

THE PANAMA CANAL
ENGINEERING AND CONSTRUCTION BUREAU
METEOROLOGICAL AND HYDROGRAPHIC BRANCH

SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Lat. 8° 57' 39" N.

Long. 79° 33' 29" W.

h = 36 meters.

Lithologic foundation: Basalt.

Time Correction: Within 1.0 sec.

INSTRUMENTS—FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.
Bosch-Omori	II	Smoked Sheet	Air	15 mm. per min.	100 kg.

INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T ₀	V	f	DETERMINED
Wood-Anderson	N-S	1.0	1370	14 to 1	June 30, 1947
Wood-Anderson	E-W	1.0	1370	18 to 1	June 30, 1947
Bosch-Omori)	Not in operation				
Bosch-Omori)					

Month January, 1955Page No. 1

No. and Date	Phase	Time G. C. T.			Period	AMPLI- TITUDE mm	REMARKS
		h	m	s			
No. 1 Jan. 5	eP	21	41	52	1.0	Approximate distance 160 miles	
	eS		42	25			
	F	21	44				
No. 2 Jan. 9	eP	02	54	45	0.9	Approximate distance 175 miles	
	eS		55	21			
	F	02	58				
No. 3 Jan. 10	eP	23	16	15	1.1	Approximate distance 155 miles	
	eS		16	52			
	F	23	20				
No. 4 Jan. 18	eP	08	44	12	0.3	U.S.C.G.S. preliminary determination of epicenter 4 1/2°N, 87 1/2°W. Approximate distance 850 miles.	
	eS		46	25			
	F	08	50				
No. 5 Jan. 20	eP	03	54	16	0.1		
	F	04	10				
No. 6 Jan. 22	iP	16	19	37	3.5	Approximate distance 195 miles	
	eS		20	18			
	F	16	27				
No. 7 Jan. 22	eP	20	46	01	2.0	Approximate distance 155 miles	
	iS		46	33			
	F	20	49				
No. 8 Jan. 23	iP	15	50 ¹⁶	50	1.3		
	F	15	18				
No. 9 Jan. 31	eP	05	09	19	0.3		
	F	05	39				

W. H. Esslinger,
Chief Hydrographer

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INSTRUMENTS - FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson		Photographic	Magnetic	60 mm. per min.	1.5 gr.

INSTRUMENTS - DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T	V	G	DETERMINED
Wood-Anderson	N-S	1.0	1370	14 to 1	June 30, 1947
Wood-Anderson	E-W	1.0	1370	18 to 1	June 30, 1947

Month **February, 1955**

Page No. **2**

No. and Date	Phase	Time G. C. T.			Period	AMPLI- TITUDE mm	REMARKS
		h	m	s			
No. 10 Feb. 7	iP	04	26	47		2.3	Approximate distance 45 miles
	iS		26	56			
	F	04	28				
No. 11 Feb. 9	eP	07	50	51		0.6	Approximate distance 200 miles
	eS		51	33			
	F	07	54				
No. 12 Feb. 11	iP	20	19	52		2.3	Approximate distance 10 miles
	iS		19	54			
	F	20	20				
No. 13 Feb. 14	iP	12	38	57		21.0	Approximate distance 95 miles
	iS		39	17			
	F	12	42				
No. 14 Feb. 14	iP	19	21	50		6.3	Approximate distance 135 miles
	iS		22	18			
	F	19	25				
No. 15 Feb. 17	eP	08	17	12		1.3	Approximate distance 25 miles
	eS		17	17			
	F	08	18				
No. 16 Feb. 18	eP	08	10	11		0.7	
	F	08	15				
No. 17 Feb. 25	eP	23	33	57		2.8	Approximate distance 50 miles
	eS		34	07			
	F	23	35				
No. 18 Feb. 26	eP	17	19	34		2.2	Approximate distance 170 miles
	eS		20	09			
	F	17	24				

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Time Correction: Within 1.0 sec.

INSTRUMENTS - FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson		Photographic	Magnetic	60 mm. per min.	1.5 gr.

INSTRUMENTS - DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T	V	G	DETERMINED
Wood-Anderson	N-S	1.0	1370	14 to 1	June 30, 1947
Wood-Anderson	E-W	1.0	1370	18 to 1	June 30, 1947

Month **March, 1955**

Page No. **3**

No. and Date	Phase	Time G. C. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
No. 19 March 4	eP iS F	03 04 04	59 00 02	47 03	4.0	Distance 75 miles	
No. 20 March 20	iP iS F	23 19 23	19 19 22	20 32	17.0	Felt, Force II Distance 60 miles	
No. 21 March 24	eP F	20 20	35 36	34	1.4		
No. 22 March 31	eP F	18 19	37 00	03	0.7		

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INSTRUMENTS - FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.

INSTRUMENTS - DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T ₁	V	Q	DETERMINED
Wood-Anderson	N-S	1.0	1370	14 to 1	June 30, 1947
Wood-Anderson	E-W	1.0	1370	18 to 1	June 30, 1947

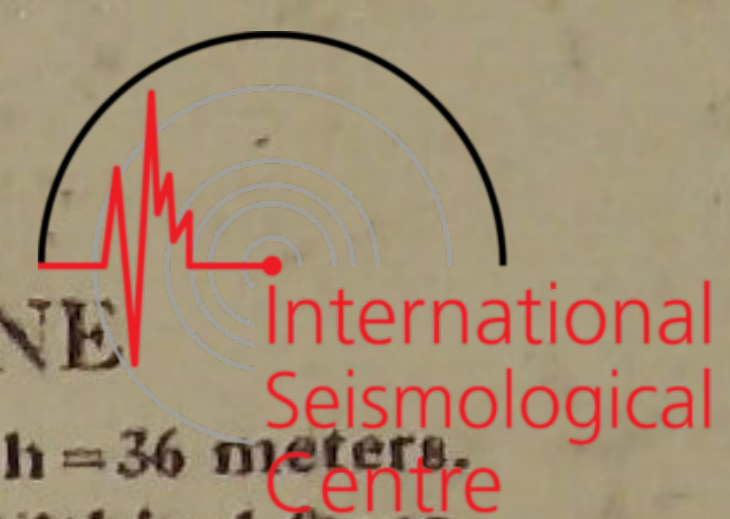
Month April, 1955

Page No. 4

No. and Date	Phase	Time G. C. T.			Period	AMPLI- TITUDE mm	REMARKS
		h	m	s			
No. 23 April 4	eP	29	26	06	1.0	Distance 925 miles. U.S.C.G.S. preliminary determination of epicenter 13° N, 87° W, Nicaragua	
	eS		28	37			
	F	19	52				
No. 24 April 6	eP	18	32	06	2.2	Distance 130 miles	
	eS		32	33			
	F	18	35				
No. 25 April 11	eP	20	23	27	0.1		
	F	20	30				
No. 26 April 19	eP	20	31	48	0.7		
	F	21	52				
No. 27 April 20	P?	05	56	29	0.1		
	F	06	14				
No. 28 April 24	eP	21	09	52	0.1	Distance 475 miles	
	eS		11	14			
	F	21	15				
No. 29 April 26	eP	03	06	08	0.1		
	F	03	20				
No. 30 April 30	eP	01	34	16	1.4		
	F	02	08				

W. H. Esalinger,
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INSTRUMENTS - FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson		Photographic	Magnetic	60 mm. per min.	1.3 gr.

INSTRUMENTS - DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T	V	G	DETERMINED
Wood-Anderson	N-S	1.0	1370	14 to 1	June 30, 1947
Wood-Anderson	E-W	1.0	1370	18 to 1	June 30, 1947

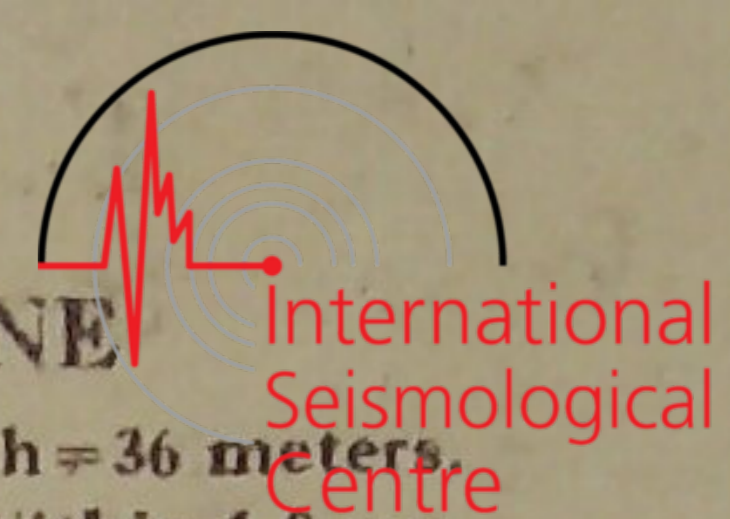
Month **May, 1955**

Page No. **5**

No. and Date	Phase	Time G. C. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
No. 31 May 1	eP iS F	06	02	13		3.0	Distance 105 miles
			02	35			
		06	05				
No. 32 May 8	eP eS F	02	50	22		0.7	Distance 285 miles
			51	21			
		02	55				
No. 33 May 11	iP F	11	06	20		1.0	USCGS epicenter 0°N, 78°W- Equador
		11	24				
No. 34 May 13	eP iS F	13	36	10		2.2	Distance 215 miles
			36	55			
		13	39				
No. 35 May 13	iP iS F	21	56	31		11.5	Distance 135 miles USCGS epicenter 7°N, 77 1/2°W, Colombia-Panama border
		21	56	59			
		22	02				
No. 36 May 19	iP iS F	03	28	06		1.9	Distance 40 miles
			28	14			
		03	29				
No. 37 May 26	iP eS F	06	11	37		76.6	Felt, Force IV Distance 50 miles
			11	47			
		06	20				
No. 38 May 30	eP F	12	49	48		1.5	
		13	00				
No. 39 May 31	eP F	18	00	53		0.7	
		18	16				

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SEISMOLOGICAL RECORD AT BALBOA HEIGHTS, CANAL ZONE

Lat. 8° 57' 39" N. Long. 79° 33' 29" W. h = 36 meters.
Lithologic foundation: Basalt. Time Correction: Within 1.0 sec.

INSTRUMENTS—FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.

INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T	V	G	DETERMINED
Wood-Anderson	N-S	1.0	1370	14 to 1	June 30, 1947
Wood-Anderson	E-W	1.0	1370	18 to 1	June 30, 1947

Month June, 1955

Page No. 6

No. and Date	Phase	Time G. C. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
No. 40 June 14	iP iS F	03	43	43		11.9	Distance 180 Miles
			44	21			
		03	47				
No. 41 June 14	eP F	06	17	20		0.2	U.S.C.G.S Epicenter 20°N, 107°W, off the coast of Colima, Mex.
		06	39				
No. 42 June 28	eP iS F	21	57	32		1.1	Distance 225 Miles
			58	19			
		22	01				
No. 43 June 28	eP eS F	22	43	29		0.7	Distance 225 Miles
			44	16			
		22	46				
No. 44 June 28	eP iS F	22	55	05		1.5	Distance 225 Miles
			55	52			
		22	58				
No. 45 June 29	iP iS F	03	24	38		1.8	Distance 230 Miles
			25	26			
		03	29				
No. 46 June 30	eP eS F	19	10	29		1.0	Distance 470. Miles
			11	47			
		19	14				

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INSTRUMENTS - FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.

INSTRUMENTS - DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T.	V	G	DETERMINED
Wood-Anderson	N-S	1.0	1370	14 to 1	June 30, 1947
Wood-Anderson	E-W	1.0	1370	18 to 1	June 30, 1947

Month July 1955

Page No. 7

No. and Date	Phase	Time G. C. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
No. 47 July 5	eP	19	49	25	1.0	Distance 550 Miles	
	eS		50	56			
	F	19	54				
No. 48 July 5	iP	23	25	05	2.0	Distance 120 Miles	
	iS		25	30			
	F	23	27				
No. 49 July 6	iP	21	59	06	1.0	Distance 320 Miles	
	iS	22	00	13			
	F	22	03				
No. 50 July 9	eP	17	22	42	1.7	Distance 240 Miles	
	iS		23	32			
	F	17	26				
No. 51 July 10	iP	19	53	54	0.8		
	F	19	57				
No. 52 July 11	eP	06	57	52	1.8	Distance 120 Miles	
	iS		58	16			
	F	07	00				
No. 53 July 11	iP	16	21	23	22.0	Distance 115 Miles	
	iS		21	47			
	F	16	26				
No. 54 July 18	iP	08	28	28	1.8	Distance 225 Miles	
	iS		29	15			
	F	08	33				
No. 55 July 21	eP	11	51	00	0.9		
	F	12	05				
No. 56 July 25	iP	08	51	08	1.5	Distance 170 Miles	
	iS		51	43			
	F	08	54				

T. C. Henter
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Act'g. Chief Hydrographer

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h = 36 metre

Lithologic foundation: Basalt.

Time Correction: Within 1.0 sec.

INSTRUMENTS—FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	T	Photographic	Magnetic	60 mm. per min.	1.5 gr.

INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T.	Y	G	DETERMINED
Wood-Anderson	N-S	1.0	1370	14 to 1	June 30, 1947
Wood-Anderson	E-W	1.0	1370	18 to 1	June 30, 1947

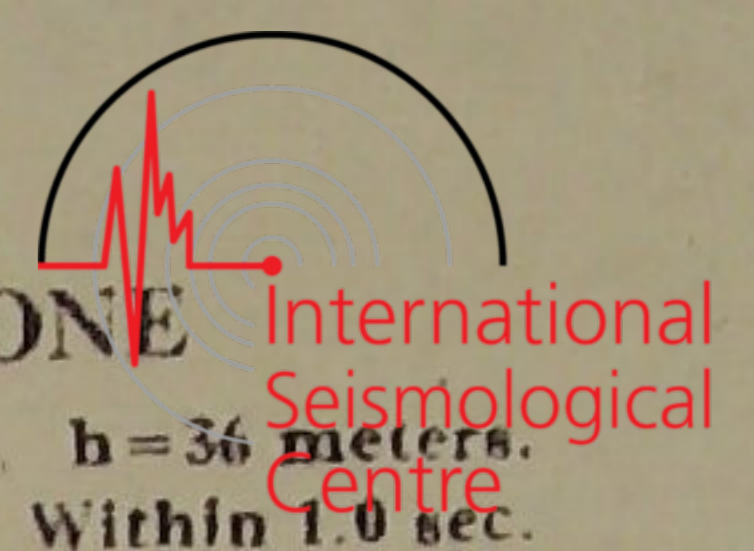
Month August, 1955

Page No. 8

No. and Date	Phase	Time G. C. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
No. 57 Aug. 9	iP	21	13	29	12.0	Distance 40 miles	
	iS		13	37			
	F	21	15				
No. 58 August 15	iP	09	06	11	3.0	Distance 195 miles	
	iS		06	52			
	F	09	09				
No. 59 Aug. 15	iP	14	17	22	4.0	Distance 80 miles	
	iS		17	38			
	F	14	19				
No. 60 Aug. 16	iP	19	12	00	1.0		
	F	19	20				
No. 61 Aug. 18	eP	20	46	31	1.5	Distance 205 miles	
	eS		47	14			
	F	20	49				
No. 62 Aug. 21	eP	05	36	40	1.3	Distance 120 miles	
	iS		37	06			
	F	05	39				
No. 63 Aug. 23	iP	16	53	25	2.0	Distance 250 miles	
	iS		54	17			
	F	16	58				
No. 64 Aug. 28	eP	20	16	27	1.0	Distance 1300 miles	
	eS		20	06			
	F	20	37				
No. 65 Aug. 29	eP	07	55	28	0.8		
	F	08	04				
No. 66 Aug. 29	eP	14	40	39	4.5	Distance 180 miles	
	eS		41	16			
	F	14	46				

W. H. ESSLINGER,
 Chief Hydrographer

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INSTRUMENTS - FIXED CONSTANTS

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Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.

INSTRUMENTS - DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	P	V	G	DETERMINED
Wood-Anderson	N-S	1.0	1370	14 to 1	June 30, 1947
Wood-Anderson	E-W	1.0	1370	18 to 1	June 30, 1947

Month September, 1955

Page No. 9

No. and Date	Phase	Time G. C. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
No. 67 Sept. 1	eP	17	34	17	2.0	U.S.C.G.S. Epicenter 10° N, 84 1/2° W Toro Amarillo, Costa Rica	
	eS query		35	49			
	F	17	51				
No. 68 Sept. 1	eP	21	16	47			
	F	21	24				
No. 69 Sept. 3	iP	12	39	10	0.9	Distance 870 miles	
	eS		41	32			
	F	13	08				
No. 70 Sept. 8	iP	03	32	08	8.2	U.S.C.G.S. Epicenter 8° N, 77° W Colombia, Panama border.	
	eS		32	43			
	F	03	38				
No. 71 Sept. 25	eP	01	23	47	2.0	Distance 130 miles	
	iS		24	14			
	F	01	26				
No. 72 Sept. 26	iP	08	31	41	1.7		
	F	08	48				
No. 73 Sept. 28	eP	18	13	57	0.8		
	F	18	19				
No. 74 Sept. 28	eP	23	25	55	1.6	Distance 95 miles	
	iS		26	15			
	F	23	28				

W. H. Esslinger
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Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.

INSTRUMENTS - DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T	V	C	DETERMINED
Wood-Anderson	N-S	1.0	1370	14 to 1	June 30, 1947
Wood-Anderson	E-W	1.0	1370	18 to 1	June 30, 1947

Month **October, 1955**

Page No. **10**

No. and Date	Phase	Time G. C. T.			Period	AMPLI- TITUDE mm	REMARKS
		h	m	s			
No. 75 Oct. 2	iP iS F	16	04	05 57	2.0	Distance 250 miles. USCGS epicenter, 5 1/2°N, 83°W, off coast of Panama.	
		16	17				
No. 76 Oct. 4	iP iS F	18	52	56 26 56			1.5
		18	56				
No. 77 Oct. 13	eP F	21	52	52 00	0.7	USCGS epicenter 12°N, 87°W, near coast of Nicaragua.	
		22	00				
No. 78 Oct. 15	iP iS F	04	32	11 36 37			1.5
		04	37				

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INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.

INSTRUMENTS—DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T.	V	G	DETERMINED
Wood-Anderson	N-S	1.0	1370	14 to 1	June 30, 1947
Wood-Anderson	E-W	1.0	1370	18 to 1	June 30, 1947

Month November, 1955

Page No. 11

No. and Date	Phase	Time G. C. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
No. 79 Nov. 12	1P 1S F	22	55	37	5.0	Distance 200 miles. USCGS epicenter, 7° N, 82 1/2° W, south of Panama	
			56	19			
		23	00				
No. 80 Nov. 13	1P 1S F	22	15	34	2.8	Distance 120 miles.	
			15	59			
		22	18				
No. 81 Nov. 16	1P 1S F	04	37	39	2.7	Distance 130 miles.	
			38	06			
		04	40				
No. 82 Nov. 29	1P 1S F	04	18	50	5.0	Distance 135 miles.	
			19	18			
		04	22				

W. H. Esslinger,
Chief Hydrographer



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Lat. 8° 57' 39" N.

Long. 79° 33' 29" W.

h = 36 meters.

Lithologic foundation: Basalt.

Time Correction: Within 0.1 sec.

INSTRUMENTS - FIXED CONSTANTS

INSTRUMENTS	SYMBOL	REGISTRATION	DAMPING	PAPER SPEED	MASS
Wood-Anderson	I	Photographic	Magnetic	60 mm. per min.	1.3 gr.

INSTRUMENTS - DETERMINED CONSTANTS

INSTRUMENTS	COMPONENT	T	V	ε	DETERMINED
Wood-Anderson	N-S	1.0	1370	14 to 1	June 30, 1947
Wood-Anderson	E-W	1.0	1370	18 to 1	June 30, 1947

Month **December, 1955**

Page No. **12**

No. and Date	Phase	Time G. C. T.			Period	AMPLI- TUDE mm	REMARKS
		h	m	s			
No. 83 Dec. 14	1P 1S F	12	52	58	5.0	Distance 175 miles	
			53	34			
		12	57				
No. 84 Dec. 20	1P 1S F	13	44	18	2.5	Distance 670 miles	
			46	11			
		13	48				
No. 85 Dec. 24	eP F	03	36	00	1.0		
		03	41				

W. H. Eslinger,
 Chief Hydrographer