

HAROLD E. EDGERTON

PAPERS

MC 25

Series III

Laboratory Notebooks

Number 9

Dated April 18, 1938 to June 12, 1939

M.I.T.
~~HARVARD~~ UNIVERSITY

COMPUTATION BOOK

NAME

HAROLD E. EDGERTON

Number

9.

Course

Used from APRIL 18 1938, to JUNE 12 1939

HAROLD E. EDGERTON
M. I. T. Cambridge, Mass.

HARVARD UNIVERSITY

COMPUTATION BOOK

GENERAL INSTRUCTIONS

The purpose of this book is to provide a systematic method for the computation of the elements of a system of linear equations. The book is intended for use by students in the Department of Mathematics, Harvard University, and by other students who are interested in the subject.

The book is divided into two parts. The first part, which is the main part of the book, is devoted to the derivation of the formulas for the computation of the elements of a system of linear equations. The second part, which is a shorter part of the book, is devoted to the application of these formulas to the solution of a system of linear equations.

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HARVARD UNIVERSITY

Cambridge, Mass.

BANTAM 12372 LENS
5382833 SHUTTER

HARVARD UNIVERSITY

COMPUTATION BOOK

GENERAL INSTRUCTIONS

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

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

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

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

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

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

* * * * *

HARVARD CO-OPERATIVE SOCIETY

Cambridge, Mass.

Harold E. Edgerton
Cambridge Mass.
M. I. T. Room 4-111.

April 18, 1938.

April 18 1938
H. E. Edgerton.

minutes

In Washington D.C. on duty as a naval reserve officer. At 9:30 in the morning I met Commander Homer Graf in his office. After an hour or so we were taken by auto to the Belvoir Research Laboratory. There I met the following

Capt. H. M. Cooley Director
Comd. Swenson asst.
Dr. Ross Gunn Tech. advisor and head of mechanical section.
Dr. Harvey Hayes Sound
Dr. E. L. Dubbert Optics
T. Borgstrom Chem
R. H. Canfield Metal

Geo. Brown working on spark photography.

Dr. Gunn took me around the laboratory and spent the entire day with me.

April 21 1938.

On Apr 19 I went to Annapolis with Mr. and Mrs. Homer Graf in their car. We left the Navy Dept at 9:30 in the morning. While at Annapolis we spent several hours at the experimental station. I met there

Capt Cox.

Comd Marcus Hutchinson

Lt Sims - doing experimental work on the measurement of sound of fans.

Jochim? Diesel engine man.
and several others.

There is a mercury arc stroboscope (G.R. type) at this station and they asked some questions concerning its operation. Apparently it is used quite a bit. I advised them to get an argon filled lamp for their work which is all at low speeds.

The diesel engine man wishes to take pictures of piston rings through a glass port in the cylinder wall of an experimental engine. I advised him to try to use the stroboscope with extra condensers.

On Wednesday April 20 I went with Mr & Mrs. Graf in their car to Dalgreen, Va., 100 miles from Washington. Here the guns and ammunition are tested for approval.

I met Col. J.H. Carson, a class mate of Graf.

Dr. L.T. Thompson - in charge of the physical test section. Thompson was a student of Webster of Clark University at Worcester Mass. He is from Michigan.

Dr. N. Riffolt. Physicist. - working with resistance pressure gage which works without an amplifier. The gage is put in the end of the gauge guns.

Dr. Storer. Physicist from Gettysburg Pa. trained at Michigan.

I spent a very interesting day inspecting the various work that they were doing at this proving ground.

Dr. Thompson has a program in mind for the study of the impact of projectiles on armor plate using 3" projectiles instead of the large ones.

I suggested the use of single flash photography and Thompson asked me to send him details on how to obtain equipment for their use.

I mentioned the possibility of measuring the distortion in the large guns due to the pressure in them.

Thompson wishes to try the method on small tubes, to measure the distortion

Apr 21 1938
H. Eggert

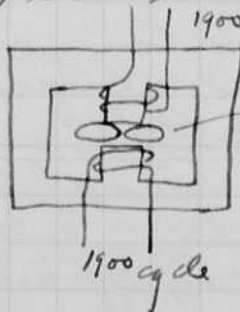
On Tuesday evening Apr. 19. I called on Mrs. Jenkins and she let me see her late husband's high speed camera. Mrs. Clark, Jenkins former secretary was there with her husband to show the camera and also ~~the~~ some of the films. Mrs. Price, Mrs. Jenkins companion and son were there also.

One reel of pictures were shown including Bobby Jones swinging a golf club, some divers, pigeons in flight. The camera took the pictures at 200 times normal speed. They were very good.

Apr. 22, 1938.

Yesterday, I spent most of my time at the Washington Navy yard. I left Commander Graf's office at 10 am or shortly thereafter in a Navy car. Lt. Conrad met me and also Commander Sexton. First we looked Capt. Eggert for permission to inspect the work at the Navy yard.

Lt. R. D. Conrad is in the structural section and showed me the testing department. Mr. S. E. Dawson was engaged in making a vibration recorder of the "Dayhart" type, illustrated below.



two coils in air gap with opposing emf at the center position. A voltage will be induced when coil is off center, thus recording displacement.

This equipment with a photographic recording method is to be used in Boston in about a month by Commander

Sexton (Strip - Ralph Talbot - radder).

Comd. Sexton showed me a high speed (960)/sec. camera for photographing a propeller model in a pressure tank. A stereoscope was used for observation. Mr. Bowers ran the apparatus. A section showing H_2O going around a corner was shown to me. This is the same as Lewis plans to use in the tunnel here.

21

Circulation

Mr. K.E. Schoenherr (MIT Graduate) was operating the carriage on the towing tank and I met him.

Mr. Kaye - Photographic Dept - Vacuum paper holder.

{ Lt. Kell - now in Boston Navy Yard.

{ Comd. Gayheart " " " " Philippine islands on duty

McGoldrick Physicist interested in stereophotography.

Apr 21 1938
H. Eggert

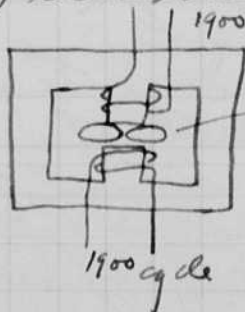
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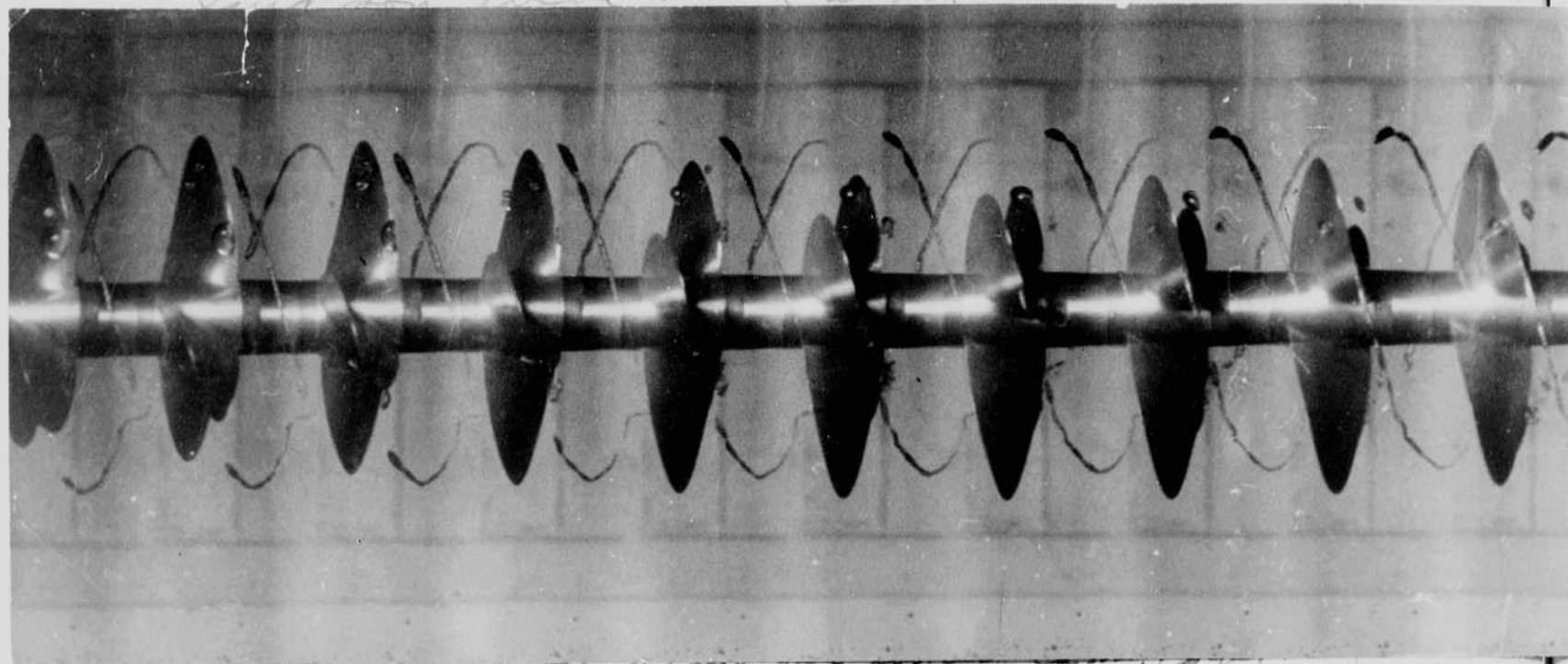
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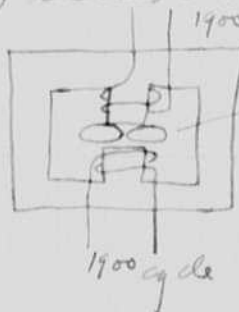
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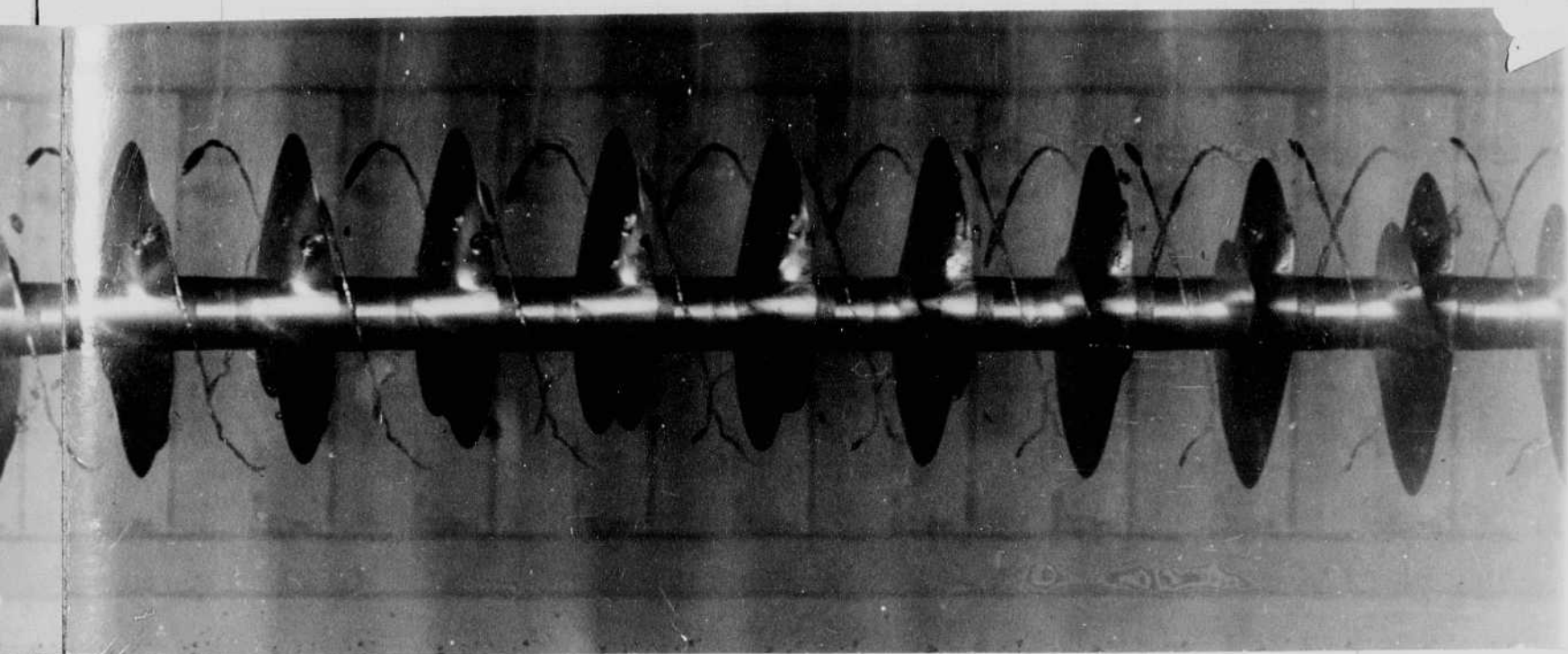


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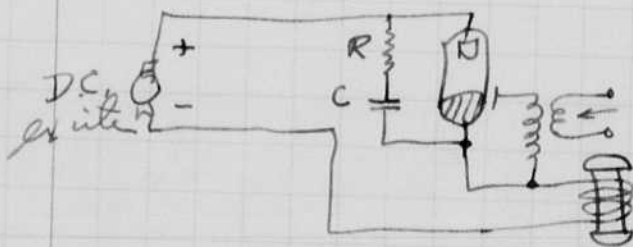
April 24 1938
 David S. Edgerton

Yesterday morning I went to the navy yard and had a medical exam.

On Friday several students tried out the single flash unit, microplume control, for open house.

Nelson and Caldwell have been working for several weeks with the motor synchronizer that I wired up some time ago. They installed it on a synchronous motor in the laboratory.

The above could not use an ignitor or band ignitor tube for a field relay since the current built up too slowly. The following circuit should overcome this difficulty as the condenser current would keep the spot in operation.



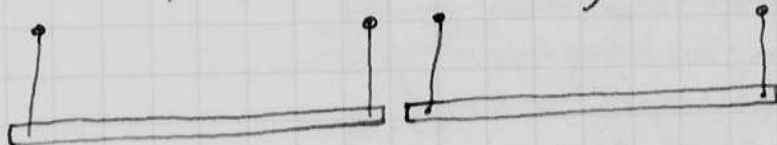
R needs to be large enough to prevent a back surge of current which might put the tube out.

April 26, 1938.
L. S. Edgerton

meas of Dynamic stress.

This morning I discussed with Strasser and Prof. ReForest the meas. of stress by the resistance strip method. Several methods of obtaining a violent stress were discussed.

1. A method now used is to impact two long bars of the same length.



At impact the wave goes through both parts and is reflected back to the ~~other~~ hit end.

2. Dynamite caps on end of bar or between bars as they hit.
3. Bullet fired into rod shaped specimen.
4. Reduce cross section of bars above in 1 so that stress is increased.

I suggested the photo graphic method of measuring the elongation, recording the time of photo on the film.

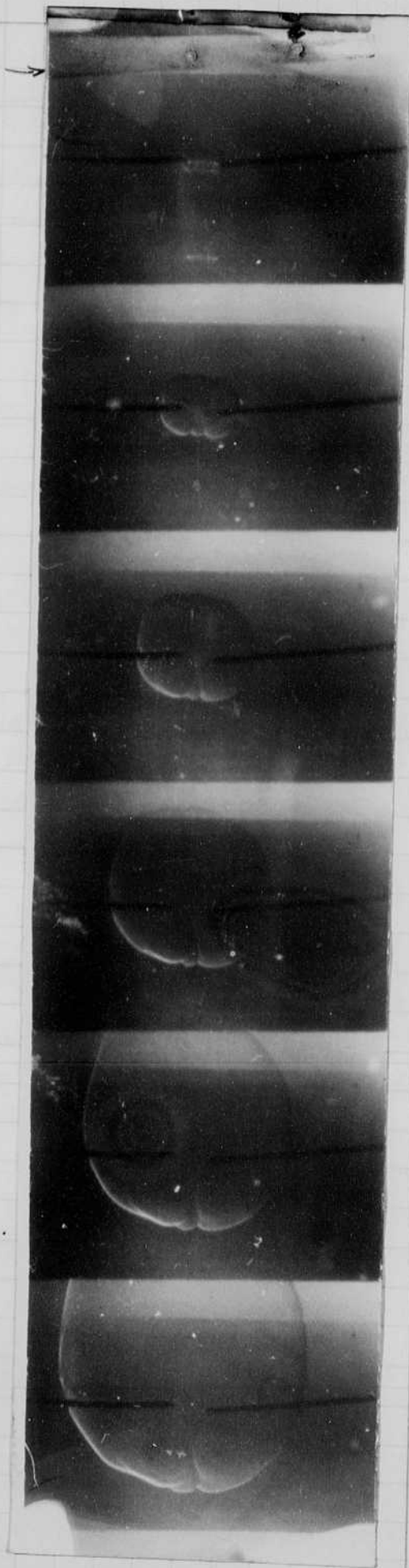
1. Single flash photo timed with sound pickup

2. moving film record with continuous light from a small ball bearing set in surface or from a turned knife edge.

initialing
spark here →

960/sec.

Silhouette movies
of an explosion
in a mixture of
gas and air.



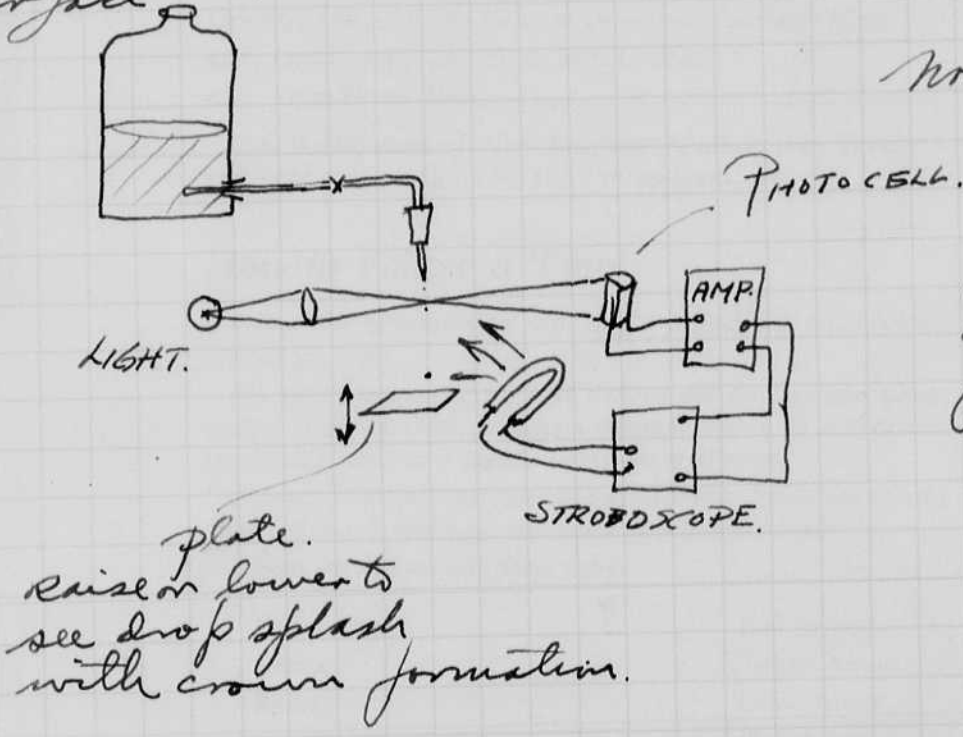
May 2, 1938.

M.I.T. open house last Saturday Apr. 30. There was the usual large crowd here.

High speed movies were shown in 10-250 by Mr. Franckel (?) and Mr. Bursing (?) seven times to a full house.

In room 4-111 we had ~~at~~ a water jet driven by a vane pump. 1000 pulses a minute. The stroboscope built by Grier recently ~~is~~ being used for light. X-Kr lamp 500 volts 2 mf. driven by the stroboscope.

I also set up the following for observing the splash of a drop on a surface.



Norman Li

- Kenneth Gerneshansen
- Fred Barstow
- Joe Kettleby
- Herb Grier
- Sheridan
- Algor.

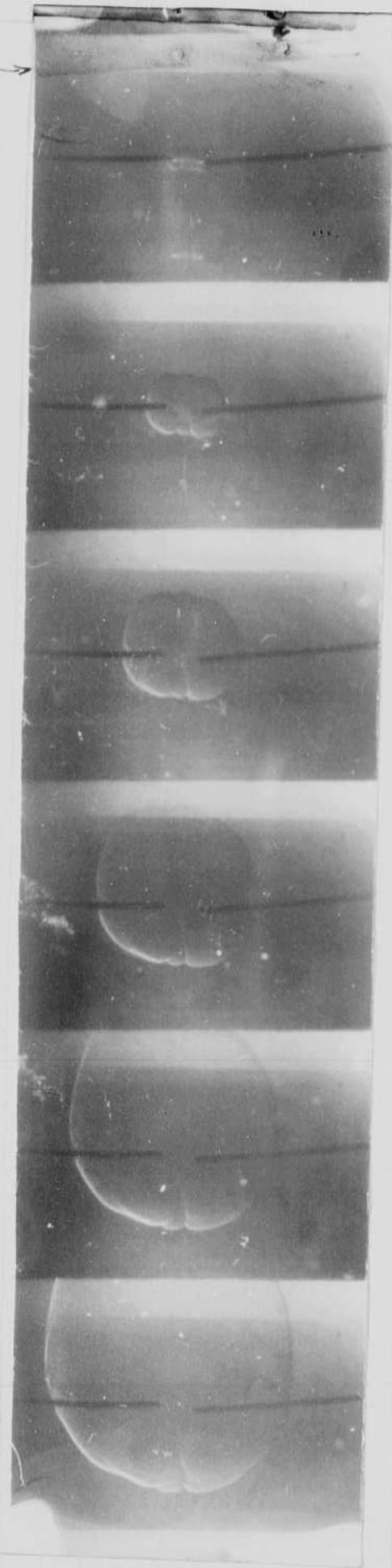
My mother, Mrs. F. E. Edgerton left this morning after a week visit, via the "Colonial" at 9 am on the N.Y. N.H. & Hartford. She will stay a week with my sister Mrs. Welch Pogue 216 Summit Ave Summit N.J. before returning to Aurora, Nebraska.

Mr. Robt Swan Hingham BYMC Camera Club came in today and gave me two pictures that he took Sat at open house with our high speed lights.

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spark here →

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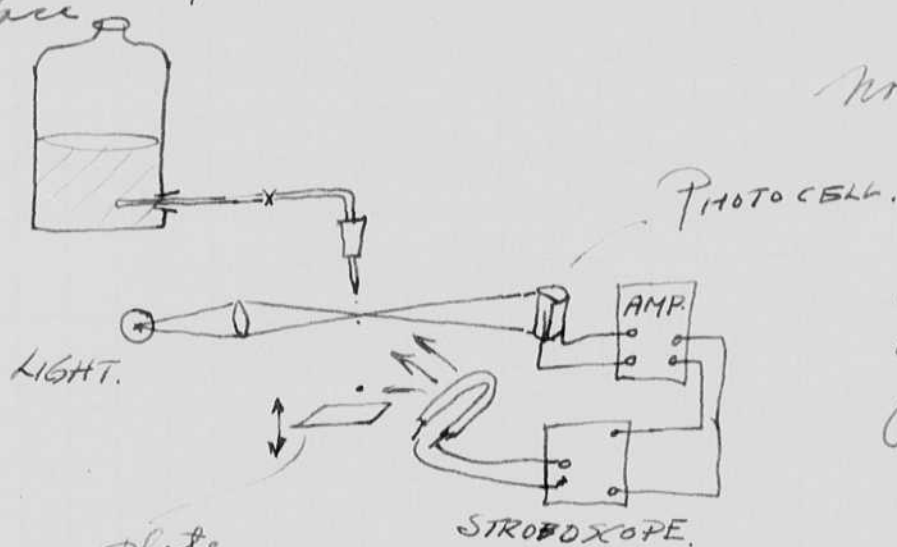


plate.
raise or lower to
see drop splash
with crown formation.

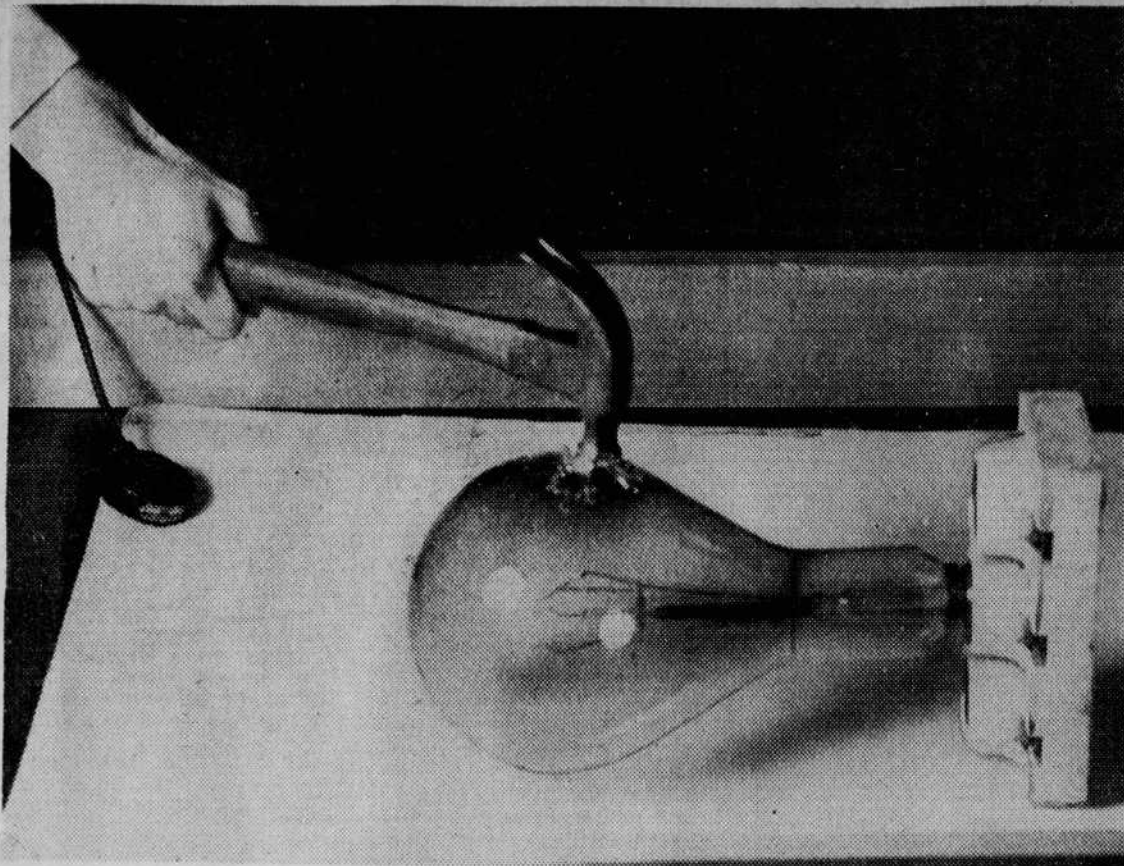
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UNUSUAL PHOTOGRAPH TAKEN AT M. I. T. OPEN HOUSE



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This remarkable stop-action picture was taken with a standard newspaper photographer's camera yesterday at the Massachusetts Institute of Technology's Open House. The secret lies in the Edgerton lighting equipment which M. I. T. scientists operated for the public for the first time. Thus visitors who brought their own cameras could make split-second action pictures which the ordinary apparatus could never catch.

25,000 ATTEND
TECH OPEN HOUSE

Marvels of Modern Science
Exhibited

More than 25,000 persons, one of the largest crowds in recent years, visited the Massachusetts Institute of Technology yesterday to see the pageant of modern science and engineering presented at the 14th open house.

All the institute's 26 acres of laboratories and equipment were in operation throughout the afternoon and evening with the various departments staging additional exhibits of special research projects.

Although the program was not officially opened until 2 P. M., many visitors invaded the apparatus-packed laboratories several hours earlier while others, fascinated and wondering, extended the scheduled 9 P. M. closing by nearly two hours.

The exhibits, more varied and comprehensive this year than ever before, ranged from colonies of termites at work on a piece of timber to giant turbines, from microscopic bacteria to huge ore crushing machines, from tiny electrons to the tremendous electrostatic generator.

One of the major centers of interest was the electrical engineering laboratory where M. I. T. scientists had set up the ultra-high-speed photographic apparatus and for the first time operated it for the public so that visitors who brought cameras could take their own split-second action pictures.

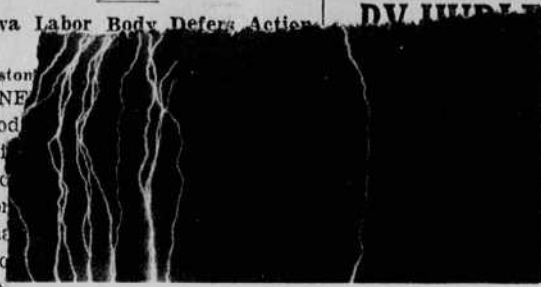
AMERICAN AS ILO HEAD
MAY OFFEND JAPAN

Geneva Labor Body Defers Action

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TREES PLANTED

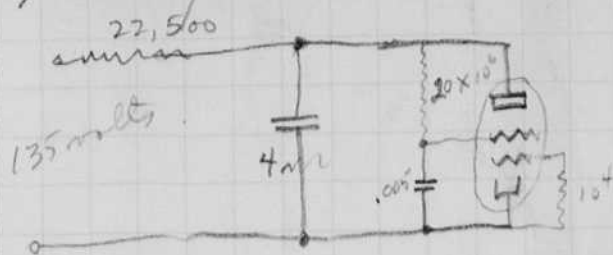
BY ILLINOIS



PROGRAM

MASSACHUSETTS
INSTITUTE OF
TECHNOLOGY
14TH ANNUAL
OPEN HOUSE

May 4 1938
H. B. Sedgwick



traffic beacon.

Photocell control.

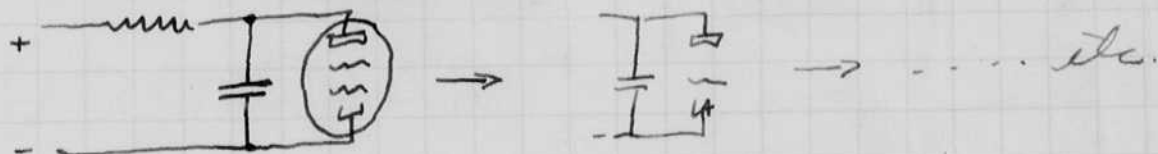
If light shines on the cathode there is photo electric current which puts the lamp out.

In day light the beacon does not operate.

May 5. 1938.

Progressive sign using tubes

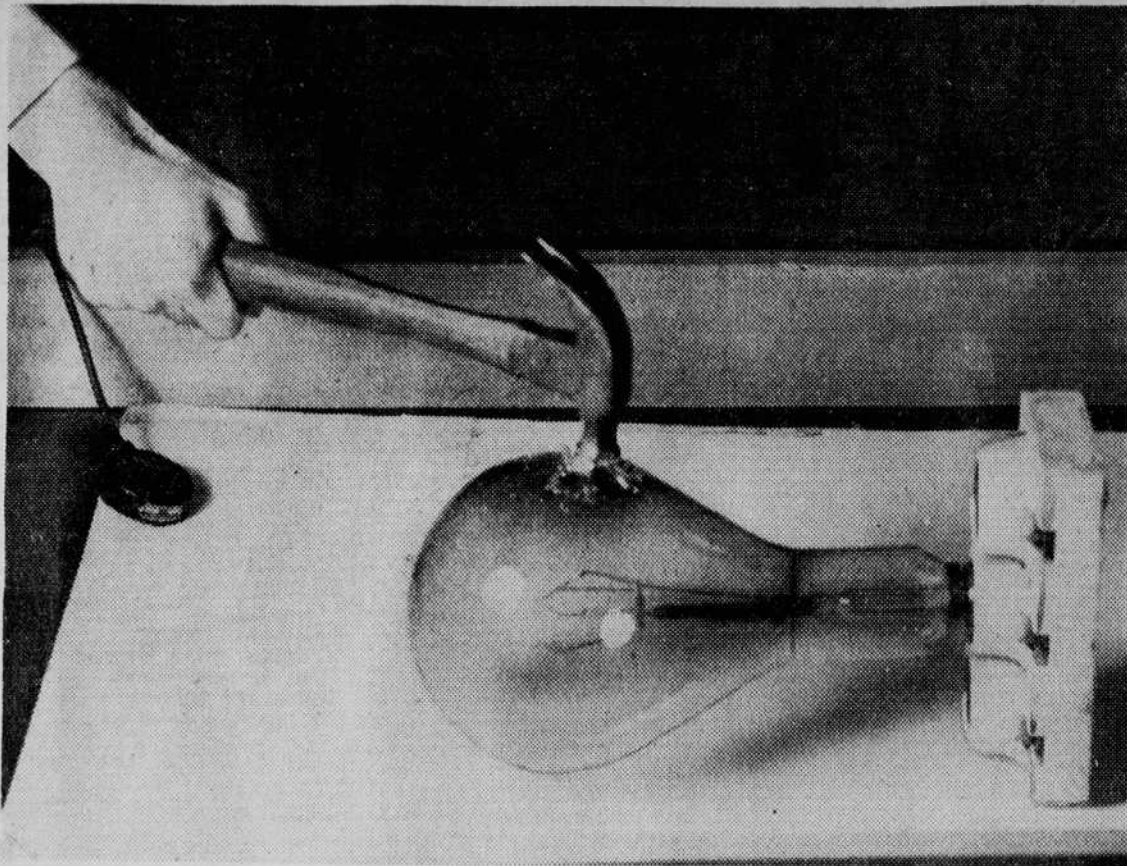
The idea is to connect up a series of tubes so that they go on progressively from one end.



Each lamp stays on after starting.

The same method can be used with AC.

UNUSUAL PHOTOGRAPH TAKEN AT M. I. T. OPEN HOUSE



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Exc carat two

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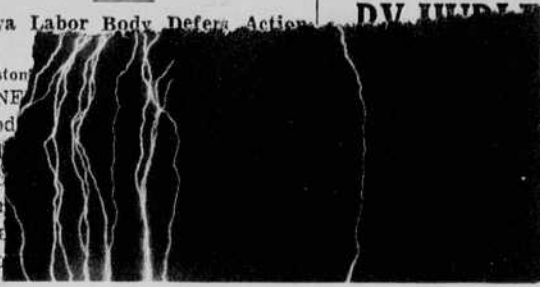
AMERICAN AS ILO HEAD MAY OFFEND JAPAN

Geneva Labor Body Defers Action

(Boston) GENE ing bod organ by dec cussion resign direct Office, May groups most time But be Ass ant of ciate land. if Was to have Phel easier TO ILO a many opposi the U that would threat Wina anese

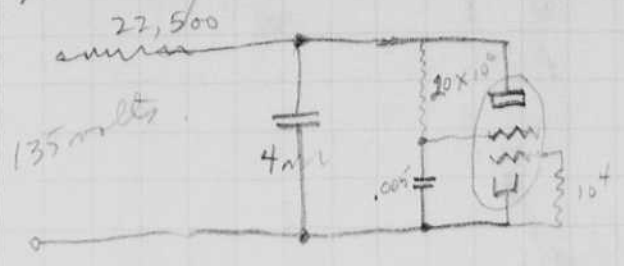
TREES PLANTED

BY JURY



PROGRAM <<< MASSACHUSETTS >>> INSTITUTE OF >>> TECHNOLOGY TENTH OPEN HOUSE

May 4 1938
H. B. Edgerton



traffic beacon.

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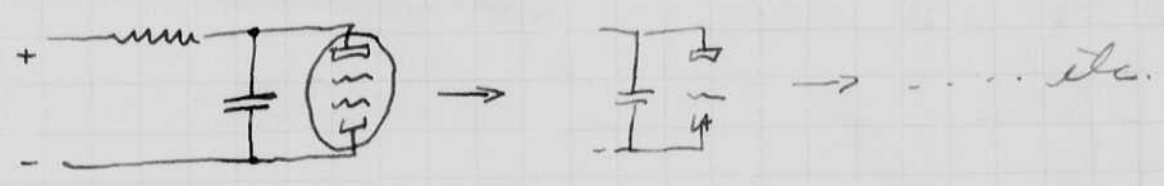
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In day light the beacon does not operate.

May 5. 1938.

Progressive sign using tubes

The idea is to connect up a series of tubes so that they go on progressively from one end.



Each lamp stays on after starting.

The same method can be used with AC.

PROGRESS OF WAR ON CANCER TOLD

Osteopaths New York Official Talks to

The authorities last night sent out notices of rejection of applications to the last batch of hopefuls who had sought apartments in \$7,000,000 government project but who were found to have incomes too large or were otherwise disqualified.

Why, it's a regular delight to work in this kitchen. I never knew housework could be such fun. People who say this place is like the coziest little home any woman ever dreamed of. Twenty more families are to move in tomorrow. There were many sighs yesterday and many more are expected today. John Carroll, a member of the Massachusetts housing commission and a prominent labor man, led a delegation of 75 union leaders, chiefly representatives of the building trades, to the site yesterday for a tour of inspection.

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Testing New Gadgets

While wives and mothers tried out gadgets that made cooking a thrill instead of a task, husbands and fathers sat in spic-and-span living rooms reading under scientific lighting and smiling as they realized that their families not only had warm rooms but that somebody else was tending the fires.

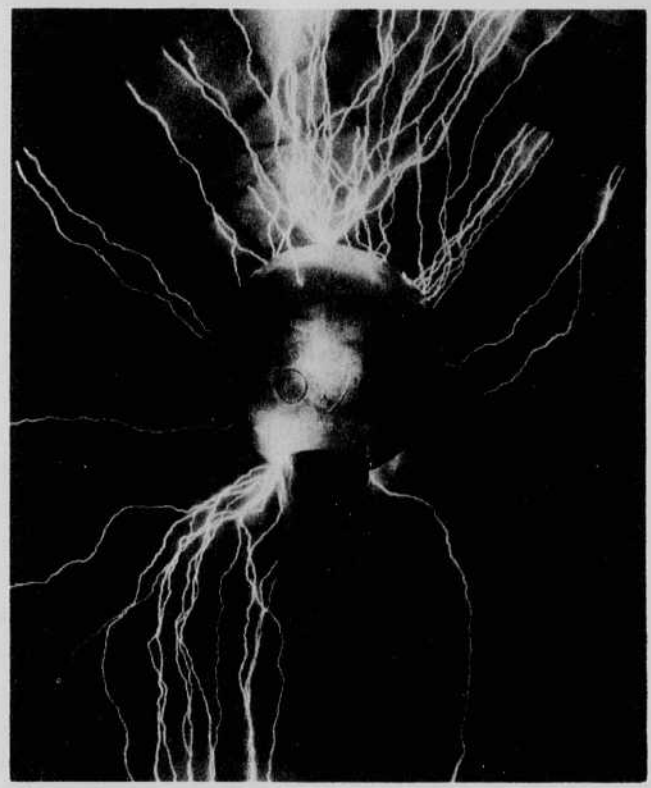
Happiest of all, it may be, were the children who couldn't look out a window yesterday without seeing a boulevard, park sites or beaches. Year-old Margaret Bacon, an infantile paralysis victim, who up until yesterday slept on a studio couch in an attic living-room in Roxbury, with the family bathtub close by, "A paradise," "divine," "regular sunshine would mean life to her."

Margaret's doctor said sea air and regular baths would mean life to her.

ACCEPTED BY NAVY

NEW LONDON, Ct., April 30 (AP) —The U. S. navy added the submarine Seal today to its fleet of fighting craft.

as 40 families moved into the 1016-family Boston, instructing Mrs. William J.



PROGRAM <<<

APR 30 MASSACHUSETTS

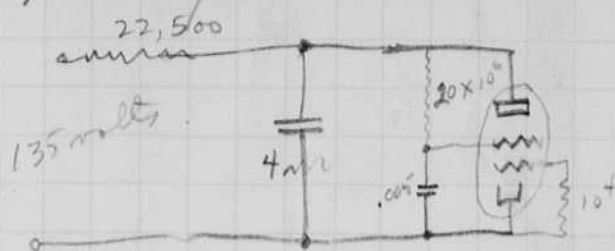
1 9 3 8 >>> INSTITUTE OF

TWO TO >>> TECHNOLOGY

NINE

FOURTEENTH OPEN HOUSE

May 4 1938
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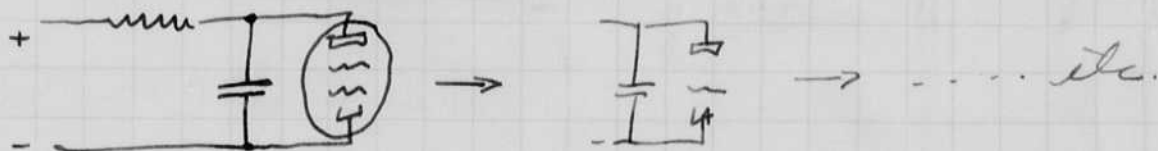
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OFFICE OF THE PRESIDENT

In throwing open its doors to the public on its Open House Day, the Massachusetts Institute of Technology continues a tradition that has yearly become more significant, for while interested visitors are always welcome, there is no other time at which the entire institution quits all other work and devotes itself to demonstration and explanation of its manifold activities.

More than four hundred research projects are in progress, ranging from studies of the new Cape Cod Canal and design of large commercial electric power networks to following microbes into textile fibres or measuring spectrum wavelengths of light to the hundred billionth of an inch. The public interest in these demonstrations is proved by the average attendance of about 25,000 visitors.

A unique feature of Open House is the fact that it is handled from start to finish by the students themselves. The faculty stands by for advice if requested, but it is essentially the students who show their institution to their friends. In fact, many faculty members remark that they learn more about the Institute on Open House Day than in any other way.

On behalf of my colleagues I support the invitation extended by our students to prospective students, parents and all other citizens of the community who are interested in the progress of technology or in M.I.T. as an institution devoted to education and research.

Karl T. Compton
President

Engineering

"TIME BY THE STARS," Astronomical surveying, Roof of Building 1 (stairway between 1-345 and 1-375)—Structures laboratory, Simultaneous equation machine, Bridge models, Trusses—Soil mechanics, Retaining walls—Surveying—Highway and railroad transportation—Seismology, Earthquake reproductions on miniature scale—Aerial photography—Hydraulic demonstration, Lecture Room 1-390—Working model filtration plant.

MATERIALS TESTING of rope, concrete, wood, and brick—Machine tools—Steam engines, Diesel engines, Otto engines, Gasoline engines—Automotive laboratory, Engines, fuels, vibration testing—Movies of Rope and Cordage Manufacture, Room 3-270.

Insulation exhibits, types, methods, and relative qualities of insulations—**TERMITES AND A DEMONSTRATION OF THEIR DAMAGE**—Material preservatives—Timber connectors, laminated wood, tropical woods—Study of modulus of elasticity of plywoods—Demonstration of permeability of concrete, Tightness of brick walls, workability of mortars.

Science

700,000 VOLT ELECTROSTATIC GENERATOR IN OPERATION—SPECTROSCOPY, 35-foot diffraction grating, Vacuum spectrograph, Gas discharges, Automatic comparator—New light sources—**PHOTOELECTRIC MOUSE-TRAP—COLOR ANALYZER**—Optical phenomena—X-ray and fluorescence, Crystal diffraction—Cosmic ray counters—Cloud chamber making visible cosmic ray paths—**GLASS BLOWING**—Oscillograph making the voice visible—Polarized light.

Production of "Cold Light," Room 4-270 at 3.00, 5.00, 7.30—Dyeing of carnations—Radioactivity—Supersonic vibrations—Inorganic, Analytical, Organic, and Physical Chemistry Laboratories—The Chemical Elements—Gas analysis—Combustions in steel analysis—Chemical experiments and lectures.

Physics Lectures and Demonstrations, Room 10-250, every hour on the half-hour.

Glass Blowing Demonstration, Room 6-120, 3.15, 4.45, 7.45.

EXHIBITORS WELCOME YOUR QUESTIONS

10

PROGRESS OF WAR ON CANCER TOLD

Doctors who advise patients to "eat heartily" and "keep their spirits up" are being told that such advice is "out of date." The progress of war on cancer is being told in a new book, "The Progress of War on Cancer," published by the American Cancer Society. The book is a collection of articles by leading cancer specialists, and it is the first book to deal with the progress of war on cancer. The book is a collection of articles by leading cancer specialists, and it is the first book to deal with the progress of war on cancer. The book is a collection of articles by leading cancer specialists, and it is the first book to deal with the progress of war on cancer.

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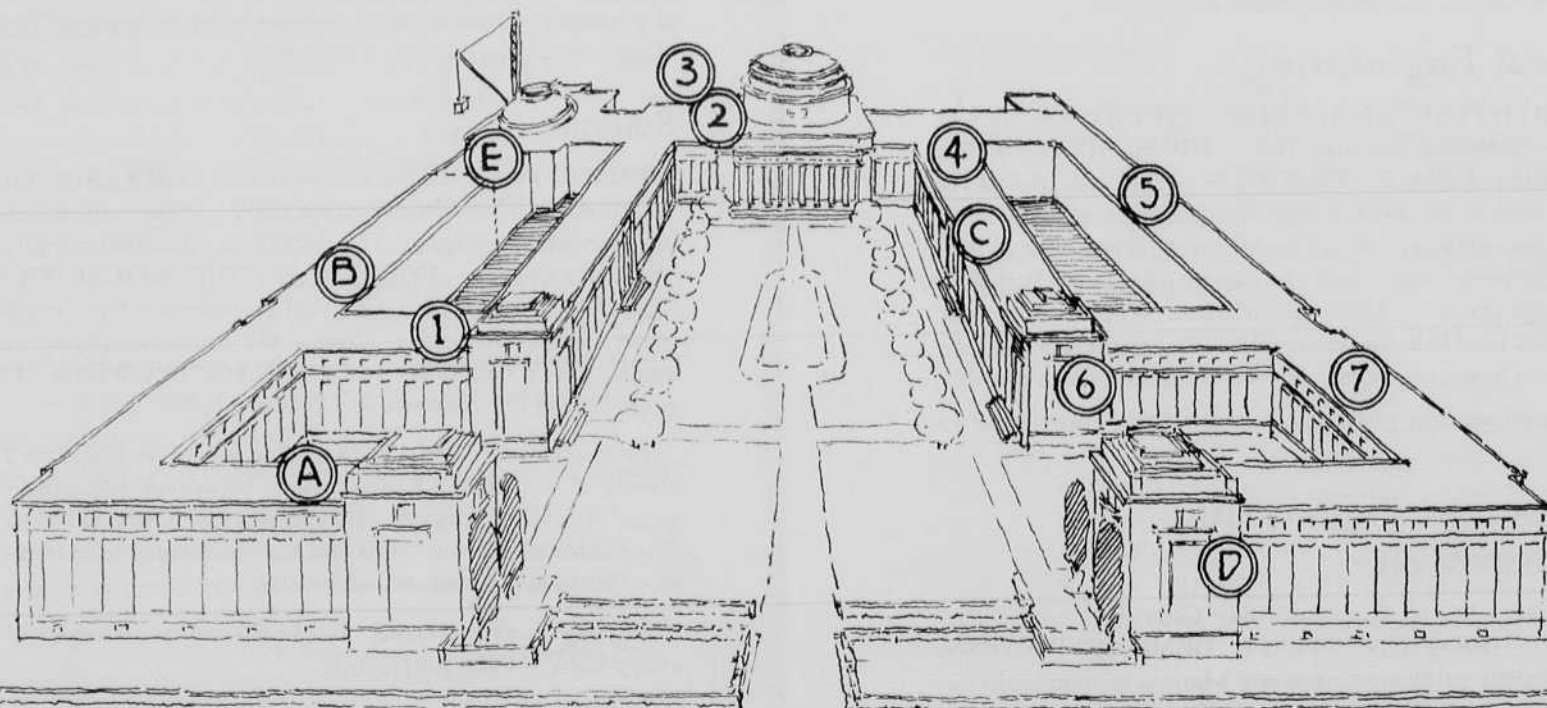
The "Tours"

1. Engineering—Mechanical and Civil
2. Electrical Engineering
3. Biology and Biological Engineering
4. Metallurgy and Mining
5. Science—Chemistry and Physics
6. Chemical Engineering
7. Architecture

The "Spots"

- A. Business Administration
- B. Naval Construction
- C. Geology
- D. Mathematics
- E. New Architecture Building,
under construction—not open.

THE NUMBERED CIRCLES ON THE BUILDINGS SHOW THE LOCATION OF THE CENTERS OF THE VARIOUS GROUPS INTO WHICH THE EXHIBITS ARE DIVIDED



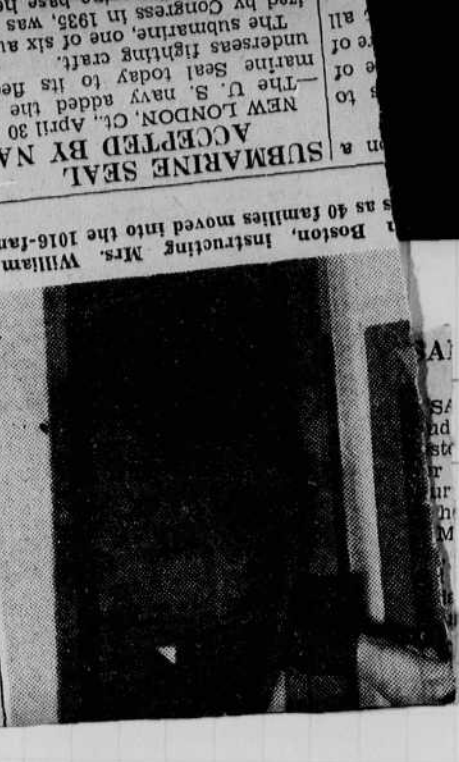
THE GUIDES ARE FOR YOUR CONVENIENCE

EXHIBITORS WELCOME YOUR QUESTIONS

PROGRESS OF WAR ON CANCER TOLD

New York Official Talks to
Osteopaths
who advise patients to
use words and phrases used by the
delight," were some of the descrip-
"A paradesse," "divine," "regular
sunshine would mean life to her."
Margarit's doctor said sea air and
with the family bathtub close by.
an attic living-room in Roxbury.
yesterday slept on a studio couch in
the paralytic victim, who up until
year-old Margaret Bacon, an infant
Happiest of all the children was 12-
boulders, park sites or beaches,
\$7,000,000 government project b
who had sought apartments in
tions to the last batch of hope
out notices of rejection of applica
The authorities last night sent
tion.
site yesterday for a tour of inspec-
tives of the building trades, to the
union leaders, chiefly representa-
bor man, led a delegation of 75
ing commission and a prominent la-
member of the Massachusetts hous-
are expected today. John Carroll, a
sightseers yesterday and many more
in tomorrow. There were many
Twenty more families are to move
home any woman ever dreamed of.
are crazy. I've got the coldest little
say this place is like an institution
work could be such fun. People who
in this kitchen. I never knew house-
"Why, it's a regular delight to work

ACCEPTED BY NAVY
NEW LONDON, Ct., April 30 (AP)
The submarine, one of six author-
by Congress in 1935, was deliv-
all
of
of
of
to
to
on a
SUBMARINE SEAL
Boston, instructing Mrs. William J.
as 40 families moved into the 1016-family



PROGRESS OF WAR ON CANCER TOLD

New York Official Talks to Osteopaths

The authorities last night sent out notices of rejection of applications to the last batch of hopefuls who had sought apartments in \$7,000,000 government project in large or were otherwise disqualified.

The authorities last night sent out notices of rejection of applications to the last batch of hopefuls who had sought apartments in \$7,000,000 government project in large or were otherwise disqualified.

Why, it's a regular delight to work in this kitchen. I never knew people who could be such fun. People who say this place is like an institution are crazy. I've got the coziest little home any woman ever dreamed of. Twenty more families are to move in tomorrow. There were many sighs yesterday and many more are expected today. John Carroll, a member of the Massachusetts housing commission and a prominent labor man, led a delegation of 75 union leaders, chiefly representatives of the building trades, to the site yesterday for a tour of inspection.

The authorities last night sent out notices of rejection of applications to the last batch of hopefuls who had sought apartments in \$7,000,000 government project in large or were otherwise disqualified.

ACCEPTED BY NAVY

NEW LONDON, Ct., April 30 (AP) — The U. S. Navy added the submarine Seal today to its fleet of 100 submarines, one of six authorized by Congress in 1935, was delivered here by

delight," "were some of the descriptive words and phrases used by the "A paradise," "divine," "regular sunshine would mean life to her. Margaret's doctor said sea air and with the family bathtub close by. an attic living-room in Roxbury, yesterday slept on a studio couch in the paralytic victim, who up until year-old Margaret Bacon, an infant Happest of all the children was 12-boulevard, park sites or beaches. a widow yesterday without seeing the children who couldn't look out Happest of all, it may be, were tending the fires.

rooms but that somebody else was their families not only had warm ing and smiling as they realized that rooms reading under scientific light-fathers sat in spic-and-span living instead of a task, husbands and gadgets that made cooking a thrill While wives and mothers tried out TESTING NEW GADGETS before.

never even had running hot water magazine advertisements, and some ultra-pictures in newspapers and yesterday came from conveniences were

Biology and Public Health

Anatomy — Embryology — Bacteriology — Food preservation — Chemistry of drinking water and milk — Fermentation — Electrocardio-tachometer for measuring heart beat — Diatoms and their uses — Air analysis for bacteria and poisonous gases — Destruction of materials by organisms — Biochemistry of human fluids — Yeast production — Blood flow in animals made visible — Sewage purification plant.

Chemical Engineering

COLLOIDAL CHEMISTRY EXHIBITS AND DEMONSTRATION — Working model of illuminating gas producing plant — Milling and curing of rubber — Demonstration of streamline and turbulent flow of fluids — Manufacture of nitric acid by the Electric Arc Process — Frasch Process for mining sulfur — Corrosion of metals — Chemical Engineering operations, adsorption, evaporation, heat transfer — Flame distribution models of furnaces.

Electrical Engineering

DIFFERENTIAL ANALYZER — NETWORK ANALYZER — Television demonstration — HIGH SPEED PHOTOGRAPHY DEMONSTRATION — Operating dial phone system — Vacuum tube construction — Insulation breakdown — Police telephone demonstration — Selsyn motor drive — Photoelectric relay control — Thyatron voltage control — Carrier telephony — High fidelity sound reproduction — Radio burglar alarms — Power transmission by radio — Polarized light for automobiles — Transmission of sound by light waves — Generators, motors, transformers, mercury-arc rectifiers.

High speed motion pictures, Room 10-250, every hour on the hour.

Business and Engineering Administration

Thorne-Loomis Bus for European Tour — Colored Movies of European Tour — MOTION STUDY DEMONSTRATION, Showing Methods of Eliminating Waste Motions in Industrial Processes — Comprehensive Exhibit of Business Charts.

THE GUIDES ARE FOR YOUR CONVENIENCE

Metallurgy and Mining

IRON BLAST FURNACE IN OPERATION — GOLD STAMP MILL — X-ray radiography — Crystal structure of metals — Fusions and cupellations in analysis of precious metals — Booth electric arc furnace — High-frequency induction furnace — Photomicrography, Alloy structures resulting from different heat treatments and compositions — Magnet steels, Directional properties of magnetism — Ceramics — Lead ore separation by flotation — Wilfley shaking table — Movies of petroleum production.

Naval Architecture and Marine Engineering

MUSEUM OF SHIP MODELS — Making Models for Performance Tests — Marine Transportation — Alumni Activities.

Mathematics

Collection of slide rules — Mathematical models — Calculating machines — Games, puzzles — Integrators — Mathematics laboratory.

Lecture by Prof. D. J. Struik, "The Historical Development of Mathematics," Room 2-170 at 3.30, 7.00.

Lecture by Prof. N. Wiener, "Games of Chance and Probability," Room 2-170 at 4.30, 8.00.

Other Exhibits

Model of the Cape Cod canal — Welding shop — Forging shop — Heat measurements laboratory — Air conditioning laboratory — Amateur Radio Station WIMX — Geology museum — Chemical warfare demonstration — Coast artillery guns — Glider — Van de Graaff's Electrostatic Generator — Printing exhibit — Graphic explanation of Architectural Education — WIND TUNNEL DEMONSTRATIONS — Testing airplane wing ribs — Meteorological weather maps and instruments.

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EXHIBITORS WELCOME YOUR QUESTIONS

The Young Engineers' Society

THE GUIDES ARE FOR YOUR CONVENIENCE

- Engineering
- Science
- Biology
- Chemical Engineering
- Electrical Engineering
- Metallurgy
- Architecture
- Business Administration
- Naval Construction
- Mathematics
- Geology

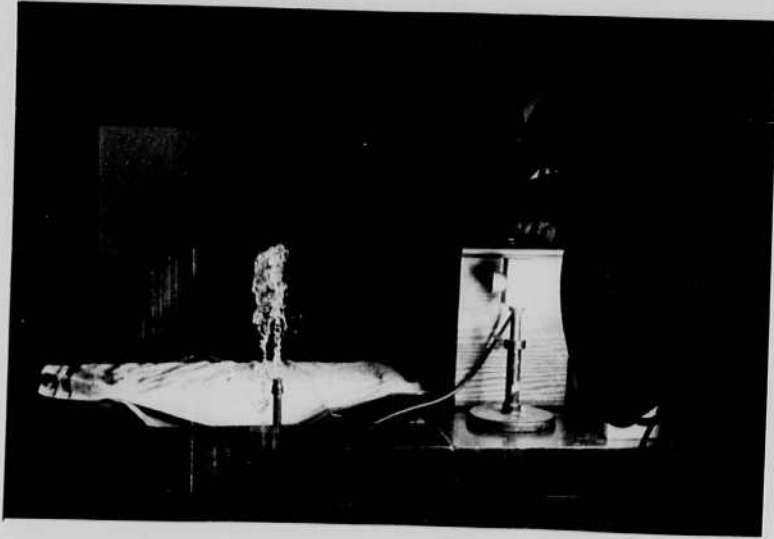
Follow the arrows—they will help you find the exhibits that interest you most. For your convenience we have divided our displays into eleven groups. Each of these presents a different branch of science and engineering. And each one has a sign that is different. Choose the subject that appeals to you. Then follow the colored arrow. You will find your visit much more worth while! Groups are marked with these signs:

How to Follow a Tour

9:00 Open House closes.
 The Association of New England Mathematics Teachers will hold a meeting at M. I. T. throughout the day.

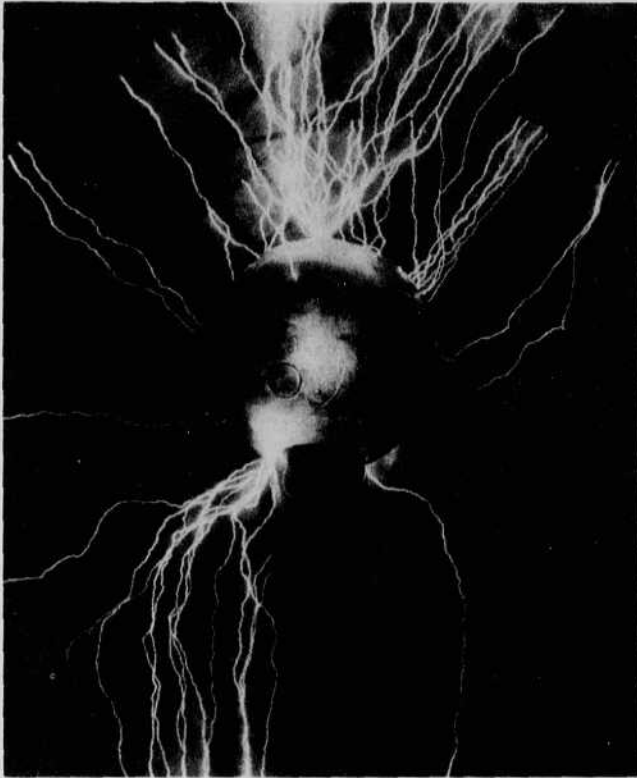
Official Talks to Osteopaths
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Janet S. Edwards
May 7 1938

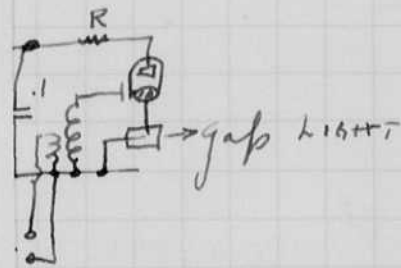
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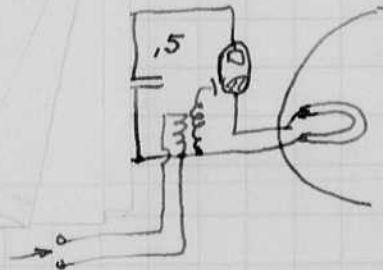
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1938 >>> INSTITUTE OF
TWO TO >>> TECHNOLOGY
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FOURTEENTH OPEN HOUSE

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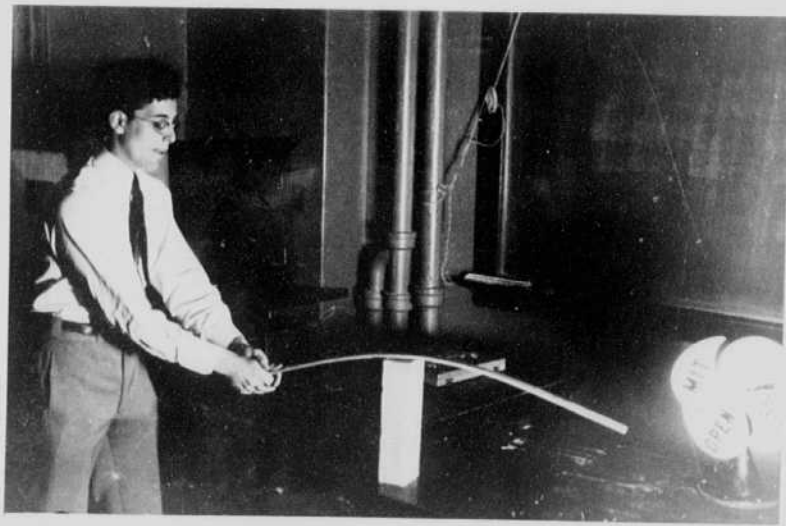


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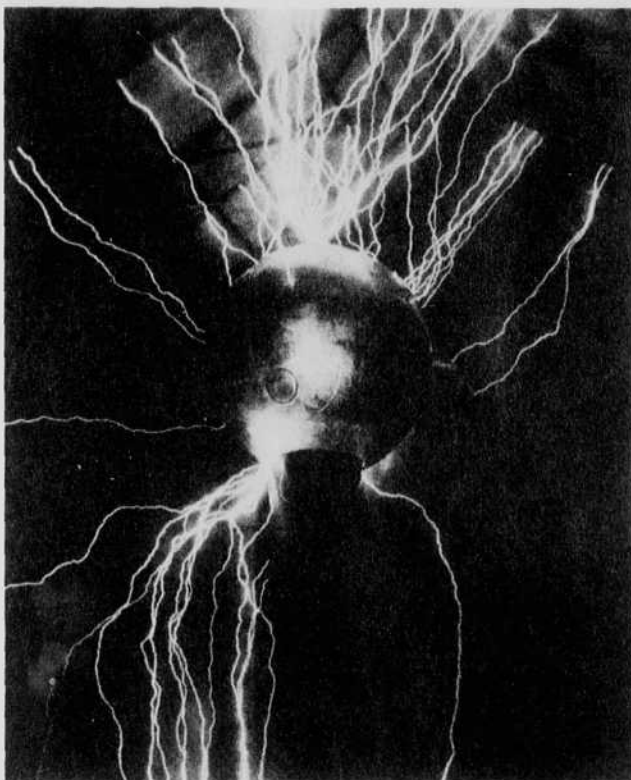


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Janet E. Elgort
 May 7 1938

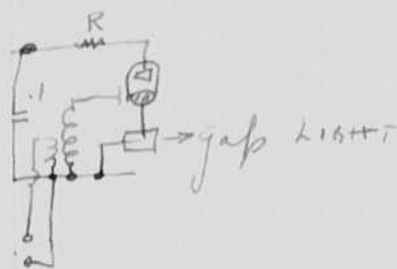
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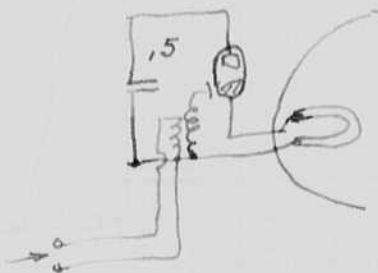
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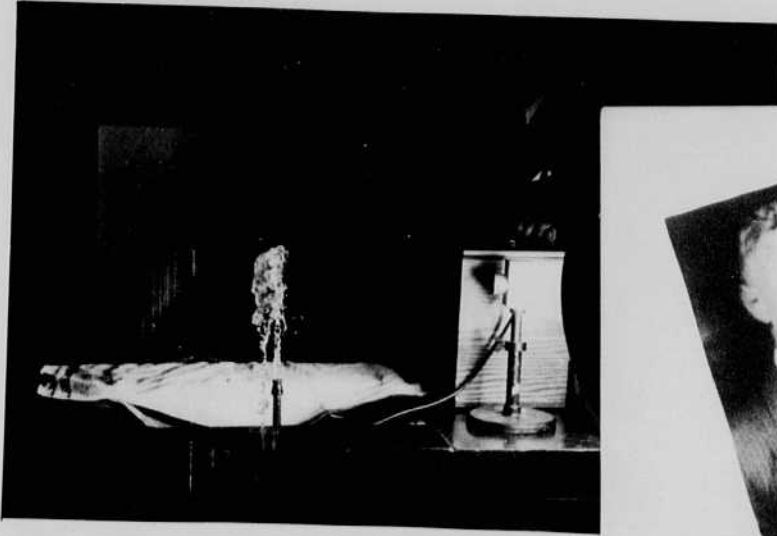


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3. Reflected light - large area.



OFFICE OF THE PRESIDENT

In throwing open its doors to the public on its Open House Day, the Massachusetts Institute of Technology continues a tradition that has yearly become more significant, for while interested visitors are always welcome, there is no other time at which the entire institution quits all other work and devotes itself to demonstration and explanation of its manifold activities.

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May 7 1938

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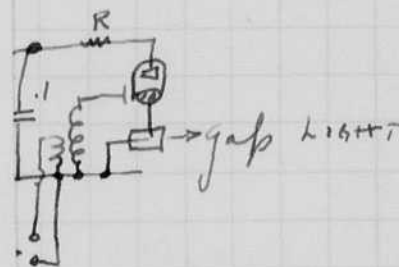
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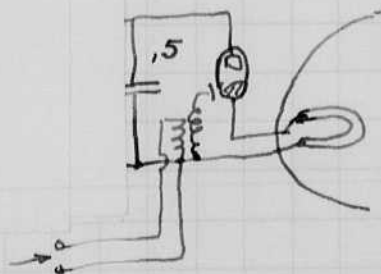
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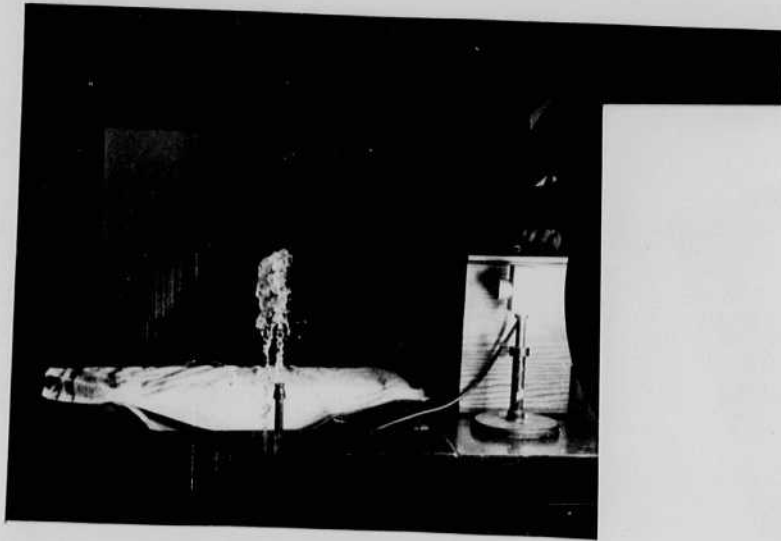
EXHIBITORS WELCOME YOUR QUESTIONS



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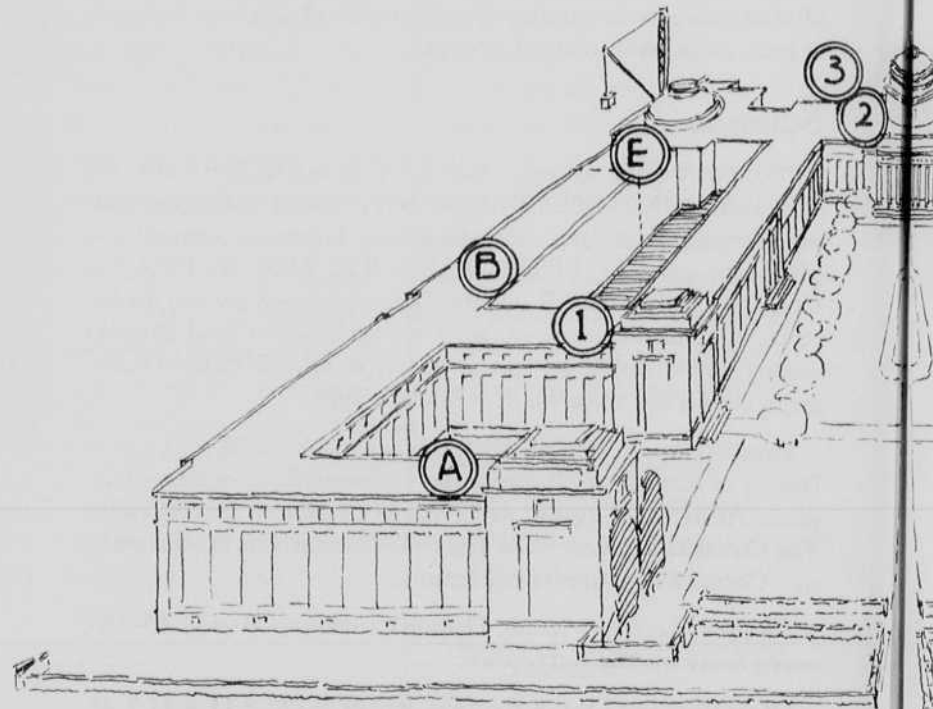
3. Reflected light - large area.



• • • *The "Tours"* • • •

1. Engineering – Mechanical and Civil
2. Electrical Engineering
3. Biology and Biological Engineering
4. Metallurgy and Mining
5. Science – Chemistry and Physics
6. Chemical Engineering
7. Architecture

THE NUMBERED CIRCLES ON THE BUILDING
CENTERS OF THE VARIOUS GROUPS



THE GUIDES ARE FOR YOUR CONVENIENCE

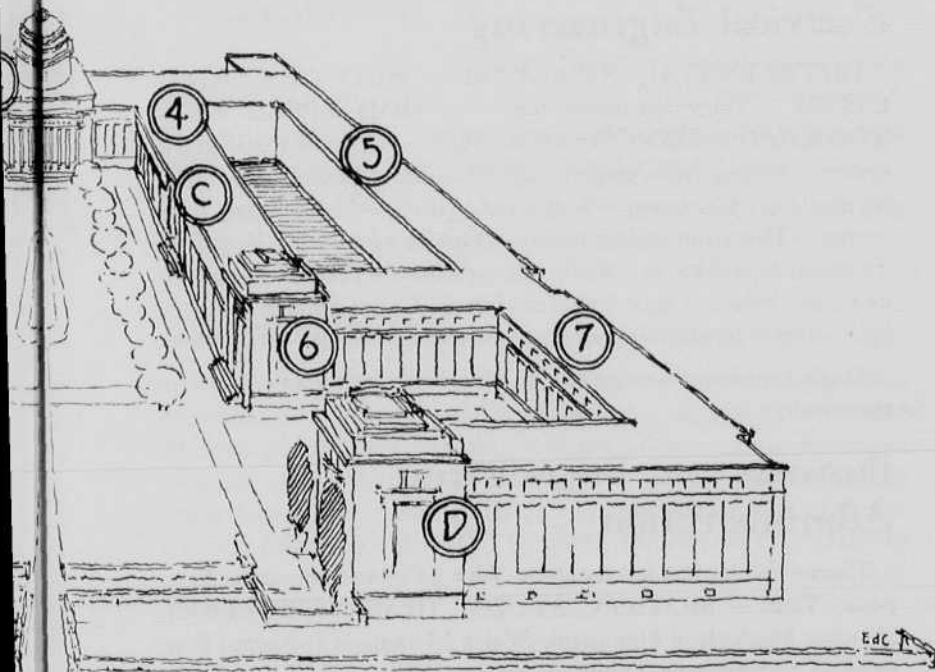
Janell Edgerton
May 7 1938

Photographic equipment for Dolgner Co.

• • • The "Spots" • • •

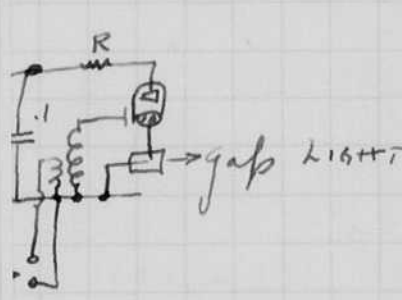
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- B. Naval Construction
- C. Geology
- D. Mathematics
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 under construction — not open.

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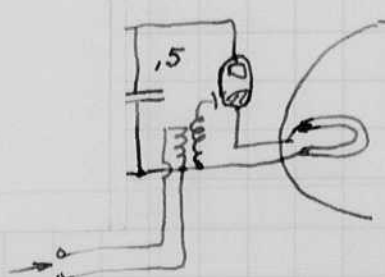
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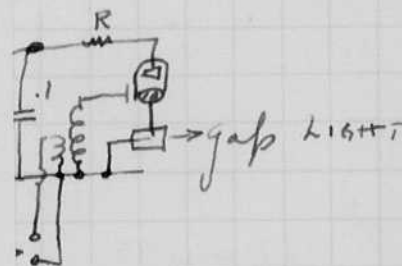
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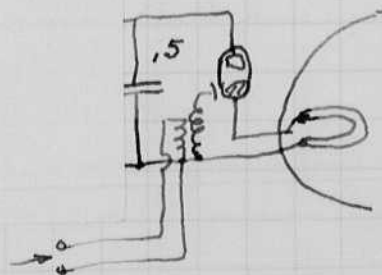
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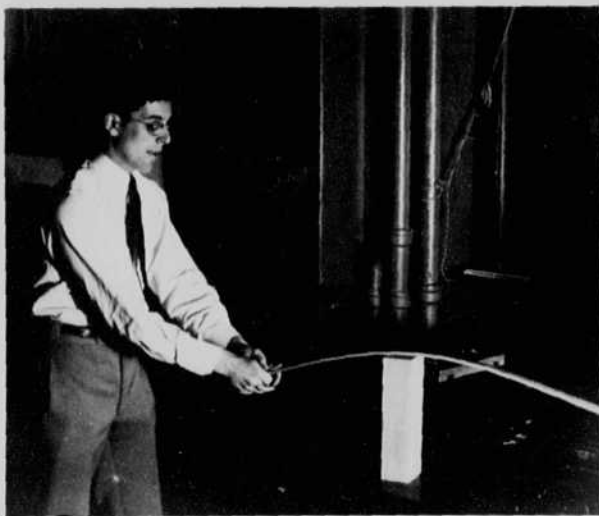
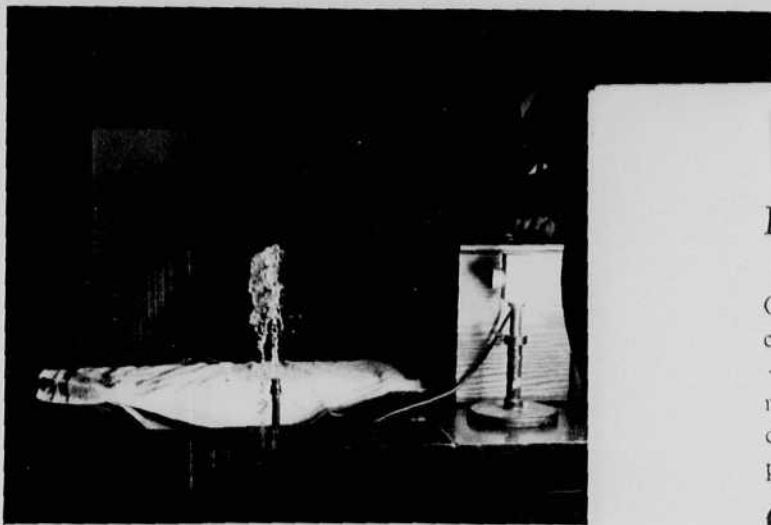
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Time Schedule

- 2.00 Open House begins.
- 3.00 Crew Race between Harvard, Rutgers and M. I. T.
- 3.00 Track Meet between Tufts, Boston University and M
- 3.30 Glee Club Concert in the Gymnasium of Walker Mem
- 4.00-5.00 Reception by Heads of Departments in their Office
- 8.00 Debate with Connecticut State College.
- 9.00 Open House closes.

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- Engineering
- Science
- Biology
- Chemical Engineering
- Electrical Engineering
- Metallurgy
- Architecture
- Business Administration
- Naval Construction
- Mathematics
- Geology

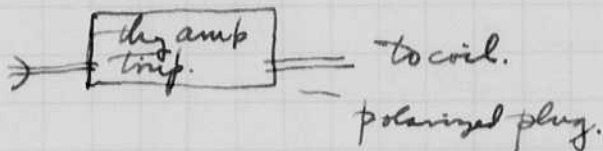
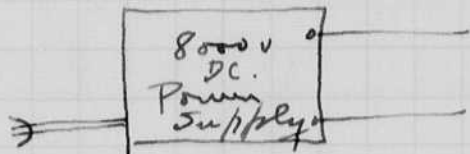
- Red Arrow
- Yellow Arrow
- Green Arrow
- Blue Arrow
- Orange Arrow
- Brown Arrow
- Purple Arrow
- Red Circle
- Blue Circle
- Purple Circle
- Yellow Circle

THE GUIDES ARE FOR YOUR CONVENIENCE

*The Murray Point
Kendall Square*

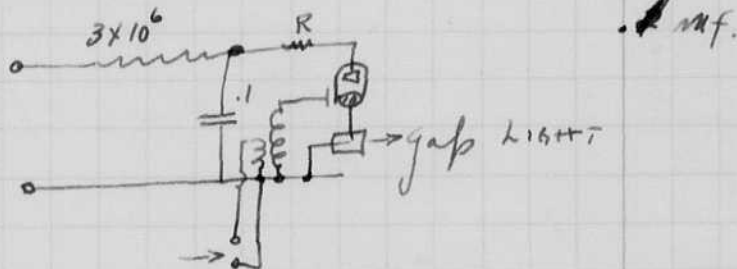
Janet Edgerton
May 7 1938

Photographic equipment for Dolgner v.

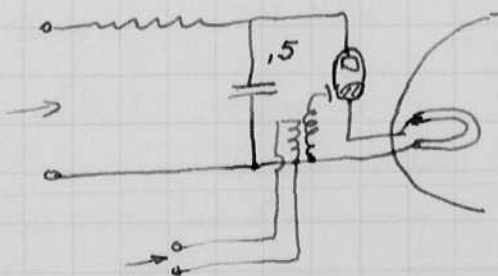


above two in one unit.

1. Silhouette set.



2. Reflected light. 10^{-6} exposure. small area.



3. Reflected light - large area.

T.
nd M. I. T.
Memorial.
Offices.

cs Teachers
day.

exhibits that

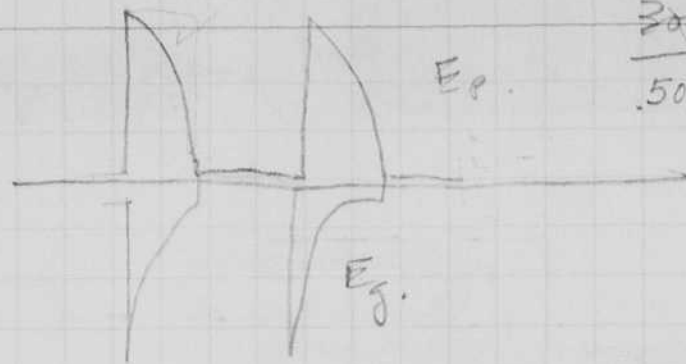
s into eleven
f science and

w the colored
e!

Arrow
v Arrow
Arrow
Arrow
e Arrow
n Arrow
e Arrow
Circle
Circle
e Circle
w Circle

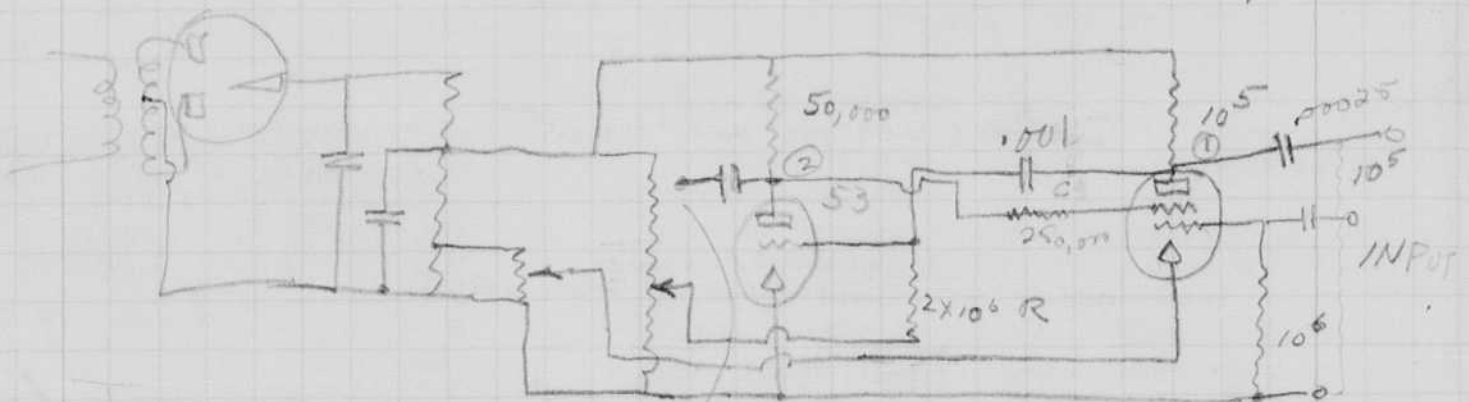
EXPERIENCE

Murray Printing Company
Seabell Square, Cambridge



$$\frac{300V}{.50,000} = 6 \text{ mm}$$

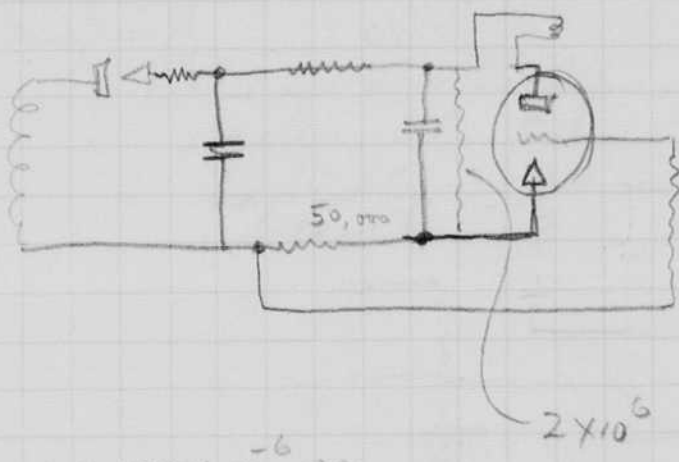
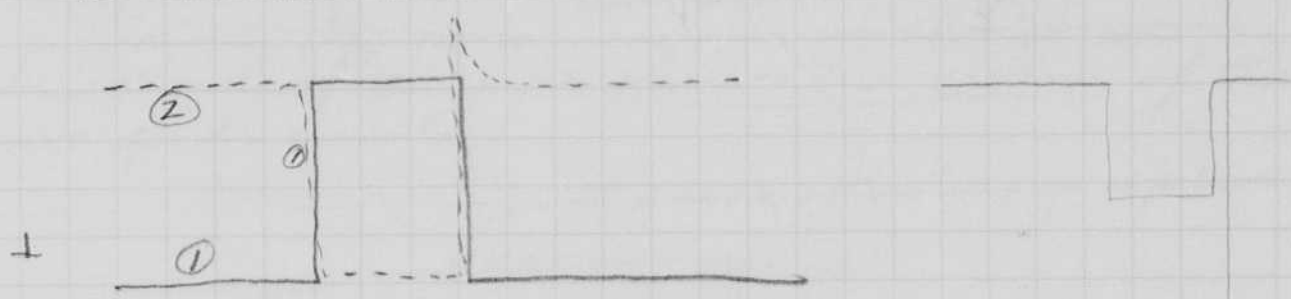
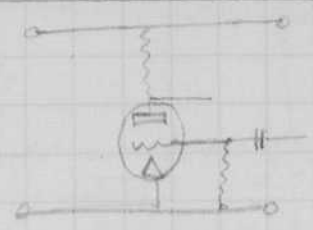
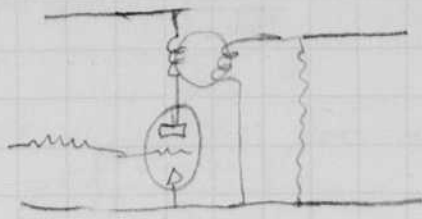
Time delay circuit for spark photo of
air waves in auditorium for Prof. Day.



$$RC = .003$$

$$R = 2 \times 10^6$$

$$C = \frac{.003}{2 \times 10^6} = 1.5 \times 10^{-9} \text{ farad or } .0015 \text{ mf.}$$

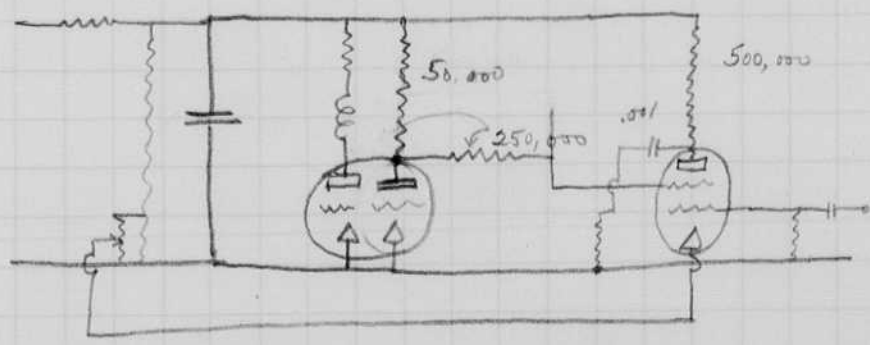


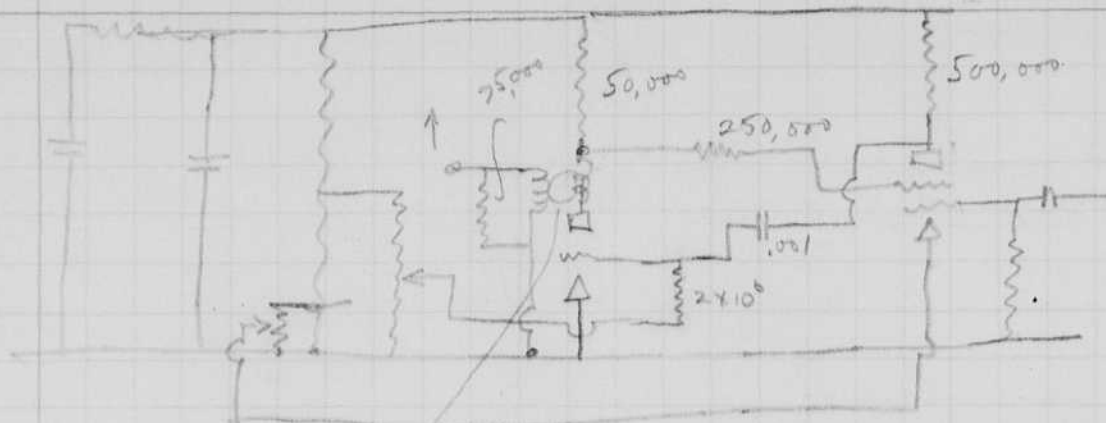
8000 volts.
 10 volts.
 $\frac{1}{30}$
 $\frac{50,000}{5}$

$50,000 \times 125 \times 10^{-6} \text{ sec}$

$.6 \times 10^{-2} \text{ sec} = .006$

$1 \times 10^{-9} \times 2 \times 10^6 = 2 \times 10^{-3} = .002 \text{ sec.}$



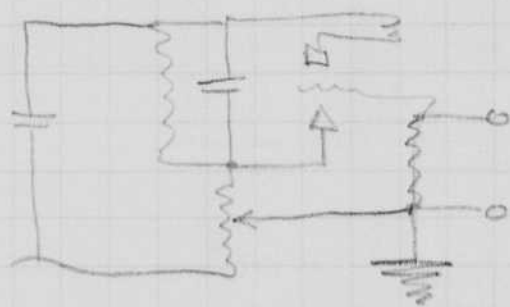


air core 57004 A

P5700 -

2340 -

input lead.
output



July 21, 1938.
J. C. Edgerton

Organ Pipe.

A study of the flow of air in an organ pipe
with a stroboscope and TC_4 smoke.

Mr. E. M. Skinner provided the pipe 528 cycles/sec.

Smoke TC_4 on a wire with a cloth end on
the outside of the pipe shows the motion of the
air quite clearly.

∴ a series of vortices go up here.



The air stream dips into the hole once
each vibration. Then it goes up
rapidly and whirls into a
vortex.

May 27, 1938.
H. S. Garton.

Strassner's test of Debye's amplifier. in
thesis 1938. Course IX. flat 10 - 40,000. 20,000 10,000
10° - 40° 10°

Speed of sound in steel

Rayleigh Theory of Sound Vol I.
Max Muller.

$$v = \sqrt{\frac{E}{\rho}}$$

$E =$ modulus of elasticity
 $= 30 \times 10^6$

$\rho =$ density $= 486.9$ lbs/cu ft.

$$v = \sqrt{\frac{30 \times 10^6 \times 144 \times 32}{486.9}} = 16,800 \text{ ft/sec.}$$

Murray

May 27, 1938.

Bill
Tuckers's
photos,
Spring 1937.

48 mf

3000 volts.

Hg lamp 1" 340°
control tube.

1 atom or 2 at.

Filter

76.

Hg. green.

15 2" square.

Eastman.

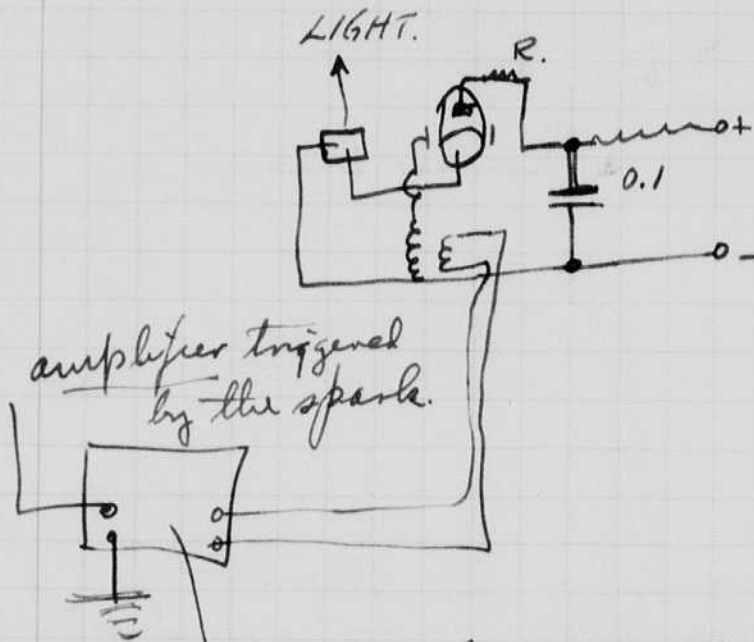
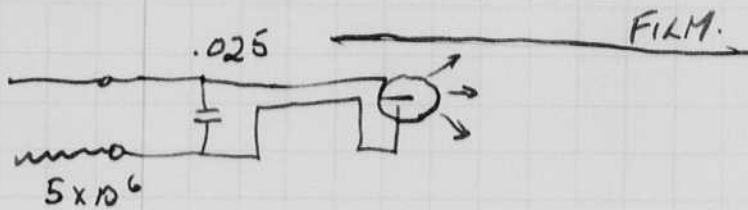
10" Polaroid discs. ✓

May 28 1938.

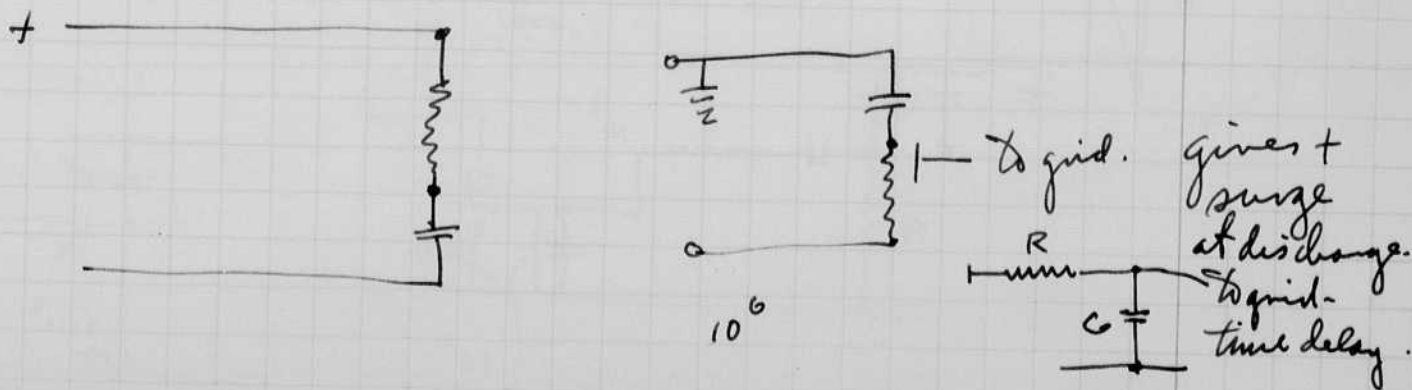
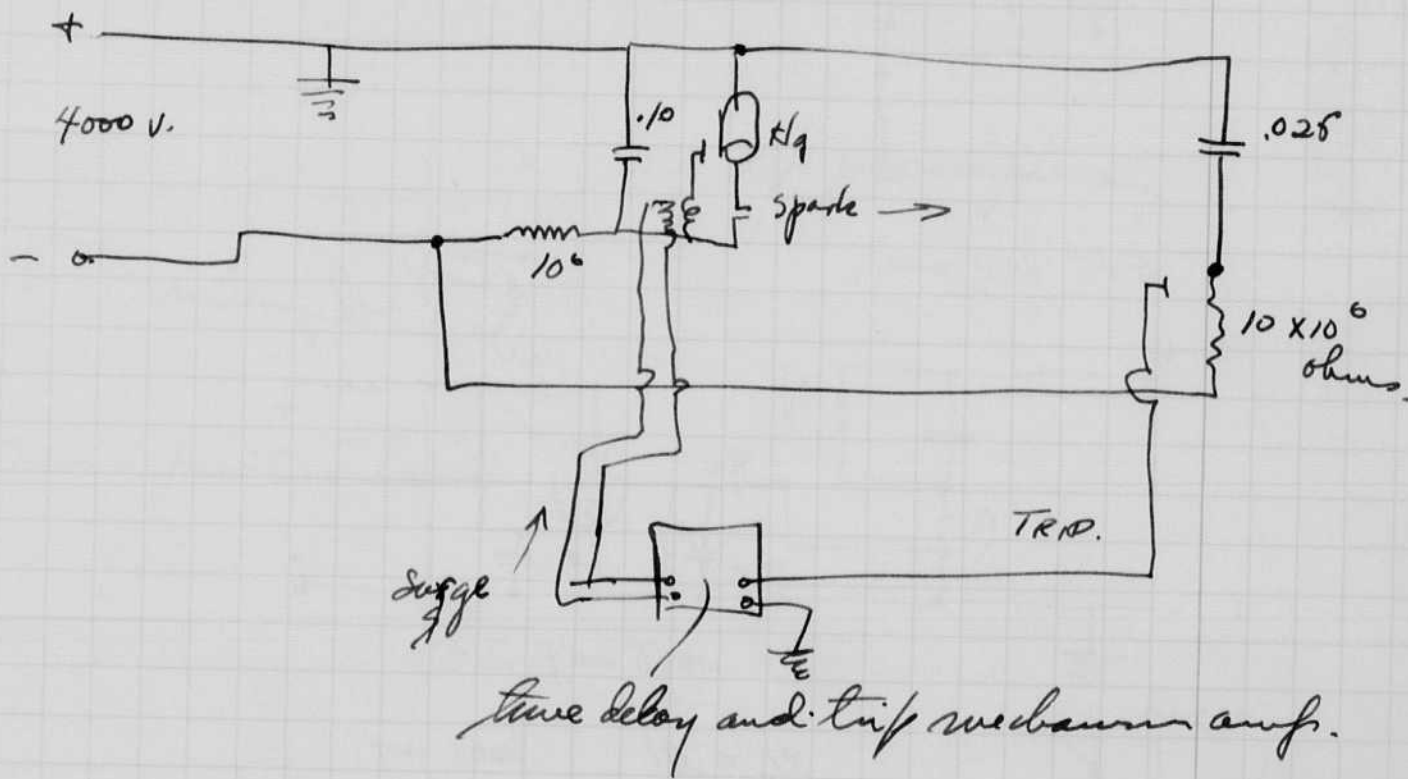
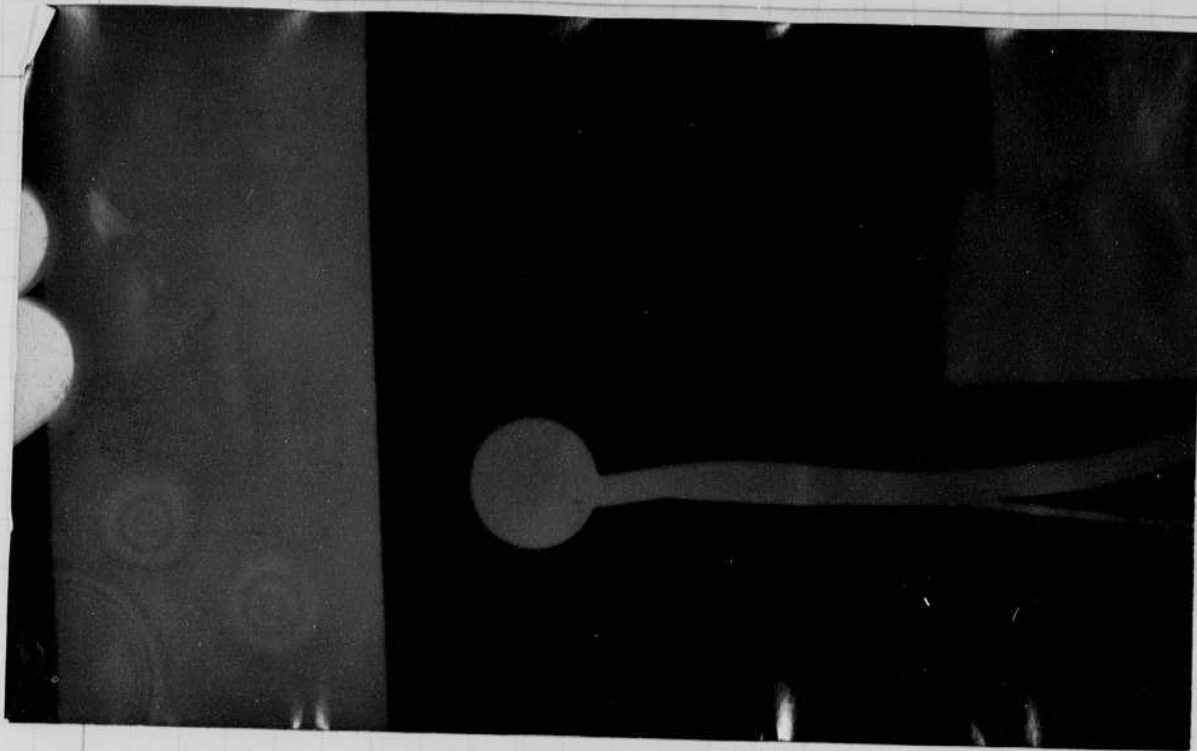
Discussed program with Murray for construction and test of apparatus for stroboscopic observation and high-speed photography of photo-labeled specimens. We suggested an expenditure of \$500 for the summer, \$300 for a man and 200 for apparatus. A memo is to be given to Prof. La Salle (?) similar to our oral discussion of the same.

May 29, 1938.
L. B. Egerton.

Sound Photos for R. D. Fay.

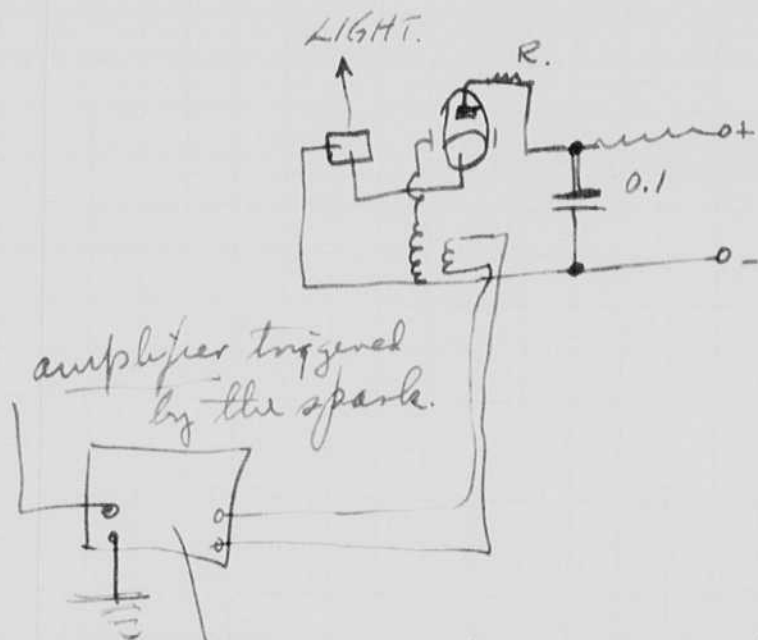


This circuit has also a time delay feature to slow up the light source.

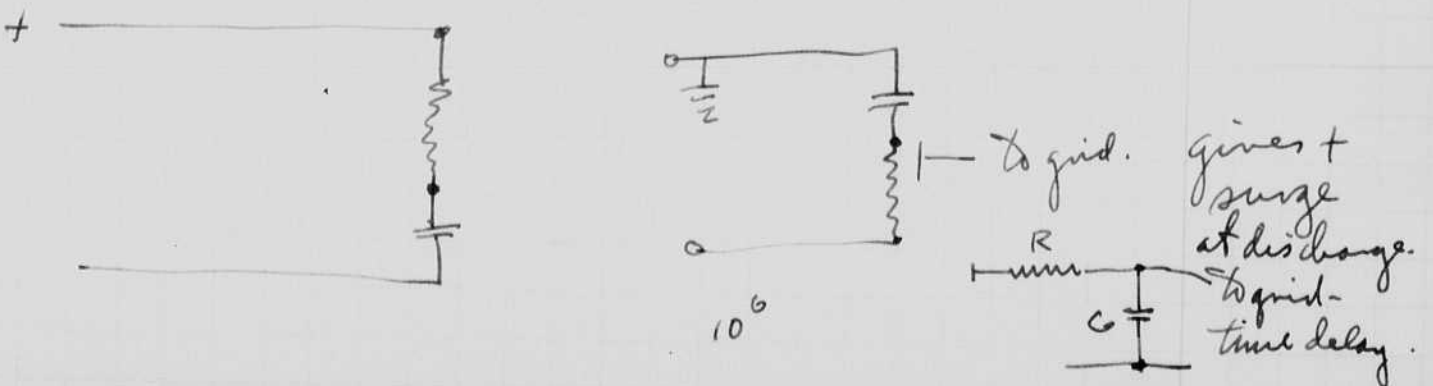
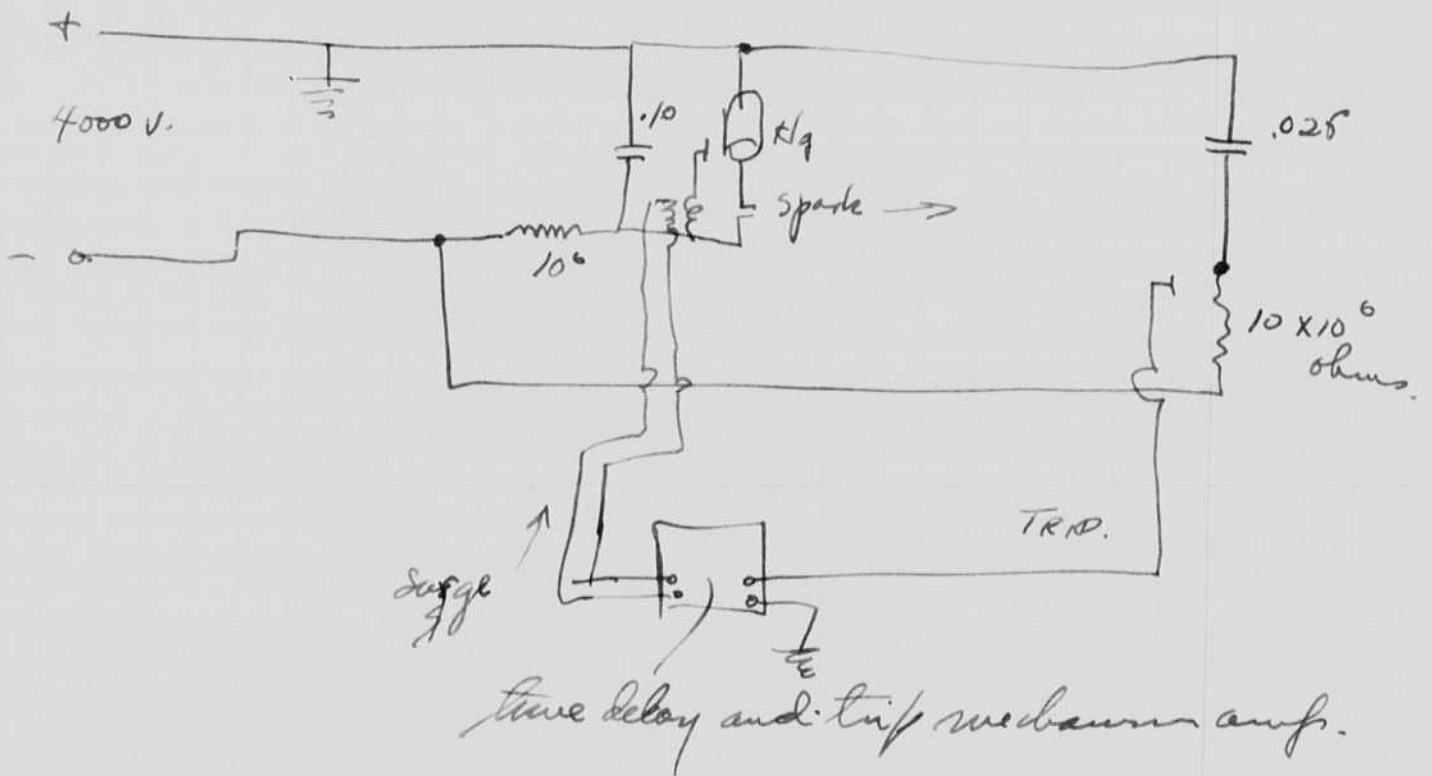
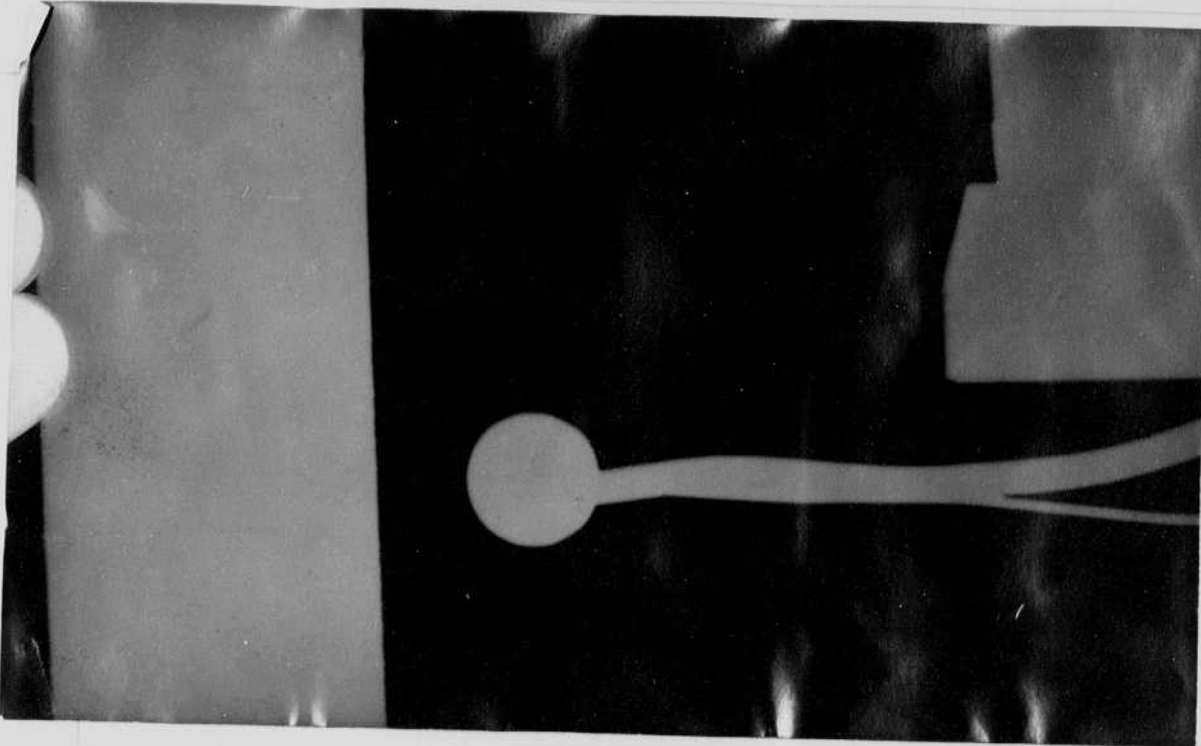


May 29, 1938.
 L. B. Spector.

Sound Photos for R. D. Fay.



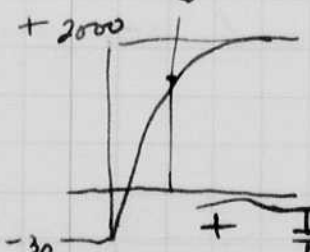
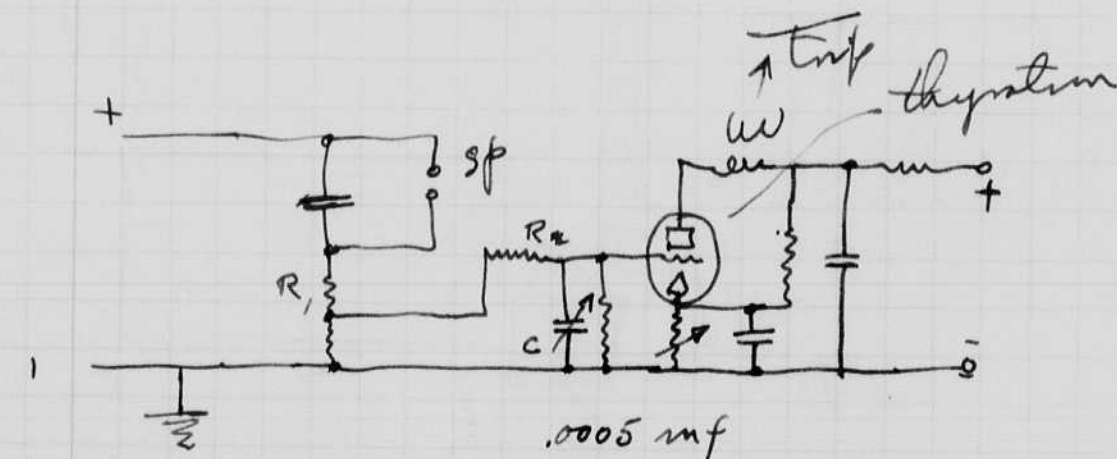
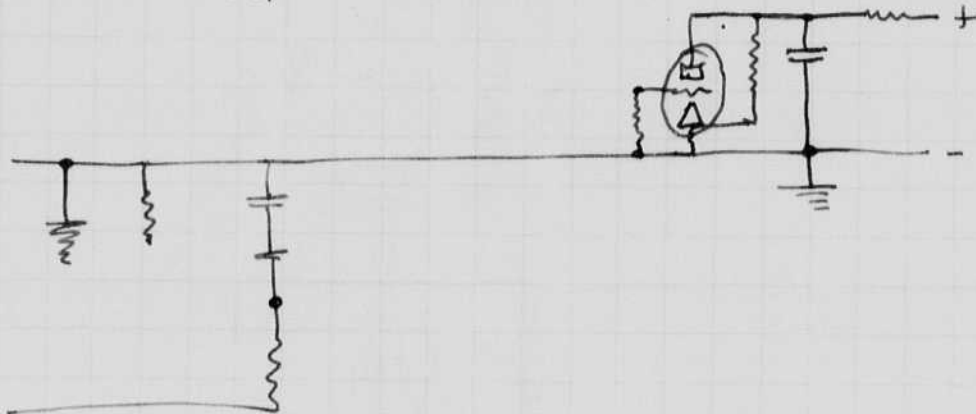
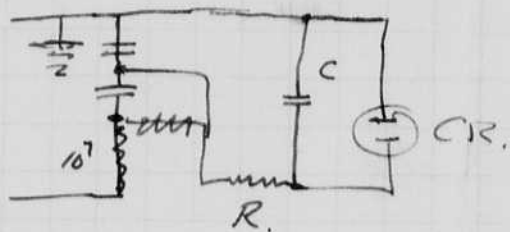
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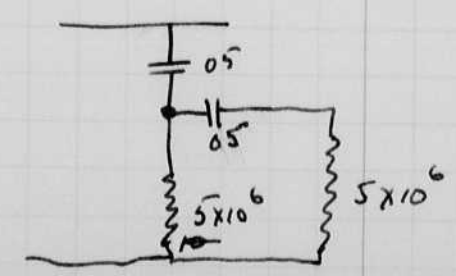
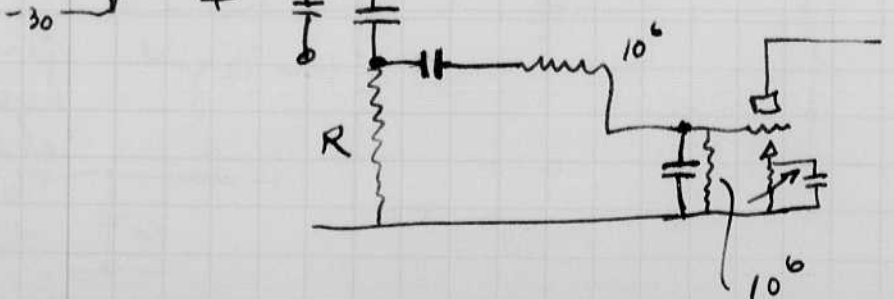
May 30 1938
 B. J. Roggenbom.

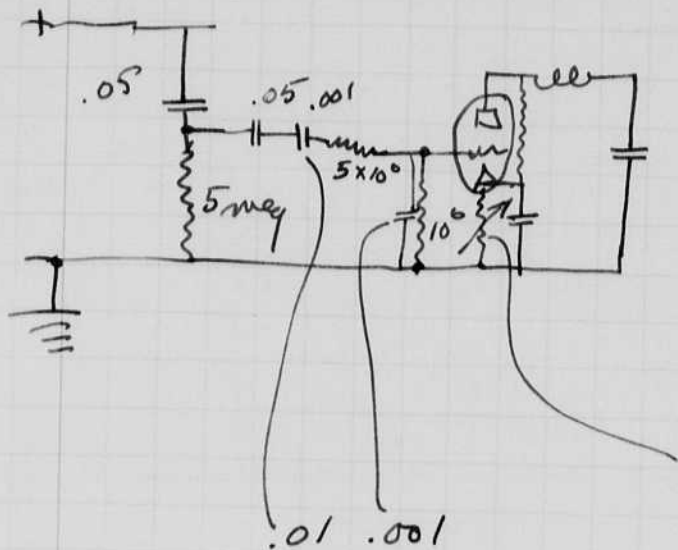
Dinner last night with uncles Li and
 brother at 8 tyfer st Boston, Hong Kong.

Cont. experiment.



$RC \leq .01$.0001 mf.
 $R = \frac{.01 \times 10^6}{.0001} = 10^8 \text{ ohms.}$





.0001 time delay.

.0001 mf x 10^6 ohms =

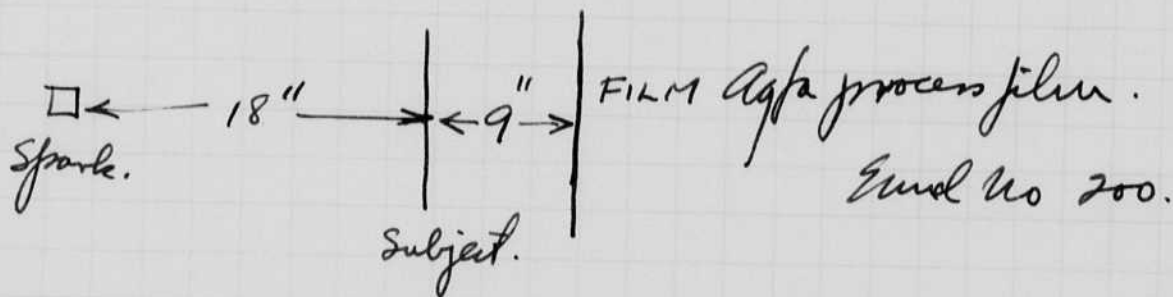
Works OK.

4 photos taken.

Different settings of this resistor.

.002
.005

3 or 4" motion of the sound wave with max. bias on the FG. 17

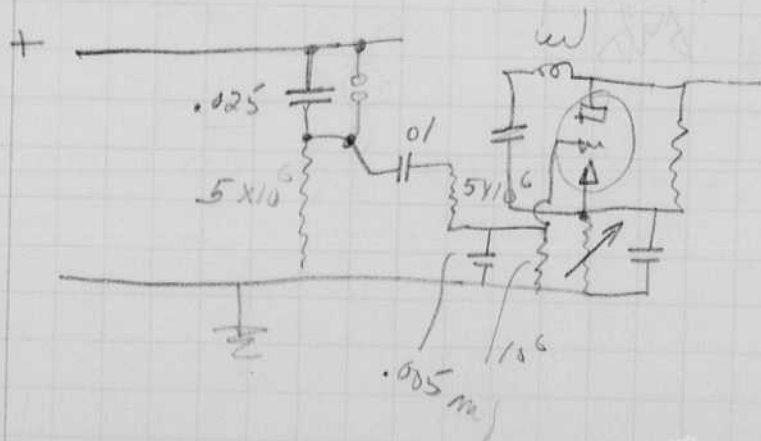


more photos taken.

May 31 1938.

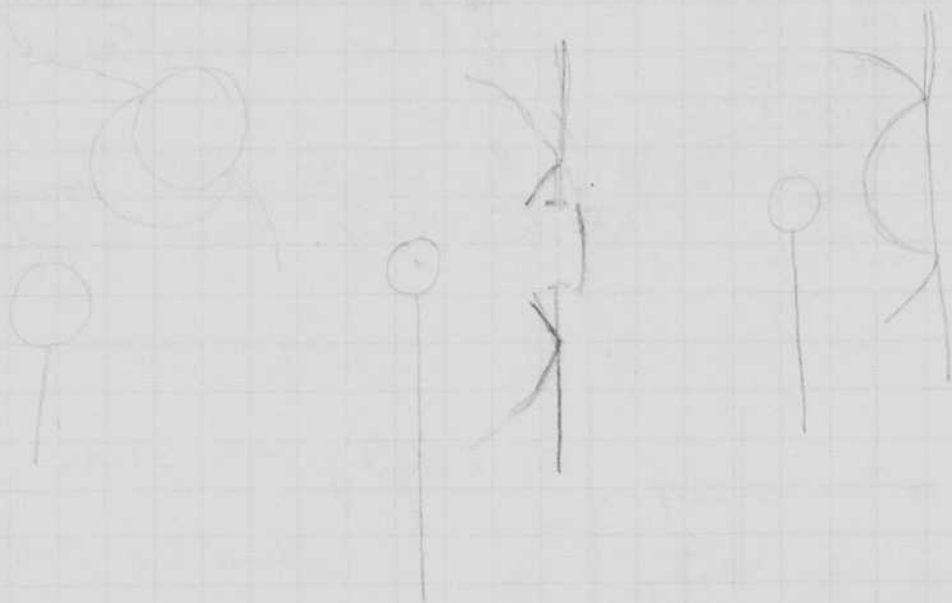
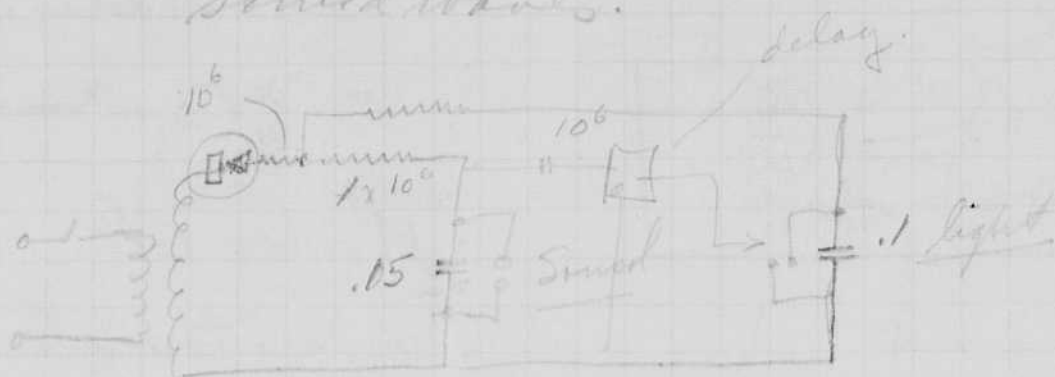
Driver last night with Chem.

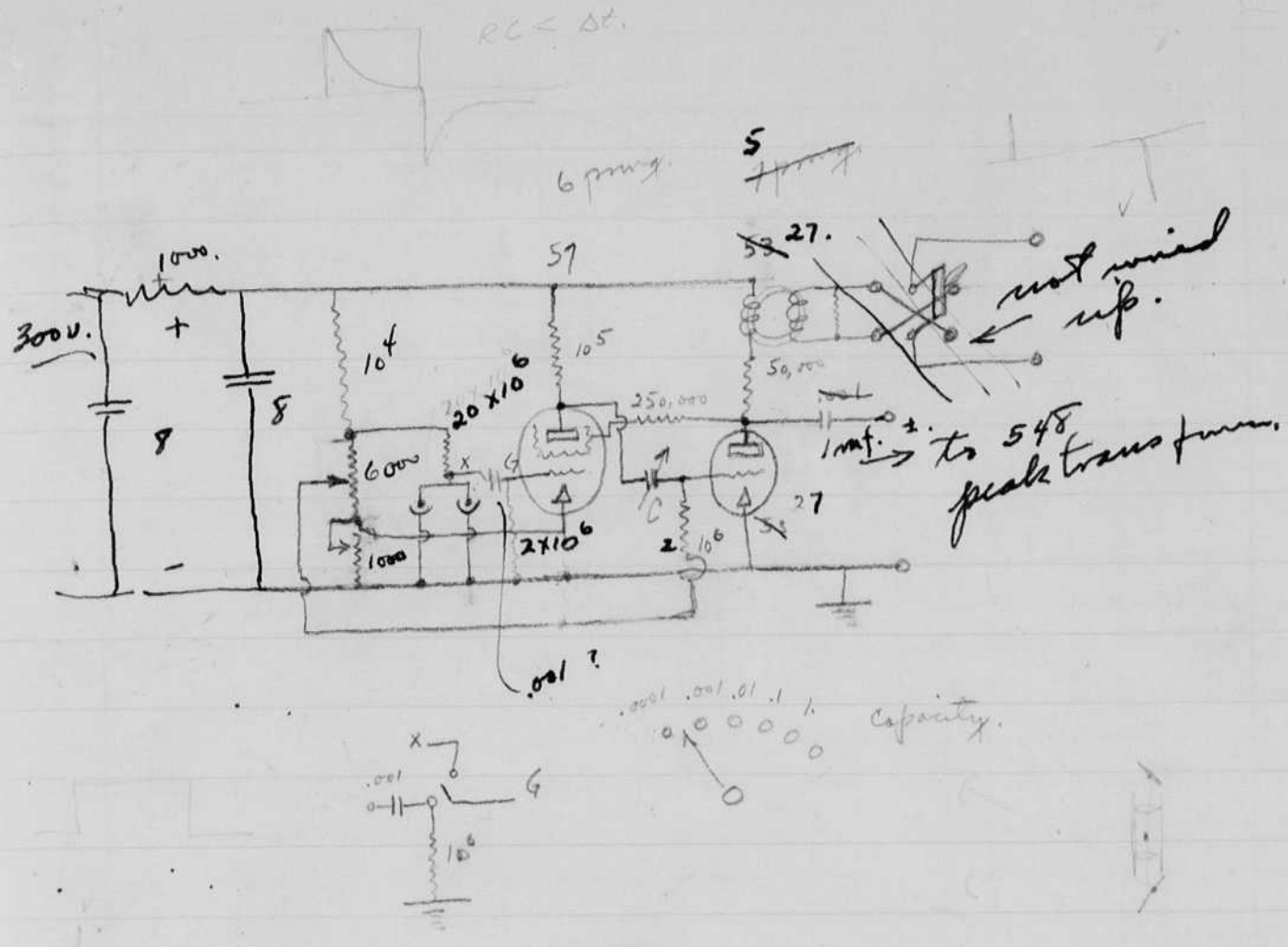
3" delay in spark on travel of wave.



5 pictures taken with a reduced scale model.

May 30, 1935 Stroboscopic exhibit of spark and
sound waves.





See page 46

- 1 DPDT Switch. outlet. @
- 4 insulated B.P.

Circuit above used on Alumni Day June 6, 1938
 to observe milk drop splash. Only
 one photocell was used.
 $C = 0.1 \text{ mf}$ $R = 2 \text{ megs.}$

June 7, 1938.
Harold E. Edgerton.

Prof Eames and Mr. Cheney arranged a small felton wheel, diam 12" \pm , for visual observation last week. This wheel is the property of ~~the~~ North Eastern Uni.

A stroboscope Kr-Ne type driven by a stroboscope was used to ~~operate~~ ^{observe} it. The wheel was driven by a d.c. motor at constant speed, about 300 r.p.m. The head was about 6 or 8 ft.

Photos were taken with the 5x7 camera and also with the 9x12 cm camera. The 48 mf 3000 volt argon spot light was used for this work, also a Kr-Xe lamp, for side lighting of some of the pictures.

Watertown arsenal stroboscope

f 3.5 ^{Super} Pan. film Dupont

11 mf 1200 v.

lamp. spiral 7" reflector.
2 ft from 15" square

$$1,200^2 \times 11 = 14 = 15 \text{ joules}$$

~~30 watts.~~ 700 volts same energy.

$$\frac{(1200)^2}{(700 \text{ volts})^2} \times 11 = 32.3 \text{ mf.}$$

49
1154

June 11 1938
James F. Edgerton

27

Yesterday I went to visit the Crompton-Knapp plant at Worcester with Joe Caldwell and Ben Thompson. We met Mr. Palmer (Harv.) Mr. Gordon (MIT) Mr. Peterson (Wor. Tech.) and others. Photos were taken of a loom in action. I used two lights, one a flood and the other a spot. 3000 V 48 amp on each. Exposure $\frac{1}{500}$ sec. Aperture f 11 to f 22.

After this we went to the elder Hydraulic laboratory at Holden and met Prof. Allen, Dr. Hopkins, and others.

Then we stopped to see Mr. Becher at the Norton Co on the way home.

Arrived home MIT at 7 pm and developed films before going home.

Waque Nottingham and family from Schenectady were with us last night. He mentioned a project planned by Edmund Arens which might need an intense flashing light.



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Notes on arrangement of apparatus

1. 3. in. film. Depth

11.700

Lamp - 3000 volt

2. Kr-Xc lamp

1.700 x 11 = 14 - 15.

~~1.700~~

700 volts

1.700
700 volts = 11 = 32.3 mf.

June 11 1938
 James F. Edgerton

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Arrived home MIT at 7 pm and developed films before going home.

Wayne Nottingham and family from Schenectady were with us last night. He mentioned a project planned by Eymond Evans which might need an intense flashing light.



6.632 class 1938 spring.



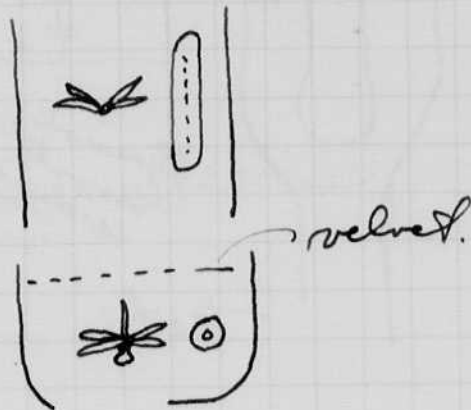
Huson Irvin Hausel Rosen Nelson Thompson Nie Steiner Caldwell
 Gemmill Kilgore McNeil Abbe
 Ito



June 15/1938.
Belgato
Chadwida

Dragon fly. 9x12 camera. 600 flashes/second. 1/25 sec. shutter.
4 mf 2400 & 800 in parallel 3KW.
Argon lamp quartz section.
Velvet background.

f 4.5
Varichrome film.



Exposure ok.

Butterfly
Black Swallow tail.

movie at 90 per second.
4 mf 1000 volts.
Argon lamp 3KW out fit.
Pan film D-11 6 min ok.
f 3.2

The specimen did not fly
very well.

6.632 class 1938 spring.



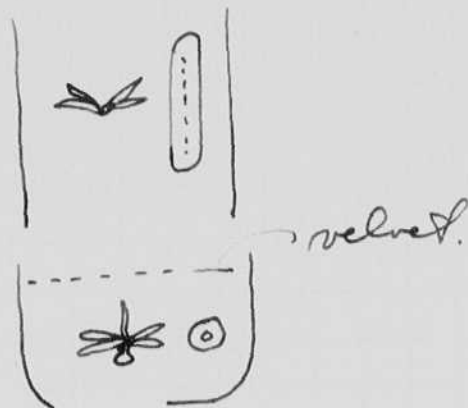
Hsu Iovin Hausel Rosen Nelson Thompson Nie Steiner Caldwell
 Gemmil Kelgore McNeil Abbe Ito



June 15/1938.
 Belgato
 Chadwida

Dragon fly. 9x12 camera. 600 flashes/second. $1/25$ sec. shutter.
 4 mf R/400 & 800 in parallel 3KW.
 Argon lamp quartz section.
 Velvet background.

f 4.5
 Varichrome film.



Exposure ok.

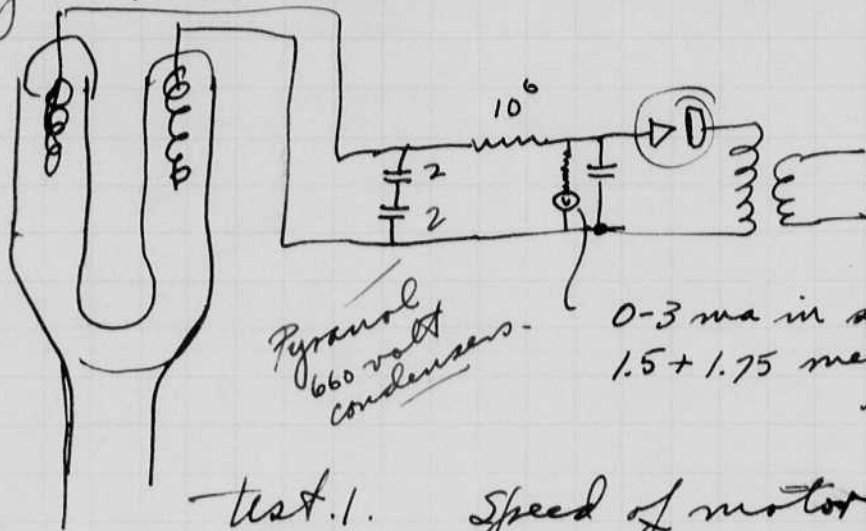
Butterfly
 Black Swallow tail.

Movie at 90 per second.
 4 mf 1000 volts.
 Argon lamp 3KW outfit.
 Pan film D-11 6 min ok.
 f 3.2

The specimen did not fly
 very well.

June 16 1938
Harold S. Edgerton

Test of high-speed light source
anyon 40 or 50 cm 1 cm ϕ 2



Pyranol
660 volt
condensers.

0-3 ma in series with
1.5 + 1.75 megohms.

test. 1. Speed of motor 7000 \pm 5% or less

f - 6.3 positive film. old app.
Volts 2 ma \times 3.35×10^3
Slightly out of focus.

Film No. 2. Voltage (2.2 ma) other same.

1' radius of film
12 \times π inches of film in 1 revolution.
2 \times 12 \times π " due to reflection angle. double.
in $\frac{1}{120}$ second.

$$1'' = \frac{1}{120 \times 24 \pi} = .110 \times 10^{-3} \text{ seconds.}$$

$$= 110 \times 10^{-6} \text{ seconds.}$$

$$\frac{100 \times 20}{9000}$$

Notebook # 9

Filming and Separation Record

_____ unmounted photograph(s)

4? negative strip(s) *inside mounted envelope
on page 31*

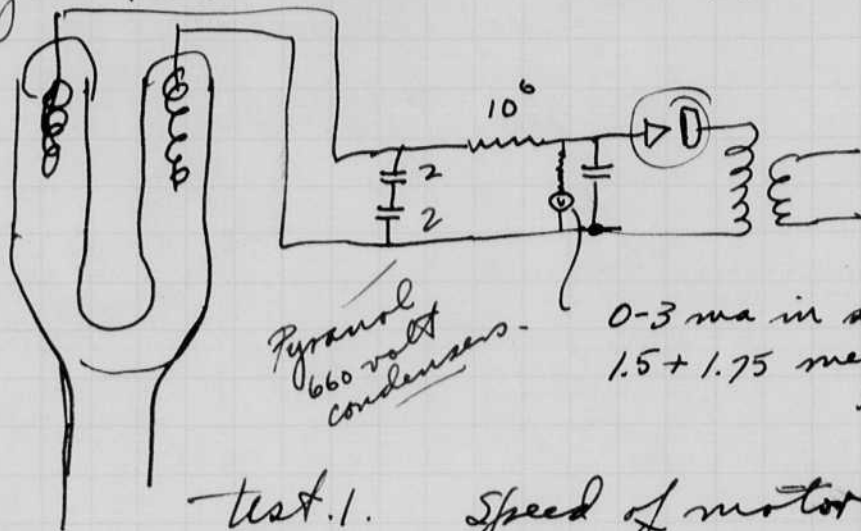
_____ unmounted page(s)
(notes, drawings, letters, etc.)

was/were filmed where originally located between page 30 and 31.

Item(s) now housed in accompanying folder.

June 16 1938
Harold S. Edgerton

Test of high-speed light source
argon 40 or 50 cm 1 cm ϕ 2



Pyranol
660 volt
condensers.

0-3 ma in series with
1.5 + 1.75 megohms.

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$$= 110. \times 10^{-6} \text{ seconds.}$$

$$\frac{100}{9000}$$

Notebook # 9

Filming and Separation Record

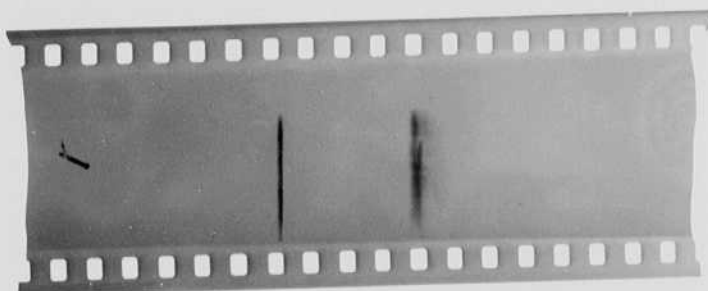
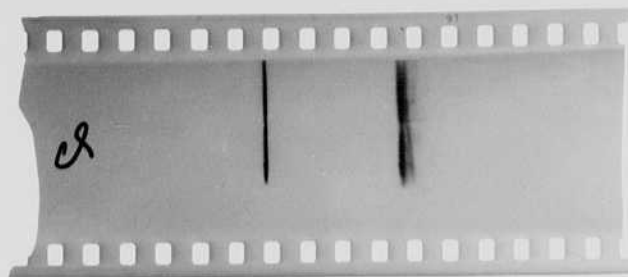
___ unmounted photograph(s)

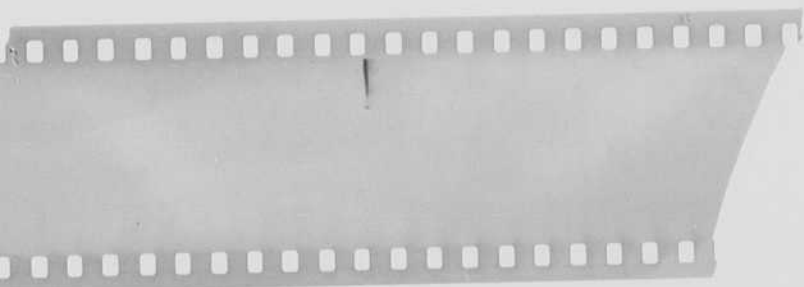
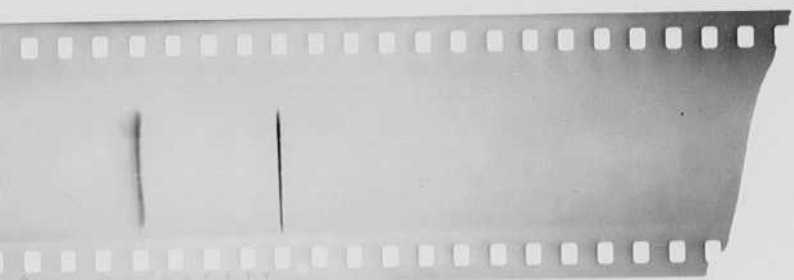
4? negative strip(s) *inside mounted envelope
on page 31*

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

was/were filmed where originally located between page 30 and 31.

Item(s) now housed in accompanying folder.







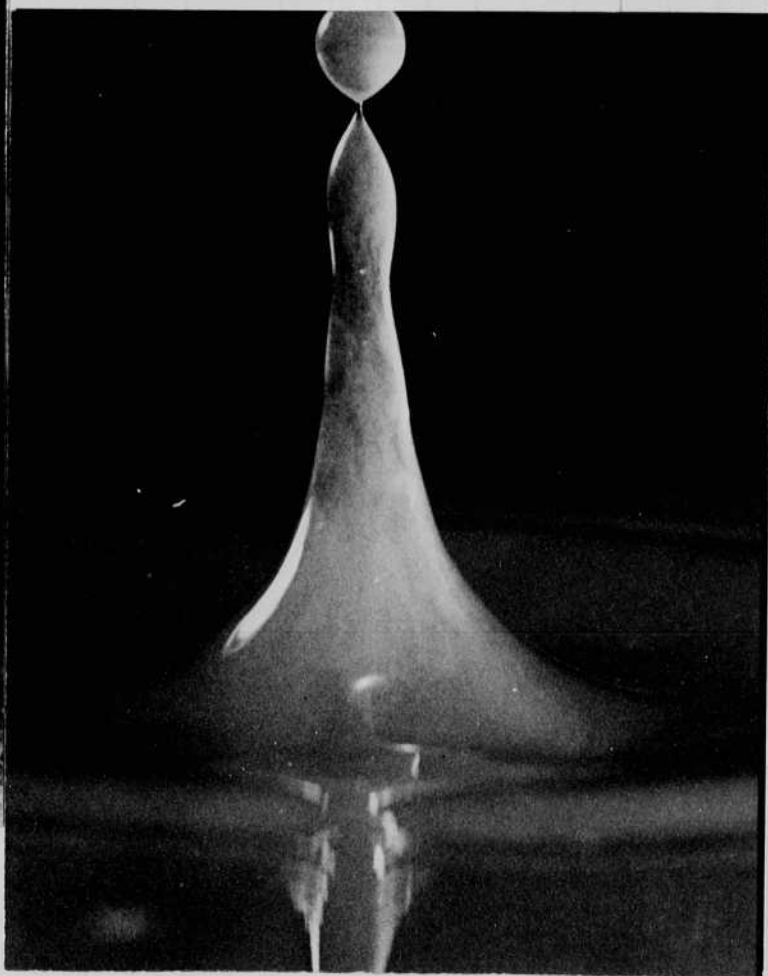
June 17 1938.

Pumped another tube same as one tested
yesterday. Filled H_2 6 cm
then argon to 50 cm.

Trip to Marion Mass. Date?
talked at Brotherhood Club at Taber Acad.
for Mr. Countway of Lever Bros.
Stayed all night at home of Robt. Soughter.
on the way stopped at Plymouth
Garage to inspect plant.



Critico.
Pole vault

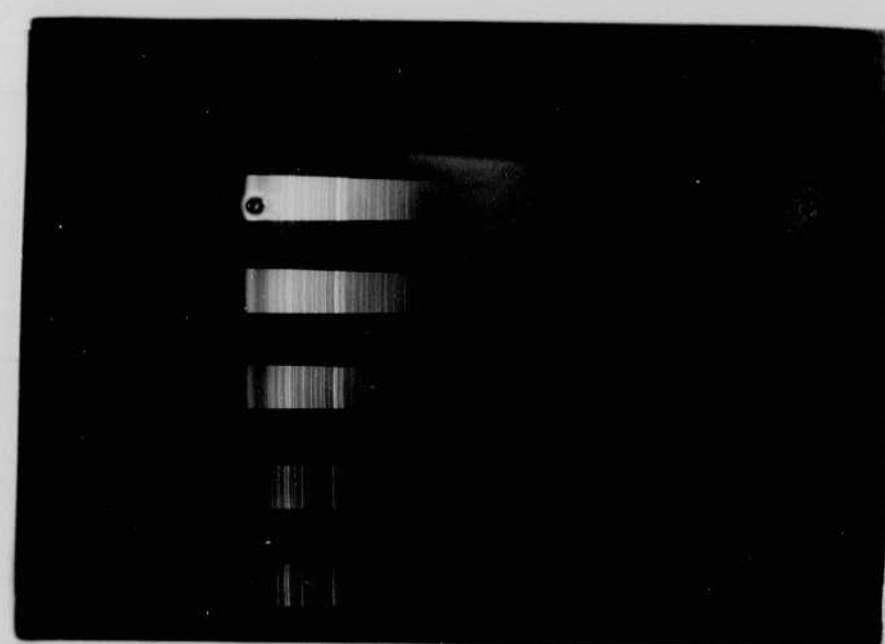
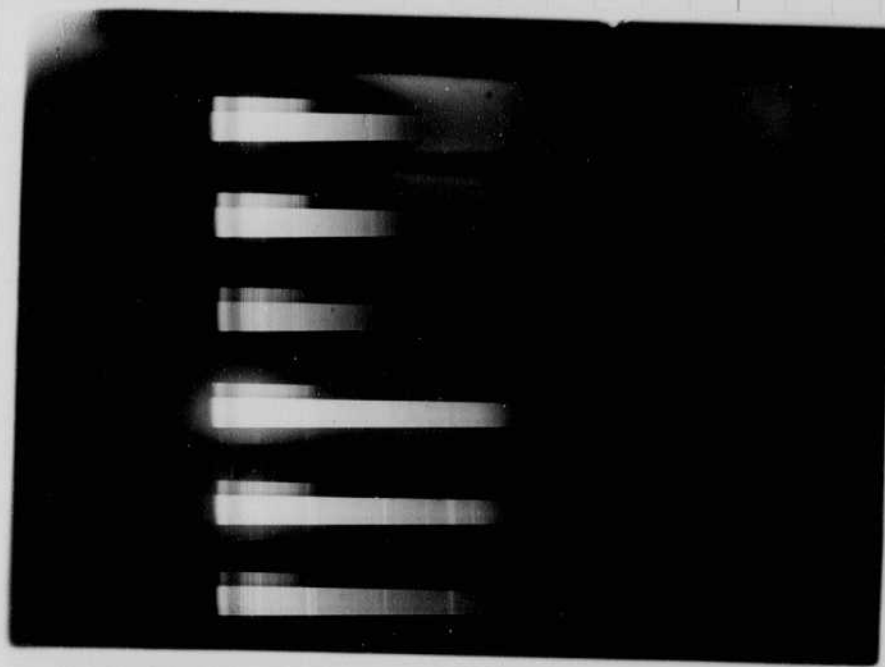
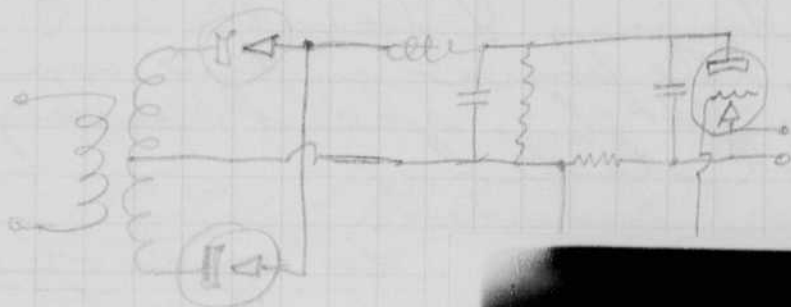


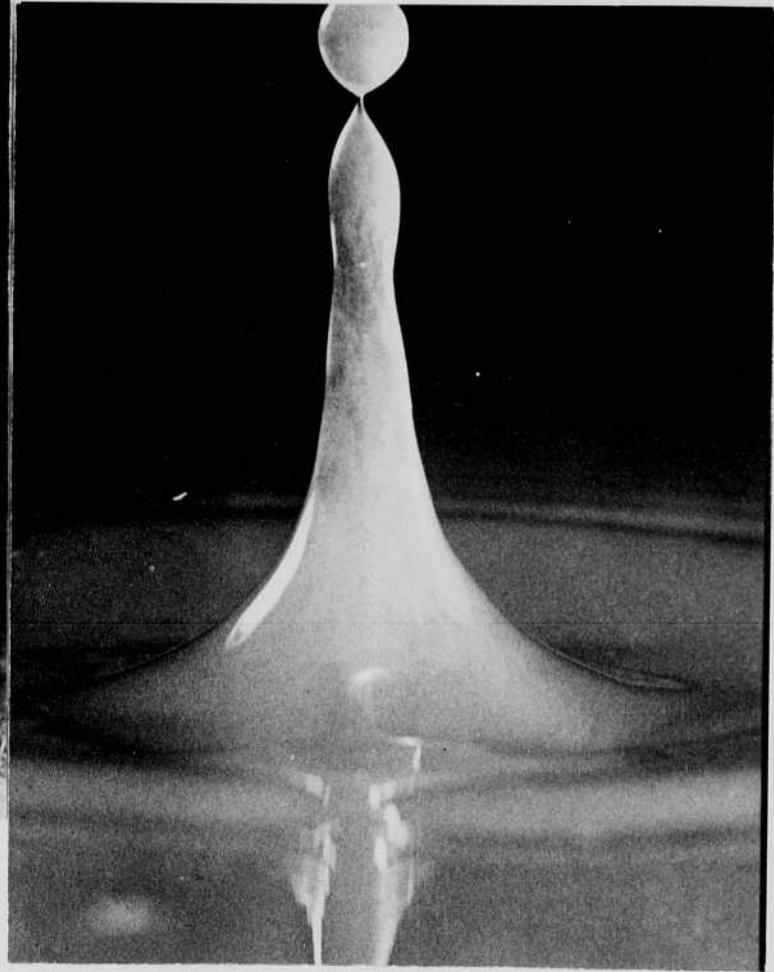
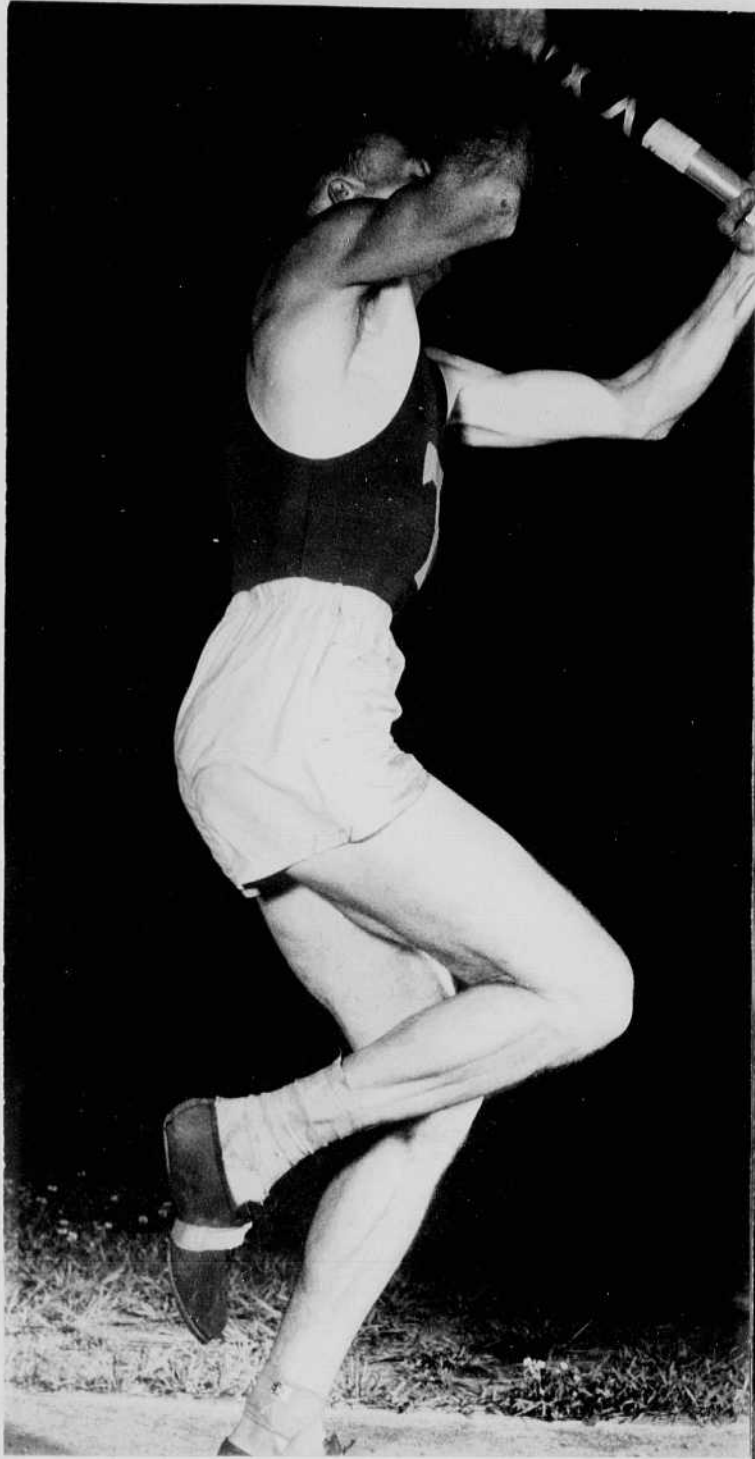
$$CE^2 = .2 \times 900^2 \times 10^{-6} = 128 \times 10^{-2} = .128 \text{ wts./flash}$$

$$\tau = 1000 \text{ cycles} \times .128 = 128 \text{ wts.}$$

$$\frac{128}{800} = .160 = 160 \text{ ma.}$$

8/10

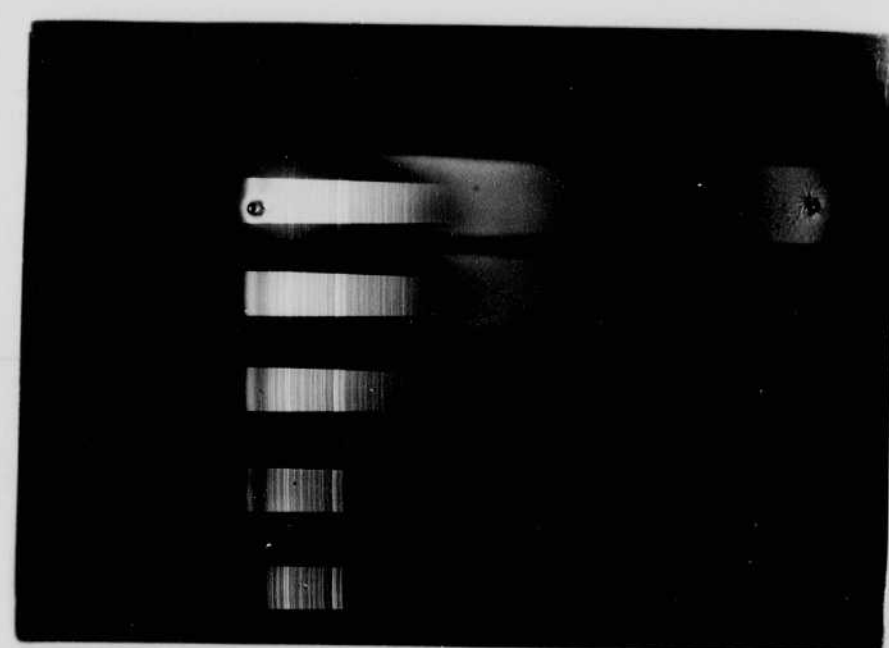
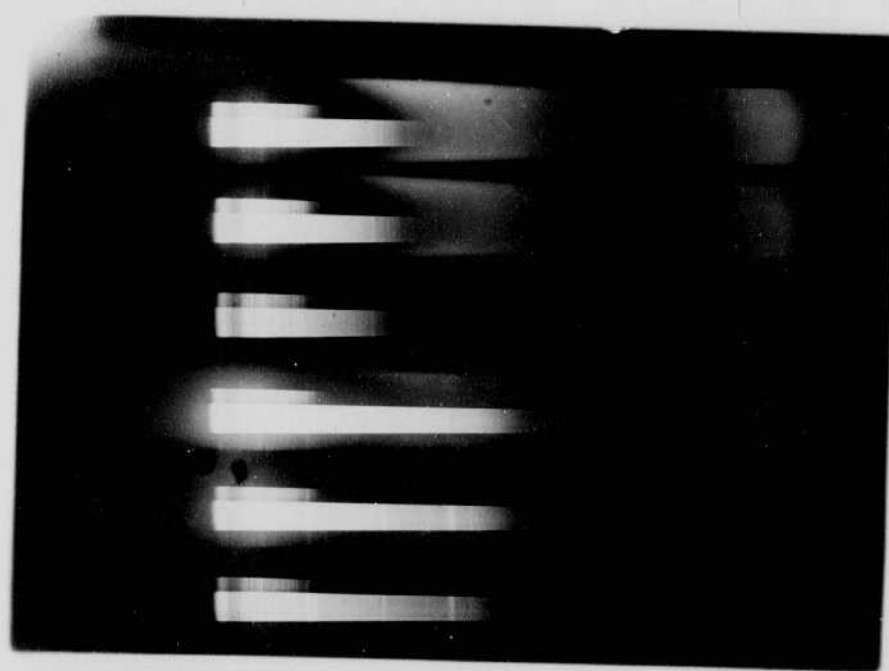




$$CE^2 = 20 \text{ cm}^2 \quad \text{Area} = 20 \text{ cm}^2 / \text{cm}^2$$

$$= 10 \text{ cm} \quad \text{Area} = 20 \text{ cm}^2$$

$$\frac{10}{10} = .467 = 160 \text{ mld.}$$

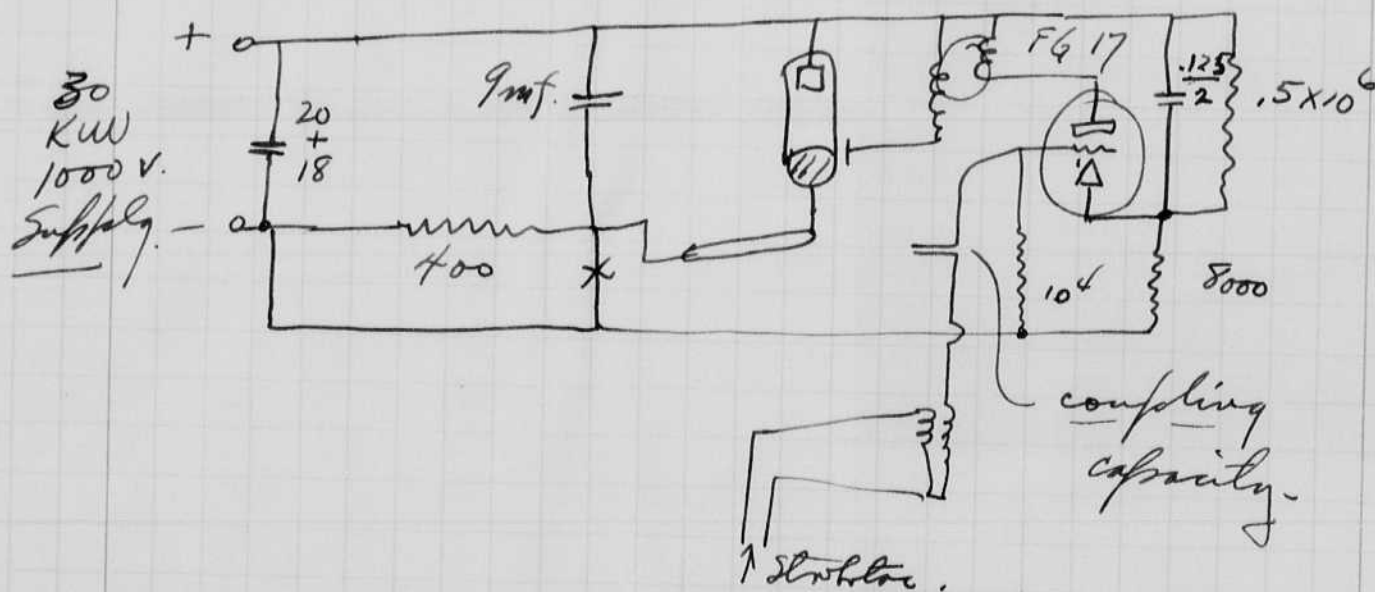


June 27, 1938
David G. Edgerton

Bill Tucker left for Calif. today. He and John Andrews are going to work for Technicolor in Hollywood.

I spent today wiring up a unit for sequence photography. First tried driving a lamp a 100 cycles. The power input was too much for this speed, using an external starter.

Then I put in a Hg control tube and tried to drive it with the Strobotac into a ~~100~~ coil (small Delco Remo) with no success for more than 30 cycles. Next a large Hg lamp was used for control and a spark circuit using a 17 was wired up to run from the 1000 volt supply. It worked ok. when driven by the Strobotac.



Took a picture on Super 8mm
Cress. f 4.5 100 frames/sec.
15 ft to Ed. Sladding, waving yard stick.
Developed in D47 at 75° for 10 min.
ok but thin.

June 28, 1938.
H. E. Edgerton.

Some difficulty was experienced with holdover with circuit shown on preceding page.

I plan to change the $.5 \times 10^6$ to 100,000 ohms this morning. This will put more bias on the FG-17 trigger.

June 30 1938

Photos of Badminton, Jack Brown yesterday at 150/sec.

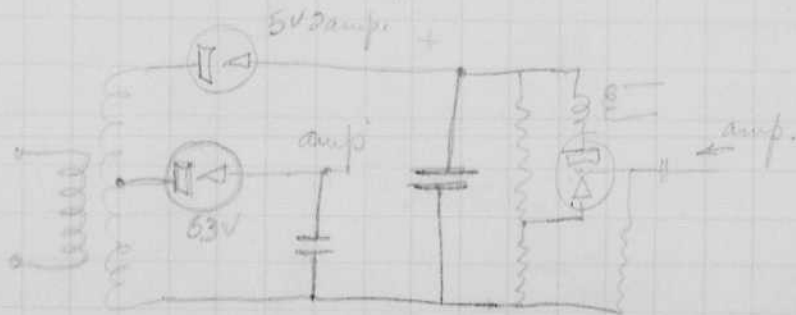
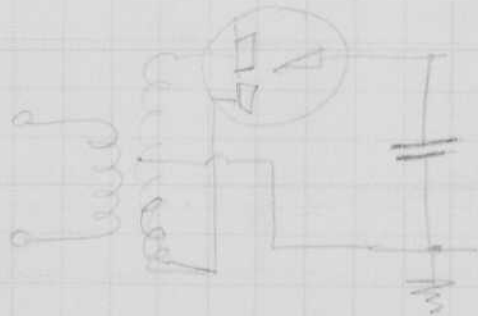
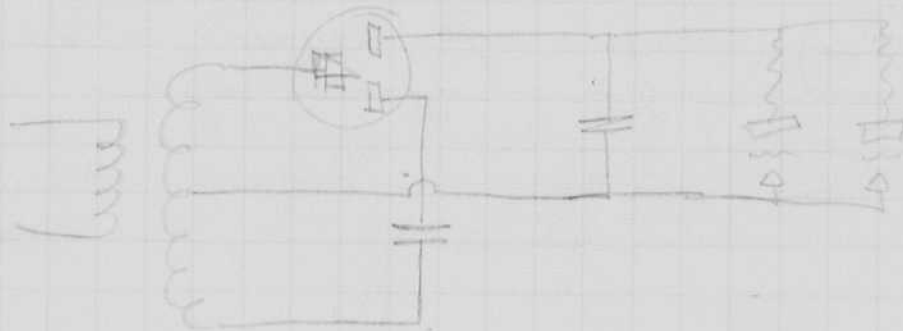
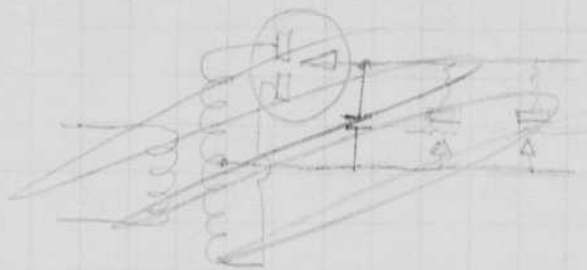
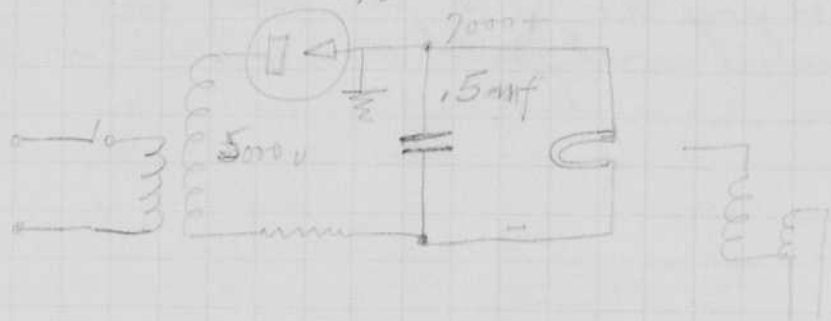
also 22 bullets going through glass lamp bulbs etc.

Today more of same. also of 22 bullets going from gun

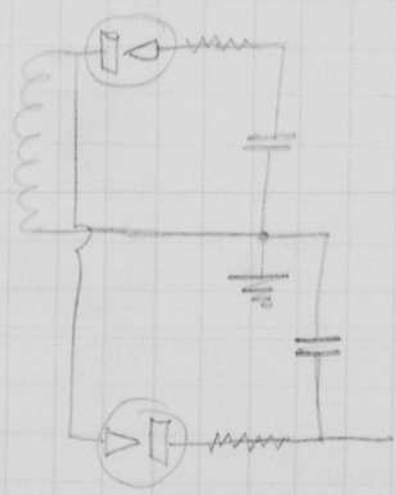
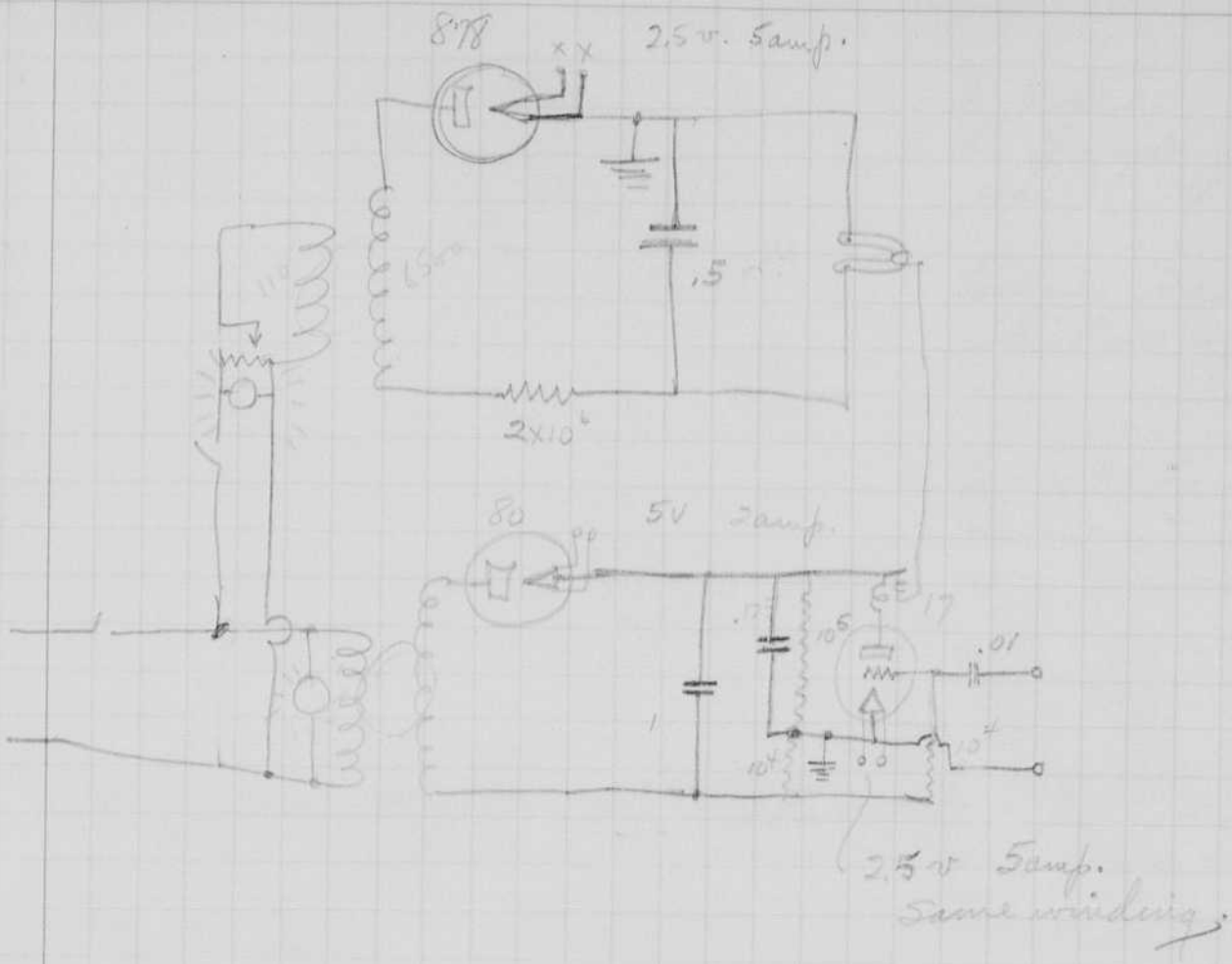
July 11, 1938
 S. S. Agoston

Design of High Speed
 Photographic Unit for
 Bullet Photography.

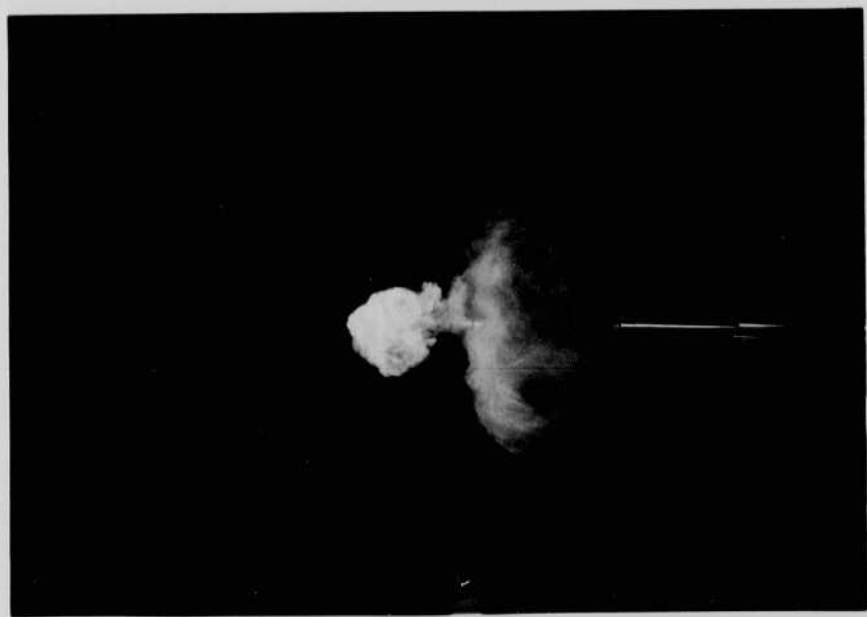
878



63V



$\frac{.85}{4000}$
6800 volts.
used on tests
yesterday



30000 50a / 450

July 7, 1938
H. E. Edgerton

Set up velvet curtains and white curtain in Hanger last weekend. Single photography also multiple shots arranged.

Denny Shute, wife, and Elmer Reed came over July 5 and I took photos of them in evening.

Ralph Guldahl came over July 6 in morning for a series of pictures.

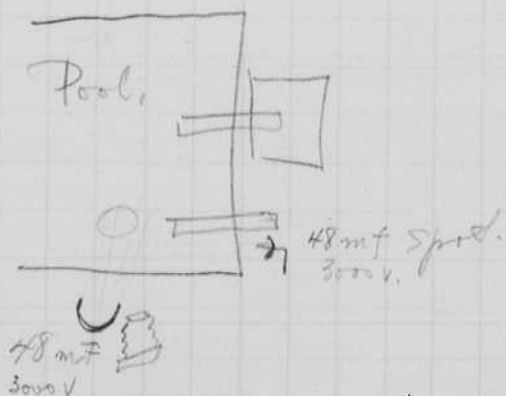
Went out to Wonderbunt track Sat. July 7 to arrange for gyrogonid photos.

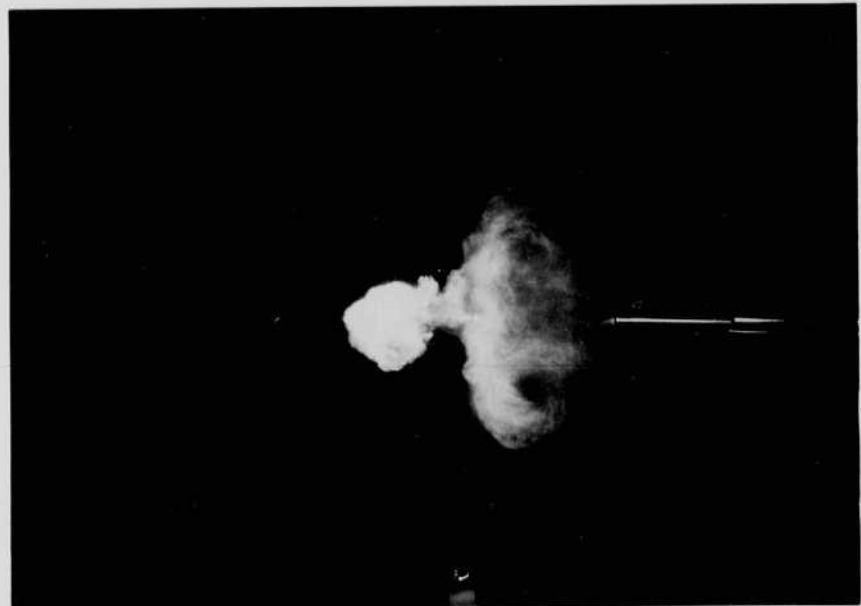
Revolver .38 with Gladding on July 8.
f 11 at $1 \text{ or } 2 \times 10^{-6}$ sec. 35 pan press.

Disinsect Spaulding studies with Stevens of AD Little on Friday aft July 8. We are to work for 6 months at 400 per on studies of golf etc.

Took photos at Howard swimming pool
35 pan Press film Agfa. f 16.

Lighting below.





37
5/4

July 7 1938
McEgertis.

Set up velvet curtains and white
curtain in hangar last weekend. Single photography
also multiple shots arranged.

Denny Shute, wife, and Elmer Reed
came over July 5 and we took photos of them
in evening.

Ralph Buldakh came over July 6 in
morning for a series of pictures.

Went to Wagon spot near Pt. J. to
arrange for ground photos.

Revised 38 with heading on July 7
p. 11 at 100° x 15° sec. 33 p.m. P. 11.

Discussed Spang's studies with
Stevens of AD. Stevens of side of Pt. J.
Went to work for 6 months at 400 feet
on studies of golf etc.

Took photos at Howard swimming pool
35 p.m. P. 11. July 16.

Lighting below:
+



U
78 m
5000 V

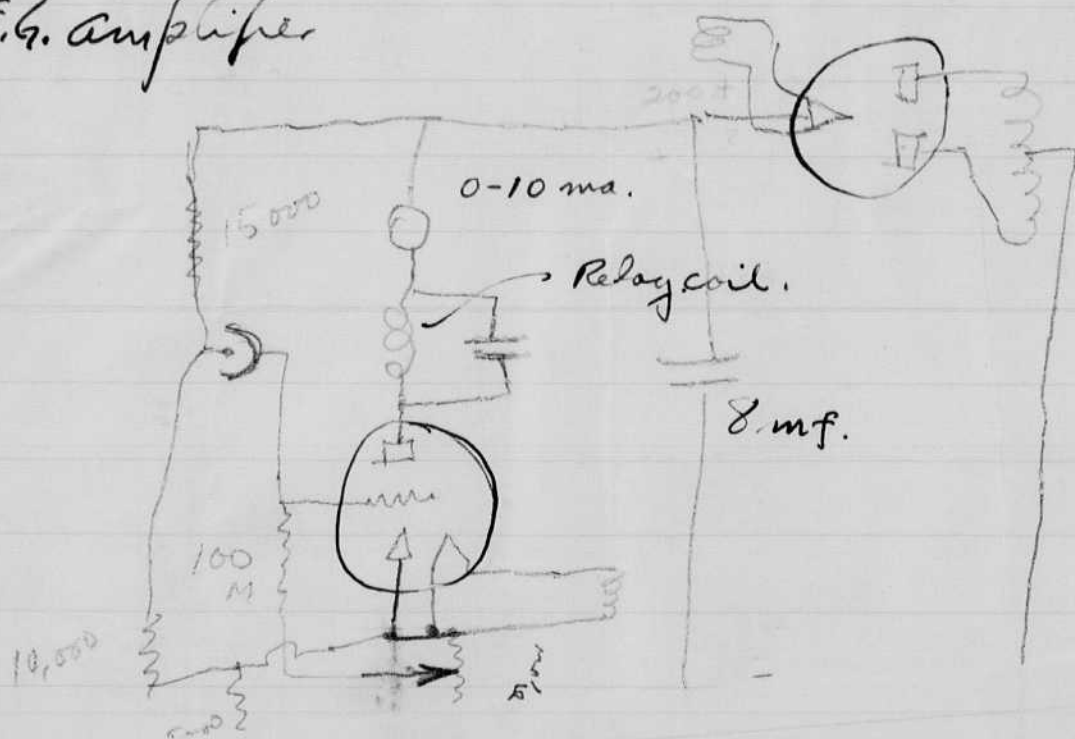
July 19 1938
Harold E. Edgerton.

I helped the Meeco Co with photo cell amplifiers on 3 wrapping machines, from Germany. The call came through the General Radio Co on Friday morning.
Mr. Moulton - manager sent
Mr. Achorn factory manager.
Mr. Schoenher

One unit was working ok, another needed the light adjusted, a third had a defective photo cell.

Since no extra tubes were sent from Germany, we proposed rebuilding the amplifiers with U.S. types. Mr. Moulton asked to do this.

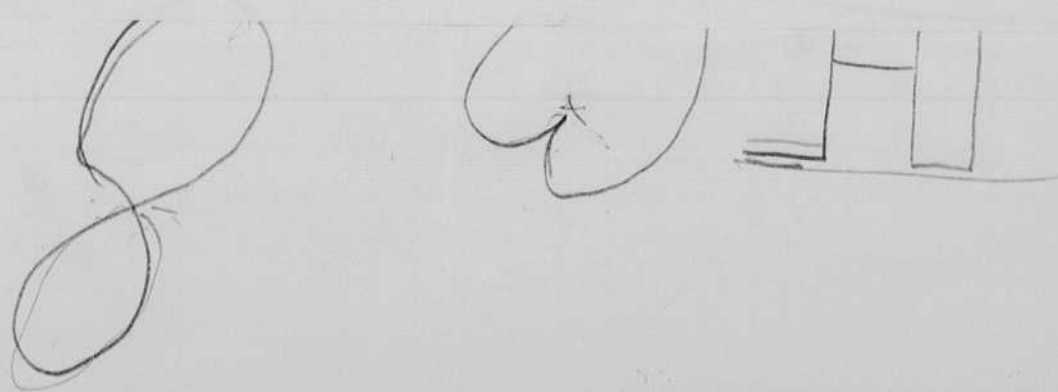
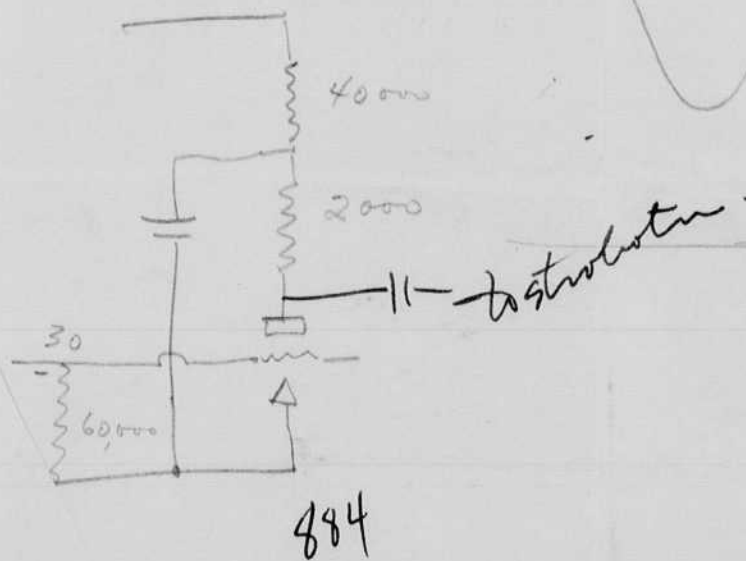
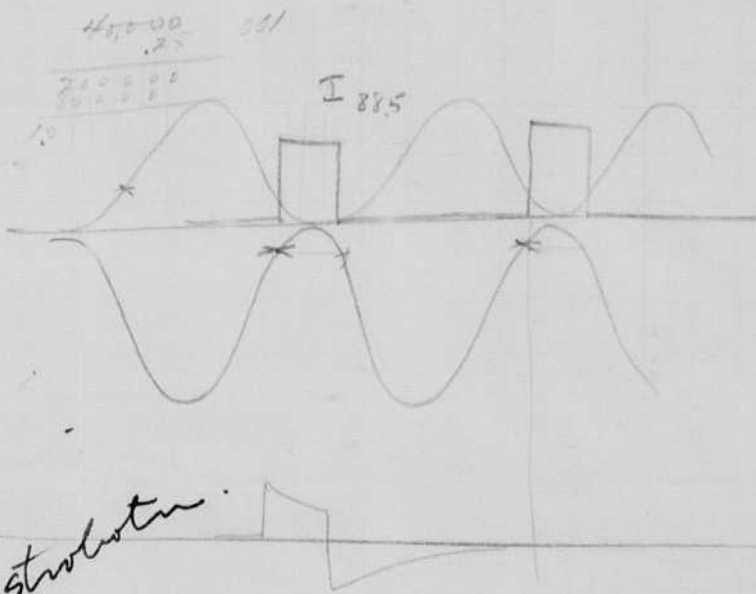
A.E.G. amplifier



cont.

Yesterday afternoon I went over to the General Communications Laboratory at the invitation of Mr. Dave to inspect his device for direction finding for aircraft. The unit was in operation and used a strobolotron for flashing the position. He discussed the operation of the unit and improvements he wished to incorporate. Below are circuits and diagrams of the unit which were made when I was there.

5
10/sec.
30 volts.



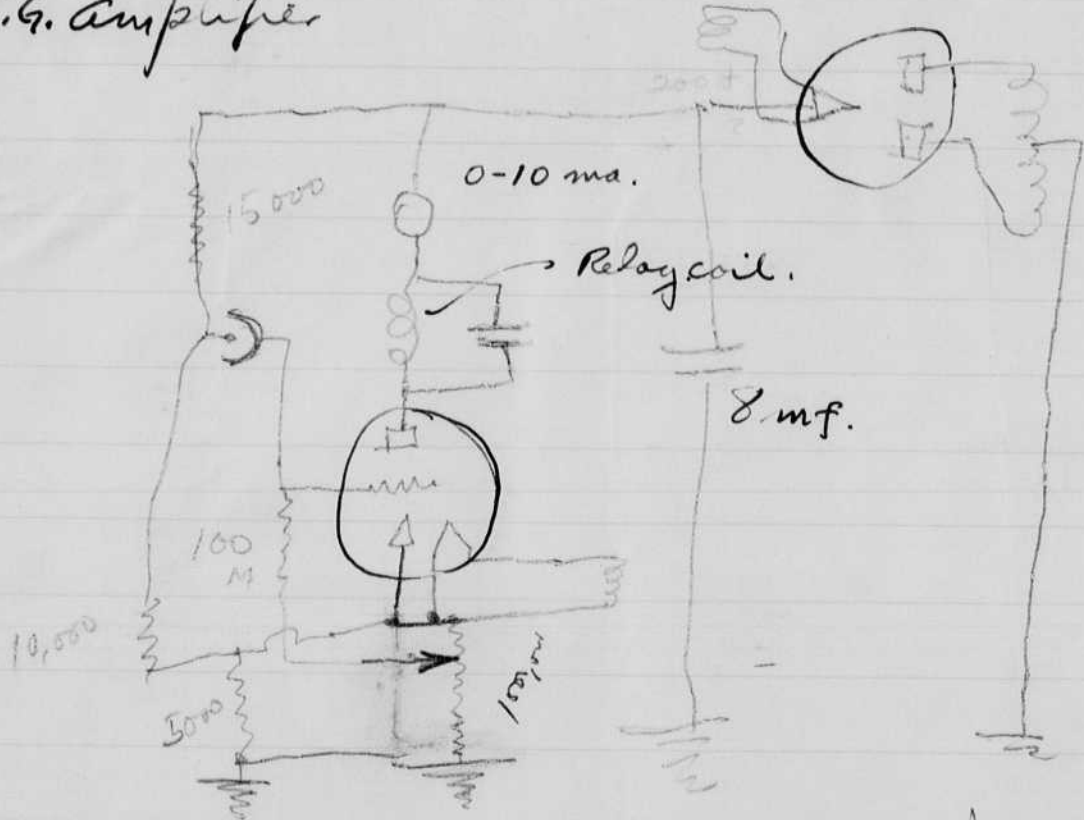
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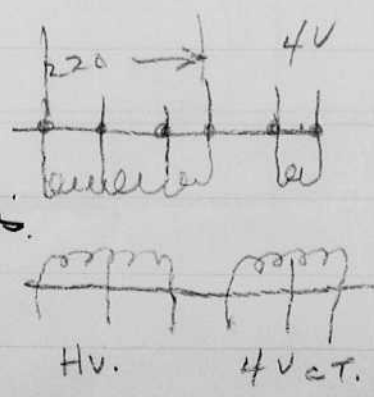
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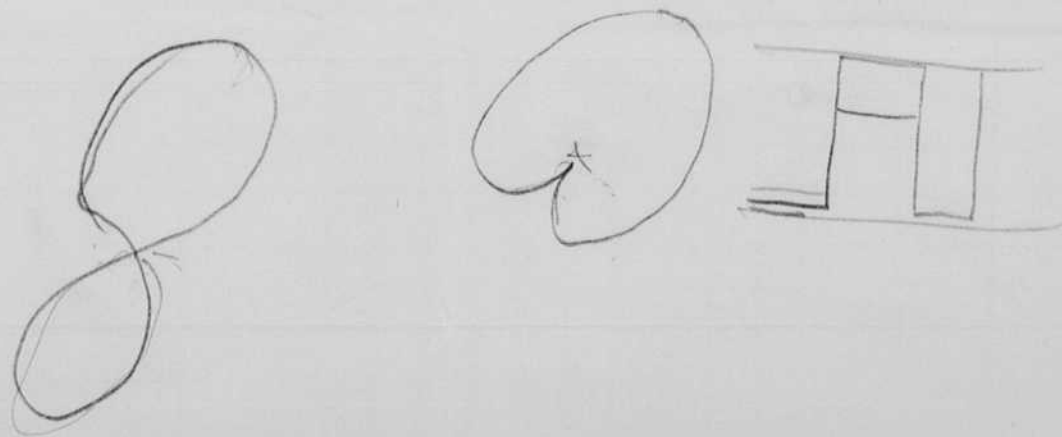
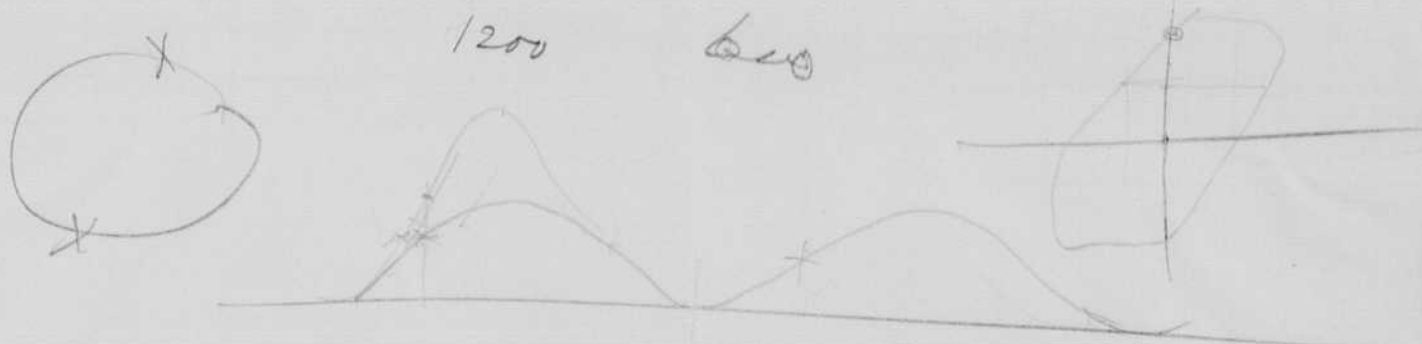
Circuit of amplifier.

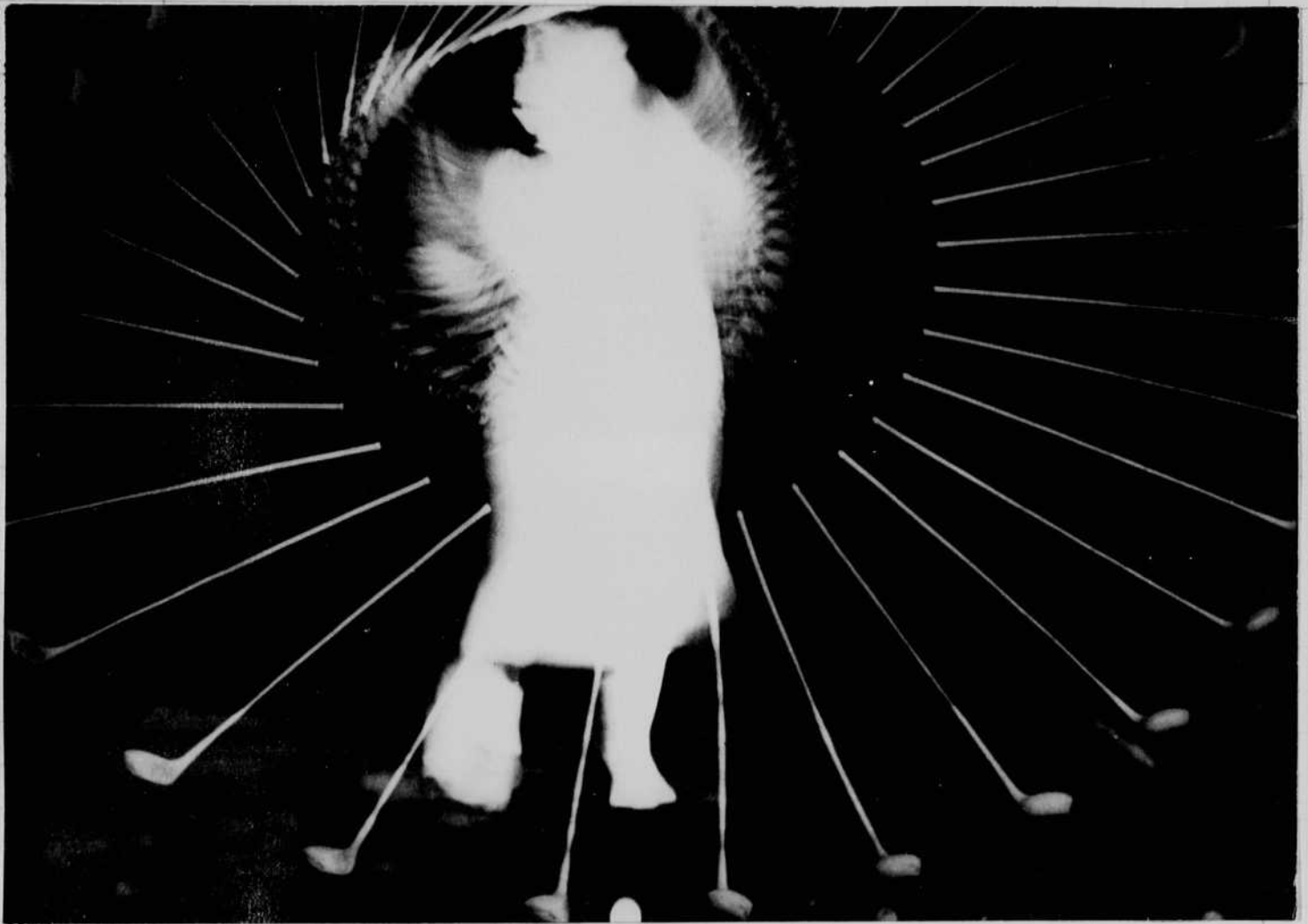
Transformer connections.



cont.

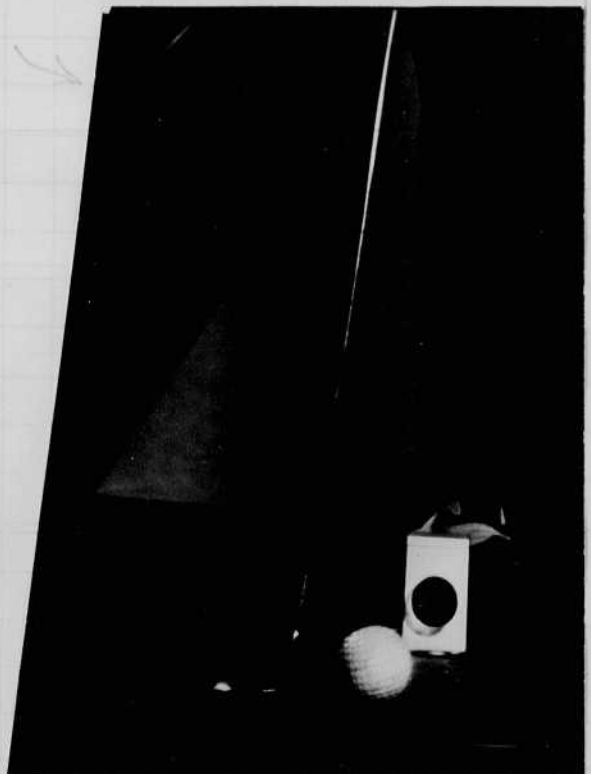
Yesterday afternoon I went over to the
General Communications Laboratory at the
1 m. Lane to inspect his



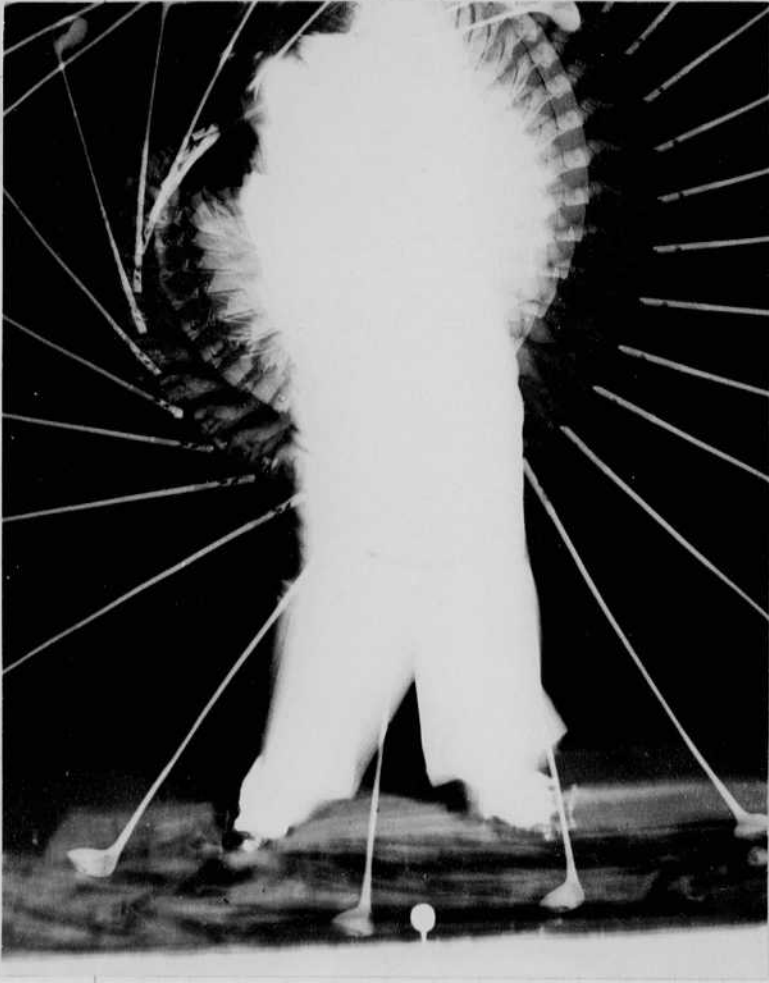


Donnie Shute

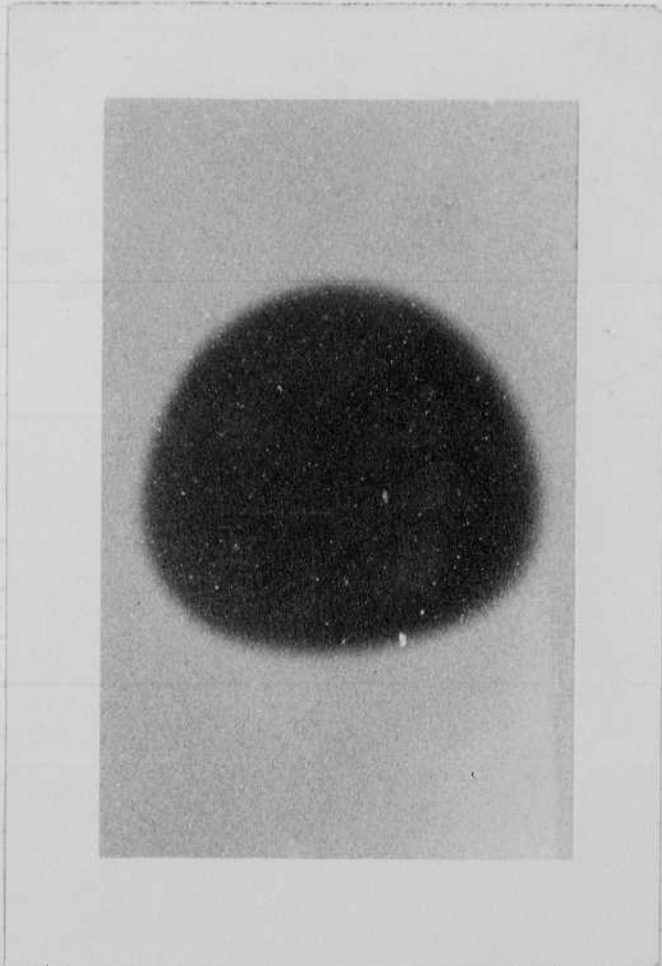
Mrs. Shute

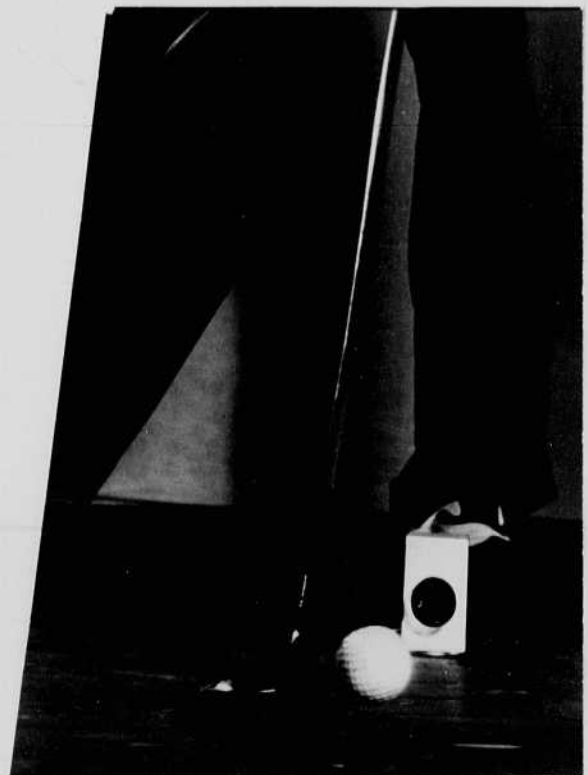
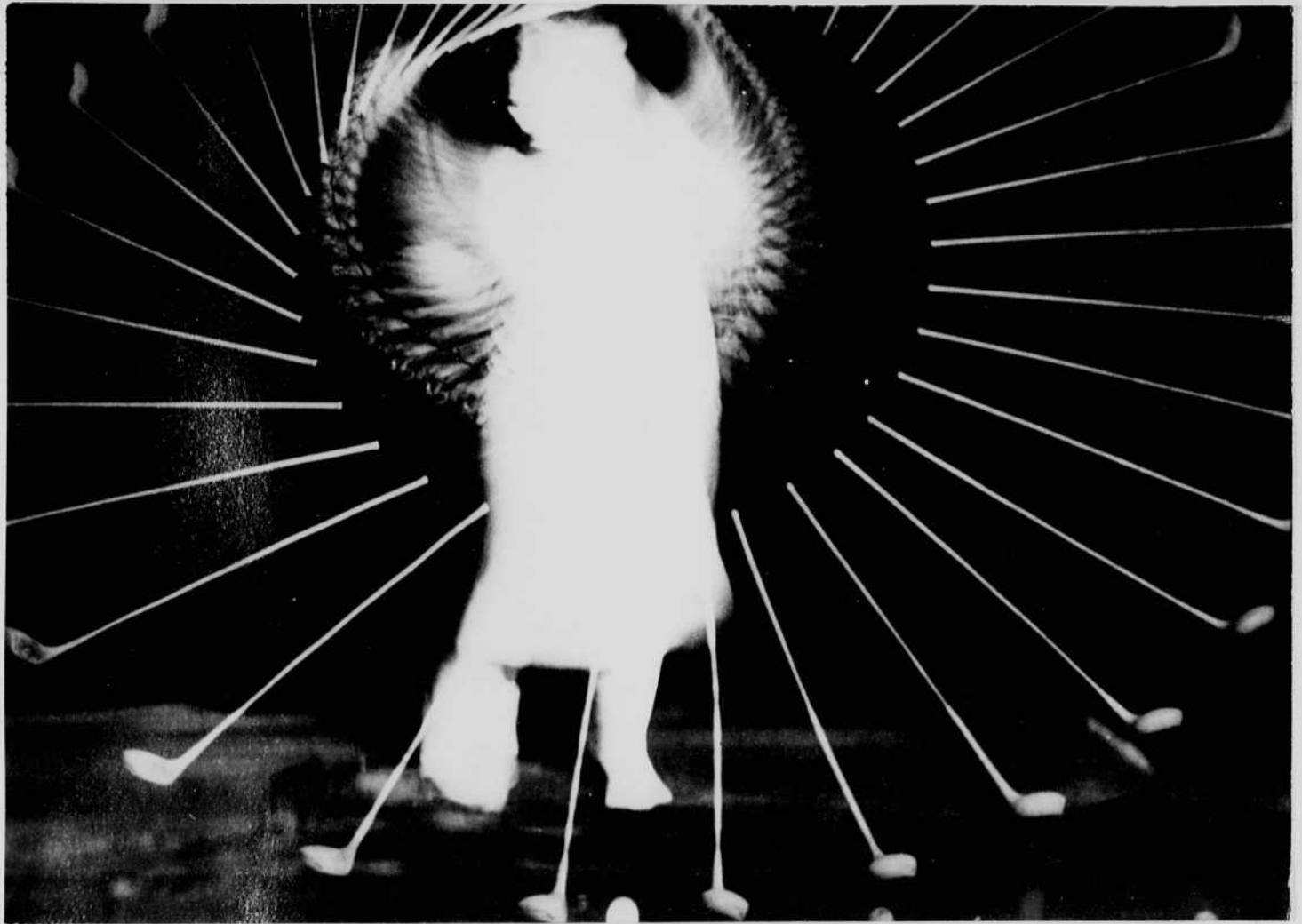


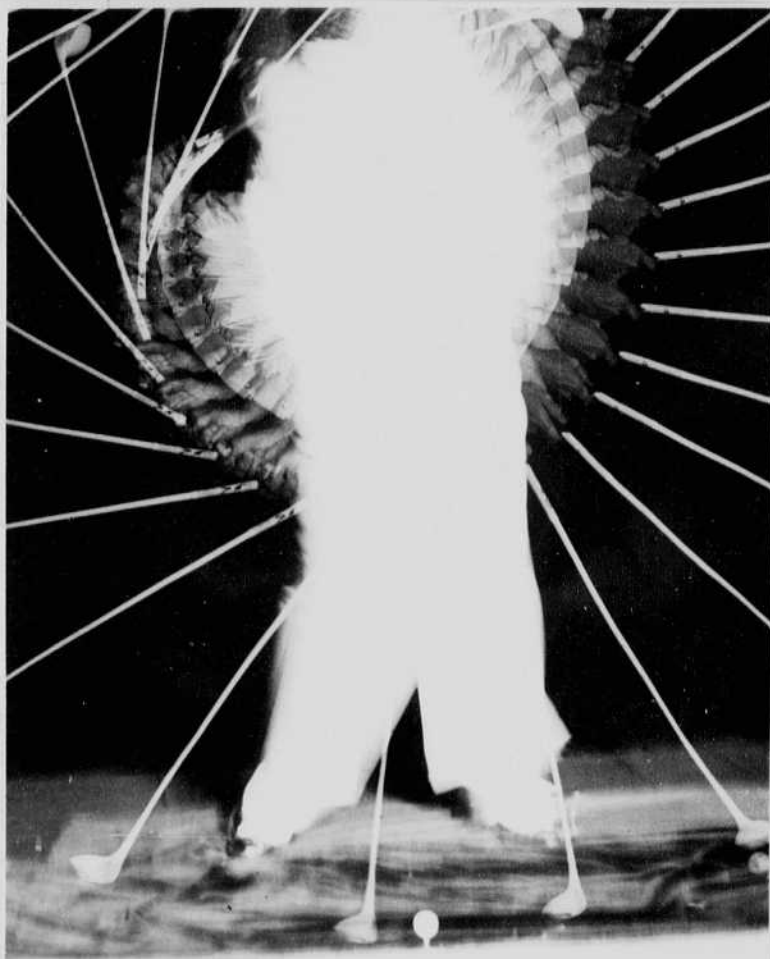
↙ ↘



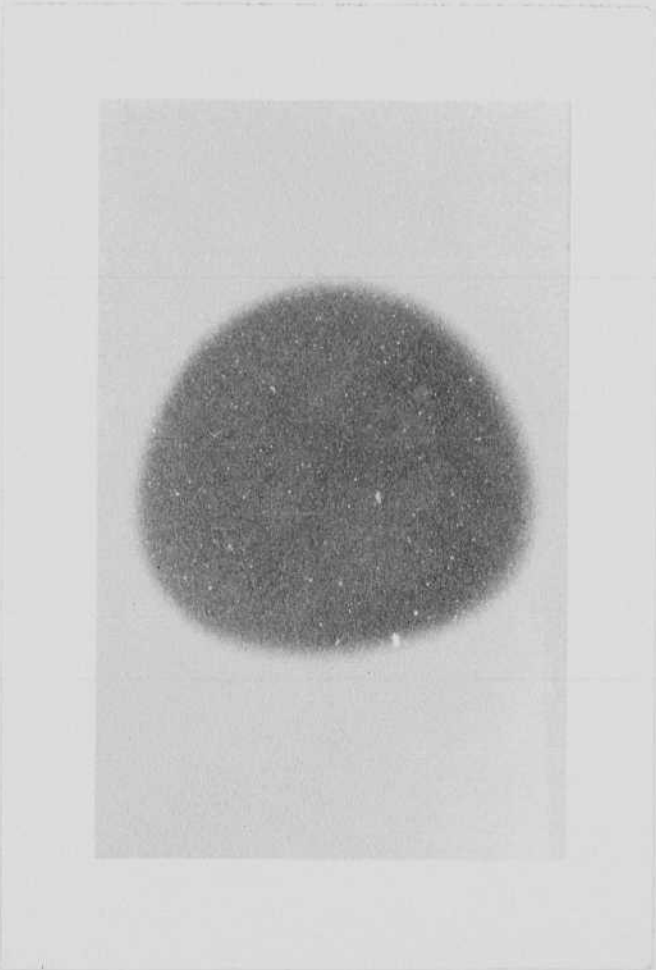
Guldahl



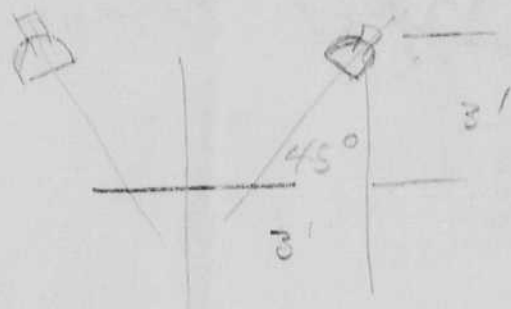




5. ...



4 #2 Photo floods.
100 volts.
1000 each. 4000 watts
320 F.C.



Some density, ±

8 flashes of 5p light.
distance 25% more
Two lights 24mf 3000.v

microfilm 4 min dev 70°

f 15 newspaper.

Graphic Survey, July 19 1938

H. S. [Signature]

Data sheet made July 19 1938 at
Graphic Service Corp.
Mr. Foote

Bob Pace from [unclear]
Beal
Abrams.
Wheelright

An exposure on
Dupont film
was o.k. with
one flash. Data on
back of sheet.

July 27, 1938.
 J. S. Edgerton.

Mr. C. Z. Case of the Eastman Co was here today, this morning, and during his visit we discussed the E. K. Co's possible interest in flash photography. I introduced him to Prof. Moreland. Also I took two negatives of Mr. Case hitting a golf ball. 150/second f 5.6 55 grain Press film.

Last week I took some photos of tennis players. In two or three weeks I plan to take more.

Mr. Hooper of the Allen Hydraulic Lab. was here today to discuss speed photography.

Al Lopez and Mac Jayden of Boston Bees were here July 29 for photos.

2
 28
 1
 4
 2
 28
 1
 B
 B
 M
 M

1/2 distance
 1/2 distance

← 4 flashes about 1/2 enough.

microfilm 4 mm dev 70°

f 15 newspaper.

Graphic Survey, July 19 1938
 H. M.

Data sheet made July 19 1938 at

Graphic Service Corp.

Mr. Foote
 Bob Pace from Edenbrook
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An exposure on Dupont film was o.k. with one flash. Data back of sheet.

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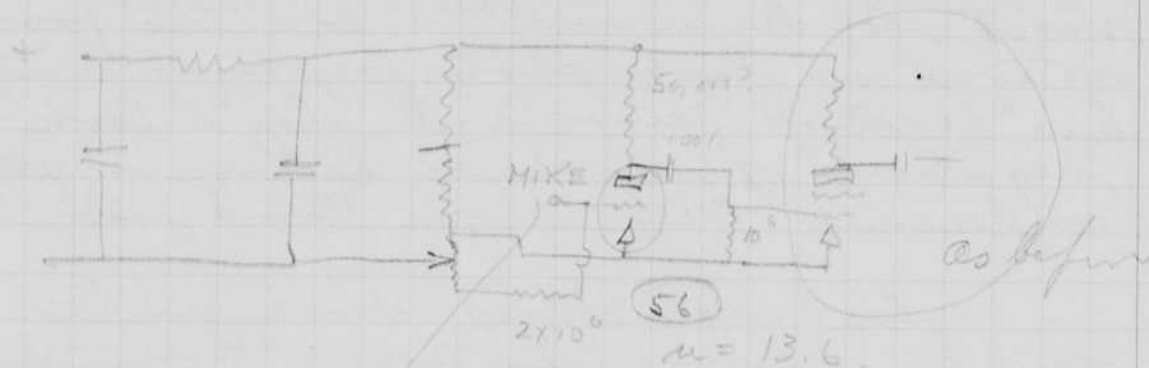
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Aug 1 1938

Added tube to circuit shown on
page 25.



and photo cells as before

works ok.

Boston Transformer No 2113
115 - 6000 volt 60 W

Open circuit 110 volts $.8 \times 50 = 40 \text{ ma.}$

Short circuit 2.3 volts $.96 \times 100 = 96 \text{ ma.}$

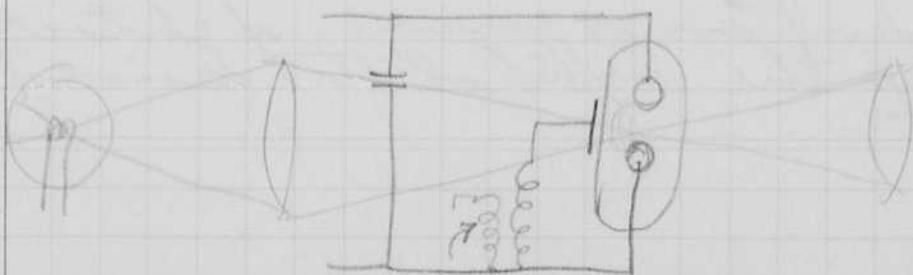
$.1 \times 50 = 5 \text{ amperes.}$

Aug. 7, 1938.

Mr. Brown, Mr. Beach, and Mr. Dixon of the Spaulding Co were here on Aug 7 and dismissed golf clubs etc.

I plan to set up apparatus for taking about 500 pictures during impact at 500 a second of golf swing.

Microscope illuminator high-speed light.



Aug. 4, 1938 cont.

Mr. Gilman of the Jackson & Moneland co was in this afternoon and discussed stroboscopic tests of propeller vibration apparatus.

Since I was going through Hartford tomorrow, he called, regarding a possible visit at the Hamilton Standard Propeller co.

Edwin D. Eaton. Asst Engineer.

Frank W. Caldwell Eng. Manager.

Erle Martin Chief Engineer.

Bob Love is arranging propeller photos. Bathiana at Inter cities.

Amer. Air Lines. ^{Mr.} Waver.

Clark & Belimur tuneup motors.
Local air line.

Yesterday I had a long discussion with Berneshansen and Grier regarding a high speed shutter for outside photographs with speed lights.

If the max aperture is only $f/16$ or $f/22$, a small high speed shutter might be practical for high speed exposure to prevent the day light from making an exposure. A contact would trip the light at the desired moment.

Notebook # 9

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 48 and 49.

Item(s) now housed in accompanying folder.

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Item(s) now housed in accompanying folder.

LIST OF SPECIAL EXHIBITS (Continued)

Structural Analysis with the M. I. T. Moment Indicator,
Professor J. B. Wilbur

Note: The Structures Laboratory on the second floor of Building 1 is also open to
visitors this evening.

The Corrosion of Steel in Salt Water, Professor J. C. G. Wulff

IN THE STEAM, HYDRAULICS AND COMPRESSED AIR LABORATORY:

Determination of Grain Orientation in Steel by Electromagnetic
Methods, Professor F. Bitter

Stroboscopic Study of Model Pelton Wheel, Professor J. J. Eames
Instrument for Measuring the Damping Capacity of Material,
Dr. H. E. Hall

Very Precisely Graduated Scales, Professor G. R. Harrison
Special Equipment for the Study of Marine Propellers,
Professor F. M. Lewis

Large and Small Cavitation Apparatus in Operation, Professor H. Peters
Model Vortex, Professor K. C. Reynolds

Constant Load-Rate Inclined Plane Textile Testing Machine,
Professor E. R. Schwarz

High Speed Engine Indicator, Professor E. S. Taylor

Demonstration of the Shielding and Reradiating Properties
of Aluminum Foil, Professor G. B. Wilkes

FIFTH INTERNATIONAL CONGRESS
FOR APPLIED MECHANICS



PROFESSOR J. C. HUNSAKER
AND THE STAFF OF THE MECHANICAL ENGINEERING DEPARTMENT
OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
REQUEST THE PLEASURE OF THE COMPANY OF MEMBERS
OF THE CONGRESS AND THE LADIES ACCOMPANYING THEM
AT A CONVERSAZIONE
TO BE HELD IN THE DEPARTMENT'S LABORATORIES
ON TUESDAY, SEPTEMBER 13, 1938
FROM 8.30 TO 11 P.M.

Informal Dress

Aug. 6, 1938.

L. W. Edgerton

Trif yesterday by car 350 miles. Left home 5:48 am. arrived Submarine base New London about 9 o'clock. Went aboard Semmes there and met Mr. Patterson, Prince, Frazier and Capt McCool. C&R Drawing no A-1140 shows dimensions of the port holes of which there are two.

Left sub. base about 10 and drove to New Haven, Winchester plant to see Mr. Pugsley. Discussed their problems and possibilities of consulting workers of setting up a laboratory for ballistic problems.

Saw R. Evans at Bridgeport Remington Co. and inspected his laboratory for ballistic studies. Bradford & ... were there.

Stopped at Hamilton Prod. Co to see vibration apparatus. Edwin D. Eaton asst. Eng. Bob. Mueller & ... Mueller and I had a luncheon together in Hartford.

Aug. 11, 1938

Took high-speed photos of Bobby Jones on Sunday Aug. 7. Mr. East and Mr. Beach of Spalding brought him over by car from Springfield.

Worked last night with Fred Barstow taking photos of cracks in tempered glass. A more powerful spring was required than he used before on the plate glass. Also more time lag was needed in the electrical circuit to photograph the cracks.

THE CONVERSAZIONE will be held on the ground floor of two of the Department's laboratories, viz.:

(a) Testing Materials Laboratory, equipped with a variety of testing machines, including a vertical Amsler machine of 1,000,000 pounds capacity for compression, a 400,000 pounds capacity Riehle machine for tension or compression and a 300,000 pounds capacity Southwark-Emery hydraulic machine capable of testing specimens 16 feet long in tension or compression, two 100,000 pounds capacity transverse testing machines and a cable testing machine with a capacity of 70,000 pounds in tension. All of these machines are located on the first floor of the Testing Materials Laboratory; other equipment and smaller machines may be seen on the upper floors of the laboratory during the day.

(b) Steam, Hydraulics and Compressed Air Laboratory with eleven engines, four turbines, and seven condensers together with miscellaneous and auxiliary equipment. That portion of the laboratory devoted to hydraulics has a plant for testing water wheels up to 175 h.p. under heads up to 38 feet; numerous measuring tanks, pumps, Pelton wheels and auxiliary apparatus. The compressed air equipment comprises four air compressors, single- and two-stage of from 2 to 25 h.p. input capacities, working with delivery pressures up to 250 pounds per square inch.

During the days of the Congress members are welcome to inspect the special laboratories devoted to Aerodynamics, Air Conditioning, Automotive Engines, Dynamic Strength of Materials, Forging, Foundry, Welding, Heat Measurements, Machine Tools, Photoelasticity, Refrigeration, and Textiles.

LIST OF SPECIAL EXHIBITS

AT THE ENTRANCE, 55 Massachusetts Avenue:

Museum of Naval Architecture and Marine Engineering,
Professor J. R. Jack

Demonstration of Solidification, Professor P. E. Kyle

IN THE TESTING MATERIALS LABORATORY:

Wear Testing Machine, Professor E. Buckingham

Various Instruments for Measuring Dynamic Stresses,
Professor A. V. de Forest

Vibration Measuring Equipment, Professor C. S. Draper

Stroboscopic Study of Water Drops, Professor H. E. Edgerton

The Cinema Integraph, Professor H. L. Hazen

Exhibit of Nitrided Material, Professor V. O. Homerberg

Detector of Yielding and Apparatus for Combined Stress Tests,
Professors J. M. Lessells and C. W. MacGregor

Simple Photoelasticity Apparatus, Dr. W. M. Murray

Chart of Creep Data, Professor F. H. Norton

Model of a Structure Subjected to an Earthquake, Professor A. C. Ruge

Seismograph Used to Record Disturbances Due to Large Quarry Blasts,
Professor L. B. Slichter

Aug. 6, 1938.

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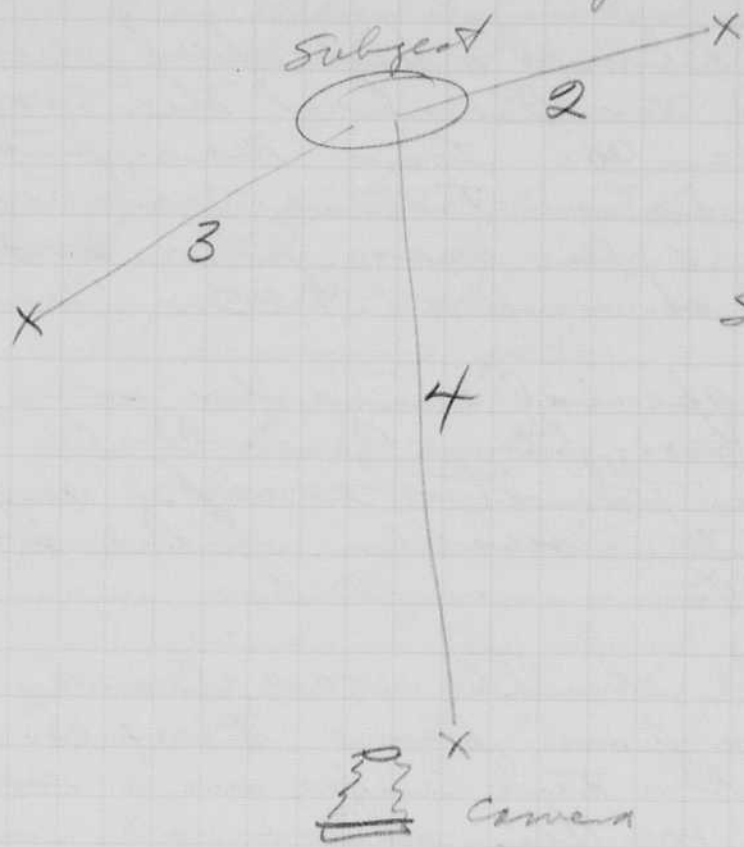
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Sept. 9, 1938.
 Lowell Edgerton

I went to the Sub base at New London on Sept 7 with Ed Gladding to try to get propeller photos of the USS Seimur. The results were nil due to several reasons. I wrote Dr Hayes at Anacosta suggesting new Windows and other changes that would help.

Yesterday in the aft. Mr. Madwan and Dr. Preston were here for a conference regarding spark photography of cracks in glass. Madwan gave me a ~~copy~~ translation of an article by Schardin and Struth in the *Glastechnische Berichte* Vol 16, page 219, 1938. Movies at 200,000 a second were taken to measure the velocity of the cracks. Concluding - cracks go at 1500 meters a second.

Lighting method. 3 lights



Same intensity of light.

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Lighting method. 3 lights



Same method of lighting.

Harold Edgerton
Sept. 26, 1938.

I delivered a high-speed photographic unit to Mr. Palmer of the Crompton-Knowles Co. Loom Manufacturers in Worcester. Pictures were taken at $f 16$ on Agfa press film and at 100 per second at $f 4.5$ on same.

A special contactor was built by the Crompton Knowles Co. to flash the stroboscope in phase with the motion of the driving shaft.

The shuttle was clearly visible with a flash from a 9 mf condenser 1200 volts. Two lamps were sometimes used for this although only one was enough.

I gave Victor Ser — a pencil drawing of the circuit. He is going to redraw it and send me a copy for checking.

New lamps and spares are to be sent to the company.

A straight farrp was used for the 100/second movies.

Harry Lawrence and I took photos of my car with 6 white spots on one of the rear wheels. One shot with a complex showed distortion \odot another with a complex showed a different kind of distortion. These photos are to be used in my book on speed photography to illustrate the action of the shutters.

Last week on Wednesday we had a very violent hurricane which did considerable damage.

I am trying to get the glass breaking research to continue. Barstow is now finishing his masters thesis in the physics dept. Remaining jobs.

1. Double flash pictures, 20 ns apart to measure velocity of crack formation. Simultaneous cathode ray oscillograms are to be taken to measure the time between flashes as well as the time from the initial impact.
2. a photo from the side showing the progress of the fracture from the very start.
3. Experiments with Polaroid to show strain before or after the cracks form.

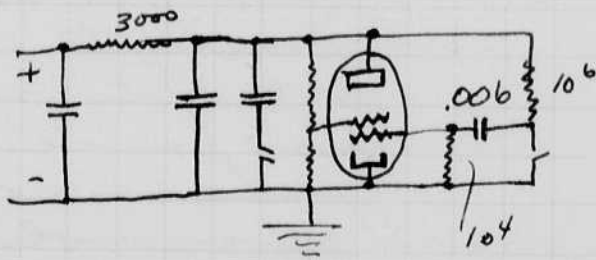
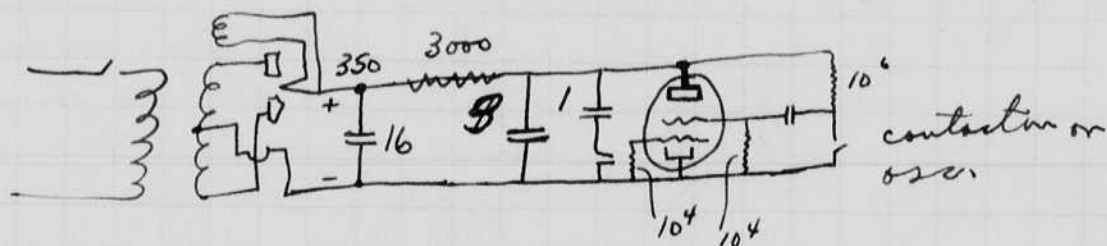
a preliminary experiment with this machine showed a negative result last week. no indication of a strain was present although the polaroid was weak and the exposure time (thin).

Sept. 27, 1938
 David E. Edgerton.

Discussion with Mr. Wilkins and Mr. Burke this morning regarding "Strobolux". Various changes were suggested and Wilkins is going to complete the no. 1 model for final experimentation. Wilkins offered to make a batch of 10 in the experimental shop in 6 weeks time.

The new model of the Strobotac is about through drafting. They will not be ready to sell until Jan. about 38 or 40 were sold (old model in August). Today there were 21 in stock and 50 in the factory. There may be a gap between the new and the old.

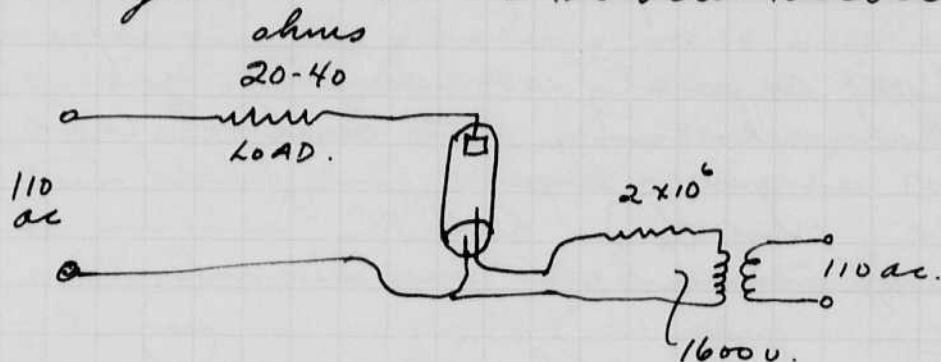
A contactor strobotac was discussed for use with the new Strobolux. It will also be useful by itself as a stroboscope. Grier is to build one and try it out.



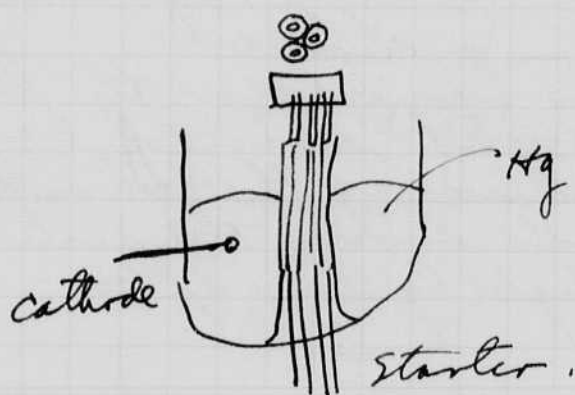
I am to try a double jack out let for the driving of two Stroboluxes in parallel.

H. S. Edgerton
Sept. 29, 1938.

Gemmerhausen has an internal glass-covered arc starter that has been running day & night now for about 700 hours +. The arrangement is as shown below.



The starter consists of a group of W 3 wires (10 mils?) in a triangular formation and covered with a thin glass layer. The wires are spot welded together at the top with a plate.



about 1000 volts starts the arc.

Teller received from Orthemie and sent to Mr. Rines

Oct, 4, 1938
 Harold S. Edwards

Photographs were taken Friday of Joe Stein hitting a golf ball and of Chambers hitting a tennis ball.

4 mf capacity was discharged through a mercury ~~vac~~ control tube and an argon-hydrogen filled tube. (40 cm or 1 cm H₂). Quartz section movie lamp. Speeds of 600 and 300 per second were used.

The photographs show acceleration or deceleration at the moment of impact of the hands plus a reduction of speed to about 75% in the first $\frac{1}{100}$ of a second. The hands then speed up and eventually decrease to zero towards the end of the swing.

Edwards
 10-14-38

at the hands
 Loading of the bundle with lead to increase the weight should be beneficial in reducing the shocks received by the hands during the disturbance at impact and slightly thereafter.

Read + understood
 Oct 4, 1938
 Kenneth J. Henningsham

Dr. Dickson and Mr. East were here on Friday for the above mentioned tests.

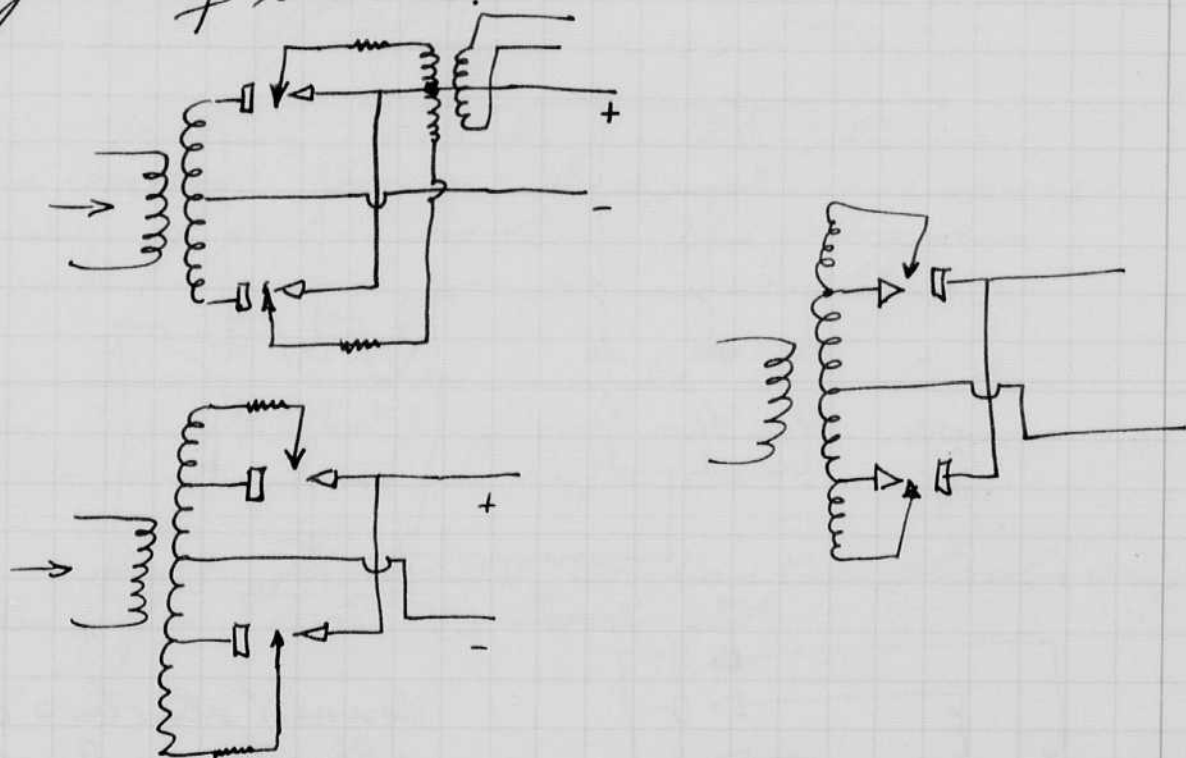
Mr. Bert Fuller of the Eastman Kodak Co was here today and I showed him various devices in the Institute for calculation. Of particular interest were the torque amplifier and the new following mechanism for the new integrator.

Harold E. Edgerton.
Oct. 10. 1938

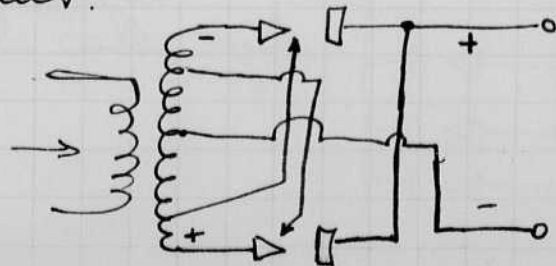
Herb Grier recently sent to Mr. Turner of the Eagle Signal Co a battery operated stroboscopy flasher. Provision was made for changing the flashing rate and also photocell control of the operation. The battery was put in an oak box below the signal, and consisted of four heavy duty 45 volt cells.

Before the unit was sent Grier tried a bell ringer magnet in series with the charging circuit for operating a bell or gong. There is ample power to ring a bell from the charging surge.

I discussed with Grier and Gemueshausen yesterday circuits for using the low voltage capacity starter.

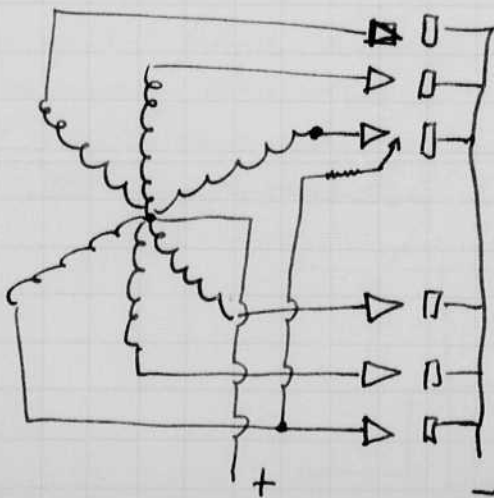
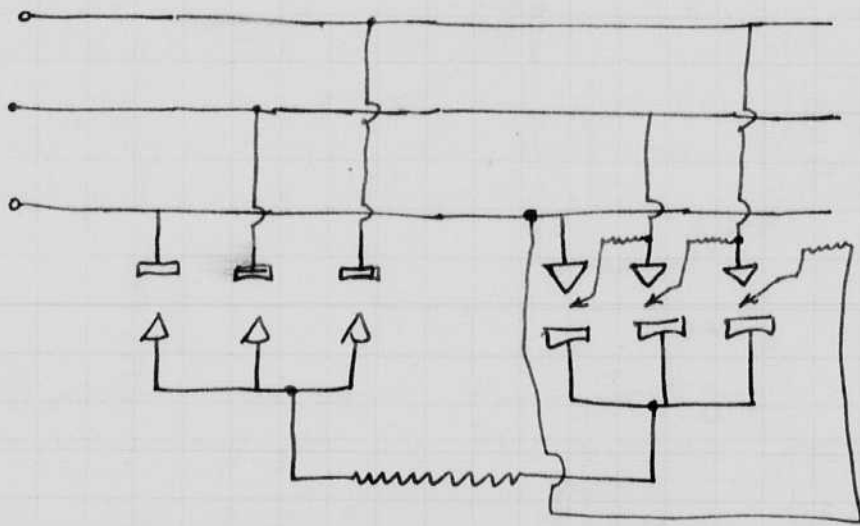
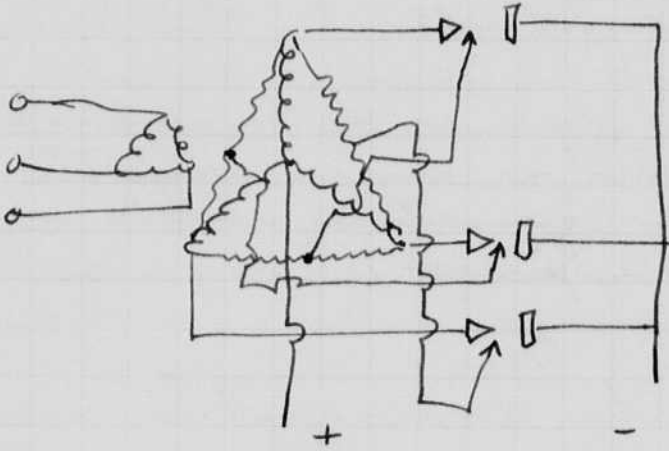
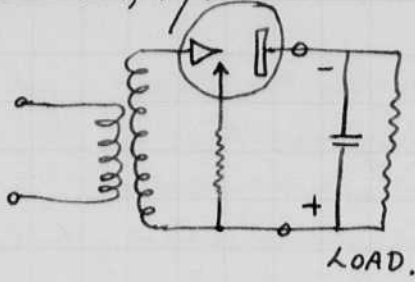


Today Gemueshausen showed me the following circuit.

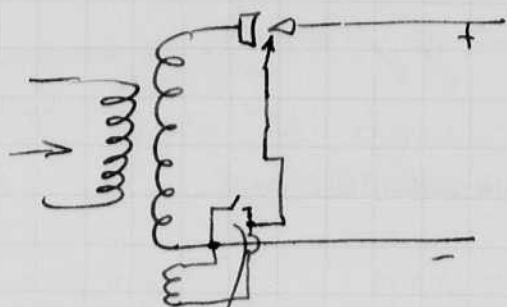


W. E. Dyer
 Oct 10, 1938.

Rectifier circuits.



*connect starters to
 opposite ends of
 phases or to center tap
 if output voltage is
 high low enough.*



Vibrator type contactor.

Synchronously driven contact point arranged to give a break at the peak of the wave or whenever desired for regulation.

This system can be made to operate multiphase.

Oct. 13, 1938

6 - Golf clubs painted white received from A. B. Spalding via A. D. Little Co.

Meeting yesterday with Stevens, Voss, Norton, Brown, Radford regarding study of golf clubs etc. The program was discussed for future work.

James Hansen made arc-starter tube today, sphere form which seems to work fine. Put in life test.

Herb. Finished contactor stroboscope today for B.R. to look at.

Oct. 15. 1938

W. E. Squires H. S. Grier

Measurement of time of flash,

4 mf 2000 volts argon lamp 2" gap $\frac{5}{8}$ glass
condenser at lamp. pressure 50 cm.minim speed 7200 r.p.m. 120/sec.
effective speed 14400 p.p.m. 240 r.p.s.24 $\frac{11}{4}$ Distance per rev. = $3.14 \times 2 \times 12 = 75.4$ inches

$$240 \times 75.4 = 18,100 \text{ inches/sec.}$$

$$= 46,000$$

$$\left\{ \begin{array}{l} 3600 \text{ r.p.m.} \\ 1 \text{ cm} = 43.5 \text{ } \mu\text{s.} \end{array} \right.$$

$$\left\{ \begin{array}{l} 7200 \text{ r.p.m.} \\ 1 \text{ cm} = 21.75 \text{ } \mu\text{s.} \end{array} \right.$$

$$1 \text{ cm} = 21.75 \times 10^{-6} = \frac{1}{46,000} \text{ sec.}$$

$$1 \text{ mm} = 55.3 \times 10^{-6} = \frac{1}{18,000} \text{ sec.}$$

Blur on film = 1.5 mm

$$\therefore \text{Flash} = 21.75 \times 4.5 = \underline{\underline{3.26}} \text{ } \mu\text{s.}$$

with 112 uf lens load. (in H+)

sec

ds

Notebook # 9

Filming and Separation Record

___ unmounted photograph(s)

3? negative strip(s) *inside envelope mounted on
Page 60*

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

was/were filmed where originally located ^{on} between page 60 and —.

Item(s) now housed in accompanying folder.

Oct. 15. 1935

H. B. Grier H. B. Grier

Measurement of time of flash.

4 mf 2000 volts argon lamp 2" gap $\frac{5}{8}$ glass
 condenser at lamp. pressure 50 cm.

minim speed 7200 rpm 120/sec.
 effective speed 14400 rpm 240 rps.

24 $\left(11\frac{1}{4}\right)$

Distance per rev. = $3.14 \times 2 \times 12 = 75.4$ inches

$240 \times 75.4 = 18,100$ inches/sec.

$= 46,000$

$1 \text{ cm} = 21.75 \times 10^{-6} = \frac{1}{46,000} \text{ sec.}$

$1 \text{ in} = 55.3 \times 10^{-6} = \frac{1}{18,000} \text{ sec.}$

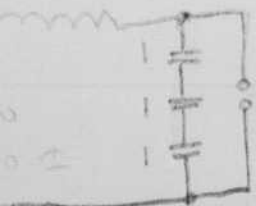
$\left\{ \begin{array}{l} 3600 \text{ mm} \\ 1 \text{ cm} = 43.5 \text{ } \mu\text{s.} \end{array} \right.$

$\left\{ \begin{array}{l} 7200 \text{ rpm} \\ 1 \text{ cm} = 21.75 \text{ } \mu\text{s.} \end{array} \right.$

Blur on film = 1.5 mm

$$\therefore \text{Flash} = 21.75 \times 4.5 = \underline{\underline{3.26 \text{ } \mu\text{s.}}}$$

Spark duration with 112 mf long leads (10 ft ±)
 the flash duration was $\frac{1}{20,000} \text{ sec}$
 $= 50 \text{ microseconds}$



Notebook # 9

Filming and Separation Record

- unmounted photograph(s)
- 3? negative strip(s) *inside envelope mounted on*
Page 60
- unmounted page(s)
(notes, drawings, letters, etc.)

was/were filmed where originally located ^{on} ~~between~~ page 60 and —.

Item(s) now housed in accompanying folder.

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H. E. Grier H. E. Grier

Measurement of time of flash,

4 mf 2000 volts argon lamp 2" gap $\frac{5}{8}$ glass
condenser at lamp. pressure 50 cm.Mirror speed 7200 rpm 120/sec.
effective speed 14400 rpm 240 rps.
$$\left\{ \begin{array}{l} 3600 \text{ rpm} \\ 1 \text{ cm} = 43.5 \mu\text{s} \end{array} \right.$$

$$\left\{ \begin{array}{l} 7200 \text{ rpm} \\ 1 \text{ cm} = 21.75 \mu\text{s} \end{array} \right.$$

$$\left[\begin{array}{l} \text{Distance per rev.} = 3.14 \times 2 \times 12 = 75.4 \text{ inches} \\ 24 \text{ } 11\frac{1}{4} \end{array} \right.$$

$$240 \times 75.4 = 18,100 \text{ inches/sec.}$$

$$= 46,000$$

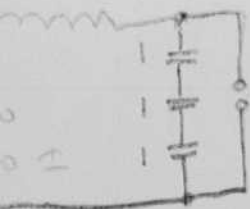
$$1 \text{ cm} = 21.75 \times 10^{-6} = \frac{1}{46,000} \text{ sec.}$$

$$1 \text{ in} = 55.3 \times 10^{-6} = \frac{1}{18,100} \text{ sec.}$$

Blur on film = 1.5 mm

$$\therefore \text{Flash} = 21.75 \times 4.5 = \underline{\underline{3.26 \mu\text{s.}}}$$

Spark discharge with 112 mf long leads (10 ft ±)
the flash duration was $\frac{1}{20,000}$ sec
= 50 microseconds



Notebook # 9

Filming and Separation Record

___ unmounted photograph(s)

3? negative strip(s) *inside envelope mounted on page 60*

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

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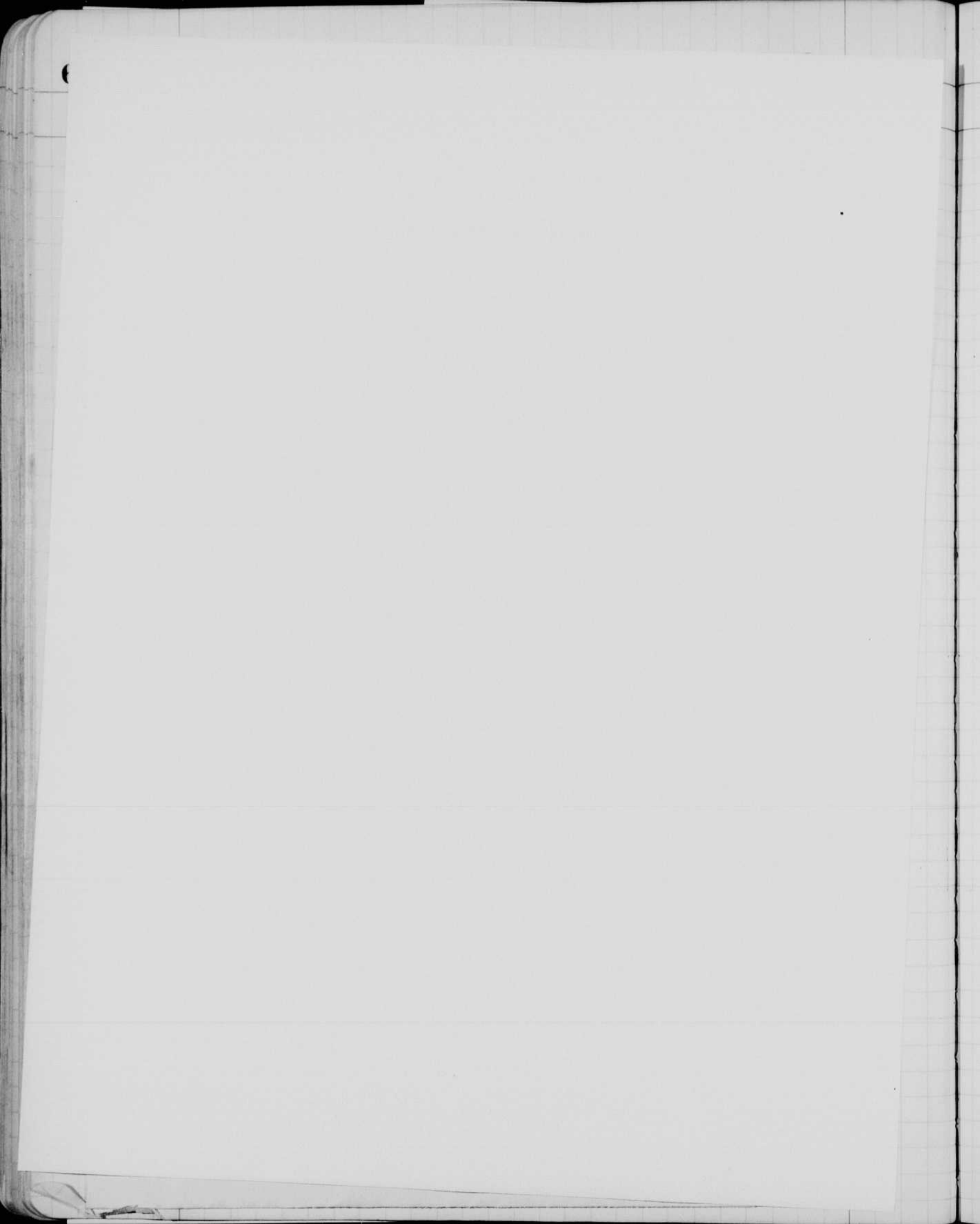
Item(s) now housed in accompanying folder.

110 536600



ICM = 22 M.S.

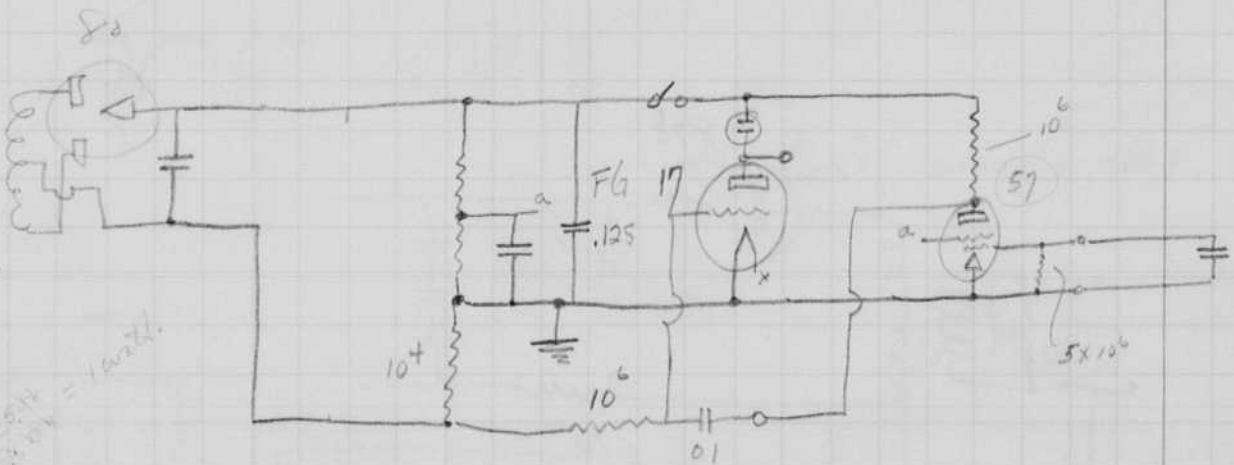
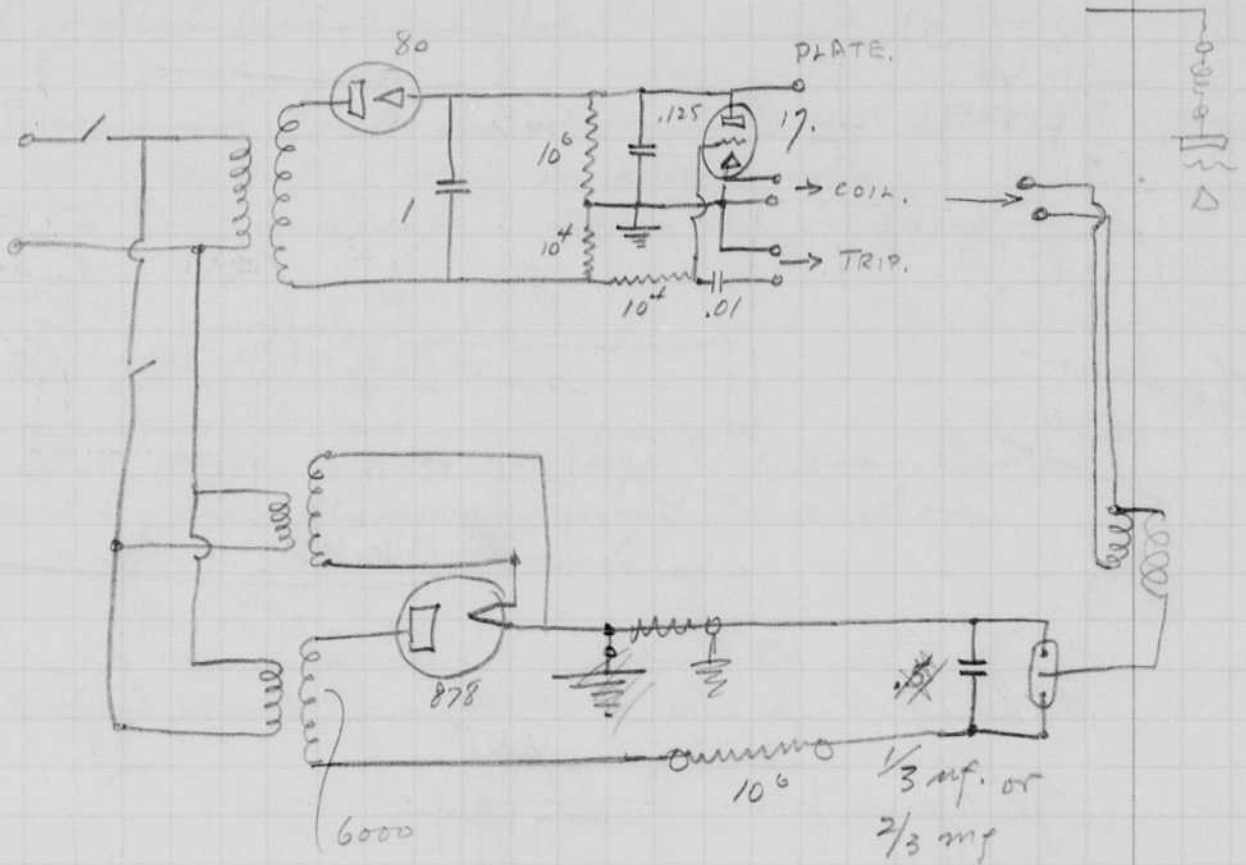
3" AR. LAMP.
4 MT 250 U.



Oct 15, 38
 P. S. S. S. S.

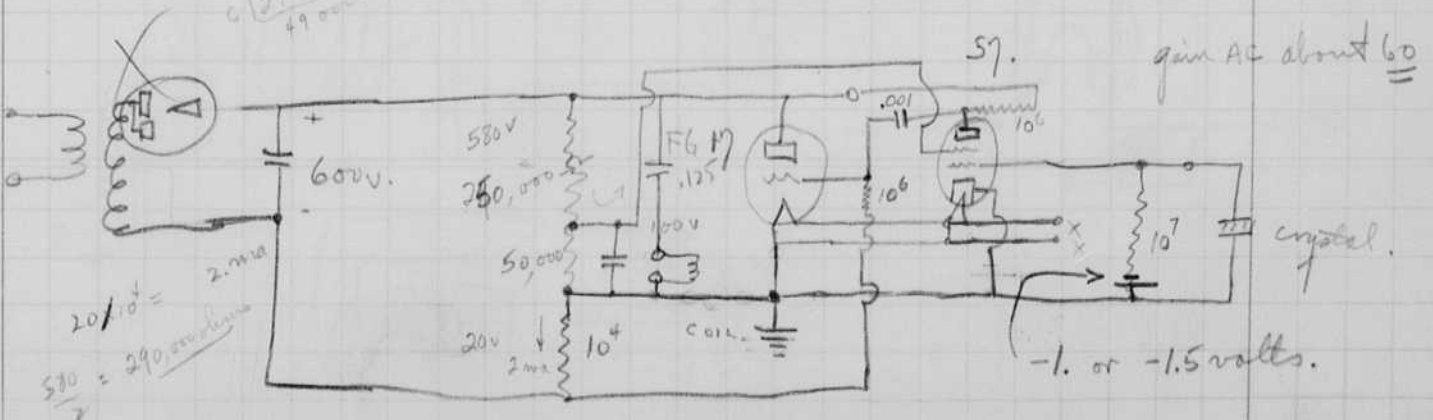
10^{-6} Flash Unit circuit

See page 36 37.



$\frac{50 \times 10^4}{20 \times 10^4} = 2.5$

$\frac{0.125 \times 10^6}{49 \times 10^4}$



$\frac{20}{10^4} = 2 \text{ ma}$
 $\frac{580}{2} = 290 \text{ ohms}$

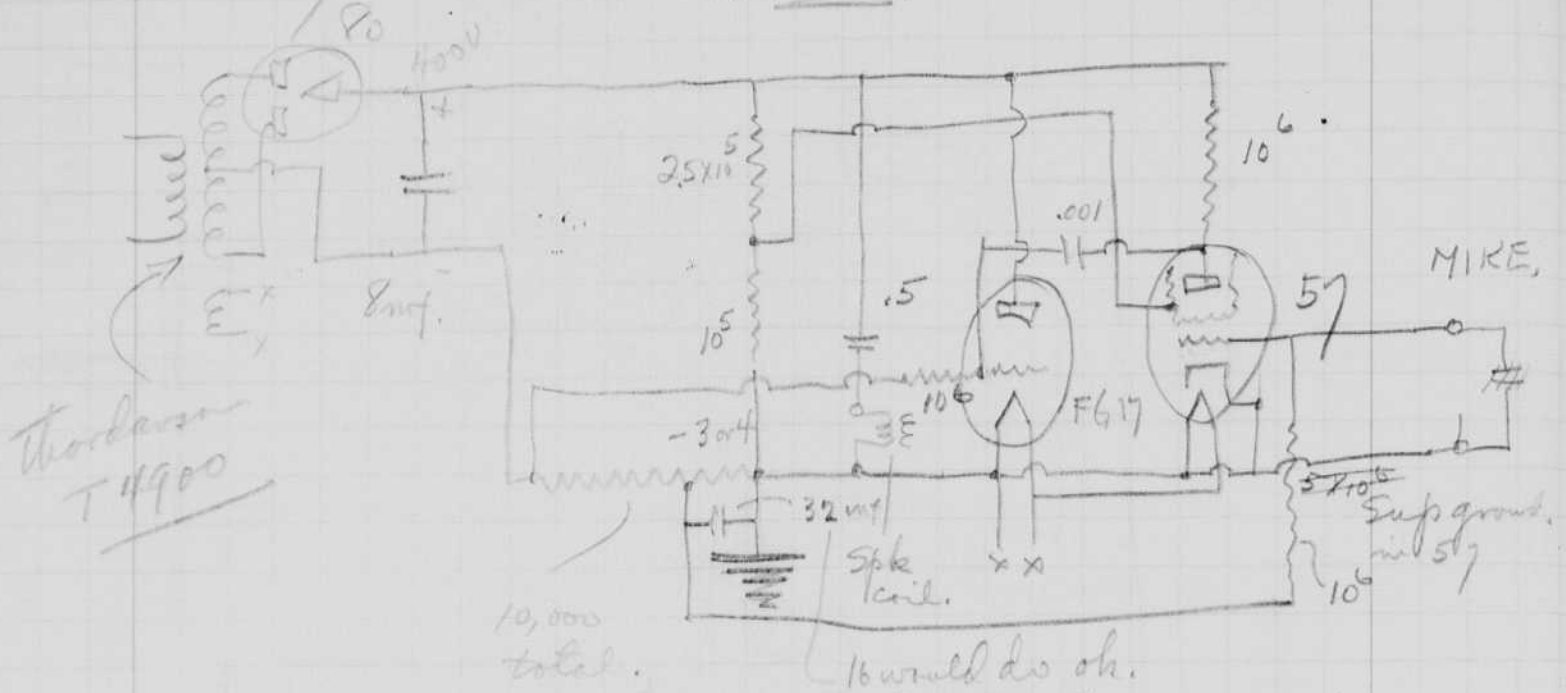
gain AC about 60

-1. or -1.5 volts.

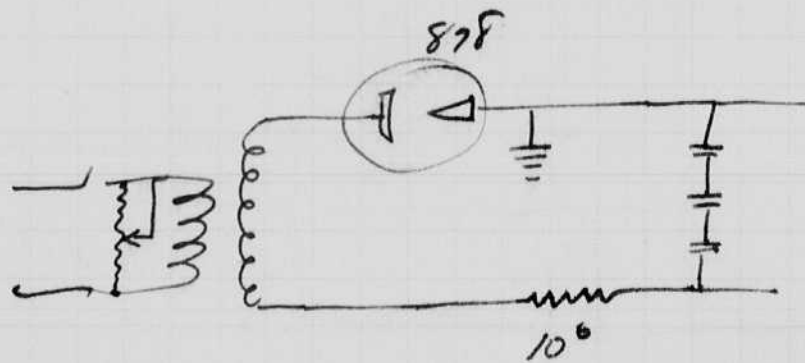
See next page for out. in

Oct. 16, 1938.
H. H. Boynton

Clap Used.



a hand clap about 1 ft from mike trips thyatron.
3/8" spark from Brown Beach coil.



Oct. 17, 1938.

Finished lamphouse for 10^{-4} flash unit with help of Herb Svir and Joe.

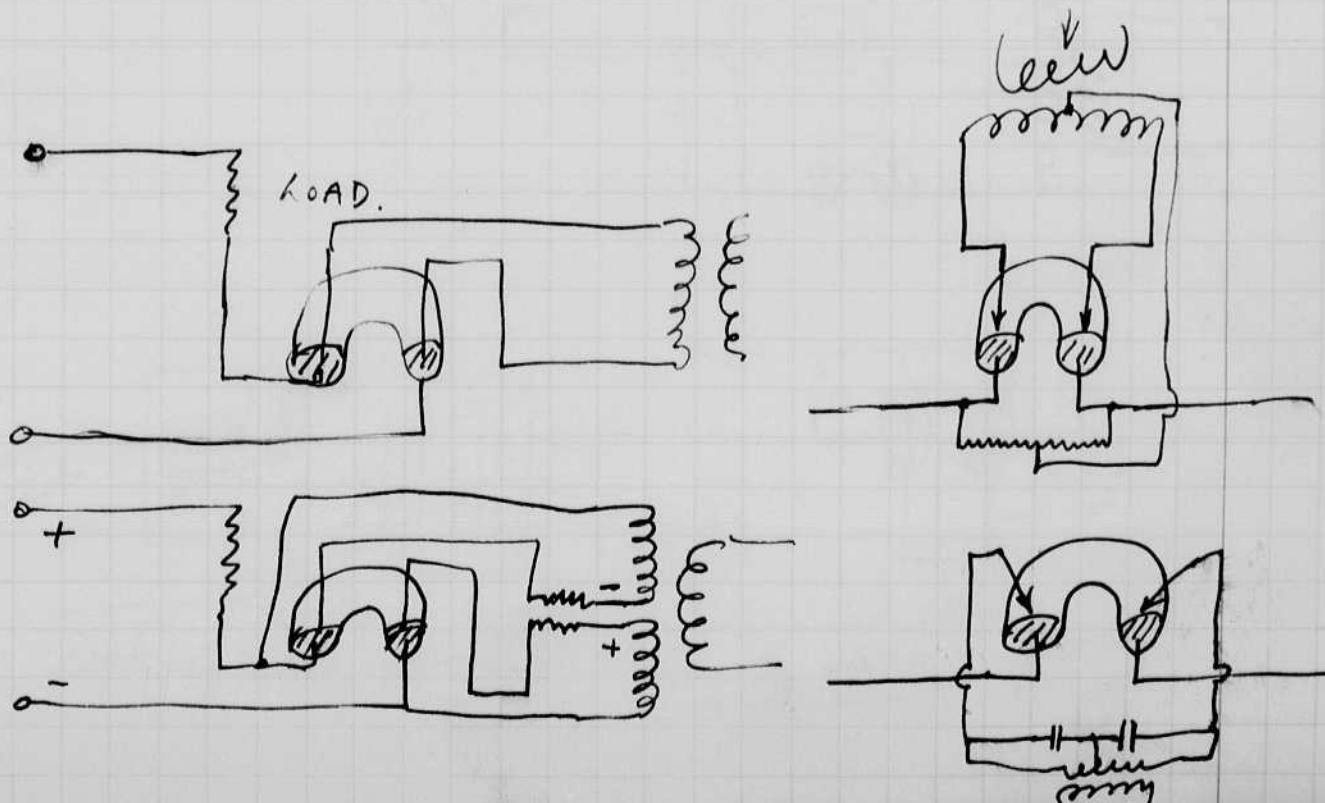
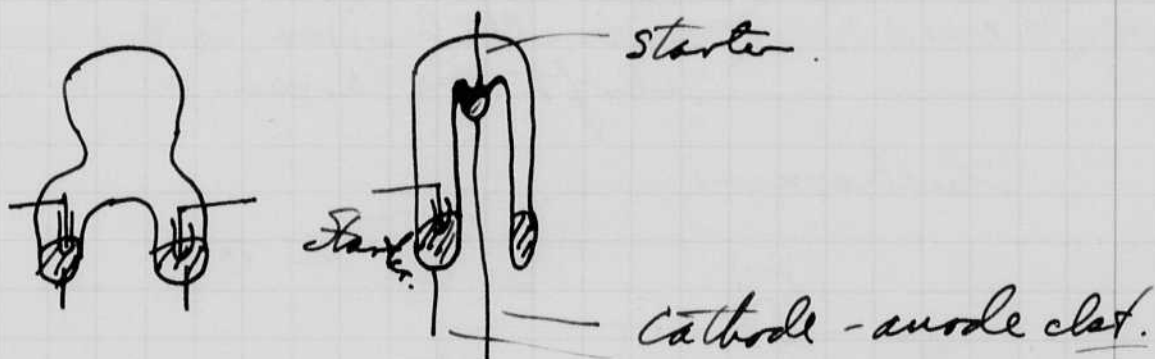
Measured flash duration. $\frac{1}{3}$ mf $5500 \times 1.4 = 7000 \pm$ volts.
about 1 or 2 microseconds.

Arym lamp. 2 cur H_2 for lamping.

Arc-starter tubes.

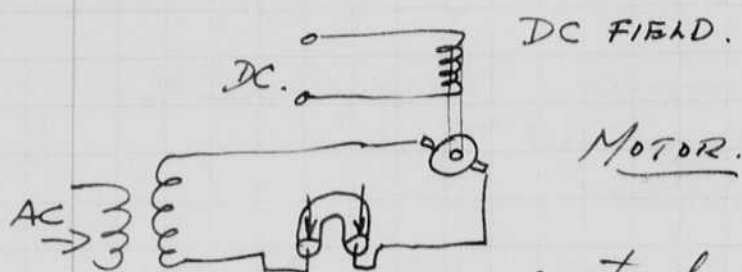
For high back voltage the arc-starter should be glass covered to aid in preventing flash back.

H_2 arc tube - double start.



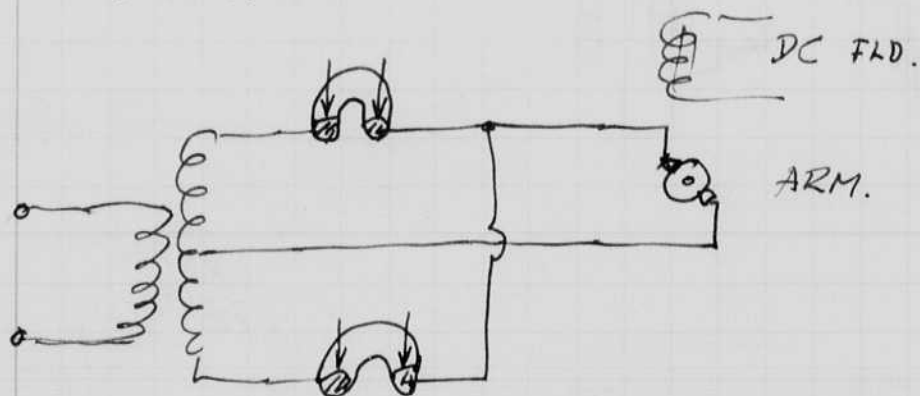
Oct. 18, 1938
H. E. Egerton.

The double ended tube shown on the preceding page can be used either for ac (current going both directions) and as a rectifier for current going in either direction. This might be useful for elevators and other applications where the direction change of rotation is needed.



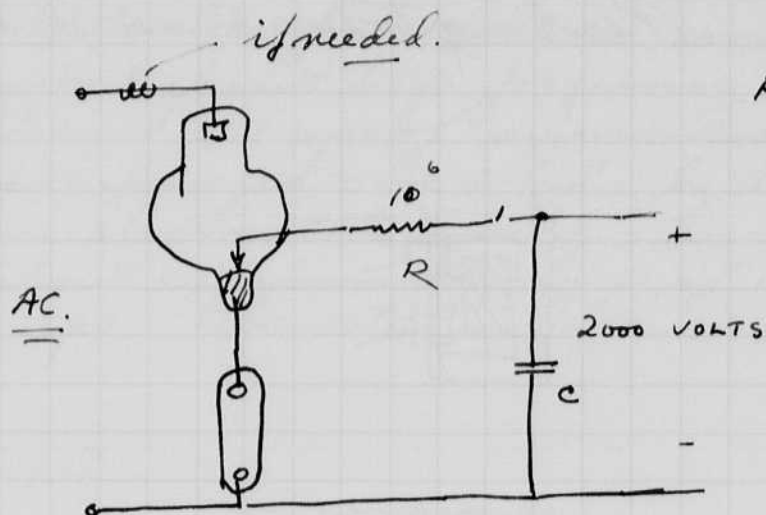
control arranged to run motor either direction at a controlled amount by phase shift methods.

Full wave.

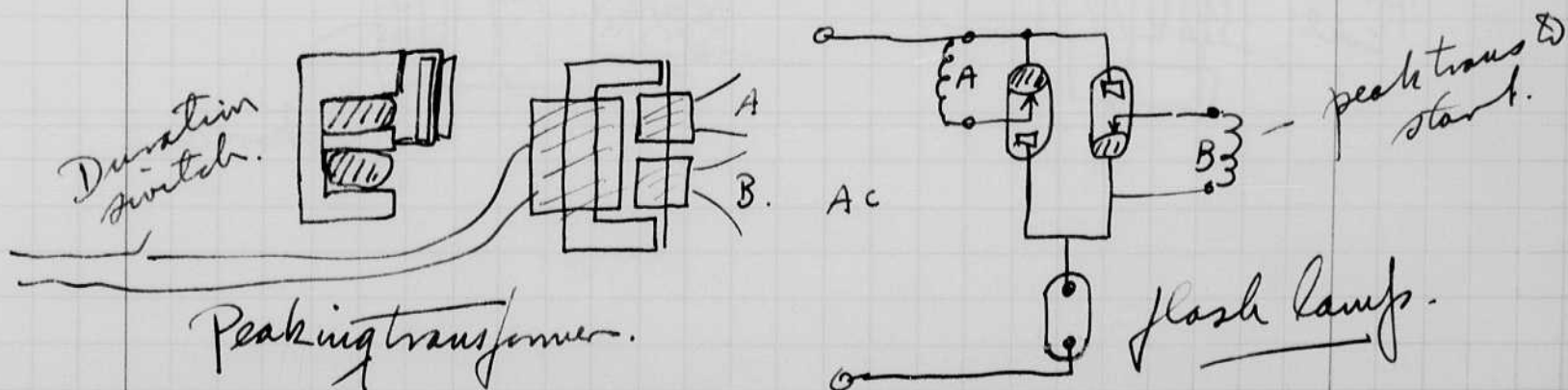
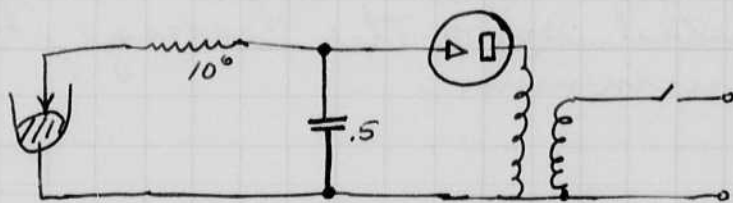


Oct 18 1938
 W. E. Edgerton.

Photo Flash lamp.

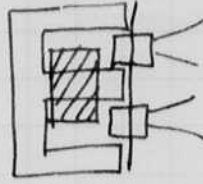
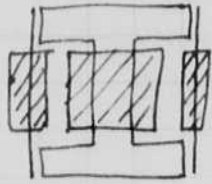
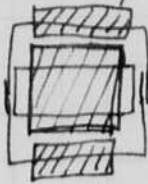


The use of other 60 cycle stroboscopic circuits with phase control could be used here to flash the light at the desired time in the cycle and for the desired duration.

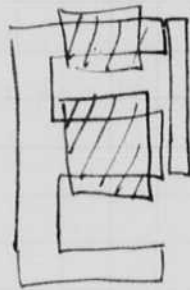


Oct. 19, 1938
 Harold Edgerton.

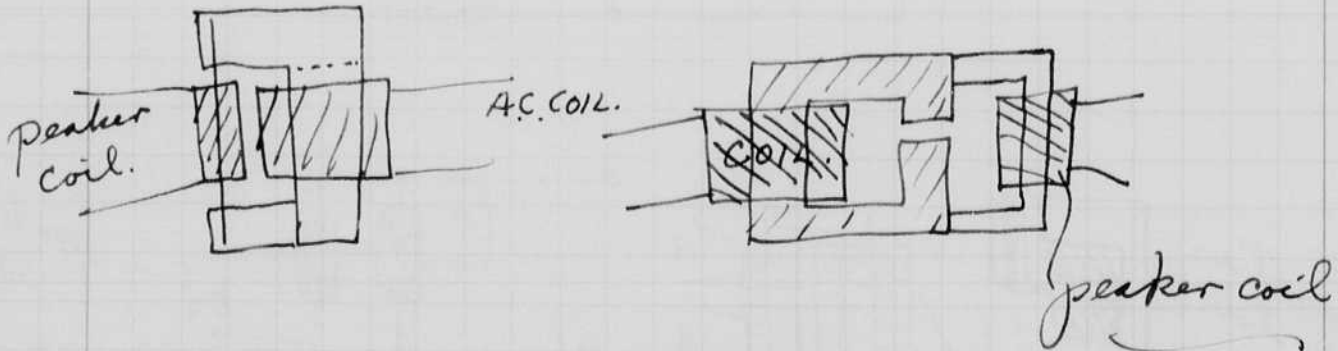
Peaking transformer design.



Resonance. —



A wire cone for the saturated section, might be an advantage as before stated since the leakage flux would be a minimum.



Oct. 22, 1938.
H. E. Garton.

Rubenstein of A.D. Little Co. came in yesterday and asked about high frequency heating. I mentioned the use of supercooled liquids that are changed into solids by the application of an electrostatic field. Mr. Bladding told me about experiments by Prof. Norton of the Chem Dept. The solutions were sugars?

Nov
Oct 3, 1938

Carroll Stansbury was here yesterday and ~~at~~ we discussed the new improvement to the capacity starter tube that Genus has been working on for the last few months. Stansbury is with the Cutler Hammer Co of Milwaukee. He left here to see D.R. Co about variacs etc.

I have been taking photos for the projected book of high-speed photography. Jack Summers posed for squashy photos. Mary Ellen Goodman for action photos. Rowland Wingate - Golf. also golf ball through a phone directory.

Nov. 7 1938
 Harold E. Edgerton

Golf Improvement.

a violent twist is given to the hands of a golfer at the moment of impact if the ball is not hit exactly square.

I suggest the use of a slipping handle that will be tight as long as the torque or acceleration does not exceed that encountered in the initial swing of the club. The violent twist at impact will slip the club shaft in the handle and remove the sting from the hands.

The above slipping handle will be something like a vibration damper such as used on rotating machinery. The object is to ~~take~~ use up the energy of the angular motion of the club with out ~~have~~ a ~~or~~ violent strain on the hands of the golfer.

A somewhat similar effect would result from the use of a free tube on the shaft at any point, with a friction connection to the shaft.

Probably some method of adjusting the tension would be needed. It is quite possible that a method of varying the tension with the centrifugal force at impact force might be useful.



The shaft might be split and sprung so that there would be a slight tension or friction on the handle to prevent slip before the blow.

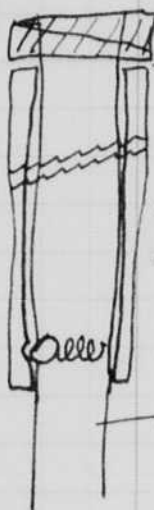
Explained 11-7-38

Herbert E. Grier

Kenneth J. Gernshausen

Nov. 12, 1938.
 Harold E. Edgerton

Discussed with Vose the design of a club to illustrate the scheme on pages 68-69. He has done this and sent specs to Ray Stevens (A.D. Little Co) to be sent to the Spalding Co.



A rough scale should be put on the handle on the shaft so that the percent motion could be measured.

A notch with some sort of an index should be used to replace the handle to the initial condition. This could be done with a counter sunk ball bearing ball held in by a spring from the back.

Some 30 photos were taken on Wednesday Nov. 9 of Joe Stein. photo 72-104 inc. Gardner Norton took down data. Herb Grier helped with the outfit.

I spoke before the Zonta Club Cambridge Nov. 9. My wife ran the projector. This club consists of business women. Miss McKenzie Burdakin, Miss Green. etc.



Roland Wingate.
 Golf ball through a
 telephone directory.

Nov 17, 1938.

trip to Plymouth yesterday with Esther.
 talked at the High School auditorium to the
 Women's club & Guests. Dinner at
 Miskelleys before.

Several discussions regarding
 strob exhibit for world's fair M.I.T.
 Today I showed strobograph to the
 avul students. Prof. Bedewitz &
 Beck were there also.

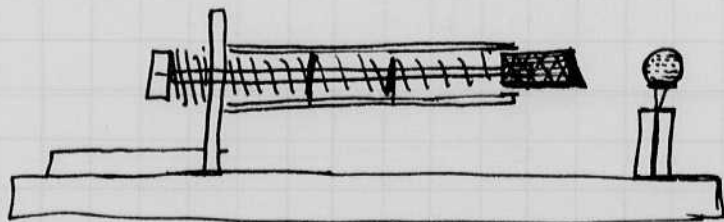
Calc. of distance to fall to attain a
 speed of 160 ft/sec. Golf head velocity.

$$v = at \quad t = \frac{v}{a}$$

$$s = \frac{at^2}{2} = \frac{a \frac{v^2}{a^2}}{2} = \frac{v^2}{2a}$$

$$s = \frac{160^2}{64.4} \approx \underline{\underline{400 \text{ ft.}}}$$

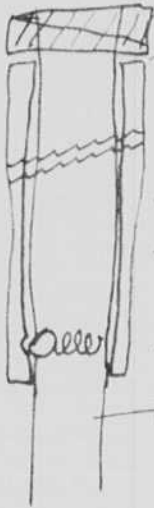
Design a spring gun. To give 160 ft/sec.



Nov 12, 1938.
 Harold E. Edgerton

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Today I showed a sketch to the
enroll students. Prof. Bedwith &
Beck were there also.

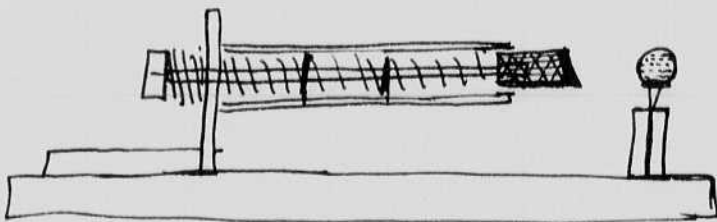
Calc. of distance to fall to attain a
speed of 160 ft/sec. Golf head velocity.

$$v = at \quad t = \frac{v}{a}$$

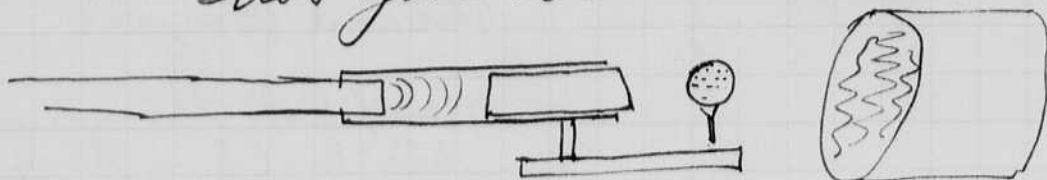
$$s = \frac{at^2}{2} = \frac{a \frac{v^2}{a^2}}{2} = \frac{v^2}{2a}$$

$$s = \frac{160^2}{64.4} \approx \underline{\underline{400 \text{ ft.}}}$$

Design a spring gun. To give 160 ft/sec.



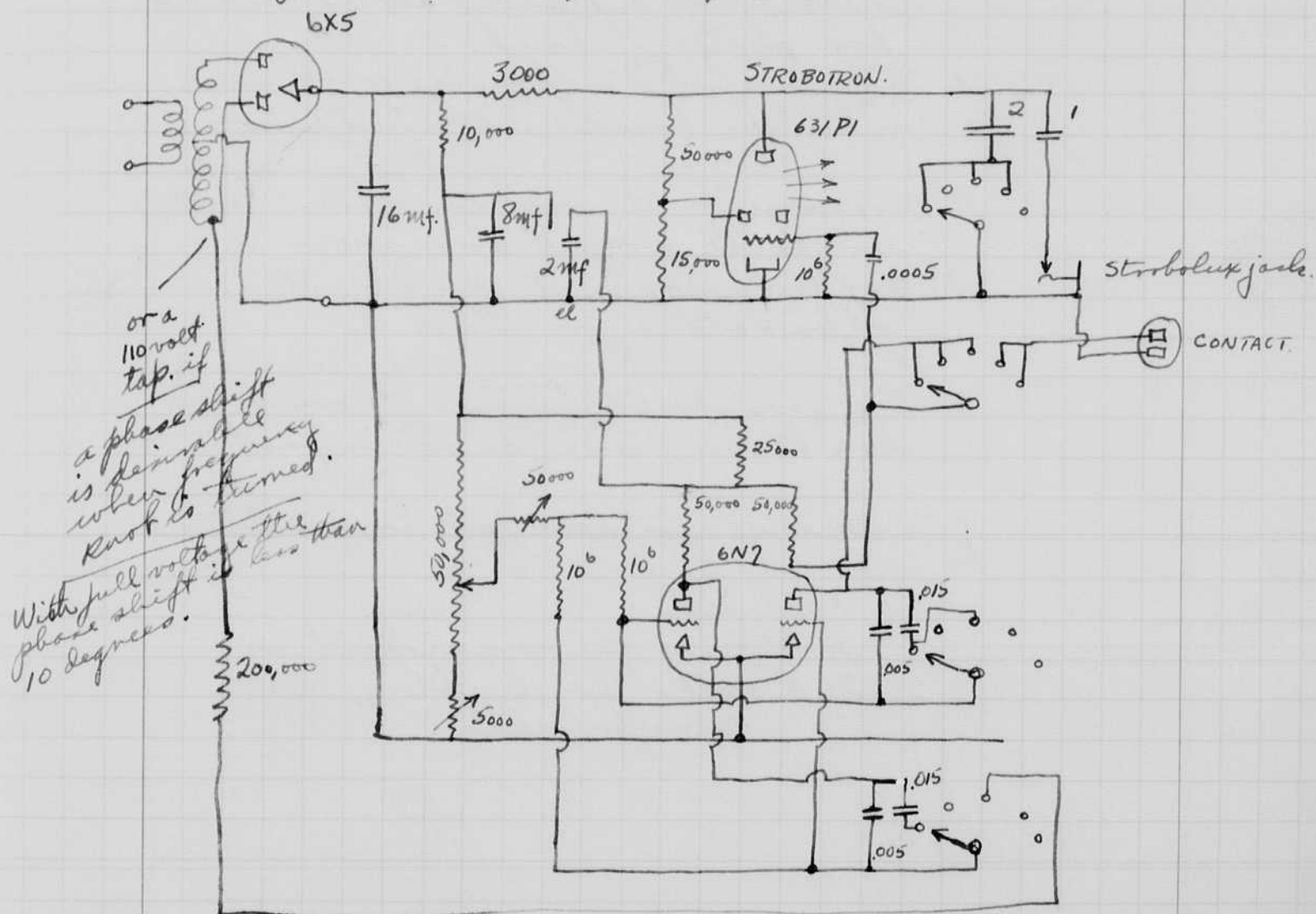
Shot gun to drive ~~club~~ ^{club head,}



Barrel of waste
etc to stop club and
ball.

David E. Edgerton.
Nov 24 1938

Yesterday afternoon I obtained a blue print of the circuit of the new model 63 Strobotac from Mr. Wilkins of the General Radio Co. I experimented with the circuit until about 11:30 pm and made several changes. The most important gives a 60 cycle operation over the entire range of adjustment of the frequency knob. Previously there was only a portion of the range at the low frequency end which would pull in - the rest giving several flashes per cycle - not equally spaced in time.



STROBO Low HIGH
A LINE
CONTACT Low HIGH

Cont.

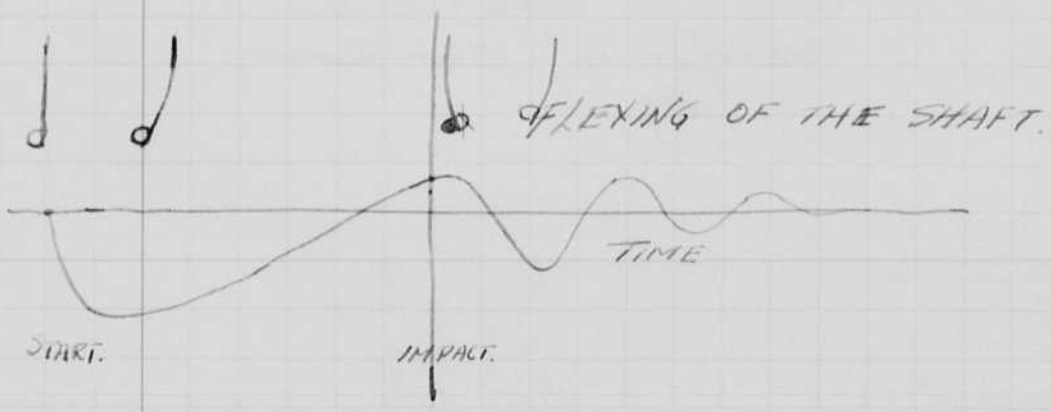
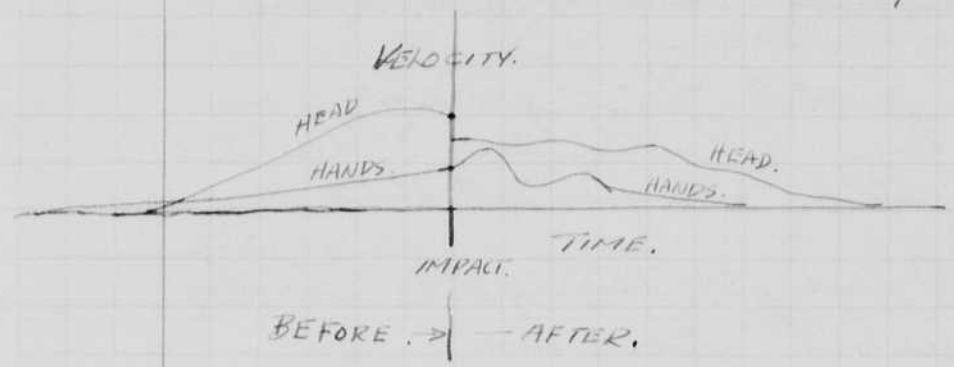
I had lunch yesterday noon with Roy Stevens (A. D. Little Co.) Jim. Killian and Jim. Lowlands. Purpose to discuss copyright of photos taken for Spalding Co. and also the proposed showing of the photos on Dec. 7 in New York.

Discussion after with Mr. Stevens in my office at 4.15. Points discussed -

1. Letter to ~~ask~~^{ask for} check on captions on any news photos that the Spalding Co may release.
2. Program of research to date.
 - a. Draw conclusions from photos as to what happens at the hands from photos on hand.
 - b. Take photos to emphasize what goes on to the hands. 200 feet/sec.
 - c. Arrange for closeup of ball and club series to project as a movie.
 - d. Trip to Chicopee to see about apparatus for item c.
 - e. See Vose about fatigue of muscles due to acceleration or impact.
 - f. Arrange for New York demonstration.
 1. Slides
 2. Stroboscope demonstration
 3. Prints for display.
(also for release.)

Analysis of golf club photos.

- 1. Prepare slides.
- 2. Read data on fall and club to plot position-time velocity-time.

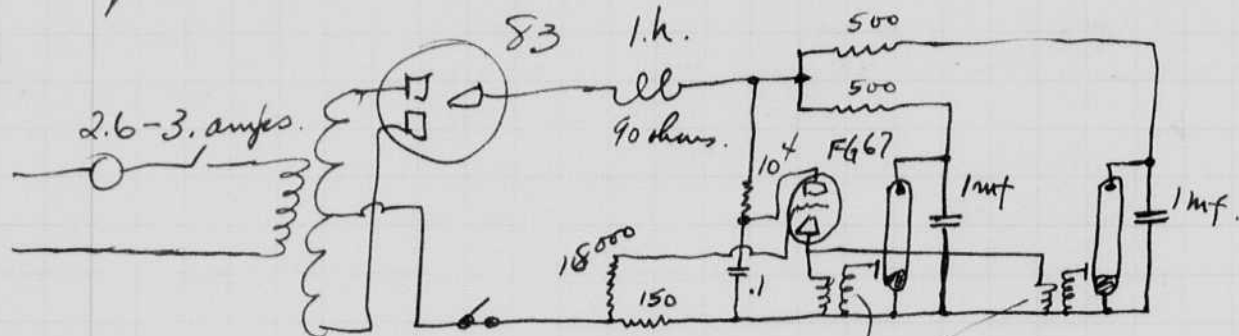


Dec. 12 1938
J. S. Edgerton

Showed multiple-flash photography at
New York, Spalding Co., 518 Fifth Ave,
New York ~~opening~~ last Wednesday.

Inspected Worlds fair grounds in
N. Y. on Thursday Dec. 8 with Mr. White
& Landeman & Hatch each for N.C.R. Co.

Herb and I rebuilt 120 cycle strobe
for math exhibit. Now is



Bosch brown with
out core.

Supps 12" 2cm diam.
Hz.

Members and guests will meet informally for dinner at Walker Memorial at 6:00 P.M.
IES Beaux Arts Drawings will be on exhibition at this meeting.

FRIDAY, DECEMBER 16

Institute of Radio Engineers, Boston Section

H. W. Lamson, Chairman

Time—8:00 P.M.

Place—3-370, Mass. Inst. Tech., Cambridge.

Speaker—Mr. Kenneth Germeshausen, Dept. of Electrical Eng., Mass. Inst. Tech.

Subject—"New Forms of Cold Cathode Arc Tubes."

The new fields of electronics should prove of considerable interest. All members of ESNE are cordially invited to attend.

An informal get-together supper will be held in the cafeteria of the Walker Memorial Bldg., M.I.T. at 6:00 P.M. Members and friends are urged to gather at this time and renew acquaintances.

C. V. COSMADES

COMMERCIAL PHOTOGRAPHER

Specialist in

INDUSTRIAL EQUIPMENT PHOTOGRAPHS

14 WARWICK ROAD, WATERTOWN, MASS.

Tel. MIDDLESEX 6850-R

Dec 11 1938
James Edgerton.

77

Left M.I.T. about 2 pm for New London on Dec 14 for New London - Sub base for another try at propeller photography on U.S.S. Semmes. Stayed in Quarters D and ~~went~~ that night and went aboard the morning of Dec 15 at 8 am.

A new hatch had been cut in the floor of the steering engine room which gave an improved approach to the two glass port holes.

I used a 2" gap in argon gas (2 cm tube diam) at $3/4$ of atmospheric pressure for a light source. A reflector was clamped over the 5" port hole on the starboard side, forward. 48 mf 3000 volts was used to discharge into this lamp. As the ac was obtained from a rotary, the exact voltage was not known.

Capt McCool
Lieut. Peterson.
Prince
Frazier
Douglas ?

Naval Officer Geyer Radio.

Dr. Stephenson. } Sound experiments.
" Arnold

Turner. Sub. Signal Co.

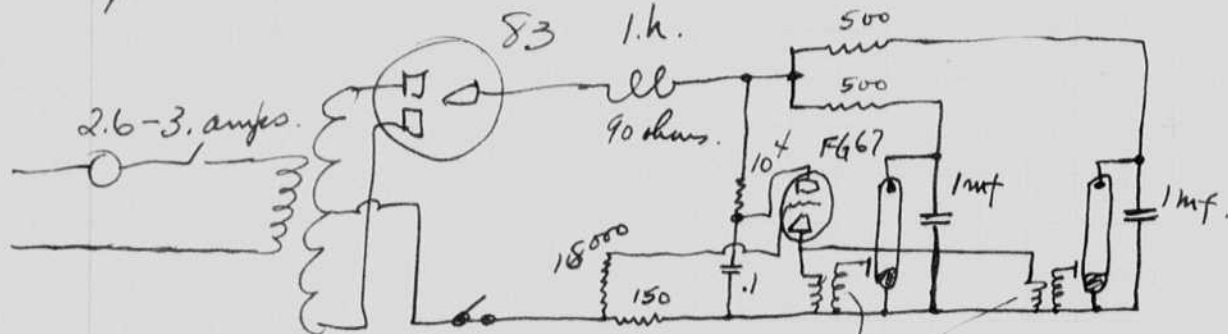
Gardner Horton Reserve Officer.
Helped me with data etc.

Dec. 12 1938
H. S. Ogden

Showed multiple-flash photography at
New York. Spalding Co. 518 Fifth Ave,
New York ~~on Tuesday~~ last Wednesday.

Inspected Worlds fair grounds in
N. Y. on Thursday Dec. 8 with Mr. White
& Landman & Hatch each for U.C.R. Co.

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.. Arnold }

Turner. Sub. Signal Co.

Gardner Horton Reserve Officer.
Helped me with data etc.

In Reply Refer
File No.

Starboard Prop

Agfa

U. S. Submarine Force

U. S. S. SEMMES
EXPERIMENTAL DIVISION ONE

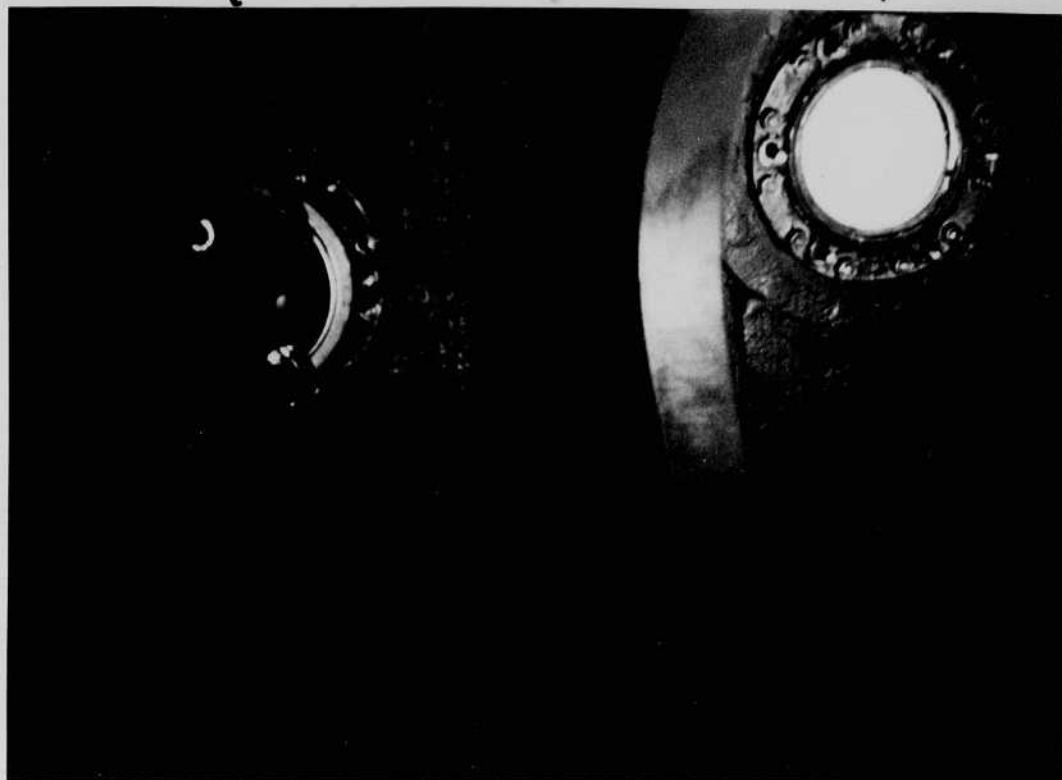
| Film No. | Time | Course | Speed | Sea. | Prop Rev. | Exp. | Exposure | Frame |
|----------|-------|--------------------------|-------|---------------|-----------|----------|----------|--|
| 4 | 11:30 | 90° | 6K | Following sea | | 2.0 | .01 sec. | 3 1/2 ft |
| 5 | 11:32 | | | | | | | Starlight Illu |
| 6 | | | | | | | 1/25 | |
| 7 | | | | | | | 1/5 sec | |
| 8 | | Submerged | | | | 2 | .01 | |
| 9 | | | | | | 2 | .01 | with Strobe Scope Controlled by HEE. |
| 10 | | | | | | 2 | .01 | |
| 11 | | | | | | | | |
| 12 | | | | | | | | |
| 13 | | | | | | | | |
| 14 | | | | | | | | |
| 15 | 12:45 | 260° | 15K | Against sea | | 2 | .01 | 2 1/2 |
| 16 | | Blank | | | | 20 Stubs | | 3.0 |
| 17-26 | | | | | | | | |
| 17 | | | | | | 2 | .01 | |
| 18 | | | | | | 4 | .01 | |
| 19 | | | | | | 8 | .01 | Strobe scope |
| 20 | | | | | | | | |
| 21 | | | | | | | | |
| 22 | | | | | | | | |
| 23 | | | | | | | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |
| 26 | | | | | | | | |
| 27 | | 270° 300° with sea | 20K | Against sea | Time 1:10 | 2 | .01 | 4.0 |
| 28 | | | | | | | | |
| 29 | | | | | | | | |
| 30 | | | | | | | | |
| 31 | | | | | | 4 | | |
| 32 | | | | | | | | |
| 33 | | | | | | | | |
| 34 | | | | | | | | |
| 35 | | | | | | | | |
| 36 | | Picture of porthole | | | 1:14 | | | |

All fourths same as others.

SPECIAL LAMP IN
REFLECTOR ↓

TOP

CAMERA HERE ↓



FORWARD

↙

Argon lamp 48mf 3000 volts.

2" gap - atmospheric pressure ±.

Camera f2 lens Dollina. 35mm film.

Estwan XX

In Reply Refer
File No.

Sturbock Prop

Agta

①

U. S. Submarine Force

U. S. S. SEMMES

EXPERIMENTAL DIVISION ONE

Flint

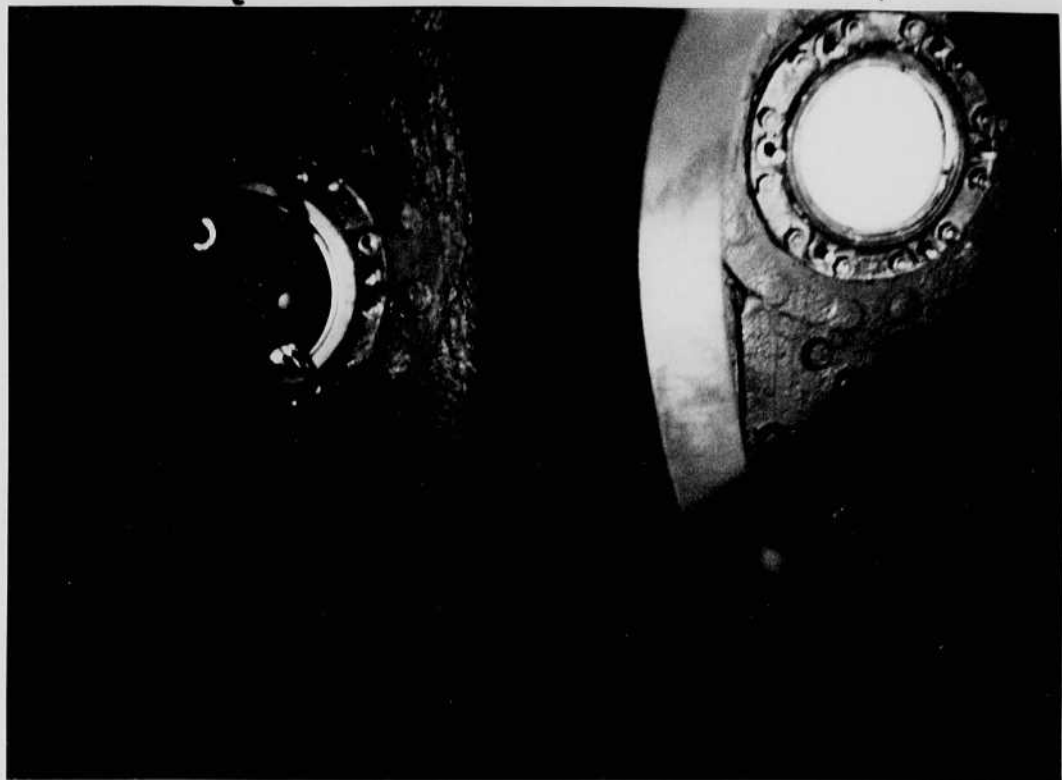
| Time | Course | Speed | Sea | Prop Rev | Hydro | Temp |
|------|--------|-------|--------|----------|----------|-------------------------|
| 4 | 30° | 15 | choppy | 30 | .01 seas | 3 1/2 ft |
| 5 | 110° | | | | | Sanlight 11m |
| 6 | | | | | 1/25 | |
| 7 | | | | | 1/500 | |
| 8 | | | | 2 | .01 | |
| 9 | | | | 2 | .01 | with 2 hydroscopes |
| 10 | | | | 2 | .01 | Controlled by HSE. |
| 11 | | | | | | All further same as 11. |
| 12 | 260° | 15K | rough | 2 | .01 | 2 1/2 m |
| 13 | | | | | | 3.0 |
| 14 | | | | | | |
| 15 | | | | | | |
| 16 | | | | | | |
| 17 | | | | | | |
| 18 | | | | | | |
| 19 | | | | | | |
| 20 | | | | | | |
| 21 | | | | | | |
| 22 | | | | | | |
| 23 | | | | | | |
| 24 | | | | | | |
| 25 | | | | | | |
| 26 | | | | | | |
| 27 | | | | | | |
| 28 | | | | | | |
| 29 | | | | | | |
| 30 | | | | | | |
| 31 | | | | | | |
| 32 | | | | | | |
| 33 | | | | | | |
| 34 | | | | | | |
| 35 | | | | | | |
| 36 | | | | | | |

Radius of port hole 1:14

SPECIAL LAMP IN
REFLECTOR ↓

TOP

CAMERA HERE ↓



FORWARD

↙

Argon lamp 48mf 3000 volts.

2" gap - atmospheric pressure ±.

Camera f2 lens Dollina. 35mm film.

Estwan XX

In Reply Refer
File No.

PM Thurn

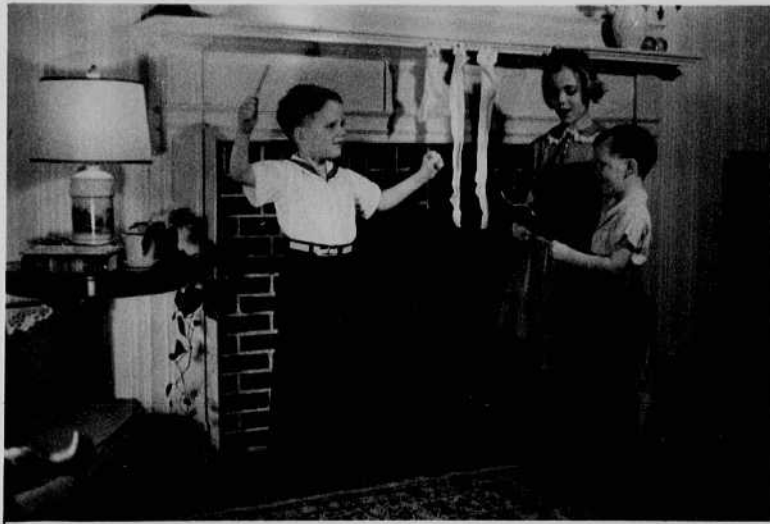
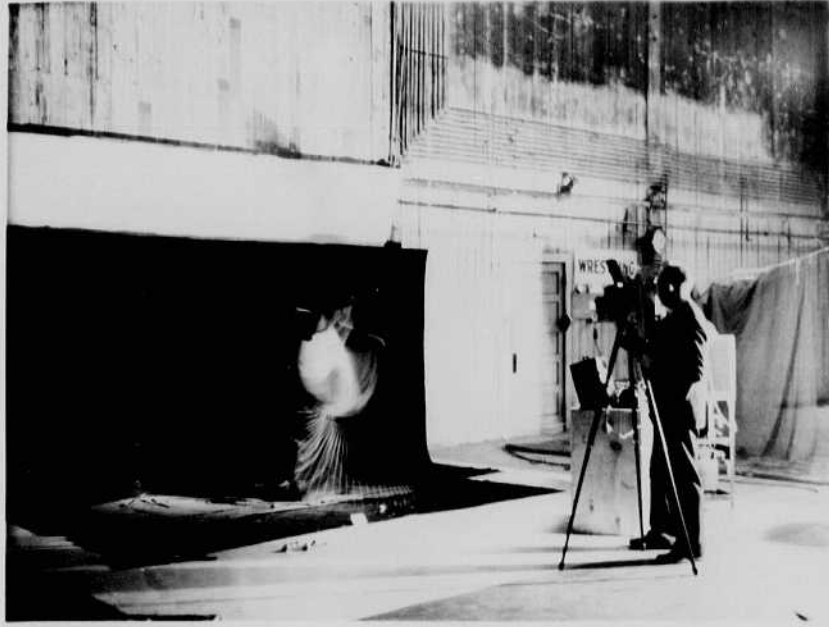
(2)
U. S. Submarine Force

U. S. S. SEMMES
EXPERIMENTAL DIVISION ONE

Eastman Film

| | Course | Time Speed | Time 9000000 | Shot | Exp. posure | f | Fres |
|-----------------------|------------------|--------------------------|------------------|-----------|----------------|---|--------------------|
| 1-2 | Pictures | Port hole | | Port hole | .01 | 2 | 4ft |
| 3-8 | 13:50 | 10 | 13:37 | Pup | | ✓ | |
| 9-11 | | 11 | 13:37 | Pup. | | 8 | Sum of port low |
| | | 14 | 13:50 | | | | |
| No pictures at 14k | | | | | | | |
| 12-14 ind | | 17k | 14:00 | Pup. | | 2 | 3 |
| 15-17 | | | 14:00 | | | 4 | 3 |
| 18-20 | | | 14:04 | | | 8 | 3 |

~~11-13~~



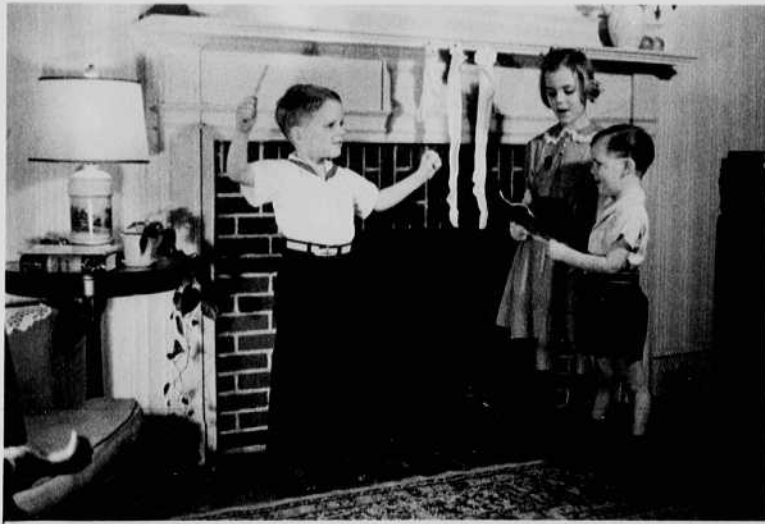
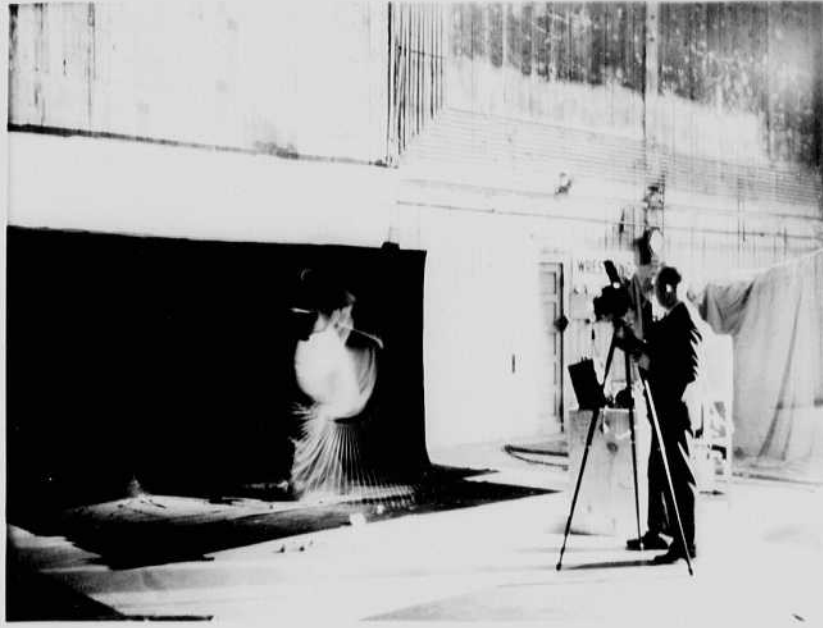
In Reply Refer
File No.

(2)
U. S. Submarine Force

U. S. S. SEMMES
EXPERIMENTAL DIVISION ONE

Eusman Film

| | Course | Speed | Time | Shot | Exp. posure | f | Fres |
|-------|-----------------------------|------------------|------------------|---------------|----------------|----------|------------|
| 1-2 | <i>Return</i> | <i>P. hole</i> | <i>13:08</i> | <i>Proble</i> | <i>.01</i> | <i>2</i> | <i>4ft</i> |
| 3-8 | | <i>13</i> | <i>13:08</i> | <i>Prop</i> | | <i>✓</i> | |
| 9-11 | | <i>11</i> | <i>13:09</i> | <i>Prop</i> | | <i>8</i> | <i>low</i> |
| | | <i>14</i> | <i>13:50</i> | | | | |
| | <i>No pictures at 14:00</i> | | | | | | |
| 14-14 | | <i>17.2</i> | <i>14:00</i> | <i>Prop</i> | | <i>2</i> | <i>3</i> |
| 15-17 | | | 14:00 | | | <i>4</i> | <i>3</i> |
| 18-20 | | | <i>14:04</i> | | | <i>8</i> | <i>3</i> |



In Reply Refer
File No.

U. S. Submarine Force

U. S. S. SEMMES
EXPERIMENTAL DIVISION ONE

Time 15:25

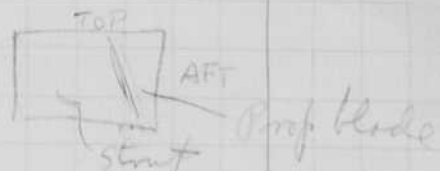
at 2 k still some
bubbles.

| No. | Propeller Structure | F | Exp | Foot Time |
|-----|--------------------------------|-------------|---------|-------------------------|
| 21 | Standing still | 2 | .01 sec | 4 feet |
| 22 | Propellers Starting: | | | |
| 23 | | 1 min after | | |
| 24 | Still | | | |
| 25 | Stbd Wheel only (Full) | | | |
| 26 | after 15 sec. | | | |
| 27 | Stbd wh. only. 1 sec | 4 | | |
| 28 | after 15 | ✓ | | |
| 29 | after 19 | ✓ | | |
| 30 | after 25 | | | |

Films printed Eastman

#1 View of port holes & Lamp.

8 11 knots speed. f2



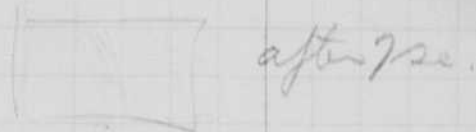
~~26~~
27

Start. f4



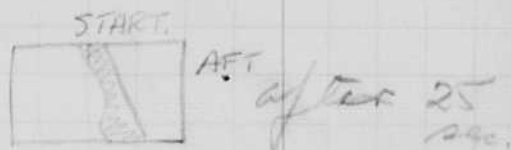
27
28

" " 4



30

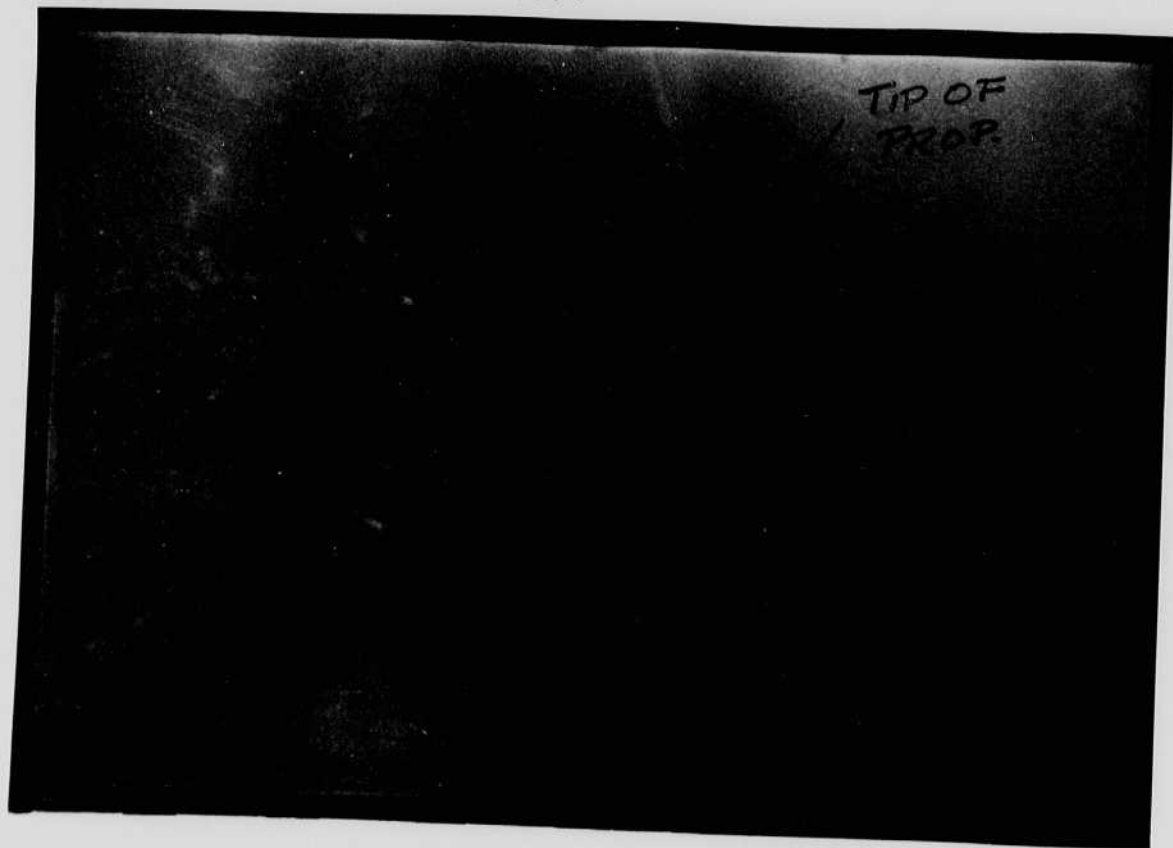
" " 4



No 8

TOP.

11 KNOTS.



TIP OF
PROP.

FORWARD.

No 26.



90 9N
CAVITATION ON TIP.



Dec. 26, 1938.

Took photos at 600/sec on Dec. 23. of golf strokes by Joe Stein. # 105 - to 153 inc. S. Norton and Herb Grier assisted.

Jan 4 1938.

My parents Mr & Mrs. J. E. Edgerton of Aurora Nebraska were here for the past week after a visit at ~~New~~ Washington D.C. with my two sisters there.

A life test has been run on a spiral Ar-Xe lamp. Note data in Lemmerhausens note book.

Conditions

30 flashes/second.

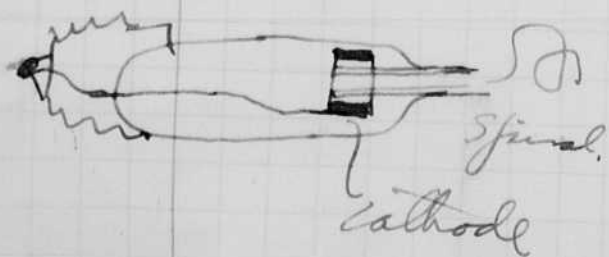
1000 volts + ?

4 mf capacity. 5000 ohms.

184 hrs until lamp started to hold over into glow more starting board added and ran 24 hrs more. Flickered some at end - not misses but different brightness on each flash.

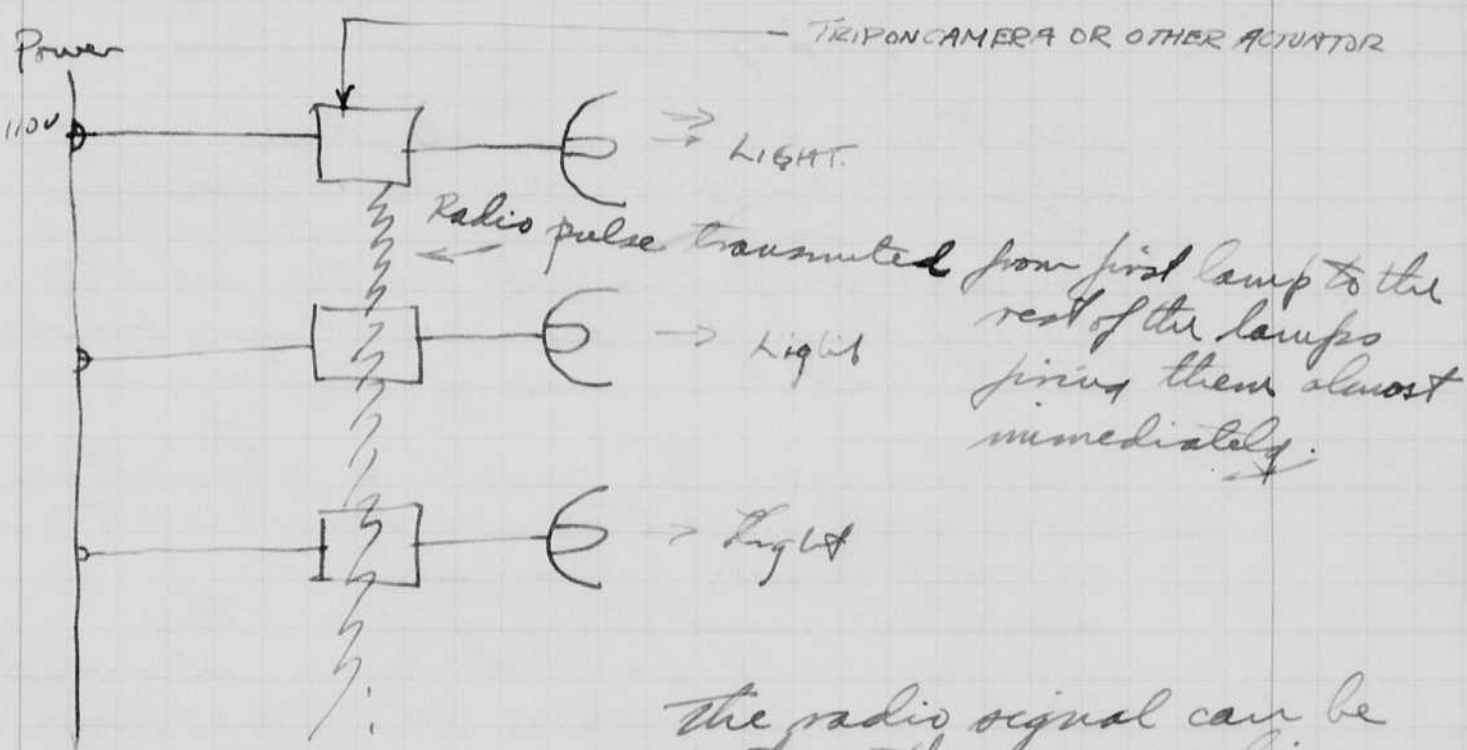
The light was about 50% decreased at the end of the life test due to a brown deposit on the inside of the glass spiral.

The chamber surrounding the cathode was very black, due to sputtering of the cathode.

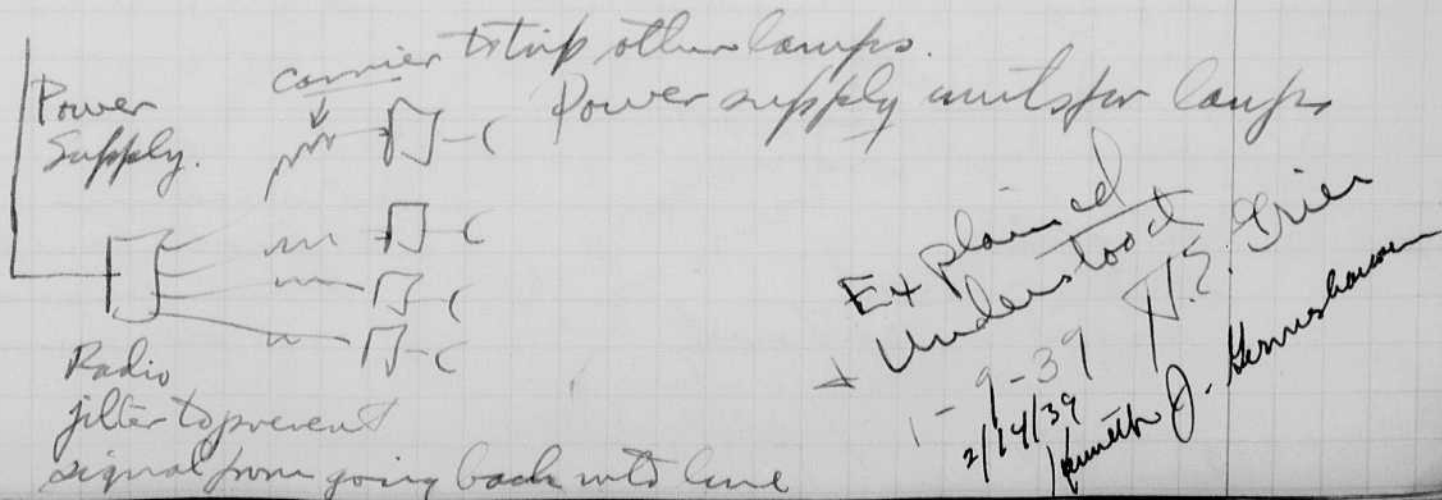


Jan. 8, 1939.
Harold E. Edgerton.

On several occasions I have considered the firing of several flash units by some radio signal in order to synchronize them. Each lamp is connected to its own power supply and trip circuit and to a separate line from the power source. The radio ~~link~~ link may go either via air or on the power lines as a carrier signal.



The radio signal can be put on the power lines as a carrier and in this way not cause any static to other radio apparatus.



Jan 8 1939
 Harold E. Edgerton.

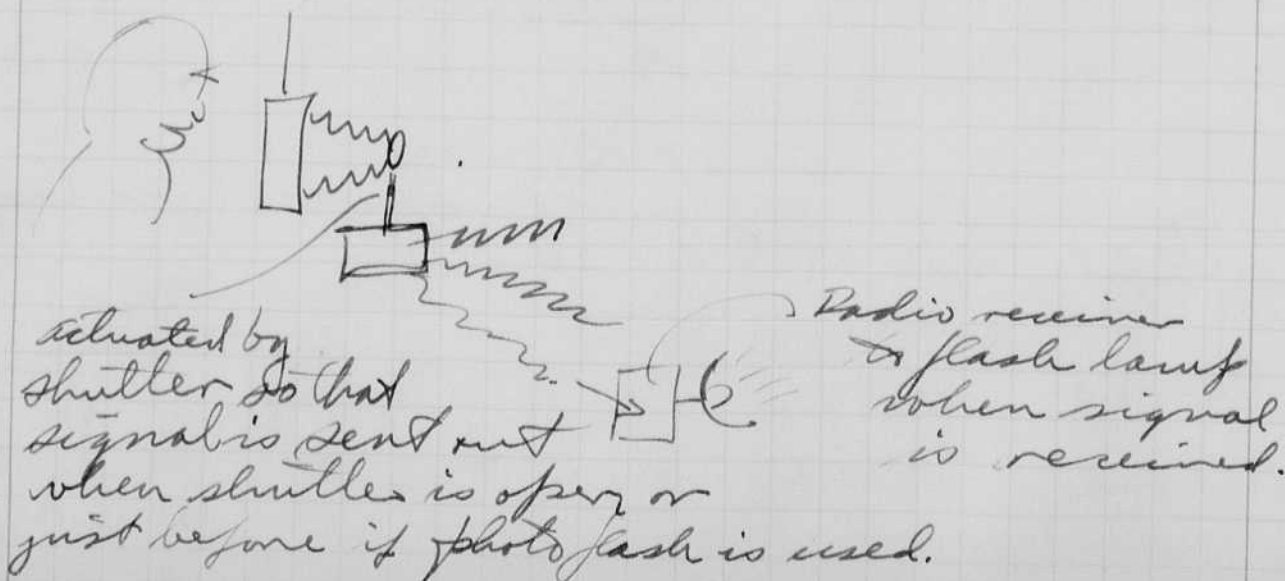
Dinner last night at the Boston Camera Club celebrating the 100 years of photography.
 There, A.C. Hardy. Phys Dept
 Lythcoe Health Dept.
 Prof. Palash Harvard. crystals?
 Mr. Trapnie Publishing Co.
 James Ahern Western College.

Trip of Flash Unit.

Use transmitter at shutter with out any wires to trip the flash lamps. This can also be accomplished with photo flash lamps as well as our electrical discharge tubes.

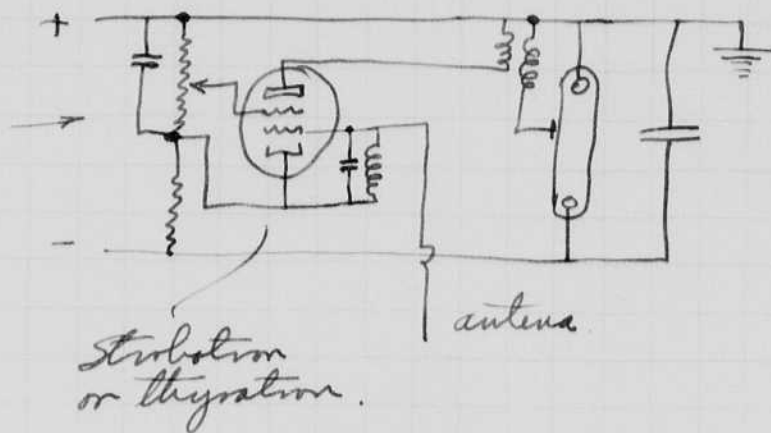
In this way the camera operator does not need to worry about connection between his shutter and the lights. No wires will bother him should he desire to move his camera.

The signal can be set up with energy from a battery or a magnet etc.

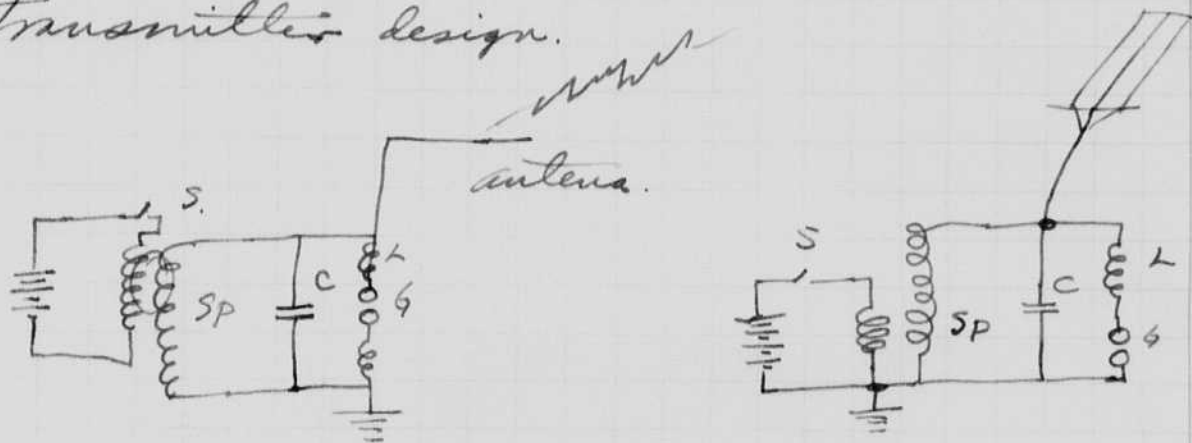


cont.

possible circuits to receive signals to flash lamp.

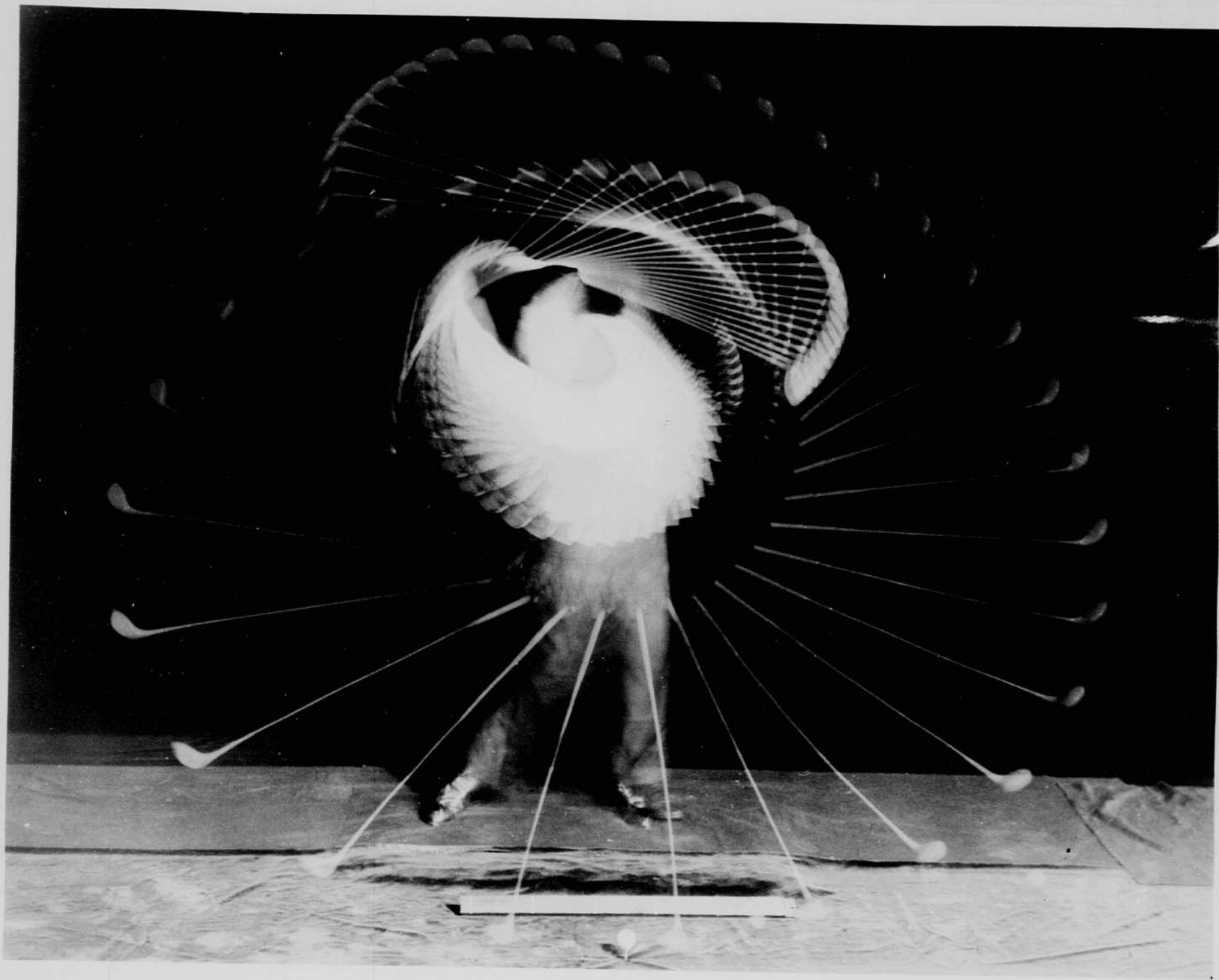


Transmitter design.



The switch S would close as the shutter started to move to establish current in the primary of the spark coil SP . The switch S would open when the shutter blades were open, interrupting the current and producing a high voltage on the secondary of SP . This would charge the condenser until the gap G broke down causing a radio frequency surge in C and L .

Pages 88 & 89 Explained & Understood J. S. Gie
1-9-39

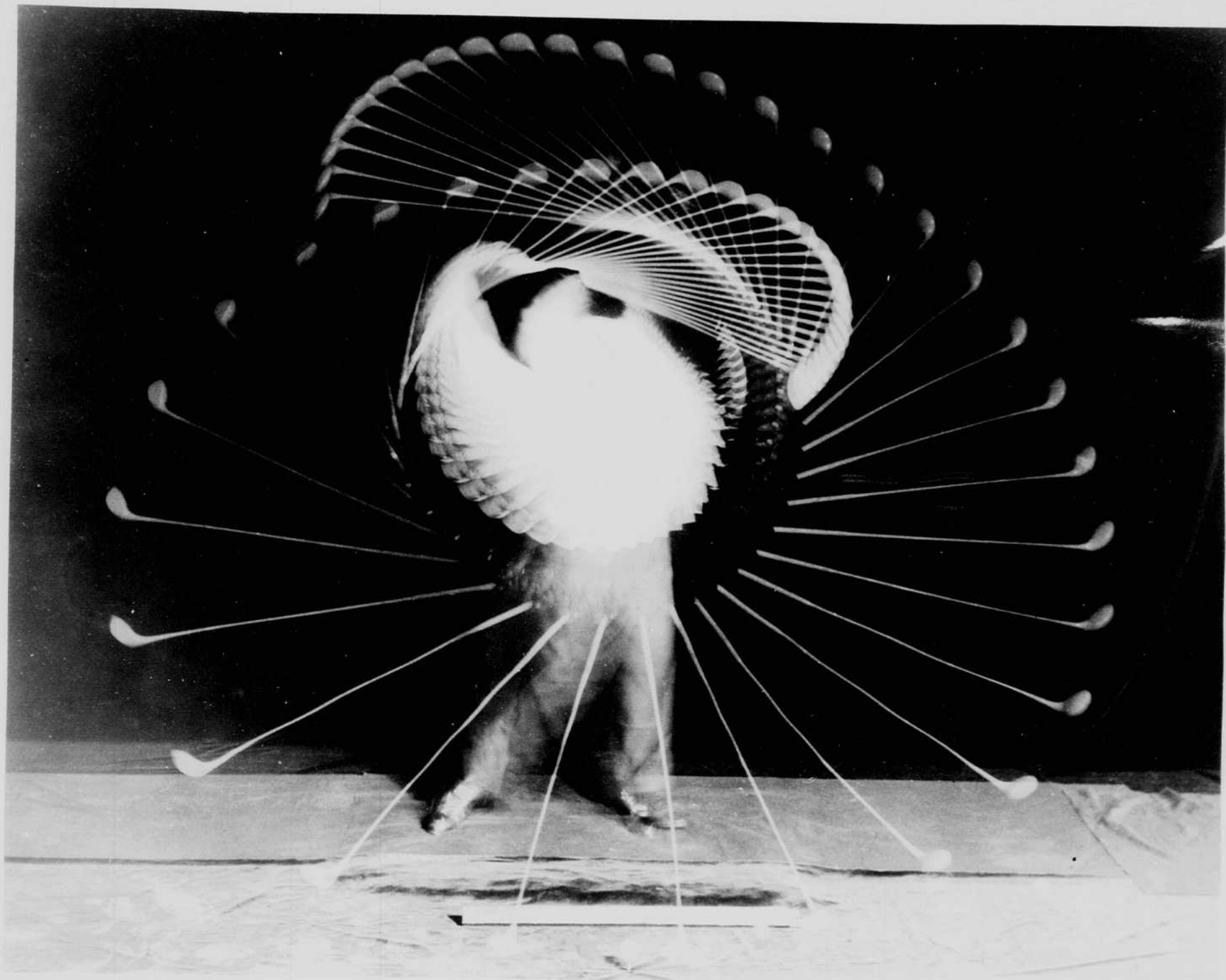


Bobby Jones

M.I.F. taken summer 1938.

100 flashes/second.

The laboratory was cleaned up on Saturday Jan. 14. I salvaged the prints on the following pages from the outcasts and pasted them in here for record purposes.



Bobby Jones

M.I.F. taken summer 1938.

100 flashes/second.

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Race track timing record made by E.P.I. camera.

Sam Caldwell with Strobotac.



Bramhall



Photo by Dhadling with Argus

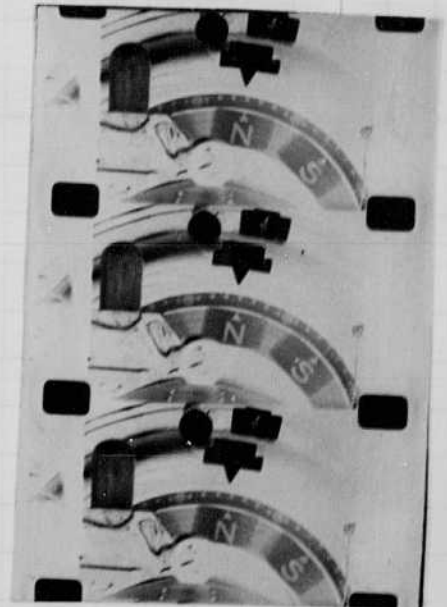


Research Lab in
1927 or 28

R.H.H. · J. W. Gardner · Kershaw · Gray · Moon · Bush · Broderick · Griffith · Kear

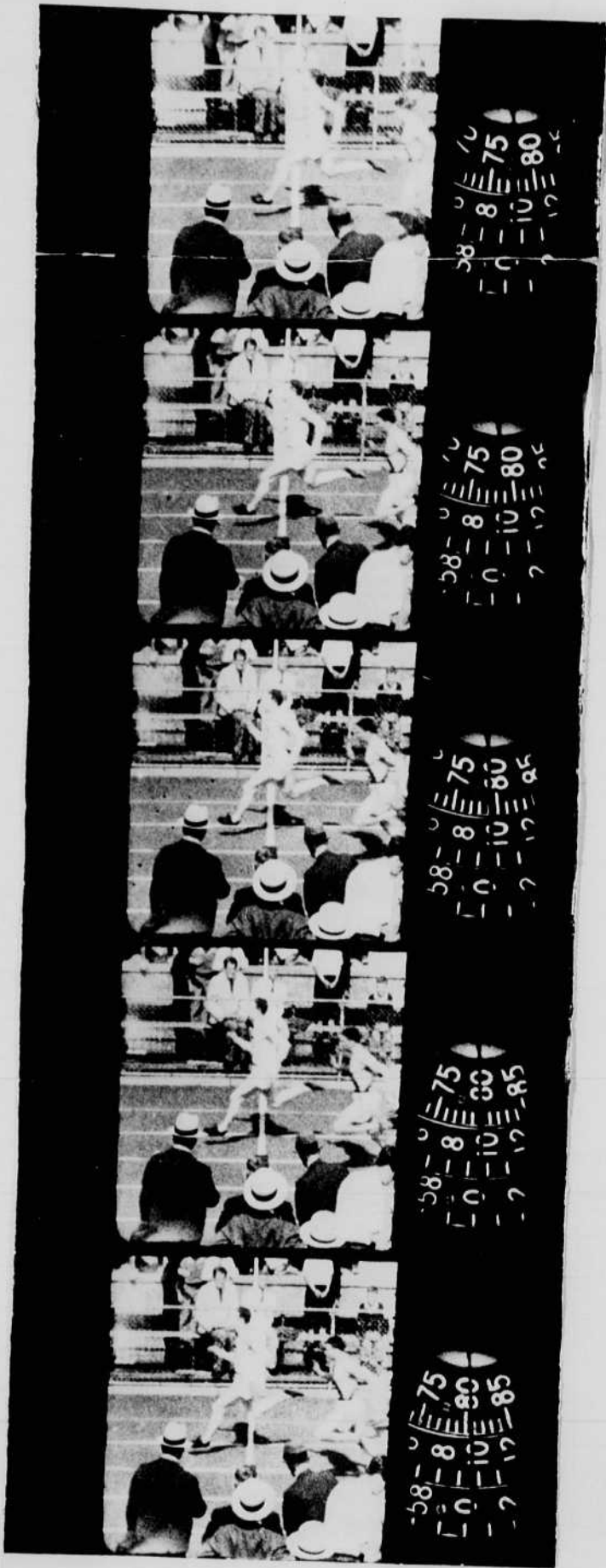


60 cycle stroboscope
and camera.



First photos of
synchronous
motor.

Race track timing record made by E.P.I. camera.



Sam Caldwell with Strobotac.



Bramhall



Photo by Shadding with Argus

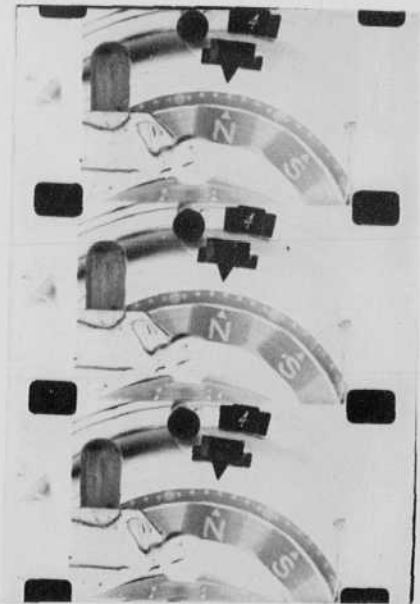


Research Lab in
1927 or 28

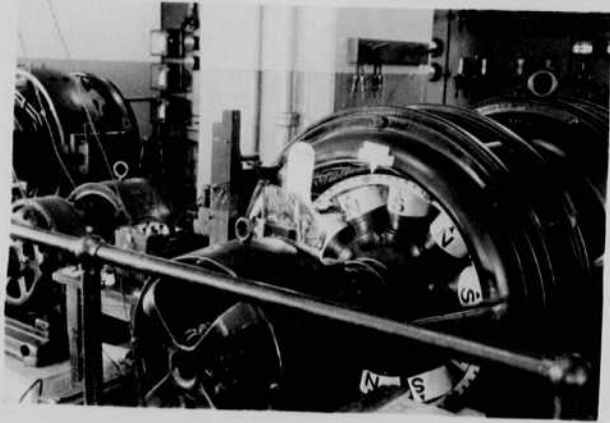
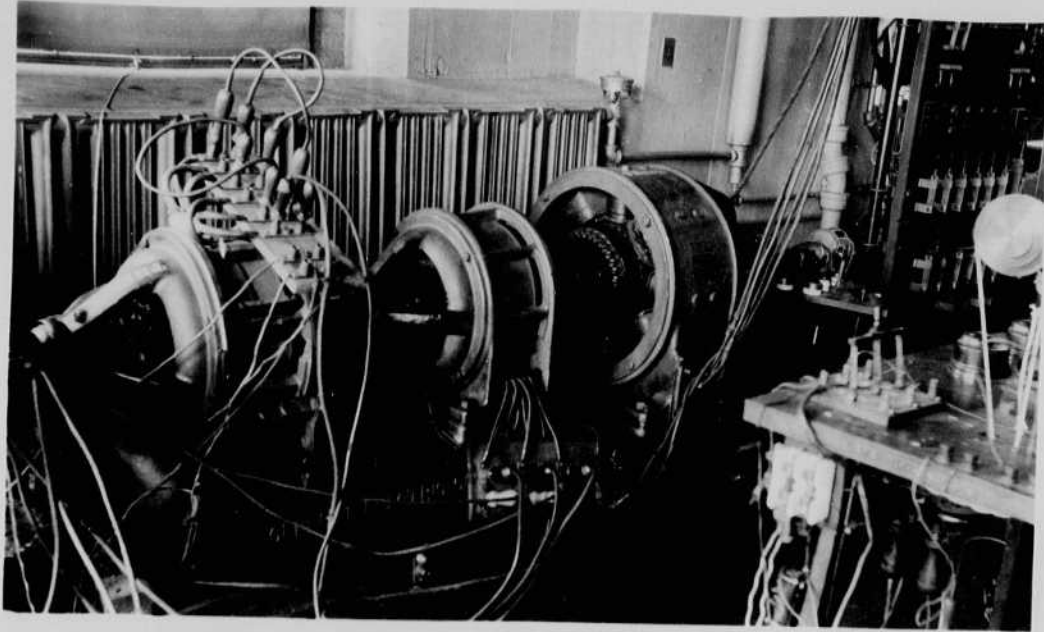
Allen · *Dixon Gardner* · *Kershaw* · *Gray* · *Moore* · *Bush*
Broderick · *Driffille* · *Kear*



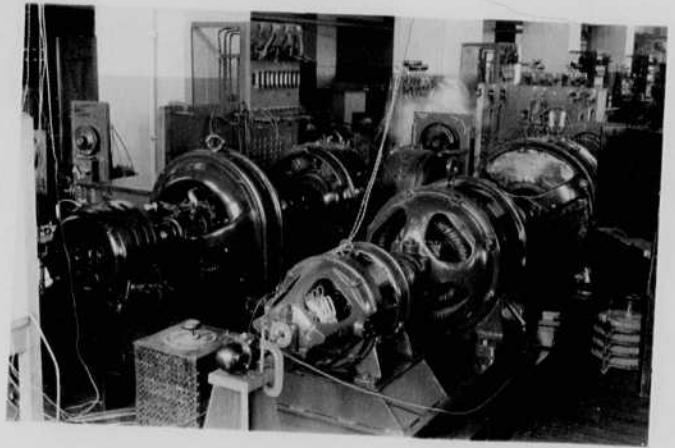
60 cycle stroboscope
and camera.



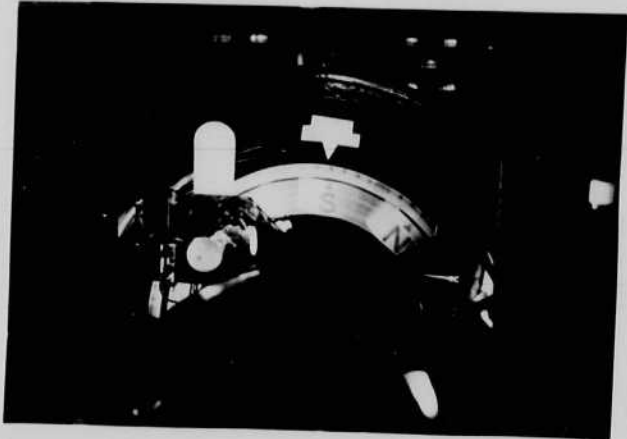
First photos of
synchronous
motor.



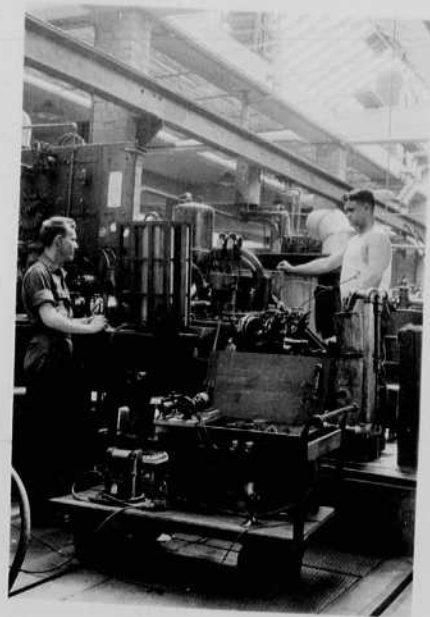
Generator and motor.



AC & DC machines at M.I.T.

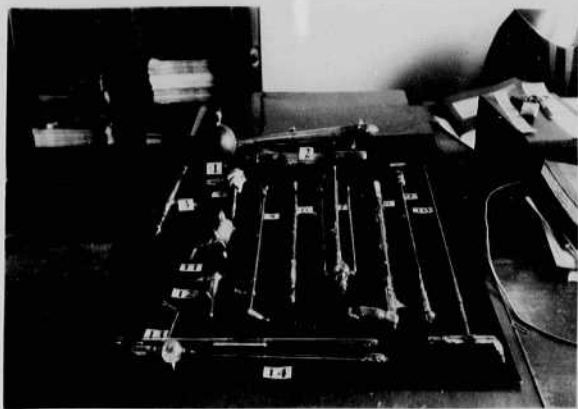


Stroboscope and synchronous motor, first setup.

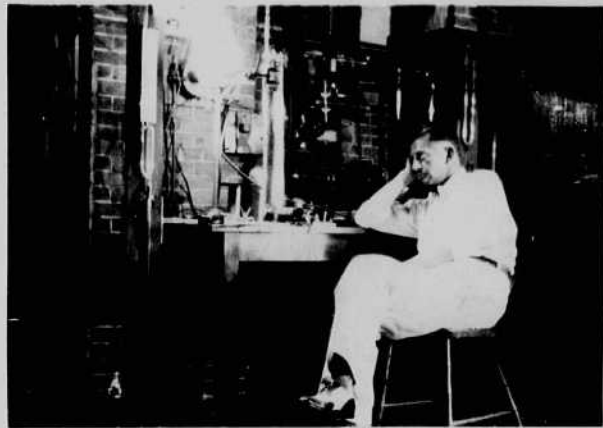
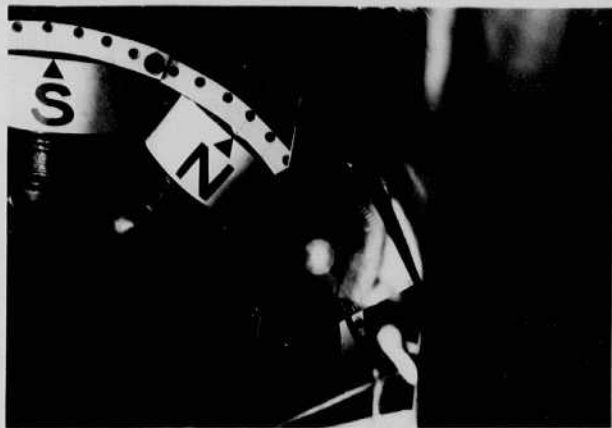


Draper.
Stroboscope

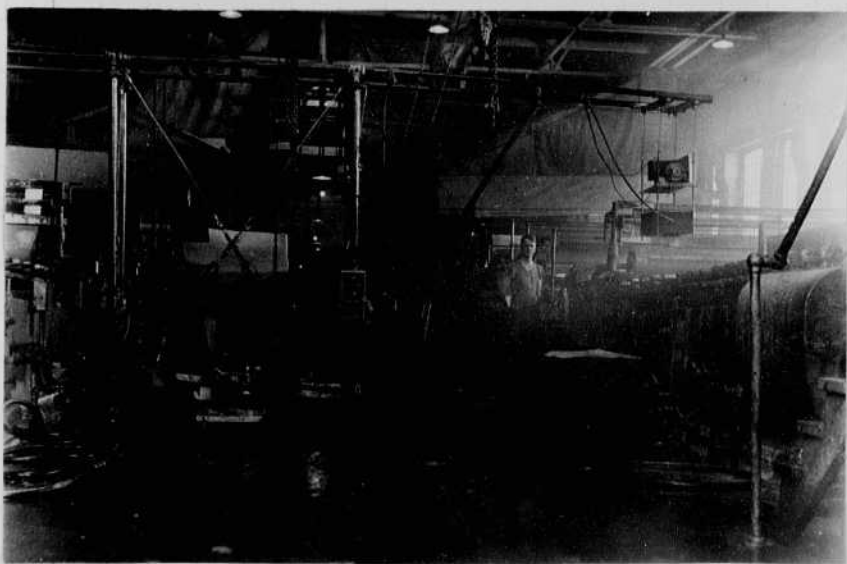
Early experimental tubes



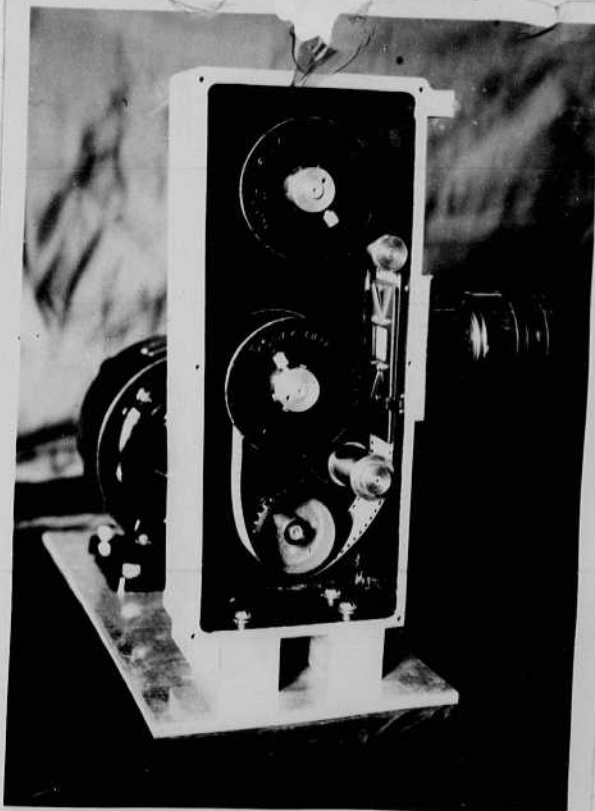
W. U. Lyon



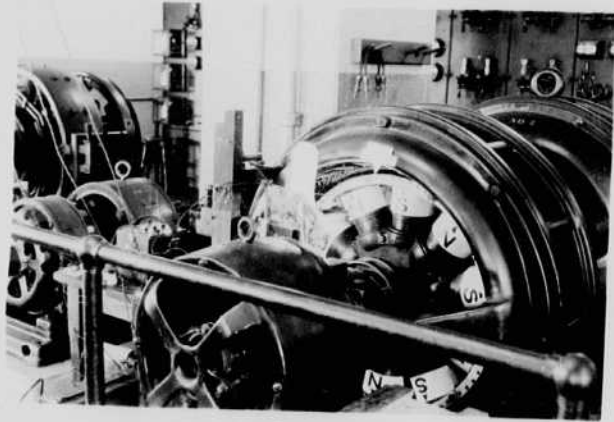
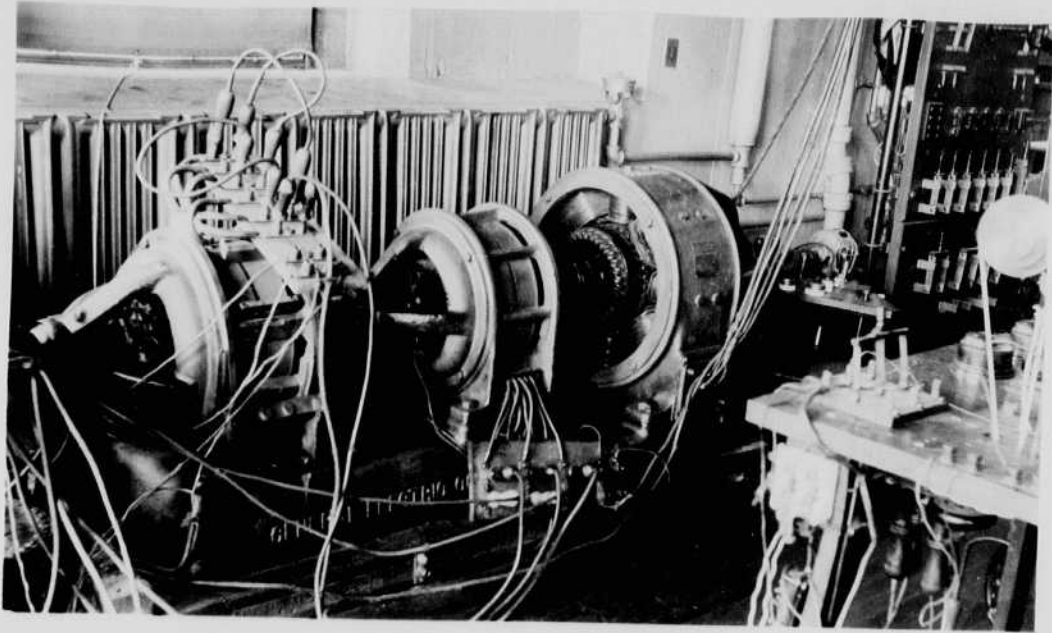
Lorenz Harvard



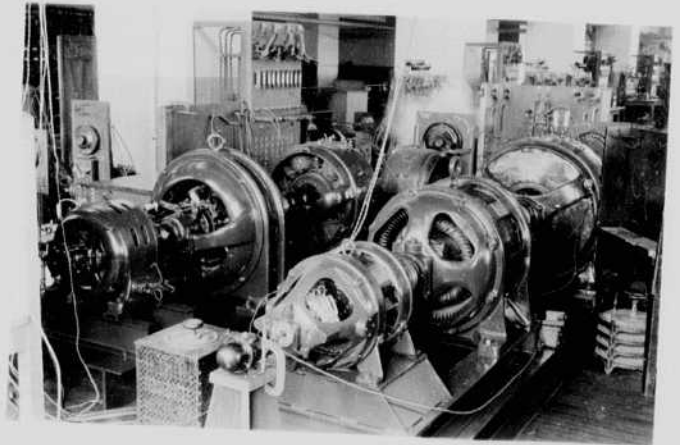
Camera in a paper mill



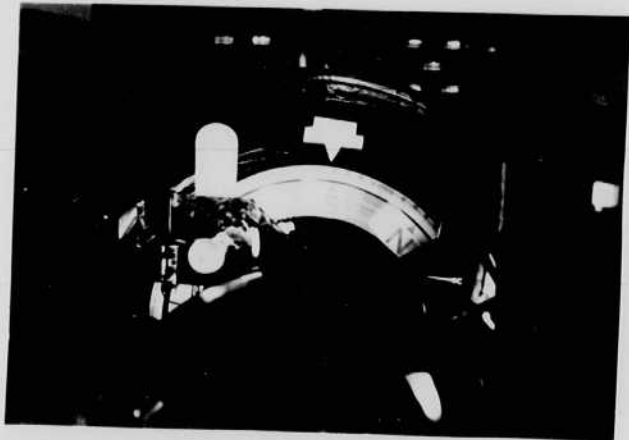
Early high-speed movie camera.
600 frames/sec.



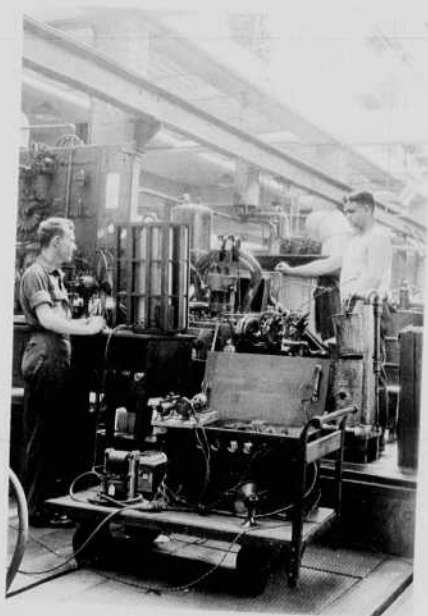
transformer and motor.



AC & DC machines at M.I.T.

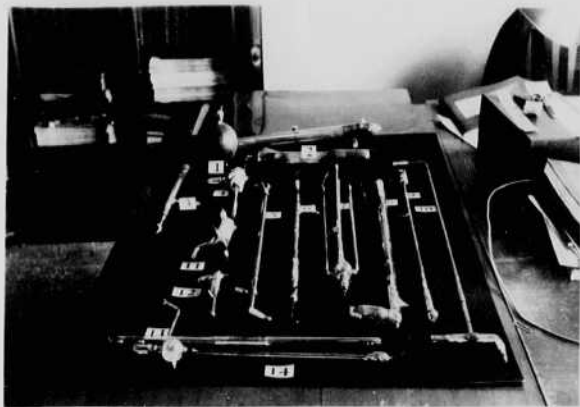


*Stroboscope and
synchronous motor,
first setup.*

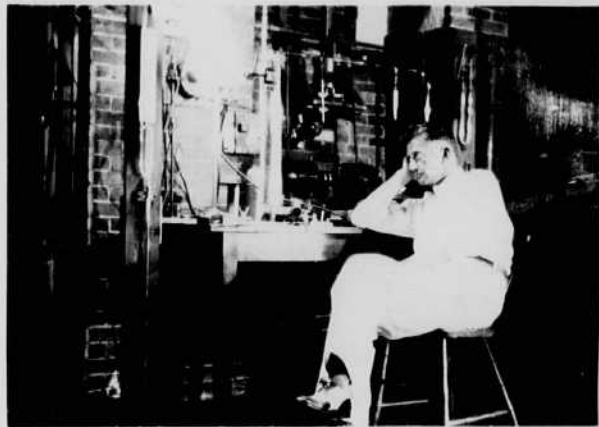
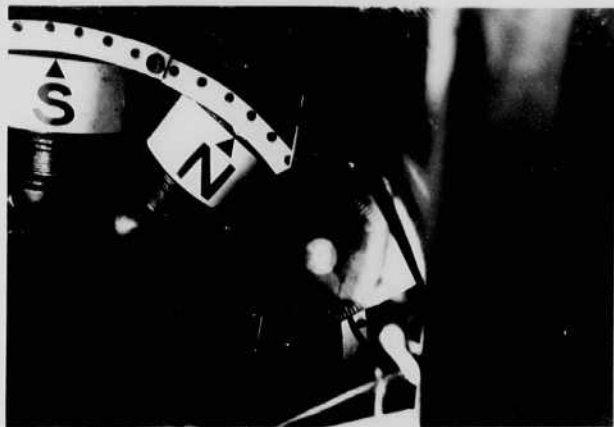


*Draper.
Stroboscope*

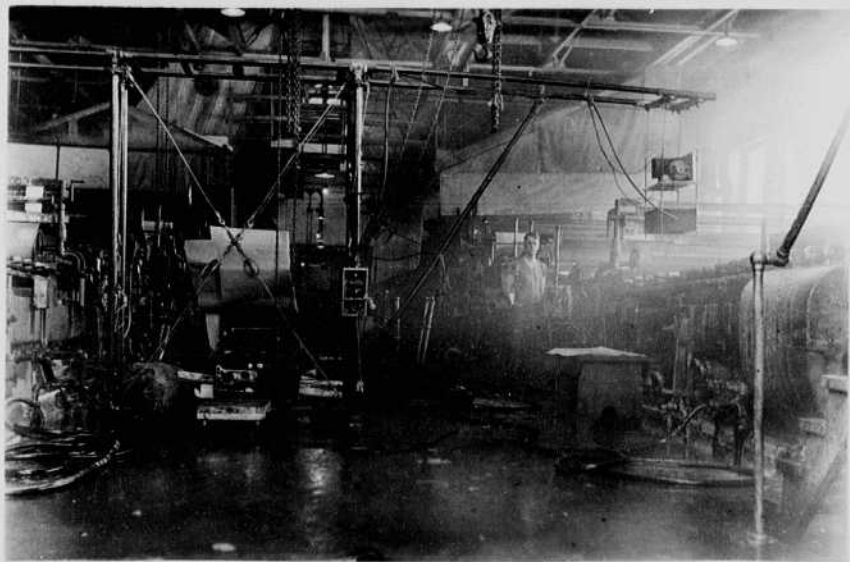
Early experimental tubes



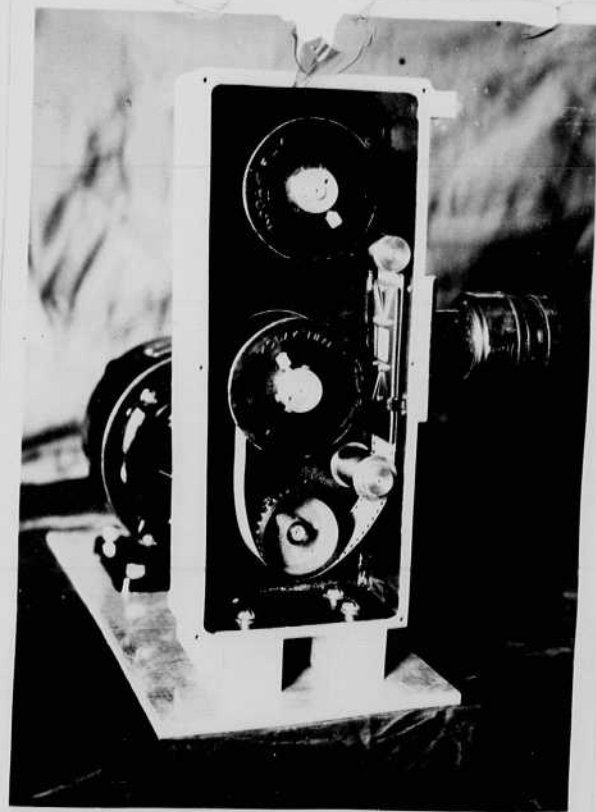
W. U. Lyon



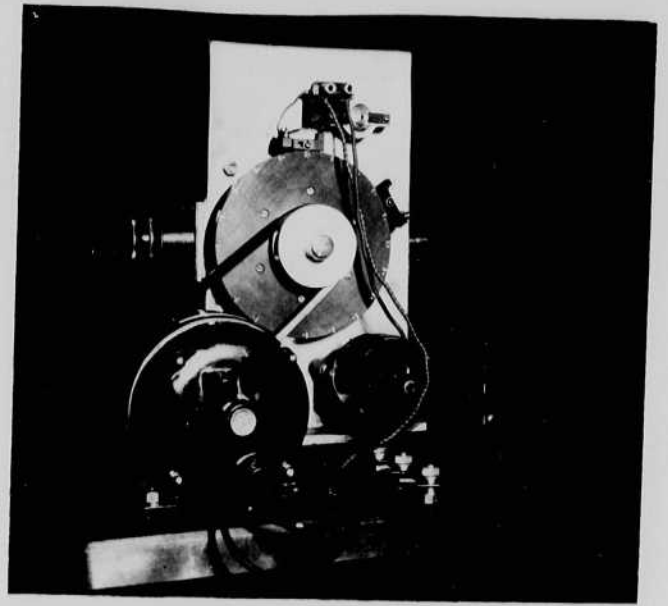
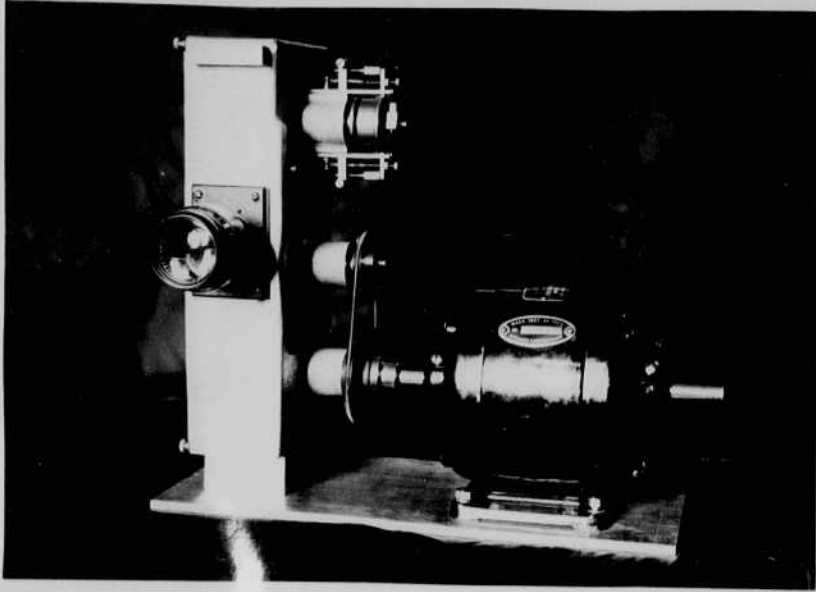
Lorenz Harvard



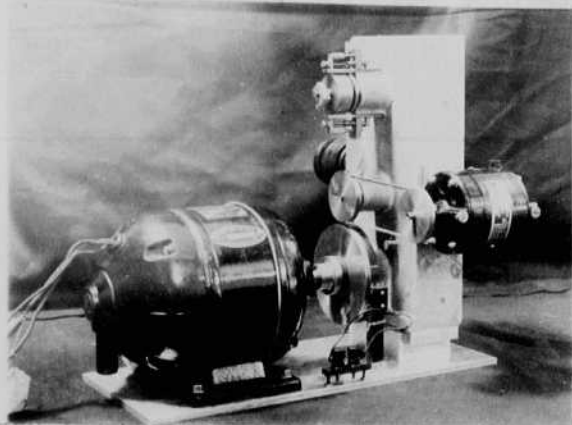
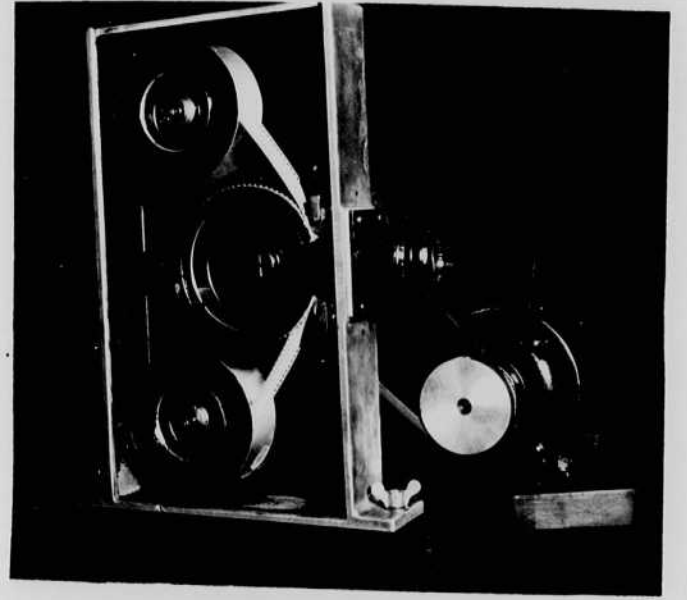
Camera in a paper mill



Early high-speed movie camera.
600 frames/sec.



Another view of early camera
House fly. 6000 frames/sec. Soap 6000 frames/sec.



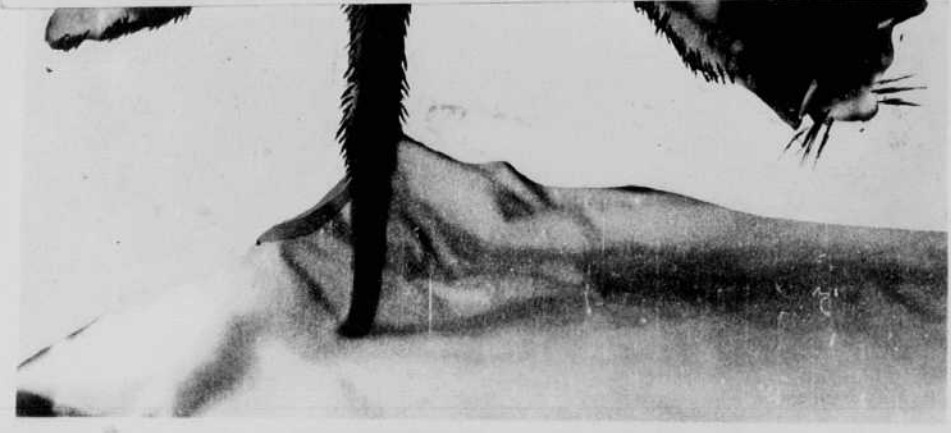
Camera with commutator

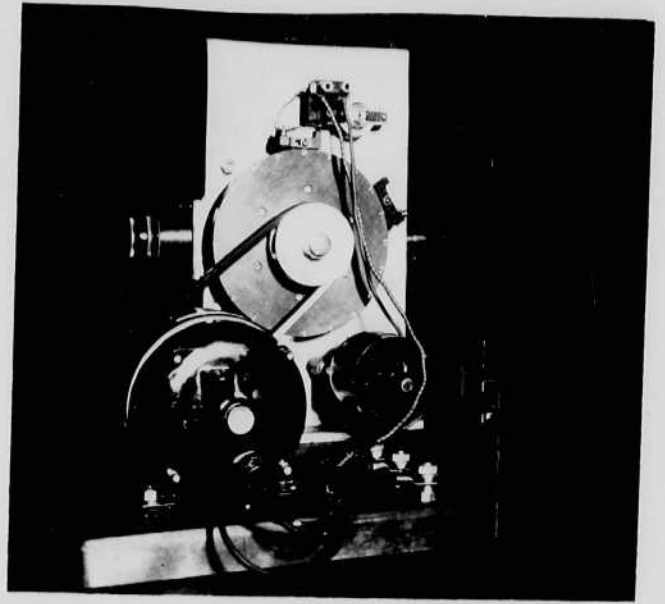
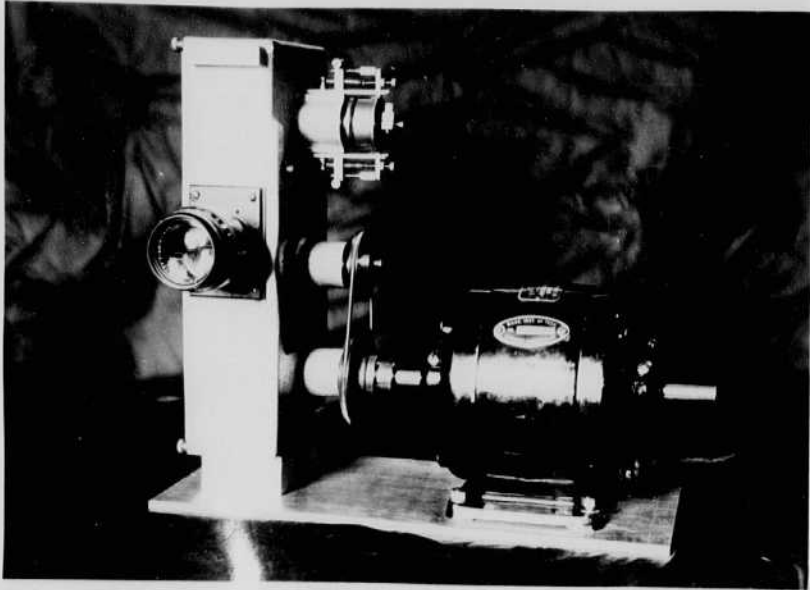


Elmer. Reed.



Falling cat.

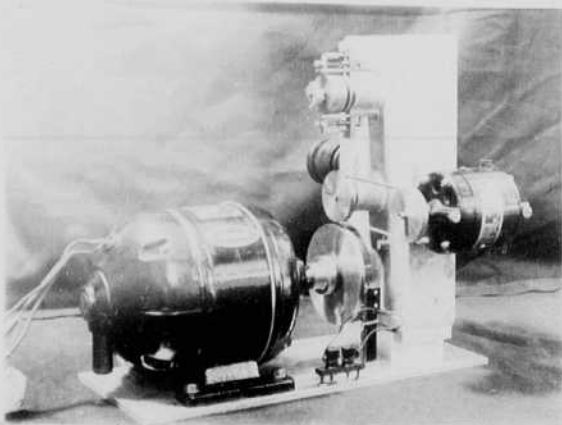
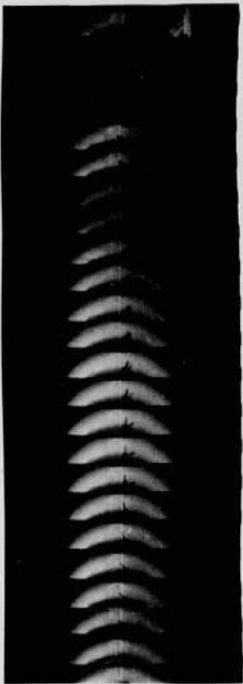
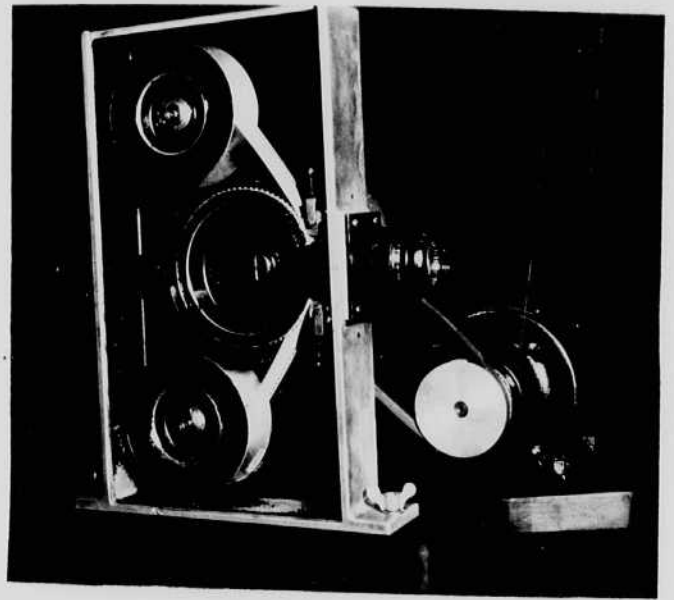




Another view of early camera

House fly.
6000 frames/sec.

Soap 6000 frames/sec.



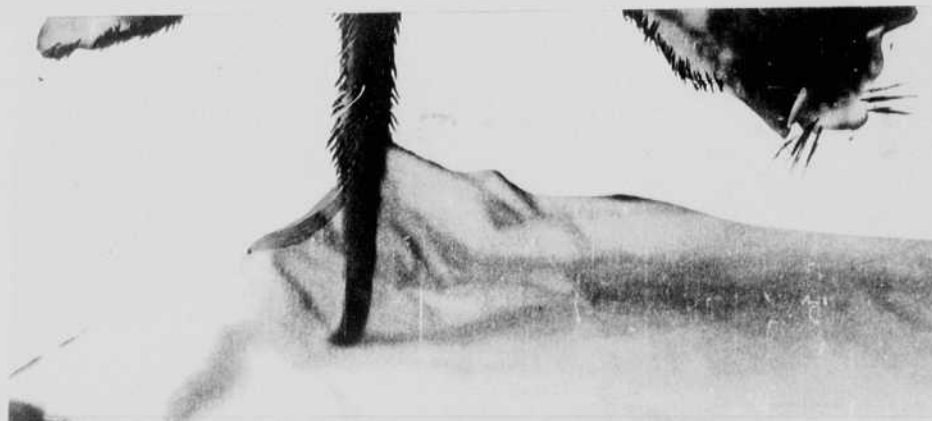
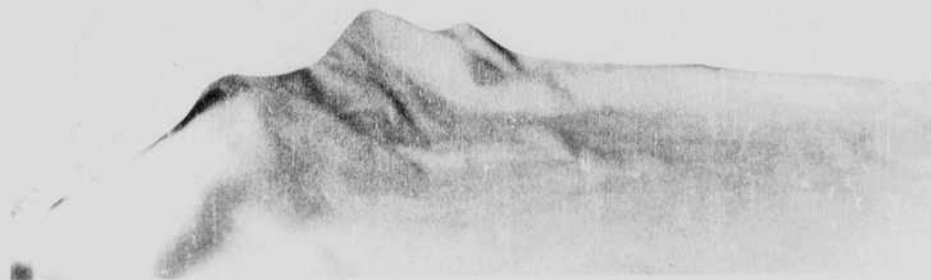
Camera with
Commutator
L

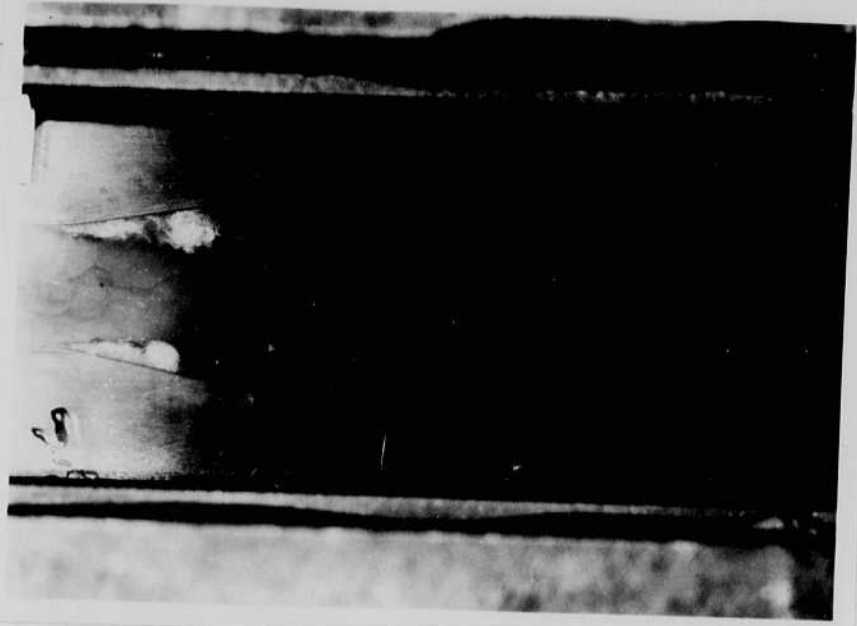


Elmer. Reed.



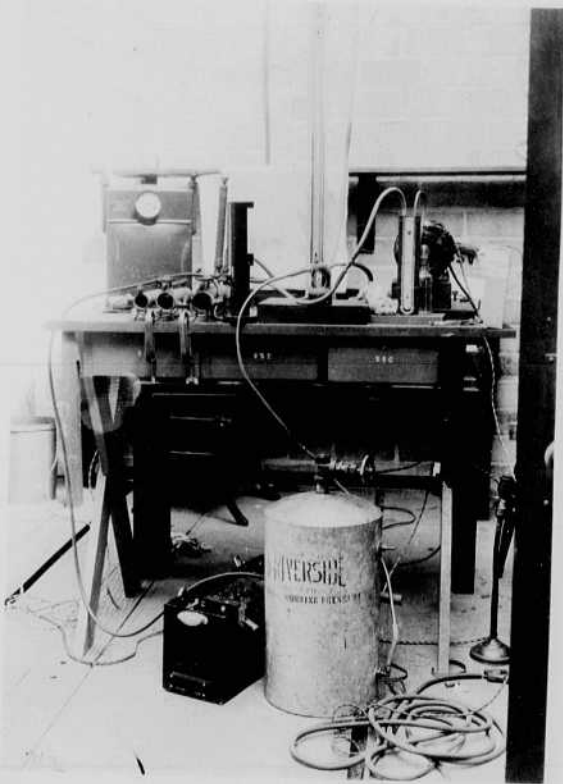
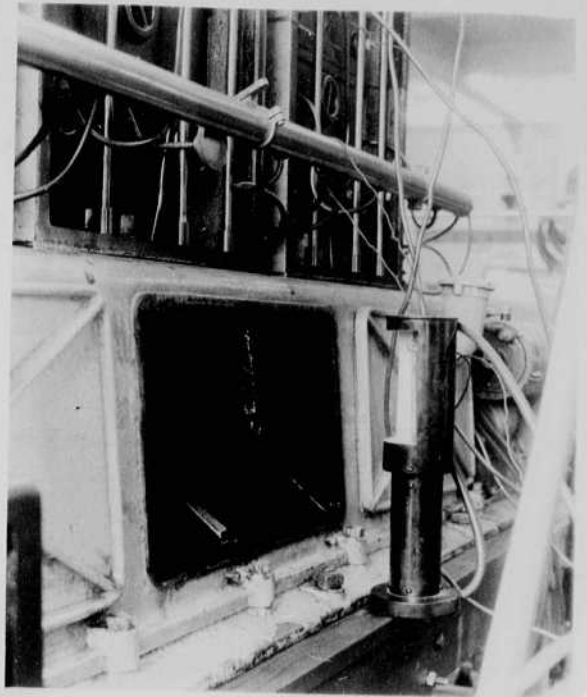
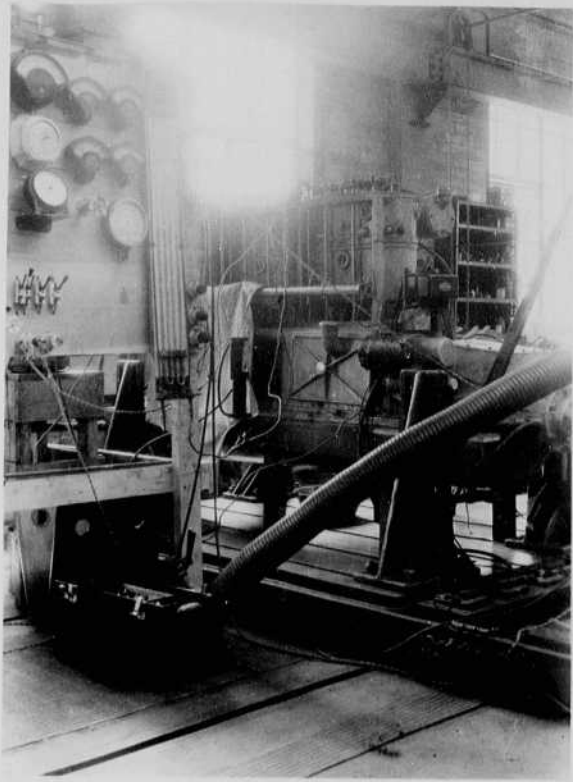
Falling cat.



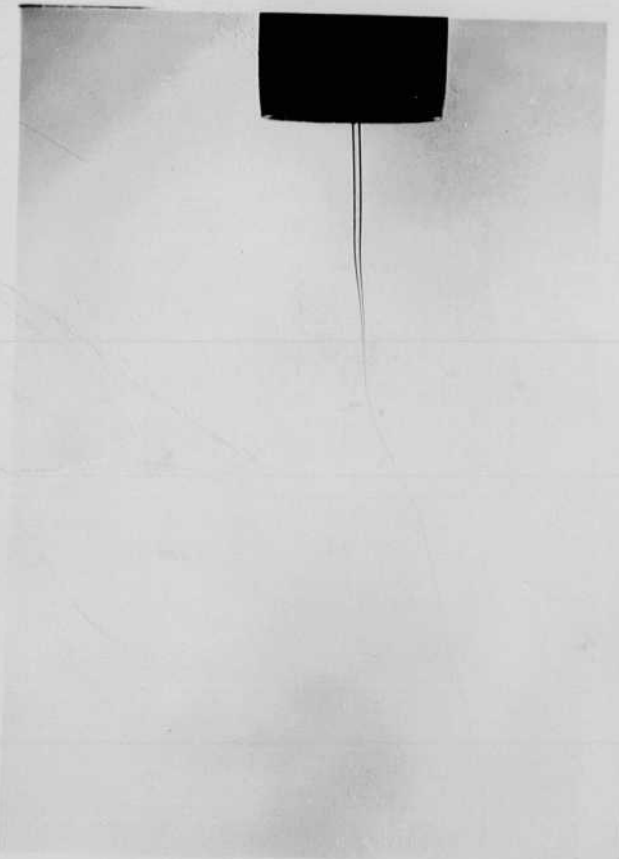


Calculation

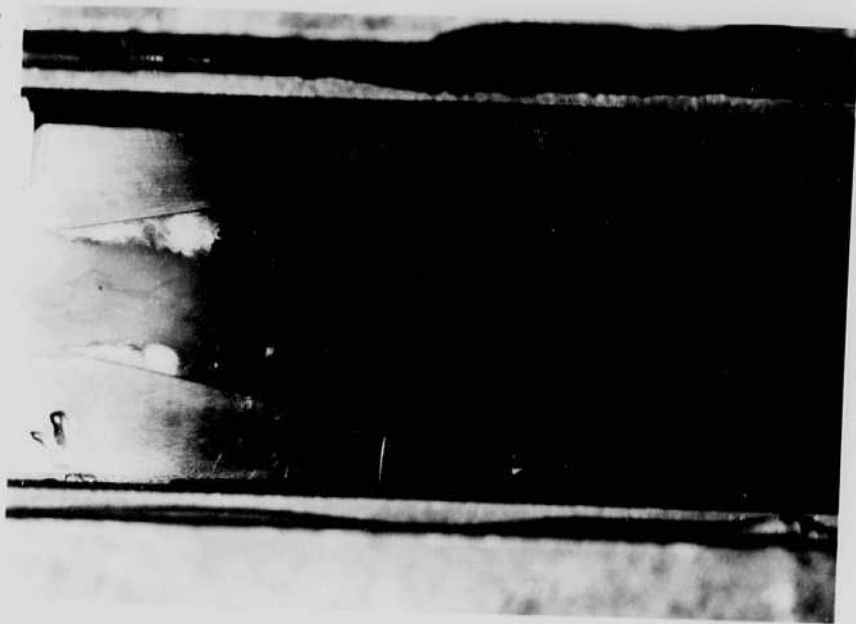




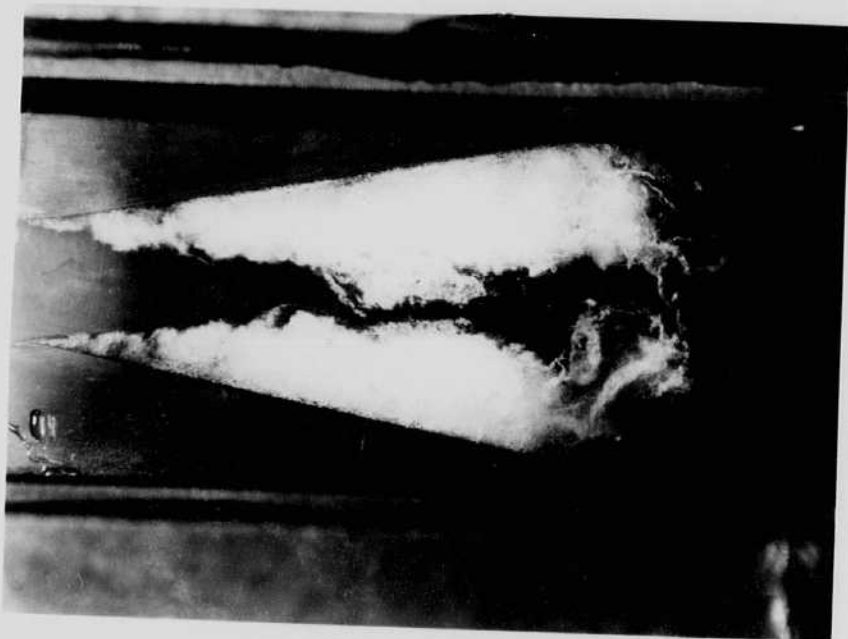
Stroboscope in use.

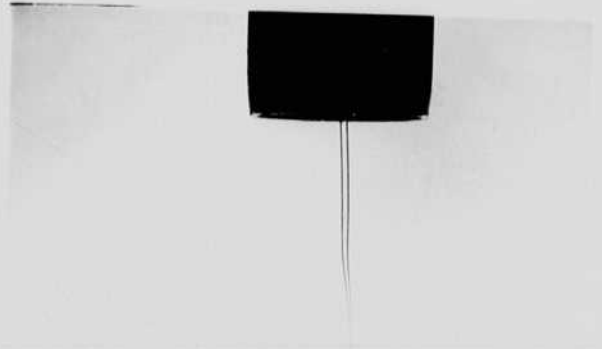
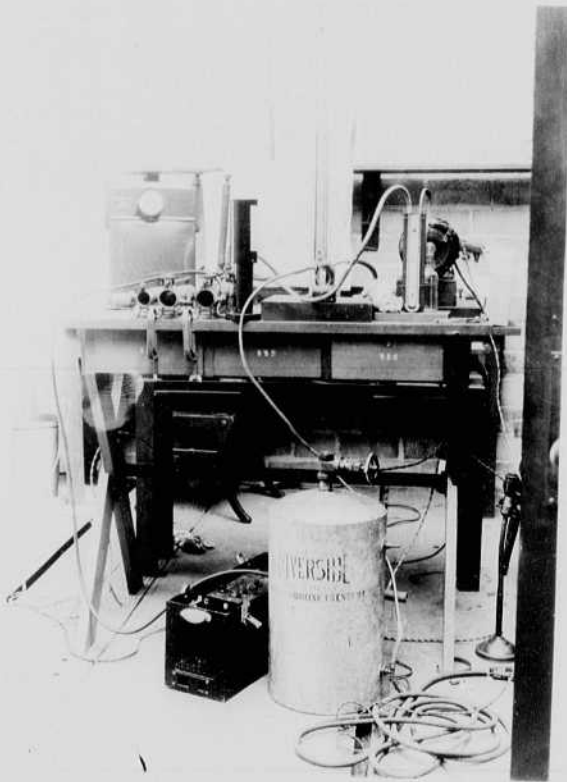
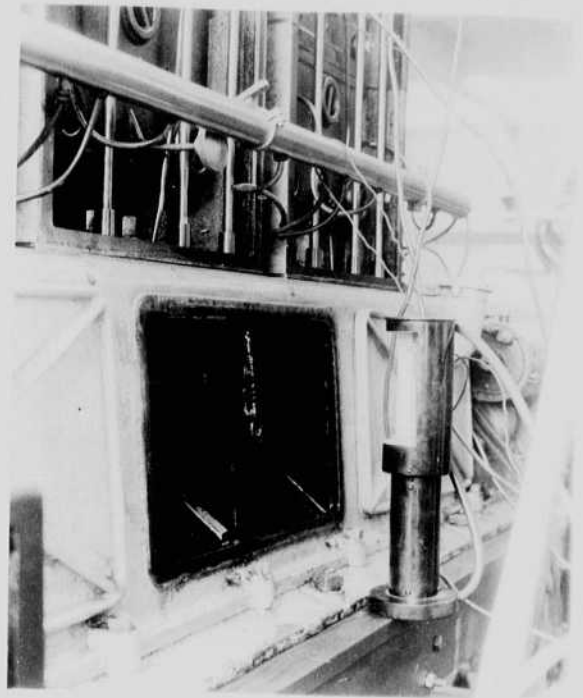
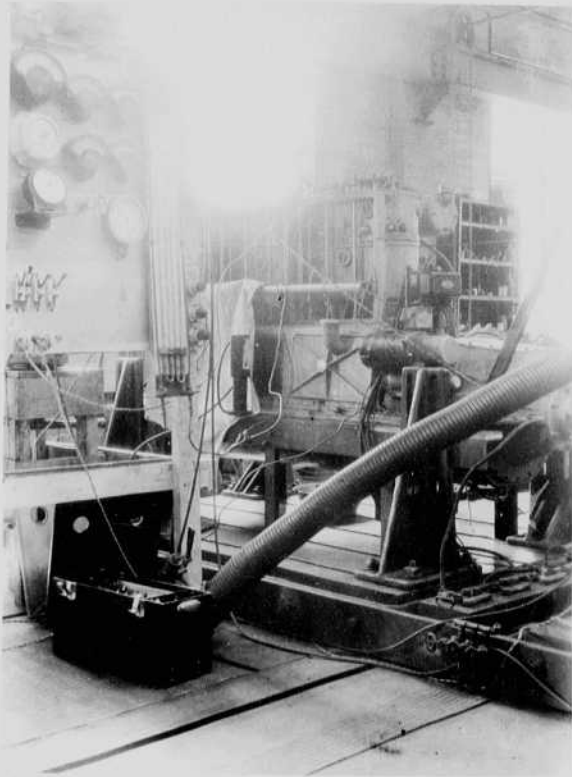


Glass blown into a fiber



Contamination





Stroboscope in use.

Glass blown into a fiber



Squam
Lake.

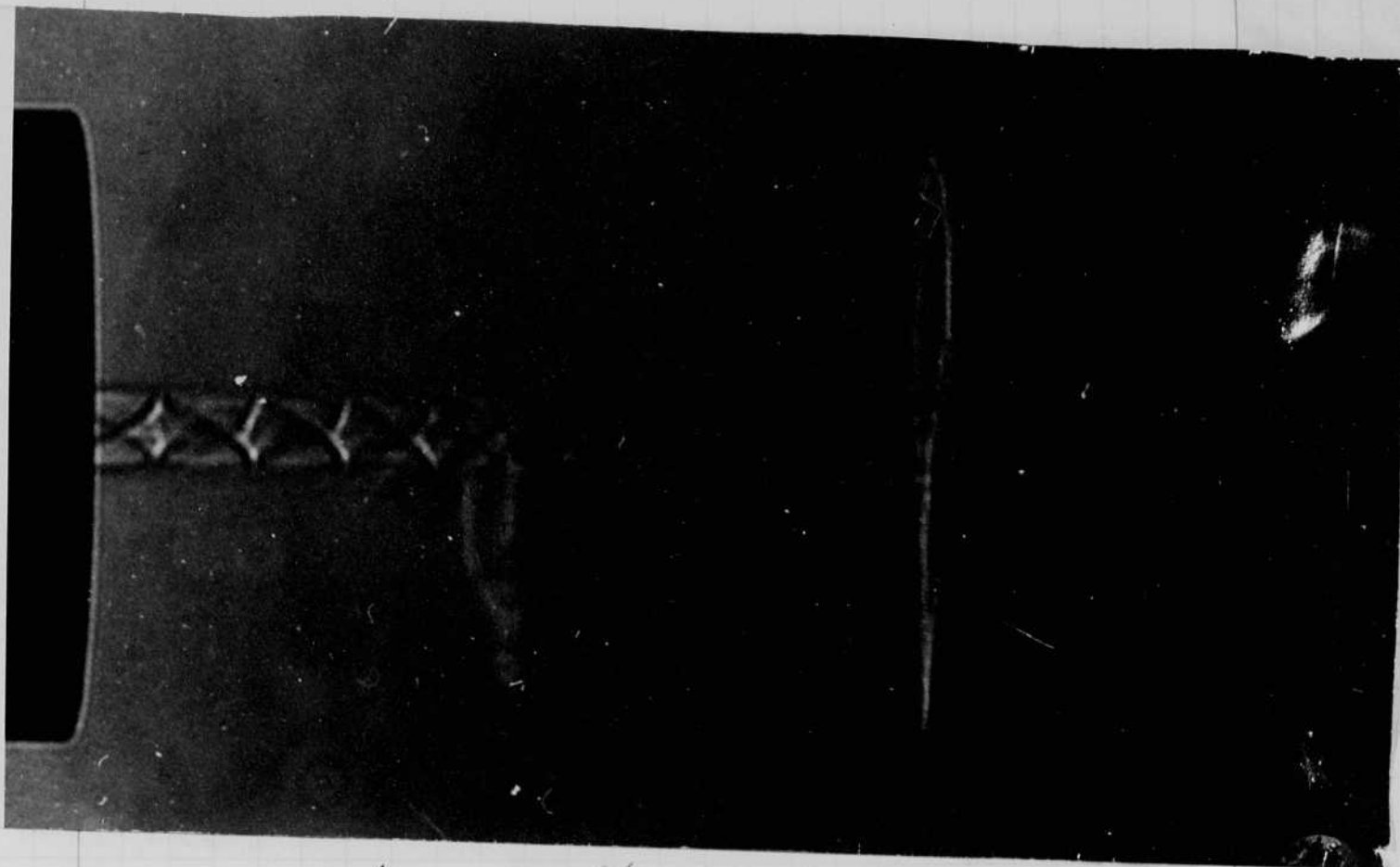
Holderness N. H.

Home of
L. H. Webster

Humming
Birds



Open house 1938.

TIP # 55 45# O₂

Oxygen from a cutting torch.



Squam
Lake.

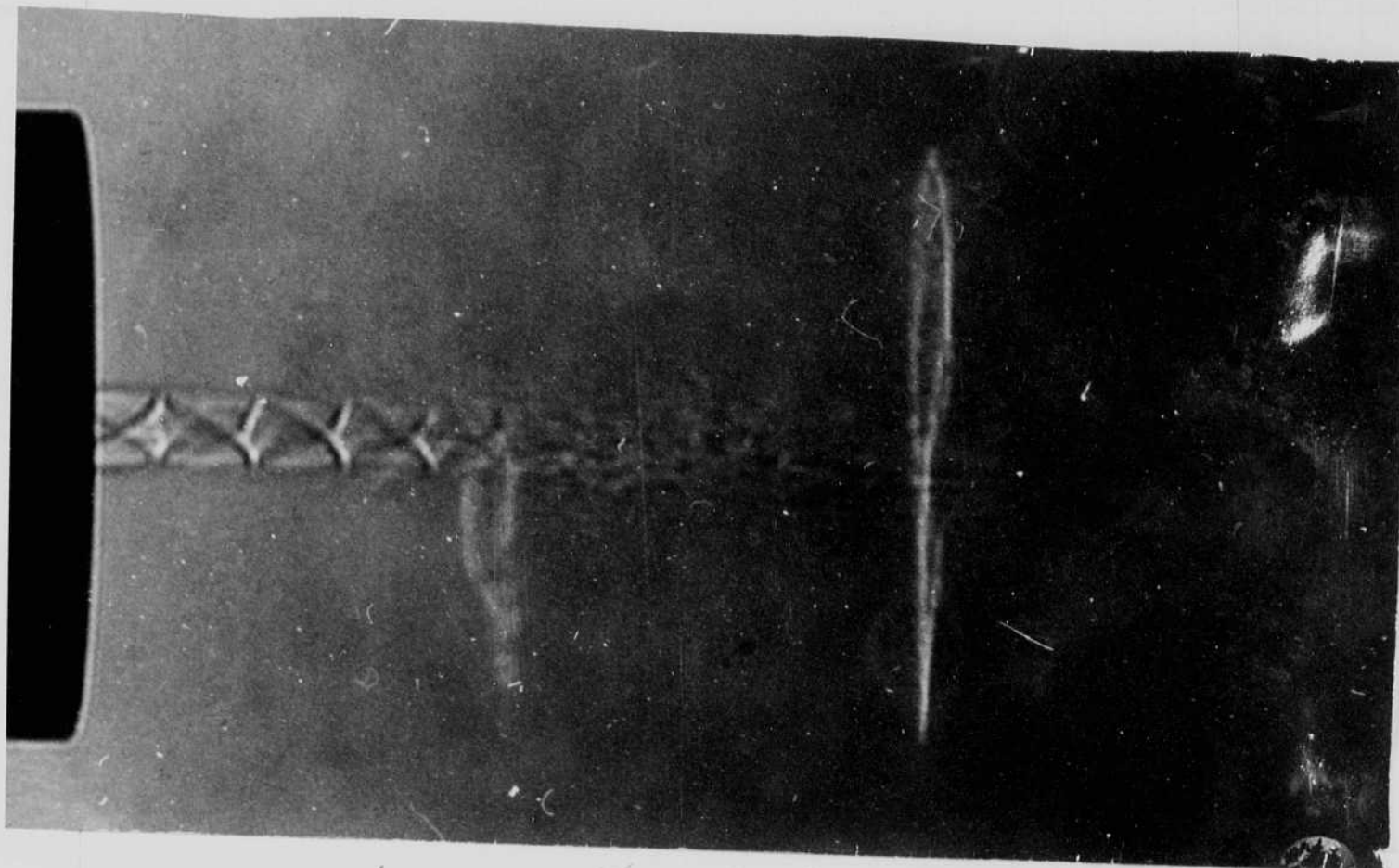
Holderness N. H.

Dome of
L. H. Webster

Humming
Birds



Open house 1938.

TIP # 55 45# C₂

Spiggen from a cutting torch.



Squam
Lake.

Holderness N. H.

Dome of
L. H. Webster

Humming
Birds



Open house 1938.

TIP # 55 H5 # C₂

Exagger from a cutting torch.



Squam Lake.

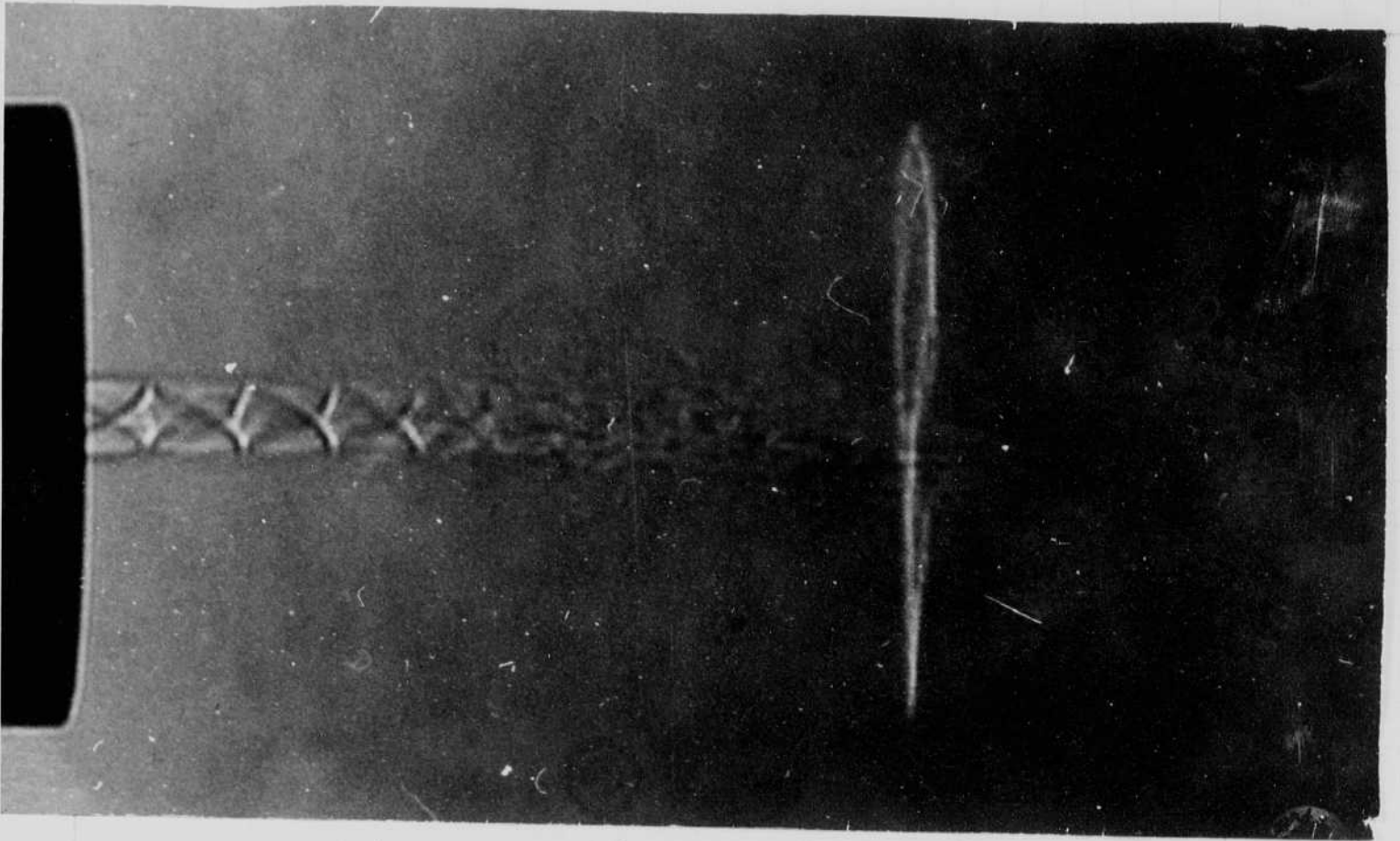
Holderness N. H.

Dome of L. H. Webster

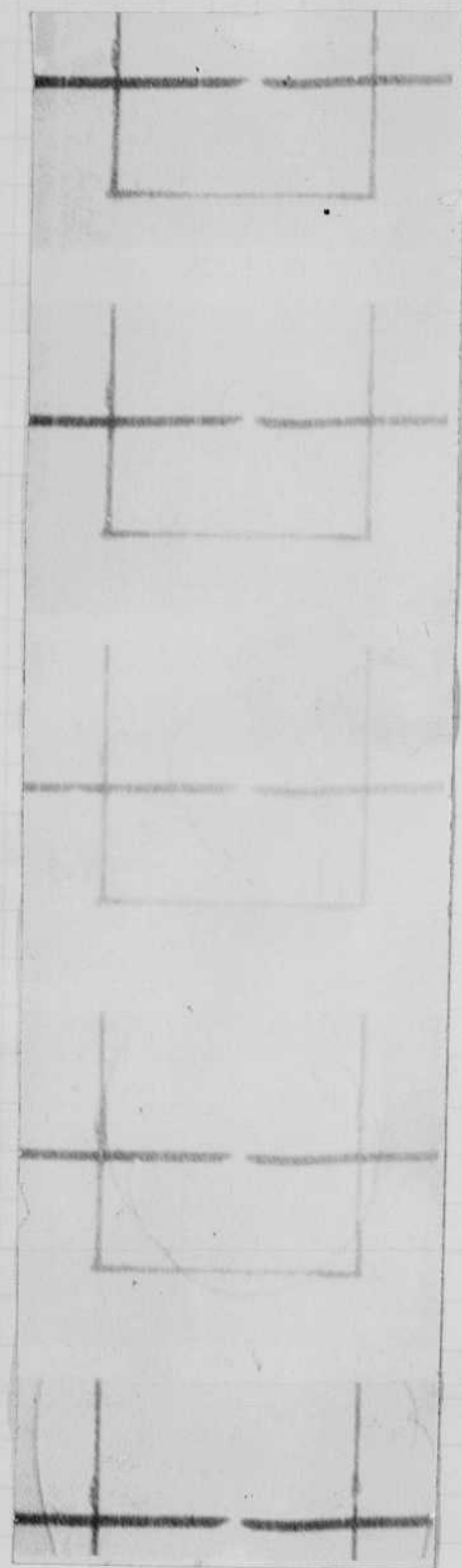
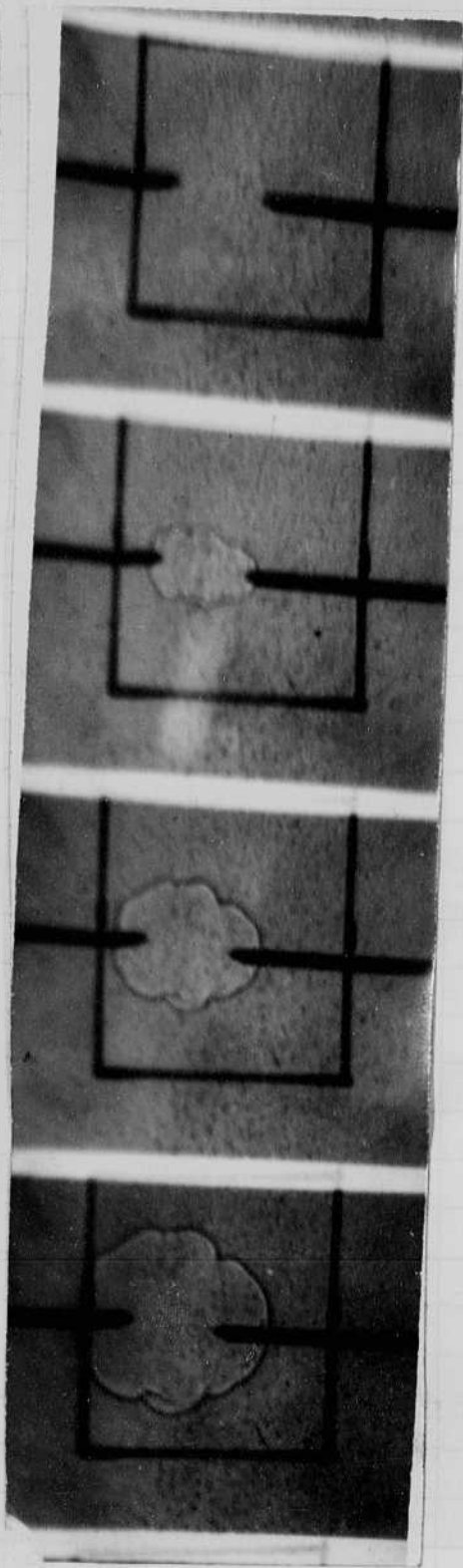
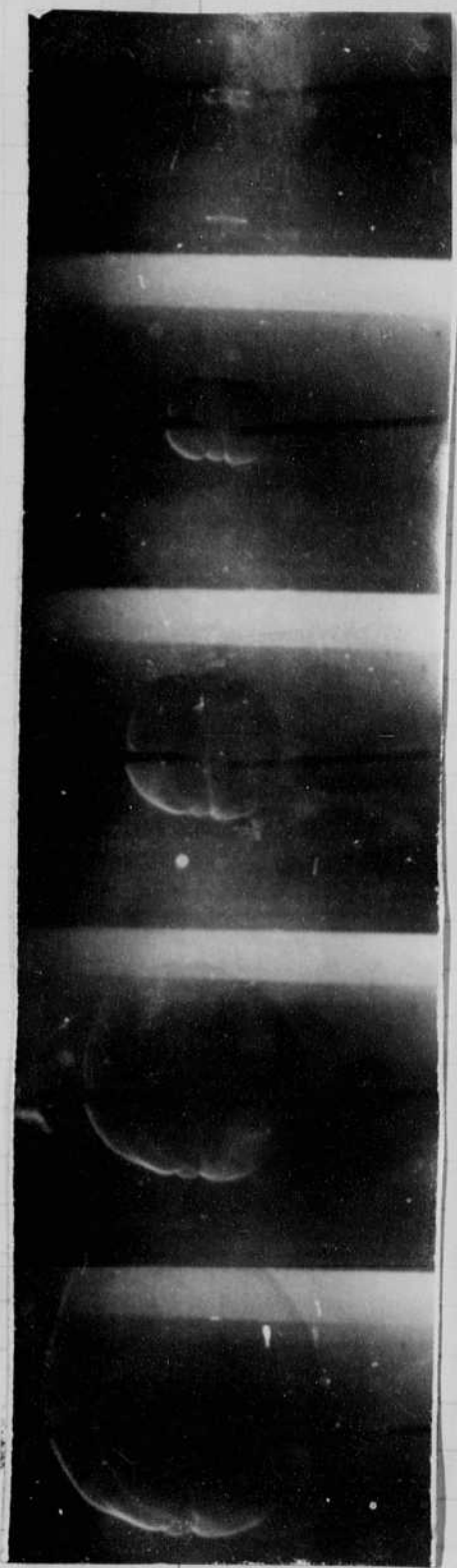
Humming Birds



Open house 1938.

TIP # 55 45" C₂

Exaggerated from a cutting torch.



Burning of gas in a cylinder.



Balmington

Prof. Edgerton

Press Clipping Service

2 Park Square
Boston Mass.

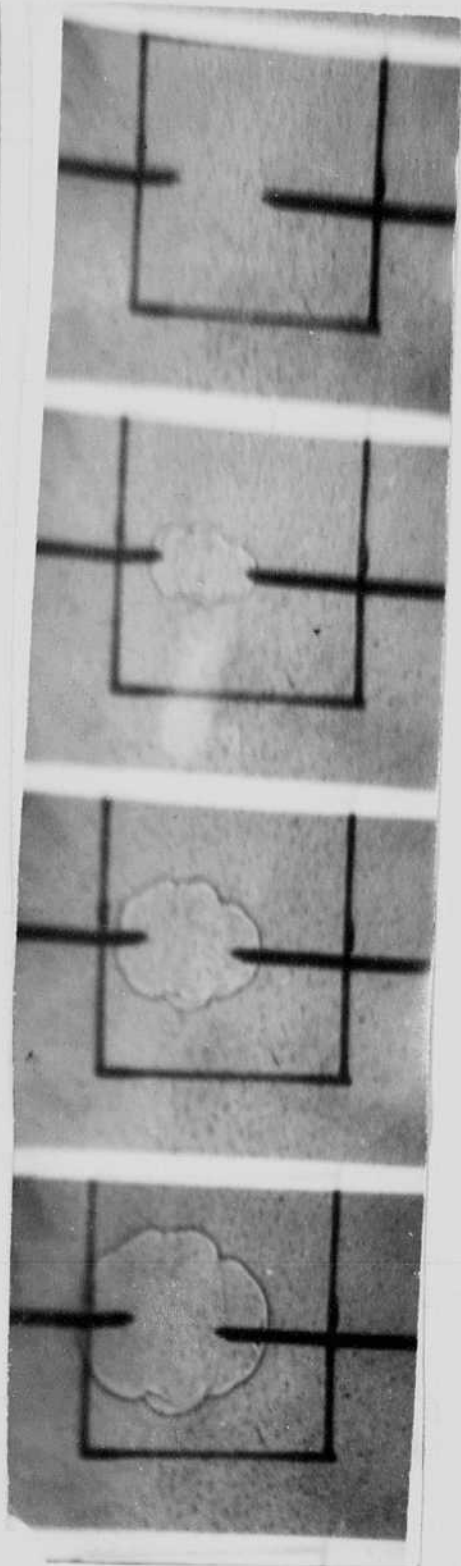
Herald
Boston, Mass.

Date JAN 12 1939

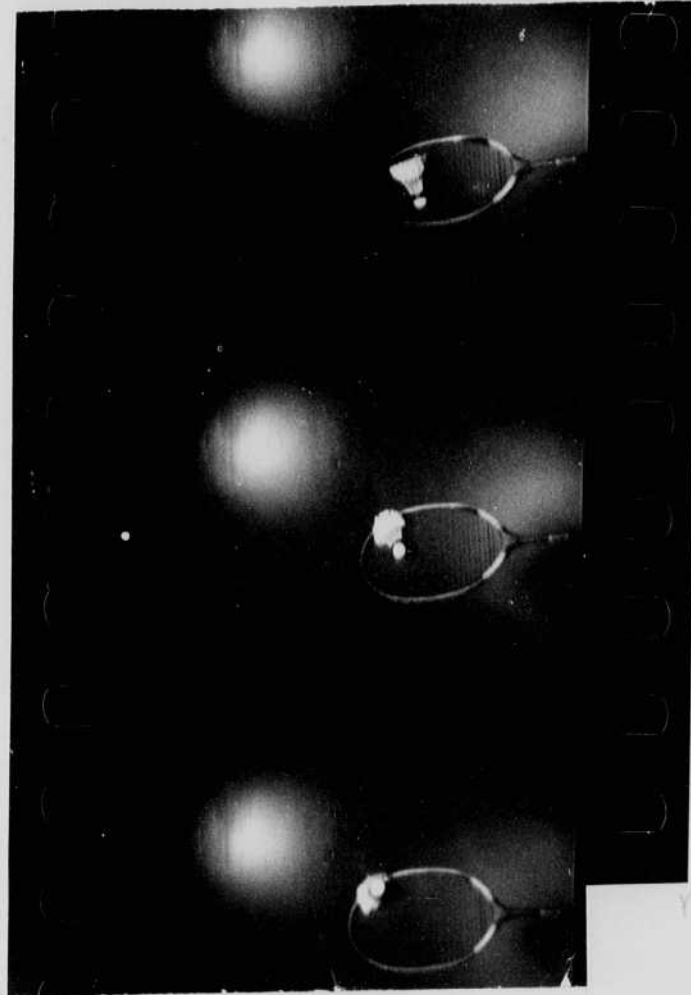
**Professor Edgerton
Lectures Today**

Professor Harold E. Edgerton of the Massachusetts Institute of Technology, will be the guest speaker at the second lecture in the series of Thursday Morning Talks to benefit the Cambridge Hospital League, to be held this morning at eleven o'clock in the ballroom of the Hotel Continental in Cambridge. Professor Edgerton's subject will be "Seeing the Unseen with High-Speed Photography," and his talk will be illustrated with moving pictures showing the amazing effects and results of this type of photography.

Morning coffee will be served from 10:15 to 10:45, preceding the lecture, and included among the pourers will be Mrs. David H. Howie, Mrs. William J. Underwood, Mrs. Campbell Bosson, Mrs. Paul Gring, Mrs. Warren MacPherson and Mrs. Parker E. Marean. Mrs. Robert S. Hurlbut is in charge of the ushers, and assisting her will be Mrs. John Cross, Mrs. G. Lincoln Dow, Jr. (Helen Blanchard), Mrs. Geoffrey Lewis (Elizabeth Locke), and Mrs. Robert Walker. Mrs. Chester M. Grover of 33 Hurlbut street, Cambridge, is in charge of subscriptions.



Burning of gas in a cylinder.



Birmingham

Prof Edgerton
Press Clipping Service
 2 Park Square
 Boston Mass.

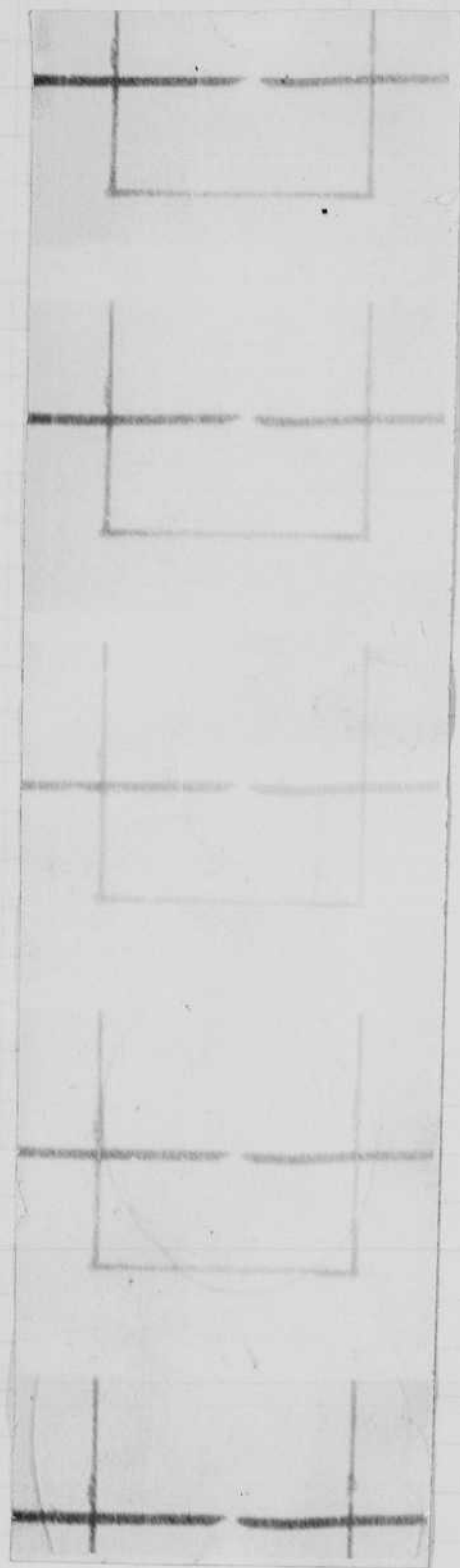
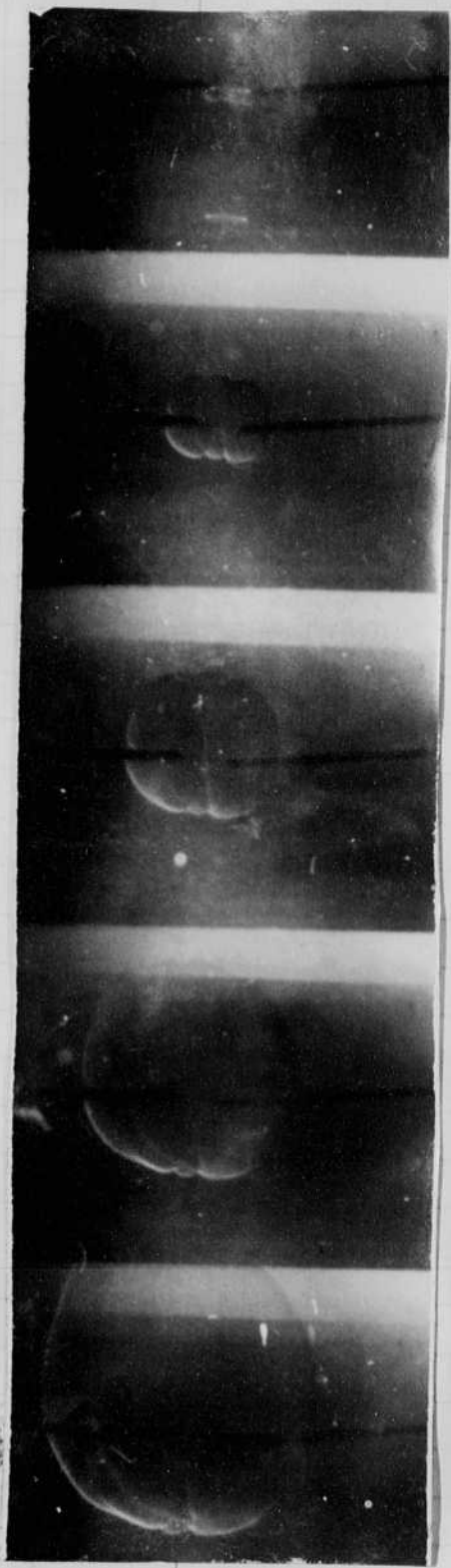
Herald
 Boston, Mass.

Date JAN 12 1939

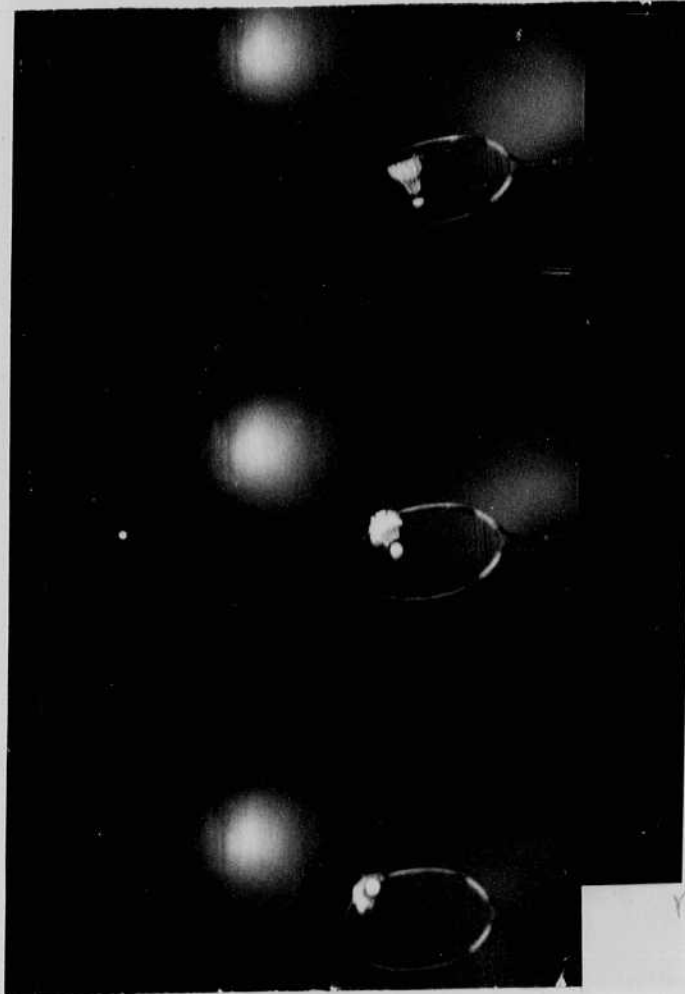
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Burning of gas in a cylinder.



Balmington

Prof. Edgerton
Press Clipping Service
2 Park Square
Boston Mass.

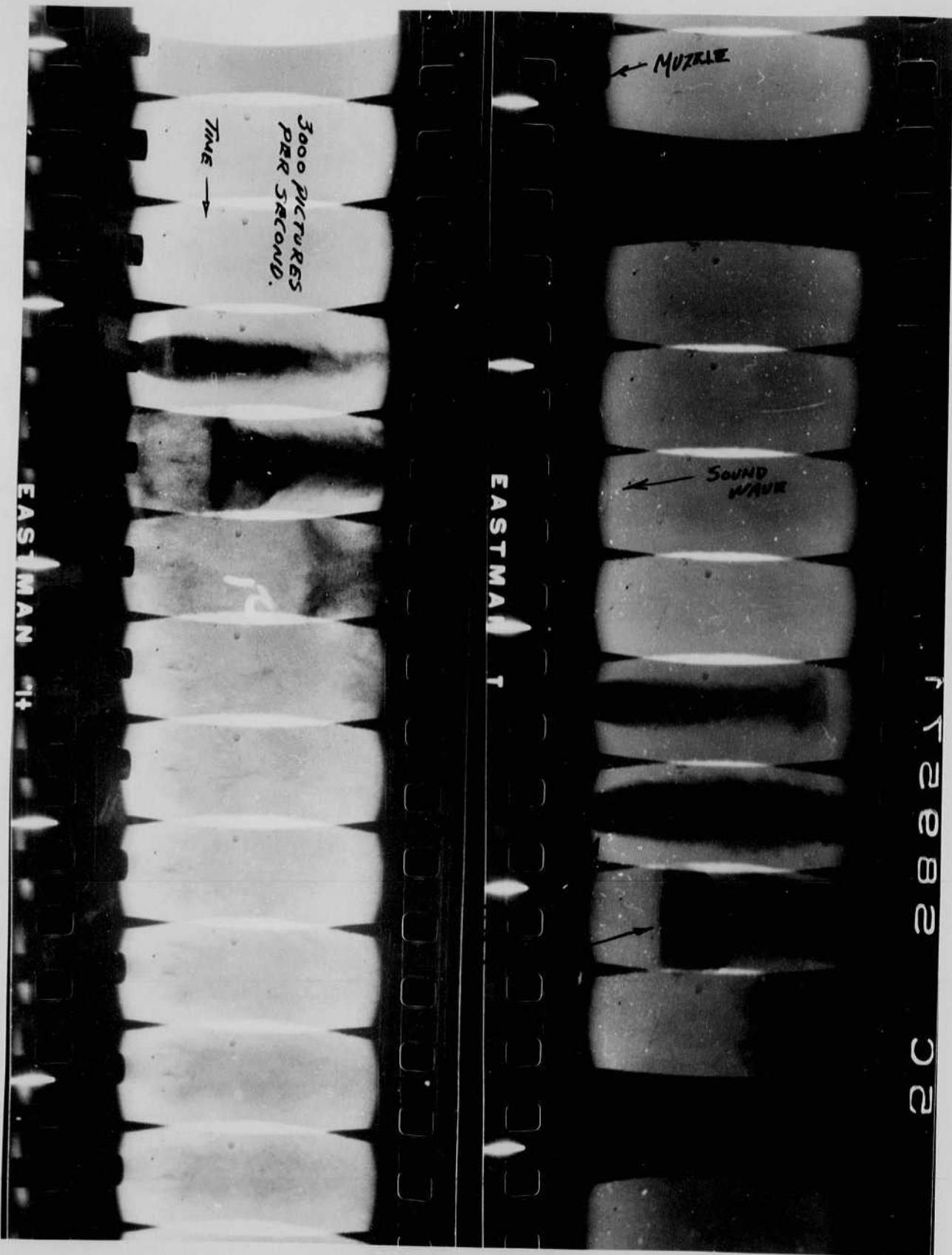
Herald
Boston, Mass.

Date JAN 12 1939

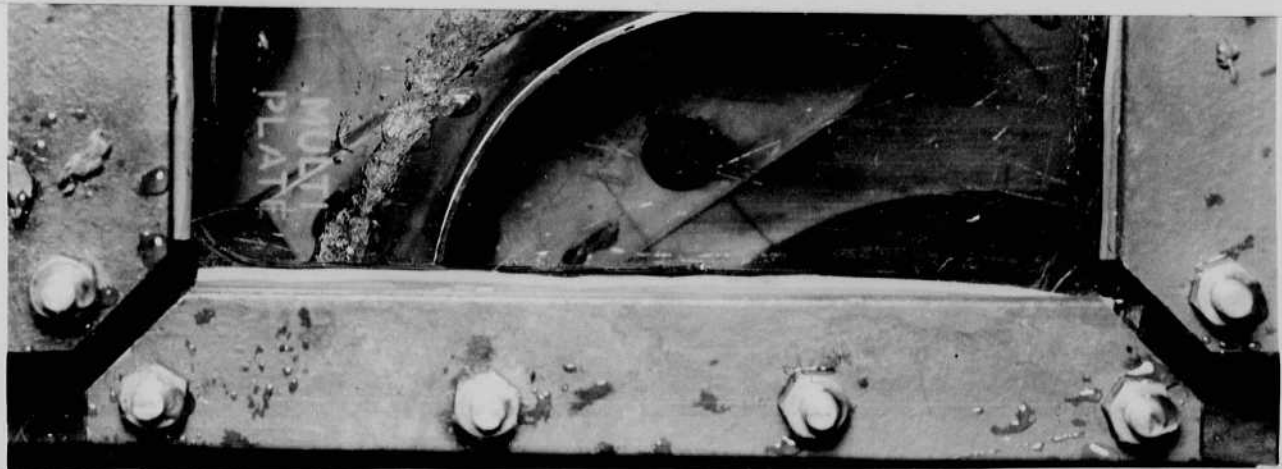
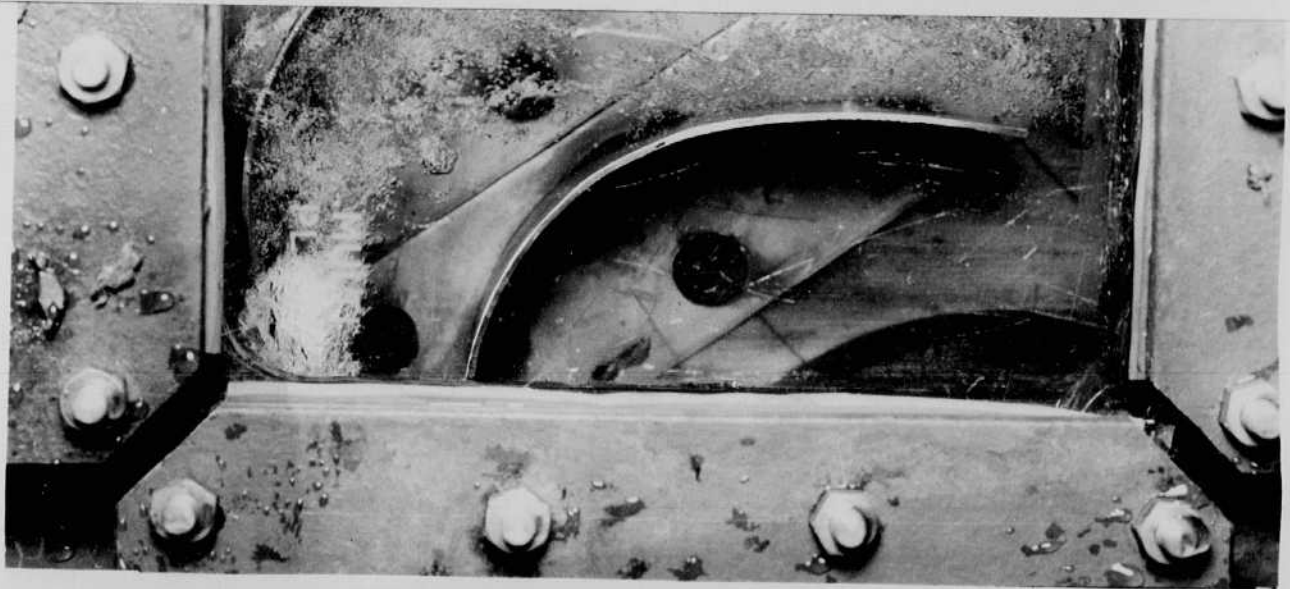
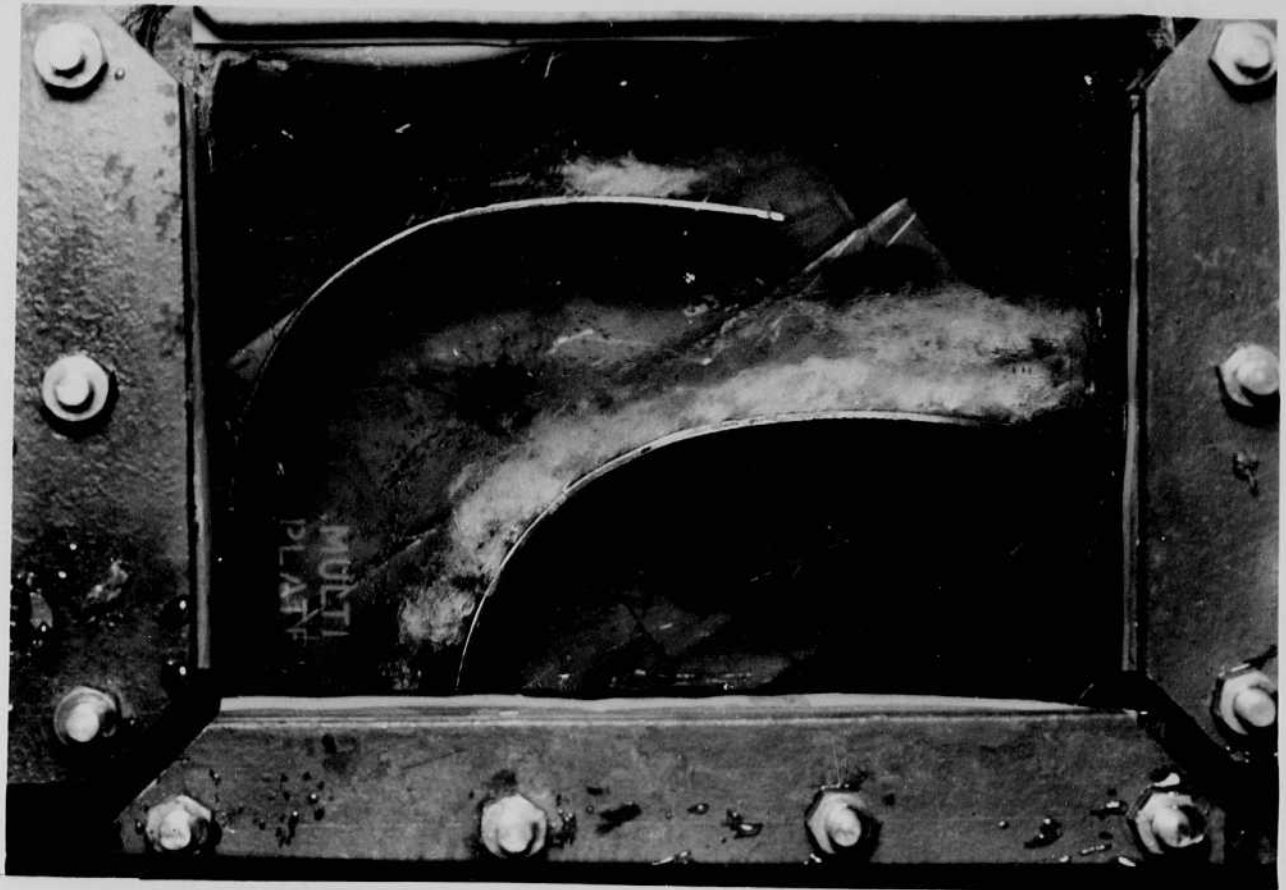
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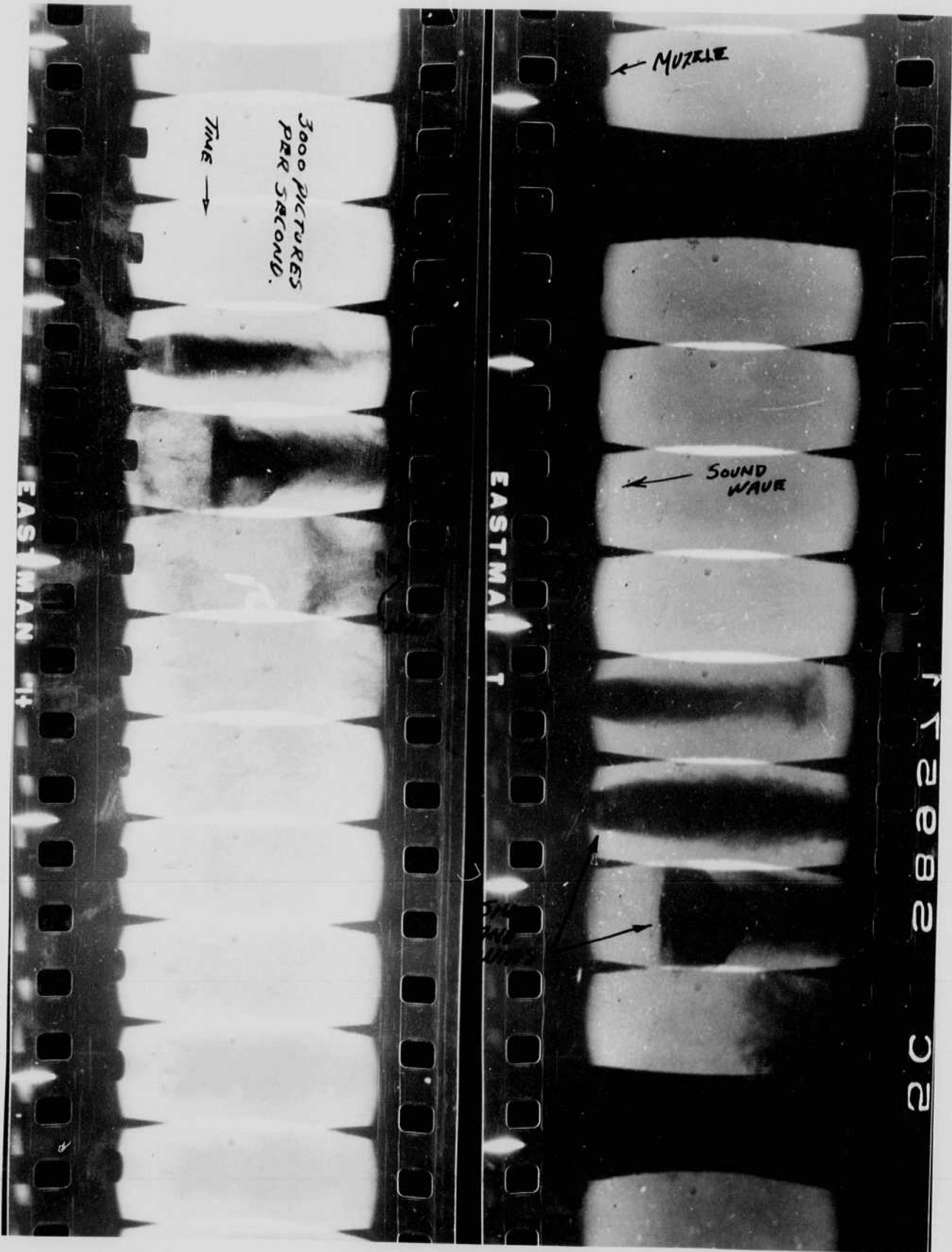
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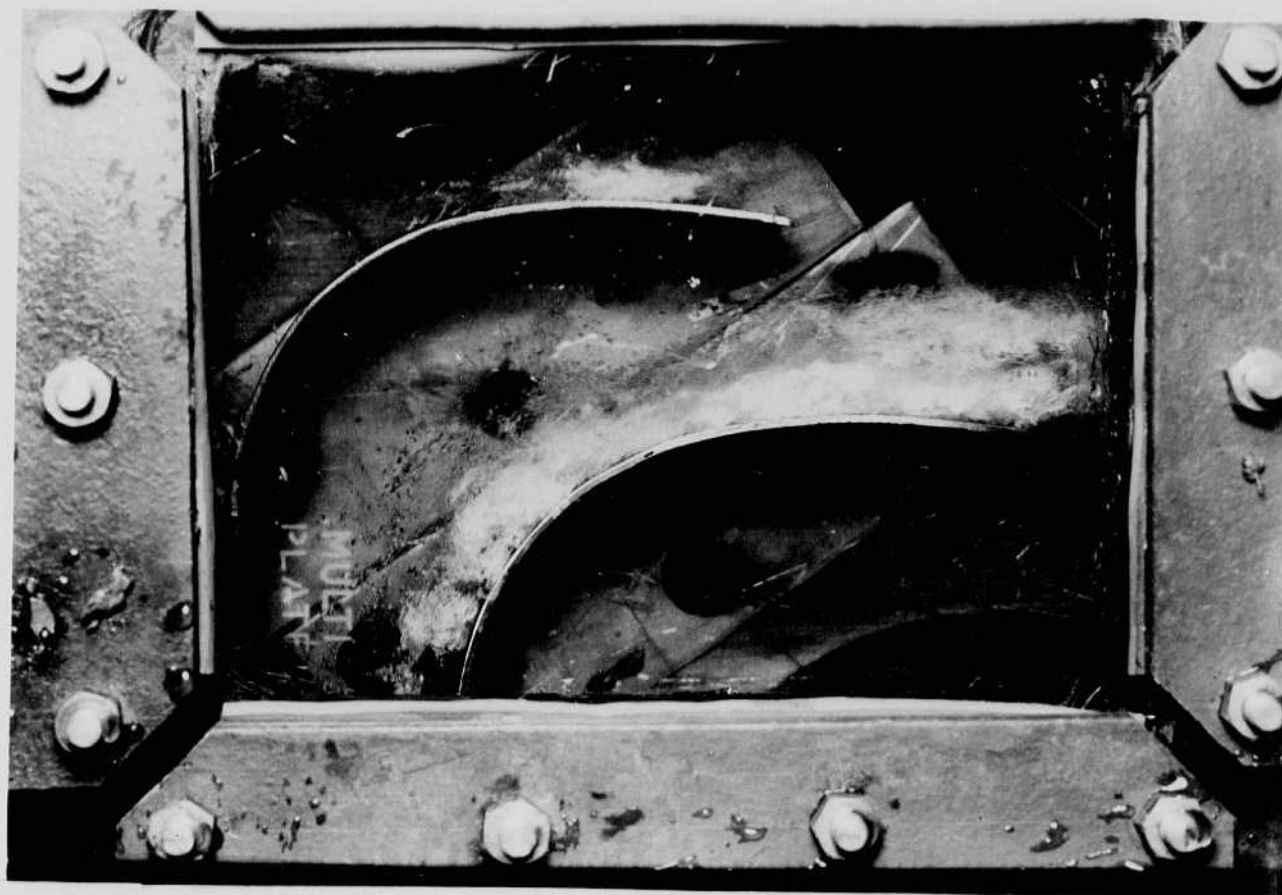


Shot gun movies 3000/sec.





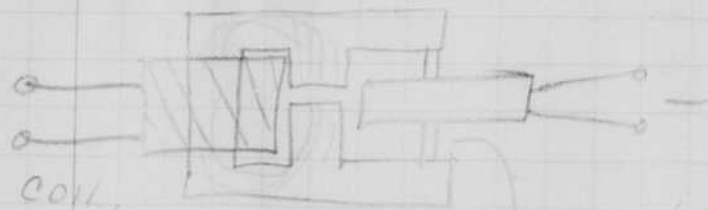
Shot gun movies 3000/sec.



Jan 16 1939
 W. R. Egerton

Peaking transformer.

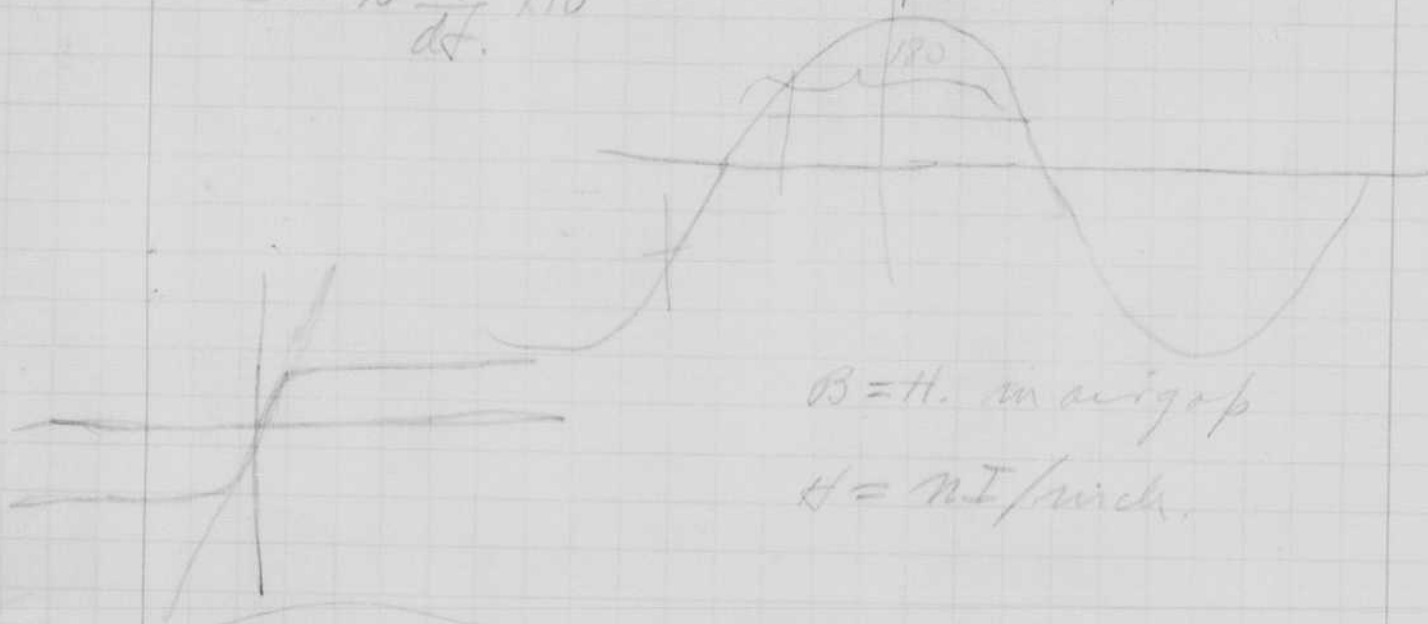
On last Friday I collected core material from B.R., for a peaker.



a few laminations.

$$e = N \frac{dd}{dt} \times 10^{-8}$$

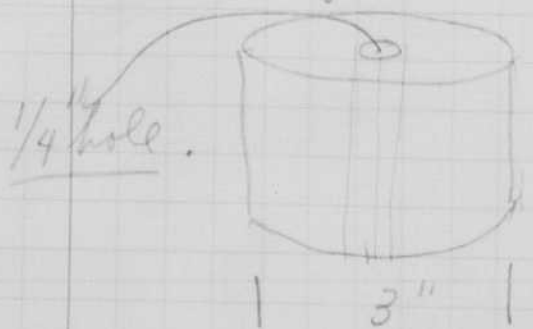
$$\beta = \mu \text{mf.}$$



$$\beta = H \cdot \mu \text{ in air gap}$$

$$H = NI / \text{inch.}$$

Coil Specs. 100,000 turns.



1 1/2"

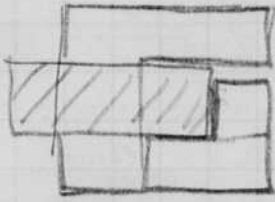
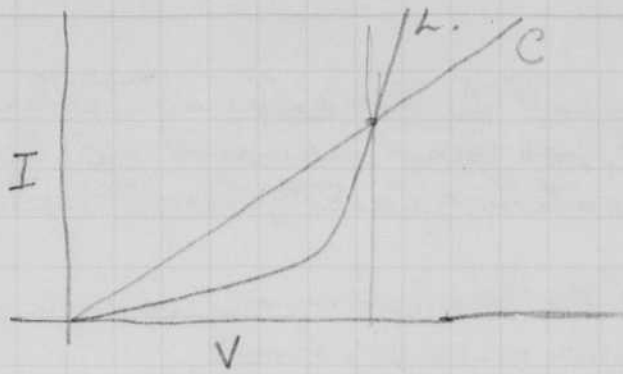
#40 wire
 0.00314 inches diam

1/2 inch

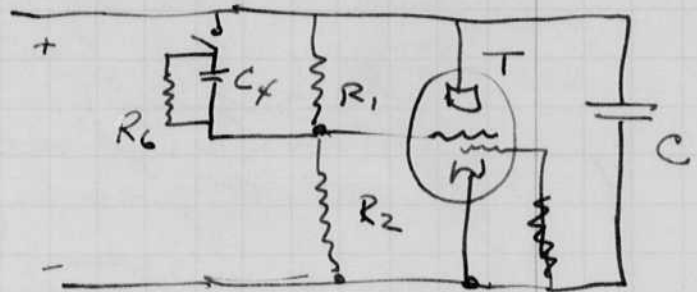
1/2 - 1/4 = 1/4 inches

$$\frac{1.25}{0.00314} = 400 \text{ layers.}$$

ordered by phone from Bob Quincy by
 Rayburn Jan 17, 1939.



Circuit sent in letter to
Paramount Studios



T - Strobotron.

$$C_4 = .005 \text{ mf.}$$

$$R_6 = 500,000.$$

$$R_1 = 500,000$$

$$R_2 = 50,000$$

R

Jan 19 1939.
 Boston.

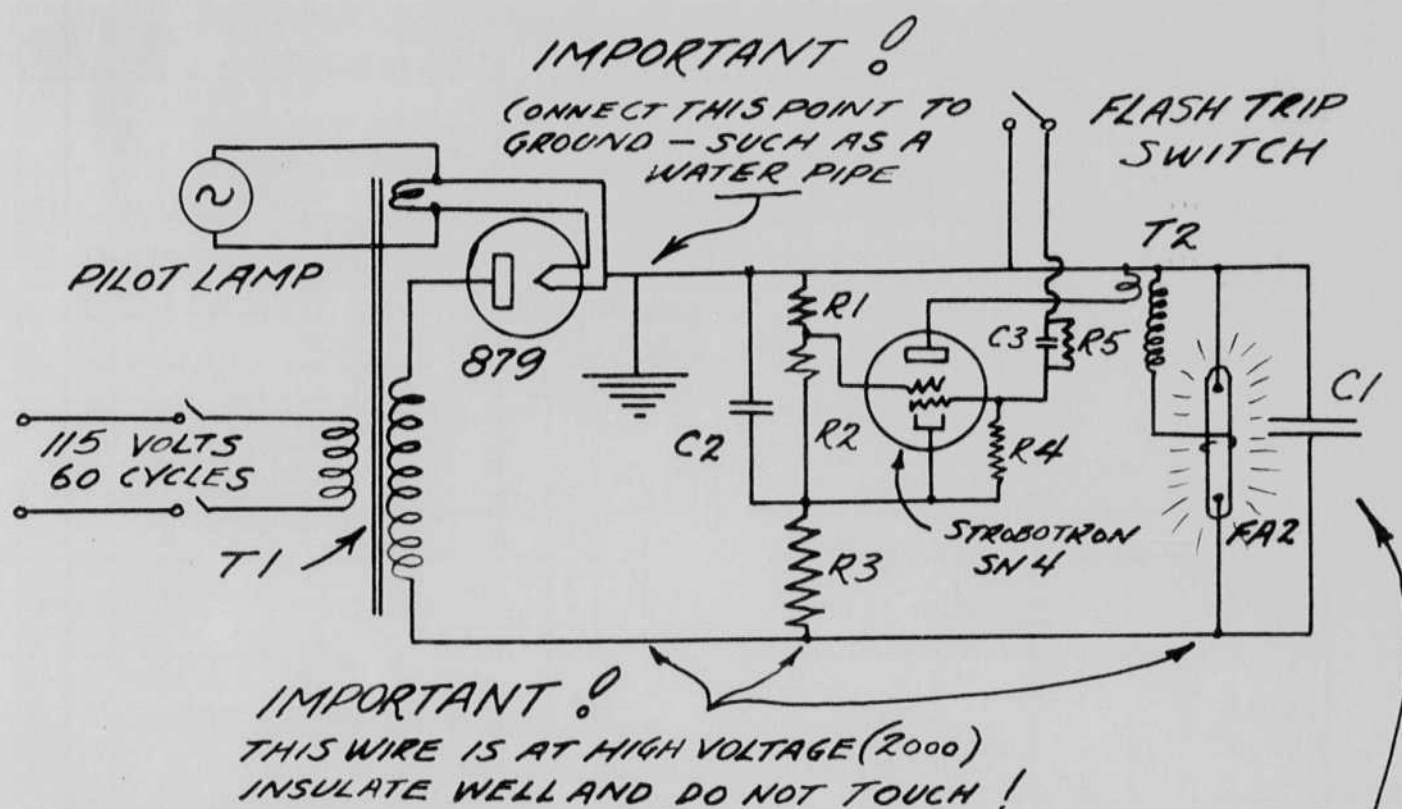
Germa. & Herb. went to New Haven today to take movies at 1000 per second of guns at the Winchester plant (Mr. Pugaley.)

Jan. 16 I talked to Mr. Driest's class at the Harvard Business school.

Bobby Jones, Mr. Reach, Mr. Rodford (Spalding Bros Co.) were here on Jan 12 from 9 to about 2 pm. Photos were taken. I gave a talk at 11 at the Cambridge Y. M. C. Club Continental Hotel. Mr. Stuber of Eastman Co. was here in the afternoon and we discussed an exhibit of single-flash photography.

Mr. Stevens has been discussing speed photography with the Westinghouse Co. We may cooperate with them in the application of the method of flash photography.

STROBLITE FLASH UNIT.



IMPORTANT

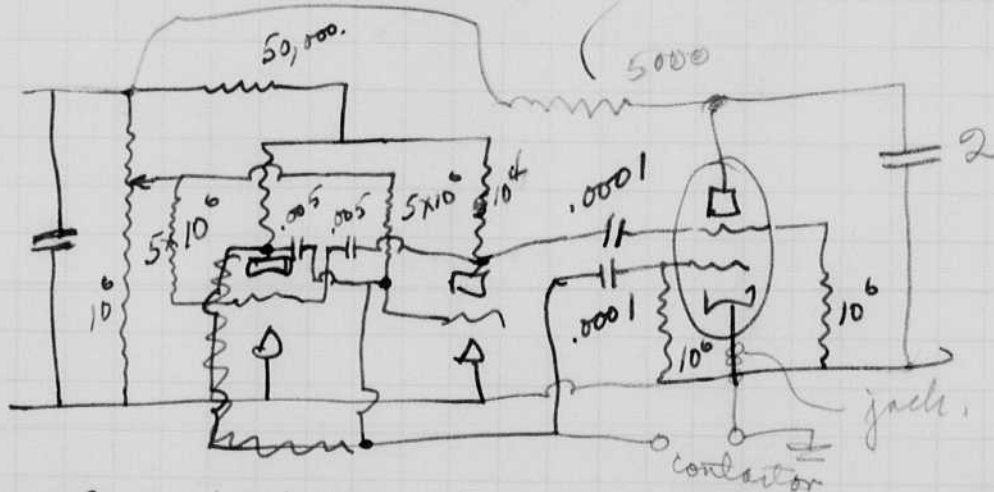
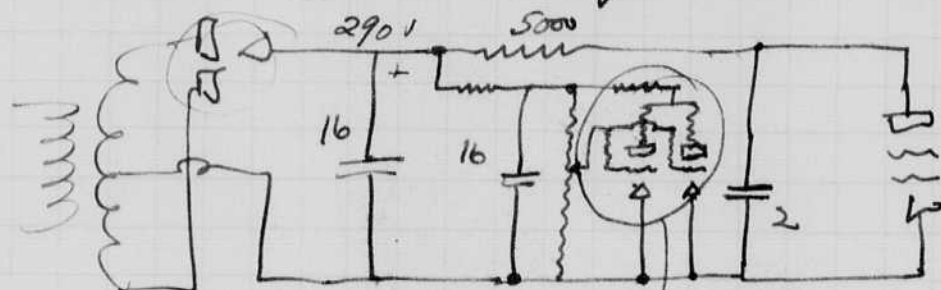
SHORT CIRCUIT CONDENSER C1
 BEFORE TOUCHING LAMP OR
 CIRCUIT EVEN IF MAIN
 SWITCH IS OFF.

JAN 2, 1939.
 H.E.E.

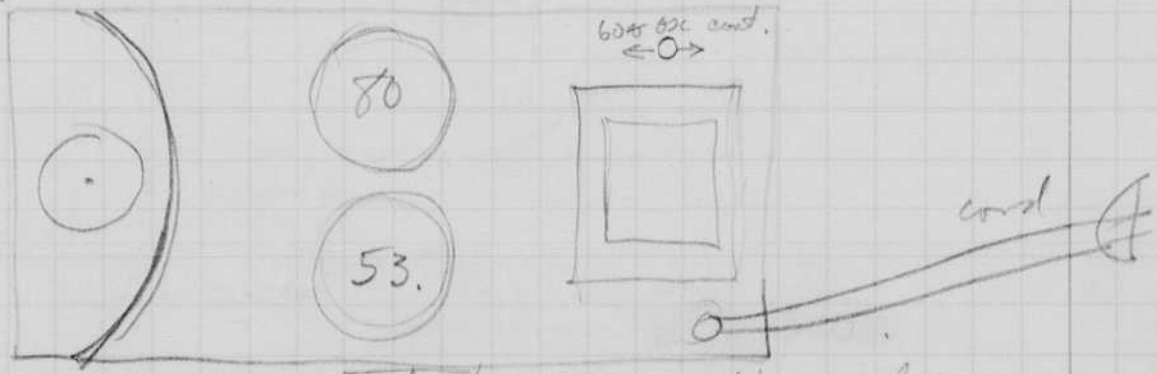
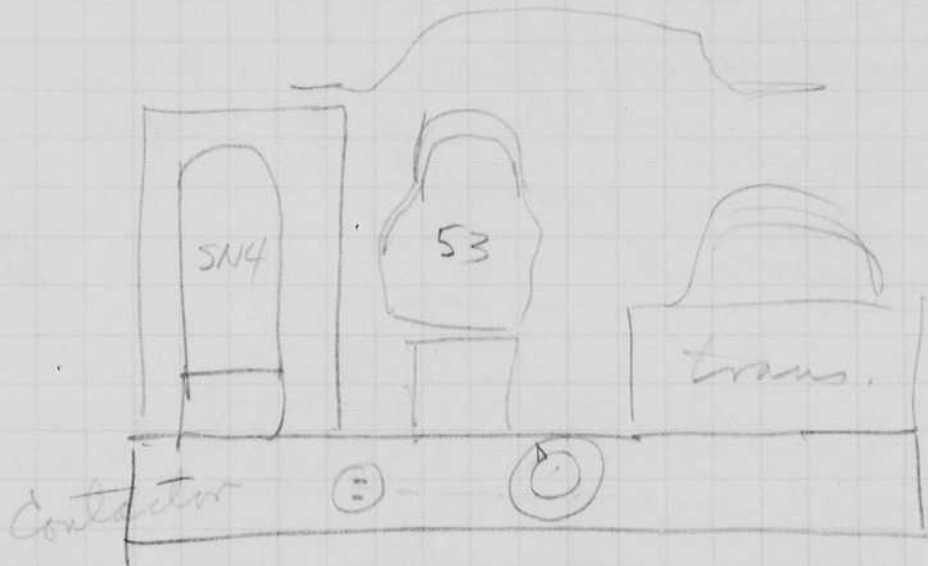
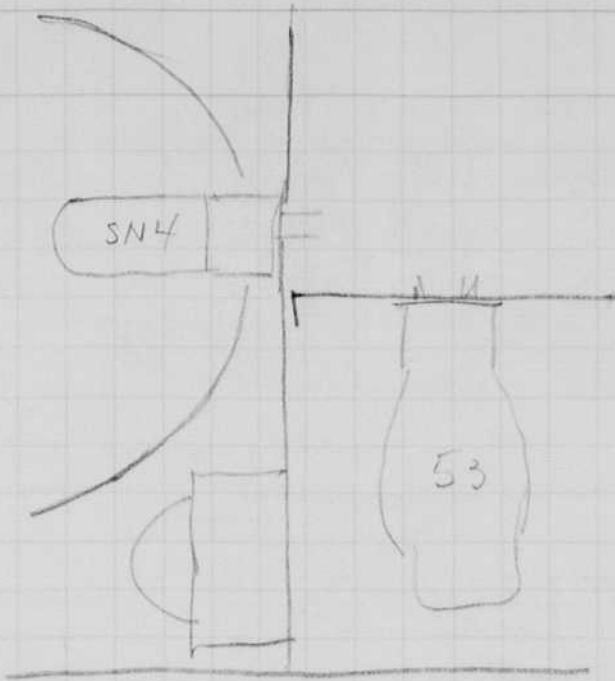
Jan 22, 1939
Harold E. Edgerton

Mr. Reed and Mr. Michels (?) of the Boston Herald came over Saturday Jan 21 morning and we took a few photos of different subjects with both photo flash lamps and with a argon flash lamp. The unit was the one that Grier is to send Monday to the Washington Navy Yard. Circuit on previous page. 112 microfarads capacity - 2000 volts.

Stroboscope



This circuit gives a + surge on one grid and a - surge on the other at the moment of relaxation.

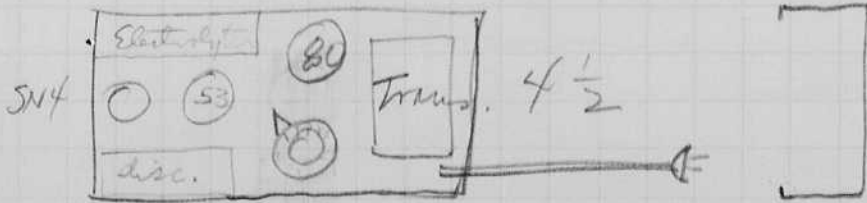


control with switch

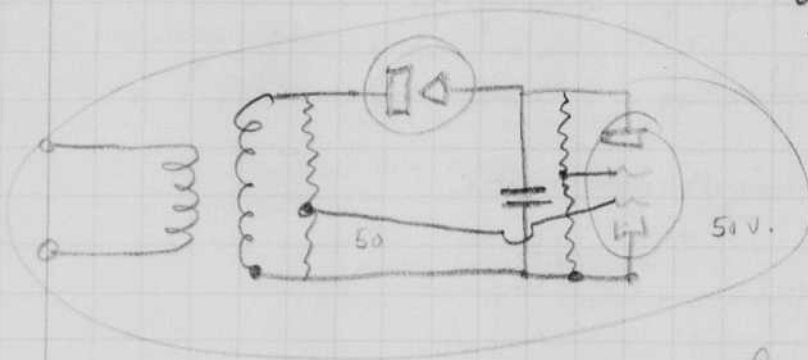
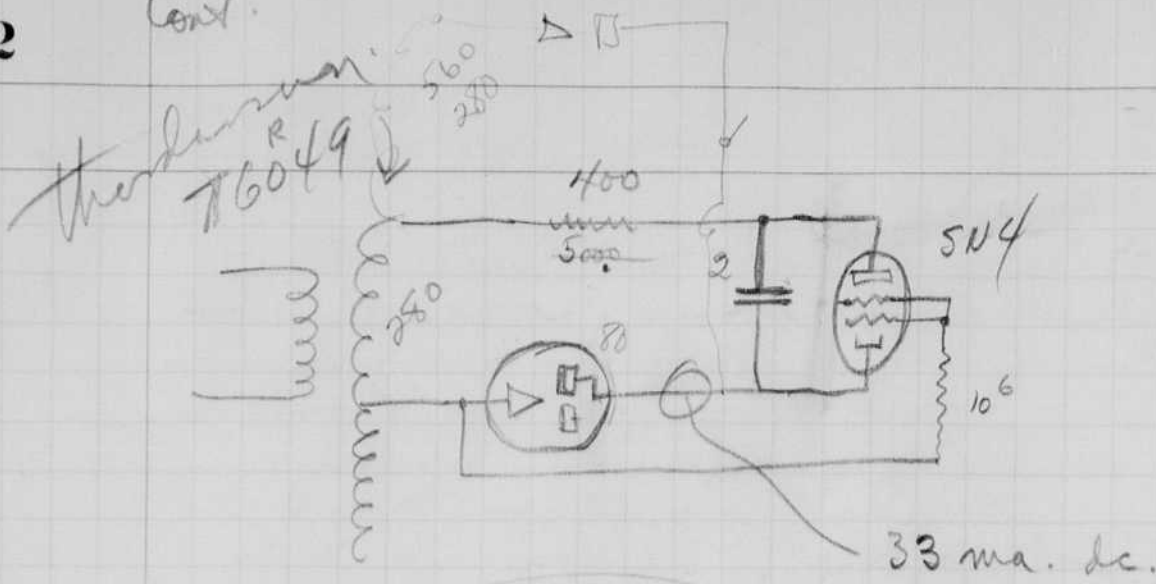
for collector operation - Remove 53 tube!

9

→ 1 3/4 ←

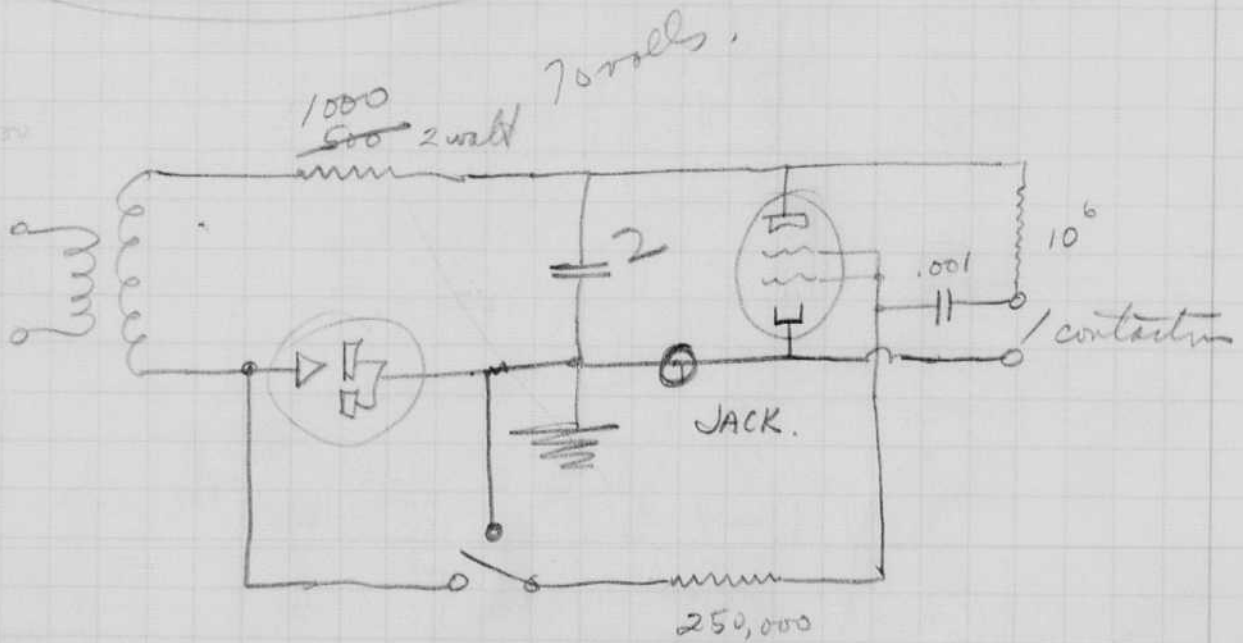


Cont.



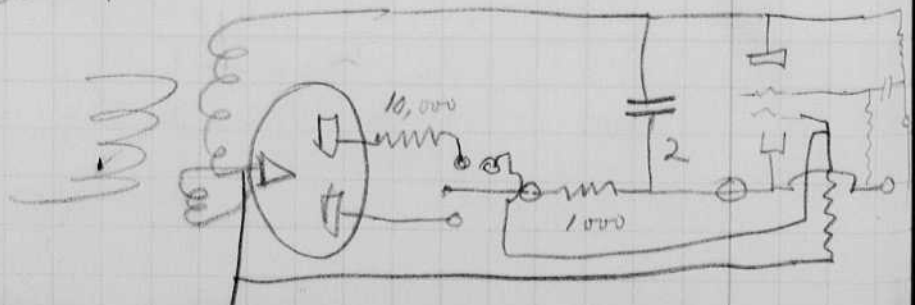
works fine

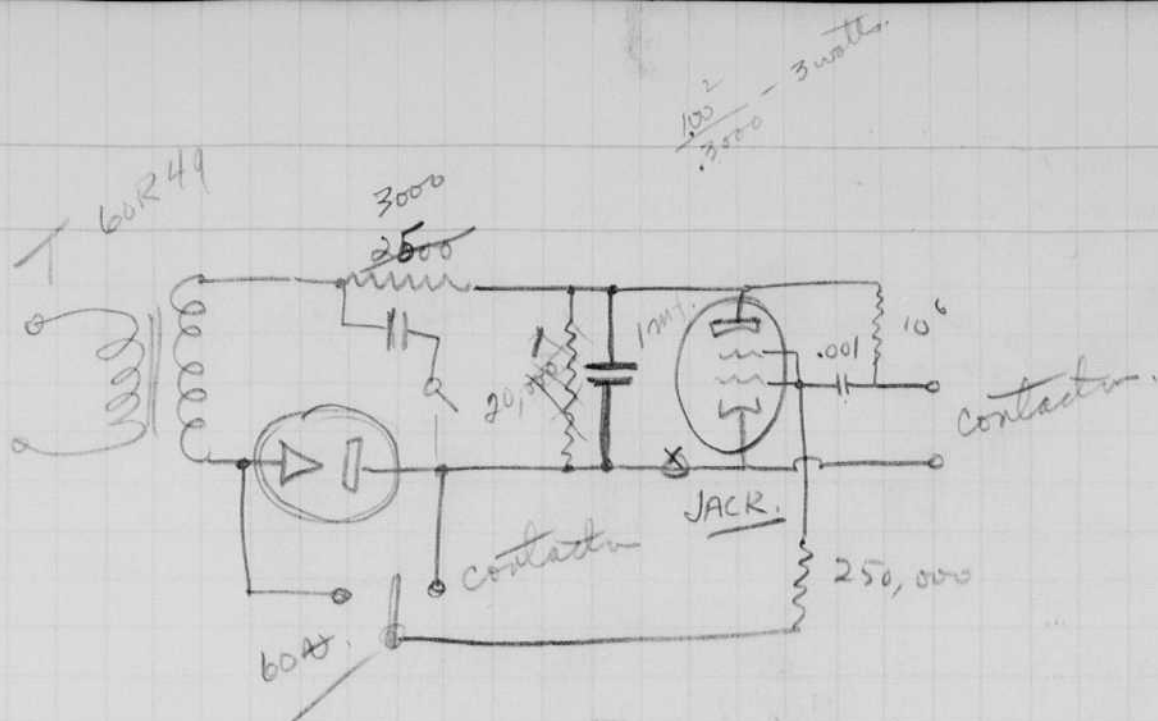
$$\frac{.03}{.03} = .01 \times 50V$$



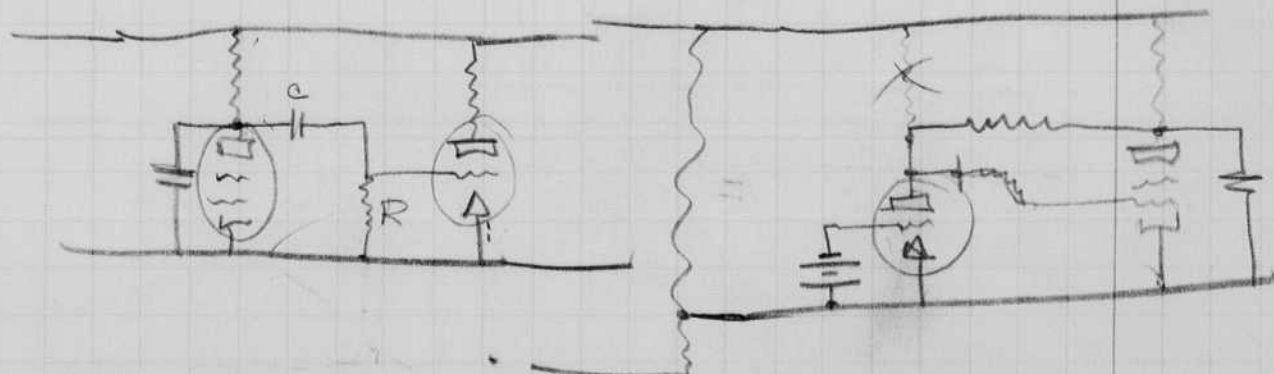
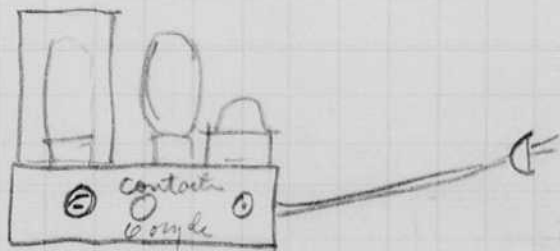
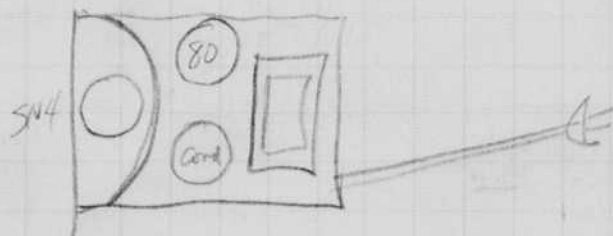
ok for surge flash

$$\frac{E^2}{R} = \frac{490}{1000} = .5 \text{ watts}$$



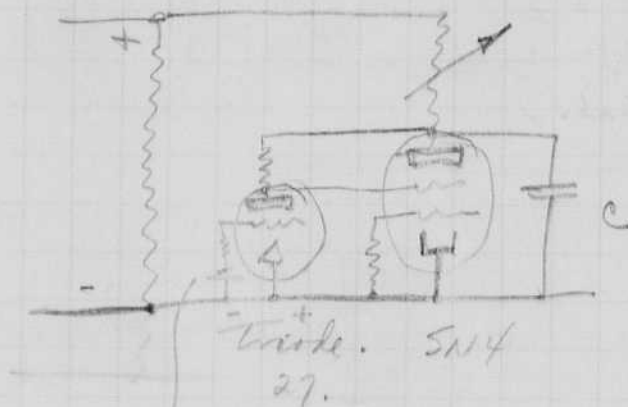


60 cycle cond as above max volts at discharge = 2.5×150
 2500 volts.
 Leak on 1mF condenser removed.
 works ok and better.
 action slightly jumpy due to poor contactor.

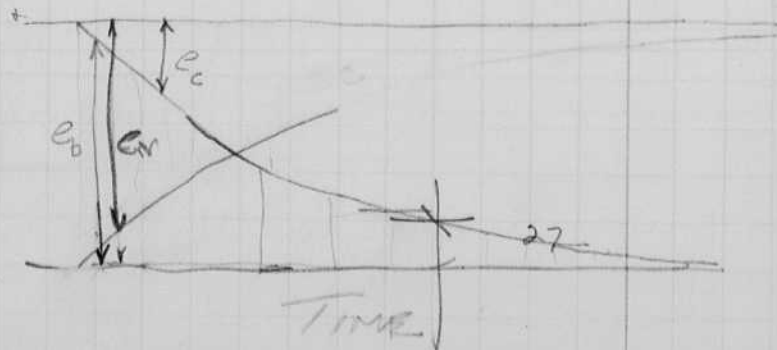
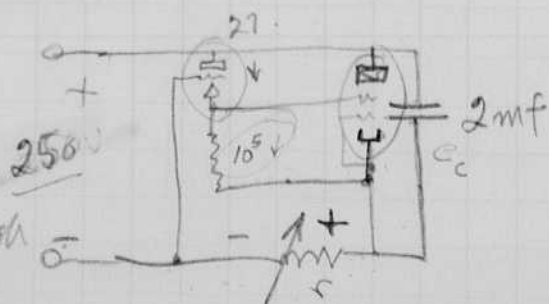
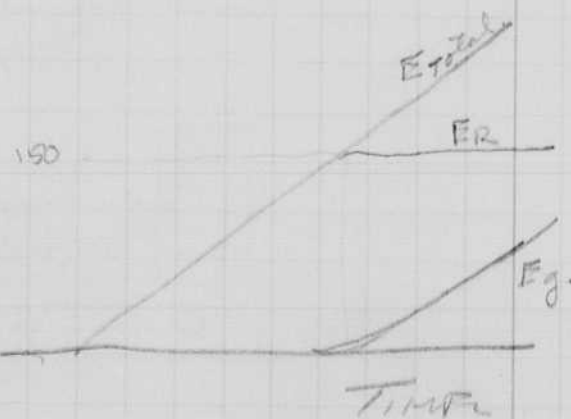
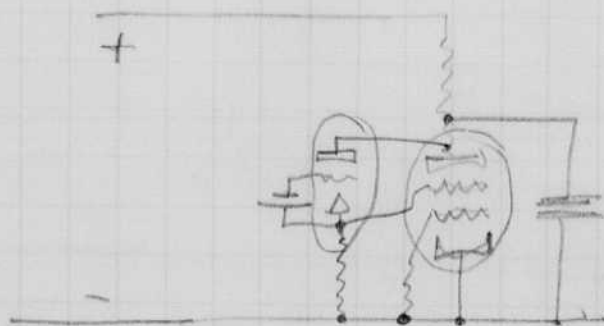
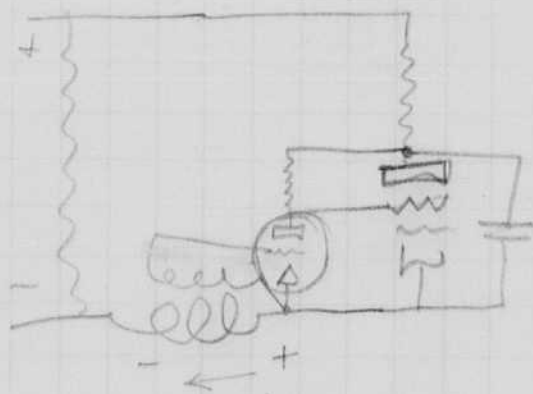


Jan 23, 1932.
H. E. Edgerton

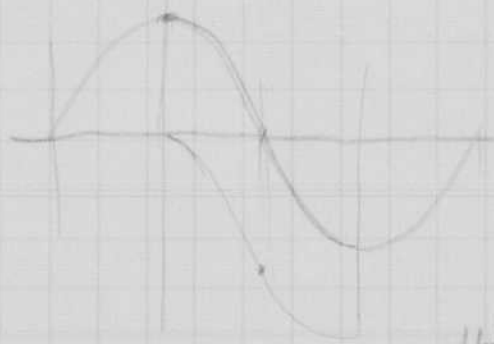
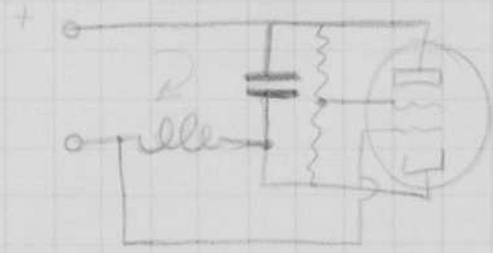
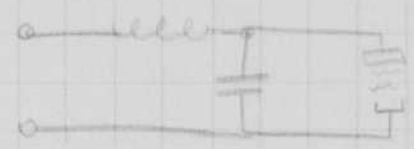
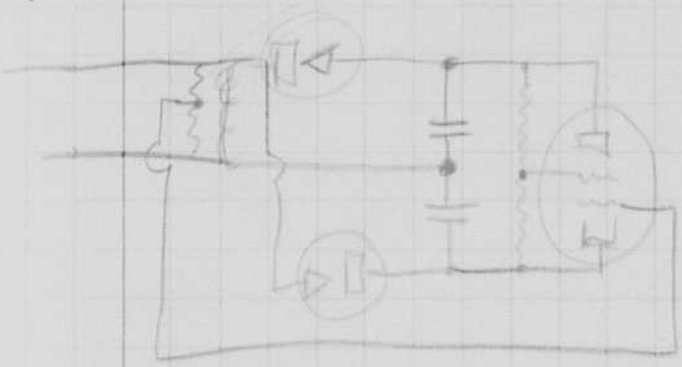
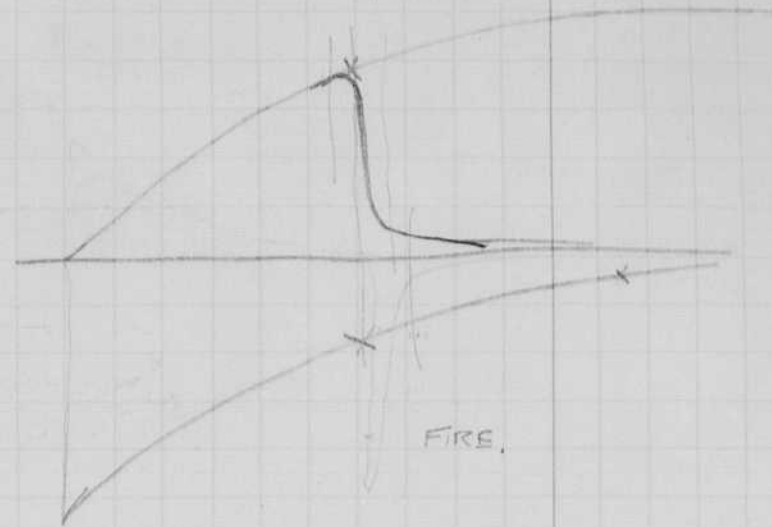
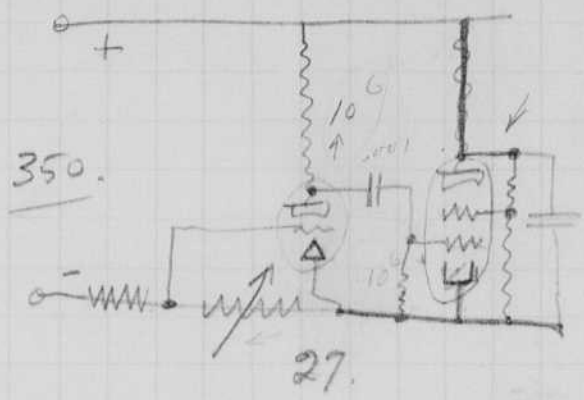
Discussion with Grier regarding
stroboscope circuits.



-18 cutoff at 150 volts on plate.



Make high



$x \cdot h =$

$T = \frac{1}{60} = 2\pi\sqrt{LC}$

$\frac{1}{60} = 2\pi\sqrt{LC}$

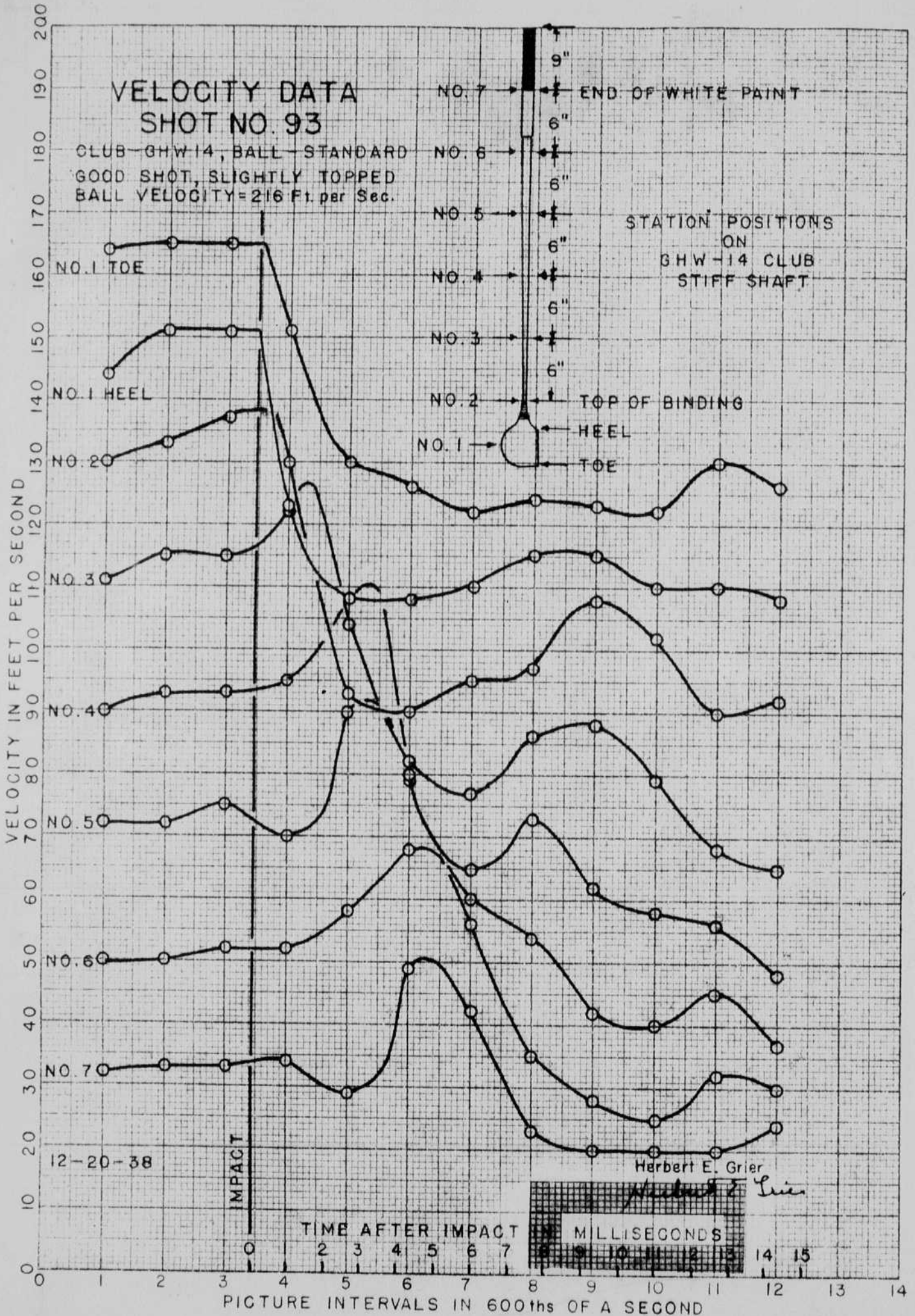
$\frac{144,000}{10^3} = \frac{10}{10^6} \cdot C$

$10h - \text{---}$
 $60A \quad C = .7 \text{ mf.}$

$5. h = 1.4 \text{ mf.}$

VELOCITY DATA SHOT NO. 93

CLUB - GHW-14, BALL - STANDARD
GOOD SHOT, SLIGHTLY TOPPED
BALL VELOCITY = 216 Ft. per Sec.



KEUFFEL & ESSER CO., N. Y. NO. 19-11
20 x 30 x 1/2 in. 1000 ft. roll
MADE IN U. S. A.



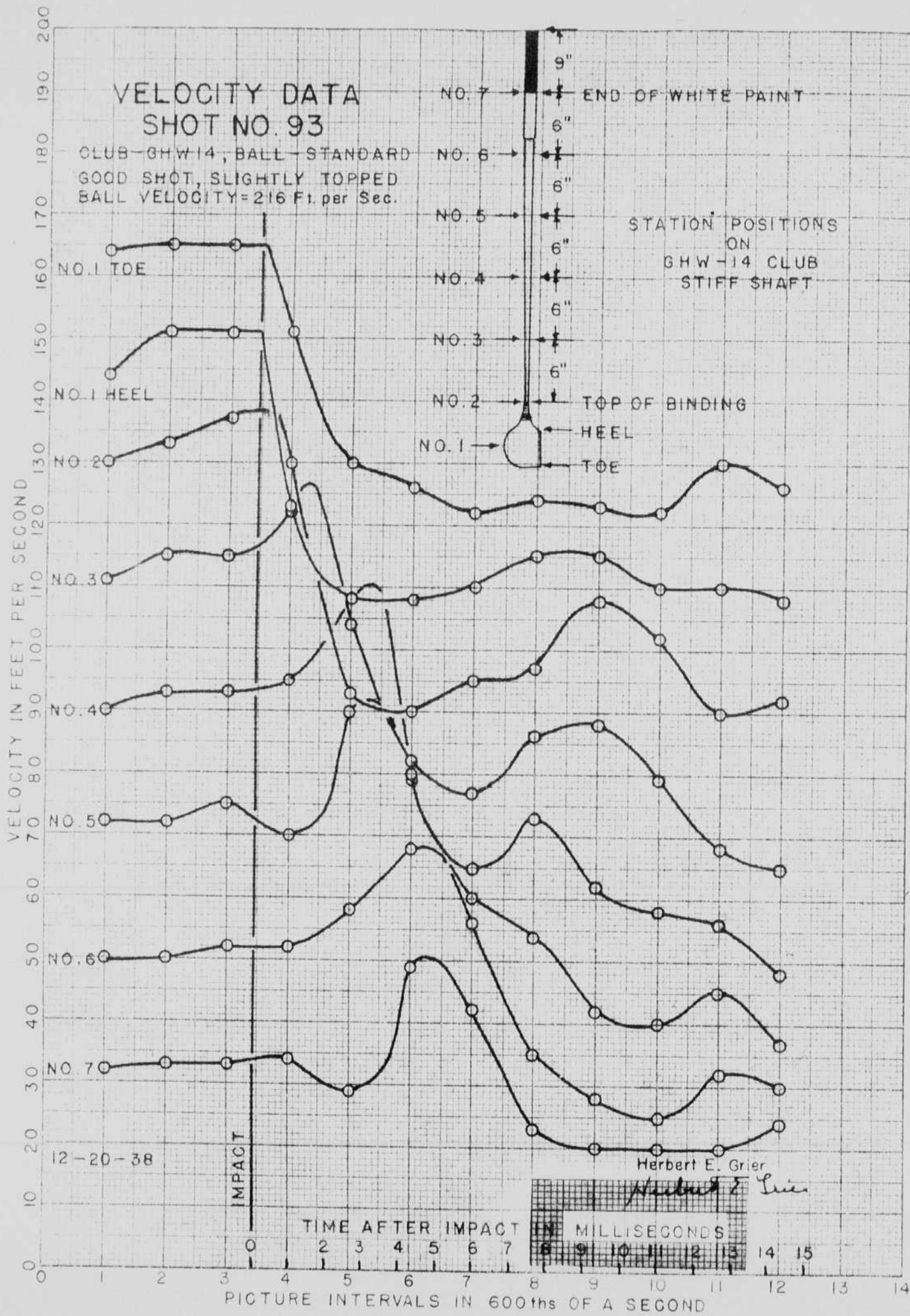
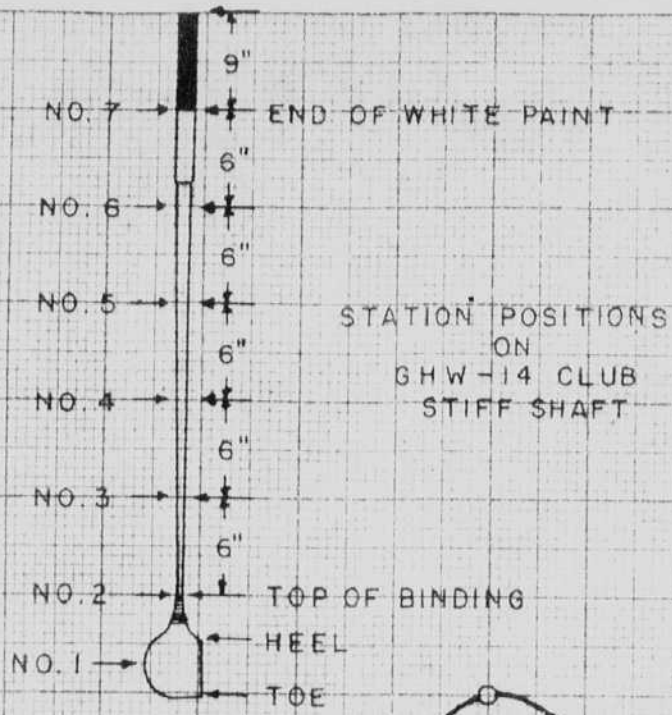
Joe
Louis.

Made with
open shade
by
Gernerhausen
and Srier.



VELOCITY DATA SHOT NO. 93

CLUB - GHW-14, BALL - STANDARD
GOOD SHOT, SLIGHTLY TOPPED
BALL VELOCITY = 216 Ft. per Sec.



KEEFE & ESSER CO. 140 N. F. WASHINGTON ST.
PHILADELPHIA, PA.



Joe
Louis.

Made with
open space
by
Gemeshausen
and Prior.



Feb. 1, 1939
 Hedyington.

Yesterday afternoon took 4:10 pm train on
 Bauda to Springfield with Ray Stevens,
 Ben. Fogler, Bob Rose, Herb. Erier. At
 Kimball Hotel met Mr. Brown, Radford (Geo),
 Victor East, John Dickson, John Baymiller
 W. F. Beach and several others. After dinner
 had discussion unite about 12 on golf
 report etc.

This morning we assembled at the
 A. S. Spalding Bros. plant and resumed
 the discussions until noon. Stevens and
 I then took the train to Boston leaving the
 others. Program -

Construction and design of club heads.
 Design of shot gun for ~~bullet's~~ balls.

Consider ultra-high speed analysis
 of the impact of club and ball.

On Jan X (or 30) Sexton, Dotson and Gold
 from navy were visitors at M.I.T.

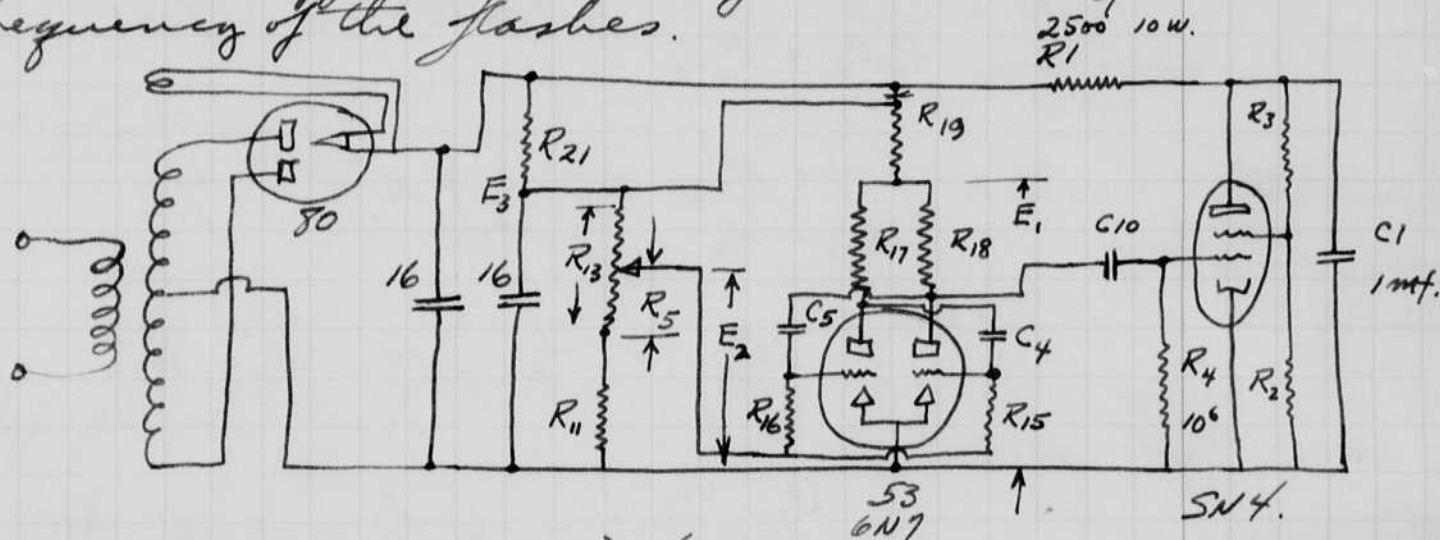
Last weekend I was at Pinkham notch
 Camp of the A.M.C. with the Nottinghams. Skiing.
 Met Janet and Bartlett. Boston. Lus. Wire.
 Mac Beth Illuminator Co. -
 Daylight reflectors.

Joe Dodge - Camp manager.

Feb. 1939.
H. S. S. S.

At General Radio in afternoon working with Genus & Sine on stroboscopes. The image was jumpy and the cause - faulty condenser. Apparently the connections in the condenser were faulty and caused a poor contact which prevented the tube from going into an arc the same each flash.

Williams of S.R. wants design of stroboscopes for limited range of speeds for special purposes. Below shows approx method of calculating the frequency of the flashes.



$$FREQ = \left(\frac{1}{R_{16}C_5 + R_{15}C_4} \right) \left(\frac{E_2}{E_1} + \frac{1}{2} \right) \quad \text{approx.}$$

$$\text{But } E_1 = \left(\frac{R_{18}}{R_{18} + R_{19}} \right) E_3 \quad \text{approx.}$$

$$\text{and } E_2 = \left(\frac{R_5 + R_{11}}{R_{13} + R_{11}} \right) E_3$$

$$\therefore FREQ = \left(\frac{1}{R_{16}C_5 + R_{15}C_4} \right) \left[\left(\frac{R_5 + R_{11}}{R_{13} + R_{11}} \right) \left(\frac{R_{18} + R_{19}}{R_{18}} \right) + \frac{1}{2} \right]$$

Trop for 166 - 853
10,000 - 5000 cycles.

$$\text{Let } R_{19} = 0$$

$$R_5 = R_{13}$$

in brackets is then $\frac{1}{2}$.

$$C_5 = \frac{10^{-6}}{2 \cdot 166} = .00452$$

$$\frac{166 \text{ cycles/sec}}{1.5} = \frac{1}{2 R_{16} C_5}$$

$$\text{use } C_5 = C_4 = .005$$

$C_5 = C_4$
if $R_{16} = R_{15} = 10^6$

then R_{15} and R_{16} will be $10^6 \times \frac{452}{500} = 903 \times 10^6$ ohms.

or since the oscillator will run fast due to the drop in the tube (triodes), the one meg value may be o.k.

now to set R_{11} - R_{13} can be 50,000 ohms.

$$f = \frac{186}{2} = 93.3 \text{ cycles.}$$

$$\textcircled{A} = \frac{1}{R_{15}C_4 + R_{16}C_5} = \text{same as before.}$$

$$\therefore \left(\frac{0 + R_{11}}{R_{13} + R_{11}} + \frac{1}{2} \right) A = \frac{1}{2}$$

$$\left(\frac{3}{2} \right) \left(1 \frac{1}{4} + \frac{1}{2} \right) A = 1$$

$$A = \frac{2}{3}$$

$$\frac{0 + R_{11}}{R_{13} + R_{11}} + \frac{1}{2} = \frac{1}{2} \frac{3}{2} - \frac{1}{2} = \frac{1}{4} - \frac{3}{6}$$

$$R_{11} = \frac{3}{4} - \frac{1}{2} = \frac{1}{4}$$

$$4 R_{11} = R_{13} + R_{11}$$

$$R_{11} = R_{13}/3 = 3/50,000 = 16,666.$$

Use 10,000 fixed.
+ 10,000 variable.

check -

with $R_5 = 0$

R_{II} varies from 10,000 to 20,000.

at $R_{II} = 10,000$

$$f = \frac{1}{2(1.005 \times 10^6 \times 10^6)} \left[\frac{10,000}{60,000} + \frac{1}{2} \right] \quad \frac{1}{6} + \frac{1}{2} = \frac{4}{6}$$

$$= 100 \times \frac{2}{3} = \frac{200}{3} = 66.6 \text{ cycles.}$$

4000 r.p.m.

at $R_{II} = 20,000$

$$f = 100 \left[\frac{2}{6} + \frac{1}{2} \right] = \frac{5}{6} \times 100 = 83.3 \text{ cycles.}$$

5000 r.p.m.

top speed.

$$f = 100 \left[1 + \frac{1}{2} \right] = 150 \text{ cycles or } 9000 \text{ r.p.m.}$$

Stevens
Brown
Joyles
Grier
Daleson
Vose
Baymiller



East Beach



Photo taken
at Kimball Hotel
Springfield Feb. 1, 1939.

Mr. Radford.

1 sec. f 2

1 sec. f 4.5

Bantow camera.
panatomic film.

Feb. 9, 1939. Second term started yesterday
I teach one section of 6.00 and
also course 6.632
6.00 junior electrical engineering
6.632 advanced eng. electronics.

Feb. 10, 1939.
David E. Egerton

Mr. Cook of the Soil Cons. Department was here today to discuss high-speed photography of drops landing on soil. He and Grier arranged a possible program.

Father O'Hara of Notre Dame was here this afternoon. He is looking for a dean of Engineering. Suggested D.C. Jackson Jr. who saw him at 5 at Hotel Statler.

Saw Stevens at noon about Westinghouse deal.

Feb. 11, 1939.

Jim Mili here from 9:30 to 3 discussing speed photography. Some lamps sparkle in base due to poor spot welded connections. A studio will be in operation by March 1 on 23rd street.

Worked on books with Jim Killian.

Set up flash unit to take photos for Eastman 24 lobit.

24 mf 3000 volts large argon lamps.
Reflector 20 inch aluminum. 3 ft from two jars.

1. From window large aperture
2. Strobo flasher " "
3. Blanks. do.
7, 8 Strobo Small "
Panatomic film 10 min D76 72°C.

Verichrome 1. 1/2 sec control large ap.
2. " " small " + pump in room
3. Strobo as above large aperture
4. " " " small "
5, 6, 7, 8. Large snaps in snow.

Stevens
Brown
Joylar
Grier
Deleson
Vose
Baymiller



East Beach



Photo taken
at Kimball Hotel
Springfield Feb. 1, 1939.

Mr.
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Worked on books with Jim Hillian.

Set up flash unit to take photos for Eastman exhibit.

24 m + 3000 volts large argon lamps. Reflector 20 inch diameter. 3 ft from the jaws.

1. From window large aperture
2. Studio flash " "
3. Blauz. 20. " "
7. 8. Studio Small " "
Kodak film 10-min D76 72°C.

Verichrome 1. 1/2 sec control large ap.
2. " " small " + pump in room
3. Studio as above large aperture
4. " " " small "
5, 6, 7, 8. Large snuffs in snow.

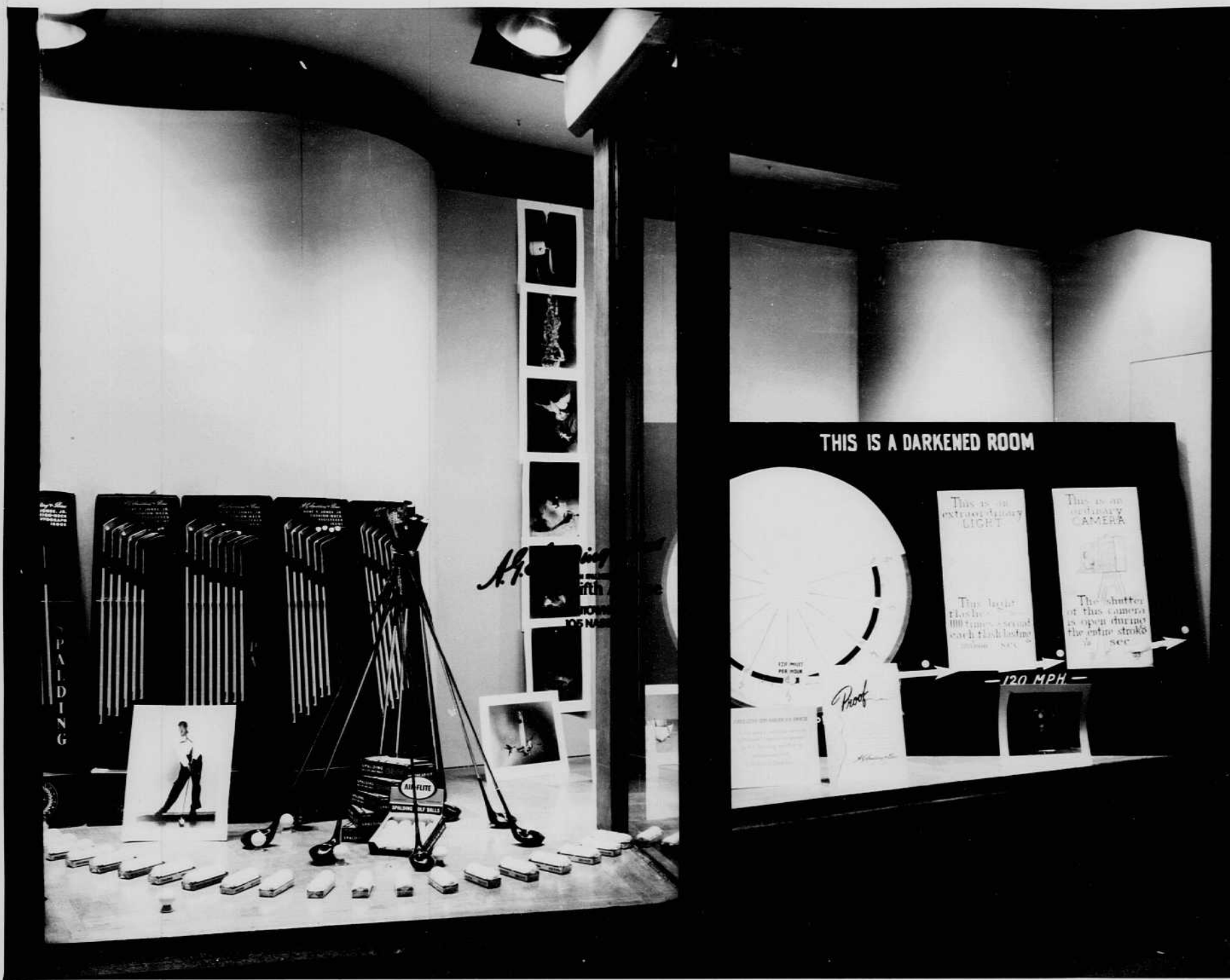


South window of A. G. Spalding & Bros. Fifth Avenue Store, designed and executed under the direction of Miss Eleanor Treacy and Mr. W. B. Okie, using the Spalding Research Department as the theme, placed January 5, 1939.

designed and executed under the direction of Miss Eleanor Treacy and Mr. W. B. Okie, using the Spalding Research Department as the theme, placed January 5, 1939.



North window of A. G. Spalding & Bros. Fifth Avenue Store, designed and executed under the direction of Miss Eleanor Treacy and Mr. W. B. Okie, using the Spalding Research De-



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North window of A. G. Spalding & Bros. Fifth Avenue Store, designed and executed under the direction of Miss Eleanor Treacy and Mr. W. B. Okie, using the Spalding Research Department as the theme, placed January 5, 1939.

Color Photo. - by Paucokke.

f 40 outside Kodachrome.

20 lamp V tube Al reflector 11"

18" from subject. 45° + reflector

Photos slightly dark.

Lighting needs ~~two~~ two lamps

Red glass with milk splash.

Feb. 16, 1939.

Mr. Grant and Mr. Dorfman of Westinghouse were at A.D.T. Inc last Tuesday and we showed them our apparatus and circuits.

Ordered a new reflector for enlarger today to be fitted with flash lamp.

LIFE TEST.

ARGON LAMP KR-XE SPIRAL (GR TYPE) 4mf.

ON TWO LIGHT POWER SUPPLY. 1000 VOLT TAPS.

TIME - FREQ. - CAPAC. - VOLTS. RES. REMARKS. TOTAL.

| TIME | FREQ. | CAPAC. | VOLTS. | RES. | REMARKS. | TOTAL. |
|---|-------|--------|--------|------|---|-------------|
| DECEMBER 4.00pm 27 off 11 ³⁰ 02 10.30 AM 7.00 29. ON 11 - OFF 5.20 | 30. | 4mf. | 1000? | 5000 | Tube 1 has had about 2 hours. 7.5 very slight coloration. 5.5 hrs. clear spiral. | 9.5 18.0 |
| | | | | | 8 | 26.0 |
| | | | | | 9 Tube still looks o.k. | 35 |
| 12 hrs. 5, 1938 off 4pm. Lamp had 184 hrs of service | 30 | 4mf. | 1000 | 5000 | Tube still operating - is now some what brown but has at least 50% light output (held over once) | |

tendency towards more sparc band added

March 6, 1939.
H. S. Edgerton.

Busy with 6.00 and 6.632 course this term.

Dadakis was in last Thursday about an oscillator to operate a clock motor for timing races. The idea was to get a going at regular intervals that would help racers to set their paces.

I suggested the use of a relaxation oscillator to do the job without the motor. Also a starter to ring the bell.

This was set set up in the comm. lab. on Saturday I went up to see why it did not work as it should. The reason - filaments of 30 tubes were not hot enough. Raising the filament voltage to normal made the operation satisfactory.

Dadakis is going to redesign the circuit to use "heater" type tube such as the 53 and make the outfit all ac.

Mar 7, 1939.

H. E. Egerton.

Note on life of capacity or capacitance type starters.

External band starters have proven to have a short life due to ^adirty condition on the glass after a length of time. This time is variable ~~depending~~ depending upon certain conditions.

The new type of internal starter using a seal as tried by Gurneys seems to have a very long life as they have been running several thousand hours now.

The small internal igniters apparently do not get dirty as does the glass on the outer ones.

The reason may be the amount of charge that suddenly flows down the side of the wall of the tube at the instant of start. In the band type tube there is a large amount of charge while in the other the amount is very small due to the small area.

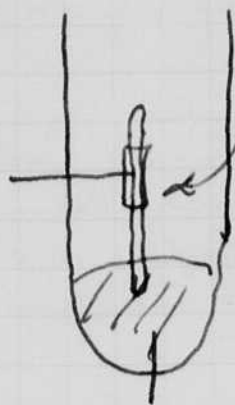


ring of metal.

capacitor to put on high voltage

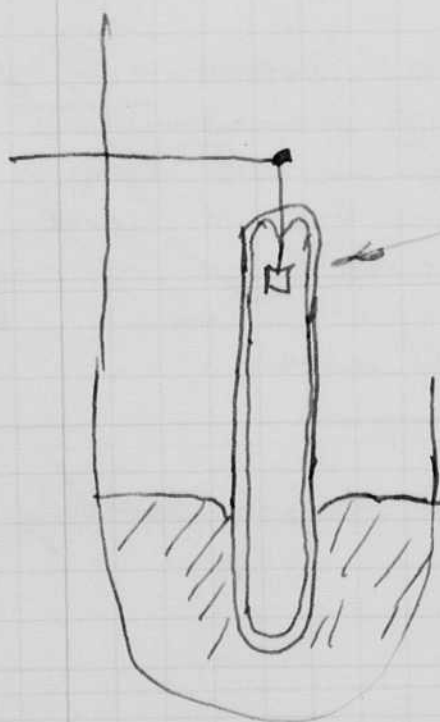
March 8, 1934.
H. H. H. H.

Last night I thought of the following arc-starter for a Hg tube. The scheme is to use a hollow glass tube filled with gas say argon at a pressure so that a discharge would occur with a sudden change.



Hollow glass tube filled with gas say argon at several cm of pressure.

Hg. a discharge would occur from the upper part to the mercury through the glass as a condenser when a certain voltage would be reached.

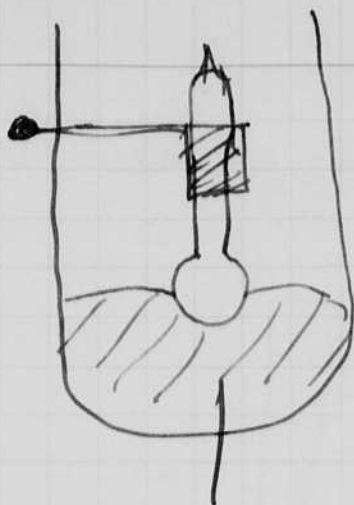


Internal electrode

Another piece of metal inside at the bottom could be used.

These should be put in at an angle to get more surface.

✓
✓
✓



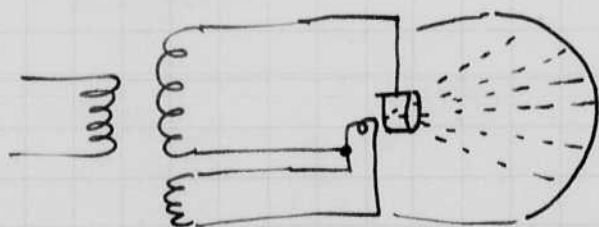
Glass bubble on the end
gas inside to give
conduction.

March 15, 1939.

Chadwick L. E. was here this afternoon and we discussed the work done last summer with insects - using high-speed photography.

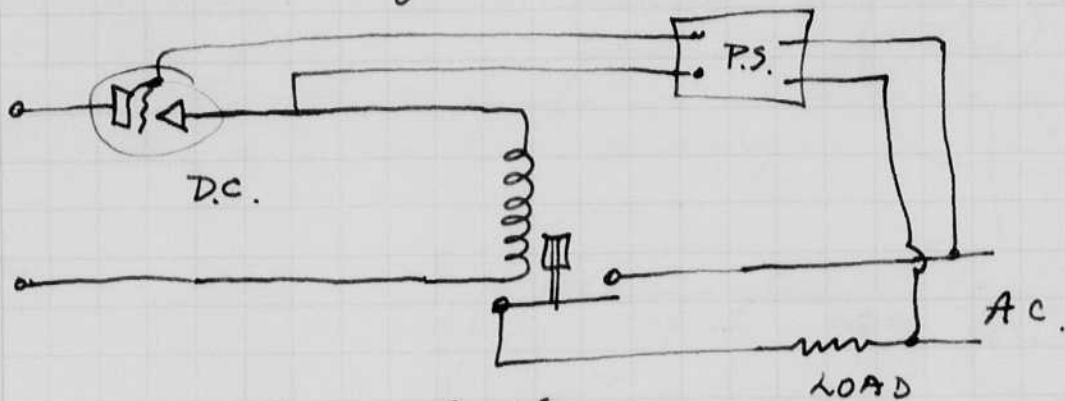
He is going to show the pictures at 11:15 on Monday March 20th p.m. in Room 4-231. I invited the astronomical people.

Several days ago I suggested to James the use of a cathode ray tube as an enlarger light source. Today he finished an experimental unit. Cathode-anode and ~~the~~ screen in bulb. This was run on ac. from a transformer.



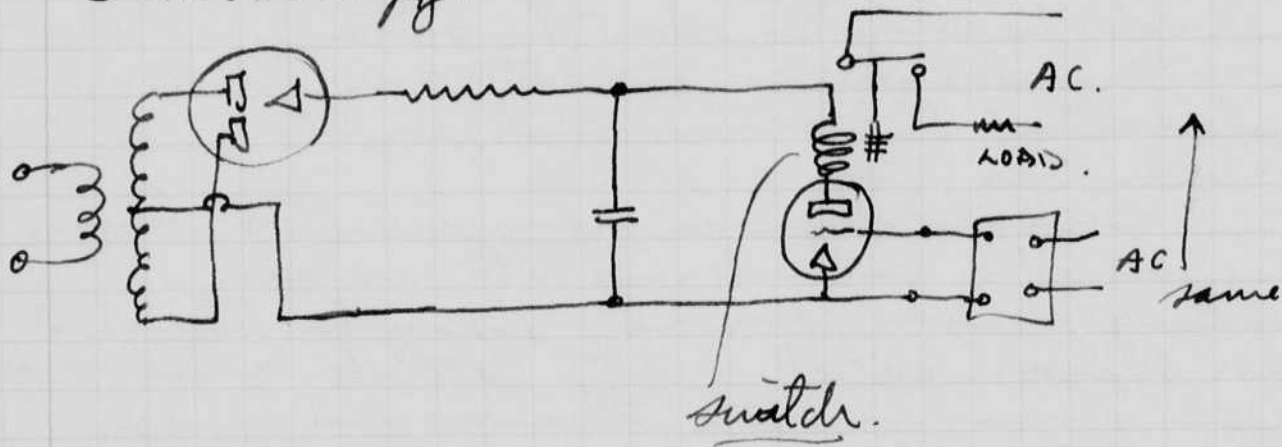
D. B. Edgerton
 Mar. 15, 1939
 cont.

Circuit to close contactor at desired point in cycle (when $V = 0$).

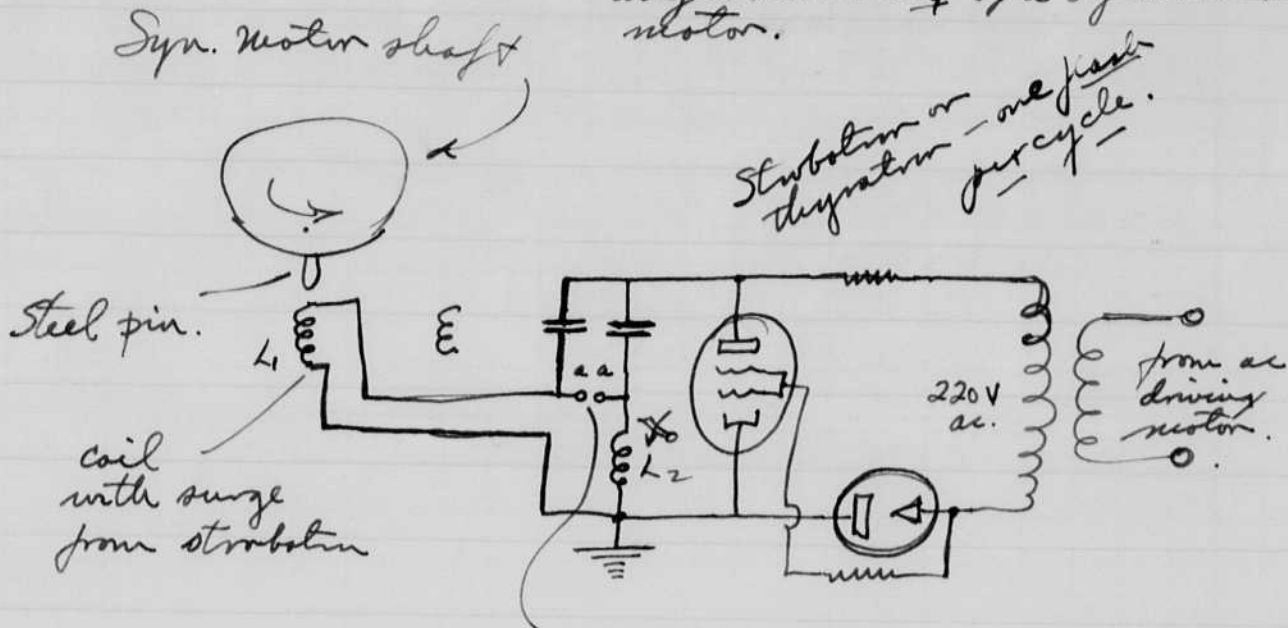


P.S. = phase shifter.

Store energy.



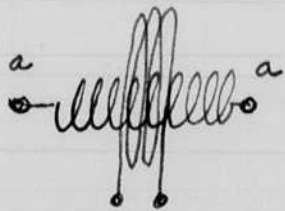
Transient Bridge for use with angle switching of a synchronous motor.



on rotating shaft of synchronous motor going at slip frequency.

voltage will appear here when steel is in position shown. this can trip thyatron to close switch.

Balance bridge with an adjustable core in L_2 so that no signal is received



to measuring device - for peak voltages. such as peak voltmeter (vac. tube) or cathode ray osc.

March 18, 1939.
Harold Edgerton

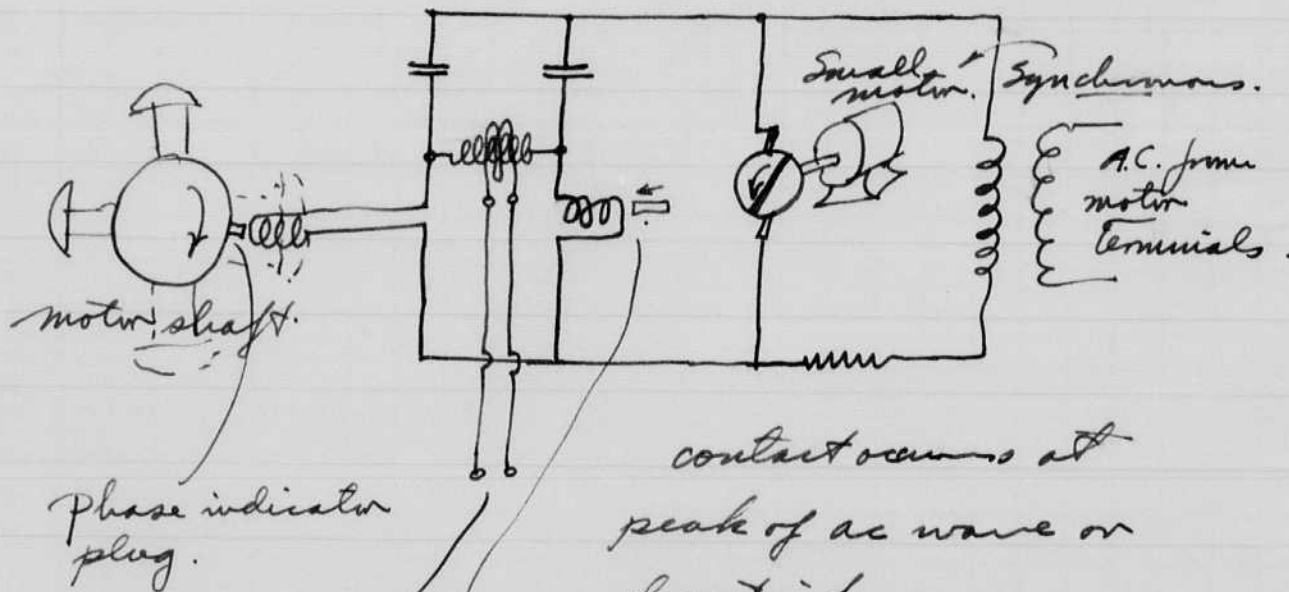
Read and understood
Mar. 21, 1939
Kenneth J. Gernsbauser

March 20 1939.
Harold E. Edgerton

The circuit ~~for~~ ^{on} the page before this (Transient Bridge) will also be useful for detecting metallic bodies underground or magnetic materials. It should be especially useful for portable outfits where the apparatus needs to be transported about.

The sudden and intense field should increase the sensitivity.

Transient Bridge angle switching method



adjustment of zero setting of bridge so that no output results.

output when indicator on shaft is at certain angle when the surge comes.

Read + understood
Mar 21, 1939
Kenneth J. Gurnea

Mar 2, 1939.

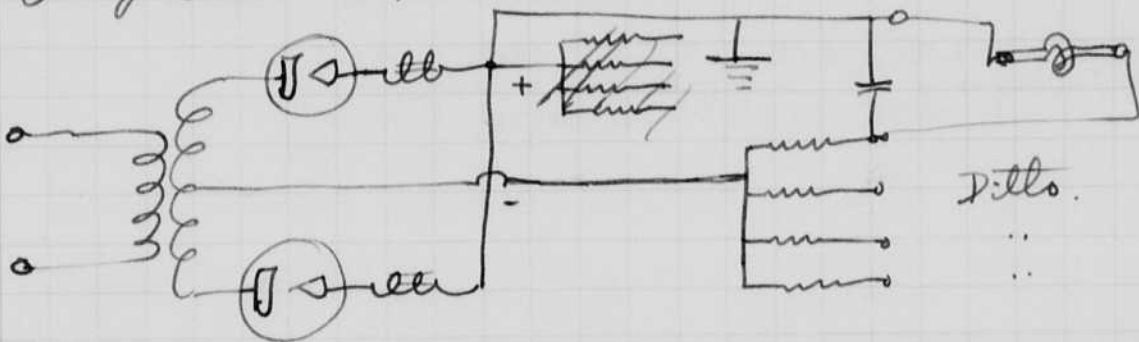
David Edgerton.

Mr. Buisson and Mr. ~~Wasserman~~ are going to try the circuit of page 133 in the laboratory using the tube-a stroboscope. They will test sensitivity and also methods of detection of the impulse from the unbalanced bridge.

Erner suggested that the circuit would be useful for operating signals (strob) where the autos would act as a metal or magnetic body.

March 29, 1939.

Power stroboscope for World's fair. 4 light unit. to be rebuilt from one designed for Prof. Eames.



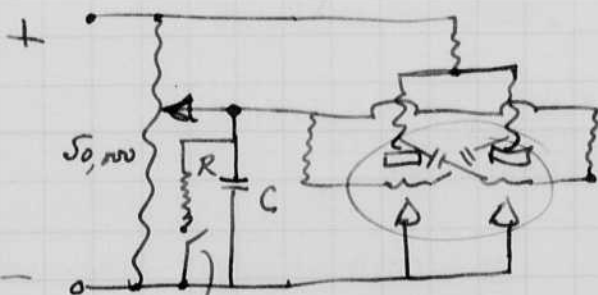
$$CE^2 = 4 \times 10^{-6} \times 10^6 = 4 \text{ joules}$$

$$20 \times 4 = 80 \text{ watts.}$$

each lamp.

frequency desired = 20 flashes/sec.

Automatic speed changer or oscillator.



50,000 ohms.

$$RC = 20 \text{ sec.}$$

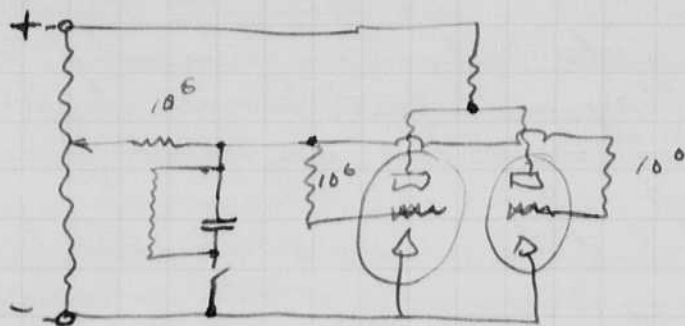
$$C = \frac{20}{R} = \frac{20}{25,000} = \frac{10}{10^4} = 10^{-3} \text{ farads.}$$

$$= 1000 \times 10^{-6} \text{ farads.}$$

5 sec interval
switch momentary
(2 sec)

10 sec strobo. speed varying slightly.

5 sec ordinary light (put on with ordinary light.)



$$\frac{20}{10^6} = C = 20 \text{ microfarads}$$

CHAIRMEN'S PROGRAM 1939 ELECTRONICS CONFERENCE
(Subject to change)

Thursday, 9:15 to 12:00 M. Dr. K. T. COMPTON, Chairman

Dr. J. P. Blewett, Res. Lab., General Electric Co.,
Schenectady.

Rate of evaporation of BaO.

Dr. S. T. Martin, Clark Univ. (Work done at M.I.T.)
Electron emission and absorptive properties of
a single crystal of tungsten.

Mr. M. H. Nichols, Coffin Fellow, M.I.T.
Quantitative measurements of the thermionic
constants for several crystallographic
directions of tungsten.

Dr. R. P. Johnson, Res. Lab., General Electric Co.
Phosphorescence decay after excitation by
ultraviolet light.

Dr. A. R. von Hippel, M.I.T., Dept. of Elec. Eng.
Temperature Dependence of the electrical break-
down in crystals. (with R. C. Buehl)

Thursday, 1:30 to 4:00 P.M. MR. B. J. THOMPSON, Chairman

Mr. W. C. Hahn, General Electric Co.
Velocity-modulated electron beams.

Dr. A. V. Haeff, RCA Mfg. Co., Radiotron Div.

Mr. John Woodyard, Stanford University

Dr. W. L. Barrow, M.I.T. Dept. of Elec. Eng.
Ultra-high frequency and instrument landing of
airplanes

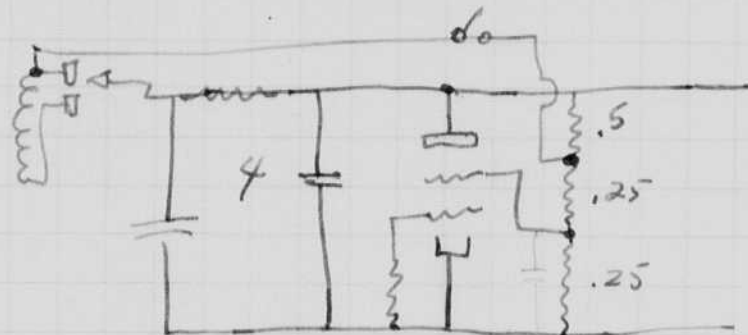
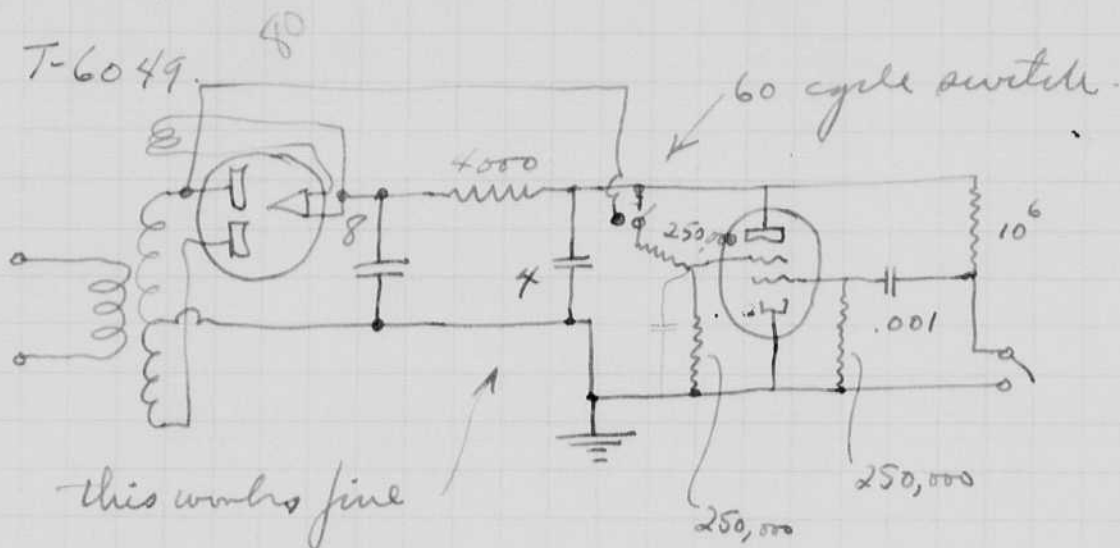
Thursday, 4:30 to 6:00 P.M. PROF. J. C. SLATER, Chairman

Drs. J. R. Pierce, G. K. Teal and W. Shockley, Bell Tel. Lab.
Secondary-emission multipliers.

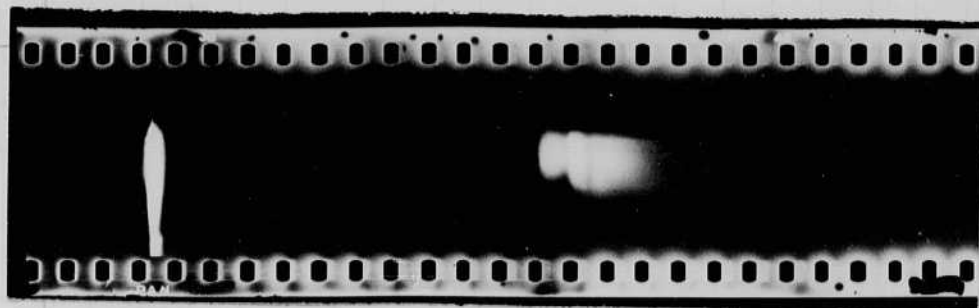
Thursday, After Dinner

Dr. H. E. Edgerton, M.I.T., Dept. of Elec. Eng.
High-speed photography.

April 17 1939.
 Harold Edgerton



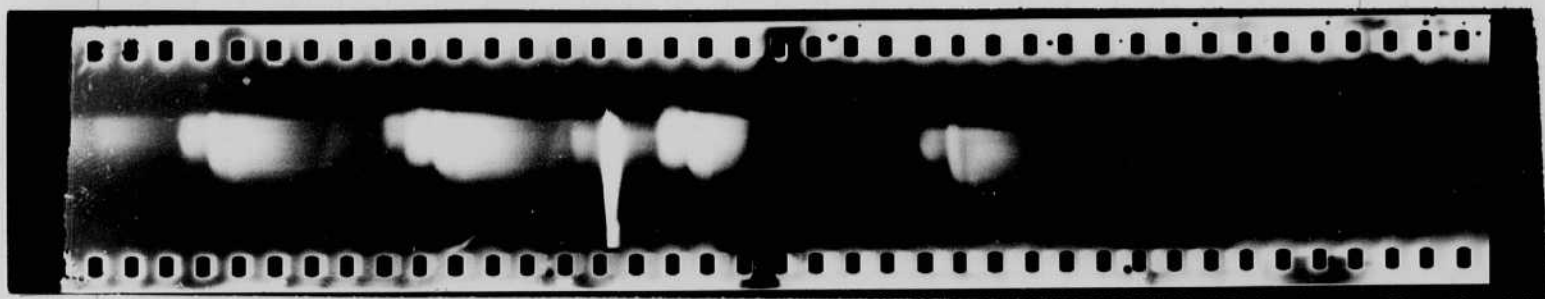
May 29 39. HSEdy & HS Brie. above put in metal frame to
 be sent to Central Sci Co Chicago. Works
 ok with good tubes 110-130 volts input.
 Transformer 1319 used instead of T6049.



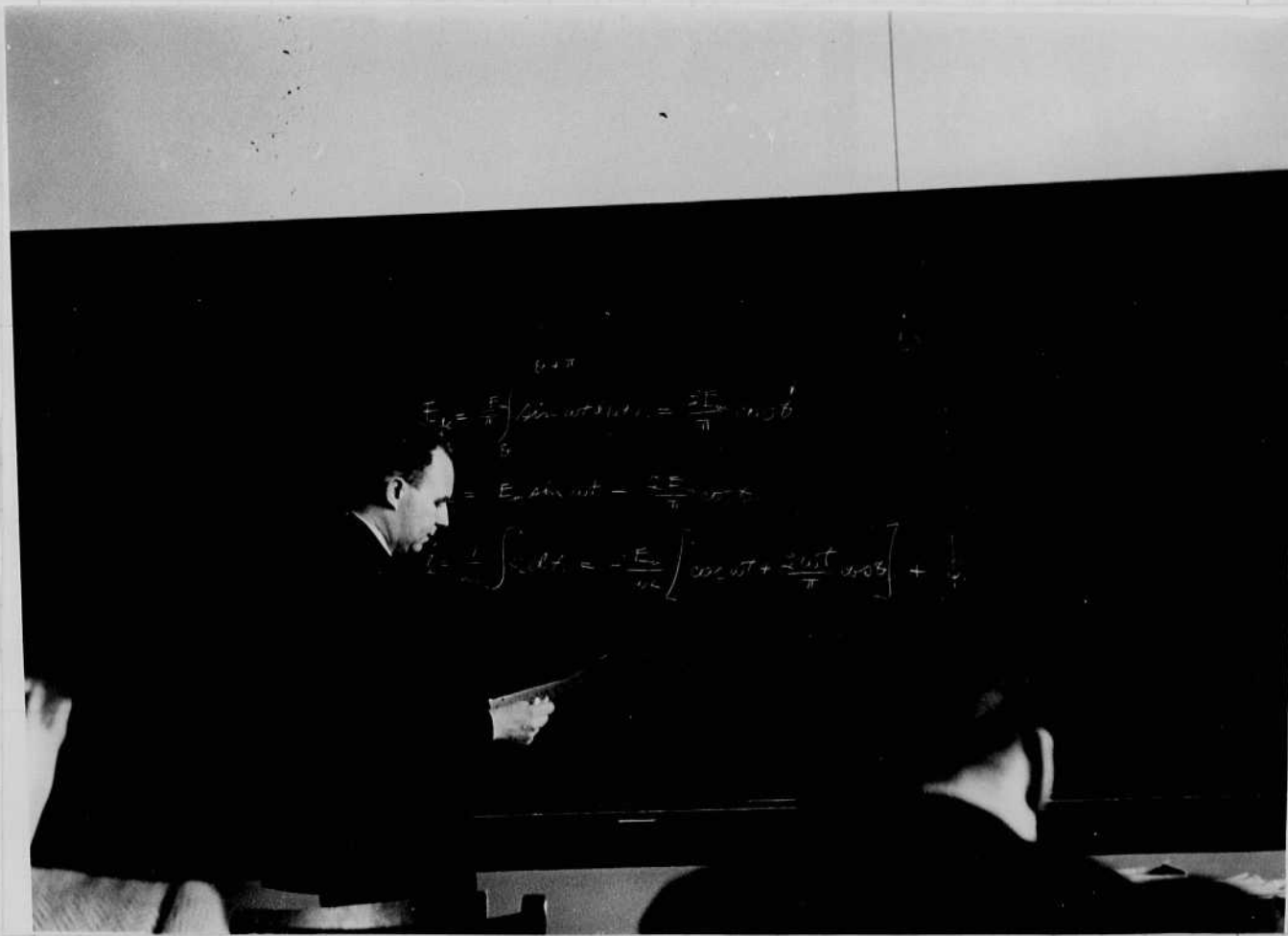
$1'' = 368 \times 10^{-4} \text{ sec.}$

*Note delay in
light !!*

*Stroboscope operated with contactor
in Strobolab.*

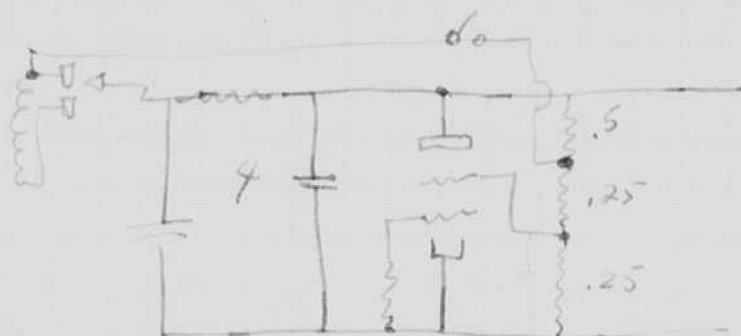
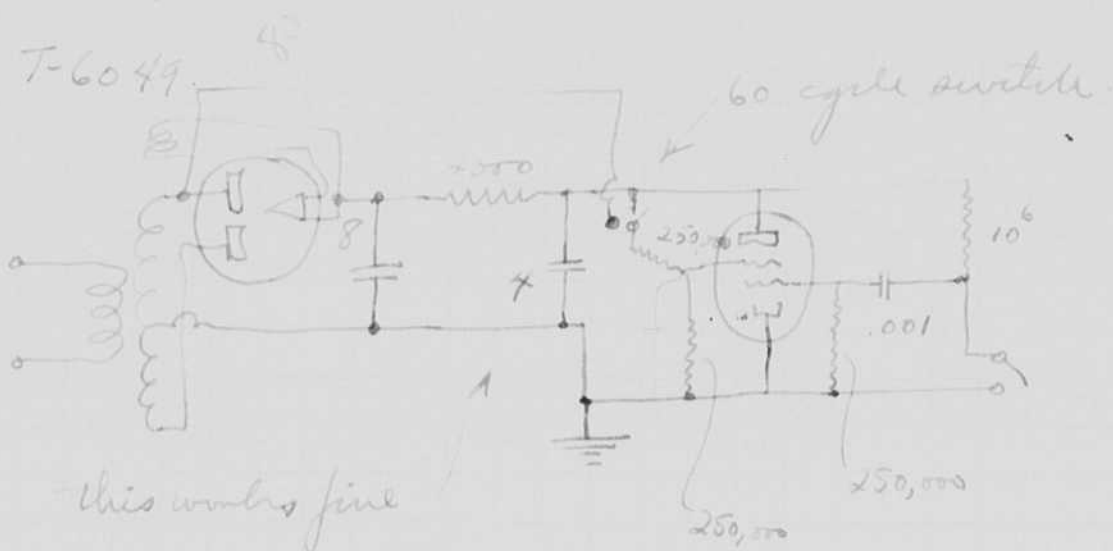


Hopgood.

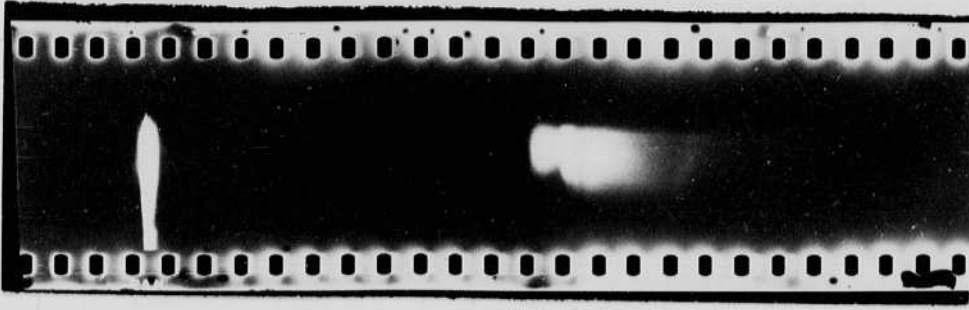


$$\begin{aligned}
 E_{\text{out}} &= \frac{E_{\text{in}}}{\pi} \int_0^{\pi} \sin \omega t \sin \omega t \, d\omega = \frac{E_{\text{in}}}{\pi} \int_0^{\pi} \sin^2 \omega t \, d\omega \\
 &= E_{\text{in}} \sin^2 \omega t = \frac{E_{\text{in}}}{\pi} \int_0^{\pi} \sin^2 \omega t \, d\omega \\
 E_{\text{out}} &= \frac{E_{\text{in}}}{\pi} \int_0^{\pi} \left[\frac{1 - \cos 2\omega t}{2} \right] d\omega = \frac{E_{\text{in}}}{2\pi} \left[\omega t - \frac{\sin 2\omega t}{2} \right]_0^{\pi} \\
 &= \frac{E_{\text{in}}}{2\pi} \left[\pi t - \frac{\sin 2\pi t}{2} \right] = \frac{E_{\text{in}}}{2} t
 \end{aligned}$$

April 17 1939.
 James E. Quinn



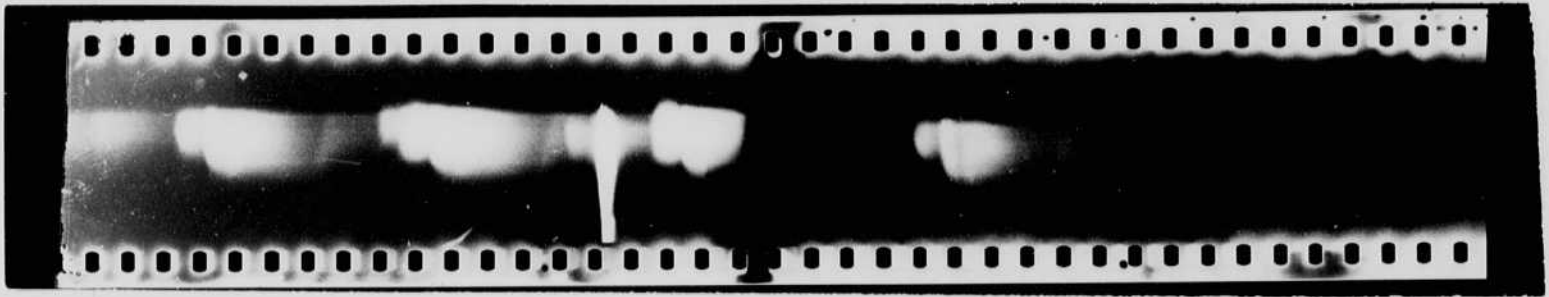
May 29 39. B. E. & H. E. above put in metal frame to be sent to Central Sci Co Chicago. Works ok with good tubes 110-130 volts input. Transformer 1319 used instead of T6049.



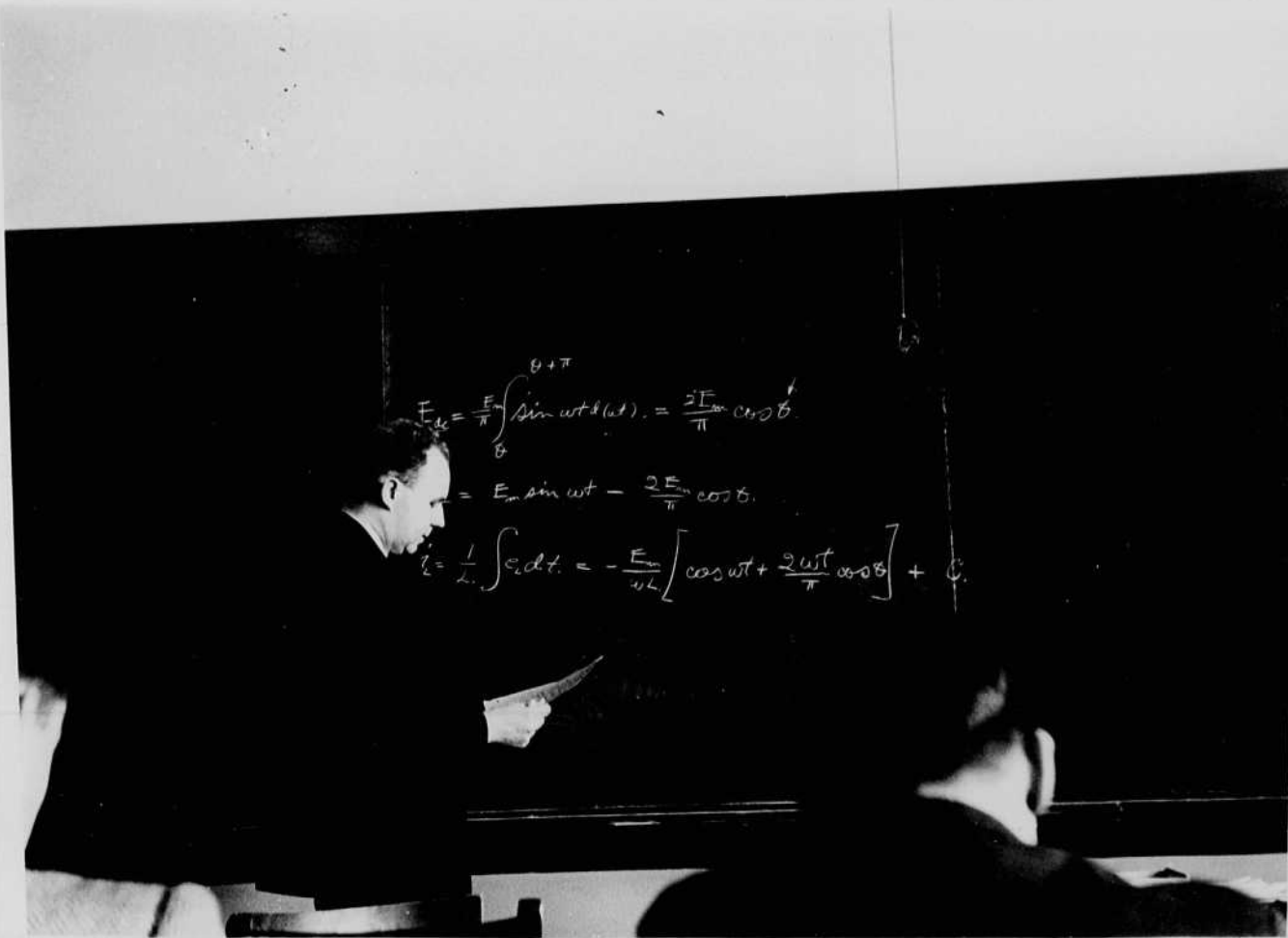
$$1'' = .368 \times 10^{-4} \text{ sec.}$$

Note delay in
light !!

Stroboscopy operated with contactor
in Strobolab.



Hopgood

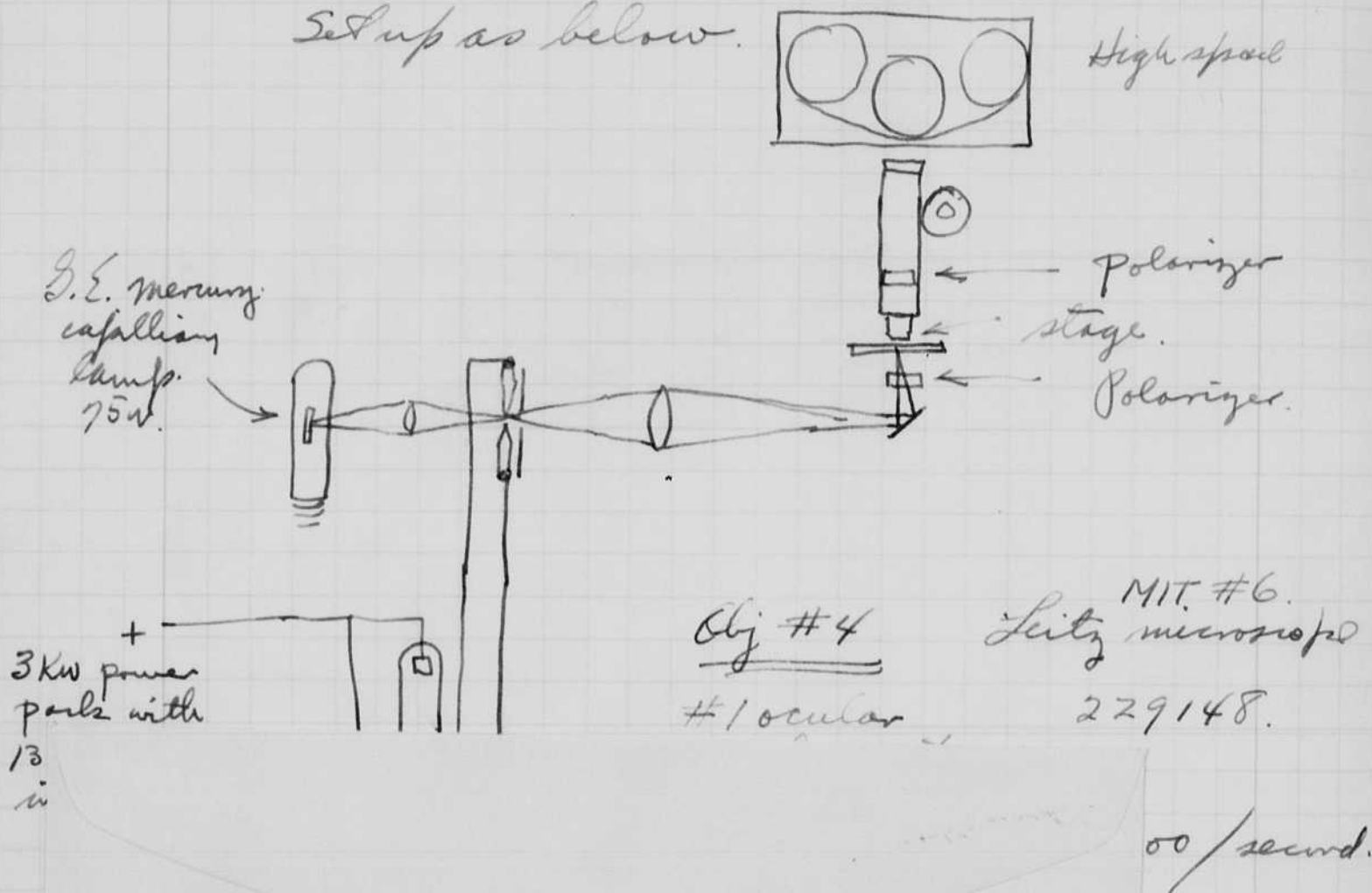


April 22 1939
 Harold Edgerton

Frog Muscle photography.

I worked 19 and 20th with Jerome Gross, biology student, taking polarized light photographs of frog muscle fibers. Some 500 ft of film was used. Eastman background x.

Set up as below.



Notebook # 9

Filming and Separation Record

___ unmounted photograph(s)

2? negative strip(s) *inside envelope mounted
on page 140*

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

was/were filmed where originally located ^{on} ~~between~~ page 140 and —.

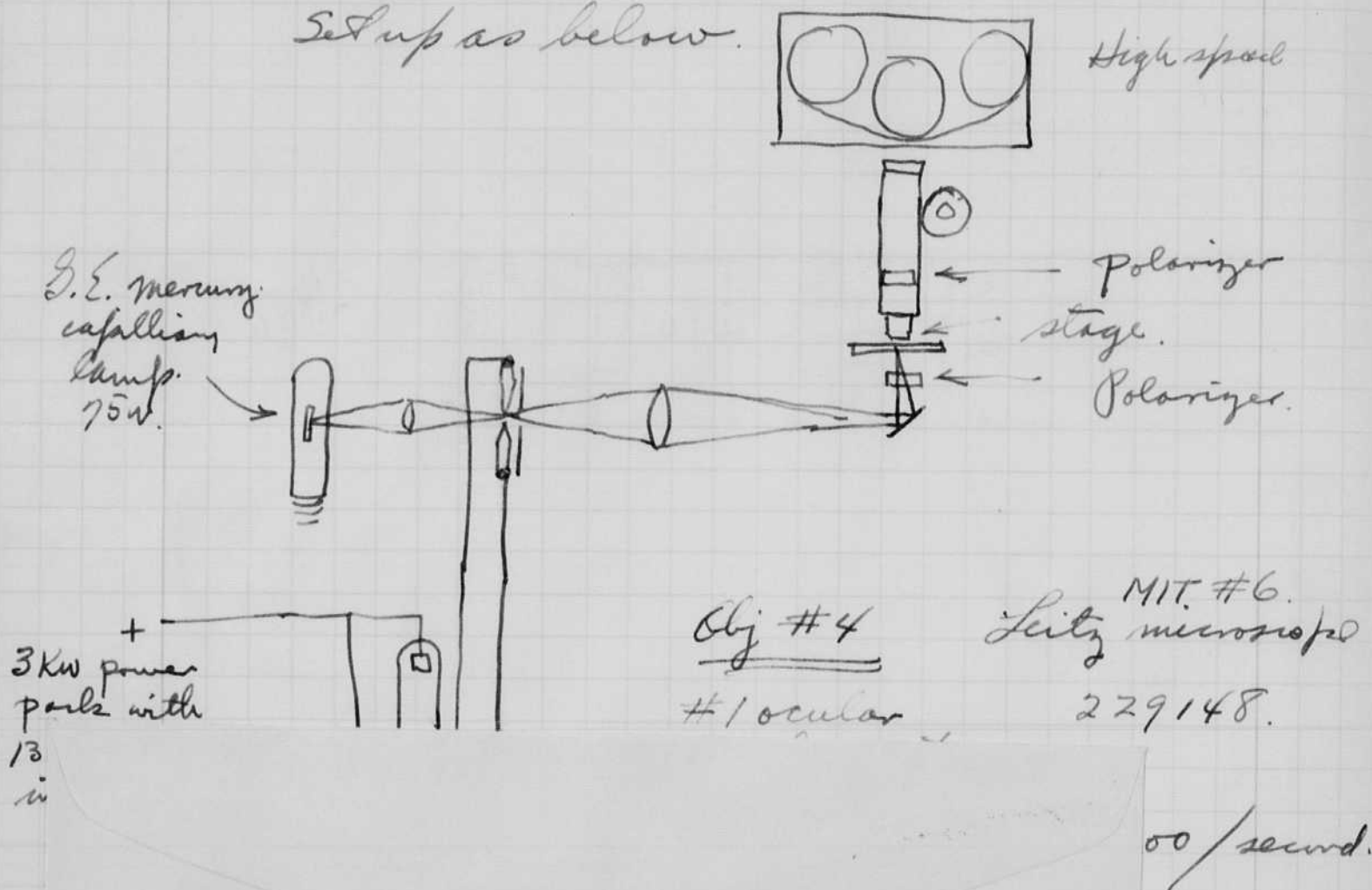
Item(s) now housed in accompanying folder.

April 22 1939
 Harold Edgerton

Frog Muscle photography.

I worked 19 and 20th with Jerome Gross, biology student, taking polarized light photographs of frog muscle fibers. Some 500 ft of film was used. Eastman background x.

Set up as below.



Notebook # 9

Filming and Separation Record

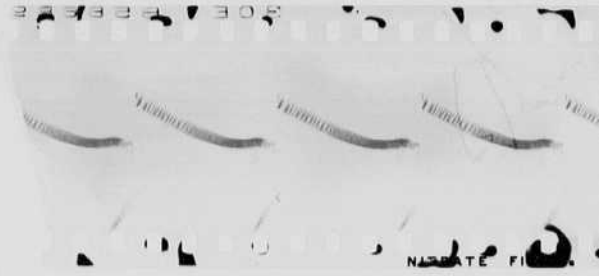
___ unmounted photograph(s)

2? negative strip(s) *inside envelope mounted
on page 140*

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

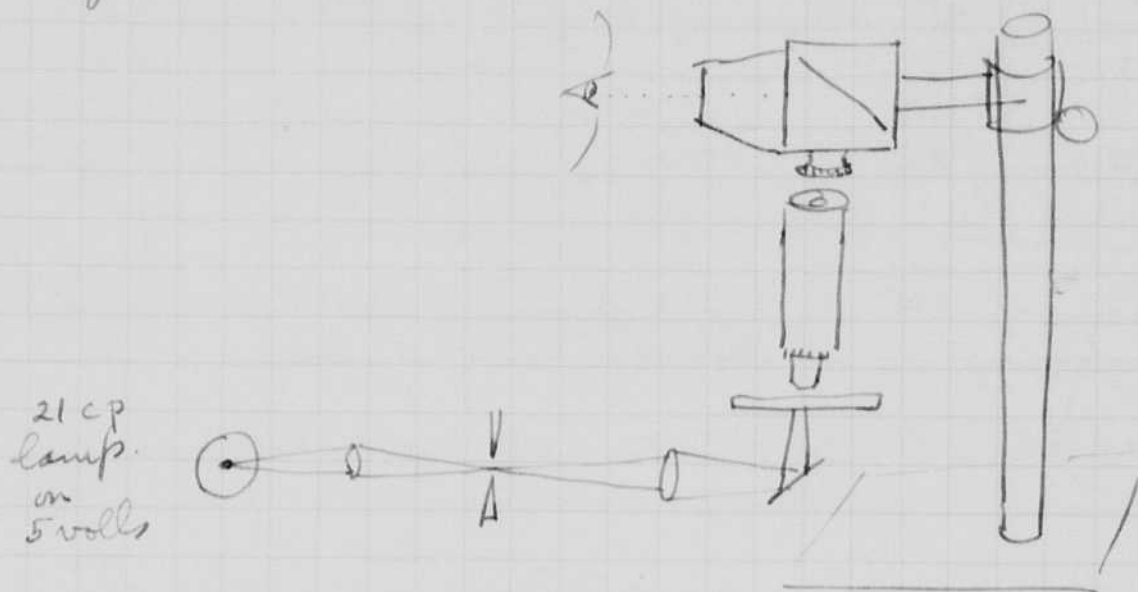
was/were filmed where originally located ^{on} ~~between~~ page 140 and —.

Item(s) now housed in accompanying folder.





Yesterday I set up a microscope and Pilot camera for photographing water bugs.



Sample film 120 size in Pilot Verichrome.

8x2

| No | EXP | AP | LAMP | OBS. | SP. | |
|----|-------|-----|--------|--------|--------|------------------|
| 1 | 1/20 | 4.5 | 21 CP. | 16 | | nothing on film. |
| 2 | 1/20 | " | 21 | 16 | | " |
| 3 | 1/150 | " | 21 | 16 | | ok. |
| 4 | 1/150 | ↓ | ↓ | ? { 40 | | |
| 5 | 1/20 | ↓ | ↓ | ? { 40 | | |
| 6 | 1/20 | | | 40 | 10 mf. | |
| 7 | 1/20 | | | 40 | ? | |
| 8 | 1/20 | | | | 10 mf. | |
| 9 | 1/150 | | | | 10 mf. | |
| 10 | | | | | | |
| 11 | | | | | | |
| 12 | | | | ↓ | | |
| 13 | | | | 16 | | |
| 14 | | | | 16 | | |
| 15 | | | | 16 | | |
| 16 | | | | 16 | | |

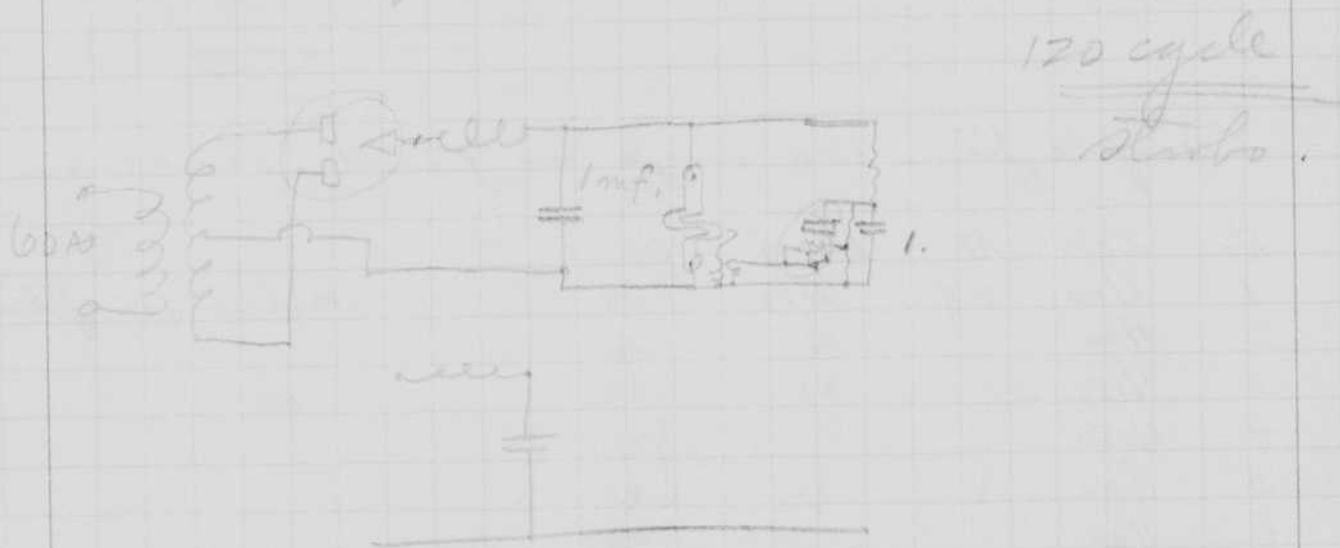
April 28 1939
 H. Day

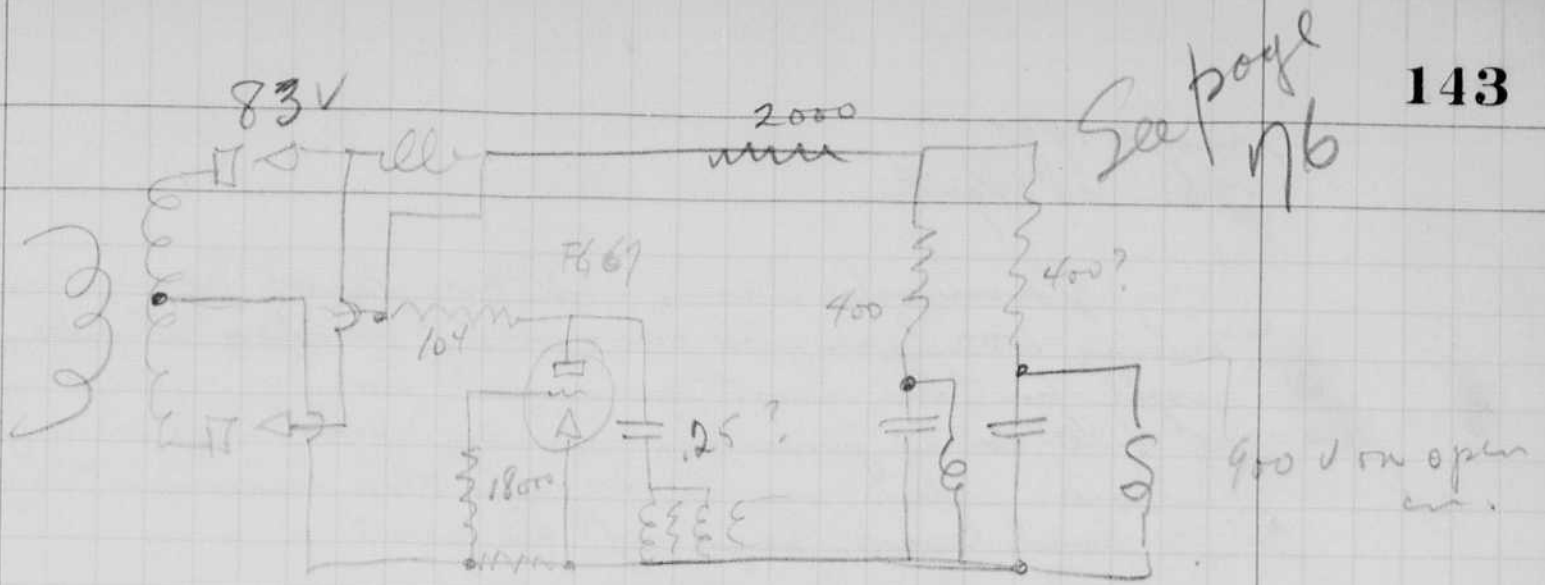
Apr 24 left at 7 for New York with
 flight stroboscope for MIT, exhibit in
 N.C.R. Bldg. 3.5 mf 5000 ohms in each lamp.

April 25 Installed unit in N.C.R. Bldg.
 at N.Y. fair grounds. Ralph Olsen

April 26 left for home at 10 am - Saw
 Pugsley and Book about 2 pm.

April 29 Herb Giese left for N.Y. with
 Eastman spark machines.

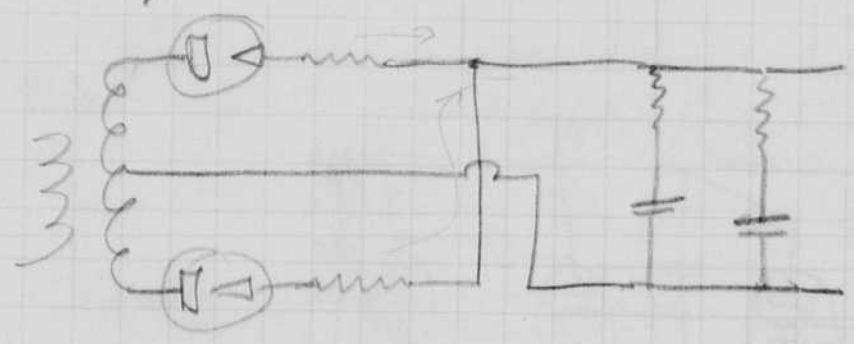




Spiral lamps.
1.5 cm x e Kr gas.

The above circuit draws 175 ma from the 83 V. Replacing the 2000 ohm with a 800 ohm increases current to 200 ma.

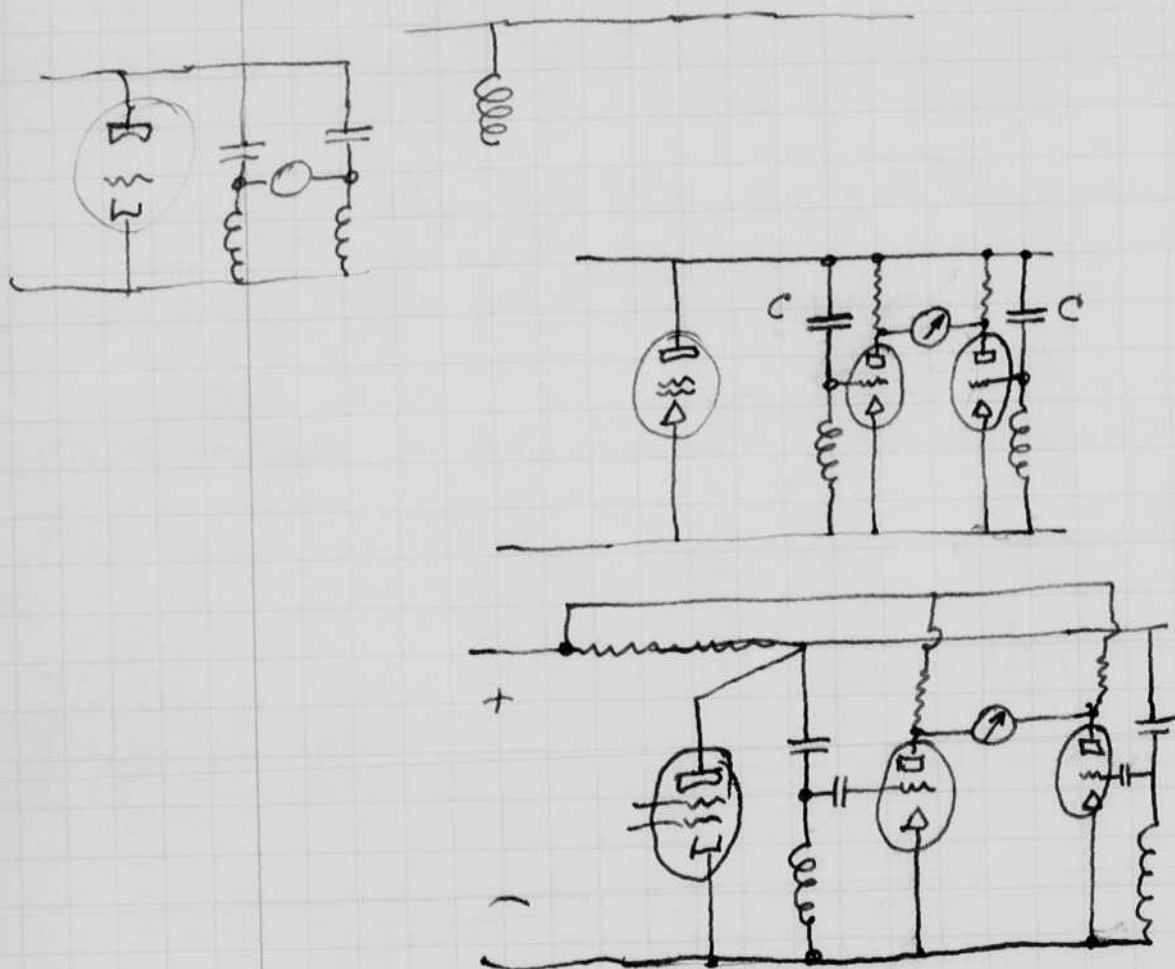
It would be advisable to use 2 rectifier tubes with resistance in each plate



May. 3. 1939.
 Jawsed Elgater.

Gemshausen and Mr. Jaws have been taking 1000 per cent moisture of drops striking soil for the last several days. The drops of H_2O come from the ceiling and hit samples below. This work is for Mr. Beninet of the Soil Cons. Dept of the Govt.

Baron Jaws Ben was here on Friday last week.
 Transient Bridge circuit with amp.



May 7, 1939
 Experiments

Setup multiple flash unit in 5-210.
 Single light argon with diffuser in 7" reflector. This light was put behind the plates and focused on the hands. Object - to show the edge only - one side - to prevent confusion due to multiple images.

1 mf 1200 volts from 35 KV power supply
 300 and 600 frames per sec.

May 9 1939 Inventory

19 Irons. 19 total

16 Drivers here + 2 in lab. 18 total.

Spent most of day setting up multiple flash apparatus 100 sec and 600/sec.

Drier and Geo. Temple Jr. left for NY last night. They expressed the multiple flash unit to Spalding Store on Fifth Ave. Temple is to operate it there.

Unit here for 100/sec.

Two lights-argon filled 8" 14 cm pressure.
 Hg control tubes.

Spark 1 mf 350± volts from
 strobotron for each lamp.

100/sec from oscillator strobotron type.

1/2 mf on each lamp 350 ohms charging
 35 KV power pack.

600/sec unit 3 mf 200 ohms Hg control tube + argon
 cap lamp quartz section.

Cont.

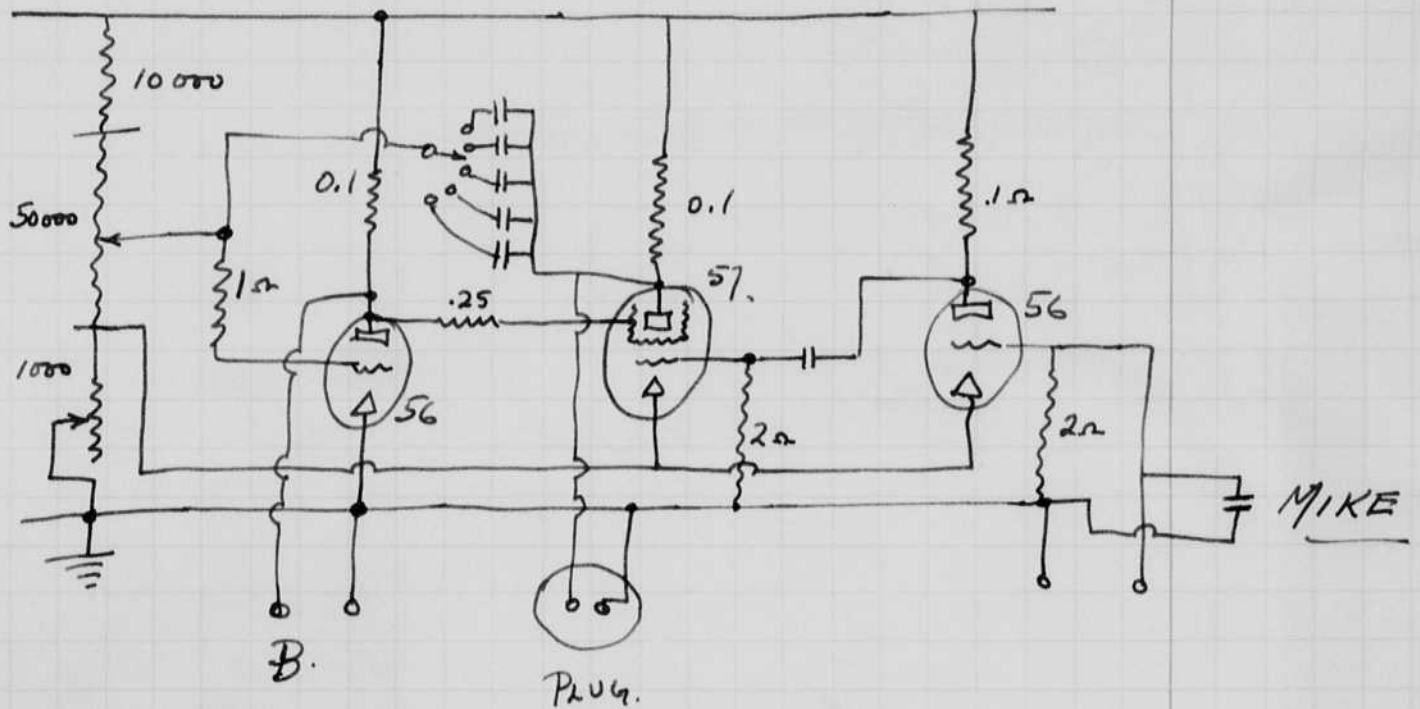
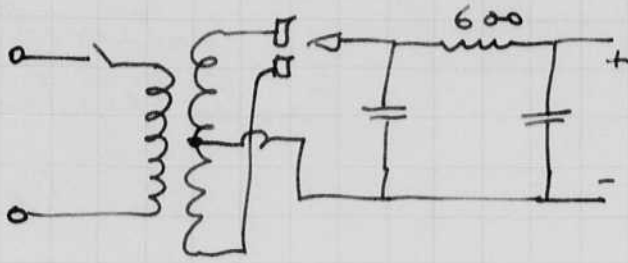
Experimented this evening with Gemestone
100 and 600/sec.

Tried Burnt cork on bands } 600/sec.
also side lighting.

Test of Eastman Output with Regulator.

| | | | | | |
|--------------|---|----------------|-------|--------------------|---------------------------------------|
| 200,000 | } | 1.775 | 110 | AC supply. | |
| 25,000 | | | | | |
| 100,000 | | 1.87 | 115 | | |
| | | 1.975 | 120 | | |
| | | 1.8 | 110 | | |
| 1 unit 14/mt | | 1.57 | 100 | Reg. | |
| | | 1.57 | 110 | | |
| | | 1.57 | 120 | | |
| | | 1.58 | 128 | | |
| | | 1.62 | 110 | 2 units | |
| | | 1.65 | 120 | | |
| | | 1.65 | 125 | | |
| | | 1.7 | 126 | changed to on Reg. | |
| | | 1.65 | 110 | | |
| | | 1.65 (113 Reg) | 125 | | |
| 2040 v. | | 1.67 | 113.5 | 125. | changed to 2 units 42 mt + 28. mt. |

Time delay circuit — as of May 22 1939.
 Traced by K.J. Gemesbauer.



Mueller-Teller

cont.

Experimented this evening with Gemeston
100 and 600/sec.

Tried Burnt cork on bands } 600/sec.
also side lighting.

Test of Eosman Output
with Regulator.

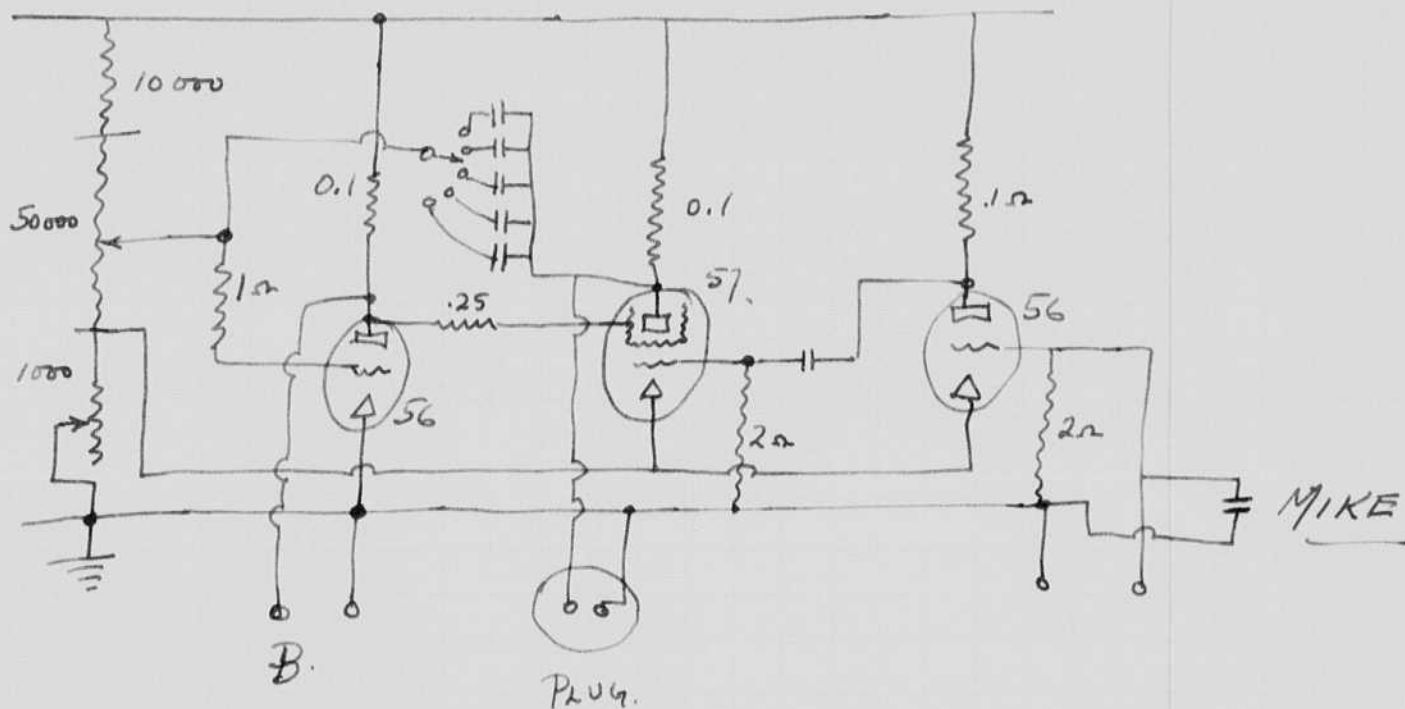
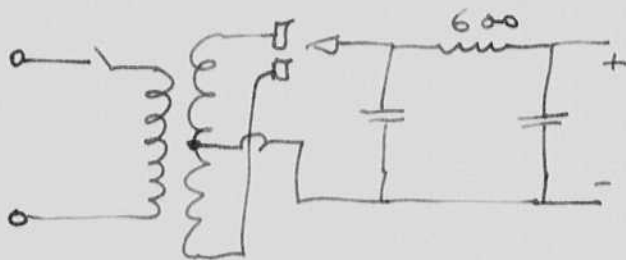
| | | | |
|-------|------|-----|-----|
| 1.35 | 110 | 100 | 100 |
| 1.37 | 115 | 100 | 100 |
| 1.395 | 120 | 100 | 100 |
| 1.41 | 125 | 100 | 100 |
| 1.43 | 130 | 100 | 100 |
| 1.45 | 135 | 100 | 100 |
| 1.47 | 140 | 100 | 100 |
| 1.49 | 145 | 100 | 100 |
| 1.51 | 150 | 100 | 100 |
| 1.53 | 155 | 100 | 100 |
| 1.55 | 160 | 100 | 100 |
| 1.57 | 165 | 100 | 100 |
| 1.59 | 170 | 100 | 100 |
| 1.61 | 175 | 100 | 100 |
| 1.63 | 180 | 100 | 100 |
| 1.65 | 185 | 100 | 100 |
| 1.67 | 190 | 100 | 100 |
| 1.69 | 195 | 100 | 100 |
| 1.71 | 200 | 100 | 100 |
| 1.73 | 205 | 100 | 100 |
| 1.75 | 210 | 100 | 100 |
| 1.77 | 215 | 100 | 100 |
| 1.79 | 220 | 100 | 100 |
| 1.81 | 225 | 100 | 100 |
| 1.83 | 230 | 100 | 100 |
| 1.85 | 235 | 100 | 100 |
| 1.87 | 240 | 100 | 100 |
| 1.89 | 245 | 100 | 100 |
| 1.91 | 250 | 100 | 100 |
| 1.93 | 255 | 100 | 100 |
| 1.95 | 260 | 100 | 100 |
| 1.97 | 265 | 100 | 100 |
| 1.99 | 270 | 100 | 100 |
| 2.01 | 275 | 100 | 100 |
| 2.03 | 280 | 100 | 100 |
| 2.05 | 285 | 100 | 100 |
| 2.07 | 290 | 100 | 100 |
| 2.09 | 295 | 100 | 100 |
| 2.11 | 300 | 100 | 100 |
| 2.13 | 305 | 100 | 100 |
| 2.15 | 310 | 100 | 100 |
| 2.17 | 315 | 100 | 100 |
| 2.19 | 320 | 100 | 100 |
| 2.21 | 325 | 100 | 100 |
| 2.23 | 330 | 100 | 100 |
| 2.25 | 335 | 100 | 100 |
| 2.27 | 340 | 100 | 100 |
| 2.29 | 345 | 100 | 100 |
| 2.31 | 350 | 100 | 100 |
| 2.33 | 355 | 100 | 100 |
| 2.35 | 360 | 100 | 100 |
| 2.37 | 365 | 100 | 100 |
| 2.39 | 370 | 100 | 100 |
| 2.41 | 375 | 100 | 100 |
| 2.43 | 380 | 100 | 100 |
| 2.45 | 385 | 100 | 100 |
| 2.47 | 390 | 100 | 100 |
| 2.49 | 395 | 100 | 100 |
| 2.51 | 400 | 100 | 100 |
| 2.53 | 405 | 100 | 100 |
| 2.55 | 410 | 100 | 100 |
| 2.57 | 415 | 100 | 100 |
| 2.59 | 420 | 100 | 100 |
| 2.61 | 425 | 100 | 100 |
| 2.63 | 430 | 100 | 100 |
| 2.65 | 435 | 100 | 100 |
| 2.67 | 440 | 100 | 100 |
| 2.69 | 445 | 100 | 100 |
| 2.71 | 450 | 100 | 100 |
| 2.73 | 455 | 100 | 100 |
| 2.75 | 460 | 100 | 100 |
| 2.77 | 465 | 100 | 100 |
| 2.79 | 470 | 100 | 100 |
| 2.81 | 475 | 100 | 100 |
| 2.83 | 480 | 100 | 100 |
| 2.85 | 485 | 100 | 100 |
| 2.87 | 490 | 100 | 100 |
| 2.89 | 495 | 100 | 100 |
| 2.91 | 500 | 100 | 100 |
| 2.93 | 505 | 100 | 100 |
| 2.95 | 510 | 100 | 100 |
| 2.97 | 515 | 100 | 100 |
| 2.99 | 520 | 100 | 100 |
| 3.01 | 525 | 100 | 100 |
| 3.03 | 530 | 100 | 100 |
| 3.05 | 535 | 100 | 100 |
| 3.07 | 540 | 100 | 100 |
| 3.09 | 545 | 100 | 100 |
| 3.11 | 550 | 100 | 100 |
| 3.13 | 555 | 100 | 100 |
| 3.15 | 560 | 100 | 100 |
| 3.17 | 565 | 100 | 100 |
| 3.19 | 570 | 100 | 100 |
| 3.21 | 575 | 100 | 100 |
| 3.23 | 580 | 100 | 100 |
| 3.25 | 585 | 100 | 100 |
| 3.27 | 590 | 100 | 100 |
| 3.29 | 595 | 100 | 100 |
| 3.31 | 600 | 100 | 100 |
| 3.33 | 605 | 100 | 100 |
| 3.35 | 610 | 100 | 100 |
| 3.37 | 615 | 100 | 100 |
| 3.39 | 620 | 100 | 100 |
| 3.41 | 625 | 100 | 100 |
| 3.43 | 630 | 100 | 100 |
| 3.45 | 635 | 100 | 100 |
| 3.47 | 640 | 100 | 100 |
| 3.49 | 645 | 100 | 100 |
| 3.51 | 650 | 100 | 100 |
| 3.53 | 655 | 100 | 100 |
| 3.55 | 660 | 100 | 100 |
| 3.57 | 665 | 100 | 100 |
| 3.59 | 670 | 100 | 100 |
| 3.61 | 675 | 100 | 100 |
| 3.63 | 680 | 100 | 100 |
| 3.65 | 685 | 100 | 100 |
| 3.67 | 690 | 100 | 100 |
| 3.69 | 695 | 100 | 100 |
| 3.71 | 700 | 100 | 100 |
| 3.73 | 705 | 100 | 100 |
| 3.75 | 710 | 100 | 100 |
| 3.77 | 715 | 100 | 100 |
| 3.79 | 720 | 100 | 100 |
| 3.81 | 725 | 100 | 100 |
| 3.83 | 730 | 100 | 100 |
| 3.85 | 735 | 100 | 100 |
| 3.87 | 740 | 100 | 100 |
| 3.89 | 745 | 100 | 100 |
| 3.91 | 750 | 100 | 100 |
| 3.93 | 755 | 100 | 100 |
| 3.95 | 760 | 100 | 100 |
| 3.97 | 765 | 100 | 100 |
| 3.99 | 770 | 100 | 100 |
| 4.01 | 775 | 100 | 100 |
| 4.03 | 780 | 100 | 100 |
| 4.05 | 785 | 100 | 100 |
| 4.07 | 790 | 100 | 100 |
| 4.09 | 795 | 100 | 100 |
| 4.11 | 800 | 100 | 100 |
| 4.13 | 805 | 100 | 100 |
| 4.15 | 810 | 100 | 100 |
| 4.17 | 815 | 100 | 100 |
| 4.19 | 820 | 100 | 100 |
| 4.21 | 825 | 100 | 100 |
| 4.23 | 830 | 100 | 100 |
| 4.25 | 835 | 100 | 100 |
| 4.27 | 840 | 100 | 100 |
| 4.29 | 845 | 100 | 100 |
| 4.31 | 850 | 100 | 100 |
| 4.33 | 855 | 100 | 100 |
| 4.35 | 860 | 100 | 100 |
| 4.37 | 865 | 100 | 100 |
| 4.39 | 870 | 100 | 100 |
| 4.41 | 875 | 100 | 100 |
| 4.43 | 880 | 100 | 100 |
| 4.45 | 885 | 100 | 100 |
| 4.47 | 890 | 100 | 100 |
| 4.49 | 895 | 100 | 100 |
| 4.51 | 900 | 100 | 100 |
| 4.53 | 905 | 100 | 100 |
| 4.55 | 910 | 100 | 100 |
| 4.57 | 915 | 100 | 100 |
| 4.59 | 920 | 100 | 100 |
| 4.61 | 925 | 100 | 100 |
| 4.63 | 930 | 100 | 100 |
| 4.65 | 935 | 100 | 100 |
| 4.67 | 940 | 100 | 100 |
| 4.69 | 945 | 100 | 100 |
| 4.71 | 950 | 100 | 100 |
| 4.73 | 955 | 100 | 100 |
| 4.75 | 960 | 100 | 100 |
| 4.77 | 965 | 100 | 100 |
| 4.79 | 970 | 100 | 100 |
| 4.81 | 975 | 100 | 100 |
| 4.83 | 980 | 100 | 100 |
| 4.85 | 985 | 100 | 100 |
| 4.87 | 990 | 100 | 100 |
| 4.89 | 995 | 100 | 100 |
| 4.91 | 1000 | 100 | 100 |

2040 v.

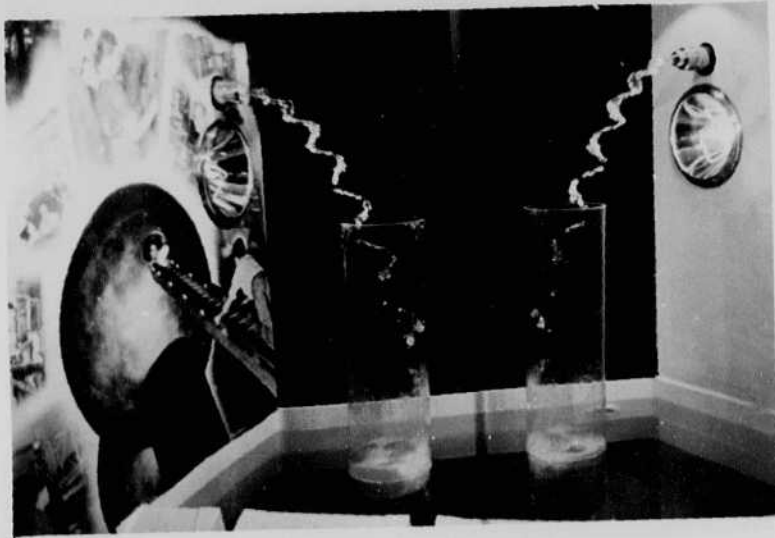
Change of Reg. 2 units
42 units + 28 units

Time delay circuit

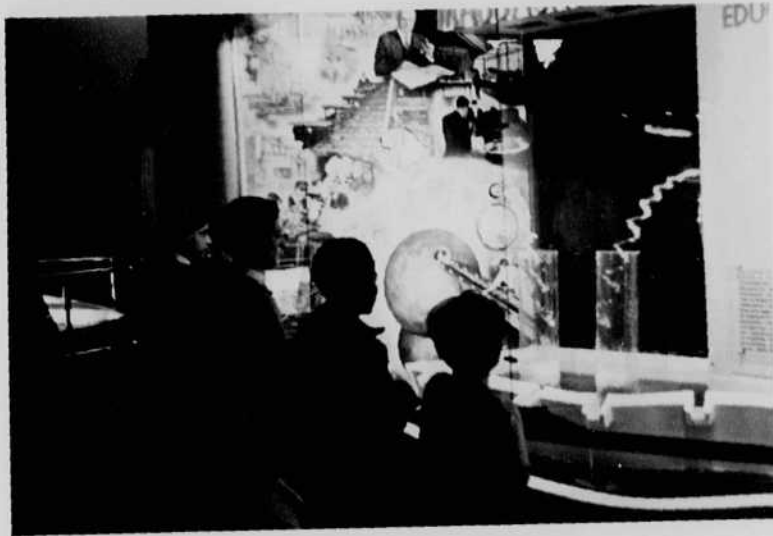
as of May 22 1939.
 Traced by K.J. Semmesbaum.



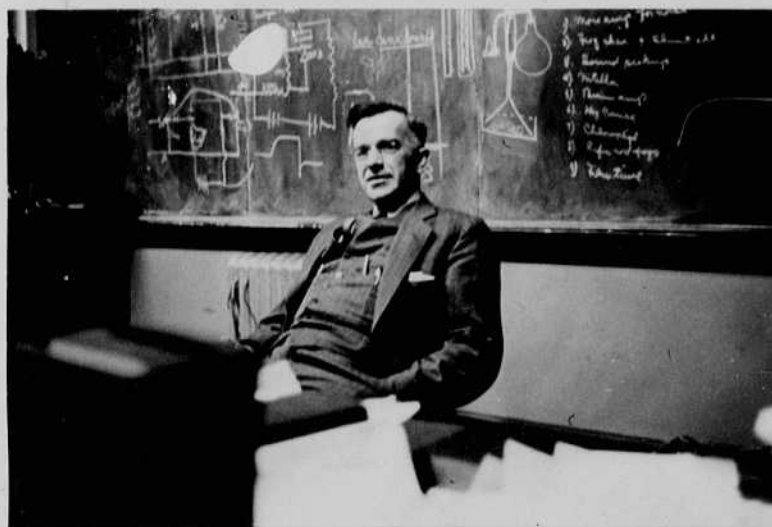
Mueller-Teller



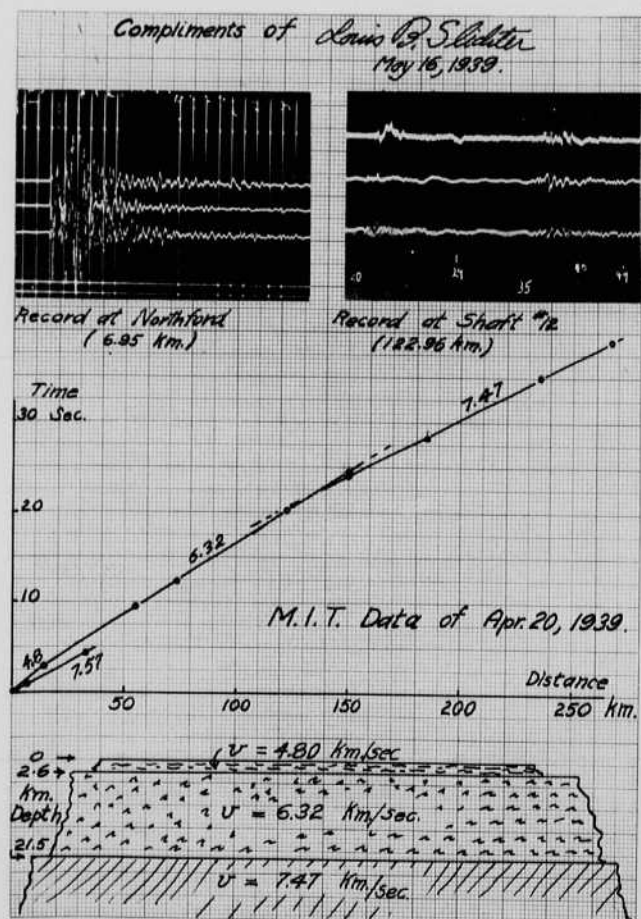
M.I.T. Exhibit
in National
Cash Register Bldg.
N.Y. World's Fair



Mr. Pugsley,
Winchester
Repeating
Arms Co.



J.M. Brunker

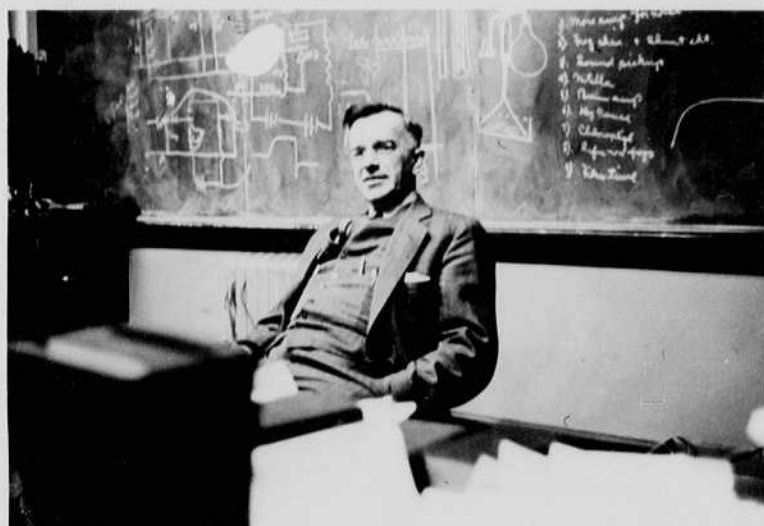




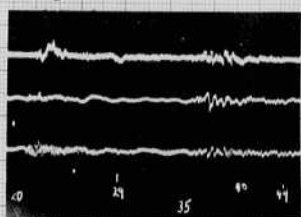
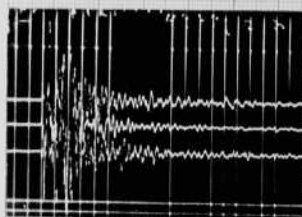
M.I.T. Exhibit
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Mr. Pugsley,
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Arms Co.

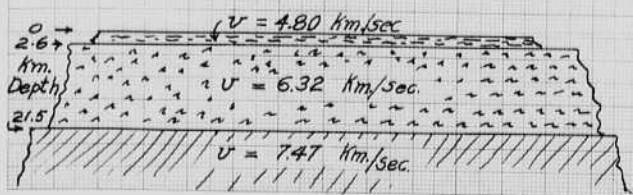
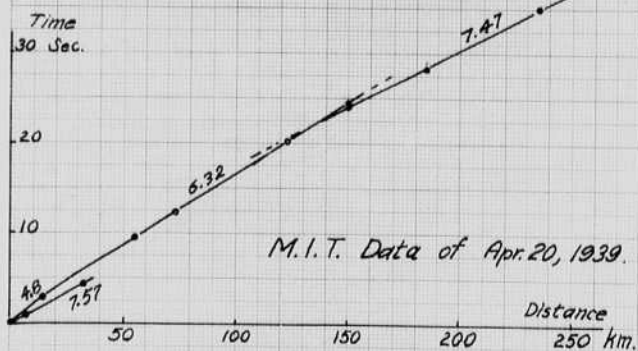


Compliments of Louis P. Slideter
May 16, 1939.



Record at Northford
(6.95 km.)

Record at Shaft #12
(122.96 km.)



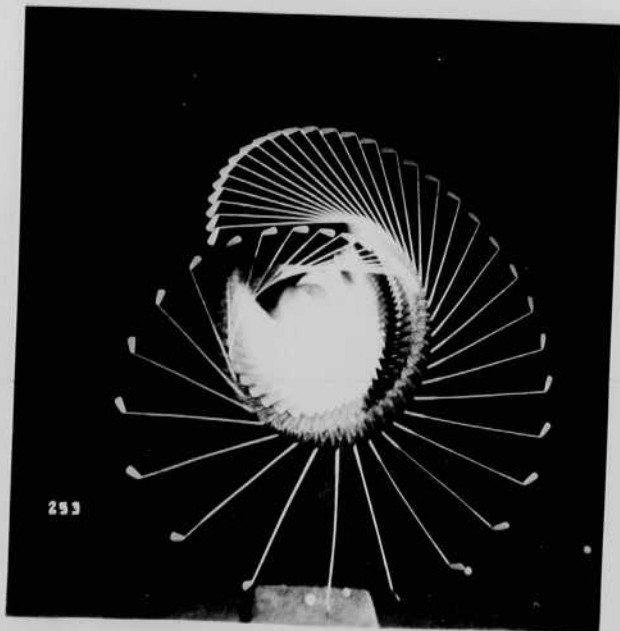
J.M. Bunker



Gy'or
Mili
Pete and Steve.
n. y.



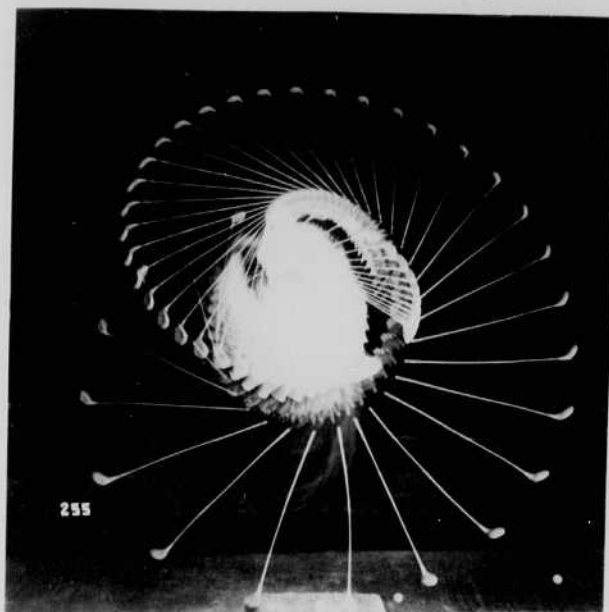
James
Laws
Soil
Cons.
Dept.



Jimmy Thomson
May 10 1939
100/sec.

Jimmie
Thomson
100/sec

Taken May 10 '39.



May 15th 1939

Mr. Undersee of G.E. Co (textile dept) was here today and took a new tube for the flash lamp. He is going to use it today at Taunton in a textile plant to study the warp of a ~~loose~~ the threads.

EDMERTON

| | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | |
|-------|----------------|----------------|----------------|----------------|--------------|----------|-------------------|
| 9-10 | | | | | 600 4-132 | | Subj. No. Room |
| 10-11 | 600 4-132 | | 600 4-132 | | ↓ | | Subj. No. Room |
| 11-12 | 6.632 4-230 | 6.632 4-230 | 6.632 4-230 | 6.632 2-230 | | | Subj. No. Room |
| 12-1 | | | | | | | Subj. No. Room |
| 1-2 | 601 | | | | | | Subj. No. Room |
| 2-3 | | | | | | | Subj. No. Room |
| 3-4 | 601 | | | | | | Subj. No. Room |
| 4-5 | | | | | | | Subj. No. Room |

4-37 85M AB STUDENT KEEPS THIS CARD

May 27. 1939.

Arrangement with Eastman Kodak complete today.

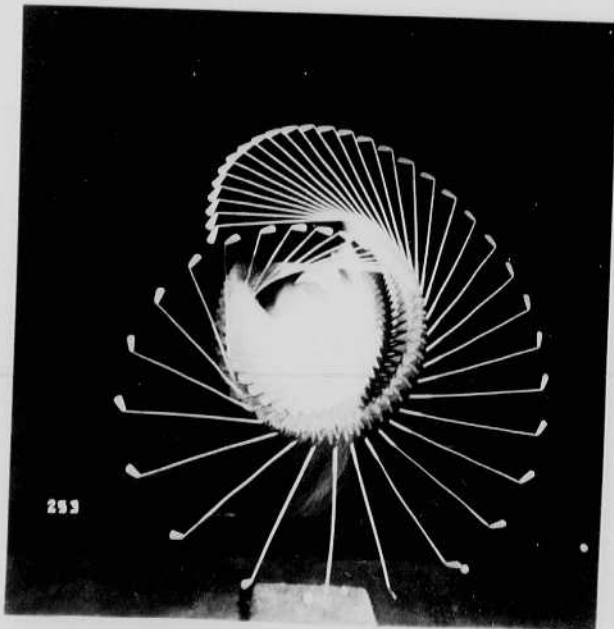
Grier spent yesterday in New York with lamps for Eastman in Worlds Fair exhibit. A pane of glass is broken for visitors two lights flash.



Gujor
Miri
Pete and Steve.
n. y.



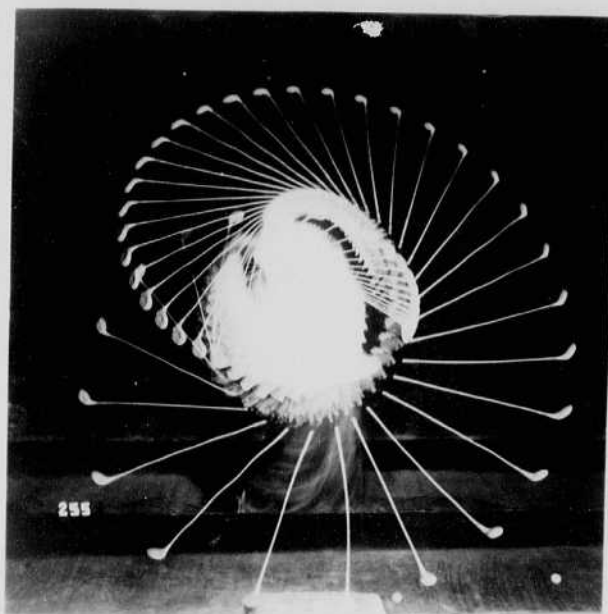
James
Laws
Soil
Cons.
dept.



Jimmy Thomson
May 10 1939
100/sec.

Jenny
Thomson
100/sec

Taken May 10 '39.



May 15 1939

Mr. Undersee of G.E. Co (textile dept) was here today and took a new tube for the flash lamp. It is going to use it today at ~~Townston~~ in a textile plant to study the wools of a ~~lance~~ the threads.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
SCHEDULE CARD—FOR STUDENT'S USE

| | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | |
|-------|---------------|----------------|---------------|----------------|---------------|----------|-------------------|
| 9-10 | | | | | 6.00 4-132 | | Subj. No. Room |
| 10-11 | 6.00 4-132 | | 6.00 4-132 | | V | | Subj. No. Room |
| 11-12 | | 6.632 4-230 | | 6.632 2-235 | | | Subj. No. Room |
| 12-1 | | | | | | | Subj. No. Room |
| 1-2 | 6.00 C | | | | | | Subj. No. Room |
| 2-3 | | | | | | | Subj. No. Room |
| 3-4 | Handy good | | | | | | Subj. No. Room |
| 4-5 | | | | | | | Subj. No. Room |

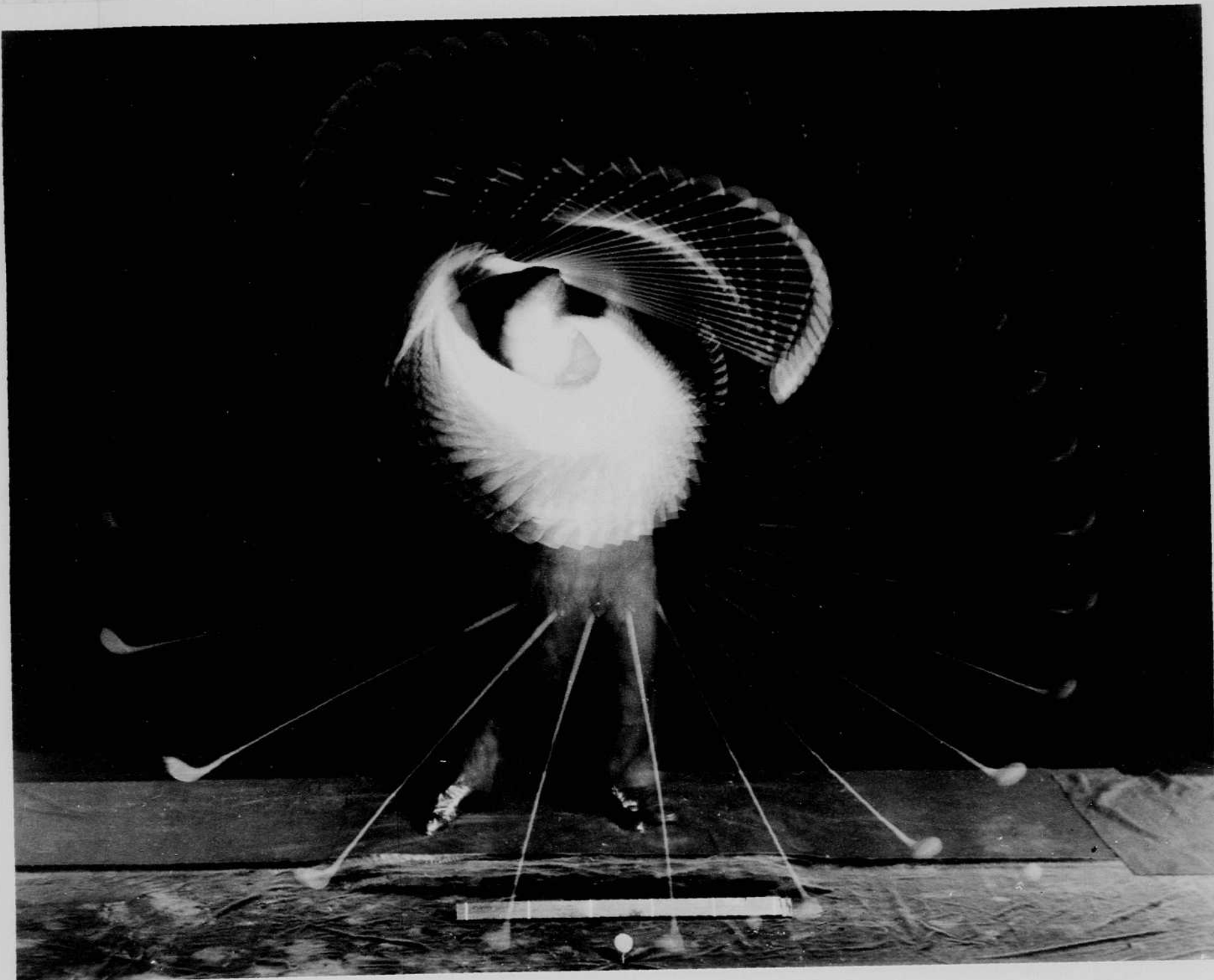
4-37 55M AS

STUDENT KEEPS THIS CARD

May 27. 1939.

Arrangement with Eastman Kodak complete today.

Grier spent yesterday in New York with lamps for Eastman in World's Fair exhibit. A pane of glass is broken for visitors two lights flash.



3. A multiple-flash photograph of Bobby Jones with a driver. The interval of time between pictures is $1/100$ second. The exposure of each picture is $1/100,000$ second. Measured from this photograph:
The ball velocity is 225 feet per second
The club velocity before impact is 166 feet per second

287-8-9. Timbie 100/sec.

Lacrosse Thomas F. Creamer
530 Beacon St Boston

May 31, 1939.
multiflash
photos.

280, 1, 2 100/sec.

283, 4, 5, 6 50/sec.

McCarty Indian Clubs.

50/sec.

25/sec.

Thorman, E. F. Western Cartridge Co.

Worked with us June 1, 2, 3, 4 taking 3000/sec movies
and single flash photographs of shot guns.

Grier was in New York June ~~12~~⁵ at Eastman Co World's Fair Exhibit.

Grier & I went to New York June 8 for opening of Spalding Co.
multiflash unit at 5th Avenue store.

I spent June 9 (Friday) at Eastman exhibit W. F.

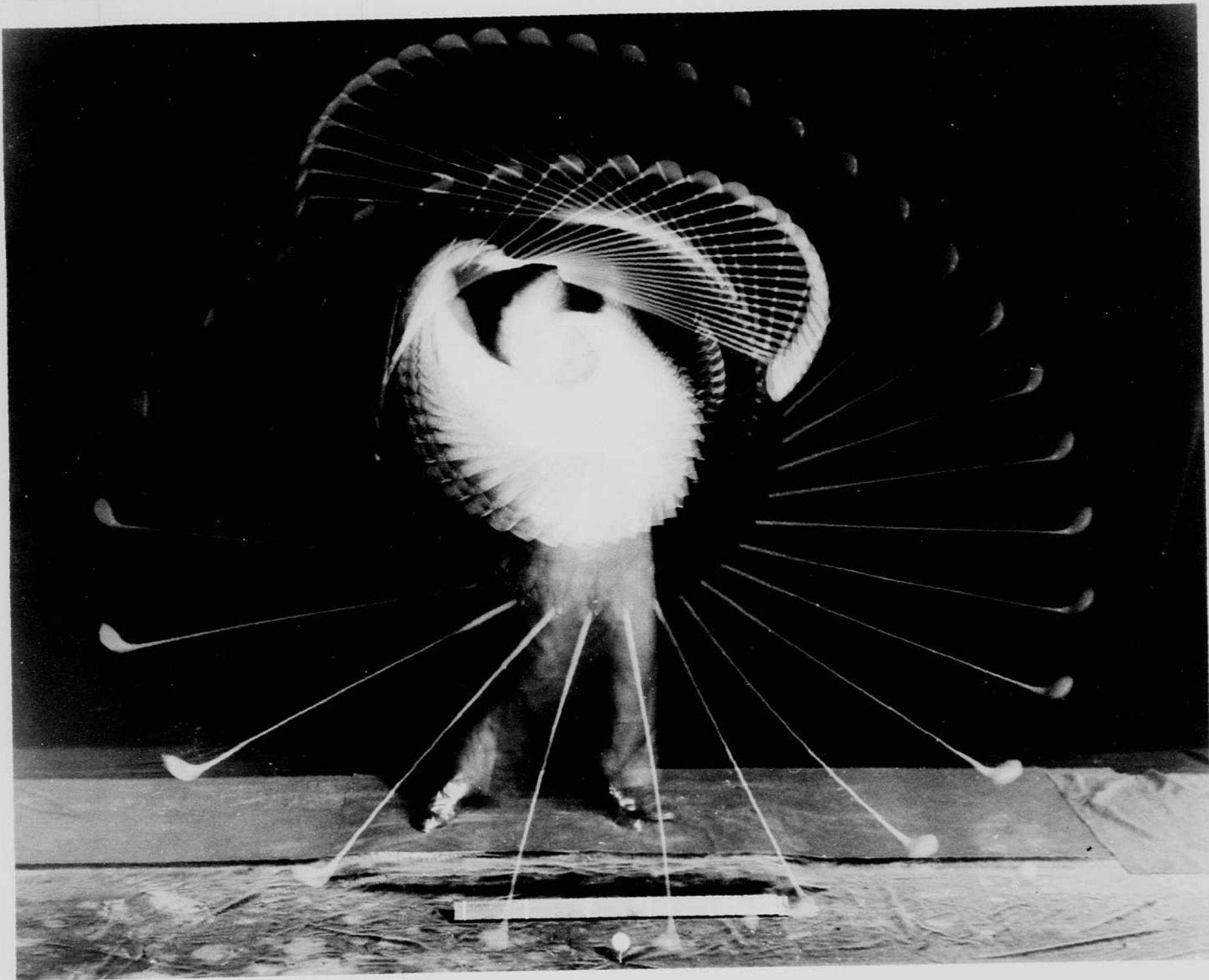
Returned to Boston on midnight train.

Sat June 10 Ralph Booth called about Edison Co Gen in L St ^{station.}

Sun June 11 Spent morning with William Mitchell Folberth Jr.
Com 8048. 22 Fenway Boston Phi Daur.
Home in Cleveland. Father makes notched Bows.

June 12 '39 Saw Ralph Booth at 10 and discussed
vibration with Mr. Julian. I and I spent two
hours or so at L St station looking over the
generator.

The ball velocity is 225 feet per second
The club velocity before impact is 166 feet per second
The club velocity after impact is 114 feet per second



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50/sec.

25/sec.

Edorman, E. F. Western Cartridge Co.

Worked with us June 1, 2, 3, 4 taking 3000/sec movies
and single flash photographs of shot guns.

Grier was in New York June 5th at Eastman Co World's Fair Exhibit.

Grier & I went to New York June 8 for opening of Spalding Co.
multiflash unit at 5th Avenue store.

I spent June 9 (Friday) at Eastman exhibit W. F.

Returned to Boston on midnight train.

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120A strobo p 142 76

10^{-6} Flash lamp. p 61-2 37

Time delay p 25 46.

H. E. E.