HAROLD E. EDGERTON

PAPERS

MC 25

Series III

Laboratory Notebooks

Number 35

Dated Dec. 8, 1983 to —

OIB 24 1565

No. 983

COMPUTATION BOOK

NAME

HAROLD EDGERTON #35

Course STROBE LAB 4-405 MIT

DEC 8 1983. — CHART 13267

AN AMPAD PAPER PRODUCT

AMERICAN PAD & PAPER CO. - P. O. BOX 1250 - HOLYOKE, MASS. 01040

13960 } BOMP

44183 } LORAN

Notebook # 35

Filming and Separation Record

1 unmounted photograph(s)

____ negative strip(s)

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

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

Item(s) now housed in accompanying folder.

July 10, 1984

Harold Edgerton

LOST CAMERA

Harold Edgerton

An elapsed-time camera, the one that was loaned to Robert Rines for use in Loch Ness (1972-1984) was lost during tests on Saturday, June 30 at a location near the U.S. Coast Guard Station, Boston. Its location can be found from the sighting shown on the attached sketch.

The camera was being tested by Mark De Cew who had planned to use it in Loch Ness this summer. The new idea was to use the camera in a vertical alignment with sunlight, for shadow illumination. The camera will only be operated at high noon and at a depth where exposure is satisfactory. A rate of one per second will be used. The 50-ft. film has 40 pictures per ft. (16-mm) making a total of 4000 photos per load, for a running time of 4000 seconds, or 66.6 minutes (about one hour).

Walter Westphal and Henry Kendall have made several dives for the camera. Because of difficulties with currents, visibility, darkness, and location no results have been obtained.

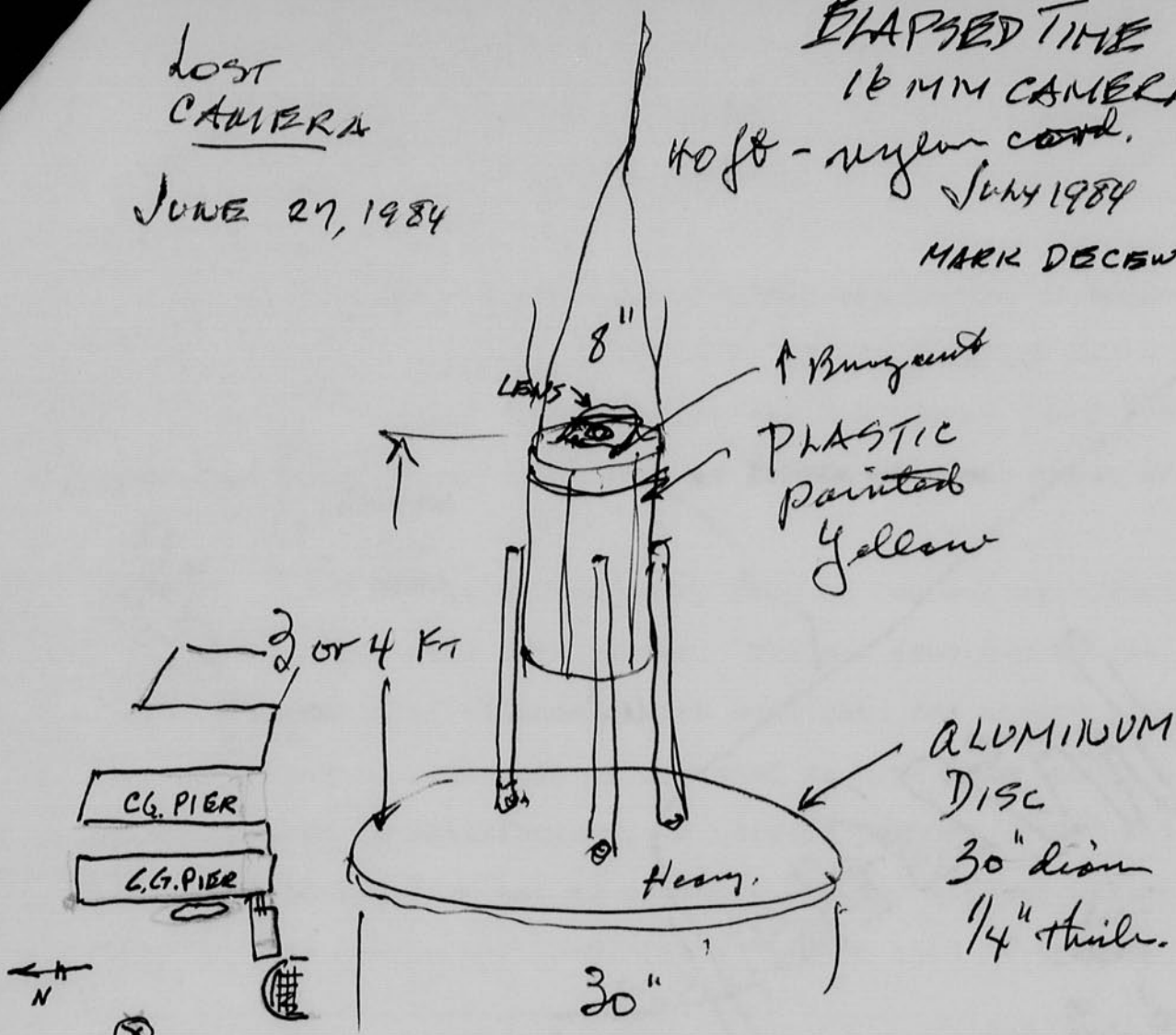
Conclusions: Since the divers could not find the camera near the buoy we now wonder (1) was the buoy at the spot where the camera was lost, (2) did the camera go below the surface into the sediment, (3) has the camera been moved by the currents, and (4) what further methods of search should be tried?

Encl.

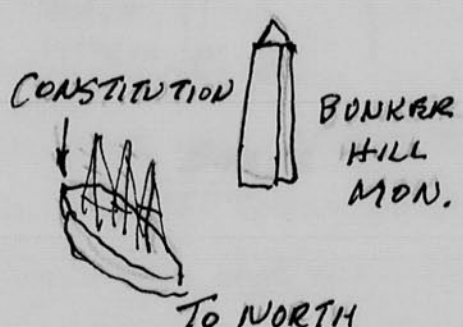
LOST CAMERA

JUNE 27, 1984

ELAPSED TIME
16 MM CAMERA.
40 ft - nylon cord.
JUNE 1984
MARK DECEW.

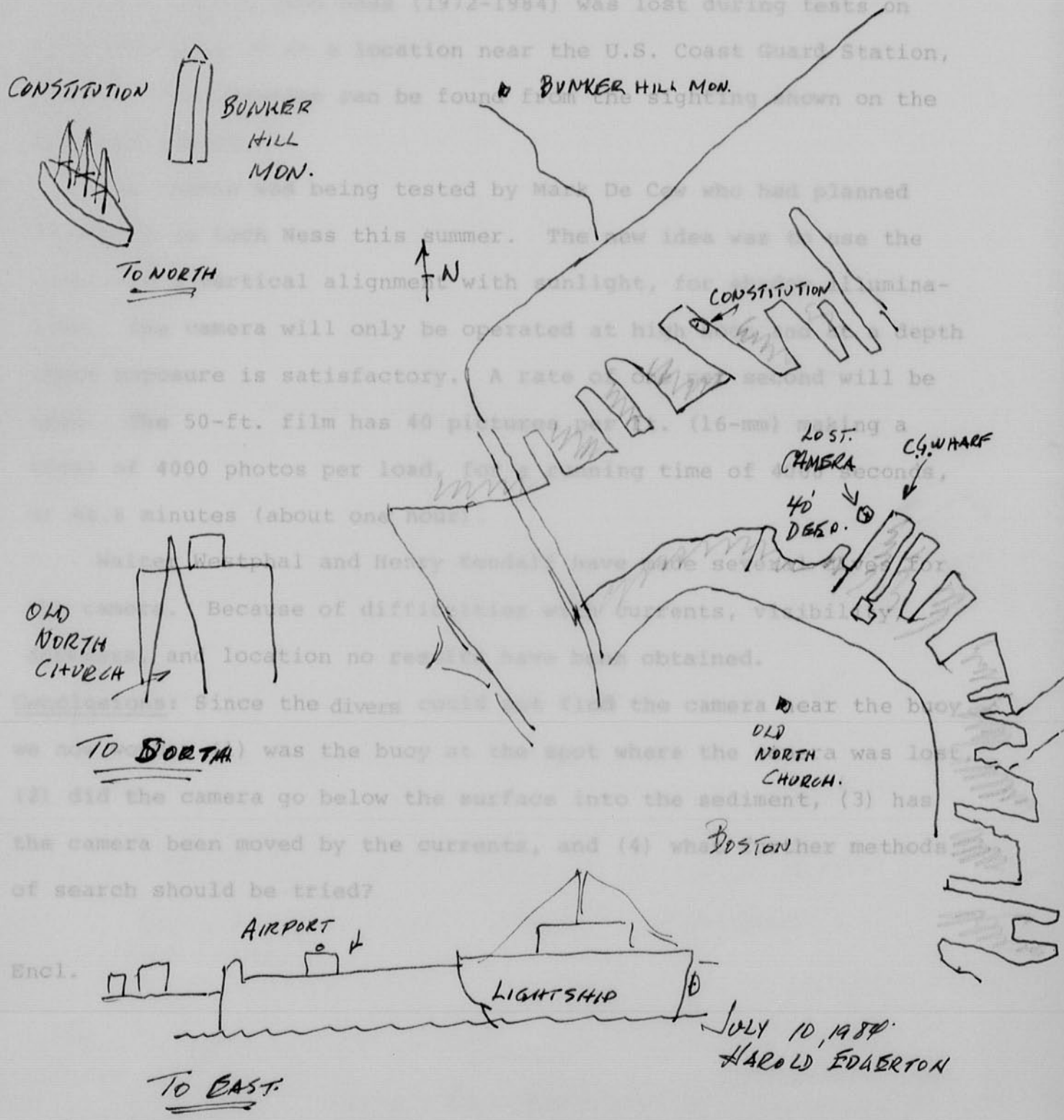


weight in water 20# ± ?
estimated



Harold Edgerton
July 5, 1984.
Fort west of
Coast Guard dock
Boston Harbor.

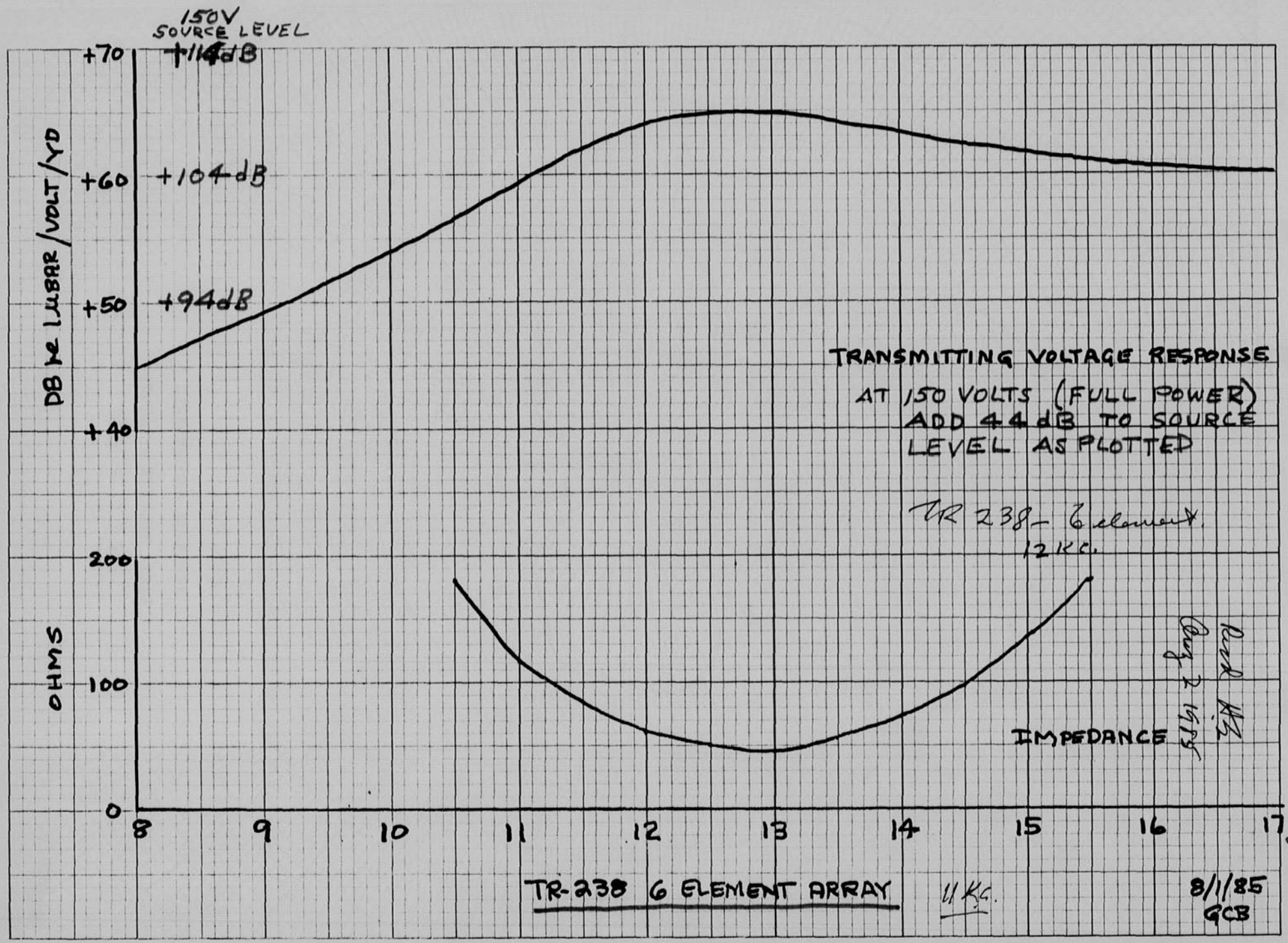
POSITION
SKETCHES.


CONSTITUTION
BUNKER HILL MON.
TO NORTH
N
BUNKER HILL MON.
CONSTITUTION
LOST CAMERA
C.G. WHARF
40' DEEP.
OLD NORTH CHURCH
TO NORTH
OLD NORTH CHURCH.
BOSTON
AIRPORT
LIGHTSHIP
TO EAST.
JULY 10, 1984
HAROLD EDGERTON

Color Plankton

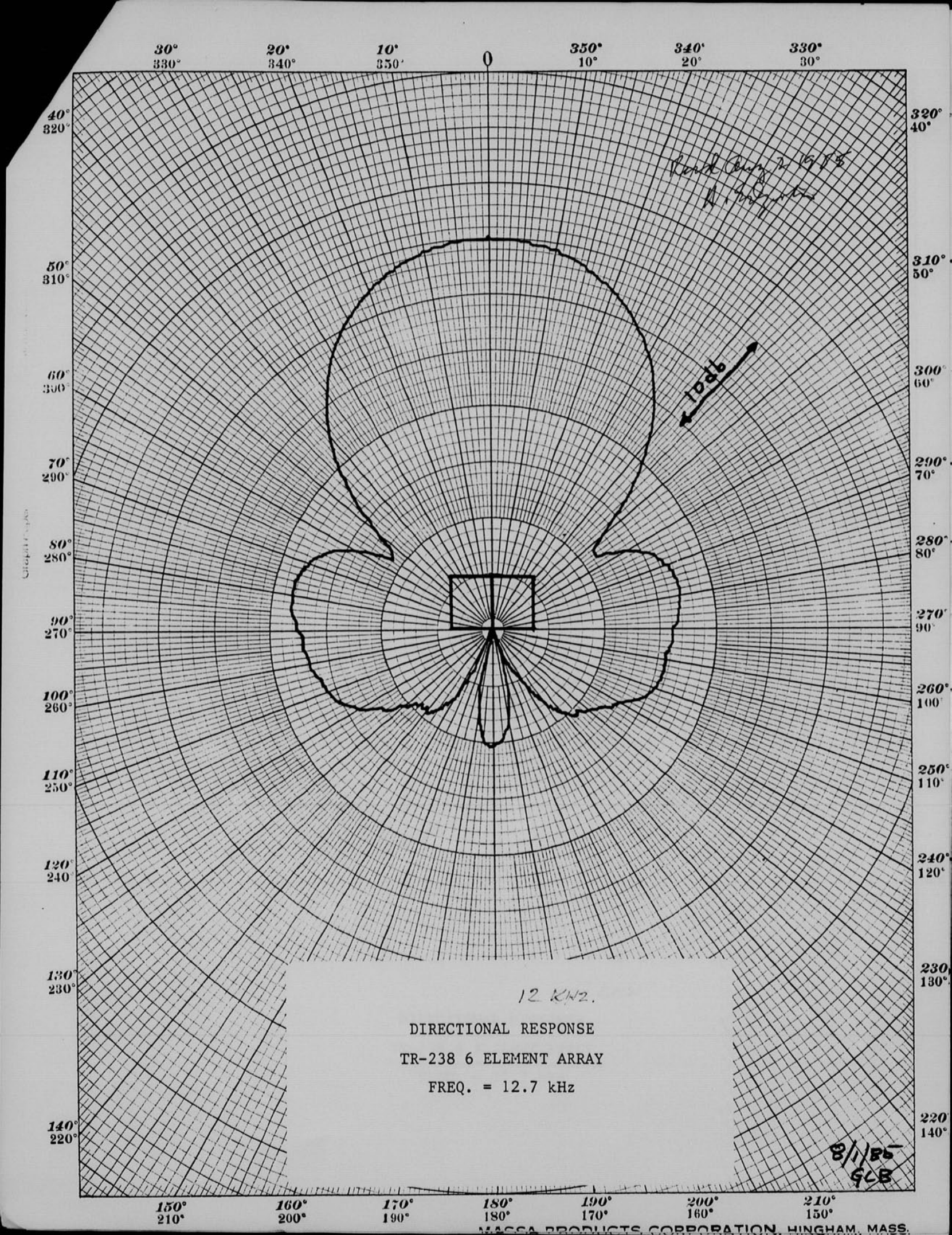
p84 85 ~~Dec~~ Nov 25	p87.	color experiment.
p86 N.B. 35 Dec 5 1974.		Color. Polaroid.
p84 35 Jan 5 1971		Experiment.
90 35 Jan 20 1975		Instant experiment.
115 35 Feb 6 1975		Experiments
116 35 Feb 8 1975		Trial Exposures.

46 0782

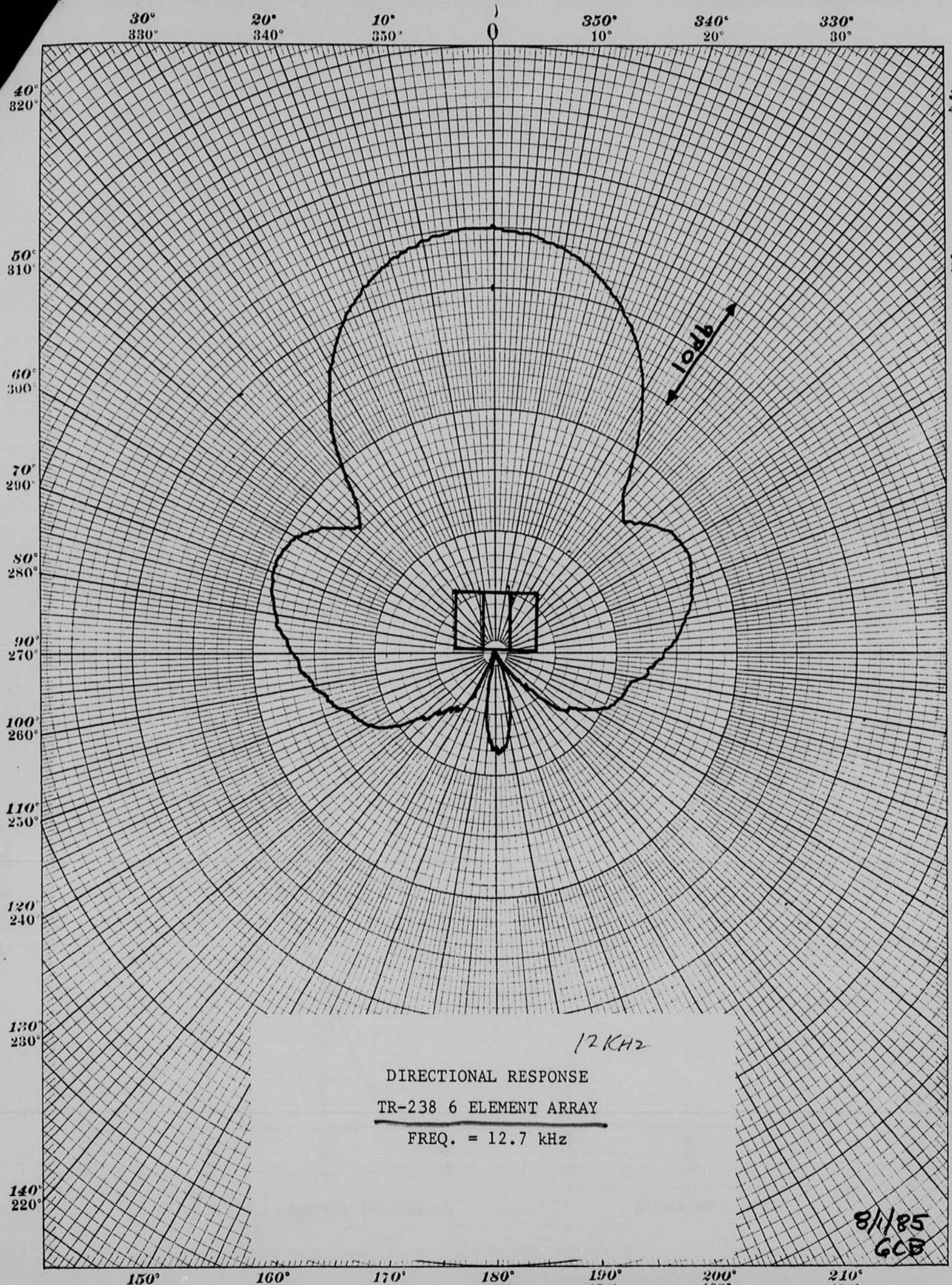


MASSA PRODUCTS CORPORATION, HINGHAM, MASS.

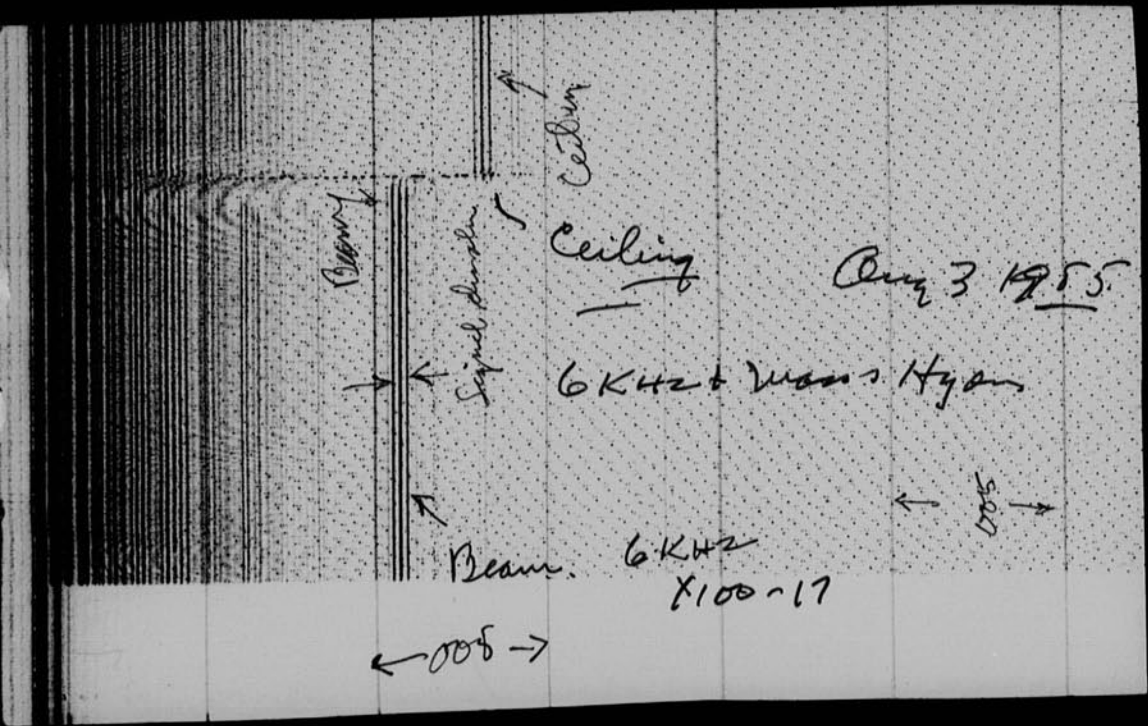
For Harold Edgerton

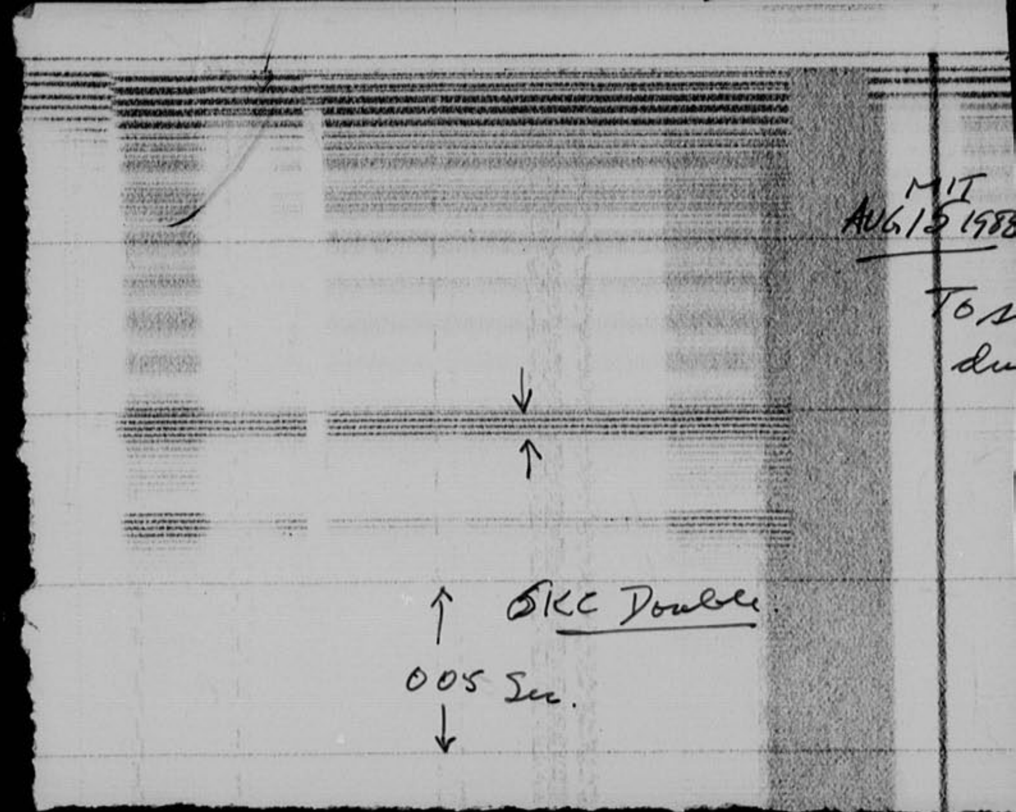


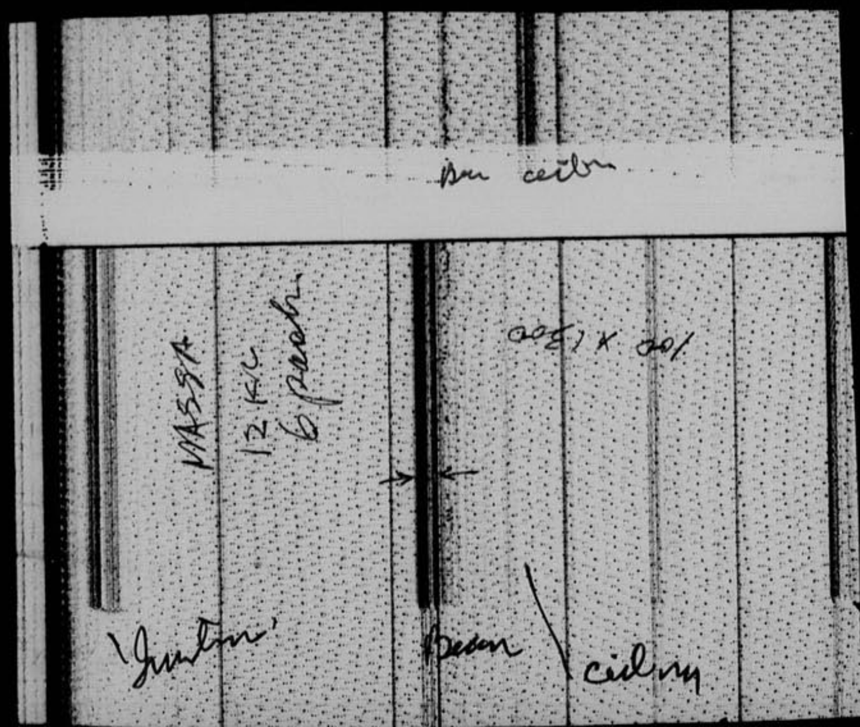
MASSA PRODUCTS CORPORATION, HINGHAM, MASS.



MASSA PRODUCTS CORPORATION, HINGHAM, MASS.


Ceiling
Aug 3 1955
Beam. 6 KHz
X100-17
←008→
005


MIT
AUG 15 1955
005 Sec.


MASSA
12 KC
Beam
ceiling

Used for paper on
Sonar of High Resolution

For paper on signal Duration.

why did the signal switch to
3.5 Kc. seem so short on the
Venice trip? Note I used a 25 (?)
mass hydrophone in Venice

3.5 KHz source.
Bronson source

last field may be specified with !, which means continue through to the last field. The field specification can be 1 of the following formats:

1. *limit-limit*
2. *limit:limit*
3. *limit*
4. OTHERS

Format 1 specifies that any limits specified as literals be excluded from the activity.

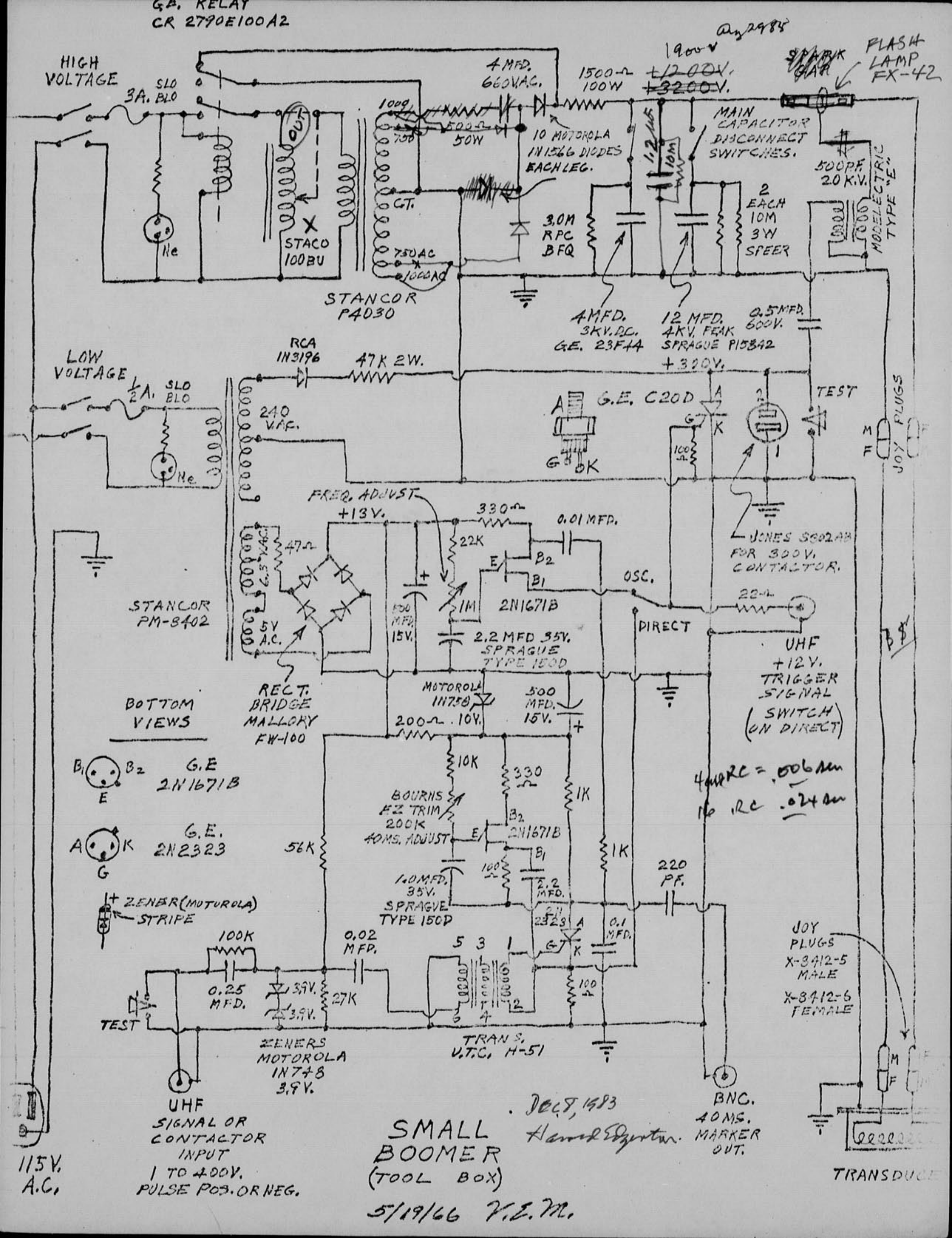
Format 2 requests that any limits specified as literals be included in the activity.

Format 3 is a single field.

Format 4 specifies the action for unspecified fields.

An option is action to be taken on a given field. Available options and their meanings are listed below:

Anchor	Start printing at a specified column.
Continue/*literal*	Process rest of the field list only if *literal* appears in the preceding field.


G.E. RELAY
CR 2790E100A2
HIGH VOLTAGE
3A. SLO BLO
OUT
Ne
STACO 100BU
STANCOR P4030
1000
750
C.T.
750AC
1000AC
4 MFD. 660V.A.C.
500Ω 50W
10 MOTOROLA 1N1566 DIODES EACH LEG.
1500Ω 100W
1900V @ 2985
+1200V.
+3200V.
1.2 µF
10M
MAIN CAPACITOR DISCONNECT SWITCHES.
SPARK GAP
FLASH LAMP FX-42
500PF. 20 K.V.
MODELECTRIC TYPE "E"
3.0M RPC BFQ
2 EACH 10M 3W SPEER
4MFD. 3KV.DC. GE. 23F44
12 MFD. 4KV. PEAK SPRAGUE P15842
0.5MFD. 600V.
LOW VOLTAGE
1/2A. SLO BLO
Ne
240 V.AC.
RCA 1N3196
47K 2W.
+300V.
G.E. C20D
A G K
100Ω
TEST
M F
JOY PLUGS
JONES S602AB FOR 300V. CONTACTOR.
STANCOR PM-8402
6.3 V.AC.
47Ω
5V A.C.
RECT. BRIDGE MALLORY FW-100
FREQ. ADJUST
+13V.
330Ω
22K
0.01 MFD.
E B2 B1
1M
2N1671B
500 MFD. 15V.
2.2 MFD 35V. SPRAGUE TYPE 150D
OSC.
DIRECT
22Ω
UHF
+12V. TRIGGER SIGNAL (SWITCH ON DIRECT)
MOTOROLA 1N758
200Ω .10V.
500 MFD. 15V.
BOTTOM VIEWS
B1 B2 E
G.E 2N1671B
A K G
G.E. 2N2323
10K
330Ω
1K
BOURNS EZ TRIM 200K 40MS. ADJUST
2N1671B
56K
1.0MFD. 35V. SPRAGUE TYPE 150D
100Ω
2.2 MFD.
2N2323
1K
220 PF.
0.1 MFD.
4µRC = .006 sec
1µ RC .024 sec
+ ZENER (MOTOROLA) STRIPE
100K
0.25 MFD.
3.9V.
27K
0.02 MFD.
5 3 1
TRANS. U.T.C. H-51
100Ω
TEST
ZENERS MOTOROLA 1N748 3.9V.
UHF
SIGNAL OR CONTACTOR INPUT
1 TO 400V. PULSE POS. OR NEG.
115V. A.C.
BNC.
40MS. MARKER OUT.
JOY PLUGS X-3412-5 MALE
X-3412-6 FEMALE
TRANSDUCER
SMALL BOOMER (TOOL BOX)
5/19/66 H.E.E.
Dec 8, 1983
Harold Edgerton

JANUARY 20TH 1981

DEAR SIRS,

Today for the first time I saw work done by Harold E. Edgerton. (Splash of milk - 1936?) AND WANT TO SEE MORE - I AM VERY EXCITED WITH THIS PHOTOGRAPH AND WANT TO KNOW MORE ABOUT THIS MAN AND HIS WORK.

IS IT POSSIBLE?

I SAW IT IN CREATIVE PHOTOGRAPHY - 1826 - PRESENT
AN EXHIBITION FROM THE
GERNSHEIM COLLECTION
by Helmut & Alison Gernsheim

Please tell me all you know and how I can learn more. Books, articles, etc. I hope he is ALIVE I read he was born in 1903 AND feel I might have missed him. Hope NOT -

Please DIRECT ME TO ANY INFORMATION CONCERNING THIS MANS ART - IF IT IS NOT POSSIBLE, please tell me!

THANK-YOU

KATHERINE V. KEATING
1106½ NUECES

KATHERINE V. KEATING
1106½ NUECES
AUSTIN TEXAS
78701

AUSTIN, TX
1PM
23 JAN
1981

MASSACHUSETTS INSTITUTE OF TECH.
77 MASSACHUSETTS AVE
CAMBRIDGE MASS.
02139

DIRECTOR OF PHOTOGRAPHY, ART, ?
INQUIRE ON HAROLD E. EDGERTON

Kasting

Massa Oceanographic Transducers

• *precision in electroacoustics*

For Harold Edgerton Red Ray 2/1985

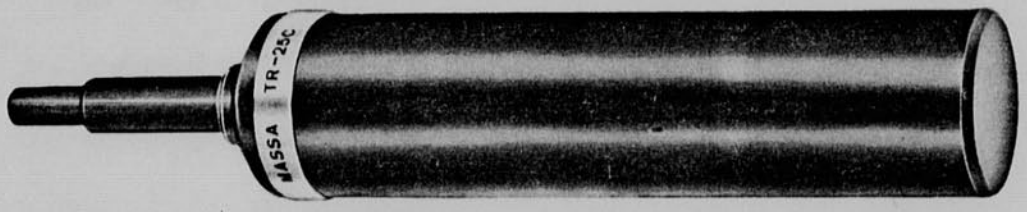
ELECTROACOUSTIC TRANSDUCER

MODEL TR-25C ALSO TR-1025C

The Massa Model TR-25C is a rugged transducer designed as a general purpose wide range hydrophone. It can be used for making accurate underwater sound measurements, as well as for generating medium power acoustic outputs in the 1 to 30 kHz region. The sensor element is lead zirconate-titanate and is assembled within a rubber housing into which an underwater high pressure cable is also sealed. The TR-25C will resist underwater explosions without damage.

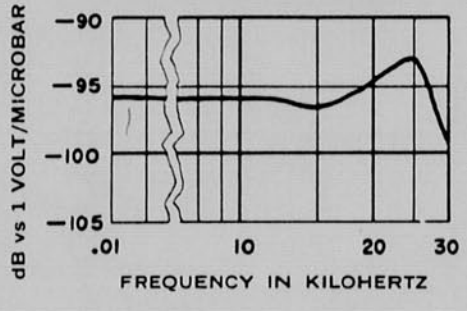
SPECIFICATIONS

RECEIVING RESPONSE (10 Hz to 20 kHz)	−96 dB vs 1 V/microbar
HORIZONTAL DIRECTIVITY	Omnidirectional
MAXIMUM POWER OUTPUT AT 25 kHz	100 Watts
CAPACITANCE	.04 microfarad
MAXIMUM OPERATING DEPTH	2000 ft
WEIGHT (LESS CABLE)	2½ lbs
DIMENSIONS	2¼" dia x 9" long

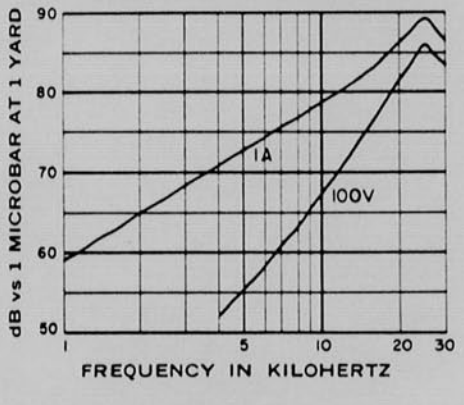


TR-25C CHARACTERISTICS

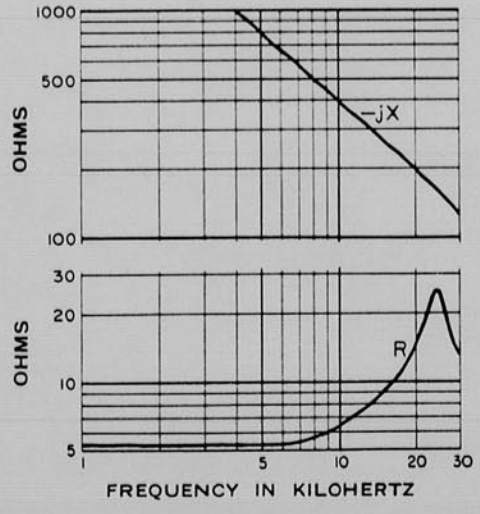
RECEIVING RESPONSE



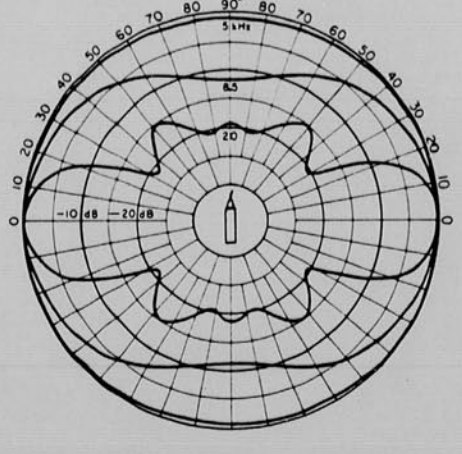
TRANSMITTING RESPONSE



IMPEDANCE

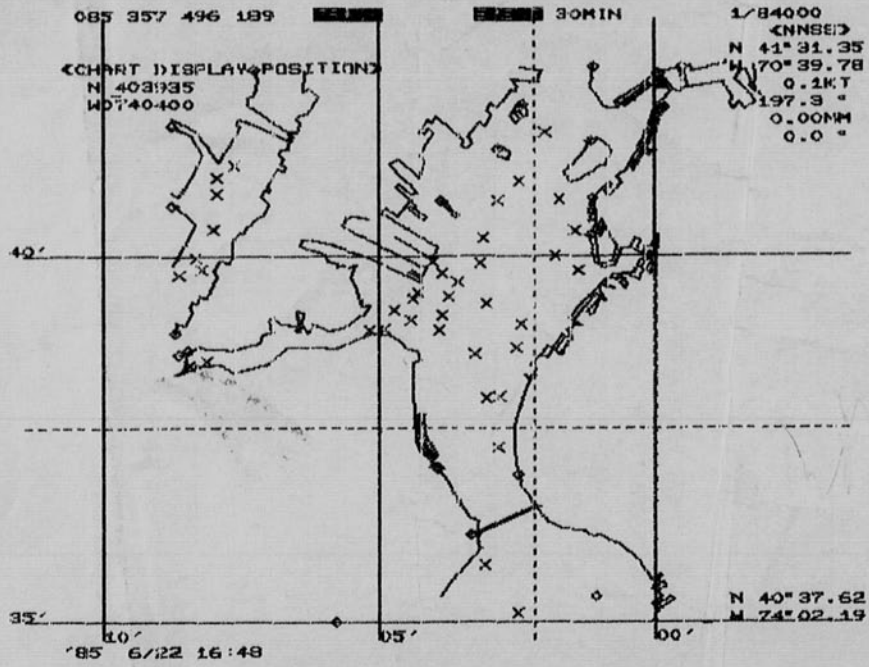


VERTICAL PATTERNS



Massa reserves the right to change prices and specifications without notice

Massa Products Corporation
280 Lincoln Street, Hingham, Mass. 02043
TWX. 710·348·6932
TEL. (617) 749·4800



~~CALYPSO~~ AT WHOI
1985

REPRINTED 11-80

KODAK VERICOLOR II Professional Film 4107, Type S

ENGLISH

- Color negative film designed for exposure times of 1/10 second or shorter.
- For exposure by electronic flash, daylight, or blue flash.
- Gives excellent quality in color reproduction without supplementary masking.
- Features dimensionally stable 7-mil ESTAR Thick Base.

Darkroom Handling: Total darkness required.

EXPOSURE

ISO 125/22°
ASA 125/22 DIN

Speed:

Light Source	KODAK WRATTEN Filter	Speed		
		ISO	ASA	DIN
Daylight	None	125/22°	125	22
Photolamp (3400 K)	80B	40/17°	40	17
Tungsten (3200 K)	80A	32/16°	32	16

Exposure times longer than 1/10 second are not recommended. For long exposures, use KODAK VERICOLOR II Professional Film 4108, Type L.

Note: ISO (International Standards Organization) film speed numbers are given in anticipation of future worldwide use.

Inclusion of Gray Card in Scene: To aid in determining exposures required in making prints from negatives, use the gray (18% reflectance) side of the KODAK Neutral Test Card. Instructions are packaged with the card.

Flash Pictures: To get the lens opening for electronic flash or flashbulbs, divide the guide number by the distance from flash to subject.

Electronic Flash Guide Numbers:

Output of Unit (BCPS or ECPS)	350	500	700	1000	1400	2000	2800	4000	5600	8000
Guide Number for Distances in Feet	45	55	65	80	95	110	130	160	190	220
Guide Number for Distances in Metres	14	17	20	24	29	33	40	50	60	65

Guide Numbers for Blue Flashbulbs: Select the guide number on the flashbulb package for the daylight film speeds listed above and for the type of reflector, shutter, and synchronization on the camera you are using.

Caution: Since bulbs may shatter when flashed, the use of a flashguard over the reflector is recommended. *Do not flash bulbs in an explosive atmosphere.*

Daylight Exposure Table: Lens openings with shutter at 1/250 second.

For the hours from 2 hours after sunrise to 2 hours before sunset.

Bright or Hazy Sun on Light Sand or Snow	Bright or Hazy Sun (Distinct Shadows)	Weak, Hazy Sun (Soft Shadows)	Cloudy Bright (No Shadows)	Heavy Overcast	Open Shade*
f/16	*f*/11†	*f*/8	*f*/5.6	*f*/4	*f*/4

*Subject shaded from the sun but lighted by a large area of sky.
†For backlighted close-up subjects, use *f*/5.6.

Reciprocity Effect Adjustments: No lens aperture, exposure time, or development adjustments are required for VERICOLOR II Professional Film 4107, Type S, when indicated exposure time is between 1/10 and 1/50,000 second. Other exposure times are not recommended.

PROCESSING • Use KODAK FLEXICOLOR® Chemicals for Process C-41 or C-41V to process this film. This film can be processed in the (1) KODAK VERSAMAT Color Processor, Model 145, when modified for Process C-41V; (2) in the KODAK VISCOUNT Processor for KODACOLOR Film, Models 1 and 2, equipped with the KODAK VISCOUNT Speed-Up Assembly, Model 1-2; and (3) in other commercial equipment using Process C-41 or C-41V. This film is not processed by Kodak.

Recommendations are available from Eastman Kodak Company, Product Support Publications, Rochester, New York 14650.

Note: This film is *not* designed for processing in Process C-22 Chemicals.

JUDGING NEGATIVE EXPOSURE • Processed negatives will have an overall orange cast, a slightly different color than Vericolor and Ektacolor negatives. Exposure can be judged by placing negatives over an illuminator. Viewing the negative through a green filter, such as a KODAK WRATTEN Filter No. 61, makes it appear much like a black-and-white negative and helps in determining whether adequate detail has been obtained.

A more precise check on exposure level can be made with a KODAK Color Densitometer or other suitable electronic densitometer equipped with a filter such as a KODAK WRATTEN Filter No. 92 or the red filter of the KODAK Densitometer Filter Set MM (Certified). Depending somewhat on the nature of the subject and the use of a recommended light source for exposure, a normally exposed color negative read through the **red filter** should have the following approximate densities:

The KODAK Neutral Test Card (gray side) receiving the same illumination as the subject	0.65 to 0.85
The lightest step (darkest in negative) of a KODAK Paper Gray Scale receiving the same illumination as the subject	1.15 to 1.35
The highest diffuse density in a normally lighted forehead	
light complexion	0.95 to 1.25
dark complexion	0.65 to 1.05

Because of the extreme range in normal skin color, the red density values given for a normally lighted forehead should be used only as a guide. For greatest likelihood of normal exposure, the use of a KODAK Neutral Test Card (gray side) is recommended.

PRINTING NEGATIVES • Color prints can be made by direct contact-printing or enlargement onto KODAK EKTACOLOR Papers or by the dye transfer process.

Color transparencies can be made by exposing directly onto KODAK VERICOLOR Print Film 4111 (ESTAR Thick Base) and KODAK VERICOLOR Slide Film 5072.

Black-and-white prints can be made on KODAK PANALURE Paper, KODAK PANALURE Portrait Paper, or KODAK PANALURE II RC Paper.

STORAGE AND HANDLING • Keep unexposed film stored at 13°C (55°F) or lower in the original sealed package. To avoid moisture condensation on film which has been refrigerated, allow film to warm to room temperature before opening package. Always store film (exposed or unexposed) in a cool, dry place. Process exposed film as soon as possible after exposure. Always protect negatives from strong light and store in a cool, dry, and dark place.

A temperature of 21°C (70°F) with a relative humidity not exceeding 40 percent is considered satisfactory for properly processed VERICOLOR II Film negatives which are intended for reprinting. Satisfactory prints can be obtained from negatives stored over a period of time if the negatives are properly protected from moisture and stored at lower temperatures. The useful life of negatives can be significantly extended if properly stored at −18 to −23°C (0 to −10°F). KODAK Storage Envelopes for processed film are available in 4 x 5- and 8 x 10-inch sizes. For more information about storage of negatives for longer periods, see Kodak Publication No. E-30, *Storage and Care of KODAK Color Films*, available from Dept. 412-L.

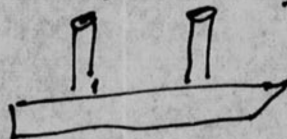
The Kodak materials described in this publication for use with KODAK VERICOLOR II Professional Film 4107, Type S, are available from those dealers normally supplying Kodak materials. Equivalent materials may be used if desired.

Read This Notice: This film will be replaced if defective in manufacture, labeling, or packaging. Except for such replacement, the sale or any subsequent handling of this film is without warranty or liability even though defect, damage, or loss is caused by negligence or other fault. Since color dyes may in time change, this film will not be replaced for, or otherwise warranted against, any change in color.

From J.Y. Cousteau

1985 at No 101 when

? Alcyone docked



Twin rotor

Ship.

LIGHT OUTPUT OF AN EG&G, INC. FX-102 FLASH TUBE
PHOTO PICKUP No. 3 "DOLLY" VISUAL RESPONSE, D = 29", R_L = 1K

DIAL SETTING PS-302 118V. ac LINE	CAP. VOLTS	CAP. μF	PEAK C.P. x 10^6	DURATION IN MICRO SECONDS	LIGHT OUTPUT HCPS
800	800	2.0	0.095	4.4	0.42
1000	1000	2.0	0.14	4.6	0.64
1200	1200	2.0	0.19	4.6	0.87
1400	1400	2.0	0.24	4.6	1.06
1500	1460	2.0	0.26	4.6	1.14
800	800	4.56	0.13	6.2	0.81
1000	1000	4.56	0.19	6.4	1.2
1200	1200	4.56	0.26	6.4	1.7
1400	1400	4.56	0.33	6.4	2.1
1500	1460	4.56	0.35	6.4	2.2

Harold Edgerton
Feb 18 1981

V. E. MacRoberts
MIT, Rm. 4-405
Cambridge, Ma. 02139
February 10, 1981

1975 ±?

Ed & Marion Fink
of
Harbor Branch
Florida.

Harold Edgerton

Clear 10 shechel Israel coin. 10 Sheqlim from Richard

ב מ ש ת ה 5742 year Jewish

2 40 300 400 5000 about 1982 USA.

4x → 26, 89 3x 2x → 72, clicks

Charles River p46

Harold E. Edgerton

MIT 4-405

Cambridge Mass

02139.

July 20 1985
SAFE COMBO

Start at 0
Clear 10x to Right

L 4x ~~to~~ 26
R 3x ~~to~~ 89
L 2x to 72
R to 82
open

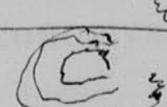
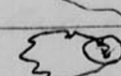
Bruce Dale.

(617) 253-4629
494 8783

Home 100 memorial Drive
Cambridge mass 02142 USA.
apt 11-7A- 2534629

617 864 4790

Dec 8 1983

Feb. 17,	198~~4~~		Eye Pattern 3pm while working on removal of photo exhibits. in Room 4-405 box. 1/2 hour duration	
Feb 23	198~~4~~	3.40 am	in Bed.	
Feb 25	1984	11 am	at MIT 4-405	Gone by 11.45.
Nov 3	84	730	100 mem.	1/2 hour gone.
Mar. 23	84	1 am	Hudson ohio.	Blood in ~~Elaine~~.
April 10	84	2 pm	MIT 4-405	
Apr 19	84	1230	MIT	
Sat, " 21	84	12 45	Home	
may 13	84	11	Harv Square	
JAN 4	85	9	Home	
Jan 17	86	4 pm	MIT 4 pm Endogonts	Both eyes!

1937

A New "Whirling Watcher"

A NEW type of stroboscope, a scientific device for "stopping" motion to study the behavior of machines operating at high speed, has been developed in the department of electrical engineering at the Massachusetts Institute of Technology.

The name stroboscope means "whirling watcher," and these instruments have long been used to study motion. The new type of stroboscope, which was developed at

This photograph was taken with the aid of a new thyratron mercury-arc tube. The "N" and "S" on the poles of the 160-horsepower motor are moving past the camera at a ground speed of 95 miles per hour

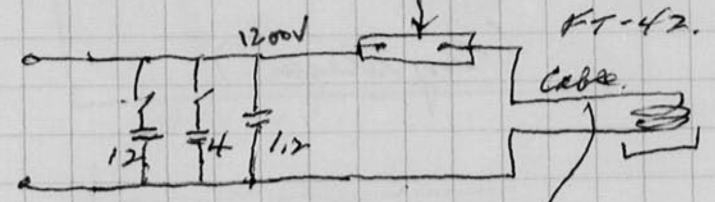
A featured exhibit is the development of the "modern stroboscope which makes possible high-speed photography of moving objects and "stop-motion" analysis of machinery, processes, and other high-speed events," by Dr. Harold E. Edgerton, Professor Emeritus of the Massachusetts Institute of Technology and one of the founding partners of EG & G, Inc.

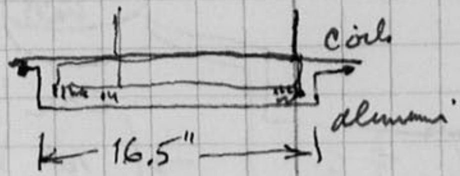
Aurora, the county seat of Hamilton County, is the "Deepwell Irrigation Center of the Nation." Aurora has three parks, with tennis courts, a swimming pool, and fine camping facilities for your enjoyment. All services available.

Dec 8 1983. Harold Edgerton Bill MacRoberts.

Mini Boomer. Pizza pan unit.
Small Boomer Tool Box job 5/9/66

Capacity. L of coil and cable. = 395×10^{-6} henries
1.2 mfd
4 "
12 "





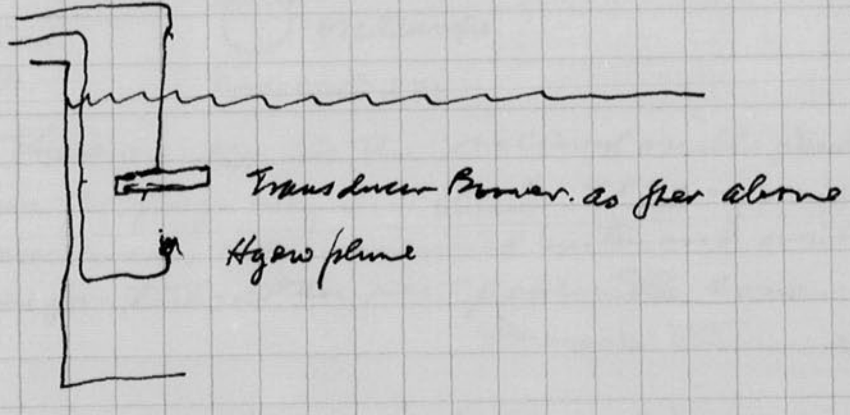
30 to 35 ft. cable. #10

$T = 2\pi\sqrt{LC}$ = time for 1/ cycle. undamped.
$T = \pi\sqrt{LC}$ = time for 1/2 cycle undamped. $f = \frac{1}{2\pi\sqrt{LC}}$ 720,000C = W.S.

C	LC	$\sqrt{LC}$	$\pi\sqrt{LC}$ μs.	f×2	f.		$\frac{CE^2}{2}$
1.2	474.	22	70	14200	7100	✓	0.864
5.2	2054	45.3	142.	7000	3500	✓	3.74
13.2	5214	72.	226	4420	2210	✓	9.50
17.2	6794	82	258	3870	1935	✓	12.38
							watts.

$P = f\frac{CE^2}{2}$

Dec 10 '83 Project in Pool or Chas River

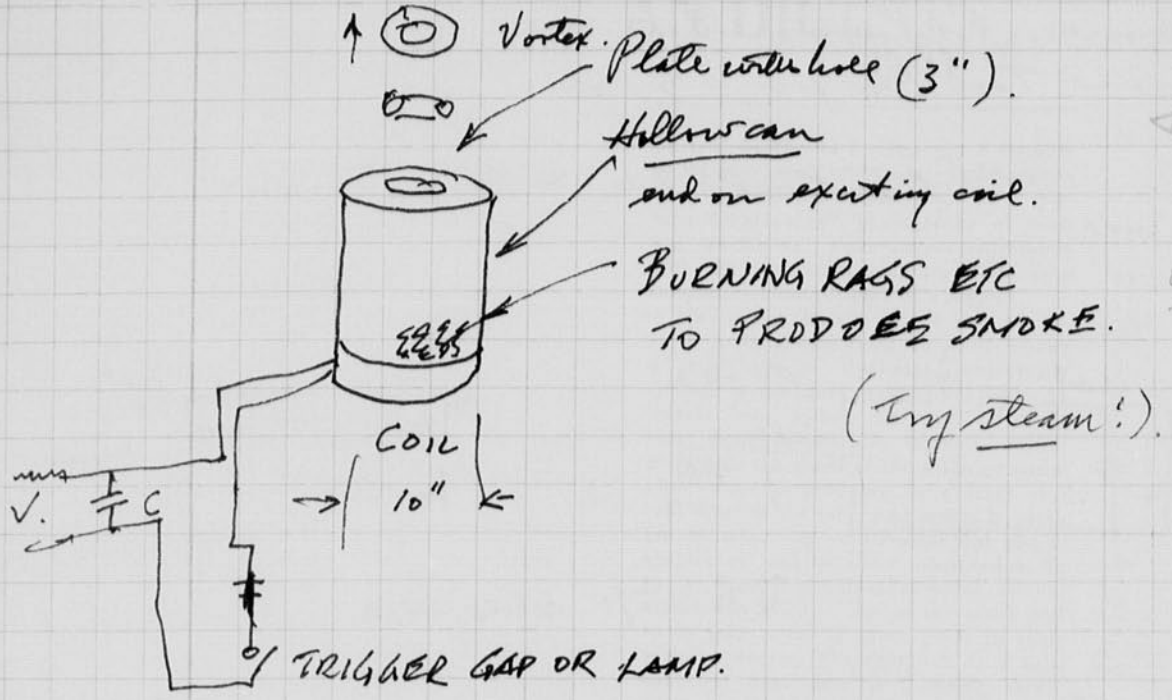


1. Measure current pulse when in air and in water

2. Measure pressure in water.

Esther went with mets Aurora Nelask for a showing of a T.V. (Educational) at the Bremer Comm. center, Gary Hochman.

Vortex Generator. Dec 10 1983 Harold Edgerton

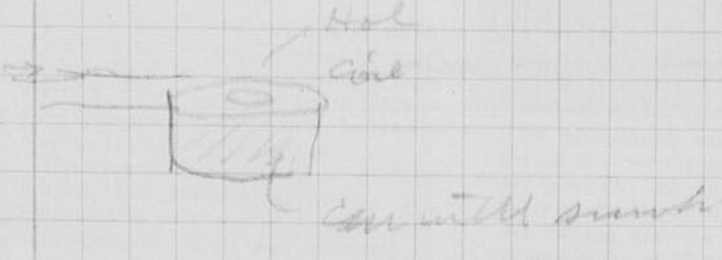


Find best hole size.

Smouldering

Ellen Dixon a sophomore in chemistry at MIT. She was here at noon today. We had fish chowder. then she went to see the Keys in Brookline 67 Carlton St. Rebecca is now 1 1/2 years old (Born April 16 1982).

Esther & I went to Aurora for Dec 5 showing of the ETV film made about high-speed strobe work.

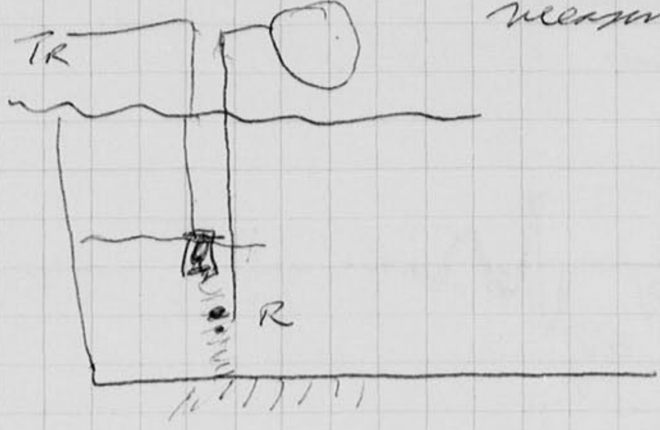


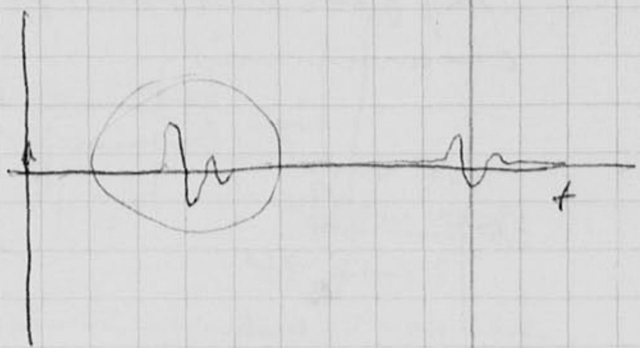
Dec 21, 1983 Gary Hockeman (Nebraska) was in today. His T.V. is finished was shown in Aurora.

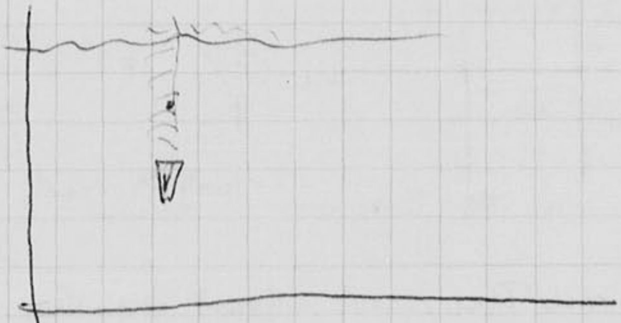
Sam Raymond helped us get a Tape JVC cassett recorder HR-D120U. We showed the tape made by Hockeman.

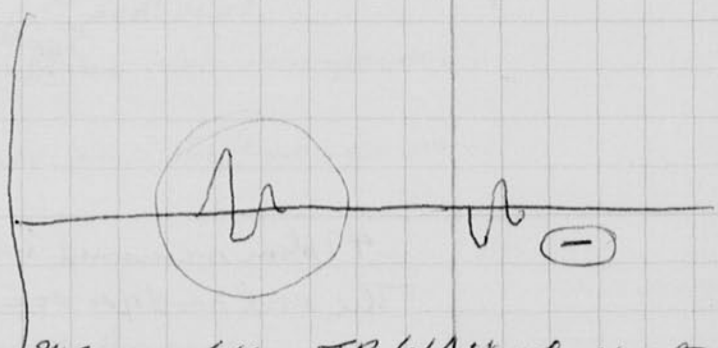
Dec 27, 1983.
HEE & Bill Mack.

Sonar. Transducer. Put in water to measure the output.

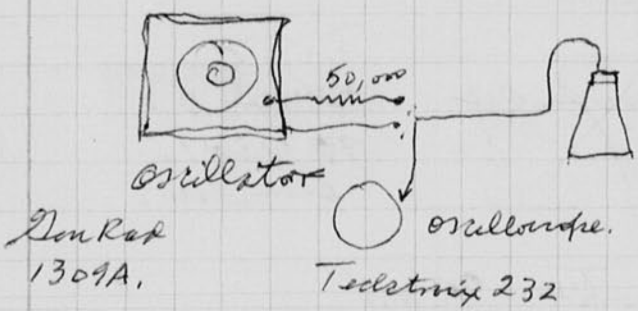








Th. Dec 29 1983 Experiments yesterday with Massa 6Kc TR 61A Under water Transducers.

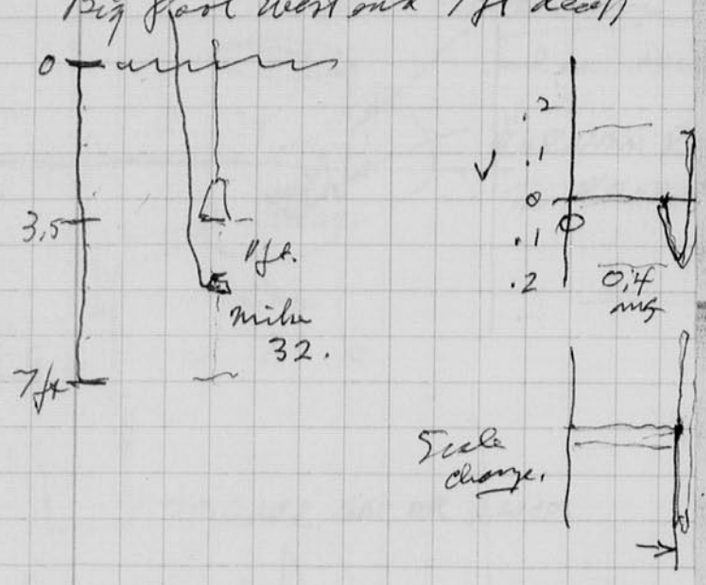


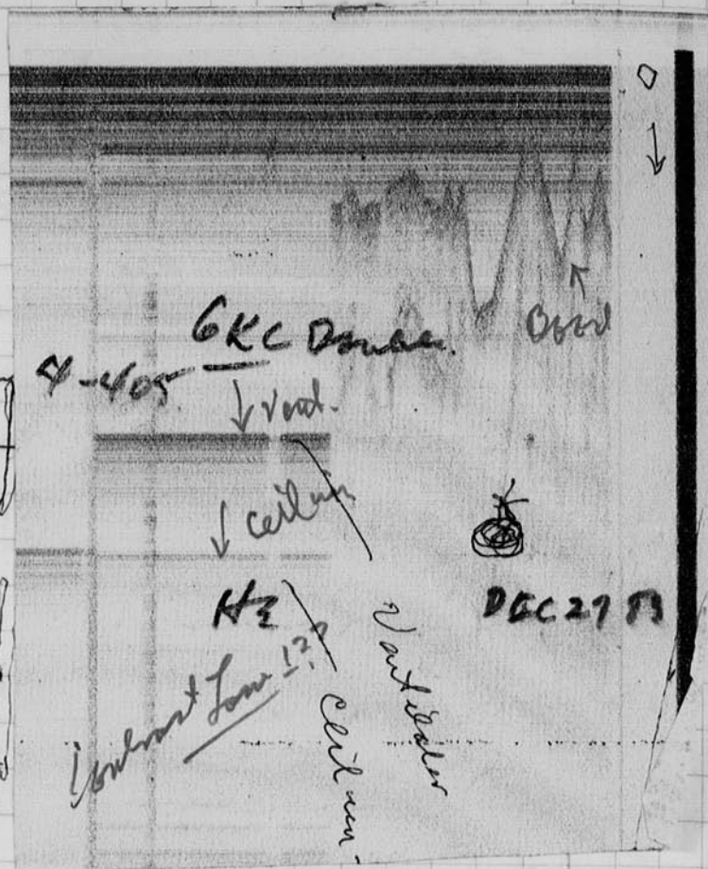
There is a dip in the received oscillograph voltage when the frequency is 4800 to 4850 cycles/sec.
Transducers were measured with and without ~~transducers~~ transformers.
Preparing for tests at the M.I.T. pool with sonar

Dec 28 TH, 1983. MIT Pool.
D Edgerton & Bill MacRoberts.

Shallow pool 4 ft deep.

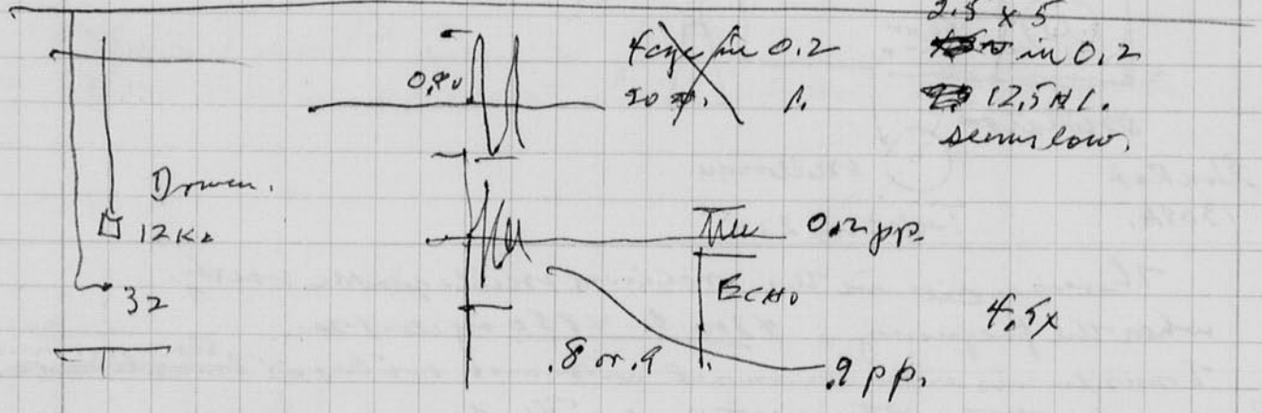
Big pool west end 7 ft deep



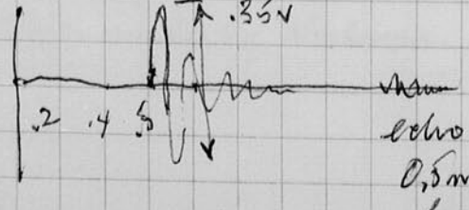


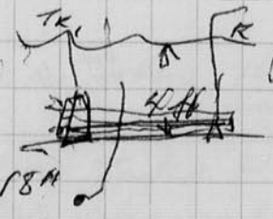
47 ohm removed increases the peak almost double.
The end nodes do not seem to be influenced by the 47 ohm.

12 KC. 0.5 = 4 cycles.
(1. = 5 cycles) calc.



6 KC fish emits 12 KC pulses.
6 KC 4 or 5 cycle signal too long,
freq sensitive ckt.





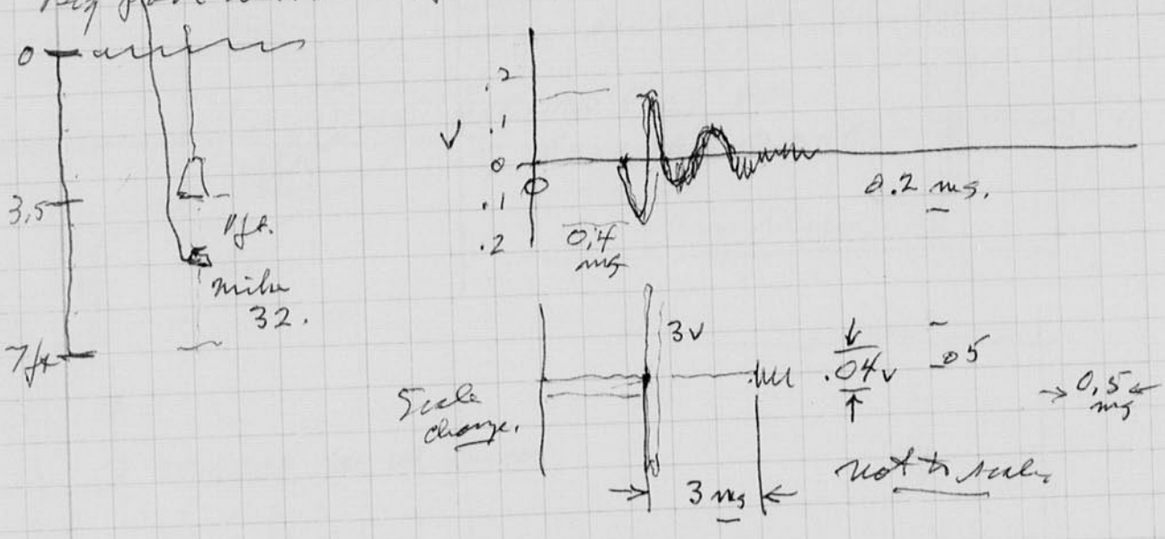
Signal about 0.5 ms. long

The River is covered with ICE

Dec 28 TH, 1983. MIT Pool.
H Edgerton & Bill MacRoberts.

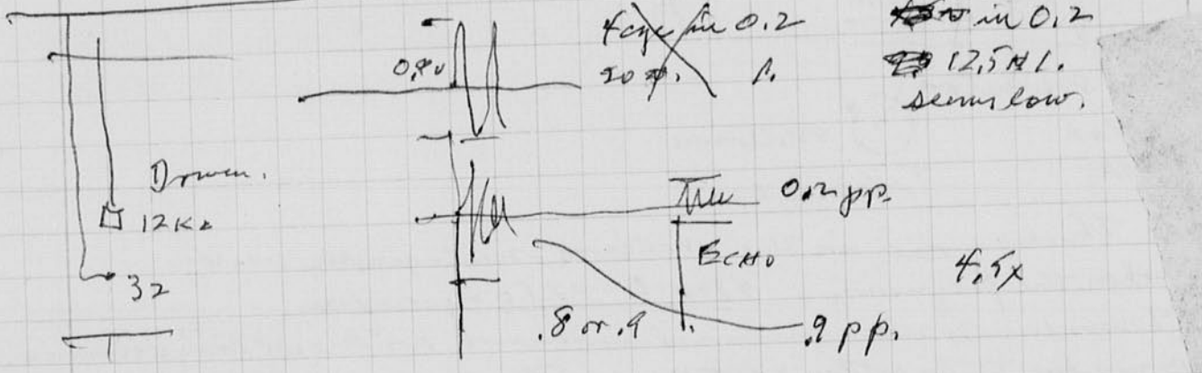
Shallow pool 4 ft deep.

Big pool west end 7 ft deep

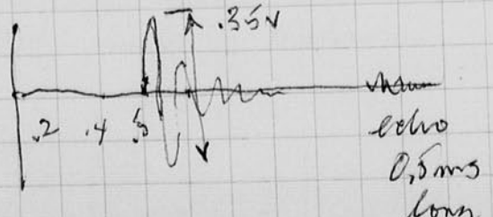


47 ohm resistor increases the peak about double.
The end wedges do not seem to be influenced by the 47 ohm.

12 Kc. 0.5 = 4 cycles.
(1. = 8 cycles) calc.



6 Kc fish with 12 Kc pinging
6 Kc 4 or 5 cycle signal too long,
freq sensitive rec ok.



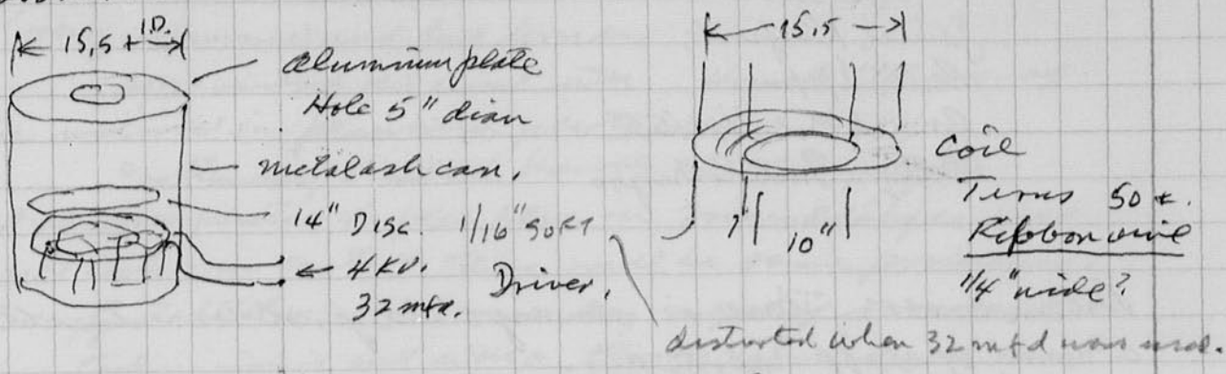
Signal about 0.5 ms. long

The River is covered with ICE

Dec. 30 1983 HE
Harold Edgerton.

VORTEX GENERATOR.

Last night about 530 I worked with Bill Makohaven & convert an ash barrel ~~into~~ into a vortex generator

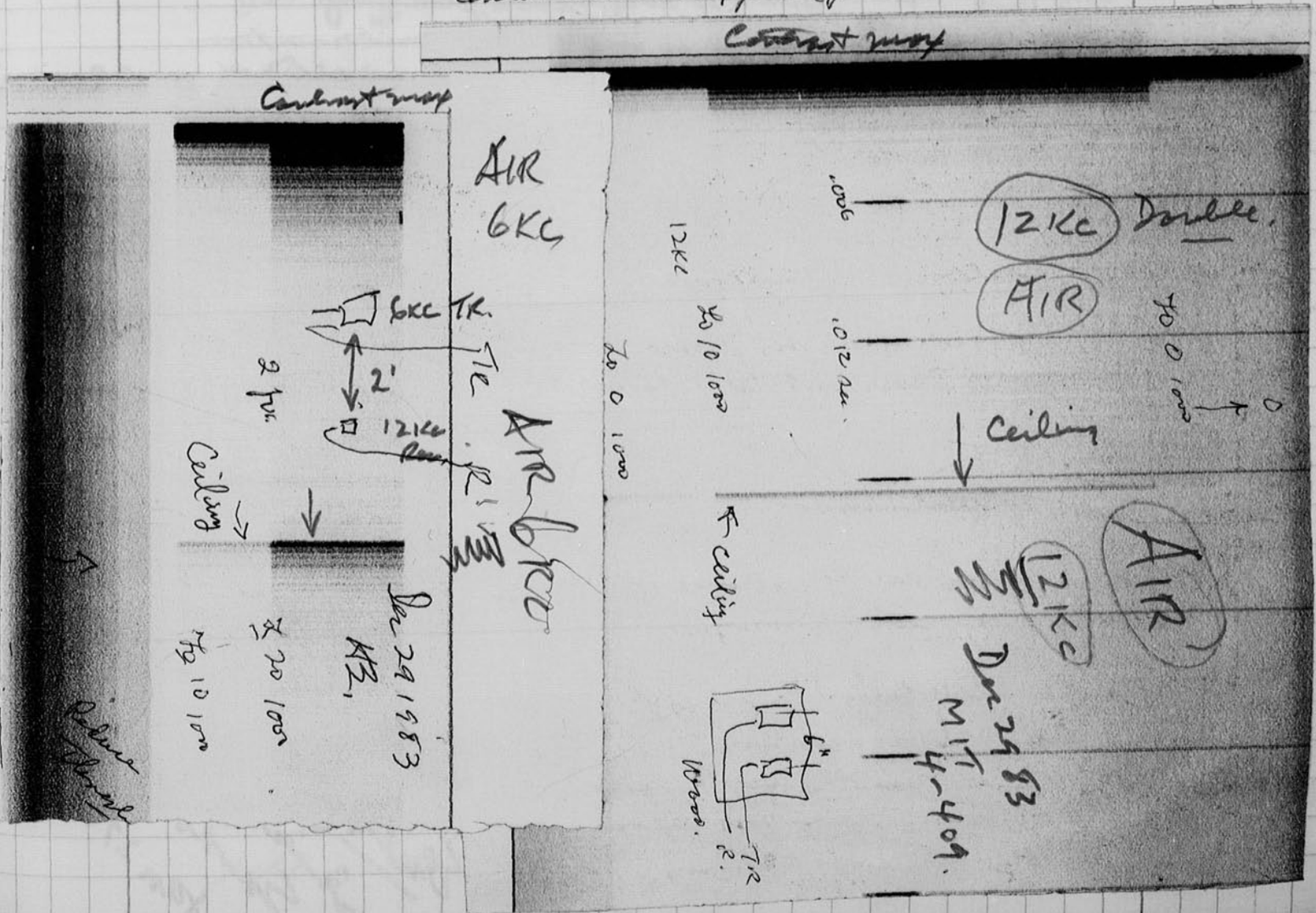


distorted when 32 mfd was used.

The driving plate was made of al. of thickness ". Diameter ". It did not always fall flat and control so the action was irregular.

I think the metal ash can has an influence on the action.

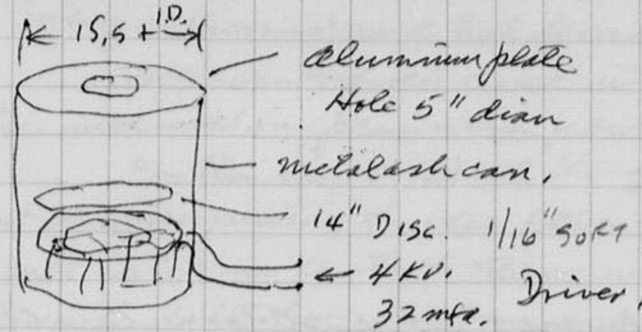
Suggestions - use a smaller coil
Center the driving plate for each

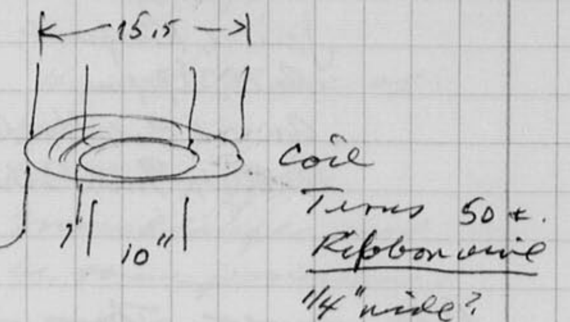


Dec 30 1983 Fri
Harold Edgerton.

VORTEX GENERATOR.

Last night about 530 I worked with Bill MacRoberts to convert an ash barrel ~~into~~ into a vortex generator





distorted when 32 mfd was used.

The driving plate was made of al. of thickness ". Diameter ". It did not always fall flat and central so the action was irregular.

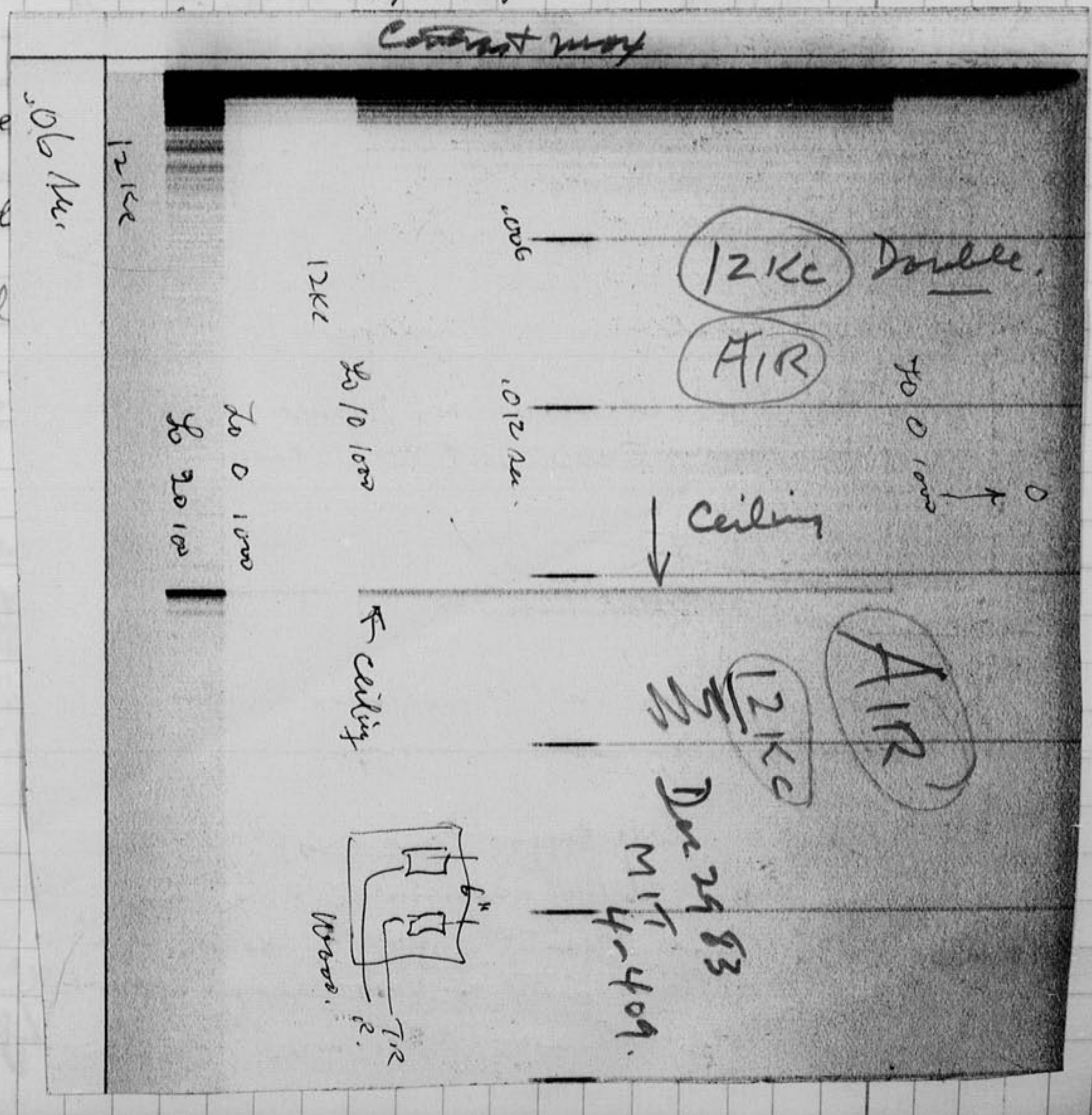
I think the metal ash can has an influence on the action.

Suggestion - use a smaller coil
Center the driving plate for each

Try some

note, the d

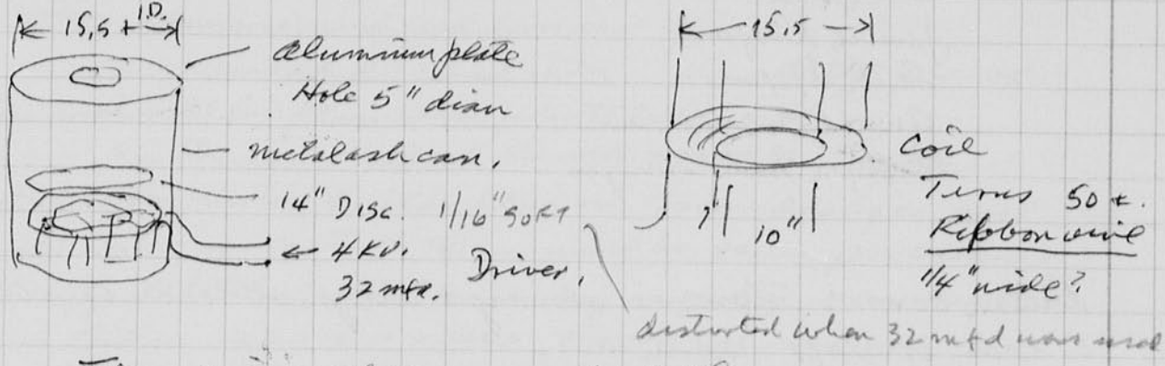
Try wood



Dec 30 1983 pm
Harold Edgerton.

VORTEX GENERATOR.

Last night about 530 I worked with Bill Makoberd to convert an ash barrel into a vortex generator



The driving plate was made of al. of thickness ". Diameter ". It did not always fall flat and centrial so the action was irregular.

I think the metal ash can has an influence on the action.

Suggestions - use a smaller coil
Center the driving plate for easier operation.

Try some smoke.

Note. the disc was distorted by the force from 32 mfd at 4 KV. ✓

Try wood box instead of metal can.

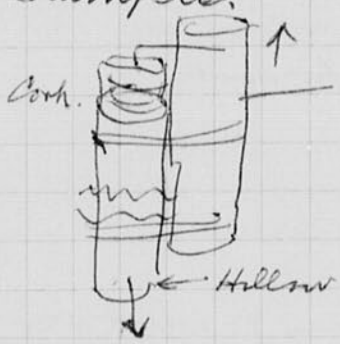
Jan. 1, 1984
Harold Edgerton.

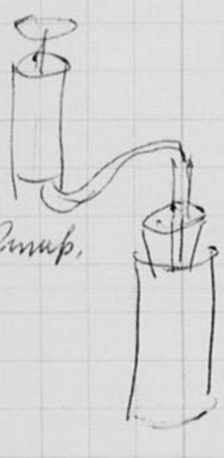
New Years Party last night at our apt 100 Memorial Dr apt 11-7?
Guests. Brandon & Marcia Rightmeyer
Bill Siebert
Janice Kiefert.
Ruth Ippen
Ann & Bob Holden
Betty & Frank Reintjes

Bottom corer. There is always the problem to obtain a core of soft sediments.

I propose to use a light tube such as 1" diam electrical conduit.

This will be attached to another pipe or rod. A cork will be fitted so that it is open when the core is made and inserted when the core is pulled out. Then an air pump will be used to squirt out the sample.





Pressure from air pump will push out the sediment.

Phone call from Elisha Linder. here in Boston from Haifa Univ.

Bronze ram will be featured in ~~his~~ book. Out in June?
465 Kilograms of Bronze.

Wood in wreck cedar. Pine (Ribs) oak (stem) elm.
Elisha will visit Steffy in Brussels Belgium
Lucien Basch. Marseille Aix in Provence
Toulon site of 7000 amphora wreck

LINDER Elisha will go to Israel and Sardinia. Jan 27 - Feb.

Jan 9 1984.
Harold Edgerton.

Wed Jan I visited the Coulter group in Bedford ?)
Mr. M had a group in the conference room to meet with me, then we visited the coating machines (very impressive) and had lunch.

Afterwards I discussed with Howell the use of the material for plankton photography.

On Thursday I called Howell about trying to get shadow photos of plankton in formaldehyde and salt water in contrast. There will be some problems. I suggested that we start on a dry subject of some sort. His technician is out with a stroke. I must call Howell again to keep this going.

SCHEUER.
Walter Scheuer will bring his movie from "Mao to Mozart" to MIT on Wed Feb 8 at 8 pm for a showing to MIT. The movie shows Isaac Stern (violinist) in China.

Jan 9. 1984 Harold Edgerton
Peter Muni
Jay Bell Some game

330 pm. Dripper on 4th floor.
camera on 3rd.
Focus 1 ruler at f 11 plus x film.
Process. DK50 10 min.

Flow Bench 49.1V ac
nozzle #10
8.18 cc
in 30 sec.

12' 9" nozzle to lens center.
13' floor to floor.

0.95 cm

Jan 17, 1984 I have been busy with a 2 week 6.001 course given by the EECS dept. Some 50 others are in this, mostly professors.

Sunday Jan. 22. 1984 100 Memorial Drive Cambridge Mass.
I have been attending a cram 6.001 course at MIT in the EECS dept. Some 50 others of the staff attended. The main thrust was about computers. We have 50+ Hewlett-Packard type — in the 4th floor at MIT in the Bernsthausen room. The lectures were held in the Bier room.

Jan 22 1984 continued

Yesterday I worked with Peter Mui on the drop problem. We took photos 2 floors (26') ends in stairway of building 4. The camera was operated at 120 cycles. One drop showed the big affair out of — drops — contact there.

There are problems about drop size. We tried some frozen water with out any conclusion.

Peter thinks the "head" of water is a critical item. He measures the drop size by gathering water in a measuring cup to get volume. Then there are 60 drops per second made by the pump. A calculation gives the diameter of the drop which is about 1 cm or slightly less.

The stream seems to break up when the drops expand. We discussed the idea of looking at the stream and measuring where the break up occurs. Then this should be plotted against drop distance.

The break up distance seems to be variable and difficult to find. We must try to get a more uniform drop size!

Pentax Camera 7336538 Ashai Oct. 30 '83.
Lens f 2 7082223. 114.00

$ 120.62 with Tax.

HE

Jan 23 1984 Harold Edgerton.

evening. Meeting at noon at N.E. Aquarium

<u>Coring devices.</u>

I propose to use a tube with a spring driven cork to close the top after the tube has been pushed into the mud.

The water in the pipe will push out the cork. Then a spring will push it closed so the tube can be pulled up without losing the material.

I propose a 1" diam tube should be used. If larger the spillage might be too much.

The tube could be split and held together with clamps. Hopefully the seal would be good enough.

I must try this in the Charles for operation. The first experiments can be done from the MIT Sailing Dock.

812 Drops. the velocity of drops.
815 Small Drops
816. Moments of Vision
817 one flower
820 Velocity of drops.
821 meeting Room.
823. Bullet
end.

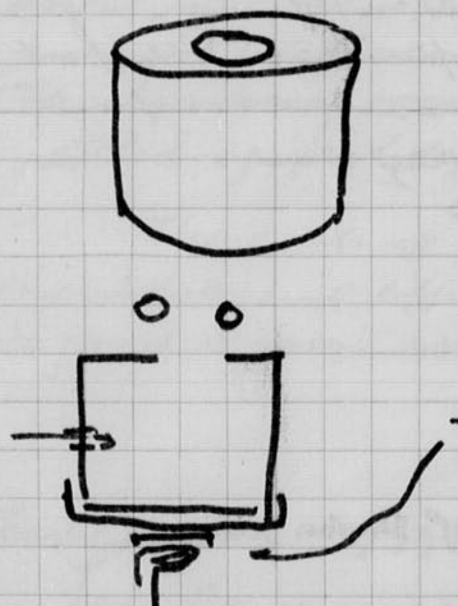
Joseph Davis. 2533456. ~~ar~~ artist
Electron Gun. 10,000 v 10 amp.
100 Km. above the earth. Electron Beam.
Oxygen - 3914 ... 6300 Red.

Discussed outer space experiment,

Feb 3. 1984. Harold Edgerton Ellen returns today from Hickory N.C. She is a freshman at MIT in the Chemistry Department.

Several visitors came today.
Peter Muir
Vicor —
Steve Benton — discussed the Chladni plate equipment with Laser-light.

Feb 4 1984 Smokering generator.



Steel Barrel.
Cover with Hole.
Size?

Open bottom.
Rubber diaphragm held by "O" Ring.

Metal circle with coil & through it

Steam.
Dry Ice.
Smoke.
Tichy.

Which is best?

I showed Steve Benton my Chladni plate device yesterday, suggesting that we use a laser beam to project the image on the ceiling. (Reflected light).
Optical method of viewing the patterns and audio to hear the sounds at Resonance

EG&G founders cut cake at the dedication of the EG&G Education Center October 7. The $5-million structure is devoted solely to teaching and conference purposes. It is named in honor of Esther M. and Harold E. Edgerton, center; Pauline S. and Kenneth J. Germeshausen, left, and Dorothy J. and Herbert E. Grier, right, whose gifts provided vigtually all of the funding for the EG&G Center.

Education theme at EG&G Center

By ROBERT C. Di IORIO
Staff Writer

The EG&G Education Center, named in honor of Esther M. and Harold E. Edgerton, Pauline S. and Kenneth J. Germeshausen, and Dorothy J. and Herbert E. Grier, was formally dedicated October 7 in ceremonies at which visions of the future and glimpses of the past coalesced to focus on the overriding goal of education.

The $5 million center is designed solely for teaching and conference purposes for students, faculty and staff of the Department of Electrical Engineering and Computer Science, of which Mr. Germeshausen, Mr. Grier and Professor Edgerton are alumni. The gifts of the Edgertons, the Germeshausens and the Griers provided virtually all of the funding for the center. EG&G, Inc., the company they founded in the 1930s, also contributed to the construction of the center in their honor.

President Paul E. Gray called the building "a living legacy of these remarkable folks."

"Doc (as Professor Edgerton is known) and Esther, Polly and Ken, Dorothy and Herb, you each are a part of MIT. You understand that education—and undergraduate education in particular—is the unifying feature of MIT. Your contributions over the years to the quality of education at MIT are surely crowned with your gift of this building to the students and faculty of this—our largest—department...I accept this building...on behalf of the faculty and students at MIT. We promise to do you proud."

Dr. David S. Saxon, chairman of the MIT Corporation, said the magnificent gift of the Edgertons, the Germeshausens and the Griers, "continue and enhance their lifelong friendship and identification with the Department of Electrical Engineering and Computer Science, with the Alumni Association and with the whole of MIT"

Dr. Gerald L. Wilson, Dean of the School of Engineering, said the spirit of the department is focused on teaching in the broadest sense—"a sense that we are here together, faculty, students, support staff, all for the purpose of helping each other to learn and to grow, and doing so in an environment that strives to build on the excellence of the past...

"The result of this attention to what we teach, this constant search for the central issues of the discipline, bring a sense of quality, value, care and confidence that the graduates of this department carry with them forever. The example set by Ken Germeshausen, Herb Grier and Harold Edgerton when they formed EG&G is representative. From a small activity they began together, the talents that each brought to the endeavor grew into a major enterprise whose products were more than electronic innovation. They were products whose hallmark was to meet a recognized need with care, quality and innovation, a hallmark that spans great changes in technology and the ravages of time...

"On behalf of the students and faculty who will teach and learn here, on behalf of all who will follow us and use these facilities, on behalf of the thousands of students who will not have the privilege of knowing each of you, Pauline and Ken, Dorothy and Herb, Esther and Doc, we can only thank you and hope that your sense of pride in what you have done here can affect you in the special way your gift has affected each of us."

Each of the principal benefactors spoke briefly. Mrs. Edgerton remarked that she hadn't been married long before she realized her husband had another love—MIT. "We've been a happy triangle ever since," she said. Mrs. Germeshausen expressed the hope that the young people who fill the ranks of the department now and in the future "will find the same spark" of friendship and cooperation at MIT that she and her associates did "so that we will have a peaceful and unified life." Mrs. Grier said she shared those sentiments "to the 10th power." Professor Edgerton, who said he came to MIT in 1926 planning to remain for a year, recalled that his career as an educator began at age five when he explained to another youngster how one puts hay and water into one end of a Jersey cow and extracts milk from the other end. Mr Germeshausen remembered graduating at the bottom of the depression when job prospects were nil and how he and Professor Edgerton agreed to do some consulting for companies using high speed photography. Mr. Grier told the audience that the raw material of research and high technology is people, that good people and good education go hand in hand and that the efforts being made at MIT toward quality education provide vital support to the realization of national goals.

During the dedication ceremony four plaques were uncovered. A fifth-floor plaque marks the Pauline S. and Kenneth J. Germeshausen Undergraduate Teaching Laboratory. A plaque on the fourth floor designates the Dorothy J. and Herbert E. Grier Conference Room. A second-floor plaque commemorates the EG&G, Inc., gift. On the first floor, a plaque marks the Esther M. and Harold E. Edgerton Lecture Hall.

Notebook # 35

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 10 and 11.

Item(s) now housed in accompanying folder.


TROBE LAB
MIT
FALL, 1983
HAROLD EDGERTON
Charlie Miller
María Paz Kudisch
Phyllis

Feb 6, 1984 Monday
HE & P. Mui.

Conference on Drop Research.

Peter has been studying literature.

Program.

60 cycle scrolls from of the floor.

All possible sizes.

observation of breakups from above.

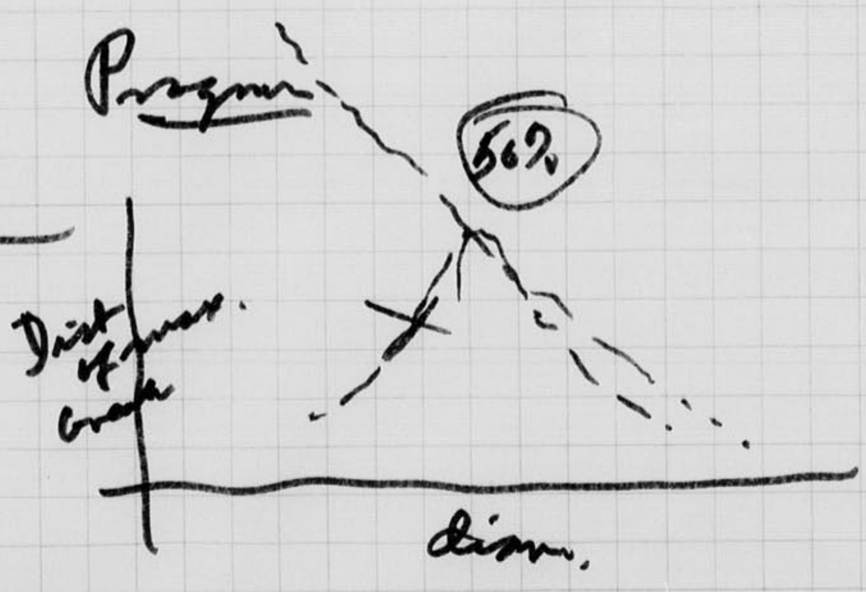
adjustment of breakups to 1 floor where a camera will be installed for many photos.

13'±1. Camera 35-mm. Nikon with 35 mm lens / ~~70~~ mm / 55.

3:1 to 1 reduction

~~Photocell trip.~~

Single flash. Probabilities.



1. Quality photo's. (Qualifying). — Mr. Reeves

Better than in old references

color.

High Resolution.

2. Quantitative data on drop dist. etc.

Plan for 7pm Monday Feb 6. 1984.

Dripper on 4 th floor. with

compliant attache of Peter [illegible].

Fast (continuous) at 3 rd floor for

breakup. Possibly on 2 nd floor. 2

Photos on B & W. Plus X. film.

with 35 mm film.

Lamps 25 ms flash. output 250 BCPS

$DA = \sqrt{250 \cdot \frac{100}{25}} \cong \underline{35}$ $DA = \sqrt{\quad \frac{S}{C}}$

$\underline{D = 2 ft.}$ $\underline{f = 16 \text{ or } 22}$ ✓

Feb 8 1984
Harold Edgerton

Peter Muir, Bill MacRoberts and I put some effort into the dripper design yesterday. A metal reinforcement was put around the hose to cause it to be straight.

Feb 9 1984 Yesterday Wally and Marge Scheuer (Walter)
101 Central Park West NY N.Y. 10023
(212) 877 4043 - were with us at 100 Memorial Dr. last night after the showing of the film OLSO & MOZART. in 10-250 MIT at 8 pm.
Dinner at Panache (feather).
Shee-chen Tan was also here from China.
Blood in urine at noon. This is the second time. No clotting. Only at first of discharge.
Will see Dr. W at MIT on Monday at 830 am.

Feb 11, 1984 Dinner and ceremony last night at the Mus of Science for Tom A Rosse, Inventor of the year. I read the citation.
Steve Quincy Bass Edison Roger
Aquarium: Al Barker. Lab on 5th floor
Tom Coffee UNH,
Samples for photography from Tom.

Clam mercenaria mercenaria 3 weeks old

Rotifer ~~Brachionus~~
Brachionus Plicatilis.

I plan to photograph these and then take them out to Bedford to be ~~photo~~ imaged on the Calton-K system with Howell. Cad sulfide crystals?

Sunday Feb 19 - 1984. Yesterday I worked with Peter Muir on the drops problem. We are trying to get photos of the breakup of drops from the 4th to the 2nd floors. The drops are about 1 cm in diam. Photos of 520 cycles are made on a moving camera.
13 ft floor spacing. Probably 10 ft + 13 = 23 ft down.

a senior Vivian Wang is going to do a thesis study on drops as they splash. I gave her my copy of Worthington to study.

I suggested she investigate the use of small drops on the ring as a function of drop distance and liquid thickness. Surface tension also enters into the phenomena.

Feb 23 1984 Eric Edgerton came yesterday + by bus from N.Y. for a lecture by Suzanne Helmuth and Jock Reynolds at MIT about their exhibit in Hayden. Ellen and Esther also were there. Supper at the Fish restaurant (Legal).

I gave a slide show at the Hilton Boston Hotel yesterday at noon before 600 at the Engineers week affair. Brian was in charge of the banquet.

I had an x ray study of my bladder etc on Feb 21.

Gjon Mili died Feb 14 in a connecticut nursing home. There will be a memorial service somewhat later.

My left eye has been causing a problem. I now have very poor vision. The images are distorted and there seems to be an area where there is a filter for low light level. The color of an image is of a different shade for the two eyes. It seems that a blood vessel may have leaked on the back side of the macula. The material distorts the active visual area. It does not seem to get any better as time goes on. My right eye seems to be normal. I hope it continues.

I gave a lecture at MIT in the class 6. which is now being taught by Chas Miller. I showed a large collection of slides.

Vivian Wang is going to do a thesis on the splashing of liquids.

Mark DeC is considering a study of photographic methods of the loch Ness. My shadow system will be considered.

Feb 29 1984 Harold Edgerton.

I went to the coulter plant on wiggins avenue Bedford yesterday. Ellen Dixon went along. We saw Hat Hauer and Phyllis Rorke (Clusimor). Photos(?) made of a turkey feather from Yucatan.

The images were made on KC 201 chromium plated plastic.

#2. 1.5 ft. 0.7 cps. no glass. exposure thin

#3 1 ft. glass on subject. Elegant exposure

4. 1.5 ft Rotifer
BRACHIONUS PLICACLUS
cover glass.
~~note~~. Water discharges the film!

5. Tap water on film
Seems to be ok.
methanol? Rinse

6. Isopar rinse coverglass on subject.
1.5 ft. Rotifer. 1/4 mm coverglass.

7. Sandwich of two (1/4) mm cover glasses. with Rotifer.
1.5 ft. 0.7 cps Left to be transferred to permanent slide.

We left about 11+ for M.I.T. There was some snow and slush.

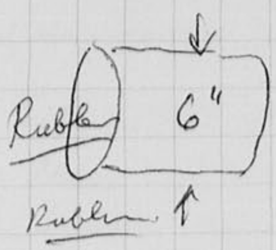
I showed slides Feb. 22 at the Sheraton-Bos Hotel. Brian Dunfield was the toast master of the National Engineers week. About 600 were at the luncheon.

Vortex experiments   March 1, 1984   GARY OBER BRUNNER
Gary Obernner
Syracuse N.Y.

Peter Muir

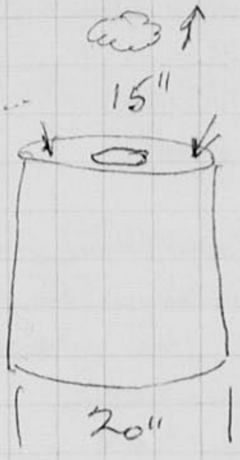
Bill MacRoberts

Harold Edgerton.



Hit gently

Bill MacRoberts



Plastic barrell.
Push down to cause air to come out of the hole.
Vortex goes to ceiling.

Smoke - Punk water   6.2909

Fionell
Smoke, oil, wax smell

SMOKE
VORTEX

Works fine with al. Disc   3/32" disc with distortion-
16 mfd - 0. resistance.

a cardboard disc used. 17".

Hole in Barrel increased to 6,5 inches diam.

Excellent 10 ft in 4 secnds to ceiling.
16 mfd ~~with 5 ohms in~~ pr 4000 v.
Dimen. of Disc

Lunch

3:15 pm. more tests. 16 mfd   6.5" diam
2 x 16 mfd. no R.   ~~2 seconds to ceiling~~

Excellent.   1 sec to ceiling +

Try 8" hole. 32 mfd 4 KV. seems to be OK.
no R.   5 seconds to Ceiling.

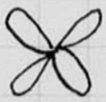
5" hole in Bakelite disc 3 sec to ceiling 16 mfd.   16" diam of barrel.
1 sec and more. to ceiling   32

8" Hole 2 sec to ceiling 32 mfd + 5 ohms   excellent!

Mr & Mrs Martin from Los Angeles (Hughes) were here. [illegible] ?

Sunday Mar 4 1984. Photo Exhibit at Rose Gallery
21 " At Boston.
Most of the photos were high-speed types.
Most were printed by Gus Kayafas.
Eric H. is the owner of Rose Gallery.
He had a wonderful open house on Sunday. Some
300+ people came 11 am to 11 pm. I left about 4:30.
Angela Rippon of Channel 7 and Jim Bennett Sound cameraman
interviewed me at 11 am. They plan to show the
material on Tuesday, Mar. 5, at 11 pm.
There will be an interview by
Jim Webber on channel 56 at 10 am on Tues Mar 5.
This was set up by Grace — several days ago.

Bronze Prop. — Connie ~~DRISCOE~~ QUINCY Mass.
1914 Belfast * TURNER STREET
479-5386
Ships. ~~Steamer~~
4 master hit by steamer 1914



Bill QUINN Orleans Cape Cod Book of wrecks
wants info on monitor.

Mar 24 Sat. Just returned (noon) from Kent college,
night with Waldo Semon 86 years old
79 Atterbury Blvd 110 Hudson OH 44236.
Jenny J. —
Ohio Jenni students of grad at Kent college
I showed slides and the pickles.

Jim Pauber 1197 Templeton
Stow Ohio 44224. Took me to the
United at Cleveland 10:42 flight 1038

Palm Press, 27 Hale Littleton Mass
01460
March 1984 1-486-8448

Greece. Negroport where Marco Polo stopped when going from
ACRE to VENICE. Throckmorton says it is on Euboea Island.
Note. There is a narrow channel here where the currents are
very strong (tidal currents). The town here is KALKIS.
Waldo Semon wanted to know where Negroport was located!

Mar 26 1984
H. Edgerton. Bob Rines Urquhart Dr
Conf on Loch Ness

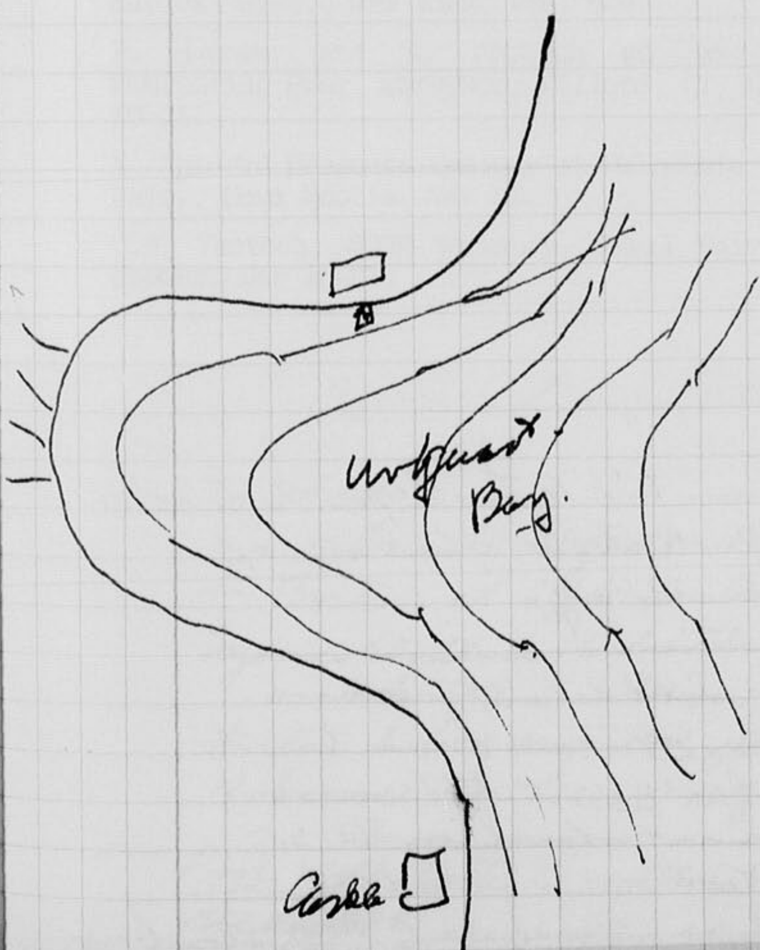
1. Silhouette of life in Loch Ness. Photography - [illegible].
2. Chas. Miller - U.W. T.V. Better [illegible] - Continued [illegible].
3. Sonar Monitor of Bay entrance.
4. Higher definition Sonar imaging.

Rines will be in Japan in May 13,14. for 2½ weeks.
Sony. U.W. housings done in Japan.

5. Jerry Lettvin, Bob [illegible]. etc Thermal Imaging.
Thermal Imaging arrays:
6. Adapting Disc cameras - Strobe lamps. Sonar trigger.
Dianna Marshall. Newton. - [illegible].
861-8177. Magazines. Bedford. [illegible].
275-2010. Zoo [illegible].
7. — Belgium photographers.

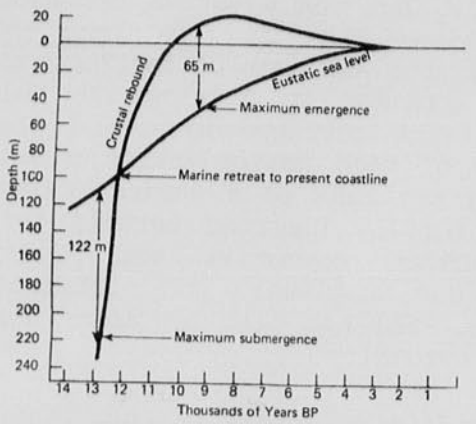
Bob will be in Cambridge for class on
Monday. 6-934. "Patents and [illegible].
6-931. 10 or 15 students. Bldg 37 - ~~[illegible]~~ ?
Mondays - 37-212.

2d floor: Bob.



Boat to Road.

Scrolls from the
Dead Sea
EDMUND WILSON



Lab Log. BIGELOW LAB SPRING 1984
Vol 3 no 2

THE SEA ALSO RISES

Mean sea level (MSL) - water level averaged over time to correct for short-term fluctuations due to waves, tides and storms has become an accepted datum from which we measure everything from storm surge heights to the altitude of jet aircraft. Its wide use as a basic datum has lulled many people into thinking of MSL as a static feature. Nothing could be further from the truth! Recently Peter Larsen and Anne Johnson of Bigelow Lab have been concerned with tidal power effects on the tides in Maine, particularly with the ecological manifestations of the predicted increases in tidal range. The appropriate concern over changes in tidal range, however, has unfortunately overshadowed the very important, longer-term changes in MSL. Three factors affecting MSL are currently believed to be operating. These are movements of the land mass (isostatic changes), changes in amount of water in the ocean (eustatic changes) and the very topical factor of thermal expansion. Isostatic changes in MSL are of regional significance, whereas the latter two factors are important globally.

During the last ice age, much of the earth's water was in the form of ice in massive continental glaciers, reducing the volume of the ocean and lowering eustatic sea level. The great weight of the glaciers, however, depressed the land masses and raised isostatic sea level. As melting began, eustatic sea level began to rise. Removal of the ice burden from the land mass caused the earth's crust to spring up, or rebound. The combination of these processes caused MSL first to decline then increase from about 8500 years ago to the present (Fig.). Recent estimates suggest that MSL in eastern Maine may be rising at nearly 2½ feet per century, largely due to down-warping of the earth's crust. Continued melting of the Greenland and Antarctic ice masses are expected to add one foot to MSL in the next century.

Recent government studies have projected that increased atmospheric carbon dioxide will contribute to global warming (Greenhouse effect). Heat transfer from surface layers resulting in thermal expansion. Present estimates, allowing for many assumptions and uncertainties, suggest thermal expansion will increase MSL between 2 and 10 feet within 100 years.

Rising MSL has far-reaching implications to our environmental and economic well-being. Major effects will be seen in coastal erosion patterns, coastal plain submergence and flood damage. Research can lead to better decision making and mitigate the inevitable individual and societal consequences.

April 1, 1984 Harold Edgerton
Returned last night about 5:30 pm from trip to Las Vegas Nevada, where I gave a lecture to High School ~~studen~~ students of the county, some 90 were there for all day.

I left Boston on Mar 27 for Salt Lake City where I met Mat Iwanek with a Ram ~~Sl~~ truck for a trip to the Snowbird Hotel where the arch colloquium was to have a seminar, I gave an after dinner speech on the 28 at 7 pm ±. Num — of Collonnes ~~[illegible]~~ before me. He described the early work at the Manhattan District on the atom bomb,

April 10, 1984
Harold Edgerton.

The new oak cabinets for the photos in the Hall and the exhibits are now in place and full. There was a opening on April 6 (my 81 birthday). cake and punch were on hand. Warren Seamans is in charge of the museums at MIT and had a lot to say about the arrangement.

Prof Mann gave the Killian lecture yesterday at 4:30 in 10-250. He is the 12th to do this.

EG&G Strobe Guard from Mandeville LS-162 Ser 1012
24 volts. 8 flashes per burst.
duration of flash = 14 μs Peak = 0.4 × 10⁶ cp.
duration of 8 flashes = 114 ms.

This is on the Green Beacon going as of Mar 1984

114 ms.

cps = 5.6 cps s.
× 8
44.8 cps.

45 cps s

Museum of Sci single flash - about 5 cps.

April 23 Monday 1984 Mary Lou and Chas arrive Apr 21
Mary Anne Hubbard arrives Apr 22
Easter dinner with Jim Dixon Rebecca. Ellen Dain &

Lunch with Rosenblith, Ziccarias, Stting, Benedict, and ESI-250.
Take notes of discussions.

April 27, 1984 The EG&G Strobe Guard 1012 was installed on top of the Green Bldg.
Rate measured at 10 pm from 100 Mem Drive = 1.57 seconds
Bill was Roberts.
Simson Garfinkle Bonnis '05. Student with camera

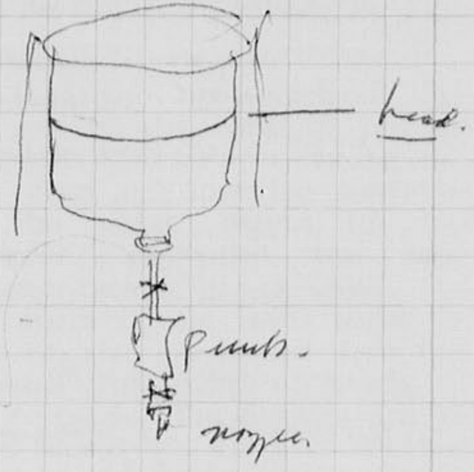
Apr. 30, 1984
Emily Edgerton Key was born 6# 2 oz.
in Boston at 6 pm on April 27 1984. This is Sylvia Edgerton's 16 birthday
Mary Louise Dixon is here from Hickory N.C. to see her grand daughter and to help take care of Rebecca Key Louise Key who is now 2 years old.

Prof Will (Betty) from the Uni of Mass was here with 15 ± students to see my amphoras. Elisha Linderstra.

May 2 1984 HZ & Pilar mee 930

Drop size equipment

1. Upper Reservoir.
Pilar says it is N.G.
Says a lock is
necessary. All air
must be out.

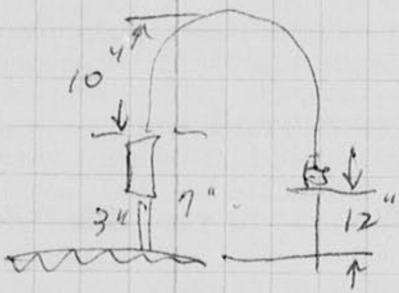


Problem - How to get large drops.

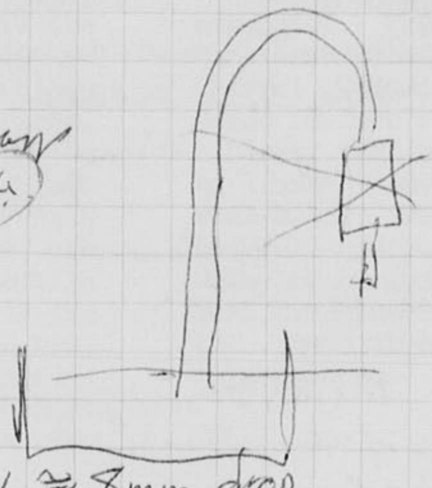
2. Nozzle size - vs. - drop size.

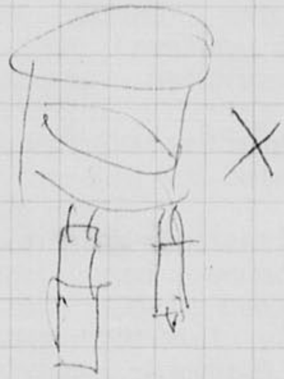
A. Nozzle vs drop size or weight Volume, curve.

B. Drop size - function of head.



Pilar says N.G.





Nozzle # 10 75V. ≈ 8mm drop
" 45V. ≈ 6mm drop 200 cc

HZ P.M.	# 10 nozzle.	50 V	1/2 min.	6mm 200 cc ~~30 x 1800 = 4500~~ ants	1800 drops
		Volts		diam cc	
	7mm	60 V ~~80~~			
		60.1		.73 cm 380 cs.	
Voltmeter 38-801		~~64~~ 70 V		.83 550	
		~~75~~ ~~75.5~~ 75.1		.90 670	
		80.0 V		.95 800	
		85		1.00 935	
		85.6		.96 850	Less Head
Reduce nozzle dist * to 0		85.3		1.00 970	Lower nozzle.
		85.4		1.00 920	Hollower nozzle

Nozzle	V.	cc	Drop. Diam. (calc by mm)	scale meas.
#1	35.0	95.	.52 X	4 mm

30 N.G. no stream of water.
Meas shows 4 mm.

Check 35.2 volts. 90 cc. .44 cm calc. 90/1800 =

DUNNE
KINZER 1948. article Jour of Meteorology.

Drop Diam	
.3 m	806
.4 m	883
.5	909
.58	917
end.	

Drops 20 meters ± largest drops.

13/4 ; 3)52 ft = 17 meters. Bldg 4.7 m

cm. Diam.

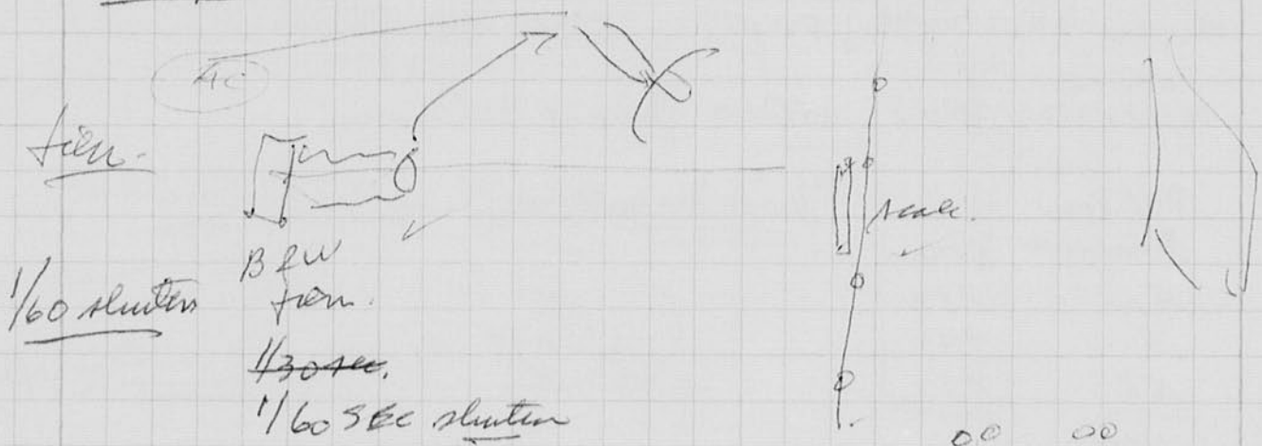
	Nozzle #.	23 ct.									
.35	1	33.4	40.4	→ N.G. 42.4	5.+ mm		34.-	0.45 cm 4.5	0°	100 cc.	✓ d.
.54	3.	33.5 V	cm .73	380 cc	38.2 (.53)	150 cc. 0.54		52.4 excellent.	.71	340	✓
.54	# 4	36.4 V	.46	97	no secondaries 51.6 V		330 cc. 0.70				
.60	# 5	33.9	.42	72 cc	53.9 / 54.1	.74	390	no sec. 58.1	cm. .78	cc. 450	✓
								67.1	.84	570	✓
								90.1	.90	700	✓ best.
.60	# 6	37.3 V	.48	110	min small drop. 49.0	.64	250	58.1	.77	440	
								61.5.	.80	500	
.63	# 7.	38.1 V	.47	100	58.6	.77.	440	61.0	.87	620	✓
.69	# 8	35.1	.43	78	51.4	.70	330	70.2	.91	720 cc	✓
.74	# 9	36.6	.46	95	67.7.	.899	685	72.5	.90	690	✓
.76	# 10	34.9	.45	84	58.4	.79	470	84.5	.85	580	N.G.
.84	# 11	42.4	.55	160	50.7	.67	290	82.7	1.0027	950	

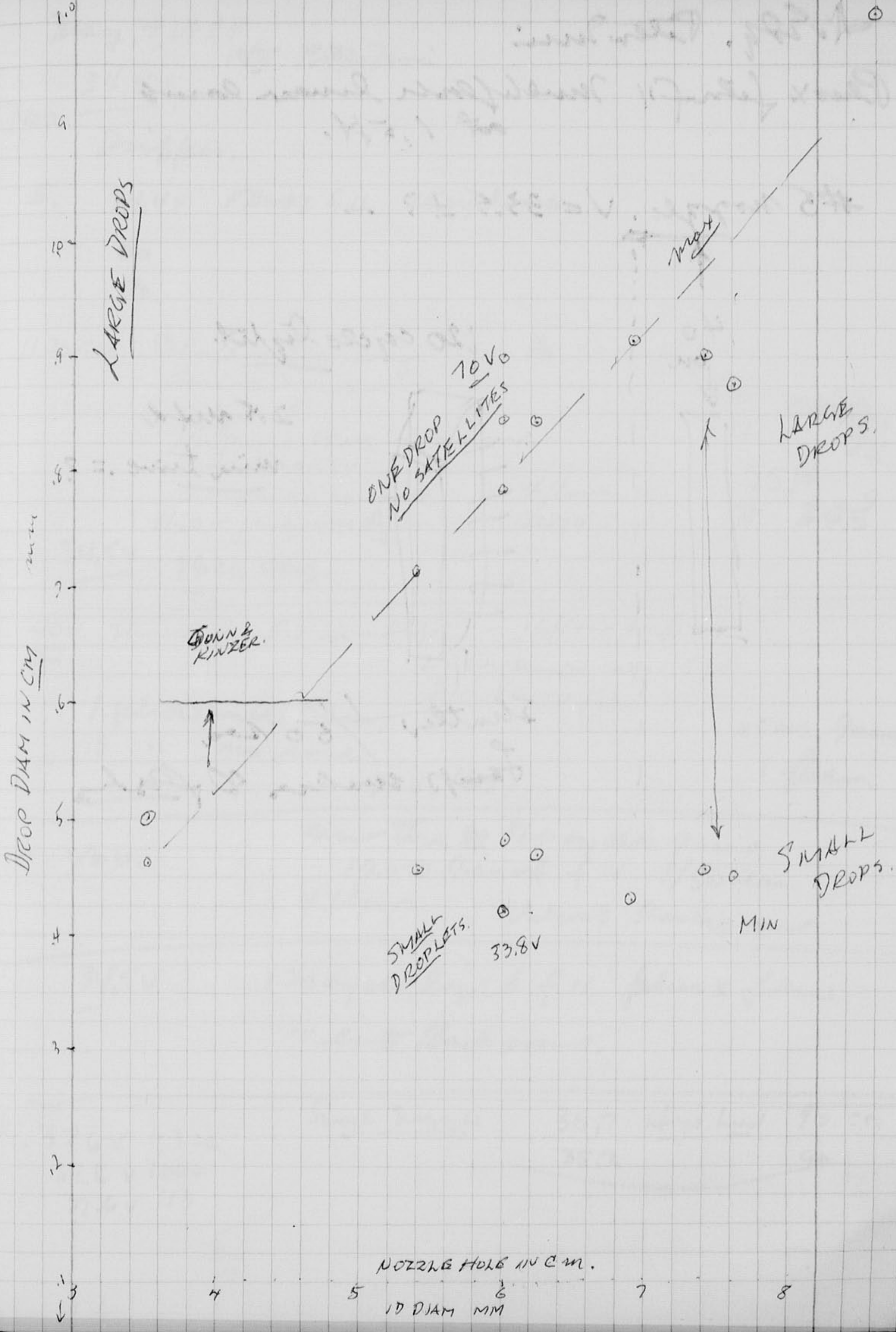
Procedure.

Nipple #5 with 33,8 V on nipple. D = 0,45 cm dep.

" " 70 V " " D = 0,90 cm.

12 candle lights: Scale on film.

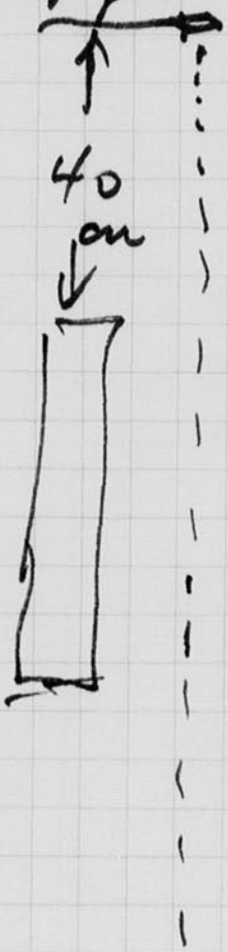



LARGE DROPS
DROP DIAM IN CM
1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
ONE DROP
NO SATELLITES
70V
max
LARGE DROPS.
GUNN & KINZER.
SMALL DROPS.
MIN
SMALL DROPLETS.
33.8V
NOZZLE HOLE IN CM.
3
4
5
6
7
8
ID DIAM MM

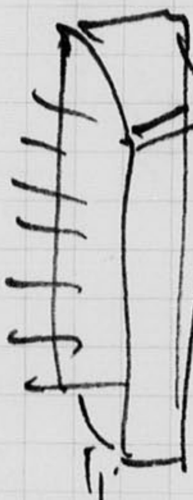
 A. Eq. [illegible]

Plus X film f/11 multiflash [illegible] at 1.5 ft.

#5 nozzle. V = 33.5 ± ? –



120 cycle light.



2.5 mfd,
min time = ?

Shutter 1/50 sec.
Lamp makes [illegible] flashes

May 3, 1984
H2 Pattern Dev

N02 34.4V.

Dripper.

5. 34.4V Plus x f11 25 μs lamps.

60

80.

11 20 am. Set up in Stairway. Hz.
Camera at Bottom
Subject 5.
1 Exposure 25 μs of Scale and drops 34.5V.
3 exposures no scale. 4 floors.
H_2O + fluorescene dye. Bed 4

34.5V 76cc Drop.

1/100 [illegible]
f 11 84
55 ft
345

40V. Showed lu 5.2 mm drops. — 4 floor drops.
2-25 μs lamps at 1.5 ft
f 11 plus x film
1. photo with Scale.
3 " no scale.
40v. 165.
25 μs. lamps
1 flash

40v. use the 120 cycle lamp.
120 Hz lamp f 11 1/50 sec.
4 floors. Velvet background

34.5V 120 cycle light f 11 plus x film
Velvet Background.

#1. 37.6 v 93 cc
37.6 v 100+
37.6 v 113

Small nozzle

35.7 Height [illegible] 90. cc.
35.7. 90

5/100

May 14 1984 Harold Edgerton

Honorary degree Humanities, Franklin Pierce Law Center on May 12 at Concord. Ellen Dixon drove in ford car. Mary Lou Dixon, Esther Edgerton went with me there was lots of rain.

a [illegible] Honors at Weston Hotel on May 13. Exhibit of paintings at Harvard Square.

MIT Press Books in Stock

Elect Flash Strobe	1060	12.50
M of V.	(2500)	14.95
M of V. Hard Cover	750	35.00

May 24 1984. HE. & Mongrosy [illegible] several rolls of 35 mm photos of drops from the 4th floor.
Size of Drops - weight. diam?,
Velocity meas. = ?

Lecture yesterday noon at the Plaza Hotel (old Statler).
to the SMPTE.? convention Harrow Polaroid asked me.

PROPELLER CONNIE DRISCOLL called this morning.
479-5886 (worth 11,000 on the dock.).

WRECK Alva - Holmes - ship full of coal sunk 1914
150' water 7 miles out.

WRECK. Louisa Smith 90 ft of water off Nahant 1896?

9.30 am AAA T.V. Co. Zenith TV
type Mike Mahoney.

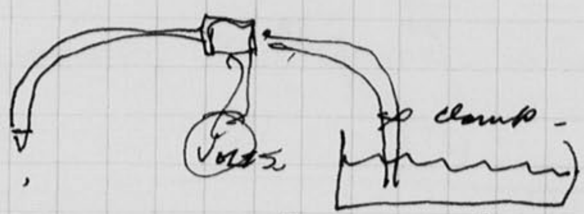
May 25. Elisha and 3 Israelis were here.

May 26 1984 Sat. H. Edgerton.
with Peter ...

4 floors Body & drop velocities.
Volume. 180 cc in 30 sec. 120 cycle light
(size 5.7 mini cells.) Plus x film. f 8.

note change of pump from vert to Horizontal

60 ∅ pump..



No 2

1 no clamp. 34.8 37.3 ok. NG with clamp off.
- clamps.. N.G. 38.4V not too good! ×

(out)

#3 42.5V (some) no clamp.
no clamp 48.5. no spray: vol = 245 cc (30 sec).
clamp 48.5. 1 → 155 cc
clamp. → 59.2
230 Same as without the clamp.
clamp on 42.5V 105 marginal.
42.7 ok
42.8 ok.

#4. no clamp. 52.6 → 57.3V
no clamp. 56.6V → 375 cc Big drops.
clamp, 56.6 → ? 265
increase with voltage increase
" " " decrease. Expand range to 64V

5. no clamp. 58.9 — .60. 58.4-60 395 cc. (58.2) .73 +
clamp. 58.2V 385. 55.9 - range .7 cm
no effect of clamp.

#6. no clamp. 63.1 60.1-66.4 65.7
w clamp. 63.7V 470 cc. (62.2 → 66.3)
clamp. → 450 67.→

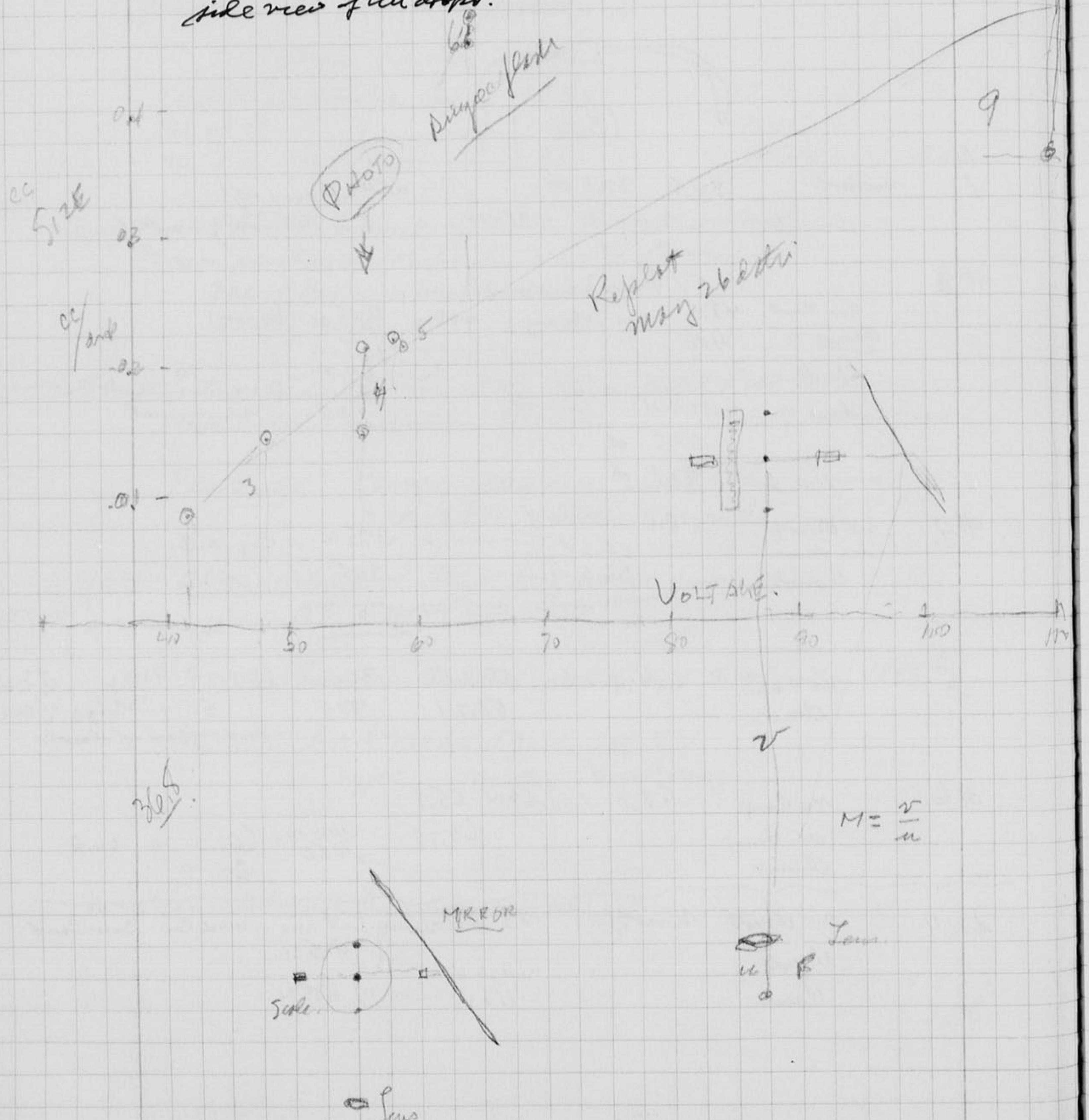
#X.9. no clamp noisy 88V noisy but big. unstable boundary
clamp. 119.2V → 945 cc.
clamp. 112V → 585 cc.

Afternoon.

After visit with Karl Wildes in the rehab hospital.

Nozzle # 4 5.3 mm hole. f16 25 μs flash at 1 1/2 ft.
voltage = 56.8 volts.
Plus x film 5 min dev.

A mirror is being constructed for a side view of the drops.



Sunday May 27 1984
1:50 am H. Edgerton.

Todd Gieg

#4 noz. to show secondary drops.
f16 Plus x film.
2 lamps on 25 μs 500 BCDS at 1 foot.

Volume = $1/6 \pi D^3$.
Density of water = 1?

Mrie data on velocity 950 cm/sec Drop size diam 4.4 mm drop.
curve. – 917 " " 4.4 mm (Dunn & Kinzer).

This aft. smaller drops. 0.45 cm = 4.5 mm. #1 nozzle

HE loaned Bill Hasket a VHS tape of the strobe lab.

2 June 1984. Honorary Dr. degree awarded today to me by at Lowell Uni. Pres Wm. Hogan.
Esther and I left about 9:30 for Lowell on Rt 3 in the Ford Escort. It rained all the way!
Rev. J. Bryan Hehir (Washington D.C.) gave the address.
There has been a lot of rain the past few days
Some flooding has resulted.

June 7, 1984 100 mem Dr. Harold Edgerton
J. Brackett and Sally Hersey were here for a late lunch at the Faculty club. Daughter, was with them. The families own inn in Vermont. Hilltop Manor Inn Danby Vt. 05739
802 290-5040

I gave Hersey a copy of "Sonar Images" Edition II.
A copy was given to Prof. Giriam.. of – who visited the strobe lab while a guest for Harvard.

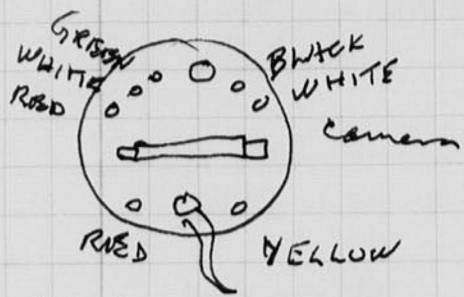
Visitors from Washington Welde Pogue & wife Mary Ellen Son John in Mary agnes Brober. We all went to Plymouth in our Ford Van to attend the ceremony when a piece of the Plymouth Rock was presented to the Smithsonian Inst. It was accepted by Ripley of the Smithsonian.

On Sat June 9. We all went to Lowell to ride the street car and canal boat, There is a new museum at the old mill area.

June 11 1984 Harold Edgerton   Summer H.S. Seminar.   34 students.

8.12 am 4-405.   HE Lecture 830am Monday

T.V. and camera assembly will be borrowed for trip to alaska by Dolphin of B.C.



Back End of camera.

HE Lecture 830 Tues.

June 12 1984 Harold Edgerton Lecture at 830 on shadow photography.

9.45 Earl Quinn of Eastman Kodak.

Estar Ester 2400. Coated. slit into size 5' wide.

acetate 1700. "

7250 Eastman Video News Film Tung.

7251 " " " 1 Daylight.

400 - 3200 by control of processing.

7278 Tri-x Reversal. Eastman sales people.

Graphic arts

Kodak RAR Do 251 Estar
" " 489 "
" " 5498 Acetate
" " 2498 Estar
" " 2477 "
" " 2422 "

Filter 85B to change from tungsten to Daylight.

Shows method of improvement of Exposure for 5 x under

10.38 Film. 7394 reg. 3399 Print film for many releases.

10.45 Chas Miller.

Tom Lemon - Light Source.   Xenon. "Bomb".

Philips Tin - Lamb   Vol 7. Sylvania book. Reflector Lamps

Explode? no variation of light in cycle.   Rosco. - Silk spreads the light eliminates wrinkles ✓.

Influence of voltage on output.

Banquet June 13 at Faculty club. for Seminar on 34

Beacon Quit → Beacon on Green Bldg quit June 15 Friday am 6 am.

Installed. April 27 1984 in page 21 Lasted 45 days

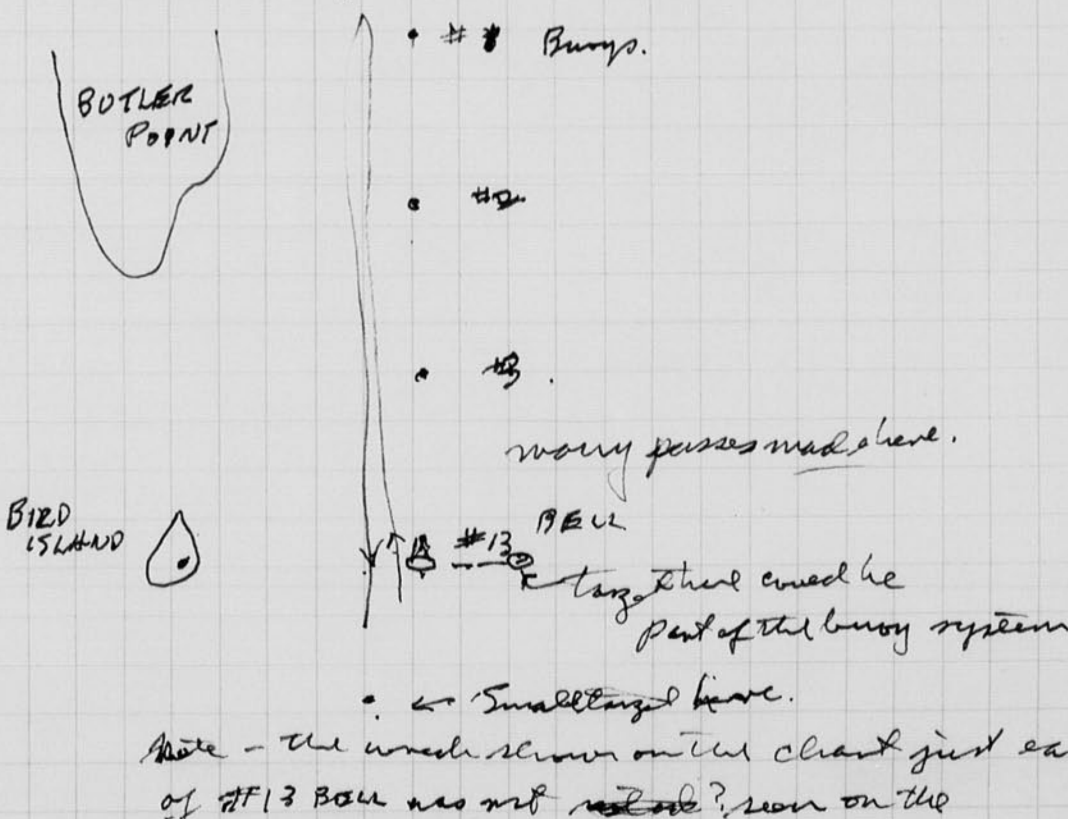
Note the Red Beacon is skipping!!

Repaired 249 Side Scan June 13 at EG&G. Bear Hill Rd Waltham
Train. F.V. technician
Frank Germaine. - discussed penetration. I was informed about the 250(?) sonar which is about to be distributed. Unmar Bulor.

June 16. 1984. HE to give lecture on elapsed time photography. See Int. H.S. Photo congress paper by Edgerton and MacRoberts. Summer session on H S photo. 3½ page.

I climbed up to the top of the Green Building tower to see why the lamp was not flashing. This was an EG&G Beacon that was installed 2½ months ago. I found it to be ok. Why was ~~it~~ off last night? ??

June 17 1984
I went to Marion Mass yesterday with my side scan sonar to work with Jim Feeney and Dr. Edward Briggs. Our objective was to search for a bell that may have been swept from a small BIRD island in the 1938 hurricane. There are some questions about it being lost at that time.
Mark De Cew a senior at MIT went with me.
Jackie ~~Sch~~ Sheckler Laura Dadagian
Wm MacDougalls also were aboard the R/V SOSI which belongs to Sippican Co.



Note - the wreck shown on the chart just east of #F13 Bell was not ~~noted~~? seen on the sonar record ?
Many Rocks were observed.
All sonar records were left with Briggs.

34

Harold Edgerton

Massachusetts Institute of Technology — Office of the Summer Session

Chas Miller

Special Summer Program 6.51s

HIGH-SPEED PHOTOGRAPHY AND VIDEOGRAPHY 33 STUDENTS

June 11 through June 15, 1984

Roster of Registrants

Mr. Malcolm Bailey
Marco Scientific, Inc.
1055 Synnyvale-Saratoga Rd., #8
Sunnyvale, CA 9087

Mr. Mitchell Z. Bistany
Massachusetts Institute of Technology
Lincoln Lab.
Lexington, MA 02173

Mr. Arthur E. Byrnes
Canadian Forces
Aerospace Engineering Test Establishment
CFB Cold Lake, Medley
Alberta, CANADA TOA 2MO

Mr. Donald M. Cobb
Xerox Corp.
800 Phillips Road
Webster, NY 14580

also Reese.

Mr. George J. Cocallas
Naval Weapons Station
Code (063)
Seal Beach, CA 90740

Mr. Richard R. Franks, Jr.
Calspan Field Services, Inc.
PWT Instrument Branch
MS 600
Arnold Air Force Station,
TN 37389

Mr. David C. Holley
Eastman Kodak Co.
1669 Lake Avenue
Rochester, NY 14650

Mr. Ronald J. Howard
Owens-Corning Fiberglass Corp./Technical Center
P.O. Box 415
Granville, OH 43023

Mr. Stewart A. Ingham
Sandia National Labs.
Div. 7556
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Albuquerque, NM 87185

Mr. Thomas M. Kegel
Foxboro Co.
38 Neponset Avenue
Foxboro, MA 02035

Dr. Krishna R. Kumar
Atomic Energy of Canada, Ltd.
General Delivery
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CANADA ROE 1LO

Mr. Robert T. Kumasaka
Naval Weapons Station
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Mr. Jeffery A. Lovett
Gould, Inc.
Ocean Systems Div.
11 Technology Plaza
Middletown, RI 02840

Mr. Frederick E. McCoy
Harry Diamond Labs.
2800 Powder Mill Road
Adelphi, MD 20783

Mr. Elzy E. McCrossin
David Taylor Naval Ship R&D Center
Bethesda, MD 20084

Mr. Vincent P. Morters
ROVI, Inc.
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16

Mr. William D. Parker
David Taylor Naval Ship
R&D Center
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Mr. Robert J. Pearson
Omark Industries, Inc.
4909 Internal Way
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Mr. James R. Ralph
Pitney Bowes, Inc.
Commerce Park
Danbury, CT 06810

Mr. Dudley J. Reese
Naval Weapons Station
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Mr. Rodney L. Robbs
Naval Weapons Center
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Portland, OR 97222

Dr. Ivar H. Stockel
University of Maine/Orno
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Jeness Hall, Rm. 115
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6329 Lomas Blvd, NE
Albuquerque, NM 87110

Mr. John F. Syphrit
US Secret Service
1800 G St., NW
Rm. 938 VIB
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[redacted]. Kerry G. Trimble
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CANADA R0E 1L0

Mr. Daniel Vaughan
Dan Vaughan Productions, Inc.
15 W 44th Street, Fl. 3
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Mr. Peter Vraka
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Alcoa Technical Center
Alcoa Center, PA 15069

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Ms. Jane M. Wells
US Army Research Center
DRXMR-MPA
Arsenal Street
Watertown, MA 02172

Mr. David T. Waitt
Commander
US Army Tropic Test Center
Attn: STETC-LD-ISL
APO Miami, FL 34004

Mr. Warren R. Wrenner
IBM Corp.
Dept. T91/Bldg. 002-2
1201 North Street
Endicott, NY 13760

33

17
17
33 +17

June 17 1984 Harold Edgerton
Mary Lou Dixon and daughter Ellen Dixon here for a few days. M.L. will retire as ... on ... .

from James Killian

June 26 1984. History — Bush and the Differential analyzer
Larry Owens. ~~Histor~~ of Science 220 08544
Palmer Hall Princeton N.J.

July 13 1984. Yesterday with Harry Kendall looking for lost elapsed time camera lost by Mark DeCamp on June — near the Coast Guard Station.

Harry made a 30 min ... line around the spot where I thought the camera would be located.

Bill MacRoberts and Adam Brody went with us.

Harry found nothing except dead fish and a large log (west of the spot). He said the bottom was stirred up by ~~his~~ fins. He said the bottom was soft up to his elbows. Perhaps the camera has sunk below and is not visible. Harry covered a large area with a rope to the anchor.

He plans to bring a metal detector on next Thursday. We will try again.

JULY 20 1984

Sonar 259, I took it out to Ed Ida (last week) Tim Sui overhauled it. new Paper rollers, Blade Sticks!, Port trans ducer weak,

Tests in Charles river were not up to expectations,

Pete Clifford got me a new fish electronics panel yesterday which Bill MacRoberts and ... installed.

We now have a 50° beam on the 259
Yesterday we tried it at Hatch Dock with mixed success. The wall does not give a big signal. I did not see a boat.

July 13' 84 cont with Joel Moses and about Strobe lab. Discussed promotion for Millies
1 Discussed program - finances, etc.

2/84

MASSACHUSETTS INSTITUTE OF TECHNOLOGY CAMBRIDGE, MASSACHUSETTS 02139
Room 4-405
Tel: 253-4629 OR 494-8783

PERSONNEL

Edgerton, Dr. Harold, 100 Memorial Drive, Cambridge 864-4790 (Professor-in-charge)
Mooney, Ms. Jean, 27 Birch Road, Watertown 924-7124 (Administrative Assistant)

Bezjian, Krikor, 43-a Aldrich Road, Watertown 5-7417 (Research Assistant)
Leong, Robert, 550 Memorial Drive, Apt. 16-F, Cambridge 494-1172 (Teaching Assistant)
MacRoberts, Vernon ("Bill"), 105 Whidden Av., Whiteman 1-447-4172 (Research Affiliate)
Miller, Charles, 116 Bingham Road, Carlisle 1-369-7074 (Lecturer)
Mui, Peter, 59 Bishop Allen Drive, Cambridge 354-6240 (Research Affiliate)

6.163 STUDENTS

Berliner, Elise, Holman 404, Senior House, dl. 5-6650
Brent, Michael, 475 Memorial Dr. French House, dl. 5-7644
Chung, Jane, 500 Memorial Dr., Rm. 531, dl. 5-8881
Clifton, Chris, 351 Mass Ave, X 3-2896 or 576-2793
Della-Fera, Anthony, 282 Newbury St., Apt. #3, Boston 236-1561
Dick, Roderick, 46 Howard Street, Cambridge X3-7764 or 876-3816
Downs, Maralene, East Campus, 409 Munroe, 3 Ames St. dl. 5-6409 or X3- 2538 ← France
Goldman, Charles, New House, Desmond 205, 475 Mem. Dr. dl. 5-7610
Haase, Ken, 390 Broadway, Cambridge 576-1137, 868-1570 X3-8829
Hess, Diane, 500 Memorial Dr., rm. 310, dl. 5-8760
Huetting, Fred, 229 Commonwealth Av:, Boston 247-9364 or 262-9061
Humphreys, Colleen, Next House, rm. 366, 500 Memorial Dr. dl. 5-8941
Israelsohn, Joshua, P.O. Box 1118, Kendall Sq. Br., Cambridge 1-741-0174
Jassowski, Michael, 528 Beacon Street, Boston 267-1801
Kowalski, Lee, 500 Memorial Drive, rm. 476, dl. 5-8973
Mui, Chun ka, Senior House, Ware rm. 401, 4 Ames St. dl. 5-6430, X3-5875
Pandava, Krishna, 2 Marney Street, Cambridge 492-6649
Plummer, David, 97 Bay State Road, Boston, 247-8691
Roach, Time, 97 Bay State Road, Boston, 247-8691
Row, Yoon, McCormick rm. 533, dl. 5-8613
Senechal, Dale, Senior House, C-301, dl. 5-6646
Soch, Kevin, Baker house, rm. 239, dl. 5-7239 or X3-7466
Solomon, Susan, Baker House, rm. 318, dl. 5-7318
Tao, Fan-Ching, Baker House, rm. 104, dl. 5-7104
Turato, Karen, 500 Memorial Drive, rm. 318, dl. 5-8768
Walker, Clifford, 229 Commonwealth Ave, Boston 247-9364
Weinreb, Glenn, 411 Wood, 3 Ames St. dl. 5-6441
Williams, Louis, 500 Memorial Dr., rm. 302, 5-8752
Witt, Michael, 518 Beacon Street, Boston 266-8664

THESES

DeCew, Mark, Bexley Hall, rm. 405, 50 Mass. Av, dl. 5-9645 (Prof. Edgerton)
Horwitz, Robert, Baker House, rm. 536, dl. 5-7286 (Mr. Miller)
Jurus, John, Burton House, rm. 1328, dl. 5-8125 " "
Oberbrunner, Gary, 112 Bexley Hall, 46 Mass. Av. dl. 5-9691, (Mr. Miller)
Wang, Vivian, 362 Memorial Drive, rm. 533, dl. 5-7283 (Prof. Edgerton)

July 20 1984 cont Harold Edgerton 530 am.

Don Means wants to use the sloop Edgerton on Friday July 27., a week from today.

There are problems about getting his sonar on the sloop.

There are problems in reaching the captain, Burke who is supposed to live on the slop.

I propose to work on this today.

The 259 side scan EG&G is at the Sailing Pavillion, I could not use it in a boat due to the sailing regatta yesterday at 4 to 6 pm. Some tests were made off the dock.

I use the north wall of the Charles river basin as a test range. On previous tests the wall showed up clearly. The pilings of the sailing pavillion did not register. Also were the Camb. Yacht club did not give an impression on the record. I hope the new changes

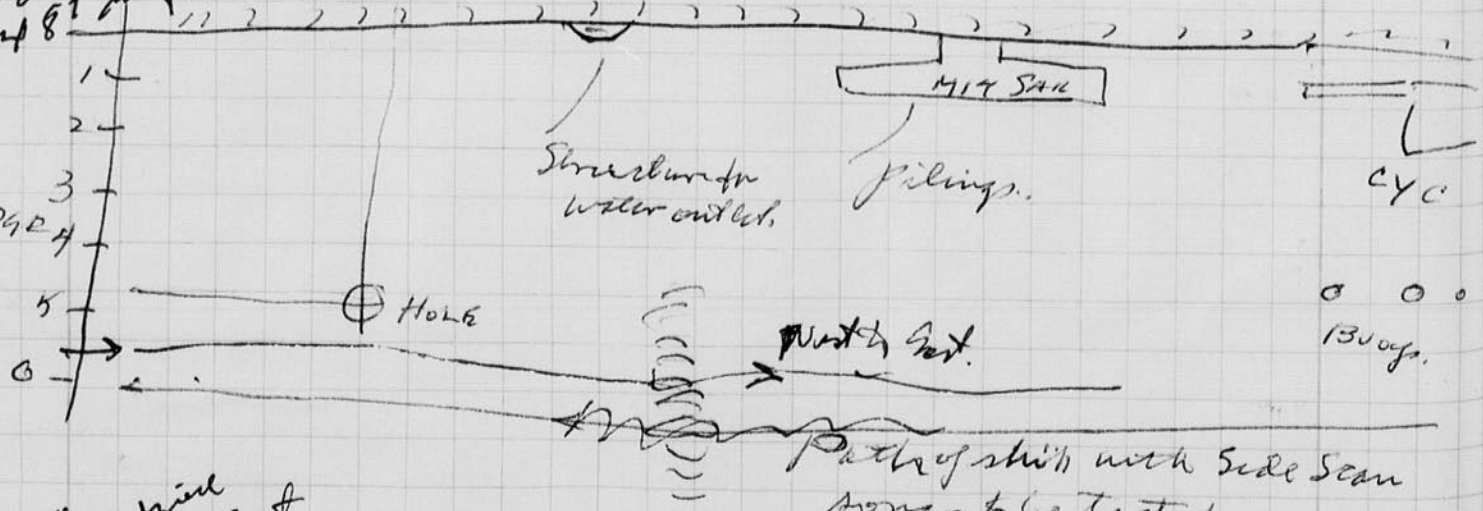
1. a new electronics package in the fish

2. I changed fm 20° down to 10° down. A single transducer is used.

3. Murray Baker ^EG&G advises using "green soap" on the transducer.

Note Port side was stronger than starboard in air. Sh 4 VBM

Serial # " 282 " HP 83 in fish



The paid West to East was cut out for mounting and copy

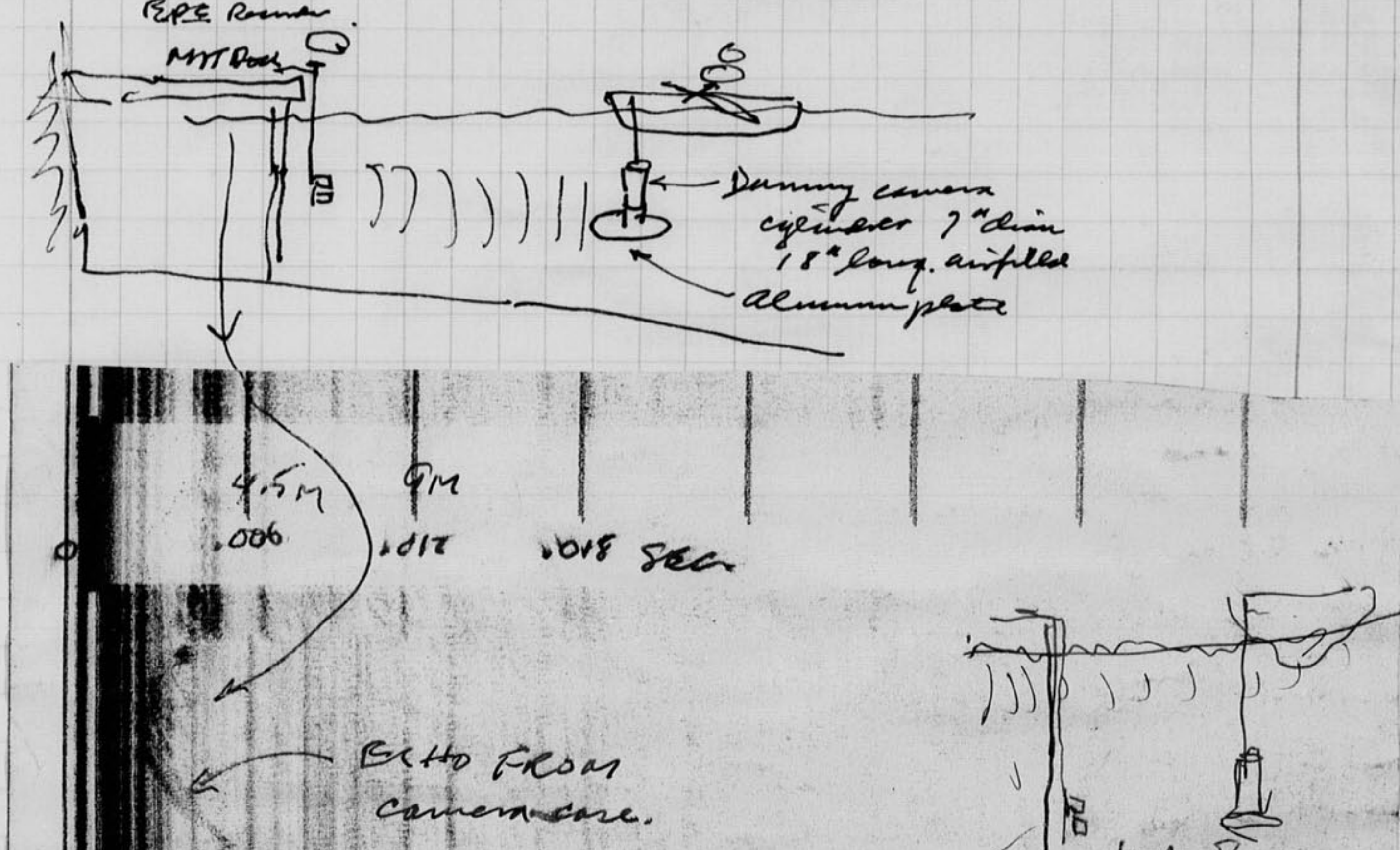
July 23, 1984
Harold Edgerton.

Many tests made with the EPC sonar and with 6KC and 12KC transducers in the side looking mode. The main object was to find the lost elapsed time camera (400 frame model) which I left on the bottom near the Coast guard station.

Mary Lou Dixon arrived at 5:36 pm from Raleigh last night. Then we had dinner with the Jamesons Lyndon Key (Robinson and Emily) also Esther.

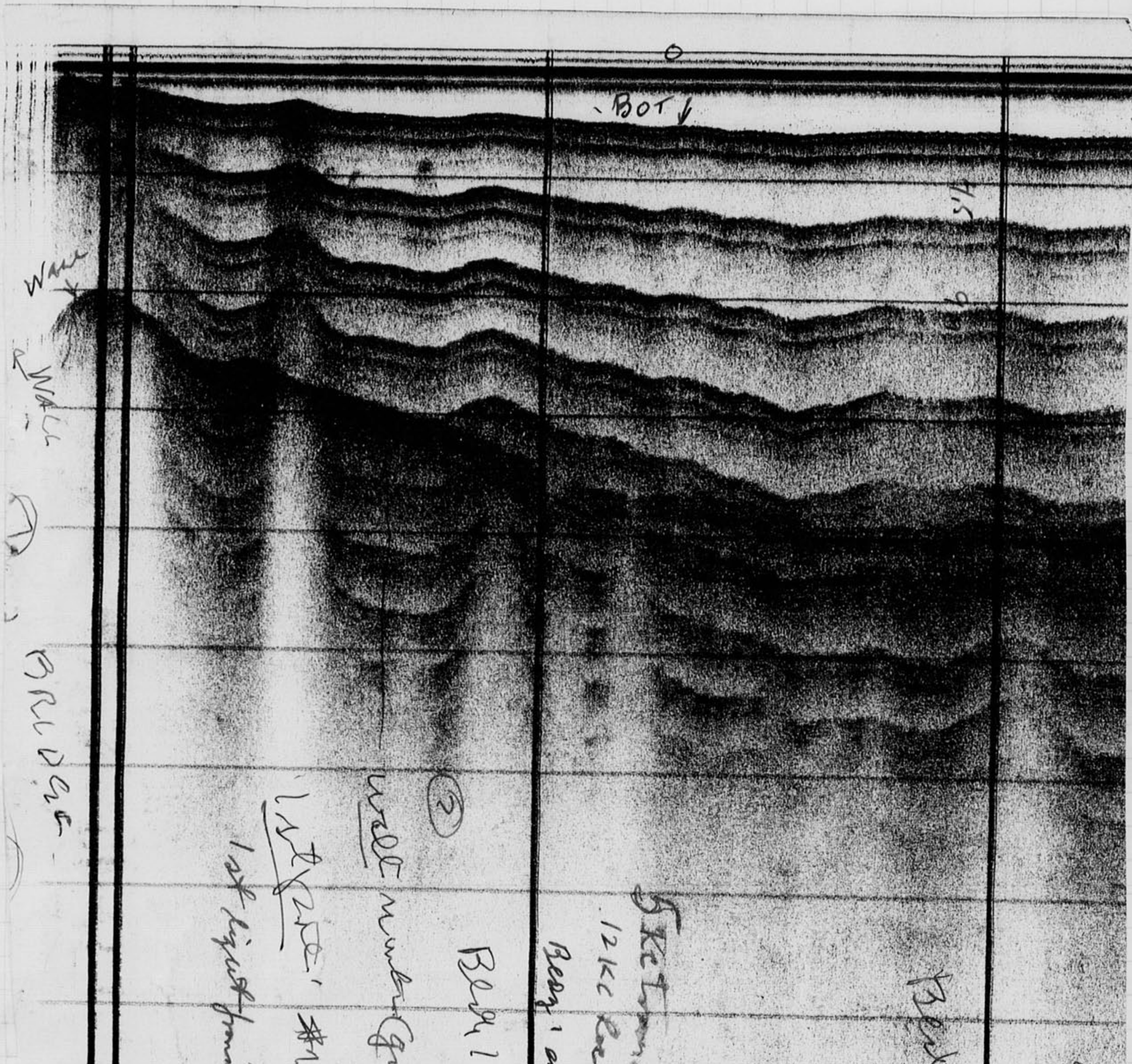
Esther is due to enter the NIH ~~autumn~~ hospital on Wed for an operation on a lump on her ~~left~~'s right side, throat.

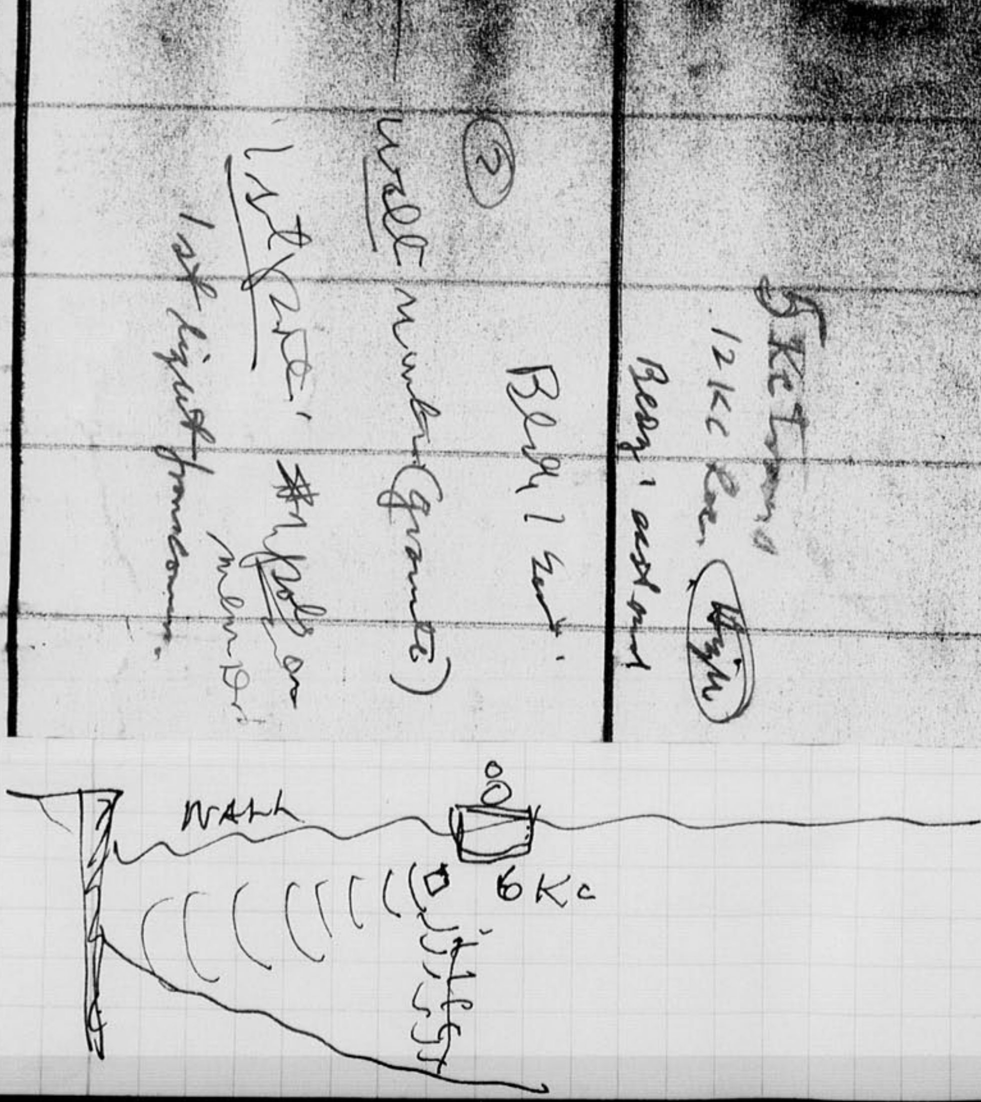
Experiment of July 22 with help from Erica Hartwig.



Can be seen at 5 meters { too weak }

HE

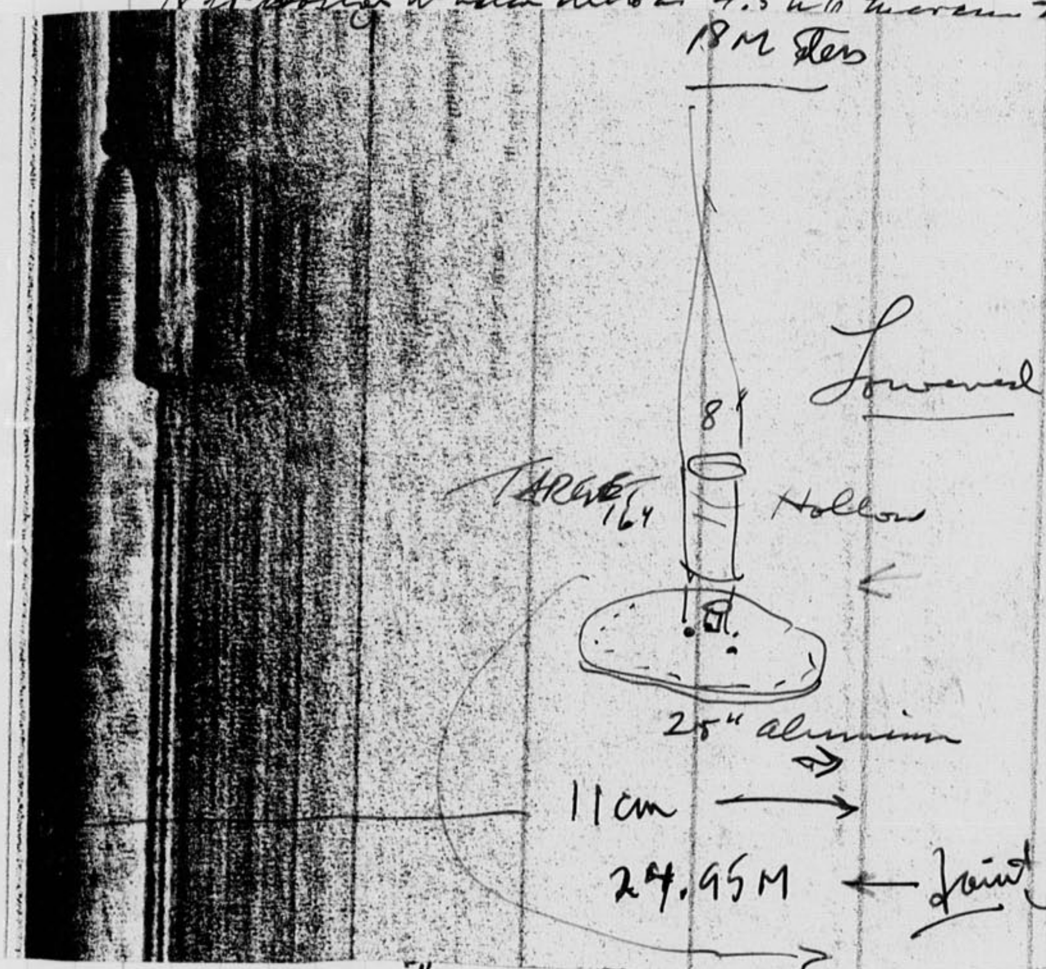

BOT
WALL


WALL
6Kc

Friday July 27 1984 Harold Edgerton

Expedition to Stellwagen Bank with Don Mason (?) and Sonar 1002

We left the Aquarium in the Boston Harbor at 7 am + on the Edgerton after loading the night before. I brought the 18 ft Boston Whaler with a 4.5 h.p. Mercury motor to use for



llwagen bank
on.
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but he has a
he noise. It
is useful
—
ind
bal

Receiver in 3 120° zones.

The signal processing equipment was in the research lab on the EDGERTON.

We experienced Rain all day but the wind was small.

Returned to dock at the aquarium at 545. I drove the Boston Whaler to MIT arriving at 6.30.

Esther was home from the hospital. Mary Jane Dixon was with her. She has been with us several days while Esther was in the hospital & have a lump in her throat cut out. It was a cyst & not cancer!

Friday July 27 1984 Harold Edgerton

Expedition to Stellwagen Bank with Dan Massa (+8) and Sonar 1002

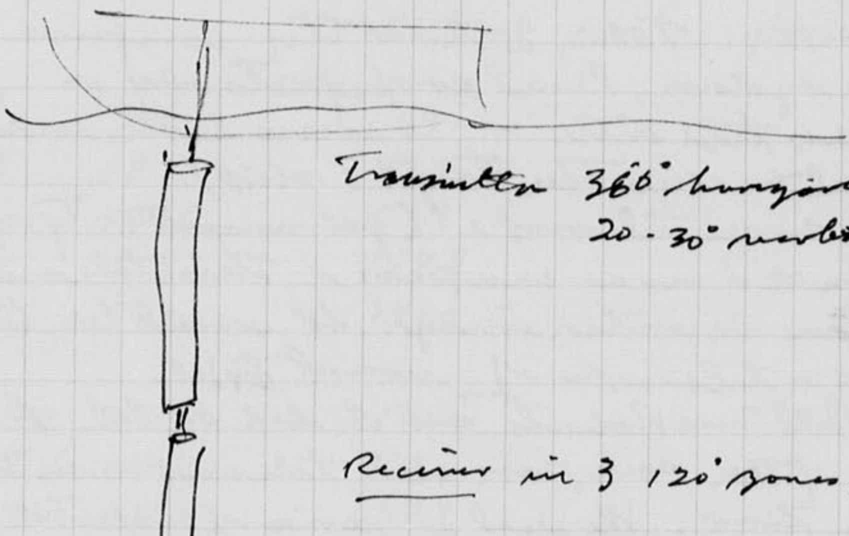
We left the Aquarium in the Boston Harbor at 7 am + on the Edgerton after loading the night before. I brought the 18 ft Boston Whaler with a 4.5 hp Mercury motor to use for a target shot. (This was not used).

After 3 hours we were on the edge of Stellwagen bank in 100 ft of water. Several whales were seen.

The noise from the 110 volt generator in the water was objectionable, Massa says that he has a large battery to operate his equipment.

Some signals were observed over the noise. It is believed that they were from whales.

Apparently the equipment worked as ok except for the noise from the ship.



Transmitter 360° horizontal
20-30° vertical

Receiver in 3 120° zones.

The signal processing equipment was in the research lab on the EDGERTON.

We experienced Rain all day but the wind was small.

Returned to Dock at the aquarium at 5:45. I drove the Boston Whaler to MIT arriving at 6.30.

Esther was home from the hospital. Mary Jane Dixon was there. She has been with us several days while Esther was in the hospital & have a lump in her throat cut out. It was a cyst & not cancer!

July 30 1984 Harvard Observatory.

Elisha Linder and son Omri came over today to discuss the expedition to Sardinia and Corsica. I had a Boston Whaler with a 115 hp motor ready to carry the 5KC sonar. We made records from the MIT sailing pavilion to the south 170°. Several speeds of the ship was used. It appears that a speed of 30 K knots is adequate.

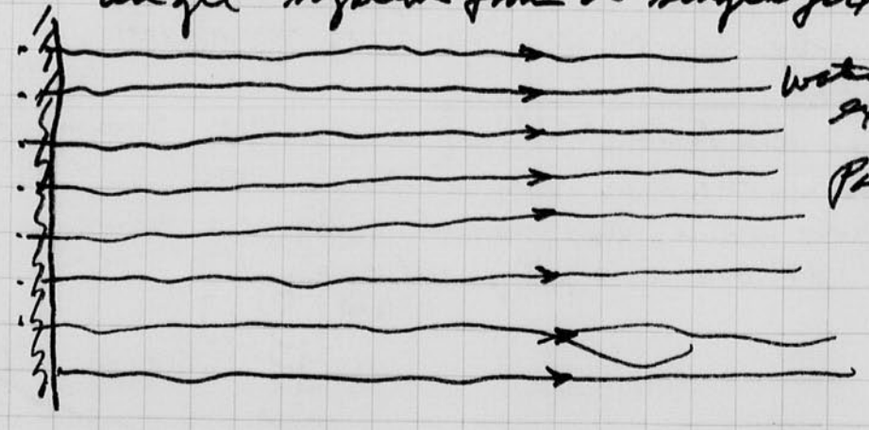
Method. Put a man on the shore with a compass and sighting tube. Also a portable radio is required to give instructions to the sonar-carrying ship. An attempt will be made to hold the ship to a constant speed so that a linear relation ship along the path will be enjoyed.

July 31 1984 Tuesday. Today I tested the compass sighting system. First as of yesterday a 3/4" Brass tube with wires across both ends was used to align the target (ship).

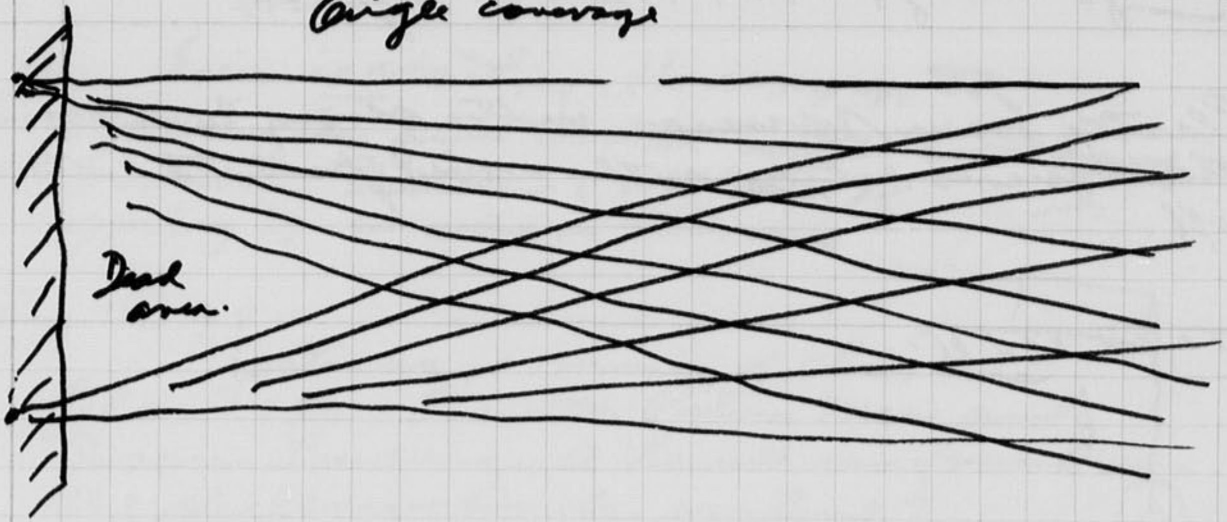
a small telescope (galvanometer type) was mounted on a compass. This telescope gives an inverted image. It would be better to use a telescope of normal type.

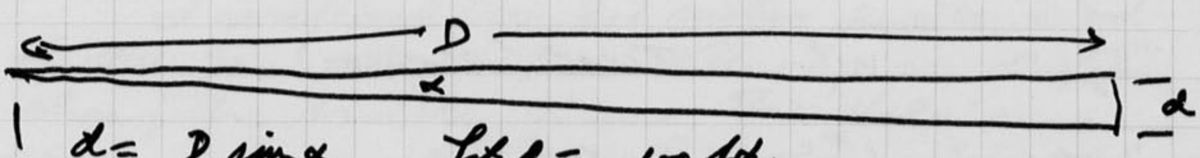
Bill MacRoberts and I did a lot of testing of the compass and telescope in the Charles River. We used a series of spots on the dock west of the main office. The dock consists of 6 ft sections from 0 to 12 to the west. We used the buildings on the other side of the river for checking the line up. We found that the accuracy was not ~~needed~~ enough.

We discussed the use of a more accurate compass. Also we considered the use of an "angle" system from a single fixed spot.



Angle coverage





$d = D \sin\alpha$ Let d = 100 ft.

D = 1000' $\sin\alpha = d/D = 0.1$

$\alpha = 5.7°$

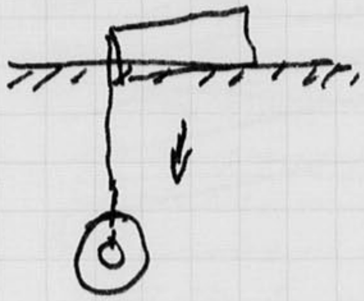
α.	sin α	at 1000'
5	.0872	87.2 ft.
10	.1736	173.6
15	.2588	258.8
20	.3420	342.0
1	.0175	17.5'
2	.0349	34.9
3	.0523	52.3
4	.0698	69.8
5	.0872	87.2

I flew on Northeast air line to Ft Lauderdale Florida on Aug 2 arriving about noon. I gave a slide demonstration at 8:00 ± and showed a 16 mm sound movie about the Nyometer at 9 pm.

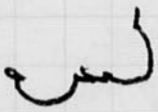
Ray McAllister took me to West Palm Beach to catch a Delta plane at 7.45 for Boston on Aug 3.

Buoys Aug 4 1984 Harold Edgerton.

Plastic foam squares with string to a weight. the squares rotate as the weight pulls the string off.



	Size	wt.	TIME (13' depth)
IV	2×6×7"	1# 3 oz.	14 seconds.
I	3.5×8×6	4# +	5 sec
2	4.75 × 9 3/8 × 12 1/4	3# 4 oz.	14 sec.

 Odd shape of wt.

Eric Edgerton arrived.
Survey of Chas with Peter Muir
Elisha Linder
Oren Linder
Tomara

We used the dock on the Boston shore. I marked 10 ft intervals on the edge 0, 1, 2 ..... 12. 6 kc Sonar into EPC recorder. No sub bottom targets were found.

I tried the area inside of the 2 Bush Islands where sub bottom ~~targets~~ target were found before - nothing! Is there a seasonal variation to the bottom!!

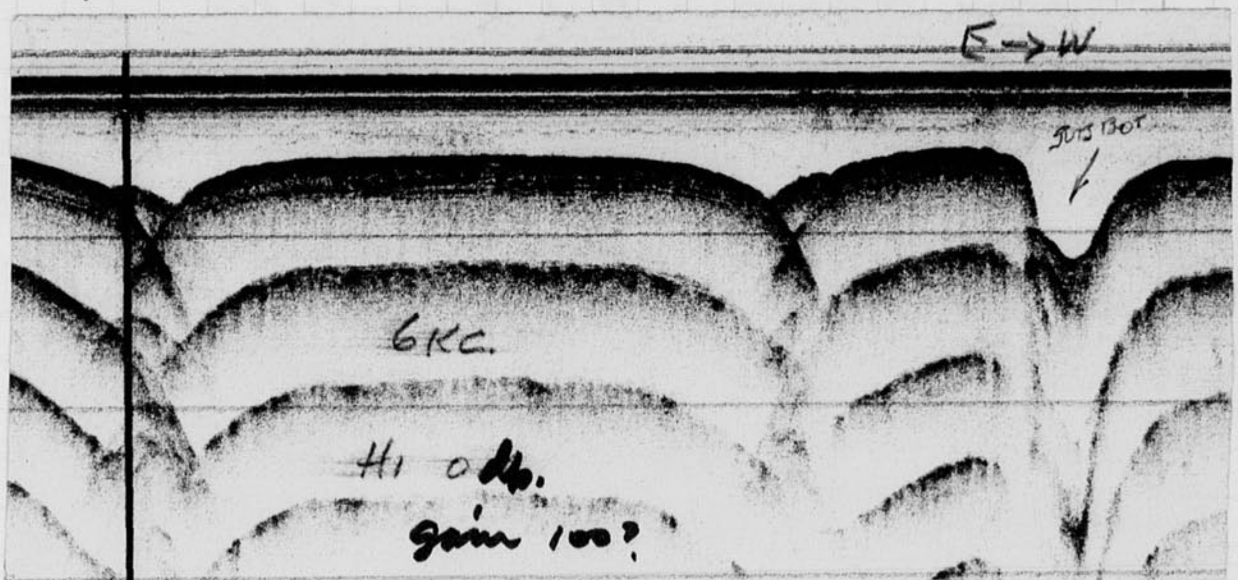
I must try further tunnels again.

Aug 6 84 I went to Columbus Ohio to lecture to the Explorers Club. of the Univ of Ohio - Mrs. - E. Murray of Lincoln Lab arranged it.

Chas Hollister gave a talk on Aug 7. about oceanography. He gave info on deep currents and storms.

Eric is visiting. He may go to Sardinia and Israel with me and Elisha Linder. Walter K. is going to make a movie.

Aug 12 1984
Yesterday - survey of Chas River Poles 1 to 15. with Peter Mui and Susan Landry. A "bomb" was found on the shallow bank on line 7.
I mapped the 2.2 meter depth area off the Faculty club and the 10 sec depth along the south shore. The "Hole" came in strong and clear in Line 8 Pole 22. 170° 350° I to wall.



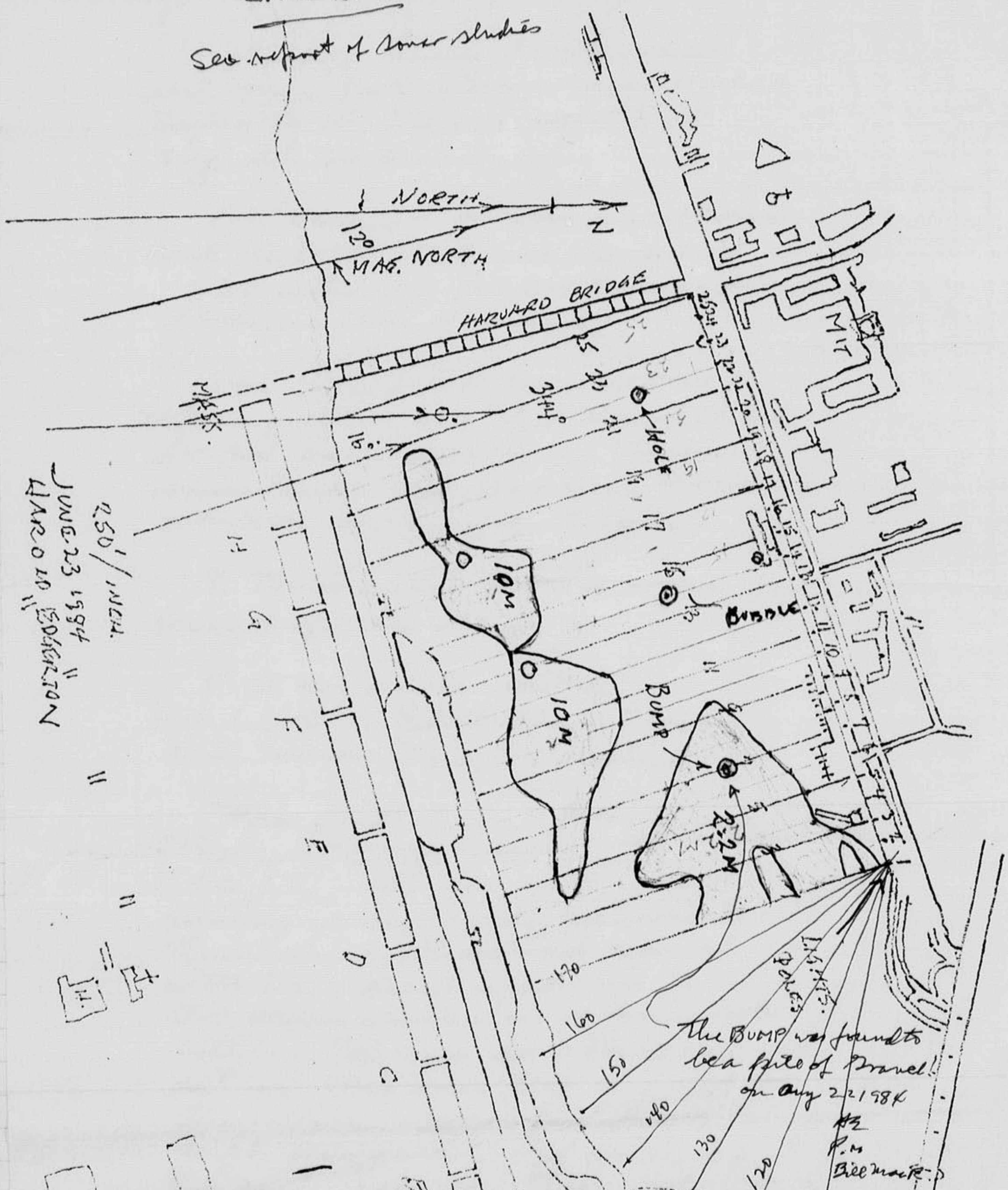
NOTE SUB BOTTOM!??
DUCK ISLAND AREA

AUG 20 monday. I took a microphone back to EG&G & Salem mass. Tom Mesurrato made the papers and shipment to Dido Sherwin for the Wisconsin seminar scheduled for Oct. 549-11 #7027 549-21-7035 2 lamps microphone - Balloons.
I then went to the EPC Salem Danvers Industrial park to see Murphy. I picked up some paper for my 1600 for Sardinia and Israel, also some belts. order no 4567 24 Rolls of paper. Kathy Condon Sue Nelson. Ed Curley was out.

Gary McCue 862-3754 wants to know about the sonar (Cartoons) from the Loch Ness scenes.

CHAS RIVER

See report of sonar studies



Aug 20 84 We plan to
plant a Buoy on the
'Bump' tomorrow!

Aug 23, 1984. Harold Edgerton

Yesterday Larry Gallagher and Tom Porter made a video tape to introduce some of my old material.

1st scene – Memorial Drive and the MIT entrance as of 1926 when I first appeared to look over the school.

2nd – The front door of MIT closing showing the door to be locked on a weekend. Then mentioned the door on Mass Ave which is <u>always</u> open.

3. Strobe alley with a bunch of visitors.

4 At my desk with two books. Electronic Flash and Moments of Vision.

This will be a build up for other material such as the BBC film which contains many of my early movies. Then comes Synchronized sound with high-speed movies – the alarm clocks – broken Coke bottle. Pop corn and Bill in action. Next comes the elapsed time film. Color photos of milk drops splashes will be the end scene. This tape will be for the MIT alumni.

Sept 2 1984 Harold Edgerton.

The ancient power boat BUBBLE (16 ft) was sunk on Aug. 1984 at a spot off the MIT Sailing pavillion. See a report.

Compass from East End of Dock = 262°
" " West End of Dock = 157°
700 ft from Dock.

See #14 light face record.

Stewart Nelson Peter Lucci Eric Edgerton Helped.

There is a trip to Sardinia and Israel cooking for Sept. We leave (HE and Eric) on Sept 3 for Cagliari Sardinia where Frank Cross (Harvard) Walter Schaeuer and a movie crew Elisha Linder will do some bottom penetration searching for ancient artifacts.

Sept 28 1984 Harold Edgerton.
I returned on Sept 26 with Eric Edgerton from a trip to Sardinia and Israel (Caesarea). We went Sept 5 - a movie was made by Allan Miller (director) - with backing by Wally Schaeuer. I used an EPC Bottom Penetrator to explore for archaeological targets.

Oct 7, 1984 Sunday.
I tried out the BDC unit (new) with a 12 KC T.R. system. It shows promise. now try with 6 KC. on Oct 6 Sat).

I went to Stellwagen bank on the EDGERTON with Don Mason, Greg Early and 3 others. to study whales, No results There was too much wind!

Oct 9. I was at sea on the "EDGERTON" yesterday Capt Rich Linehan Don Mason and 2 from Wilco with the Sonar for 360° coverage. We looked for whales, See Reports.

Today Kaplan and Shannon came at 9 to H to discuss my estate. Several minor decisions were made. A summary sheet was given to us.

Oct 11 1984 Mary Lou and Chas Dixon from Hickory N. C. came yesterday morning. M.L. had bone scan tests to the hospital. All seems to be ok!

Dinner last night at 100 Memorial Dr. Apt 11-2A Harold & Esther Edgerton M.L. and Chas Dixon, Lyman and Joe Kay, Rebecca, Emily, Ellen Dixon.
Lecture by Carpenter about outer space in Kresge

Notebook # 35

Filming and Separation Record

2 unmounted photograph(s)

____ negative strip(s)

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

was/were filmed where originally located between page 46 and 47.

Item(s) now housed in accompanying folder.

TO: HAROLD E. EDGERTON—
PROJECTION OF KODACHROME SLIDE
ON PLASTER CAST OF
THE FACE OF
JEFF CHITOURAS.

Samuel O. Raymond
SEPTEMBER, 1984.

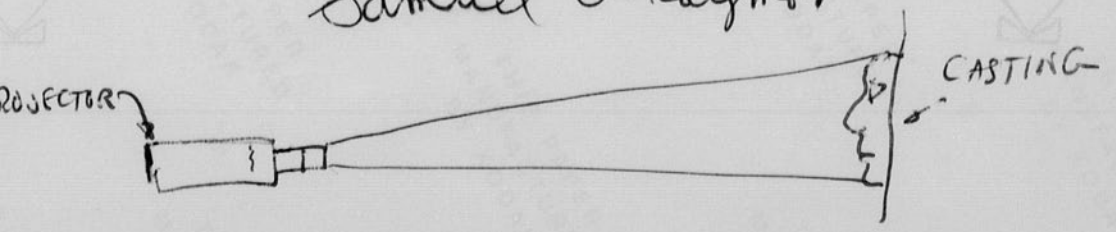
HAROLD E. EDGERTON—

PROJECTION OF KODACHROME SLIDE
OF S.O. RAYMOND
ON PLASTER CAST OF THE FACE OF

SAMUEL O. RAYMOND.

SEPTEMBER, 1984.

Samuel O. Raymond



Oct 11 1984 cont. Harold Edgerton.

Yesterday I experimented with the new Cov EPC recorder-driver unit.

I used 200 ohms in series with the output to reduce the pulse length of the output.

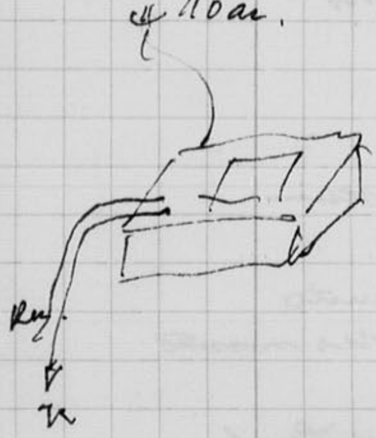
My experiments were all made with a fish consisting of two Massa 6KC transmitters one had a transformer (TR). the other none (Receiver).

A resistance of 1000 ohms across the receiver had a small effect.

The Massa hydrophone will be tried again.

Oct 23 1984. Yesterday I took the EPC to the Charles River. The 200 + ohms in the transmitter circuit was fine for making a short line signal but it widened when the gain was increased!

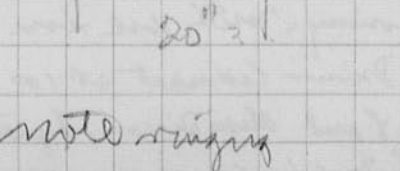
The feed leads to the pickups was less in the water than in air. There is still a problem in the transducer pulse. I am going to the Massa co on Tuesday to discuss and measure. Frank and Don are going to help get a short pulse 5KC signal. A low Q circuit and driver are required.



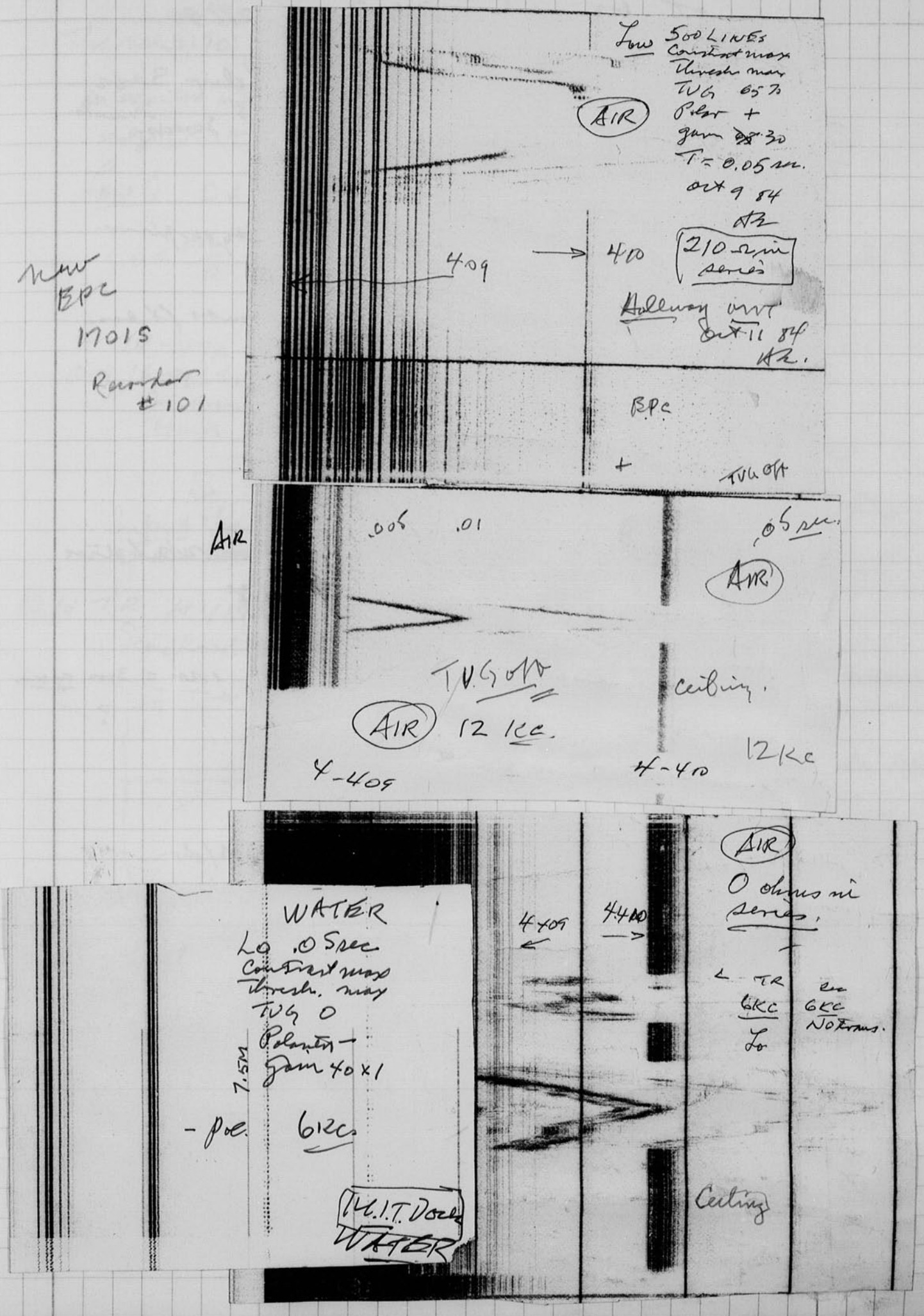
EPC Unit with internal pinger driver is # 17015 #101.

Suggestions. Change titles on dials (position).

Mary Tom and Charlie from Holbrook N.C. are here. Jan and children came over for supper last night. Lyndon went to the basket ball game.

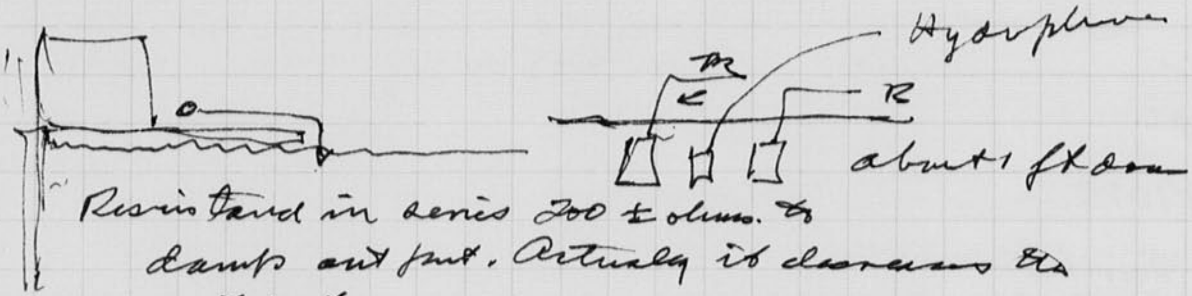


note ringing


Low 500 LINES
Constant max
threshold max
TVG 65 %
Polar +
gain 30
T = 0.05 sec.
Oct 9 84
AR
210 series
AIR
409
400
Hallway WWT
Oct 11 84
AR.
New
EPC
MOIS
Recorder
#101
BPC
+
TVG OFF
AIR
.005
.01
.05 sec.
AIR
TVG OFF
ceiling.
AIR
12 kc.
12KC
4-405
4-410
AIR
O olympus ni
series.
WATER
LO .0 Sec
Constant max
threshold max
TVG 0
Polarity +
Gain 40 x 1
7.5M
- pol.
6KC
4x05
4x10
TR
6KC
Lo
6KC
Norrows.
M.I.T. Docks
WATER
Ceiling

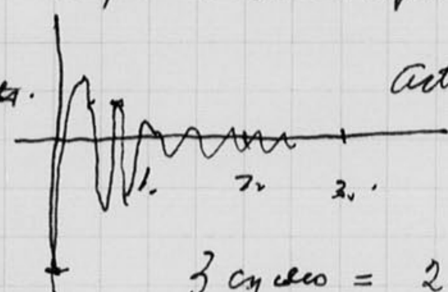
Tecktronix type 317 Ser no. 001190.
2 3/4" diam Screen Screen 50 to .01 v/div Sens
.4 sec to .2 us Sweeps Sweeps

Oct 15 1984 MIT Sail Pav 830 am
Test of 6 KC Trans 6 KC Rec (natural) with
EPC 1701



Resistance in series 200 ± ohms. to damp out put. Actualy it decreases the output.

Oscillograph observation of input to cable after the resistance.



Actual curve smaller than steel dress voltage

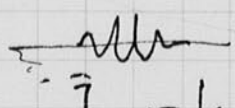
3 cycles = 2 squares = 1 ms.   1 sec = 3000 cycles
1 " 1/3 ms.   ?
voltage.
acoustic is 1/2 of this 6000 ?

Measd Hydrophone voltage out ups.
~~2 volts/div~~. Time scale same 0.5 ms/div
.5 " div

3 cyc./1 ms.

voltage from Hydrophone.

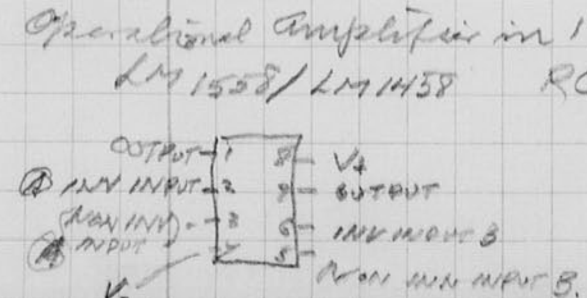
.2V/div Echo from Bottom 1/2 ms. 3 cycles.



1/3 div = .06 volts peak.

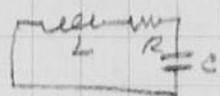
about the same with R = 0 }

Operational Amplifier in 1700 E.P.C. unit taken to Sardinia & Sercal
LM 1558/LM 1458 RCA 919 CA 358 G
↑ Burned out in Sercal.



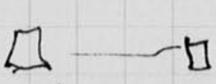
(1901?)
The new 1701 EPC has an AD 524 analog Devices for a integrated circuit. It offers gain of 1, 10, 100, 1000
only 1, 10, and 100 are used. see

Low Q C & L



? $Q = \frac{\omega L}{R}$ $\omega L = \frac{1}{\omega C}$ for Resonance, $\omega^2 = \frac{1}{LC}$ $\omega = \sqrt{\frac{1}{LC}}$ $Q = \frac{1}{\omega C R}$ Q = 3?

P. TR-47A or 61 Sonar 6 Kc. Massa
Oct 16 1984
Don Massa
Frank

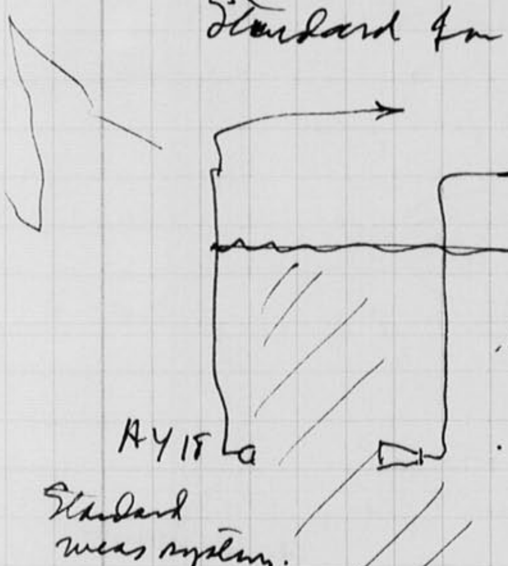


Input Low. Primary probe to plug on unit. 200 V
Showed beat on print.

500

Gift TR AY18 Hydrophone. 10 – 10,000 cycles.
Standard for measurement.

2 1/2 discs cylinders.
End caps of aluminum
U.W. cable.
Excellent cable bulkhead



To
High.

WATER.

AY18

47 Ω on primary helps to reduce.

Standard
meas system.

Bill Barrows
Technician & Employee.

Approx Sensitivity of Hydrophone DT-276

50 microvolts / µbar

Transmitter Massa Model TR-47A (4–6 kHz) –
" Massa " TR-75 ($3\frac{1}{2}$ kHz) –

Frank Massa
10/16/84
Lunch Peter Mui
Frank, Don & —
H.Q. at Whitman?
near Rt 3.

Oct 17 1984 Harold Edgerton,

Yesterday Mark Masson at their Anglian place showed me that the use of a 12Kc transducer as a hydrophone was not good since the 4-6 Kc signals were not picked up.

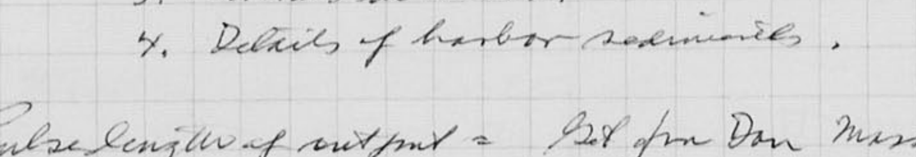
Above taken this 12Kc unit off and installed a DT-276 Massa Hydrophone. It was put in their special holder. Foam was put beneath the microphone to make the double bounce. Is now ready to try it in the Chas River and the harbor.

Targets, 1. Double echo off the MIT Faculty club.
2. Subbottom echos in Deer Island area.
3. Tunnels in Harbor.
4. Details of harbor sediments.

Pulse length of output = Set for Don Massa. 0.5 ms.
Resonance of TR-47A (4-6 Kc) 2 cycles ±.

Oct 20 1984 HE.

Yesterday Peter [?] went with me in the Chas River and out into the Boston Harbor. We used the EPC MD18 no 101 and a Massa 6Kc (4 to 6) transducer type TR47A. A Massa hydrophone DT-276 for a pickup.



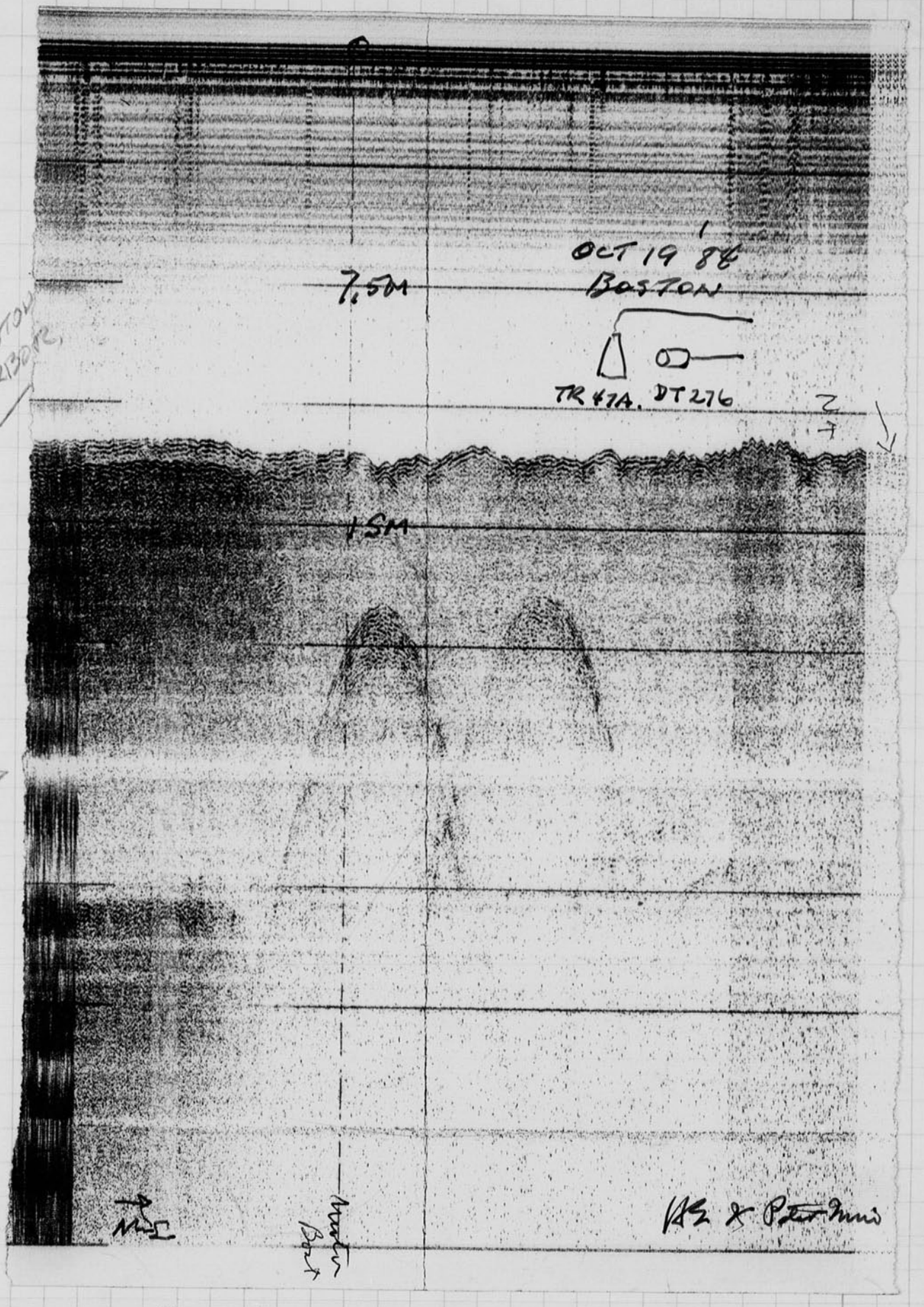
Foam used beneath to isolate from reflected signal.

The Boston Tunnel signals were excellent etc.
A sample will be entered on the next page.

Also see letter to Leslie Linder..

Sunday Oct 21 1984 9am H.E. Explored
Gary Hochman about Nova program.
1. The Nebr. reels will be sold to Nova
2. Nova wants 10 min of sound about the strobe and sonar.

Contact. NIXON B.B. Channel 2 WBGH.
I suggested Oct 27 and 28 as days for shooting.
A. Tunnels.
B. Geology of Harbor
C. Side scan of cars at 1800 club
D. Propeller search.



Boston Harbor between FIREBOATS & HODGE.
TUNNELS TO AIRPORT.

Harold Edgerton.

Oct 23 1984 Tuesday Harold Edgerton.

With Mac Roberts, we surveyed the Charles River Basin for "Bubbles" the 30' boat which we sunk a few weeks ago. I was not able to recognize the wreck! Why? Perhaps it has sunk below the mud level. I need to overhaul the side scan and learn how to use it effectively. Contrast seems to be missing.

I used the survey mode. First I used a 100 meter range - then the 200 meter. The fish was hung about 6' down, maybe more. The boat went very slowly.

Oct 25 84 Dinner with Johnson, Hertz + 3 others at Sheraton Hotel.

24-25 at Madison Wisc with the Uni Ext Service. 45 students Lamman & Hyzer. I gave two lectures. on strobe etc.

45 attendees
Lamman
Bill Hyzer
Dick Shoemaker
[illegible]

45 x 750 =
$33,750

Returned on
Northwest Orient Oct 25
plane at 2 05 via
Chicago. arrived at
6 30 P. Then to home and
dinner with
Johnson & - -
Dr. Hertz. at the
Somerset Hotel. at 7.30.

Fri Oct 26 at M.I.T. all day.
Sat Oct 27. at Home, 100 Memorial
Drive, Cambridge, Mass.
Jan, Lynda, Ellen, Andy
Rebecca went to the
Circus at 10.30 am.
Emily (6 months old) is staying
with Esther and me.

6:00 Social Hour (Cash Bar) & Dinner
Wisconsin Center
702 Langdon Street, Madison

7:00 Strobe Photography: Its First 50 Years
Dr. Harold Edgerton
Professor Emeritus
Massachusetts Institute of Technology
Cambridge, Massachusetts

THURSDAY, October 25 1984

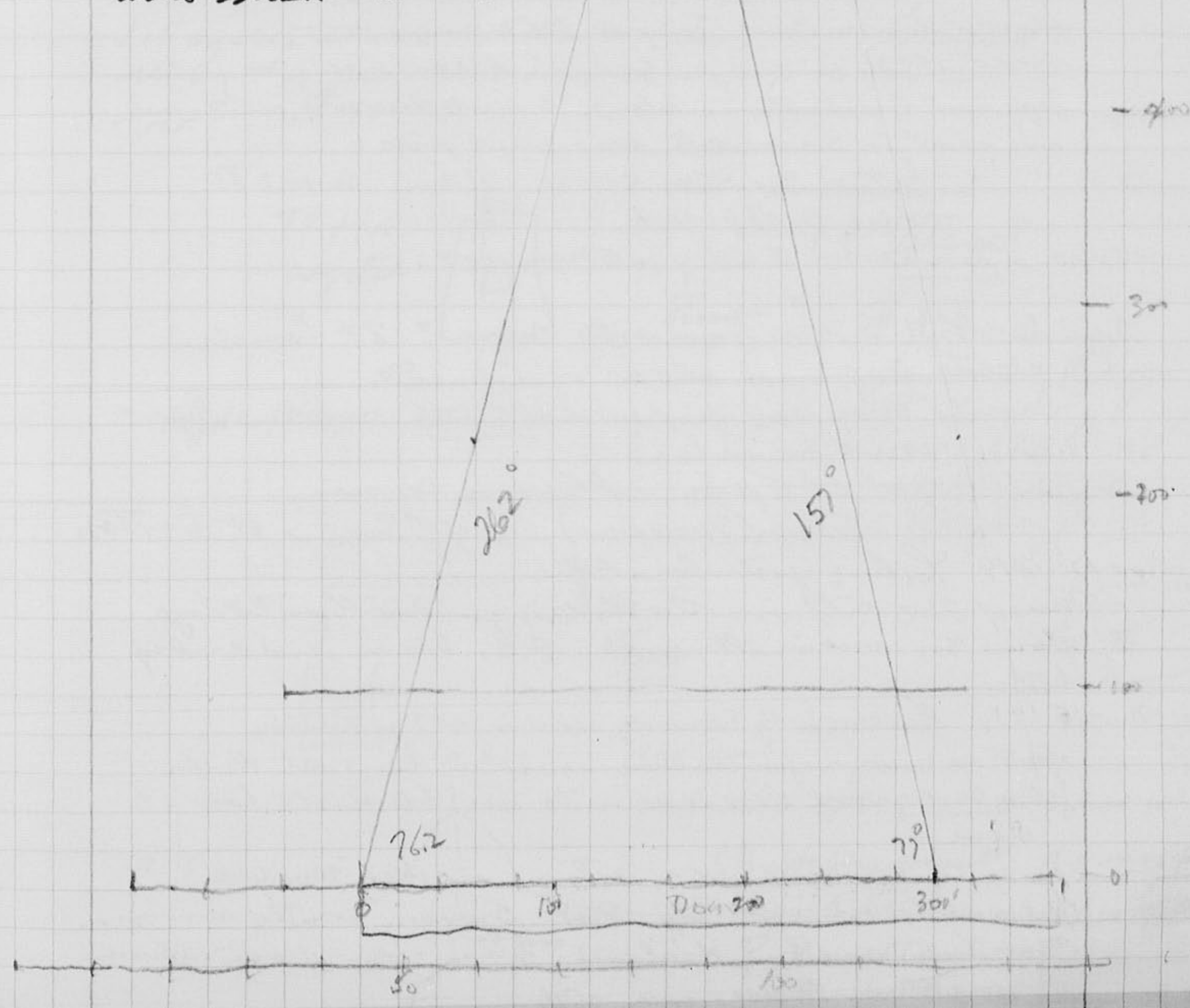
8:00 A.M. Electronic Flash Techniques
Dr. H. E. Edgerton — Strobo

9:30 Coffee, Rolls and Conversation

10:00 Effective Presentation of Scientific Information by Means of Visuals
John Hyzer
Training Specialist
Exxon Corporation
Houston, Texas — Polaroid film 600.

11:00 Consultation and Interaction with staff and assignment of workshop problem

12:00 P.M. Lunch



Oct 31 1984 Harold Edgerton
Wed

Yesterday. To tunnel site in large whaler with Muir and MacRoberts. T.V. movies made by WGBH (Bebe Nixon). This footage is to be used in the Nebraska film stretching it to 1 hour from 47 minutes. Also Gene O'Connor took some footage of fish feeding in the tropical tank of the Aquarium.

For sonar I used the new 1701 EPC recorder - driver with a Massa 4-6KC transmitter. A Massa hydrophone was used to pick up the signals as per page (52).

The Aquarium had a 15 year party on Monday night Oct 29.

Dolphin brought back our T.V. viewer with camera (B.U.) attached. He has been using this in Alaska this summer. Some 40 lowerings were made. There were no problems! ASA 64 film was used (Kodachrome color). Shrimp density was great in some cases. Also small fish.

Interviews Ken CHOW VI Jan Nov 1 84
Also GOLDMAN VI Jr.

Tape. Interview for EKN for 6th grade ?:

Ogilvie visit to Mus Fine arts Nov ? 84 Lunch.
wants improved ORTEC equipment.
wants to expose paper - Xsection - blue light.
phone Nov 5 for info.

Loolumi tonight at 5 pm at Edison Co new
south Station (Meadow). 245 Summer St Boston

Nov 12 1984. Lecture yesterday at the Mus of Fine arts on the Strobe is quicker than the Eye. Some 300 were in attendance. Ellen Dixon and Andy Esther.

Nov 15 1984 Ben Nunn & Cy Schmurty came in at 8:30 to talk about a for the Oceanographic Inst. at Haifa. John Curley and class came in to see the strobe lab at 10 am. -

I was in Wash. D.C. for a lecture on Wed Nov 14 in the new Grosvenor Hall. Bob Breden was the manager. Mary Lou came from Hickory. Esther - John - Wilde at lunch at Mary Ellen House, order 15th

H. Edgerton,
Sunday 18 84, 9 am - 12 conference on paper about
the Sardinia trip with E. Linder.
Plans - About May: Ashkelon
aug. Nora Sardinia
Thanksgiving dinner at the new House MIT
Alex and Steve.

Nov 27 1984 Thanksgiving. 1030. Hank Edgerton.

I have been organizing a lecture for
me in the EECS dept. 7-9 tues night on
the "history of the strobe".

Yesterday I phoned Frank and Ron Massa about
a shorter pulse transmitter for sub bottom signals.
I proposed the present 4-8 Kc model with out the
the standard transformer. I plan to make some
frequency - impedance curves of the crystal alone
with various inductors in series, possibly
resistors too to reduce the Q. I want a pulse of
1.5 cycles at about 5 KC or (less). Ron promised to
study the problem and come up with a
suggestion.

$f = \frac{1}{2\pi}\frac{1}{\sqrt{LC}}$?

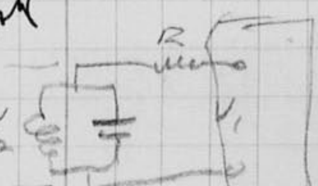
1. measure C
2. calc Inductance
from $f = \frac{1}{2\pi\sqrt{LC}}$ or

$\frac{1}{5000}$ sec = $\pi\sqrt{LC}$.

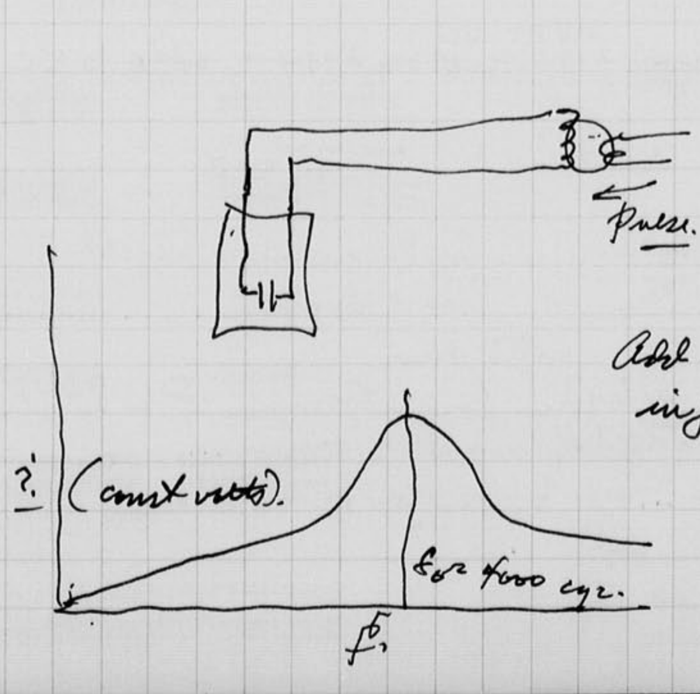
TR47A,
crystal

Hydrophone DT-276.

Alternative solution
Experiment with
magnetic transducers.



vary f plot
V_2/V_1



Add series or parallel R to
influence Q to desired value when
$1\frac{1}{2}$ cycles result. The neg pulse
should be less an 1/10 of the +.
? Should the transducer be in
water for this experiment ??

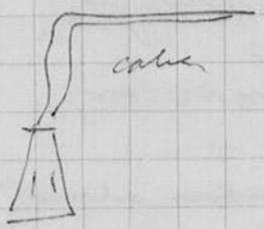
Nov 26 1984

Transformer 22R31 Thordarson 117 360x2
5V 6.3V.

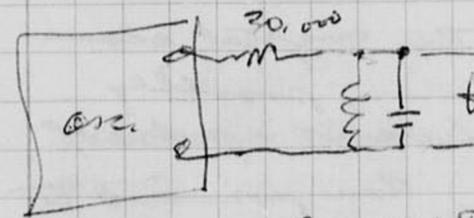
Remove Iron to reduce the inductance

Measure C of Massa 5KC

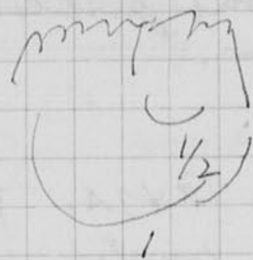
c = 2.4x10^9 farads. .0024 uf.



Calc. C = .0028 uf



A Iron about 1/3



C = .0028
L = ?
f. for dip.

L	c	f0
A 1/2	.0028	17,000
A 1	.0028	10,000+
A1	massa + [illegible]	11,500

the freq is too high. X dis connected!

Oscillator to mass (no trans)
" " Trans Peak at 2.9KC of oscillograph also 6 KC

Massa no trans. 5.3KC 30,000 ohms [Osc. ... oscillo]
" " 8.5KC Trans former and the bare amplifier
8.0 " " more Iron!
" " 12.0 1/2" with Iron.
" " 5.4 With new larger Trans. PC8411 X
" " 6.4 nothing changed
21. KC Trans PC8411 on Bare trans.

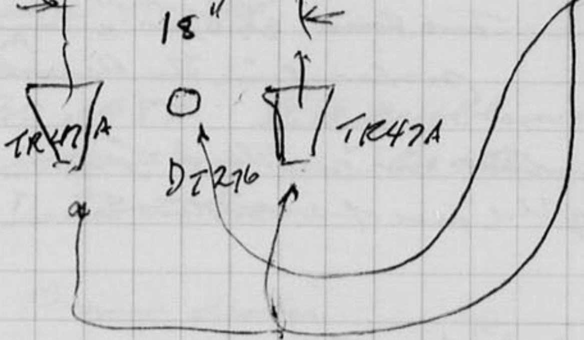
nozzle lecture on photo by strobe ~~38-101~~ by MADRICK BALLI of Ballor Co. Nov 26 26-100.

Nov 28 1984 H. Edgerton

Lecture yesterday in 34-101. about history of the Strobe. 300± attended.

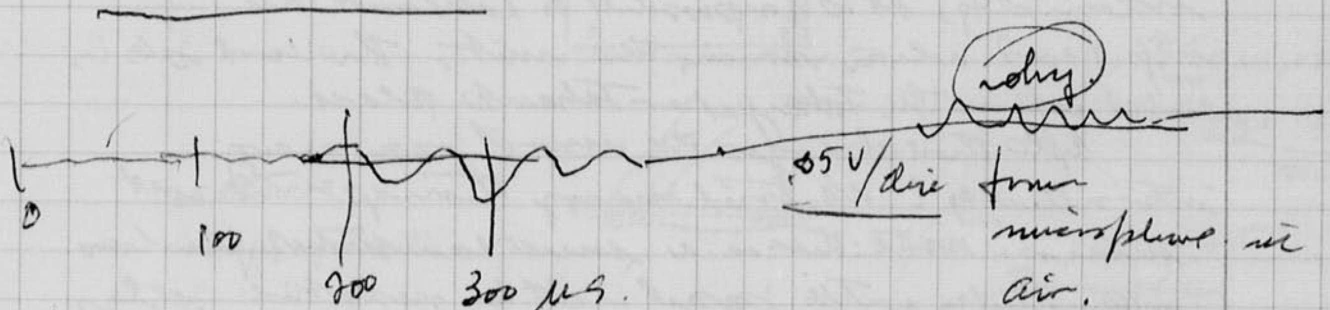
5Kc sonar experiments

Two transducers. (p53). Massa TR47A
Hydrophone DT276 Massa.



All mounted in wood.

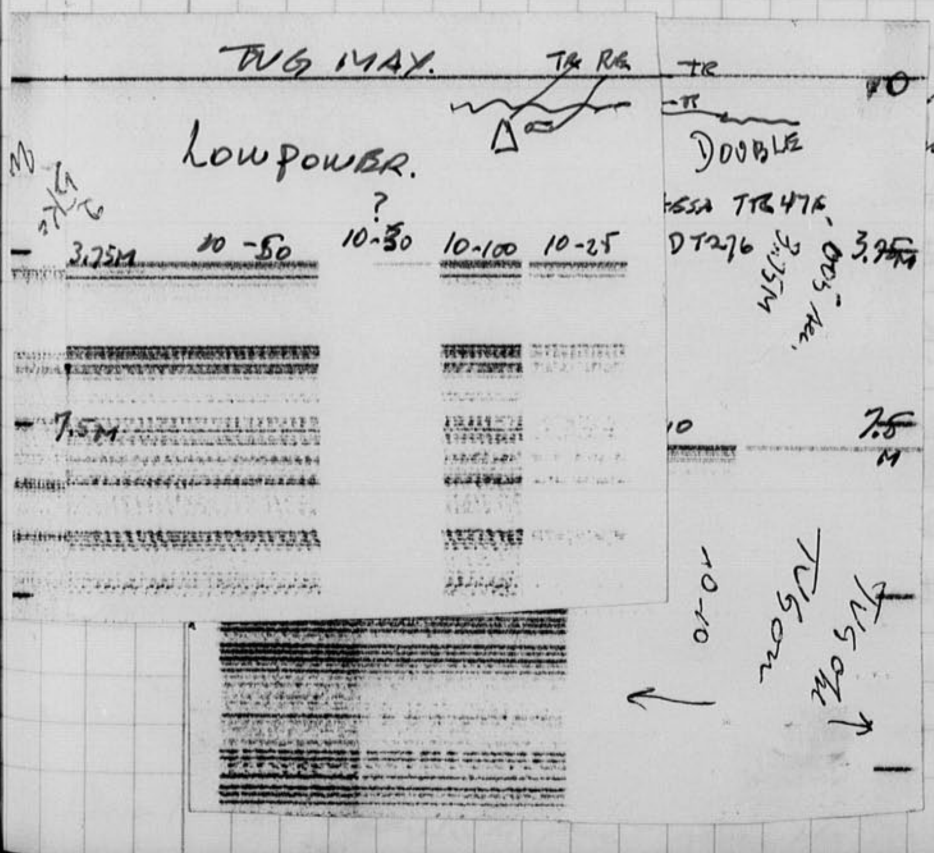
I phased the two transducers by using the hydrophone in air at 4" above each. Both gave a signal in air

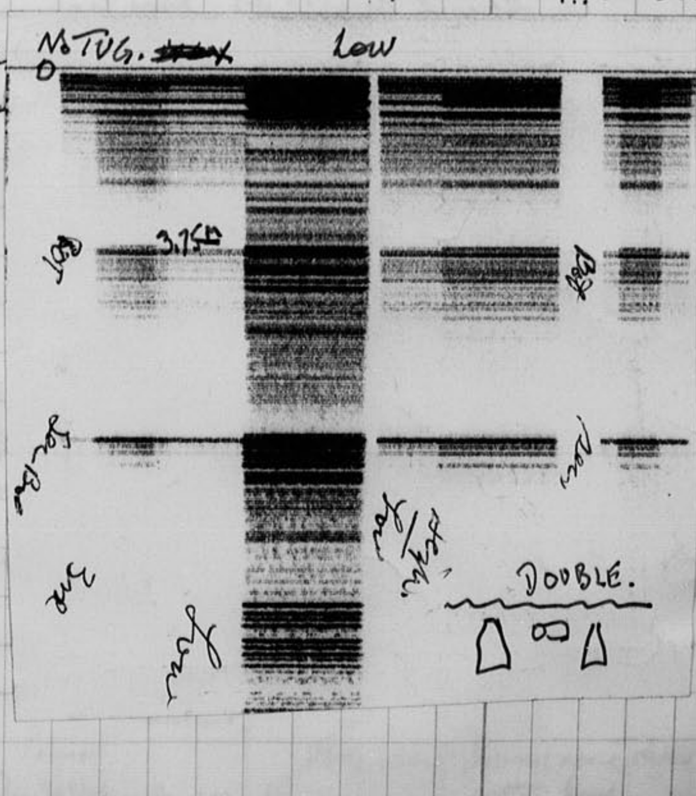


.05V/div from microphone in air.

Should this be repeated in air?

Off Dock M.I.T. Sail Pav.





Nov 26 Lecture on Photo by Strobe ~~34-101~~ by. MADRICK BALLI of Ballor Co. [illegible] Nov 26 26-100.

Nov 28 1988 H. Edgerton.
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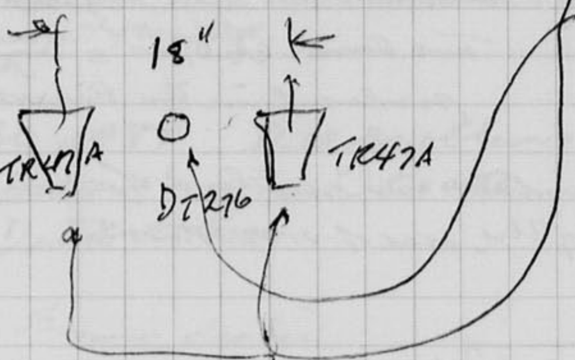

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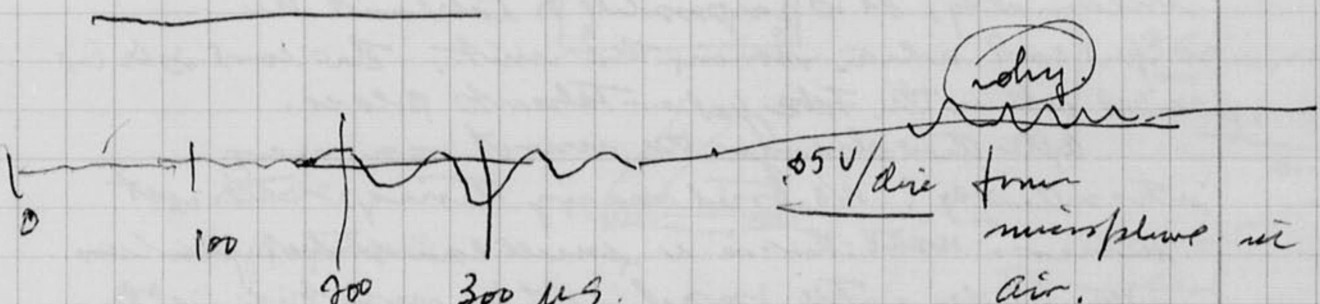

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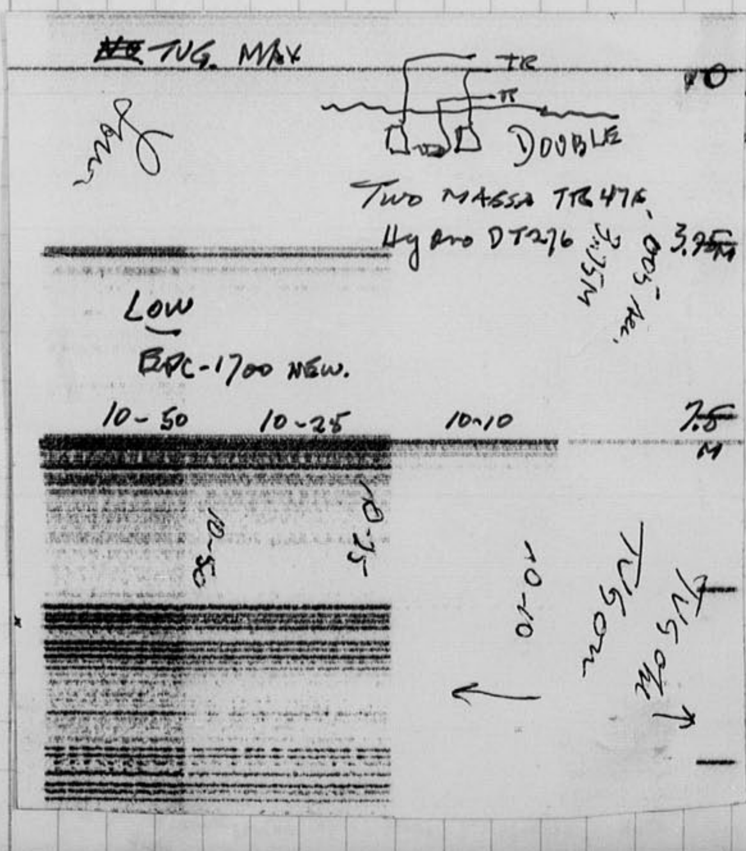
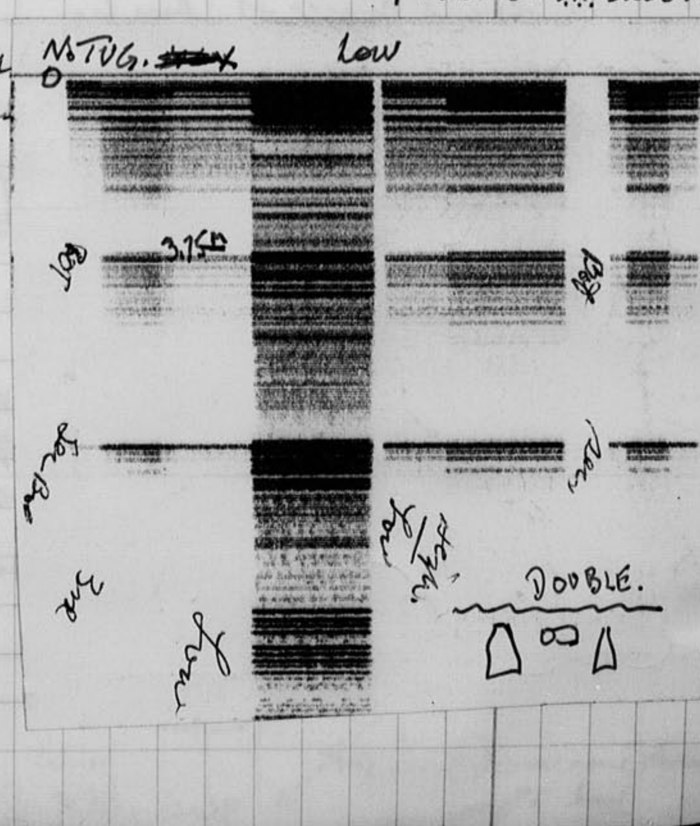
Should this be repeated in air?

Off Dock M.I.T. Sail Pav.

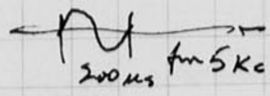




Thursday.
Nov. 29, 1984 Harold Edgerton

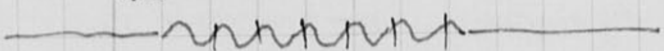
.001 sec = 10,000 μs.

More experiments to get a shorter pulse.
The Massa recorder TR47A.
Two lines and more come there.



6 cycles × 200
= 1200 μs

not accurate.



Actually there was some modulation of the signal. Two lines 250 μs & were produced in the Recorder.

I phoned Don Massa. He is working on a method of reducing the pulse length by the use of resistors to decrease the Q of the affair.

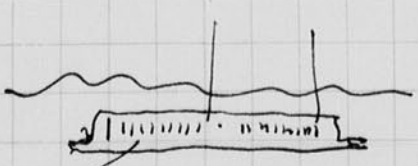
(Bill) Mac Roberts put a handle on the EPC 8700 sonar driver today. Also he changed the input cord so that it was permanently attached internally. It is impossible to take out the input cord when moving the unit. The cord is to be coiled up in the ~~take~~ paper takeout place.

After these changes the unit ran very intermittently? We tried many things without success. Note: there is a small lamp that flashes intermittently on the panel. It is marked "stops need attention." Bill thinks that grounding has something to do with the problem.

A sound source of low frequency and a single pulse is needed for archeological research in the sea. The Boomer system should be perfect even if inefficient.

coil with iron core

metal plate.



old design.
Flat coil of wire
Air tight cover.

note. this design traps air which is important for the rapid expansion of gas [illegible] thru [illegible].

Coal

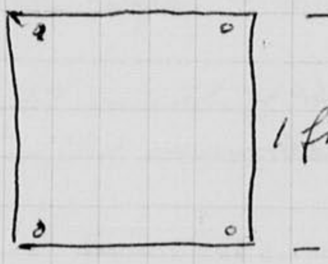
Test program
- Go to water in Pool or River.
- Lower transducer.
- Put microphone below the transducer.
- to read the direct signal and the reflection
- Make a voltage vs time study of the ~~output of the ...~~

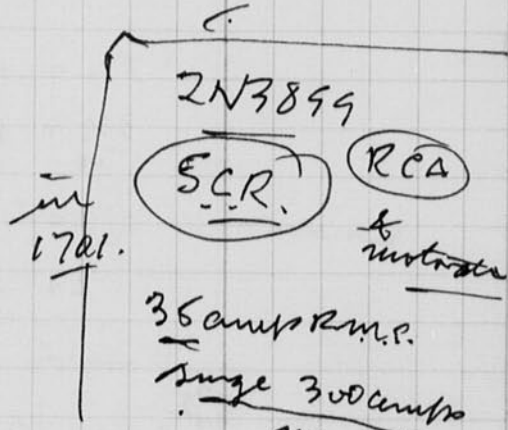
Julie Kern phone design
E.P.G

Paul Ago = Technician
marketing
Sales, Eng.

Nov. 30, 1984 Still problems with the EPC. 1701 S.
~~Danvers~~ . 01923 Ser no 101
E.P.G. Danvers. Mass. 284 - 3174.

Boomer design





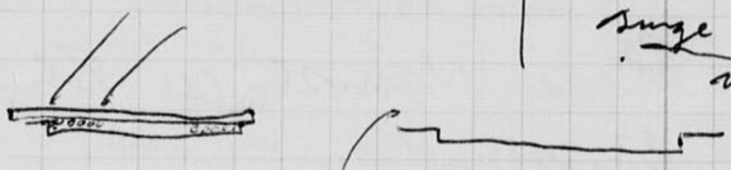
in
1701.

2N3899
S.C.R.
RCA
& motorola

38 amps R.M.S.
Surge 300 amps
Max negative
300 amps
or 250
Better
600v.

1701 600v

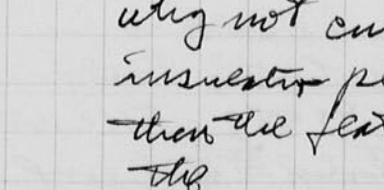
measure L.
Calc 1/2 cycles with
C = ?



Spun metal cover
(aluminum)

Glue to plate, make wires inside.

Energy Conversion



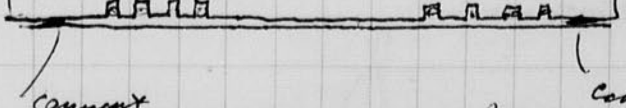
what is the efficiency in %.

energy.

Use 2 Ω
2.5 Ω.

why not cut spiral groove in the insulator plate for the wire coil?
~~then the flat plate ... can be glued to the~~

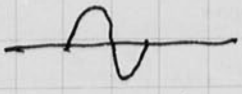
Refer to page 1
on Boomer



N.Y. Whitehall

Dec 1 1984 H Edgerton & Gus Kayser with the Pace-McGill
Peter
Eric and Insurance here!
3 law.

C of penetration circuit = ?



$f = \frac{1}{2\pi\sqrt{LC}}$ $T = 2\pi\sqrt{LC}$. Let $T =$ $T = \frac{1}{F}$ seconds.

f = 1000 T = 1000 μs

~~f = 100 = 10,000 μs.~~

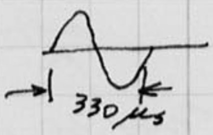
f = 3000 − T = 330 μs.

5000 = 200 μs

10,000 = 100 μs.

100,000 = 10 μs.

Try for 3000 cycles
then T = 330 μs.



$330 = 2\pi\sqrt{LC}$ 314×2 6.28

$\frac{330}{2\pi} = 52.5 = \sqrt{LC}$

[C = .5×10^6 farads.]

$L = \frac{2750}{0.5\times10^{6}} = 5500\times10^{-6} = .0055\times10^{-6}$ h. = 5500 h Seems high.

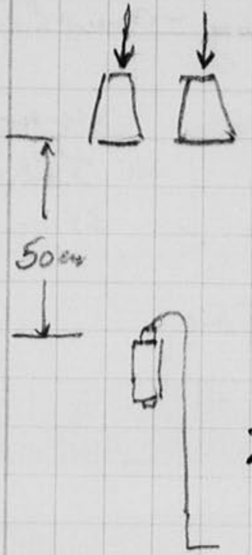
Steve Wamstall. Bldg. — 530

Dec. 3, 1984. HES.
At BPC-9 am Murphy fixed #701 Somarby
adjusting the zero "switches" under the paper.
Then went to Bldg Salan for lunch on the 10th floor.
Des Mandeville — Jerry. — I.
Robt BUCKWALD.
Migdal 10551 Israel HaEmets.) with Jacques Muralva at lunch.

[SUN EXPOSURE 730R Blue Sens Film. Bldg 1 M.I.T. 3 pm
10 min devel. Exposure OK f90 1/100 SEC

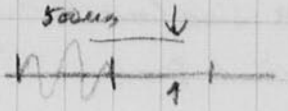
SUN OBSCURED — 1/100 SEC f 45. NO EXPOSURE.]

Dec. 12 1984. N.S. Edgerton 4-405 9 am.
Last night Amos. Stark from Washn gave a talk in Walker to the Sustaining fellows of M.I.T. Big Party.
Frank Moss brought in a TR45 # 89951 5KC with internal resistance damping. Tested it and found the signal is shorter in air, will repeat in water and take oscillograms.



TR MASSA #
" "

TR Std
High. 1701



2.5 cyc = 500ms.
2.5 mv = peak volts.

85957
TR ~~89957~~ HIG. 1701
TR wides Ray.

Same but smaller

2 mv = peak out

at "Low" power the amplitude was down to 1/2. The freq was the same.

DT. 276 Hydrophone.

1 cycle = 185 ms. $\frac{1}{.000185 \text{ ms.}}$ = 5405 cycles/sec.

Dec. 13 1984. Water in Barrel for trans

~~Yesterday~~ day. air vessel was still on the
nozzle. I put a film in the camera. HC 135-12 Poland

approx	time	open	Subject.	Van Tin
1	1/30	2.8	"Hold" of signal	~~Massa 85957~~ in air
2	"	"	" " "	" "
3	"	"	" " "	Massa 85957 (Damped)
4	"	"	Hold.	Mass. old
5	"	"	Hold.	Massa old.
6				
7				
8				
9				
10				
11				
12				

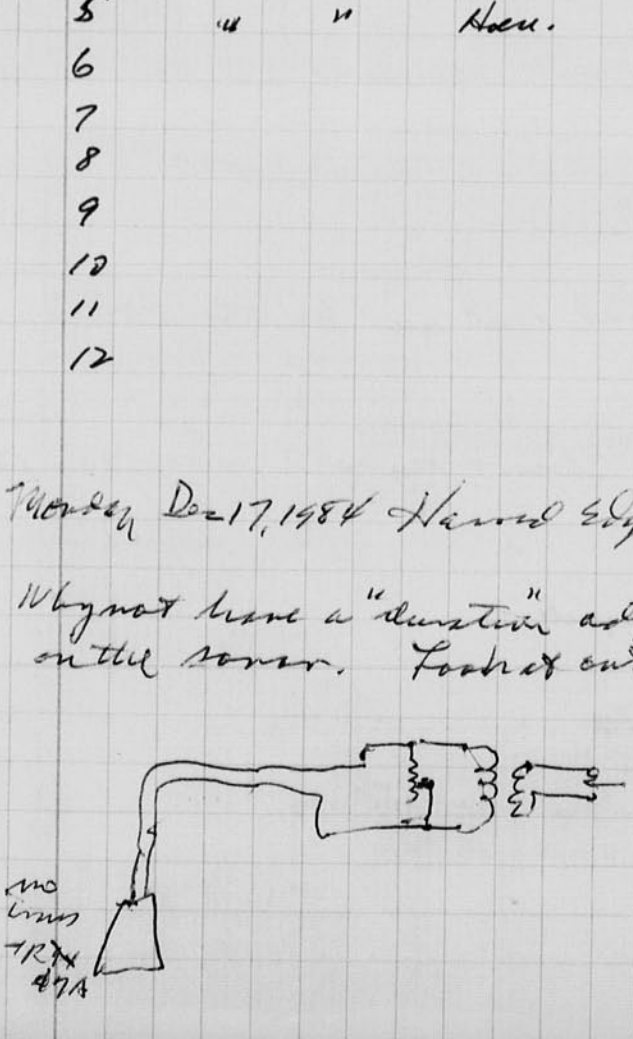
One of out put

Experiment stopped since the sound shows at least 3 cycles.

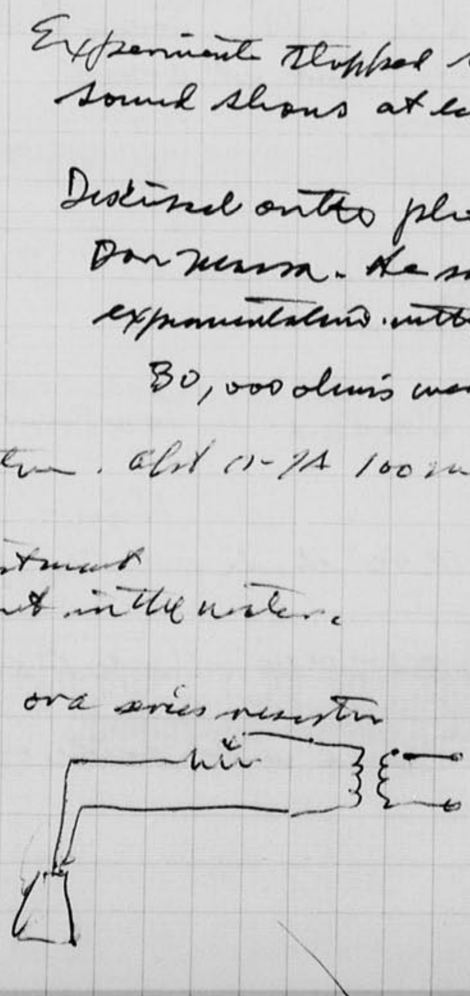
Discussed on the phone with Don Massa. He says bring out for experimentation with some resistors. 30,000 ohms were used in parallel.

Monday Dec 17, 1984 Harold Edgerton. Old 11-7A 100 Memorial Drive Camb. Mass. 02142

Why not have a "duration" adjustment on the sonar. Look at out put in the water.



or a series resistor



Dec 1956.

10.08 Massa Boston Hingham, — Casey - Consultant

Frank and Don. Gil Barrow. - 40 years.

weight		
# 18 lbs	Std	5
35 "	"	3.5

Testing Tank — hyperson (?) across 5 Kc.

#1 — Std Massa transducer. voltage Low. Std Massa

V = 100/div. Time .2 ms per div.

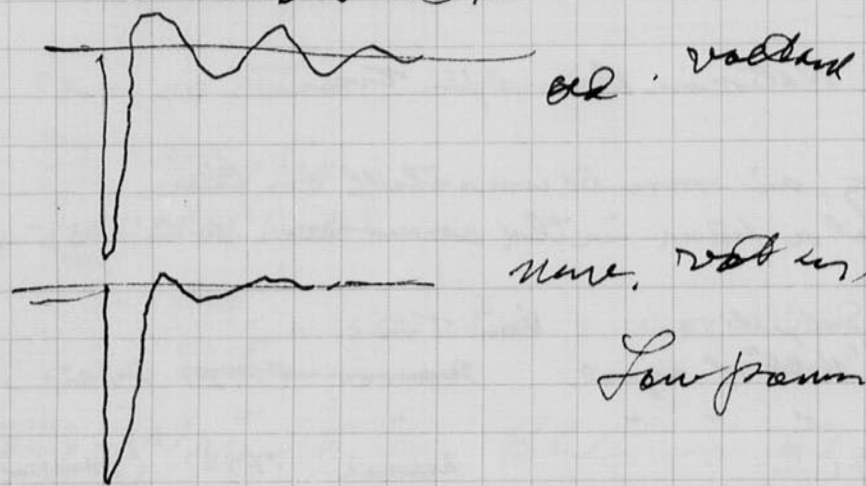
Hydrophone frequency looks like 10 Kc ? why why ?. × 5 Kc.

voltage looks like ~~5Kc~~. 2.5 kc?

~~30,000~~ 10, Kc on ripple on voltage.

voltage = 400 volts 2.5 Kc !! on voltage

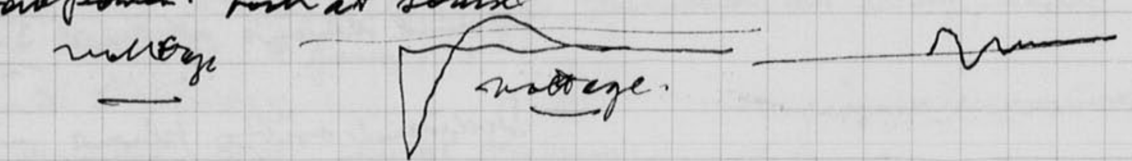
(#1) Special transducer with 30,000 ohms across the sec. of the transformer



Shows effects of damping res.

Sound pulses about the same for both.

#2 TR 786. 3.5 Kc with series tuned with resistor.
Low power. Look at sound voltage



Sound (on Hydrophone). Sound came out WBZ. radio
Low Power

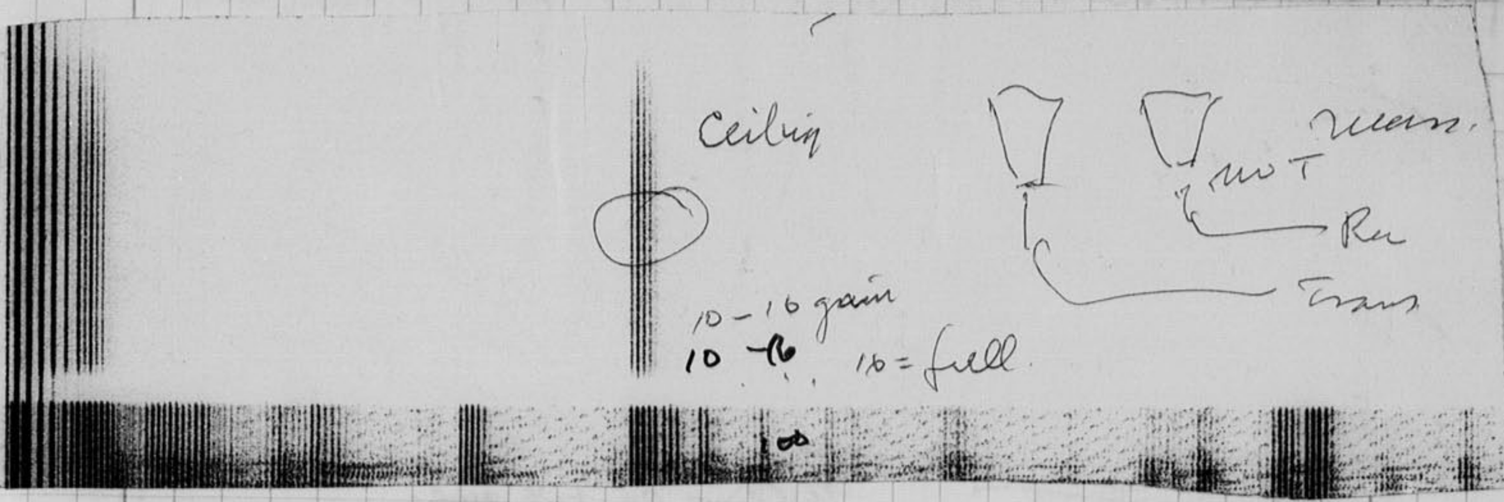
#3 TR.46 - Standard - Low Power Shows signal large neg pulse.

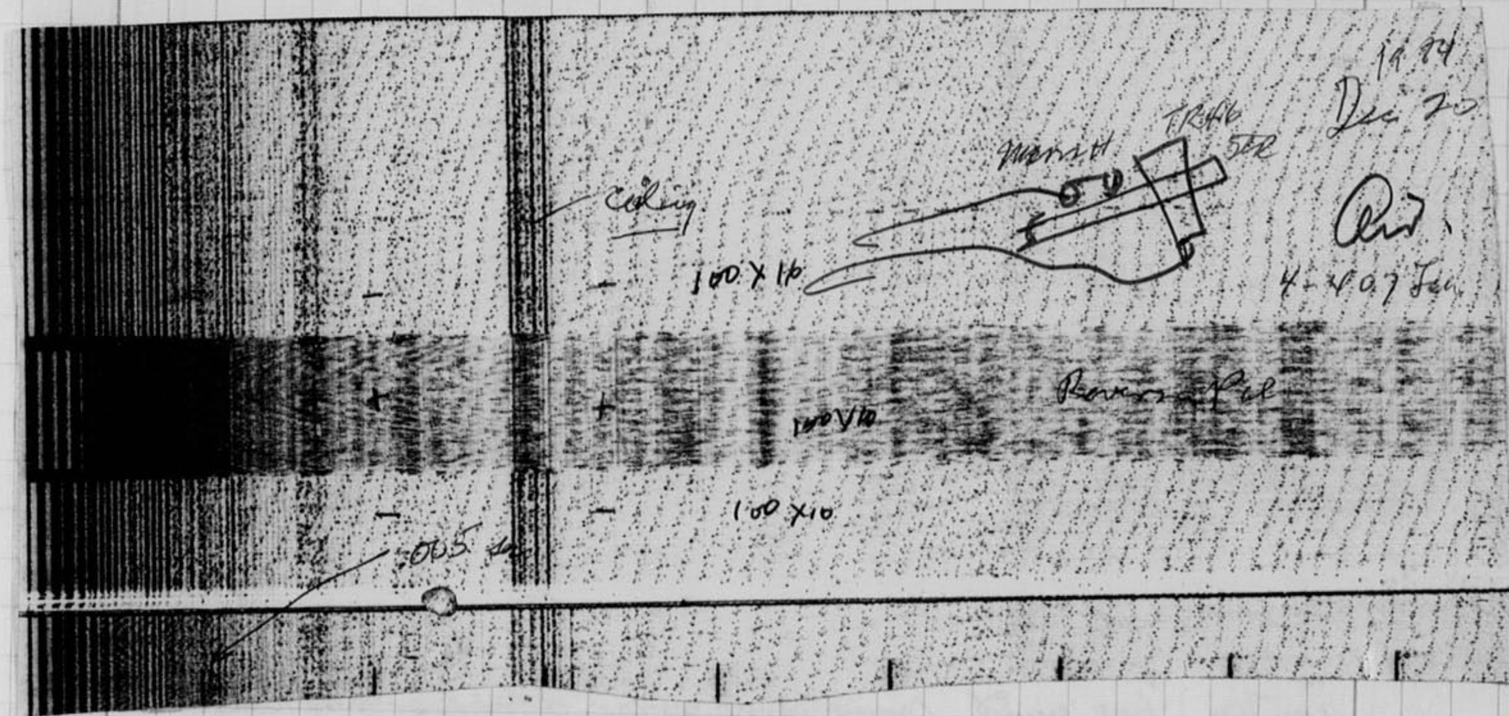
#4. " " High " "

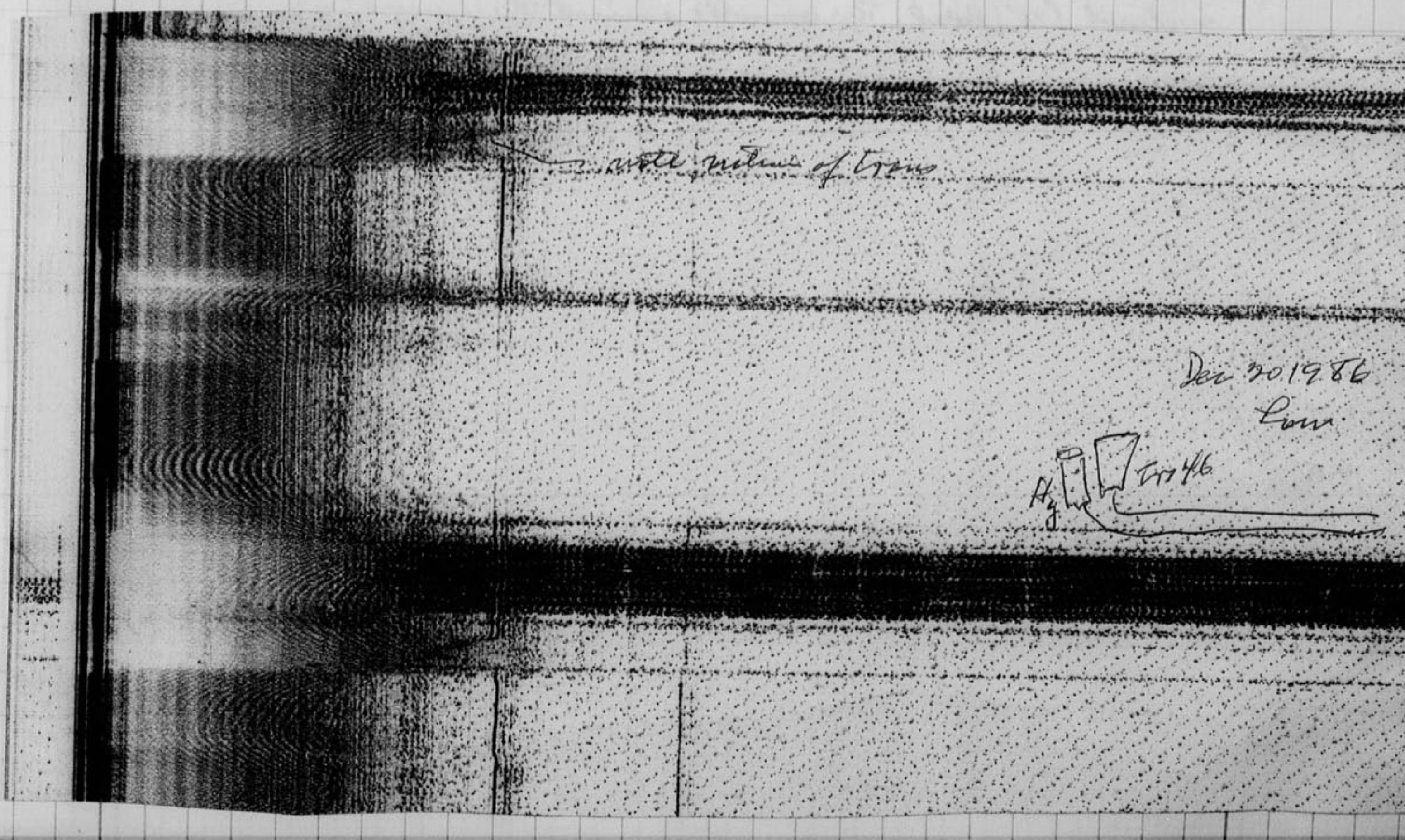
Use TR 46: check polarity of signal.

Conclusion use Std TR 47 - check polarity.

I hope that Don Massa will write up his observations.

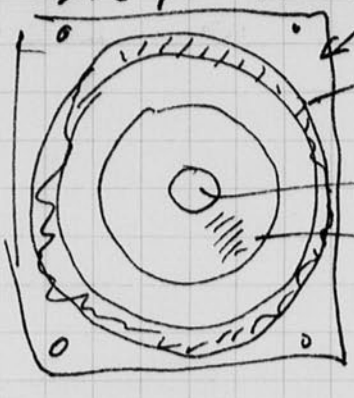

Ceiling
10 - 16 gain
10 = full
Rec
Trans


Ceiling
100 X 10
100 X 10
Dec 20


of trans
Dec 30 1986

00 Jan 4, Friday 1985. MIT 4-405 Cambridge Mass.

Yesterday with Bill MacRoberts on the design of a small boomer.



of Bakelite 1/4" + thick.

Al ring with many screws.

1" + center core

#16 Solid plastic insulated

Aluminum thin plate.

Rubber gasket seal.

This was tried on the EPC 1400 driver. It was just audible. We may increase the turns or use smaller wire.

"Sign" on EPC = 1 mfd at 400 volts. not much.

Jan 5, Dinner at Jan Key's home in Boston. Lyndon, Rebecca Emily.

Jan 9, 1985 Thursday. Coil furnished by MacRoberts on Tues.

32 turns of #16 wire on a 1 3/8" diam core out to 6" diam attached to 1/2" Bakelite plate.

Noise from foil better than for aluminum sheet.

See record for a main plume Hyperplume. on to the EPC Recorder from the 1400 unit 1 mfd 300 volts. I tried a long wire a short (10') lead. The results seemed the same.

Dean Horn gave a lecture last night at the MIT club about the expedition to study the ice shelf in the Antarctic.

I sat next to Capt Rich RYBACK, of the Coast Guard also Chris Polloni Sylvania Salem Mass. (Former WHOI

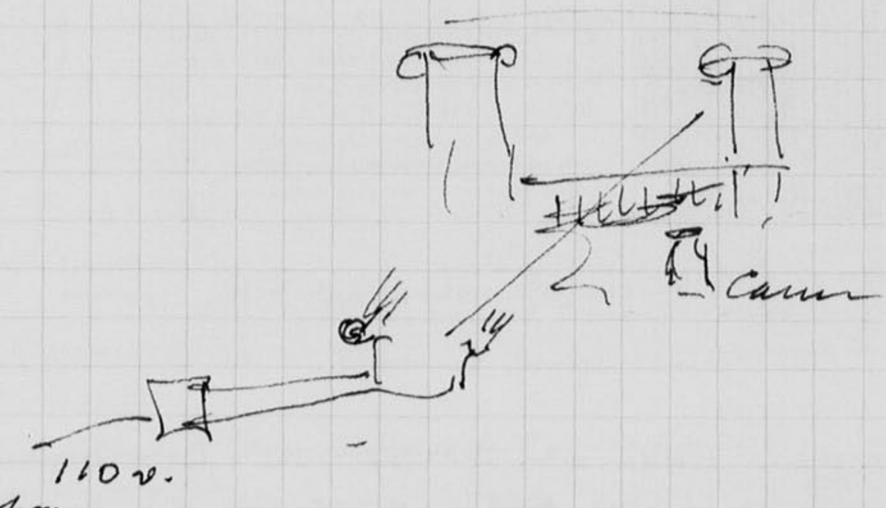
Photos of Sun

1/1 sec f 90 7302 film (see OK)

1/ f 5, not exposed no film.

Sun photo from Bldg 7 at M.I.T.
Jan 10 Set at 1958 at 3 pm.
camera 8X10 Pos film on 3rd floor.
Lens 15 cm. f9 1526555 Goertz Dagor Carl Zeiss Lens
#1 5 min at f9 3 to 3.05.

#2 Strobe lights 2. 25 us 50 cps cam. 20 ft from column.



#2 Shutter open.
3.11 open 3.12 off. 20 + 20 + 20 flashes at different
plus sun at 1/100 sec f9. positions of the lamps.

Note sky had some clouds!

3.25
3.28 can't see sun from 3rd floor!
3.40 coming!
3.50 Sun reaches the 3rd floor (a few moments ago)
4.05 Still coming. Center ~~shadow~~ line 18' north of ℄.

4.40 after Sun set. Missed.

Process films for approx. Positive fine grain film.

Comment. I think the Jan 21 (?) date for the axis illumination by the sun is in accord. Suggest check with Norton etc.

TV Nova program on strobe etc is all set for Jan 15 at 8 pm on WGBH
Bebe Nixon put the tape together.

Jan 14 1985 12-1 Lecture on under ~~Water Photo~~graphy. Monday
About 40 people attended. Peter Donnelly - Draper Lab.

Jan 15 1985
Harold Edgerton

Nova on TV will be shown at 8 pm, It is a one hour affair by Bebe Nixon of WGBH. The basis is the TV program set up by Gary Hoolman of Nebraska.

9.40 a Wayne Child (?) called. (Hershoff). phone
He reported on the "Republic" a 569 ft ship sunk off cape cod on June 23 1909 52.5 east of —
depth 185' 250' to bottom.

He also went on at length about sonar studies of medical and other subjects.

962 6146 Lexington

Wreck REPUBLIC 52.5 miles east of ?
White Star Line 185' deep - 240' Bottom
Sunk Jan 23 1909
Data from Wayne Child ? (Hershoff).

WGBH Program NOVA on Jan 15 1985 for 1 hour
Bebe NIXON ~~492~~ - 2777.

CALYPSO

The Cousteau Society

Ironically, some of the fastest growing populations are in the world's most water-scarce regions. 1/4 of the usable water supply is tapped by humans- 70% goes to crop irrigation and 25% for industrial use.

Hidden Aquifer Disappearing WP 12/31

The Texas Panhandle's irrigation water comes from the world's largest underground lake or aquifer- Ogalala- which extends from South Dakota to Texas, underlying eight states. This is an area the size of California. It contains as much water as Lake Ontario, providing 30% of irrigation water. And it is drying up from mismanagement. Cousteau 11 Jan 85.

Peter Vogt Sunedyne Port Richie 813-847-2777 Fla 33568
Jan 25 sent SN 1698 with 2 lamps & charger by Parcel Post.
Fred Teyling 491-2886 (Jan 23).
Lecture at Research Center for Photo Kelly Conway 8 pm. 600 came one
Lecture on Friday Jan 25.

Chris Stinson Chicago. apt 3930 Pine Grove 2406 Ch 60613.

BURNELL, WEST.
San Jose calif
415-657-4622.
from David Callander.
Control Data
Minneapolis Minn.

13 poses

Who is this diver? This photograph, taken with a multiple-strobe-flash technique, has turned up unidentified in Professor Harold E. Edgerton's archive. "Doc" believes it was made in the mid-1960s—and will be grateful to any Review reader who can name the athlete.

Dave Callander knows the Diver.

(WEST) Burnell

Humming Bird Movie on TV
Feb 1st. 1955 by
Marty Stouffer. WGBH.
excellent—some at high speeds

(15 Specials)

Jan 30 1986 Harold Edgerton Frank Don Mass a [illegible] Barrow
[illegible] Prof Hong Chen

10 20 am tests of TR 75 [illegible]
BQR 7 Hydrophone. same as used at MIT.

- #1 TR 75 A. BQR 7. of above Low. ok but no grid. (3,8 Kc)
- #2 " " " " Zero line ok
- (5) #3 " " " High
#3 - #4 TR 25 Hydrophone. Low. ← - + - tried noise [illegible] another Hydrophone. noose
Use Same [illegible] and [illegible] see paper.
The [illegible] & transmitter.
(#4) photo. TR 75 A. trans. TR 25 Hydrophone. Low (ok [illegible])
A means [illegible] parallel. 3,8 Kc. Pri - 100 Ω at 3,7 Kc.
#5. TR 75A TR 25 Low pow attached to input of Recorder.
[illegible] try a parallel Resistor on the transformer (no change) ✓ 3,5 Kc
~~100,000~~ 10K.
2000 ohm no change in form of signal.

#6. TR ~~75A~~ 61A 5-6 Kc. TR 25 rec. Low power.
#7 " " High " (6 Kc ?)
8. TR.61A BQR-7 ~~TR 25~~ Low
9 TR 61A ~~BQR 7~~ ~~TR 25~~ High. ✓

---

10 TR 237 (8-10 Kc) BQR 7 Hy. ~~Low~~ High
(Best) 11 " square. ~~High~~ Low 8-10 Kc
Low gives more signal ?!!.
~~S~~uggestion: increase voltage depress ©.

#12. TR 237 8-10 TR-25. ~~Low~~ Small Signal
#13. " " High

#14 TR 238 12K. TR-25. Low. 12 Kc
#15. " " High
[illegible]

Oscillograms
Modest massa Prod.

#16	TR 238	~~TR~~ BQR7	Low	12 Kc.
17	"		High	

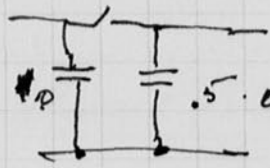
Suggestion Reduce capacity on the input..
Output maybe resonance of hydrophone.?

18	TR-238	TR-25:	Low	changed angle of Rec.
19	"	"	High	" " " "

(Best)	20	TR 237	TR-25	Low	Square 8-10Kc.
	21	"	"	High..	

Best into TR-25. Best:

.5 cap removed. 1 uf left
0.047 cap replaced for the 0.5 cap. Change of circuit
Geo Johnston

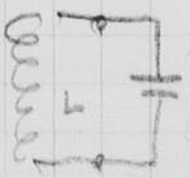


changed to 0.047

Different.

Sends "chinese" excellent.
Discussion change 0.047 to 0.15 mfd

22	TR ~~237~~ 75. ~~...~~ 2.5Kc.	TR-25.	Low.	now — Low = 0.147 mfd
23	" 3.5Kc	"	High	High = 1.147. mfd
24	TR-75	BQR 7	Low	before Low = 0.5
25	"	"	High	High = 1.5



$$f = \frac{1}{2\pi}\frac{1}{\sqrt{LC}} = 3.5\text{ Kc.}$$

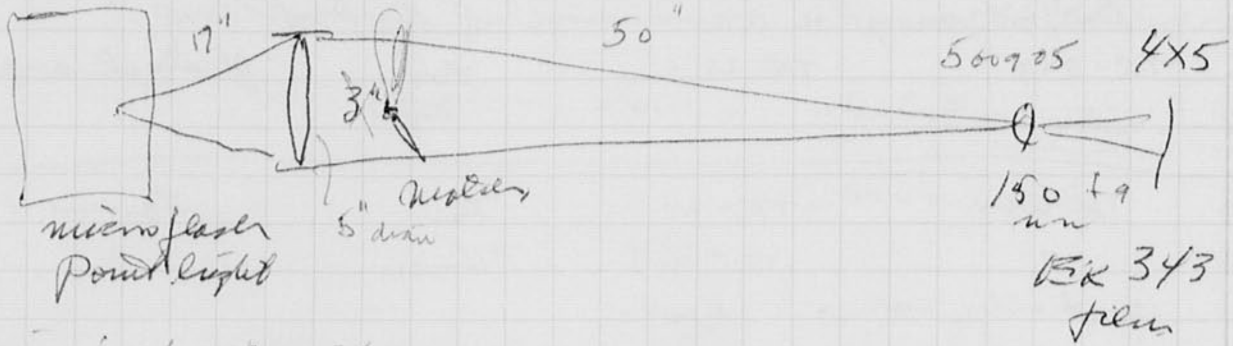
Conclusions – It seems difficult to get a single pulse out of a Massa Transducer.

I plan to continue development of the boomer.

72

Feb 5 1985 Harold Edgerton. 19 x 10°

X 3588
Photo of match, Visit to Bldg 12,
1-234-3553 Home → Jim Billingham Flame.
E-203



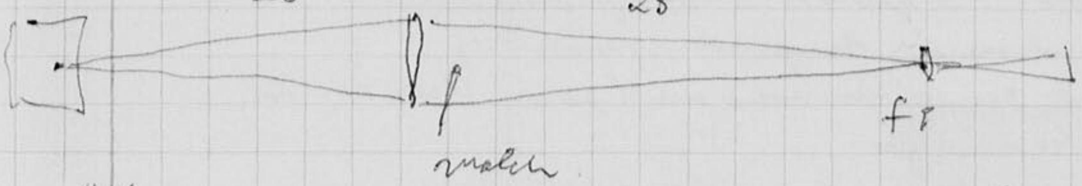
Dimensions of experiment
Suggestions: Strive for a larger image
Go from 343 to Plus X film for bigger image.

Subjects – Sparklers, match flame, firecracker, falling drops (evaporated water.

Lens moved to make a larger image on the film.

comment. The lens is a simple glass one. It might be better if an improved lens was used. HE

Wed Feb 6. 1985 AZ.
Cont.



Plusx film
10 min dev.
over exposed
focus soft.

#1

#2. f/8 on shutter. match 1302 Pos film
Realigned lamps
Focus changed ⅛ 2" from field lens.
Plusx. full open shutter

Exposure ok,
no flame shown.

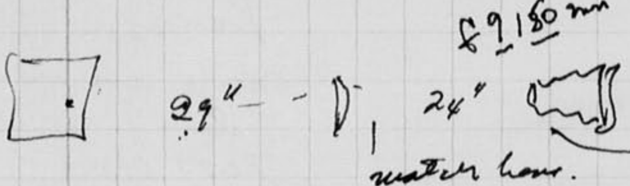
~~why is 343 better~~? Try again with new lineup?
again Plusx A-64. Schlieren same.

flame photography by back light. match!

Sat Feb 1985 H. Edgerton

#1 neg. Plusx A16 on shutter. 5 min DK? Time.

at A 22 the light was completely cut off!

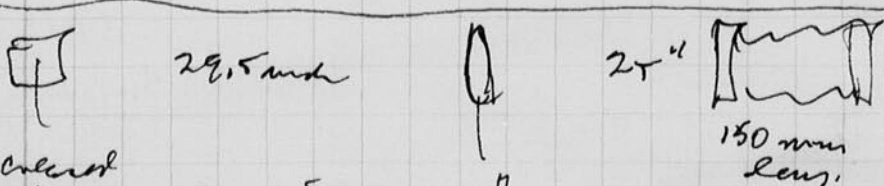


9" lens with electrical operated shutter.

~~overexposed no flame image.~~ no schlieren fine H at.

Too much exposure

2	7304 film	A	match	Ng — 230 pm
3.	7304 "	A16	match	Ng
4.	Plusx	A 32 + a pin	match	this was OK! too much Schlieren



Increased size of image marks

32 mm — 22.8"
33 — 22

5 " " A8 — 16 — ash. light — Over exposed no schlieren!
6 " " A32

Comment. Nothing is photographed without the Schlieren trick!!

Feb 16 1986 Harold Edgerton

Sybil Sandard (Smithsonian Inst.) gave a lecture with movies on Feb 14. in 34-101.
Elisha Linder was here yesterday. He plans an expedition to Sardinia in August – possibly Isreal too. Frank Cross (Harvard) will go on this. He is looking up the history etc.

Eric, Denise, and Maryanne — arrived 1030 last ~~[illegible]~~ night from N.Y. Eric is here for a few days. He is working at the Museum of Modern Art in N.Y.

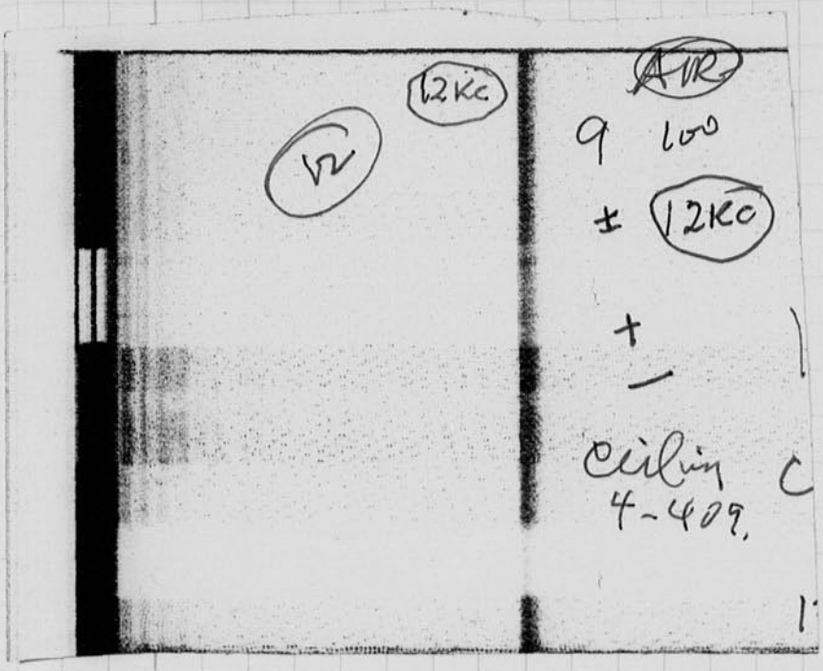
Feb 17 Eric helped me yesterday test the microflash with a balloon burst. We used Polaroid 4x5 color film at 2 ft f 4.5 in my 4x5 view camera. a microphone was used to trigger the flash.

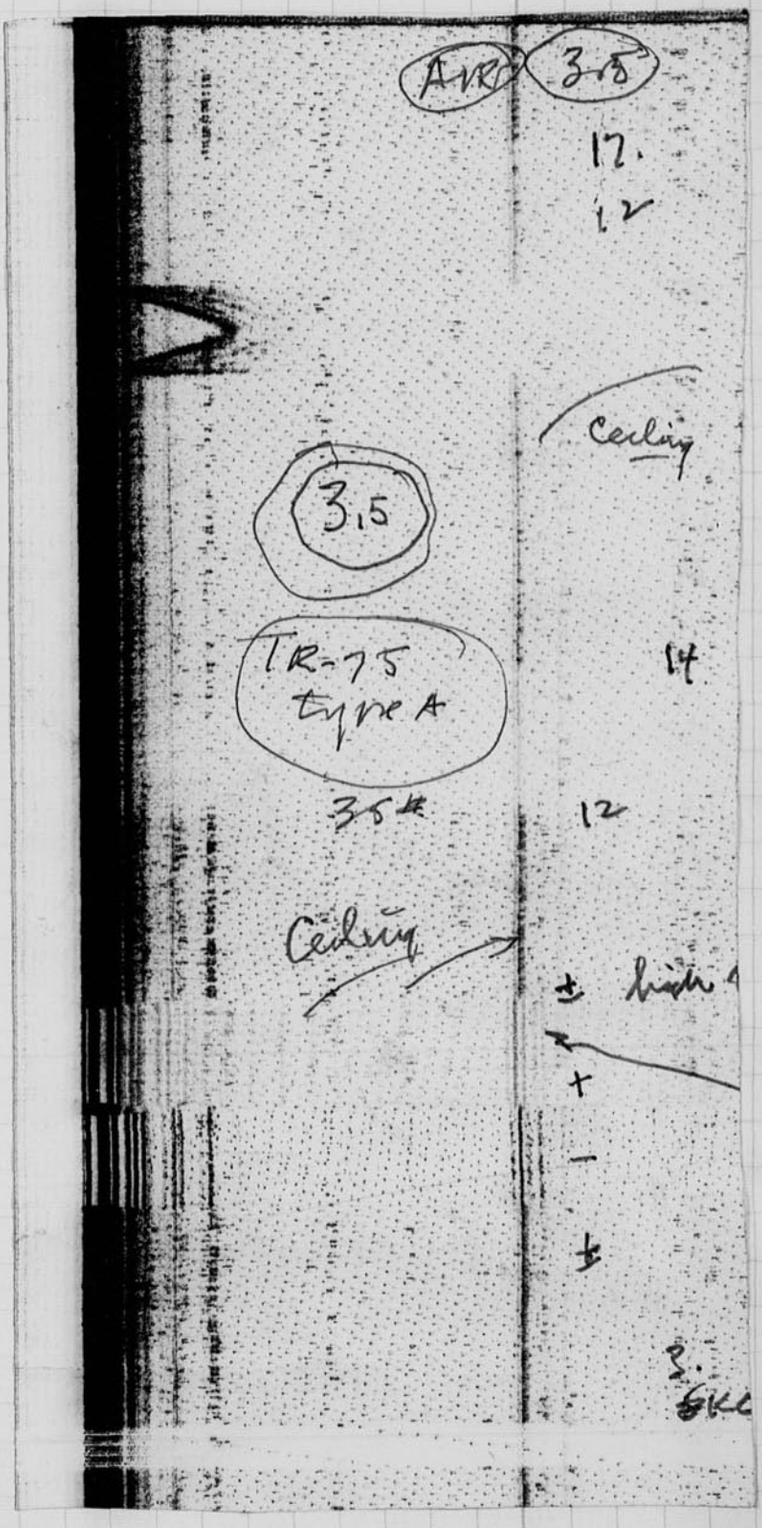
Eric Edgerton

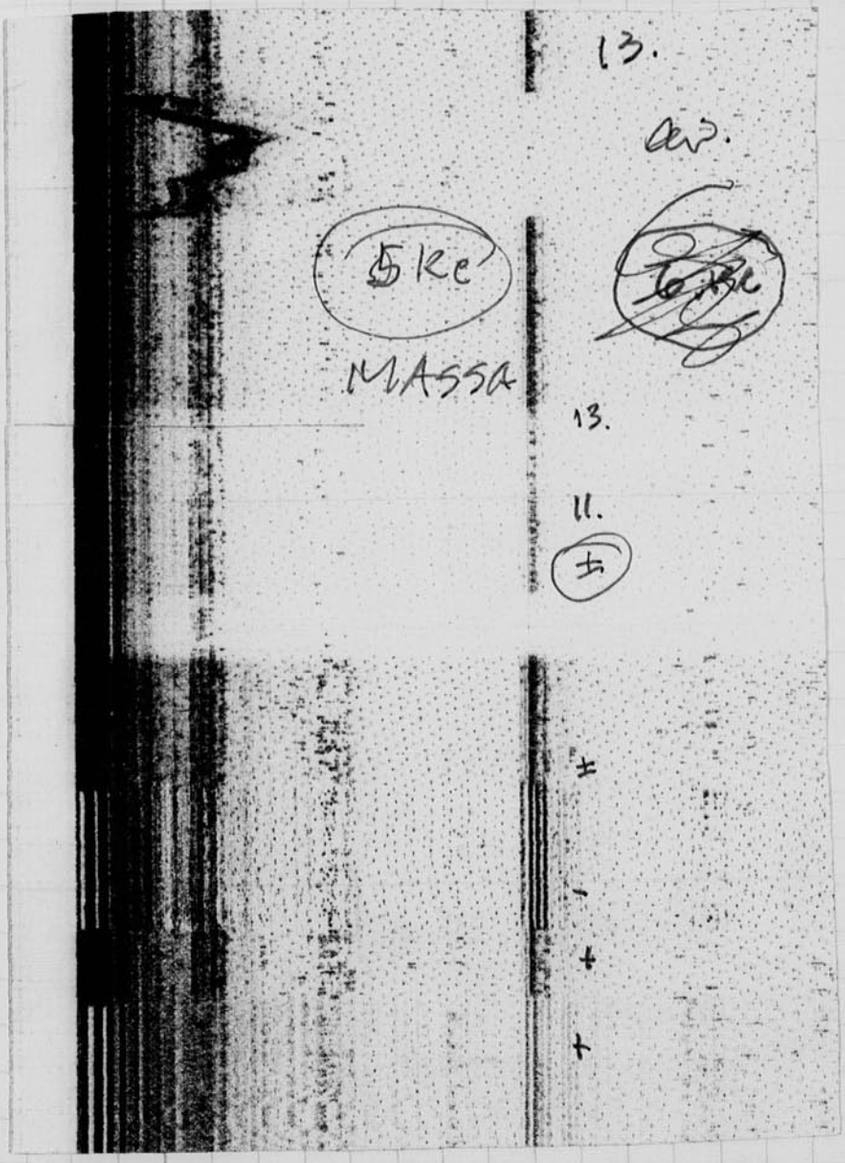
note early exposure due to room light (Red).

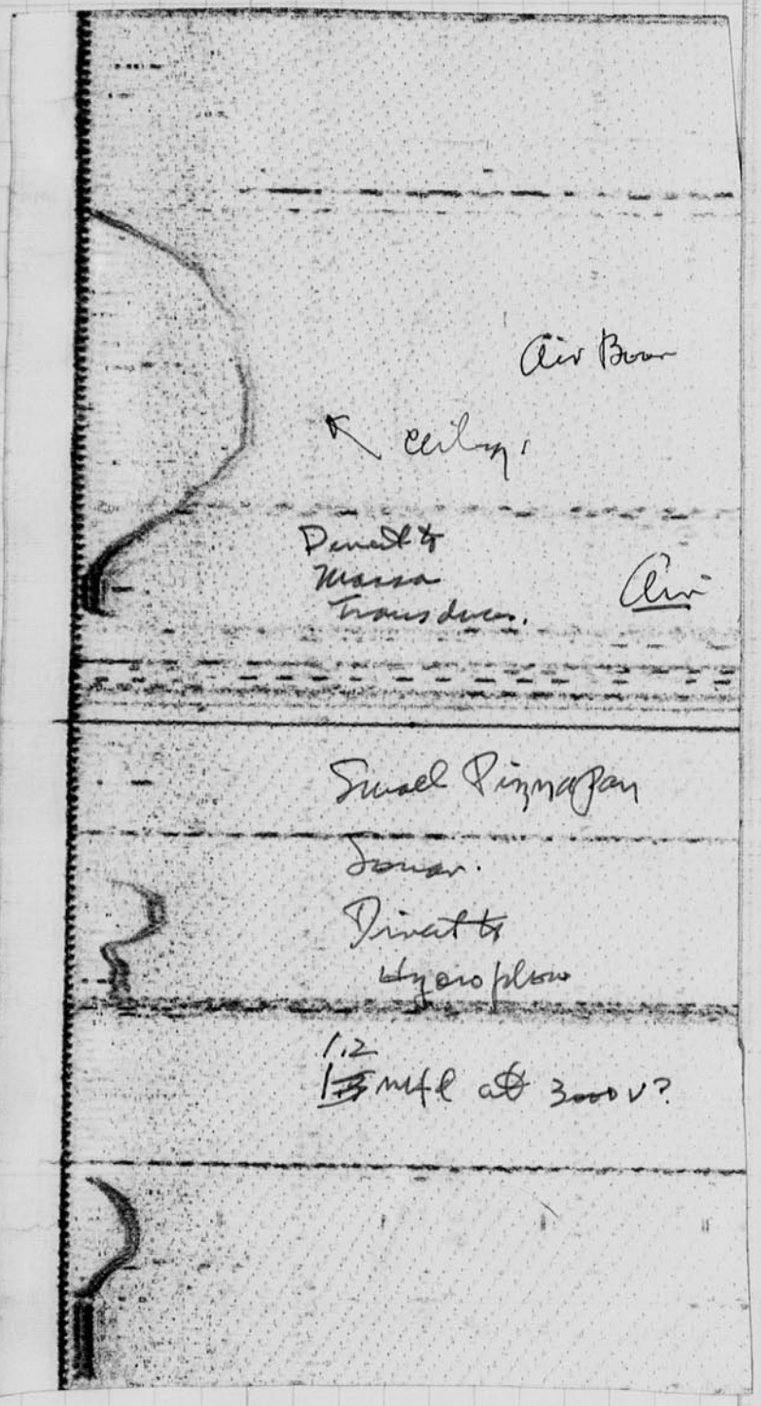
Gus & Aaron Kayafas came in on Feb 17 ~~to~~ test and assemble the equipment to take to N.Y. for the David Letterman Show, NBC for Feb 19.

Hydrophone
Massa

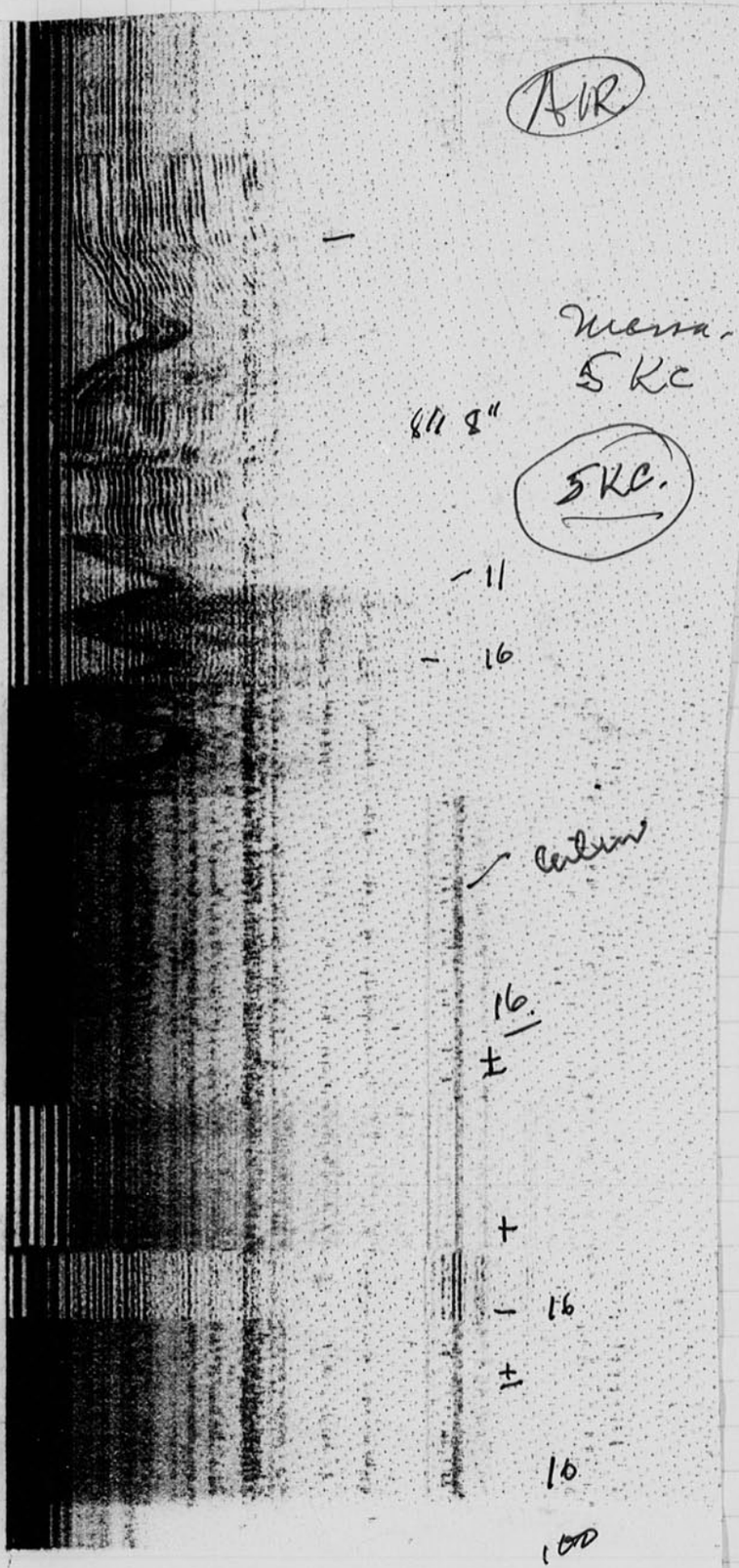


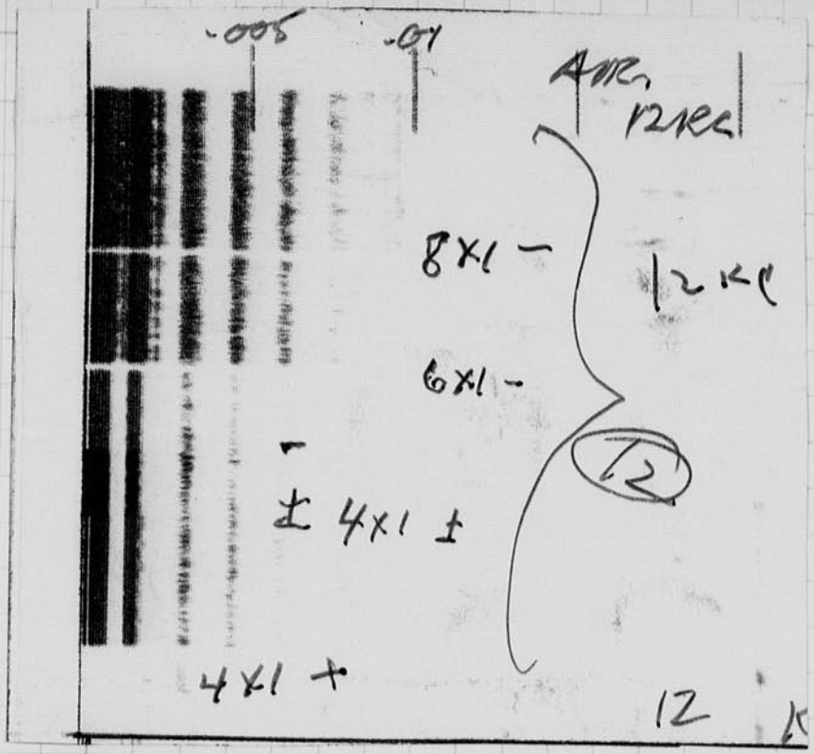






This is a coil of wire (#18) on a piece of Bakelite. an al sheath is clamped over it.





July 21 1935
Harold Edgerton
M.I.T. Pool.
Shallow end.
Noon.

Tests of 12Kc 5Kc
& 3.5Kc
units.

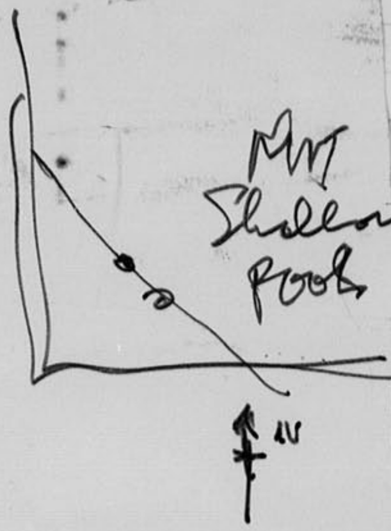
8×1 Low –
6×1 Low –
11×11 Low –

M.I.T.
Shallow
Pool

8×1 Low –

6×1 Low –

4×1 Low –



4×1 High –
3×1

2×1
4×1 High
4
High

11 5×11 +

9 Pool.

7 Feb 22 1985.

Feb 2

15

1.4 mm × .01 / 23 mm =
.00048 sec.
2083.3370

Bot. Shallow pool.
– + 5×1 Low. 5Kc

Low

–14
5×1 Low –

3×1 Low –

6

– 5Kc.

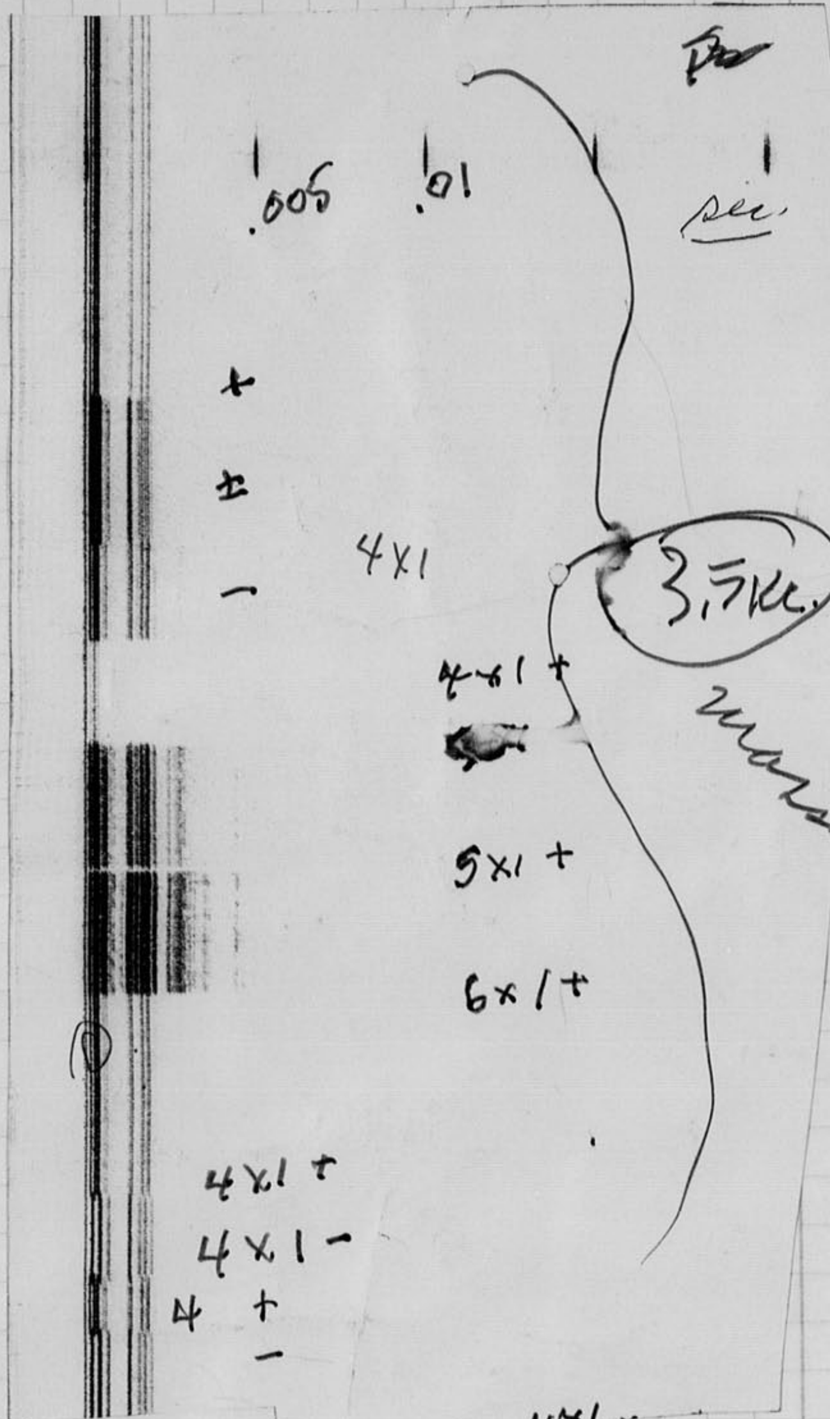
×1 8.5 Low.

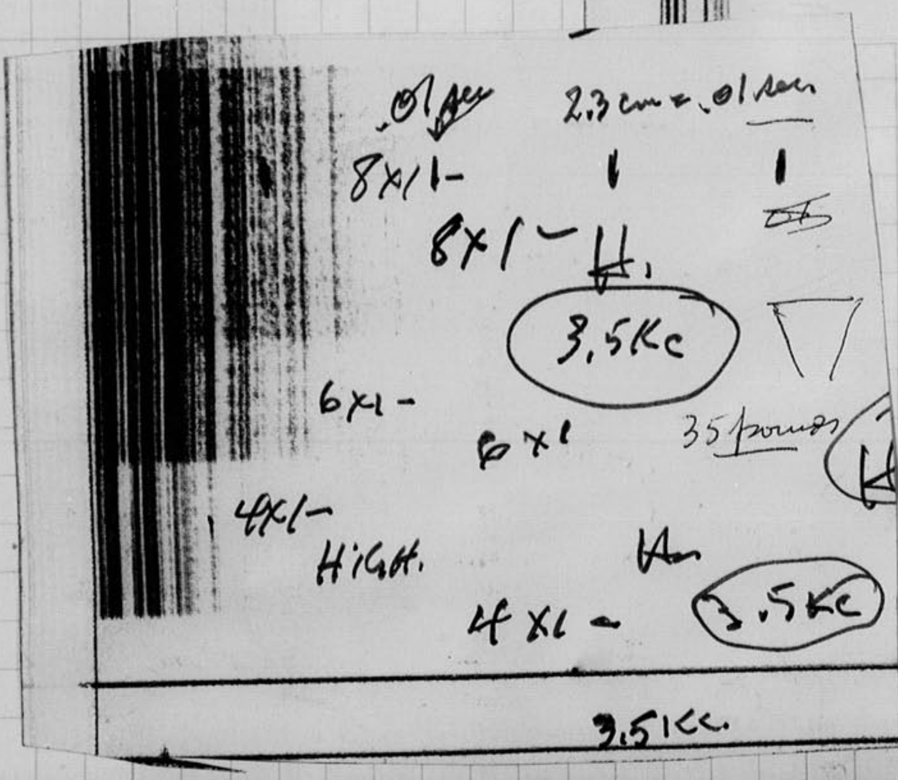
Aurora Nebraska
Cemetery.

Nordline to Mary Coe
Born Mar 2 1875
Aurora Died Nov 7 1972

Frank Eugene Edgerton
Nordline to Born Sept 29 1875
Aurora Died Nov 25 1961

from tomb stone in
the cemetery north of
Aurora Nebr.





Feb 21 1985
Harold Edgerton

BPC unit 1701

High 1,5 mfd
low .3 ± ? mfd.

March 3 1985 Harold Edgerton

Esther & I returned yesterday about 3:30 pm from Aurora Nebraska. We went on Mon by to Omaha on United air lines where we met Mary Lou Dixon at Chicago. She came from Hickory N.C.

A Hertz car, Ford escort, was rented at Omaha for them at Lincoln (Mere).

We stayed at the Ken's Motel in Aurora for Mon, Tues, Wed nights.

Howard Anderson came over from York to show us the Kremer farm operation south of Aurora. I am in partnership with Bob in the cattle feeding business. Ken Kremer is also in this effort. The Nat Bank of Commerce is my representative.

There is a crisis in farms at the moment — the price for corn is down due to world conditions such as the expensive cost of the US dollar. Interest rates are high. Farmers operating on loans are in trouble. The income is short of paying for the loans. We noticed that there were many auctions of land and equipment.

Esther slipped on a patch of ice and badly sprained her right wrist. There was a small bone fractured in the wrist, a cast was put on by Dr Penner in Aurora.

We went to Clay Valley to see aunt Etta. She is 101 years old — lives at the Good Samaritan Home.

I attended the Rotary Club in Aurora on Tuesday(?) with Ken Wortman. My father, Frank Edgerton was the first president when the Club was organized.

A marker, stone 5' x 6" x 3.5 ft of Georgia Granite was ordered from the Dech - Payne Monument Co of Grand Island. Keith Hansen cut advised on the location near the place where the Sharp farm house was burned some years ago. The stone will have an [illegible] of the house and some historical information on it.

Notebook # 35

Filming and Separation Record

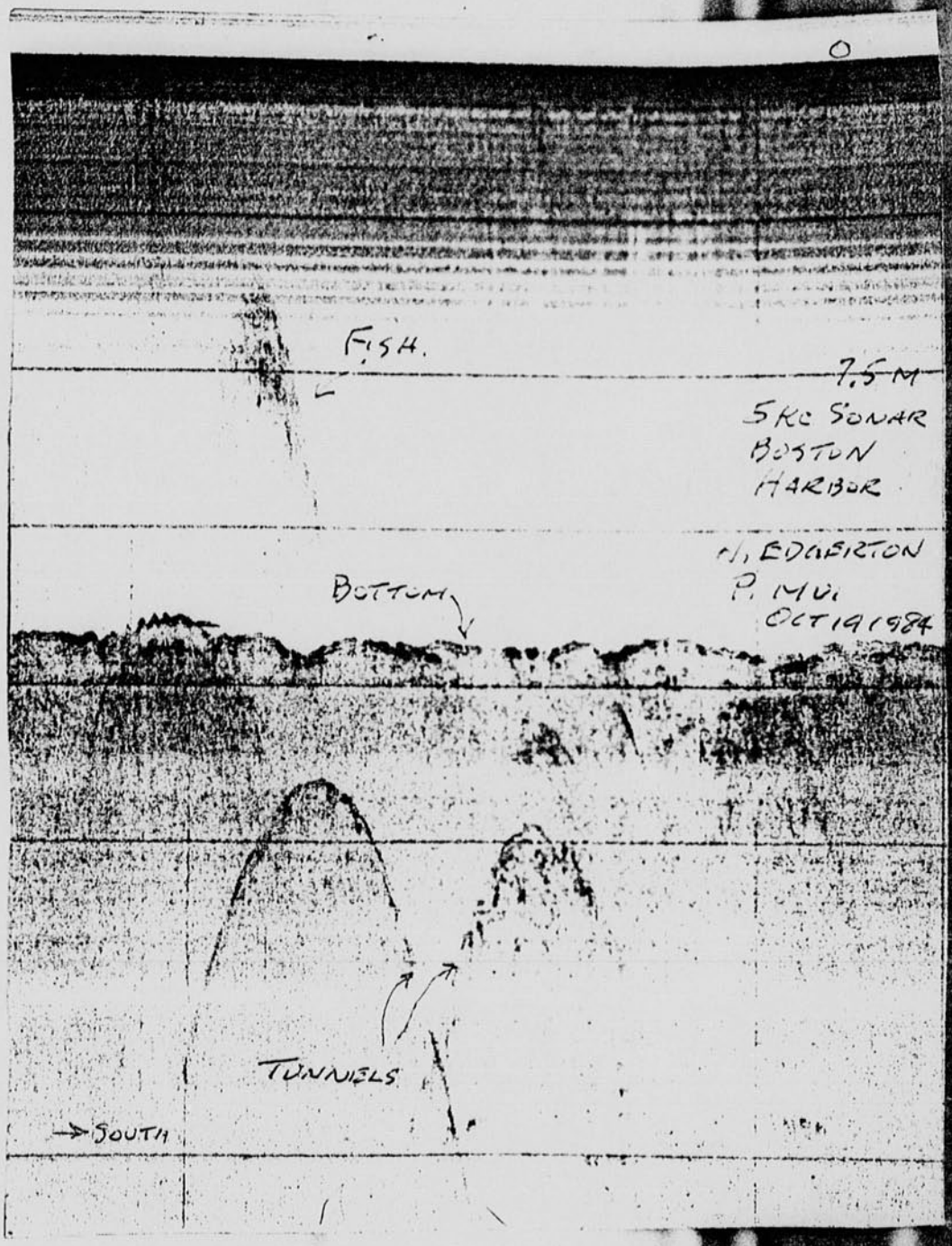
___ unmounted photograph(s)

___ negative strip(s)

_1_ unmounted page(s)
(notes, drawings, letters, etc.)

was/were filmed where originally located between page 78 and 79.

Item(s) now housed in accompanying folder.



Harold E. Edgerton

1984

Gov Robt. Kerrey.
Harold Edgerton
Lincoln Nebraska — Trailblazers award
State Capitol Bldg. — Friday Mar 2 1985

MAR 18 1985.

Esther & I returned from Tampa by Delta 202 yesterday afternoon. We went to Tampa, then to St Petersburg with Ro Lamb and Mrs Lamb for the opening of the St Pete Science Museum. I showed strobe photos etc.

After all night at the Biltmore (?) hotel on the bay we went to Sarasota via a Ford Tempo (Hertz). to stay with Margaret and Bob Robinson in Bird Key. We had lunch with Lynn (Farrow) Milne and saw Michael and David (her sons). There was a few guests for lunch which we enjoyed. Then on the next day there was a dinner at the Bird Key club by Hande (?). I met Mr & Mrs Leight B Yost 99 Sunset Drive PH2 - Bay 8 Sarasota Fla 33577 He was with Patton and the red Ball Express in France 1944.

We called on the Farrows Frans and Adelle 3320 Gulf Drive Bird Key Florida.

Belcher will be here Thurs Mar 21 at 11 am to discuss search with Sonar at ~~Santa~~ Vava Cruise. (June 10).

Belcher phone No 415-543-1908 San Francisco.

April 1985

Harold Edgerton at 100 memorial Drive apartment 11-7A 11-? Two apartments.

I arrived at the Boston air port about 5 pm on TWA 811 from Paris. The trip had started at Venice Italy at 7 30 am, then to Milan and Paris. Since Mar 23 I have been in Venice with Ed Curley. W. took a 3.5 kc transducer and an EPC 1705 driver. This project was proposed by Antonio Stefanon who is at the uni in Venice. He also has connections with ECO who are helping him in his geology studies.

Dr. Werner from Kiel Uni was a visitor in his house. A rather full record of my activities are in a small pocket note book dated March 5 1985.

A report will be in draft form within a few days. It will be submitted to Dr. A. Stefanon for revision and improvement before being published.

Photo taken in the Museum at St Petersburg Fla several weeks ago.

April 5 1985 H. Edgerton. Strobe Lab 4-405

Robt Spinder B.V. 254 3856 in Museum (Yates)

April 14 Friday 1985.
Harold Edgerton. 9 pm

Esther and I have just returned today from Idaho Falls Idaho
We went on Wed Apr 17 via United to Chicago. Salt Lake
City to Idaho Falls, met by Harlin Summers and
Jim Zane 525 8287. Room 388 at Littletree Inn.

Apr 18 picked up by Summers at 830 to University Plaza
Lecture at 9 am for high school students 54 on program
Lee Ann Briscoe –
Darlene Lee — Rigby High School
John De Felice
Sarah Christian) Skyline High School.
Mick Aquilina – Deputy Mayor 100
Troy Wade II manager
I gave a slide lecture until 1030.
Donut and coffee break.
1045. Movies – Bat in action
Sea water ... sound
Diving on calypso. Baby

Discussion at Lab with group after
inspection of some projects.

Dinner at Snipe Club Restaurant with
group invited by Zane – Troy

Picked up at 650 by Harlin Summers for
airport Western flight to Chicago

Edgerton fellows
Joshua Cohen
84-85 E53-489
ph 35247

Judy Seidel. Bank Street center for children & science
college of Education
610 west 112 st 10025
Manhattan n.y.

Jay Lin
36-653
ph 3-8843

T.V. Program for children
(Nancy Ennis) Arthur Miller Univ Penn.

Gordon Watts will go aboard Aug 5 or 12 to Norfolk and
Roanoke 1585 – 1587 – English Colony.

O'Keefe B.J. April 17 #3 PO Box 1440 PO Box 4400 Reno
Excellent article in ... Quad of ... #

May 12 1985. Yesterday at Hawthorne College in N.H. to give the commencement address.

I went "out" in the talk and did not "come to" until I left the stage some 1/2 hour later. I do not remember finishing my talk or the awarding of the degrees; ~~after~~ I went thru the ceremony in a ~~[illegible]~~ daze, I was ok at the dinner [illegible]. Will this happen again??

It reminded me of an accident I had in a football game in [illegible]. I was "out" for several plays with no memory, but I kept going.

Watts in N.C. wants an expedition to Virginia to find the lost colony of Roanoke, 1585–1588. Suggests Aug 5 or 12. [illegible] Sam and [illegible] I may take [illegible] with me as a helper

May 14 1986 Monday 12:07 at Mt Auburn Hospital Cambridge, Esther went in for surgery on her arm at 9:15 am. I now await her to get out of the recovery room. Her nerves in her right arm (wrist) seem to be pinched!

H. Edgerton
May 15 1985

T.V. Program suggestion
~~Halley's Comment~~. ~~Comet~~

John Wilkinson
Gerry. Pomeroy.) 202 234-4277. Wash.

Senior MIT. Physics dept.
Meghan DONAHUE 6X5 8766
New House

from Kearney - near East of town. Paul Mansky - Lives at Wellesley VIII student
239-6908.

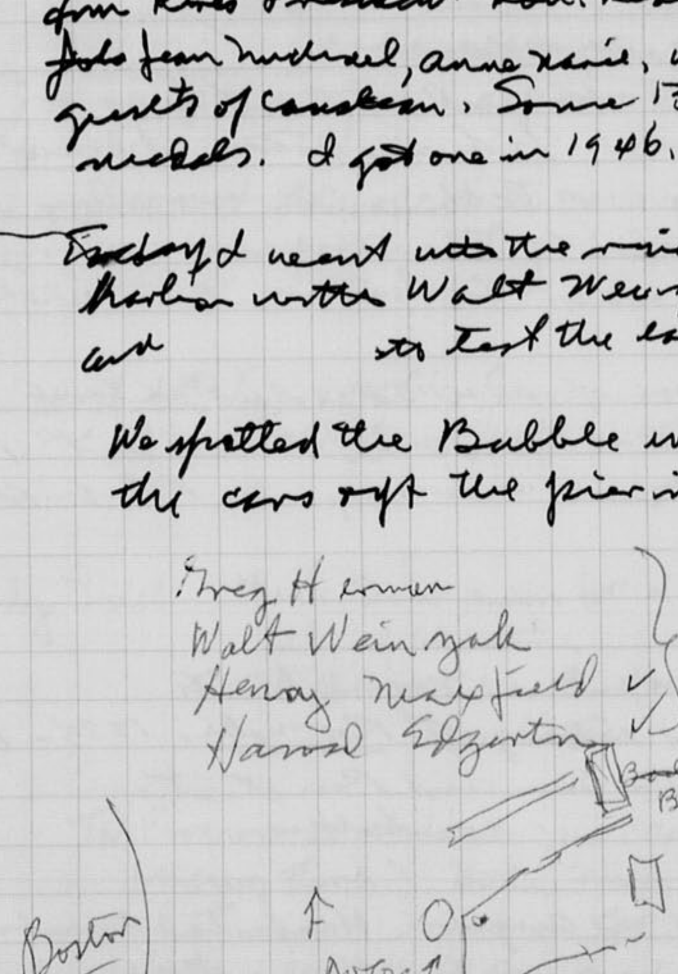
Tan-jin Lee - String in Stair way. Exhibit Bldg 4.

May 24 1985. Yesterday I took the N.H. air plane to Wash at 9.15. Then I went to the White House to meet Capt Jacques Yves Cousteau who received a medal of Freedom from ~~Pres~~ President Ron. Reagan. Simone Jean Michael, Anne Marie, were the other guests of Cousteau. Some 13 people got medals. I got one in 1946.

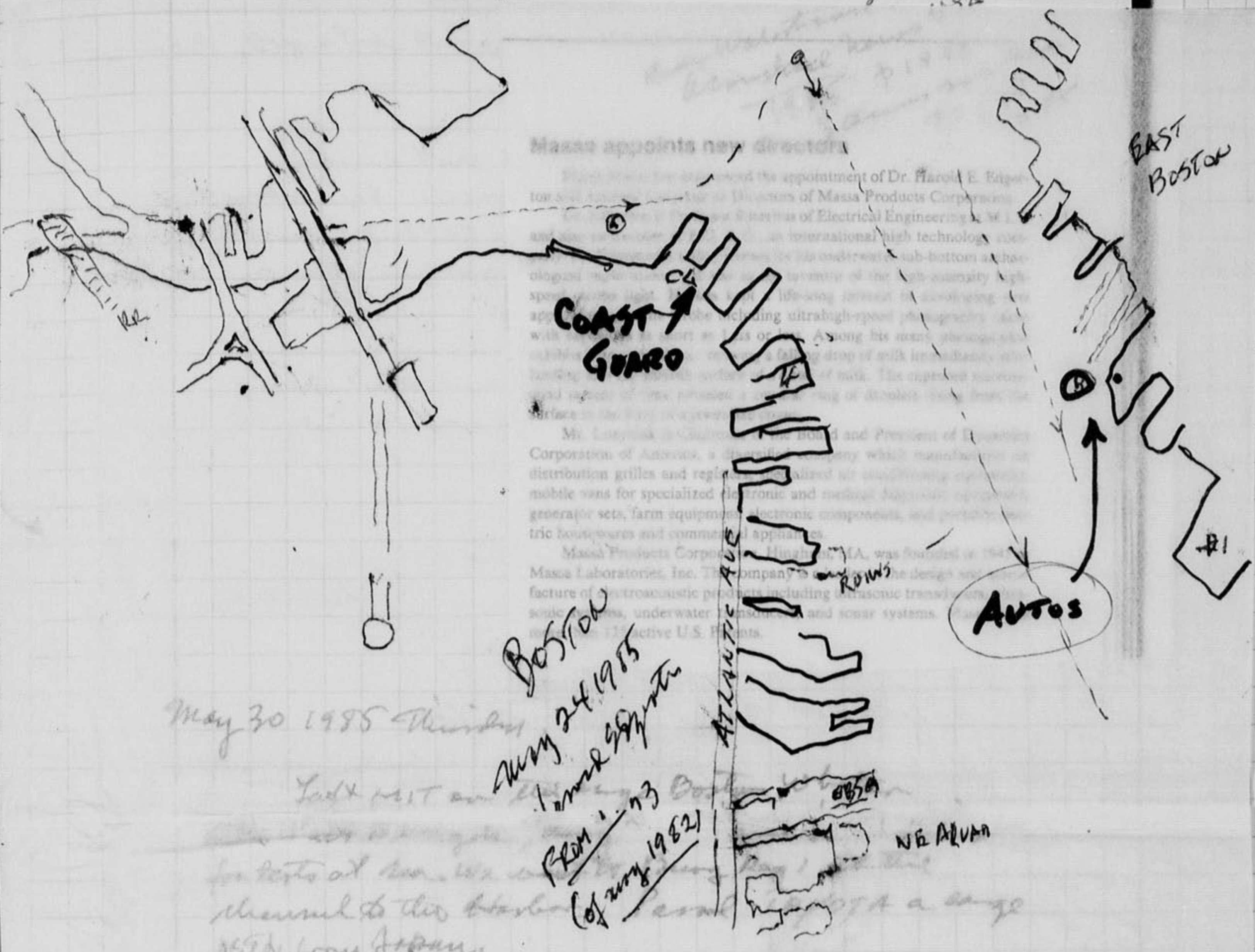
~~Today~~ I went into the river and harbor with Walt Weinzyk (of Bldg) and to test the latest sonar.

We spotted the Bubble wreck, and the cars off the pier in East Boston.

Greg Herman
Walt Weinzyk
Henry Mayfield ✓
Harold Edgerton ✓
} in M.I.T. (whaler) Boat with Rg&S Side Scan sonar.



a, Maryland 20084



Massa appoints new directors

[illegible] the appointment of Dr. Harold E. Edgerton [illegible] of Directors of Massa Products Corporation.

[illegible] Emeritus of Electrical Engineering at M.I.T. and [illegible] an international high technology company [illegible] underwater sub-bottom archaeological [illegible] of the high-intensity high-speed [illegible] life-long interest in developing new app[illegible] including ultrahigh-speed photography [illegible] with [illegible] as short as 1[illegible] or less. Among his many photograph[illegible] a falling drop of milk [illegible] of milk. The [illegible] surface [illegible]

Mr. [illegible] of the Board and President of [illegible] Corporation of America, a diversified company which manufactures air distribution grilles and registers, specialized air conditioning equipment, mobile vans for specialized electronic and medical diagnostic equipment, generator sets, farm equipment, electronic components, and portable electric housewares and commercial appliances.

Massa Products Corporation, Hingham, MA, was founded in 1945 as Massa Laboratories, Inc. The company is a leader in the design and manufacture of electroacoustic products including ultrasonic transducers, [illegible] sonic systems, underwater transducers and sonar systems. [illegible] more than 125 active U.S. Patents.

May 30 1985 Thursday

[illegible] MIT [illegible] Boston [illegible]

[illegible] a large [illegible] from Japan.

[illegible]

1985

260 Bill Scan

EG&G.

Harold Edgerton
Harry Maxfield.
Walt. Kainzjek.

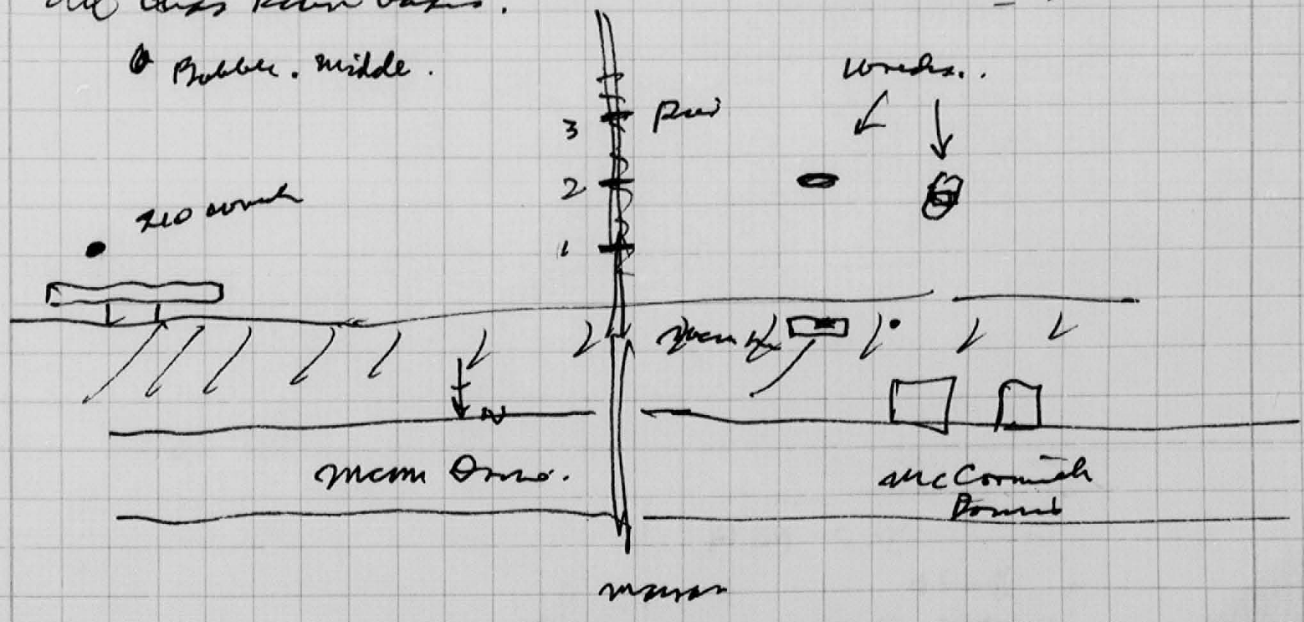
a, Maryland 20084

River Waterhouse.
Acoustical News USA
1985 p 1963
J Acous Soc Am
77 (5) 1985

May 30 1985 Thursday,

Left MIT on the large Boston Whaler with Walt Weingarten(?), Harry and Jim Billingham for tests at sea. We went to Buoy Reg 1 at the channel to the Harbor. Passed TOYOTA a large ship(?) from Japan.

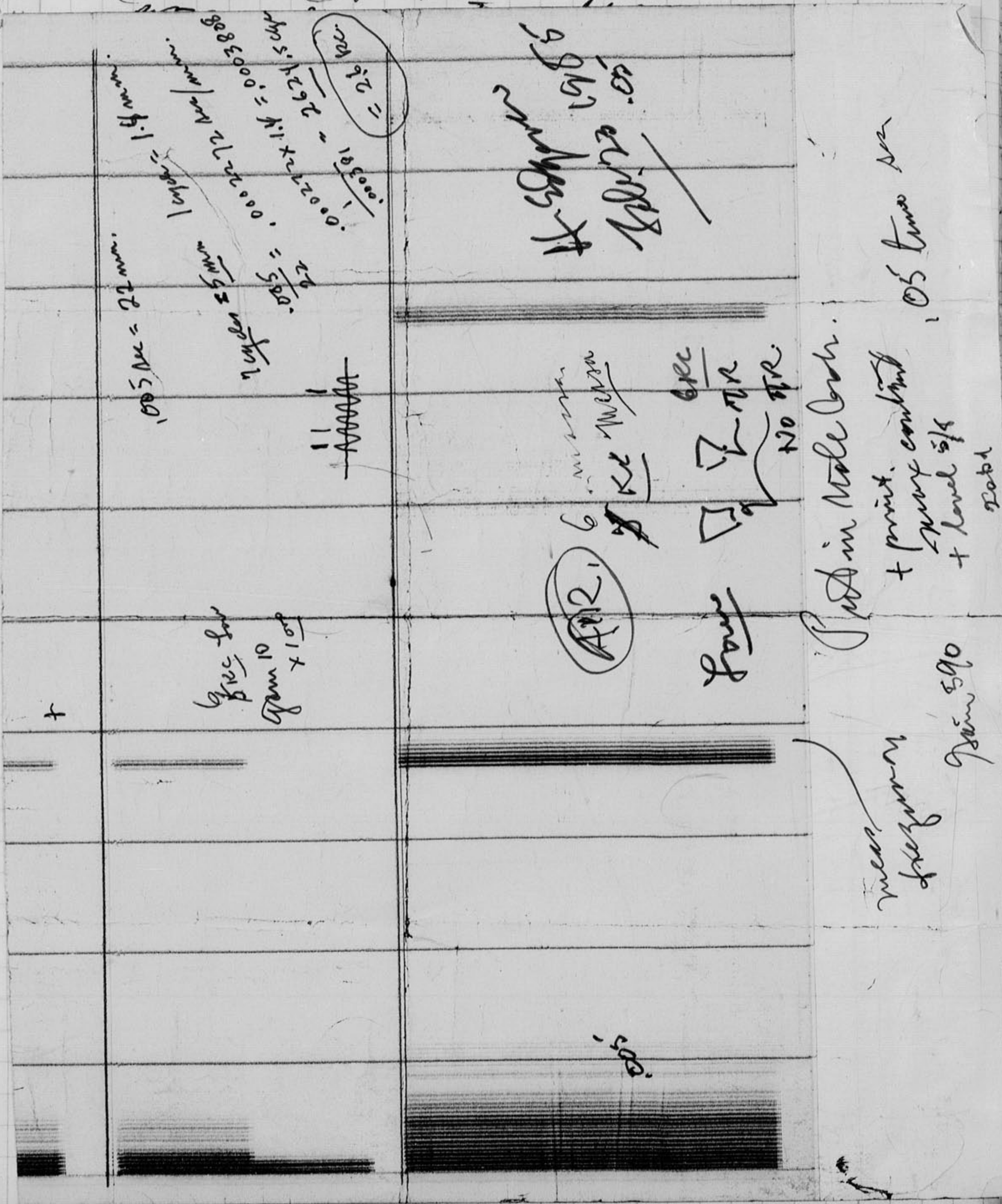
Two wrecks were found in all Chas River bases. See with BL 46 260



June 2 1985 Sunday.
Museum of Science opened Edison exhibit last night. A large crowd attended..

HIGH SPEED SEMINAR.
got list of attendees

June 16 1985. The High Speed seminar last week (June 10-14) - 25 people attended. Excellent



MAP OF
CHARLES RIVER
AT MIT
5 WRECKS.

Harold E. Edgerton
JUNE 1985.

June 2 1985 Sunday..

Museum of Science opened Chinese exhibit last night. A large crowd attended..

HIGH SPEED SEMINAR, got list of attendees.

June 16 1985. The High Speed seminar last week (June 10-14) - 25 people attended. Excellent program. Many visitors. I talked about every day. Experiments on measured stars.

Mary Lou and Martha Dixon came several days ago. We are scheduled to have lunch at 12:30 today with Jen Dixon and family in Brookline.

June 25. Brian Rosebrough, called also Chamberlain for Entheusiasts on the phone. conference.

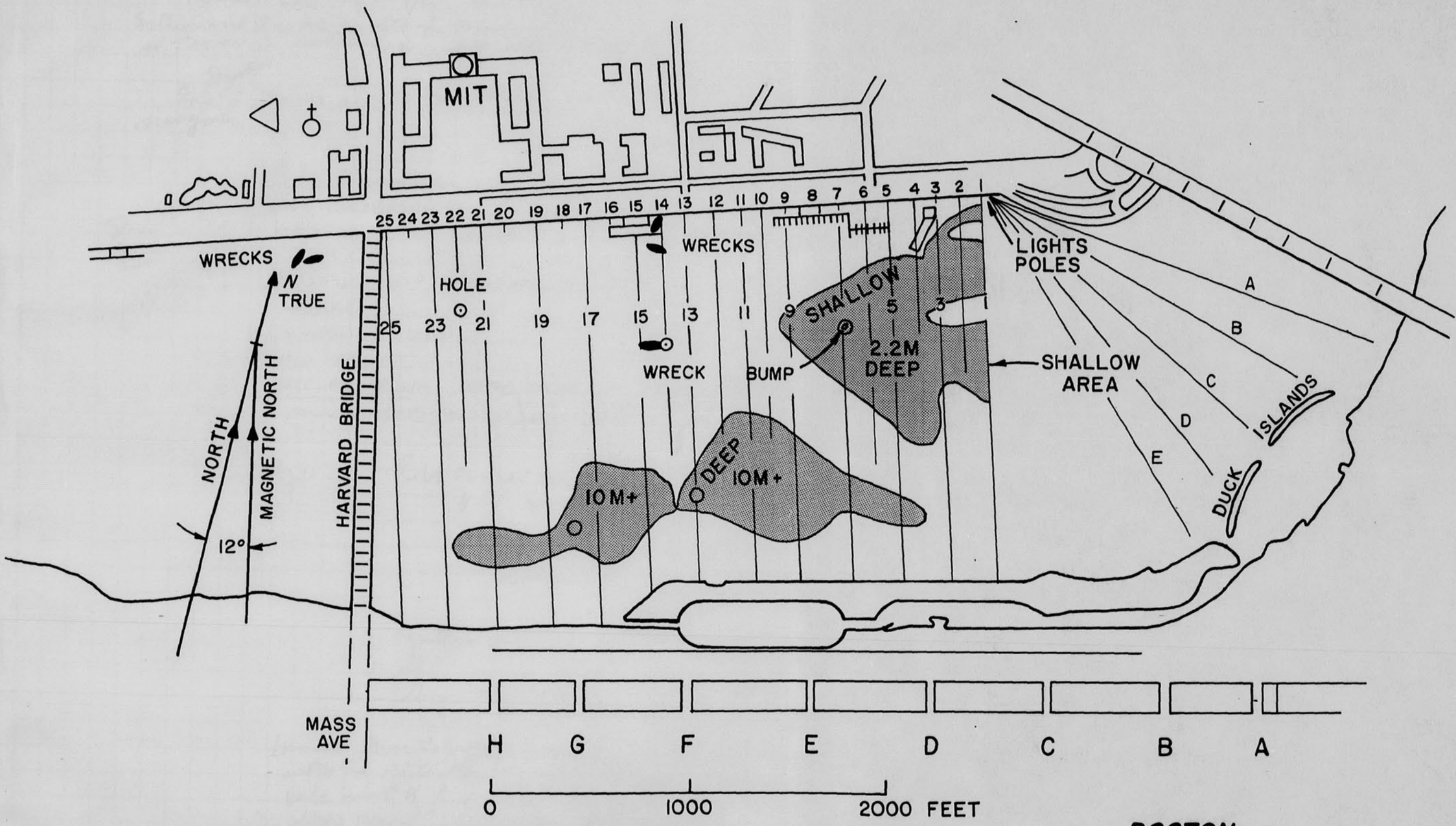
50,000 3 year 10% interest -

June 27, 85 Bill MacRoberts went with me to EPC. to try to get noise out of the 1701 - unit. No results!

MAP OF
CHARLES RIVER
AT MIT
5 WRECKS.

Harold Edgerton

JUNE 1985.



CHARLES RIVER BASIN

BOSTON

HAROLD EDGERTON - JUNE 1985

July 5 85 HE.

Returned last night from San Diego. Esther and I were guests of Medical Salcar at TACAN in Carlsbad, We went west on July 1.

Eric Edgerton & Denise are in Cambridge from New York.

Eric Howlett.
241 CRESECENT ST.
WALTHAM, MA .02154

POP - OPTIX LABS
647.1395

Glover
Oxman

· DEVELOPED LEEP STEREOSCOPIC CAMERA SYSTEM
· LIFESIZE
· WINDOWLESS VIEW
· NEW PATENT
· GREGORIO RIVERA VISITED STROBE LAB WITH VIEWER
Mexico. - J.F. Wentz. July 9 1985.

July 10 85 Robt Cooke, Sci Writer
404 526-5408
PO Box 4689
Atlanta Geo 30302

Cynthia Herman

Greg Herman.

Herman, Max Roberts & I went out to the Boston Harbor with Odd OKE unit to find side bottom targets off the playground just before the coast guard

July 11 1985
H. Edgerton.

Sea Grant -
Erin Johnson.

Roy Ryder and wife were here last night
Dinner at Seafood (Legal). Alexander 6 years old. coke etc.

I inspected the ROV Program yesterday
3-062 Room. Fran O'neil in charge. I saw the
articulated arm - complicated!
Sea Grant 3-7041 3-7042 Norman Doering..
(Remote operated Vehicle) ROV.

(Wed).
July 17, Bruce Dale and son Greg came in Monday with
a rifle and many watches. They are taking photos of
the bullet hitting the watches - possible subject for the
Nat Geo mag. Bill Ross Roberts helped yesterday.

Luncheon at Earth watch today at noon Esther and
Jean go with me at 12 noon. Brian Rosborough, Lucy and
daughter Annabel may be there.

Tomorrow July 18 Ken Mamashasson will come to the
lab to be interviewed by Sylvia Stephens of WBZ as an
inventor.

Ammo used by Bruce Dale. 223 Remington
55 gr full metal case. X223R1.
Winchester.
2 Boxes obtained by M.I.T. - for Dale.

July 20 1985 Harold Edgerton
Photo of EX 6A to show the arc starter
over glass. Actually the EX-108 which lacks the
tabs off of glass on the bulb..
Greg Harman is preparing to take a EPC recorder and
camera sponge to Sardinia. He will work with
Shisha.

July 21 1985 H. Edgerton. Greg Harman had a problem with salt. water.
Yesterday. Today it was dried out. I will recommend he
use two metal box. Also I plan to make covers for
the unit. P.L.R.

Aug 3 1985 Sat. 9am ~~#405~~ M.I.T. Strobe Lab.

Yesterday morning - Massa. Co Board meeting at #3 Boston.

" " afternoon - 40 students visit strobe lab

Russ in N.Y. writes Jim Blanchette? to look for 1500 #000 silver bars in Arthur Kill wells

KLENCK-? Greg Harmon - we used a 6 KHZ sonar without success except we have many records of the depth and subbottom off buoys 10, 12, 14 16 etc. opposite Sullivans(?) Creek.

Richard and Bob Rayan operated the boat ~~Ratter~~ R.

Mass. 6 pack 12KC transmitters. from Frank Mann

Hydroplan TR 1025C Ser 440 from Don Mann.

Demo of 4 color disco tech sound actuated strobe by (Imaginering Plus)

Boise Idaho

Michael Stringer	Jim Forsythe
10718 Whitecloud ?ords	HC 33 Box 3050
83709	83704
~~206~~ 208-362 6276.	208-343-1473.

Notebook # 35

Filming and Separation Record

____ unmounted photograph(s)

____ negative strip(s)

4 unmounted page(s) 4 page pamphlet
(notes, drawings, letters, etc.)

was/were filmed where originally located between page 88 and 89.

Item(s) now housed in accompanying folder.

(1 475 - 8431 andover Marty Klein House.

Students at M.I.T.

SEAGRANT 1
Christening

June 19, 1985

RV EDGERTON
New England Aquarium

3.7041 Sea Grant. arm
42 Doeling

[606V Tran ant. arm]
3.062.

R.O.V.

Reg 10 — 2 mon
~~Oct~~ 11-14 Sold

2 to 1 cont.

Welcome	Norman A. Doelling
ROV Program at MIT	Thomas Sheridan
Introduction of SEAGRANT 1 Development Team and comments	Jean O'Neal Eric Jackson
Christening	Jean Doelling
Box Lunch	on board the Discovery
Inspection of SEAGRANT 1	On board RV Edgerton

ROV

SEAGRANT 1 is truly a cooperative project among government, industry and academic collaborators. In 1982 John and Hap Perry contributed the mechanical portions of SEAGRANT 1 to MIT. The Sea Grant College Program at MIT funded MIT faculty and students to apply their laboratory tested hardware and software ideas to this vehicle. Additional student support was provided by a generous grant from the Chevron Corporation. Robotic Systems, Inc. has cost-shared with us on a hydraulic manipulator arm which will be installed on SEAGRANT 1 this summer. International Submarine Engineering, Ltd. (ISE) provided computers, connectors and miscellaneous hardware. ENDECO, Inc. lent us a compass and sensors on a long-term basis. SubSea Systems overhauled and repaired the video system on the vehicle and provided technical assistance. Emerson & Cuming generously donated flotation materials. Benthos, Inc. has provided technical assistance and lent us cameras to work with during sea trials.

Jim McFarlane, President of ISE, most generously sent Eric Jackson to work with us for a full semester and to share with the faculty and the students his technical knowledge, experience, patience and pleasant personality. Eric's leadership made this project an important educational experience for us all. His dedicated, talented and enthusiastic research team is listed on the next page.

maggie - #12

Roehling
Sheridan

SEAGRANT 1 Student Development Team

Eric Jackson	Project Manager
Fran O'Neill	Assistant Project Manager, Mechanical Engineering
Andy Bennet	Ocean Engineering
Mark Brown	Aeronautics and Astronautics
Hanson Cheah	Freshman
Tom Darci	Mechanical Engineering
Dave DiPietro	Mechanical Engineering
Tom Esselmen	Electrical Engineering
Kleber Gallardo	Mechanical Engineering
Rohan Khaleel	Electric Engineering
Tom Liu	Freshman
Alberto Moel	Electrical Engineering
Phillip Paolella	Mechanical Engineering
Andy Schiller	Mechanical Engineering
Jon Singer	Mechanical Engineering
Mark Traudt	Electrical Engineering
Omar Valerio	Electrical Engineering
Bill Walter	Mechanical Engineering
Dana Yoerger	Mechanical Engineering

Ron Chrisley

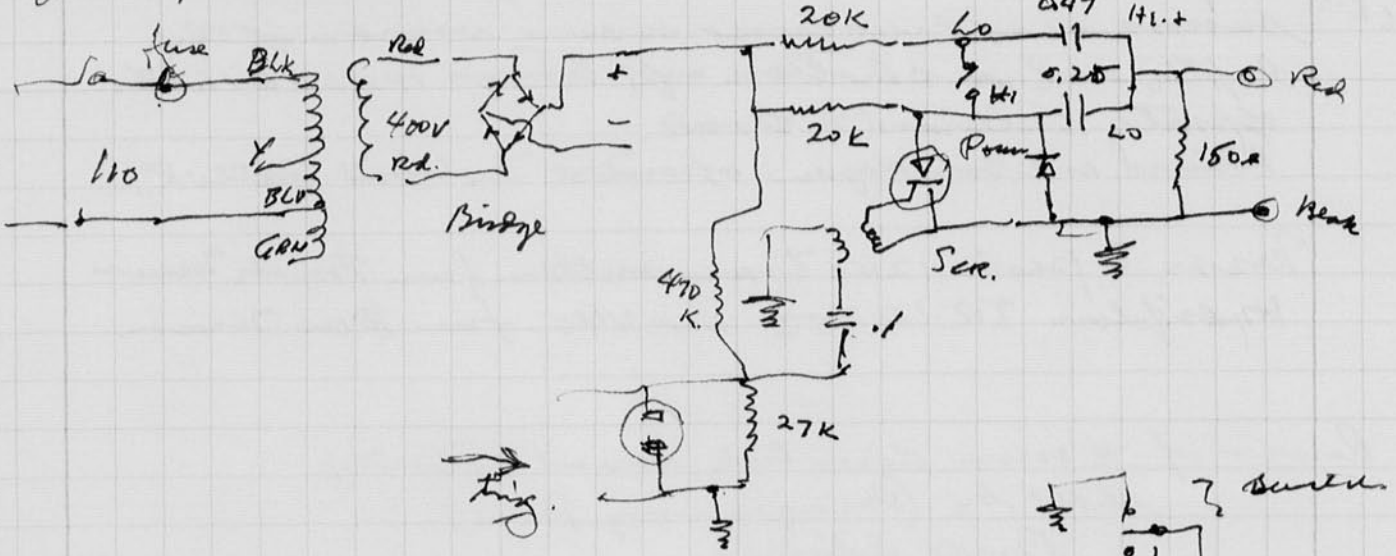
18 Students.

Edgerton.

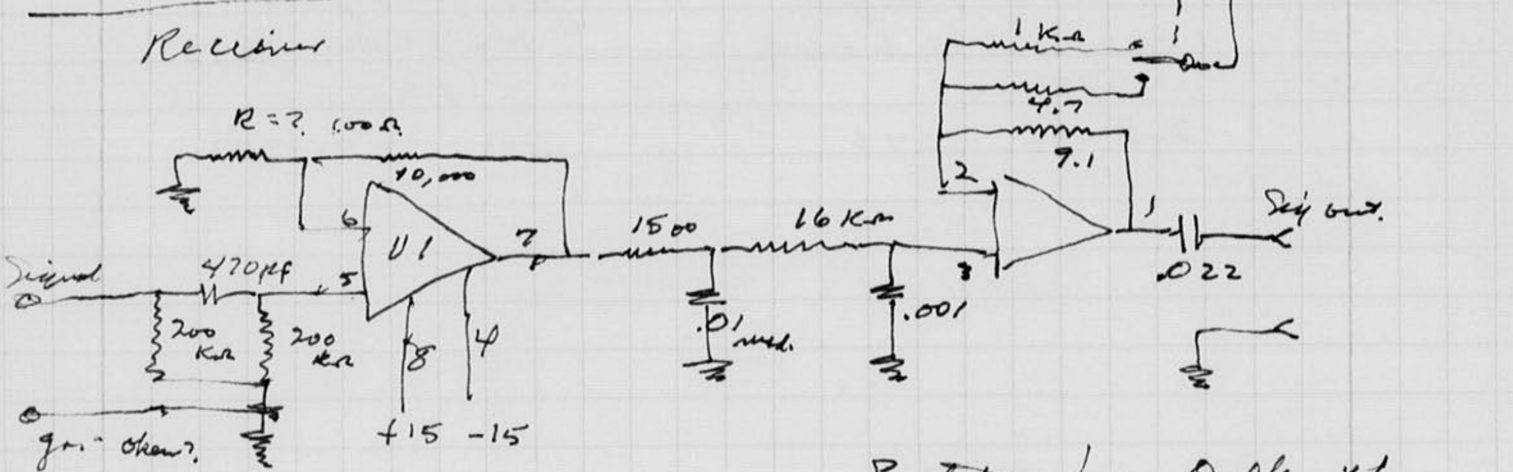
EPC 1700 model SK1084 Drawing Murphy 15 — 1981 apm?
EPC

Driver circuit Hi 0.72 mfd 400V
Lo 0.25 " 400V

Driver for transducer.

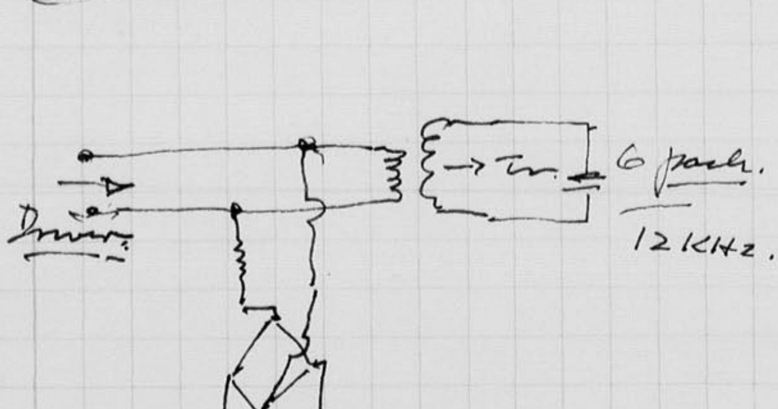


Receiver



Switches for 0 db x1
10 db. x10
20 db x100

Try single transducer.



3 mm x .005/22 = sec

22)0.150 = .00006 sec. between signals
132

1/.00006 = 1666 cycles?

10,000/6 = 1666 cycl

H3, Aug 3, 1985.

Many experiments with transducers and two EPC recorders.

(1). Grounds are important.

(2). Don't over volt receiver.

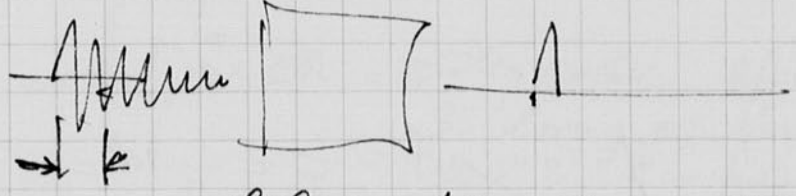
3. Cut down oscillation of transducer (a boomer single pulse should be better. Should try pursue this).

Conversation with Peter Numi & Michael Mutter.

Apollo - ~~N.H.~~ Chelmsford Mass

256 - 6600 - 8000 people. 6 days off.

Digital Processor. Signal manipulation.



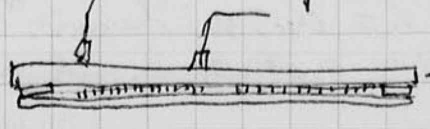
delay. 1 period persistent.

T.I. chip ~~20~~ 20. convolutions. Every a sample.

3210 T.I. chip Texas Instruments

Suggested system to clip the return signal so that it would be shorter in time — and give better resolution of the sonar records.

Aug 3 1985 5pm. The signal must be of shorter duration to get more resolution. I must get busy on a Boomer design. There are many notes about boomers in this book.



— Bakelite square 1 ft x 1 ft x 1/2"
Flat wire coil with shape
Solid core at ends.
Flat aluminum plate
Spacer around ends.
Epoxy together.
Cables exposed.

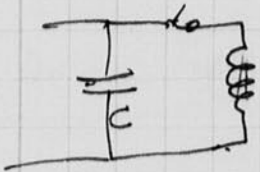
1. Measure L with no plate.
2. Measure L with plate as a function of frequency.
3. Measure current-time when the coil is pulsed.
4. Measure the output in water.

Aug. 8, 1985. AE & Bill ~~Mac~~.

Inductance - Plastic

Primary of Ehd... 1080 transformer.
On short Iron core. Stacked in middle.

3 millihenries. Q = 13.6 & 23.3 ?



$T = 2\pi\sqrt{LC} = 6\sqrt{3\times10^{-3}\ 2\times10^{-6}}$

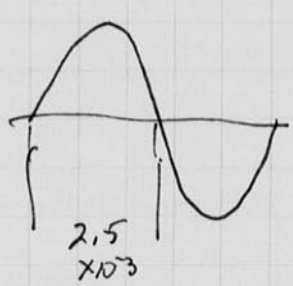
$= \sqrt{6\times10^{-9}} = \sqrt{60\times10^{-10}}$

7" diam Iron
2 1/8" thick.

$T = \quad 6\times8\times10^{-4}$

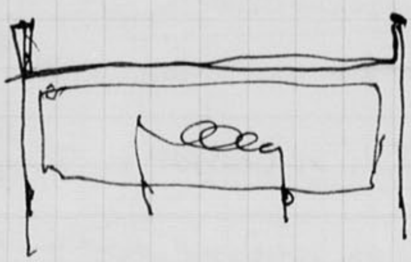
$T = 50\times10^{-4}$ sec

$= 5\times10^{-3}$ sec. 1 cycle.



$T = 2.5\times10^{-3}$ sec.

$f = \frac{1}{T} = \frac{1}{5}10^{3} = 200.$ cycles. 3



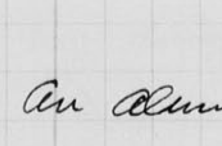
Bill says a pan with drawn edge will kill the motion.

Westgate Michael - Inductive energy. M.I.T.
Uni of Glasgow.

An alum plate on the coil reduces the ind to 1/2
~~1.5 x 10^-3 henries.~~ 1.7×10^{-3} henries. .04 [illegible] al.

Disctron - (no iron?). $L = 0.17\times10^{-3}$ henries. Q 69. ? changes Bare
$L = 0.08\times10^{-3}$ - Q 1.8 Al plate

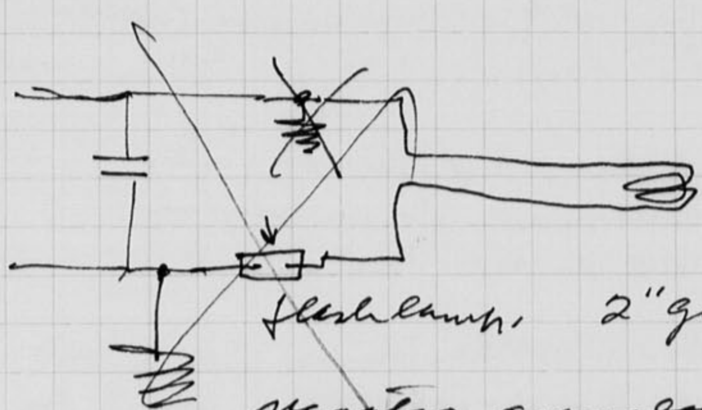
8" diam.



2 1/4 thick. Spiral coil.

Tool Box Driver. Az. & Bill Tuck.

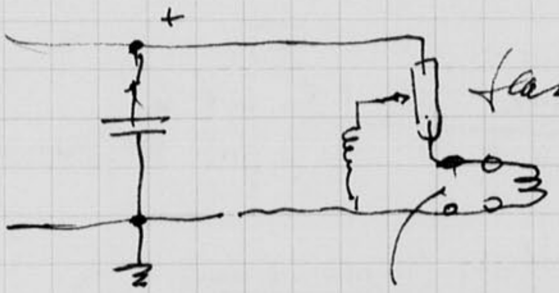
0.47 mfd. Smallest capacity: (0.4 measured) ✓
volts.



1300 volts open. air.
D.C, no good.

flashlamp. 2" gap 1cm diam Xenon for trials.

negative grounded.



with cable. 2conductor.
35' long of heavy
(~~#8?~~) 2conductor.
(# 10) Tirex cable.

Coil + 35' cable #10
$L = 3.14 \times 10^{-3}$ henries.

Coil only $L = 3.14 \times 10^{-3}$. (can't see cable effect).
Cable only $L = .143 \times 10^{-3}$ henries.

No Iron coil + cable. 35' #10. $L = .178 \times 10^{-3}$ h.
Coil only. (no Iron.) $.16 \times 10^{-3}$. h.

Cap = 0.47 + 4 + 16 mfd, with Switches.

Maria Biel PhD
Sci and Medical correspondent
Stern magazine corp.
60 East 56th St
New York NY 10022,
Photographer Robt Lebeck 2000 Hamburg 50
Warburgstrasse 50 040 41 18 35 67/68
Visited MIT the same day as group from Oursler.

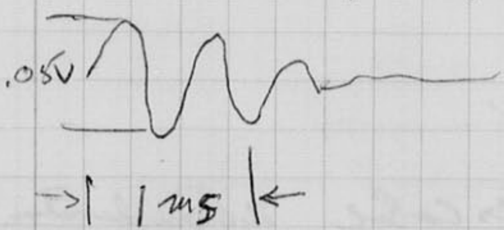
Aug 12, 1985 Harold Edgerton 4-405

Air backed boomer plate. It occurred to me that a thin walled balloon could be used to supply air in back of the plate and the driver of a boomer.

First I must try to see how far I can go without any air. Then a balloon can be compressed in the plate-coil area for further tests.

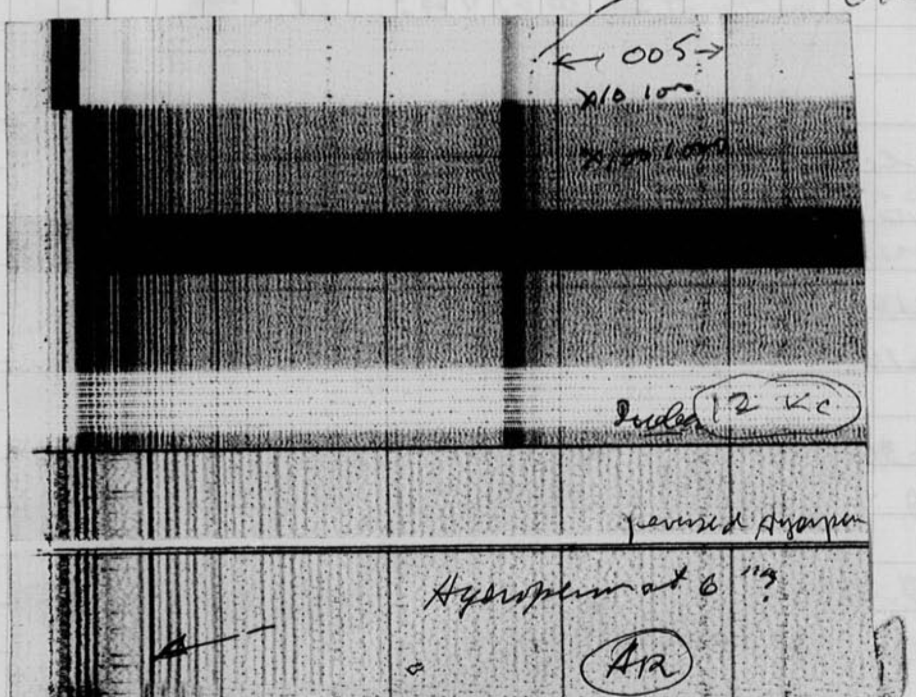
Boomer. with 4 mfd + [illegible]
Metal plate on 6" coil See page 92.
f into Massa transducer at 8"!
= 2000 ft. for 3 cycles ± in air

.05 volts peak to peak



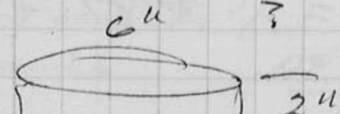
Massa TR-25, at 6"
or 8". ±

ceiling 12 KC. Double
×10 - 100.



Note. operate with - signal when the Massa Hydrophone is used.

This was made in AIR. will the small signals go when immersed in water
6" ?



Al plate held on with 2 screws.

Aug 15 1955
H. Edgerton.

Boomer	Distance	Peak volts	f
6" diam	9"	.01	2000
12 kc	2"	.005 volts.	12 kc ?
6 kc	6"	±.01	6 kc ?

This test in air indicates that the Boomer should be ok for use in the water and maybe for underwater sound. The pulse duration is about 0.2 millisecond.
$D = vt = 1500 \text{ m/sec} \times .0002 = 0.3 \text{ meters} \cong 1 \text{ foot}$.

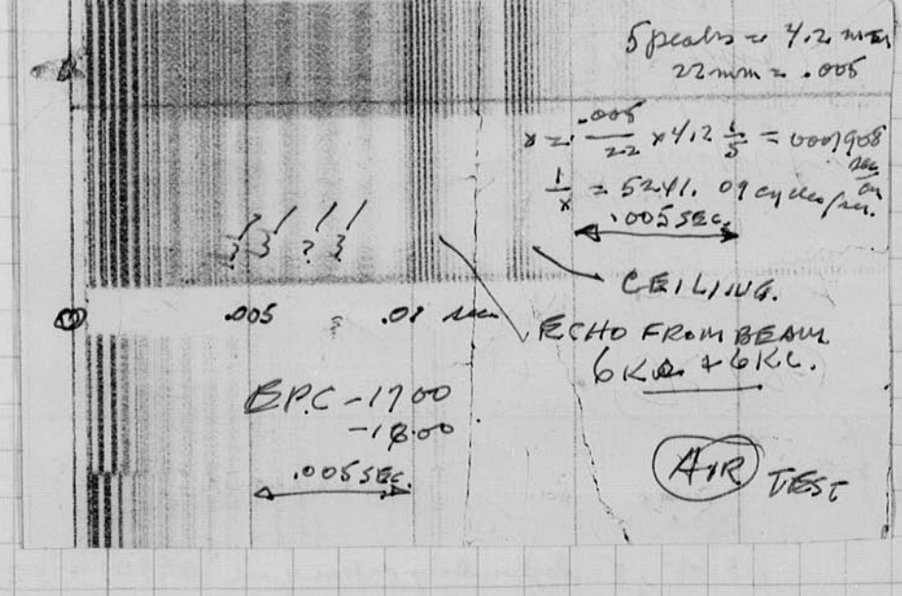
$t = \pi\sqrt{LC}$ 1/2 period

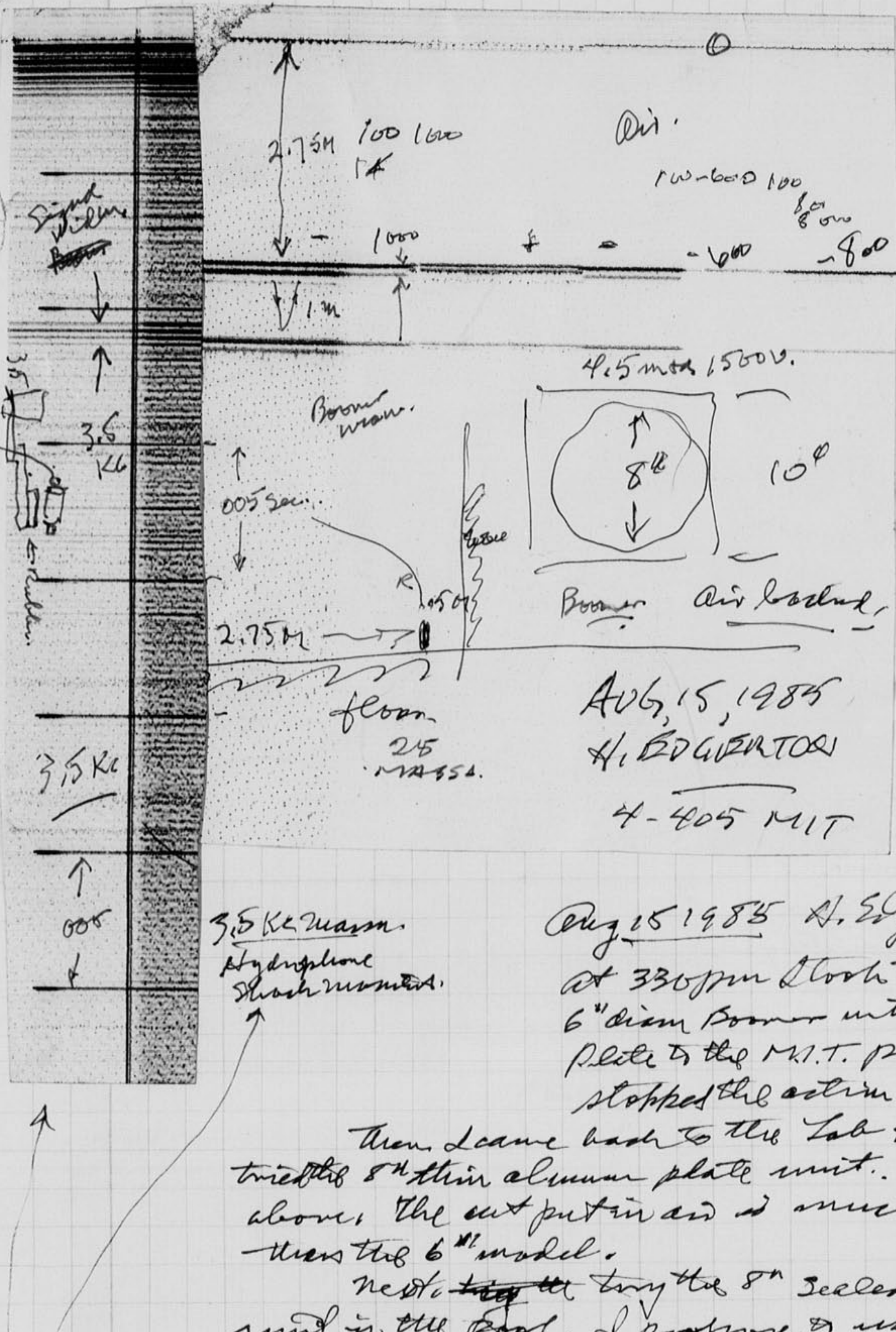
Cond. $R = 2\sqrt{\frac{L}{C}} = 2\sqrt{\frac{3\times10^{-3}}{5\times10^{-6}}} = 2.\times\times\sqrt{10^{3}}$

$\cong = 12$ ohms

Resistance of 25 ohms matched on the two signals from the Boomer.

Why do the signals come in pairs!! from a plate!!





Air Backed
8" diam
Thin Alumin
4.4 mfd
1500 V.

3.5 Kc wave.
Hydrophone
Shock monitor.

Aug 15 1985 H. Edgerton Friday.
at 330 pm I took the
6" diam Boomer with a 1/8" al
plate to the M.I.T. pool. The water
stopped the action!!!

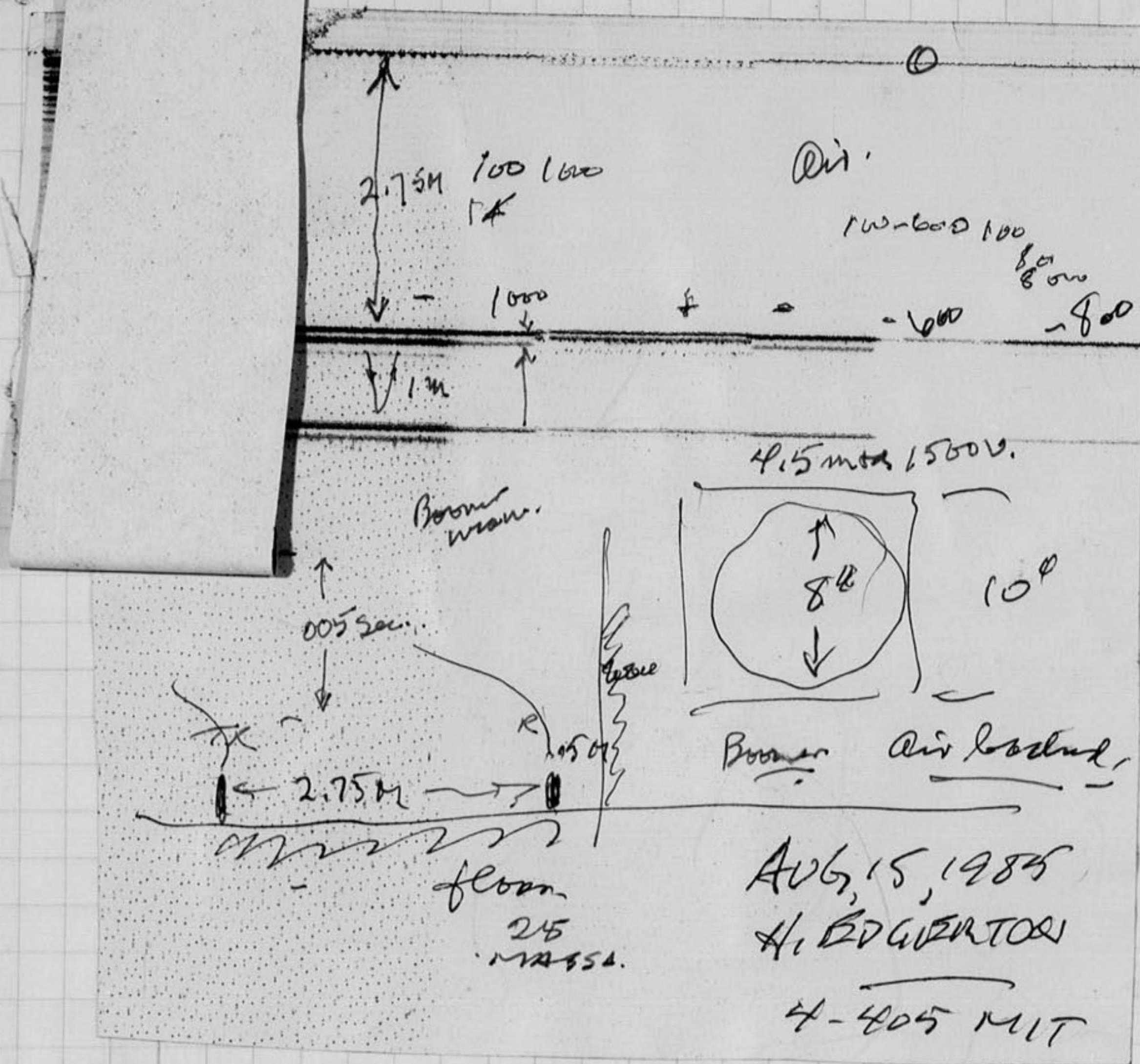
Then I came back to the Lab 4-405 and
tried the 8" thin alumin plate unit. See results
above. The output in air is much greater
than the 6" model.

Next to ~~try~~ try the 8" Sealed
unit in the pool. I propose to use the "-"
signal.

	Signal Duration.		Time, ms
6KC wave Double	2.5 mm	→ Delta next page	.1136
3.8 Kc wave Hydro.	3.5 mm		.1590 ~~.7954~~
Boomer	1.3 to .5 depending upon gain		.05909 - .0227
12 KC 6 pack - Hydro	2.5 to 1 depending on gain		.1136 .0454

$\frac{.005 \text{ sec}}{22} = .22727$ ms/mm

Obviously the Boomer should give the
best results as far as resolution is
Concerned!! Try in water!



Air Backed
8" diam
Thin Alumin
4.4 mfd
1500 V.

3.5 Kc Massa Hydrophone Shock mounted.

Aug 15 1985 H. Edgerton Friday.
At 330 pm I took the 6" diam Boomer with a 1/8" al plate to the M.I.T. pool. The water stopped the action!!!

Then I came back to the Lab 4-405 and tried the 8" thin alumin plate unit. See results above. The output in air is much greater than the 6" model.

Next ~~try the~~ try the 8" sealed unit in the pool. I propose to use the "–" signal.

	Signal Duration.		Time ms.
6KC Massa Double	2.5 ms	→ Sell next page	.1136
38 Kc Massa Hydro.	3.5 ms		.1590 ~~.1954~~
Boomer	1.3 to .5 depending upon gain		.05909 – .0227
12Kc 6 pack – Hydro	2.5 to 1 depending on gain		.1136 .0454

$\frac{.005 \text{ sec}}{22} = .22727$ ms/mm

Obviously the Boomer should give the best results as far as resolution is concerned!. Try in water!

$\frac{5}{22}$ = .2272727 ms/mm

Resolution. – Distance per Duration

Res = v × Dur time v = 1500 m/sec.

– = .1136 ms × 1500 = 1.151 meters.

	Signal Duration	ms.	(× 1.5) M	
6KC Double.	2.5	.5682	.85	in water
6KC – Massity	2.5	.5682	.85	in water
3.5KC Hgar	3.5	.7954	1.148	" "
~~6KC Hgar~~ 12KC 6pack.	2.5 – 1	.568 – .2272	.852 .3408	" "
Boomer.	1.3 – .5	.295 .1136	~~1.??~~ .4425 .1704	(in air) ✓

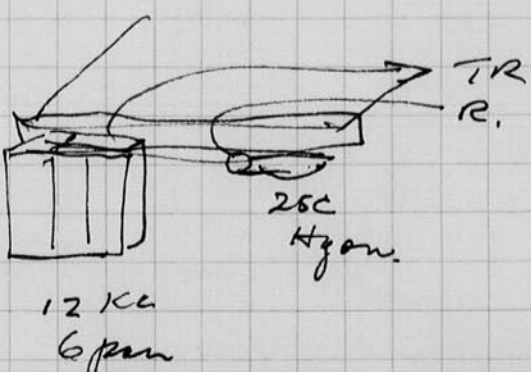
See page 98 for water performance of Boomer

These are estimates only. I need to get oscillograms of the pressure-time output of these units. The mass units all oscillate too long. Is there some way to reduce the output to 1/2 cycle or ~~even~~ one!

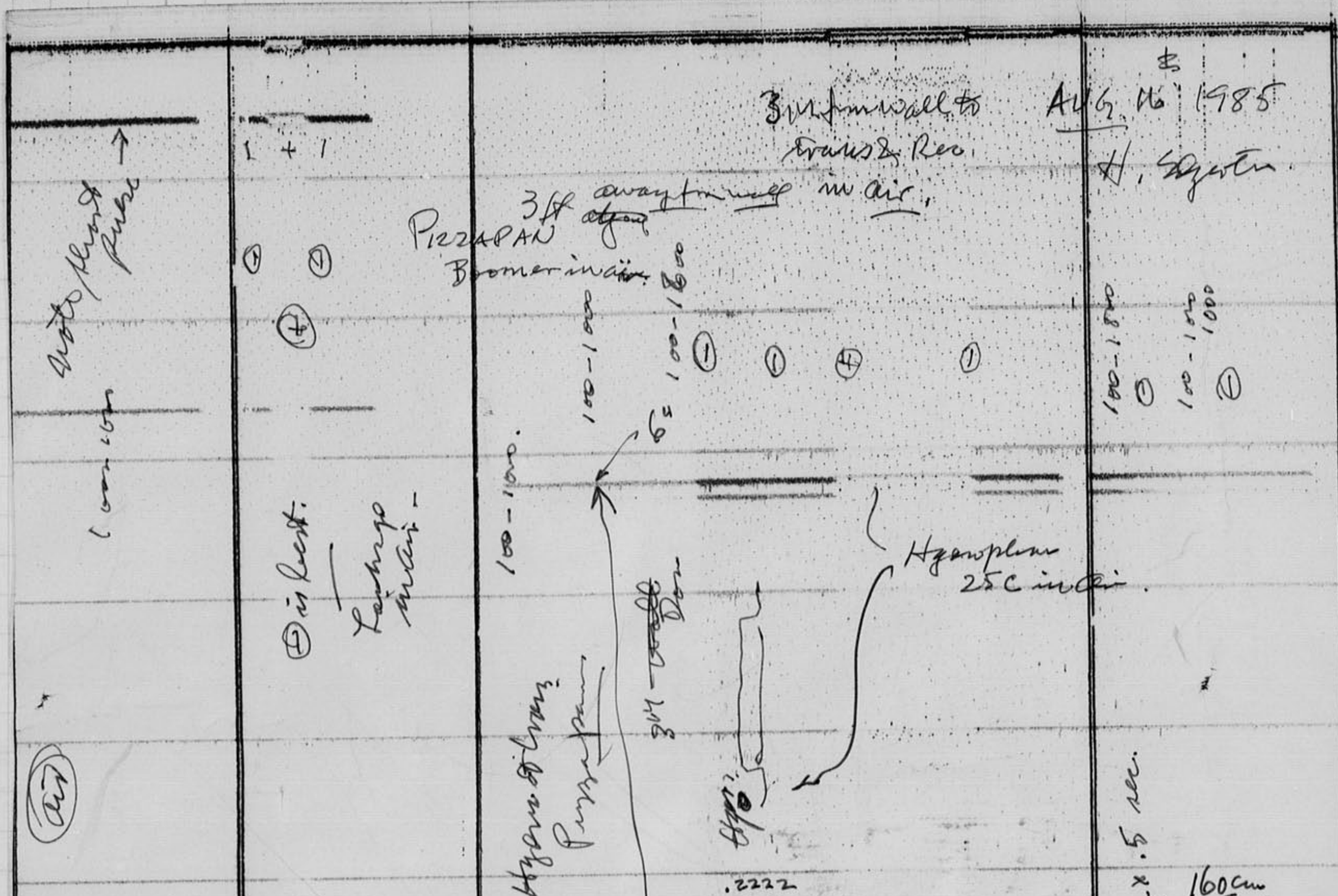
Program, 1. test Boomer in Pool.
2. Check in Boston Harbor at the tunnel site.
3. Improve the Boomer. ✓

Aug 17 1985. ~~Yesterday~~ Today I put the 8" round Boomer with a clean ~~old~~ aluminum foil in water. The sound was greatly diminished. I used 4.5 mfd at 1500 volts.

Note a strobe tube was used as a trigger device. Does this influence the output??



6' to door – good signal with 100 gain × 1600 m air.


AUG. 16 1985
H. Edgerton
3 ft from wall to Trans & Rec
3 ft away from wall in air.
PIZZAPAN
Boomer in air
100-1000
Hydrophone 25C in air.
Hydrophone
.2222
x005
22.5
x 0.5 = .1111 ms.
D = 1500 x .1111 = 0.16 meters
160 cm
2.54
= 6.3"
6"
Note 100-1000 gives single line of 1/2 mm thickness
1 gram of 100-800 shows 2 lines. 2.5 mm apart.
PIZZAPAN
Boomer in air.
Room.
DOOR
1
2
3
25C
P.P. Boom.
Hydrophone in air.
3 yds.
Boomer
Air
8" diam Boomer

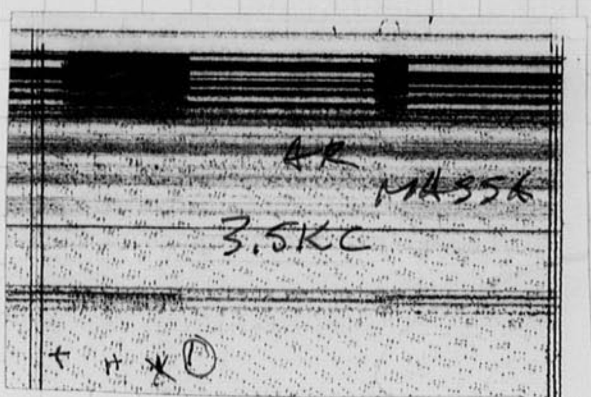
Pooltests. H.E. & Bill Wu (Aug 20 1985).

	C	V	Hydrophone V	Dur	Dur	Dist	Hyd
Pizza pan	~~4.5 mfd~~	1300V	V	Dur	Dur	Dist	Hyd
	4.5	1300V	.14	0.1	.2 ms	4 ft.	25c
	12.5	1300V	.4	.3	.3	4 ft.	25c
Res 12.5 Ω	12.5	1300	.07	.2	.2	4 "	"
6 Ω	12.5	1300	0.015	.15	—	4 "	"
Al thin.	4.5	1300	0.1	.2		4	"

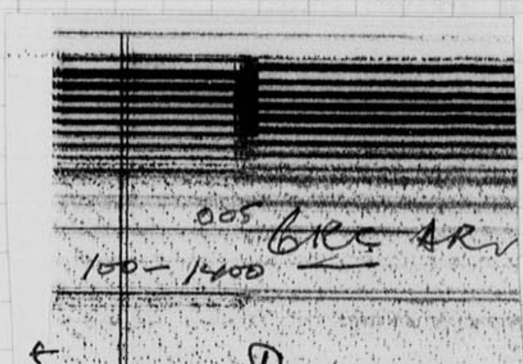
These tests were made on Booms in the MIT Pool where the water was 4 ft deep.

The duration should be shorter to get better resolution! 6 ohms helps some but does not lower the signal.

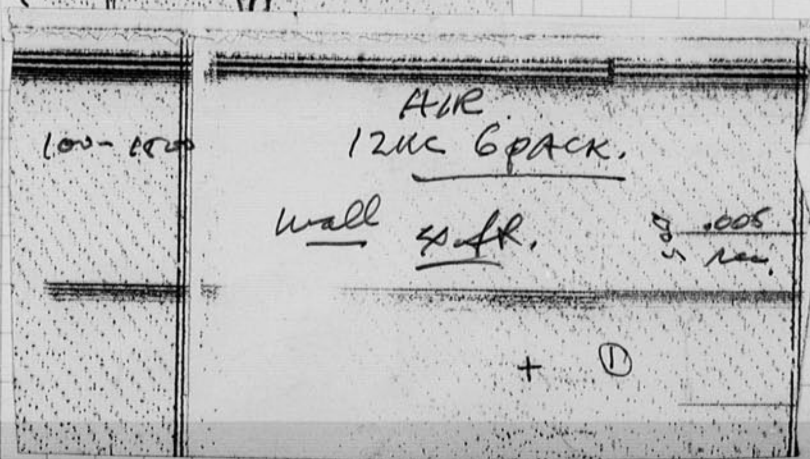
How can I whether 3.5KC Massa transducer gives a shorter pulse.



3.5



6K

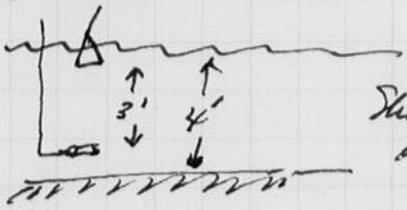


12 - 6pack

Aug 23 1985 Harold Edgerton.

I made tests in air and in water on the 6KC the 3.5KC and the 12 KC to pools (air only) to show the waveform.

I had to use the 25C Massa Hydrophone in contact when in air. The Hydrophone was 3 ft in water.



Shallow pool at M.I.T.
west end on the south side.

I used a Tektronix scope 3" size and a camera at 1/8 sec at f 2 to f 4. Film was polaroid 125 ASA for self processing.

Cost $12.^+ per roll. $\frac{12.00}{36}$ = 38¢ per frame

Aug 25 1985 Sunday 1030 am.

Yesterday I made many oscillograms in the M.I.T. pool of the output of the Massa transducer and the Boomers.

The Massa gives about 10X the output in the hydrophone than the Pizza Pan Boomer.

The Boomer looks good for seismic work since the duration of the first peak is about 0.1 m.s.

$$\text{Distance} = vt = 1500\,m/s \times 0.1 \times 10^{-3} = 1.5\,M$$

Can I expect more? Probably not since the high frequency of the signal will not penetrate. So at the moment, I plan to settle for 0.1 ms

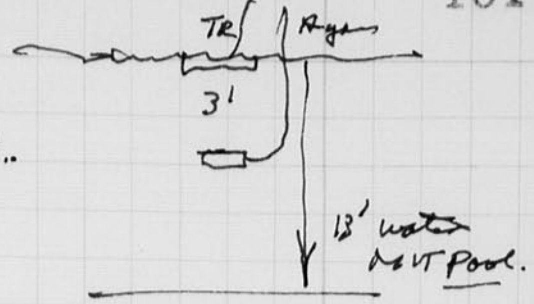
I plan to test this pizza pan Boomer in the Chas River and the Boston Harbor (tunnels) next week.

Frank Massa says he will fill a 6 kHz transducer with silicon grease to damp out the oscillations. This may be an alternative method to the Boomer system of obtaining resolution! Apparently the Massa transducers are much more efficient than the boomer. All we need to do is to damp the oscillation so a single pulse of pressure is obtained.

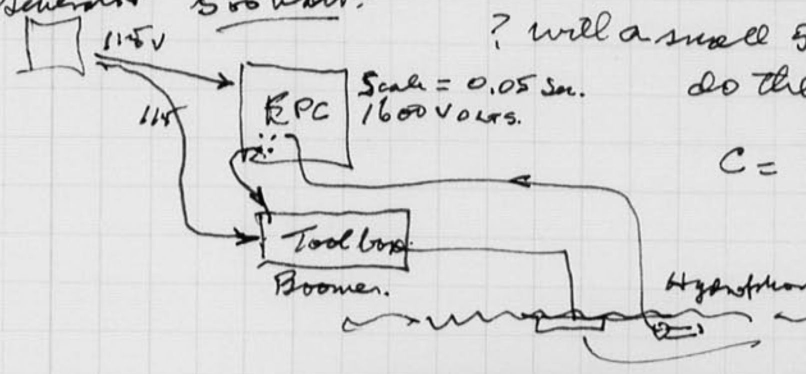
Pizza Pan system with 4.5 mfd 1300 v.

output 25C Hydrophone at 3' e = 0.1 volts.

1/2 cycle. ~~Dur~~ = .05 to 0.1 ms..



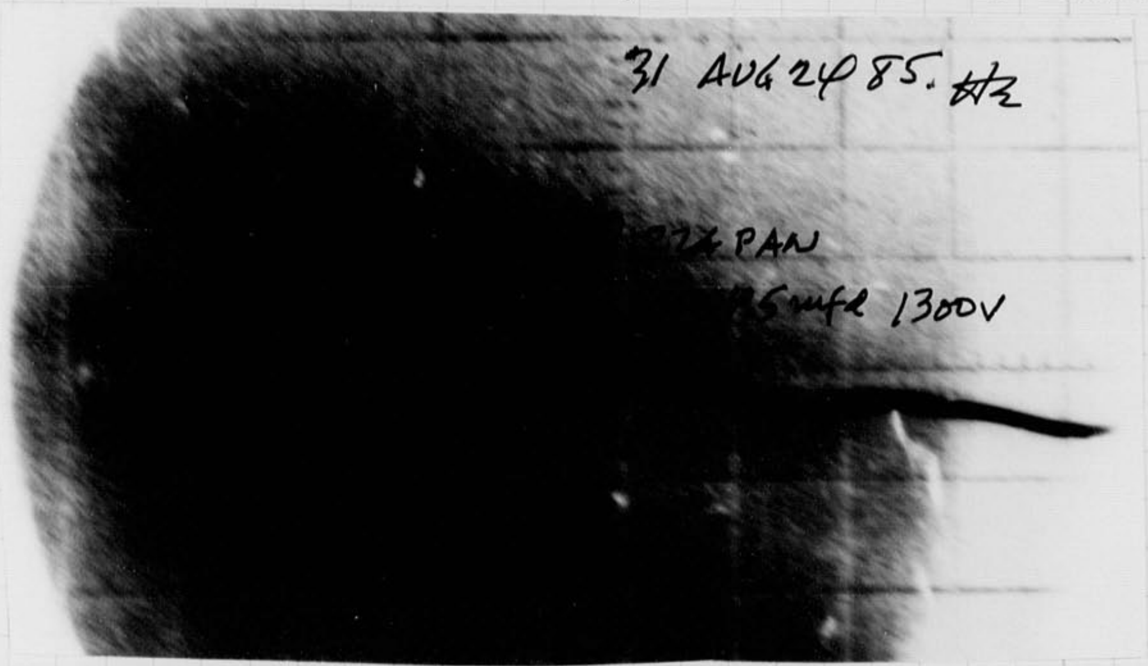
Generator 500 watt.



? will a small 500 watt generator do the job??

C = 4.5 mfd 1300 V at 20/sec.

L = 0.65 mh



→ .05 s

TRIAD ~~B~~ C48U choke.

Bryn J.K. 1657.

R-B- 17.3 mh. yellow - R spot connected. 18 Ω

Y-B 4.5 mh. open 21.7 Ω.

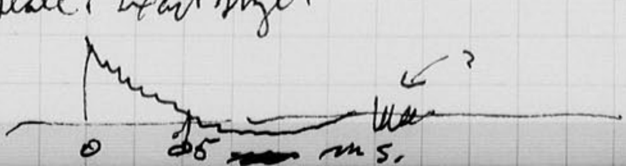
R - R sp 4.6 mh " 22 — 1/2 coil.

Y-B 16.6 16.3 mh. ~~7~~ 34 16.3

(16.25 / 17.26) mh when al plate on magnet ←

(16.38 / 14.2) al-plate. Exact size.

Sound Pulse in Air



TESTOR AUG 24 1985

Harold E. Edgerton. MIT Prof.

TRANSDUCER	+ VOLTS **	1/2 CYCLE MILLISEC DURATION	COMMENTS.
MASSA 12 KHZ	0.6	.05 *	EDC DRIVER ON "HIGH".
" 6 "	0.6	.3	"
" 3.5 "	0.5	.32	(OSC 24) "
" 12 6 ARRAY			
BOOMER (AL THIN)	.04	.02	4.5 MFD 1300 VOLTS. 3.8 WATTSEC
" MILLER	.075	.05	"
" PIZ PAN	.1	.05	(33) " L = 0.66 mh
" "	.1	.10	(35) "

* DURATION, ESTIMATED.

HYDROPHONE., 25C (MASSA), ALL TESTS.

3' BELOW TRANSDUCER IN 13' WATER. (AT SURFACE)

** THE NEGATIVE PEAK CAN BE SLIGHTLY MORE THAN THE POSITIVE.

BOOMER OUTPUT VOLTAGE IS LESS THAN 1/10 OF THE MASSA TYPES.

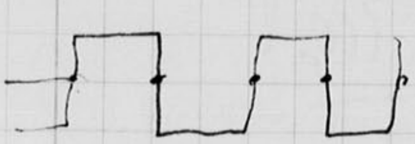
Aug 29 1985 Harold Edgerton 8:45 am

Yesterday I went into the Boston Harbor with Bill MacRoberts. We took the Pizza pan Boomer set up shown on page 101 using the Honda generator. The large Boston Whaler was used for a boat.

There was a lot of "noise" on the record – apparently caused by propeller noise, ac noise etc. I reversed the part in the water so the hydrophone was forward. This helped a little.

Upon return to the lab, we found that the a.c. supply did not cause noise! The Honda did! It has a wave form somewhat peaked like the sketch.

Then we tried the 500 watt small generator from Kearney Nebraska. It gave a square wave form with a small signal at to zero. See diagram. ←



An old 1800 RPM KOEHLER generator was tried. It has a sinusoidal output. It worked fine on the equipment.

Why does the EPC show so much "noise" with these first two generators??

Frank Massa is going to make me a like transducer with silicone grease for damping. It will be about 2 weeks before it is ready to try.

Photo of Bell type tube with flat face.
Coil assembly FX-505. Spark only. 10 sec pulses
spot light framing.

Notebook # 35

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 102 and 103.

Item(s) now housed in accompanying folder.

Sept. 24, 1985

MINI-BOOMER TESTS

Harold Edgerton
MIT, Cambridge

Three sample mini-boomers were tested in the MIT swimming pool (13' water depth). The Boomers were at the surface, with a Massa type 25-C hydrophone located at 3' below the active surface of the boomer. Three oscillograms are attached as recorded on the output of the following sources

SIZE	TRANSDUCER	DIA.	PEAK VOLTAGE	1/2 CYCLE TIME	
17"	pizza pan		0.23 Volts	0.06 ms	p. 107, NB 35
11"	Miller		0.16	0.05	p. 107
6"	thin aluminum		0.20	0.03	p. 107
5"	6-kHz Massa on EPC "HIGH"		0.60	0.30	p. 102
6"	3.5 Massa "HIGH"		0.50	0.32	p. 102

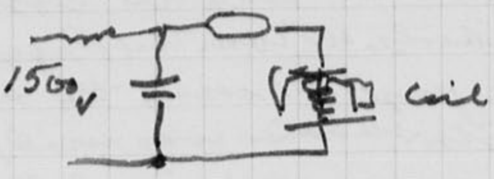
All boomers were pulsed with a 4.5-mfd capacitor, charged to 1900 V. The oscilloscope was triggered by the ignition of spark on the power supply. Thus, the sweep was active when the pressure wave from the boomer reached the microphone. The first pulse is a positive pressure. The oscillograms show a negative pulse due to the way in which the hydrophone leads were attached to the oscilloscope.

Aug 29 1985 Harold Edgerton

See page 101 for B strobe data.

16.35×10^{-3} h. air

14.2×10^{-3} al. plate



1/2 cycle $T = \pi\sqrt{LC}$

$L = 14 \times 10^{-3}$

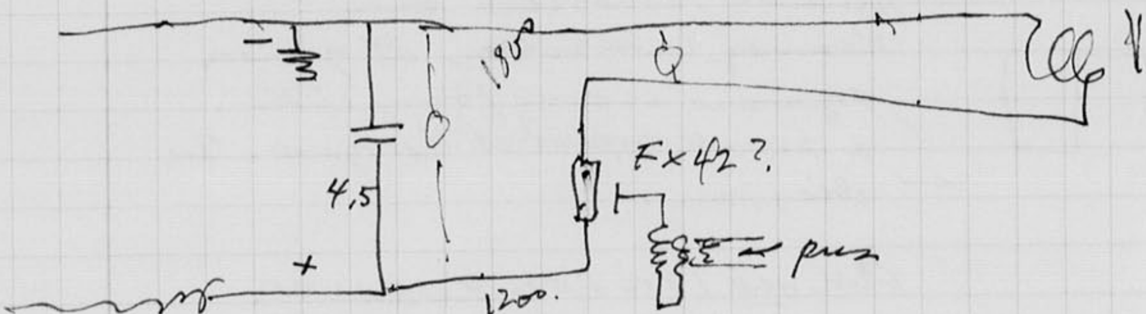
$C = 5 \times 10^{-6}$

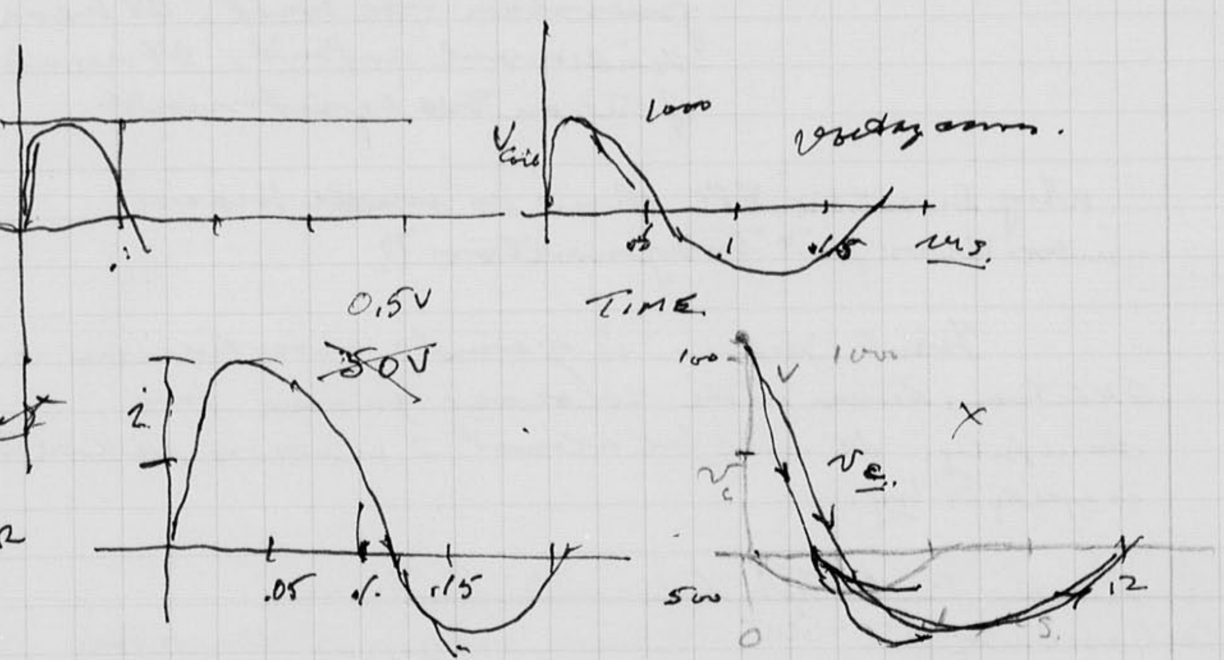
$T = \pi\sqrt{14 \times 10^{-3} \; 5 \times 10^{-6}} = \pi\sqrt{70 \times 10^{-9}}$

$= 2.65 \times 10^{-4}$ sec.

$= 265 \times 10^{-6}$ sec.

At the moment I am going to abandon the boomer system. My hopes are with the damped Massa 6KHz transducer which Frank Massa will have ready for me in about 2 weeks.





Current

R = .0035Ω

peak. $i = \frac{0.5 \;(\text{50 crossed out})}{.0035} = 142.85$ amp.

$\frac{5000}{.35}$ 142.85 amps.

12 15 voltage increased from 250 to 1000 output 1500 1900 volts. from 1900 before

cond. H. Edgerton Bill Mac Roberts

Pyzzalan Boone.

voltage from 1300 to 1900.

C. = 4 + 1.2 = 5.2 mfd.

5.2 mfd 1900 v.

					Peak	Dur
3	Coil volts. 1000v/div.	50 us/div.		P.P. coil.		
4	"	"	"	"	1500 volts.	60 us.
5.	Voltage	1000/cm	50 us/div	"	1900 peak volts.	High volts
6.	"	"	"	"		
7	Blank					
8.	current.	1/2 v/div	50 us/div			
9	"	"	"			

$i = \frac{1.3 \times .5 \text{ volts}}{.00035 \Omega} = = \frac{.65}{.0035} = 186a$ peak.

The Power supply holds up at 20 cycles. with 4.5 mfd. Lets try more C. Suppose we double.

High volt condenser

10 Blank. —

$4 + 4 + 1.2 = 9.2$ mfd

11. Cap. Volts. 1000V/div 50 us/div. ~~....~~ added cap.

Hi. voltage. 1600 volts.

12 " " " Same. $1.6 \times 60 = 960$ ms.

~~13.~~ 13 Cap Volts 20/sec rate. Voltage = 1300 volts.

14. current. 1.3 x .5 V. 50 us/. 9.2 mfd 1300 V.

Film Developed (2 land High contrast 12 exp film).

Conditions $4 + 1.2 = 5.2$ mfd at 1900 V = 9.4 watt. x 20 v 188. x 20 watts 376.

5.2 1300 = 4.4 watt sec. 20 88. watts 176.

Air Contact.

comment

1. Reduce trace thickness
2. & 4 same
3. Bischoff to get cal data on film.
4. Number of picture on screen with X ax pencil.

16

I tried the P P in a bowl of water some air leaked out of the seal! (wire). Is this serious?

Ind of P.P. 0.65 mh. 114 D

0.65 " 115

Hydro

.05 ms time.

Sept 5, 1985
Harold Edgerton.

Pizzapan in 7' pool at surface.
Hydrophone 25c massa at 1.5 ft

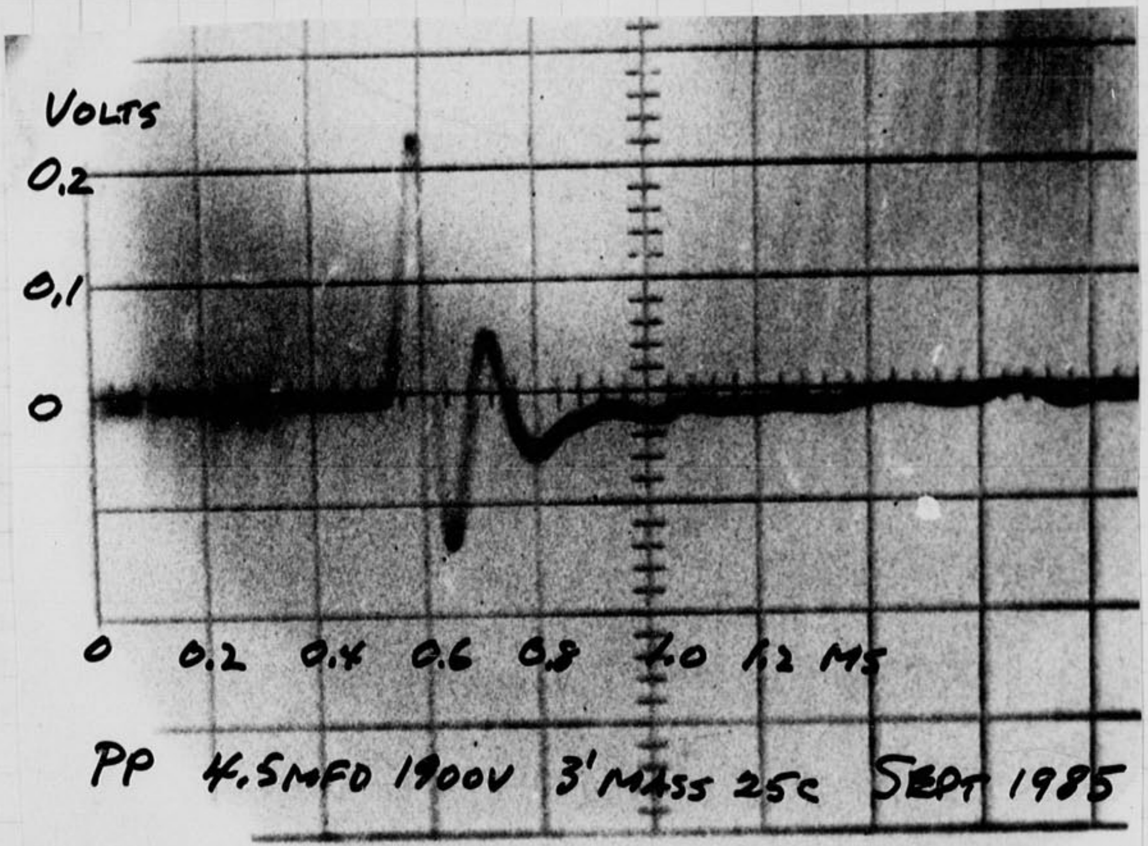
output 0.22 volts. negative pulse
.05 - then 0.05+ that's all!
Echo from Bottom 0.1 volts.-

Hydrophone now at 3 ft. 0.17 volts-
Bottom echo outlets of signal!! end.
2 x 2.8 = 0.56 ms. delay.
The trigger was from the spark.

The Sweep circuit holds over? why ???

3 pm. 1 Pizzapan 0.1V 0.2 ms.
2 " " "

Sept 7 85 Eat off. Photos of FX - Bulb. 10 sec f22 plus x pan + 10 flashes of strobe? E.
EXP OK. for Arc and Lamp!

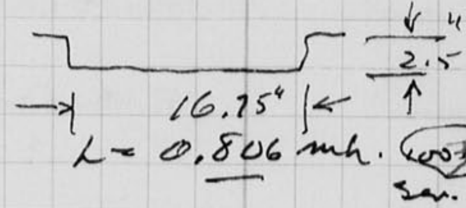


Pool.

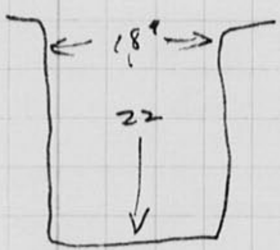
Sept 12 1985
Harold Edgerton.

Further design of mini Boomer, a new model is being made by Max Roberts. Features

1 ft square.
Coil of 6" inside diam.
Thin al 1/16. for skirt
no air at center for start.
Balloon bag at center.

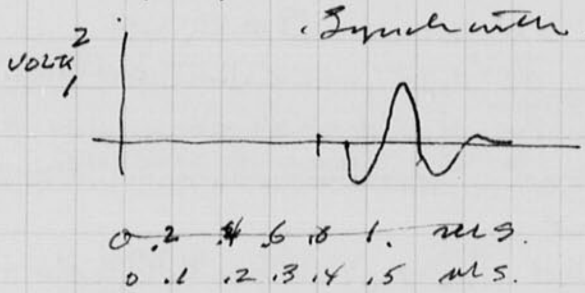


A test set up is in Room 4-~~409~~ 410.



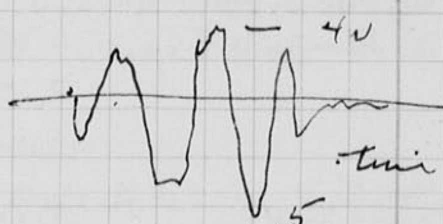
Plastic Barrel full of water.
Massa 28C Hydrophone at Bottom
Tektronix 317 scope.

Pyrex pan 4.5 mfd 1800 v. at top of Barrel.
Synch with spark.



3 ms to signal.
1500 m/sec × .003 × 1/10
= ~~4.5 meters.~~
= .45 meters ✓

	volt	Dur.
P.P. 12 Kc.	1.2 V peak	.05 ±
Hi 6 Kc.	+4 V peak	0.1 ms ±
	-5.5 "	



A Massa 6 Kc transducer is due tomorrow with silicone grease to dampen the oscillations. call Frank Massa.

Osc No

Osc No					
1	6Kc Massa.	2V/cm	0.1 ms/div.	High EPC 1600	Barrel of H_2O
2	"	"	"	"	
3	"	"	"	"	
4	"	"	"	LOW	"
5	12	1.	0.1	HIGH	
6	12	1.	0.1	LOW	

HE

Sept 13 Fri – Ind of new coil 1' diam OD 6" ID, #14 wire. Peter [illegible]
L = .090 mh at 100 cycles sine.

7. #14 wire off diam. 2V 0.1
8, 9, 10 Blanks (3)
11 Screws loosened on plate. 2V 0.1 #16 [illegible]

Cont Sept 13 1985 HZ & Proton mm

#18 wire removed and # 16 or 18 used in Double layer. L = 1.05 mh. .2 D.

Osc #12. #18(?) wire many turns 2.5 mfd 1900 v. Peak ≈ 0.425
0.2 V/div. 0.1 ms./div.

13 Blank

14. #18 coil 3/4" deep in Barrie 0.2 V/div 0.1 ms/div.
Peak = 0.8 volts.

15 #18 coil rearranged Hydrophone (Bonnell?)
0.5 V/d 0.1 ms/div
Peak = 1.2 volts + .. loops good.
no outside screws on coil.

16. 6 Kc massa high on EPC 1800 at 20/sec.
0.5 V/div 0.1 ms/div.
Peak. more than 2 V both transd –

→ Inductance meas. on G.R. 1657

100 cycles series. L ≈ 1.1 mh D = 0.08
Coil of #18 (or 16) wire) Al (Sept) plates in contact.
outer dia = 12½ Inner 6.8".
4 corner screws out 4 inner screws loose.
4 inner screws tight.
L = 1.095 D = 0.09 (about the same!)

Sept. 15, 1985 Sunday noon
Things to try. 1. Epoxy winding with solid Block.
2. Cut out center of Bakelite disc and insert Balloon full of air.

"Bonnell" with H_2O

1. Inner 4 screws tight. –.5V. +.7V. + 1.3 – .6 Shows Ring wash inside screws cavitation?

2 Inner 4 screws out completely 4 outer screws finger tight.
–.25 +.25 – 1.2 Less. with 4 screws outer!

3. Inner 2 loose/tight screws 4 outer tight
–.25 +.4 – .5 outer tight (4)

4. " " Same –.25 + .4 –.7 outer Removed.

5 Inner "4" finger tight. –.6 +1.1 – 4. outer 4 screws out.

why best?

84. Sept 17 1985 Harold Edgerton & Bill [illegible]

~~Osc # 17 Massa 6KC with silacone grease~~ .. −2.6 + 2.5 − 3.2 + 1.5
~~1 V/div 0.1 ms/div.~~

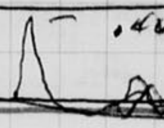
17 1 V/div 0.1 ms Low + .8 − 1.2 + 1.2 − 1.3. Barrel
6KC Regular? Std.
Polarity reversed on ~~old~~ 6KC. Low − 1.0 + 1.2 − 1.3 + 1.2 − 1. Barrel

18 Massa 6KC with Silacone. Low ~~−1.2 + 1.8 − 2.6 + 1.0~~ Barrel
1 V/div 0.1 ms/div. −1.5 + 2.9 − 3.0 + 1.0 − 1

19 6KC Silacone [illegible] 2V/div. 0.1 ms. High. − 3.0 (~~1.5~~) + 5.0 − 7 + 4.5 (~~2.5~~) Barrel
new damped transducer in Barrel.

20 Regular 6KC. 2V 0.1 ms. +2.5 − 4 + 6.5 − 6. Barrel.

Boomer. #18 wire [illegible] Soft el. 4.5 [illegible] 1900V 12" [illegible]
1/8 f4. 21 X 0.2V 0.1 ms −.12 + .2 − .12 Boomer
~~[illegible]~~ Slow rate I may have missed it.
0 [illegible]

? could the sweep be late? ~~missed sweep~~.

.4V peak. [illegible] wire is loose!

#22 Sept 18 Wed 8 10 am Pool. Photo of 2 6KC transducers [2] & EPC Pool
Photo of Pool and transducer

✓23. Old 6KC in Pool (13' deep) 1/2 dunked. 0.5V 0.2 ms. Trig on start.
Massa Hydrophone 25 cat +.4 − .7 + .7 − .3 volts. 0.2 ms/cyc
3' below the transducer face.

✓#24. 6KC Silacone dipped. Face only in Pool (13' deep)
Hydro Hand shield. Scales. (.5V 0.2 ms) −.6 + 1.2 − .8 + .4.
3' 25. 6KC Sil Massa 0.5 0.1 ms. 1/8 − f4 Polaroid 35 mm
3' 26 6KC Sil Massa 0.5 0.2 ms. Trans immersed in 13' water.
3' 27. 6KC Sil Massa 0.5 0.1 ms. [illegible] .75 + 1.2 − .75 .3.


6' 28 6KC Sil Massa 0.2 0.5 ms. Echo Bot. not seen
9' 29 " " " 0.1 V 1.0 ms
9' 30 " " 0.5 1.0 Shows weak Bottom

Tests of light meter control. O.K. with meter

Sept 19 1985 Harold Edgerton.

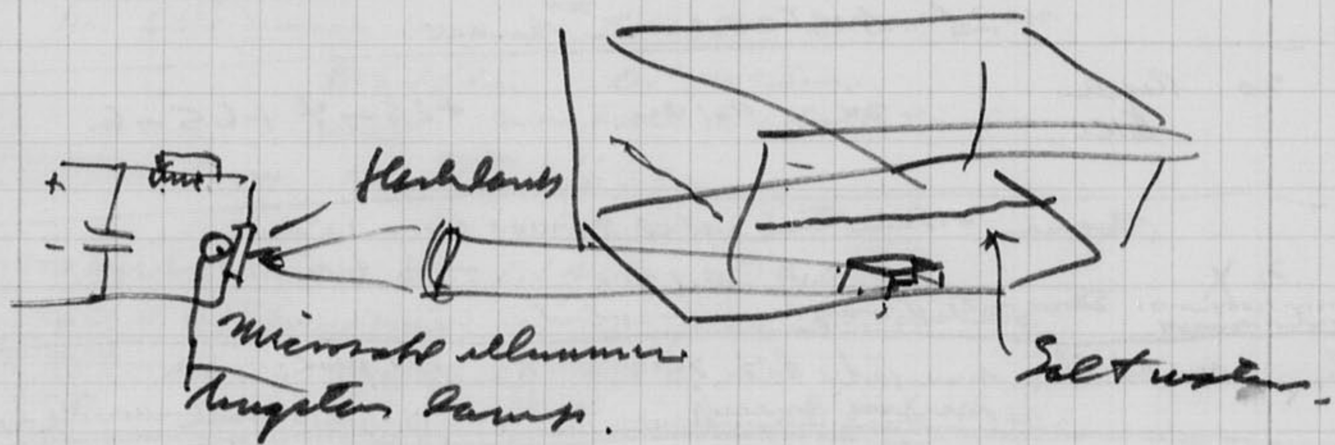
Diana Barshaw B.U.M.P.-MBL Woods Hole Mass. 02543
1-548-3705-Ext 518.521.

Kari Lavalli "
Doread Bryant. - Grad stud. "

Lobsters. 5 stage. 1" long.

f22 X4 power exposure ~~[illegible]~~.

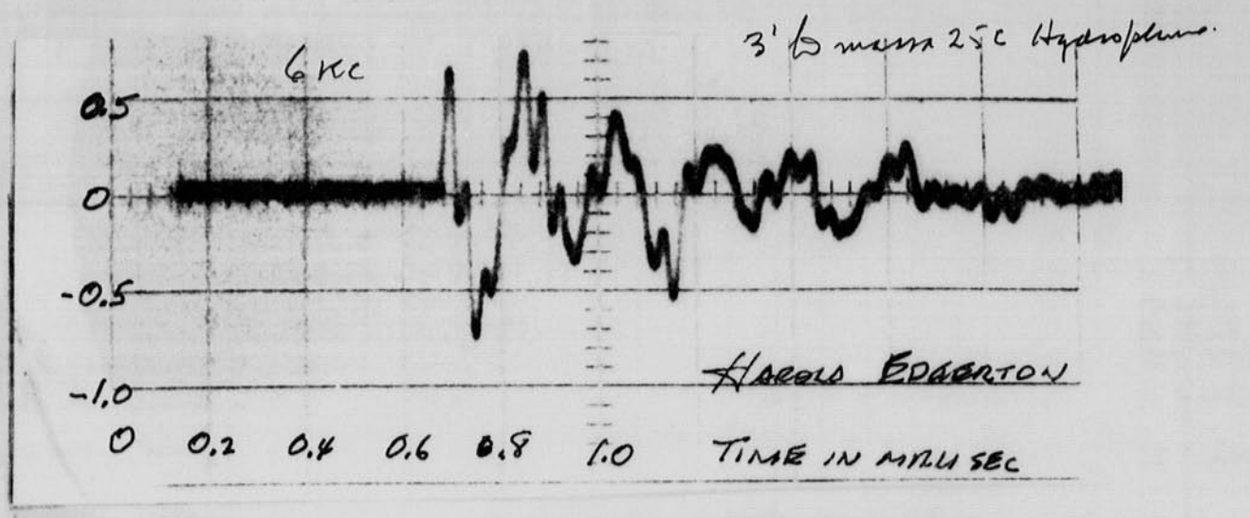
B&W f22 Bot 4 Side at 2X (should be 4X).
Microscope illuminator imaged on the lobster.

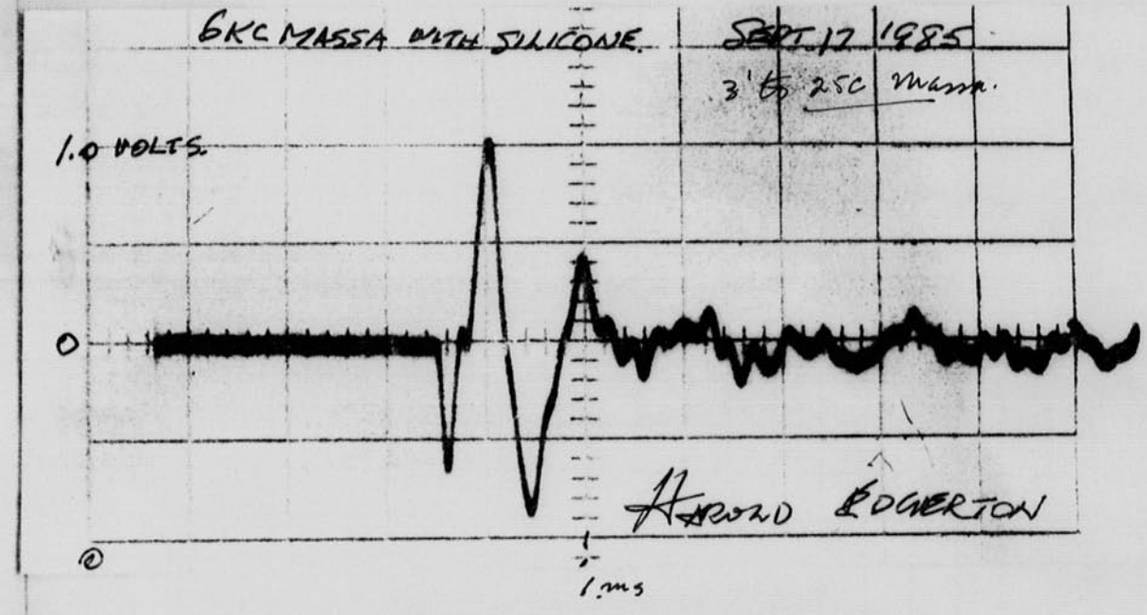


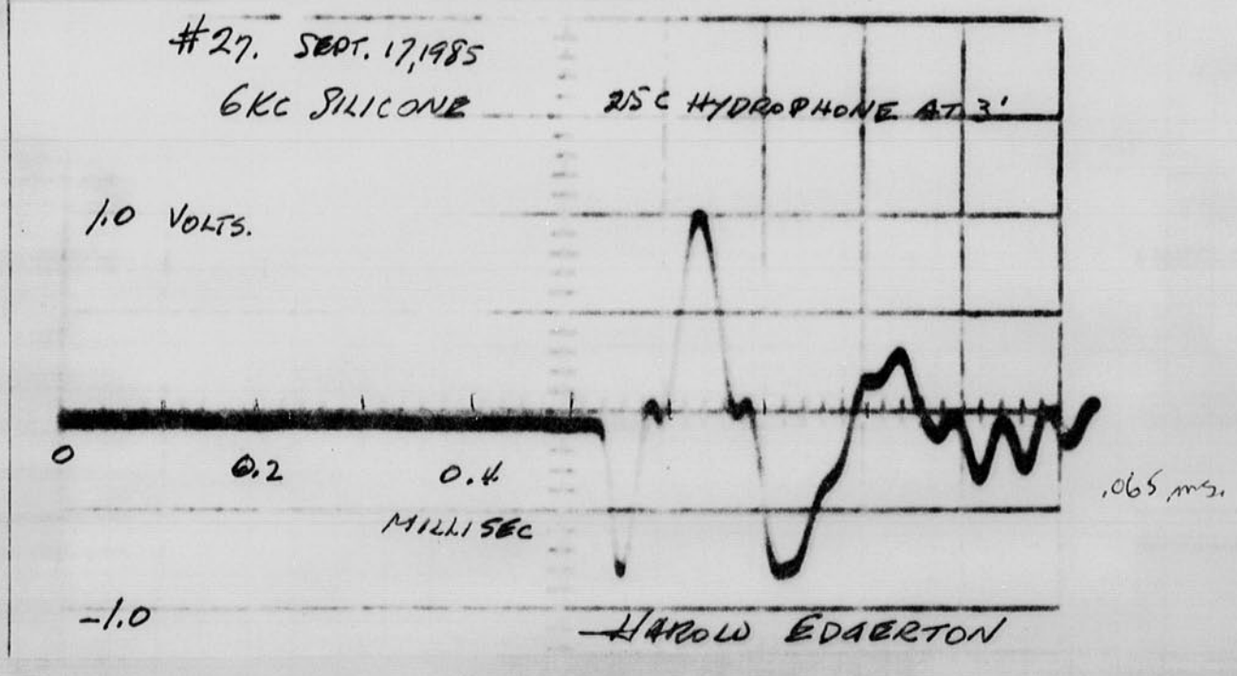
I took a silhouette photo of two lobsters by shadow on 7302 ~~[illegible]~~ film. 7302
Developed 1:1 dev for 2 min.

The Massa 6KC with Silicone damping → see p. 113 OK.
seems to be slightly better on the + signal.

I plan to try it now in the sea.


3' to mass 25c Hydrophone.
6 KC
0.5
0
-0.5
-1.0
0
0.2
0.4
0.6
0.8
1.0
TIME IN MILLI SEC
HAROLD EDGERTON


6KC MASSA WITH SILICONE.
SEPT. 17 1985
3' to 25C Massa.
1.0 VOLTS.
0
1 ms
HAROLD EDGERTON


#27. SEPT. 17, 1985
6KC SILICONE
25C HYDROPHONE AT 3'
1.0 VOLTS.
0
0.2
0.4
MILLI SEC
.065 ms.
-1.0
HAROLD EDGERTON

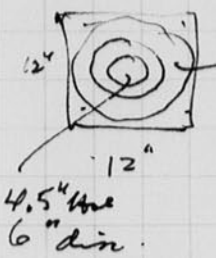
Sept 22 1985 Bill MacRoberts

Howard Edgerton 4-40 Band 4 10

Ds Scale M Scale on 0.1 M.
.1 = 7.6 = 15 M

Mini Boomer.

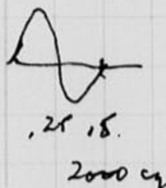
(18 turns)



coil of 19/25 stranded wire 3.0 + cm with teflon insula
4.5 mfd 1900 volts Single layer.
in Barrell in Room.

+ .44 volts + peak - 0.2 volts. 1/2 cycle. 25. ms 0.25 ms.
317 scope with 25 c Massa Hydrophone.

Comment: Needs more turns.
Needs more capacity.



Note. An air filled Balloon was used in the 6" diam center section. It may have had some effect. not clear! The hydrophone position was in portance in the barrell.

Sept 25 1985 HE.

New Winding made on 12 x 12" plexiglass.
an O ring was put in the 6" bakelite piece at the center 4½" hole to keep out the water.
Two wires (1/16") each were put in parallel
The Al plate bent out and slightly.
The four screws at the edge were put in to the plate.
The middle 4 screws with Rubber washers were loosened some what.

Parallel wires. 4.5 mfd 1900 volts. + .78 - 1.2 + .75
(why - first signal ?).
4 Inner screws tight

Parallel windings 4 inner screws loose 3 turns. + 1.3 - 1.75 + 0.9
4 outer screws tight.

Parallel " 2 turns more loose on Inner 4 screws.
+ .70 - 1.3 + .65

Parallel. " 1 turn loose on 4 inner screws
+ 1.2 - 1.5 + 1.3
after 10 min. + .8 - 1.3 + .8

Same output: Series. " Ditto on screws + .5 - 1.2 + .8
why neg first !!??

Note 12.5 mf was tried. The peak voltages were about the same!
The duration seemed to be longer.

Series inductance 2.06 mh D = 0.4. 100 hz series.
0.54 mh D = 0.8 1 ... series

Sept 25 1985 H2 & Ulmer.

O.P. { Pizzapan. ~~5.5~~ 4.8 mfd 1900 v. +.3 -.6 + .42 Barrel. H_2O

more water under the finger.

" " " " " +.6 -1.0 +.75 Barrel H_2O

more water + .7 -1.2 +(.OE) "

1/2 Turns. next to metal plate. +.9 -1.25 + ~~1.25~~ +.9 Barrel.

Par 1/2 + 1/2 Turns in Parallel +.5 -.9 + .5 Barrel

Par. Both coils in circuit. .8 -1.28 + 1.2

Repeat. .8 -1.28 + ~~1~~ .9

above are air filled in the center hole. 4.5" diam

Tape removed to volume is now full of ~~air~~ water.

Parallel connection with H_2O in center.

(no change) +.8 -1.3 + .9 Barrel

Single layer..

" " Loosen Inner & screws. → +.9 - 1.1 +.8 Barrel.

→ +1.3 -1.5 + 1.2

Sept 27 1985 930 am.

Test of single layer. #16? Teflon wire on 12 x 2 plane Barrel

.040 gage al soft plate. 4.5 mfd 1900 v.

Inner screws tight. +1.6 - 1.6 + 1.2 Barrel

Ditto, inner screws loose. Barrel

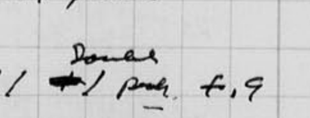
(about same?)! +1.2 - 1.2 + 1.2 volts.

" & screws tight again. 1.1 - 1.1 + 1 "

1st cycle (1/2) about .03 ms.

10 am " " after 15 min. .8 - .9 + .8 "

lower why? positive? angle?

the neg pulse has a ripple on it  → 0.7 ms.

note the Barrel may be influencing the signal. I should try this one in the MIT pool where the water is 13 feet deep..

10.08 2 Screws removed 2 loose 2 turn. of inner 4. +1 ~~+1~~ Same pk +.9 Barrel.

(about the same?

Ind = 0,241 D = ,18 for 1000 cycles

.0556 D = .36 for 1000 cycles.

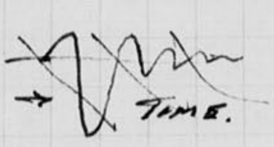
 Sept 22 1988

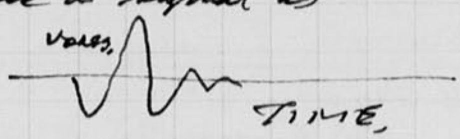
Harold Edgerton & Peter Mui.

Tests of experimental mini Boomer made with Bill MacRoberts yesterday. It has a 12x12 inch plexiglas base 1 cm thick. a .040 al (soft) plate is driven. A coil on a 6" diam 1 layer thick was wound of #16? wire of 1/16" diam including ~~insulation~~ insulation. 4 Screws hold the al plate to the square base.

Excitation was from a 4.5 mfd capacitor charged to 1900 volts. A xenon flash lamp was used in series for triggering. A rate up to 20 per second can be used with the power supply that was available.

Many tests were made in a plastic barrel in 4-405 full of water. ~~these~~ These are described on page 115. The hydrophone a [illegible] 25C in the bottom of the barrel showed a signal as sketched.





Today I took the latest model to the Swimming pool for testing in 13 feet of water.

The signal now lacks the first negative pulse! However the first pulse often had a ripples. This was influenced by the position of the hydrophone and the angle of the transmitter.

	Exp no			
Pool H_2O	0-5	.05 fm, 0.1 ms/div	3' to 25C Hydrophone.	
	6-10		flash Rate increases	
	14	.05	0.1 ms (One trig ok).	peak = 0.12 volts.
6'	18 19-20	.05		1.3V at 6 ft.
9'		.02-	0.5 ms.	
	21	Blank.		
	22 23 24			
	25 26 27	.05	0.1 3' to Hyd. +.9 -.8	
	28 29 30	.05	0.1 3' " " but changed angle to reduce the ripple.	
	31 32	Transducer at 6" below surface. Hydrophone at 3' below trans.		

These experiments show that we must
hold the transducer and hydrophone firmly at
known angles! The sides of the pool may make a
problem.

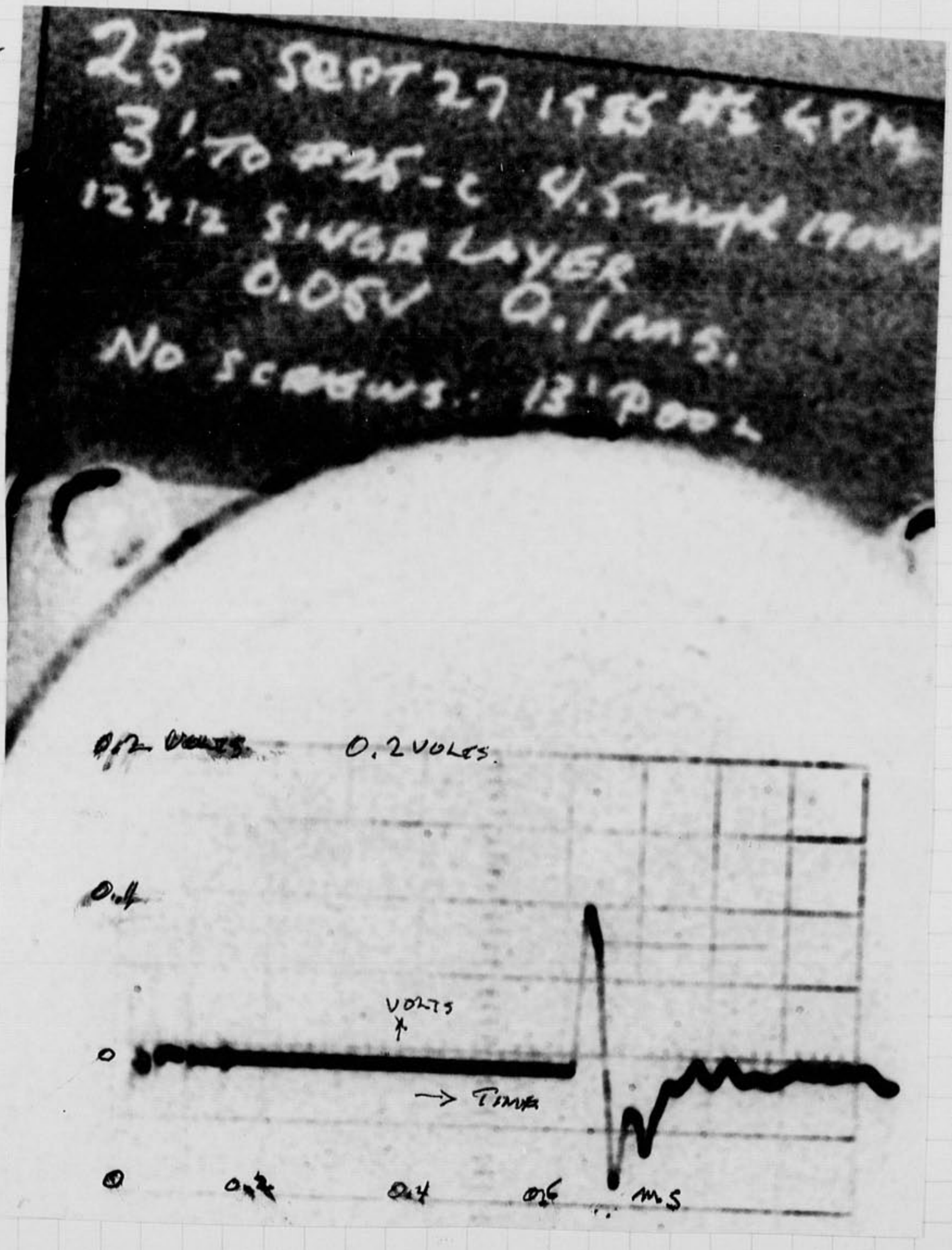
Print 25, 26 or 27. which show the
output of the square 12" single layer
1/16" diam wire on a 0.40" Soft alum plate
held at the edges. (4).

✓ note 28, 29, or 30 may be better. The ripple in
the first plus signal is reduced.

Repeat the 6Kc with silicone. see page (113) Too low.
The output as measured in the MIT pool is about 0.1 volts!.

Sept 27, 85
10-12 noon

MIT Pool.



note: It was a dark day with a hurricane GLORIA

I should give the data more exposure!

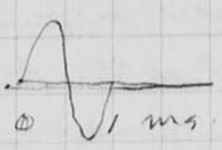
Trace exp. ok.
1/8 1 sweep.
f 4.
Crosssection
under exp'd.
Try f 4 at 1/4 sec
(Tests at 1/8).

Tektronix 3"
517 scope.

About
10,000 ft

Sept. 28, 1985 H. Edgerton.

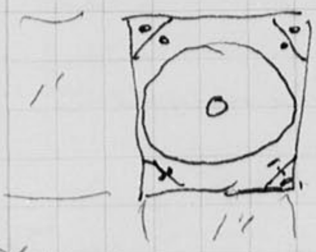
Conclusions. Increase inductance
new app. Increase ½ cycle time.
Try backup aluminum Plate.
Epoxy coil to the backup Plate.



.5 ms - 1000
.05 ms 10,000
5. ms - 100
.25 ms 2000
.125 4000
.0625 8000

Smaller inner diam..?

Center bolt. Rubber grommet
4 corner bolts
2" diam center 1/16 thick.
single layer #16. (or #18?) 1/16" wire plus ins

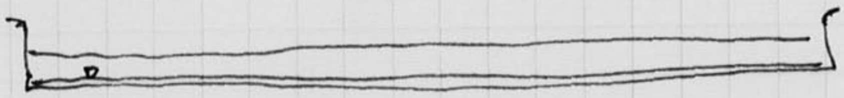


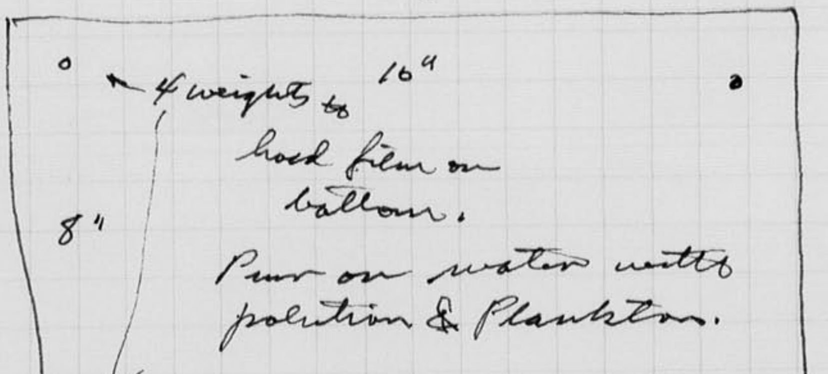
Layout same as plexiglass.
1/4" or 1/2" Al.

Esther went with me to Bedford
for a 2pm party (birthday) 80 years
old, Karl Wildes.
Truman Gray.
Katherine Hazen
Mr & Mrs. Harris. (son at MIT
Walter Harris VIII)
new House.

Plankton concentration. Thesis suggestion. measure and evaluate Plankton & Polution.

Shadow Photography on 8x10 7302 film in a tray with controlled volume of liquid.



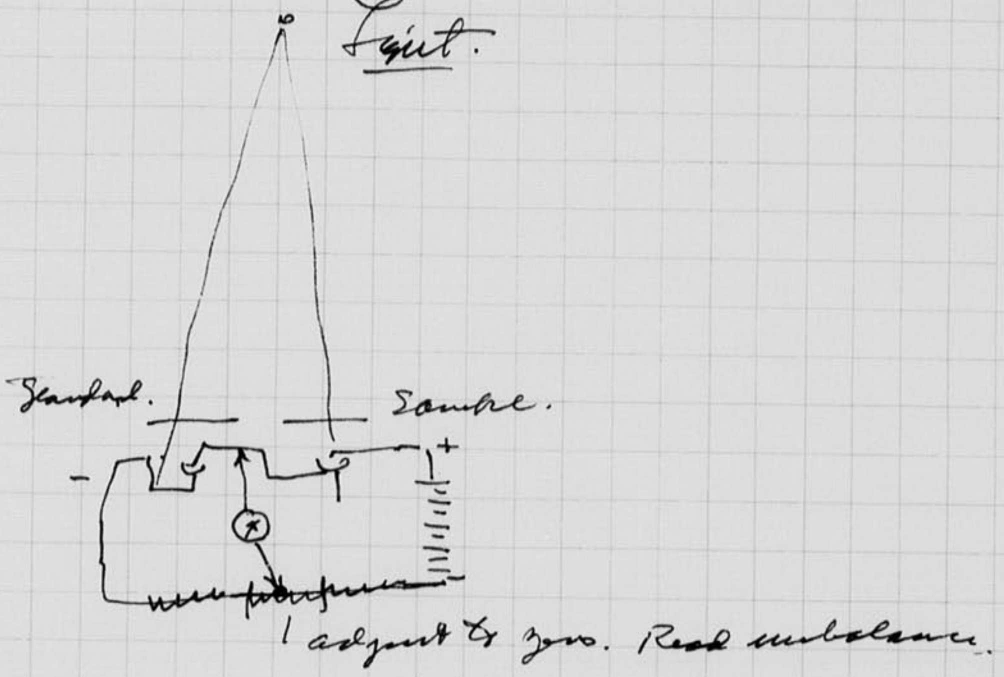


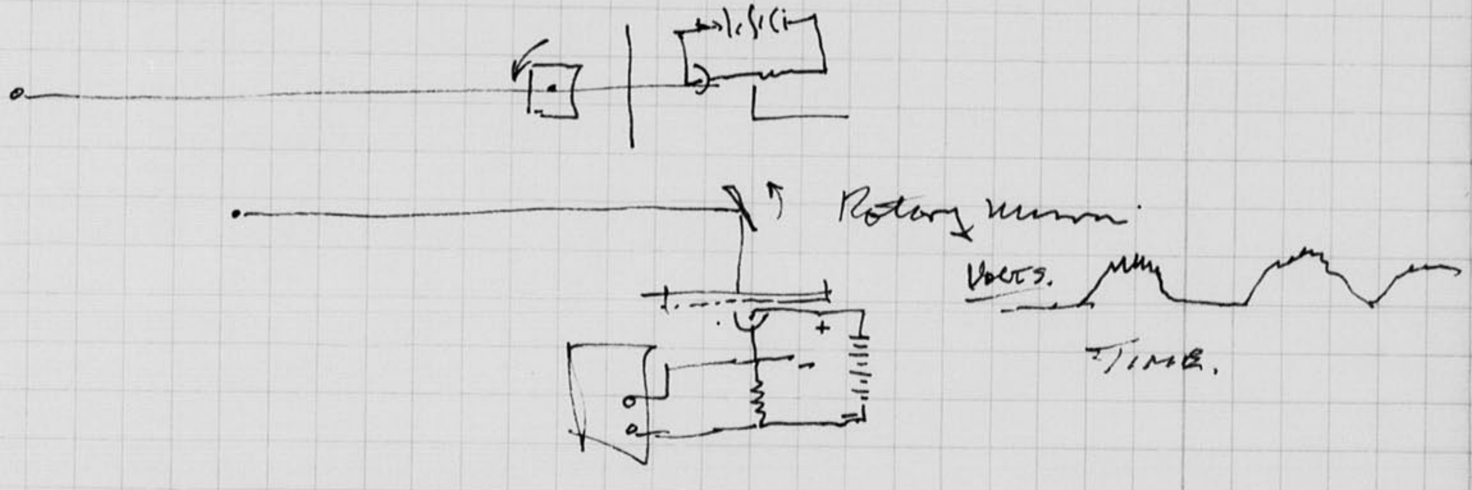
Process. 2 or 3 min in Dektol 1:1.
Wash
Acid stop bath
Hypo.
Wash
Dry.
measure transmission and count and identify subjects.

1. Measure light transmission - compare to clear film - no pollution.

Harold Edgerton

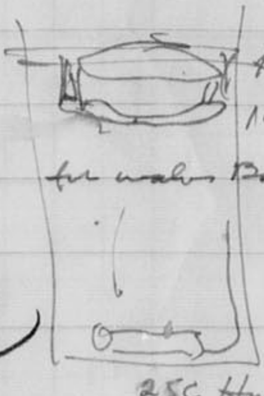
2. Count sample areas. Sweep light - meas. frequency and amplitude of light changes.





analysis of ~~signal~~ important. Find number of particles, sizes, etc, etc.

Sept. 29 1988 HE, 9 am MIT.
Tests of mini Boomers

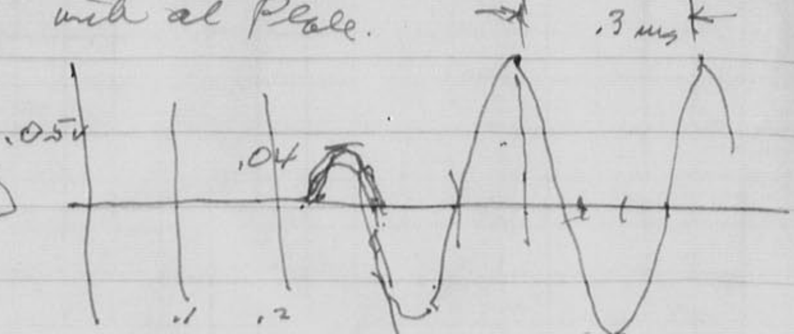


100 2.56" mh 2.10? with al Plate.
1000 1.75 18.6
for water Barrel. no plate
100 3.09 mh 5.6
1000 3.09 mh 11.98

A

25C Hyen.

Potted

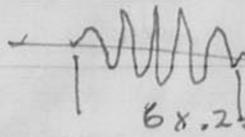


with metal plate potted on edges.

100 thin plate. 3.049 3.67.
1000 2.03 4.94 .04 - .07 + .1

B This gives "loss" signal. +.025 - . .03 X NG

C another plate B +.05 - .1 + . - .125 + .14
lettuce ?
Painted

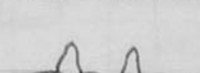


D another al. -.04 + .07 + .1 + 1.1.
NG

E Donut Al. +.03 -.02 + .03 NG.

Fearg. Earle
Chanel. Arou
Infor

Plexi .12" with 16 cone and 0.4 al plate into screws.



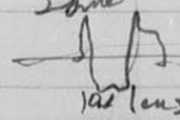
+.6 - .7 + .65 volts. ✓

Polypropylene. + .04 - .08 + .07
Probably not
competitive. NG!
decrease ×4.5

P.P. more water in Barrel. + .13 - .24 + .2.

Plexi → again. + .8 - .7 + .6 Same

Note Plexi is 5× stronger than PP but of higher frequency.



Plexiglas. 1" deep in Bowl.
+~~.035~~ .25 -.7 + .4

Less than before why??? Loose coils

Rearranged Windings ↳ +.8 -1.0 + .025

Put screw at center.
Wind again. P. Fluxor
plexiglas Let partially dry.
Rewind coil put on more turns

After Lunch Sept 29 Sunday.
Rebuilt the 12 x 12" Plastic back Boom.
I put a .020" soft al plate behind the coil.
The system still has Double layer problem.

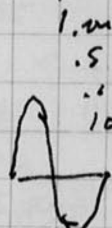
A Test with all screws in.
+.39 -.42 +.3

B Remove 4 outer screws leave 1 at middle
+.31 - .5 + .2

C Remove center screw about same.
+.35 - .5 + .31

Note. Microphone not at center of bowl
+.62 - .59 + .2

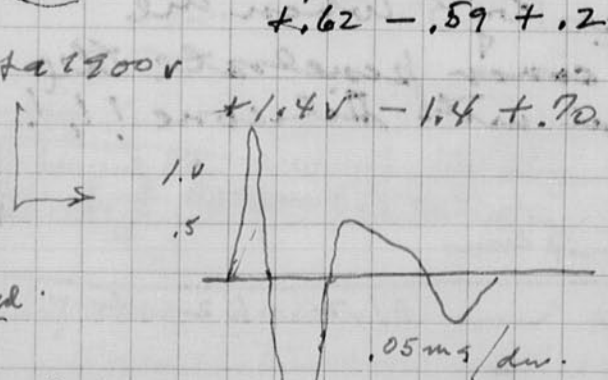
cycle.	1/2 cy.
1. ms = 1000 N	.5
.5 = 2000 N	.25
.1 = 10,000	.05
1000 to	

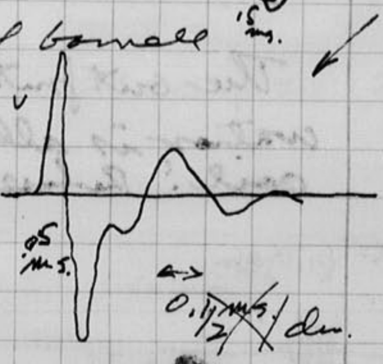


What freq is this?

.5 ms.

14.6 mfd 1900 v
+1.4V -1.4 +.70





freq is too high!

0.1 ms/2 /div.

Aurora B.S. 87063
Silicone filled

Again 21.5 mfd 1900 v +.9V -.7 + ~~.4~~ best yet adjust nicked

Mersa GKC Silicone on EPC 1701 Dim.
+2.2-3. +7.0 -5. Much more than boomer!!

note 2 mil + peak 8.2 could be obtained.

Signal longer in time + Peak 1st peak (1st) - 0.12ms max is 12V +.

Oct 3 1985

Hz Systems Bill MacRoberts – Barrel test in Cov.

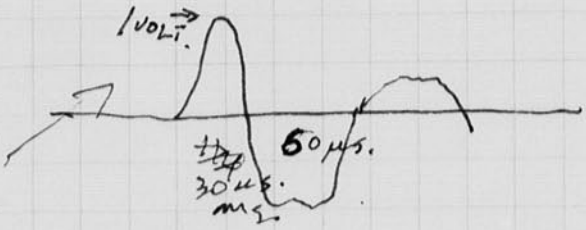
New Boomer

1" inner diam. # 20 wire. metal 1/32

11.5" outer diam. al plate medium 5052 al?

4.5 mfd 1900.

25C Hydrophone



Center bolt tight loose,

12 screws around edge.

Center out slightly better

+.9 –.6 +.4 volts.

Rewind

New al. plate. wire #18, 1/16" diam

0.090" thick.

6061?. +1.3 –1.3 +.6.

+ 1/2 cycle = 30 μs,

– 2 1/2 cyc. = 75 μsec

Air out of coil +.6 –.7 +.3.

Oct 4 1985. 8:40 am

The trans ducer has been in the barrel all night

Shows 2 1/2" deep. +.3 –.4 +.3.

Water drained. +.6 –.7 +.3

Note signal slightly higher.

8.43 The transducer is now draining water.

The output decreases by 3 when the water is allowed to ~~enter~~ penetrate the coil! Rebuild and seal with Silicone !!, !

Oct 6 1985 8:15 am. Test of +1.4 –1.2 +.6

Hz Sys. Water proof trans.

Oct 9 1985 [redacted] glued +1.2 –1.2 +

Oct 10 Copper plate Cu glued +1.1 –1.2

+.9 –.9

Al plate glued +1.3 –1.4 Some leaks.

Oct 11 1985 Harold Edgerton 100 mem Dr 730 am.

Esther went with me to Detroit. Science Museum on oct · where I gave a lecture on Strobe of [illegible] — then the next day I conferred with students

Whales - museum
(Wehle [illegible]) Detroit

Dr Schanzo - Cornell [illegible] mentioned by Francis Bj---.
Expert on chicken embryos,
ARACAHNA chickens
have "blue" eggs!
(South America)

Detroit lecture to
Sigma xi club at
Ford, - Visit to Ford
plant. Otto, Franz. Pres of ΣΞ.

John G GERLOCK
23655 ROWE DEARBORN MI
48124.
Chemist at Ford. Took us to the airport.

VENICE - BUCINTORO - Special Ship of the Doge.
sunk by ~~napoleon~~ napoleon.

FOLCO QUILICI movie maker. in Italy.

Profs. Edg. - 1985.
Edgerton Profs {
Amed Ahmed [illegible] Mech. Robot
LORNA GIBSON Civil.
R. JOHN HANSMAN AERO - ASTRO
DAVID RUDMAN Mat. Sci
award -> Robt Berwick. EE & comp sci 2 books.

Oct 12 1985
Mary Jane Dix on Ellen Dixon
Roberta Roy and Emily Roy helped me
will [illegible] in the stage on the 5th floor

Oscillograms under exposed HC film f8 1/15 sec
Cross sections do not expose well!
Oscil curve does not expose.
next give f4 at 1/8 sec. same film & ~~[illegible]~~
I only used 1 mm instead of 2! as suggested.

2nd film f4 1/8 sec of cross hatch for exposure

Oct. 12, 1985 7am Wt 174# stripped. H.E. EDGERTON WEIGHT

9/ 26/

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Strobe Lab, Room 4-405 Tel: 253-4629/494-8783

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Lee, Eric, 410 Bexley, dl. 9640
Lincoln, Pat, 40 Ceder St., Somerville 666-8426
Mercado, Antonio, rm. 503, New House - Coolidge, dl. 7587
Mulcahey, Brian, 487 Comm. Av., Boston, 267-2199
Munson, Ken, 531 Baker, dl. 7281
Ogura, Ayami, 3 Ames St., dl. 6171
Person, Jim, rm. 210, 500 Memorial Dr. dl. 8710
Rogoff, Brian, 46 Mass. Av. dl. 9602
Russel, Jim, 415 Next House, dl. 8815
Sealy, Dexter, B112 MacGregor, dl. 9502
Stern, Charles, 58 Manchester, Brookline, 3-6778
Yang, Julia, 324-F Burton, dl. 8292
Yueh, Alan, 58 Manchester Rd., Brookline 734-3650
Zagorski, Dave, 408 Walcott, dl. 6453

Osc cond
nr 2 - Bright line in scope 1/8 f ~~4~~ } 8 Barnel Matte KC Silicone 10V peak on 2nd pulse!
nr. 3 . Intensity less. " 1/8 f ~~4~~ } 8 — 2 1/2" scope out of water " "

5 Trans completely covered with 1/8 f4 Less signal!!
6. without Barrel 1/8 f4

Also copy photos of planform & Telsonic.
note Osc overexposed! go back to f8 for better background.
Oscillograms are burned out all white.
For next trial 1/8 sec at f8 2 min development. Critical.
Reduce intensity of CR. beam.

Students at Buffalo Mus of Sci Marcus Bjler.
John Tessman Halograms.
Donald Kelly
Michael Sulkowowski
Prof Paul Young Teachers college

Sunday Oct 20 1985 at MIT 5 pm
Jan, Rebecca & Emily at home here
lunch and dinner yesterday.
Jan and family will shortly move to
Chapell-Hill N.C where Lyndon has
a job in a school.

I was out Friday with the EDGERTON ship
with the EG&G 251 Sidescan (7 people),
on Monday last I was also on the same
ship with 17 people. We were trying to
spot a propeller (30 tons) that
supposedly was lost many years ago.
Some dozen fixes were made
and a report written.
Fran O'Neil with students
hopes to win their valise in the area.

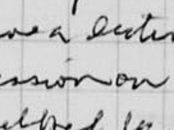
Oct 26 1985 Esther went with me to Madison Wisc on
Oct 23 for the High Speed Motion analysis course, &
Gave a lecture that night. Then on the 24 I had a work
session on microflash equipment etc. I was greatly
helped by Dick Sherwin from Chicago who represents the
EG&G co in that area. (50 attendees)
There was a banquet for Dave Frisch on
Oct 25 last night at Walker. I met Duhay who is
the mayor of Cambridge at this banquet. Many of
Daves students and friends were there.

From MARSH J. YOUNGBLUTH HARBOR BRANCH (7 Oct 1985) (NAME)

anterior nectophore of an abylid siphonophore
possibly Bassia

Shadow photos.

Silhouette photographs made years ago at H.B.



Bruce DePalma
1060 CHAUCHET DRIVE
Santa Barbara Calif 93108

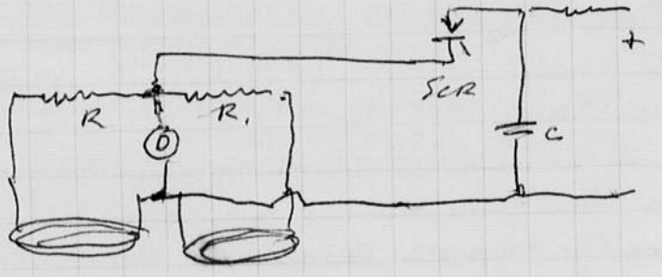
Sunday Oct. 27, 1985 Harold Edgerton 100 Memorial Drive Cambridge Mass.

Under water metal detectors - is an instrument that is used for exploration.

I hope that a study of detectors can be made since I am sure that there are several types.

Why not start with a bridge type of metal detector. This depends upon an unbalance between two coils that couples to the unknown target. This unknown can be a small one close to the surface or a large one at a large distance.

I normally would use a pulsed system of energy into the coils since most of my circuits consist of pulsed systems. In this way a very powerful pulse can be enjoyed and detection should be benefited.



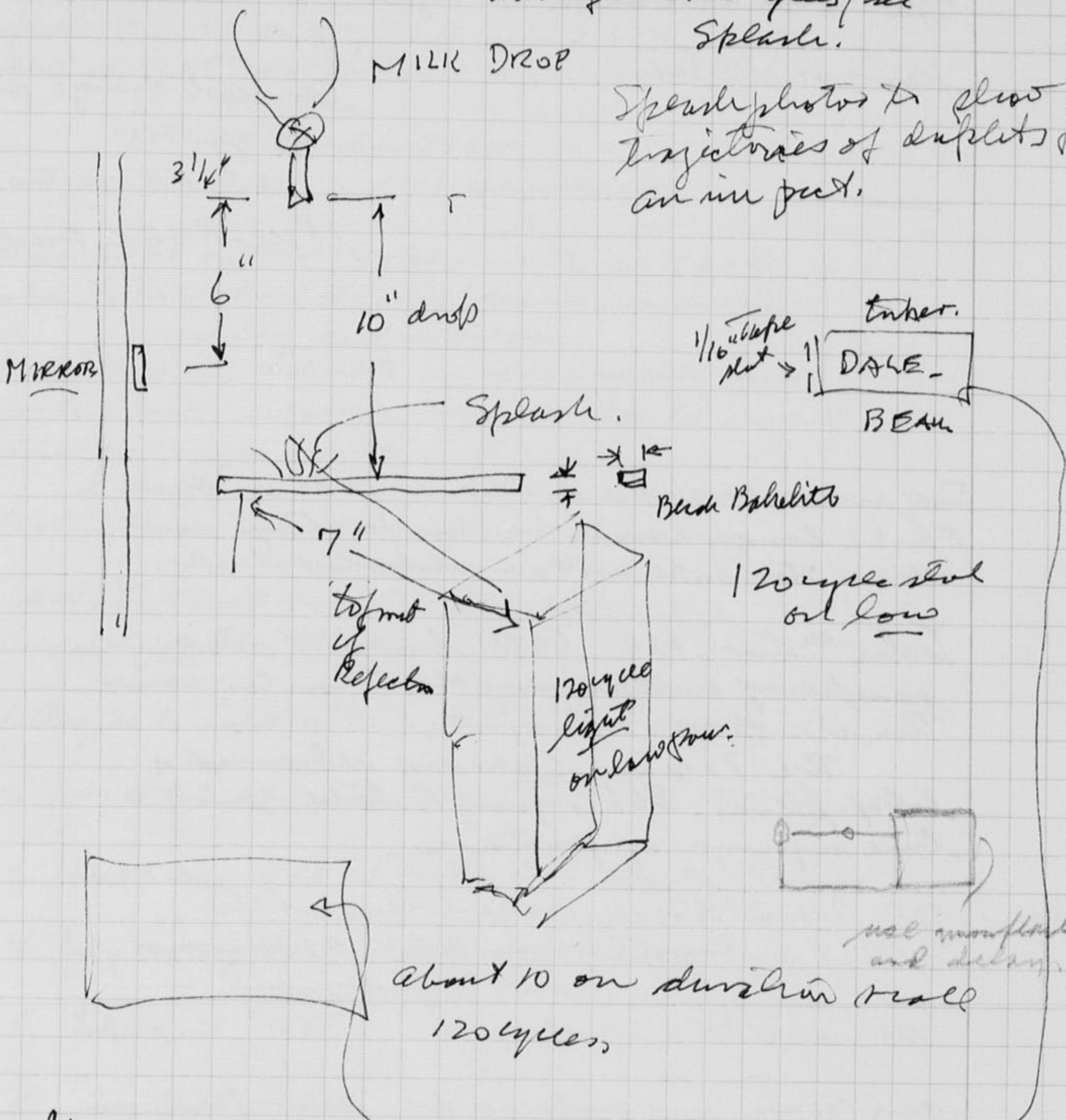
TARGET.

The capacitor discharges into the bridge network of 2 resistors and 2 coils. Any unbalance will result in a voltage into detector system (D).

Nov 1985
Harold Edgerton MIT

Multiflash 120 cycles/sec
Splash.

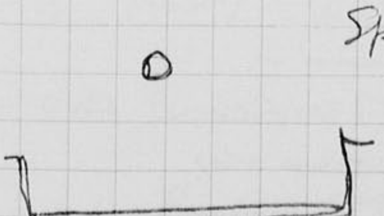
Splash photos to show trajectories of droplets for an impact.



Hor. f 16 for some
Hor. f 20 for others

Vert. f 22 on remainder of 36 exp. film.

Splash of a drop of different quality. for example water on milk dye mixt. Shadow photos of reactions



Nov 2 1985 Harold Edgerton

Drop breakup with height of fall.

Object to find distribution of sizes vs fall distance.

floors at MIT Bldg 4

Sea Level change predicted
by year 2100
0 to 0.3 meters up
Polar Research Board

Sugawara was here on Nov 4 1985 with
FX-6L lamps made in his factory and
with a stroboscope with a calibrated scale.

Leslie McLean 225-6381 brought in a
sample of water from the Charles River.
This is a EUROD Project.
The 8x10 negs (shadows) showed a
lot of fibres. She is going to take a
time sequence of pictures.

Nov 8 1985, I was in St Louis Mo yesterday at the
Fellows meeting at the Omni Hotel. Al Kemper
met me at the Plane. A photographer —
took me to the airport.

Ain Sonin came over to settle microflash
system and discuss it for the impact of
various particles.

Nov 27 1985. H. Edgerton — Many experiments with drops.
Bill MacRoberts helped me yesterday in the stair well of Bldg 4.
A dripper was put on the 4th floor on a tripod for
stability.
We used a black velvet background and a
120 ayce light. strobe. 1/10 shutter time on plus X film. Bill
would yell when a drop left so I could snap the
shutter.

The drop follows the no-resistance curve up to about
13 feet. Then the drop is influenced by the air friction.
a drop of 0.495 cm has a velocity
13' - 4800 cm/sec
29' - 1316 cm/sec. 895.8
29'. no air. 1316 calculated vel.

Cousteau called on Nov 16 sat - wants me to go to
Cuba to help find the (1715) Spanish wrecks in
the bay east of Havana.
Frank Germain offered to send a mapping sonar
for two weeks to Cuba. Peter Mui will be checked out
on it and go to operate.
I may go and try to get Cousteau's side scan
to operate. Plans call for Dec. 2 to 15 at Cuba.

Nov 30 1985 HE at 4-405. Work on file
Expeditions with Cousteau

1. Aug 20 to Sept 10 1953 France with Bob Edgerton
2. July 10 to Sept 12 1954 Cannes France with Bill Edgerton
3. June to Aug 1955 (with Bob Edgerton) France
4. July to Aug 1956 Romanche Trench.
5. Sept to Oct 1958 France
6. Aug - Sept 1962 "
7. July - Sept 1965
8. Oct 6 - 26 1968 Lake Titicaca Peru
9. Nov 7 - Dec 21 1975 Greece
10. June 1978, Cape Hatteras Monitor.
11. Proposed trip Cuba. Mar - vag. bay
wrecks and sonar. Peter Mui goes to Cuba.

 Dec. 2, 1985 Monday. H.E. Edgerton

Peter Mui left at 8 am for Miami to join Cousteau in Cuba

Dec. 3, H.E. Ford Van left for new clutch - alignment at Elbery Motor

Dec 4 John Hansman Bldg 33-118 basement. phone 2271
2 or 3 mm drops with air blown across the drop path.
Photos show balloons. 10 m/sec velocity of air used!

Dec 6 Big affair for Gordon Brown - new Bldg etc.

Dec 8. Jan scheduled to go to Ft Lauderdale tomorrow. Then by plane to the Calypso off Cuba Montezuma? Bay. to help Cousteau.

Dec 18 1985, I was in Cuba on the Calypso from Dec 8 to Dec 16. with Peter Mui using EG&G 960 (3,590) side scan sonar in Mantanzas ? bay and Havana.

In Stretch Moments of Vision 1300 EF5. 326 Dec 18 1985

Dec 26 Sonar Images pub by Prentice Hall N.J.

Jan 2, 1986 I went to North Carolina Hickory for the Christmas season with Esther. Jan Dix on H.E. pneumonia to Winston-Salem N.C.

Jan 8 Lecture on Sonar at 11 am. 20 people.

Jan 9. " " Loch Ness 50 people +

220
Loch Ness Update
Harold E. Edgerton and Robert Rines
Thurs, Jan 9, 11 am-12 noon, 4-402 (first meeting)
The study of biological activities in the largest Scottish lake (Loch Ness) will be reviewed. Current activities and new proposed activities will then be listed and discussed. Sponsor: Harold E. Edgerton and Robert Rines. Contact: Jean Mooney, 4-405, x3-4629.

50.-

221
Sonar: Use Of Pulsed Sound Sources In The Charles River Basin And Boston Harbor
Harold E. Edgerton, Peter Mui
Wed, Jan 8, 11 am-12 noon, 4-402 (first meeting)
There will be a series of examples to show side scan and penetration sonars in action. A new book, *Sonar Images*, should be off the press (Prentice-Hall) in January. Weather permitting, a few expeditions are proposed for the Charles River Basin and Boston Harbor. Sponsor: Prof. Harold E. Edgerton. Contact: Jean Mooney, 4-405, x3-4629.

20.-

222

R

HE

Jan 10, 1985

"SONAR IMAGES"

Book published by Prentice Hall - N.J.

first copies arrived on Jan 9. 1986
H. E. Edgerton

for Mar. 8, '86 Sea Rovers.

Copley Plaza
aft & Evening.

Buckley.
068 0129 Home
926 7750 office.
Afternoon Talk.

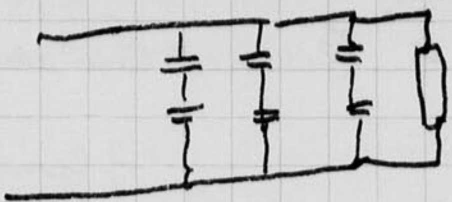
Peter Mui. On Calypso off Cuba with sonar.

H.E. - Rendezvous update - Afternoon Talk

Jan 9 update on Loch Ness

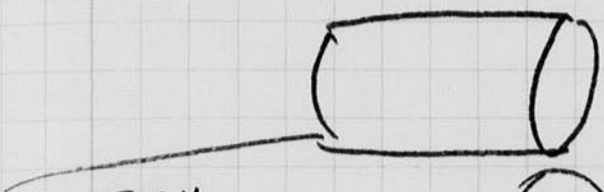
Jan 14 86 Sat.

Work on abr 64 Bat unit. _



~~Lamp~~ — each string of caps

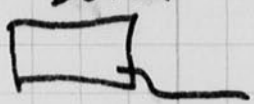
Duration 3 lamps on 6 caps. 50+ ~~to~~ 75 μs duration.



800V.

150 cm

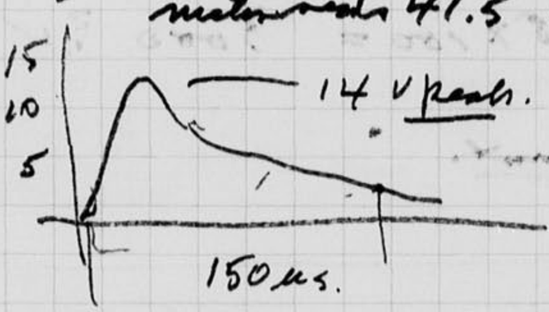
DORA.



R = 1K.

(111) 3 lamps on 6 caps.

meter reads 41.5 × 200.   D = 150 cm



Variation. Tubes may shift? Seem clean.

$$\text{peak} = \frac{K(VD)^2}{R} \text{ C.P.} \qquad K = 258 \times 10^6$$

$$\frac{258 \times 10^6 \; 15}{1000} \; 150^{D^2} \times 150 = 902.$$

C.P.

$258 / 15^3 = 258 \times 3400 = 2950 \;\hat{=}\; 10^4$ C.P.

$D_m \approx 70$ μs.

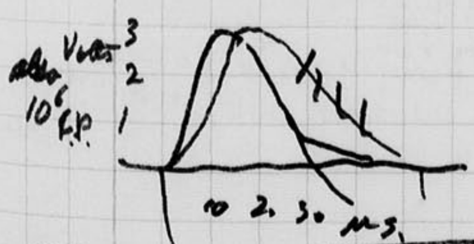
See check next page: output = 3500 c.p.s.

output = $10^4 \times 70 \times 10^{-6}$ = 70×10^{-2} = 0.7 c.p.s. ??

h.c.p = 100×10^6 — X peam low?

check — should ~~be~~ 7000 hpss.   Bat unit.

H Bird unit. 2 lamps in parallel   D = 1.94 m



(2 lamps in parallel)

output = $3 \times 10^6 \times 30 \times 10^{-6}$ = 90 c.p.s.

check on Bat 1964 unit. $D = 1.9$ #M.

v = Peak cp. = 3.5×10^6 cp. to (2.5×10^6 low charge).

Duration = 100×10^{-6} sec.

3 lamps and one reflector.

Output = 3500 cp.s.

Light meter Integration

10'

f = 8

#306

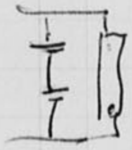
METER 3.3/10 ? meter reading.

Output = $.33 \times 8 \times 100 = 3000$? ✓

↑

check. ? correct.

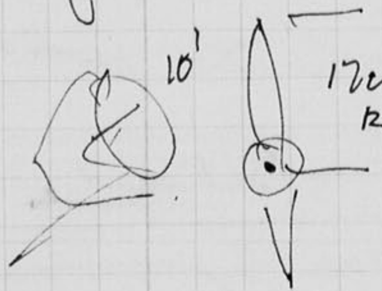
Jan 15 1986. Bill MacRoberts and I completed the study of the short flash unit.



3 of these in parallel in the same reflector.

Output measured with integrating meter = 5000 BCPS 100.10-5

Jan 16. Tests with Bill MacRoberts and visitor Norman Biggart.



$2\pi 17$ cm for 1 revolution.

1/60 sec. $v = 2\pi 17 \times 60$ cm/sec.

Blur with 1/1,000 sec. = $D = v \times T$

Blur in cm = $\left| \frac{2\pi 17 \times 60}{1} \right| \times 10^{-4} = 6.37$ cm

Tell

Photo shows loss.

Jerry Gingerich
25120 Punta Gardo
Islander
33950

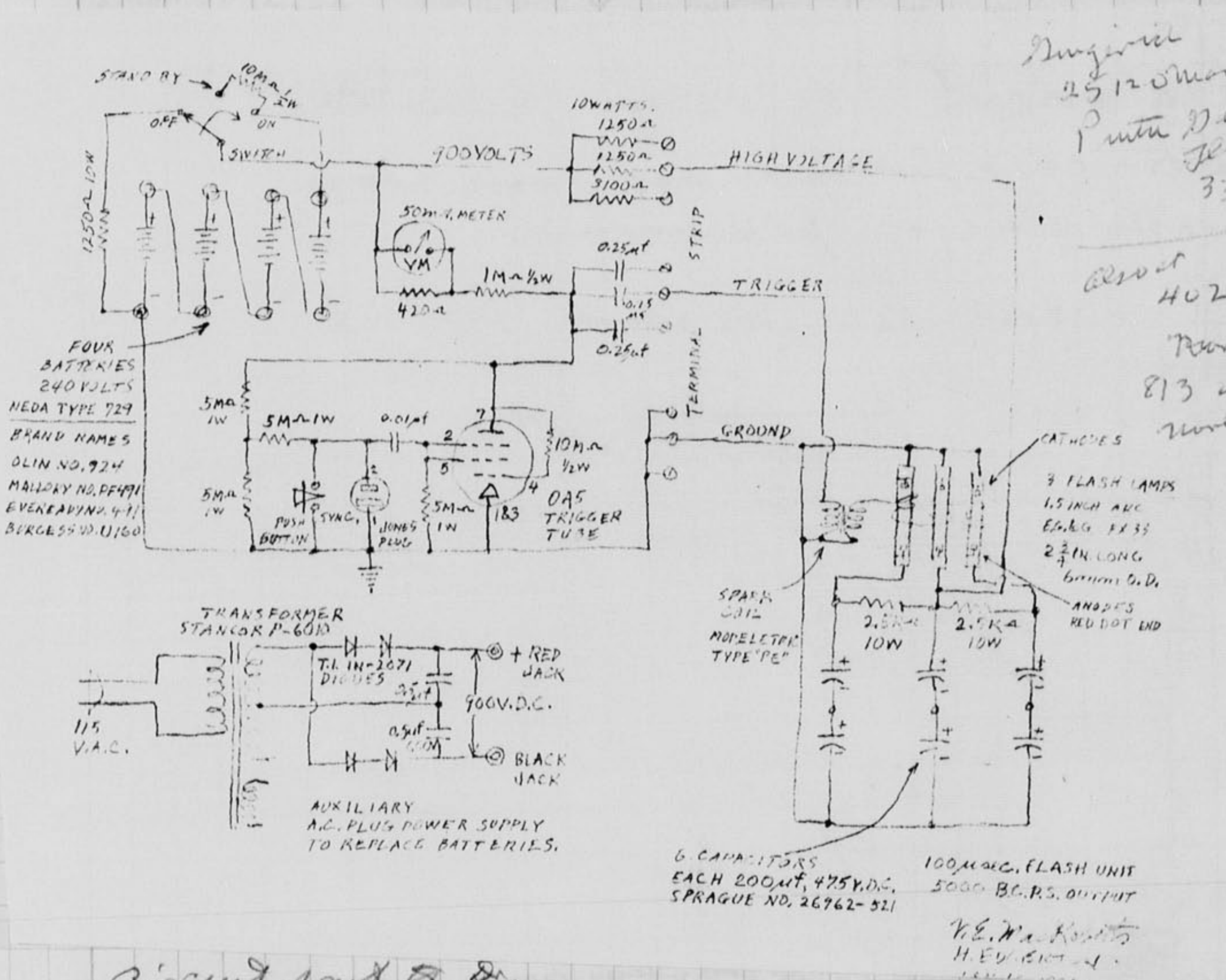
CHANNEL V Jan 16

10am 449 0400 x 4428 Stella Gould

four 1 hour exposure.

Stella Gould Channel 5 was here today until 2 pm to take T.V.

Dr. Gingerich 102 East South Square (turn polisher)
North Port Florida North port Fla.
813 4200661 Newport Animal Hospital



Gingerich
2512 Monroe
Punta Gorda
Fla
33950

Also at
402 East South Square
Northport Fla
813 426-0661
North port Animal Hospital

Circuit sent to Dr.
in Florida.

500 CPS 100 μs or less.

Bob Gerald
Channel V TV
Called to arrange a sequence.
Stella Gould + 2
10 am Friday

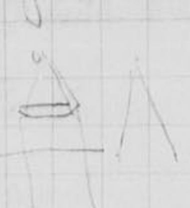
Dr. Schmidt brought in paramecium at 3 pm
1st test 1" 10 cm ⊗ spark. 730 ppm 5 min dark dish.
2nd " 75 cm ⊗ tube 730 ppm 10 min dark

Sat. Jan 18 1986 Visit Silhouette photograph samples by Dr. ~~Schmidt~~
I first used the U.S. point source at 90 cm
then the portable unit at " 70 cm
I used a blue to show streams. fog etc.

12:00 pm conclusion.
Photos of Paramecium are Grainy and not good.
Suggestion Try finer grain film such as 343.
Model 343 is being sent
the FX6 lamp at 10 cm barely gave a darkening!

Jun ~~19~~ 18 1986 HR

70.5 MHz 1500V Beam MS F16x



3" from Point Spark Source gave an image on 343!

Jan ~~20~~ 19 1986 Sunday. Sending out book "Sonar Images 4" published by Prentice-Hall last week.

Conclusion! The silhouette method with 7302 film is not good enough for the study of paramecium!

343 film takes too much [illegible]!

Jan 21 1986 Jean back from vacation.

Jun 28 1986 Sat. 10 am in 4-405 experimenting with Paramecia.

Photography of Paramecium

Multimicronucleation (?) [illegible]

Carolina Bio Supply Co.

Burlington S.C.

#1 Distance to microflash spark 70 cm

5 min Development in ~~D~~ [illegible] 7:1

Note — not level water ran off the film

#2. Lined some butter:

3. Circle of wax from marking pencil.

Some leakage. Water too thick?

4 Same with cover glass Large area? Leakage!

5. Larger area defined by glass marking grease pencil

no cover glass. Some ~~Death~~ leakage.

Enlargements used in [illegible] Enlargement ×5

Enlargement 3.8 element 4

Leakage on ~~[illegible]~~ paper =

6 [illegible]

Jan 26 1986 H. Edgerton. Photos by Shadow of [illegible] Method —

1. 3" I.D. circle on film — 3mm — No [illegible] Why?

2. Small grease pencil circle. no [illegible]

3. 3" I.D. circle on film — Large grease pencil circle 3mm no [illegible]

Feb 3, 1986. M.I.T. 12KC Sonar on Curly small [illegible] no trans former 12' cable shielded (4).

Feb. 10, 1986 10 am Just back from Washington D.C. where I received a medal from the Patent Dept. I was inducted into the Inventor's Hall! There was a big party before and after the induction.
Those present Esther Edgerton
Mary Ellen Walsh and Jack Pogue
Mark Pogue an
John and Barbara [illegible]. Bethesda
~~many others.~~
Brunch at the Hotel Marriott on Sat before the induction. By Mary Ellen.

Feb 16 1986. Shadow tests. Dead animals in preservative — Harold Edgerton.

1. FX 265 · 1/8" gap in Xenon 800V 20.5 mfd at 60 cm. — 343 film EK. ok
3 min in Dektol 1:1?. Shows image – thin.
Resolution excellent.

2. " 2 min Development. — 7302 Dense
negative very dense. Thin [illegible].

3. FX 258. 5 min Development — 343 — ok
density looks the same as 2. could be denser!
Lamp does not always flash! overloaded?

4. FX 198 ? 45° side to [illegible]. — no exp
Same input 5 min Dev. VERY THIN NEG!! — 343 — " "
This proves that the U.V. is doing the exposure.

5. MICROFLASH 1M 5 min – no exposure — 343 no exp.

6. " 50 cm 5 min. — 343 No exp!

7. Fx 265 20.5 mfd 800V 50 cm — 343 OK.

Feb 16 1985 Harold Edgerton.

Exposure is ok with the Fx 265 with 20.5 mfd at 800 v.
Microfocal-point source gives no exposure at 1 meter or at 1/2 m!
Glass FX 198 gave no exposure? why?

Apparently the FX 265 has light that exposes the 343 film.
Could this be for U.V.?

8 #? 343 50 cm to FX 286 20.5 at 800 v.
Two batches of samples from Supply House.
3 min dev. Thin, but printable.

9 1302 Next try 1302 at greater distance or [illegible] intensity. 3 min dev 150 cm to lamp.
Exposure is about right could be less.

#1 #2 Samples from
Carolina Supply (Biological) Co
Burlington N.C. 27214. Paramecium.
Paramecium CAUDATUM. Paramecium Multimicronucleatum.

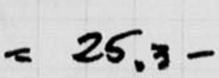
Seen enlarger [illegible] from lens
[illegible] from = 25/7.5 = 25 19/7.5 = 25.3 - mag.

Enlargement 13./.9 = 15/14.7 = 19.5/1.3 magnification

! 1302 negative is lost lost. ! ! !

Feb 19 1986 Harold Edgerton more tests of 343 and 1302 films.
Feb 20 86 HE with Russ Kazafas to Columbus Ohio for a lecture at 4 pm at O.S.U.
Feb 21 Returned to Cambridge - Rain car but OK!

Tech 468 Scope intermittent
Feb 22 Fx 265 Both [illegible] at 800 volts 505 305 Quartz [illegible]. 83" calc / 36" actual
Fx ? D 3/8 90°. 600 volts min start on PS 302 front base 36" to Blue.
5-4 photo tube 2.5 mfd. 6.75 Blue 1000 Ω. Dur. 5 μs



HNA

$HCP = KVD^2/R_L$ $K = 22.6 \times 10^6$

(H) [illegible] C=[illegible] not 2!

$= 22.5 \times 10^6\ 6V\ \frac{.912^2}{1000}$ $D = 3/4 = .912\,M$ $.912^2 = .835$

$= 112 \times 10^3 = 112000$ peak cp. $Dur = 5 \times 10^{-6}$

Input = $800^2 \times 2.2 \times 10^{-6} / 2$ $= .64 \times 1.1$

output ~ $112 \times 10^3 \times 5 \times 10^{-6} = 560 \times 10^{-3} = .56$ cps

$.56/.71 = .785$ cp/watts seems high!? .071 watts

$Ws = \frac{4 \times 800^2 \times 10^{-6}}{2}$ $\frac{256}{2} = 128$ $\frac{64.\times 10^4 \times 4^2 \times 10^{-6}}{2}$ $128.\times 10^{-2} = 1.28$ wattsec. input

Light = $\frac{K D^2 V}{R}$ = $\frac{22.15 \times 10^6 \times 91^2 \times 6 V}{1000}$ = 111. ×1000 = 110,000 peak cp.
D = 5μs (1/3) μs.
output = 550,000 × 10^{-6} = 0.550 cps.

$\frac{cp}{watt} = \frac{0.55}{1.28} = 0.428$ cp/watt.

Prob. signal current too — coble EG&G ✓

Sketch Zenon. the output peak is 8V/instead of 6. 8/6 = 1.33   PS 302.

effy now is .425 × 1.33 = 0.665

Check D = 1 meter.

C.P. = $\frac{22.5 \times 1^2 \times 6.5}{1000} \times 10^{-6}$ = 146. ×10^{-3} = 0.146 output. cps.

Duration = 5
.730 cps output.

effy = $\frac{1.28 \text{ wattsec}}{0.730}$ = $\frac{.730}{1.28}$ = 0.57

#1. FX 265 ~~[illegible]~~ 9 volts. Blue Zen 3-4 plates alle sync.
U.V.

#2 FX 255 take   10 volt.

March 3 1986, MIT phone call from Wm D. Forsaglia
369-4884 Concord mass
120 Ridge (Rd?) 01742
Discussed energy source fusion without neutrons.
I called EG&G - Chas Francisco will pass word & Rader

Steve Freedman Crimson Camera
Discussed microflash Flash Meter #365.
and Infrared filter. for Nikkor f 3.5 lens.
Hoya IR RM90 filter.
617924-3382 → 58 Olivia St Watertown ma 02172

Mar 4 1986, Abe Frondlich. and Phil McElroy were here
all day to take color shots for a Germann paper
Jordan Meyers writer. will come later.

PHILIP GRECO called mar 3 about ship wreck Rolo near the
721-2900   Canada (?), Cape Cod Marconi wireless station

Mar 10 1986. MIT
Chris Wolfe - Aero problem - Smash a model plane. Jumin
I suggested a 35 mm film with 120 year light.
Will be back in 2 weeks.

H. Edgerton Mar 10 1986 Sun.

John Scott Tube Dept Dalem Film called several weeks ago.

Ken Bates - Several phone calls - letter in file. Penfield N.H.

Draper Lab - Miniature Vehicles Brian Chevers 182-8-3100

Cummings 182-8-3108

McJorland 182-8-3103.

miniature vehicle suppliers.

Ap. 4-405
Mar 9 1986. Tests of FX 265 lamps (Quartz window).

#	V	
1	1200V	Dial on PS ~~320~~ 302 Voltage for reliable start
2	620	
3	540	(1/8" gap).
4.	~~450~~	
FX 198 ?	720	has 1/4" gap

$$\frac{18000}{205} \approx 88$$

Lamp #3 put in unit. 20.5 mfd $\frac{CE^2}{2} = \frac{20.5\ 600^2 \times 10^{-6}}{2} =$ 36.9 ws. 600V.
Coil, 805. 1/8" gap.

1 approx thin 20.5 mfd at 40 cm 600V? 2 min in
3 ok " " 3 flashes. Density ok. Dektol 1:1

7302 Film 3.68 mfd 600 V made 1 and 3 flashes
Dektol 1:1. 1 min. Excellent density. 40 cm from film.
All above with ~~PS 320~~ 302.

Try again with FX 198 flash lamp or FX 6?
which is cheaper. Use battery supply and 4 mfd at
50 or 60 cm. Develop 2 - ~~to~~ 5 min intervals.
? Does the FX 198 have a 3 mm gap or 6 mm?
Also try the FX 64 with 7302 at closer distances.
and for density of 0.8 or .9 with no subject.
Try 4 min development in Dektol 1:1. Enlarge to
measure grain.

Mar 18 1986 Harold Edgerton

Exposure tests FX 302 (32?) Supply
3.68 mfd 6.3 ~ seal. V = 620 V

#1 7302 film with target. 40 cm to FX158
#2 7302 " " " 40 cm to FX198 U.
3 min development in DEKTOL 1:1.

			plain	glass			
7302	DENSITY	FX 198	.57	.51	3.68	620 V	3.63
7302	Density.	FX 198 U.	.77	.56	3.68	"	14.4
7302	"	FX 265	.68	.62	3.68	"	18.03
343	Density.	FX 265	.07 ~~.29~~	.17	3.68 mf-		3 min } Same film sheet
343	"	"	.17	~~.29~~	3.68 + 14.4, 620 (18.0)		
343	"		.21		18.0 - + ~~620~~		
343	"		.29		18.0	820 V	
7302.	"	FX 265	1.5	1.46	18.08	620 V	Dense
7302		FX 64	0.81		~~+8~~ 4 mfd 500 V BATTERY.		

From this set of experiments I recommend the FX198 U at 40 cm with 4 mfd at 500 volts. The lamps will be changed tomorrow and new experiments made at 40, 50, 60, 70 cm to the subject. An analysis for subject brightness will be tried at each setting.
I will use 7302 film with Dektol 1:1 for 3 min. dev.

Try 30 cm
40
50
60

~~FX~~ 343 film, use PS320 at 800 volts with 18 mfd.

(Sun diam = .8654 million miles
Earth to Sun 93,000 ") from Gunn

MEMO — The Pentalite unit has 8 mf (I thought it had 4)!

Mar 11 1986 Harold Edgerton and Bill MacRoberts.

Tests for Density and Resolution of small sources and fine grained films.

Portable power unit with 510 v battery. 3 min in Rektol 1:1.
fine grain film 7302

LAMP	C.	V	FLASHES	Height to film	Density
→ same film { FX1980	8	500	1	50 cm	1.74
"	"	"	4	50	2.56
{ Fx 1980	8	500	1	70	1.40
			2	70	2.2
→ Fx 1980	8	500	1	100	0.91
			4	100	1.91

Tests with EK type 343 film.

LAMP	C.	V	FLASHES	Height to film	Density
{ FX1980	8	500	1	40	.14
			4	40	.55
→ { FX1980	8	500	1	20	.43
			4	20	.70

The 343 has superior grain than the 7302

$8 \times 4 = 32$ wsd. ✓

We examined the resolution target with a microscope. Apparently in contact the 20 cm lamp spacing gives excellent Resolution. I can live with the single flash at 20 cm spacing for 1 flash. Comment it would be better to use 2 or 4 x the energy.

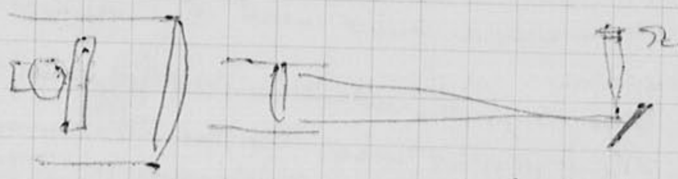
I phoned EG&G, and talked to Lee and Judy P. Lee recommended a sapphire window lamp FX-? which has a small gap and uses xenon at 5 atmospheres? Several will be sent to me for trial in this shadow experiment.

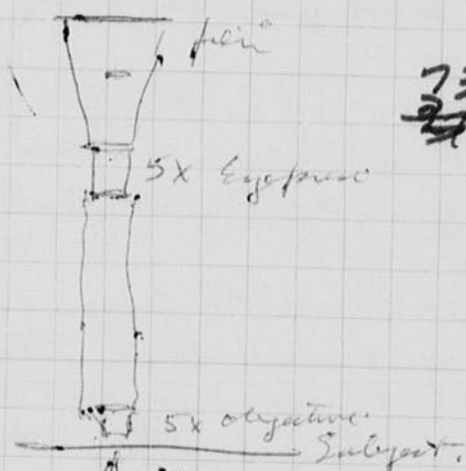
To do make micro scope photos of some of the above records to show grain and resolution.

Mar 12 1986. Phoned EG&G Salem - Joe Lee 665-9010. He plans to send me some sample lamps (non standard) for experimentation.

7.5 mm 1930
3. mm 2470

Emillonik plate of 7302 film 5X am 100cm Emfd 500v.
88 on 0.1 mm scale. Model 515 flash and tungsten lamp beam





Low mid magnification range
80 606 5X.
NA 0.1
TL 170.

Eyepiece 5X

7302 ✓

	0	1
	foc	1
	0	1
	full	1
	W	X
33	full	1
34	0	1
35	full	2X
36	0	2X
37	fil	2X
38	0	2X
39		

ASA 25 color.

focus problem
Input Dim.

out of film.

Tungsten and flash.

All above
with 7302 film
lowest power.

Second film ASA 25 Color. 1/125 sec. 343 Resolution.

	W.	X mm Scale
1	on	1
2	off	1
3	?	
4	??	
5	?	
6	on	4
7	off	4
8	on	5
9	off	1
10		
11	on	2
12	off	2
13	on	4
14	off	4

3–5: Skips. why? cords maybe.

15 on 4X
16 off 4X
17

9am tomorrow Mar 13 86
Chas Hamlin
861 78 80 A7
discuss finding of ridges of avalanche areas on sled plates

March 21. 1986.

from film

	0
	off
	0
	0
31	0
32	0
33	off
34	on
35	off
37	on
36	off

All strands at angles are overexposed

Mar 13 1986. Harold Edgerton

Jack Naylor and Dave Ostroff (Smithsonian Wash DC)
were in my office from 10 to 12 today. ~~[illegible]~~
a lot of pictures - we made a list and I am looking up
the negatives for action.
He talked to Gus Kayafas about a set of big prints
color and B&W for the exhibit in the Smith museum.
Also wants some old equipment. I gave him some
20 or 30 years ago.

Mar 17, 1986. Director's meeting at 3 — State Boston
Lawyer's office. Don & Mark Marsa Kurda — L — Lunch at
old City Hall "Robert" restaurant.

Mar 18 1986. Kaufman due in am at 100 Memorial Dr.
Try shadow fresh into salt water.
Find equipment for color photographs of plankton.
Get plankton Brine Shrimp from aquarium.
Plankton from Pond in canal.

Mar 23 Sat 1986 MIT
Photos of Drops falling 40cm and bottom
layer of water some 1/8" thick. A 4 cm thick sample was
put adjacent at 40 cm and was excited under 4 mfd at 500 v.
Timing was by hand at random. Results
excellent, - Tem 2302 developed 2 min in Dektol 1:2.

Mar. 25, 1986 Wednesday Esther has the Church bridge club
for some games and lunch.

Mar 28 1986. Friday.

1. Test of water FILTERED .05 mfd 500v 40 cm — Depth of H2O 0.6 cm
   not enough exposure
2. 4 mfd 500v 1.5 min Dev. 40 cm Lots of Dirt
3. Re filtered " " " "

4 3-28 On Delay
5 3-26 on delay. Enough?
6 3-20

7 3-18 0.9 — Lamp 40 — Thick 0.9 cm
8 3-20 0.9
9 3-26 1.2 cm
10 3-20 1.2 cm Lamp 24 Drops 26
Problems with the circuit. D.R. Box delay.

Sat Mar 29 86 - H. Edgerton Sat.

FX-~~19~~ 209U small gap metal
FX-712 Trigger module

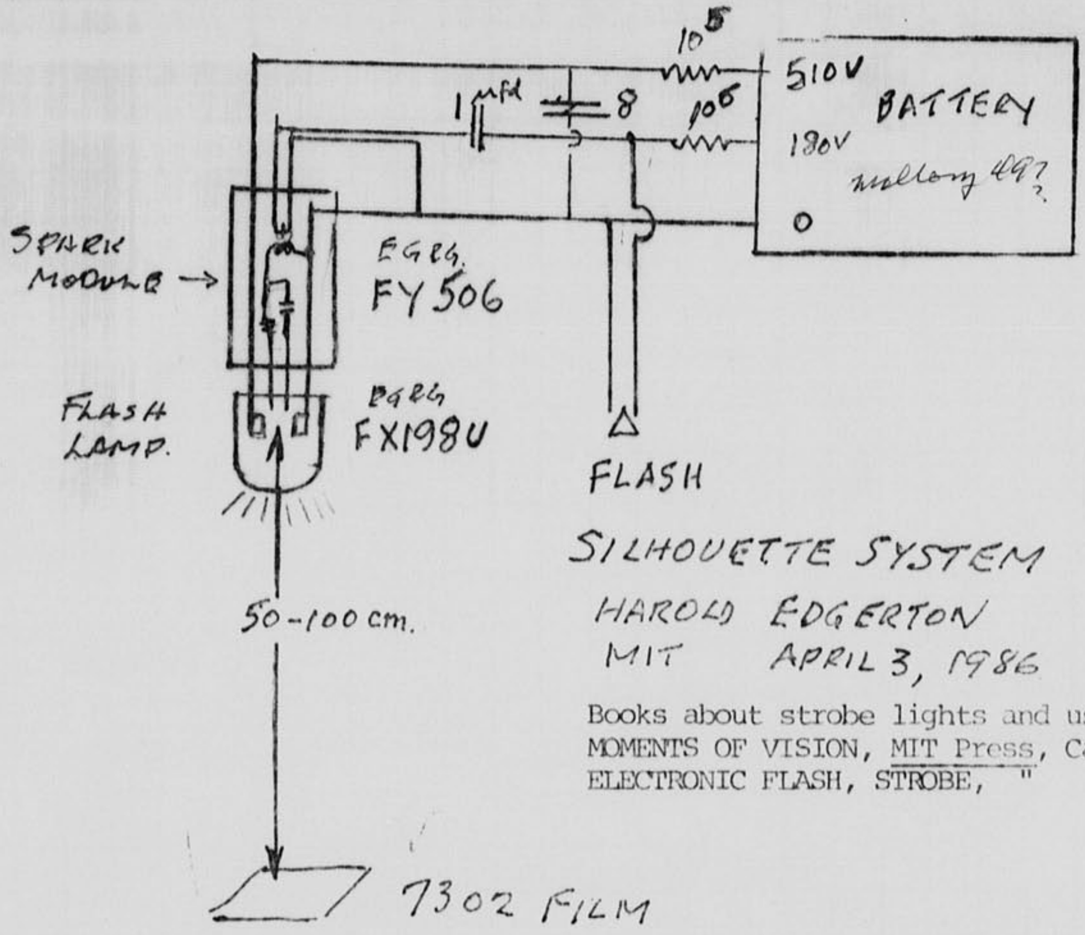
FX-193U FX7146 coil module

Both High pressure short gap metal Xeplin window
FX-193U. Starts sometimes at 900
better at 900 on scale ~~PS322~~ PS302.

#	FILM	C	V	Dist	Remarks	D	CE²/2	1.5 mm in ... rotated 1:2
#1	193U 343	18.55	900 S	50 cm	.38	.21	8 ± WS	
2	193U 343	18.55	"	40	.49	.37	"	
3	193U 343	18.5 + 20	"	40	.64	.57	20 ± WS. Lamp Stops.	
4	7302	3.55	~~500~~ 900	50	1.12	.93		
	water boundary not clear							
5	7302	8	500	50	1.07	.78	Portable.	
6	7302	8	500	70			Portable	
	H_2O boundary + Hypo							
7.	7302	3.55	900	70				
	Drops Hypo into water.							

MAR 30 1986 EASTER MT AUBURN POND 11 am.

#	Film	C	V	Dist	Remarks
1	343	~~38~~ 3.55 mfd	900V	50 cm	No apparent? Put in bottle Ok.
2	7302	~~—~~ 3.55	"	50	Dark - Plankton in water? lots of Dust in water. 1 cm thick.
3	343	38	"	50	1 copepod! 1 cm H_2O
4	343	38	"	40	Water thicker 1.5 cm H_2O



SILHOUETTE SYSTEM
HAROLD EDGERTON
MIT APRIL 3, 1986

Books about strobe lights and uses:
MOMENTS OF VISION, MIT Press, Cambridge, Ma.
ELECTRONIC FLASH, STROBE, " " "

H. Edgerton.
April 4 1986 I am scheduled to go to Lawrence Kansas tomorrow with Gus Kayafas for an exhibit and lecture about high-speed photography.
I am taking the above equipment for a demonstration plus a selection of slides.
Bob Ballard lectured about the finding of the titanic last night at the mus. of Science for the associates of MIT.

April 10 Thurs. 1986. Last night with Rowe Wells and June Wells at the ~~cont~~ ... club in Dedham.
Again a lecture illustrated with slides. Then we had ~~...~~ dinner at the country club in Brookline.

Apr 23 Wed. Lots of visitors. Mary Lou Dixon Hickory N.C.
Mary Anne Hubbard N.C.
Rosemary " N.C.
Bob Edgerton Portland.
Nina Edgerton "
Ellen Dixon MIT Seminar.

May 8 1986 H. Edgerton

Herbert and Margot Sander from Frankfurt Germany were here on the Tues 8.

Lunch at WGBH: Henry Becton and 3 staff presented
adventure
World coverage
Special etc.. programs for 1986 and 7
Wide Screen movies · Subjects are important.

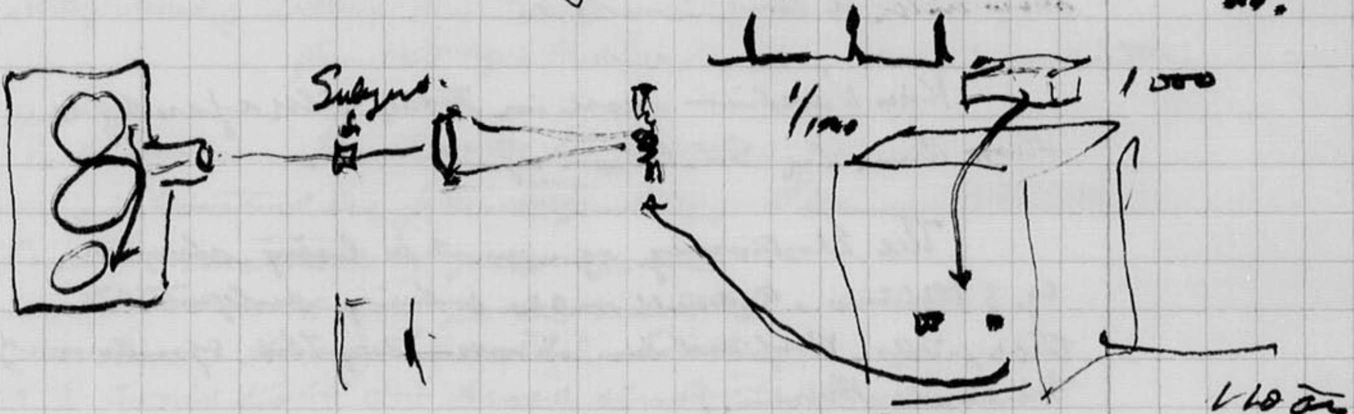
May 13 Lobsters

KARI LAVALLI } Bo
DIANA BARSHAW

ASTHOR POTAT. Teaching asst 1985-6. Strobe Lab.

MAY 13 1986 M.I.T.

KARI LAVALLI - BOSTON UNIVERSITY MARINE PROGRAM, MBL 548 3705 521
Diana Barshaw - Boston University Marine Program, MBL Woods Hole MA



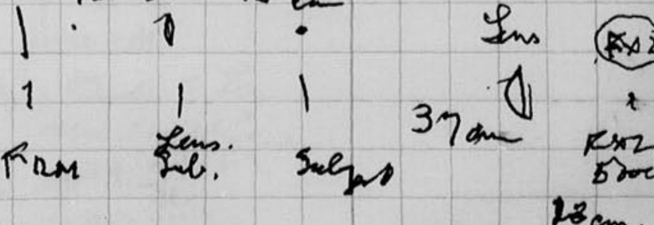
5302 film. Pos.

#1. 60 cycles. Ei Comments 1. Focus soft
2. Image too small
F.O. mfd, Low Power
Exposure OK.
Suggestions, 1. Constraint. Smaller field.
2. Adjust focus - (diastolic)

#2. Enlarged (mistake). f 5.6 500 cycles
out of focus
f22 8, f1 220

4th stage Lobsters copepods.

#3. 500 cycles, F11 ~~[illegible]~~
in focus - can see copepods!



 MAY 23 1986 MIT 4-405 Harold Edgerton

I went to the M.B.L Marine Biological Laboratory - (Wed) on May 21 - at noon: Karin Lovell & Diana Barstow.] M.B.L. Woods Hole Mass.

and ran the strobe at 1000 per sec. to get a series of photos. The lobster was 1" long and did not move!

I lectured on Wed May 21 at noon. Slides were shown of strobe circuits etc.

A lecture by Rudy Strickler was presented at 4 pm - I attended, He showed movies and slides.

"Summer School Registration" 22 as of May 23.

Chas Miller and wife Jean had a car accident in Charlottesville Virginia last week. He is home now with a broken rib etc.

Kim Vandiver came in today with a family to show them the Soliton equipment.

The Electronmag equipment is being shown by 3 Italians. A small radio is being subjected to the fields. Prof Melcher is operating the equipment; — usual Boom!

Monday Decoration Day Lynn and Dick are here from Florida for a few days. We went to the Wayside inn ~~last~~ yesterday for a big lunch!

June 2 1986 Ellen Dixon graduated at MIT in the rain. Her mother Mrs Mary Lou Dixon came up from Hickory N.C.

Ellen and Mary Lou left for a trip in Ellen's car stopping at Pontiac to see Bob's family and Rietta Lanes family in Kentucky.

June 11 1986 Harold Edgerton.

Esther and I returned from ~~Pontiac~~ Detroit air port about 11 am today. We went to Midland Mich to attend a [illegible] celebration on June 5 on Republic air line. The air port is called Bay City / Saginaw.

My talk was in the small auditorium at the Midland Art center. Some 400 people attended. [illegible] Judi Dow introduced me.

We toured the Dow Corning co to see the microscope set ups. Arnie Kolb was our host most of the time. Mrs Carol [illegible] was a guide to show us around.

After an interesting morning we had lunch at the headquarters building of the Dow Corning Co. A man [illegible] from Hastings Nebraska is a vice president.

On ~~Sat~~ Fri (2) morning I instructed 12 people who were interested in photography. I demonstrated the silhouette method of photography.

A lamp back coil are to be sent to Arnold Boston; He will build it and give it to Arnie Kolb for some students to use at a camp.

We attended a lawn party at Bob Edgerton's home in Pontiac on ~~Satur~~ Sunday morning. Some 150 people attended. Then in the afternoon Sylvia Edgerton graduated from Roper. It was a bright sunny day. Some 48 students got their degrees. Ed Haroland was one of these. He and Sylvia are good friends!

Monday June 9 at Bob's House

Tuesday morning at E.C.D. to see Bob's [illegible] [illegible]. The E.C.D. group are in a collection of buildings (more than 11).

Dinner at the Phoenician restaurant with June 10 Lora and Stanley Olshinsky, Schwartz, Bob & Ly. before the my lecture at the Institute. The hall was [illegible] Bob had put up about a dozen of my photos. I showed a tray of high-speed slides and a movie (exposed time of [illegible] [illegible] and [illegible] [illegible]: Eric, Mrs. Bob and Ly, 50 women in the audience.

ON CALYPSO
IN CUBA 1986

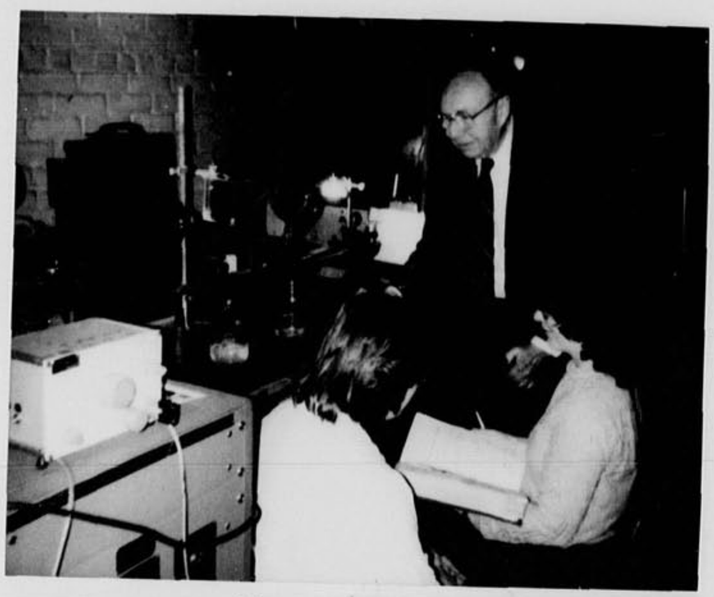
PETER MUI

HAROLD
EDGERTON

H. EDGERTON RELAXED! 83 years old

on calypso. 1986.

Diana Barshaw
Kari Lavalli
} M.B.L. Woods Hole.

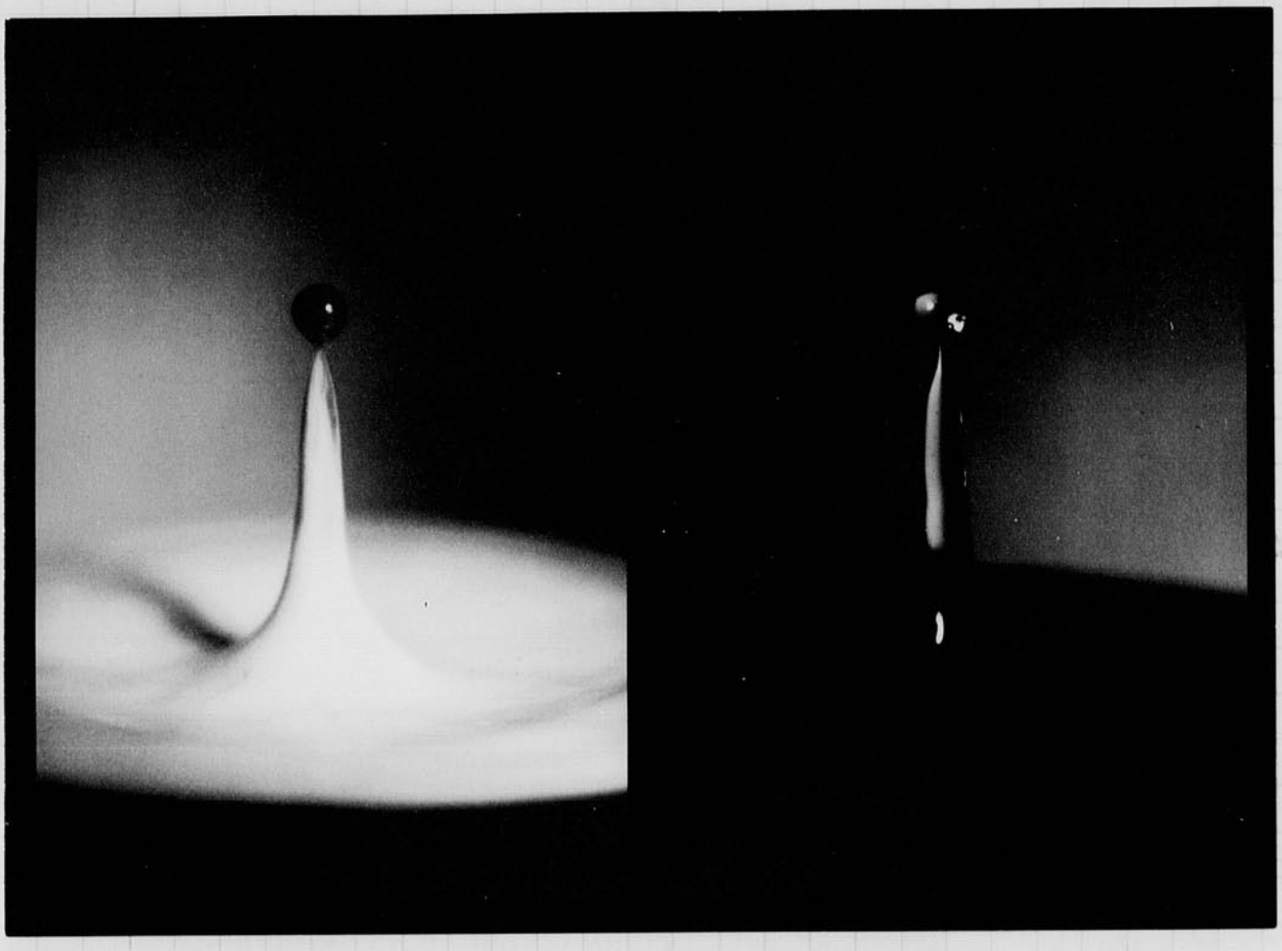


MBL March 1986 KARI LAVALLI DIANA Barshaw

Mass Ho Edgerton

FROM M.B.L.

1 cm/sec movies of Lobsters, 1" long. no action.



Cranberry juice into milk.

Water into cranberry juice.

June 14 1986 Hank Edgerton

Chas. Miller is organizing a summer High School Seminar starting next week. Some 30 to 35 people have signed up. Some of lectures during the week many visiting people will give lectures.

Roy Swanson was in yesterday. He was in the lab as a student years ago. He now works for Hewlett Packard corp Calif.

H.S. Seminar – GEWINNER

	YEAR	attendees	Date.
$84	1984	33	
$86	1985	25	
$851	1986	40	June 16 1986

Notebook # 35

Filming and Separation Record

____ unmounted photograph(s)

____ negative strip(s)

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

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

Item(s) now housed in accompanying folder.

"Rare Coins Are the Most Profitable Investment in America!"

The news is out—"Rare coins are the number-one investment in all of America." For more than three decades, rare coin investments have been providing a few smart investors with spectacular profits. Some of these investors have earned profits of more than 80 times their original investment.

What's more, rare coins have provided some of the most consistent gains of any investment. Rare coin investments stack up impressive profits in virtually every economic environment imaginable. Numerous studies have shown rare coins to be the top-rated investment over time periods ranging from 30 years, 10 years, 5 years, and 1 year, as well.

Well-respected investment publications across the country are now extolling the virtues of rare coin investments:

Rare coins--#1 for the past 10 years!

Barron's magazine—June 17, 1985

Compounded Annual Rates of Return

	10 Years	Rank
U.S. Coins	20.4%	1
Chinese Ceramics	17.1	2
Stamps	14.5	3
Old Masters	10.7	4
Stocks	10.4	5
Treasury Bills	10.0	6
Diamonds	9.5	7
Bonds	9.3	8
Oil	8.0	9
Housing	7.9	10
CPI	7.3	11
U.S. Farmland	6.9	12
Gold	6.9	13
Silver	3.5	14
Foreign Exchange	−0.6	15

Basic Data: Salomon Brothers Investment Survey, 1985

And look at the fantastic gains they made this year!

Money magazine—November, 1985

	Early October	One year earlier	12-month change
Collectables			
Coin portfolio	$36,450	$23,840	+52.9%
Stamp portfolio	$529.79	$523.54	+1.19%
Stocks			
Dow Jones industrial average	1324	1182	+12%
Food stocks	216	145	+49%
Cosmetics stocks	59	49	+20.4%
Hospital management stocks	50	57	−12.2%
Interest-bearing securities (price index)			
Long-term corporate	74.08	65.74	+12.7%
Long-term Treasury	73.94	65.85	+12.3%
Interest-bearing securities (yield average)			
Long-term corporate	11.71%	13.34%	−12.2%
Long-term Treasury	10.83%	12.38%	−12.5%
Municipal bonds	9.74%	10.47%	−6.97%
Six-month CDs	7.48%	11.17%	−33.03%
Money-market funds	7.18%	10.62%	−32.39%
Metals and currencies			
Gold (per ounce)	$326	$346	−5.8%
French franc (per dollar)	8.67	9.3	−6.77%
Japanese yen (per dollar)	237.3	245.5	−3.34%
German mark (per dollar)	2.84	3.03	−6.27%
Real estate			
Median single-family house	$77,100	$73,700	+4.61%
REIT index	104.06	103.85	+0.2%

Notes and Cautions: House price is for August. Sources: Standard & Poor's, Shearson Lehman Bros., Federal Reserve, Bond Buyer, Bank Rate Monitor, Donoghue's Money Fund Report, National Association of Realtors, National Association of Real Estate Investment Trusts, Linn's Stamp News, Numismatic Professionals. Foreign currency changes are percent gain or loss in units of the currency $1 buys.

Basic Data: Money magazine, November, 1985

Fact magazine—July/August 1985

"While investor attentions have been focused elsewhere this year, rare coins have staged an impressive rally. Coins now rate the number-one investment in FACT's exclusive Investment Report Card, over the most recent six- and twelve-month periods included."

E-91-A

Mailroom:
Limited Offer—DO NOT DELAY!

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P.O. Box E-1414, NCB-56
Minneapolis, MN 55480-9955

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IN THE
UNITED STATES

Security Rare Coin's Commitment To Professional Service

From the moment you call SRC, you are in the hands of investment professionals—serious men and women who really care about you and your investments.

OC-195

SRC's Ironclad Guarantee

Every coin purchased from SRC is completely covered by a double guarantee of authenticity and complete satisfaction. This double guarantee, one of the strongest in the industry, makes buying rare coins virtually risk free.

If you are dissatisfied with your coins for any reason, you may return them within 30 days for a full refund. SRC will pay all shipping costs.

Classic Old-World Gold

FRENCH GOLD ROOSTERS OVER 70 YEARS OLD

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Minneapolis, MN 55480-9955

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From the moment you call SRC, you are in the hands of investment professionals—serious men and women who really care about you and your investments.

OC-195

SRC's Ironclad Guarantee

Every coin purchased from SRC is completely covered by a double guarantee of authenticity and complete satisfaction. This double guarantee, one of the strongest in the industry, makes buying rare coins virtually risk free.

If you are dissatisfied with your coins for any reason, you may return them within 30 days for a full refund. SRC will pay all shipping costs.

Classic Old-World Gold

FRENCH GOLD ROOSTERS OVER 70 YEARS OLD

Order Form Inside

Three Ways to Earn the Most Profits from Rare Coins

Rare coin investment expert William J. Ulrich, Chairman of the Board of Security Rare Coin & Bullion Corp, offers these three tips on rare coin investment:

1. Purchase only original mint-condition silver and gold coins. The reason for this is simple. Rare coins minted with precious metals (silver and gold) have two ways to appreciate: 1) They make strong gains whenever silver and gold bullion prices increase, and 2) they also make strong gains from their scarcity value.

Rare coins are exactly that—"rare." They are scarce and hard to come by, and the demand for them continues to increase. The result: Rare coins continue to profit in all kinds of economic environments—even when gold and silver drop in price. But it is during times of rising precious metals prices and heavy inflation that rare coins really excel.

In the past, these kinds of conditions have provided gains for many rare coins of more than 200% in a single year.

2. Buy the highest-quality coins. High-quality coins have consistently outperformed lesser-quality coins by an incredibly wide margin. These coins are scarcer and much harder to find. The problem is that many coin companies simply don't have these kinds of coins to sell.

Fantastic Profits Ahead!

Security Rare Coin was established to provide a source of superior, high-quality investment coins—coins that have a stronger potential for spectacular gains. The high-quality coins SRC sells offer a profit potential as high as 600% and more during the next three to five years.

3. Find a reputable coin company. I've gone to great trouble to see to it that my company, Security Rare Coin, is the industry's leader when it comes to service and dependability. When you call SRC's toll-free number, you'll speak with one of our Monetary Specialists—an expert in the coin investment field. We are trained to help people honestly with their coin investments. . .to answer your questions, and never, ever to use high-pressure sales tactics. These are the cardinal rules we live by.

SRC will always insist that you take immediate delivery of your coins. We will never hold your coins for you. That is a dangerous practice that has led to grave trouble for many investors in the past.

Most important, when you purchase coins from SRC you will get an ironclad guarantee of both authenticity and satisfaction. If any coin is ever found not to be authentic, or altered in any way, they will promptly refund the entire purchase price, plus 15% interest paid from the date of purchase.

Furthermore, if for any reason you are dissatisfied with your coins, you may return them within thirty days for a full refund. It is also SRC's practice to buy back the coins at the same grade at which they were sold. And we will even pay the shipping costs.

In short, there is absolutely no safer or more profitable way to purchase rare coins than by calling Security Rare Coin.

"While the profits earned on rare coin investments in the past have been great, every market indicator I've seen points to even more spectacular gains in the future. There has never been a better time to acquire high-quality rare coins than right now."

William J. Ulrich

Financial Analyst/Chairman of the Board
Security Rare Coin & Bullion Corp

SECURITY RARE COIN & BULLION CORP
600 Shelard Plaza North
Minneapolis,
Minnesota 55426

Market Analysis

Specifications:

Purity: .900 Gold
Gold Weight: .18 troy ounces
Mint: Paris, France
Diameter: 21 mm
Type: "Rooster"
Dates: 1907-14

Rating:	**Fair**	**Good**	**Superior**	**Outstanding**
Scarcity			✓	
Liquidity				✓
Quality				✓
Safety				✓

Projected Growth Potential (Next 3 to 5 years):	*Premium Grade** (MS 63 +):	Mint Grade (MS 60 +):
	475% to 725%	300% to 400%

**Most highly recommended for investment purposes.*

ORDER FORM: Detach This Card And Mail Today!

YES! I want to take advantage of the fantastic profit potential of French Gold Roosters. Please rush the following original mint-condition coins to me. I understand that if I am dissatisfied with my coins for any reason, I may return them within 30 days for a full refund. SRC will pay all shipping costs.

Original Mint-Condition
French 20-Franc Gold Roosters

Coins And Rolls	*Premium Grade* MS 63+ Quantity	Price*	Mint Grade MS 60+ Quantity	Price*	Subtotal
Single Gold Coins	_____	$ 155	_____	$ 120	$_____
5-Coin Mini-Rolls	_____	$ 765	_____	$ 595	$_____
10-Coin Half Rolls	_____	$1,525	_____	$1,185	$_____
20-Coin Full Rolls	_____	$3,045	_____	$2,365	$_____
				TOTAL:**	$_____

* Prices subject to change without notice.
** Minnesota residents add 6% sales tax.

☐ Enclosed is my check/money order for: $ _____

Please Print:

NAME _____

ADDRESS _____

CITY_____ STATE_____ ZIP_____

PHONE (_____) _____ (_____) _____
Area Code Daytime Area Code Evening

My SRC Monetary Specialist is: _____

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AK and MN: (612) 593-0533 collect.