B No: 2026 to d/1.9.85

Communicated to the Superintendent concerned for information

(Sd) J.S.

Govt. of {1885} Madras,

MARINE.

Issued

Recd. Encl.

G.O., &c., 30th July 1885,
Nos. 321, 322.

B No. 2026 to Sy 1-9-85

JULY.

S. Exp. I. II. III. V & VI.

Light-houses.

Forwarding to the Government of India copy of a report by the Master Attendant on the Madras Lights for 1884-85.

W. Rodder

	Amount. RS. A. P.	Total. RS. A. P.
Cochin Light-house.		
One Assistant Superintendent	144 0 0	
Two Lascars	203 8 0	
Oil	127 8 0	
Stores	8 0 0	
Contingencies	9 1 4	492 1 4
Calicut Lighthouse.		
One Assistant Superintendent	120 0 0	
Three Lascars	276 0 0	
Stores	13 2 0	
Contingencies	20 2 5	429 4 5
Beypore Light.		
One Lightkeeper	120 0 0	
Oil	14 0 0	
Contingencies	2 1 0	136 1 0
Tellicherry Light.		
One Assistant Superintendent	120 0 0	
Two Lascars	180 0 0	
Oil	85 0 0	
Stores	18 4 0	
Contingencies	15 2 9	418 6 9
Cannanore Light-house.		
One Assistant Superintendent	120 0 0	
One Lascar	96 0 0	
Oil	136 0 0	
Stores	12 0 0	
Contingencies	17 4 1	381 4 0
Mangalore Light-house.		
One Assistant Superintendent	120 0 0	
Four Lascars	348 0 0	
Oil	13 0 0	
Stores	19 8 0	
Contingencies	24 2 11	664 10 11
Total		30,374 14 11

ORDER—dated 30th July 1885, No. 321, Marine.

Ordered to be forwarded to the Government of India.

(True Extract.)

E. F. WEBSTER,
Chief Secretary.

To the Master Attendant, Madras.

ENDORSEMENT—dated 30th July 1885, No. 322, Marine.

Copy forwarded to the Government of India, Department of Finance.

E. F. WEBSTER,
Chief Secretary.

Exd. J. Wright.

GOVERNMENT OF MADRAS.

MARINE DEPARTMENT.

READ—the following paper:—

From J. H. TAYLOR, Esq., Lieut., R.N.R., Master Attendant, Madras, to the Chief Secretary to Government, dated Madras, 16th July 1885, No. 5910.

Administrative department.

I have the honor to submit the accompanying report on the Madras Lights for the official year 1884-85.

ENCLOSURES.

REPORT on the Lights of the Madras Presidency for the official year 1884-85.

During the year the efficiency of the different lights belonging to this presidency was maintained satisfactorily. No changes took place, and the only important measure to record is the regular inspection of the lighthouses by the Chief Engineer and the Master Attendant ordered by Government. They are periodically to visit the light-houses and report upon their condition. Such visits should be made as frequently as may be necessary with respect to the conditions affecting each light-house, but every one should be visited once at least in the course of the year. The first inspection was made by those officers in February and March last. The light-house buildings at Pulicat were badly damaged during the cyclone of 21st November, and those at Armeghon also sustained some injury. There are thirteen lights on the East, and seven on the West Coast, or twenty altogether. The strength of the establishments maintained for the whole number is as follow: four Superintendents on Rs. (70) seventy, three on Rs. (100) one hundred, and one on Rs. (125) one hundred and twenty-five monthly; and seventy-eight Assistant Superintendents and lightkeepers, whose salaries range at Rs. (21) twenty-one, (15) fifteen, (12) twelve, (11) eleven, (10) ten, (9) nine, (8) eight, (7) seven, and (6) six per mensem. The total expenditure on account of establishments and other charges amounted to Rupees (30,374-14-11) thirty thousand three hundred and seventy-four, Annas fourteen and Pies eleven, viz., establishments Rs. (16,830-6-6) sixteen thousand eight hundred and thirty, Annas six and Pies six, contingencies Rs. (11,672-4-10) eleven thousand six hundred and seventy-two, Annas four and Pies ten, and public works charges Rs. (1,872-3-7) one thousand eight hundred and seventy-two, Annas three and Pies seven. Kerosene oil is used by most of the lighthouses, and the others, four in number, burn cocoanut oil. The average annual cost of kerosine and cocoanut oil for each light was Rs. (118-12-6) one hundred and eighteen, Annas twelve and Pies six, and Rs. (1,286-8-8) one thousand two hundred and eighty-six, Annas eight and Pies eight, respectively.

LIST OF LIGHTS IN THE MADRAS PRESIDENCY.

Names of lights.	Location.	Position. Latitude.	Position. Longitude.	Color of lights.	Fixed, flashing, intermitting, alternating, or revolving.	Interval of revolution or flash.	Miles visible in clear weather.	Height in feet of centre of lantern above high water.	Height in feet of building from base to vane.	Arc of illumination (bearings are magnetic and from seaward).	Nature of construction, color, or any peculiarity of light-house.	Character and order of illuminating apparatus.	Year lighted.	Remarks.
		N. DEG. M. S.	E. DEG. M. S.				MILES.	FEET.	FEET.					
Gopálpur ..	On mainland, sixty yards from low-water mark.	19 13 0	84 52 0	White.	Fixed..	..	10	85	..	180°, or the whole sea horizon.	Flagstaff painted white.	Third-class, country-made.	1871.	Intended as a guide to vessels making the anchorage at night, and exhibited at the special requisition of Commanders of the British India Steam Navigation Company's mail steamers.
Calingapatam ..	On the point ..	18 19 0	84 7 30	Do. ..	Do. ..	..	8	68	73	..	Obelisk of cut-stone, column white, capital dark blue.	Do. ..	15th December 1876.	Intended to warn vessels off a small reef which projects from the point, and which should not be passed in less than eight fathoms when making the port at night.
Santopilly ..	On Santopilly hill, three-quarters of a mile inland.	18 4 56	83 37 35	Do. ..	Do. ..	..	14	169	31	180°, facing S.E.	On the roof of a house.	Dioptric, 4th order.	1st November 1849; improved 1871.	Exhibited to warn mariners off the Santopilly rocks, from which this light bears N.W. $\frac{3}{4}$ W., distance 6$\frac{1}{2}$ miles.
Cocanada (Vakalapudi).	Four-and-three-quarter miles north of Cocanada river, 500 yards from the shore.	17 0 40	82 16 30	Do. ..	Revolving.	A flash every 10 seconds.	14	80	76	In every direction seaward.	White column..	Catoptric, 4th order.	15th Jannary 1879.	This light is intended to lead vessels clear of the shoals to the northward of Point Godávari when coming into the Cocanada anchorage from the southward and eastward.
Coringa or Hope Island.	On the southern part of Hope Island and distant about two-and-a-half miles from the sea.	16 49 5	82 18 58	Do. ..	Fixed..	..	10 to 12	83	94	All round the compass.	Masonry tower horizontal alternate bands of black and white.	Country-made, with brass reflectors.	1817.	Intended to lead vessels clear of the rocks and shoals off Godávari Point.
Masulipatam ..	In the fort	16 9 15	81 9 25	Do. ..	Do. ..	..	6	69	112	180°	Flagstaff ..	Dioptric, 6th order.	1858; improved 1870.	As a guide for vessels to the anchorage.
Point Divi ..	Two miles N. W. of point.	15 58 55	81 9 25	Do. ..	Do. ..	..	14	48$\frac{1}{2}$	50	225°, or from north through west to south-west.	Masonry column white.	Dioptric, 4th order.	1st May 1851; improved 1870.	Is intended to point out the position of the danger.
Armeghon or Armogham.	Mainland, village of Moona or Moonapollium.	13 53 8	80 11 47	Do. ..	Flashing.	A flash every 20 seconds.	14	107	111	180°, or the whole sea horizon.	Do. ..	Do. ..	1st January 1853; improved 1881.	Warns vessels off the Armeghon shoal, the shoalest part of which (1$\frac{3}{4}$ fathoms) lies six miles off shore.
Pulicat	Near the beach ..	13 25 15	80 19 6	Do. ..	Fixed..	..	14	68	57	180°, or the whole sea horizon.	Masonry column with black bands.	Do. ..	1859; altered 1881.	To guide vessels clear of the Pulicat shoal. When the light bears W. $\frac{1}{2}$ N. a vessel is to the northward of all dangers.
Madras	On esplanade north of the fort.	13 5 11	80 16 51	Do. ..	Flashing.	Light has five faces, and every minute one face flashes towards the same spot, but three faces are presented seaward at one time.	20	128	125	310°, facing east.	Granite column.	Catadioptric ..	1st January 1844.	To guide vessels clear of the Pulicat shoal and into the roadstead. Mariners should not bring this light to southward of S.S.W. $\frac{1}{2}$ W. to avoid Pulicat shoal.
Negapatam ..	On bastion	10 45 30	79 50 20	Do. ..	Fixed..	..	14	79$\frac{1}{2}$	83	180°, or the whole sea horizon.	Masonry column white.	Dioptric, 4th order.	1st August 1846; improved 1870.	As a guide for vessels to the anchorage.
Pamban Pass ..	On a sand hill about one mile east of northern channel.	9 17 14	79 12 38	Do. ..	Do. ..	..	14	97	72	All round the compass.	Circular masonry column.	Catadioptric, 4th order.	21st April 1846; improved 1860.	Is a guide to vessels making for the Pámban channel.
Tuticorin ..	North extreme of Hare Island or Paundiantivo, 2$\frac{1}{2}$ miles east of Tuticorin.	8 47 10	78 11 20	Do. ..	Do. ..	..	14	85	91	All round the compass.	Sandstone column, colored, brown, lantern white.	Do. ..	15th May 1845; improved 1874.	As a guide for vessels to the anchorage.
Muttum (Cadiapatam).	A rocky promontory known as "Muttum Point."	8 7 30	77 18 10	Do. ..	Do. ..	..	20	132	72	All round ..	Dark grey granite column.	First order, dioptric.	1st January 1883.	This light, in the territory of Travancore, is intended to mark the vicinity of the Crocodile rock.

LIST OF LIGHTS IN THE

Names of lights.	Location.	Position. Latitude.	Position. Longitude.	Color of lights.	Fixed, flashing, intermitting, alternating, or revolving.	Interval of revolution or flash.	Miles visible in clear weather.	Height in feet of centre of lantern above high water.
		N. DEG. M. S.	E. DEG. M. S.				MILES.	FEET.
Cochin	On a small mound which formed a bastion of the old fort to the south of the harbour.	9 57 47	76 13 45	White.	Fixed.	..	15	100
Calicut	On the sandy beach.	11 15 5	75 45 35	Do. ..	Do. ..	..	14	102
Beypore ..	Near the beach ..	11 10 0	75 47 0	Red ..	Do. ..	..	5	60
Tellicherry ..	On the fort wall near the beach.	11 44 50	75 28 30	White.	Do. ..	..	8	70
Cannanore ..	On the fort rampart near the beach.	11 51 10	75 21 45	Red ..	Do. ..	..	6 to 8	64
Mangalore ..	On a hill above the town, and near some high trees.	12 52 17	74 50 8	White.	Do. ..	..	14	240

MADRAS PRESIDENCY—*continued.*

Height in feet of building from base to vane.	Arc of illumination (bearings are magnetic and from seaward).	Nature of construction, color, or any peculiarity of light-house.	Character and order of illuminating apparatus.	Year lighted.	Remarks.
FEET. 91	270°	White laterite column.	Catadioptric, 4th order.	1st April 1839; improved 1868.	Harbour light. During the S.W. monsoon, when Cochin port is avoided by shipping, a small light is exhibited from a flagstaff at Narakel, about five miles to the northward of Cochin.
98	180 seaward.	White column..	Dioptric, 4th order.	1847; improved 1881.	To guide vessels to the anchorage clear of the reef, which lies about one mile S. 30° W. from the light.. A small red light is exhibited from the head of the pier as a guide for small coasting craft when entering the port.
..	180°	Flagstaff ..	Globular lantern.	17th February 1883.	As a guide for vessels to the anchorage.
..	158°, or between the bearings of S.E. by E. and N.W. by N.	Small masonry tower.	Dioptric, 6th order; Chance's port or signal light	1835; improved 1881.	Harbour light.
25 from the rampart.	180°	Small masonry tower of a light yellow color.	Dioptric, 6th order.	17th October 1843; improved 1880.	Do.
65	180°	Small white masonry tower.	Dioptric, 4th order.	1st October 1842; improved 1870.	As a guide for vessels to the anchorage.

STATEMENT of expenditure of light-houses of the Madras Presidency for 1884-85.

Gopalpur Light.

	Amount. RS. A. P.	Total. RS. A. P.
One Assistant Superintendent	120 0 0	
Two Lascars	192 0 0	
Oil	68 0 0	
Stores	4 8 0	
Contingencies	7 5 0	
		391 13 0

Calingapatam Light-house.

One Assistant Superintendent	120 0 0	
Two Lascars	192 0 0	
Oil	824 10 0	
Stores	8 4 0	
Contingencies	8 6 6	
		1,153 4 6

Light-house at Santopilly.

One Superintendent	840 0 0	
One Assistant do.	175 0 0	
Four Lascars	360 0 0	
Oil	102 0 0	
Stores	30 2 0	
Contingencies	26 1 2	
Public Works charges for repairs	298 3 9	
		1,831 6 11

Vakalapudi Light-house, Cocanada.

One Superintendent	1,200 0 0	
One Assistant do.	144 0 0	
Four Lascars	360 0 0	
Oil	85 0 0	
Stores	52 0 0	
Contingencies	53 1 2	
Value of 6th order light	4,144 9 0	
		6,038 10 2

Hope Island Light-house.

One Superintendent	840 0 0	
One Assistant do.	144 0 0	
Four Lascars	372 0 0	
Oil	1,280 0 0	
Stores	53 4 0	
Contingencies	124 5 1	
		2,813 9 1

Masulipatam Light.

One Assistant Superintendent	120 0 0	
Three Lascars	252 0 0	
Oil	42 0 0	
Stores	5 8 0	
Contingencies	7 9 6	
		427 1 6

Point Divi Light-house.

One Superintendent	840 0 0	
Five Lascars	405 3 8	
Oil	85 0 0	
Stores	25 0 0	
Contingencies	55 12 2	
		1,437 15 10

Armeghon Light-house.

	Amount. RS. A. P.	Total. RS. A. P.
One Superintendent	1,347 14 10	
Five Lascars	396 0 0	
Oil	119 0 0	
Stores	85 0 0	
Contingencies	54 15 4	
Public Works charges for repairs	622 3 10	
		2,625 2 0

Pulicat Light-house.

One Superintendent	840 0 0	
Five Lascars	396 0 0	
Oil	85 0 0	
Stores	75 8 0	
Contingencies	62 8 6	
Public Works charges for repairs	376 12 0	
		1,835 12 6

Madras Light-house.

One Superintendent	*1,500 0 0	
One Assistant Superintendent	252 0 0	
Four lascars	504 0 0	
One sweeper	12 0 0	
One washerman	12 0 0	
One toty	12 0 0	
Oil	1,755 0 0	
Stores	302 8 0	
Contingencies	61 5 9	
		4,410 13 9

Negapatam Light-house.

One Assistant Superintendent	120 0 0	
Two Lascars	179 4 0	
Oil	85 0 0	
Stores	18 0 0	
Contingencies	15 0 6	
		417 4 6

Pamban Light-house.

One Assistant Superintendent	120 0 0	
One Lascar	95 8 0	
Oil	102 0 0	
Stores	20 4 0	
Contingencies	24 1 9	
		361 13 9

Tuticorin Light-house.

One Assistant Superintendent	144 0 0	
Four Lascars	360 0 0	
Oil	102 0 0	
Stores	28 4 0	
Contingencies	21 5 2	
		655 9 2

Muttum Light-house.

One Superintendent	1,500 0 0	
One Head Lightkeeper	180 0 0	
Four Lascars	336 0 0	
Oil	510 0 0	
Stores	230 8 0	
Contingencies	121 5 9	
Public Works charges for repairs	575 0 0	
		3,452 13 9

*Including house-rent 25 rupees per mensem.

	Amount. RS. A. P.	Total. RS. A. P.
Cochin Light-house.		
One Assistant Superintendent	144 0 0	
Two Lascars	203 8 0	
Oil	127 8 0	
Stores	8 0 0	
Contingencies	9 1 4	
		492 1 4
Calicut Lighthouse.		
One Assistant Superintendent	120 0 0	
Three Lascars	276 0 0	
Stores	13 2 0	
Contingencies	20 2 5	
		429 4 5
Beypore Light.		
One Lightkeeper	120 0 0	
Oil	14 0 0	
Contingencies	2 1 0	
		136 1 0
Tellicherry Light.		
One Assistant Superintendent	120 0 0	
Two Lascars	180 0 0	
Oil	85 0 0	
Stores	18 4 0	
Contingencies	15 2 9	
		418 6 9
Cannanore Light-house.		
One Assistant Superintendent	120 0 0	
One Lascar	96 0 0	
Oil	136 0 0	
Stores	12 0 0	
Contingencies	17 4 1	
		381 4 0
Mangalore Light-house.		
One Assistant Superintendent	120 0 0	
Four Lascars	348 0 0	
Oil	13 0 0	
Stores	19 8 0	
Contingencies	24 2 11	
		664 10 11
Total		30,374 14 11

ORDER—dated 30th July 1885, No. 321, Marine.

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(True Extract.)

E. F. WEBSTER,
Chief Secretary.

To the Master Attendant, Madras.

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Chief Secretary.

Exd. J. Wright.

B.n.2026. W. 41. 9.85-

Communicated to
the Supg. Sygmens concerned
for information
LDI J.S.S.

Govt. of {1885} Madras.

MARINE.

Issued

Recd. *Encl.*

G.O., &c., 30th July 1885,
Nos. 321, 322.

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JULY.

To
S Es I, II, III. IV. & VI

Light-houses.

Forwarding to the Government of India copy of a report by the Master Attendant on the Madras Lights for 1884-85.

	Amount. RS. A. P.	Total. RS. A. P.
Cochin Light-house.		
One Assistant Superintendent	144 0 0	
Two Lascars	203 8 0	
Oil	127 8 0	
Stores	8 0 0	
Contingencies	9 1 4	492 1 4
Calicut Lighthouse.		
One Assistant Superintendent	120 0 0	
Three Lascars	276 0 0	
Stores	13 2 0	
Contingencies	20 2 5	429 4 5
Beypore Light.		
One Lightkeeper	120 0 0	
Oil	14 0 0	
Contingencies	2 1 0	136 1 0
Tellicherry Light.		
One Assistant Superintendent	120 0 0	
Two Lascars	180 0 0	
Oil	85 0 0	
Stores	18 4 0	
Contingencies	15 2 9	418 6 9
Cannanore Light-house.		
One Assistant Superintendent	120 0 0	
One Lascar	96 0 0	
Oil	136 0 0	
Stores	12 0 0	
Contingencies	17 4 1	381 4 0
Mangalore Light-house.		
One Assistant Superintendent	120 0 0	
Four Lascars	348 0 0	
Oil	13 0 0	
Stores	19 8 0	
Contingencies	24 2 11	664 10 11
Total		30,374 14 11

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MADRAS PRESIDENCY—*continued.*

Height in feet of building from base to vane.	Arc of illumination (bearings are magnetic and from seaward).	Nature of construction, color, or any peculiarity of light-house.	Character and order of illuminating apparatus.	Year lighted.	Remarks.
FEET. 91	270°	White laterite column.	Catadioptric, 4th order.	1st April 1839; improved 1868.	Harbour light. During the S.W. monsoon, when Cochin port is avoided by shipping, a small light is exhibited from a flagstaff at Narakel, about five miles to the northward of Cochin.
98	180 seaward.	White column..	Dioptric, 4th order.	1847; improved 1881.	To guide vessels to the anchorage clear of the reef, which lies about one mile S. 30° W. from the light. A small red light is exhibited from the head of the pier as a guide for small coasting craft when entering the port.
..	180°	Flagstaff ..	Globular lantern.	17th February 1883.	As a guide for vessels to the anchorage.
..	158°, or between the bearings of S.E. by E. and N.W. by N.	Small masonry tower.	Dioptric, 6th order; Chance's port or signal light	1835; improved 1881.	Harbour light.
25 from the rampart.	180°	Small masonry tower of a light yellow color.	Dioptric, 6th order.	17th October 1843; improved 1880.	Do.
65	180°	Small white masonry tower.	Dioptric, 4th order.	1st October 1842; improved 1870.	As a guide for vessels to the anchorage.

STATEMENT of expenditure of light-houses of the Madras Presidency for 1884-85.

Gopalpur Light.

	Amount. RS.	A.	P.	Total. RS.	A.	P.
One Assistant Superintendent	120	0	0			
Two Lascars	192	0	0			
Oil	68	0	0			
Stores	4	8	0			
Contingencies	7	5	0			
				391	13	0

Calingapatam Light-house.

One Assistant Superintendent	120	0	0			
Two Lascars	192	0	0			
Oil	824	10	0			
Stores	8	4	0			
Contingencies	8	6	6			
				1,153	4	6

Light-house at Santopilly.

One Superintendent	840	0	6			
One Assistant do.	175	0	0			
Four Lascars	360	0	0			
Oil	102	0	0			
Stores	30	2	0			
Contingencies	26	1	2			
Public Works charges for repairs	298	3	9			
				1,831	6	11

Vakalapudi Light-house, Cocanada.

One Superintendent	1,200	0	0			
One Assistant do.	144	0	0			
Four Lascars	360	0	0			
Oil	85	0	0			
Stores	52	0	0			
Contingencies	53	1	2			
Value of 6th order light	4,144	9	0			
				6,038	10	2

Hope Island Light-house.

One Superintendent	840	0	0			
One Assistant do.	144	0	0			
Four Lascars	372	0	0			
Oil	1,280	0	0			
Stores	53	4	0			
Contingencies	124	5	1			
				2,813	9	1

Masulipatam Light.

One Assistant Superintendent	120	0	0			
Three Lascars	252	0	0			
Oil	42	0	0			
Stores	5	8	0			
Contingencies	7	9	6			
				427	1	6

Point Divi Light-house.

One Superintendent	840	0	0			
Five Lascars	405	3	8			
Oil	85	0	0			
Stores	25	0	0			
Contingencies	55	12	2			
				1,437	15	10

Armeghon Light-house.

	Amount. RS.	A.	P.	Total. RS.	A.	P.
One Superintendent	1,347	14	10			
Five Lascars	396	0	0			
Oil	119	0	0			
Stores	85	0	0			
Contingencies	54	15	4			
Public Works charges for repairs	622	3	10			
				2,625	2	0

Pulicat Light-house.

One Superintendent	840	0	0			
Five Lascars	396	0	0			
Oil	85	0	0			
Stores	75	8	0			
Contingencies	62	8	6			
Public Works charges for repairs	376	12	0			
				1,835	12	6

Madras Light-house.

One Superintendent	*1,500	0	0			
One Assistant Superintendent	252	0	0			
Four lascars	504	0	0			
One sweeper	12	0	0			
One washerman	12	0	0			
One toty	12	0	0			
Oil	1,755	0	0			
Stores	302	8	0			
Contingencies	61	5	9			
				4,410	13	9

Negapatam Light-house.

One Assistant Superintendent	120	0	0			
Two Lascars	179	4	0			
Oil	85	0	0			
Stores	18	0	0			
Contingencies	15	0	6			
				417	4	6

Pamban Light-house.

One Assistant Superintendent	120	0	0			
One Lascar	95	8	0			
Oil	102	0	0			
Stores	20	4	0			
Contingencies	24	1	9			
				361	13	9

Tuticorin Light-house.

One Assistant Superintendent	144	0	0			
Four Lascars	360	0	0			
Oil	102	0	0			
Stores	28	4	0			
Contingencies	21	5	2			
				655	9	2

Muttum Light-house.

One Superintendent	1,500	0	0			
One Head Lightkeeper	180	0	0			
Four Lascars	336	0	0			
Oil	510	0	0			
Stores	230	8	0			
Contingencies	121	5	9			
Public Works charges for repairs	575	0	0			
				3,452	13	9

* Including house-rent 25 rupees per mensem.

	Amount. RS. A. P.	Total. RS. A. P.
Cochin Light-house.		
One Assistant Superintendent	144 0 0	
Two Lascars	203 8 0	
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Stores	13 2 0	
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Beypore Light.		
One Lightkeeper	120 0 0	
Oil	14 0 0	
Contingencies	2 1 0	136 1 0
Tellicherry Light.		
One Assistant Superintendent	120 0 0	
Two Lascars	180 0 0	
Oil	85 0 0	
Stores	18 4 0	
Contingencies	15 2 9	418 6 9
Cannanore Light-house.		
One Assistant Superintendent	120 0 0	
One Lascar	96 0 0	
Oil	136 0 0	
Stores	12 0 0	
Contingencies	17 4 1	381 4 0
Mangalore Light-house.		
One Assistant Superintendent	120 0 0	
Four Lascars	348 0 0	
Oil	13 0 0	
Stores	19 8 0	
Contingencies	24 2 11	664 10 11
Total		30,374 14 11

ORDER—dated 30th July 1885, No. 321, Marine.

Ordered to be forwarded to the Government of India.

(True Extract.)

E. F. WEBSTER,
Chief Secretary.

To the Master Attendant, Madras.

ENDORSEMENT—dated 30th July 1885, No. 322, Marine.

Copy forwarded to the Government of India, Department of Finance.

E. F. WEBSTER,
Chief Secretary.

Exd. J. Wright.

LIST OF LIGHTS IN THE

Names of lights.	Location.	Position. Latitude.	Position. Longitude.	Color of lights.	Fixed, flashing, intermitting, alternating, or revolving.	Interval of revolution or flash.	Miles visible in clear weather.	Height in feet of centre of lantern above high water.
		N. DEG. M. S.	E. DEG. M. S.				MILES.	FEET.
Cochin	On a small mound which formed a bastion of the old fort to the south of the harbour.	9 57 47	76 13 45	White.	Fixed.	..	15	100
Calicut	On the sandy beach.	11 15 5	75 45 35	Do. ..	Do. ..	..	14	102
Beypore ..	Near the beach ..	11 10 0	75 47 0	Red ..	Do. ..	..	5	60
Tellicherry ..	On the fort wall near the beach	11 44 50	75 28 30	White.	Do. ..	..	8	70
Cannanore ..	On the fort rampart near the beach.	11 51 10	75 21 45	Red ..	Do. ..	..	6 to 8	64
Mangalore ..	On a hill above the town, and near some high trees.	12 52 17	74 50 8	White.	Do. ..	..	14	240

	Amount. RS. A. P.	Total. RS. A. P.
Cochin Light-house.		
One Assistant Superintendent	144 0 0	
Two Lascars	203 8 0	
Oil	127 8 0	
Stores	8 0 0	
Contingencies	9 1 4	
		492 1 4
Calicut Lighthouse.		
One Assistant Superintendent	120 0 0	
Three Lascars	276 0 0	
Stores	13 2 0	
Contingencies	20 2 5	
		429 4 5
Beypore Light.		
One Lightkeeper	120 0 0	
Oil	14 0 0	
Contingencies	2 1 0	
		136 1 0
Tellicherry Light.		
One Assistant Superintendent	120 0 0	
Two Lascars	180 0 0	
Oil	85 0 0	
Stores	18 4 0	
Contingencies	15 2 9	
		418 6 9
Cannanore Light-house.		
One Assistant Superintendent	120 0 0	
One Lascar	96 0 0	
Oil	136 0 0	
Stores	12 0 0	
Contingencies	17 4 1	
		381 4 0
Mangalore Light-house.		
One Assistant Superintendent	120 0 0	
Four Lascars	348 0 0	
Oil	13 0 0	
Stores	19 8 0	
Contingencies	24 2 11	
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APPENDIX to Marine G.O., No. 529, dated 3rd December 1884.

From Lieutenant-General A. FRASER, R.E., C.B., late Secretary to the Government of India, Public Works department, to the Under Secretary of State for India, dated 30th June 1884.

Although no explanation of mine can remove the distress I feel at the destruction of works with which I, as an engineer and adviser to the Government of India, have been intimately connected, I beg to offer some observations on the subject of the loss last month in a cyclone of the lighthouse on the Oyster Reef of Akyab. This serious misfortune has followed the disappearance, seven years ago, of the somewhat similar building which had been erected on the Krishna shoal. Both were on screw piles, both were recommended by me, the designs were generally approved by me, and one (that on the Krishna shoal) was put up under my personal direction; and the following remarks are necessary, in order that the Government may be able to consider how far my judgment, in recommending the erection of these structures on these particular points, may have been in error, and to what extent it should trust again in similar buildings under similar conditions.

2. With a view of arriving at a just estimate of the considerations which influenced my judgment in this weighty matter, I must ask the Government to go back with me for a moment thirty years—to the time (1854) when Lord Dalhousie was Governor-General of India. This noble Lord, foreseeing the strides which British Burma was likely to make in commercial prosperity, saw at the same time, in the Alguada Reef, a great danger to ships in their approach to, and departure from, the coasts of the province. His Lordship, having at the close of the Burmese war expressed himself, in terms noted in the margin, satisfied with the manner I had dealt with Rangoon as Executive Engineer under the lead of Major Hugh Fraser, R.E., the then Chief Engineer, did me the honor of selecting me, at the recommendation of that officer, to undertake the work of building a lighthouse on that dangerous reef. I had then no experience of such works, and Lord Dalhousie, noting this, desired that I should be sent home for the purpose of inspecting works of a similar character in England and abroad, first making a general survey of the reef and its neighbourhood.

Military department of Government of India, No. 457, of 16th December 1854, conveys "to Lieutenant Fraser, the Executive Engineer, an expression of the approbation with which the Most Noble the Governor-General in Council views the zeal and ability he has displayed in forming the new cantonment in question."

3. I made this general survey at that time, but some State financial difficulties intervening it was determined to postpone the works on the reef. In the meantime some specially important and large operations in building barracks and in otherwise improving the condition of the European troops in the garrison of Fort William, Calcutta, were required, and in these Lord Canning, the then Governor-General (1855), took personal interest. I was moved to forego the furlough, for which I had applied, in order to undertake these works. This I did, and when they were sufficiently in train towards completion,* the Governor-General expressing himself completely satisfied (His Excellency often personally visited my works) with my proceedings in Fort William, found himself able to forward the desire of his great predecessor by sending me, early in 1857, to England to fit me for the work which Lord Dalhousie had had at heart.

* I have some pride in noting here that, in dealing with Rangoon and Fort William, I carried out the chief works, which resulted in rendering the two most notoriously unhealthy stations for British troops in the East, those which became thereafter more healthy for Europeans than any other places in the plains of India.

4. The result of my deputation to England was embodied in a report, dated October 1857, which I submitted to the Honorable the Court of Directors, but owing to the occurrence of the Mutiny it was not till 1859 (I being then Under Secretary to the Government of India in the Public Works department) that Lord Canning recorded the observations I have transferred to the margin. I extract these observations and those of Lord Dalhousie because they show (1) that, at whatever inconvenience, experience *was* then considered necessary in this class of work; and (2) that the heads of the Government had fair reason, from works already executed with success, for their confidence in my ability to carry out perhaps the most difficult of all engineering works, in a country where all labor had to be instructed, and all material had to be obtained from abroad.

Extract letter of 16th December 1859 from the Secretary, Government of India, with the Governor-General, to the Officiating Secretary to the Government of India, Public Works department, Calcutta:—

"2. The Governor-General is of opinion that this work (the Alguada Reef lighthouse) should now be commenced at once, and he comes to this conclusion not merely on account of the importance of the work in itself, but because by further delay we risk the loss of an officer who was especially deputed to England to study the subject.

"3. Though Captain Fraser's services as Under Secretary in this department (Public Works department) are very highly valued, and their loss will be seriously felt, it is necessary that he should now resume the duties originally confided to him."

Cochin Light-house.

	Amount. RS.	A.	P.	Total. RS.	A.	P.
One Assistant Superintendent	144	0	0			
Two Lascars	203	8	0			
Oil	127	8	0			
Stores	8	0	0			
Contingencies	9	1	4			
				492	1	4
Calicut Lighthouse.						
One Assistant Superintendent	120	0	0			
Three Lascars	276	0	0			
Stores	13	2	0			
Contingencies	20	2	5			
				429	4	5
Beypore Light.						
One Lightkeeper	120	0	0			
Oil	14	0	0			
Contingencies	2	1	0			
				136	1	0
Tellicherry Light.						
One Assistant Superintendent	120	0	0			
Two Lascars	180	0	0			
Oil	85	0	0			
Stores	18	4	0			
Contingencies	15	2	9			
				418	6	9
Cannanore Light-house.						
One Assistant Superintendent	120	0	0			
One Lascar	96	0	0			
Oil	136	0	0			
Stores	12	0	0			
Contingencies	17	4	1			
				381	4	0
Mangalore Light-house.						
One Assistant Superintendent	120	0	0			
Four Lascars	348	0	0			
Oil	13	0	0			
Stores	19	8	0			
Contingencies	24	2	11			
				664	10	11
Total				30,374	14	11

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4. The result of my deputation to England was embodied in a report, dated October 1857, which I submitted to the Honorable the Court of Directors, but owing to the occurrence of the Mutiny it was not till 1859 (I being then Under Secretary to the Government of India in the Public Works department) that Lord Canning recorded the observations I have transferred to the margin. I extract these observations and those of Lord Dalhousie because they show (1) that, at whatever inconvenience, experience *was* then considered necessary in this class of work; and (2) that the heads of the Government had fair reason, from works already executed with success, for their confidence in my ability to carry out perhaps the most difficult of all engineering works, in a country where all labor had to be instructed, and all material had to be obtained from abroad.

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"3. Though Captain Fraser's services as Under Secretary in this department (Public Works department) are very highly valued, and their loss will be seriously felt, it is necessary that he should now resume the duties originally confided to him."

5. During the period between December 1859 and April 1865 (when the Alguada Reef lighthouse was lighted) I thought it my duty to employ myself not only on the special work for which I had been fitted by the Government, but in seeking to utilise the experience gained in England on lighthouse work generally, by suggesting measures for fully protecting the trade with Burma, which was advancing at a rate which probably even Lord Dalhousie had not anticipated. These suggestions resulted in my building (1) the stone lighthouse on Double Island, showing a light of the first class, as a guide for vessels making for the port of Moulmein; (2) the iron lighthouse on Table Island, of the Great Coco group, Andaman Islands, which also shows a light of the first class, to facilitate the navigation of the Preparis Channel. I subsequently arranged, before leaving Burma, for a lighthouse on screw piles; (3) the China Bukeer, showing a first-class light; and (4) for a second of similar structure on the eastern grove, showing a specially designed light, as "land-fall" lights for the Rangoon river. I further had (5) the Savage Island light, used to facilitate entering Akyab Harbour, improved from an apparatus furnished with common oil lamps to a third-class ordinary dioptric light. I was thus, in return for the experience the Government had allowed me to gain in Europe, enabled to add six lights to the 20 which previously lighted both sides of the Bay of Bengal, and, with *two exceptions*, had made the entire coast on the eastern side of that bay practically safe, as regards *land-fall*, to ships trading on that side from Chittagong to Acheen head.

6. The *two exceptions* noted in the last paragraph required to be dealt with in order that ships might be completely guarded against all the prominent dangers of the entire British Burma coast. *The one* was the Krishna shoal and Baragon flat, the junction of which formed the turning point from the Bay of Bengal to the Rangoon river, and Gulf of Martaban on its western side, the light in Double Island forming the guard on its (the Gulf's) eastern side. *The other* was the Oyster Reef, which required to be lighted to render safe the northern and western approaches to the harbour of Akyab. In thick weather ships attempting to make Akyab were always in more or less fear, according to the time at which sun or stars had been last seen, of this reef, which was all the more dangerous from the fact of its being only just a-wash at low water.

7. By the cyclone of 1864, and previous years, immense damage had been done to ships lying in the Hooghly off Calcutta, by reason of the insufficiency of the moorings, and the Government of India had lost more than one lightship with all hands on board in these disastrous winds. I had thus had my attention called to works with Mitchell's screws and screw piles. My plan for mooring the shipping was approved by the Secretary of State (*see* letter from your office, dated 18th January 1867, to my address), and the work was successfully carried out. I believe the only danger to ships now lying in the Hooghly from a cyclone, as regards moorings, is the comparative weakness of the ships' own chains. I suggested also screw-pile jetties for Calcutta, which were afterwards carried out with, I believe, complete success.

8. I found, moreover, that no *solid* building could be erected, on either of the points which, as I have shown, remained to be lighted for the complete protection of ships making the coasts of British Burma, at any reasonable cost, if it could be done at all. I, at all events at that time, did not see my way to any successful result from any amount of expenditure in this direction.

With the knowledge of the loss of life which had occurred by the destruction of such vessels,* I was equally undesirous of recommending a lightship at points which in either case, to my mind, would have involved the putting of a ship on a dead lee shore, and its inevitable destruction, with all hands, in case of a severe cyclone.

* Even the best cared for lightships on British coasts are liable to destruction. This is the latest example extracted from a report in the *Morning Post* of the 22nd June 1884:—

"Sinking of the *Girdler* Lightship.

"A Lloyd's telegram from Dover states that the P. and O. steamer *Indus* from London to Sydney, laden with a general cargo and 400 passengers, ran into and sank the *Girdler* lightship on Friday night. The crew of the lightship were taken on board the *Indus* and landed at Dover." It might easily have been otherwise with the crew had there been unfavorable conditions of weather.

9. As a lighthouse require the attendance of not more than three or four keepers, my decision was largely influenced by the smaller loss of life which would ensue, on any accident occurring, than would be the case in respect of a lightship which would require eight or nine times the number of men to manage her.

10. Again, I was influenced by the much smaller cost of maintaining a lighthouse which, including interest on cost, was not above half that of maintaining a lightship (*see* also on this point the report of Captain A. Dundas Taylor, I.N., No. 73, D.B., dated 14th February 1877, to the Government of India, Department of Revenue, Agriculture, and Commerce, on the subject of the substitution of lighthouses for lightships in the Hooghly and its approaches).

11. A third point which swayed my judgment in favor of the lighthouse was the superiority of the light in power, elevation, and steadiness over that borne by a lightship.

12. The way I put to the Government the result of my considerations is shown in the following extract of a memorandum which I prepared for the Lieutenant-Governor of Bengal

(Sir A. Eden): "On the substitution of lighthouses for lightships" at the Sandheads, dated 27th March 1879 (after the loss of the screw-pile lighthouse on the Krishna shoal):—

"21. From the figures given in the margin it will be seen that, by substituting lighthouses for lightships, the Port (Calcutta) funds will save £7,625 a-year, with better lights and less risk to human life. Accidents may occur, but there is plenty of money to repair damages, and accidents are less likely to occur to lighthouses than to lightships. The risk must be accepted, but the risk is less with lighthouses than with lightships." All my previous reports (which I have not by me) adopted the same tone.

Was I justified or not in adopting this tone? I really cannot feel sure that, even now were I in a position to be consulted, I should not recommend as strongly as I did then the erection of lighthouses of this class in positions where *weight* cannot, by reason of absence of adequate foundations, or in consequence of excessive cost and danger in construction, be opposed to the impact of the sea, or where lightships on a lee shore would be subject to cyclones. I must leave to the Government the decision on this question, being, however, certain that whatever the decision may be, it cannot either deepen or alleviate the regret I feel at the event which I am now deploring. The only feelings which give relief to my mind on the subject are that—

(1) If these dangerous points had not been marked at all, which but for me they probably would not have been, the loss by wrecks of life and property for the eight or nine years of increasing trade during which these lighthouses stood would have been very considerable.

(2) I should have incurred greater risk of life by placing lightships in these positions. But I could not again recommend construction on such points of a coast as I have noted of such lighthouses as those on screw piles, unless the Government followed the recommendations I previously gave in respect of *their care*.*

* Paragraph 42 of my report on the Savage lighthouse, dated 13th March 1865. My letter to Secretary to the Government of India, No. 39-59C., dated 5th June 1865, said:—

"But it would be better, in my opinion, to do nothing than to go to the expense of alteration or restoration, and, indeed, of building any new lighthouses at all, unless the Government are prepared to admit the necessity of, and meet the extra expense consequent on, having this and all their lighthouses properly visited and cared for by competent people."

13. It is necessary now to observe that I had nothing to do personally with the construction of the lighthouse on the Oyster Reef beyond a recommendation of a structure, the design for which I had *generally* approved, on screw piles specially strengthened for that position. I knew nothing of the precise spot selected for its position (a matter here of deep moment), but it was built under the direction of Colonel W. S. Oliphant, R.E., who was at the time Chief Engineer of British Burma, and of Mr. H. M. Mathews, M.I.C.E., a Civil Engineer of great ability, who was then Executive Engineer of the Rangoon Division of Public Works. I do not doubt, therefore, but that it was properly constructed, and, from these competent officers adopting the design, I may assume that they found nothing faulty in it.

14. Before, however, leaving Rangoon permanently for the North-Western Provinces in 1870,† I placed very distinctly before the Government my view of how these structures should be built and cared for. I said in effect that it was impossible, with any sense of safety, for the Government to spend large sums of money on their construction without making adequate arrangements for their care and maintenance in efficiency. I don't for a moment presume to say that such care as was possible, by such officers as were available in such sea transport as the exigencies of other service might from time to time be placed at their disposal, was not exercised. But what I do say is that there has been no care taken of these important works when built directed by that continued experience which both Lords Dalhousie and Canning considered essential as to their construction; that no systematic inspection, repair, or protection of the buildings and their surroundings by persons having full knowledge of all the circumstances and conditions of each work has been undertaken, or indeed has been possible under the system adopted—a system which involves the constant removal of officers, inexperienced in the first instance in this class of work, just as they begin to know something of the works and the conditions affecting them; a system which limits their power of inspection to the time when perhaps the only steamer available for the general service of the local Government can be placed at their disposal.

† I had refused in 1863, I may here remark, the offer of the Government of India to appoint me Chief Engineer and Secretary to the Government of Bengal in the Public Works department, in order that I might devote my special experience to the completion of the lighthouse on the Alguada Reef and other works of cognate character. I thus lost a chance of promotion which did not recur till 1870.

15. The Chief Commissioner, in submitting my final report regarding the British Burma lighthouses to the Government of India with his letter, No. 821-104 C.I., dated Rangoon, 8th October 1869, said:—

"Paragraph 7. Colonel Fraser points to the satisfactory financial condition of those lighthouses that have been for some time in operation. He would abolish as a separate charge ‡

‡ Substituting a tonnage due as in France.

all light dues, make the works Imperial works, supervise them by Imperial establishments, and maintain them from Imperial funds. These are, indeed, portions of the propositions * put forward many years ago by him for the consolidation of the various managements of the lighthouses around the coast of the empire under one central board of management." A reference to my report noted in the margin, and to that mentioned by the Chief Commissioner as having been forwarded to the Government with his above letter, wlll show what my proposals were. It may not have been consistent with the policy of the Government to adopt them, but of this I am certain, that unless a department, combining engineering and nautical knowledge (and not only knowledge, but engaging the sympathy of official nautical officers), with a power of keeping and transmitting the results of experience gained in this class of work, and of providing proper means of transport for inspectors and material and labor for the repair of damage, be organised, great sea lights will be very much left to the mercy of the waves and the winds, while the valuable apparatuses which have in many cases been provided will never be kept up to that state of efficiency which distinguished the Scotch and French lights and those under the Trinity Board of England. I endeavoured, without success, to utilise my experience in establishing such an arrangement, and when I look down the list (1882) of lights on the coasts of India, and see the nature of those exhibited as described in the numbers in the list noted in the margin, I cannot help feeling, considering also the many other dangerous points requiring attention, that there would be ample field for the operations of such a department, while surely the cost of its care of works already executed would be more than compensated by a comparative freedom from disaster. Any how the system I have described as existing is not fair to the constructors, whose reputation may be compromised; it is not fair to those who, though most anxious to do their duty, cannot look after the works properly; it is unfair to the Government itself, inasmuch as it prevents its maintaining in efficiency these important adjuncts to the safety of the commerce upon which the prosperity of the State depends, while it must share with every one the discredit of preventible disaster.

* See report to the Honorable Court of Directors of East India Company mentioned in paragraph 4.

Nos. 15, 16, 20, 22, 26, 28, 29, 30, 32, 42, 43, 48, 49, 56, 77, 81, 82, 83 (84 False Point was before 1880 a wretched light, although it was the chief "land-fall" light in British India. It was altered at my suggestion), 93, 94.

16. I have only to refer to the papers accompanying the despatches from the Government of India to the Secretary of State, No. 54, dated 30th November 1877, reporting the disappearance of the Krishna Shoal lighthouse, to show the want of care (of the kind I insist upon) to which these structures have been, and no doubt still are, subject. From these papers it would appear that, subsequently to the date I visited the lighthouse in 1870, about two years after it was built, and in which year I finally left the province, no soundings to test scour had been taken, although that was one of the special instructions I left in the light-house. I also requested that at suitable times, before and after each monsoon, soundings should be taken all round the lighthouse to the distance of a mile from it as a centre. I don't believe myself that scour alone could have caused the destruction of the building, still, if it had been ascertained that great scour *had* been going on for some time, measures might have been taken to move the light or divert the scour, or, at all events, to remove the light-keepers. It had not been found difficult, I believe, to move the "China Bukeer" lighthouse of similar character from the shore into two fathoms at low water.

Inspection was made apparently annually only, and that probably when it was least important. This was not nearly enough; and the older the lighthouse grew the more frequent should have been its inspection.†

† *See* my "Rules and Instructions," Appendix C, of my report forwarded to Government of India, with letter quoted in note, page 5.
"Rule VIII.—Each lighthouse shall be visited at least *once a month* by a visiting officer, when possible."
This appendix was deposited in the Alguada Reef lighthouse.

In November 1875 (cyclone time) "the structure of the 'Krishna Shoal lighthouse shows considerable wear in the clasps and braces,' and other deterioration of the bracing is described, apparently caused by the trembling motion given to it by the water striking against it." This would go to show that the bracing had been for years wearing.

Then, again, in October 1876 "the structures was in good repair down to high-water mark," but nothing is said of the structure down to low-water mark; and there was a rise of 9 feet between low and high-water at full and change, or to the ground. The piles themselves might have been wearing under the influence of a silt-bearing six-knot tide, and it would have been easy to have ascertained this by waiting for low-water, when there *ought* to have been only 3 fathoms to the ground.

If asked, General Hyde will probably inform you that the strength of an iron structure of this character depended on its rigidity; and if from a constant "trembling motion" any parts worked loose, the whole thing was open to damage, or even destruction, by a force which might have no effect upon it if rigid.

17. Turning again to the subject of the loss of the Oyster Reef lighthouse, the piles had not been screwed down the full depth I designed, and the floor of the building was consequently between two and three feet higher above the ground; but the screws could not be got in further, it was said, and the greater height would hardly effect stability. There is, however, a curious

coincidence of time during which this and the Krishna Shoal lighthouse stood. The first was lighted in 1876, and the lighthouse was carried away in 1884. The Krishna Shoal structure was lighted in 1869, and it disappeared in 1877.

The strain on the former from its position, although a more substantial structure, would be greater than on the latter; "the trembling motion," in fact, would be more forcible; and if inspection and repair were not effective, would be open to succumb about the same time as the latter. This leads me to the "uneasy" feeling (a feeling that I had expressed in 1865) that the primary cause of disaster was the same in both cases, *i.e.*, ineffective inspection and consequent ineffective repair. In the absence of certain knowledge, the loss of the Krishna Shoal lighthouse was attributed to scour. This could hardly have been the cause in respect of that on the Oyster Reef. But "the trembling motion of the water" in its effect on the braces would, more or less, be similar in each case; and if the braces or other parts had worked well, further cause of disaster need not be looked for. But I shall be able to judge better on this point if you will send me the record of inspection and repair of the Oyster Reef building from the time of its erection. While on this subject I may as well extract the following paragraph (37) from my report of 1865 before alluded to on "the Savage" lighthouse, as it gives my opinion as to the alternative to be adopted if it were decided that a lighthouse on the Oyster Reef should not be erected:—

"If a lighthouse is not to be put on the Oyster Reef, then I am of opinion (first) that 'the Savage' lighthouse ought to be raised, so that the centre of the light shall be 150 feet above high-water mark, which would make the light visible from the deck of a ship 20 miles off; (second) that a new light apparatus of the first order, and of a description suited to the arc of the horizon required to be illuminated, be procured, for which, as the present lantern would be too small, (third) a new lantern would be required." The report referred to gave other details, which, however, it is not necessary here to refer to. I only give the extract in case it should prove necessary, in the absence of a light on the Oyster Reef, and the danger of putting a lightship there, to adopt some, though inferior, protection to shipping visiting Akyab.

18. Finally, I would dwell for a moment on one more point, which is, perhaps, of still greater importance to the Government and to me than any which has been hereinbefore discussed; and that is, the state of the lighthouse on the Alguada Reef, or rather of the rock on which it, a column of 4,000 tons in weight, has stood since 1863. The column was practically completed in that year, although it was only lighted in 1865. In July 1881 I wrote to Mr. Bernard, c.s.i., the Chief Commissioner, about possible encroachments by the sea on the foundation, and I recommended protection in a certain direction (I sent him a plan and proposal) which I thought would prove dangerous if the sea was cutting at all. In April 1882 I heard from Colonel Scott-Moncrief, R.E., the then Chief Engineer, who said among other things that "the fissure" of which I had written "is cutting in through, I believe;" and as from his statement it seems to have cut in some 8 or 9 feet since 1859 when I examined it, and there is only some 4 or 5 feet left between the end of the fissure and the foundation of the lighthouse, in 10 or 15 years' time one may calculate that, if nothing be done, the sea will again be master of the situation. As all the officers have probably changed since I wrote in 1881, may I request the favor of your drawing the attention of the Government of India to the matter? The protection required would probably be easily carried out with concrete in bags as a coffer dam, behind which, in the fine weather, "the fissure" may be dealt with at no great cost. But it is worth doing at any reasonable expense, as it will be very difficult to find on the reef an equally good position for a lighthouse. It is besides a monument worth preserving, if only in memory of the great Governor-General who saw its necessity and ordered its construction, or in that of the noble man under whose auspices, at a very difficult period of his administration, I had the honor of carrying it out, and who, as Colonel Yule will tell you, found time personally to encourage me in my very difficult and anxious task.

GOVERNMENT OF MADRAS.

MARINE DEPARTMENT.

Read—the following papers:—

From J. E. O'CONOR, Esq., Assistant Secretary to the Government of India, Department of Finance and Commerce (Separate Revenue, &c.—Commerce and Trade—Lights and Light Dues), to the Chief Secretary to Government, dated Simla, 2nd October 1884, No. 3739.

I am directed to forward a copy of a despatch from the Secretary of State, No. 42 (Public Works), dated the 7th August 1884, and its enclosure, in which General Fraser advocates a much more frequent and systematic inspection of lighthouses on the Indian coasts than that which he understands to have hitherto been carried out by officers who are qualified for such duties by possessing the necessary engineering and nautical knowledge.

2. I am to request that the Government of India may be furnished with a report showing the existing system of inspection of lighthouses in the Madras Presidency, as well as with such remarks and suggestions as the Government of Madras may wish to make in connection therewith.

Enclosures.

From Her Majesty's Secretary of State for India, to the Government of India, dated 7th August 1884, No. 42.

I transmit, herewith, for the information of your Excellency's Government, copy of a letter* which has been addressed to this office by Lieutenant-General A. Fraser, R.E., C.B., late Secretary in the Public Works department to the Government of India, on the subject of the disappearance of the Krishna and Akyab lighthouses, with the erection of both of which structures he was professionally connected.

* Dated 30th June 1884.

2. In this letter, which calls for the very serious attention of your Excellency's Government, you will observe that General Fraser advocates a much more frequent and systematic inspection of lighthouses on the Indian coasts than that which he understands to have been hitherto carried out by officers who are qualified for such duties by possessing the necessary engineering and nautical knowledge, and I shall be glad to be informed of your views on this suggestion, as well as on the question of the course to be followed in giving the needful protection to the coast on the eastern side of the Bay of Bengal, and the expediency of reconstructing the oyster reef lighthouse, and the system of construction to be adopted if it is thought necessary to restore it.

3. I would also draw your Excellency's special attention to the last paragraph of General Fraser's letter, in which he points out certain dangers to which, he believes, the lighthouse on the Alguada Reef to be at present exposed.

4. I request that full reports may be furnished to me on the points above mentioned, to place me in a position to obtain the opinion of the most competent authorities in this country on any part of the subject which, on further consideration, it may appear desirable to submit to them.

From Lieutenant-General A. FRASER, R.E., C.B., late Secretary to the Government of India, Public Works department, to the Under Secretary of State for India, dated 30th June 1884.

From J. H. TAYLOR, Esq., Lieutenant, R.N.R., Master Attendant, Madras, to the Chief Secretary to Government, dated Madras, 24th October 1884, No. 9921.

Administrative department.

With reference to the papers from the Government of India, relating to a proposal from General Fraser as to the frequent and systematic inspection of lighthouses on the Indian coasts, forwarded with endorsement, No. 2317, dated 15th October 1884, I have the honor to report that most of the British lights of this Presidency are situated at the different ports, where they are under the immediate charge of the Port officer, and any formal inspection is therefore unnecessary in their case. The seven lighthouses located out of port limits are in charge of competent Superintendents, men who can read and record barometrical readings, answer a reference, and are able to act independently of advice in case of emergency. They are situated at a convenient distance, so that the Superintendent can refer to the nearest Port officer, who is, besides, in constant communication with the lighthouse Superintendent, regarding the supply of stores and other requirements, which are duly attended to. As often as circumstances will permit, they are visited by me personally, but for necessary repairs the nearest officer of the Public Works department is always available. It will thus be seen that all that is necessary for the care and supervision of the lighthouses are fully provided for, and nothing further is called for, so far as the lights of this Presidency are concerned.

Order—dated 3rd December 1884, No. 529, Marine.

The Government do not concur in thinking it wise to leave the very important business of inspecting lighthouses in the hands of local officers unchecked and uncontrolled by the periodical visits and inspection of some professional officer of high standing.

2. In future, the Government desire that the Chief Engineer (or a competent officer of the Public Works department) shall periodically visit the lighthouses in the Madras Presidency, in the company of the Master Attendant, and report upon their condition. Such visits should be made as frequently as may be necessary with respect to the conditions affecting each lighthouse; but every one should be visited once at least in the course of the year.

(True Extract.)

E. F. WEBSTER,
Chief Secretary.

To the Public Works department,
„ Master Attendant, Madras, } with copy of General Fraser's report.

Endorsement—dated 3rd December 1884, No. 530, Marine.

Copy to the Government of India, Department of Finance and Commerce.

E. F. WEBSTER,
Chief Secretary.

Exd. J. Wright.

Govt. of {1884} Madras.

MARINE.

Issued

Recd. *Encl.*

G.O., &c., 3rd December 1884,
Nos. 529, 530.

DECEMBER.

Lighthouses.

Passing orders regarding the periodical inspection of the — in the Madras Presidency.

30TH JULY 1885, NOS. 321, 322, MARINE.

GOVERNMENT OF MADRAS.

MARINE DEPARTMENT.

READ—the following paper:—

From J. H. TAYLOR, Esq., Lieut., R.N.R., Master Attendant, Madras, to the Chief Secretary to Government, dated Madras, 16th July 1885, No. 5910.

Administrative department.

I have the honor to submit the accompanying report on the Madras Lights for the official year 1884-85.

ENCLOSURES.

REPORT on the Lights of the Madras Presidency for the official year 1884-85.

During the year the efficiency of the different lights belonging to this presidency was maintained satisfactorily. No changes took place, and the only important measure to record is the regular inspection of the lighthouses by the Chief Engineer and the Master Attendant ordered by Government. They are periodically to visit the light-houses and report upon their condition. Such visits should be made as frequently as may be necessary with respect to the conditions affecting each light-house, but every one should be visited once at least in the course of the year. The first inspection was made by those officers in February and March last. The light-house buildings at Pulicat were badly damaged during the cyclone of 21st November, and those at Armeghon also sustained some injury. There are thirteen lights on the East, and seven on the West Coast, or twenty altogether. The strength of the establishments maintained for the whole number is as follow: four Superintendents on Rs. (70) seventy, three on Rs. (100) one hundred, and one on Rs. (125) one hundred and twenty-five monthly; and seventy-eight Assistant Superintendents and lightkeepers, whose salaries range at Rs. (21) twenty-one, (15) fifteen, (12) twelve, (11) eleven, (10) ten, (9) nine, (8) eight, (7) seven, and (6) six per mensem. The total expenditure on account of establishments and other charges amounted to Rupees (30,374-14-11) thirty thousand three hundred and seventy-four, Annas fourteen and Pies eleven, viz., establishments Rs. (16,830-6-6) sixteen thousand eight hundred and thirty, Annas six and Pies six, contingencies Rs. (11,672-4-10) eleven thousand six hundred and seventy-two, Annas four and Pies ten, and public works charges Rs. (1,872-3-7) one thousand eight hundred and seventy-two, Annas three and Pies seven. Kerosene oil is used by most of the lighthouses, and the others, four in number, burn cocoanut oil. The average annual cost of kerosine and cocoanut oil for each light was Rs. (118-12-6) one hundred and eighteen, Annas twelve and Pies six, and Rs. (1,286-8-8) one thousand two hundred and eighty-six, Annas eight and Pies eight, respectively.

LIST OF LIGHTS IN THE MADRAS PRESIDENCY.

Names of lights.	Location.	Position. Latitude.	Position. Longitude	Color of lights.	Fixed, flashing, intermitting, alternating, or revolving.	Interval of revolution or flash.	Miles visible in clear weather.	Height in feet of centre of lantern above high water.	Height in feet of building from base to vane.	Arc of illumination (bearings are magnetic and from seaward).	Nature of construction, color, or any peculiarity of light-house.	Character and order of illuminating apparatus.	Year lighted.	Remarks.
		N.	E.				MILES.	FEET.	FEET.					
Gopálpur ..	On mainland, sixty yards from low-water mark.	19 13 0	84 52 0	White.	Fixed..	..	10	85	..	180°, or the whole sea horizon.	Flagstaff painted white.	Third-class, country-made.	1871.	Intended as a guide to vessels making the anchorage at night, and exhibited at the special requisition of Commanders of the British India Steam Navigation Company's mail steamers.
Calingapatam ..	On the point ..	18 19 0	84 7 30	Do. ..	Do. ..	..	8	68	73	..	Obelisk of cut-stone, column white, capital dark blue.	Do. ..	15th December 1876.	Intended to warn vessels off a small reef which projects from the point, and which should not be passed in less than eight fathoms when making the port at night.
Santopilly ..	On Santopilly hill, three-quarters of a mile inland.	18 4 56	83 37 35	Do. ..	Do. ..	..	14	169	31	180°, facing S.E.	On the roof of a house.	Dioptric, 4th order.	1st November 1849; improved 1871.	Exhibited to warn mariners off the Santopilly rocks, from which this light bears N.W. $\frac{3}{8}$ W., distance $6\frac{1}{2}$ miles.
Cocanada (Vakalapudi).	Four-and-three-quarter miles north of Cocanada river, 500 yards from the shore.	17 0 40	82 16 30	Do. ..	Revolving.	A flash every 10 seconds.	14	80	76	In every direction seaward.	White column..	Catoptric, 4th order.	15th January 1879.	This light is intended to lead vessels clear of the shoals to the northward of Point Godávari when coming into the Cocanada anchorage from the southward and eastward.
Coringa or Hope Island.	On the southern part of Hope Island and distant about two-and-a-half miles from the sea.	16 49 5	82 18 58	Do. ..	Fixed..	..	10 to 12	83	94	All round the compass.	Masonry tower horizontal alternate bands of black and white.	Country-made, with brass reflectors.	1817.	Intended to lead vessels clear of the rocks and shoals off Godávari Point.
Masulipatam ..	In the fort	16 9 15	81 9 25	Do. ..	Do. ..	..	6	69	112	180°	Flagstaff ..	Dioptric, 6th order.	1858; improved 1870.	As a guide for vessels to the anchorage.
Point Divi ..	Two miles N. W. of point.	15 58 55	81 9 25	Do. ..	Do. ..	..	14	$48\frac{1}{2}$	50	225°, or from north through west to south-west.	Masonry column white.	Dioptric, 4th order.	1st May 1851; improved 1870.	Is intended to point out the position of the danger.
Armeghon or Armogham.	Mainland, village of Moona or Moonapollium.	13 53 8	80 11 47	Do. ..	Flashing.	A flash every 20 seconds.	14	107	111	180°, or the whole sea horizon.	Do. ..	Do. ..	1st January 1853; improved 1881.	Warns vessels off the Armeghon shoal, the shoalest part of which ($1\frac{3}{4}$ fathoms) lies six miles off shore.
Pulicat	Near the beach ..	13 25 15	80 19 6	Do. ..	Fixed..	..	14	68	57	180°, or the whole sea horizon.	Masonry column with black bands.	Do. ..	1859; altered 1881.	To guide vessels clear of the Pulicat shoal. When the light bears W. $\frac{1}{2}$ N. a vessel is to the northward of all dangers.
Madras	On esplanade north of the fort.	13 5 11	80 16 51	Do. ..	Flashing.	Light has five faces, and every minute one face flashes towards the same spot, but three faces are presented seaward at one time.	20	128	125	310°, facing east.	Granite column.	Catadioptric ..	1st January 1844.	To guide vessels clear of the Pulicat shoal and into the roadstead. Mariners should not bring this light to southward of S.S.W. $\frac{1}{2}$ W. to avoid Pulicat shoal.
Negapatam ..	On bastion	10 45 30	79 50 20	Do. ..	Fixed..	..	14	$79\frac{1}{2}$	83	180°, or the whole sea horizon.	Masonry column white.	Dioptric, 4th order.	1st August 1846; improved 1870.	As a guide for vessels to the anchorage.
Pamban Pass ..	On a sand hill about one mile east of northern channel.	9 17 14	79 12 38	Do. ..	Do. ..	..	14	97	72	All round the compass.	Circular masonry column.	Catadioptric, 4th order.	21st April 1846; improved 1860.	Is a guide to vessels making for the Pámban channel.
Tuticorin ..	North extreme of Hare Island or Paundiantivo, $2\frac{1}{2}$ miles east of Tuticorin.	8 47 10	78 11 20	Do. ..	Do. ..	..	14	85	91	All round the compass.	Sandstone column, colored, brown, lantern white.	Do. ..	15th May 1845; improved 1874.	As a guide for vessels to the anchorage.
Muttum (Cadiapatam).	A rocky promontory known as "Muttum Point."	8 7 30	77 18 10	Do. ..	Do. ..	..	20	132	72	All round ..	Dark grey granite column.	First order, dioptric.	1st January 1883.	This light, in the territory of Travancore, is intended to mark the vicinity of the Crocodile rock.

LIST OF LIGHTS IN THE

Names of lights.	Location.	Position. Latitude.	Position. Longitude.	Color of lights.	Fixed, flashing, intermitting, alternating, or revolving.	Interval of revolution or flash.	Miles visible in clear weather.	Height in feet of centre of lantern above high water.
		N. DEG. M. S.	E. DEG. M. S.				MILES.	FEET.
Cochin	On a small mound which formed a bastion of the old fort to the south of the harbour.	9 57 47	76 13 45	White.	Fixed.	..	15	100
Calicut	On the sandy beach.	11 15 5	75 45 35	Do. ..	Do. ..	..	14	102
Beypore ..	Near the beach ..	11 10 0	75 47 0	Red ..	Do. ..	..	5	60
Tellicherry ..	On the fort wall near the beach	11 44 50	75 28 30	White.	Do. ..	..	8	70
Cannanore ..	On the fort rampart near the beach.	11 51 10	75 21 45	Red ..	Do. ..	..	6 to 8	64
Mangalore ..	On a hill above the town, and near some high trees.	12 52 17	74 50 8	White.	Do. ..	..	14	240

Govt. of {1884} Madras.

MARINE.

Issued

Recd. *Encl.*

G.O., &c., 3rd December 1884, Nos. 529, 530.

DECEMBER.

Lighthouses.

Passing orders regarding the periodical inspection of the — in the Madras Presidency.

LIST OF LIGHTS IN THE

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		Latitude.	Longitude.					
		N. DEG. M. S.	E. DEG. M. S.				MILES.	FEET.
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Beypore ..	Near the beach ..	11 10 0	75 47 0	Red ..	Do. ..	..	5	60
Tellicherry ..	On the fort wall near the beach	11 44 50	75 28 30	White.	Do. ..	..	8	70
Cannanore ..	On the fort rampart near the beach.	11 51 10	75 21 45	Red ..	Do. ..	..	6 to 8	64
Mangalore ..	On a hill above the town, and near some high trees.	12 52 17	74 50 8	White.	Do. ..	..	14	240

APPENDIX to Marine G.O., No. 529, dated 3rd December 1884.

From Lieutenant-General A. FRASER, R.E., C.B., late Secretary to the Government of India, Public Works department, to the Under Secretary of State for India, dated 30th June 1884.

Although no explanation of mine can remove the distress I feel at the destruction of works with which I, as an engineer and adviser to the Government of India, have been intimately connected, I beg to offer some observations on the subject of the loss last month in a cyclone of the lighthouse on the Oyster Reef of Akyáb. This serious misfortune has followed the disappearance, seven years ago, of the somewhat similar building which had been erected on the Krishna shoal. Both were on screw piles, both were recommended by me, the designs were generally approved by me, and one (that on the Krishna shoal) was put up under my personal direction; and the following remarks are necessary, in order that the Government may be able to consider how far my judgment, in recommending the erection of these structures on these particular points, may have been in error, and to what extent it should trust again in similar buildings under similar conditions.

2. With a view of arriving at a just estimate of the considerations which influenced my judgment in this weighty matter, I must ask the Government to go back with me for a moment thirty years—to the time (1854) when Lord Dalhousie was Governor-General of India. This noble Lord, foreseeing the strides which British Burma was likely to make in commercial prosperity, saw at the same time, in the Alguada Reef, a great danger to ships in their approach to, and departure from, the coasts of the province. His Lordship, having at the close of the Burmese war expressed himself, in terms noted in the margin, satisfied with the manner I had dealt with Rangoon as Executive Engineer under the lead of Major Hugh Fraser, R.E., the then Chief Engineer, did me the honor of selecting me, at the recommendation of that officer, to undertake the work of building a lighthouse on that dangerous reef. I had then no experience of such works, and Lord Dalhousie, noting this, desired that I should be sent home for the purpose of inspecting works of a similar character in England and abroad, first making a general survey of the reef and its neighbourhood.

Military department of Government of India, No. 457, of 16th December 1854, conveys "to Lieutenant Fraser, the Executive Engineer, an expression of the approbation with which the Most Noble the Governor-General in Council views the zeal and ability he has displayed in forming the new cantonment in question."

3. I made this general survey at that time, but some State financial difficulties intervening it was determined to postpone the works on the reef. In the meantime some specially important and large operations in building barracks and in otherwise improving the condition of the European troops in the garrison of Fort William, Calcutta, were required, and in these Lord Canning, the then Governor-General (1855), took personal interest. I was moved to forego the furlough, for which I had applied, in order to undertake these works. This I did, and when they were sufficiently in train towards completion,* the Governor-General expressing himself completely satisfied (His Excellency often personally visited my works) with my proceedings in Fort William, found himself able to forward the desire of his great predecessor by sending me, early in 1857, to England to fit me for the work which Lord Dalhousie had had at heart.

* I have some pride in noting here that, in dealing with Rangoon and Fort William, I carried out the chief works, which resulted in rendering the two most notoriously unhealthy stations for British troops in the East, those which became thereafter more healthy for Europeans than any other places in the plains of India.

4. The result of my deputation to England was embodied in a report, dated October 1857, which I submitted to the Honorable the Court of Directors, but owing to the occurrence of the Mutiny it was not till 1859 (I being then Under Secretary to the Government of India in the Public Works department) that Lord Canning recorded the observations I have transferred to the margin. I extract these observations and those of Lord Dalhousie because they show (1) that, at whatever inconvenience, experience *was* then considered necessary in this class of work; and (2) that the heads of the Government had fair reason, from works already executed with success, for their confidence in my ability to carry out perhaps the most difficult of all engineering works, in a country where all labor had to be instructed, and all material had to be obtained from abroad.

Extract letter of 16th December 1859 from the Secretary, Government of India, with the Governor-General, to the Officiating Secretary to the Government of India, Public Works department, Calcutta:—

"2. The Governor-General is of opinion that this work (the Alguada Reef lighthouse) should now be commenced at once, and he comes to this conclusion not merely on account of the importance of the work in itself, but because by further delay we risk the loss of an officer who was especially deputed to England to study the subject.

"3. Though Captain Fraser's services as Under Secretary in this department (Public Works department) are very highly valued, and their loss will be seriously felt, it is necessary that he should now resume the duties originally confided to him."

5. During the period between December 1859 and April 1865 (when the Alguada Reef lighthouse was lighted) I thought it my duty to employ myself not only on the special work for which I had been fitted by the Government, but in seeking to utilise the experience gained in England on lighthouse work generally, by suggesting measures for fully protecting the trade with Burma, which was advancing at a rate which probably even Lord Dalhousie had not anticipated. These suggestions resulted in my building (1) the stone lighthouse on Double Island, showing a light of the first class, as a guide for vessels making for the port of Moulmein; (2) the iron lighthouse on Table Island, of the Great Coco group, Andaman Islands, which also shows a light of the first class, to facilitate the navigation of the Preparis Channel. I subsequently arranged, before leaving Burma, for a lighthouse on screw piles; (3) the China Bukeer, showing a first-class light; and (4) for a second of similar structure on the eastern grove, showing a specially designed light, as "land-fall" lights for the Rangoon river. I further had (5) the Savage Island light, used to facilitate entering Akyab Harbour, improved from an apparatus furnished with common oil lamps to a third-class ordinary dioptric light. I was thus, in return for the experience the Government had allowed me to gain in Europe, enabled to add six lights to the 20 which previously lighted both sides of the Bay of Bengal, and, with *two exceptions*, had made the entire coast on the eastern side of that bay practically safe, as regards *land-fall*, to ships trading on that side from Chittagong to Acheen head.

6. The *two exceptions* noted in the last paragraph required to be dealt with in order that ships might be completely guarded against all the prominent dangers of the entire British Burma coast. *The one* was the Krishna shoal and Baragon flat, the junction of which formed the turning point from the Bay of Bengal to the Rangoon river, and Gulf of Martaban on its western side, the light in Double Island forming the guard on its (the Gulf's) eastern side. *The other* was the Oyster Reef, which required to be lighted to render safe the northern and western approaches to the harbour of Akyab. In thick weather ships attempting to make Akyab were always in more or less fear, according to the time at which sun or stars had been last seen, of this reef, which was all the more dangerous from the fact of its being only just a-wash at low water.

7. By the cyclone of 1864, and previous years, immense damage had been done to ships lying in the Hooghly off Calcutta, by reason of the insufficiency of the moorings, and the Government of India had lost more than one lightship with all hands on board in these disastrous winds. I had thus had my attention called to works with Mitchell's screws and screw piles. My plan for mooring the shipping was approved by the Secretary of State (*see* letter from your office, dated 18th January 1867, to my address), and the work was successfully carried out. I believe the only danger to ships now lying in the Hooghly from a cyclone, as regards moorings, is the comparative weakness of the ships' own chains. I suggested also screw-pile jetties for Calcutta, which were afterwards carried out with, I believe, complete success.

8. I found, moreover, that no *solid* building could be erected, on either of the points which, as I have shown, remained to be lighted for the complete protection of ships making the coasts of British Burma, at any reasonable cost, if it could be done at all. I, at all events at that time, did not see my way to any successful result from any amount of expenditure in this direction.

With the knowledge of the loss of life which had occurred by the destruction of such vessels,* I was equally undesirous of recommending a lightship at points which in either case, to my mind, would have involved the putting of a ship on a dead lee shore, and its inevitable destruction, with all hands, in case of a severe cyclone.

* Even the best cared for lightships on British coasts are liable to destruction. This is the latest example extracted from a report in the *Morning Post* of the 22nd June 1884:—

"Sinking of the *Girdler* Lightship.

"A Lloyd's telegram from Dover states that the P. and O. steamer *Indus* from London to Sydney, laden with a general cargo and 400 passengers, ran into and sank the *Girdler* lightship on Friday night. The crew of the lightship were taken on board the *Indus* and landed at Dover." It might easily have been otherwise with the crew had there been unfavorable conditions of weather.

9. As a lighthouse require the attendance of not more than three or four keepers, my decision was largely influenced by the smaller loss of life which would ensue, on any accident occurring, than would be the case in respect of a lightship which would require eight or nine times the number of men to manage her.

10. Again, I was influenced by the much smaller cost of maintaining a lighthouse which, including interest on cost, was not above half that of maintaining a lightship (*see* also on this point the report of Captain A. Dundas Taylor, I.N., No. 73, D.B., dated 14th February 1877, to the Government of India, Department of Revenue, Agriculture, and Commerce, on the subject of the substitution of lighthouses for lightships in the Hooghly and its approaches).

11. A third point which swayed my judgment in favor of the lighthouse was the superiority of the light in power, elevation, and steadiness over that borne by a lightship.

12. The way I put to the Government the result of my considerations is shown in the following extract of a memorandum which I prepared for the Lieutenant-Governor of Bengal

(Sir A. Eden): "On the substitution of lighthouses for lightships" at the Sandheads, dated 27th March 1879 (after the loss of the screw-pile lighthouse on the Krishna shoal):—

"21. From the figures given in the margin it will be seen that, by substituting lighthouses for lightships, the Port (Calcutta) funds will save £7,625 a-year, with better lights and less risk to human life. Accidents may occur, but there is plenty of money to repair damages, and accidents are less likely to occur to lighthouses than to lightships. The risk must be accepted, but the risk is less with lighthouses than with lightships." All my previous reports (which I have not by me) adopted the same tone.

Was I justified or not in adopting this tone? I really cannot feel sure that, even now were I in a position to be consulted, I should not recommend as strongly as I did then the erection of lighthouses of this class in positions where *weight* cannot, by reason of absence of adequate foundations, or in consequence of excessive cost and danger in construction, be opposed to the impact of the sea, or where lightships on a lee shore would be subject to cyclones. I must leave to the Government the decision on this question, being, however, certain that whatever the decision may be, it cannot either deepen or alleviate the regret I feel at the event which I am now deploring. The only feelings which give relief to my mind on the subject are that—

(1) If these dangerous points had not been marked at all, which but for me they probably would not have been, the loss by wrecks of life and property for the eight or nine years of increasing trade during which these lighthouses stood would have been very considerable.

(2) I should have incurred greater risk of life by placing lightships in these positions. But I could not again recommend construction on such points of a coast as I have noted of such lighthouses as those on screw piles, unless the Government followed the recommendations I previously gave in respect of *their care*.*

* Paragraph 42 of my report on the Savage lighthouse, dated 13th March 1865. My letter to Secretary to the Government of India, No. 39-59C., dated 5th June 1865, said:—

"But it would be better, in my opinion, to do nothing than to go to the expense of alteration or restoration, and, indeed, of building any new lighthouses at all, unless the Government are prepared to admit the necessity of, and meet the extra expense consequent on, having this and all their lighthouses properly visited and cared for by competent people."

13. It is necessary now to observe that I had nothing to do personally with the construction of the lighthouse on the Oyster Reef beyond a recommendation of a structure, the design for which I had *generally* approved, on screw piles specially strengthened for that position. I knew nothing of the precise spot selected for its position (a matter here of deep moment), but it was built under the direction of Colonel W. S. Oliphant, R.E., who was at the time Chief Engineer of British Burma, and of Mr. H. M. Mathews, M.I.C.E., a Civil Engineer of great ability, who was then Executive Engineer of the Rangoon Division of Public Works. I do not doubt, therefore, but that it was properly constructed, and, from these competent officers adopting the design, I may assume that they found nothing faulty in it.

14. Before, however, leaving Rangoon permanently for the North-Western Provinces in 1870,† I placed very distinctly before the Government my view of how these structures should be built and cared for. I said in effect that it was impossible, with any sense of safety, for the Government to spend large sums of money on their construction without making adequate arrangements for their care and maintenance in efficiency. I don't for a moment presume to say that such care as was possible, by such officers as were available in such sea transport as the exigencies of other service might from time to time be placed at their disposal, was not exercised. But what I do say is that there has been no care taken of these important works when built directed by that continued experience which both Lords Dalhousie and Canning considered essential as to their construction; that no systematic inspection, repair, or protection of the buildings and their surroundings by persons having full knowledge of all the circumstances and conditions of each work has been undertaken, or indeed has been possible under the system adopted—a system which involves the constant removal of officers, inexperienced in the first instance in this class of work, just as they begin to know something of the works and the conditions affecting them; a system which limits their power of inspection to the time when perhaps the only steamer available for the general service of the local Government can be placed at their disposal.

† I had refused in 1863, I may here remark, the offer of the Government of India to appoint me Chief Engineer and Secretary to the Government of Bengal in the Public Works department, in order that I might devote my special experience to the completion of the lighthouse on the Alguada Reef and other works of cognate character. I thus lost a chance of promotion which did not recur till 1870.

15. The Chief Commissioner, in submitting my final report regarding the British Burma lighthouses to the Government of India with his letter, No. 821-104 C.I., dated Rangoon, 8th October 1869, said:—

"Paragraph 7. Colonel Fraser points to the satisfactory financial condition of those lighthouses that have been for some time in operation. He would abolish as a separate charge ‡

‡ Substituting a tonnage due as in France.

all light dues, make the works Imperial works, supervise them by Imperial establishments, and maintain them from Imperial funds. These are, indeed, portions of the propositions * put forward many years ago by him for the consolidation of the various managements of the lighthouses around the coast of the empire under one central board of management." A reference to my report noted in the margin, and to that mentioned by the Chief Commissioner as having been forwarded to the Government with his above letter, will show what my proposals were. It may not have been consistent with the policy of the Government to adopt them, but of this I am certain, that unless a department, combining engineering and nautical knowledge (and not only knowledge, but engaging the sympathy of official nautical officers), with a power of keeping and transmitting the results of experience gained in this class of work, and of providing proper means of transport for inspectors and material and labor for the repair of damage, be organised, great sea lights will be very much left to the mercy of the waves and the winds, while the valuable apparatuses which have in many cases been provided will never be kept up to that state of efficiency which distinguished the Scotch and French lights and those under the Trinity Board of England. I endeavoured, without success, to utilise my experience in establishing such an arrangement, and when I look down the list (1882) of lights on the coasts of India, and see the nature of those exhibited as described in the numbers in the list noted in the margin, I cannot help feeling, considering also the many other dangerous points requiring attention, that there would be ample field for the operations of such a department, while surely the cost of its care of works already executed would be more than compensated by a comparative freedom from disaster. Any how the system I have described as existing is not fair to the constructors, whose reputation may be compromised; it is not fair to those who, though most anxious to do their duty, cannot look after the works properly; it is unfair to the Government itself, inasmuch as it prevents its maintaining in efficiency these important adjuncts to the safety of the commerce upon which the prosperity of the State depends, while it must share with every one the discredit of preventible disaster.

* See report to the Honorable Court of Directors of East India Company mentioned in paragraph 4.

Nos. 15, 16, 20, 22, 26, 28, 29, 30, 32, 42, 43, 48, 49, 56, 77, 81, 82, 83 (84 False Point was before 1880 a wretched light, although it was the chief "land-fall" light in British India. It was altered at my suggestion), 93, 94.

16. I have only to refer to the papers accompanying the despatches from the Government of India to the Secretary of State, No. 54, dated 30th November 1877, reporting the disappearance of the Krishna Shoal lighthouse, to show the want of care (of the kind I insist upon) to which these structures have been, and no doubt still are, subject. From these papers it would appear that, subsequently to the date I visited the lighthouse in 1870, about two years after it was built, and in which year I finally left the province, no soundings to test scour had been taken, although that was one of the special instructions I left in the light-house. I also requested that at suitable times, before and after each monsoon, soundings should be taken all round the lighthouse to the distance of a mile from it as a centre. I don't believe myself that scour alone could have caused the destruction of the building, still, if it had been ascertained that great scour *had* been going on for some time, measures might have been taken to move the light or divert the scour, or, at all events, to remove the light-keepers. It had not been found difficult, I believe, to move the "China Bukeer" lighthouse of similar character from the shore into two fathoms at low water.

Inspection was made apparently annually only, and that probably when it was least important. This was not nearly enough; and the older the lighthouse grew the more frequent should have been its inspection.†

† *See* my "Rules and Instructions," Appendix C, of my report forwarded to Government of India, with letter quoted in note, page 5.
"Rule VIII.—Each lighthouse shall be visited at least *once a month* by a visiting officer, when possible."
This appendix was deposited in the Alguada Reef light-house.

In November 1875 (cyclone time) "the structure of the 'Krishna Shoal lighthouse shows considerable wear in the clasps and braces,' and other deterioration of the bracing is described, apparently caused by the trembling motion given to it by the water striking against it." This would go to show that the bracing had been for years wearing.

Then, again, in October 1876 "the structures was in good repair down to high-water mark," but nothing is said of the structure down to low-water mark; and there was a rise of 9 feet between low and high-water at full and change, or to the ground. The piles themselves might have been wearing under the influence of a silt-bearing six-knot tide, and it would have been easy to have ascertained this by waiting for low-water, when there *ought* to have been only 3 fathoms to the ground.

If asked, General Hyde will probably inform you that the strength of an iron structure of this character depended on its rigidity; and if from a constant "trembling motion" any parts worked loose, the whole thing was open to damage, or even destruction, by a force which might have no effect upon it if rigid.

17. Turning again to the subject of the loss of the Oyster Reef lighthouse, the piles had not been screwed down the full depth I designed, and the floor of the building was consequently between two and three feet higher above the ground; but the screws could not be got in further, it was said, and the greater height would hardly effect stability. There is, however, a curious

coincidence of time during which this and the Krishna Shoal lighthouse stood. The first was lighted in 1876, and the lighthouse was carried away in 1884. The Krishna Shoal structure was lighted in 1869, and it disappeared in 1877.

The strain on the former from its position, although a more substantial structure, would be greater than on the latter; "the trembling motion," in fact, would be more forcible; and if inspection and repair were not effective, would be open to succumb about the same time as the latter. This leads me to the "uneasy" feeling (a feeling that I had expressed in 1865) that the primary cause of disaster was the same in both cases, *i.e.*, ineffective inspection and consequent ineffective repair. In the absence of certain knowledge, the loss of the Krishna Shoal light-house was attributed to scour. This could hardly have been the cause in respect of that on the Oyster Reef. But "the trembling motion of the water" in its effect on the braces would, more or less, be similar in each case; and if the braces or other parts had worked well, further cause of disaster need not be looked for. But I shall be able to judge better on this point if you will send me the record of inspection and repair of the Oyster Reef building from the time of its erection. While on this subject I may as well extract the following paragraph (37) from my report of 1865 before alluded to on "the Savage" lighthouse, as it gives my opinion as to the alternative to be adopted if it were decided that a lighthouse on the Oyster Reef should not be erected :—

"If a lighthouse is not to be put on the Oyster Reef, then I am of opinion (first) that 'the Savage' lighthouse ought to be raised, so that the centre of the light shall be 150 feet above high-water mark, which would make the light visible from the deck of a ship 20 miles off; (second) that a new light apparatus of the first order, and of a description suited to the are of the horizon required to be illuminated, be procured, for which, as the present lantern would be too small, (third) a new lantern would be required." The report referred to gave other details, which, however, it is not necessary here to refer to. I only give the extract in case it should prove necessary, in the absence of a light on the Oyster Reef, and the danger of putting a lightship there, to adopt some, though inferior, protection to shipping visiting Akyab.

18. Finally, I would dwell for a moment on one more point, which is, perhaps, of still greater importance to the Government and to me than any which has been hereinbefore discussed; and that is, the state of the lighthouse on the Alguada Reef, or rather of the rock on which it, a column of 4,000 tons in weight, has stood since 1863. The column was practically completed in that year, although it was only lighted in 1865. In July 1881 I wrote to Mr. Bernard, C.S.I., the Chief Commissioner, about possible encroachments by the sea on the foundation, and I recommended protection in a certain direction (I sent him a plan and proposal) which I thought would prove dangerous if the sea was cutting at all. In April 1882 I heard from Colonel Scott-Moncrief, R.E., the then Chief Engineer, who said among other things that "the fissure" of which I had written "is cutting in through, I believe;" and as from his statement it seems to have cut in some 8 or 9 feet since 1859 when I examined it, and there is only some 4 or 5 feet left between the end of the fissure and the foundation of the lighthouse, in 10 or 15 years' time one may calculate that, if nothing be done, the sea will again be master of the situation. As all the officers have probably changed since I wrote in 1881, may I request the favor of your drawing the attention of the Government of India to the matter? The protection required would probably be easily carried out with concrete in bags as a coffer dam, behind which, in the fine weather, "the fissure" may be dealt with at no great cost. But it is worth doing at any reasonable expense, as it will be very difficult to find on the reef an equally good position for a lighthouse. It is besides a monument worth preserving, if only in memory of the great Governor-General who saw its necessity and ordered its construction, or in that of the noble man under whose auspices, at a very difficult period of his administration, I had the honor of carrying it out, and who, as Colonel Yule will tell you, found time personally to encourage me in my very difficult and anxious task.

Bk 164 W 20/4/85

GOVERNMENT OF MADRAS.

MARINE DEPARTMENT.

Read—the following papers:—

From J. E. O'CONOR, Esq., Assistant Secretary to the Government of India, Department of Finance and Commerce (Separate Revenue, &c.—Commerce and Trade—Lights and Light Dues), to the Chief Secretary to Government, dated Simla, 2nd October 1884, No. 3739.

I am directed to forward a copy of a despatch from the Secretary of State, No. 42 (Public Works), dated the 7th August 1884, and its enclosure, in which General Fraser advocates a much more frequent and systematic inspection of lighthouses on the Indian coasts than that which he understands to have hitherto been carried out by officers who are qualified for such duties by possessing the necessary engineering and nautical knowledge.

2. I am to request that the Government of India may be furnished with a report showing the existing system of inspection of lighthouses in the Madras Presidency, as well as with such remarks and suggestions as the Government of Madras may wish to make in connection therewith.

Enclosures.

From Her Majesty's Secretary of State for India, to the Government of India, dated 7th August 1884, No. 42.

I transmit, herewith, for the information of your Excellency's Government, copy of a letter* which has been addressed to this office by Lieutenant-General A. Fraser, R.E., C.B., late Secretary in the Public Works department to the Government of India, on the subject of the disappearance of the Krishna and Akyab lighthouses, with the erection of both of which structures he was professionally connected.

* Dated 30th June 1884.

2. In this letter, which calls for the very serious attention of your Excellency's Government, you will observe that General Fraser advocates a much more frequent and systematic inspection of lighthouses on the Indian coasts than that which he understands to have been hitherto carried out by officers who are qualified for such duties by possessing the necessary engineering and nautical knowledge, and I shall be glad to be informed of your views on this suggestion, as well as on the question of the course to be followed in giving the needful protection to the coast on the eastern side of the Bay of Bengal, and the expediency of reconstructing the oyster reef lighthouse, and the system of construction to be adopted if it is thought necessary to restore it.

3. I would also draw your Excellency's special attention to the last paragraph of General Fraser's letter, in which he points out certain dangers to which, he believes, the lighthouse on the Alguada Reef to be at present exposed.

4. I request that full reports may be furnished to me on the points above mentioned, to place me in a position to obtain the opinion of the most competent authorities in this country on any part of the subject which, on further consideration, it may appear desirable to submit to them.

From Lieutenant-General A. FRASER, R.E., C.B., late Secretary to the Government of India, Public Works department, to the Under Secretary of State for India, dated 30th June 1884.

From J. H. TAYLOR, Esq., Lieutenant, R.N.R., Master Attendant, Madras, to the Chief Secretary to Government, dated Madras, 24th October 1884, No. 9921.

Administrative department.

With reference to the papers from the Government of India, relating to a proposal from General Fraser as to the frequent and systematic inspection of lighthouses on the Indian coasts, forwarded with endorsement, No. 2317, dated 15th October 1884, I have the honor to report that most of the British lights of this Presidency are situated at the different ports, where they are under the immediate charge of the Port officer, and any formal inspection is therefore unnecessary in their case. The seven lighthouses located out of port limits are in charge of competent Superintendents, men who can read and record barometrical readings, answer a reference, and are able to act independently of advice in case of emergency. They are situated at a convenient distance, so that the Superintendent can refer to the nearest Port officer, who is, besides, in constant communication with the lighthouse Superintendent, regarding the supply of stores and other requirements, which are duly attended to. As often as circumstances will permit, they are visited by me personally, but for necessary repairs the nearest officer of the Public Works department is always available. It will thus be seen that all that is necessary for the care and supervision of the lighthouses are fully provided for, and nothing further is called for, so far as the lights of this Presidency are concerned.

ORDER—dated 3rd December 1884, No. 529, Marine.

The Government do not concur in thinking it wise to leave the very important business of inspecting lighthouses in the hands of local officers unchecked and uncontrolled by the periodical visits and inspection of some professional officer of high standing.

2. In future, the Government desire that the Chief Engineer (or a competent officer of the Public Works department) shall periodically visit the lighthouses in the Madras Presidency, in the company of the Master Attendant, and report upon their condition. Such visits should be made as frequently as may be necessary with respect to the conditions affecting each lighthouse; but every one should be visited once at least in the course of the year.

(True Extract.)

E. F. WEBSTER,
Chief Secretary.

To the Public Works department, } with copy of General Fraser's report.
„ Master Attendant, Madras, }

ENDORSEMENT—dated 3rd December 1884, No. 530, Marine.

Copy to the Government of India, Department of Finance and Commerce.

E. F. WEBSTER,
Chief Secretary.

Exd. J. Wright.

C&O 1981 92

Govt. of {1884} Madras.

MARINE.

Issued

Recd. *Encl.*

G.O., &c., 3rd December 1884,
Nos. 529, 530.

B&C 164 WR 20.1.85

DECEMBER.

Lighthouses.

Passing orders regarding the periodical inspection of the — in the Madras Presidency.

From Lieutenant-General A. FRASER, R.E., C.B., late Secretary to the Government of India, Public Works department, to the Under Secretary of State for India, dated 30th June 1884.

Although no explanation of mine can remove the distress I feel at the destruction of works with which I, as an engineer and adviser to the Government of India, have been intimately connected, I beg to offer some observations on the subject of the loss last month in a cyclone of the lighthouse on the Oyster Reef of Akyab. This serious misfortune has followed the disappearance, seven years ago, of the somewhat similar building which had been erected on the Krishna shoal. Both were on screw piles, both were recommended by me, the designs were generally approved by me, and one (that on the Krishna shoal) was put up under my personal direction; and the following remarks are necessary, in order that the Government may be able to consider how far my judgment, in recommending the erection of these structures on these particular points, may have been in error, and to what extent it should trust again in similar buildings under similar conditions.

2. With a view of arriving at a just estimate of the considerations which influenced my judgment in this weighty matter, I must ask the Government to go back with me for a moment thirty years—to the time (1854) when Lord Dalhousie was Governor-General of India. This noble Lord, foreseeing the strides which British Burma was likely to make in commercial prosperity, saw at the same time, in the Alguada Reef, a great danger to ships in their approach to, and departure from, the coasts of the province. His Lordship, having at the close of the Burmese war expressed himself, in terms noted in the margin, satisfied with the manner I had dealt with Rangoon as Executive Engineer under the lead of Major Hugh Fraser, R.E., the then Chief Engineer, did me the honor of selecting me, at the recommendation of that officer, to undertake the work of building a lighthouse on that dangerous reef. I had then no experience of such works, and Lord Dalhousie, noting this, desired that I should be sent home for the purpose of inspecting works of a similar character in England and abroad, first making a general survey of the reef and its neighbourhood.

Military department of Government of India, No. 457, of 16th December 1854, conveys "to Lieutenant Fraser, the Executive Engineer, an expression of the approbation with which the Most Noble the Governor-General in Council views the zeal and ability he has displayed in forming the new cantonment in question."

3. I made this general survey at that time, but some State financial difficulties intervening it was determined to postpone the works on the reef. In the meantime some specially important and large operations in building barracks and in otherwise improving the condition of the European troops in the garrison of Fort William, Calcutta, were required, and in these Lord Canning, the then Governor-General (1855), took personal interest. I was moved to forego the furlough, for which I had applied, in order to undertake these works. This I did, and when they were sufficiently in train towards completion,* the Governor-General expressing himself completely satisfied (His Excellency often personally visited my works) with my proceedings in Fort William, found himself able to forward the desire of his great predecessor by sending me, early in 1857, to England to fit me for the work which Lord Dalhousie had had at heart.

* I have some pride in noting here that, in dealing with Rangoon and Fort William, I carried out the chief works, which resulted in rendering the two most notoriously unhealthy stations for British troops in the East, those which became thereafter more healthy for Europeans than any other places in the plains of India.

4. The result of my deputation to England was embodied in a report, dated October 1857, which I submitted to the Honorable the Court of Directors, but owing to the occurrence of the Mutiny it was not till 1859 (I being then Under Secretary to the Government of India in the Public Works department) that Lord Canning recorded the observations I have transferred to the margin. I extract these observations and those of Lord Dalhousie because they show (1) that, at whatever inconvenience, experience *was* then considered necessary in this class of work; and (2) that the heads of the Government had fair reason, from works already executed with success, for their confidence in my ability to carry out perhaps the most difficult of all engineering works, in a country where all labor had to be instructed, and all material had to be obtained from abroad.

Extract letter of 16th December 1859 from the Secretary, Government of India, with the Governor-General, to the Officiating Secretary to the Government of India, Public Works department, Calcutta:—

"2. The Governor-General is of opinion that this work (the Alguada Reef lighthouse) should now be commenced at once, and he comes to this conclusion not merely on account of the importance of the work in itself, but because by further delay we risk the loss of an officer who was especially deputed to England to study the subject.

"3. Though Captain Fraser's services as Under Secretary in this department (Public Works department) are very highly valued, and their loss will be seriously felt, it is necessary that he should now resume the duties originally confided to him."

5. During the period between December 1859 and April 1865 (when the Alguada Reef lighthouse was lighted) I thought it my duty to employ myself not only on the special work for which I had been fitted by the Government, but in seeking to utilise the experience gained in England on lighthouse work generally, by suggesting measures for fully protecting the trade with Burma, which was advancing at a rate which probably even Lord Dalhousie had not anticipated. These suggestions resulted in my building (1) the stone lighthouse on Double Island, showing a light of the first class, as a guide for vessels making for the port of Moulmein; (2) the iron lighthouse on Table Island, of the Great Coco group, Andaman Islands, which also shows a light of the first class, to facilitate the navigation of the Preparis Channel. I subsequently arranged, before leaving Burma, for a lighthouse on screw piles; (3) the China Bukeer, showing a first-class light; and (4) for a second of similar structure on the eastern grove, showing a specially designed light, as "land-fall" lights for the Rangoon river. I further had (5) the Savage Island light, used to facilitate entering Akyab Harbour, improved from an apparatus furnished with common oil lamps to a third-class ordinary dioptric light. I was thus, in return for the experience the Government had allowed me to gain in Europe, enabled to add six lights to the 20 which previously lighted both sides of the Bay of Bengal, and, with *two exceptions*, had made the entire coast on the eastern side of that bay practically safe, as regards *land-fall*, to ships trading on that side from Chittagong to Acheen head.

6. The *two exceptions* noted in the last paragraph required to be dealt with in order that ships might be completely guarded against all the prominent dangers of the entire British Burma coast. *The one* was the Krishna shoal and Baragon flat, the junction of which formed the turning point from the Bay of Bengal to the Rangoon river, and Gulf of Martaban on its western side, the light in Double Island forming the guard on its (the Gulf's) eastern side. *The other* was the Oyster Reef, which required to be lighted to render safe the northern and western approaches to the harbour of Akyab. In thick weather ships attempting to make Akyab were always in more or less fear, according to the time at which sun or stars had been last seen, of this reef, which was all the more dangerous from the fact of its being only just a-wash at low water.

7. By the cyclone of 1864, and previous years, immense damage had been done to ships lying in the Hooghly off Calcutta, by reason of the insufficiency of the moorings, and the Government of India had lost more than one lightship with all hands on board in these disastrous winds. I had thus had my attention called to works with Mitchell's screws and screw piles. My plan for mooring the shipping was approved by the Secretary of State (*see* letter from your office, dated 18th January 1867, to my address), and the work was successfully carried out. I believe the only danger to ships now lying in the Hooghly from a cyclone, as regards moorings, is the comparative weakness of the ships' own chains. I suggested also screw-pile jetties for Calcutta, which were afterwards carried out with, I believe, complete success.

8. I found, moreover, that no *solid* building could be erected, on either of the points which, as I have shown, remained to be lighted for the complete protection of ships making the coasts of British Burma, at any reasonable cost, if it could be done at all. I, at all events at that time, did not see my way to any successful result from any amount of expenditure in this direction.

With the knowledge of the loss of life which had occurred by the destruction of such vessels,* I was equally undesirous of recommending a lightship at points which in either case, to my mind, would have involved the putting of a ship on a dead lee shore, and its inevitable destruction, with all hands, in case of a severe cyclone.

* Even the best cared for lightships on British coasts are liable to destruction. This is the latest example extracted from a report in the *Morning Post* of the 22nd June 1884:—

"Sinking of the *Girdler* Lightship.

"A Lloyd's telegram from Dover states that the P. and O. steamer *Indus* from London to Sydney, laden with a general cargo and 400 passengers, ran into and sank the *Girdler* lightship on Friday night. The crew of the lightship were taken on board the *Indus* and landed at Dover." It might easily have been otherwise with the crew had there been unfavorable conditions of weather.

9. As a lighthouse require the attendance of not more than three or four keepers, my decision was largely influenced by the smaller loss of life which would ensue, on any accident occurring, than would be the case in respect of a lightship which would require eight or nine times the number of men to manage her.

10. Again, I was influenced by the much smaller cost of maintaining a lighthouse which, including interest on cost, was not above half that of maintaining a lightship (*see* also on this point the report of Captain A. Dundas Taylor, I.N., No. 73, D.B., dated 14th February 1877, to the Government of India, Department of Revenue, Agriculture, and Commerce, on the subject of the substitution of lighthouses for lightships in the Hooghly and its approaches).

11. A third point which swayed my judgment in favor of the lighthouse was the superiority of the light in power, elevation, and steadiness over that borne by a lightship.

12. The way I put to the Government the result of my considerations is shown in the following extract of a memorandum which I prepared for the Lieutenant-Governor of Bengal

(Sir A. Eden): "On the substitution of lighthouses for lightships" at the Sandheads, dated 27th March 1879 (after the loss of the screw-pile lighthouse on the Krishna shoal):—

"21. From the figures given in the margin it will be seen that, by substituting lighthouses for lightships, the Port (Calcutta) funds will save £7,625 a-year, with better lights and less risk to human life. Accidents may occur, but there is plenty of money to repair damages, and accidents are less likely to occur to lighthouses than to lightships. The risk must be accepted, but the risk is less with lighthouses than with lightships." All my previous reports (which I have not by me) adopted the same tone.

Was I justified or not in adopting this tone? I really cannot feel sure that, even now were I in a position to be consulted, I should not recommend as strongly as I did then the erection of lighthouses of this class in positions where *weight* cannot, by reason of absence of adequate foundations, or in consequence of excessive cost and danger in construction, be opposed to the impact of the sea, or where lightships on a lee shore would be subject to cyclones. I must leave to the Government the decision on this question, being, however, certain that whatever the decision may be, it cannot either deepen or alleviate the regret I feel at the event which I am now deploring. The only feelings which give relief to my mind on the subject are that—

(1) If these dangerous points had not been marked at all, which but for me they probably would not have been, the loss by wrecks of life and property for the eight or nine years of increasing trade during which these lighthouses stood would have been very considerable.

(2) I should have incurred greater risk of life by placing lightships in these positions. But I could not again recommend construction on such points of a coast as I have noted of such lighthouses as those on screw piles, unless the Government followed the recommendations I previously gave in respect of *their care*.*

* Paragraph 42 of my report on the Savage lighthouse, dated 13th March 1865. My letter to Secretary to the Government of India, No. 39-59C., dated 5th June 1865, said:—

"But it would be better, in my opinion, to do nothing than to go to the expense of alteration or restoration, and, indeed, of building any new lighthouses at all, unless the Government are prepared to admit the necessity of, and meet the extra expense consequent on, having this and all their lighthouses properly visited and cared for by competent people."

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If asked, General Hyde will probably inform you that the strength of an iron structure of this character depended on its rigidity; and if from a constant "trembling motion" any parts worked loose, the whole thing was open to damage, or even destruction, by a force which might have no effect upon it if rigid.

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coincidence of time during which this and the Krishna Shoal lighthouse stood. The first was lighted in 1876, and the lighthouse was carried away in 1884. The Krishna Shoal structure was lighted in 1869, and it disappeared in 1877.

The strain on the former from its position, although a more substantial structure, would be greater than on the latter; "the trembling motion," in fact, would be more forcible; and if inspection and repair were not effective, would be open to succumb about the same time as the latter. This leads me to the "uneasy" feeling (a feeling that I had expressed in 1865) that the primary cause of disaster was the same in both cases, *i.e.*, ineffective inspection and consequent ineffective repair. In the absence of certain knowledge, the loss of the Krishna Shoal lighthouse was attributed to scour. This could hardly have been the cause in respect of that on the Oyster Reef. But "the trembling motion of the water" in its effect on the braces would, more or less, be similar in each case; and if the braces or other parts had worked well, further cause of disaster need not be looked for. But I shall be able to judge better on this point if you will send me the record of inspection and repair of the Oyster Reef building from the time of its erection. While on this subject I may as well extract the following paragraph (37) from my report of 1865 before alluded to on "the Savage" lighthouse, as it gives my opinion as to the alternative to be adopted if it were decided that a lighthouse on the Oyster Reef should not be erected:—

"If a lighthouse is not to be put on the Oyster Reef, then I am of opinion (first) that 'the Savage' lighthouse ought to be raised, so that the centre of the light shall be 150 feet above high-water mark, which would make the light visible from the deck of a ship 20 miles off; (second) that a new light apparatus of the first order, and of a description suited to the are of the horizon required to be illuminated, be procured, for which, as the present lantern would be too small, (third) a new lantern would be required." The report referred to gave other details, which, however, it is not necessary here to refer to. I only give the extract in case it should prove necessary, in the absence of a light on the Oyster Reef, and the danger of putting a lightship there, to adopt some, though inferior, protection to shipping visiting Akyab.

18. Finally, I would dwell for a moment on one more point, which is, perhaps, of still greater importance to the Government and to me than any which has been hereinbefore discussed; and that is, the state of the lighthouse on the Alguada Reef, or rather of the rock on which it, a column of 4,000 tons in weight, has stood since 1863. The column was practically completed in that year, although it was only lighted in 1865. In July 1881 I wrote to Mr. Bernard, C.S.I., the Chief Commissioner, about possible encroachments by the sea on the foundation, and I recommended protection in a certain direction (I sent him a plan and proposal which I thought would prove dangerous if the sea was cutting at all. In April 1882 I heard from Colonel Scott-Moncrief, R.E., the then Chief Engineer, who said among other things that "the fissure" of which I had written "is cutting in through, I believe;" and as from his statement it seems to have cut in some 8 or 9 feet since 1859 when I examined it, and there is only some 4 or 5 feet left between the end of the fissure and the foundation of the lighthouse, in 10 or 15 years' time one may calculate that, if nothing be done, the sea will again be master of the situation. As all the officers have probably changed since I wrote in 1881, may I request the favor of your drawing the attention of the Government of India to the matter? The protection required would probably be easily carried out with concrete in bags as a coffer dam, behind which, in the fine weather, "the fissure" may be dealt with at no great cost. But it is worth doing at any reasonable expense, as it will be very difficult to find on the reef an equally good position for a lighthouse. It is besides a monument worth preserving, if only in memory of the great Governor-General who saw its necessity and ordered its construction, or in that of the noble man under whose auspices, at a very difficult period of his administration, I had the honor of carrying it out, and who, as Colonel Yule will tell you, found time personally to encourage me in my very difficult and anxious task.

APPENDIX to Marine G.O., No. 529, dated 3rd December 1884.

From Lieutenant-General A. FRASER, R.E., C.B., late Secretary to the Government of India, Public Works department, to the Under Secretary of State for India, dated 30th June 1884.

Although no explanation of mine can remove the distress I feel at the destruction of works with which I, as an engineer and adviser to the Government of India, have been intimately connected, I beg to offer some observations on the subject of the loss last month in a cyclone of the lighthouse on the Oyster Reef of Akyab. This serious misfortune has followed the disappearance, seven years ago, of the somewhat similar building which had been erected on the Krishna shoal. Both were on screw piles, both were recommended by me, the designs were generally approved by me, and one (that on the Krishna shoal) was put up under my personal direction; and the following remarks are necessary, in order that the Government may be able to consider how far my judgment, in recommending the erection of these structures on these particular points, may have been in error, and to what extent it should trust again in similar buildings under similar conditions.

2. With a view of arriving at a just estimate of the considerations which influenced my judgment in this weighty matter, I must ask the Government to go back with me for a moment thirty years—to the time (1854) when Lord Dalhousie was Governor-General of India. This noble Lord, foreseeing the strides which British Burma was likely to make in commercial prosperity, saw at the same time, in the Alguada Reef, a great danger to ships in their approach to, and departure from, the coasts of the province. His Lordship, having at the close of the Burmese war expressed himself, in terms noted in the margin, satisfied with the manner I had dealt with Rangoon as Executive Engineer under the lead of Major Hugh Fraser, R.E., the then Chief Engineer, did me the honor of selecting me, at the recommendation of that officer, to undertake the work of building a lighthouse on that dangerous reef. I had then no experience of such works, and Lord Dalhousie, noting this, desired that I should be sent home for the purpose of inspecting works of a similar character in England and abroad, first making a general survey of the reef and its neighbourhood.

Military department of Government of India, No. 457, of 16th December 1854, conveys "to Lieutenant Fraser, the Executive Engineer, an expression of the approbation with which the Most Noble the Governor-General in Council views the zeal and ability he has displayed in forming the new cantonment in question."

3. I made this general survey at that time, but some State financial difficulties intervening it was determined to postpone the works on the reef. In the meantime some specially important and large operations in building barracks and in otherwise improving the condition of the European troops in the garrison of Fort William, Calcutta, were required, and in these Lord Canning, the then Governor-General (1855), took personal interest. I was moved to forego the furlough, for which I had applied, in order to undertake these works. This I did, and when they were sufficiently in train towards completion,* the Governor-General expressing himself completely satisfied (His Excellency often personally visited my works) with my proceedings in Fort William, found himself able to forward the desire of his great predecessor by sending me, early in 1857, to England to fit me for the work which Lord Dalhousie had had at heart.

* I have some pride in noting here that, in dealing with Rangoon and Fort William, I carried out the chief works, which resulted in rendering the two most notoriously unhealthy stations for British troops in the East, those which became thereafter more healthy for Europeans than any other places in the plains of India.

4. The result of my deputation to England was embodied in a report, dated October 1857, which I submitted to the Honorable the Court of Directors, but owing to the occurrence of the Mutiny it was not till 1859 (I being then Under Secretary to the Government of India in the Public Works department) that Lord Canning recorded the observations I have transferred to the margin. I extract these observations and those of Lord Dalhousie because they show (1) that, at whatever inconvenience, experience was then considered necessary in this class of work; and (2) that the heads of the Government had fair reason, from works already executed with success, for their confidence in my ability to carry out perhaps the most difficult of all engineering works, in a country where all labor had to be instructed, and all material had to be obtained from abroad.

Extract letter of 16th December 1859 from the Secretary, Government of India, with the Governor-General, to the Officiating Secretary to the Government of India, Public Works department, Calcutta:—

"2. The Governor-General is of opinion that this work (the Alguada Reef lighthouse) should now be commenced at once, and he comes to this conclusion not merely on account of the importance of the work in itself, but because by further delay we risk the loss of an officer who was especially deputed to England to study the subject.

"3. Though Captain Fraser's services as Under Secretary in this department (Public Works department) are very highly valued, and their loss will be seriously felt, it is necessary that he should now resume the duties originally confided to him."

5. During the period between December 1859 and April 1865 (when the Alguada Reef lighthouse was lighted) I thought it my duty to employ myself not only on the special work for which I had been fitted by the Government, but in seeking to utilise the experience gained in England on lighthouse work generally, by suggesting measures for fully protecting the trade with Burma, which was advancing at a rate which probably even Lord Dalhousie had not anticipated. These suggestions resulted in my building (1) the stone lighthouse on Double Island, showing a light of the first class, as a guide for vessels making for the port of Moulmein; (2) the iron lighthouse on Table Island, of the Great Coco group, Andaman Islands, which also shows a light of the first class, to facilitate the navigation of the Preparis Channel. I subsequently arranged, before leaving Burma, for a lighthouse on screw piles; (3) the China Bukeer, showing a first-class light; and (4) for a second of similar structure on the eastern grove, showing a specially designed light, as "land-fall" lights for the Rangoon river. I further had (5) the Savage Island light, used to facilitate entering Akyab Harbour, improved from an apparatus furnished with common oil lamps to a third-class ordinary dioptric light. I was thus, in return for the experience the Government had allowed me to gain in Europe, enabled to add six lights to the 20 which previously lighted both sides of the Bay of Bengal, and, with *two exceptions*, had made the entire coast on the eastern side of that bay practically safe, as regards *land-fall*, to ships trading on that side from Chittagong to Acheen head.

6. The *two exceptions* noted in the last paragraph required to be dealt with in order that ships might be completely guarded against all the prominent dangers of the entire British Burma coast. *The one* was the Krishna shoal and Baragon flat, the junction of which formed the turning point from the Bay of Bengal to the Rangoon river, and Gulf of Martaban on its western side, the light in Double Island forming the guard on its (the Gulf's) eastern side. *The other* was the Oyster Reef, which required to be lighted to render safe the northern and western approaches to the harbour of Akyab. In thick weather ships attempting to make Akyab were always in more or less fear, according to the time at which sun or stars had been last seen, of this reef, which was all the more dangerous from the fact of its being only just a-wash at low water.

7. By the cyclone of 1864, and previous years, immense damage had been done to ships lying in the Hooghly off Calcutta, by reason of the insufficiency of the moorings, and the Government of India had lost more than one lightship with all hands on board in these disastrous winds. I had thus had my attention called to works with Mitchell's screws and screw piles. My plan for mooring the shipping was approved by the Secretary of State (*see* letter from your office, dated 18th January 1867, to my address), and the work was successfully carried out. I believe the only danger to ships now lying in the Hooghly from a cyclone, as regards moorings, is the comparative weakness of the ships' own chains. I suggested also screw-pile jetties for Calcutta, which were afterwards carried out with, I believe, complete success.

8. I found, moreover, that no *solid* building could be erected, on either of the points which, as I have shown, remained to be lighted for the complete protection of ships making the coasts of British Burma, at any reasonable cost, if it could be done at all. I, at all events at that time, did not see my way to any successful result from any amount of expenditure in this direction.

With the knowledge of the loss of life which had occurred by the destruction of such vessels, * I was equally undesirous of recommending a lightship at points which in either case, to my mind, would have involved the putting of a ship on a dead lee shore, and its inevitable destruction, with all hands, in case of a severe cyclone.

* Even the best cared for lightships on British coasts are liable to destruction. This is the latest example extracted from a report in the *Morning Post* of the 22nd June 1884:—

"Sinking of the *Girdler* Lightship.

"A Lloyd's telegram from Dover states that the P. and O. steamer *Indus* from London to Sydney, laden with a general cargo and 400 passengers, ran into and sank the *Girdler* lightship on Friday night. The crew of the lightship were taken on board the *Indus* and landed at Dover." It might easily have been otherwise with the crew had there been unfavorable conditions of weather.

9. As a lighthouse require the attendance of not more than three or four keepers, my decision was largely influenced by the smaller loss of life which would ensue, on any accident occurring, than would be the case in respect of a lightship which would require eight or nine times the number of men to manage her.

10. Again, I was influenced by the much smaller cost of maintaining a lighthouse which, including interest on cost, was not above half that of maintaining a lightship (*see* also on this point the report of Captain A. Dundas Taylor, I.N., No. 73, D.B., dated 14th February 1877, to the Government of India, Department of Revenue, Agriculture, and Commerce, on the subject of the substitution of lighthouses for lightships in the Hooghly and its approaches).

11. A third point which swayed my judgment in favor of the lighthouse was the superiority of the light in power, elevation, and steadiness over that borne by a lightship.

12. The way I put to the Government the result of my considerations is shown in the following extract of a memorandum which I prepared for the Lieutenant-Governor of Bengal

(Sir A. Eden): "On the substitution of lighthouses for lightships" at the Sandheads, dated 27th March 1879 (after the loss of the screw-pile lighthouse on the Krishna shoal):—

"21. From the figures given in the margin it will be seen that, by substituting lighthouses for lightships, the Port (Calcutta) funds will save £7,625 a-year, with better lights and less risk to human life. Accidents may occur, but there is plenty of money to repair damages, and accidents are less likely to occur to lighthouses than to lightships. The risk must be accepted, but the risk is less with lighthouses than with lightships." All my previous reports (which I have not by me) adopted the same tone.

Was I justified or not in adopting this tone? I really cannot feel sure that, even now were I in a position to be consulted, I should not recommend as strongly as I did then the erection of lighthouses of this class in positions where *weight* cannot, by reason of absence of adequate foundations, or in consequence of excessive cost and danger in construction, be opposed to the impact of the sea, or where lightships on a lee shore would be subject to cyclones. I must leave to the Government the decision on this question, being, however, certain that whatever the decision may be, it cannot either deepen or alleviate the regret I feel at the event which I am now deploring. The only feelings which give relief to my mind on the subject are that—

(1) If these dangerous points had not been marked at all, which but for me they probably would not have been, the loss by wrecks of life and property for the eight or nine years of increasing trade during which these lighthouses stood would have been very considerable.

(2) I should have incurred greater risk of life by placing lightships in these positions. But I could not again recommend construction on such points of a coast as I have noted of such lighthouses as those on screw piles, unless the Government followed the recommendations I previously gave in respect of *their care*.*

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coincidence of time during which this and the Krishna Shoal lighthouse stood. The first was lighted in 1876, and the lighthouse was carried away in 1884. The Krishna Shoal structure was lighted in 1869, and it disappeared in 1877.

The strain on the former from its position, although a more substantial structure, would be greater than on the latter; "the trembling motion," in fact, would be more forcible; and if inspection and repair were not effective, would be open to succumb about the same time as the latter. This leads me to the "uneasy" feeling (a feeling that I had expressed in 1865) that the primary cause of disaster was the same in both cases, *i.e.*, ineffective inspection and consequent ineffective repair. In the absence of certain knowledge, the loss of the Krishna Shoal lighthouse was attributed to scour. This could hardly have been the cause in respect of that on the Oyster Reef. But "the trembling motion of the water" in its effect on the braces would, more or less, be similar in each case; and if the braces or other parts had worked well, further cause of disaster need not be looked for. But I shall be able to judge better on this point if you will send me the record of inspection and repair of the Oyster Reef building from the time of its erection. While on this subject I may as well extract the following paragraph (37) from my report of 1865 before alluded to on "the Savage" lighthouse, as it gives my opinion as to the alternative to be adopted if it were decided that a lighthouse on the Oyster Reef should not be erected:—

"If a lighthouse is not to be put on the Oyster Reef, then I am of opinion (first) that 'the Savage' lighthouse ought to be raised, so that the centre of the light shall be 150 feet above high-water mark, which would make the light visible from the deck of a ship 20 miles off; (second) that a new light apparatus of the first order, and of a description suited to the are of the horizon required to be illuminated, be procured, for which, as the present lantern would be too small, (third) a new lantern would be required." The report referred to gave other details, which, however, it is not necessary here to refer to. I only give the extract in case it should prove necessary, in the absence of a light on the Oyster Reef, and the danger of putting a lightship there, to adopt some, though inferior, protection to shipping visiting Akyab.

18. Finally, I would dwell for a moment on one more point, which is, perhaps, of still greater importance to the Government and to me than any which has been hereinbefore discussed; and that is, the state of the lighthouse on the Alguada Reef, or rather of the rock on which it, a column of 4,000 tons in weight, has stood since 1863. The column was practically completed in that year, although it was only lighted in 1865. In July 1881 I wrote to Mr. Bernard, C.S.I., the Chief Commissioner, about possible encroachments by the sea on the foundation, and I recommended protection in a certain direction (I sent him a plan and proposal) which I thought would prove dangerous if the sea was cutting at all. In April 1882 I heard from Colonel Scott-Moncrief, R.E., the then Chief Engineer, who said among other things that "the fissure" of which I had written "is cutting in through, I believe;" and as from his statement it seems to have cut in some 8 or 9 feet since 1859 when I examined it, and there is only some 4 or 5 feet left between the end of the fissure and the foundation of the lighthouse, in 10 or 15 years' time one may calculate that, if nothing be done, the sea will again be master of the situation. As all the officers have probably changed since I wrote in 1881, may I request the favor of your drawing the attention of the Government of India to the matter? The protection required would probably be easily carried out with concrete in bags as a coffer dam, behind which, in the fine weather, "the fissure" may be dealt with at no great cost. But it is worth doing at any reasonable expense, as it will be very difficult to find on the reef an equally good position for a lighthouse. It is besides a monument worth preserving, if only in memory of the great Governor-General who saw its necessity and ordered its construction, or in that of the noble man under whose auspices, at a very difficult period of his administration, I had the honor of carrying it out, and who, as Colonel Yule will tell you, found time personally to encourage me in my very difficult and anxious task.

GOVERNMENT OF MADRAS.

MARINE DEPARTMENT.

Read—the following papers:—

From J. E. O'CONOR, Esq., Assistant Secretary to the Government of India, Department of Finance and Commerce (Separate Revenue, &c.—Commerce and Trade—Lights and Light Dues), to the Chief Secretary to Government, dated Simla, 2nd October 1884, No. 3739.

I am directed to forward a copy of a despatch from the Secretary of State, No. 42 (Public Works), dated the 7th August 1884, and its enclosure, in which General Fraser advocates a much more frequent and systematic inspection of lighthouses on the Indian coasts than that which he understands to have hitherto been carried out by officers who are qualified for such duties by possessing the necessary engineering and nautical knowledge.

2. I am to request that the Government of India may be furnished with a report showing the existing system of inspection of lighthouses in the Madras Presidency, as well as with such remarks and suggestions as the Government of Madras may wish to make in connection therewith.

Enclosures.

From Her Majesty's Secretary of State for India, to the Government of India, dated 7th August 1884, No. 42.

I transmit, herewith, for the information of your Excellency's Government, copy of a letter* which has been addressed to this office by Lieutenant-General A. Fraser, R.E., C.B., late Secretary in the Public Works department to the Government of India, on the subject of the disappearance of the Krishna and Akyab lighthouses, with the erection of both of which structures he was professionally connected.

* Dated 30th June 1884.

2. In this letter, which calls for the very serious attention of your Excellency's Government, you will observe that General Fraser advocates a much more frequent and systematic inspection of lighthouses on the Indian coasts than that which he understands to have been hitherto carried out by officers who are qualified for such duties by possessing the necessary engineering and nautical knowledge, and I shall be glad to be informed of your views on this suggestion, as well as on the question of the course to be followed in giving the needful protection to the coast on the eastern side of the Bay of Bengal, and the expediency of reconstructing the oyster reef lighthouse, and the system of construction to be adopted if it is thought necessary to restore it.

3. I would also draw your Excellency's special attention to the last paragraph of General Fraser's letter, in which he points out certain dangers to which, he believes, the lighthouse on the Alguada Reef to be at present exposed.

4. I request that full reports may be furnished to me on the points above mentioned, to place me in a position to obtain the opinion of the most competent authorities in this country on any part of the subject which, on further consideration, it may appear desirable to submit to them.

From Lieutenant-General A. FRASER, R.E., C.B., late Secretary to the Government of India, Public Works department, to the Under Secretary of State for India, dated 30th June 1884.

From J. H. TAYLOR, Esq., Lieutenant, R.N.R., Master Attendant, Madras, to the Chief Secretary to Government, dated Madras, 24th October 1884, No. 9921.

Administrative department.

With reference to the papers from the Government of India, relating to a proposal from General Fraser as to the frequent and systematic inspection of lighthouses on the Indian coasts, forwarded with endorsement, No. 2317, dated 15th October 1884, I have the honor to report that most of the British lights of this Presidency are situated at the different ports, where they are under the immediate charge of the Port officer, and any formal inspection is therefore unnecessary in their case. The seven lighthouses located out of port limits are in charge of competent Superintendents, men who can read and record barometrical readings, answer a reference, and are able to act independently of advice in case of emergency. They are situated at a convenient distance, so that the Superintendent can refer to the nearest Port officer, who is, besides, in constant communication with the lighthouse Superintendent, regarding the supply of stores and other requirements, which are duly attended to. As often as circumstances will permit, they are visited by me personally, but for necessary repairs the nearest officer of the Public Works department is always available. It will thus be seen that all that is necessary for the care and supervision of the lighthouses are fully provided for, and nothing further is called for, so far as the lights of this Presidency are concerned.

Order—dated 3rd December 1884, No. 529, Marine.

The Government do not concur in thinking it wise to leave the very important business of inspecting lighthouses in the hands of local officers unchecked and uncontrolled by the periodical visits and inspection of some professional officer of high standing.

2. In future, the Government desire that the Chief Engineer (or a competent officer of the Public Works department) shall periodically visit the lighthouses in the Madras Presidency, in the company of the Master Attendant, and report upon their condition. Such visits should be made as frequently as may be necessary with respect to the conditions affecting each lighthouse; but every one should be visited once at least in the course of the year.

(True Extract.)

E. F. WEBSTER,
Chief Secretary.

To the Public Works department, } with copy of General Fraser's report.
„ Master Attendant, Madras, }

Endorsement—dated 3rd December 1884, No. 530, Marine.

Copy to the Government of India, Department of Finance and Commerce.

E. F. WEBSTER,
Chief Secretary.

Exd. J. Wright.

20-8-92

Govt. of {1884} Madras.

MARINE.

Issued

Recd. *Encl.*

G.O., &c., 3rd December 1884,
Nos. 529, 530.

B-86164 W 20-1-85-

DECEMBER.

Lighthouses.

Passing orders regarding the periodical inspection of the — in the Madras Presidency.

APPENDIX to Marine G.O., No. 529, dated 3rd December 1884.

From Lieutenant-General A. FRASER, R.E., C.B., late Secretary to the Government of India, Public Works department, to the Under Secretary of State for India, dated 30th June 1884.

Although no explanation of mine can remove the distress I feel at the destruction of works with which I, as an engineer and adviser to the Government of India, have been intimately connected, I beg to offer some observations on the subject of the loss last month in a cyclone of the lighthouse on the Oyster Reef of Akyab. This serious misfortune has followed the disappearance, seven years ago, of the somewhat similar building which had been erected on the Krishna shoal. Both were on screw piles, both were recommended by me, the designs were generally approved by me, and one (that on the Krishna shoal) was put up under my personal direction; and the following remarks are necessary, in order that the Government may be able to consider how far my judgment, in recommending the erection of these structures on these particular points, may have been in error, and to what extent it should trust again in similar buildings under similar conditions.

2. With a view of arriving at a just estimate of the considerations which influenced my judgment in this weighty matter, I must ask the Government to go back with me for a moment thirty years—to the time (1854) when Lord Dalhousie was Governor-General of India. This noble Lord, foreseeing the strides which British Burma was likely to make in commercial prosperity, saw at the same time, in the Alguada Reef, a great danger to ships in their approach to, and departure from, the coasts of the province. His Lordship, having at the close of the Burmese war expressed himself, in terms noted in the margin, satisfied with the manner I had dealt with Rangoon as Executive Engineer under the lead of Major Hugh Fraser, R.E., the then Chief Engineer, did me the honor of selecting me, at the recommendation of that officer, to undertake the work of building a lighthouse on that dangerous reef. I had then no experience of such works, and Lord Dalhousie, noting this, desired that I should be sent home for the purpose of inspecting works of a similar character in England and abroad, first making a general survey of the reef and its neighbourhood.

Military department of Government of India, No. 457, of 16th December 1854, conveys "to Lieutenant Fraser, the Executive Engineer, an expression of the approbation with which the Most Noble the Governor-General in Council views the zeal and ability he has displayed in forming the new cantonment in question."

3. I made this general survey at that time, but some State financial difficulties intervening it was determined to postpone the works on the reef. In the meantime some specially important and large operations in building barracks and in otherwise improving the condition of the European troops in the garrison of Fort William, Calcutta, were required, and in these Lord Canning, the then Governor-General (1855), took personal interest. I was moved to forego the furlough, for which I had applied, in order to undertake these works. This I did, and when they were sufficiently in train towards completion,* the Governor-General expressing himself completely satisfied (His Excellency often personally visited my works) with my proceedings in Fort William, found himself able to forward the desire of his great predecessor by sending me, early in 1857, to England to fit me for the work which Lord Dalhousie had had at heart.

* I have some pride in noting here that, in dealing with Rangoon and Fort William, I carried out the chief works, which resulted in rendering the two most notoriously unhealthy stations for British troops in the East, those which became thereafter more healthy for Europeans than any other places in the plains of India.

4. The result of my deputation to England was embodied in a report, dated October 1857, which I submitted to the Honorable the Court of Directors, but owing to the occurrence of the Mutiny it was not till 1859 (I being then Under Secretary to the Government of India in the Public Works department) that Lord Canning recorded the observations I have transferred to the margin. I extract these observations and those of Lord Dalhousie because they show (1) that, at whatever inconvenience, experience *was* then considered necessary in this class of work; and (2) that the heads of the Government had fair reason, from works already executed with success, for their confidence in my ability to carry out perhaps the most difficult of all engineering works, in a country where all labor had to be instructed, and all material had to be obtained from abroad.

Extract letter of 16th December 1859 from the Secretary, Government of India, with the Governor-General, to the Officiating Secretary to the Government of India, Public Works department, Calcutta:—

"2. The Governor-General is of opinion that this work (the Alguada Reef lighthouse) should now be commenced at once, and he comes to this conclusion not merely on account of the importance of the work in itself, but because by further delay we risk the loss of an officer who was especially deputed to England to study the subject.

"3. Though Captain Fraser's services as Under Secretary in this department (Public Works department) are very highly valued, and their loss will be seriously felt, it is necessary that he should now resume the duties originally confided to him."

5. During the period between December 1859 and April 1865 (when the Alguada Reef lighthouse was lighted) I thought it my duty to employ myself not only on the special work for which I had been fitted by the Government, but in seeking to utilise the experience gained in England on lighthouse work generally, by suggesting measures for fully protecting the trade with Burma, which was advancing at a rate which probably even Lord Dalhousie had not anticipated. These suggestions resulted in my building (1) the stone lighthouse on Double Island, showing a light of the first class, as a guide for vessels making for the port of Moulmein; (2) the iron lighthouse on Table Island, of the Great Coco group, Andaman Islands, which also shows a light of the first class, to facilitate the navigation of the Preparis Channel. I subsequently arranged, before leaving Burma, for a lighthouse on screw piles; (3) the China Bukeer, showing a first-class light; and (4) for a second of similar structure on the eastern grove, showing a specially designed light, as "land-fall" lights for the Rangoon river. I further had (5) the Savage Island light, used to facilitate entering Akyab Harbour, improved from an apparatus furnished with common oil lamps to a third-class ordinary dioptric light. I was thus, in return for the experience the Government had allowed me to gain in Europe, enabled to add six lights to the 20 which previously lighted both sides of the Bay of Bengal, and, with *two exceptions*, had made the entire coast on the eastern side of that bay practically safe, as regards *land-fall*, to ships trading on that side from Chittagong to Acheen head.

6. The *two exceptions* noted in the last paragraph required to be dealt with in order that ships might be completely guarded against all the prominent dangers of the entire British Burma coast. *The one* was the Krishna shoal and Baragon flat, the junction of which formed the turning point from the Bay of Bengal to the Rangoon river, and Gulf of Martaban on its western side, the light in Double Island forming the guard on its (the Gulf's) eastern side. *The other* was the Oyster Reef, which required to be lighted to render safe the northern and western approaches to the harbour of Akyab. In thick weather ships attempting to make Akyab were always in more or less fear, according to the time at which sun or stars had been last seen, of this reef, which was all the more dangerous from the fact of its being only just a-wash at low water.

7. By the cyclone of 1864, and previous years, immense damage had been done to ships lying in the Hooghly off Calcutta, by reason of the insufficiency of the moorings, and the Government of India had lost more than one lightship with all hands on board in these disastrous winds. I had thus had my attention called to works with Mitchell's screws and screw piles. My plan for mooring the shipping was approved by the Secretary of State (*see* letter from your office, dated 18th January 1867, to my address), and the work was successfully carried out. I believe the only danger to ships now lying in the Hooghly from a cyclone, as regards moorings, is the comparative weakness of the ships' own chains. I suggested also screw-pile jetties for Calcutta, which were afterwards carried out with, I believe, complete success.

8. I found, moreover, that no *solid* building could be erected, on either of the points which, as I have shown, remained to be lighted for the complete protection of ships making the coasts of British Burma, at any reasonable cost, if it could be done at all. I, at all events at that time, did not see my way to any successful result from any amount of expenditure in this direction.

With the knowledge of the loss of life which had occurred by the destruction of such vessels,* I was equally undesirous of recommending a lightship at points which in either case, to my mind, would have involved the putting of a ship on a dead lee shore, and its inevitable destruction, with all hands, in case of a severe cyclone.

* Even the best cared for lightships on British coasts are liable to destruction. This is the latest example extracted from a report in the *Morning Post* of the 22nd June 1884:—

"Sinking of the *Girdler* Lightship.

"A Lloyd's telegram from Dover states that the P. and O. steamer *Indus* from London to Sydney, laden with a general cargo and 400 passengers, ran into and sank the *Girdler* lightship on Friday night. The crew of the lightship were taken on board the *Indus* and landed at Dover." It might easily have been otherwise with the crew had there been unfavorable conditions of weather.

9. As a lighthouse require the attendance of not more than three or four keepers, my decision was largely influenced by the smaller loss of life which would ensue, on any accident occurring, than would be the case in respect of a lightship which would require eight or nine times the number of men to manage her.

10. Again, I was influenced by the much smaller cost of maintaining a lighthouse which, including interest on cost, was not above half that of maintaining a lightship (*see* also on this point the report of Captain A. Dundas Taylor, I.N., No. 73, D.B., dated 14th February 1877, to the Government of India, Department of Revenue, Agriculture, and Commerce, on the subject of the substitution of lighthouses for lightships in the Hooghly and its approaches).

11. A third point which swayed my judgment in favor of the lighthouse was the superiority of the light in power, elevation, and steadiness over that borne by a lightship.

12. The way I put to the Government the result of my considerations is shown in the following extract of a memorandum which I prepared for the Lieutenant-Governor of Bengal

(Sir A. Eden): "On the substitution of lighthouses for lightships" at the Sandheads, dated 27th March 1879 (after the loss of the screw-pile lighthouse on the Krishna shoal):—

"21. From the figures given in the margin it will be seen that, by substituting lighthouses for lightships, the Port (Calcutta) funds will save £7,625 a-year, with better lights and less risk to human life. Accidents may occur, but there is plenty of money to repair damages, and accidents are less likely to occur to lighthouses than to lightships. The risk must be accepted, but the risk is less with lighthouses than with lightships." All my previous reports (which I have not by me) adopted the same tone.

Was I justified or not in adopting this tone? I really cannot feel sure that, even now were I in a position to be consulted, I should not recommend as strongly as I did then the erection of lighthouses of this class in positions where *weight* cannot, by reason of absence of adequate foundations, or in consequence of excessive cost and danger in construction, be opposed to the impact of the sea, or where lightships on a lee shore would be subject to cyclones. I must leave to the Government the decision on this question, being, however, certain that whatever the decision may be, it cannot either deepen or alleviate the regret I feel at the event which I am now deploring. The only feelings which give relief to my mind on the subject are that—

(1) If these dangerous points had not been marked at all, which but for me they probably would not have been, the loss by wrecks of life and property for the eight or nine years of increasing trade during which these lighthouses stood would have been very considerable.

(2) I should have incurred greater risk of life by placing lightships in these positions. But I could not again recommend construction on such points of a coast as I have noted of such lighthouses as those on screw piles, unless the Government followed the recommendations I previously gave in respect of *their care*.*

* Paragraph 42 of my report on the Savage lighthouse, dated 13th March 1865. My letter to Secretary to the Government of India, No. 39-59C., dated 5th June 1865, said:—

"But it would be better, in my opinion, to do nothing than to go to the expense of alteration or restoration, and, indeed, of building any new lighthouses at all, unless the Government are prepared to admit the necessity of, and meet the extra expense consequent on, having this and all their lighthouses properly visited and cared for by competent people."

13. It is necessary now to observe that I had nothing to do personally with the construction of the lighthouse on the Oyster Reef beyond a recommendation of a structure, the design for which I had *generally* approved, on screw piles specially strengthened for that position. I knew nothing of the precise spot selected for its position (a matter here of deep moment), but it was built under the direction of Colonel W. S. Oliphant, R.E., who was at the time Chief Engineer of British Burma, and of Mr. H. M. Mathews, M.I.C.E., a Civil Engineer of great ability, who was then Executive Engineer of the Rangoon Division of Public Works. I do not doubt, therefore, but that it was properly constructed, and, from these competent officers adopting the design, I may assume that they found nothing faulty in it.

14. Before, however, leaving Rangoon permanently for the North-Western Provinces in 1870,† I placed very distinctly before the Government my view of how these structures should be built and cared for. I said in effect that it was impossible, with any sense of safety, for the Government to spend large sums of money on their construction without making adequate arrangements for their care and maintenance in efficiency. I don't for a moment presume to say that such care as was possible, by such officers as were available in such sea transport as the exigencies of other service might from time to time be placed at their disposal, was not exercised. But what I do say is that there has been no care taken of these important works when built directed by that continued experience which both Lords Dalhousie and Canning considered essential as to their construction; that no systematic inspection, repair, or protection of the buildings and their surroundings by persons having full knowledge of all the circumstances and conditions of each work has been undertaken, or indeed has been possible under the system adopted—a system which involves the constant removal of officers, inexperienced in the first instance in this class of work, just as they begin to know something of the works and the conditions affecting them; a system which limits their power of inspection to the time when perhaps the only steamer available for the general service of the local Government can be placed at their disposal.

† I had refused in 1863, I may here remark, the offer of the Government of India to appoint me Chief Engineer and Secretary to the Government of Bengal in the Public Works department, in order that I might devote my special experience to the completion of the lighthouse on the Alguada Reef and other works of cognate character. I thus lost a chance of promotion which did not recur till 1870.

15. The Chief Commissioner, in submitting my final report regarding the British Burma lighthouses to the Government of India with his letter, No. 821-104 C.I., dated Rangoon, 8th October 1869, said:—

"Paragraph 7. Colonel Fraser points to the satisfactory financial condition of those lighthouses that have been for some time in operation. He would abolish as a separate charge ‡

‡ Substituting a tonnage due as in France.

all light dues, make the works Imperial works, supervise them by Imperial establishments, and maintain them from Imperial funds. These are, indeed, portions of the propositions* put forward many years ago by him for the consolidation of the various managements of the lighthouses around the coast of the empire under one central board of management." A reference to my report noted in the margin, and to that mentioned by the Chief Commissioner as having been forwarded to the Government with his above letter, will show what my proposals were. It may not have been consistent with the policy of the Government to adopt them, but of this I am certain, that unless a department, combining engineering and nautical knowledge (and not only knowledge, but engaging the sympathy of official nautical officers), with a power of keeping and transmitting the results of experience gained in this class of work, and of providing proper means of transport for inspectors and material and labor for the repair of damage, be organised, great sea lights will be very much left to the mercy of the waves and the winds, while the valuable apparatuses which have in many cases been provided will never be kept up to that state of efficiency which distinguished the Scotch and French lights and those under the Trinity Board of England. I endeavoured, without success, to utilise my experience in establishing such an arrangement, and when I look down the list (1882) of lights on the coasts of India, and see the nature of those exhibited as described in the numbers in the list noted in the margin, I cannot help feeling, considering also the many other dangerous points requiring attention, that there would be ample field for the operations of such a department, while surely the cost of its care of works already executed would be more than compensated by a comparative freedom from disaster. Any how the system I have described as existing is not fair to the constructors, whose reputation may be compromised; it is not fair to those who, though most anxious to do their duty, cannot look after the works properly; it is unfair to the Government itself, inasmuch as it prevents its maintaining in efficiency these important adjuncts to the safety of the commerce upon which the prosperity of the State depends, while it must share with every one the discredit of preventible disaster.

* See report to the Honorable Court of Directors of East India Company mentioned in paragraph 4.

Nos. 15, 16, 20, 22, 26, 28, 29, 30, 32, 42, 43, 48, 49, 56, 77, 81, 82, 83 (84 False Point was before 1880 a wretched light, although it was the chief "land-fall" light in British India. It was altered at my suggestion), 93, 94.

16. I have only to refer to the papers accompanying the despatches from the Government of India to the Secretary of State, No. 54, dated 30th November 1877, reporting the disappearance of the Krishna Shoal lighthouse, to show the want of care (of the kind I insist upon) to which these structures have been, and no doubt still are, subject. From these papers it would appear that, subsequently to the date I visited the lighthouse in 1870, about two years after it was built, and in which year I finally left the province, no soundings to test scour had been taken, although that was one of the special instructions I left in the light-house. I also requested that at suitable times, before and after each monsoon, soundings should be taken all round the lighthouse to the distance of a mile from it as a centre. I don't believe myself that scour alone could have caused the destruction of the building, still, if it had been ascertained that great scour *had* been going on for some time, measures might have been taken to move the light or divert the scour, or, at all events, to remove the light-keepers. It had not been found difficult, I believe, to move the "China Bukeer" lighthouse of similar character from the shore into two fathoms at low water.

Inspection was made apparently annually only, and that probably when it was least important. This was not nearly enough; and the older the lighthouse grew the more frequent should have been its inspection.†

† *See* my "Rules and Instructions," Appendix C, of my report forwarded to Government of India, with letter quoted in note, page 5.
"Rule VIII.—Each lighthouse shall be visited at least *once a month* by a visiting officer, when possible."
This appendix was deposited in the Alguada Reef lighthouse.

In November 1875 (cyclone time) "the structure of the 'Krishna Shoal lighthouse shows considerable wear in the clasps and braces,' and other deterioration of the bracing is described, apparently caused by the trembling motion given to it by the water striking against it." This would go to show that the bracing had been for years wearing.

Then, again, in October 1876 "the structures was in good repair down to high-water mark," but nothing is said of the structure down to low-water mark; and there was a rise of 9 feet between low and high-water at full and change, or to the ground. The piles themselves might have been wearing under the influence of a silt-bearing six-knot tide, and it would have been easy to have ascertained this by waiting for low-water, when there *ought* to have been only 3 fathoms to the ground.

If asked, General Hyde will probably inform you that the strength of an iron structure of this character depended on its rigidity; and if from a constant "trembling motion" any parts worked loose, the whole thing was open to damage, or even destruction, by a force which might have no effect upon it if rigid.

17. Turning again to the subject of the loss of the Oyster Reef lighthouse, the piles had not been screwed down the full depth I designed, and the floor of the building was consequently between two and three feet higher above the ground; but the screws could not be got in further, it was said, and the greater height would hardly effect stability. There is, however, a curious

coincidence of time during which this and the Krishna Shoal lighthouse stood. The first was lighted in 1876, and the lighthouse was carried away in 1884. The Krishna Shoal structure was lighted in 1869, and it disappeared in 1877.

The strain on the former from its position, although a more substantial structure, would be greater than on the latter; "the trembling motion," in fact, would be more forcible; and if inspection and repair were not effective, would be open to succumb about the same time as the latter. This leads me to the "uneasy" feeling (a feeling that I had expressed in 1865) that the primary cause of disaster was the same in both cases, *i.e.*, ineffective inspection and consequent ineffective repair. In the absence of certain knowledge, the loss of the Krishna Shoal lighthouse was attributed to scour. This could hardly have been the cause in respect of that on the Oyster Reef. But "the trembling motion of the water" in its effect on the braces would, more or less, be similar in each case; and if the braces or other parts had worked well, further cause of disaster need not be looked for. But I shall be able to judge better on this point if you will send me the record of inspection and repair of the Oyster Reef building from the time of its erection. While on this subject I may as well extract the following paragraph (37) from my report of 1865 before alluded to on "the Savage" lighthouse, as it gives my opinion as to the alternative to be adopted if it were decided that a lighthouse on the Oyster Reef should not be erected:—

"If a lighthouse is not to be put on the Oyster Reef, then I am of opinion (first) that 'the Savage' lighthouse ought to be raised, so that the centre of the light shall be 150 feet above high-water mark, which would make the light visible from the deck of a ship 20 miles off; (second) that a new light apparatus of the first order, and of a description suited to the are of the horizon required to be illuminated, be procured, for which, as the present lantern would be too small, (third) a new lantern would be required." The report referred to gave other details, which, however, it is not necessary here to refer to. I only give the extract in case it should prove necessary, in the absence of a light on the Oyster Reef, and the danger of putting a lightship there, to adopt some, though inferior, protection to shipping visiting Akyab.

18. Finally, I would dwell for a moment on one more point, which is, perhaps, of still greater importance to the Government and to me than any which has been hereinbefore discussed; and that is, the state of the lighthouse on the Alguada Reef, or rather of the rock on which it, a column of 4,000 tons in weight, has stood since 1863. The column was practically completed in that year, although it was only lighted in 1865. In July 1881 I wrote to Mr. Bernard, C.S.I., the Chief Commissioner, about possible encroachments by the sea on the foundation, and I recommended protection in a certain direction (I sent him a plan and proposal) which I thought would prove dangerous if the sea was cutting at all. In April 1882 I heard from Colonel Scott-Moncrief, R.E., the then Chief Engineer, who said among other things that "the fissure" of which I had written "is cutting in through, I believe;" and as from his statement it seems to have cut in some 8 or 9 feet since 1859 when I examined it, and there is only some 4 or 5 feet left between the end of the fissure and the foundation of the lighthouse, in 10 or 15 years' time one may calculate that, if nothing be done, the sea will again be master of the situation. As all the officers have probably changed since I wrote in 1881, may I request the favor of your drawing the attention of the Government of India to the matter? The protection required would probably be easily carried out with concrete in bags as a coffer dam, behind which, in the fine weather, "the fissure" may be dealt with at no great cost. But it is worth doing at any reasonable expense, as it will be very difficult to find on the reef an equally good position for a lighthouse. It is besides a monument worth preserving, if only in memory of the great Governor-General who saw its necessity and ordered its construction, or in that of the noble man under whose auspices, at a very difficult period of his administration, I had the honor of carrying it out, and who, as Colonel Yule will tell you, found time personally to encourage me in my very difficult and anxious task.

GOVERNMENT OF MADRAS.

MARINE DEPARTMENT.

Read—the following papers:—

From J. E. O'CONOR, Esq., Assistant Secretary to the Government of India, Department of Finance and Commerce (Separate Revenue, &c.—Commerce and Trade—Lights and Light Dues), to the Chief Secretary to Government, dated Simla, 2nd October 1884, No. 3739.

I am directed to forward a copy of a despatch from the Secretary of State, No. 42 (Public Works), dated the 7th August 1884, and its enclosure, in which General Fraser advocates a much more frequent and systematic inspection of lighthouses on the Indian coasts than that which he understands to have hitherto been carried out by officers who are qualified for such duties by possessing the necessary engineering and nautical knowledge.

2. I am to request that the Government of India may be furnished with a report showing the existing system of inspection of lighthouses in the Madras Presidency, as well as with such remarks and suggestions as the Government of Madras may wish to make in connection therewith.

Enclosures.

From Her Majesty's Secretary of State for India, to the Government of India, dated 7th August 1884, No. 42.

I transmit, herewith, for the information of your Excellency's Government, copy of a letter* which has been addressed to this office by Lieutenant-General A. Fraser, R.E., C.B., late Secretary in the Public Works department to the Government of India, on the subject of the disappearance of the Krishna and Akyab lighthouses, with the erection of both of which structures he was professionally connected.

* Dated 30th June 1884.

2. In this letter, which calls for the very serious attention of your Excellency's Government, you will observe that General Fraser advocates a much more frequent and systematic inspection of lighthouses on the Indian coasts than that which he understands to have been hitherto carried out by officers who are qualified for such duties by possessing the necessary engineering and nautical knowledge, and I shall be glad to be informed of your views on this suggestion, as well as on the question of the course to be followed in giving the needful protection to the coast on the eastern side of the Bay of Bengal, and the expediency of reconstructing the oyster reef lighthouse, and the system of construction to be adopted if it is thought necessary to restore it.

3. I would also draw your Excellency's special attention to the last paragraph of General Fraser's letter, in which he points out certain dangers to which, he believes, the lighthouse on the Alguada Reef to be at present exposed.

4. I request that full reports may be furnished to me on the points above mentioned, to place me in a position to obtain the opinion of the most competent authorities in this country on any part of the subject which, on further consideration, it may appear desirable to submit to them.

From Lieutenant-General A. FRASER, R.E., C.B., late Secretary to the Government of India, Public Works department, to the Under Secretary of State for India, dated 30th June 1884.

From J. H. TAYLOR, Esq., Lieutenant, R.N.R., Master Attendant, Madras, to the Chief Secretary to Government, dated Madras, 24th October 1884, No. 9921.

Administrative department.

With reference to the papers from the Government of India, relating to a proposal from General Fraser as to the frequent and systematic inspection of lighthouses on the Indian coasts, forwarded with endorsement, No. 2317, dated 15th October 1884, I have the honor to report that most of the British lights of this Presidency are situated at the different ports, where they are under the immediate charge of the Port officer, and any formal inspection is therefore unnecessary in their case. The seven lighthouses located out of port limits are in charge of competent Superintendents, men who can read and record barometrical readings, answer a reference, and are able to act independently of advice in case of emergency. They are situated at a convenient distance, so that the Superintendent can refer to the nearest Port officer, who is, besides, in constant communication with the lighthouse Superintendent, regarding the supply of stores and other requirements, which are duly attended to. As often as circumstances will permit, they are visited by me personally, but for necessary repairs the nearest officer of the Public Works department is always available. It will thus be seen that all that is necessary for the care and supervision of the lighthouses are fully provided for, and nothing further is called for, so far as the lights of this Presidency are concerned.

ORDER—dated 3rd December 1884, No. 529, Marine.

The Government do not concur in thinking it wise to leave the very important business of inspecting lighthouses in the hands of local officers unchecked and uncontrolled by the periodical visits and inspection of some professional officer of high standing.

2. In future, the Government desire that the Chief Engineer (or a competent officer of the Public Works department) shall periodically visit the lighthouses in the Madras Presidency, in the company of the Master Attendant, and report upon their condition. Such visits should be made as frequently as may be necessary with respect to the conditions affecting each lighthouse; but every one should be visited once at least in the course of the year.

(True Extract.)

E. F. WEBSTER,
Chief Secretary.

To the Public Works department, } with copy of General Fraser's report.
,, Master Attendant, Madras, }

ENDORSEMENT—dated 3rd December 1884, No. 530, Marine.

Copy to the Government of India, Department of Finance and Commerce.

E. F. WEBSTER,
Chief Secretary.

Exd. J. Wright.

Govt. of {1884} Madras.

MARINE.

Issued

Recd. *Encl.*

G.O., &c., 3rd December 1884,
Nos. 529, 530.

B. 98=16 dy 20-1-85

DECEMBER.

Lighthouses.

Passing orders regarding the periodical inspection of the — in the Madras Presidency.

From Lieutenant-General A. FRASER, R.E., C.B., late Secretary to the Government of India, Public Works department, to the Under Secretary of State for India, dated 30th June 1884.

Although no explanation of mine can remove the distress I feel at the destruction of works with which I, as an engineer and adviser to the Government of India, have been intimately connected, I beg to offer some observations on the subject of the loss last month in a cyclone of the lighthouse on the Oyster Reef of Akyab. This serious misfortune has followed the disappearance, seven years ago, of the somewhat similar building which had been erected on the Krishna shoal. Both were on screw piles, both were recommended by me, the designs were generally approved by me, and one (that on the Krishna shoal) was put up under my personal direction; and the following remarks are necessary, in order that the Government may be able to consider how far my judgment, in recommending the erection of these structures on these particular points, may have been in error, and to what extent it should trust again in similar buildings under similar conditions.

2. With a view of arriving at a just estimate of the considerations which influenced my judgment in this weighty matter, I must ask the Government to go back with me for a moment thirty years—to the time (1854) when Lord Dalhousie was Governor-General of India. This noble Lord, foreseeing the strides which British Burma was likely to make in commercial prosperity, saw at the same time, in the Alguada Reef, a great danger to ships in their approach to, and departure from, the coasts of the province. His Lordship, having at the close of the Burmese war expressed himself, in terms noted in the margin, satisfied with the manner I had dealt with Rangoon as Executive Engineer under the lead of Major Hugh Fraser, R.E., the then Chief Engineer, did me the honor of selecting me, at the recommendation of that officer, to undertake the work of building a lighthouse on that dangerous reef. I had then no experience of such works, and Lord Dalhousie, noting this, desired that I should be sent home for the purpose of inspecting works of a similar character in England and abroad, first making a general survey of the reef and its neighbourhood.

Military department of Government of India, No. 457, of 16th December 1854, conveys "to Lieutenant Fraser, the Executive Engineer, an expression of the approbation with which the Most Noble the Governor-General in Council views the zeal and ability he has displayed in forming the new cantonment in question."

3. I made this general survey at that time, but some State financial difficulties intervening it was determined to postpone the works on the reef. In the meantime some specially important and large operations in building barracks and in otherwise improving the condition of the European troops in the garrison of Fort William, Calcutta, were required, and in these Lord Canning, the then Governor-General (1855), took personal interest. I was moved to forego the furlough, for which I had applied, in order to undertake these works. This I did, and when they were sufficiently in train towards completion,* the Governor-General expressing himself completely satisfied (His Excellency often personally visited my works) with my proceedings in Fort William, found himself able to forward the desire of his great predecessor by sending me, early in 1857, to England to fit me for the work which Lord Dalhousie had had at heart.

*I have some pride in noting here that, in dealing with Rangoon and Fort William, I carried out the chief works, which resulted in rendering the two most notoriously unhealthy stations for British troops in the East, those which became thereafter more healthy for Europeans than any other places in the plains of India.

4. The result of my deputation to England was embodied in a report, dated October 1857, which I submitted to the Honorable the Court of Directors, but owing to the occurrence of the Mutiny it was not till 1859 (I being then Under Secretary to the Government of India in the Public Works department) that Lord Canning recorded the observations I have transferred to the margin. I extract these observations and those of Lord Dalhousie because they show (1) that, at whatever inconvenience, experience *was* then considered necessary in this class of work; and (2) that the heads of the Government had fair reason, from works already executed with success, for their confidence in my ability to carry out perhaps the most difficult of all engineering works, in a country where all labor had to be instructed, and all material had to be obtained from abroad.

Extract letter of 16th December 1859 from the Secretary, Government of India, with the Governor-General, to the Officiating Secretary to the Government of India, Public Works department, Calcutta:—

"2. The Governor-General is of opinion that this work (the Alguada Reef lighthouse) should now be commenced at once, and he comes to this conclusion not merely on account of the importance of the work in itself, but because by further delay we risk the loss of an officer who was especially deputed to England to study the subject.

"3. Though Captain Fraser's services as Under Secretary in this department (Public Works department) are very highly valued, and their loss will be seriously felt, it is necessary that he should now resume the duties originally confided to him."

5. During the period between December 1859 and April 1865 (when the Alguada Reef lighthouse was lighted) I thought it my duty to employ myself not only on the special work for which I had been fitted by the Government, but in seeking to utilise the experience gained in England on lighthouse work generally, by suggesting measures for fully protecting the trade with Burma, which was advancing at a rate which probably even Lord Dalhousie had not anticipated. These suggestions resulted in my building (1) the stone lighthouse on Double Island, showing a light of the first class, as a guide for vessels making for the port of Moulmein; (2) the iron lighthouse on Table Island, of the Great Coco group, Andaman Islands, which also shows a light of the first class, to facilitate the navigation of the Preparis Channel. I subsequently arranged, before leaving Burma, for a lighthouse on screw piles; (3) the China Bukeer, showing a first-class light; and (4) for a second of similar structure on the eastern grove, showing a specially designed light, as "land-fall" lights for the Rangoon river. I further had (5) the Savage Island light, used to facilitate entering Akyab Harbour, improved from an apparatus furnished with common oil lamps to a third-class ordinary dioptric light. I was thus, in return for the experience the Government had allowed me to gain in Europe, enabled to add six lights to the 20 which previously lighted both sides of the Bay of Bengal, and, with *two exceptions*, had made the entire coast on the eastern side of that bay practically safe, as regards *land-fall*, to ships trading on that side from Chittagong to Acheen head.

6. The *two exceptions* noted in the last paragraph required to be dealt with in order that ships might be completely guarded against all the prominent dangers of the entire British Burma coast. *The one* was the Krishna shoal and Baragon flat, the junction of which formed the turning point from the Bay of Bengal to the Rangoon river, and Gulf of Martaban on its western side, the light in Double Island forming the guard on its (the Gulf's) eastern side. *The other* was the Oyster Reef, which required to be lighted to render safe the northern and western approaches to the harbour of Akyab. In thick weather ships attempting to make Akyab were always in more or less fear, according to the time at which sun or stars had been last seen, of this reef, which was all the more dangerous from the fact of its being only just a-wash at low water.

7. By the cyclone of 1864, and previous years, immense damage had been done to ships lying in the Hooghly off Calcutta, by reason of the insufficiency of the moorings, and the Government of India had lost more than one lightship with all hands on board in these disastrous winds. I had thus had my attention called to works with Mitchell's screws and screw piles. My plan for mooring the shipping was approved by the Secretary of State (*see* letter from your office, dated 18th January 1867, to my address), and the work was successfully carried out. I believe the only danger to ships now lying in the Hooghly from a cyclone, as regards moorings, is the comparative weakness of the ships' own chains. I suggested also screw-pile jetties for Calcutta, which were afterwards carried out with, I believe, complete success.

8. I found, moreover, that no *solid* building could be erected, on either of the points which, as I have shown, remained to be lighted for the complete protection of ships making the coasts of British Burma, at any reasonable cost, if it could be done at all. I, at all events at that time, did not see my way to any successful result from any amount of expenditure in this direction.

With the knowledge of the loss of life which had occurred by the destruction of such vessels, * I was equally undesirous of recommending a lightship at points which in either case, to my mind, would have involved the putting of a ship on a dead lee shore, and its inevitable destruction, with all hands, in case of a severe cyclone.

* Even the best cared for lightships on British coasts are liable to destruction. This is the latest example extracted from a report in the *Morning Post* of the 22nd June 1884:—

"Sinking of the *Girdler* Lightship.

"A Lloyd's telegram from Dover states that the P. and O. steamer *Indus* from London to Sydney, laden with a general cargo and 400 passengers, ran into and sank the *Girdler* lightship on Friday night. The crew of the lightship were taken on board the *Indus* and landed at Dover." It might easily have been otherwise with the crew had there been unfavorable conditions of weather.

9. As a lighthouse require the attendance of not more than three or four keepers, my decision was largely influenced by the smaller loss of life which would ensue, on any accident occurring, than would be the case in respect of a lightship which would require eight or nine times the number of men to manage her.

10. Again, I was influenced by the much smaller cost of maintaining a lighthouse which, including interest on cost, was not above half that of maintaining a lightship (*see* also on this point the report of Captain A. Dundas Taylor, I.N., No. 73, D.B., dated 14th February 1877, to the Government of India, Department of Revenue, Agriculture, and Commerce, on the subject of the substitution of lighthouses for lightships in the Hooghly and its approaches).

11. A third point which swayed my judgment in favor of the lighthouse was the superiority of the light in power, elevation, and steadiness over that borne by a lightship.

12. The way I put to the Government the result of my considerations is shown in the following extract of a memorandum which I prepared for the Lieutenant-Governor of Bengal

(Sir A. Eden): "On the substitution of lighthouses for lightships" at the Sandheads, dated 27th March 1879 (after the loss of the screw-pile lighthouse on the Krishna shoal):—

"21. From the figures given in the margin it will be seen that, by substituting lighthouses for lightships, the Port (Calcutta) funds will save £7,625 a-year, with better lights and less risk to human life. Accidents may occur, but there is plenty of money to repair damages, and accidents are less likely to occur to lighthouses than to lightships. The risk must be accepted, but the risk is less with lighthouses than with lightships." All my previous reports (which I have not by me) adopted the same tone.

Was I justified or not in adopting this tone? I really cannot feel sure that, even now were I in a position to be consulted, I should not recommend as strongly as I did then the erection of lighthouses of this class in positions where *weight* cannot, by reason of absence of adequate foundations, or in consequence of excessive cost and danger in construction, be opposed to the impact of the sea, or where lightships on a lee shore would be subject to cyclones. I must leave to the Government the decision on this question, being, however, certain that whatever the decision may be, it cannot either deepen or alleviate the regret I feel at the event which I am now deploring. The only feelings which give relief to my mind on the subject are that—

(1) If these dangerous points had not been marked at all, which but for me they probably would not have been, the loss by wrecks of life and property for the eight or nine years of increasing trade during which these lighthouses stood would have been very considerable.

(2) I should have incurred greater risk of life by placing lightships in these positions. But I could not again recommend construction on such points of a coast as I have noted of such lighthouses as those on screw piles, unless the Government followed the recommendations I previously gave in respect of *their care*.*

* Paragraph 42 of my report on the Savage lighthouse, dated 13th March 1865. My letter to Secretary to the Government of India, No. 39-59C., dated 5th June 1865, said:—

"But it would be better, in my opinion, to do nothing than to go to the expense of alteration or restoration, and, indeed, of building any new lighthouses at all, unless the Government are prepared to admit the necessity of, and meet the extra expense consequent on, having this and all their lighthouses properly visited and cared for by competent people."

13. It is necessary now to observe that I had nothing to do personally with the construction of the lighthouse on the Oyster Reef beyond a recommendation of a structure, the design for which I had *generally* approved, on screw piles specially strengthened for that position. I knew nothing of the precise spot selected for its position (a matter here of deep moment), but it was built under the direction of Colonel W. S. Oliphant, R.E., who was at the time Chief Engineer of British Burma, and of Mr. H. M. Mathews, M.I.C.E., a Civil Engineer of great ability, who was then Executive Engineer of the Rangoon Division of Public Works. I do not doubt, therefore, but that it was properly constructed, and, from these competent officers adopting the design, I may assume that they found nothing faulty in it.

14. Before, however, leaving Rangoon permanently for the North-Western Provinces in 1870,† I placed very distinctly before the Government my view of how these structures should be built and cared for. I said in effect that it was impossible, with any sense of safety, for the Government to spend large sums of money on their construction without making adequate arrangements for their care and maintenance in efficiency. I don't for a moment presume to say that such care as was possible, by such officers as were available in such sea transport as the exigencies of other service might from time to time be placed at their disposal, was not exercised. But what I do say is that there has been no care taken of these important works when built directed by that continued experience which both Lords Dalhousie and Canning considered essential as to their construction; that no systematic inspection, repair, or protection of the buildings and their surroundings by persons having full knowledge of all the circumstances and conditions of each work has been undertaken, or indeed has been possible under the system adopted—a system which involves the constant removal of officers, inexperienced in the first instance in this class of work, just as they begin to know something of the works and the conditions affecting them; a system which limits their power of inspection to the time when perhaps the only steamer available for the general service of the local Government can be placed at their disposal.

† I had refused in 1863, I may here remark, the offer of the Government of India to appoint me Chief Engineer and Secretary to the Government of Bengal in the Public Works department, in order that I might devote my special experience to the completion of the lighthouse on the Alguada Reef and other works of cognate character. I thus lost a chance of promotion which did not recur till 1870.

15. The Chief Commissioner, in submitting my final report regarding the British Burma lighthouses to the Government of India with his letter, No. 821-104 C.I., dated Rangoon, 8th October 1869, said:—

"Paragraph 7. Colonel Fraser points to the satisfactory financial condition of those lighthouses that have been for some time in operation. He would abolish as a separate charge ‡

‡ Substituting a tonnage due as in France.

all light dues, make the works Imperial works, supervise them by Imperial establishments, and maintain them from Imperial funds. These are, indeed, portions of the propositions* put forward many years ago by him for the consolidation of the various managements of the lighthouses around the coast of the empire under one central board of management." A reference to my report noted in the margin, and to that mentioned by the Chief Commissioner as having been forwarded to the Government with his above letter, will show what my proposals were. It may not have been consistent with the policy of the Government to adopt them, but of this I am certain, that unless a department, combining engineering and nautical knowledge (and not only knowledge, but engaging the sympathy of official nautical officers), with a power of keeping and transmitting the results of experience gained in this class of work, and of providing proper means of transport for inspectors and material and labor for the repair of damage, be organised, great sea lights will be very much left to the mercy of the waves and the winds, while the valuable apparatuses which have in many cases been provided will never be kept up to that state of efficiency which distinguished the Scotch and French lights and those under the Trinity Board of England. I endeavoured, without success, to utilise my experience in establishing such an arrangement, and when I look down the list (1882) of lights on the coasts of India, and see the nature of those exhibited as described in the numbers in the list noted in the margin, I cannot help feeling, considering also the many other dangerous points requiring attention, that there would be ample field for the operations of such a department, while surely the cost of its care of works already executed would be more than compensated by a comparative freedom from disaster. Any how the system I have described as existing is not fair to the constructors, whose reputation may be compromised; it is not fair to those who, though most anxious to do their duty, cannot look after the works properly; it is unfair to the Government itself, inasmuch as it prevents its maintaining in efficiency these important adjuncts to the safety of the commerce upon which the prosperity of the State depends, while it must share with every one the discredit of preventible disaster.

* See report to the Honorable Court of Directors of East India Company mentioned in paragraph 4.

Nos. 15, 16, 20, 22, 26, 28, 29, 30, 32, 42, 43, 48, 49, 56, 77, 81, 82, 83 (84 False Point was before 1880 a wretched light, although it was the chief "land-fall" light in British India. It was altered at my suggestion), 93, 94.

16. I have only to refer to the papers accompanying the despatches from the Government of India to the Secretary of State, No. 54, dated 30th November 1877, reporting the disappearance of the Krishna Shoal lighthouse, to show the want of care (of the kind I insist upon) to which these structures have been, and no doubt still are, subject. From these papers it would appear that, subsequently to the date I visited the lighthouse in 1870, about two years after it was built, and in which year I finally left the province, no soundings to test scour had been taken, although that was one of the special instructions I left in the light-house. I also requested that at suitable times, before and after each monsoon, soundings should be taken all round the lighthouse to the distance of a mile from it as a centre. I don't believe myself that scour alone could have caused the destruction of the building, still, if it had been ascertained that great scour *had* been going on for some time, measures might have been taken to move the light or divert the scour, or, at all events, to remove the light-keepers. It had not been found difficult, I believe, to move the "China Bukeer" lighthouse of similar character from the shore into two fathoms at low water.

Inspection was made apparently annually only, and that probably when it was least important. This was not nearly enough; and the older the lighthouse grew the more frequent should have been its inspection.†

† *See* my "Rules and Instructions," Appendix C, of my report forwarded to Government of India, with letter quoted in note, page 5.
"Rule VIII.—Each lighthouse shall be visited at least *once a month* by a visiting officer, when possible." This appendix was deposited in the Alguada Reef lighthouse.

In November 1875 (cyclone time) "the structure of the 'Krishna Shoal lighthouse shows considerable wear in the clasps and braces,' and other deterioration of the bracing is described, apparently caused by the trembling motion given to it by the water striking against it." This would go to show that the bracing had been for years wearing.

Then, again, in October 1876 "the structures was in good repair down to high-water mark," but nothing is said of the structure down to low-water mark; and there was a rise of 9 feet between low and high-water at full and change, or to the ground. The piles themselves might have been wearing under the influence of a silt-bearing six-knot tide, and it would have been easy to have ascertained this by waiting for low-water, when there *ought* to have been only 3 fathoms to the ground.

If asked, General Hyde will probably inform you that the strength of an iron structure of this character depended on its rigidity; and if from a constant "trembling motion" any parts worked loose, the whole thing was open to damage, or even destruction, by a force which might have no effect upon it if rigid.

17. Turning again to the subject of the loss of the Oyster Reef lighthouse, the piles had not been screwed down the full depth I designed, and the floor of the building was consequently between two and three feet higher above the ground; but the screws could not be got in further, it was said, and the greater height would hardly effect stability. There is, however, a curious

coincidence of time during which this and the Krishna Shoal lighthouse stood. The first was lighted in 1876, and the lighthouse was carried away in 1884. The Krishna Shoal structure was lighted in 1869, and it disappeared in 1877.

The strain on the former from its position, although a more substantial structure, would be greater than on the latter; "the trembling motion," in fact, would be more forcible; and if inspection and repair were not effective, would be open to succumb about the same time as the latter. This leads me to the "uneasy" feeling (a feeling that I had expressed in 1865) that the primary cause of disaster was the same in both cases, *i.e.*, ineffective inspection and consequent ineffective repair. In the absence of certain knowledge, the loss of the Krishna Shoal lighthouse was attributed to scour. This could hardly have been the cause in respect of that on the Oyster Reef. But "the trembling motion of the water" in its effect on the braces would, more or less, be similar in each case; and if the braces or other parts had worked well, further cause of disaster need not be looked for. But I shall be able to judge better on this point if you will send me the record of inspection and repair of the Oyster Reef building from the time of its erection. While on this subject I may as well extract the following paragraph (37) from my report of 1865 before alluded to on "the Savage" lighthouse, as it gives my opinion as to the alternative to be adopted if it were decided that a lighthouse on the Oyster Reef should not be erected:—

"If a lighthouse is not to be put on the Oyster Reef, then I am of opinion (first) that 'the Savage' lighthouse ought to be raised, so that the centre of the light shall be 150 feet above high-water mark, which would make the light visible from the deck of a ship 20 miles off; (second) that a new light apparatus of the first order, and of a description suited to the are of the horizon required to be illuminated, be procured, for which, as the present lantern would be too small, (third) a new lantern would be required." The report referred to gave other details, which, however, it is not necessary here to refer to. I only give the extract in case it should prove necessary, in the absence of a light on the Oyster Reef, and the danger of putting a lightship there, to adopt some, though inferior, protection to shipping visiting Akyab.

18. Finally, I would dwell for a moment on one more point, which is, perhaps, of still greater importance to the Government and to me than any which has been hereinbefore discussed; and that is, the state of the lighthouse on the Alguada Reef, or rather of the rock on which it, a column of 4,000 tons in weight, has stood since 1863. The column was practically completed in that year, although it was only lighted in 1865. In July 1881 I wrote to Mr. Bernard, C.S.I., the Chief Commissioner, about possible encroachments by the sea on the foundation, and I recommended protection in a certain direction (I sent him a plan and proposal) which I thought would prove dangerous if the sea was cutting at all. In April 1882 I heard from Colonel Scott-Moncrief, R.E., the then Chief Engineer, who said among other things that "the fissure" of which I had written "is cutting in through, I believe;" and as from his statement it seems to have cut in some 8 or 9 feet since 1859 when I examined it, and there is only some 4 or 5 feet left between the end of the fissure and the foundation of the lighthouse, in 10 or 15 years' time one may calculate that, if nothing be done, the sea will again be master of the situation. As all the officers have probably changed since I wrote in 1881, may I request the favor of your drawing the attention of the Government of India to the matter? The protection required would probably be easily carried out with concrete in bags as a coffer dam, behind which, in the fine weather, "the fissure" may be dealt with at no great cost. But it is worth doing at any reasonable expense, as it will be very difficult to find on the reef an equally good position for a lighthouse. It is besides a monument worth preserving, if only in memory of the great Governor-General who saw its necessity and ordered its construction, or in that of the noble man under whose auspices, at a very difficult period of his administration, I had the honor of carrying it out, and who, as Colonel Yule will tell you, found time personally to encourage me in my very difficult and anxious task.

GOVERNMENT OF MADRAS.

MARINE DEPARTMENT.

Read—the following papers:—

From J. E. O'CONOR, Esq., Assistant Secretary to the Government of India, Department of Finance and Commerce (Separate Revenue, &c.—Commerce and Trade—Lights and Light Dues), to the Chief Secretary to Government, dated Simla, 2nd October 1884, No. 3739.

I am directed to forward a copy of a despatch from the Secretary of State, No. 42 (Public Works), dated the 7th August 1884, and its enclosure, in which General Fraser advocates a much more frequent and systematic inspection of lighthouses on the Indian coasts than that which he understands to have hitherto been carried out by officers who are qualified for such duties by possessing the necessary engineering and nautical knowledge.

2. I am to request that the Government of India may be furnished with a report showing the existing system of inspection of lighthouses in the Madras Presidency, as well as with such remarks and suggestions as the Government of Madras may wish to make in connection therewith.

Enclosures.

From Her Majesty's Secretary of State for India, to the Government of India, dated 7th August 1884, No. 42.

I transmit, herewith, for the information of your Excellency's Government, copy of a letter* which has been addressed to this office by Lieutenant-General A. Fraser, R.E., C.B., late Secretary in the Public Works department to the Government of India, on the subject of the disappearance of the Krishna and Akyab lighthouses, with the erection of both of which structures he was professionally connected.

* Dated 30th June 1884.

2. In this letter, which calls for the very serious attention of your Excellency's Government, you will observe that General Fraser advocates a much more frequent and systematic inspection of lighthouses on the Indian coasts than that which he understands to have been hitherto carried out by officers who are qualified for such duties by possessing the necessary engineering and nautical knowledge, and I shall be glad to be informed of your views on this suggestion, as well as on the question of the course to be followed in giving the needful protection to the coast on the eastern side of the Bay of Bengal, and the expediency of reconstructing the oyster reef lighthouse, and the system of construction to be adopted if it is thought necessary to restore it.

3. I would also draw your Excellency's special attention to the last paragraph of General Fraser's letter, in which he points out certain dangers to which, he believes, the lighthouse on the Alguada Reef to be at present exposed.

4. I request that full reports may be furnished to me on the points above mentioned, to place me in a position to obtain the opinion of the most competent authorities in this country on any part of the subject which, on further consideration, it may appear desirable to submit to them.

From Lieutenant-General A. FRASER, R.E., C.B., late Secretary to the Government of India, Public Works department, to the Under Secretary of State for India, dated 30th June 1884.

From J. H. TAYLOR, Esq., Lieutenant, R.N.R., Master Attendant, Madras, to the Chief Secretary to Government, dated Madras, 24th October 1884, No. 9921.

Administrative department.

With reference to the papers from the Government of India, relating to a proposal from General Fraser as to the frequent and systematic inspection of lighthouses on the Indian coasts, forwarded with endorsement, No. 2317, dated 15th October 1884, I have the honor to report that most of the British lights of this Presidency are situated at the different ports, where they are under the immediate charge of the Port officer, and any formal inspection is therefore unnecessary in their case. The seven lighthouses located out of port limits are in charge of competent Superintendents, men who can read and record barometrical readings, answer a reference, and are able to act independently of advice in case of emergency. They are situated at a convenient distance, so that the Superintendent can refer to the nearest Port officer, who is, besides, in constant communication with the lighthouse Superintendent, regarding the supply of stores and other requirements, which are duly attended to. As often as circumstances will permit, they are visited by me personally, but for necessary repairs the nearest officer of the Public Works department is always available. It will thus be seen that all that is necessary for the care and supervision of the lighthouses are fully provided for, and nothing further is called for, so far as the lights of this Presidency are concerned.

ORDER—dated 3rd December 1884, No. 529, Marine.

The Government do not concur in thinking it wise to leave the very important business of inspecting lighthouses in the hands of local officers unchecked and uncontrolled by the periodical visits and inspection of some professional officer of high standing.

2. In future, the Government desire that the Chief Engineer (or a competent officer of the Public Works department) shall periodically visit the lighthouses in the Madras Presidency, in the company of the Master Attendant, and report upon their condition. Such visits should be made as frequently as may be necessary with respect to the conditions affecting each lighthouse; but every one should be visited once at least in the course of the year.

(True Extract.)

E. F. WEBSTER,
Chief Secretary.

To the Public Works department, } with copy of General Fraser's report.
,, Master Attendant, Madras, }

ENDORSEMENT—dated 3rd December 1884, No. 530, Marine.

Copy to the Government of India, Department of Finance and Commerce.

E. F. WEBSTER,
Chief Secretary.

Exd. J. Wright.