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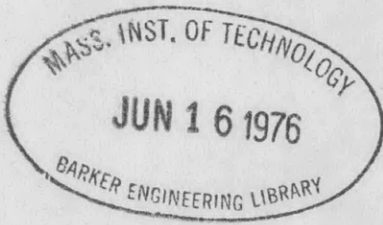
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VELOCITY OF WATER CURRENTS
IN
U. S. EXPERIMENTAL MODEL BASIN



U. S. EXPERIMENTAL MODEL BASIN
NAVY YARD, WASHINGTON, D. C.

JUNE, 1931.

REPORT NO. 304.

VELOCITY OF WATER CURRENTS
IN
U. S. EXPERIMENTAL MODEL BASIN

INTRODUCTION

There has been some uncertainty as to the amount of water currents set up in the U. S. Experimental Model Basin by ship models and the time required for them to subside. There was a possibility that water currents set up during one run of the towing carriage might have more of a detrimental effect on the next run than waves and, if such was the case, wave quashers were unnecessary and longer intervals between runs would be necessary.

PROCEDURE

Some tests were made in January and February, 1931. A camera was mounted in the girders about three feet to one side of the center line of the basin. A float having a reflecting bulb (Christmas tree tinsel) on top and sheet brass fins extending about 6" below the surface

was used for a target. One negative was used for each run of the carriage. At first an arc spot light was used to illuminate the target. This gave a very clear image for checking calculations. Later it was found that a 200 watt bulb hung from the girders several feet to one side of the camera gave good results. On bright days there was a good spot from the sky lights, which had not been painted for some time. Old plates which could not be used for pictures were found to be all right for this purpose. The camera aperture was opened wide when using the 200 watt light and old plates.

The target was held in position with a hook and pole, there being a wire frame on the target for this purpose. When the carriage started the target was released and bulb exposures of about $1/4$ or $1/5$ seconds were made every 5 seconds. From the distances between spots on the film the velocities of the water currents were calculated.

RESULTS OF TESTS

The results show that for self-propulsion tests with runs at different speeds and intervals of time no definite tendency could be found. For towing tests having a constant velocity and run at a definite interval of time,

definite tendencies were found. The currents near the center of the basin were in the general direction of the carriage during these runs showing that the slow return of the carriage had but small breaking effect on the currents set up during the run.

A comparison of the vector diagram for February 24, 1931, with that of February 3, 1931, shows the large influence in time interval between runs. The vectors for February 24, 1931, have a mean velocity of .012 knots for a carriage speed of 4.90 knots and a 5 minute schedule against a mean of .028 knots on February 3, 1931, for a carriage speed of 3.65 knots and a 4 minute schedule.

The general drift to the left is unaccounted for. There is a possibility that it may be due to ventilation currents. The camera was placed 300 feet from the starting end so that these results are for a portion of the basin near the finishing end.

ACCURACY

The target float is 6" in diameter. Its diameter as calculated from measurements on the film was found to be sometimes over and sometimes under 6" but usually within 2%. The percentage of error for the smaller distances between spots was probably greater than 2% due to errors in measuring on the film.

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ILLUMINATION BY ARC SPOTLIGHT
ONE EXPOSURE EVERY 5 SECONDS

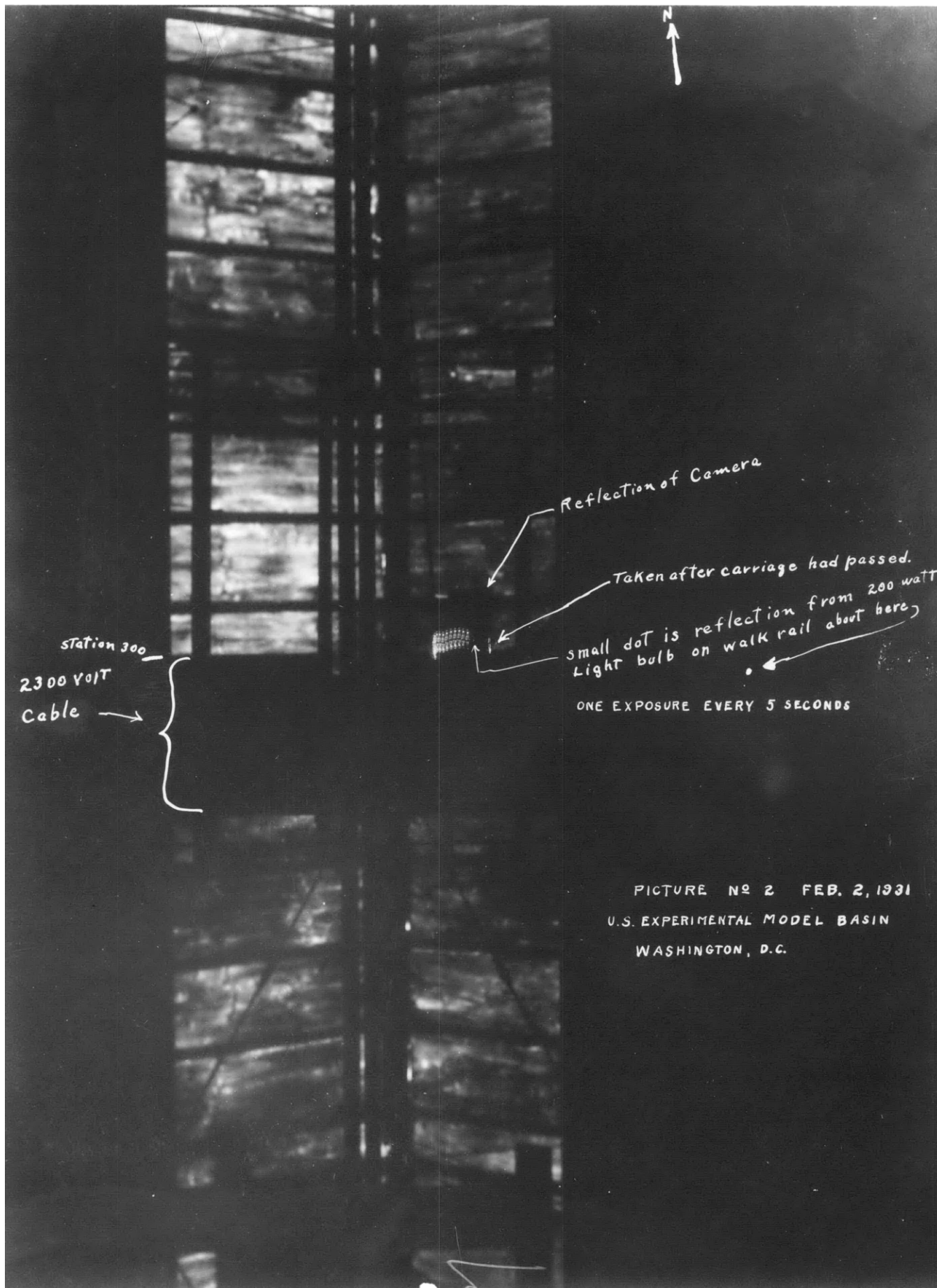
STATION 300 —

2300 VOLT CABLE WAY

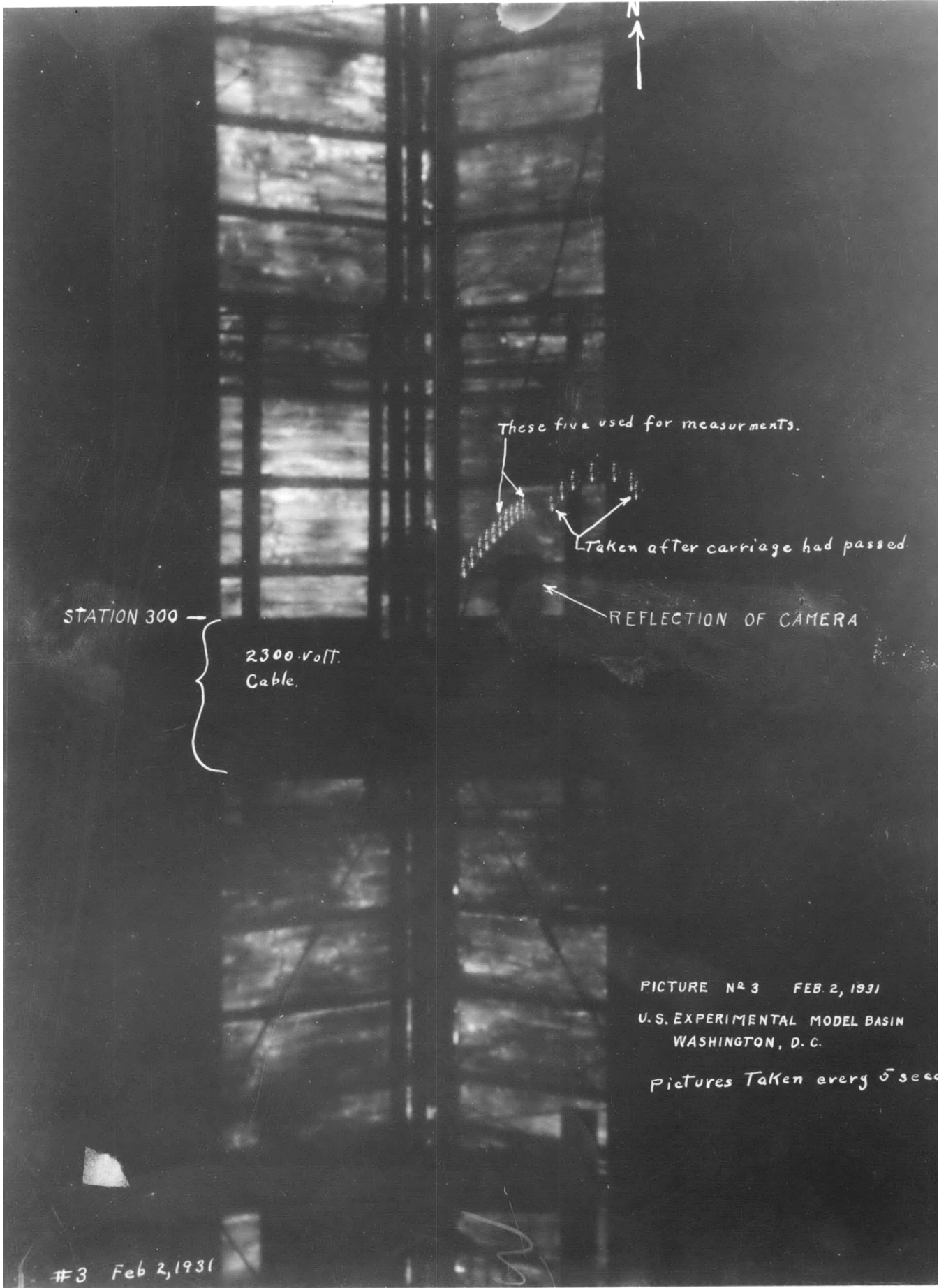


REFLECTON OF CAMERA

TRIAL PICTURE N°1
DECEMBER 23, 1930



PICTURE NO 2 FEB. 2, 1931
U.S. EXPERIMENTAL MODEL BASIN
WASHINGTON, D.C.



These five used for measurements.

Taken after carriage had passed.

REFLECTION OF CAMERA

STATION 300

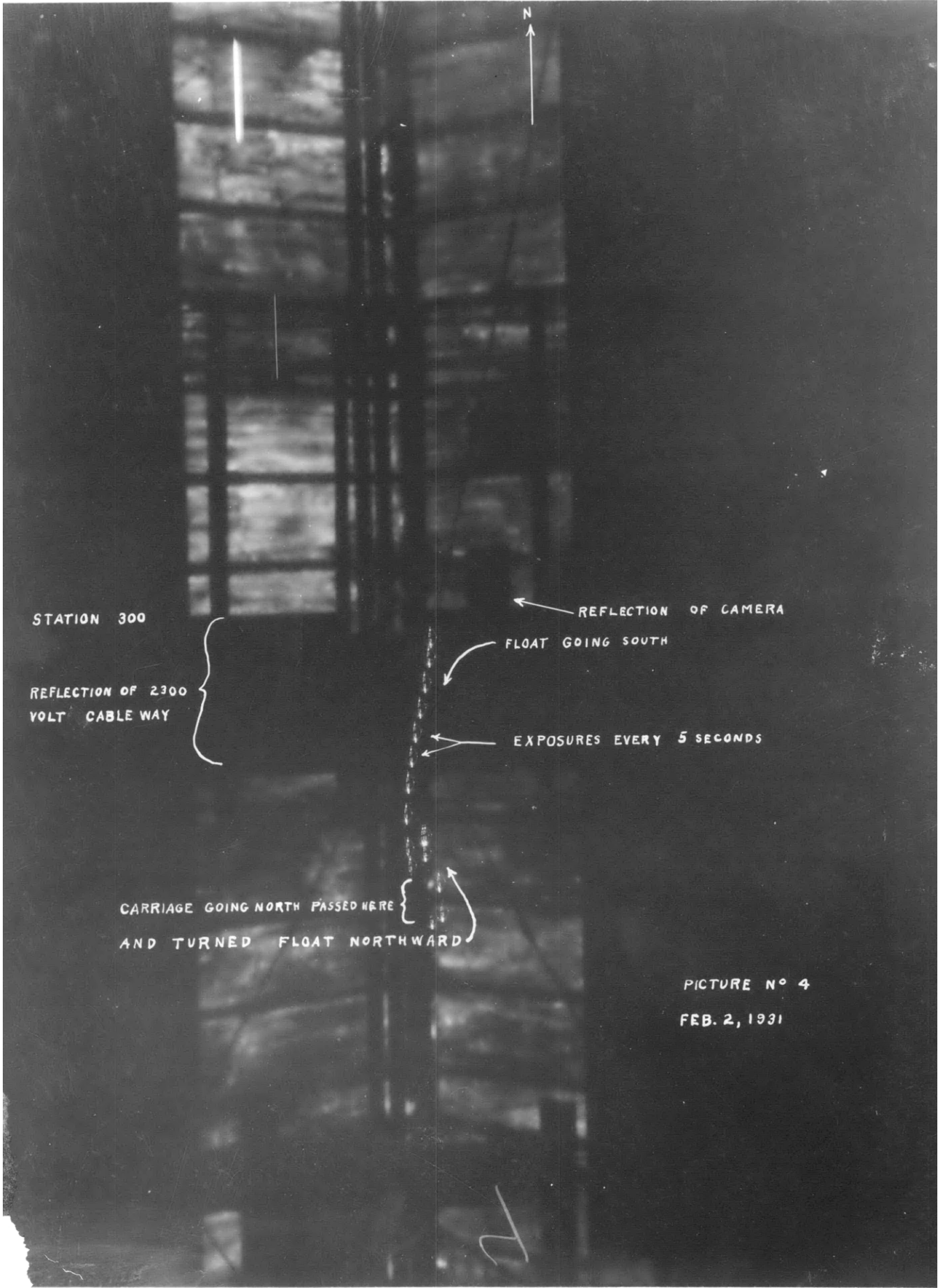
2300 volt.
Cable.

PICTURE N° 3 FEB. 2, 1931

U.S. EXPERIMENTAL MODEL BASIN
WASHINGTON, D. C.

pictures Taken every 5 sec

#3 Feb 2, 1931



STATION 300

REFLECTION OF 2300
VOLT CABLE WAY

N
↑

REFLECTION OF CAMERA

FLOAT GOING SOUTH

EXPOSURES EVERY 5 SECONDS

CARRIAGE GOING NORTH PASSED HERE
AND TURNED FLOAT NORTHWARD

PICTURE N° 4

FEB. 2, 1931



AFTER CARRIAGE HAD PASSED



USED FOR MEASUREMENTS

STARTING POINT

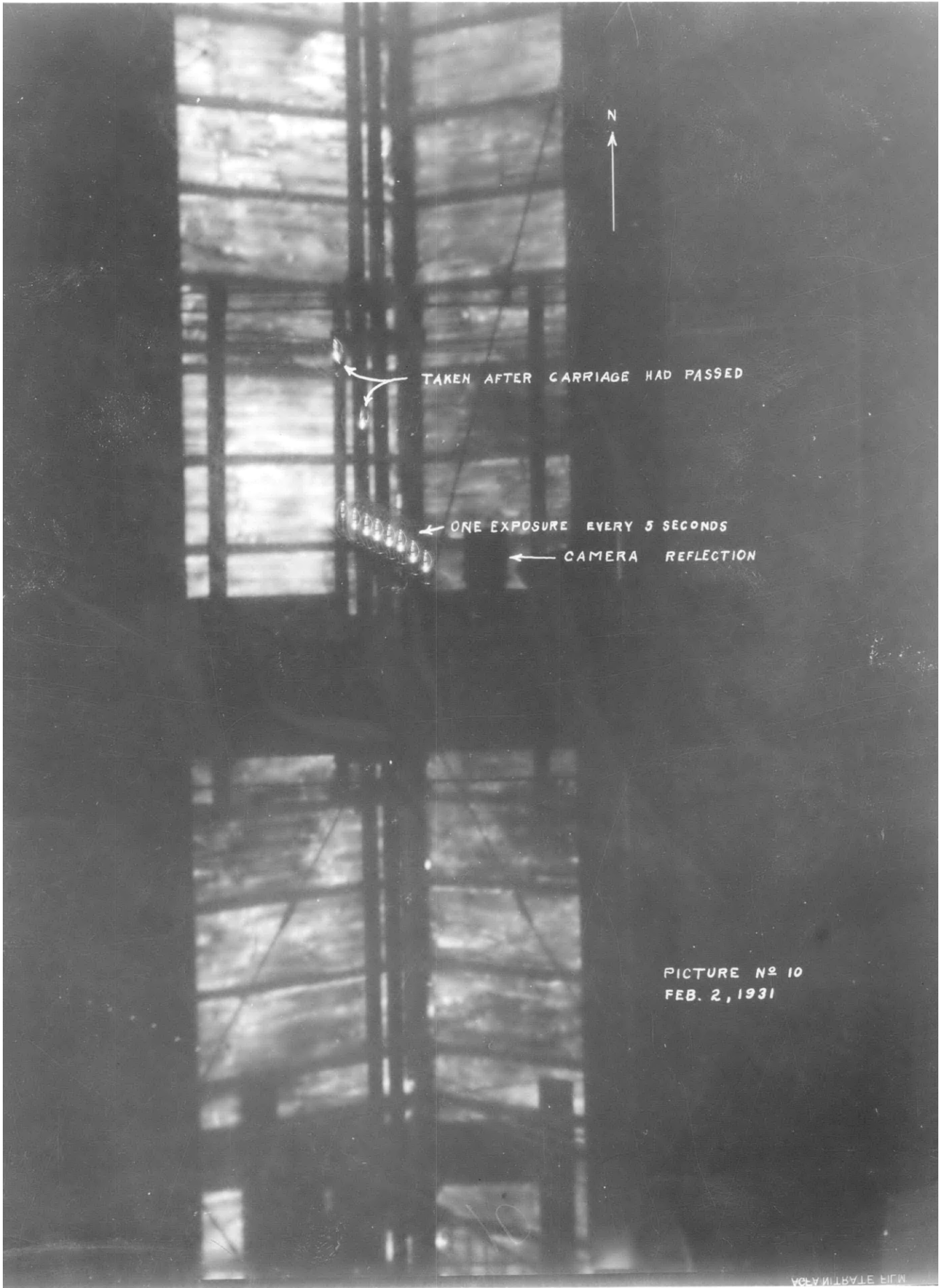
EXPOSURES EVERY 5 SECONDS

← CARRIAGE PASSED HERE

CARRIAGE GOING NORTH ↑

PICTURE № 9
JAN. 8, 1931

U.S. EXPERIMENTAL MODEL BASIN
WASHINGTON, D.C.



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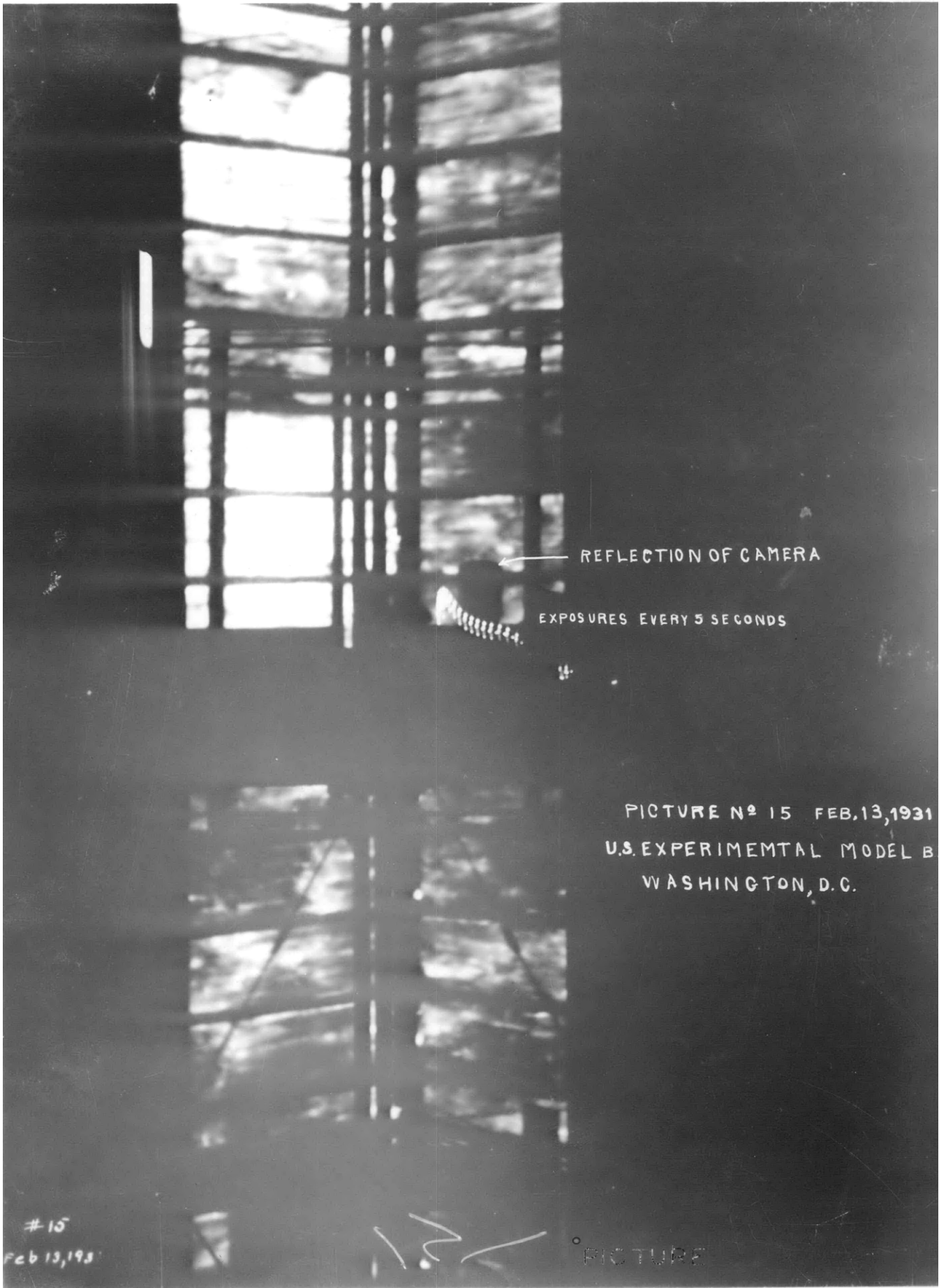
TAKEN AFTER CARRIAGE HAD PASSED

← ONE EXPOSURE EVERY 5 SECONDS

← CAMERA REFLECTION

PICTURE No 10
FEB. 2, 1931

M. E. WILBY, JR. PHOTO



REFLECTION OF CAMERA

EXPOSURES EVERY 5 SECONDS

PICTURE Nº 15 FEB. 13, 1931
U.S. EXPERIMENTAL MODEL B
WASHINGTON, D.C.

#15
Feb 13, 1931

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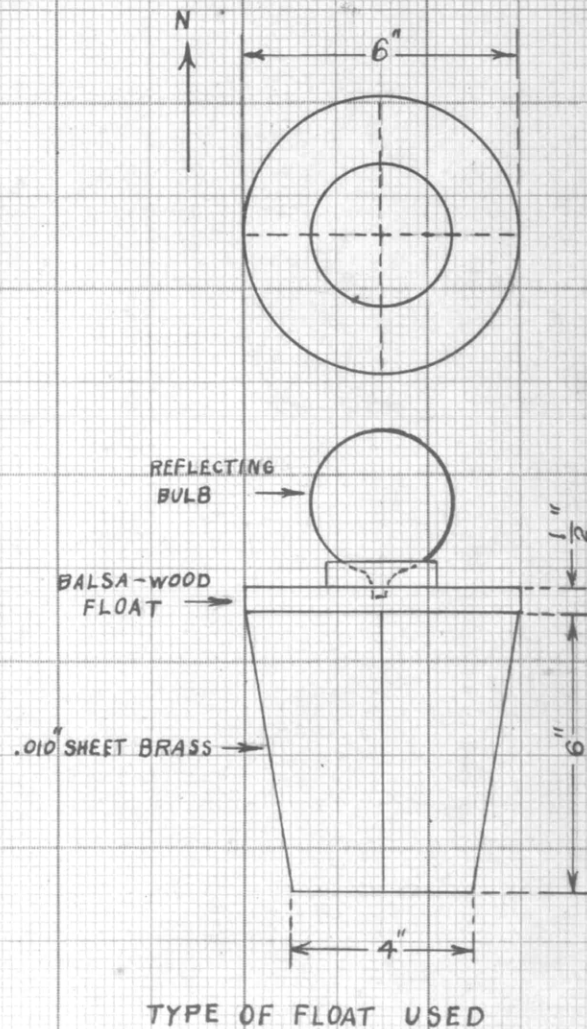
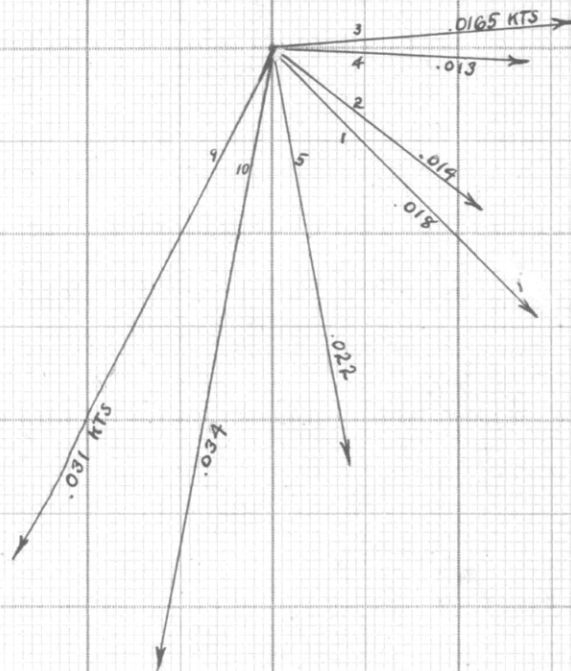
PICTURE

VELOCITY & DIRECTION OF WATER CURRENTS IN MODEL BASIN

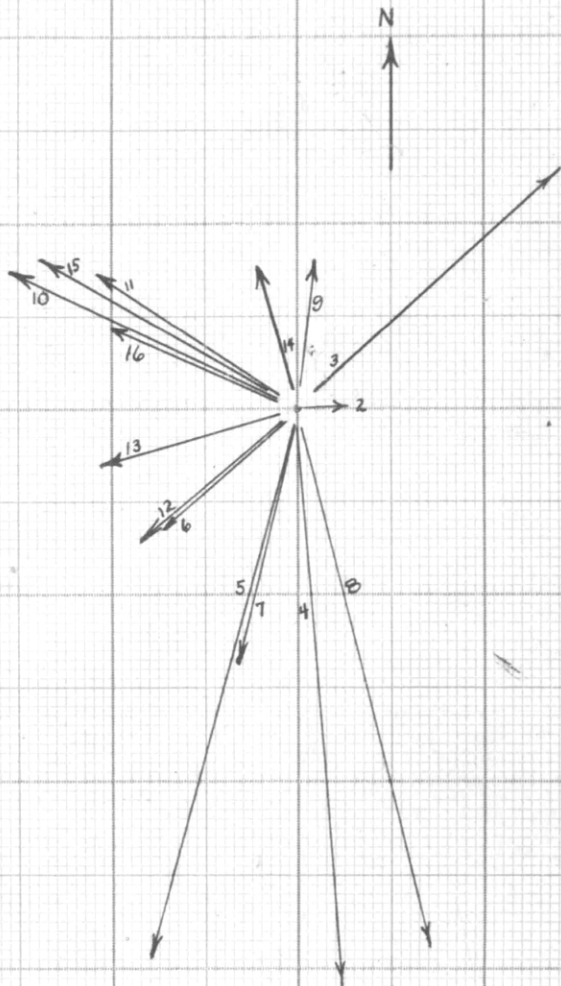
SCALE 1" = .01 KNOTS MODEL 2193 CARRIAGE RUNNING AT 5 MINUTE INTERVALS JAN 8, 1931
 NO 6 OUT OF RANGE OF CAMERA NO 7 & 8 UNINTELLIGIBLE STATION 300

VELOCITY OF CARRIAGE ON PREVIOUS RUN

NO 1	3.54 KNOTS
2	3.64
3	3.90
4	4.20
5	4.43
9	5.53
10	5.80



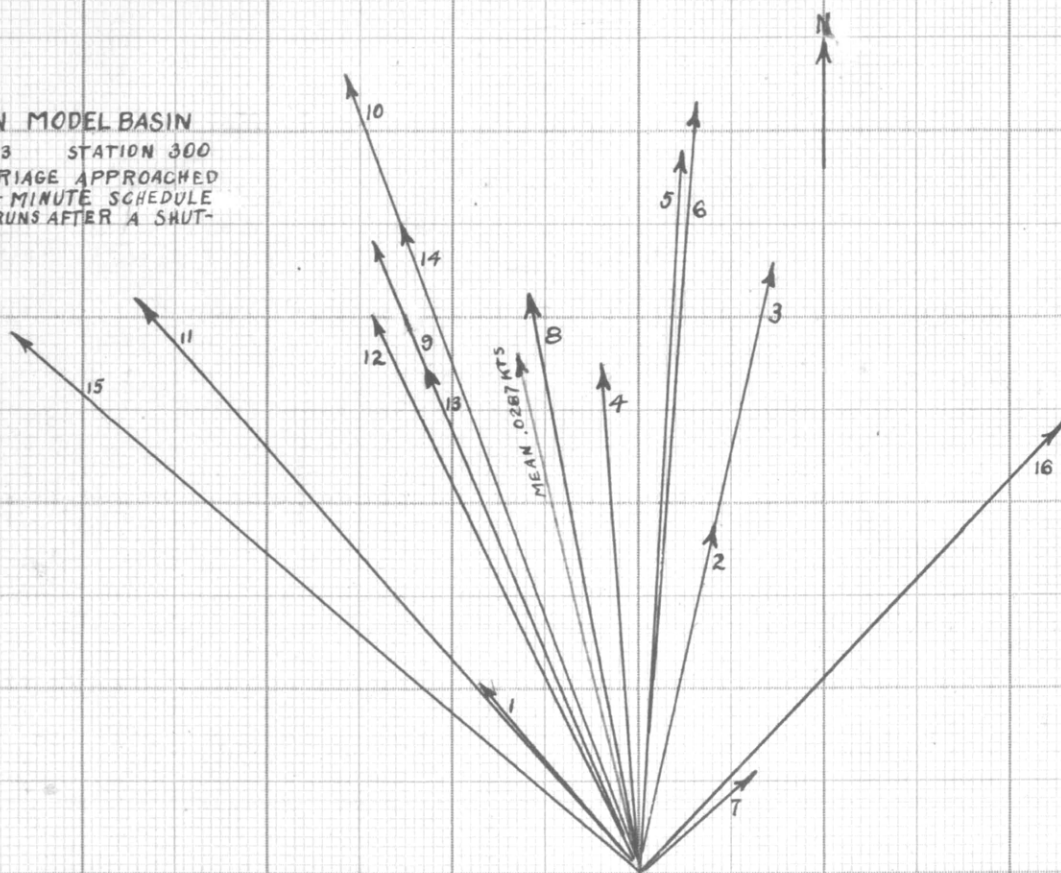
VELOCITY OF WATER IN BASIN
 FEB 2, 1931 MODEL 2285 PROPELLER 914
 SCALE 1" = .01 KTS Station 300
 Carriage running at irregular intervals
 PICTURES TAKEN EVERY 5 SEC. FROM START
 OF CARRIAGE TILL AFTER IT HAD PASSED



NO. OF PICTURE	SPEED OF CARRIAGE PREVIOUS RUN KTS	WATER VELOCITY KTS
1		N.G
2	3.45	.0027
3	1.64	.0189
4	1.74	.031
5	1.88	.030
6	1.97	.010
7	2.10	.014
8	2.25	.030
9	2.50	.008
10	2.55	.017
11	2.67	.013
12	2.71	.011
13	2.94	.011
14	3.20	.008
15	3.08	.016
16	3.08	.011

WATER CURRENTS IN MODEL BASIN

FEB 3, 1931 MODEL 3083 STATION 300
 PICTURE TAKEN AS CARRIAGE APPROACHED
 CARRIAGE RUNNING ON 4 MINUTE SCHEDULE
 NO 1 & 7 ARE THE SECOND RUNS AFTER A SHUT-
 DOWN.

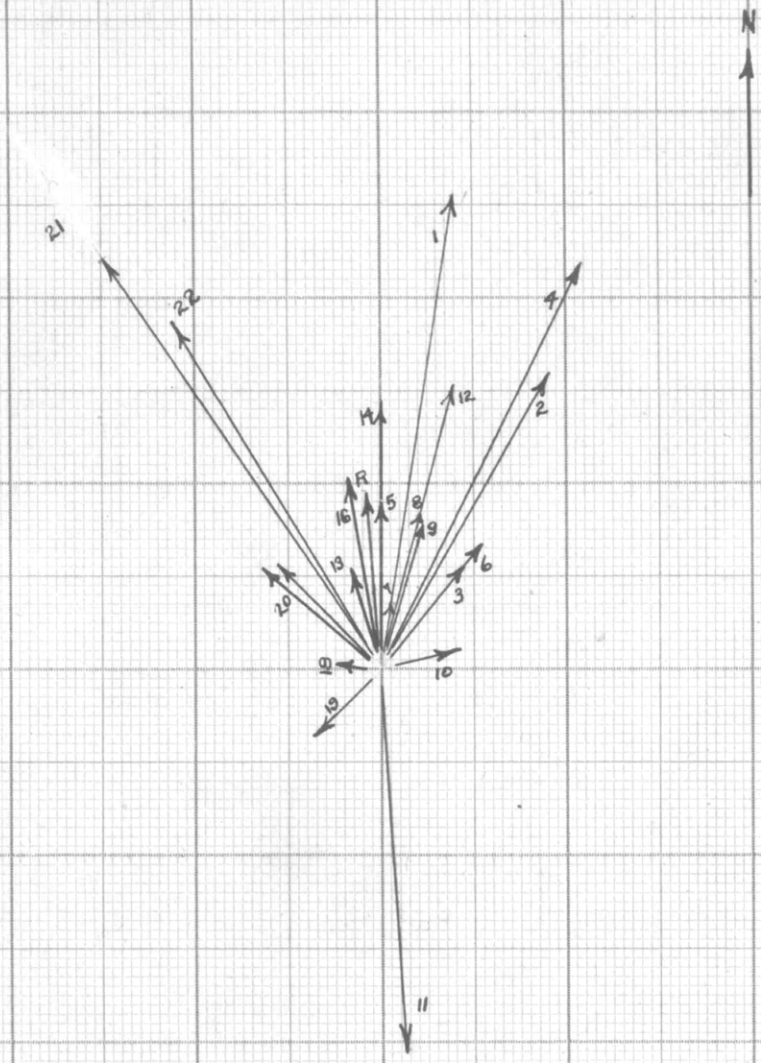


N° OF PICTURE	SPEED OF CARRIAGE PREVIOUS RUN KTS	WATER VELOCITY KTS
1	3.65	.0133
2	3.67	.0194
3	3.64	.0333
4	3.64	.0275
5	3.64	.0389
6	3.60	.0416
7	3.64	.0083
8	3.68	.0317
9	3.66	.0366
10	3.63	.0408
11	3.66	.0411
12	3.65	.0338
13	3.65	.0296
14	3.65	.0372
15	3.65	.0447
16	3.67	.0333

SCALE 1" = .01 KNOTS

WATER CURRENTS IN MODEL BASIN
 FEB. 9, 1931 STATION 300 MODEL 3010 PROP 1020
 PICTURES TAKEN AS CARRIAGE APPROACHED

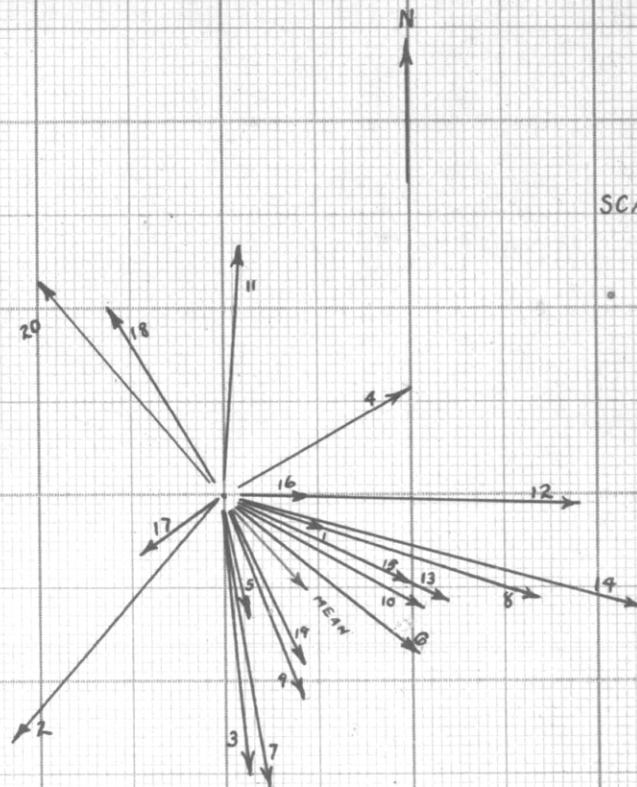
NO OF PICTURE	MINUTES SINCE LAST RUN	SPEED OF CARRIAGE PREVIOUS RUN KNOTS	WATER VELOCITY KNOTS
1	15	3.99	.0258
2	7	1.739	.018
3	7	1.849	.007
4	10	2.112	.024
5	7	2.315	.009
6	7	2.453	.010
7	8	2.565	.004
8	8	2.732	.008
9	9	2.97	.008
10	6	3.223	.001
11	7	3.237	.020
12	7	3.38	.015
13	8	3.547	.005
14	6	3.54	.014
15	8	3.68	.017
16	8	3.67	.010
17	4	1.65	.006
18	3	2.22	.003
19	3.9	2.49	.004
20	4	2.98	.006
21	2	3.40	.018
22	3	3.58	.008
R			.0096



WATER VELOCITY IN MODEL BASIN
 MODEL 1080 PROPELLERS 1142-1143 FEB. 13, 1931

SCALE: 1 INCH = .01 KNOT

NO OF PICTURE	MINUTES SINCE PREVIOUS RUN	SPEED OF CARRIAGE PREVIOUS RUN KNOTS	VELOCITY OF WATER KNOTS	DIRECTION
1	7		.005	S70°E
2	9	4.23	.018	S41°W
3	5	4.41	.015	S5°E
4	5	4.58	.012	NG60°E
5	8	4.78	.007	S12°E
6	6	5.26	.013	S51°E
7	7	4.83	.018	S9°E
8	12	5.03	.018	S72°E
9	7	5.40	.012	S22°E
10	9	5.54	.013	S61°E
11	9	5.53	.013	N3°E
12	6	5.80	.019	S89°E
13	14	5.95	.013	S65°E
14	7	6.21	.023	S75°E
15	20	6.43	.011	S63°E
16	6	1.50	.004	S87°E
17	7	1.74	.005	S54°W
18	5	2.34	.012	N31°W
19	3	2.89	.010	S25°E
20	5	3.82	.015	N41°W
MEAN	7.8	4.32	.006	S41°E



WATER CURRENTS IN MODEL BASIN

MODEL 2961 FEB 24, 1931 SCALE 1 INCH = .01 KNOTS

CARRIAGE RUNNING 4.30 KNOTS ON A 5 MINUTE SCHEDULE

№ OF PICTURE	VELOCITY OF WATER KTS	DIRECTION
1	.006	N19E
2	.009	N42W
3	.026	N47W
4	.014	N40W
5	.010	N51E
6	.018	N26W
7	.026	S83W
8	.016	N35W
9	.013	N55W
10	.014	N44W
11	.006	S73W
12	.003	N28W
13	.010	N62W
14	.010	N54W
15	.026	N69W
16	.017	N42W
17	.018	N53W
18	.017	N6W
MEAN	.012	N38W

