20 -	9:50	Silhouette and Schlieren Photography	J. Carson
9:50 -	10:10	Uses of The Strobotac	R. Richmond
10:10 -	10:30	Rotating Prism Cameras	J. Waddell
10:30 -	10:40	BREAK	
10:40 -	11:00	The Fastax Camera	F. Emens
11:00 -	11:20	Field Emission Equipment	F. Odell
11:20 -	11:40	BNK Camera	T. Korneff
11:40 -	12:00	Reciprocity Failure	D. Eisendrath
Afternoon		Bush Room, 10-105	
1:30 -	2:00	Discussion & Scheduling of Lab Experiences	H. Edgerton
2:00 -	5:00	Lab Sessions IV, V, VI - 1 hour each Coffee break at 3 p.m. in Strobe Lab 4-409	
Evening		No scheduled talks or experiences	

60

July 14 1966

H. Edgerton:

Last week it occured to me that the drying problem on the Alden Recorder could be cured partially by the use of a cooling system on the sheff where the paper comes on to the drum



The cold plate would condense moisture from the evaporated reservoir below thus keeping the paper wet as it enters the working area.

This was discussed with Mr Carthy and with at Salem who sells the cold junctions.

(Tentative Program - as of July 18, 1966)

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Cambridge, Massachusetts

TECHNIQUES IN HIGH-SPEED PHOTOGRAPHY

Stroboscopic Light Laboratory - Room 4-405, Bush Room 10-105
July 25-29, 1966

MONDAY - July 25

Morning		Bush Room, 10-105	
9:00 -	9:20	General Considerations Regarding High-Speed Photography	W. Hyzer
9:20 -	10:30	Theory of Electronic Flash	H. Edgerton
10:30 -	10:40	BREAK	
10:40 -	11:00	Theory of Electronic Flash (Continued)	
11:00 -	11:30	Radiometer for Evaluating Electronic Flash	V. Gates
11:30 -	12:00	Sympathic Detonation of Explosives	M. Sultanoff
Afternoon		Bush Room, 10-105	
1:30 -	2:00	Discussion & Scheduling of Lab Experiences	H. Edgerton
		Demonstration of Polaroid Equipment	C. Sieburth
2:00 -	5:00	Lab Sessions I, II, III - 1 hour each Coffee break at 3 p.m. in Strobe Lab 4-409	
Evening		M.I.T. FACULTY CLUB PENTHOUSE (50 Memorial Dr.)	
6:00		Informal social hour as guests of MIT - Wives invited	
7:00		Buffet dinner in Dining Room at participants expense	
8:00		"History of High Speed Photography" (Penthouse) 7th floor of Faculty Club	D. Eisendrath

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Morning		Bush Room, 10-105	
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9:20 -	9:50	Silhouette and Schlieren Photography	J. Carson
9:50 -	10:10	Uses of The Strobotac	R. Richmond
10:10 -	10:30	Rotating Prism Cameras	J. Waddell
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11:00 -	11:20	Field Emission Equipment	F. Odell
11:20 -	11:40	BNK Camera	T. Korneff
11:40 -	12:00	Reciprocity Failure	D. Eisendrath
Afternoon		Bush Room, 10-105	
1:30 -	2:00	Discussion & Scheduling of Lab Experiences	H. Edgerton
2:00 -	5:00	Lab Sessions IV, V, VI - 1 hour each Coffee break at 3 p.m. in Strobe Lab 4-409	
Evening		No scheduled talks or experiences	

WEDNESDAY - July 27

Morning	Bush Room, 10-105	
9:00 - 9:20	Microphotography With Flash	H. Edgerton
9:20 - 9:40	Strobe Photography of Blood Flow In Man	R. Wells
9:40 - 10:10	Operational Limits of Xenon Flash Tubes	J. Goncz
10:10 - 10:30	Cine and Elapsed Time	D. Bass
	Image Dissection Camera	R. Hayes
	Kerr Camera System Kappa Sci.	P. Hast
10:30 - 10:40	BREAK	
10:40 - 11:05	Beckman & Whitley Cameras & Uses	T. Healey
11:05 - 11:30	Red Lake Lab Cameras	R. Shoberg
11:30 - 12:00	Industrial Uses Of High Speed Techniques	E. Quinn
		W. Hyzer
Afternoon	Bush Room, 10-105	
1:30 - 2:00	Discussion & Scheduling of Lab Experiences	H. Edgerton
2:00 - 5:00	Lab Sessions VII, VIII, IX - 1 hour each	
	Coffee Break at 3 p.m. in Strobe Lab 4-409	
Evening	Tour of Boston Harbor by boat STARDUST with comments by the author, Edward Rowe Snow (Leaves India Wharf at 6 p.m. - Returns at 8 p.m.)	

THURSDAY - July 28

Morning	Bush Room, 10-105	
9:00 - 10:00	Ultra High Speed Photography As A Tool In Physical Research Of Explosions	M. Sultanoff
		D. Fladlien
10:00 - 10:30	TRW Instruments	
10:30 - 10:40	BREAK	
10:40 - 11:10	Electronic Flash Equipment & Light Measuring	W. Rybka
		C. Holzapfel
11:10 - 11:25	Milliken Cameras	M. Sultanoff
11:25 - 12:00	Armor Penetration Studies	
Afternoon	Bush Room, 10-105	
1:30 - 2:00	Discussion & Scheduling of Lab Experiences	H. Edgerton
2:00 - 5:00	Lab Sessions X, XI, XII - 1 hour each	
	Coffee break at 3 p.m. in Strobe Lab 4-409	
Evening	M.I.T. FACULTY CLUB (50 Memorial Dr.)	
6:00	Social Hour (buy your own drinks)	
7:00	Banquet - Main Dining Room* (Participants and Staff are guests of M.I.T.)	
	"Problems With Lunar Surface Photography"	C. Wyckoff
8:00	"High Speed Motion Pictures of Large Detonations"	

* Please make reservations in advance (Room 4-405, Ext. 4629) for a head count.

09

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	"High Speed Motion Pictures of Large Detonations"	

* please make reservations in advance (Room 4-405, Ext. 4629) for a head count.

FRIDAY - July 29

Morning	Bush Room, 10-105	
9:00 - 9:45	Some Aspects In Miniaturization In High Speed Photography	J. Courtney-Pratt
9:45 - 10:00	Exploding Wire Techniques	W. Chace
10:00 - 10:30	Laser Developments	P. Miles
10:30 - 10:40	BREAK	
10:40 - 11:10	Underwater Photography	H. Edgerton
11:10 - 12:00	High Speed Photography at A.W.R.E. England	K. Coleman
Afternoon	Bush Room, 10-105	
1:30 - 2:00	Discussion & Scheduling of Lab Experiences	H. Edgerton
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July 26 1966 Harold Edgerton. Seminar in full swing!
69 attendees. plus 42 staff.

July 31 London pan. with Louis Wolfson
Monaco -
aug 3 Cenchreae Greece.

7. To Tel Aviv. Israel
26 Join CHAIN at athens (Piraeus)
27. Santorin.
Sept 7. Leave for Athens
12 Khalkis Greece
13 Egina Stormy / no work.
14 Egina. ok.
15 Left for Boston via London
Sam Mills.
16 Arrived Boston

27. Dir. meeting E.G.&G. at Los Vegas.
Left at 9.45 for Denver - 12.+
28 Left Denver 7 am for Grand Island nebr.
Hertz to aurora - & see mother
Left 7.30 pm for Omaha.

Oct 4 1966 Plans.
Oct 7. Johnson Inaug. at M.I.T. as Pres.
" 7. Leave 555 for Los angeles.
8. Lecture in Santa Barbara
Sci & Eng Council

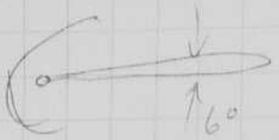
Sunday Oct 9. -
10 Miramar Hotel SPVE
11
12 Leave for Roanoke Va. V.P.I. Polytechnique.
13 } V.P.I.
14 }

H. E. Edgerton
Sept. 29, 1966
4-405 M.I.T.

Beacon

Appleton Reflector #
Intenso quartz lite.

4-6035-1
Fx-1 with 20 mfd 1400 volts

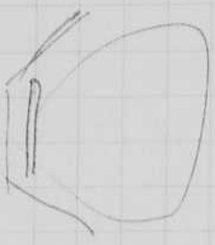


B.C.P.S. = 63, 62.

B.C.P.S = 1813. 19 Watt sec.

M = 30 29.2. (6°)

98 Degrees to ½ light



Blue Hill FT-36H 80,000 P.H.C.P
100 m.s.

80 = H.C.P.S.

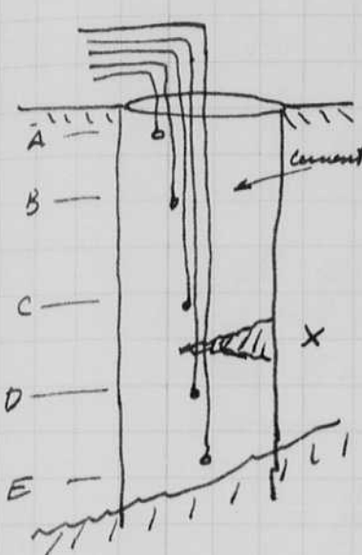
Prudential H.P.C.P 24 x 10^6
125 m.s.

3000 H.C.P.S.
2500 H.C.P.S. DR meter

October 5, 1966
Harold E. Edgerton

Monday at 3 at the Faculty club I suggested the use of hydrophones in cement foundations as they are poured. According to there is a serious problem in Chicago due to voids in the 10 ft diameter cement pillars that serve as foundations.

The scheme would be to install hydrophones in depth during the construction. Each hydrophone can also be used as a transmitter of sound as well as a receiver. Note the sketch. The time of travel of the sound is one factor. A second is the multipath circuit of the sound especially if there are velocity differences. The void at x might be of clay or water or sand which has invaded the cement column. Certainly the signal received on D from C will be different than that received at C from B. Pulse techniques are probably preferred for this testing.



Hydrophones at A --- E etc.

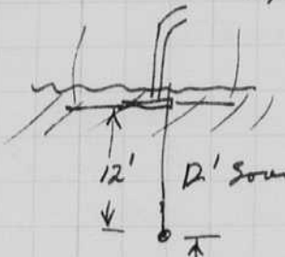
Prof. Geo. Neville was present at the discussion of the use of submerged hydrophones in cement.

Harold E. Edgerton. Sonar tests.

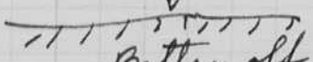
Boomer equipment was taken to the M.I.T. location on the end of Lewis Wharf in the Boston harbor. Harold Payson assisted with the tests and slides.

Three Chesapeake hydrophones were tested. One showed a change of sensitivity with time. Later this one had a leak and an open circuit. The other two seemed about the same sensitivity.

16, 32, or 48 mfd at 1 per second rate.



14.5' at high tide about 330 pm Oct 3 1966



Bottom off Landing slope at Lewis Wharf.

Hydrophone A	16 mfd	1.05 volts	1000 WS with 1/8" plate.	?
	32	1.45 "	"	← about ~~3000~~ cycle
	48	1.55 "	"	
			"	
Hydrophone C	48	2.4 "	"	

108 lb. 3'
9.2 volts.

Hydro. C	~~5~~ 16.	2.0	Pizza Pan Boomer.	← 3000 cycles
	32	2.3		← Good wave form.
	48			

The pulse duration is about 1 MS or perhaps less.

Photos of wave form ~~should~~ should be made to measure the frequency.

My Home light generator 300 watts operates ok with 1.5 volts in Hydrophone, 1 per sec at 48 Mfd and 3000± volts.

Oct. 20, 1966. HE.

new President inaugurated Oct 7. Howard Johnson
Left via Amer Air Lines for Santa Barb via L.A. with Esthers.
Oct. 8. Lectured at Baltimore for Oz Soundingsland
before the affiliated engineering groups.
Sun. Oct 9. Drove to Glendale to see Mary K and
Steve Koriagin
" 10 Miramar Hotel - meeting SPIE on Optics.
" 11 " " " "
" 12 Left 7.30 am for Roanoke Va met by Dean
Herb. Manning and W Worcester. V.P.I.
13 V.P.I. 2 lectures.
14 " 1 "
15 Hickory N.C. with Claus Dixon Family.
16 Back to Cambridge.

18. Went with Payson and Bob Henderson
in the Shrook to Deer Island test range to
try 5KC massa with 8 ball and Peppa Pan
Boomer with 16, 32, and 48 mfd.

Data on Boomer 32 mfd.
8 Ball Hydrophone at 12 ft voltage = 2.3 peak

at 3.2KC -85 db ref 1 volt/μbar. 3 feet.

$2.3 \text{ volts} \times \frac{12}{3} = 9.2$ volts if at 3 ft.

$db = 20 \log 9.2 \text{ db.} = 20 \times .9638 = 19.2.$

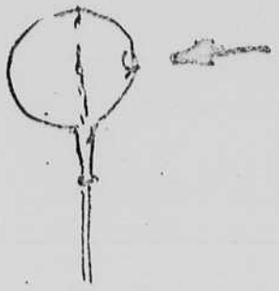
$.9638 \quad -(-\underset{19.2}{85}) + 19.2 = \boxed{\underline{\underline{104.2}}}$ at 32 mfd

OCT. 1966.
H. EDGERTON.

SPECIFICATIONS

262B Rocket Hydrophone

8 BALL
CHESPEAKE.



Overall dimentions: 36" long X 8" X 8"

Weight: 10 lbs. in air
8 lbs. in water

Sensitivity: -90 db ref 1 volt/micorbar minimum

Frequency range: 10-3000 cps

Beam Pattern: spherical

Tow Fish: stainless steel

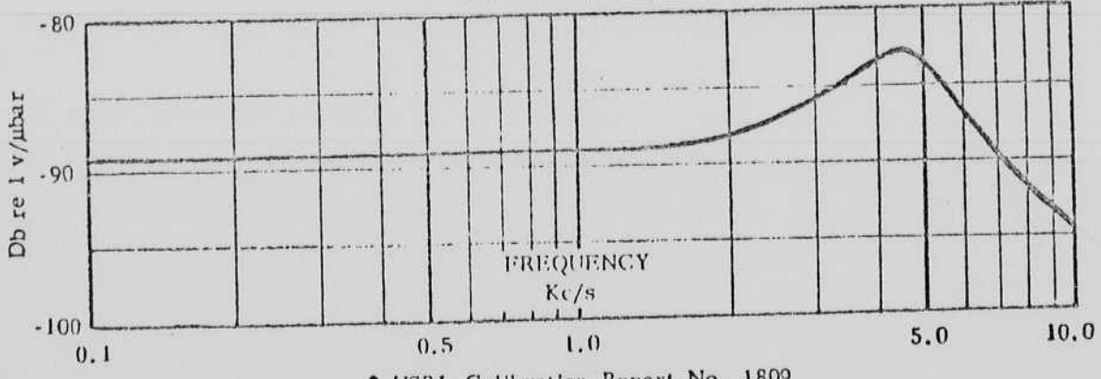
Towing Cable: 20 feet 3/32" diameter wire rope plus
25 feet 7/32" diameter braided nylon rope

Hydrophone Signal Cable: 70 feet

Fairing: 20 feet

Sensitivity (re 1 v/μb)	Frequency Range (c/s)	Resonant Frequency (c/s)	Capacitance (μuf)	Operating Depth (ft)	Beam Pattern	Weight (oz)	Cable (ft)
-90 (min)	10 to 6000	4000 Approx.	4500 ± 15%	60	Spherical	Air 10 Water 6	60.0 +2' -0'

* Free-Field Voltage Sensitivity
(Open-circuit voltage at end of 60-ft cable)



* USRL Calibration Report No. 1809

8 bell

Volts → db chart for 3 ft calc.

Voltage at 3 ft.	Log V	20 log V	db.
1.	0	0	90
2.	.301	6.02	96.0
3.	.477	9.54	99.54
4	.602	12.04	102.0
5	.699	13.98	103.
6	.778	15.58	105.6
7	.845	16.90	106.9
8	.903	18.03	108.
9.	954	19.08	109.1
10	1.0	20	110.
20	13.	26.02	116.
40	1.6	32.	122
80	1.9	38	128

First correct for distance linearly

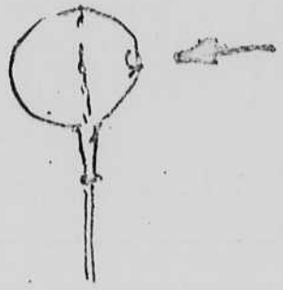
100 to 3000 cycles.

OCT. 1964.
H. EDGERTON.

SPECIFICATIONS

262B Rocket Hydrophone

8 BALL
CHESPEAKE.



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Sensitivity: -90 db ref 1 volt/micorbar minimum

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Beam Pattern: spherical

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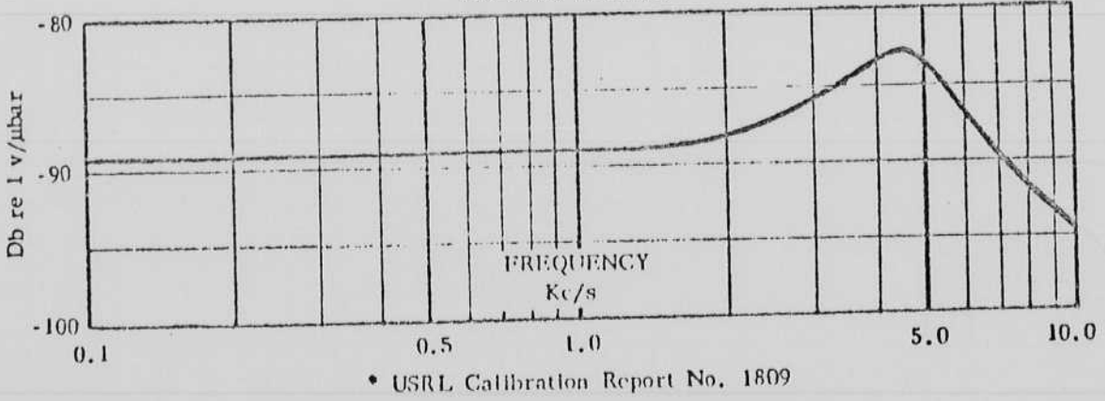
Hydrophone Signal Cable: 70 feet

Fairing: 20 feet

Sensitivity (re 1 v/μb)	Frequency Range (c/s)	Resonant Frequency (c/s)	Capacitance (μμf)	Operating Depth (ft)	Beam Pattern	Weight (oz)	Cable (ft)
-90 (min)	10 to 6000	4000 Approx.	4500 ± 15%	60	Spherical	Air 10 Water 6	60.0 +2' -0'

* Free-Field Voltage Sensitivity
(Open-circuit voltage at
end of 60-ft cable)



* USRL Calibration Report No. 1809

8 ball

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5	.699	13.98	103.
6	.778	15.58	105.6
7	.845	16.90	106.9
8	.903	18.03	108.
9.	954	19.08	109.1
10	1.0	20	110.
20	13	26.02	116.
40	1.6	32.	122
80	1.9	38	128

First correct for distance. Linearly

100 to 7000 cycles.

 Oct. 28. 1966

Harold Edgerton Sonar Measurements.

made yesterday on Shrook with Pepper and Mac Roberts.

NOTE LC57 gives 50% more voltage than the 8 ball with the boomer signal.

Hydrophone LC 57 at 12 feet below transducers at the surface.

		Peak.	ma t yes
Pizza Pan	16 mfd	+1.9 volts	0.12
1 per sec rate of fire.	32	2.0	0.15
	48	2.0	0.18

2600 .09

note that peak is the same for these three values of capacitance. The zero crossing time is different, being greater for the larger capacitor.

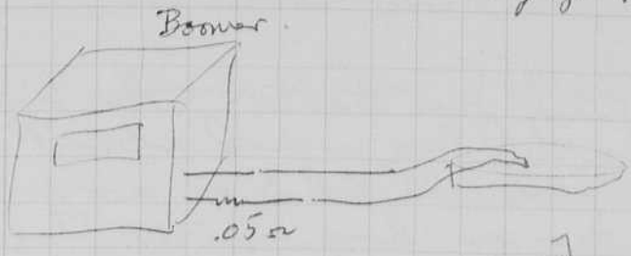
Mud Pen driver into Massa 5KC.

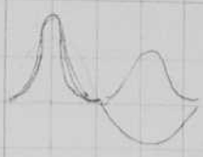
Cap		volts.	
1/4	Long.	+0.2	-.1
1/2		+0.3	-.2
1.0		+0.5	-.4
2.		+0.7.	-?

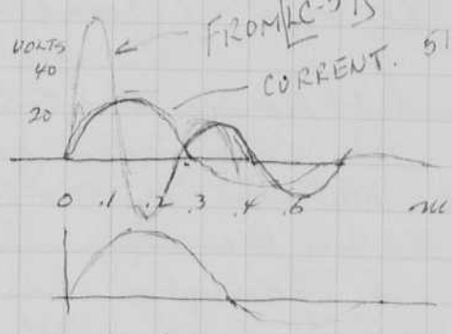
Orig data in small note book in my map holder.

Oct 29 1966 4-405 MIT.
H. Edgerton

Pizza Pan Boomer tests. Current.





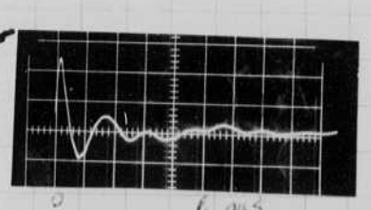


		I amps.	
16 mfd.	26V / .05	510	3900 V
32 "	30 / .05	600	3500

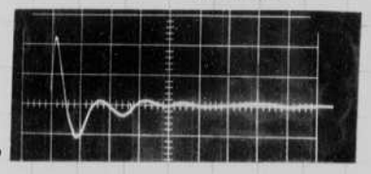
LC-5? Records at MIT Sailing Pavillion in afternoon.
Distance = 6 feet below Pizzapan at about 6" deep.
Volts = 2V/div. Time = 0.2 ms/div.

16 mfd
3900V

Steel frame work.



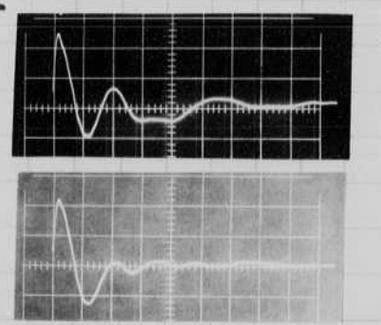
No Framework.



(at surface.)

.1 x .2 = .24 ms
4150
3.7 x [illegible] per cycle.
f = [illegible].
f = 3130

Note: the peak pressure is prop. to voltage over a 350 change in capacity! The beat frequency is half the acoustic frequency. no signal with 48 mfd.

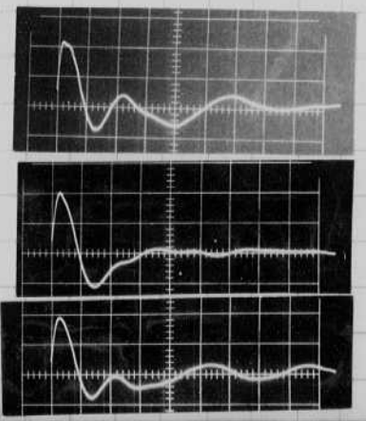


With Framework
1.75 x .2 = 350
.33 mf equiv 3000

no frame
(at surface)

48 mfd.
3400

Suggest - bigger voltage! Larger size.



Steel Frame

no frame
at surface

.2 x 2 = .4
2500

Extra rubber.
Below Surface.

 Oct. 28. 1966

Harold Edgerton Sonar Measurements.

made yesterday on Shrook with Pepson and Mac Roberts.

NOTE LC57 gives 5070± more voltage than the 8 ball with the boomer signal.

Hydrophone LC 57 at 12 feet below transducers at the surface.

		Peak.	ma t zero
Pizza Pan	16 mfd	+1.9 volts	0.12
1/per sec rate of fire.	32	2.0	0.15
	48	2.0	0.18

2600 .05

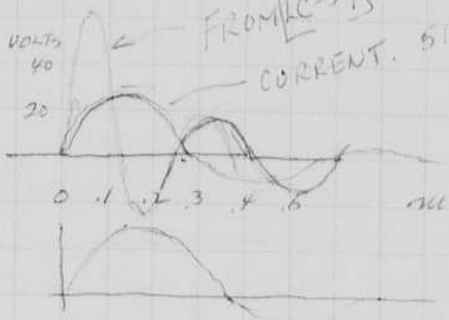
note that peak is the same for these three values of capacitance. The zero crossing time is different, being greater for the larger capacitor.

Mud Pen driver into Massa 5KC.

Cap		volts.	
1/4	Long.	+0.2	-.1
1/2		+0.3	-.2
1.0		+0.5	-.4
2.		+0.7	-?

Orig data in small note book in my map holder.

Pizza Pan Boomer tests. Current.



C — FROM [LC-5] CURRENT. 510 amp peak.

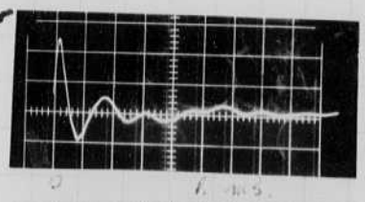
		I amps.	
16 mfd.	26 V / .05	510	3900 V
32 "	30 / .05	600	3500

LC-5 Records at MIT Sailing Pavillion in afternoon.
Distance = 6 feet below Pizzapan at about 6" deep.
Volts = 2V/div. Time = 0.2 ms/div.

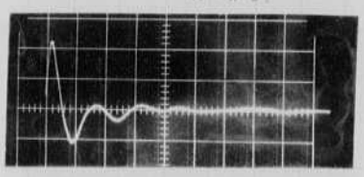
16 mfd
3900 V

Steel frame work.

16 mfd



No Frameworks.



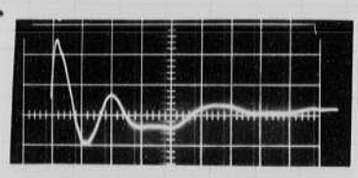
(at surface.)

.2 x .2 = .04 ms
3.2 x [illegible] = [illegible] frequency.
f = [illegible].
f = 3130

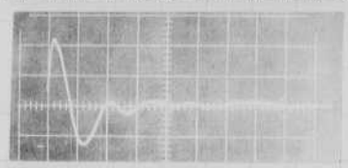
4150

Note: the peak pressure is proportional to voltage over a 350 V change in capacity! The best frequency to beat the acoustic impedance of water with a transducer is [illegible] mfd.

32 mfd



With Framework



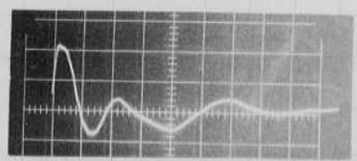
no frame (at surface)

1.75 x .2 = .350
.33 mf equiv 3000

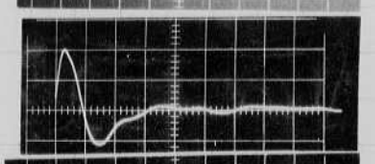
48 mfd.
3400

Suggest - bigger voltage! Larger size.

48 mfd.

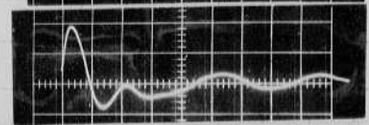


Steel Frame



no frame
at surface

.2 x .2 = .4
1500 A



Extra rubber.
Below Surface

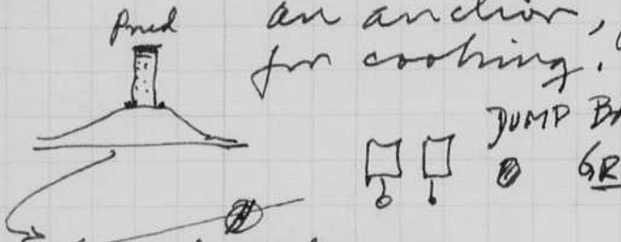
70 Oct 3, 1966

Harold Edgerton.

Tug boat Hunt.

Phone call early from Jim Walter - His tug boat was sunk Sat by the big wind about 3 pm. Two men were aboard. Ed S - and — Both were in the water an hour after the boat went down. She was the Jane Walter!

We went out about 12.30 in the Shrock with Martin Klein, N. Payson, Jim Walter Ed. and me. We used a side finger 12 Kc and a 254 EG&G Recorder. Ed was on the last ship and thought he knew where she was. We did not find her here. Then we went further north and soon noticed an oil slick. This was it. We could see it easy on the sonar. Soon two buoys were on her. The last one, an anchor, pulled off a gas tank as used for cooking. This came to the surface!



calf

Walter showed have a crane at the site tomorrow to raise the tug.

Jan 25, 1967 I hear that the tug boat was left on the bottom after most of the equipment was stripped from her.

Plans Leave Nov 3, 5 pm for Frankfurt.

Leave Frankfurt Nov. 7 11.30 for Athens.

Leave Athens Nov 24 for N.Y. or Boston.

November 24, 1966 Returned with Esther 9 pm on the 22 from Athens Greece where we left at 10.25 am on Nov 22. Boeing 707 to Penn, N.Y. Boston.

We were in Frankfurt at the conference of the Dept of commerce on oceanography. Jack McCarthy and John Mills were there with an exhibit. Left Munich about noon for Athens. met by Mavratos and Mrs Helice Jannas. Grande Britania Hotel. Left by car for Aigion in Bay of Corinth. Trapeza.

Nov 12, 13 at Porto Kheli. H with Sally Dublin, Anna -? Ed Loring. Studied submotion signals at excavation of V. of Pa at H Isis. Signals showed at 3 meter water depth and 1 meter below.

Nov 14-16, 17, 18 at Trapeza - Aigion Volimilka again on Helice search. Cond't Lionakis was with us with a group from the Brecklavy.

Sunday Nov. 27, 1966. Since Aug I have been bothered by a lesion in my rectum. This causes pain and discomfort. On Friday it flared up badly. Dr Chamberlain said it was infected. Now it seems to be better. Chamberlain says it must be cut out since otherwise it will not heal.

Dec. 3, 1966 Sonar tests with 4 hydrophones were made yesterday with Pete Clifford of EG&G. H. Payson rafted the Shrouds. Snow and cold! Drained water from the tanks and the generator.

Dec 20, 1966. I went to the Mt Auburn Hospital on Dec 7 for rectal surgery by Dr Johnson Chamberlain & removed cyst. Came home Dec 11. Still going slow for a while.

I am working on my book Electronic Flash-Strobe which is now outlined and about 1/3 & 1/2 done.

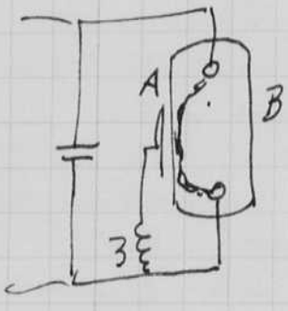
I was at M.I.T. yesterday for 1/2 day.

Dec 20 1966 ~~and~~
Harold Edgerton.

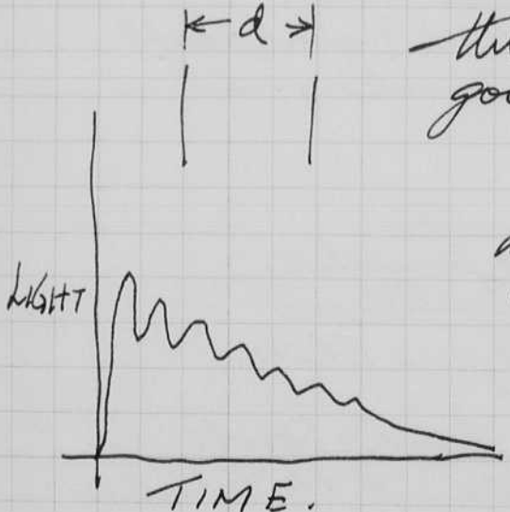
Modulated light Source

A beam of light which is modulated is easier to pick up with a photo tube than one that is not since a tuned receiver circuit can be arranged to give a high sensitivity. Other signals will be rejected, so the signal to noise ratio can be greater.

I propose to modulate the beam of light by means of a pressure variation in the gas which is being excited. Observe the example below.



The arc will start at the wall on the inside at A where the ~~starting~~ electrode is located. Then there will be a pressure wave that goes to B at the velocity of sound. The pressure wave strikes B and is reflected back to A. There will be an increase in light when the wave of increased pressure goes through the arc.



The frequency of oscillation will depend upon the wave oscillation therefor the frequency will mainly depend upon the dimensions of the lamp

$$\text{One cycle time} = \frac{\text{Vel of sound}}{d}$$

$$\text{frequency} = \frac{d}{\text{Vel of sound}} \text{ cycles/sec.}$$

Jan 8 1967
MIT 4-405
Harold Edgerton

Back Jan 6 from Hebron Nebraska for funeral of Clara Garrett Esther's mother. Died Jan 2 in sleep. Mary Lou and Bob were at the funeral on Jan 5.

~~Bryon Lou and~~ family came in Dec 21 bringing my mother from Washington. Bob and family came Dec 24. We had 13 people in our apts 11-6A and 11-7A 100 memorial Drive for Christmas. It was great.

Jan. 15, 1967.

Steven Putnam Bobby and Debbie 545 2125 brought in a rock throwing machine & show how rocks make a bubble mark when they hit a sand beach. Fred Centanni and I made 150 cycle photos of the impact. Also shot a 600 cycle photo of a pencil bounce.

MacRoberts has finished the 16 mm 50 ft elapsed time camera. Took it to the MIT pool last night with old Bell film and left it running overnight at 10 am today I took out the film and reloaded with Kodak 4-X.

Expect 3 ft 6 ft 9 ft 12 ft bm ~~per volt~~. Had a target board in the field.

My camera lens 10 mm lens with a ~~flattened~~ ~~correct~~ the rise last night was 15 sec. today it is 65 seconds

Agous stable with a 510 volt battery in each.

Jan 19 1967
Harold Edgerton.

Tests of Elapsed time camera under water are now ok after several small defects - light leaks - have been repaired. Plan to use 1 min time interval in the ocean off Lewis Wharf over the weekend.

See attached. Kod II shots at 3ft 6ft and 9ft. The ones at 3ft are best f4 - 50 ws strobe 1500 B.C.P.S.

$DA = 3 \times 4 = 12 = X\sqrt{\frac{1500}{25}\frac{25}{}} = (40)X$ $X = \left(\frac{12}{40}\right)$ water factor.

Design conf with Dr. Ken Read B.U.
Bill was Roberts & Hs
10 to 12 noon.

Lamp - 150 watt 30 volt for underwater movie for Ogunquit

Battery - will try 3 amp hour lead batteries. from Angelo Decinesco. or Varta.

The battery case will be attached to the movie camera - it operates at 32 f.p.s. at 3ft or 64 f.p.s. at 1 foot. The lamp will be above and on a swivel.

Jan 25 1967. Test run back from Eastman Kodak.
Kodachrome II film f 2.8 Strobe 25 ws in calypso case with 1 510 volt battery.
Pictures show plank and cable with flounder? and crabs. The crabs move slowly!
Photos get dimmer with time.
Daylight has no influence at 15 ft in Boston Harbor with f 2.8 and 1/50 sec?
Resolution is dim.

Battery tests of "Sunensheim" batteries
3 amp hour 30 volts with 16 batts.

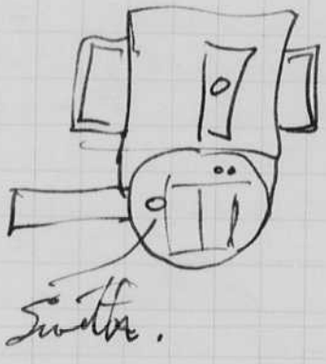
Initial 33 volts.

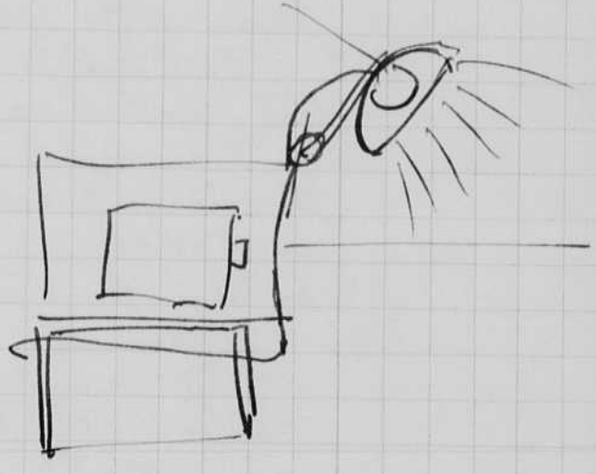
150 watt Sylvania Flood. (3900 candle 12° beam.)

45 sec on 45 sec off cycle. 4.9 amps.
Operation to 30 volts was almost an hour!
Then on continuous for another 5 min.
Looks very good for portable light.
Built in charger. 125 ohms and diode in series with 115 volt line.

(2000 candela 60° Beam? White reflector. Check these.

6" tube Johns Manville with 14 inch length. 1/2" lost on each end with plexiglass ends. An 8" length would work but would weigh 4 pounds.





Notebook # 29

Filming and Separation Record

___ unmounted photograph(s)

1 negative strip(s)

___ 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.

Jan. 30, 1967
Harold Edgerton

A beacon was installed Jan. 29 in Ipswitch Mass on the private runway of Crocker Snow. The reflector had a BCPS output of 1500 with a 5° vertical beam (3°?) and a 90° horizontal. It was arranged to operate from a photocell controlled 115 volt circuit.

Feb 1. 1966. First day of the second term. 12 students in 6.202

Last week was busy. Left Tues pm on the 7 am plane for N.Y. Hilton Hotel. Then to Washington Jefferson Hotel after dinner with Pogues. Walter met me at the Hilton, saw the double jet strobe and then we took the 7 pm Eastern Planets Wash.

Wed Feb 1. Was meeting all day at the Nat Acad of Science.

Thurs Feb. 2 morning at the Nat. Geo. Society to see carmichael, Garrett and Weber?. Talked about strobe and other projects.

Afternoon spent lunch with J.B. Hersey at the Navy Research Lab in Wash. Talked at Seminar. Afterwards saw Patterson and Buchanan. about deep sea cameras with wide angle lenses.

Took 6 pm plane (Eastern) to N.Y. Commodore Hotel. Gave lectures at the BBN office 110 Park Ave.

7 pm plane to Boston.

Gave BBN office Cambridge Feb. 4 oceanographic course talk 9-5 pm 5 hour talk again!

Feb 5 - Worked in book (Strobe)
Feb 6 Registration. Ralph Bennett here.
Feb 7. School again.

Snow Storm starts about 2 pm.
Still going strong at 3:30.

Cont Feb 7 1967. Phone call from Silver (Life) Wash D.C. 202-337-8000 about tape Pryor in a glass sphere from Oahu to Hawaii.

Discussed cameras for 9000 feet and strobes. I suggested a photo triggered camera on the outside of the sphere. The strobe on the inside would trigger the camera shutter, then the x contacts on the shutter would trigger the external strobe.

Feb 14 1967
AB.

Phone call from Isban at Marseille yesterday about 11 am concerning lamps and reflectors.

Regular Reflector 20 ft 180 candela + 400 ft 72,000 beam candles

Spot. 20 ft. 600 + 400 = 240,000 240,000 beam candles.

Ames Lamp metal Products (B-15)
10" B-15 reflector chrome.

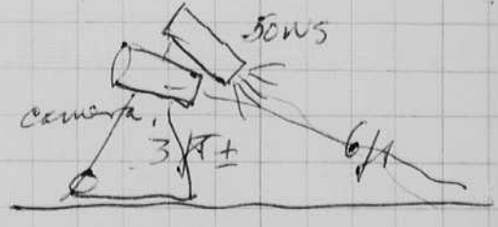
Bare Lamp. 600 at 15" 1 ft 7" 1,583 sq ft. = 2,5 ft²
15,000 candles, 600 / 15000

$\frac{240,000}{15,000} = 16$ factor. Reflector off it.

17,5 sec camera
500 hour bulb.

The 16mm ELAPSED TIME movie camera was put in the pool last night with a faster charging circuit that used a zener diode to cut off the voltage at 430 from a 750 volt battery.

f 4 12mm Dome of glass.
50 watt sec. with lamps above
1 minute interval of flash.



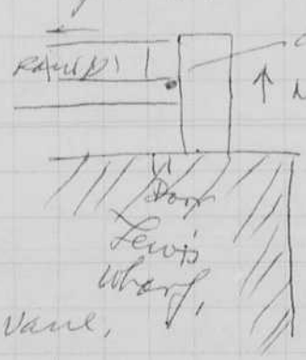
78 March 1 1967
H. Edgerton V.E. MacRoberts. U.W. Portable capacitor tests.

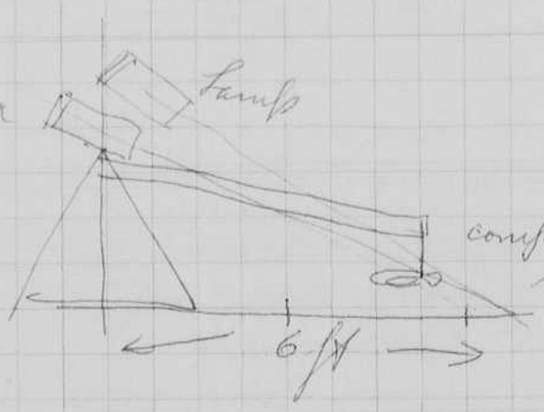
Light FT-120
Watts/ft.

		C	N	
22 x 9	198	2 Sprague 29D13 250 rated 450. (317) (645).		
22 x 9	198	500 mfd	450	
22.5 x 9		500	450	
11 or 12		250	450	
42		4 x 250	450	
43		4 x 250	450	
3 or 4		0	0	Room light
	39	4 x 250	450	Lights out
Regular capacitors →	18	2 x 250	450	
	8	1 x 250	450	
	9	1 x 300	450	Siemens.
	16	2 x 300	450	
Proposed unit. →	34.5	4 x 300	450	

March 6, 1967.
H. Edgerton

The 16mm Hasselblad time camera was put into the water at the Lewis Wharf on Friday morning at 9:15 by Jan Kleiman and myself. 1 per minute rate f 4. 450 watt second - 6 ft to bottom at 30° angle. Lamp above.





My watch pulled up at 7 pm on Sat night. Film all through - all seemed to be ok. Kodachrome II film.

April 8, 1967 Sat.

Miami Fla Everglades Hotel Mar 25-26.
Corpus Christi Texas Mar. 27 - 30 1967.
Padre Island
Port Mansfield. J.R. McNabb.
W Thomas Bolton "Del Ray" 33 class craft.
Mike Thompson
See Report of Expedition.

Sonar tests of mass transducers.

Bridge 1000 cycles 2.57×10^{-9} farads nanofarads?
.00257 mf.

#1	2.57×10^{-9}	4.7
#2	2.65 "	4.70
#3	2.63 "	4.85
#4	2.77 "	5.4 KC 4.8

$2\pi\sqrt{LC} = \left(\frac{1}{5000}\right)$ sec $= 200\ \mu s$

$4\pi^2 LC = 4 \times 10^{4} \times 10^{-12}$

$L = \frac{4 \times 10^{-8}}{4\pi^2 C} = \frac{10^{-4}}{2.6 \times 10^{-9}} = \frac{1}{2.6}$ henry.

$= 0.383$
for 5 KC.

2 trans in parallel
$C = 2 \times 2.6 \times 10^{-9}$ f.
$L = \frac{1}{5.2}$ henry.

$L = 48 \times 10^{-9}$ henrys

Xod Trans.
0.c. 1/2 sec 40 h
1/2 sec pri shunted 2 h.
0.28 h 7 Ω Primary input
.53 14 Ω (see shorted EGG T-1140)
done for
open core EGG T-1140 115 volt.
.47 h 24 Ω 1/2 Imm
.17 14 Ω no Imm.

Crit Damped =
$CR^2 = 4L$
$R = 2\sqrt{\frac{L}{C}} = \sqrt{\frac{1}{2.6} \times \frac{1}{2.7 \times 10^{-9}}}$
$= \sqrt{\frac{10^9}{7}} = \sqrt{1.4 \times 10^8}$
$= 1.2 \times 10^4$
$= 12{,}000.$

April 8,000 on the transducer. The effect was great.

Ron Sandberg with to go to Harbor with Shamrock. Set up at 5 pm.

April 9 1967 Sunday.
D. Shorter.

4 Massa transducers without transformers in parallel.

$C = 2.6 \times 10^{-9} \times 4 = 10.4 \times 10^{-9}$ farads.

L for resonance at. 5 KC = $4 \times .3 \times 8 = 14.4$ henrys.

If force is double frequency.
then the inductance must be 4x larger.

April 20, 1967 Daylight Assimulator.

(Xenon lamp + fluorescents
Tungsten lamp.)

Xenon 93. Too strong. Too blue.
Too Red
Tungsten 60?
Fluorescent 95 sylvania.

Metamerac.

Tsuneyoshi Ugemura
in Tokyo at
M.I.T. for one year
in Strobe Lab.

May 23, 1967 Harold Edgerton 4-405 M.I.T.

Sonar Surveying System.

It has always taken considerable effort to make a sonar depth chart of an area. The mechanics of the effort require considerable data reduction.

Proposal. (1) Use aerial photography from a helicopter to locate the exact position of a high speed boat that carries the sonar equipment. (2) Arrange a photographic presentation of the depth of water on the top of the boat which will be in the field of the helicopter camera. The data could be put in by other methods also such a voice or some digital system.

This system would be fast and accurate for map production of the sonar charts since the maps could be made directly from an enlarger.

It will be necessary to use buoys with markers in the photos if the area is out of sight of land (in the photos).

Read and understood
V. E. MacRoberts.
May 25, 1967.

16 June 1967
Read & easily understood. Hs Papanicolaou

My Boston Whaler 16' boat was just in the water on Friday. I went out with Guamura, Klein, Krotser into the harbor with a side looking sonar on a 5" chart.

Notebook # 29

Filming and Separation Record

____ unmounted photograph(s)

____ negative strip(s)

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

was/were filmed where originally located between page 80 and 81.

Item(s) now housed in accompanying folder.

April 9 1967 Sunday.
H. Ozeki.

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(Xenon lamp + fluorescents
Tungsten lamp.)

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Too Red
Fluorescent 95 sylvania. Mazda.

Metamerac.

Tsuneyoshi Ogamura
in Tokyo at
M.I.T. for one year
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May 22, 1967 Harold Edgerton 4-405 M.I.T.

Sonar Surveying System.

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May 25, 1967.

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Read & easily understood. Hs Papanikolas.

My Boston Whaler 16' boat was put in the water on Friday. I went out with Okamura, Klein, Kraft & Mrs into the harbor with a side looking sonar on a 5" chart.

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___ negative strip(s)

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

was/were filmed where originally located between page 80 and 81.

Item(s) now housed in accompanying folder.

Data of Under Water Flash Photography for "KAYAK"

Date: May 9, 16, 1967
Place: at the Swimming Pool of MIT

Photographers: Prof. Harold H. EDGERTON
Dr. Tom UYEMURA

Equipments:

(a) Camera: NIKONOS

Lens: UW-NIKKOR f=28mm f/3.5

Film; Ektachrome-X (EX135-36) ASA 64

Shutter Speed: 1/60 sec

F-Stop: f/5.6, f/8, f/11 (f/11 was best)

Distance: From 5 to 8 feet

(b) Flash Units

No. 1 Flash Unit synchronized with the camera.(under water)

EG&G INC. MODEL 211 ELECTRONIC FLASH

Flash tube FT-120, Battery 510V,

50 watt-seconds, 1200 B.C.P.S.

No. 2 Flash Unit synchronized with No.1 Flash Unit

by the photo-cell same as the No.1 Unit.(under water)

No. 3 Flash Unit synchronized with No.1 Flash Unit

by the photo-cell same as the No.1 Unit.(under water)

No. 4 Flash Unit (above water)

synchronized with No.1 Unit by the photo-cell.

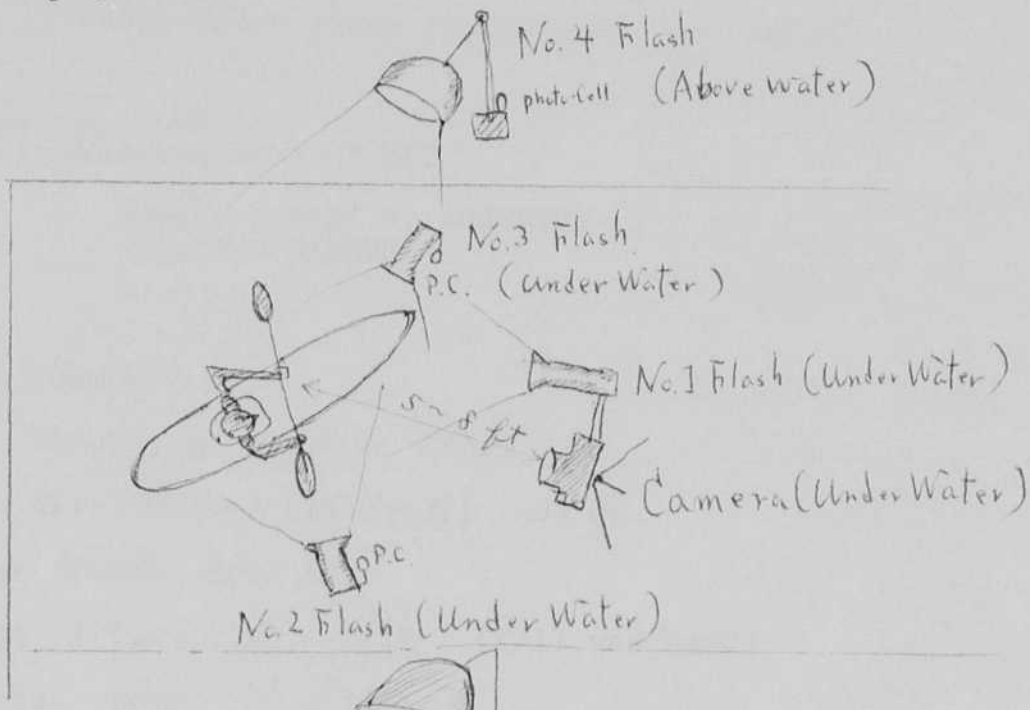
EG&G ~~INC.~~ Speed Light Electronic Flash

Flash Tube FT-2, 110V A.C. output 225 watt-seconds,

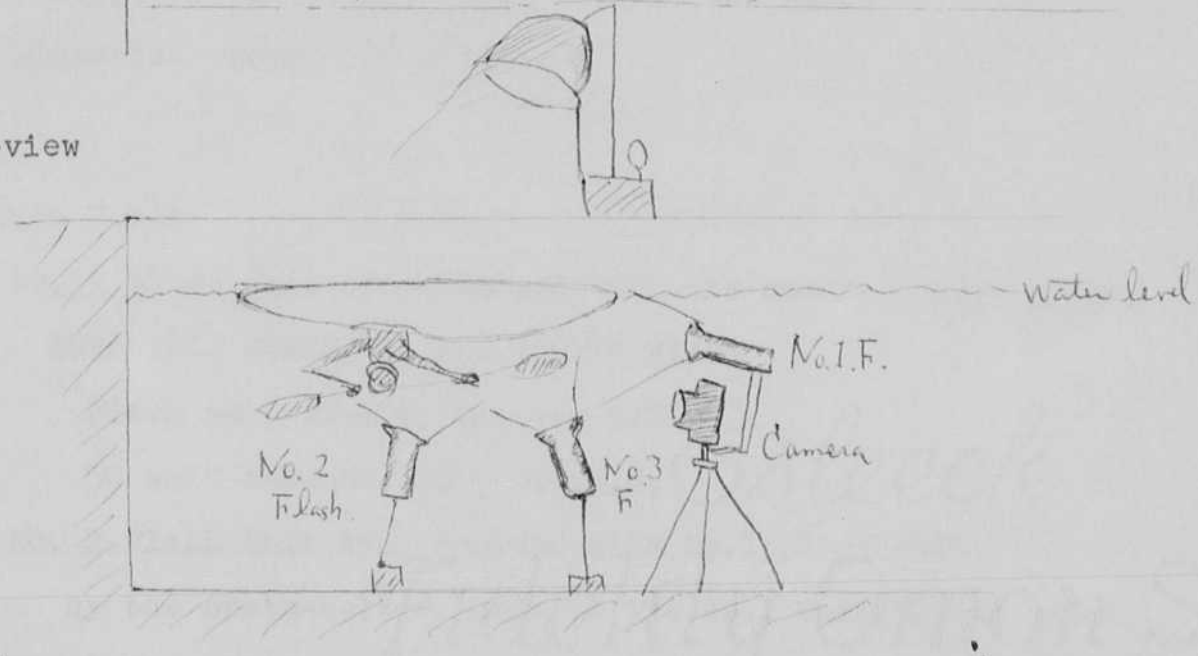
3,000 B.C.P.S.

Arrangement of equipments

Top-view



Side-view



Results

? ① The result of 1st Test was not so good, (used only one flash unit.)

② The Result of 2nd Test was good ?.

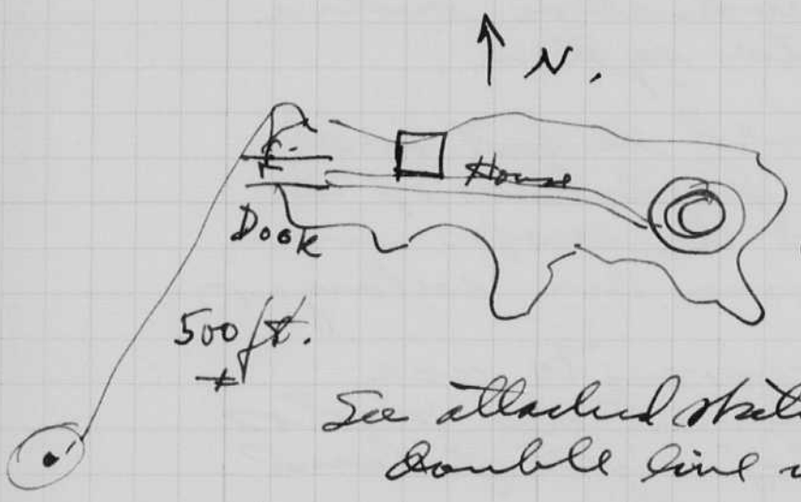
- under water Pictures. No 3 ~ No 13. f/8. a little good
  No 13 ~ No 29 f/5.6 over-Exposured
  No 30 ~ No 36 f/11 good.) ?
- general Pictures. No. 24 ~ No 38.

May 25, 1967.
Harold E. Edgerton

Three Miller of the E.E. dept. I found the group in Bldg 4/ who are busy on the sonar survey problem. Olson was present also ~~others~~ others who I did not know. Prof. Worley in charge.

I told them about the idea of a photo scheme using a sonar depth display system on the top of the boat which would record on the film. See page 81.

June 11, 1967. Elapsed time camera was put near Boston Light on June 4 1967



See attached sketches for double line ids.

Subs. water about 10 am June 4.

Could not find buoy at noon on June 5. Returned at 3 pm when tide was going out. Buoy came up and we had the camera aboard at 3:20 pm

Rate was 10 seconds between flashes.

~~Films~~ Films look out of focus. why.
~~Star~~ Star fish more clear on ~~frame~~ film
Dark water comes into scene
Sea weed marks on the compass.

Sketches to show
Position of the
camera;

84 June 11 1967.

Harold Edgerton Circus photos by multiflash.

Ring 2. VÁRADI, tumblergroup. Red costumes.
Venice Florida.
P.O. Box 967

Ring 1
[Silagio] - yellow? on last night.
3 men high + a girl from board.

Rivera's Trapeze - Lights bothered them some so I stopped.

Helped by Tom Vyenuna and a physics Student.

Deep Sea Camera June 16 1967. 16 m/m Kod II
f 4
Into water at
Run to completion 20 sec.
Poseln Agast
Depth 50 ft.

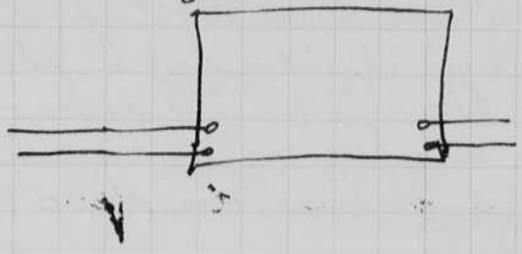
Movie shows star fish walking on bottom. Many leaves from sea weed get caught on the compass. Also leaves flap over the end of the camera.

June 26 1967 7:30 pm – conference.
Harold Edgerton

Warren Moon & Richard Weiner
propose a Real time Data Enhancement
Technique for Seismic Profiling.

Boundary reverberations.
Multipath signals.
Resolution problem
Signal to noise improvement
Increased penetration

80 db noise to signal enhancement



Practical problem (worst case).

1. Six months (min) maybe year.
2. Money. $10,000 – 15,000 for equipment. | $40,000
   Tape recorder.
   Scope.
   Lab. Support.
   Technicians.

Competition.

Ways to go

1. Individualists $40,000
   → outside $60,000
2. American Res & Dev.
3. Umbrella E.G.G. Inc
4. Quit.
5. Patent & Sell

Income.
1. Sell Hardware.
2. Rental Services.

June 29, 1967 - 894.2400 - Blackwell. 21 213

John M. Ford 217 Chas River Study.
Milton Silverman asst.
(John. Caffrey.)

visited M.I.T. Castwells to discuss
some of River Bottom (Chas).

Any aerial maps will be made for
location of sonar records.

July 4 1967. The survey was accomplished
yesterday with John Yules and John Blackwell.
We used the RK&C Edo equipment sonar trans
with the 254 EG&G Recorder-driver. Records
were made from the Science Museum to the
muddy River outlet.

on July 2 I took the shrader out to Boston
Light, planning to put the elapsed
time 16mm (50 ft) camera into
the water.

Ken Read brought his movie camera
(also two boys)
Wally Westfield came as a diver
John & — Blackwell with sons Tom & Bill
H.Z. & Tom Uyemura.

We did not lower the camera because
the bottom has already been plowed
3 times. Plan to move to Nahant

July 5 67 all day spent on book. Read old note books
etc and worked on chapter VI & equipment.

July 6 67 Jane & am to manage for Iowa Spirit Lake
to pick up Aunt Jessie Decan and
my mother. Esther, Mary Lou and
Ellen go along. Then to Aurora Nebr
and Baltimore for a week or 10 days.

July 12, 1967

Harold Edgerton

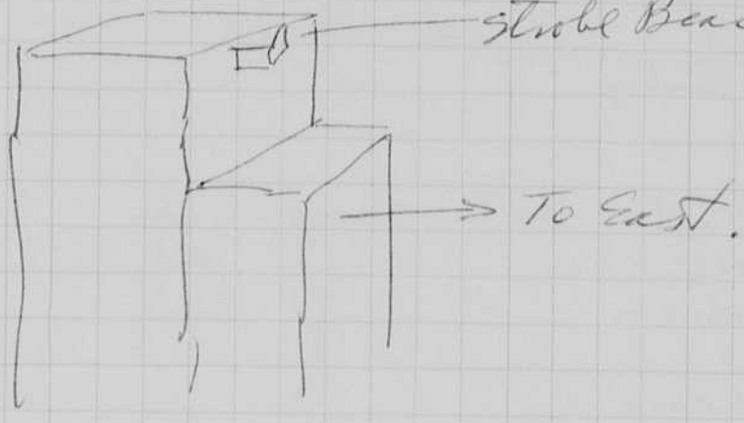
Abbot Caldwell Forbes

C.C.F.

Lunch on 59th floor of Prudential Bldg with Johnson (Bill) Chapman, Franklin (Bunge) King, and Fletcher Chamberlain of the Merchants Nat. Bank.

Discussed strobe light for Merchants new building in Boston. I proposed a copy of the large light-house strobe as used by the Coast Guard in Chesapeake Bay.

King suggested the lamps be placed at the steps near the top. Two lamps to be used.



June 12 evening. Analysis of Elapsed time film made in Boston Harbor. Camera was towered by Tow Tetourneau on Judge — at ——. Seventy seconds between photos maybe 60?

Kodak analyst Projector

Start Frame 0

3 fish small
5 - Dirt
6 - fish small
12 - fish
16 fish
71 fish
73 fish head
77 Big fish
60 4 fish
64 2 fish
79 fish

103 fish
121 fish
130 fish
187 Vane - seaweed.
247 Mud off.
298 ± Many seaweeds.
554 Seaweed on vane
576 off.
618
650 Swing
678 Big weed.
728
740 fish

June 29, 1967 - 894.2400. Blackwell. 21 213

John M. Field 217 Chas River Study.
Fulton Silverman asst.
(John. Caffrey.)

visited M.I.T. Lab. wks to discuss
sonar of River Bottom (Chas).

Arrangements will be made for
location of sonar records.

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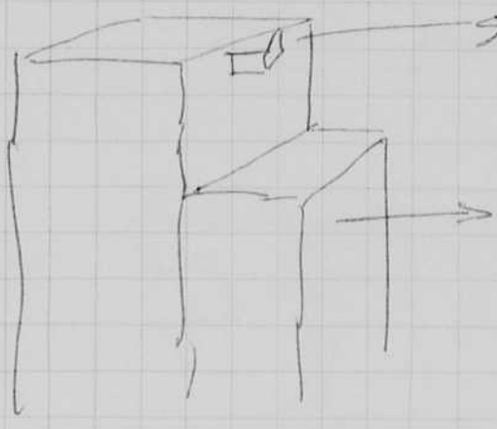

June 12 evening. Analysis of Elapsed time film made in Boston Harbor. Camera was lowered by Jon Letourneau on Judy — at ——. Ninety seconds between pilots maybe 60?

Kodak analyst Projector

Start Frame 0

3 fish small
5 - Dirt
6 - fish more.
12 - fish
16 fish
71 fish
73 fish head
77 Big fish
604 fish
642 fish
79 fish

103 fish
127 fish
130 fish
187 Vine - seaweed.
247 Mud off.
298± Many seaweeds.
554 Seaweed on rope
576 off.
618
650 Swing
678 Big weed.
728
740 fish

Notebook # 29

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 86 and 87.

Item(s) now housed in accompanying folder.

JETSAM FOUND IN DAVY JONES' LOCKER

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... The University of Bridgeport and the U. S. Naval Oceanographic Office have formulated a five year Cooperative Work Study Program for college students. Information may be obtained from Dr. W. C. Difford, University of Bridgeport, Bridgeport, Connecticut 06602.

. Through a joint effort between NODC, the Institut ceanographique (Monaco), and the American Meteoro-gical Society, a Bibliography on Marine Seismics has en published. It is authored by Oliver Leenhardt. dividuals interested in purchasing a copy should con-ct AMS headquarters, 45 Beacon Street, Boston, Massachusetts. Telephone: (617) 227-2425.

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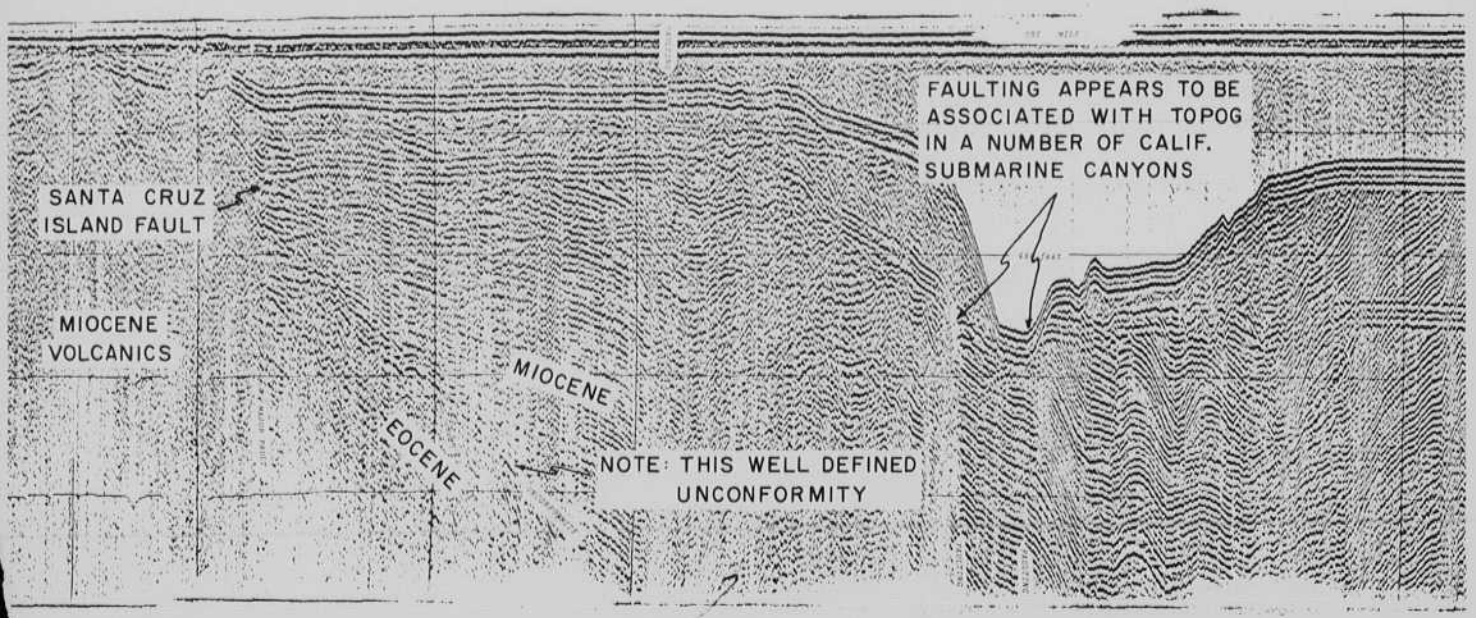
The demonstration was conducted aboard a 55 foot single screw diesel powered vessel. The first day, rough seas hindered operations, but Herron reports the second and third days were ideal. Ninety nautical miles of profiles were run (operating during daylight only).

The system used to obtain these profiles included two Model 232 Power Supplies, one 231 Triggered Capacitor Bank, one Model 267 Sparkarray, array hydrophone and 254 Recorder. A two second repetition rate was used.



Profile from Fraser Pt. to a point SE of East Pt. Scale lines: 100 milliseconds.

NEW 5 KHZ PINGER PROBE

Israel and Greece were proving grounds for a new experimental 5 kHz pinger probe transducer design by Dr. H. E. Edgerton. The unit was designed for high resolution seismic profiles of the shallow subbottom sediments. It employs four closely spaced transducers mounted on a simple towing sled. Reflections are received by a single element hydrophone which is usually suspended from a pole near the bow.

In the Sea of Galilee, subbottom penetration was frequently impossible due to a layer of entrapped gases at the bottom. The lower frequency Boomer was also tried in this area without success. However, some penetration was obtained at the edges of the sea.

Dr. Edgerton notes that penetration of 10 meters was obtained off Joppa, Israel while working with Elisha Linder, an Israeli archaeologist interested in underwater structures and wrecks. Good results were also noted during an investigation of fine sand layers off Caesarea with Dr. David Neev, Chief Geologist, Geological Survey of Israel. Penetration was in the order of 5-6 meters.

Later, in use off Khalkis, Greece, penetration of about 15 meters of soft sediment was recorded in an archeological search for ancient wrecks. It was from this area that Ulysses supposedly left with the Greek fleet to invade Troy. A possible wreck was found and buoyed for further investigation by divers.

The experimental use in Greece and Israel plus further tests in the United States indicated the usefulness of the 5 kHz unit which is available as the Model 229 Pinger Probe. The Model 229 can be used with the EG&G 254 Recorder which contains a built-in driver for the Model 229.

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The hydrophone is a "stretched out" version of EG&G's Model 264 with a 250 ft (75 meter) active length. C. K. Daniels, EG&G International's chief engineer, gives much of the credit for the system's performance to the 264's unique signal summing circuitry. A number of highly successful demonstration lines have been run at ship speeds up to six knots.

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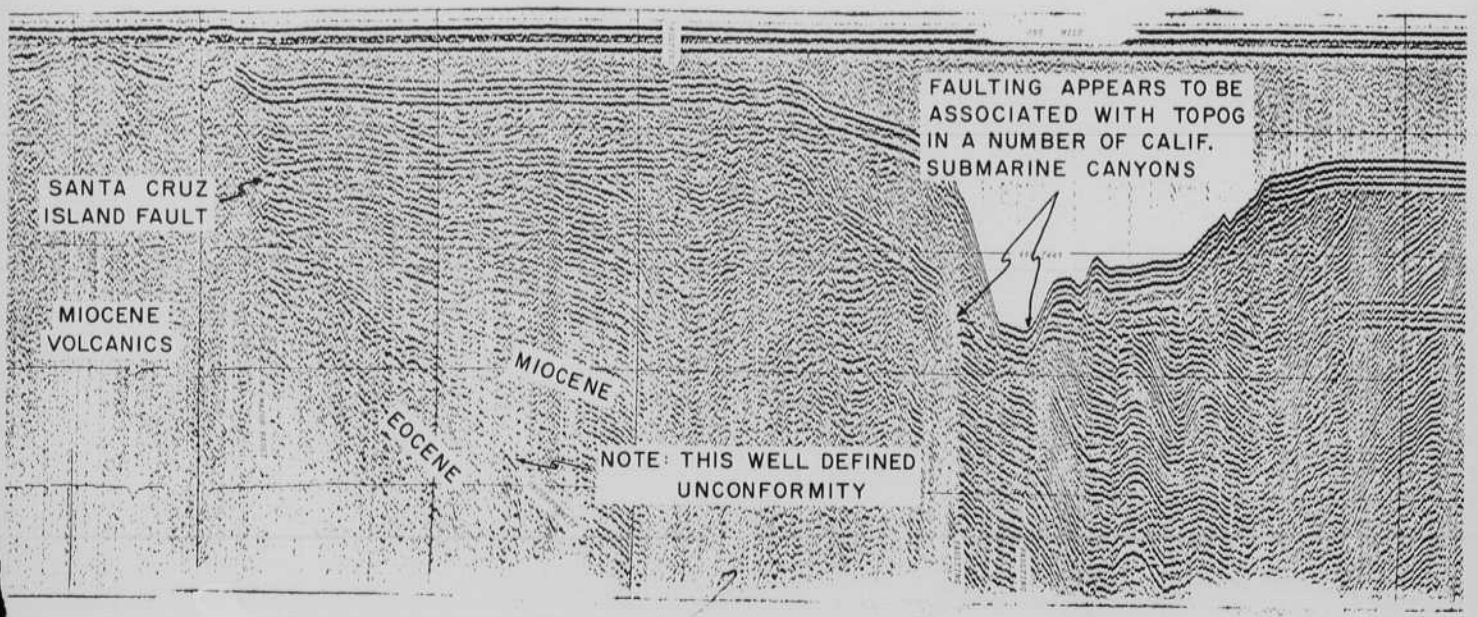

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746 fish

770

781 fish

803 fish

821 fish

852

864 fish

875 more weeds.

894 fish weed

917 fish "

923 ∫ weed gone

982 Water dirty

1034 fish

1419 fish Tail water clear.

1630 Large Fish "

1662 Fish Large

1990 end. ?

Movie of Date	Subject.	Comments.	
Feb. 27, 1967	MIT pool	Shows Bruce - overexposed Focus N.G. Lint in pool.	NG

Mar 67 Lewis tests Short reel. M I T. NG

Mar 4	Boston Lewis	Water Dirty - Vane stuck	N.G.
Mar 16 1967	Boston Lewis. Water Dirty. N.G.	Vane low. Strobes skipped	N.G.
April 20	Boston Lewis Water Dirty	no Vanes	Newspaper? N.G.

July 2		
	0	Lewis Wharf.
	11	Dirty ↑
	74	fish. ↑
	139	" ↑
	1162	" ↑
	231	Seaweed ↑
	283	" gone ↑
	588	fish ↑
	594	" ↑
	619±	Seaweed. ↑
	612	fish ↗
	629	fish ↖
	639	3 fish ↗
	656±	Seaweed ↗
	848	2 fish →
	867	fish ↓
	1125	2 fish ↑
	1153	fish ↑
	1191	fish ←
	1256	fish ←
	1365	fish ↓
	1512	Dirty!
	1588	clear!
	1659	fish
	1662	fish ↖ Weed
	1712	fish
	1722	fish ↑ ? weed.
	1822	fish →
	1915	fish ↓
	2002	Dirty

July 13 1967
June 4 Sunday Board - 10am with water
Elapsed time film 70 ~~sec~~ of 4 Kodachrome II.

152.	crab under vane.	←
542	fish	→
637	clear! Water.	→
676	fish — Star fish	→
743	fish.	←
784	Dirty water.	←
867	" "	
1006	fish	→ ? weeds
1010	Flounder,	→ ? "
1011	"	
1012	"	
1013	"	
1014	"	
1015	Gone.	
1017	fish.	→ Weeds.
1282	fish	← weeds.
1455	out of water with weed.	

Gronberg.

Test of Green White Strobe for Airport Marker
Top of BG 84
Bedford.

July 20, 1967.

Rebuilt 5" tube with 16mm 50 ft Elapsed time camera front. The spherical window was removed and I suspect the warpiness of the glass causes the poor quality.

A flat window 1" thick was put in door installed a type C 10 mm focal length Angenieux f 2 lens (1.9?) set at f 4.

The equipment was at the bottom of the M/V pool from 6 pm July 18 to 9 am July 19.

The equipment was taken to Nahant to the N.W. Biological station at 10:30 am today with Frank Bolden. We met Ken Reed, Ruth Turner and Dr. Richard Chester M.C.Z. 864 7600 2579 for dinner.

The elapsed time camera was set at 40 ft deep between two rocks. More rocks were piled onto the base. A buoy was left on the assembly.

581-0089 Louis F Tournean - Nahant

July 30, 1967. I spent the 28 and 27 at the Univ of Rhode Island. V.P. Humphreys was there for a talk at the Oceanographic meeting. I was on a panel on the 28 with Hill Colson Ray (Raytheon) Benoit (Boat Co?) McMahon (A.D. Little).

I spent the 29 at Flatter Island with Don Becker at outer Bridge and at Pratt's Island looking for copper and anchors - None found. But we have a lot of sonar records and experience.

July 13 1967
Jamel 4 Sunken Reef - 10am milk water
Elapsed time filter 70 ~~22~~ of 4 Kodachrome II.

152.	Crab under Vane.	←
542	fish	→
632	clear! Water.	→
676	fish — Star fish	→
743	fish.	←
784	Dirty water	←
867	" "	
1006	fish	→ ? weeds
1010	Flounder,	→ ? "
1011	"	
1012	"	
1013	"	
1014	"	
1015	Gone.	
1017	fish.	→ Weeds.
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92 August 7, 1967
Harold E. Edgerton.

Ken Rad. Movie Elapsed time. Ken Reed.
Hodgekin's cove - Sand Dollars in action.
Aug 3 camera in at 11 am ±.

Aug 4 camera out 6 pm
High tide at 10 30 am ±
10 30 pm ±.

16 mm f 4 with 50 watt sec on Kodak II.

Aug 8. 1967. Again - Camera to Hodgekin's Cove
arrived 9.30. Submerged at 10 ±
Ken Reed left at 11 am for Boston.

Unit near wall opposite Lobster
factory to see results.

The tide was coming in at 11 am.
from low tide.

We plan to pull the camera
out at 5.30 pm on Aug. 9.

~~Aug 16, 1967~~

Aug 21 1967 Worked on the "Boots" Sat, Sunday like
I have for all summer. The title
is Electronic flash Strobe. It will
be a summary of all that I
know.

Elapsed time of Charles River at
15 sec interval in 16 mm camera
with out pointers or timing lamps.
Start 2.30 am
Stop ~~9.00~~ 9.00 +
Then till 9 30 with 1" glass plate off.
10 mm aperture f 1.9 set at f 4
Kod II film.

Aug. 22, 1967 FX-33 - Helium and H_2.

For Ford work with Poe.

4 unpumped FX-33 were obtained from EG&G.

Plastic connection to Pump pin 4-409
Evacuated.
Heated with Jexane.

6cm He - Start volts about 1200 - 1500 volts, orange 5960 line strong.
" fired off. 5pm movements at 2300 V.

Ok in Special display with 10 mfd at 1500 volts.
Room 10-250 - Regal Trailing for 7th order.

Then made a H_2 Deturium hydrogen lamp
20cm - Pressure
2200 volts starting. Red line 6670 A° Red at 7300 7900.
2mf - 2300
Starts ok.

Taped a leaker with a soldering iron
Filled with Helium 1700 volts with 2mfd.
6cm

August 31, 1967 - More Progress on the book Electronic Flash - Strobe. It looks like another month.

Conf with C.C. & F about N.Y. Merchants' Bldg. Bungee King & Bangs. We hope to put two 7700 B.C.P.S. 10° x 110° beam lamps in the top next week for tests.

October 22 1967

Harold Edgerton.

C John Duncan and wife Esme left at 5:30 for Washington. They have been house guests for 3 days. John is from New Castle England. He is to give a talk in Wash next week.

Louis Wolfson, Martin Klein join me on the 26 of Oct for trip to Israel to help the asdod expedition. We will see Elisha Snider and David Neev while there. We go to Rome then Tel aviv.

Bob Rines also intends to come on Nov 7. I return on the 16 of Nov. to Boston.

On last Sunday a/14, Marty Klein and I took the 12KC and the 5 KC Massa in the Charles River.

The 12KC worked excellently on the side scan. I used it on the 1200 foot scale to show the walls of the charles the bridges, the sail pavillion and the field of the Rhodes in front of M.I.T. It was a clear day with no wind.

I have a seminar / E this term with 25 freshmen and John Wilson. Dr. Mark Kahana is the assistant Uyemura, uni of Tokyo is here this term for his academic visit.

20 Nov 1967
Harold Edgerton.

Returned 16 Nov from Ashdod Israel where I went with Martin Klein, Dr. Louis Nelson, Ray Peabody & Jim Thompson on Oct 1967. We worked with Elisha Linder, David Neer. Moshe Dothan.

28 Nov. 1967. EG&G. directors meeting today. I attended after my Seminar class.

Thanksgiving with Bob and Fiz at 1601 East shore Drive Ithaca N.Y. Nov 23.

Mass transducers $f = \frac{1}{2\pi\sqrt{LC}}$ $L = \frac{1}{(2\pi)^2 C f^2}$

$C = .0027$ microfarads x2 for Two in parallel.

$L = \frac{f^2}{f^2 (2\pi)^2} = \frac{5000^2}{.0053 \times 40 \times 10^{-6}} = \frac{25 \times 10^{12}}{.212 \times 25} = 4.2 \times 10^{12}$

$\frac{25}{40}$
$\frac{1000}{}$

$= \frac{1}{5.3 \times} = 0.19$ h. for 5000 cy. elect

$= 0.047$ for 2500 elect.

$= 0.67$ h. for 2500 $\frac{17}{67}$

Put four caps in series. $C = \frac{.0027}{4} = .00065$ mfd.

$L = 0.67$

$L = \frac{1}{.00065 \times 10^{-6} \times 40 \times 5000^2}$

$= \frac{1}{00.130} = .77$ h.

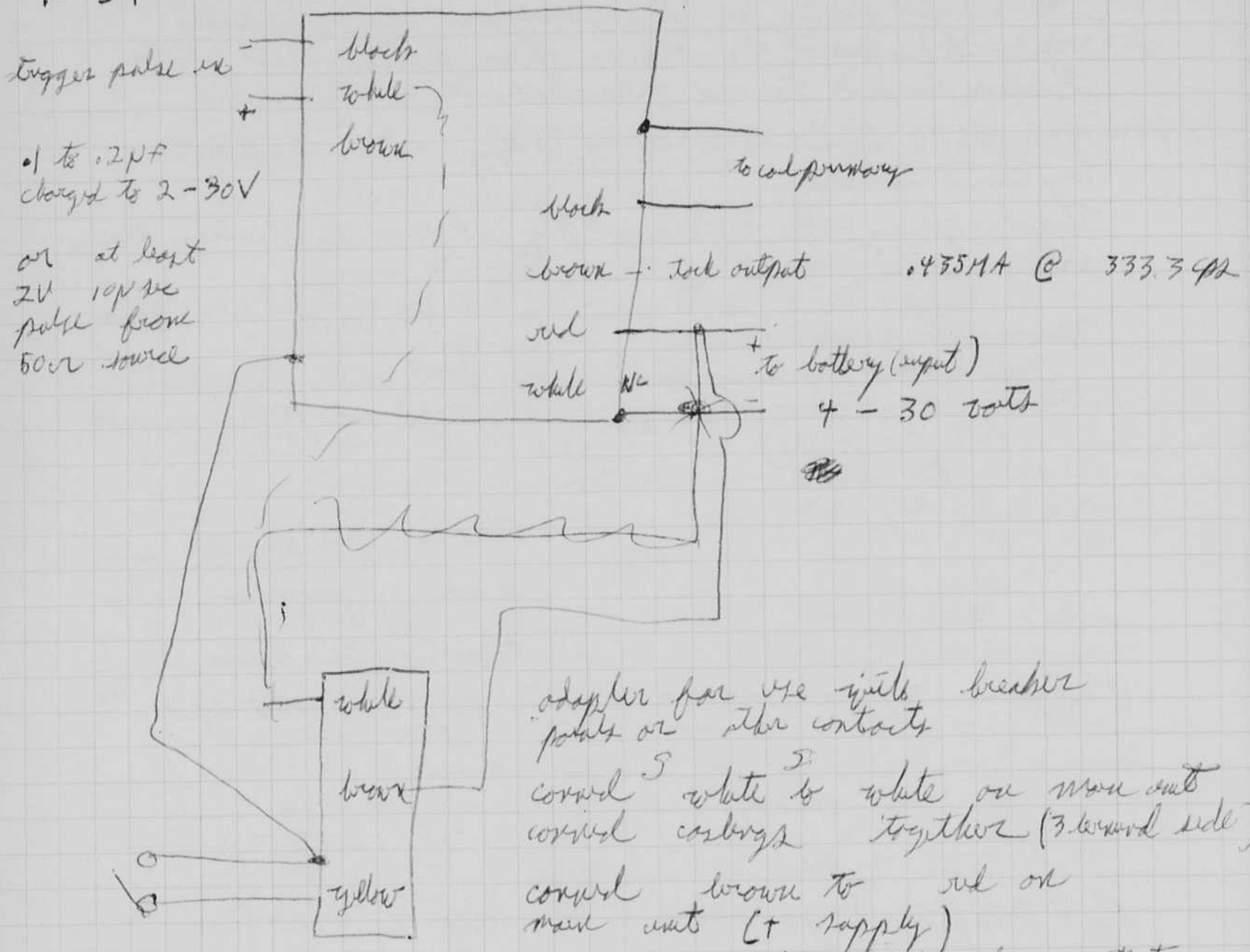
Put 4 caps in parallel. $L = 0.19 \times 0.13$ h.

Dec. 3, 1967 Still struggling with Book Electronic Flash and Strobe. Hope to ship it on Dec 15th to McGraw Hill N.Y.

96
Dec 11 1967
H. Edgerton

Left from Floyd miles

#062515-4



adapter for use with breaker points or other contacts

connect S white to white on mono cable
connect cables together (3 wound side)

connect brown to red on main unit (+ supply)

connect yellow through contacts to battery (ground — negative input)

disconnect any capacitor across switch.

Max PRF increases from 100 PPS at 4 volts to 750 PPS at 14 or greater volts input. do not exceed 6 amps input current

Div of Brunswick.
KIRKHAEFER
305 892-2124
~~Kissimmee~~ St Cloud Florida

output is aprox 60 millijoules per pulse. Output is matched into 150 pf load.

F. Mims
11 Dec 67

Distributor unit - connect black & white & brown leads to input side of mark unit.

connect castings together.

jumper adjust rel & white terminals together & to + battery

Surface gap 5

Spark plug.
Sufficient energy to clear the spark and burn off deposits, etc.

Notebook # 29

Filming and Separation Record

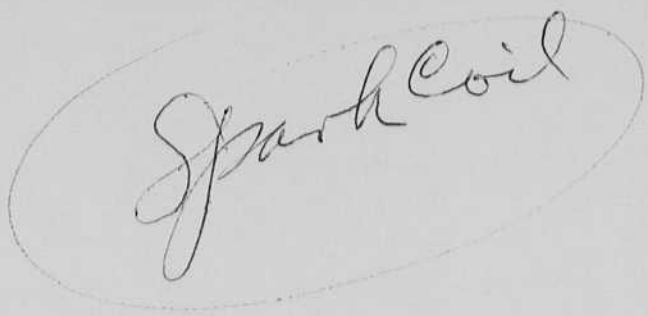
____ unmounted photograph(s)

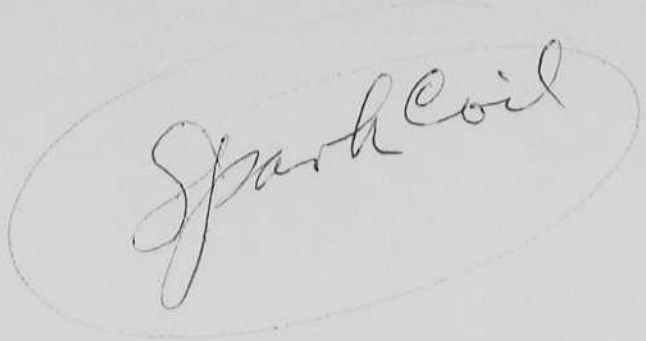
____ negative strip(s)

__1__ unmounted page(s)
(notes, drawings, letters, etc.)

was/were filmed where originally located between page 96 and 97.

Item(s) now housed in accompanying folder.


Spark Coil


Spark Coil

Notebook # 29

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 98 and 99.

Item(s) now housed in accompanying folder.

Portsmouth N.H.

Lab. D Do

.0027
.0026

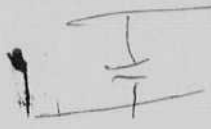
1. Measure C of 4 units.
2. Calc L. for

$$f = \frac{1}{2\pi\sqrt{LC}} = 2{,}500 \text{ cycles/sec.}$$

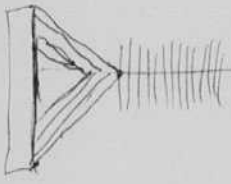
Check "q" of output acoustics.

$$(2\pi)^2 LC = f^2$$

$$L = \frac{f^2}{f^2 C (2\pi)^2} \text{ henries.}$$



measure C. at 1000 ft.



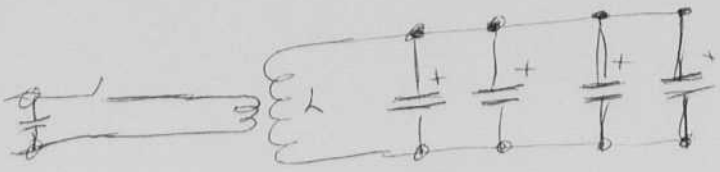
Bob Bowie
Prof Sales.

Leo Fisher Coastal Oceanography
Code 7250
-574.2841-

Measure coil frequency.
Add capacitance.

Portsmouth N.H.

Lab. D Do.



1, Measure C of 4 units.

2. Calc L. for

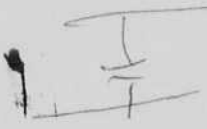
$f = \frac{1}{2\pi\sqrt{LC}} = 2{,}500$ cycles/sec.

.0027
.0026

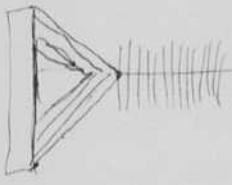
Check "q" of output acoustic.

$(2\pi)^2 LC = f^2$

$L = \frac{f^2}{f^2 C (2\pi)^2}$ henries.



measure C. at 1000 ft.



Bob Bowie
Prof Sales

Leo Fisher Coastal Oceanography
Code 7250
574-2841

Measure coil frequency
and capacitance.

98 11 Dec 1967
Film Tests for L Breslau (Light 88A filter. not used.

Dark I.R. Filter 87C

High Speed Infra Red Film
16 mm.

f 1.9 to f 22.
150 watt see (maybe 200) B.C.P.S. = ?

Exposure at f 1.9 is fine with 30 ft
Lamp 20" from Camera.

Dec 30 1967 Elapsed time camera

4 second rate f11 Kod II ASA 25
on Roof of M.J.T. pointing at Dome
to show cloud and sun movement.

Lloyd Breslau wants this camera in
Panama City Florida on Jan 10 for some
Infra Red tests.

Max Roberts is working on the
Nebraska Beacons.
N.E. Merchants Bank Bldg Tampa,

Polestar
Altair.
B&L type

1 Bulb fitted with 2 - 2 ohms in series (50 W)
for 4 ohms to reduce the light

✓ B.C.P.S. =	800	with 16 mf	4 ohms
✓	= 1156	16	2
✓	= 2560	16	0
	~~= 8000~~	~~40~~	~~0~~
✓	= 1664.	16	1
	= 960	16	3
	= 8100	40	0
	= 2816		3
	= 2176		5
✓	= Holdover.	X X	15 X
✓	= Holdover	X X	25
✓	= "		20
✓	= 1400 "		10

Dec 31 1967 Elapsed time Camera

Sunrise from 100 memorial Drive
apt 11-7A with 10 cm lens.

6:20 start at f 1.8 3 second interval.

7:20 f 5.6. Sun in view.

Jan. 3, 1967 Plummer Tomas of John Hancock were in to discuss strobe for the Chicago 100 story Building.
I suggested to wait two months until the N.E. Merchants bank Bldg lamps were onand running.

Capacitors for fast Strobes. 443 664-4411
Ex 6729
Kowalski

Discuss with Ron McManus (Sprague Elect)

Present 250 mfd 450 v caps have 0.6 ohms ESR.

Suggested 260 mfd 250 v " with 0.4 ohms, (Same at lower voltage),

Can make.
250 mfd 250 volt with 0.2 ohm

I ordered 12 of these for tests. P 601 D.

Also talked to Kowalsky about
200 mfd at 450 volts of evaporated film type. P 49057
I ordered 3 samples for test.

2 1/2 x 3 3/4 x 5 3/4 1.5 pounds?
?

Jan 9 1968
~~Harold Edgerton~~
Ralph Ballatin

Strobe for I.R. System.
to be used by Breslau.

as wired with 3 -
Zener Diodes

475 → 440

There was a 27K 1/2 ohm resistor in series with 3 zeners. & put another 27K resistor in parallel. The "on" ~~voltage~~ dropped from 488 to 450.

Feb. 2 1968.
~~Harold Edgerton~~

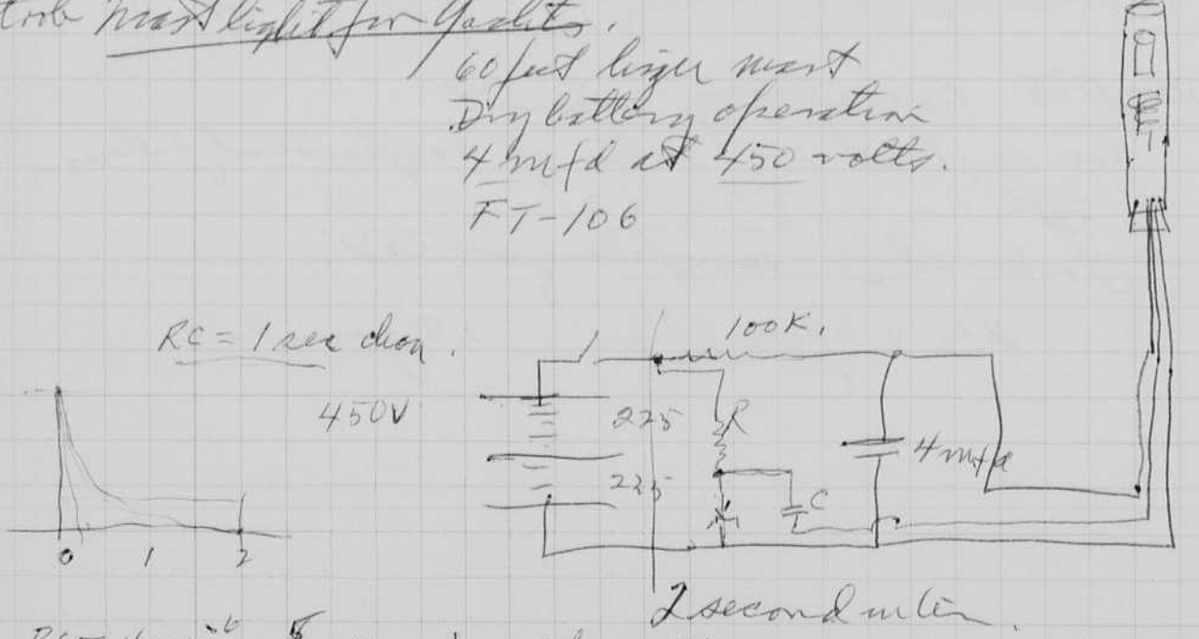
Jan. 17. 1968 left for Jamaica with Esther, Dr Wolfson and Breslau of (Hale & Dorr)

Worked with Bob marx of Port Royal with 12Kc and 5Kc short-pulse sonar.
Area of interest at Port Royal flooded
Some targets were identified.

St Ann's bay. 12Kc with LC5 hydrophone showed sub bottom targets.
Bob plans to expand.

Returned Jan 31 1968 to Boston. Dental gear to Florida. Perry Submarine.

Strobe ~~mast light for yachts~~.
60 foot light mast
Dry battery operation
4 mfd at 450 volts.
FT-106



RC = $4 \times 10^{-6} \times 10^{5} = .4$ sec

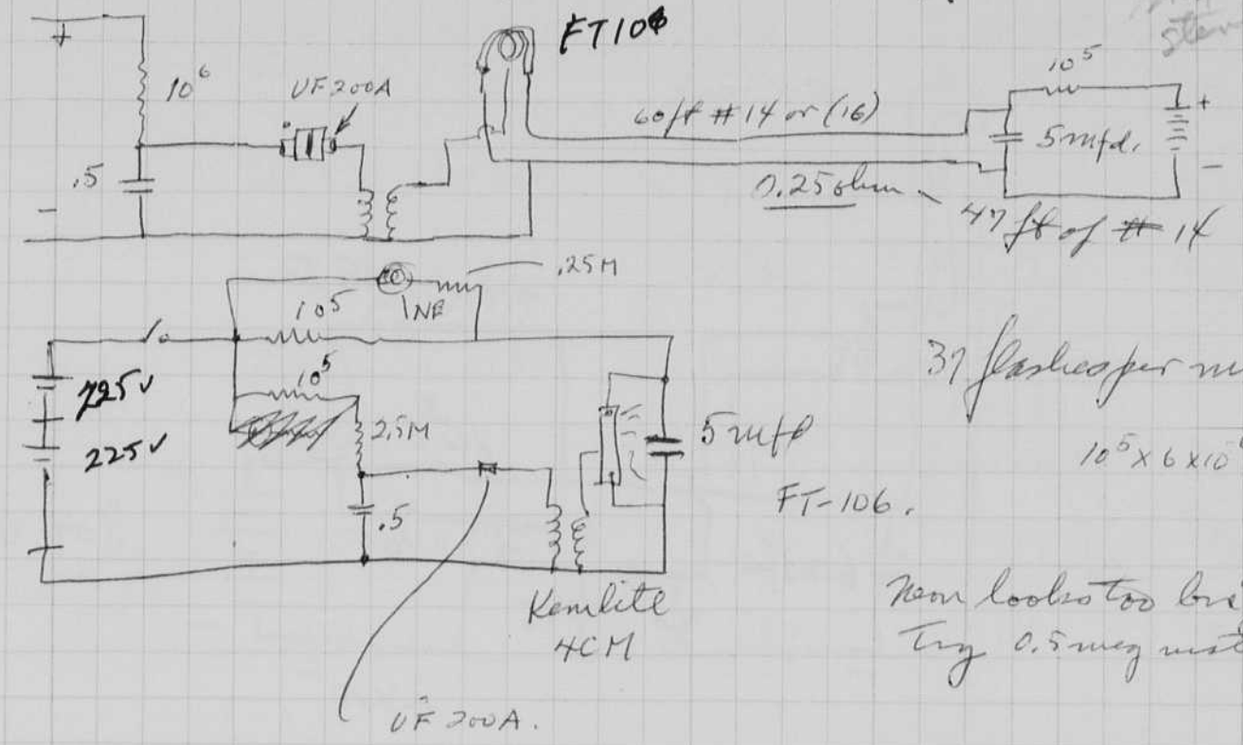
$\frac{400}{100{,}000} = 4.5$ ma =
avg. = 1 ma.

~~4 hours to 2~~
Eveready. 180 volts 410 hours 2 hours/day
390 " continuous.

Feb. 3, 1968 H. Edgerton.

UNITRODE. UF 200A. Try FT-31

Use Greg Mellyn's through Steve Howe.



37 flashes per minute

$10^5 \times 6 \times 10^{-6} = 0.6$ sec

Now looks too bright.
Try 0.5 meg instead of 0.25M

John J. Wilson 232-4249 Brookline mass.

Feb. 5, 1968

This was put on the Green Building on Saturday night. Mark Khana helped me. Wilson saw it at night. He says the light output is enough.

He wants a smaller pack for the batteries. 100 hours + running time is too much.

Other batteries to try are

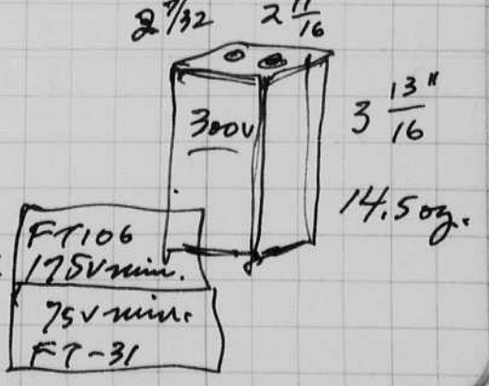
Bat

2 # 492 450 v 4# 16 oz. 101.8 cubic inches now on Green Bldg.

1 493 300 v 14.5 oz. 23.4 cubic in. ← Try this one.

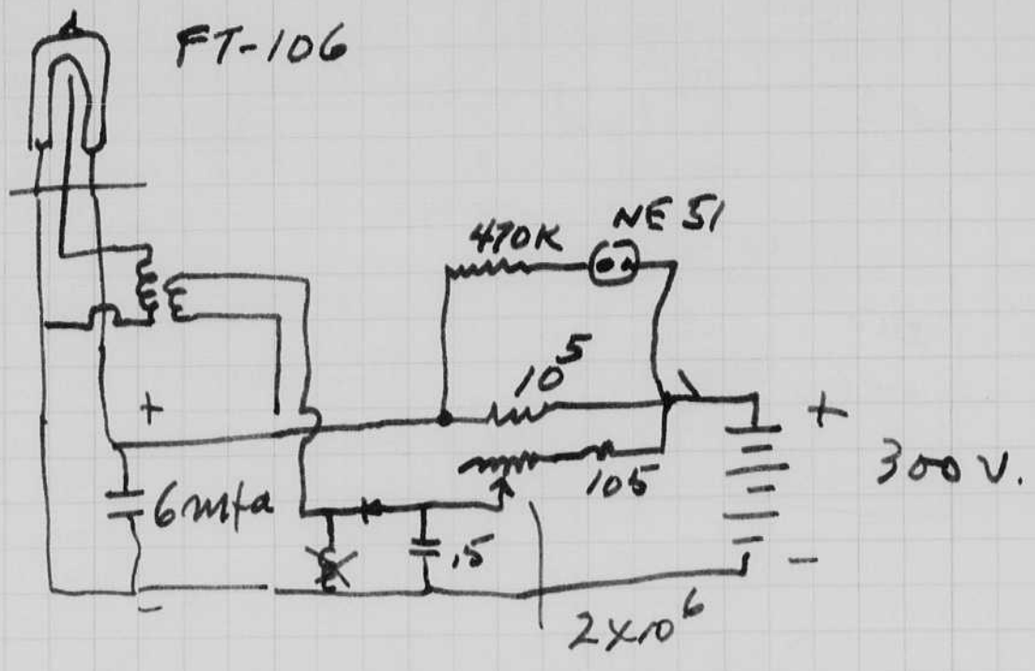
1 497. 510 1# 10 oz 26.9 " "

→ The 300 volt battery might be ok for a 10 hour life. Will it do it. Try.



The FT 106 is twice or more efficient than the FT-31. The min voltage for the -106 is 200 PS spark coil.
FT-31 is

Feb 6 1968 Beacon.
H.E. Edgerton.



Feb. 11, 1968
H.E. Edgerton
Mapleton K.

4-405.

Cap.
A. 200 mfd paper 450 V Sprague
B. 250 mfd electrolytic 4 series
C. 14 mfd 2000 volts. (12.6).

FX33 - 1½" Dirty. 6 mm

FX33 - 1" old. 6 mm.

xFX53 - 1½" 5 mm

FT-214 10" 6 mm.

DxP	DUR. ms.	PEAK.	Cap.	Lamp
320	100	3.2	~~C FX33~~ A	~~FX33 FX214~~ FX33
350	80	4.4	A	FX53.
460	100	4.6	12.6	FX-214
150	75	2.	239/2	FX33
375	125	3	(R30/2)2	FX33
320	100	3.2	"	FX52
	85		A	1" (FX33)
	125		B	1"

(Lumen sec/sq ft) Light Output /10	D	Tube	V	Cap.
2.02, 2.1, 2.0.	2ft	XFX-52	450	250 μfd
1.6, 1.1, 1.65, 1.75,	2ft	XFX-52	450	207 μfd paper
2.0, 1.9, 2.05	2ft.	FX-33 (* 502)	450 paper	207 μfd (pap)
2.35, 2.35, 2.30	2ft	~~XFX-52~~ FX-33	450	250 μfd (elec)
2.2, 2.2,	2ft	Greenwalds	2000	12.6 μfd
Fooler test 2.55, 2.55, 2.50	2ft	* 1" tube	450 v.	250 μfd (elec)
2.2, 2.2,	2ft	1"	450	207 (paper)

New tubes EGG

A. XFX 42 ~~1" GAP~~ 008
B. FX 81-1 1" GAP 537
C. Thin

Output (BCPS)	Tube	Cap.	V	Dur.
~~FBC~~ 52, 48, 52	B.	(250) .2	400 ?	80 μs.
88, 80, 88	A.	~~26~~ same	450	100 μs.
128, 120, 128	C.	(250) 2	400 ~~350~~ ?	150 μs

Tube D. 4 mm ID 1" gap short ends (FX33) Sp.
E. 7 mm ID 1" gap FX45A
F. 9 mm ID 1" gap FX81

D.		(250)/2	~~450~~ 500	120 μs. (?)
E.		(250)/11 2	500	80 μsec (?)
F.			500	80 μsec.

LIGHT OUTPUT: ① CAP: (250) ½ · 2 V-500

	Tube Type Gap	Int. D.	Ident. #	Sp. Mod.	~~Type~~	Light Output (BCPS)	V ~~500~~	Duration 80
F)	1"	9 mm	FX-81 623 (F)	—		64, 64, 672	500	
E)	1"	7 mm	FX-45A #539	—		92, 96, 92	500	80
D)	1"	4 mm	FX-33	short ends		108, 112, 108	500	85 usec
⇒	1"	4 mm	—	3" tube (long ends)	old cathode mayflower	112, 108, 116	500	
	1½"	4 mm	FX ~~33~~ -502.	KAPUT		120, 124, 120		
(A	1¼"	7 mm	XFX-42 #008-1	small Electrodes		94, 96, 94.		
	1½"	7 mm	XFX-52 #8	large Electrodes		104, 100, 102		
						86, 88,		

2/16/68 Sensitive light meter.

V.T.V.M.	D	C	f No.	t	Head	Cap	V.
	1M	.1 Mfd	4.7	1/100		Sprague 34D	
FT-31					32	.1/5 Mfd.	200
FT-106 } slightly					55	"	"
SA-309 } dirty					66	"	"
S-413 → crazed					f5	"	"

OUTPUT

Cap = ~~175~~ 500 μfd V = 250 volts.

250 ⊣⊢ 250 Electrolyte

lamp Type

GAP	ID	IDENT. #	LIGHT OUTPUT	DURATION
1"	7mm	FX-45A #539	45, 40 BCPS (KAPUT)	150 μsec
1"	9mm	FX-81-1 (623)	— no start	—
1"	4mm	FX-33 (shorts)	50, 45 BCPS	250 μsec
1¼"	7mm	XFX-42 008-1	42, 46 BCPS	175 μsec

Cap = ~~250~~ 125 μfd V = ~~250~~ 250 volts.

Electrolyte 1 ⊣⊢ 250, 1 ⊣⊢ 250

1¼"	7mm	XFX-42 008-1	~~28~~, 32, 36, 32.	70 μsec.
1"	9mm	FX 81-1 537	12, 16, 16 BCPS.	60 μsec
1"	9mm	FX-81 623	20, 20 BCPS	65 μsec
1"	4mm	FX-33	32, 36, 32, 32 BCPS	85 μsec
1½"	7mm	XFX-52 #8	32, 32 BCPS	70 μsec
1"	4mm	XFX-1	48, 44, 44	60 μsec (70?)

Capacitors

2/300 μfd in series (475 v. Elec.)

Voltage = 950 volts

GAP	I.D.	#	BCPS (Output)	Duration	
1 3/4"	7 mm	XFX52	130, 136, 140	90 μsec	
1"	9 mm	FX-81 537	76, 80, 84	65 μsec.	
1"	9 mm	FX-81 623	92, 92, 92	75 μsec	
1 1/2"	9 mm	FX-81 527	16, 20, 20 μsec	65 μsec	X
1"	4 mm	XFX-1	132, 132, 132	50 μsec	
1"	4 mm	FX-33	128, 128	80 μsec	
1"	4 mm	XFX-1	88	60 μsec	

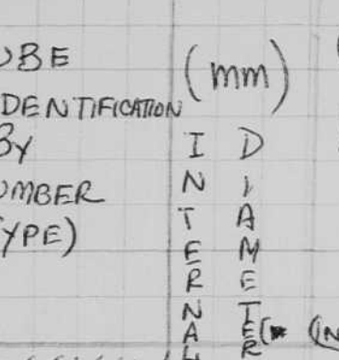
300 μfd

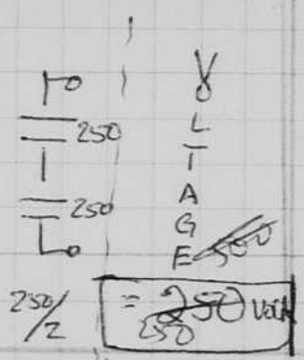
FX-33 ~~no. 4~~ (h-bird unit) (250/2).2 Capacitors

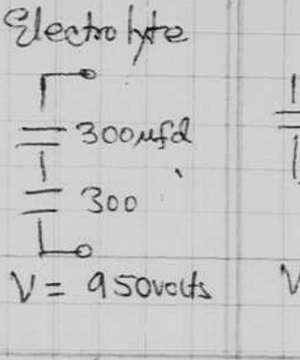
Bulb I - Output = 76 BCPS
Duration = 75 μsec ~~80-82 μsec~~ 1" } Long tubes

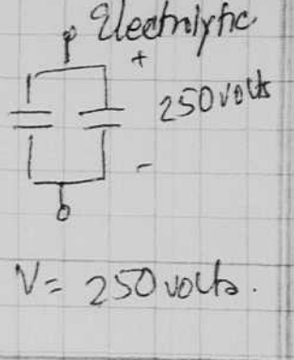
Bulb II - 88 BCPS ; 80-82 μ sec 1"

Bulb III - 96 BCPS ; 94 μ sec ~~short~~ short tube









TUBE IDENTIFICATION BY NUMBER (TYPE)	INTERNAL DIAMETER (mm)	GAP LENGTH (INCHES)	DURATION (μs)	OUTPUT BCPS	DURATION (μs)	OUTPUT (BCPS)	DURATION (μs)	BCPS (OUTPUT)	DUR.	OUTPUT BCPS
FX-81 #623	Mm.	Inches								
FX-81 #537	9mm	1"	80μs 70μs	56	60μs	16	65μs	80		
FX-45A #539	7mm	1"	80μs	94	TUBE KAPUT				150μs.	42
FX-33	4mm	1"	120μs 85μs	108	85μs	45 checked	80μs	128	250μs.	48
XFX-42 #008-1	7mm	1¼"	100 μsec	94	70μs	32			175μs	44
XFX-52 #8	7mm	1½"		100	70μs	32	90μs	135		
XFX-1 #	4mm	1"	80μs* or 90 μsec	88	60μs	44	50μs*	132		
FX-81-1 #623	9mm	1"	80μs	66	65μs	20	75μs	92		
FX-81 #527	9mm	½"	-	—	—	—	65μs	20		
FX-33 #2	4mm	1½"	120μs	108						

C = 250 μfd
V = 500 V.

C = 125 μfd
V = ~~250~~ 500 V.
258

C = 150 μf
V = 950 V.

C = 500 μfd
V = 250 volts.

March 1968
Harold E. Edgerton

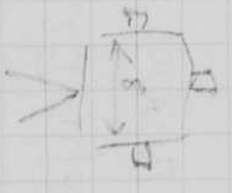
Space Rays
Hardesty
Burlington Mass.
Calabar.

Rhoned Lee. 468 Elec. about flash lamps
~~#~~ 7 mm I.D. 1" gap. He will make
5 lamps with #X-33 spacing and
electrode. 3 week estimate given.

N.G

2500 V. 14 μfd (44 ws per lamp)

Battery 7 lbs
3 lamp reflector 25 lbs
Camera → 10 lbs. Tripod & mount 3 or 4 lbs



wants 1/3rd weight.

→ $\tau < 75 \mu sec$

For a cage — 15" to bird

f/32 Ektachrome X
ASA 64

— low idling current —

March 8 1968
Harold Edgerton.

Greenwald was in on mar 4 to talk Electronic flash for Birds

He will settle for 75 us (maybe a bit more).

He requires 1/3 of his present unit in weight. this means about 15 pounds!

Several students talked to him about details, such as reflectors.

On Mar 7 I spent most of the day at Bolt Beranek and Newman / office in camb. with discussions on instrumentation in the ocean.
Russel Kean.
Leo Beranek chairman.
Jim Snodgrass Scripps
Marcellio Uchall.
Fred Fleming Woods Hole.

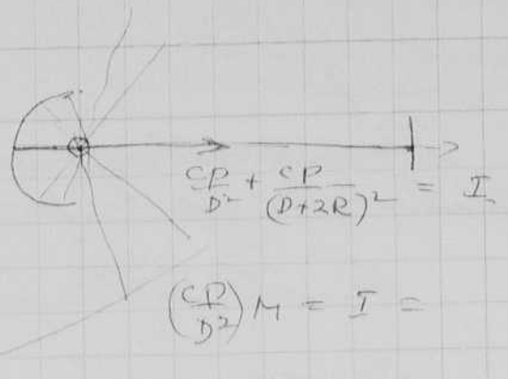
My mother Mary Edgerton from 1003 J St Aurora Nebraska has been here visiting at 100 memorial Drive Camb. for a few weeks. Her sister Mrs. Jessie Coe from Woodbine Iowa is here too. Today we all go to the Drake Hotel in U.U. to meet the Pogues and have a good time.

Mar. 12, 1968
Mar 9 Friday at U.U. at 1 pm to Drake Hotel.
Concert at night with Pogues & MacMorrans.
Mar 10 Sat. Radio Hall - Rockettes. in afternoon.
Manos at night
Canadian Club at noon.

March 12, 1968.
H. Edgerton.

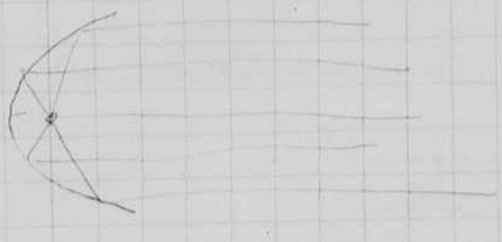
Reflectors.

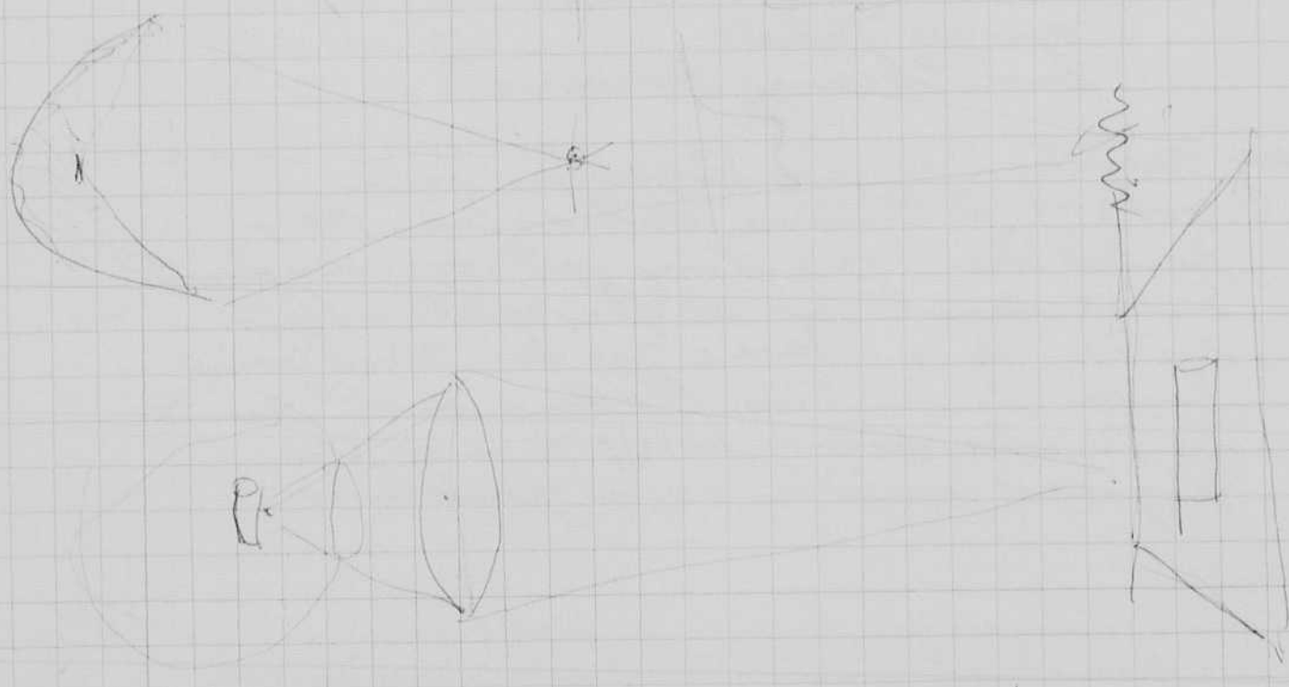
Cylindrical types.



$\left(\frac{CP}{D^2}\right) M = I =$

$\left(\frac{\frac{1}{D^2} + \frac{1}{(D+2R)^2}}{\frac{1}{D^2}}\right) = M$





March 1941
K. Edgerton. FT-214 output.

3 ft.

10.3 + 3.9 mfd = 14.2 mfd at 2000 volts. BCPS = 13 × 9 = 117. BCPS

peak = 1.8 × 2 = 3.6 × 10⁶ c.p. 50 × 1.5² = 112. 80 μs.

14.2 2500 75 μs.

peak = 3.5 × 2 = 7 × 10⁶ c.p.

92 × 1.5² = 207 BCPS

check 1000 v 52 × 1.5² =

FT-220 14.2 mfd at 2000 v. 105 × 9 = 945 BCPS.

2590 190 × 9 = 1710 BCPS

$M = \frac{1710}{207} = 8.3$

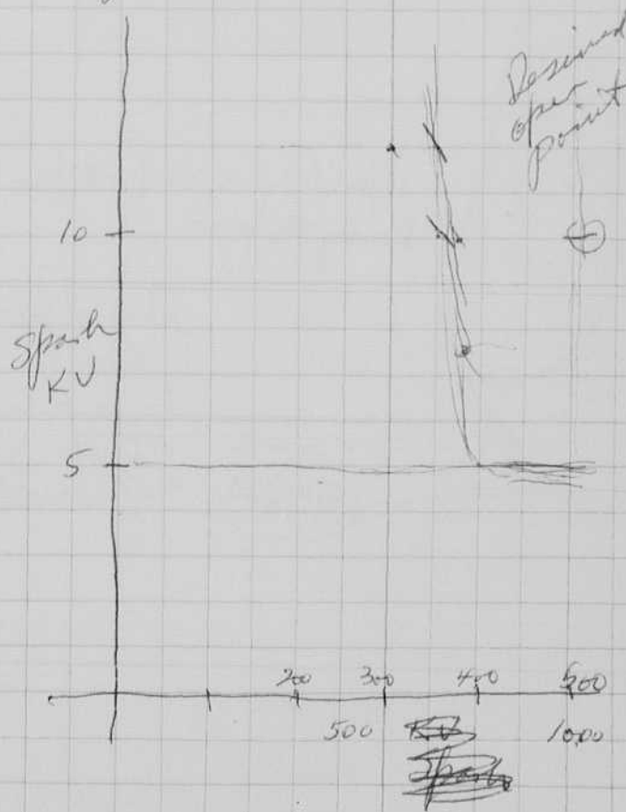
$M = \frac{945}{112} = 8.4$

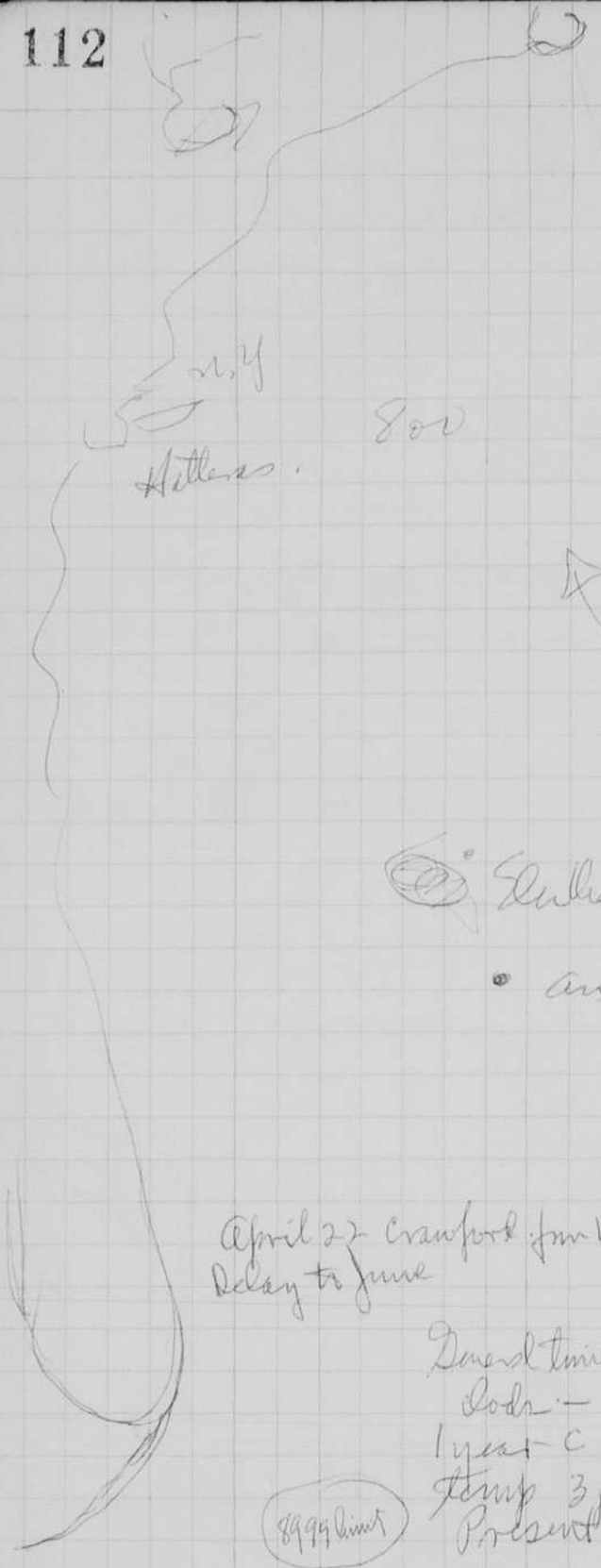
2.5 cm × 0.7 250 p 500 v 16 × 2.25 = 36 BCPS.

250 40 × 2.25 90

Freeman & Edgerton Spark Characteristics of FX 335 spec 2.5 cm 0.7

	70%	300 volts	12,000 trig
	100	350 "	12000
	100	350	10,000
	80	320	10,000
	100	355	7500
Triggs	~100	360	5000
	~100	390	5000
	~100	410	5000
	~100	430	5000
	~100	500	5000





Bruce Wagner
Nov. 21, 1968.

1200 meters. Swallow float
100 meters setting
measure to 5 meters.

20 floats. 10 in a cluster.

Sound depth
4000 ft.

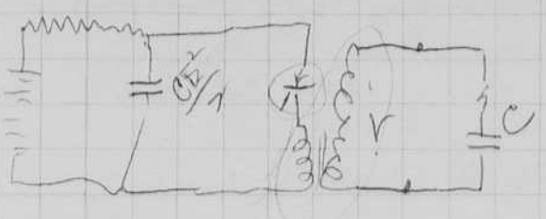
Timers 1/10th - 1 week
10 day 100 sec. accum
5 minutes apart

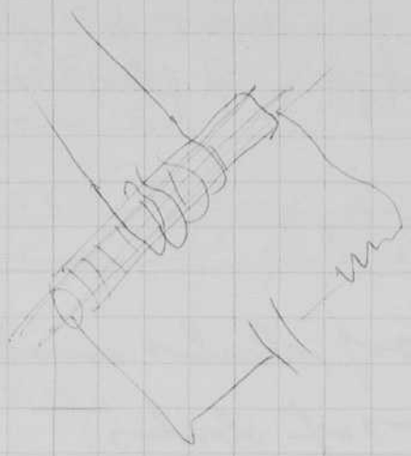
April 22 - Crawford from WHOI (may not be ready).
Delay to June

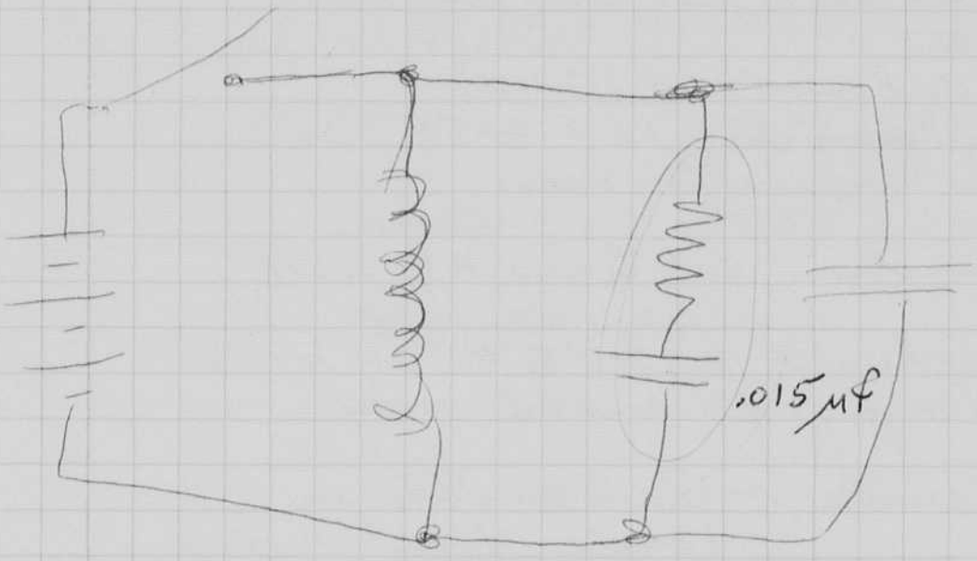
Doesn't time $4,50 1 per hour.
Cods — modify with switches
1 year C size battery 1/10⁴ easy.
Temp 3 per E in 10⁵ per cent. 1 month.
Present counter. 1/2 Hecon Waltham.

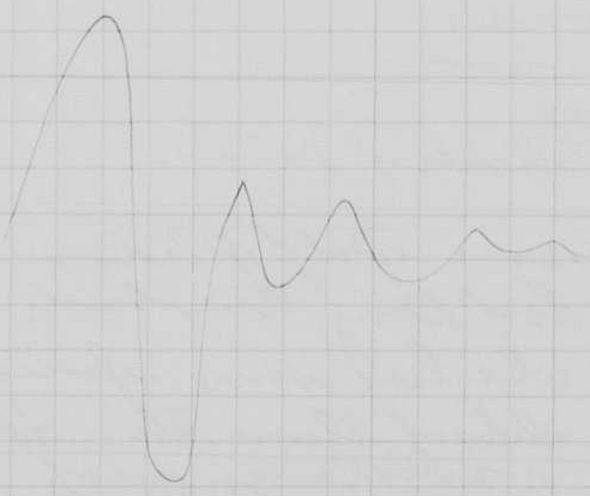
2N 5163 Fairchild 1000, one megohms.

Design of Trigger Driver.









Golf setup in Bldg 13 on first floor March 21 1968
Lamps in on Mar 22 for trial shots.
1000 fps 9 photos. spacing too much
1500 " " " too close
1250 " " ok.

Sideviews of clubs and (iron X)
top views of clubs. . .

Mar. 22, 1968 East end Bldg 13 first floor Dark Room

Golfer
John Boda Andover CC 475 2024
John Thoren Myopia Hunt VO 2 2253
Hamilton Mass

Leonard Kamsler 140 7th Ave N.Y. 10011
212-242-4678
Desmond Tolhurst 305 East 86th NY 10028
Golf Mag. 235 East 45 10017.

Photos made with 100/sec multiflash.
120 cycle w/full swing
0.3 ms microflash.

Top views
Side views
Irons.
Multiflash of Driver.

March 29 68 — More Golf photos with
Friday Prof. Benj Averbach
who had some "special"
clubs of Alum etc. He is
a metallurgy prof.

Mark Khanna
Steve Reddy helped.
Date for Mar 30 at 3 pm with Golf Pro Jim Averbach

april 3 1968
H. Edgerton.

overhead & flex more 2000 fps photos of golf balls and clubs. 3pm on Sat.

Tues Apr. 2. Ringe High School at 10 am for shots Cedar Lamell (art fair) freshman helped me with the exhibits.

April 25 1968 - Still mostly busy.

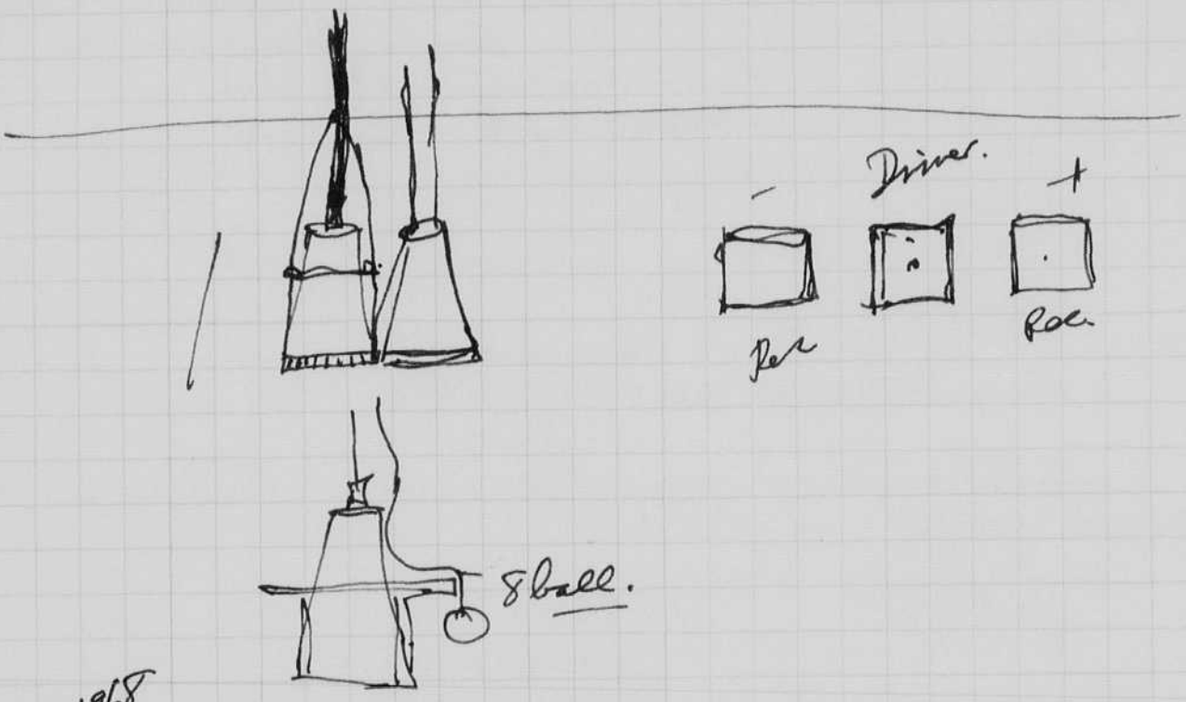
May 9 1968 H. Edgerton

Angelo de Innocentis

Multiflash Press	299.50
Booster	79.95
Ring light	69.55
Ring to Camera	6.95
Jones 2 light 29.95	29.95
Spot light	1595

May 9 1968 Sonar test in M.I.T. Pool
Harold Edgerton. by Don Kroltar.

.625 - 15° .22 30° .1 45°	Edo —	12 Kc is 12 or 13 kc.	112 lb.	Long full Power.
	Klein —	14 kc. Klein.	105 lb.	Full power on EG&G. Driver.
	4 model mass.	5 KC	1/2 TIME. Cycle. 90 ms.	107 lb. "
	1 model mass.	5 KC.	65 ms.	101 lb. "



May 11, 1968

Edo Special 36236. Ser 101A 465 C = .0038 mf at 1000 ~~ft~~

Special EL86 - 2 layer transformer. L = .051 henries

$$f = \frac{1}{2\pi\sqrt{LC}} = \frac{1}{2\pi\sqrt{.0038 \cdot .051}} = 11.5 \text{ Kroltar}$$

this Edo has half as many crystals as the Regular one.

May 24 1968
H. Edgerton.
4-405 M.I.T.

May 15. Big Surprise party in the Center.
Bob. Jan, Mary Ellen & Deb Margaret, Bob
and 4 grand children. Swing from M.I.T.
Tuvalu Boys Band. Sinclair Lynches. Banjo
by Bob & Merrill Guitar. Some great
speeches by Rosenblith, Killian, Brown
Hagen, Brescan, Douglas Frost. Marilla Constan.
Woodson was toastmaster.

Book of letters from friends
received. Gold Key

Richard Richardson 70 Warren St
Roxbury Mass 02119 619 442-8990-I came in
to get Beacon for yachts. He is with
BG&G Roxbury. Gave him lamps, Batteries
and a diagram plus a complete model.

Aug 14. Report
Stew. Nelson used one of the Mast beacon
lamps on the Bermuda Race (?) or trip (?)
He says it worked great - Toly of interest.
Also Reed used it on a yacht with success

929.1706.

Apr. 22 (Mon.) - Downtown Club, 225 Franklin St. Boston (meeting N.E. Aquarium) 5;30 (meeting), 6:00 (cocktails), 7:15 (dinner), 9:15 (Adjourn)

Apr. 23 (Tues) - Undergraduate theses oral presentation (Goetz, Haase, Cornell, Sartin) room 13-3101, from 10-12 (H. Edgerton & J. Roberge)

" " - Harvard Club (W.H.O.I. meeting, Prof. Kanwisher lecturing)

Apr. 24 (Wed.) - Museum of Science - Board of Trustees meeting, 5:30 (cocktails) 6:15 dinner, 7:30 meeting

Apr. 25 (Thur) - Harvard Club, Boston (12 noon) License Executives' meeting (for R. Cadwallader, EG&G ext. 81-6074) lecture

" " - Dedication of the Center for Space Research at M.I.T., 8:30 Registration, 9 Welcome, etc, 1pm dedication luncheon, Dr. Killian and Pres. H. Johnson, 3pm, informal reception. (Campus Room - dinner 5pm)

Apr. 26 (Fri.) - E.D.C., Chapel St., Newton (Kevin Smith) 9 am
1-3 - Pope: 208 224 12 pm Robinson ?
" " - Harvard Club (lecture for Walter Feinberg's class, 6pm)

" 29 (Mon.) - Fish Protein Concentrate Symposium (Gov. John Volpe) New Bedford Hotel, New Bedford, Mass. 10am, lunch 1pm H. Humphrey, Dr. Wenk, Gov. Volpe, 2:30 dedication

Apr. 30 (Tues) - Optical Society of America (lecture) Sweet's Farm, Rochester, N.Y. cocktails 6 or 6:30, dinner 7pm, Dr. John Urbach (716) 546-4500 Xerox)

May 1 Emerson Room 7-403, 5pm Comm Serv. Council.

~~May 1 (Wed.) - M.I.T. Faculty Club (In coming and out going officers dinner meeting) 6:30 pm~~ (from 2-4pm) 2010

May 2 (Thurs)- Oral Presentation (McFarren, Phillips, Blanco, Cheng) Rm. 13-

May 2 (Thurs)- Student-Faculty Steak Banquet (Guest of honor - H. Edgerton) 5pm

3 Ed Curley.

May 4 (Sat.) - PARRENT'S WEEKEND (R. Brockette x 6172 H. Edgerton to lecture in room 10-250, Strobe Lab opened for tours 9 - 3

(Thurs.)

" " Sea Hunter Roast 4:30 - 6:30

" " - Faculty Club's annual party (Art Lichfield ext. 7240)

5 Sun ZIMMERMANS

May 6-7 (M & T) - RLE's Annual Research Review (R. Sayers) 9am Kresge's Little Theatre, 1 pm lunch in Sala de Puerto Rico, 7pm dinner Fac. Club

May 8 (Wed.) - Valley's Steak House (Rt. 9) lecture for Prof. Franzen, B.U. Phys. Dept. 353-2615 or 2600

may 9 - Pines House Woburn

" " " - Res. Problems connected with Diseases of the Eye Conference Fac. Club Penthouse, 2-5pm (Prof. Geo. Benedek, Phys. Dept.)

10 9am Dental

May 11 (Sat) - Tau Beta Pi Initiation and Banquet (Mike Ginsberg x 5800)

~~May 10-11-12~~ - ?? Mine Adv. Committee meeting, Washington, D.C.?????

May 10 (Fri.) - Governor's Conference, Prudential Center, Boston 9-5 —

May 12 (Sun.) - MOTHER's DAY

" 14 (Tues) - Mr. Muesar (Bell Tel. Lab. to lecture) Naval Arch. Dept., 4pm

" 14 " - Hamilton Trust meeting, The Country Club, Brookline, 7pm

May 15 (Wed.) - Dinner Party (Mrs. Edgerton)

May 16 (Thur) - Bowdoin College, Brunswick, Me. (Prof. Wm. Hughes) 2pm lecture

8

M.I.T. presentation June 1968

In a teaching career that spans 39 years, Professor Edgerton has set an example of rapport with and concern for students, and his popularity and effectiveness is attested to by generations of alumni. His public fame rests on his development of high-speed photography. Professor Edgerton was graduated from the University of Nebraska in 1925, spent a year in industry working with large generators, then came to M.I.T. as a graduate student, receiving the S.M. in 1927. His work with generators had persuaded him that stroboscopic techniques could be used to study them in motion, and he and his students perfected the complex circuitry for synchronous studies which have found application throughout technology. Professor Edgerton began high-speed photography to draw attention to the potentials of stroboscopic lights. During World War II, he developed electronic photoflash for night aerial photography and even flew missions over Europe to check his equipment. For the Atomic Energy Commission, he developed the high speed photographic techniques required to study atomic explosions. In later years, his interests turned to deep ocean photography, especially in asscciation with Captain Jacques-Yves Cousteau. Sonar pinging techniques to position his cameras at great ocean depths interested Professor Edgerton in the use of sonar as a means of studying topographical features and sublayers of ocean bottoms. Professor Edgerton is a member of numerous professional societies, including both the National Academy of Sciences and the National Academy of Engineering.

June 13, 1968.

Preparing for a 1 week seminar for June 17-21 next week for about 55 people. Many came in from other areas such as Aberdeen Proving Ground and N.Y. This will be the 4th seminar and the last as far as I am concerned.

729.1706.

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Aug. 7 Salamis Harbor, Famagusta - 3 day effort

Aug. 12 Cyprus, England, Boston

Harold & Esther Edgerton
Janice Dixon

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Joe Cohen & me

Monaco Sept. 1968 Annita Picard

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Joe Cohan
&
me

Monaco
Sept. 1968
Cousteau
Diving

Monaco
Sept 1968
on Esperdon
Villefranche
Harbor.

Leenhardt Frudski Edgerton
WHOI
Hurley.
Miami

Trip to Lake Titicaca with 254 donar 12KC and 6KC mass.

Left Boston for Miami Oct 5. Delay of 10 hours in Miami with Braniff. Sunday Oct 6 to Lima Peru. Stayed overnight at Crillion(?) Hotel. Then on to La Paz on Monday Oct. 7. Equipment delayed in La Paz.

Jeep gone with battery etc. Delay in Douane ~~Customs~~. 54 signatures etc. Finally left for Copacabana in Jeep on Friday. Arrived at 7 pm.

Frederick Dumas. in charge
Albert Falco. " "
Jigmone Cousteau.
Isabel wife of photographer Monne
Isak Producer.
+ and 15 ± others.

Joe Rohrbirsch (Peru) came about by with a Ford Econoline bus which was great.

The Lake has over 7000 sq miles of water. The max depth is 270 meters. We measured 230 meters in our area. Large flat bottom with ~~Floating~~ Islands.

Nov. 2, 1968
Harold E. Dezetter
Danny Geiger
Geisser

Test of Microwise ® Amplifier
model MN-80 NM 80 #75 SN 8332A

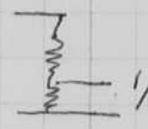
Roulti Inst
238 West 58 123
Indianapolis
Monfort
2140
301-974 0876

Output 1 volt peak to peak
Input $\frac{0.34}{20}$ x volts. $1.7 \times .2 = .34$ volts $\frac{1000}{202,000} = \frac{1}{20}$

min gain CCW Gain = $\frac{20}{.34}$ = 59 ratio. at 1000 cycles,

---

max gain C.W. Max gain shows noise. 1 volt output
ground necessary.
output = 1
$0.3 \times .05 = .015$ volts peak to peak.

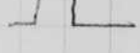


Gain = $\frac{1}{.015} \times \frac{1}{20}$ $67.0 \times 20 = 1330$, gain max,

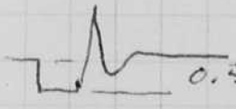
input $\frac{.015}{20} = \frac{.0007}{.001}$ volts. 700 mv. 1000 cycles

---

* Pulse and Input 7 volts x $\frac{1}{20}$ } min amp.
Output 0.5 volts



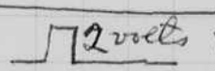
Gain = $\frac{0.5}{7} \times 20 = 1.43$ gain ???

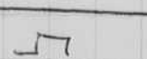


100 usp wide
30 cycles

Gain is even from 20 to 20K and more 200 K.

---

* Pulse gen.  2 volts x $\frac{1}{20}$ = input
$0.5 \times 2.5 = 1.25$ volt output



$\frac{125}{1} = 12.5$ gain.

---

* Overloaded with 0.1 volts.

Output .05 volts
input $2 \times \frac{1}{2000} = .001$ volts

Gain = 50. noise is evident in output.
with 50 u s square wave.

Leenhardt Frudski Edgerton
WHOI
Hurley.
miami

Monaco
Sept 1968
on Esperdon
Villefranche
Harbor.

Trip to Lake Titicaca with 254 Sonar 12KC and 5KC mosa.

Left Boston for Miami Oct 5. Delay of 10 hours in Miami with Braniff. Sunday Oct 6 to Lima Peru. Stayed overnight at Crillon(?) Hotel. Then on to Lapaz on Monday Oct. 7. Equipment delayed in Lapaz.

Jeep gone with battery etc. Delay in Douane ~~Customs~~. 54 signatures etc. Finally left for Copacabana in Jeep on Friday, arrived at 7 pm.

Frederick Dumas. in charge
Albert Falco. " "
Jiguoul Cousteau.
Isabel wife of photographer Monne
Isak Producer.
+ and 15 ± others.

Joe Rohrbirsch (Peru) came about by with a Ford Escoline bus which was great.

The Lake has over 7000 sq miles of water. The max depth is 270 meters. We measured 230 meters in our area. Large flat bottom with Floating Islands.

Nov 2, 1968
Harold E. Dezotor
Danny Zeiger
Zeisser

Test of Microwise ® Amplifier
model NN-80 NM 80 #75 SN 8332A

Rovelt Inst
238 West St 123
Indianapolis
Hanford
21401
301-974 0876

Output 1 volt peak to peak
Input $\frac{0.34}{20}$ x volts. 1.7 x .2 = .34 volts $\frac{1000}{202,000} = \frac{1}{20}$

min gain CCW Gain = $\frac{20}{.34}$ = 59 ratio at 1000 cycles,

---

max gain C.W. Max gain shows noise. 1 volt output
ground necessary.

output = 1

0.3 x .05 = .015 volts peak to peak.

Gain = $\frac{1}{.015 \times \frac{1}{20}}$ = 67.0 x 20 = 1330, gain max,

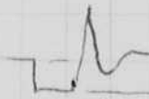
input $\frac{.015}{20}$ = .0007 volts. 700 mv. 1000 cycles

---

* Pulse cond Input 7 volts x $\frac{1}{20}$ } min amp.
Output 0.5 volts

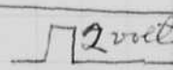
Gain = $\frac{0.5}{7}$ x 20 = 1.43 gain ???

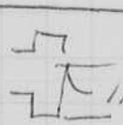
100 usp wide
30 cycles



Gain is const from 20 to 20K and more 200K.

---

* Pulse gen.  2 volts x $\frac{1}{20}$ = input

0.5 x 2.5 = 1.25 volt output 

$\frac{12.5}{1}$ = 12.5 gain.

---

* Overloaded with 0.1 volts.

$\frac{\text{Output .05 volts}}{\text{input } 2 \times \frac{1}{2000} = .001 \text{ volts}}$ Gain = 50. noise is evident in output with 50 ns 1 µsec wave.

Send Regrets

HAROLD E. EDGERTON

Sept. 10 (Tues.) M.I.T. Community Fund meeting (Walter Milne)
Room 10-300 at 2pm

Sept. 10 " Somerset Hotel, Boston - Lecture for IEEE/G-AP Symposium
(Dr. Edward Altshuler, Northeastern Univ.)
6:30 cocktails, 7:00 dinner, 8± lecture (wives invited)

Sept. 11 (Wed.) Logan Airport 7:30 am flight to Europe

Sept. 12-20 Centre National de la Recherche Scientifique Conf. (CNRS)
Nice, Monaco, and Villefranche (deliver a paper)

Sept. 20 (Fri.) Nice Airport 10:30 am flight to Paris/Boston

Sept. 22 (Sun.) M.I.T., East Campus - Picnic for freshman, 6:30pm

Sept. 24 (Tues.) EG&G Dir. meeting

Sept. 25 (Wed.) FIRST CLASS 11-12 in Room 10-275

Oct. 6 (Sun.) TO LAKE TITICACA, BOLIVIA

~~Oct. 8 (Tues.) N.E. Life Building, Charter Room, 225 Clarendon St., Bos.~~
~~Public meeting on Water Pollution 9:30 am~~

~~" 15 (Tues) Dr. Piccard - Somerset Club, Boston (Boston Globe)~~

~~Oct. 16-19(Wed.) Boston War Memorial building, EXPO '68 - 2nd Annual~~
~~Am. Com. Fish expo (sponsored by the Boston Globe)~~

" 24 (Thurs) Conference for N. E. Executives-Kresge 1pm (Pres. Johnson' house 5:30)

Oct. 28 (Mon.) H.E.E. class

" " " Statler Hilton, NYC, Keynote speaker for ISA conference
(28-31) 10½ am (Pulse Techniques with Light & Sound)
Owen Williams, A.F. Camb. Res. Lab, Bedford, Mass.

Nov. 7 (Thurs) NEREM award (evening) Boston.

Nov. 8 (Fri.) NEREM, Sheraton Boston noon lunch, give paper at 2:30pm

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" " " VETERANS' DAY

" 19 (Tues) RCA - Princeton, New Jersey

Nov. 19 (Tues.) Boston Museum of Science - Annual Dinner

Nov. 26 (Tues.) EG&G Dir. meeting, 9:30 am

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Dec. 21 - 1/5 CHRISTMAS VACATION

Feb. 17 IEEE Merimack Valley Subsection, No. Andover, Mass.
Sam Baffo or Bruce Birnie (EG&G, Salem, Mass.)

Mar. 25 Ind. Photog. of New England, Bill Ginevicz (EG&G x5059)

Mar. 25 Boston Museum of Science meeting

Nov. 24 1968 Sunday.
H. Edgerton

F.O. Schmidt retirement party at Student House last night.

9-29-68

HAROLD E. EDGERTON

31 - Brother noon.

Oct.	31 (Thurs.)	M.I.T. Community Service dinner at the Faculty Club 5:30 cocktails, 6;00 dinner
"	" "	M.I.T. Course 6, Steak Banquet, room 10-050, 6pm
Nov.	5 (Tues.)	ELECTION DAY (?)
"	" "	City College, N.Y. (139th St. and Convent Avenue - East side, 140th St. is nearest entrance to SHEPARD HALL, Room 105) 10:30am - Prof. Harold Stolov, UN6-3600 x225 (Prof. Menchner)
"	7 (Thurs.)	NEREM award at 5pm Sheraton-Boston (Clarendon Room) Prof. Goldner, Tufts University 628-5000 x287 Banquet.
"	8 (Fri.)	NEREM - lunch and deliver a paper (2:30pm) in Commonwealth Room - Jay Harford 547-0970) Sheraton-Boston
"	11 (Mon.)	VETERANS' DAY - HOLIDAY
~~" 12~~	~~" Stud House~~	SMPTE meeting and award, Washington Hilton, 12 noon Trip to FIT. Wellesley Flowers
"	19 (Tues.)	RCA Lab, Sarnoff Res. Center, Princeton, N.J. (Mr. Robert Silver, 609-452-2700 x2725) Colloquium 11-12noon, lunch.
~~"~~	~~" "~~	~~Museum of Science, Annual dinner~~ a guinea.
"	23 (Sat.)	Dinner for Prof. Schmitt, American Academy of Arts and Sciences, Brookline, Mass. 6:30cocktails, 7:30 dinner
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SEA KING 50 ft boat Sunk nov. 1968 Wally Beaudreau, capt.
Position reported 27°0' from Braves light 3.25 miles.
6 EG&G people were aboard.
fortunately a coast guard ship was close to get there quickly!

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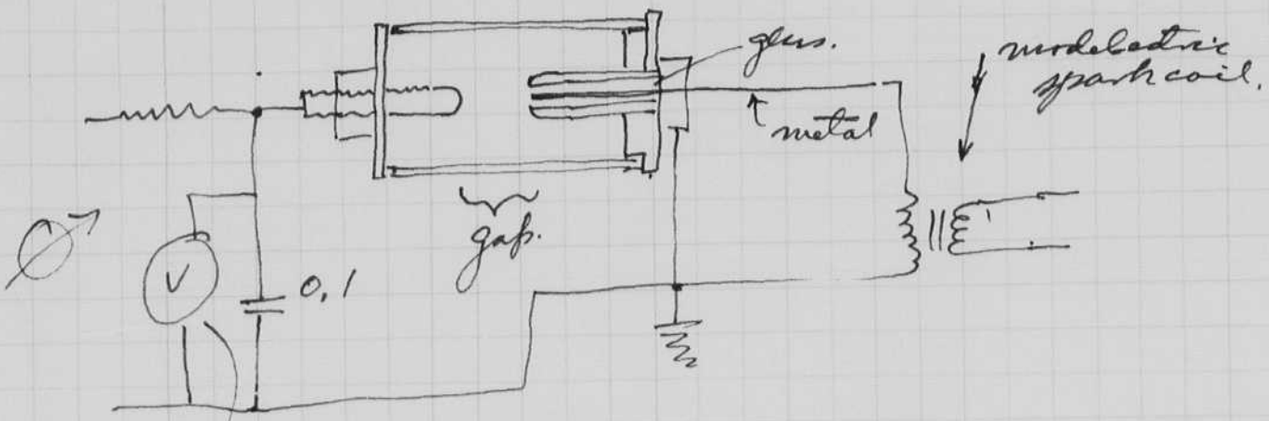
Fortunately a coast guard ship was close to get there quickly!

+Harold Edgerton

Francis Lee is doing a thesis on time jitter and starting of sparks.

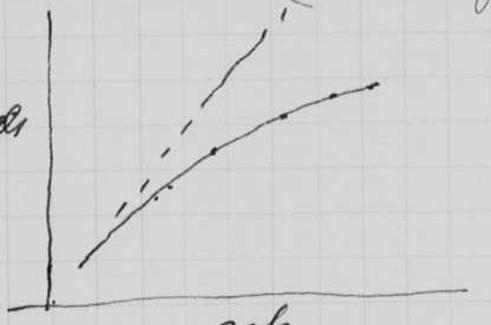
We tried a 3 electrod spark gap yesterday (3rd) as follows.



electrostatic volt meter.

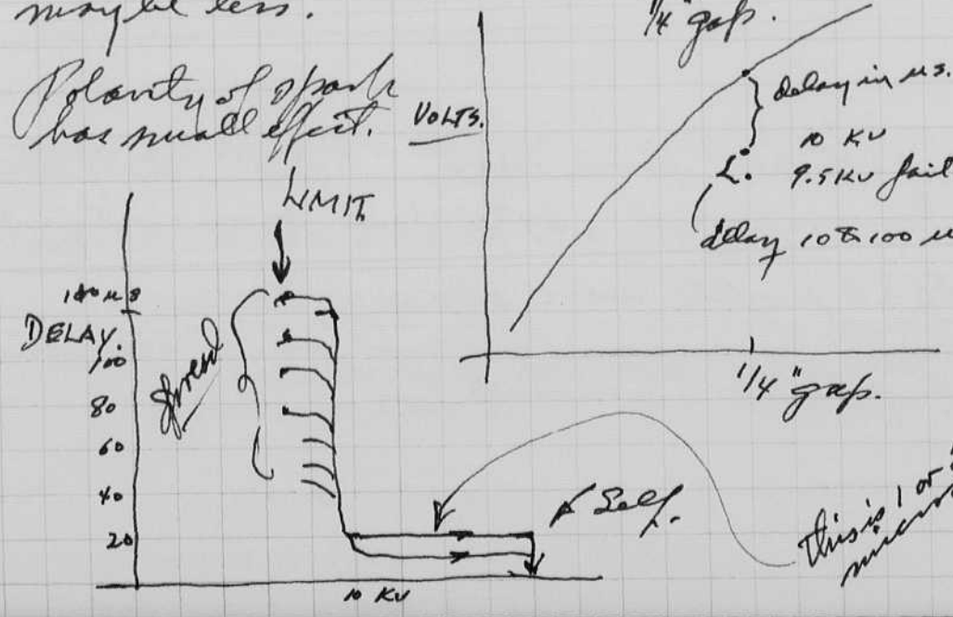
1. Breakdown is not linear (with out spark).

Breakdown is also variable due to ions etc.



2. Spark trigger was made either + or − with breakdown over glass at 3 to 5 KV maybe less.

Polarity of spark has small effect.



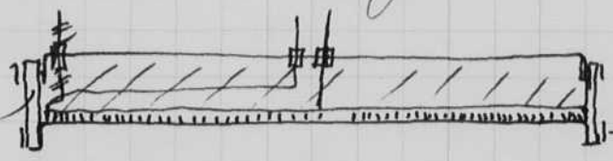
Dec. 7 1965
H. Edgerton. Short pulse Boomer

Yesterday I had a long discussion with Don Krotzer about the Pizza pan Boomer and the E G & G H.R.B. (High Resolution Boomer).

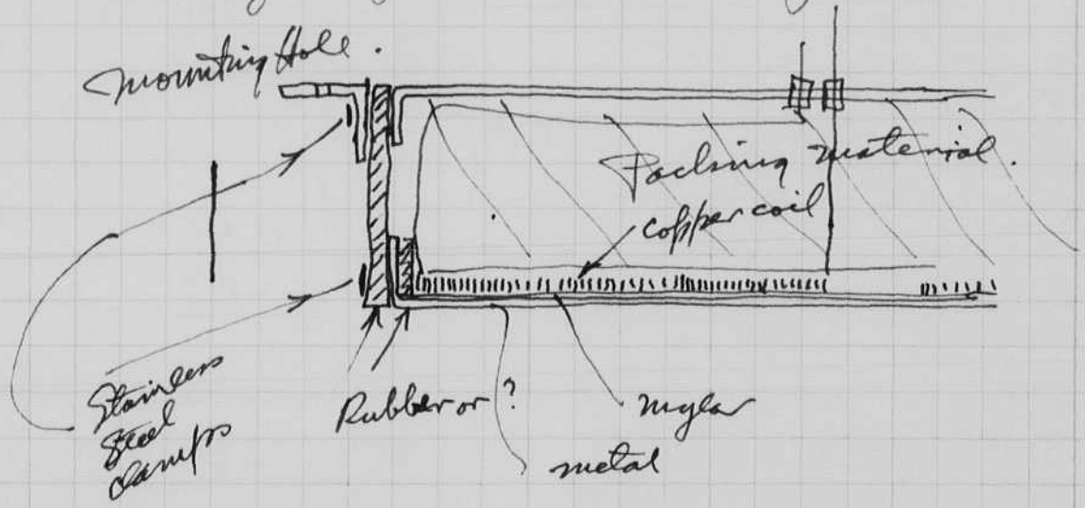
It appears that the HRB give a very clean ~~sig~~ signal without subsequent ringing & clutter the seismic record.

Krotzer thinks that this is due to the metal side walls of the Pizza pan model. The side walls of the HRB are of Rubber.

He also thinks there should be additional air flow in the Pizza pan between the coil and the plate.



Rubber. Diving suit type
glued with overlaps. Stainless steel clamps rings around rubber to seal to metal pan.
Flat copper coil over
thin mylar film to metal plate.



Dec 15 1968
Harvard Boyston

Alden 4" recorder received last week.

Motor does not always start. 1500 r.p.m.
Twist shaft or release load momentarily.
Trim fuzzy - Ed Cuely plans to rework.

speed of motor. Probably
ival. However it may be
slip phenomena.
mechanisms or not? If yes
ry.

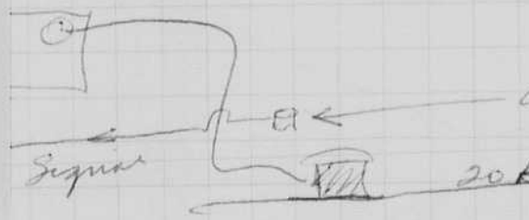
or slightly less.

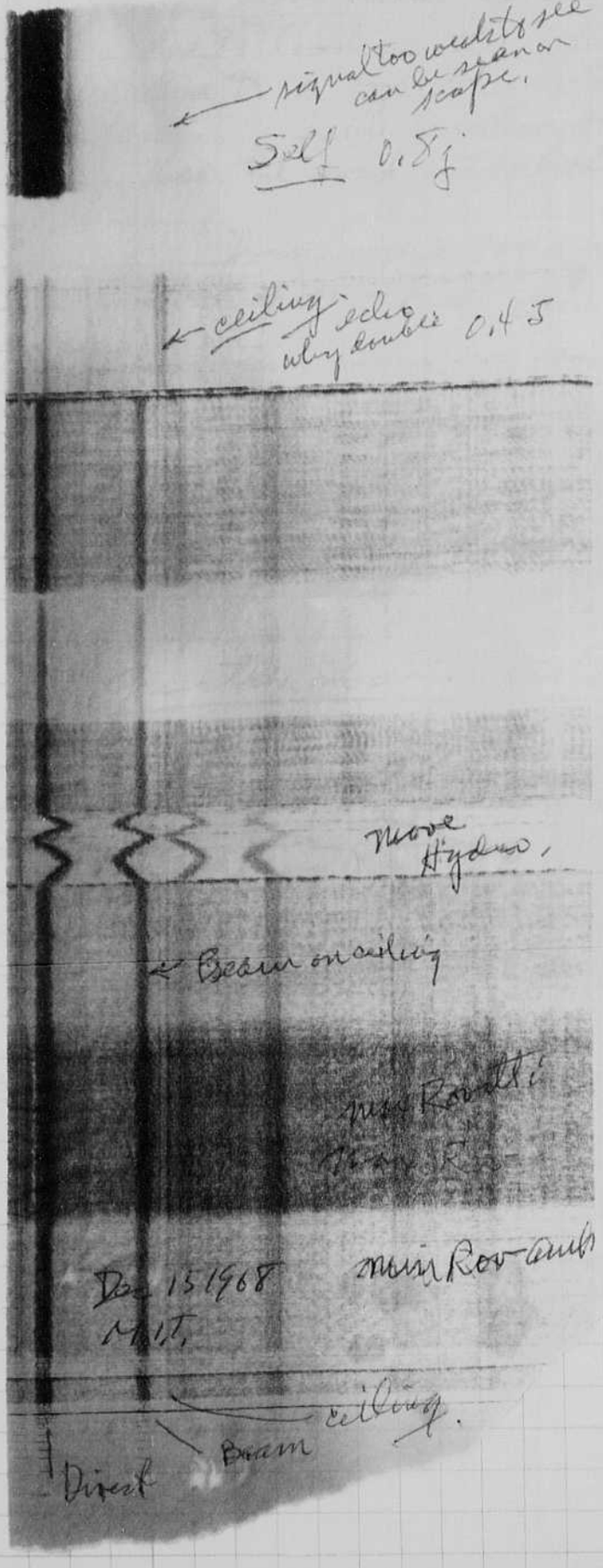
$= \frac{4''}{\frac{60}{900}\ \frac{sec}{rev}} = \frac{4 \times 900}{60} = 60$ inches/sec

sec = .0666 sec = 60 m.s

$= 5000\ ft/sec \cdot \frac{.060}{2} = 150$ feet for 4"

Cab



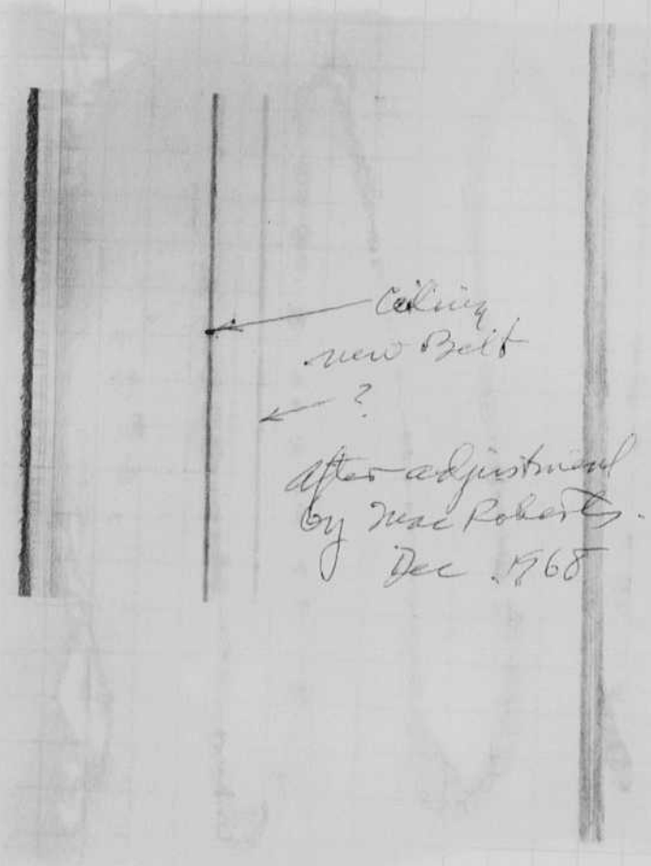


Wide due to Synch motor ~~Hunting~~ slipping. NOT IN SYNCH.

Induction motor

KCI 26 B7200 E was purchased from
Electronics Inc 100 Tallmadge Ave ~~$~~ $25.75.
Stock 666-0500.

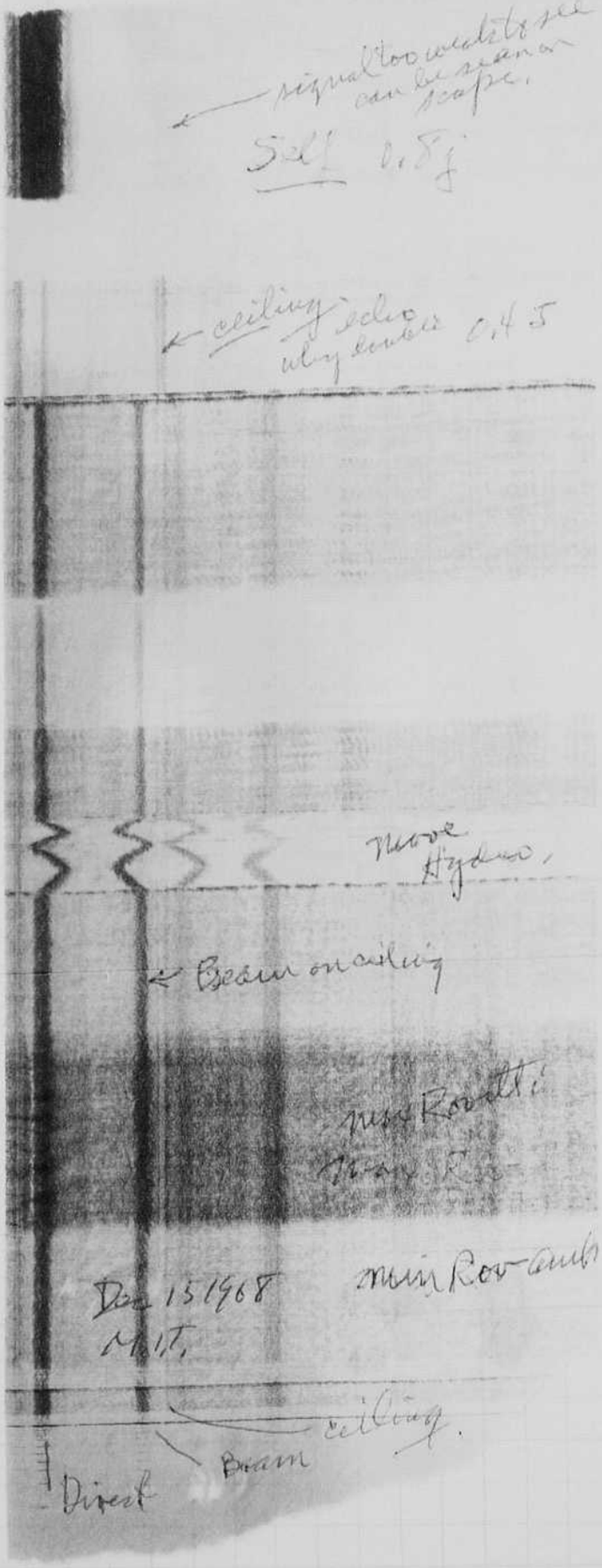
New Belt on motor PIC FA80 helped greatly to
reduce speed variation.



Dec 15 1968
Howard Taylor

Alden 4" recorder received last week.

Motor does not always start. 1800 r.p.m.
Twist shaft or release load momentarily.
Trim fuzzy - Ed Canby plans to rework.



speed of motor. Probably not. However it may be slip phenomena. Intermittent or not? Hope so.

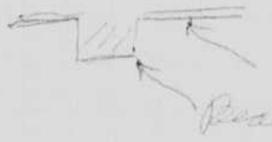
4" or slightly less.

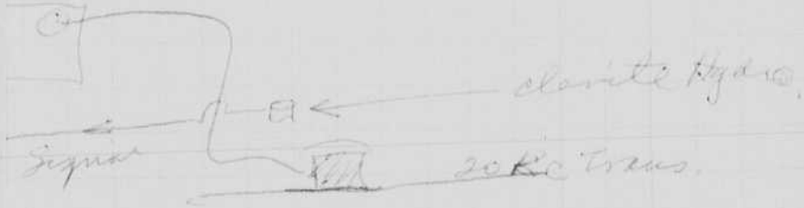
$$\frac{\text{in}}{\text{rev}} = \frac{4''}{\left(\frac{60}{900}\right)\frac{\text{sec}}{\text{rev}}} = \frac{4 \times 900}{60} = 60 \text{ inches/sec}$$

1 sec = .0666 sec = 66 ms

= 5000 ft/sec · 60/2 = 150 feet for 4"

Cable

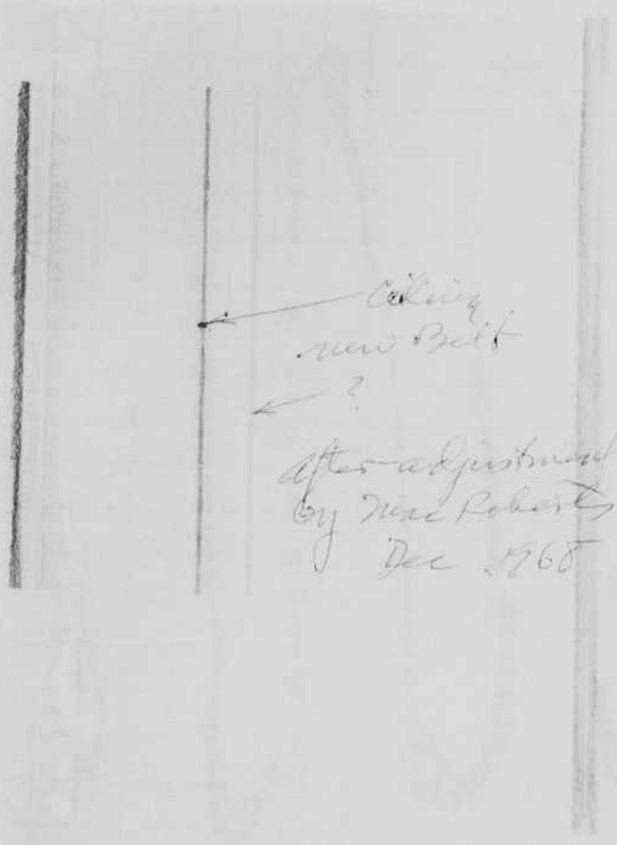




Drift due to Signal motor ~~Hunting~~ slipping. NOT IN SYNCH.

Induction motor

KCI 26 B8200 E was purchased from
Electrodes Inc 140 Hillsdale Ave for $275.
Bulletin 666-0500.
New Belt on motor Pic FA80 helped greatly to
reduce speed variation.



Dec 15 1968
Hawck Scyphter

Alden 4" recorder received last week.

Motor does not always start. 1800 r.p.m.
Twist shaft or release load momentarily.
Trim fuzzy - Ed early plans to rework.

speed of motor, Probably
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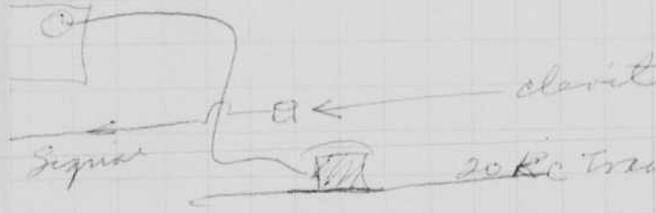
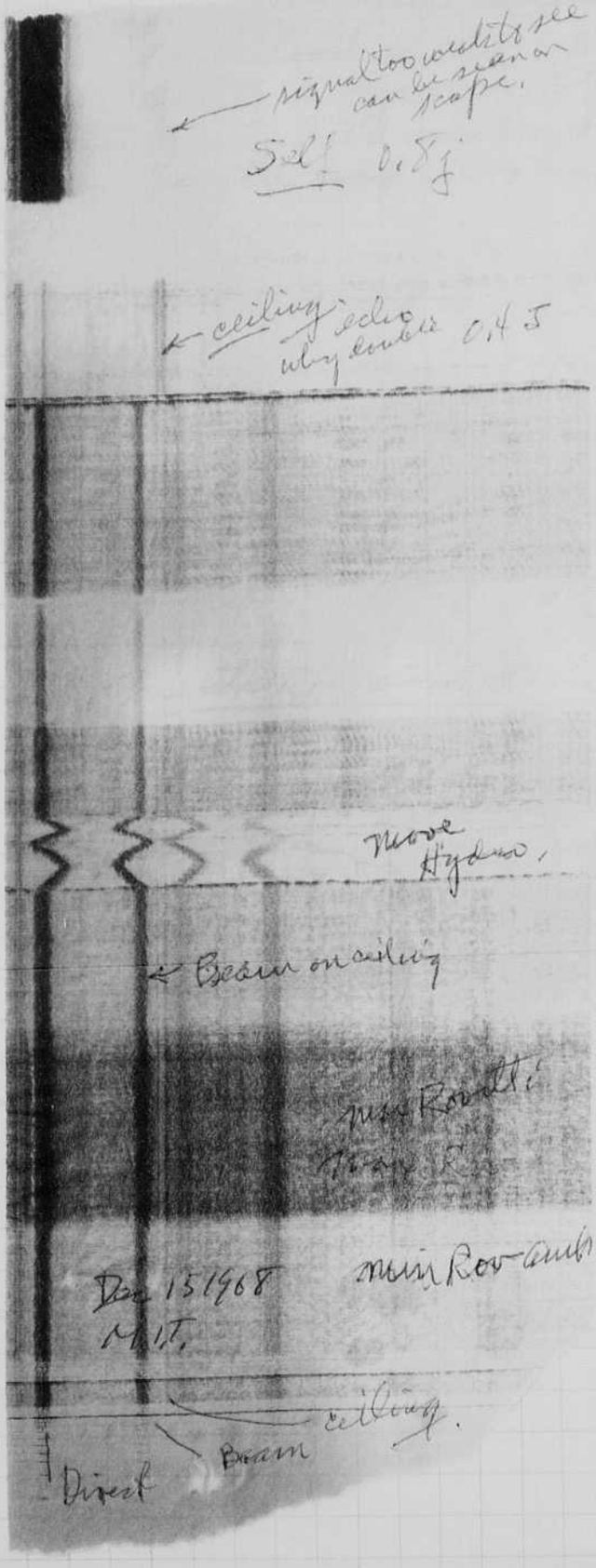




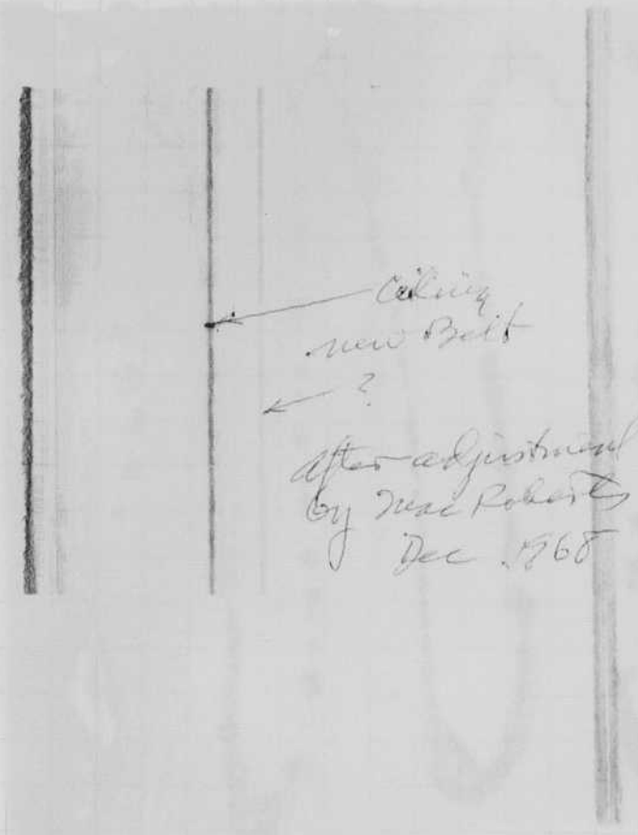
↑ Wide due to Signal motor ~~Hunting~~ slipping. NOT IN SYNCH.

Induction motor

KCI 26 B8200 E was purchased from Electronic Inc 110 Tallmadge Ave $25.75.

Pic 666-0500.

New Belt on motor Pic FA80 helped greatly to reduce speed variation.



 Dec 15 1965

Howard Royster

Alden 4" recorder received last week.

Motor does not always start. 1500 r.p.m.
Twist shaft or release load momentarily.

Trim fuzzy - Ed Curly plans to rework.

Strobe shows variable speed of motor. Probably due to load on the spiral. However it may be due to a synch motor slip phenomena.
?, Is the motor synchronous or not? If yes then the load is too heavy.

Drum runs 900 r.p.m. or slightly less.

$$\text{Speed of sweep} = \frac{4''}{\frac{1}{900}\frac{\text{min}}{\text{rev}}} = \frac{4''}{\left(\frac{60}{900}\right)\frac{\text{sec}}{\text{rev}}} = \frac{4 \times 900}{60} = 60 \text{ inches/sec}$$

Then $4'' = \frac{4}{60}$ sec $= .0666$ sec $= 60$ ms

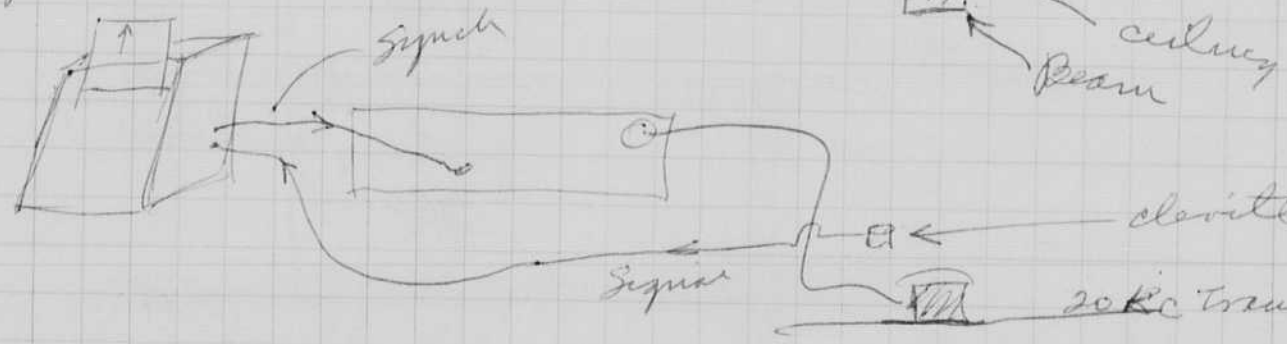
6 | 4.0 (6 | 36 | 40)

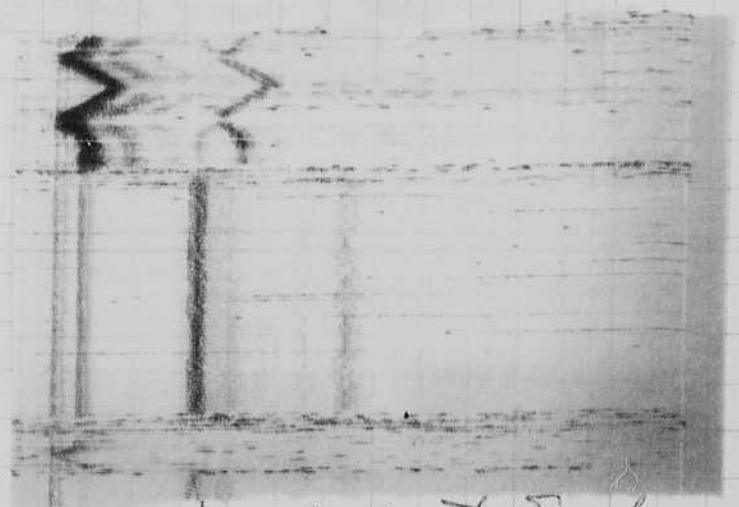
$2d = vt$

$t = \frac{2d}{v} =$

$d = \frac{vt}{2} = 5000 \frac{ft}{sec} \cdot \frac{.060}{2} = 150$ feet. for 4"

Operation in air in Strobe lab





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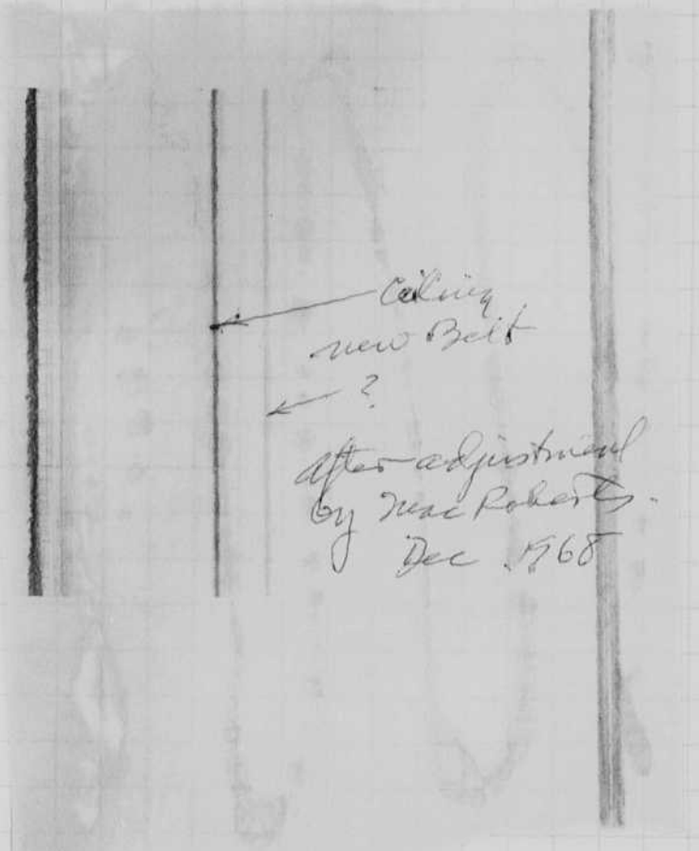

Harold E. Edgerton 11-29-68

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1969

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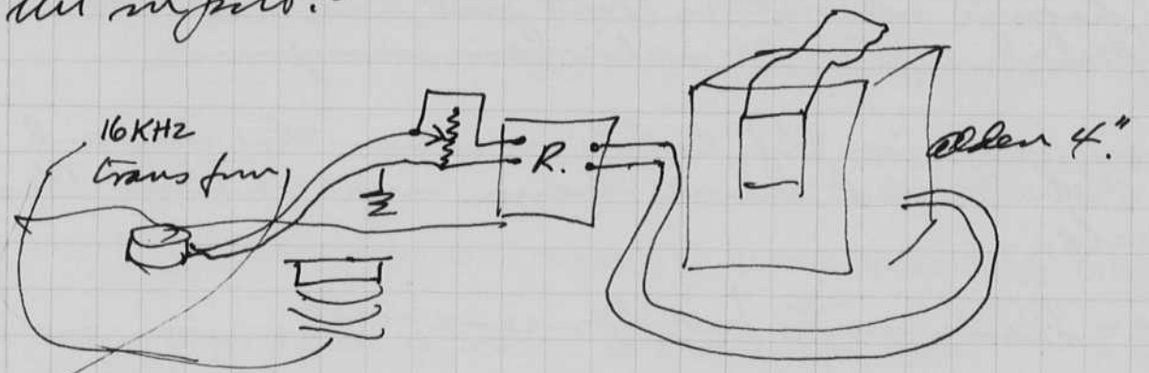

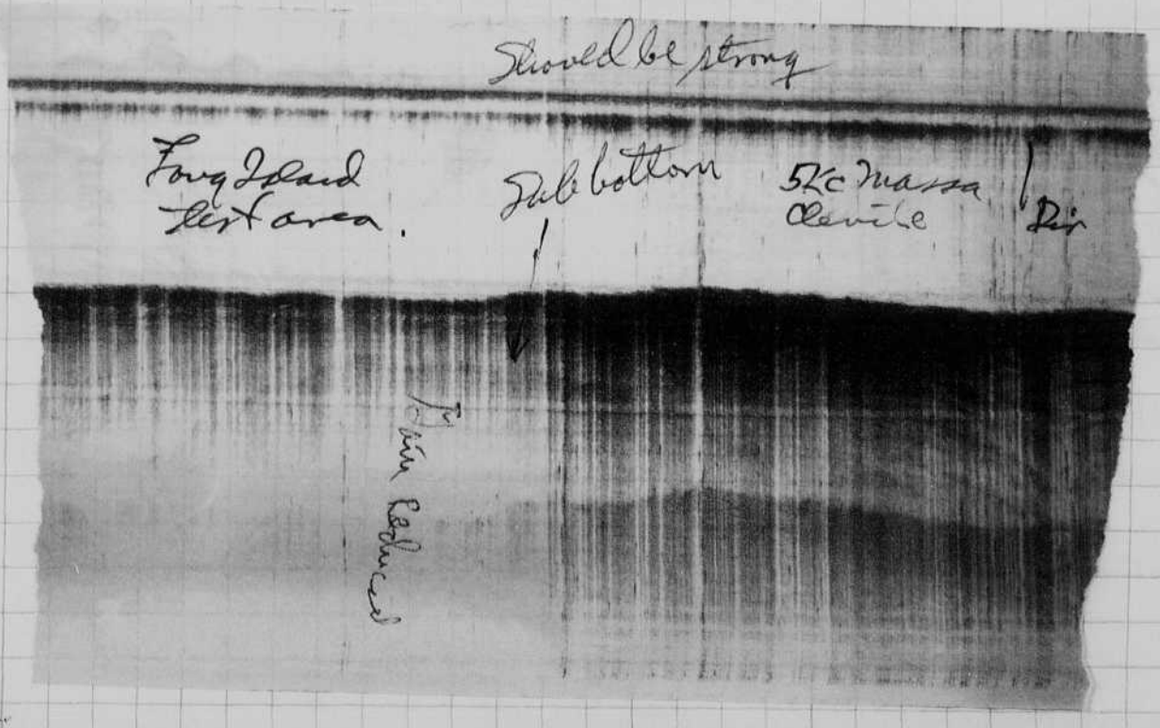

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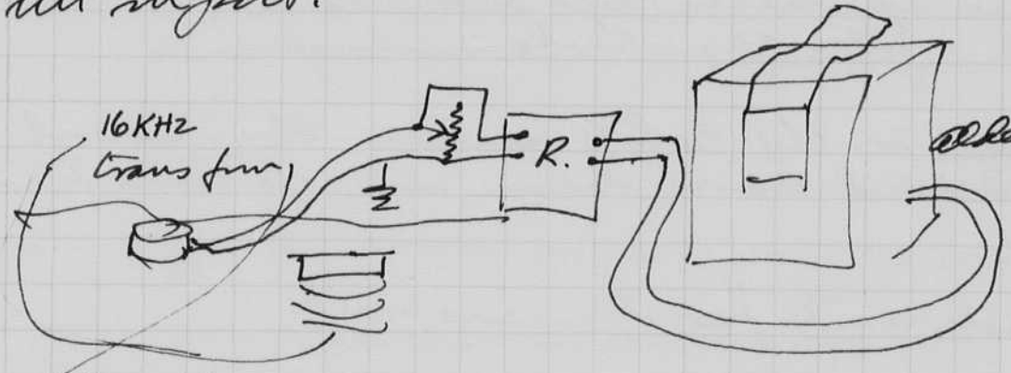
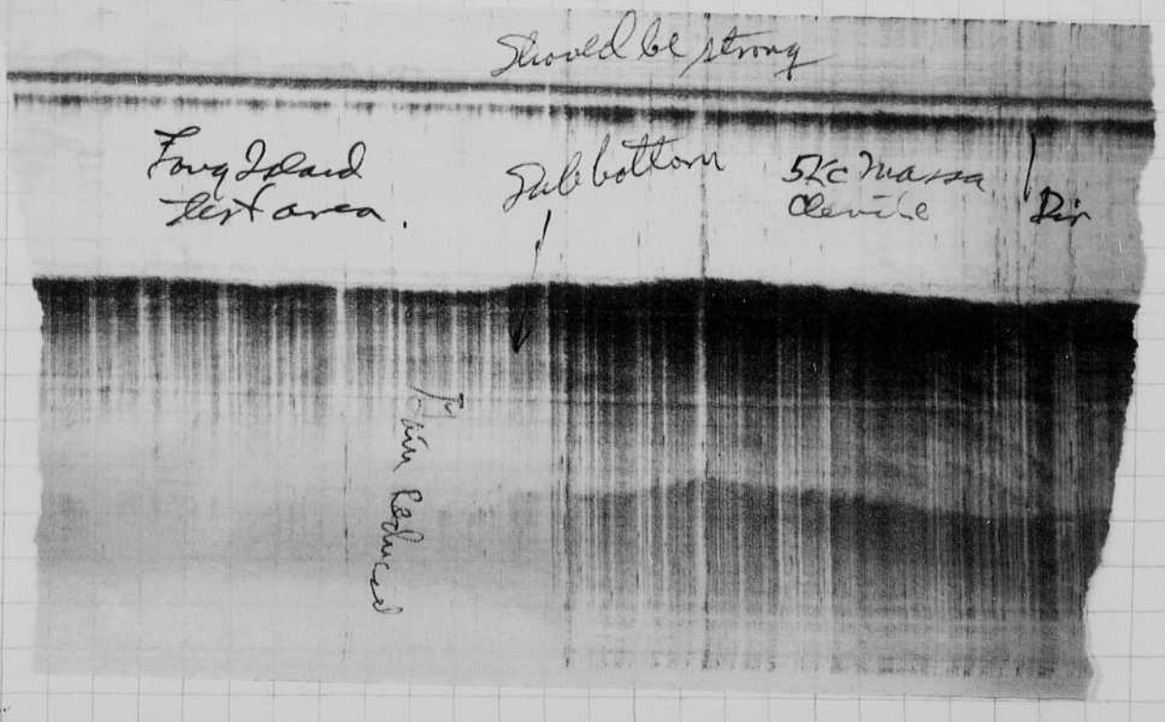


Adjustable liner.



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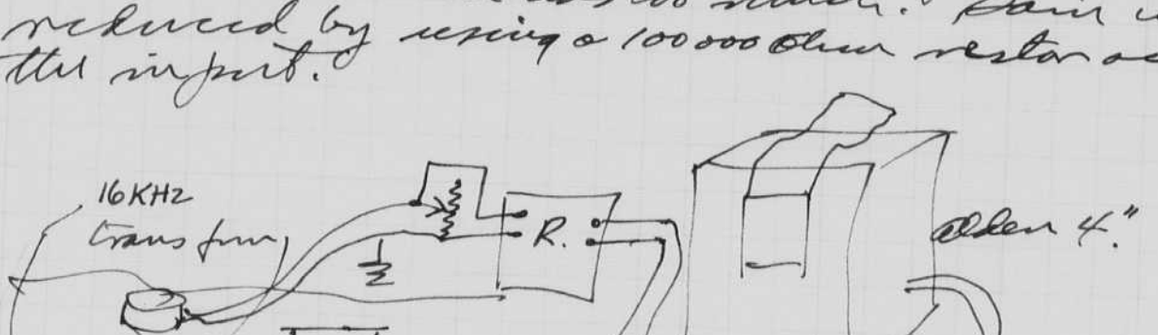

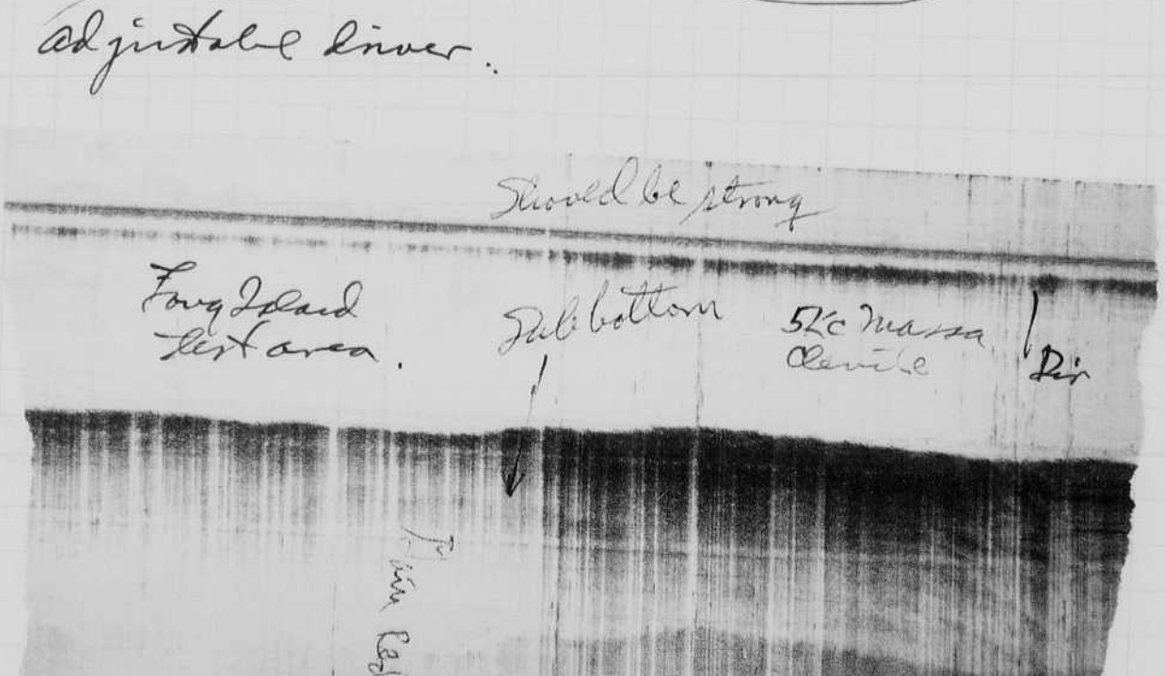

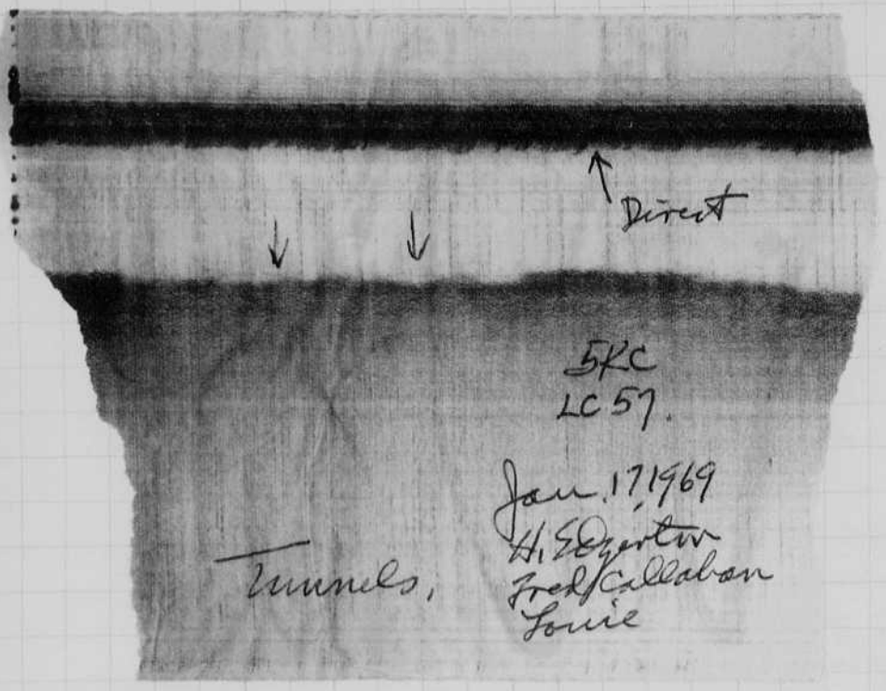

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why?

Blade does not more! Star does not engage.

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Sonar - 4" size for instrumentation

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H. Edgerton

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light (see letter to Don Cooley)

He suggests the following

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Valentine Day

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" 23 (Sun.) EG&G Winter Dinner Dance (Monticello Restaurant, Rt. 9, Framingham) 6:30 pm cocktails, 7:30pm dinner (2 seats will be held for you)

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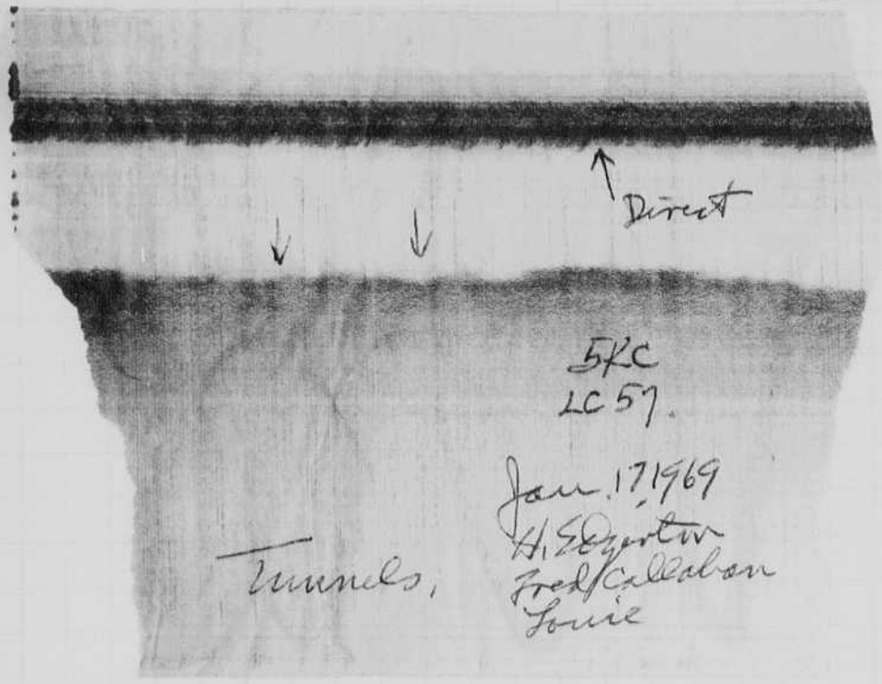

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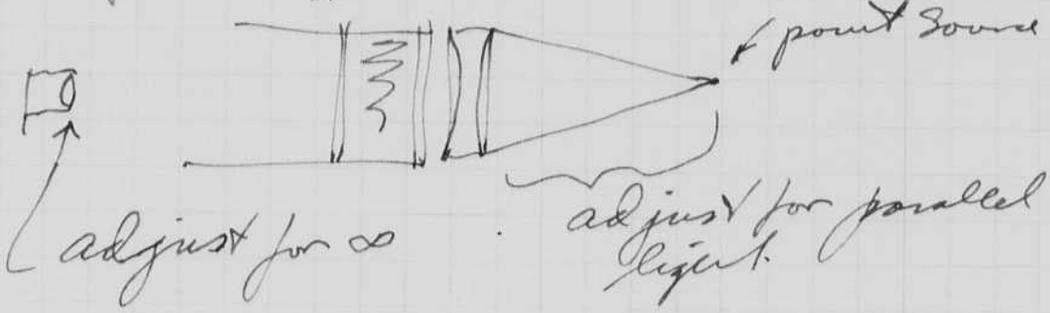

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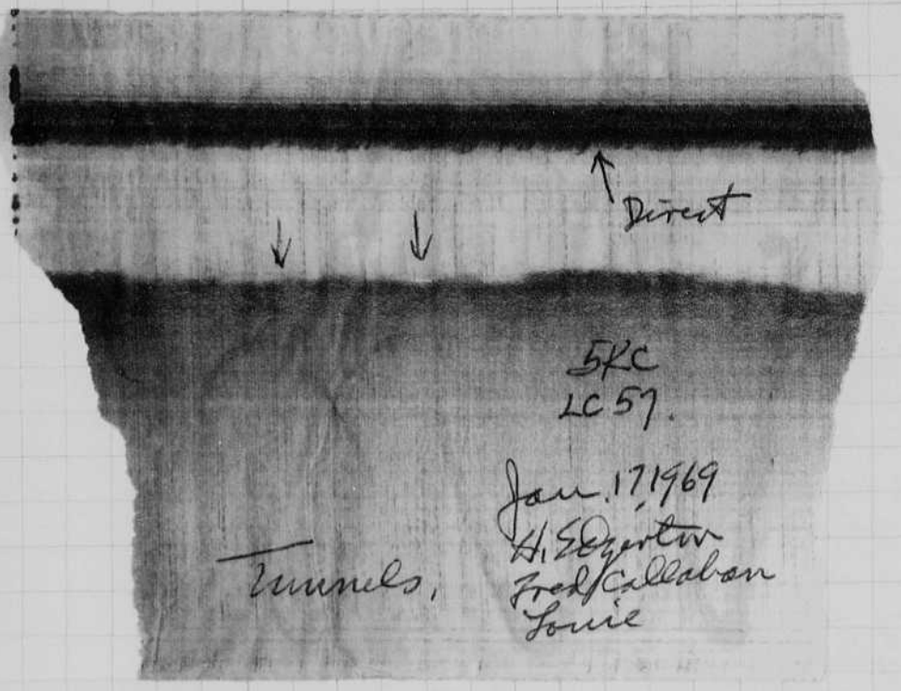

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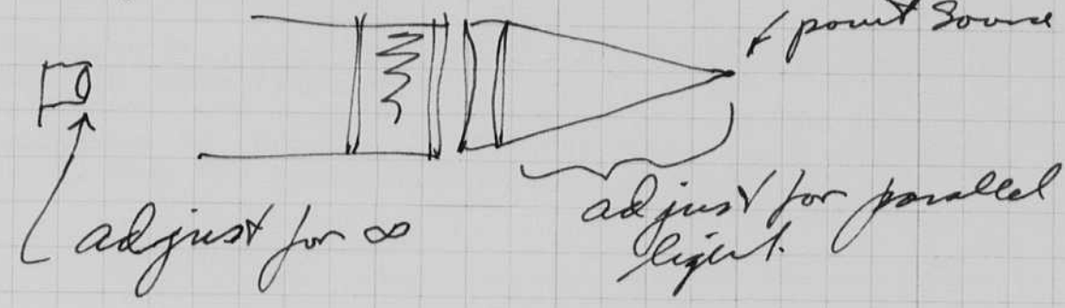

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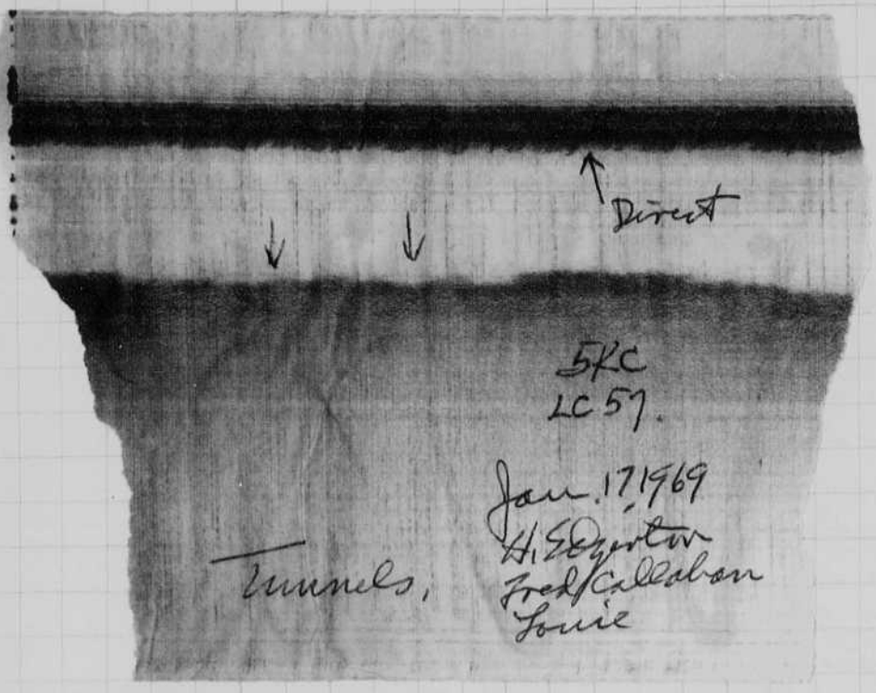

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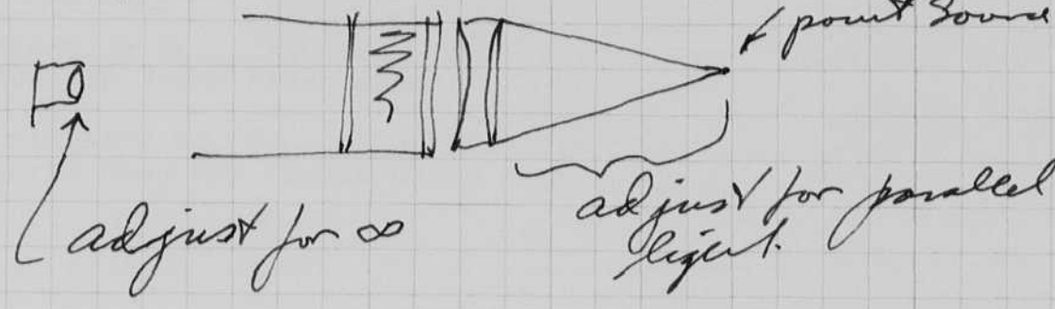

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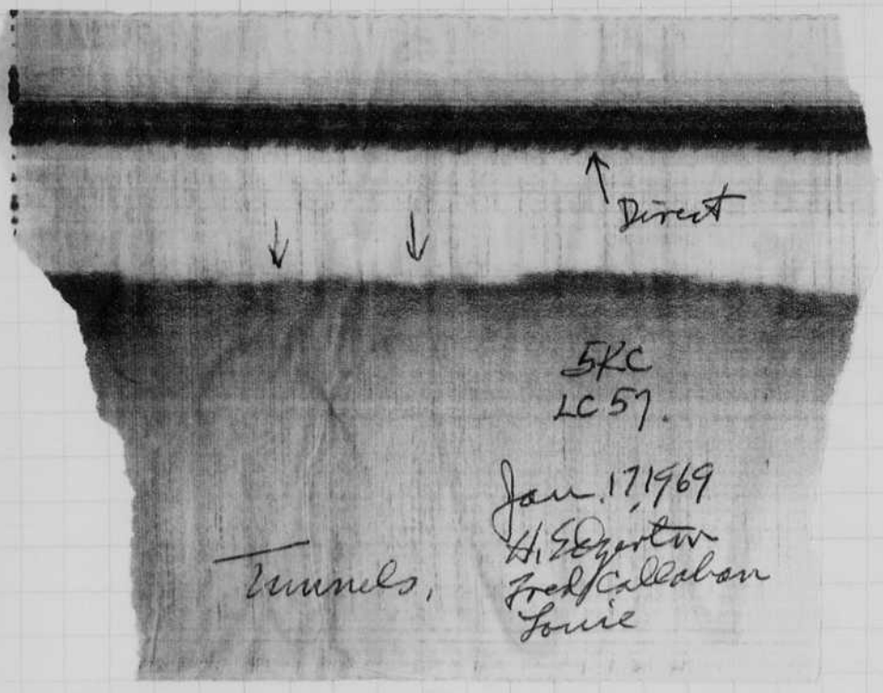

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John Thompson Rochester N.Y.
Nelly " VIII 55
Dave " Hamilton VI
Bowman VIII, 18
Hamilton college

Allen Lazarus VIII
MIT
Stamford.

Mike Barco # 17 21
Seattle W.A.

John Briggs Exp Antiles
Boston Univ. Jun Hampton

Alvo Smith IV. Jun Boston
Minneapolis

Santo IV. Penn.
phys.

Bill Ryder XII
Hamilton Mass

Wesley Erb Detroit, Mich

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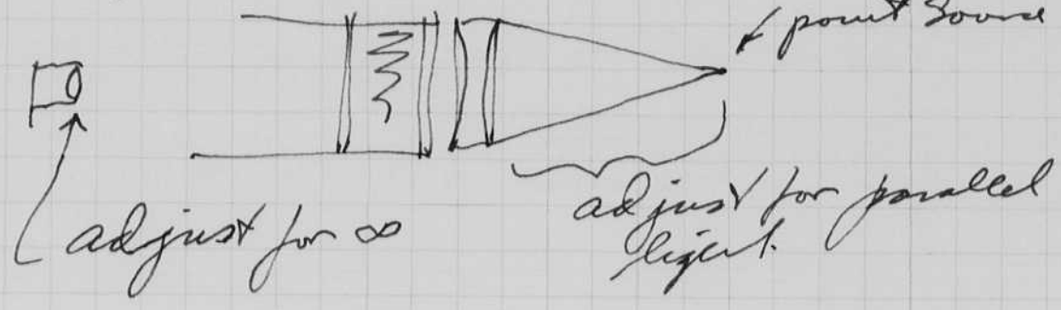

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Latham, Roy, Burton 512-B, ext. 3275, "Electromagnetic Sonar Transducer Design"

Lei, Franklin, 22 Magazine St., Cambridge, Apt. 8 864-5398 "Insulated and Open-Gap Breakdown in Xenon Flashtubes"

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STROBE LAB (Rm. 4-405 & 20D-009, ext. 4629)
Classrooms 13-5101 & 8-431

LABORATORY PERSONNEL

Edgerton, Harold, 100 Memorial Drive, Cambridge UN 4-4790
DePalma, Bruce, 240 Commonwealth Ave., Boston 262-0737 (Work: UN4-6000 x 2392)
Kayafas, Gus, 42 Craigie Street, Somerville 623-3441 (or x 4424)
MacRoberts, Bill, 105 Whidden Avenue, Whitman (1) GI 7-4172
Mooney, Jean, 27 Birch Road, Watertown 924-7124
KROTSBR 1191.8409

6.202 & 6.714

Bone, Terry, Bemis 504, East Campus, 3 Ames Street, Cambridge ext. 2871
Bullitt, Julian, 23 Avon Road, Watertown 924-4528
Edwards, William, Apt. 8, 183 Forest Hills, Jamaica Plain 522-1099
Fahlman, Scott, 22 Magazine Street, Cambridge 864-8841
Goldberg, Alan, 252C Burton House, ext. 3278
Goldstein, Andrew, Apt. 3, 262 Sidney Street, Cambridge
Haase, Wayne, 10 Bowdoin, Apt. 3, Cambridge 547-1724
Hander, Robert, 528 Beacon Street, Boston, 247-7790 or ext. 3265
Horowitz, Martin, 58 Manchester Street, Brookline 232-3258
Jackson, Greg, 58 Manchester Street, Brookline 232-3258
Kessinger, John, 362 Memorial Drive, Cambridge ext. 3161
Laing, David, Senior House, Cambridge 492-6638
McPeters, Richard, 4562 Burton House, Camb. ext. 3279
Reynolds, Jeff, 484 Beacon Street, Boston ext. 3782 or 536-1139
Rodriquez, Mike, 229 Commonwealth Avenue, Boston CI 7-9360 or ext. 3175
Rouben Ben, 158 Auburn St., Cambridge 547-2574
Schwartz, Joshua, Alumni Houses, Box 362 ext. 2871
Seymour, Robert, 3 Ames St. East Campus, ext. 2871
Staruk, Walter, Burton House, 221 B, Camb. ext.3261
Timko, Mike, Burton House, box 2231, Camb. ext. 3282
Wallin, Dick, 58 Manchester, Brookline, 232-3258
Wiener, Bob, Box 1136, Burton House, ext. 4674 or 3271

Other students approached.

Seminar 11

Autry, Reid, 532 Beacon Street, Boston, ext. 3784 or 262-3192
Bailey, Doug, 532 Beacon St., Boston, ext. 3784 or 262-3192
Baron, Dennis, Box 423, 3 Amest St., Camb. ext. 2871
Boucher, David, 64 Bay State Road, Boston, 3207
Davey, Rick, 532 Beacon Street, Boston 262-3192 or ext. 3784
Delvers, Ed, 412 Random Hall 282, Cambridge (Mass. Ave.) ext. 7564
Francis, Ronald, 37 Bay State Rd., Boston ext. 3214 or 247-8029
Geisser, Daniel, 155 Bay State Road, Boston ext. 3205 or 267-8574
Hansen, Victor, 230 Burton House, Cambridge ext. 3261
Jacobson, Alex, box 1061, Baker House, ext. 3161
Lodestro, Lynda, 236 McCormick, Camb. ext. 6997
Lopato, Leslie, 609 McCormick, Camb. ext. 6997
Mann, Stephen, 302 Holman, Senior House, Camb. 3192
Mapstone, Tim, 518 Beacon St., Boston ext. 3616 or 536-1300
Pini, Richard, 647 Baker House, Camb. ext. 3161
Roberts, Wm., 305 Goodale, Box 309 East Campus ext. 2888
Rowsam, Glenn, box 189, 3 Ames St., Camb. ext. 2871
Stamp, Michael, 58 Manchester Rd., Brookline 232-3258 or ext.
Tavan, Steven, 32 Hereford St., Boston, ext. 2955 or 247-8355
Turner, Mark, box 5452 Burton House, Camb. ext. 3270
Zahler, Bob, Holman 304, 4 Ames St., Camb. ext. 3192

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STROBE LAB (Rm. 4-405 & 20D-009, ext. 4629)
Classrooms 13-5101 & 8-431

LABORATORY PERSONNEL

Edgerton, Harold, 100 Memorial Drive, Cambridge UN 4-4790
DePalma, Bruce, 240 Commonwealth Ave., Boston 262-0737 (Work: UN4-6000 x 2392)
Kayafas, Gus, 42 Craigie Street, Somerville 623-3441 (or x 4424)
MacRoberts, Bill, 105 Whidden Avenue, Whitman (1) GI 7-4172
Mooney, Jean, 27 Birch Road, Watertown 924-7124
KROTSER 1141-8409

6.202 & 6.714

Bone, Terry, Bemis 504, East Campus, 3 Ames Street, Cambridge ext. 2871
Bullitt, Julian, 23 Avon Road, Watertown 924-4528
Edwards, William, Apt. 8, 183 Forest Hills, Jamaica Plain 522-1099
Fahlman, Scott, 22 Magazine Street, Cambridge 864-8841
Goldberg, Alan, 252C Burton House, ext. 3278
Goldstein, Andrew, Apt. 3, 262 Sidney Street, Cambridge
Haase, Wayne, 10 Bowdoin, Apt. 3, Cambridge 547-1724
Hander, Robert, 528 Beacon Street, Boston, 247-7790 or ext. 3265
Horowitz, Martin, 58 Manchester Street, Brookline 232-3258
Jackson, Greg, 58 Manchester Street, Brookline 232-3253
Kessinger, John, 362 Memorial Drive, Cambridge ext. 3161
Laing, David, Senior House, Cambridge 492-6638
McPeters, Richard, 4562 Burton House, Camb. ext. 3279
Reynolds, Jeff, 484 Beacon Street, Boston ext. 3782 or 536-1139
Rodriquez, Mike, 229 Commonwealth Avenue, Boston CI 7-9360 or ext. 3175
Rouben Ben, 158 Auburn St., Cambridge 547-2574
Schwartz, Joshua, Alumni Houses, Box 362 ext. 2871
Seymour, Robert, 3 Ames St. East Campus, ext. 2871
Staruk, Walter, Burton House, 221 B, Camb. ext.3261
Timko, Mike, Burton House, box 2231, Camb. ext. 3282
Wallin, Dick, 58 Manchester, Brookline, 232-3258
Wiener, Bob, Box 1136, Burton House, ext. 4674 or 3271

other students to approve list!

Seminar 11

Autry, Reid, 532 Beacon Street, Boston, ext. 3784 or 262-3192
Bailey, Doug, 532 Beacon St., Boston, ext. 3784 or 262-3192
Baron, Dennis, Box 423, 3 Amest St., Camb. ext. 2871
Boucher, David, 64 Bay State Road, Boston, 3207
Davey, Rick, 532 Beacon Street, Boston 262-3192 or ext. 3784
Delvers, Ed, 412 Random Hall 282, Cambridge (Mass. Ave.) ext. 7564
Francis, Ronald, 37 Bay State Rd., Boston ext. 3214 or 247-8029
Geisser, Daniel, 155 Bay State Road, Boston ext. 3205 or 267-8574
Hansen, Victor, 230 Burton House, Cambridge ext. 3261
Jacobson, Alex, box 1061, Baker House, ext. 3161
Lodestro, Lynda, 236 McCormick, Camb. ext. 6997
Lopato, Leslie, 609 McCormick, Camb. ext. 6997
Mann, Stephen, 302 Holman, Senior House, Camb. 3192
Mapstone, Tim, 518 Beacon St., Boston ext. 3616 or 536-1300
Pini, Richard, 647 Baker House, Camb. ext. 3161
Roberts, Wm., 305 Goodale, Box 309 East Campus ext. 2888
Rowsam, Glenn, box 189, 3 Ames St., Camb. ext. 2871
Stamp, Michael, 58 Manchester Rd., Brookline 232-3258 or ext.
Tavan, Steven, 32 Hereford St., Boston, ext. 2955 or 247-8355
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Photograph by Crawford H. Greenewalt, '22

Reprinted from Technology Review, March, 1969
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Massa Hydrophone picks up in contact.

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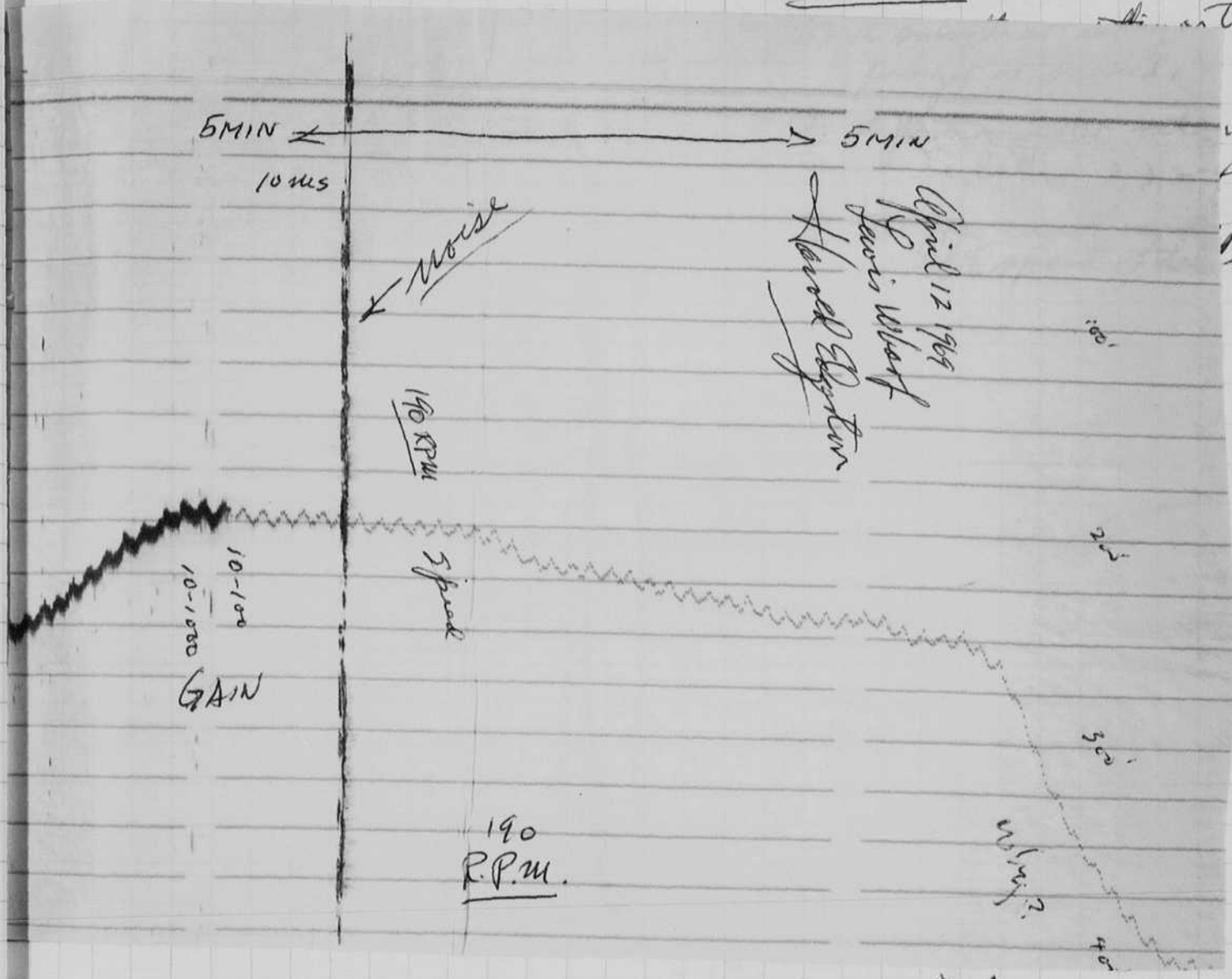
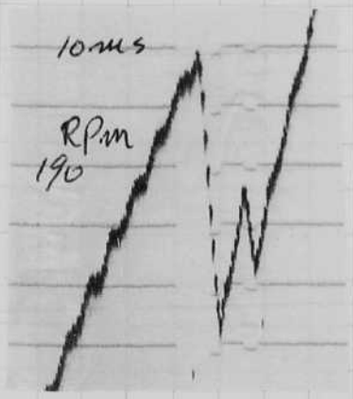
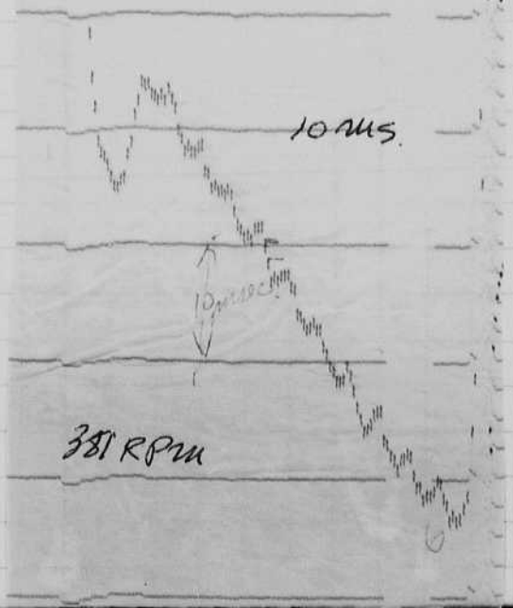


would
1 per sec.
send to
recorder!



Shows difficulty to adjust the speed to match the pinger



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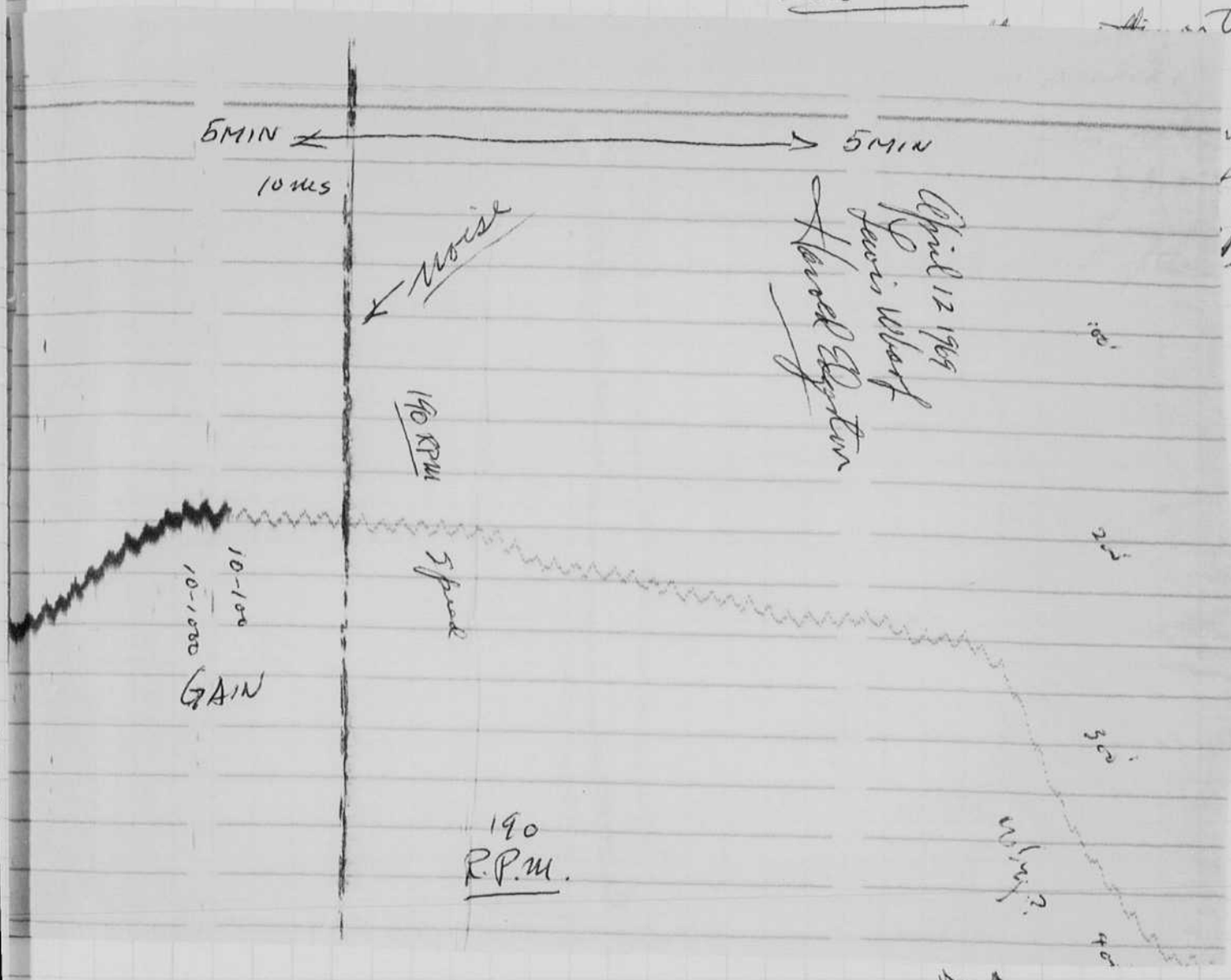

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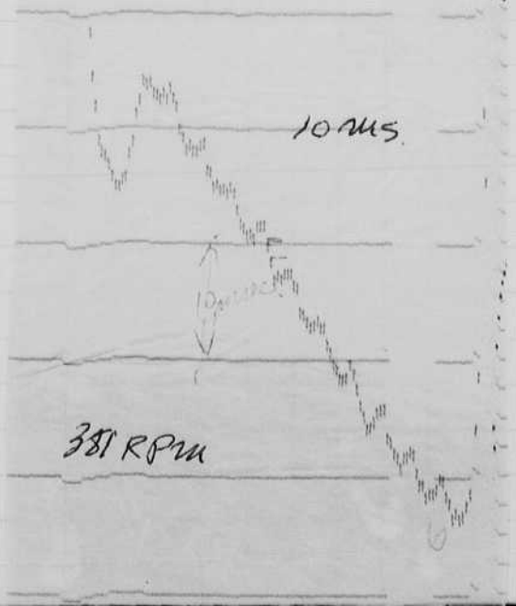

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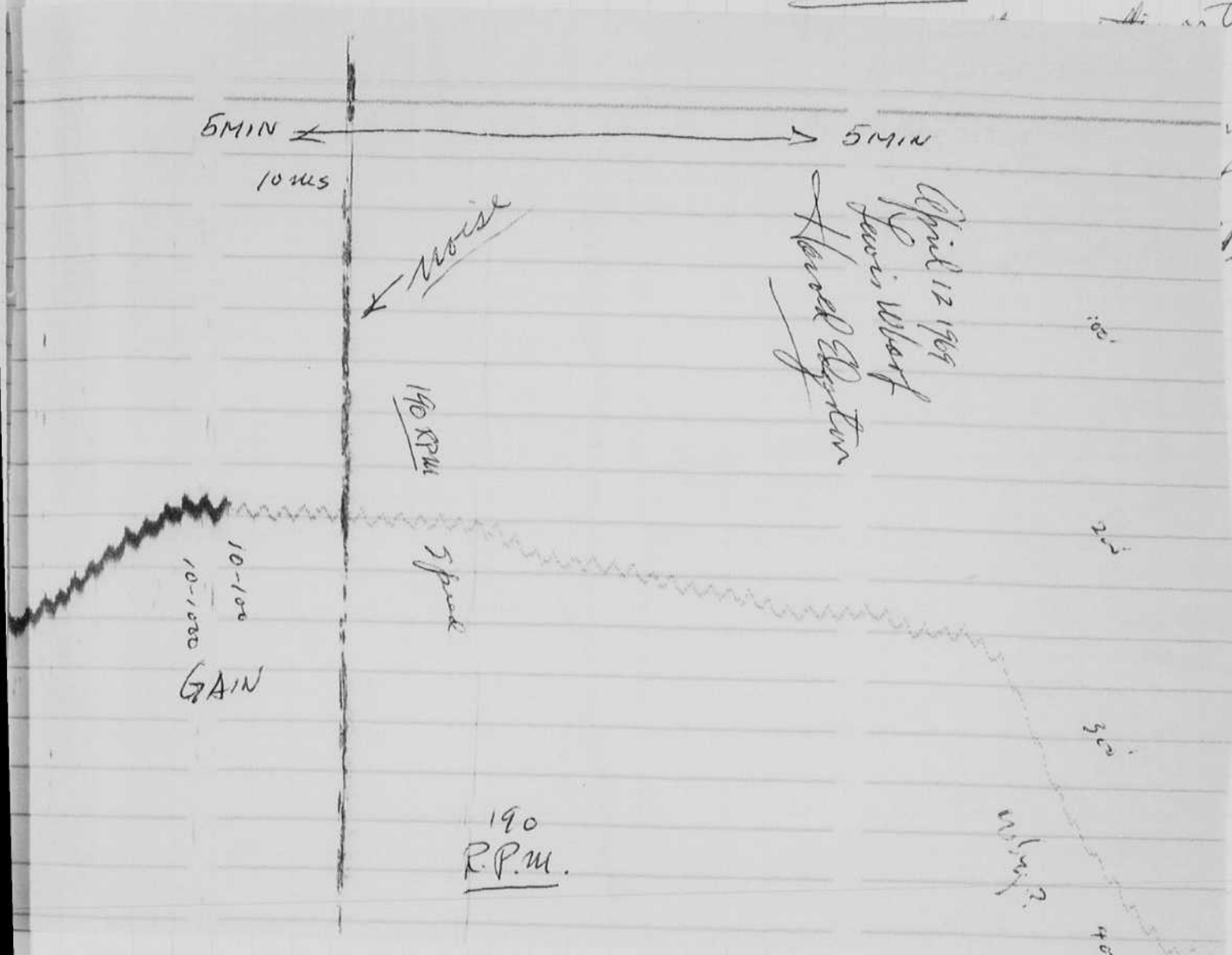

would
1 per sec.
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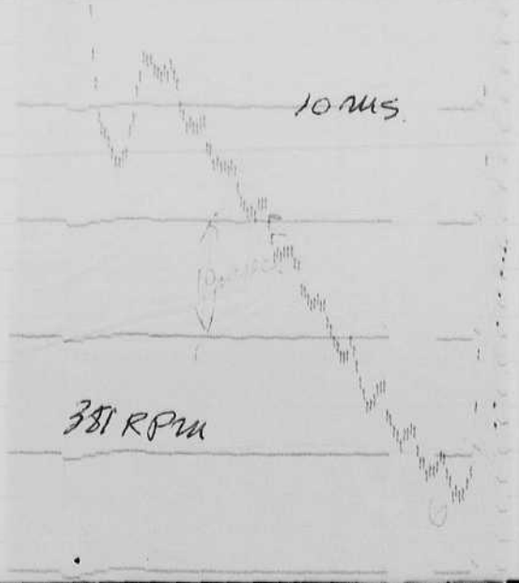

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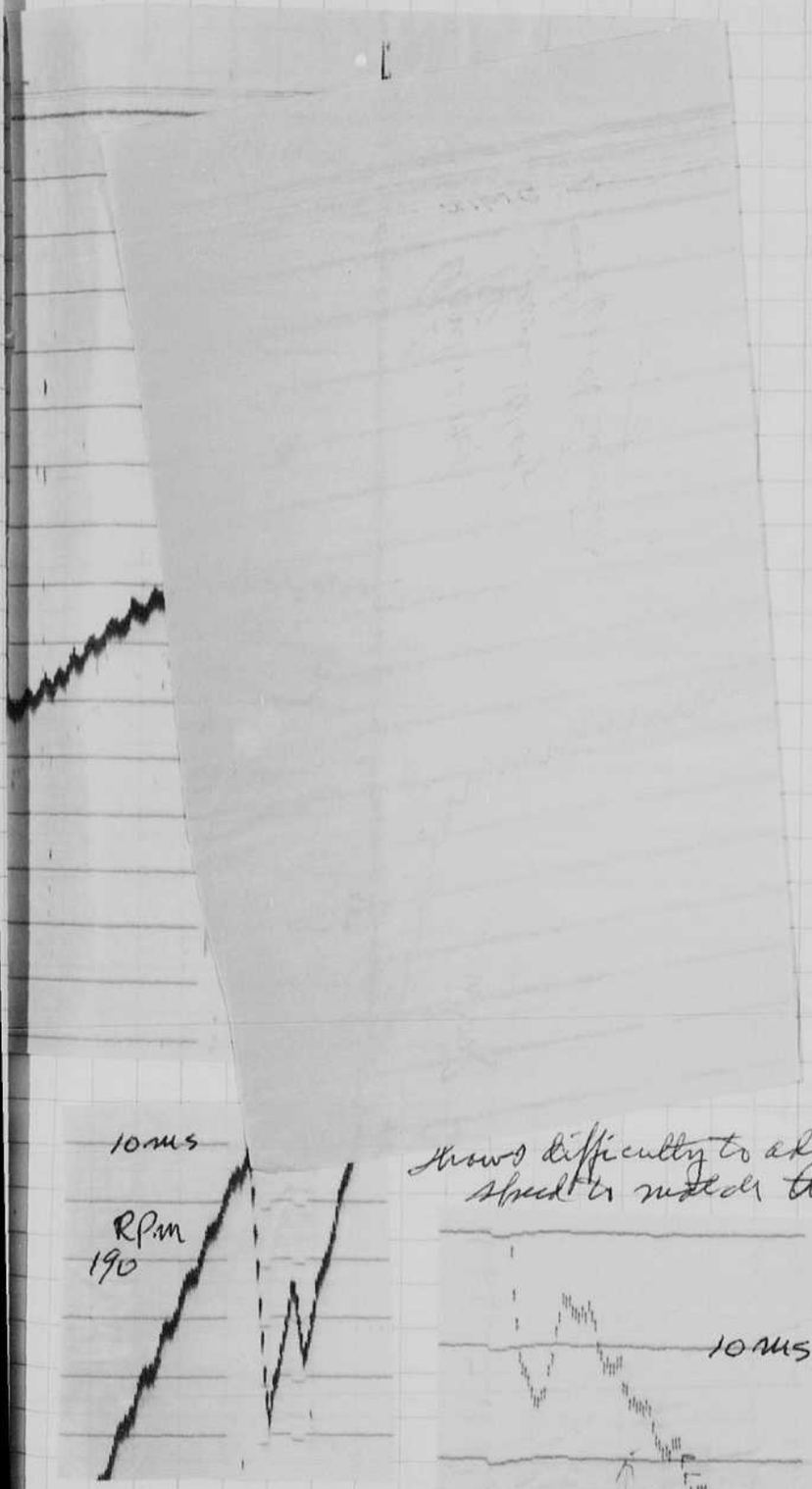
(1) a smoother setting on the pinger is needed.

(2) a ~~faster~~ faster rate would be better 2, 3, or 4 per sec.

3. The freq must correspond to the speed of the recorder!



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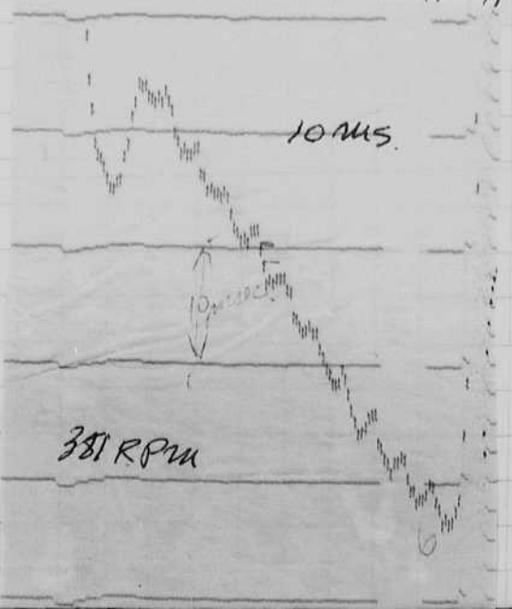
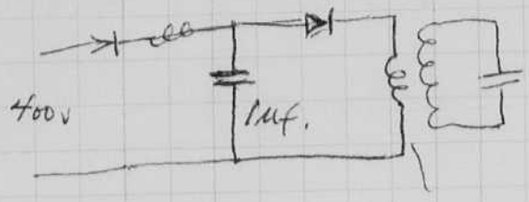


This was a lucky Break!

April 19, 1969 H. Edgerton

Further experiments were made yesterday at Lewis Wharf on the stability problem of the pinger and the EG&G 254 recorder. It is impossible to ~~hook~~ hook them together. I believe the 254 is not stable enough.

I was at EGC Lab in ~~Salem St~~ Beverly last week to see the new recorder. It seems to synch ok for the pinger. Now I need a crystal controlled frequency at 1 per sec or 2 per sec with lots of power for penetration. Try 1 ~~mf~~ mf at 900 volts.



1/2 cycle = $\frac{1}{10{,}000}$ sec.

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

$\left(\frac{T}{2}\right) = \pi\sqrt{LC}$ $\quad \left(\frac{T}{2}\right)^2 = L$

$I_{max} = E\sqrt{\frac{C}{L}}$ $\quad \frac{}{C\pi^2}$

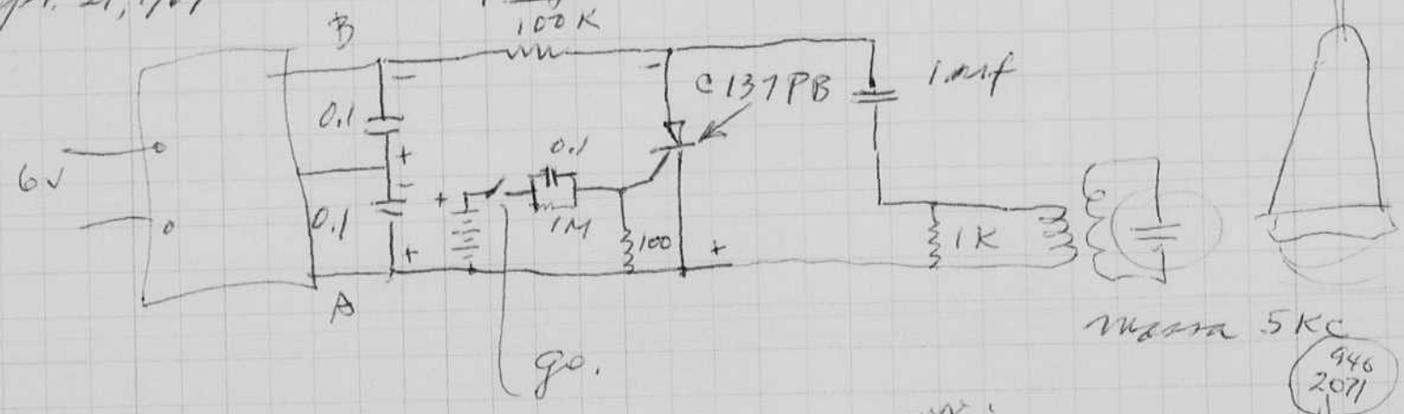
Known T, C,

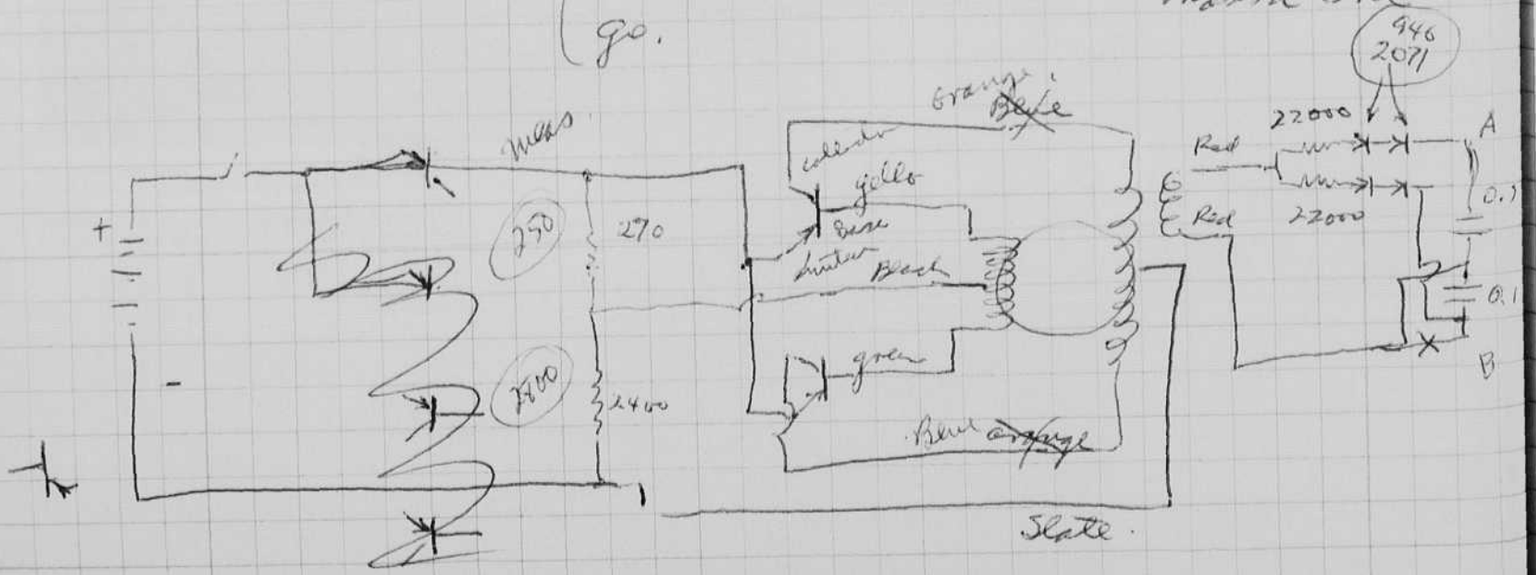
what is $I_{max} = E\sqrt{\frac{C}{L}}$

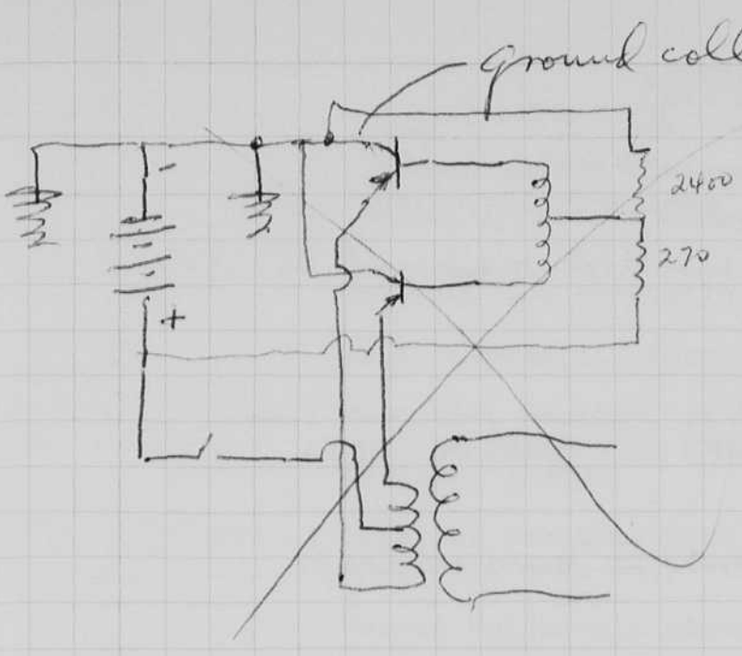
$= E\sqrt{\frac{C \times C\pi^2}{\left(\frac{T}{2}\right)^2}} = E\frac{C\pi}{\left(\frac{T}{2}\right)} = \frac{900 \; 1\times10^{-6} \; 3.14}{10^{-4}} = 27$ amp.

Apr. 21, 1969

Pinger.



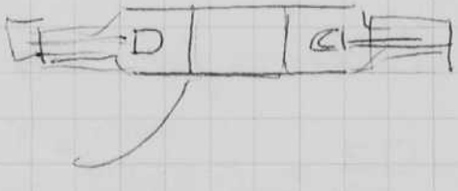




April 21, 1969.

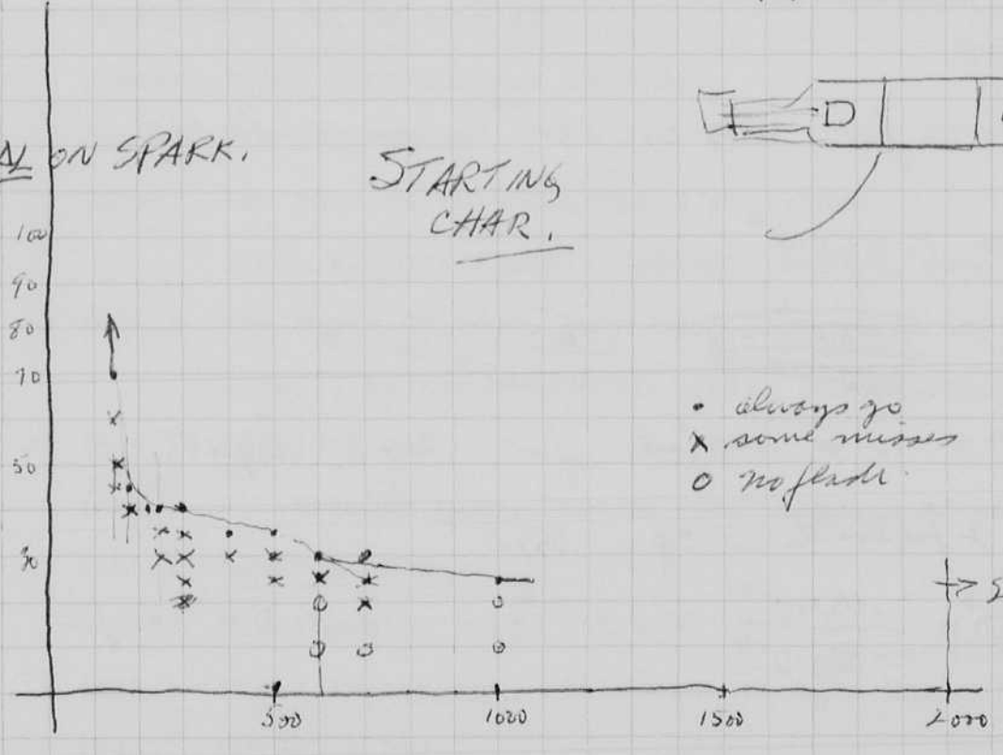
FX113C-1 Starting tests. (22-47)

12.6 mf paper. BL&G Flashlamp for Birds.



DIAL ON SPARK.

STARTING CHAR.



• always go
X some misses
O no flash

→ Self greater than 2000 V.

Apr. 25, 1968 Mt Washington tests

Harold Edgerton Dr. Howells 271-5506 Day
802 4039 night

Prudential Bldg. – Harvard mem. church 37° Right
Bunker hill monument 35° Left.

FT-17A in 30° reflector

measured by Jim Keyser. 150 x 2 360 mfd at 4kV 200,000 B.C.P.S.

$$\frac{CPS}{D} = \frac{200000}{(150 \times 5280)^2 \text{ (.792,000 ft)}^2} = .32 \times 10^{-17} \times 10^{6} = .32 \times 10^{-6} \text{ lumen sec/sq ft.}$$

$.63 \times 10^{12}$ ft²

Try bare strobotac lamp.

$.140{,}000 \times 10^{6}$ cp bare at low speed 100 f.p.m.

$.25 \times 10^{-6}$ sec duration.

.35 C.P.S

what distance for ~~.32~~ 0.32×10^{-6} lumen sec/sq ft

$$\frac{CPS}{D^2} = 0.32 \times 10^{-6}$$

$$D^2 = \frac{.35}{.32 \times 10^{-6}} = 10^6$$

so $D = 10^3 = 1000$ feet. for same light.

Use Density 2 filter then cp = $.35 \times 10^{-2}$

$$D^2 = \frac{.35 \times 10^{-2}}{.32 \times 10^{-6}} = 1 \times 10^4 = \quad \text{and } D = 100 \text{ ft.}$$

Sabbatical for Book

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" " " Mus. of Science (& W.H.O.I.) meeting, Dr. A. Maxwell to lecture, 5:30pm

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140

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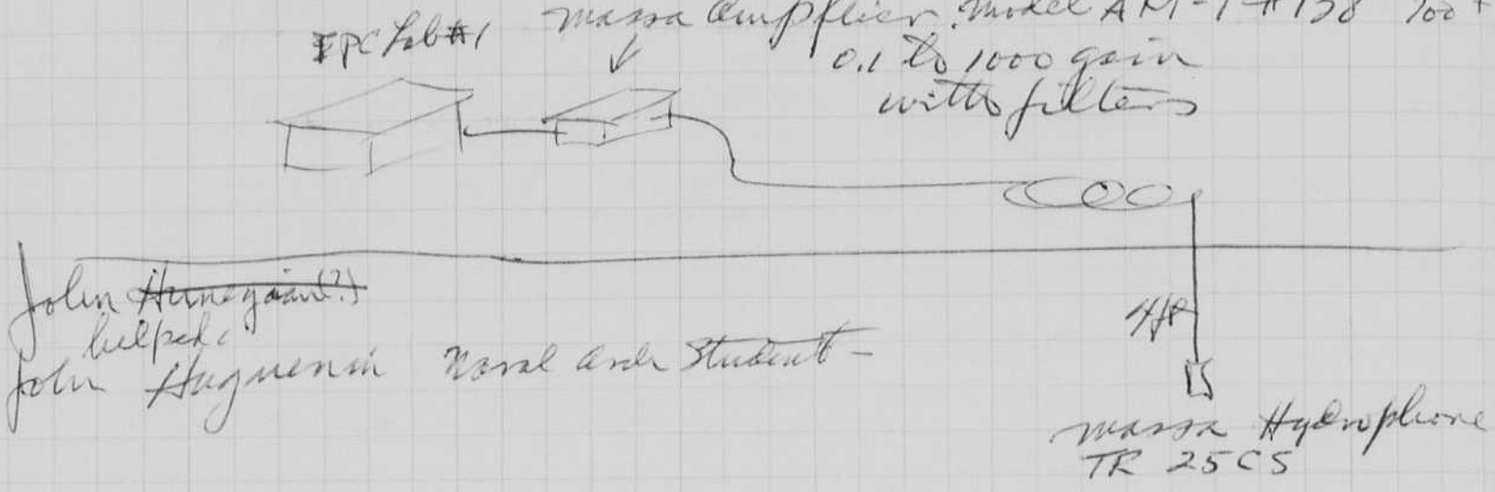
142 May 2 1969. Pinger in Charles

Harold E. Edgerton.

Experimented with 2PCarbey using his new recorder for the first time in the water – the Charles.

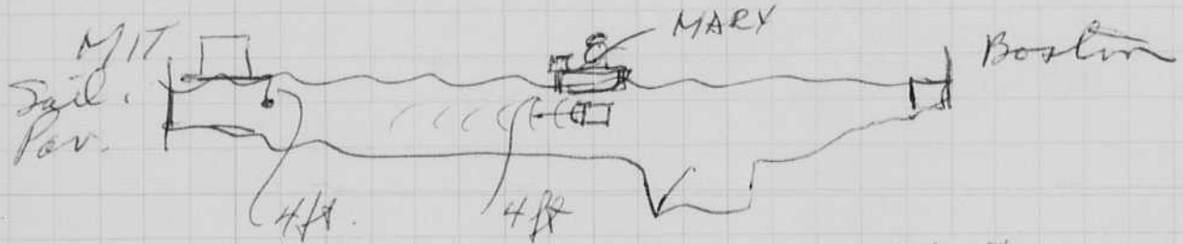
We put the receiver in the MIT Boat house.



The 12Kc pinger was run from a crystal controlled oscillator.

also a similar oscillator operated the servo on the recorder.

the results were excellent on the experiment.



The results show directionality of the transmitter and absorption of the sound by the water.

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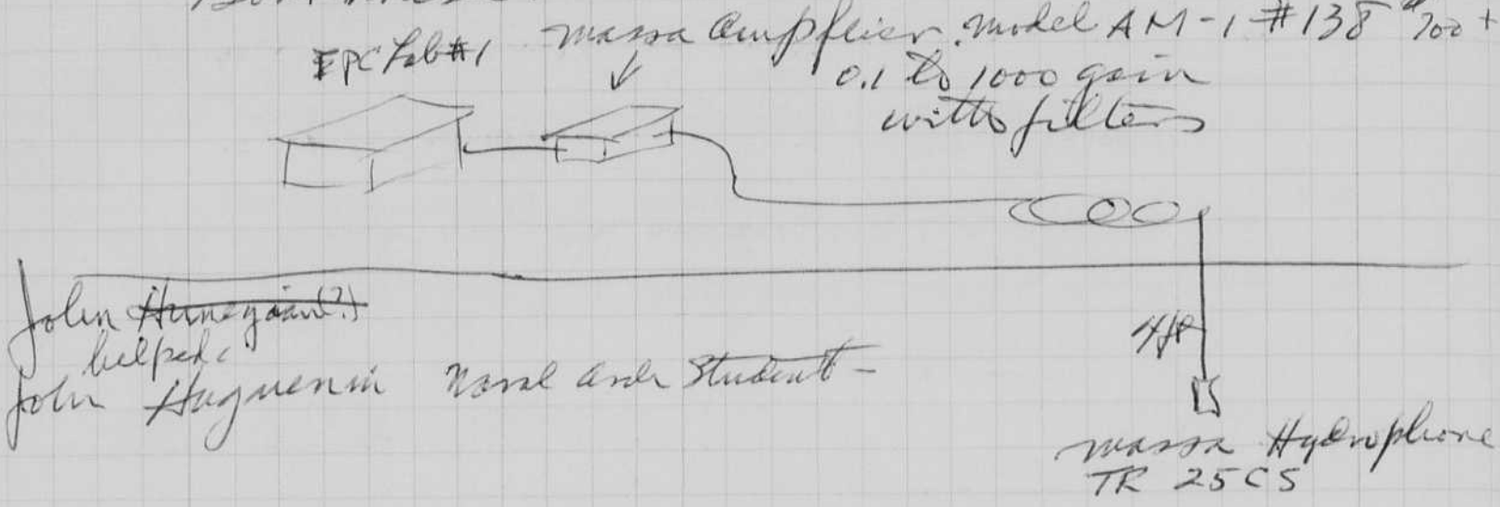
142 May 2 1969. Pinger in Charles

Harold E. Edgerton.

Experimented with EPCarbey using his new recorder for the first time in the water - the Charles.

We put the receiver in the MIT Boat House.



The 12Kc pinger was run from a crystal controlled oscillator.

also a similar oscillator operated the sweep on the recorder.

The results were excellent on the experiment.

The results show directionality of the transmitter and absorption of the sound by the water.

H. E. Edgerton

March 19, 1969

Mar. 19 (Wed.) Prof. C. Gordon to lecture at Brandeis University, Golding Building, 8pm

" 24 (Mon.) Ind. Photog. of N. E., Piety Corner Gardens, 260 Lexington St. Waltham, 6pm cocktails (Bill Ginevicz, ext. 81-5059)

" 24 - 27 IEEE Internat'l. Convention, Hilton Hotel, New York City

" 25 (Tues.) EG&G Dir. meeting, 9:30am

" " " Mus. of Science (& W.H.O.I.) meeting, Dr. A. Maxwell to lecture, 5:30pm

" 28 (Fri.) Univ. of New Hampshire, Durham, H. H. Prof. Blanchard (868-5511 ext. 380) Kingsbury Hall - noon luncheon & lecture

" " " Walter Feinberg's class dinner (The Barge) 6pm

Mar. 31-Apr. 6 SPRING VACATION

April 3 (Thurs) MIT Seattle Club (Wash. athletic club) lecture (Otto Kirchner, 9640 NE 32 St.)

" 6 (Sun.) EASTER SUNDAY

" 13 (Sun.) Tech Nursery School (Bob Weatherall) rm. 26-100, 3pm

" 14 (Mon.) Mus. of Science (?)

" 15 (Tues) EG&G, Stockholders meeting

" 16 (Wed.) JYC (may be ?) J.Y. Cousteau

" 17 (Thur) Ken Read on TV - Channel 5 at 9:30am

" " " Prof. W. Chesterman - Geology lecture, noon

" 18 (Fri.) New Haven College, Dean Lyon, 11:45am (lecture for 1 hr.±)

" " " A-Ball, Walker Mem. (Mike Nesja, Senior House, ext. 3192)

" 21 (Mon.) PATRIOTS DAY

May 2 (Fri.) St. Botolph Club, Boston - MIT members of the Nat'l. Ac. ofSci.

" 3 (Sat.) MIT Open House

" " " Faculty Club Party

" 7 (Wed.) Texas Instrument, Attleboro (Richard Barone) lecture, ~~7~~ 6:30 cocktails 7pm dinner

" 11 (Sun.) MOTHER's DAY

" 17 (Sat.) Boston Sea Rovers Clinic

" 19 (Mon.) Museum of Science meeting, 12:15

" 22-25 W.H.O.I., Dr. Paul Fye, "Uses of the Seas" conference

" 26 (Mon.) Doane College, Crete, Nebraska (MEMORIAL DAY)

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May 29 1964.
Harold Edgerton.

Ed Carley is putting a 4 mf capacitor into the pings 5KC so he can get more zip out of it. He says the output with 2 mf is about 90 db. We should have 110 or 120 to be effective.

Course 061 seminar (freshmen) students discuss silhouette photography of bullets in the Strobe Lab with Prof. Harold Edgerton. Left to right:

Drew Gillett, Prof. Edgerton, Charles Hanf, Bonnie Miller, Scott Stoney, Robert Cohen, Michael Stauffer, Richard Fish, Eugene Viens, Don Falkenstein, Nagasato Uchida, Greg Shubin, Donald Seltzer (checkered shirt), Cris Davis, John Hyde, Lower front - Gus Kayafas (Lab Assistant), Jim Davis
Missing from photo - Loren Freudenberg, Gary Chirlin, and Steve Gass

H. E. Edgerton

May 7, 1969

May 7 (Wed.) E.E. Department Faculty meeting, 2pm, room 10-250
Open Faculty meeting, 4 pm, room 9-150

" 7 " Texas Instrument, Attleboro 6 pm cocktails, 6:30 pm dinner, Bernie Kulwicki and Dr. Burkhalter (Dir.) HU-2-5967

" 8 (Thurs) M.I.T. Club of Boston (lecture) Union Oyster House, 12 noon John Stelling, 232-2105 "Applications of PUlsed Sound to Underwater Archaeology & Geology"

" 11 (Sun.) Endicott House, E.E. Department tea, 3pm
" " " Sigma Chi, 5-8 pm –
MOTHER's DAY

" 14 (Wed.) N. E. Aquarium Board meeting, 12:30 pm
" " " Faculty meeting, 3:15 pm

" 15 (Thurs) Leave for Bermuda. Panamar.

" 17 (Sat.) Return from Bermuda ~~on~~ Hamilton US Coast Guard.
" " " Boston Sea Rovers ~~cocktail-party~~ Barge., 8 pm, party 11 pm

" 19 (Mon.) Museum of Science meeting, 12:15 pm

" 20 (Tues.) RLE's Annual Research Review, 9 - 5 pm
" 21 (Wed.) " " " " "

" 22-25 W.H.O.I., Dr. Paul Fye, "Uses of the Seas" conference

" 26 (Mon.) Doane College, Crete, Nebraska (MEMORIAL DAY) with Esther Aurora Nebraska.

" 28 (Wed.) H.E.E. - Last Class

" " " N. E. Aquarium Trustees meeting, 6 pm / Harvard Club/introduce Finder (H.E.E. to ~~lecture~~)

" 30 (Frid.) Leave for Columbia, S. C., Dr. Tom Jones with Esther

" 31 (Sat.) Leave for ~~Charlotte~~ Hickory by car.

June 12 (Thurs) Graduation Eve Party, Mike Mann, ext. 3283

" 13 (Fri.) Graduation Day - M.I.T.

" 15 (Sun.) FATHER's DAY

~~" 16-18 Marine Tech. Society, Florida~~

~~" 22 (Sun.)~~ Southampton, England to Mid-Atlantic Rift Valley,
July 16 (Wed.) (with Mike Hobart)
Aug. 22 (Fri.) Boston, Mass. return from Rift Valley expedition, aboard AKADEMIK KURCHATOV, Russian research vessel

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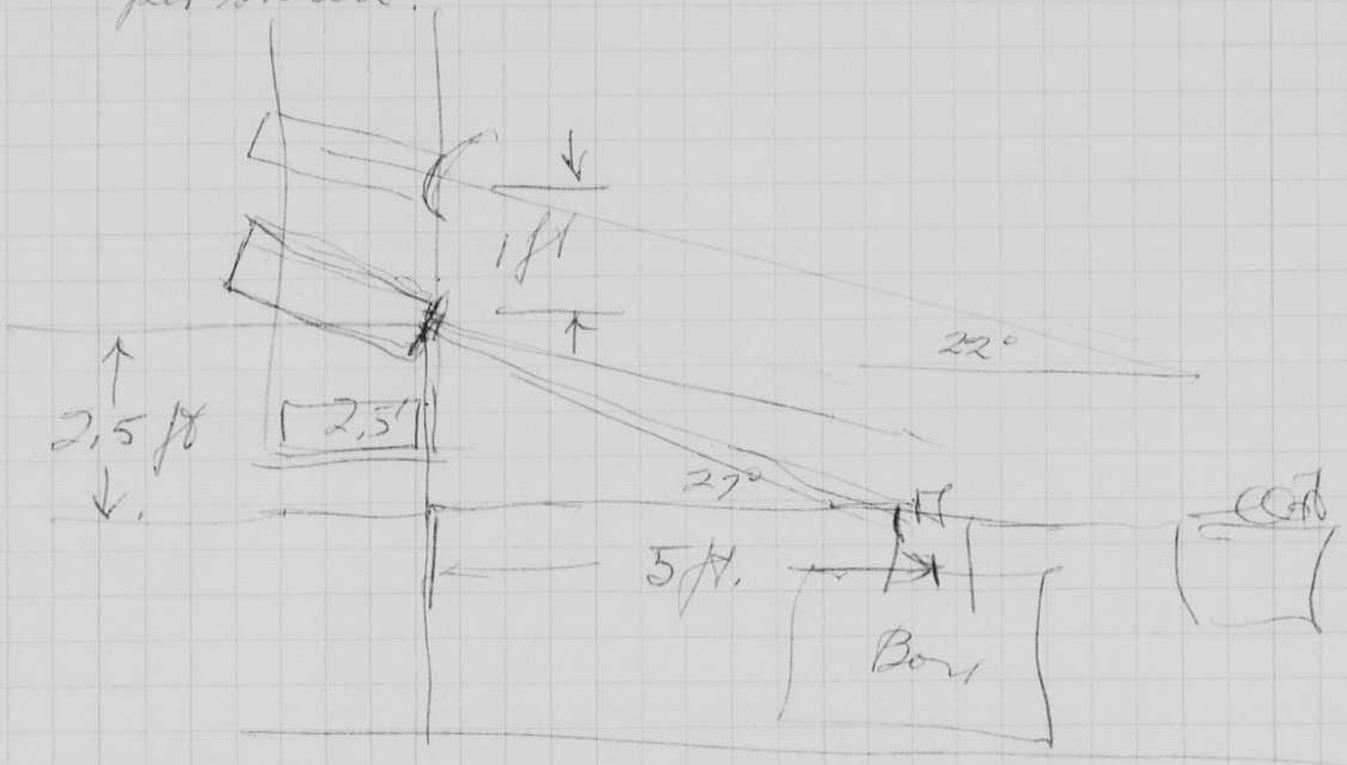
June 8. 1969 Deep Sea Camera Tests
type 206 #646. 35 mm cassette. Camera #50.

The camera and a strobe were mounted on a finger framework. First I tried 45° down. Then I changed it to 27° with the light at 22° and 1 ft above as per sketch.



Pan x film at f16 5 ft in air 1/50 sec.
Dev. in DK 50 for 20 minutes. Exp obs in air.
Suggest f 8 in water.

June 13 1969 → **Malfunction due to switch lead in water. 2 ocean trips and one in MIT pool to find it!**

Long fest last night at Stratton Hall. Ted Wood Guitar Johnny Ward Banjo. Neil Tornberg Trumpet & Uke. 1030 pm.
Good. Today.

Mark systems model 230 Processor Serial No 155 was used to process Panatomic x film at ASA 160 f11 with 50 WS strobe in pool was underexposed.

June 4 1969 Mass Amplifier AMI - #138

Input .005 volts p.to.p. fm H.P. 1309A oscillator 830 hz.
Output. 60 db - .005 volts but with ripple fm AC.
Bats were down to 5 volts.
No amplification
Changed to 7.8 volt bats 3
Burgess c5 Radio A.
Gain now 1 at 60db. with
no ripple.

40 db. gain is 10

20 db. gain is 100

0 db gain is 1000. ✓
Bat and ac both ok.

Why ripple when db is 60 to 100.

Tektronix 30 10 20 scope type 323 sony.

Notebook # 29

Filming and Separation Record

___ unmounted photograph(s)

2 negative strip(s)

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

was/were filmed where originally located between page 146 and 147.

Item(s) now housed in accompanying folder.

 June 20 1969
H. Sharp

Tested camera June 19. in Sea. Negs foggy in Long Island test range. Nancy Zernohausen went along.

June 20 tests were 3½ miles east of Graves light. Went ok.

5' focus 30" tripcord 26° camera exposure meter
" 18" " " " " " focus fuzzy. Lamp aimed too ~~too~~ light.

could be improved
Vibration in pictures due to camera tipping.

Curley recorder made a good recording of the Long Island range.

G.B. UDINTSEV

June 25. 69. Cable from Udintsev Moscow.
Kurchatov not in South Hampton before July 15. 1969. We were originally supposed to be met at S.H. on June 20.- then 25- now more delay.

Jim Sholer is going with me. We are all packed ready to go.

Yesterday we unpacked the Hydroplane and plan to make tests with them at Lewis wharf today.

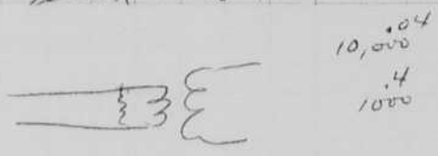
Test of Hydrophones.
June 26 1969 at Lewis wharf.

Note TR61 is the best!

Source TR61 Massa 5KC with improved transformer. EG&G driver 0.1 0.2 0.4 and 0.8 watt sec.

June 26 1969.
H. Edgerton.
J. Snoder.

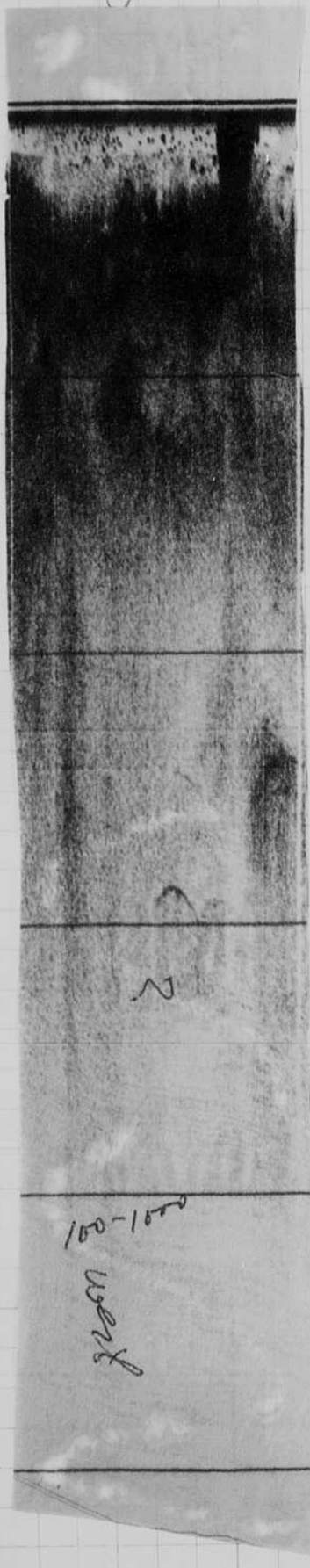
Lewis wharf.

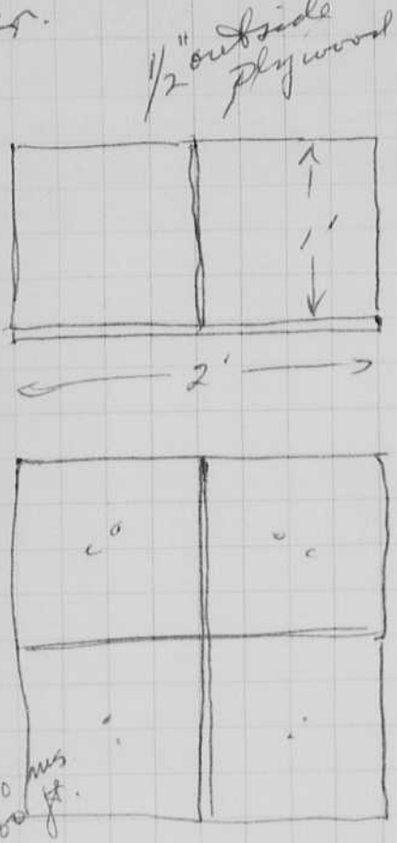


Driver TR61 from EG&G. Dis Rec.		Hydrophone 3ft deep.	Volts p. to p.	Noise
Dist. 11¼	0.1 joule normal.	LC32	0.4	.05
	.2 — N	"	0.6	
	.4 — N	Repaired model	0.8	
11¼ ± ¼	.8 N	50ft cable,	1.0	
	.8 Short	with moulded	.45	
	.1 N	Splice	0.4 volts	
	.1 N	LC32 with home made cable splice, Small cable.	0.4	
11¼	0.1 N	Massa 1 ft deep.	1.0 volts. (6) to 1 volt.	
	0.1 N	3 ft " deep.	.5	
	0.1 N	LC57 in lead weight.	.2 to .4	
	0.1 N.	Watch case	.2 to .5. large range of outputs	
	0.1 N	" "	.8 to 1.2-1.4 why? Forward	
	0.1 N	TR61 5000 ft	12. side ways (2.5 N = 0.5 m s) 40 vert. 5 N = 1 m s.	
	0.1 N	Spider.	0.1	
	0.1 N	144 DT-70 BQR3A	.5	Heavy Long Hydro Navy.
	0.1 N	B89. DT168A-BQR2D	.2	Short Hydro Navy
	0.1 N	~~EBC~~ Eel in tube.	.2 - .4	
Front & Back signal of TR-61 front		11 ft .5 v.	.50	10 to 1 front to Back.
		3 ft. .2 v	.05	

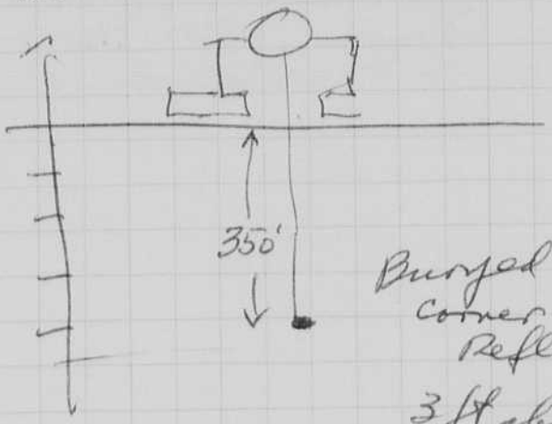
150 June 27 1969
H. Edgerton
Hans Shrler.

Test of Corner Reflector

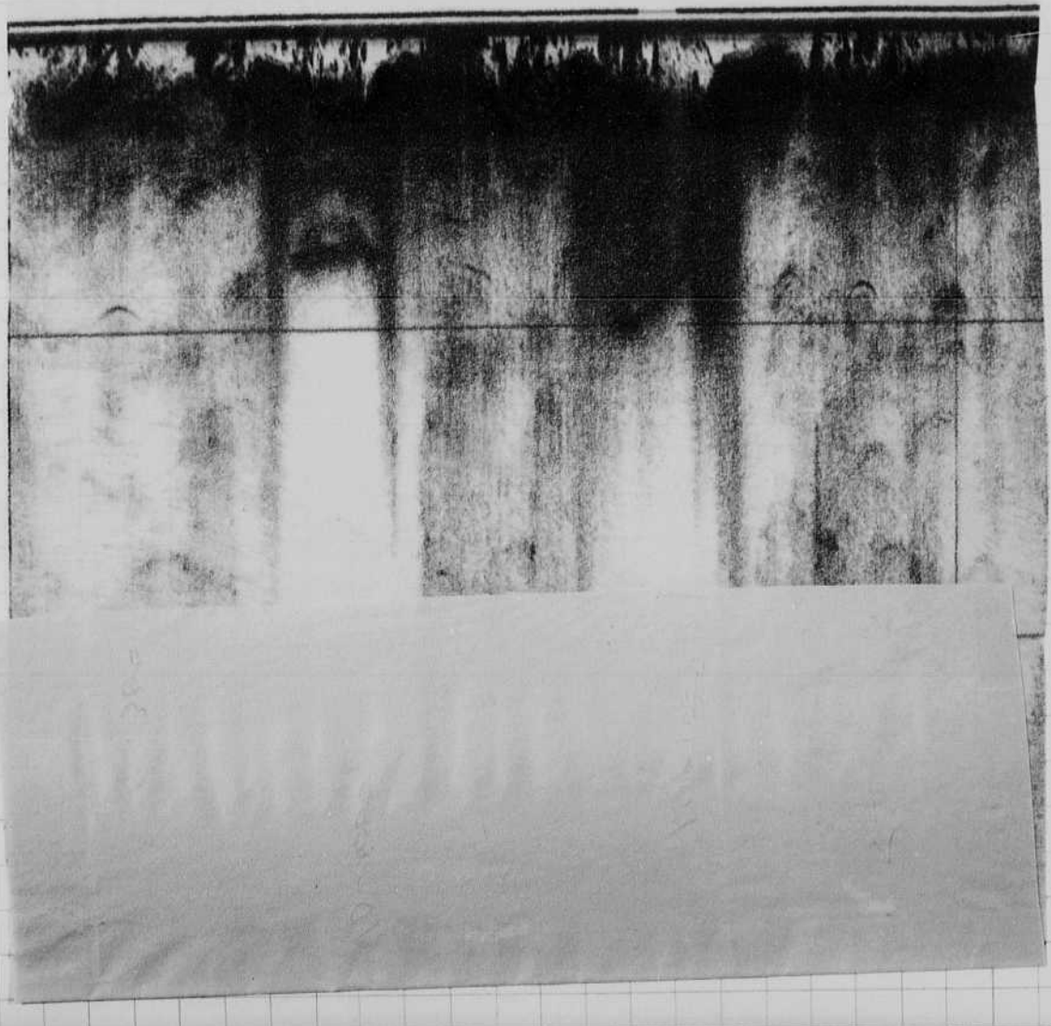




Tested in Charles River.



We could see it nicely from the north at 350 feet. See records. We could not see it at this or any distance from the south or west or east. Why!??



Lamp test. 206 Decksyne w

July 2, 1969 - Kz. Jim Sholer Bill Mackoberts

Pressure tested Prizer case and bottom Switch. were tested at 5000 psi 10 min.

Sea link connector failed at 5000 psi and 10 min.

Flat white Back to base	6'	22,5	810.
Flat white lamp inside out front in	6'	21	755
Small Salira to 7/8"	6'	49	1770
Small Salira 1/2" to back.	6'	82	2960
Forge EG&G 1/8 to back	6'	53x2 106	3820
Forge EG&G. 3/4 to back. 1 1/2	6'	53x2 106	3820
Forge EG&G. 7/8" to back	6"	38x2 76	2740
Small Salira all back.	6'	40	1440.
"	6'	38	1370
" 30°L	6'	17	610
" 30°R	6'	17	610

July 4 1969. Tested Deep Sea Camera 205, 206 system used #2 South of Grouper ledge

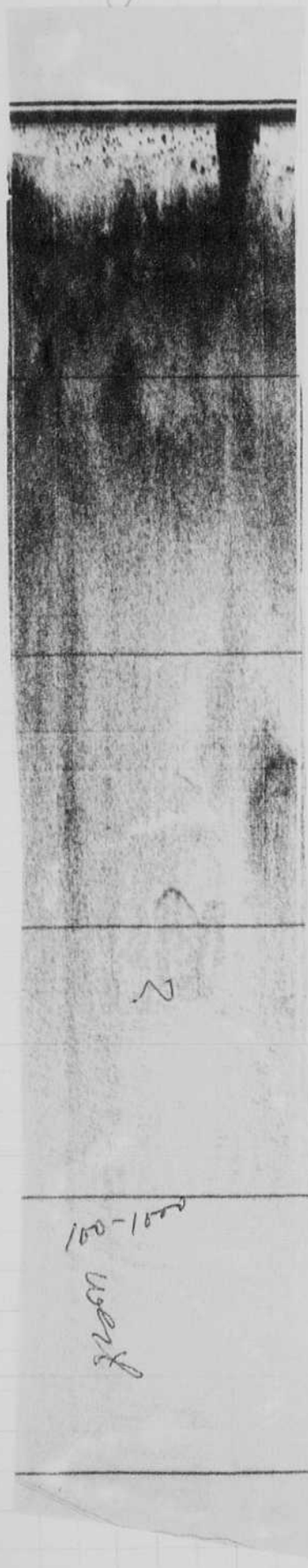
f 16 Plus X film ok at 3 ft

Closeups out of focus, steep place.

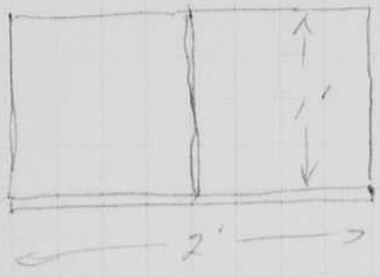
Jim Sholer Joe Harold Curley. - H. Bowman & H. Edgerton on SHARK.

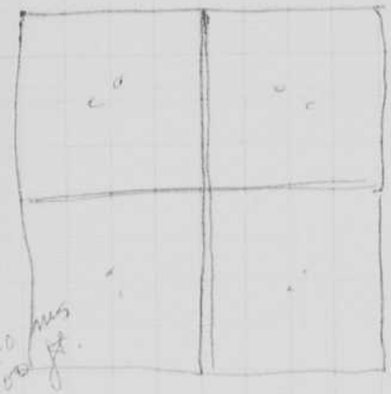
150 June 27 1969
H. Edgerton
Hans Shuler.

Test of Corner Reflector

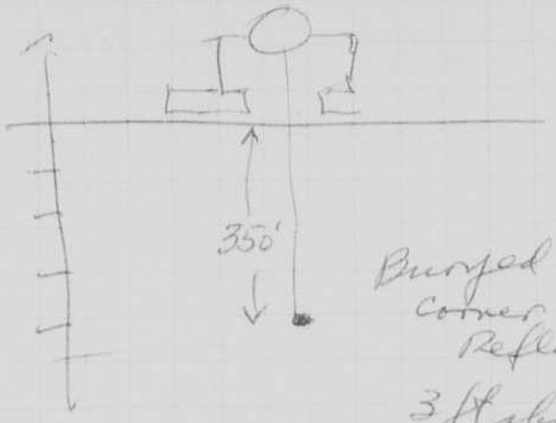


1/2" outside plywood





Tested in Charles River.



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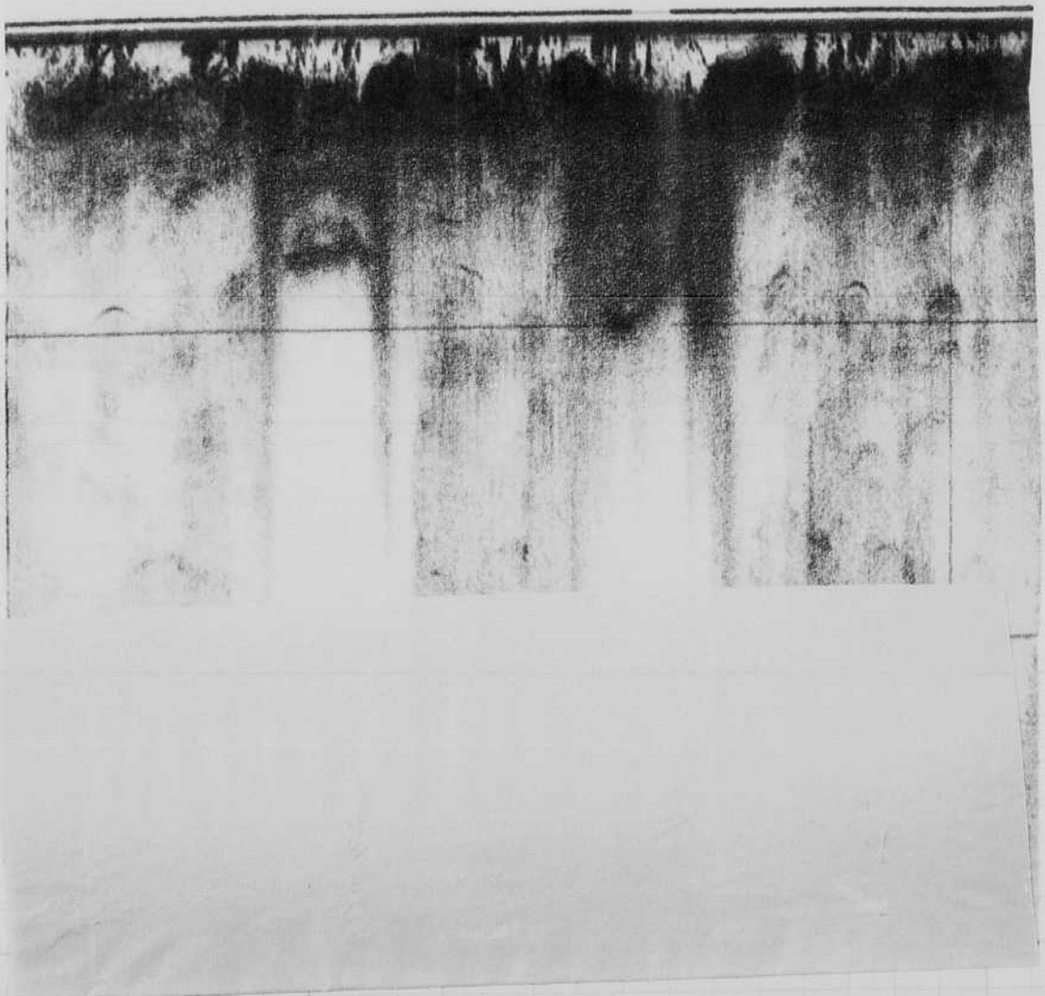


Lamp test 206 Deckgun w

July 2, 1969 - Re. Jim Sholer Bill Mockobee Roberts Pressure tested Prize case and bottom Switch. were

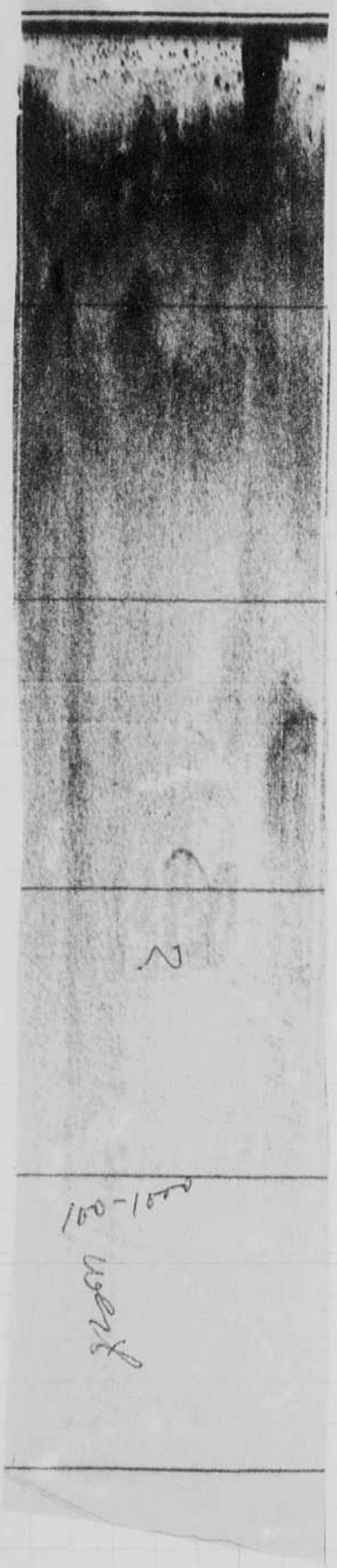
			BCPs	
Flat white Back to base	6'	22.5	810.	tested at 5000 psi 10 min.
Flat white Lamp inside out front in	6'	21	755	Sea link connector failed at 5000 psi and 10 min.
Small Satin to 48"	6'	49	1770	
Small Satin 1/2" to back.	6'	82	2460	
Large EGG 1/8 to back	6'	53x2 106	3820	
Large EGG. 1/8 to back. 1/2	6'	53x2 106	3820	
Large EGG. 1/8" to back	6"	38x2 76	2740	
Small Salsa all back.	6'	40	1440.	
"	6'	38	1370	
" 30°L	6'	17	610	
" 30°R	6'	17	610	

July 4 1969. Tested Deep Sea Camera 205, 206 system near #2 South of Grosse Ile

f16 Plus X film ok at 3 ft
Close ups out of focus. Steep place.
Jim Sholer Joe Hamlin Curley - R Tomeo & H. Edgerton
on SHROCK.

Test of Corner Reflector

Hans Shiler.



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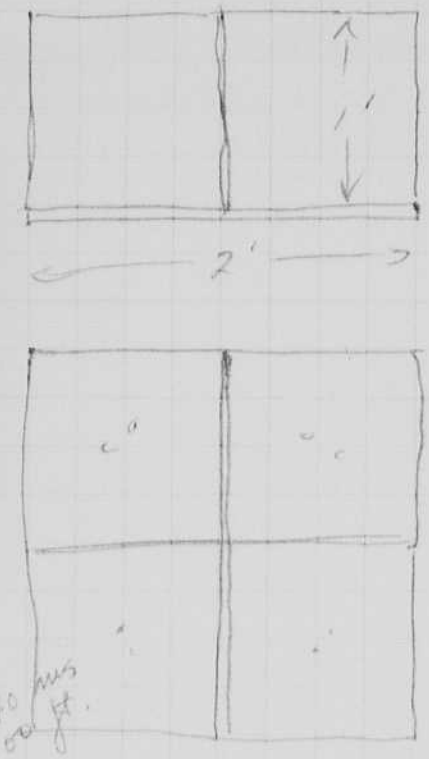
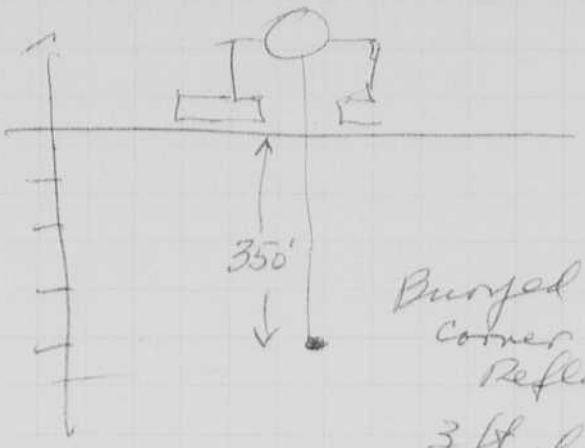


Tested in Chesapeake River.

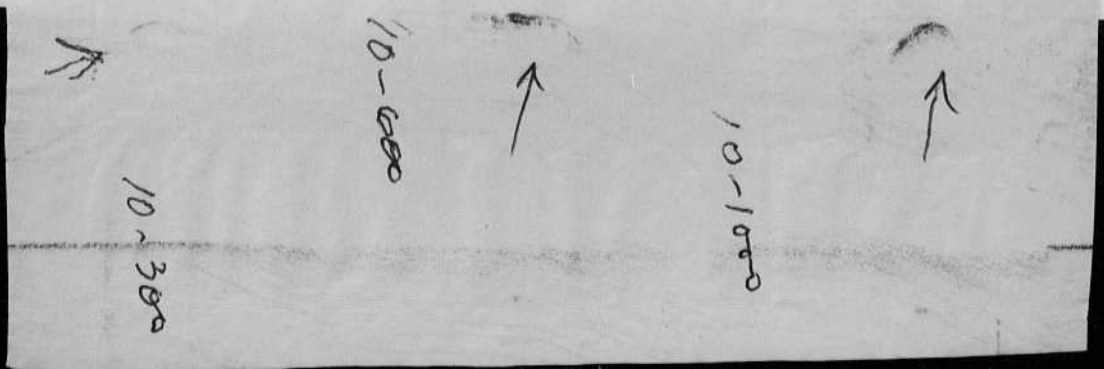


Buried Corner Reflector 3 ft above Bottom.

We could see it nicely from the north at 350 feet. See records. We could not see it at this or any distance from the South or west or east. Why!??

Side to south
3 passes to west.

10-300 10-600 10-1000



July 2, 1969 - Re. Jim Sholer Bill Mack Roberts Pressure tested Nagel case and bottom Switch. were

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Flat white Tamp inside out from tin	6'	21	755	Sea link connector failed at 5000 psi and 10 min.
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Small Satin all back.	6'	40	1440.	
"	6'	38	1370	
" 30°L	6'	17	610	
" 30°R	6'	17	610	

July 4 1969. Tested Deep Sea Camera 205,706 system near #2 South of Grassy Key

f 16 Plus X film ok at 3 ft

Close ups out of focus. Steep place.

Jim Sholer Joe Haralin Curley - R Thomas & H. Edgerton on SHROCK.

July 11 1969.

H. Edgerton

Repaired strobe on Prudential Bldg last night. One of 5 16.5 μf capacitors was shorted. I disconnected the bad one.

Any SCR in the oscillator was repaired about a month ago. At that time a 75 μf cap was disconnected since it made noises?

Packing for expedition on Akademik Kurchatov. She should be in Portsmouth harbor on the 15th.

Jon Shiler is going with me on this trip.

We have 3 passes.

Russian Research Ship

Deep sea camera 205-206 combination