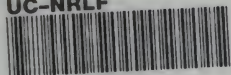


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To be filled in by Navigating Officer.

[In Chart Depôts the two first columns are alone to be filled up.]

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THE
AUSTRALIA DIRECTORY.

VOLUME I.

SOUTH AND EAST COASTS
FROM CAPE LEEUWIN TO PORT JACKSON ;
INCLUDING
BASS STRAIT; AND TASMANIA.

CHIEFLY FROM THE RESULT OF VARIOUS SURVEYS MADE BY ORDER OF THE
LORDS COMMISSIONERS OF THE ADMIRALTY.

ORIGINALLY COMPILED BY
CAPTAIN CHARLES B. YULE, R.N.

NINTH EDITION.



PUBLISHED BY ORDER OF THE LORDS COMMISSIONERS OF THE ADMIRALTY.

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THE Australia Directory, Vol. I., contains sailing directions for the south coast of Australia, commencing at cape Leeuwin, proceeding towards and including Bass strait and Tasmania, and thence along the east coast to port Jackson.

The early editions of this volume were derived from the original survey of the coast by Captain Flinders, and the subsequent examination of various parts by Captains Sir J. G. Bremer, P. P. King, Owen Stanley, J. L. Stokes, F. P. Blackwood, J. C. Wickham, C. B. Yule, T. Lipson, and J. S. Roe, of the Royal Navy; the published voyages of the French navigators, D'Entrecasteaux and Freycinet; the reports of Lieutenant Jeffreys; and the Remark books of Her Majesty's Ships; all effected between the years 1793 and 1853.

In the sixth edition, compiled in 1868, by Captain C. B. Yule, R.N., the results of various detached surveys, extending to 1865, undertaken by the Imperial and Colonial governments, and made by Captain H. M. Denham, Commanders Ross, Cox, and Hutchison, of the Royal Navy, and by the harbour authorities of the Colonies, were added.

The seventh edition contained results from surveys to 1875, by Commander F. W. Sidney, Staff-Commanders F. Howard, H. J. Stanley, and J. T. Gowland, of the Royal Navy.

In the eighth edition, prepared by Captain G. H. Inskip, R.N., results were incorporated from the surveys of Staff-Commanders H. J. Stanley, F. Howard, W. E. Archdeacon, and J. E. Coghlan, of the Royal Navy, together with information from official Colonial documents and the Remark books of H.M. Ships to 1884.

The present edition, by Commander H. S. Penn, R.N., contains the latest available information to November 1896.

As the coast from King George sound to Eucla road in the Great Australian bight, and also the west coast of Tasmania have not been surveyed in detail, this work must be considered incomplete, and doubtless there will be occasions for amendment throughout.

By the publication of this book, all former editions as well as all Hydrographic Notices relating to former editions, and all Notices to Mariners, including No. 724 of 1896, are cancelled.

W. J. L. W.

Hydrographic Office, Admiralty, London,
17th December 1896.

SO 11712—2500—8/94 Wt 9572 D & S.



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SYSTEM OF ORTHOGRAPHY.

As far as has been found possible with existing knowledge the native names in this book are spelt in accordance with the following system, which is being gradually introduced into all Admiralty Sailing Directions.

1. Where native names have been so long written in a form, which, though not in accordance with this system, has become familiar to English eyes from being so spelt in all charts and maps, they are retained, and no European names are changed from the correct orthography.

2. The true sound of the word as locally pronounced is taken as the basis of the spelling.

3. An approximation of the sound is alone aimed at. A system which would attempt to represent the more delicate inflections of sound and accent would be so complicated as only to defeat itself.

4. The broad features of the system adopted are that vowels are pronounced as in Italian and consonants as in English, *every letter being pronounced*. One accent only is used, the acute, to denote the syllable on which stress is laid. This is very important, as the sounds of many names are entirely altered by the misplacement of this "stress."

5. When two vowels come together, each one is sounded, though the result, when spoken quickly, is sometimes scarcely to be distinguished from a single sound, as in *ai, au, ei*.

The amplification of the rules is given below.

Information as to the proper spelling of native names, so as to produce the nearest approximation to the true sound, by this system, is invited.

Letters.	Pronunciation and Remarks.	Examples.
a	<i>ah, a</i> as in <i>father</i> - - - -	Java, Banána, Somála, Bari.
e	<i>eh, e</i> as in <i>benefit</i> ; <i>a</i> as in <i>fate</i> - -	Tel-el-Kebír, Oléleh, Yezo, Levúka, Peru.
	English <i>e</i> ; <i>i</i> as in <i>ravine</i> ; the sound of <i>ee</i> in <i>beet</i> . Thus, not <i>Feejee</i> , but	Fiji, Hindi.
o	<i>o</i> as in <i>mole</i> - - - -	Tokyo.

Letters.	Pronunciation and Remarks.	Examples.
u	long <i>u</i> as in <i>flute</i> ; the sound of <i>oo</i> in <i>boot</i> . <i>oo</i> or <i>ou</i> should never be employed for this sound. Thus, not <i>Zooloo</i> or <i>Zoulou</i> , but All vowels are shortened in sound by doubling the following consonant.	Zulu, Sumatra. Yarra, Tanna, Mecca, Jidda, Bonny.*
	Doubling of a vowel is only necessary where there is a distinct repetition of the single sound.	Nuulúa.
ai	English <i>i</i> as in <i>ice</i> - - - -	Shanghai.
au	<i>ow</i> as in <i>how</i> . Thus, not <i>Foochow</i> , but	Fuchau.
ao	is slightly different from <i>au</i> - - - -	Macao.
aw	when followed by a consonant or at the end of a word, as in <i>law</i> .	Cawnpore.
ei	is the sound of the two Italian vowels, but is frequently slurred over, when it is scarcely to be distinguished from <i>ey</i> in the English <i>they</i> , or <i>ei</i> in <i>eight</i> .	Beirút, Beilul.
b	English <i>b</i> .	
c	is always soft, but is so nearly the sound of <i>s</i> that it should be seldom used. If <i>Celébes</i> were not already recognised it would be written <i>Selébes</i> .	Celébes.
ch	is always soft as in <i>church</i> - - - -	Chingchin.
d	English <i>d</i> .	
f	English <i>f</i> . <i>Ph</i> should not be used for the sound of <i>f</i> . Thus, not <i>Haiphong</i> , but	Haifong, Nafa.
g	is always hard. (Soft <i>g</i> is given by <i>j</i>) -	Galápagos.
h	is always pronounced when used.	
hw	as in <i>what</i> ; better rendered by <i>hw</i> than <i>wh</i> , or <i>h</i> followed by a vowel. Thus, not <i>Whang ho</i> or <i>Hoang ho</i> , but	Hwang ho; Ngan hwi. Japan, Jinchuen.
j	English <i>j</i> . <i>Dj</i> should never be put for this sound.	
k	English <i>k</i> . It should always be put for the hard <i>c</i> . Thus, not <i>Corea</i> , but	Korea.
kh	The Oriental guttural - - - -	Khan.
gh	is another guttural, as in the Turkish -	Dagh, Ghazi.
l	} As in English.	
m		
n		
ng		has two separate sounds, the one hard as in the English word <i>finger</i> , the other as in <i>singer</i> . As these two sounds are rarely employed in the same locality, no attempt is made to distinguish between them.
p	As in English.	
ph	As in <i>loophole</i> - - - -	Mokpho, Chemulpho.

* The *y* is retained as a terminal in this word under rule 1 above. The word is given as a familiar example of the alteration in sound caused by the second consonant.

Letters.	Pronunciation and Remarks.	Examples.
th	Stands both for its sound in <i>thing</i> , and as	
q	in <i>this</i> . The former is most common -	Bethlehem.
r	should never be employed; the sound of <i>qu</i>	Kwangtung.
s	in <i>quiver</i> is given as <i>kw</i> . When <i>qu</i> has	
sh	the sound of <i>k</i> , as in <i>quoit</i> , it should be	
t	given by <i>k</i> .	
v	As in English.	
w	As in <i>sin</i> .	
x	} As in English.	
y		
z		
zh		
y	is always a consonant, as in <i>yard</i> , and there-	Sawákin.
z	fore should never be used as a terminal,	Kikūyu.
zh	<i>i</i> or <i>e</i> being substituted.	
z	Thus, not <i>Mikindány</i> or <i>Wady</i> , but	Mikindáni, Wadi
zh	not <i>Kwaly</i> , but	Kwale.
z	English <i>z</i> - - - - -	Zulu.
zh	French <i>j</i> , or as <i>s</i> in <i>treasure</i> - - - -	Muzhdaha.
z	Accents should not generally be used, but	
zh	where there is a very decided emphatic	Tongatábu,
z	syllable or stress which affects the sound	Galápagos,
zh	of the word, it should be marked by an	Paláwan,
z	<i>acute</i> accent.	Saráwak.
zh		

INFORMATION RELATING TO CHARTS, SAILING
DIRECTIONS, AND THE GENERAL NAVIGATION
OF H.M. SHIPS.



ON THE CORRECTION OF CHARTS, LIGHT LISTS,
AND SAILING DIRECTIONS.

There are three descriptions of publications as guides to navigation—the charts, the sailing directions, and the light lists—which are all affected by the continual changes and alterations that take place.

Of these the charts should always be, so far as our knowledge permits, absolutely correct to date; and the light lists should be noted for the recent alterations, though space will not permit of full details being always inserted; the sailing directions, however, cannot, from their nature, be so corrected, and *in all cases where they differ from charts, the charts must be taken as the guide.*

1. *Charts.*—When issued to a ship on commissioning, the charts have received all necessary corrections to date. As sent from the Hydrographic Office they are, as a rule, fresh from the plates. They then receive such corrections by hand in the depôts as are required, and are so issued to the ships.

All small but important corrections that can be made by hand are notified by Notices to Mariners, and should at once be placed on the charts to which they refer.

Large corrections that cannot be conveniently thus made are put upon the plates, and fresh copies are issued to the ships to replace the others, which are directed to be destroyed to prevent the possibility of their being used in the navigation of the ship.

The dates on which these large corrections are made are noted on the chart plates in the middle of the lower edge; those of the smaller corrections at the left-hand lower corners.

In all cases of quotations of charts, these dates of corrections should be given, as well as the number of the chart (which will be found in the lower right-hand corner), in order that at the Admiralty it may be known what edition of the chart is referred to.

2. *The Light Lists*, annually published at the beginning of each year, are not corrected in the depôts before issue, but appendices are issued every two months, giving the alterations that have taken place, copies of which are put into the chart boxes.

It is the duty of the navigating officer when he receives the set of charts to make notations in the light lists from these appendices, and from the Notices to Mariners in the box; and to keep them so corrected from time to time.

The Light Lists should always be consulted as to the details of a light, as the description in the Sailing Directions may be obsolete, in consequence of changes made since publication.

3. *The Sailing Directions* are not corrected before issue, except occasionally for very important new rocks or dangers. Hydrographic Notices and Supplements referring to each volume are published from time to time.

Supplements contain all the information received up to date since the publication of the volume to which they refer, and cancel all previous Hydrographic Notices.

Hydrographic Notices contain all information up to date since the publication of the volume, or since the last Supplement or Hydrographic Notice, but endeavour is made to issue no more than one of these affecting each volume, and, on the collection of fresh information, to include the former Notice in a Supplement.

The existence of Supplements or Hydrographic Notices is to be noted, in the tabulated form placed for the purpose inside the cover of each volume, in cases when such notations have not been made before issue, and also on receipt of further Notices after commission.

Notes should be made in the margin of the volume of sailing directions affected, as references to the Supplements or Hydrographic Notices when the latter are printed on both sides.

To enable the books to be more conveniently corrected, however, such Supplements and Hydrographic Notices as are of moderate size are now being printed on one side only, and two copies are issued to each ship; one to cut up, the slips being pasted in at the appropriate place; the other to retain intact for reference.

To make these notations or paste in these slips is one of the early duties of a navigating officer after drawing his box of charts and books, and similar notes are to be made from Notices to Mariners that may thereafter be received.

It must, however, be thoroughly understood that sailing directions will never be correct in all details, except up to the date of the last Hydrographic Notice or Supplement, and that, as already stated, when differences exist, the chart, which should be corrected from the most recent information, should be taken as the guide; for which purpose, for ordinary navigation, they are sufficient.

THE USE OF CHARTS AS NAVIGATIONAL AIDS, AND GENERAL REMARKS RELATING TO PRACTICAL NAVIGATION.

1. *Accuracy of a Chart.*—The value of a chart must manifestly depend upon the accuracy of the survey on which it is based, and this becomes more important the larger is the scale of the chart.

To estimate this, the date of the survey, which is always given in the title, is a good guide. Besides the changes that, in waters where sand or mud prevails, may have taken place since the date of the survey, the earlier surveys were mostly made under circumstances that precluded great accuracy of detail, and until a plan founded on such a survey is tested, it should be regarded with caution. It may, indeed, be said that, except in well-frequented harbours and their approaches, no surveys yet made have been so minute in their examination of the bottom as to make it certain that all dangers have been found. The fulness or scantiness of the soundings is another method of estimating the completeness of a chart. When the soundings are sparse or unevenly distributed, it may be taken for granted that the survey was not in great detail.

Blank spaces among soundings mean that no soundings have been obtained in these spots. When the surrounding soundings are deep it may with fairness be assumed that in the blanks the water is also deep; but when they are shallow, or it can be seen from the rest of the chart that reefs or banks are present, such blanks should be regarded with suspicion. This is especially the case in coral regions and off rocky coasts, and it should be remembered that in waters where rocks abound it is always possible that a survey, however complete and detailed, may have failed to find every small patch.

A wide berth should therefore be given to every rocky shore or patch, **and this rule should be invariably followed, viz., that instead of considering a coast to be clear unless it is shown to be foul, the contrary should be assumed.**

2. *Fathom Lines a Caution.*—Except in plans of harbours that have been surveyed in detail, the five-fathom line on most Admiralty charts is to be considered as a caution or danger line against unnecessarily approaching the shore or bank within that line, on account of the possibility of the existence of undiscovered inequalities of the bottom, which nothing but an elaborate detailed survey could reveal. In general surveys of coasts or of little frequented anchorages, the necessities of navigation do not demand the great expenditure of time required for such a detailed survey. It is not contemplated that ships will approach the shores in such localities without taking special precautions.

The ten-fathom line is, on rocky shores, another warning, especially for ships of heavy draught.

Charts where no fathom lines are marked must be especially regarded with caution, as it generally means that soundings were too scanty and the bottom too uneven to enable them to be drawn with accuracy.

Isolated soundings, shoaler than surrounding depths, should always be avoided, especially if ringed round, as there is no knowing how closely the spot may have been examined.

3. *Chart on largest scale always to be used.*—It sometimes happens that, from press of work, only the copper plate of the larger scale chart of a particular locality can at once receive any extensive

re-arrangement of coastline or soundings. This is an additional reason, besides the obvious one of the greater detail shown on a larger scale chart, why this largest scale chart should always be used for navigating.

4. *Caution in using small Scale Charts.*—In approaching the land or dangerous banks, regard must always be had to the scale of the chart used. A small error in laying down a position means only yards on a large scale chart, whereas on a small scale the same amount of displacement means large fractions of a mile. This is particularly to be observed when coming to an anchor on a narrow ledge of convenient depth at some distance from the shore.

For the same reason bearings to objects near should be used in preference to objects farther off, although the latter may be more prominent, as a small error in bearing or in laying it down on the chart has a greater effect in misplacing the position the longer the line to be drawn.

5. *Distortion of Printed Charts.*—The paper on which charts are printed has to be damped. On drying distortion takes place, from the inequalities in the paper, which greatly varies with different paper and the amount of the original damping; but it does not affect navigation. It must not, however, be expected that accurate series of angles taken to different points will always exactly agree, when carefully plotted upon the chart, especially if the lines to objects be long. The larger the chart the greater the amount of this distortion.

6. *Buoys.*—It is manifestly impossible that any reliance can be placed on buoys always maintaining their exact position. Buoys should therefore be regarded as warnings and not as infallible navigating marks, especially when in exposed positions; and a ship should always, when possible, be navigated by bearings or angles of fixed objects on shore and not by buoys.

7. *Lights.*—Circles drawn on charts round a light are not intended to give information as to the distance at which it can be seen, but solely indicate, in the case of lights which do not show equally in all directions, the bearings between which the variation, or visibility, or obscuration of the light occurs.

All the distances given in the Light Lists and on the charts for the visibility of lights are calculated for a height of an observer's eye of 15 feet. The table of distances visible due to height at end of each

Light List, affords a means of ascertaining how much more or less the light is visible should the height of the bridge be more or less. The glare of a powerful light is often seen far beyond the limit of visibility of the actual rays of the light, but this must not be confounded with the true range. Again, refraction may often cause a light to be seen farther than under ordinary circumstances.

When looking out for a light at night, the fact is often forgotten that from aloft the range of vision is much increased. By noting a star immediately over the light a very correct bearing may be afterwards obtained from the standard compass.

The intrinsic power of a light should always be considered when expecting to make it in thick weather. A weak light is easily obscured by haze, and no dependence can be placed on its being seen.

The power of a light can be estimated by remarking its order, as given in the Light Lists, and in some cases by noting how much its visibility in clear weather falls short of the range due to the height at which it is placed. Thus, a light standing 200 feet above the sea and only recorded as visible at 10 miles in clear weather, is manifestly of little brilliancy, as its height would permit it to be seen over 20 miles if of any power. (*See table in Light List above-mentioned.*)

8. *Fog Signals.*—Sound is conveyed in a very capricious way through the atmosphere. Apart from wind, large areas of silence have been found in different directions and at different distances from the origin of a sound, even in clear weather. Therefore too much confidence should not be felt in hearing a fog signal. The apparatus, moreover, for sounding the signal often requires some time before it is in readiness to act. A fog often creeps imperceptibly towards the land, and is not observed by the people at a lighthouse until it is upon them; whereas a ship may have been for many hours in it, and approaching the land. In such a case no signal may be sounded. When sound has to travel against the wind, it may be thrown upwards; in such a case, a man aloft might hear it when it is inaudible on deck.

Taken together, these facts should induce the utmost caution in closing the land in fogs. The lead is generally the only safe guide.

9. *Tides and Tidal Streams.*—In navigating coasts where the tidal range is considerable, caution is always necessary. It should be remembered that there are indraughts to all bays and bights, although the general run of the stream may be parallel to the shore.

The turn of the tidal stream off shore is seldom coincident with the time of high and low water on the shore. In open channels, the tidal stream ordinarily overruns the turn of the vertical movement of the tide by three hours, forming what is usually known as tide and half-tide, the effect of which is that at high and low water by the shore the stream is running at its greatest velocity.

In crossing a bar or shallow flats, the table (B) at page 98 of the Tide Tables will be found of great assistance in calculating how much the water has risen or fallen at any hour of the tide.

On coasts where there is much diurnal inequality in the tides, the amount of rise and fall can never be depended upon, and additional caution is necessary.

It should also be remembered that at times the tide falls below the level of low-water ordinary springs. This always occurs in temperate regions at the equinoxes, but wind may produce it at any time, and the amount varies with locality. When the moon's perigee coincides with the full or new moon the same effect is often produced.

10. *Current Arrows* on charts only show the most usual or the mean direction of a tidal stream or current. It must never be assumed that the direction of a stream will not vary from that indicated by the arrow. In the same manner, the rate of a stream constantly varies with circumstances, and the rate given on the chart is merely the mean of those found during the survey, possibly from very few observations.

11. *Fixing Position*.—The most accurate method of fixing a position relative to the shore is by angles between well-defined objects on the chart. All ships are now being supplied with a station pointer, and this method should be used whenever possible.

Two things are, however, necessary to its successful employment. First, that the objects be well chosen; and second, that the observer is skilful and rapid in his use of the sextant.

For the former, reference can be had to the pamphlet on the use of the station pointer, which is in every chart-box.

The latter is only to be obtained by practice.

It will readily be seen that in war time, when the compass may be knocked away, or rifle-fire may make it undesirable to expose the person more than necessary, a sextant offers great advantages, as

angles can be obtained from any position whence the objects are visible. It is this contingency that makes it especially desirable that all navigating officers should become expert in this method of fixing a ship's position.

In many narrow waters also, where the objects may yet be at some distance, as in coral harbours or narrow passages among mud banks, navigation by sextant and station-pointer is invaluable, as a true position can only be obtained by its means. A small error in either taking or plotting a bearing under such circumstances may put the ship ashore.

It is not intended that the use of the compass to fix the ship should be given up; there are many circumstances in which it may be usefully employed, but errors more readily creep into a position so fixed. In all cases where great accuracy of position is desired, angles should invariably be used, such as the fixing of a rock or shoal, or of additions to a chart, as fresh soundings or new buildings. In all such cases angles should be taken to several objects, the more the better; but five objects is a good number, as the four angles thus obtained not only prevent any errors, but they at once furnish a means of checking the accuracy of the chart itself. In the case of ordinary soundings, it is only necessary to take a third angle now and then; firstly, to check the general accuracy of the chart as above stated; secondly, to make certain that the more important soundings, as at the end of a line, are correctly placed.

Sometimes, when only two objects are visible, a compass bearing and sextant angle may be used with advantage.

In passing near a point of land, or an island, the method of fixing by doubling the angle on the bow is invaluable. The ordinary form of it, the so-called "four-point bearing," when the bearing is taken four points on the bow, and on the beam, the distance from the object at the latter position being the distance run between the times of taking the two bearings, gives an excellent fix for a departure, but does not ensure safety, as the point, and probably the rocks off it, are abeam before the position is obtained.

By taking the bearings of two points and four points on the bow, a very good position is obtained before the object is passed; the distance of the latter at the second position being, as before, equal to the distance run in the interval, allowing for current.

A table of factors, by which to multiply the distance run, to obtain the distance of the object when any number of degrees between the two bearings has been observed, is now supplied in all chart boxes.

The use of a danger angle in passing outlying rocks with land behind should also not be forgotten. In employing this method, however, caution is necessary, as should the chart be not accurate, *i.e.*, should the objects selected be not quite correctly placed, the angle taken off from it may not serve the purpose. It should not, therefore, be employed when the survey is old or manifestly imperfect.

In fixing by the compass, it must always be remembered that two bearings only are liable to error. An absolute error may be made in either bearing observed; errors may be made in applying the deviation; or errors may creep in in laying them on to the chart. For these reasons, a third or check bearing of some other object should be taken, especially when near the shore or dangers. The coincidence of these three lines will prevent any mistakes.

In ships still fitted with the Admiralty standard compass, the tripod supplied to hold the lamp will be found of great service in fixing position at night, as by its aid a bearing can be as accurately taken as in daylight. With Thomson's compass bearings can also be accurately observed at night. The utility of this in connection with ascertaining the change of bearing of an approaching ship's light should not be forgotten.

Amongst astronomical methods of fixing a ship's position, attention is drawn to the great utility of Sumner's method. A Sumner line, that is, a line drawn through the position (obtained by an assumed latitude and longitude by chronometer) at right angles to the bearing of the sun, as obtained from the azimuth tables, gives at times invaluable information, as the ship must be somewhere on that line provided the chronometer is correct. A deep cast at the same time may often serve to get an approximate position on the line. An early and very accurate position can be also obtained by Sumner's method, by getting longitude by a bright star at daylight when the horizon is well visible, and another longitude by the sun when a few degrees above the horizon, or by observing two or more stars at

twilight. The Summer lines drawn through the two positions thus obtained will, if the bearing of sun and star differ three points or more, give an excellent result.

12. *Change of Variation of the Compass.*—The gradual change in the variation must not be forgotten in laying down positions by bearing on charts. The magnetic compasses placed on the charts for the purpose of facilitating plotting become in time slightly in error, and in some cases, such as with small scales, or when the lines are long, the displacement of position from neglect of this change may be of importance. The compasses are re-engraved when the error amounts to a quarter of a point, but the chart plates cannot be corrected more frequently from the impossibility of making alterations too often on one spot in a copper plate.

The geographical change in the variation is in some parts of the world sufficiently rapid to need consideration. For instance, in approaching Halifax from Newfoundland the variation changes 10° in less than 500 miles. The variation chart should be consulted on this head.

13. *Local Magnetic Disturbance of the Compass on board Ship.*—The term "local magnetic disturbance" has reference only to the effects on the compass of magnetic masses external to the ship in which it is placed. Observation shows that disturbance of the compass in a ship afloat is experienced only in a few places on the globe.

Magnetic laws do not permit of the supposition that it is the visible land which causes such disturbance, because the effect of a magnetic force diminishes in such rapid proportion as the distance from it increases, that it would require a local centre of magnetic force of an amount absolutely unknown to affect a compass half a mile distant.

Such deflections of the compass are due to magnetic minerals in the bed of the sea under the ship, and when the water is shallow, and the force strong, the compass may be temporarily deflected when passing over such a spot, but the area of disturbance will be small, unless there are many centres near together.

The law which has hitherto been found to hold good as regards local magnetic disturbance is, that north of the magnetic equator the north end of the compass needle is attracted towards any centre of disturbance; south of the magnetic equator it is repelled.

It is very desirable that whenever a ship passes over an area of local magnetic disturbance, the position should be fixed, and the facts reported as far as they can be ascertained.

14. *Use of Oil for Modifying the Effect of Breaking Waves.*—Many experiences of late years have shown that the utility of oil for this purpose is undoubted, and the application simple.

The following may serve for the guidance of seamen, whose attention is called to the fact that a very small quantity of oil, skilfully applied, may prevent much damage both to ships (especially the smaller classes) and to boats, by modifying the action of breaking seas.

The principal facts as to the use of oil are as follows :—

1. On free waves, *i.e.*, waves in deep water, the effect is greatest.
2. In a surf, or waves breaking on a bar, where a mass of liquid is in actual motion in shallow water, the effect of the oil is uncertain ; as nothing can prevent the larger waves from breaking under such circumstances ; but even here it is of some service.
3. The heaviest and thickest oils are most effectual. Refined kerosene is of little use ; crude petroleum is serviceable when nothing else is obtainable ; but all animal and vegetable oils, such as waste oil from the engines, have great effect.
4. A small quantity of oil suffices, if applied in such a manner as to spread to windward.
5. It is useful in a ship or boat, both when running, or lying to, or in wearing.
6. No experiences are related of its use when hoisting a boat up in a sea-way at sea, but it is highly probable that much time and injury to the boat would be saved by its application on such occasions.
7. In cold water, the oil, being thickened by the lower temperature, and not being able to spread freely, will have its effect much reduced. This will vary with the description of oil used.
8. The best method of application in a ship at sea appears to be : hanging over the side, in such a manner as to be in the water, small canvas bags, capable of holding from one to two gallons of oil, such bags being pricked with a sail needle to facilitate leakage of the oil.

The position of these bags should vary with the circumstances. Running before the wind they should be hung on either bow—*e.g.*, from the cathead—and allowed to tow in the water.

With the wind on the quarter the effect seems to be less than in any other position, as the oil goes astern while the waves come up on the quarter.

Lying to, the weather bow and another position farther aft seem the best places from which to hang the bags, with a sufficient length of line to permit them to draw to windward, while the ship drifts.

9. Crossing a bar with a flood tide, oil poured overboard and allowed to float in ahead of the boat which would follow with a bag towing astern, would appear to be the best plan. As before remarked, under these circumstances the effect cannot be so much trusted.

On a bar with the ebb tide it would seem to be useless to try oil for the purpose of entering.

10. For boarding a wreck, it is recommended to pour oil overboard to windward of her before going alongside. The effect in this case must greatly depend upon the set of the current, and the circumstances of the depth of water.

11. For a boat riding in bad weather from a sea anchor, it is recommended to fasten the bag to an endless line rove through a block on the sea anchor, by which means the oil is diffused well ahead of the boat, and the bag can be readily hauled on board for refilling if necessary.

IN THIS WORK THE BEARINGS ARE ALL MAGNETIC,
EXCEPT WHERE MARKED AS TRUE.

THE BEARINGS OF THE VISIBILITY OF SECTORS OF
LIGHTS ARE FROM SEAWARD OR TOWARDS THE
LIGHT.

THE DISTANCES ARE EXPRESSED IN SEA MILES OF
60 TO A DEGREE OF LATITUDE.

A CABLE'S LENGTH IS ASSUMED TO BE EQUAL TO
100 FATHOMS.

THE SOUNDINGS ARE REDUCED TO LOW WATER OF
ORDINARY SPRING TIDES.





NOTE
 The charts and plans shown on this Index represent those published at the date given at the foot. They are liable to alteration and amendment.

**INDEX TO
 ADMIRALTY PUBLISHED CHARTS
 ALLUDED TO IN THIS WORK**

* indicates that a plan of the place is given upon the coast chart which is shown by the diagram to embrace it. * 2152 indicates that a plan of the place against which it is written is given on sheet 2152. A number against a place thus: Melbourne 624 shows that a separate plan is published bearing that number.

For details of scales, prices &c. see Admiralty Catalogue.

For later information respecting the Lights which are described in this work, seamen should consult the Admiralty List of Lights, Part VI.; South Africa, East Indies, China, Japan, Australia, Tasmania, and New Zealand. This Light list is published early in the current year, corrected to the preceding 31st December.

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AUSTRALIA DIRECTORY.

VOL. I.



SOUTH AND EAST COASTS, BASS STRAIT, AND TASMANIA.

CHAPTER I.

GENERAL REMARKS. — WESTERN AUSTRALIA ; PHYSICAL FEATURES ; GEOLOGY.—SOUTH AUSTRALIA, VICTORIA, TASMANIA, AND NEW SOUTH WALES ; GENERAL REMARKS ; PHYSICAL FEATURES ; GEOLOGY ; PRODUCTS ; FISHES ; POPULATION ; TRADE ; COMMUNICATION ; COAL ; DOCKS ; PILOTS ; CLIMATE. — WINDS AND WEATHER ; STORM SIGNALS.—CURRENTS.—UNIFORM SYSTEMS OF BUOYAGE. — PILOT SIGNALS. — STANDARD TIME SYSTEMS. — PASSAGES.

GENERAL REMARKS.—Australia,* the largest island in the world, is situated between the parallels of 10° and 39° South latitude and the meridians of 113° and 153° East longitude, its area being about three million square miles, an area nearly equal to that of the United States of America excluding Alaska. Washed on the west and south by the Indian ocean, and on the east by the Pacific, to the north it is separated by an intricate, narrow, and shallow coral strait from New Guinea. Its existence was probably altogether unknown to the ancients, and the exact time of its discovery is doubtful. In some Portuguese charts of the year 1531, vague references are made to a large extent of country south of the Moluccas. In 1606 Torres

See charts, No. 2,759*a*, Australia, northern portion, and No. 2,759*b*, Australia, southern portion, scale $d = 1.0$ inch.

* The name Australia was suggested by Flinders. *See* his "Voyage to Terra Australis," Introduction, page iii.

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sailed from east to west through the strait which still bears his name and during the same year the Dutch appear to have landed on the peninsula of Cape York. Cape Leeuwin was sighted and named by a Dutchman in 1622, and the remainder of the south coast was discovered by a Dutch vessel some five years later. In 1642 Tasman discovered Tasmania, and in 1695 the Swan river was partially ascended by Vlaming. The first English visitation was in 1688, by Dampier, who afterwards visited and explored the north-west coast in H.M.S. *Roebuck*, but it is owing to the energy of Captain Cook, who first mapped and explored the whole of the east coast, that the most important discoveries were made and its suitability for settlement ascertained.

In 1791 Vancouver entered and named King George sound. Flinders and Bass extended the discoveries of Cook to the westward in 1798, and were followed by Murray in 1802.

In 1788 the first settlement was founded at port Jackson, New South Wales ; in 1803 Tasmania was occupied as an auxiliary station, but became a separate province in 1825. In 1829 an English company took possession of Swan river, Western Australia ; and in 1835 another settlement was founded at port Phillip, which in 1851 became a separate colony under the name of Victoria.

South Australia was founded by a Joint Stock company in 1836 as an experiment in the Wakefield system of colonisation ; and Queensland was formed into a separate government in 1859.

Governed originally entirely by the Officers appointed to represent the Crown, the first Representative Parliament was opened in New South Wales in 1856, followed shortly afterwards in the same year by similar Parliaments for Victoria and Tasmania, and in the year 1857 by a Parliament for South Australia. Western Australia was, however, governed as a Crown colony until 1890, its first Representative Assembly meeting in that year.

The several colonies, except Queensland, are all remarked on in the large extent of coast line described in this work, and a general description of each colony is first given.

WESTERN AUSTRALIA* (South coast).—Physical features.—Ranges of hills of moderate elevation stretch along the southern portion of the west coast at a distance of 15 to 20 miles

See charts, Nos: 2,759a and b.

* The more general description of Western Australia is in *Australia Directory*, Vol. III.

from the sea. There are also two short ranges, between 2,000 and 3,600 feet in height, running east and west, about 25 and 40 miles north of Albany. The rivers of the south are small. A great deal of the country on the south-western seaboard is heavily timbered, principally with jarrah and white gum; but when the hilly district is passed there is believed to be little else than a sandy or stony waste to the boundary of South Australia.

Geology.—The base of Western Australia is of granite and its kindred formations, which underlie Silurian or more ancient rocks. Not only are the principal elevations so composed, but throughout the vast extent of bare and sterile land eastward, and inland, granite is most prominent, rising through recent deposits in knobs and tables onwards into South Australia. King George sound and the mountains around are granite. Granite, both on the south and west coasts, supports the recent deposits of calcareous and arenaceous material. Secondary formations are rare. Tertiary beds of limestone are more plentiful, and are generally seen near the coast. Arenaceous limestone cliffs rise 200 to 400 feet for hundreds of miles along the south coast. Calcareous accretions abound in the south-west. Cape Arid stops with its granite the progress of the tertiary beds. Nuyts land is probably Pliocene. Columnar greenstone occurs at cape Leeuwin.

SOUTH AUSTRALIA.—South Australia was established as a separate colony in 1834; it now comprises the central division of Australia from the meridian of 129° E. longitude on the west side to the meridians of 141° E. longitude in the southern half, and 138° E. longitude in the northern half on the east side. Its area is 903,425 square miles.

Physical features.—The southern part of the colony is generally flat or slightly undulating. A range of mountains, of about 3,000 feet greatest height, commences at cape Jervis and extends about 175 miles to the northward, another range of about the same elevation begins at the head of St. Vincent gulf and runs northward to the lake Torrens country. The ranges on the west side of Spencer gulf attain a height of 1,500 feet. In the south-east are several extinct volcanoes. The Murray is the only river of importance, but it is not available for navigation by sea-going vessels, owing to the shallow water and dangerous surf over its bar. Light

draught steamers, however, navigate the river and its tributaries from Goolwa, within the entrance, to far into the interiors of Victoria, New South Wales, and Queensland.

Geology.—The few mountain ranges scattered throughout the colony were once, possibly, islands rising from an inland sea, that connected the Indian ocean and Java sea with the southern ocean. In the Tertiary times, water flowed over the southern half of South Australia. The rise of the country displayed that vast extent of arenaceous limestone forming the southern coast floor and extending hundreds of miles to the westward and far into Victoria to the eastward. The Murray cuts its channel through this vast coralline formation. The Murray cliffs are Upper Miocene, the Murray flats are Lower Miocene. The South Australian ranges are generally of Primary order, the Silurian formation being often pierced or flooded by igneous rocks. Westward and south-eastward the Tertiary rests on a granite floor. Recent volcanic action is apparent near the Victoria boundary. Several of the lakes there were once craters. The Deep Blue lake or Devil's Inkstand occupies the centre of mount Gambier. Mount Schanck, between Gambier and the sea, is known as the Devil's Punch bowl; its cone of lava has an empty crater 200 feet deep.

Products are principally agricultural and pastoral; there are nearly two and three-quarter million acres under cultivation, a large proportion being cropped with wheat. Vines are extensively grown, 594,038 gallons of wine were produced in 1892. The amount of wool produced in 1892 was 45,850,292 lbs., the number of sheep being over 7,000,000.

A large quantity of copper is produced, which is exported to the value of one-third of a million sterling annually. Other metals are worked, as bismuth, lead, and gold.

Both whaling and sealing were important industries on these coasts, but the whales have migrated and the fur seals are nearly exterminated. There are vast numbers of hair seals on all the out-lying rocks.

Oysters are found at port Lincoln and Coffin bay.

Fishes.—The fish on the coasts of South Australia are the barracouta, bonita, bream, carp, catfish, rock, cray fish, cuttle, dog fish, flathead, gar fish, grayling, gurnard, hake, John Dory, mullet, ray,

schnapper, seahorse, shark, sole, squid, and whiting. In the Murray river the mulloway abounds in the estuary, and the Murray cod above the tidal waters.

Population.—The population of South Australia was 346,874 in 1893. In 1881 it was 286,324. The aboriginal population is estimated not to exceed 3,200.

Trade.—In 1893 the value of the imports was £7,934,200 and of the exports £8,463,936; the tonnage of the arrivals and departures of shipping was 2,392,600. The chief imports are textiles, sugar, alcohol, tea, hardware, and machinery, and the exports, bread stuffs, wool, silver, and copper.

Harbours.—The principal harbours are at Port Adelaide, Port Pirie, Port Lincoln, and Port Augusta.

Communication.—Steam vessels.—The vessels of the Peninsular and Oriental, and Orient Companies, each leaving London and Sydney every fortnight, call at Port Adelaide. The mails for and from the eastern colonies are landed and shipped at Port Adelaide, where they are despatched and received by rail. There are also steamers every month of the Messageries Maritimes from Marseilles, of the Norddeutscher Lloyd from Southampton, of the Elder line from London, and of Lund's line every 21 days from London.

There are two regular lines of steamers between Port Adelaide and Melbourne, and steam vessels constantly proceed from Port Adelaide to the ports in South and Western Australia.

Railways.—There were 1,831 miles of railway open at the end of 1893. They furnish communication from Adelaide to Port Victor; to Serviceton, on the Victoria frontier (and in connection with the railway system of that colony); to Moonta bay; to Morgan; to Broken hill; to Petersburg and Port Augusta, besides branches to other places. There is also a line, intended eventually to cross the continent northwards, open to Oodnadatta, a distance of nearly 700 miles from Adelaide. The railways are constructed some on the 5 feet 3 inches gauge and others on the 3 feet 6 inches.

Telegraphs.*—South Australia possesses 5,493 miles of telegraph lines. Besides providing for the wants of its own settled districts

See chart, No. 2,759b.

* Telegraph messages between Australia and England are usually transmitted by the cables between port Darwin and Roebuck bay, on the north coast of Australia, and Java. thence to Singapore, Penang, Madras, Bombay, Aden, Suez, Alexandria, Malta, Gibraltar and England.

and taking its share in the communication with the other colonies, it has formed and is successfully working the overland line to port Darwin. There is also a line along the southern coast to Eucla on the boundary of Western Australia, and in connection with the telegraph system of that colony. The rate per word for telegrams to the United Kingdom is 4s. 9d., *viâ* Turkey 4s. 7d.

Coal.—Coal can be obtained at Port Adelaide in any quantity.

Docks, &c.—At Port Adelaide are five building slips, the largest of which can take a vessel of 1,500 tons.

Repairs of any size can be executed at Port Adelaide.

Pilots.—Pilots may be obtained at Port Adelaide and generally at Wallaroo, Port Victor, Port Macdonnell, and Rivoli bay, also at Ports Pirie, Germein, and Augusta.

Climate.—December, January, and February are very trying months, the thermometer often rising at Adelaide to 110° or 115° Fahr. in the shade for a few days at a time, the mean temperature being 71°·0, 74°·5 and 73°·7 respectively; but the great heat is considerably mitigated by the extreme dryness of the air in the summer months; the rest of the year is pleasant and the winter is mild and rainy. Frosts occur in the early morning during June and July, and snow occasionally falls on land elevated more than 2,000 feet. The mean temperature in June is 53°·6, in July 51°·6, and in August 54°·0. The usual rainfall is small, averaging 20·4 inches annually, but the amount varies greatly.*

VICTORIA.—This colony, separated from New South Wales in 1851, is situated between the parallels of 34° and 39° South latitude and the meridians of 141° and 150° East longitude; it is separated from New South Wales on the north by the river Murray to one of its sources at Forest hill, thence in a straight line to cape Howe. Its area is 87,884 square miles.

See chart, No. 2,759b.

* The term average rainfall is very apt to mislead and foster the idea that the quantity of rain which is called the average is what may be fairly expected to fall, when the fact is quite the contrary. Take the records of any place for a few years and the rainfall is found to be most erratic; for instance at Sydney in 1860 the fall was 82 inches, in 1862, 24 inches. Therefore the knowledge of the mean gives no guarantee of what the fall will be in any year, but it is instructive to compare the average rainfall at a number of places.

Physical features.—A broad and irregular chain of mountains, ranging in height from 4,000 to 6,500 feet, runs through the colony from east to west dividing it into two unequal parts, the rivers having their sources on the southern side of the water shed flowing to the sea, and those rising on the northern slopes empty themselves into the Murray.

There is no connected system of coast ranges.

The larger portion of Victoria is mountainous or hilly, only in the north-west are vast sandy and sparsely grassed plains intersected with belts of scrub and forests. With the exception of the Murray, there are few navigable rivers. In winter most of the rivers become angry torrents, carrying devastation over much fertile country, whilst in summer many of them dwindle down to small streams or detached pools. There are many shallow lakes, both fresh and saline, some of which dry up in the summer heat.

Geology.—The geological formation of Victoria is very varied, which helps to give the country much of its beautiful scenery. It possesses a large proportion of Palæozoic and volcanic rocks to which it owes its extreme fertility. The Dividing range running east and west through the country consists of granitic and Silurian rocks. South of the mountains there was once an enormous deposit of Upper Palæozoic or Secondary rocks which have since been greatly denuded. Devonian sandstones, slates, and limestones occur in Gipps land. Secondary rocks occur in the cape Otway country and in the region east of Western port.

Tertiary deposits cover one third of the surface of the colony. The calcareous or desert sandstone of Pliocene age, which is so largely developed in Western and South Australia, enters Victoria in the west and north-west and forms much of the poor arid pastures of that country. To the south of the mountains small patches of it are found at port Phillip heads and Western port.

The quartz, gravel, clay, sandstone, and conglomerate in which alluvial gold is found, are Older Pliocene, while the fresh water sandstones of Geelong and of the Loddon valley are Newer Pliocene. The coloured clays of Warrnambool on the south-western coast are Post-Pliocene. Miocene beds occur in the Moorabool valley west of Geelong and in the cape Otway region; while the sandstones of Portland in the west, and the rough limestone of the Gipps land lakes are of the same age.

Products.—The principal product of Victoria was formerly gold, to which it owes its extraordinarily rapid progress; considerable quantities of tin, copper and antimony have also been worked. Wheat is grown in such quantities as not only to support the population, but to leave a large surplus for export. Potatoes, oats, barley, maize are cultivated. Tobacco and wine are largely manufactured. The rearing of cattle and sheep (especially the latter) forms one of the staple industries. The number of sheep in 1893 was 12,965,306.

Population.—The population in 1891 was 1,140,405. In 1881 it was 862,346. The aboriginal population in 1891 numbered less than 600.

Trade.—In 1894 the value of the imports was £12,470,599, and of the exports £14,026,546; in the same year 4,128 vessels of an aggregate tonnage of 4,291,459 entered and cleared at Victorian ports. The chief articles of import were wool (from across the border), sugar, cottons, woollens, live stock, iron and steel; of export, wool, gold, wheat, and live stock.

A trade is also springing up in preserved and frozen meats.

Harbours.—The principal harbours are port Phillip, Portland bay, port Fairy, Lady bay, Western port, Venus bay, and port Albert.

Communication.—Steam-vessels.—The Peninsular and Oriental Steam Navigation Company and the Orient Steam Navigation Company, each provide a fortnightly service to and from England and Melbourne. There are also steamers to Melbourne: of the Austrian Lloyd's Company from Trieste every week; of the Messageries Maritimes from Marseilles every month; of the Anglo-Australasian Steam Navigation Company, and of Lund's line from London. Local companies' steam vessels connect Melbourne with all the Australian and New Zealand ports.

Railways.—In 1893 there were 2,975 miles of railway completed, all of which belong to the Government, and which have a gauge of 5 feet 3 inches. Lines radiate in every direction from Melbourne: by the North-Eastern line to Wodonga, through railway communication is effected with Sydney (which can be reached in 19 hours from Melbourne); and the Western line to Serviceton gives through communication with Adelaide. Other extreme points reached are Portland, Belfast, on the south-west coast; Swan hill and Echuca on

the Murray river; Warracknabeal, Donald, and Wychproof to the north-west; and eastward to Bairnsdale, on the Mitchell river.

Telegraphs.—There are 818 stations for electric telegraphs in the colony, and 8,241 miles of line in operation. There are also 9,460 miles of telephone wire in connection with exchanges, &c. The rate per word for telegrams to the United Kingdom is 4s. 10*d.* Messages of 6 words or under can be sent within the colony for 6*d.*

Coal can be obtained at Melbourne, the average quantity kept in stock being about 20,000 tons.

Docks, &c.—There are several docks and patent slips at Melbourne. The largest dock is the Alfred, which is 470 feet long over all, has a breadth of entrance of 80 feet, with a depth of 26 to 27 feet over the sill at high water ordinary springs. There is a complete set of workshops and factories in connection with this dock.

Repairs of any size can be executed at Melbourne. *See* pages 460, 461, 463.

Pilots.—There is a pilot establishment at port Phillip heads. The vessels are schooners, and each has her number on her mainsail. They cruise from 3 to 15 miles off the heads. *See* page 430. There are also pilots at port Albert.

Climate.—Although the maximum summer temperature rises to 105° Fahr. in the shade, there is a considerable amount of fine clear weather not oppressively warm and excepting when the hot northerly winds blow, the climate is exceedingly agreeable. The mean temperature at Melbourne is 57½°, and the minimum is 25°. In the low lands frost is almost unknown, but in the mountainous districts it often freezes at night, though the days may be hot. The average rainfall in Melbourne is 25½ inches; it is very variable. In the north-west interior it is very dry, the rainfall being seldom more than 14 inches.

TASMANIA, formerly known as Van Diemen's Land, was a dependency of New South Wales till 1825, when it was made a colony. Situated to the south of the south-eastern portion of Australia, from which it is separated by Bass strait, 150 miles wide, it has an area of 26,375 square miles. The colony includes numerous dependent islands, of which King island and Flinders island are the largest.

Physical features.—Perhaps Tasmania is the most thoroughly mountainous island on the globe; it is one continuous series of mountains and valleys, peaks and glens. The highest

mountains just exceed 5,000 feet. The southern and western parts of the island are particularly remarkable for bold and commanding scenery. The coast, which is rocky and bold in its outlines, is broken by numerous inlets, many of which constitute good natural harbours. Rivers are numerous, some of them are of considerable size and a few are navigable for a portion of their course. There are also several mountain lakes near the sources of the rivers, the largest, Great lake, 3,820 feet above the sea, is about 12 miles long, and has an area of 28,000 acres.

Geology.—Formations of the ancient and Palæozoic and metamorphic rocks, and abundance of granite, constitute almost the whole of the table lands and lofty peaks. Mesozoic rocks occur in the lower hills and are more prevalent than in Australia.

Sandstone, supposed to be of Triassic age, occurs near Hobart, forming hills capped with basalt. Tertiary beds occupy much of the larger valleys and plains. Igneous and volcanic rocks abound. Porphyries and greenstones occur on most of the plateaux, and form parts of many of the highest mountains. Basalts occur of every age down to the Pliocene Tertiary. The islands in Bass strait are granite, as are also the north-eastern corner of Tasmania and Wilson promontory in Victoria. Tasman peninsula presents grand vertical precipices of basaltic columns. The Secondary sandstones produce fine building material. Limestone occurs in the Derwent valley and on the north coast, where are extensive caves. Coal and lignite occur in many localities and are believed to be both of Palæozoic and Mesozoic age. Some of the coal is of good quality and it is becoming more largely worked. Rich iron ore occurs on the north coast and in many other places. Tin, lead, antimony, manganese, and plumbago also occur, but only the tin has been worked to any extent. There are also some quarries of good roofing slates.

Products.—The chief products of the colony are wool, gold, silver, tin, and fruit. The wool is much esteemed and commands a high price. The live stock is celebrated for its general excellence, especially the stud sheep. The woods are scarcely yet fully appreciated; the sources of supply are practically inexhaustible, abounding with the most beautiful cabinet woods and the largest sized timbers adapted for every variety of purpose. Much beer is brewed for exportation to the neighbouring colonies. In the early years of occupation both sperm and black oil, with whalebone, were important

articles of export till the retreat of the whales to other seas, and sealing was carried on successfully in Bass strait till the seals were destroyed.

Fishes.—The bays contain excellent fish, particularly the trumpeter found on the south side of the island. The species include the trumpeter (*Latris*) up to 60 lbs. weight, the salmon (*Arripis*), the flathead (*Platycephalus*), trevally (*Neptonemus*), garfish (*Hemirhamphus*), barracouta and kingfish (both *Thrysites*), perch and bream. The anchovy is migratory. English mackerel have been seen off the east coast and some of the herrings are like the English. Rock and bull kelp cod are favourites. English trout (*Salmo fario*) are more certainly found than the true salmon (*Salmo salar*); the last are doubtful, though numbers have been raised in hatcheries on the Derwent. Among freshwater fish are a so-called freshwater herring (*Prototroctes*), various kinds of so-called trout (*Galaxias*), black fish (*Gadopsis*), and fine perch.

Population.—The population in 1891 was 146,667; in 1881 it was 115,705. The aboriginal population are extinct; the last native having died in May 1876.

Trade.—In 1894 the value of the imports was £979,676, of the exports £1,489,041; in the same year, 1,423 vessels of an aggregate tonnage of 898,367 entered and cleared at the Tasmanian ports.

The imports are chiefly, railway material, apparel and haberdashery, cottons and woollens, wrought and unwrought iron; and the exports, wool, gold, tin, timber, fruit, hops, grain, hides, and bark.

Communication. — Steam-vessels.—The steam-vessels of Shaw, Savill, and Albion Company, and of the New Zealand Shipping Company from London for New Zealand, call at Hobart (on the outward voyage only).

The Tasmanian and Union Steam Navigation Company's vessels run between Melbourne and Launceston twice a week (three times in summer); and between other colonial ports and Hobart. The same company's steamers call at Hobart every fortnight on their voyage to New Zealand from Melbourne.

Railways.—There are two railways—the Main line from Hobart to Launceston and the Western line from Launceston to Ulverstone.

There are also branches to Glenora and Apsley, from Cleveland to St. Mary's, from Parattah to Oatlands, and from Launceston to Scottsdale. A line has recently been completed from Strahan in Macquarie harbour to Zeehan and mount Dundas.

The railways of Tasmania are constructed on the 3 feet 6 inches gauge.

Telegraphs.—Electric telegraphs extend along the railways and to all the chief towns. A submarine line connects Tasmania with Victoria and thus with the universal telegraph system.

The rate per word for telegrams to the United Kingdom is 5s. 5d. by the Eastern Company's and the Indo-European Company's cables, and 5s. 3d. *viâ* Turkey.

Coal.—Coal can be obtained at Hobart, where the average quantity kept in stock is 3,500 tons.

The chief coal-fields at present worked in the colony are those of the Fingal district on the east coast. The coal is bituminous and of an excellent character. Coal of a poorer quality is found on the rivers Don and Mersey on the north-west coast. The quantity of coal raised in 1892 was 35,669 tons.

Docks, &c.—There are four patent slips at Hobart, one of which can take vessels of 1,000 tons (without bilge keels); and there is a floating dock at Launceston which can take a vessel of 200 tons.

Small repairs can be executed at Hobart. *See* page 710.

Pilots.—The pilot station for Hobart is at Pierson point at the junction of D'Entrecasteaux channel and Derwent river; the pilots board inward bound vessels, in Storm bay, from a whale boat. There are also pilots for the river Tamar and Macquarie harbour.

Climate.—The climate, though differing in the eastern and western portions—the former being dry and the latter very wet—is very healthy. It possesses the full summer heat due to its latitude, and even some excess, for it occasionally feels the hot northern winds from Australia; but the nights are always cool and refreshing. The mean temperature at Hobart is $54\frac{1}{2}^{\circ}$ Fahr. The maximum temperature of Hobart in summer is 100° , which is rarely reached; in winter it seldom falls below 29° , though on the uplands it often sinks to 18° below freezing, producing ice of a considerable thickness. The

rainfall at Hobart averages 22·9 inches annually, at Launceston about 30 inches, and at Macquarie harbour on the west coast over 100 inches. But it varies greatly at the same place. There is abundance of wind, often violent. Thunderstorms are rare.

NEW SOUTH WALES.—This colony is situated to the southward of Queensland, from which it is separated by Macpherson range, the Dividing range, the Dumaresq river and the parallel of 29° S. latitude; its western boundary is the meridian of 141° E. longitude, and it has Victoria on the south. It comprises an area of 309,175 square miles.

Physical features.—The surface of this country is greatly diversified. A range of mountains, attaining an elevation of about 6,000 feet, runs parallel to the coast at an average distance of 30 miles from it. The country on the eastern side of this range is an elevated undulating plain intersected with numerous streams. On the west side is a considerable breadth of high table-lands, which further west sink into vast plains. The coast line is bold and rocky, with several remarkable peaks and summits a short distance inland, and presents a number of important capes and headlands, and many bays and inlets.

Geology.—The mountain ranges and table-lands of New South Wales consist mainly of the older Palæozoic formations, pierced and rent by intrusive igneous rocks of various ages. The settled districts of the east coast lie mostly on rocks of the Carboniferous formation, or on newer deposits of Mesozoic age, while the great western plains and valleys are almost wholly Tertiary sandstone, or more recent deposits, with intervening areas covered by overflows of igneous trap rock. Granitic rocks of various kinds are abundant, and syenite forms the summit of Kosciusko (7,336 feet), the highest mountain in Australia. Gold occurs in granite, in quartz veins and in beds of iron pyrites. The carboniferous rocks cover an immense area and are largely coal-bearing, so that the coal-fields are among the most extensive in the world. These deposits are of Palæozoic formation and correspond to the coal of England. No active volcano exists in the colony.

Products.—The great staple productions of New South Wales are wool, gold, and coal. At the end of 1892 the number of sheep was 58,080,000, the wool of which is very fine. Accessory products

are tallow, skins, and preserved meats. The country is rich in minerals, besides gold, copper, silver, tin, iron and antimony are found. Agriculture is one of the principal industries; wheat, maize, potatoes, tobacco and sugar-cane are grown. Large quantities of wine are also produced.

Fishes.—The principal species of fish are the bream, mullet, whiting, schnapper, jewfish, kingfish, taraglin, salmon, mackerel, flathead, garfish and Murray cod. Oysters, many of them equal to the best English species, abound in all tidal waters; lobsters and prawns are plentiful, but the shrimp is not found.

Population.—The population in 1891 was 1,132,234; in 1881 it was 751,468.

Trade.—In 1894 the value of the imports was £15,801,941, and of the exports £20,577,673; the number of vessels which entered and cleared the ports of the colony was 6,563, with an aggregate tonnage of 5,738,554.

Communication.—Steam-vessels.—Frequent communication with Europe and America, also with New Zealand, India and China, is maintained by steamships.

The steam-vessels of the Peninsular and Oriental Steam Navigation Company, and of the Orient Steam Navigation Company each leave London for Sydney, and Sydney for London every fortnight.

Those of the British India Company run *viâ* Queensland and Torres strait to India and Great Britain.

Those of the Austral-Canadian line run monthly to and from Vancouver island, calling at Suva in Fiji and Honolulu.

Steam-vessels of the Union Steamship Company of New Zealand run from Sydney to San Francisco every month, calling at Auckland and Honolulu. There are also steamers of the Messageries Maritimes from Marseilles, and the Norddeutscher Lloyd from Bremerhaven every month. Local companies' steamers connect Sydney with colonial ports, Fiji, &c.

The average time now taken in the conveyance of the mails between London and Sydney, *viâ* Suez, is about thirty-four days.

Railways.—The most important line is that in a south-west direction from Sydney through Goulburn to Wagga Wagga, at the

head of the Murrumbidgee navigation, with a continuation to Albury on the Victoria frontier, which now completes the communication between Sydney and Melbourne. It is also extended westward to Hay, with branches to other places. Another line runs from Sydney across the Blue mountains to Bourke on the Darling river, with several branches. A railway has recently been opened into the well-known Illawarra district; it passes along and near the coast to the southward of Sydney, the present terminus being at Nowra. To the north there is a line, *viâ* Newcastle, to Tenterfield and on into Queensland, passing through a fine pastoral, agricultural and mining district. The gauge of the lines is 4 feet 8½ inches.

Hence although there is through railway communication between Adelaide and Brisbane, a break of gauge occurs both on entering and leaving the colony of New South Wales.

Telegraphs.—The electric telegraph is carried to every important place in the colony and is being constantly extended. There is also communication with the other Australian colonies, and a submarine cable to New Zealand.

The rate per word for telegrams to the United Kingdom is 4s. 11*d*.

Coal.—Coal for steaming purposes to any quantity may be obtained at Sydney and Newcastle. Vessels can be coaled at Sydney at the rate of 1,000 tons a day.

The amount of coal produced in the colony in 1892 was 3,780,968 tons.

Docks, &c.—There are several docks at Sydney, the largest is the Sutherland (Biloela), which is 638 feet long, the breadth of entrance being 84 feet, with a depth of 32 feet over the sill at high-water ordinary springs. Every facility is to be obtained at Sydney for repairing vessels of any size or description, with abundant supplies and stores of every kind. *See* pages 838, 839.

Pilots.—The master of every vessel not by law exempt from the necessity of accepting the services of a pilot, on arriving at or off any port or place in New South Wales, at which there is a pilot establishment, and intending to enter that port or place, is to place her in charge of the first licensed pilot that may come alongside; and such master is not to enter the harbour, or proceed

to sea, or quit his anchorage without having a licensed pilot on board, under a penalty not exceeding twenty pounds in addition to the amount of pilotage to which he would have been subject if a pilot had been employed.

Every ship the master of which possesses a pilotage certificate and every ship engaged in the whaling trade shall, except in cases where a pilot is actually employed, be exempt from pilotage.

There shall be payable and paid at every port at which there shall be a pilot establishment a pilotage rate upon every vessel (excepting those entitled to exemption) of 4*l.* per ton on her arriving at, and on her departing from such port, and one moiety of such rate in any case of her being compelled to return into such port after having put to sea; provided that in respect of any such vessel the amount of such rate shall not be in any case less than fifty shillings for the port of Sydney or Newcastle, nor less than twenty-five shillings for any other port of the colony. These regulations do not refer to war-vessels.

At port Jackson a constant look-out is kept at the Signal station for vessels requiring pilots. Upon a vessel being signalled, a steam pilot vessel will proceed to sea and place a pilot on board. *See* page 825.

A pilot is stationed at each of the following places,—Twofold bay, Moruya river, Shoalhaven river, Kiama, and Wollongong.

Harbour regulation.—Every steamship whilst proceeding in any harbour in New South Wales, between sunset and sunrise, shall sound a prolonged blast from a steam-whistle at intervals of not more than two minutes.

Climate.—A great range of climates may be found within the colony, from the cold at Kiandra, where the thermometer sometimes falls 8° below zero Fahr., and where 8 feet of snow has fallen in a month, to the more than tropical heat and extreme dryness of the inland plains, where frost is never seen and where the thermometer often in summer reaches from 100° to 116° Fahr. Along the coast the air is moist and soft, the temperature varying from about 78° in January to 59° in July, with a mean of 62½°. The average rainfall to the east of the mountains is 40 inches, while in the interior to the west of the mountains it is about 14 inches. At Sydney the rainfall has varied from 22 to 82 inches, the mean being 48·97 inches.

WINDS AND WEATHER.

INDIAN OCEAN.—To the southward of the region of the south-east trade, 26° to 30° S., the winds are variable. Southward of the parallel of 30° S. the prevailing winds are from S.W. and N.W.; but between the parallels of 40° and 44° S., from the meridian of the cape of Good Hope to Tasmania, strong winds from North and N.N.E. have been frequently encountered, shifting sometimes suddenly to N.W. or more to the westward. Several ships have experienced these northerly winds when steering for Bass strait, and have been obliged to proceed south of Tasmania.

It was formerly thought that between 40° and 50° South latitude, the wind blew constantly from the westward. Investigation has shown that the winds here are cyclonic in their character, and that as the central depression is generally south of 45° S., the cyclone having a large area and a progressive movement to the eastward, the wind in the northern semicircle is mostly from the western quarter, commencing from about North, freshening from the north-westward, and frequently shifting more or less suddenly to the south-west with a rising barometer and stronger gale. A vessel steering eastward, will therefore, hold the fair wind for a time, dependent on her own speed and the velocity of the translation of the system, and when the latter is moderate may carry the westerly winds for days. As the centre of the system is generally south of 45° S. latitude, though a vessel may have less wind about the parallel of 40° S., she will probably have a greater proportion of westerly wind than if she went further south. Should the central depression be further north than usual, so as to leave the vessel to the southward, the wind will shift from North to north-east and a hard easterly or south-easterly gale will follow.

The **barometer** in the southern oceans generally rises with southerly and falls with northerly winds, although a heavy gale from either quarter may be preceded by a falling barometer. In the southern hemisphere, the effect of the shifting of the wind on the barometer is,—with East, N.E., and North winds the barometer falls, with N.W. winds the barometer ceases to fall and begins to rise; with West, S.W., and South winds the barometer rises; with S.E. winds the barometer ceases to rise and begins to fall.

See Wind and Current charts for the Pacific, Atlantic and Indian oceans.

Seamen should bear in mind the well known rule for ascertaining the position of a storm's centre, or, in other words, of the area of low barometric pressure round which the wind circulates in the southern hemisphere, viz., to face the wind, when the centre will be from eight to twelve points to the left of its direction. Careful attention to the barometer and to any changes in the direction of the wind will give a clue to future probable changes. It is now well understood that the wind has a tendency not only to circulate round areas of low pressure, but also round areas of high pressure, though in the opposite direction. The former is known as the cyclonic, the latter as the anti-cyclonic, system.

The thermometer in the southern hemisphere rises with east north-east and north winds ; with a north-west wind it ceases to rise and begins to fall : it falls with west, south-west, and south winds ; and with a south-east wind it ceases to fall and begins to rise.

CAPE LEEUWIN to BASS STRAIT.—Near cape Leeuwin the wind blows generally from the westward, varying in summer from N.W. in the night, to S.W. in the latter part of the day, though not with regularity.

In the neighbourhood of the south coast of Australia, within 100 miles of the land, the most settled weather prevails during January, February, March and April, the wind being generally south-easterly, and partaking of the nature of land and sea breezes, being most easterly during the night and early morning, and most southerly during the day and afternoon. With the above winds the barometer is usually very high, often above 30·5 inches. The easterly wind in this season falls light after sunrise, freshening in the forenoon from S.S.E. to a force of 5 to 6, and often bringing up a haze if the morning has been hot ; the sea breeze attains its greatest force during the afternoon, becoming lighter near sunset as its direction changes towards the land. Should the barometer fall, the wind, instead of veering to the southward in the morning may turn to the northward, and blow from that direction, a very hot dry wind, for from one to three days. When this northerly wind falls light, a moderate gale from West to S.W. usually springs up, seldom lasting more than 24 hours ; after which a period of fine weather again ensues with south-easterly winds as above. At the end of April the south-easterly winds almost entirely cease, although sometimes they continue at

intervals during the whole of May ; at this time there are also occasionally fresh N.E. winds, not followed by any change to the westward.

From the middle of May until the end of October westerly winds prevail, the gales from that direction quickly raising a heavy sea, and blowing with as much strength near the land as further seaward.

GALES.—The signs of the approach of a westerly gale on the south coast of Australia are so well marked that no vessel need encounter one unprepared. From May to October if the barometer falls rapidly when below 30 inches, with a fresh and gusty northerly wind, whilst heavy clouds, with lightning, gather to the north-westward, a westerly gale is certainly approaching. The northerly wind usually falls light as the bank of clouds to the north-westward rapidly rises, and the wind then shifts to N.W. in a heavy squall, with rain and lightning. In the lull before this squall St. Elmo's fire is often seen on the iron-work of the masts and yards.

When the barometer rises the wind soon shifts to the westward and S.W., the weather clearing up when the wind becomes well southward of S.W. Frequently the barometer remains nearly stationary, or falls after the gale begins, and the wind continues to blow hard from N.W. to S.W. for from a week to ten days, though the average duration of these winter gales is from three to four days. Besides the rising of the barometer to above 30 inches, the entire clearing of the clouds from the western horizon is one of the surest signs of the gale having passed ; after which a short interval of fine weather ensues, and the wind turns again to the northward on the approach of the next gale. The three months, October, November and December, have sometimes settled weather with a preponderance of south-easterly winds, but the westerly gales of October are frequently as severe as those experienced at any time during the winter, and an occasional gale from that quarter is likely to be experienced in November, sometimes in December, and at rare intervals in the early months of the year.

The force of the south-easterly wind in summer has been known to increase to a strong gale, lasting about 48 hours, and raising a very irregular cross sea, as the constant south-westerly swell does not subside with the south-easterly wind. These gales are accompanied by a red haze, the barometer being steady, but below the average height for the time of year ; and the wind continues from the south-eastward while the gale lasts, not changing its direction seaward and

landward as in fine weather. Several years sometimes elapse without the recurrence of one of these gales.

FOG.—Fogs are extremely rare on the south coast of Australia, only one having happened in 10 years, from 1870 to 1880; the haze which comes up with the sea breeze in the summer is sufficiently thick occasionally to render objects indistinct at a distance of three or four miles.

BASS STRAIT.—In Bass strait the winds are similar to those which are met with along the whole of the south coast of Australia, except towards its eastern part, where they partake of the nature of those on the east coast, and the strongest gales blow frequently from between South and S.E., accompanied by thick weather and often by heavy rain. In Bass strait appearances favour the theory that the strongest winds come from the S.W., but it is not so. Northerly winds are common both in summer and winter, and preponderate over all others in frequency and force, more especially during the winter months; these winds being off the land are not so much felt or dreaded. In fine weather a light northerly wind is frequently found near the shore, though light southerly outside. Next in force come south-westerly and southerly winds. The north wind of the Victorian coast is generally a north-west wind in the vicinity of cape Howe. In January, February, and March easterly winds with fine weather seem to be not uncommon, but no dependence is to be placed on them at any other season. At the eastern side of the strait and of Tasmania, it is not unusual to meet a north-east wind, though it seldom blows strong.

As the western part of the Ninety mile beach is approached, easterly gales are not so generally felt; Wilson promontory appears to be the divisional line.

January and February are the best months for making a passage to the westward through Bass strait, although easterly winds blow on some rare occasions at other times; but these are mostly gales, and generally terminate in a breeze from the opposite quarter, having much the character of a rotatory gale. The gales that prevail in the strait begin at N.N.W., and gradually draw round by west to S.W., at which point they subside; if, however, the wind, before it has so much southing, shifts again to the northward of West, the gale will

continue ; it is seldom fine when the barometer is lower than 29·95, and bad weather is certain if it falls to 29·70.

Thick weather accompanying a breeze from the south-eastward, especially from May to September, is generally the precursor of a gale, and should be regarded accordingly.

WEST COAST OF TASMANIA.—The prevailing winds are from S.W., and bring much bad weather, especially in the months of June, July, and August. N.W. and westerly gales are frequent.

COAST OF NEW SOUTH WALES.—The prevailing winds between cape Howe and port Jackson are from the N.E. from October to April, and from the westward from May to September. There are occasional gales from S.W. as well as strong breezes from between North and E.N.E., bringing rain with thunder and lightning ; these, however, are usually of short duration. Very oppressive hot winds from N.W. sometimes blow fiercely from November to February, and are usually followed by a sudden shift from between S.E. and S.S.W., and against which vessels near the coast should be particularly guarded, as the first gust is generally very violent, and apt to occasion damage, unless due precautions have been taken. The effect of these sudden changes is so great, that the thermometer at port Jackson sometimes descends from 100° to 64° in less than half an hour.

Besides the sudden change from N.W. to the southward, a similar change from N.E. to South is very frequent from November to February, and generally happens after some days of north-east winds. These changes, as a rule, may be foreseen by clouds rising in the southward, with lightning ; sometimes, however, very little warning is given, as the shift of wind may happen with a cloudless sky ; they are the well known southerly bursters.

Southerly winds are more frequent from April to October than from October to April, yet they occasionally blow for three or four successive days in the latter period : the southerly wind usually draws off the land at night, from a S.W. or even a W.S.W. direction, especially from April to October, and with more westing in it the nearer the land.

From May to September, cold westerly winds are prevalent, and are generally accompanied with fine weather and a dry atmosphere ; gales from between N.E. and South, bring rain with them ;

indeed there is no settled weather during these months with any winds from the sea, and even with north-west and north winds, which are usually light, there is frequent rain.

Land and sea breezes are frequent from November to February; the north-east wind springs up from a calm early in the forenoon, and subsides at about midnight; a slight draught off the land being occasionally felt close inshore between these intervals.

A heavy dew in the night is an indication of a north-east or sea breeze the following day.

The north-east breeze sometimes blows a steady gale for three or four days, veering from North to N.E. in squalls. When likely to be of this duration, it sets in with thick, overcast weather, and increasing in strength, is accompanied with gloomy dense clouds and heavy rain, and an atmosphere so thick that during the squalls objects are not distinguishable at a distance of a quarter of a mile. These gales are locally known as Black north-easters, the barometer gives no indication of them, and is not affected during their continuance.

If at any time during the months of June, July, and August the weather is unsettled, with the wind unsteady and with gloomy weather and occasional rain, an easterly gale may be expected, which will last for two or three days, shifting from N.E. to E.S.E., accompanied with heavy leaden clouds and sheets of incessant blinding rain. The barometer is not in any way affected by the approach or continuance of these gales, and stands steady at 30·12 to 30·18.

A heavy sea rolls in on the coast, which is a dead lee shore, and there is little chance for small craft, caught close, being able to gain an offing. There is nothing, however, to prevent a well-appointed ship, having an offing, from holding it, by watching the shifts of wind, and keeping as long as prudent on the starboard tack, thus bringing the prevailing current setting to the southward under her lee.

The barometer.—If the weather be tolerably fine, and the mercury does not stand above 30 inches, there is no probability of danger; but when the mercury is much higher and begins to descend, with the weather becoming thick, a gale from S.E. to East is to be apprehended, and a proper offing should be immediately obtained.

With respect to the rise and fall of the barometer, it may be taken as a general rule upon this coast that a rise denotes either a fresher wind in the quarter where it then may be, or that it will veer more to seaward ; and a fall denotes less wind, or a breeze more off the land. Too much faith, however, should not be put in the barometer, unless the observer can combine local experience with the use of the instrument.

On this coast the barometer is at its greatest mean height in August and September with south-east and southerly winds, and at its lowest mean height in December, January, and February with north-west winds. It ranges between 30·92, and 29·26 inches. From April to October a marked fall in the barometer is certain to be followed by westerly winds and fine weather, whatever may be the quarter or the conditions under which the wind may be blowing when it commences to fall.

From October to April it may be similarly and as surely depended on as the forerunner of a north-west hot wind.

From November to February the barometer generally falls on the approach of a southerly gale whilst the north-east wind is blowing, but this fall must not be implicitly relied on, as southerly gales have occurred without its showing any perceptible change. After the strength of a south-west or southerly gale is over, the barometer rises to about 30 inches, when fine weather and a gradual change of wind to N.E. may be expected.

Fogs rarely occur, except in the summer months, and then seldom last longer than from day dawn to 10 a.m.

In the vicinity of port Jackson.—From the early part of October to April, in the vicinity of port Jackson tolerably regular land and sea breezes prevail, the former blowing from the north-east and the latter from the westward. The sea breeze generally begins at 10 a.m. and subsides after sunset ; the land breeze commences at about midnight and continues till 8 a.m. North and south winds and also the north-west hot winds occasionally interfere with the regularity of the land and sea breezes. The north-west hot winds after blowing for a period of from 12 to 72 hours, are usually succeeded by sudden violent gusts from S.S.E. to S.S.W., which generally settle into a gale from those quarters accompanied with rain. The greatest vigilance of the masters of vessels possessing

local experience is frequently insufficient to prepare for these gusts, owing to the suddenness with which they come ; mariners should be careful to be ready for the change during the time the hot wind is blowing ; the calm which sometimes intervenes is brief.

From May to September the wind prevails strong from the westward, between N.W. and S.W., with fine clear weather ; and occasional gales from the North and South, with rain.

The wind rarely blows on shore with sufficient violence to endanger the safety of a well-appointed vessel, but sometimes in September and October, gales set in from S.E. to East, accompanied with heavy rain and a high barometer ; they blow with great fury for from 24 to 48 hours and finish with a long slowly declining gale from South to S.W.

Barometer.—As a general rule the barometer stands low with westing in the wind, lowest with a north-west wind ; high with easting in the wind, and highest with south-east gales.

Fogs rarely occur except in the summer months and then seldom last longer than from dawn to 10 a.m. When the sea breeze blows it is accompanied with a thin haze, which envelopes the land and renders it indistinct ; this haze disperses with the land breeze.

Storm signals.—The existence of gales which are likely to endanger shipping is signalled at the principal telegraph stations on the coast of New South Wales, in the following manner,—

The signal staffs support two yards, which cross each other at right angles, and are placed in a North and South, and East and West direction. The yard arms denote their respective points of the compass ; midway between them the intermediate points, as, midway between North and East denotes N.E.

A violent squall is represented by a diamond shaped signal.

A heavy sea, by a drum shaped signal.

A gale, with clear weather, by a diamond shaped signal over a drum.

A gale, with thick weather and rain, by a drum over a diamond shaped signal.

The direction from which the gale is blowing is indicated by the yard arm between which and the mast-head the signal is suspended.

The place where the squall or gale is blowing is shown by the numerical flag at the mast-head. *See* page 840.

Gales that are general over a large portion of the coast are indicated by the shaped signals, without flags.

At some places in South Australia (which are indicated in this book), the storm signal is a blue swallow-tailed flag with or without a red ball on top.

CURRENTS.

The Indian ocean, like the Atlantic and Pacific oceans, has its equatorial, counter, and variable currents, besides those near the land. Of these, the Agulhas current off the south-east coast of Africa, flows south-westward towards the Agulhas bank; and in about lat. 37° S., long. 22° E., it divides into two branches, one turning north-west to the cape of Good Hope, and the other is deflected and turned to the eastward.

The easterly drift current, which is mostly found between the parallels of 37° and 40° or 42° S., is a continuation of that from the Atlantic ocean, combined with the returning branch of the Agulhas current, already mentioned. This current runs to the eastward, and sets East and E.N.E; the rate is variable, depending upon the winds; in the meridian of cape Agulhas its mean velocity is about 30 miles a day, and it crosses from Africa to Australia at a mean rate of 12 to 20 miles a day.

Off cape Leeuwin the easterly drift current divides, a large portion of it flows along the south coast of Australia and the other portion turns to the north and north-west along the west coast.

South coast of Australia.—Near cape Leeuwin, and off the south coast of Australia, the current at all times of the year appears to be principally influenced by the prevailing winds, some vessels having experienced constant northerly and north-easterly currents, running from one to $1\frac{1}{2}$ knots, while others have been set to the eastward, and but little to the northward, as they approached the south-west coast of Australia.

From cape Leeuwin to the archipelago of the Recherche the current usually sets eastward, in a parallel direction with the coast, being strongest between D'Entrecasteaux point and King George sound, where its rate is sometimes $1\frac{1}{2}$ knots. From the archipelago, round the Australian bight, to cape Northumberland, it has less strength than further to the southward; as Bass strait

is approached it is experienced running eastward and south-eastward at the rate of one to $2\frac{1}{2}$ knots. When coming from the eastward, the easterly current is not felt till on the meridian of cape Howe, where it is experienced running at the rate of one knot to the eastward, and it disperses in the waters of the Pacific.

From November to April the easterly current abates in strength, and after a fresh easterly wind it not unfrequently changes its direction to the north-westward.

In the offing between cape Leeuwin and cape Otway the currents appear to be mainly influenced by the prevailing winds, which are strong westerly during nine months of the year. Except during easterly winds (which prevail from January to the beginning of April), at the western entrance of Bass strait a current sets to the south-east at rates of from a half to $2\frac{1}{2}$ knots an hour according to the strength, direction and duration of the winds.

Near the land with easterly winds a current has been found setting to the westward, but this current is probably confined to the vicinity of the coast.

Vessels making the land about cape Otway during the continuance of strong westerly winds should be prepared for a southerly set.

With southerly or westerly winds a current setting on to the land at a rate of a knot an hour is sometimes experienced between capes Willoughby and Otway.

From cape Northumberland to the western entrance of Bass strait, in October, November, and December, when south-westerly breezes prevail, a current may be expected to run to the eastward. In January, February, and March a westerly current may be expected; but as these currents appear to depend on the winds, they cannot with certainty be allowed for. They are stronger as the coast is approached, and strongest off the various headlands, such as capes Bridgewater and Nelson, Moonlight head, and more particularly cape Wickham.

The current off cape Wickham loses in strength as the distance from the land is increased, and is scarcely felt at a distance of 6 miles. Upon the west coast of King island a current often sets to the north-west. South-westward of King island the currents or tidal streams are irregular; they are known at times to be very strong.

Sealers reported that in the strait between King island and Tasmania a current sets eastward during easterly winds.

North and west coast of Tasmania.—Near the coast, between Circular head and cape Portland, there is almost a constant current running to the eastward during the greater part of the year.

The current generally sets to the northward along the west coast of Tasmania, particularly during the prevalence of south-west and southerly winds.

Coast of New South Wales.—The current almost constantly sets to the southward along this coast, in a broad serpentine belt, extending 20 to 60 miles from the land, at a rate varying from half a knot to 3 knots, the greatest strength being at about the 100 fathom line, near which it has been observed running at a rate of about 5 knots an hour. To the eastward of this south-going belt the currents seem to be variable; and close to the land, especially in the bights, there is commonly an eddy, setting to the northward, from a quarter of a knot to one knot. Along the southern part of this coast the current runs strongest; and towards cape Howe it takes a variable direction between South and N.E. at a rate of one to $1\frac{1}{4}$ knots an hour.

Vessels bound northward avoid the current by keeping inshore, about 2 miles off the land, though the wind may be puffy.

UNIFORM SYSTEM OF BUOYAGE.—**South Australia.**—The uniform system of buoyage adopted in British waters will be introduced into South Australian ports as opportunity offers.

This system is :—

1. The mariner when approaching the coast must determine his position on the chart and must note the direction of the main stream of flood tide.

2. The term Starboard Hand shall denote that side which would be on the right hand of the mariner either going with the main stream of flood or entering a harbour, river, or estuary from seaward; the term Port Hand shall denote the left hand of the mariner under the same circumstances.

3. Buoys showing the pointed top of a cone above water shall be called Conical, and shall always be Starboard Hand buoys as above defined.

4. Buoys showing a flat top above water shall be called Can, and shall always be Port Hand buoys as above defined.

5. Buoys showing a domed top above water shall be called Spherical, and shall mark the ends of Middle grounds.

6. Buoys having a tall central structure on a broad base shall be called Pillar buoys, and like other special buoys, such as Bell buoys, Gas buoys, Automatic Sounding buoys, &c., shall be placed to mark special positions, either on the coast or in the approaches to harbours, &c.

7. Buoys showing only a mast above water shall be called Spar buoys.

8. Starboard Hand buoys shall be painted in one colour only.

9. Port Hand buoys shall be painted of another characteristic colour, either single or parti-colour.

10. Spherical buoys at the ends of Middle grounds shall always be distinguished by horizontal stripes of white colour.

11. Surmounting beacons, such as Staff and Globe, &c. shall always be painted of one dark colour.

12. Staff and Globe shall only be used on Starboard Hand buoys; Staff and Cage on Port Hand; Diamonds at the outer ends of middle grounds; and Triangles at the inner ends.

13. Buoys on the same side of a channel, estuary, or tide way, may be distinguished from each other by names, numbers, or letters, and where necessary by a staff surmounted with the appropriate beacon.

14. Buoys intended for moorings, &c. may be of shape or colour according to the discretion of the Authority within whose jurisdiction they are laid, but for marking Submarine Telegraph cables the colour shall be green, with the word "Telegraph" painted thereon in white letters.

Buoyming and Marking of Wrecks.—15. Wreck buoys in the open sea or in the approaches to a harbour or estuary, shall be coloured green, with the word "Wreck" painted in white letters on them.

16. When possible, a buoy shall be laid near to the side of the wreck next to mid-channel.

17. When a wreck-marking vessel is used it shall, if possible, have its topsides coloured green, with the word "Wreck" in white letters thereon, and shall exhibit,

By day: Three balls on a yard 20 feet above the sea, two placed vertically at one end and one at the other, the single ball being on the side nearest to the wreck.

By night : Three white fixed lights similarly arranged, but not the ordinary riding light.

18. In narrow waters or in rivers, harbours, &c., under the jurisdiction of Local Authorities, the same rules may be adopted, or at discretion, varied as follows :—

When a wreck-marking vessel is used she shall carry a cross-yard on a mast with two balls by day placed horizontally not less than 6 nor more than 12 feet apart and two lights by night similarly placed. When a barge or open boat only is used, a flag or ball may be shown in the daytime.

19. The position in which the marking vessel is placed with reference to the wreck shall be at the discretion of the Local Authority having jurisdiction.

Victoria.—The same system is introduced into the ports of the colony of Victoria, with the following exceptions :—

Conical buoys shall be painted red.

Can buoys shall be painted black.

Gas buoys shall be painted red or black to correspond with the side of the channel on which they may be moored.

The buoyage of Sorrento and Cole's channel, port Phillip, also of Western port, port Albert, and Corner inlet has not been altered to this system in shape, but all Starboard Hand buoys and beacons are painted red and all Port Hand buoys and beacons are painted black.

New South Wales.—In New South Wales, an uniform system of buoyage is maintained in all the ports of the colony, and is as follows :—

When entering the port, red buoys must be left on the starboard hand, and black buoys on the port hand.

PILOT SIGNALS.—Vessels steering for port Phillip are bound to show the usual signal for a pilot, when 12 miles off the entrance. At night the pilot signal is a blue light every fifteen minutes, or a white light flashed or shown at frequent intervals for about a minute at a time. Vessels exempt from pilotage must have a large white flag flying at the main mast head until past Swan point.

For the ports of New South Wales, the day signal for a pilot is the pilot Jack at the fore ; and the night signal, burning a blue light or a white light shown at frequent intervals. Vessels exempt from pilotage fly at the main, the numerical flags of the port Jackson code, denoting the place from which she last sailed.

Standard time systems.—In Western Australia the mean time of the meridian of 120° or 8 hours East of Greenwich has been adopted as a standard; in South Australia that of the meridian of 135° or 9 hours East; in Queensland, New South Wales, Victoria and Tasmania, that of the meridian of 150° or 10 hours East.

PASSAGES.

CAPE OF GOOD HOPE TO AUSTRALIA.

Full powered steam vessels.—The route recommended is as follows:—from the cape of Good Hope stand to the southward across the Agulhas current, and thence to the eastward on about the parallel of 40° S.; proceed by great circle when in about long. 90° E. if bound for Swan river, in about long. 95° E. for King George sound, and to Port Adelaide as directed at page 36.*

To Melbourne, or through Bass strait, proceed as directed at pages 37 to 40. *See* caution and icebergs at page 31.

Auxiliary steam vessels.—Ships with auxiliary steam power, from October to April, when south-easterly winds prevail, make southing, and keep on the port tack even if not making better than S.W. till the westerly winds are reached. From May to September, when westerly winds prevail, follow the directions for full powered steamers.

The longitude is then run down on or about the parallel of 39° to 40° S., where the winds generally blow from some western point, and seldom with more strength than will admit of carrying sail. In a higher latitude the weather is frequently more boisterous and stormy; sudden changes of wind with squally wet weather are almost constantly to be expected, especially in the winter season. By sighting St. Paul or Amsterdam island, the errors of the chronometers can be obtained, before approaching Australia; in clear weather they may be seen from a distance of 60 miles. To Swan

See charts, No. 2,483, Atlantic and Indian oceans, scale $d = 0.2$ inch; No. 748a, Indian ocean, southern portion, scale $d = 0.5$ inch; No. 1,077, the World showing tracks followed by full powered steam vessels; and No. 1,078, showing tracks followed by vessels with sail and auxiliary steam power; No. 1,241, Ice chart of the southern hemisphere; and Wind and Current charts.

* The Shaw, Savill, and Albion Company's steamers from the cape of Good Hope cross long. 40° E. in lat. 44° S., 60° E. in $45^{\circ} 25' S.$, 80° E. in $45^{\circ} 55' S.$, 100° E. in 47° S., and 120° E. in $46^{\circ} 20' S.$, and thence proceed south of Tasmania, to Hobart.

river proceed direct from lat. 39° S., long. 100° E.; to King George sound proceed direct when in long. 105° E., and to Bass strait or port Phillip, as directed at pages 37-39.

Sailing vessels.—Sailing vessels proceed as directed for auxiliary steam vessels. If from the Atlantic, not touching at the cape of Good Hope, enter the Indian ocean in about 39° to 40° S.

Great circle and composite tracks.—**Caution.**—The routes recommended above are not the shortest in point of distance. The distance, from the Atlantic or cape of Good Hope to Australian ports, is diminished as higher parallels of latitude are adopted until the great circle is reached. Thus, for example, the distance from the cape of Good Hope to Melbourne, by the great circle, which reaches the latitude of $58^{\circ} 19'$ S., is 5,592 miles; by composite tracks, with the maximum latitude 50° S., it is 5,666 miles; with the maximum latitude 45° S., it is 5,790 miles; with the maximum latitude 40° S., it is 5,988 miles, and by Mercator's track it is 6,156 miles. So the advantage of the composite track with the maximum latitude of 50° S. over that with a maximum latitude of 40° S. is a distance of 322 miles. But the disadvantages attending the selection of any route in high latitudes should be clearly understood by the seaman, especially for passenger ships proceeding at a high speed, or small, ill found or deeply laden vessels. The steadiness and comparatively moderate strength of the winds, with the smoother seas and more genial climate, north of 40° S., compensate by comfort and security for the time presumed to be saved by taking a shorter route, with tempestuous gales, sudden violent and fitful shifts of wind, accompanied by hail or snow and the terrific and irregular seas, which have been so often encountered in the higher latitudes; moreover the islands in the higher latitudes are so frequently shrouded in fog that often the first sign of their vicinity is the surf beating against them.

Icebergs.—Independently of the severity of the climate occasionally experienced in high latitudes, there exists the lurking danger of disrupted masses of ice and icebergs of large dimensions. The absence or approximate positions of these dangers cannot be depended on for any season of the year; they are, however, rarely encountered north of lat. 40° S. Nevertheless there are instances of icebergs being seen off the Cape; and north of lat. 40° S. as far as long. 60° E., and it is therefore desirable to keep a good look out for them.

Between 40° and 45° S. they have been occasionally met with to as far as 65° E., on the 45th parallel to 135° E., and on the 50th parallel to 140° E.

In July 1895, 13 icebergs were passed by the steamship *Tainui*, between lat. 44½° S., long. 44° E., and lat. 45½° S., long. 67° E.; and in the same month the steamship *Port Chalmers* collided with an iceberg in lat. 44° 55' S., long. 52° 23' E.

ADEN TO AUSTRALIA.

Full powered steamers from Aden to the southern ports of Australia make a direct course towards cape Leeuwin at all seasons, passing between Sokotra and ras Asir, except in the height of the south-west monsoon, when it is desirable to pass north of Sokotra; the Chagos archipelago may be passed on either side. If bound to Tasmania or New Zealand follow the great circle route from ras Asir to the south ends of these islands. See page 65.

To the north coast of Australia from ras Asir proceed through the One-and-a-half degree channel, and thence southward of Java through the Arafura sea.

As, however, few vessels carry sufficient coal to proceed from Aden to Australia direct, it is customary to call at Colombo.

Auxiliary steam vessels.—During the south-west monsoon (April to September), when westerly winds prevail in the gulf of Aden, pass north of Sokotra and through the One and a half degree channel and to the eastward till in long. 80° E., then steer to pick up the south-east trade in about lat. 5° S., long. 85° to 90° E., and run through this into the westerly winds, then keep to the south-eastward, and when in lat. 38° to 40° S., proceed as recommended from the cape of Good Hope to Australia.

During the north-east monsoon (October to March), work, or steam, along the Arabian coast until able to weather ras Asir, and thence stand to the south-eastward across the equator into the north-west monsoon. Run to the eastward with the north-west monsoon until in about long. 90° E., when stand to the southward into and through the south-east trade, and when in the westerly winds proceed as above directed.

To Sydney or the eastern ports, keep in the north-west monsoon, pass through Torres strait and proceed to the southward by the Inner route.*

Sailing vessels.—The track to be followed is similar to that for auxiliary steam vessels, except that, in the north-west monsoon, to Sydney or the eastern ports it is preferable to go by the Outer route.*

AUSTRALIA TO ADEN.

Full-powered steam routes.—From the south and south-east coasts, direct round cape Leeuwin, thence, during the south-west monsoon, pass south-westward of the Chagos group, cross the equator in about long. 58° E. and steer direct for ras Hafun. Great care is required in making ras Hafun in this monsoon. During the north-east monsoon pass north-eastward of the Chagos group and thence direct for ras Hafun.

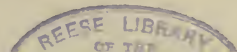
From the north coast of Australia; during the south-west monsoon, pass northward of the Chagos group, and thence keep to the southward of lat. 4° S. till in about long. 60° E., when proceed direct for ras Hafun. During the north-east monsoon, or from October to April, cross the equator in about long. 87° E., and thence proceed through the Eight degree channel and northward of Sokotra.

Sailing and auxiliary steam routes.—From the south-east coast of Australia. Between December and April; proceed direct round cape Leeuwin into the south-east trade, and run to the north-west to cross lat. 10° S. in about long. 80° E., then stand to the northward through the north-west monsoon into the north-east monsoon. Proceed through the Eight degree channel and direct, northward of Sokotra, into the gulf of Aden. Towards the end of the north-east monsoon, about the middle of March, pass south of Sokotra, as light south-westerly and westerly breezes may then be expected near this island.

From April to December, proceed by the Inner or Outer route (auxiliary steam vessels always by the Inner) to Torres strait, through the Arafura sea and across the Indian ocean, passing south-

See charts, No. 1,077, No. 1,078 and Winl and Current charts.

* The route along the east coast of Australia, within the Great Barrier reefs, is called the Inner route; the route eastward of the Great Barrier reefs, through the Coral sea, and entering or leaving Torres strait by one of the openings north of cape Melville is called the Outer route. *See page 45 and Australia Directory, Vol. II.*



ward of the Chagos group, north-eastward of the Seychelles islands crossing the equator in about long. 53° E., and thence steering direct for ras Hafun. From ras Asir keep along the African coast as far as Burnt island, whence stand across to Aden.

From the north coast of Australia, during the north-west monsoon, keep along the coast until able to fetch into the south-east trade, whence proceed, as above directed, as from the south-east coast between December and April.

COLOMBO TO AUSTRALIA.

Full powered steam vessels.—To the south and south-east coasts; direct round cape Leeuwin. *See* page 65. To the north coast; as direct as possible passing southward of Java.

Auxiliary steam vessels.—During the south-west monsoon (April to September) steer to pick up the south-east trade in lat. 5° S., long. 90° E. During the north-east monsoon steer to pick up the trade in lat. 10° S., long. 90° E.

Pass through the trade with the ship close hauled on the port tack, and on losing the trade steer to the south and south-eastward to lat. 39° S., then proceed as directed from the cape of Good Hope to Australia.

To Sydney in the north-east monsoon proceed northward of Australia through Torres strait and southward by the Inner route.

Sailing vessels.—The same track should be followed by sailing as auxiliary steam vessels, except that, from Torres strait, it might be found advisable to take the Outer route.

AUSTRALIA TO COLOMBO.

Full powered steam vessels.—The reverse course from Colombo to Australia.

Sailing and auxiliary steam routes.—There are two routes—the northern and the southern—from port Phillip and the south-east coast of Australia.

The northern route, which is taken from April to October, when the south-east monsoon joins the south-east trade of the Pacific to

the south-east trade of the Indian ocean, is by the Inner or Outer route to Torres strait (auxiliary steamers always taking the Inner), and through the Arafura sea, keeping in the south-east trade until in the meridian of Colombo, then making a direct course.

The southern route is taken from December to April, when easterly winds are prevalent on the south coast of Australia. From Sydney proceed to cape Leeuwin as directed at pages 42 to 44. When round cape Leeuwin stand to the north-west into the south-east trade and thence as in the northern route, remembering that this is the cyclone season in the South Indian ocean.

AUSTRALIA TO SINGAPORE.

Full-powered steam vessels make a direct course along the south coast of Australia and from a position off cape Leeuwin steer for Java head, passing through the Sunda and Banka straits and thence to Singapore.

Auxiliary steam vessels.—In the north-east monsoon (October to March) steer from off cape Leeuwin to lat. 7° S., long. 102° E., thence proceed through the Sunda and Banka straits to Singapore.

In the south-west monsoon (April to September), from port Phillip, Sydney, or any of the eastern ports, proceed by the Inner route, through Torres strait, north of Timor, Flores and Java, and through the Carimata strait to Singapore. From ports in Western Australia proceed through Sunda and Banka straits.

Sailing vessels.—In the south-west monsoon, from the ports of Western Australia, make a direct course for Sunda strait and thence through Banka or Gaspar straits to Singapore; from port Phillip, or any of the eastern ports, proceed as recommended for auxiliary steam vessels in this monsoon. In the north-east monsoon the passage to Singapore south of Australia is not recommended for sailing vessels, for from November to March northerly winds and southerly currents prevail in Sunda, Banka, Gaspar, and Carimata straits, and it is a tedious process endeavouring to get to the northward under such adverse circumstances. A vessel has been known to take 30 days from Sunda strait to Singapore, a distance of 500 miles. It is therefore advisable at this season to take one of the routes passing eastward of New Guinea, as if bound to Hong Kong and run down the China sea to Singapore.

See charts, No. 1,077, No. 1,078 and Wind and Current charts.

SINGAPORE TO AUSTRALIA.

Full-powered steam vessels.—Pass through Banka and Sunda straits, thence make a direct course to any of the western ports or to port Phillip; but to Sydney or the eastern ports proceed *viâ* Torres strait.

Auxiliary steam vessels.—In the south-west monsoon (April to September) pass through Banka and Sunda straits into the south-east trade.

In the north-east monsoon (October to March), to any of the western or southern ports proceed through Banka strait, north of Java, and through Bali or Lombok strait, thence steer to the southward into the south-east trade. Keep the ship close hauled on the port tack in the trade wind and on losing the trade steer to the south and south-east into the westerly winds, whence proceed as directed for cape of Good Hope to Australia.

To Sydney or any of the eastern ports, proceed north of Java, Flores and Timor, through Torres strait, and to the southward by the Inner route.

Sailing vessels.—Follow the directions for auxiliary steam vessels.

EASTWARD : SOUTH OF AUSTRALIA.

South of cape Leeuwin to Port Adelaide.*—Full-powered steamers.—Having proceeded eastward on about the parallel of 40° S. until on the meridian of 100° E., bound for Spencer gulf or Port Adelaide, steer for cape Borda, the north-west point of Kangaroo island, the light on which may, in clear weather, be seen from the distance of 30 miles.

Having sighted cape Borda or the Neptune isles, enter Spencer gulf as directed at page 256; or proceed through Investigator strait for Port Adelaide as directed at pages 293 and 316.

Auxiliary steam and sailing vessels.—Follow the same route.

¹See charts, No. 1,077, No. 1,078, No. 2,759b and Wind and Current charts.

* Masters of inward bound ships carrying passengers should signal, when practicable, on passing the telegraph station at cape Borda, or at cape Willoughby, as to any and what kind of sickness has occurred during the voyage; by so doing possible delay and inconvenience may be avoided.

Port Adelaide by Backstairs passage.—In entering the gulf of St. Vincent by Backstairs passage, the Young rocks, lying S.E. by E. $\frac{3}{4}$ E. (S. 65° E.), 32 miles from the same cape, must be given a wide berth at night, but they are not very dangerous by day, as one of them is 30 feet high, although the S.W. rock is only 5 feet above water. At 10 or 12 miles to the southward of cape Willoughby, after south-west gales, there is a tide race with heavy breaking seas, dangerous for deeply laden vessels or small craft. This race is cleared to the eastward by keeping cape Willoughby light west of N.N.W. (N. 22° W.). Proceed to Port Adelaide as directed at page 308.

Backstairs passage to cape Otway.—Full-powered steam vessels.—From 3 miles East of cape Willoughby lighthouse to $5\frac{1}{2}$ miles S.W. of cape Banks, the course is S.E. (S. 45° E.) 163 miles. This course passes 15 miles West of the Margaret Brock reef and in sight of the light on it, 10 miles S.W. of cape Dombey in 26 fathoms, 8 miles S.W. of cape Buffon in 35 fathoms, and is nearest to the coast when the Carpenter rocks bear N.E. $5\frac{1}{2}$ miles distant, the depth then being 35 fathoms. Thence to 6 miles South of cape Northumberland the course is S.E. by E. $\frac{1}{2}$ E. (S. 62° E.) 20 miles. From 6 miles off cape Northumberland steer to pass about 5 miles to the southward of capes Bridgewater, Nelson, and Otway. With southerly or westerly winds a current setting on to the land at a rate of a knot an hour is sometimes experienced from cape Willoughby to cape Otway.

To the southward of cape Jaffa a current sets to the eastward about one knot an hour during westerly gales, at the same time near cape Jaffa the current runs to the northward.

Between Rivoli bay and cape Northumberland do not shoal the water to less than 25 fathoms at night; this depth is on the average rather more than 5 miles off shore.

Auxiliary steam and sailing vessels.—Follow the same track, but in south and westerly winds keep further off the land.

Approaching Bass strait.—Full-powered steam vessels approaching Bass strait from the westward make the land at Moonlight head or the light at cape Otway. The high bold

*See charts, No. 2,759*b* and No. 1,063, Western approach to Bass strait, scale $m = 0.19$ inch.*

promontory of cape Otway is easily distinguished by the white lighthouse on it, and the signal station to which all passing vessels are recommended to show their numbers and communicate what public intelligence they may have. *See* caution below.

It is desirable to round cape Otway at a distance of not less than 3 miles.

In approaching Bass strait the winds and currents must be carefully attended to, particularly during the prevalence of south-west or southerly gales. The 100 fathoms line of soundings is 35 miles to the south-westward of Moonlight head, and the depth of 40 fathoms at 10 miles from that headland. When approaching Bass strait in thick weather, or when uncertain of the vessel's position, do not reduce the soundings to less than 40 fathoms. Soundings of 60 or 70 fathoms will be found at 25 or 30 miles westward of King island. Outside this limit the soundings deepen rapidly to over 100 fathoms. Inshore of 60 fathoms the depths are irregular, but there are 30 fathoms at a distance of 4 miles to the north-west of cape Wickham.

Auxiliary steam and sailing vessels.—Follow the same directions.

Caution.—In approaching King island from the westward, especially during thick or hazy weather, caution is required on account of the variable strength of the current, and the use of the lead is enjoined. Many vessels have been wrecked on this island in consequence of not making the land near cape Otway. *See* page 413.

Commanders of iron ships, especially of those newly built, are cautioned as to the necessity of ascertaining the deviation of their compasses on approaching the Australian coast.

To port Phillip.—**Full-powered steam vessels.**—When cape Otway lighthouse bears W. by N. $\frac{1}{2}$ N. (N. 73° W.), distant 6 miles, the course and distance to port Phillip heads is N.E. (N. 45° E.) 56 miles, passing $3\frac{1}{2}$ miles outside Henty reef. *See* page 425.

All other dangers are cleared by giving the coast a berth of not less than 2 miles.

Should the cape be rounded early in the evening, with a fresh southerly wind, beware of overrunning the distance, as a strong

current after a prevalence of southerly gales, often sets along the land to the north-east. Bearings of Eagle Nest light give a good position. The white lights of Eagle Nest point lighthouse are to warn mariners of *too close* approach to the land. See pages 427, 477.

Auxiliary steam and sailing vessels.—Follow the directions for full-powered steamers. When abreast of Eagle Nest point lighthouse, if there is not sufficient daylight to get into pilot waters, a sailing vessel should stand off and on shore till daylight, not shoaling the water to less than 20 fathoms.

Bass strait to Sydney.—Full-powered steam vessels.—From a position off cape Otway steer to pass about 2 miles south of the Anser islands, 3 miles north of Rodondo, and 2 miles south of South-east point, Wilson promontory. Then steer to pass about 5 miles south-eastward of Rame head and Gabo island. Occasionally and especially during and after easterly gales the current sets strongly towards the land; in thick weather the lead must not be neglected. From a position east of cape Howe steer to the northward along the land to port Jackson, in fine weather at a distance of about 2 miles, passing inside Montagu island, to avoid the southerly current.

Auxiliary steam vessels.—Follow the same track as full-powered steamers.

Sailing vessels.—When the position off cape Otway is ascertained, shape an easterly course as desired or for Rodondo island, which is visible in clear weather from a distance of 30 miles. Having passed Rodondo island or the Kent group, steer for a position about 20 miles to the south-east of Rame head and make Gabo island light or the land in the vicinity of cape Howe; but should it blow hard from the southward, a more easterly course should be steered, to avoid Ninety-mile beach, extending from Corner inlet for 150 miles, or nearly to cape Howe, which would then be a dangerous lee shore. From a position east of cape Howe, steer to the northward along the east coast for port Jackson, at such distance from the land as the wind and weather would suggest, bearing in mind that the current generally sets to the southward at a distance of 20 to 60 miles from the land. Having made the Outer South Head light enter the port as directed on pages 832-6.

See charts, No. 1,695*a* and *b*, Bass strait, scale $m=0.2$ inch; No. 1,016, Corner inlet to Gabo island, scale $m=0.2$ inch; No. 1,211, Rame head to port Jackson, scale $m=0.14$ inch.

The soundings off this coast to the 100 fathoms line have been carefully obtained ; and being accompanied with the nature of the ground at various depths, a mariner making the coast in thick weather, and uncertain of his position, can by sounding estimate the distance from the land.

South-western entrance of Bass strait.—The entrance to Bass strait between King island and the Hunter group is not recommended, on account of Bell reef and Reid rocks which lie in it. If from necessity or choice entering Bass strait by this passage, keep to the southward of Reid rocks and Bell reef, the latter being cleared at the distance of $2\frac{1}{2}$ miles to the southward of it, by steering for Black Pyramid on an East bearing. With steam or a commanding breeze, the passage between King island and Reid rocks may be taken without danger, by paying attention to the tidal stream, which sets across the channel.

From Black Pyramid pass about one mile north of Albatross islet, whence to port Dalrymple, round the sunken dangers, Mermaid rock, and the reported Taniwha rock, off Three Hummock island, and then make a direct course.

To the north-eastward through Bass strait from Albatross islet continue about N.E. by E. (N. 56° E.) for the Kent group.

South of cape Leeuwin to the south of Tasmania.—Full-powered steam vessels having arrived in lat. 40° S., long. 115° E., steer for about 10 miles south of the South-west cape of Tasmania and make Maatsuyker islets or the light, thence proceeding north of the Mewstone to about 3 miles southward of South cape.

Auxiliary steam vessels.—Follow the same track.

Sailing vessels.—Having run through the Indian ocean on or about the parallel of 40° S. to the meridian of 115° E., by the time the meridian of 145° E. is reached, be far enough south to round Tasmania before making the land, in order to avoid falling in with its rocky western coast in the night from any error in the reckoning, or from being caught on a lee shore by a south-west gale. From about 10 miles southward of the South-west cape of Tasmania, proceed E. by N. (N. 79° E.) between Maatsuyker islets and the Mewstone, a clear channel 5 miles wide ; and thence 25 miles on the

same course to about 3 miles southward of South cape. When blowing heavily from the S.W. or southward, especially if unable to obtain observations before making the land, it is desirable to keep more to the southward, passing south of the Mewstone, and on either side of Piedra Blanca and the Eddystone, taking care to avoid Sidmouth rock.

For Hobart.—All ships from off South cape may proceed through D'Entrecasteaux channel to Hobart, or take the (for sailing ships far better) route through Storm bay, giving a good berth to the Friar rocks, off Tasman head, and follow the directions given on pages 695 and 706.

From south of Tasmania to Sydney.—**Full-powered steam vessels.**—From off South cape steer to pass about 5 miles off the Friar rocks and one mile off Tasman island, then make a direct course to cape Howe, but not closing the coast of Tasmania within 5 miles. From cape Howe proceed to the northward as directed at page 39.

Auxiliary steam vessels.—Follow the same route.

Sailing vessels.—After rounding South cape, give a berth of 20 or 30 miles to cape Pillar and the east coast of Tasmania, to escape the baffling winds and calms which frequently perplex vessels in-shore, while a steady breeze is blowing in the offing. This is more desirable from December to March, when easterly winds prevail, and a current is said to be experienced on the south-east coast at 20 to 60 miles off shore, running N. by E. at the rate of three-quarters of a knot, while in-shore it is running in the opposite direction, with nearly double that rate. From a position about 30 miles eastward of cape Pillar, 350 miles on a North course will take a vessel to 15 miles eastward of cape Howe, whence proceed as directed at page 39.

ALONG THE SOUTH COAST OF AUSTRALIA.

Full-powered steam vessels.—Direct. Distances:—Melbourne to Port Adelaide, 510 miles; Melbourne to King George sound, 1,350 miles; Port Adelaide to King George sound, 1,040 miles; King George sound to Fremantle, 330 miles; and Hobart to King George sound, 1,500 miles.

WESTWARD : SOUTH OF AUSTRALIA.

Sydney through Bass strait to cape Otway.—Full-powered steam vessels.—It is usual to keep about 15 miles off the east coast of Australia, along the 100-fathoms line of soundings, in order to take advantage of the southerly current, closing the land in the vicinity of cape Howe or Gabo island. From off Gabo island steer for South-east point lighthouse, Wilson promontory; pass about 2 miles southward of the lighthouse and the Anser islands, thence shape a course for cape Otway, which should not be approached to less than 3 miles.

Auxiliary steam vessels.—Follow the same route.

Sailing vessels.—Proceeding from Sydney to Bass strait, in order to take advantage of the current as far as cape Howe, which appears to run strongest from November to March, keep along the outer edge of the 100-fathoms line of soundings, or a distance of 15 to 18 miles from the coast, where the current runs stronger and with more regularity than elsewhere.

From about 15 miles eastward of cape Howe, if the wind is southerly, do not steer a more westerly course than S.S.W. (S. 22° W.) until in lat. 39° 30' S., on account of the danger to be apprehended from south-easterly or southerly gales upon the Ninety mile beach between cape Howe and Corner inlet. On reaching the parallel of 39° 30' S., steer to pass about 3 miles northward of Wright rock, and the same distance southward of the south point of Deal island, the south-easternmost of the Kent group. Having passed the Kent group, steer to pass 2 or 3 miles south of the Sugarloaf rock, leaving the Judgment rocks on the starboard hand.

Local experience has shown that with westerly and south-westerly winds smoother water is found near the coast between Shallow inlet and Conran point, known as the Ninety mile beach; and as south-westerly winds are the prevailing ones, mariners bound westward may often take advantage of the smoother water and an absence of danger to approach the beach, instead of avoiding it.

A vessel in-shore when an easterly gale threatened should at once get an offing; these gales give signs of warning.

As westerly gales veer to the southward from December to March,

it is advisable to stand towards the Tasmanian coast, and so be ready to take advantage of the shift of wind.

In the other months, and more particularly in September, October and November, the same course cannot be recommended; then the wind does not shift for a continuance, but is constantly backing to the west-north-westward.

From the Sugarloaf steer 15 or 20 miles to the northward of King island, if the winds permit; but should the wind hang to the westward of North, a course may be safely directed for the north extreme of Three Hummock island, taking care to avoid the Mermaid and the reported Taniwba rocks, passing afterwards north or south of King island, as may be most favourable.

Bass strait to St. Vincent or Spencer gulfs.—Full-powered steam vessels.—In fine weather from off cape Otway steer to pass about 5 miles southward of cape Nelson, 10 miles south-westward of capes Northumberland and Banks, thence make a direct course to cape Willoughby. Care must at all times be taken to guard against a set towards the land, but with southerly and westerly winds the coast should be given a much greater berth, as a current of a knot an hour sometimes sets towards it between cape Otway and cape Willoughby. From cape Northumberland to Spencer gulf; give a good berth to the S.W. Young rock, which is only 5 feet high; and, except with strong south-easterly winds, make allowance for the easterly set which usually prevails. From December to March, with south-easterly winds, a current runs about one knot an hour to the north-west. For Backstairs passage, *see* page 37.

Enter Spencer gulf or Investigator strait as directed at pages 256, 293, 316.

Auxiliary steam vessels.—Follow the same track as full-powered vessels, but in the event of threatening weather from the south and westward, care must be taken to secure a good offing.

Sailing vessels.—Follow as nearly as possible the same track, giving the coast a wider berth with westerly winds.

To the westward south of Australia.—Full-powered steam vessels make a direct course from cape Otway or Investigator

See charts, No. 2,759*b*; No. 1,063; No. 1,062, Glenelg river to cape Otway, scale $m = 0.25$ inch; No. 1,015, Guichen bay to Glenelg river, scale $m = 0.25$ inch; No. 1,014, C. Jervis to Guichen bay, scale $m = 0.25$ inch; and Nos. 2,389*a* and *b*, St. Vincent and Spencer gulfs, scale $m = 0.24$ inch.

strait to the westward at all seasons, and keep at a distance of about 10 miles off the land from King George sound to cape Leeuwin, giving a sufficient berth to the White topped rocks.

Auxiliary steam vessels.—Follow the directions for sailing vessels, using steam when favourable opportunities offer to get to the westward.

Sailing vessels bound westward from Sydney may, from December to March, proceed through Bass strait, or round Tasmania, easterly winds prevailing in the strait and along the south coast of Australia at that season, when ships have made good passages, by keeping to the northward of lat. 40° S., and have passed round cape Leeuwin into the south-east trade wind, which then extends well to the southward. A vessel from Bass strait bound round cape Leeuwin is recommended, with a favourable wind, to shape a course which will lead about 150 miles south of that cape. In adopting this route advantage must be taken of every favourable change of wind, in order to make westing; and it is advisable not to approach too near the land, as it would become with south-west gales, which are often experienced, even from December to March, a most dangerous lee shore, and the contrary currents run strongest near the land. The prevalence of strong westerly gales renders the southern route very difficult, indeed, generally impracticable, for sailing vessels, from April to November. The northern route, through Torres strait, is then preferred, directions for which are given in Vol. II. of this work. *See* page 45.

The worst months for making a passage to the westward are September, October, and November, for westerly gales are then of frequent occurrence, the wind sometimes being from W.S.W. to W.N.W. for more than a week at a time, and blowing very strong. From December to August, northerly winds are very common.

ALONG THE EAST COAST OF AUSTRALIA.

Full-powered and auxiliary steam vessels.—Direct as possible, and taking the Inner route, along the north-east coast. Distances from Sydney:—to Melbourne, 570 miles; to Brisbane, 510 miles; to Townsville, 1,100 miles; to Cooktown, 1,330 miles; to Thursday island, 1,740 miles.

Sailing vessels.—On the coast to the southward of Sandy cape, when making southing keep about 15 or 18 miles from the land in the strength of the current; but in making northing keep about 60 miles from the land until nearing the port of destination. There is no difficulty in making northing during the greater part of the year, as the prevailing winds are from the south-westward.

Northward to Torres strait.—From Sandy cape, the Inner route may be taken during the south-east monsoon, or from March to September, entering by the Capricorn channel, which is the most direct and free from danger, and following as closely as circumstances permit the track laid down on the Admiralty charts, especially when north of Hinchinbrook island, as the surveys on which the majority of the charts are still based, were not in sufficient detail to ensure that all dangers have been discovered. When inside the reefs it is advisable that strangers should anchor at night; but those acquainted with this route can often, on clear nights, proceed with due caution.

Large sailing vessels, however, seldom navigate the Inner route, but take the Outer route, between the Great Barrier reefs and the Chesterfield reefs and islands as far north as Mellish reef, and thence to Torres strait by Raine island or Bligh entrance, or by one of the openings in the Great Barrier reefs north of cape Melville. The passage through the Great Barrier reefs, from the Coral sea into Torres strait, is frequently attended with danger, and sometimes the loss of the vessel; but these disasters would be less frequent were the Great North-east channel more used, as it may be safely navigated by night, and the time and labour saved by not being compelled to anchor so frequently, as in the route by Raine island, would more than compensate for the 90 miles, which the former route exceeds the latter in distance.

The track recommended is to cross the parallel of 24° S. in long. 157° E., passing about 60 miles eastward of Cato, Wreck, Kenn and Lihou reefs, thence direct for the Bligh entrance to the Great North-east channel.

During the north-west monsoon this passage would be very tedious and protracted.

Southward from Torres strait.—In going southward by

the Outer route, during the south-east monsoon, it is a dead beat to windward for a great part of the way. H.M.S. *Herald* made the passage from Raine island to Sydney in 6 weeks, having worked against the full force of the south-east trade to Mellish reef.

During the north-west monsoon, from the middle of November to the middle of February, the route is through Raine island entrance, or preferably by the Great North-east channel. Take every advantage of westerly winds to make easting, and endeavour to reach lat. 15° S. and long. 156° E., going as much as practicable over the frequented route shown on the chart. Thence, on the port tack, stand through the south-east trade, and from Sandy cape keep the land just in sight, so as to profit by the southerly current.

Vessels from Torres strait may proceed southward by the Inner route during the north-west monsoon ; but as it would be necessary to anchor frequently, at night or in thick weather, the Outer route is recommended.

ALONG THE WEST AND NORTH COASTS OF AUSTRALIA.

Full-powered steam vessels.—Direct as possible. Distances from Fremantle :—to Geraldton, 220 miles ; to Cossack, 880 miles ; to Derby, 1,390 miles ; and to port Darwin, 1,800 miles. From port Darwin to Thursday island, 720 miles.

Sailing vessels.—The prevalent winds on the west coast are mostly between S.S.W. and S.S.E., occasionally interrupted in winter by winds between north and west, which at times, blow with great violence. On the north coast are the north-west and south-east monsoons, the former from November to March, and the latter during the remainder of the year. In going against the prevailing wind take advantage of the land and sea breezes inshore.

AUSTRALIA AND TASMANIA TO AND FROM NEW ZEALAND.

Full-powered steam vessels.—From Australia ; direct as possible, proceeding round North cape to Auckland ; through Cook strait for Wellington ; round the south end of South island and through Foveaux strait for Otago or port Lyttelton. Distances :—Brisbane to

Wellington, 1,430 miles ; Sydney to Auckland, 1,260 miles ; Sydney to Wellington, 1,200 miles ; Sydney to Otago, 1,230 miles ; Melbourne to Auckland, 1,650 miles ; Melbourne to Wellington, 1,470 miles ; Melbourne to Otago, 1,360 miles ; Hobart to Auckland, 1,480 miles ; Hobart to Wellington, 1,260 miles ; and Hobart to Otago, 1,010 miles.

From Torres strait proceed through the Great North-east channel and Bligh entrance, between Lihou and Mellish reefs, between Kenn and Chesterfield reefs, and south-westward of Norfolk island, if bound to Auckland ; to Wellington, or ports on the east coast of South island, steer for Cook strait as soon as Kenn reef is passed ; or proceed to the southward by the Inner route and direct from the Capricorn or Curtis channels.

Distances from Thursday island to Auckland, by Outer route, 2,560 miles ; by Inner route, 2,490 miles.

From New Zealand the routes are the reverse of the above.

Sail and auxiliary steam vessels.—From Brisbane or ports to the southward, after clearing the land, to Auckland, steer as direct as possible for North cape ; to Wellington, steer for Cook strait ; and to Otago or port Lyttelton, steer for the south-west extreme of South island and through Foveaux strait. From ports north of Sandy cape proceed southward inside the Great Barrier reefs and to sea by the Capricorn or Curtis channels, and thence as direct as possible to destination.

From New Zealand to Australia and Tasmania, reverse the above routes, observing that between Australia and New Zealand a southern route is usually more favourable than a northern one when making easting, and *vice versa*.

AUSTRALIA TO CAPE HORN.

From port Phillip.—Full-powered steam vessels bound round cape Horn, on leaving port Phillip proceed through Bass strait, and then steer for a position in lat. 49° S., long. 165° E., between the Snares and Auckland isles, south of New Zealand.

See charts, No. 2,759*b*, Australia, southern portion, scale $d = 1$ inch ; No. 1,695*a* and *b*, scale $m = 0\cdot2$ inch ; No. 1,079, Tasmania, scale $m = 0\cdot11$ inch ; No. 1,212, New Zealand, scale $m = 0\cdot04$ inch ; No. 788, South Pacific ocean, Melbourne to cape Horn western sheet, No. 789, eastern sheet, scale $d = 0\cdot6$ inch ; No. 1,077 and No. 1,078.

Auxiliary steam and sailing vessels with a westerly wind, follow the route of full-powered steam vessels, but if on leaving port Phillip the wind should blow from East or N.E., it may be desirable to run to the south-westward, pass between cape Otway and King island, and then proceed along the west coast of Tasmania; being prepared for the prevailing westerly or south-westerly winds, when this coast becomes a dangerous lee shore. Having rounded the outlying dangers off the south coast of Tasmania, proceed for the position before mentioned, between the Snares and Auckland isles.

From Sydney.—Full-powered steam vessels proceed to the position in lat. 49° S., long. 165° E., south of New Zealand.

Auxiliary steam and sailing vessels.—At all seasons, and from whatever quarter the wind may blow, it is advisable on leaving port Jackson to proceed to the southward rather than to the northward of New Zealand. Advantage therefore should be taken of the most favourable winds for either reaching the before-mentioned position, between the Snares and Auckland islands; or, if baffled by southerly winds and favoured by fine weather, the passage through Cook strait may be taken with advantage, especially from October to February.

Eastward to cape Horn.—Full-powered steam vessels.—From the position south of the Snares proceed eastward (passing between the Antipodes and Bounty islands) in about lat. 49° S. until in long. 150° W., and thence make a direct course to cape Horn.

Auxiliary steam and sailing vessels, from the position south of the Snares, proceed eastward between the Antipodes and Bounty islands, keeping the parallel of 49° S. to about the meridian of 115° W., and then gradually incline to the southward, to round Diego Ramirez and cape Horn. Or having passed through Cook strait, steer to the south-east between the Chatham and Bounty islands until in the parallel of 49° S.

Caution.—The course frequently pursued between the 50th and 60th parallels, and even in higher latitudes in this great extent of ocean, would, with a clear sea and favourable weather, doubtless ensure the quickest passage, as being the shorter distance, but

experience has proved that at nearly all seasons of the year so much time is lost at night and in thick weather, and even serious danger incurred in avoiding the great quantities of ice met with in these higher latitudes, that a parallel even as far north as 47° has been adopted with advantage. Between this latter parallel and that of 50° , it is believed the mariner will experience steadier winds, smoother water, absence of ice, and will probably make as short a passage, and certainly one in a more genial climate, and with more security, than in a higher latitude.

The seamen in navigating this wide expanse of ocean, and also for rounding cape Horn, should be provided with the Ice chart published by the Admiralty, wherein he will find much useful information; and he is further referred to the paragraphs on great circle and composite tracks and icebergs at page 31, descriptive of the tempestuous gales, the heavy and irregular seas, the sudden and fitful shifts of wind occasionally experienced, together with the existence of icebergs, in the high latitudes of the South Indian ocean, features which appear to be equally common to those of the South Pacific.

Cape Horn.—Winds and weather.—In the neighbourhood of cape Horn, March and September are, generally speaking, the worst months in the year; heavy gales then prevail. March is usually the most boisterous month. In April, May, and June, the finest weather is experienced. Bad weather often occurs during these months, but not so much as at other times. Easterly winds are frequent, with fine clear settled weather. June and July are much alike, but easterly gales blow more during July. In August, September, and October westerly winds and cold weather prevail. December, January, and February are the warmest months, but westerly winds, which often increase to very strong gales, with much rain, are frequent.

The barometer is lowest with N.W. winds, and highest with S.E.; if it fall to 29 inches, or 28·8, a south-west gale may be expected, but the gale does not commence until the barometer has ceased to fall.

Provision depôts.—For particulars of the provision depôts established on islands in the South Indian and South Pacific oceans, for the benefit of shipwrecked mariners, *see* pages 52, 56, and Appendix.

See chart, No. 2,683, Pacific ocean, scale $d = 0\cdot2$ inch; No. 1,241, Ice chart of the southern hemisphere; Wind and Current charts for Pacific, Atlantic, and Indian oceans.

CHAPTER II.

ST. PAUL AND AMSTERDAM ISLANDS.

 VARIATION IN 1897.

St. Paul - 23° 0' W. | Amsterdam - 22° 0' W.

Increasing 2½ minutes annually.

ST. PAUL ISLAND, the southern of the two remarkable isolated islands of volcanic formation, in the South Indian ocean was surveyed by Captain H. M. Denham in H.M.S. *Herald*, 1853, and is about 2½ miles long in a north and south direction, 1½ miles in width, and attains an elevation of 860 feet. A considerable portion of the area is occupied by Crater lake, a circular basin about 6 cables in diameter formed by the crater of the volcano, which has 28 fathoms water in the centre, and is entered from the eastward, over a bar having a depth of 6½ feet at high water springs.*

Position.—The north entrance point of Crater lake is in lat. 38° 42' 45" S., long. 77° 34' 45" E.

The east coast of the island is inaccessible, except just eastward of Smith point, the north extreme of the island.

Ninepin rock, the southern of the islets and rocks off the east coast northward of the crater, is composed of horizontal layers of lava, piled regularly one upon the other to a height of 255 feet. The face of these layers is cracked and divided by perpendicular fissures, many of which are filled with veins of obsidian or volcanic glass. The soil is altogether volcanic; when the crew of H.M.S. *Megara* (which ship was beached to save life upon St. Paul island in June 1871), were excavating for building purposes, they found the ground hot, smoking, and strongly impregnated with sulphur; they also found a sort of clay that was used as a substitute for soap, producing a good lather.

* When visited by Vlaming in 1697, the portion forming the bar was 7 or 8 feet above water.

See chart, No. 1,945, Amsterdam and St. Paul islands, scale $m = 0.16$ inch and plan, No. 1921, St. Paul island, scale $m = 6$ inches.

The sloping sides of the crater contain many thermal springs varying in temperature to boiling heat; also stagnant pools with a temperature varying from 80° to 130° Fahr. exist in every part of the island. These waters when cold are drinkable, and when used for baths are esteemed a specific for rheumatism.

Resources.—There are no trees or shrubs of any sort, but the hills are covered with long, coarse grass, some ferns, mosses, and mushrooms, also a few cabbages and potatoes that have at one time been cultivated. Some of the grasses and dandelion were used by the crew of the *Megara* as anti-scorbutics during their sojourn on the island. There are wild goats, wild cats, rats and mice; petrels, gulls, whale birds, and in August vast flocks of penguins invade the island for breeding purposes, but there are no land birds. Both fish and crayfish abound, affording an unlimited supply of wholesome food, with the additional advantage of the boiling springs at hand to cook them.

Water.—During the rainy season an abundant supply of water may be obtained from a pool on the north side of the crater; there are several hot sulphurous springs near the same part, and there are pools on the south-west side of the island.

Inhabitants.—In 1871, there were two Frenchmen residing upon St. Paul, employed collecting water in casks for the use of whale ships, which visit the island during the summer months.

In 1880, a party of 29 fishermen from Réunion were met at St. Paul, engaged curing fish; they had a schooner of 100 tons secured to the shore in Crater lake.

Anchorage.—The anchorage is off the east side of the island south-east of Ninepin rock, where depths of less than 30 fathoms extend 8 cables from the land, but the holding ground is decidedly bad, being fine black sand over rock, and of the vessels engaged upon the recovery of the *Megara's* stores only one did not lose her anchors and cables. If standing in from the northward with wind fresh from N.W. or N.N.W., great caution is required in coming to, for the wind veers to North and N.N.E. off Ninepin rock, with heavy gusts, which will drive a vessel off the bank before she can be brought up.

North or Middle islets should on no account be shut in by Ninepin rock.

In 1893, the French vessel of war *Eure* anchored in about 17 fathoms, with Ninepin rock W. by N. $\frac{1}{2}$ N. nearly half a mile. The bottom at this anchorage was uniformly sand and free from rocks on which the anchor might be lost. The position is good for weighing if compelled to leave by bad weather.

Landing.—The passage into Crater lake is sometimes rendered dangerous by the breaking swell, and was observed to be at its worst when light easterly winds prevailed, with a high barometer.

Wind and weather.—Westerly winds prevail throughout the year, varying between north-north-west to south-west; but during December, January, and February, easterly winds are sometimes experienced.

Gales are frequent from June to September, also heavy hailstorms, and snow falls occasionally.

Tides and tidal streams.—It is high water at St. Paul island, full and change, at 11h. 0m., springs rise 3 feet.

Captain Denham draws especial attention to the set of the tidal streams upon the east side of the island, a knowledge of which might be of the greatest importance, should a vessel be obliged to claw off shore.

At the outer anchorage in 30 fathoms, with Ninepin rock bearing W.N.W., distant 8 cables, the stream sets N.W. from low water to 2 hours ebb on the shore, or for 8 hours; and sets S.E. from 2 hours ebb until low water.

At the inner anchorage in 14 fathoms with Ninepin rock bearing about N.W. by W., distant 3 cables, the stream sets in the opposite direction or S.S.E. from low to high water, and N.N.W. from high to low water. The rate of the streams at springs is about one knot an hour.

At the entrance to the lake the tidal streams frequently attain the rate of 2 to 3 knots an hour.

Provision dépôt.—A dépôt containing provisions and clothing was established on St. Paul island by the French vessel of war *Eure* in 1893. It is situated in a hut of rough stones with a thatched roof, on the north side of the crater, near the jetty and about 50 yards from the flagstaff erected in 1892. It contains, 1,350 lbs. preserved

beef in 9 lb. boxes, 1,125 lbs. biscuit, 10 woollen shirts, 10 pairs cotton drawers, 10 blankets, and a box containing 4 packets of matches. The provisions and clothes are in 13 iron-hooped barrels, coated with tar and sand and placed under a tarpaulin. On the door of the hut is the inscription, *France, Vivres et Vêtements pour naufragés, Eure, Janvier, 1893*; and a similar inscription is on a board inside the hut.

AMSTERDAM ISLAND is 2,760 feet in height, situated North (*true*) about 50 miles from St. Paul island, and was discovered by Magellan's companions in the *Victoria* on the 18th March 1522, during that vessel's voyage round the world.* It was named New Amsterdam by Anthonio Van Diemen, who sighted the island on the 17th June 1633, from the Dutch ship *Nieuw Amsterdam*, when on a voyage from Holland to Java. The Dutch navigator Vlaming anchored off the south side of the island in the year 1696, and it has been visited subsequently by several eminent navigators. The island is conveniently situated for correcting the reckoning before approaching the coast of Australia, but the strong westerly gales and thick weather that are frequently met with near this and St. Paul island from April to September render caution necessary in approaching them during those months, as there are no certain indications of their vicinity, and the seaweed they produce is carried to leeward in small patches.

Amsterdam island was partially examined during a running survey made by Navigating Lieutenant Henry Hosken, on board H.M.S. *Pearl* in 1873, and who furnished the following account:—

The island was sighted at 4.20 a.m. on the 30th August, at a distance of 12 miles on a S.E. by E. bearing; the west, south, and east sides were then coasted round at about a mile distant, no bottom being obtained with the hand lead. Soundings in 120 fathoms and 60 fathoms, black sand, were obtained at about three-quarters of a mile from the east side; and also near the north-east extreme of the island (Hosken point), in from 7 to 17 fathoms in a bight formed by a slight indentation of the coast; from Hosken point a reef extends seaward about 3 cables.

The mountains on the west side of the island rise precipitously from the sea cliffs facing the west, and abrupt spurs stretching to

* Magellan was killed in the Philippines, 27th April 1521.

See plan, No. 1,945, Amsterdam island, scale $m = 1.0$ inch.

the north-west coast render landing on this side of the island, even if possible, useless, on account of the impracticability of reaching the interior. D'Entrecasteaux head, the south-west extreme, is remarkable, having a peaked top and serrated edges. Abreast of this head the *Pearl* passed through patches of discoloured water, caused either by the débris from the cliffs, or by streams of fresh water that could be seen falling into the sea.

The southern portion of the island has abrupt wall-like cliffs at the water's edge, averaging about 60 feet in height, from which the land rises in a gradual slope to a number of spurs that jut from the high land in the centre of the island; several cones of apparently extinct craters are situated on the spurs. Vlaming head, the south extreme, appears on a S.E. by E. bearing as a steep bluff.

Heavy rollers were observed to break on the west and south sides of the island, the back-wash extending about 3 cables and giving the appearance of foul ground.

The east side of Amsterdam forms a contrast to the west side, the land rising with a gentle slope from the north and south extremes to a mountain, the summit of which appears to be near the centre of the island. From a position eastward several craters of great elevation are visible.

On the north side of the island, in a small indentation westward of Hosken point, a hut, occasionally occupied by fishermen, is situated between two points in a hollow near a small beach.

No verdure exists on the west side of the island. On the south side the ground is covered with tufts of long grass. On the north-east side, near the coast, on lower ranges are small stunted trees; the grass is here longer and thicker than to the southward, making walking through it difficult.

Position.—The examination made in H.M.S. *Pearl* confirms the extent of Amsterdam island as given by former navigators; namely, about 5 miles long in a north and south direction, and about 4 miles broad. Also the assigned position agreed nearly with that deduced by Navigating Lieutenant Hosken for the landing place in the bight on the north-east side, latitude $37^{\circ} 49' S.$, longitude $77^{\circ} 33' E.$

Anchorage.—In the bight, to the southward of Hosken point, there appeared to be fair temporary anchorage, with winds from

N.N.W. to South. With the south point of the cove bearing S. $\frac{1}{4}$ W., and Hosken point N.W. by N., a vessel will be in from 10 to 15 fathoms, fine black sand. The dense patch of kelp extending off, and to the southward of Hosken point, would, it is considered, break the force of a sea from the northward. A depth of 7 fathoms was found amongst the kelp, and 10 to 17 fathoms at half a cable distant from it.

The *Eure* anchored eastward of the flagstaff and near the position of the anchorage indicated in the plan. There is anchorage off the south-east coast with northerly winds.

Landing.—A landing-place was found on the north-east part of the island, to the southward of Hosken point, near a landslip or break in the cliff, the swell being broken by patches of kelp. The ship's cutter was anchored in $\frac{1}{2}$ fathoms, and the whale boat veered astern from her until close to the shore, when no difficulty was found in jumping on the rocks.

The position of the landing place may be known by a flagstaff, which was erected by the French vessel-of-war *Eure*, about half a cable inland of it.

No landing-place could be distinguished along the west, south-west, and south-east sides, but on the east side, being under the lee, with water tolerably smooth, a boat might have approached the shore, and possibly landing might have been effected.

In May, 1880, landing was safely effected by boat from H.M.S. *Raleigh*, at $1\frac{1}{2}$ miles southward of Hosken point.

Resources.—The vacant fisherman's hut mentioned is beyond the ridge, about three-quarters of a mile by land from the anchorage, it is in size about 30 feet by 15 feet; the framing of it is apparently made from trees which grow in sheltered places in the island. At the time of the *Pearl's* visit the hut was found to be in a good state of preservation, and would, together with a cave near, afford protection to 40 or 50 people in case of necessity. A journal in French, and kept by some one from Mauritius, dated 27th December, 1870, was found in the hut, and mentions a well having been dug; the building seemed to have been uninhabited for several months, and from appearances was last occupied by a sealing party, or by fishermen.

Recent footprints of a full-grown cow or bullock, and of a calf or heifer, were observed, also the droppings of sheep or goats near the hut. There is an abundant supply of grass for cattle.

A spot near the hut seen from the ship where the verdure seemed to be greener than the immediate neighbourhood, and almost to approach the water's edge through a gap in the cliff, proved to be a cabbage garden, with last year's seeds on the plants.

A number of fine fish of the rock-cod species, weighing from 8 to 35 pounds each, were caught on the bank of soundings near the anchorage; not a single seal was observed from the *Pearl*, although the early navigators speak of having seen great numbers.

In 1880 a party of 10 men from Réunion were engaged curing fish; other huts and a flagstaff were seen on Hosken point.

The *Eure* in 1893 reports that there are herds of cattle in the south-west of the island and that there are only a small number of rabbits. Sea elephants are numerous; care must be taken not to cut off their retreat, as they can inflict terrible wounds. They should be stunned by a blow on the muzzle, and then killed; their flesh is good, especially when smoked. The waters of this and St. Paul island are crowded with crawfish and fish. Mere cask hoops, furnished with a few threads of rope yarn, bring up crawfish by dozens. Fish, principally at the edges of the seaweed banks, are in equally great numbers.

Water.—There appeared to be abundance of fresh water running down the steep cliffs on the southern part of the island, but probably difficult to obtain.

Provision dépôt.—A dépôt containing provisions and clothing was established on the island by the French vessel-of-war *Eure* in 1893. It is in a large cavern in the side of a hill, about W. by S. $\frac{1}{2}$ S. 800 yards from Hosken point. The dépôt contains 1,350 lbs. preserved beef, 1,125 lbs. biscuits, 10 woollen shirts, 10 pairs cotton drawers, 10 blankets, and a box containing 4 packets of matches.

At the entrance to the cavern is a board fixed to two upright posts, with the inscription, *France, Vivres et Vêtements pour naufragés, Eure, Janvier, 1893.*

To find the depôt :—Having landed, go to either of the flagstuffs, whence a cross will be seen ; from the cross follow the direction of its arms, leading past two ruins of rough stones, and then directly to the cavern, the entrance to which faces seawards. In the cavern, besides the provision and clothing, there are cots, a cooking pot, and dry wood, left by the fishermen who sometimes live there. Cabbage and celery will be found near, and fish and crawfish abound near the landing place.

See plan, No. 1,945.

CHAPTER III.

AUSTRALIA.—SOUTH COAST, CAPE LEEUWIN TO CAPE
CATASTROPHE.

VARIATION IN 1897.

Cape Leeuwin	-	5° 0' W.	|	Cape Adieu	-	-	2° 45' E.
Point Culver	-	0° 10' W.	|	Cape Catastrophe	-	-	4° 25' E.

Nearly stationary.

HAMELIN BAY, about 12 miles north-westward of cape Leeuwin, lies between North point and White cliff point, and is protected from the southward and westward by Hamelin island and the reefs extending from it; this bay affords good shelter from December to February (the summer months), or with winds south of West, but it is quite open between north and west, from which directions, at times, severe gales blow from March to November. The eastern shore of the bay from North point, is a long sandy beach, which, for the first $1\frac{1}{2}$ miles is backed with limestone cliffs, about 100 feet in height; these gradually decrease to about 40 feet at the south end and are fringed with several rocky ledges, many of which dry at low water. Quoin rock, 36 feet high, lies about a third of a mile southward of North point.

Boranup sandpatch, about the middle of the bay, is a sandy flat extending inshore about 200 yards, rising thence to a white sandstone ridge 600 feet high, at one mile from the beach.

The sand drift is gradually moving eastward, maintaining apparently a height of 150 feet on its eastern side, as the decayed

See charts, No. 2,759b, Australia, southern portion, scale $d = 1$ inch; No. 1,034, cape Naturaliste to King George sound, scale $m = 0.12$ inch; No. 1,037, Hamelin bay, Flinders bay, scale $m = 1.87$ inches.

tops of the karri trees, which just show through the sand, are about the same height as those not yet enclosed; these trees frequently attain a height beyond 150 feet. Boranup sandpatch is conspicuous, and is visible in clear weather from a distance of 22 miles.

Peak islet, 43 feet high, and **Mushroom rock**, 21 feet high, lie respectively N.N.W. $4\frac{1}{2}$ cables, and N. by E. $2\frac{3}{4}$ cables from White Cliff point, having several ledges dry at low water around them.

There are many sunken rocks between these islets and the ledges extending off White Cliff point, and also to the westward of Peak islet.

Hamelin island, 105 feet high, and nearly a quarter of a mile in diameter, has steep cliffy coasts, and its top is covered with a scrubby vegetation. From its north extreme a flat ledge extends north-westward over one cable, having on it several pinnacle rocks from 25 to 40 feet high; the island is surrounded with ledges and has a small sandy beach near its north-east end on which landing may be effected.

Beacons.—There are two beacons surmounted with triangles on Hamelin island; the northern is red and the southern white; in line they lead in the deepest water from the outer to the inner harbour.

Edith rock.—Northward and westward of Hamelin island are several rocks and ledges dry in places at low water; the outer, named Edith rock, is 14 feet high and lies with the north-west extreme of Hamelin island S.S.E. $\frac{1}{2}$ E., distant $1\frac{2}{10}$ miles.

Two ledges just awash at low water, lie about 2 cables south-westward from Edith rock, and two sunken rocks on which the sea generally breaks, with $1\frac{1}{2}$ to $2\frac{3}{4}$ fathoms, lie S.S.W. 5 cables from Edith rock. At half a cable N. by W. $\frac{1}{2}$ W. from Edith rock is a rock with $2\frac{1}{2}$ fathoms water.

About midway between Hamelin island and Edith rock, is Old Man rock, nearly one cable in extent, with a small head 6 feet above water, from which Edith rock bears N. by W. $\frac{1}{2}$ W., distant 7 cables.

Several ledges and rocks extend north and south, half a mile from Old Man rock, some of which are awash at high water.

Grace rock, on which the sea breaks, lies $1\frac{1}{2}$ miles N.N.E. $\frac{1}{2}$ E. of Edith rock; it is of small extent and awash at high water. Shallow heads lie from 2 to 3 cables south-eastward of Grace rock and $1\frac{1}{2}$ cables north-west of it. Foul ground extends in a north-westerly direction 4 cables from Grace rock, and in a N.E. and E.S.E. direction nearly to the shore.

Middle rock, with $4\frac{1}{2}$ fathoms over it and 6 and 7 fathoms close around, is about one mile S.S.E. from Grace rock, and about $1\frac{1}{4}$ miles E. by N. from Edith rock.

South rock, with 13 feet over it and 6 fathoms close around, is about one mile E. by S. from Edith rock. Knobby head extreme ($1\frac{3}{4}$ miles south of White Cliff point), just open west of Peak islet, S. by E. leads westward of the rock.

Buoy.—A black can buoy with red staff and ball is moored close westward of South rock, but it is not to be depended on.

South-east ledge, with $3\frac{1}{4}$ to 5 fathoms over it and $5\frac{1}{2}$ to 6 fathoms around, is about 4 cables E.S.E. from South rock, and is about a cable in length, east and west, and half a cable in breadth.

Inside rock, with 13 feet on it, is 5 cables E. by N. from Peak islet.

Tides.—It is high water, full and change, in Hamelin bay at 9h. 49m.; springs rise $2\frac{3}{4}$ feet, neaps 2 feet. The tides are irregular and greatly influenced by the prevailing winds; westerly and northerly winds causing the highest and off-shore winds the lowest tides.

Directions.—From the southward, after passing cape Leeuwin and Géographe reef, steer to the northward until the south end of Boranup sand-patch bears E. by S., which leads between Edith rock and Grace rock. As the entrance is approached, Edith rock will be easily recognised, pass the rock at 2 cables distance, and when to the

eastward of it steer about S.E. for the anchorage in 6 fathoms water, with Edith rock bearing N.W. by W. $\frac{3}{4}$ W., and highest point of Hamelin island seen over Peak islet S.W. by S.

From the northward do not approach Freycinet point within a mile, and when the middle of Boranup sand-patch bears East, steer to pass about 2 cables eastward of Edith rock, and proceed as before directed.

If working into the bay, do not approach Grace rock on its north-west side nearer than 5 cables, and in standing towards Edith rock, when within it, avoid opening North point west of Grace rock; Mushroom rock well open north of Peak islet clears all dangers on the south-west side of the bay. On the north-eastern side, do not shut in the high land of cape Hamelin with White Cliff point until Edith rock bears west of W. by S. (to clear the rocks extending southward and eastward from Grace rock). Thence the beach may be closed to 3 cables, taking care to avoid South rock and South-east ledge.

Lisle channel, between Old Man rock and the $1\frac{1}{2}$ fathoms patch 4 cables north-west of it, is usually taken by sailing vessels from the southward with a leading wind. The depths in the channel are from $5\frac{1}{2}$ to 7 fathoms.

Anchorage.—Hamelin bay is exposed to the north-west, from which quarter gales are experienced at all seasons, and a heavy swell is thrown in. Vessels should ride at single anchor with a long scope of cable. From the beginning of May until the beginning of November, upon the usual indications of a north-west gale (barometer about 29.80 and falling, with strong land winds between east and north-east), vessels unable to find shelter in the inner harbour are advised to put to sea and seek shelter in Flinders bay until the gale is over. Having regard to the severity of the gales at that season, and the possibility of accident from the nature of the holding ground, the delay and inconvenience occasioned would be compensated by the assured safety of the vessel.

There is a considerable swell with southerly winds in the usual anchorage, but smoother water $2\frac{1}{2}$ cables to the south-eastward, in 5 fathoms with east extreme of Peak islet bearing S.W. by W. $\frac{1}{2}$ W., and Mushroom rock S. $\frac{3}{4}$ W.

Moorings are laid down in 6 fathoms, $2\frac{1}{2}$ cables northward of Peak islet, and are marked by a black cask buoy. There are similar moorings in the inner harbour.

Inner harbour lies immediately southward of Peak islet with depths of 4 to $4\frac{1}{2}$ fathoms. It is a small secure haven for vessels shipping timber, when the outer anchorage is hazardous (May to November). The channel into the inner harbour from the outer anchorage is usually marked by small black cask buoys. The services of a pilot are necessary.

Jetty.—A jetty, 627 yards in length, extends from the eastern shore of the inner harbour. Vessels of 16 feet draught lie alongside the end of it, but must haul off to the moorings, if necessary, on account of bad weather. There is a tramway from the jetty to Karridale, a distance of 4 or 5 miles.

Supplies.—Wood, water, provisions and dairy produce can be obtained from Karridale.

Exports consist of karri and jarrah timber, suitable for jetty piles, railway sleepers, wood paving, &c.

Communication.—The coastal mail steamers call off Hamelin bay, weather permitting, monthly or as requisite for freight. Karridale is in telegraphic communication with the universal telegraph system, and signals made by commercial code at Hamelin bay or letters can be sent there by tramway.

The COAST from White Cliff point trends $1\frac{3}{4}$ miles southward to Knobby head, with several small rocky projections and sandy bights between, the whole being fringed with ledges and sunken rocks, forming the east side of Foul bay. Knobby head is smooth and grassy, 133 feet high, with a high reddish cliff to seaward. A short distance within the head are some dark bushy topped sandhills, from which a large bare sand patch extends to the south-westward (not visible from the north-west). Off the north point of Knobby head, half a cable distant, is a rock, 40 feet high, eastward of which, about 3 cables distant, is a small bight with a sandy beach; from the head of this bight, a valley extends in an easterly direction for

upwards of a mile, to a swampy plain, the coast hills rising on the north and south sides of the valley to a height of 350 feet. Seaward of Knobby head are several ledges awash at low water, the outer ledge being W. $\frac{1}{2}$ N. 6 cables from it, with several sunken rocks beyond; the outer of these, on which the sea only breaks with a heavy swell, is W. by N. $1\frac{1}{2}$ miles from the head.

Foul bay is so filled with sunken reefs that it is useless as an anchorage or place of shelter.

Cape Hamelin is a low cliff-faced point, fronted with numerous dry ledges and sunken rocks extending westward $1\frac{1}{4}$ miles, and south-westward and southward 2 miles. Turner brook flows into sea at one mile south-eastward of the cape; at a quarter of a mile above its mouth and on its south side, there is a high perpendicular cliff, which is conspicuous from the south-west.

The coast trends south-eastward from cape Hamelin 9 miles to cape Leeuwin and is fronted by numerous sunken reefs and rocky islets. A high and conspicuous sandpatch lies $3\frac{1}{2}$ miles south-eastward of cape Hamelin, which, in hazy weather, might be mistaken for Boranup sandpatch, over Hamelin bay.

Cumberland rock, 33 feet high, and of a dark colour, lies S. by E. 5 miles from cape Hamelin and N.W. $\frac{1}{2}$ W. $4\frac{1}{2}$ miles from cape Leeuwin; at about $1\frac{1}{4}$ miles S.W. by W. from this rock, lies a reef on which the sea breaks only during a heavy swell.

Géographe reef on which the sea breaks only at uncertain intervals in moderate weather, lies S.W. $3\frac{3}{4}$ miles from cape Hamelin, and N.W. by W. $\frac{1}{4}$ W. about 8 miles from cape Leeuwin; it consists of two small rocks about one cable apart, with deep water close to. St. Alouarn island well open south of cape Leeuwin bearing S.E. by E. $\frac{3}{4}$ E. leads southward; and Boranup sand-patch, north of cape Hamelin, N.E. $\frac{1}{2}$ N. leads north-westward of Géographe reef.

CAPE LEEUWIN (Lioness), the south-west extremity of Australia, was so named by the captain of the Dutch ship *Leeuwin* in 1622. The cape is in lat. $34^{\circ} 22'$ S., long. $115^{\circ} 9'$ E., depending on fort Macquarie, Sydney, being in $151^{\circ} 14' 0''$ E.

The cape is a small round head 48 feet high, fronted with reefs, which extend south-eastward 5 miles. It is joined to the mainland

by a low swampy neck, half a mile to the northward ; the land then rises abruptly 487 feet and continues moderately high with a few breaks to beyond cape Hamelin. A hill 730 feet high, is situated 4 miles north-westward of cape Leeuwin.

Breakers.—The sea breaks in heavy weather from 2 to nearly $3\frac{1}{2}$ miles westward of cape Leeuwin.

LIGHT.—A cylindrical, stone lighthouse, 135 feet high, on the southern summit of cape Leeuwin,* exhibits, at 185 feet above high water, a first order, dioptric, *flashing* white light *every five seconds*, thus :—flash, *a fifth of a second*; eclipse, *four and four-fifths seconds*; with an illuminating power of 145,000 candles, which may be seen from a distance of 20 miles in clear weather.

Caution.—The dangerous Géographe reef lies 8 miles N.W. by W. $\frac{1}{2}$ W. (N. 62° W.) of this light. Powerful as the light is it is unsafe, with the weather at all thick, to stand in with the intention of making it. There may also be mist over the land when it is clear at sea.

ST. ALOUARN ISLETS.—These rocky islets and reefs form a chain extending nearly 5 miles in a south-easterly direction from cape Leeuwin.

Seal islet, 29 feet high, the north-westernmost of St. Alouarn islets, lies one mile E. by S. $\frac{1}{2}$ S. from cape Leeuwin ; between this islet and the mainland there are numerous dry rocks and sunken reefs.

St. Alouarn islet, 86 feet high, is the largest islet, and lies S.E. by E. $3\frac{1}{2}$ miles from cape Leeuwin. A reef, with $1\frac{3}{4}$ fathoms over it, which breaks only in bad weather, lies about 2 miles westward of St. Alouarn islet, with cape Leeuwin bearing N. by W. $\frac{3}{4}$ W. distant $2\frac{3}{10}$ miles.

Flinders islet, 20 feet high, lies S.S.E. three-quarters of a mile from St. Alouarn islet ; at half a mile S.E. from Flinders islet lie the two South-east rocks, 15 feet high, near each other ; these rocks present a bluff face to the south-west, and slope to a point in a north-east direction. A small sunken rock lies about one cable east of South-east rocks.

South-west breaker, on which the sea seldom breaks, has 6 feet over it and 10 fathoms around ; it lies S.W. $\frac{1}{2}$ W. nearly 2 miles from South-east rocks, and S.S.E. $\frac{1}{4}$ E. nearly 5 miles from cape

See chart, No. 1,037.

* A signal station is also to be placed here.

Leeuwin. The high land of cape Hamelin, seen well open west of cape Leeuwin, bearing N.N.W., leads westward; and a remarkable dome-shaped, dark hill, near the coast about $9\frac{1}{2}$ miles east of Blackwood river, N.E. $\frac{1}{2}$ N. leads south-eastward of South-west breaker.

General directions.—Rounding cape Leeuwin.—The distance to which sunken dangers extend off a long stretch of coast about cape Leeuwin, the frequent thick weather which prevails with strong on shore winds, and an inset in the same direction, make it very desirable to give a good berth to this dangerous point in all but settled weather. Twenty miles is a good margin to leave, and if a position at this distance south-westward of the cape is steered for, when coming from the north-westward, very little time is lost in making King George sound. Approaching the coast between cape Leeuwin and cape Naturaliste during the day, in clear weather vessels may stand into 30 fathoms, the bottom being coarse sand mixed with shells and small stones; by night or in thick weather, the water should not be shoaled to less than 70 fathoms, upon obtaining that depth, a vessel should, if bound to the eastward, haul off until the water deepens to 100 fathoms. Then steer S.E. by E. keeping in soundings of from 60 to 70 fathoms until the position is verified.

The existence of the new light should make no difference in the use of the lead.

Currents.—Between cape Leeuwin and cape Naturaliste, in November 1882, the current ran to the northward at the rate of one mile an hour; and a confused sea was experienced just outside the 100 fathoms line of soundings, with smoother water both seaward and inshore. In the months of January and February strong currents to the eastward, or setting towards the land, are reported as having been experienced in the offing between cape Leeuwin and Swan river.

Gales.—The gales off cape Leeuwin are very severe, and during the winter months one is quickly followed by another. The barometer always foretells these gales, it generally begins to fall a day or two before they commence. A southerly current, and—when observed at anchor near the coast—the rising of the water above the usual sea level, are also certain signs of an approaching north-westerly gale.

FLINDERS BAY lies within and north-eastward of cape Leeuwin. The bay being exposed to the south-east, from which quarter strong gales sometimes blow during the summer, sending in a heavy ground swell, should not be entered at that season except by steamers. The north-west side of the bay is rocky; but there is a good winter anchorage about one mile from the shore, off Augusta timber station, in 7 to 8 fathoms, protected from northerly and westerly winds by the mainland and from southerly winds by St. Alouarn islets and reefs. During westerly gales, heavy squalls descend from the hills over cape Leeuwin.

The coast from the mouth of Blackwood river for a distance of 9 miles to the eastward is comparatively low and sandy, the ridge of hills ranging from 150 to 200 feet in height, and covered with dense bush. Eastward the land becomes higher with several sand-patches on its slopes for a distance of 7 miles to White point, so named from the long white sand-patch at its extremity; several reefs, some of which dry at low water, extend half a mile from White point.

Black point, 140 feet high, situated 4 miles south-eastward from White point, is composed of dark, basaltic rock, projecting abruptly from the coast, and forming a bight on either side, both of which are foul; Black point is easily recognised, the coast for several miles east and west being sandy. Dickson peak, 485 feet high, is a dark conspicuous hill, N. by E. $3\frac{1}{2}$ miles from Black point.

Coles rock, with $2\frac{1}{4}$ fathoms over it and $5\frac{1}{2}$ to 6 fathoms close around, lies with Barrack point N.W. distant 4 cables.

Augusta, a post town and telegraph station, just northward of Barrack point, was formerly a small military settlement. It is now a timber station, connected by tramway with Karridale. Vessels load here from May to November, during which period the outer anchorage in Hamelin bay is unsafe.

The population is about 200.

Landing can be effected, except during bad weather, with tolerable safety within a small rocky ledge, which extends half a cable in a northerly direction from Barrack point.

Climate.—At Augusta the mean annual height of the barometer is 29.83 inches; maximum 30.31; minimum 29.17. The mean

temperature is 60° Fahr.; maximum 95°; minimum 20°. The mean annual rainfall is 44·36 inches and is the highest in the colony.

Supplies.—Provisions and dairy produce can be procured from Karridale and the farms in the neighbourhood.

Good fresh water may be obtained from the stream near Barrack point; firewood is plentiful. It is reported that large quantities of karri and jarrah timber can be obtained on the banks of the Blackwood river. Black swan and other water fowl are plentiful and fish abound in the river.

Blackwood river.—The bar across the mouth of this river is very shallow and the channel shifting. During the summer months there are seldom more than 4 to 5 feet over the bar at high water, but in winter and after heavy freshets there are said to be 6 and 7 feet, partly caused by the prevalence of north-westerly winds, when the water is always considerably above its ordinary level. The channel over the bar is tolerably well defined, but as there is a constant surf, boats should not attempt to cross it without local knowledge. Fishermen residing in this neighbourhood are available as pilots.

Within the mouth of the river there is a depth of 2 to 3 fathoms for the first 2 miles, where it is known as Hardy inlet; above, the channel is obstructed by numerous shoals and sandbanks dry at low water. The river trends in a northerly direction for about 18 miles, thence in an easterly direction, draining a large tract of country.

Ledge point, about 3½ miles eastward of Blackwood river, has several dry ledges extending nearly a quarter of a mile off it.

About one mile westward of Ledge point and 4 cables off shore, is a rocky patch having 2½ to 3 fathoms on it, with deeper water in shore. Eastward of Ledge point the sandy beach is fringed with ledges and sunken rocks extending from 2 to 3 cables off shore.

Bessie reef is a rocky ridge 2 miles in length, in an east and west direction, and varies from 1½ to 4 cables in breadth; it has

depths of 3 to 4 fathoms over it except near its eastern end, where there is a rock with $2\frac{1}{4}$ fathoms over it, from which Ledge point bears N.W. $\frac{3}{4}$ N., distant $1\frac{1}{2}$ miles. Between this rocky ridge and the shore is a similar ridge one mile in length with depths of $2\frac{1}{2}$ to 4 fathoms. Seaward of Bessie reef the depths rapidly increase to 8 and 9 fathoms.

Flinders bay.—**Directions.**—From the westward, give the South-west breaker (p. 64) a wide berth. When St. Alouarn islet is open east of Flinders islet, haul to the northward and proceed to the anchorage.

Working into the bay, when standing towards South-east rock and the other dangers, keep cape Leeuwin open north of St. Alouarn islet; and when between that islet and Matthew point, keep the west extreme of Flinders islet open east of St. Alouarn islet until cape Leeuwin is open north of Seal islet, whence do not bring the mouth of Blackwood river north of N. $\frac{3}{4}$ W. The shore north of Matthew point may be approached to 7 fathoms, taking care to avoid Coles rock. In the vicinity of Bessie reef, keep the mouth of Blackwood river north of W. by N. $\frac{1}{2}$ N.

Tides.—It is high water, full and change, in Flinders bay at 10h. 35m.; springs rise $2\frac{3}{4}$ feet, neaps 2 feet.

The **COAST** from Black point trends in a south-east direction 34 miles to D'Entrecasteaux point; at 7 miles south-east from Black point is Donnelly river, 10 miles south-east of which is Warren river; the mouths of these rivers are closed, except during winter and after heavy freshets. The coast a short distance south-east of Warren river is composed of dark bushy-topped sand-hills 700 to 800 feet high, with swamp extending from their base to the beach.

From Warren river the low sandy beach becomes nearly a mile in width; at $4\frac{1}{4}$ miles south-east of this river is Meerup brook, which runs some few miles inland, the beach through which it percolates into the sea is quicksand, and can only be crossed by keeping on the edge of the surf. These quicksands occur at the mouths of most of the rivers along this coast. At $9\frac{1}{2}$ miles south-east of Warren river, the high coast ridges suddenly terminate in a bare sand-topped hill 550 feet high, from which the coast is comparatively low and rocky

to Black head, one mile south-eastward of which is a small brook running through a bare sand-patch of moderate height. At the south-east end of this patch high rocky sandstone cliffs commence and continue to about half a mile beyond D'Entrecasteaux point, (with the exception of a small break $1\frac{1}{2}$ miles north of the point), when the land becomes low and grassy.

D'Entrecasteaux point, composed of reddish perpendicular cliffs about 400 feet high, is one of the most remarkable projections on this part of the coast. At 6 miles N.E. of this point is a remarkable granite hill, 685 feet high, named Chomdalup, rising abruptly from a low swamp.

Flat island, 8 feet high, with several dry rocks around it, is of small extent, and lies half a mile S.W. from D'Entrecasteaux point.

South-west reefs, situated S. by W. $3\frac{1}{4}$ miles from D'Entrecasteaux point, consist of three reefs half a mile from each other, in a N. by W. and S. by E. direction; the two northern reefs are about 300 yards in diameter, and nearly awash, the southern reef is smaller with more water over it, and does not break regularly.

Sandy island, 30 feet high, S.E. $2\frac{1}{2}$ miles from D'Entrecasteaux point, is one-third of a mile long, E.S.E. and W.N.W., and 300 yards broad, several small ledges and sunken rocks extend from it. Between the island and the shore there are several reefs, some of which are awash, and in heavy weather this locality appears a mass of breakers. At 2 miles S.E. of Sandy island there is a heavy breaker, 2 miles east of which (abreast Gardner river) there is another breaker. Between these breakers and the shore lie several small reefs.

Sandy island affords good shelter for coasting vessels, and is said to yield fresh water by digging in the sand. The anchorage must, however, be approached with caution on account of the reefs in its vicinity.

The COAST between D'Entrecasteaux point, and Gardner river at $6\frac{1}{4}$ miles E. by S. from it, is low, and fronted with a sandy beach,

off which are numerous rocky patches. Behind the beach are low grassy ridges and swamps extending some miles inland, with here and there clumps of trees.

Gardner river flows into the sea over a narrow rocky bar generally with great strength, except in very dry seasons, when it may be forded at the mouth, off which are several dry ledges and sunken rocks. At $8\frac{1}{2}$ miles S.E. by E. $\frac{1}{2}$ E. from Gardner river is West Cliff point, and between them is a small projection fronted by some rocks.

West Cliff point, 140 feet high, is the first cliff to the eastward of D'Entrecasteaux point, whence high and precipitous cliffs continue S.E. $\frac{1}{2}$ E. 12 miles to Clifty head. There is a conspicuous sand patch about one mile to the north-west of this point. At three-quarters of a mile W.S.W. from West Cliff point there is a sunken rock on which the sea breaks at times; there are other rocks and ledges nearer the shore.

White-topped rocks, situated S.S.W. $\frac{3}{4}$ W. 8 miles from West Cliff point, consist of two rocks, the higher and western rock is 109 feet high, about 200 yards long N.W. and S.E., and 100 yards broad, having a jagged top whitened by guano deposit. The smaller rock lies about a cable east of the larger, is 40 feet high, of dark appearance, and has a flattened top. The soundings give no indication of approach to these rocks as they are steep-to.

Brookes inlet, situated $4\frac{1}{2}$ miles to the eastward of West Cliff point, is 8 miles long N.W. and S.E. and $1\frac{1}{2}$ to $2\frac{1}{2}$ miles wide, with several small islands near its east and west ends; the entrance, half a mile wide is generally closed by a broad bar of sand; within this bar a channel a quarter of a mile wide runs about E. by S. 2 miles to the south-west corner of the inlet.

Brookes reefs, $1\frac{1}{2}$ to 2 miles off the mouth of Brookes inlet, occupy a space nearly 2 miles in extent. The outer reef lies S.W. by W. $\frac{1}{2}$ W. $2\frac{1}{4}$ miles from the mouth of the inlet; the shoalest reef, on which the sea constantly breaks, lies W. by S. $1\frac{3}{4}$ miles from the inlet. The extreme of Nuyts point seen just open north of Chatham island leads to the southward of Brookes reefs.

Cliffy head and Chatham isle.—From Brookes inlet the coast trends S.E. $\frac{1}{2}$ E. 7 miles to Cliffy head, the hills gradually rising to a height of 815 feet at $1\frac{1}{2}$ miles to the westward of the head.

Chatham isle, half a mile to the southward of Cliffy head, is 610 feet high and has a few scrubby bushes near its summit. The south end of this isle rises perpendicularly from the sea, with a steep slope towards the north, and when seen from the east or west has a wedge-shaped appearance. A rock 90 feet high lies $1\frac{1}{2}$ cables to the westward of the isle, it is one-third of a mile long N.N.E. and S.S.W., and 100 yards broad with a small rock off its north end. One mile W.N.W. from the highest point of Chatham isle is a rock awash. The channel between Chatham isle and Cliffy head is apparently clear.

The COAST from Cliffy head trends N.E. about 2 miles, thence S.E. 2 miles to Long point, a narrow cliffy projection 140 feet high and one-third of a mile long. At the head of the bight thus formed is a conspicuous sand-patch, thence the coast rises into high cliffs, which continue nearly to Long point, about one mile from which is a remarkable round green hill, rising abruptly on its eastern side from a narrow gully. To the eastward of this gully the high cliffs continue to a mile beyond Nuyts point.

NUYTS POINT, 367 feet high, situated 3 miles S.E. by E. from Long point, extends three-quarters of a mile from the coast line, and forms a bight on either side. From Nuyts point the coast trends E. by N. $\frac{1}{2}$ N. $3\frac{3}{4}$ miles, thence S.E. to a dark cliffy head. Black rock, 70 feet high, lies $1\frac{1}{2}$ miles to the eastward of Nuyts point and a quarter of a mile off shore. About 3 miles inland to the northward of Black rock is a remarkable mass of granite boulders on the summit of a ridge 680 feet high, which rises abruptly. One mile to the westward of the dark head above mentioned is a narrow sandy beach backed by a steep sand cliff.

Saddle isle, 150 feet high, named from its resemblance to a saddle with distended flaps, lies East 5 miles from Nuyts point.

There are some outlying rocks, which are generally visible, at about half a cable from its south-east end. Off its north-west side lies a black rock 20 feet high, and about 300 yards long, north and

south, having ledges and foul ground extending about halfway across to the mainland, and nearly joining Snake ledge, which extends in a north-east direction to within a short distance of Rocky head.

Fresh water is abundant on Saddle isle.

Goose isle, 150 feet high, lies E. by S. 5 miles from Nuyts point. There are two sunken rocks, on which the sea generally breaks, at 2 cables from the east and at 2 cables from the west end of Goose isle. At three-quarters of a mile S.W. by W. $\frac{1}{2}$ W. from this isle is a ledge about 4 feet above water, on which the sea constantly breaks.

Between Saddle and Goose isles there is a clear channel.

Rocky head, 80 feet high, lies N.N.E. one mile from Saddle isle, and is the western head of a bay nearly 2 miles deep. In the western corner of this bay is the entrance to Nornalup inlet.

Anchorage is reported to exist with shelter from westerly gales, north-eastward of Rocky head.

Nornalup inlet, the north and west sides of which are thickly wooded, is 3 miles long and $1\frac{1}{2}$ miles wide, having two rivers flowing into it; Dup river on its north and Gordon river (which is locally known as Deep river) on its east side; there are also two small streams running into its west side. Dup river is navigable for about 2 miles, and Gordon river 5 to 6 miles; the banks of these rivers are covered with the finest timber for naval purposes. The entrance to Nornalup inlet is a little over a cable wide between the heads, the southern head being high and rocky, the northern low and sandy. A long sandy spit extends from the northern nearly across to the southern head, leaving but a narrow channel; the entrance is close round the southern head, between it and a patch of rocks about 100 feet distant. Passing these rocks, the channel deepens and continues along the south shore for about one-third of a mile into the inlet; extensive sand banks accumulate in the last bend, through which are several small streams. In January 1877 there was not more than 4 feet water in the entrance, but during the winter months, after heavy and continuous rains, the rush of water deepens the channel, and as much as 12 feet is said to have been found; it is

however, always attended with danger even to boats, on account of the heavy swell which constantly rolls into the bay, even during light winds and the finest weather. This must especially be the case during the months of January, February, and March, when strong S.E. winds sometimes blow on this coast.

Nornalup inlet abounds in fish and water fowl, among the latter being the black swan. Emu and kangaroo are also plentiful on the south side of the inlet.

Fresh water may be found by digging near the shores of Nornalup inlet.

The COAST from the mouth of Nornalup inlet gradually curves to the eastward for 4 miles to a rocky bluff. The first 3 miles is composed of sandy hillocks 150 to 200 feet high, then for about a mile they rise to 320 feet, and are faced with overhanging cliffs; off the east end of these cliffs, at about a cable from the shore, lies a ledge of rocks awash. Abreast the middle of these cliffs three-quarters of a mile from the shore, and 2 miles to the eastward of Rocky head, is a rock on which the sea breaks with a heavy swell. Off the above rocky bluff are some ledges of rocks extending 2 cables from the shore, and at three-quarters of a mile to the eastward is a deep bight, on the north-west side of which are two small streams of fresh water. On the north-east side of the bight there is a high sand-patch, out of which a small stream runs; from the south-west corner of this sand-patch the land rises abruptly to a height of 550 feet, the seaward side being perpendicular dark cliffs, sloping gradually to the N.E.

Midway between the sand-patch and Rame head is a small green headland 146 feet high, having some sunken rocks a quarter of a mile off it, between which and Rame head is a large dry ledge.

RAME HEAD, 410 feet high, E. by S. $\frac{1}{2}$ S. $5\frac{1}{2}$ miles from Rocky head, is sharp and perpendicular, having a high rock close to; at a quarter of a mile S. by E. from the head are two rocks above water, with some sunken rocks off their south-west and south-east sides, nearly a mile from the shore.

Between Nuyts point and Rame head are three remarkable peaks named Sugar-loaf, Rugged, and Caldyanup, each nearly 1,400 feet

high, lying in a N.N.W. and S.S.E. direction, Caldyanup, the south-eastern peak, being N.E. by N. 16 miles from Nuyts point and N. by W. 14 miles from Rame head. At 3 miles to the eastward of Caldyanup, there is a detached ridge 4 miles long E. by S. and W. by N. having several peaks, the highest, 1,339 feet high, being near its western end.

The **COAST** from Rame head trends E. by S. $\frac{1}{2}$ S. 3 miles to Irwin point. Eastward of the head the cliffs gradually descend to a small green hilly projection at three-quarters of a mile distant, off which are some rocks. East of this projection is a sandy bight, three-quarters of a mile wide, backed by high cliffs terminating in a point having a rock 20 feet high on it. From this rock to Irwin point the coast is rocky, with a sand-patch near the middle.

From Irwin point, which is 170 feet high, steep and cliffy, the land is low, and trends 3 miles N.N.E. to the mouth of Irwin inlet, and at a mile from the point is a bare sand-patch conspicuous from the eastward.

Irwin inlet is about $2\frac{1}{2}$ miles long in a N.E. and S.W. direction, and upwards of a mile wide; its mouth is seldom altogether closed, but it is too shallow for a boat to enter, except, perhaps, immediately after a heavy freshet. Notwithstanding the shallowness over the bar, it is dangerous to ford in consequence of the quicksands.

On the eastern side of the entrance is a bushy-topped hill 370 feet high, fronting which is a bare sand-patch.

The **COAST** from Irwin inlet trends E.S.E. 3 miles, to a small dark round head, three-quarters of a mile west of which is a conspicuous green peak rising abruptly from the beach to a height of 320 feet. Foul bay, between Irwin point and the round head, is full of reefs and sunken rocks, and in bad weather the whole bay for a distance of over 2 miles from the land is a mass of breakers.

From the round head, which has a dry ledge off its east point, the coast trends to the northward three-quarters of a mile, thence 2 miles E.S.E. to a small dark head about 160 feet high with some rocks half a cable off its south-east extreme; on its eastern side is a small rocky opening named Boat harbour, about half a cable wide and 2 cables

deep, with rocks extending nearly half a mile from the north entrance point; the entrance is safe for boats in moderate weather; at the head of the harbour there is a small sandy beach where landing might be effected.

The swampy flats in this vicinity extend to the beach, forming a break in the coast ridges a mile wide. From this break the coast becomes precipitous, the grassy coast ridges gradually becoming higher to Hillier point, when they attain a height of 532 feet.

About a mile to the eastward of Boat harbour and half a cable from the shore, lies a small islet 120 feet high, with outlying rocks between it and Hillier point extending nearly a mile from the coast.

Hillier point, 440 feet high, E. $\frac{1}{4}$ S. 11 miles from Irwin point, is a narrow projection with a cliffy face and flat top, thence the land abruptly rises to an elevation of 532 feet.

Stanley islet, 160 feet high, lies one cable to the southward of Hillier point, having its summit covered with coarse grass; off its south side is a rock, and off its north-west side a ledge, between which and the point there is a clear passage.

At three-quarters of a mile E. by S. from Stanley islet a heavy swell was observed, which would doubtless break during bad weather. At 5 miles off this part of the coast there are 30 to 40 fathoms water.

Williams bay, the bight between Hillier point, and Edward point E. by N. $\frac{1}{2}$ N. 5 miles from it, is about 2 miles deep with numerous sunken rocks, and having at its eastern side small dry ledges. There is a conspicuous sand-patch in this bay, which is visible from a distance of over 20 miles.

Parry inlet, the mouth of which is generally closed, lies 2 miles to the northward of Hillier point, and extends 2 miles in a north-west direction. Kangaroo, wild duck, and black swan are plentiful on this inlet.

Edward point is low, rocky, and fronted by small rocky ledges; at half a mile north of the point is a green ridge 500 feet high, on which are several large granite boulders.

The **COAST** from Edward point is rocky and fronted by ledges for about $1\frac{1}{2}$ miles in an E.N.E. direction to two small streams which

run into the sea. It then trends S.E. by E. 3 miles to Wilson head, a broad cliffy projection 400 feet high.

A dark wooded peak 1,047 feet high, rises 2 miles N.N.W. of Wilson head; it is the southern peak of an irregular and broken range named Bennett Range, which extends in a northerly direction and terminates at mount Lindesay, 1,469 feet high, from which a long spur extends to the eastward. This mount is $12\frac{1}{2}$ miles North from Wilson head, and is conspicuous from seaward.

From Wilson head the coast trends in a northerly direction $1\frac{1}{2}$ miles to the mouth of Wilson inlet, thence S.E. by E. $8\frac{1}{2}$ miles to Knapps head.

Ratcliffe bay, into which Wilson inlet empties itself, has on the north and east sides several sunken rocks. This bay appears shallow for a considerable distance seaward, and a heavy rolling swell generally sets into it.

A little to the eastward of the mouth of Wilson inlet are two sand drifts, thence the coast rapidly rises to a height of 500 feet and upwards, with a perpendicular cliffy front, which continues 7 miles in an E.S.E. direction to Knapps head. A heavy surf constantly rolls against this coast.

One mile and a half north-west of Knapps head and one-third of a mile off shore is a sunken rock, on which the sea always breaks.

Wilson inlet, the entrance to which is half a mile wide, and generally blocked with sand, is over 8 miles long and $1\frac{1}{2}$ to 3 miles broad. Several streams run into it, the principal being the Hay on the north-east and the Denmark on the north-west side.

The only habitation near the coast between cape Leeuwin and King George sound is a small farm and cattle station on the south-east side of Wilson inlet. Fish and wild fowl are plentiful.

Knapps head, 400 feet high, is conspicuous and presents to seaward a cliff front; three-quarters of a mile northward of this head grassy ridges rise to an elevation of 600 feet, sloping rapidly to the swampy ground 1 to $1\frac{1}{2}$ miles inland.

The COAST from Knapps head trends N.E. by E. 2 miles to a small sandy beach, from which the coast abruptly rises, and trends

in a S.E. by E. direction 7 miles to West cape Howe; the first 2 miles of this distance is fronted by high cliffs, thence for a mile is a low sandy ridge, which rises to a flat-topped hill 864 feet high; this hill slopes suddenly on its south-east side to a valley extending in a north-east direction, having at its head a lagoon of fresh water.

WEST CAPE HOWE, E. by S. $\frac{1}{4}$ S. 2.3 miles from Hillier point, is the western of three bluff headlands, each 300 feet high and steep. Northward of the cape the ridges of hills rise suddenly to a height of 900 feet.

Torbay head, the eastern of the three bluff headlands, has a round, dark, scrubby top.

Anchorage.—Coasting steam vessels frequently anchor under West cape Howe, when unable to proceed westward in consequence of gales from that quarter.

Tides.—It is high water, full and change, at West cape Howe at 9h. 0m.; springs rise 2 feet; but there is a large diurnal inequality and during north-west and westerly gales the water remains about 3 feet above its ordinary level.

Soundings at 5 or 6 miles south of West cape Howe are 40 to 42 fathoms.

TORBAY, which includes ports Harding and Hughes, extends from Torbay head E. $\frac{3}{4}$ N. $7\frac{1}{2}$ miles to Stony islet, and is 4 miles deep; but it is too much exposed to the south-east to afford secure anchorage, although the islets and reefs in the bay give shelter to coasting vessels. From Torbay head the coast trends N. by E. $\frac{1}{4}$ E. 3 miles to Forsyth bluff, forming a bight about three-quarters of a mile deep, in which there are three sandy beaches. Seagull isle, 65 feet high, lying E.N.E. $1\frac{1}{2}$ miles from Forsyth bluff, is small, rocky, and conspicuous, with a reef partly dry extending three-quarters of a mile from its west and south-west sides, and a sunken reef near its south-east point.

Port Harding.—At $1\frac{1}{2}$ miles to the westward of Seagull isle there is good shelter for coasting vessels, in port Harding, formed by Migo and Richard isles, which lie about a cable from the shore, with $1\frac{1}{2}$ to 3 fathoms water between. Several dry and covered reefs extend half a mile north-east and north from Migo isle, which

is the northern of the two; and between these reefs a 5-fathoms channel leads in a south-west direction towards the best sheltered anchorage, in 3 fathoms, except close on the north side of a small bare rock that fronts a sandy beach abreast Migo isle; for larger vessels there is anchorage in 5 fathoms, sandy bottom, at one-third of a mile North from Migo isle, but the space is limited and surrounded by reefs and 3-fathoms patches. The approach to these anchorages is intricate, and should not be attempted without local knowledge.

Anchorage may also be obtained in 5 fathoms, sand and rock, but with less shelter, about three-quarters of a mile north-westward of Seagull isle, with Migo isle bearing S.W. by W. $\frac{1}{2}$ W. distant nearly a mile. The approach to this anchorage is round the north side of Seagull isle, which on its east and north sides may be passed at the distance of a cable. The coast abreast Migo isle is low and gradually curves to the north-east 2 miles to port Hughes.

Torbay inlet.—Inshore north-westward of Torbay are extensive swamps, and several high wooded ridges. At 2 miles north-east of Migo isle is the mouth of Torbay inlet, generally blocked with sand; it is broken through occasionally, when it forms a deep and rapid channel.

The inlet is not of great extent, but numerous streams and swamps drain into it, the chain of swamps extending, at a distance of one or 2 miles from the coast, to the western side of Princess Royal harbour.

Port Hughes, formed by Shelter isle and the mainland, is merely a boat harbour sheltered on its eastern side by several dry ledges.

The entrance to port Hughes is close round the north-west side of Shelter isle and is 10 or 15 yards wide, with a spit extending from the northern shore nearly across to the island.

At $1\frac{1}{2}$ cables from the south-west side of Shelter isle lies a sunken rock, on which the sea breaks with a moderate swell; the south-east and south sides are also foul to about the same distance.

Water.—At the north end of the beach good water is to be found at all seasons of the year.

The COAST.—From the mouth of Torbay inlet the land rises, and at three-quarters of a mile north-east from Shelter isle attains a height of 470 feet.

From Shelter isle the coast trends N.E. about three-quarters of a mile, with an elevation of nearly 400 feet, thence E.S.E. 9 miles to Sharp point, 540 feet high.

Stony island is dome shaped, 148 feet high, with two or three large conspicuous boulders on top of it, and in sunshine appears white; it is E. $\frac{3}{4}$ N. $7\frac{1}{2}$ miles from Torbay head and $2\frac{1}{4}$ miles from the shore; the island is steep-to, composed of granite, and may be approached to a cable; between it and the shore there are depths of 23 to 12 fathoms.

Green islands.—At half a mile S. by W. from Sharp point lie Green islands; the larger island is 210 feet high, and nearly a quarter of a mile in diameter; the smaller island, a cable to the westward, is 134 feet high and about 200 yards in diameter; at one cable W.N.W. of this islet is a black ledge 20 feet high, having a small rock near its south-west side. Green islands are not so smooth as Stony island, and appear to be composed of large boulders with several fissures in them.

There is a clear channel between Green islands and Sharp point with depths of 11 and 12 fathoms.

Passage reefs consist of three rocky patches, on which the sea breaks heavily with southerly gales.

The south-west reef, with 18 feet water on it and 20 fathoms at the distance of a cable around, lies N.W. $\frac{3}{4}$ W. $4\frac{1}{2}$ miles from the summit of the largest Eclipse isle; S.S.E. $\frac{1}{4}$ E. $2\frac{1}{3}$ miles from Stony island; and S.W. by W. $\frac{1}{4}$ W. 3 miles from Green islands.

The south-east reef, with 5 fathoms on it and 20 fathoms at a cable around, lies E.S.E. from the south-west reef, distant two-thirds of a mile; N.W. $\frac{1}{2}$ W. $3\frac{3}{4}$ miles from the largest of the Eclipse isles; and S.W. $\frac{3}{4}$ W. $2\frac{1}{2}$ miles from Green islands.

The inner reef, with 6 fathoms on it, bears N. by E. distant 8 cables from the south-west reef; N.W. $4\frac{3}{4}$ miles from the largest Eclipse isle; and W. by S. $2\frac{1}{2}$ miles from Green islands.

North rock, S.W. by W. 7 cables from the highest point of the eastern Green island, has 8 fathoms over its shoalest part, with 20 fathoms at less than a cable around.

Cave point, 2 miles S.E. by E. from Sharp point, is about 200 feet high, and faced with low dark cliffs, from which the coast trends suddenly to the northward for half a mile, thence to the eastward one mile to Black head, which projects a quarter of a mile, and off its extremity is a small black rock 50 feet high.

Grassy ridges gradually rise to 650 feet to the northward of Cave point; there are two sand-hills with dark bushy tops half a mile N.N.W. of Black head.

The **COAST** forms a deep bight between Black head and Peak head, with a narrow rocky cove in its northern part. At one-third of a mile E. by S. from Black head and $1\frac{1}{2}$ cables off shore is a rock on which the sea generally breaks; nearly three-quarters of a mile eastward of the head and abreast the rocky cove is another sunken rock with $5\frac{1}{2}$ fathoms over it, which breaks with a heavy southerly swell.

Landing.—On the eastern side of the bight, and half a mile north-west of Peak head, is a small cove with a sand beach, on which, during easterly winds, landing may be effected, this being the only landing place between Torbay and King George sound.

Peak head, 491 feet high, is a bluff rocky projection, E.S.E. $1\frac{1}{3}$ miles from Black head; about a quarter of a mile to the northward the land rises abruptly to a height of 735 feet, terminating in a conspicuous mass of granite boulders named Stony hill. Close to Peak head lies a small rock above water.

The **COAST** from Peak head trends in a N.E. $\frac{1}{2}$ E. direction $1\frac{1}{3}$ miles to a bluff, then northward half a mile to a small sandy bight. A short distance round this bluff is a deep and precipitous ravine, out of which a stream of fresh water is constantly flowing, its northern side being formed by a narrow grass-topped ridge 500 feet high, sloping suddenly to the sandy bight. At the east end of this sandy bight is a dark round head of granite 460 feet high. Landing cannot be effected in this sandy bight as it is fronted by a ledge of rocks.

Bald head, 400 feet high, the eastern extremity of the peninsula forming the south side of the entrance to King George sound, rounds off with a smooth surface of rock almost destitute of vegetation, which gives it the appearance of being an elevated island of sterile-white aspect when approached from the eastward.

Limestone head, 767 feet high, is the highest point of this peninsula, and bears N.W. $\frac{1}{2}$ N. about one mile and a half from the extremity of Bald head.

At half a cable south of Bald head is a ledge of rocks, 12 feet high, steep-to, and with 11 fathoms inside them.

Eclipse islands are a cluster of rocky islands lying S. by W. 3 miles from Cave point, and S.W. by W. 7 miles from Bald head. The largest island, 357 feet high, is one mile long east and west, a third of a mile broad, and scantily covered with grass and shrub; a small spring of water, with a bitter taste, but not unwholesome, runs from the south-east slope of the island. Landing may be effected in a small indentation on the north-east side of this island, but not without some risk, as it requires exceptionally fine weather and smooth water.

At the south-east extremity of the largest island is a narrow, perpendicular rock, 85 feet high, almost detached from the island.

A rock nearly awash, on which the sea generally breaks, lies 2 cables from the north-east extreme of this island.

South-west islet, 137 feet high, barren and steep-to, with two other islets, 60 and 40 feet high respectively, north of it, lie a third of a mile off the south-west end of the largest island, with an apparently clear channel between; the northernmost islet has a detached ledge off its north end, and about a quarter of a mile West of it is a sunken rock on which the sea generally breaks.

North-west rock, 5 feet above water, small, and steep-to; from the rock the highest part of the largest Eclipse island bears E. by S. $\frac{1}{4}$ S. $1\frac{1}{2}$ miles, and the highest part of Green islands N. $\frac{3}{4}$ E. $3\frac{1}{2}$ miles.

Eclipse channel, between Passage reefs and North-west rock, is $2\frac{1}{2}$ miles wide, and has a depth of over 30 fathoms. The extremes of Bald and Peak heads in line E. by N. $\frac{1}{4}$ N. (N. 76° E.) leads through this channel, which should not be used at night.



Cave shoal, S. by E. one-third of a mile from Cave point : after a heavy gale, a swell was observed, but the least water found was 13 fathoms ; less water may however exist.

Maude reef, the shoalest part of which is about 200 yards long in a north-east and south-west direction, and 150 yards wide ; there is a pinnacle rock near its north-west side with 8 feet water on it, 5 to 7 fathoms close around, and depths of 25 to 34 and 37 fathoms, rocky ground at the distance of a quarter of a mile. On Maude reef the sea breaks only with a heavy south-westerly swell.

The west point of Breaksea island open of Bald head, bearing N. by E. $\frac{3}{4}$ E. (N. 20° E.), leads eastward ; and West cape Howe open south of South-west islet leads southward of Maude reef.

Vancouver rock, 15 feet high, 160 yards long, E.S.E. and W.N.W. and about 80 yards broad, is steep-to on all sides, and the swell which generally rolls in from the southward and westward breaks violently over it ; from Vancouver rock Peak head bears N.W. by W. $\frac{1}{2}$ W. 2 miles and the extreme of Bald head N.E. $\frac{1}{4}$ N. $2\frac{1}{2}$ miles. There are 20 to 28 fathoms between this rock and the land.

Directions.—The channel north of Eclipse islands is safe, but when working through stand no nearer Passage reefs than to bring Stony hill in line with Black head ; and with light winds do not approach the shore too closely, as there is always a heavy swell setting on it.

North-west rock and the north side of the largest Eclipse island may be safely approached, care being taken to avoid the rock to the N.E. ; from the westward, after passing North-west rock, steer to pass on either side of Vancouver rock, and close round Bald head into King George sound.

The south side of Eclipse island may be approached to half a mile, the extreme of Bald head in line with Vancouver rock, bearing N.E. $\frac{1}{3}$ N. (N. 44° E.), leads between Eclipse islands and Maude reef.

The breakers on North-west rock and Vancouver rock can be seen from a considerable distance.

In making King George sound from the south-west in thick weather, mount Gardner makes as a peak and has been mistaken for Peak head.

Caution at night.—Approaching King George sound at night this channel should not be used, neither should a vessel come into less than 45 fathoms until Breaksea light (remembering that the light can be seen over the low neck of land behind Bald head bearing from N. 48° E. to N. 45° E.) bears N.N.E. $\frac{1}{4}$ E. (N. 25° E.), which will lead east of Maude reef and Vancouver rock.

KING GEORGE SOUND* is the most convenient port on this part of the coast for refitting; it is the port of call for the steamers of the Peninsular and Oriental, and Orient companies, as well as those of various inter-colonial companies.

Supplies.—*See* page 88.

The entrance of King George sound lies between Bald head and Herald point, and is divided into three channels by Breaksea and Michaelmas islands. The sound is about 5 miles wide, north and south, and 5 miles deep, with depths of 10 to 5 fathoms, sand; on the south side of the sound there is a deep 2 miles long north and south, and one mile broad, having 11 to 20 fathoms, with 7 to 10 fathoms close around.

From Bald head the land trends to the north-west $1\frac{1}{2}$ miles to Limestone head, thence nearly 3 miles westward to a low narrow neck of land which projects about $1\frac{1}{2}$ miles to the north, forming with Mistaken island a bight named Frenchman bay.

Then the coast trends nearly a mile in a north-west direction to Quarantine head, with a small cove between, formerly a whaling station. From this head a narrow strip of sandy hillocks extends about half a mile north to Possession point, which is 151 feet high, scantily covered with bush and forms the south side of the entrance to Princess Royal harbour. Northward of Possession point are several sunken rocks.

Breaksea island, under 3 miles to the north-east of Bald head, is a rugged mass of rock $1\frac{1}{2}$ miles long E. by S. $\frac{1}{2}$ S. and W. by N. $\frac{1}{2}$ N., and a quarter of a mile broad, its height is from 200 to 336 feet; a small round islet 65 feet high lies close to its eastern end, and at 20 yards from the south-east extreme of this islet a small rock 4 feet high. Near the south-west end of Breaksea island there is a small head 139 feet high, almost detached from the

* This sound was entered by H.M.S. *Discovery*, Captain Vancouver, and named by him, King George the Third's sound, in 1791.

island. On the north-west side in a slight indentation a landing stage is erected, but owing to the constant swell washing round the island, it is necessary to anchor off and haul in to the stage. The light keeper on the approach of a boat will attend to lowering the ladder.

LIGHT.*—An iron light tower, 43 feet high, rising from the centre of the keeper's dwelling, stands on the summit of Breaksea island, 1,200 yards from its eastern end. The lighthouse is painted white, and exhibits at an elevation of 384 feet above the sea a *fixed* white light. The light is visible in clear weather from a distance of 24 miles, between the bearings of N.E. $\frac{1}{4}$ N. (N. 42° E.) and W. by S. $\frac{1}{2}$ S. (S. 73° W.); it is also visible over the low neck of land inside Bald head bearing between N.E. $\frac{1}{4}$ E. (N. 48° E.) and N.E. (N. 45° E.). From within the sound it is visible all round, except when obscured by Michaelmas island.

This light is of the third order and it is reported that it is seldom seen from its proper distance.

Signal station.—There is a signal station on this island and telephonic communication with the mainland and the telegraph system. Communication can be made by the commercial code.

Belches foul ground, on which is a confused and dangerous sea during southerly gales, lies E.N.E. about $1\frac{1}{4}$ miles from Bald head, and consists of several patches.

East shoal, with 5 fathoms on it and 20 fathoms at the distance of a cable, lies with Breaksea island lighthouse bearing N. $\frac{7}{8}$ E., 2 miles; and Bald head W. by S. $\frac{1}{2}$ S., distant $1\frac{2}{3}$ miles. It breaks heavily on this shoal in southerly gales.

West shoal, with 9 fathoms on it and 20 fathoms around, lies with Breaksea island lighthouse N.N.E. $\frac{1}{2}$ E., $2\frac{1}{6}$ miles; and Bald head S.W. by W. $\frac{1}{2}$ W., distant $1\frac{1}{10}$ miles.

King point light bearing N.W. by W. $\frac{1}{2}$ W. (N. 62° W.) leads through the fairway into King George sound between Breaksea island and Belches foul ground. The summit of a remarkable, dark, wooded hill, on the mainland, about $4\frac{1}{2}$ miles N.W. by N. from mount Gardner, open east of the east extreme of Breaksea

* A new lighthouse, which will exhibit a *fixed* white light of the first order, to replace the present light, is about to be constructed in proximity to the present lighthouse.

island bearing N.N.E. $\frac{1}{3}$ E. (N. 26° E.) leads eastward; the south-west extreme of Seal islet touching the north-west extreme of Limestone head N.W. by W. $\frac{1}{4}$ W. (N. 59° W.) leads south-westward; Stony hill in sight south of Bald head, bearing West, leads southward of Belches foul ground.

A conspicuous notch on the east end of Michaelmas island kept in line with the round part of the west end of Breaksea island, N. by E. $\frac{1}{2}$ E. (N. 17° E.), is a good mark for running between Belches foul ground and Bald head. From the westward be prepared for the vessel taking several heavy rolls on rounding Bald head.

Michaelmas island, separated from the north side of Breaksea island by a deep passage three-quarters of a mile wide, is covered with grass and stunted trees; it is a mile long east and west, one-third of a mile broad, and from 300 to 500 feet high.

From the north-west end of Michaelmas island a shoal extends north-west two-thirds of a mile with 3 fathoms 2 cables off and 4 to 5 fathoms beyond. A spit extends to the southward from half a mile west of Herald point and nearly joins the spit extending from Michaelmas island: there are depths of $5\frac{1}{2}$ and 6 fathoms between them.

Landing may be effected on the north-west or in a small bight on the north-east side of the island.

Michaelmas reefs consist of several patches extending westward of Michaelmas island, the shoalest of which, with 14 feet water, bears W. $\frac{1}{4}$ S., distant one mile from the west end of Michaelmas island.

In a S.W. by W. direction, one cable from this shoalest patch, is a patch of $4\frac{1}{2}$ fathoms, and in an E.N.E. direction shoal patches extend for a distance of 4 cables.

Buoy.—A red buoy, with staff and cage, is moored in $9\frac{1}{2}$ fathoms water, S.W. by W., distant one-third of a mile from the 14 feet rock. The passage between Michaelmas island and this buoy should not be used.

This buoy is liable to shift its position, it has dragged several times in south-west gales.

Rock Dunder open south of Michaelmas island bearing E. $\frac{3}{4}$ N. (N. 82° E.) leads to the southward, and the end of Bald head S. by E. (S. 11° E.), or Gull rock North leads west of Michaelmas reefs.

Herald rocks, with 12 feet water, lie from a quarter to half mile south of Herald point.

Middle rock, with $5\frac{1}{4}$ fathoms over it and 7 fathoms around, lies nearly half a mile from the north extreme of Michaelmas island, and nearly midway between mount Pleasant and Herald rocks.

Mount Pleasant rock, with 18 feet water, lies nearly midway between Michaelmas island and Herald rocks, with the north extreme of Rock Dunder in line with cape Vancouver bearing East; and the eastern extreme of Herald point N. $\frac{1}{2}$ E.

Seal islet, 105 feet high and 200 yards in diameter, nearly midway between Limestone head and Mistaken island, is steep-to except on its west side, from which a rocky spit extends three-quarters of a cable.

Flat rock, 10 feet high and 100 yards in diameter, lies nearly 2 cables from the south shore of Frenchman bay, and $1\frac{3}{4}$ miles from Limestone head.

Mistaken island, 143 feet high, one-third of a mile long east and west, 300 yards broad, covered with grass and stunted trees, is separated from the shore by a channel a cable wide, in which there are several dry rocks. Off its east end lie several sunken rocks, and two rocks 6 and 4 feet high, named the Two Sisters; the eastern of which lies one cable and a half from the extreme of the island, with a small sunken rock half a cable north-east of it.

Frenchman bay.—A ship only wanting wood and water may anchor in a sandy bay in the south-west part, where two or three streams of excellent water run into the sea over the sand, from which a ship might complete in a day or two, by digging a well to collect it. Wood may also be procured at this place, but not of so large a size, nor perhaps of so good a quality, as at other parts. This

bay is readily found by its being the first to the westward of a rocky point that projects from some remarkable bare sand-hillocks, as also from its being the second sandy beach to the westward of Flat rock.

Anchorage.—The anchorage is good, being a bottom of sand and weeds, and is sufficiently protected from easterly winds by Breaksea and Michaelmas islands. A very convenient berth is in 9 fathoms water at one-third of a mile from the shore, with the centre of Michaelmas island over Seal islet, and Flat rock S.E. From April to October a berth so near the shore should not be retained longer than may be necessary.

The anchorage between Seal islet and the first sandy beach to the westward of Limestone head, with Flat rock bearing about W. by S. $\frac{1}{2}$ S., in 6 or 7 fathoms water, sand and weeds, should be preferred from November to March, for easterly winds then prevail, and sometimes blow strong. The anchorage is land-locked, excepting in the direction of E. by N., where the sea horizon is open to the extent of only 10° . There is no fresh water nearer this anchorage than in the sandy bay above mentioned.

The entrance of Princess Royal harbour being very narrow, a vessel only requiring water should give the preference to the anchorage south of Seal islet, where she would not be subject to any detention from easterly winds, that are fair for running along the coast to the westward, but which would confine a vessel in Princess Royal harbour. Good anchorage may also be found west of Seal islet in $5\frac{1}{2}$ fathoms water, at half a mile from the shore, where water might be completed more expeditiously than in any other place, as the casks might be filled in the boat. By a little digging, two vessels might water at one time.

PRINCESS ROYAL HARBOUR.—The entrance, which is about a quarter of a mile wide, lies between Possession and King points, and the channel has been dredged to a depth of 30 feet at low water spring tides, for a width of 400 feet. The harbour is $4\frac{1}{2}$ miles long north-west and south-east, and about 2 miles wide; it is very shoal at its west and south sides.

Dredging is in progress in the harbour.

Albany, founded in 1826, is situated on the north side of Princess Royal harbour, between mount Clarence on the east and mount Melville on the west. The town jetty, which has a crane on it, is $1\frac{2}{3}$ miles inside the lighthouse. The population in 1892 was 2,858.

There is a railway to Perth, and trains run daily. A jetty has been constructed close to the harbour-master's house, it is built of wood and is about 1,700 feet long. The depth of water at the head of the jetty is 27 feet; vessels can lie alongside in a depth of 28 to 32 feet. The railway runs to the end of the jetty, so freight and passengers can be shipped directly on board the vessels lying there. There are landing steps on each side of the jetty at about the middle of its length. On either side of the jetty are buoys for warping and securing vessels.

There is telephonic communication from a shed at the jetty end with the town railway station.

Trade.—The exports are, wool, sandal wood, pearls, jarrah timber, horses, sheep, fish, flour, gum, hides, leather, oil, ore, tallow, guano, gold, tortoiseshell. In 1894, vessels of a tonnage of 1,138,407 entered and cleared at Albany.

Supplies of provisions, fresh meat, bread, and vegetables are plentiful.

Water.—A water pipe is carried to the new jetty head, and water can also be procured from a pipe on the town jetty.

Coal may always be obtained. Three coal hulks, fitted with steam winches, are kept replenished with New South Wales coal.

In 1892, the average quantity kept in stock was 4,200 tons. Vessels can be coaled at the rate of 300 tons a day, or 500 tons a day and night.

Climate.—The climate is one of the healthiest and most enjoyable in the world, and the thermometer is seldom below 60° or above 85° Fahr.; this evenness of temperature at all seasons of the year is remarkable, and is particularly suitable for invalids.

Pilots.—For the harbour, it is desirable to take a pilot, who will be found on the alert. The harbour-master's house, pilot station, and semaphore are on the north shore, just inside the entrance. On a vessel passing Breaksea island at night, a white light is usually burned at the lighthouse to show that the vessel's arrival has been reported to the pilots.

LIGHTS.—A lighthouse, consisting of a small wooden square tower 17 feet high, with the keeper's dwelling attached, on the extremity of King point, the northern bluff of the entrance to

this harbour, exhibits, at an elevation of 47 feet above high water, a *fixed* white light of the fifth order, visible in clear weather (through the approaches to the harbour) from a distance of 12 miles.

Beacons, buoys, lights.—The north side of the channel leading into Princess Royal harbour is marked by two pile beacons, the outer situated about half way through the channel at the edge of a 19-foot bank, and the inner near the extremity of the shoal sand-spit extending from Semaphore point. These beacons are painted red and at night carry *fixed* red lights. The south side of the channel is marked by two beacons, one S.S.W. $\frac{1}{2}$ W. 2 cables from King point lighthouse and the other further in. These beacons are painted white and carry *fixed* white lights at night.

Fixed red lights are shown at the end of the railway jetty, and from the town jetty.

Bramble rock, half a cable west of Bramble point, is marked by a beacon with a white top.

Jail rock, E. by S. $1\frac{3}{4}$ cables from the end of the town jetty, is marked by a tripod beacon.

The shoal westward of the railway jetty is marked by a red buoy; the channel leading to the town jetty has a red buoy on its north and a black buoy on its south edge; there are black buoys, S.S.E. $\frac{1}{4}$ E. $4\frac{1}{2}$ cables from the end of the town jetty and on the south edge of the deep water anchorage.

There are also several mooring buoys in the harbour.

Tides.—It is high water, full and change, in Princess Royal harbour at 11h. 3m.; springs rise $2\frac{1}{2}$ feet, neaps 2 feet. The tides are greatly influenced by the wind, westerly winds causing high tides, and easterly winds low tides. There is a large diurnal inequality, which sometimes reduces the two daily tides to one.

Tidal streams.—There is no tidal stream in the sound, but it runs with considerable strength in the entrance of Princess Royal harbour; with a rising tide the stream sets strongly across the channel towards Bramble rock, with a falling tide it sets on to King point.

DIRECTIONS.—**North channel.**—Vessels drawing more than 10 feet should not use the North channel without a pilot.

Middle channel, between Breaksea and Michaelmas, is clear, and for steam vessels from the eastward is to be preferred, taking care

not to shut Rock Dunder in with Michaelmas island until past the red buoy off the Michaelmas reefs, or the extreme of Bald head bears S. by E. (S. 11° E.). At night, when abreast the west end of Breaksea island, steer more to the southward, and bring King point lighthouse north of W.N.W. (N. 67° W.) before steering for it.

Between Breaksea island and Bald head.—From the south-west or westward, having passed Bald head, haul gradually to the westward, and steer a course directly for King point lighthouse if bound into Princess Royal harbour; but for the anchorages in Frenchman bay haul close round Limestone head.

Should there be a heavy sea running and it be desirable to pass south of Belches foul ground, keep Seal island (north extreme) touching Limestone head N.W. by W. (N. 56° W.) or King point lighthouse N.W. $\frac{1}{2}$ W. (N. 51° W.) until Breaksea lighthouse bears N.E. $\frac{1}{2}$ N. (N. 39° E.). To pass north of the foul ground, King point lighthouse N.W. by W. $\frac{1}{2}$ W. (N. 62° W.) leads between it and Breaksea island. It should be remembered that in squally weather with the wind from the southward and westward the gusts come down with great strength when in the vicinity of Bald and Limestone heads. Working in or out of King George sound and not wishing to cross the foul ground, use the channel between it and Breaksea island. The island is clear to a cable, and in standing towards the foul ground, do not bring King point lighthouse to bear north of N.W. by W. $\frac{1}{4}$ W. (N. 59° W.) until Breaksea island lighthouse bears N.E. $\frac{1}{2}$ N. (N. 39° E.).

King point lighthouse is sometimes difficult to make out, but the cluster of boulders on the rising ground above can always be seen, and may be used until near enough to see the building.

Princess Royal harbour.—For Princess Royal harbour a pilot should be obtained, but if proceeding without, on closing King point, steer between King point and the outer white beacon, which pass at the distance of about half a cable; when abreast this beacon steer a little to the southward to leave the red beacons on the starboard hand, and the inner white beacon on the port hand; having passed the beacons steer to the westward and anchor when convenient, observing that the residency open south of the town jetty leads outside the 3 fathoms edge off the north shore; and the church tower not brought to bear north of N.N.W. $\frac{3}{4}$ W. (N. 31° W.) will just keep a vessel east of the same depth. About $1\frac{1}{2}$ cables southward of the railway jetty an anchor-hole has been dredged to a depth of 34 feet.

For Hanover bay, approach with the end of the town jetty bearing about N.W., leave the black buoys on the port hand and the red buoys on the starboard hand.

At night.—On closing King point light, steer to leave the white lights shown from the beacons on the port hand, and the red lights on the starboard hand; then steer to the westward and anchor as convenient. The outer white beacon light should be passed at the distance of about half a cable.

OYSTER HARBOUR.—The entrance of Oyster harbour is $2\frac{1}{4}$ miles N.E. $\frac{3}{4}$ N. from King point; the coast between is low and fronted by Middleton beach. It is half a cable wide with a bar a quarter of a mile outside, having 10 feet water, but during spring tides the depth is increased to $14\frac{1}{2}$ feet. High water occurs at night during springs, when it would not be prudent to cross the bar. The tidal stream runs with considerable strength in the entrance.

Two rivers, the King and Kalgan, empty themselves into the harbour; the entrance to King river is nearly dry at low water, but the Kalgan is navigable for boats some 4 or 5 miles, where much useful timber is obtained. Oyster harbour abounds in fish, and a few oysters can be obtained by dredging on the banks.

Directions.—To go into Oyster harbour to refit or heave down (for which purpose it is more suitable than Princess Royal harbour) anchor off the entrance and send a boat to sound the bar and mark the channel, as there are no well-defined leading marks. The channel inside the bar is clearly defined by the sand-banks on either side, and when past the narrows moor as convenient.

Water may be obtained by digging in the swampy ground near the beach, just round the east point of the entrance.

Telegraph.—The overland telegraph line from Albany to South Australia crosses the mouth of Oyster harbour and extends through the country behind mount Manypeak to the eastward.

The coast from the eastern entrance point to Oyster harbour trends south-east nearly $1\frac{1}{2}$ miles to Cheyne head. The land between rises to 513 feet, and is densely wooded. Half a mile from the entrance, and a cable off shore, lies Cheyne ledge, awash at high water, with 2 to 3 fathoms inside it; at half cable outside there are 4 fathoms water.

From Cheyne head the coast trends in an easterly direction about a mile, thence southerly half a mile to Ledge point, forming a deep sandy cove, sheltered from winds between N.W. round by north and east to South.

Ledge point is 170 feet high, and high boulders extend half a cable from it. Between Ledge point and Herald point the high sandy coast recedes about a quarter of a mile; the beach is fronted by sunken rocks about one cable from the shore.

Gull rock, about 32 feet high and 200 yards in diameter, lies W. $\frac{1}{2}$ S. one-third of a mile from Ledge point. Between it and the point is a clear channel with 3 to 5 fathoms water. Small vessels will find good anchorage in the cove, north-east of Gull rock in 3 fathoms sand, with Seal islet seen over the rock, and the west extreme of Breaksea island, just shut in by Ledge point. At the back of this cove are two lakes of fresh water; $1\frac{1}{2}$ miles north-east of it is a high grassy ridge, 625 feet high, having on its summit a small but conspicuous bush, and on its western slope a remarkable granite boulder. There is another ridge 3 miles N. $\frac{1}{2}$ E. from Ledge point, on the west slope of which is also a mass of granite boulders; between these ridges are extensive swamps, almost impassable during the winter.

Herald point, 226 feet high, is covered with grass, and about a quarter of a mile north of it a small stream of fresh water runs into the sea.

Between Herald point and Islet point, $1\frac{3}{4}$ miles to the north-eastward, is a high rocky head half a mile long; on either side of which the shore recedes, forming two sandy bights, each of which has a small stream of fresh water running into it; at the back is a grassy ridge 690 feet high, which gradually slopes towards Ledge point.

Local magnetic disturbance.—Captain R. Fitzroy, in alluding to an extraordinary degree of local attraction about this place, says:—“We could not ascertain the amount of variation with any degree of accuracy until our compasses were placed upon a sandy beach of considerable extent, near the sea. Whenever there was a stone (a kind of granite) near the instruments, they were so much affected as to vary many degrees from the truth, and quite irregularly; those on board were not influenced, at least not more than a degree.”*

* Voyages of *Adventure* and *Beagle*, Captain Robert Fitzroy, R.N., vol. ii., p. 625.
See chart, No. 2,619.

Islet point, 77 feet high, is composed of rock, and connected with the shore by a narrow sand-beach; on its west side is a small creek with an entrance about 20 yards wide, through which boats may pass, and find safe landing on the beach inside. Landing may also be effected on its north side, but in easterly winds a heavy surf breaks on the whole of this coast.

The coast.—A quarter of a mile to the northward of Islet point is Taylor inlet, always closed, but the beach is so low that a heavy sea washes over. The inlet is two-thirds of a mile long, north-east and south-west, and a quarter of a mile wide. Oysters are found on the shoal sand-banks within. From Taylor inlet the sandy coast trends in an E. by N. direction for $2\frac{3}{4}$ miles to Rocky point. This beach is fronted by detached sunken rocks, extending about a quarter of a mile from the shore.

Behind the east end of this beach is a black bushy-topped peak rising from the southern edge of a bare sand drift over a mile square. Behind the sand drift are several lakes and swamps, from the vicinity of which rise several bushy ridges, varying from 200 to 360 feet in height. A conspicuous dark wooded hill, 540 feet high, lies N.N.E. 3 miles from Rocky point.

Off Rocky point are several rocks, the highest being 10 feet high, one cable to the westward of the point.

From Rocky point the coast trends E. $\frac{3}{4}$ S. $2\frac{3}{4}$ miles, thence in a S.S.E. direction one mile to False islet; at one mile east of Rocky point, and a cable off shore lies Black rock, which is about a cable in diameter and 40 feet high, having 2 and 3 fathoms inside it, and 14 fathoms close to its southern side. The coast-line is fronted by a flat ledge of rock, outside of which there is deep water, but several sunken rocks lie about half a cable off it.

Inner islet, 100 feet high, rocky and covered scantily with grass, lies $1\frac{1}{2}$ miles S.E. by E. $\frac{1}{2}$ E. from Black rock. A dry ledge extends from its southern end.

False islet, 275 feet high, two-thirds of a mile from Inner islet, is a third of a mile long N.W. and S.E., and 300 yards broad, with a rocky ledge near its south-east extremity; it is connected with the mainland at low water by a short narrow ridge of rocks.

Mount Gardner, 1,305 feet high, is a peaked mass of granite, partially covered with grass and poisonous scrub, the deep gullies on

either side having a dense growth of stunted gum trees ; it is visible from a distance of about 40 miles in clear weather.

On its seaward sides it has a steep descent to a cliffy rock-bound coast, terminating to the southward in cape Vancouver, which is 167 feet high, and perpendicular on its south and south-east sides.

Between False islet and cape Vancouver is a deep, rocky bight, the northern side of which is almost perpendicular ; its east side slopes to a height of 448 feet. There is a depth of 20 fathoms rocky bottom close to the shore in this bight.

Rock Dunder, 196 feet high, is nearly a quarter of a mile long E.S.E. and W.N.W., and 100 yards broad. Close to its south-east extreme is a rock a few feet above water. It is steep-to on all sides, but should not be approached by sailing vessels nearer than half a mile, as the swell and current set on to it with considerable strength, especially during south-west winds.

The coast from cape Vancouver trends to the northward nearly 3 miles to Two-People bay.

Caffin island, about 2 miles from cape Vancouver, 148 feet high, half a mile long north-west and south-east, and 300 yards broad, is separated from the main by a channel a little more than a cable wide, having apparently about 3 fathoms over a white sandy bottom. Its north-west and north-east sides are steep-to, and off its south-east end are several dry and sunken rocks ; the outer rock 8 feet above water lying S.S.E. 2 cables from the south-east end of the island.

Two small rocks, on which the sea continually breaks, lie nearly a quarter of a mile to the north eastward of the 8-foot rock. Between these rocks and the south-east end of the island are several rocks.

Two-People bay, open to the eastward, is about 2 miles wide north and south, and 2 miles deep ; about a cable to the north-west of South point, which projects a short distance from the south side of the bay, is a dry ledge of rocks, with a sunken rock on which the sea generally breaks, a quarter of a mile to the eastward.

The west shore of Two-People bay is a low sandy beach, behind which are two lakes ; the southern is a mile in diameter, from which

a small stream runs over the sand beach at the south-west corner of the bay. On the south side of the bay is a low rocky ledge one cable from the shore, having shallow water and rocks between.

In the north-west corner of the bay a small bushy-topped rocky headland projects a third of a mile. North point is a rough stony headland with scant vegetation on its top, and connected with the main by a narrow ledge of rocks. Behind the point the land rises steeply to a height of 640 feet, having on its summit a remarkable square granite boulder.

The **COAST** from North point trends W.N.W. half a mile, thence N.E. by E. $1\frac{3}{4}$ miles, the latter part being composed of a ridge of bushy-topped sand hillocks 90 to 100 feet high, fronted by a long sandy beach, fringed with rocks. At the west end of this beach is a small stream, and another two-thirds of a mile from its east end. Both are salt for a considerable distance from their mouths. At the east end of the beach the rocky coast projects nearly half a mile, and thence continues with several steep and rocky indentations $7\frac{1}{2}$ miles in an easterly direction to Mermaid point.

Waychinicup river, 7 miles to the eastward of Two-People bay, having a deep but narrow entrance, runs in a N.N.E. direction 3 cables; East 2 cables; thence north-westward for some distance, abruptly terminating at the foot of a high cliff, over which the inland stream falls, forming in winter a picturesque fall. Excellent shelter may be found inside the second bend of the river.

Mount Manypeak, 1,855 feet high, is situated $3\frac{1}{2}$ miles west of the Waychinicup river and falls gradually towards the river in a succession of granite-topped peaks, the eastern peak being 1,050 feet high. The ridge is a mass of broken granite rising abruptly from the sea, with deep gullies, from which run several springs of fresh water.

Mermaid point.—The coast ridge in the vicinity of Mermaid point rises to a height of from 500 to 642 feet, surmounted with huge granite boulders, and terminates about 2 miles north-east of the point.

The south-east and south-west sides of this point are high cliffs; its west side slopes gradually to two small sand beaches fronted by

rocks ; S.W. 4 cables from the south-west extreme of the point is a sunken rock, on which the sea generally breaks.

Twin islets, each 86 feet high, situated S.W. by S. 2 miles from Mermaid point, are 2 cables apart, with sunken rocks between. A shoal patch extends a quarter of a mile northward of the north islet.

Bald island, 1,020 feet high, is $2\frac{1}{2}$ miles long, north-west and south-east, $1\frac{1}{4}$ miles broad, and is visible in clear weather from a distance of about 30 miles. Between the island and the mainland there is a deep passage three-quarters of a mile wide, the north point of which is named Channel point ; a rocky shoal extends one cable from the north-west side of the island.

A ledge 2 feet above water, over which the sea constantly breaks, lies S. by E. $\frac{1}{4}$ E. nearly a quarter of a mile from the south point of Bald island with deep water between.

Half a mile from the north-east side of the island lies Bird rock, 12 feet high, near the south and west sides of which are two small dry rocks.

Landing may be effected during south-westerly winds in a small bight on the north side of Bald island.

Water may be obtained in the gullies at the north end of the island.

The COAST from Mermaid point trends N.E. $\frac{3}{4}$ E. $1\frac{3}{4}$ miles, to Channel point, with a steep rocky indentation half a mile deep between ; the north-west side of the bight rises perpendicularly to a height of 668 feet, terminating in a huge mass of granite ; from this it slopes gradually to the northward and eastward, forming a cliffy shore.

From Channel point the coast trends northerly about half a mile to Look-out point, with a small deep bight between, at the head of which is a sandy beach. Thence the coast turns to the north-west and west $1\frac{1}{2}$ miles to a small rocky point, and a sandy beach (Whaling cove) where a boat could land at any time except during heavy easterly gales. From Whaling cove a sandy beach (Cheyne beaches) extends to the north-eastward, and for 4 miles it is backed by grassy ridges 150 to 260 feet high. A long sand-drift then continues for

about $3\frac{1}{2}$ miles, backed at half a mile distant from the beach by bushy-topped hillocks 260 feet high.

At $10\frac{1}{2}$ miles north-east from Whaling cove is Warriup point, steep and rocky. There are four small streams of fresh water along Cheyne beaches within a distance of 7 miles from Whaling cove.

At the back of Warriup point the coast rises to Warriup hill, a conspicuous scrubby mount 1,020 feet high, north-west of which a grassy ridge 800 to 1,000 feet high continues for 10 miles.

From Warriup point the coast trends about E. by N. 16 miles to cape Riche.

Haul-off rock.—A conspicuous granite rock, 314 feet high, N.E. $\frac{1}{2}$ N. 16 miles from the summit of Bald island, and about a mile off the mainland; off its south-west side is a low ledge of rocks, connected by a narrow rocky ridge, W.S.W. of which is a detached ledge, about half a mile from the highest point of the rock. There are 20 fathoms water a mile to the southward of Haul-off rock.

CAPE RICHE.—A clifly projection, of level appearance and moderate elevation, bearing N.E. $\frac{1}{4}$ N., distant $24\frac{1}{2}$ miles from Bald island. Two small rocks lie near the shore at 4 miles to the south-westward of it.

A reef, on which there is said to be not less than 3 fathoms, rises up in deep water, about S.S.E. $\frac{1}{2}$ E. $3\frac{1}{2}$ miles from the extremity of the cape. As the sea has seldom been seen to break on this danger, it is considered to be of small extent, but is very little known.

Cheyne islet, 112 feet high, lies N.N.W. rather more than a mile from cape Riche.

Anchorage and supplies.—Whalers occasionally anchor in the bight north of cape Riche, whence farm produce is frequently sent to King George sound by settlers at cape Riche.

Stirling range, situated about 30 miles N. $\frac{1}{2}$ E. from mount Manypeak, is a high and rugged range of mountains about 30 miles long, in a general east and west direction, rising abruptly from a comparatively level country. The most remarkable peak is named Toolbrunup or Castle peak, 3,341 feet high, near the centre of the range, bearing N.N.W. $\frac{3}{4}$ W. 38 miles from the summit of Bald islet,

and N. $\frac{1}{2}$ W. 37 miles from mount Gardner. The highest peak, 3,640 feet high, is named Bluff knoll, and lies 4 miles from the east end of the range. Ellen peak is a conspicuous sugar-loaf peak near the east end of the range.

The **Porongorup range**, consisting of several rugged peaks, is remarkable, and lies 12 miles to the south-westward of the Stirling range, and about north from King George sound ; its highest point is 2,145 feet above the sea.

The **COAST**, between capes Riche and Knob, forms a bay 7 miles deep and 23 miles across. Groper point, 190 feet high, N.E. $\frac{1}{4}$ N. 9 miles from cape Riche, projects upwards of 2 miles from the general line of coast, the land at the back rising to a height of 506 feet. Salt river discharges itself in the head of the bay, 2 miles north of Groper point. This bight may be known by the land on its west side being clifty, and that to the eastward almost bare sand-hills.

Smooth rocks, which are three in number and bare of vegetation, lie close to each other near the shore, W.N.W. $4\frac{1}{2}$ miles from cape Knob ; they are large and conspicuous objects against the mainland abreast of them, which is little else than bare sand. Roe rock, 12 feet above the surface of the water, and about the size of a large boat, lies S.E. by E. $\frac{1}{4}$ E. 2 miles from the largest of the Smooth rocks, and about W.N.W. 3 miles from the south-west extremity of cape Knob.

CAPE KNOB, E. $\frac{3}{4}$ N. from cape Riche, is a rugged stony projection, extending east and west about 3 miles, with a sandy bight on each side ; that to the eastward containing a small rocky islet. The middle stony lump on the summit of this cape is in lat. $34^{\circ} 31' 0''$ S., long. $119^{\circ} 14' 30''$ E. (fort Macquarie, Sydney, being in $151^{\circ} 14' 0''$ E.). At 3 miles to the southward of it are soundings in 40 fathoms.

HOOD POINT, 367 feet high, and N.E. by E. $\frac{3}{4}$ E. 19 miles from cape Knob, projects about 6 miles from the coast line, and makes like an island, being connected with the main by low sandy land. Between its clifty extremity and cape Knob is a projection 313 feet high, having a deep sandy bight on each side, the western named Dillon bay, and the eastern, Bremer bay, into the head of which a stream flows. There is a telegraph station at about a mile from the mouth of this stream.

Doubtful islands, off Hood point, are four in number, the highest elevated 246 feet, and are rocky and steep; there is a good channel nearly a mile wide between the outermost two, which lie 2 miles from the point, and another closer to it. Captain Flinders passed through this channel in H.M.S. *Investigator* into Doubtful island bay, carrying 20 to 24 fathoms water, which shoaled to 15 and 12 fathoms as he hauled close round their north side, between them and a sunken rock about a mile north-west of them.

There are $7\frac{1}{2}$ fathoms, sandy bottom, in the bay, a cable from the shore, 2 miles inside Hood point; but in the narrow channel between the inner island and the point, only 2 fathoms. The northernmost islet is composed of sand and rock, and is frequented by seals. At 2 miles to the eastward of these islands there are 35 and 38 fathoms water, and at 6 miles N.E. of them 33 fathoms; the soundings being irregular, and apparently deep close to the shore.

DOUBTFUL ISLAND BAY.—On the north side of Hood point the land trends west 2 miles, and then turns to the northward, forming Doubtful island bay, which is about 5 miles deep, affording shelter in its south-west part from all winds except between N.N.E. and East; its western shores are composed of sandy and rocky land, with some barren-peaked hills rising to a considerable elevation a short distance from the sea. At $3\frac{1}{2}$ miles and one mile respectively to the south-west of Middle mount Barren, are Fitzgerald river and Dempster inlet.

Mounts Barren.—West mount Barren bears N.W. by N. distant 12 miles from the largest Doubtful island; it is 1,220 feet in height, and is visible at the distance of 30 miles. Middle mount Barren, 1,500 feet high, is the summit of some steep rocky land, and is visible 35 miles off.

East mount Barren, 982 feet high, E.N.E. 19 miles from the Middle mount, is a third rocky hill of similar aspect, with high land stretching to the north-westward.

The coast between Middle and East mount Barren is high and rocky, with 30 to 34 fathoms water 4 or 5 miles off it; Red islet, 142 feet high, lies 5 miles to the eastward of the Middle mount, between it and East mount Barren there are two inconsiderable bights,

See chart, No. 1,059, Doubtful island bay to the head of the Great Australian bight scale $m = 0.12$ inch.

and midway between them is the entrance to Hammersley river ; there is also a bight immediately under the mount.

The coast from East mount Barren is low and sandy, with sand-hills here and there at the back, for about 40 miles in an easterly direction to the bottom of a sandy bight. From the sandy bight the coast trends to the eastward about 15 miles to Shoal cape. There are several sunken and dry rocks, lying from 5 to 11 miles off the coast between East mount Barren and Shoal cape.

Mary Ann haven, 5 miles to the eastward of East mount Barren, and formed by reefs about 2 feet above water, is one mile in circumference, the only entrance, which is little over half a cable wide, being from the eastward. In the middle of this haven lies a rock above water, one cable northward of which is the deepest water and the best anchorage. During S.W. gales, although the sea breaks heavily on the outside reefs, it is quite smooth inside.

Dangers East of mounts Barren.—The westernmost of the dangers known to exist off this part of the coast is a small covered rock, 7 miles off shore, with East mount Barren bearing N. by W. $\frac{3}{4}$ W. distant 9 miles ; there are 25 fathoms water in-shore of it, but no bottom with 44 fathoms to the southward ; the sea breaks on this danger only at times. Three miles to the eastward of it is a similar rock, and E. $\frac{3}{4}$ N. 6 miles from this, is another of greater extent, patches extending $1\frac{1}{2}$ miles in a N. by E. direction, on which the sea breaks heavily ; caution and a good look-out are therefore requisite in navigating this part of the coast, as the soundings give no indication of the vicinity of these dangers, many of which are several feet below the surface of the sea, and are only occasionally to be discerned in rough weather.

West islet, small, low, rocky and of smooth and sterile aspect, frequented by seals in 1802, lies S.E. by E. $\frac{3}{4}$ E. 25 miles from East mount Barren. Breakers extend northward and north-westward from it, nearly half-way to the mainland, which is 8 miles distant, and appears to be fronted by other breakers approaching so near the former as to render the existence of a safe channel between them very doubtful ; it is otherwise very steep, with soundings in 38 fathoms between the islet and Black rock, a small reef lying W. by S. $\frac{3}{4}$ S. 2 miles from it, and 35 fathoms at 3 miles to the eastward ; but there is no bottom at that depth a mile off its south side.

Rocky islets.—A cluster of four small rocky islets lie East 21 miles from the last-mentioned islet, with 34 fathoms water half-way towards the low and sandy mainland, which is distant 10 miles from them; the northernmost islet is the largest, and the whole are surrounded with breakers that appear to extend farthest off their south-west end. There is a small detached breaker N.E. by E. $\frac{1}{2}$ E. 3 miles from the body of the group.

The soundings decrease eastward from 35 to 23 fathoms, 5 miles N. by E. of this detached danger, which renders it probable there may be other covered rocks in its vicinity; and the total absence of information relative to the south side of this cluster renders great caution necessary in approaching them in that direction.

SHOAL CAPE, East 55 miles from East mount Barren, is composed of sand-hills, forming like white cliffs, and there is an islet, surrounded with much broken water, close to its south-east side. The appearance of an opening in the land, on each side of this cape, was observed by Captain Flinders, while passing in 33 fathoms water, 5 or 6 miles off, and was thought to be a low connexion between the sand-hills. Young and Lort rivers, both of which are crossed by the telegraph line, discharge their waters into a lagoon 2 miles to the northward and westward of Shoal cape.

Fanny cove immediately to the eastward of Shoal cape; the entrance to this cove is between two sunken rocks about half a cable apart; there is very little room in it. Fresh water can be obtained at a sheep station 3 miles from Fanny cove.

The COAST from Shoal cape trends about E. $\frac{1}{2}$ S. 32 miles to the west point of Esperance bay; at 25 miles from the cape is a point of land, apparently surrounded with breakers, and with a small dry rock on its east side; to the westward of this the coast forms two or three open sandy bays, destitute of shelter; and to the eastward an open bight; off the eastern part of which are some dry and sunken rocks.

Red islet, East $8\frac{1}{2}$ miles from Shoal cape, lies off Barker inlet and about $2\frac{1}{2}$ miles from the mainland. At 6 or 7 miles to the southward of Red islet the soundings are irregular from 25 to 42 fathoms, and become deeper as the islands to the eastward are approached.

ARCHIPELAGO OF THE RECHERCHE AND ADJACENT COAST.

The **Archipelago** of the Recherche commences abreast this part of the coast, and extends about 123 miles from the western island of the West group, in lat. $34^{\circ} 2' S.$, long. $121^{\circ} 35' E.$, to the northern rock of the Eastern group, in lat. $33^{\circ} 43' S.$, long. $124^{\circ} 5' E.$; to give a minute description of every island and reef in this dangerous labyrinth would be both impracticable and useless; a notice of its most remarkable and detached objects with a description of the coast must suffice. They should be avoided when working to the westward, on account of the haze that is frequently found to prevail among them, and in the neighbourhood of the small detached reefs in the south-west part, which lie 15 or 18 miles from any islands.

Local magnetic disturbance.—When navigating amongst the islands of this archipelago, Flinders observed considerable disturbance of the compass on board his ship, which was probably due to the action of submerged adjacent magnetic rocks. Thus in the neighbourhood of Termination island, the variation observed on board when west of the island was 5° in excess of that observed when east of it.

TERMINATION ISLAND, in lat. $34^{\circ} 30' S.$, long. $121^{\circ} 58' E.$, is the south-western island of the Recherche archipelago, and is a smooth mass of rock, rising gradually to rather a peaked summit, visible from a distance of 27 or 30 miles in clear weather; a small rock, surrounded with breakers, lies half a mile off its north end. Soundings in 62 fathoms, white sand, were obtained 7 miles to the S.W.; and in 72 fathoms, coral, about 55 miles W. by S. $\frac{1}{2}$ S. from this island; but farther south they are quickly lost.

Brown reef, lying about 3 miles N.E. by E. from Termination island, dries about 4 feet and is 50 yards long east and west; several other reefs, the positions of which are doubtful, lie to the northward of Termination island.

The Twin rocks, two small lumps of reddish appearance, lying N.E. by E. $\frac{3}{4}$ E. 13 miles from Termination island, are conspicuous objects on a reef which extends about a mile all round them, with deep water close to its edge.

A reef, which might not break in fine weather, is reported to lie 5 miles N.N.E. $\frac{1}{2}$ E. from Twin rocks.

There is a small reef, with two rocks above water, bearing N.W. $\frac{3}{4}$ W., distant 16 miles from Termination island; and a dry rock surrounded with breakers lies N.N.W. $\frac{1}{2}$ W. 12 miles from the island. At half-way between the former and the western island of West group there is another reef, with two dry rocks on it.

The Causeway is a chain of reefs projecting westward to about 4 or 5 miles north-eastward of the last mentioned reef, from a great number of islands that front cape Le Grand, which lies 24 miles eastward from the western island of West group.

The islands and reefs just described are the south-westernmost dangers of the Archipelago that are known to exist; and within their limits the chart must be consulted for many dry and covered reefs with which the sea is studded towards the mainland.

WEST GROUP consists of three principal islands, lying from 7 to 10 miles from the mainland, and occupying a space of 6 miles in an E.N.E. and W.S.W. direction, with several small islets and breakers among them. The westernmost is the largest of the cluster, with a small hill on its north and south ends, it is rocky and moderately elevated; and there are 46 to 48 fathoms water at a little over a mile from their south side, and a safe passage to the northward.

Sunk rock.—A small sunken rock lies East 4 miles from the middle island of West group, with soundings of 40 to 30 fathoms between it and the great number of high rocky islets already noticed as fronting cape Le Grand, to the westward.

Observatory isle, 7 miles to the north-eastward of the nearest of West group, is about $1\frac{1}{2}$ miles long, N.W. and S.E., and lies close to the southward of the point on the mainland that forms the west side of Esperance bay.

Anchorage.—There is a passage all round Observatory isle; and between its north-east side and some covered and dry rocks at a mile to the eastward, the French ships, *La Recherche* and *L'Espérance*, in December 1792, under Admiral D'Entrecasteaux, anchored in

23 fathoms water, fine sand, at half a mile from the shore, having the mainland to the northward, and the numerous islands fronting cape Le Grand, at about 9 miles to the south-eastward. But this confined anchorage can by no means be recommended, even for a night, unless in very fine weather, on account of the strong winds that frequently blow in the neighbourhood, and which obliged the French ships to ride with three anchors ahead, in order to prevent being driven on shore.*

Fresh water could not be procured in the neighbourhood of this anchorage in the month of December; extensive salt lagoons were found to occupy that part of the main immediately behind it, and the whole country as well as the islands, proved rocky and sterile.

ESPERANCE BAY† extends from the point abreast of Observatory isle nearly 17 miles to cape Le Grand, and is 9 miles deep, but is filled with so many rocky islands and reefs both covered and uncovered, that its utility as a place of anchorage is very doubtful. In its northern and south-eastern parts good shelter from south-west and southerly winds may probably be afforded by the numerous islands and reefs in those directions; but the bay has not been surveyed, and should be approached with caution.

Telegraph station.—Close to the shore, at 6 miles eastward of the west point of the bay, and near Dempster station, is a telegraph station.

CAPE LE GRAND, in lat. $34^{\circ} 1' S.$, long. $122^{\circ} 4' E.$, projects 2 or 3 miles into the sea in a W.S.W. direction, towards the chain of high rocky islets already noticed, that extends southward from the bight of Esperance bay, having among them many narrow channels with deep water, and forming part of the Recherche archipelago. Near the shore, in the south-east corner of the bay, and N.E. by E. 5 miles from the extremity of the cape, is Frenchman peak, visible 40 miles, with a smaller hill between them; inland from this peak the country is believed to be sandy and barren. No dangers are known to exist immediately off this cape, except a small rocky islet about a mile to the S.S.E., and a smaller islet a mile to the eastward of that.

See chart, No. 1,059.

* Voyage de D'Entrecasteaux, vol. i., p. 181.

† There is frequent communication with Esperance on the shores of this bay by steam vessels from Port Adelaide. A custom's office, bank, hotel, and several stores have been established at the township, and a jetty has been constructed, one route to the Coolgardie gold fields starting from here. Population about 50.

Remark islet, S.W. by W. $\frac{1}{4}$ W. 7 miles from cape Le Grand, is situated near the centre of the group of islands off the cape, and although small, is rendered more remarkable than the others by its high round summit. Small islands, interspersed with numerous reefs, extend 8 miles southward and south-eastward from Remark islet; and the chart shows two more remote patches than the others, one bearing S. by W. $\frac{1}{2}$ W., distant 11 miles, and the other S. by E. $\frac{1}{2}$ E. 12 miles from the islet, the latter patch having two rocks above water.

The **COAST** from cape Le Grand trends eastward 6 miles to a point separating a small bay, fronted by four dry rocks, from Thistle cove, on the west side of the point. At midway between the cape and the point, and one mile from the shore, lies a small island with a dry rock and some breakers at S.S.E. one mile from it, and several dry rocks lie near the shore between the island and the cape.

Thistle cove, which may be known by its lying S.E. 3 miles from the high peak inside cape Le Grand, is little more than half a mile in extent either way, but it has 10 fathoms water in its entrance, 7 fathoms in the north-east part, and it affords complete shelter in its western corner, where a vessel may be placed in perfect security, with anchors out on the off bow and quarter, and hawsers on the other side fast to the shore, in from 3 to 5 fathoms water, almost near enough to lay a stage to the beach. This is much superior to Lucky bay, to the eastward, where neither wood nor water can be procured without much time and trouble, nor is the shelter so complete; but Thistle cove is too small to be entered in a gale of wind.

In approaching Thistle cove a look-out must be kept for a small sunken rock, on which the sea breaks only at times, bearing nearly S. $\frac{1}{2}$ E., distant one mile from the west point of the cove.

Wood and water.—There is wood for fuel, though in no great abundance; and at less than 100 yards from the shore is a lake of fresh water a mile in circumference, from which a small stream runs into the cove; but another stream descending from the hills nearer the western corner would better suit the purposes of a ship.

LUCKY BAY, which is separated from Thistle cove by a small projection, nearly a mile across, may be known by its being nearly

7 miles North of Mondrain isle. South, a little more than a mile from the east point of the bay, are two small islands, between which is a clear channel one mile wide, with 20 fathoms water, and 35 fathoms between the islands and the point. The bay is about a mile in extent, and afforded anchorage to the *Investigator* in its north-east part, in January 1802, but it is open to the S.W., in which direction the numerous isles and reefs in the offing are 8 miles and more distant. The north-west part of the bay is shoal, but in the entrance the depth is 17 fathoms, which decreases gradually towards the sandy beach at its head, where wood and water are procurable, though not so easily as in Thistle cove. Between Lucky bay and the point of the land 2 miles to the eastward are numerous islets and rocks, which extend 5 or 6 miles south-eastward from the coast.

MONDRAIN ISLAND, one of the largest in the archipelago and visible 30 miles, is upwards of 3 miles long, north and south, and $1\frac{1}{2}$ miles wide; with breakers surrounding two rocky islets near its west side, and other breakers extending about a mile, perhaps farther, off its south point. There is also a detached reef nearly 2 miles from the north point of the island, with 25 to 30 fathoms water on three sides of it; and 19 fathoms between it and the point. An islet with reefs lies W. by N. 2 miles, and another islet, W. $\frac{1}{2}$ S. 4 miles from the south point of Mondrain island, with a sunken rock at 2 miles to the north-westward of the latter. This island was considered by Captain Flinders not to afford secure anchorage; a reef runs out a little way from a small islet off the north-east side.

At 3 or 4 miles off the east side of Mondrain island lie two clusters of covered and dry rocks, with 25 and 26 fathoms water between them, by borrowing towards the northern cluster, in a channel $1\frac{1}{2}$ miles wide; but other covered reefs exist to the S.E. of this channel, towards Draper isle, and there are two islets close together S.E. $\frac{1}{2}$ E. 7 miles from the summit of Mondrain island.

Draper isle, E. by S. $\frac{1}{2}$ S. 13 miles from the summit of Mondrain island, is an elevated mass of rock, with a dry rock and breakers about a mile off its north-east end.

There is a small sunken rock N.E. by E. $\frac{3}{4}$ E. 9 miles from Draper isle; and there are three small islands, bearing W.N.W. 6 miles, N.E. by N. 6 miles, and E. by N. $\frac{1}{2}$ N. 8 miles from this rock, having

apparently clear channels and deep water among them; another sunken rock lies S.W. by W. $\frac{3}{4}$ W. 3 miles from the western, and a reef at 2 miles to the southward of the eastern of the three small islets. As this small sunken rock was not seen by Captain Flinders, who passed in the *Investigator* about 6 miles to the northward, it is probable the sea does not at all times break over it.

Sunken dangers.—A small sunken patch lies E. by S. $\frac{1}{4}$ S. 19 miles from Draper isle, and is the more dangerous from the sea only breaking on it at times, and when the water is smooth, perhaps, not at all.

Another patch of a similar kind, but smaller, was seen by Captain Flinders, N.E. by N. about 6 miles from the former, and must have been passed very close by Admiral D'Entrecasteaux, in 1792, without being seen.

A patch, which apparently always breaks, is reported to lie about S.S.W. $\frac{3}{4}$ W. 6 miles from Draper isle.

Caution.—The existence of these sunken rocks and probably of more in their vicinity, renders it advisable for a vessel making a passage not to go to the northward of a line from Termination isle to the south end of South-east isles.

The COAST.—About 2 miles to the eastward of Lucky bay, the land trends to the north, north-east and east, and the low sandy coast forms a bay 4 or 5 miles deep, extending 12 miles to Cheyne point. In the western part of this bay is a bight with numerous islets and rocks off it, and between two clusters of these islets there are soundings in 10 fathoms, at 2 miles from the mainland, towards which the depth gradually decreases to 4 fathoms at half a mile from the beach. This bight appears to give complete shelter from westerly and northerly winds, and is defended to the eastward and southward by small islands and reefs, both contiguous and in the offing; but the passage to it lies among numerous dry and covered rocks, which are very little known. There are also several small islets and rocks in the eastern part of the bay, the largest being Station islet, which lies 5 miles to the westward of Cheyne point.

At 3 miles to the eastward of Cheyne point is another point, from which mount Belches rises to a height of 550 feet. From this point cape Arid bears about E. $\frac{1}{2}$ S. 29 miles, the land between forming a bay 8 miles deep in the eastern part.

The coast between mount Belches and cape Arid is sandy and generally low, with higher land on its projecting parts.

The space, from 10 miles E.N.E. of Mondrain isle to 13 miles westward of the summit of cape Arid, is occupied by a chain of small rocky islands and dry and covered rocks, extending to about 7 miles from the shore.

Twin peaks, the most conspicuous of these islands, lie nearly West 16 miles from cape Arid; they are separate islands, 2 miles apart, bearing from each other nearly N.E. $\frac{3}{4}$ E. and S.W. $\frac{3}{4}$ W., and are visible 27 miles. On steering to pass to the northward and eastward of Twin peaks, and the small islands immediately contiguous, the *Investigator* shoaled the water from 30 to 10 fathoms, and then suddenly to 3 fathoms, when the bottom was distinctly seen under the ship, at this time she was nearly in line with the Twin peaks, 2 miles from the north-eastern one; and steering towards the two easternmost islands of this chain, the water immediately deepened to 7 fathoms; between these islands were 20 fathoms, in a channel about three-quarters of a mile wide.

Duke of Orleans bay, immediately to the north-east of mount Belches, affords good shelter; there are two sunken rocks in the middle of the bay, which can be seen from aloft by the kelp.

Tagon harbour.—The coast from Duke of Orleans bay trends about East 18 miles to Tagon harbour, it has several islands and sunken reefs off it; the clearest passage appears to be tolerably close inshore, and anchorage can be obtained should the wind fail. Tagon harbour is formed by a high bluff extending in a southerly direction about one mile.

The anchorage is on the east side of this bluff in 6 fathoms, white sand, with the extreme of the bluff bearing S.S.E.

Water can be obtained by digging at the back of the sand hills.

CAPE ARID in lat. $34^{\circ} 2' S.$, long. $123^{\circ} 7' E.$, is sterile, and rises to rather a peaked summit, 1,160 feet high, the land to the northward of it is low and forms a large sandy bight on each side; that to the westward, which is 10 miles across, N.W. $\frac{3}{4}$ W. and S.E. $\frac{3}{4}$ E., and 5 miles deep, has not been distinctly traced, but it contains two small islands near its shore. Tagon harbour is in the north-west part of this bight.

The cape is bordered by many small rocks and breakers, which extend nearly a mile from the coast, and $1\frac{1}{2}$ miles off its western extremity there is a detached reef.

MIDDLE ISLAND, south of cape Arid, is the largest of the Recherche archipelago; the round hill on its north-west point is visible about 22 miles. The channel between cape Arid and Middle island is about 3 miles wide and is filled with small islands and reefs. Between these and the north-east point of Middle island there is a passage with 16 to 9 fathoms water, and from 14 to 20 fathoms are found within a mile of the island on its east and south sides; the west side has no bottom in 14 fathoms, at a quarter of a mile from its steep rocky coast.

Goose isle bay.—Goose isle, which lies about one mile off the north side of Middle island, is small and very rocky, but bold to approach having deep water close to it, except on the south-east side. Goose isle bay is an indentation of the north side of Middle island, and consists of three sandy beaches separated from each other by rocky points; between which and Goose isle, anchorage may be found on a sandy bottom.

Anchorage.—Between Goose isle and the middle sandy beach, where the anchorage is contracted, there is a shoal with 3 fathoms water on its deepest part; to the westward of which the depth to anchor in is 7 fathoms, in line between the western sandy beach and the west end of Goose isle, with the north-west point of Middle island W.N.W.; the bottom of sand and weeds will then be plainly visible.

On the east side of the bar the anchorage is in 11 and 12 fathoms water between the north points of the two islands, at about three-quarters of a mile from each; but the anchor does not hold so well here as in the former situation, occasioned perhaps by the increased depth of water; there is also a small rock above water, lying a third of a mile from the east side of Goose isle, having 7 fathoms close to it.

Supplies.—Among the tufts of wiry grass on the summit of Goose isle, and on most of the neighbouring isles, a large bird, the goose (*Cereopsis Novæ Hollandiæ*), is to be found during the summer months, and may be easily taken. Firewood of small size may be

procured on Middle island, in sufficient quantity for the supply of two or three ships; but no fresh water is to be had, except perhaps during the winter; Captain Flinders found even the drainings from the hills too salt to be drinkable in the month of January. Cape Arid appears more likely to afford fresh water, which should be sought in the bight on either side, at the foot of the high land that forms it. During the summer, a great quantity of salt may be obtained from a small lake behind the eastern sandy beach in Goose isle bay.

The tides are very weak and inconsiderable in this neighbourhood, and are much influenced by the wind.

Dangers N.W. of Middle island.—To the north-west of Middle island there are several small detached reefs and sunken rocks, the nearest of which lies N.W. $\frac{1}{2}$ N. $1\frac{1}{2}$ miles from the round hill on the north-west point, and does not always show itself. There is a clear passage nearly a mile wide between this and a small dry rock W. $\frac{1}{4}$ S. from it, which has 28 fathoms water within half a mile of its north side. Two covered patches lie respectively $1\frac{1}{2}$ and $2\frac{1}{2}$ miles to the westward of the small dry rock.

Low Flat isles are four in number, extending between 4 and 11 miles westward from Middle island, and surrounded with breakers; there is also a small rocky island E.S.E. 6 miles from Middle island, with breakers off its west side, and a detached reef at one mile from its north-east point.

Douglas isle lies S.W. by S. nearly 3 miles from the south-west point of Middle island, with a clear passage between them, and no bottom with 35 fathoms at a mile from the north side of the former island, which is low and rocky, and rises quickly to the summit of steep rocky cliffs that face to the southward and westward. A deep notch in the middle, over which the sea must break in rough weather, gives it the appearance of two isles near each other; the eastern half being very rocky and uneven, and entirely without vegetation.

THE SOUTH-EAST ISLES lie respectively S.E. $\frac{3}{4}$ E. 23 miles, and S.E. $\frac{1}{2}$ S. 26 miles from the summit of cape Arid; the southern isle appears at a distance as two islands lying close together, is about 3 miles long N.E. by N. and S.W. by S., and is nearly divided in two

by a narrow strip of low land. Breakers lie W. by N. 2 miles from its north point.

The northern isle, which is about one mile in extent, lies N. by E. $\frac{3}{4}$ E. nearly 6 miles from the former; it has not been approached very closely, but a reef was observed by Captain Flinders lying 4 or 5 miles from it in a N.E. by E. direction.

D'Entrecasteaux's position of the southern of these islands is 6' of latitude more South, and 7' of longitude more East than the position assigned to it by Flinders and the Admiralty chart: there may be a third island, but Lieutenant P. P. King, H.M.S. *Mermaid*, made these islands from the S. by E. in 1818, and saw only two.

POLLOCK REEF.—This dangerous reef was discovered in 1834, by Captain Pollock, in the barque *Merope*, who describes it as extending 8 or 10 miles east and west, and being about 100 yards broad, with apparently about 2 feet water upon it. The western extremity, upon which alone the sea was breaking when the reef was seen at 7 a.m., is in lat. $34^{\circ} 35'$ S., long. $123^{\circ} 27'$ E., or S. $\frac{1}{4}$ W. 14 miles from the largest of South-east isles. Captain C. R. D. Bethune, H.M.S. *Conway*, in 1838, placed it in lat. $34^{\circ} 34'$ S., long. $123^{\circ} 25'$ E., and observed: "I steered to make the Pollock reef, and at daylight was 2 miles from it; it breaks heavily over a space of about a quarter of a mile; at North 2 miles from it there are 40 fathoms water, sand." Lieutenant J. S. Roe, R.N., in 1856, when passing at a distance of $3\frac{1}{2}$ miles to the southward of Pollock reef, under favourable circumstances, ascertained the position of that part of the reef on which the sea breaks to be 14 miles S. $\frac{1}{2}$ E. from the nearest part of South-east isles, the breakers extending one-third of a mile in an east and west direction, and one-third of a cable in width.

CAPE PASLEY forms a hill that is visible about 30 miles, and bears about E. $\frac{1}{2}$ N., distant nearly 17 miles from the summit of cape Arid. The cairn on its summit is 345 feet above the sea; there is a spring at its base near the shore. A low islet lies 3 miles southward of the cape, with some rocks and breakers extending nearly 2 miles to the north-east from the islet, between which and the mainland are soundings in 28 to 34 fathoms, shoaling to the N.E.; but in approaching the cape from Middle island a look-out must be kept for a small dry rock surrounded with breakers, S.W. $\frac{1}{2}$ S. nearly 11 miles from the summit of this cape, and about the same distance from that

of cape Arid ; the rock is steep-to having no bottom with 34 fathoms a mile from its north side.

Between these two very projecting capes there is an extensive sandy bight open to the S.E., which has not been explored, but appears capable of affording shelter from westerly and northerly winds.

Malcolm point, N.E. $\frac{1}{2}$ E. 14 miles from cape Pasley, is low and sandy, with a dry rock close to it, and a ledge of rocks extending from it upwards of 2 miles to the north-eastward.

The **COAST** for 5 miles to the eastward of cape Pasley forms a slight indentation, fronted by some small islets. The depth decreases from 28 fathoms off cape Pasley to 10 fathoms outside a sunken rock, which lies S. by E. $\frac{1}{2}$ E. $2\frac{1}{4}$ miles from Malcolm point, and upon which the sea only breaks at times. From Malcolm point a low sandy coast curves round into a sandy bight and then trends north-east 11 miles to Dempster point.

Israelite bay,* just to the northward of Dempster point, affords good anchorage in 3 fathoms water, inside a reef that extends in an E.S.E. direction from the shore.

There are several shoals in Israelite bay, which can, however, be seen from aloft.

Between the months of November 1878 and January 1879, the prevailing winds were from the eastward, with hazy weather.

Telegraph station.—There is a post and telegraph station at Israelite bay.

Round isle is a conspicuous small rock, bearing N.E. by E. $\frac{3}{4}$ E., distant 17 miles from the northern of the South-east isles. Two small rocks lie about half a mile off its north and north-west sides ; they are very conspicuous, and are the only dangers known to exist in its vicinity.

THE EASTERN GROUP of the Recherche archipelago consists of eight low sterile rocky islets and a rock above water, lying from 11 to 18 miles off Dempster point, and scattered over an extent of 10 or 12 miles. The southernmost and largest island is 2 miles long, with some vegetation on its surface ; and there are hills visible 24 miles on its north and south ends.

See chart, No. 1,059.

* There is occasional communication with Israelite bay by steam vessels from Port Adelaide.

A chain of sunken rocks appears to connect this island with the greater part of the group that extends 7 miles to the northward from it, leaving apparently clear channels between them and the remaining two islands to the westward; one of these islands lies from Malcolm point E. by S. $\frac{1}{4}$ S. 11 miles, and the other E. $\frac{1}{2}$ N. 14 miles, with soundings of 20 to 23 fathoms between them and the mainland.

Aspect.—A level bank of land commences behind cape Arid, where it bears the appearance of having once formed the seashore; it continues thence with a remarkably uniform aspect, nearly E. by N. $\frac{3}{4}$ N. 435 miles, to the head of the Great Australian bight, preserving an elevation of 400 to 600 feet above the level of the sea, and intercepting the mast-head view of the interior country, with the exception of the first 60 miles.

Mount Ragged.—For 60 miles to the eastward of cape Arid some craggy, barren-looking hills, 15 to 30 miles in the interior, and of considerable elevation, are visible over the bank; mount Ragged, 1,920 feet high, the most remarkable of them, bearing from Malcolm point N.W. by N., distant 25 miles.

The COAST, from the point north-east 7 miles from Dempster point, trends to the north-eastward, and is low and sandy, without irregularity for 48 miles to a bluff, 285 feet in height, forming a bay 10 miles deep.

Islets near the coast.—There are two small islets, with a reef extending more than a mile off their east side, lying nearly East 7 miles from Dempster point, and about 4 miles from the shore. There are soundings in 18 fathoms about a mile S.E. of the breakers, but the water quickly shoals to 6 fathoms at 3 miles N.E. of them, and the depths are afterwards variable between 12 and 8 fathoms at 4 or 5 miles from the shore to the northward.

POINT CULVER.—The above mentioned bluff is the extremity, where the bank of level land behind the bluff approaches the coast, of a range of cliffs of moderate elevation, which commence about 5 miles to the north-westward of Malcolm point.

From this bluff, cliffs, forming the coast, extend E. $\frac{1}{2}$ N. 10 miles, to point Culver of Flinders, about 250 feet high, and then N.E. by E. $\frac{1}{2}$ E., upwards of 70 miles, without any remarkable feature

by which one part can be distinguished from another, except at 47 miles from point Culver, where a slight projection forms point Dover.

These cliffs are about 500 feet high; the upper third part of them is brown, and the lower portion almost white; each small projection presents the appearance of a steep cape, as it opens out in sailing along; but before the ship arrives abreast of it it is lost in the general uniformity of the coast. Point Dover and the bluff are exceptions to this general uniformity, but it is necessary to be near the land before even these are distinguishable.

Soundings.—Dry rock.—Soundings in 28 to 21 fathoms are found from 4 to 7 miles off the base of these cliffs, and no dangers lie near them, except a small dry rock, 16 miles from point Culver. There are 21 fathoms water a mile from the shore to the eastward of point Dover; the soundings increase to 34 fathoms at 27 miles S.E. of it, on a bottom of brown sand mixed with coral and shells.

Eyre sand-patch anchorage lies about 155 miles north-eastward of Israelite bay. This place, at which there is a telegraph station, may be easily recognised by the white sand-patch, and by a peaked sand-hill covered with scrub $4\frac{1}{2}$ miles inland, bearing N.E. from the anchorage. It is said that vessels with telegraph materials have ridden in safety at this anchorage during heavy weather from all quarters. There is communication by steamer four times a year.

LOW SANDY POINT.—From point Dover the cliffs curve into a bight, 50 miles across to a low sandy point in lat. $32^{\circ} 18' S.$, long. $126^{\circ} 25' E.$, about 7 miles eastward of Eyre sand-patch, being the projecting extremity of some sand-hills, and only sprinkled with vegetation. Here the soundings are 7 fathoms at 2 and 3 miles off the shore, increasing to 27 fathoms at 12 miles farther South.

The COAST.—From Low Sandy point, the sandy coast, having a level summit, on which there are some shrubs and trees, extends with a slight curve to the southward turning gradually to E. by N. $\frac{1}{2}$ N. nearly 99 miles, to another low point in lat. $32^{\circ} 1' S.$, long. $128^{\circ} 15' E.$ The soundings are between 7 and 15 fathoms at 3 to 8 miles off this coast, and are tolerably regular as far as the latter point, at 2 miles to the southward of which there are 5 fathoms, increasing to 25 fathoms at 27 miles in the same direction.

From the low sandy point in long. $128^{\circ} 15' E.$, the coast, which has low sand hills at the back, trends N.E. by E. $\frac{1}{2} E.$, 35 miles, curving slightly outwards, to Eucla roads. A limestone ridge, from 250 to 350 feet high, is about 10 miles inland northward of the low sandy point, and gradually approaches the coast towards the vicinity of Eucla. This part of the coast should not be approached nearer than 5 miles.

EUCLA ROADS, in lat. $31^{\circ} 44' S.$, long. $128^{\circ} 54' E.$, affords shelter at all times for vessels not exceeding 12 to 13 feet draught; and is the only known anchorage between Eyre sand-patch and Fowler bay, a distance of upwards of 300 miles. The anchorage is about half a mile offshore in a depth of $2\frac{1}{2}$ to $3\frac{1}{4}$ fathoms, sand, and is protected by a rocky shoal lying to the southward and south-west, which has depths of one to 3 fathoms on it, with its outer edge, generally marked by breakers, $1\frac{1}{2}$ miles from the beach.

Beacons.—Two beacons, which are poles surmounted by casks, painted red, are situated on the sand hills close to the shore, $1\frac{1}{4}$ miles westward of the anchorage. These beacons are distant about 250 yards from each other, and nearly in line, bearing W. by S., lead to the anchorage (*see* Directions). A similar beacon, painted black, is erected on the summit of a sand hill, 41 feet high, one mile east-north-east of the red beacons. The best landing is about half a mile east of this beacon, although usually there is good landing anywhere on the sandy beach near the beacons.

The coast near the red beacons is a low sand bank, covered with bushes, and not more than 15 feet high; the sand hills rise gradually to the north-eastward, attaining a height of 50 feet $2\frac{1}{2}$ miles from the red beacons. A limestone ridge rises steeply from the Roe plains behind the coast sand bank, and is about $2\frac{1}{2}$ miles inland north of the roads, and close to the coast 6 miles to the east-north-east of the red beacons. This ridge is from 270 to 350 feet high, cliffy near the summit, and covered with mallee scrub.*

Delisser sands, near the shore, about 4 miles east-north-east of the red beacons, is a patch of bare sand stretching about $1\frac{1}{3}$ miles

See chart, No. 1,059.

* Mallee scrub is composed of dwarf species of eucalyptus called mallee by the natives; the *eucalyptus dumosa* in South Australia and probably allied species in other parts of the country. The appearance is a dark brown mass of bushes as far as the eye can reach.

north-east and south-west, and rising to several conspicuous bare peaks, the highest of which, near the centre of the sands, is elevated 114 feet.

A rocky bank, with depths of $2\frac{1}{2}$ to 3 fathoms, nearly 2 miles in length, and on which the sea breaks with a heavy swell, lies parallel to the shore, and $1\frac{1}{2}$ miles off, southward of Delisser sands. The channel northward of this bank has a least depth of $3\frac{1}{4}$ fathoms.

Eucla sands.—For upwards of one mile from the eastern end of Delisser sands the coast is a low sand bank, with the limestone ridge, here about 280 feet high, half a mile inland. Eucla sands, partly bare, then commence, extending back a quarter of a mile to the limestone ridge, which rises above them.

WILSON BLUFF, a nearly perpendicular cliff, 296 feet high, is remarkable as being the western extreme of the long line of cliff, which commences at the head of the Great Australian bight. The bluff is dark, but immediately eastward of it the lower part of the cliff is white, and continues so for about $2\frac{1}{2}$ miles, or to the western extreme of Murdeyerrah sands. The summit of these sands is a bare peak 122 feet high, 5 miles eastward of Wilson bluff. Murdeyerrah sands are on the slope of scrub-covered hills, which rise to an elevation of 330 feet, northward of the sands. The boundary between South and Western Australia meets the coast rather more than one mile west of Wilson bluff.

DIRECTIONS FOR EUCLA ROADS AND ANCHORAGE.—Wilson bluff is the best landfall to make on approaching Eucla, and having identified it, and the bare sand peaks of Delisser sand, a stranger may proceed to the anchorage without difficulty. From a position about one mile south of Wilson bluff, steer along-shore W. by S., not shoaling the water to less than 4 fathoms, and keeping a look out for the north-eastern extreme of the rocky bank southward of Delisser sands; when the highest peak of those sands bears N.W. (which bearing leads close eastward of the eastern extreme of the rocky bank), bring the summit of Wilson bluff to bear N.E. by E. $\frac{1}{4}$ E., and alter course to S.W. by W. $\frac{1}{4}$ W., keeping Wilson bluff astern, until the western red beacon is open only a little northward of the eastern red beacon, bearing W. by S. Then steer for the beacons on this bearing, until the black beacon

bears N.W. by W., when anchor in 3 fathoms sand, half a mile off shore, and south of the landing place. A small vessel may anchor in $2\frac{1}{2}$ fathoms, 3 cables north-east of this position. There is a passage into Eucla roads, with a depth of $3\frac{3}{4}$ fathoms, west of the rocky bank south of Delisser sands; but as the sea breaks across in bad weather, and the mark which leads through, Moopina head station (on the slope of the limestone ridge inland), in line with the 50 feet sand hill, $1\frac{1}{4}$ miles north-eastward of the black beacon, bearing N.W. by N., could not be easily identified by a stranger, it should not be attempted without some local knowledge. The 10-fathoms line is about $2\frac{1}{2}$ miles offshore near Eucla roads.*

Tides.—It is high water, full and change, in Eucla roads at 11h. 5m.; springs rise 5 feet.

Telegraph.—The combined telegraph station of the South and Western Australian Governments, on the overland line between Perth and Adelaide, is situated half-a-mile north of the landing place at Eucla roads. This station is connected with the universal telegraph system.

Its position is in lat. $31^{\circ} 42' 48''$ S., long. $128^{\circ} 53' 31''$ E., by telegraphic signals from Adelaide (Adelaide Observatory being in long. $138^{\circ} 35' 6''$ E.). Except the telegraph station, there was no settlement at Eucla in 1880. There is monthly mail communication overland with Adelaide, and also with Albany by schooner.

Meteorological observations.—In 1890, the mean height of the barometer at Eucla was 30·018 inches, the maximum 30·47 inches, the minimum 29·36 inches, and the mean temperature 63° Fahr., the maximum being 115° in January and the minimum 34° in August. The rainfall in the year was 7·5 inches; the mean annual rainfall during 14 years being 9·9 inches, the maximum fall 13·78 inches in 1877 and the least 6·37 inches in 1878.

Supplies.—Sheep may possibly be obtained from Moopina station; and water from Chinalta well, half-a-mile east of the landing place; but no other supplies could be got at Eucla in 1880.

The **COAST** from Wilson bluff trends E. $\frac{3}{4}$ N. for 63 miles in nearly a straight line; then E. $\frac{1}{4}$ S. 26 miles; and after that,

* A jetty has been constructed at Eucla.
See chart, No. 1,059.

E. by N. $\frac{1}{2}$ N. 15 miles, to the point situated 4 miles south-west of the head of the Great Australian bight. Eastward of Murdeyerrah sand, already described, the coast continues steep, dark, and about 300 feet high, to longitude $129^{\circ} 19' E.$, or 15 miles eastward of Wilson bluff; a perpendicular cliff, with a white substratum, then begins, and extends without any prominent recognisable feature to the head of the Great Australian bight. The Nullabor plateau is reported to rise at the back of this cliff in a slope of about 10 feet per mile, so that the elevation is not sufficient for any land to be visible beyond the cliff from the sea. The western part of the cliff is about 325 feet high, midway between Eucla and the head of the Great Australian bight the height is about 270 feet, and it gradually decreases in height to the eastward, being elevated from 200 to 170 feet for the last 30 miles. There are no dangers off this coast, the depth being generally between 20 and 30 fathoms sand, to within 2 miles of the cliff, with little alteration in the soundings for a distance of 20 miles off shore. There is a depth of only 35 fathoms 50 miles south of the coast midway between Eucla and the bight.

HEAD OF THE GREAT AUSTRALIAN BIGHT.—Twin rocks, lying near the shore off the junction of the cliff and sand at the head of the bight, are situated in about lat. $31^{\circ} 29' 45'' S.$, long. $131^{\circ} 8' 15'' E.$ Conspicuous bare sand-hills stretch inland upwards of a mile from the head of the bight, rising to an elevation of 186 feet. There is usually a heavy surf on the beach here, even in very fine weather, which breaks in 3 fathoms, at a distance of about half-a-mile off-shore and renders landing impracticable, or at any rate very hazardous. The general direction of the south coast of Australia, which from King George sound has been east-north-east, now changes to the south-east, and is fully exposed to the heavy south-westerly swell, which constantly rolls in, even during the season of south-easterly winds.

CAPE ADIEU.—S.E. by E. $\frac{1}{2}$ E., 60 miles from the head of the bight, is a dark cliffy point, 120 feet high. The highest land on this part of the coast is a dark wooded hill, elevated 565 feet, situated N. by E. $6\frac{1}{2}$ miles from cape Adieu.

The coast between the head of the Great Bight and cape Adieu curves slightly inwards, and consists of a series of low, dark, rocky points and sandy beaches, fronted by rocks and foul ground, on which

the swell breaks, to a general distance of half-a-mile off-shore. Inland, dark hills, from about 250 to 350 feet in height, are visible, broken here and there by conspicuous bare sand-hills or patches, the positions of which are marked on the chart. Sunken rocks lie off cape Adieu, the outer ones near being situated 3 miles west, and 2 miles south-south-west, respectively from that cape.

Sunken reef.—A sunken reef, about half-a-mile in extent, north and south, and on which the sea breaks with a heavy swell, lies with its south extreme 2 miles off shore, 17 miles north-west of cape Adieu. There are three round-topped hills, about 250 feet high, at the back of the beach north of this reef. The depth is 14 fathoms midway between the reef and the shore, and upwards of 20 fathoms close to the southward.

D'Entrecasteaux reef, the centre of which is $11\frac{1}{2}$ miles west of cape Adieu, and the south extreme nearly 10 miles off shore, is in two parts; the north part is about 2 miles square, and all under water, with the exception of some rocks near the north-east extreme, which are awash at low water; the south part, which lies upwards of one mile south of the south side of the north part of the reefs, is about half-a-mile in extent, north and south, and breaks only with a heavy swell. The edges of the north part of D'Entrecasteaux reef are always marked by breakers.

There are 22 to 26 fathoms between this reef and the bare sand on the shore to the north-eastward, and 33 to 36 fathoms one mile from its southern side. The soundings are not a good guide in approaching this part of the coast, and it should be given a wide berth at night.

NUYTS REEFS extend 9 miles to the southward from cape Adieu, and consist of several bare rocks above water, and sunken rocks. The highest rock, which is 43 feet high, lies $7\frac{1}{2}$ miles south of cape Adieu, and consists of two islets above water, connected by rocks which cover at high water; these islets appear steep-to, except off the north point where the sea breaks nearly 2 cables to the northward of some rocky heads which lie off that point. There are three reefs $1\frac{1}{2}$ miles to the southward of the highest rock, the centre of the north-eastern one is awash at high water and the others are always covered. The two southern reefs do not always break, but with a westerly gale and high swell, the breakers on them can be

seen before the islets are sighted. Two bare rocks with rocky heads between and lying close together, the north-eastern one being 30 feet high, bear E.N.E. $1\frac{1}{2}$ miles from the highest rock. The northern of the Nuyts reefs, 20 feet high, is N.N.E. 5 miles from the highest rock, with a sunken reef extending nearly one mile to the southward of it. There are depths of 12 to 28 fathoms between this reef and the southern islets of Nuyts reefs, and 27 to 38 fathoms close southward of the southern sunken reefs.

Cape Nuyts, 10 miles eastward of cape Adieu, is a rocky cliff with sand-hills 192 feet high immediately above. A hill, 397 feet high, is 3 miles north-westward of cape Nuyts, and is the western summit of three of nearly equal height, the slopes of which are covered with dense mallee scrub, and descend to the coast between cape Nuyts and cape Adieu. Between these capes the coast consists of low, dark cliffs with some sand-hills immediately above them here and there, fronted by foul ground, the outer rocks of which are one mile offshore, and break only with a heavy swell. A sunken rock, which seldom breaks, lies one mile south-east of cape Nuyts; there are 23 fathoms a quarter of a mile south of this rock.

Scott point, $2\frac{1}{2}$ miles E.N.E. from cape Nuyts, is 161 feet high, faced by steep cliffs; the point slopes down to the swamps behind, and appears like an island when seen from the south-west or south-east. An isolated rock, 60 feet high, lies eastward of the north-east side of cape Nuyts; between it and Scott point the coast is sandy, and fronted by rocks to a distance of 3 cables from the beach.

Scott bay, eastward of Scott point, is full of rocks and breakers; there is an extensive area of bare sand at the back of this bay, the summit of which is a peak 123 feet high.

FOWLER POINT, 7 miles eastward of cape Nuyts, is faced by dark cliffs, and appears from seaward flat on the top. On its south-west side, sand-hills, sparsely covered with vegetation, are slightly elevated above the summit of the cliff; its north-east side is lower, and slopes gently upwards, the hills in that direction being covered with coarse grass. The south-east extreme of the point is 158 feet high, and there are depths of 10 fathoms 3 cables from that part of the point, off which rocks extend $1\frac{1}{2}$ cables to the

south-eastward. Three rocky banks, with depths of 9 to 10 fathoms over them, are situated from one-half to $1\frac{1}{4}$ miles to the south-eastward of Fowler point; the sea breaks on these banks in very high rollers with the heavy swell accompanying and following a south-westerly gale.

FOWLER BAY,* PORT EYRE, is in the bight north-west of Fowler point and affords anchorage with all winds, as the sea raised outside by a south-east wind decreases quickly in height inside the 5-fathom line to the northward of Fowler point. A rock awash at low water lies 2 cables offshore, one mile north-west of the pitch of Fowler point; and in the south-western part of port Eyre, a flat, with depths less than one fathom, extends 4 cables from the beach. In the western part of the port, the bare sand-hills, which are at the back of Scott bay, come down to the beach; their north end is steep and conspicuous, with the telegraph and police buildings near it; to the northward, the land is low and swampy, with a sand-bank behind the beach, and a dark scrub-covered range, 180 to 217 feet high, one to 2 miles inland.

Nantabi sand, nearly 8 miles north-eastward of Fowler point, and 136 feet high, is a conspicuous mark on the north shore of Fowler bay.

There is often a large camp of aborigines on the beach at port Eyre, the place being a Government depôt for the distribution of rations and blankets to them.

DIRECTIONS AND ANCHORAGE.—From the south-east the aspect of Fowler point is somewhat similar to that of cape Nuyts and Scott point, but as the land recedes so much to the northward of Fowler point, it is not likely to be mistaken for either of those points, except at night with a moderate amount of light, and hazy weather, when the bare sand hills eastward of Scott point especially are difficult to distinguish, and at a distance of a few miles it may appear as if there were a deep bay in that direction. Vessels should not attempt to enter port Eyre at night, unless Fowler point has been sighted before dark, or if there is no doubt as to their position. In fine weather Fowler point may be rounded at a distance of one mile, but, with a very heavy swell or westerly gale, vessels should keep 2 miles from the point until it bears south of W.S.W.,

* So named by Flinders after the first lieutenant of the *Investigator*.

See chart, No. 1,061.

and then steer to the north-west, taking care to avoid the rock awash one mile north-west of Fowler point; when the northern steep fall of the sand-hills near the telegraph office bears W. by N., steer for it on that bearing; large vessels anchor in 5 to $5\frac{1}{2}$ fathoms when Fowler point bears S. by E. $\frac{1}{2}$ E., and other vessels according to draught further in. Small vessels able to anchor inside the 3-fathom line only require to allow a depth of about 3 feet more than their draught for safe anchorage; but outside the 3-fathom line about one fathom should be allowed for the increased height of the sea with a strong south-easterly wind. The bottom in the anchorage is sand and weed, and good holding ground.

Landing place.—The best landing place is opposite the south building of the settlement; and there is usually good landing anywhere on the beach for half a mile to the southward of the telegraph office. Half-way from the telegraph office to Nantabi sand a heavy surf commences, and increases to the eastward. A jetty has recently been constructed in Fowler bay.

Tides.—It is high water, full and change, in port Eyre at noon; springs rise $5\frac{1}{2}$ feet.

Telegraph office and communication.—The telegraph office is in lat. $31^{\circ} 59' 53''$ S., long. $132^{\circ} 26' 39''$ E., Snapper point (Adelaide) being in long. $138^{\circ} 31' 0''$ E. It has communication with the universal telegraph system. There is also communication by fortnightly steamer, or overland fortnightly to Port Lincoln thence steamer, to Port Adelaide.

YATALA REEF lies S. by E. $37\frac{1}{2}$ miles from Fowler point; the reef is a rock of small extent, with probably a depth of less than one fathom over it; on this part the swell always breaks; at a distance of 2 cables to the southward is a rock with a greater depth on it, which only breaks occasionally. This reef is on the east side of a bank with less than 30 fathoms water, the north extreme of the bank is $1\frac{1}{4}$ miles from the reef, the south extreme nearly 2 miles, the west side upwards of one mile, and the east side less than half a mile off. Outside the bank for a distance of 5 miles from the reef, the soundings are from 34 to 38 fathoms, and do not vary sufficiently to give good warning of too close an approach to the reef. The position of this dangerous reef is in lat. $32^{\circ} 39'$ S., long. $132^{\circ} 35'$ E., and it should not be approached at night, or in hazy weather.

Clare bay, a landing place for small craft, is about one mile westward of Eyre bluff; there is a mooring buoy in $4\frac{1}{2}$ fathoms in its western bight, with a swinging space of about 300 feet, and a depth of 15 feet at low water springs round it. Vessels should be made fast to the buoy.

EYRE BLUFF, E.N.E. 13 miles from Fowler point, is a steep rocky islet, about 120 feet high, close to the coast, with which it is connected by rocks which dry at low water. Eastward of Nantabi sand the sandy coast continues for about 4 miles, it then changes to red cliffs, with rocks and sandy beaches at their base, and so continues for upwards of 5 miles, to one mile eastward of Eyre bluff. About 4 miles north of Nantabi sand a dark wooded range commences, and extends nearly to Sinclair point; behind Nantabi sand and Eyre bluff the summits of this range are about 400 feet in height. A patch of foul ground, with a depth of 10 fathoms, lies S.S.W. $4\frac{1}{4}$ miles from Eyre bluff; generally the depth is 20 fathoms $2\frac{1}{2}$ miles off-shore, from Nantabi sand to Sinclair point.

SINCLAIR POINT, S.E. by E. $\frac{1}{4}$ E., 16 miles from Eyre bluff, projects nearly 2 miles from the general line of coast; its summit is 154 feet high. The south extreme of this point is a smooth granite slope, about half way up which is a bare limestone cap, rising 5 or 6 feet perpendicularly, the land above being covered with coarse grass. Landing may be affected in fine weather in a small bay on the east side of Sinclair point, north-east of the summit; but there is no anchorage under the point. The coast from one mile eastward of Eyre bluff is a sandy beach for upwards of 6 miles, with some bare sand hills at the back of the western part; there is then a succession of low rocky points, with sandy bays between, and scrub covered rises behind, for 6 miles; after which a sandy beach (inland from this, bare sands, the summit of which, Chadinga hill, is 172 feet high, stretch 2 miles), extends 2 miles to the north-west part of Sinclair point. There are heavy breakers on the rocks off this part of the coast, and a patch of 10 fathoms, rock, 4 miles W.N.W. from Sinclair point.

Sinclair island and rocks.—Sinclair island, $2\frac{1}{4}$ miles south of Sinclair point, is 53 feet high, and composed of granite. A rock, 5 feet high, with a breaker close to its north-east side, lies nearly midway between Sinclair island and Sinclair point. Pudding rock, 2 miles south-east of Sinclair point, is a bare granite rock,

19 feet high. Midway between Pudding rock and Sinclair point there is a reef awash at low water, extending a quarter of a mile north-west and south-east; sunken rocks extend 4 cables south-west from this reef, and there is a sunken rock between the reef and Pudding rock. The depth between the above reef and Sinclair point is 7 fathoms.

BELL POINT is nearly 10 miles south-eastward of Sinclair point, the coast between a sandy beach nearly straight, with sand hills above from 80 to 120 feet high. Bell point projects $2\frac{1}{2}$ miles south-south-west from the sandy coast. Its summit, 179 feet high, is covered with coarse grass, and the south extreme is a smooth low granite point, with rocks, that cover at high water, stretching off nearly 2 cables. A dark rock, a quarter of a mile long, and 15 feet high, lies $1\frac{1}{4}$ miles south-south-west of Bell point; it is surrounded, to the distance of 2 to 3 cables from it, by sunken rocks, on which the sea breaks heavily. Foul ground extends more than a mile south-south-west of this rock; the outer danger, close to which is a depth of 17 fathoms, breaks only with a heavy sea and swell.

DIRECTIONS and ANCHORAGE.—There is anchorage for small vessels, drawing less than 12 feet, at all seasons, in a depth of 2 to 3 fathoms, sand, in the bight on the north-east side of Bell point. A conspicuous bare sand peak, 115 feet high, and $2\frac{1}{2}$ miles north-north-east of Bell point summit, is situated on the north-east side of this bight; steer for this peak when it bears North, and about 5 miles distant, to pass between the reefs off Bell point and Flinders rock. When the shed near the beach, on the low neck of the northern part of Bell point, bears W. by N., alter course towards it; and anchor a vessel of about 10 feet draught in $2\frac{1}{2}$ fathoms, with the east extreme of Bell point bearing S. $\frac{1}{2}$ W., and the shed on the beach W. by N. Coasters occasionally load wool at this anchorage.

Flinders rock, E. $\frac{1}{2}$ S. 4 miles from the south extreme of Bell point, and N.N.W. $\frac{1}{4}$ W. from the highest Purdie island, has a depth of about 3 fathoms on it, with 7 to 10 fathoms half a mile off all round. This rock, when there is a moderate swell, breaks occasionally.

PURDIE ISLANDS, $6\frac{1}{2}$ miles south-eastward of Bell point, consist of one large islet, and several rocks above and below water. The large islet is 83 feet high, and of granite formation. A small

rock, about 10 feet high, lies 4 cables south of it; sunken rocks extend 3 cables north, and a chain of rocks, 5 to 15 feet high, and breakers, stretch $1\frac{1}{2}$ miles to the north-eastward. The eastern rock of the group is a round isolated lump, about 10 feet high, situated nearly $2\frac{1}{4}$ miles east of the large islet. The depth is upwards of 10 fathoms close to all the islets and rocks of this group.

ROCKY POINT, $6\frac{1}{2}$ miles eastward of Bell point, is low, with dark grass-covered hills behind, about 100 feet high. There is a rock awash at high water 4 cables west of the point, on the south and east sides of which the rocks do not extend more than one cable. The coast from Bell point to Rocky point is a sandy beach with bare sand hills behind, the most conspicuous of which are the sand peak already mentioned near Bell point, and another bare sand-hill, 120 feet high, midway between Bell and Rocky points. There are 5 to 6 fathoms three-quarters of a mile from the beach.

JAMES POINT, $8\frac{1}{2}$ miles eastward of Rocky point, has three dark rises, about 140 feet high, north-westward of it, with two bare sandhills, the eastern one elevated 155 feet, close to the westward of them. From Rocky point to these sand hills the coast is low and consists of rocky points and low cliffs, with sandy beaches between, and rocks extending about a quarter of a mile offshore. Abreast the western sandhill, $2\frac{1}{2}$ miles westward of James point, there is a rock on which the sea breaks, 6 cables from the beach.

Lounds island, $5\frac{1}{2}$ miles S.S.W. $\frac{1}{2}$ W. from James point, and 7 miles East of the highest Purdie island, is 67 feet high, and steep-to all round.

Lounds reef lies N. by W. $\frac{1}{4}$ W. $2\frac{8}{10}$ miles from Lounds island, and only breaks occasionally. There are depths of 10 to 16 fathoms, one mile off this reef.

PETER POINT, $3\frac{1}{4}$ miles E. $\frac{1}{2}$ S. of James point, and the point at the western entrance of Denial bay, has a grassy summit, 110 feet high, which slopes down gradually to the point. A rock, with a depth of 3 fathoms on it, lies S.W. by S. 7 cables from Peter point, and only breaks at times. Between James point and Peter point the coast forms a sandy bay, the most conspicuous object in which is Cowie Yalkeena, a bare sand-hill, 120 feet high.

NUYTS ARCHIPELAGO comprises a number of islands and rocks, stretching 40 miles south-westward from Denial and Smoky

bays; and was the eastern part of Australia (New Holland) discovered by the navigator Peter Nuyts in 1627. The only anchorages among the outer islands are north of St. Francis island and the Franklin islands, but the latter is only available in the summer months with S.E. winds. These islands are breeding places of the cape Barren goose (*cereopsis*); mutton birds (sooty petrels) burrow in the sandy soil, their holes being often inhabited by snakes, of which the black ones are venomous, the coloured ones, known as carpet snakes, killing their prey by constriction. There were no inhabitants on any of the islands of Nuyts archipelago in 1878, and the sheep stations at the back of Denial and Smoky bays are not close to the coast. Sheep are sometimes taken across to St. Peter island from the mainland.

ST. FRANCIS ISLES, the south-western group of Nuyts archipelago, consist of 11 uninhabited islands, of which the largest is St. Francis island; this island is upwards of 2 miles across, east and west, and north and south, and is nearly covered with a low green bush; the round summit on the east side of the island is 264 feet high, and the highest part of the west side is 227 feet. The sea breaks heavily on the exposed west, south, and east sides of the island, which are faced by steep cliffs. Petrel bay, on the north side, has a sandy beach, with a depth of 3 fathoms one cable off, and close beyond 7 to 10 fathoms, over sand and weed. A rock, 58 feet high, with a breaker one cable south of it, lies one cable off the south-east point of St. Francis island, and sunken rocks extend 4 cables south of the south point; the north and east sides, outside Petrel bay, are steep-to and free from danger. There is no water on St. Francis island, but a little might be obtained by digging.

Anchorage.—There is anchorage in Petrel bay, except perhaps with strong north-easterly and northerly winds, but a vessel compelled to seek shelter there would probably ride out safely any wind from those directions, if she were anchored far enough from the beach to be able to veer cable; N.E. winds seldom blow with sufficient force to raise a heavy sea at the distance this bay is from the main land. With westerly winds the best anchorage in Petrel bay is in about 9 fathoms, in the western part of the bay, about 4 cables off-shore, and the west point of the bay bearing N.W. by N.; small vessels may bring the point to bear more northerly, and the west end of

the sandy beach there, W. by S. In the summer, with S.E. winds, the best anchorage is at the eastern end of the bay, in 9 fathoms, sand and weed, with the west side of Egg island just open of the west side of Smooth island, N.N.E., and the north end of the east point of Petrel bay, East.

Smooth island, nearly one mile north of the east point of Petrel bay, is a smooth, round island, 115 feet high, and steep-to.

Egg island, three-quarters of a mile north of Smooth island, is 134 feet high, with a rounded summit, steep on the east side, and sloping on the west. It is steep-to, with the exception of a breaking rock, one cable from its north point.

Dog island, $1\frac{1}{2}$ miles north-east of the east point of Petrel bay, is 6 cables long north and south, and surrounded by light coloured cliffs, which on the east side rise to the summit, 199 feet above high water. There are a few detached boulders on the north and east sides of the island, and rocks stretch upwards of one cable from its east and north-east points, otherwise it is steep-to. The north side of the island falls steeply to the sea, while the south end is a gentle slope.

Freeling island, half a mile north-east of Dog island, is 116 feet high, and dark in appearance, with a rounded summit. Two rocks, awash at high water, lie $1\frac{1}{2}$ cables north of the north point of Freeling island ; elsewhere it is steep-to.

West island, 98 feet high, is nearly one mile W.S.W. from the west point of St. Francis island. There are a number of loose boulders on the slope of its west side, which have been washed there by heavy seas. Breakers extend 4 cables north of West island, and for half a mile to the southward there are high rollers which break at times. A long bare rocky islet, about 25 feet high, lies between West island and St. Francis island. The passage on either side of this rock should not be attempted.

Masillon island, 2 miles south of St. Francis isle, is 251 feet high, with three summits of nearly equal height. Its coast is very steep, and usually it is very difficult to effect a landing. There is a deep bight on the west side, but there is no anchorage in it.



With the exception of a few detached boulders near the shore, the island is steep-to.

Fenelon island, three-quarters of a mile south of Masillon island, is also very steep and apparently inaccessible ; it has only one summit, 189 feet in height. There is a rock above water 2 cables off the north point, and detached boulders extend one cable from the north-west point, and from the east point ; elsewhere the island is steep-to.

Cannan reefs.—The only rock above water of these reefs is 25 feet high, and lies S.S.W. $\frac{1}{2}$ W. $4\frac{1}{2}$ miles from Fenelon island ; it is nearly 2 cables long east and west, and washed bare by the sea. There is a breaking rock nearly 2 cables W.S.W. from the west end of this rock. A rock awash lies 3 cables north-north-east of the east end, and a rock, which breaks occasionally, lies 8 cables off in the same direction. The depths are 28 to 34 fathoms within one mile of Cannan reefs.

Hart island, in lat. $32^{\circ} 39' S.$, long. $133^{\circ} 9' E.$, and $5\frac{1}{4}$ miles west of Cannan reef, is the south-western islet of Nuyts archipelago, and a good mark to steer for when bound to port Eyre from the south-eastward. The island is a nearly bare rock, 65 feet high, and steep-to, except that a rock above water lies close to its north-east point, and a rock under water less than a cable from its south-west point. Yatala reef is 28 miles W. $\frac{3}{8}$ S. from Hart island.

Lacy islands.—The largest island of this group is 7 miles north-north-east of St. Francis island. It is 148 feet high, with a steep, apparently inaccessible coast, and free from outlying dangers. A small round islet, 50 feet high, is situated 2 miles N.W. by N. of this island. A rock, which covers at high water, with a sunken rock one cable north of it, lies 3 cables east of the round islet ; and a rock above water lies half a mile W.S.W. of it.

Evans island is E. by N. $\frac{1}{2}$ N. $5\frac{1}{2}$ miles from the largest Lacy island, and 122 feet high. Detached rocks extend a quarter of a mile west of the north-west point of the island ; also 2 cables south of the south-east point ; sunken rocks stretch 2 cables east from the last point, and there is a breaking rock half a cable from the south-west end of the island. The depth is about 10 fathoms close to all the

above rocks. In moderate weather landing may be effected in a little bay, on the east side of the north part of this island.

Flinders reef, $3\frac{1}{2}$ miles east of Evans island, and 6 miles north-west of the west end of Franklin islands, consists of two rocks, each about 10 feet high and 2 cables long, and lying N.N.W. and S.S.E. nearly 2 cables from each other. The swell breaks heavily on this reef, and there are depths of 17 to 21 fathoms half a mile from it all round.

Franklin islands are about 18 miles, E. by N., from St. Francis island; the two large islands of the group, each about $1\frac{1}{2}$ miles in length, are flat-topped, and joined together by a sandy bar, which dries at low water. The western island is 159 feet high; and the eastern nearly the same height, with a conspicuous bush on the summit at the north end. A chain of rocks, about one mile and a quarter in length, some of which are above water and the highest elevated 15 feet, lies from 3 to 7 cables off and nearly parallel to the south coast of the western island. A pyramidal rock, about 50 feet high, with rocks that dry extending nearly 2 cables from it, lies 6 cables east of the north point of the eastern island. Franklin islands are frequented by mutton birds (sooty petrel), and cape Barren geese (cereopsis); also by a large species of hair seal. Venomous black snakes are very numerous on these islands, and as they are not usually alarmed at the approach of human beings, great care is necessary to avoid treading on them among the low bushes with which the islands are covered.

Anchorage and directions.—The anchorage, available only with south-easterly winds, is on the north side of the western island, about 4 cables from the beach, in depths of 6 to 9 fathoms sand. In approaching this anchorage there are two dangers to avoid, a sunken rock which lies 2 cables north of the point at the west end of the western of the two sandy beaches, on the north side of the western island; and a rock, with a depth of about 6 feet over it and 3 fathoms one cable westward, which lies 4 cables north-west of the middle point on the west side of the eastern island. In steering for the west point of the Franklin islands, keep that point east of north after the pyramid rock, mentioned above, begins to shut in with the eastern island to avoid the rocks southward of the islands. Round the west side at the distance of about one mile,

and when the high water south point of the eastern island is in line with the high water north-east end of the western island, bearing S.E. by E. $\frac{3}{8}$ E. (S. 60° E.), steer towards the anchorage, keeping that mark on, until the point between the two sandy beaches on the north side of the western island bears S.S.E.; then alter course towards that point, and anchor almost immediately with the north-west point of the western island bearing W.S.W. A small vessel may anchor further in, with that point bearing W. by S.

ST. PETER ISLAND, separating Denial from Smoky bay, is nearly 8 miles long, north-east and south-west, and 4 miles broad at its southern end, tapering to a long low sandy point at its north-east point. The southern end of the island has two parallel ranges of hills, covered with bushes and coarse grass, and elevated about 140 feet. Mount Younghusband, in the northern part of the island, is a conspicuous landmark, 144 feet high, falling steeply on the north-east side to the low sandy point, and sloping gradually to the south-westward. A line of reefs, on which the sea breaks heavily, extends nearly 4 miles eastward of the southern part of St. Peter island; a large sandbank, which dries at low water, extends the same distance eastward of mount Younghusband, and a similar bank stretches 2 miles north-east of the low sandy point at the northern end of the island.

Gliddon reef, which dries at low water, lies with its southern extreme 4 cables south of the south point of St. Peter island.

Goat island, 195 feet high, is situated near the south-west side of St. Peter island, between which is a bank with less than 3 fathoms on it; rocks drying at low water nearly blocking up the passage. There is temporary anchorage about one mile north of the east end of Goat island, with south-easterly winds only; but the bottom is rocky in places. The west side of Goat island is free from danger.

DENIAL BAY, consisting of Tourville and Murat bays, has good anchorage in several parts; vessels of 12 to 13 feet draught can navigate its channels at all times of tide, while at high water there is sufficient depth for vessels of 15 feet draught at neaps, and 18 feet at spring tides.

TOURVILLE BAY, in the north-western part of Denial bay, is almost filled up by sand-banks which cover and uncover with the tide. The shores of the bay are lined by mangroves for the greater part; near cape Beaufort the land descends steeply to high-water mark, the hills rising here to an elevation of 140 feet.

Davenport is a mangrove creek on the southern side of Tourville bay, the entrance $2\frac{1}{2}$ miles north-west of Peter point. The least depth outside the entrance to the creek is 7 feet, between the mangroves it soon deepens to 2 and $2\frac{1}{4}$ fathoms.

Directions and anchorage.—Secure anchorage in Tourville bay can be found by vessels drawing less than 12 feet, and the anchorage is so confined that it is necessary to moor. Approaching Peter point from the south-west, bring that point to bear west of North when 2 miles from it, to avoid the shoal ground to the southward, and then steer for a position one mile East of the point, close to the entrance to the narrow shallow channel between the banks. As no leading mark can be given for proceeding up the channel, the position should be ascertained by bearings of Peter point and the north extreme of the mangroves on the southern side of the bay; when the water is smooth, and the tide low, the edges of the banks can be plainly seen. The deepest water is near the southern bank. The best position to moor is in mid-channel, with Peter point bearing about S. $\frac{1}{2}$ E., or with the summit of Goat island just open east of that point. To proceed into Davenport creek, when the summit of Goat island is in line with the east side of Peter point, steer for the north extreme of the mangroves just westward of the entrance to the creek on a W. by N. $\frac{1}{2}$ N. bearing, until the creek has well opened out, bearing S.W., when alter course to pass midway between the mangrove points, and up the creek. The most convenient place to moor is at the southern end of the first reach, before the creek turns to the north-west.

Tides and tidal streams.—It is high water, full and change, in Tourville bay at Oh. 50m.; springs rise 7 feet. The tidal streams attain a velocity of $2\frac{1}{2}$ knots at springs in the channels of Tourville bay.

Water.—A limited quantity of water can be obtained by digging

in the bare sand of Cowie Yalkeena above the sea beach, but care must be taken not to dig too deeply, or the water will become salt. The original native wells, about half a mile south of the anchorage in Davonport creek, were filled up with drifted sand in 1878.

MURAT BAY, the north part of Denial bay, has depths of 4 fathoms over a large area. It is protected seaward by extensive banks, northward and eastward of which there is secure anchorage in all weathers.

Cape Beaufort, the south-western point of Murat bay, is a bold dark point, with hills above covered with mallee scrub. The shores of Murat bay consist of sandy beaches and cliffy points, with a few mangroves on the beaches in the north part and near cape Thevenard. A hill, 133 feet high, is situated near a point 2 miles north-eastward of cape Beaufort. The north shore of Murat bay is lower, with scrub-covered hills rising gradually inland, the most conspicuous one, 223 feet high, being 3 miles from the coast. In the eastern part of the bay rocky reefs, with less than one fathom on them, extend one-mile from the shore.

Cape Thevenard, on the eastern side of Denial bay, projects $1\frac{1}{2}$ miles, and is connected with the land by a low neck with mangroves on it, very little above the level of high water springs. The cape is a square grassy point, 55 feet high, with a conspicuous clump of bush on the summit.

Daphne rock, which is awash at low neaps, lies half a mile S.S.W. of the south point of cape Thevenard. One mile west of that part of cape Thevenard is the north end of an extensive sand bank which dries at low water springs, and forms the western side of the channel into Murat bay.

Buoy.—A red buoy, with staff and ball, has been placed on the south edge of the Daphne rock, in 9 feet.

Bird rock, awash at high water, and consisting of granite boulders, is at the south-eastern end of the above sand bank, and north of the narrowest part of Yatala channel. The north end of a sand bank, which dries at low water springs, is 4 cables south of this

rock ; and thence shoal water extends to the southward to St. Peter island.

Beacon.—A black beacon, with a can-shaped head, 10 feet high, has been placed on Bird rock.

Cape Vivonne, the eastern point of Denial bay, is a flat grassy point, about 30 feet high, sloping gradually from the summit of a hill, 113 feet high, one mile to the eastward of the cape, which falls steeply to the coast south of it. A long sandy beach with some sand hills behind forms the north-eastern part of the bight between cape Thevenard and cape Vivonne ; at the south-eastern end of this beach, where the coast turns to the southward, is a conspicuous red cliff, about 60 feet high ; thence to cape Vivonne are low rocky points and sandy beaches, the rises at the back being covered with mallee scrub.

Directions and anchorage—Denial bay.—To enter Denial bay, from about 2 miles to the north-west of Goat island, steer to the north-east ; before Peter point bears West, bring the clump on cape Thevenard summit to bear N.E., and steer for it on that bearing, which leads up Yatala channel between the banks to one mile from Bird rock. If the clump on cape Thevenard cannot be made out, fix the position by bearings of mount Younghusband and the summit of Goat island. When Bird rock, marked by a black beacon, is in line with the north end of the red cliff, north of cape Vivonne, alter course towards the rock, keeping the mark on until half a mile from the rock, then steer to pass about 2 cables south of it. When the rock bears North, steer E. $\frac{1}{2}$ S. for the summit of the hill east of cape Vivonne, and keep the hill on that bearing until the clump on cape Thevenard bears N. $\frac{1}{2}$ W., a vessel will then be eastward of all dangers. The western part of Murat bay affords the best anchorage with strong westerly winds, the bottom being mud, and the holding good. With S.E. winds the best anchorage for moderate draught vessels is to the southward of cape Vivonne, about three-quarters of a mile north of the north-east point of St. Peter island, in a depth of 3 fathoms, mud. Mount Younghusband, bearing South, leads midway between Daphne rock, marked by a red buoy with staff and ball, and the sand bank to the westward, and also clear of the rocks off cape Thevenard ; from the south-eastward, keep the top of the cliff of cape D'Estree touching cape Vivonne,

bearing S.E. $\frac{1}{2}$ E., until mount Younghusband bears South, then proceed with the mount on that bearing until north of cape Thevenard. To enter Décrés bay from Denial bay, pass rather over half a mile south of cape Vivonne, then steer to the north-east, and bring the first high bare sand hill westward of Peter point summit in line with cape Vivonne, bearing West, which mark leads in 3 fathoms, north of the spit extending north-eastward from St. Peter island; this mark should be kept on until the summit of the hill, one mile eastward of cape Vivonne, bears N.W., when alter course towards cape D'Estree.

Tides and tidal streams.—It is high water, full and change, in Denial bay at 0h. 50m.; spring rise 7 feet. In the narrow parts of the different channels the tidal streams run at the rate of 2 knots an hour at springs. Along the shore, northward of mount Younghusband, the streams run $1\frac{1}{2}$ knots; during the rising tide the direction is E. by N. $\frac{1}{2}$ N., and during the falling W. by S. $\frac{1}{2}$ S.; in the northern part of Murat bay the streams are almost imperceptible.

Water.—There is a limited supply of water in a well near a hut on the north-west side of St. Peter island, at the southern end of some sand hills, $3\frac{1}{4}$ miles south-west of mount Younghusband. Elsewhere on the island brackish water can be obtained.

SMOKY BAY, east of St. Peter island, is protected by the shoals east of that island and Eyre island with its surrounding banks. Waterwitch channel, by which the bay is entered from seaward, can be navigated at low water by vessels drawing 21 feet, but the 4 fathoms channel has a width of only 2 cables at its narrowest part.

Cape D'Estree, 6 miles S.E. $\frac{3}{4}$ E. of cape Vivonne, divides Smoky bay into two parts, the north-west being called Décrés bay. The coast between cape Vivonne and cape D'Estree consists for the most part of two long sandy beaches, with a low rocky point between them, and low sand hills at the back. For 2 miles N.N.W. of cape D'Estree the coast is clifty, and about 70 feet high; the light coloured cliff at the pitch of the cape is 100 feet high, the land immediately behind being lower, but the scrub-covered hills, about $2\frac{1}{2}$ miles back, are slightly higher. A sand bank, which dries between half-tide and low water, lies 2 miles south-west of cape D'Estree, on the north side of Waterwitch channel; and another bank, with depths

of one foot to one fathom, is 3 miles south of that cape, on the south side of that channel.

Laura bay, a shallow bight, $2\frac{1}{2}$ miles N.E. by E. of cape D'Estree, is sometimes used as a shipping place, there being a small stone pier at the eastern point of the bay, from which a track leads to the nearest sheep station. With strong southerly winds the landing at the pier is bad, as there are some rocks near it; during these winds the best landing is on the beach close inside the western point of the bay. The overland mail track to Port Lincoln passes along the shore of Laura bay. Between cape D'Estree and Laura bay the coast is a broken limestone cliff.

The coast, south-east of Laura bay, consists of rocky points, low limestone cliffs and sandy beaches, with sand hills behind. One mile from the eastern point of Laura bay is a small rocky islet, 30 feet high; between it and the shore is a spit which dries. The hills inland are thickly wooded with mallee scrub; the most conspicuous being one, 143 feet high, one mile east of Laura bay; Saddle peak, a saddle-shaped sand peak, 93 feet high, close to the coast, 5 miles from Laura bay; and two long round-topped hills, the northern one 165 feet high, 3 miles further to the south-east. The shores of the south-eastern part of Smoky bay are very low, and in some places lined with mangroves, with swamps at the back. On the eastern shore, 10 miles south-east of Laura bay, there is a steep shell beach, on which the landing is good, and where cargo is sometimes shipped, coasters being able to anchor about a quarter of a mile from the beach.

Cape Missiessy, on the south side of Smoky bay, is the extreme of a low sand bank, with swamps to the eastward of it. Smoky bay hill, $2\frac{1}{2}$ miles south of this cape, and the first rise in that direction from it, is a dark peak, 107 feet high.

Eyre island, on the southern side of Smoky bay, is nearly entirely occupied by mangroves and swamps; the highest part of the island is the sand ridge which runs along the southern coast, and which near the middle is 25 feet above high water. Westward of Eyre island is a long, narrow, bare sandy islet, about 8 feet high; and at the south-west extreme of Eyre island shoals, and 3 miles north-east of the eastern Franklin island, are Goalen rocks, the

north-west of which is 10 feet high, and the south-east, on which the swell breaks heavily, is awash at high water. Rocky reefs, which break with an ordinary swell, extend from Goalen rocks, parallel to the southern coast of Eyre island, to the mainland south of Smoky bay hill. The edge of the one-fathom bank is generally $1\frac{1}{4}$ miles from the northern sides of the Eyre islands.

Directions for Smoky bay, and anchorage.—Having passed westward of Franklin islands, bring cape D'Estree to bear N.E. by N., and steer for it on that bearing up Waterwitch channel, until Saddle peak, 5 miles south-east of Laura bay bears E. $\frac{1}{2}$ N., then keep that peak on that bearing to pass through the narrow channel into Smoky bay; this leads very close to the shoals especially on the south side, where there are only 3 feet at low water. In navigating Waterwitch channel, cross-bearings of mount Younghusband and cape D'Estree will readily fix the position. When cape D'Estree bears N.N.W., alter course to N.E., and anchor in $4\frac{1}{2}$ fathoms, sand, with cape D'Estree bearing about N.W. by W., and the hill one mile eastward of Laura bay N.E. by N. Small vessels anchor anywhere inside the banks in Smoky bay, according to draught and the direction of the wind, the western part of Décrés bay affording the best shelter and smoothest water with strong westerly winds. The lead should be attended to in standing towards the banks.

Tides and tidal streams.—It is high water, full and change, in Smoky bay at 0h. 43m.; springs rise $6\frac{1}{2}$ feet. The tidal streams in Waterwitch channel run in the direction of the channel; at the southern entrance they attain a rate of one knot at springs, and in the narrow part of the channel a rate of 2 knots; inside the bay the streams are very slight.

STREAKY BAY.—A depth of 5 fathoms at low water can be carried through Warburton channel into the north-eastern part of Streaky bay; where, eastward of Lindsay point, in a depth of $5\frac{1}{2}$ fathoms, is the only secure anchorage, in all weathers, for vessels of heavy draught, between King George sound and port Lincoln. Dashwood channel, leading into the southern part of the bay, and towards Blanche port, is navigable by vessels of 13 feet draught at low water, and of 19 feet draught at high-water springs. The South channel has not more than 11 feet at low water. The township of

Flinders is at the southern end of Blanche port, in the south-eastern part of Streaky bay, in which port there is excellent anchorage for any vessel that can pass through Dashwood channel. The country about Streaky bay is principally occupied by sheep farmers, but some of the land has been bought and settled on by agriculturists for the cultivation of wheat. The population of Flinders is 150.

BROWN POINT, the north-west point of Streaky bay, is red in appearance, 115 feet high, and covered with coarse grass; the eastern side is a steep cliff, and the western a gradual slope. Between Brown point and Smoky bay hill, 6 miles to the northward, the coast consists of rocky points and sandy beaches, the latter with sand hills behind, of which the highest is mount Mary, 149 feet high, 2 miles north of mount Brown. Inland there are rises covered with mallee scrub, rising to a height of 137 feet, 4 miles from Brown point. Detached sunken rocks extend some distance from this part of the coast, and it should not be approached nearer than 2 miles.

Gascoigne bay extends from Collinson point, which is 2 miles east of Brown point, to De Mole point, $5\frac{1}{2}$ miles further to the east-north-east. Collinson point is low and sandy, with a sunken reef, which breaks only with a heavy swell, one mile south of it. There are rollers for nearly a mile off-shore between Brown and Collinson points in bad weather; and $1\frac{1}{2}$ miles E. $\frac{1}{2}$ N. of Collinson point is a detached rocky bank, with a depth of 3 fathoms on it. The shores of Gascoigne bay are low and sandy, and fronted by rocks, except in the northern part of the bay. De Mole point is 102 feet high, dark, and wooded, with a rock, awash at half-tide, 7 cables S. by W. of it.

Anchorage.—There is good anchorage for coasters in a depth of $2\frac{1}{4}$ fathoms, sand and weed, in the north-western part of Gascoigne bay. To approach this anchorage it is necessary to pass between two sunken rocks, which are usually shown by the sea breaking on them; the high sand hill near the beach, 3 miles westward of De Mole point, bearing N. $\frac{1}{2}$ E., leads between the rocks, whence a vessel should steer N.W., and anchor with Collinson point bearing S.W. by S., and De Mole point E. $\frac{1}{4}$ N. There is good landing north-west of this anchorage, the beach there being free from rocks, with a moderate depth close to it.

Lindsay point, 5 miles N.E. by E. $\frac{1}{2}$ E. of De Mole point, is round, sandy, and only 12 feet high. The most conspicuous object in the sandy bight between those points is a dark hillock, 67 feet high, in the middle of the bight and close to the beach. The bight just north of De Mole point is sometimes used as a shipping place for the sheep station near that point, but the shore is rocky and shallow, the landing bad, and the anchorage exposed. Shoal banks extend south of Lindsay point to a distance of more than 3 miles, forming the northern side of Warburton channel. The mouth of Acraman creek, on the bar of which there is a depth of 5 feet at high water springs, is on the north-eastern side of Lindsay point; the creek runs for some miles among samphire swamps. A sand hill, 51 feet high, one mile north-west of the entrance, is a conspicuous object from the anchorage eastward of Lindsay point.

PERLUBIE is a conspicuous bare sand patch on the eastern side of Streaky bay, 15 miles S.E. $\frac{1}{4}$ E. of Lindsay point. It is 71 feet high, and is the best mark for leading through the Dashwood channel. Between Lindsay point and Perlubie the coast is sandy, with low broken rocky points; the sand hills near the beach are 40 to 90 feet in height, rising gradually to the southward. A range of rounded hills, clothed with dark mallee scrub, and from 120 to 150 feet high, runs parallel to the coast, one to 2 miles inland.

North bank stretches nearly 6 miles off shore midway between Lindsay point and Perlubie, with a $2\frac{1}{4}$ fathoms channel between its eastern end and the beach. A low narrow sand bank dries at low water in the eastern part, with several detached dry patches extending southward from its western end to the northern side of Dashwood channel.

South sand, separating Dashwood and South channels, lies with its eastern extreme 7 cables W. by S. of Perlubie, with a $5\frac{1}{2}$ fathoms channel between. The sand dries at low water springs, in an east and west direction, for a length of $4\frac{1}{2}$ miles and a width of a quarter to half a mile, the depth of $1\frac{1}{2}$ fathoms extending from the bank being nearly 8 miles westward of Perlubie.

Dashwood rock, situated in the middle of Streaky bay, off the entrance to Dashwood channel, and N. $\frac{1}{4}$ W. $6\frac{2}{10}$ miles from the west side of cape Bauer, is a dangerous pinnacle rock with a depth of 9 feet

on it, and 5 fathoms 2 cables off all round. The sea only breaks occasionally on this rock, even with a heavy swell.

Breakers.—A rocky patch, with a depth of 5 fathoms on it, and 13 to 16 fathoms half a mile off all round, on which the sea breaks with a heavy swell, is situated $4\frac{1}{2}$ miles S.E. $\frac{1}{4}$ E. of Brown point. Another patch, on which the least water found was 8 fathoms, although there may possibly be less, is situated 4 miles E. by N. from the above 5-fathoms patch, and $4\frac{1}{2}$ miles W.N.W. from Dashwood rock. The sea breaks in this position with a heavy swell.

Eba island, 3 miles to the southward of Perlubie, is 85 feet high, covered with coarse grass and low bushes, with some sand hills above a sandy cliff on its north side. Between this island and the land is a sand bank which dries at low water. Nearly one mile south of the east end of Eba island is a rocky islet, 30 feet high, with a rock, that dries 4 feet at low water, $1\frac{1}{2}$ cables south-west of it.

BLANCHE PORT.—The coast between Perlubie and the entrance to Blanche port consists of low rocky points and sandy beaches, with sand hills and grass flats behind in some places, and scrub-covered hills 150 to 200 feet high further inland; from one to 3 miles south of Perlubie the scrub-covered hills slope right down to the shore.

Perforated rocks, on the eastern side of the entrance to Blanche port, are two limestone rocks, one cable off shore, each 5 feet high, and full of holes.

Fairway rock, W. by S., 7 cables from the west Perforated rock, is a rocky patch, $1\frac{1}{2}$ cables across, and with a depth of 3 feet over it. The deepest channel into Blanche port is eastward of Fairway rock.

Buoy.—A small red buoy, with a staff, is on the east side of Fairway rock in 2 fathoms.

Oyster spit dries at low water, for nearly four cables westward of Crawford landing, the next point to the southward of Perforated rocks. The west end of this spit is very steep, and as it is covered with dark green weed, the water looks deep directly the spit is covered by the tide, therefore care is necessary to avoid it.

Sponge rock, on the west side of the middle of Blanche port, is a small mound, consisting of large shells and marine fungoids over rock. It has a depth of 5 feet on it at low water, with 3 fathoms, muddy bottom, all round. This rock lies W. by S. $\frac{1}{2}$ S., $1\frac{1}{2}$ miles from the low rocky point of Crawford landing, and 7 cables from the west side of the port. The Perforated rocks are touching one another from Sponge rock.

Blanche port is of more pleasing appearance than the other parts of Streaky bay; the hills are covered with coarse grass, and here and there the slopes are wooded with shea-oak* trees, intermingled with mallee scrub. The shore is fronted by sandy beaches, with cliffy banks, some coloured red. A hill, with a single tree on it, to the south-east of the port, the church of Flinders township, and a house on the western shore, are good marks.

Gibson point, on the western side of the entrance to Blanche port, is very low and sandy, with bushes nearly as far as its high water extreme. The sand spit dries from Gibson point to a position 7 cables north-west of Perforated rocks, and its eastern end is very steep. On the south side of Gibson point a shallow creek runs 3 miles to the westward, its shores bordered by mangroves.

Buoy.—A red buoy, with staff and ball, is at the north end of the one fathom patch, lying N.W. by N. 3 miles from Gibson point. The buoy is in 3 fathoms, with Eba island E. by N., and Gibson point S.E. by S.

CAPE BAUER, the south-western point of Streaky bay, is 9 miles west of the entrance to Blanche port, the coast between being sandy until 2 miles from the cape, when cliffs commence. Near the extreme of cape Bauer some sandy rises are above the top of the cliff, the summit of the cape, one mile inland, covered with stones and low scrub, being 295 feet high. From there a scrub-covered range, of about the same height, trends south-eastward. Some detached rocks lie with the northernmost 6 cables from the north-west part of cape Bauer.

Olive island is a flat-topped rock, 82 feet high, 5 miles W. $\frac{1}{4}$ S. of cape Bauer, and much frequented by seals. A small head of rock,

See chart, No. 1,061.

* Shea-oak is the name given to a remarkable leafless tree, whose long drooping rigid branchlets render it singular and picturesque. It is of the genus *casuarina*.

about 10 feet above water, is 2 miles N.E. by E. of Olive island, and near the north-east extreme of the numerous rocks in the vicinity of that island. Rocks extend one mile to the southward and westward of Olive island. They usually show by the heavy breakers on them.

DIRECTIONS FOR STREAKY BAY.—Streaky bay should be entered by passing about 3 miles north-west of Olive island. The passage between the island and cape Bauer should not be attempted, except under steam or with a commanding breeze. From about 3 miles north-west of Olive island, steer N.E., taking care to avoid Dashwood rock, by not shutting in mount Westall, the summit of Westall point, with cape Bauer, until Perlubie sand bears south of East, or Brown point summit west of W.N.W.

No marks can be given for entering Warburton channel, but the position of a vessel can be readily ascertained by cross bearings of Brown point, the summits of De Mole point and cape Bauer; the chart is a sufficient guide for passing through the channel to the anchorage, and the course must be altered as necessary.

To enter by Dashwood channel, observing the marks and bearings above to avoid Dashwood rock, when Perlubie sand bears E. $\frac{3}{4}$ S., or if that is not in sight, Brown point summit is W. by N. $\frac{1}{2}$ N., steer E. $\frac{1}{2}$ N., and bring the northern part of Perlubie sand to bear E. by S., then alter course towards it, remembering that in crossing the bar the deepest water will be found by keeping Perlubie rather southward than northward of that bearing. The same bearing of Perlubie should be preserved after the bar is passed, until the west end of Eba island bears S. $\frac{1}{2}$ E., when alter course towards it, keeping it bearing S. $\frac{1}{2}$ E. to proceed between Perlubie and the east end of South sand. When Perlubie bears N.E. by E., steer to pass not less than half a mile westward of Eba island, and then steer for the Perforated rocks at the entrance to Blanche port. Give those rocks a berth of about 3 cables, passing between them and the Fairway rock buoy, when the church at Flinders will bear S. by W. $\frac{1}{2}$ W.; steer for the church on that bearing, until the east Perforated rock is just open south of the west rock, bearing N.E., when alter course to S.W., keeping that mark on astern, until the church bears S. $\frac{1}{2}$ E.. Then keep the church bearing S. $\frac{1}{2}$ E., and proceed to the southward according to the depth of water required. In following the above directions the least water passed over will be 16 to 17 feet at low

water and 22 feet at high water. When near Oyster spit, extending off Crawford landing, care is necessary to avoid it.

To enter by South channel, a passage available at low water for vessels of less than 10 feet draught, from about 3 miles north-west of Olive island, steer E. by N. until Eba island summit bears East; keep this bearing on and cross the bar, which will be passed when One Tree hill in Blanche port is in line with Gibson point, bearing S.S.E., or, when the buoy on the one fathom bank is seen and bearing E.S.E. or the southward of it, steer to pass about 2 cables north of the buoy. Then steer S.E. $\frac{1}{2}$ E., taking care to give the spit east of Gibson point a good berth, and when the east Perforated rock bears S.S.E. steer towards those rocks and as above directed.

Anchorage in Streaky bay.—The northern anchorage for large vessels is with Lindsay point, bearing West, distant 2 miles, the summit of the conspicuous sand hill inside Acraman creek N.W. by W., and De Mole point summit, W. by S. $\frac{1}{2}$ S., in a depth of $5\frac{1}{4}$ fathoms, sand and weed. Small vessels may anchor between this position and Acraman creek, according to draught. There is good shelter and fairly smooth water in this locality under all conditions of wind and weather. Vessels may anchor anywhere inside the North bank or South sand, or the banks between them and the shore to the southward, but with westerly gales there is an unpleasant short sea near the eastern shore of Streaky bay, and considerable strain on the cables. Under these circumstances the anchorage south-east of the middle of North bank, and as near as possible to its edge, is the best for shelter; but Blanche port is altogether preferable, as it is a perfectly landlocked harbour, with excellent holding ground. Anchor a vessel of 18 or 19 feet draught in Blanche port in about 4 fathoms, mud, with the church at Flinders bearing S. $\frac{5}{8}$ E. and the north extreme of the low rocky point at Crawford landing E. by N. Small vessels anchor nearer the township, the depth being about 12 to 15 feet for from 2 cables to one mile from the southern shore, with the church bearing S.S.E. to S. by W., and there is a hole having upwards of 3 fathoms in it, with its centre N.N.W. $\frac{1}{2}$ W., one mile from the church. There is a good berth for a vessel drawing less than 12 feet, with the church bearing S. $\frac{1}{2}$ E., and One Tree hill E. $\frac{3}{4}$ N., in 14 to 15 feet, muddy bottom, about 3 cables from the landing at the township.

Jetty.—A jetty has been constructed at Streaky bay; it is 870 feet long with a depth of 12 feet at the outer end at low water.

Tides and tidal streams.—It is high water, full and change, in Blanche port at 0h. 5m.; springs rise 6 feet, neaps 3 to 4½ feet. The tidal streams generally run directly through the channels, and are insignificant in the open parts of the bay. In Warburton channel they attain a rate of one knot; in Dashwood channel 1½ knots; in South channel less than one knot; between Perlubie and the South sand 1½ knots; and at the entrance to Blanche port, between Perforated rocks and Gibson spit, a rate of 2½ knots at springs. Inside Blanche port the streams are very slight.

Observation spot at Blanche port is in lat. 32° 47' 50" S., long. 134° 13' 20" E.; Snapper point (Adelaide) being in long. 138° 31' 0" E.

Telegraph and communication.—The telegraph office at Flinders has communication with the universal telegraph system. There is a weekly mail from Adelaide to Streaky bay, overland, *via* Port Lincoln, also a regular steamer and schooner.

Meteorological observations.—In 1890 the mean height of the barometer at Streaky bay was 29·996 inches, the maximum 30·452 inches, the minimum 29·347 inches. The rainfall in the year was 23·5 inches; the mean annual rainfall during 12 years being 15·8 inches, the greatest fall being 22·39 inches in 1889 and the least 9·48 inches in 1881.

Supplies.—A moderate quantity of supplies can be obtained at Blanche port, and oysters may be dredged in some parts of that port. Water may be best obtained at Perlubie sand.

Life-saving apparatus.—A rocket life-saving station has been established at Blanche port, and assistance will, if possible, be rendered, in the event of a vessel being stranded in or near Streaky bay, under such circumstances that the lives of the crew are in danger.

CORVISART BAY, between cape Bauer and Westall point, is exposed to the south-westerly swell. The surveying schooner sometimes anchored, with south-easterly winds, in the southern part of the bay, N.N.E. from mount Westall, but this anchorage is not recommended. The shore of this bay is a mixture of sand and

rocks, with sand hills behind, and the scrub-covered hills of Gibson peninsula further inland. The water is deep near the shore, except northward of mount Westall, where a reef with 4 fathoms at its end, and on which the sea breaks at times, extends to the northward upwards of one mile from the land.

Westall point, 11 miles south of cape Bauer, rises to mount Westall, a conspicuous, regularly-shaped summit, 315 feet high. The coast of the point is generally steep, and reddish in appearance, with fringing shelves of rock, on which the sea breaks heavily. There are also heavy breakers on a reef which stretches one mile south-west of the southern part of Westall point.

SCEALE BAY, south-east of Westall point, is a clear sandy bay, having anchorage for small vessels at both ends, with S.E. winds; but it is unsafe with westerly gales, except close inshore at the north-western part. The north rocky point of this bay is $3\frac{1}{2}$ miles east of Westall point, the bight between being foul, and the shore lined with sand hills 120 to 130 feet high. Yanerbie hill, 150 feet high, is at the north end of a large patch of bare sand on the shore of Sceale bay, and is conspicuous. A rocky patch, with a least depth of $4\frac{1}{2}$ fathoms, on which the sea breaks at times, lies $1\frac{1}{4}$ miles east of the north rocky point of Sceale bay, otherwise the bay is free from danger.

Anchorage.—To avoid the above rocky patch, in proceeding towards the northern anchorage, keep Yanerbie hill bearing N.N.E. $\frac{3}{4}$ E., until the end of the north point of Sceale bay bears south of West. The bay is then clear to the northward. A small vessel should anchor in 3 fathoms, with the point near bearing S.S.W., and mount Westall, seen over the sand hills in the bight to the westward, N.W. by W. The southern anchorage is with the junction of the long sandy beach and the rocky coast of cape Blanche, bearing S. by E., according to draught.

Cape Blanche, S.E. $\frac{3}{4}$ S., about 9 miles from Westall point, is a bold cliffy point; a sandy hill, 335 feet high, rises above the cliff close to the west extreme. The cliff, with sand tops above, is nearly as high for 2 miles to the south-eastward; from the sea face, the point slopes inland to the low grassy plain forming the neck connecting the point with the land eastward. Rocks and breakers.

extend nearly one mile west and north of the west extreme of cape Blanche, and a reef, on which the sea breaks heavily, projects 6 cables south of the south point.

CAPE RADSTOCK,* the north point of Anxious bay, is steep and bold, the cliff rising to a height of 477 feet; the cliffs and rises decrease in height on either side of the cape. From the neck inside cape Blanche the coast trends S.S.E. for 8 miles, and consists of sandy beaches and small rocky points with sand hills behind, from 120 to 220 feet high. About 5 miles north-west of cape Radstock the cliffs begin and extend uninterruptedly to that cape. Sunken rocks, with heavy breakers, stretch nearly 2 miles offshore at the northern end of the cliff; and the coast 5 miles north-west of cape Radstock has rocks and foul ground off it for about one mile in all directions seaward. A reef, which breaks at times, extends three-quarters of a mile south of cape Radstock.

Rock.—A rocky shoal, about half a cable across, and upon which a depth of 12 feet was found, with cape Radstock bearing N.W., distant $2\frac{1}{4}$ miles, has been reported.

Beard bay is a shallow inlet running for 10 miles to the north-west, with its entrance $1\frac{1}{2}$ miles eastward of cape Radstock. The entrance is barred by rocks, and the sea generally breaks across, but boats might enter at high water in very fine weather.

ANXIOUS BAY, fully exposed to the prevailing south-westerly swell, extends 33 miles south-east of cape Radstock, 15 miles from which is the entrance to Venus harbour, a port available for vessels of about 12 feet draught. The conspicuous objects inland round the bay are:—mount Hall, 638 feet high, 12 miles north-eastward of cape Radstock, and the summit of a flat-topped sandy scrub-covered range, which ends towards Beard bay in a steep fall, Calca bluff, 326 feet high; the range continues to the eastward of mount Hall, but the summits are not remarkable enough from the sea to be used as navigating marks; mount Campbell, close to the coast, 5 miles south-east of the entrance to Venus harbour, 260 feet high, showing above the sand hills on both sides of it; Talia hill 4 miles inland, and 13 miles south-east of Venus harbour, a round hill standing alone, about 400 feet high; and Bramfield hill, some

* Named by Flinders after Admiral Lord Radstock.

See chart, No. 1,061.

what similar in appearance to Talia hill, 634 feet high, and 6 miles inland from the southern part of Anxious bay.

Weyland point, westward of the entrance to Venus harbour, is a conspicuous bold cliff point, 293 feet high; it rises to 325 feet, 4 cables to the northward, sloping inland towards Venus harbour. For 5 miles eastward of Beard bay entrance the coast is mixed rock and sand, with sand hills about 100 feet high behind, and rocks and breakers stretching one mile offshore. Cliffs then continue without a break for 10 miles to Weyland point, the most conspicuous part of that coast being 380 feet high, above a bold cliff projection, 5 miles north-west of Weyland point.

Howard rock lies S.E. 3 cables from Weyland point. The sea breaks heavily on the rock in bad weather, but at high water, and with smooth water, it may not show.

VENUS HARBOUR has a very limited anchoring space even for the small vessels to which it is accessible. It is unnecessary to describe in detail the greater part of the shallow lagoon, with its sand banks and islands, as it is not used for navigation. The entrance is between two low rocky points north-east of Weyland point, and in the narrow part is only $1\frac{3}{4}$ cables wide. A depth of 21 feet can be carried over the most exposed part of the bar, which usually breaks, except with the in-going tidal stream, and in moderate weather; but 13 feet is the deepest water in the narrow part, with the advantage that comparatively smooth water will be found in that place. The township of Parkin is on the south shore, nearly one mile east of the entrance. At 2 cables east of the middle of the entrance is the west end of a sand bank, which dries at low water, and extends with a width of half a cable three-quarters of a mile to the eastward. The south-west edge of a rocky patch, 2 cables across, which dries, is 4 cables E. by N. from the north entrance point. Germein island is low and swampy, with mangroves near the coast, except at the southern end, where is a sand ridge 40 feet high.

Buoys.—A red buoy is placed on a one fathom patch, just inside the entrance. A black buoy is placed on a 5 foot patch, 150 yards to the north-east of the red buoy. These buoys are cheese-shaped and mark the channel, which is 7 feet deep, over the tail of the shifting sand bank.

Jetty.—A jetty extends 535 feet from the west end of Parkin township. It has a depth of 10 feet at low water.

Directions for Venus harbour.—This harbour should only be entered by a sailing vessel with a commanding fair wind, and then only during moderate weather, and with the tidal stream running in. A good guide as to the practicability of the bar, which in bad weather and with the out-going stream is a mass of breakers, is to observe if the sea is breaking on Howard rock near Weyland point. If that rock has no break on it, the bar may be taken under the conditions mentioned above. In the event of its being considered unadvisable to enter, a vessel may stand off and on, or await a favourable opportunity at the anchorage under Flinders island. From a position one mile to the south-east of Weyland point, steer N. by E., allowing for the tidal stream, and when the eastern extreme of the north head bears N.E. $\frac{3}{4}$ N. (just open of the south-eastern extreme of that head), steer for it on that bearing, until about one cable from the head; then, to go northward of the sand bank, proceed E. by N. $\frac{1}{2}$ N., midway between the heads, leaving the black buoy on the starboard side, and bring the south point of the north head to bear W. $\frac{1}{4}$ S., keeping it on that bearing up to the anchorage. A good look-out should be kept for the edges of the banks. To proceed southward of the sand bank, from the entrance, pass between the buoys, and keep the north point of the south head bearing W. $\frac{1}{4}$ S.; the least depth in this channel is 7 feet at low water, and the anchorage is only available for small vessels of less than 8 feet draught. The best time for leaving Venus harbour under sail is in the early morning, when the tide suits, while the land breeze is still blowing.

Anchorage.—Vessels should moor in Venus harbour. The best anchorage is in $3\frac{1}{2}$ fathoms, with the south point of the north head bearing W. $\frac{1}{4}$ S., and the highest sand hill on the western side of Germein island N.N.W. Southward of the sand bank the sand hill on Germein island should be on the same bearing, and the north point of the south head W. $\frac{1}{4}$ S.

Tides and tidal streams.—It is high water, full and change, in Venus harbour at 1h. 30m.; springs rise 4 to 5 feet. The tidal streams run with the channels, and at a rate of 3 to 4 knots through the entrance.

Mail communication.—There is weekly mail communication between Parkin and Adelaide, *viâ* Port Lincoln.

CAPE FINNIS, at the southern end of Anxious bay, is a rocky point, with a rounded top, 176 feet high. Sunken rocks, with less depths than one fathom on them, extend from the north side of the point to the east side of Waldegrave island. For 9 miles south-eastward of Venus harbour the coast is rocky, and mount Campbell is the highest hill near it; there is then an unbroken sandy beach for a distance of 14 miles, with sand hills and grassy hills behind; the remaining 4 miles to cape Finnis is a sandy beach broken by several small rocky points. The coast may be approached to a distance of one mile between Weyland point and cape Finnis.

INVESTIGATOR GROUP stretches nearly 40 miles south-westward of cape Finnis, and consists of Waldegrave islands, Top-gallant islands, Flinders island, Ward islands, and Pearson islands. There is anchorage, except with strong northerly winds, east of Flinders island; and for small vessels, with southerly winds, north-east of Waldegrave island.

Waldegrave islands lie $1\frac{1}{2}$ to 4 miles north-west of cape Finnis. The larger and eastern island is flat-topped and grassy, the highest part, 120 feet high, being near the east end. The western island, 76 feet high, has a steep cliff on its south side, from the top of which the land slopes gradually on the northern side. These islands are connected by rocks, of which the only one always above water is situated $1\frac{1}{2}$ cables west of the larger island; another rock above water is on the northern end of a reef, stretching upwards of a cable north of the north-east point of that island.

The Watchers are two rocks about a mile apart; the western one, 24 feet high, is 3 miles W. by S. of the smaller of the Waldegrave islands. These rocks are surrounded by sunken rocks to a short distance, and have 8 to 10 fathoms in the channel between, with 15 to 16 fathoms half a mile off in other directions.

FLINDERS ISLAND, the largest and central island of the Investigator group, is of limestone formation, the coast consisting of cliffs and sandy beaches, the southern bay on the north-east side having sand hills behind the beach. The cliff at the south-east point of

the island is 175 feet high, and that of the next point westward 202 feet, and remarkable in appearance, the land sloping northward from the top of the cliff, which shows three heads when seen from the eastward. The north-east point is also a steep cliff, 203 feet high. The island has several long-topped rises, which slope to the south and west, and are somewhat higher than the cliffs before mentioned; the most conspicuous of these hills is 215 feet high, one mile north-east of the south point of the island. A large area of sunken reefs, on which the sea always breaks, lies from 3 to $5\frac{1}{2}$ miles west of the northern part of Flinders island, and extends $2\frac{1}{2}$ miles in a north and south direction. There is an isolated breaking rock midway between the south-eastern extreme of these reefs and Flinders island, and a similar rock $2\frac{1}{2}$ miles north-west of the north-west point of the island. The north and west sides of Flinders island are generally foul, sunken reefs and rocky patches extending over one mile from the coast. A detached reef, the centre of which dries at low water, lies half a mile east of the south extreme of the beach in the south bay on the north-east side of Flinders island; the anchorage for small vessels is between this reef and the beach. The bays west of the south-east point are foul, but between them and the south point of the island rocks do not extend more than a quarter of a mile from the coast.

Topgallant isles, 3 miles east of Flinders island, consist of an islet half a mile long, and several bare rocks extending nearly a mile south-east of it. The group takes its name from these rocks, the southern of which is 180 feet high, and from several points of view they have the appearance of vessels, the upper sails only of which are above the horizon. The coast of the islet is a steep cliff, about 250 feet high; the top of the islet is round and 330 feet above high water. Sunken rocks extend 4 cables south-west of the islet, and a quarter of a mile east of the southern rock; elsewhere Topgallant isles are steep-to.

Directions for Flinders island anchorage.—This anchorage, which is off the southern beach on the north-east side of the island, is not safe with strong north or north-east winds, and should only be used when necessary to seek shelter from a west or south-west gale; or in the summer with fine weather and moderate south or east winds. In approaching Flinders island from the westward care should be taken to avoid the rocks

and reefs mentioned above in the description of the island. Steering for the anchorage from the southward, pass between Flinders and Topgallant islands, and do not approach Flinders island nearer than one mile, until the north Topgallant isle bears E. $\frac{1}{2}$ S., then alter course to W. $\frac{1}{2}$ N., keeping the north Topgallant isle bearing E. $\frac{1}{2}$ S. Large vessels anchor about half a mile off shore, north of the middle of the beach, in 6 to 8 fathoms, sand, with the south-east point of Flinders island bearing S. by E. $\frac{1}{4}$ E., and the point at the north end of the beach N.W. by W. $\frac{1}{2}$ W. Small vessels anchor in 3 to 4 fathoms, sand, further south, between the reef and the shore, with the south-east point bearing S.S.E.; and the junction of the sand and cliff at the south end of the bay S.W. by S. From these anchorages vessels should get under way if the wind comes from the north or north-east, before the sea has time to rise.

Supplies.—A moderate amount of water may be obtained from the wells at the back of the anchorage beach. There are generally a number of sheep on Flinders island, and mutton may possibly be procured from the shepherd. The best landing is near the south end of the beach, but if there is a swell at the anchorage, care is necessary in landing, as there may be a considerable surf.

Ward isles, 7 to 10 miles westward of the south end of Flinders island, consist of two islets surrounded by sunken rocks, and three detached sunken reefs on which the sea usually breaks. The larger and north-west islet is flat-topped, and its sides are cliffs, rising to an elevation of 162 feet. The north-west reef is one mile north-west of this islet, and the south reef, $1\frac{1}{4}$ miles south, with the third reef between it and the islet. Sunken rocks extend nearly half a mile north of this islet. The south-east islet is a small rock, 92 feet high, with sunken rocks extending one cable north and south of it.

PEARSON ISLANDS, the south-west islands of Investigator group, which are of bold granite formation, comprise four islands, and a rock above water westward of the north island, with a sunken rock between that island and the next to the southward. The north island has steep cliffs on the west side, rising in the north part of the island nearly to its peaked summit, which is 781 feet high, and when first seen very similar in appearance to Greenly island, 50 miles S.E. by S. from it.

The north point has another peak above it about 600 feet high.

The east side of the summit of the north island is a grassy slope, partially wooded with shea-oaks. The south part of this island has two bare rocky tops, the one near the south point 378 feet high.

In fine weather there is landing on the east side of the island on the sandy beach under the low summit in the middle of the island. Here there are usually great numbers of hair seals, and in the breeding season the islands are frequented by albatross, large flocks of which may be seen on the water eastward of them. The two middle islands of the group are bare rocks, the northern 269 feet, and the southern 84 feet high. The south island, also bare, is nearly divided in the middle, the north part being 460 feet high, and the south 336 feet. There is a breaker close to the south-west point of this island. With the exceptions mentioned, there is deep water close to all the Pearson islands. They are uninhabited.

WATERLOO BAY, $2\frac{1}{2}$ miles south-east of cape Finnis (the coast between being cliffy, with hills upwards of 200 feet high behind), is a semi-circular opening in the coast about one mile in depth, and the same distance between the entrance points. The bay is open to the south-west, but is somewhat protected from that quarter by the reefs which occupy most of the space between the entrance points. Much wheat is grown in the district and a large area is utilised for squatting purposes.

This bay, owing to its being so much easier of access, is often used in preference to Venus harbour as a port for the district in the vicinity of Anxious bay. The township of Elliston is on the east side of the bay, where there is a jetty, 348 feet in length, with a depth of 6 feet at its outer end. The wheat and wool are shipped from here. The population of the district is 964.

Beacons.—Two beacons, with triangular-shaped heads, painted black, are on the north-east shore of Waterloo bay. These beacons in line bearing N.E. by N. lead over the bar in the deepest water and to the moorings in the bay.

Moorings for two vessels have been laid down in Waterloo bay in 27 feet at low water. Two black mooring buoys are attached to them.

Life-saving apparatus.—A rocket station is maintained here.

Directions.—Waterloo bay is available for vessels of 10 feet draught at low water, and 14 to 15 feet at high water. The bay should not be entered with a south-west gale blowing, although a vessel can lie safely at the moorings at all times. The most conspicuous object in the neighbourhood is Bramfield hill, 634 feet high, and nearly 6 miles north-east of the bay. This hill, the highest land in the vicinity, has a round top, the land apparently sloping away on either side when seen from the south-westward. To enter Waterloo bay, when about 2 miles from the entrance, bring the beacons in line bearing N.E. by N., which lead in between the reefs, over the bar in the deepest water and to the moorings. The edges of the reefs can usually be seen.

Tides.—It is high water, full and change, in Waterloo bay at about 1h. 0m. ; springs rise about 6 feet.

Telegraph and mail communication.—The telegraph station at Elliston has connection with the universal telegraph system. A weekly mail calls at Elliston, *en route* between Adelaide and the western ports of South Australia.

The coast from Waterloo bay trends in a curve, 38 miles south-eastward to Drummond point, and consists principally of steep cliffs ; the only dangers near the coast being a reef on which the sea breaks heavily, extending nearly one mile off shore, 14 miles from Waterloo bay ; and some rocks in the sandy bight 6 to 8 miles further south-east. The conspicuous hills between Waterloo bay and Drummond point are Tungketta hill, 417 feet high, near the coast 11 miles from Waterloo bay ; mount Misery, 374 feet, nearly midway between Tungketta hill and Drummond point ; and Kiana cliff, steep and bold, 376 feet high, and nearly 6 miles north of Drummond point.

Cap island, so named from its appearance, is a small islet, 93 feet high, and steep-to all round. It lies nearly 5 miles off shore, west of mount Misery.

DRUMMOND POINT* is a prominent cliffy head projecting from the line of coast ; there is a small dry rock and some breakers close to its extremity, with 27 fathoms water on a sandy bottom, $1\frac{1}{2}$ miles off it.

* Named by Flinders after Captain Adam Drummond, R.N.
See chart, No. 1,061.

The hillock at the point is 164 feet high ; that near the south point 147 feet ; mount Hope, 5 miles west of Drummond point, a wooded hill, 564 feet ; and mount Drummond, also wooded, and 6 miles south-east of Drummond point, 569 feet ; these are conspicuous landmarks in this vicinity.

From Drummond point the coast trends S.E. by S. about 2 miles, having 10 fathoms on a rocky bottom one mile off it, to a point with a rock awash nearly one mile south of it. Thence the coast falls back to the north-east for a mile, forming a bight, from the head of which it trends S.S.E. $12\frac{1}{2}$ miles to the foot of mount Greenly, north-east of Coffin bay. This coast is sandy, and rises gradually to some woody ranges about 3 miles from the sea, and which terminate abruptly at about 2 miles to the southward of mount Greenly.

Rocky islet, 50 feet high, lies S. by E. 6 miles from Drummond point, and $3\frac{1}{2}$ miles from the land to the eastward.

KRAUSE ROCK, with 8 fathoms on it, and 18 to 21 fathoms close around, lies S.W. by W. $\frac{1}{4}$ W., $8\frac{1}{2}$ miles from Drummond point, and W. by N. $8\frac{1}{2}$ miles from Rocky islet. There are heavy breakers on this rock with a high swell.

Sir Isaac point, the western point of Coffin bay, and the north end of Horse peninsula, is S. $\frac{1}{4}$ W. 17 miles from Drummond point. The western part of Sir Isaac point is cliffy, with hills above, partially covered by vegetation, rising to a height of 170 feet. The eastern part of the point is lower, with a sandy beach at its base. There are 10 fathoms water half a mile from the point, except to the east and south-east.

COFFIN BAY* extends nearly 8 miles to the eastward of Sir Isaac point, and is nearly 6 miles deep in a southerly direction.

There is deep water in parts of it, but in so exposed a position that anchorage cannot be recommended there ; anchorage can only be obtained in this bay by small vessels, in 2 to 3 fathoms.

From Sir Isaac point the coast trends south for 4 miles, and is generally low, with rocky points and sandy beaches. Thence E. $\frac{3}{4}$ S. for 7 miles to Longnose point, being a sandy beach, only projecting slightly in places. At 2 miles from the south-west corner of the bay there are some conspicuous bare sand-hills close to the beach, the

* Named by Flinders after Admiral Sir Isaac Coffin Greenly, Bart.

See chart, No. 1,061 ; with plan, Coffin bay, scale $m = 0\cdot5$ inch.

highest of which is 150 feet. Longnose point is a narrow sandy peninsula 2 miles long, and nowhere more than 20 feet high.

The eastern shore of Coffin bay may be said to commence under a hill called Frenchman Lookout, whence it trends south for one mile, and then curves slightly inwards 5 miles S.S.E. $\frac{1}{4}$ E., where the cliffs end to the southward. As far as this the nature of the shore is rugged cliff, with wooded hills rising to various heights behind. Then it changes to a sandy beach, with a wooded bank at the back, and alters its direction to S.W. by S. for $1\frac{3}{4}$ miles, to a low point $1\frac{1}{4}$ miles east from Longnose point.

Aspect.—There are some remarkable hills inland on the eastern side of Coffin bay. Mount Greenly is 1,001 feet high, and N.E. $\frac{3}{4}$ E. $9\frac{1}{2}$ miles from Sir Isaac point. Viewed from the north or south this hill is a sharp peak; from an east or west direction it has rather a long summit, falling suddenly to the northward, and sloping gradually with three drops to the southward. A line of rocky cliff runs along the top of the hill on the seaward side and round the summit; from the base of the cliff the hill's wooded sides slope down to the summit of the coast cliff. To the southward the next hill is Frenchman Lookout, which has three wooded summits of nearly equal height, all about half a mile from the coast. The highest and centre summit is 546 feet high, and S. $\frac{1}{4}$ E. $3\frac{3}{4}$ miles from mount Greenly. Cliff hill, $3\frac{1}{4}$ miles S.S.E. from Frenchman Lookout, is very similar in appearance, having also three summits, the middle one of which is 586 feet high.

Mount Dutton is E. by S. $\frac{1}{2}$ S., 11 miles from Sir Isaac point, 904 feet high, and about $1\frac{1}{2}$ miles inland from the south end of the cliff on the east side of Coffin bay. Its top is rather more than half a mile long, and curves from the highest part of the west side to the eastward and southward. This hill slopes down equally in all directions, and is well covered with shea-oaks and other trees.

The Marble range, which runs in a north and south direction nearly 5 miles, is about $4\frac{1}{2}$ miles eastward of Cliff hill, and has two remarkable rocky summits. One, at the north end, is 1,421 feet high, and the other, near the south end of the range, 1,317 feet, and very rocky near the top.

Soundings in Coffin bay.—From Sir Isaac point the 3-fathoms line runs about half a mile offshore for $1\frac{1}{2}$ miles to the southward, it

then forms a bight about 2 miles deep in a south-easterly direction, and comes out again to a point where there are only $2\frac{1}{4}$ fathoms, S.E. by E. $\frac{1}{2}$ E. $2\frac{1}{2}$ miles from the eastern part of Sir Isaac point; there is only three-quarters of a fathom S.S.E. $\frac{1}{4}$ E. $1\frac{1}{4}$ miles from the $2\frac{1}{4}$ fathoms, and 14 to 15 fathoms will be found a quarter of a mile to the northward and eastward. From the point the 3-fathoms line trends S.E. for $2\frac{1}{2}$ miles, and then curves round with the shore, continuing about $1\frac{1}{2}$ miles off as far as the south part of Cliff hill. To the northward of that, as far as Frenchman Lookout, there are 4 to 5 fathoms water within half a mile of the shore; and then 10 fathoms at that distance on to mount Greenly.

Directions for the anchorage.—Approaching Coffin bay from the southward, after Reef point bears south of E.S.E., keep mount Greenly open north of Sir Isaac point N.E. by E. $\frac{1}{4}$ E., to clear all the reefs and foul ground offshore between Reef point and Sir Isaac point.

The latter point may be rounded about half a mile off, and then bring the conspicuous bare sand-hill in the south-west part of the bay a little on the port bow, and steer for its western extreme S. by E. $\frac{1}{2}$ E. Continue this course for 2 miles, or until a low sand-hill in the middle of a long sandy beach on the coast bears W.S.W. Then haul to the westward and anchor almost immediately in $2\frac{1}{2}$ fathoms water, sand and mud, with the low sand-hill bearing W.S.W., and Sir Isaac point N.N.W. $\frac{1}{4}$ W.

In working towards this anchorage to keep in not less than $2\frac{1}{4}$ fathoms, when standing towards the shore south from Sir Isaac point, that point should not be brought to bear north of N. by W. $\frac{3}{4}$ W., and in standing to the eastward the summit of the conspicuous bare sand-hill should not be brought west of South.

PORT DOUGLAS, the entrance to which is over a bar in the south-east part of Coffin bay, is an extensive sheet of water, with an average depth of from 2 to 4 fathoms, but its northern part is much blocked up by sand-banks. From the entrance the port extends south 6 miles, and then east 4 miles, with a general breadth of 2 to 4 miles from shore to shore. Mount Dutton bay opens out on the north side of the eastern part of port Douglas; it is 4 miles long north and south, and $1\frac{1}{2}$ miles broad, with a general depth of 2 to

3 fathoms. From the north part of Mount Dutton bay, a shallow bay extends nearly 3 miles farther to the westward and northward.

A large sand-bank which dries in patches at low water extends to the eastward and southward of Longnose point. The eastern edge of this bank is the right hand side of the channel into port Douglas. The north point of the bank stretches well into Coffin bay, and is N.N.E. $\frac{3}{4}$ E., fully 2 miles from Longnose point, and one mile from the eastern shore of Coffin bay. The east point is E.S.E. $1\frac{1}{4}$ miles, and the south point S. by W. $2\frac{1}{2}$ miles from Longnose point, and only 4 cables from the western shore of port Douglas. Between the western edge of the bank and the shore near it, there is a deep pool which runs $2\frac{1}{4}$ miles to the north-west, and is one mile wide in the middle, with depths from $2\frac{1}{2}$ to 5 fathoms all over it.

A bank, with less than one fathom on it, extends half a mile from the middle of the long sandy beach on the south-eastern side of the entrance to port Douglas, the north point of which bank is S. by E., nearly 4 cables from the north point of the sand-bank described above.

On the eastern side of the north part of port Douglas a large irregular dry bank stretches 2 miles from the shore, the western edge of which is the left hand side of the channel into port Douglas for 5 miles from the entrance.

The western point of this bank is E.N.E. half a mile from the southern point of the large western sand-bank; from there the edge of the bank recedes towards the eastern shore to the south-east, and the deep water part of the port increases to more than a mile in width as far as two small rock islets, which lie in the middle of the port and S. by E. $\frac{3}{4}$ E. $4\frac{1}{2}$ miles from Longnose point. The western extreme of a bank connected with the eastern shore is E.N.E. 4 cables from the larger islet; and the eastern extreme of a spit, which has as much as one fathom water over the greater part of it, extending off the western shore, is South nearly 4 cables from the same islet. There are $1\frac{1}{4}$ fathoms water east of this islet, $1\frac{1}{2}$ fathoms south, and 2 fathoms west of it.

A spit extends South three-quarters of a mile from the shore which trends West from the West entrance to mount Dutton bay, and a bank nearly dries for about three-quarters of a mile from the whole of the southern shore of port Douglas, opposite the entrance of mount Dutton bay.

The islet which lies in the south-east part of port Douglas is 28 feet high, and surrounded by a dry bank which extends about half a mile east and west of it, and not more than 200 yards north and south.

Buoys.—At the entrance to port Douglas, a red buoy is at the north end of the west spit, in 9 feet at low water, mount Dutton bearing E. by N. distant 2 miles; and a black buoy at the north end of the east bank, in 6 feet at low water, mount Dutton bearing E.N.E. distant 2 miles. These buoys are small and cheese shaped.

Mount Dutton bay.—The eastern shore of mount Dutton bay is steep-to, and the western may be generally approached to half a mile. A dry bank extends 4 cables from the round headland at the northern part of the western shore, and the north-east side of the upper part of this bay is shallow. The deepest water in the north part of mount Dutton bay is near the headland on the north side of that portion which runs west. A low rocky islet at the head of mount Dutton bay has no more than 2 feet water inshore of it.

The country on all sides of Coffin bay is used for sheep stations, and a quantity of land west and south-west of mount Dutton is cultivated for wheat. The agricultural areas of lake Wangary and Wanow are studded with homesteads.

The mail road, running as far as Fowler bay from Port Lincoln, passes within a mile of the north part of mount Dutton bay, and a track from the road comes down to the shore, where there is a jetty 270 feet long, having at its outer end 4 feet at low water, from which cargo is usually shipped.

Killidie bay.—At the eastern end of port Douglas a narrow channel connects it with Killidie bay, which is 3 miles long east and west, one mile broad, and very shallow. This bay is noted for the quality and abundance of its oysters, but as the dredging has been carried on all the year round, regardless of season, the mollusc was getting scarce. An Act, however, has been passed proclaiming a close season for oysters all over the coasts of the colony.

There is a rocky bar at the entrance of Killidie bay nearly awash at low water. The depth of water is as much as $2\frac{1}{4}$ fathoms in some parts of the bay, but it is so much occupied by sand and mud-banks,

that local knowledge is necessary for its navigation even by very small vessels.

Directions for port Douglas and mount Dutton bay.—Port Douglas is only available for vessels drawing 10 feet, as there is a depth of only 8 feet on the bar at low water, and on many days the rise of tide does not exceed 3 feet. If drawing more than 8 feet anchor in Coffin bay and ascertain the time of high water before entering port Douglas; and on going in, the wind should be in such a direction as to allow a vessel to lie two points either east or west of South. Having rounded Sir Isaac point, or from Coffin bay, bring mount Dutton to bear E. by S. $\frac{3}{4}$ S., and steer for it until the summit of mount Greenly is open to the right of all the summits of Frenchman Lookout, bearing N. $\frac{1}{2}$ W.; the vessel will then be less than three-quarters of a mile from the eastern shore, and should alter course to S. $\frac{1}{2}$ E., keeping mount Greenly open to the right of Frenchman Lookout until mount Dutton is in line with the junction of the sandy beach and cliff on the eastern shore, bearing E. by N. $\frac{1}{2}$ N. Leave the red buoy on the starboard side, and the black buoy on the port side. Then haul quickly to the westward, until mount Greenly is between the two summits seen of Frenchman Lookout, bearing N. $\frac{1}{4}$ W. This mark leads midway between the two banks at the entrance to port Douglas, and should be kept on until the low south extreme of Longnose point bears W.S.W. The direction of the fairway of the channel is then S.S.E. for one mile, and then S.W. by W. $\frac{1}{2}$ W. for $1\frac{1}{2}$ miles, or until mount Greenly is just over the extreme of Longnose point. No leading marks can be given for the last two courses of the main channel; the channel is from 2 to 4 cables in width, and the edges of the banks on either side tolerably steep, and can generally be made out from aloft, or, when mount Greenly is over the extreme of Longnose point bearing N. $\frac{1}{4}$ E., steer S. $\frac{1}{4}$ W., and keep the above leading mark on until within half a mile of the western shore.

The banks at the entrance to port Douglas being then cleared, alter course to S.E., to pass close to the south side of the rocky islets in the middle of the port.

The stream from one hour after high to one hour after low water, runs very swiftly over the east point of the bank on the right hand side of the channel, and a good berth should be given it in consequence if entering while that stream is running. If the wind will

not allow a vessel to steer S.W. by W. $\frac{1}{2}$ W., anchor in the first bend of the channel, and wait a convenient opportunity.

From near the rocky islets steer S.E. by E. for 2 miles, or for a rocky point in the middle of the long sandy beach at the south-east part of port Douglas. A vessel will then be at the best anchorage in the port in $2\frac{1}{4}$ fathoms water, sand and mud, with the point at the western entrance of mount Dutton bay bearing N.E. $\frac{1}{2}$ N., and the small islet in the south-east part of port Douglas bearing East; or, if wishing to go up mount Dutton bay, steer for the entrance about N.E., and keep rather on the eastern side in going up the bay. To clear the spit in the north part of the bay, running off the western shore, mount Dutton should be kept a little to the eastward of the rocky islet in the north part of the bay N. by W. $\frac{1}{4}$ W., until the junction of the sand and cliff on the east side of the bay bears East, then steer N.W. until mount Dutton is just open to the westward of the rocky islet bearing N. $\frac{3}{4}$ W., and anchor in $1\frac{1}{2}$ to 2 fathoms water, mud.

A stranger should prefer port Lincoln, in Spencer gulf, about 40 miles to the south-eastward of Sir Isaac point, for procuring any of the supplies this part of the coast affords, as it is in every respect a more desirable anchorage, and affords perfect shelter from all winds.

Tides and tidal streams.—It is high water, full and change, on the bar of Coffin bay at 0h. 45m.; springs rise 6 feet; at the entrance to port Douglas at 0h. 55m.; springs rise barely 5 feet.

At the bar the streams make an hour after low and high water respectively. The stream runs in the direction of the channel at the entrance to port Douglas, where the fairway is north and south, but across that part trending nearly east and west inside the entrance. The stream from one hour after high to one hour after low water, after a continuance of westerly winds, is so strong at the entrance that a vessel should not attempt to enter while it is running except with a fresh fair wind.

Reef point.—From Sir Isaac point a rugged cliffy coast, with rocks and sandy beaches beneath, and sand-hills above, which in some places are covered with bushes, trends S.W. by S. $5\frac{1}{2}$ miles to Reef point, the most projecting part of the coast between Sir Isaac point and Whidbey point.

A covered rocky reef, extending N.N.E. and S.S.W. $1\frac{1}{2}$ miles, and on which the sea breaks heavily, lies off Reef point, from which point the north extreme of the reef bears N.N.W. $\frac{1}{4}$ W. $1\frac{1}{2}$ miles, and the south extreme W. by S. $\frac{1}{2}$ S. one mile.

Rocky ground, with 6 to 8 fathoms water on it, and over which the sea breaks in westerly gales, extends as far as $2\frac{1}{2}$ miles N.N.W. from Reef point. To avoid this and all the foul ground between Reef point and Sir Isaac point, after Reef point bears E.S.E., mount Greenly must be kept open north of Sir Isaac point bearing N.E. by E. $\frac{1}{4}$ E.

WHIDBEY POINT, which is S. by W. $\frac{1}{4}$ W. $5\frac{1}{4}$ miles from Reef point, is fronted by low cliffs; there is a round hill one mile back from the point, 181 feet high. The coast between Whidbey point and Reef point is rugged, cliffy, with rocks and sandy beaches beneath and sand hills above, which are in some places covered with bushes.

A reef, on which the sea generally breaks, runs off the middle and eastern parts of this point for nearly three-quarters of a mile.

There are 20 fathoms water one mile from Whidbey point, and 10 to 13 fathoms at that distance off shore between it and Reef point; this part of the coast, however, should not be approached nearer than 2 miles, because of the heavy westerly swell that rolls in.

Greenly island is a bold mass of granite, apparently inaccessible, with a peaked summit 755 feet high, W. by S. $\frac{1}{2}$ S. $15\frac{1}{2}$ miles from Whidbey point. The island is about $1\frac{1}{2}$ miles long W.N.W. and E.S.E. and half a mile wide at its broadest part; it is nearly divided into two islands at its north-west part, the sea sometimes running through the division. A small rock about 200 feet high lies E. by N. $\frac{1}{2}$ N. half a mile from the summit of Greenly island.

There are 50 to 53 fathoms water one mile to the westward of Greenly island, 46 to 40 fathoms from it to 5 miles from Whidbey point, towards which the depth gradually decreases to 20 fathoms, and between 40 and 50 fathoms from Greenly island to within one mile of the Four Hummocks of the Whidbey islands.

ROCKY or BEAGLE ISLAND lies S. by W. $\frac{1}{2}$ W. $10\frac{1}{2}$ miles from Greenly island; it is a precipitous granite rock, 222 feet high, and one mile in circumference.

A covered rock, which always breaks, lies W. $\frac{1}{4}$ N. half a mile from the north point of the island, and rocks extend 2 cables from its southern part; elsewhere the island appears to be steep-to. There are 45 to 53 fathoms water at the distance of rather more than a mile from Rocky island all round.

WHIDBEY ISLANDS are to the southward of Avoid bay, and consist of the Four Hummocks, a rock to the eastward of them, Perforated island, and two islands near Avoid point.

Four Hummocks are four steep rounded granite islands, with several small rocks amongst them, most of which are uncovered. The southern hummock is S. by W. $\frac{1}{2}$ W. $12\frac{1}{2}$ miles from Whidbey point, and E. by N. $15\frac{1}{2}$ miles from Rocky island. It is 362 feet high, the most elevated of the Four Hummocks, and rather more than a mile in circumference. A large rock lies close to its south-east side. The passage between the southern and the two middle hummocks is 3 cables wide, and quite filled up with rocks, one of which is about 50 feet high.

The two middle hummocks are nearly joined, and on most bearings appear as one island with two summits.

Their joint extent is half a mile north and south, and about 2 cables east and west.

The northern of these two hummocks is the higher, its summit being 288 feet above water. There is a clear channel, 6 cables wide, and with 15 to 26 fathoms water in it, between the two middle and northern hummocks.

The northern hummock is N. by E. $\frac{1}{4}$ E. nearly 2 miles from the southern, half a mile long, N.N.E. and S.S.W., a quarter of a mile broad, and 293 feet high. E. by N. 2 miles from this hummock is a bare rock, 75 feet high, and about half a mile in circumference, with 21 to 27 fathoms water between it and the Four Hummocks, within a mile of all of which there are 27 to 45 fathoms.

PERFORATED ISLAND has a hole through it, nearly at the top of the island, about a quarter of a mile from its north point. The centre of Perforated island is S. by E. $\frac{3}{4}$ E. $8\frac{1}{4}$ miles from Whidbey point, and it is nearly midway between the Four Hummocks and Avoid point.

The island is of a very irregular shape; the heavy sea, which breaks on it, having washed the limestone, of which it is composed, into wild and rugged forms. It is $1\frac{1}{4}$ miles long N.N.E. and S.S.W. from 600 yards to 50 yards wide, and surrounded by steep cliffs nearly as high as the top of the island, which is 235 feet above water.

The sea breaks heavily on a sunken reef, which extends W. by S. nearly a mile from the south point of the island; and there is so much foul ground between E. by S. round by south to W.S.W. to the distance of 3 miles from its south point, that the island should not be approached nearer than 4 miles on any bearing to the northward of East or West. With the island bearing to the southward of East or West it is safe to approach to one mile.

The depth of water between it and the outer island of the two off Avoid point is 13 to 23 fathoms, and there is a depth of 20 to 25 fathoms between it and Whidbey point.

The outer of the two islands near Avoid point bears S.W. $\frac{1}{4}$ W. $2\frac{1}{2}$ miles from that point, and is $5\frac{3}{4}$ miles from Perforated island. It is 209 feet high, about $1\frac{1}{2}$ miles in circumference, and surrounded by limestone cliff. This island is steep-to, with the exception of a reef running N.N.W. 2 cables from its north point. The island nearer to Avoid point lies S.S.E. three-quarters of a mile from the south part of that point. The island and point are connected by a rocky ledge, the greater part of which is covered. This island is of limestone formation, 181 feet high, more than half a mile long, E.N.E. and W.S.W., and about 200 yards broad. A sunken reef extends W. by S. one mile from the west point of the island.

Currents.—Between Greenly island, Rocky island, and Whidbey islands the currents are very strong, causing in many places about those islands a confused sea during and after a gale.

Amongst the outer islands, from November to May, the current runs to the N.W. as much as 2 knots an hour after a continuance of southeasterly winds. From May to November, with westerly winds, it runs quite as rapidly to the eastward.

AVOID BAY is 11 miles across from Whidbey point to Avoid point, and 4 miles in depth. The soundings average 10 fathoms one mile from any part of the shore of the bay, and from 18 to 24 fathoms in the middle. From the east part of Whidbey point to a point N.E. by E 4 miles from it the coast forms a bay, with low rocky

cliffs, and here and there a sandy beach. In some places sunken rocks extend nearly half a mile from this part of the coast. A small rocky islet lies a quarter of a mile S. by E. from the latter point; its sides rise quite smoothly from the water towards the centre, which springs up abruptly from the surrounding rock in the shape of a small dome, the summit of which is about 75 feet above the sea. The northern part of the last-mentioned point runs back about half a mile to the north-west; and from there a sandy beach, with bare sand-hills behind rising to a height of 216 feet, curves to the eastward for nearly 3 miles. The coast then becomes cliffy, with green and wooded hills inland, (one of which is 254 feet high), for $3\frac{1}{2}$ miles to the south-east, as far as a projecting point inside the Black rocks. Thence a sandy beach, with some bare and some wooded sand-hills behind, runs nearly 5 miles south-east, to the beginning of the cliffs of Avoid point. This beach is broken in the middle by two or three dark rocks which extend a short distance into the water.

Black rocks are in the middle of Avoid bay, three-quarters of a mile from the projecting point mentioned above.

The largest and highest is 154 feet high, and about three-quarters of a mile in circumference. A reef, on which the sea breaks, extends S.E. 7 cables from the south point of this island, with a small rock above water at the south-east extreme of the reef. A flat rock lies one cable W.N.W. from the large island, and a reef extends 3 cables farther in that direction, with another small rock at its north-west extreme.

There are 5 to 9 fathoms water between the Black rocks and the shore, and 15 fathoms within a mile to seaward of them.

AVOID POINT is S.E. by E. $\frac{3}{4}$ E. 11 miles from Whidbey point, and there is a green hill above it 188 feet high. It is surrounded by limestone cliffs, about 150 feet high, on its north, west, and south-west sides, which change abruptly to sand-hills to the eastward of its south point. A rock on which the sea seldom breaks lies 3 cables N.E. from a rocky point which has a sand-hill above it, on the north part of Avoid point. There is a flat rock above water close to the west part of Avoid point; and a sunken rock, which nearly always breaks, lies W. $\frac{3}{4}$ N. one mile from the flat rock; with 9 to 11 fathoms water between, and 20 to 23 fathoms half a mile to the westward of the sunken rock.

Clearing mark.—To avoid the sunken rock, when standing into Avoid bay, the western extreme of the outer island near Avoid point should not be brought to bear west of South, until the north end of Avoid point bears south of East.

STUART POINT is S.E. by E. $\frac{1}{4}$ E. $10\frac{1}{4}$ miles from Avoid point. The summit of Stuart point is a round green hill, about 450 feet high, and its cliff face about 400 feet from the sea to the top of the cliff.

The COAST.—From the south part of Avoid point a sandy beach trends N.E. $1\frac{1}{4}$ miles, and then runs in almost a straight line 8 miles S.E. by E. to where the cliffs begin, nearly 2 miles from Stuart point. There is always a heavy surf on the beach between Avoid and Stuart points, and not less than 13 fathoms within a mile of the coast.

Aspect.—Directly inland from Avoid point the hills are wooded, and about 200 feet high; at the back of the long sandy beach they are nearly bare sand, and extend inland 5 miles from the eastern part of the beach; about 2 miles behind which they attain their greatest height, 540 feet. North $2\frac{1}{2}$ miles from Stuart point is the summit of a wooded hill, which slopes down to the cliff north-west of Stuart point, and joins on to the sand-hills to the northward. This hill is 750 feet high, and the most elevated land between Whidbey point and cape Catastrophe.

Stuart reef.—A dangerous reef, which is always covered, and only breaks heavily when there is much swell, lies S. by E. $\frac{3}{4}$ E. $8\frac{1}{4}$ miles from Avoid point, and S.W. by W. $\frac{3}{4}$ W. $6\frac{3}{4}$ miles from Stuart point. The reef is about 800 yards long W.N.W. and E.S.E., and very narrow. There are 22 to 23 fathoms water close to it, and nearly all the way from it to the shore; and 34 to 41 fathoms, 2 miles to the southward of it.

The COAST from Stuart point extends S.E. 10 miles, with no considerable indentation.

It is all very rugged limestone cliff, about 400 feet high, rising in many places perpendicularly from the sea to its summit; the hills above the cliff are from 50 to 100 feet higher, most of them being covered with coarse grass, with here and there bare sandy patches. Close under a green hill, 470 feet high and $6\frac{1}{2}$ miles from Stuart point, is a remarkable cone of rock about 350 feet high, and almost

detached from the adjacent cliff. It can only be seen when near the shore north-west or south-east of it.

There are 14 to 20 fathoms water within a mile of this part of the coast, and deep water to seaward, with the following exceptions :—

A rock which is covered, and which seldom breaks with S.E. winds, lies half a mile off shore, 4 miles S.E. of Stuart point.

Cape reef, 21 feet above water, and extending a quarter of a mile north and south, lies S. by E. $\frac{1}{2}$ E. 8 miles from Stuart point, and W. by N. $\frac{3}{4}$ N. $4\frac{1}{2}$ miles from the west point of cape Wiles. There are 40 fathoms water at less than a mile west of this reef, and 21 to 27 fathoms the same distance from it elsewhere. A small sunken rock, which breaks with a moderate swell, lies N.N.E. $\frac{1}{2}$ E. 2 miles from the north point of the above reef, and nearly 2 miles S.W. by S. from the cone rock. There are 20 fathoms water midway between this rock and the shore, and 23 to 26 fathoms between it and Cape reef.

CAPE WILES is a broad point, its southern face extending more than 3 miles east and west. Its west point is S.E. by S. $11\frac{1}{2}$ miles from Stuart point; from there the coast forms a small indentation to the northward, and joins the east point. The summit of the west part of the cape is a round stony hill 292 feet high, which slopes down to the shore. Low cliffs commence from the south point of the west part of the cape, and rise gradually, attaining their greatest elevation at the east point of cape Wiles, where the scrub-covered summit, 468 feet high, shows just above them.

A rock, on which the sea breaks, lies N.W. $\frac{1}{2}$ W. 7 cables from the extreme west point of cape Wiles. And a reef above water extends 3 cables to the southward from the part of the cape northward of Liguanea island.

There are two high rocks just detached from the east point of cape Wiles, which are conspicuous from Sleaford bay or the westward. A rock above water, 400 yards in extent east and west, lies 3 cables south from the east point of the cape.

There are 18 to 29 fathoms water between cape Wiles and Liguanea island, and deep water half a mile off all the rocks and reefs mentioned above.

Liguanea island is $1\frac{1}{2}$ miles long north and south ; and half a mile broad, except at its south end, where it is narrow and irregularly shaped.

All the coast of the island is clifty, and its top is rather flat ; the highest part, at the south end, is 127 feet above the sea.

Its north point is S. by E. 2 miles from the west point of cape Wiles. The south extreme of a detached reef above water bears S. by W. $\frac{1}{2}$ W., half a mile from the south point of the island.

There are 45 fathoms water one mile south of Liguanea island, and between 30 and 40 fathoms that distance east or west of it.

SLEAFORD BAY, east of cape Wiles, is 8 miles across and 5 miles deep in a northerly direction. There are 10 to 20 fathoms water a mile from the shore all round the bay. No anchorage can be recommended in any part of it, as a heavy swell always sets in, and during bad weather the sea is very confused.

Fishery bay.—From the east point of cape Wiles a high dark limestone cliff trends north 2 miles to Fishery bay. This bay is about half a mile across at its entrance, and runs in a half a mile to the N.W., the shore being clifty on either side, with a sandy beach occupying the head of the bay.

An establishment for whale fishing was carried on in this bay in the early days of the colony. It has been long abandoned, the whales having become scarce on this part of the coast, although it is occasionally visited by whalers from Tasmania.

Water.—There is good water behind the middle of the beach, amongst the low sand-hills ; and although the bay cannot be recommended as an anchorage, a boat may easily land on the beach in moderate weather.

The COAST.—From the north point of Fishery bay to a point N.E. by E. three-quarters of a mile from it, the coast forms a bay with clifty coast, and a sandy beach in its north part. A breaking rock E. by N. half a mile from the north point of Fishery bay, lies outside the line joining the two outer points of the bay. The coast, which is rocky and sloping up to the top of a round green hill, about 300 feet high, and with two clumps of trees on its eastern side, then trends N. by E. for $2\frac{1}{2}$ miles. It then runs East and E. by S. for

8 miles; for 5 miles it consists of small sandy beaches, broken by bits of dark limestone cliff, with green wooded hills at the back rising to a height of about 250 feet. The remaining 3 miles is a sandy beach, with high bare sand-hills behind, stretching a mile inland, where they join some wooded hills, the highest of which is 280 feet above the sea. A quarter of a mile off the east end of the long sandy beach is a small rocky islet about 25 feet high. From there the coast rises in high cliffs, and curves to the southward for $2\frac{1}{4}$ miles to the east point of Sleaford bay, which has a green hill 340 feet high for its summit, with no trees on it, and is E. by N. $8\frac{1}{2}$ miles from cape Wiles. Three-quarters of a mile S.E. by S. from the rocky islet mentioned above is another rocky islet, about 2 cables from the nearest cliff, and 180 feet high.

Cobbler hill is a conspicuous landmark from the north-west part of Sleaford bay. It is N. $\frac{1}{4}$ E. $11\frac{3}{4}$ miles from the east point of cape Wiles, conical in form, 640 feet high, and stands alone. North Side hill is also remarkable from the west part of Sleaford bay. See page 184.

Sleaford mere is a lake of brackish water, nearly $3\frac{1}{2}$ miles long, north and south, and one mile to half a mile wide; it is divided near its centre into two branches, one trending southward and the other south-eastward, and both terminating within 100 yards of the head of Sleaford bay. Its northern extreme extends to about 2 miles south-west of some fresh-water pits, at the head of port Lincoln.

The COAST from the east point of Sleaford bay trends E.S.E. 4 miles, and then S.S.E. 4 miles to West point of cape Catastrophe. The east point of Sleaford bay runs back three-quarters of a mile N.N.E., the cliff on that side being nearly 300 feet high; there are then three small sandy beaches with rocky points between, and sand-hills behind. From off the middle beach a chain of low rocks and islets extends 2 miles south; the highest of these islets is about 120 feet above water, and the south point of the outer rock, which is all large smooth boulders, is S.S.E. $1\frac{3}{4}$ miles from the east point of Sleaford bay. There are about 30 fathoms water at one mile from this rock to the southward of East or West from it.

Eastward of the third beach the coast-line becomes bolder, the cliffs rising 400 feet above the sea under a wooded hill 640 feet high,

See charts, No. 1,061 and No. 2,389a, St. Vincent and Spencer gulfs, southern sheet, scale $m = 0.24$ inch.

about 2 miles farther on. The coast is bold and rocky the remainder of the distance to West point, the soundings being from 20 to 38 fathoms one mile off shore.

WEST POINT.—The south-west extremity of cape Catastrophe, a clifly headland, in lat. $35^{\circ} 0' 30''$ S., long. $135^{\circ} 56' 30''$ E., Snapper point, Adelaide, being in $138^{\circ} 31' 0''$ E., rises to a smooth conical hill 460 feet high, clothed with vegetation.

WILLIAMS ISLE, the north-west extreme of which lies S.S.E. one mile from West point, is about 3 miles in circuit, its south side being very rugged, with long ledges of rock running out from the cliffs; there is a bay on the north side with a small sandy beach at its head. The top of the island is nearly flat, covered with stunted bushes about 2 feet high; it is much burrowed by mutton-birds, and in the winter months is frequented by cape Barren geese.

The bay on the north side of the isle is unsuitable as an anchorage, unless as a last resort.

The passage between Williams isle and the mainland is quite clear, with 27 fathoms in mid-channel; but a heavy sea and race extend across the passage. At 2 cables from the west side of the island there are 20 fathoms water, and 50 fathoms $1\frac{1}{2}$ miles to the S.W. of it; but on its parallel farther to the westward the depth is not so great, 40 fathoms, on a regular sandy bottom, being found at the distance of 2 to 16 miles in that direction.

See charts, No. 1,061 and No. 2,389a.

CHAPTER IV.

AUSTRALIA.—SOUTH COAST, SPENCER GULF.

Variation in 1896.

Gambier islands - 4° 30' E. | Port Augusta - 5° 5' E.

Nearly stationary.

SPENCER GULF,* on the south coast of Australia, is 48 miles across at the entrance from cape Catastrophe to cape Spencer, and extends in a N.N.E. direction 180 miles to Port Augusta, at the head of the gulf, with navigable water for vessels of a large size. Although the entrance is 48 miles wide, this space is partly occupied by Thistle island, near the western shore, and the Gambier group, midway between that island and cape Spencer; besides these, there lie in the offing to the south-west, the Low rocks and the stragglings Neptune isles.

Neptune isles consist of two groups, the North and South Neptunes. The South Neptunes are two isles, the centre of the south-eastern being in lat. 35° 20' 15" S., long. 136° 6' 45" E. This isle, which is barely 2 miles round, seems to be entirely composed of black-looking granite; it is 120 feet high, with a little stunted vegetation.

The other isle, which lies N.N.W. half a mile from that just described, is 2 miles round, and 115 feet high; it is about three-quarters of a mile long, north and south, and a quarter of a mile wide, and also appears to be composed of black-looking granite. The passage between these isles is about one quarter of a mile wide, but it has two or three large rocks in it. The sea breaks so heavily on the south sides of these islands that the spray has been seen flying 40 or 50 feet over the top of the south-eastern isle.

See charts, No. 2,759b, Australia, southern portion, scale $d=1$ inch; and Nos. 2,389a and b, St. Vincent and Spencer gulfs, scale $m=0.24$ inch.

* Named by Flinders after Earl Spencer, who presided at the Board of Admiralty when the *Investigator* was commissioned.

The North Neptunes consist of an island with an islet and rocks off it. The island lies N.N.W. $\frac{1}{2}$ W. 5 miles from the south-eastern isle of the South Neptunes, it is 3 miles in circuit, and 160 feet high. It is nearly flat-topped, its south and south-west sides forming granite cliffs, against which the sea rolls very heavily. At a quarter of a mile east of the south point of the island is a rock on which the sea only breaks at times, but then with great violence. There is a bay on the east side of the island with a small sandy beach, on which there is heavy surf.

An islet lies a quarter of a mile to the east of the north-east point of this island, consisting of a mass of granite half a mile long, east and west, 200 yards broad, and 95 feet high. At half a mile off the east end of the islet there is a rock, which breaks heavily, more than 200 yards across.

There are 40 to 50 fathoms between the North and South Neptunes, and 56 fathoms, sand, at 2 or 3 miles to the southward of them.

LOW ROCKS, North $3\frac{1}{2}$ miles from the North Neptune island, are a straggling mass about 600 yards long, east and west, 50 yards broad, and 30 feet high. N.E. by N. 4 cables from them is a small rock awash, with a heavy break upon it. There are 42 fathoms between the North Neptunes and Low rocks, and 32 to 44 fathoms in the channel between Low rocks and Thistle island.

Caution.—As Neptune isles are rocky and surrounded by breakers, and Low rocks have little elevation, they should be carefully avoided at night.

GAMBIER ISLES,* N.E. by E. about 19 miles from the south-eastern Neptune isle, consist of Wedge isle and four small islets near it.

Wedge isle is nearly midway between cape Spencer and Thistle island; being visible from the distance of 30 miles, it may be seen by nearly every vessel passing into or out of Spencer gulf. It is 3 miles long, E.S.E. and W.N.W., with an average breadth of one mile; three of its sides are cliffs. West rock (awash), on which the sea always breaks, lies W. by S. $\frac{1}{2}$ S. 4 cables from the north-west point; and a reef with some sunken rocks extends more than a quarter of a mile from a low projection of the island, one mile to the south-

See chart, No. 2,389a.

* Named by Flinders after Admiral Lord Gambier.

eastward of that point. From the south-east end the island rises to the height of 662 feet, forming nearly a perpendicular cliff to the southward, which gives the island a wedge-like appearance from a distance.

Wedge isle, principally formed of limestone, is covered with low bushes and casuarina trees, with a little grass, and has for some years been used as a sheep-run. At present it is uninhabited.

Water.—There was in 1873 a good stone house and several wells of good water in the low land inside the beach, on the north-east side, and another well by the sand-hills near the north-west point.

Anchorage.—There is a sandy beach on the north-east side of Wedge isle, off which there is good anchorage in 5 or 6 fathoms water, sheltered from N.W. and round westward to S.E., at about a quarter of a mile from the shore, with the house or east corner of the field on the island bearing South, and the north-west point N.W.; landing on the beach is generally easy.

Peaked rocks are two conical islets, one S.W. half a mile, and the other S.E. a quarter of a mile from the south-east end of Wedge isle. The outer rock is 212 feet, the inner 141 feet high, and both are much frequented by seals.

South-west rock, a mass of granite 70 feet high, is $1\frac{1}{2}$ miles from the south-west part of Wedge isle, with the west point of the island and the west end of North islet in line. This rock, which is about one mile in circumference, is divided into two unequal parts by a cleft running N.N.E. and S.S.W. There is a clear channel, with 27 fathoms, between South-west rock and Wedge isle.

Foul ground.—A rocky patch, with 12 fathoms water on it, lies S.E. nearly 4 miles from Wedge isle, with 28 to 30 fathoms all round it; it is nearly circular, and about a quarter of a mile in diameter, with occasionally heavy breakers upon it, during and after west and south-west gales.

Clearing marks.—When on the shoalest part of the Foul ground, the west end of North islet is in line with the north-east point of Wedge isle, bearing N.W. by N., and the south side of the highest Peaked rock in line with the south-west point of the island, bearing N.W. by W. In order, therefore, to pass well to the

northward of the Foul ground, keep the outer Peaked rock well open south of Wedge isle, or North islet well open north of the island; and to pass to the westward keep North islet entirely shut in.

North islet lies $1\frac{1}{2}$ miles to the northward of Wedge isle, and is three-quarters of a mile long, east and west, half a mile broad, and 155 feet high. Landing is easy on its north-west side in fine weather. It has stunted vegetation and a few casuarina trees on it; the whole islet is much burrowed by mutton-birds. There is a 9-fathoms channel between Wedge and North isles.

Ward rock, which has 6 fathoms water over it, lies West three-quarters of a mile from North islet. This rock is less than 200 yards across each way, and rises nearly abruptly from the depth of 20 fathoms. Ward rock is dangerous in a heavy swell, as it then breaks violently at times; in fine weather it does not show.

Clearing marks.—In proceeding between Ward rock and West rock, keep the high cliff of the east point just open of the north-west point of Wedge island, bearing S.E. by E.

The north-west point of Wedge isle may be rounded close to, but a good berth should be given to the reef and sunken rocks extending from the low point one mile south-east of it, having cleared which, anchor off the sandy beach, as already directed.

Middle and N.N.E. rocks are both awash, and lie respectively North one mile, and N.N.E. nearly 3 miles from North islet; Middle rock being in line with the west extreme of North islet, the west points of Wedge isle and South-west rock. There are 17 fathoms between North islet and Middle rock, and 20 to 24 fathoms between the two rocks, which may be passed close to.

Clearing marks.—To clear Middle and N.N.E. rocks to the westward, keep South-west rock its own breadth open of the west point of Wedge isle bearing S. by W. $\frac{1}{4}$ W. (S. 14° W.) The eastern Peaked rock open of Wedge isle bearing S. $\frac{1}{2}$ W. (S. 6° W.) clears Middle and N.N.E. rocks to the eastward.

Tides and tidal streams.—It is high water, full and change, at the Gambier isles, at 2h. 0m.; springs rise about 5 feet. The stream sets to the N.W. during the rising tide and to the S.E. during the falling tide, from less than half a knot to three-quarters of a knot.

THISTLE ISLAND* lies near the western shore, and forms part of the eastern side of Thorny passage, the south-east extremity of the island bearing about E. by S., distant $12\frac{1}{2}$ miles from the West point of cape Catastrophe. Thistle island is 9 miles long, north-west and south-east, three-quarters of a mile broad at the centre, increasing to 2 miles in breadth towards each end. The centre of the island rises to the height of 772 feet, and may be seen in clear weather from the distance of 35 miles.

Thistle island has from time to time been used as a sheep and cattle run, but has not been found hitherto to answer; owing, it is stated, to the cattle and sheep eating some poisonous grass or herb which grows on the island; otherwise it appears very fit for grazing purposes. In 1863 the island was deserted; but there was a good weather-board house, just within the beach north of Snug cove; in the garden were some wells of slightly brackish water.

Waterhouse point, the narrow south-east extreme of Thistle island, is a rugged cliffy head 120 to 130 feet high, sloping gradually down to the northward on either side. An islet lies W.S.W. three-quarters of a mile from the point, at a quarter of a mile from the shore, with 6 fathoms between it and the point northward of it; in a gale the water breaks right across.

Race.—Waterhouse point is fronted with high black rocks and very deep water, and the tidal streams sweep round the point at the rate of 2 knots, the north-going stream during the rising tide and the south-going stream during the falling tide; the latter meeting the south-westerly swell, causes, with southerly winds, a dangerous race, which is felt as far as 2 miles off the point.

SOUTH ROCK, S.W. $1\frac{1}{2}$ miles from Waterhouse point, is about 100 yards across; it is just awash, and has always heavy breakers on it. There is deep water all round this rock, and 30 fathoms between it and the islet.

Directions.—In rounding the south-east end of Thistle island give it a berth of more than 2 miles, to avoid South rock and the race off Waterhouse point.

Waterhouse bay, on the eastern side of Thistle island, about one mile north of Waterhouse point, affords shelter for coasters in

See chart, No. 2,389a.

* Named by Flinders after the master of the *Investigator*, see footnote, page 181.

3 fathoms water, sand, a cable from the beach, with the southern point of the bay bearing E.S.E. Care must be taken, when going in or out, to avoid a rocky patch 200 yards long, east and west, which lies N.W. nearly one-third of a mile from the point, with its inner end one cable from the beach. This patch only breaks at times, though part of it is nearly awash at low water.

East coast.—From Waterhouse point to Horny point, about N.N.W. $3\frac{1}{2}$ miles, the east coast of Thistle island consists of sandy beaches and rocky points with ledges running out, but with no dangers beyond 2 cables from it. The soundings deepen rapidly to more than 20 fathoms at $1\frac{1}{2}$ miles from this part of the coast.

Whalers bay.—Horny point, the south-eastpoint of Whalers bay, is rocky, with a limestone cliff, and points to the northward; on its western side the land recedes, and a fine sandy beach forms Whalers bay, which affords good anchorage for coasters, in 4 fathoms water, sand, sheltered from West round southward to East, with Horny point bearing E.N.E., distant a quarter of a mile.

Supplies.—There is good schnapper fishing inside Horny point, and firewood may be cut in abundance.

North-east coast.—W. by N. about one mile from Horny point the high cliffs at the centre of Thistle island commence and continue 2 miles in a N.W. direction, after which alternate beaches and points extend to Observatory point, the north end of Thistle island, bearing N.W., distant 6 miles from Horny point.

Observatory point is a low projection of a long sandy beach, extending on one side S.E. one mile, and on the other S.W. an equal distance. From Observatory point a sand-flat extends three-quarters of a mile to the north-west, studded with rocky patches, some not having more than 5 feet over them at low water. There are occasionally breakers on this flat with strong south or south-west winds.

Anchorage.—On the north-east side of Thistle island the soundings gradually shoal to the north-westward, and a vessel can get good anchorage in 7 fathoms on a sandy bottom, with Observatory point bearing W.N.W., distant three-quarters of a mile, and the south-east end of the beach S. by W. or South. Here the tidal

streams never run more than half a knot, sometimes to the S.E. during the rising tide, and to the N.W. during the falling tide. See page 181.

South-west coast.—Between Waterhouse point and the point about one mile to the westward, off which is the islet before noticed, the coast forms a deep bay, with two small sandy beaches at its head; the water shoals gradually as they are approached; but the bay does not afford good anchorage, as the south-westerly swell sets into it.

Fossil point.—From the west point of the bay just described the south-west coast of Thistle island takes a N.W. direction $2\frac{1}{2}$ miles to Fossil point, at a quarter of a mile to the south-eastward of which is a gully containing fossil trees of various sizes.

From Fossil point the coast forms a bay to the eastward about half a mile deep, and then trends north-west 3 miles to a sandy beach; it is formed of reddish limestone cliffs, 600 to 400 feet high. The cliffs, which are highest in the bight, fall gradually and assume a white appearance, being formed of white limestone nodules and sand on a granite base. Rocks, on which the sea occasionally breaks, extend half a mile south from the beach.

The prevailing south-west winds have blown the sand from the beach nearly across the island to the north-eastward, forming a causeway of white sand, which, at the distance of three-quarters of a mile from the beach, has formed a hill 268 feet high; it is very remarkable.

North-west coast.—The coast from the sandy beach trends W. by S. one mile to a high white cliff, with a ledge of rocks, on which the sea breaks, extending 400 yards to the southward. Between this cliffy projection and a point lying N.N.W. one mile from it, the coast forms a bay, and thence becomes rocky, with whitish limestone cliffs, gradually falling to the northward, and takes a north-east direction for about a mile to the south-west point of Snug cove, a boat harbour between this point and the south-west end of the beach extending from Observatory point.

Tides.—It is high water, full and change, in Snug cove, about 2h. 0m.; springs rise 5 feet; but the rise and time of high water seem to be influenced a great deal by the wind; strong westerly winds apparently producing the highest tides. The times of high and low water seem to be regular for the first week after full and

change ; after which there is only one tide in 24 hours for five or six days, with high water from 8h. p.m. to midnight, when the tides again become regular.

Hopkins isle, known also as Snake isle, lies three-quarters of a mile off the white cliffs at the north-west end of Thistle island, to which its own coast bears a great resemblance. Hopkins isle is one mile long, north-east and south-west, half a mile broad, and rather flat-topped, with perpendicular cliffs ; it is 200 feet high, its sandy surface being burrowed all over by mutton birds.

The passage between Thistle and Hopkins islands is about half a mile wide, but it is blocked up with rocks and breakers, the rollers during the south-going stream frequently breaking right across. A few detached rocks lie nearly half a mile northward of the island, and abreast of the landing-place, which is on a small patch of sand.

This island is dangerous to approach from the southward, as the rocky shoal connecting it with Thistle island extends nearly three-quarters of a mile south-westward of it towards Smith isle. There is a sunken rock on this shoal S. by W. 4 cables from Hopkins isle, upon which the sea breaks heavily, except in fine weather, when it does not break at all.

Reported shoal.—A fisherman at Port Lincoln has reported (1896) that he often fishes on a shoal, with a depth of about 4 fathoms on it and which only breaks in southerly gales, situated about 2 miles S.S.E. (S. 22° E.) from Hopkins isle. This position must be considered doubtful.

BLACK ROCK, N. $\frac{3}{4}$ W., $1\frac{1}{3}$ miles from Observatory point, is awash at high water, but at low water appears as a mass of black granite, 6 feet above water, and 50 yards in circumference. Rocks under water extend from Black rock for half a cable all round, and a ledge projects 2 cables to the northward ; there are 4 fathoms water between the rock and Observatory point.

There is seldom much broken water on Black rock, and it is not easily distinguished from the southward late in the afternoon, until half a mile from it. From Black rock the cliffy extremes of Hopkins and Thistle islands appear a little open, bearing S.S.W., and the rocky projection south-east of Observatory point is in line with the highest part of Thistle island, bearing S.S.E. $\frac{1}{2}$ E.

Clearing marks.—Hopkins isle kept well open of Thistle island clears Black rock to the westward, and the projection south-east of Observatory point kept between the high cliffs and Horny point, leads between Black rock and the flat north-west of Observatory point.

PORTER ROCK, N.N.E. $\frac{1}{2}$ E. $1\frac{3}{4}$ miles from Black rock, with the cliffs of Thistle and Hopkins islands just opening S.S.W. $\frac{1}{4}$ W., is a covered patch 400 yards long and 150 yards across, the least water on it being towards its north end, where there are several knobs with only 3 feet on them at low water; towards the south end there are 2 fathoms.

Caution.—This rock is very dangerous, as it lies in the direct track of vessels from the south-east proceeding to port Lincoln, with seldom sufficient breakers upon it to attract attention, and frequently there is no broken water upon it for some days.

From Black rock to Porter rock there are 6 fathoms, on a rocky bottom, and soundings in 7 fathoms extend north-west one mile from Porter rock; with these exceptions there are 10 and 11 fathoms about it.

Clearing marks.—Porter rock is cleared to the eastward by keeping Hopkins isle closed in by Thistle island; and to the westward by the same islands being kept well open of each other; the north of the high-wooded conical hills north of Memory cove open north of Taylor isle, bearing West, leads three-quarters of a mile northward of this rock.

CAPE CATASTROPHE.*—The general aspect of the coast about this cape is high and rocky, with cliffs of reddish and white limestone 50 to 100 feet high, behind which the land rises to conical hills densely wooded with gum scrub to their summits. From West point the coast trends to the north-east 3 miles to the cape, and forms two small exposed sandy bays, separated by some projecting cliffs of whitish and level aspect. Behind the coast the land rises to a rocky range of considerable elevation, upon which there are a few trees. Cape Catastrophe is high and rocky, with a ledge of black rocks, on which the sea breaks heavily, extending about 100 yards from it.

TIDAL STREAMS and RACE.—Strong tidal streams run

See charts, Nos. 2,389a and b.

* Named by Flinders, *see* footnote, page 181.

close round cape Catastrophe to the south-west during the falling tide, and to the north-east during the rising tide, between it and Williams isle, causing, with the wind on shore, a race which is dangerous to a small vessel.

The COAST.—From cape Catastrophe the coast, consisting of high cliffs, mostly of granite formation, trends N. by W. $\frac{1}{2}$ W. $1\frac{1}{2}$ miles to the east point of Memory cove; this point, which is very low, may be rounded in 8 fathoms water at the distance of 20 yards.

Memory cove is about half a mile across, east and west, and one-third of a mile deep, with a narrow sandy beach, one cable long in the bight. It is well sheltered from all winds from N.N.W. round by west to S.E.; but with north-east or north winds a short sea gets up, which washes the sand off the beach leaving the rocks underneath exposed.

The anchorage for moderate sized vessels is in 5 fathoms water, sand, with the east point of the cove in line with the north cliff of Hopkins isle bearing E. $\frac{1}{2}$ N., and the east corner of the beach South; larger vessels anchor farther out in 8 or 9 fathoms, with the point touching the north extreme of Smith isle bearing S.E. by E., and the east extreme of the beach S. by W.

Supplies.—Rock fish may be caught with hook and line off the east point of Memory cove, and firewood may be obtained in abundance; but no fresh water can be procured, except a few bucketfuls after heavy rains.

The COAST.—From Memory cove the coast trends North $2\frac{1}{2}$ miles to a point having a detached rock off it; and thence N.N.W. 5 miles to a long sandy beach, with low land behind it. Nearly the whole of this coast consists of limestone cliffs, forming several small coves; one of which, with 5 fathoms water, lies close to the westward of the point just noticed, and Shag cove, with 3 fathoms water, N.N.W. $1\frac{3}{4}$ miles from it. Coasters might lie in these little bights out of the influence of the tidal streams, and sheltered from all westerly winds. The land at the back of the cliffs, and the hills also, are thickly covered with scrub.

The long sandy beach just mentioned trends N.E. 2 miles to a rocky point, whence the coast takes a N.N.E. direction for 2 miles to Maclaren point, which projects half a mile from the line of coast,

and has a bight on either side of it. A rock with one fathom on it, lies N.E. by N. $1\frac{1}{2}$ cables from the pitch of Maclaren point, and another rock, about 10 feet high and 100 yards long north and south, lies N. $\frac{1}{4}$ E. $1\frac{1}{2}$ miles from the same point, and 4 cables off shore; there are 6 fathoms water close to this rock to seaward, and one to $2\frac{1}{2}$ fathoms between it and the shore.

There is a good schnapper ground in 5 or 6 fathoms water off Maclaren point.

From the inner part of Maclaren point the coast trends North for $2\frac{1}{2}$ miles, forming a bay; it then curves round $2\frac{1}{2}$ miles N.W. by N. to cape Donington, being composed of sandy beaches and low rocky points, with scrub-covered rises behind about 150 feet high. Stamford, North Side, and Winter's hills can be seen when more than 2 or 3 miles off shore.

There are 6 to 7 fathoms water a quarter of a mile from the coast between Maclaren point and cape Donington.

THORNY PASSAGE has on its east side Thistle island, Hopkins isle, and Black and Porter rocks; and on its west side cape Catastrophe and the coast thence northward towards cape Donington.

Thorny passage is about $2\frac{1}{2}$ miles wide at its narrowest part, between cape Catastrophe and Hopkins isle, whence its width gradually increases to about 7 miles between Porter rock and the land. Several small islands, which lie between the north-west end of Thistle island and cape Catastrophe, so contract this passage that the only safe ship channel is between the cape and Smith isle. This channel is one mile wide, with a depth of 22 to 25 fathoms, From 20 to 24 fathoms in the southern part of Thorny passage the soundings gradually decrease to about 11 fathoms westward of Porter rock.

Smith isle, the south of these small islands, lies E. $\frac{1}{2}$ N. $1\frac{1}{4}$ miles from cape Catastrophe, and S.W. nearly 2 miles from the centre of Hopkins isle; it is of an oval form, and flat-topped, half a mile long, N. by W. and S. by E., and 400 yards broad; it is 73 feet high, and covered with stunted vegetation. Smith isle is steep-to, with more than 20 fathoms water within a cable of it.

Lewis isle, North $1\frac{1}{2}$ miles from Smith isle, differs in aspect from the other islands in Thorny passage, being round, peaked, and 128 feet high, while the others are all flat-topped. Lewis isle is a quarter

See charts, Nos. 2,389a and b, and No. 784, port Lincoln, scale $m = 2\cdot0$ inches.

of a mile long, N.N.W. and S.S.E., and little more than 200 yards broad, with 13 and 14 fathoms water close to it.

Little islet, N.W. half a mile from Lewis isle, is a mass of black granite of irregular form, 27 feet high, and about 150 yards in diameter.

Caution.—It is dangerous to pass between Little and Lewis isles, as the tidal streams sweep from one to the other at the rate of more than 3 knots, with strong eddies and ripples. With a strong north-going stream these ripples extend more than half a mile north from Little isle.

GRINDAL ISLE, W. by N. $\frac{1}{2}$ N. nearly 4 miles from Observatory point, and 2 miles from the land to the westward, is rather more than three-quarters of a mile long, north and south, and half a mile broad. It is 84 feet high, flat-topped and covered with detached bushes, which seem to spring up from a soil of white limestone lumps, and although apparently without a blade of grass, the island is used as a sheep run. Some rocks awash lie off the north-east point; and a coral ledge, with 4 to 7 fathoms water on it, extends three-quarters of a mile from the north end of Grindal isle; but there are 9 to 10 fathoms one cable from all other parts of it.

TAYLOR ISLE,* N.W. $\frac{1}{2}$ W. $1\frac{1}{2}$ miles from Grindal isle, is the northern island in Thorny passage, it is $1\frac{1}{2}$ miles long, north and south, and about half a mile broad; the highest part, near the north end, is 227 feet high. Taylor isle is rocky, with its eastern side forming a high cliff; and there is no other beach than a small one at the north-west point. It is mostly covered with scrub; the south end is grassy, and the island has been used as a sheep run.

A small islet lies 3 cables off the north end of Taylor isle, with only 7 feet water between them; and a similar islet lies off the south end of Taylor isle, from which it is separated by a boat passage.

Taylor isle is steep-to, except off its north-west side, where a sand-flat extends a quarter of a mile off shore to the islet. There is a clear channel $1\frac{1}{2}$ miles wide, with 11 fathoms water, between Taylor and Grindal isles; and that between Taylor isle and the mainland, which is $1\frac{1}{4}$ miles wide, with 10 to 8 fathoms, is equally free from dangers.

See charts, Nos. 2,389a and b.

* This isle is named after the midshipman, and the six isles nearest cape Catastrophe are named after the six men, lost from the *Investigator*. *See* footnote, page 181.

Anchorage.—There is good anchorage for large vessels, in 9 fathoms water, marl, with the south point of Taylor isle bearing S.E., and a high and remarkable striped limestone cliff on the mainland bearing about S.W.

TIDES and TIDAL STREAMS.—It is high water, full and change, in Thorny passage, at noon; springs rise 6 to 8 feet. The tidal streams run North and South, through Thorny passage, at the rate of 2 or 3 knots, and one knot between Taylor isle and the mainland at springs. In the vicinity of the isles, between cape Catastrophe and Thistle island, there are tide-ripples, which are so violent as to swamp a boat.*

Between Observatory point and Porter rock the stream sets to the north-east during the rising tide, and to the south-west during the falling tide, about $1\frac{1}{2}$ knots; but at the anchorage about one quarter of a mile eastward of Observatory point, the stream was sometimes found setting to the south-east during the rising tide, and to the north-west during the falling tide, at about half a knot at springs, with no regularity, the stream frequently running one way all day and night.

DIRECTIONS.—Thorny passage is very seldom used, there being little trade between Port Lincoln and any ports to the westward; and it cannot be recommended to strangers, as the wind frequently dies away in the passage with a south wind outside and some other wind in Spencer gulf, leaving a sailing vessel to the full influence of the tidal streams in deep water.

When proceeding northward through Thorny passage, with a strong fair wind, pass cape Catastrophe at the distance of about 4 cables, and then steer North, going between Grindal and Taylor isles.

To enter Thorny passage by the narrow channel between Smith and Hopkins isles, the rock southward of Hopkins isle will be cleared at the distance of half a mile, in 27 fathoms water, by keeping the east side of Lewis isle touching the west side of Grindal isle, bearing N. by W., until cape Catastrophe opens north of Smith isle, bearing W.S.W.

See charts, Nos. 2,389a and b.

* In these tide-ripples H.M.S. *Investigator*, Captain Flinders, lost her master, a midshipman, and six men, by the upsetting or filling of a boat that was crossing over from Memory cove to the ship, at anchor off the north-west side of Thistle island, which renders care and daylight necessary in crossing this track, especially with a weather tide.—Flinders' "Terr. Aust.," vol. i. p. 135.

DANGEROUS REEF, the centre of which is N. $\frac{1}{4}$ W. nearly $14\frac{1}{2}$ miles from the south point of Thistle island, E.S.E. $11\frac{3}{4}$ miles from cape Donington, and S. by W. $\frac{1}{2}$ W. $8\frac{1}{2}$ miles from Stickney island, is composed of four large rocks above water extending W. by S. 6 cables, and S.E. 7 cables from the centre of the largest one; none of them being more than 200 yards broad.

The highest rock is about 12 feet above water, and can be seen from a distance of 6 miles; there are several small rocks above water between the large ones.

There are 10 to 14 fathoms water half a mile off the reef all round, and between it and Stickney island are 12 to 16 fathoms.

Reported shoal.—A fisherman at Port Lincoln has reported (1896) that he often fishes on a shoal, with a depth of about 12 feet on it and which only breaks in southerly gales, situated about $2\frac{1}{2}$ miles S.S.E. (S. 22° E.) from Dangerous reef. This position must be considered doubtful.

HOWARD ROCK is W.S.W. $2\frac{3}{4}$ miles from the centre of Dangerous reef, between it and which there are 10 to 12 fathoms water. The rock is not more than 50 yards across, with 9 feet least water on it, and 7 to 9 fathoms close to all round. It very seldom breaks. The distance between it and Porter rock is $4\frac{1}{4}$ miles, with depths of 9 to 11 fathoms.

CAPE DONINGTON, is the north-east point of a headland, on the south-east side of the entrance to port Lincoln, which extends about 4 miles to the northward from Maclaren point, with a breadth of three-quarters of a mile. From the cape the land rises to its wooded summit, 175 feet, half a mile to the south-west; the north-west side of the headland is cliffy.

This cape was so named by Flinders after the town Donington, near Boston in Lincolnshire, where he was born in 1774.

Donington reef.—A rock 10 feet high, lies N.N.E. $\frac{1}{2}$ E. 3 cables from cape Donington; there are 5 fathoms water 2 cables from the cape towards the rock. The reef extends N. $\frac{1}{4}$ W. a quarter of a mile from the rock. There is one fathom water on the north part of the reef, and 6 to 7 fathoms close to its north, west, and east sides.

PORT LINCOLN.—The harbour known as port Lincoln consists of Boston bay, port Lincoln proper and Spalding cove. The

usual anchorage is off the township of Port Lincoln, situated in the south-west part of Boston bay.

Port Lincoln is the finest harbour in South Australia, having ample room for a large number of vessels of heavy draught to lie perfectly land-locked; the land, however, in its immediate vicinity is poor, and it has never had a large population.

Life saving apparatus.—A rocket apparatus is maintained at Port Lincoln, and in the event of a vessel being stranded at or near the port, and the lives of the crew in danger, assistance will, if possible, be rendered from the shore.

Spalding cove, between cape Donington headland and Surfleet point, extends 3 miles south from the former, and is nearly $1\frac{1}{2}$ miles broad throughout. The general depth to within one mile of its head is from 5 to 8 fathoms.

Its shores consist of low rocky points and sandy bays; on its eastern shore there is a good deal of sandy cliff, with scrubby rises at the back.

There are no dangers in Spalding cove, and anchorage anywhere, the best is in the the bay south of cape Donington summit.

With a strong northerly wind there is a short sea in the cove.

Surfleet point, S.S.W. $\frac{3}{4}$ W. a little more than 2 miles from the west part of cape Donington headland, is the west point of Spalding cove, and the north-east point of port Lincoln proper.

Bicker islets are two, each about half a mile in circumference and 30 feet high; lying N. $\frac{3}{4}$ W. half a mile and nearly one mile respectively from Surfleet point. The north islet has 7 to 8 fathoms water at rather more than one cable from its north, west, and east sides. A ledge of rocks runs S. $\frac{1}{2}$ E. from its south-east point half-way towards the south islet, between which and the extreme of the ledge are 2 fathoms.

The south islet is steep-to on its west side; rocks extend 50 yards from its north side; the east side should not be approached nearer than a quarter of a mile, and a stony bank extends S.E. 200 yards from its south-east point. There are 4 fathoms water midway between the south islet and Surfleet point.

PORT LINCOLN PROPER is situated between Kirton and Surfleet points, and is more than 7 miles in depth in a south-west direction. The soundings in it are generally from 3 to $4\frac{1}{4}$ fathoms.

Stamford hill is 471 feet high, and the most conspicuous feature on the south-east side of port Lincoln proper. Its top is a quarter of a mile long north and south; the sides are covered with scrub. On its highest part is a monument of white marble erected by Sir John Franklin, R.N., in memory of Captain Flinders, R.N., the discoverer of South Australia.

North Side hill has a conical summit, with a large boulder on one side, is 638 feet high, and the only conspicuous hill on the west side of the port. It is the southern summit of the range to which Winter's hill, N. $\frac{1}{4}$ E. 3 miles, and mount Liverpool, N. by E. $\frac{1}{4}$ E. 23 miles, belong.

The coast from Surfleet point trends S.W. by W. $\frac{1}{4}$ W. nearly $1\frac{1}{2}$ miles to a round rocky point under Stamford hill, there being two sandy beaches between. It then runs S.W. by S. $2\frac{3}{4}$ miles, and W. by S. nearly 2 miles, to near Horse rock, and consists of rocky points and sandy beaches, with low scrub-covered rises at the back, over which the sand-hills behind Sleaford bay are visible.

From the point near Horse rock the direction of the coast is W. $\frac{1}{2}$ S. for more than 3 miles to the sandy beach at the head of the port; it consists of low limestone cliffs, with hills covered by mallee scrub rising directly from them.

Between Surfleet point and a mile from the head of the port there are 3 fathoms or more water anywhere half a mile off shore.

From the north end of the sandy beach the low limestone coast trends N.E. $\frac{1}{2}$ N. $4\frac{1}{2}$ miles to the west end of a long sandy beach, where it turns to the eastward and south-east, forming a bay $1\frac{1}{2}$ miles across. A flat dries to nearly one mile off this long beach, and there is not more than one fathom water north of a line W. $\frac{1}{2}$ N. from the east point of the bay across it. The north-west part of port Lincoln proper is generally shallower than the south; the edge of the 3-fathoms bank runs from close south of Grantham island to a spot, where there are $2\frac{3}{4}$ fathoms, N.W. one mile from the Horse rock, and thence continues quite one mile off shore to the head of the port.

A sandy spit, which dries, extends 600 yards off shore from the sandy beach, N.E. $1\frac{1}{4}$ miles from the head of the port.

A shoal, with 3 fathoms water on it, and 200 yards across, lies West $1\frac{1}{4}$ miles from Horse rock, and S.W. $\frac{1}{4}$ W. $2\frac{1}{4}$ miles from the south-west point of Grantham island. There are 4 to $4\frac{1}{4}$ fathoms for half a mile to the northward and eastward of the patch, but not more than $3\frac{3}{4}$ fathoms to the southward of it.

Horse rock is S.W. by W. $\frac{3}{4}$ W. $4\frac{1}{4}$ miles from Stamford hill, and S. by W. $\frac{3}{4}$ W. rather more than $1\frac{1}{2}$ miles from the south-west point of Grantham island, between it and which are 4 to $4\frac{3}{4}$ fathoms.

The rock is of small extent, and not more than 2 feet above high water; between it and a point S.E. $\frac{1}{4}$ E. 3 cables from it, is a sandy spit with 2 feet on it at low water.

Grantham island, the centre of which is West 3 miles from Stamford hill, is three-quarters of a mile long N.E. by N. and S.W. by S., a quarter of a mile broad, and 50 feet high. Its coast is clifty, with rocks extending a short distance off; it is covered with scrub, and rabbits abound on it. There are one to $1\frac{3}{4}$ fathoms water between the island and the land north-west of it; the south-east side is steep-to, there being $4\frac{1}{4}$ to 5 fathoms one cable off it.

The COAST from the point near Grantham island takes the direction of N.E. $\frac{1}{2}$ N. for 2 miles to the east point of Porter bay, and is formed of low cliff, with small sandy beaches. There are two slightly projecting points between, each having a scrub-covered hill about 150 feet high behind it. There are 5 to 6 fathoms water a quarter of a mile off the coast to the north-east of Grantham island.

A bank, with $3\frac{3}{4}$ fathoms least water obtained on it, lies S.S.W. $\frac{1}{2}$ W. 2 miles from the south point of Boston island; there are 5 to 6 fathoms all round it, but another patch with 4 fathoms water, mud, lies N.W. by W. $\frac{3}{4}$ W. 4 cables from it.

DIRECTIONS for PORT LINCOLN PROPER.—Between Boston island and cape Donington. With a fair wind it is better to pass between cape Donington and the rock off it, rather than north of the rock.

In passing north of the rock, to clear the Donington reef, do not

bring the rock south of S. by W. or in line with the east side of cape Donington, until the summit of South Bicker islet is open to the right of cape Donington headland, S.W. $\frac{1}{2}$ S. If drawing less than 21 feet there is then nothing to avoid until to the westward of Grantham island. When standing towards the north-west shore of port Lincoln proper to keep in not less than $3\frac{3}{4}$ fathoms, tack when the north end of South Bicker islet is nearly in line with the south end of Grantham island, N.E. by E. $\frac{1}{2}$ E. To clear the 3-fathoms shoal S.W. of Grantham island, the summit of North Bicker islet in line with the south end of Grantham island, N.E. by E., leads 3 cables north-west of it in 4 fathoms; and the south-east point of Boston island in line with the south end of Grantham island, N.E. $\frac{1}{4}$ E., leads to the south-east of it in $3\frac{3}{4}$ to 4 fathoms.

Anchorage.—There is good anchorage anywhere in port Lincoln proper, according to draught. The anchorage at the head of the port where wool is shipped from the beach, is in 4 fathoms, with North Side hill bearing North, and a black point at the south end of the beach at the head, W. by S.; and in $2\frac{1}{4}$ fathoms, at a little more than half a mile from the beach, with the same objects bearing N. by E. and W.S.W. respectively.

Boston island is nearly 4 miles long N. by W. and S. by E., and $1\frac{1}{2}$ miles broad at its widest part; it is prettily wooded with shea-oaks and small gum trees, and in the winter covered with very green grass. The island is generally hilly, its highest point being 319 feet high. Maria point, the north end of the island, is low and rocky, the end of a narrow projection about 40 feet high.

On the west coast, rather more than half a mile from Maria point, is a small white cliff, with a house near; a rocky reef with 3 feet water on it runs W.S.W. nearly 3 cables from this cliff; it is 200 yards broad, and has $4\frac{1}{2}$ to 5 fathoms close to. The west side of Boston island is composed of sandy bays and sloping points, with low rocks at the water's edge, and except near the reef mentioned there are 8 fathoms a quarter of a mile off it. The south point is low and very narrow; a reef with $1\frac{1}{2}$ fathoms projects S.S.E. one cable from it. Between the south point and a point N.E. by E. $\frac{1}{2}$ E. $1\frac{1}{4}$ miles from it, the coast bights in nearly three-quarters of a mile, forming a bay with 6 to 8 fathoms about 2 cables from the shore.

Rocks extend off the east point of the island, N.E. by E. $\frac{1}{4}$ E. 2 cables.

The east side of the island is rather steeper than the west, and has 8 to 10 fathoms water a quarter of a mile off, except about Kangaroo reef, off Maria point.

Kirton point is more than half a mile broad facing the north-east, and is W. $\frac{3}{4}$ N. 2 miles from the south point of Boston island, the water between being 6 to 9 fathoms. The summit of the point is a round scrubby hill 220 feet high. There are 6 to 8 fathoms 2 cables off the point.

Porter bay, south of Kirton point is nearly one mile across and three-quarters of a mile in depth.

The head of the bay is a sandy beach, at the centre of which the waters of an extensive swamp at the back discharge themselves. Off the beach there are 4 fathoms more than half a mile out. There is a scrubby hill 206 feet high, south of the beach. The south shore is low rocky cliffs and sandy beaches; the hills behind are covered with mallee scrub, good for fuel.

Rocks uncovered at low water, and foul ground extend a quarter of a mile off the east point of the bay.

BOSTON BAY is included between Kirton and Boston points, and protected seaward by Boston island. The depth in the greater part of it is from 9 to 6 fathoms. It is free from danger, with the exception of the following:—

Kangaroo reef, a rocky patch extending between N.E. $\frac{3}{4}$ N. and E. by N. nearly 6 cables from Maria point. Its shallowest part is a rock awash at low water N.E. by E. $\frac{1}{4}$ E. 4 cables from Maria point; and it has one to 3 fathoms over it, with 5 to 8 close to. The channel between it and Boston point is one mile wide, with 8 fathoms in it.

A bank, with $3\frac{1}{2}$ fathoms least water on it, bottom soft mud over rock, lies N.N.E. $\frac{1}{2}$ E. $1\frac{2}{3}$ miles from Port Lincoln jetty end, and one mile from the western shore of the bay. It is 600 yards long N.W. and S.E., 200 yards broad, and has $7\frac{1}{2}$ to $8\frac{1}{2}$ fathoms close-to all round.

Port Lincoln township is situated close to the sea in the valley between Kirton point and the range continuing south from Winter's hill. There is a jetty 700 feet long, having a crane on it, with $11\frac{3}{4}$ feet water near the end, on its western side. Population in 1891, 402 persons.

The weekly steam vessel between Port Adelaide and Port Augusta discharges cargo alongside, and so do the small craft trading there. Very good water can be obtained at a spring on the beach, N.N.W. 8 cables from the jetty end ; and provisions at the stores.

Port Lincoln and the whole district to the westward is rather isolated from the rest of the colony. The exports of Port Lincoln are principally wool, wheat, and oysters, the latter being carted overland from the inner waters of Coffin bay ; much of the trade which might go to Port Lincoln is shipped at different points along the coast to the northward, and land carriage thus avoided ; the coasting steam vessel calling in anywhere where cargo is collected.

There is a telegraph station at Port Lincoln.

From Kirton point a sandy beach which fronts the township trends West half a mile, and N.W. half a mile ; the coast then trends North 6 miles in almost a straight line to the north-west part of Boston bay ; it is composed of red sandy cliffs, with stony and sandy beaches at their base, and may be approached anywhere to half a mile. A wooded range slopes down to this part of the bay, cultivated near the shore ; it is lowest behind the north-west part of the bay, and rises gradually to the southward, attaining its greatest elevation at Winter's hill, which is 771 feet high, with a long flat summit, and is $1\frac{1}{4}$ miles inland from the south-west part of the bay.

From the north-west part of Boston bay (behind which is the small village of North Shields) the coast turns to the eastward, and is a long sandy beach, with low sand-hills behind for $2\frac{1}{2}$ miles ; from the east end of the beach to Boston point it is S.E. 2 miles, the coast being sandy beaches and low rocky points, with a hill 170 feet high, above, and sloping gradually down to Boston point.

Boston point on the north-east side of Boston bay is broad and low. It is N.E. by N. $1\frac{3}{4}$ miles from Maria point, and there are 7 fathoms water at the distance of one cable from it.

The peninsula which runs out to Boston point has two round

grassy hills on it; between it and the mainland is a narrow neck of land partially covered with vegetation.

DIRECTIONS.—For the north entrance between Boston point and Boston island, Boston point may be rounded close to. North Side hill open to the right of Maria point S.W. $\frac{1}{2}$ S. (S. 39° W.) clears the Kangaroo reef to the westward. To clear Kangaroo reef to the eastward keep mount Gawler in line with the eastern extreme seen of the long sandy beach in the north part of Boston bay, N.N.W. $\frac{3}{4}$ W. (N. 31° W.). This mark leads half a mile north-east of the reef in 10 fathoms. To clear the reef in the bay, off the cliff point of Boston island, keep Boston point open of Maria point until the white cliff bears to the north of N.E. by E. To clear the $3\frac{1}{2}$ -fathoms bank in Boston bay, North Side hill in line with the jetty S.W. $\frac{1}{2}$ S. (S. 39° W.), leads a quarter of a mile south-east of it in 8 to 9 fathoms water; and the Roman Catholic chapel, which is somewhat elevated, and half a mile inland from the jetty, in line with the outer end of the jetty S. by W. $\frac{1}{4}$ W. (S. 14° W.), leads a quarter of a mile west of it in 9 fathoms.

By the entrance between cape Donington and Boston island.—For rounding cape Donington directions have been given in those for port Lincoln proper. In working into Boston bay to avoid the bank S.S.W. from the south point of Boston island; when standing to the southward in that vicinity tack when the summit of cape Donington is in line with the north side of North Bicker islet E.N.E. (N. 67° E.), and if of draught requiring more than 4 fathoms do not go within half a mile of the east point of Porter bay. Give the south point of Boston island a berth of a quarter of a mile, and keep the same distance off Kirton point and the beach to the westward.

Anchorage.—There is anchorage almost anywhere in Boston bay, well protected with good holding ground. The usual anchorage is off the township, with the jetty bearing S.W. $\frac{1}{2}$ S. (S. 39° W.), in $2\frac{1}{4}$ to 3 fathoms one cable off, and 5 to 8 fathoms 4 to 6 cables off. The bottom is mud and shells.

TIDES and TIDAL STREAMS.—It is high water, full and change, in Boston bay at 1h. 50m., springs rise 6 feet. There is very little tidal stream in any part of port Lincoln. At 2 or 3 miles off

the coast outside, the stream sets to the northward during the rising tide, and to the southward during the falling tide, its greatest strength being from $1\frac{1}{2}$ to 2 knots an hour.

LOUTH BAY lies between Boston point and Bolingbroke point, and is about 6 miles deep in a north-west direction. The formation of the coast divides it into three distinct bays, one between the point $2\frac{1}{2}$ miles North of Boston point and Louth island; another between Louth island and a cliff point W.N.W. $3\frac{3}{4}$ miles from Bolingbroke point, and the third between the last-mentioned two points.

The southern bay is $1\frac{1}{4}$ miles across between the south point of Louth island and the point opposite on the mainland, and $2\frac{1}{4}$ miles deep. It is shallow; a bank dries off a quarter of a mile from the shore, and there is less than one fathom water half a mile further out. At the entrance there are 4 fathoms nearly all the way across, and there are $2\frac{1}{2}$ to 3 fathoms half a mile off the whole extent of the south-west side of Louth island.

Todd river discharges itself into this bay; the mouth is generally blocked up with mud and weed. The missionary station at Poonindie is on the north bank of Todd river, one mile from the mouth, the mission church being visible from the bay.

Todd river is the most western river in South Australia; a few small rivulets discharge into port Lincoln during the winter, but thence to the western boundary there is no river or fresh water stream whatever.

The second bay is more than 3 miles in depth, with from 4 to 8 fathoms in it, and a general depth of 5 fathoms half a mile from the shore. The shore consists of rocky points and sandy bays, with high, well wooded, and cultivated land behind.

The jetty, 600 feet long, with a depth of $11\frac{1}{2}$ feet at its end, for shipping wool, &c., is in the small cove, west of a point, N.N.W., 2 miles from the north-west point of Louth island.

There are $2\frac{1}{2}$ fathoms 4 cables off shore, with the north-east end of Louth island just open of the point near the jetty. N. $\frac{3}{4}$ E. 8 cables from this point, and a quarter of a mile from the beach, is a small rock with 3 feet water on it. There are $1\frac{1}{2}$ fathoms between it and the beach, and $3\frac{1}{2}$ fathoms all round elsewhere.

Anchorage.—There is anchorage in the southern part of the bay, under the sandy bar between Louth island and the land to the westward.

The northern bay is nearly 3 miles in depth, with from 2 to 7 fathoms water in it, and with a general depth of 3 fathoms three-quarters of a mile from the shore. The shore is red cliffy points, and sandy beaches, with sand-hills immediately behind, and beyond them low hills covered with dense scrub.

There is a rock with one fathom water on it, N. by E. $\frac{1}{4}$ E. a little more than $1\frac{1}{4}$ miles from the western point of the bay, and nearly half a mile off a red rocky point. There are $3\frac{1}{2}$ fathoms directly to the eastward of it, and $2\frac{1}{2}$ fathoms between the rock and the nearest point.

Hawker's Devil is a rock awash at low water, lying N. by E. $1\frac{1}{4}$ miles from Boston point, and 7 cables off shore. There are 6 fathoms water half a mile east of it.

Rabbit island is N.E. $\frac{1}{2}$ N. nearly $3\frac{1}{2}$ miles from Boston point; it is half a mile long north and south, 400 yards broad, 32 feet high, and cliffy on its east side, from which it slopes gradually down to its west side. A rock awash at low water lies North 3 cables from its north point, with 3 fathoms 2 cables, and less than 5 fathoms nearly three-quarters of a mile, further north. The island may be approached as near as a quarter of a mile anywhere else; there are 6 to 7 fathoms water between it and Louth island.

Louth island, the south point of which is N. $\frac{3}{4}$ E. nearly $3\frac{1}{2}$ miles from Boston point, is $1\frac{1}{2}$ miles long N. by W. and S. by E., and from three quarters to one quarter of a mile wide; it has two wooded summits, each about 76 feet high. The coast of the island is formed of rocky points and sandy bays, its east side is safe to approach to a quarter of a mile. A dry sand-spit extends 800 yards W. by N. $\frac{1}{2}$ N. from the north-west point; this spit is connected with the land to the westward by a sandy bar nearly dry at low water.

BOLINGBROKE POINT, N.E. $9\frac{3}{4}$ miles from Boston point, is a round rocky point about 40 feet high. A reef with less than one fathom water on it extends half a mile south from it.

Bolingbroke reef extends to the westward from Bolingbroke point, its end having $2\frac{3}{4}$ fathoms water on it, with 6 to 7 all round,

except between the bearings of N.E. $\frac{1}{2}$ E. and E.S.E. from it; the end bears West a little more than $2\frac{1}{2}$ miles from the point. Its shallowest part is a rock with less than one fathom water on it. W. $\frac{1}{2}$ N. $1\frac{3}{4}$ miles from Bolingbroke point.

Aspect of Louth bay.—There is a fine range of hills running parallel to the western shore of Louth bay, about 2 miles inland. The highest of this range is mount Knott, a well-wooded flat-topped hill, 832 feet high, W. by N. 2 miles from the point near the shipping place. Another remarkable hill is mount Gawler, 808 feet high, also flat-topped, and S.W. by W. $\frac{3}{4}$ W. 2 miles from mount Knott. Mount Gawler is behind mount Knott from the north-east part of Louth bay.

To the northward of mount Knott the range is lower, with no remarkable hill until mount Liverpool is reached, the round summit of which, 1,055 feet high, is very conspicuous from Louth bay, as is also a conical hill of about 800 feet elevation, bearing E.N.E. $1\frac{1}{2}$ miles from mount Liverpool. All the range is well wooded with shea-oaks.

From the foot of the high range to Bolingbroke point, the country consists of low hills between 200 and 300 feet high, covered with dense scrub. The land west of Louth bay is of a better nature, being well grassed with open wood on it.

DIRECTIONS for LOUTH BAY.—From the southward.—To clear Hawker's Devil:—Bolingbroke point open east of Rabbit island N.E. leads to the south-east of it; and mount Liverpool over the east side of Louth island N. $\frac{1}{2}$ W., leads well to the east of the rock.

To clear the rock north of Rabbit island:—Mount Knott open to the right of the north point of Louth island, N.W. by W. $\frac{1}{4}$ W., leads to the north-east of it. In going to the usual shipping places, if standing towards the spit between Louth island and the shore, a vessel should tack when the north end of Rabbit island is in line with the north-east end of Louth island S.E. $\frac{1}{2}$ S.

From the northward.—In rounding Bolingbroke point do not approach it nearer than three-quarters of a mile, or shoal the water to less than 6 fathoms. When it can be seen, the south end of Reevesby island just open south of Kirkby island, E. $\frac{3}{4}$ N., clears the foul ground off Bolingbroke point, and Bolingbroke reef to the southward. In

standing towards Bolingbroke reef from the southward, Bolingbroke point should not be brought to bear east of E. by N., or the water shoaled to less than 5 fathoms. A vessel is clear of the reef to the westward when mount Liverpool is over the western extreme of the west point of the north bay, N.N.W. $\frac{1}{2}$ W. North of the Bolingbroke reef, Bolingbroke point should be kept south of E. by S., or the water not shoaled to less than 5 fathoms until within three-quarters of a mile of the shore, when the chart will be the best guide.

Anchorage.—The best anchorage in Louth bay is to the northward of Louth island spit, in $3\frac{1}{4}$ fathoms, sand, with the extremes of Louth island bearing S.E. by E. and S. by E. Good anchorage, except with southerly gales, will be found off the first long sandy beach north-west of Bolingbroke point, in 3 fathoms, sand; with the west side of Bolingbroke point S. by E. $\frac{1}{2}$ E., and the right extreme of some rocks which stretch off the middle of the beach N.E. $\frac{1}{2}$ E.

SIR JOSEPH BANKS GROUP consists of 20 islands, islets, and rocks, above water, lying to the eastward of Louth bay and Bolingbroke point. Reevesby and Spilsby are the only islands on which water is obtainable, and where the vegetation is higher than low bushes. The islands are used for pastoral purposes.

There are several good anchorages amongst them. They are all frequented during the breeding season by great numbers of cape Barren geese; the young ones are fit to rear about August, and can then be easily run down and caught. The old birds come to the islands in the latter end of May and leave when the young can fly in October.

Kirkby island is East 6 miles from Bolingbroke point; its form is that of a haycock; it is one mile in circumference, and 85 feet high. A small rock, with 5 fathoms water on it, lies N. by E. $\frac{1}{2}$ E. 7 cables from Kirkby island; it does not break, and has 10 to 11 fathoms all round.

The centre of a rock awash bears N.N.E. $1\frac{1}{4}$ miles from Kirkby island; a narrow reef, with less than one fathom water on it, extends 500 yards E. by N., and the same distance W. by S., from the rock. There are 10 fathoms midway between the reef and the 5-fathoms rock, and 11 fathoms half a mile off, to the westward or northward.

Sibsey island, open west of Kirkby island S. $\frac{1}{2}$ W., leads to the

westward of the reef, and Winceby island open north of Partney island N.E. by E. leads well clear and to the northward of the foul ground.

To pass between the reef and Kirkby island, keep the clump on the south hill of Reevesby island over the south end of Lusby island E. $\frac{1}{4}$ N.; or in standing towards the reef, do not bring the clump north of the centre of that island. The west end of Langton island open of the east end of Dalby island S. by E. $\frac{1}{2}$ E. leads to the eastward of the reef.

Sibsey island is S. by W. $5\frac{3}{4}$ miles from Kirkby; it is about 80 feet high, half a mile long north and south, and a quarter of a mile broad. There are 7 to 11 fathoms water close to, all round it. English islet lies N.E. $\frac{1}{4}$ E. 9 cables from Sibsey island; it is about 15 feet high, rocky, steep-to, and there are 7 to 9 fathoms between it and Sibsey.

Stickney island is S.S.E. 8 miles from Kirkby, and 100 feet high. It is less than one mile across, and has two deep inlets which run nearly through it; there is good landing in the one on the north side of the island. A rock above water, and connected with the island by rocks which cover and uncover, lies 2 cables S.E. from its south-east point. The island has 9 to 15 fathoms water within half a mile of it all round.

Spilsby island is S.E. $\frac{1}{2}$ E. $9\frac{1}{4}$ miles from Kirkby. This is the highest, and only wooded and inhabited island of the group; its north part rises to a round summit 162 feet high, and is well clothed with shea-oaks. It is 2 miles long north and south, and $1\frac{1}{2}$ miles wide in its north part; its south end is a narrow point three-quarters of a mile long, and a quarter of a mile broad. Its coasts consist of low cliffs, rocky banks, and sandy beaches with sand-hills behind them. There is fresh water in a well among the sand-hills at the north-west point of the island.

A spit with less than one fathom water on it runs off the north-west point, N.N.W. $\frac{1}{2}$ W. 6 cables, with $2\frac{1}{2}$ fathoms 3 cables farther out in the same direction, and 8 fathoms directly outside the latter.

There is a small islet about 20 feet high, W.S.W. 8 cables from the north-west point of Spilsby. A ledge of rocks extends 2 cables

S.S.W. from the islet. There is deep water between this islet and Stickney, but between it and Spilsby $1\frac{1}{2}$ fathoms is the deepest.

The south-west side of Spilsby has ledges of rocks which uncover with the tide, jutting out 400 yards from the shore.

A covered reef, 800 yards in extent, lies W. $\frac{1}{2}$ S. one mile from the south point of Spilsby; there are $1\frac{3}{4}$ to $2\frac{1}{2}$ fathoms between it and the shore, and 7 to 8 fathoms close to seaward. English islet in line with the north-east end of Stickney, N.W. by W. $\frac{3}{4}$ W., leads to the southward; and Kirkby summit over the west point of Langton N.W. $\frac{3}{4}$ N. leads to the south-westward of the reef.

The east side of Spilsby is rocky, but may be approached as near as half a mile. Three-quarters of a mile from the north-east point is Boucaut islet, 32 feet high, and about three-quarters of a mile in circumference; S.E. $\frac{1}{2}$ E. 4 cables from the centre of this islet is Seal rock, about 10 feet high, and connected with the islet by rocks which uncover at low water.

The channel between Spilsby island and Boucaut islet has $1\frac{1}{2}$ fathoms water in the middle; it sometimes breaks across. There is deep water north of the islet, but only 3 fathoms a quarter of a mile east of Seal rock, and E. by N. $\frac{1}{2}$ N., $1\frac{1}{4}$ miles off the north-east point of Spilsby.

Anchorage.—North of the centre of Spilsby island there is good anchorage in 5 fathoms water a quarter of a mile off shore, with the wind between West, round by south to S.E.

Anchorage in 3 fathoms may be found during easterly winds, with the extremes of Spilsby bearing E. $\frac{1}{2}$ N. and S. by E. $\frac{1}{2}$ E.; this is close to the edge of the bank with less than one fathom on it, which runs off the whole of the north-west side of Spilsby to a distance of 3 cables from the beach.

BUFFALO REEF lies S.E. by E. $\frac{1}{2}$ E. $6\frac{3}{4}$ miles from the summit of Spilsby island. It is a rock above water, about 10 feet high, 400 yards long east and west, and 50 yards broad. Rocks under water extend 2 cables west, and one cable north-east from its west and its east extremes respectively; otherwise it is steep-to. There are 15 fathoms half a mile north of the reef, and 21 fathoms the same distance off elsewhere. The sea sometimes breaks with great violence on this dangerous reef.

The channel between Buffalo reef and Spilsby island is free from danger.

Roxby island lies E.S.E. $5\frac{3}{4}$ miles from Kirkby island ; it is one mile long east and west, 400 yards broad, and 74 feet high ; and is separated from Hareby island by a channel half a mile wide, with $2\frac{1}{2}$ fathoms water in it. Its north and east sides are cliffy, and the south and west sides are sloping points with small sandy beaches. A reef, with a rock awash at low water, runs off the south-east point S.S.E. $\frac{1}{2}$ E. half a mile. There are 4 to 6 fathoms close to this reef on its east, south, and west sides.

There is no other danger farther than a quarter of a mile from the island. Kirkby summit over the middle of Dalby island, bearing N.W. by W. $\frac{1}{2}$ W. leads to the south-westward of the reef, and the shoal water south of Hareby island. The clump on Reevesby island over the north-east end of Roxby island N.W. $\frac{1}{4}$ N. leads clear to the north-eastward of it.

Hareby island, E. by S. $\frac{3}{4}$ S. $4\frac{1}{2}$ miles from Kirkby, is 8 cables long east and west, and 2 cables broad ; its highest part is its east end, which is 49 feet above water. Rocks which dry for about half the distance extend W. $\frac{3}{4}$ S. half a mile from its west point ; there is shallow water a quarter of a mile farther out on the same bearing. Six cables north from the north point of Hareby island is Blyth island, a round sandy islet, 38 feet high ; and 3 cables N.E. by E. from Blyth island is a rock above water, between them are rocks which uncover at low water.

Between Hareby island and Blyth island, enclosing the latter and extending N.W. by W. $1\frac{1}{2}$ miles from it, is a bank half a mile east and west, with from one-quarter to three-quarters of a fathom generally on it, and $1\frac{1}{2}$ fathoms at its north-west end. There is a channel between the north end of this bank and Reevesby island, with $2\frac{1}{2}$ fathoms in it.

Anchorage may be found with westerly or southerly winds under the lee of this bank, with Blyth island bearing N.W. by W., and the north extreme of Hareby island S.W. by W.

Langton island is S.E. $\frac{1}{2}$ S. $3\frac{1}{4}$ miles from Kirkby island ; it is 6 cables long north-east and south-west, 2 cables broad, and 30 feet

high. Its north-east part is a sandy bank 2 cables in length. There are only 2 fathoms water at 2 cables off its north-west point, but it is safe to approach to half a mile on its north, south, and west sides.

Smith rock, which is awash at high water, is N.N.E. $\frac{1}{2}$ E. half a mile from the north-east point of Langton island. There are $1\frac{1}{2}$ fathoms at 2 cables E.S.E. from it, 2 fathoms the same distance N.E. by N., and $3\frac{1}{2}$ fathoms midway between it and the north-east point of Langton island.

The summit of Kirkby island over the centre of Dalby island N.W. by W. $\frac{1}{2}$ W., leads in $3\frac{1}{2}$ fathoms, which is the deepest water, through the narrow channel between Smith rock and Hareby island.

Dalby island, S.E. by E. $\frac{1}{2}$ E. nearly $1\frac{1}{2}$ miles from Kirkby, is a quarter of a mile long north-east and south-west, 200 yards broad, and 29 feet high. It is steep-to, with deep water between it and the islands near.

Reevesby island.—The south end of this island is E. $\frac{1}{2}$ N. 3 miles from Kirkby, above which is its highest part, a round green hill 107 feet high and three-quarters of a mile in diameter, with some bushes forming a clump near the top. From the north part of this hill the island extends N. $\frac{1}{2}$ E. $2\frac{1}{4}$ miles, varying from a quarter to half a mile in width, and from 20 to 40 feet high, the coast being sandy beaches with low rocky points. From the north part of the island, a narrow sandy neck and a peninsula half a mile long with a sand hill 66 feet high for its summit, extend east $1\frac{1}{4}$ miles.

The east coast of Reevesby island is steep-to, there are 10 to 11 fathoms one mile off. On the west side, one mile from the north point of the island, a sandy spit, with a rock awash at its extreme, extends 4 cables from the beach.

Anchorage.—North of this spit there is good anchorage, except with North and N.W. winds, in from 5 to 3 fathoms water. A good berth for small vessels is in $3\frac{1}{2}$ fathoms, a quarter of a mile from the beach, with the house on Reevesby bearing E. by N.

Water.—There is a well in the middle of the island about a third of a mile S.S.E. from the house.

TIDES.—It is high water, full and change, at this anchorage at 2h. 30m. ; springs rise 6 feet.

Lusby island is very small and 29 feet high, lying W. $\frac{1}{2}$ N. one mile from the south summit of Reevesby island. It is connected with that island by a sandy bar which dries at low water. Rocks which dry in patches at low water extend between north and west 3 cables from its north-west point; between these rocks and Marum island there are 4 to 5 fathoms.

Between Lusby and Kirkby there are 9 to 10 fathoms.

Marum island is N. by W. $\frac{1}{4}$ W. one mile from Lusby island; it is of an irregular shape, half a mile across, and about 30 feet high. A rocky patch with less than one fathom on it, lies W. $\frac{1}{2}$ S. 7 cables from the centre of the island. Between the southern part of Marum and Reevesby islands there are $1\frac{1}{2}$ to 3 fathoms, and 4 fathoms midway between the northern part of Marum and the end of the spit off Reevesby.

Anchorage.—A small vessel may find anchorage with north-west and northerly winds S.E. of Marum, and if not drawing more than 9 feet, run between it and the spit for Reevesby anchorage, when the wind shifts to west and south-west.

Clearing mark.—Winceby island open north of Partney island, N.E. by E., leads clear of all the dangers west of Marum island.

Partney island is S.W. by W. $\frac{3}{4}$ W. $1\frac{1}{2}$ miles from Reevesby north point; it is 29 feet high, a quarter of a mile long north-west and south-east, and a quarter of a mile broad. There are 5 to 6 fathoms water between it and the north part of Reevesby; the island is steep-to on its north and west sides. It is connected with Marum island on its south-east side by a sandy spit which dries in places.

Winceby island is N. $\frac{1}{4}$ E. one mile from the north point of Reevesby island; it is 33 feet high, half a mile long north-west and south-east, and a quarter of a mile broad. The channel between it and Reevesby has $2\frac{1}{4}$ to 4 fathoms water in it.

The **COAST** between Bolingbroke point and Tumby island runs in a northerly direction, and consists of low red cliffs and sandy beaches, with rocks which dry, extending in some places half a mile from the shore. The point, which is N.N.E. $\frac{1}{2}$ E. 2 miles from

Bolingbroke point, has Secret rock lying E. by S. $\frac{1}{4}$ S. nearly half a mile from it; this detached rock is of small extent, awash at low water, with 2 to 3 fathoms water all around it, and 5 fathoms half a mile to seaward.

Rabbit island open of Bolingbroke point S.W. $\frac{3}{4}$ W. clears Secret rock in 5 to 9 fathoms, and passes half a mile south-east, and three-quarters of a mile eastward of it.

North $7\frac{1}{2}$ miles from Bolingbroke point is the entrance to a swamp; whence the sandy beach curves round to a low point, the spit from which curves half a mile to the northward and connects Tumby island with the mainland. The land should not be approached nearer than one mile between Bolingbroke point and Tumby island.

Tumby island, N. by E. $\frac{1}{4}$ E. $8\frac{1}{4}$ miles from Bolingbroke point, is 800 yards long north-west and south-east, and 500 yards wide. Its north-west part is 3 cables from the low point mentioned above. The island is clifly, except on its north side, where there is a sandy beach, and of nearly equal height all round, its highest part being 37 feet above water.

A rocky ledge, dry at low water, runs from the north-east point of the island N.E. by E. half a mile, and then curves to the southward for 3 cables to its south point, which is E. by N. 6 cables from the centre of the island. A reef composed of rocks awash at low water extends S. by E. half a mile from the south point of the island; there are 4 fathoms a few yards south of this reef, and the same water one mile east of it; and $3\frac{1}{2}$ fathoms at a little more than one mile north from the centre of the island.

HARVEY BAY (Tumby bay) is nearly 3 miles deep, between Tumby island and Salt creek. It is rather shallow, there being less than 5 fathoms to an average distance of 2 miles from the shore. From the point near Tumby island, the low sandy shore forms a small bay N.W. $1\frac{1}{2}$ miles across to a low rocky point.

From the low rocky point, the shore of the bay—a sandy beach, with a wooded bank behind—curves to the north and north-east for 4 miles to the mouth of Salt creek. A rock awash at low water, with a few dry rocks between it and the shore, lies N. by E. $\frac{1}{2}$ E. 3 cables from the low rocky point.

The entrance to a swamp is on the west side of this point; and

there is a jetty half a mile north from it, where a remarkably good macadamised road to Port Lincoln and the Burrowing mine leaves the beach. The jetty is 525 feet long with 10 feet at low water at its outer end, and has a crane on it. The copper and agricultural produce of the district are shipped here. There is a post office here. The population is about 150.

Anchorage.—The best anchorage for small vessels in Harvey bay is off the centre of the beach to the east of the rocky point, in $2\frac{1}{2}$ to 3 fathoms water, with the north end of Tumby island bearing S.E. by E. $\frac{1}{2}$ E.

Salt creek is a stream which discharges itself into the sea at the north-east part of Harvey bay. There are only $2\frac{3}{4}$ fathoms water $1\frac{3}{4}$ miles south-east of the entrance to Salt creek, and 5 fathoms one mile farther out. The edge of this bank continues from one mile to half a mile off shore as far as the north end of the long sandy beach to the northward, and is quite a mile from the beach along the north-west part of Harvey bay.

Aspect of coast.—From 3 or 4 miles east of Tumby island, the Sheep hills are conspicuous to the northward; the low land at the back of Harvey bay is scarcely visible; the red cliffs of Tumby island and the coast between it and Bolingbroke point show out, the low hills near, which are covered with dense scrub, scarcely appearing above the cliffs; and inland is seen the fine range of which mount Liverpool—bearing W. $\frac{1}{4}$ N., $9\frac{1}{4}$ miles from Tumby island, and 1,055 feet high—is the most conspicuous and elevated summit. To the southward and south-east Kirkby island appears like a haycock, and Reevesby and the adjacent islands are seen to the left.

DIRECTIONS.—In rounding Tumby island do not approach it nearer than one mile, or shoal the water to less than 6 fathoms until the island bears south of S.W. With Tumby bearing S.W. one mile, the course to the usual shipping place is N.W. by W. $\frac{1}{2}$ W. $2\frac{1}{2}$ miles, keeping the low rocky point near there well on the port bow.

In entering Harvey bay from the northward, keep about 2 miles off shore until mount Liverpool bears W. by S. $\frac{1}{4}$ S. Then alter course to W. by S. $\frac{3}{4}$ S.; this course leads direct for the shipping place, where anchor according to draught, there being 3 fathoms half a mile off shore. In standing towards the

north shore of Harvey bay, mount Liverpool should not be brought to bear south of W. by S. $\frac{1}{2}$ S. to keep in more than $2\frac{1}{4}$ fathoms.

The COAST.—From Salt creek to Lipson cove the coast trends about N.E. $\frac{1}{2}$ N. 7 miles ; a sandy beach, with low land immediately behind, for $3\frac{1}{2}$ miles, then high rocky points with small sandy beaches as far as the cove.

LIPSON COVE is formed by a sandy beach, and a rock which runs out in a north-easterly direction 2 cables from the south end of the beach. The cove is N.N.E. $\frac{3}{4}$ E. $10\frac{3}{4}$ miles from Tumbay island.

Anchorage.—There is anchorage for one or two small vessels in 3 fathoms water midway between the north-east end of the rock and the north end of the beach ; it is only 3 cables across, leaving little room for a vessel to get under weigh with a north-easterly wind. This anchorage should only be used when the wind is off the land and likely to continue so.

The chimneys of an abandoned copper mine in the first little bay south of Lipson cove are still standing and visible from the sea. The land in the vicinity has been surveyed for an agricultural area, and will doubtless soon be settled on by farmers. There is a jetty 330 feet in length with 8 feet water at its outer end.

Water.—A well of excellent water is 50 yards back from the middle of the cove beach. No water is to be found on the coast to the northward.

Cape Hardy, a grassy knob, 97 feet high, is N.N.E. $\frac{1}{2}$ E. $5\frac{3}{4}$ miles from Lipson cove ; the coast between being of the same nature as that south of the cove.

A wooded range named Sheep hills, the summit of which, 432 feet high, bears N.N.W. distant 2 miles from Lipson cove, runs parallel to the coast north 8 miles to cape Burr.

CAPE BURR is 4 miles N. by E. $\frac{3}{4}$ E. from cape Hardy, the coast between being rocky points and sandy bays. From Lipson cove to cape Burr the coast is steep-to, there being 5 fathoms at less than half a mile off it.

The edge of the 10-fathoms bank is half a mile off Lipson cove and cape Hardy, and $1\frac{1}{2}$ miles from cape Burr.

Anchorage.—There is good anchorage for small vessels in the bight north of cape Burr, in 3 fathoms, with the cape bearing S.S.E., three-quarters of a mile distant.

Mount Hill, W. by N. $\frac{3}{4}$ N. $8\frac{1}{2}$ miles from cape Burr, a truncated cone 1,240 feet high, standing by itself, is the highest and most conspicuous landmark about this part of the coast.

DUTTON BAY.—From cape Burr to a sandy point N.E. $\frac{1}{2}$ N. 11 miles from it, the coast trends in a slight curve forming Dutton bay. The features of the coast are sandy bays, with higher cliffs than those south of cape Burr, the country immediately behind being lower, and covered with dense mallee scrub.

The edge of the 3-fathoms bank is nearly a mile off shore in the south part of Dutton bay, and the same distance off its northern sandy point; the 5-fathoms line is $1\frac{1}{2}$ miles off the former part, and $1\frac{3}{4}$ miles off the latter, but less than half a mile off shore in the middle of the bay, where the cliffs are highest. The 10-fathoms line is 5 miles off shore midway between cape Driver and cape Burr, $1\frac{1}{2}$ miles off cape Burr, and only three-quarters of a mile off cape Driver.

Anchorage.—There is good anchorage for small vessels on the bank in the north part of Dutton bay, in 3 fathoms water, sand, with cape Driver N.E. $\frac{1}{2}$ N., and the south-west extreme of the long beach in the north part of the bay W. by S.

The COAST.—From the north point of Dutton bay, behind which the land is very low, the coast trends north-east 3 miles to a red cliffy point 67 feet high; this point is very similar in appearance to cape Driver, which bears from it N.E. $\frac{1}{4}$ E. 2 miles.

CAPE DRIVER, N.E. $\frac{1}{4}$ N. $15\frac{1}{2}$ miles from cape Burr, is a broad point extending more than half a mile N.N.E. and S.S.W., 53 feet high, with rocky ledges a quarter of a mile off it.

SALT CREEK COVE, locally known as Arno, is the bight, about one mile north of cape Driver. A reef, uncovered at low water, extends 2 cables from the sandy south point of the cove, and a similar reef runs S.E. by E. nearly 3 cables from its north sandy

point, with a rock always covered 2 cables S.W. from the end of the reef. A salt creek runs into the south-west part of the cove; it has about 5 feet over the bar at its mouth at high water, and is navigable for boats for half a mile. There is a jetty 330 feet long, with $7\frac{1}{2}$ feet water at its outer end, northward of the mouth of the creek.

Arno or Salt Creek cove is visited by small vessels for cargo and with stores, but the neighbourhood is not inhabited.

Anchorage.—There is shelter for a small vessel in Salt Creek cove, with the wind between North and S.W., in $3\frac{1}{4}$ fathoms sand; cape Driver bearing S. by W. nearly $1\frac{1}{4}$ miles, and the mouth of the creek W. by S. $\frac{1}{2}$ S.

Water.—There is a well near the beach about half a mile north from the mouth of the creek.

TIDES.—It is high water, full and change, in Salt Creek cove at 3h. 30m.; springs rise 6 feet.

Aspect.—Off cape Driver, Elbow hill, 710 feet high, shows by itself on the extreme right to the north-east; Triple hill, 928 feet high, is the first conspicuous summit to the westward of it; it is 9 miles N.W. $\frac{1}{4}$ W. from Price point, and has three summits of nearly equal height. On a clear day, two ranges can be seen W.N.W. of Triple hill; the summit and most conspicuous part is a sharp peak 1,340 feet high, bearing N.W. by W., $16\frac{1}{2}$ miles from Price point. To the south-west of these ranges the land is much lower, and there is nothing striking as far as mount Priscilla, a sharp cone about 800 feet high, standing by itself directly inland from Salt Creek cove. Mount Priscilla is N.W. $\frac{1}{2}$ W., 12 miles from cape Driver.

There is also a conical hill, and a range about one mile in length midway between mount Priscilla and cape Driver; these hills are all about 400 feet high. To the west and south-west there is nothing remarkable except Mount hill, which may be seen if it is sufficiently clear. The land immediately behind the coast is composed of low rises covered with dense scrub, and is scarcely higher than the cliffs or coast sand-hills.

The COAST.—The north point of Salt Creek cove is N. $\frac{1}{2}$ E. 2 miles from the pitch of cape Driver. From the cove a sandy bight extends N.E. $\frac{1}{2}$ E. $1\frac{3}{4}$ miles; the coast is then clifly, with here and

there a sand-hill for $5\frac{1}{2}$ miles; from the north end of the cliffs, a sandy beach, with low sand-hills behind, curves to the eastward for $3\frac{1}{2}$ miles to Price point.

The highest part of the coast between cape Driver and Price point is a green hill, 147 feet high, one mile north from the south end of the cliffs. A rock with less than one fathom water on it lies S. by W., half a mile from this hill; and a rock awash (situated at the south-east extreme of a reef extending W. by S. half a mile from it) lies South half a mile from the south end of the cliffs. The reef has less than one fathom on it. A ledge of rocks extends half a mile off the coast, at the junction of the cliff and the sandy beach west from Price point. At 4 miles north-east of the point another ledge of rocks extends off for some distance. With these exceptions there are 5 fathoms anywhere half a mile off the land between Salt Creek cove and Price point, and 10 fathoms $1\frac{1}{2}$ miles off it.

PRICE POINT, N.E. $\frac{1}{2}$ E. 12 miles from cape Driver, is a sandy point, 55 feet high, and surrounded to seaward by rocks which cover and uncover.

Anchorage.—There is anchorage for a small vessel, with westerly winds, in $3\frac{1}{2}$ fathoms water, with Price point, S.W. half a mile.

The land between Price point and a low rocky point N.E. by E. $3\frac{3}{4}$ miles from it forms a bay, in which the 5-fathoms line is half a mile off shore. The southern half of the shore of the bay is low red sandy cliffs, and the northern half a sandy beach, backed by low sand-hills. From the low rocky point the sandy shore extends N.E. $\frac{3}{4}$ E. $7\frac{1}{4}$ miles to Germein point.

GERMEIN POINT, on the west side of the entrance to Franklin harbour is low, being composed of masses of weed, which shift about from time to time.

A spit runs S.E. $\frac{1}{2}$ S. $1\frac{1}{4}$ miles from the point, with depths of from $1\frac{3}{4}$ fathoms to a quarter of a fathom over it. Between this spit and the shallow water extending $1\frac{1}{4}$ miles south of Victoria point, is the channel over the bar into Franklin harbour.

VICTORIA POINT, on the north side of the entrance to Franklin harbour, is N.E. $\frac{1}{4}$ E. $1\frac{1}{4}$ miles from Germein point; its

face is a red cliff 50 feet high, east, south, and west ; 6 cables from the point, is a bank composed of sand and detached rocky ledges, which covers and uncovers. There is only three-quarters of a fathom S. by E. $\frac{1}{4}$ E. rather more than one mile from Victoria point, and $1\frac{1}{2}$ fathoms S. $\frac{3}{4}$ E. $1\frac{1}{4}$ miles from it.

Aspect.—From about 5 miles to the south-east of Franklin harbour, the low hills connecting Elbow and Triple hills are seen on the extreme left to the westward. Triple hill is not very conspicuous, as it stands far back. Elbow hill is the first remarkable one ; it has a bold round summit. The next noticeable hill to the northward, is mount Parapet, 1,013 feet high ; this hill falls very steeply on its south-east side.

Farther to the right, the range of which mount Olinthus is the summit, rising to the height of 1,446 feet, can be seen over the nearer hills.

Mount Olinthus and the hills of the same range are all sharp-topped.

On the nearer range to the right, is Long-back hill, 1,038 feet high, which is one of the leading marks over the bar ; the summit of this hill is at its south-west part, from which it slopes down suddenly on its south side, but it is nearly level for half a mile to the north-east.

Three miles further north is a peak 882 feet high, and 4 miles more in a north-easterly direction the range ends abruptly at N.E. peak, which is 861 feet high, and stands alone.

The hills mentioned are on the following bearings from Victoria point : Elbow hill, W. $\frac{1}{4}$ S. $9\frac{1}{2}$ miles ; mount Parapet, W. by N. $\frac{1}{2}$ N. $9\frac{3}{4}$ miles ; mount Olinthus, N.W. $\frac{3}{4}$ W. 13 miles ; Long-back hill, N.W. $\frac{3}{4}$ N. 11 miles ; and N.E. peak, N. by W. 15 miles.

About Franklin harbour the red cliff of Victoria point and the trees above, are at once the highest and most conspicuous landmarks to recognise Franklin harbour by ; the cliff of the south part of Entrance island is next in height ; and the rest of the coast, where it is seen, appears as a low bank covered with trees and shrubs.

FRANKLIN HARBOUR, a good port for coasters, is a large sheet of shallow water half filled up by sand banks which cover and uncover with the tide. The shores all round are very low, swampy,

and fronted by mangroves. From Germein point, a sandy bank runs to the westward for half a mile to the mouth of Observatory creek; the observation spot is on the west side of the entrance to the creek. From Observation point the shore trends N.W. half a mile (bordered by sand-hills about 20 feet high, for half that distance, and then by mangroves) to a mangrove point, which is one of the marks for entering the harbour. Two islands entirely surrounded by mangroves are on the dry bank to the westward of this point.

From near the south-west point of the southern island the mainland extends in a bight S. by W. $\frac{1}{4}$ W. $1\frac{1}{4}$ miles to a mangrove point. The south end of Franklin harbour is 2 miles from this point, the coast between being mangroves and sandy beaches, with some detached clumps of mangroves lying a short distance from the beach.

With the exception of the low sandy bank on the sea beach, the land between the east shore of Franklin harbour and the sea is swampy, and nearly covered by a high tide. The edge of the bank which dries at low water is one cable off shore at Germein point, and continues the same distance to the mangrove point north-west from Observation point; it then trends N.N.W. about one mile to a point, from which it turns sharply to the westward and south-west, running S.W. $\frac{1}{2}$ W. $2\frac{1}{2}$ miles to a sharp tongue named Howard spit.

From Howard spit the edge of the bank describes nearly a circle, 2 miles in diameter, and enclosing a pool with depths from $1\frac{1}{2}$ to $2\frac{1}{4}$ fathoms in it, and drying generally to a distance of half a mile from the mangroves. To the west of Howard spit the channel into the pool is 3 cables wide, with $1\frac{1}{2}$ to 2 fathoms.

From the south end of Franklin harbour the edge of the mangroves runs in a curve 4 miles to the northward to a point N. $\frac{1}{2}$ E. 7 cables from the end of Howard spit; the edge of the dry bank is 2 cables from the mangroves at this point. From there the mangrove shore trends in a northerly direction 4 miles to the north end of the harbour, with two slightly projecting points between. Along all the west shore the mangroves are fronted by rocks with sand outside.

Cowell.—The township of Cowell is close to the beach on the west shore, at a gap in the mangroves, near the north end of the harbour; it possesses a post and telegraph office and a hotel; a jetty runs out 540 feet and has a depth of 9 feet at the end at low water. There are two mails a week from Adelaide. Steam vessels occasionally

visit the harbour to load wool, &c., the produce of the sheep runs in its vicinity. The south extreme of a spit stretching off the north shore bears E. $\frac{1}{2}$ N., 6 cables from the wool shed.

South-east $2\frac{1}{2}$ miles from the north end of the harbour is a broad point facing the north end of Entrance island; the point has a hill on its western side. There is a shallow bight to the northward between this point and the jetty, scarcely any part of it having more than one fathom. The shore of the bight is generally fronted by mangroves, except in the north-east part, where there is a bare sandy beach. From the point near Entrance island the shore bights to the north-eastward, with very low swampy land behind, and then out to Victoria point.

A large portion of the northern part of Franklin harbour is occupied by a sand-bank, which dries in patches. Its south extreme is N.W. $\frac{1}{2}$ W. $3\frac{1}{2}$ cables from the south-west point of Entrance island; from there the bank extends N.N.W. $1\frac{1}{4}$ miles, and W.S.W. three-quarters of a mile, and is from 500 to 1,000 yards in width. The channel between the sand-bank and the bank running off the south shore is 400 yards wide, with 2 to 4 fathoms water in it; it is narrowed to less than 200 yards for a quarter of a mile by a spit with $1\frac{1}{4}$ to 2 fathoms on it, which runs off the south end of the large sand-bank. The edge of the south bank in this part of the channel is very steep. The south end of the spit mentioned is W. $\frac{1}{2}$ S. $2\frac{1}{2}$ cables from the south-west point of Entrance island. Between the large bank and the west shore the channel is 2 to 4 cables wide, with from $1\frac{1}{4}$ to $1\frac{3}{4}$ fathoms water in it.

Between the large bank and Entrance island for the first half mile there are two channels; the one nearer the bank is one cable wide, with from 2 to 3 fathoms water in it; the other channel is from one to 3 cables wide, with $1\frac{1}{4}$ to 2 fathoms in it; north-east and north of the bank, the deep water space is from 4 to 8 cables wide, with a depth of $1\frac{1}{4}$ to $2\frac{1}{2}$ fathoms.

The bar is sand over rock; the sea generally breaks on it (except with winds off the land), more with a southerly wind than any other, but never dangerously. The shallowest part of the bar is on a bank, where there is 10 feet, lying South $1\frac{3}{4}$ miles from Victoria point. The extent of the bank is 200 yards N.W. and S.E., and 100 yards N.E. and S.W. Between this bank and the south-east extreme of

the spit from Germein point the channel is 2 cables wide, with $2\frac{1}{4}$ fathoms least water. The channel between the bank and the spit from Victoria point is the same width, with 2 fathoms water.

Generally, the width of the channel between the two spits, over the shallowest part of the bar, is 6 cables; with not less than 10 feet at low water.

After crossing the bar, the channel between the spits narrows to 3 cables in width, and deepens to $3\frac{1}{4}$ fathoms, but before passing Germein point shoals again to 2 fathoms.

Entrance island, the centre of which is one mile to the westward of Victoria point, is $1\frac{3}{4}$ miles long N.N.E. and S.S.W., and from a quarter to half a mile wide.

It is divided into two islets at high water, the sea overflowing a portion in the middle, which is covered with mangroves. The north part has a general height of 25 feet, is covered with bushes, and bordered by mangroves and sandy banks, with rocks here and there which cover and uncover with the tide. There is a blind channel between the island and Victoria point which ends north of the island.

The south part of the island is cliffy on its east side, the highest part of which is 32 feet above high water, and 5 cables from the south end of the island; from the top of the cliff the land slopes down to the mangroves which border its western coast.

The edge of the dry bank, which south of Entrance island is about 50 yards off shore, runs from there in an E. by N. direction for a quarter of a mile to a rock 400 yards in extent E.N.E. and W.S.W., and then extends to the northward parallel to the coast of the island.

A line of rock, the outer part of which is 100 yards from the coast, runs parallel to the whole of the south-west face of the island.

This island is infested with deaf adders of the most venomous description; a few quail and pigeons were also seen there, and some teal near Germein point.

Rock.—E. by N. 6 cables from the south extreme of Entrance island is a rock 300 yards long east and west, and 100 yards wide, uncovered at low water, and surrounded by a sandy bank, the edge of which is nowhere more than half a cable from the rock.

Buoys.—The channel leading into Franklin harbour is marked by six buoys; the fairway buoy, chequered black and red, with staff and ball, is on the south side of the 10 feet patch, from it Victoria point bears North $1\frac{3}{4}$ miles.

Two red buoys with staff and ball lie with Victoria point N.N.E. $\frac{3}{4}$ E. 8 cables and N.E. by E. $\frac{3}{4}$ E. one mile, and a red buoy lies 2 cables E. $\frac{3}{4}$ S. from the south point of Entrance island.

Two black buoys are moored with the south point of Entrance island W.N.W. 8 cables and N.W. by W. $\frac{1}{4}$ W. $1\frac{3}{4}$ cables.

The channel between the large sand banks and Entrance island is marked by two red buoys and two black buoys.

To the north of this channel six small red tub-shaped buoys have been placed to mark the north-eastern edge of a new cutting and the deepest water from this cutting to the jetty.

The red buoys must be left on the starboard hand and the black buoys on the port hand entering.

A black warping buoy attached to a 30 cwt. anchor has been placed 250 feet south-east from the jetty end for the purpose of hauling off from the jetty. This buoy must not be used for riding or mooring purposes.

DIRECTIONS.—Franklin harbour is only available for vessels drawing less than 12 feet. It should never be attempted at night, as the marks for entering cannot be clearly seen, and a vessel might easily get on shore before her position could be identified.

Approaching Franklin harbour, keep 3 miles off shore until Victoria point bears North, (and if from the north and east the water must not be shoaled to less than 5 fathoms), then steer towards it, until the fairway red and black chequered buoy is seen (it is tub-shaped, surmounted by staff and ball, and moored on the edge of the $1\frac{3}{4}$ fathoms patch, South $1\frac{3}{4}$ miles from Victoria point).* Leave the buoy on the starboard hand, when a course of N.N.W. $\frac{1}{2}$ W. will lead half-way between two buoys rather over a mile distant from the fairway buoy, red with staff and ball on the starboard hand, black on the port hand; when the black buoy is abeam, alter course to about N.W. by W. $\frac{3}{4}$ W.; pass the next red buoy with staff and ball

* Long back hill summit in line with the small sandy beach on Entrance island, a little north of the highest part of the cliff, bearing N.N.W. $\frac{3}{4}$ W., is said to lead over the bar in not less than 2 fathoms. Having crossed the bar with this mark on, keep a little to the northward when the water deepens.

See chart, No. 785.

on the starboard hand, then steer to pass between the red and black buoys, E.S.E. about 2 cables from the south point of Entrance island and round the south point of the island at the distance of one cable.

A vessel may anchor in 4 fathoms water with the south point of Entrance island bearing East, and Observation point S. $\frac{1}{2}$ E.

To proceed to the anchorage off the township of Cowell, give the south-west point of the island a berth of $1\frac{1}{2}$ cables, then steer to pass the red buoy, which is about 3 cables north-west of the south-west point of the island, on the starboard hand, afterwards leaving the black buoys marking the channel on the port hand and the red buoys on the starboard hand; and anchor with the end of the jetty bearing N.W. $2\frac{1}{2}$ cables distant, in $1\frac{3}{4}$ fathoms, mud. There are 9 feet at low water in this channel.

If going through the channel between the large sand banks, after passing Entrance island, when Observation point bears South, bring the north end of the bushes on Germein point nearly in line with the south point of Entrance island S.E. by E. $\frac{1}{4}$ E., this leads in $2\frac{1}{4}$ fathoms over the spit off the south extreme of the large sand-bank; the end of Germein point in line with the south point of Entrance island leads over $1\frac{1}{4}$ fathoms, so the point must be kept open. Keep the marks on until well into the channel between the two sand-banks, the edges of which show very clearly except near the time of high water. There is no more difficulty until rounding the spit to turn to the northward along the west shore; the turn is so sharp and the channel so narrow that great care is required there to avoid grounding on the western bank. After rounding the spit keep about half a mile off the mangroves on the west shore, and anchor as directed above.

If bound to the south-west part of the harbour, after leaving the large detached sand-bank on the starboard hand, the deepest water will be found on the east side of the channel up to Howard spit, not more than a cable from the edge of the eastern bank. A spit with 3 feet on it extends W.S.W. 600 yards from the dry end of Howard spit. The shallowest part of the channel is at the entrance to the pool, where there are not more than 8 feet at low water. There is anchorage in 9 feet, with Elbow hill over the left extreme of a series of small sandy beaches on the western shore W. by N., and the right extreme of the mangroves on the western shore N.E. $\frac{1}{2}$ N.

In working in or out over the bar, a vessel should be conned from the masthead, and close attention be paid to the lead, the tide, the tidal streams, and the chart.

TIDES AND TIDAL STREAMS.—It is high water, full and change, at the entrance to Franklin harbour at 4h. 0m.; springs rise 5 feet 6 inches. The streams begin a few minutes after high and low water respectively. A long continuance of south-westerly and southerly winds raises the general level of the water in Franklin harbour 2 to 3 feet; the tidal streams are then very strong, running as much as 5 knots an hour off Germein point during the falling tide. At ordinary springs it runs there, and in the narrow channels up the harbour, at a greatest rate of 3 knots.

Seaward of Franklin harbour, 4 miles S.S.E. of Germein point, the stream runs N.E. by E. during the rising tide and S.W. by W. during the falling tide, at the rate of 2 knots an hour; 5 miles East of the same point, E. by N. $\frac{1}{2}$ N. during the rising tide and W. by S. $\frac{1}{2}$ S. during the falling tide, at the rate of $1\frac{1}{2}$ knots; and 3 miles S.E. of Shoalwater point, N.E. during the rising tide and S.W. during the falling tide, at the rate of 2 knots an hour.

The COAST.—From Victoria point the coast describes a convex curve N.E. by E. $\frac{1}{2}$ E. $3\frac{1}{2}$ miles to a sand-hill at the entrance to a swamp. The land between is very low with the exception of one wooded rise. S.E. by S., nearly $1\frac{1}{4}$ miles from the sand-hill is a small dry bank, 200 yards across, with 3 feet water half a mile W.S.W. of it, and the same depth 3 cables W.N.W. There is one fathom water between the bank and the coast, and only 2 fathoms 4 cables south of the bank. From the sand-hill mentioned, the direction taken by the coast is E. by N. $\frac{1}{4}$ N. 6 miles to a very low point and then N.E. $\frac{1}{4}$ E. $2\frac{1}{2}$ miles to Shoalwater point. At $3\frac{1}{2}$ miles along the coast from the sand-hill are three wooded rises, each about 40 feet high; off them, the edge of the dry bank is rather more than one mile from the beach.

From Victoria point to 4 miles eastward, the edge of the 5-fathoms bank is 2 miles off shore, and thence to Shoalwater point from 3 to $3\frac{1}{2}$ miles off.

SHOALWATER POINT bears E.N.E. $11\frac{3}{4}$ miles from Victoria

See charts, No. 785 and No. 2,389b.

point, the coast between projecting nearly a mile beyond the line joining the two points.

Shoalwater point is not more than 10 feet high, the land behind being swampy up to the foot of the range, 15 miles in-shore. The dry bank extends to a distance of $1\frac{1}{2}$ miles in a south-easterly direction from the point; and S.E. $\frac{3}{4}$ S. about 2 miles from Shoalwater point there is a bank with only 2 feet water on it, one fathom in-shore, and 4 fathoms one mile to seaward.

Anchorage.—To the north-east of Shoalwater point there is good anchorage anywhere on the bank, in from 2 to 5 fathoms. The water is always smooth and the holding ground good.

The COAST.—From Shoalwater point it is N.N.E. $\frac{1}{3}$ E. 15 miles to Plank point, the coast between being nearly straight, and in no part higher than 20 feet. A sandy bank extends on the average one mile from the beach; there is generally a depth of 5 fathoms 3 miles from the edge of the bank. There are only $2\frac{3}{4}$ fathoms S.E. $\frac{1}{2}$ S. 3 miles from Plank point.

PLANK POINT, nearly N.E. by E. 32 miles from Elbow hill, may be easily known by three sand-hills along the coast, the point being close to the northern; the southern and most conspicuous hill is 56 feet high, and is the highest part of the coast between Franklin harbour and mount Young, to the north-east.

The COAST.—From Plank point the coast takes a general N. by E. $\frac{1}{4}$ E. direction, 21 miles to the foot of mount Young, and forms a shallow bay immediately to the southward of the mount. The coast consists either of beach or mangrove bushes, fronted the whole distance by shoal water, extending in some parts about 2 miles from it; the water shoals quickly from 7 and 8 to 2 and 3 fathoms.

TIDES.—It is high water, full and change, at Plank point, at 6 h. 15 m.; springs rise 6 to 8 feet.

MOUNT YOUNG, the most prominent feature of this part of Spencer gulf, bears N. by E. $\frac{1}{4}$ E. distant 22 miles from Plank point; it rises steeply to the height of 475 feet, from the low land on all sides of it. This hill, which, when seen from a distance, makes out as a double peak, is situated $1\frac{1}{2}$ miles from the nearest part of the mangrove coast: the intermediate space being mostly occupied by swamps,

which extend along the coast to Hummock hill, 6 miles to the north-east, and far to the south. The country inland of mount Young is an extensive plain, gradually rising to the westward and covered with stunted scrub.

Middle-back mount, nearly W. by S. $\frac{1}{2}$ S. 19 miles from mount Young, is 1,519 feet high, and is the summit of ranges of hills extending from about 10 miles west of Plank point to 18 miles W. by N. $\frac{1}{2}$ N. of mount Young; but they are too distant to be of any great service to vessels. Between this range and the coast there are ranges of hills of less elevation, besides those already noticed.

Four-fathoms shoal is about half a mile in diameter, with mount Young bearing N.W. $\frac{3}{4}$ N., and Hummock hill N. by W.; the least water on this shoal is 24 feet.

WESTERN SHOAL.—A sandy patch about half a mile across which dries, lies 2 miles from the shore in the shallow bight immediately south of mount Young; and from this patch the shallow part of Western shoal extends to the eastward 3 miles with a width of about half a mile; there are 3 feet on it at low water, and there is a 2-fathoms channel between it and the sand flat fronting the shore. The 5-fathoms edge of Western shoal extends about $3\frac{1}{2}$ miles south-eastward from the sandy patch, and then sweeps round in a northerly direction to about 2 miles off Hummock hill; there are 3 fathoms on the outer edge E. by S. $\frac{3}{4}$ S. 6 miles from mount Young, and S. by E. $6\frac{3}{4}$ miles from Hummock hill.

Beacon.—A pile beacon, painted black, and surmounted by a large square head has been placed on an outlying patch of Western shoal, in 19 feet at low water springs. From it mount Young bears W.N.W., mount Laura N.N.W. $\frac{1}{4}$ W. and Hummock hill N. $\frac{1}{2}$ W.

Anchorage.—In the bay south of mount Young there is anchorage in from 12 to 15 feet water, to the south-west of the patch which dries on the west end of Western shoal, at about three-quarters of a mile from the shore, with mount Young bearing N. $\frac{1}{2}$ E.

DIRECTIONS.—After sighting mount Young, which may be seen from a distance of 22 miles, the shoal water fronting the western coast in the vicinity of the Plank point is cleared by keeping the mount bearing west of North. When Hummock hill is

distinguished, by keeping it west of North, the Western shoal will be cleared to the eastward in 3 fathoms; this, however, leads close to shoaler water and when near the Western shoal the position should be frequently fixed by cross bearings, attention should also be paid to the lead. Vessels should pass to the eastward of the beacon.

The COAST from $1\frac{1}{2}$ miles south of mount Young trends N.E. $\frac{3}{4}$ N. $7\frac{1}{2}$ mile to Hummock hill point; it is very low and swampy for some distance inland, and has a fringe of mangrove bushes; sand-flats, which dry at low water springs, extend half a mile to one mile off it.

Hummock hill, N.E. $\frac{1}{4}$ E. $6\frac{1}{2}$ miles from mount Young, is round and grassy, and rises from a point of the coast to the height of 201 feet above high water. The point has a shingle beach, with sand-flats extending 100 yards off it, and 4 fathoms at half a mile from the shore.

Mount Laura, N. by E. $\frac{1}{4}$ E. $6\frac{1}{2}$ miles from mount Young, is situated on a ridge extending north-west from Hummock hill, and rises to the height of 596 feet; it is a sharp wedge-shaped hill, with its west face nearly perpendicular.

FALSE BAY extends from Hummock hill point N.E. by E. $\frac{1}{4}$ E. 7 miles to Black point, and is $3\frac{1}{2}$ miles deep, with 4 or 5 fathoms in the centre, and the water gradually decreasing in depth towards the head of the bay. Black point, however, is nearly steep-to, with 4 or 5 fathoms 2 cables off shore. The shore of False bay is fronted by a sand-flat, which dries at low water, and extends, in some places, more than a mile off it.

Buoy.—*See* Ballast, p. 255.

Anchorage.—The bay affords good anchorage, with northerly and westerly winds.

Caution.—The land at the head of False bay is very low and swampy, and continues so for many miles inland, so that to vessels running up Spencer gulf, the bay presents the appearance of an opening which has been mistaken for the entrance of Port Augusta estuary, before the entrance of the head of the gulf makes out.

TIDES and TIDAL STREAMS.—It is high water full and change in False bay, at 7 h. 0 m.; springs rise 6 to 8 feet. At half a

mile off Black point, in 5 fathoms water, the tidal stream sets East during the rising tide and West during the falling tide about one knot; at about half a mile off Hummock point the streams set North and South.

Black point, the north-east extreme of False bay, is formed of a limestone cliff about 50 feet high, and, although the cliff is of a light colour, its overhanging face, having a southern aspect, is nearly always in shadow and appears black.

From Black point the coast trends E. $\frac{1}{2}$ S. 3 miles to Lowly point, and is bordered by a rocky ledge extending 300 yards from high-water mark. There is a patch with 25 feet water on it, at about one mile off shore, midway between Black point and Lowly point, with 10 fathoms between the patch and the latter point.

FAIRWAY BANK, on which the least water is 24 feet, lies nearly in mid-channel off False bay, with its north-east end S.W. $\frac{1}{2}$ S. 4 miles from Lowly point; it is 3 miles long, N.N.E. $\frac{1}{2}$ E. and S.S.W. $\frac{1}{2}$ W., and three-quarters of a mile broad. Mount Laura and Hummock hill in line, bearing N.W. by W. $\frac{1}{2}$ W. just clear the south-west end of this bank in $5\frac{1}{2}$ fathoms. There is a safe channel, 3 miles wide, with 6 to 10 fathoms water in it, between Fairway bank and the shoal water of False bay.

EASTERN SHORE of Spencer gulf.—The western shore having been described from cape Catastrophe to Lowly point, where the gulf is only $8\frac{1}{2}$ miles wide, the navigator's attention will be next directed to the eastern shore, before proceeding farther up the gulf to Port Augusta.

YORKE PENINSULA, at one time looked on as only fit for pastoral purposes, has been settled in many places by farmers, and a large quantity of wheat is now grown.

CAPE SPENCER, in lat. $35^{\circ} 18' 21''$ S., long. $136^{\circ} 53'$ E., is the southern of three cliffy points with sand-hillocks behind them, forming the south-west end of Yorke peninsula; it is 258 feet high, with a ledge of rocks at its base, and from the southward appears like a cone.

Reef head is W.N.W. 2 miles from cape Spencer; a reef extends

S.S.W. $\frac{1}{2}$ W. 4 cables from it, and there is foul ground about 3 cables off the coast in the vicinity.

West cape, bearing N.W. by N. $2\frac{1}{2}$ miles from Reef head, is 189 feet high.

ALTHORPE ISLES are three in number, the centre of the south and largest, lies S. by W. $4\frac{1}{2}$ miles from cape Spencer, and N.N.E. $\frac{1}{4}$ E. $26\frac{1}{2}$ miles from cape Borda; it is of an irregular shape about 6 cables across, nearly flat-topped, and 305 feet high, with steep sides and a cleft across its southern part, visible from the eastward and westward. Dry rocks lie a quarter of a mile west of the south point, and some larger ones half a mile from the west side of the island. A rock, upon which the sea breaks, lies north-west half a mile from the island, with 9 fathoms between them; there is also a sunken rock a quarter of a mile north of the island. The summit of the island is much burrowed by mutton birds and penguins. The south point of the island, after passing the rocks west of it, may be rounded at the distance of a mile in 20 fathoms; close in, the wind is generally baffling from the westward.

The other two Althorpe isles are bare rocks, lying S.E. $1\frac{3}{4}$ miles, and S.E. $\frac{1}{4}$ S. 3 miles from cape Spencer, the former being 131, and the latter 102 feet high. A sunken rock upon which the sea generally breaks, lies N.N.W. 3 cables from the southern of the two islets.

Telegraph station.—A submarine telegraph is laid in a south-east direction for three-quarters of a mile from cape Spencer and thence to the south Althorpe island. This is not a signal station, but if signals be hoisted and are observed at the lighthouse, they will be reported to Adelaide and Port Adelaide.

Anchorage.—There is anchorage in 8 to 10 fathoms water, on a sandy bottom, sheltered from westerly gales, off a remarkable yellow overhanging cliff, on the east side of the south Althorpe island, with its extremes bearing N.N.W. and South; and in fine weather, landing may be effected upon the sandy beach or the rocks on the north-east side, and in a small cove on the south-east side of the island. There is a jetty 230 feet in length, with a depth of 11 feet at its outer end on the north-east side of the island.

LIGHT.—The lighthouse on the south Althorpe island is 50 feet

high and painted white; it exhibits at 350 feet above the sea a *flashing* light of the first order, showing a *flash every 15 seconds*. The light is white, except between the bearings of S. 25° E. and S. 61° E., where it is red. The white light should be seen from a distance of 25 miles and the red from a distance of 17 miles in clear weather. The white light is also visible over Yorke peninsula between the bearings of S. 14° E. and S. 8° E.; and S. 6° E. and S. 6° W.

The northern edge of the red sector leads half a mile eastward of Emmes reef and the southern edge nearly half a mile southward of S.W. rock.

EMMES REEF, W. by S. $\frac{1}{4}$ S. $3\frac{1}{4}$ miles from cape Spencer, is a rocky patch 50 yards across, that dries 5 feet at low water springs, and upon which the sea at other times breaks heavily; there are 17 fathoms at a quarter of a mile from the reef.

Breakers.—Heavy breakers have been reported about $2\frac{3}{4}$ miles off Reef head, bearing W. by N., distant about one mile from Emmes reef. At the time the breakers were seen, a moderate south-west gale was blowing, with a heavy sea.

S.W. ROCK, upon which the sea only breaks at intervals during a heavy swell, or in a westerly gale, lies N.W. by W. $3\frac{1}{4}$ miles from the centre of the south Althorpe isle.

Tidal streams.—At the south Althorpe isle the stream sets N.W. during the rising tide, and South during the falling tide.

Soundings.—There are 35 to 45 fathoms at 8 or 9 miles west and south of the south Althorpe isle, and 22 fathoms at 6 miles to the eastward of it. From cape Spencer to the Foul ground south-eastward of Gambier isles there are 20 to 35 fathoms.

PONDALOWIE BAY, so called by the natives, is the northern of two small bays between West cape and Royston head. From Royston head Pondalowie bay extends $2\frac{1}{2}$ miles to its southern bight, its eastern shore being a sandy beach backed by high sand-hills. A reef of sunken rocks, upon which the sea breaks in south-west gales, projects from a cliffy head just outside of the south point of Pondalowie bay, to three-quarters of a mile N.N.W. of West cape.

The entrance of Pondalowie bay, which is nearly three-quarters of a mile wide, with 6 fathoms water, lies between South and Middle islets; South islet is small, and connected at low water with the south point of the bay; and Middle islet, which lies north of South islet, and S. by W. $\frac{1}{2}$ W. $1\frac{1}{4}$ miles from North islet, close off Royston head, is half a mile long, W.N.W and E.S.E., and is 94 feet high, with a reef of dry and covered rocks projecting W.N.W. 800 yards from its western point, and a reef of sunken rocks extending 200 yards from the middle of its south side. A rock, with 7 feet water on it, upon which the sea breaks at intervals in south-west gales, lies close inside the entrance, with the outer point of South islet bearing S.W. $\frac{1}{2}$ S., distant $3\frac{1}{2}$ cables. The channel between Middle islet and the shore is rocky, with only 2 fathoms water in it.

The three islets fronting Pondalowie bay, which are the Black rocks of Flinders, being of a dark-coloured limestone on their western sides, appear in the forenoon quite black when seen from seaward against the sand-hills on the land.

Directions.—In approaching Pondalowie bay from the southward, keep the cliffs of Reef head open south-west of West cape, bearing S.E. $\frac{1}{2}$ S., to clear the end of the reef which lies N.N.W. from the cape. And any small vessel entering the bay between South and Middle islets should, to avoid the sunken rock in it, and the reef on the south side of Middle islet, run in with the high sand-hill just open north of South islet bearing E. by S., passing the islet, which is steep-to, at the distance of a cable.

Pondalowie bay would afford good shelter in $3\frac{1}{2}$ fathoms for a small vessel, with any winds from North round by east to W.S.W., at a quarter of a mile off shore, but there is no good holding-ground, the bottom being smooth limestone with a thin covering of sand.

ROYSTON HEAD, a clifly point 195 feet high, bearing N. by E. $\frac{1}{4}$ E. distant 3 miles from West cape. North islet, a steep rocky islet, 80 feet high, lies close off the head, with which it is connected by a reef.

DALY HEAD is steep and rocky, with a grassy summit 207 feet high; a reef, partly 4 feet above water, extends half a mile west from the head. The country behind Daly head, to the northward, is low,

with several salt swamps and small grassy plains, and some wells of good water in the hills. This part of Yorke peninsula is occupied during the summer months by sheep stations.

The COAST.—From Royston head a succession of small sandy beaches and rocky points trends N.E. by N. 8 miles to the bight of a bay, and thence a sandy beach trends N.W. by N. 4 miles to Daly head, which bears N. by E. $\frac{1}{2}$ E., $10\frac{1}{2}$ miles from Royston head. The whole of this coast is backed by high sand-hills, and the points have generally rocks extending 200 to 400 yards from them.

A rock upon which the sea breaks heavily, except in very fine weather and with easterly winds, lies N.N.E. $\frac{3}{4}$ E. $3\frac{1}{2}$ miles from Royston head, a little more than a mile from the shore.

From Daly head the coast curves slightly N. by E. $\frac{1}{2}$ E. $5\frac{1}{2}$ miles to the southern point of a sandy bay, which extends thence N.N.E. $\frac{1}{4}$ E. $3\frac{1}{4}$ miles to Corny point. Two reefs project one-third of a mile from a rocky point one mile N.E. $\frac{1}{2}$ N. of Daly head, and there are several rocks a quarter of a mile off the beach to the northward. N.N.E. 4 miles from Daly head is a rocky point, off which are two detached rocks, always above water, the outer one being three-quarters of a mile off shore. The coast between Daly head and Corny point is generally sandy, and from immediately north of the head, a range of high sand-hills extends along the beach.

WEBB ROCK lies N. by W. $3\frac{1}{4}$ miles from Daly head, and S.W. $\frac{1}{2}$ S. $6\frac{1}{2}$ miles from Corny point; it has generally heavy breakers upon it, but during the summer months, after long-continued easterly winds, the sea only breaks slightly on it at intervals. A knob of the outer part of the rock is awash at low-water, springs.

CORNYPPOINT is a double sloping rocky projection, in lat. $34^{\circ} 54'$ S., long. $137^{\circ} 1'$ E.; the coast to the southward is higher than the point itself; but to the northward it is low and sandy, the only dangers about the point being some rocks above water to the south-westward, which do not extend beyond a quarter of a mile from the shore.

LIGHT.—The lighthouse on Corny point, a round stone tower, 40 feet high, exhibits at 98 feet above the sea a *fixed* white light of the third order, visible through an arc of 200° , between the bearings of N. 45° E. and S. 65° W.; it should be seen in clear weather from

a distance of 14 miles. Thé lighthouse, keepers' dwellings, and store room are painted white.

An arc of reflected light from the lighthouse is visible inshore of Webb rock, and unless the night be clear and the land in sight, might (in the absence of bearings) be mistaken for the true light. The reflected light may, in clear weather, be seen from a distance of about 10 miles, inside the bearing of N.E. $\frac{3}{4}$ N. (N. 37° E.).

Vessels approaching from the southward, should keep well to the westward until Corny point lighthouse bears N.E. $\frac{1}{2}$ E. (N. 51° E.).

The passage inside the rock should never be attempted at night by a sailing vessel, unless with a fair wind and thorough knowledge of the coast.

Signal station.—There is a signal station at Corny point and communication can be made by the commercial code, but it is not connected by telegraph.

Directions.—Corny point may be safely rounded at the distance of half a mile, in 9 to 10 fathoms water, the only dangers about it being the rocks which project a quarter of a mile south-west from it. After rounding the point into Hardwicke bay the water quickly shoals to the eastward of Corny point, and for the first 2 miles, do not bring the point west of S.W. by W.

HARDWICKE BAY extends from Corny point N.E. by N. 28 miles to the south point of Wardang isle, and is 18 miles deep.

From Corny point, the coast consists of a sandy beach, backed by gently rising woody land, and curves eastward $12\frac{1}{2}$ miles to Souttar point, on which is a sand-hill, partly white and 85 feet high. At 4 miles east of Corny point are some shepherds' huts, and a well of good water at half a mile from the beach. There is anchorage in $4\frac{1}{2}$ fathoms water North of the huts, with Corny point bearing W. by S. $\frac{1}{2}$ S.

A spit with 6 to 18 feet water on it, projects 3 miles north from a low sandy point at 4 miles west of Souttar point, having as little as 9 feet on it at $2\frac{1}{4}$ miles from the shore. From this spit a 4-fathoms bank extends 6 miles to the north-east. There is good shelter with smooth water, in $3\frac{1}{4}$ fathoms, between the spit and Souttar point, half a mile from the beach. From Souttar point the coast trends E. by S. one mile, and then curves round to Turton point, a cliffy

projection E.S.E. $4\frac{1}{2}$ miles from Souttar point. There are 3 to 4 fathoms water half a mile from the shore, which consists of small stony beaches and low limestone cliffs.

From Turton point a sandy beach, forming the bight of Hardwicke bay, curves round 5 miles in an E.N.E. direction, with low sandy land extending between two wooded ranges, in a S.S.E. direction, and forming the narrowest part of Yorke peninsula, which is there only 9 miles across. Mount Gore, S. $\frac{1}{4}$ E. $5\frac{1}{2}$ miles from Souttar point, is 326 feet high. From the bight of Hardwicke bay the coast extends north 26 miles to Gawler point, and consists of sandy beaches and low rocky points, with a coast range of sand-hills, behind which the country gradually rises to the height of 400 feet at about 5 miles inland.

Soundings.—The general depth of water in Hardwicke bay is 8 to 12 fathoms; there are, however, some rocky patches, with only 6 to 7 fathoms in the middle of the bay, between which and Corny point there are 16 to 6 fathoms. In the north part of the bay there are 7 to 9 fathoms, between 3 and 5 miles off shore: and between 5 and 10 miles south-west of Wardang isle there are very irregular soundings in 10 to 6 and 16 fathoms, on a sandy bottom.

General directions.—In approaching any of the ports in Hardwicke bay at night, anchor immediately on shoaling the water to less than 5 fathoms, unless it is light enough to clearly identify the position when the most convenient berth may be sought. As a general rule, there is a depth of 5 fathoms within one mile of the shore, but in some parts off port Victoria and Turton point much nearer, and it will clear all dangers.

In working to windward in Hardwicke bay the east coast may be approached as near as one mile, or into 5 fathoms, and a vessel should stand off about 6 or 7 miles before tacking in-shore. There is less tidal stream near the shore than out towards Spencer gulf. Although there is comparatively shallow water in Hardwicke bay, the bottom is so rocky that it has not much effect in breaking the sea in a westerly gale.

Anchorage.—Vessels may anchor in many parts of Hardwicke bay, sheltered from all southerly winds, which are the only ones that seem to blow with much strength. The best anchorages appear to be

those off the huts eastward of Corny point; and between Souttar point and the spit to the westward of it, where there is soft good holding ground.

The bottom at all the ports in Hardwicke bay is rocky; with a good scope of cable a vessel will, however, ride safely.

Fish.—There is good fishing ground for schnapper off Corny point, and mackerel abound in the bay.

TIDES and TIDAL STREAMS.—It is high water, full and change, all over Hardwicke bay, at 2 h. 45 m.; springs rise 4 to 6 feet. The stream sets to the northward during the rising tide, and to the southward during the falling tide, following the direction of the coast.

Port Turton is situated just eastward of Turton point. The bottom of this port is so rocky that a broken sea gets up very quickly, and goes down as quickly when the wind ceases. A jetty extends from the south-east side of Turton point for 340 feet in a north-east direction, with $7\frac{1}{2}$ feet water at its outer end on both sides. Several rocks, with from 2 to 4 feet on them, lie off either side and its extremity. The north side of the jetty is available for one small vessel drawing 4 feet, and the south side for one drawing 6 feet, if not more than 100 feet long. With a North or N.W. wind a vessel could not lie on the north side of the jetty, or if it blew strong from those quarters on the south side. Sailing vessels using the jetty should be prepared to haul off and anchor without delay.

Directions.—From the northward; when one mile S.W. of the south point of Wardang island, the course is S. $\frac{1}{2}$ E. (S. 6° E.) $23\frac{1}{2}$ miles to near Turton jetty. From the southward; when one mile N.W. of Corny point, steer N.E. by E. $\frac{1}{4}$ E. (N. 59° E.), 16 miles, keeping Corny point bearing south of S.W. by W. until mount Gore bears South, then steer S.S.E. $\frac{1}{4}$ E. (S. 25° E.) 11 miles for Turton jetty. Vessels not requiring more than 15 feet water, may from one mile N.W. of Corny point shape a course E.N.E. (N. 67° E.) for $10\frac{1}{2}$ miles, or until mount Gore bears S.S.E. (S. 22° E.), keeping Corny point bearing south of S.W. by W. $\frac{1}{2}$ W. Then steer S.E. by E. (S. 56° E.) 10 miles for Turton jetty.

Vessels may with a fair wind cross the shoals in 10 feet least water by keeping Corny point bearing W. $\frac{1}{4}$ S. (S. 87° W.) until abreast the

west part of Souttar point, then keep half a mile off that point. At the west part of Turton point the 3-fathoms line is only one cable off from high-water mark, north of the jetty it is 2 cables off, and as the shore bights to the southward it increases its distance, being one mile off shore at less than a mile east of the jetty.

Anchorage.—A large vessel may anchor in 21 to 23 feet water, with the jetty bearing S.W. distant 3 cables, and a small vessel with the jetty in line bearing S.W. by W., $1\frac{1}{2}$ cables distant, in 12 to 16 feet water.

Port Minlacowie.—About Minlacowie the shore is backed by low sand-hills 20 to 40 feet high, covered with bushes and shea-oaks, and fronted by a ledge of rocks which dry to about $1\frac{1}{2}$ cables from high-water mark. The jetty is N.E. $\frac{1}{2}$ N. 8 miles from Turton point, and 7 miles south of Brown point. It extends west 1,150 feet from high-water mark, and has 13 feet water at its outer end, with from 9 to 10 feet water 150 feet in; the low-water mark being about 700 feet from the end. Several dangerous rocks, with from 2 to 11 feet water on them, lie in different directions from one-third to $2\frac{1}{4}$ cables off the jetty. There is a black warping buoy about 300 feet west of the jetty end, it is attached to an anchor and is to be used for hauling off only.

To the northward and southward of Minlacowie jetty the 3-fathoms line is, on the average, half a mile off shore. There are no dangers outside the 3-fathoms line, the depth rapidly increasing to 5 fathoms at one mile from the coast.

Directions.—From the northward; from one mile S.W. of the south point of Wardang island, the course is S.S.E. (S. 22° E.) 19 miles. From the southward; when one mile N.W. of Corny point steer N.E. by E. $\frac{1}{4}$ E. (N. 59° E.) 16 miles, and do not bring Corny point to bear west of S.W. by W. until mount Gore bears South, thence the course and distance to Minlacowie is E.S.E. (S. 67° E.) 10 miles. For vessels not requiring more than 15 feet water, from the position off Corny point, steer E.N.E. (N. 67° E.) $10\frac{1}{2}$ miles, taking care not to bring Corny point to bear west of S.W. by W. $\frac{1}{2}$ W. until mount Gore bears south of S.S.E., then steer E. $\frac{1}{4}$ N. (N. 87° E.) $12\frac{1}{2}$ miles to Minlacowie.

Anchorage.—A vessel of 18 feet draught may anchor in

20 to 22 feet water, with the jetty bearing E.S.E. 3 cables distant; 6 cables distant on the same bearing there are 24 to 26 feet water. A vessel drawing more than 10 feet must approach the jetty by keeping its outer end bearing S.E. by E. $\frac{1}{4}$ E. (S. 59° E.), and 10 feet is the greatest draught of vessel that can be altogether alongside the jetty. If drawing more than 8 feet do not bring the outer end of the jetty to bear south of S.E. or north of N.E. while within half a mile of the shore, to clear the 9-foot rocks. Any sailing vessel going alongside the jetty should let go an anchor to ride by, in case it becomes too rough to lie alongside.

Port Rickaby is off a sandy beach 10 miles S. by E. of Gawler point. The length of beach clear of fronting rocks is nearly 4 cables. To the northward there are rocks which cover and uncover, projecting 4 cables from high-water mark, half a mile N. $\frac{1}{2}$ W. from the north end of the beach. The high-water line at the back of the beach runs N. by W. and S. by E. with two bare sand-hills behind, the northern 58 and the southern 55 feet high. From the south end of the beach the coast runs S.S.W. 3 cables to a rocky point, with rocks which dry at low-water one cable off it. The outer end of the rocks with 10 feet water on it, and 20 to 22 feet close-to outside, is $2\frac{1}{2}$ cables west of the point. South of the southern beach sand-hill there is a gap through which Rickaby's house is visible from the westward; sand-hills then commence again, one being 69 feet high with shea-oaks on the top, at half a mile to the southward of the beach. The jetty is 660 feet long, with $14\frac{1}{2}$ feet at its outer end at low water. There is a black warping buoy about 300 feet north-west of the jetty end attached to an anchor, to be used for hauling off only.

A strong sea breeze causes enough run on Rickaby beach, to make care necessary in landing.

Soundings.—Off the clear beach the general 3-fathoms line is only $1\frac{1}{2}$ cables distant. Several rocky patches, with 16 to 18 feet water on them, lie farther out, the most distant being nearly 4 cables west from the centre of the beach. The bottom is very irregular farther out, but there is nothing less than 20 feet, and 5 fathoms at one mile off shore.

Directions.—From one mile S.W. of Wardang island the course is S.E. $\frac{1}{4}$ E. (S. 48° E.) 11 miles. From the southward, one mile N.W. of Corny point the course is N.E. by E. $\frac{1}{4}$ E. (N. 59° E.)

27½ miles, but Corny point must be kept south of S.W. by W. until mount Gore (which is the highest land to the southward of Turton point), bears South, to avoid the shoal ground in the south part of Hardwicke bay. Anchor a large vessel three-quarters of a mile off shore, with the southern beach sand-hill (on which there is a pole), bearing East, in 4 to 4½ fathoms; a small vessel with the sand-hill on the same bearing, 2 cables off shore, in 3½ fathoms. To clear all dangers do not come within a mile of the coast, until the southern beach sandhill bears between E.N.E. and S.E. A westerly gale might oblige a vessel to slip her cable, therefore, have room to get underway.

GAWLER POINT.—Gawler point is low, sloping and grassy, whence port Victoria extends N. by W. 4 miles. Rocks which cover and uncover stretch from Gawler point 3½ cables towards Eclipse rock, with 16 to 20 feet between.

WARDANG ISLE, the south point of which lies W. by S. ½ S. 6 miles from Gawler point, is 4 miles long, north and south, 2 miles broad, and rises to a grassy surface 107 feet high towards its west side, which consists of a succession of small sandy beaches and rocky points, with sand-hills towards the north end of the island, where there are some remarkable cliffy points.

With the exception of a red cliff 50 feet high within a mile of the north point of Wardang isle, its east side forms a continuous sandy beach, Bird point being about the middle. From Bird point, a sandy spit, intersected by three narrow boat channels, stretches 3½ miles in an E.N.E. direction into port Victoria. These channels are liable to change in position and depth. On the north side of this spit, at 2¼ miles from Bird point, and South three-quarters of a mile from the north-west point of port Victoria, is Rocky islet. Between Rocky islet and the north-west point of port Victoria, is a channel half a mile wide, with 6 to 9 feet water, leading into port Victoria.

Goose islet, which is small and grassy, lies 4 cables off the north point of Wardang isle, with which it is connected at low water. Two small dry rocks lie 2 cables north of the islet.

ISLAND POINT, which forms the north-east side of the north entrance of port Victoria, is a low grassy projection N.E. 2½ miles

from Wardang isle, with a small islet 20 feet high, lying close off it, the islet being connected with the point at low water.

Dangers.—Beatrice rock, N. by W. 7 cables from Island point, does not show at high water; a small portion of it dries 2 feet at low water.

Another small rock, which dries 3 feet at low water, springs, lies W. by S. $\frac{1}{4}$ S. nearly one mile from Island point, and from its position near the entrance, is dangerous to vessels working into port Victoria.

North entrance to port Victoria, which lies between Wardang isle and Island point, is protected from the southward by the long sandy spit which projects E.N.E. from the east side of the isle. Green islet, E.N.E. $1\frac{1}{2}$ miles from the red cliff on the north-east end of Wardang isle, is connected at low water with the shore to the east of it. There is anchorage here in $3\frac{1}{2}$ to 4 fathoms, with good holding ground of ooze, and well sheltered from all except North and N.W. winds.

Directions.—In running in from the westward, the rocks which lie north of Goose islet may be rounded in 4 and 5 fathoms, at the distance of a cable; but if it be necessary to make a tack outside Green islet, a vessel should go round before Rocky islet on the spit comes in line with Green islet, or when the latter islet bears S.E.

Anchorage.—The best anchorage for large vessels is in $4\frac{1}{2}$ fathoms water, sand and mud, with Goose islet bearing West, and Bird point South; but smaller vessels may anchor farther to the southward.

PORT VICTORIA.—The bay north-west of Gawler point is called port Victoria. The water in the bay is shallow, but there are from $3\frac{1}{2}$ to 5 fathoms, sand, for $1\frac{1}{2}$ miles between N.N.W. and West of Gawler point, with shelter from all winds except those from between W.S.W. and South; the holding ground is not good, and north-west and westerly gales generally terminate with a gale from S.W., when this is a dangerous anchorage.

The jetty is three-quarters of a mile North of Gawler point, and runs N.W. by W. $\frac{1}{2}$ W. 1,095 feet from high-water mark, with 10 feet water at its outer end and 6 feet 600 feet in, the low-water mark being 850 feet from its outer end. There is a crane on the jetty.

There are three black warping buoys off the jetty, one to the north-west and two to the north-east, to be used for hauling off only. With a fresh S.W. wind (the prevailing sea breeze), a vessel cannot lie on its south side.

Wauraltee (the township) had a population of 117 in 1891. There are six mails a week from Adelaide, and there is a telegraph station here. The main street is in line with the jetty.

Eclipse rock lies W. by S. $\frac{1}{2}$ S. $2\frac{3}{4}$ cables from the outer end of the jetty, and N. $\frac{1}{2}$ W. 7 cables from the north part of Gawler point. Its extent, with 6 feet water, is 70 yards east and west, and 100 yards north and south, and double those distances with less than 12 feet. Midway to the jetty there are 8 feet water.

Buoy.—A red buoy, with staff and ball, lies in 9 feet on the north edge of the rock, with the jetty end bearing E. $\frac{1}{2}$ N. 3 cables.

LIGHT.—A *fixed* white light is shown from a small wooden house at the end of the jetty, and is visible 4 miles.

Directions.—From one mile South of Wardang isle steer N.E. by E. (N. 56° E.) 7 miles to port Victoria, taking care not to bring the end of the rocks off the south point of Wardang isle to bear south of S.W. by W. to avoid the shoals between the isle and port Victoria. From one mile N.W. of Corny point to port Victoria jetty the course is N.E. $\frac{1}{2}$ N. (N. 39° E.) $33\frac{1}{2}$ miles. Gawler point is steep to the westward, there being 3 fathoms less than a cable off. The buoy on Eclipse rock should not be approached nearer than a cable; to clear this rock and the rocks north of Gawler point, the west side of the point should not be brought to bear south of S. by E. until the outer end of the jetty bears south of East, when the jetty may be steered for.

Anchorage.—Vessels of 18 feet draught anchor in 21 to 23 feet water, with the jetty end bearing S.E. $\frac{1}{2}$ E. distant half a mile. If of more draught, with the jetty end bearing East, three-quarters of a mile in 26 to 27 feet. Small vessels unable to go alongside the jetty anchor in 10 or 12 feet water with the jetty end S.S.E. distant $1\frac{1}{2}$ cables.

TIDES and TIDAL STREAMS.—It is high water, full and change, in port Victoria, at 2 h. 40 m.; springs rise 5 feet. The tidal

streams set North and South ; about $1\frac{1}{4}$ knots to the northward during the rising tide.

REEF POINT, N.N.E. 3 miles from Island point, is low, with a reddish cliff or bank on its west side, and a remarkable white sand-patch 4 cables south of it. Ledges of rocks, which dry, extend about 400 yards west and a quarter of a mile north from the point, and a sunken reef half a mile north-west. Several detached rocks, upon which the sea generally breaks at low water, extend 2 miles north of Reef point.

The COAST.—Between Reef point and a low rocky projection at N.N.E. 5 miles from it, named Balgowan point, the low coast forms a sandy bay $1\frac{1}{2}$ miles deep in its southern part ; it is inaccessible to vessels on account of the rocks in it, and the shoal water which extends nearly 2 miles off shore to the westward. Behind a flat, which dries nearly half a mile off the south shore of the bay, there are some wells of brackish water, used for watering sheep of the neighbouring stations.

Balgowan point has a grassy summit and a sandy beach on either side.

Jetty.—A jetty runs out 120 feet from Balgowan point and has a depth of $4\frac{1}{2}$ feet at its outer end at low water.

From this point the coast trends north 3 miles to some low red cliffs in a small open bay, and mostly consists of red cliffs, rising in one place to the height of 54 feet. This part of the coast is bolder than that to the southward or northward, there being generally 3 fathoms half a mile off the cliffs. The coast from the little open bay just noticed consists of a sandy beach extending N. by W. $\frac{1}{4}$ W. 4 miles to some bare white sand-hills, close to which are the Tipara wells ; but the water is brackish. From the bare white sand-hills a continuation of the sandy beach trends N.N.W. $3\frac{1}{2}$ miles to cape Elizabeth, and is bordered with rocky ledges, which in some places run out half a mile.

There is no anchorage to be recommended between Island point and cape Elizabeth, there being no good holding ground along this coast, which is exposed to the westward.

Fish is plentiful all along the shore between port Victoria and cape Elizabeth, principally schnapper, mackerel, and whiting.

DIRECTIONS.—In working down this coast small vessels generally keep close inshore ; but large ones should not approach the bay north of Reef point, within 2 miles, as the water shoals suddenly in some places, from 6 fathoms to less than 6 feet.

Soundings.—There are regular soundings in 25 to 28 fathoms, fine brown sand, across Spencer gulf from Corny point to Dangerous reef, northward of Thistle island. At 3 miles off the reddish cliffs along the centre of the bight between Reef point and cape Elizabeth there are 8 fathoms, then the depth gradually increases westward, to 17 and 18 fathoms at about 25 miles from the coast.

CAPE ELIZABETH, the south-west point of Tipara bay, is a rounded sandy point, clothed with scanty vegetation ; a long sandy beach, with rocky ledges one quarter of a mile to half a mile from the shore, extends S.S.E. $\frac{1}{2}$ E. from the cape ; and north-east of it is a small cliffy point. Close to the southward of the cape are some sand-hills covered with bush, which from seaward appear as separate lumps, the highest being 70 feet above high water. The land behind the cape is very low, level, and grassy.

Reef.—A ledge of rocks runs out about 3 cables from cape Elizabeth ; and a dangerous rocky patch, which is awash at low water, springs, lies with its outer edge, N.W. by W., a little more than three-quarters of a mile from the cape, with a 2-fathoms channel between them ; but the channel is of no use, as the tidal streams rush through it to the N.E. and S.W. at the rate of nearly 3 knots.

Buoy.—A red buoy with staff and ball is moored in $4\frac{1}{2}$ fathoms water, 3 cables west of the shoalest part of the reef, with cape Elizabeth bearing E. by S. $\frac{1}{2}$ S., and the lighthouse on Tipara reef N.N.W. $\frac{3}{4}$ W. The buoy may be seen in clear weather, at the distance of 2 miles.

Dangers.—A small 3-fathoms rocky patch lies about N. $\frac{1}{4}$ W. a little more than a mile from cape Elizabeth ; and N.N.E. $1\frac{1}{2}$ to 2 miles from the cape is a shoal nearly half a mile across, with $2\frac{1}{4}$ to 3 fathoms water on it. There are $3\frac{1}{4}$ fathoms between the shoal and the rocky patch, and $3\frac{1}{2}$ to 6 fathoms between the latter and the other rocky patch before noticed, off cape Elizabeth.

The soundings off cape Elizabeth deepen to 8 and 10 fathoms,

See chart, No. 402, Tickera point to cape Elizabeth, including Wallaroo and Tipara bays, scale $m = 1.2$ inches.

at the distance of 4 miles, over a sandy, rocky, or coral bottom ; and 13 miles off the cape are 12 and 13 fathoms, mixed sand.

TIPARA BAY extends from cape Elizabeth N. by E. $\frac{1}{2}$ E. 8 miles to Long point, and is 3 miles deep. Its eastern shore is only $2\frac{1}{2}$ miles distant from the Moonta copper mines, which are the most valuable and productive on the Yorke peninsula. This fine bay is used as a shipping place for the ore raised, for which purpose it is as available as Wallaroo bay to the northward.

The shore.—From cape Elizabeth the southern shore of Tipara bay trends east $2\frac{1}{4}$ miles to the west point of the southern bight of the bay, which curves round eastward and northward 3 miles to Sand-hill point. Rocky ledges project 200 to 300 yards from the shore for about $1\frac{1}{4}$ miles eastward from the cape, and there is a small ledge at the head of the bight. This shore of the bay is fronted by a sand-flat, which dries from half a mile to nearly one mile from the land ; and there are some salt swamps behind the bight.

Nearly E.N.E. 4 miles from cape Elizabeth is a sand-hill 100 feet high, which is one of the highest hills bordering Tipara bay. This, like those farther north, is covered with bushes, except on its side, where a considerable bare space distinguishes it from the other hills. This sand-hill, when seen from the northern part of the bay, appears as a point.

From Sand-hill point, which has a rocky ledge projecting from it a quarter of a mile to low-water mark, a sandy beach trends N.N.E. 2 miles to Middle point, backed by sand-hills 50 to 60 feet high, covered with bush. From nearly one mile off Sand-hill point, the 3-fathoms edge of the shoal water fronting the shore gradually closes the land to about $1\frac{1}{2}$ cables off Middle point.

Middle point, on which is the site of Port Hughes, is a rocky projection, with a smooth grassy summit, and may be more closely approached by large vessels than any other part of the shore in Tipara bay, there being anchorage in 4 fathoms, ooze, about 3 cables west of the beach.

The eastern shore of Tipara bay, after receding a quarter of a mile eastward from Middle point, trends N.N.E. 2 miles, and mostly consists of sandy cliffs of a light reddish colour, with rocky points

and ledges of rocks projecting to low-water mark, 200 to 400 yards from the shore. At $1\frac{1}{2}$ miles north of Middle point the land rises from the shore to a hill 105 feet high; the land north-east of the point being smooth and grassy.

From three-quarters of a mile N.N.E. of this hill, the shore curves round to the north-west for 3 miles to a low point, and forms a fine sandy bay, with a sand-flat that dries nearly half a mile out at low water; the 3-fathoms edge of the shoal water fronting it, extending from one-third of a mile to one mile from the shore.

Soundings.—Between the shoal water extending from Long point and the north-eastern shore of Tipara bay, there are 4 fathoms at about $1\frac{1}{4}$ miles from Long point, and from the beach to the eastward.

From 2 miles south of Long point to about the same distance north-east of cape Elizabeth, a space of 4 miles, the depth of water only varies from 6 to $5\frac{1}{4}$ fathoms, with 5 to 4 fathoms one mile off any part of the eastern shore, and 5 fathoms half a mile off Middle point, the bottom being sand and shells.

LONG POINT.—From the north end of the sandy bay just noticed, a low mangrove shore, with rocky ledges projecting half a mile to the southward, extends $1\frac{1}{2}$ miles west to Long point; this point is rocky, and about 20 feet high, with a mangrove shore on either side.

Buoy.—A large red buoy with staff and ball lies in 3 fathoms, at the west end of the shoal water extending from Long point, with cape Elizabeth bearing S. $\frac{1}{2}$ E., and Long point E. by N. $\frac{3}{4}$ N.

Shoal.—The 3-fathoms edge of the shoal water stretching out from Long point extends from $1\frac{1}{4}$ miles southward of the point to Long point buoy, and then sweeps round in a north-east direction towards Wallaroo bay. At about 6 miles from the land there are 6 fathoms, and where the depth of water is less than 6 fathoms, the bottom is generally sand covered with grass or weed; but west and south-west of Long point, where the soundings exceed 6 fathoms, the bottom is generally coral.

Small vessels may pass inside Long point buoy. Cape Elizabeth bearing S. $\frac{1}{4}$ W. leads over the bank in $2\frac{1}{4}$ fathoms at low water springs, passing Walrus rock nearly a mile and a half distant, but

only 7 cables off the rock about one mile north-west of it. The vicinity of these rocks should be given a wide berth.

Moonta, a mining township about 2 miles inland from the middle point of Tipara bay, near which is situated Port Hughes. There are several copper mines in the vicinity, but the most productive of all are the mines bearing the name of the town, which were discovered in 1861, and give employment to 1,000 hands.* In the first half of 1874, over 11,000 tons of ore were raised, and the gross proceeds amounted to 122,000*l*. There is communication with Adelaide by steam vessel *viâ* Wallaroo bay; or by rail, *viâ* port Wakefield and Green plains; also by telegraph. A railway connects Moonta with Wallaroo, 12 miles distant. The population in 1891 was 1,487 persons.

At Moonta bay, $1\frac{1}{2}$ miles north of Middle point, is a jetty 1,706 feet long, with a depth of 10 feet at its outer end at low water. There are two cranes on the jetty.

Light.—A *fixed* red light, elevated 15 feet above the sea, is exhibited from a white wooden house at the end of the jetty, and should be visible in clear weather from a distance of 4 miles.

The **Moonta mines** lie East 3 miles from Middle point of Tipara bay, but the buildings and miners' houses cannot be seen from seaward, except from a westerly direction. This part of the country has a very pleasing aspect, being formed of ridges trending straight in from the sea, covered with long grass; there are clumps of scrub here and there, with undulations of moderate steepness.

TIPARA REEF, directly in front of Tipara bay, is a bank of sand extending $2\frac{1}{2}$ miles east and west, and 2 miles north and south. The reef consists principally of sand; but there is a rocky patch of an oval shape, 600 yards long and 400 yards broad, with its centre N.N.E. $\frac{1}{2}$ E. $7\frac{1}{2}$ cables from the lighthouse, which nearly dries at low water springs. There is also a small patch with only 3 feet water on it, N. $\frac{1}{4}$ W. $1\frac{1}{4}$ miles from the lighthouse. The depths on the reef otherwise vary from $1\frac{1}{2}$ fathoms to $2\frac{3}{4}$ fathoms.

* In 1894, the production was 13,989 tons copper ore, containing 2,931 tons fine copper.

Unless it is blowing very strong, there is only a small break on the rocky patch, and none whatever on any other part of Tipara reef; some of the shallow parts show white, where the sand is clear of weeds. No vessel should approach the reef to a less depth than 7 fathoms.

From the northern extremity of Tipara reef Long point buoy bears N.E. by E. $\frac{1}{2}$ E., distant $3\frac{1}{4}$ miles.

LIGHT.—An iron screw pile lighthouse, painted red, with a white lantern, is on the south side of Tipara reef, with Long point bearing N.E. by E., and cape Elizabeth S.E. $\frac{1}{2}$ S. The lighthouse exhibits at 100 feet above high water a *revolving* white light of the first order, which attains its greatest brilliancy *every thirty seconds*, and in clear weather should be visible from a distance of 16 miles.

Signal station.—There is a signal station at the lighthouse on the Tipara reef, and communication can be made by the commercial code, but it is not connected by telegraph.

Buoy.—A red buoy with staff and ball is moored in 4 fathoms, west of a rocky patch with 12 feet water on it, at the west end of Tipara reef, with Tipara lighthouse bearing S.E. by E. $\frac{1}{4}$ E., and the smelting works chimney, Wallaroo, N.E. by E.

Soundings.—At 4 miles west of Tipara reef there are 10 fathoms, coral, and on the north-west side the soundings decrease very regularly towards it, but on the south and south-west sides there is a sudden shoaling from 5 fathoms to the edge of the reef.

Between Tipara reef and Tipara bay a broad sandy bank, with $3\frac{1}{4}$ to 5 fathoms water on it, extends from the west part of the shoal water stretching out from Long point to the rocky patches north of cape Elizabeth. From the shoalest part (3 fathoms) yet discovered on this bank, Middle point of Tipara bay bears nearly E. by S. $\frac{1}{2}$ S., and cape Elizabeth S. $\frac{1}{2}$ W.

DIRECTIONS.—From the southward bound for Tipara bay; approach cape Elizabeth so as to pass $1\frac{1}{2}$ or 2 miles west of it, to avoid the rocky patch which extends nearly a mile north-west from the cape; then steer North till the high sand-hill on the south-east side of the bay bears East, when an E.N.E. (N. 67° E.)

course leads to Middle point, off which there is anchorage; or a N.E. by E. $\frac{1}{4}$ E. (N. 59° E.) course leads up to the jetty in Moonta bay. Middle point may be easily known by the coast to the southward being sand-hills and bush, whilst Middle point and the land to the northward is smooth and grassy.

Southern passage.—Tipara bay may be entered between cape Elizabeth and the rocky shoals north of it, by rounding the cape at the distance of about a mile, passing close westward of the buoy; then bring the high sand-hill on the south-east side of the bay to bear E. by N. (N. 79° E.) and steer for it. This course will lead in from 6 to 4 fathoms, about 2 cables north of the shoal water extending from cape Elizabeth, and the same distance from the rocky patch to the northward.

From the westward.—To round the south side of Tipara reef do not bring cape Elizabeth to bear south of S.E. $\frac{1}{2}$ E. (S. 51° E.), and keep a mile off the lighthouse; whilst to pass north of this danger, do not bring Long point buoy to bear north of E. by N. $\frac{1}{2}$ N. (N. 73° E.). Long point, if visible, kept in line with the buoy bearing E. by N. $\frac{1}{2}$ N., will lead a quarter of a mile northward of Tipara reef, in about 4 fathoms.

Anchorage.—In south-westerly gales there is good anchorage in $4\frac{1}{2}$ fathoms water, mud, in the southern part of Tipara bay, with the north-west point of cape Elizabeth bearing S.W. by W., and the high sand-hill E. $\frac{1}{2}$ N. Vessels can also anchor off Middle point in 4 or 5 fathoms water, half a mile from the shore; or in Moonta bay, in 4 to 5 fathoms, about three-quarters of a mile off the jetty.

Tidal streams.—The stream sets N.N.E. during the rising tide, and S.S.W. during the falling tide, at the rate of 2 knots an hour over Tipara reef; outside it the streams set more North and South.

In Tipara bay the stream sets round the coast to the northward during the rising tide, and to the southward during the falling tide. Off Middle point the streams set N.N.E. and S.S.W.; and along the south side of the bay they set East and West.

Off cape Elizabeth the tidal streams are stronger than in Tipara bay, and set N.E. and S.W., about 2 knots. But as the streams are irregular and rapid in the vicinity of Tipara reef, cape Elizabeth,

and Long point, their influence must be guarded against in these localities. *See* page 242.

WALRUS ROCK, N.N.W. $\frac{1}{2}$ W. nearly one mile from Long point, is a dangerous patch 400 yards long, N.E. and S.W., and 200 yards broad. Although there is not more than one foot at low water, springs, on some parts of this patch, the sea does not break upon it in ordinary weather as the shallow water outside it prevents any sea from rolling in. There are strong tide ripples over the rock; notwithstanding which, small coasters have struck on it. There are only 9 feet water between Walrus rock and the shore.

A rock, with only 4 feet water on it, lies N.W., nearly one mile from Walrus rock. As this danger lies in the track of small vessels proceeding to and from Moonta and Wallaroo, they are recommended to give the neighbourhood a wide berth.

Clearing marks.—A pile of stones was erected on the north-east part of Bird reef in 1862, N.N.E. $\frac{1}{2}$ E. $2\frac{1}{4}$ miles from Long point; if still remaining, keep the pile in line with the smelting chimney at Wallaroo, bearing N.E. by E., which will lead between Walrus rock and the rock above mentioned, in 2 fathoms water. Long point bearing east of S.E., leads to the south-west of both these dangers.

The COAST from Long point takes a general north-east direction $6\frac{1}{4}$ miles to Hughes point, on the south side of Wallaroo bay, and consists of a low sandy beach, in some places fringed with mangroves, and rocky ledges projecting from half a mile to 400 yards upon sand-flats, which front the shore, and at low water, springs, dry out $1\frac{1}{2}$ miles to Bird reef. Between Long point and Bird reef the flat dries out above three-quarters of a mile, and north-east of the reef the outer edge of the flat closes the shore to about 300 yards off Hughes point.

BIRD REEF, which lies nearly N. by E. $\frac{3}{4}$ E. $2\frac{1}{4}$ miles from Long point, and $1\frac{1}{4}$ miles from the shore, is a hard rocky ledge about a quarter of a mile long, N.E. and S.W., and 200 yards broad; it is awash at high water, springs, but at other times is generally covered with birds. There are 2 fathoms water 2 cables west of Bird reef.

Long point buoy, bearing S.W., leads half a mile north-west of the reef.

BIRD ISLANDS, which are low and covered with mangroves, are situated in line, bearing N.W. by W. $\frac{1}{2}$ W., on the sand-flat between the shore and Bird reef. The outer isle is half a mile and the inner 200 yards long, both being less than 200 yards broad.

Soundings.—From $2\frac{1}{2}$ miles north-west of Long point the 3-fathoms edge of the shoal water which fronts this part of the coast trends N.E. by E. $\frac{1}{2}$ E. 4 miles to a narrow spit, with $2\frac{3}{4}$ to 3 fathoms on it, extending $1\frac{1}{2}$ miles north-east, and $1\frac{3}{4}$ miles off shore. From the bight within this spit the 3-fathoms edge of the shoal water closes the shore to about a quarter of a mile off Hughes point. There are three 3-fathoms patches between the spit and Wallaroo bay, lying, respectively, West one mile, W. by N. three-quarters of a mile, and W.N.W. $1\frac{3}{4}$ miles from Hughes point.

Hughes point, on the south side of Wallaroo bay, cannot be distinguished when entering the bay until close to the anchorage. From the westward this point appears as a small red patch on the coast, it being a red cliff about 25 feet high; at one-third of a mile south-west of the point there is a hill 52 feet high, close to the shore.

WALLAROO BAY, situated about half-way up the east side of Spencer gulf, was in 1862 the only shipping port for the copper ore raised from the adjacent mines on Yorke peninsula. This bay extends from Hughes point N. $\frac{1}{2}$ W. $3\frac{1}{2}$ miles to point Riley, and is about $1\frac{1}{2}$ miles deep. There are regular soundings in 4 to $5\frac{1}{4}$ fathoms across the bay, from half a mile north of Hughes point to about one mile south of point Riley, and from that line to half a mile from the shore there are $5\frac{1}{2}$ to 4 fathoms, over an even bottom of sand and weed.

From Hughes point the shore of Wallaroo bay trends N.E. by E. $\frac{1}{2}$ E. one mile to Wallaroo jetty, and may be approached to a quarter of a mile in $3\frac{1}{2}$ to 4 fathoms water.

From the wells, which are three-quarters of a mile north-east from the jetty, a fine sandy beach extends N. by W. $\frac{1}{4}$ W. $1\frac{1}{2}$ miles, bordered by a sand-flat, which dries off about 2 cables at low water, and has some rocky ledges on it to the northward. From the north end of this beach a rugged rocky coast trends N.W. $1\frac{1}{2}$ miles to

point Riley. The shore between the wells and the point may be approached to half a mile in $3\frac{1}{4}$ fathoms.

Storm signal.—A blue swallow-tail flag is hoisted at Wallaroo, on the indication of bad weather.

The bar.—At about 5 miles off shore, abreast of Wallaroo bay, there are soundings in 10 and 11 fathoms, sand and shells, whence the depth of water rapidly decreases to $4\frac{1}{2}$ and $3\frac{1}{2}$ fathoms on a sort of broad flat bar stretching across outside the entrance of the bay, within which, as just stated, there are $5\frac{1}{4}$ fathoms.

As the depth of water on the southern part of this bar decreases to 3 and $2\frac{3}{4}$ fathoms on the spit to the south-west of Wallaroo bay, the anchorage, though apparently open and exposed, is only so with winds from N.W. by N. round to West, which winds cause the most sea; and even with winds from N.W., the 4-fathoms part of the bar breaks much of the sea, which cannot be very great, as the western shore of Spencer gulf is only distant about 30 miles. The spit to the W.S.W. protects the anchorage from winds in that quarter.

Reported dangers.—Numerous dangers have from time to time been reported to lie between the bearings of W.S.W. and W.N.W. from Wallaroo jetty; these reports are attributed to the shoal appearance of the water on running in from 10 and 11 to 4 and $3\frac{1}{2}$ fathoms; the bottom then becomes distinctly visible, and the weeds growing at the bottom appear in the sun quite brown, like rocks, with white sand between them. The bottom is sand and apparently even; no breakers have been seen or reported.

Wallaroo.—From Hughes point the southern shore of Wallaroo bay, although somewhat rocky, may be approached to a quarter of a mile in $3\frac{1}{2}$ to 4 fathoms, and there are $2\frac{1}{4}$ fathoms, close to the old jetty, immediately behind which is situated Wallaroo.

The municipality of Wallaroo is elevated about 50 or 60 feet above the beach. The rise of Wallaroo has been rapid, since the discovery of the famous Wallaroo copper mines in 1860, at which time there was only one house in the bay, and the present town site was part of a sheep-run. A railway connects the mines with the port*. The population, in 1891, numbered 1,685 persons, mostly interested in copper. There is communication by the universal telegraph system. A steam vessel calls on her way between Port Augusta and Adelaide;

* In 1894, the quantity of copper ore produced was 12,457 tons, containing 1,773 tons fine copper.

and communication with Adelaide is kept up by coasting vessels ; also the mail, six times a week, by rail *viâ* port Wakefield.

The new or south-west jetty is of wood, and extends 1,605 feet into 23 feet water at low water, giving berths for six vessels, from 140 to 300 feet in length. There are 12 black warping buoys attached to screw moorings off the new jetty for warping purposes. The old jetty, 800 feet in length, with a depth of 16 feet at the outer end at low water, is closed, except possibly for landing mails and passengers. Rails are laid on these jetties in connection with the railway system ; the new jetty is provided with hydraulic cranes.

The Custom-house is a one-storied stone building near the shore, 150 yards east of the old jetty. It is also the court-house and residence of the sub-collector of customs, who is also harbour master and shipping master. In 1892, 66 vessels of a tonnage of 43,982 entered and cleared at Wallaroo. The imports are coal,* general merchandise and timber ; the exports, wheat, copper ore, copper, and flour.

Smelting is carried on, on a very extensive scale, and the works are the largest in the colony. There is a large smelting establishment for copper ore close to the water's edge, 300 to 400 yards east of the Custom-house. The chimney, which is square and built of light-coloured bricks, rises from about the centre of the works to the height of 140 feet above high water. As it is much higher than any of the adjacent land, it shows well from seaward, and can be seen over Long point.

During the frequent northerly winds the chimney is apparently so raised by mirage that it can be discerned 20 miles off, and has been distinctly seen from a boat off cape Elizabeth, a distance of 15 miles. In a calm the smoke may be seen at a much-greater distance.

The smelting furnaces are arranged in a long line facing the north-west, and from seaward have some resemblance to a heavy battery with more than 30 embrasures ; the light from the furnaces can be seen from a distance of about 6 miles north-west of Wallaroo, as one or two doors are nearly always open, showing a brilliant light near the water's edge.

N.N.E. half a mile from the smelting works chimney is a bare sand-hill, at the foot of which, on the beach, are some wells

* About 25,000 tons of coal are now imported annually.

See chart, No. 402.

of brackish water, where most of the live stock of Wallaroo are watered.

Light.—A *fixed* red light, elevated 25 feet above the sea, and visible in clear weather from a distance of 4 miles, is exhibited from a white wooden house at the end of the new jetty.

Supplies.—Fresh meat, both of beef and mutton, may be procured at Wallaroo; also abundance of firewood, but no vegetables nor fruit.

Water.—Wallaroo is in a Government water district, and is supplied from the Beetaloo mains; the principal reservoir at Beetaloo springs has a capacity of 800,000,000 gallons. There is a stand pipe on the jetty. The mean annual rainfall at Wallaroo is 13.45 inches.

POINT RILEY, on the northern side of Wallaroo bay, is a cliffy projection, but is not easily distinguished until well in to the southward or northward of it, the back land being very much higher than the point, which is only 45 feet high. A ledge of rocks projects about a quarter of a mile west and south-west from the point; the soundings for more than half a mile off it are irregular, and the bottom is rocky.

Riley shoal, the west end of which lies S.W. by W. $\frac{1}{4}$ W. $1\frac{1}{4}$ miles from point Riley, and N.W. $\frac{1}{2}$ W. $3\frac{1}{4}$ miles from the smelting chimney, is a bank of hard sand, with 9 feet on its shoalest part at low water springs. This bank is about 800 yards long east and west, and 300 yards broad; its shoalest part shows white, from the tidal streams washing away the weed, which thickly covers the sandy bottom in other parts of Wallaroo bay.

Buoys.—A red buoy with staff and ball is placed on the north side of Riley shoal near the shoalest part, with point Riley bearing N.E. by E. $\frac{3}{4}$ E., rather more than a mile, and the smelting chimney S.E. $\frac{1}{4}$ E., nearly $3\frac{1}{2}$ miles. Vessels should not approach this buoy under 4 fathoms when working into Wallaroo bay.

Two 3 fathoms rocky patches, with $3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms about them, lie nearly midway between Riley shoal and the south side of Riley point; and a rocky shoal, having $2\frac{3}{4}$ fathoms on it, with a 3-fathoms patch at $\frac{2}{2}$ cables to the south-west of it, lies N.W. by W. $\frac{1}{2}$ W. nearly

one mile from the point. For a radius of about one mile from Riley shoal the soundings are irregular, varying from 5 and $4\frac{1}{2}$ fathoms to the westward, to 5 and $3\frac{1}{2}$ fathoms to the southward and south-eastward of the shoal.

A red perch buoy with ball is placed close to a shoal patch, with 16 feet at low water, lying about a mile south of Riley shoal buoy, with the following bearings:—point Riley N.E. by N., and the smelting chimney S.E. by E. $\frac{1}{2}$ E.

Vessels beating up to the anchorage with S.E. winds should not bring the old jetty south of E.S.E., until point Riley bears north of N.N.E.

Aspect.—The land between cape Elizabeth and point Riley presents no prominent feature; and at 10 or 12 miles off the land the outline appears nearly straight and of a uniform dark colour, from the thick scrub that clothes the back land. The objects on the coast are low, and not seen distinctly until close in. The lighthouse on Tipara reef is a prominent object. During the frequent northerly winds the mirage is so great that everything appears distorted, and the aspect of the coast entirely different to what it usually is.

DIRECTIONS for WALLAROO BAY.—In running for Wallaroo bay from the southward, during the daytime, it is advisable, in a large vessel, to shape a course to pass 8 miles west of cape Elizabeth. From that position steer North, taking care not to approach Tipara reef to less than 7 fathoms.

When Tipara lighthouse bears E.S.E. distant 5 miles, steer N.E. When the smelting chimney bears East, haul right in for it; but if of much draught, run in with the chimney bearing E. by S., which passes over $3\frac{1}{2}$ fathoms, or E.S.E., which passes over 4 fathoms.

The best anchorage is off the end of the jetty in 4 fathoms, sand, with the smelting chimney bearing E. by S. to E.S.E., and Hughes point S.W.

If a passage nearer the land be preferred, do not approach Tipara lighthouse from the westward to less than 7 fathoms. From 2 miles west of the lighthouse steer N.N.W. in $4\frac{3}{4}$ and 5 fathoms, this passes 3 cables west of the red buoy at the west end of Tipara reef, till

Long point buoy bears East; then steer N.E., taking care not to go into less than $4\frac{1}{2}$ fathoms. When Long point buoy bears South steer N.E. by E., and when the smelting chimney bears East proceed as before directed.

Should a vessel run too far to leeward, and have to work into Wallaroo bay against a south-east or south wind, or work out against a north-west wind, tack off shore when the chimney bears S.E. by E., if Riley point is east of N.N.E. to avoid Riley shoal. When to the southward of that danger the chimney may be brought as far south as S.E. by S.

Pilot.—Sea pilotage is not compulsory, but a pilot may generally be obtained. The employment of the harbour master as harbour pilot is compulsory. The limit of harbour pilotage is within one mile of the outer end of the new jetty.

Working.—Large vessels working up for Wallaroo bay from the southward should keep outside Tipara reef, not shoaling to less than 7 fathoms, or not bringing cape Elizabeth to bear south of S.E. till the smelting chimney bears N.E. by E. $\frac{1}{2}$ E., when the vessel may stand into $4\frac{1}{2}$ fathoms, taking care not to get into less water till the chimney bears East, as the water shoals quickly from 9 to 4 and 3 fathoms.

Inner passage.—To pass eastward, or inside Tipara reef from the southward to Wallaroo bay; give cape Elizabeth a berth of $1\frac{1}{2}$ miles, passing half a mile west of the buoy, to avoid the rocky patch off the cape, then steer N. $\frac{1}{4}$ E., which will lead through the passage inside Tipara reef, in not less than 4 fathoms, passing three-quarters of a mile eastward of the reef; when Tipara lighthouse bears S.W. by W., steer N. $\frac{1}{2}$ W. and pass half a mile west of Long point buoy.

Beating through, keep the lead going and when standing in shore, a vessel drawing more than 17 feet should not bring Long point buoy west of W.N.W.; and in standing off, when in the vicinity of Tipara reef, the east end of the reef will be avoided by not bringing Long point buoy to bear east of N.N.E.

Small vessels may pass inside Long point buoy, taking care not to bring cape Elizabeth to bear west of S. $\frac{1}{4}$ W., so as to avoid Walrus

rock, and the sunken rock N.W. nearly a mile from it, which rock the above bearing of the cape passes in $2\frac{1}{2}$ fathoms at the distance of rather over half a mile.

At NIGHT, in the vicinity of Tipara reef, do not go into less than 7 fathoms, and ascertain the position by bearings of Tipara reef light and the courses and distances run in the intervals. When the light bears E.S.E. distant 5 miles, the depth of water being 10 fathoms, steer a N.E. course for 10 miles, the depth not being less than 7 fathoms. Tipara reef light will then bear S. by W. and the course should be altered to East. The depth of water must not be reduced below 6 fathoms. The smelting lights should now be seen ahead and when the red light on the jetty is seen, bring it to bear E. $\frac{1}{2}$ N. or E. by S. and approach it according to the draught. Except in fine weather it is unadvisable to enter the bay at night in a sailing ship.

Anchorage.—There is good anchorage in Wallaroo bay, in 4 fathoms, water, with the old jetty end bearing E.S.E. distant 2 cables. Vessels can anchor in 3 fathoms, with the end of the old jetty bearing S.S.E. to South, or may find berths alongside the jetties.

Vessels alongside the new jetty use moorings. Vessels alongside the old jetty have an anchor laid out well to the N.N.W. with a long scope of chain; and in casting off swing clear when the wind is from N.W. to W.S.W., the only winds which throw any sea into Wallaroo bay.

TIDES.—It is high water, full and change, in Wallaroo and Tipara bays, at 5 h. 45 m.; springs rise 4 feet 8 inches, but both the time of high water and the rise and fall are subject to the wind. When there is no disturbing cause the ebb and flow are regular at the time of springs, and for two or three days before and after; but at neaps there are great irregularities, the tide sometimes remaining nearly stationary for 24 hours, and with one ebb and flow during that period, at which time the stream along the coast is very weak and irregular. The ordinary methods of finding the time of high water are impracticable at Wallaroo, as it is frequently high water at about the same time every day for a week.

Light easterly and northerly winds bring the lowest tides and

south-westerly gales the highest; in the latter case high water generally remains stationary till the wind begins to lull. From October to March the tides are more regular and the tide generally falls about a foot lower than from April to September.

As a general rule, at springs from October to March, it is high water at 6 a.m. ; low water at noon, or an hour before. From April to September, high water, 6 p.m. ; low water, midnight.

Tidal streams.—At the anchorage in Wallaroo bay the stream is barely felt ; but when the wind is blowing strong into the bay there is a sensible set to windward. Outside the line from Hughes point to Riley point the stream sets to the N.E. during the rising tide, and to the S.W. during the falling tide, about one knot.

Outside Tipara reef the streams set North and South, but within it the streams follow the line of coast.

A westerly gale seems to have the same effect on the stream that it has on the rise and fall, causing a long flood or north-going stream, and stopping the ebb altogether.

Winds.—During the four months, August to November 1862, no particular wind could be said to prevail, as it shifted round the compass every three or four days. After a day or two of calms, or land and sea breezes, the former from the East, and the latter from S.W., the wind veered to the northward ; at first light with a clear sky, the barometer falling sometimes to 29.5 inches, and the land on the opposite side of the Spencer gulf becoming miraged into view.

If the wind shifted to N.W., and the sky became overcast, and the barometer did not rise, a gale was expected. On the barometer beginning to rise, the wind shifted to West and S.W., with a clear sky. When the wind in veering gets to S.W. or West, and backs to N.W. again, some heavy weather may be expected, which sometimes lasts two or three days.

The wind from the northward is very hot, even in winter, and the shift of wind to the westward sometimes comes in heavy squalls, accompanied by thunder and lightning, the blast being extremely hot. If the wind shifts from North to S.W., and does not back, and the barometer suddenly rises, the weather remains fine.

From November to March the prevailing winds are South and S.W. sometimes blowing for weeks together in Spencer gulf, with land

and sea breezes in shore, the south-west wind sometimes blowing very freshly, but occasionally interrupted by a day or two of hot wind from the North.

The barometer is a very good guide, and rises rapidly as a gale shifts to the S.W., after which the wind soon subsides.

TICKERA BAY.—From point Riley a rocky coast and limestone cliffs trend N.N.E. $\frac{3}{4}$ E. $3\frac{1}{2}$ miles to Tickera point, and in the same direction for 5 miles further to Tickera bay, a slight indentation of the coast, with a smooth sandy beach, fronted by sand-flats, and extending from the end of the cliffs. N.E. by N. 4 miles. About the middle of the bay is a red cliff 44 feet high, with some huts to the southward of it.

Anchorage.—Tickera bay affords anchorage in 3 fathoms, about one mile off shore, sheltered from winds south of S.W., with the huts bearing S. by E. This anchorage is partially protected by a 2 and 3 fathoms spit, which runs out to the north-west.

The COAST.—From Tickera bay a smooth sandy beach extends N.E. by N. $4\frac{1}{2}$ miles to a small bight, and thence continues in the same direction $5\frac{1}{2}$ miles to Webling point. The whole of this beach is fronted by a flat stretching out one to 2 miles, with $3\frac{1}{2}$ and 4 fathoms water about 2 miles from the shore, except off Webling point, where a $2\frac{1}{2}$ fathoms spit runs out 3 miles W.N.W. from the point. From Webling point the low coast sweeps round north-eastward about 3 miles to the entrance of the south Hamilton lagoon.

Aspect.—The back land between point Riley and Webling point rises to between 100 and 200 feet high, at 2 or 3 miles in shore; it is nearly level, and covered with thick scrub. From a distance at sea the clear grassy spaces at Tickera look like the face of a cliff.

Webling point is higher than any of the coast to the northward, and is thickly covered with green scrub and stunted pines; there is a bank of reddish earth 50 feet high, just north of the point.

TIDES.—It is high water, full and change, at Webling point, at 6 h. 10 m.; spring rise 6 to 9 feet.

Hamilton lagoons are two shallow inlets east and north-east

of Webling point, surrounded by swampy land, except on their east sides, which are thickly wooded; the entrances are about 2 cables wide, with narrow boat-channels leading in through the sand-flats which extend nearly 2 miles off shore.

The channel leading into the south lagoon has 6 or 8 feet at low water, and in some parts more than 2 fathoms; the entrance cannot be distinguished until close in with the land, as it is embayed and hid by mangroves. From the entrance this lagoon runs in about $2\frac{1}{2}$ miles to the southward, and is $1\frac{1}{2}$ miles wide at its south end; at low water, springs, it is nearly dry. Here is situated Port Broughton.

The entrance of the north lagoon lies $2\frac{3}{4}$ miles northward of that just described, and can be plainly distinguished from seaward, having a red cliff on its north side, and a small mangrove islet W.S.W. one mile from it; but the channel leading into it is entirely blocked up at low water, springs. This lagoon runs straight in from the entrance, nearly at right angles to the coast, and is about 2 miles across; like the southern lagoon, it is nearly dry at low water springs.

The COAST.—From the entrance of the north Hamilton lagoon the coast trends N. by W. 8 miles, and West $2\frac{1}{2}$ miles to Wood's point, and forms a sandy beach, having low swampy land behind, and is fronted by a hard sand-flat, which dries 2 to 4 miles out.

PORT BROUGHTON.—At this port, on the east side of the south Hamilton lagoon, a jetty has been built and Mudoora channel (leading to the port) dredged to a depth of 6 feet at low water and not less than 40 feet in width. This port is the nearest to a rich wheat-producing country, east of the Barn hill range. The jetty is 1,260 feet long with 10 feet water at its outer end. Port Broughton, a post town with a telegraph station, is connected by a railway with the town of Mudoora 10 miles inland. The population is 350.

Water.—Port Broughton is supplied with water by the Beetaloo mains.

Mudoora channel, leading to Port Broughton is marked by one perch buoy at the entrance, 13 tub-shaped buoys, 27 cask buoys, and 1 pile beacon, all painted red, to be left on the starboard hand going in. On the port hand, one perch buoy at the entrance, and 2 pile beacons, all painted black.

Directions.—From the southward, bound for Mudoora channel,

after passing Riley point do not approach the land to less than 6 fathoms of water, in order to avoid the long hard sand-flat, which dries at low water springs, and extends from Tickera bay to the entrance of the channel, a distance of 17 miles, running out from the land, in one instance, for nearly $2\frac{1}{4}$ miles. With point Riley bearing East 4 miles distant, a course of N.N.E. $\frac{1}{2}$ E. (N. 28° E.) 25 miles will lead into a good position for entering the channel, and about 4 miles off; at this distance the outer bar beacons marking the old entrance will be distinguished; if not, bring Barn hill (a flat-topped mountain) with a saddle and small peak immediately north of it—remarkable objects from the offing—to bear E. $\frac{1}{2}$ S. (S. 84° E.), then run in.

Leave the red buoys on the starboard hand entering, and when approaching the entrance, bear towards the perch buoys, as by passing either of these at a distance of 70 or 80 feet, a small knoll which lies in mid-channel, and has a foot less water upon it, will be avoided.

By following these directions, when nearing or crossing the entrance, not less than 6 feet at low water will be obtained.*

The bar consists of a long shallow patch, of about 150 yards in length, covered with grass, and extends across the whole breadth of the channel.

Anchorage.—Large vessels can bring up in $5\frac{1}{4}$ fathoms water, good holding ground, about $1\frac{1}{2}$ miles to the westward of the outer bar.

Wood's point, nearly N. $\frac{1}{2}$ W. 12 miles from Webling point, is a low sandy projection, with a clump of trees a little in-shore; the sand-flat fronting it dries out 3 miles at low water, springs, and a spit runs out from the flat W.N.W. 4 miles from the point.

Jarrold point.—The low sandy beach from Wood's point sweeps round north-eastward 3 miles to a swampy bight, with clumps of wood behind it, extending $2\frac{1}{2}$ miles across from S.E. to N.W., whence the low coast trends north-west $4\frac{1}{2}$ miles to Jarrold point, which is low and sandy. This coast is in some parts broken where the water forces its way into the swamps behind. The sand and mud-flats which border the shore, and uncover at low water springs, extend about $1\frac{1}{2}$ miles off Jarrold point.

* The channel is so narrow, tortuous and shallow and the tidal stream so strong, that loaded lighters have great difficulty in getting out.

See chart, No. 403, Wood's point to Lowly point, scale $m = 1.0$ inch.

Shoals.—A shoal, reported in 1880, with 5 fathoms over it, is situated in lat. $33^{\circ} 26'$ S., long. $137^{\circ} 36'$ E., with mount Young bearing N. by W. $\frac{3}{4}$ W. (distant $20\frac{1}{2}$ miles).

Four-fathoms shoal lies 10 miles northward of this shoal, *see* page 213.

In 1885 a shoal (Musgrave shoal) was reported with its centre about S.S.W. $\frac{3}{4}$ W., 4 miles from the buoy on the south end of Eastern shoal. This shoal, with a depth of 4 fathoms on it at low water springs, and 7 to 8 fathoms close around, extends about one mile in a north and south direction and three-quarters of a mile east and west.

The COAST.—From Jarrold point the mangrove coast trends N.N.E. $3\frac{1}{2}$ miles to the entrance of Germein bay. The low land behind is partially flooded at high water springs, and the sand and mud-flat dries out $1\frac{1}{2}$ miles at low-water springs.

Soundings.—The sand and mud-flats which extend along shore from Hamilton lagoons to the entrance of Germein bay are fronted by shoal water of 2 to 3 fathoms, extending generally about 2 miles from the flats, with a 3-fathoms spit extending 3 miles north-west of Jarrold point.

Aspect.—From a hill (which may be seen from Spencer gulf) bearing E. $\frac{1}{4}$ N., distant 26 miles from point Riley, a hilly range takes a general N. $\frac{1}{2}$ W. direction nearly 30 miles to a hill, 612 feet high, bearing East, distant $11\frac{1}{2}$ miles from Wood's point.

Barn hill, E. $\frac{1}{2}$ N. 13 miles from Webling point, is conspicuous, 1,169 feet high, with a flat top, and a saddle with a small peak immediately north of it; at 9 miles farther south is another hill, which is 1,370 feet high. These hills are too distant to be of much use to the navigator.

Middle bank, which lies nearly midway between Webling point and the opposite side of Spencer gulf, and has 3 to $4\frac{1}{2}$ fathoms water on it, extends N. $\frac{1}{2}$ E. and S. $\frac{1}{2}$ W. 13 miles, including the extension to the northward reported in 1885, and is about 3 miles across. The shoalest part is a patch $1\frac{1}{2}$ miles long and half a mile broad, with 3 fathoms on it, and situated near the eastern edge of the bank, with point Riley bearing S. $\frac{1}{2}$ E., distant 17 miles, and Plank point N.W. by W. $\frac{1}{4}$ W. nearly 15 miles. The south extreme of Middle

bank lies S. by W. 7 miles, and the north extreme N. $\frac{1}{2}$ W. 6 miles from the centre of its shoalest part.

Less water reported.—It has recently been reported that a vessel, drawing 21 feet, grounded on Middle bank, about 5 miles S. $\frac{1}{2}$ W. from the centre of its shoalest part.

LIGHT.—A light-vessel, painted red, with one mast carrying a ball at the masthead, is moored in a depth of $3\frac{3}{4}$ fathoms at low water springs, about one mile eastward of the western edge of the Middle bank, with Riley point bearing S. by E. $\frac{1}{2}$ E. (S. 16° E.), distant $15\frac{1}{4}$ miles, and exhibits a *fixed* white light, which should be seen from a distance of 10 miles in clear weather.

Soundings.—From Tipara reef to Middle bank the soundings are mostly regular, over a sand and coral bottom. Between Middle bank and the shoal water extending from the west coast, southward of Plank point, the channel is $8\frac{1}{2}$ miles wide, with 6 to 15 fathoms, coral.

Between the south part of Middle bank and the shoal water bordering the east coast about Tickera bay there is a space 5 miles wide, with 6 to 11 fathoms. A shoal spit extends S.W. 15 miles from the sand-flat which fronts Wood's point; the extremity of this spit, on which there are $4\frac{3}{4}$ fathoms, lies 7 miles off shore, and 3 miles east of Middle bank. There are $3\frac{1}{4}$ and $3\frac{3}{4}$ fathoms on the middle of the spit, with 4 to $4\frac{3}{4}$ fathoms towards its south-west extreme, and 4 to $3\frac{1}{2}$ fathoms towards the sand-flat of Wood's point. A patch with $4\frac{3}{4}$ fathoms on it, lies 2 miles south of the south-west extreme of the spit, in the track of vessels going to Port Broughton.

There is a channel 2 miles wide, with 7 to 10 fathoms, coral, between Middle bank and the spit; and between the spit and the shoal water fronting the eastern shore there is a space 4 miles wide leading to Port Broughton, with $4\frac{3}{4}$ to 8 fathoms; but there appears to be no certain passage out of it to the northward, except across the inner part of the spit, where there may be not more than $3\frac{1}{4}$ fathoms.

From Middle bank to a line between Jarrold point and mount Young, a distance of 22 miles, Spencer gulf appears free from any shoal under 4 fathoms, over a width of 14 miles, with general depths of 6 to 14 fathoms, sand and coral.

Eastern shoal is a sand-bank 7 miles long, N.E. by N. and S.W. by S., and one mile broad; a patch half a mile in extent on its

north-east end, which dries at low water, bearing from Lowly point S. by E. $\frac{1}{4}$ E., 5 miles, and from Hummock hill E. by S., distant 11 miles. At $1\frac{1}{2}$ miles south-west of the patch there are 9 feet water, the depth gradually increasing to 3 fathoms on the south-west end of the shoal. There is a clear channel 3 miles wide, with 6 to 11 fathoms, ooze and fine dark sand and shells, between Eastern shoal and Fairway bank. *See page 215.*

Buoy.—A spherical buoy, painted red and white in horizontal stripes, and surmounted by a red globe, is placed on the south end of Eastern shoal, in 22 feet at low water springs, with mount Young bearing W. by N. $\frac{1}{2}$ N. (N. 73° W.) distant about $12\frac{3}{4}$ miles, and Lowly point N. by E. (N. 12° E.). There is a less depth than 5 fathoms for one mile south of this buoy.

A red pile beacon with a round head marks the north end of the shoal, it is in 10 feet, and about 4 cables W.N.W. from the north end of the patch which dries.

GERMEIN BAY.—From the mangrove point $3\frac{1}{2}$ miles N.N.E. of Jarrold point, the entrance of Germein bay extends north $9\frac{1}{2}$ miles to Ward spit, and is 10 miles deep; but it is mostly occupied by sand-banks and shoal water. This bay is frequented by vessels going to Port Pirie.

Large vessels which come here in the season to load wool, wheat, &c., lie about $2\frac{1}{2}$ miles W.N.W. of mount Ferguson, or at the anchorage southward of Ward point.

From the mangrove point at the southern entrance of Germein bay its south-eastern shore, consisting of thick mangroves, with partially flooded land behind, trends N.E. $\frac{1}{2}$ E. $9\frac{1}{2}$ miles to the entrance of Port Pirie. This shore is bordered by sand and mud flats, which dry out one mile at low water springs, and is fronted by a shoal with 3 to 12 feet water on it, extending 3 to $4\frac{1}{2}$ miles from the shore, and occupying nearly the southern half of the bay. N.W. by N. $3\frac{1}{2}$ miles from the mangrove point at the entrance is a 3-foot patch, from which a spit extends $1\frac{1}{4}$ miles to the south-west, forming between it and the shore a bight with 4 fathoms water in it.

The outer edge of the shoal fronting the southern shore of Germein bay, after extending N.E. 4 miles from the spit just noticed, curves round eastward and north-eastward, forming a bight $4\frac{1}{2}$ miles broad

and $1\frac{1}{2}$ miles deep, in the northern edge of the shoal; and then trends E. by S. 4 miles to within 2 miles of the entrance of Port Pirie. Between the north-western edge of this shoal and Eastern shoal is the southern channel into Germein bay; it is $1\frac{1}{2}$ miles wide, with a depth of 4 to 12 fathoms.

PORT PIRIE, in the south-east bight of Germein bay, is a creek resorted to by vessels in the wool season; its entrance may be recognised by mount Ferguson, which is about 2 miles to the eastward of the entrance. From mount Ferguson the mangrove coast curves to the southward and forms a bight 2 miles across, the creek between the mount and the south-west entrance point being nearly one mile wide, with a depth of 14 feet in the centre; but the sand and mud-banks on either side close each other to the southward, leaving a narrow channel between the banks eastward of the south-west entrance point. The channel has been straightened and deepened, and from seaward to Port Pirie has a depth of not less than $12\frac{1}{2}$ feet at low water; it is to be further deepened to 15 feet at low water. The width is not less than 150 feet. A swinging berth, 400 feet wide, has been made opposite the Government wharf.

Vessels up to 2,747 tons have taken advantage of the improvements by partially loading at the wharves.

Port Pirie, about 30 miles north of Port Broughton, is rapidly coming forward as an important place; a municipality has been formed at the south bend of the creek with well laid out streets, and substantial wharves having nearly half a mile of frontage;* railways connect it with the wheat-producing areas, Port Augusta and Adelaide, and other parts of the colony. There is also a telegraph station. The population in 1891 was 4,006 persons. The town is built in a swamp, the land about being flooded at spring tides.

In 1894, vessels of a tonnage of 244,215 entered and cleared at Port Pirie. The exports are, wheat, flour, silver and lead, and the imports, coal, iron and mining stores.

Supplies.—Port Pirie is supplied with water obtained from springs; there is a storage reservoir at Nelshaby, which has a capacity of 23,123,000 gallons; it is laid on at several of the jetties. Almost any kind of ship's stores can be purchased.

* Port Pirie affords special advantages as the most direct outlet for the mineral country at the Barrier ranges and the western part of New South Wales, owing to the railway breaking gauge at Petersburg for Port Adelaide, whilst it is continuous to Port Pirie.

Pilots.—The boundary of the cruising station and limit of compulsory sea pilotage for Port Pirie, Port Germein and Port Augusta, is on a line drawn from Jarrold point to Hummock hill. Usually there is at least one boat at the station, outside the boundary line. The employment of a harbour pilot in these ports is not compulsory. It should be ascertained that there is sufficient accommodation at the wharves before a vessel is taken into Port Pirie.

TIDES.—It is high water, full and change, at the entrance of the channel leading to Port Pirie, at 6 h. 45 a.m., and 8 h. 30 p.m.; springs rise $9\frac{1}{2}$ feet, but heavy south-west gales cause a rise of 12 feet. At Port Pirie, at 7 h. 15 m., springs rise 8 to 12 feet.

A tide gauge has been fixed on the outer (No. 10) light beacon, at the entrance of the channel leading to Port Pirie. Tide gauges have also been fixed on the Cackle spit beacon, and on the outer end of Port Germein jetty. These gauges, which can usually be read at a distance of one to $1\frac{1}{2}$ miles, show the least depth of water in the channel between No. 10 beacon and the Port Pirie wharves.

MOUNT FERGUSON, on the north-eastern entrance point of Port Pirie creek, is a round grassy hill, 133 feet high, and shows out well against the dark scrub covering the slopes of Flinders range near mount Bluff, which is 2,301 feet high, and bears E. $\frac{1}{2}$ N., distant 6 miles from mount Ferguson. Mount Ferguson is insulated at high water, the land about it being a mangrove swamp. A sand-flat with a black beacon off its western end, extends 2 miles north-west from the mount, and then curves in to its south-west side.

From about three-quarters of a mile north-east of mount Ferguson the north-eastern shore of Germein bay forms a sandy beach curving north-westward about 6 miles to Ward point; it is bordered by a sand-flat extending about three-quarters of a mile from the beach, with $2\frac{1}{2}$ and 2 fathoms at 2 to $1\frac{1}{2}$ miles from the shore. A black buoy is placed on the 3-fathoms edge of a spit about 2 miles off shore nearly midway between mount Ferguson and Ward point, and S. $\frac{1}{4}$ E. distant $1\frac{1}{4}$ miles from the jetty end.

The country behind this beach is thickly wooded with gum scrub and pines, and is generally low for 3 miles inland, when it rises gradually to the Flinders range, which is from 5 to 7 miles distant.

The township of Port Germein, on the north side of the bay, and 8 miles eastward from the entrance, had a population of 287 in 1891. The jetty is 5,459 feet long, with two berths 300 feet long and 20 feet depth at low water, and one berth 300 feet long and 16 feet depth. To accommodate vessels using these berths two small cask buoys have been placed, each buoy attached to a 30-fathoms length of $1\frac{3}{4}$ inch chain for use as head moorings; and a black iron warping buoy, connected with a screw mooring, 350 feet south from the jetty end. There is daily coach communication with Port Pirie.

Water.—Port Germein is supplied with water from works at Baroota creek springs. The storage reservoir contains 1,500,000 gallons.

LIGHT.—A *fixed* light is exhibited from the end of the jetty in Germein bay, which is visible in clear weather from a distance of 10 miles. The light shows white from N. 80° E. (south of Ward spit) to N. 66° E. (north of the dry part of Cockle spit); red from N. 66° E. to N. 12° E. (over Cockle spit); and white from N. 12° E. (east of Cockle spit) to N. 10° W. The lighthouse is an iron tower, painted white.

Signal station.—There is a signal station at Port Germein and communication can be made by the commercial code. It is connected by telegraph.

WARD POINT, which forms the east, as Lowly point does the west side of the upper part of Spencer gulf, is a round mangrove point bearing E. $\frac{1}{4}$ S., distant 9 miles from Lowly point.

Ward spit, which forms the north side of Germein bay, extends W. by S. 6 miles from Ward point, and is dry at low water springs. Its average breadth is about $1\frac{1}{4}$ miles; but it is much less near the shore, where the water forces a passage over the spit at half-tide. A shoal, with from 6 to 9 feet water on it, extends $1\frac{1}{2}$ miles south-westward from the extremity of Ward spit, and thence continues along the south side of the spit to Ward point, with a breadth of about half a mile, and 3 to 12 feet water on it. The north edge of Ward spit is also bordered by a shoal, with 7 to 15 feet water on it, extending a quarter of a mile to half a mile from the edge of the spit, and forming a bight at about $1\frac{1}{2}$ miles north-west of Ward point.

The Northern entrance of Germein bay, between the north-east end of Eastern shoal and the shoal water projecting south-west from Ward spit, is about 2 miles wide, with 4 fathoms; the depth within increasing to 8 or 9 fathoms. The deepest water in the bay is along the south side of Ward spit, about one mile from it.

Cockle spit, a sandy-bank, uncovered at low water springs, lies S.S.W. $\frac{1}{2}$ W. 3 miles from Ward point, and W.N.W. 5 miles from mount Ferguson. It is about $1\frac{1}{2}$ miles long, E.N.E. and W.S.W., and half a mile broad, with a narrow shoal enclosing it, and extending more than a mile from its western end. South of this bank the water in Germein bay is nearly all shallow, the depth rarely exceeding $2\frac{1}{2}$ fathoms.

There is a shoal between Cockle spit and the north-east part of Eastern shoal, with as little as 7 feet water on it; it is about 2 miles long, E.N.E. and W.S.W., with $3\frac{1}{2}$ to 5 fathoms about it. There are also two small shoal patches between Cockle spit and the eastern shore, one with $2\frac{3}{4}$ fathoms water on it, lying N.W. by W. 3 miles from mount Ferguson, and the other, with 3 fathoms on it, South $1\frac{1}{2}$ miles from Ward point.

Beacons and buoys.—On the north side of the channel a black cylindrical buoy with a staff and ball is placed on the south-west end of Ward spit in 12 feet water, with Lowly point N.W. $3\frac{1}{4}$ miles; a black pile beacon, with a square head, a quarter of a mile further east in 10 feet water; a black buoy, with a staff and ball, lies E. $\frac{1}{2}$ N., $2\frac{1}{2}$ miles from this beacon, in 3 fathoms water on the south edge of Ward spit; and $2\frac{1}{4}$ miles E. by N. $\frac{1}{2}$ N. from this buoy is a similar buoy in 3 fathoms water on the south-east edge of the spit.

The south side of the channel is marked by a red pile beacon, surmounted by a ball, on the north end of Eastern shoal; a red cheese-shaped buoy with a cylindrical framework and ball lies E. by N. $\frac{1}{2}$ N. 6 miles from Eastern shoal beacon, in 4 fathoms water, on the north-west edge of Cockle spit; one mile E. by N. from this buoy is a red pile beacon with a ball on top, on the north side of Cockle spit; a red buoy with framework and ball on top is moored in 3 fathoms water on the north edge of Cockle spit, three-quarters of a mile E. by S. from the beacon.

Another cheese-shaped red buoy, surmounted by a staff and ball, lies E. by S., one mile from the buoy just mentioned, in 15 feet at low water.

A red and black chequered buoy, with staff and ball, is placed on the 7 feet shoal with the Eastern shoal beacon W. $\frac{1}{2}$ N. distant $3\frac{1}{4}$ miles; and a black buoy, with staff and ball, is placed on the south edge of the Cockle spit, in 13 feet at low water springs, with Cockle spit beacon N. $\frac{1}{2}$ E., Eastern shoal beacon W. $\frac{1}{4}$ S. These buoys indicate the channel into Port Pirie, south of Cockle spit.

DIRECTIONS.— In entering Germein bay keep the lead going and a good look-out ahead, as after a few days' fine weather, the water becomes clear and the shoals can be seen. But during and after bad weather, the mud and sand are disturbed from the bottom, and the deepest water is generally the most discoloured.

In entering between Eastern shoal and Ward spit, the northern detached hill north-west of False bay, just open of Black point bearing N.W. by W. $\frac{1}{4}$ W. (N. 59° W.), leads in 4 fathoms water, to the southward of the shoal water extending from Ward spit. When Bay hill (a low grassy hummock N.N.W. 7 miles from Lowly point) is well open of the bluff just north of Lowly point, with the point bearing N.W. by N. (N. 34° W), distant $3\frac{3}{4}$ miles, steer an E. by N. (N. 79° E.) course which leads up the bay in the deepest water, between Ward spit and Cockle spit, to the anchorage southward of Ward point.

Or after passing west of Eastern shoal, steer for Germein jetty light on an E. by N. (N. 79° E.) bearing, which will lead to the anchorage.

The black buoys and beacon marking Ward spit must be left to the northward, and the red buoys and beacon marking Cockle spit to the southward.

Anchorage, in 3 to $3\frac{1}{2}$ fathoms, may be obtained in Germein bay to the southward of Ward point, with the north end of the long sandy beach bearing North to N.N.E., at about $1\frac{1}{2}$ miles off shore.

Large vessels intending to anchor in the outer roadstead should be prepared to do so after passing the south-east black buoy on Ward spit.



Due allowance must be made for the tidal streams, as the stream sets N.E. during the rising tide and S.W. across the entrance during the falling tide, about $1\frac{1}{2}$ knots, at springs.

The chart is an excellent guide.

Ballast.—All vessels bound to Port Pirie or Port Augusta, and requiring to discharge ballast must do so in False bay inside a line drawn between Lowly point and Hummock hill.

A white buoy with staff and ball lies with Lowly point bearing E. by N. $\frac{3}{4}$ N. distant $5\frac{1}{10}$ miles, to mark the ballast ground.

Going out.—In going out of Germein bay a W. by S. course, or a direct course for mount Young, will lead into Spencer gulf.

For Port Pirie anchorage, proceed into Germein bay as above directed, pass about a quarter of a mile south of the black buoy on the spit off the jetty, and then steer for No. 10 light beacon; or bring the northern detached hill north-west of False bay on with Black point bearing N.W. by W. $\frac{1}{4}$ W. (N. 59° W.), or Bay hill just open of the bluff land north of Lowly point, bearing N.N.W. $\frac{1}{4}$ W. (N. 25° W.), which will lead east of the north-east end of Eastern shoal. Keep these marks on till mount Ferguson comes on with mount Bluff (the summit of the southern part of Flinders range) bearing E. $\frac{1}{2}$ N. (N. 84° E.), then steer in, with these latter marks on, or as directed at page 256.

As the outer light beacon is approached, edge a little more to the northward. There is good anchorage, in 11 to 14 feet, with the wool-sheds just showing over the east side of the creek, and mount Ferguson N.E. by N. (N. 34° E.).

Southern entrance.—There is a channel $1\frac{1}{2}$ miles wide, with 4 to 12 fathoms, between the Eastern shoal and the shoals eastward of it, and there is nothing to prevent its being used by steam-vessels or coasters, and others well acquainted with the locality, bound to Port Pirie from the southward. Run up the gulf until Hummock hill is in line with the northern detached hill north-west of False bay, bearing N.W. by N. (N. 34° W.), and enter the channel about $5\frac{1}{2}$ miles W.N.W. of Jarrold point. Then steer N.E. by N. (N. 34° E.) in mid-channel, leaving the spherical buoy at the S.W. end of Eastern shoal nearly a mile to the westward.

When mount Ferguson is in line with mount Bluff bearing E. $\frac{1}{2}$ N. (N. 84° E.), steer E. by N. $\frac{1}{2}$ N. (N. 73° W.), till the chequered buoy on the 7-foot shoal bears N.N.W. (N. 22° W.) distant three-quarters of a mile, then steer N.E. by E. (N. 56° E.), and when the south Cockle spit buoy bears E. $\frac{3}{4}$ N. (N. 82° E.) steer E. $\frac{1}{4}$ N. (N. 87° E.), passing $1\frac{1}{2}$ cables south of the south Cockle spit buoy and on to the anchorage. The least water in this track is 19 feet at low water.

If drawing less than 10 feet, when mount Ferguson bears E. $\frac{1}{2}$ N. (N. 84° E.), in line with mount Bluff, an E. by N. (N. 79° E.) course will lead to the anchorage, passing about one mile to the southward of the 7-foot and south Cockle spit buoys, and in 12 feet at low water.

The red light at the outer, or No. 10, beacon is an excellent guide at night.

The services of a pilot should be obtained if bound to Port Pirie.

Port Pirie.—Lights.—Ten pile beacons, painted red and carrying lights, mark the channel from off mount Ferguson to the wharves at Port Pirie. The outer, or No. 10, light is *fixed* red, and is visible round the horizon, the other lights are *fixed* white, except No. 1 which is *fixed* red, and are only visible from the directions of and towards the channel. These beacons are 18 feet in height, and the lights are visible from a distance of 4 miles.

Beacons and buoys.—The channel is marked by light beacons and buoys painted red, to be left on the starboard hand entering.

A black perch buoy is moored on the north side of the channel, opposite the outer light beacon, to denote the width of the channel, which is further marked by other black buoys, to be left on the port hand entering.

Directions.—In going to Port Pirie pass between the outer red beacon and the black buoy, then leave the red beacons and buoys on the starboard hand at the distance of about 90 feet; at night, leave the red light on the outer beacon, the white lights on the other beacons and the red light on No. 1 beacon on the starboard hand at the same distance.

GENERAL DIRECTIONS for SPENCER GULF.—Large vessels bound for Spencer gulf from the westward, are advised to keep South of Neptune isles; Wedge isle may be passed on either side, taking care to clear the Foul ground about $3\frac{1}{2}$ miles south-east

of it, and the other dangers near the Gambier group. From midway between West cape and Wedge isle, a N. by E. $\frac{1}{2}$ E. course for about 100 miles leads nearly midway between Middle bank and the western shore, passing 7 miles west of Webb rock and Tipara reef.

From mid-channel on the west side of Middle bank, which is marked by a light-vessel, to Lowly point, the fairway course is N.N.E., in 6 to 12 fathoms, 7 miles off the western shore below Plank point; but this course passes not far from two 4-fathoms patches, and it is usual to keep more over towards the western shore; when in the vicinity of Western shoal it will be cleared to the eastward, in 3 fathoms, by keeping Hummock hill west of North; the black beacon on an outlying patch of the shoal should be left to the westward. The spherical buoy on the south end of Eastern shoal is a good guide for the channels on either side of that shoal. When in sight of Lowly point, mount Brown kept over the point, bearing N. by E. $\frac{1}{2}$ E. (N. 17° E.), leads up the gulf in 10 and 8 fathoms between Eastern shoal and Fairway bank.

From Wallaroo bay for Port Augusta pass on either side of Middle bank, but the west side is to be preferred.

For Tipara and Wallaroo bays steer N. by E. $\frac{1}{2}$ E. only so far as to arrive at about 8 miles westward of cape Elizabeth, and then proceed as directed at page 240.

In entering Spencer gulf from Investigator strait, large vessels pass south of Althorpe isles, and having rounded the south isle, do not bring it south of E.S.E. until the islets about Pondalowie bay open west of West cape, or until the cape bears N. by E., which leads one mile outside of S.W. rock and Emmes reef, in 19 fathoms. West cape bearing N.N.E. $\frac{1}{2}$ E. leads outside the position of the breakers reported one mile W. by N. from Emmes reef. Small vessels generally pass between the north Althorpe isle and cape Spencer; or from midway between the south and east isles, a N.W. course leads three-quarters of a mile north of Emmes reef, and nearly one mile off the reefs of Reef head.

At night, bring cape Borda light to bear South before hauling into Spencer gulf, and then run up North, between Wedge isle and Yorke peninsula.

TIDAL STREAMS.—The stream divides off cape Spencer

during the rising tide, one branch setting along shore, E.N.E., and the other to the north-westward and northward.

DIRECTIONS for the WEST SHORE.—From April to September, if bound up Spencer gulf to Port Augusta, and when near Althorpe isles (or between them and Thistle island), there is a north-easterly or northerly wind with a falling barometer, it will eventually prove of great advantage to get over on the west side of the gulf, as the wind sooner or later will shift to N.W., and a vessel near the west shore has then a fair wind to Shoalwater point. No one, however, unacquainted with the rocks and islets north of Thistle island should attempt to do so until north of Sir Joseph Banks group.

From port Lincoln to Lowly point.—From near Boston point to midway between Bolingbroke point and Kirkby island the course is N.E. by E. 12 miles; with the north-going stream a more easterly course is necessary to avoid being set on to the rocky ground south of Bolingbroke point. Thence N.N.E. 5 miles until Wineby island bears East, and then a course of N.E. $\frac{1}{2}$ E. for 75 miles, leads midway between Shoalwater point and Tickerà bay. This course passes 14 miles north-west of the Tipara reef lighthouse. The position of the vessel should be ascertained by bearings of Tipara reef light and a course shaped up the fairway of the gulf to the westward of the Middle bank; with the light bearing S.S.E. distant 15 miles, the course is N.N.E., thence proceed as previously directed.

Caution.—If between Sir Joseph Banks group and Shoalwater point during the north-going stream, a vessel will be set considerably to the northward of her course, and may get too close to the banks between Franklin harbour and Shoalwater point. Frequent sounding is the best guide to rely on, both by day and night, and while off that part of the coast the water should not be shoaled to less than 8 fathoms, or a southerly course should be taken immediately it does so.

From October to April, after very hot days, the Tipara light may be so much elevated by mirage, that it being in sight cannot ensure a vessel being in safety, although in ordinary weather it would not be visible if passing too near Shoalwater point.

With a strong wind blowing up or down Spencer gulf, the water always gets much smoother at the edge of the banks, and in working either way the lead is the best guide for tacking.

Winds on the west shore.—From May to December the winds are the same as those described at pages 243 and 278 for the east shore and Port Augusta. From January to April hot winds are not nearly so prevalent as in those places, seldom lasting 12 hours, and always succeeded by the cool S.S.E. wind, which, although occasionally interrupted by a moderate westerly gale, blows with tolerable regularity, being fresh in the afternoon, dying away before midnight, and coming up again at 8 or 9 o'clock the next morning.

Tugs can be procured at Port Adelaide. The steam vessel which trades to Port Augusta frequently tows vessels up or down, through the estuary on her trips backwards and forwards.

NORTHERN PART OF SPENCER GULF, OR ESTUARY OF PORT
AUGUSTA.

This estuary extends from its entrance, between Lowly point and Ward point, nearly N. by W. 32 miles to Port Augusta, and thence about 4 miles farther to the head of the gulf, gradually contracting from 8 miles in width, at the entrance, to a quarter of a mile above Port Augusta.

Flinders range, on the east side of the estuary, has some remarkable peaks; mount Remarkable, N.E. $\frac{3}{4}$ E. 22 miles from Lowly point, being 3,130 feet, and mount Brown, N.N.W. $\frac{1}{2}$ W. 19 miles from mount Remarkable, being 3,174 feet high.

Caution.—Vessels running for Lowly point from the south-west, have sometimes mistaken False bay for the entrance of the estuary, which does not show till close to Lowly point; by day mount Brown can almost always be seen, and when it bears N. by E. $\frac{1}{2}$ E. Lowly point is directly in line with it; by night the light on Lowly point is a sufficient guide.

The WESTERN SHORE.—**LOWLY POINT** is a long low projection, with a high sandy beach on its southern side, and gradually rising land at about half a mile to the westward. Although Lowly point is steep-to, a large vessel should give it a berth of not less than half a mile, to avoid Lowly point shoal, to the northward.

LIGHT.—A lighthouse (a round tower 54 feet high), two cottages, and a store are on Lowly point, all painted white. The lighthouse exhibits at an elevation of 57 feet above high water, a *flashing* white light, showing *a flash every ten seconds*, which is visible in clear weather from a distance of 10 miles.

Signal station.—There is a signal station at this lighthouse, which is connected with the telegraph system, and communication can be made by the commercial code. The storm signal is a blue swallow-tailed flag under a red ball.

Lowly point shoal, N.N.E. three-quarters of a mile from Lowly point, is a bank of hard sand and rock, 400 yards long, north and south, and 200 yards broad, the least depth on it being $2\frac{1}{4}$ fathoms.

Tide.—It is high water, full and change, at Lowly point at 7 h. 0 m. ; springs rise 6 to 8 feet.

BACKY BAY.—From Lowly point a nearly straight coast extends N.N.W. $5\frac{3}{4}$ miles to the head of the bay ; it is formed of low whitish cliffs and stony beaches, with mangroves after the first 3 miles. Between one and 4 miles from Lowly point the coast rises to a ridge of hills, 328 feet high. From the head of the bay, behind which is a salt swamp, the coast trends E. $\frac{1}{2}$ S. 2 miles to Backy point.

The coast from Lowly point to within one mile of the head of Backy bay may be approached to a quarter of a mile in 9 to $3\frac{1}{2}$ fathoms ; but a hard sand-flat, covered at high water, extends half a mile from the head of the bay, with shoal water a quarter of a mile farther out.

BACKY POINT is a bold, black rocky point, 178 feet high, which may be approached to one cable in 8 fathoms. From Backy point a bold, broken, rocky coast trends N. by E. $\frac{1}{2}$ E. $1\frac{1}{4}$ miles to Crag point.

DOUGLAS POINT, N. $\frac{3}{4}$ E. $2\frac{1}{2}$ miles from Crag point, is rocky, with a low black cliff, the intermediate coast forming two bays, with

hard sand-flats which, at low water, dry out to the line of points, and are fronted by shoal water, of which the 3-fathoms edge extends half a mile from the sand-flats.

The COAST from Douglas point takes a general N. $\frac{1}{2}$ W. direction $6\frac{1}{4}$ miles to Two Hummock point, and from $2\frac{1}{2}$ miles north of Douglas point to half a mile from Two Hummock point it consists of thick mangroves, with low land behind, and is bordered nearly the whole distance by a hard sand-flat covered at half-tide, extending from a quarter to half a mile from the shore. The sand-flat is fronted by a narrow border of shoal water from Douglas point to Two Hummock spit, nearly one mile south-east of the southern part of Two Hummock point.

Douglas hills are detached grassy ranges rising behind the coast between Crag and Two Hummock points, some of them being separated by rocky ravines. One of these hills, north-west 2 miles from Douglas point, has a cairn of stones 653 feet above high water.

About 2,500 sheep were pastured on these hills in 1862, the shepherd's stone hut and well being situated two-thirds of a mile from the shore, one mile north of Douglas point. The well, which supplies about 240 gallons of very brackish water daily, is 120 feet deep, and is conspicuous from having a heap of white limestone round it, thrown up during the excavation.

Douglas bank, the centre of which lies N. by E. $2\frac{2}{3}$ miles from Douglas point, is about half a mile long, north and south, and 200 yards broad, with a depth of 10 feet on it at low water; the shallowest water being on the west side of the bank, whence it deepens suddenly to 6 and 8 fathoms; whilst on the east side and off the south end of the bank the water gradually deepens to 6 fathoms at half a mile off.

There is a clear channel nearly three-quarters of a mile wide with $5\frac{1}{2}$ to 10 fathoms west of Douglas bank; and on its east side there is a clear channel one mile wide, with 8 to 4 fathoms.

Buoy.—There is a chequered red and black perch-buoy with ball near the south end of the bank, with Douglas point bearing S. by W., distant $2\frac{1}{2}$ miles.

Clearing marks.—Mount Gullet, a wooded hill 209 feet high, on

the eastern shore, N.E. by E. $\frac{1}{2}$ E. 6 miles from Douglas point, bearing E. by N. (N. 79° E.), clears the south end of Douglas bank, in 5 fathoms, and the same hill bearing E. $\frac{1}{2}$ S. (S. 84° E.) clears the north end of the bank in 6 fathoms. Crag point in line with Douglas point, bearing S. $\frac{3}{4}$ W. (S. 8° W.), just clears the west side of the bank in 7 fathoms; and Crag point in line with Backy point, bearing S. by W. $\frac{1}{2}$ W. (S. 17° W.), or the north part of Two Hummock point in line with the north end of Bluff range, bearing N.N.W. $\frac{1}{4}$ W. (N. 25° W.), leads half a mile to the eastward of it.

Two Hummock point is a low broad projection with alternate rock and sandy beach. There are two hummocks covered with scrub; one on the point, and the other nearly three-quarters of a mile to the north-west; North hummock, the higher hill, is 94 feet above high water. There is a salt swamp extending from between these towards a third, or Inshore hummock, which bears W.S.W., distant $1\frac{1}{4}$ miles from South hummock.

Two Hummock spit.—From Two Hummock point the sand-flat dries out nearly half a mile, beyond which, Two Hummock spit, with 9 to 12 feet water on it, extends nearly one mile south-east from the south part of the point.

The edge of the spit is marked by a black buoy.

A knoll.—A small knoll, with $3\frac{1}{2}$ fathoms on it, lies N.E. by E. $\frac{1}{2}$ E two-thirds of a mile from the north part of Two Hummock point.

THE EASTERN SHORE from Ward point trends N. by W. $\frac{1}{2}$ W. $9\frac{1}{2}$ miles to a small salt creek, nearly half a mile south-eastward of which is mount Mambray. For nearly 3 miles from Ward point there are thick mangroves, between which and the creek the coast consists of a low sandy beach, with a level country, covered with thick gum scrub behind it.

From the salt creek, the low coast extends nearly in a straight direction N. by W. $5\frac{1}{2}$ miles to a point of thick mangroves on the south side of Yatala harbour. For about one mile north of the creek there is thick scrub, whence a salt swamp, intersected by several creeks, extends to the south side of Yatala harbour.

The coast from Ward point to Yatala harbour is bordered by a hard sand-flat, generally from three-quarters to one mile broad, which is covered at high water, and fronted by shoal water extending from

one-third to three-quarters of a mile from the edge of the flat. W. $\frac{3}{4}$ N. $2\frac{3}{4}$ miles from mount Gullet the sand-flat stretches out to a spit, on the north side of which a deep narrow creek, barred at its entrance, trends about $1\frac{1}{2}$ miles north-eastward, into the flat. From the entrance of this creek the edge of the sand-flat curves in a N.W. $\frac{3}{4}$ N. direction $1\frac{3}{4}$ miles, and then trends nearly N. by E. $1\frac{1}{2}$ miles to a spit, forming the south side of the entrance of Yatala harbour.

To the north-west of the creek the shoal water which borders the sand-flat projects one mile south-westward, in the direction of Douglas bank ; but between this projection and the entrance of the harbour, the shoal water does not extend beyond a quarter of a mile from the edge of the sand-flat.

Buoy.—A perch buoy with staff and ball, painted red, is placed at the end of this projection in 17 feet at low water, with mount Grainger bearing N.N.E. $\frac{1}{4}$ E., and mount Gullet E. by S.

Mount Mambray is covered with thick scrub, rising to the height of 111 feet, and bears N. by W. $\frac{1}{4}$ W. nearly 9 miles from Ward point, and East nearly 6 miles from Douglas point.

Mount Gullet, N. $\frac{3}{4}$ W. 3 miles from mount Mambray, is broad at the base, with a round flattish top, 209 feet high, and thickly covered with scrub. This and mount Mambray are the only conspicuous objects near the coast between Ward point and Yatala harbour.

YATALA HARBOUR.—From the point of thick mangroves on the south side of the harbour the mangrove shore trends east half a mile to Dowsett creek, thence north-east one mile, and south-east about the same distance to the head of Yatala harbour, where there is a mangrove swamp. This bight is about two-thirds of a mile wide and is so filled by a flat of sand, mud, and weeds, as only to leave a narrow channel leading into it, and which is barred at the entrance.

From the north side of the entrance of this bight the coast, which is backed by thick scrub, trends N.W. by W. $1\frac{3}{4}$ miles to a small jetty and hut, one-third of a mile north of which is mount Grainger, a round black-looking hill covered with bushes, which, from its rising to the height of 257 feet from low flat land, is a good mark for the entrance of Yatala harbour. The coast from the jetty turns north-westward round the foot of the mount to a small salt creek about one

mile from the jetty. From the creek the coast extends W.N.W. $2\frac{3}{4}$ miles to Red cliff point, midway between which and the creek, Red cliff rises to the height of 60 feet, the land behind it being swampy.

The coast from mount Grainger to Red cliff point is fronted by a sand-flat, covered at high water, extending off from two-thirds of a mile to one mile. W. by S. $\frac{1}{2}$ S. 2 miles from the mount, an oyster bank, awash at low water springs, projects half a mile to the southward, and forms the north side of the entrance to Yatala harbour. Shoal water extends from three-quarters of a mile south of the oyster bank, to about one-third of a mile from the edge of the flat abreast of Red cliff point.

The anchorage, or navigable portion of Yatala harbour, is now a mere basin of shallow water in the sand and mud-flats, which extend from half a mile to nearly 2 miles from the land, the nearest approach to the shore being to the south-west of the jetty under mount Grainger; and even here the sand and mud dry out more than half a mile, the tide seldom reaching to the end of the jetty.

The entrance, which is three-quarters of a mile wide, lies between the north end of the southern sand-flat and the oyster bank. There are 4 to 3 fathoms water close to the south side of the entrance, between which and the oyster bank the depth decreases from 9 to $1\frac{1}{2}$ feet. The basin within the entrance is about 2 miles across, with 6 to 15 feet water, and having the before-mentioned narrow deep channel leading eastward through the mud-flat to the head of the harbour; but the channel, as before stated, is barred at the entrance. By comparing the soundings taken in former surveys with those obtained in 1863, Yatala harbour appears to be fast filling up.

DIRECTIONS.—Small vessels entering Yatala harbour should bring the Inshore Hummock in line with the south part of Two Hummock point, bearing W. $\frac{1}{2}$ S., till mount Grainger bears N.E., and then steer for it. To get into a position off the jetty, a vessel must pass over a 6-foot bank, about half a mile within the entrance. There is a strong tide-ripple off the entrance, with southerly winds.

Middle bank, the south-eastern end of which lies N.N.E. $\frac{1}{2}$ E. $1\frac{1}{3}$ miles from the north part of Two Hummock point, is a little more than three-quarters of a mile long N.N.W. and S.S.E., with an average breadth of 200 yards, the least water on it being 7 feet.

There is a clear channel nearly three-quarters of a mile wide on the west side ; and one on the east side half a mile wide having 6 to 10 fathoms. The west and more direct channel is preferred.

Buoys.—A red perch buoy is on the west side of the bank in a depth of 10 feet at low water.

Clearing marks.—Inshore hummock open north of South hummock, bearing S.W. $\frac{3}{4}$ W. (S. 53° W.), clears, in $4\frac{1}{2}$ fathoms, the south-east end of Middle bank at the distance of one cable ; or Mangrove point, in line with the north side of a deep ravine in Bluff range, bearing W.N.W. (N. 67° W.), just clears the south end of the bank in $3\frac{1}{2}$ fathoms.

Mount Brown, in line with the end of the mangroves on the north side of Red cliff point, bearing N.E. by N. (N. 34° E.), clears in 4 fathoms the north-western end of Middle bank at the distance of a cable.

WESTERN SHORE.—From Two Hummock point the low mangrove coast trends north-west nearly 3 miles to Mangrove point, and is bordered by a hard sand-flat extending from one-third of a mile off Two Hummock point, nearly N.W. by N. 4 miles, to the southern entrance of Blanche harbour. This entrance, which is one quarter of a mile wide, with $4\frac{1}{2}$ to 8 fathoms water, is bounded to the northward by the West sands ; from which a spit, marked by a black pile beacon with a diamond shaped head, projects a quarter of a mile to the eastward.

West sands, which uncover at low water springs, form a bank $1\frac{1}{3}$ miles long, N.W. by N. and S.E. by S., and half a mile to one quarter of a mile broad. Its north-eastern side may be passed at the distance of a quarter of a mile in 7 fathoms.

BLANCHE HARBOUR.—From Mangrove point the low mangrove shore of Blanche harbour trends west $1\frac{1}{4}$ miles, and then turns north to the west side of the northern entrance, nearly three-quarters of a mile west of the north-west end of the West sands. There is an extensive salt swamp behind the southern shore of the harbour.

The shores are fronted by flats extending half a mile to a quarter of a mile from the mangroves, leaving a space about three-quarters of a mile across, with one to $2\frac{1}{2}$ fathoms water. Blanche harbour

has two entrances; the southern entrance one-quarter of a mile wide, between the West sands and the flat extending one mile from Mangrove point; and the northern entrance, which has a channel carrying 6 to 4 fathoms nearly one mile in towards the harbour, between West sands and the land.

The COAST from the northern entrance of Blanche harbour trends N. $\frac{1}{2}$ E. $4\frac{1}{2}$ miles to Commissariat point, and mostly consists of rough stony beach, fringed with mangroves and fronted by a sand-flat, which at low water dries out nearly a quarter of a mile. The land behind this coast rises to the Bluff range, which at $1\frac{1}{2}$ miles south of Commissariat point is only one mile inside it.

Bluff range.—The Bluff is the eastern and highest part of a long flat-topped range, rising near Lowly point and extending about N.N.W. 12 miles and then N. by E. nearly the same distance to the Bluff, on which a cairn of stones has been erected 948 feet above high water; the cairn is not easily distinguished from the scattered bushes on the summit, which is a few hundred feet broad, with a gradual slope to the westward. From the Bluff the range extends N.N.W. $4\frac{1}{2}$ miles, when it turns to the westward; a detached ridge at the angle, named the Sisters, when seen from the south-east, appears as two peaks, the south-eastern being 737 feet high.

Commissariat point lies N.E. $\frac{1}{2}$ N. $1\frac{3}{4}$ miles from the Bluff, and is so slight a projection of the mangrove coast as only to be distinguished when well north or south of it. The sand dries out 100 yards from the mangroves, and a 2-fathoms bank extends 400 yards beyond the sand-flat.

Beacon.—A black pile beacon with a diamond-shaped head is near the edge of the shoal off the point.

Buoy.—A black perch buoy with a staff and diamond shaped head is moored on a sand-spit between the above beacon, and the one to the northward. Vessels should keep well in mid-channel.

EASTERN SHORE.—From Red cliff point a margin of thick mangroves curves round N.E. by N. and N.N.W. $3\frac{1}{4}$ miles, and thence a low shore, with swampy land behind it, trends N.W. $\frac{1}{2}$ W. about the same distance to Paterson point.

Paterson point is low, with a sandy beach and a large clump of mangroves immediately north of it. Sand and mud-flats intersected by several navigable inlets, extend from this nearly across to the western shore at Commissariat point, to which side the gulf channel is confined.

FLINDERS CHANNEL trends nearly N.W. $\frac{1}{2}$ N. $3\frac{3}{4}$ miles from Middle bank to the north end of West sands, and is from $1\frac{1}{4}$ miles wide at its lower end, to little more than half a mile wide at its upper, with 5 to 9 fathoms water.

Sand and mud flats.—At S.W. by W. and W.S.W. $1\frac{1}{2}$ miles from Red Cliff point there are two small $\frac{1}{4}$ and $4\frac{1}{2}$ feet patches, from which a narrow intricate channel, carrying $1\frac{1}{2}$ to $4\frac{1}{2}$ fathoms water, penetrates above 2 miles north-east and north into the sand and mud-flat, and terminates in a basin about half a mile across, with $1\frac{1}{2}$ to $2\frac{1}{2}$ fathoms water.

At three-quarters of a mile north-westward of this inlet is a small $4\frac{1}{2}$ feet patch at the entrance of a narrow channel, carrying $2\frac{1}{2}$ to $4\frac{1}{2}$ fathoms, and leading nearly north 2 miles from Flinders channel into a sheet of water $2\frac{1}{2}$ miles long, north-west and south-east, and $1\frac{1}{2}$ miles wide, with $1\frac{1}{2}$ to 5 fathoms water; it approaches nearest to the shore $1\frac{3}{4}$ miles south-east of Paterson point, where the flat extends off half a mile.

East sands.—From the narrow channel just noticed the south-west side of East sands extends N.W. $\frac{1}{2}$ N. $2\frac{3}{4}$ miles, and has a narrow border of shoal water, nowhere more than 2 cables broad, except within half a mile of the spit forming the north-west end of the sands, whence the shoal extends about half a mile to the southward, and a quarter of a mile to the westward; the western edge being marked by a red pile beacon with a round head, bearing N. by W. $\frac{1}{2}$ W., nearly 2 miles from the black beacon on the south-east spit on the West sands. From the north-west spit of East sands the shoal continues nearly a mile to the northward, and has a mass of banks on it, partly uncovered at springs, with a similar red beacon at the north-west point, 7 cables N.N.W. from the red beacon just mentioned.

Between a half and one mile northward of the northern red beacon is a detached bank 300 yards broad, and uncovered at springs, having a narrow but deep channel leading round each end from Bluff reach

into the sheet of water before mentioned. From Paterson point the hard sand-flat which fronts the shore extends south-west 2 miles to a spit forming the south side of the entrance of port Paterson, which is nearly blocked up by a narrow bank, uncovered at springs extending from $1\frac{1}{4}$ miles S.S.E. of Commissariat point to one mile west of Paterson point.

Buoy.—The south-west end of the spit forming the south side of the entrance to port Paterson is marked by a red perch buoy with a ball.

BLUFF REACH is a continuation of the gulf channel from Flinders channel to Commissariat point; it is bounded to the westward by the west shore, and to the eastward by the shoals extending from the north-west spit of East sands, the detached bank to the northward of them, Paterson point spit, and the narrow detached bank in the entrance of port Paterson. The reach averages half a mile in width, and carries 4 to 9 fathoms water. Vessels navigating in this reach should keep well in mid-channel.

WESTERN SHORE.—**Curlew point.**—From Commissariat point the coast trends N. by W. nearly 3 miles to a mass of thick mangroves, of which the south-eastern margin trends N.E. by N. one mile to Curlew point. This coast is bordered by a sand and mud-flat, covered at half tide, nowhere extending beyond a quarter of a mile except within one mile of Curlew point, where the flat extends half a mile from the mangroves.

Beacon.—A black pile beacon with a diamond-shaped head has been erected on a projecting part of the flat $1\frac{1}{2}$ miles north of Commissariat point.

Curlew isle is merely a patch of mangroves on the flat projecting eastward from Curlew point, from which it is separated by a narrow channel dry at low water, and has a sandy knoll at its north end, which only covers at high water springs.

The shoal extends one-third of a mile eastward from the centre of the island, and is marked at its outer edge by a black beacon.

Tide gauge.—A tide gauge is fixed to the beacon eastward of Curlew isle, showing the least depth of water in the channel thence to Port Augusta.

EASTERN SHORE.—**Snapper point** is north-west of port Paterson, and the west end of a mass of thick mangroves projecting one mile south-westward from the high-water beach.

Port Paterson.—The low coast round this port from Paterson point trends irregularly N.N.E. $2\frac{3}{4}$ miles, and west nearly the same distance to Snapper point. The gulf channel here narrows to barely three-quarters of a mile in width from mangrove to mangrove and assumes the appearance of a river between the dense mangrove flats on either side. The coast north-east of Paterson point is fringed with mangroves, and 2 miles north-east of the point is intersected by a creek branching into the swamp to the south-eastward.

The shores of port Paterson are fronted by sand and mud-flats generally extending about half a mile from the land, and covered at half-tide. From Snapper point a sand-flat, covered at half-tide, extends $2\frac{3}{4}$ miles southward, to the entrance of port Paterson, which lies S.E. two-thirds of a mile from Commissariat point.

The western bend of this flat is marked by a red pile beacon with a round head, bearing S.S.W., distant three-quarters of a mile from Snapper point,

The approach to the anchorage is by a channel 2 miles long, leading N.E. from the entrance, and is open to the gulf channel when the north end of the beach at Paterson point bears E. by N. At about two-thirds of a mile and $1\frac{1}{4}$ miles within the entrance the deep water is confined to a width of one cable, with a depth of not less than 4 fathoms.

The communication from the outer to the inner basin is by a narrow winding passage, about a quarter of a mile long. It has only $1\frac{1}{4}$ fathoms in the entrance at low water springs, but within the channel the soundings in the inner basin increase to $2\frac{1}{2}$ fathoms.

DIRECTIONS.—There are no marks to lead up the entrance of port Paterson, but the best time to enter is at low water, as the banks then show on either side, and if they are covered the tidal streams fill the channels with eddies, which give the appearance of the whole being blocked up.

The anchorage of port Paterson is a sheet of water three-quarters of a mile across, with a depth of $3\frac{1}{2}$ fathoms, mud; there is an inner basin half a mile in diameter, to the north-eastward, and both are

enclosed by the sand and mud-flats which occupy the bight between Paterson and Snapper points.

The objection to port Paterson arises from the extent of the sand and mud-flats surrounding it on all sides, rendering communication with the shore difficult after half-ebb; besides which, the adjacent coast is a swamp, with the exception of the sandy beach to the northward of the inner basin, which is nearly half a mile from low-water mark.

Snapper reach.—The continuation of the gulf channel from Bluff reach to Curlew isle is 2 cables wide, with 3 fathoms water off Commissariat point; thence Snapper reach trends N. by W. $\frac{1}{4}$ W. 2 miles, when the channel is again contracted from a quarter of a mile to $1\frac{1}{2}$ cables in width, with 4 fathoms water, between the black and red beacons south-westward of Snapper point. From between these beacons the reach takes a general N.N.E. direction 2 miles, to abreast of Curlew isle.

A red buoy with staff and ball is moored on a 14-foot patch westward of Snapper point.

To the northward of Snapper point the channel shows at low water springs, as the sands uncover, leaving a width of a quarter of a mile to less than one cable.

A red pile beacon with a round head, north of Snapper point, marks the edge of the channel on the west side. It bears S.E. by E. $\frac{3}{4}$ E. $1\frac{3}{4}$ cables from the black beacon east of Curlew isle.

From Curlew point a margin of thick mangroves, forming the western shore, curves round west and north 2 miles to Brown point; and from half a mile east of Curlew isle the eastern shore, also consisting of mangroves, curves north and west $1\frac{1}{2}$ miles to Orchard point, and thence nearly N.N.E. one mile to abreast of Brown point.

Both shores are bordered by sand and mud-flats, and the land behind the mangroves is mostly overflowed at springs, the adjacent country at the back of these swamps not exceeding 70 or 80 feet in height. Nearly opposite Brown point there is a creek, on the north side of which a red bank covered with bushes, rises to the height of 77 feet.

The gulf channel from the black beacon off Curlew isle nearly follows the direction of the southern and western shores, and shows at low-water springs, when the sands are uncovered; the passage is

a quarter of a mile to less than one cable wide, but there are some dangers which do not show at low water.

A bank, forming the south side of the narrows north of Curlew point, extends 2 and 3 cables northward and westward from Curlew isle; it has very regular depths of 3 to 9 feet on it. Its northern edge, which extends 400 yards east and west, is marked by two black buoys.

Shoals and sand and mud-flats, having one to 2 fathoms water between them, extend nearly half a mile from the northern shore, their southern edge being defined by four red beacons with round heads; the first on the south side of a 5-foot patch and bearing N. $\frac{1}{2}$ W. nearly $3\frac{1}{2}$ cables from the black beacon east of Curlew isle. The next two beacons are on the north side of the narrows north of Curlew point, which are further marked by a red buoy south of the west of these beacons. The narrows are here only half a cable wide, with 3 to 4 fathoms water. The fourth beacon is on the south-west end of the flat extending from Orchard point. There is a red buoy about N.W. by W. $1\frac{1}{2}$ cables from this beacon.

From the beacon last noticed, the edge of the flat which borders Orchard point curves to the northward and the gulf channel takes a general N. by E. direction to abreast of Brown point, with an average width of less than one cable, and depths of not less than 18 feet. The eastern side is rather steep-to, except opposite Brown point, where a spit projects 200 yards from the sand and mud-flat. On the west side, shoal water and the sand and mud-flat extend one-third of a mile from the mangroves, their outer edge being marked by four black beacons with diamond-shaped heads. The channel is nearly one cable wide, and carries $2\frac{1}{2}$ to $3\frac{1}{2}$ fathoms.

The coast from the south end of the red bank opposite Brown point trends N.W. $\frac{1}{2}$ N. $1\frac{2}{3}$ miles to Flagstaff point. A sand and mud-flat, partly covered with mangroves, extends off the shore.

From Flagstaff point, the bank on the east side of the channel curves to the southward for $6\frac{1}{2}$ cables, it then turns to the south-east for $5\frac{1}{2}$ cables, where it forms a spit marked by a red beacon. This beacon bears N.E. by E. $\frac{1}{2}$ E. $2\frac{1}{4}$ cables from Brown point.

Between this spit and the flat which extends off the land there is an inlet one to $1\frac{1}{2}$ cables wide, extending three-quarters of a mile to the north-west. In the entrance, which is on the east side of the spit-beacon, there are 21 feet, quickly shoaling to 4 and 5 feet.

The western shore from the mangroves off Brown point curves in a north-west and northerly direction $2\frac{1}{2}$ miles to Camp point, and is lined with mangroves. For $1\frac{3}{4}$ miles between this shore and the higher land behind there is a swamp a quarter of a mile broad, overflowed at springs; this swamp, thence to Camp point does not exceed 150 yards in breadth.

The sand and mud-flat which borders this shore is not more than 100 yards broad, except off the north black beacon, and between 2 and 4 cables south of Camp point, where it extends more than 200 yards from the mangroves. For 4 cables south of this beacon the flat is fronted by a shelf, having 5 to 11 feet water on it, and a rocky spit projects nearly to the opposite side of the channel about half a mile south of Camp point.

The channel.—From off Orchard point the channel is marked on the west side by black buoys and beacons and on the east side by red buoys and beacons. Vessels proceeding to Port Augusta should leave the red buoys and beacons on the starboard hand at a distance of from 75 to 100 feet.

There is now a clear channel between Curlew isle and Port Augusta of not less 17 feet at low water springs and with a width of not less than 200 feet.

Anchorage.—The anchorage of Port Augusta, extends from abreast Flagstaff point N.E. $\frac{1}{2}$ N. nearly half a mile, and is one to $1\frac{1}{2}$ cables wide, with $4\frac{1}{2}$ to 2 fathoms water, having sufficient space for eight or ten large vessels to swing at moorings, in 18 to 20 feet water.

Abreast the wharf, the port has been dredged for a length of 1,200 feet and a width of 600 feet to 20 and 22 feet at low water.

Moorings.—Seven complete sets of first class moorings have been laid down in from 15 feet (for small vessels) to 29 feet at low water, providing accommodation for twenty-one vessels.

At those out-ports where harbour masters are stationed, or where pilots take charge of vessels, the direction and position of the mooring anchors and chains will be duly pointed out, and instructions given to masters of vessels in mooring and unmooring.

Masters and other persons in charge of vessels are required, when using the moorings laid down at the out-ports in South Australia, to observe the following directions:—In fine weather, when there is

little sea, a line may be made fast to the large buoy; but on no account must a vessel hang on to the buoy longer than is absolutely necessary to moor the vessel to the bridle, the buoy chains not being intended to moor by, but simply to show the positions of the moorings, and to facilitate picking up the mooring bridles.

In the event of the weather being such as would render it improper to take hold of the large buoy, the vessel must let go an anchor clear of the direction of the mooring chain on the bottom.

Having brought the vessel near the mooring-buoy, a little black wooden buoy will be seen, riding by a small chain attached to the mooring bridle, lying on the bottom. Having hauled up the small chain and brought the large link, or shackle to the hawse, shackle on the vessel's cable. Should an anchor be down, lift it, and, if necessary, shackle on the second chain; unshackle the small buoy, and veer cable as requisite; observing that, as the bridles are in short lengths, a vessel should ride with as much range as the locality or state of the weather would require were she riding at her own anchors.

In unmooring, the small buoy chain must be secured before slipping, and the large buoy used under the same conditions as expressed in the first part of these regulations.

It will be obvious to masters of vessels that no confidence can be placed in securing vessels to the large buoys, when it is remembered that the constant friction of that portion of the chain touching the bottom so wears the stoutest chains, that very few months' wear shakes out the studs, rendering the chains quite unfit to hold on by in any weather likely to cause a strain on them.

As every precaution is taken by the Marine Board to keep the moorings in a perfect state of efficiency, masters and others in charge of vessels will be held liable for all expenses in the event of the moorings being injured, in addition to penalties of not less than 5*l.*, nor exceeding 20*l.*

Port Augusta.—The town of Port Augusta is situated on the south-east side of the port, and from the flag-staff, which stands in front of the Custom house, extends over a quarter of a mile to the north-eastward. In front of the town is the wharf, which is 1,201 feet long, with a depth of 22 feet alongside it, and with railways laid on it. There are three jetties to the north-east of the wharf. There is also a jetty at Port Augusta West, 500 feet long, with 5 feet water at its outer end.

Port Augusta, at the head of Spencer gulf, is the northernmost and one of the most important ports of South Australia; it is the shipping place for the produce of a vast pastoral and mineral district lying to the northward, westward, and eastward. Every year adds to the number of copper mines opened.

In 1862 it only consisted of a few wooden houses, and two substantial stone and brick stores. The population of the town in 1891 numbered 1,274 persons. A steam vessel plies weekly between Adelaide and the intermediate ports. There is also rail communication with Adelaide *viâ* Terowie. Port Augusta is connected with the universal telegraph system.

Supplies.—All kinds of dry goods can be obtained from the stores at Port Augusta, and fresh meat from Stirling, a township E.S.E. 4 miles from Port Augusta; but vegetables are not to be had, the surrounding country not being fit for cultivation.

Water.—The supply of water for Port Augusta and the district is obtained from numerous springs on the western slope of the Flinders range. Storage reservoirs contain 8,205,000 gallons, and an additional reservoir is proposed. Water is laid on at the wharf and also at the jetty at Port Augusta West. Firewood can be obtained in small quantities.

Fish, principally schnapper, may be caught in great quantities with hook and line. The best schnapper ground is between Snapper and Curlew points and close off the north-west edge of the bank forming the narrows at Curlew point.

Trade.—In 1892, 51 vessels of a tonnage of 45,981 entered and cleared at Port Augusta. The trade of Port Augusta is chiefly in exports, which are—wheat, flour, copper, wool, tallow, hides, skins, bark, silver, lead ores, bullion, oats, bran, hay, &c. After shearing time, from September to December, large vessels are constantly at this port loading wool or copper ore; in 1894, there were shipped in 30 vessels of 27,079 tons,—wheat 1,224,744 bushels, flour 3,818 tons, wool 20,286 bales, bullion 1,350 bars, and manganese ore 550 tons. In 1894 several ocean steamers sailed with wool and other produce direct for London, the largest being of 2,555 tons, and many other steamers and sailing vessels for various ports. Vessels lying in the stream at Port Augusta receive cargo from both sides

at the same time. Railway trucks are shunted close alongside vessels at the wharves, enabling cargo to be handled direct.

There being no slips nearly every iron ship is beached on the soft sand to clean the bottom, which is easily done owing to the rise and fall of tide.*

Stirling, E.S.E. 4 miles from Port Augusta, is a township containing in 1891, 77 inhabitants. The overland telegraph from Port Darwin joins the other line to Adelaide at this point. In 1881 an abundance of good water was obtained by boring. It is famed for its fruit gardens.

HEAD of SPENCER GULF.—From Port Augusta the low eastern mangrove shore curves northward two-thirds of a mile. The sand and mud-flat which borders the shore extends about 100 yards from the mangroves to 200 yards opposite Camp point, and has a narrow shelf of shoal water along it.

The gulf channel from Camp point winds to the northward, and is navigable but narrow for about 3 miles above Port Augusta; at about one mile north-west of the point it passes close to the eastward of Flinders Red cliff, at one mile above which, in a N.N.E. direction, the channel is dry at low water; but the gulf, here reduced to a mere salt swamp, flooded at springs, extends about 22 miles further to the northward.

Aspect.—The land immediately behind Port Augusta rises to the height of 73 feet, and Flinders Red cliff is 95 feet high, the latter being apparently the greatest elevation in this vicinity; most of the adjacent land is low, with bare mud-swamps, flooded at springs.

Flinders range, on the east side of the upper part of Spencer gulf, appears to be almost a continuation of the high range—of which Barn hill, already mentioned, forms one of the summits—extending in a N. $\frac{1}{2}$ W. direction from the head of the gulf of St. Vincent.

From 10 miles south-east of mount Ferguson, in Germein bay, Flinders range extends N. by W. $\frac{1}{4}$ W., 48 miles to Devil's peak, 2,288 feet high; the most conspicuous of the intermediate heights being mount Bluff, 2,301 feet high, 6 miles E. $\frac{1}{2}$ N. of mount Ferguson; mount Remarkable, 3,130 feet high, North, 18 miles from mount Bluff; and mount Brown, 3,174 feet high, N.N.W. $\frac{1}{2}$ W. 19 miles from mount Remarkable.

* The largest ostrich farm in the world (about 700 birds) is situated about 8 miles northward of Port Augusta.

From Devil's peak other peaked mountains of considerable elevation, extend northward along the ridge of the same barren rocky range, which terminates at mount Arden, beyond which nothing is visible from the sea. The ridge of Flinders range is distant 8 to 12 miles from the eastern shore between Ward point and Port Augusta, the intermediate space being mostly low and swampy.

Pilots.—*See* page 251.

DIRECTIONS.—The channel to Port Augusta being marked by beacons and buoys, vessels bound up the gulf keep the black beacons and buoys to port, and the red to starboard. The black beacons and the black perch buoys have diamond shaped heads; the red beacons are round headed, and the red perch buoys have a ball. The beacons are placed in depths varying from 2 to 10 feet at low water, and care should be taken in approaching them, as many of them are close to the edge of steep banks. There is a red and black chequered perch buoy with a ball on Douglas bank, which may be passed on either side.

From about half a mile east of Lowly point steer N. $\frac{1}{2}$ E. (N. 6° E.) for about 12 miles, according to the tidal stream, passing in 10 and 11 fathoms 2 cables eastward of Lowly point shoal. This course leads about one mile off Backy point, two-thirds of a mile off the shoal water to the southward of Douglas point, and half a mile eastward of Douglas bank. On this course, with soundings of 10 to 11 fathoms off Lowly point shoal, the depths are irregular, from $6\frac{1}{2}$ to 12 fathoms to Backy point, between which and Douglas point there are 12 to 10 fathoms, and thence the depth of water gradually decreases to 6 fathoms eastward of Douglas bank.

After passing Douglas point, keep Backy point in sight or in line with Crag point, bearing S. by W. $\frac{1}{2}$ W. (S. 17° W.), until the north end of Bluff range comes on with the north part of Two Hummock point bearing N.N.W. $\frac{1}{4}$ W. (N. 25° W.), and then steer N. by W. (N. 11° W.) till North Hummock of Two Hummock point bears West. The course then is N.W. $\frac{3}{4}$ N. (N. 37° W.), to pass about a quarter of a mile westward of Middle bank, and through Flinders channel, between East and West sands, taking care not to get into less than 7 fathoms in the vicinity of Middle bank. The East and West sands, which are nearly one mile apart, generally show.

If, when in 10 or 9 fathoms at half a mile off Douglas point, it be desirable to pass westward of Douglas bank, where there is the deepest water, and the tidal streams are strongest, steer N. by W. (N. 11° W.) for South Hummock on Two Hummock point taking care to keep Crag point shut in by Douglas point, and do not go into less than 9 fathoms, while mount Gullet bears between E. by N. and E. $\frac{1}{2}$ S. When mount Gullet bears E. $\frac{1}{2}$ S. haul out N. by E. (N. 11° E.) till Inshore Hummock comes on with the south part of Two Hummock point, bearing W. $\frac{1}{2}$ S., and then steer N.W. $\frac{3}{4}$ N. (N. 37° W.), passing westward of Middle bank and through Flinders channel, as just directed.

When the black beacon off Commissariat point bears North, or Red cliff is nearly in line with the foot of mount Grainger, bearing S.E. by E. $\frac{1}{2}$ E., the mangroves on the western shore being distant half a mile, alter course to N. $\frac{1}{4}$ E. (N. 3° E.) to pass through Bluff reach, having the red beacons on the starboard hand, gradually closing the western shore as Commissariat point is approached. Just before reaching Commissariat point the depth of water decreases to 3 fathoms.

Pass a cable east of Commissariat point beacon and steer about N. by W. (N. 11° W.) through the lower part of Snapper reach, leaving the black buoy and beacon on the port, and the red beacon on the starboard hand; having cleared the spit close to the northward of the red beacon, alter course to about N.N.E. (N. 22° E.), keeping on the eastern side of the channel, and passing nearly 2 cables from Snapper point.

North of Snapper point the gulf channel becomes so narrow that the plan of Port Augusta is a better guide than written directions for proceeding to Port Augusta, and the channel is so well marked that it is easy with a leading wind, without which no square-rigged vessel should proceed beyond Commissariat point.

The wind from S.S.W. round to E.S.E. is a leading wind through all the reaches in going up; and from N.N.E. to W.N.W. it is a leading wind in coming down.

Anchorage.—There is anchorage in any part of the estuary of Port Augusta, south of Douglas bank, the best being in 6 fathoms, near the east shore, as the strength of the tidal streams is greater in the deep water along the west shore.

An anchorage in Backy bay has been recommended, with Lowly point bearing S. $\frac{1}{2}$ E., distant 3 miles; but from May to September, when strong north and west winds are frequent, more shelter may be obtained in 6 fathoms, sand, near the head of the bay, with Backy point bearing from N.E. to E.N.E., distant about one mile, where a vessel is out of the stream.

In the strong winds from S.S.E. which prevail from December to March, when Port Augusta is most frequented, a vessel seeking anchorage for the night or a tide should, when within Lowly point, haul to the eastward and come to in 6 fathoms, under the lee of Ward spit.

TIDES and TIDAL STREAMS.—The tides in the northern part of Spencer gulf are very irregular. At Port Augusta it is high water, full and change, at 8 h. 30 m., and at Lowly point at 7 h. 0 m. The rise at ordinary springs at the former place varies from 9 to 12 feet, and at the latter 6 to 8 feet; but after a strong hot North wind, when it veers round to West and South, the tide at Port Augusta has been known to rise 16 feet. The times of high water, and the rise and fall, are subject to the wind. During springs, strong North winds sometimes cause the water to fall one to $1\frac{1}{2}$ feet lower than usual, and than shown on the chart.

After full and change, the time of high water gets gradually later till the time of neaps, when it is high water between 10 h. and 11 h., both at Port Augusta and Lowly point. Then a day occurs when the tide ebbs or flows twelve hours together, the whole tide often not ranging more than a few inches. After this the tides again become regular; but the time of high water has changed to between 5 h. and 6 h., and gradually returns to the full and change times. It may thus be generally assumed that at Port Augusta high water takes place in the morning and evening, and low water in the middle of the day. At night the tide is generally one or 2 feet higher than in the morning.

The stream generally sets fairly up and down the gulf channel, $1\frac{1}{2}$ to 2 knots, and changes with the rise and fall, except about the mouths of the small channels through East sands, and to the southward of Douglas bank, where the in-going stream sets N.W. across into the deep channel, the out-going stream setting S.E.

Winds.—From December to March strong winds from South and S.S.E. prevail; and in January, February, and March they are often interrupted by hot winds, which blow fiercely from the northward.

sometimes for seven or eight days, raising the temperature to 120° in the shade. The hot winds frequently terminate in a squall from the southward, or a thunderstorm from S.W. They blow under a cloudless sky, with a thick red haze.

Whirlwinds are common from November to March; but they are usually confined to the plain between Flinders range and the gulf, where several may be seen at once, raising pillars of dust to a great height.

During the months of April and May strong northerly winds are sometimes experienced, with a hard, cold-looking sky; these winds, although coming from the same quarter as the hot winds, do not raise the temperature above 75° or 80° . From May to September north-west to south-west winds generally prevail.

Barometer.—At Port Augusta in 1890 the mean height of the barometer was 30.00 inches. The highest reading was 30.54 inches in May, and the lowest 29.35 inches in October.

Temperature.—The average temperature in 1890 was $66^{\circ}5$ Fahr., the maximum $110^{\circ}8$ in January, and the minimum $35^{\circ}7$ in June. January was the hottest month, with a mean of $82^{\circ}1$, and July the coolest, with a mean of 52° . Sometimes the temperature is constantly over 100° for several days.

Rainfall.—At Port Augusta in 1890, the rainfall was 13 inches, falling on 77 days. The mean annual rainfall (for 30 years) was 9.09 inches; the greatest fall in one year being 15.08 inches and the least 2.21 inches.

See chart, No. 401.

CHAPTER V.

AUSTRALIA.—SOUTH COAST, CAPE SPENCER TO CAPE OTWAY;
INCLUDING INVESTIGATOR STRAIT, THE GULF OF ST. VINCENT,
AND KANGAROO ISLAND.

 VARIATION IN 1897.

Cape Spencer - - 4° 45' E. | Cape Otway - 7° 40' E.
Cape Northumberland - 6° 20' E.
Nearly stationary.

INVESTIGATOR STRAIT, the most direct channel between Spencer gulf and the gulf of St. Vincent, lies between the north coast of Kangaroo island, from cape Borda to Marsden point, and the south coast of Yorke peninsula, from cape Spencer to Troubridge point.

Investigator strait extends 52 miles E. by N. $\frac{1}{2}$ N. and W. by S. $\frac{1}{2}$ S., and is 23 miles wide. With the exception of the rocks in the vicinity of Althorpe isles and the shoal flat off Sandy point, the strait is free from dangers. From 45 fathoms, in the middle of the western entrance of Investigator strait, the depth decreases to 25 and 20 fathoms, after which it is irregular between 12 and 20 fathoms as far as the gulf of St. Vincent, the deepest water being on the south side; but there is no danger in any part to prevent a ship passing through the strait with perfect confidence. The bottom is mostly broken shells, mixed with sand, gravel, or coral.

CAPE BORDA, the north-west point of Kangaroo island, and the south-west side of the western entrance of Investigator strait, is a bold cliff headland, the cliffs being 200 feet high at the pitch of the point, but rising to over 400 feet $1\frac{1}{2}$ miles to the southward. At cape Borda the upper half of the cliff is whitish limestone and the lower half very dark volcanic stone. The hills at cape Borda rise above the cliff to a height of more than 500 feet, and are covered with small scrub. The cape should not be approached too closely,

especially in light winds, when the swell might set a vessel too near the shore, on which the surf, in westerly winds, breaks with great violence.

Caution.—During the rising tide the stream sets strongly to the northward, towards Spencer gulf.

Rocket apparatus.—A rocket apparatus is maintained at cape Borda, and in the event of a vessel being stranded near, and the lives of the crew being in danger, assistance will, if possible, be rendered from the shore.

LIGHT.—The lighthouse on cape Borda exhibits at 510 feet above high water a *revolving* light, showing white and red alternately *every half-minute*; the tower, square and painted white, is about 33 feet in height, and is built on the slope of the hill, one-third of a mile S.E. from the cape; the keepers' houses are close to it, and the hill rises above them. The light is visible from N. 34° E. round by south and east to S. 56° W. The white light may be seen from a distance of 30 miles in clear weather, and the red light 15 miles, but during the hot winds and calms of the summer months they may be seen much farther. When the red light is not visible the white light will appear at intervals of *one minute*.

During thick or hazy weather, or strong S.S.W. winds with rain, the light is occasionally partially obscured; in such weather great caution is necessary, and the lead should be used.

Signal station.—There is a signal station at the lighthouse and communication can be made by the commercial code. This station is connected by telegraph. Ships hoisting their number will be reported at Adelaide and Port Adelaide. The storm signal is a blue swallow-tailed flag under a red ball.

Meteorological observations.—The mean height of the barometer at cape Borda in 1890 was 30·03 inches. The highest reading was 30·61 in July and the lowest 29·32 also in July. The mean temperature for the year was 60° Fahr., the maximum 97° in January, and the minimum 40°·8 in July.

The rainfall in that year was 31·9 inches, rain falling on 157 days. The mean annual rainfall is 24·4 inches for 21 years, the greatest amount in one year being 36 inches and the least 17 inches.

SOUTH SIDE of Investigator strait.—From cape Borda the north coast of Kangaroo island trends E.N.E. for 10 miles to cape Forbin, and is bold and cliffy between those points.

Landing.—Nearly $2\frac{1}{2}$ miles east of cape Borda is a break, forming a small cove in the cliffs, called Harvey's Return; here all the stores for the lighthouse are landed in fine weather in the summer, on a small sandy beach, which washes away in winter, during which season there is sometimes nearly an interval of a month before any safe landing can be effected.

Cape Torrens, 7 miles E.N.E. of cape Borda, is a very high point, the cliff, which divides the space between capes Forbin and Borda into two bights, being 725 feet high; in the western bight the cliffs continue high and level for nearly 4 miles, and in the eastern bight fall gradually to De Mole river, a small stream running into the sea over a little beach, three-quarters of a mile south of cape Forbin.

Cape Forbin is a rugged cliffy point, 176 feet high, from which the coast trends E. by N. $\frac{1}{2}$ N. for 8 miles, East for 8 miles, and then curves round to cape Dutton, which is nearly E. by N. $\frac{1}{2}$ N 18 miles from cape Forbin. The whole of this coast is very rugged, broken, and cliffy, with several small coves and beaches on which landing can be effected, according to the direction of the wind.

Snug cove, the second cove eastward of cape Forbin, and $3\frac{1}{4}$ miles from it, is the most sheltered, being only open to the north-west, and is partially protected by some rocks which run off a point to the westward of it. The beach does not show from seaward, but the cove may be known by a small peaked islet about 90 feet high, which lies close to the point of the cove, and by its being $1\frac{1}{4}$ miles to the westward of a high cliff, with some white marks near its summit.

Small coasters visit Snug cove, and lie in 6 to 9 feet water close to the beach on the north side, made fast head and stern. There is a house and some cultivated land in the gully which runs into Snug cove; it is the western inhabited spot on the island, except cape Borda lighthouse. Snug cove is about 300 yards long and 150 broad, with 2 to 5 fathoms water in it.

Western river, 6 miles eastward of Snug cove, is a small stream which runs into a cove, with a sandy beach, about 300 yards deep, and 150 yards wide; the cove is open to the north, and there are 4 fathoms water in its centre.

The COAST.—Between Snug cove and Western river is a range of high cliffs nearly level; the highest part, 733 feet above high water, rising to 877 feet at $1\frac{1}{4}$ miles inland, is $2\frac{1}{2}$ miles west of Western river. The next beach, 5 miles east of Western river, is known as Snellings, which faces to the north-west, and is a quarter of a mile in length. The cliffs about Snellings beach are much lower than to the westward, with a range of wooded hills rising behind them, giving this part of the island a more pleasant appearance than that hitherto described. The Middle river flows into the sea through Snellings beach in winter, and is navigable for boats for a short distance; in the summer its mouth is blocked up with sand and weed. The coast between Snellings beach and cape Dutton is formed of broken cliffs of moderate height, with small patches of beach between, and no dangers more than 2 cables off it.

Anchorage.—There is anchorage for coasters with southerly winds in 3 fathoms water, about a cable from the beach; and in 7 fathoms half a mile off, but the bottom is rocky at the latter depth. Vessels anchoring off Snellings beach should give the north-east point of the beach a berth of a quarter of a mile to avoid a reef which runs off the point to the northward, on which the sea generally breaks.

Cape Dutton is a sloping cliffy point nearly 200 feet high; a sunken reef runs off N.E. by E., nearly a quarter of a mile from the cape, with 10 fathoms water outside. There is sometimes a tide race off the cape, which in strong winds looks like a break.

Cape Cassini, nearly E.N.E. 9 miles from cape Dutton, is 127 feet high, and formed of white limestone.

The COAST immediately west of cape Cassini rises to high broken cliffs, and the same kind of coast continues to cape Dutton, forming several small coves, which, however, are all open to the north and west.

Stokes bay.—The largest cove, 3 miles east of cape Dutton, is called Stokes bay, and coasters occasionally anchor there with southeasterly winds, in from 4 to 7 fathoms water, rocky bottom, 2 cables off the beach.

MOUNT MACDONNELL, the highest land on the north side of Kangaroo island, lies S. by W. $2\frac{1}{2}$ miles from cape Cassini, it is a round-topped hill, 984 feet high.

The land at the back of cape Cassini rises gradually, forming a range of scrub-covered hills between 700 and 800 feet high.

Soundings.—The coast from cape Borda to cape Cassini is very bold and steep-to. Between capes Borda and Forbin there are 20 to 30 fathoms water at half a mile off shore, and between the latter and cape Dutton 25 to 15 fathoms at the same distance off, with rather shallower water off Snellings beach.

The COAST.—From cape Cassini the coast trends E. $\frac{1}{2}$ N. 9 miles to cape D'Estaing.

For $1\frac{1}{2}$ miles east of cape Cassini the coast is low and rocky, with a rocky ledge running out nearly 200 yards from it. East $1\frac{1}{4}$ miles from cape Cassini a reef, nearly awash, extends a quarter of a mile off the coast.

The coast then rises in high dark cliffs for nearly 4 miles, broken by the small sandy beach of Dashwood bay, which is a slight indentation $3\frac{1}{2}$ miles east of cape Cassini.

Anchorage.—In Dashwood bay there is anchorage in 5 fathoms water, sand, a quarter of a mile off the beach.

Smith's bay is shallow, with a black boulder beach $1\frac{1}{2}$ miles in length. The shore behind is low and rises gradually to the southward to Freestone hill, 563 feet high, flat-topped, and wooded in clumps. There is anchorage with off shore winds in Smith's bay in $5\frac{1}{2}$ fathoms, a quarter of a mile off the middle of the boulder beach, but the landing is bad.

The coast is a continuous cliff from the east end of Smith's bay to cape D'Estaing, a distance of 2 miles.

There is a reef on which the sea generally breaks, $1\frac{1}{4}$ miles west of

cape D'Estaing ; it extends a quarter of a mile off shore, with 6 to 9 fathoms water close outside it.

Cape D'Estaing, on the western side of Emu bay, is a cliff point about 50 feet high, with a whitish face to the northward. A ledge of rocks just awash at high water springs extends nearly half a mile north from the cape, with shoal water between.

Emu bay is 3 miles broad east and west, and one mile deep ; with 8 to 10 fathoms water in the centre, gradually shoaling towards the shore. The west side trends about S.E. for one mile from cape D'Estaing, and the bay then curves round into a fine sandy beach for $2\frac{1}{2}$ miles.

Anchorage.—There is good anchorage in 5 fathoms water with the east rocky point of the bay in line with the extreme of White point beyond, bearing E.N.E. ; and the highest sand-hill near the west end of the beach in line with the west end of Table-topped hill bearing S.S.W. Cape D'Estaing will then bear West. At this anchorage the beach is three-quarters of a mile distant, but a small vessel would have smoother water by anchoring a quarter of a mile from the west end of the beach, in 3 fathoms, with the cape bearing W.N.W., and end of beach S.W.

White point is E. by N. $\frac{1}{2}$ N. 5 miles from cape D'Estaing, with a white cliff face, and a narrow rocky ledge awash extending a quarter of a mile north from it. The land to the westward rises in high dark cliffs as far as the east end of Emu bay. To the eastward of White point the land falls, and bights into a small bay $1\frac{1}{4}$ miles in width and nearly half a mile deep, with 6 fathoms water in the centre, gradually shoaling towards the shore. There is a small sandy beach in the south-west corner of the bay ; the rest of its beach consists of boulders. Between White point and Emu bay the coast rises to the wooded summit of mount Marsden, a hill with a rounded top, 584 feet high.

NORTH SIDE of Investigator strait.—From cape Spencer the coast of Yorke peninsula trends round E.N.E. into Marion bay, forming three small bays with cliffy and rocky points and low land between. The first point is $3\frac{1}{4}$ miles E.N.E. of cape Spencer, bold and steep, with white high cliffs to the westward. About half-way

between this point and cape Spencer a small rocky islet lies 2 cables off shore, with a reef between it and the land.

Rhino head is a sloping cliffy head, N.E. by E. $\frac{1}{2}$ E. $4\frac{1}{2}$ miles from cape Spencer, with a remarkable pinnacle of rock on its extreme, and much resembles the head of a rhinoceros.

MARION BAY.—The south point of this bay is $1\frac{1}{4}$ miles N.E. by N. from Rhino head, it is low and cliffy, with sand-hills at the back, and a sunken reef runs off about 200 yards to the south-east. From this point to the east point of Marion bay is E.N.E. $4\frac{1}{2}$ miles, and the bay is a little more than a mile in depth.

Anchorage.—Marion bay has been used by coasters for a temporary anchorage, but it cannot be recommended, being very shoal, with a foul rocky bottom covered with weeds, which would soon choke any small anchor dragging a short distance. After strong westerly gales heavy rollers set in from the southward, and the whole bay becomes a mass of breakers.

TIDES.—It is high water, full and change, in Marion bay, at 2 h. 5 m. ; springs rise 4 feet.

Hillock point.—The east point of Marion bay is cliffy, and the cliffs extend from the point E. by S. $1\frac{1}{2}$ miles, when the coast becomes sandy, trending S.E. by E. three-quarters of a mile to Hillock point, which is low and rocky, with a small hillock on it. After S.W. gales the sea breaks heavily off the east shore of Marion bay, and for more than half a mile off the above mentioned cliffs, the bottom being rocky and uneven ; a sounding of 5 fathoms has been obtained a mile south of the east point of the bay. From Hillock point the land trends East $1\frac{1}{2}$ miles, then E.N.E. $2\frac{1}{2}$ miles ; it forms a small bay on the east side of Hillock point, 4 cables across, and then becomes cliffy and rugged, with low rocks in front, on which the sea breaks heavily.

Yorke point, 180 feet above the sea, with a small islet off it close under the cliff, lies near the centre of this rugged coast. The water is deep off Yorke point, there being 8 fathoms half a mile off it.

FOUL BAY.—About a mile E.N.E. from Yorke point the coast curves to the north-east and east for 8 miles, forming a shoal bay

about 2 miles deep, and ending in a low sandy point; from the south-west point of the bay the coast is cliffy for a mile to the northward, after which it becomes a low sandy beach; the soundings in the western part of Foul bay decrease gradually towards the shore, there being 3 fathoms from one-half to a mile off, but at the head of the bay and towards Sandy point, the soundings become very irregular, with rocky patches of 2 to 3 fathoms, more than $1\frac{1}{2}$ miles off shore. The southerly swell sets into Foul bay, but in fine weather there is no surf on the beach.

There is a good schnapper fishing ground, in 11 fathoms water off the south-west point of the bay, with Yorke point bearing W. by N. 3 miles.

TIDAL STREAMS.—During the rising tide the stream sets N.N.E. $1\frac{1}{2}$ miles an hour into Foul bay; and during the falling tide it sets S.W.

Sandy point, forming also the west end of Sturt bay, is very low and not easily made out from the southward, being merely a point in the beach. At low water the sand dries for half a mile off the point, and a triangular-shaped shoal, separated from the point by a narrow channel with 5 and 6 fathoms in it, extends S.E. $\frac{1}{2}$ E. for 3 miles, with less than 18 feet water; thence it trends E. by S. for one mile, with $3\frac{3}{4}$ fathoms on the outer edge, when the water deepens to 7 fathoms.

Sandy point shoal consists of light sand, with large patches of weed; it is 2 miles broad at the base, which lies towards the shore, and has a rocky patch, with only 10 feet water, on which the sea occasionally breaks, lying S.E. $\frac{1}{2}$ E. $1\frac{1}{2}$ miles from the point. *See* page 289.

STURT BAY, $14\frac{3}{4}$ miles wide and 4 miles deep, lies between Sandy point and Troubridge hill, the hill bearing from Sandy point E. $\frac{1}{4}$ N.; from the point the coast trends N.N.W. for half a mile, then rounds to the north-east and afterwards to E.S.E., being a sandy beach for $8\frac{1}{2}$ miles as far as Gilbert point. The soundings in Sturt bay decrease regularly towards the shore, the 5-fathoms line being about a mile from the beach; within $3\frac{1}{2}$ miles of Troubridge hill the depth increases, there being 7 fathoms within a quarter of a mile of the shore.

Gilbert point has some sand-hills, 60 feet high, on its western part. Rocks having less than one fathom water on them extend 3 cables south of the point, and there are 5 fathoms at half a mile in the same direction.

From Gilbert point a rocky bank, 20 to 40 feet high, trends to the N.E. for one mile to a point, having above it some sand-hills, the highest of which is 65 feet. From this point a reef awash at low water extends in a S.S.W. direction for 2 cables, and then for $2\frac{3}{4}$ cables farther with not more than one fathom on it.

Port Moorowie is a coaster's port, immediately east of Gilbert point. The anchorage is a round pool, 2 cables in diameter, with 2 to 3 fathoms water in it, capable of holding 10 or 12 small vessels. As a general rule the port is not available for vessels drawing more than 10 feet water. There is a boat jetty 285 feet long, with a depth of $3\frac{1}{2}$ feet at its outer end at low water.

A chequered black and red buoy marks the centre part of a rocky bank lying south of the jetty, having only $4\frac{1}{2}$ to 6 feet water on it. From the buoy the post office bears North, half a mile.

Directions.—Keep Gilbert point north of N.W. by W. until the post office, the highest limestone house, bears N. by W.; then steer for it on that bearing, passing a cable to the eastward of the chequered buoy. Vessels anchor $1\frac{1}{2}$ cables inside the buoy in 20 feet, sand and mud, the holding ground being very good.

From the westward, keep more than half a mile off Gilbert point, until the post office bears N. by W., then proceed as before.

In going in a vessel will pass over a bar with 8 to 9 feet water, some distance outside the buoy. If obliged to wait outside for high water, anchor in 30 feet, with Gilbert point hill bearing N.W., and the sand-hill east of the township, N.E. by N.

Tides and tidal streams.—It is high water full and change in port Moorowie at 3 h. 10 m., springs rise 6 feet. The tidal stream is scarcely felt inside the port; outside, in 10 fathoms, it sets to the eastward during the rising tide and to the westward during the falling tide, following the direction of the coast at the rate of $1\frac{1}{2}$ knots at springs.

The coast from port Moorowie is a sandy beach, trending E.S.E. for 2 miles, it then turns S.E. $\frac{1}{2}$ E., becomes bold and clifty, as far as Troubridge hill, with sand-hills about 140 feet high behind, and sandy beaches at the foot of the cliffs.

Cootes hill is a grassy rise at the head of Sturt bay, about 7 miles N.E. $\frac{1}{4}$ E. from Sandy point; although only 91 feet high, this hummock is conspicuous from its shape and the lowness of the land in the vicinity, which forms in salt swamps, extending inland nearly across to Hardwicke bay.

Anchorage.—Sturt bay affords good anchorage to the north-east of Sandy point in 5 fathoms water, with the point bearing S.W. one mile. Good holding ground, fine sandy clay. This anchorage gives shelter in all winds, from N.E. round by north and west to S.E. by S., Sandy point shoal completely breaking the swell from the south-west. With the wind strong between S.E. and N.E. a short sea sets in, which is made more unpleasant by the tidal stream setting South during the falling tide, and N.E. by N. during the rising tide.

Directions.—Eastward of Marion bay, about 3 miles inland, the land rises to a level scrub-covered range nearly 300 feet high, which extends almost parallel to the shore to about the centre of Sturt bay, when it abruptly terminates, forming a well-defined shoulder 270 feet high. This shoulder bearing just west of North leads into Sturt bay and eastward of the Sandy point shoal in 5 fathoms. Yorke point kept West clears the south end of Sandy point shoal in 8 or 9 fathoms water. In making for the anchorage it is advisable not to haul in for it until Sandy point is made out, bearing W.S.W.

Troubridge hill, on the east point of Sturt bay, 103 feet above the sea, makes as an island from the westward. It presents a cliff face to the sea, but on the landward side is grassy and sloping.

TROUBRIDGE POINT is E. $\frac{1}{2}$ N. 2 miles from Troubridge hill, the coast between being a low cliff, with no danger more than a cable from it, and may be approached to half a mile in 10 or 11 fathoms water. From this point the coast, a series of broken cliffs, trends N. by E. a mile; the cliffs are then succeeded by a sandy beach running north-east for 5 miles, fringed by a flat of sand and

rocks drying at low water, and extending from one-half to three-quarters of a mile off shore.

Hungry point is a low point at the termination of this sand-flat ; from it the beach trends N.W. by W. for a mile to some low cliffs which trend northward and form the rounding De Mole point. A fishery is established at Hungry point. The coast-line then runs north-westward to the entrance of Salt creek.

Edithburgh.—On De Mole point, Edithburgh jetty, 368 feet long, having a crane on it, and $14\frac{1}{2}$ feet at its outer end at low water, has been erected for the shipment of Troubridge area produce. There is a black warping buoy in 13 feet at low water, 275 feet from the end of the jetty. Edithburgh is a watering place, with a population in 1891 of 221. There is a telegraph station here. Steam communication is established with Port Adelaide twice a week.

LIGHT.—From a white wooden house, 15 feet above the sea, on the outer end of the jetty, a *fixed* white light is exhibited, which shows to the eastward and is visible in clear weather for 5 miles.

Salt creek, 4 miles from Hungry point, is dry at low water, being merely a channel for the sea to flow into a salt lagoon at high water, but the bay at its mouth serves as the landing place for stores, brought by coasters from Port Adelaide for the sheep stations in this part of the peninsula. This bay is 2 miles across from De Mole point and nearly $1\frac{1}{2}$ miles deep, but the greater portion of this space is a sand and mud-flat drying at low water springs, and in no part of the bay inside the line from point to point is there more than 6 feet water.

Giles point, on the north side of this bay, is a round point, low and grassy to the southward and cliffy to the northward, the end of the cliff lying N. $\frac{1}{4}$ W. $4\frac{1}{2}$ miles from Hungry point ; a rocky ledge dries about 200 yards from the point, and shoal water extends over half a mile to the eastward and three-quarters of a mile to the south-eastward.

TROUBRIDGE SHOALS extend nearly 4 miles east from Hungry point, and consist of three large sand-banks, which dry in patches at low water springs, and a reef of rocks, lying about three-

quarters of a mile to the southward of the sand-banks. The eastern and outer shoal is nearly $1\frac{3}{4}$ miles long N.W. by N. and S.E. by S., and three-quarters of a mile broad in its widest part, with a small sandy island on it, 600 yards long and 100 feet wide, lying parallel to, and about 3 cables from, the eastern edge of the bank. On the south end of this islet, which is 15 feet above high water, and covered with bushes, stands the lighthouse.

The western and inner shoal lies W.N.W. and E.S.E., $2\frac{1}{4}$ miles long, by little more than a mile broad, separated from Hungry point by a narrow channel, with only 7 feet water between the rocky patches at its southern entrance, on which the sea breaks with southerly winds. A semicircular reef, known as the Sultana reef, which dries at half tide, lies near the eastern, and there is a solitary rock on the western, end of the bank. The third shoal is a small bank of a similar nature, lying between and to the south and east of the other two.

Marion reef, a rocky ledge nearly a mile long, having in some places not more than 6 feet water over the rocks, lies east and west, about three-quarters of a mile south of the sand-banks, its centre bearing S. by W. about $2\frac{1}{2}$ miles from the lighthouse. One mile south of these rocks the water deepens to 8 or 9 fathoms, inside which the bottom is rocky. The sea does not break in fine weather on Marion reef, or on the south side of these shoals.

LIGHT.—The lighthouse on the Troubridge shoals exhibits at 80 feet above high water, a white light, *revolving every minute*, which should be seen in clear weather from a distance of 15 miles. The light shows 24 seconds, is eclipsed 36 seconds, and when within a distance of about 7 miles, a continued faint light will be seen in clear weather, between the intervals of the brighter light. The tower is iron, 78 feet high, striped red and white horizontally, with a white top, and rises from the keeper's dwelling. Seamen should not, however, estimate their distance from the time of their first making the light, as, owing to refraction, it is often seen from distances when the lantern is considerably below the line of the natural horizon.

Signal station.—There is a signal station at Troubridge lighthouse, and communication can be made by the commercial code. It is connected by telegraph. The storm signal is a blue swallow-tailed flag under a red ball.

Shoal water.—There is said to be shoal water on rocky patches, at least 3 miles to the southward and south-westward of the lighthouse.

The inner channel, between Troubridge shoals and the mainland, passes close to Hungry point, where it is only about one cable wide; but it may be found useful to save coasters going round the shoals.

TIDES.—It is high water, full and change, at Hungry point, at 4 h. 18 m.; springs rise 7 feet, and neaps 4 to 6 feet. An investigation of the observations made between February and April, shewed that the afternoon tides were the highest from the second or third day after full and change until the irregular tides had passed, when they became the lowest. From observations made at Kooley Wurta, 30 miles to the northward, in the months of August and September, it is probable that during the winter months the reverse of this may be found to be the case. At the Troubridge shoals the tidal stream turns about 45 minutes before high or low water on the shore. The stream runs close round Hungry point between 3 and 4 knots at springs, the north-going stream beginning 45 minutes before low water.

Tapley shoal, a bank of from 3 to 5 fathoms over sand and weed, extends N. by E. for 5 miles, nearly a mile wide at its south end, but only a quarter of a mile wide near the north end. On the east side of this shoal the water deepens quickly to 9 and 10 fathoms, and the south end bears E. by N. $3\frac{1}{4}$ miles from Troubridge lighthouse. The bottom in fine weather can be easily seen. It is reported that as little as 16 feet water has been found on the shoal, and the effect of the rapid tidal streams on the sandy bottom may be to either reduce or increase the depth in some places.

Tapley shoal offers no impediment in proceeding up the gulf of St. Vincent; but to vessels bound down, meeting unsteady winds, and trying to keep the weather shore aboard, it will be found to be directly in their track, and should be carefully avoided by those of more than light draught. *See page 294.*

MACDONNELL SOUND lies between Troubridge and Tapley shoals and the land; it has a general depth of water of 5 to 8 fathoms.

Anchorage.—The best anchorage in Macdonnell sound is in

5 to 7 fathoms, fine sand, with the lighthouse bearing South to S.E. 2 to 3 miles.

Wool bay.—Coasters lie about half a mile off in 2 fathoms. Large vessels further out in 6 fathoms, with the north end of the beach W. by N. and Giles point S. by W. $\frac{1}{2}$ W. See page 344.

Vessels bound down the gulf of St. Vincent against strong south or south-west gales, are strongly recommended to avail themselves of the anchorage in Macdonnell sound, as it is almost impossible for a deeply-laden vessel to contend against the strong tidal streams, which, from the direction of the winds act more adversely than favourably for a vessel working to windward.

DIRECTIONS for Investigator strait and Troubridge shoals.—The fairway course up Investigator strait from a position 10 miles North of cape Borda lighthouse is E.N.E. (N. 67° E.), this course passing about 8 miles south of Althorpe islands, and the same distance south of Troubridge hill and the shoals lighthouse. It is well, however, to give the north side of the strait a wide berth, the coast of Kangaroo island having no off-shore danger, and being very high and bold. If obliged to stand over towards Yorke peninsula, do not go into less than 13 fathoms, or when Yorke point is in sight do not bring it south of West. When east of Troubridge hill, do not bring the hill south of West until the lighthouse is well to the westward.

Bearings should be taken in Investigator strait as often as possible to fix the position of the vessel, which should not be to the north of mid-channel. On the north side of the strait, the soundings vary but little, and will not give timely notice of nearing the shoals.

From 8 miles South of Troubridge lighthouse a N.E. (N. 45° E.) course leads to the Semaphore jetty at Port Adelaide, but the tidal stream must be allowed for. On approaching the east side of the gulf a bearing of mount Lofty will be useful.

If entering Macdonnell sound from the westward keep Troubridge hill north of West till Troubridge lighthouse bears North, then steer N.N.E. till it bears N.W., then North till it bears S.W., when a W. by N. course will lead to the anchorage, taking care on these courses not to go into less than $4\frac{1}{2}$ or 5 fathoms. Due allowance must be made for the tidal stream, which sets round and

towards the shoals at a rate of 2 to 3 knots at springs. South of the lighthouse, the streams run E.N.E. and W.S.W.; east of the lighthouse the streams run North and South.

Troubridge lighthouse ought not to be approached from the southward within 3 miles, but east and north of it, vessels may come as near as $1\frac{1}{4}$ miles. To clear the south end of Tapley shoal keep the lighthouse north of W. $\frac{1}{2}$ S.

KANGAROO ISLAND, at the entrance of the gulf of St. Vincent, is 80 miles long east and west, and about 24 miles broad, resembling in shape the Malay kris or dagger, with its handle to the eastward. The land is of good elevation and well wooded.*

Kangaroo island is becoming settled as an agricultural area. The farmers are located mostly about the eastern part of the island, at Antechamber bay, Hog bay, Eastern cove, and Kingscote. They are a very orderly and healthy community. Townships are forming at Nepean bay, and jetties are being constructed.

There is a scattered population settled along the banks of the Three Well, or Cygnet river, and some land has been taken up for agricultural purposes along the course of Hog bay river, on the south coast.

There are settlers at Emu, Smith, Dashwood, and Stokes bays, and the barley fields at Snellings beach were conspicuous marks from the sea during the survey (1863-73). There are also settlers at Snug cove, at D'Estree and Vivonne bays.

Barley is the staple produce of the island, which grows the best in South Australia.

The island is well watered, but from Kingscote, westward, is mostly covered with thick scrub, and unfit for either sheep or wheat farming.

The COAST.—Between cape Borda and West bay the coast is composed of dark limestone cliffs from 200 to 400 feet high, having many caves, into which the sea runs a short distance. The ravine de Casoars is a break in the cliffs $2\frac{1}{2}$ miles south of cape Borda, and can be seen from a distance of 12 miles; scrub-covered hills rise to a height of 500 to 600 feet behind the cliffs. There are 12 fathoms

See charts, No. 2,389a and No. 2,152.

* The first emigrants from Great Britain reached this island in July 1836, who after a little delay removed to Adelaide.

one mile off shore for 2 miles south of cape Borda, and 17 to 25 fathoms the same distance off from the ravine de Casoars to West bay. With a heavy westerly swell there are rollers off the ravine de Casoars to the distance of one mile.

This part of the coast should be carefully avoided, particularly during light winds, when the ocean swell rolls in with great force.

West bay, the north point of which is S. by W. $8\frac{1}{4}$ miles from cape Borda, is three-quarters of a mile across at its entrance, and the same in depth; with soundings gradually decreasing from 10 fathoms at the entrance, to 4 fathoms 2 cables from the sandy beach at its head. Its north and south shores are clifty, with rocks running off a short distance, and there is a low islet, the western end of which is 3 cables from the south point of the bay, having 5 to 9 fathoms within 2 cables of it. Small vessels sealing on this coast sometimes anchor in West bay; the heavy swell which comes in with a westerly wind renders this a risky proceeding, unless the wind is likely to continue off shore.

There is landing at the north end of the beach in West bay, when the wind is off shore; in 1873 there was only one settler, trapping wallabies.

Cape Bedout, S.E. $3\frac{3}{4}$ miles from the south point of West bay, is a round point, with a scrubby hill at the back about 300 feet high, and a little islet one cable off it. South of West bay the cliffs and land behind are much lower than north of it. Between West bay and cape Bedout there are 10 fathoms water half a mile off shore, and 14 fathoms 4 cables off cape Bedout. In a heavy swell there are rollers in from 16 to 13 fathoms one mile south of cape Bedout.

CAPE COUËDIE, the south-west point of Kangaroo island, and S.E. $9\frac{1}{2}$ miles from cape Bedout, is a narrow promontory one mile in length and three-quarters of a mile broad; facing to the south-west it slopes down gradually to the sea on that side, but its north and south sides are steep cliffs.

The COAST.—South-east rather more than one mile from cape Bedout is a low sloping point, the coast between forming a bight half a mile in depth, with a sandy beach at its head. From this

point the coast trends E. by N. $\frac{1}{2}$ N. $1\frac{1}{2}$ miles to a sandy beach, and then E. by S. $\frac{1}{4}$ S. $1\frac{1}{2}$ miles to the mouth of Rocky river; the coast being low cliffs, with scrub covered hills behind it, from 100 to 150 feet high. From Rocky river the coast trends S.E. by S. 6 miles to the inner part of cape Couëdie, curving slightly and forming Maupertuis bay.

Half a mile south of Rocky river is a conspicuous bare sand-patch, extending three-quarters of a mile north and south, and sloping down to the sea from sand-hills about 300 feet high.

South-east of this the cliffs rise to within a mile of cape Couëdie, where they are 470 feet high. The hills inland are highest about 3 miles north of the cape, where a range partially wooded, extends E.N.E. $3\frac{1}{2}$ miles from the coast. The summit of the range is 715 feet high, and N. $\frac{1}{4}$ E. 4 miles from cape Couëdie. Between cape Bedout and cape Couëdie there are 16 to 21 fathoms water one mile off shore.

Soundings.—West of cape Borda there are 50 fathoms, $1\frac{1}{2}$ miles off shore; off West bay it is $3\frac{1}{2}$ miles out to 50 fathoms; off cape Bedout, there are less than 50 fathoms for 8 miles to the south-west; and it is nearly 11 miles W.S.W. of cape Couëdie before 50 fathoms are found, the depth there being more than 40 fathoms to 3 miles from the shore.

CURRENTS and TIDAL STREAMS.—The current from the westward splits at cape Couëdie and runs to the northward along the west coast of Kangaroo island, considerably augmenting the north-going tidal stream, and at times quite overcoming the south-going stream.

The north-going tidal stream runs during the rising, and the south-going during the falling tide.

Casuarina islets are two in number, and lie S.S.W. $\frac{1}{2}$ W. and S. by W. $\frac{1}{2}$ W., nearly a quarter and $1\frac{1}{2}$ miles respectively, from the south point of cape Couëdie. The one near the cape is 95 feet high, about half a mile in circumference, and composed of large bare rocks. It is surrounded by rocks which uncover at low water; a ledge runs off 400 yards to the south-east.

The other islet is 115 feet high, 400 yards long W.N.W. and E.S.E., and 100 yards broad; it is similar to the islet near the cape, except

that the rocks which uncover extend farthest off one cable from its north-west point.

There are 16 to 22 fathoms water on a rocky bottom between the islets; and the outer one has more than 20 fathoms, half a mile off anywhere to seaward, excepting at one mile south-west from it, where there are only 13 fathoms.

There is a heavy tide rip south-west from the outer islet.

Lipson reef is S.E. by E. $\frac{3}{4}$ E. 8 miles from the outer Casuarina islet. The portion above water is 10 feet high, and of very small extent; the extent of the broken water surrounding the reef is only 400 yards east and west, and 200 yards broad. There are nearly 40 fathoms water one mile from the rock; no soundings have been obtained south-west of it, but there are apparently no dangers in that locality. The swell usually breaks with violence over the rock.

The COAST.—From cape Couëdie the coast trends N.E. for nearly 2 miles, being high steep cliffs with deep water close to; there is then a sandy beach, under precipitous cliffs; the cliffs over the west end of the beach are 428 feet high. The beach extends to the eastward $1\frac{1}{4}$ miles, to a sloping point about 250 feet above the sea, having on the top three remarkable boulders, one of which is nearly 100 feet high.

Between this point and the west point of Hanson bay, the coast bights in rather more than half a mile, and is composed of moderately high cliffs with three little sandy beaches in the north-west part of the bight. At N.E. by E. $\frac{1}{2}$ E. 6 cables from the west point of Hanson bay is a rock about 50 feet high, and not 200 yards across.

Hanson bay, the west point of which bears E.N.E. $5\frac{1}{2}$ miles from the south point of cape Couëdie, is 4 miles across and one mile in depth with 11 to 19 fathoms water over a rocky bottom. It is quite open to the south and south-west, and not available as an anchorage.

There are four sandy beaches in the north part of Hanson bay, with low land behind them. The west and east shores of the bay are cliffy, with hills behind rising to a height of about 300 feet.

Douglas rock is E. $\frac{3}{4}$ S. $1\frac{3}{4}$ miles from the west point of Hanson bay; it is a pinnacle awash at low water, and there are not less than 14 fathoms water a quarter of a mile off all round. It does not always

break. The highest part of cape Kersaint well open of cape Bouguer E. by N. $\frac{1}{4}$ N. leads half a mile to the southward of it.

Cape Bouguer, the east point of Hanson bay, is E. by N. 10 miles from cape Couëdie; it is one mile broad east and west, and has three cliffy projections, with rocks stretching a short distance off them. Wooded hills rise to a height of 300 feet inland from it. N. $\frac{1}{4}$ E. $11\frac{1}{2}$ miles from cape Bouguer is a conspicuous clump on the table land in the middle of Kangaroo island. This clump may be seen from the sea, off this part of the coast.

Between cape Couëdie and cape Bouguer there are 14 to 20 fathoms water, one mile from the shore, the latter depth being found at half a mile from cape Bouguer. As a south-west swell rolls in with great force upon this part of the island, an offing of at least a couple of miles should be kept until cape Kersaint bears North.

Cape Kersaint, E. $\frac{3}{4}$ N. a little more than $10\frac{1}{4}$ miles from cape Bouguer, is a bold cliffy headland, with a scrub-covered hill 315 feet high above it.

The COAST between capes Bouguer and Kersaint is formed of low cliffs and scrubby rises, nowhere more than 250 feet high, and with no considerable indentation. N.E. by E. 2 miles from cape Bouguer is a remarkable sand-patch, at the top of the cliff, close to the coast. A covered reef extends 600 yards south from a point three-quarters of a mile east of the sand-patch. Stun'sail-boom river discharges itself over a sandy beach, 5 miles E.N.E. from cape Bouguer. There are more than 20 fathoms water one mile off shore, between capes Bouguer and Kersaint.

Ellen point, the south point of Vivonne bay, is N.E. by N. a little more than $2\frac{1}{4}$ miles from a point E. by N. $\frac{3}{4}$ N. $1\frac{1}{4}$ miles from cape Kersaint. The latter point is faced by cliffs and rises to a height of 193 feet; there is a small bight between it and cape Kersaint with 9 to 10 fathoms water in it. There are 13 fathoms close to the south side of the point, and rocks extend more than 200 yards off its east side. From there the coast has two slight projections to Ellen point, the cliffs gradually decreasing in height. Ellen point is a grassy mound, 28 feet high, bordered by low rocks. There are 6 to 9 fathoms a quarter of a mile off the coast between cape Kersaint and Ellen point.

N.W. Snare, E. $\frac{1}{4}$ N. 3 miles from cape Kersaint, and S. by E. nearly $2\frac{1}{4}$ miles from Ellen point, is a dangerous pinnacle rock, with 2 fathoms water on it, and 11 to 20 fathoms close to all round. It breaks heavily when there is much swell, but when the water is smooth, only occasionally. There is a good channel, $1\frac{1}{2}$ miles wide, between it and the coast north-west of it, having 16 to 20 fathoms in it. Mount Mary open of Ellen point N.N.E. leads through this channel. When standing towards the rock from the westward, Ellen point should not be brought to bear west of North; nor from the eastward, north of N.N.W.

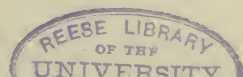
S.E. Snare, E. by S. $\frac{1}{4}$ S. $6\frac{3}{4}$ miles from cape Kersaint, S.E. by E. $\frac{3}{4}$ E. 4 miles from the N.W. Snare, and W. $\frac{1}{4}$ S. 10 miles from cape Gantheaume, is also a dangerous pinnacle rock, with 3 fathoms water on it, and 14 to 20 fathoms close to all round. It does not break so frequently as the N.W. Snare, and a good look-out for it is necessary when in its vicinity. In moderate weather, a vessel may ascertain her position when near the rock, by bearings of cape Gantheaume or cape Kersaint, and mount Bloomfield, or the black hill over Nobby islet. In bad weather it breaks heavily.

Vivonne bay is $1\frac{1}{2}$ miles broad and one mile deep, north of Ellen point. It has a general depth of 4 to 9 fathoms water. Its shores are sandy, with low limestone cliff near Ellen point, and a small rocky point 6 cables north-west of that point.

The mouths of Harriet and Mary rivers are N.W. $\frac{1}{2}$ N. 8 cables and N. by E. $\frac{1}{2}$ E. $1\frac{1}{2}$ miles respectively from Ellen point. They drain a considerable area of country, but are only open after heavy rains or high tides. A deep pool just within the mouth of Harriet river abounds with fish.

Mount Mary and mount Bloomfield.—Mount Mary is a round vegetated sand-hill, 224 feet high and $1\frac{1}{4}$ miles inland, on the north or right bank of Mary river. Mount Bloomfield is a conical and barren sand-hill, 272 feet high, three-quarters of a mile inland, and N.E. 3 miles from Ellen point. These two summits are the most conspicuous landmarks about Vivonne bay.

Anchorage.—There is anchorage in Vivonne bay during north and west winds, with Ellen point bearing S.S.E. half a mile distant,



and the rocky point in the bay bearing W.S.W., in 5 to 6 fathoms, sand.

The bay is quite open to the south-east, and although with the wind fresh from that quarter the water is smooth, there is not room to get under way if it increases in strength; and the sea soon comes in.

During the season for S.E. winds, from January to June, vessels seeking shelter are recommended to go to D'Estree bay, where the water is smoother, with abundant room, if necessary to go to sea.

The COAST.—Eastward of the mouth of Mary river there is a sandy beach, for $1\frac{1}{2}$ miles, with two small rocky points on it. Sand-hills stretch inland from this beach to half a mile north of mount Bloomfield. Between the sandy beach and Nobby islet the coast is limestone cliffs of a rugged formation, gradually rising to the eastward, to a black hill 287 feet high, a little east of the islet. With this exception, the hills near this part of the coast are nowhere more than 250 feet high, and are but partially covered with scrub or bushes.

To one mile from Nobby islet there are 12 fathoms water a mile off shore to the east of Vivonne bay. One mile south of Nobby islet there are rollers with a heavy swell, in from 7 to 9 fathoms, which vessels should avoid by keeping further off shore.

From near Nobby islet the coast runs East for $2\frac{3}{4}$ miles, being composed of broken cliffs with little sandy beaches here and there; having scrub-covered hills about 250 feet high, inland; and rocky reefs extending off the coast, an isolated one, $1\frac{1}{2}$ miles east of Nobby islet, being three-quarters of a mile from the coast. There are then three sandy bays, with an extensive sand-flat extending inland from them as far as three wooded sand-hills, the southern and highest of which is 271 feet high; the sea breaks heavily on the beaches and rocks of the eastern and western bays; but if it is tolerably smooth outside, there is landing on the beach of the middle bay, inside two low rocks off the east point. From the eastern bay the coast, which is all rugged limestone cliffs, except a small sandy beach three-quarters of a mile east of a projecting point, is nearly straight S.E. by E. to cape Gantheaume; the narrow projecting point is $3\frac{1}{2}$ miles from the cape.

The conspicuous hills north-west, $4\frac{1}{2}$ miles from cape Gantheaume,

are the summit of a wooded range inland. On the coast is a sand-peak 313 feet high, and a conical green hill 282 feet high, $3\frac{1}{4}$ miles and $1\frac{1}{2}$ miles respectively from cape Gantheaume. Between cape Gantheaume and the sandy bays there are 11 to 16 fathoms water, one mile off shore, and 12 fathoms one-third of a mile south from the outer rock off cape Gantheaume.

Nobby islet, E. $\frac{3}{4}$ N. $4\frac{3}{4}$ miles from Ellen point, is an inaccessible limestone rock, 400 yards long N.N.E. and S.S.W., and 200 yards broad; it is 245 feet high, and about 300 yards from the coast, to which it is joined by a rocky reef.

CAPE GANTHEAUME is E.S.E. 10 miles from Nobby islet. The cape is about 150 feet high, steep on its west side and sloping on the east side; a reef runs S.W. $\frac{1}{2}$ W. half a mile from it, several rocks of which are just above water, and the outer rock awash. There is a breaker one cable to the westward of the outer rock.

Quin rock, W. by S. $\frac{3}{4}$ S. nearly $2\frac{1}{4}$ miles from cape Gantheaume, is of very small extent, and has about one fathom water on it, with 13 to 16 fathoms half a mile off all round. When the sea is tolerably smooth it seldom breaks. Cape Linois (which, from the westward, is the first point which opens to the right of cape Gantheaume), open of cape Gantheaume N.E. $\frac{3}{4}$ E. leads three-quarters of a mile south-east of the rock; and Pelorus islet just open south of the outer rock off cape Gantheaume, E.S.E., leads in deep water between the rock and the shore.

YOUNG ROCKS consist of a middle group, North rock, and S.W. rock. The largest rock is in the middle group, and is S.S.W. 20 miles from cape Gantheaume, and S.S.E. $21\frac{1}{2}$ miles from cape Kersaint; it is 400 yards long E.S.E. and W.N.W., about 100 yards broad, and 30 feet high. It is visible about 10 miles, but the swell may often be seen breaking over it from a greater distance. The rest of the middle group are two low rocks together, and a rock under water, the former bearing N.E. by E. 3 cables, and the latter S.W. by S. 3 cables, respectively from the large rock. North rock bears N. $\frac{3}{4}$ W. rather more than $4\frac{1}{4}$ miles from the large rock, is 10 feet high, and about 200 yards in circumference; the sea generally

runs completely over it. S.W. rock S.W. $\frac{1}{4}$ S. a little over $2\frac{1}{4}$ miles from the large rock, is smaller than North rock, and only 5 feet high.

Soundings.—There are 38 to 42 fathoms water half a mile off North rock, 33 to 36 fathoms half a mile from the rocks of the middle group, and 39 to 40 fathoms the same distance from S.W. rock. The deepest water between the Young rocks and Kangaroo island is 45 fathoms; there are 50 fathoms $3\frac{1}{2}$ miles south from S.W. rock.

Pelorus islet, S.E. by E. $\frac{1}{2}$ E. $4\frac{1}{4}$ miles from cape Gantheaume, is a round bare rock, 40 feet high, and 600 yards in circumference. A reef, with several rocks above water on it, extends E. by N. $\frac{1}{2}$ N. 600 yards from the islet, and there is a rock above water close to its south-west side. There are 19 to 21 fathoms water half a mile from the islet, and a clear deep channel, with 17 to 22 fathoms in it, between the islet and cape Gantheaume. When there is a heavy south-west swell the sea breaks magnificently over Pelorus islet, dashing up sometimes to a height of 100 feet, and falling down all over the rock.

Cape Linois, N.E. $\frac{3}{4}$ E. $7\frac{1}{2}$ miles from cape Gantheaume, is a bold cliff headland, 235 feet high. Between cape Gantheaume and cape Linois the coast curves slightly; it consists generally of cliffs, with several small sandy beaches at their base, and rocks running off for 200 yards from the points. The highest part of the cliff—282 feet—is $1\frac{1}{4}$ miles south-west from cape Linois. The highest land near the coast is a scrub-covered hill, 303 feet high, and $4\frac{1}{4}$ miles from cape Gantheaume.

From cape Gantheaume to cape Linois the average depth one mile off shore is 20 fathoms.

Tinline point is a low limestone projection, with a remarkable detached cracked rock, open north and south, forming the south-west point of D'Estree bay. It is N.N.E. $\frac{1}{2}$ E. $3\frac{1}{4}$ miles from cape Linois. From cape Linois the cliffs decrease in height and end altogether at $1\frac{1}{2}$ miles from it; there is then a little sandy bay with a low point north of it; between this point and Tinline point are two sandy beaches divided by a cliff point about 90 feet high, with a sand-hill behind its centre 118 feet in height. There is deep water close to the shore as long as the cliffs continue; but between the

southern sandy bay and Tinline point, ledges of rocks and sunken reefs extend quite half a mile from the coast.

D'ESTREE BAY extends from Tinline point N.E. $\frac{3}{4}$ N. $7\frac{3}{4}$ miles to Reynolds point, and is $2\frac{3}{4}$ miles deep. From Tinline point the coast consists of a clean sandy beach with several white limestone cliffs for 5 miles; it then becomes bold and cliffy to Reynolds point, which is a high bluff.

Anchorage.—The western part of the bay affords anchorage, there being 6 fathoms water a mile off shore, the bottom sandy.

There is good anchorage with the highest limestone cliff in the bay bearing West, and the extreme of Tinline point S. $\frac{1}{4}$ E. $2\frac{1}{4}$ miles, in 5 fathoms, sand. Here a vessel would hardly feel the swell in ordinary weather and off-shore winds. By keeping Tinline point bearing S. $\frac{1}{4}$ E., a depth of $4\frac{1}{2}$ to 5 fathoms will be got to three-quarters of a mile from the point. In ordinary weather there is good landing on the beach from half a mile north of the above mentioned limestone cliff to half a mile from Tinline point, there being no surf whatever, even with moderate south-easterly winds, in this space.

Within the 5-fathoms line the soundings quickly shoal to 3 and 2 fathoms half a mile off shore, the bottom at these depths is sandy with patches of limestone crust; the north side of the bay is steeper, there being from 5 to 6 fathoms, less than half a mile off shore where the cliffs begin. There are 15 fathoms half a mile off Reynolds point.

Osmanli reef is formed of several detached patches, which extend about half a mile off the coast. The northern and outer patch lies N.E. half a mile from Tinline point, and in fine weather does not break once in ten minutes. There are 7 to 9 fathoms close outside it; a vessel should give Tinline point a berth of nearly a mile when standing out of the bay. The summit of the highest white cliff in the bay, kept west of N.W. leads to the eastward of the reef.

Reynolds point, the north-east point of D'Estree bay, is a high, bluff point; steep-to.

The COAST.—From Reynolds point the cliffy coast runs N.N.E. $1\frac{1}{2}$ miles into the low sandy bight of Pennington bay, whence the

coast trends East 7 miles to a dark rocky point, with a ledge of rocks extending 200 yards to the southward.

Immediately behind Pennington bay, on a narrow isthmus which connects Macdonnell peninsula with the main part of Kangaroo island, Prospect hill rises to a height of 328 feet; it is a sand-hill covered with bushes, about half a mile inland.

Between Pennington bay and the dark rocky point the coast is generally cliffy, it becomes sandy a mile from the point. From the point the cliffy coast trends E. by N. 3 miles to a small beach, through which the stream named Willsons river flows into the sea.

From Willsons river the coast trends E.S.E. 5 miles, to False cape. The intermediate coast is sandy, with nearly bare high sand-hills, broken by a rocky point about half way which juts almost half a mile into the sea.

Cape Hart is E. $\frac{1}{2}$ N. about $1\frac{1}{4}$ miles from False cape, and $5\frac{1}{2}$ miles S.W. from cape Willoughby. Cape Hart is a low rocky point, and a reef extends 600 yards to the southward of it, on which the sea breaks heavily. There is a small sandy beach on the west side of the cape, and the cliffs rise gradually to the north-east from it for three-quarters of a mile.

Soundings.—The coast between Pennington bay and cape Hart is bold, there being 8 to 12 fathoms water half a mile off it.

Tide race.—South of cape Hart the soundings increase to 30 fathoms, about 9 miles off shore. At this distance, apparently from the rocky nature of the bottom, and the south-going stream from Backstairs passage meeting the heavy westerly swell, there is sometimes a considerable tide race during and after westerly gales. *See* page 37.

Sanders bank, 15 miles S.E. by S. from cape Willoughby. The bank within the 20-fathoms line is 12 miles in length north-east and south-west, and its greatest breadth is 5 miles; it is of coral formation, and the least water obtained on it is 16 fathoms, but there may be shoaler places. After gales the sea breaks on it.

Carter knoll, a small patch with 20 fathoms water on it, lies 5 miles W.S.W. of the south-west end of Sanders bank and 15 miles S.S.E. $\frac{1}{2}$ E. from cape Hart.

CAPE WILLOUGHBY.—Cape Willoughby, the east end of Kangaroo island, is a bold rocky headland 173 feet high.

LIGHT.—Cape Willoughby lighthouse stands on the summit of the cape. The tower is white, 75 feet high, and exhibits, at 247 feet above high water, a *revolving catoptric* light of the first order, which attains its greatest brilliancy *every one-and-a-half minutes*, and may be seen from a distance of 24 miles in clear weather. It is visible between the bearings of N. 45° E. round by north and west to S. 14° E.

Signal station.—This lighthouse establishment is connected by telegraph, and communication can be made by the commercial code of signals. The storm signal is a blue swallow-tailed flag under a red ball.

Tides and tidal streams.—It is high water, full and change, at cape Willoughby, at 4 h. 10 m.; springs rise 6 feet. Inside the cape, the stream sets to the northward during the rising tide and to the southward during the falling tide.

Cape St. Alban, the eastern headland of Antechamber bay, lies $2\frac{1}{2}$ miles in a N. by W. direction from cape Willoughby.

Scraper shoal.—A bank of sand and rock, about half a mile south-east of cape St. Alban. The least water on the shoal, bearing E.S.E. 4 cables from cape St. Alban, is 13 feet. This is a sandy patch which apparently shifts in position and depth, and does not break. The shoal is at times nearly dry, and in stormy weather breakers mark its position; it should be carefully avoided by vessels keeping this part of the coast aboard, as the tidal streams run with great rapidity in its vicinity, and set directly over the shoal. In fine weather, with smooth water, the tide-ripples show the position of the shoal. There are 4 fathoms water in the passage between the shore and Scraper shoal, and 7 fathoms close to its eastern edge.

The depth on the Scraper shoal varies according to the season; generally less water will be found in the winter. At times a ship drawing 12 feet might cross it, whilst occasionally it is nearly awash.

Directions.—The telegraph station (89 yards from the lighthouse) on cape Willoughby kept in line with the centre of the

lighthouse S. by W. (S. 11° W.), leads 3 cables to the eastward of Scrapper shoal in 7 fathoms at low water, spring tides.

By night, when the telegraph station is not visible, keep a good berth by not bringing the light to bear south of S. by W. (S. 11° W.).

ANTECHAMBER BAY is between cape St. Alban to the south-east, and cape Coutts to the north-west, the distance between these headlands being $3\frac{3}{4}$ miles. The bay, which is $1\frac{1}{2}$ miles deep, is bordered by a sandy beach. There are 13 fathoms in the centre of the bay, gradually shoaling to 10 fathoms at 7 cables off shore, when the water suddenly shoals to 3 fathoms, sand, and then shoals gradually to the beach. The north-west shore of the bay is high and rocky, the centre low, and the south-east end high and woody. A rocky point, $1\frac{1}{4}$ miles from cape St. Alban, divides the beach. North-east of this point are some rocky patches, the least water on which—12 feet—is W. by S. from cape St. Alban, and nearly N. E. by E. 4 cables from the point. In the southern part of the bay no vessel of any considerable draught should anchor in less than $3\frac{1}{2}$ fathoms, at low water; this part, however, is only frequented by vessels employed by the Government to take supplies to the lighthouse.

Anchorage.—This bay affords a most convenient anchorage for vessels bound though Backstairs passage meeting with head winds during contrary tides, and for shelter during gales. Vessels anchor in any part of the bay half a mile off the beach; but the most frequented anchorage is off the north-west end of the beach, with cape Coutts N. by W. $\frac{1}{2}$ W. and the entrance to Chapman river (a small stream near the north-west end of the beach), from S.W. to W.S.W. in $3\frac{1}{4}$ fathoms, sand, about a quarter of a mile off shore. This anchorage is perfectly sheltered from all westerly winds and out of the strength of the tidal stream. Good anchorage may be obtained in $3\frac{1}{2}$ fathoms, on a sandy bottom in the south-east angle of the bay, with cape St. Alban in line with South Page island bearing E. by N. $\frac{1}{2}$ N., about half-way between the cape and rocky point, 4 cables off shore. Smaller vessels anchor further in, according to draught. The stream is scarcely felt inside the 3-fathoms line.

From its position it would appear to a stranger that during winds from E.S.E. a heavy sea would enter the bay ; such, however, is not the case, as the strong tidal streams in the passage cause so great a ripple that the swell is smoothed before it reaches the shoal water. The heaviest swell is after strong southerly gales, when a *roll* comes in round cape St. Alban, and at times renders landing in the north-west corner of the bay difficult. In such cases the southern portion of the anchorage is the smoothest ; but with plenty of cable a vessel will ride in any part of the bay.

Fish.—The bay abounds with fish.

Cape Coutts, the north-west end of Antechamber bay, is bold high land, with soundings of 14 fathoms within 100 yards of the rocks.

Tides and tidal streams.—It is high water, full and change, in Antechamber bay at 2 h. 15 m. ; springs rise 4 to 5 feet, neaps rise 2 to 3 feet. The streams in the passage run for nearly 2 hours after high and low water.

The coast.—From cape Coutts a bold clifty coast rounding gradually, with deep water close to, extends to Hog bay point.

Hog bay point is W. by N. $\frac{1}{2}$ N. 7 miles from cape Coutts. It has a small sandy beach on its west side, and a shallow boat harbour on its east side. The land about Hog bay point is cultivated. There is anchorage for coasters in the sandy bay to the eastward in from 2 to 4 fathoms water, one to 2 cables off the beach. Small coasters also anchor off the mouth of the boat harbour where they are out of the stream, to land and take in cargo.

BACKSTAIRS PASSAGE.—The eastern entrance into the gulf of St. Vincent and Investigator strait is bounded to the south-west by Kangaroo island, from cape Willoughby to Kangaroo head, and to the north-east by cape Jervis, a prominent headland, bearing N. by W. $\frac{1}{4}$ W. distant 13 miles from cape Willoughby, with a ledge of rocks extending about 400 yards from its north-western side. This passage is 12 miles long, and 7 miles wide between cape Jervis and Kangaroo island.

The Pages are a rocky group lying N.E. by E., between 8 and

10 miles from cape Willoughby. North Page, the largest of the group, is a rocky islet 69 feet high, and may be seen from a distance of 11 miles. South Page is nearly as high as North Page, from which it lies S. by W. about one mile. There is a channel between these two islets nearly one mile wide, having 7 to 13 fathoms water, which is quite safe with a commanding breeze.

The north portion of the rocks which lie S. by W. $\frac{1}{2}$ W. from 3 to 5 cables from the South Page islet, shows above water at all times of tide; but the south portion forms a reef, always covered.

CAUTION.—During light southerly winds, and the stream setting to the northward, this reef should be most carefully avoided by vessels standing across the passage, when to windward of the group.

Yatala shoal is $3\frac{3}{4}$ miles long N.W. and S.E., and a quarter of a mile broad, with 8 to 3 fathoms water on it; but round it the depth increases to 14 fathoms. The upheaving of this considerable body of sand may have been caused by the action of the tidal stream, which in this passage sometimes runs at a rate of 4 to 5 knots; and as it appears possible that time may reduce the depth of water on the bank, it should be guarded against by vessels of great draught. From the shoalest part, cape Willoughby lighthouse bears S. by W. $6\frac{3}{4}$ miles, cape Jervis N.W. by N. $7\frac{1}{4}$ miles, and South Page E. by S. $\frac{1}{2}$ S. $6\frac{1}{4}$ miles.

DIRECTIONS.—Backstairs passage presents to the navigator but few difficulties to overcome, it being navigable for vessels of any size or draught; and as there is a clear channel nearly 4 miles wide, on the south-west side, and another 3 miles wide, on the north-east side of Yatala shoal, the chart will suggest the best route through. If, on coming from the eastward, and bound up the gulf of St. Vincent, night should be approaching, keep on the north side of the passage, and haul round cape Jervis, all that coast being quite bold. To clear the rocks off cape Jervis keep cape Willoughby lighthouse shut in by the high land of cape St. Alban. When the gulf is open, and the vessel is about 5 miles north-west of cape Jervis, steer a N. by E. $\frac{1}{2}$ E. (N. 17° E.) course till off Port Adelaide. See page 316.

At night, from the southward, cape Willoughby light should not be brought to bear south of W. by S. $\frac{1}{2}$ S. (S. 73° W.) until quite certain.

of passing well east or west of the Pages islets. By keeping 3 or 4 miles from the coast of Kangaroo island, these islets are easily avoided; Yatala shoal and the rocks off cape Jervis are cleared by shutting in cape Willoughby light behind cape St. Alban.

Working to the southward.—As in deeply-laden ships it is impossible to beat through Backstairs passage in one tide, it is prudent, when bound out against southerly winds, to wait during the north-going stream in Antechamber bay.

The **TIDAL STREAMS** demand great attention, as they are rapid and sometimes irregular, often causing delay for days, unless the anchorage in Antechamber bay is taken advantage of. The tidal influence in the southern entrance of the passage does not extend far beyond cape Willoughby, when the stream takes a direction parallel with the coast, coming from the westward during the rising tide, and setting in a contrary direction during the falling tide.

As the stream in Encounter bay and off Murray beach runs from the south-east during the rising tide, the streams probably meet in the vicinity of the Pages islets. The rate of the stream in Backstairs passage varies according to the direction and strength of the prevailing winds, but at times it exceeds 4 knots, and it may be that under extraordinary circumstances it runs 5 knots.

KANGAROO HEAD, which is W. $\frac{1}{2}$ S. $1\frac{1}{2}$ miles from Hog bay point, is the eastern point of Nepean bay. It is a bluff, rocky point, with 7 fathoms water close to; the land rises steeply above the point to between 300 and 400 feet. The stream sets rapidly past Kangaroo head, and during the west-going stream it forms an eddy to the southward, with strong tide ripples, dangerous for an open boat, off the point.

NEPEAN BAY extends from Kangaroo head N.W. by W. $\frac{1}{2}$ W. 16 miles to Marsden point, and contains three extensive anchorages—Eastern cove, Western cove, and Kingscoté harbour.

Eastern cove, immediately west of Kangaroo head, extends across to Morrison point W. by S. 6 miles, with a depth north and south of $4\frac{1}{2}$ miles. There is good anchorage in Eastern cove anywhere

in from 7 fathoms water between the outer points, to 4 fathoms near the head of the cove.

The shore of Eastern cove trends S. by W. $2\frac{1}{2}$ miles from Kangaroo-head, rugged and rocky, to a sandy beach nearly three-quarters of a mile long; and then S.W. by S. 3 miles, in alternate beaches and low rocky points, to the south-eastern corner of the cove: the 3-fathoms bank extends from one-half to three-quarters of a mile from this shore.

From the south-east corner a beach trends to the south-west corner, $3\frac{3}{4}$ miles west with a curve to the southward, and broken by only one small rocky point.

At the south-west corner of the cove is the channel leading into Pelican lagoon, locally known as American river; off this part of the beach extensive sand-flats dry out nearly three-quarters of a mile.

Ballast head, a bluff-looking point, the lower part of which is composed of black rock, is 2 miles N.E. of the entrance to Pelican lagoon, and S.E. by E. $2\frac{1}{4}$ miles from Morrison point. Between Ballast head and Morrison point, the coast is rocky, with small stony beaches, and some cultivated land behind. There are 3 to 4 fathoms water a cable from the shore, and 4 fathoms close to Ballast head.

Southward of Ballast head the land rises in wooded hills from a low and rocky shore, fronted by a flat which increases in extent near the entrance to the lagoon.

The south side of the cove is low, with wooded hills at the back.

Anchorage.—The best anchorage is on the western side of the cove, with Ballast head bearing from S.W. to N.W., in from 6 to 7 fathoms water on the former, and 4 to 5 fathoms on the latter bearing; and from one-half to $1\frac{1}{2}$ miles off shore. The bottom is ooze and mud.

Towards the eastern side of the cove the holding ground is not so good, there being extensive patches of limestone rock. A northerly gale throws a high short sea into Eastern cove: to be out of this coasters usually anchor under Ballast head, with that point bearing N.N.E., in 3 fathoms, or as far in as their draught will allow. Eastern cove abounds in fish.

Eastern cove is principally frequented by coasters and small craft overtaken by bad weather from the north-westward, at the out-ports in the gulf of St. Vincent. There is, however, no reason why vessels of a larger class, when seeking shelter, should not take advantage of this fine bay, as a ship will often fetch into Eastern cove, when a day's hard work would be requisite to beat up, during westerly gales, to the anchorage under Marsden point or into Kingscote harbour. Large vessels, from their draught, will not obtain much shelter from northerly winds, as they are unable to get under the lee of Ballast head.

Pelican lagoon, a shallow sheet of water south of Eastern cove, is about $3\frac{1}{2}$ miles long east and west, and $1\frac{1}{2}$ miles north and south. An arm of the lagoon extends to half a mile from the south side of Kangaroo island. Pelican lagoon is connected with Eastern cove by American river, a passage 2 miles long, half a mile broad, and much narrowed by sand-banks which run out on each side. This channel runs in a south-westerly direction from Eastern cove into the west end of the lagoon, after passing on the west side of two small islets.

Buoys and directions.—For the guidance of those who may be desirous of seeking shelter in American river, the entrance has been marked by a chequered black and red perch buoy, moored in mid-channel in 9 feet at low water. Vessels pass on either side of it; half a mile to the S.W. of this buoy, a similar buoy has been moored in mid-channel. After passing this latter buoy, by attending to the lead and keeping a good look out, no difficulty will be experienced in reaching the anchorage off Buick's, the sand-banks on either side being well defined.

Tides and tidal streams.—It is high water, full and change, at the entrance of Pelican lagoon at about 4h. 0m; spring tides rise 4 feet.

The streams in the American river run at the rate of from 2 to 3 knots, and begin from one to two hours after high and low water respectively.

Morrison point is a headland of moderate elevation, having a few straggling rocks at a cable off it.

Western cove extends from Morrison point across to Bear

point, W.N.W. 8 miles. Its southern shore trends from Morrison point half a mile West, and then $2\frac{1}{2}$ miles W.S.W. to a red cliff point, being high and rocky between. A range of wooded hills along the south side of Western cove gradually falls to the westward.

Frenchman rock lies N.W. by N. to N. by W. from three-quarters to one mile from the red cliff point; it is an extensive rocky patch half a mile long N.W. and S.E., and a quarter of a mile broad. There are 20 feet water just inside the rock, and 5 fathoms directly outside. The shoalest water on the rock is 12 feet, with the red cliff point S.E. by S., 8 cables distant. The soundings decrease from the rock towards the shore, from 3 fathoms to 2 close to the cliff point, with several rocky patches on the bottom.

Morrison point bearing E. $\frac{1}{2}$ S. leads a quarter of a mile to the north of the rock, the point bearing East just clearing the north end of the rock; and Kangaroo head just shut in by Morrison point, bearing E. $\frac{3}{4}$ N., just leads clear inside the rock, but over a 2-fathoms rock one mile farther to the westward.

The southern shore from the red cliff point trends about West for $7\frac{1}{2}$ miles to the bight of Western cove. The red cliffs extend $1\frac{1}{2}$ miles west from the red cliff point, after which the shore is a continuous sandy beach to the western end of the cove.

Two rocky patches which dry at low water lie off the west end of the red cliff, and bear N.W. and W.N.W. from it, each half a mile off, with only 9 feet water between them and the shore.

Commencing to the eastward from the red cliff point, a sand flat dries off shore from a quarter to half a mile all round the cove.

From the west corner of Western cove the shore trends N.E. by N. $5\frac{1}{2}$ miles to Bear point, at the entrance to Kingscote harbour; this is low and swampy, with shallow water extending more than a mile off shore. The Three-well or Cygnet river joins the sea $2\frac{3}{4}$ miles from Bear point, it is only navigable for boats at high water.

Anchorage.—There is good anchorage in any part of Western cove except off the red cliffs on the south side, where the bottom is rocky. In the centre of the cove there is a depth of from 5 to 6 fathoms water, gradually shoaling towards the west side.

More than 3 fathoms water will be found anywhere to the eastward of the western sand-hills on the south side; and there is good

anchorage in 3 fathoms with these sand-hills, bearing South half a mile distant.

Bear point is low and cliffy ; from it, a low and sandy coast leads N. by W. one mile to Kingscote point, and from which a narrow sand-spit extends half a mile in a northerly direction.

The land between these points is high, and cultivated on the summit.

Bay of Shoals.—From Kingscote point the land trends nearly West, for 3 miles, and then curves round to a low sandy point bearing N.N.W. $2\frac{3}{4}$ miles from Kingscote point, enclosing a shallow sheet of water known as the bay of Shoals. This bay is blocked up at its entrance by sand banks, through which there are three narrow channels, the inner parts of which have not more than 3 feet in them at low water. Inside the bay there is a depth of 9 to 10 feet ; it is only used by coasters.

The **COAST**, from the low sandy point at the north end of the bay of Shoals, trends North 2 miles to Marsden point, which is $4\frac{1}{2}$ miles N. by W. of Kingscote point.

KINGSCOTE HARBOUR.—The eastern sand-bank off the mouth of the bay of Shoals extends to the eastward and southward nearly 4 miles, and forms Kingscote harbour, a sheltered anchorage for vessels under 18 feet draught of water. The outer part of the above sand-spit runs nearly in a straight line S.E. by E. $\frac{1}{2}$ E. $4\frac{1}{4}$ miles from the north point of the bay of Shoals, and then S. by W. $\frac{1}{4}$ W. $1\frac{1}{4}$ miles to its south end. The spit then curves back, being more than half a mile wide ; a considerable portion of it is dry at half tide, with two small bushy islets on it ; Busby islet North one mile, and Beatrice islet E. by N. 2 miles, from Kingscote point. The south end of the spit may be rounded near to in 15 feet water, but there are not more than 17 feet south-east $1\frac{1}{2}$ miles from the end.

Kingscote, a postal township with telegraph station, has weekly steam communication with Port Adelaide.

Jetty.—There is a jetty, 287 feet long, with a depth of 10 feet at the outer end running out from Kingscote point.

Light.—A *fixed* white light is exhibited from a white wooden house on Kingscote jetty end, visible in clear weather from a distance of 8 miles.

Buoys.—A circular bell buoy, with framework and ball, painted red and marked with letter T on each side of frame, is moored in $3\frac{1}{2}$ fathoms at the end of the shoal; in line with beacons on Bear point, N. 67° W., 4 miles, it marks the direction of the telegraph cable between Kingscote and Yankallila; and a perch buoy, painted red, is moored in 4 fathoms, with the bell buoy bearing E. by S. $1\frac{1}{2}$ miles. Vessels anchoring to the southward of these buoys, or well to the westward of the bell buoy, will be clear of the telegraph cable.

Supplies.—Fish are plentiful off the end of the small spit running north from Kingscote point, and there is a well of good water on the point, a short distance from the beach.

Rocket apparatus.—A rocket apparatus is maintained at Kingscote harbour, and in the event of a vessel being stranded near, and the lives of the crew being in danger, assistance will, if possible, be rendered from the shore.

Tides and tidal streams.—It is high water, full and change, in Kingscote harbour at 3h. 0m.; springs rise 5 feet. At the anchorage in Kingscote harbour the stream sets North during the rising tide and S.S.E. during the falling tide, half a mile an hour at springs. North of Kingscote, the tidal streams run through the narrow channels leading into the bay of Shoals, at the rate of 3 or 4 knots an hour.

Directions for Kingscote harbour.—Steering for Kingscote harbour from the eastward, Table-topped hill west of Kingscote point will be observed. To enter the harbour, bring a tall clump near the south fall of this hill to bear W. by N. and steer for it until Kingscote point bears N.W. by W. A N.W. by W. course, straight for Kingscote point, will then clear the sand-spit in $3\frac{1}{2}$ fathoms; and lead up to the best anchorage in 3 fathoms, with Bear point bearing S.W. by W. $\frac{1}{2}$ W. or W.S.W. 7 cables distant. Should the low sandy extreme not be made out, the high steep part of the point may be steered for when on the same bearing, N.W. by W.

Small vessels may bring the south fall of Table hill over the second beach south of Bear point, bearing West, until Beatrice islet is east of North, then steer for Kingscote point. By following

these directions a vessel will clear the south end of the spit by nearly 2 cables.

A good berth for a small vessel is with the bluff land west of Kingscote point seen over that point, bearing W. by N., and Bearpoint S.S.W., in 12 or 13 feet water, soft sandy bottom.

In rounding Marsden point bound to Kingscote, keep that point bearing west of N.W. $\frac{1}{2}$ W., until the red cliff point in Western cove bears South, to clear the shoal water outside the long sand-spit. The red cliff point bearing South leads east of the shoal water in 4 fathoms. Attention to the lead and a good look-out from aloft are necessary.

Telegraph cable.—Vessels running into Kingscote harbour for shelter, are requested to anchor to the southward or well to the westward of the telegraph buoy, in order to avoid the cable.

Two beacons have been erected on Bear point, which, when in line bearing N. 67° W., mark the position of the cable. It is particularly requested that vessels will anchor well to the north or south of this line.

Should a vessel anchor near the cable, a square blue flag will be shown from the telegraph station at Kingscote, signifying that her position must be shifted immediately.

MARSDEN POINT is a rocky headland of moderate height; with woody land rising to the westward for half a mile, to a height of 270 feet. A rocky fringe extends from 100 to 200 yards off Marsden point. The point may be rounded at the distance of half a mile, there being 10 fathoms north and $4\frac{1}{2}$ fathoms east of it, a quarter of a mile off.

Tidal streams.—East of Marsden point, the stream sets to the westward during the rising tide and to the eastward during the falling tide, nearly 2 knots at springs. In bad weather the streams are very irregular.

Anchorage.—There is good anchorage under Marsden point with the wind westward of N.N.W., with the point bearing from N.W. $\frac{1}{2}$ N. to N.W. $\frac{1}{2}$ W. distant from a half to one mile, in from 4 to 6 fathoms, with good holding ground, and smooth water out of the tidal stream.

This anchorage is much used by square-rigged vessels bound through Investigator strait during winter gales. By paying attention to the lead, the bearings of the point, and Kingscote jetty light, it may be taken advantage of by night with nearly the same facility as during the day.

THE GULF OF ST. VINCENT* is formed between the east coast of Yorke peninsula and the coast extending to the northward from cape Jervis. The breadth of the gulf between that cape and Troubridge hill, which bears N.W. from it, is nearly 34 miles; and in this space there are regular soundings in 18 to 20 fathoms. The soundings decrease to 12 and 11 fathoms within 4 miles of Troubridge shoals, to the eastward of which in mid-channel are 22 fathoms. The gulf extends nearly 80 miles to the northward, gradually decreasing in width to its head.

In fine weather small vessels anchor and work cargo off any of the beaches in the gulf, but the coast from cape Jervis to Port Adelaide is exposed to the westward, and a gale from that quarter throws in a heavy sea.

Directions.—In entering the gulf of St. Vincent the high range of hills on its eastern side, extending from the southward to mount Lofty, the northern extremity of some table land, may be seen from a considerable distance. This mount, the highest part of the range, 2,330 feet above the sea, bears N.N.E. $\frac{1}{4}$ E. 50 miles from cape Jervis. For 18 miles from cape Jervis the coast is high and bold, thence to the head of the gulf it is very low, with sand hummocks upon it. After passing the high coast land the water shoals some distance out, and in some places, within 10 miles of Port Adelaide lighthouse, there are 5 fathoms about 4 miles from the beach. Great attention must be paid to the soundings, and in running for Port Adelaide it is not desirable to go into less than 6 fathoms, as within that depth it shoals suddenly.

CAPE JERVIS is a high bold headland, having but little vegetation. It is intersected by gullies, and has several cliffy projections, the western and most prominent of which is referred to as the cape; this does not present so steep a face to the sea as the other projections, but gradually slopes down from the heights 2 miles inland. There is a convenient little boat-harbour within the rocks,

See chart, No. 2,389a.

* So named by Flinders in honour of the noble Admiral who presided at the Board of Admiralty, when the *Investigator* sailed from England.

which extend about 2 cables from the north-west side of the cape ; off which the soundings rapidly increase from 4 to 11 fathoms. From the cape the coast trends N.N.E. $\frac{1}{2}$ E. 6 miles to Rapid head.

LIGHT.—Cape Jervis lighthouse is 23 feet high, painted white, and exhibits at 74 feet above the sea a *fixed* white light, visible from seaward between the bearings of N. 5° W. and S. 22° W., which may be seen from a distance of 10 miles in clear weather.

Signal and telegraph station.—There is a signal station at the lighthouse, which is connected by telegraph, and communication can be made by the commercial code of signals. The storm signal is a blue swallow-tailed flag under a red ball.

Second valley.—From Rapid head the coast curves East about a mile to Rapid bay, where there is a jetty, 160 feet long, with a depth of $2\frac{1}{2}$ feet at its outer end at low water. It then trends N.E. by E. about 2 miles to Second valley, a little cove formed by a slight indentation of the coast, affording to small vessels some protection from southerly winds by a rocky point, on which there is a jetty 105 feet long, with a tramway, and a depth of 6 feet at its outer end at low water. The district is an agricultural one, and coasters carry away the produce.

There is deep water close to the rocky point on the western side of this little bight ; but as the anchorage is exposed to winds from W.S.W., round by north, to N.N.E., and a heavy sea sets in on the approach of a westerly gale, coasters should leave this exposed anchorage with the first sign of bad weather.

TIDES.—It is high water, full and change, in Second valley, at 3h. 20m. ; springs rise 6 feet.

YANKALILLA is a township situated on the Bungala river, 2 miles from the sea, N.E. 6 miles from Second valley, with a population in 1891 of 370 persons. Bungala river intersects a sandy beach extending to Carrickalinga, a bold headland N. by E. $\frac{3}{4}$ E. $3\frac{1}{2}$ miles from the river. The jetty is 420 feet long with two cranes on it, but it has only 3ft. 6 ins. at its outer end at low water. Soundings off the jetty decrease from 5 fathoms, on a sandy bottom, at one mile, to 4 fathoms at three-quarters of a mile from the shore ; but the whole extent thence to within a few yards of the beach is one

mass of rocks. Coasters carry away the agricultural produce of the district, and occasionally large vessels load wheat, wattle bark, &c.

Telegraph.—There is a telegraph station, and a submarine cable is laid from here to Kingscote, Kangaroo island.

Caution.—Vessels are cautioned not to anchor near the line of telegraph cable : in case of a vessel doing so, a square blue flag will be hoisted at the Yankalilla flagstaff, when she must at once weigh, and take up another position. To moor or anchor clear of the cable keep the jetty bearing East to E.S.E.

A rocket apparatus in case of shipwreck is kept here.

TIDES.—It is high water, full and change, at Yankalilla, at 3h. 30m. ; springs rise 6 feet. †

Myponga bay, S.S.W. about 7 miles from Willunga, although open to winds from North, round by west to S.W., is safe in southerly winds. There is a jetty 360 feet in length, with 7 feet at low water at its outer extremity, and a patch of sunken rocks off it ; the shoalest part with 3 feet water, is 40 yards N.N.E. of the jetty end.

Small vessels constructed to take the ground may load at the end of the jetty, but in no case to a draught of more than 8 feet.

Anchorage for large vessels is to the northward of the jetty, there being 3 fathoms at low water within 200 yards of it.

Caution.—Masters of vessels should pay great attention to the barometer during the winter season ; and in the event of its falling and the wind drawing to the North or N.W., an offing should be sought without delay, and shelter taken in Eastern cove.

The coast from Carrickalinga head trends N.E. by E. $5\frac{1}{2}$ miles to the bight of Aldinga bay, and thence N. by W. $4\frac{1}{2}$ miles to Snapper point, from which a reef extends more than half a mile in a W.N.W. direction, with its western edge trending nearly parallel with the coast, for fully 2 miles to the southward. Its northern edge extends east to about $1\frac{1}{2}$ cables north of Snapper point, and then rounds into the bight of Willunga bay.

Buoy.—A large red perch buoy, which may be seen at a distance of 4 miles, has been placed in 12 fathoms water, with Snapper point bearing S.E. by S. distant three quarters of a mile, near the edge of the reef stretching westward from the point. In the event of any accident occurring to the buoy, the reef off Snapper point may be cleared by keeping the inn—which is close to the beach on the north side of the jetty of port Willunga—twice its own breadth open north of the end of the jetty. The buoy is placed inside this line.

Willunga.—The township of Willunga, with a population in 1891 of 532 persons, is situated at the western foot of the hills, about 5 miles eastward of the port. Large quantities of slate are shipped from here. The district is agricultural. There is a jetty 621 feet long, with a crane on it, having 9 ft. 6 ins. at low water, at its outer end. Large vessels at times load wheat, wattle bark, &c., from this port. There is also a coasting trade.

There is a telegraph station at Willunga, and there are mail coaches twice daily between it and Adelaide.

PORT WILLUNGA, which lies north of Snapper point, and may be recognised by its white cliffs, extends from that point nearly N.N.E. $\frac{1}{4}$ E. $1\frac{3}{4}$ miles to Blanche point, and is about one-third of a mile deep.

DIRECTIONS.—Approaching port Willunga from the southward stand in for the white cliffs, guarding most carefully against the reef which extends from Snapper point, by keeping the red buoy on the starboard hand, or not hauling into the bay until the end of the jetty bears E. by N. $\frac{1}{4}$ N. (N. 76° E.), in line with a small house on the high ground inland. On this line stand in and anchor.

From the northward there is no difficulty in approaching the coast after having passed the reefs off Onkaparinga, 7 miles to the northward of port Willunga.

Anchorage.—There are 6 to 3 fathoms water in the bay, sheltered from southerly winds by the reef extending from Snapper point, which is the only danger near the anchorage. The holding ground is good anywhere outside the 4-fathoms line off the jetty; but the anchorage being exposed to all winds from N.W. round by

west, to S.W., at times a heavy sea rolls in, causing vessels at anchor to be uneasy, and, unless well found in ground tackle, rendering their position unsafe. On the approach of a north-west gale, which is indicated by a falling barometer and the wind freshening from the northward with a cloudy sky, shelter should be sought in Eastern cove, Kangaroo island, where a vessel may anchor in perfect safety, according to her draught, and remain until favourable weather enables her to return to port Willunga.

Rocket apparatus.—A rocket apparatus is maintained at port Willunga and in the event of a vessel being stranded near, the crew being in danger, assistance will, if possible, be rendered from the shore.

Onkaparinga head and river.—From Blanche point, 120 feet high, the coast trends N. $\frac{1}{2}$ W. about 5 miles to Onkaparinga head, a cliffy projection, 80 feet high, with a ledge of sunken rocks extending from it. Onkaparinga river is a small stream, which flows into the sea through a bar of shifting sand, about one-third of a mile north of the head. From the mouth of the river a sandy beach, with sand-hills behind it, trends N. by W., nearly a mile to Witton bluff.

Noarlunga, 20 $\frac{1}{2}$ miles south of Adelaide, is a small township, with, in 1891, 154 inhabitants, on the banks of the Onkaparinga river, a short distance from its mouth. The district, which has a population of 842, is agricultural, principally wheat growing. There is a telegraph station, and daily communication with Adelaide by coach.

PORT NOARLUNGA (ONKAPARINGA) is a safe and convenient little harbour formed by the protection which two narrow reefs afford the anchorage. It may be easily recognised by Witton bluff, a bold reddish-coloured cliffy projection, 114 feet high, having a remarkable square detached rock at its base, lying nearly one-third of a mile north of the jetty.

The two breakwater reefs which protect the anchorage from the westward, lie in a N. by W. $\frac{1}{2}$ W. direction, nearly parallel with the coast, from the low-water mark of which they are distant from 200 to 350 yards; the greatest distance being between the northern reef and the shore, immediately south of the jetty. The north and south reefs together extend from half a mile south to nearly a quarter of a mile north-west from the outer end of the jetty, and are

separated by Middle channel. The north reef is 630 yards long and the south reef 550 yards.

These reefs are only about 30 yards wide, and the highest parts do not exceed about 4 feet above low-water level ; they are consequently, during high springs, covered for a short time to the depth of 2 feet, but at other times they distinctly show their extent and direction by appearing above water.

Port Noarlunga is said to be a safe port for coasters not exceeding 200 tons, and of moderate draught. In westerly gales a short sea gets over the reefs at high water, but at other times of tide, when the reefs are uncovered, the water is quite smooth. The jetty which is 600 feet long, with a depth of 13 feet at the outer end at low water and a crane and tramway, is a great convenience in loading ; it is sheltered by the north reef, and being visible a considerable distance from seaward, is a good mark by which a stranger may pick up the entrance of the harbour.

South channel, which should only be used by small vessels of light draught, is 100 yards wide at its narrowest part, between the reef and a shoal spit projecting from the beach, nearly opposite the southern end of the reef. There are 9 to 10 feet water near the southern end of the reef.

Middle channel is 130 yards wide, and has as much as 5 fathoms water in its centre, with the depth decreasing to 3 fathoms close to the points of the reefs on either side.

North channel is 270 yards wide, with 10 feet water, the deepest water being close to the reef, whence the depth gradually decreases to 8 feet about 50 yards from the beach.

Soundings.—There are 6 to 7 fathoms water at a moderate distance from the back of the reefs, and in the harbour the soundings vary from 2 to $3\frac{1}{2}$ fathoms ; the deepest water being close to the reefs, and in the northern part of the harbour.

DIRECTIONS.—From the southward, for port Noarlunga keep at least one mile off the coast until Onkaparinga head bears East, when steer for either of the entrance channels.

From the northward.—To enter the port from the northward keep fully one mile off the coast until Witton bluff bears East, to avoid Horse-shoe rock, which lies about half a mile from that headland.

South channel.—If under 10 feet draught, entering by this channel, bring the black beacon on the beach, in line with the upper red beacon on the sand-hills, bearing N. by E. $\frac{3}{4}$ E. which leads into the harbour, in not less than 10 feet at low water. Having passed the southern point of the south reef keep close along its inner edge, to avoid the spit which projects from the beach on the opposite side.

Middle channel.—The fairway of this channel is marked by two square red beacons, one being that on the sand-hills before noticed, and the other being near the beach; these kept in line bearing E. by N. $\frac{3}{4}$ N. lead into the harbour in 5 fathoms water, quickly shoaling inside. After passing between the reefs anchor according to circumstances, but the north side should be preferred, as the water is smoother under the north reef, and is more convenient to the jetty.

North channel.—A round black beacon on the jetty in line with the inner square red beacon on the sand-hills, bearing S.E. $\frac{1}{4}$ E. leads into the harbour.

TIDES.—It is high water, full and change, at port Willunga and port Noarlunga at 4h. 0m.; springs rise 6 feet.

The COAST in this part of the gulf of St. Vincent consists of sand-hills, with occasional reddish-coloured cliffs of moderate elevation. The soundings are generally deep and regular; but some rocky points have reefs projecting into deep water, which are easily avoided by keeping a moderate distance off the land. As a rule it is not prudent to stand into less than 9 fathoms water.

From Witton bluff a somewhat rocky coast extends nearly N.N.E. 4 miles to Black cliff, and thence 2 miles farther in the same direction, when it is succeeded by a sandy beach, trending N. $\frac{1}{2}$ W. 4 miles to Glenelg jetty, which is distinguished by a lighthouse. There is a jetty at Brighton, about 3 miles south of Glenelg, 580 feet long. The population of Brighton in 1891 was 874. The coast about

Glenelg makes a slight curve inland, and a creek, which dries across the mouth at low water springs, runs into the sea a short distance to the northward.

Horse-shoe rock, nearly half a mile N.N.W. from Witton bluff, dries at low water. The rock is 400 yards long in a N. by W. and S. by E. direction.

Mount Lofty, the highest part of a range lying along the east side of St. Vincent gulf, is 2,330 feet high, and visible from any part of the gulf in clear weather, forming a good mark for vessels. The summit of the range is thickly wooded, but the spurs and lower slopes are grassy. A spur of this range extends south-west from mount Lofty, till it reaches the coast about $3\frac{1}{2}$ miles south of Glenelg, entirely changing the character of the coast from low sand-hills to abrupt cliffs.

Glenelg, $6\frac{1}{2}$ miles to the southward of Adelaide, is a favourite place of resort during the summer months for sea bathing. Two railways connect it with Adelaide. The population in 1891 was 3,650 persons. There is a telegraph and signal station here.

HOLDFAST BAY* is an open roadstead off the town of Glenelg, having gradually decreasing soundings from 7 fathoms at 2 miles, to 2 fathoms at a quarter of a mile off the jetty.

Anchorage.—The anchorage is in 5 or 6 fathoms water, clay, at $1\frac{1}{2}$ to 2 miles from the shore, with the flag-staff in line with mount Lofty bearing E. $\frac{1}{2}$ N.; or in 5 fathoms, the jetty lighthouse bearing E. by N., distant $1\frac{1}{4}$ miles. South-west gales cause a heavy sea in this roadstead; but as the holding ground is good, vessels ride in perfect safety, if provided with good anchors and cables. The anchorage off the jetty is known as Holdfast bay, and was once the port for Adelaide. It is now seldom used, Port Adelaide being more convenient and safer, and Glenelg has become a watering place.

Storm signal.—A blue flag is hoisted at Glenelg on the indication of bad weather.

Glenelg jetty.—The jetty is a fine broad structure of iron,

* H.M.S. *Buffalo* anchored in Holdfast bay in 1836, when Governor Hindmarsh proclaimed South Australia a British province from under an old gum tree about half a mile from the beach.

See charts, No. 2,389a and No. 1,752, Approaches to Port Adelaide, scale $m = 1.0$ inch.

1,246 feet long, with 9 feet at low-water springs alongside the end; it is furnished with cranes, a tramway, and trucks, which, however, are seldom used.

The water deepens off this jetty much quicker than off the Semaphore, there being $3\frac{1}{2}$ fathoms half a mile, and 5 fathoms one mile from the shore.

LIGHT.—At Glenelg jetty end, a *fixed* red light 40 feet above high water is exhibited from an iron tower, 33 feet high and painted red and white; it may be seen from a distance of 8 miles in clear weather.

The COAST.—From Glenelg the sandy beach trends N. by W. $\frac{1}{2}$ W. 8 miles to point Malcolm, presenting a continuous line of sand-hills, dotted with houses, behind which the land is low and swampy for some distance. In fine weather the churches, town-hall, the smelting chimney, and other prominent buildings of Port Adelaide and Adelaide are visible, if not too close in, and at night some of the gas and electric lights are distinctly seen.

Jetties.—There is a jetty at Henley beach, about $3\frac{1}{2}$ miles north of Glenelg, 805 feet long with a depth of $7\frac{1}{2}$ feet at its outer end at low water, and one at Grange, nearly 4 miles south of the Semaphore, 1,010 feet long with a depth of $9\frac{1}{2}$ feet at its end at low water.

ADELAIDE, the capital of South Australia, and the seat of Government, is on the river Torrens, about 5 miles from the coast. The city is divided into North Adelaide and Adelaide by the river Torrens. The population, including suburbs, in 1894 numbered 142,663 persons. It is pleasantly situated on a large plain, the mount Lofty range of mountains walling it in on the eastern and southern sides. A plentiful supply of water is obtained from storage reservoirs holding together nearly 950,000,000 gallons of water filled from the river Torrens, and new waterworks are in progress at Happy valley, about 10 miles south of the city.

Meteorological observations.—In 1890, the mean height of the barometer was 30·04 inches, the mean of the previous 33 years being 30·06. The highest reading in 1890 was 30·58 in July, the highest during 33 years 30·73. The lowest reading in 1890 was 29·36 in September, the lowest during 33 years 29·23.

The maximum temperature was 105° Fahr. in January, the minimum

34° in July. The mean temperature of the previous 33 years was 63°, and during this period the temperature reached 90° on an average of 45 days a year.

The mean temperature of the sea, at Port Adelaide lighthouse, during the previous 18 years was 62°; the temperature of the sea ranged from 76° to 52°.

The rainfall in 1890 was 25·78 inches on 139 days; the greatest fall in 24 hours 1·8 inches on February 5th. The mean rainfall of the previous 33 years was 20·41 inches, the maximum annual fall was 30·87 inches in 1889 and the minimum fall 13·43 inches in 1876.

Semaphore jetty.—The semaphore jetty and signal station is three-quarters of a mile north of point Malcolm, and about a mile from Port Adelaide, across the peninsula. At the signal station the arrival of all vessels, and the depth of water in the river are signalled. *See* pages 334–6. Communication can be made with the signal station, which is connected by telegraph, by the commercial code. The jetty, which has a crane on it, is of wood, 2,200 feet long, with a cross head, forming a protection to the beach boats in bad weather; it runs out at right angles to the beach in a W. $\frac{3}{4}$ N. direction, and has a tranway for trucks along it; fresh water is laid on for supplying ships. There are 9 feet at low water at its outer end. Large numbers of passengers land here, a railway and telegraph station being at the inner end.

The sand-flat in front of Lefevre peninsula dries at low-water springs nearly out to the Semaphore jetty end, leaving barely room for the large boats employed by the boarding officers to moor inside the cross head. In fine weather the steam tug-vessels moor about a quarter of a mile off the jetty, ready to go to any ship signalled.

PILOTS.—Vessels are boarded by boats from the jetty. Pilots board ships arriving off Port Adelaide before such ships are within a distance of 2 miles from the Semaphore jetty. It is not compulsory for masters of ships to employ a pilot for the outside anchorage.

Caution.—The employment of a sea pilot is, at Port Adelaide, compulsory for all vessels not registered in one of the Australian colonies. Masters of ships should not attempt to enter the river at night without a pilot, unless they are well acquainted with the navigation, and then great care must be exercised, as some of the lights may be extinguished. It is also recommended that large or

heavy draught vessels should not enter until the tidal signals exhibited from the Semaphore show at least one foot above the vessel's draught.

LIGHT.—From a wooden tower at the jetty end, at an elevation of 30 feet above the sea, a *fixed* green light is shown, which in clear weather should be seen from a distance of 5 miles; it is visible between N. 65° E. and S. 33° E.

Wonga shoal, extending off Malcolm point and curving to the northward has from 8 to 11 feet on it for a mile off shore, on the north-west point there are 17 to 18 feet at about $1\frac{1}{4}$ miles W.N.W. from the Semaphore jetty; and there is less than 12 feet at about three-quarters of a mile W. $\frac{1}{2}$ N. from the jetty.

Buoy.—The end is marked by a red bell buoy with cage and ball in 19 feet water, lying W. by N. $\frac{3}{4}$ N. $1\frac{1}{10}$ miles nearly from the Semaphore jetty lighthouse, and S. by W. $\frac{1}{2}$ W. $2\frac{3}{10}$ miles from Port Adelaide lighthouse.

Anchorage.—The general anchorage for large vessels is in from $5\frac{1}{2}$ to $4\frac{1}{2}$ fathoms water, about a mile outside Wonga shoal buoy, with the jetty lighthouse E.S.E. to S.E. by E., and Port Adelaide lighthouse N.E. to N.E. by N.

Between Wonga shoal and the outer bar of Port Adelaide river there are no dangers, and the holding ground is good, bottom sand and weed; the best anchorage is about three-quarters of a mile to the northward of Semaphore jetty, where there are 18 feet at 2 cables, and 24 feet about three-quarters of a mile from the beach. This is known as the Semaphore anchorage.

A good scope of cable should be given and it is preferable to lie at single anchor.

In case of a vessel dragging her anchor, it is well to let go a second at once, as veering cable is of little use owing to the weedy nature of the bottom.

This anchorage is partially protected with the wind between S.W. by W. and South, by Wonga shoal.

Mooring buoy.—The black mooring buoy at the Semaphore anchorage is attached to a screw mooring by a $2\frac{1}{2}$ inch chain, and is strong enough for the largest ships. It lies in a depth of 28 feet at low water springs, with Port Adelaide lighthouse bearing N. 4° E. $1\frac{1}{2}$ miles.

Telephone buoy.—A black buoy floating the ends of the telephone cable lies 700 feet to the eastward of the mooring buoy at the Semaphore anchorage.

Prohibited anchorage.—Vessels using the Semaphore anchorage in Largs bay, are cautioned, in order to prevent damage to the telephone cables, against anchoring in the line between the telephone buoy and the outer end of Largs jetty, or between the mooring and telephone buoys, where the cables are laid.

Leading lights for Semaphore anchorage.—Two *fixed* red leading lights are exhibited, one from the Time ball tower, the other from the flagstaff at the inner end of the Semaphore jetty; which kept in line, bearing S.E. $\frac{1}{4}$ S. (S. 42° E.) lead through the deepest water in Semaphore anchorage to the mooring buoy for ocean steam vessels. These lights appear some distance apart vertically; they are obscured southward of Wonga shoal buoy. The red light, north-east of the Port Adelaide light, in line with the white light on No. 11 beacon, bearing N. by E. $\frac{1}{2}$ E. (N. 17° E.), also leads to the mooring buoy.

Directions.—Large vessels approaching the Semaphore anchorage keep Port Adelaide lighthouse east of N.E., until the Time ball tower and the Water tower are in line, when the anchorage is steered for. The least water in this route is 4 fathoms. Vessels of suitable draught steer for the anchorage on passing the Wonga shoal buoy.

At night large vessels keep Port Adelaide light east of N.E. until the leading lights at the inner end of the Semaphore jetty are in line, which are then steered for and anchorage taken as convenient, or the mooring buoy picked up, in which case the lights leading to the buoy, bearing about N. by E. $\frac{1}{2}$ E. should be remembered.

Vessels of suitable draught, not intending to use the mooring buoy steer for the anchorage as soon as the two red lights at the inner end of the Semaphore jetty are visible, as they are obscured south of the Wonga shoal buoy.

Largs bay jetty.—The jetty at Largs bay is 2,105 feet long, and there is a depth of $17\frac{1}{2}$ feet at the outer end at low water. A railway from the jetty connects with the railway system.

Coal.—A large supply of coal is kept in stock at Port Adelaide ; vessels coal rapidly from lighters, generally without interruption, but occasionally in winter a heavy gale interferes with coaling at the Semaphore anchorage.

PORT ADELAIDE, the chief port of South Australia, is 6 miles from Adelaide, the capital. The town is situated on the south side of the river.

Westward of the town the stream is crossed by the Jervois railway swing bridge, connecting the port with Lefevre peninsula, above which the stream is not navigable, and after running 2 or 3 miles ends in swamps inside the sand-hills on the coast. Close to the above-mentioned bridge, on the east side of the stream, are the smelting works of the English and Australian Copper Company, the chimney of which is the best landmark for Port Adelaide ; it is of red brick, 160 feet high, and can be seen from seaward 12 or 14 miles.

Port Adelaide inner dock has an area of 5 acres, and a depth of 18 feet ; the outer dock has a depth of 14 to 20 feet at low water.

The principal wharves at Port Adelaide are,—the Dockyard wharf, 230 feet long and a depth of 18 feet alongside it at low water ; North Parade wharf 1,150 feet long and 18 feet depth ; Queen's wharf 300 feet long and 18 feet depth ; Coal Shed Creek wharf 1,650 feet long and 24 feet depth ; South Australian Company's No. 1 Quay 890 feet and 24 feet depth ; Commercial wharf 610 feet long and 24 feet depth (this wharf has a 15-ton crane on it) ; and McLaren's wharf 340 feet long and 22 feet depth (this wharf has a 25-ton crane on it). The Eastern and Australian Copper Company's wharf is nearly 700 feet long with a depth of from 13 to 24 feet alongside. Moccings are laid down on the north and west sides of the harbour to which ships are secured bow and stern.

There is a good road and railway between Port Adelaide and Adelaide. Tramways are laid down from the railway terminus along the wharves. Fresh water is laid down at all the wharves, so that a vessel can water alongside. The population was 5,005 in 1891.

Trade.—During the year ending June 1891, 88 ocean steamships arrived at Port Adelaide of a total registered tonnage of 152,549.

The largest of these vessels was 404 feet in length, drawing 22 to 23 feet of water.

In 1894, vessels of a tonnage of 2,235,766 entered and cleared at Port Adelaide. The exports are wool, wheat, bark, gold, copper and lead ores, salted hides, tallow, gums, wine, fruit, &c.

Docks, &c.—There is no dry dock at Port Adelaide, the site for one has been excavated, but nothing further done. There are five patent slips on the north side of the river, the largest is 250 feet long and 33 feet broad, and is capable of taking up vessels of 1,500 tons register; another, vessels of 500 tons, whilst vessels of 200 tons can be repaired on the smaller slips. Repairs of any size can be executed at Port Adelaide, by the different firms for large work.

Telegraph.—Port Adelaide is connected with the universal telegraph system.

Port Regulation.—All vessels arriving from over-sea ports, within 5 miles of the Semaphore station, between daylight and dark (or after dark at daybreak), shall hoist the following signals:—

- 1st. The national ensign at the peak or ensign staff.
 - 2nd. The ship's name
 - 3rd. The port whence she arrives
- } by commercial code.

3rd. All vessels arriving coastwise, within 5 miles of the Semaphore, or within the same hours as above, shall hoist at the main, and keep flying for one hour, one of the following signals, indicating the name of the port of departure, the figures corresponding with commercial code book, numeral and number table, part I., page 73:—

V.W.G. or 1 Port Wakefield.	V.W.N. or 7 Port Robe.
V.W.H. „ 2 Willunga or Noarlunga.	V.W.P. „ 8 Port Macdonnell.
V.W.J. „ 3 Yankallila, Second valley, or Rapid bay.	V.W.Q. „ 9 Port Augusta.
V.W.K. „ 4 Kangaroo island.	V.W.R. „ 0 Wallaroo or Tiparabays.
V.W.L. „ 5 Port Victor, or Encounter bay.	V.W.S. „ 10 Port Lincoln.
V.W.M. „ 6 Port Caroline.	V.W.T. „ 12 Any other part of Spencer gulf.
	W.B.C. „ 13 Fowler bay.
	W.B.D. „ 14 Streaky bay.

W.B.F. or 15 Flinders island, or westward of Spencer gulf.	W.B.R. Glenelg.
W.B.G. ,, 16 Yorke peninsula.	W.B.S. Goolwa.
W.B.H. ,, 17 Any part of gulf of St. Vincent not enumerated.	W.B.M. Greytown.
W.B.J. ,, 18 Fishing or whaling voyage.	W.B.T. Minlacowie.
W.B.P. Port Alfred.	W.B.V. Moonta.
W.B.Q. Ardrossan.	W.B.L. Port Pirie.
W.B.M. Beachport.	B.C.D. Port Rickaby.
W.B.K. Port Broughton.	B.C.F. Stansbury.
W.B.N. Edithburgh.	B.C.G. Port Turton.
	B.C.H. Port Victoria.
	B.C.J. Port Vincent.
	B.C.K. Eucla.
	B.C.L. Venus bay.

Boarding station.—Bearings of limits,—end of Semaphore jetty, from E. to E.S.E. ; Port Adelaide lighthouse, N.N.E. to N.E.

Should the Customs boat (showing Customs flag and pendant by day, flash light by night) appear at any other part of the gulf, all ships must heave-to and allow the officer to come alongside, and keep hove-to during the time the officer is on board, or has his permission to proceed.

Lefevre peninsula is the tongue of low land, about 7 miles long, north and south, and one broad, between Port Adelaide river and the sea. From Snapper point its northern coast trends W. by N. nearly a mile to a low sandy point named Pelican point, and then about S. $\frac{1}{2}$ W. 5 miles to a rounded point known as Malcolm point ; the coast line is beach backed by sand-hills about 40 feet high.

Snapper point, a low sandy beach point, forming the north-east corner of a low tongue of land known as Lefevre peninsula, bears S. $\frac{1}{2}$ W., half a mile from the north end of Torrens island.

Position.—A cast iron pile with a white top marks the observation spot, which is in lat. $34^{\circ} 46' 50''$ S., and has been considered in long. $138^{\circ} 31' 0''$ E.

In 1883, the longitude of this pile was determined by telegraphic observations to be $138^{\circ} 30' 50''$, or 9h. 14m. 3.37s. E., considering it 17.02s. West of Adelaide observatory.

Buoys marking silt discharging ground. To mark the western limit of the discharging ground, two buoys are placed on the west side of the north bank at the entrance to Port Adelaide river. The southern buoy is red, cheese shaped, with staff and ball, and lies in $3\frac{1}{4}$ fathoms, Port Adelaide lighthouse bearing S. by E. $\frac{3}{4}$ E. $1\frac{1}{4}$ miles. The northern buoy is red, cheese shaped, with framework and ball, and lies in 2 fathoms, Port Adelaide lighthouse bearing S. by E. $\frac{3}{4}$ E. distant $3\frac{4}{10}$ miles.

LIGHT.—At the entrance of Port Adelaide river, a *revolving* white light is exhibited from an iron tower 80 feet above high water; the light attains its greatest brilliancy *every half-minute*, and is visible in clear weather from a distance of 15 miles. The tower is painted red, and built on piles in 7 feet at low water, about 2 cables west of the western point of the southern sand-bank, and is known as Port Adelaide lighthouse.

Lights.—Two leading lights, about 340 yards apart, when in line bearing N.E. by E. nearly, are exhibited from beacons at the entrance of the river. The inner is a *fixed* red light and the outer, on No. 12 beacon, a *fixed* white light. Twelve white lights are exhibited from beacons, Nos. 1 to 12, erected on points of the channel leading to Port Adelaide, and red lights from the Quarantine station jetty, and the jetty to the southward of North arm.

The light beacons are wooden piles painted red, and 18 feet above the sea. See footnote page 332.

PORT ADELAIDE RIVER.*—The channel of this river from the outer anchorage to the south end of No. 1 quay, Port Adelaide, has been deepened to a depth of 23 feet at ordinary low water, springs, or 31 feet at high water, for a width of 250 feet. The entrance to the river is marked by two perch buoys, red on the starboard, and black on the port hand in entering, about a quarter of a mile W. by S. $\frac{1}{2}$ S. from the lighthouse. This is at the commencement of the outer bar, through which a channel about 1,100 yards in length, and 250 feet wide has been made, the depth 23 feet at low water.

To keep in the centre of this channel, bring No. 12 light beacon, and the red leading light beacon in line, bearing N.E. by E. (nearly)

* Dredging operations have lately been carried on in this river, full details of which have not yet been received, November 1896.

See chart, No. 1,750.

until $1\frac{1}{2}$ cables past the reflecting beacon, when the cutting will be passed and Lights passage reached. Here the channel widens to between 400 and 500 feet, and retains that width for a distance of about 3,000 yards; the depth being from 20 to 24 feet at low water.

The inner bar is next approached, through which a channel has been dredged 250 feet in width, and 23 feet in depth at low water. In this cutting from No. 8 light beacon the width gradually increases to 600 feet, with not less than 20 feet water, at No. 7 beacon and decreases to 250 feet at No. 6 beacon.

Abreast the Coal Shed creek wharf, the depth for 550 feet off it, is not less than 21 feet at low water. From Coal Shed creek wharf to Jervois bridge, the channel varies in width from 300 to 400 feet with a depth of 23 to 20 feet at low water.

The widths above mentioned refer to the deep water, the river being much wider.

Beacons, Buoys, &c.*—The channel is marked throughout by red buoys, beacons, and light beacons, which exhibit white lights at night, to be left on the starboard hand entering and by black buoys and beacons (the outermost beacon is a reflecting beacon, having a mirror) to be left on the port hand entering.

There are two black leading beacons, with V-shaped heads, on Torrens island, to indicate the mid-channel course between Nos. 3 and 2 light beacons.

Six black cask buoys have been placed on the edge of the bank, where silt has been discharged opposite No. 6 and No. 8 light beacons, on Torrens island side of the river. Small craft should not go within 100 feet of any of these buoys.

Six black cross headed beacons have been placed off the north bank between Torrens island and Lights passage, marking the limit of silt deposit. Vessels must not go within the line of these beacons.

Torrens island, the north point of which is S.W. by S., one mile from the bathing houses on St. Kilda, is low, about 3 miles long, and $1\frac{1}{2}$ broad across the south end, tapering toward the north end. Southward of St. Kilda beach, the coast forms the east side of the channel between Torrens island and the mainland; this channel

* The river is to be lit by electricity; the positions of some of the beacons are being altered and additional leading lights are being erected (1895-6).

See chart, No. 1,750.

narrows gradually, till at S.S.E. $3\frac{3}{4}$ miles from St. Kilda it is only 3 cables across at high water; it dries at low water springs, and is only used by small boats and barges. On the south side, a narrow channel called the North arm separates Torrens island from the main.

The east and south sides of Torrens island are nearly entirely covered with mangroves, as are some parts of the west side. There is also a range of sand-hills in the south-west part of the island.

From the north end of Torrens island a sand-spit, drying at low water, extends about 3 miles to the westward in the form of a fish-tail, the north end being W.N.W. $2\frac{3}{4}$ miles, and the south end S.W. by W. $\frac{3}{4}$ W. $2\frac{1}{2}$ miles, from the north end of Torrens island; a small bank about half a mile long lies southward of the south extreme, round the southern end of which is the entrance into Port Adelaide river.

Telegraph cable.—Two beacons with V-shaped heads, painted green, on the south side of Torrens island mark the direction in which the telegraph cable is laid to the mainland. Anchorage is prohibited within 50 fathoms of the line of beacons.

TIME BALL.—The time is shown daily, Sundays excepted, by dropping a ball 5 feet in diameter at the Semaphore, 89 feet above high water, 59 feet above ground and 13 feet drop. The ball is hoisted half way up at 0h. 55m. p.m., close up at 0h. 57m. and dropped at 1h. 0m. 0s. p.m. standard time of South Australia, or 16h. 0m. 0s. mean time at Greenwich. Should the ball drop before or after the time, it is hoisted again for 10 minutes at 1h. 15m. 0s. p.m., then lowered gently, and dropped at 2h. 0m. 0s. p.m. when practicable.

Adelaide observatory is in latitude $34^{\circ} 55' 33\cdot8''$ S. and longitude $138^{\circ} 35' 6''$ or 9h. 14m. 20·39s. E. This longitude was determined telegraphically in 1883.

TIDES.—It is high water, full and change, at the Semaphore jetty at 4h. 40m.; springs rise $7\frac{1}{4}$ feet, neaps 4 feet. During the summer months, at springs, it is high water in the morning and low in the afternoon; at neaps it is low in the morning and high in the afternoon. During the winter months the reverse of this is the case. Westerly winds raise the general level of the water 2 to 3 feet, easterly winds depress it about $1\frac{1}{2}$ feet.

Five days before full and change, the tides cease to flow regularly : there is then a very small rise and fall : the first making tide of high-water generally occurs from one to two o'clock on the following morning ; the tides then run in their usual course to springs. This peculiarity of the tides is experienced in both St. Vincent and Spencer gulfs.

It is high water at Semaphore jetty and at Port Adelaide lighthouse at the same time. With south-easterly winds it is high water at Semaphore jetty 30 minutes before high water at Port Adelaide, and with strong north-westerly winds 90 minutes ; on the average 45 minutes.

At Jervois bridge, Port Adelaide, it is high water at 5h. 25m. ; springs rise 8 feet, neaps $4\frac{1}{2}$ feet. On the inner bar it is high water at the same time as at Port Adelaide.

Tidal streams.—Between Wonga shoal and Port Adelaide lighthouse, the stream turns to the southward about one hour before high water and to the northward about one hour before low water. The streams inside the lighthouse and up to Port Adelaide turn at high and low water.

Between the lighthouse and Snapper point, the stream attains its greatest strength, but seldom exceeds 2 knots an hour.

The stream sets strongly into, and out of North arm ; between that and the bridge it seldom exceeds one knot an hour.

Tidal signals.—The following signals are exhibited from the Semaphore pilot station to show the least depth of water in the channel of the Port Adelaide river :—

One ball at masthead and one ball at South yardarm - - - - -	18 feet water.
One ball at masthead and one ball at North yardarm - - - - -	19 "
Two balls at South yardarm - - - - -	20 "
" North " - - - - -	21 "
Ball at South yardarm and South quarter - - - - -	22 "
" North " North " - - - - -	23 "
Ball at each yardarm - - - - -	24 "
Two balls at South quarter yardarm - - - - -	25 "
" North " " - - - - -	26 "
One ball at North and South quarter yardarm	27 "

One ball at North and two balls at South yardarm - - - - -	28 feet water.
Two balls at North and one ball at South yardarm - - - - -	29 „
Ball at masthead - - - - -	30 „
One ball at masthead and one at North and South quarter yardarm - - - - -	31 „
One ball at masthead and one ball at each yardarm - - - - -	32 „
One ball at masthead, one ball at South quarter and South yardarm - - - - -	33 „
One ball at masthead, one ball at North quarter and North yardarm - - - - -	34 „

The following symbols denote additional inches over any of the preceding feet, when hoisted on the spare yardarm, excepting the 24 feet signal, when the symbol is hoisted on the quarter.

A cone with apex upwards denotes - - -	3 inches.
A diamond „ „ „ - - -	6 „
A cone with apex downwards - - -	9 „

In the event of vessels of unusually heavy draught proceeding down the river, the signals will be made until the vessel anchors or passes the lighthouse.

High water.—A square *red* flag under the outer ball, exhibited at either yardarm. When, as in the case of the 24 feet signal, balls are hoisted at both yardarms, the flag is hoisted at the mast head.

Low water.—A square *blue* flag under the outer ball at either yard-arm.

Tide gauges showing the depth of water in the channel of the Port Adelaide river have been erected on the Port Adelaide and the Semaphore jetty lighthouses.

Dredger signals.—The following signals are used on board the Government steam dredgers when working at South Australian ports:—

1. Proceed with caution - - - By day.—Square blue flag.
2. Leave dredger on starboard
hand entering and port
hand going out. { By day.—Red ball.
By night.—Red light under white
light, 2 feet apart.
3. Leave dredger on port hand
entering and starboard
hand going out. { By day.—A black diamond shape.
By night.—Green light under
white light.

4. Accident.—Dredger cannot be moved. } By day.—Blue swallow-tailed flag with white circle.
} By night.—Two red lights vertical.

A white or electric light is also exhibited from the dredger from sunset to sunrise.

Steam-tugs of 80 to 120 horse-power can be procured by hoisting the ensign at the fore.

Signals.—Vessels' arrival.—Vessels approaching are signalled on the southern flagstaff masthead; red ball (sail in sight) above code flags, thus :—Ship or barque, B; brig, C; schooner, D; steamer, F; coasting steamer, G; inter-colonial steamer, T; ocean steamers, the house flag; a blue flag with white B is hoisted above house flag on an ocean steamer passing cape Borda; South Australian government vessel, union jack over C; British man-of-war, union jack; foreign man-of-war, square flag red and white stripes; storm signal, blue swallow-tailed flag; pilot wanted, square flag, upper half red, lower white.

Compass adjustment.—Five warping buoys are placed in the North arm in 15 feet at low water for swinging ships for compass adjustment.

A **life-boat** is kept at Port Adelaide, to be sent to any part of the coast by steam vessel, should information of a wreck be received in time to render the service of a life-boat available.

Winds.—During the summer, and with fine weather in the winter, as a rule the wind blows off the land all night. It veers to the northward about daylight, and either remains or falls calm until the beginning of the rising tide, when the sea breeze comes from the S.W., and veers to the southward and S.S.E. by sunset.

The heaviest gales occur in May, June, July, or August. Forty-eight hours is usually the limit they blow from between North and S.W.

Sanitary regulations.—The commander of every vessel arriving at Port Adelaide shall allow no person to leave the vessel, and no goods, personal luggage, or any other thing to be sent from the vessel, the mails only excepted, till he shall have obtained permission to that effect from the health officer or one of his assistants. And no one shall be allowed to go on board except the health officer, his

assistants, and the pilot, who takes charge, until permission is given by the health officer or his assistants.

No pilot shall bring any vessel over the outer bar till the health officer or his assistant has boarded, and given directions how far the vessel may proceed. Vessels are detained below the North arm while in quarantine.

Gunpowder regulations.—All vessels arriving in the ports or harbours of South Australia, having gunpowder on board, exceeding the quantity necessary for stores, for their own use, shall hoist the pilot jack at the main; and no vessel proceeding up the river to Port Adelaide shall pass Lipson reach, North arm, without landing all gunpowder exceeding 30 lbs. Twenty-four hours after anchorage shall be allowed for landing gunpowder at the appointed powder magazines.

Gunpowder shall only be landed or removed during such hours as are fixed by the Governor, at the expense of the proprietor or owner; and all boats used in the conveyance of gunpowder shall be properly housed over and covered with tarpaulins. No iron shall be used in the construction of the barrels or packages, and no package shall contain more than 100 lbs. weight of powder.

Moorings.—Two mooring buoys for the use of vessels having explosives on board have been placed on the western side of the cutting in 20 feet at low water, where such vessels must moor head and stern. Their position is nearly north-west from the entrance to the North arm.

The buoys are painted red, and serve as guides to the edge of the cutting.

PORT GAWLER, formed by low mangrove bushes, lies S.E. $\frac{1}{2}$ S. 15 miles from Great Sandy point, and N.W. by N. 6 miles from the north end of Lefevre peninsula, and is the mouth of a small river flowing about S.W. by W. 17 miles from the township of Gawler. A line of high trees, apparently marking the course of a creek, stands out above the mangroves south-east of Great Sandy point, their western end lying E. $\frac{1}{2}$ N. $2\frac{1}{2}$ miles from the north end of the mangroves. A large grove of much higher trees gradually rising to the centre, appear to the eastward of port Gawler point the apex being E.N.E., $2\frac{3}{4}$ miles from the entrance of port Gawler creek. The

entrance is denoted by a black cheese-shaped buoy, and three red beacons.

The entrance of port Gawler creek is not easily distinguished from seaward, as the mangroves overlap. It is half a mile south-east from port Gawler point, and about a quarter mile north-west of a sandy beach which shows through the mangroves, being less than 50 yards across, and an ordinary rowing boat cannot cross the flat of sand and mud, which is three-quarters of a mile wide, till half-flood.

The first reach is not more than a cable long, running about N. by E.; the creek then turns sharp round to E. by S. On the north side of this reach, and 4 cables from the entrance, is a substantial wharf, 80 feet long, with $3\frac{1}{2}$ feet water alongside at low water. A good macadamized road is carried across the mangrove swamps at the back of the wharf to Two-Wells, the nearest township. From port Gawler the coast trends nearly S.E. for 4 miles, and then E.S.E. 2 miles to St. Kilda beach, which has some bathing houses on it.

Port Gawler is the only shipping place between Port Adelaide and the head of the gulf of St. Vincent. It is frequented by barges and light draught steam vessels, which take away wheat and farming produce.

Great Sandy point is low and rounded, with a long spit which dries, at low water springs, 3 miles in a S.W. by W. direction from the point. The land at the back is flat and swampy for a long distance from the beach, the distant hills being too far off to be used as landmarks for a vessel in the fairway of the gulf. A sand-flat extends from $1\frac{1}{2}$ to 2 miles from the beach, outside which the water deepens slowly, the 3-fathoms line being about $3\frac{1}{2}$ miles off shore, except off Great Sandy point, where it runs out to a distance of $7\frac{1}{2}$ miles from the point in a W.S.W. direction.

LONG SPIT and buoy.—A perch buoy, with ball and cage, painted red, but usually much whitened by sea-birds, is moored in 19 feet water, on the shoalest part of a detached bank, lying off the Long spit extending from Great Sandy point, and 4 miles to the southward of it. From Long spit buoy, Port Adelaide lighthouse bears S.E. by E. $\frac{1}{8}$ E. 23 miles; Hummock mount N. $\frac{3}{4}$ W. About 2 miles W.S.W., and $2\frac{1}{2}$ miles south of the buoy, the water gradually deepens to 5 fathoms. To the northward there are 7 fathoms within half a mile. The 3-fathoms end of the Long spit bears N. $\frac{1}{2}$ W. 4 miles, and the 5-fathoms end N.W. by N. 3 miles.

Eastward of the Long spit buoy the soundings are uneven, between $3\frac{1}{4}$ and $4\frac{1}{2}$ fathoms over a rocky bottom, with a narrow channel of $5\frac{3}{4}$ to 7 fathoms, between the buoy and the shoal water extending from the land.

From Long spit buoy, the low land forming the east shore of the gulf is not visible, unless much raised during hot weather by refraction. The land on the west side of the gulf can be plainly seen, and during the forenoon, with sunshine, the high red cliff north of Kooley Wurta is easily distinguished.

The COAST.—The sandy beach continues 7 miles south-east from Great Sandy point, when it is succeeded by a mangrove coast running in the same direction for $3\frac{1}{2}$ miles, with several small creek openings through the mangroves, at the south-east end of which is a sandy beach a mile long, followed by a low mangrove point, and then another beach 2 miles long, at the south-east end of which the mangroves forming port Gawler point commence. The land inside the beaches is very low and swampy. A sand-flat runs off this part of the coast 2 miles wide in front of the beaches and three-quarters of a mile off port Gawler point.

Sandy point the eastern point of entrance to port Wakefield, is a low mangrove point, fronted by a sand-spit which dries out nearly 2 miles at low water. A low wooded range rising above the mangrove swamp between this and Wakefield township terminates in a shoulder called Bald hill, bearing N.E. $\frac{3}{4}$ E. about a mile from Sandy point.

The coast southward of Sandy point is a continuous low sandy beach trending east for 2 miles, and then running nearly S.S.E. for 12 miles to Great Sandy point, projecting slightly at S.E. $\frac{1}{2}$ S. 7 miles from Sandy point.

PORT WAKEFIELD, the head of the gulf of St. Vincent, extends from its entrance between Mangrove and Sandy points, 8 miles to the northward, and is 6 miles wide. Its shores are low and lined with mangroves, the northern part of the western and all the eastern shore being swampy, and fronted by a flat of sand, mud, and weed, about one mile broad, covered at half tide. Although so spacious, port Wakefield is so occupied by sand and mud-flats, as only to leave a comparatively small space available for shipping, the

3-fathoms line extending barely 2 miles within the entrance. Many large vessels load here in the wool and wheat season, their cargoes being brought from Wakefield creek.

Wakefield is 60 miles northward of Port Adelaide, to which vessels run frequently. Population in 1891 was 523. This township exports large quantities of grain and wool; firewood is plentiful, but water is very scarce in summer; vessels are therefore recommended to get a sufficient supply at Port Adelaide, if touching there on their way up the gulf.

The wharves are 1,260 feet in length, with a depth of $1\frac{1}{2}$ feet alongside at low water.

There is telegraphic communication at Wakefield; and there are railways between Adelaide, Wakefield and Wallaroo.

Wakefield creek lies on the eastern side of the port, about $4\frac{1}{2}$ miles north of Sandy point. The entrance of the creek is fronted by a flat extending more than a mile off it, uncovered at low-water springs. Dredging operations have been carried on in the creek, and warping buoys placed on both sides of the channel, to enable coasting vessels to get in and out of the creek without difficulty.

The channel leading to the creek has beacons placed on its edges; the western side of the entrance is marked by a black beacon with a round top, and the eastern side by a red beacon having a lozenge-shaped head; a square post black beacon and two red beacons are placed inside.

LIGHT.—A *fixed* white light which can be seen from a distance of 6 miles is exhibited from the railway wharf, and shows to the southward through the cutting leading to Wakefield. The lighthouse is a wooden house painted white.

Clinton.—On the western side of port Wakefield, about 3 miles north of Mangrove point, with a jetty 900 feet long and a tramway (not now used, the flat drying beyond it), may be known by a single white house, which shows out against the dark scrub behind.

Wills creek.—In the bight between Mangrove point and Clinton jetty are some red cliffs, south-west of the jetty. This bight is filled by a shoal flat intersected by Wills creek, a narrow channel, nearly

dry at low water, which from its mouth, at $1\frac{1}{2}$ miles N. by E. $\frac{1}{2}$ E. of Mangrove point, trends S.S.W. $\frac{1}{2}$ W. $2\frac{1}{4}$ miles into an opening in the mangroves. The channel is only available for small craft at high water, and is marked by red buoys, to be left on the starboard hand entering, and black buoys to be left on the port hand.

There is a wharf in Wills creek, about half a mile inside the mangrove entrance, 100 feet long and a depth of 5 feet alongside it at low water.

Bald hill beacons.—Two triangular beacons have been placed on Bald hill, the termination of the low wooded range rising above the mangrove swamp south of Wakefield. The upper beacon, about 50 feet above high water is painted white, 23 feet high, and distant 322 yards from the lower beacon, which is painted red, and 26 feet in height. The beacons in line bearing E. $\frac{1}{4}$ S. (S. 87° E.) mark the deep water anchorage.

Bald spit buoy.—The shoal water of Sandy point extends to the westward, the 3-fathoms line being over 2 miles from the extreme of the mangroves. A red perch buoy is moored in 17 feet water with Bald hill beacons bearing N.E. by E. $\frac{3}{4}$ E., Wakefield mill N. by E. $\frac{1}{2}$ E., and the house at Clinton N.W. by W. $\frac{1}{4}$ W. There are $3\frac{1}{2}$ fathoms water one cable, and 5 fathoms three cables west of the buoy.

Anchorage.—Large vessels approaching this anchorage shorten sail off Bald spit buoy, and anchor in 4 to $4\frac{1}{2}$ fathoms at low water, with Bald hill beacons in line, and the Spit buoy, S. $\frac{3}{4}$ E. (S. 8° E.).

Should a vessel anchor in such shoal water in port Wakefield as to touch the ground, no injury is likely to occur, if care be taken to keep the vessel clear of her anchor, as the bottom is composed of sand and mud, is everywhere soft, and there is no sea.

TIDES AND TIDAL STREAMS.—It is high water, full and change, in port Wakefield, at 4h. 40m. ; springs rise 11 feet ; neaps 5 to 6 feet. But the tides are very irregular, and much affected by prevailing winds ; with strong westerly winds the rise is much greater, whilst the fall is considerably diminished. With westerly winds, there is often a higher tide at neaps than at springs. In fine weather and south-east winds, when the tides are at the lowest,

the rise at springs is much reduced, and at neaps the rise is almost imperceptible, the time of high water being very irregular. Off Bald spit buoy the flood stream sets N. by W. and the ebb S.S.E. one to 2 knots at springs.

Aspect.—From mount Gawler (1,680 feet high), which bears N. by E. distant $12\frac{1}{2}$ miles from mount Lofty, a range of moderately high and well-wooded hills, decreasing in elevation to the north-west, extends 64 miles in a north-westerly direction to the hill marked on the chart as being seen from Spencer gulf.

Mount Hummock lies 6 miles N. $\frac{1}{2}$ W. from the head of port Wakefield, and being 1,064 feet high, is a good mark for vessels running up St. Vincent gulf.

The soundings in the gulf between Glenelg and the Semaphore jetty are 8 to 6 fathoms 3 miles off shore, and 16 to 11 fathoms 10 miles off shore. In the centre of the gulf the depth is from 18 to 20 fathoms west of Glenelg, 14 to 15 fathoms west of the Semaphore jetty, and 11 fathoms between Kooley Wurta and Long spit buoy, from which place it gradually shoals to 8, and 6, and 5 fathoms in mid-channel off Mangrove point.

DIRECTIONS.—From Port Adelaide to port Wakefield;—bring the smelting works chimney at Port Adelaide on with mount Lofty, bearing S.E. by E. $\frac{1}{4}$ E., and steer N.W. by W. $\frac{1}{4}$ W. (N. 59° W.); a distance of about 23 miles on that course will bring Long spit buoy to bear N.E. (N. 45° E.) 2 miles, and the Hummock mount N. $\frac{1}{2}$ W. (N. 6° W.), the depth being about $5\frac{1}{2}$ fathoms. A course of N. $\frac{1}{2}$ W. (N. 6° W.) for the Hummock, for 18 miles, will bring Bald spit buoy to bear N.E. $\frac{3}{4}$ E. (N. 53° E.) $1\frac{1}{2}$ miles, then proceed as directed at page 341. A large vessel should steer to the west of N.W. by W. $\frac{1}{4}$ W. (N. 59° W.), and bring the Hummock north of N. $\frac{1}{2}$ W. (N. 6° W.) before steering for it; the courses given passing close to the south-west side of Long spit, over its west end in $4\frac{1}{4}$ fathoms, and close to the spit with $3\frac{1}{4}$ fathoms extending from Great Sandy point. The above courses are given irrespective of the tidal streams, which, especially in light winds, throw a vessel considerably off her course, but in clear weather bearings of mount Lofty and the Hummock will determine the position. In thick weather a N.W. by W. $\frac{1}{4}$ W. (N. 59° W.)

course might be continued for 7 or 8 miles beyond Long spit buoy, or until about 3 miles off the west side of the gulf, then run up the coast, keeping about that distance from it.

In leaving port Wakefield it is advisable to start in the morning, when the land wind being generally easterly, an offing may be obtained without beating out.

Coasting vessels in working up or down keep on the east side of the gulf, passing inside Long spit buoy, the water being smooth on that side; square-rigged vessels should keep on the west side of the gulf when to the northward of Kooley Wurta.

In beating up the gulf from Port Adelaide against head winds, make the first board to the westward for about 16 miles, taking care not to go into less than 8 fathoms, so as to avoid Orontes bank. Then endeavour to work between Orontes bank and the flats which front the eastern shore; and in approaching Long spit care must be taken to sight the buoy, in order to insure being north of Orontes bank.

By maintaining a depth of 5 fathoms the edge of the Long spit may be avoided, and the buoy sighted.

Being off Long spit buoy, and consequently north of Orontes bank, the western shore may be safely approached, making long boards from 5 fathoms outside Long spit, on the east side, to $1\frac{1}{2}$ or 2 miles off the western shore.

Caution.—In thick weather, or in the middle of a summer day, when the sun is ahead, and objects are much affected by refraction, the lead should be in constant use and carefully attended to in going either up or down the gulf.

The winds during fine summer weather are, from sunrise to about 8 A.M., generally from East to E.S.E. In hot weather the wind in the morning may be from N.E., generally falling calm towards 8 A.M., the sea breeze setting in at about 11, freshens about 5 P.M., and gradually moderates till sunset, when it veers round to the S.E., and dies away towards night. In winter the strongest winds are from the westward.

Weather.—The barometer falls rapidly with northerly winds, and a fall generally precedes a change of weather from the westward.

In summer, a change often occurs suddenly from the southward, when it blows hard.

The WEST SIDE of the GULF of ST. VINCENT.—From Giles point the coast, an unbroken cliff, trends N. by W. $\frac{1}{2}$ W. 3 miles as far as Wool beach, which is about one-third of a mile long, with a high cliffy bank behind it. *See* page 293.

Wool beach.—During the wool season upwards of 2,000 bales of wool are shipped from Pickering into coasters for Port Adelaide. The coasters lie about a half to a quarter of a mile from the beach in 2 fathoms water. A large ship may anchor off Wool beach in 6 fathoms, with the north end of the beach W. by N. $1\frac{1}{4}$ miles, and Giles point S. by W. $\frac{1}{2}$ W. 3 miles.

There is a jetty at the north end of the beach, 510 feet long, with a depth of 7 feet at its outer end at low water, and a black warping buoy is 225 feet off the jetty end in 9 feet water.

There are two mails a week from Adelaide to Pickering.

Shoal.—A sandy shoal of $2\frac{1}{2}$ to 3 fathoms water, running E.S.E. and W.N.W., about 2 miles long and half a mile broad, lies in front of Wool beach, the north-west part of the shoal, bearing E.N.E. 3 miles from the north end of the beach. There is a depth of 6 fathoms between the shoal and Wool beach; the water deepens to 4 fathoms north of the shoal, after which it gradually shoals.

The coast between Giles and Oyster points forming Wool bay, presents a line of cliffs from 60 to 90 feet high, till within a mile of Oyster point. The back land is but slightly elevated above the cliffs, and has a flat wooded outline. North of Oyster point the coast again takes a cliffy form, but the cliffs are much lower than those south of the point.

Oyster point, N. by E. $\frac{1}{2}$ E. $5\frac{1}{4}$ miles from the north end of Wool beach, is low and sandy, jutting out to the eastward about half a mile from the general line of coast. A few settlers have established themselves in the neighbourhood. The point is not easily distinguished, but its position is marked by some 4 or 5 huts on the grassy slope inside it.

Stansbury.—A small place in Oyster bay about half a mile from

Oyster point. The population was 110 in 1891. There is a jetty 1,000 feet long, with a depth of $5\frac{1}{2}$ feet at its outer end at low water. A channel has been dredged to the jetty, 50 feet wide with a depth of 5 feet at low water. It is a telegraph station, and there are six mails a week from Adelaide.

South spit is a long sand-spit drying in patches at low water, running off Oyster point to the north-east, curving to the north, and forming Oyster bay. The end of the spit is N.E. $\frac{3}{4}$ N., 3 miles from Oyster point.

Beacons.—On the north-east edge of South spit in 2 fathoms, are two black beacons, the north beacon square and the south beacon round headed; the beacons are 830 yards apart; from the north beacon the township bears S. 46° W. and from the south beacon S. 50° W. 3 miles.

Anchorage.—Oyster bay affords good shelter for coasters from all winds in 2 fathoms, with Oyster point S. by W. or S. by W. $\frac{1}{2}$ W., and Beach point W.N.W. to N.W. by W.

Beach point, about $2\frac{1}{2}$ miles N. $\frac{3}{4}$ W. from Oyster point, may be known by a short high patch of white sand in a gully, with a small rocky point on its north side; this point bearing West leads a quarter of a mile north of South spit.

Surveyor point, bears N. by E. $\frac{1}{2}$ E. distant $8\frac{1}{2}$ miles from Oyster point; a sand, named Middle spit, extends off it in a curve to the north-east, about $2\frac{1}{2}$ miles long by half a mile broad, drying in patches at low water. The coast continues cliffy till within a mile of Surveyor point, with a few houses.

A beach extends a mile northward of Surveyor point, when a cliffy coast again commences, and three-quarters of a mile farther is Streak point, so called from a narrow white mark down the face of the cliff. This point bearing W. $\frac{1}{2}$ S., clears the end of Middle spit in 2 fathoms water.

Beacon.—A black beacon with a circular head is on the north end of Middle spit in 2 fathoms at low water.

Port Vincent forms a good anchorage for small vessels inside Middle spit, in $2\frac{1}{4}$ fathoms water, with Streak point bearing N.W. $\frac{1}{2}$ N.,

and the first cliff point to the southward, just inside Surveyor point, bearing S.S.W. $\frac{1}{2}$ W. A third projection of the same nature, North spit, lies N. $\frac{1}{4}$ W. $4\frac{1}{4}$ miles from Surveyor point. The spit, however, is smaller, its end being N.E. $1\frac{1}{2}$ miles from the point off which it runs, and the bay formed by it is very shoal. A jetty, 140 feet long, with a depth of $4\frac{1}{2}$ feet at its end at low water, extends into port Vincent from the north side of Surveyor point.

Beacon.—A pile beacon surmounted by a black St. Andrew's cross is placed in 8 feet on the north-east end of North spit. This beacon clears the spit leading to what is known as Shea-oak flat.

ORONTES BANK.—A large flat with a general depth of 4 fathoms, but having in some parts as little as 9 feet water, extends in front of this coast, from Wool beach to Kooley Wurta, for a distance of about 7 miles to seaward, where the water deepens suddenly to 10 or 12 fathoms; the shoalest part lies E. $\frac{1}{2}$ S., distant $3\frac{1}{2}$ miles from Surveyor point. Its margin can frequently be distinguished in fine weather by the change in the colour of the water; the bottom, which is weedy, with bare sandy spots, being at times distinctly visible, and in rough weather by the sea becoming suddenly smooth.

Buoy.—A black buoy surmounted by a framework with a ball on top, has been moored on the tongue of Orontes bank in 13 feet water, E.N.E. 6 miles from Surveyor point.

Kooley Wurta, or Black point, is a low beach point, bearing N. $\frac{1}{2}$ E. $9\frac{3}{4}$ miles from Surveyor point, with a spit of sand and weed, which barely dries in patches at low-water springs, extending off the point to the north-eastward. The end of this spit bears N.E. $1\frac{1}{2}$ miles from the point.

Beacon.—A black pile beacon with circular head, has been erected on the north end of the spit running off from Kooley Wurta (Black point), in 8 feet at low water. At a distance of 300 yards north of the beacon there is a depth of 12 feet of water.

Port Alfred.—The beach trending back W.N.W. $1\frac{3}{4}$ miles from the north side of Kooley Wurta forms with the sand-spit a small bay known as port Alfred, affording shelter for small vessels in $2\frac{1}{4}$ fathoms water, sand and marl, with Kooley Wurta bearing S.S.E., a gap in the

cliff West, and the end of the spit E. by N. $\frac{1}{2}$ N. The land behind is level and covered with scrub, with one slight rise about 300 feet above the sea; this rise kept W. $\frac{1}{2}$ S., or open of the north end of a line of cliffs on the west shore of the port, clears the end of the spit in $3\frac{1}{2}$ fathoms water. A small community has sprung up in the neighbourhood of Kooley Wurta.

TIDES.—It is high water, full and change, at port Alfred, at 4 h. 37 m.; springs rise 8 feet, neaps 5 to 6 feet.

The **COAST** between Oyster point and Kooley Wurta is a mixture of low cliffs and sandy beaches, with few prominent marks to which the attention may be directed; if the sun is not shining on the cliffs the land presents a dark flat outline, gradually rising towards Kooley Wurta. There is a grassy rise, 400 feet high, W. $\frac{3}{4}$ N. from Surveyor point, but being more than 7 miles inland it does not appear much higher than the rest of the back land. On a bright forenoon the white sand and limestone spots on Dowcers bluff, $1\frac{1}{2}$ miles north of Surveyor point, and the two red cliffs, one north and the other south of North spit point, are conspicuous from about 7 miles off shore.

North of Kooley Wurta the coast trends W.N.W. $1\frac{3}{4}$ miles, and then North 6 miles; it is rocky, with red and yellow cliffs and small sandy beaches, and a remarkable red cliff 104 feet high rising near the centre. A sandy, and in some places a rocky flat, drying at low water, extends from 200 to 600 yards in front of the coast.

Perara.—Seven miles north of Kooley Wurta a sandy beach succeeds the cliffs for 4 miles, forming two small points, the northern one, on which there are two houses, being called Perara. Here the ridge of high land approaches the coast, the scrub having almost disappeared, and the hills, covered with grass, are about 300 feet high. From Perara the ridge of high land extends about N. $\frac{1}{2}$ E. parallel to and at an average distance of 2 to 3 miles from the coast, forming a level range of scrubby hills about 400 feet above the sea, rising gradually towards mount Hummock. About $1\frac{1}{2}$ miles north of Perara the last red cliffs on this part of the coast commence; they are 80 feet high, with a gap at Ardrossan, and the cliffs extend 2 miles in a N.N.E. direction; the land then becomes very low, with a sandy beach trending N.E. $\frac{1}{2}$ N. 5 miles, when it

curves round to Mangrove point, the western point of entrance to port Wakefield. The land behind and north of the red cliffs is covered with scrub, and when well out in the gulf, a hill, bearing N.W. by N. $9\frac{1}{2}$ miles from Perara, rises above the nearer land.

Ardrossan is a small postal town with a telegraph station. The population was 122 in 1891; there are five mails a week from Adelaide.

There is a jetty at Ardrossan, 1,420 feet long and with a depth of $6\frac{1}{2}$ feet at its outer end at low water.

Light.—A *fixed* white light is exhibited from a white wooden house on the end of the jetty, it should be seen in clear weather from a distance of 5 miles.

Water, &c.—There are wells of good water at Hungry point, Surveyor point, and Kooley Wurta, but fresh water is scarce along the coast in summer. Kangaroo abound in the southern part of Yorke peninsula, and fish are plentiful along the coast during certain seasons.

DIRECTIONS.—From port Wakefield there is no difficulty in proceeding down the gulf if due attention be paid to the lead, and care taken to avoid the shoals on either side. From the Semaphore anchorage steer S.S.W. (S. 22° W.) until south of Troubridge shoals, on which course the land on the east side of the gulf will keep in sight, and the vessel be out of the influence of the tidal stream, which sets through Backstairs passage. But on no account steer a course under the impression that it will weather the shoals, until far enough to the southward to shape a course down Investigator strait, as it would expose a vessel's broadside to the rapid tidal stream which sets directly upon Troubridge shoals.

In moderate weather, by closing the eastern shore at sunset, the wind, which usually blows from the S.E. about that time, is favourable for proceeding down the gulf, being careful not to stand too far off shore until south of Troubridge shoals and well down with cape Jervis. Vessels bound eastward keep as close to the cape as wind and weather will permit, to avoid the west-going stream from Backstairs passage.

SOUTH COAST OF AUSTRALIA.

From **CAPE JERVIS** the coast trends E.S.E. 4 miles and E. by N. 3 miles, and is of a bold and rocky aspect, with high scrub-covered hills, intersected by deep ravines, rising steeply from it, to Porpoise head. The coast then trends N.E. 2 miles, and E. $\frac{1}{2}$ N. 7 miles to a bold cliff point, 3 miles west of which is Tunkalilla beach, upwards of 2 miles in length, and quite inaccessible, from the heavy surf which always rolls in.

Newland head, the south-west point of Encounter bay, is a steep cliff, E. $\frac{1}{2}$ N. $5\frac{1}{2}$ miles from the above-mentioned cliff point, and N.E. $\frac{1}{2}$ E. $22\frac{1}{2}$ miles from cape Willoughby.

The coast immediately to the westward trends W. $\frac{1}{2}$ N., and is sandy, with rocky points between the beaches, and high land at the back. There is a range of sand-hills half a mile west of Newland head, which is of a dark colour.

Soundings.—There are apparently no dangers near the shore between cape Jervis and Newland head, the soundings being from 9 to 13 fathoms half a mile off the coast, deepening to 15 and 18 fathoms off the sand-hills west of Newland head; except off the west end of Tunkalilla beach, where the soundings are irregular, with a 7-fathoms rocky patch S.S.W. $\frac{1}{2}$ W. $2\frac{1}{3}$ miles from the west end of the beach. The water gradually deepens to 14 and 18 fathoms. 5 miles off shore.

ENCOUNTER BAY* extends from Newland head to Murray river mouth, a distance of 19 miles E.N.E., and is 5 miles deep with 15 to 18 fathoms in the centre, gradually shoaling to the northward. The only anchorage in Encounter bay at present used is at Port Victor, in the north-west part of the bay. The shore of Encounter bay trends N.E. 5 miles from Newland head to Rosetta head, with a high cliff steep-to for most of the distance, but towards Rosetta head it is low and grassy.

West island lies nearly half a mile off a small point, one mile south-west from Rosetta head. It is three-quarters of a mile in circumference, and 132 feet high, steep-to to seaward; there is a rocky ledge between it and the shore which generally breaks.

* So named in consequence of Flinders in the *Investigator* meeting here the French ship *Géographe*.

Rosetta head is a grassy mound, 317 feet above high water, cliffy to the eastward, and covered with granite boulders. The head is steep-to on its south and east sides, with 12 fathoms water half a mile off.

Between Rosetta head and Freeman Nob, which bears N.E. 5 miles from the former, and is the south point of Port Elliot, the coast bights in and forms the anchorages of Rosetta harbour and Port Victor.

Rosetta harbour, which is formed by the land trending to the north-west close round Rosetta head, is quite open between S.S.W. and East, and only available for small coasters. It is not used.

Seal rock, N.E. by E. $\frac{1}{2}$ E. 2 miles from Rosetta head, is a mass of granite boulders 40 feet high. A reef on which the sea breaks heavily extends nearly 400 yards west of Seal rock. At about 100 yards east of Seal rock is another reef, and at a quarter of a mile from the rock in the same direction is a rock with 26 feet water over it, on which the sea breaks with great violence in bad weather.

Wright island is a small islet, about a quarter of a mile in circumference, N.N.E. nearly half a mile from Rosetta head, and the same distance off shore. The sea breaks on a reef which runs off the south side; the water is shoal inside Wright island, but deep close outside.

Granite island, N.E. by N. $1\frac{3}{4}$ miles from Rosetta head, is bare-topped, half a mile east and west, and about a quarter of a mile broad. The summit of the island, which is nearly level, is 113 feet high. Granite boulders are scattered in great numbers over the sides of the island, and a very large one stands upright at the west end.

LIGHT.—A lighthouse on the east end of Granite island exhibits, at 120 feet above the sea, a *fixed* white light of the 6th order, visible between the bearings of N. 31° E. and S. 59° W. and which should be seen from a distance of 10 miles in clear weather. The lighthouse is a wooden house about 4 feet high, painted white.

The limits of this light lead close to the eastward of West island, and to the southward of Pullen's island.

See charts, No. 1,014, cape Jervis to Guichen bay, scale $m = 0.25$ inch, and No. 2,493, Ports Victor and Elliot, scale $m = 3.0$ inches.

Shoal water extends off the low sandy beach between Rosetta head and Granite island to a distance of from one-half to one mile, and a rocky ledge, with from 17 to 27 feet water, extends from it to Seal rock; the shoalest part, 15 feet, is about 3 cables W. by N. of Seal rock. The sea breaks heavily on this ledge in places during a S.W. gale, and in all the space between Rosetta head and Granite island.

There is a passage between Seal rock and Granite island, the depth being from $4\frac{1}{2}$ to 7 fathoms; but in bad weather, or when the ocean swell rolls in heavily, the sea in some places breaks with great violence. This passage is not recommended, except in fine weather, and with smooth water.

Soundings.—Outside Granite island the soundings shoal gradually from 12 to 5 fathoms; but inside the 5-fathoms line, on its north side, when the east end of the island bears east of South, it shoals rapidly to 3 and 2 fathoms.

Anchorage.—West of Granite island there is a good anchorage, named Davenport, available for moderate-sized vessels. It is, however, not recommended, as the approach is indifferent, and Port Victor harbour to the eastward renders the use of Davenport unnecessary.

PORT VICTOR, 64 miles southward of Adelaide, had a population of 465 persons in 1891. A jetty, built on a rocky causeway, awash at low-water springs, along which is a railway, connects the mainland with Granite island, from which a causeway projects into 9 feet at low water; a granite breakwater is carried out from the eastern point of Granite island, in a north-east direction, for 1,000 feet, to a depth of 43 feet at low water; inside this breakwater is a screw pile jetty, 298 feet long, with $25\frac{1}{2}$ feet water at its outer end, for the accommodation of large wool and other vessels. There is also an old jetty, the outer end of which has recently been removed.

Port Victor is connected with Adelaide by railway, *viâ* Port Elliot and Goolwa. There is a telegraph station here. Provisions may be obtained at Port Victor.

Trade.—The imports consist of,—fencing wire, coal, timber, potatoes, groceries, ironmongery and general goods used by settlers; the exports,—wool, copper, bark, wheat, flour, hides, tallow and honey.

Beacon.—At the end of the breakwater is a beacon consisting of a tripod surmounted by a white globe.

The harbour is situated in the bight between Granite island and Port Elliot to the north-east, the town of Port Victor being built on the low sandy point near Granite island, from which the beach curves round to Freeman Nob. The Hindmarsh river enters the sea three-quarters of a mile to the north, and a small river, the Inman, enters the sea half a mile to the south-west of the point. The water shoals gradually towards the mainland, but more rapidly towards the rocky coast of Granite island and the reef which connects it with the mainland.

A heavy swell sets in at times. This harbour is the shipping port for much of the Murray produce, which comes down to Goolwa, the river Murray port, by steam vessel, and thence to Port Victor by rail.

Anchorage.—The anchorage in Port Victor harbour is not good, the bottom under 5 fathoms being mostly limestone rock, with a thin coating of sand; but to obviate this objection heavy moorings have been laid down. There are three mooring buoys, in 4, 5, and 6 fathoms; and there are two warping buoys for off chains on the inner side of the jetty.

To moor.—If the moorings be used, the pilot or harbour master will give the master all necessary information. Ships using the inner and outer moorings are required to take in the mooring chains.

Storm signal.—A blue flag is hoisted on the indication of bad weather.

DIRECTIONS.—Vessels from the southward, bound to Port Victor, during the prevalence of strong south-westerly winds, are liable to be set to the eastward of their estimated positions. It is, therefore, desirable to steer direct for Rosetta head, and make this headland, as the coast near it is bold and free from outlying dangers.

As the swell is generally very heavy on this part of the coast, care should be taken against getting too close in with the land about Rosetta head in moderate or light winds, as the wind sometimes suddenly falls light when the high land is approached.

Having closed with the land so as to make out Seal rock, steer so as to pass half a mile to the southward of it, and haul round under its north-east side. Thence steer a N.W. course towards the harbour, within which the mooring buoys will be seen. In rounding the rock during a south-west gale, or a heavy swell succeeding one, keep close (outside), or keep off at least a mile, until it bears W.N.W., then shape a course for the anchorage.

At night.—Approaching from the south-west do not steer towards the harbour until Granite island light bears N.W. by W. (N. 56° W.), and by keeping it on that bearing, or to the west of it, pass not less than $3\frac{1}{2}$ cables east of Seal rock. But strangers having no pilot on board, should be very cautious in approaching the coast to the eastward of Rosetta head during the night.

Rocket station.—A rocket apparatus is maintained here.

Pilots.—A pilot can be obtained on hoisting the usual signal when approaching the coast. On a vessel nearing the moorings in Port Victor harbour, the harbour-master will come off and point out the moorings to be taken up. There are no licensed pilots at Port Elliot.

It is compulsory to employ a harbour pilot for Port Victor.

TIDES.—It is high water, full and change, at Port Victor, at 1 h. 9 m. ; springs rise $4\frac{3}{4}$ feet.

PORT ELLIOT, N.E. 5 miles from Rosetta head, had a population of 279 persons in 1891. This town is a favourite resort during the summer months. The port is a small bight on the east side of Freeman Nob, which is 89 feet high, and distinguished by a white obelisk, visible at a distance of 10 miles ; it is only a quarter of a mile across to Commodore point on its north-east side, barely 2 cables in depth, and is now quite deserted by shipping.

The Port Victor and Strathalbyn railway runs through the town, and there is a telegraph station.

Pullen's island and a small breakwater off Freeman Nob partially protect the port from the ocean swell, which occasionally breaks

outside in fine weather, and rolls right in through the southern entrance to the beach. The Twins, a rock nearly awash, lies right in the centre of the southern entrance, which should never be attempted, the northern entrance between Commodore point and the reef off Pullen's island being by far the safest.

The depth of water in the port is from 12 to 15 feet, rapidly increasing outside Pullen's island to 6 and 8 fathoms.

Pullen's island lies a quarter of a mile E. by S. from Freeman Nob; it is a mass of granite boulders, 20 feet high, about 350 yards long east and west, and 150 yards broad. A reef of rocks extends towards the port 400 yards in a north-westerly direction.

THE COAST from Commodore point trends N.E. $\frac{1}{2}$ N. for half a mile to a low stony point, to the northward of which the beach makes a small shallow bight; E.S.E. about 2 cables from this point lies the Frenchman rock awash; north-west from Frenchman rock foul rocky ground extends to the beach, which trends N.E. one mile to Middleton, where there is a rocky point. The beach then trends E. by S. $\frac{1}{2}$ S. $9\frac{1}{2}$ miles to Murray river mouth, backed by bushy sand-hills about 80 feet high, gradually falling to the eastward until within a mile of the Murray mouth, the west point of which is a flat of white bare sand.

Aspect.—The appearance of the land at the back of Port Victor and Port Elliot is that of gently sloping hills, rising to a height of 500 to 900 feet about 2 miles inland, with wooded summits and cultivated sides, broken north of Port Victor by the gap formed by Hindmarsh river as it flows towards the sea.

SEA MOUTH of MURRAY RIVER.—The sea mouth of Murray river is a narrow opening in the beach, it may be recognised by Barker's knoll, about 70 feet high, and the first bare sand-hill of any elevation or extent eastward of the high land of Encounter bay; the west side of the opening is low and flat.

The surf usually breaks heavily across the mouth of the river, except in the finest weather; it is only used by vessels of light draught.

See charts, No. 1,014 and No. 849, Sea mouth of the Murray river, scale $m = 3.0$ inches; plan of bar, scale $m = 6.0$ inches.

The Murray is navigable from beyond Albury in New South Wales, to lake Alexandrina, thence to the sea, a distance of about 1,500 miles. Vessels of over $6\frac{1}{2}$ feet draught cannot pass Ram island bar, about 12 miles above Goolwa, except during high floods.

Barker's knoll.—This extraordinary hill, which forms the eastern side of the sea mouth of Murray river, is ever changing in its form and appearance, according to the prevailing winds, and is fast receding to the eastward, in which direction the entrance has shifted 500 yards in four years.

The channel through the sea mouth, or entrance of Murray river is bounded to the eastward by Nation bank, which extends a considerable distance to the south-westward from the base of Barker's knoll; and Pullen's spit extending from Sir Richard peninsula, forms the western limit of the channel.

The bar, 5 cables in a southerly direction from the entrance proper, consists of sand, shells, and small stones, hard on the east side and moderately firm on the west; in March 1876, the bar was about $2\frac{1}{4}$ cables across in a north and south direction in the middle, $1\frac{1}{4}$ cables on the west, and 2 cables on the east side, with depths to 7 to 8 feet. It is constantly shifting and altering in extent, depth, and relative position to Barker's knoll. It has been observed that the heaviest rollers break well outside the bar, in $3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms, whilst the bar is tolerably free from rollers of any considerable height.

Within two hours either before or after high water, 10 to 11 feet might be depended on as the least water on the bar, except for three or four days during neap tides with south-east winds, when there would be barely 10 feet at high water.

During the finest weather, when there is no break on the bar, the height of the swell on it is 3 to 4 feet, the average break being 6 feet; the ordinary outer break is at about the 2-fathoms line, and is from .5 to 8 feet high. On the west side of the bar the waves gradually curl round at right angles to Pullen's spit, decreasing in height, but breaking over it sometimes in Goolwa channel. On the east side the breakers do not extend on the shore further than the south-west point of Nation bank, but they are the same height close to the beach as on the bar. Although the sea is very confused, it never breaks in

the channel inside the bar. In the heaviest seas, caused by westerly gales, or by heavy gales which do not always reach the coast although the swell does, the sea breaks in 5 fathoms water, the waves being 18 to 20 feet high.

Within the bar the soundings vary considerably, and the channel is generally deeper and more direct in the winter months, trending more in a westerly direction as the descending currents become lessened in volume during the summer.

The channel within the bar is $3\frac{1}{4}$ cables long in a north and south direction, about one cable wide, and nearly 40 feet deep in some parts, bottom fine sand and shells; on the east side of the channel there are 18 to 30 feet hard bottom close to Nation bank. Pullen's spit is more shelving, and the bottom soft, being kept continually in motion by the breakers.

Nation bank, on the east side of Murray river entrance, covers only with spring tides, and during strong north-west winds; the outer edge of this bank trends in an E.S.E. direction, and is the low-water limit of the sea beach of Younghusband peninsula. In 1877 the bank extended $1\frac{1}{2}$ cables in a westerly direction from the base of Barker's knoll. The shoal with less than 6 feet on it, that extends 4 cables in a S.S.E. direction from the south-west point of Nation bank, forms the eastern limit of the channel over the bar.

Pullen's spit, on which the sea usually breaks heavily, lies on the west side of Murray river entrance, and which, in 1876, was for the most part covered, except when low-water spring tides occurred with south-east winds, in 1878, was above the level of high water. The outer edge of this spit trends to the westward, and is the low-water limit of the sea beach of Sir Richard peninsula. The shoal with less than 6 feet on it, which extends $2\frac{1}{2}$ cables in a South direction from the south point of Pullen's spit, forms the western limit of the channel over the bar.

Directions.—The best time for passing through Murray river entrance is from two hours before to two hours after high water, and if the sea be breaking heavily, by watching and going through

directly after a heavy roller, a steam vessel could cross the bar before another sea broke; 3 to 4 feet is considered sufficient to allow for scend in ordinary weather.

Masters of vessels, acquainted with the entrance, having taken all requisite precautions, should steer towards it; before shoaling the water to less than 5 fathoms, if the bar is not quite smooth it is advisable to observe if the rollers break with sufficient force to endanger the steering; when satisfied that the condition of the bar is safe, steer in. In 1880 the bar was navigable for 300 days.

Masters of vessels having a limited knowledge of Encounter bay and the entrance of the Murray, will act prudently if they avail themselves of the services of the harbour-master stationed at Port Victor harbour, or any other duly qualified pilot, to guide them through the entrance.

A vessel arriving off the sea mouth of Murray river, finding the surf too heavy for her to attempt the bar, is recommended to proceed to Port Victor harbour, in which place she may safely wait for a favourable opportunity to cross the bar, which is not likely to occur whilst the sea breaks heavily on Seal rock, as by this a fair estimate may be formed of the state of the bar.

Caution.—No sailing vessel should at any time attempt the passage with a scant or light wind, unless it be quite smooth on the bar.

TIDES and TIDAL STREAMS.—It is high water, full and change, on the bar of Murray river at 0 h. 50 m., extraordinary springs rise 6 feet, ordinary springs 3 to 4 feet, neaps 2 to 3 feet; highest tides occur with north-west winds, and lowest with south-east winds.

On the bar at the sea mouth of the Murray river, high tide occurs in the night or morning from September to March; and from March to September in the day or afternoon. Also the time of high water only varies two hours from the time observed on full and change days (0 h. 50 m.), ranging from 11 h. when the moon's age is 10 or 26 days; to 3 h. when the moon's age is 20 or 7 days.

In the Murray mouth the ebb tidal stream runs strongest at low water, the ordinary rate then being 3 knots on the surface in the deep part, and 4 knots on the bar.

If the tide does not rise more than 2 feet the ebb stream runs on the surface during the whole of the flood, its strength being less than one knot at high water. The flood stream ordinarily makes from the south-eastward, descending under the outgoing fresh water on the east side of the bar, and not coming to the surface until it has entered the Coorong.

The flood stream does not generally run on the surface until about two hours before high water during spring tides, and with north-west gales, at half flood; at ordinary springs the ebb stream commences to make out about one hour after high water.

In the Goolwa channel the ebb stream runs continuously on the surface when the tide does not rise more than $2\frac{1}{2}$ feet; at ordinary springs the tide commences to flow along the bottom at half flood, but does not flow on the surface until one hour before high water; the ebb stream begins to make an hour after high water.

In the Mundoo channel the stream turns about the same time as in the Goolwa, except that the sea breeze blows up the channel, and retards the ebb stream on the surface.

In the Coorong channel the flood stream makes underneath directly after low water, but does not flow on the surface at once; the ebb stream commences to make soon after high water.

Information relating to the state of the channel and bar should be obtained at Goolwa before proceeding to sea.

Lakes Alexandrina and Albert.—Within the sea mouth of the Murray are three openings, leading into lake Alexandrina, which is 20 miles long, east and west, 10 miles wide, and forms the estuary of the river which flows into its eastern end. On the south side of the lake a narrow opening leads nearly 5 miles south-eastward, into lake Albert, which is about 5 miles wide, and extends 10 miles southward, to within 3 miles of the sea coast.

Lights.—A *fixed* white light is shown from a lighthouse, 67 feet above high water on Malcolm point; and a *fixed* white light is shown from a mast on Milang jetty.

GOOLWA, on the west bank of the river Murray, 60 miles from Adelaide, is the oldest established port in connection with the trade of that river, which is large and extending. There is railway communication with Adelaide and Port Victor, and also a telegraph station. The wharf is 700 feet in length, and has $6\frac{1}{4}$ feet alongside it at low water. There is a yard for building and repairing steam vessels; also a patent slip. Population in 1891, 632 persons.

Goolwa or the Lower Murray.—The westernmost of the three channels between the sea mouth of the Murray and lake Alexandrina, extends nearly W.N.W. 6 miles from inside the entrance of the river, to the township of Goolwa. It trends along the south side of Hindmarsh island, and in nearly a parallel direction with the north shore of Encounter bay, from which it is separated by a long neck of land only about a quarter to three-quarters of a mile broad.

The north side of the Goolwa channel is bordered by low swampy land, and near the mouth by a sand-bank which partially covers at high water neap tides, and covers entirely at high water spring tides, up to the high-water mark of Hindmarsh island.

The entrance to this channel between the east end of Sir Richard peninsula and the spit off the south-east end of Hindmarsh island is 200 yards wide at low water, with depths of 12 to 16 feet.

The channel between West bank and the township of Goolwa varies from about 120 to 300 yards in width, with 8 to 30 feet water. About half a mile within the entrance is port Pullen, in which there are 10 to 14 feet water.

About three-quarters of a mile below Goolwa wharf the channel is divided into two narrow passages by Middle shoal, the northern being the direct passage.

From Goolwa the channel of the Lower Murray trends 8 miles in an easterly direction along the north side of Hindmarsh island to its east point, and two creeks branch off to the north-west. From the east point of the island the channel continues eastward 5 miles to the entrance of lake Alexandrina.

River beacons.—Beacons have been placed on the steep sides of the banks forming the channel to Goolwa. The black beacons, which have round tops, are on the south side; and the red beacons,

which have diamond-shaped heads, are on the north side. By keeping the black beacons on the port, and the red beacons on the starboard side in going up, and the contrary in going down, there is no difficulty in navigating the channel from West shoal to Goolwa wharf by any vessel that can cross the bar.

Anchorage.—At the township of Goolwa there is ample space to anchor in $2\frac{1}{2}$ to $3\frac{1}{2}$ fathoms water a convenient distance off the wharf.

Hindmarsh island is 8 miles long, east and west, and 4 miles broad, its south-east side being separated by a narrow opening from Mundoo island, between which and the extensive shoals to the eastward there is a channel leading to the entrance of lake Alexandrina.

Mundoo is the central channel between the sea mouth of Murray river and the entrance to lake Alexandrina; this channel near its mouth is about 60 yards wide at low water, and has a sandy bar stretching entirely across with 4 to 6 feet water for a distance of 200 yards in a north and south direction.

Coorong channel begins between Nation bank and the shoal extending south from Mundoo island; there are depths of 12 to 26 feet for a distance of a mile from its mouth; about a mile further up, the channel becomes contracted by extensive banks, partially covered, on either side, extending 70 miles along the back of the beach to the south-east. This inlet is one to 2 miles wide, the barrier or beach which separates it from the sea-coast being rarely more than one mile across.

The COAST.—Murray mouth to Lacepede bay.—From the Murray mouth the coast trends S.E., forming one unbroken sandy beach for 92 miles, which curves slightly inwards.

There are sand-hills at the back of the beach for the whole distance, varying in height from 90 to 160 feet, but there is such a similarity in their appearance that the recognition of any particular one is very difficult, except, perhaps, of some of the bare patches. At 6 or 7 miles off the land it is difficult to recognise any marks on it.

The surf on the whole of this beach is heavy at all times, and in

westerly and south-westerly gales extends in some places 3 to 4 miles from the shore.

Caution.—Vessels should keep as far out of the bight between Encounter and Lacepede bays as possible; it is a dangerous place with the wind blowing on-shore, or to be becalmed in.

LACEPEDE BAY is formed by the bight in the coast between cape Jaffa and the Granite rocks, which are N.N.E. 19 miles from the cape. It is a remarkable fact that this bay, although apparently exposed to the ocean swell, affords safe anchorage in all weathers, there being tolerably smooth water even in the height of a westerly gale. Two reasons account for the smoothness of the water; the force of the prevailing swell from the S.W. is broken by the reefs off cape Jaffa, and that from the N.W. and West by traversing (before it arrives near the anchorage) a long extent of undulating ground with shallow water over it, there being only 20 fathoms, 16 miles West of Kingston jetty.

Buoy.—A black and red chequered buoy is placed on a shoal patch, having $1\frac{3}{4}$ fathoms on it at low water. This patch lies directly in the track of vessels bound to or from Kingston, and bears W. by S. nearly $1\frac{3}{4}$ miles from the inner end of Kingston jetty.

If drawing more than 12 feet do not approach it within 3 cables.

Granite rocks, N. $\frac{1}{2}$ W. $9\frac{1}{2}$ miles from the mouth of Maria creek, and S.E. $\frac{1}{4}$ S. 80 miles from the Murray mouth, are two conspicuous rocks on the beach close to the sea; the larger is 19 feet high. They show black against the sand behind. Some rocks which uncover with the tide extend 100 yards to seaward from them.

Nation rock, S.W. $\frac{3}{4}$ S. rather more than one mile from the Granite rocks, and one mile off shore, is about 80 yards across east and west, and 30 yards broad. A pinnacle about the size of a capstan dries 2 feet, the rest has $1\frac{1}{2}$ to 2 fathoms water on it, with 5 fathoms close to all round. The long weeds, with which the rock is covered, seem to prevent the sea from breaking, which it seldom does.

Rocks.—A rock of small extent with 7 feet water on it, and $5\frac{1}{2}$ fathoms a quarter of a cable off all round, lies one mile south-west of Nation rock.

Two rocky heads, about 6 yards apart, with a depth of 12 feet over them, are reported lying S. by E. $\frac{3}{4}$ E. half a mile from Nation rock.

From Kingston to cape Jaffa the land is very low ; the coast is a sandy beach with a bank behind covered with trees, the tops of which are visible 7 to 8 miles to seaward.

A sandy spit runs out from the beach $6\frac{1}{2}$ miles south-west from Kingston jetty ; the deepest water on it is one fathom ; a small portion dries. To clear it, do not bring cape Jaffa west of S.W. by S. until a remarkable sand-patch on the bank above the beach, $1\frac{3}{4}$ miles E.N.E. from the north end of cape Jaffa, bears east of South.

Surf.—There is no surf between cape Jaffa and a position on the beach 3 miles north from Maria creek, where the sand-hills commence and rise gradually to the north ; landing should not be attempted northward of this position.

Maria creek, which flows into the sea just north of Kingston, is the means of escape for the accumulation of water in the swamps behind the township. The mouth is sometimes blocked up with weed, otherwise it is available for boats.

Kingston.—The township of Lacepede bay, 169 miles south-east of Adelaide, is situated close to the sea, on the banks of Maria creek, 10 miles from the Granite rocks, and 11 from cape Jaffa. The name of the port is Caroline. Usually a steam vessel calls here weekly on her voyage between Adelaide and Melbourne ; several small sailing vessels trade regularly. The railway extends from Kingston to Naracoorte, a township 54 miles inland, in the middle of a large wheat-producing district, and to Wolseley, joining there the main line between Adelaide and Melbourne. This port has the safest and most commodious anchorage between Adelaide and Melbourne. There is an iron jetty 4,005 feet in length, and having at its outer end $12\frac{1}{2}$ feet at low water. Four warping buoys for hauling off only are placed on the north-east side of the jetty, but vessels are not to ride by them.

There are six mails a week from Adelaide, and there is communication by the universal telegraph system ; communication can be made with the signal station by the commercial code. The population in 1891 was 198.

Supplies.—Provisions can be obtained at the stores, and water from the railway authorities in a tank, which is taken off by lighter.

LIGHT.—A *fixed* white light is exhibited from a white iron tower, 20 feet high, and 25 feet above the sea, on the outer end of the jetty. The light is visible in clear weather for 10 miles.

CAPE JAFFA, or Bernouilli, S.W. $11\frac{1}{2}$ miles from Kingston, is a low sandy point extending one mile north and south. A wooded range rises near the southern part of it, which attains a height of 254 feet at mount Benson S.E. by E. $8\frac{1}{2}$ miles from the cape. Three rocky ledges extend from the point; the end of the northern one is N.W. by N. 2 miles from the north point of cape Jaffa, where there are 3 fathoms, with $1\frac{3}{4}$ fathoms just inside; the western ledge W. $\frac{1}{2}$ S. a little above $2\frac{1}{2}$ miles from the cape, with depths from 2 to 3 fathoms over it; and the southern extends the same distance South from the south part of the cape, terminating in an isolated rock with 3 fathoms water on it, and 6 fathoms outside. There are 4 to 6 fathoms water between the above-mentioned reefs; the sea breaks on all parts of them in an irregular and uncertain manner, making it dangerous for boats going over them. A rock dry at low water lies close to the south part of the cape.

There is good landing on cape Jaffa between the northern and western ledges, near where the lightkeepers' cottages are built.

Rocket station.—A rocket apparatus is maintained at cape Jaffa.

MARGARET BROCK REEF.—The rock on which the lighthouse stands is the only one above water of this extensive danger; it is awash at high water and bears W. $\frac{1}{2}$ S. nearly 4 miles from cape Jaffa. The west end of the reef, a rock awash at low water, is N.W. half a mile from the lighthouse; the North rock, a little more than $1\frac{1}{2}$ miles N. $\frac{1}{4}$ E. from the lighthouse with 2 fathoms on it; and the south breaker S. $\frac{1}{2}$ E. $2\frac{3}{4}$ miles from the lighthouse with 2 fathoms, rock. There is another breaker with $2\frac{1}{2}$ fathoms water on it, E. $\frac{1}{2}$ S. 2 miles from the last, from which to the end of the reef running south from cape Jaffa, it is E. by N. about $1\frac{1}{4}$ miles, with 6 fathoms between.

A rock is reported, situated with the lighthouse bearing about S. by W. $\frac{3}{4}$ W. distant $2\frac{3}{4}$ miles. As it was not found in a search made for it, its existence is considered doubtful.

Margaret Brock reef is not all connected, there being channels through parts of it with not less than 4 fathoms water; it is well, however, to regard it as a whole, and not attempt to pass through it anywhere. There is a channel between the reef and cape Jaffa with .5 fathoms least water; it passes three-quarters of a mile east of the lighthouse, where it is only half a mile wide; but it should not be attempted except by people well acquainted with the locality. The extremes of this reef do not always break; there are 6 to 8 fathoms water close to all parts of it to seaward.

Owing to the uneven nature of the bottom, the sea often breaks in bad weather for a distance of 4 or 5 miles outside the outer rock with such violence as would jeopardize a small deeply laden vessel.

LIGHT.—Cape Jaffa lighthouse is an iron structure on the central part of the Margaret Brock reef; iron piles screwed into the rock support a platform on which the dwellings of the keepers are built, and from which the lighthouse, painted white, rises to a height of 100 feet above high water. It exhibits at 100 feet above high water, a *revolving* white light of the first order, which attains its greatest brilliancy *every half minute* and should be visible from a distance of 16 miles in clear weather.

Signal station.—There is a signal station at the lighthouse and communication can be made by the commercial code, but it is not connected by telegraph.

Anchorage.—The anchorage off Kingston for large vessels is with the inner end of the jetty bearing E. by S. rather more than 2 miles, in $4\frac{1}{2}$ fathoms water, sand and weed. There is a bank with $2\frac{3}{4}$ fathoms on it half a mile S.S.W. from this position; to the west and north the water is deeper. The inner end of the jetty bears from the south part of the bank mentioned E. by N. nearly $2\frac{1}{2}$ miles; there is good anchorage in 4 fathoms half a mile S.W. of this, with the inner end of the jetty bearing E. by N. $\frac{1}{2}$ N.; it is, however, nearly a mile farther from it than the first-mentioned anchorage. Small vessels anchor in 2 fathoms, sand and weed, with the inner end of the jetty bearing E. by S., 6 or 7 cables off. Twice this distance off on the same bearing there are 3 to $2\frac{3}{4}$ fathoms. With a good scope of chain out a vessel may ride here in safety during a south-west or westerly gale.

The anchorage in the southern part of the bay, where vessels

usually ship wattle bark, is for large vessels, with cape Jaffa S.S.W. nearly 2 miles, and the remarkable white patch on the bank above the beach S.E. $\frac{1}{2}$ S., in $4\frac{1}{2}$ fathoms water, sand ; or for small vessels in $2\frac{1}{2}$ fathoms, with the north end of cape Jaffa S.W. $\frac{1}{2}$ S. $1\frac{1}{4}$ miles, and the white patch E.S.E. The bark is embarked from a position some distance west of the small jetty, where the beach is rocky and shelving.

There is a place 5 miles south-west of Kingston jetty with 21 feet water, at three-quarters of a mile off shore, but the water is much shoaler towards the beach than at the white patch.

The surveying schooner *Beatrice* rode out at single anchor, a heavy west and south-west gale, in 3 fathoms water, with the white patch bearing E.S.E., and about the same amount of sea as is experienced in the same depth off Kingston. With strong North winds the water is much smoother off Kingston, but the holding ground is not so good.

A vessel may anchor with safety according to her draught anywhere between Kingston and cape Jaffa, inside the 5-fathoms line by the chart.

TIDES.—It is high water, full and change, in Lacepede bay at 0 h. 6 m. ; springs rise 5 feet. The time of high water is generally within an hour of noon and midnight for four days before, and the same time after a new and full moon ; on the fifth or sixth day there is only one tide in 24 hours, about 18 hours elapsing between two successive high waters. The time of high water is then irregular and uncertain for 4 or 5 days, after which it returns again to near twelve o'clock. The remarks relative to the times of high water with reference to the moon's age, apply to all the ports on the south-east coast of South Australia. After several days' westerly wind the general level of the water in Lacepede bay is raised 3 to 4 feet, the ordinary rise and fall of tide remaining the same as usual.

DIRECTIONS.—In steering for Kingston it is always advisable to first make cape Jaffa lighthouse. Kingston may be found by a wide gap in the trees, there being none between the township and Maria creek ; a large white store near the beach is conspicuous from the offing when the afternoon sun is shining on it.

At night, the lead and bearings of cape Jaffa light and the light on the end of Kingston jetty, are sure guides.

From the North-west.—From 3 miles East of cape Willoughby steer S.E. $\frac{3}{4}$ E. 85 miles; when, by night the light, or by day the lighthouse and high land south-east of cape Jaffa, the former bearing S.E. by S. (S. 34° E.), distant 11 miles, will be well in sight, and the depth 22 fathoms. From this position an East course will bring the jetty light or its tower in sight, and lead to the anchorage off Kingston.

From the southward or westward.—In rounding Margaret Brock reef do not shoal the water to less than 15 fathoms; this depth is rather more than 2 miles to seaward of any part of the shoal. With the lighthouse bearing East, distant 3 miles, steer N.N.E. (N. 22° E.) until the lighthouse bears S.S.E. $\frac{3}{4}$ E. (S. 31° E.). The north extreme of the reef will then bear S.E. by E. $\frac{1}{2}$ E. (S. 62° E.) 2 miles, and the course thence to the anchorage off Kingston, is N.E. by E. $\frac{1}{4}$ E. (N. 59° E.) 13 miles.

From Lacepede bay to Backstairs passage.—Steer a N.W. by W. $\frac{1}{2}$ W. (N. 62° W.) course for cape Willoughby from the anchorage off Kingston.

To the southward.—From the outer anchorage near Kingston steer S.W. by W. $\frac{1}{2}$ W. (S. 62° W.) 14 miles, or until the lighthouse bears S.E. (S. 45° E.) distant 4 miles, then South 7 miles, when the south extreme of Margaret Brock reef will bear E. by N. $\frac{1}{2}$ N. (N. 73° E.) 3 miles, and the course may be altered to the south-eastward.

In working in or out of the bay the lead and chart are the best guides.

Tidal stream.—There is no tidal stream in Lacepede bay, but both inside and outside Margaret Brock reef there is a strong northerly set after easterly winds.

Boatswain point, S.E. by S. 8 miles from cape Jaffa, is the north point of Guichen bay. There are some sand-hills 74 feet high close to the point, and the coast between it and cape Jaffa is low. Sand-hills attaining a height of 73 feet commence at cape Jaffa and continue for 3 miles to the south-east, there is then only a low bank as far as Boatswain point. The wooded range which rises at cape Jaffa is seen at the back, and passes 3 miles east of Boatswain point.

This part of the coast should not be approached; rocks and foul ground extend off it generally for a distance of 2 miles.

Caution.—Mariners approaching this part of the coast should do so with caution, and be careful to ascertain their position before attempting to pass cape Jaffa, as the current sets round it to the north-eastward, and has a tendency to draw vessels towards Margaret Brock reef.

Baudin rocks are a rugged and broken group stretching half a mile north and south; the highest, 30 feet, being S.W. $\frac{1}{4}$ S. about $1\frac{1}{4}$ miles from Boatswain point. There is a narrow channel between the rocks and the point with more than 2 fathoms water in it, but the ground is foul.

Black Pigs, S. by W. $\frac{1}{2}$ W., 2 miles from Boatswain point, and 7 cables S.S.E. from the South Baudin rock, are awash at half tide. A rocky reef with $2\frac{3}{4}$ fathoms on its extreme, extends half a mile towards them from the Baudin rocks, leaving a 4-fathoms channel $1\frac{1}{2}$ cables in width between.

There are 4 fathoms water at 2 cables south-west of the Black Pigs, and 6 to 8 fathoms close to the south and east of them.

Snewin rock is of small extent, with 26 feet least water over it, S. by W. $\frac{1}{2}$ W. $1\frac{1}{4}$ miles from the Black Pigs, and N.W. $\frac{1}{4}$ W. nearly $2\frac{1}{4}$ miles from the obelisk on cape Dombey, having 8 to 10 fathoms all round, and 15 fathoms a quarter of a mile west. It lies right in the mouth of Guichen bay, and only breaks when there is a high westerly swell, then seldom, but very heavily.

Clearing mark.—One Tree hill beacon in line with Robe lighthouse bearing S.E. (S. 45° E.) leads southward of the Black Pigs and northward of Snewin rock and South reef.

CAPE DOMBEY, the southern point of Guichen bay, is S. $\frac{1}{2}$ E. 5 miles from Boatswain point, and may be easily distinguished by an obelisk, painted in red and white bands, on its west point. The top of the obelisk is 76 feet above the sea.

South reef, composed of rocks awash with 2 to 3 fathoms water between, extends N.W. by N. more than half a mile from the north point of cape Dombey. The sea nearly always breaks on it, and as the ocean swell sets towards it, the reef should be carefully avoided. There is a boat channel with $3\frac{1}{2}$ fathoms between it and the cape, and 5 to 6 fathoms all round elsewhere.

GUICHEN BAY, included between Boatswain point and cape Dombey, is $2\frac{1}{2}$ miles in depth with soundings of 4 to 6 fathoms all over it. There is a rocky point E. by S. $\frac{1}{2}$ S. three-quarters of a mile from Boatswain point, from which a sandy beach with a low bank behind runs to the southward for 6 miles, the coast then takes a westerly direction for 2 miles to cape Dombey, being composed of rocky points and sandy bays, with rocks uncovered at low water extending a short distance off. A wooded range about 200 feet high and 4 miles inland, is seen to the east of the bay.

Light.—A small lighthouse, painted white, on the first rocky point eastward of Robe jetty, exhibits a *fixed* white light, with a red sector showing over Snewin rock, South reef, and the rocks north-eastward of cape Dombey, which may be seen from a distance of 5 miles in clear weather.

Beacon.—A beacon, with a square top, 25 feet high and painted red, has been placed on One Tree hill, situated S.E. (S. 45° E.) distant $1\frac{2}{10}$ miles from the above lighthouse.

Robe township is three-quarters of a mile south-east of cape Dombey; a jetty 1,122 feet long, with a rocky reef west of it, and 11 feet at the end of its east side runs out from the town. There are two cranes on the jetty. Vessels cannot go alongside, but boats can generally load at it. There are moorings in 3 fathoms, off the jetty, for the steam vessel calling here weekly between Adelaide and Melbourne, by which means the principal part of the trade is carried on. There is a telegraph station at Robe town, and there are six mails a week from Adelaide. The population in 1891, was 134. The climate is considered salubrious.

A life-boat is attached to the port; and a rocket apparatus for saving life from wrecked vessels is maintained at cape Dombey.

Supplies.—Fresh water and provisions may be obtained.

Meteorological observations.—In 1890 the mean height of the barometer at Robe was 29.99 inches, the maximum 30.58 inches in July and the minimum 29.28 inches in October.

The mean temperature for the year was $59^{\circ}6$ Fahr., the maximum $97^{\circ}2$ in January and the minimum $35^{\circ}5$ in July.

The rainfall for the year was 24·97 inches, falling on 164 days. The mean annual rainfall for 29 years was 24·65 inches, the greatest being 33·17 inches in 1861 and the least 17·21 in 1877.

DIRECTIONS.—From the northward, having passed Margaret Brock reef, do not bring the lighthouse on it north of N. by E. until the northern wooded hill near cape Jaffa bears E.N.E. Then steer S.E. by E. $\frac{1}{2}$ E. (S. 62° E.) until the beacon on One Tree hill, which is the north-western summit of a low range 120 feet high, and 2 miles S.E. by E. from cape Dombey, is in line with the lighthouse on the first rocky point east of Robe jetty, bearing S.E. (S. 45° E.). This leading mark clears the Black Pigs, Snewin rock, and South reef; passing one mile south-west of the first, and half a mile north-east of the second danger. It should be kept on until cape Dombey bears South, which leads a quarter of a mile to the north-east of South reef; then steer S.E. by E. $\frac{1}{2}$ E. (S. 62° E.), or for the south end of the long sandy beach at the east side of the bay, for the anchorage.

From the southward, do not approach within 2 miles of the coast until cape Dombey bears E.N.E. From the position with the cape on that bearing and distance, steer N.E. by N. (N. 34° E.) until the leading mark given above is on, then proceed as before. The leading mark given is the only practicable one for clearing the dangers about the bay.

When working in or out, bearings of the points are the best guides for clearing the rocks and shoals. Bound northward, steer out with the leading mark on until the Baudin rocks bear East, then haul to the westward, as the previous course N.W. (N. 45° W.) leads directly on to the south breaker of the Margaret Brock reef. If bound to the southward, keep the leading mark on until the obelisk bears S.S.E., then steer S.W. (S. 45° W.) until sufficient distance off-shore to alter course to the south-eastward.

At night.—Great care is required in entering Guichen bay at night.

Anchorage.—The anchorage is in 4 fathoms water, fine sand, with cape Dombey W. by S. $\frac{1}{2}$ S., and Robe lighthouse S. by E. $\frac{1}{4}$ E. During the first five months of the year when south-easterly winds prevail it is safe to anchor in Guichen bay; with north-west and

westerly winds, the season for which is from June to December, the anchorage is unsafe. Vessels should proceed to sea in time on the approach of a N.W. gale, of which the barometer usually gives ample warning: they sometimes occur in the early part of the year.

A good scope of chain should be veered on anchoring, and a second anchor be ready to let go in the event of bad weather.

Small vessels, in the winter season, should not anchor too close to a rocky point at the eastern end of the town, as, in the event of its being necessary to veer cable, such a position might be inconvenient.

Storm signal.—A blue flag is hoisted on the indication of bad weather.

TIDES.—It is high water, full and change, at Guichen bay at 0 h. 37 m.; springs rise 4 feet.

The **COAST** from cape Dombey takes a southerly direction for one mile to cape Lannes, a point with some rocks above water off it, and a reef running out one mile to the westward. From this point the coast trends to the south-east in an almost straight line to Rivoli bay.

Bishop's Pate, 110 feet high, is a round bare sand-hill near the coast, 5 miles S.E. from cape Dombey.

Rabelais peak is a pointed and conspicuous sand-hill, 157 feet high, close to the coast, 11 miles from cape Dombey. The coast between the peak and the cape is alternate rocky points and sandy bays, with sand-hills somewhat over 100 feet high behind; rocks uncovered at low water, and isolated patches always covered, extend from a quarter to one mile off it. The sea breaks heavily on the rocks and beaches; landing is impossible.

Nora Creina bay is a small opening in the coast under Rabelais peak; a boat may go inside where there is landing, but the attempt to get in is generally attended with danger, as it sometimes breaks right across the entrance of the bay.

Cape Martin, 82 feet high, the north-west point of Rivoli bay, is S.E. $\frac{1}{2}$ S. 24 miles from cape Dombey. The features of the coast are the same as between cape Dombey and Rabelais peak. From Nora Creina bay a reef runs nearly parallel to the coast for 6 miles to the

south-east, its greatest distance from the beach being $1\frac{1}{2}$ miles, which is at its south-east end. For 3 miles south of this and to a distance of 3 miles off-shore there are very irregular soundings, from 5 to 12 fathoms, causing high rollers and overfalls when the swell is heavy. Above the beach at the point where the reef ends are a number of bare sand-hills, the highest 108 feet, conspicuous from the southward. Between these hills and cape Martin the sand-hills are somewhat higher and not so bare. There is a green point 5 miles north-west from cape Martin, with a wooded hill 153 feet high at the back. From this point to cape Martin the coast is more cliffy, with foul ground, on which the sea generally breaks, extending off to an average distance of one mile.

Caution.—Do not shoal the water to less than 20 fathoms at night between Guichen and Rivoli bays; this will ensure being at least 5 miles off shore. The average depth at 2 miles from the shore is 12 fathoms, this is close to danger.

Inland hills.—A wooded range, which may be seen above the sand-hills from a greater distance than 5 miles off the land, runs parallel to the coast. The highest part of the range, a hill elevated 252 feet, is N.E. by E. $\frac{3}{4}$ E. 5 miles from Rabelais peak.

Salt lakes.—Between the range and the coast sand-hills, and extending from Guichen bay to Rivoli bay, are four large salt lakes, varying from 2 to 18 feet in depth; the bottom is limestone under soft white clay, the latter sometimes 2 feet thick. During the early part of the year they are frequented by great numbers of black swan, mountain duck, and seals. Kangaroos are very numerous on the sand-hills between the lakes and the sea.

Lake George, at the north end of Rivoli bay, approaches within 300 yards of the coast. Eastward of lake George, and close to the beach, are a range of sand-hummocks, 60 feet high.

RIVOLI BAY is an indentation near the middle of the sandy coast extending from cape Lannes, Guichen bay, to cape Banks. The sameness in character of the coast features, north and south of Rivoli bay, is such that when seen from an offing there is difficulty in making the anchorage unless certain of the latitude.

Landing is safe and easy on the beach north of Glen point to within 200 yards of the fence. A well of good water may be found about 200 yards north-west of Glen point, and about 50 yards from the beach.

The south end of Rivoli bay has been selected for the site of a small township, Grey town. At present few people reside here. They live in tents and temporary huts near the beach, and are engaged in collecting and carting wattle bark from the interior. The only conspicuous house is built on some rising ground near the end of the beach.

Extensive drainage works have been undertaken to the south-east of Rivoli bay, and the produce of the drained land will most likely be shipped from Grey town.

From cape Martin, cape Buffon, the south-east point of Rivoli bay, bears S.E. by E., distant nearly 6 miles; the depth of the bay from this line of bearing being about 2 miles near the north and $1\frac{1}{4}$ miles near the south end.

Soundings outside Rivoli bay, and from 4 to 5 miles off shore, are 20 fathoms rocky bottom, with occasional broken shells.

Penguin islet, close to the south-east of cape Martin, is a small rocky islet, extending N.W. and S.E. nearly a quarter of a mile, with an average width of 150 yards; it is 54 feet high at its north-west end, near which it is perpendicularly cleft down to the water's edge. This cleft is open to the east and west, and is a good mark for making cape Martin.

LIGHT.—From a white stone tower, 28 feet high, on Penguin islet, a *flashing* white light showing a *flash every ten seconds* is exhibited at an elevation of 80 feet above high water, which should be visible from a distance of 12 miles in clear weather. The keepers' dwellings are painted white.

Signal station.—There is a signal station at the lighthouse, and communication can be made by the commercial code, but it is not connected by telegraph.

Glen point.—Inside Penguin islet the coast trends to the northward, and forms a small sandy bay, which is shoal with rocky

patches. The north point of this bay, Glen point, is rocky, and bears North 6 cables from the south end of Penguin islet. From Glen point the beach extends in front of Beachport nearly three-quarters of a mile to the northward, and then trends east and south-east 7 miles, thence curving south-westward about 2 miles; this part, with cape Buffon, forming the south end of Rivoli bay.

A large rock awash, lies N. by E. $\frac{1}{2}$ E. 4 cables from the south point of Penguin islet, and 2 cables S.S.E. of Glen point, with rocky ground, extending 400 yards to the eastward of Glen point.

Several rocks skirt the south point of Penguin islet, and with a heavy swell the sea breaks in 5 fathoms water a cable S.E. by E. of the point.

Buoy.—A black buoy with a staff and ball is moored in 16 feet off Glen point, with the point bearing N. 64° W., and the south end of Penguin island S. 36° W.

Beachport is pleasantly situated in the north-west part of Rivoli bay on elevated ground. It was only founded in 1878, and has made rapid progress, being the outlet for the produce of a large district. The population was 179 in 1891. There is a railway to mount Gambier, and thence *viâ* Naracoorte to Wolseley on the line from Adelaide to Melbourne; there are three mails a week from Adelaide and it is also a telegraph station. An iron jetty, 2,563 feet in length, with a depth of $16\frac{1}{2}$ feet at its outer end at low water, runs off from the northern part of the town, and four buoys for hauling-off purposes are placed on its north side.

LIGHT.—A *fixed* red light is shown from a white wooden house at the outer end of the jetty, 15 feet above high water; it may be seen from a distance of 5 miles in clear weather.

Signals.—A black ball hoisted during the day, and a *fixed* white light exhibited at night, at the mast head of the flagstaff adjacent to the harbour master's residence at Beachport, denotes that steam and sailing vessels must not come to the jetty.

Lifeboat.—A lifeboat with crew is stationed here.

CAPE BUFFON is cliffy, 35 feet high, projecting about half a mile to the north-west. The coast south of cape Buffon is rugged

and broken for nearly 4 miles, with many outlying rocks, and backed by sandy hills covered with scrub. The bare sand is not so conspicuous from seaward as at the north-west end of the bay.

The land rises gradually from cape Buffon, and at 3 miles from the cape attains a height of 200 feet. A range of low wooded hills runs parallel to the coast from 2 to 3 miles back from the beach, rising to a height of from 150 to 180 feet. Between this range and the beach the land is low and sandy, with swamps near the hills.

Lake Frome, the waters of which are fresh, lies about one mile east of the south end of Rivoli bay. Fresh-water swamps extend from it towards the beach nearly half a mile.

Ringwood reef.—The central part of Rivoli bay is dangerous to navigation from the numerous reefs and rocky patches. The outer reef, Ringwood, lies a mile outside the line joining cape Martin and cape Buffon. It extends east and west one mile, and north and south 400 yards; the eastern end is thickly covered with long kelp. Some part of this reef always breaks. The western edge, in 3 fathoms, lies 2 miles nearly S.S.E. from Penguin islet, and W. by N. $\frac{1}{2}$ N. $4\frac{1}{2}$ miles from cape Buffon. During bad weather it breaks in 5 fathoms water about 100 yards west of the reef.

Ringwood reef is detached from the mass of rocks and reefs lying inside it by a channel with from 5 to 8 fathoms water. Its west and south-west sides shoal suddenly from 7 and 8 fathoms, which is the general depth across to cape Buffon.

Glen point in line with Penguin islet bearing North leads outside Ringwood reef in 9 or 10 fathoms, and cape Buffon bearing E. by S. clears this danger to the southward.

Lipson rock lies S.E. by E. $\frac{1}{2}$ E. $1\frac{1}{4}$ miles from Penguin islet, and is just awash at high water; it extends about 250 yards north-east and south-west with a breadth of about 100 yards. The ground is foul and rocky with from 9 to 18 feet water for one-third of a mile to the north-west, and one mile S. by E. from Lipson rock; in the finest weather there is a break on the south-west side of the rock, and, with the ordinary swell, breakers extend over the foul rocky ground in from 9 to 18 feet water.

West rock is the outer danger on the south side of the channel

leading to the anchorage off Beachport ; it is of small extent, with 17 feet water on it, breaks heavily at times, and lies North nearly one mile from the west end of Ringwood reef, and S.E. by S., $1\frac{1}{3}$ miles from Penguin islet.

A small rocky patch, with $4\frac{1}{2}$ fathoms on it, lies 2 cables North of West rock, and breaks at times with a heavy swell, when also breakers extend from West rock to Lipson rock.

De Mole reef lies in the north part of Rivoli bay, E.N.E. one mile from the south point of Penguin islet, and N. by W. $\frac{1}{2}$ W. a little over one mile from Lipson rock. This reef has 15 feet over it, with 4 fathoms, sand, close to its south-west side. North-east of De Mole reef are some straggling rocky patches, with from 16 to 18 feet. The sea breaks in a moderate swell on De Mole reef and the adjacent patches, and in a south-west gale or heavy swell, breakers extend from De Mole reef to the beach.

Northern anchorage.—In the entrance to the northern anchorage of Rivoli bay the soundings are from 11 to 8 fathoms, with Penguin islet bearing N.E. about one mile ; and 8 to 6 fathoms, with the islet bearing N.W. ; between the islet and De Mole reef the water suddenly shoals to 4 fathoms, when the south-east point of the islet bears W. by S. $\frac{1}{2}$ S., and 2 cables farther north to 3 fathoms, which is the greatest depth between Glen point and the shoal water N.W. of De Mole reef.

During a heavy swell, with a strong breeze from south-west to south-east, the whole of the space included between Penguin islet, Glen point, and De Mole reef, breaks in detached patches, and in a gale, continuously.

When Glen point bears south of W. by S. distant about half a mile, the depth increases to $3\frac{1}{2}$ and 4 fathoms ; but this patch of comparatively deep water is small ; only about 800 yards north and south and 400 yards east and west, with 17 feet water to the eastward, and shoaling gradually to 9 feet about 300 yards from the beach, inside which the soundings are irregular.

This anchorage is safe for a limited number of vessels, drawing less than 15 feet, with Glen point bearing south of W.S.W., and the south point of Penguin islet bearing south of S.S.W. $\frac{1}{2}$ W. Here the sea never breaks, and the bottom, firm, white, marl-like clay, is good holding ground.

Sherbert rock, lying E. by S. $\frac{1}{4}$ S. $1\frac{1}{3}$ miles from Lipson rock, and S.S.W. $1\frac{1}{4}$ miles from the nearest part of the beach, is a small heap of stones, 6 feet above high water, in the middle of a rocky patch which is awash, about 150 yards long by 100 yards broad; this again is surrounded by a large rocky shoal, extending one-third of a mile north-eastward, and half a mile southward of the rock.

There is a small rocky patch of 3 fathoms, which does not break, midway between Sherbert rock and the beach.

There are also six rocky patches, of about 3 fathoms, lying between S. by E. and S.E. by E. of Sherbert rock. The southern ones extend $1\frac{1}{2}$ miles, and the south-eastern ones $1\frac{3}{4}$ miles from the rock. The line of shoals S.S.E. from Sherbert rock break heavily with an ordinary swell, and those S.E. from it only at times with a heavy swell.

There is a 2-fathoms rocky patch, rather more than half a mile S.W. by W. of Sherbert rock, which breaks in ordinary weather. Also two 15-foot patches, one 6 cables N.W. $\frac{1}{2}$ N., the other N.W. $\frac{1}{2}$ W. $1\frac{1}{2}$ miles from Sherbert rock. These patches each extend 3 cables, and do not break in fine weather, being protected by the shoal water round Lipson rock.

Kelp.—From Ringwood reef to near cape Buffon the bay is strewn with a growth of long kelp, which reaches the surface from a depth of 9 or 10 fathoms.

The Beak is a dangerous reef lying off cape Buffon, on which the sea breaks heavily. The north-west and outer end of it is S.W. three-quarters of a mile from cape Buffon. The line of breakers extends nearly half a mile parallel to the coast in fine weather, and with a heavy swell extends right along the rocky coast to the south-east, about 6 cables off shore.

There is a patch of from $4\frac{3}{4}$ to 5 fathoms and 400 yards across, lying W. by S. $1\frac{3}{4}$ miles from cape Buffon, which breaks heavily, at times. Between this patch and the Beak reef is the best channel into Rivoli bay during rough weather.

Shoal water extends nearly 2 cables to the northward of cape Buffon, for a mile to the eastward of it, and the same distance north of the west end of the beach. The general depth outside this shoal water is 15 feet to half a mile off shore, outside which the water deepens quickly to $3\frac{1}{2}$ and 4 fathoms.

The southern anchorage in Rivoli bay is sheltered by the land from North round by east and south to S.W. From North to W.N.W. it has the partial shelter of the distant north end of the bay and the outer reefs, but between W.N.W. and S.W. by W. it is entirely open to the ocean swell. In fine weather, or off-shore winds, this anchorage is comparatively smooth, the prevailing south-west swell being broken by the Beak reef, and by the shoal water off cape Buffon.

During summer months, when strong south and south-east winds blow for weeks together, this anchorage is smoother than the northern one.

DIRECTIONS for the northern anchorage.—Approaching the northern anchorage, bring the south-east point of Penguin islet to bear N.E. and when it is distant about 2 miles steer N.E. by E. $\frac{1}{2}$ E. (N. 62° E.), or so as to give the point a berth of about half a mile. Gradually haul to the northward and leave the buoy off Glen point on the port hand at a distance of 2 cables.

At night.—After passing Penguin island at the distance of about half a mile, keep to the north-eastward, and when the jetty red light bears N.W. by N. (N. 34° W.), steer towards it.

The best anchoring position for vessels drawing over 12 feet is Glen point in line with a low gap in the sandy bay north of cape Martin, bearing S.W., and about a quarter of a mile off the end of the jetty, in from 3 to 4 fathoms, marl. The depth alters quickly.

For working in, no good directions can be given, the chart, lead, and look-out being the best guides.

To navigate the bay inside the reefs, keep parallel to the coast and about three-quarters of a mile off shore. If coming from seaward past cape Martin to run down inside the reefs, bring the south-east point of Penguin islet to bear W. $\frac{1}{2}$ S. (S. 84° W.), and steer E. $\frac{1}{2}$ N. (N. 84° E.), passing 2 cables south of De Mole reef, in $5\frac{1}{2}$ fathoms. When Sherbert rock bears S.S.E. keep parallel to the coast.

Working inside the reefs, it is best to make short tacks within a mile of the beach, which can be approached to one-third of a mile in 3 or 4 fathoms, except to the northward of De Mole reef, where a long tongue of rocky ground stretches out towards the reef.

The long stretch of beach between the north and south ends of the bay has much surf on it, extending fully a quarter of a mile off.

For the southern anchorage.—The best course is to bring cape Buffon to bear N.E. or N.E. $\frac{1}{2}$ E., and steer for it until 2 miles off; then haul a point to the northward, passing west one-third of a mile from the Beak, in 9 fathoms, and rather more from cape Buffon. When the end of the beach bears S.E. steer East for the anchorage.

The best anchorage is with cape Buffon bearing S.W., distant half a mile, and the house in line with the left fall of a bluff wooded sand-hill, bearing S. by E., in $3\frac{1}{4}$ fathoms water, marl. The holding ground here seems as good as at the north end of the bay. Small vessels anchor in $2\frac{1}{2}$ fathoms, with the cape bearing W.S.W., and the house S. by E.

There is no surf at the west end of the beach, the approach being shallow; and the landing is good for more than a quarter of a mile along the beach.

In a gale from West to W.S.W. the swell rolls directly into the southern anchorage. A vessel caught at anchor in one of these gales must remain and trust to her ground tackle, as the sea breaks in heavy rollers across the entrance. In the event of the weather and the barometer indicating the approach of a westerly gale, it is advisable to get under way and make for the northern end of the bay. These gales are uncertain, but are not likely to occur in the summer.

The southern anchorage, though not so safe as the northern, is easier to approach, and can be used by vessels of greater draught of water.

Current.—In the south end of the bay there is little or no current; but at the north end of the bay a set to the southward, of about half a knot an hour, is experienced at times.

Outside the bay the current seems to be influenced by the wind, setting strong to the southward during and after strong north or north-west winds, and *vice versa*.

TIDES.—It is high water, full and change, at Glen point at 0 h. 33 m. The spring tides rise 4 feet in fine weather, but the height is influenced by the wind. The time of high water at neaps

and height of the tide at that period are uncertain, there being only one tide every twenty-four hours for several days.

The COAST.—Between Rivoli bay and Carpenter rocks the coast is nearly straight. From cape Buffon to 4 miles south of it, the hills above the coast are wooded and attain a height of 197 feet. South-east of this, the coast hills are sandy and of less elevation; the most conspicuous is a sand-hill 145 feet high, $9\frac{1}{4}$ miles from cape Buffon. From cape Buffon the coast is clifty for 5 miles to the south-east, with rocks uncovered at low water extending off a quarter of a mile, except the Beak, which extends off three-quarters of a mile. There is then a sandy beach for 8 miles, which is steep-to, with the exception of a rocky patch with less than one fathom water on it, lying S.E. by S. $1\frac{3}{8}$ miles from the north end of the beach, and half a mile off shore. From the south end of this beach to the Carpenter rocks, 11 miles, the coast is sandy, with here and there rocks above water a short distance off; a reef, on which the swell breaks, fronts the beach for the whole of this distance; N.W. by W. 2 miles from the Carpenter rocks, it extends as far as one mile off shore.

Inland hills.—The best way to obtain the position off this coast is by bearings of the following hills, which stand up boldly from the low surrounding country, and are visible above the coast sand-hills from a greater distance than about 3 miles off the land. Their bearings and distances from cape Buffon are as follows:—mount Muirhead, 492 feet high, which stands by itself, E. $\frac{3}{4}$ N. 14 miles; mount Burr, 802 feet high, East $17\frac{1}{2}$ miles; mount Lookout, 709 feet high E. by S. $\frac{1}{4}$ S. 21 miles; and the Bluff, 703 feet high, which has a very steep fall on its southern side, E. by S. $\frac{1}{2}$ S. 24 miles. The last three occupy respectively the north, centre, and south parts of a connected range.

Caution.—Special care and attention is required to the navigation along the coast between capes Martin and Northumberland, the prevailing winds being from the S.W. A continual swell sets on the coast, which, together with an uneven bottom, produces such an irregular sea, that in the event of a vessel being obliged to carry sail to get off the land, the wear and tear would be excessive.

Carpenter rocks are two black rocks above water, a short distance off a point S.E. $\frac{1}{2}$ S. $23\frac{1}{2}$ miles from cape Buffon.

CAPE BANKS is a rocky point 50 feet high, S.E. $1\frac{1}{4}$ miles from the Carpenter rocks. Between the rocks and the cape is a little bay, with a reef across the entrance, and one off the beach in it. There is a sand-hill 125 feet high at the back of the bay. S. by E. rather more than $2\frac{1}{2}$ miles from cape Banks is a rock with 5 fathoms water on it, which breaks heavily with a high south-westerly swell; there are 15 fathoms close to seaward, and 6 to 7 inside.

LIGHT.—A lighthouse, a white stone tower 25 feet high, is situated on Carpenter rocks point, near cape Banks, and adjacent to Carpenter rocks; it exhibits at 92 feet above high water, a *revolving* light of the second order, showing alternately one red and two white lights at intervals of *twenty seconds* each. The white light should be seen from a distance of about 10 miles, and the red light from 8 miles in clear weather.

Signal station.—There is a signal station at this lighthouse and communication can be made by the commercial code, but it is not connected by telegraph.

Douglas point is a green point 76 feet high, S.E. by E. $\frac{1}{4}$ E. 11 miles from cape Banks. Off the point there are 10 fathoms half a mile to seaward. The coast between is low and sandy, the highest part being a sand-hill of 105 feet, 5 miles from Douglas point. Isolated rocks and reefs extend to an average distance of one mile from the beach. At about 3 miles south-east of cape Banks are two rocks, which from seaward appear as two islands; they are part of the mainland, and form a cove where two small vessels might lie.

Middle point, with a bare sand-hill for its summit, 55 feet high, lies 2 miles E. by S. from Douglas point. The coast is low between the two points, with only one sand-hill on it, three-quarters of a mile north-west of Middle point. S.E. by S. 8 cables from Middle point is a reef, a quarter of a mile in extent north and south, with less than one fathom on it. Rocks uncovered at low water extend half a mile off on either side of this point, and nearly a mile off between it and cape Northumberland.

Soundings.—Between cape Buffon and cape Banks there is a depth of 10 fathoms at an average distance of one mile from the land.

between cape Banks and Douglas point at 3 miles off, from Douglas point to cape Northumberland at one mile, and between cape Northumberland and the Glenelg river at 2 to 4 miles from the land, being farthest off south of Danger point. Between capes Buffon and Northumberland the depth is 25 fathoms at an average distance of rather more than 5 miles from the land, over a rocky bottom.

CAPE NORTHUMBERLAND, S.E. by E. $\frac{3}{4}$ E., nearly $2\frac{1}{4}$ miles from Middle point, is rugged and cliffy, about 100 feet high, with a hill behind it rising to 136 feet, and several detached rocks lying close to it. It may be easily distinguished by the lighthouse. Mounts Gambier and Schanck are also excellent marks to recognise it by. *See* page 386.

For a mile from Middle point towards cape Northumberland the coast is low, with a swamp behind, sand-hills then commence and continue to the cape.

LIGHT.—The lighthouse, on a knoll on cape Northumberland, is 42 feet high, painted with three bands,—white, red, and white. It exhibits at 150 feet above high water, a *revolving* white light of the first order, which attains its greatest brilliancy *every minute*, and should be seen from a distance of 20 miles in clear weather.

During hot weather and north-east winds, when there is often much refraction, the light is frequently seen from a great distance.

The light-keepers are provided with a gun, to warn vessels, if observed standing into danger.

Signal station.—There is a signal station at the lighthouse, and communication can be made by the commercial code of signals. This station is connected by telegraph.

All vessels passing cape Northumberland lighthouse during the day, and wishing to be reported, will, on showing their numbers, be telegraphed to Adelaide and Port Adelaide free of expense.

In consequence of the difficulty in making out the answering pendant, a round ball with the answering pendant underneath is used at the signal station, instead of the answering pendant only.

The station is connected with Port Macdonnell by a telephone.

The storm signal is a blue swallow-tailed flag under a red ball.

Meteorological observations.—In 1890 the mean height of the barometer at cape Northumberland was 29·99 inches, the maximum 30·57 inches in July and the minimum 29·09 in October.

The mean temperature for the year was 57° Fahr., the maximum being 103° in January and February, and the minimum 29°·1 in July.

The rainfall in the year was 25·9 inches, falling on 162 days; the mean annual rainfall for 24 years was 27·47 inches; the greatest fall was 35·02 inches in 1870 and the least 20·73 inches in 1888.

DIRECTIONS.—In approaching cape Northumberland at night from the north-westward if the light is sighted on a more southerly bearing than E. $\frac{1}{2}$ S. (S. 84° E.), alter course to the southward in good time, and give a wide berth to the outlying reefs west of the cape, which run parallel with, and extend a mile off shore.

In approaching the cape from the eastward do not bring the light to bear west of W.N.W. (N. 67° W.), nor approach the light on that bearing, but steer more southerly, to give a wide berth to the reef which stretches eastward from cape Northumberland.

In bad weather, with the wind from the southward, the lead should be carefully attended to. Several vessels have been wrecked between cape Northumberland and cape Buffon from neglecting this precaution.

The coast north-west of cape Northumberland soon becomes low, and owing to the heavy ocean swell which sets directly on it should be very carefully avoided.

Kelp.—Between cape Banks and cape Northumberland, and from one to 4 miles off shore, there are forests of kelp, the tops of the plant trailing a long distance on the surface of the water; it does not appear to grow where the depth is greater than 15 fathoms. Steam vessels have been obliged to stop to clear their screws of the accumulated weed. There is a quantity of it in Rivoli bay between the Ringwood reef and cape Buffon, but it is not in the way of vessels passing along the coast; and there are patches of it which

look like rocks, where there are 10 fathoms, westward of Margaret Brock reef.

Fish.—Barracouta are very plentiful in the waters between cape Jaffa and cape Northumberland; they are easily caught when in more than 20 fathoms, and with the vessel going from 4 to 6 knots.

Breaksea reef, the south end of which is S.E. by E. 2 miles from cape Northumberland, is a dangerous rocky reef, extending $1\frac{1}{2}$ miles east from the cape and the same distance off shore. There are less than 2 fathoms on most of it, and the sea generally breaks all over it with great violence. To clear it to the south-west keep the sand-hill on the beach between Middle and Douglas points well open to the left of cape Northumberland N.W. $\frac{3}{4}$ W., until the Custom-house at Port Macdonnell bears west of North; and from the eastward the Custom-house should not be brought to bear east of North until the sand-hill is well open of cape Northumberland. There are 11 fathoms water half a mile south-west from cape Northumberland, and 5 to 6 fathoms close to the south-west edge of the Breaksea reef.

MACDONNELL BAY, is a very slight indentation of the coast, extending E. by N. about 4 miles from cape Northumberland, and affords shelter from north-westerly and northerly winds, within Breaksea reef.

Port Macdonnell being near to the most fertile portion of the colony, and connected with it by good roads, is one of the principal trading places of the south-east districts of South Australia, and is situated on the coast, 2 miles to the eastward of cape Northumberland. There is a considerable export of wheat, flour, wool, potatoes, ground bark, and dairy produce. The population in 1891 was 316. There is telegraphic communication, and there are six mails a week from Adelaide. It is 14 miles from the railway at mount Gambier.

A steam vessel trading between Adelaide and Melbourne calls weekly, and there is a large trade by small vessels between the port and Melbourne. Vessels trading regularly are especially fitted with hawse-holes large enough to take in the mooring chain, and are provided with hawsers to be used as springs when there is much swell.

Bonded and free stores have been established; and provisions,

water, and ships' stores can be procured. There is a convenient jetty, 1,060 feet long, with trucks and cranes, and having at its outer end $5\frac{1}{2}$ feet at low water, in the most sheltered part of the bay. The lighters are fine sailing boats, carrying about 15 tons of cargo.

Moorings.—There are four sets of moorings with anchors of 80 cwt. in $2\frac{1}{2}$ to 3 fathoms at low water; these represent the total possible accommodation in from 14 to 17 feet water for shipping at Port Macdonnell, for with a south-westerly swell coming in it breaks everywhere else for miles round. The centre of the moorings is E. $\frac{1}{4}$ N. $2\frac{3}{4}$ miles from cape Northumberland lighthouse. Vessels parting from the moorings usually run on the shore North from them, and generally get off uninjured when the water has smoothed down.

Pilots.—Before approaching the coast, strangers should hoist the signal for a pilot, who will come off in favourable weather. Should the pilot not be able to board, it is recommended to maintain an offing until the weather moderates.

DIRECTIONS for Port Macdonnell.—It is necessary to have daylight to enter the bay. From the westward, with cape Northumberland North 2 miles distant, steer E. $\frac{1}{2}$ N. (N. 84° E.) until mount Gambier, a peak, is seen over the right or eastern fall of mount Schanck, a truncated cone, bearing North, the depth will be then 5 fathoms. Go in with the above leading mark on, it leads directly to the moorings, the water gradually shoaling; 13 feet will be the least passed over, which depth is $2\frac{1}{2}$ cables, a little west of South, from the outer moorings. This may be avoided by hauling a little to the eastward when half a mile from the moorings, and steering for them when they bear N.N.W. From the eastward do not approach the shore nearer than 3 miles until the leading mark given above is brought on, then proceed as directed.

In going out, if the wind is from the southward make the first board to the eastward, if the vessel will lie E.S.E., or to the southward of it. If obliged to cast to the westward, do not stand in a S.W. or westerly direction for more than half a mile. S.S.W. made good, clears Breaksea reef, and leads in safety to sea. The best course, if practicable, is to go out with the leading mark

on for 3 miles, by so doing passing through the smoothest water obtainable; a vessel will then be in 10 fathoms, clear of all breaks and dangers, and may proceed as desired. The chart is a good guide.

In the event of all the moorings being occupied, vessels entering the bay must anchor, and be kept in such a condition, as to ballast and trim, as will enable them to seek an offing should bad weather come on.

Although the moorings now laid down at this port are of the heaviest description, and fully competent to hold any vessel that can enter Macdonnell bay, it must be remembered that, during and directly after, heavy south-west gales, the sea rolls in over the out-lying reefs, breaking heavily in the bay, and in 7 to 9 fathoms to the southward of the port.

It is obvious, from the nature of the bottom, that no vessel is safe in bad weather from the westward, if at her own anchors.

The harbour master has coir springs for the use of vessels in bad weather.

At night.—Do not enter the bay at night without a pilot, but keep the light bearing from N.N.W. to N.N.E., taking care not to come under 25 fathoms water, or about 5 or 6 miles from the cape.

To moor.—The direction and position of the mooring anchors and chains will be duly pointed out, and instructions given to masters of vessels in mooring and unmooring by the harbour master or pilot.

In case of the weather being such as would render it improper to take hold of the large buoy, an anchor must be let go, clear of the direction of the mooring chains at the bottom.

TIDES.—It is high water, full and change, at Port Macdonnell at 0 h. 2 m. ; springs rise 4 feet.

Signals.—The flagstaff at which the signals are shown is situated near the inner end of the jetty.

A blue flag is hoisted by the harbour master at the flagstaff, when he deems it unsafe for vessels in the offing to come in and moor; or for boats to land from vessels at the moorings.

A lifeboat and rocket apparatus are in readiness in case of accident, and there is a pilot boat with coir springs, available for vessels at Port Macdonnell. In the event of shipwreck near, and the lives of the crew being in danger, assistance will, if possible, be rendered.

Mounts Gambier and Schanck are two isolated conspicuous hills, inland from this part of the coast. Mount Gambier, N. by E. $\frac{1}{4}$ E. 14 miles from cape Northumberland, is a peak 630 feet high, with table land attached which extends to the eastward of it. It is an extinct volcano and there are four lakes in the crater; the eastern, known as the Blue lake, is 160 fathoms deep and about half a mile in diameter.

Mount Schanck, N. by E. $\frac{3}{4}$ E. 8 miles from cape Northumberland, is a truncated cone, 380 feet high; it is also an extinct volcano and the crater is dry.

The COAST.—**Flint point**, E. $\frac{3}{4}$ N. 5 miles from cape Northumberland, is very low, and fronted by rocks and heaps of stones dry at low water. There are 3 fathoms more than a mile south of it. From cape Northumberland to this point the coast is low, a sandy beach with a bank behind, and except from Port Macdonnell jetty to 2 miles to the eastward of it, fronted by extensive rocky ledges dry at low water. A low wooded range runs in a northeasterly direction $1\frac{1}{2}$ miles from cape Northumberland; elsewhere the country at the back of Port Macdonnell is swampy for more than a mile inland. The swamps discharge themselves into the sea by Cress creek, the mouth of which is nearly one mile east of the jetty.

Danger point, N.E. by E. $\frac{3}{4}$ E. $1\frac{3}{4}$ miles from Flint point, is also low, with fresh water swamps at the back. The indentation between Danger and Flint points called Brown bay, is shallow; a rocky reef, with 3 fathoms on its extreme, extends S.S.E. $1\frac{1}{2}$ miles from Danger point. A range of wooded hills, which continues to the Glenelg river, commences N.W. by N. 3 miles from Danger point, with an elevation at that spot of 125 feet. Moorak creek, a fine fresh water creek, discharges itself into the sea close to Danger point; when there is no ocean swell on, a boat may run into the mouth of the creek, and fill water casks from alongside.

Green point, 50 feet high, E. $\frac{1}{4}$ N. $3\frac{1}{2}$ miles from Danger point,

is named from its verdant appearance. There is a sandy beach between it and Danger point, forming Riddoch bay, and a range of sand-hills, the highest 70 feet, commences in the bight of Riddoch bay and extends to Green point.

Landing.—Butte reef with 2 feet on it, having deeper water inside, makes landing practicable on Green point in ordinary fine weather, when there is a swell outside.

Ruby rock, East 12 miles from cape Northumberland, and nearly 2 miles off shore, has 3 feet on it at low water, and during south-east and easterly winds seldom breaks; with the sun ahead, there is no indication of the rock, attention must be given to the lead and bearings. There are 2 to 3 fathoms in an E.S.E. direction 3 cables from the rock, 8 fathoms close to seaward and 4 fathoms directly inshore of it; no leading mark can be given for clearing it. There are 16 fathoms 2 miles, and 20 fathoms 4 miles south of it.

At night, should the light be obscured, Ruby rock may be avoided by keeping in more than 10 fathoms water.

VICTORIA.

Glenelg river, which discharges itself into the sea at the boundary of South Australia, is E. $\frac{1}{2}$ N. $15\frac{1}{4}$ miles from cape Northumberland. The coast between it and Green point is a sandy beach with low sand-hills behind. There is a sandy bar at the mouth, which is fordable at low water when the sea is smooth.

Mount Ruskin is 150 feet high, N.W. by W. $1\frac{1}{2}$ miles from Glenelg river mouth.

The COAST.—Eastward of Glenelg river the coast in the bight is a succession of hummocks about 150 feet high, partly covered with bushes, the sand in many places reaching the summits. At 2 or 3 miles inland there are densely timbered tracts of rising ground about 300 feet high.

A heavy swell constantly rolls on this coast, rendering a wide berth necessary.

At a distance of about 12 miles to the north-west of cape Bridgewater a range of hills 500 feet high, and heavily timbered, lies at the back of the coast hummocks, about 2 miles from the coast. At the west extremity of this range, between it and the coast, is a group of high bare sand-hummocks, and a large tract of bare sand is situated at a distance of 4 to 7 miles from the cape.

Mount Kincaid, 692 feet high, lies N. by W. $\frac{1}{2}$ W. $12\frac{1}{2}$ miles from cape Bridgewater, and about 4 miles from the coast. It is scarcely visible from seaward, its appearance being that of a few trees only slightly elevated above the surrounding country.

Mount Richmond, 711 feet high, is conspicuous, and has a broad flat top. It lies N. $\frac{1}{4}$ W. nearly, $7\frac{1}{4}$ miles from cape Bridgewater.

CAPE BRIDGEWATER, E.S.E. 39 miles from cape Northumberland, has a flat summit 441 feet above the level of the sea, and falls gradually to the cliffy coast south and west of it, and to the cultivated land to the northward, the latter at its lowest part being about 200 feet high. The cape may be seen from a distance of 25 miles.

Anchorage.—West of cape Bridgewater there is slight shelter from easterly winds, but the bay is exposed to the prevailing winds. With discretion steam-vessels may use it, but a heavy swell almost constantly rolls into the bay.

Bridgewater bay.—East of cape Bridgewater is a bight known as Bridgewater bay, but which, like the bay to the westward, cannot be recommended as an anchorage. A heavy swell rolls in during southerly and south-westerly breezes, and, except under favourable circumstances, vessels ride uneasily. The swell threatens to break in 20 fathoms, on a line between capes Bridgewater and Nelson, and does actually break at nearly a mile off shore. The current often sets outward along the cape.

In the bight between capes Bridgewater and Nelson, but nearer the latter, there is a large conspicuous body of drift sand, just eastward of which is mount Chaucer, a small peaked hill 405 feet high.

CAPE NELSON lies E. by S. 7 miles from cape Bridgewater, and is an irregular cape of jagged cliffs, 200 feet high, rising at the back and centre to lightly timbered and grassy hummocks, the highest of which is 459 feet high; it is bold to the south-east. From

cape Nelson the land trends northerly for nearly 3 miles, and thence East for 2 miles, where it suddenly turns to the south-east forming a promontory named cape Sir Wm. Grant; this coast is composed of limestone cliffs from 100 to 200 feet in height.

LIGHT.—The lighthouse on cape Nelson is of stone, 79 feet high, and painted white. It exhibits at 250 feet above high water a *fixed* light of the first order, which should be visible in clear weather from a distance of 19 miles. The light is white seaward between the bearings of S. 84° E. and S. 84° W.; red between S. 84° E. and S. 79° E. over the southernmost point of cape Bridgewater and one mile seaward of that point; and red between S. 84° W. and S. 67° W., over Lawrence rock.

Auxiliary light.—An auxiliary *fixed* red light, visible seaward over an arc of 180°, is exhibited from cape Nelson lighthouse. This light is invisible to an observer, whose eye is 14 feet above the sea, until at a distance of 3 miles or less from it, and is intended to warn mariners of their near approach to the shore; when seen course should be altered to seaward until beyond the range of the red light. In hazy or misty weather mariners should not rely on sighting this red light, but should keep a good offing.

Signal station.—There is a signal station at the lighthouse and communication can be made by the commercial code of signals. Signals are telephoned to Portland, which is connected by telegraph.

Cape Sir William Grant.—A well defined point, projecting one mile to seaward, lies N.E. by E. $\frac{1}{2}$ E. 4 miles from cape Nelson, and has a table summit, the highest part of which is 222 feet high; the cape on all sides has precipitous cliffs, about 150 feet in height.

Danger point lies N.E. $\frac{1}{4}$ E. from cape Sir William Grant, forming a bight between, outside of which, and at a distance of two-thirds of a mile South of the point, is a reef, with only 16 feet water, upon which the sea breaks heavily. A reef with 17 feet water, also extends from the point half a mile in an easterly direction.

Lawrence rock, lying E. $\frac{1}{4}$ N. 2 miles from cape Sir Wm. Grant and S.E. by E. one mile from Danger point, consists of two small but conspicuous islets of limestone, the larger having two summits, the

higher of which is 132 feet above the sea. The passage between Danger point and Lawrence rock is not safe for shipping.

With strong winds from seaward a current sets out through this channel, sometimes at the rate of 3 knots.

Aspect.—In clear weather, when off Portland bay, mount Napier, 1,449 feet high, bearing about N. by E. 32 miles, is visible, and with mount Clay, 612 feet high, near the coast between Portland bay and port Fairy, will enable a stranger to identify the land in the vicinity. The appearance of mount Clay is that of a flat-topped hill with a notch in the centre; but for the notch it would closely resemble mount Richmond, which is 14 miles W. by S. $\frac{3}{4}$ S. from it.

PORTLAND BAY may be said to extend from Danger point N.E. $\frac{3}{4}$ N. 12 miles to Fitzroy river: and is the natural outlet of many millions of acres of agricultural and pastoral country. In the depth of the bay off the town of Portland there is good anchorage, sheltered from all but south-easterly gales, which seldom occur, and still more rarely with strength to do any damage to shipping.

The holding ground is good, being limestone ledges full of holes, generally filled with sand, but occasionally with blue clay and small boulders, apparently of volcanic origin. Coir rope springs are supplied by the Government for the use of shipping caught in south-easterly gales.

From Danger point the coast trends N.N.W. $\frac{3}{4}$ W. one mile to Blacknose point, and thence in the same direction nearly 2 miles to Observatory hill.

The coast about Danger and Blacknose points is low, being only from 60 to 70 feet in height. Blacknose point has a reef extending from it nearly 2 cables, at which distance the depth is 3 fathoms.

From Observatory hill the coast trends W.N.W. nearly half a mile, to the entrance of Wattle hill creek, which winds westward by the southern end of the town of Portland; from the entrance of the creek the coast curves along the front of the town N. by W. nearly a mile to Whaler point.

The coast from Observatory hill to Whaler point, or what may be termed Portland bay proper, is bordered by a sand-bank; the edge of the sand-bank in 3 fathoms water is a quarter of a mile from the shore, the water then deepens more suddenly, and at about 3 cables,

there is a depth of 5 fathoms. The water then deepens gradually, until at a distance of nearly 2 miles there is 10 fathoms.

From Whaler point the land trends N. by W. for a quarter of a mile then N.W. nearly a mile, whence it turns suddenly to the northward, and at half a mile again suddenly to N.E. $\frac{1}{4}$ E. At a distance of 5 miles is the mouth of Surrey river, about which is the village of Narrawong; this coast from its turn to the north-eastward is low, being only from 6 to 12 feet above high water. At a short distance from the beach it rises, but the whole coast is so densely timbered as to make it uncertain where the elevation takes place. A sandy beach fringes the coast described and off it is Minerva reef.

At $2\frac{1}{2}$ miles north of the mouth of Surrey river is mount Clay, 612 feet above the sea. From the mouth of Surrey river the land trends with a slight curve in an easterly direction nearly 8 miles to the mouth of Fitzroy river.

The whole coast from Surrey river is a succession of sand-hummocks about 30 feet high, nearly destitute of vegetation, having perpendicular or cliffy faces.

Whaler point is a limestone cliff 107 feet high, off which a reef of rocks extends a quarter of a mile, with 7 feet water on its outer and shoalest part. There is no channel over this reef.

Buoy.—East of the point, on the tail of the reef, a chequered black and white buoy is moored in 4 fathoms.

LIGHT.—The stone lighthouse on Whaler point is 37 feet high and of a gray colour. It exhibits at 130 feet above high water, a *fixed* green light of the fourth order, which should be seen from a distance of 12 miles in clear weather. The light is visible between the bearings of S. 34° W. through west to N. 50° W.

Minerva reef extends almost the whole distance between Surrey river and Whaler point. Its shoal water of 9 feet does not lie more than half a mile from the shore, but there are 21 and 22 feet at the distance of a mile; the whole forms a large piece of uneven bottom on which the sea breaks at times heavily.

The quarantine ground is about two-thirds of a mile north of Blacknose point, where a yellow buoy is moored. There is no station.

PORTLAND, the capital of the county of Normanby, 225 miles west of Melbourne, was founded in 1834, and is the oldest settlement in Victoria. The chief exports are cattle, wool, butter, corn, tallow, hardwood, fruit and agricultural produce.

Near the centre of the bay a jetty runs out 1,000 feet into 17 feet water. There is a boat harbour for small craft.

Portland is in communication with Melbourne by rail. There is also telegraphic communication. Steam-vessels frequently call during the week. The estimated population in 1892 was 2,284.

Meteorological observations.—At Portland, 37 feet above the sea, in 1892, the highest temperature was 102° Fahr., the lowest 32°, the mean 56·4°; rain fell on 169 days, and the amount was 29·22 inches.

SUPPLIES.—Fresh provisions and vegetables may be obtained. There is no regular stock of coal at Portland, but a small quantity, about 40 tons, can usually be obtained: vessels can be coaled at the rate of 200 tons a day.

Signal station.—There is a signal station at Portland pilot station, and communication can be made by the commercial code. It is connected by telegraph.

Light.—A *fixed* red light is exhibited from the end of the jetty near the centre of the bay, which should be seen from a distance of about 3 miles. It is visible between the bearings of S. 17° W. through west to N. 70° W.

A life-boat is stationed at the jetty.

Anchorage.—The best anchorage is in about 6 fathoms, half a mile from the shore, with Lawrence rock open of Blacknose point S.E. $\frac{1}{2}$ S., and in a line with the jetty, but vessels may anchor where most convenient; the southern shore is to be preferred. A vessel of heavy draught may anchor in 7 fathoms, about a mile from the town, with Lawrence rock bearing S.E. $\frac{3}{4}$ S., and the jetty W. by S.; and there is more convenient anchorage, in 6 and 7 fathoms, half a mile farther to the north-west. For the gunpowder anchorage, see page 499.

DIRECTIONS.—From the westward to Portland bay, endeavour to sight the high land of cape Bridgewater, which, when

seen from the distance of 12 or 15 miles from the south-westward, appears covered with white sand-patches. Then, after making cape Nelson, steer for a convenient distance outside Lawrence rock. When Whaler point lighthouse bears N.W. $\frac{1}{2}$ W. (N. 51° W.) steer for it, and anchor when the jetty end bears W.S.W., or as convenient. As the vessel proceeds northward the houses of Portland open out from Observatory hill. Should the wind be scant, the vessel may pass to the northward of the town until it bears S.W., and then tack for the anchorage.

At night.—Entering Portland bay from the westward do not round the Lawrence rock until the green light on Whaler point becomes visible, when shape a course for the light, and anchor when the red jetty light bears W.S.W.

From the eastward.—In proceeding to Portland bay from the eastward, Lady Julia Percy isle should be sighted; it lies E. $\frac{1}{4}$ N. 17 miles from cape Sir William Grant, and may be passed at the distance of half a mile. Then shape a course for the bay.

Caution.—Between Lady Julia Percy isle and the mainland is a passage 3 miles wide; but it is not advisable for a large vessel to go through it, as a heavy swell from the south-west generally rolls in upon the coast, and frequent calms in summer make it unsafe; the whole coast being fronted by a border of dangerous rocks, extending for three-quarters of a mile off shore, with a breaking sea even further off. Steam vessels and other trading vessels using this passage are therefore cautioned against approaching the land in this vicinity.

At night.—From the eastward shape a course for Whaler point light until the jetty light becomes visible, when steer for the jetty or anchorage. Care must be taken not to lose sight of the red light, which becomes invisible on nearing the chequered buoy off Whaler point. The southern edge of the green light leads about a quarter of a mile off shoal water. A boat is always in readiness to afford assistance when required.

TIDES.—The tide in Portland bay, as regards its rise and fall, is entirely dependent on the winds. It is high water, full and change, at 0 h. 30 m.; springs rise about 3 feet.

The COAST.—From Fitzroy river, which is 12 miles to the north-east of Portland, the coast trends with a curve E. by S. $\frac{3}{4}$ S. 10 miles to the entrance of lake Yambuk, in a south-easterly direction from which is Mills reef.

From lake Yambuk, Boulder point bears S.E. by E. $\frac{3}{4}$ E. $5\frac{3}{4}$ miles. The coast for the first half of the distance is sandy, having bare sand and grassy hummocks immediately over it; the highest, mount Hummock, 213 feet high, forms one of the points in the triangulation of the colony. The remaining half of the distance is of a rocky character.

From Boulder point to the south point of Griffith island (port Fairy), $4\frac{3}{4}$ miles, the general direction of the coast is E. $\frac{1}{4}$ N.; it is strewn with boulders of various sizes, some uncovered at high water, and a few sunken rocks lie at about a quarter of a mile off it.

Mills reef lies a mile eastward of the entrance to lake Yambuk, and three-quarters of a mile from the shore, abreast of Lady Julia Percy island; it consists of several rocks awash at high water, and marked by kelp. *See* caution, page 393.

Lady Julia Percy island, lying E. $\frac{3}{4}$ N. 21 miles from cape Nelson, is of a triangular form, 155 feet high, flat-topped, and cliffy on all sides. The island presents the same appearance from all directions, with the exception that the southern end is a few feet higher than the other parts, towards which the island has a small decline. There is indifferent landing on the north side in a small bay. Rabbits have been placed upon the island, and are numerous.

PORT FAIRY.—For 7 miles on either side of port Fairy the coast is low, that to the westward having grassy slopes with a few scattered trees, whilst that to the eastward is composed for the most part of bare sand-hummocks about 60 feet in height. In making this port from the southward the most remarkable land seen is Tower hill, lying 7 miles N.E. $\frac{1}{4}$ N. from Griffith island, which extends from off the land in a north-easterly direction, and forms port Fairy.

Tower hill, 300 feet high, presents the appearance of a tableland, but that part more particularly named Tower hill is a peak thrown up by volcanic agency in the centre of a fresh-water lake; upon it there was a surveying station. From the westward, Tower

hill itself is not visible, as it then appears in line with the higher table-land which lies one mile east of it. When Tower hill begins to bear northerly it opens out west of the table-land, and continues to be visible as a single conical peak. The table-land falls to the westward, and appears to join Tower hill; eastward it falls to the same elevation as the western land. The land in the vicinity, both east and west, is higher than the general coast.

This hill is not only a good mark for port Fairy, but also for the adjoining port of Warrnambool, it being situated midway between the two places. After making Tower hill, Griffith island is the next conspicuous land seen.

Griffith island is conspicuous on this coast, and has two or three hummocks, the highest of which is 74 feet above high water; it is three-quarters of a mile long and half a mile broad, tapering away to the north-east point, where it is only 15 feet above high water; in it is included what was formerly Rabbit island; these two islands were united to seaward by artificial means, since which the sand has heaped up inside.

From the south end of Griffith island, which is composed of large volcanic boulders, the same description of coast extends to the eastward a quarter of a mile, terminating in a hillock 10 feet high, known as Dusty Miller island, there being a channel at high water between it and Griffith island.

Sunken rocks extend 200 yards from the south coast of Griffith and Dusty Miller islands, and continue to 200 yards off the east point of Griffith island, upon which the lighthouse stands.

LIGHTS.—A red circular stone lighthouse stands on the east point of Griffith island. It is nearly at high-water mark, and it exhibits at 41 feet above high water, a *fixed* red light, varied by a *flash* every *three minutes*; visible from a distance of 9 miles in clear weather. Within 3 miles it appears as a *fixed* light.

The light appears *fixed* for one minute and 40 seconds, is suddenly eclipsed for 34 seconds, then exhibits a *flash* for 12 seconds, and is again eclipsed for 34 seconds, when the *fixed* light re-appears.

A *fixed* white light is exhibited from one of the lower windows in the tower, and shows over the anchorage.

A light is exhibited from the end of the southern dyke forming

the entrance to Moyne river. The light is a *fixed* light, and shows red from the black buoy off the river entrance over the foul ground to Griffith island; and white from the black buoy over the river entrance. It should be visible in clear weather from a distance of about 3 miles.

From Look-out hill near the inner end of the jetty a *fixed* green light is exhibited, which should be seen from a distance of 3 miles, between the bearings of South and S. 67° W.

Buoys.—From the east point of Griffith island to the east and north-east a reef, dry at low water, extends a cable off. Also from the same point, rocky ground extends more than 600 yards in a N. by W. direction, with 7 and 10 feet near its north part, and with not more than 15 feet anywhere on it. At the north end of this rocky ground a black buoy is moored in 17 feet, with the Custom-house just open of the end of the jetty, bearing S. 68° W., and the light-house S. 11° E.

A small red buoy marks a 3 fathoms patch on the edge of the 3 fathoms line, and bears N. by W. $\frac{1}{2}$ W. $1\frac{1}{2}$ cables from the black buoy.

Back pass, a narrow channel between Griffith island and the mainland, has a bar of 6 feet, outside which the depth rapidly increases to 10 fathoms. This passage has been used by boats, but is not safe except in very calm weather.

With south-westerly winds a strong current sets along the coast to the eastward, which has led the Government to remove some of the obstructions from the pass, in order that a current may go through into the river Moyne and scour the sand from the river's mouth.

The stone removed from the Back pass has been formed into walls, which are extended from the Moyne river entrance into the bay in an E.N.E. direction.

The coast west of Back pass is bordered by sunken rocks, which extend from 200 to 400 yards from it, and is formed principally of large volcanic boulders.

Moyne river flows into port Fairy, and on Look-out hill on the eastern bank, 38 feet high, and close to the river's mouth, stands a flagstaff. When the survey was made there was a bar at the mouth

of the river with only 2 feet on it at low water. The channel has been excavated and two training piers run into the bay: now there is a minimum depth of $10\frac{3}{4}$ feet at low water in the centre of the channel from the black buoy outside the bar to the Government wharf, or 10 feet to the north end of the swinging basin in the river.

Belfast.*—At the mouth of Moyne river, W.S.W. of Melbourne, between which steam vessels run at frequent intervals. There is a railway in connection with the system of Victoria. Vessels drawing 10 feet water can be loaded and discharged at the wharf stores in the middle of the town. It is the principal shipping port of the western district, and there is a large trade in wool, grain, and general produce. In 1881 the exports were valued at 350,000*l*. The population was 1,864 in 1891.

There is telegraphic communication, and there are 18 mails a week from Melbourne.

Signal station.—There is a signal station at Belfast pilot station and communication can be made by the commercial code. It is connected by telegraph.

Jetty.—At $1\frac{1}{2}$ cables north of Moyne river entrance a jetty extends 400 yards into 7 feet water; but it can seldom be used except as a landing place. At one and 2 cables north of the jetty, and $1\frac{1}{2}$ cables from the shore, are two patches of sunken rocks; being in shoal water they do not interfere with shipping.

A lifeboat is stationed at port Fairy.

Reef point.—From Moyne river entrance the coast trends N.N.W., and thence curves gradually round to N:N.E. and E. by N. to Reef point, which is N.E. by N. $2\frac{1}{4}$ miles from Griffith island lighthouse. All this coast has a sandy beach with grassy sand-hummocks until within a mile of Reef point, when the hummocks are all of bare sand 50 to 65 feet in height.

Off Reef point boulders from 9 to 2 feet above high water extend a distance of 400 yards, and sunken rocks extend 100 yards further.

DIRECTIONS.—After making out the hill on Griffith island, steer so as to clear the reef which extends from the lighthouse, then

See chart, No. 2,506.

* Also called Port Fairy.

haul up for the anchorage, for which the flagstaff in line with the jetty is a good mark.

At night do not enter port Fairy until the green light on Look-out hill is opened out, when steer for it and anchor as convenient.

TIDES.—It is high water, full and change, at port Fairy, at 0 h. 31 m. ; ordinary springs rise 3 feet.

Anchorage.—The best anchorage for small vessels is in about 3 fathoms water, a cable north-west of the black buoy of the foul ground, with Griffith island lighthouse bearing S.S.E. The anchorage for large ships is in 5 to 6 fathoms off the tail of the reef extending from the north-east point of Griffith island, with the lighthouse bearing S. $\frac{3}{4}$ W., and the flagstaff in line with, or a little open north of the end of the jetty S.W. $\frac{3}{4}$ W.

Vessels trading to port Fairy generally pick up an anchorage in about 15 feet water between the black buoy and the jetty ; vessels making use of the port only during the continuance of a south-westerly gale may get as close in as their draught of water will permit. For the gunpowder anchorage *see* page 499.

The anchorage is bad with easterly winds, and vessels are recommended not to try and ride out a south-easterly gale, except as a matter of necessity, and then all precautions should be taken and springs placed on the cable. Here, as at Portland and Warrnambool, there are coir hawsers in charge of the harbour-master.

Sisters point is conspicuous from its having immediately over it two hummocks 65 feet high, so like each other as to have obtained the name of The Sisters. Boulders 4 feet above high water lie a quarter of a mile seaward of this point.

The COAST.—From Reef point, Sisters point bears E. by N. $\frac{1}{2}$ N., $1\frac{1}{2}$ miles. A point lies midway between forming a sandy bight on either side, but the whole distance between them from a quarter to half a mile from the land is filled with high-water, half-tide, and sunken rocks. The coast between Reef and Sisters points is a succession of bare sand-hummocks about 50 feet high.

From Armstrong bay the coast is a sandy bight with grassy hummocks over it, from 100 to 160 feet in height, trending to

the E.S.E. for about 6 miles to Middle island, at the western part of Lady bay. Between one and 2 miles from Middle island is a tract of bare sand.

Armstrong bay.—One mile E. by N. of Sisters point is a small sandy point fringed with boulders, forming a small bay known by the name of Armstrong. Sunken rocks are numerous, and nearly fill it up. This bay is used by fishing boats.

Helen rock, with one fathom on it, lies E. $\frac{1}{4}$ S. $2\frac{1}{2}$ miles from Sisters point, and S. by E. $\frac{1}{4}$ E. from Tower hill. The rock is one mile from the shore, has 8 or 10 fathoms close to on all sides, and is of so pinnacle a form that a lead will not rest upon its summit. It rarely breaks, and is much in the way of coasters.

Mount Warrnambool.—In clear weather, and if more than 5 miles from the land, between port Fairy and Lady bay, mount Warrnambool is visible; it has a round but not very even summit 707 feet above the sea. It lies from Warrnambool lighthouse N.E. by E. $\frac{1}{4}$ E. 13 miles, and from Flaxman hill N. $\frac{3}{4}$ W. 14 miles. A low spur of the same hill lies about 3 miles west of it.

LADY BAY is an indentation of the mainland extending from Middle island, E. by N. $1\frac{3}{4}$ miles to Hopkins river, whence Hopkins reef, which is awash at high water, projects one-third of a mile to the southward. From Pickering point the land trends W. by N. $\frac{1}{2}$ N. for about three-quarters of a mile, this coast being composed of sandstone cliffs, having numerous indentations with half tide and sunken rocks lying off it, in some places to a distance of 3 cables. Immediately over the cliffy coast are numerous sand-hummocks, in some cases grassed, but generally bare; the western and highest of these is 115 feet high, the others vary from 60 to 80 feet. Behind Lady bay it is high and well wooded, while the land east of Hopkins river is clear of timber and grassy, rising gradually from the coast, and terminating in a high grassy down $1\frac{1}{2}$ miles inland.

Warrnambool harbour, on the western side of Lady bay, is formed by several outlying islands and rocks, nearly connected with each other, which extend from Pickering point in a S.E. and E.S.E. direction. The largest of these is what is named Middle island,

See charts, No. 1,062, and No. 2,494, Lady bay and Warrnambool harbour, scale $m = 8.5$ inches.

between Middle island and Pickering point is Merri island, and outside to the eastward is Breakwater rock.

Merri island, lying 100 yards S.S.E. from Pickering point, to which it is all but attached by half-tide rocks, is 47 feet high, and very small, being about 120 yards across.

Middle island, the central and largest of the three islets which form Warrnambool harbour, is 250 yards long north-west and south-east and 100 yards broad; it is 70 feet high and on its summit is the old lighthouse; it lies south-east of Merri island, to which it is almost joined by rocks of various heights. On one of these, Datum rock, a datum mark for tides has been placed, on which is written "The bottom of this is 5 feet 6 inches above ordinary low water."

From Middle island, several half-tide rocks extend in a southerly direction for a distance of a cable, and at a further distance of 4 cables in a S.S.E. direction is a dangerous rocky patch of 17 feet, upon which the sea breaks heavily, the intervening space between it and the island being uneven and rocky.

Breakwater rock, a small islet 18 feet high and encircled by sandstone ledges which uncover at half-tide, lies a cable east of the old lighthouse on Middle island. Between it and Middle island is a small rocky passage with from 2 to 12 feet water. Fronting Breakwater rock to the south and south-east are several half-tide ledges nearly joined to one another, and distant from Breakwater rock nearly a cable. Off these again to the south-east at a further distance of a cable is another half-tide ledge, with two small patches, each a foot above high water. Rocks awash at low water extend a cable from the last-mentioned ledge.

Breakwater.—A well-built breakwater extends from Merri point over the rocky shoal north of Breakwater rock and thence about 350 yards in a N.E. by E. $\frac{1}{2}$ E. direction. Ships of 265 feet in length could be berthed alongside it, the depth at the outer part being $19\frac{1}{2}$ feet at low water.

Light.—A *fixed* red light is exhibited from a post at the end of Warrnambool breakwater, it is about 30 feet above high water, and should be seen from a distance of 3 miles in clear weather. The

light is obscured seaward to the south of the line indicated by the direction of the breakwater (N. 62° E.).

WARRNAMBOOL, the main part of the town is situated about half a mile northward from Lady bay, and is 170 miles to the south-west of Melbourne. Jetties, one about 700 feet long, with a tramway to the stores, and the other about 500 feet long, give facilities for loading and discharging vessels; cargo is transhipped into lighters in Lady bay. A large trade is done from the port, the principal exports are wool, potatoes, wheat, preserved meats, and dairy produce. Steam vessels ply three times a week to Melbourne. There is a railway in connection with the system of Victoria. The population, in 1891, was 6,582 persons.

There is telegraphic communication, and there are 12 mails a week from Melbourne.

Merri river.—Immediately behind Pickering point is the mouth of the Merri river, which ordinarily may be stepped across, but floods wash the sand from its mouth, allowing the discharge of a large body of water. Formerly the Merri river curved along the shore at the back of the sand-hummocks, but it was feared that as the sand was blown inland the river might be the means of conveying a large quantity into the harbour and so help to fill it up; in consequence of which a chain of lagoons was joined and united with the river above the sand encroachment.

From Merri point, at the eastern side of the entrance to the Merri river, the land trends in a northerly direction for about one-third of a mile, whence it trends in an easterly direction for about half a mile, and then south-east to the mouth of the Hopkins river, the heads of which form the east side of Lady bay.

The bar.—Warrnambool harbour is protected to the south-eastward by a bar of $3\frac{1}{2}$ to 5 fathoms water, which adjoins and extends from a rocky patch awash at high water, lying South 3 cables from Hopkins river heads.

The 5-fathoms extreme of this bar is only 3 cables from the low-water rocks, extending S.E. from the islands off Pickering point, and this distance forms the main or south channel into Warrnambool harbour.

Between the bar, and about a quarter of a mile from the shore, the

soundings vary from 7 to 4 fathoms, the bottom being generally sand over rock or sandstone rock.

Moorings.—There is a set of moorings in Warrnambool harbour, in $3\frac{1}{2}$ fathoms, consisting of a 30 cwt. anchor with 90 fathoms of $1\frac{3}{4}$ inch chain; to the end of the chain a red mooring buoy is attached.

Coir springs, each of 20 fathoms, are kept on the end of the jetty.

Signal station.—There is a signal station at Warrnambool pilot station, and communication can be made by the commercial code. It is connected by telegraph.

Lifeboat.—At the jetty is a lifeboat station.

Danger signal for fishing boats.—When the sea is breaking in the fairway, rendering the entrance to Warrnambool harbour unsafe for boats, a chequered black and white cone is shown from the eastern yardarm at the signal station, between sunrise and sunset.

LIGHTS.—Two leading lights in line bearing N. $\frac{1}{8}$ E. are established on the sites of the obelisks, on the hill ridges immediately in front of the town.

The upper, a *fixed* white light, is exhibited from a tower, at an elevation of 109 feet above high water, and is visible from East round by north to N. 45° W., from a distance of 14 miles in clear weather. The lower light is a *fixed* red light, shown from the top of the lower obelisk at 87 feet above high water, and can be seen between the bearings of N. 1° E. and N. 39° W. from a distance of 5 miles.

A *fixed* green light is exhibited from the end of the tramway jetty, visible from a distance of 3 miles.

DIRECTIONS.—The leading marks into Warrnambool harbour are the two light towers 140 yards apart, erected on the north shore, the summits being respectively 109 and 87 feet above high water.

The South channel, which is the best entrance into Warrnambool harbour, has in its centre two rocky patches of 27 and 29 feet. The bottom of the whole channel is rocky and uneven, varying from 9 fathoms to 28 feet, but in which a depth of 6 fathoms might be maintained.

A stranger bound to Warrnambool harbour from the westward or southward will be greatly guided as to his relative position by Tower hill, which is only 3 miles from the coast, and 7 miles west of Warrnambool.

Taking care to avoid the 17-foot patch which lies S.S.E. nearly half a mile from Middle island, bring the two light towers in line bearing N. $\frac{1}{8}$ E. (N. 1° E.), which mark leads in the fairway between the 5 fathoms bank and the foul ground to the south-east of Breakwater rock. When past the break off the rocks, and the end of the breakwater bears about N.W. by N., steer for the harbour, giving the end of the breakwater a fair berth. Sailing vessels cannot do better than hug the break off the rocks, as by getting under their lee they are enabled, without danger of shipping a heavy sea, to haul up for the anchorage.

Vessels are recommended not to approach too near the mouth of Hopkins river. In bad weather, or with a heavy southerly swell, the sea breaks a mile off the land. In fine weather, however, vessels may, and do cross in all directions, the bar extending from Hopkins river.

From the eastward Tower hill is the best guide to the locality. Mount Warrnambool is hidden by the land if within 4 miles, and being upwards of 10 miles inland is often obscured by mist.

Having made out Warrnambool, either cross the bar to the south-eastward, or if the sea is breaking on the bar, haul off and stand to the westward until the coast in that direction be opened clear of the islands, then proceed to get the leading marks as before directed. Crossing the bar must depend entirely on the weather. The great disadvantage of crossing it is that vessels have to proceed broadside to the swell.

Warrnambool is the only one of the three western ports of Victoria which may be considered safe in south-easterly gales. This is in consequence of the outer swell being broken on the bar fronting the harbour to the south-eastward. Coir rope springs are supplied by the Government and should be placed on the cable in the event of a heavy swell setting in to the anchorage.

At night.—To enter Warrnambool harbour, (having avoided the 17-foot patch which lies S.S.E. half a mile from Middle island) bring the red light in line with the white light,

bearing N. $\frac{1}{8}$ E. (N. 1° E.), which leads in between the 5-fathoms bank and the foul ground south-east of Breakwater rock until the green light on the jetty opens, bearing about W.N.W. (N. 67° W.), when steer in for the anchorage, giving the breakwater end, on which is a red light not visible seaward, a fair berth in passing. From the eastward, either bring marks above described on or cross the bar to the south-eastward, taking care not to shut the white light in when standing towards the mouth of Hopkins river.

In bad weather, or with a heavy southerly swell, the sea breaks one mile off the land.

On the approach of a heavy south-west gale with night coming on, Portland bay is easy of access, and affords good shelter until the gale abates. This is considered of great importance, as it would be dangerous to take Lady bay in a gale from S.W. or South, the sea then breaking with great violence across the south-east entrance.

Caution.—It is not safe to enter or leave the harbour in south-westerly or southerly gales.

Anchorage.—Warrnambool harbour is small and not adapted for large vessels, the outer anchorage being in $3\frac{1}{2}$ to 4 fathoms, with a swell sometimes which causes a diminution of the depth. The best anchorage is in about 15 feet water, northward of the breakwater and about a cable from the ledge off Breakwater rock.

Vessels having entered the harbour must pick up an anchorage where most convenient, according to their draught of water; or they may make fast to the moorings. For the gunpowder anchorage, see page 499.

All vessels using this port should be provided with good springs for their cables, as even in the finest weather there is a heavy range.

TIDES.—It is high water, full and change, in Warrnambool harbour at 0h. 37m.; springs rise about 3 feet.

The COAST.—From 4 miles east of Warrnambool to Moonlight head, which is 38 miles farther to the south-east, the coast is of a cliffy character, and presents an almost unbroken appearance, the only break to its uniformity being a broad-topped cultivated hill, 221 feet high, over the east bank of Hopkins river, and a fall in the land 9 miles east of Warrnambool. The cliffs are higher as Moonlight head is approached.

The coast from Hopkins river, at the eastern part of Lady bay, to Flaxman hill is nearly straight, and apparently bold, but a heavy swell constantly rolls in and breaks in about 5 fathoms water; the coast thence continues to trend in the same direction, and is of the same character, for a further distance of about 3 miles, and is locally known as the Bold projection. Sunken rocks here exist at a distance of a quarter of a mile from the coast. The Bold projection is the only projecting part of the coast between Moonlight head and Warrnambool, but otherwise is no more conspicuous than other parts of the coast in the neighbourhood.

Flaxman hill, 262 feet high, bears S.E. by E. $\frac{1}{2}$ E. 14 miles from the mouth of Hopkins river; a quarter of a mile north-west of Flaxman hill is a second hill not quite so high, but sometimes more conspicuous, in consequence of its sandy appearance. The two hills together are a good guide to the locality of a part of the coast, which otherwise presents a great sameness of appearance, overhanging cliffs forming the principal feature. About midway between Hopkins river and Flaxman hill the coast range immediately over the cliffs is rather higher than the adjacent land, being there elevated 242 feet above the level of the sea. A large pile of stones has been built upon the summit of Flaxman hill.

Bay of islands.—The western land of the bay of islands lies close south-eastward of the Bold projection and S.E. by E. $\frac{1}{2}$ E. 18 miles from Warrnambool. The bay may be identified by its white cliffy appearance, varied by numerous small islands all of the same character, the whole presenting a pleasing and striking appearance.

From the western part of the bay of islands to Curdie inlet, distant 4 miles E.S.E., the coast is cut by bays and studded by small islands. The sea breaks heavily half a mile from the shore, and it is probable that sunken rocks fringe the whole distance. It was not safe to sound off this part of the coast, and therefore it should be carefully avoided.

Curdie inlet is conspicuous from the sandy nature of the entrance, and is often barred across. The mouth is low and interspersed with low water rocks. At the west point of the inlet, on the highest part of the coast, there is a conspicuous sand-patch, and



eastward there are other sandhills or patches; these are more conspicuous from their contrast with the cliffy coast on either side.

From the immediate mouth where the fresh water discharges itself there is a widening of the entrance to a second or outer mouth, and at the points which form the outer mouth are several limestone rocks, those about the western point being more numerous; those off the eastern point are about one-third of a mile from it, and are joined to it by a narrow neck of sand, the central portion of which is washed over by the sea; the highest of the eastern rocks is about 17 feet in height, and a ledge extends from it in a north-west and south-east direction. The sea breaks violently to the east and south, and across the mouth from the ledge to the rocks off the western point there is also a heavy break.

From Curdie inlet, Hesse point bears E. by S. 3 miles; the coast between is irregular and cliffy. At Curdie inlet the appearance of the coast begins to change in consequence of the cliffs being backed by higher ground. From Hesse point the coast trends E. by N. 2 miles to the mouth of port Campbell.

Port Campbell is the only anchorage between Warrnambool and cape Otway; but it is directly open to the S.W. The entrance to port Campbell is marked by headlands, the eastern head is from 60 to 80 feet high, and the western 200 feet high, and bears from the former W.S.W. A reef off the eastern head reaches in a south-westerly direction to nearly three-quarters of a mile, and breaks heavily; whilst the reef off the western head extends in the same direction only a little more than a quarter of a mile, and on which there is very little break. The channel between these reefs is from 250 to 300 feet wide. The western side of the port is formed by almost perpendicular cliffs 200 feet high, running out from the beach to the south-west. The eastern side is also formed by cliffs, but not as high or projecting as far from the beach. At the western end of the beach Campbell creek flows into the sea. There are about 12 acres of anchorage ground, with soundings from one to 3 fathoms, gradually increasing to 4 fathoms when abreast of the eastern head, and to 5 and 6 fathoms to a point in line with the western head. The bottom is sandy with patches of limestone rock. In heavy weather there is a great drawback off the beach, which causes vessels to surge considerably at their anchors, necessitating a spring being run out to the shore. It is reported that during the

summer months (from December to March inclusive), there is smooth water at the anchorage. The port may be considered an anchorage for small craft of 30 to 40 tons, and for steam vessels of the Murray river class, drawing from 6 to 8 feet water.

After northerly winds there is good landing; a jetty has been built, telegraphic communication is established, and when the district becomes more populated there will be no difficulty in utilising the port in favourable weather. The population of the township is 260.

Moorings.—There are two sets of moorings, and the mooring buoys are red. Vessels using these moorings must have a spring out astern to the beach.

DIRECTIONS.—Upon approaching port Campbell from either side the sea appears to break right across the entrance, but, when the sandy beach becomes well open, a passage will be seen between the breakers, and can with confidence be taken in moderate weather on the fairway marks. The eastern break is very defined, as it is one continuous break from its outer extreme to the shore, with bold water immediately clear of the break on its west side. The left extreme of the East head in line with beacon on hummocks N.E. $\frac{1}{2}$ N. leads between the east and west breaks, until the two poles on Napier bluff are in line N. by E. $\frac{1}{4}$ E., which line keep until the beacon on hummocks shows a little to the westward of mooring buoy, then steer straight for the moorings.

The tides are influenced greatly by the wind. The set is principally south-easterly, or outward across the east break. Mean rise about 4 feet.

The COAST.—From port Campbell the coast trends E. by S. $\frac{1}{2}$ S. 3 miles to the Sherbrook river, and thence with a slight curve S.E. by E. 11 miles to Moonlight head. At one and 2 miles east of the Sherbrook river are a few islets and rocks known as the Sow and Pigs. At a distance of one to 3 miles west of Moonlight head there are several ledges which cover and uncover and are skirted by a few sunken rocks, a quarter of a mile from the shore.

Ronald point, lying midway between Sherbrook river and Moonlight head, is a bluff point 257 feet high, conspicuous by a large

body of drift sand to the eastward; the point forms the west head of the entrance to the Gellibrand river. This river, though draining a rather large tract of country, is similar to Curdie inlet, Campbell creek, and Sherbrook river, having a small mouth never very broad and barred across in dry seasons.

MOONLIGHT HEAD is bold, rounded and densely timbered, not only over the cliffs, but wherever it is possible for vegetation to cling; the undergrowth is almost impenetrable. The hills immediately over the coast are about 500 feet high, the highest being 546 feet; these hills form spurs of the Otway ranges, which rise gradually at the back, until at 2 and 3 miles inland they attain an elevation of over 1,000 feet.

The highest hill of the Otway ranges west of cape Otway is 1,800 feet high, and has a rounded summit; it lies N.E. $10\frac{1}{2}$ miles from Moonlight head.

Several rocks above water closely skirt Moonlight head.

The **COAST** from Moonlight head trends to the N.E. and East, and forms a bight to Lion headland, which is 3 miles distant.

North-eastward of Moonlight head, distant one-third of a mile, is Reginald point, with a small islet close to.

Lion headland is formed of bold high cliffs, perhaps the highest on the coast of Victoria; here too the Otway ranges have the greatest elevation when near the coast.

Rotten point lies E. by S. $\frac{1}{4}$ S. 4 miles from Lion headland. Between the two points a bight is formed, in the depth of which, at 3 miles from the headland, is the mouth of Joanna river, with a sand island in it. Rotten point is rocky, and there is a rock awash at high water a quarter of a mile south of it. Cape Otway bears from the rock S.E. by E. 7 miles distant; nearly midway between them is the mouth of Ayr river. There are several conspicuous sand-patches about the mouth of Joanna river and Rotten point, and there is one very large body of drift sand just to the eastward of Ayr river.

The coast between Rotten point and cape Otway is rocky, and the sea generally breaks in 5 fathoms of water.

A conspicuous conical peak 1,650 feet high, with a range of about the same elevation near it to the northward, lies N. by E. 10 miles from cape Otway.

CAPE OTWAY, on the north side of the western approach to Bass strait, is a bluff cliffy projection 250 feet high, of a dark brown colour, with patches of coarse sandstone rising to openly timbered grassy hummocks, not exceeding 350 feet in height. A rocky ledge, with 10 feet water on its shoalest part, extends S.S.E. three-quarters of a mile from the cape; and a very heavy ripple extends nearly 2 miles from the land, with the lighthouse bearing N. by E. to N.N.W. This ripple had, until sounded, been looked upon as a dangerous reef.

The cape should not be approached within a mile on a N.W. to N.N.E. direction and to the westward nearer than 2 miles; it should be rounded at a distance of not less than 3 miles.

LIGHT.—On the south-west extreme of cape Otway a circular white lighthouse, 62 feet high, exhibits at 300 feet above high water, a *group flashing* white light of the first order, showing *three flashes every minute*, which should be seen from a distance of 24 miles in clear weather. It is visible between the bearings of S. 78° E. and S. 63° W.

Danger light.—A *fixed* red danger light is exhibited from cape Otway lighthouse, 48 feet below the group flashing light.

This light is so screened as to be obscured when approaching it from seaward, until 4 miles distant, on a N. 11° W. bearing; and is visible (in clear weather) to a vessel proceeding on a S. 79° W. or N. 79° E. course, until 8 miles distant.

It is exhibited to warn mariners of the proximity of danger, and when seen, the course should be altered to run it out of sight. In thick or foggy weather mariners should not rely on sighting the red light, but should keep a good offing.

Fog signal.—During thick or foggy weather an explosive fog signal gives *one report* similar to that of a gun *every five minutes*.

The explosive fog signals (rockets) explode at a height of about 600 feet, with a sharp report, which, under favourable atmospheric conditions, may be heard at a distance of 5 or 6 miles. Mariners

should on hearing the signal take precautions immediately, as sometimes the sound may only be heard at a much shorter distance.

Signal station.—There is a signal station at cape Otway light-house, and communication can be made by the commercial code. It is connected by telegraph.

Meteorological observations.—At cape Otway, 270 feet above the sea, in 1892, the maximum temperature in the shade was 104° Fahr., the minimum 40°, and the mean 55·6°; rain fell on 175 days, and the amount was 36·8 inches.

Soundings.—The 50-fathoms line of soundings, distant 3 miles south of cape Nelson, increases its distance from the land rapidly until south of Lady Julia Percy island, where it is distant 23 miles from the main shore. South of Moonlight head, it is distant 30 miles; it then takes a gradual sweep in towards the mouth of Bass strait, and at cape Otway is distant only 8 miles.

In-shore of the 50-fathoms line the soundings shoal very gradually.

The 100-fathoms line of soundings is found at about 15 miles distant from cape Northumberland, 17 miles from capes Bridgewater and Nelson, and thence it increases its distance from the land until south-west of Moonlight head it is 40 miles off. It is about 50 miles from a line joining capes Otway and Wickham, and 30 miles from the west coast of King island. At the depth of 100 fathoms the bank of soundings appears to drop very suddenly. Seaward of this depth no bottom was obtained at 165 fathoms and 175 fathoms.

Tides and tidal streams.—It is high water, full and change, at all places on this coast at nearly the same time, namely, Portland bay, 0h. 30m.; port Fairy, 0h. 31m.; Warrnambool, 0h. 37m.; New Year islands (King island), 0h. 48m.; Surprise bay (south part of King island), 0h. 43m.; Sea Elephant bay (King island), 0h. 50m.; springs rise 3 feet.

The tides and tidal streams are much affected by the winds, and are uncertain. A south-westerly or westerly breeze keeps up the flood or east-going tidal stream, and increases its rate; an easterly breeze has an opposite effect. While the tides were observed in Surprise bay, an easterly gale had the effect of doing away entirely with one flood tide.

Currents—In October, November, and December, when south-westerly breezes mostly prevail, a current may be expected to run to the eastward. In January, February, and March, a westerly current may be expected, but as these currents do not appear to be at any time continuous, they cannot with certainty be allowed for. They are stronger as the coast is approached, and strongest off the various headlands, such as capes Bridgewater and Nelson, Moonlight head and particularly near cape Wickham.

The barometer is a valuable companion on this coast, *see* pages 18, 19.

See chart, No. 1,062.

CHAPTER VI.

AUSTRALIA.—SOUTH COAST ; WESTERN ENTRANCE OF BASS STRAIT, KING ISLAND, CAPE OTWAY TO PORT PHILLIP, AND PORT PHILLIP.

VARIATION IN 1897.

Cape Wickham - - 7° 45' E. | Port Phillip entrance 8° 5' E.

Nearly stationary.

SINCE the discovery of Bass strait by an enterprising gentleman of that name, the surgeon of H.M.S. *Reliance*, in an open whale-boat from port Jackson, in 1798, it has been much used by vessels navigating to and from that port, and is a safe and generally much shorter route than south of Tasmania.

BASS STRAIT separates Australia from Tasmania, it is about 200 miles long, nearly East and West, and 120 miles wide. The west end between cape Otway and cape Grim, the north-west point of Tasmania, is 120 miles wide, but King island, which lies midway, occupies nearly 36 miles of this space. The safest entrance, 47 miles wide, is to the north-west, and the other entrance, 37 miles wide, to the south-east of the island ; the latter entrance, however, being much impeded by numerous dangers, is only recommended to the general navigator in cases of emergency.

The east end of Bass strait is still more crowded with islands and rocks, more than 50 miles of the southern portion of the entrance being occupied by Flinders and Barren islands, the latter being separated from the north-east part of Tasmania by Banks strait.

As the north portion of Bass strait contains the approach to port Phillip, and the most frequented route between the south and east

See charts, No. 2,759*b*, Australia, southern portion, scale $d = 1\cdot0$ inch ; No. 1,063, Western approach to Bass strait, scale $m = 0\cdot19$ inch ; No. 1,695*a* and *b*, Bass strait scale $m = 0\cdot2$ inch ; No. 404, King island, scale $m = 0\cdot49$ inch.

coasts of Australia, the navigator's attention will be first directed to this portion of the strait, together with the coast from cape Otway to Gabo island, including port Phillip; the south portion, with the north coast of Tasmania, being described in chapters VII. and VIII.

KING ISLAND, the north end of which forms the south-east side of the safest entrance into Bass strait from the westward, is 36 miles long north and south, and 13 miles broad at the centre.

Caution.—In approaching King island from the westward, especially during thick or hazy weather, caution is required on account of the variable strength of the current, and the use of the lead is enjoined. Many fatal wrecks have occurred on this island, from errors in reckoning, and in consequence of not making the land near cape Otway. Commanders of iron ships, especially of those newly built, are warned as to the necessity of ascertaining the deviation of their compasses on approaching the Australian coast.

Soundings of 60 or 70 fathoms are found at 25 to 30 miles westward of King island. Outside this limit the soundings deepen rapidly to no bottom at 100 fathoms. Inshore of 60 fathoms soundings the depths are irregular, but there are 30 fathoms at a distance of 4 miles to the north-west of cape Wickham. For further description, *see* page 423.

The COAST.—From the point a mile south-westward of cape Wickham the coast is of the same nature for 2 miles as cape Wickham, and trends with a curve S. by W. $\frac{3}{4}$ W. 8 miles to Whistler point. At 2 miles distant from the first-mentioned point some sunken rocks extend to a distance of nearly three-quarters of a mile from the land; and a sandy beach commences and continues to three-quarters of a mile of Whistler point. At the south-western end of the sandy beach there is good landing in nearly all weathers. A dilapidated hut points out the landing-place. Three-quarters of a mile N. by E. from Whistler point is Elizabeth rock, dry at low water. Numerous other rocks above water, as well as sunken, lie off the point in all directions. At 2 miles N.E. of Whistler point a fresh water creek empties itself. At one mile S.E. by S. of the point the land rises to a height of 265 feet.

CAPE WICKHAM, the north point of King island, is formed

of gray granite, and bears S.E. by S. 48 miles from cape Otway. A few sunken rocks fringe it at the distance of a cable. North of the cape the unevenness of the bottom and the strong tidal streams often cause a break at a much greater distance than the rocks extend.

LIGHT.—Cape Wickham lighthouse is a white circular tower 145 feet high, exhibiting at 280 feet above high water a *fixed* white light of first order, which should be seen from a distance of 24 miles in clear weather. It lies 6 cables S.S.W. $\frac{1}{2}$ W. from the cape, and to the north-west of a round hill 300 feet high. The light is visible seaward between the bearings of N. 22° E. and N. 76° W. When bearing N. 39° E. and within the distance of 19 miles the light is obscured by the highest part of North New Year island. A ray of light is visible on a N. 70° W. bearing over a dip in the land.

Caution.—The attention of mariners is called to the following extract from the report of the Lighthouse Commissioners appointed by the Colonial Government :—“ In advising the erection of a lighthouse on King island, the Commissioners wish to guard themselves from affording the public any reasonable supposition that this light can be at all considered in the position of a great highway light for the navigation of Bass strait. The south coast of Australia, at the western end of the strait, being free from danger, affords in their opinion the safest route for the prudent mariner to approach, and they conceive that the light on King island is only to be regarded as a beacon for warning navigators of danger, rather than as a leading light to a great thoroughfare.”

Harbinger rocks.—East Harbinger rock lies N.W. by W. $\frac{1}{2}$ W. $3\frac{3}{4}$ miles from cape Wickham lighthouse, and consists of a group of sunken rocks about 200 yards in extent. In heavy weather, or when there is a swell, this reef breaks much more heavily than the West Harbinger, but there are times when it will only occasionally break.

The West Harbinger, lying W. by N. $4\frac{1}{2}$ miles from cape Wickham lighthouse, has the appearance of a small flat-topped boulder about a foot above high water. A sunken rock, which does not always break, lies $1\frac{1}{2}$ cables to the south-west.

The Harbingers are $1\frac{1}{4}$ miles apart. There is deep water between

them, and from 9 to 14 fathoms all round. Irregular depths, varying from 15 to 28 fathoms, are found between them and the shore.

Navarin reef lies N.N.E. $\frac{1}{2}$ E. $2\frac{1}{4}$ miles from cape Wickham lighthouse, and $1\frac{1}{2}$ miles from the shore. The principal part is a rock awash at high water, N.E. of which, at the distance of a cable, is another rock occasionally dry. The body of the reef is nearly half a mile long, in an E.N.E. and W.S.W. direction. The sea generally breaks on this reef.

Victoria cove.—At one mile from cape Wickham, in a south-west direction, is a second cape, which may almost be considered as a part of the former. Between the two capes is Victoria cove; it has a small sandy beach, on which the sea breaks continuously and violently. This cove, being in the vicinity of the lighthouse, is used as a landing place for stores. The lighthouse keeper has a large surf boat, which lessens the danger of landing, but no ordinary boat should attempt to land without a thorough understanding with the keeper that it is safe.

The following signals are adopted :—

A ball at the South yard-arm of the flagstaff, in addition to the ensign at the head of the staff, and then lowered a little signifies that a boat can land at the cove.

Ensign at South yard-arm. Vessels should anchor at New Year islands.

Ensign at North yard-arm. Vessels should anchor on the east side of King island.

Two fires on the point is a signal to a vessel waiting at New Year islands that there is safe landing at the cove.

Notwithstanding these signals as to safety of landing it would be wise not to risk valuable lives in ill-adapted boats, but to let this dangerous service be performed by those thoroughly acquainted with its nature, and supplied with proper appliances.

New Year islands and Franklin road.—North New Year island lies S.W. $\frac{1}{2}$ S. 7 miles from cape Wickham lighthouse, is curved in form, and about one mile long N.E. and S.W.; its highest part, near the south-west end, is 117 feet above high water. A channel one-quarter of a mile broad, divides North from South New Year

island. The latter island is three-quarters of a mile long, in a N.N.W. and S.S.E. direction, and less than 100 feet high. East of these islands is Franklin road, an anchorage for small craft protected from all weathers, known locally as New Year islands anchorage.

Between South New Year island and King island there is a distance of over a mile. Several rocks, some above water, others sunken, occupy at nearly equal distances the whole of this space, leaving, however, channels of deep water between. As the sea breaks upon the various dangers the channels may be used in a case of necessity, such as a vessel happening to get upon a lee shore.

The anchorage in Franklin road is in 5 or 6 fathoms water, with the east point of North New Year island bearing N. by W., and a remarkable rock at the north extreme of South New Year island, known as the Asses ears, bearing about S.W. The best guide for the anchorage is the absence of kelp. Kelp grows everywhere except in the tidal gutter setting between the islands; here only is the bottom comparatively free from rocks. The anchorage ground being small in extent it is necessary to moor, unless in a small craft, for which there would be room nearer the shore. A moderate sized vessel must either moor, or anchor further out and be exposed to the swell, which, more than the wind, has to be guarded against at this anchorage. Immediately a swell sets in, a spring should be placed on the cable, and care taken that the cable does not foul any sunken boulders, but this is not likely to happen in the position recommended. A small rock, generally above water, but sometimes covered, occupies what would otherwise be the best anchorage.

Though the anchorage may be considered quite safe if the above precautions are taken, yet mariners are not advised to use it. Independently of the foul bottom, and the small extent of the anchorage ground, which will only accommodate one vessel, the tidal streams often run too strong to enable a ship to pick up a berth as wished. A schooner was in this way forced to take up an outer berth, and was only saved from wreck by a steam vessel towing her into a place of safety.

The principal use of Franklin road anchorage is as a place of waiting for the vessel bringing stores for or wishing to communicate with the lighthouse.

See chart, No. 1,694, Anchorages in Bass strait; scale of Franklin road, m = 1.0 inch.

Tides and tidal streams.—It is high water, full and change, at New Year islands at 0 h. 48 m.; springs rise 3 feet. The stream turns, in fine weather, at high or low water, but is greatly affected by prevailing winds.

Supplies.—Crayfish are numerous here, and occasionally other fish abound. The mutton-bird, the flesh of which is eaten and the oil used for tanning purposes, has a breeding place on New Year islands, and arrives regularly every year from the 23rd to the 28th of November, to deposit its eggs.

There is a watering place in the south-east corner of North New Year island facing the anchorage.

Snakes are numerous.

The COAST.—Netherby point lies S. $\frac{1}{2}$ E. 12 miles from Whistler point. The intervening coast presents a very uniform appearance; the coast ranges are densely timbered, and about 300 feet in height. The coast is broken up into small bays, with off-lying rocks generally above high water, but sometimes sunken. The sunken rocks in some cases extend to a distance of three-quarters of a mile from the shore, and outside of these there is much foul ground, which, with tidal streams and a westerly swell, often make a breaking sea, leading anyone unacquainted with the coast to imagine rocks everywhere. At $1\frac{1}{2}$ miles southward of Whistler point there is a small sand-patch; and at $7\frac{1}{2}$ miles from the former there is a very conspicuous long and bare sand-hill, at the foot of which there is a sandy beach.

At $3\frac{3}{4}$ miles W.S.W. from the sand-hill, and $8\frac{1}{2}$ miles S. $\frac{3}{4}$ W. from Whistler point, is a patch of foul ground, which often breaks, but upon which when not breaking not less than 6 fathoms water could be found. N.W. $\frac{3}{4}$ W. 2 miles from Netherby point is a rock awash at low water, which breaks heavily.

From Netherby point the land trends about S.S.E. for nearly 2 miles to Waterwitch point.

From Waterwitch point the coast trends south-easterly for 2 miles to a conspicuous long sand-hill similar to that to the northward, and thence the coast, of the same broken and rocky character, trends S. by E. $5\frac{1}{2}$ miles to Fitzmaurice bay.

Waterwitch reef.—At a distance of 2 miles South of Waterwitch point is Waterwitch reef.

This reef with the foul ground adjacent is nearly a mile in extent but the centre is the only part which continuously breaks. Midway between Waterwitch reef and the shore is a rock which uncovers, and between it and Waterwitch point it is all foul ground.

Currie harbour lies just to the southward of Netherby point, and affords shelter from all winds. It is only adapted for small craft, such as frequent the island for the skins of seals or kangaroos.

LIGHT.—Currie harbour lighthouse, on the south side of the harbour, is 70 feet high, built of iron with a central tube for the staircase and supported on 6 columns, the whole painted white. It exhibits at 150 feet above high water a *flashing* white light of the first order, which shows a flash *every 12 seconds*, and which should be seen in clear weather from a distance of 17 miles. The light is visible through an arc of 180°, from New Year islands on the north, to Cataraque point on the south.

FITZMAURICE BAY affords good shelter in easterly winds in about 10 fathoms sand, off the sandy beach in the depth of the bay. A sand-patch is a good guide to the locality. As the wind usually veers from East round northerly to N.W. and West, and as the westerly change is often very sudden, this bay can only be used with caution.

Water.—There is a good fresh water stream near the northern corner of the sandy beach, but a heavy surf will nearly always be found.

Cataraque point is on the south-west side of Fitzmaurice bay. It lies from Netherby point S. by E. $\frac{1}{2}$ E. 9 miles. At a cable N.W. there are a few sunken rocks, some of which are awash at low water. From Cataraque point the coast, which has an elevation of about 300 feet, and is here bold and cliffy, trends S.S.E. for $3\frac{1}{2}$ miles to Surprise point, eastward of which is the bay of the same name.

Surprise point.—Rocks above water extend a quarter of a mile south of this point, and between it and the opposite point of Surprise bay is a rock just above high water, with a group of sunken

rocks lying round it. South of Surprise point the land falls suddenly to 100 feet in height.

Surprise bay is much used by sealers and small craft visiting the island. It affords good protection in all weathers for this class of vessels, the sea being broken upon the group of rocks in the centre of the bay. In strong westerly winds the bay cannot be entered.

TIDES.—It is high water, full and change, in Surprise bay at 0h. 43m.; springs rise 3 feet. During the period tidal observations were being taken an easterly gale had the effect of doing away with one flood tide, showing how the tides are influenced by the winds. See page 410.

STOKES POINT, the south end of King island, lies S.E. $\frac{1}{4}$ E. $3\frac{1}{2}$ miles from Surprise point; it is only a few feet above high water, and has the appearance of a group of boulders, over and outside which the sea is constantly breaking; there are a few sunken rocks south of the point at $1\frac{1}{2}$ cables from the high-water line. At one mile North of the point the land has an elevation of 144 feet, and falls gradually on the opposite side to about 100 feet. In rounding Stokes point care must be taken to give it a good wide berth; the low point and the rocks lying off it appear more distant than they are in reality, in consequence of the gradually rising hill to the northward.

Seal bay.—From Stokes point the east coast of King island trends North for about a mile, and then N.W. half a mile to the sandy beach of Seal bay. Middle point, on the north side of Seal bay, bears from Stokes point N. $\frac{1}{2}$ E. $2\frac{1}{4}$ miles. Off Middle point, half tide and sunken rocks extend in an E.S.E direction for half a mile.

Anchorage.—The anchorage in Seal bay is near the centre, in 7 to 8 fathoms water, over coarse sand of a loose nature, with the eastern part of Stokes point just open of the next point to the northward.

Seal bay, though seemingly protected from the prevailing winds, is actually exposed, for easterly winds are of more frequent occurrence here than on the Victorian coast; the bay has a bleak and

warning appearance, and sealers never use it, as they prefer the safer anchorage upon the opposite side of the island in Surprise bay. A sailing vessel is recommended to anchor in Seal bay in about 10 fathoms water, outside the anchorage ground above given. A swell setting into the bay, or indications of an easterly wind, should be the signal for a vessel to get under weigh.

Seal rock, 12 feet high, lies N.E. by E. $1\frac{1}{2}$ miles from Stokes point; at $1\frac{1}{2}$ cables S. by E. $\frac{1}{2}$ E. from Seal rock is a smaller rock which uncovers at low water; a few sunken rocks lie near it. East of Seal rock, at a distance of $1\frac{1}{2}$ miles, are several rocky patches, Stanley rocks, with less than one fathom upon them; between these and Seal rock the general depth is about 7 fathoms, but there is one patch of 3 fathoms at 4 cables from the rock, and another of 5 fathoms at three-quarters of a mile. No shoaler water could be found, but in stormy weather the sea breaks the whole distance from Seal rock to the outer rocky patches.

The COAST.—Black point lies N.N.E. $\frac{1}{2}$ E. $3\frac{1}{4}$ miles from Stokes point, and may almost be considered the north-east point of Seal bay. Over the point there is a hummock 113 feet high, and to the northward over the coast there is a higher range of conspicuous sandy hummocks. The point itself is a black rock about 30 feet high; and half a mile eastward of it, but only one quarter of a mile from the nearest shore, is a rock above water, with sunken rocks between it and the land.

Two miles N.E. $\frac{1}{2}$ E. from Black point is another small point, at the back of which the land rises, and off which to the south-east, at a distance of 2 cables, is a small rock above water. At one mile N.E. $\frac{1}{2}$ E. from the latter point is a smaller point, off which on a S.S. E. $\frac{1}{4}$ E. bearing, and at a distance of 4 and 7 cables respectively, are the Brig and South Brig rocks. At the back of this land King island attains its greatest elevation, namely, 700 feet.

Brig rock, so called from its resemblance to a brig under sail is 45 feet high; there is deep water between it and the shore, and between it and South Brig rock.

South Brig rock is 40 feet high, and of much greater extent than Brig rock; it has no resemblance to a vessel under sail, but is

more easily seen, from its black appearance. A few detached rocks lie off it to the southward, and the sea breaks one cable off its south side. South Brig rock bears from Seal rock N.E. $\frac{1}{4}$ N. distant $4\frac{1}{2}$ miles. The coast abreast should not be closely approached in light winds on account of the swell which usually breaks upon the rocks fronting it.

Bold point bears from South Brig rock N.E. by N. 5 miles. Several small points and bays occupy the space between; the first half of the distance has several rocks, most of them above high water, lying about 3 cables off the shore. Over the point the coast range has an elevation of 630 feet, and is densely timbered. Three-quarters of a mile S.W. by S. from Bold point there is a point with a small detached rock forming its south extreme; at a cable off this, are a few sunken rocks.

From Bold point the coast trends N. by E. 4 miles, and North 3 miles to the south point of Sea Elephant bay. This coast is broken and almost steep-to. Small sandy beaches vary its rocky character, and over it are densely timbered ranges about 500 feet in height, which at the south point of Sea Elephant bay trend away to the north-westward.

SEA ELEPHANT BAY, nearly 6 miles broad, and $1\frac{1}{2}$ miles deep, is open to the eastward; its extreme points bear from each other N. by W. and S. by E. Off its north point, on an East bearing and distant $1\frac{1}{2}$ miles is Sea Elephant rock, 76 feet high and nearly a quarter of a mile in extent. Between the point and the rock is a channel of about 3 fathoms water. At one mile N. $\frac{3}{4}$ E. from Sea Elephant rock is Sea Elephant reef, which at very low tides is uncovered about 2 feet; there is foul ground round it, half a mile in extent. A cable to the south-west of Sea Elephant rock is a rock above water, near which are a few sunken rocks.

Anchorage.—Sea Elephant bay affords a safe anchorage during westerly gales, and the wind generally, when the weather is clearing, veers to the southward. The bottom throughout the bay is sand, or sand and shells, and there is anchorage anywhere in about 9 fathoms, but the centre of the bay, in a line between its south point and Sea Elephant rock, is most convenient, where there is nothing in the way of a vessel getting to sea on the first appearance of a fresh breeze

from the eastward. In the summer months there is much easterly weather, and a swell rolls in.

Water.—In the southern part of the bay there is a good fresh water stream. Also an abundance of firewood.

Elephant bank.—East of Sea Elephant bay, at nearly 7 miles from the shore, there is a bank with 22 feet water upon it; the bank generally has a depth of $4\frac{1}{2}$ and 5 fathoms, sand, and at this depth is 3 miles long, in a N. by W. and S. by E. direction. From the north or shoalest part, Sea Elephant rock bears W. $\frac{1}{2}$ N. about $4\frac{1}{2}$ miles. Midway between the bank and the shore the water deepens to 12 and 14 fathoms, and thence shoals gradually again, until at half a mile from the shore there are 5 fathoms. As the sea breaks heavily on the bank in strong winds, Sea Elephant bay should be approached with caution.

Tides and tidal streams.—It is high water, full and change, in Sea Elephant bay at 0 h. 50 m.; springs rise 3 feet. The flood stream runs to the northward and the ebb to the southward, at springs $1\frac{1}{2}$ knots. The turn of the stream is influenced by the wind; in fine weather it occurs at high and at low water.

The COAST.—From the north point of Sea Elephant bay the coast, consisting of low sand-hummocks, trends N. by W. $\frac{1}{4}$ W. $9\frac{1}{2}$ miles to Lavinia point. At one mile distant from the north point of the bay is Sea Elephant river, a small stream accessible at high water to small craft drawing 3 feet water; at the back is a swamp. Midway, and at 2 miles inland, is a double-topped hill, densely timbered, 338 feet in height, known as Sea Elephant hill.

Lavinia point, the north-east extremity of King island, is low and sandy; thence the coast, which continues sandy, trends N.W. $\frac{1}{2}$ W. $3\frac{3}{4}$ miles to Boulder point, so named from a large granite boulder which forms it. At $1\frac{1}{2}$ miles to the north-west of Lavinia point is a conspicuous sand-patch. A few sunken rocks lie off Boulder point, and a shoal with 10 feet water, extends from the point N. by W. $\frac{1}{2}$ W. three-quarters of a mile.

The meeting of the tidal streams has caused a heaping up of the sand in the vicinity of Lavinia point, and it is not uncommon for coasters to anchor in westerly gales in about 9 fathoms upon the bank thus

formed. If the gale should have settled into a westerly one this anchorage is as safe as Sea Elephant bay, and it is handier for proceeding westward when the weather clears.

At one mile to the north-west of Boulder point is a large and conspicuous sand-patch, much more conspicuous than that between Lavinia and Boulder points.

Doughboy rock.—The coast from Boulder point trends N.W. for 3 miles to another point, off which, at one cable, is a rock awash; W. by N. $\frac{1}{2}$ N. $1\frac{3}{4}$ miles from the latter point lies a rock above water known as the Doughboy, and a reef dry at low water connects it with the shore, from which it is distant 3 cables. Doughboy rock lies E. $\frac{1}{2}$ S. one mile from cape Wickham. There is a passage of deep water between it and Navarin reef (*see* page 415), but the tidal stream often runs strong and causes a rip. The passage is not recommended.

SOUNDINGS.—The 30-fathoms line, commencing at about 4 miles N.W. of cape Wickham, just outside Harbinger rocks, follows the curve of the land, and passes New Year islands at a mile distant, thence down the west coast of King island at a distance of about 3 miles until at 5 miles N.W. of Netherby point it is distant 5 miles from the adjacent coast. Here are 21 fathoms and 22 fathoms with much foul ground leading to the rocky patch of 6 fathoms already described. Thence the 30-fathoms line approaches to within 3 miles of Netherby point, increasing its distance from the land to 4 miles, but again nearing the land at Cataraque point, where it is distant only one mile. At Surprise point it is distant only half a mile, and at Stokes point nearly a mile, whence it becomes a very irregular line trending first easterly, and then towards Reid rocks. *See* page 413.

At 6 miles W. by S. from Stokes point there is a rocky patch, on which not less than 10 fathoms were found; it is probable that the sea breaks here in bad weather.

On the east side of King island the soundings are less than 30 fathoms. Twenty-one miles to the eastward of Sea Elephant bay is a depth of 25 fathoms, sand, and 23 miles to the eastward of Lavinia point 24 fathoms, fine white sand. From these positions towards the island the water appears to shoal very gradually, while eastward it appears to deepen as gradually. North of the island the

30-fathoms line is 2 miles North from cape Wickham, it passes Navarin reef a mile distant, and trends easterly.

Currents and tidal streams.—Off cape Wickham there is occasionally a very strong current, which may be more correctly termed a tidal stream accelerated by the wind. Close to the cape it is said to run occasionally as much as 5 knots, but 2 knots is the ordinary rate at spring tides.

The current loses in force as its distance from the shore increases. It is probable that a westerly gale keeps up the flood stream which here sets to the eastward, and an easterly gale has an opposite effect.

Southward and westward of King island the currents or tidal streams are irregular; they are known at times to be very strong, but they were never experienced of any strength during the survey of the island.

Sealers have reported that in the strait between King island and Tasmania a current sets eastward during easterly weather; if this be so in the centre of the strait it is likely that in-shore on both sides there is a stream setting in an opposite direction.

CAPE OTWAY TO PORT PHILLIP.

Parker river.—From cape Otway the coast trends E. by N. 2 miles to Franklin point, which is low and sandy, with some rocks lying near it. At three-quarters of a mile North of this point is the mouth of the small river Parker, where the end of the Tasmanian submarine cable is, and where the lighthouse stores are landed. As there is usually a heavy surf at the mouth of the river, it is dangerous to attempt a landing there.

The COAST.—From Franklin point the coast trends nearly N.E. $\frac{1}{4}$ N. 43 miles to Addis point, and begins with high dark-coloured cliffs, backed by densely wooded hills, rising to the height of 2,297 feet, at N.N.E. $\frac{3}{4}$ E. 25 miles from cape Otway, and extending to within 5 miles of Addis point. At about 8 miles north-eastward

*See charts, No. 1,695*b*, and No. 1,063, Western approach to Bass strait, scale $m = 0.19$ inch.*

of Addis point the coast changes to sand-hummocks, backed by undulating hills, with patches of wood, and farm-houses.

From Blanket bay, a small bight $1\frac{1}{2}$ miles N.E. by N. of Parker river, the coast trends N.E. by N. and East 4 miles to Storm point, and thence N.N.E. $\frac{1}{4}$ E. $2\frac{1}{4}$ miles to Bunbury point. Hayley reef, just above high water, projects half a mile from the shore between the two points.

HENTY REEF, N.E. $\frac{3}{4}$ E. $9\frac{3}{4}$ miles from cape Otway lighthouse, is a dangerous reef, with 18 feet water over it, on which the sea breaks heavily in moderate weather. It is steep-to, with 6 to 10 fathoms all round within a cable of its shoalest part.

Beacons.—The position of Henty reef is shown by the intersection of two lines drawn through four pillar-beacons, each surmounted by a ball. Two of these beacons, which are 200 yards apart, and when in line bear West, the inshore one being white, and the outer black, are situated one-third of a mile S.W. of Hayley point, and two-thirds of a mile N.E. by N. of Storm point.

The other two beacons are 285 yards apart, when in line bear N.W. $\frac{1}{4}$ N., the north-west one being white, the other red, and are situated on Bunbury point.

Directions.—If bound to the north-east, keep the black beacon near Storm point well open north of the white one until the white beacon on Bunbury point opens well to the north-east of the red beacon. In proceeding to the south-west, keep the outer or red beacon on Bunbury point well open south of the white one until the white beacon near Storm point is well open south of the black beacon.

APOLLO BAY, on the north-east side of Bunbury point, lies just under a high part of the Otway range, and may be known by the beacons on the point, and the few houses at the northern part of the bay. There is generally a heavy swell in the bay.

A reef, on which the sea breaks, extends off Bunbury point for one-third of a mile.

The settlement is called Krambruk and is a favourite watering place; there are mails twice a week from Melbourne. The population is about 250.

Jetty.—A jetty extends about 360 yards to the north-east from a position just to the northward of the red beacon on Bunbury point.

Light.—A *fixed* red light, 25 feet above high water, is exhibited from a lamp post at the outer end of the jetty in Apollo bay, and should be visible from a distance of 3 miles in clear weather.

Anchorage.—There is anchorage during westerly winds in Apollo bay in from $4\frac{1}{2}$ to 7 fathoms water. Vessels must be prepared for a change of wind to the South or S.E.

Moorings.—There are two mooring buoys on the north side of the jetty, the outer buoy in 14 feet bears N.N.E. $\frac{1}{2}$ E. 60 fathoms, and the inner buoy in 7 feet bears N.W. by W. $\frac{1}{2}$ W. 30 fathoms from the jetty.

Cape Patton, N.E. $\frac{1}{2}$ E. $8\frac{1}{2}$ miles from Bunbury point, is a bold dark-looking wooded head, at S.W. $1\frac{1}{2}$ miles from which a $1\frac{1}{4}$ to 2 fathoms shoal projects half a mile from the shore; and at N.E. $\frac{1}{4}$ N. $1\frac{1}{2}$ miles from the cape a 12 feet spit extends half a mile from Hawdon point. From this point the coast extends N.N.E. $\frac{3}{4}$ E. 9 miles to Grey point, a low grassy projection, with a reef extending one-third of a mile from it, and forming the south side of Louttit bay.

LOUTTIT BAY may be recognised by a square land-mark 30 feet high, surmounted by a staff and ball, and erected on the adjacent coast range. Louttit reef, with 6 to 10 fathoms water on it, extends off Grey point E. by N. $1\frac{1}{2}$ miles.

Lorne, a watering place and the settlement in Louttit bay, had a population of 260 in 1891; there are 3 mails a week from Melbourne, and there is a telegraph office.

Jetty.—There is a jetty 600 feet long at Lorne in Louttit bay.

Light.—A *fixed* green light, 27 feet above high water, and visible 3 miles in clear weather, is exhibited from the end of the jetty. This light is white over the inner end of the jetty.

Anchorage, in from 4 to 7 fathoms water, may be obtained in Louttit bay. The anchorage in this bay is preferable to that in Apollo bay, there being less swell. Sailing vessels anchoring in this

bay, with westerly gales, must prepare for a change of wind, as it often chops round to South, and sometimes to S.E.

Moorings.—There is a red mooring buoy in Louttit bay in 12 feet, 45 fathoms north-west of the jetty end.

Eagle Nest point (Split point), N.E. $\frac{1}{4}$ N. 7 miles from Grey point, is of a reddish-brown colour, and appears like three cliffs close together, divided by dark ravines. Eagle Nest reef, which is a wash, projects half a mile from the shore at two-thirds of a mile N.E. of Eagle Nest point.

LIGHT.—Eagle Nest point lighthouse is constructed of concrete, coloured white, and is 83 feet high. It exhibits at 218 feet above high water a *fixed* light of the first order, which should be seen from a distance of 18 miles in clear weather. The light is red seaward through an arc of about 150° , visible from $1\frac{1}{2}$ miles off Addis point to the north-east, to one mile off cape Patton to the south-west; inshore towards the land it is white.

An auxiliary *fixed* white light, visible from a distance of 3 miles and through an arc of 180° seaward, is also shown from this lighthouse. It is invisible, from a height of 14 feet above the sea, until within the distance of about 3 miles from it.

The white lights are to warn mariners of too close approach to the land.

Demons bay.—Between Eagle Nest reef and Addis point, at N.E. $\frac{1}{2}$ E. $7\frac{1}{2}$ miles from it, the coast forms two bights, separated by Roadnight point, the north-eastern being Demons bay. At N. by E. one mile from Roadnight point is a creek, with a sunken rock close off it, between which and Addis point there are two rocks above water; these are the Ingoldsby reefs, and they break heavily.

Addis point.—From Addis point the coast trends N.E. $\frac{1}{4}$ N. 5 miles to Zealey point, whence it curves N.E. and East $9\frac{1}{2}$ miles to Barwon head.

Victoria reef, on which there are 15 feet of water, lies E. by N. $\frac{3}{4}$ N. $1\frac{1}{4}$ miles from Zealey point, with which it is connected by a bank, that continues along the coast to Barwon head; at midway it only extends a quarter of a mile from the shore. Ant spit, on

which there are 12 feet water, projects from this bank to $2\frac{3}{4}$ miles W. by S. of the head.

BARWON HEAD is a saddle-shaped scrubby hummock 122 feet high, appearing from seaward like an island, on account of the low land in its rear. This head forms the south side of Barwon river, which boats can only enter with very smooth water. On the north bank of this river, at about 10 miles to the north-west of its mouth, is situated the important town of Geelong.

There is a telephone station at the head in communication with the telegraph, but communication cannot be made by the commercial code of signals.

An automatic signal buoy is placed off Barwon head, west side of port Phillip entrance. The buoy is moored in 12 fathoms water, with Barwon head bearing N.W., distant about $1\frac{1}{2}$ miles.

Charlemont reef, S.W. by W. one mile from Barwon head, is a detached 9-foot patch, with deep water about it.

The COAST.—From Barwon river the low sandy coast curves eastward nearly 6 miles to point Lonsdale, the outer point on the west side of the entrance to port Phillip. A spit having 9 to 15 feet water on it projects one mile eastward from the mouth of the river, whence a continuous rocky shoal, nearly half a mile broad, with 6 to 16 feet water on it, extends to point Lonsdale. From the edge of this shoal to $3\frac{1}{2}$ miles off shore the soundings gradually increase to 28 and 30 fathoms.

PORT PHILLIP includes all inlets, rivers, bays, and harbours contained within a line drawn from point Lonsdale to point Nepean, and not included in the ports of Melbourne, the metropolis of the colony of Victoria, and Geelong. It is situated at the head of an extensive bight between cape Otway on the west, and Wilson promontory, 130 miles to the eastward of the cape. In approaching the port from the westward, the entrance is not easily distinguished until point Nepean, the eastern entrance head, bears N.N.E., when Shortland bluff, on which the highest and leading lighthouses are erected, shows out, and the estuary becomes visible. If Barwon head is previously seen, the entrance of port Phillip is easily found by its relative position with that head.

See charts, Nos. 1,171a and b, port Phillip, scale $m = 1\cdot0$ inch; Nos. 2,747a and b, port Phillip entrance, scale $m = 3\cdot0$ inches; No. 1,695b.

Port Phillip extends about 32 miles, north and south, is 18 miles wide, exclusive of an arm which trends 16 miles in a W.S.W. direction to Geelong, and is capable of receiving and sheltering a large number of ships; but the entrance is less than 2 miles wide, and nearly one-half of it is occupied by rocks and shoals.

Depth in channels.—The least depth of water which must be passed over in the channels of port Phillip between the sea and Hobson bay is,—in the West channel 18 feet, in the South channel 28 feet; and in the Hopetoun channel to Geelong 23 feet, at low water.

POINT LONSDALE, the western head of the entrance to port Phillip, is low and juts out from a dark rocky cliff, it being neither so high nor so well marked in outline as point Nepean, the eastern head; but can now be easily distinguished by a lighthouse, look-out house, and a tidal signal flagstaff.

Signal station.—There is a signal station at point Lonsdale lighthouse and communication can be made by the commercial code. It is connected by telephone with Queenscliff telegraph station.

Lonsdale reef, the greater part of which dries at low water, projects a quarter of a mile south-eastward from point Lonsdale, and is about 200 yards broad, having dangerous rocky patches extending nearly 400 yards farther to the south-east, with 5 fathoms water close outside them.

LIGHT.—On point Lonsdale, from the lighthouse which is 54 feet high, and painted red and black in alternate bands, is exhibited a *fixed* light, which can be seen in clear weather from a distance of 10 miles. The light is green seaward when bearing about N. 11° W. to N. 50° W.; and red towards point Nepean between the bearings of N. 50° W. and S. 79° W.; the red is of a deeper shade between the bearings of N. 79° W. and S. 79° W.

Vessels having the green light in sight are outside, and with the red in sight, inside Lonsdale rock, which bears S.E. $\frac{1}{2}$ E. (S. 51° E.), distant nearly two-thirds of a mile from the light. The blending of the two colours shows that a vessel is in the vicinity of, or in line with this danger; great caution is therefore necessary before these colours begin to blend.

Fog signal.—During thick or foggy weather a siren on point Lonsdale produces a high pitched note of about *four seconds* duration *every two minutes*, which should be heard under favourable circumstances from a distance of 3 to 4 miles.

In the event of the siren being disabled, fog signal rockets are fired *every five minutes*.

Lifeboat.—A lifeboat is maintained at point Lonsdale in case of shipwreck.

PILOTS.—There is a pilot establishment at port Phillip heads; the vessels are fore-and-aft schooner rigged, painted a light stone colour, each with her number on her main-sail. They cruise from 3 to 15 miles outside the heads, borrowing on either shore according to the weather; and one of them is constantly outside when there is a possibility of keeping the sea. The middle cruising ground is comprised within a radius of 7 miles from a point midway between port Phillip heads to seaward.

The outer cruising ground extends from the outer boundary of the middle cruising ground to a line drawn from Zealey point to a point bearing S.W. by S. 15 miles from a point midway between port Phillip heads, from that point E. $\frac{3}{4}$ N. until Arthur's seat bears N.E. $\frac{1}{4}$ N. and thence on that bearing to the land.

The pilot-vessels carry at the main mast-head by day a red and white flag in horizontal stripes, and between sunset and sunrise exhibit a white light at the fore mast-head, and show a flash-light every quarter-hour.

When nearing the pilot schooner, vessels requiring a pilot should be stopped dead or hove to, giving such schooner the lee, to enable the pilot to board in safety.

Vessels which miss the pilot-vessel will be boarded by a pilot from a whale-boat, when they are inside point Lonsdale. But no stranger should attempt to enter without taking a pilot; although the channels are so carefully lighted and buoyed that it is quite possible to do so.

Signals.—Vessels steering for port Phillip are bound to show the usual signal for a pilot when within 12 miles of the entrance.

At night, vessels requiring a pilot should show a blue light *every fifteen minutes*; or a bright white light flashed or shown at *short or frequent intervals*, just above the bulwarks, for about a *minute* at a time.

Vessels which are exempt from pilotage must, on arriving within 12 miles of the entrance, have a large white flag flying at the main mast-head until past Swan point, under a heavy penalty, to prevent the pilots' time being unnecessarily taken up running after vessels which do not require their services.

Tidal signals are shown at point Lonsdale, denoting the quarter of the tide with reference to the stream.

The flood or in-going stream—

During the first quarter is denoted by a blue flag half-mast.

„ second quarter „ „ „ at mast-head.

„ third quarter „ „ red flag half-mast.

„ fourth quarter „ „ „ at mast-head.

The ebb or out-going stream.—The same signals are used for the four quarters of this stream ; with a ball below the flag.

By attention to these signals a mariner will know the state of the tidal stream, which cannot be always ascertained by the usual process of finding the time of high-water, its strength and duration being much influenced by the wind and weather.

The signal-keeper has instructions, if he sees vessels approaching the heads and running into danger, to warn them by signals; strangers should therefore watch these signals.

For tides and tidal streams, *see* pages 493–4.

Tide signals for South channel, *see* page 442.

POINT NEPEAN.—The eastern head of the entrance to port Phillip is the narrow western termination of a peninsula, which extends 15 miles in a westerly direction from Arthur's seat, and consists of a series of sand-hummocks slightly covered with low bushes, and having a beacon on its extremity. This beacon is a white triangle, 20 feet high, with a square on top.

Nepean reef and rock.—Nepean reef projects westward nearly 400 yards from point Nepean to Nepean rock, a small islet, on which is a red triangular-shaped beacon, 25 feet high, with a ball on top; thence the reef and several pinnacle rocks outside it extend 700 yards farther west to Corsair rock, 150 feet to the N.N.E. of

which is a small detached rock with 10 feet water on it. Nepean reef dries at low water out for 700 yards from the point.

The northern edge of the rocky ledge along Nepean reef trends from Corsair rock E. by N. to 200 yards north of point Nepean. The coast outside point Nepean is bordered by a continuation of this reef and numerous rocks; but they do not extend off more than 200 to 300 yards and the coast may be approached to a third of a mile in 5 fathoms.

Corsair rock, the outer end of Nepean reef, is 20 feet in diameter, having 8 feet water over it with 3, 4, and 5 fathoms close to; this rock lies with the red beacon on Nepean rock in line with the white beacon on point Nepean, bearing E. $\frac{1}{4}$ S. (S. 87° E.), the red beacon distant $3\frac{1}{2}$ cables.

ENTRANCE.—The entrance to port Phillip, between points Lonsdale and Nepean, is $1\frac{3}{4}$ miles wide, but the navigable channel is contracted to a little less than one mile in width between the reefs that project from these points.

Lonsdale rock, S.E. $\frac{1}{2}$ E. (S. 51° E.) a little more than half a mile from point Lonsdale, with 18 feet water on it, lies on the west side of the fairway.

Depths of 24 feet water extend about one cable to the south and east of Lonsdale rock. In the entrance fairway, between these depths and Corsair rock there is a least depth of 30 feet at low water.

Caution.—Outside the bank there are 9 to 14, and inside 10 to 47 fathoms. This great inequality, with tidal streams at times running 5 to 7 knots, causes the well-known race, or “*rip*,” between port Phillip heads, which during or immediately after a north-westerly gale breaks so furiously as to be dangerous to small vessels.

Leading marks.—The two lighthouses on Shortland bluff in line, N.E. by N. (N. 34° E.), lead through the fairway of the entrance into port Phillip in not less than 30 feet. See page 434.

The two beacons in Lonsdale light kept in line N.N.W. $\frac{1}{4}$ W. (N. 25° W.) lead in with not less than 42 feet at low-water spring tides. See page 477.

Vessels drawing less than 14 feet may, in the daytime, pass

between Lonsdale reef and rock by keeping Swan point just open east of Shortland bluff, bearing N.E. $\frac{1}{3}$ N. (N. 44° E.).

Swan beacon (white with a red top) open of Shortland bluff, bearing N.E. $\frac{1}{2}$ N. (N. 39° E.), leads half a cable to the eastward of Lonsdale rock.

Corsair rock is cleared by keeping the low lighthouse on Shortland bluff in line with the east end of the houses near the high lighthouse N.N.E. $\frac{1}{4}$ E. (N. 25° E.), until the white beacon on point Nepean is well open to the north of the red beacon, when going in, or well open to the south, when going out.

THE WESTERN SHORE of port Phillip from point Lonsdale curves northward and eastward, forming a bay which extends from the point N.E. by E. $2\frac{1}{3}$ miles to the south end of Shortland bluff, and is three-quarters of a mile deep; it is mostly occupied by shoals with irregular soundings between them, extending from the shore to a line from point Lonsdale to Shortland bluff; the only part of the bay which appears free from shoals and has tolerably regular soundings is within about one mile of Shortland bluff; even here anchorage is not recommended.

At three-quarters of a mile to the northward of point Lonsdale is a cemetery, near the shore, from which a low coast-range extends to Shortland bluff. The telegraph passes close along the shore, and behind the coast-range from point Lonsdale to Shortland bluff.

Victory shoal lies nearly in the centre of the above bay, its outer edge, on which there are 11 to 14 feet water, being in line between point Lonsdale and Shortland bluff; the least depth of water on the shoal is about 6 feet.

Queenscliff, at the entrance of port Phillip, is about 32 miles from Melbourne by water, and 65 miles by land. Two trains run daily to and from Geelong, 20 miles distant; and a steam vessel plies three times a week to and from Melbourne. When the weather permits the intercolonial steam vessels embark and disembark passengers. All vessels arriving from foreign ports are boarded here by the health officer. It is much used by visitors as a watering and bathing place. The population was 1,905 in 1891.

Shortland bluff, on which are two lighthouses and a red stone obelisk 40 feet high, with the town of Queenscliff in their rear, is the south-east extreme of a peninsula projecting nearly 2 miles in a north-easterly direction from the line of coast, with which it is connected by an isthmus little more than 200 yards broad. The peninsula is about half a mile broad at Shortland bluff, from whence it gradually contracts to the north-eastward, where it terminates in a low narrow point.

LIGHTS.—The high lighthouse on Shortland bluff, which bears N.E. $\frac{3}{4}$ E. (N. 53° E.), distant $2\frac{1}{2}$ miles from point Lonsdale, is a tower 81 feet high, built of blue stone, which retains its natural colour. It exhibits at 130 feet above high water a *fixed* white light, which may be seen from a distance of 17 miles in clear weather.

The light is visible seaward between the bearings of about N. 79° E. and North; but when close in with the land about point Lonsdale, it is only visible between N. 56° E. and North. Within port Phillip the light is visible when bearing from N. 56° E., round by north and west, to S. 56° W.

Low light.—The low lighthouse tower, 69 feet high, painted white, with a dark red lantern, stands S.W. by S. (S. 34° W.) 352 yards from the high lighthouse, and at the height of 90 feet above high water exhibits a *fixed* light, showing white when bearing from about N. 56° E. to N. 39° E., red from N. 39° E. to N. 22° E., and white from N. 22° E. round by north, to N. 79° W. It also shows red between the bearings of S. 59° W. to S. 65° W., as a guide in the fairway from Swan spit to between No. 1 and No. 2 Royal George gas buoys. The white light should be seen in clear weather at a distance of 14 miles, and the red at 10 miles.

In entering port Phillip keep Shortland bluff low red light in line with the high white light bearing N.E. by N. (N. 34° E.). The change of colour of the low light from red to white indicates an approach to Lonsdale rock on the west, or to Corsair rock and Nepean reef on the east side of the entrance.

The low white light between the bearings of N. 56° E. and N. 39° E. shows over the dangers extending from point Lonsdale. Between the bearings of N. 22° E. and N. 79° W. the light shows white over the Corsair rock and through the South channel; passing along the black buoys which mark the north side of the channel, so that vessels

with light winds or adverse tidal streams, may be aided by a bearing of the light.

Queenscliff jetty, N.N.E. nearly half a mile from the high lighthouse, projects about 130 yards from the shore, and has a *fixed* red light at its end, visible at a distance of 4 miles.

Queenscliff new jetty, rather more than a cable southward of the old jetty, is about 360 yards long. Two *fixed* green lights, visible from a distance of 3 miles in clear weather, are exhibited from lamp-posts on the new jetty, one at the inner corner of \perp end, the other about 200 feet therefrom on the north side of the jetty.

Buoyage.—Three buoys, two of which are white and one black, are placed in 7 to 10 feet water off Queenscliff new jetty, and define a channel leading thereto not less than 200 feet wide and 12 feet deep. Vessels proceeding to the jetty from seaward leave the black buoy on the port side.

Life-boat.—There is a life-boat station at Queenscliff new jetty.

Swan island is low, with several small lagoons on it, and is separated from the north-east point of Shortland peninsula by a shallow opening 100 yards wide, communicating with Swan bay to the westward. From this opening, the south side of Swan island trends nearly E.N.E. $1\frac{1}{3}$ miles, and thence the east side sweeps three-quarters of a mile northward, round Swan point, to the north-east end of the island. Swan island is nearly 2 miles long, E.N.E. and W.S.W., and one mile across at its broadest part; but it is nearly divided in two by a bight, with a small islet in it, on its north side. There are three islets close to the south-west extreme, and another close to the north point.

Queenscliff bight.—Between Shortland bluff and the south-east part of Swan island a bay extends 2 miles N.E. and S.W., and half a mile deep; but it is fronted by a bank having irregular depths of 3 to 12 feet water on it, the outer edge of which, from $1\frac{1}{2}$ cables off Shortland bluff, trends nearly N.E. by E. $1\frac{1}{2}$ miles to No. 1 black can buoy, and thence one mile farther in the same direction to Swan-spit gas buoy.

Many shoal patches, with from 3 to 6 feet upon them, have formed

in Queenscliff bight. The two outer patches are on a line joining Shortland bluff high lighthouse and Swan-spit gas buoy, and are 4 cables apart; the south-west being $1\frac{1}{4}$ miles from Swan-spit gas buoy.

The coast in Queenscliff bight is extending, and is partially covered with grass.

Clearing mark.—To clear the edge of the bank and the shoals just noticed, keep Lonsdale lighthouse open of Shortland bluff.

Swan beacon, which, when open of Shortland bluff, bearing N.E. $\frac{1}{2}$ N. (N. 39° E.), leads clear of Lonsdale rock, is white, 80 feet high, surmounted with a red cone and a red ball on top, and is situated near the south-east part of the island, the high lighthouse on Shortland bluff bearing nearly S. 41° W., distant a little less than 2 miles.

Submarine cable.—A submarine cable is laid between Swan beacon, Swan island, *via* Popes Eye fort, to Observatory point. Vessels are cautioned that anchorage is prohibited within 4 cables of either side of this cable.

Gas buoy.—A gas buoy is moored in 18 feet water on the south-east part of the Swan spit, bearing S. 80° E., nearly 9 cables from the Swan beacon. The buoy is painted black and shows a red *occulting* light, which is occulted 6 to 8 times every minute.

Swan bay is a large shallow lagoon, extending from the isthmus behind Queenscliff N.N.E. $5\frac{1}{4}$ miles, and $1\frac{1}{4}$ miles across, with an opening $1\frac{1}{4}$ miles wide, between Swan island and a narrow tongue of land projecting nearly $1\frac{1}{2}$ miles from the N.N.E.

From the north point of Swan island a mud-flat stretches nearly across the opening to Duck islet, between which and the south end of the tongue of land is a narrow boat channel, having 6 to 14 feet water, marked by white beacons on the north-east side, and by a black beacon on the south-west side of the entrance; but a bank extends from the north-east extreme of Swan island to the tongue of land, forming a 3-foot bar across the mouth of the boat channel.

The east and south parts of Swan bay are mostly occupied by mud-flats, leaving only portions of the west side accessible even to

boats; there being generally not more than 2 to 5 feet water in the bay.

The shore from the northern entrance point of Swan bay extends nearly N. by E. $2\frac{1}{4}$ miles to South Red bluff, and thence about three-quarters of a mile farther in the same direction, to a point, close to the northward of which St. Leonards jetty projects into about 8 or 9 feet water. A continuation of the bank which stretches northward from Swan island borders this shore, from which it projects 200 to 300 yards, with 2 to 6 feet water on it. The 3-fathoms edge of the shoal water, which extends about one-third of a mile from the shore, between the entrance of Swan bay and St. Leonards, forms the northern portion of the west side of Coles channel.

St. Leonards is a small fishing village, 24 miles south-westward of Melbourne, with a population in 1891 of 152 persons.

Light.—A *fixed* green light is exhibited from the end of the jetty at St. Leonards, which should be visible in clear weather from a distance of 3 miles.

Buoys.—A black buoy is placed to mark a shoal 2 cables S.E. of St. Leonards jetty.

A mooring buoy is placed in 10 feet water about 360 feet off the end of the jetty and 100 feet to the northward of it.

Point George.—From St. Leonards the shore, after extending N. by W. $\frac{1}{2}$ W. $1\frac{1}{4}$ miles to North Red bluff, trends N.N.E. one-third of a mile to Indented head, whence it recedes in a N.W. $\frac{1}{2}$ N. direction $1\frac{1}{4}$ miles to point George, close to the northward of which is White Woman rock. From the point of St. Leonards to point George a shoal, with 2 to 3 feet water on it, borders the shore, from which it extends about 200 to 300 yards.

Governor reef is a patch with one foot water on it, marked by a beacon, consisting of a mast and ball, painted black, and about 16 feet above high water, from which North Red bluff bears W. $\frac{1}{2}$ N., distant nearly two-thirds of a mile. At about one-third of a mile to the north-west of the beacon, and E.S.E. nearly a quarter of a mile from Indented head, is another patch, which dries one foot.

Prince George bank.—From half a mile off the point of St. Leonards the 3-fathoms edge of the shoal water, which extends from the shore, trends in a N. by E. direction to two black buoys, the north and south St. Leonards buoys, which mark the edge of the bank, and lie in 20 feet, respectively S.E. by E., and E.N.E., each distant half a mile from the Governor reef beacon. From the north St. Leonards buoy the eastern 3-fathoms edge of the bank extends irregularly, in a N. by W. direction $2\frac{1}{2}$ miles to the north-east extreme of Prince George bank, a quarter of a mile off which is moored a black gas buoy in 6 fathoms water, which shows an *occulting* white light, with from 6 to 8 flashes every minute, visible from a distance of 6 miles in clear weather, bearing N.E. $\frac{1}{4}$ N., a little more than 2 miles from point George.

From the north-east extreme of Prince George bank, its northern edge, after trending half a mile to the north-westward, extends, with a slight southerly curve, 3 miles in a W. by S. direction, to a quarter of a mile off the shore to the westward. There are two 4-foot patches on the northern edge of the bank nearly in line with Prince George buoy bearing E. by N. $\frac{3}{4}$ N., from which one patch is distant two-thirds of a mile, and the other $1\frac{1}{2}$ miles.

THE SOUTHERN SHORE of port Phillip from point Nepean to Observatory point, E. $\frac{1}{4}$ S. $1\frac{1}{4}$ miles from it, forms a bight a quarter of a mile deep; but the depth of water in it does not exceed 17 feet, and there are numerous sunken patches; the 3-fathoms edge of this shallow water and foul ground extends from the shore to a cable outside the line of the points of the bay.

Observatory point and Sanitary station.—There is a flag-staff on Observatory point, which marks the western boundary of the Sanitary station, and from this flag-staff the coast trends E. by S. $\frac{3}{4}$ S. nearly $1\frac{1}{3}$ miles to another flag-staff, the eastern boundary of the station. There is a jetty two cables eastward of Observatory point and another at the quarantine station, 4 cables westward of the eastern flag-staff; a *fixed* green light is shown from the end of this jetty, which should be seen from a distance of 3 miles in clear weather.

From the eastern flag-staff the coast trends E. $\frac{1}{2}$ S. three-quarters of a mile to point Franklin, the eastern point of Weeroona bay; in the depth of the bay, at Portsea, there is a small jetty.

Buoy.—A red conical buoy is moored in 11 feet water 250 feet off point Franklin.

From point Franklin the coast takes an E. by S. $\frac{1}{2}$ S. direction to point King; between the two flag-staffs it may be approached to one cable, Weeroona bay is shoal for $1\frac{1}{4}$ cables off shore, and eastward of point Franklin a shoal extends $1\frac{1}{2}$ cables from the shore, and is steep to.

The quarantine ground extends between Observatory point and point King, the anchorage being in 8 and 9 fathoms three-quarters of a mile from the shore.

Caution.—Strangers, who through stress of weather bring up here or at the anchorage off Shortland bluff, should not attempt to proceed above these anchorages without a pilot, as a collection of banks, with intricate channels, extends 8 miles in all directions above these anchorages.

Shoals in South channel.—Between Nos. 1 and 3 buoys of the South channel, shoals with 27 and 28 feet water over them extend 2 cables into the channel; a patch with 26 to 28 feet over it and about $1\frac{1}{2}$ cables across lies on the south side of the fairway, and North rather over a mile from point Franklin; a small knoll with 26 feet on it lies N.N.W. $\frac{1}{2}$ W. 9 cables from point Franklin, and another with 30 feet on it N. $\frac{3}{4}$ W. 6 cables from that point.

Portsea, a much frequented sanatorium and watering place, $6\frac{1}{2}$ miles by road from Melbourne, between which place and Portsea a coach travels and steam vessels also ply. There is a telegraph station here, and there are 12 mails a week from Melbourne. Population in 1891, 101, many of whom are lime burners.

LIGHT.—A *fixed* red light is exhibited from the outer end of the jetty at Portsea, visible 3 miles in clear weather.

The coast from point King curves S.E. $\frac{1}{4}$ E. about $1\frac{3}{4}$ miles to the Sisters, a double point, from the east side of which the coast, after trending E. by S. $\frac{3}{4}$ S. $2\frac{1}{2}$ miles to White cliff, takes an E. by N. $\frac{3}{4}$ N. direction for $6\frac{1}{2}$ miles to the foot of Arthur's seat. Between point King and the Sisters is Sorrento jetty.

Aspect.—The land from point Nepean to White cliff has hills 100 to 225 feet high on it, with numerous lime kilns, wells, and some

ponds. Between White cliff and Arthur's seat the country is flat, and at 3 miles to the eastward of the cliff it appears to be swampy, with a creek intersecting the shore midway between White cliff and Arthur's seat. Half a mile eastward of White cliff is Rye jetty, from the end of which a *fixed* red light is shown, visible 3 miles, and one mile west is Canterbury jetty.

Banks.—From point King to White cliff the coast is fronted by a bank mostly of sand with weeds, extending, midway, $2\frac{1}{2}$ miles from it. This bank, named the South sand, has generally 8 to 10 feet water upon it, with some small hollows of deeper water, and numerous knolls, on some of which there are only one to 6 feet water. Between the south-east extreme of this bank and White cliff is the entrance of a channel one quarter to half a mile wide, with 4 to 9 fathoms water, trending along the coast towards point King; but a bar of from 8 to 10 feet extends from point King to the shoal bank eastward. This passage is named Sorrento channel and is buoyed.

Sorrento channel.—**Buoys.**—The east side of this channel is marked by four black buoys placed as follows:—E. $\frac{1}{2}$ N. $2\frac{1}{4}$ cables from point King; N. $\frac{1}{2}$ E. about 2 cables from the outer end of Sorrento jetty; East 4 cables from the outer end of Sorrento jetty; N. by W. $2\frac{1}{2}$ cables nearly from the end of Canterbury jetty; and the west side by three red buoys placed:—S.E. by E. $\frac{3}{4}$ E. $2\frac{1}{4}$ cables from point King; N.E. one cable nearly from the end of Sorrento jetty; and E. by S. $\frac{1}{2}$ S. one mile from the end of Sorrento jetty. The channel has a minimum depth of 8 feet at low water, but there is a small patch of 6 feet about 100 yards W.N.W. of the northern black buoy.

There is a black and red mooring buoy close off Canterbury jetty end.

Sorrento is a watering place, 40 miles from Melbourne by sea. The population was 603 in 1891. A coach runs to Melbourne, and in the summer steam-vessels ply daily between the two places. There is a telegraph station here, and there are 12 mails a week from Melbourne.

Light.—From the end of Sorrento jetty, which runs out into 12 feet water, a *fixed* green light is exhibited from a lamp post, which in clear weather should be seen from a distance of 2 miles.

Submarine cable.—Prohibited anchorage.—A submarine telegraph cable has been laid between Sorrento and South channel fort, passing about one cable westward of No. 4 and No. 5 buoys. Vessels are prohibited from anchoring within three-quarters of a mile on either side of the line joining point King to South channel fort.

CAPEL SOUND is a clear space 2 miles long, east and west, and $1\frac{1}{2}$ miles wide, bounded to the northward by the two banks just described, and to the southward by the coast extending eastward from White cliff. There are regular soundings in 6 to 8 fathoms throughout the greater portion of the sound, over a bottom of sand and shells and mud; but shoal water extends from a quarter to one-third of a mile off the south shore.

From Capel sound to Arthur's seat the shore continues bordered by a shoal one-third of a mile broad, the soundings increasing from 3 fathoms at the edge of the shoal to 7 fathoms at $1\frac{1}{2}$ miles from the shore, over a bottom of sand and shells.

Jetty light.—A *fixed* green light is exhibited from the end of the Rosebud jetty, which is about $1\frac{1}{2}$ miles to the westward of Arthur's seat; it is visible about 3 miles in clear weather.

Anchorage.—Vessels entering, and caught in South channel by a northerly or north-west gale, will find anchorage in 5 to 7 fathoms in Capel sound, with White cliff bearing S.W. and the top of Arthur's seat East; but, if daylight and the wind permit, it would be better to run back to the anchorage off Shortland bluff lighthouses.

By night the Pile light shows red over safe anchorage in Capel sound.

ENTRANCE BANKS AND CHANNELS.—For the first $2\frac{1}{2}$ miles within the heads the estuary is free from dangers, but above that distance, where it widens between the directions of North and East, it is crowded with sand-banks, radiating nearly 8 miles from their southern and western extremes. Between these banks there are several channels, three being buoyed, namely, the South, West, and Coles channels; the others are narrow and intricate.

LIGHT.—The South channel pile lighthouse at the eastern end of the channel exhibits a *fixed* light showing red between the bearings

S. 84° W. through north to N. 42° E., and white between N. 42° E. and S. 22° E. ; between S. 22° E. and S. 76° W. the light is obscured, and it shows white between S. 76° W. and S. 84° W. ; it is elevated 27 feet above the level of high water, and in clear weather the white light should be seen from a distance of 10 miles, and the red light 8 miles.

TIDE SIGNALS.—The following tide signals are exhibited from the Pile lighthouse in the South channel, indicating the depth of water in the deepest or north side of the channel, in the vicinity of the lighthouse :—

From SUNRISE to SUNSET.

				Ft.	Ins.
One blue flag	-	-	-	25	0
One ball	-	-	-	25	6
One ball with blue flag over	-	-	-	26	0
One ball with blue flag under	-	-	-	26	6
Two balls	-	-	-	27	0
Two balls with red flag under	-	-	-	27	6
Two balls with red flag over	-	-	-	28	0
Two balls with red flag between	-	-	-	28	6
One red flag	-	-	-	29	0

From SUNSET to SUNRISE.

				Ft.	Ins.
One green light	-	-	-	25	0
One white light	-	-	-	25	6
One white light with green light over	-	-	-	26	0
One white light with green light under	-	-	-	26	6
Two white lights	-	-	-	27	0
Two white lights with red light under	-	-	-	27	6
Two white lights with red light over	-	-	-	28	0
Two white lights with red light between	-	-	-	28	6
One red light	-	-	-	29	0

The tide gauge at the Pile lighthouse shows 28 feet at low water springs.

SOUTH CHANNEL.—The South, or great ship channel, is bounded to the southward by the north edge of the three banks last described, along which are placed four red numbered conical buoys, and the pile lighthouse at the east end of the spit ; two gas buoys marking the dredged channel. The channel is bounded on the north

side by the southern edge of Great sand and Middle ground, defined by seven numbered black can and one black gas buoys.

Buoys.—North side of channel.—No. 1 black can buoy with staff and cage is placed at the west end of Great sand; from it Shortland bluff high lighthouse bears W. by N. $\frac{1}{4}$ N. and South Red bluff N. $\frac{3}{4}$ W.

No. 3 black can buoy on the south edge of Great sand bears E. by S. $\frac{1}{2}$ S. distant $1\frac{3}{10}$ miles from No. 1 buoy.

No. 5 black can buoy on the south edge of Middle ground bears E. $\frac{3}{4}$ S. distant $2\frac{3}{10}$ miles from No. 3 buoy.

No. 7 black can buoy on the south edge of Middle ground bears E. $\frac{1}{2}$ S. distant $1\frac{3}{10}$ miles nearly from No. 5 buoy.

No. 9 black can buoy on the south edge of Middle ground bears E. by S. $\frac{1}{4}$ S. distant one mile nearly from No. 7 buoy.

No. 11 black can buoy on the south edge of Middle ground bears N.E. by E. $\frac{1}{2}$ E. distant $3\frac{1}{2}$ cables from the pile lighthouse.

No. 13 black can buoy on the south edge of Middle ground bears E. $\frac{1}{4}$ N. distant 9 cables from No. 11 buoy.

No. 15 black gas buoy at the east end of Middle ground bears E. by N. $\frac{1}{4}$ N. distant one mile from No. 13 buoy. This buoy exhibits a white *occulting* light, showing 8 flashes *every minute*.

Buoys.—South side of channel.—The western spit of the South sand is marked by No. 2 red conical buoy bearing N. by W. $\frac{1}{2}$ W., distant 8 cables from point King; and between them a light, having 6 to 3 fathoms, trends one mile eastward into the bank; from No. 2 red buoy the north edge of the bank extends East $1\frac{3}{4}$ miles to No. 4 red conical buoy, and thence E. $\frac{1}{4}$ S. $1\frac{1}{4}$ miles to No. 6 red conical buoy, moored close to the north-east extreme of the bank from which its eastern edge sweeps round in a S.E. by S. direction $1\frac{3}{4}$ miles to about N. by W. three-quarters of a mile from White cliff.

Two other banks extend together, 2 miles eastward from the large one, from which they are separated by a narrow channel one mile long, with $3\frac{1}{4}$ to 7 fathoms in it. These two banks are nearly divided by a narrow inlet three-quarters of a mile long, running in a south-east direction with 5 to 3 fathoms water. The northern edge of the eastern bank is marked by No. 8 red conical buoy, bearing nearly E. $\frac{1}{2}$ S. distant $1\frac{1}{2}$ miles from No. 6 red buoy. From the eastern bank a spit, with $3\frac{1}{4}$ fathoms on it, projects E. by N. rather less than half a mile

to the pile lighthouse, which bears E. $\frac{1}{4}$ S., distant one mile from No. 8 red buoy.

South channel* is one mile wide at its western entrance, between No. 2 red buoy and No. 3 black buoy, and half a mile wide abreast of No. 6 red buoy; but only a quarter of a mile wide at its eastern entrance, between the pile lighthouse and No. 11 black buoy. The soundings in the channel are very irregular, varying from 10 fathoms in the middle of the western entrance to 20 fathoms at $1\frac{1}{2}$ miles farther eastward; thence the depth varies from 11 to 16 fathoms between No. 4 red and No. 5 black buoys, gradually decreasing eastward to 23 and 26 feet north of the pile lighthouse. Between Nos. 9 and 11 black buoys and in alignment therewith, the channel has been dredged for a width of 400 feet extending southerly from the north edge of the channel. The southern half of this dredged channel has a navigable depth of 28 feet at low water springs; the northern half of 26 feet. The deepening of the northern side is in progress (June 1896). The south edge of the western end of the dredged channel is marked by a gas buoy showing a *fixed* white light at 10 feet above the sea and visible 5 miles in clear weather; and the south edge of the eastern end of the dredged channel is marked by a gas buoy showing a *fixed* green light at 10 feet above the sea and visible 3 miles in clear weather.

The in-going stream sets through South channel at a rate of one to $1\frac{1}{4}$ knots, and the out-going three-quarters of a knot to 2 knots.

Middle ground.—The south edge of this bank extends nearly $5\frac{1}{2}$ miles from No. 15 to No. 5 black buoys, and from the latter buoy the north-west edge of the bank, which forms the south-east side of Pinnacle channel, takes a general north-east direction $2\frac{1}{2}$ miles, and thence the north-east edge curves nearly $4\frac{3}{4}$ miles south-east to No. 15 black buoy, where the bank terminates in a narrow point.

Between Nos. 7 and 9 black buoys an inlet, having from $3\frac{1}{4}$ to $4\frac{1}{2}$ fathoms, trends one mile in a N.E. by E. direction, nearly dividing Middle ground into two banks. The general depth of water on Middle ground varies from 9 to 12 feet; but there are several ridges and knolls on it with only one and 3 feet water over them.

See charts, Nos. 2,747a and b.

* Dredging operations are in progress (1896) in the South channel, near the Pile lighthouse. During their continuance, two small red buoys are moored near No. 11 black buoy. The dredger will show the following signals on the side which vessels should pass;—by day, a basket ball; at night, three red lights vertical. The dredger must be passed at the slowest speed, and the engines stopped while passing over her cables.

Fort.—South channel fort is on the Middle ground about midway between Nos. 5 and 7 buoys. In connection with defence works, seven pile beacons are set up in the Middle ground, commencing at one cable North of No. 5 buoy and extending to one cable East of the fort.

Pinnacle channel, which is only suitable for vessels of light draught, is merely an inlet from the north-east, between Middle ground and Great sand, extending S.W. by S. $2\frac{1}{2}$ miles, nearly to No. 5 black buoy, where the entrance to the channel in that direction is over a 12-foot ridge which connects Middle ground with Great sand. The channel is half a mile to a quarter of a mile wide, having 3 to 4 fathoms, in it.

Great sand.—From near No. 5 black buoy the east 3-fathoms edge of Great sand sweeps round N.N.E., North, and N.N.W. 5 miles to a narrow spit, forming the north-east point of the sand and the south-west point of the north-east entrance into Symonds channel. The south 3-fathoms edge of Great sand extends from No. 5 black buoy nearly W. by N. $\frac{1}{4}$ N. $3\frac{1}{4}$ miles to the south-west point, $1\frac{1}{2}$ cables off which lies No. 1 black buoy. From the south-west point of Great sand its north-west 3-fathoms edge, which forms the south-east side of Symonds channel, trends N.E. by N. 5 miles, and thence E. by N. three-quarters of a mile to the north-east point of the sand.

The main body of Great sand forms a flat $4\frac{1}{2}$ miles long, N E. by N. and S.W. by S., and extends from its north-west 3-fathoms edge $2\frac{1}{4}$ miles across towards Pinnacle channel. The depth of water on this flat is very uniform, rarely being more than 5 feet, nor less than one foot.

Mud islands, which are three in number, and on the centre of Great sand, are low and wooded, and are situated on a bank about one mile across, enclosing a small lagoon, having about 6 inches water in it. There is a narrow hollow one mile long, N.E. and S.W., with 8 to 20 feet water, close to the north-west side of the isles, and there are several knolls on the flat to the northward and southward of them.

Popes Eye shoal, which forms the north-west side of the south-west entrance of Symonds channel, is a bank of sand one mile long, N.E. by E. and S.W. by W., and about 2 cables broad, with 3 to 5 feet

water on its shoalest part, which rises to a ridge 4 cables long, its centre bearing S. $\frac{3}{4}$ E. distant one mile from Swan-spit gas buoy. A detached narrow ridge trending N.N.E. and S.S.W. 2 cables, with 17 feet water on it, has formed at half a cable off the south-west point of Popes Eye shoal.

Buoy.—The south-west extreme of the shallow water extending from Popes Eye shoal is marked by a red and white buoy, moored in about 5 fathoms, and 3 cables to the south-west of the 3-fathoms edge, with the high lighthouse on Shortland bluff bearing W.N.W. distant $1\frac{1}{2}$ miles.

Popes Eye fort is situated on the south-west part of the shallow water of the shoal. In the vicinity of the fort and at a distance of about 2 cables from it, two beacons and four buoys have been placed in connection with defence operations and they should be avoided by passing vessels.

West Middle sand extends from Popes Eye shoal about $5\frac{1}{2}$ miles in a north-east direction, between Symonds and Lœlia channels. The south-east 3-fathoms edge of the sand, which forms the north-west side of Symonds channel, trends from the south-west end of Popes Eye shoal, N.E. $\frac{1}{2}$ E. $1\frac{3}{4}$ miles, and N.N.E. 2 miles, whence it takes a N.E. by E. direction 2 miles, and after a turn of a quarter of a mile to the southward, the edge of the sand extends one mile eastward to its east point, on which is a bank with 5 and 6 feet water over it, its east point being marked by a beacon, from which the high lighthouse on Shortland bluff bears nearly S.W. by W. $\frac{1}{4}$ W., and Arthur's seat S.E. $\frac{1}{2}$ E. At about half a mile west of the beacon a spit, with 16 feet water on it, projects south-westward one-third of a mile from West Middle sand into the entrance of Symonds channel.

The north-west 3-fathoms edge of West Middle sand, which forms the south-east side of Lœlia channel, from the south-west end of Popes Eye shoal, trends irregularly about N.E. by N. $2\frac{1}{2}$ miles, where it forms a spit, between which and the sand to the eastward of it, an inlet, one quarter of a mile wide at its entrance, and having 4 fathoms water, runs in S. by W. three-quarters of a mile. From the bight of this inlet the north-west edge of West Middle sand extends N.N.E. 3 miles, when, after trending E. by N. half a mile, the edge of the bank resumes its N.N.E. direction one mile to its north point.

From the north point the east point bears S.E. by E. $\frac{1}{2}$ E., distant a little more than 2 miles, and between them an inlet, having $2\frac{1}{4}$ to $4\frac{1}{2}$ fathoms, trends $2\frac{1}{2}$ miles south-westward, nearly dividing the north-east portion of the sand into two separate banks. The south-east of these banks rises to a narrow ridge, with only one to 3 feet water on it, extending from half a mile W.N.W. to nearly $2\frac{1}{2}$ miles W.S.W. from the beacon on the east point of the sand. There are two ridges, with 2 to 6 feet water over them, on the north-western of the banks; and there is another ridge about one mile long, with one to 6 feet water over it, on the middle of West Middle sand, at one mile to the south-west of which there is a bank with 3 to 5 feet water over it.

SYMONDS CHANNEL is one mile wide at its south-west entrance, between No. 1 South channel black buoy and Popes Eye buoy, whence the channel extends 6 miles in a north-easterly direction, and is two-thirds of a mile to one mile wide, until within $1\frac{1}{2}$ miles of the east point beacon, where detached banks, with 16 and 17 feet water on them, so encumber the channel, that at half a mile S.W. of the beacon there is only a width of about $1\frac{1}{2}$ cables, with 17 feet water.

There is a knoll with 16 feet water on it, on the south-east side of Symonds channel, at nearly $1\frac{1}{2}$ miles from No. 1 South channel buoy, and another, having 17 feet water on it, nearly in mid-channel at about 2 miles S.W. of the beacon; but, with these exceptions, there are generally 9 to 5 fathoms from the south-west entrance to within $1\frac{1}{2}$ miles of the beacon.

Symonds channel may be made available in northerly or north-west winds, when unable to fetch through West channel; but it is only recommended for small vessels, not being buoyed.

Royal George sand, which forms the south-east side of the entrance of West channel, and lies midway between Popes Eye shoal and the bank extending from Shortland bluff to Swan-spit gas buoy, is nearly half a mile long, east and west, with 12 feet least water on it.

The west end of the shoal is marked by No. 2 West channel buoy, a red gas buoy, moored in 19 feet water; from it Shortland high lighthouse bears W. by S. $\frac{1}{2}$ S., Swan beacon N. $\frac{1}{2}$ W. and No. 1 black West channel buoy N.N.W. distant 3 cables. No. 2 buoy

shows a white *occulting* light, which is occulted 6 to 8 times every minute.

The east end of the shoal is marked by a red conical buoy in 21 feet and bears E. $\frac{3}{4}$ N. nearly 6 cables from the buoy on the west end.

The south-west entrance of West channel, between Royal George sand and the bank to the north-west of it, is 3 cables wide, with 22 to 33 feet water. The channel between the east end of Royal George sand and the south-west spit of West Middle sand, is about the same width as the south-western entrance of West channel, with 22 and 24 feet water in it.

William sand, which forms the north-west side of Lœlia channel and the south-east side of West channel, is 4 miles long S.W. by S. and N.E. by N., and a quarter of a mile to half a mile broad within its 3-fathoms edges, its south-west extreme bearing N.E. by E. $\frac{1}{4}$ E. 4 cables from the Swan-spit gas buoy. From a quarter of a mile within its south-west extreme to about three-quarters of a mile within its north-east spit, William sand rises to a narrow ridge, with one to 7 feet water over it.

Lœlia channel extends from the south-west part of West channel 4 miles in a north-easterly direction, between West Middle sand and William sand; its south-west entrance is half a cable wide, with $3\frac{1}{4}$ fathoms water; but thence the channel increases to 3 and 4 cables in width, with $3\frac{1}{2}$ to 5 fathoms, until within one-third of a mile of its north-east entrance, which is only one cable wide, with 3 fathoms water.

WEST CHANNEL, which is the one most used, extends from Royal George sand 5 miles in a N.N.E. direction, and is from one cable to half a mile wide, with 30 to 19 feet water, over a bottom of sand and shells. This channel is distinguished by No. 2, Royal George and Swan-spit gas buoys, in the south-west, and by West channel pile lighthouse, in the north-east entrance, the sides being marked by red conical buoys and one gas buoy, with even numbers on the south-eastern side, and black can buoys, with odd numbers, on the north-western side.

North of the east end of Royal George shoal, and at distances of nearly 2 and 4 cables from it, are two small patches of 19 and 17 feet water respectively.

The south-east side of West channel, after passing Royal George sand, is formed by the south-west part of West Middle sand and the north-west edge of William sand.

No. 4 red conical buoy is moored in 21 feet, nearly one cable to the northward of the south-west spit of West Middle sand, and S. $\frac{1}{2}$ E. 6 cables from Swan-spit gas buoy. No. 6 red conical buoy marks the shoal formed on the south-west spit of William sand, and bears N.N.E. $\frac{3}{4}$ E., distant nearly half a mile from Swan-spit gas buoy.

No. 8 red conical buoy bears N.N.E. $\frac{3}{8}$ E. nearly one mile from No. 6. No. 10 red conical buoy is withdrawn. No. 12 red gas buoy (the Elbow buoy) bears N. $\frac{5}{8}$ E. 9 cables from No. 8; it shows a *fixed* white light at 10 feet above the sea and visible 5 miles in clear weather.

Shoals with 17 and 18 feet water extend from about 4 cables S.S.W. of No. 12 buoy, about $2\frac{1}{2}$ cables westward and north-westward.

No. 14 buoy, also on the north-western 3-fathoms edge, and No. 16 on the north-east end of William sand, lie respectively N.E. $\frac{3}{4}$ N. $1\frac{1}{10}$ miles, and N.E. $2\frac{1}{10}$ miles from No. 12 buoy.

West channel is bounded on the north-west side by the bank which extends from Swan island, marked by No. 1 black buoy and Swan-spit black gas buoy (*see* page 436); and thence by the irregular 3-fathoms edge of shoals extending $4\frac{1}{2}$ miles in a N.N.E. direction.

Between Swan-spit gas buoy and No. 3 black can buoy, which lies about N. by E. $\frac{1}{4}$ E. $1\frac{1}{4}$ miles from it, is the entrance into Coles channel.

A black can buoy marks a recently formed shoal with 10 feet water on it, bearing North, three-quarters of a mile from the Swan-spit gas buoy.

No. 3 black can buoy is situated a cable within the 3-fathoms edge of the shoal, and at 3 cables to the southward of it a spit with 16 to 18 feet water on it projects a cable into the fairway of the channel. N.E. $\frac{1}{2}$ N. 3 cables from No. 3 buoy is the end of a spit, part of an irregularly shaped shoal with 16 to 18 feet water on it, lying to the northward of the buoy. From the spit it trends N.W. nearly half a mile and then its west edge forms with the south end of West sand a narrow inlet. From the south end of this inlet the 3-fathoms edge of the West sand trends N.N.E. one mile to No. 5 black can buoy.

From No. 5 buoy the 3-fathoms edge of the shoal extends N.E. by N $1\frac{1}{3}$ miles to No. 7 black can buoy, and then N.E. $\frac{1}{4}$ N. 8 cables to the pile lighthouse near the north-east end of the shoals, and on the north-west side of the north entrance of West channel.

The water shoals suddenly towards the north-west and south-east sides, throughout the greater part of the channel.

LIGHT.—A lighthouse erected on piles in 15 feet water, on the north-east side of West sand, West channel, exhibits a *fixed* light showing white between the bearings of N. 34° E. (through west) and S. 14° E., and red in all other directions. The light is elevated 31 feet above high water, and should be visible in clear weather from a distance of 11 miles.

Fog signal.—During thick or foggy weather, a gong and a fog horn are sounded alternately *every five minutes*, at the lighthouse.

Note.—The red light extends from the direction of No. 5 buoy of the West channel to the Prince George black gas buoy.

Vessels should pass a cable eastward of the lighthouse.

There are banks with 16 to 18 feet water over them from about 2 to 5 cables to the southward of the lighthouse.

West bank.—The bank which forms the western side of West channel rises to several narrow ridges, with one to 5 feet water over them. West sand, the longest of these ridges, from nearly half a mile N.W. of No. 3 black buoy, extends N. $\frac{3}{4}$ E. 2 miles, and is from 100 to 400 yards broad, with a narrow spit returning three-quarters of a mile in a S. by E. direction from the north end of the sand, and again bending to the N.N.E. for a mile. A narrow sand, half a mile long, nearly N.E. and S.W., lies between West sand and the north-east extreme of the bank on which this ridge is situated; the south-east edge of this ridge is about 100 yards within No. 7 black buoy.

From the north end of West sand the bank, with 8 to 17 feet water over it, extends N. $\frac{1}{2}$ E. one mile, to a sand-head, between which and that marked by West channel lighthouse, a bight one-third of a mile wide, with 4 to $3\frac{1}{4}$ fathoms water, trends one-third of a mile S.W. into the bank.

Clearing mark.—Station peak, 1,132 feet high, on the north-west side of port Phillip, open of the high land of point George, bearing nearly N.W. by W. $\frac{1}{4}$ W. (N. 59° W.), leads clear of the north-east extremes of all the entrance banks, at a distance of a mile from the nearest.

Coles channel, between West channel and the western shore of port Phillip, is a 2-fathoms passage used by small vessels acquainted with the locality. It is bounded on the east side by West bank which forms the western side of West channel; the shoalest parts of the bank being West sand. This side of the channel is marked by three red conical buoys, the south buoy in 18 feet water, on the south-west edge of West sand and bearing N. $\frac{3}{4}$ W. one and a quarter miles from the Swan-spit gas buoy; the middle buoy in 20 feet water, on the west edge of West sand bears N. $\frac{1}{4}$ W. $2\frac{7}{10}$ miles from the Swan-spit gas buoy; and the north buoy, in 18 feet water, is on the north-west edge of the sand with South Red bluff beacon W. $\frac{3}{4}$ S. half a mile.

The west side of Coles channel is formed by the shoal extending northward from the east end of Swan island and along the western shore, noticed at page 437. South Red bluff is marked by a white beacon and there is also a white beacon on the coast $1\frac{7}{10}$ miles to the southward of it. The channel is a quarter of a mile to half a mile wide, with $2\frac{1}{2}$ to $3\frac{1}{2}$ fathoms in its north and south entrances, but only 2 fathoms in its central and widest part; the water shoals suddenly towards West sand, but gradually towards the shore.

The EASTERN SHORE.—Arthur's seat, E. by S. nearly 14 miles from Shortland bluff, is so called from its resemblance to the hill of that name near Edinburgh; it is a conspicuous bluff 975 feet high, sloping down to the south-east, and is visible nearly 40 miles at sea. From the southward its north-west extreme appears precipitous, and being the highest land on the coast, is a remarkable object by which to distinguish the entrance to port Phillip.

LIGHT.—The Eastern lighthouse, built of iron, painted white, immediately under Arthur's seat, exhibits, at 100 feet above high water, a *fixed* light, showing red between the bearings S. 17° W. and S. 48° E.; and white between S. 48° E. and N. 73° E.; in clear weather the light should be seen from a distance of 13 miles.

Water.—The land between Arthur's seat and Martha point is low, with good spring-water near the shore, north of Arthur's seat.

Dromana bay.—From the foot of Arthur's seat the coast curves N.E., North, and N.W. 4 miles to Martha point; the north-eastern part of this bight forms Dromana bay, where there are 3 fathoms water a quarter of a mile from the shore.

Dromana is a small town, with a population of 272 persons in 1891. There is a telegraph office here, and daily communication by coach and steam-vessel with Melbourne. The jetty is 1,400 feet long.

Light.—A *fixed* red light visible from a distance of 4 miles is exhibited from Dromana jetty end.

The shore, from Martha point, may be approached to a quarter of a mile in 3 fathoms, and trends nearly N.N.E. 2 miles to Martha cliff, which forms the south-west point of Balcolms bay. The land between the point and cliff rises to a ridge, of which the south-west and highest part is mount Martha, a hill 527 feet high, bearing N.N.E. $\frac{1}{2}$ E., distant $4\frac{1}{4}$ miles from Arthur's seat.

Balcolms bay extends from Martha cliff N. by E. $\frac{1}{4}$ E. nearly 3 miles to Fisherman point, and is two-thirds of a mile deep; except within half a mile of Martha cliff the shore may be approached to a quarter of a mile in 3 fathoms, but there are some rocks close along shore, of which Shag rock lies $1\frac{3}{4}$ miles N.E. of Martha cliff; at three-quarters of a mile north-eastward of the cliff is Balcolms creek.

Fishermans bay and Mornington.—Fishermans bay, which is the water frontage of Mornington, is merely a slight indentation of the coast extending from Fisherman point N. by E. nearly one mile to Snapper point. Shoals project a quarter of a mile from the southern quarter of the bay, but the shore north of these shoals may be approached to a cable in 3 fathoms.

The population of Mornington was 909 in 1891. There is railway and telegraph communication.

Snapper point projects a quarter of a mile from the coast, and has a small jetty for the convenience of coasters.

LIGHTS.—On Snapper point, a *fixed* white light is exhibited at an elevation of 50 feet above the level of the sea, and is visible at a distance of 10 miles. The lighthouse is built of wood and painted white.

At the end of the jetty is a mast with a lamp 30 feet high, showing a *fixed* red light visible at a distance of 3 miles.

Mount Eliza.—From Snapper point the coast trends N.E. by N. 4 miles to Davy point; it is slightly embayed, and is intersected by four small creeks flowing north-westward from the hills at the back; the most conspicuous of these hills is mount Eliza, 527 feet high, which bears N.N.E. $\frac{3}{4}$ E., distant $11\frac{1}{4}$ miles from Arthur's seat. This coast may be approached to a quarter of a mile in 3 fathoms; but it is rocky for about $1\frac{1}{2}$ miles southward from Davy point.

The coast from Davy point, after receding nearly half a mile to the eastward, extends N.E. $\frac{1}{2}$ N. $1\frac{1}{2}$ miles to the village of Frankston. The country behind is hilly, and is intersected by two or three small creeks.

The south-eastern shore of port Phillip, which is mostly wooded, has several townships, and numerous houses and other buildings are scattered along it.

Between Davy point and Frankston a shoal, with 3 to 17 feet water on it, extends one-third of a mile from the shore; and at a little more than half a mile N. by E. from the point a spit projects north-westward a quarter of a mile further from the shoal to a rock with only $4\frac{1}{2}$ feet water on it.

Frankston, a township 27 miles to the south of Melbourne, has a jetty extending a quarter of a mile into the bay, and is the centre of a large fishing and firewood trade. The population in the township numbered 794 in 1891, but the chief part is scattered in the suburbs. It is connected with Melbourne by rail, and there is a telegraph station. A *fixed* green light, visible 3 miles, is shown from the end of the jetty.

Garrum swamp.—From Frankston a low uniform coast curves in a N. by W. $\frac{3}{4}$ W. direction $8\frac{1}{2}$ miles to the point of Mordialloc, and is separated by a narrow piece of wooded land from Garrum swamp. The coast from Frankston nearly to the point of Mordialloc may be approached to the distance of 3 cables in 3 fathoms; but a ledge of rocks projects a quarter of a mile south from the point.

From Mordialloc to Ricket point, W. by N. $2\frac{3}{4}$ miles from it, the coast forms a bay $2\frac{1}{2}$ miles across and three-quarters of a mile deep. From 4 and $4\frac{1}{2}$ fathoms in the entrance of this bay the water shoals to 3 fathoms at a quarter of a mile from the shore. Three patches, on the central and smallest of which there are only 6 feet water, and on the others 12 and 15 feet, lie W. by N. two-thirds of a mile, one mile, and $1\frac{1}{2}$ miles from the eastern point of the bay.

Mordialloc is a township on the river Plenty, $15\frac{1}{2}$ miles from Melbourne, with a population in 1891 of 263 persons. There is a jetty which affords facilities for landing, and steamers ply to Melbourne, with which place there is also communication by rail and telegraph.

Light.—A *fixed* red light, visible 3 miles, is shown from a post at the end of Mordialloc jetty.

Mentone is about $1\frac{1}{2}$ miles north-west of Mordialloc. There is a jetty and communication by railway and telegraph. The population was 1,076 in 1891.

Light.—A *fixed* green light, visible about 3 miles, is exhibited from a lamp post at the end of Mentone jetty.

Ricket point.—From between Ricket point and the western point of the bay, just noticed, foul ground and shoal water to 3 fathoms project south for half a mile.

Picnic point.—From Ricket point a mostly rocky coast extends N.W. $\frac{3}{4}$ N. $3\frac{1}{4}$ miles to Picnic point. There are two intermediate projections, one at a mile and the other at nearly 2 miles from Ricket point. Close to the southward of the former projection is Quiet Corner; and between the latter and Red cliff, one-third of a mile to the northward of it, is Half-moon bay. The coast between Ricket and Picnic points is bordered by foul ground and sunken patches, some with only 4 and 5 feet water on them, extending off nearly half a mile. A spit projects south-westward from Picnic point to 3 fathoms at half a mile off.

Buoy.—A nun buoy, painted red, is placed in 18 feet water off Black rock and marks the outer limit of the foul ground between the buoy and shore.

From Picnic point to Green point, N.N.W. $\frac{3}{4}$ W. $1\frac{1}{3}$ miles from it, the coast forms a slight indentation, bordered by a shoal, of which the 3-fathoms edge extends from half a mile off Picnic point to 400 yards close to the southward of Green point.

Anonyma shoal is a rocky patch one-third of a mile long, N.W. and S.E., and 300 yards broad, with one foot water on its shoalest part; there are 4 fathoms at a cable from its outer edge, and $3\frac{1}{2}$ fathoms between it and a quarter of a mile off the beach.

Beacon and buoy.—There is a chequered beacon on this shoal, bearing S. by W. nearly three-quarters of a mile from Picnic point, and two-thirds of a mile from the shore; and there is also a red conical buoy on the north-west edge of the shoal.

Jetty.—From about a cable to the north-east of Picnic point, a jetty runs out about 800 yards to the north-westward.

A beacon, consisting of a mast with a red ball on it, 11 feet high, is placed in 7 feet at low water 240 yards N.W. by W. from the end of the jetty. A *fixed* green light is exhibited from a lamp post at the outer end of the jetty and should be visible in clear weather from a distance of 3 miles. Vessels going to and from the jetty should pass north of the beacon.

A rocky patch, with $3\frac{1}{2}$ fathoms water over it, lies nearly West $1\frac{1}{4}$ miles from Picnic point; there are 5 and $4\frac{1}{2}$ fathoms between this patch and the shore.

Green point.—Shoal water to 3 fathoms extends W.S.W. half a mile from the point.

About a cable to the south-east of Green point a jetty runs out 200 yards to the south-west.

From Green point the coast extends N. by W. $\frac{1}{4}$ W. $1\frac{1}{2}$ miles to point Cole, and thence curves in a N.N.W. $\frac{1}{4}$ W. direction $1\frac{1}{4}$ miles to point Ormond, the eastern point of Hobson bay. For about one mile north from Green point the coast is bordered with rocks, and from half a mile off the point, the 3-fathoms edge of the shoal water fronting the shore trends irregularly to one-third of a mile off point Cole and then about N.W. $\frac{1}{2}$ N. to three-quarters of a mile off point Ormond.

Brighton.—The southern and greater portion of the coast from about Green point to point Ormond forms the water frontage of the town of Brighton, a watering place, and a suburb of Melbourne, from which it is distant 8 miles. It is a favourite place of residence, abounds with handsome villas, and there is a long sandy beach. Market-gardening is the chief industry of the district. Trains run half-hourly to Melbourne, and there is communication by telegraph. The population in 1891 was 9,158.

Jetty.—From nearly a mile to the north of Green point a jetty runs out W.N.W. about 200 yards, and a *fixed* red light is exhibited from the end of it, which should be seen about 3 miles. A red conical buoy marks the outer patch of rocks opposite Park street, Brighton.

HOBSON BAY,* the port of Melbourne, consists of all inlets, rivers, bays, &c., within a line drawn from point Ormond, west to point Gellibrand, and is 2 miles deep; but the western portion only is available for shipping, nearly all the eastern half of the bay being occupied by a shallow bank.

From point Ormond the low shore of Hobson bay trends N. by W. $\frac{1}{2}$ W. a little more than a mile to a pier at the west point of the town of St. Kilda: the pier projects from the shore 600 yards into 11 feet water. The 6-foot edge of the shoal which borders the shore extends from a little more than a cable off point Ormond to about 400 yards within the outer end of the pier. For about one-third of a mile north of point Ormond there are numerous rocks scattered over the shoal.

In connection with the reclamation of Elwood swamp, 2 mooring buoys, painted red, are moored about half a mile off shore and with point Ormond bearing E.S.E., in 15 feet water.

The shore from about a quarter of a mile northward of St. Kilda pier extends in a straight line N.W. by W. $\frac{3}{4}$ W. 2 miles to Port Melbourne town pier. There are 9 feet water within a cable of the shore from St. Kilda to Port Melbourne piers.

The shore from the Melbourne and Hobson bay railway pier, which is nearly 3 cables to the west of Port Melbourne town pier, trends W. by S. $1\frac{1}{4}$ miles to the entrance of the Yarra river. The 6-foot edge of the shoal which borders the shore, extends from it 100 yards

* The rate of silt deposit in Hobson bay, as ascertained by careful observations of the Melbourne authorities, is at the rate of an inch per month. More is deposited in the harbour to the northward of Williamstown than to the southward.

See chart, No. 624, Hobson bay and river Yarra to Melbourne, scale $m = 6.0$ inches.

at the railway pier to 300 yards from the northern side of the entrance of the river.

St. Kilda, about $3\frac{1}{2}$ miles southward of Melbourne is a watering place, with an esplanade along the sea beach. Several tracts of water are fenced in for bathing purposes; the fencing is for protection against sharks. Trains and omnibuses constantly run to and from Melbourne. The population in 1891 was 19,838.

Light.—A *fixed* green light, elevated 19 feet above high water, and visible in clear weather from a distance of 2 miles, is exhibited from the outer end of St. Kilda pier.

Floating beacon.—The outer stake, a floating beacon, is placed with the south-west end of St. Kilda pier bearing N.E. $\frac{3}{4}$ E. 6 cables. This beacon marks the limits east of which fishing is prohibited near St. Kilda.

Port Melbourne town pier.—The pier projects from Port Melbourne, nearly S.W. by S. 720 yards, into 26 and 29 feet water. Three red buoys are moored in line along the south-east side, and two on the north-west side of the pier, from which the former are distant about 100 yards and the latter 170 yards.

On this pier are steam cranes to lift 50 tons, and hand cranes from 1 to 10 tons.

Railway pier.—At W. by N. $\frac{1}{2}$ N. 600 yards from Port Melbourne town pier, the Melbourne and Hobson bay railway pier extends from the shore S. by W. $\frac{1}{2}$ W. 730 yards, into 28 to 30 feet water.

Lights.—At the outer end of Port Melbourne town pier is a *fixed* red light, visible at the distance of 3 miles.

At the outer end of the railway pier is a *fixed* green light, visible at the distance of 3 miles.

A *fixed* red light is exhibited from the Torpedo depôt drill room, about 300 yards to the west of the inner end of the railway pier. This light in line with the green light at the end of the railway pier, bearing about N. $\frac{3}{4}$ W. (N. 8° W.) leads in the fairway of the channel to the piers.

Near the inner end of the railway pier on each side is a small *fixed* green light.

Beacons.—Westward of the Torpedo depôt are two beacons, one black, the other white, which in line about N. $\frac{3}{4}$ W. (N. 8° W.) mark the western side of the deep water channel to the piers. This line, a little southward of the red conical buoy, passes over depths of 23 to 25 feet for about 4 cables, which depths extend some distance into the channel.

Depth of water.—At the inner end of the town pier, the 3-fathoms edge of the bank extends off about 200 yards, increasing to 280 yards midway between the piers and decreasing to about 100 yards at the inner end of the railway pier.

On the east side of the town pier there are 27 to 29 feet at low water springs, on the west side 26 feet, and on the east side of the railway pier 28 and 30 feet, on the west side 27 and 28 feet. Vessels of large tonnage and heavy draught lie alongside the piers and are rapidly loaded or discharged, there being numerous steam cranes for that purpose.

Port Melbourne, formerly called Sandridge, is almost entirely dependent on shipping. Population 12,019.

The Melbourne and Hobson bay railway runs N.E. 2 miles from the pier to the locality of the Custom-house at Melbourne.

Soundings and buoys.—From about one mile West of point Ormond the 3-fathoms edge of the bank which fills the eastern half of Hobson bay extends N.W. $\frac{1}{2}$ W. $1\frac{1}{2}$ miles to its western elbow, marked by a gas buoy, in 28 feet water, which exhibits an *occulting* red light. N. $\frac{3}{4}$ W. $5\frac{1}{2}$ cables from this gas buoy, is a red conical buoy with staff and ball. A channel, with 28 feet at low water in it, and about 500 to 800 feet in width has been dredged to the westward of the line of these buoys and to the railway pier. This channel also leads to the town pier with a depth of 26 feet at low water.

From about a cable eastward of the red conical buoy the 3-fathoms edge of the bank trends N.E. by E. nearly 2 cables, and then takes a northerly direction towards about 200 yards from the inner end of the town pier.

The depth of water on this bank gradually decreases from 18 feet at its edge to 10 and 12 feet at a quarter of a mile from the shore, over an even bottom of sand and shells.

Between the red conical buoy and the town pier are several mooring buoys.

POINT GELLIBRAND.—From the southern extreme of point Gellibrand a low rocky shore trends N.E. nearly two-thirds of a mile to the east extreme of the point, on which stands the Time ball tower, and is bordered by ledges of rocks, with spits of foul ground, which, midway, extend a quarter of a mile from the shore towards the light-vessel. These spits are enclosed by a shoal bank, the 3-fathoms edge of which, from 2 cables S.E. of the south extreme of point Gellibrand trends E. by S. 2 cables, and N.E. by E. a quarter of a mile, to the south-east elbow of the bank, and from thence extends North two-thirds of a mile to 2 cables N.N.E. of the east extreme of point Gellibrand.

LIGHT.—Point Gellibrand light-vessel is moored in 5 fathoms water, S.S.E. one cable from the south-east elbow of the bank which projects from the point, with the south extreme of the point bearing W. by N. $\frac{1}{4}$ N., and the Time ball tower on the east extreme of the point, bearing N. by W. $\frac{1}{2}$ W. The vessel, which is circular, painted red, with a cylindrical iron tower, painted white, exhibits a *fixed* red dioptric light of the fourth order, elevated 38 feet above the sea, which is visible from the distance of 10 miles in clear weather.

Fog signal.—During thick and foggy weather, a horn and explosive rocket are sounded and fired alternately *every five minutes* from the light-vessel. The sound of an explosive rocket should be heard under favourable atmospheric conditions at a distance of 5 or 6 miles, but it may not be heard more than 2 miles, and it should be assumed when the explosion is heard, that the point Gellibrand light-vessel is not more than one to $1\frac{1}{2}$ miles distant.

WILLIAMSTOWN, on the south-west side of Hobson bay and 8 miles from Melbourne, had in 1891 a population of 15,960 persons; their business is principally with shipping. There is accommodation alongside the piers for vessels of various sizes; there is also provision for the repairs of vessels.

Breakwater pier.—From the east extreme of point Gellibrand the breakwater pier extends N.E. $\frac{1}{4}$ E. nearly 500 yards; there is a depth of 29 feet at low water at its outer end and of 25 to 19 feet for a length of 900 feet on its north-west side.

Light.—On the end of the breakwater pier a *fixed* white light is shown, which should be seen from a distance of 3 miles.

Railway pier.—From about 40 or 50 yards to the north-westward of the Time ball tower on the east extreme of point Gellibrand, the railway pier extends N. by E. $\frac{1}{2}$ E. about 600 yards, and has 28 feet water alongside it. Three red buoys (two are mooring buoys) are off the east side of the pier, from which they are distant about 80 yards; a narrow 3-fathoms shoal extends out nearly 400 yards midway between the breakwater and railway piers. There are two red mooring buoys on the west side of the pier.

West railway pier, 300 yards westward of the railway pier, is 500 feet long, with a depth of 30 feet at its outer end, and 13 to 22 feet alongside it. On this pier are 30-ton sheer legs.

Ann's wharf, $2\frac{1}{2}$ cables West of the railway pier, projects from the shore N. by E. about 500 feet into 22 feet water. From about 400 feet within the end of this wharf, the dockyard wharf extends to the inner part of the patent slip jetties, and encloses the dockyard reserve.

Light.—A *fixed* green light is shown from the end of Ann's wharf, visible 3 miles.

Gem pier.—From the inner patent slip, the shore continues westward a little more than one cable, to the Gem pier, which projects N. by E. 480 feet from the shore into 8 feet water.

Docks and Slips.—The Alfred graving dock, which was opened in 1874, is about 100 yards westward of the railway pier; its dimensions are:—Length over all 470 feet; available length on floor to side of caisson, 459 feet; breadth of entrance, 80 feet; depth over sill at high water, ordinary springs, 27 feet. With a long continuance of northerly and easterly winds the depth on the sill is not more than $25\frac{3}{4}$ feet at high water ordinary springs.* Immediately westward of the Alfred dock are the two entrance jetties of the Government patent slip, which has a cradle 200 feet long, and can receive vessels of 1,500 tons weight. Between Ann's wharf and Gem pier is Wright and Orr's patent slip for vessels of 400 tons register. There are also floating docks 210 and 154 feet long, with the breadth of

* In November 1887, H.M.S. *Nelson*, drawing 24 feet 10 inches, was floated in the dock with a view to undocking. The tide however failed, the depth on the dock sill at high water being 24 feet 1 inch. On the following day the depth on the sill was 24 feet 4 inches. The ship was undocked on the third day after a delay of 40 hours. It is intended to lengthen this dock 120 feet.

entrance 36 and 35 feet, capable of lifting ships of about 700 tons register, drawing 13 and 11 feet.

The Victorian Government has a complete set of workshops and factories in connection with the Alfred dock. For repairs *see* page 495.

Railways.—Within the railway pier is the terminus of the Melbourne and Williamstown railway which curves and forms nearly a semicircle to Melbourne, which is distant about 9 miles. From Geelong junction, about $2\frac{1}{2}$ miles from the Williamstown terminus, the Geelong and Ballarat railway branches to the westward.

The Western shore.—From about 150 yards West of Gem pier the shore trends nearly N.N.W. 5 cables ; it then curves to the N.W. and N.N.E. for a mile to a point near which are the directing walls of the river Yarra, and where is the Williamstown steam ferry. The water frontage of North Williamstown extends to the north-west about one mile from the Gem pier. About 3 cables N.N.W. of the Gem pier is the Stevedore pier, 550 feet long, with a depth of 7 feet at its outer end. There are also several boat jetties and sheds along this frontage.

From the east side of the Williamstown steam ferry, the shore trends eastward nearly $1\frac{1}{2}$ miles to Port Melbourne railway pier ; one and a half cables West of which some baths extend 300 feet into the sea, and close to the baths is a pier, 400 feet long, with a depth of 12 feet at its end. Nearly one mile West of Port Melbourne railway pier is the Prisoner's jetty, 700 feet long, with a depth of 12 feet at its end.

Banks.—Between Ann's wharf and Gem pier, the one-fathom line extends from 50 to 300 yards off shore ; from the Gem pier it trends to the northward (a small bight; with 13 to 7 feet water, running in to the Stevedore pier) nearly half a mile ; it then turns west towards the stone embankment on the south side of the river Yarra.

The north-western bight of Hobson bay is occupied by a bank extending nearly across it. The 3-fathoms edge of this bank from the end of Ann's wharf trends irregularly to about $1\frac{1}{2}$ cables north-eastward of the Williamstown railway pier ; it then extends N. by E.

and North nearly one mile, and from that curves inwards towards the inner end of the Port Melbourne railway pier. The entrance of the river Yarra has been dredged through this bank.

Buoys.—A gas buoy is placed in 21 feet at low water, with the end of Williamstown railway pier bearing S. $\frac{1}{2}$ E. nearly $2\frac{1}{2}$ cables. It exhibits an *occulting* white light.

A wreck green buoy lies in 18 feet water, with the end of Port Melbourne railway pier bearing E. $\frac{1}{4}$ N. $2\frac{1}{2}$ cables.

Compass adjusting buoys.—Five buoys for this purpose are moored in 16 feet at low water, about $5\frac{1}{2}$ cables to the westward of Port Melbourne railway pier, and may be used free on application to the Chief Harbour Master.

TIDES.—It is high water, full and change, in Hobson bay, at 2h. 31m. ; springs rise 2 ft. 8 in. ; neaps, 2 ft. 2 in. ; neaps range 1 ft. 10 in.

Anchorage.*—Between the banks which extend from the eastern and western shores of Hobson bay, there is a space of about 2 square miles, capable of affording shelter, in 3 to 5 fathoms water, with good holding ground of mud. The bay is open to southerly gales, which send in sufficient sea to interrupt traffic ; but small vessels can at all times find shelter off Williamstown.

The **Torpedo ground** lies south of Williamstown breakwater pier, between lines drawn from Gellibrand light-vessel to the outer end of that breakwater pier, and from the light-vessel to the Time ball tower. Mariners are cautioned not to anchor in the vicinity.

Danger buoys.—Red spar beacon buoys have been placed 2,000 yards off shore at Williamstown rifle ranges. Vessels are cautioned to keep outside these buoys.

YARRA RIVER is a narrow winding stream, rising about 65 miles to the eastward in the Dividing range ; from Hobson bay to Melbourne its length is about $5\frac{1}{2}$ miles. The entrance to the river in Hobson bay has been dredged for a distance of half a mile from the gas buoy ; thence to the Queen's bridge at Melbourne, the river is "walled," "piled," and dredged. There is not less than 19 feet water in the river at low water.

* Portions of the wreck of the *Cape Verde* still remaining in the mud at S. 36° E 3,900 feet from the Breakwater pier end, it is inadvisable to anchor in the vicinity. There is a depth of 51 feet over all parts of the wreck.—January 1896.

The channel at the gas buoy in the bay is about 1,000 feet in width ; it narrows to about 300 feet at the commencement of the retaining walls, and is between 150 and 300 feet wide to Melbourne. The distance between the retaining walls is from 300 to 350 feet.

The course of the river is to the N.W. for $1\frac{1}{4}$ miles from the entrance, then to the North for a mile, whence it curves to the N.E. and East to Melbourne.

At about 2 miles from the entrance is Stony creek, on the west side, and 2 cables further, on the east side, are timber jetties. Six cables from Stony creek the old course of the river turns to the North for three-quarters of a mile, where it is joined by the Saltwater river ; it then curves to the East and S.E. round Coode island ; the new channel curves to the eastward on the south side of the island. There is a depth of 12 feet at low water in the channel to Footscray.

Within about $1\frac{1}{2}$ miles from the Queen's bridge there are wharves on both sides of the river ; three-quarters of a mile from the bridge is a swinging basin, 550 feet across.

Ships have to lighten to 19 feet before proceeding to Melbourne, and the speed must not exceed 5 knots. Only masters exempt from pilotage for the port are permitted to navigate their vessels in the river without the services of a pilot.

Buoys.—The channel is marked by buoys, about a cable apart, as far as the Williamstown steam ferry. Proceeding inwards are black buoys, each alternate buoy being a gas buoy and exhibiting a light, to be left on the port hand, and red buoys, the outer being a gas buoy and exhibiting a light, to be left on the starboard hand.

Docks.—At Melbourne are two dry docks—Duke's dock, 480 feet in length over all, 50 feet breadth of entrance, and 16 feet depth over sill at high water springs ; this dock can be divided into two parts, respectively 300 and 180 feet in length ; and Wright and Orr's dock, 330 feet in length over all, 46 feet breadth of entrance, and 17 feet depth over sill at high water springs.

The West Melbourne wet dock has an area of about 90 acres.

For repairs *see* page 495.

TIDES.—It is high water, full and change, in Yarra river, at

Queen's Wharf, Melbourne, at 2h. 48m.; springs rise 2ft. 8in. The rate of the stream of Yarra river depends on the rains that have fallen; but it generally runs down.

The North-western shore of port Phillip, from the south extreme of point Gellibrand, extends irregularly, W. by N. $1\frac{1}{4}$ miles, to a low rocky point, and thence N.W. $\frac{1}{2}$ W. two-thirds of a mile to the entrance of Kororoit creek, which trends to the westward. The 3-fathoms edge of the foul rocky ground which borders the shore projects 600 yards except about midway between the two points, where there are 3 fathoms at 300 yards from the shore. A small rocky patch, at the extremity of a spit projecting 400 yards from the shore, lies E. by S. $\frac{1}{2}$ S. $4\frac{1}{2}$ cables from the low rocky point.

From Kororoit creek the shore trends S.W. by W. $1\frac{2}{3}$ miles to the point of Altona, and is also bordered by a rocky bank, extending $1\frac{1}{4}$ miles south-eastward off Altona point, with 7 to 18 feet water and shoal patches upon it. From the south point of this bank the south extreme of point Gellibrand bears N.E. by E. $\frac{1}{2}$ E. distant 2 miles. Two bights, having $3\frac{1}{2}$ and $3\frac{1}{4}$ fathoms water, run half a mile into this bank from the south-eastward. The north-eastern bight, which is close to the low rocky point before noticed, approaches the mouth of Kororoit creek to one-third of a mile, with 3 fathoms water.

Beacon.—On the outer shoal patch in Altona bay is a black beacon, consisting of a mast and ball, 10 feet above low water.

Jetty.—From Altona a jetty projects about 380 yards to the southward; there is a depth of 10 feet at its outer end at low water.

Buoy.—A black buoy is moored $2\frac{1}{2}$ cables to the south-east of the end of Altona jetty.

From the point of Altona a low shore, with several small lagoons close behind it, forms a shoal bay, barely one mile deep, extending S.S.W. 4 miles to point Cook. At midway between the two points is the mouth of Skeleton creek, which winds through the low swampy ground to the north-westward. The 3-fathoms edge of the shoal, which fills this bay, extends beyond the line of the two points, and forms, midway, a spit projecting southward to N.E. $\frac{1}{2}$ N. $1\frac{3}{4}$ miles from point Cook.

Point Cook is low and rocky, with a spit, extending one mile to

the eastward, having 10 feet water at its extremity, at half-way between which and the shore there is a rocky patch with 3 and 4 feet water on it.

Buoy.—A black buoy is moored in $4\frac{3}{4}$ fathoms water, at a quarter of a mile off the spit, with point Cook bearing West, distant $1\frac{1}{4}$ miles.

A dynamite hulk is moored in 20 feet water with the buoy bearing S. by E. $\frac{1}{2}$ E. about 7 cables distant.

From point Cook a continuation of the low north-western shore of port Phillip trends S.W. $\frac{1}{4}$ W., 6 miles to Werribee river. At 2 miles S.W. of point Cook there is a low projection, whence rocky shoals, with 3 and 4 feet water on them, project half a mile. The 3-fathoms edge of the shoal water, which borders the shore, extends from one-third of a mile off point Cook to about the same distance off the rocky shoals just mentioned. Thence to Werribee river the 3-fathoms edge of the shoal water generally extends a little more than a mile from the shore; and from the mouth of the river, a spit, with 16 feet water on its extremity, projects $1\frac{1}{2}$ miles to the south-east.

Werribee river has a 3-foot bar across its entrance, within which the first reach trends westward about one mile. It is about one cable wide, with one to 2 fathoms water. Above this reach the river is merely a small stream, flowing in a winding direction from the north-north-west.

The Western arm of port Phillip forms the approach to Geelong.

The Southern shore of the Western arm, after a slight curve for a little more than three-quarters of a mile in a N.W. by W. direction from point George, extends W. by N. $1\frac{1}{2}$ miles, and thence, with a slight bend to the southward, nearly West $1\frac{3}{8}$ miles to point Richards. From about the middle of this bend, a mile East from point Richards, Portarlington jetty projects from the shore to the edge of the one-fathom line.

Portarlington is a small township 63 miles in a south-westerly direction from Melbourne by land, and 23 miles across the bay. It is a watering place, and there is telegraphic communication. The population in 1891 was 852. The district is an agricultural one.

Light.—A *fixed* green light is exhibited from a white wooden framework erection on Portarlington jetty, at an elevation of 22 feet

above high water, visible from any direction seaward, for a distance of 5 miles in clear weather.

For the first 2 miles from point George, shoal spits and detached patches, with 2 to 6 feet water on them project upwards of one-third of a mile to a quarter of a mile from the shore. From one mile N.W. of point George to half a mile East of point Richards the 3-fathoms edge of a continuation of Prince George bank extends one-third of a mile to a quarter of a mile from the shore ; but from point Richards it projects N.W. by N. half a mile to a spit with 10 feet water on it.

Point Richards gas buoy.—A quarter of a mile to the northward of the spit is a black gas buoy, moored in $4\frac{1}{2}$ fathoms, with point Richards, bearing S.S.E., distant three-quarters of a mile. This buoy exhibits an *occulting* red light, which is occulted from 6 to 8 times every minute, and is visible from a distance of 6 miles in clear weather.

From point Richards the shore trends S.W. $4\frac{3}{4}$ miles to Drysdale jetty, which projects about 400 yards from the land.

Drysdale had a population of 340 in 1891. There is communication by railway and telegraph.

Light.—From the end of Drysdale jetty, a *fixed* white light is exhibited, which should be seen in clear weather from a distance of 5 miles.

For the first $1\frac{1}{2}$ miles south-westward of point Richards, a bank, with 3 to 4 feet water on it, extends nearly two-thirds of a mile from shore. From the outer edge of this bank, close to which there are 3 and 4 fathoms water, the 3-fathoms edge of the shoal water bordering the shore trends south-westward to half a mile off Drysdale jetty. Three or four detached patches, with 3 to 6 feet water on them, lie between $1\frac{1}{2}$ and $2\frac{1}{4}$ miles S.W. of point Richards. There are only 6 feet water at about one cable off the jetty, and between half a mile and $1\frac{3}{4}$ miles to the north-east of it, spits, with 3 to $4\frac{1}{2}$ feet water on them, project about one-third of a mile from the shore.

The shore from Drysdale jetty trends W. by S. $\frac{1}{2}$ S. $2\frac{1}{2}$ miles to a slight projection of the land forming the south point of the south entrance of the channel to Geelong outer harbour ; some rocks lie

close to the shore on either side of the projection, and between one and two-thirds of a mile to the westward of it. The 3-fathoms edge of the shoal water fronting the shore extends from half a mile off Drysdale jetty to 800 yards off the south entrance of the channel.

The South entrance of the channel into Geelong outer harbour lies between the slight projection of the land on the south side and Wilson spit, the extremity of a bank extending from the north shore with less than 18 feet water on it, $1\frac{1}{3}$ miles from the south shore.

Wilson spit gas buoy.—A red gas buoy is moored in 25 feet, South about $1\frac{1}{2}$ cables from the spit, and a little more than one mile from the land to the southward. This buoy exhibits an *occulting* white light, which is occulted from 6 to 8 times every minute and is visible from a distance of 6 miles in clear weather.

Buoys.—Two black can buoys are moored on the south side of the entrance, one in 4 fathoms, bearing S.E. $\frac{1}{2}$ S., distant half a mile, and the other in $3\frac{1}{2}$ fathoms, bearing S.W., distant nearly one mile from Wilson spit gas buoy.

A black and white buoy is moored in 4 fathoms on the north-east and shoalest part of a narrow patch with 19 to 23 feet water on it, extending south-west $3\frac{1}{2}$ cables from the buoy. This buoy bears S.W. $\frac{1}{2}$ W. distant 3 cables from Wilson spit gas buoy.

The channel through this entrance is upwards of three-quarters of a mile wide, with $3\frac{1}{2}$ to 5 fathoms, the deepest water being between the Wilson spit gas buoy and the black buoy to the south-east of it; but the bank with 19 to 23 feet water over it, to the south-west of the Wilson spit buoy, reduces the width for vessels of heavy draught.

The coast from the south entrance of the channel forms a bay extending N.W. by W. $\frac{3}{4}$ W. 4 miles to point Henry. It is barely one mile deep, and is mostly occupied by a bank, the 3-fathoms edge of which projects from 4 cables off the south entrance point to three-quarters of a mile eastward of point Henry, where a spit, with 16 feet water on it, extends a quarter of a mile northward from the edge of the bank.

Aspect.—The land between points Richards and Henry is mostly low, the hills scattered over it rarely exceeding 120 feet in height,

except the summit of Bellarine, S. by W. $2\frac{3}{4}$ miles from point Richards, which attains an elevation of 447 feet. Much of this land is under cultivation, and several villages and country residences of the merchants and inhabitants of Geelong are on it.

Point Henry is low, the Bluff, which is its most elevated part, being only 25 feet above the mean level of low water springs. A jetty projects about 620 yards from the east side of the point into 13 feet water, and another from the west side, 360 yards into 4 feet water.

Anchorage.—There is good anchorage in the outer harbour in 4 to 5 fathoms, mud, between one and $1\frac{1}{2}$ miles eastward of point Henry.

The Northern shore of the western arm from Werribee river trends S.W. $\frac{1}{2}$ S. $2\frac{3}{4}$ miles, and thence W. by S. $2\frac{1}{4}$ miles to a low point, on the east side of which is a small stream flowing from the northward, and on the west side of the point is the mouth of Little river, which winds through the lowland from the west-north-west. From the projection of the land midway between Werribee and Little rivers, a spit with $4\frac{1}{2}$ feet water on its extremity, projects one mile to the southward, having a red conical buoy moored in 15 feet water, half a mile South of the spit.

Beacon point.—From Little river the shore extends S.S.W. $\frac{1}{2}$ W. $1\frac{1}{4}$ miles to Beacon point, from which a shoal spit projects two-thirds of a mile towards a beacon bearing S.E. by E. $\frac{1}{2}$ E., distant one mile from the point. This beacon, on the east part of the spit off Beacon point in 6 feet water, consists of a mast and ball, painted red, 11 feet high. There are two patches between the beacon and the spit; on the outer one there is one foot water, and the inner one is awash. From Werribee river to the point half-way between the river and Beacon point the 3-fathoms edge of shoal water projects irregularly half a mile to $1\frac{1}{2}$ miles; and from the half-way point to the beacon, it extends $2\frac{1}{4}$ miles from the shore, the edge of the bank closing to a quarter of a mile off the beacon.

Kirk point.—From Beacon point the shore extends S.S.W. $\frac{3}{4}$ W. $1\frac{1}{3}$ miles to Kirk point, and is fronted by a bank, of which the 3-fathoms edge projects from half a mile southward of the beacon to about the same distance from Kirk point.

From Kirk point the low shore trends W.S.W. 2 miles, and thence South $2\frac{3}{4}$ miles to point Wilson, forming a bay, of which the bight for a distance of $1\frac{1}{2}$ miles is filled by a mud flat. For about a mile south-westward from Kirk point rocky spits project from a cable to a quarter of a mile off the shore.

Buoys.—From half a mile off Kirk point the 3-fathoms edge of an extensive bank, with some shallow patches on it, curves in a S.S.W. and S.S.E. direction to a spit with 9 feet water on it, marked by a red conical buoy, moored in 20 feet water, from which point Wilson bears S.W. by W. $\frac{1}{2}$ W., nearly $2\frac{1}{4}$ miles. From the end of this spit, the 3-fathoms edge of the bank, after turning two-thirds of a mile to the north-west, extends S.S.W. $2\frac{3}{4}$ miles to another spit, having 14 feet water on it, and marked by a red conical buoy, moored in 19 feet water, at S.S.E. $\frac{1}{2}$ E. $1\frac{3}{10}$ miles from point Wilson; some banks with 15 to 17 feet water on them lie within 3 cables eastward and southward of the buoy.

Wilson spit.—From the last mentioned red buoy, a continuation of the bank which extends off point Wilson, trends S. by W. $\frac{1}{2}$ W. 2 miles to Wilson spit, which forms the north side of the south entrance of the channel into Geelong outer harbour. This projecting bank, which has 13 to 17 feet water on it, is 200 to 600 yards broad, the narrowest part being midway between the red conical buoy and the spit. For Wilson spit gas buoy, *see* page 467.

Point Wilson is low, with a small islet close off it, and numerous rocks extending about 200 yards to the southward. Two detached patches, having 5 and 6 feet water on them, lie respectively E.S.E. one-third of a mile, and S.E. $\frac{1}{2}$ S. half a mile from point Wilson.

From point Wilson the coast extends in a N.W. by W. $\frac{3}{4}$ W. direction $1\frac{1}{2}$ miles to the central and longest of some jetties, projecting into 2 or 3 feet water; and thence nearly half a mile westward to a low point, close off which lies Snake island. The coast is bordered by mud and sand, with numerous rocks, which for upwards of three-quarters of a mile westward from point Wilson extend from more than a half to a quarter of a mile from the land.

Beacon.—A beacon, surmounted by a basket ball, painted red, and 9 feet above high water, has been erected at the extreme of the foul ground south-westward of point Wilson; from the beacon that point bears about N.E. (N. 45° E.) distant $5\frac{1}{2}$ cables.

Snake island extends from 100 yards to 900 yards from the mainland, with which it is connected by a flat, terminating in a rocky spit, projecting 2 cables southward from the island.

From the low point immediately behind Snake island the coast curves to the W.S.W. and South one mile to a double point, having a ledge of rocks projecting about one cable southward of it, between which and Snake island is a clear space of nearly one-third of a mile, with 9 to 13 feet water.

From two-thirds of a mile westward of the red conical buoy off point Wilson, the 3-fathoms edge of the bank fronting the shore trends N.W. by W. to a 17-foot spit, at S.W. a little more than one mile from point Wilson. From this spit the 3-fathoms edge of the bank extends irregularly, in a W. by N. $\frac{1}{2}$ N. direction 2 miles, to within half a cable of the ledge of rocks projecting from the double point already noticed. There are patches, with 3 and 4 feet water over them, between the edge of the bank and the rocks extending south from Snake island.

Point Lillias.—From between a quarter of a mile and half a mile west of the double point just noticed a tongue of land, not more than 2 to 3 cables broad, projects S.S.W. two-thirds of a mile from the line of coast to point Lillias, a double projection, bearing N. by E. $\frac{1}{4}$ E. distant nearly $2\frac{1}{2}$ miles from the bluff on point Henry.

Bird rock.—From the western projection of point Lillias a narrow rocky ledge extends nearly S.S.W. one-third of a mile to Bird rock, on which is a beacon. The beacon consists of a white mast and skeleton ball and is on the centre of the rock. This rock, and the ledge connecting it with point Lillias, are enclosed by a rocky shoal, with 2 to 5 feet water on it, extending one cable from the east side of the ledge, and S.W. 2 cables from the beacon to a red conical buoy, with staff and globe, moored near the edge of the spit.

The 3-fathoms edge of the shoal bordering the shore from one cable southward of the double point, West of Snake island, trends S.S.W. to 4 cables eastward of Bird rock, and then curves round in a S.E. by E. direction to the east point of a bank, which projects S.E. one mile from Bird rock. At half a mile from the rock, this bank is only 2 cables broad; but from its east point the south-east edge extends S.W. $\frac{1}{2}$ W. half a mile to the Artificial cut, that forms a ship-channel through the narrowest part of the bank.

Buoy.—The middle of the south-east edge of the bank extending from Bird rock is marked by a red conical buoy.

From the Artificial cut the bank, here only one cable broad, stretches S. by W. three-quarters of a mile to within a cable of the spit, which projects North from the bank on the east side of point Henry. There are 15 to 17 feet water over this ridge.

The Outer harbour of Geelong extends north and south $3\frac{1}{2}$ miles between the 3-fathoms edges of the banks fronting the north and south shores, and is bounded to the eastward by the bank, which projects from point Wilson to Wilson spit. On the west side it is separated from the inner harbour by the bank and narrow ridge extending from point Lillias and a collection of other banks, forming together a bar, which stretches across from point Henry to point Lillias and the shore to the westward of it.

The soundings over the outer harbour are remarkably even, rarely varying from 4 to $4\frac{3}{4}$ fathoms, except on the western side, where there are 5 to $5\frac{1}{2}$ fathoms. The bottom is mostly mud, with some patches of clay.

Channels to Inner harbour.—The outer harbour, from its entrance, southward of Wilson spit, is crossed towards either the Artificial cut and the South channel, or to the eastern end of the Hopetoun channel.

Artificial cut.—This passage, which bears N.E. by N. from the bluff on point Henry, and S.S.E. $\frac{3}{4}$ E. from Bird rock, has been dredged through the bank one cable in a S.E. and N.W. direction, and is 100 yards wide, with a depth of 19 feet at low water springs.

The channel is marked by two black can buoys on the south-west, and two red conical buoys, the outer of which has a staff and globe, on the north-east side.

South channel.—At half a mile N.W. from the Artificial cut, is the eastern entrance of the South channel that has been cut through the bank which extends from point Henry to the north shore. It is nearly $1\frac{1}{4}$ miles long E. $\frac{1}{2}$ N. and W $\frac{1}{2}$ S., and 132 feet wide at the bottom, sloping to 165 feet at the surface, at its narrowest part. This channel, which has been dredged to the depth of 18 feet at low water, has a black can buoy on the south side of its east entrance.

Within the entrance the channel is marked on the south side by black, and on the north side by white beacons. A black can buoy also marks the south side of the west entrance.

At 4 cables within the east entrance the channel communicates with a bight in the bank, extending a quarter of a mile to the southward, with 4 to 5 fathoms water; and opposite this are two other inlets having $3\frac{1}{2}$ fathoms, separated by a spit, on which is one of the white beacons that mark the north side of the channel.

The 3-fathoms edge of the bank from the east entrance of the South channel trends in a S. by E. and S.S.W. direction to a small bight, with 20 feet water, within the spit before noticed to the eastward of point Henry. The western 3-fathoms edge of the bank from the western entrance of the South channel extends nearly S. by W. $2\frac{1}{2}$ miles, and from thence W. by S. $\frac{1}{2}$ S. three-quarters of a mile to one cable off Limeburners point, which bears S.W. by W., distant 2 miles from the bluff on point Henry.

The shoalest part of the bank between its 6-foot edges extends from point Henry to the South channel, and is half a mile to a quarter of a mile broad, with a narrow ridge on it, which dries, trending three-quarters of a mile from the South channel towards point Henry. There is a small knoll at $1\frac{1}{2}$ cables to the southward of the ridge, and on the north-east part of the bank is a 5-foot knoll, a quarter of a mile S.W. of the black can buoy at the east end of South channel.

North channel.—The east entrance of this channel lies between a quarter of a mile and 4 cables westward of Bird rock beacon. From the red conical buoy S.W. of Bird rock, the 12-foot edge of the bank which forms the eastern and northern limits of the channel, turns North and then curves West to a projection of the bank, close to the westward of which is a red conical buoy, W. $\frac{3}{4}$ N. 6 cables from Bird rock beacon.

Beacon.—On the beach, bearing N.W. $\frac{1}{2}$ N. 6 cables from Bird rock beacon, is a beacon consisting of a white mast and ball, 30 feet high. This beacon on with Station peak clears the spit to the west of Bird rock; it is also a guide for entering South channel by keeping it open west of Bird rock.

The bar.—From the last mentioned red buoy, the north side of

the channel curves round nearly 4 cables to the bar, which is 200 yards broad, with 9 to 11 feet water on it.

The channel is bounded to the southward by the 12-foot edge of the bank, which, from the middle of the north side of the South channel, trends N. by E. $\frac{1}{2}$ E. to a spit the north-east edge of which is marked by a black can buoy and which is 150 yards from the north side of the channel. Between this and another projection of the bank, on which is a black can buoy, bearing West, distant nearly $4\frac{1}{2}$ cables from the above mentioned black buoy, is a bight in the bank, with 12 to 14 feet water, trending 600 yards to the south-west.

From the western side of the bar the North channel trends S.W. by W. $\frac{1}{2}$ W. one-third of a mile to its west entrance, with a width of 150 to 200 yards between the 12-foot edges of the bank, and is marked by a red beacon on the north side and a black beacon near the entrance on the south side.

The south-western 3-fathoms edge of the bank from the west entrance of the South channel trends N.W. one-third of a mile to the western entrance of the North channel, and thence $1\frac{1}{4}$ miles in nearly the same direction toward the entrance of Limeburners creek. At about three-quarters of a mile to the north-west of the entrance of the North channel, a narrow detached shoal, with 15 feet water on it, extends 800 yards along the edge of the bank, from which it is separated by a very narrow channel having 22 feet water.

Hopetoun channel.—The east entrance of Hopetoun channel bears N.E. $\frac{1}{4}$ E. rather over a mile from the bluff on point Henry; the channel then extends in a W. by S. $\frac{1}{2}$ S. direction, 2 miles, into Geelong inner harbour; it is 110 feet wide and has a depth of 23 feet at low water. The north side of the channel is marked by 4 *fixed* white lights, visible all round the horizon, each elevated 26 feet above the sea and exhibited from pile structures situated about 20 feet North of the north side of the channel. These lights extend from the east to the west entrance of the channel, and are at equal distances of 4040 feet apart; they may be seen from a distance of 6 miles in clear weather.

The south side of the channel is marked by 3 *fixed* red lights, visible all round the horizon, each elevated 26 feet above the sea, exhibited from pile structures situated about 20 feet South of the south side of the channel and at equal distances of 4040 feet apart, placed so as to alternate with those on the north side of the channel.

These lights may be seen from a distance of 6 miles in clear weather.

The channel is further marked on the north side by 7 beacons and on the south side by 2 beacons ; there is also a white buoy close to the south-east of the east light beacon.*

The North shore between point Lillias and a low point at N.W. $\frac{1}{2}$ W. half a mile from it, forms a bight extending two-thirds of a mile to the north-east ; but it is nearly filled by a flat of mud, sand, and weeds.

From the low north-west entrance point of this bight the shore trends West and N.W. about $1\frac{2}{3}$ miles to the south-east entrance point of Limeburners creek ; from this point a mud spit projects W.N.W. one-third of a mile to within 100 yards of the western side of the entrance, leaving a narrow channel with 20 feet water, between the spit and the west shore.

Limeburners creek from its entrance trends E.N.E. two-thirds of a mile, and thence about the same distance in a N. by E. direction, and is 2 to nearly 4 cables wide. At about half a mile within the entrance a low point projects from the west shore, below which there is a basin having 7 to 13 feet water ; but above the point the creek is mostly filled by a mud-flat, leaving only a narrow channel, carrying 6 to 11 and 5 feet water for about a quarter of a mile along the east side of the creek, and then returning south-westward towards the point.

GEELONG INNER HARBOUR, the most spacious and secure anchorage in port Phillip, extends from Limeburners point North nearly $4\frac{1}{4}$ miles to the entrance of Limeburners creek, and is $2\frac{1}{2}$ miles wide between the west shore and the 6-foot edge of the bank which extends from point Henry to the north shore. The soundings are remarkably regular, over mud, the depth gradually increasing from the 3-fathoms edge of the bank on the east side, to 5 and $5\frac{1}{2}$ fathoms within a quarter of a mile of the west shore, and to 4 fathoms at 2 cables off the town of Geelong, in the south-west bight of the harbour.

* Dredging operations have been commenced, October 1894, at the east end of Hopetoun channel. During their progress the dredger will show the following signals on the side which vessels should pass :--By day, a basket ball ; at night, three red lights placed vertically. The dredger must be passed at a slow rate of speed and steam vessels must stop their engines while passing over her cables.

See chart, No. 2,731.

The east shore from point Henry extends South 2 miles to an elbow of the coast, between which and a low point half a mile to the west of it, a shallow inlet nearly half a mile wide trends three-quarters of a mile into the low flat land in an E.S.E. direction, towards point Henry township; but the inlet is filled by a mud-flat, which dries one and 2 feet above low water.

From the west entrance point of the inlet the low shore trends nearly W.N.W. $1\frac{1}{4}$ miles to Limeburners point. On the west side of the former point is a bight in the land, a quarter of a mile in extent, partly enclosing a remarkable pond in the mud-flat which projects from the bight.

The shore from three-quarters of a mile South of point Henry to the same distance S.E. of Limeburners point is difficult to approach, in consequence of its being fronted by a continuous mud-flat, which extends one to 2 cables from the east shore, and 4 cables northward from the west entrance point of the inlet. This mud-flat is again fronted by a broad shoal bank, the 6-foot edge of which curves round in a south-westerly direction from half a mile N.W. of point Henry to Limeburners point.

From Limeburners point the water frontage of the town of Geelong forms Corio bay, two-thirds of a mile deep, extending from the point N.W. by W. $\frac{1}{4}$ W. $1\frac{2}{3}$ miles to Hutton wharf. There are generally 6 feet water within 150 yards, and 22 to 24 feet within $1\frac{1}{2}$ cables of the shore.

From Hutton wharf the west shore trends N. by E. a little more than one mile to the south point of a cove about a quarter of a mile in extent, into the head of which Cowies creek flows through the low land from the north-west. The shore from the north point of this cove turns round one mile to the north-east, and then curves in nearly the same direction $1\frac{3}{4}$ miles to the entrance of Limeburners creek.

From Hutton wharf to the cove, and thence to the projection of the shore one mile to the north-east of it, there are $4\frac{1}{2}$ to $5\frac{1}{2}$ fathoms water within $1\frac{1}{2}$ cables of the shore; but from this projection to the entrance of Limeburners creek the shore is fronted by a bank, of which the 3-fathoms edge, at two-thirds of a mile southward of the entrance, forms a spit extending about half a mile from the shore. Between this spit and the bank fronting the opposite shore a narrow inlet, having 22 to 19 feet water, trends northward about half a mile towards the entrance of Limeburners creek.

Aspect.—The country between Melbourne and Geelong is generally low, flat, and partially wooded; it is intersected by several creeks, already noticed, and there are many small lagoons, most of which are situated near the shore within about 8 miles of Williamstown.

Station peak.—The only hills in the neighbourhood worthy of notice appear to be Youangs, the most elevated of which is Station peak, rising from the south portion of the group to the height of 1,132 feet. It bears nearly N. $\frac{3}{4}$ W., distant $10\frac{3}{4}$ miles from the bluff on point Henry.

GEELONG lies 45 miles south-westward of Melbourne. The town is well laid out on ground sloping to Corio bay, with broad streets at right angles to each other, and large public buildings. There are several cloth manufactories, also meat preserving works, and extensive tanneries. The country surrounding Geelong is agricultural. The population in 1891 was 24,283.

The Ballarat and Melbourne railways form a junction at about $1\frac{1}{2}$ miles to the northward of Geelong station. From this junction the Geelong and Melbourne railway curves in a N.E. by N. and N.E. by E. direction nearly 32 miles over a low flat country to the Geelong junction north-west of Williamstown.

The chief articles of import are provisions, coal, grain, spirits, and timber. The chief exports, wool, gold, leather, sheep and horses. The principal trade is with the United Kingdom and intercolonial.

Yarra wharf nearly one mile West of Limeburners point, projects about 330 yards from the shore into 23 feet water. A warping buoy is moored off the centre of this wharf, about $1\frac{1}{2}$ cables from the outer end. There is a smaller jetty on either side of the wharf, extending about 120 yards from the shore into 6 or 7 feet water.

Light.—A *fixed* white light is exhibited from the end of Yarra wharf, which may be seen from a distance of 5 miles in clear weather.

Moorabool wharf 250 yards West of Yarra wharf, extends 220 yards from the shore into 12 or 13 feet water. There is a red buoy moored in 25 feet water, nearly one cable to the north-east of the end of the wharf. The Custom-house is situated near the inner end of this wharf.

Light.—A *fixed* red light is exhibited from the end of Moorabool wharf, which may be seen from a distance of 4 miles in clear weather.

Railway wharf.—The railway wharf, 100 yards West of Moorabool wharf, extends 350 yards from the shore into about 25 feet water. This wharf is the southern terminus of the Geelong and Ballarat, and the Geelong and Melbourne railways.

Buoys.—A large red warping buoy is placed in 26 feet water 90 fathoms off the north end of the Railway wharf.

There is also a red warping buoy in 7 feet water about 75 fathoms west of the wharf.

Hutton wharf, at the north-west point of Corio bay, projects about 200 yards from the shore into 15 feet water.

For repairs *see* page 495.

DIRECTIONS.*—For Port Phillip from the Westward.
—*See* pages 37, 38.

After passing Eagle Nest point, 36 miles to the north-east of cape Otway, if the weather be at all clear, Arthur's seat will be seen rising inland over the waters of port Phillip before the lower and nearer land in that direction becomes visible. Proceeding onward, the land about cape Schanck will be seen to the eastward, appearing at first like a long low island trending to the south-east. On nearing the entrance, Barwon head will open out on the port bow. This headland, formerly known as Flinders point, is a good mark for making the port; but in thick, hazy weather care must be taken not to mistake this for port Phillip heads, which in several instances has led to vessels going ashore.

If Shortland bluff high light is sighted bearing east of N.E. by E. (N. 56° E.), haul to the eastward, to avoid Barwon bight, and open Shortland bluff low light, which is first seen on a N.E. by E. (N. 56° E.) bearing; and in bringing the two lights in line, the low light changes from white to red on a N.E. $\frac{1}{2}$ N. (N. 39° E.) bearing.

Deep water channel between the heads. Two leading beacons, the outer red and the inner chequered black and white, are situated in Lonsdale bight, nearly $1\frac{2}{5}$ miles from point Lonsdale and

* Keep a good look out for floating wreckage when approaching and entering port Phillip.

See charts, No. 2,731, No. 1,695*b*, and No. 1,171*a*.

$1\frac{6}{10}$ miles from Shortland bluff low lighthouse, and in line bearing N.N.W. $\frac{1}{4}$ W. (N. 25° W.), lead in with not less than 42 feet at low water spring tides, until the beacon on point Nepean is in line with the beacon on Nepean rock.

For Port Phillip from the Eastward.—When steering for port Phillip from the southward and eastward it is usual to make the land about cape Schanck, 17 miles to the south-east of the entrance. The cape has a round white lighthouse on its highest part, which exhibits a *fixed and flashing* white light, visible from the distance of 23 miles in clear weather. The red light shown from the lighthouse is intended to warn mariners of too close approach to the land. *See* pages 501–2. Having passed cape Schanck, keep a good offing in proceeding towards the heads, until Shortland bluff lighthouses open out, the intervening land of point Nepean preventing their being seen before the high light bears N. $\frac{1}{2}$ W. (N. 6° W.), and the low light N. $\frac{1}{2}$ E. (N. 6° E.); in bringing the two lights in line, the low light changes its colour from white to red on a N.N.E. (N. 22° E.) bearing.

Caution not to heave to.—At night, a vessel should keep a good offing, and on no account be hove to when waiting for daylight near port Phillip heads. Several vessels that have done so have drifted into danger, others have been lost from this cause, combined with inattention to the lead and the tidal streams.

Causes of wreck at the heads.—A careful inquiry into the casualties which have occurred at the entrance of port Phillip has shown that in nearly every case they have taken place in consequence of either attempting to enter the heads at night without a pilot, or against a strong out-going stream; which, it must be remembered, runs partly athwart the entrance with great force, frequently at the rate of 7 knots, causing a high confused tumbling sea, which in southerly or westerly gales, often breaks from point to point. The mariner must not suppose that because he has a fine fair wind outside the heads he can always force his vessel against the stream. To this error is attributable the loss of several vessels. The wind, although fresh outside, frequently falls light just as the vessel gets into the tide-ripple between the heads, when she becomes unmanageable; and even with a strong breeze, vessels often shear athwart the stream, which hereabouts forms a series of strong irregular eddies.

Waiting for tide.—By the tidal signals on point Lonsdale, the time and state of the tidal stream may be known; it is advisable for vessels waiting for the turn of the stream outside the heads, to keep point Lonsdale shore aboard, where the stream runs fairer, and in bad weather small vessels incur less danger from tide-ripples, besides having much smoother water. Carefully attend to the lead.

PILOTS.—As there is constantly one pilot-vessel outside the heads, when it is practicable to keep at sea, no stranger should attempt entering without taking a pilot; but the channels are so carefully lighted and buoyed, that it is quite possible to do so. If proceeding from sea to Geelong, and requiring a harbour pilot, save time by sending a telegram from the heads, stating draught of water to the harbour master, in order to have a pilot ready to board the vessel off point Henry. *See* page 430.

Signals.—Vessels aground.—Vessels grounding in the South, West, or Hopetoun channels, thereby obstructing the navigation, are to show the undermentioned signals:—By day, two balls or shapes placed vertically 6 feet apart; by night, in addition to the ordinary lights, two red lights, placed vertically 6 feet apart, in globular lanterns of not less than 8 inches in diameter and in such a position with respect to the ordinary white light as to indicate as nearly as possible the position and extent of the obstruction. A look-out is to be stationed on board, or in a boat, to give warning to approaching vessels.

To enter the heads with the in-going stream.—If a pilot has not been taken on board outside the heads, and the last quarter ebb stream signal be up, or the in-going stream be made, steer, when within 8 or 10 miles of the entrance, to bring the high lighthouse on Shortland bluff in line with the low lighthouse bearing N.E. by N. (N. 34° E.); and with a fresh fair wind and stream, steer so as to keep the two lighthouses in line, until the red beacon on the rocky islet off point Nepean is open south of that point, or, if using the deep channel, steer in with the beacons in Lonsdale bight in line, until the beacons on point Nepean and rock are in line.

Lonsdale rock is cleared on its east side by keeping Swan island beacon open of Shortland bluff N.E. $\frac{1}{2}$ N. (N. 39° E.), until point Lonsdale signal house, white with a slate roof, opens well to the northward of the tidal signal flag-staff. Vessels drawing less than 14 feet may, in the daytime, pass between Lonsdale rock and reef by keeping Swan point a little open of Shortland bluff.

The west side of the Corsair rock is cleared by keeping the low lighthouse on Shortland bluff in line with the east end of the houses near the high lighthouse, N.N.E. $\frac{1}{4}$ E. (N. 25° E.), until the white beacon on point Nepean is well open north of the red beacon on the rocky islet off that point.

With a scant or light easterly wind and in-going stream, Swan island beacon must be kept open of Shortland bluff, so as to avoid Lonsdale rock.

To enter the heads against the out-going stream steer, when within 2 miles of the heads, to get the low lighthouse open east of the high one, until near point Lonsdale, when haul as close round Lonsdale reef as practicable; taking care, however, if the draught be more than 14 feet, to avoid Lonsdale rock by not shutting Swan island beacon in with Shortland bluff, and on no account to shut in Swan point with Shortland bluff, until clear of Lonsdale reef, and the red beacon on the rocky islet off point Nepean is open south of that point, when the rocks and reefs in the entrance are cleared.

Working in between the heads, is best done near the time of slack water, when the race is nearly quiet, and the vessel will be much more under command. In standing to the westward, Swan island beacon must be kept open of Shortland bluff until Lonsdale point signal house opens well north of the tidal flag-staff. Vessels of light draught may stand more in-shore, keeping Swan point a little open of Shortland bluff, making due allowance for the set of the in-going stream. After clearing Lonsdale rock and reef, do not bring Shortland bluff low lighthouse east of N.E. $\frac{1}{2}$ E. (N. 51° E.) in order to avoid Victory shoal and the foul ground between point Lonsdale and Shortland bluff. Lonsdale bight should be avoided by all vessels.

In standing to the eastward, do not proceed farther than when the obelisk on Shortland bluff touches the east side of the high lighthouse bearing N.N.E. $\frac{3}{4}$ E. (N. 31° E.), to avoid the tide-ripples near point Nepean.

At night.—The passage through the heads should not be attempted at night, except with steam or a commanding fair wind; to enter under either of these favourable circumstances, when the high and low lights on Shortland bluff are clearly distinguished,

bring them in line, bearing N.E. by N. (N. 34° E.), which leads through the fairway.

Should the wind become scant, and a vessel be compelled to tack when near Lonsdale reef or the Corsair rock, these dangers will be avoided by vessels of light draught, so long as Shortland bluff low red light is kept in sight; but they must go about or haul towards mid-channel before the low light changes from red to white.

In entering, point Lonsdale light first appears green, bearing N. by W. (N. 11° W.), and so long as this colour is in full view the vessel is seaward of Lonsdale rock; the green begins to blend with red, bearing N.W. $\frac{1}{2}$ W. (N. 51° W.), in line with the Lonsdale rock; the red light opens into full view inside this danger; and the deep red light is seen, on a W. by N. (N. 79° W.) bearing, when inside the Corsair rock.

ANCHORAGES.—Having entered and cleared the dangers which lie between the heads, proceed north-eastward for the anchorage off Shortland bluff, towards the West channel; or if of heavy draught, eastward, for the anchorage off the Sanitary station, in from 8 to 9 fathoms water, in the entrance of the South channel. See caution, page 439.

Off Shortland bluff.—If necessary to anchor off Shortland bluff before proceeding through the West channel, steer N.E. from the entrance, keeping Shortland bluff low lighthouse north of N.E. $\frac{1}{2}$ E. (N. 51° E.), to avoid the Victory shoal; and if of heavy draught, anchor on the south-east side of the fairway, which is shown by Swan spit gas buoy being in line with No. 2 Royal George gas buoy; at night, by their *occulting* red and white lights, bearing N.E. $\frac{1}{2}$ N. (N. 39° E.).

With the view of keeping the fairway to the West channel clear, vessels of light draught, when anchoring off Shortland bluff, bring up as close towards the shore as possible on the north-west side of the fairway, with Swan spit gas buoy in line with No. 1 black buoy; and at night, with Swan spit gas buoy, *occulting* red light, on a N.E. by E. (N. 56° E.) bearing.

When about to anchor off Shortland bluff at night, it must be remembered that the low light shuts in on a W. by N. (N. 79° W.) bearing; and that it shows red between the bearings of S.W. by W. $\frac{1}{4}$ W. (S. 59° W.) and S.W. by W. $\frac{3}{4}$ W. (S. 65° W.).

Off the Sanitary station.—If from quarantine regulations, southerly gales, or from drawing too much water to take the West channel, it is necessary to anchor off the Sanitary station before proceeding through the South channel, after getting well inside the heads, steer to the eastward along the north side of point Nepean, avoiding the shoals which front the shore by keeping Barwon head just open of point Lonsdale; or, at night, by keeping just south of the W. by S. (S. 79° W.) limit of point Lonsdale red light; when the high light on Shortland bluff bears about N.W. $\frac{3}{4}$ W. (N. 53° W.), keep it so astern and anchor in 8 or 9 fathoms, abreast of the Sanitary station, half or three-quarters of a mile from the shore, and with point Lonsdale light bearing about West, but not within 4 cables of the telegraph cable.

Not to anchor in the channels.—It is not advisable in bad weather, to anchor in either the West or South channel, on account of the stream and the loose nature of the bottom; but in south-westerly gales small vessels find good shelter in 3 to $3\frac{1}{2}$ fathoms, under Swan spit, with the high lighthouse just shut in with Swan point, at about half a mile off shore. Vessels bound up, and caught in the South channel with a north or north-westerly gale, find anchorage in Capel sound, in 5 to 7 fathoms, sand, by bringing the White cliff to bear S.W., and the top of Arthur's seat East; but, if daylight and the wind permit, it would be better to get back to the anchorage off Shortland bluff.

No stranger should anchor close to the heads, except to save the vessel from going ashore; although coasters sometimes, to avoid being carried by the stream inside the heads in a calm, anchor at about a mile outside, where the bottom is sandy; and sometimes in the bight between Barwon head and point Lonsdale.

WEST CHANNEL.—The West channel may be considered safe for vessels drawing not more than 17 feet of water. If the tide could be depended upon, it would be quite possible and safe for vessels of 18 feet draught to use the channel, but the tides are so influenced by the winds that it is not safe to trust to the calculated time of high and low water for rise and fall. An easterly wind has a precisely similar effect to that which it has on the outer coast, viz., that of keeping the tide low; a westerly or southerly wind, on the contrary, keeps the tide up.

If bound through the West channel, after entering the heads and clearing the dangers in the entrance, steer about N.E. (N. 45° E.) from the fairway between points Lonsdale and Nepean, keeping Swan point well open of Shortland bluff, to avoid Victory shoal, and giving the bluff a berth of at least 2 cables, to avoid the reef which projects from it. Having passed Shortland bluff, keep point Lonsdale light-house open of it S.W. by W. $\frac{1}{4}$ W. (S. 59° W.), which will lead clear of the bank, lying between Shortland bluff and Swan spit.

Pass between No. 1 black can buoy and No. 2 Royal George red gas buoy, then steer N.E. by E. (N. 56° E.) and round the Swan spit gas buoy at the distance of a cable. Care must be taken (if necessary) to avoid a small 17 feet patch about 6 cables from No. 1 buoy.

Then steer to the northward, passing a cable westward of No. 6 red conical buoy, the same distance from No. 8 red conical buoy and from No. 12 red gas buoy; and thence to pass nearly a cable to the south-east of the pile lighthouse.

With a scant wind, proceeding up against the out-going stream, do not stand too near the eastern bank, as the stream sets upon it, especially at the northern end of the channel.

The West channel may also be entered between Popes Eye and Royal George sands by passing half a mile N.W. of the Popes Eye red and white buoy, and one cable S.E. of the east Royal George red conical buoy, then steer to pass S.E. one cable from the Swan spit gas buoy. This leaves No. 4 red conical buoy one cable to the eastward. For signals if aground in this channel, *see* page 479.

At night, enter between the heads with the Shortland bluff lights in line, bearing N.E. by N. (N. 34° E.), and when point Lonsdale light bears W. by N. (N. 79° W.), on which bearing it changes to a deep red, steer about N.E. (N. 45° E.), giving a good berth to Shortland bluff.

When the *occulting* white light of No. 2 Royal George gas buoy is seen steer to pass about $1\frac{1}{2}$ cables N.W. of it, and when the red light exhibited from Shortland bluff low lighthouse comes in sight, steer about N.E. by E. (N. 56° E.) taking care to keep the above light in sight and pass about a cable to the south-east of the Swan spit gas buoy, showing an *occulting* red light. Then steer North and bring the Swan spit light to bear S. by W. $\frac{3}{4}$ W. (S. 20° W.), when keep it so astern. This leads a cable westward of No. 6 buoy, $1\frac{1}{2}$ cables eastward of No. 3 buoy, and brings No. 12 gas buoy, which

shows a *fixed* white light, ahead. Pass about a cable westward of No. 12 gas buoy.

From this position steer N.N.E. $\frac{3}{4}$ E. (N. 31° E.), and pass a cable to the south-eastward of the pile light. The pile light changes from white to red on a N.E. by N. (N. 34° E.) bearing. If necessary, on account of draught, care must be taken to avoid the 16 feet shoal lying $3\frac{1}{2}$ cables South of the pile light. The above directions lead through the channel in not less than 17 feet at low water.

Attention must be paid to the tidal streams which do not set fairly through this channel.

WEST CHANNEL to HOBSON BAY.—From a cable eastward of West channel pile lighthouse, the course is nearly N. by E. $\frac{1}{4}$ E., and the distance $20\frac{1}{2}$ miles to point Gellibrand light-vessel. There are no dangers in the way, and the soundings are regular, gradually increasing from 9 fathoms a mile northward of West channel lighthouse to 12 fathoms midway, and thence decreasing to 6 fathoms one mile southward of point Gellibrand light-vessel; and the bottom being soft mud and shells, a vessel may anchor anywhere along this route.

At night.—West channel pile light is white between N.E. by N. (N. 34° E.) through west and S. by E. $\frac{1}{4}$ E. (S. 14° E.), and red in other directions. The red light is cut about one cable to the south-east of Nos. 7 and 5 buoys of the West channel, and one cable to the eastward of Prince George black gas buoy.

Working up from the West channel lighthouse to Hobson bay, do not stand into less than 5 fathoms on either side, nor approach the western shore nearer than 3 miles, until Station peak comes on with point Cook, W. by S. $\frac{1}{4}$ S. (S. 76° W.); when, in standing to the westward, point Gellibrand light-vessel must not be brought East of N.E., nor must point Gellibrand be approached within half a mile, until north of it. The bottom, at the distance of a mile off shore, from point Gellibrand to point Wilson, is rocky, with shoal patches.

Anchorage.—Having passed eastward of point Gellibrand light-vessel, which may be rounded at the distance of a cable, in 5 fathoms, the best anchorage is in 4 fathoms, with the Time ball

tower on point Gellibrand bearing from South to S.W. Vessels must moor in Hobson bay.

SOUTH CHANNEL.—For the South channel, after having entered and cleared the dangers between the heads, steer along the north side of the land of point Nepean, in 8 or 9 fathoms, with Barwon head just open of point Lonsdale, nearly W. $\frac{1}{2}$ S. (S. 84° W.), passing 6 cables South of the Popes Eye red and white buoy, and 4 cables South of No. 1 black can buoy. Thence steer E. $\frac{3}{4}$ S. (S. 82° E.) and pass $2\frac{1}{2}$ cables southward of No. 3 black can buoy. In ships of heavy draught avoid the 26 and 28 feet patches about midway between these buoys, $1\frac{1}{2}$ cables to the north and one cable to the south of the track. From south of No. 3 buoy steer nearly midway between the red conical buoys, which mark the south side, and the black can and gas buoys, which mark the north side of the channel, bringing the South channel pile lighthouse in line with Arthur's seat lighthouse, bearing E. $\frac{3}{4}$ S. (S. 82° E.) as soon as they are seen. When abreast of No. 6 buoy steer to pass a cable southward of No. 9 buoy and thence close northward of the gas buoys at each end of the dredged channel, bearing in mind that the channel is 400 feet wide, extending southerly from a line between Nos. 9 and 11 black buoys; the northern half having a navigable depth of 26 feet, and the southern of 28 feet, at low water springs. For tide signals at South channel pile lighthouse, *see* page 442.

Having passed to the southward of No. 11 black buoy continue about E. by S. (S. 79° E.), so as to pass 2 to 3 cables southward of No. 13 black buoy, and then steer E. by N. (N. 79° E.) and round, on the south-east side, No. 15 black gas buoy, which marks the eastern spit of the Middle ground.

The banks on either side are steep-to, with the in-going stream setting strongly over the northern banks, and the out-going stream over the southern banks. For signals if aground in this channel, *see* page 479.

Working through.—When working through the South channel be guided by the lead, not standing into less than 4 fathoms on either side, nor within the line of buoys; bearing in mind the tidal streams which set over the banks. After passing South

channel pile lighthouse there is plenty of room between the Middle ground and the shore, which may be approached to nearly three-quarters of a mile, in 5 fathoms. When clear of the Middle ground, and to the northward of Martha point, a vessel may stand westward until Station peak is open of the high land on point George bearing N.W. by W. $\frac{1}{4}$ W. (N. 59° W.).

At night, after getting well inside the heads with the Shortland bluff lights in line and point Lonsdale light, deep red, bearing West, steer about E. by N. (N. 79° E.), taking care to keep clear of the shoals which border point Nepean. As the low lighthouse on Shortland bluff shows a white light up the South channel, the north banks in the west entrance of the channel are avoided by not shutting in the white light on a W. by N. (N. 79° W.) bearing, but this line passes very close to the shoals. When south of Popes Eye shoal, the leading mark through the South channel, the Eastern light under Arthur's seat in line with the South channel pile light, both *fixed* white, will come on. Steer through the channel with these lights in line bearing E. $\frac{3}{4}$ S. (S. 82° E.) until about one mile from the pile light, when alter course to pass close northward of the *fixed* white and the *fixed* green lights shown from the gas buoys marking the dredged channel.

On passing the green light of the gas buoy at the east end of the channel steer E. by S. (S. 79° E.) for one mile (the pile light will open first white then red), when alter course to E. $\frac{1}{2}$ N. (N. 84° E.), taking care not to change the pile light from red to white till east of No. 15 gas buoy, showing an *occulting* white light or till the Eastern light has changed from white to red; the vessel is then clear of the east end of the Middle ground. Attention must be given to the tidal streams.

SOUTH CHANNEL to HOBSON BAY.—Having rounded No. 15 black gas buoy, which marks the eastern spit of Middle ground, steer N. $\frac{1}{2}$ W. (N. 6° W.) 27 miles, which is the course and distance thence to Hobson bay; enter eastward of point Gellibrand light-vessel and anchor or moor, as directed at page 484.

For Geelong.—From No. 15 buoy a N.W. by N. (N. 34° W.) course leads about a mile eastward of Prince George buoy. *See* page 487.

Working up.—As the eastern shore of port Phillip is free from outlying dangers, it may be approached within a mile from Arthur's

seat all the way up to Red cliff. Between Anonyma shoal and Hobson bay, shoal water extends farther from the shore, which should therefore be approached according to the vessel's draught.

WEST CHANNEL to GEELONG.—From the West channel to Geelong, after rounding West channel pile lighthouse, steer N. by W. $5\frac{1}{2}$ miles and pass eastward of the black gas buoy off the north-east extreme of Prince George bank. When half a mile to the northward of this, the Prince George gas buoy, steer W. $\frac{1}{2}$ S. (S. 84° W.) for the black gas buoy off point Richards, and having passed at the distance of a cable north of it, haul up to S.W. by W. (S. 56° W.) for the red gas buoy off Wilson spit; pass to the southward of this buoy, and midway between it and the black and white buoy moored nearly 3 cables to the south-westward. If drawing less than 14 feet steer W.S.W. from point Richards buoy, pass south of the red conical buoy nearly 2 miles N. by E. $\frac{1}{2}$ E. from Wilson spit buoy, and cross over the bank extending from point Wilson. See page 467.

Working up.—From the West channel to Geelong, with a contrary wind between the West channel lighthouse and the north-east extreme of Prince George bank, do not stand into less than 5 fathoms, nor bring the lighthouse east of S. by E., until north of the Prince George buoy, between which and the buoy off point Richards do not stand into less than 5 fathoms, nor bring that point west of W. by S. From point Richards to point Henry the south shore should not be approached to less than 4 fathoms; and the north shore to less than 5 fathoms, until west of Wilson spit, which is marked by the red gas buoy off it.

At night.—From about 2 cables eastward of West channel pile light steer N. by W. (N. 11° W.), keeping the pile light white, as it shows red over Prince George bank, and pass east of Prince George buoy, which shows an *occulting* white light. When half a mile northward of this buoy steer W. $\frac{1}{2}$ S. (S. 84° W.) and pass north of point Richards buoy, which shows an *occulting* red light. Thence steer about S.W. by W. (S. 56° W.) and round the Wilson spit buoy, which shows an *occulting* white light, at the distance of a cable, leaving it to the northward.

From point Richards buoy, if drawing less than 14 feet steer S.W. by W. $\frac{1}{2}$ W. (S. 62° W.), and when the eastern *fixed* white light of the Hopetoun channel bears W. $\frac{3}{4}$ S. (S. 82° W.) proceed into the Outer harbour with it on that bearing.

Anchorage.—To anchor in the Outer harbour of Geelong, steer about W.N.W. (N. 67° W.) from Wilson spit red gas buoy, and come to in $4\frac{1}{2}$ fathoms, with point Henry bluff bearing W.S.W. (S. 67° W.), at about one mile from the shore.

From the Outer to the Inner harbour.—South channel.
—From Wilson spit red gas buoy steer N.W. by W. (N. 56° W.) for the buoys at the entrance of the Artificial cut. In passing through the cut leave the red conical buoys on the starboard, and the black can on the port, hand, and then steer direct for the Bird rock beacon, until the black buoys and beacons, which mark the south side of South channel, begin to be brought in line, when haul sharp up and proceed through the channel, keeping midway between the two lines of beacons.

Vessels drawing 24 feet can, by choosing a proper time of tide, and employing steam, pass through the channel, from the Outer to the Inner harbour, and go close up to the Geelong wharves.

Caution.—As both streams set across the entrance of the South channel, care must be taken that the vessel is kept under good command, to prevent her being set on either bank.

When using the Hopetoun or the Geelong South channels, their limited width must be especially remembered, so that every precaution may be taken to avoid collision with other vessels, or with the buoys or beacons. It is not advisable for vessels to pass each other from opposite directions in these channels; but a vessel should wait outside either entrance when another vessel is seen entering from an opposite direction, until she has passed through.

North channel.—A vessel of less than 9 feet draught bound from the Outer to the Inner harbour may proceed for the buoys at the entrance of the Artificial cut, and having passed through this channel, as before directed, steer to leave the eastern black can buoy of the South channel on the port hand, and the red conical buoy with staff and globe S.W. of Bird rock on the starboard hand; then steer for the east black buoy of the North channel, leaving it and

the black buoys and beacon of the channel on the port, and the red buoy and beacon on the starboard, hand.

Hopetoun channel.—From Wilson spit red gas buoy steer about W.N.W. (N. 67° W.) for the eastern light beacon. Then enter the channel and keep the beacons marking the north side of the channel on the starboard hand and the beacons marking the south side on the port hand. As the channel is only 110 feet in width careful steerage is necessary.

At night.—In navigating the Hopetoun channel at night leave the white lights marking the north side of the channel on the starboard hand entering from the outer harbour, and the red lights marking the south side of the channel on the port hand.

NOTE.—The speed of steam vessels navigating the Hopetoun channel or the Geelong South channel is not to exceed 5 miles an hour, and no sailing vessel is to enter either of the above channels whilst any other vessel is proceeding through such channel in an opposite direction.

For signals to be made by vessels aground in this channel, *see* page 479.

ANCHORAGES.—Having cleared the South channel steer S.W. $\frac{1}{2}$ S. (S. 39° W.) 3 miles and anchor in $4\frac{1}{2}$ fathoms, 3 cables northward of the Geelong wharves; the bottom being soft mud mixed with sand and clay, a long scope of chain is necessary in strong winds, to prevent the vessel from driving.

Having cleared the North channel steer S.W. by S. (S. 34° W.) $3\frac{1}{4}$ miles, and anchor off Geelong wharves, as directed when coming from the South channel.

Having cleared the west or inner beacon of Hopetoun channel, steer about S.W. $\frac{1}{2}$ W. (S. 51° W.) nearly $1\frac{3}{4}$ miles and anchor as above directed.

Gunpowder anchorages.—*See* page 499.

Mooring.—All vessels in Geelong harbour must moor, for which purpose every vessel should be provided with a strong mooring swivel.

From GEELONG to HOBSON BAY.—If drawing more than 14 feet, after passing through the South channel and the

Artificial cut, proceed S.E. by E. (S. 56° E.), or on passing through the Hopetoun channel E.S.E. (S. 67° E.), for Wilson spit red gas buoy, from whence the course is N.E. $\frac{1}{4}$ N. (N. 42° E.), and the distance $25\frac{1}{2}$ miles, to point Gellibrand light-vessel. In a vessel of heavy draught, first steer N.E. $\frac{1}{4}$ E. (N. 48° E.) until Station peak bears W.N.W. (N. 67° W.), and then alter course to N.E. $\frac{1}{2}$ N. (N. 39° E.) for point Gellibrand, to avoid the shoal water off Werribee river, and be outside the 5-fathoms edge of the bank between it and point Gellibrand, passing two-thirds of a mile off the black buoy which marks the shoal projecting from point Cook.

From HOBSON BAY to SEA by the West channel.—Sailing vessels bound to sea from Hobson bay by the West channel will generally clear the heads the same day, by leaving Hobson bay two or three hours before daylight, when there is frequently a moderate land or northerly wind. A S. by W. $\frac{1}{4}$ W. (S. 14° W.) course for 20 miles, from a fair berth off the light-vessel, leads to the West channel lighthouse, where, if prevented by southerly gales from proceeding through the channel, there is good anchorage with the lighthouse bearing S. by W. (S. 11° W.), and Station peak just shut in with Indented head.

From the northern entrance proceed through the West channel, following inversely, the directions already given for going northward, keeping the red conical and No. 12 red gas buoys on the port, and the black can buoys on the starboard, hand. Having passed Swan spit black gas buoy at the distance of one cable, steer about S.W. by W. (S. 56° W.), passing between No. 1 black can buoy on the starboard, and the Royal George No. 2 red gas buoy on the port hand, and keeping point Lonsdale a little open of Shortland bluff. When between No. 1 and No. 2 buoys steer to pass a quarter of a mile off Shortland bluff and then bring the Shortland bluff lighthouses in line bearing N.E. by N. (N. 34° E.), which mark kept on astern leads between the heads to sea; due attention must be paid to the tidal streams which do not set fairly through the channel.

South channel.—From Hobson bay to sea by the South channel steer from Gellibrand light-vessel about S. $\frac{3}{4}$ E. (S. 8° E.) 27 miles, for No. 15 black gas buoy, which marks the east spit of the Middle

ground, after rounding which haul up S.W. by W. (S. 56° W.) for the White cliff, until South channel pile lighthouse comes open to the northward of Observatory point flagstaff; then steer for the lighthouse, pass close northward of the gas buoys marking the south edge of the dredged channel, and about one cable south of No. 9 buoy, then gradually bring the pile lighthouse in line with the Eastern lighthouse; these kept in line astern, bearing E. $\frac{3}{4}$ S. (S. 82° E.), lead down in mid-channel; the red conical buoys are left on the port, and the black can and gas buoys on the starboard hand.

Keep the leading mark on and pass $2\frac{1}{2}$ cables South of No. 3 black can buoy and 4 cables South of No. 1 black can buoy. In ships of heavy draught avoid the 26 and 28 feet patches about midway between these buoys, $1\frac{1}{2}$ cables to the north and one cable to the south of the track. From 4 cables South of No. 1 buoy steer W. $\frac{1}{2}$ S. (S. 84° W.) leaving the Popes Eye red and white buoy 6 cables on the starboard hand, taking care to keep Barwon head just open of point Lonsdale until Shortland bluff lighthouses are in line N.E. by N. (N 34° E.), with which marks on astern, proceed out between the heads to sea, or if in a vessel of heavy draught, bring the beacons in Lonsdale bight in line bearing N.N.W. $\frac{1}{4}$ W. (N. 25° W.), and steer out with them so astern, see pages 477, 478, paying due attention to the tidal streams.*

At night.—From Hobson bay at night steer about S. $\frac{3}{4}$ E. (S. 8° E.); the Eastern light will then be made nearly ahead, and when the *occuling* white light of No. 15 buoy is seen steer to pass to the eastward of it. Having passed the buoy at a distance of about 2 cables, continue to the southward till the pile light has fully changed from white to red, then alter course towards it, bearing in mind that the northern limit of the red light passes less than a cable south of the Middle ground. Pass close northward of the *fixed* green and the *fixed* white lights of the gas buoys marking the dredged channel; then gradually bring the pile and Eastern lights in line astern bearing E. $\frac{3}{4}$ S., which lead through the South channel.

When point Lonsdale light bears about W. by S., the northern limit of the deep red light, steer for it, until Shortland bluff low light changes

* H.M.S. "*Cordelia*" in 1892, passed to sea between the heads against a strong in-going tidal stream and a moderate south-west gale with a heavy sea; the ship had plenty of steam and no difficulty was experienced.

See charts, Nos. 1,171*a* and *b*, and Nos. 2,747*a* and *b*.

from white to red. Then bring the Shortland bluff lights in line astern, bearing N.E. by N. (N. 34° E.), which lead between the heads to sea. Attention must be given to the tidal streams.

Working.—Vessels leaving Hobson bay against strong southerly winds, especially during the summer months, when these winds prevail, will get to sea sooner by working down the eastern side of port Phillip, and going through the South channel, where having smooth water, they will be enabled to lead through the South channel, down to the entrance between the heads; by beating down the middle of port Phillip, and taking the West channel, more swell will be experienced, and a large vessel probably have to anchor off the West channel lighthouse, and wait for a shift of wind.

To work out between the heads, the tidal streams must be attended to, and it is better to do so near slack water, when the race is nearly quiescent and greater command of the vessel obtained. With an out-going tidal stream and light winds, be careful not to be drawn into the bight between Shortland bluff and point Lonsdale, the stream setting from thence directly over Lonsdale reef. A vessel within its influence, nearly becalmed, and having only her sails to trust to, has no resource but that of dropping her anchor, which she is nearly certain to lose, from the rocky nature of the ground.

From GEELONG to SEA by the West channel.—From the Artificial cut steer S.E. by E. (S. 56° E.), or from the east end of the Hopetoun channel E.S.E. (S. 67° E.), for Wilson spit red gas buoy, and from thence N.E. by E. (N. 56° E.) for the black gas buoy off Richards point. Having passed close outside this buoy, haul in E. $\frac{1}{2}$ N. (N. 84° E.) to go half a mile northward of the black gas buoy off Prince George bank, and when the buoy bears S. by W. $\frac{1}{2}$ W. (S. 17° W.), steer S. by E. $\frac{1}{4}$ E. (S. 14° E.) for the West channel pile lighthouse whence proceed through the channel and to sea, as directed when going from Hobson bay.

By the South channel.—From Geelong to sea, proceed as just directed, to half a mile northward of the black gas buoy off Prince George bank; and from thence proceed S.E. $\frac{1}{2}$ S. (S. 39° E.) 15 miles for No. 15 black gas buoy, which marks the eastern spit of the Middle ground, and having rounded this, follow the directions given for proceeding to sea from Hobson bay by the South channel.

Anchorage.—Vessels having good ground tackle may, if necessary, anchor in any part of port Phillip above the entrance banks, there being nowhere a greater depth than 15 fathoms, and good holding ground.

Outside the heads.—Steam and coasting vessels from port Phillip bound round cape Otway, encountering heavy weather, might, instead of running back to the heads, find shelter in Louttit bay, in 5 to 7 fathoms, about half a mile from the shore, sheltered from all winds from South, round westerly, to N.E.; or in Apollo bay, in from $4\frac{1}{2}$ to 7 fathoms, at about half a mile to a mile off shore. Vessels availing themselves of either of these bays have only to round the reefs off the points, at a moderate distance, taking care to avoid the Henty reef, and may then choose an anchorage in $5\frac{1}{2}$ fathoms, sand. See pages 425-6.

TIDES.—Within the heads the tides are most irregular, the narrow entrance to the large basin within checking the fair course of the tidal wave; hence after southerly gales it may be high water all day, and the contrary with northerly gales.

On the average, it is high water, full and change at :—

		h. m.	ft. in.	ft. in.
*Entrance to Port Phillip	} at	2 0	springs rise —	; neaps rise —
		[Approximate.]		
Dromana bay	- „	2 19	„ 3 0	„ 2 6
Snapper point	- „	2 14	„ 2 8	„ 2 0
Bellarine jetty	- „	2 21	„ 2 6	„ 2 0
Bird rock	- „	2 30	„ 3 6	„ 2 6
Point Henry,	} „	2 39	„ 3 0	„ 2 6
Geelong				
Williamstown	- }	2 31	„ 2 8	„ 2 2
Hobson bay-				
Queen's Wharf,	} „	2 48	„ 2 8	—
Melbourne				

*With the view to the determination of the true establishment of the entrance to port Phillip, it is proposed (April 1895) to erect registering tide gauges at cape Schanck, Eagle Nest point, point Nepean, Queenscliff, and the South and West channel pile lighthouses.

See charts, Nos. 2,747a and b, Nos. 1,171a and b, and No. 1,694.

The mean water, or half tide level, varies as much as the rise and fall of the tide, it being influenced by the strength and direction of the wind outside the heads. Southerly gales cause an elevation of both high and low water, and northerly gales have a contrary effect; the latter sometimes keeps back the flood tide for an hour, or even $1\frac{1}{2}$ hours later than the time by calculation. See page 442.

TIDAL STREAMS.—The streams turn from 2 to 3 hours after high and low water on the shore. In the middle of the entrance between point Lonsdale and point Nepean the period of slack water is very limited. For tidal signals, see page 431.

Set of the In-going stream.—The In-going stream comes from the southward and eastward, increases in strength as it nears the heads, sets right into the entrance, across and through the reefs, with great force, and spreads towards Shortland bluff and point King. The stream decreases in strength as it enters the channels, setting towards Swan point and through the West channel in an oblique direction, tending towards Coles channel and Indented head; and above the West channel lighthouse, north-westward across Prince George bank; spreading from thence towards Geelong, point Cook, and Hobson bay. In the South channel the stream sets to the E.N.E., across the Middle ground, through Pinnacle channel, and spreads along the eastern shore towards Hobson bay.

Set of the Out-going stream.—The Out-going stream sets out of Hobson bay south-eastward for a few miles, when it takes a more southerly direction towards Prince George bank; it then passes obliquely through the various channels, the stream from Symonds channel joining and turning that of the West channel below the Royal George sand, setting towards the bight between Shortland bluff and point Lonsdale, and from thence out through the heads at a great rate; the body of the stream setting athwart the entrance towards point Nepean, and away south-eastward along the land and in to the shore between point Nepean and cape Schanck.

Between the heads the stream runs from 5 to 7 knots; in the West and South channels between 2 and 3 knots; and about $1\frac{1}{2}$ knots in the broad space above the channels. In Hobson bay during the winter months, there is always a surface current running out, owing to the freshets from the river Yarra; this current frequently sets along both sides of the bay, at the rate of 2 knots. The stream is

weak in Geelong bay, but in the North channel it sets $2\frac{1}{2}$ knots across the bar, and becomes weaker as it spreads over the Inner harbour of Geelong.

Mooring.—All vessels in Hobson bay and Geelong harbour must moor with two anchors, for which purpose every vessel should be provided with a strong mooring swivel.

Repairs.—There are several foundries in Melbourne and Williamstown capable of undertaking marine repairs of every description. At Geelong there is a firm that can execute large repairs.

Coal.—*See* page 9.

Water.—Vessels in Hobson bay can water by sending boats under the spout at the Port Melbourne watering-place, or be supplied by floating tanks.

Water Police.—The water police are quartered on board a vessel in Hobson bay, and at all times row guard amongst the shipping.

Signals.—The following signals are in use at the ports of Victoria:—

Mails on board	-	-	{	White flag at the fore, to be kept flying till the mails are out of the ship.
Gunpowder on board	-	-	-	Pilot jack at the main.
Government emigrants on board	-	-	-	Ensign at the mizen head.
Sea pilot	-	-	-	Pilot jack at the fore mast-head.
Harbour pilot	-	-	-	Ensign at the fore mast-head.
Boarding officer	-	-	-	Blue flag at the main.
Medical assistance	-	-	-	Letter B at the peak.
Water police	-	-	{	Day signal, Ensign at the main mast-head; by night, two lights vertical, five feet apart, at any mast-head or peak.
Customs boat	-	-	-	Pilot jack at the peak.
Steam-boats	-	-	-	Rendezvous flag at the peak or mizen-mast.
Clearing officer outwards	-	-	-	White flag at the main when the ship is ready for sea.
Water	-	-	-	Letter M at mizen.
Health officer	-	-	{	Ensign at main-mast head with blue flag underneath.
Quarantine	-	-	-	Yellow flag at the main.

Launching vessels from	} Red flag on flag-staff one hour before launching.
patent slips or building	
yards - - - - -	} Letter S at mizen.
Ballast - - - - -	

And from the signal station :—

A ball at the yard arm -	} Sailing vessel in sight making for port from eastward or westward as ball is hoisted at East or West yard arm. Hauled down when anchored.
A ball at the mast-head and at the yard arm -	
Flag P at mast-head -	} Steamer in sight making for port from eastward or westward as ball is hoisted at East or West yard arm.
	- Bad weather signal, cannot work in the bay.

Wharf regulation.—The propelling engines of any vessel are not to be worked whilst moored alongside any wharf in the ports of Victoria without permission of the port or wharf authority.

Time signals.—A black time ball is dropped daily, Sundays excepted, from a staff on the time ball tower at Gellibrand point, at 1 h. 0 m. 0 s. p.m., standard time of Victoria, equivalent to 15 h. 0 m. 0 s. Greenwich mean time. This signal when hoisted is 72 feet above high water and the drop is 11 feet. The ball is dropped by electricity from Melbourne Observatory. An error of one-third of a second is notified in the next day's newspapers. *See page 30.*

A ball is also dropped from the telegraph office, Geelong, at 1 h. 0 m. 0 s. p.m., standard time of Victoria, equivalent to 15 h. 0 m. 0 s. Greenwich mean time. This signal is 122 feet above high water and the drop is 12 feet. The ball is dropped by electricity from Melbourne Observatory.

At the signal station, Queenscliff, a flag is dipped in coincidence with the time ball signal.

These signals are not made on Sundays or public holidays.

Position.—Melbourne Observatory is in latitude $37^{\circ} 49' 53''$ S., and in longitude $144^{\circ} 58' 32''$ E. of Greenwich.

Adjustment of compasses.—The fall of mount Macedon is a good distant mark to use, when swinging in Hobson bay, to ascertain the deviation of the compass. *See page 462.*

There are several compass adjusters, who, if required, swing the vessel and furnish tables of deviation, for which they make a small charge.

A buoy for the adjustment of compasses is moored off the end of the railway pier, Geelong. From it the angle between the lamp post at the end of the railway pier and the gas works chimney is $102^{\circ} 50'$, and between the lamp post at the end of the railway pier and chimney, Volumn's brewery, $45^{\circ} 44'$.

The magnetic bearings of the undermentioned marks from the buoy are as follows, the magnetic variation being considered $7^{\circ} 52' E$.

Station peak, N. $6^{\circ} 5' E$.

Flag staff, point Henry, N. $73^{\circ} 3' E$.

Conspicuous tree, Stingaree bay, S. $84^{\circ} 41' E$.

Flagstaff, Botanic gardens, S. $37^{\circ} 33' E$.

Conspicuous tree in hollow, mount Anakie, N. $24^{\circ} 51' W$.

Chimney, Geelong gasworks, N. $38^{\circ} 52' W$.

Before using this buoy for swinging ship, it should be ascertained that it is in position.

Barometers.—With the view of enabling masters to test the accuracy of their barometers, the Government Astronomer issues daily in the newspapers a notice from the Williamstown Observatory, showing the height of the standard barometer for the previous day, a comparison with which and the height of the vessel's barometer—the altitude being the same—will show the error, if any. The attention of masters of vessels is specially invited to this notice, as it is evident that the value of meteorological data, collected by different vessels, will be materially enhanced by the barometer readings agreeing with the standard.

Ship's Log-books.—The Chief of the Melbourne Magnetic Observatory invites masters of vessels to deposit their log-books with him for a few days, to enable him to glean facts important to nautical science, for the purpose of constructing wind and current charts of these coasts. The immigration officer will take charge of any log-books for transmission to the Observatory, and return them within four days.

Port Regulations.—Quarantine.—Masters of vessels arriving, report to the pilot the places at which they loaded and touched, and answer all questions respecting the health of the crew and passengers, under penalty of 100*l.*

The pilot is to give notice to the master if the vessel is liable to quarantine, whereupon he shall hoist a yellow flag, under penalty on the master of 100*l.*

Pilots conducting vessels liable to quarantine to any place not specially appointed for such vessels, liable to a penalty of 200*l.*

A master refusing to deliver to the superintendent of the quarantine station the bill of health, manifest, &c., liable to a penalty of 100*l.*

A master quitting, or suffering persons to quit, his vessel, if liable to quarantine, or not conveying such vessel to the place appointed, liable to a penalty of 400*l.*

Persons quitting such vessels liable to a penalty of 300*l.* and six months' imprisonment.

And all persons neglecting duty, damaging goods, or landing, receiving, or secreting goods, &c., from vessels liable to, and actually performing, quarantine, are subject to penalties varying from 100*l.* to 500*l.*

All vessels from other than Australian ports must undergo an examination at the Heads by the health officer.

Gunpowder.—The master of every ship arriving in any port of Victoria with gunpowder on board shall specially report the same at the time of making entry at the Custom-house. All vessels, entering or in, the ports of Victoria having more than 20 pounds of gunpowder on board shall hoist the pilot jack at the main. Gunpowder may be landed only between 7 a.m. and 5 p.m. No boat shall be used for the conveyance of gunpowder, either to or from any ship or wharf or other place, unless duly licensed for that purpose, and no gunpowder shall be landed or conveyed from the ship until notice shall have been given to the water police (if there be any) at the port or place where the ship shall lie, in sufficient time to enable the police to give such directions as may be necessary to prevent danger; which directions the person in charge of such gunpowder shall obey. Boats licensed to convey explosives are subject to all the regulations for the management of hulks containing explosives; and no boat

with explosives on board shall be towed by a high pressure open-decked steam-boat, whose furnaces are exposed, or by any steamer with less tow-line than 60 feet in length, and no steamer shall approach within 60 feet of any hulk, lighter, or boat containing explosives. No gunpowder shall be removed from any ship for conveyance to the magazine except between the hours of 7 a.m. and 4 p.m., and gunpowder shall only be permitted to be deposited in the magazine between those hours.

Vessels receiving gunpowder must be anchored beyond the limits within which ships having gunpowder on board are not permitted to anchor, and it may only be put on board between the hours of 7 a.m. and 4 p.m.

The importer of gunpowder, at any port where there is a public, or licensed private, magazine, shall within 24 hours after the arrival of the importing ship enter such gunpowder at the Custom-house and obtain, from the principal officer, a permit for the same to be landed and deposited in such magazine.

Gunpowder anchorages.—No vessel having more than 20 pounds of gunpowder on board, arriving in or off any of the under-mentioned ports of Victoria shall be permitted to anchor within the limits hereinafter specified, viz. :—

Port of Melbourne, within three-quarters of a mile of Gellibrand point; nor to the northward of a line bearing East from the light-vessel.

Geelong Outer harbour, within 2 miles of the shore.

Geelong Inner harbour, within three-quarters of a mile of Limeburners point, nor to the westward of a line bearing N.N.W. from that point.

Portland bay, within three-quarters of a mile of the shore; nor to the northward of a line bearing East from the lighthouse.

Port Fairy, within three-quarters of a mile of the shore; nor to the westward of a line bearing N.N.E. from the lighthouse.

Port Warrnambool, within half a mile of the shore; nor to the westward of a line bearing S.S.W. from the beach lighthouse.

Port Albert, within 2 miles of the wharves; nor to the northward of Sunday island.

Damaging buoys, &c.—Any person damaging light-vessels, buoys, or beacons is liable to a penalty of 100*l.* to 20*l.*

Pilotage.—The employment of pilots is optional with all vessels belonging to Her Majesty.

MELBOURNE.—Few cities can boast of so rapid a rise as Melbourne. It was first settled in 1835, when the population numbered 14. By the census of 1841 its population was 4,440; by that of 1846 it was 10,945; and by that of 1851, two months before the gold discoveries, it was 23,143. In 1891 the area of the city was 163,942 acres, and the population, including suburbs, amounted to 438,955 inhabitants at the end of 1894.

It is the capital of the colony of Victoria, and stands on seven hills, rising gradually from the Yarra; it is laid out in broad straight streets at right angles to each other, and has many handsome public buildings. Its secure port and central position, with the network of railways and rivers connecting Melbourne with a large portion of Australia, command for it the chief export and import trade of an immense pastoral and agricultural district, independently of the demands of the gold-fields.

There is good wharf accommodation for steam vessels and other craft drawing 19 feet water, Yarra river having been made navigable for such. The principal articles of import are, manufactured goods of all kinds, provisions, machinery, railway materials, coal, timber, wine, spirits, &c. The principal exports are gold, live stock, hides, wine, timber, and wool.

The principal trade appears to be with the United Kingdom. In 1894 vessels of a tonnage of 4,025,492 entered and cleared at Melbourne.

Meteorological observations.—In 1890 at Melbourne, the maximum temperature in the shade was 103·4° Fahr., the minimum 29°, and the mean 58·7°; the mean height of the barometer was 29·92 inches; and the amount of rainfall was 24·24 inches, rain falling on 140 days. On an average the thermometer rises to above 100° in the shade on 4 days in the year and falls below freezing point on 3 nights in the year. The mean temperature is 57·3°, the maximum registered in the shade for 32 years 111·2°, the minimum 27°. Rain falls on an average on 131 days annually, the amount averaging 25·75 inches. In 25 years the extremes as regards rainfall were 33·76 inches in 1870, and 15·94 inches in 1865.

CHAPTER VII.

AUSTRALIA.—SOUTH COAST, PORT PHILLIP TO CAPE
HOWE.—BASS STRAIT.

 VARIATION IN 1897.

Cape Schanck, 8° 15' E. | Cape Howe, 9° 50' E.

Nearly stationary.

The **COAST** from point Nepean trends S.E. $\frac{3}{4}$ E. 16 miles to cape Schanck, and may be approached to one mile in 8 to 16 fathoms. The highest hill along it is 433 feet above the sea, 2 miles north of the cape.

CAPE SCHANCK, the southern extremity of the peninsula which separates port Phillip from port Western, is a narrow cliffy head, 278 feet high, close off which is the remarkable Pulpit rock, with a smaller rock lying S. by E., nearly a quarter of a mile from the cape.

Caution.—The reef to the southward of Pulpit rock lies S.S.E. about 7 cables from the lighthouse; in passing the light it must therefore be given a wide berth.

Signal station.—There is a signal station at cape Schanck lighthouse and vessels can communicate by the commercial code. It is connected with the telegraph system.

LIGHT.—The lighthouse on the highest part of cape Schanck, at about half a mile N.N.W. from Pulpit rock, is a white circular stone tower about 70 feet high, which exhibits at 328 feet above the sea, a *fixed and flashing* white light, visible between the bearings of

See charts, No. 1,063, Western approach to Bass strait, scale $m = 0.19$ inch; No. 1,695*a* and *b*, Bass strait, scale $m = 0.2$ inch; No. 1,171*a*, port Phillip, scale $m = 1.0$ inch; No. 1,707, port Western, scale $m = 1.0$ inch.

N. 87° W. and S. 53° E., and which may be seen from a distance of 23 miles in clear weather. The light shows for one minute, then it is eclipsed for 25 seconds, when it shows for 10 seconds and is again eclipsed for 25 seconds. When within 6 miles of the light, the eclipses are scarcely observable, and a faint light is seen between the flashes.

Danger light.—From cape Schanck lighthouse an auxiliary *fixed* red light is also exhibited. It is visible through an arc of 180° seaward, but is invisible to an observer, whose eye is 14 feet above the sea, until at a distance of 3 miles or less from the light. It is intended to warn mariners of too near approach to the shore, and when seen, course should be altered to seaward until it is out of sight.

In misty or hazy weather mariners should not rely on sighting this red light, but should keep a good offing.

It is desirable to sight cape Schanck before running far into the great bight for port Phillip; and if the wind blows strong from the southward, it is unsafe to run without having seen it. The cape is also an excellent mark for port Western, the western and principal entrance of which lies between 7 and 10 miles eastward of the cape.

On the east side of cape Schanck a rocky bight extends E. by N. $\frac{1}{2}$ N. $1\frac{1}{2}$ miles to Barker point; and at half a mile to the W.N.W. of the point is a small stream of fresh water. From Barker point the coast, which is closely bordered with rocks, trends E. by N. $\frac{1}{2}$ N. $5\frac{1}{2}$ miles to West head.

West head, a clifty projection 85 feet high, and enclosed by reefs, with a 10-foot rock lying S.E. two-thirds of a mile from it; this head forms the western point of port Western.

PORT WESTERN is an extensive bay, protected from the sea by Phillip island, between the west point of which and West head is the West entrance to the port; the East entrance being a narrow channel separating the east end of the island from the mainland to the eastward.

The north shore of port Western, from West head, curves N.N.E. $\frac{1}{2}$ E. $7\frac{1}{2}$ miles, and thence E. $\frac{3}{4}$ S. 5 miles to Sandy point, forming a bight, the north-eastern and greatest portion of which is

occupied by shoal water, thickly strewed with knolls, extending from the shore to Middle bank, which trends S.W. by W. $\frac{1}{2}$ W. $4\frac{1}{2}$ miles, and S.S.W. 2 miles from Sandy point; and is reported to have extended half a mile further to the south-west. The high land (275 feet) near Barker point open of West head bearing W. by S. $\frac{1}{2}$ S. (S. 73° W.) until Tortoise head bears N.E. $\frac{3}{4}$ E. (N. 53° E.) clears the south-west edge of the bank. Between the south-west spit of this bank and West head there are 4 to 10 fathoms.

Light.—A *fixed* light is exhibited, from a lamp-post 24 feet high, on the outer end of Flinders jetty, N.W. two-thirds of a mile from West head. The light is white between the bearings of N. 42° W. and S. 84° W., red north of the latter bearing, and can be seen 4 miles.

Anchorage.—There is a red mooring buoy off the end of the jetty; to avoid fouling the telegraph cable, anchor off the jetty within the limits of the bearings of the red light by day, and with the red light in sight by night. The telegraph cable from port Dalrymple, Tasmania, is landed here.

Grant point, E. by S. $\frac{1}{2}$ S. $4\frac{1}{2}$ miles from West head, is a craggy projection, forming the west extreme of Phillip island, and a reef extends W.S.W., a quarter of a mile from it to Round islet, which is 98 feet high. At S.W. $\frac{1}{2}$ S. three-quarters of a mile from this islet is Black rock, which is 34 feet above high water and fringed by a reef, on which the sea breaks heavily with a southerly swell; between the reef and Round islet is a passage with $5\frac{1}{2}$ to 7 fathoms water, available for small craft, on an emergency.

The south shore of port Western, or the north-west coast of Phillip island, from Grant point, trends N.N.E. one mile to the rocky south-west point of Cat bay; reefs project a quarter of a mile from this shore and from the south side of the bay. From the bight of this little bay the coast sweeps round N. by E. $\frac{1}{2}$ E. $2\frac{1}{2}$ miles to McHaffie reef, which is marked by a red buoy; then N.E. 2 miles to Red rock, off which is a red buoy; and East 5 miles to Observation point, the north-east end of the island; for the first $4\frac{1}{2}$ miles it is bordered by reefs, and thence to the point it is steep and sandy; none of these reefs project beyond a quarter of a mile from the shore.

About 2 miles eastward of Red rock is Cowes jetty, which extends

nearly 400 yards northward. There is a red mooring buoy off its north end.

Light.—A *fixed* white light is exhibited from the end of Cowes jetty, which should be seen from a distance of 5 miles in clear weather.

The township of Cowes is southward and westward of the jetty; there is a telegraph station here. Communication is by steamer to Stony point, thence rail. It is a splendid watering place and there is excellent shooting and fishing. Population 340.

Observation point, which is low, broken, and swampy, is separated from the higher land south of it by a shallow creek, 2 cables wide at its mouth, whence it branches to the south-westward.

The West entrance of port Western, which lies between West head and Grant point, is $3\frac{1}{2}$ miles wide between Black rock and the 10-foot rock off West head, with 15 fathoms in mid-channel and 5 to 6 fathoms close to the rocks on either side; and being open and free from any other hidden danger, it is easy of access, and affords sufficient room for a vessel of any size to work in or out. From $3\frac{1}{2}$ miles within the entrance a clear channel one to $1\frac{1}{2}$ miles wide, with 6 to 17 fathoms water, extends N.E. $\frac{3}{4}$ E., between Philip island and Middle bank, to abreast of Sandy point, where the port divides into two arms, one trending North and the other East.

Tortoise head, E. by N. $\frac{1}{4}$ N. $1\frac{3}{4}$ miles from Sandy point, is the south end of a table-topped isle nearly one mile long, with a low point projecting from its west side; reefs extend a quarter of a mile from this and the head, and a spit, with 13 feet water on it, projects S.W. three-quarters of a mile from the latter.

French island, on the north side of the eastern part of port Western, is 11 miles long, east and west, and $7\frac{1}{2}$ miles broad at its west end, between Tortoise head and Scrub point, whence it narrows to 4 miles towards Spit point, the east extreme of the island. The southern and greater portion of the island is hilly; but the north-western part and northern coast are low and marshy. From the south-west extreme of French island its southern coast trends E. by S. $\frac{1}{2}$ S. $3\frac{3}{4}$ miles to its south point; between this and Finger point, at N.E. $\frac{3}{4}$ E. 2 miles from it, is a shoal bight, in the entrance of which is Elizabeth isle, 60 feet high.

The bights formed between Tortoise head and the south point of French island, and that from thence to Finger point, are filled with mud-flats, having one to 5 feet water on them at high water, with navigable creeks reaching in to the shore. From a 15-foot spit, marked by a buoy, at S.S.W. $\frac{1}{2}$ W. $1\frac{1}{4}$ miles from Tortoise head, the 5-fathoms edge of the bank, which is mostly covered by these mud-flats, trends E. $\frac{1}{2}$ N. 4 miles, and then sweeps round close outside Elizabeth isle to Finger point.

The North arm of port Western is one mile wide between Sandy point and the spit $1\frac{1}{4}$ miles S.S.W. of Tortoise head; and from its entrance trends N. $\frac{1}{2}$ W. 10 miles to Watson inlet, the width increasing to 3 miles between Scrub point and the western shore,

The channel of the North arm is on the west side, between the mud-flat which projects one to 4 cables from the shore, and the banks which extend a quarter of a mile to 2 miles from the west side of French island. This channel is three-quarters of a mile to one mile wide with 11 to 6 fathoms water, from the entrance to abreast Scrub point. The banks on the east side of the arm are separated from French island by a passage about one-third of a mile wide, with $3\frac{1}{2}$ to 8 fathoms water in it, but it is encumbered with shoal patches.

At N.W. by N. 2 miles from Sandy point is a shoal inlet; and between Crib point, at N. by W. $\frac{3}{4}$ W. 4 miles, and Long islet, N. by W. $\frac{1}{4}$ W. 6 miles from Sandy point, the low western shore forms a bight, in the southern part of which is Sandstone isle, lying N.N.W. $1\frac{1}{4}$ miles from Crib point. This bight is filled by a flat, intersected by creeks, the largest of which, from half a mile north-eastward of Sandstone isle, winds north-west about $1\frac{1}{2}$ miles to the town of Hastings; this creek is marked by beacons, and has irregular depths of one to 5 fathoms.

Off Stony point at $2\frac{1}{2}$ miles, and at $4\frac{1}{2}$ miles northward of Sandy point, 4-fathoms shoals project half a mile from the bank which borders the western shore.

A jetty extends about 600 yards eastward from Stony point.

The railway from Melbourne ends near here.

Light.—A *fixed* white light, 33 feet above high water, is exhibited from a lamp post on the end of Stony point jetty. It should be seen from a distance of 3 miles in clear weather.

There are several shoal patches north-west of Scrub point, that on the northern side of the fairway being Eagle rock, which is awash at low water and marked by a red beacon, consisting of a staff and ball, 12 feet high, N.W. by N. $1\frac{1}{4}$ miles from the point.

A beacon bearing N. by E. a little more than three-quarters of a mile from Scrub point is on Crawfish rock on the south side of Bagge harbour. The beacon is 15 feet high, with a 5-foot square top painted white.

Between Scrub point and Quail island, $2\frac{1}{2}$ miles northward of it, in which space is Bagge harbour, the North arm turns to the eastward into a sheet of water extending 9 miles east and west, and 4 miles across, between the north side of French island and the low mainland to the northward and eastward, the north shore being intersected by numerous creeks and inlets. This sheet of water is occupied by a mud-flat, with 6 to 8 feet on it at high water, ordinary springs, and numerous channels branching into it from the North arm. There are 13 to 4 fathoms for about 4 miles into the flat from Eagle rock; but few of the smaller branches of this navigable water carry 6 feet water to within half a mile of the low woody shores.

Anchorage.—There is anchorage at the entrance of the North arm in 7 fathoms water, at a quarter of a mile to the eastward of Sandy point.

Hastings, a post town and telegraph station, 41 miles from Melbourne, with a population in 1891 of 388; it is an extensive fishing station, and supplies the Melbourne market to a considerable extent, with which place it is connected by rail.

Lights.—A *fixed* white light is shown from the end of Hastings jetty, and should be seen in clear weather from a distance of 3 miles. Towards the channel the light is red.

A *fixed* white light is exhibited from Tooradin, about N.E. $\frac{3}{4}$ N. 6 miles from Scrub point. The light should be seen from a distance of 3 miles in clear weather.

The East arm of port Western, between the north side of Phillip island and the bank which extends from the south side of French island, is $1\frac{1}{4}$ miles wide, with regular soundings in 7 to 9 fathoms. At one mile North of Observation point is the west point of a narrow

spit, with 12 to 6 feet water on it, projecting W.S.W. and West $2\frac{3}{4}$ miles from the shoal flat which nearly fills the eastern part of port Western. Between this spit and the north-east extreme of Phillip island there is a bight in the shoal flat, extending 2 miles east and west, and one mile across, where vessels may anchor in 6 to 8 fathoms sand and shells. From the west point of the spit the northern branch of the East arm sweeps round eastward and north-eastward past Elizabeth island and Finger point, and is two-thirds of a mile to half a mile wide, with $4\frac{1}{2}$ to 11 fathoms water between the banks which border the south coast of French island, and the shoal flat on its south side.

Settlement point, E. $\frac{1}{2}$ N. $1\frac{1}{2}$ miles from Finger point, is a rocky projection of the mainland, between which and the south-east extreme of French island, at W.N.W. $1\frac{1}{4}$ miles from it, are Pelican islet and Schnapper shoal, the latter marked by a white beacon, with a square top, 16 feet high. The islet lies W. by N. half a mile from Settlement point, with which it is connected by a reef; and Schnapper shoal, which lies between Pelican islet and French island, divides the East arm into two narrow channels with only $3\frac{1}{4}$ to 4 fathoms water.

There is a white beacon, a staff and ball, 16 feet high, about 100 yards N.N.W. of Settlement point, and a black beacon, a staff and ball, bearing W.N.W. 240 yards from the white beacon.

From Settlement point the coast trends E. $\frac{3}{4}$ N. 3 miles to Queensferry, between which and Passage point, at one mile N.E. of Spit point, is a bight 2 miles deep, forming between it and the island a sheet of water $2\frac{1}{2}$ to $3\frac{1}{2}$ miles wide, the south eastern and greater portion being filled by mud-flats, having 6 to 9 feet on them at high-water springs. The East arm branches into this space and round Spit point, much as the North arm does into the mud-flat north of the island.

Lights.—A *fixed* red light is exhibited from the jetty end at Queensferry, and a *fixed* white light from the jetty end at Grantville.

DIRECTIONS.—The tidal streams always raise a sufficient ripple to break on the banks which form the north-west side of the main channel, giving timely notice of the shoal water on that side;

but if this cannot be trusted steer for Tortoise head, bearing N.E. $\frac{3}{4}$ E. (N. 53° E.), and well open of the north-west point of Phillip island, to avoid McHaffie reef which projects from it. To clear Middle bank, *see* page 503.

The red buoy off McHaffie reef, and the red buoy on the edge of the shoal near Red rock must be left on the starboard side entering.

The north coast of the island, although bold, should not be approached within half a mile, as the tidal streams set along it at a great rate, and may, in light winds, sweep a vessel too near the shore. Having arrived abreast of Sandy point, proceed northward or eastward.

Anchorage.—There is good anchorage in 8 fathoms, at half a mile off Observation point.

PHILLIP ISLAND is 12 miles long, and $4\frac{3}{4}$ miles across, at its western and broadest part; the eastern end of the island being a peninsula, connected with the western part by an isthmus half a mile broad, at $8\frac{1}{2}$ miles eastward of Grant point.

Quoin hill, N.E. by E. $\frac{1}{2}$ E. $3\frac{1}{4}$ miles from Grant point, is 218 feet high.

South coast.—From Grant point the irregular and rocky south coast of the island curves East 5 miles to a point, close off which is the high needle-shaped Pyramid rock. Between Pyramid rock and cape Wollamai, E. by S. 7 miles from it, the coast forms a bay 2 miles deep, affording anchorage at one mile north-eastward of Pyramid rock, sheltered from north-west and northerly winds. The northern shore of the bay consists of a range of low sand-hills covered with scrub, and is bordered by reefs none of which appear to extend beyond one-third of a mile off shore.

CAPE WOLLAMAI, the south-east extreme of Phillip island, is a remarkable helmet-shaped granite headland, of a reddish colour, rising abruptly from the sea to the height of 332 feet, whence it slopes towards the N.W., forming a peninsula nearly $1\frac{1}{2}$ miles long, N.W. by N. and S.E. by S. and three-quarters of a mile broad. This head is the more conspicuous from its being the highest land on Phillip island, all the remaining portion of it being low hills, clothed in an almost impervious scrub. The cape is fringed with

dry and covered rocks ; but none extend beyond a quarter of a mile from the shore.

Sandy peak, 161 feet in height, is the highest and most southerly of the sand-hills on the east end of Phillip island. The peak is steep, well defined, and is a good mark for the anchorage.

Red point, North one mile from the south-east point of cape Wollamai, is a mass of red granite boulders, 50 feet high, and is marked by a black beacon with square top, 15 feet high, standing 40 feet from the water's edge.

Woody point.—Between Red point and Woody point, at N. $\frac{3}{4}$ W. 2 miles from it, the east end of Phillip island forms a bay nearly $1\frac{1}{4}$ miles deep, with rocky points and sandy beaches, bordered by a bank, of which the 3 fathoms edge projects one cable to half a mile from the shore, the edge being marked by three black beacons, one at N.W. $\frac{1}{2}$ W. half a mile from Red point, one at 3 cables S. by W. $\frac{1}{2}$ W. from Woody point, and the other on the easternmost Middle rock which covers at half tide, at nearly one cable E. $\frac{1}{2}$ N. from the point.

The North-east coast of Phillip island, between Woody point and the bluff close to the south-eastward of Observation point, forms a bay 2 miles deep, divided by a broad projection, into two bights, that to the southward being Swan corner. Between one and 2 miles N.W. by W. of Woody point, is Churchill isle.

This bay is filled by a mud-flat, partly dry at low water, the outer edge of which, from Woody point, trends N.N.E. $\frac{1}{2}$ E. $1\frac{1}{4}$ miles to a spit, marked by a black buoy, and from thence N.W. by W. $4\frac{1}{2}$ miles to Observation point. This mud-flat is intersected by several creeks, the largest of which, from its entrance, at three-quarters of a mile S.E. by E. of Observation point, trends S.E. by S. and S.S.W. 3 miles, carrying 3 to 6 and 2 fathoms to within half a mile from the shore of Swan corner. The entrances to this creek and that to the westward of it, leading past Rhyl, a settlement with a population of 47 persons, are marked by red beacons. There is a jetty at Rhyl.

The western side of the channel extending to the N.N.E. from Woody point is further marked by a black buoy E.N.E. a quarter of a mile from the point, and by 3 black pile beacons with crosses.

The eastern side of the channel is marked by a beacon, a mast and ball 18 feet high, and by 3 red pile beacons with crosses.

The Eastern entrance into port Western is available at high water for vessels of 12 feet draught. The outer heads of the entrance are Red point, already described, and Griffith point.

Griffith point, N.N.E. $\frac{1}{2}$ E. nearly one mile from Red point, is a bold sandstone bluff 70 feet high, bare of trees for some distance inland, and fringed by a reef. From Griffith point the coast trends N.W. by N. $1\frac{1}{4}$ miles to Davis point, which is low, sandy, and wooded to the water's edge, with a pillar beacon on it, surmounted by a white ball. Between this and Woody point, a quarter of a mile to the northward of it, are the Narrows.

An extensive bank, with dry patches on it, and only 4 feet water over most parts of it, projects about one mile from the coast between Griffith and Davis points; its outer edge being marked by a red beacon at one mile N.W. of Red point, and a red buoy at half a mile North of the beacon. From this buoy the edge of the bank trends north-eastward to Davis point.

In bad weather, especially during the ebb, the sea breaks over the edge of the bank.

Light.—A *fixed* green light is exhibited from Davis point jetty, which is visible for 2 miles.

Water.—Excellent water can be obtained at all times, at the fisherman's hut, just within Red point.

The East entrance channel, which lies between the bank just described and that which borders the western shore, is one to 3 cables wide, with 5 to 3 fathoms for one-third of a mile above Red point. From 2 cables below the first black beacon to the Narrows, the channel varies from 50 or 60 yards near the beacon to 250 yards in width, with $3\frac{1}{4}$ to 5 fathoms, and 6 fathoms in the Narrows.

From the Narrows into port, the passage through the banks, which has only 5 to 12 feet water, leads from the east side of the beacon off Woody point, to the east side of the buoy off the point, then curving to the westward it takes a N.N.E. $\frac{1}{4}$ E. (N. 25° E.) course between the black and red beacons.

DIRECTIONS.—After rounding cape Wollamai, haul in for Red point, passing it within a cable, until it bears S.W.; if desired, a vessel may anchor in $3\frac{1}{2}$ fathoms between it and the first black beacon. From this outer anchorage pass midway between the beacon and the eastern bank, where the channel is only 50 or 60 yards wide, and then steer N.W. half a mile, keeping the red beacon on the starboard bow; give it a berth of half a cable; and if not intending to anchor in the channel, follow its course to the northward and north-eastward, leaving the red buoy on the starboard, and the black beacons on the port hand. From the Narrows, after passing east of the buoy off Woody point and between the first black and red beacons north of it, steer N.N.E. $\frac{1}{4}$ E. (N. 25° E.), leaving the black beacons and buoy on the port, and the red beacons on the starboard hand, and having cleared the channel, proceed according to destination.

Caution.—If drawing 12 feet water, bound into port Western by the East entrance, wait in the inner anchorage (to the northward of the first red beacon) till nearly slack water, as the stream runs at a great rate through the Narrows.

From Port Western to sea.—From the east side of the buoy at N.N.E. $\frac{1}{4}$ E. of Woody point, follows the trend of the channel towards and through the Narrows, leaving the red beacons on the port, and the black beacons and buoys on the starboard hand, leave the red buoy and red beacon on the west edge of the sand, on the port hand, and then steer through the channel about S.E. by E. (S. 56° E.) out to sea, leaving the southern black beacons on the starboard side.

The chart and lead are the best guides for this entrance.

Anchorage.—From a depth of 8 fathoms north-eastward of cape Wollamai the soundings decrease gradually towards the East entrance, close within which is the outer anchorage, in 3 to 4 fathoms, sand, between Red point and the black beacon to the north-westward. Vessels drawing 18 feet, seeking shelter, and unable to fetch the West entrance, need not lose ground by running back eastward, round Wilson promontory, but may find anchorage within the entrance, at a quarter of a mile inside Red point, sheltered from all winds except south-east gales. Vessels of 12 feet draught may bring up in the inner anchorage, between the black beacon and the Narrows, in 15 to 20 feet water, sand and mud. The most convenient anchorage

is between the red buoy and Davis point, where the channel, being widest, affords more room for getting under way. As the streams run through the channel at a great rate, it is advisable for vessels at anchor to lay out a kedge to keep them from fouling their anchors.

East shore of Port Western.—From Davis point the shore forms a bay extending N.N.E. $3\frac{3}{4}$ miles to Reef islet, which is surrounded with rocks that connect it with the low north-east point of the bay. This bay is nearly 2 miles deep; but it is shallow throughout, there being only 6 to 12 feet water across its entrance from point to point.

On a rock, about 300 yards to the north-west of Reef islet, is a red beacon, consisting of a mast and ball, 16 feet high.

Maggie shoal.—The bank which mostly fills the bay, projects to a 4-foot spit, close off which is Maggie shoal, with a red buoy on it, lying N.E. by N. 2 miles from Davis point.

Bass river is a small stream winding through the low marshy land into the bay at E. $\frac{3}{4}$ N. 2 miles from Maggie shoal.

Between Reef islet and Settlement point, at North $3\frac{3}{4}$ miles from it, the eastern shore of port Western is divided into two small bays of nearly equal extent by Cobb bluff, from which a reef projects about a quarter of a mile.

Lœlia shoal, W. by S. $\frac{1}{2}$ S. $1\frac{1}{4}$ miles from Reef islet, is a small patch with $1\frac{1}{2}$ feet water on it. It is marked by a black and white chequered buoy.

There is another small patch with 4 feet water on it, a quarter of a mile north-eastward of Lœlia shoal.

Soundings.—With the exception of the northern branch of the East arm and the bight between Observation point and the spit northward of it, the whole of the eastern part of port Western is filled by a flat, with rarely more than 3 fathoms water over any part of it.

Aspect.—The mainland about the eastern end of port Western is moderately elevated and thinly wooded with short trees; the soil is rich, especially near the banks of Bass river, and is clothed with

coarse grass to the water's edge. From the hilly promontory forming the east side of the East entrance, a range of wooded hills stretches away in an East and N.E. direction; River hill, one of the summits, is 816 feet high, bearing N.E. $\frac{3}{4}$ E., distant 10 miles from cape Wollamai.

TIDES.—It is high water, full and change, at Spit point, French island, at 1 h. 0 m.; springs rise 10 feet, and neaps 8 feet, the latter ranging $6\frac{1}{2}$ feet; at Bouchier channel, north of French island, at 1 h. 13 m.; springs rise $10\frac{3}{4}$ feet, and neaps $8\frac{3}{4}$ feet, the latter ranging $7\frac{1}{2}$ feet: at Mussel rock, north side of Philip island, at 0 h. 12 m.; springs rise $8\frac{1}{2}$ feet, and neaps $6\frac{1}{2}$ feet. At Woody point at 0 h. 50 m.; springs rise about 8 feet, and neaps 5 feet.

Tidal stream.—The stream in the main channel, between Philip island and Middle bank, runs 3 knots, and in the East arm one to 2 knots. The streams run at a great rate in the eastern channel.

THE COAST from Griffith point, which is N. by E. $\frac{1}{2}$ E., 2 miles from cape Wollamai, forms a slight curve trending E. $\frac{1}{4}$ S. $4\frac{1}{2}$ miles to Black head, and thence south-easterly 3 miles to Powlett river, continuing on in the same direction for a further distance of 5 miles to Coal point. The mines there are not being worked.

Coal point has numerous sunken rocks off it at the distance of a mile southward of the point; one rock uncovers at low water spring tides. The heavy break shows the point to be dangerous of approach.

From Coal point the land takes a S.E. by E. $\frac{1}{2}$ E. direction to cape Patterson, from which it is distant $2\frac{1}{4}$ miles. The whole coast south-east of Black head is little more than a succession of sandy hillocks, from 100 to 140 feet high, covered in most places with dwarfed ti trees, but occasionally bare.

CAPE PATTERSON is an ill-defined point, rounded and low; and the least conspicuous point along the whole coast; the highest land within a mile of the point is 127 feet above the sea, and this elevation scarcely increases until it joins a range of hills over 900 feet high to the east and north-east of River hill, at a distance of 11 miles from the cape.

There is nothing to point out cape Patterson. A conspicuous rock, 59 feet high, about 3 miles to the eastward of the cape, known as the Eagle's Nest, lying half a cable off the coast at its turn towards Anderson inlet, serves to distinguish it. East and west of this rock the coast has a cliffy appearance.

Reef.—A reef, dry at low water, extends 3 cables in a south-east direction from cape Patterson, and there are 3 fathoms 4 cables S. by E. of the cape.

The COAST from cape Patterson trends 2 miles in an E. by N. direction, and thence N.E. 4 miles to the mouth of Anderson inlet.

Anderson inlet, which by its two streams, Tarwin river and Screw creek, drains about 300 square miles of country, is not navigable except for flat-bottomed boats or barges, but there is depth of water in patches sufficient to allow the vessels which enter to anchor.

The bight formed about the mouth of Anderson inlet is known as Venus bay, but it does not afford good anchorage.

Petril rock, only 2 feet above high water, lies nearly half a mile from the shore, about midway between Eagle's Nest and the mouth of Anderson inlet.

TIDES.—It is high water, full and change, in Venus bay, at 11 h. 56 m. ; springs rise about 7 feet.

The COAST.—From Smythe point, the east entrance point of Anderson inlet, the coast trends south-eastward 13 miles with a slight curve to Watercress creek ; all this coast is a succession of sand-hills 110 to 160 feet in height, which for the last 5 miles are comparatively destitute of verdure.

Watercress creek (so named from the abundance of that plant) is at the foot of the table land of cape Liptrap. On the coast, three-quarters of a mile north-west of the mouth of Watercress creek, is a small rock of sandstone 15 feet above high water, and from this to a distance of 4 cables seaward are several sunken rocks. The coast line here is composed of low sandstone cliffs.

For one mile S. by E. $\frac{1}{2}$ E. from Watercress creek is a very rugged

coast of overhanging sandstone, with jagged and pointed rocks strewn along it.

One mile South of Watercress creek and off this rugged coast, at the distance of 2 cables, lies Arch rock, 82 feet high, having a natural arch on its eastern side. There is a rock awash at half-tide, lying a cable to the W.S.W. of it. The same character of coast continues for a mile beyond Arch rock in a S.E. by S. direction, having innumerable pinnacle rocks of various heights strewn along the whole distance, with other outlying sunken and half-tide rocks, in some places nearly half a mile from the shore. Off this coast craw-fish abound.

Hence, the land trends in a S.S.E. direction 3 miles to a conspicuous islet, 63 feet high, off the western part of cape Liptrap. Half this distance being a straight piece of sandy coast, with the table land of cape Liptrap getting nearer as the coast runs southward. There are outlying sunken rocks about 3 cables off this coast. From the islet the coast forms three small bays to the cape.

CAPE LIPTRAP, which is nearly perpendicular, and 297 feet high, forms the south-west extremity of a table-topped promontory 550 feet high, joining the base of the Hoddle range of hills, which are 968 feet above the sea; at 16 miles N.E. by N. from the cape, these again join the Fatigue mountain range, the highest part of which is above 2,000 feet high.

Several outlying rocks, varying in height from 5 to 30 feet, partially fringe the coast south and east of cape Liptrap, but none extend more than 2 cables from the shore.

The COAST.—From cape Liptrap the land forms a bight to Grinder point, which is 2 miles N.E. by E. $\frac{1}{2}$ E. from the cape. This bight is fringed with low water and sunken rocks, which in some places extend 3 cables from the shore, and farther out even than this in bad weather the sea breaks violently.

From Grinder point the land takes a north-easterly direction for a further distance of $2\frac{1}{4}$ miles to Bell point, and a similar description of coast to the last is found, with the exception that the land is somewhat lower, and a number of rocks from 10 to 30 feet high are found at short distances off it.

Bell point may be known by a large broad-topped rock about 40 feet high, and a cable from the shore. From this point the land

takes an abrupt turn into Waratah bay, trending about N.N.W. for 2 miles. At 3 cables from Bell point is a small islet 60 feet high, and about the distance of one mile are the Bird rocks, three in number, and from 40 to 60 feet high, the outer rock being 2 cables from the shore. These rocks are guides to mariners using the bay, enabling them to ascertain their position.

WARATAH BAY affords good anchorage. In the depth of the bay, at 4 miles from Bell point, the coast falls to a height of only 100 feet, when the ordinary feature of sand-hills, generally covered with ti tree, is again met with.

Light.—A harbour light is exhibited from a lamp-post on the shore in Waratah bay, bearing W.S.W. from Bird rocks, distant 2 cables.

The light is a *fixed* red light, elevated 120 feet above the sea, and should be visible in clear weather from a distance of about 3 miles.

Anchorage.—In Waratah bay, there is anchorage in 6 fathoms water, with the light bearing S.W. distant 7 cables.

Or in good holding ground more than a mile from the shore during south-westerly gales, and with plenty of room for working out in the event of the wind chopping round to the eastward.

Tides.—It is high water, full and change, in Waratah bay at noon, springs rise 8 feet.

Shallow inlet.—From Waratah bay the coast trends E.S.E. until within 2 miles of the entrance to Shallow inlet, when it becomes low, bare, and sandy, scarcely above high water. The east entrance point of this shallow inlet or lagoon is much higher, but is likewise of bare sand. It was not found possible to sound the entrance of the inlet on account of the heavy break; but the depth varies with the prevailing winds and freshets, being occasionally dry at low water, and at other times having sufficient water for a large boat to enter.

From the mouth of this inlet the land trends with a slight curve in a S.E. $\frac{1}{2}$ S. direction for nearly 6 miles to Black rock, which is about 30 feet high, and a cable from the coast.

From a position 4 miles N.W. of Shallow inlet to about a mile from Black rock, shoal water with a sandy bottom extends about half a mile from the shore, and off the inlet this shoal water runs out nearly a mile. From about $1\frac{1}{2}$ miles northward to $2\frac{1}{2}$ miles southward of Black rock, the sandy bottom is interspersed with rocks, some of which uncover at low water.

Shellback island.—About $1\frac{1}{2}$ miles S.W. of Black rock lies Shellback island, 357 feet high; it is the northernmost of the islands on the west coast of Wilson promontory.

Tongue point, 167 feet high, lies S. $\frac{1}{2}$ E. $2\frac{1}{2}$ miles from Black rock, the coast between forming a deep bight, in the depth of which are a few low red cliffs, but they are not conspicuous. Tongue point has a remarkable conical white rock, 30 feet high, close off it to seaward. Abreast of the point at the distance of a mile, the coast is high, and rises at a distance of 4 miles to parts of the promontory range, which are here about 2,000 feet above the sea. Mount Vereker, the north-west mountain of the promontory, bearing N.E. by E. 6 miles from Tongue point, is 2,092 feet high, and has a spur 1,654 feet high, running N.W. about 2 miles from it; this spur gradually falls in a westerly direction, and forms the north-west termination of the high land of the promontory.

From Tongue point the coast trends S.E. $\frac{1}{2}$ E., forming a bight to Leonard point, southward of which and on the same bearing are Pillar and Norman points, forming the south sides of Leonard and Norman bays.

Norman Island lies a little more than a mile southward of Tongue point, and may be known by its two peaks, the higher and northern of which is 316 feet high.

Anchorage.—At one and $\frac{1}{2}$ cables off this island on its eastern side are 9 and 11 fathoms of water, where, in the course of the survey, it was often found convenient to drop the anchor during a prevalence of south-westerly winds. Coasting steam vessels of little power bound to the westward, having rounded the promontory and being met by a south-westerly gale, might find it convenient to anchor here in preference to running back again and anchoring in Waterloo bay, to the eastward of the promontory.

See chart, No. 1,703, Wilson promontory, with Corner inlet and port. Albert, scale $m = 1\cdot0$ inch.

OBERON BAY, lying southward of Norman point, is the largest of the three bays on this coast, and affords the best anchorage. The bay is a mile deep, $1\frac{1}{2}$ miles across, and has a broad sandy beach upon which the sea breaks heavily. Landing can in general only be effected in the south-eastern corner. From the prevalence of south-westerly winds none of these bays can be recommended as anchorages for other than steam vessels.

Good shelter has been found in this bay with Oberon point bearing S.W. about 3 cables during a heavy gale from the eastward.

Caution.—From experience in this locality easterly gales appear to die away at East or N.E., but a south-westerly gale may spring up with scarcely any notice of its approach, when sailing vessels would find themselves on a lee shore with a swell setting them dead to leeward.

The **COAST** from Oberon point, trends for a mile in a S. by E. direction, and then gradually takes a more easterly turn to a moderately deep bight, whence it again runs S. by E. to South-west point. All this coast is bold and cliffy, the cliffs in some places being several hundred feet in height, and rising again at the back towards the mountain land of the promontory.

Off South-west point, at the distance of about a mile S.W. $\frac{3}{4}$ S., is Anser island, the largest island of the group of the same name.

GLENNIE GROUP consists of four islands, which lie about 4 miles W. $\frac{1}{4}$ S. to S.W. $\frac{1}{4}$ W. from Oberon point, the nearest land of Wilson promontory.

Glennie island, the largest, is 455 feet high, nearly 2 miles long N.W. by N. and S.E. by S., saddle-shaped, and strewn over with blocks of granite (of which it is composed), and which give it a castellated appearance. A rock 3 feet high, over which the sea generally breaks heavily, lies about 2 cables North of its north end, and another somewhat larger, 15 feet high, lies about a cable off its north-east end. Three smaller islands lie off the south point of Glennie island; the southernmost, 367 feet high, is named Citadel island, from its resemblance to an ancient fortress.

ANSER GROUP of three islands, apparently takes its name from the numerous geese frequenting them. Anser island is the

highest, and rises to a nipple point, 498 feet above the level of the sea ; it is cliffy in all directions, but least so to the northward, where landing may often be effected.

Cleft island, the most remarkable of this group, lies nearly $1\frac{1}{2}$ miles S.W. from Anser island. It is 371 feet high, of a round form, and may be known from having a large slice out of its north-west side, which gives it a cavern-like appearance ; it is also perpendicular, and white on all sides.

Two small islets, between 40 and 50 feet high, lie between it and the next or middle island of this group, equally dividing the distance between them. A third islet not quite so high lies a cable off the north-west point of the middle island, which is 312 feet high.

Carpentaria rock.—This rock has a depth of 6 feet over it, and lies with the summit of Cleft island bearing S. $\frac{3}{4}$ E. distant 8 cables.

There is deep water between the Anser and Glennie groups and also between them and the mainland. The whole of the coast adjacent to the islands is bold, and all dangers, except the Carpentaria rock, are visible.

Seals inhabit these rocks and islands.

Tides.—It is high water, full and change, at the Glennie islands, at 11h. 44m. ; springs rise about 9 feet.

The COAST.—From South-west point the land runs E. by S. $\frac{1}{2}$ S. $1\frac{1}{2}$ miles to a projecting low and stony point, named South point, the southernmost point of Australia, off which, at a distance of one cable W.S.W., is a rock 15 feet high, and in the same direction at a further distance of 2 cables is Wattle island, 270 feet high, which from being so close to the shore appears connected, but between the island and the 15-foot rock just spoken of is a deep channel through which a strong tidal stream constantly sets. A rock awash lies nearly a cable S.W. of the west point of Wattle island, but with this exception the coast is bold.

Half a mile from South-west point a freshwater creek flows into the sea, and at a short distance inland, eastward of this, is a remarkable stone near the summit of the coast range, which closely resembles a tower.

From South point the coast trends in a general E. by N. $\frac{1}{2}$ N. direction $2\frac{1}{2}$ miles to South-east point, where is the promontory lighthouse; but in this distance there are two deep bights, the westernmost running more than half a mile into the land, and forming at its termination a natural basin where there is a running stream.

From South-west point to South-east point the land rises suddenly from the water's edge to nearly 1,000 feet.

From South-east point the land trends N. $\frac{3}{4}$ E. $2\frac{1}{2}$ miles to Waterloo point, the south-west point of Waterloo bay. At one mile in that direction is a point with a small islet off it, but almost connected with the shore by large boulders; the islet does not extend beyond the line of the coast, and immediately northward of it is an indentation half a mile deep.

Soundings.—South of cape Liptrap the depths are 28 and 30 fathoms at 4 miles, and 38 and 46 at 14 miles distance. For 13 miles southward of Citadel island the depths are from 37 to 43 fathoms.

WILSON PROMONTORY is a lofty peninsula, 22 miles long, north and south, and 8 miles broad at the centre. It is connected with the mainland to the north-westward, by a low sandy neck 10 miles long and 3 to 5 miles broad, which separates Waratah bay from Corner basin. This promontory rises to rugged mountains, some of which are above 2,000 feet in height, thickly wooded on their upper and less exposed parts; but towards the coast they are nearly destitute of vegetation, and descend abruptly to the sea. The soil is shallow and generally barren; though the brushwood, dwarf gum trees, and some smaller vegetation, which mostly cover the granite rocks, give the country a deceitful appearance to a distant observer.

LIGHT.—The lighthouse which stands on South-east point, Wilson promontory, is a white circular stone tower, 70 feet high, exhibiting at 342 feet above the sea a *fixed* white light which may be seen from a distance of 24 miles in clear weather. This light is visible between the bearings of N. 62° E. and S. 22° W., and a ray is also visible between the islands of Anser group, on a N. 67° E. bearing.

Signal station.—There is a signal station at Wilson promontory

lighthouse and communication can be made by the commercial code of signals. It is connected by telegraph.

Meteorological observations.—In 1892, at Wilson promontory, 300 feet above the sea, the maximum temperature in the shade was 92° Fahr., the mean 56·6°; rain fell on 129 days, the amount being 39·95 inches.

Landing.—Except when the wind is directly from the southward and fresh, a landing may be effected on one side of South-east point, with or without the aid of a crane, which is placed specially for landing stores. The first distinguishing pendant denotes that there is landing on the east side, the second distinguishing pendant that there is landing on the west side, and number 5 red flag that there is no landing.

Forty-foot rocks lie S. $\frac{1}{2}$ E. $4\frac{1}{4}$ miles from the lighthouse, and consist of three separate and distinct islets of granite, of which the largest and westernmost is 165 feet long, with a breadth of 50 feet at the broadest part near its centre; this islet is 20 feet high, and on its south extremity there is a granite boulder, 20 feet in height, and 40 feet above high-water mark, which, when the sea is breaking over these rocks, is probably the only part of them visible. These rocks are steep-to in all directions.

RODONDO ISLAND, S. $\frac{3}{4}$ W. 6 miles from Wilson promontory lighthouse, is a conspicuous conical mass of granite, three-quarters of a mile across, rising to a distinct peak 1,150 feet above the sea, and visible in clear weather from a distance of 30 miles. It has high cliffs on all sides, the surface above being covered with a dense dwarf scrub, and is steep-to in all directions. The Forty-foot rocks lie N.N.E. $\frac{3}{4}$ E. 2 miles from Rodondo, and between there is a clear channel with a depth of 36 to 39 fathoms.

Moncœur islands.—East and West Moncœur islands, $1\frac{1}{2}$ miles apart, 331 and 318 feet high, lie nearly in line E. by N. from Rodondo island, at 5 miles and $6\frac{1}{2}$ miles respectively from it; and S.E. $\frac{1}{2}$ S. 7 miles, and S.E. $\frac{1}{2}$ E. $7\frac{3}{4}$ miles from Wilson promontory lighthouse. The West island is nearly half a mile long north and south, and about 200 yards wide; with a small islet at half a cable southward of it.

The East island is one-third of a mile long N. by W. and S. by E., and rather more than 200 yards wide. They are bold-to.

TIDAL STREAMS.—Off Wilson promontory the tidal streams as a general rule set E.N.E. and W.S.W., the west-going stream running during the rising tide. The streams turn at nearly high and low water on the shore, but the direction of the streams is much influenced by the winds. Near the promontory, after an easterly gale, the ebb or east-going stream which has been checked during the gale continues to run to the eastward when the flood should have made; and at the strength of the flood the stream sets to the northward, except inshore, where the tidal streams follow their general law; a south-westerly gale has an opposite effect.

The rate of the streams off the promontory, where they are strongest, does not exceed $2\frac{1}{2}$ knots. Along shore, from the promontory to cape Wollamai, and to a distance in the offing of 7 or 8 miles, the streams are scarcely felt, but run with their greatest strength off the several points.

Current.—During and after heavy easterly and westerly weather a current sets in the direction of the wind which is blowing, or has just ceased to blow.

Soundings.—Off Wilson promontory the soundings afford little guide, but in the bight between Tongue point and cape Liptrap, or off cape Liptrap, a depth of 30 fathoms ensures a vessel's being 3 miles off shore. This depth likewise ensures this distance from the land all along the coast to near cape Wollamai.

South and S.W. of cape Patterson the soundings shoal much more gradually than on any other part of this coast, and there are 30 fathoms or less 6 miles off shore. From thence westward the 30-fathom line again nears the coast until off cape Wollamai where it is distant only $1\frac{1}{2}$ miles.

WATERLOO BAY, extending from Waterloo point N.E. $2\frac{1}{4}$ miles to cape Wellington, is $1\frac{1}{3}$ miles deep, with 14 fathoms, sand, in the centre, whence the depth of water decreases gradually to 6 fathoms at 2 cables from the shore, but increases towards the outer points. Waterloo bay, being so immediately under the high land of Wilson promontory, and exposed to the swell from both sides of Bass strait, is not recommended as an anchorage for sailing vessels.

The western shore of Waterloo bay forms the eastern end of a low valley 3 miles long, which stretches across the promontory to Oberon bay. The valley makes a conspicuous break in the high land and divides the Boulder range from the Wilson range.

Anchorage.—The best anchorage is about 4 cables from the south-west shore in 9 to 12 fathoms water. Steam vessels bound westward met by a south-westerly gale may anchor close in to the land in a small cove under Waterloo point. The holding ground is good.

CAPE WELLINGTON, a hilly headland, 255 feet above the sea, rising to 442 feet half a mile inland, and forming the north-east point of Waterloo bay, projects $1\frac{1}{2}$ miles S.E. from the line of the coast; Kersop peak, its most elevated summit, rises to a height of 729 feet, a mile N.W. of the cape.

The bold eastern face of cape Wellington extends N. by E. half a mile from its south extreme, thence the land trends N.N.W. $\frac{1}{4}$ W. one mile to Brown head, with a cove midway extending a quarter of a mile to the south-west.

Mount Wilson, on the north side of the valley and $3\frac{1}{2}$ miles West of cape Wellington, rises abruptly from the southward until its wooded summit reaches the height of 2,320 feet. On the south side of the valley opposite mount Wilson is a mountainous range known as Boulder range, which at its highest part rises to an elevation of 1,725 feet. The whole mountainous range on Wilson promontory is of granite, with immense boulders generally visible, but more particularly on the part known as Boulder range.

Mount La Trobe, which reaches an elevation of 2,434 feet, lies N.N.W. $\frac{3}{4}$ W. $3\frac{1}{2}$ miles from mount Wilson; nearly midway between them is mount Ramsay 2,313 feet high.

REFUGE COVE, half a mile W.N.W. from Brown head, and the only anchorage on this side of Wilson promontory sheltered from the eastward (unless Corner basin and Bentley harbour are considered exceptions), is the central of three small deep-water bights between Brown head and Horn point, which latter lies a mile N. by W. from the head. Hobbs head, half a mile southward of Horn point, forms the north side of the entrance to Refuge cove, which is only $1\frac{1}{2}$ cables wide.

The cove may be easily recognised from being distant midway between Kersop peak and Horn point, and from its having the first sandy beach which opens north of cape Wellington. It is about one-third of a mile in extent with 8 fathoms in the entrance, from which the depth gradually decreases to 3 and 4 fathoms, in most places close to, but near the sandy beaches at half a cable from the shore.

The anchorage in the cove is in the south part. Refuge cove is not much used owing to the difficulty of getting out, the high hills around almost completely screening it from any winds off the land.

The cove between Brown head and Refuge cove trends one-third of a mile to the southward with 9 to 4 fathoms; that between Hobbs head and Horn point has the same depth of water, but is open to the eastward.

Tides and tidal streams.—It is high water, full and change, in Refuge cove, at 0h. 5m.; springs rise, 8 feet.

Off cape Wellington the tidal flood stream divides and runs in opposite directions, one portion of the stream which comes from the north-eastward turning and running along the shore to the northward, the outer portion of the same stream continuing its course round the promontory to the westward. The ebb streams meet and act in an opposite manner.

SEALERS COVE.—From Horn point, a cable off which N.W. by N. there is a 9-foot rock, the coast trends W. by N. $\frac{1}{2}$ N. for three-quarters of a mile, and then West for another three-quarters of a mile to the southern point of Sealers cove, which is nearly three-quarters of a mile wide N.N.W. and S.S.E. at its entrance, and about one mile in extent within. There are depths of 4 and 5 fathoms at the entrance, within which the water shoals gradually, the 3-fathoms line being only $1\frac{1}{2}$ cables inside. A heavy swell often rolls into Sealers cove.

Water.—Fresh water may be obtained either in Refuge or Sealers cove, but in the latter it might be necessary to go some distance up the creek in the south-east corner. At Refuge cove water may be obtained with greater facility, principally in the south-west corner of the northern sandy beach.

Five-mile Beach.—From the north side of Sealers cove the coast trends northerly and north-westerly $1\frac{1}{2}$ miles to the south end of Five-mile beach, and thence extends with a slight curve N. by E. $\frac{1}{4}$ E. $4\frac{1}{4}$ miles, being intersected at each end by a stream of fresh water. The beach may be approached to two-thirds of a mile in 5 and $6\frac{1}{2}$ fathoms. At the back of this beach is flat swampy ground, which extends for $1\frac{1}{2}$ and $2\frac{1}{2}$ miles until met by the slopes of mount Vereker.

At the north end of Five-mile beach the higher part of the promontory again approaches the coast, forming a small point from which in a north-easterly direction about half a mile is another point abreast of Rabbit island. Off this point in a S.S.E. direction is a rock which, from its resemblance to the island of the same name, has been named Rabbit rock; this rock is 50 feet high, and has a small detached rock close to on its west side.

RABBIT ISLAND, so named from the number of rabbits upon it, lies East three-quarters of a mile from the east point of Wilson promontory. It is nearly half a mile long north-east and south-west, and being 194 feet high, is an excellent mark when proceeding northward to Corner inlet.

Anchorage.—There is good anchorage in all but south-easterly or easterly gales in $4\frac{1}{2}$ and 5 fathoms one mile N.E. of Rabbit island. Traders bound westward anchor here during south-westerly gales. Small craft bound westward during westerly gales often anchor near Rabbit island, but in a seaworthy vessel such a course should not be adopted, unless the gale is of unusual violence.

Wood and water may be obtained at this anchorage; the water will be found in the little sandy valley on Rabbit island by sinking a cask, and the wood may be obtained on the adjacent mainland, or both may be obtained on the mainland.

TIDES.—It is high water, full and change, at Rabbit island at 0h. 14m.; springs rise 8 feet.

The COAST.—From the point abreast Rabbit island the coast trends N. by W. one mile to a point behind which are two good fresh-water streams. At a further distance of half a mile in the

same direction is another small point, whence the land trends in a westerly direction for half a mile, and then N. $\frac{1}{2}$ W. 2 miles to a point at the south-east base of mount Hunter, and thence again in the same direction to a smaller point East of the same mount, whence the coast, which then becomes low and sandy, still trends N. $\frac{1}{2}$ W. about 2 miles to Entrance point, at the entrance to Corner basin. Between the several points here spoken of are sandy beaches.

Abreast of Rabbit island and to the northward of Five-mile beach the hill over the coast rises to an elevation of 778 feet; and N.N.W. $\frac{1}{2}$ W. $1\frac{1}{2}$ miles from this, and nearly a mile from the coast, is mount Roundback, 1,050 feet high. At $3\frac{1}{2}$ miles N. by W. of mount Roundback and one mile from the coast is mount Hunter, 1,175 feet high, which is conspicuous being of a pyramidal shape and the northern high hill of the promontory.

Between mounts Roundback and Hunter the range falls considerably, but about midway is a wedge-shaped hill 716 feet high. At $2\frac{1}{2}$ miles N. by W. $\frac{1}{2}$ W. of mount Hunter, and on the northernmost point of the promontory, is mount Singapore, 480 feet high; this hill forms a useful leading mark into Bentley harbour. One mile eastward of mount Singapore is Entrance point.

SEAL or DIRECTION ISLANDS.—About 7 miles E. $\frac{1}{4}$ N. of Rabbit island is Seal island, the largest of the Seal islands. The group consists of four small islands and three rocks, which latter extend in a north-westerly direction from Seal island. The largest of the rocks, White rock, is 33 feet high, and distant from Seal island $1\frac{1}{2}$ miles. One other rock is adjacent to Seal island, and nearly midway between is a rock 8 feet above high water, with a rock awash off it to the northward.

Seal island is 154 feet high, about a mile round, and covered with tufts of coarse grass, among which are the burrows of penguins and mutton-birds.

Notch island, the second largest, is 123 feet high, and lies one mile S.E. from Seal island; it has two hills upon it, and the valley between giving it a notched appearance caused it to be named Notch island.

Nearly one mile S.S.E. from Notch island is Rag island, 94 feet high; and E. by S. $1\frac{1}{2}$ miles is Clifty island, 144 feet high.

With the exception of rocks awash a cable off the west side of Rag island, a rock awash one cable off the north-east part of Clifty island, and the rocks mentioned as lying off Seal island to the north-westward, the islands are all steep-to.

CLIFFY ISLAND.—LIGHT.—A stone lighthouse, 25 feet high, on the southern side of Clifty island, exhibits a *flashing* red light, showing *five flashes every minute*; it is elevated 180 feet above the sea, and should be seen in clear weather from a distance of 15 miles.

Fog signal.—The fog signal at Clifty island lighthouse is a gun, which, during thick or foggy weather, is fired once every five minutes.

CORNER INLET, lying between Entrance point and La Trobe island, is the entrance to Corner basin, an extensive sheet of water between Wilson promontory and the land to the northward, with deep channels leading between its numerous mud-flats. The inlet is fronted by a bar (which is 2 miles across), the deepest water over which at low water is 22 feet. Within the bar S.E. by E. $\frac{1}{2}$ E. 4 miles from Entrance point, there is a depth of $5\frac{1}{2}$ fathoms of water. Here the channel is more than a mile wide, decreasing to half a mile between Entrance point and La Trobe island; having crossed the bar the depths in the channel gradually increase, until nearly abreast of Entrance point, where the depth is 18 and 19 fathoms.

Buoys.—There are two black buoys moored on the southern side of Corner inlet, the outer lies in 5 fathoms S.E. by E., $3\frac{1}{2}$ miles, and the other in $3\frac{1}{2}$ fathoms S.E. by E. $\frac{1}{2}$ E., one mile from Entrance point.

There is also a black and white buoy moored in 10 feet water off the point of La Trobe island, immediately opposite Entrance point; this buoy is for vessels making use of Bentley harbour.

No good mark can be given for entering the inlet. The chart and lead are the best guides; no stranger, however, should attempt to enter Corner inlet without a pilot.

Corner inlet sand-banks.—The coast of the promontory northward of Rabbit island is fronted by an extensive shoal sand-bank.

The south-east extremity of the shoal with 17 feet water lies N.E. $\frac{3}{4}$ N. 3 miles from Rabbit island, and its inner part trends thence westward to the shore, leaving $3\frac{1}{2}$ and 4 fathoms between it and Rabbit island, as well as in a gully between it and the land. A line drawn from Rabbit island to the bar entrance to port Albert passes over the seaward and south-eastern parts of the banks extending from Corner basin.

The end of the bank on the south side of the entrance to Corner inlet is on this line, N.E. by N. 5 miles from Rabbit island. The 3-fathoms line forming the edge of the southern bank turns from this point W. by S. for 2 miles, when it trends N.W. $\frac{1}{2}$ W. $4\frac{1}{2}$ miles to Entrance point.

The northern banks of Corner inlet extend from the point of La Trobe island, opposite Entrance point, in a S.E. by E. direction for 6 miles, then curving to the westward for more than a mile, in about 12 feet, at low water. The deepest channel to Corner inlet lies between these banks, and is about half a mile wide, with 22 feet at low water.

The outer parts of the northern banks just described trend to the north-west for about 2 miles, and then in a westerly direction for a mile to Townsend point, where they approach the land to one-third of a mile and form the southern side of the channel into Bentley harbour.

Clearing mark.—Mount La Trobe, open south of Rabbit island, S.W. $\frac{1}{4}$ S. (S. 42° W.), leads a quarter of a mile south-east of the banks.

CORNER BASIN extends 4 miles north and south, and 14 miles from Entrance point to the north-west corner of the basin, into which flows Tarwin rivulet. The northern and south-eastern shores are fronted by swampy mangrove islands, and the basin is mostly filled by mud-banks.

Franklyn channel is the main channel in Corner basin, it extends about 8 miles in a westerly direction from between Entrance point and La Trobe island, then dividing into three creeks. It has a width of from 3 cables to nearly one mile, with depths of 5 to 18 fathoms. Two black buoys are on its south side at about 7 cables N.W. of mount Singapore, and at the end of a spit where the channel divides.

A narrow sand-bank on the north side of the channel is marked by a black and white striped buoy at each end and by a red buoy on its south side $1\frac{1}{4}$ miles from its east end.

The entrance to Lewis channel is marked by a black and white striped buoy at N.N.W. 2 miles from mount Singapore, the channel then curves to the north and north-east 4 miles to the township of Welshpool, where there is a jetty from which a *fixed* white light, visible about 3 miles is exhibited. The middle of the three creeks at the end of Franklyn channel, known as Stockyard creek, is marked by two buoys, a red buoy on the north and a black buoy on the south side. Benison channel extends to the south-west from the west side of mount Singapore for about 8 miles, and Middle channel to the S.W. by W. from the north side of mount Singapore for about 9 miles.

BENTLEY HARBOUR.—During the continuance of strong easterly or south-easterly gales, vessels may anchor in Bentley harbour, which, as already described, lies between La Trobe island and the northern banks of the inlet; they are there protected from all winds, and there is a strong ebb stream to assist them in getting out again. Bentley harbour is protected to the southward by a sand-bank which dries at low water. The pilot stationed at port Albert often takes vessels through Bentley harbour into Corner basin.

Leading mark.—A good leading mark in is mount Singapore open of Townsend point, the southern point of La Trobe island, W. $\frac{1}{4}$ S. (S. 87° W.). When abreast of Townsend point keep along the shore and anchor as convenient.

Pilots are always on the look out at port Albert, and will come off at any time.

Caution.—Mariners are recommended to avail themselves of their services, and not to attempt to enter either Corner inlet or port Albert without local knowledge.

La Trobe island, which lies between Corner basin and port Albert entrance, extends from the point abreast Entrance point, E. by S. $2\frac{1}{4}$ miles to Townsend point, and thence with a curve inwards N.E. $\frac{1}{4}$ E. 4 miles to port Albert lighthouse, which is situated nearly

a mile from the east point of that part of the island called Snake island. La Trobe island is low, but the trees on it give it an apparent elevation of 40 to 60 feet.

Snake island is a narrow island about $1\frac{1}{2}$ miles long at the east end of La Trobe island with which it is almost connected.

Light.—From a tower on Snake island and at about 40 feet above high water, a *fixed* green light is exhibited, which should be seen from a distance of 4 miles in clear weather.

Signal and pilot station.—The signal and pilot station is on Snake island and communication can be made by the commercial code of signals. This station receives flag signals from Clonmel island station.

Clonmel island is the narrow sandy island, only 14 feet high, which forms the east side of the entrance to port Albert. It extends N.N.E. $\frac{3}{4}$ E. $2\frac{1}{2}$ miles to an entrance known as Kate Kearney channel, which always breaks across, and probably has its outside bar above low-water mark. There is a signal staff and station on the north-west part of the island.

PORT ALBERT.—The entrance to port Albert is over a mile wide between the east point of Snake island and Clonmel island on the opposite side. But this entrance is divided by a large bank of sand, which extends from midway between these two islands for nearly 2 miles in a southerly direction.

On this large bank of sand there are two parts which form islands, one being elevated 3 and the other 2 feet above high water. From the north point this sand-bank also extends in a south-westerly direction for one mile, with a small detached sand-bank off its south-west extreme.

The population of Port Albert, a township at the mouth of the Tarra river, was in 1891, 415; of Alberton on the east bank of the river Albert, 4 miles distant, and the surrounding district, about 3,000. Port Albert is one of the principal fishing grounds in the colony. Its exports are wattle bark, leather, raw hides, and grain. There is communication with Melbourne by rail; there is also

telegraphic communication, and regular steam communication with Melbourne. Port Albert has monopolised the trade of the district, which is not large.

There is a wharf with 6 feet at low water, but vessels drawing 10 feet can lie alongside it, as the bottom is all soft mud.

A life-boat is stationed at the town of Port Albert, 4 miles from the entrance.

Snake channel.—The north-west side of the bank described forms the south-east side of a very narrow channel running close along the shore of La Trobe island, with 5 feet water generally at its shoalest part. This is known as Snake or Western channel. It is marked by three black buoys to be left on the port hand entering, and five red buoys to be left on the starboard hand entering.

Main channel.—From the south-east part of Clonmel island another sand-bank extends in a southerly direction for more than a mile. It is between this bank and the one extending from mid-entrance that the main channel into port Albert lies, and from the tails of these banks breakers extend in a south-easterly and southerly direction, those to the eastward extending nearly a mile, and those to the westward half a mile.

The bar of port Albert is strictly speaking only navigable for vessels drawing 9 feet water. Vessels of greater draught run the risk of being detained inside either for high tides or smooth water.

Though the general feature of the bar of port Albert remains the same, yet in so far as the navigation is concerned it is continually shifting.

A body of sand appears to be perpetually driving from the east to the west side of the channel, but more particularly during strong breezes from the eastward or south-east. The tidal stream out of the port is considered, however, to keep a channel across the bar of 5 feet at low water, though it may be doubted whether at all times even this depth is maintained.

Wreck buoys are sometimes moored in the channel over wrecks which interfere with shipping.

See chart, No. 1,703.

Inside the bar the depth increases rather suddenly ; when abreast of the south point of Clonmel island there are from 8 to 11 fathoms. About one-third of a mile N.W. $\frac{1}{2}$ W. of this point is a black buoy which is moored on the tail of a spit extending in a S. by W. direction from the east point of Sunday island.

Within the entrance there are two channels, the deeper one sweeping round westward, northward, and north-eastward for 7 miles ; and the other northward and westward for 5 miles, when they re-unite at a point N. $\frac{1}{2}$ W. 4 miles from Snake island lighthouse. The western trend, north-eastward of Sunday island, is called the Midge channel. The space enclosed by these channels is occupied by Sunday and a few smaller islands separated at low water by mud-banks. Sunday island is mostly covered with ti trees, the highest being about 41 feet above high water. It is surrounded by mud flats.

The Eastern channel, from its commencement at the black buoy off Clonmel island, is from one to 2 cables wide ; it extends in a northerly direction for nearly 3 miles, when it forms two branches, the one to the westward being the Midge channel, already spoken of, and the other, which trends in a N.N.E. direction, and leads to the township of Port Albert, 7 miles from the bar. From the junction the town is distant nearly 2 miles. The channel from the black buoy at the entrance is well marked by wooden piles on either side, those on the port hand being painted black, and those on the starboard hand red. In the channel, until its turn to the N.N.E., are from 15 to 25 feet, and thence to the township 15 to 6 feet, which latter depth is also the depth at the wharf, though 10 feet at low water will be found in the stream. The shoalest water in the channel is about 2 cables from the wharf. The channel runs between numerous low islands, generally mangrove, with other smaller channels between them, mostly dry at low water.

The continuation of the eastern channel is known as the river Tarra. Tarra, upon which, at 2 miles from the town of Port Albert in a straight line, is the township of Tarraville.

Tarraville is a small township on the left bank of the Tarra, near its mouth. Small vessels can get up to it at high water. It is a telegraph station. There is communication by coach with Port Albert, and thence with Melbourne by rail. The population was 140 in 1891.

The Western channel.—Inside the narrow western channel

is a red buoy moored close to the sand-bank, which extends to the bar; it lies nearly 4 cables N.E. of the east point of Snake island, and nearly 2 cables North of this buoy is a black buoy on the south edge of a sand-bank. From the north-east end of Snake island the channel trends West $3\frac{1}{2}$ miles, North one mile, and north-easterly for $2\frac{1}{2}$ miles, to the Midge channel, where a branch, which takes the name of the Albert river, continues to trend in a north-easterly direction for a further distance of 2 miles, whence it becomes more winding, and at a distance of 4 miles is Alberton. Coal of good quality is found to the westward of the township, but the country is densely wooded.

On both sides of this channel, which for 3 miles is 3 cables broad, there are mud-banks, and when clear of La Trobe island, at $3\frac{1}{2}$ miles from the entrance, there is a channel leading to Welshpool, fit only for boats and small craft. Midway the meeting of the tidal streams has formed mud-banks, which at low-water spring tides completely block the channel.

Tides and tidal signals.—No tides were observed at the bar. It may be presumed that the time of high water, full and change, is the same as at Rabbit island, or 0 h. 14 m.; springs rise 8 feet.

The signal master at the port, who has great opportunities of watching the tides, reports that for six months of the year, ending with the month of February, the highest tides occur in the morning. The P.M. tides begin to be the highest in March. Winds from W.S.W. cause the highest tides. When the wind is eastward of South a low tide follows.

Tidal signals denoting the tidal stream and the depth of water over the bar in the Western channel, leading to Port Albert, are exhibited daily between sunrise and sunset, from the flagstaff above the light-house tower on Snake island as, follows:—

Cone at eastern yardarm—Ebb stream.

Cone at western yardarm—Flood stream.

Cone at half mast—Under 6 feet depth of water.

One ball suspended from yard— 7 feet depth of water.

Two balls	”	”	”	— 8	”	”
Three balls	”	”	”	— 9	”	”
Four balls	”	”	”	—10	”	”
Five balls	”	”	”	--11	”	”
Six balls	”	”	”	—12	”	”
Seven balls	”	”	”	—13	”	” and over.

The average depth of water over the bar in the western channel is 6 feet at low water springs. As shown above, one ball indicates 7 feet and every additional ball an additional foot of water.

DIRECTIONS.—To port Albert from the westward, after rounding Wilson promontory, steer for cape Wellington, after passing which keep Rodondo island just open of it, bearing S. by W. $\frac{1}{2}$ W. (S. 17° W.) until mount Singapore is in line with Townsend point W. $\frac{1}{2}$ S. (S. 84° W.), which will ensure a distance of a mile from the bar; or, in the event of Rodondo being obscured, mount La Trobe kept open south of Rabbit island S.W. $\frac{1}{4}$ S. (S. 42° W.), will lead rather more than a mile to the south-eastward. When a mile off the bar, the break will be observed; the pilot will at once board the vessel. It must be borne in mind that, as the coast of La Trobe island is low, Townsend point is not visible off the bar, except from a height of above 15 feet; and the lead should be attended to.

From the Eastward vessels may approach the shore to a distance of 3 miles, and if at that distance, and coasting to the southward, they will observe the break on the bar; or they may bring mount La Trobe in line with Rabbit island S.W. $\frac{1}{4}$ S. (S. 42° W.), and make out the bar from that line.

The lighthouse on Snake island is an object by which the bar may be recognised. For the gunpowder anchorage *see* page 499.

Caution.—Mariners are cautioned against attempting port Albert bar without a pilot. *See* pages 529–30.

At night.—As the land is very low, it is recommended not to approach port Albert by night, but to keep a good offing until daylight, and attend to the lead.

The COAST.—Half a mile N.N.E. of Clonmel island is another island of similar formation, which trends in an E.N.E. direction for $1\frac{1}{4}$ miles, where there is an entrance between it and the island forming the western side of Shallow inlet. This latter island is nearly 4 miles long N.E. by E. $\frac{1}{2}$ E., with a few hummocks upon it, the highest being those near its eastern extreme, upon one of which (42 feet high) a surveying station is erected. The island, except where the hummocks rise, or a few scattered bushes grow, is scarcely

above high water and composed of sand. All is covered with a dwarf vegetation.

Shallow inlet is about 4 cables wide from shore to shore. From either side of the entrance, sand-spits extend in a southerly direction, the eastern for three-quarters of a mile, the western for half a mile, leaving a channel between them with not less than 3 feet at low water. The inlet is never used by shipping.

The COAST.—From the eastern shore of the inlet the coast trends N.E. $\frac{1}{2}$ N. for $3\frac{1}{2}$ miles, and thence N.E. by N. in a nearly straight line to Merriman creek entrance. The distance from Shallow inlet to Merriman creek is $24\frac{1}{2}$ miles; and as the coast from Shallow inlet ceases to have any more openings for a considerable distance, by which even boats may enter, this distance may be spoken of as the first portion of the Ninety-mile beach, which may be said to end at Conran point, though the Red bluff at the old entrance to the lakes is a break to its uniformity.

From Shallow inlet to Merriman creek the coast line is nearly separated from the land at the back, which is somewhat higher and thickly timbered, by fresh and salt lagoons or ti-tree swamps, generally salt. At a distance of 17 miles from the inlet, a slightly elevated piece of country, thickly timbered, about 150 feet in height, nears the coast to half a mile, and just to the eastward of this is situated lake Denison, whose waters discharge into and near the mouth of Merriman creek.

This district is all low, having an elevation from 50 feet to the westward to only 25 to the eastward. Here and there the hummocks fall considerably, and much of the coast is scarcely above high water, while in heavy rains the water of the lagoons breaks through the coast line.

Soundings.—From 18 miles north-east of Shallow inlet to the neighbourhood of port Albert is one immense flat with 6 to 9 fathoms at a mile from the shore, gradually increasing to 13 and 14 fathoms at a distance of 6 miles. Eastward of Seal islands the depths are somewhat greater, especially off Cliffy island, where there are 20 fathoms at the distance of a cable. A depth of 10 fathoms runs from 2 to 3 miles off the coast about Merriman creek, inside the Seal islands, to the southern shore of Sealers cove. From Seal

islands to the Monœur islands, which lie S.E. of Wilson promontory at a distance of 7 and 8 miles, and towards the promontory, the depths gradually increase, but are no guide to the vicinity. The greatest depth of 43 fathoms, gravel, is about 3 miles S.S.W. of Wilson promontory lighthouse.

NINETY-MILE BEACH.—The line of coast between Shallow inlet and the Red bluff is locally known as the Ninety-mile beach. Landing may be effected on it, but such a measure is extremely dangerous, as the beach is treacherous, being what is commonly known as a double beach.

When only a few miles from the land on the western part of the Ninety-mile beach nothing can be seen but the back ranges of mountains. These extend in a south-westerly direction for 27 miles, from Toms cap, 1,196 feet high, lying 19 miles West of Merriman creek, to mount Fatigue, which is 2,050 feet above the sea. The range between rises to summits of even greater elevation than mount Fatigue, the highest being 2,453 feet. A range of hills, the highest of which is mount Albert, 1,050 feet high, lies S.E. and East of mount Fatigue at a distance of 6 to 12 miles.

From Corner inlet, north-eastward, to the Red bluff, eastward of the old entrance to the Gipps Land lakes, the coast is a continuous sandy beach, much broken by inlets and small streams, the latter breaking through the narrow strip of sand after a heavy rainfall. Although a sandy beach is again found north-eastward of the Red bluff for a distance of 30 miles yet this is not a part of the well known, and hitherto dreaded, Ninety-mile beach.

From Merriman creek, which is N.E. by N. $24\frac{1}{2}$ miles from Shallow inlet, the coast stretches, with a slight curve inwards, N.E. $\frac{1}{8}$ N. 50 miles to the entrance of the Gipps Land lakes. All this coast is low, from 40 to 85 feet in height, in some places densely covered with ti tree, in others sparsely timbered with honeysuckle, the whole of so uniform and monotonous appearance that, with one exception, no objects easy of identification to the mariner present themselves. The exception is a group of houses immediately at the back of the entrance to Merriman creek, known as Buckley's station.

Lakes or lagoons extend close inside the sand-hummocks the

See chart, No. 1,695a and No. 1,016, Corner inlet to Gabo island, scale m = 0.2 inch.

whole distance; inside these lakes the land is low and densely timbered, and the same low country interspersed with lakes and marshes extends for miles inland, much of it being subject to floods.

At distances from Merriman creek of 18, 24, and 28 miles respectively are three hummocks (the easternmost is named Stockyard hill), on two of which marks have been erected. The middle hummock is covered with ti tree, and easily identified by coasters.

At a distance of 10 miles W. by S. of the old entrance of the Gipps Land lakes, and 3 miles from the outer line of coast, is a bluff, known as Tambo, about 250 feet high. Two miles S.E. of Tambo bluff is Shaving point, and this comparatively high land on the north shore of the Gipps Land lakes continues to the lakes entrance, then follows to Red bluff, skirts the arms and streams of lake Tyers beyond it, and following the line of the shore at about 2 miles inland, is not again lost; and giving as it does a higher appearance to the coast line, clearly marks the difference between the land to the eastward and that to the westward of the old entrance to the Gipps Land lakes.

The most conspicuous portion of the land just described is Jemmys point, which lies north-westward 4 cables from the new entrance of the lakes; it is 233 feet high, and partly cleared of timber. The artificial (New) entrance supersedes the old natural entrance, which partially closed in 1889.

The NEW ENTRANCE to the GIPPS LAND LAKES is about $4\frac{1}{2}$ miles W.S.W. of Red bluff. This entrance has an average depth of 12 feet at low water and is navigable during daylight in moderate weather, at slack water, for steam vessels or vessels in tow of steamers.

Steam-vessels trade regularly to the lakes; the vessels are flat-bottomed. The worst months for navigation are March, April, May, and June.

The entrance is easily recognisable by Jemmys point, the Red bluff to the east, and the flagstaff on the sand hummocks at the eastern side of it.

Navigation signal lights.—A white light is shown from the extremity of the platform on East pier, when the entrance is safely navigable and a red light is shown there when the entrance is dangerous.

Tidal signals.—Semaphores and wicker balls; painted white, denoting the state of the tidal stream, depth of water and condition of the entrance for navigation, are exhibited daily between sunrise and sunset, from a flagstaff erected on the sand hummocks at the eastern side of the entrance, as follows :—

Out-going stream running	...	Ball at eastern yard arm.
Slack at low water	... ..	Two balls at eastern yard arm.
In-going stream running	...	Ball at western yard arm.
Slack at high water	... ..	Two balls at western yard arm.
Depth of water 9 ft. 0 ins.	...	One semaphore.
" 9 " 6 "	... ..	Two semaphores.
" 10 " 0 "	... ..	Three "
" 10 " 6 "	... ..	Four "
" 11 " 0 "	... ..	Five "
" 11 " 6 "	... ..	Six "
" 12 " 0 " and		
more	... ..	Ball at masthead.
Wait for tide	... ..	One ball half-mast.
Entrance dangerous	... ..	Two balls half-mast.

All other signals are made by the commercial code.

Light.—A light is exhibited from the flagstaff to indicate the position of the entrance, but it does not in any way mark the fairway.

Gipps Land.—The climate and soil of Gipps Land are well fitted for the growth of oranges, limes, hops, tobacco, and opium, and the rivers abound in fish. The most important exports of Gipps Land are gold, wattle bark, cattle, wool, leather, grain, hops, dairy produce, sheep and kangaroo skins, and a large fish trade.

The principal towns are Sale the capital, and Bairnsdale.

Sale lies 9 miles up the river La Trobe, which falls into lake Wellington, and is 50 miles from the entrance to the lakes. It is

connected with Melbourne by rail and telegraph, and had a population of 3,442 in 1891. The district is pastoral, agricultural and mining. Hops are largely cultivated.

Bairnsdale, 20 miles from the entrance to the lakes, lies 8 miles up the river Mitchell, which falls into lake King. There is a telegraph station here, and it is in connection with Melbourne by railway. Hops are largely grown in the vicinity and the country is both pastoral and mineral. The population was 3,270 in 1891.

Signal station.—There is a signal station at Cunninghame, about 2 miles to the eastward of the New entrance and nearly half a mile inland. Communication can be made by the commercial code and the station is connected by telegraph.

Communication can also be made by the commercial code with the station at the New entrance to the lakes.

Lights.—The following lights are exhibited in the Gipps Land lakes; they are visible from a distance of about 2 to 3 miles in clear weather.

Reeves river entrance, north end of eastern pier, a *fixed* red light; north side at the end of Bullock island barrier, a *fixed* white light.

South wharf, about 150 yards N.E. of flagstaff, a *fixed* green light.

Cunninghame jetty, a *fixed* red light.

Shaving point, a *fixed* red light.

Metung jetty, a *fixed* green light.

On the south-east side of channel leading from lake King to Tambo river, a *fixed* green light.

Entrance to Mitchell river on the south side, a *fixed* white light and a *fixed* red light marking the west side of the entrance to Jones bay.

McMillan strait, eastern entrance. A *fixed* light showing red to the north of the beacon on the shoal extending from the north-east end of Raymond island, and white south of the beacon.

McMillan strait, Paynesville jetty, a *fixed* red light.

McLennan strait, lake Victoria entrance. A *fixed* light showing white in the entrance to the strait from lake Victoria, and red to the south-east and north-west of the entrance.

Seacombe jetty, a *fixed* green light.

McLennan strait, lake Wellington entrance. A *fixed* light, showing white from the outer pile beacon round southerly to Roseneath point, and red from Roseneath point round westerly to the outer beacon.

La Trobe river, lake Wellington. A *fixed* light showing white between the entrance beacons, and red to the north and south of the beacons.

Adjustment of compasses.—A swinging station consisting of one central beacon and four surrounding beacons has been established in Eagle-point bay, lake King, at which vessels may be swung for the adjustment of compasses. The magnetic bearings of several conspicuous landmarks from the central beacon are as follows :—

Pile No. 1	...	...	...	N. 0° 18' E.
Pile No. 2	..	...	...	S. 89° 54' E.
Pile No. 3	...	...	...	S. 0° 41' W.
Pile No. 4	...	...	...	N. 89° 36' W.
Tambo river, light beacon	...	...	...	N. 57° 2' E.
Raymond island, north-east end	...	...	...	N. 76° 31' E.
Cowl, James hop kiln	...	...	...	N. 68° 31' W.
Mount Look-out Gap	...	...	...	N. 50° 57' W.
Mount Taylor Gap	...	...	...	N. 42° 29' W.

The magnetic variation being considered 9° 10' E.

TIDES.—It was found to be high water, full and change, at the old entrance of the lakes at 8 h. 30 m.; the greatest rise observed at spring tides was 3 feet; but at a position on the beach 15 miles to the westward it was high water, full and change, at midnight, the same time nearly as at Rabbit island, and port Albert. Here the rise was also 3 feet, and in both places the rise depended entirely upon the wind, rising highest with south-westerly winds. In calms, or with other than south-westerly winds, or even with south-westerly winds if light, the rise was almost nothing, upon one occasion during a calm only giving a range of one inch.

Red bluff lies E.N.E. one mile from the old entrance to the lakes; it is over 100 feet high, and conspicuous from its colour. It

rises gradually to a height of 200 feet, and, like the land about it, is thickly timbered, though not so much near the coast as inland; the bluff has a few rocks off it, which do not extend far to seaward.

From Red bluff the coast, which is similar to the land of Red bluff, runs N.E. by E. $\frac{1}{4}$ E., $1\frac{1}{2}$ miles to the entrance to lake Tyers.

Lake Tyers.—The entrance to lake Tyers is generally barred across, but after a season of heavy rains the bar opens, and vessels of nearly 6 feet draught can enter during the short period that it is open; it is easily recognised from seaward.

Tidal signals to denote the depth of water on the bar are shown between sunrise and sunset from a flagstaff on the mainland near the entrance. Ebb tide is indicated by letter J, commercial code, at half-mast; and the flood by the same flag at the masthead.

ASPECT.—When off the Ninety-mile beach at a distance of 10 or 12 miles (unless near its eastern part), nothing will be visible except the high mountainous ranges to the west, north-west, and northward; the coast being generally about 60 feet high, is not visible from a ship's deck at that distance. As the eastern part of the Ninety-mile beach is approached, the mountain ranges gradually near the shore and take the character of high and distinct hills, or separate hilly ranges.

Mount Taylor.—The first hill of importance is mount Taylor, 1,630 feet high; this hill lies W. by N. $\frac{1}{4}$ N. 25 miles from the old entrance to the lakes; as the trees on the summit have been cut down, it presents a table-like appearance.

A hill of greater extent, but not so high, lies 2 miles West and N.W. of mount Taylor.

Little Dick, N.N.W. 23 miles from the entrance of the lakes, is 3,154 feet high, and shows generally with three round summits; being a high and large range it is a conspicuous landmark.

Mount Willie.—South-east of Little Dick, and 9 miles from the coast at lake Tyers, is a prominent hill known as mount Willie. It is 1,182 feet high, has a flattish top, and is conspicuous as being nearer the coast than any hill from Wilson promontory to lake Tyers.

Mount Tara, N.N.E. $\frac{1}{4}$ E. 9 miles from mount Willie, has two conspicuous summits with other smaller summits of lesser importance; the principal summit is flat-topped, and 1,993 feet high. Much timber has been cut down here, but a solitary large tree is left standing; the large gap on the summit of the hill and the solitary tree enable strangers to recognise mount Tara.

From mount Tara eastward and north-eastward the country is mountainous, some of the ranges approaching within a few miles of the coast.

The COAST from the entrance to lake Tyers trends with a curve E. by N. $\frac{3}{4}$ N. 21 miles to the Snowy river entrance, and is similar to that westward of the entrance to the lakes, though the sand-hummocks are higher, especially towards Snowy river, near which they attain a height of 176 feet. Immediately at the back of the coast, extending the whole distance, is a fresh-water morass, and generally half a mile from its margin is the higher back country, which along this part of the coast is about 200 feet high and densely timbered. The hummocky coast is faced with sand-cliffs or patches, but of so uniform an appearance that only one patch close to the Snowy river is worthy of notice. This patch, lying half a mile to the westward of the entrance, is a good guide to it; a log station built by the survey party on the highest hummock, rather more than a mile West of the Snowy river, is also a good guide.

Shoal.—At 4 miles S. by W. $\frac{1}{2}$ W. of the Snowy river entrance is a patch of uneven rocky bottom, upon which the least depth found was 8 fathoms; close to this foul ground is 20 fathoms, sand.

Snowy river has an entrance similar to lake Tyers; it discharges a large body of water, and appears during the time it is open to preserve nearly the same depth as is found on the bar at the entrance to that lake. The entrance with similar precautions to those taken at the lakes, is equally safe. The land about Snowy river is occupied as cattle stations, and is a large maize growing district.*

Light.—A beacon erected on the eastern side of the entrance to Snowy river exhibits, at 100 feet above high water, a *fixed* red light, which should be seen from a distance of 6 miles in clear weather. This light does not mark the fairway over the bar of the river; it is only intended to indicate the approach to the entrance.

See chart, No. 1,016.

* Marlo, at the junction of Snowy and Boodribb rivers, is a beautiful spot and likely to become a favourite watering place.

Ricardo point bears E. $\frac{1}{2}$ N. $4\frac{1}{2}$ miles from the Snowy river entrance. Some years since this entrance was close to the westward of the point, but a low sandy shore now occupies the space between, at the back of which is a salt-water lake, with an occasional opening into the sea, near the mouth of the Snowy river. The hummocks on Ricardo point are about 100 feet high, the point itself is rocky, sunken rocks extending more than 2 cables from the shore in all directions.

Mount Raymond.—N.N.W. 6 miles from Ricardo point is mount Raymond, a conspicuous hill, 992 feet high at its north elevation; mountain spurs extend in a southerly and south-easterly direction.

CONRAN POINT lies E. $\frac{1}{2}$ N. 5 miles from Ricardo point; it projects nearly one mile from the general line of coast, but is not easily distinguished; the land about the point is flat, and covered with a dense dwarf scrub. On the highest part of the point, 192 feet above the sea, a surveying station is erected, but this is not visible except when it is within a distance of 2 or 3 miles. The coast between Conran and Ricardo points forms a sandy bight, skirted with grassy hummocks over 100 feet high. In the centre is one conspicuous hummock 163 feet high, with a sand-patch near its summit, over which is a grove of ti tree.

Under the eastern part of Conran point, extending one-third of a mile off shore, are numerous sunken rocks upon which the sea breaks heavily.

In fine weather there is landing to the westward of the point; landing will also be found to the eastward, but it is not good. At one and a half miles inland from Conran point, and extending at that distance from the coast to the Snowy river, the higher ground is densely timbered, with an average height of about 300 feet.

Beware reef lies E. $\frac{1}{4}$ N. about $2\frac{1}{2}$ miles from Conran point; the reef is 8 feet above high water, and has sunken rocks (upon which the depth is uncertain) lying East and S.E. of it to a distance of one-third of a mile.

Pearl point bears E. by N. $\frac{3}{4}$ N. $7\frac{1}{2}$ miles from Conran point; the low sandy coast between forms a bight, and the back range rises to a height of about 300 feet. In the bight are two small fresh-water streams; off the mouth of the westernmost are two

patches of sunken rocks more than a quarter of a mile from the shore.

To the eastward of Pearl point are two conspicuous conical sand-cliffs, which render the point easy to identify. Scattered rocks lie off Pearl point to the southward for a distance of 2 cables, and one mile to the eastward sunken rocks extend from the shore one-third of a mile. The ridge of densely timbered broken country spoken of as lying at the back of Conran point, is also found at the back of Pearl point, whence it extends more inland towards mount Cann at the back of Sydenham inlet.

The aspect of the land at the back of Pearl point is marked in character, as from the Snowy river eastward to cape Howe there is no part of the coast that is not defined by some conspicuous mountain or hill. At the back of Ricardo point, 6 miles inland, is mount Raymond, which has been already described. N. by E. $\frac{1}{2}$ E. of mount Raymond, distant 12 miles, is the conspicuous long range of Diana, over 3,000 feet high; and still to the N.N.E., at a distance of 21 miles from mount Raymond, is mount Ellery, a double-peaked mountain. A surveying station is erected on its southern summit, being built on an enormous granite boulder 4,300 feet above the sea.

Sydenham inlet.—From Pearl point the coast runs in a nearly straight line E. by N. $\frac{1}{4}$ N. $6\frac{1}{2}$ miles to Sydenham inlet, the entrance to lake Bemm; over this district are well grassed hummocks about 100 feet in height, northward of which the land is low for some distance. At the back of lake Bemm the land is densely timbered, with an elevation of about 300 feet.

Sydenham inlet is small, and not worthy of particular notice. North of lake Bemm, at a distance of 8 miles from the coast is mount Cann, a peaked hill 1,885 feet high, upon the summit of which is a surveying station. Trees have been felled to make the station clear, and the gap will prevent mistake as to the identity of this mountain.

From Sydenham inlet the coast trends E. by N. $5\frac{1}{2}$ miles to the Tamboon river, and thence about 2 miles in the same direction to a rocky stretch of coast, off which are several sunken and dry rocks, the highest of which, named Cloke rock, is 25 feet above high water. One and a half miles inland is Point Hicks hill, 924 feet high.

CAPE EVERARD bears E. $\frac{1}{4}$ S. $6\frac{1}{2}$ miles from the Tamboon river, and is easily recognised by a sandy peak 538 feet high, lying

about one mile North of the cape. This summit has a gradual fall to the westward of bare sand, and is more remarkable when viewed from that direction.

Cape Everard has four points, the southernmost of which projects nearly $1\frac{1}{2}$ miles from the line of coast. The cape is composed of granite, with boulders strewed over the whole face. There is landing in fine weather in the western bight. A deep but exposed bight lies to the south-eastward of the cape. A rock above high water, and several awash or sunken, are scattered 2 cables off the southern points of cape Everard.

A reef of rocks, nearly awash at high water, lies nearly 2 cables East of the eastern part of the cape. There is deep water between these rocks, the outer of which has 18 fathoms close-to to seaward.

Dangers off cape Everard.—In addition to the scattered rocks there is a rock 3 feet above low water, and therefore barely covered at high water, lying E. by S. $\frac{3}{4}$ S. three-quarters of a mile from the southern part of the cape; and another the same distance E. $\frac{1}{2}$ N. from the same point, with only 7 feet on it at low water. These detached dangers occupying a position close to the fairway of steam vessels between Melbourne and Sydney, require due caution to avoid them.

LIGHT.—Cape Everard lighthouse, on the south extreme of the cape, built of concrete, painted white and 98 feet high, exhibits at 185 feet above high water, a *group flashing* white light with sectors of red light, showing a *double flash every 30 seconds*. The white light may be seen from a distance of 21 miles in clear weather, and it is visible seaward through an arc of 188° ; the sectors of red light extend about $1\frac{1}{2}$ miles seaward from the coast line, both eastward and westward of the lighthouse.

The illuminating apparatus is by reflectors of the first order.

Danger light.—An auxiliary *fixed* red light and visible through an arc of 188° (the same as the white arc of the principal light), is exhibited from a lower part of the lighthouse. This light is not seen, by an observer 14 feet above the sea until within the distance of about 2 miles from the lighthouse.

NOTE.—The red lights are to warn mariners of too close proximity to the shore or to outlying dangers.

Everard hill, 5 miles North of cape Everard, is densely timbered, and 1,200 feet high. From cape Everard a sandy beach trends in a north-easterly direction 2 miles to the mouth of the little river Toolaway.

Island point, named from a rock, 30 feet high, which lies close off it to the southward, at about 7 miles eastward of cape Everard ; S.E. by S. 2 cables from this rock is a smaller rock, only one foot above high water. The coast between cape Everard and Island point consists of sandy beaches with rocky points having reefs lying off them for 2 cables. About midway, and close to the coast, is a group of conspicuous bare sand-hummocks, and to the eastward of this group are several sand-patches.

From Island point the land trends with a curve E. by N. $2\frac{1}{2}$ miles to Rame head. Between cape Everard and Rame head the coast rises gradually inland, until at 2 or 3 miles inland it attains an elevation of about 600 feet. The country is densely timbered and undulating.

RAME HEAD, of granite formation, rises to 378 feet on its eastern side ; another summit of the same elevation rises close to the south-westward. The western part of the head is fringed with rocks, and a rock awash lies close to the south-east of the extreme point. Densely timbered ranges occupy the district between Rame head and Genoa peak ; the latter bears from the head N. by E. $\frac{1}{4}$ E. distant 16 miles.

From Rame head the coast trends in a northerly direction for $1\frac{1}{2}$ miles as far as a sandy beach ; thence in a north-easterly direction for nearly a mile to Wingan inlet. Over the sandy beach, and near its western part, is a sand-cliff 204 feet high.

Wingan point, which forms the eastern side of the entrance into Wingan inlet, bears from Rame head N.E. by N. 2 miles. Wingan inlet is difficult of access. The best time for entering in a boat is after westerly winds. Landing may sometimes be effected outside the inlet to the westward of Wingan point. Oysters are found in this inlet.

Off and southward of the point are the three Skerries rocks, the highest and centre of which is 42 feet above high water. In addition to the Skerries, there are detached rocks, some above high water, lying near them ; the outer of these, which is covered at high water,

is half a mile from Wingan point. From Wingan point the coast trends in a north-east direction 4 miles to Sand-patch point.

Sand-patch point is well named; a large body of drift sand near the point making it conspicuous. The only part of the coast which at all resembles Sand-patch point is cape Everard, but there the drift sand is not so conspicuous when seen from the eastward; the sand also at cape Everard is higher than at Sand-patch point.

Danger off Sand-patch point.—S. $\frac{1}{2}$ E. nearly half a mile from Sand-patch point is a pinnacle rock with $1\frac{1}{4}$ fathoms on it at low water, known as the Long reef. It is a dangerous rock, on which the sea breaks occasionally. In the surveying steam-vessel *Pharos* the rock was passed several times, and almost considered not to exist, when one day it was observed to break. A rock awash lies close to the south-eastward of Sand-patch point.

Little Rame head lies N.E. $\frac{1}{2}$ E. 4 miles from Sand-patch point; the coast between is about 300 feet high, and forms a rocky bight with a few sandy beaches. Upon a hill 240 feet high, immediately over the head, a survey station is erected. East of the head, at a distance of 2 cables, is a rock 10 feet above the sea.

Race.—Off Little Rame head, at a distance of 4 miles in a S.E. by S. direction, there is a depth of 19 fathoms, rock, near 35 fathoms, sand; and at a distance of 7 miles in the same direction 27 fathoms, rock, near 50 fathoms. This uneven bottom extends over a distance of 3 miles, causing a confused sea; in heavy weather small craft should avoid the place.

The COAST.—From Little Rame head the coast trends with a bight 3 miles N. by E. $\frac{3}{4}$ E., and thence with another and deeper bight N.N.E. $\frac{1}{4}$ E. 5 miles to Bastion point. As a continuous heavy swell rolls on this coast, it should not be approached nearer than a mile; it is also fringed with sunken rocks. One mile to the south-west of Bastion point is a conspicuous sand-patch.

Bastion point is comparatively low, being only 75 feet high; the land behind the point, and between it and Little Rame head, is densely timbered, and rises to the height of about 300 feet.

South and south-east of Bastion point are numerous rocks on which the sea breaks, one, with $1\frac{1}{2}$ fathoms upon it, lies 3 cables to the

south-east, and another, 3 feet above high water, lies 3 cables to the south-west. The land of Bastion point forms the west side of Mallagoota inlet. There is a landing place in fine weather on the north side of the point.

Mallagoota inlet forms the entrance to Mallagoota lake and Genoa river; the bar can rarely be crossed in a boat. The depth upon this bar is uncertain, and except in the finest weather a heavy swell rolls into the inlet, and breaks at half a mile from the shore.

Three-quarters of a mile North of Bastion point is the low and sandy eastern point of Mallagoota inlet. From this point the land forms a sandy bight to Telegraph point, which lies from it E. by N. $\frac{1}{2}$ N. $6\frac{1}{2}$ miles.

At 4 miles from the inlet, the coast projects to the southward, towards Tullaburga island.

Tullaburga island, 28 feet high, lying E.N.E. 4 miles from Bastion point, is a rock with little soil, and a few bushes on the north-east part.

At $1\frac{1}{4}$ miles south-westward of Tullaburga there is uneven bottom, but not less than 7 fathoms water was found.

GABO ISLAND lies E. $\frac{1}{2}$ N. 3 miles from Tullaburga island. It is nearly $1\frac{1}{2}$ miles long, in a N.W. by N. and S.E. by S. direction, and about half a mile broad near the centre and south end; towards the north end the island tapers gradually to a point, which latter consists of low granite boulders, separated by a channel about $1\frac{3}{4}$ cables wide, from Telegraph point on the mainland. Gabo island, composed of red granite, is steep-to in all directions, except to the northward. To the westward the slopes of the island are covered with grass and dwarf bushes. Near the centre are a few sand-hills whose bare sides face the south-east, and only show as sand-hills in that direction; the remains of the old light-house are upon the highest of these hills, which has an elevation of 171 feet.

On the north-west side of the island is a small sandy bay, with 5 fathoms in the central part, where there is good anchorage for one vessel, except in south-westerly gales. In the course of the survey in 1871 the steam-vessel *Pharos* rode out several moderate south-westerly gales in this bay. It is probable that a gale of some con-

continuance would have to blow direct in before the swell would make the anchorage unsafe. It was observed that though there was often a heavy swell outside, scarcely any was felt at this anchorage.

A small but constant stream of fresh water runs out on the small sandy beach at the anchorage.

In the narrow channel between Gabo island and the mainland, the deepest part has about 6 feet water; boats occasionally use this channel, but a confused sea, caused by the meeting of the swell from opposite sides of the island, renders it unsafe.

LIGHT.—The lighthouse, 156 feet high, on the south-east extreme of Gabo island, close to high-water mark, is built of red granite, with a white lantern, and exhibits, at 179 feet above high-water, a *fixed* light of the first order, showing the following sectors: *red* from S. 14° W. to S. 34° W., *white* from S. 34° W., through west and north, to N. 45° E., *red* from N. 45° E. to N. 84° E.; it is visible from a distance of 20 miles in clear weather.

Danger light.—An auxiliary *fixed* red light, visible seaward over an arc of 180°, is exhibited from Gabo island lighthouse. This light is invisible to an observer, whose eye is 14 feet above the sea, until at a distance of 3 miles or less from the light. It is intended to warn mariners of too close approach to the shore, and when seen, course should be altered to seaward until it is out of sight.

In hazy or misty weather mariners should not rely on sighting this red light, but should keep a good offing.

Fog signal.—In thick or foggy weather, from the Gabo island lighthouse station, three explosive rockets are fired in quick succession every 15 minutes.

NOTE.—The rockets explode at a height of about 600 feet with a sharp report, which, under favourable atmospheric conditions, may be heard at the distance of 5 or 6 miles, but mariners are cautioned, on hearing the report, to take precautions immediately, as sometimes the sound may only be heard at a much shorter distance.

Signal station.—There is a signal station at the lighthouse and communication may be made by the commercial code of signals. It is connected by telegraph (direct to Sydney).

See charts, No. 1,016; No. 1,211, Raine head to port Jackson, scale $m = 0.14$ inch; No. 1,017, Gabo island to Montague island, scale $m = 0.5$ inch.

TIDES.—It is high water, full and change, at Gabo island at 8 h. 50 m. ; springs rise 6 feet.

Tidal streams.—At the western part of the Ninety-mile beach tidal streams exist, which are gradually lost in proceeding north-eastward, and near the entrance of the lakes are not observable. The flood stream runs to the south-west, and the ebb to the north-east, with at 20 miles eastward of Shallow inlet a rate of one knot at springs. *See* page 551.

Currents.—A current, averaging from $\frac{1}{2}$ to $1\frac{1}{2}$ knots an hour, generally sets eastward through Bass strait with westerly winds, and westward with easterly winds, continuing for one or two days after the respective winds have ceased.

During the progress of the survey, no current was felt inshore between Wilson promontory and Gabo island.

Weather.—The experience of the weather on this coast, which was obtained during the survey, does not point to any great hazard in approaching the Ninety-mile beach. In westerly gales comparatively smooth water is obtained by working up in-shore when to the westward of the entrance of Gipps Land lakes. Easterly gales are not without warning signs, therefore a vessel in-shore when an easterly gale threatens should at once get an offing.

As the western part of the Ninety-mile beach is approached, easterly gales are not so generally felt ; Wilson promontory appears to be the dividing point. In the summer months, as westerly gales usually veer to the southward, it is more advisable to stand towards the Tasmanian coast, and so be ready to take advantage of the shift of wind.

In the winter months, and more particularly in September, October, and November, the same course cannot be recommended ; the wind during these months does not shift for a continuance, but constantly backs to the west-north-westward.

SOUNDINGS.—From Hogan group, 29 miles eastward of Wilson promontory, to 7 miles South of Gabo island, there are 28 to 42 fathoms for the first 60 miles. On this line no soundings have been taken, after the first 60 miles until within 10 miles of Rame head, where there are 66 fathoms, sand. Few soundings have been taken beyond

10 miles from the coast from Shallow inlet to Gabo island. Twenty-five miles eastward of the inlet there are 20 fathoms; at the same distance South of the entrance to the lakes are 30 fathoms, and at 27 miles S.E. of the entrance are 29 fathoms, whence the depth increases to 67 fathoms at 7 miles to the eastward. South-south-east of Conran point at 10 miles there are 34 fathoms, and at 40 miles, 70 fathoms. At 5 miles off cape Everard there are 60 fathoms, and this depth is found between Little Rame head and Gabo island at about 7 miles off the land.

EASTERN ENTRANCE OF BASS STRAIT.

The eastern entrance of Bass strait is the space included between Wilson promontory and the north-east part of Tasmania. Between these two headlands are numerous islands, occupying an extent of about 120 miles, which, from their formation of granite, and the manner in which they lie, as a connecting chain, would appear to have been the upper part of a range of hills which once joined the two lands before natural causes produced the opening which bears the name of Bass strait.

That such was the original formation of this part, or at least its disposition a comparatively few years ago, appears extremely probable on inspecting the chart; as also that Wilson promontory and cape Liptrap were formerly insulated.

Tidal stream.—At the eastern part of the fairway of Bass strait, the flood stream sets to the south-west and the ebb to the north-east.

Vessels proceeding eastward from the neighbourhood of King island find the tidal stream against them of longer duration than the stream in their favour.

CURTIS ISLAND is $1\frac{1}{2}$ miles in length in a N.N.E. and S.S.W. direction. It rises in two peaks; the southern is square-topped and 1,100 feet high; the northern, 736 feet high, has a bare granite summit. The coast is precipitous all round, but especially so at the

south end of the island. Landing may be effected close to the north point, but only in very fine weather.

Cone island, $1\frac{1}{4}$ miles S.E. by E. of the south point of Curtis island, is a rocky islet, 368 feet high; on its northern side there are two small rocks; the outer, Passage rock, is distant 3 cables, and uncovers 3 feet at spring tides; the other is 8 feet above high water; on its south side, and close-to, there is a remarkable leaning pinnacle, 82 feet high.

Sugar loaf, so named from its appearance, is 308 feet high, and lies $2\frac{1}{2}$ miles S.S.E. of the south point of Curtis island; on its north side, and close-to, there is a small rock, 8 feet high.

Clarendon rock, lying 8 cables E. by S. of the north point of Curtis island, has 4 feet water on it at low water springs. This rock is of very small extent, and is surrounded by deep water; it breaks in heavy weather, but is generally difficult to distinguish.

CROCODILE ROCK lies $9\frac{3}{4}$ miles N.W. by W. $\frac{1}{4}$ W. from the north point of Curtis island, and almost in the centre of the channel between Rodondo and the Monœur islands, and Curtis island. It is a large smooth boulder of granite, about 2 feet above high water springs. The sea almost continuously sweeps over it, so that the rock itself is seldom visible; as a general rule, however, its position is well marked by the breakers.

Cutter rock, $1\frac{1}{2}$ miles N.E. $\frac{3}{4}$ N. from Crocodile rock, has 4 fathoms water on it at low water springs; it is of small extent, surrounded by deep water, and has not been observed to break.

Devil's Tower is a rugged islet, 363 feet high, lying $6\frac{1}{2}$ miles N.N.E. $\frac{1}{2}$ E. from the north point of Curtis island; there are a few detached rocks quite close-to on the south-east side, otherwise it is free from danger or fringing reefs. When viewed from the N.W. or S.E., the Devil's Tower shows a double summit, the north-eastern being the higher of the two.*

* Reported rocks.—In 1890 the master of the barque *Carlisle* reported that his vessel struck on a rock $2\frac{3}{4}$ miles S.S.E. $\frac{1}{2}$ E. from East Monœur island; the position according to witnesses was 4 miles N.W. by N. from Devil's Tower; an examination of these localities by H.M. surveying vessel *Dart* in 1891, gave no indication of uneven bottom, and it is probable that the *Carlisle* struck the Crocodile rock. A search was also made by the *Dart* for a rock reported to exist about 7 miles E.N.E. of Crocodile rock, but no trace of it or of shallow water was found.

HOGAN ISLAND, the largest of the group of the same name, the summit of which lies $14\frac{1}{2}$ miles N.E. $\frac{3}{8}$ N. from Devil's Tower, is $1\frac{1}{2}$ miles long, north and south, by three-quarters of a mile wide; it is 428 feet high, and is precipitous on the south and west sides.

To the northward and eastward of Hogan island there are several small islets and rocks; the outermost, Seal rock, is 15 feet above high water, and lies about $2\frac{1}{2}$ miles N.E. of the summit of Hogan island. There are no hidden dangers in the neighbourhood of the group.

Anchorage.—Excellent shelter in heavy southerly winds may be obtained on the north-east side of Hogan island, in the bay formed by the rocks projecting to the northward, and Long island. The water is rather deep (about 20 fathoms), but the holding ground is good. With westerly gales, the bay on the eastern side of Hogan island, and south of Long island, is a better anchorage than the above bay. The depth is 10 to 15 fathoms, with a bottom of rocks, stones, and sand; affording good holding ground.

Water.—Fresh water in small quantities may be obtained on Hogan island, either in the bay on its eastern side, or in the small cove on its north-west side.

The Hogan group is infested with black snakes.

Soundings.—There are soundings in 40 to 30 fathoms from Curtis isle to Hogan group, and between them and Wilson promontory there are similar depths of water, the bottom being generally sand, shells, and coral.

DIRECTIONS.—No other covered dangers are known to exist between Curtis isle and Wilson promontory; in the night, or during thick weather, it is prudent for a stranger who is desirous of clearing the strait, to obtain a sight of Curtis isle, and pass on its south side, to the southward of the Sugarloaf, between the latter and Judgment rocks, as its high summit, Cone islet and Sugarloaf rock to the southward of it, are remarkable objects, by which its identity cannot be mistaken; (unless passing between the promontory and Rodondo).

KENT GROUP, S.E. by E. 18 to 23 miles from Hogan group, consists of Deal, Dover, and Erith islands, and N.E. isle, which

lies E.N.E. $1\frac{3}{4}$ miles from Garden point, the north extreme of Deal island.

Deal island, the largest of the group, is $3\frac{1}{4}$ miles long and $2\frac{1}{2}$ miles broad. It rises to conical granite hills, some of which are clothed to their summits with an impervious scrub. The highest of these hills, on which is the lighthouse, rises from the south point of the island to the height of 949 feet. The coast is generally precipitous, especially on the south side, and is indented with numerous bays.

LIGHT.—The lighthouse on Deal island, which is situated on the summit, at the south-west side, and three-quarters of a mile North of the south point of the island, is a circular stone tower 46 feet high, painted white, and exhibits, at 957 feet above high water, a white light which *revolves every minute and forty seconds*. At the distance of 10 miles it is *fifty seconds* bright and *fifty seconds* dark. The light may be seen from the distance of 36 miles in clear weather; but from its great elevation, it is frequently obscured by fogs.

The lighthouse is built 2 cables south-eastward of the highest part of the island, and is sufficiently high to show over it.

Murray pass, the channel which separates Deal from Erith island, is nearly half a mile wide, with soundings in 25 to 33 fathoms in mid-channel.

Erith and Dover islands are connected at low water, but at high water there is a boat passage between them, and together are $3\frac{1}{4}$ miles long, N.N.E. and S.S.W., and about $1\frac{1}{4}$ miles across, at the broadest part.

Erith, the northern island, is irregular in shape with a deeply indented coast line; a grassy valley, in which is a great number of rabbits, runs in a north-west direction through it.

Dover island rises abruptly to a height of 774 feet; the coast, especially on the south side, is precipitous.

North rock, a small black rock 27 feet high, lies 4 cables W.N.W. of the northern bluff of Erith island; there are two smaller rocks about half a cable S.S.E. of it.

N.E. isle is small and 345 feet high, it lies about one mile N.E. of Deal island. At 2 cables N.W. of the north point of the isle is a remarkable rock, 40 feet high, called from its appearance the Anvil rock.

Anchorage.—Of the numerous bays with which the coast line of this group is indented, there are only two where it is at all safe to anchor, East cove and West cove.

East cove affords good shelter in easterly and southerly winds, but it is a dangerous place in a south-westerly gale; the bottom is uneven, the holding ground not good, and in the strength of the tidal stream the swirls and eddies come well into the cove. At the bottom of this cove there is a sandy beach, and a boat-house; it is here the stores for the lighthouse are landed. There is a fairly good road from the beach to the lighthouse.

West cove gives protection from all but north-easterly gales, and as an anchorage, generally is to be preferred to East cove. At present, however, the space in it is somewhat restricted, owing to the presence of a wreck close to the N.E. shore of the bay.

The channel between Hogan and Kent groups is 17 miles wide, with soundings in 30 to 35 fathoms.

Tides.—It is high water, full and change, in East cove at 10h. 15m. The greatest range of tide observed in January, February, and March, was 8 feet. The tides at neaps are very irregular.

Tidal streams.—The flood stream comes from the N.E., the ebb from the S.W. In fine weather it is slack water at the time of high and low water; but this is not always to be depended on, as the duration of the stream appears to be greatly influenced by the wind.

Both flood and ebb run with considerable velocity through Murray pass, frequently causing a very turbulent sea; in bad weather there are heavy tide rips off all the salient points of this group, and especially at the exposed entrance to the pass.

Supplies.—The light keepers and their families are the only inhabitants of this group; they all reside on Deal island.

In 1886 there were about 600 sheep on the island; a few may be purchased at a reasonable price; no vegetables are grown, but

excellent watercresses grow in profusion in the stream which runs into Garden cove, and can easily be obtained.

Water.—Fresh water is abundant in the northern part of Deal island.

Communication.—The Tasmanian Government communicate with Deal island once every four months for the purpose of landing stores.

Steamers plying between Sydney and Launceston pass close to this group, and communicate if signalled from the lighthouse flagstaff to do so.

SOUTH-WEST ISLAND lies $9\frac{1}{4}$ miles W. by S. $\frac{1}{4}$ S. from the south bluff of Deal island; it is a small rocky islet half a mile long, north and south, and 323 feet high.

JUDGMENT ROCKS, are a group lying to the northward of South-west island. The northern and largest of these rocks is 105 feet high, and distant 9 cables from the north point of South-west island.

The passage between these rocks and South-west island should not be used.

THE PYRAMID is a bare, square-topped mass of granite, 243 feet high; there is deep water close to its western side, and from 11 to 20 fathoms for about half a mile from its eastern side; it is usually surrounded by tide rips, except when there is no wind. This rock has frequently been mistaken for a sail.

WRIGHT ROCK, 124 feet high, is situated in lat. $39^{\circ} 35' 40''$ S., long. $147^{\circ} 32' 30''$ E. This rock should be given a berth of one mile; there are irregular soundings within that distance around it, and there are several small rocks close to, both on its north and south sides; it is also generally surrounded by tide rips.

The channel between Kent group and Wright rock, which is 10 miles wide, has tolerably regular soundings (except within $1\frac{1}{2}$ miles of the rock) in 24 to 29 fathoms, sand and shells; there are 29 fathoms, gravel and small stones, at 2 miles to the north-west of Wright rock, and the same depth, on a coarse sandy bottom, 5 miles to the northward. This depth continues for 30 miles farther in a

N. by E. direction, when it gradually increases, and the bottom becomes fine sand.

Endeavour reef lies $2\frac{3}{4}$ miles E. by S. $\frac{3}{4}$ S. from Wright rock ; it is about half-a-mile long, in a north and south direction ; the reef does not uncover, and is usually marked by a heavy breaker.

Beagle rock, $5\frac{1}{2}$ miles E. $\frac{3}{4}$ S. from Wright rock, is of small extent, 5 feet above high water, and is steep-to.

CRAGGY ISLE is bare and rocky, about two-thirds of a mile in length, and rises at its western end to a height of 371 feet. Rocks extend about 2 cables from the western extreme of the isle ; and east-north-eastward of it, for rather more than 4 cables from the eastern extreme.

Dangers.—An extensive rocky patch, with a least depth of $2\frac{1}{4}$ fathoms, lies upwards of one mile eastward of the east extreme of Craggy isle ; and irregular soundings extend south and south-westward from that isle for a distance of about $1\frac{1}{2}$ miles.

Craggy rock, S.E., $2\frac{1}{4}$ miles from the summit of Craggy isle, has a least depth of 4 fathoms. The soundings between this rock and the patch eastward of Craggy isle are irregular. The dangers in this locality break heavily in bad weather, and both they and Craggy isle are usually surrounded by tide rips.

Tidal streams.—The flood and ebb streams run through these channels at a rate of about 2 knots at springs. In strong breezes there are generally heavy tide rips in the vicinity of the reefs.

FURNEAUX GROUP,* the south-easternmost of the chain of islands between Wilson promontory and the north-east extreme of Tasmania, consists of Flinders and Barren islands, the largest of the group, and numerous smaller islands, rocks and shoals. This group extends from the Sisters S.S.E. nearly 60 miles to Moriarty banks, and 32 miles across.

These islands were inhabited in 1881 by 289 persons who procure a living by seal-fishing and preserving mutton birds ; many of them half-castes, the offspring of marriages between the sealers and aboriginal women.

See chart, No. 1,695a.

* Discovered by Captain Tobias Furneaux, (Cook's second in command on his second voyage of discovery) in the *Adventure* in 1773.

The Sisters are two high islands, from one to 5 miles off North point of Flinders island, one bearing E. by S. $\frac{1}{4}$ S., distant 29 miles, and the other E. $\frac{1}{2}$ S. 32 miles from Deal island lighthouse, and are visible in clear weather, at the distance of 30 miles. The Sisters have rather uneven surfaces with not much vegetation, but they harbour numerous sea-birds.

East Sister is $2\frac{1}{4}$ miles long, 615 feet high, and lies $3\frac{3}{4}$ miles northward of Flinders island. South of East Sister, and separated from it by a narrow channel, is a ledge of rock, part of which is above water; the south point of this ledge is 8 cables from the shore.

West Sister is $2\frac{1}{2}$ miles long, almost divided in the middle by a deep valley. The western part is 526 feet high, and the eastern 636. The east point of this island lies one mile North of North point of Flinders island, and 2 miles S. by W. of the west point of East Sister.

The soundings around these islands and the north part of Flinders island from North point to Bligh point, are very irregular and are apparently the result of the action of the tidal streams.

When passing between the Sisters, take care to avoid a spit which extends three-quarters of a mile in a north-westerly direction from the N.E. point of West Sister island.

Tidal streams.—In the channel between the Sister islands the stream runs at the rate of $1\frac{1}{2}$ knots at springs. In the channel between West Sister island and Flinders island, the stream runs at a much greater rate, causing tide rips and overfalls, and has scoured out the narrow channel to a depth of over 70 fathoms.

FLINDERS ISLAND, the largest of the Furneaux group, is 36 miles long, about N.W. and S.E., 20 miles broad at the centre, and contains 513,000 acres; Bligh point, the north-west point of the island, from which a reef projects a short distance, bears nearly E. by S. $\frac{3}{4}$ S., distant $28\frac{1}{2}$ miles from Deal island lighthouse. The principal ridges on the island take a general S.S.E. direction from its north-west point to its south-west extreme, and are barren and mountainous, presenting a bold abrupt front to the westward, and sloping to low land on the eastern side, which is bordered by a sandy beach. These ridges are separated at about the middle of the island, by Heathy valley, which stretches across it. The west side of

Flinders island is fronted by several small islands, under the lee of which vessels may find shelter from westerly winds.

The coast of Flinders island from North point to cape Frankland is rocky and broken, between Bligh point and Sentinel island it falls back considerably, forming a bay on the side of mount Killiecrankie, in the middle of which there is a small rocky islet 22 feet high.

This bay is entirely exposed to the N.W., but affords protection from S.W. gales, the violence of the sea being broken by Sentinel island and the surrounding rocks; a moderate swell only comes into the bay. Although the bottom is sand, the holding ground is good.

There are two places in this bay where boats may find shelter, one amongst the rocks in the south part of the bay, and the other at the N.E. point under mount Killiecrankie. When entering and leaving this bay it is advisable to pass east of the islet, so as to avoid a sunken rock which lies 3 cables south-westward of it.

Mount Killiecrankie rises in the north-west part of the island to the height of 1,035 feet.

Cape Frankland, S.S.W. 9 miles from Bligh point, is the western and central extremity of a hilly peninsula extending 5 miles N. by W. and S. by E., and 4 miles from the western coast-line of Flinders island.

A reef projects a short distance from the cape, and an islet lies half a mile and Sentinel islet $2\frac{1}{2}$ miles N. by E. of it; rocks extend for some distance from these islets.

A reef extends one-third of a mile from the south point of the peninsula; and in the bight to the eastward of it, is the cluster of Flat rocks, between which and the shore to the northward, there is a boat-harbour, with 3 fathoms water in it. Between the south point of the peninsula of cape Frankland and Settlement point S.E. by S. 6 miles from it, the west coast of Flinders island forms Marshall bay, $3\frac{1}{2}$ miles deep, with 8 to 10 fathoms across its entrance, and $9\frac{1}{2}$ to 4 fathoms along its southern shore; but it is exposed to the westward.

Roden and Pasco islets, mostly connected by reefs, extend from the shore at 2 miles south-eastward of the cape, 4 miles in a South direction. North Pasco islet is 242 feet high and South Pasco 36 feet.

Neither Marshall bay nor Pasco islets give any protection in westerly winds.

Tides.—At Roden island it is high water, full and change, at 10 h. 7 m.; springs rise 10 feet, neaps 7 to 8 feet, neaps range about 5 feet.

Frankland rock, W. $\frac{3}{4}$ S. $4\frac{1}{4}$ miles from cape Frankland, is a double rock awash at half tide, with 18 to 23 fathoms close about it, except on its east side, where a bank of not less than 8 fathoms extends half a mile.

Settlement point is hilly, having a small reef on its south side, and a cluster of islets and rocks extending a quarter to $1\frac{1}{4}$ miles south-west from it, with 6 and 4 fathoms between the islets and the point.

The west coast of Flinders island, from Settlement point, curves E. by S. $\frac{1}{2}$ S. 2 miles to a projection, between which and Long point, south-east $4\frac{1}{2}$ miles from it, is a bay $1\frac{1}{2}$ miles deep, with mountainous land behind it; the highest summit being the Sugarloaf, which bears East, distant $6\frac{1}{2}$ miles, from Settlement point, and is 1,472 feet high.

HUMMOCK ISLAND, the north point of which lies W. by S. $3\frac{3}{4}$ miles from Settlement point, is $5\frac{1}{2}$ miles long, N. by E. and S. by W., and is one mile broad at either end, between which it is only half a mile across. Its two highest hills are on its northern and southern ends, the former being 483 and the latter 570 feet high. From the north point a reef stretches three-quarters of a mile to the northward, and this reef continues to the east point of the island, the 5-fathoms line being about 4 cables off shore. Shoal water extends three-quarters of a mile southward from the east point, and there is a rock dry at low water, S. by W. 3 cables from the point; along the island from the east point to the Koh-i-noor rock, there is then deep water to a quarter of a mile off shore.

Anchorage.—There is good anchorage in 6 fathoms water, on the east side of Hummock island, at about three-quarters of a mile to the northward of the Koh-i-noor rock just noticed, and half a mile from the shore. It may be approached by passing round either the north or south end of the island.

From the southward the island must not be hugged too closely.

as the Koh-i-noor rock, which is awash at low water, lies about one-third of a mile off shore.

Tides.—It is high water, full and change, at the anchorage, Hummock island, at 10 h. 30 m. ; springs rise 10 feet.

Passage islets are three in number, lying between S.E. by S. a mile, and South $1\frac{1}{2}$ miles from the south point of Hummock island : they lie in line, N.N.E. $\frac{1}{2}$ E. and S.S.W. $\frac{1}{2}$ W. ; the southernmost and largest islet being 3 cables in extent. The reef on which these islets are situated extends nearly a quarter of a mile northward from the north-eastern islet, between which and the south point of Hummock island is a safe passage half a mile wide.

Myrmidon rock, on which there is 9 feet at low-water springs, lies $1\frac{3}{4}$ miles W. by S. $\frac{1}{4}$ S. from the north point of Hummock island ; it is of small extent, and there is deep water between it and the island.

Swires patch, on which there are 5 fathoms at low-water springs, lies $2\frac{3}{4}$ miles N.W. by W. $\frac{3}{4}$ W. from the south point of Hummock island, and irregular soundings extend $1\frac{1}{4}$ miles to the northward and north-westward of it.

Long point, which has a rock awash close off it, is a peninsula stretching about $1\frac{1}{2}$ miles southward from the line of coast, from which it is nearly separated by a shallow inlet having a narrow entrance, with a small islet close to its eastern point, and another on the west side of the inlet. Between Long point and another projection $2\frac{1}{4}$ miles to the eastward of it, the bight is full of shoal patches, which prevent a near approach to the fresh water close to the shore, at three-quarters of a mile to the northward of the east point of the bight.

From the east point of the bight, just noticed, the west coast of Flinders island takes a S.S.E. direction $6\frac{1}{2}$ miles to the north point of a hilly projection, extending $1\frac{1}{4}$ miles N. by W. $\frac{1}{2}$ W. and S. by E. $\frac{1}{2}$ E., and one mile from the line of coast. Between 2 and 3 miles northward of the point is a slight projection of the coast, close behind which is a fresh-water swamp.

The south-west point of Flinders island lies S.E. by S. $1\frac{1}{4}$ miles from the south extreme of the hilly projection just described, and there is a small bight on either side of it.

Strzelecki peaks.—At N. by E. 3 miles from the south-west point of Flinders island, Strzelecki peaks, the highest mountains on the island, rise to the height of 2,550 feet.

Reef isles are four in number, with several rocks above water, connected by reefs extending from 3 miles westward to $4\frac{3}{4}$ miles S.W. by S. from Long point. Chalky island, 79 feet high, the northern, is three-quarters of a mile long, north and south, and is enclosed by rocky shoals; the island should not be approached on its west side, within a mile in 11 fathoms water. The other three, which are small islets, lie respectively S.E. by E. 2 miles, S. by E. $\frac{1}{4}$ E. 2 miles, and S. $\frac{3}{4}$ E. $2\frac{1}{2}$ miles from the northern island, and are connected by a narrow continuous reef, extending westward and south-westward from the eastern to the western, and southern islets.

Another small island, Isabella, lies South $1\frac{3}{4}$ miles from Long point, between which and Reef isles there are 4 and 5 fathoms water; the depth decreases northward to 2 fathoms abreast of Long point. Between this island and the coast eastward of it, the space has been little sounded, but there are only 6 to 9 feet water at half a mile and three-quarters of a mile from the shore.

Soundings.—There is a clear channel nearly 2 miles wide, with 8 to 10 fathoms water, between the north end of Hummock island and the islets off Settlement point; and another 5 miles wide between the island and Reef islets; the soundings gradually increasing to the southward, to 21 fathoms between Passage islets and the southern Reef islet.

Tidal streams.—The tidal streams in this channel follow nearly the trend of Hummock island, the flood setting to the southward, three-quarters of a knot, and the ebb to the northward, half a knot.

Kangaroo island, the centre of which lies S. by E. $\frac{1}{2}$ E. 5 miles from the summit of Chalky island, is of a crescent form, with its points to the southward and south-eastward, each having a reef, projecting a short distance from it. This island is $1\frac{1}{2}$ miles long N.E. and S.W., and one-third of a mile broad at the centre. Reefs

extend 2 and 3 cables from its north-west side and north-east point, and for a mile to the northward.

Anchorage.—There is anchorage in 7 fathoms water, off the north-east end of this island.

Green island, of which the centre lies E. $\frac{1}{4}$ N. 3 miles from the north-east point of Kangaroo island, is $1\frac{1}{4}$ miles long, north and south, and one-third of a mile broad at the centre, where it rises to a hill. A cluster of islets extends nearly a mile northward from the north end of the island. There is deep water close round the rocks which skirt the southern half of Green island, but there are only $2\frac{1}{2}$ to $1\frac{1}{2}$ fathoms along the southern edge of a shoal which connects the island with the mainland.

Anchorage.—There is anchorage in 4 fathoms water, at about one-third of a mile off the south-east side of the island.

Soundings.—There are 7 to 13 fathoms water between Kangaroo and Green islands, from whence the depth gradually decreases northward, to 4 and 5 fathoms between the eastern Reef islet and Isabella island.

CHAPPELL ISLANDS are three in number, with numerous islets and rocks, lying S.W. by W. $\frac{3}{4}$ W. 5 to 12 miles from the south-west point of Flinders island.

GOOSE ISLE, the westernmost of the group, lies S.W. by W. $\frac{3}{4}$ W. 12 miles from the south-west point of Flinders island, it is $1\frac{1}{2}$ miles long, N.N.W. and S.S.E., and half a mile broad, with an islet about a quarter of mile in extent, surrounded by a reef, close off its north-west extreme. The island is 54 feet high at its highest and northern part and consists of granite boulders with a shallow covering of soil in the hollows where a few sheep are grazed. There are 6 fathoms water close to the south point, and 7 to 9 fathoms near the east side of Goose isle.

Anchorage may be obtained in 9 to 11 fathoms, sand, to the eastward of Goose island, with the northernmost of the lighthouse-keepers' dwellings in line with the flagstaff; and Hummock island open of the north-east point of Goose island. This anchorage is good

during westerly winds, but being so close to the shore, is unsafe, should the wind shift to the south-east.

Tides and tidal streams.—It is high water, full and change, at Goose island at 10h. 48m., springs rise 9 feet. The flood stream sets to the N.W., the ebb to the S.E., at an average rate of one knot.

LIGHT.—The lighthouse on Goose isle, a quarter of a mile from its south point, is 74 feet high, painted white; it exhibits at 100 feet above the sea, a *fixed* white light, visible between the bearings of S. 28° E. through north and N. 50° W., which may be seen from the distance of 14 miles in clear weather. To the eastward of these bearings the light is frequently eclipsed by intervening islands.

Badger island, the central and largest of the Chappell islands, is flat, about 4 miles in extent, 109 feet high at its N.E. point, and sparsely covered with timber. A rocky spit with 12 feet upon it extends nearly $1\frac{1}{2}$ miles to the northward of its north-west extreme. The north-west and north-east points lie nearly E. by N., the former 2 miles, and the latter $4\frac{1}{2}$ miles from the north point of Goose isle. From the north-west point the west side of Badger island trends South three-quarters of a mile, and thence, forming a bay half a mile in depth, S.S.E. $1\frac{1}{4}$ miles to Unicorn point, the south-west point of the island, from whence the south and east coasts of the island sweep round 4 miles to its north-east point. Over Unicorn point, there is a conspicuous granite boulder. The north side forms a bay extending from the north-east point W. $\frac{1}{2}$ S. $1\frac{1}{2}$ miles, and having 9 to 3 fathoms across its entrance. The western point of this bay has a reef projecting nearly two-thirds of a mile northward from it, between which and the north-west point of the island is a projecting point fringed by a reef. At a quarter of a mile eastward of the east point of Badger island is Little Badger island, 17 feet high, and at $1\frac{1}{4}$ miles south-eastward of the south-east point of Badger island is Beagle island.

Anchorage.—Eastward of Badger island, good anchorage may be obtained in about 7 fathoms, sandy bottom, with Little Badger island in line with the summit of Mount Chappell island.

The channel between Goose and Badger islands is $1\frac{3}{4}$ miles wide, and has 7 to 19 fathoms water in it.

Boxen island and Double rock.—Boxen island, 22 feet high, lies S.E. by E. $\frac{1}{4}$ E. 6 miles from Goose island lighthouse, having rocks and foul ground all round it, but principally on its west and north sides, where they extend half a mile. Double rock, 34 feet high, lies one mile N.W. $\frac{1}{2}$ N. from Boxen island. Three cables from Double rock in a north-westerly direction is a rock, dry at low-water springs. Foul ground extends a quarter of a mile to the south-east of Double rock, and there is only a very narrow channel with not more than 4 fathoms between it and Boxen island.

Beagle island, N.N.E. $\frac{1}{2}$ E. nearly 2 miles from Double rock, is 21 feet high, with a reef for a quarter of a mile off its western side. A $3\frac{1}{2}$ fathoms bank extends off its north side for half a mile, on which are several rocks above water; and there is a sunken rock a quarter of a mile to the southward of it.

Rochfort rock.—Nearly midway between Double rock and Beagle island lies Rochfort or Lucy rock with 6 feet water over it, on which the sea breaks in westerly winds during low tides.

Mount Chappell island, $1\frac{1}{2}$ miles in length N. $\frac{1}{2}$ E. and S. $\frac{1}{2}$ W., and three-quarters of a mile in breadth, lies one mile north-eastward of Badger island, and rises to a rounded summit 653 feet high. To the westward, and extending northward for $2\frac{1}{2}$ miles and north-eastward for half a mile of this island there are several groups of rocks 15 to 25 feet high, the highest bearing N.W. by N. distant $1\frac{1}{4}$ miles from the north end of the island; a shoal patch with $4\frac{1}{4}$ fathoms water on it, which breaks in heavy westerly weather, lies $1\frac{1}{2}$ miles N.E. by E. from the north-east end of the island; and in the centre of the channel between Mount Chappell and Badger islands is a rock which dries 3 feet at low water. Mount Chappell island is the favourite breeding place of the mutton bird or sooty petrel, and during the season above 200 men, women, and children are employed in salting the young birds (which form an article of diet amongst the poorer population in Tasmania) and collecting their oil, which is used for softening leather, lubricating machinery, and other purposes. The birds deposit their eggs about the 25th, 26th, and two or three following days of November. The season for obtaining the young birds and oil is from January to March.

South coast of Flinders island.—From the south-west point of Flinders island the coast trends south-easterly $1\frac{1}{2}$ miles, E.S.E.

$2\frac{1}{4}$ miles, East $1\frac{1}{2}$ miles, and N.E. by E. $3\frac{1}{2}$ miles to Badger corner, and is formed by numerous small sandy bays and sharp projecting points, the spurs from Strzelecki peaks generally extending to the points.

The dangers near this part of Flinders island are Entrance rock with 2 feet water, lying S. by W. $\frac{1}{4}$ W. $1\frac{1}{2}$ miles from the south point of the hilly projection; a rock with 12 feet, nearer the point; a bank with 12 feet, lying a mile off S.W. point; and a shoal of 9 feet, extending to a distance of half a mile from the shore.

Badger corner is a small cove in the western corner of a bay, which extends from the south-east point of the cove E.N.E. 4 miles, and is $1\frac{3}{4}$ miles deep. This bay is mostly occupied by small islands and shoals, with generally very shallow water between them, and is fronted by the two Dog isles.

Between the Little Dog isle and Badger corner there is a group of rocks covered at high water, to the westward of which is a narrow channel, with 12 feet water, leading to the anchorage for small vessels in Badger corner; the channel to the eastward of these rocks is blind.

Dog isles are situated between Badger corner and the S.E. point of Flinders island. Little Dog isle, about half a mile across and 118 feet high, lies E. by S. 6 cables from the S.E. point of Badger corner. Shoal water extends from it in a south-westerly direction $1\frac{1}{2}$ miles; a rock 3 feet high lies 2 cables from its south extreme; and another $1\frac{1}{2}$ cables from its north-west extreme. Other rocks, with numerous sand-banks, lie to the northward, and a sandy flat, nearly dry at low water, extends half a mile to the north-eastward.

Dog isle, nearly one mile from Little Dog isle, is about $1\frac{3}{4}$ miles in extent, having a flat-topped, conspicuous hill 254 feet high at its north-west point; there is a shoal sandy bay eastward of the south-west point of the isle, dry at low water except near the centre, where there is a depth of 3 feet; at the head of this bay there is a house occupied by the lessee of the island, off which small vessels anchor. At 6 cables E.S.E. of the south-west point is a rock 2 feet above high water, from which a sand-bank extends nearly half a mile to the eastward, parallel to and at a distance

of a quarter of a mile from the south coast of the island. Three-quarters of a mile North of Dog isle is Little Green island, and one mile N.E. of the north-east point of the isle is a sandy point of Flinders island, from which the coast trends E.N.E. and north-easterly for 3 miles to the south-east extreme of Flinders island, thence in a northerly direction to the mouth of a lagoon extending above 2 miles to the north-westward, and nearly 2 miles to the south-westward from its mouth. From the north-east point of Dog isle, shoal water extends almost to the nearest point of Flinders island. In the depth of the bay north of Dog isles there is a small river named Samphire river. Midway between Dog and Vansittart islands is a rocky islet, with shoal water extending more than a quarter of a mile to the northward; the remainder of the space between Dog, Vansittart, and Flinders islands is clear of danger, with 6 to 25 fathoms water.

The East coast of Flinders island is low and sandy; from North point it trends in a south-easterly direction for a distance of 18 miles, and then curves to the eastward for about 5 miles, there forming a junction with Babel island in a low sandy spit. South of Babel island the coast runs S. by E. for a distance of 15 miles to the northern side of Franklin sound.

Aspect.—Quoin hill, S. by W. $3\frac{1}{4}$ miles from North point, rises to the height of 810 feet; but there are no conspicuous objects along this coast between this hill and the Patriarchs, three remarkable peaks, rising from the low sandy land behind the east point of the island, and separated from the mountainous ranges to the westward by a low sandy plain. The north-east and highest of the Patriarchs bears S.E. $\frac{1}{4}$ E., distant 19 miles from North point, is 772 feet high, and has a very sharp conspicuous appearance when seen from the south-east.

Beagle spit.—At about $3\frac{1}{2}$ miles to the south-east of North point a dangerous sandy spit stretches out from the shore $5\frac{1}{2}$ miles in an east-north-east direction, with only 9 feet water on a patch at $1\frac{3}{4}$ miles within its extremity, where the depth is 18 feet: from the east extreme of this spit North point bears W. $\frac{1}{4}$ N., distant $7\frac{3}{4}$ miles.

Soundings.—There are soundings in 10 to 18 fathoms between

the Sisters and the end of the spit, off which there are 10 to 8 fathoms; and from 7 fathoms at two-thirds of a mile S.E. of it, there are regular soundings in 12 and 13 fathoms to Babel isles, off the east point of the island.

At 3 miles East of East Sister island there are 18 fathoms, thence decreasing to 12 and increasing again to 22 fathoms at 3 miles N.E. of Babel isles.

BABEL ISLES were so named by Captain Flinders from the discordant and various notes of the innumerable birds on them. The principal isle, situated S.E. by E. $\frac{1}{2}$ E., 19 miles distant from North point, Flinders island, is about $1\frac{1}{2}$ miles in extent east and west, and the same distance north and south. The summit of this isle is a flat-topped wooded peak, 656 feet high; and near its western end there is a remarkable pyramidal hill, 446 feet high. Two islets lie close to the eastern side of the principal isle, the northern and larger islet is 105 feet high, and the southern islet 55 feet high.

Dangers.—The bay southward of Babel isles is free from dangers: in that to the northward are several small rocks, but they all show above water; the outermost rock lies N.W. by W., distant $1\frac{1}{4}$ miles, from the north-western point of the principal Babel isle, and is 4 feet high; another rock, awash at high water springs, lies N.W. by W. distant half a mile from that point. Three miles westward of the principal Babel isle, and about one mile from the beach, are two small groups of rocks.

Anchorage.—With westerly winds, there is anchorage on a sandy bottom, either northward or southward of the sandy spit connecting the principal Babel isle with Flinders island. The soundings are regular, decreasing gradually to 3 fathoms close to the beach. With winds eastward of North or South, no vessel should anchor in this neighbourhood.

TIDES.—It is high water, full and change, at the Babel isles, at 10 h. 5 m.; springs rise 7 feet.

Tidal streams.—North of Babel isles the flood sets to the northward and ebb to the southward, parallel to the coast, and generally with regularity, especially near the shore. South of Babel isles the tidal streams are weak and irregular.

Minnie Carmichael shoal.—This shoal, off the east coast of Flinders island, on which the British barque *Minnie Carmichael* is stated to have struck, has an estimated depth of $3\frac{1}{2}$ fathoms, and lies with cape Barren bearing S. $\frac{1}{4}$ E., and Babel island summit W. by N., distant 10 miles.

Close southward of this position no bottom could be obtained at 21 fathoms.

This shoal was searched for by H.M. surveying vessel *Flying Fish* in 1887, under favourable circumstances with regard to weather, but no indication of shallow water could be found in its assigned position.

Rock.—A rock, reported by the Master of the New South Wales pilot steam-vessel *Captain Cook*, also by the Master of the barque *Woollahra*, and on which the barque *Lawrence* was wrecked in 1869, is stated to be situated with cape Barren bearing S. $\frac{1}{4}$ E., distant 16 to 18 miles. This rock was searched for unsuccessfully by H.M. surveying vessel *Dart* in 1888, but a thorough examination could not be made of the locality.

Caution.—Seeing the doubtful nature of the above, as also that several vessels are reported to have been wrecked on detached dangers off the east coast of Flinders island, when seeking shelter from westerly gales, mariners are cautioned accordingly.

FRANKLIN SOUND, 4 miles wide, between Flinders and Barren islands, is fronted to the westward by the Chappell islands; the only navigable channel into this sound from the westward is between Flinders island and the Oyster rocks. A bar with $3\frac{1}{2}$ to 5 fathoms extends across its entrance; the summit of Vansittart island in line with the south point of Flinders island bearing E. by N. (N. 79° E.) leads over the bar in $4\frac{1}{2}$ fathoms water. A quarter of a mile southward of this leading mark on the bar there is 14 feet water, at half a mile south 10 feet; and on the north side at a quarter of a mile distance 12 feet. After crossing the bar the only danger to be avoided is a sand-bank with patches of 8 and 11 feet, parallel to and half a mile northward of East Anderson isle. At this part of the sound the channel is divided into three arms, the northern running north-eastward as far as Little Dog isle and Badger corner, the middle eastward to the south end of Dog isle narrowing there to a bar of $3\frac{1}{2}$ fathoms, which separates it from the main channel of the sound; and the southern or main to

the south-eastward round the rocks off East Anderson isle towards Barren island, thence to the north-eastward maintaining a broad channel up to the passage between Dog and Vansittart islands.

South of East Anderson isle a branch of the main arm runs westward, and good anchorage may be obtained in $4\frac{1}{2}$ or 5 fathoms water, near the south side of the isle.

The south-west entrance to Franklin sound is blocked by numerous rocks and banks, and cannot be navigated without danger.

Oyster rocks are two rocks a quarter of a mile apart, N.E. and S.W. from each other, the northern rock, 35 feet high, lies W.N.W. 2 miles from the summit of West Anderson isle; the north side of this rock is bold; from these rocks a sand-bank, dry in some parts, extends $1\frac{1}{2}$ miles in a westerly and southerly direction, thence easterly to the west coast of West Anderson isle.

West Anderson isle, 211 feet high, lies S. by W. 2 miles from the south point of Flinders island; this isle was originally named Woody island, but every particle of timber has been cut down or burnt, nearly its only vegetation being a coarse grass which supports a few cattle and sheep. The island is about one mile long N.N.E. and S.S.W., and two-thirds of a mile broad. One cable North of West Anderson isle is an islet the north side of which is bold; this islet is connected with West Anderson isle at low water by a sand-bank having on it a smaller islet. The south side of West Anderson isle is foul to a distance of three-quarters of a mile, thence a narrow shoal with 2 to 18 feet water extends westward to a distance of 3 miles.

East Anderson isle, known locally as Tin Kettle, is $1\frac{1}{2}$ miles long in an east and west direction, and a quarter to a half a mile broad. Off its east point four rocks, only a few feet above high water, extend a quarter of a mile in a northerly direction, and $1\frac{1}{2}$ cables north-eastward of the outer rock is a rock which dries 2 feet at low water. About these rocks and extending for three-quarters of a mile to the eastward of the east point is a shoal bank. At $1\frac{1}{4}$ miles N.E. of the east point is the west extreme of a sand-bank with 15 feet water; this bank extends eastward towards the south end of Dog isle and has from 2 to 18 feet water on it.

A flat, in some places dry, connects East and West Anderson isles, which are distant from each other three-quarters of a mile.

Long island is situated at the south-west entrance of Franklin sound and E. by S. $\frac{1}{2}$ S. $4\frac{3}{4}$ miles from Badger island; it is $2\frac{1}{3}$ miles long, N.E. by E. and S.W. by W., and one-quarter to three-quarters of a mile broad, and is bordered with rocks; on its northern part, 165 feet high, there is a conspicuous granite boulder, and near its western extreme, 98 feet high, there is another granite boulder.

Doughboy island is small, and lies N.E. $\frac{1}{4}$ E. $1\frac{1}{4}$ miles from Long island; the soundings between this island and Ned point are very irregular.

BARREN ISLAND, the second in size of the Furneaux group, contains about 110,000 acres, and extends from cape Sir John, its west point, E. $\frac{3}{4}$ N. $22\frac{1}{2}$ miles to cape Barren, its east point, and is 12 miles broad between its north and south points. The island is high, rocky, and irregular, with some rounded hills near its north-west coast. There is also a remarkable peak on the south-east part of the island.

North-west coast of Barren island.—Ned point, E. by N. $\frac{1}{4}$ N. $1\frac{1}{4}$ miles from Doughboy island, projects nearly half a mile from the coast line, having to the eastward a small bay named Munro bay, used by small vessels. Several rocks extend from the point in a N.N.W. direction, and at a distance of half a mile there is a rocky islet lying N.E. and S.W. The coast from Ned point trends south-westerly 4 miles to Franklin village, the population of which, in 1877, amounted to, Europeans 132, and half-castes 106. Their principal occupation is salting the mutton-bird and procuring the oil.

North coast of Barren island.—From Ned point, the coast trends in an easterly direction 5 miles to Lee river, thence in a northerly direction 2 miles to Apple Orchard point; from which three small islets extend half a mile in a north-westerly direction, affording good shelter to the eastward of them, but the tidal streams run very strong in different directions, and an anchor invariably comes up foul. Eastward of Ned point for 3 miles, as well as north-eastward along the south coast of East Anderson island there is deep water, but at 2 miles N.E. by E. from Ned point is the west tail of a

large flat, which extends the whole distance to Apple Orchard point, and inshore to Lee river.

Mount Munro, 2,348 feet high, situated S.E. $\frac{3}{4}$ E. $2\frac{1}{2}$ miles from Ned point, has a rounded summit densely timbered; between it and the coast are ranges, sterile in appearance, composed chiefly of granite.

Puncheon point.—From Apple Orchard point the coast trends E. $\frac{3}{4}$ S. $1\frac{1}{2}$ miles to Dover point; E.S.E. $1\frac{1}{4}$ miles to Dover river, and N.E. 4 miles to Puncheon point, the north point of Barren island; several islands and rocks surrounded with sandy flats lie westward and south-westward of this point over a space of more than a mile.

Vansittart island, locally known as Gun-carriage, the south point of which lies W. by S. $\frac{1}{2}$ S. one mile from Puncheon point, is $2\frac{1}{4}$ miles long, N.N.W. and S.S.E., and $1\frac{3}{4}$ miles broad at its southern end, and almost connected with Puncheon point at low water; it rises at its centre to a broad summit 552 feet high, from which a spur extends to its south-west point. On the west side there is a sandy bay, where the owner of the island resides.

To the southward of a line from Apple Orchard point to the south-west point of Vansittart island, there are numerous shoals dry at low water.

The **Eastern entrance** to Franklin sound lies between sand-banks extending from the south-east point of Flinders island and others extending from Vansittart island; these banks have been named Vansittart shoals. The channels between them are said to shift with every strong wind. The best and probably the most permanent channel was found to have a depth of 4 fathoms. The shifting channel along the coast of Flinders island is very narrow. Northerly and north-easterly winds are said to have the greatest effect in shifting the Vansittart shoals. The sea breaks heavily in easterly weather.

TIDAL STREAMS.—At the eastern entrance of Franklin sound the flood streams meet, one coming from the N.N.E., and the other from S.E. The flood stream sets to the westward through Franklin sound, and from thence about W.N.W. on the north side, and W.S.W. on the south side of Chappell islands; and the ebb

in the contrary direction. In the north channel the streams run 2 to $2\frac{1}{2}$ knots.

West coast of Barren island.—The west coast is rock-bound, and trends 2 miles in a S. by E. direction, from a point one mile to the southward of the west extreme of Long island to cape Sir John. This coast is foul to the distance in places of about half a mile from it. At one mile from the coast, and 2 miles from the south-west point of Long island is a rock 7 feet high, from which foul ground extends nearly half a mile in north-westerly and south-westerly directions.

Cape Sir John, the south-west extreme of Barren island, has three off-lying rocks above water, situated respectively S.W. $\frac{1}{2}$ W. three-quarters of a mile, S.E. $\frac{1}{2}$ S. three-quarters of a mile, and E. by S. half a mile from the cape. One mile to the northward of cape Sir John is a conspicuous round-topped hill 531 feet high.

The coast from cape Sir John, recedes to the north-eastward, forming a bay, Thunder and Lightning bay, nearly a mile deep, and $1\frac{1}{4}$ miles wide. An islet 58 feet high, nearly connected with the shore, lies a quarter of a mile south-eastward of the east entrance point of Thunder and Lightning bay. East of this islet is another small bay, the south point of which lies E. by S. three-quarters of a mile from the islet, and has numerous boulders lying off it to a distance of a quarter of a mile; thence the coast trends south-easterly half a mile, and easterly 2 miles to a point, 3 cables to the southward of which lies Malms rock, dry at low water. The latter part has numerous rocks off it to a distance of a quarter of a mile.

Wombat point, locally known as Rocky head, lies E. $\frac{1}{2}$ N. $2\frac{1}{2}$ miles from the point north of Malms rock; near the extremity of Wombat point is a small granite island 74 feet high, $1\frac{1}{2}$ cables South, and $1\frac{1}{2}$ cables East of which there is a rock uncovering at one-third ebb, and to the south-westward at three-quarters of a mile is a sand-bank with $2\frac{1}{2}$ fathoms water.

Sloping point bears E. $\frac{1}{2}$ N. 4 miles from Wombat point; between these points is a shoal bay having near its centre an island about 20 feet high, named Battery island. A rock awash at low

water lies one cable southward of Sloping point, and another above water lies nearer the shore.

Middle bank is a long, narrow shoal, fronting the bay just noticed, the east end of which in 3 fathoms lies S.W. by W. half a mile from Sloping point; whence it extends W.S.W. 2 miles, with as little as 3 feet on the shoalest part.

KENT BAY extends from Sloping point E. $\frac{1}{2}$ S. $5\frac{1}{2}$ miles to Passage point, the south point of Barren island, and is 3 miles deep; it is nearly filled with shoals, and the only anchorage is in 11 fathoms water, 3 cables from the shore, $1\frac{1}{4}$ miles N.E. by E. from Sloping point. Abreast this anchorage is the most convenient place for watering. From Sloping point the north-western shore trends N.E. $\frac{1}{2}$ N. 3 miles to a small point, at E. by N. $\frac{3}{4}$ N. three-quarters of a mile from which, a projection of the northern shore divides the head of the bay into two bights. A narrow shoal upwards of 2 miles long in an E. $\frac{1}{2}$ S. and W. $\frac{1}{2}$ N. direction, with from 3 to 18 feet water on it, lies across the mouth of the bay; its west end bearing E.N.E. about $1\frac{3}{4}$ miles from Sloping point. There is a clear channel half a mile wide between the south edge of this shoal and the 3-fathoms edge of the bank to the southward.

Sloop rock, N.E. $\frac{1}{2}$ E. nearly $2\frac{1}{4}$ miles from Sloping point, is situated on a reef of rocks. Sloop rock is 12 feet high, and lies about 4 cables from the west shore of Kent bay.

Anchorage.—Small vessels may anchor between Sloop rock and the shore in 3 to 6 fathoms. Several vessels may here lie at anchor in 4 or 5 fathoms, sheltered from all winds. From this anchorage the soundings decrease to one fathom at three-quarters of a mile northward of Sloop rock; and between the rock and the head of the bay, there are irregular soundings of 4 to 2 fathoms.

The eastern bight of Kent bay—where there was a run of fresh water—is filled by a shoal flat, which extends in patches along the eastern shore, nearly to Passage point.

East coast of Barren island.—From Puncheon point the coast trends S.E. by E. $\frac{1}{4}$ E., $7\frac{1}{2}$ miles, with several rocky points and intermediate sandy bays, to Harley point, off which several rocks above and below water extend E.S.E. nearly half a mile, thence at a

distance of nearly a mile S.E. by E. $\frac{3}{4}$ E. is Flat rock 3 feet high, with a few sunken rocks extending to the north-westward. Harley point is nearly separated from the land behind by a lagoon. There are lagoons behind the beach, at intervals for $3\frac{1}{2}$ miles to the south-east of Puncheon point, and at 2 miles to the north-west of Harley point, is an inlet barred across at its entrance.

Cape Barren, the east point of Barren island, S.E. by S. $3\frac{1}{2}$ miles from Harley point, is a rounded rocky point having numerous hillocks over it; at three-quarters of a mile East of the cape lies a rocky islet 40 feet high, named Gull islet; and at one mile East is Gull rock 12 feet high, with numerous other rocks above and below water extending nearly half a mile in a northerly direction. Midway between cape Barren and Gull islet is a sunken rocky patch with 14 feet over it. There are 17 fathoms water at half a mile to the eastward of Gull islet; but there are strong tide ripples near the reef. At $1\frac{1}{4}$ miles S.E. by E. from cape Barren there is a patch with $6\frac{1}{2}$ to 8 fathoms water on it.

Between Harley point and cape Barren, the coast forms a double bay.

Cone point, so named from two conspicuous, cone-shaped granite rocks, lies S.W. $\frac{1}{4}$ S. 5 miles from cape Barren, with two bays between, having sandy beaches in their depths. The point dividing the bays has a conspicuous sand-patch over it.

The north-eastern bay extends 3 miles from cape Barren, and is one mile deep. The south-western bay is two-thirds of a mile deep, with a lagoon extending $1\frac{1}{4}$ miles along the back of the beach, at about half a mile from it.

Soundings.—From 7 fathoms, at 2 miles eastward of Puncheon point the soundings increase to 14 fathoms at $1\frac{1}{2}$ miles off Harley point, and 17 fathoms at $1\frac{1}{2}$ miles off cape Barren; thence to about 3 miles eastward of Cone point there are 13 to 17 fathoms.

Passage point, the south extremity of Barren island, lies W. by S. $\frac{1}{2}$ S., 2 miles from Cone point, having a bay with a steep sandy beach lying between; the bay is nearly one mile deep, with 7 to 9 fathoms water in it. Behind the sandy beach on the west side of this bay is a lagoon, the water in which is of a red colour and a

little brackish. On the west side of Passage point there are several smaller ponds, which contain good water.

Mount Kerford, 1,644 feet high, is the highest peak of the range which rises from the various points on the south-east coast of Barren island. The whole range is conspicuous from its barren and whitish appearance.

ARMSTRONG CHANNEL, between Barren and Clarke islands, is seldom used owing to the numerous banks and strong tidal streams in it. The passage of Armstrong channel between Barren island and Preservation isle is neither so wide nor so straight as that along the coast of Clarke island. At the west entrance, the passage between Barren island and Preservation isle is about half a mile wide; E.N.E. nearly $1\frac{1}{2}$ miles from the north point of Preservation isle, lies Malms rock, between which and Wombat point, and extending a mile from the shore, is a shoal bank interspersed with rocks, above and below water. The passage between Preservation isle and Clarke island is nearly 2 miles wide; the only dangers in the entrance of this passage are, Eclipse rock off the west point of Clarke island (*see* page 579), a rock awash a quarter of a mile off the same point, and the 2-fathoms rock to the south-east of Rum islet; the better side of the channel is along the coast of Clarke island; care, however, is necessary to give the coast north of Clarke hill a berth of half a mile, and again to approach the next point, the western point of Kangaroo bay, to avoid the Middle bank, with 3 feet upon it, which lies in mid-channel.

Westward of Seal point, the north-east extreme of Clarke island, lies Kangaroo bay, one mile deep, having a narrow channel leading into it along the western shore, and anchorage may be obtained in the centre of the bay in 3 or $3\frac{1}{2}$ fathoms; the remaining portion of the bay is shoal.

From the western point of Kangaroo bay, Armstrong channel runs in the direction of Sloping point, between which and Seal point there is a depth of 41 fathoms in mid-channel.

From half a mile N.E. of Seal rocks (*see* page 577), on the north-west side of Seal point, several sand-banks, dry at low water, and shoals extend to Forsyth isle. Armstrong channel continues north of these shoals, a narrow shoal sand-bank occupying a central position, and terminates in a passage 4 cables wide between Forsyth

and Passage isles. A smaller passage exists between Passage isle and Passage point, but it should only be used in case of necessity as the tidal streams run at the rate of 5 or 6 knots, and its centre is occupied by a half-tide rock. It should be entered with the flood stream, keeping near Passage point.

Night islet, 46 feet high, lies S.E. by E. $14\frac{1}{4}$ miles from Goose island lighthouse. Dry and sunken rocks, nearly half a mile in extent, lie half a mile from it in a north-easterly direction; and Little Night islet lies half a mile in a S. by E. direction.

Preservation isle, 84 feet high, in the west entrance of Armstrong channel, is of granite formation, $1\frac{3}{4}$ miles long in a north-west and south-east direction, and half a mile across its broadest part. Many small islets and rocks extend half a mile from its north-west extreme, and from its east side a shoal spit, partially dry at low-water spring tides, extends to a distance of $1\frac{1}{2}$ miles.

Rum islet, close to the south point of Preservation isle, is about a quarter of a mile in extent; it has a reef projecting a short distance from its southern end, and is joined to Preservation isle by a reef of dry and covered rocks, which, together with the islet, protects Hamilton road from the south-westward. A rock with 2 fathoms water on it, East 4 cables from the south point of Rum islet, lies in the track of vessels bound into Hamilton road.

Hamilton road, eastward of the south-east point of Preservation isle, affords anchorage in 4 fathoms water, 3 cables from the point; in this vicinity there are patches of 3 fathoms. After a continuance of heavy gales from the westward a long swell rolls round the south point of Rum islet, and the swell does not gradually increase but sets in suddenly; which on one occasion compelled the *Victoria* surveying vessel to get under weigh and run to Kent bay for shelter.

Tides.—It is high water, full and change, at Preservation isle at 10h. 36m.; springs rise from 5 to 7 feet.

Seal rocks are a cluster of dry (8 feet high) and sunken rocks on a shoal projecting to the north-west about one-third of a mile from Seal point, the north-east point of Clarke island, leaving a channel two-thirds of a mile wide between them and Sloping point.

Forsyth isle is $1\frac{1}{2}$ miles long, north and south, and one-third of a mile broad. The bank which forms the southern side of Armstrong channel extends $1\frac{1}{4}$ miles northward of Forsyth isle, thence in a westerly direction towards Sloping point; and numerous banks and channels exist between Forsyth isle and Clarke island. A sand-bank extends 3 cables from the east side of Forsyth isle, and a shoal of $3\frac{1}{2}$ fathoms extends nearly a mile to the eastward of the south-east point, and almost unites with another shoal extending S.W. from the south point of Passage isle. At one mile S.W. $\frac{3}{4}$ S. from the south-west point of Forsyth isle lies a rock awash at half-tide. In the vicinity of the shoal water the sea breaks heavily.

Passage isle, 177 feet high, lies 3 cables from Passage point; it is $1\frac{3}{4}$ miles long N.W. by N. and S.E. by S., and about half a mile broad. At one cable from its north-east point, and nearly in mid-channel, is a rock dry at low water, and 2 cables North of its north point are several rocks above water.

A few rocks above water extend one cable off the south point, and rocks having less than 6 feet water extend a quarter of a mile S.E. from the south-east extreme. Off the western side a sand-bank extends 4 cables from the shore, except off the north-west point, which is steep-to.

Armstrong channel.—Remarks.—Although there are many shoals of sand in, as well as on each side of, the wider parts of Armstrong channel, a passage of sufficient width and depth is swept out by the tidal streams for vessels to go through. The bottom is either rocky or sandy; rocky in the deep and narrow parts, and sandy in the bights and shoaler pieces. A careful study of the chart, with a good look-out, and attention to the lead are the safest and best guides for this channel.

Water.—Good fresh water may be collected at certain seasons in small pools near the south-eastern end of Preservation isle; but that which drains from the rocks appears to possess some pernicious qualities. Small pools or runs of water are to be found almost everywhere under the high parts of Barren island, and it is probable there may be some on Clarke island.

Birds.—Preservation isle and the adjacent rocky islets are visited by numerous sea birds, including the cape Barren goose,* a few black

* *Cereopsis Novæ Hollandiæ*; this bird is only known in Australia.

swans, and great numbers of the sooty petrel ; which latter burrow in the ground like rabbits, and when skinned and smoked, are passable food.

Clarke island, the southern of the Furneaux group, 8 miles long, N.E. $\frac{3}{4}$ N. and S.W. $\frac{3}{4}$ S., and 6 miles across its south-western part, rises near its north-west coast to a peaked hill 676 feet high ; and to a broad-topped hill 525 feet high near its south-west extreme. The west point of Clarke island is rocky, and at half a mile from the point in a westerly direction is the Eclipse rock with 11 feet over it, about which there is a confused sea. Sloping point open north of Clarke island bearing N.E. $\frac{3}{4}$ E. (N. 53° E.), leads to the northward, and a conspicuous boulder on a hill 783 feet high, near the west end of Barren island, open west of Rum islet N.N.W. (N. 22° W.) leads to the westward of Eclipse rock. *See* page 576.

Southward of the west point is a deep bay, which was formerly much used by coasting vessels, but cannot be recommended.

A few scattered rocks lie off Look-out head (the south-west point of Clarke island) to the south-eastward and eastward ; the outer is distant 3 cables from the shore, and is 2 feet above high water. Between Look-out head and the south point of Clarke island, which lies E. by S. $\frac{1}{2}$ S. $2\frac{3}{4}$ miles from the head, the south-west coast of the island forms an exposed bay one mile deep, with reefs extending about one-third of a mile from the north-west and eastern shores of the bay.

The south point of Clarke island is enclosed by a reef of sunken rocks, between which and Moriarty point, the south-east point of the island, is a small exposed bight. From the south point of Clarke island Swan isle lighthouse bears S. $\frac{1}{2}$ W., $8\frac{1}{2}$ miles.

Moriarty point lies N.E. by E. $\frac{3}{4}$ E. three-quarters of a mile from the south point, thence the east coast of Clarke island trends in a N. by E. direction for 7 miles to Seal point, its N.E. extreme.

Moriarty bay, lying to the northward of Moriarty point, has bad holding ground, on a broken rocky bottom ; there is good landing in a corner of the bay, but the whole of this vicinity should be avoided.

Look-out rock, 60 feet high, lies S.E. by E., 5 miles from Little

Night islet, and three-quarters of a mile W.N.W. from Look-out head, between which and Look-out rock is the Napper rock, awash at high water.

A rock lies about a quarter of a mile N.W. by N. from Look-out rock.

Moriarty rocks.—At $3\frac{3}{4}$ miles E. by N. from Moriarty point lies the outer of two rocks, named Moriarty rocks from their proximity to the Moriarty bank; the outer or S.E. rock is 20 feet high, and the N.W. rock, 25 feet high. At 2 miles N.W. by W. from Moriarty rocks are two rocks 20 and 15 feet high, with several smaller rocks above and below water near them.

Moriarty banks.—The western of these banks extends in a S.W. by W. direction nearly $2\frac{1}{2}$ miles from the highest Moriarty rock; the least water upon it is one foot, but the general depth is about 9 feet. The eastern tail of the east bank lies E.S.E. $2\frac{1}{4}$ miles from the same rock; the least water found on it was 16 feet: to the north-westward of the east bank is another bank, the least water upon which is 15 feet. A fourth bank extends in a N.E. by N. and S.W. by S. direction from the two rocks which lie N.W. by W. nearly 2 miles from the Moriarty rocks; this bank, which has a sunken rock at its north-easterly termination, is nearly $2\frac{1}{2}$ miles long. Nearly midway between it and the shore is a half-tide rock.

Caution.—The whole of the space included between the east coast of Clarke island, the Moriarty rocks, and Passage and Forsyth isles is either foul ground, or the strong tidal streams cause such a race and heavy break as to make the place very dangerous.

Clearing marks.—Mount William, 714 feet high, near the north-east coast of Tasmania, bearing S. by W. $\frac{1}{4}$ W. (S. 14° W.) clears the eastern end of Moriarty banks; and to pass to the southward of them, the south point of Clarke island must not be brought west of W. by N. (N. 79° W.)

The soundings in Bass strait are tolerably regular, ranging from 30 to 48 fathoms, with generally 5 fathoms within a mile of its shores. The bottom mostly consists of sand and shells in the north-western and greater portion, and more of mud, marl, and ooze in the south-eastern part of the strait.

Eastward of Bass strait.—Between 35 fathoms at 20 miles eastward of the south extreme of Barren island, and 38 fathoms at about 40 miles north-eastward of the north point of Flinders island, the depths range from 20 to 42 fathoms, and thence the soundings deepen rapidly to more than 200 fathoms in the direction of Rame head and cape Howe.

ANCHORAGES in BASS STRAIT, when going eastward.—The most convenient places for anchoring in this strait, with foul winds, when going to the eastward, are :—

- 1st. Franklin road, under the north-west end of King island.
- 2nd. Port Phillip; anchoring just within the entrance, on the south side. When a fair wind comes, a ship can get out of the port by means of the strong tidal streams.
- 3rd. Off the north-west extreme of Tasmania, between Three Hummock and Hunter islands; taking care not to anchor too near to the weather shore, lest the wind change suddenly.
- 4th. The bight between Wilson promontory and cape Liptrap, in case of necessity; but it is a place not to be recommended, from its being very dangerous should the wind shift to S.W.
- 5th. Kent group, for small vessels; in East cove, Deal island.
- 6th. Furneaux group, between Clarke and Preservation islands. If the ship be not able to weather Clarke island, and pass out to the south-eastward, when the wind comes fair, she may run through Armstrong channel, with a boat ahead and a good look-out.

When going westward.—In case of foul winds, which, if the weather be thick or rainy, may be expected to fix at S.W. and blow strong, there are many places where a ship may anchor, to wait a change; but the following appear to be the most convenient :—

- 1st. West cove, in Erith island, Kent group.
- 2nd. Hamilton road, at the east end of Preservation isle. Also on the east side of Hummock island.
- 3rd. Western port, under Phillip island; anchoring so soon as the ship is sheltered. A fair wind for going onward through the strait will take a ship out of this port.
- 4th. Port Phillip.

5th. Sea Elephant bay, on the east side of King island, where there is fresh water; or under the north-east end of that island, if the wind be from S.W.

And on the north coast of Tasmania there is anchorage :—

1st. On the south side of the largest Swan isle for small vessels, Mussel Roe bay, or under Waterhouse isle, 22 miles farther to the westward.

2nd. Port Dalrymple.

3rd. Port Sorell; but it is accessible only to small vessels.

4th. Various places among the Hunter group.

See charts, Nos. 1,695a and b.

CHAPTER VIII.

TASMANIA.—NORTH AND WEST COASTS.

 VARIATION IN 1897.

Cape Portland	-	9° 30' E.	|	Cape Sorell	-	-	8° 40' E.
Cape Grim	-	8° 10' E.	|	South West cape	-	-	8° 50' E.

Nearly stationary.

TASMANIA.—The north coast of Tasmania forms the south side of Bass strait, it extends for about 165 miles between Eddystone point and cape Grim, its north-east and north-west points; and near the bottom of the bight, which it forms by curving to the southward, are ports Dalrymple and Sorell, the former being the embouchure of the river Tamar. The whole of this coast lies generally in very smooth water, the prevailing winds being off the land, and the long south-westerly swell outside being interrupted by the islands at the western entrance of the strait. Its navigation is represented to be free from dangers to within a mile of the coast and of the islands which lie off it; except in the neighbourhood of port Dalrymple, where on the Hebe reef, lying $1\frac{1}{2}$ miles from the land, the ship of that name was lost in 1808.

The north-east extreme of Tasmania is low, with a coast-range of sand-hills; from this level part, rise mounts Cameron and William, the loftiest of a group of peaks cresting a ridge; the latter is used as a guide for vessels working through Banks strait.

EDDYSTONE POINT, 81 feet high, the north-east extreme of Tasmania, forms the north point of the bay of Fires. At 4 cables S.E. by E. $\frac{1}{2}$ E. from the point is the Eddystone rock, 19 feet high, the southern of the Victoria rocks, having between it and the land

See charts, Nos. 1,695a and b, Bass strait, scale $m = 0\cdot2$ inch; No. 1,706, Banks strait, scale $m = 0\cdot5$ inch; No. 1,079, Tasmania, scale $m = 0\cdot11$ inch.

two half-tide rocks. The eastern of the Victoria rocks is named Norgate, and the northern, Greyhound rock. Greyhound rock lies nearly two-thirds of a mile E.N.E. from Eddystone point and has only 5 feet water on it; Norgate rock lies about one mile East of the point, with 14 feet water on it.

At $2\frac{1}{2}$ miles N.W. by N. from Eddystone point and one mile from the coast is a rock awash at low water, and at N.W. $\frac{1}{2}$ W. three-quarters of a mile is a rock awash at high water.

On the north side of Eddystone point there is good landing.

LIGHT.—The lighthouse, 2 cables north-west of Eddystone point, 85 feet high and painted white, exhibits at 139 feet above high water a *group flashing* light of the first order, showing a series of *three flashes every thirty seconds*, which may be seen from a distance of 18 miles in clear weather. The light is white with two sectors of red light, the change between red and white not being made at once; it shows white seaward between the bearings of N. 32° W. and S. 13° W.; one red flash and two white flashes from N. 32° W. to N. 27° W.; one white flash and two red flashes from N. 24° W. to N. 19° W.; and three red flashes from N. 17° W. to N. 14° E.; one red flash and two white flashes from S. 13° W. to S. 8° W.; one white flash and two red flashes from S. 5° W. to South; and three red flashes from S. 2° E. to S. 48° E.

There is also a small *fixed* red subsidiary light shown from this lighthouse, covering the Victoria rocks, which should be seen from a distance of $2\frac{1}{2}$ miles in clear weather.

Signal station.—There is a signal station at the Eddystone point lighthouse; communication cannot be made by the commercial code of signals. It is a telegraph station, is connected with the telephonic system of the colony, and is easily accessible by boat.

Tides and tidal streams.—It is high water, full and change, at Eddystone point at 8h. 10m.; springs rise 7 feet. The flood stream sets to the northward, the ebb to the southward, but neither stream has any strength to the southward of Banks strait.

Bay of Fires, close south of Eddystone point, affords good shelter when the wind is steady from the westward, but should be left immediately there is a lull, as the wind often at the termination of a westerly gale shifts suddenly to the S.E. The anchorage is in

10 or 11 fathoms, near the centre of the bay. The water shoals suddenly when near the beach.

Anson lake is situated in the southern part of the bay of Fires, and the entrance is so small as not to be discernible from seaward, and scarcely permits boats to enter even at high water. Landing can seldom be effected outside the entrance. At most times there is a dangerous heavy surf rolling on to the beach.

The **COAST** from Eddystone point trends N.W. $\frac{1}{4}$ N., $10\frac{1}{2}$ miles to cape Naturaliste, with several small points and bays between; off the points are numerous granite boulders, some of which are 20 feet high.

Cape Naturaliste, 71 feet high, is faced by sand-cliffs, but the coast about it is lower than that of Eddystone point.

Mounts Cameron, William, and Pearson, are the only remarkable hills near this vicinity. The highest peak of mount Cameron, 1,825 feet, lies S. by W. $\frac{3}{4}$ W. $17\frac{1}{2}$ miles from Swan isle lighthouse. It is one of several peaks, and the summit is of a haycock form; the ridge, of which mount Cameron is the highest part, is over 3 miles in length in a north-east and south-west direction. Mount William, S.S.E. $\frac{1}{4}$ E. $11\frac{1}{4}$ miles from Swan isle lighthouse, rises gradually to a rounded summit 714 feet high. Mount Pearson, S.S.E. $\frac{1}{2}$ E. $15\frac{3}{4}$ miles from Swan isle lighthouse, is a broad-topped hill 623 feet high.

George rocks are a group of granite boulders, the highest of which (64 feet high) lies N.N.W. 4 miles from Eddystone point; these rocks occupy a space of over a mile, and with the exception of the largest two, are quite barren; scattered through the group are a few half-tide rocks, but most of the rocks are from 10 to 30 feet high.

The space between George rocks and the main land is, with the exception of the rock awash at low water described at page 584, apparently clear, but masses of kelp along the shore and on the west side of George rocks give an appearance of hidden dangers, which may exist, though they have escaped detection.

Eucalyptus rock, with 10 feet water, lies 3 miles from the shore, about 8 miles N.N.W. from Eddystone point; the sea rarely

breaks on it, but the position may be known by kelp in the vicinity. Eddystone point open of George rocks bearing S. by E. $\frac{3}{4}$ E. (S. 20° E.) leads between Eucalyptus and Salamander rocks.

Salamander rock.—This danger, with 10 feet over it, lies N.E. by E. $3\frac{1}{4}$ miles from Eucalyptus rock. No distinct break has been on this rock. The south round hill of mount Cameron range open south of mount William bearing S.W. by W. (S. 56° W.) leads to the southward, and the same hill well open north of mount William S. W. $\frac{1}{2}$ W. (S. 51° W.) leads to the northward of Salamander rock. The rock lies in the direct track of vessels between Melbourne and Hobart.

Black reef, 9 feet high, lies N.E. $\frac{1}{4}$ E. $1\frac{1}{4}$ miles from cape Naturaliste; rocks above water extend to a distance of one-third of a mile N.W. by W.; and at three-quarters of a mile E.S.E. is a rock above water, with sunken rocks around it.

Mussel rock, with 6 feet, on which the sea sometimes breaks, lies $1\frac{1}{3}$ miles N.W. $\frac{1}{4}$ W. from Black reef. Mount Pearson in line with cape Naturaliste bearing S. by E. $\frac{1}{4}$ E. (S. 14° E.) leads to the westward of Mussel rock.

Soundings.—There are 41 fathoms at 5 miles and 42 fathoms at 13 miles off Eddystone point, and about 35 fathoms from the latter to the same distance off cape Barren, the bottom being rock at about midway, and sand to the northward. There are 23 fathoms at one mile eastward of George rock, and from Black reef to 8 miles E. by N. $\frac{1}{2}$ N. from it, the soundings range from 14 to 21 fathoms.

Mussel Roe point lies N.W. by W. $\frac{3}{4}$ W. $2\frac{1}{2}$ miles from cape Naturaliste; to the east and north-east of this point there are many sunken rocks, and others awash at low water, the most outlying of which is situated E. $\frac{1}{2}$ N. nearly three-quarters of a mile from the point.

From Mussel Roe point the coast trends South for nearly half a mile to the mouth of Mussel Roe river, which is small and only navigable for boats. From the mouth of this river the coast trends S.W., West, and N.W. for about 6 miles, forming the bay known as Mussel Roe bay.

Mussel Roe bay affords good anchorage in 6 or 7 fathoms, sandy



bottom, in the north-western portion of the bay, with Swan isle lighthouse bearing about N. by W. (N. 11° W.) Near the anchorage is a sandbank named Cockle bank, with 19 feet water, which bears W.N.W. from Mussel Roe point, distant 2 miles. At 1½ miles S. by W. ¼ W. from the south point of Swan isle, is Tree point, the N.W. point of Mussel Roe bay, thence the coast trends in a westerly direction for 2 miles to Little Mussel Roe river, the mouth of which may be entered by boats at half tide; from Little Mussel Roe river the coast trends three-quarters of a mile in a north-westerly direction to a point made conspicuous by two bare sand-hills.

Little Mussel Roe bay, between Tree point and the last mentioned point, is used by the smaller coasting vessels on account of the shoal anchorage; it is, however, much more exposed than Mussel Roe bay.

The coast from the point north-west of Little Mussel Roe river trends westerly 2½ miles to a point extending in the direction of Foster islets, thence 1½ miles to cape Portland; this part of the coast is irregular, and has numerous shoals extending from it. Near cape Portland, between it and Foster islets, is a low islet, there are also other islets nearer the shore connected by ledges; the whole locality is very dangerous for boats on account of the confused sea. There is a good navigable channel between Swan isle and the coast just described, but in consequence of the strength of the tidal streams it is well to give a wide berth to the foul ground extending from Swan isles and Foster islets. The leading mark for mid-channel is mount William in line with rocky part of coast north of Mussel Roe bay bearing S.E. ½ S. (S. 39° E.)

SWAN ISLE, 109 feet high, lying 1½ miles off the north-east coast of Tasmania, is of grey granite, but sand-hills covering the granite give it the appearance of being nearly all sand. At one-third of a mile West of the west point of the island is a sunken rock. A group of rocks, some of which uncover at low water springs, lies nearly 1½ miles in a N.W. by W. ¼ W. direction from the lighthouse.

A rocky patch with 4 fathoms water over it is situated with Swan island lighthouse, bearing N.W. ½ W. distant 6 cables, and another with a depth of 5 fathoms with that lighthouse N. ¼ W. 8 cables.

Little Swan isle lies N.W. by N. one mile from the west end of Swan isle, and at half a mile beyond in the same direction lies Cygnet isle. Between these isles are numerous rocks, some of which are above water; and shoal water extends three-quarters of a mile to the westward of the west point of Little Swan isle.

Harry rock, lying N. by W. $\frac{1}{2}$ W. one mile from Cygnet islet and N.W. by W. $\frac{3}{4}$ W., nearly 3 miles from Swan isle lighthouse, has 16 feet over it at low water.

At one to $1\frac{3}{4}$ miles North of Swan isle lighthouse there is a race or overfall, but no shoaler water than 7 fathoms could be found.

LIGHT.—The lighthouse on the north-east point of Swan isle stands close to the water's edge, it is round, 74 feet high, painted white, and exhibits at 100 feet above the sea, a white light, *fixed and flashing every minute*, which can be seen in clear weather from a distance of 15 miles.

Signal station.—There is a signal station at Swan isle lighthouse and communication can be made by the commercial code. It is connected by telegraph.

Anchorage may be obtained off a small sandy bay on the south-east side of Swan isle; the bottom is rock, or sand over rock, the holding ground is therefore bad. Sailing vessels working through Banks strait from the eastward often get as far as Swan isle with the flood stream, and anchor during the strength of the ebb: but it is not advisable to anchor at Swan isle if westerly gales are expected, as it is not uncommon for the wind to veer to the south-eastward.

Tides and tidal streams.—It is high water, full and change, at Swan isle at 9h. 16m.; springs rise 7 feet. The flood stream sets to the north-westward, the ebb to the south-eastward, at the rate of 3 knots at spring tides, influenced however by the wind.

CAPE PORTLAND, W. by S. $\frac{1}{4}$ S. $8\frac{1}{2}$ miles from Swan isle lighthouse, is low and rocky; S.S.E. $\frac{3}{4}$ E. three-quarters of a mile from the cape is a pile of stones 119 feet above the sea; the coast from the cape trends in a S.S.E. direction, three-quarters of a mile, thence easterly half a mile and southerly $1\frac{1}{2}$ miles, to a point which bears S. by E. $\frac{1}{2}$ E. $2\frac{1}{4}$ miles from the cape. At one-third of a mile N.W. of this point is an islet about 20 feet high, with another islet

half a mile N.N.W. of it, from which a reef projects a quarter of a mile to the northward. These islets are too small to afford protection to the bay immediately east of them, and although used by small vessels it is only during a continuance of easterly winds; the best channel into the bay is between cape Portland and the northern islet; between the southern islet and the shore there is also a channel of $2\frac{1}{2}$ fathoms.

Foster islets, 47 feet high, situated W. $\frac{3}{4}$ S. 7 miles from Swan isle lighthouse, are two islets connected at low water. A shoal with 3 feet water extends $1\frac{3}{4}$ miles to the eastward, and a rock awash at low water lies N.N.W. $\frac{1}{2}$ W. one mile from the islets; the sea breaks heavily upon this rock, and there is a heavy tide rip in the vicinity. There are 9 fathoms water at $1\frac{1}{2}$ miles north-east of the outer Foster islet.

BANKS STRAIT, which separates the Furneaux group from Tasmania, may be said to lie between Goose island to the north-west, and Eddystone point to the south-east.

In the strait with a head wind it is generally impossible for sailing vessels to work to the westward during the ebb stream, and the custom is to anchor either under Swan isle, or in Mussel Roe bay, the latter anchorage being preferable, as the holding ground is not good at Swan isle anchorage. Occasionally small vessels anchor off Little Mussel Roe river, the water there being shoaler.

The survey of 1874-77 proved the existence of many dangerous rocks, and the navigation of Banks strait consequently requires great care. The bottom in Banks strait consists of sand, and in some parts rock.

DIRECTIONS.—In Banks strait the chief dangers to be avoided are the reef and rocks off Swan isles, and the foul ground and rocks northward of Foster islets. It may, however, be noticed that a vessel from the south-eastward, can close the shore when mount Pearson is over cape Naturaliste bearing S. by E. $\frac{1}{4}$ E. (S. 14° E.), as she will then be past Mussel rock, Black reef, and the rocks that lie off the coast. *See* page 594.

TIDAL STREAMS.—The flood stream is the west-going stream, and the ebb the east-going; the streams are each of $6\frac{1}{4}$ hours duration at springs; but during neaps, the flood runs 7 hours and

the ebb $5\frac{1}{2}$ hours. The interval of slack water never exceeds a quarter of an hour; the west-going stream begins 30 minutes after low water at springs, and 50 minutes after it at neaps; the east-going begins 40 minutes after high water at springs, and 10 minutes before it at neaps.

In the narrowest part of the strait ($8\frac{1}{2}$ miles wide) between Swan isles and Clarke island, the tidal streams run at the rate of 3 knots at springs; westerly winds accelerate the east-going stream, which occasionally attains a rate of 5 or 6 knots.

The rate of the streams, the strongest being the east-going, at springs, in the middle of Banks strait causes, when opposed to the wind, a high topping sea, dangerous for small craft.

RINGAROOMA BAY extends from cape Portland S.W. by W. $\frac{1}{4}$ W. 13 miles to Waterhouse point, and is $6\frac{1}{2}$ miles deep.

From the point $2\frac{1}{4}$ miles, S. by E. $\frac{1}{2}$ E. from cape Portland, a rocky coast trends S. by E. $\frac{1}{2}$ E. nearly one mile; the beach which forms the south-eastern shore of Ringarooma bay then curves S.S.W. $5\frac{1}{2}$ miles to Ringarooma river; the coast thence continues S.W. for 2 miles with the same sandy beach, and W. by N. 4 miles with a rocky formation to the mouth of Tomahawk river, whence it trends half a mile North to Tomahawk point, close off which, and connected with it at low water, is Tomahawk islet. Between this islet and Waterhouse point the coast consists of a sandy bight and rocky points. At three quarters of a mile westward of Tomahawk point is a remarkable bare sand hill. There are 14 to 9 fathoms water at $1\frac{1}{2}$ miles from the south-eastern shore, and 9 to 5 fathoms within a mile of the south-western shore of the bay.

Ringarooma river* is used by small vessels occupied in the export of tin ore, quantities of which are found in the vicinity of mount Cameron, where the Ringarooma takes its rise. The mouth of the river is small, and at low water there is very little more than one foot on the bar, but as the rise of tide is 7 to 9 feet, there is generally sufficient water for the small vessels using the river; the principal danger is the surf during strong northerly and westerly winds, at which time vessels do not venture.

Tomahawk river is not navigable, but small vessels are beached in fine weather at high water, and floated again at the

* Lower Ringarooma for Boobyalla, at the mouth of the river, is the shipping place; there is regular steam communication with Launceston.

next high tide. The bight about the mouth of Tomahawk river is shoal.

Both rivers have fresh water within 3 miles of their mouths, and there is a fresh water lagoon at 2 miles N.E. of Ringarooma river.

WATERHOUSE POINT, $4\frac{1}{2}$ miles W. by N. $\frac{3}{4}$ N. from Tomahawk point, is the rocky termination of a range of hills descending from Hardwick hill, 385 feet high; the point has a reef of rocks (pinnacles of which dry at low water) projecting a quarter of a mile to the northward. Between Tomahawk and Waterhouse points is a bay, in the depth of which rocks awash and sunken extend to a distance of half a mile from the shore; and at half a mile East of Waterhouse point there is a reef of rocks, some of which dry at low water.

The coast from Waterhouse point trends S.W. $1\frac{1}{3}$ miles to a small point abreast Little Waterhouse island; this part of the coast has a sandy beach, with numerous dry and sunken rocks extending 3 cables from the shore. Off this point, in the direction of Little Waterhouse island, there is a rock dry at low water lying $3\frac{1}{2}$ cables from the shore, and at 6 cables from the point there is a depth of 14 feet, between which and the shoal extending from Little Waterhouse island there is a navigable channel $2\frac{1}{2}$ cables wide, with 4 to 5 fathoms water.

WATERHOUSE ISLAND, the north point of which lies N.W. $\frac{3}{4}$ N. 3 miles from Waterhouse point, is $2\frac{1}{2}$ miles long, N.N.E. and S.S.W., and half a mile broad.

Waterhouse island is 144 feet high, and the channel between it and Waterhouse point is $1\frac{1}{2}$ miles wide; it has an even summit, and falls gradually at its north end; in some parts there are a few trees, but the island is nearly cleared of timber. The owner of the island resides in a small wooden cottage near the sandy beach on the south-east side of the island.

Off this sandy beach a spit dry at low-water spring tides, extends in a north-easterly direction about 4 cables; the outer edge of the spit lies 2 cables from the shore, with shoal water one cable to the eastward of it. Along the east coast of the island northward of the sand-spit a shoal flat extends to a distance of 4 cables until

within half a mile of the north point, thence there are no dangers beyond one cable, along the north and west coasts of the island.

Little Waterhouse island, 38 feet high, lies nearly three-quarters of a mile south-east of the south point of Waterhouse island, and is about 200 yards across; rocks above and below water, extend nearly 2 cables from it in the direction of the south end of Waterhouse island, narrowing the principal passage to a width of 3 cables. A spit extends 2 cables in an easterly direction from the east point of the island, the tail of which has 16 feet water.

Dangers.—At a distance of about three-quarters of a mile W.S.W. from Little Waterhouse island is a rock dry at low water; and S.W. by W. $\frac{3}{4}$ W. $1\frac{2}{3}$ miles is Barrett rock with 11 feet water. Between the rocks and Little Waterhouse island there are 9 to 10 fathoms water.

North-east of Little Waterhouse island, in the direction of the channel and occupying a central position, is a sand-bank with patches of rock upon it; the south-west end of this sand-bank is distant half a mile from Little Waterhouse island, and the north-east end $1\frac{1}{2}$ miles. The shoalest part of this bank has 7 feet water, and lies N.E. $\frac{1}{4}$ N. one mile from Little Waterhouse island. Several sandy knolls of 14, 16, and 18 feet respectively, extend to the eastward, the outer of which lies 2 miles from Little Waterhouse island.

Anchorage.—Waterhouse anchorage, on the east side of Waterhouse island, is a safe and useful anchorage, affording shelter from easterly or westerly gales. Anchor as convenient either in the channel near the west end in 5 fathoms, about 3 cables off the west end of the only sandy beach on the south side of the island, or just clear of the channel at the east end, over a sandy bottom, in about the same depth, near a patch of 3 fathoms, with Croppies point over the west end of Little Waterhouse island, bearing S.W. by S. (S. 34° W.).

ANDERSON BAY.—From South Croppies point the coast, a sandy beach backed by sand-hills which attain an elevation of 140 feet, trends in a S.W. by S. direction for about $11\frac{1}{2}$ miles, to the head of Anderson bay, where the rivers Great Forester and Brid discharge themselves by one mouth into the sea. The coast then

trends in a north-west direction for about 5 miles to East Sandy cape, being of a rocky and broken nature. On the east side of the bay the soundings are regular, with a depth of 5 fathoms, generally about half a mile from the beach; on the west side the soundings are variable.

Tides and tidal streams.—It is high water, full and change at Waterhouse island at 10h. 16m.; springs rise 8 feet. The flood is the west-going stream, and its rate about 2 knots at the anchorage.

CROPPIES POINT, S.W. $\frac{3}{4}$ W. 4 miles nearly from Waterhouse point, is free from off-lying dangers to the eastward as far as the point abreast Little Waterhouse island; the coast line is rocky, and the few sunken rocks which exist are not more than one cable from it.

South Croppies point lies S. by W. $\frac{3}{4}$ W. nearly one mile from Croppies point, with two small points and exposed sandy bays between.

Rocks.—At half a mile N.W. by W. $\frac{3}{4}$ W. from South Croppies point is the Croppie rock with 12 feet water over it.

At $2\frac{1}{4}$ miles to the south-west of South Croppies point is a rock 9 feet above high water, and at $2\frac{3}{4}$ miles in the same direction, a rock 2 feet above high water; these rocks are about one mile off shore. Nearly one mile off the mouth of the Little Forester river is Forester rock, 2 feet above high water.

Great Forester river.—The mouth of this river is blocked by a sandy bar which dries at low water springs. The outermost rocks in this vicinity are always above water.

Communication.—The town of Bridport on the left bank of the Great Forester river, half a-mile from the mouth, has a post office and telegraphic communication; a small steam-vessel calls at Bridport every ten or twelve days from port Dalrymple, and there is a railway from Launceston to Scottsdale, about 13 miles to the southward.

Anchorage.—Anderson bay generally affords shelter only with southerly winds, but fair shelter has been obtained in westerly gales, half a-mile south-east of East Sandy cape, in 5 fathoms, sand, and good holding ground. In approaching this anchorage care must be

taken to avoid a rocky ledge projecting from a point, situated about one mile south-eastward of East Sandy cape.

Working to the westward in Banks strait.—In the summer months when westerly gales are of short duration it is advisable to stand towards the Tasmanian coast, to take advantage of the shift of wind.

Winds.—During the survey of Banks strait, the heaviest and most frequent gales (generally from the westward) were experienced in the months of September, October, and November.

On the termination of a westerly gale the wind in the vicinity of Banks strait sometimes shifts to the south-eastward; the barometer standing a little above 29.60 inches. The wind seldom blows home with much strength, but sufficiently so, the swell rolling in simultaneously, to necessitate leaving the anchorages, which are open to the south-east. All anchorages in Banks straits which are exposed to the south-east require great caution in their use, owing to the uncertain nature of the winds.

Mussel Roe bay is, taken altogether, recommended as the safest anchorage.

EAST SANDY CAPE is formed by a long low ridge extending in a northerly direction from the high ground inland; the cape terminates in a conspicuous sand-hill, 125 feet high, which shows a bare face to seaward except in a westerly direction. A ledge of rocks, which covers and uncovers, with no outlying dangers, stretches 2 cables northward from the cape.

West Sandy cape, about 3 miles westward of East Sandy cape, is formed by a series of low sand-hills, fronted by shelving rocks.

Dangers.—A rocky patch, which breaks heavily in bad weather, and has a depth of less than 6 feet on it at low water, lies three-quarters of a mile northward of West Sandy cape. Two miles westward of that cape, Flat rocks, detached ledges which mostly cover at about three-quarters flood, extend one mile from the shore. The soundings off this coast are irregular, and it should not be approached nearer than $1\frac{1}{2}$ miles.

Ninth island, 108 feet high, is flat-topped, devoid of trees, and nearly covered with grass. The depths round the island are

irregular, especially northward and eastward of it, and as the examination of that locality was only partial, and less water may exist than shown on the chart, the north-east side of the island should be given a berth of at least one mile.

NOLAND BAY.—From West Sandy cape the coast trends south-westward for about 7 miles, thence West about 7 miles to Stony head. Noland bay is the eastern part of this indentation; its shore is sandy, with sand-hills 30 to 70 feet high, and fronted by ledges of rocks which cover and uncover. Nearer Stony head the land becomes more elevated, and is faced by cliffs 40 to 100 feet in height. The soundings in Noland bay are tolerably regular, and there are no outlying dangers known.

Great Piper river, which discharges itself into the south-west part of Noland bay, is blocked at its mouth by a bar of sand which dries at low water springs.

STONY HEAD is a conspicuous headland, 295 feet high, with cliffs and broken ground, 120 feet high, seaward of its summit. This headland is the extremity of a range of hills running down from the inland mountains, the most conspicuous of which is Round hill, 770 feet high, situated about 2 miles S.S.E. of the head.

Tenth island, N.W. $\frac{1}{4}$ N., $2\frac{3}{4}$ miles from Stony head, is a rock 30 feet high, which may be passed on any side at a distance of a quarter of a mile.

Five Mile bluff is about $6\frac{3}{4}$ miles S.W. by W. $\frac{1}{2}$ W. from Stony head, the coast between forming a bay. One mile westward of Stony head there is a slight projection fronted by shelving rocks and shallow water, which should be given a berth of one mile.

TIDES.—It is high water, full and change, in Tam O'Shanter bay $2\frac{1}{2}$ miles East of Stony head, at about 11h. 0m.; springs rise about 10 feet.

Tidal streams.—The flood is the west-going stream and sets parallel to the shore, the ebb is the east-going stream. In the channel between Tenth island and Stony head, and near salient points such as the Sandy capes, the streams attain a rate of about one knot; as the distance from the shore increases, the tidal streams become weaker, and much affected by prevailing winds.

DIRECTIONS.—Tenth and Ninth islands are good guides for Waterhouse anchorage; the course and distance from the former are N.E. $\frac{3}{4}$ E. (N. 53° E.) 14 miles to the latter island, and from Ninth island E. by N. $\frac{1}{4}$ N. (N. 76° E.) $15\frac{1}{2}$ miles to the south point of Waterhouse island. Mount Cameron bearing nearly S.E. by E. $\frac{1}{4}$ E. (S. 59° E.), is a distant mark for making Waterhouse island from the north-westward.

LOW HEAD.—From Five Mile bluff the coast trends S.W. $\frac{1}{2}$ S. $4\frac{1}{2}$ miles to a bight formed on the south-west side by a narrow promontory extending N.W. by W. one mile to Low head, the eastern entrance point of port Dalrymple and Tamar river. There are two lighthouse towers on Low head, the old and the new, both are painted white and are of about the same height. A reef lies N.E. $\frac{1}{2}$ E. $1\frac{2}{3}$ miles from Low head, and three-quarters of a mile from the shore, with which the reef is connected by a shoal. Vessels are liable to be set by the ebb stream into the bay between the reef and Low head.

Buoy.—A bell buoy, painted brown with black staff and ball, is moored in 9 fathoms with Low head lighthouse bearing S.E. $\frac{7}{8}$ S. (S. 35° E.) distant one mile.

Signal station.—There is a signal station at Low head, and communication can be made by the commercial code. It is connected by telegraph.

LIGHTS.—The lighthouse on Low head, which stands 2 cables within its extremity, is a tower 36 feet high, painted white; it exhibits at 142 feet above high water, a white light *revolving every minute*, which may be seen from a distance of 15 miles in clear weather.

A *fixed* light is shown from the pilot station, it shows white from the direction of the Shear rock to the point of the reef south of the Barrel rock beacon, and red over the anchorage. A fixed white light is also shown from a position about 2 cables N.N.W. from the preceding light.

Leading Lights.—Two leading lights are exhibited from two towers 30 feet high, painted white, on Shea-oak point, port Dalrymple, east side of Tamar river entrance. The lights are *fixed* lights, placed 400 yards apart, and when kept in line bearing S.E. by E. $\frac{1}{2}$ E. (S. 62° E.) lead through the Middle channel, Tamar river entrance.

The lights should be seen in clear weather from a distance of 9 miles. The upper light is white, 55 feet above high water, and is visible between the bearings of N. 22° W. and S. 50° E. The lower light is red, 38 feet above high water, and is visible between the bearings of N. 5° W. and S. 40° E.

PORT DALRYMPLE and TAMAR RIVER. — Port Dalrymple, the principal harbour on the north coast of Tasmania, constitutes the entrance of Tamar river, which river, formed by the confluence of the North and South Esk rivers at Launceston, flows through a valley betwixt two irregular chains of hills, that shoot out north-westward from the great body of inland mountains. In some places these hills stand wide apart, and the river then widens to a considerable extent; in others, they nearly meet and contract it to narrow limits. Of the two chains of hills which bound the valley, the eastern one terminates at Low head; the other descends to Badger head, S.W. by W. $\frac{1}{4}$ W., $6\frac{1}{2}$ miles from Low head.

The ends of these chains, when seen from directly off the entrance, appear as two clusters of hills having some resemblance to each other; and in fine weather, the distant blue heads of the back mountains are seen over the tops of both clusters. These appearances, together with the position of the vessel, are the best distant marks for finding port Dalrymple.

From the eastward, Ninth island, and afterwards Stony head with Tenth island lying off it, show the vicinity of the port; and Low head, with the conspicuous lighthouse towers (the old and new) on it, will be perceived in the bight to the S.S.W. At about 10 miles south-westward of the port the back land is high, rising to 1,700 feet, and the top of the ridge is rugged, forming unusual shapes. These mountains, with the direction of the coast and the most remarkable of the clusters of hills just noticed, serve as marks for port Dalrymple, from the westward.

The entrance of port Dalrymple, between Low head and Friend point, S. by W. $\frac{3}{4}$ W. $1\frac{2}{3}$ miles from the head, is difficult of access, on account of the numerous reefs and banks in it, extending a considerable distance from the western side of the entrance, which should therefore be avoided, and entrance made by Low head. The greater part of these shoals, and also of those within

are covered at half tide, so that at half flood, or even a little before, is the best time to enter port Dalrymple, as almost the whole of the dangers are then visible.

HEBE REEF, the outermost danger off the entrance of port Dalrymple, is about a quarter of a mile in extent, mostly in an east and west direction. A small portion of its centre, which is nearly dry at low water, lies West $2\frac{1}{3}$ miles from Low head lighthouse. A bank with 4 to $4\frac{1}{2}$ fathoms water on it extends half a mile eastward from the reef; but there are 6 and 7 fathoms at less than a quarter of a mile North and South of the reef. As the northern edge of Hebe reef is in line with Flinders point and Badger head, bearing S.W., Badger head open seaward of Flinders point, leads outside it.

Buoy.—A nun buoy painted with horizontal red and white stripes, and with staff and ball, is moored in 12 fathoms water at one cable northward of the reef, with Low head lighthouse bearing E. $\frac{1}{2}$ S.

The Eastern shore of port Dalrymple, from Low head, trends $1\frac{3}{4}$ miles in a S.E. $\frac{1}{4}$ S. direction to Shea-oak point, the south point of port Dalrymple, and consists of alternate points and small bights, bordered by a shoal, the 3-fathoms edge of which projects one to 2 cables from the low water line; the shoal extends as a spit, $1\frac{1}{2}$ cables north-westward from Low head; at a quarter of a mile southward of the lighthouse it projects $1\frac{2}{3}$ cables south-westward, nearly to the Middle bank.

Barrel rock beacon is red and white, and stands on a projection of the reef which borders the shore, at S. by E. $\frac{1}{2}$ E. two-thirds of a mile from Low head lighthouse; a spit projects one cable from the beacon in a S.S.E. direction, towards a $2\frac{1}{4}$ fathoms patch of kelp, known as the 3-fathoms bank, which extends $2\frac{1}{2}$ cables from the beacon.

Marks.—Two red beacons on Cordell point in line lead to the south extreme of the bank, S. by E. $\frac{1}{2}$ E. $2\frac{1}{2}$ cables from Barrel rock beacon. Barrel rock beacon and Low head lighthouse in line also lead to this extreme.

Anchorage.—There are $3\frac{1}{2}$ to 4 fathoms water between the 3-fathoms bank and the shore, and anchorage in 4 to 8 fathoms in port Dalrymple, or anywhere between the 3-fathoms bank and Shea-oak point, with 3 fathoms water from 2 to $2\frac{1}{2}$ cables from the shore.

The Towers are two circular black stone beacons, built on the southern end of lagoon beach, bearing nearly S.E. by E. $\frac{1}{2}$ E. distant about three-quarters of a mile from Barrel rock beacon; they bear W.N.W. and E.S.E. distant about 340 yards from each other, and being 30 feet high, are visible 7 miles. These towers were erected to guide strangers into the port, when the weather was too bad for the pilots to venture outside.

Middle bank, the most dangerous shoal in the entrance of port Dalrymple, is a rocky patch, between the bearings of W. by S. $\frac{1}{2}$ S. 5 cables, and S.W. $\frac{1}{4}$ S. 6 cables from Low head lighthouse, with only 12 feet in some parts at low-water springs. The northern extremity of Low head in line with the first black cliffy projection to the eastward of it, or the flagstaff on Low head open to the northward of the lighthouse, clears its northern edge, and its south-west side is marked by a black buoy, bearing S.W. by W. $\frac{1}{4}$ W., distant 6 cables from the lighthouse.

Eastern channel, lying between Middle bank and the shoal which borders the west side of Low head, is one-third of a mile wide in the outer part, with 4 to 6 fathoms water; but the inner part is rather more than half a cable in width, with $3\frac{1}{4}$ fathoms apparently on a ridge, extending from the south-east extreme of the Middle bank to the shore. Browne's house open west of Shear beacon S. $\frac{3}{4}$ E. (S. 8° E.) leads through. This channel is not safe for a stranger without a pilot.

MIDDLE CHANNEL, the main entrance into port Dalrymple, is formed by the Middle bank on the north-eastern, and Yellow rock on the south-western side; it is nearly 2 cables wide, with depths of 22 to 10 fathoms.

Yellow rock and West reef.—Yellow rock is an extensive patch of kelp, with a double light-coloured rock, on which the least depth of water is 9 feet; it is marked by a white buoy, bearing S.W. $\frac{3}{4}$ W., distant 8 cables from the lighthouse. This rock forms the east extreme of West reef, the northern edge of which extends from the white buoy nearly three-quarters of a mile in a West direction. This reef is about one-third of a mile broad, but the only part of it uncovered at high water is Black reef, which is dry 2 feet near the centre, bearing S.W. $\frac{1}{2}$ W., distant nearly $1\frac{1}{4}$ miles from the lighthouse.

Shear beacon, S.W. by W. $\frac{1}{2}$ W., $4\frac{1}{2}$ cables from Barrel rock beacon, is white, and stands on the uncovered part of Shear reef, which is connected with West reef by shoal water, where the greatest depth does not exceed 15 feet; a spit, with $1\frac{1}{2}$ fathoms on its extremity, projects N. by E. nearly 2 cables from Shear beacon. Shear rock, which dries 2 feet, lies between the beacon and the spit. A white buoy lies to the northward of the rock.

The **South-west shore** of port Dalrymple from Friend point, the south-west entrance point of the port, trends S.E. by E. about three-quarters of a mile to Browne's house, the first within Friend point. From Browne's house the shore extends nearly S.E., $1\frac{1}{2}$ miles to the north-west point of Kelsal bay.

This shore is fronted by a bank, which extends about one mile northward and north-eastward to West and Shear reefs, with a narrow inlet—about midway between Friend point and the outer edge of the reefs—running into the bank from the westward, and carrying $1\frac{3}{4}$ to $1\frac{1}{4}$ fathoms water. Between this inlet and the shore there are numerous patches of reef, dry at low water.

From the spit, which projects northward from Shear beacon, the 3-fathoms edge of the bank extends S.E. $\frac{1}{2}$ S. $1\frac{1}{4}$ miles, and thence S. by E. $\frac{1}{2}$ E. nearly $1\frac{1}{2}$ miles to the west point of Kelsal bay. There are several knolls on the bank, the edge of which is marked by 3 white buoys, the northern buoy bearing S.E. $\frac{3}{4}$ E., distant nearly 7 cables from Shear beacon, the middle buoy bearing S.E. $\frac{1}{2}$ S. 5 cables from the northern buoy, and the southern buoy bearing S.S.E. $\frac{1}{2}$ E. $4\frac{1}{2}$ cables from the middle buoy. There is good anchorage in 4 or 5 fathoms at about 2 cables above, or to the south-east of, the northern buoy. Honduras bank with 15 feet water on its outer edge, extending about half a mile off from the low-water line is marked by a white buoy.

The **Eastern shore** of the river Tamar from Shea-oak point takes a general S.S.E. $\frac{1}{2}$ E. direction, for 2 miles to the south-west point of Georgetown; the shore curves a little to the eastward, and about midway between the two points is Long Tom point, which is fringed with reefs, projecting nearly 2 cables from the shore. At a quarter of a mile northward of Long Tom point stands Cox house near the shore.

The eastern shore of the river is fronted by a flat, the 3-fathoms edge of which, from 2 cables off Shea-oak point trends irregularly

S.S.E. half a mile to Simmons mistake beacon, which is black and from which a spit, with 3 feet water on it, extends nearly a quarter of a mile to the north-eastward. From Simmons beacon, the edge of the east flat, which is slightly curved and steep-to, trends S. by E. $\frac{3}{4}$ E. rather more than a mile to the west point of the east flat, which is marked by a beacon, and thence E.S.E. for half a mile, with an intermediate beacon, to the south-west point of Georgetown. There are several patches of reef on the flat between the beacon and the town.

Bombay rock, N.W. 2 cables from the west beacon just noticed, has 4 feet water on it and is marked by a red buoy; there is a narrow 6-fathoms channel on the east side, but the main channel is on the west side.

GEORGETOWN is situated on the eastern shore, at nearly $3\frac{1}{2}$ miles within Low head; it is built upon a flat, forming the north-western side of Georgetown or York cove, at the western foot of a group of conical hills. Mining is carried on in the neighbourhood. There is steam communication with Launceston and Melbourne. It is also a telegraph station. Population of town 229 and of district 3,607 in 1891.

Georgetown cove extends about N.E. by E., 4 cables along the south-eastern side of the town, and is $1\frac{1}{2}$ cables wide, with 10 to 2 fathoms water.

Middle shoal, which lies in the entrance of the cove, is a cluster of rocks one cable long, and has a beacon on its south-west end, bearing S.E., distant $1\frac{1}{2}$ cables from the south-west point of Georgetown. There are 9 fathoms water between the shoal and the town, and 16 fathoms between the shoal and the south-east entrance point of the cove.*

Kelsal bay and Arthur head.—Kelsal bay extends from its north-west point S.E. $\frac{1}{2}$ E. three-quarters of a mile to Arthur head, and is one-third of a mile deep; the bay, except a small inlet close to its north-west point, is filled by a shoal flat, which extends about half way across towards Georgetown. The north extreme of this flat forms a spit, with 3 feet water on it, marked by a white buoy, lying West three-quarters of a mile from the south-west point of Georgetown.

See chart, No. 1,080.

* There is a light on Garrow rock (middle shoal), but particulars have not yet been received.

Garden isle.—From the northern spit of the flat its north-eastern edge trends E.S.E two-thirds of a mile to the north point of Garden isle, which is 2 cables long N.E. and S.W., with a small hillock 30 feet high on its north-east end, close off which there are 18 fathoms water. There is a narrow reef on the edge of the flat between $1\frac{1}{2}$ and 3 cables north-westward of the island, marked by two white beacons. Between Arthur head and Garden isle there are 7 fathoms water.

Port Dalrymple channel from the Middle bank to Georgetown is half a mile to one cable wide between the flats which front the shores; the narrowest part being abreast of Simmons mistake beacon. There is a sufficient depth of water for ships of the heaviest draught in the fairway, where the soundings range from 29 to 5 fathoms, without any other known hidden danger than the Bombay rock.

Beacons and buoys.—The shoals on either side within the entrance of Tamar river are marked with beacons and buoys: the beacons on the western shore are marked thus \triangleleft , and those on the eastern side by a cross †. Shoals or rocks, marked with chequered buoys, may be passed on either side; a red or black buoy signifies that the danger extends from the eastern shore, and a white one that it extends from the western shore.

PILOTS.—By making the proper signal, mariners may always procure pilots off port Dalrymple, when the weather will admit of their going off; and should the weather be too bad to permit the pilot to proceed outside, the boat will lie in mid-channel with the flag flying.

DIRECTIONS.—For the guidance of those who are obliged to run in, the following directions and a good look-out may prove sufficient; especially since the two leading lights have been established on Shea-oak point, which in line bearing S.E. by E. $\frac{1}{2}$ E. (S. 62° E.), see page 596, lead in through the Middle channel with safety, if, on arriving off the port, it is blowing too hard for a pilot to get outside. The Eastern channel should not be attempted without a pilot.

Middle channel.—For port Dalrymple or Tamar river, use Middle channel, being the safer. When from the northward or eastward, keep the lead going, and having Low head lighthouse or light bearing South, it may be approached to 3 miles, when a S.W. (S. 45° W.) course can be steered until the leading white light towers or red and white lights are sighted on a south-east bearing, then steer South and bring them in line bearing S.E. by E. $\frac{1}{2}$ E.

(S. 62° E.), which is the mark for steering in, *see* page 596, passing close to the buoys on Yellow and Shear rocks, also to the point of the reef near Barrel rock.

Before the leading lights are brought in line, care must be taken not to bring Low head light east of E. by S. (S. 79° E.). The same precaution is necessary when coming from the westward.

When Shear rock is passed (at night the white light at the pilot station opens when past the rock) bring the leading light towers or lights about 1½ points on the port bow, taking care not to open the low tower or light south of the high, to avoid the bank westward of Cordell point, and having the hand lead quickly going, steer by the white buoys on the starboard hand, and Simmons mistake beacon on the port,* whence the course to the Bombay rock is S. by E. (S. 11° E.). So long as the low or red leading light is in sight, the vessel is clear of this last danger, which is marked by a red buoy. Beyond Bombay rock the course is S.E. (S. 45° E.), and the low light becomes obscured. Garden island can be closely rounded. The high or white leading light must be kept in sight to clear the Garrow rock (or Middle shoal) near Georgetown.

Great attention must also be paid to the tidal streams, as they set obliquely across this part of the river; the ebb, for instance, crosses from Kelsal bay to the beacon on the west point of the east flats, and with such strength as to form whirlpools.

Anchorage.—The anchorage in port Dalrymple is about one cable within the line of lights (the high light to eastward open of the low) in 8 fathoms water.

Directions.—The red light at Low head pilot station having become visible, or the red beacons on Cordell point being in line, to anchor at port Dalrymple haul a little to the eastward of the line of the leading lights on Shea-oak point, taking care not to approach too near the shoals.

Georgetown cove.—Having entered the cove, anchor opposite the wharf, in 5 fathoms, and moor either with half a cable each way, or with a kedge on the shore, or perhaps, with a hawser to the trees.

Kelsal bay.—To anchor in Kelsal bay, pass on the west side of Bombay rock, and keep near the western shore, in order to avoid the northern spit of Kelsal bay flat, marked by a white buoy. After entering the bay a vessel may moor to the trees.

See chart, No. 1,080a.

* The red light at the pilot station and the white light north-north-west of it in line lead westward of Simmons mistake beacon.

Eastern channel.—To enter port Dalrymple by Eastern channel, which it is not advisable for a stranger to do—and should never be attempted at night—close the west side of Low head, to avoid the shoals which stretch out at least two-thirds of the way across from the south-western shore of the entrance.

Shear beacon being clearly distinguished, bring Browne's house open west of the beacon, bearing S. $\frac{3}{4}$ E. (S. 8° E.), which leads through Eastern channel. Continue this course until the leading beacons on Shea-oak point are in line, when steer towards them, and as above directed.

To sea.—From close eastward of Garden island, leave the white beacons and buoys on the port hand and the black and red beacons and buoys on the starboard hand. To clear the shoal westward of Cordell point, do not bring the red beacons on that point in line until Low head lighthouse is open west of Barrel rock beacon. Then proceed to sea with the leading light beacons in line. At night from Garden island, without losing sight of the high white leading light, steer a north-west course, and when the low red leading light comes in sight bearing N. $\frac{1}{2}$ W. (N. 6° W.) steer for it, keeping a sharp look out for the buoy near Bombay rock. Bring and keep the red light at the pilot station in line with the white light north-north-west of it until the white leading light on Shea-oak point is just open south of the red leading light; keep these lights so until the pilot station light becomes white, then bring them in line and keep them so until outside. When Low head light bears E. by N. $\frac{1}{2}$ N. (N. 73° E.) the vessel is outside the entrance of Middle channel.

The Eastern shore of Tamar river, between the south-east entrance point of Georgetown cove and Roundabout point, which lies S. by W. two-thirds of a mile from it, forms an irregular sandy bay, between which and Garden isle the river is one-third of a mile wide, with 9 to 25 fathoms water, affording room for many vessels to anchor; but the bottom is uneven, and the streams are rapid and irregular.

Porpoise rock lies one cable off Roundabout point, and has 4 feet on it at low water; it is marked by a black buoy, and the water is deep close round it.

Deceitful cove.—From Roundabout point the shore trends

nearly S.E. three-quarters of a mile to the foot of a hillöck, between which and Effingham point, 3 cables to the southward of it, is the entrance of Deceitful cove, a shoal creek trending to the northward.

The Western shore from Arthur head curves nearly S.S.E. half-a-mile to the north-west extreme of Bryan bay, thence the bay extends S.E. by S. nearly one mile to Anchor point, and is a quarter of a mile deep, with 4 and 5 fathoms close to the shore. There are 26 to 7 fathoms between Roundabout and Anchor points, with anchorage in 4 to 8 fathoms, in Bryan bay, at a quarter of a mile from the shore.

Shag rock, E.S.E. nearly 2 cables from Anchor point, is just covered at high water; there is deep water close round the rock, and 19 fathoms between it and the shore; this rock is marked by a beacon.

West arm.—Ilfracombe.—Yorktown.—The entrance of West arm extends from Anchor point S. by E. $\frac{3}{4}$ E. three-quarters of a mile to Inspection head, at Ilfracombe, whence the arm trends west and south-westward $2\frac{1}{2}$ miles to the ruins of Yorktown; West arm is a shoal inlet one-third of a mile wide half way in, above which it expands to two-thirds of a mile in width, and has a small fresh water stream flowing into its western corner.

Middle arm* is about three-quarters of a mile wide, N.W. and S.E., between Inspection and Middle heads, whence it trends $2\frac{1}{4}$ miles to the southward. There are 10 to 13 fathoms in the entrance, and 3 fathoms at about three-quarters of a mile within it; above which the arm is mostly filled by a shoal flat, branching to the southward and south-eastward.

Middle isle.—Between Middle head and Middle point, N.E. $\frac{3}{4}$ E. 2 miles from it, the south shore of the river forms a bay three-quarters of a mile deep; but it is filled by a shoal flat, the edge of which from Middle head extends N. by W. one mile to a spit, whence it curves round eastward and northward to Middle isle, which lies W. by N. half a mile from Middle point. There is good anchorage in 5 to 7 fathoms one-third of a mile westward of Middle isle, with soft regular bottom, and out of the strength of the stream, where a vessel not having a pilot is recommended to anchor before proceeding farther up the river.

See chart, No. 1,080.

* Beaconsfield, the third town of importance in Tasmania, is situated in a mining district, $1\frac{1}{2}$ miles inland from the left bank of the river about 10 miles southward of Georgetown. Its population was 1,950 in 1895.

The **quarantine ground** is the bight formed in the northern edge of the shoal flat, just noticed, from its north-west spit to Middle isle, between which there are 7 fathoms, with 4 fathoms close to the edge of the flat.

From **Effingham point** the north shore extends E. $\frac{1}{2}$ N. $1\frac{1}{2}$ miles to 3 cables North of Middle isle; there are 6 fathoms close to this shore, and 19 to $4\frac{1}{2}$ fathoms in the fairway between it and the quarantine ground.

Long Reach.—From Middle point, the south-western shore of Long reach trends E. by S. $1\frac{1}{3}$ miles and S.E. by E. $1\frac{1}{3}$ miles to point Rapid. A shoal bank about one cable broad, extends from Middle isle along this shore to point Rapid, a projection of the bank being marked by a beacon, E. by N. 3 cables from the north point of the island; a rocky spit extends 2 cables from the shore, half a mile north-westward of point Rapid.

From one-third of a mile N.N.W. of Middle isle, the north-east shore—where there is copper and iron ore—curves N.E. and E.S.E. 2 miles to a fresh-water stream, close off which there is anchorage in 4 fathoms. Thence the shore extends S.E. $\frac{1}{2}$ E. 2 miles to the entrance of East arm; it is intersected by small creeks, and rises to a range of stony, but well-timbered hills. The depths of water in Long reach are irregular, varying from 9 to 4 and from 15 to 9 fathoms in the fairway; the deepest water being on the north-east side of the reach, as a bank, with $2\frac{1}{2}$ to 3 fathoms on it, extends 3 cables from the south-west shore for a distance of 2 miles from Middle isle.

Buoy.—This bank is marked by a white buoy bearing E.N.E. nearly 7 cables from the north point of Middle isle.

A **bank**, with 12 feet water on it, lies about N.N.E. from point Rapid, nearer to the southern than the northern shore. Clearing beacons for leading either side of it are placed on the shore to the south-eastward.

East arm is 4 cables wide at its entrance, whence it runs East half a mile, and S.E. one mile, its eastern corner terminating in Fourteen Mile creek. From 9 fathoms in the entrance, the depths decrease to $1\frac{1}{2}$ fathoms about one mile within it. There is ironstone along the south-west shore of East arm.

Moriarty reach.—From point Rapid the western shore of Moriarty reach trends S.W. by S. one mile to Shark bay, and thence sweeps round in a S.S.W. direction $1\frac{1}{4}$ miles to Devil's Elbow point, close off which is an islet, with sunken rocks along its south-east side. This shore is indented by several shoal bights, and may be generally approached within a cable in 6 to 8 fathoms. There is anchorage in 6 or 7 fathoms, close off Shark bay; and in 8 fathoms, off a similar bight at one-third of a mile north-eastward of Devil's Elbow.

Sidmouth.—Between Devil's Elbow and a projecting part of Sidmouth, S. by W. one-third of a mile from it, is a bay having 3 to 5 fathoms water, in which there appears to be anchorage, out of the stream.

The eastern shore of Moriarty reach from East arm trends S.W. one mile to a projecting point, thence South half a mile to another point, between which and a projection S. by W. $\frac{1}{2}$ W. three-quarters of a mile from it, is a bay half a mile deep, with a creek in its bight; the bay is bordered by a flat which extends a quarter of a mile from the shore. At the entrance of this bay is a one fathom bank, one-third of a mile long, N.N.E. and S.S.W., with a beacon on its south-west point. There is a small 2-fathoms patch in the southern part of the bay, at a quarter of a mile eastward of the beacon, with 4 fathoms close to the eastward and westward, and 5 to 7 fathoms to the northward of it, where there is anchorage with soft bottom. The channel between the bank and the western shore is one cable wide, with 2 to 4 fathoms water in it.

Redwood islet lies 3 cables south-westward of the south-west point of the bay, just described, from which point the shore trends S.S.W. half a mile to the east point of the north-western entrance of Whirlpool reach; the channel between Redwood islet and the islet off Devil's Elbow is one cable wide, with 12 fathoms water in it:

Whirlpool reach.—Whirlpool reach, from its north-west entrance, between Sidmouth and the opposite point, trends S.E. by E. nearly one mile, and is barely 2 cables wide, with irregular depths of 20 to 7 fathoms.

From a creek on the south-west side of the south-eastern entrance of Whirlpool reach, the south-western shore trends nearly S.E. by E.

$1\frac{1}{4}$ miles, and then S.E. by S. $1\frac{1}{3}$ miles to Supply rivulet; about half a mile E.S.E. of the creek, and also at the same distance N.N.W. of the rivulet, some sunken rocks lie about a cable from the shore.

Whirlpool rock is just within the north-west entrance of Whirlpool reach; it is composed of numerous pinnacles of blue stone, intermingled with thick clay, and is about 120 feet by 90 feet inside the 20 feet line at low water springs. It lies nearly in the centre of the channel and 490 feet from the eastern shore. The least water on it was 12 feet 6 inches at low water springs in 1893. It is being removed by blasting, and it was expected that there would be 17 feet over it at the beginning of 1894. This danger has 10 fathoms water on its south-west side, but only 3 fathoms on its north-east side.

Spring bay is a bight $1\frac{1}{2}$ miles deep, situated between the north-eastern point of the south-east entrance of Whirlpool reach and another point E. by S. $\frac{1}{2}$ S. $1\frac{2}{3}$ miles from it. At half a mile within the entrance, where the bight is reduced to two-thirds of a mile in width, is a narrow bank half a mile long, E. by S. $\frac{1}{2}$ S. and W. by N. $\frac{1}{2}$ N., with 6 to 9 feet water on it, and marked by a beacon. There is a channel barely one cable wide, between each end of the bank and the shore, that to the westward having 7, and the other 5 fathoms; these channels lead into a basin, with 10 to 3 fathoms water in it, between the bank and a shoal flat extending half a mile from the head of the bight. There is anchorage in 5 to 8 fathoms, sand and shells, between the south-east entrance of Whirlpool reach and the bank to the eastward of it.

Exeter.—Swan point.—From 2 cables south-eastward of Supply rivulet, the river frontage of Exeter trends N.E. $\frac{1}{2}$ N. one mile to the west point of a shallow bight, which extends E. $\frac{1}{2}$ S. 4 cables to Swan point, a narrow projection with a spit extending a quarter of a mile to the north-east.

Supply flats.—From the shore between Supply rivulet and Swan spit, Supply flats extend above one mile in a north-west direction; the outer part, for a distance of half a mile, forming a spit 3 to 2 cables broad, with 12 to 9 feet water on it, and a beacon at 300 yards within its north end. There is a channel 3 to 2 cables wide between the flats and the south-west shore, carrying 8 to 3 fathoms water, to

within 4 cables of the entrance of Supply rivulet. There are 16 to 10 fathoms between Spring bay and the spit of Supply flats.

The fairway between the spit of Supply flats and the point to the northward of it is a quarter of a mile wide, with 9 fathoms water; thence to abreast of Swan point the channel is about one-third of a mile wide, with 5 to 7 and 14 fathoms water, and in which there is anchorage about N.N.W. 4 cables from Swan point.

Dorchester.—Between the south-eastern point of Spring bay and another point E. by S. $1\frac{1}{4}$ miles from it, three shallow indentations of the northern shore form the river frontage of Dorchester.

Egg islet lies N.W. by N. three-quarters of a mile from Swan point and one cable from the most prominent point of Dorchester; it is 300 yards long, N.E. and S.W., and has a spit extending 4 cables to the westward, where it is marked by a beacon. This islet and spit are separated from the shoal which borders the shore by a channel one cable wide, having 9 to 15 feet water.

From the point one-third of a mile eastward of Egg islet the north-eastern shore curves $1\frac{1}{2}$ miles, in a S.E. by E. $\frac{3}{4}$ E. direction, to a fresh-water inlet, and thence S.E. three-quarters of a mile to a small stream, the south point of the mouth of which has a ledge of sunken rocks projecting a quarter of a mile from it. From this point a bay extends S. by W. $\frac{1}{2}$ W. one mile, and is half a mile deep, with a stream flowing into its bight; but it is inaccessible on account of the shoal flat which fills the bay. From the southern extreme of this bay the Crescent shore extends S.W. by S. nearly $1\frac{1}{4}$ miles to its western point, and is bordered by a shoal one to 2 cables broad.

The western shore from Swan point to a projection at S.S.E. one mile from it, forms a bay one-third of a mile deep; but it is filled by a shoal flat. From the south-eastern point of this bay the shore trends nearly S. by E. $1\frac{1}{4}$ miles, and then sweeps round three-quarters of a mile in a S.S.W. direction to a small bight, 300 yards southward of which is Stony creek.

The shore from Swan point to Stony creek is fronted by shoals, the northern portion of which, for about three-quarters of a mile south-eastward of Swan point, extends nearly one mile from the bank; but the outer edge from thence gradually closes southward to one cable off Stony creek. There are generally 3 to 12 feet water on

these shoals ; but the northern part consists of a bank, the edges of which are marked by four beacons, standing respectively E. $\frac{1}{4}$ S. half a mile ; E. $\frac{3}{4}$ S. two-thirds of a mile ; S.E. by E. $\frac{1}{2}$ E. three-quarters of a mile ; and S.E. half a mile, from Swan point. There is a small inlet between the north-west extreme of this bank and Swan point. The shore is also bordered by an inner bank about $1\frac{1}{2}$ to 3 cables broad, on the outer edge of which are two beacons, one at S.E. by S. one mile, and the other S.S.E. $\frac{3}{4}$ E. $1\frac{1}{2}$ miles from Swan point.

Swan bay.—From Egg islet the channel trends S.E. by E. $\frac{1}{2}$ E. $1\frac{1}{2}$ miles, and is one-third of a mile wide, with 14 to 4 fathoms, between the north-eastern shore and the shoals which extend from Swan point. The river then increases to one mile in width, forming Swan bay, which has 4 to 8 fathoms water, and affords convenient anchorage. After retaining nearly this width for one mile to the southward, the river gradually contracts to one-third of a mile abreast of Stony creek, where there are irregular depths of 16 to 5 fathoms.

Mount Macquarie.—**Upway.**—**Signal station.**—Mount Macquarie, N.E. by E. $\frac{1}{2}$ E. nearly 3 miles from Swan point, rises from Upway to the height of 1,212 feet, and has a signal station on its summit.

From Stony creek the river sweeps round S.E. and East $2\frac{3}{4}$ miles to Cimitere point, and is generally about one-third of a mile across, from shore to shore ; the channel being one-quarter of a mile wide, with 12 to 7 fathoms water in the fairway.

Rosevears is situated at Cimitere point, where there is a pier, and post and telegraph offices ; letters are received daily from Launceston. There is also communication by steamer and coach every week-day.

Ships of fairly heavy draught can proceed up the river as far as this, further up the river becomes shallow and the channel narrow.

It is advisable to moor when lying off Rosevears, on account of the limited space when swinging.

From Cimitere point the south-west shore trends S.E. $2\frac{1}{4}$ miles to the west side of the entrance of Muddy creek, which extends from thence N.E. by E. nearly half a mile, and is half a mile deep ; but it is filled by a shoal flat. The shore from Muddy creek trends

N.E. by E. about three-quarters of a mile, to 3 cables south-east of Pedder's point. Between Cimiterie point and Muddy creek the shore is bordered by a shoal one to 2 cables broad, and the range of Stony and Pleasant hills extends from Stony creek along shore to Muddy creek.

Nelson shoals.—The shore from a quarter of a mile northward of Cimiterie point trends E. by N. 2 miles to a small stream flowing from the eastward, and thence the shore trends S.S.E. $\frac{1}{2}$ E. $1\frac{1}{4}$ miles to Pedder's point. The bight thus formed is filled by Nelson shoals, which extend so far towards the opposite shore as to contract the river channel to the width of 3 or 4 cables, with 4 to 2 fathoms water. From about $1\frac{1}{4}$ miles south-eastward of Cimiterie point the channel round to Pedder's point is only one to 2 cables wide; but the depth of water ranges from $2\frac{1}{2}$ to 6 fathoms. The edge of Nelson shoals is marked by beacons.

From Pedder's point the river takes a semicircular course $2\frac{1}{2}$ miles to Barnards or Muddy Plains creek, on the eastern side of the river, E.S.E. $1\frac{1}{2}$ miles from Pedder's point. The south-eastern shore of this part of the river is bordered by a shoal one to $1\frac{1}{2}$ cables broad; but the north-eastern, or Crescent shore, is steep-to. The channel from Pedder's point to Barnards creek is one to 2 cables wide, with 2 to 9 fathoms water; but from the north point of the mouth of the creek a 9-foot spit projects 2 cables, leaving a channel only one cable wide, with $2\frac{1}{2}$ fathoms water, between it and the western shore. On either side of this part of the river there are hills of no great elevation, between which the land appears low and swampy.

From Barnards creek the river trends S.S.E. three-quarters of a mile, with a width of one-third of a mile, and depths of $2\frac{1}{2}$ to 4 fathoms, hence the river expands to three-quarters of a mile in width for about $1\frac{1}{4}$ miles in a S.E. by S. direction, when it trends E.S.E. $1\frac{1}{4}$ miles; its width gradually decreasing from three-quarters of a mile, midway, to 300 yards abreast of the south-eastern of two small jetties, 4 cables apart, projecting from the north-east shore.

From a low point one mile S.S.E. of Barnards creek the north-eastern shore of Tamar river curves S.E. $\frac{1}{2}$ S. $1\frac{1}{4}$ miles to a point projecting 2 cables from Green hillock. From this point the shore trends nearly S.E. by E. $\frac{1}{2}$ E. a little more than a mile to the south-eastern of the two jetties, just noticed. The south-western shore is low, and from about $1\frac{1}{3}$ miles S. by E. of Barnards creek, curves

uniformly $2\frac{1}{2}$ miles in a S.S.E. and easterly direction to abreast of the south-eastern jetty. This broad part of the river, from about one mile southward of Barnards creek to the south-eastern jetty, is mostly filled with shoal flats, through which the river is reduced to a very narrow winding channel, with so little as 6 feet water in it, passing between Green hillock and Pig islet. This islet, which is about 300 yards in extent, is the north-eastern of two or three small wooded islands lying westward of Green hillock.

The river channel from nearly one mile south of Barnards creek trends S.E. by E. three-quarters of a mile towards Green hillock, and is a quarter of a mile wide, with 9 feet to 3 fathoms water. At half a mile N.N.W. of Pig islet this part of the channel is nearly blocked up by a rocky patch, which is marked by a beacon; the sides of the channel one cable to the north-east and south-west of the rocky patch being also marked by beacons. From a quarter of a mile north-eastward of Pig islet the channel trends South between the islet and Green hillock, about one mile, or to within a quarter of a mile of the south-western shore, when the channel sweeps round to the eastward, and then turns to the south-east close to the two jetties. From a quarter of a mile north-eastward of Pig islet to about the same distance southward of the south-eastern jetty the channel varies from 100 to 200 yards in width, with irregular depths of 3 to $1\frac{1}{4}$ and 4 fathoms, and 6 to 9 feet near the jetties. The numerous buoys and beacons which mark the channel are best understood by reference to the plan.

From a quarter of a mile southward of the south-eastern jetty the river trends S.E. $\frac{1}{2}$ E. three-quarters of a mile, S.W. by S. two-thirds of a mile, and S.E. one mile to the junction of the North and South Esk rivers, at Launceston. The channel varies from one to 3 cables in width, with 3 fathoms to 6 feet water.*

Vessels drawing 18 feet can proceed almost as far as Launceston at high water, but if drawing more than 14 feet 6 inches would probably touch the mud at low water. A basin has been dredged off Town point (immediately opposite Launceston), 400 feet long and 50 feet broad, to 20 feet at low water, and head and stern moorings have been laid down.

A range of woody hills extends from Barnards creek nearly 6 miles to Launceston. Between these hills and the river the land is low,

* The river has been dredged in places since the above description was written, and dredging operations are being carried on in various parts of the river, particularly above Rosevears, where the cuttings and beacons differ from chart No. 1,080.

and to the northward swampy; but between Green hillock and a lagoon at one mile northward of Launceston, the north-eastern shore is hilly.

DIRECTIONS up the Tamar river from Georgetown;—haul close round Garden islet, to avoid Middle shoal, and having run between Porpoise rock and the western shore, proceed S.E. $\frac{3}{4}$ S. (S. 37° E.), so as to pass midway between Anchor and Effingham points; and after clearing Shag rock—if not required to anchor in the quarantine ground—steer for the north point of Middle isle, thence north-eastward into Long reach; and having fully opened its south-eastern trend, steer through it, keeping nearer the north-eastern shore than otherwise, to avoid the shoals and spit which project from the south-western shore. It is not prudent to proceed beyond Middle isle without a pilot. The pilots prefer going up on the flood and coming down on the ebb, as the tide then suits better for rounding the Porpoise and Whirlpool rocks. Going up on the flood they pass to the westward of the Porpoise rock, but on coming down with the ebb they, as a rule, pass between it and Roundabout point, which is steep-to.

LAUNCESTON, the second city in Tasmania, is situated at the head of Tamar river, which, following the winding course of the river, is 35 miles from the sea. It lies in a valley enclosed with hills, and the lofty mount Barrow, 4,644 feet high, is 12 miles to the eastward. The town has wide streets, excellent public buildings, an extensive public library, and large public gardens. Large vessels are prevented from approaching close to the town by a bar, upon which there are generally about 15 feet at high water. Vessels of 17 or 18 feet draught can go within half a mile of the town, below the bar. The mail steamers between Melbourne and Launceston draw 15 feet, and go alongside the pier at Launceston; they frequently have to wait for tide at Rosevears. Launceston is connected with Hobart, Scottsdale, and Ulverstone by railway, and there is a telegraph station. Steam vessels run to Melbourne thrice a week; to the north-west and north-east coasts weekly; and to Sydney fortnightly. The population in 1891 was 17,208 persons.

Trade.—The principal imports are—manufactured goods, tea sugar, wine, &c.; and the exports—wool, oats, fodder, gold, silver, tin, lead, coal, timber, potatoes, fruit, and bark. In 1894 vessels of a tonnage of 217,044 entered and cleared at Launceston.

Wharves and pier.—The following particulars are given in *Lloyd's Register* 1893–94.

Queen's Wharf (Marine Board) :—

Length - - - - - 2,058 feet.
 Depth alongside at ordinary springs { High water, 19½ feet.
 { Low water, 10 feet.

This wharf cannot be reached at high water ordinary springs by vessels drawing more than 19 feet.

There is one crane to lift 7 or 8 tons.

Town pier (Marine Board) :—

Length - - - - - 550 feet.
 Depth alongside at ordinary springs { High water, 20½ feet.
 { Low water, 12 feet.

The pier cannot be reached by vessels drawing more than 19½ feet at high water ordinary springs.

Market wharf (Marine board) :—

Length - - - - - 990 feet.
 Depth alongside at ordinary springs { High water, 10 feet.
 { Low water, nil.

The wharf cannot be reached at high water ordinary springs by vessels drawing more than 8 feet.

The railways are connected with the wharves.

A steam tug, maintained by the Marine Board, is available for towing vessels, at moderate rates; the signal for the tug is the rendezvous or chequered flag, hoisted where best seen. When this signal is made by a vessel in the offing, entering the port, the tug, if at Launceston, will be telegraphed for on that vessel's account.

Water.—Fresh water may be obtained by applying to the Marine Board; it can be sent off in their tug.

Floating dock.—There is a floating dock at Launceston, capable of receiving vessels of 200 tons, or 132 feet in length, 22 feet beam, and 7 feet draught. In Georgetown cove and other places on the banks of the river, vessels of considerable size may be safely placed upon the *hard* to be cleaned or examined.

Pilotage for sailing vessels at the port of Launceston is 1s. per ton inward or outward; for steam vessels 8*d.* per ton each way; no single act of pilotage to exceed 3*l.* or be less than 5*l.* Vessels anchoring below Georgetown, charged one-third pilotage; at or above Georgetown, and below Whirlpool reach, one-half pilotage. Vessels arriving and sailing in ballast or putting in to seek freight, or from stress of weather, and not breaking bulk, are exempt from all port charges, except only those of pilotage in cases where the services of a pilot have been actually required and received.

Tides and tidal streams.—It is high water, full and change, at the pilot station at 11h. 10m., springs rise 10 feet, neaps 7½ feet; at Georgetown, at 0h. 5m., springs rise 10 feet, and neaps 4 feet. The rise is irregular, the greatest observed being 10 and the least 4 feet. The highest tide noticed was during the neaps, caused by a strong north-west gale. The flood stream runs 5h. 50m., and the ebb 6h. 25m., at a rate varying from 2 to 5 knots, according as the river is confined or open. The ebb stream setting round Low head into the bay to the eastward drifts vessels in that direction. At 3 miles in the offing the flood stream runs W.N.W., one to 2 knots.

At Launceston it is high water, full and change, at 1h. 0m.; spring rise 12½ feet. During winter, after rains, the stream sets down for days together, at the rate of one to 3 knots.

THE NORTH COAST of Tasmania from Flinders point curves nearly W. $\frac{3}{4}$ S. 34 miles to Round hill point, and there are 10 to 15 fathoms water 2 miles off it. There are not many projecting points; but this coast is intersected by no fewer than six rivers and one creek, all of which, except the creek, are accessible to vessels of 80 to 200 tons. These rivers flow through a hilly country, which is tolerably wooded to the back mountains. Upon this elevated range are many variously shaped summits; among which are mount Roland, 4,047 feet high, bearing S.E. $\frac{3}{4}$ S., distant 27 miles, and Black bluff, 4,381 feet high, S. $\frac{3}{4}$ E. 24 miles, from Round hill point. But the most worthy of notice of these mountains appears to be Valentine peak, S. by W. $\frac{3}{4}$ W. 21 miles from the point; this peak is a bare mass of granite 4,100 feet high, and as it glistens in the first beams of the morning sun like an immense spire, it becomes the most remarkable hill feature on the north coast of Tasmania.

From Friend point, Flinders point bears W. $\frac{3}{4}$ N. distant 2½ miles,

and the coast between the points forms a bay having three bights, behind the south-eastern of which is a lagoon of fresh water. The south-eastern, and apparently greater part of the bay is fronted by a continuation of the shoal flat which projects from Friend point, with its 3-fathoms edge extending two-thirds of a mile from the shore. A small bight in the edge of the flat, close to West reef, affords anchorage in 3 to 5 fathoms, sheltered from all winds between W. by S. round by South, to N.E. by E., with the dry part of West reef bearing W. by N., distant half a mile. There is a detached patch on the east side of Flinders point, with three feet water on it, lying about E. $\frac{1}{2}$ N. two-thirds of a mile from the eastern part of Flinders point. There is a channel above two-thirds of a mile wide, with 6 to 8 fathoms water, between this bay and Hebe reef.

FLINDERS POINT is a headland projecting two-thirds of a mile from the line of coast, and is nearly half a mile broad ; a shoal, with dry and covered rocks on it, extends a quarter of a mile northward from the point.

Badger head and Asbestos hills.—Badger head, S.W. $3\frac{1}{2}$ miles from Flinders point, and another projection $1\frac{1}{2}$ miles southward of Badger head, are rocky and form the north-western termination of the Asbestos hills, in which the mineral of that name is found ; the hills are from 1,240 to 1,350 feet high, and in clear weather are conspicuous from seaward. From the rocky projection southward of Badger head a low coast curves in a S.W. $\frac{1}{2}$ W. direction 4 miles to a spit forming the south-east side of the entrance of port Sorell.

PORT SORELL.—The north-western entrance head of port Sorell, which lies S.W. by W. $\frac{1}{2}$ W. $5\frac{1}{2}$ miles from Badger head, projects above a mile from the line of coast, and is fringed by a reef of rocks. At about a mile south-eastward of the head is Carbuncle islet, which is connected with the shore by the reef, and forms the west point of the entrance over the bar, where there are 6 to 7 feet water ; the bar does not shift, and the only unseen danger is a rock on the east side, with an iron beacon upon it. From the bar the channel trends between the shoals, $1\frac{1}{2}$ miles in a S.S.E. direction, with 2 to 5 fathoms, close up to the south-eastern entrance point ; above this a very narrow channel turns about $1\frac{1}{4}$ miles southward and eastward into the port, where there are 2 to 4 fathoms water, between the Sisters islet

on the west, and a broad, but shallow creek on the east side, trending N.E. by E. nearly 2 miles; the east point of the Sisters islet had a temporary beacon on it.

Burges.—This township, which is situated on the west side of port Sorell, about $2\frac{1}{2}$ miles within the entrance, has an extensive jetty, with tramway and trucks, for the purpose of loading vessels.

DIRECTIONS.—In approaching port Sorell, it is usual to make the land a little to the westward of the port, as the wind during nearly nine months of the year, prevails from N.W., West and S.W., and there is almost a constant current setting to the eastward.

To proceed for the fairway, avoid the beacons on the east side of the entrance, pass near Carbuncle islet, leaving it on the starboard hand; keep the houses of Burges right ahead, and run between the east point of the Sisters islet and a black buoy which lies off it; after which anchor, in 4 fathoms, off the jetty.

Rubicon river, which flows into port Sorell, is navigable for vessels of more than 100 tons for a distance of 7 miles from the entrance; but its narrow winding channel requires the aid of an experienced person as a pilot, who may be obtained on the spot.

Heidelberg is a township situated near Green creek, a shipping place about 8 miles up the river.

Supplies.—The exports of port Sorell consist of posts, rails, and paling, fruit, farm and dairy produce, some of which is shipped at Heidelberg. There is a shipbuilding yard in port Sorell, where vessels have been launched equal to any in the colony for strength, model, and workmanship. The timber at this port is of excellent quality, and vessels may be repaired at the current rates.

Tides.—It is high water, full and change, in port Sorell, at 11h. 35m.; springs rise, 8 to 9 feet.

THE COAST.—From the north-western head of port Sorell the coast trends S.W. by W. $7\frac{1}{2}$ miles to the entrance of port Frederick, and may be approached within a mile in 4 to 7 fathoms, except at about $4\frac{1}{2}$ miles westward of port Sorell head, where the Horse-shoe reef extends $1\frac{1}{2}$ miles from the shore.

Egg and Wright islets are two rocks, one on the northern, and the other on the south-western part of Horse-shoe reef, which consists of detached dry and sunken rocks.

PORT FREDERICK and MERSEY RIVER.—Port Frederick is by far the best harbour between port Dalrymple and Circular head, which lies nearly 70 miles to the westward of that port; it is easy of access to vessels of 300 tons. Mersey river, which flows into port Frederick, is navigable for about 6 miles.

The entrance to port Frederick may be easily known by its western head, Mersey bluff, being high land covered with foliage, except the extreme point, or bluff, upon which is the lighthouse.

A reef, discernible from the broken water on it, projects a considerable distance from the east side; and there is a bar across the entrance, consisting of hard shingle, which is not known to shift. The depth of water on the most shallow part of the bar,* at low tide is $6\frac{1}{2}$ feet; at springs there are sometimes 19 feet water; and an average depth of 16 or 17 feet on the bar at high water, may be depended upon throughout the year. There is a white buoy moored on the bar.

LIGHT.—The lighthouse on Mersey bluff is 35 feet high and painted white. It exhibits at 122 feet above high water a *fixed* light of the fourth order, which may be seen from a distance of 16 miles in clear weather. The light shows white through an arc of 105° seaward, and red through an arc of 35° on each side of the white light.

The northern limits of the red light pass within one mile of the Horse-shoe reef to the eastward, and within five-eighths of a mile from the rocks off Don bluff to the westward.

Pilot.—Pilots are always to be had and communication can be made with the lighthouse by the commercial code; the pilot boards all vessels requiring his services, outside the white buoy; therefore, anchor outside the bar, when the weather permits; or stand off and on, keeping the pilot-jack flying at the mast head until boarded. When the weather does not admit the pilot to come outside, his boat remains in mid-channel with the pilot flag flying.

* It is stated in the *Australian Handbook* for 1896, that the bar entrance has been deepened to 16 feet at low water.

See chart, No. 1,695a.

Anchorage.—There is good anchorage in 7 fathoms, outside the bar; but vessels should bring up well under the west head, so as to have sea-room when getting under way, and to avoid the reef which projects from the east side of the entrance.

DIRECTIONS.—In approaching port Frederick from the eastward, along the coast, keep a good look-out for Egg and Wright islets, on the dangerous Horse-shoe reef; the lighthouse bearing S.W. $\frac{3}{4}$ S. (S. 37° W.) or at night the white light showing leads clear of the reef. But, as a general rule, the land should be made a little to the westward of the port, in consequence of the prevailing westerly winds and easterly current.

Having made the land just to the westward of port Frederick, and passed Don bluff—which is a cleared piece of land, with dead trees upon it, about 2 miles westward of port Frederick—round Mersey bluff at the entrance of the port, and steer for the opening of Mersey river, leaving the white buoy on the bar close on the starboard side. Two land beacons will then be seen ahead, one being a tree without branches, painted white, and the other a spar with cross cleats, forming steps; keep these beacons in line bearing S. $\frac{3}{4}$ W. (S. 8° W.), and proceed inward, leaving the white buoys and beacons on the starboard, and the black on the port hand. Anchor abreast the railway station.

At night.—The following directions are given for entering the river at night, but local knowledge is necessary in addition. Keep Mersey bluff light white until the leading lights on the west shore of the river are in line; the high leading light is *fixed* green and the low light *fixed* red. Proceed in with these lights in line until the white beacon on the Mussel rock is passed, then keep along the west shore until abreast the railway station, when anchor.

Devonport, East and West, is a sea-port town near the mouth and on both sides of the Mersey. Steamers run weekly to Melbourne, regularly to Sydney and other ports of Tasmania, and it is a favourite resort of tourists. There is railway communication by the Western line. Population 1,805 in 1891. There are telegraph stations here.

Latrobe.—The township of Latrobe is situated at the head of the navigable part of the river. The wharves at Latrobe have

tramways and trucks for unloading vessels; and good commodious buildings have been erected for stowing grain and other produce. There is railway communication by the Western line, and it is a telegraph station. Population 1,560 in 1891.

Supplies.—Port Frederick possesses many natural facilities for repairing vessels, as they may be laid upon the hard shingle without the least danger, and take advantage of the saw-mills, where every kind of timber, of the best description, may be purchased at a moderate cost, and resident shipwrights may be procured.

Exports consist of timber of every description, coals from the mines in the vicinity, farm and dairy produce, and fruit.

Tides.—It is high water, full and change, at port Frederick, at 11h. 40m.; rise, 10 to 12 feet.

Tidal streams.—The tidal streams are strong at port Frederick, attaining a rate of 5 to 6 knots an hour both with the flood and ebb.

Outside the port, the flood is the west-going stream; it is not felt beyond 5 miles from the coast.

DON RIVER, $1\frac{1}{2}$ miles westward of port Frederick, is narrow, although quite safe for vessels of 100 to 200 tons, which keep up a trade with this port. Don bluff is higher than Mersey bluff, and has cultivated land and dead trees upon it. A reef, which projects a quarter of a mile from Don bluff, serves to break the sea from the immediate entrance.*

Although there is no bar at the entrance of Don river there are only 4 to 5 feet at low water; but at high water, springs, there are 12 to 14 feet. A buoy is moored, with a heavy anchor and chain, to the north-westward of the mouth of the river, and another buoy in mid-channel one cable from the immediate entrance. These buoys may be passed on either side, and are fitted with shackles, to enable vessels to warp in or out.

Pilot.—Assistance may be obtained from the heads of Don river,

* The harbour, which has no bar, admits vessels drawing 11 ft. 4 in., has a break-water with a *red* light visible 6 miles, and can be entered except during heavy N.W. gales.—*Australian Handbook*, 1896.

by sending a boat on shore ; or a pilot may be procured at port Frederick, by standing off that port with the pilot-jack flying.

DIRECTIONS.—After making the entrance of Don river, at a little to the westward of it, as directed for the neighbouring ports, stand in for Don bluff, and having passed the buoys on either side, proceed in, leaving a beacon at the end of the western reef, on the starboard hand, and with the prevailing north-westerly winds, luff up to the jetty, or run the vessel aground upon the bank, which may be done with perfect safety.

Don is a township near the mouth of the river Don and 2 miles westward of Devonport. The population is 140, chiefly employed by the Don Trading Company.

Supplies.—Several vessels belong to the proprietors of the coal mines in the vicinity, and there is every facility for repairing vessels in Don river, there being a *gridiron*, by means of which the bottoms of vessels of 300 tons may be repaired. There is a steam saw-mill in constant work, with excellent timber of all kinds, fit for shipbuilding ; and resident shipwrights may be engaged at the shortest notice, and on reasonable terms.

Exports.—Piles of the largest dimensions may be procured, and there is a constant export of timber, both sawn and split ; also coal and farm produce.

TIDES.—It is high water, full and change, in Don river, at 11h. 35m. ; springs rise 8 to 9 feet.

FORTH RIVER, the mouth of which forms port Fenton, lies 4 miles westward of Don river, and has a bar at the entrance, which until within the last few years was fordable on foot at low water. A reef projects from each head, and the entrance is difficult of access, on account of the changing nature of the channel. At N. by W., one mile from the mouth of the river, a bank is said to have been formed, upon which the sea breaks at low water. Forth river is deep within the bar, and vessels of about 100 tons load afloat alongside the stores erected on the bank of the river.

PILOT.—Regular traders are assisted from time to time by marks or beacons placed on the land to show the channels ; but a pilot may be obtained by hoisting the signal, and the river should

not be attempted without local knowledge, especially in rough weather, when the sea breaks across the bar.

DIRECTIONS.—In making the heads of Forth river, keep well to the westward, to counter-act the easterly set, and steer for the entrance; bring mount Roland, a precipitous mountain, 4,047 feet high, which is situated S. by E. 19 miles from the entrance, to bear nearly S. $\frac{3}{4}$ E., and proceed as guided by the marks and beacons.

Leith township is situated on the eastern side of the river, near the entrance or heads; there is a station of the Western railway here.

Hamilton-on-Forth is situated on both sides of the river, about 2 miles from Leith, a bridge spanning the river. It is a telegraph station. The land in this vicinity is of a superior quality. Population about 520.

Exports.—The exports of Forth river consists of posts, rails, paling, and farm produce.

Tides and tidal streams.—It is high water, full and change, in Forth river, at 11h. 30m.; springs rise 10 feet. In the Forth, like the other rivers on this coast, the tidal streams are rapid; and the ebb is accelerated in winter by the river freshets. This, together with the seldom-failing night calms and early morning land breeze, enables vessels to make a good offing before meeting the sea breeze.

LEVEN RIVER.—The entrance of this river, which is open to the north-east, lies between masses of irregular and pinnacle-shaped rocks and ledges, with a bar across. The mouth, $3\frac{1}{2}$ miles westward of Forth river, is wide and well sheltered from the prevailing westerly winds by the reefs of rocks extending three-quarters of a mile from Dial point, the western entrance head, under the lee of which there is good temporary anchorage outside the bar in moderate weather for vessels awaiting the tide. The coarse sandy bar at the entrance of Leven river, which seldom alters, is fordable on foot at low water, but at high water generally has $9\frac{1}{2}$ feet water on it.

Bar or Channel rock lies a quarter of a mile in a north-east direction from Black Jack rock, which has a white beacon on it, and this Bar rock is the principal danger in Leven entrance. Half-tide rock lies about half a mile eastward of Bar rock, this rock is sufficiently distant from the entrance not to form a danger if its position is known: its name signifies its depth.

Bar or Channel rock dries one foot at low water, and in respect of its hidden character at nearly all times of tide, as well as in respect of its position, may well be considered a serious obstacle to navigation. Black Jack rock with its beacon is an excellent guide. There is only one obstruction after the bar is crossed, this is Mussel bank, a bed of stones and gravel 300 feet long by 30 broad, dry at low water.

Ulverstone.—This township is situated on the east bank of Leven river, a short distance within the entrance. It is in a good pastoral and agricultural district, and there is very picturesque scenery up the river. The present terminus of the Western railway is here. A steam-vessel runs to Launceston once a week. The population is 1,129 (1891).

Pilot.—Vessels of 80 to 100 tons frequent Leven river, it being commodious and safe for vessels of light draught to go in or out; but strangers should make a signal for assistance before entering.

DIRECTIONS.—In coming from the eastward, make for a gap in Dial range, on the west side of Leven river, and when off the entrance, steer for Black Jack, a large isolated round rock, having a white beacon on it, which is the second beacon observed in standing in. When Black Jack is covered there is said to be $10\frac{1}{2}$ feet water on the bar. East of this is Half-tide rock, uncovered at half-tide, which will be avoided by keeping Black Jack rock bearing South. Leave Black Jack rock on the starboard hand, and anchor off Macdonald's public-house, which is situated in the township of Ulverstone.

Exports.—The exports consist of split timber of every sort; the timber is of good quality, and well adapted for ship-building and railway sleepers. Various kinds of farm produce are also exported from Leven river, which, from the fertility of the adjacent land, are likely to increase.

The climate, like that of the other rivers on this coast, is salubrious, and admirably adapted to invalids.

TIDES.—It is high water, full and change, in Leven river, at 11h. 45m.; springs rise $9\frac{1}{2}$ feet.

Dial range is a ridge of mountains 1,590 to 2,100 feet high, on the west side of Leven river, between 4 miles West and 7 miles S.W. of its mouth, and terminating to the northward, in two headlands bearing N.W. by W. and S.E. by E. distant $2\frac{1}{2}$ miles from each other, the

south-eastern projection being Dial point, the western entrance head of Leven river. Both heads are fronted by dry and covered rocks, some of which appear to extend above half a mile from the shore, with 6 and 7 fathoms close outside them. From the north-western of these two headlands the coast trends W. by N. $\frac{1}{4}$ N. $6\frac{1}{2}$ miles to Blythe river.

Penguin creek.—The coast between Leven and Blythe rivers is intersected by Penguin creek, which is merely a boat harbour.

The mouth of this creek is sheltered from westerly and north-westerly winds by a small headland, and a ledge of rocks which covers at half tide partially protects it. The ledge extends in a north-easterly direction a third of a mile from the point westward of the creek.

A wooden jetty extends 426 feet in an easterly direction from the western side of the creek's mouth; the jetty was built to shelter the corner in which the creek's mouth is situated. Vessels of 8 or 9 feet draught run in alongside the jetty at high water, and lie aground while taking in or discharging cargo. The scend of the sea towards high water is at times considerable. At about 100 feet off the end of the jetty there is a depth of 14 feet at high water. There is no bar at Penguin creek; from the end of the jetty seawards the water first deepens gradually and then more rapidly; at a quarter of a mile off there are 4 to 5 fathoms.

Penguin, a seaport with a telegraph station, is on Penguin creek. There are lodes containing silver in the locality; split timber is exported. There is steam communication with Launceston weekly. Population 396 in 1891.

BLYTHE RIVER is only accessible to small vessels, the entrance being narrow with a dangerous rock in it, which might be removed, as it is a flaky rotten-stone. No vessel should attempt to enter without the assistance of a person acquainted with it. There is a well-constructed bridge over the river, one mile above the heads, for the Circular head road.

Supplies.—Small vessels frequent Blythe river for paling, posts, and rails; and there is a large quantity of good splitting timber in the vicinity, where the land is of excellent quality.

District boundary.—Blythe river is the western boundary of the police district of port Sorell, and also divides the customs' survey

from that of Circular head ; the two surveys being under the immediate superintendence of sub-collectors of customs, which officers are also police magistrates.

Round hill point.—Round hill point, W. by N. $\frac{1}{2}$ N. $1\frac{3}{4}$ miles from Blythe river, is backed by a hill 760 feet high. Between Round hill point and Blackman point, W. by N. $2\frac{1}{4}$ miles from it, is Emu bay, into which flows the small river of that name.

EMU BAY is 2 miles broad by three-quarters of a mile in depth, and is open to winds from North round to East ; it has a very even bottom and good holding ground. Its disadvantage is that during easterly winds embarkation or disembarkation is not always possible. Emu bay is reported to afford safe anchorage in all weathers to sea-going vessels of any size possessing good ground tackle. The water in the bay deepens rather suddenly to 25 feet at low water. The breakwater at Emu bay is formed of concrete ; it is 730 feet long, and has $27\frac{1}{2}$ feet at low water at its extreme ; small coasting boats and also the intercolonial steamers lie alongside.

Emu bay is the outlet for the minerals obtained from the country extending about 40 geographical miles to the southward, 25 miles to the westward, and 12 miles to the eastward of the bay. The minerals are tin, gold, silver, copper, iron, bismuth, zirconia, corundum, nickel, and asbestos.

Fish.—Very good seining can be obtained, (except when the wind is from seaward on account of the surf on the beach). The best place is on the west side of the river during the last of the ebb, and on the east side during the first of the flood, when fine grey mullet may be caught in abundance.

Burnie, the town in the north-west corner of Emu bay, has a population of about 1,100 ; it is rapidly increasing, principally as it is the port at which most of the minerals are shipped from the many valuable gold, silver and tin mines in the north-west of Tasmania. It is also becoming a watering place on account of its fine sandy beach, which extends nearly $1\frac{1}{2}$ miles, and is much frequented by visitors from Melbourne during the summer.

There is weekly communication with Melbourne by the Union Steamship Company's steamers, and with Ulverstone twice daily by coach, thence to Hobart and Launceston by rail. A well-constructed bridge carries the main road over the river Emu.

See plan of Emu bay on chart, No. 1,079, scale $m = 3\cdot0$ inches.

There is also a railway from Burnie to mount Bischoff tin mine, distant 49 miles. It is intended to construct a railway connecting this line with mount Zeehaan, which will establish through communication with Macquarie harbour; and also to construct a railway along the coast to Wynyard, about 10 miles to the westward, and to Ulverstone to the eastward, joining there the Western railway. There is a telegraph station here.

Water.—Fresh water can be obtained from the stream near the breakwater in small boats.

Anchorage.—There is good anchorage in 6 to 8 fathoms, 3 or 4 cables off the end of the breakwater.

Tides.—It is high water, full and change, at Emu bay at 11h. 40m.; springs rise 10 feet, neaps 8 feet.

Beacons.—On the east side of Emu bay are two white beacons, which, kept in line bearing E.S.E. (S. 67° E.), lead clear of the shoal water off Blackman point.

The coast, from Blackman point, which has a rock close off it, connected by a reef, and shoal water extending about 6 cables from the point, curves W. by N. $\frac{1}{2}$ N. 7 miles to a sandy projection, between which and Table cape, N.W. $\frac{1}{2}$ N. $3\frac{1}{2}$ miles from it, is a bay with reefs extending above half a mile from its southern shore. The Inglis river flows through the reefs into the bight of the bay. The coast between Blackman point and the bay is bordered by a reef, and is intersected by several streams, of which the largest is Cam river, $3\frac{3}{4}$ miles westward of Blackman point.

INGLIS RIVER.—The mouth of the river, about 3 miles S.S.E. of Table cape, is open to the north-eastward, and is protected from all winds west of N.N.W. by the cape; it is further protected by a ledge of rocks running out to the north-east from the left bank of the river, upon which ledge an embankment of stones has been formed; it is also protected from the eastward by ledges of rocks extending from the shore in that direction. There is said to be no outer bar at the Inglis; the depth over the inner one is from 8 to $8\frac{1}{2}$ feet.

At the wharves in the river there is a depth of only 5 feet at low water and not much room in the stream. Vessels drawing 8 feet use

the Inglis and lie aground while taking in cargo. On the right bank of the river a wooden embankment has been formed, 450 feet long, which is said to have had the effect of driving the bar seaward for a considerable distance. The township of Wynyard is at the mouth of the river.

TABLE CAPE is the cliffy extremity of woody flat-topped land, 380 feet high.

LIGHT.—The lighthouse on Table cape is 50 feet high and painted white; it exhibits at 390 feet above high water, a *fixed* white light of the second order, which is visible seaward between the bearings of S. 56° E. and N. 72° W., and may be seen from a distance of 27 miles in clear weather. The light shows red for about 6° inshore of the above bearings.

Caution.—The seaward edge of the red light passes one mile off the reef off Rocky head, and the same distance off the reef extending from Blackman point; therefore, keep in the white light.

Signal station.—There is a signal station at Table cape lighthouse; it is a telegraph station, is in telephonic communication with the system of the colony, and is easily accessible by boat. Communication cannot be made by the commercial code.

From Table cape the coast extends W. $\frac{3}{4}$ N. 7 miles to a low point surmounted by the Sisters, two remarkable round hills 870 feet high. A reef, with a small islet on it, projects N.N.W. nearly one mile from the point; and a detached patch lies E.N.E. about half a mile from the islet. There is a small boat harbour 5 miles westward of Table cape. On the west side of Sisters point is a sandy bay, with 2 fathoms water near the shore, and a small stream flowing into it; this bay is apparently protected from the eastward by the reef, with the islet on it, which projects from the point. The coast from Sisters point to Rocky head, N.W. $\frac{3}{4}$ W. 5 miles from it, is bordered with rocks, but it may be approached to a mile in 9 and 10 fathoms.

ROCKY HEAD has a high pointed summit, with other peaks inland, rising to the height of 1,000 feet. The head is bordered with rock; and a rock 2 feet dry at low water, surrounded by a reef, lies N.E. nearly $1\frac{1}{4}$ miles from the head.

Sawyers bay extends from Rocky head W.N.W. 11 miles to Circular head, and is $3\frac{1}{2}$ miles deep, with low sandy shores, except between Detention river, S.W. by W. 3 miles from Rocky head, and Black river, S. by E. 5 miles from Circular head; the intermediate shore being rocky, with hills rising behind it. From 19 fathoms water 2 miles N.W. by N. of Rocky head there are 16 to 8 fathoms across the bay to about 2 miles south-eastward of Circular head, with 3 fathoms close off the beach near Detention river, and 3 to 7 fathoms in the bight close to the southward of Circular head.

Anchorage in Sawyers bay can be obtained in the bight south-eastward of Circular head, in 5 to 8 fathoms water, sheltered from westerly winds.

Tides and tidal stream.—It is high water, full and change, in Sawyers bay, at 11h. 40m.; springs rise 9 feet. The north-west-going stream begins 2 hours before high water.

CIRCULAR HEAD is the east point of a peninsula which projects N. by W. $4\frac{1}{2}$ miles from the coast, and is half a mile to $1\frac{1}{2}$ miles broad; the isthmus which connects this peninsula with the mainland is low and narrow, with an inlet on either side. The head, which appears from the eastward, like a small flat-topped island, is a singular mass of trappean rock, rising abruptly from the sea to the height of 486 feet, and is visible in clear weather from a distance of 30 miles. A slight covering of withered grass, with only some green bushes, gives it a smooth appearance. The head is connected with the peninsula by a narrow neck of lower land.

Signal station.—There is a signal station on Circular head; it is connected by telegraph and is easily accessible by boat. Communication cannot be made by the commercial code.

North point, N.W. $\frac{1}{4}$ N. $3\frac{3}{4}$ miles from Circular head, is rocky, with a dangerous rocky ledge, just awash, extending E.N.E. three-quarters of a mile from it, on which several vessels have run; this ledge may be avoided by keeping the bluff extremity of the head open of an intermediate projection of the land. Shoal water also extends one mile north-west from North point.

The north-east side of the peninsula is divided into Half-moon bay and a sandy bight to the south-eastward of it by a rocky projection, with dry rocks close off it N.W. by N. $1\frac{1}{2}$ miles from Circular head. There are 12 to 14 fathoms water within 2 miles of this side.

of the peninsula, and there are 4 to 6 fathoms in the sandy bight on the north side of the head.

The soil on the peninsula is generally of a poor, light nature, and not well watered. English grasses have, however, been sown with great success; but English fruit trees planted there suffered much from blight, brought by westerly winds. In the park at Hyfield there were, in a thriving condition, some fallow deer brought from England.

Stanley is a rather important seaport town. It was laid out by the Tasmanian Land Company, and is situated on a flat, facing the bay on the south side of Circular head. It is the nearest port to Melbourne, and there is regular communication weekly with Launceston by steam-vessel. The district is agricultural, and there is a large trade with Victoria, the export of potatoes alone being very great. There is a telegraph station here. The population of Stanley is 400, and of the district 1,625 (1891).

PERKINS ISLE and BAY.—From the south extreme of Circular head peninsula a low sandy beach trends W. by S. $\frac{1}{4}$ S. 7 miles, where it terminates in a low point, separated by a narrow opening from the south-east point of Perkins isle, which extends thence N.W. 4 miles, and is $1\frac{3}{4}$ miles broad at the centre. The west side of the peninsula, the sandy beach trending westward from it, and the north-east side of Perkins isle, together, form a bay, which extends from North point W.S.W. 9 miles to the north-east extreme of Perkins isle, and is $4\frac{1}{2}$ miles deep. There are 8 to 4 fathoms water across the entrance of the bay, with regular soundings towards the shore, affording good anchorage.

The south-west extreme of Perkins isle is separated from the mainland by a narrow opening; this, and the other opening between the south-east point of the island and the spit of the sandy beach, communicate with Duck bay, a land-locked sheet of water nearly 5 miles long, east and west, and 2 miles wide, with Duck river flowing into its south, and a smaller stream into its east corner. Inside the entrance of Duck bay, there is safe anchorage in any winds in from 3 to 4 fathoms water, sandy bottom.

Duck bay.—A black fairway buoy is placed in 4 feet at low water in mid-channel, and a white buoy on the end of the sand-spit off Perkins isle, at E.S.E. three-quarters of a mile from the black

buoy. Keep the white buoy on the west side. There are from 3 to 5 feet in mid-channel at low water between the buoys, and from 2 to 4 fathoms between the white buoy and the mouth of Duck river.

From the south-west extreme of Perkins isle the coast extends 12 miles in a W. by N. direction to the east entrance point of Welcome river. This coast consists of small inlets and points, and is intersected by two streams at $5\frac{1}{2}$ miles and at 10 miles from Perkins isle. A small islet lies close off the mouth of each stream, and Long islet lies half a mile north-eastward of the east entrance point of Welcome river.

Robbins passage, which separates Robbins island from the mainland, is bounded to the southward by Perkins isle and the coast from thence to Welcome river; and to the northward by Robbins island. The eastern entrance of the passage, which appears like the mouth of a river, is about one mile wide between the north point of Perkins isle and cape Elie, the south-east point of Robbins island; but an islet in the middle of the entrance connected with Perkins isle by a bar, leaves only a narrow passage between the islet and cape Elie. Small vessels find good anchorage in the mouth of this opening, sheltered from all winds.

Immediately within its entrance Robbins passage is 4 miles wide, with 5 to 2 fathoms water, whence it contracts to two-thirds of a mile in width at about 7 miles within the eastern entrance, the channel being apparently blocked up to the westward by banks which extend from both shores, some of which dry at low water. Two small islets or rocks lie nearly in mid-channel $4\frac{1}{2}$ miles within the eastern entrance; and 5 miles farther to the westward there are two others lying close to the south-west extreme of Robbins island. From the western entrance, which is one mile wide, a narrow 2-fathoms channel trends to the northward between the west point of Robbins island and Long islet, which lies about one mile westward of the point; thence the channel, with 2 to 3 fathoms water, continues 3 miles farther in the same direction, through shoals extending from Robbins island to the mainland westward of it.

From Welcome river the general trend of the coast is N.W. 6 miles to Woolnorth point. The western side of the mouth of Welcome river forms a projecting point, on the west side of which is a small inlet, with an islet close off it. There are several islets and rocks

close to the east side of Woolnorth point, the largest two being Murkay and Harbour islets, the former lying one mile to the south-east, and the latter close to the north-east of the point; besides these, an islet lies $1\frac{1}{2}$ miles northward of the point, with which it is connected by a reef that extends to within a quarter of a mile of Murkay islet.

WOOLNORTH POINT, the north-west extremity of Tasmania, is rather low and rocky, but the adjacent soil is most productive. At 3 miles from the point is an out-station of the Tasmanian Agricultural Company.

HUNTER GROUP consists of three principal, and many small conspicuous islands, extending N.W. $\frac{3}{4}$ W. 28 miles from the south-east extreme of Robbins island to Albatross islet, and N.N.E. $\frac{1}{2}$ E. 18 miles from Woolnorth point to the north-east extreme of Three Hummock island, and includes Black Pyramid, which bears W.S.W., 21 miles from cape Keraudren.

Robbins island, the south-eastern and second in size of the Hunter group, and of which the south side has already been described with Robbins passage, is a sandy island of a somewhat triangular form, with sides 7 to 8 miles long. There are 6 fathoms water over a sandy bottom, at one to 2 miles East of cape Elie, and 6 fathoms on foul ground, close off Guyton point, a rocky projection 3 miles north-westward of the cape. Guyton point divides the north-east side of the island into two sandy beaches, the north-western, and more extensive of which forms a slight indentation, with 4 and 6 fathoms water to 3 miles off it. Between the north-west end of this beach and the north point of the island are two small inlets. The north-west side of Robbins islet is fronted by a shoal, on which a small islet lies near the shore 2 miles south-westward of the north point.

Water may be procured in the neighbourhood of cape Elie; but the anchorage seaward of it is exposed to all winds between North and East.

Walker isle, when examined by Lieutenant Robbins in 1800, formed part of Robbins island, from which it has since been separated by a narrow opening caused by the encroachment of the sea. Walker isle is 3 miles long, N.N.W. and S.S.E., and one mile broad, with rocky shoals extending from its west side and north end.

Between half a mile and $1\frac{1}{2}$ miles N.W. from the north point of the island is a bight having 6 to 8 fathoms water in it, its western side being formed by a narrow 6-foot spit, projecting $1\frac{1}{2}$ miles to the northward, and its east side being formed by the shoal, on which are situated the Petrel islets, extending N.N.E. nearly 2 miles from the north point of Walker isle.

The east end of a 3-fathom shoal lies E.N.E. $3\frac{1}{2}$ miles from the north point of Walker isle, but it has not yet been surveyed.

Petrel islets are a cluster of small islets and rocks, the largest two of which lie respectively, North half a mile, and N.N.E. $1\frac{1}{2}$ miles from the north point of Walker isle; the outer islet is 74 feet high.

A sandy bank lies nearly 3 miles to the westward of Walker isle, with apparently an extensive shoal flat about it.

Tomatin bank, on which the barque of that name grounded in 1865, is reported by her master to lie N.E. by E. $\frac{3}{4}$ E. $4\frac{3}{4}$ miles from the north Petrel islet, with the north-east point of Three Hummock island bearing N.W. by N., distant 9 miles. The chart shows 10 to 12 fathoms water close to the eastward of this danger.

THREE HUMMOCK ISLAND, the south point of which bears N.N.W. $\frac{1}{4}$ W., distant 6 miles from the north point of Walker isle, is the north-eastern island of the Hunter group, being 6 miles long, N.N.E. and S.S.W., and nearly 5 miles broad. It is of an oval form, with a bay on its north-west side, and a coast ridge of moderately elevated land, partly bare of vegetation, extending from the south to the north-east point of the island. Three hills, from which the island derives its name, rise gradually from this ridge, the southern, a conical peak 790 feet above the sea, one mile north-eastward of the south point, is the most elevated part of the island.

The northern hill, one mile south-west of the north-east point of the island, is 590 feet above the sea. At a distance of $1\frac{1}{2}$ miles South of this hill, is the third and intermediate hummock.

Between the south and north-east points of Three Hummock island the coast consists of sandy bays and rocky points. H.M.S. *Norfolk* anchored in $3\frac{3}{4}$ fathoms, in a small sandy bight on the east coast of the island at the foot of the northern hill, and found shelter from North round by west, to S.S.E. There are 8 and 9 fathoms water

a little more than a mile off this part of the island; but breakers project nearly half a mile from the points. The depth of water off the south point of the island is irregular, varying from 17 to 6 fathoms one mile from the shore, and shoaling to 2 fathoms at $3\frac{1}{2}$ cables in a S.S.W. direction.

Reported rock.—In 1894, a sunken rock, on which the cutter *Taniwha* struck, was reported to be situated with the north-east point of Three Hummock island bearing W.N.W. distant about $2\frac{1}{2}$ miles and the southern hill of the island bearing S.W. This position is to be considered doubtful.

Mermaid rock is a small sunken danger lying N.W. half a mile from the north-east point of Three Hummock island; there is deep water close to the rock, and a passage a little more than one cable wide, between it and the shore, through which H.M. cutter *Mermaid* passed.

From the north-east point of Three Hummock island its rocky coast trends West $3\frac{1}{2}$ miles to the north-west point, and thence S.W. one mile to the north-east point of the bay before mentioned, which extends $2\frac{1}{2}$ miles in a S.W. by S. direction, and is one mile deep, with a shoal in the entrance, between which and the points of the bay there are 5 to 7 fathoms water. A short distance behind the beach is a small lagoon of fresh water. A projection three-quarters of a mile south of the south-west point of this bay forms the west point of the island, which, although rocky, may be rounded at the distance of half a mile, in 11 to 7 fathoms water.

Anchorage.—A bay extends S.E. $1\frac{1}{2}$ miles from the west point of Three Hummock island, and is nearly half a mile deep, with $4\frac{1}{2}$ fathoms water in its centre, where there is good anchorage, sheltered from the westward by Hunter island, and from the southward by the shoals which extend from Walker isle and the sandy banks to the westward of it. From the south-east point of this bay the coast trends E.S.E. 2 miles to the south point of the island, near which is a dry rock.

Water is plentiful on Three Hummock island, the surveying vessel *Beagle* having been supplied from wells dug on the north point of a sandy bay on the south-east side. The island is covered with an impervious scrub, the trees being small and stunted.

There is a passage 4 miles wide, between the south point of Three Hummock island and Petrel islets, having depths of 12 to 14 fathoms, which extends from $1\frac{1}{2}$ miles north-eastward of the north Petrel islet to the south point of Three Hummock island.

HUNTER ISLAND, the western and largest of the Hunter group, and formerly known as Barren island, is $12\frac{1}{2}$ miles long, north and south; at the middle and broadest part of the island it is 4 miles across, with a small rocky bight on the west side. The southern part of Hunter island is 2 miles broad, but the northern part, from $1\frac{1}{2}$ miles in breadth near the middle, narrows gradually for a distance of 6 miles to cape Keraudren, the north point of the island. It is moderately elevated, the highest parts being a hill 300 feet high on the east side of the middle of the island, and another 292 feet high, at $3\frac{1}{2}$ miles from cape Keraudren. Its northern part has a most barren and sterile appearance, but its southern coasts are formed by wooded hills of moderate height.

The east side of Hunter island is nearly straight, North and South, and has small sandy bays between its slightly projecting points, off which there is good anchorage in a moderate depth, with shelter from all but easterly winds. There are 10 and 12 fathoms water close to the south point of the island; but a bank, with 2 to $3\frac{1}{2}$ fathoms on it, borders the east side between 2 and $5\frac{1}{2}$ miles from the south point, with its north end extending $1\frac{1}{2}$ miles from the shore. From the north extreme of this bank to cape Keraudren, there are 12 to 7 fathoms water within half a mile of the shore.

Stack islet, 140 feet high, about one mile eastward of the south point of Hunter island, is small, rocky, and destitute of vegetation, with rocks and shoals projecting about a quarter of a mile from its north-east and south-west extremes. There are 22 fathoms, gravel, at a quarter of a mile and 18 fathoms at $1\frac{1}{2}$ miles, from the south side of the islet, with quickly-decreasing depths to the south-eastward, in the direction of the banks which extend from the mainland.

Penguin islet, small and rocky, on the north-west edge of the shoal water which extends from Walker isle, lies N.N.E. $\frac{1}{2}$ E. 2 miles from Stack islet. There is a narrow channel, with 6 to 7 fathoms water, between Penguin islet and the south-east part of Hunter island.

The channel between Hunter and Three Hummock islands is 2 to 3 miles wide, with 7 to 17 fathoms water, and apparently no other hidden dangers than the rocks which closely border the west point of Three Hummock island.

Anchorage.—The best anchorage for large ships on the east side of Hunter island is said to be in 14 fathoms, with the island distant nearly 2 miles, the west point of Three Hummock island bearing North about the same distance. The approach to this anchorage between these two islands is said to be safe, but the lead must be used and attention paid to it, as this locality has not yet been completely examined.

Tides and tidal stream.—It is high water, full and change, at the anchorage on the east side of Hunter island, at 10h. 30m.; springs rise 8 feet. The west-going stream begins 3½ hours before high water.

Cuvier bay, which extends N.N.E. $\frac{1}{4}$ E. 6 miles from the north-west point of Hunter island to cape Keraudren, is $1\frac{3}{4}$ miles deep in its southern part. As this bay is entirely exposed to westerly winds, it cannot afford desirable anchorage; the ground, however, is clean, the bottom being everywhere sand, and the depth variable between 8 and 12 fathoms. The coast in the bay is steep, and may be closely approached, except near the northern part.

The south end and west side of Hunter island are rocky, and as dangerous rocks and breakers extend considerably to seaward from the north-west point of the island, it should be carefully avoided.

Cape Keraudren is a low sloping rocky point with 23 to 24 fathoms water within half a mile of it. A dangerous reef, upon which the sea breaks, lies W. by S. $\frac{1}{2}$ S. between $1\frac{1}{2}$ and 2 miles from the cape; there is said to be a good passage between the reef and the cape.

NO PASSAGE.—There is no passage between Hunter island and the north-west coast of Tasmania, owing to the numerous islets and reefs with which this space is studded; it should therefore not be approached.

Tidal streams.—The tidal streams westward of these islets and reefs run at the rate of 2 knots, the flood to the N.E.

Trefoil islet, W. by N. 2 miles from Woolnorth point, is nearly one mile in extent, and receives its name from its resemblance to a clover leaf; reefs extend from its north-west and south-east extremes.

Bird, or Long islet, N. E. $\frac{1}{2}$ N. $2\frac{1}{4}$ miles from Trefoil islet is one mile long, north and south, and nearly connected by rocks and reefs with the south-west extreme of Hunter island. There are 6 fathoms water one mile East of Bird islet, and from 6 to 9 fathoms on the east side of some rocks which extend between it and Woolnorth point.

Steep islet, 250 feet high, N.W. $\frac{1}{2}$ N. $2\frac{1}{2}$ miles from Bird islet, is about half a mile in diameter, and its coasts are steep cliffs. There is a space of nearly $1\frac{1}{2}$ miles between Steep islet and Hunter island, but it is so much occupied by small, though conspicuous rocks, that it cannot be safely used by ships. There are also numerous dry and sunken rocks between it and Trefoil islet, preventing any safe passage that way.

South Black rock, W. $\frac{1}{2}$ S. nearly 4 miles from Steep islet, is a round mass 130 feet above the sea, with a reef extending from its south side, close to the southward of which there are 23 to 36 fathoms water; and there are 19 fathoms between this rock and Steep islet.

North Black rock, which is much smaller than the South Black rock, lies N. by E. $\frac{1}{4}$ E. $5\frac{1}{2}$ miles from it, and W. $\frac{1}{4}$ S. 3 miles from the north-west point of Hunter island.

Albatross islet, the north-western of the Hunter group, lies W. $\frac{1}{2}$ N., 6 miles from cape Keraudren; the islet is three-quarters of a mile long, north and south, a quarter of a mile broad and 125 feet high, being visible in clear weather at a distance of 16 miles. Its coasts are mostly steep cliffs, and it is rocky and straggling at the extremities, with breakers lying a little way out from them; when seen from a S.W. by W. or N.E. by E. direction, a deep notch in the middle of the island appears to divide it.

Caution.—Soundings give no indication of approach to Albatross isle, there being 25 to 34 fathoms within $1\frac{1}{2}$ miles of its west side, and 31 fathoms at three-quarters of a mile from its north end, over a coarse ground with sand and shells. These depths correspond so nearly with those towards King island and for several miles to the westward of it, that in the night, or in thick weather, it should be approached with caution.

BLACK PYRAMID, S.W. by W. $\frac{1}{4}$ W. 15 miles from Albatross islet, is the most prominent of the islets west of Hunter island, and is the first seen from a vessel approaching the Hunter group from the westward. Black Pyramid is a small dark-looking islet, with a round summit, 240 feet above the sea. It appears bold to approach, there being 24 and 25 fathoms within a mile South, East and North of it.

CHANNEL between TASMANIA and KING ISLAND.

—The channel between Hunter and King islands is 38 miles wide, and the positions of the islets in it are known, but it is little used by vessels going through Bass strait, as the safer entrance, between King island and cape Otway is generally preferred.

REID ROCKS.—The north-western and highest of these rocks, which lie in the north-west part of this channel, is a small dark mass 40 feet above the sea; it bears E. by S. $\frac{1}{2}$ S., distant $11\frac{1}{2}$ miles from Stokes point, and has a rock dry at low water E. $\frac{1}{4}$ S. half a mile from it. The other patches of this cluster lie, respectively, E.S.E. one mile, and S. by E. $1\frac{3}{4}$ miles from the north-western rock, and on the latter patch is South Reid rock, 6 feet above water. The space between and immediately around these rocks is dangerous ground. There are 27 fathoms one mile north-eastward of Reid rocks, and 35 fathoms between 3 miles to the south-east and south-west of them, showing that the lead is no certain guide for approaching these dangers at night or in thick weather; and as the tidal streams here are rapid, this vicinity should be avoided at such times, unless the position has very recently been well ascertained by bearings of the land.

BELL REEF, bearing S. by W. $\frac{1}{4}$ W., distant $8\frac{1}{2}$ miles from the north-western Reid rock, and S.E. $\frac{3}{4}$ S. $14\frac{1}{2}$ miles from Stokes point, is about $1\frac{1}{4}$ miles long, N. by W. and S. by E., and a quarter of a

mile broad, with 33 fathoms E.S.E. one mile from its south extreme, and 36 fathoms, sand and shells, midway between it and Reid rocks.

This reef lies much in the way of vessels using the passage south of King island, and is the more dangerous as the sea only breaks at intervals on it, even with a heavy swell.

Clearing marks.—Black Pyramid bearing East leads $2\frac{1}{2}$ miles south of Bell reef; and the north-western Reid rock bearing North leads 2 miles east of the reef.

Soundings.—There is no bottom in 220 fathoms, at 47 miles S.W. $\frac{1}{2}$ S. of Black Pyramid; but at 35 miles from it in the same direction, there are 70 fathoms, sand and shells, with regular soundings in 44 to 35 fathoms, between that depth and Black Pyramid. In the channel between the Hunter group and King island, the soundings generally range from about 24 to 36 fathoms, the deepest water being 44 fathoms, at about 6 miles to the westward of Albatross islet.

DIRECTIONS.—The channel between the Hunter group and King island, as before stated, is not recommended; and as there is a possibility that some dangers are still undiscovered between King island and the north-west coast of Tasmania, the safer passage between King island and cape Otway should be preferred. But should it be desirable to enter Bass strait by this channel, keep well to the southward of Bell reef, observing the clearing marks given above, and pass close to Black Pyramid. Or, with a commanding breeze, a vessel may pass between King island and Reid rocks, without danger, by keeping well over on the north-western side and paying attention to the tidal stream, which sets across the channel, occasionally with some strength.

Tidal streams set through mid-channel between King island and Hunter group from one to 3 knots, the flood to the north-east, and the ebb to the south-west.

WEST COAST OF TASMANIA.

The West coast of Tasmania is generally rocky, of sterile aspect, with reefs fronting it to the distance of 3 or 4 miles in some places, and a heavy swell usually rolling in upon it from the S.W. The prevailing winds are from the same quarter, and bring much bad weather, especially in the winter months of June, July, and August.

CAPE GRIM, the north-west cape of Tasmania, is a steep black head, close off which are the high conical Doughboy and Steeple rocks, nearly of the same description as the cape. The coast between Woolnorth point and cape Grim consists of a sandy beach and a rocky point, fronted by dry and covered rocks.

Caution.—At a distance of 4 miles S.S.W. from the high conical rocks which lie close to cape Grim, and 3 miles from the cliffy land abreast there are 120 fathoms, on a sandy bottom. A coast so steep should be avoided in the night, or in thick weather, especially with the wind blowing from the westward.

Tides and tidal streams.—It is high water, full and change, at cape Grim, at 10h. 30m.; springs rise 8 feet; the south-west-going stream has a rate at springs of 5 knots, and at neaps of 3 knots.

Studland bay.—To the southward of cape Grim, black cliffs extend nearly 5 miles to the northern Bluff point, on the east side of which is Studland bay, a small exposed sandy bight with an islet in it.

Boat harbour.—From Studland bay the coast trends S. by E. $\frac{1}{2}$ E. $4\frac{1}{2}$ miles and S. by W. $5\frac{1}{2}$ miles to the northern Boat harbour, from the bight of which Green point stretches out nearly $1\frac{1}{2}$ miles to the north-west. There is a rock close off Green point, and a reef lies nearly one mile to the south-west of it. Within the reef is a small bay, from the inner part of which the coast trends S.W. $\frac{1}{2}$ W. $2\frac{1}{2}$ miles to West point.

WEST POINT is a sandy projection, enclosed by dry and covered rocks, in lat. $40^{\circ} 57'$ S., long. $144^{\circ} 38'$ E. M. Freycinet obtained no bottom at 53 fathoms at 6 miles off the point.

Between West point and the southern Bluff point, which lies S. by E. $\frac{1}{2}$ E. $3\frac{1}{2}$ miles from it, is a bight with an islet near its south-eastern shore, and $1\frac{1}{2}$ miles south-east of the latter point is a small opening, close off the entrance of which is Church rock. From Church rock the coast trends S.E. by E. $\frac{1}{2}$ E. 4 miles to Arthur river.

HALLY BAYLEY ROCK, on which the sea breaks heavily in bad weather, has a depth of 3 fathoms on it, and is situated about 15 miles off the west coast of Tasmania. From the rock cape Grim bears N.E. $\frac{1}{2}$ E., distant 16 miles, and West point S.E. by E. $\frac{1}{2}$ E. 14 miles.

ARTHUR RIVER is about half a mile wide at the mouth, and at 17 miles above it, in a S.E. direction, it is joined by Hellyer river, a small stream which rises near Valentine peak.

Southern Boat harbour.—From the mouth of Arthur river the general trend of the coast is S. $\frac{1}{2}$ E. 12 miles to Ordnance point, the southern boat harbour being an inlet, with a narrow entrance, 7 miles to the southward of the river. Both entrance points of the harbour are fronted by rocks; and Ordnance point has dry and covered rocks lying about $1\frac{1}{2}$ miles off it.

SANDY CAPE, S. by E. $\frac{1}{2}$ E. 11 miles from Ordnance point, projects 2 miles from the line of coast; the cape and the exposed bight between it and Ordnance point, are bordered by reefs of dry and covered rocks. Between the southern boat harbour and Sandy cape there are 44 to 26 and 45 fathoms water at 4 to 7 miles from the shore, with irregular depths of 35 to $5\frac{1}{2}$ fathoms between the former soundings and the reefs.

Asbestos is found to the eastward of Sandy cape.

Between Sandy cape and another projection S.E. $\frac{3}{4}$ S. 13 miles from it, the coast forms an exposed bight, having an inlet about 7 miles south-east of the cape. From the south-east point of the bight the coast trends S.E. by E. $\frac{1}{2}$ E. 5 miles to the entrance of Pieman river, 2 miles to the north-westward of which is a small inlet or creek. There is a patch of dry and covered rocks close off the mouth of Pieman river, and 2 miles to the southward of it are two conical rocks, standing on a reef of dry and covered rocks, extending along a projecting part of the coast.

Pieman river.—There are three bare rocks on the north side of the entrance to this river, the least water on the bar, 10 to 12 feet, being south of the eastern one. The sand forming the bar is continually shifting; in fine weather the entrance to the river is contracted both in width and depth; after heavy rains the scour of the current deepens and widens the channel. With southerly winds, the conical rocks, south of the river entrance, partly break the sea on the bar; with N.W. or westerly winds the bar is very dangerous, with heavy breaking rollers. The channel over the bar takes a north-east direction, and passes close south of the eastern of the three rocks north of the river entrance, thence along the north side of the river until the sandy beach on the south side is passed, after which it is midway between the river banks. Inside the bar there is deep water, and a fine river running many miles into the interior. The township of Corinna is situated about 12 miles from the entrance.

Buoy.—A buoy, painted red, has been placed near a rock with 5 feet of water on it, in the mouth of the Pieman river, about 30 feet from the north bank.

From the two conical rocks the coast is rocky, with high cliffs, and takes a S.S.E. $\frac{3}{4}$ E. direction 13 miles to Heemskerk point, one mile within which is a small stream, whence Long Sandy beach curves south-east and south 20 miles to the entrance of Macquarie harbour; at 8 and 14 miles northward of which the beach is intersected by two small streams. There are 12 and 13 fathoms water, at $1\frac{1}{4}$ miles, and 20 to 28 fathoms between 4 and 5 miles from the beach.

Trial Boat harbour is a small bight, sheltered from winds north of N.W. by Heemskerk point, and from the southward by a low reef of rocks that runs out in a south-westerly direction, but the harbour is wholly exposed between N.W. and S.W. In fine weather a small vessel or boat, though there is room for only one at a time, may run in and land cargo, but it is a dangerous place; great caution is necessary, and no vessel should approach Trial boat harbour except in very fine weather.

Ring-bolts have been let into the rocks for warps. Any craft using this landing place is recommended to let go an anchor and run warps to the ring-bolts, then hauling into a position with a depth of 10 or 12 feet, sandy bottom. The water space is very confined, the distance between the rocks north and south being less than 150 feet.

Signals.—The following signals are made from a mast which has been erected on the shore of the harbour.

Two red flags	... ..	The harbour is unsafe, vessels must not enter.
One red flag	... ..	No more vessels must enter at present.
A red and a blue flag	... ..	Vessels in the harbour must put to sea immediately.
A red and a white flag	...	The harbour is unsafe, the sea moderate.
A white flag	... ..	The harbour is safe.

Signal station.—There is a signal station at Remine, a small post town, and communication can be made by the commercial code. It is connected by telegraph and is accessible by boat only in fine weather.

Aspect.—From West point to about 60 miles southward of it the country is low for 2 or 3 miles inland, it then rises gently to a chain of low barren hills, behind which there is a second chain much higher and better wooded than the first.

Mount Norfolk.—East 10 miles from Sandy cape, is the northern and higher of two hills near each other, which are conspicuous from the offing, and in clear weather, are visible before the coast abreast of them.

MOUNT HEEMSKERK* and ELDON RANGE.—Mount Heemskerk N.E. by N. 4 miles from the north end of Long Sandy beach, is the western summit of a ridge extending thence nearly E. $\frac{1}{2}$ S. 26 miles to Eldon range, 4,739 feet high; the former is visible at a distance of more than 30 miles.

Soundings.—From 35 fathoms, rocky bottom, 17 miles West of Sandy cape, the soundings increase to 106 fathoms, fine white sand and shells, about 30 miles westward of mount Heemskerk, 5 miles outside which the depth decreases to 66 fathoms, rock. About S.W. by W. 27 miles from mount Heemskerk there is no bottom at 120 fathoms, the intermediate soundings being 95 and 91 fathoms; and there are 85 to 91 fathoms between 11 and 17 miles from Long Sandy beach.

* The two mountains, Heemskerk and Zeehan, were so named by Flinders after the names of Tasman's ships. It is probable that the first land seen by the Dutch navigator was the mountainous country northward of Macquarie harbour.

See chart, No. 1,579.

CAPE SORELL is a rocky projection of moderate height, forming between it and the north end of Long Sandy beach an extensive bay, in the southern part of which is the entrance of Macquarie harbour; cape Sorell being the western head of the entrance.

The extremity is low, terminating in straggling bare rocks of brown appearance, and the coast on each side is very rocky and sterile. Many patches of breakers and rocks above water lie detached from the shore; and there is one small rock just above the water's surface, lying N.W. 2 cables from the cape, with apparently no safe channel in-shore of it.

Watts hill, E. $\frac{1}{4}$ N. $1\frac{1}{2}$ miles from cape Sorell, is a conspicuous lump of rock on the north-eastern part of the cape; a rock above water connected with the coast by a reef, lies N.W. $1\frac{1}{2}$ cables from the foot of the hill. There is a small rocky islet E. $\frac{3}{4}$ N. from the hill and about 100 yards from the coast, the least depth of water between them being 3 fathoms on a sandy bottom, with somewhat less close to the southward of the islet, in a small bight formed in the northern edge of the shoal which extends from the shore. This small nook, although scarcely an eighth of a mile across in any direction, would nevertheless afford shelter in very smooth water, to a vessel caught suddenly by a north-wester in the outer road, and unable to cross over the bar of Macquarie harbour.

MACQUARIE HARBOUR is an extensive sheet of water, trending from its entrance S.E. by E. 17 miles, and 2 to 4 miles wide, with regular soundings within the entrance, ranging from 5 to 20 fathoms; but the entrance is narrow, and obstructed by a 7-foot bar between the outer and inner roads. It must be borne in mind that the channels are liable to alter in position and depth, owing to the occasional great rush of water out through the banks and shoals which, being composed of sand, are of a shifting nature.

Macquarie harbour formerly an ultra penal station is now, owing to the tin mines in the locality and King river gold field, a post town and port of entry, with a population of 60. Both iron and copper are found to the eastward of Macquarie harbour.

Frenchman cap, 4,756 feet high, bears East, distant 30 miles

See chart, No. 1,629, Macquarie harbour, scale $m = 0.9$ inch.

from cape Sorell, and would probably serve in clear weather, to point out the entrance of Macquarie harbour.

Pilot bay extends from the foot of Watts hill S.E. $\frac{1}{2}$ E. about one mile to the western entrance point of Macquarie harbour, and has a sandy beach, in the western bight of which, behind some dry and covered rocks, is a small run of fresh water flowing from the swampy land behind it; but this bay is only accessible to boats, on account of its being filled by the western sands of the bar, there being only 6 feet water on their outer spit, about two-thirds of a mile to the eastward of Watts hill.

Mount Antill, S.S.E. about one mile from Watts hill, is similar to it, but has a remarkable double summit; mount Antill is situated about half a mile southward of the beach of Pilot bay, and is little more than half that distance from the sea to the westward; there is abundance of water near the mount.

ENTRANCE ISLET lies about 100 yards eastward of the steep rocky projection which forms the south-eastern point of Pilot bay and the west entrance point of Macquarie harbour. The islet is a mass of rock, having some small detached rocks close about it, except apparently, on its eastern side. The proper channel into Macquarie harbour is between this islet and the western entrance point, where there are over 7 fathoms water close to the rocks.

LIGHT.—A lighthouse on the western side of Entrance islet, exhibits at 34 feet above high water a *fixed* light, which should be seen, when not obscured by the land, from a distance of 11 miles in clear weather. The light is white, except between the bearings of S. 16° E. and S. 19° W., when it is red.

This lighthouse in line with the lighthouse on Bonnet islet, or the lights in line at night, bearing about S.S.E. $\frac{3}{4}$ E. (S. 31° E.), lead over the bar in the deepest water.

The sector of red light is intended to cover the north spit, which extends from Entrance islet to the bar, and to guide vessels approaching from the northward, when the inner leading light (*fixed* green) on Bonnet islet is obscured by Entrance islet.

Caution.—As the bar shifts occasionally to a greater or less distance from the north spit, mariners are cautioned that they should

not depend on being, clear of the spit, and in the channel, directly the light changes from red to white, but should bring the leading lights in line.

SANDY POINT.—From one-third of a mile eastward of Entrance islet the sandy beach which forms the eastern side of the entrance to Macquarie harbour trends S. by E. half a mile to Sandy point, on each side of which the land is low and sandy for several miles, and covered with shrubs; the land which forms the western side of the channel is steep, and rises to irregular ranges of rocky hills, amongst which are several masses of quartz, or other white stone, which give them the appearance of being partially covered with snow.

The western side of Sandy point is fronted by a bank, the outer edge of which extends westward from about 2 cables off the point nearly to the opposite shore, then passing close to Entrance islet, and N. by W. half a mile to a spit which always breaks, forming the eastern part of the bar. From this spit the north-eastern edge of this bank trends S.E. by E. to within a quarter of a mile of the beach. There is said to be a narrow channel, with 10 to 12 feet water, close to the eastern side of Entrance islet.

Buoy.—A black buoy is placed on the western edge of the shoal extending from Sandy point, from which point it bears West $3\frac{1}{2}$ cables.

The BAR, which has only 7 feet on its deepest part at low water, lies nearly three-quarters of a mile outside Entrance islet, and separates the outer from the inner road. The soundings outside the bar, from 14 fathoms at 2 miles N.N.E. of cape Sorell, decrease irregularly to 7 feet on the bar. At a quarter of a mile within the shoalest part of the bar the channel is about $1\frac{1}{2}$ cables wide, with 2 to 3 fathoms water, whence it narrows towards Entrance islet, and the depth increases to 5 and 6 fathoms. There is a buoy on the bar.*

Pilots.—Tidal and pilotage signals.—The following signals are made from a flagstaff on the bluff at the west side of the entrance to Macquarie harbour.

Two balls at the masthead signify :—flood tide.

One ball at the masthead signifies :—ebb tide.

A square flag at the eastern yard-arm signifies :—alter course to the eastward.

See chart, No. 1,629.

* This buoy is in 14 feet at low water and in a line with the western entrance point and Bonnet island. On what part of the bar is not yet known.

A square flag at the western yard-arm signifies :—alter course to the westward.

In fine weather the pilot boards vessels outside the bar, but in bad weather, when the pilot cannot cross the bar, vessels should steer in with the lighthouses on Entrance and Bonnet islets in line.

If the vessel is steering a safe course, no flag will be shown from the flagstaff, but if necessary a flag will be shown as above. When the course is sufficiently altered the flag will be hauled down.

When practicable the pilot will direct the vessel by flags from a boat. In this case vessels should steer for the boat, altering course towards the side of the boat from which a flag is shown.

Wellington head.—From the western entrance point the coast trends S. by E. half a mile and then S.E. three-quarters of a mile to Wellington head, a conspicuous hill, bearing South, distant half a mile from Sandy point. This head rises rather abruptly from the west side of the harbour, and is easily distinguished by its table top which is 260 feet above the level of the sea, and is separated from the other hills to the westward by a deep notch, that gives it the appearance of being isolated, before the connecting land becomes visible. There is a white mark about half way up the hills on the south side of the head.

Bonnet islet lies close to the shore, one-third of a mile N.W. by N. of Wellington head, it is small with a round bushy summit; two dry rocks lie one cable southward of it. There is a narrow 13-foot channel between this little cluster and the western shore, by keeping the former aboard; as also between it and a small sandy bight at the foot of mount Wellington. A wire hawser to facilitate communication has been stretched from Bonnet islet to the mainland, there is therefore no channel for vessels south-west of it. Cap islet is a small rock about half a cable south-east of Bonnet islet.

Light.—From a lighthouse on the eastern side of Bonnet islet a *fixed* green light is exhibited at 45 feet above high water.

Telegraph cable.—A telegraph cable has been laid across Macquarie harbour in the vicinity of Bonnet islet. The position of the cable is marked by a diamond-shaped black beacon on the north shore and by a diamond-shaped white beacon on the south shore.

Prohibited anchorage.—Vessels are prohibited from anchoring in the vicinity of the cable; it is advisable that vessels should not anchor in the space enclosed between lines drawn from Wellington head and Bonnet islet to the black telegraph beacon.

The channel.—From Entrance islet to Bonnet islet the channel is one to 2 cables wide, with 9 to 4 fathoms water; but from Bonnet islet to Wellington head, between which and the edge of the eastern shoals the channel is only $1\frac{1}{4}$ cables wide, the depth of water varies from 2 to 4 fathoms.

Channel bay extends from Wellington head S.E. by S. nearly one mile to Round head, and is half a mile deep; a shoal in the middle of the bay, which dries in places, divides the channel into two passages; the inshore passage which follows the curve of the bay between the bank and the shore, is about one cable wide, with a depth of only 7 feet water. The passage between the bank and the extensive sand-banks which stretch out from the northern shore, is also about one cable wide, and has 7 to 18 feet water. This passage is not marked by beacons.

Mosquito cove is a small sandy bight on the south side of Wellington head, with a run of fresh water, and good anchorage in 12 to 20 feet water, on a sandy bottom, within 40 to 50 yards of the beach.

Round head is a high steep projection, with 2 to $3\frac{1}{2}$ fathoms close to it.

The north shore from Sandy point trends E. by S. $\frac{1}{2}$ S. $2\frac{1}{4}$ miles to River point, and then sweeps round in a N.E. direction about one mile to Yellow bluff, and is fronted by extensive sand-banks, nearly dry at low water, which form the eastern and northern sides of the channel leading into Macquarie harbour.

Backagain point.—From Round head the south-western shore forms a bight extending nearly S.E. $1\frac{1}{2}$ miles to Backagain point, a high projection, having $4\frac{1}{2}$ fathoms water close to it. The steep elevated shore of this bight is separated from the southern extensive sand-banks in front of it by a narrow channel, which is said to be finally lost among the shoals to the eastward.

Table head and Liberty point.—Between Backagain point

and Liberty point, the northern extremity of a narrow sharp ridge of moderate elevation, lying E. by S. $2\frac{3}{4}$ miles from Backagain point, the coast forms two bights separated by Table head, a high, steep, flat-topped point, E.S.E. $1\frac{2}{3}$ miles from Backagain point. Each of these two bights is about three-quarters of a mile deep, that to the westward being mostly occupied by shoal flats; the eastern bight is supposed to be free from dangers, though its depth of water is not known.

Betsy and Bird islets lie respectively E. by S. three-quarters of a mile, and E. $\frac{1}{2}$ N. two-thirds of a mile from Backagain point; the former, though little more than one cable in extent, is conspicuous; but the latter is a mere rock. Both islets, together with the rocks about them, are connected with, and surrounded by the extensive sand-banks which stretch $1\frac{3}{4}$ miles to the north and north-east from Table head, and which are generally covered.

KELLY CHANNEL, the passage from the entrance channel into the deep water of Macquarie harbour, is about $1\frac{1}{2}$ cables wide, with 18 to 12 feet water at its western end, North of Round head. Thence the channel takes an easterly direction between the sand-banks for $1\frac{1}{2}$ miles, with depths of 7 to 18 feet water. Kelly channel then gradually widens in an E.N.E. direction, to more than a mile in width at its eastern entrance between the sands, where the depths increase to more than 12 fathoms.

Beacons.—The sides of the channel are marked by beacons, each 12 feet high above water; those on the starboard side, entering from seaward, are painted white, and surmounted by V-shaped marks; those on the port side are painted black, and surmounted by triangular-shaped marks; the black beacon, at the point of the spit E.S.E. of Yellow bluff, is 24 feet high, and surmounted by a diamond. There are two white beacons, one on the north-east side of a shoal in Channel bay, and the other on the north side of the bank at the east end of the channel. Besides the black beacon already mentioned there are four others, one in Channel bay, the next at the south-east end of a shoal half a mile E. $\frac{1}{2}$ N. from Round head, and the others on the south edge of the north bank, S. $\frac{1}{2}$ E. and S.E. by $\frac{1}{2}$ E. from River point. There is also a black buoy $1\frac{1}{4}$ miles eastward of Round head.

Sophia point is a low projection of the north-eastern shore of Macquarie harbour, lying N.E. $\frac{1}{2}$ N. $2\frac{1}{2}$ miles from Liberty point, and

is enclosed by a reef, with straggling rocks extending about 2 cables from it. Sophia point, and Yellow bluff nearly W. by N. $\frac{1}{2}$ N. from it, form the entrance points of the north arm of the harbour, which extends nearly 5 miles in a northerly direction.

Pine cove is a bight in the eastern shore of the north arm of Macquarie harbour, lying North between $1\frac{1}{4}$ and $2\frac{1}{4}$ miles from Sophia point. In proceeding from Kelly channel to Pine cove the steep south side of the spit which projects from Yellow bluff must be approached with caution, as the soundings are very irregular; but thence the depths gradually decrease to 3 fathoms within the cove, where there is good anchorage for small vessels, with muddy bottom.

Tide and tidal stream.—There is little or no tidal stream in Pine cove, and the rise and fall does not usually exceed $1\frac{1}{2}$ feet.

King river.—From the north entrance point of Pine cove a narrow peninsula extends N.W. two-thirds of a mile to the south point of the mouth of King river, which is one-third of a mile wide; but it is encumbered by two islets, from the outer and smaller of which a shoal extends at least one-third of a mile to the south-west, as another does also from the north-east entrance point of the river. King river takes its rise among the mountains to the eastward.

Strahan, a post town and the principal port on the western side of the island, is situated nearly 2 miles northward of the entrance to King river; a railway runs from here to mount Zeehan. Steamers call here regularly from Hobart and Launceston, and there is direct communication two or three times a month with Melbourne. Population 561 in 1891.

Signal station.—There is a signal station at Strahan, and communication can be made by the commercial code. It is connected by telegraph.

Smith cove is a small indentation forming a natural dock, situated 3 miles N. by E. of Yellow bluff. The entrance has a depth of 10 feet in it, and there are upwards of 2 fathoms over the greater part of the cove inside. A ledge of sunken rocks runs E.S.E. from the west entrance point; and rocks extend a short distance southward of the eastern point; a black buoy is moored at the extremity of the western reef, which buoy should be left close on the port hand in entering, thence steering towards the middle of the cove.

Buoy.—A black buoy is moored at the extreme of a rocky ledge, extending nearly 2 cables eastward of the point one cable East of Smith cove.

Swan basin, on the west side of the north arm of Macquarie harbour, extends from one to $2\frac{1}{2}$ miles northward from Yellow bluff. From the south extreme of this basin a narrow neck of land sweeps round north-east and north nearly a mile, and terminates in a peninsula, half a mile long, E.N.E. and W.S.W., between which and a small island to the northward of it is the narrow and only entrance into the basin. This small island, and the rocks northward of it, are connected with the north part of the basin by a dry sandy flat, which lines its shores. A vessel may lie completely land-locked in Swan basin; but from the narrowness of its entrance and the confined space within, it can scarcely be called a port.

The head of the north arm of Macquarie harbour, above King river and Swan basin, is formed by numerous points and bights, affording several sheltered anchorages, secure from all but south-east and southerly winds.

The South-west shore of Macquarie harbour from Liberty point trends South $2\frac{1}{4}$ miles, and E. by S. three-quarters of a mile to a projecting head, forming the north-west entrance point of Double cove.

Double cove is one-third of a mile wide at its entrance between two projecting points lying N.W. and S.E. from each other, within which it is little more than half a mile in extent, with only 6 to 3 feet water, and is much contracted by a projection near the middle of it, which renders the anchoring space very confined, even for the small vessels which are enabled to cross over the bar at the harbour's mouth. Good shelter for boats may, however, be found here; and there are several runs of fresh water, crossing over the beach from the higher land behind.

From the south-east entrance point of Double cove the south-west shore of Macquarie harbour extends in an E.S.E. direction $4\frac{3}{4}$ miles, and then S.E. $\frac{1}{2}$ E. 2 miles to the north-west entrance point of the south arm of the harbour. It consists of rocky points and small bights, mostly fronted by sunken rocks, none of which appear to

extend more than a quarter of a mile from the shore. Inshore, from Double cove to the south arm of the harbour, the land chiefly consists of yellow loam, and is thickly wooded.

Head Quarters island.—Between the north-west entrance point of the south arm of Macquarie harbour and the projection, at 2 miles to the north-west of it, the shore is fronted by a reef extending about a quarter of a mile from each point, and $1\frac{1}{4}$ miles from the shore midway between them. Head-quarters island, the central and largest of the islets and rocks on this reef, and which lies S.E. $\frac{3}{4}$ E. $8\frac{1}{2}$ miles from Liberty point, is half a mile long N.E. by N. and S.W. by S., but is only one cable broad. It has dry and covered rocks close to each end, and there is a small islet on the spit of the reef E.N.E. 4 cables from the north-east point of Head-quarters island. There is anchorage in 4 to 6 fathoms water in the bight of the reef about half a mile to the south-east of the island.

On this island there was formerly a Government establishment for convicts who had been re-transported for crimes committed in the colony.

Birch inlet.—The south arm of Macquarie harbour is 2 miles wide, W.N.W. and E.S.E., at its entrance, whence it gradually narrows for about 2 miles to the south-westward, where it is only one-third of a mile wide, and after continuing this width nearly a mile to the southward, the channel opens into Birch inlet, a sheet of water above one mile wide, and extending 3 miles and probably more, in a south-east direction.

Gordon river flows into the south-eastern end of Macquarie harbour, between the south-east entrance point of the south arm and another point at $1\frac{1}{4}$ miles to the north-east of it. Both entrance points of the river have rocks projecting about one or 2 cables from them, between which is a bar with 12 feet water on its deepest part, upon the south-west side of the entrance of the river. Thence Gordon river trends S.E. 2 miles, and after turning to the north-east for one mile it winds nearly 6 miles in an easterly direction, and then trends 4 miles southward to some marble cliffs on the west side, above which the river is formed by several streams flowing from the interior mountains. From 2 fathoms on the bar the depth of water increases to 10 fathoms $2\frac{1}{2}$ miles within it, with navigable water to within half a mile of the falls.

The North-eastern shore of Macquarie harbour, from a small bight on the south-east side of Sophia point, trends S.E. by E. 4 miles, and thence South nearly a mile to Coal head ; there is a small creek or rivulet $1\frac{3}{4}$ miles from Sophia point. The land in-shore, although bad, is thickly wooded.

Between Coal head, and a projecting point S.E. $3\frac{3}{4}$ miles from it are two bights, the north-western and deeper one being filled by a shoal flat which extends three-quarters of a mile from the shore ; but the south-eastern bight may be approached within a quarter of a mile of the shore in 2 to 4 fathoms. The land behind these bights is poor and heathy, rising inland to mount Sorell E. by N. $\frac{1}{2}$ N. 7 miles from Coal head.

Phillip isle, S.E. $\frac{1}{2}$ S. between one and $1\frac{2}{3}$ miles from Coal head, is about 2 cables broad, and situated on the edge of a rocky shoal, which extends about half a mile from the broad projection, which separates the two bights just noticed. A dry rock lies between the island and the shore.

Pine point, E. by S. three-quarters of a mile from the south extreme of the south-eastern bight before mentioned, is the extremity of an irregular projection of the north-eastern shore, stretching out nearly a mile in a S.W. direction, and separating a kind of basin on its north-west side, from the north-east arm of Macquarie harbour. This basin is more than a mile across each way, with an island in the centre ; but its entrance has a reef stretching nearly half way towards Pine point from the western side.

Kelly basin is a sheet of water $1\frac{1}{2}$ miles long, N.W. and S.E., and three-quarters of a mile wide, forming the head of the north-east arm of Macquarie harbour, which from its entrance between Pine point and the north-east entrance point of Gordon river, extends about $2\frac{1}{2}$ miles in a N.E. direction to the entrance of this basin, which is only half a mile wide. Nothing is known of the depth or capabilities of this branch of the harbour, nor of the basin on the north-west side of Pine point.

Mountains and rivers.—To the north-eastward of Kelly basin are some high ridges of white-topped mountains, which are visible

from the borders of the river Derwent. The Gordon and Birch rivers flow into the south-eastern part of Macquarie harbour.

The soundings in Macquarie harbour, between the spit off River point and the reef projecting from Head Quarters island, range from 13 to 20 fathoms in mid-channel, and thence generally decrease to 10 and 6 fathoms within half a mile of the shore on either side. From 8 fathoms at a mile south-eastward of Head Quarters island the depths decrease to 2 fathoms on the bar of Gordon river.

DIRECTIONS.—The north-west and westerly gales which frequently blow with great violence on the west coast of Tasmania, not only influence the tides in Macquarie harbour very considerably, but render it unsafe for any vessel to anchor outside the bar when there is a prospect of the wind blowing from those quarters, as there is no shelter between North and West, in the outer road, for any but small vessels. Vessels bound for Macquarie harbour should make cape Sorell, and it is recommended that the services of the pilot be obtained. In fine weather, vessels waiting for the tide to cross the bar, should anchor about half a mile from the nearest part of the bar and the same distance north-east of Watts hill, with the north extreme of cape Sorell bearing W. $\frac{3}{4}$ S. (S. 82° W.), and the leading lighthouses in line S.S.E. $\frac{3}{4}$ E. (S. 31° E.) in 6 to 7 fathoms, sand. Vessels of 5 to 6 feet draught can generally enter Macquarie harbour, except with strong westerly winds, the least depth on the bar with the lighthouses in line being 7 feet, which depth continues for about 250 yards. To cross the bar, the leading lighthouses should be brought in line, bearing S.S.E. $\frac{3}{4}$ E. (S. 31° E.), before the north extreme of cape Sorell bears West. Keep the lighthouses in line across the bar, and when the water deepens to $2\frac{1}{2}$ fathoms alter course to the southward until Bonnet islet lighthouse is midway between Entrance islet and the bluff rocky point immediately West of that islet. Then steer towards the Bonnet islet lighthouse. After passing Entrance islet keep near the western shore, and leave the black buoy on the port hand and Bonnet and Cap islets on the starboard hand. Pass close round Wellington head and keep near the western shore until almost abreast Channel hill, then steer to leave the first white beacon on the starboard hand and the first black beacon on the port hand. Give Round head a berth of one cable, then steer to pass half a cable southward of the second black beacon. Proceed passing south of the black buoy to about one cable south of

the third black beacon, and then between the second white beacon and the fourth black beacon. If bound to Smith cove or the north part of Macquarie harbour, the black beacon eastward of Yellow bluff may be rounded at the distance of 2 cables, leaving it on the port hand.

Sailing vessels, inward bound, should not attempt to cross the bar, against the ebb tidal stream, without a strong commanding breeze.

There is good anchorage in the inner road, between the bar and Entrance islet, in 10 feet to 6 fathoms, clear sandy bottom, with the centre of Wellington head over the west point of the narrow entrance; but the breadth between the breaking water on each side is, in some parts, only a quarter of a mile. In working through the inner road, the shoals on the east side should not be approached nearer than to bring the east pitch of the summit of Wellington head over the west end of Entrance islet; nor the shoals on the west side nearer than to bring the centre of the narrow channel, on the west side of Entrance islet, in line with the inner extremity of Sandy point.

Great attention must be paid, not only to the marks and to obtaining quick soundings, but to the tidal streams, which run here with great strength, and during freshets, sometimes at the rate of 5 and 6 knots.

In sailing against the ebb between Entrance islet and the steep rocky point to the westward of it, keep the western shore aboard while passing the islet, as the tidal stream sets strong out of a bight just within it, and is likely to drift a vessel upon the islet.

At night.—No stranger should attempt to enter Macquarie harbour at night, unless on a lee shore and unable to keep outside.

Productions.—The land in the vicinity of Macquarie harbour and the rivers which flow into it is said to be wholly unfit for cultivation, but the forests abound with various kinds of timber, fit for spars, boat-building, cabinet work, and architecture. The Adventure bay pine, which is fit for small spars and a variety of other purposes, grows about King river, and in the south-east as well as the north-west parts of the harbour; it ordinarily grows to the height of 40 or 50 feet, and is from 12 to 16 inches in diameter, with leaves resembling parsley. These spars are generally rafted over the bar, and taken on board in the outer road.

Supplies.—Fish may also be procured in plenty near the rocky parts of the shore, and fresh water almost everywhere.

TIDES.—The time of high water, full and change, on the bar at the entrance of Macquarie harbour, is 7h. 30m. ; springs rise 3 feet ; but the time of high water and rise are both influenced by westerly and north-west gales, and by the great freshets that during the prevalence of rainy or thick cloudy weather, flow into the harbour from the high mountains in the interior, at which periods the channels between the shoals are deeper than usual. During Capt. P. P. King's stay of a fortnight in Macquarie harbour, the tides were irregular, making high water sometimes twice, and at other times only once in 24 hours, and in both cases the ebb ran twice as long as the flood, producing a difference in the level of the water, which on several occasions did not exceed the average fall of 18 inches.

Mr. Kelly, commander of the brig *Sophia*, and the original discoverer of Macquarie harbour, in 1816, experienced a constant outset or ebb for nine days together, without the water rising or falling so much as one foot, although at other times, during north-west gales, the inundations were great, frequently overflowing the adjoining low lands to such an extent, that on one occasion, a large Huon pine tree, 16 inches in diameter, was left by the swollen waters on some sharp-pointed rocks on Entrance islet, at least 10 feet above the common level of the sea.

THE WEST COAST of Tasmania from cape Sorell extends S.S.E. $\frac{1}{4}$ E. 26 miles, and then S.W. $\frac{1}{4}$ W. $3\frac{1}{2}$ miles to point Hibbs, and consists of a series of rocky bights and projections. For the first 12 miles from the cape the coast is fronted by rocky ledges and rocks above water, generally extending about $1\frac{1}{2}$ miles from it. The land behind the whole of this coast rises by a gentle ascent, for a distance of 2 or 3 miles, and is apparently smooth and uniform, but destitute of wood and almost of other vegetation.

SLOOP ROCK, S. $\frac{1}{2}$ E. $10\frac{1}{2}$ miles from cape Sorell, is a small islet, about $2\frac{1}{2}$ miles from the shore, with some sunken rocks at $1\frac{1}{2}$ miles to the northward, and others to the south-eastward of it.

Point Hibbs and Pyramid rock.—Point Hibbs projects south-westward about 3 miles from the line of coast, and is higher than the neck by which it is joined to the back land. A remarkable

pyramidal rock lies N.E. by N. nearly $2\frac{1}{2}$ miles from point Hibbs, which rock may be seen, appearing like the crown of a hat, when bearing N.N.E. over the extremity of the point. A ledge of rocks projects about $1\frac{1}{2}$ miles from point Hibbs, and along the south side of the point, some of the rocks on the eastern part of the ledge being above water. There is a fresh-water pond near the shore, abreast of Pyramid rock, and at $1\frac{1}{2}$ miles south-east of the pond, a small stream flows into the bight on the south side of point Hibbs.

Reported anchorage.—From the small stream which flows into the bight on the south side of point Hibbs, the coast trends S.E. by S. $8\frac{1}{2}$ miles to a headland projecting $1\frac{1}{2}$ miles from the coast line; between this headland, and a clifly peninsular head southward of it extending 3 miles from the coast, is an inlet half a mile wide, said to afford anchorage for small vessels. A reef with a rock above water on it, extends from one mile south-westward to $1\frac{1}{2}$ miles northward of the north head, and a larger reef, with high rocks on it, one mile off shore, projects south-west $2\frac{1}{2}$ miles from the clifly peninsular head, which forms the south side of the reported anchorage.

Mainwaring cove is the bight formed on the south side of the clifly peninsular head just noticed, and Mainwaring inlet, which has a reef projecting from each side of its entrance, lies south-eastward $3\frac{1}{2}$ miles from the head.

ROCKY POINT.—From Mainwaring inlet the coast curves slightly in a S.S.E. $\frac{1}{4}$ E. direction for about 8 miles to Rocky point, from which reefs extend about $1\frac{1}{2}$ miles to the south-west and nearly a mile to the north-west. The land between point Hibbs and Rocky point is somewhat more elevated, and not so destitute of wood as that northward of point Hibbs; the summit of Junction range, 1,210 feet high, is situated N. $\frac{1}{4}$ E., 8 miles from Rocky point.

Black rock, N.W. 7 miles from Rocky point, and nearly 3 miles from the shore, is 20 feet high and surrounded by rocks and breakers, with another patch of rocks and breakers about 2 miles south-east of it.

Elliott cove.—Between Rocky point and a roundish projection of the land S.E. $\frac{1}{2}$ E. 14 miles from it, the coast forms a bay 5 miles deep, the head of which is Elliott cove.

From the roundish projection which forms the south-east extreme of the bay just noticed, the general trend of the coast is S.E. 8 miles to point St. Vincent, between 2 and 3 miles to the north-west of which is a small bight having two islets or rocks one mile off its entrance; they lie close together and are connected by a reef.

Aspect.—The coast for about 18 miles to the south-eastward of Rocky point is high, and at the back are several bare white peaks, as if covered with snow; De Witt range, 2,445 feet high, the most elevated of these peaks, is situated S.E. by E. $\frac{3}{4}$ E. $17\frac{1}{2}$ miles from Rocky point.

Point St. Vincent, North head, and Dock islet.—Point St. Vincent and North head, at 2 miles to the south-east of it, are each fronted by a reef with dry rocks on it. Dock islet lies about one mile off the bight between the point and the head, and there is a detached reef about half a mile South of North head.

POLLARD HEAD.—From North head the coast trends nearly E. $\frac{1}{2}$ S. $1\frac{1}{4}$ miles to Pollard head, the north-west entrance point of port Davey: there are some sunken rocks close to Pollard head; but there is a depth of 5 fathoms one cable off it.

PORT DAVEY.—When nearing this port the land on either side presents a most rugged and barren aspect, and is steep and mountainous to the eastward. The entrance, which is easily known by the high Pyramidal rock three-quarters of a mile north-west of Hilliard head, is $3\frac{3}{4}$ miles wide from Pollard head S.E. $\frac{1}{2}$ E. to Hilliard head; it has a bold approach, and is easy of access, the chief danger to be avoided being a sunken rock, said by Captain Stokes to lie nearly midway between Pollard head and Pyramidal rock. The soundings across the entrance gradually increase from 5 fathoms at a cable off Pollard head to 27 fathoms near Stokes' reported sunken rock, and from thence decrease to 9 fathoms close to Pyramidal rock.

Port Davey extends 10 miles from its south-eastern to its north-western extreme, and has several branches: that which affords the most secure anchorages being apparently on the east side, which includes Bramble cove and Bathurst harbour.

HILLIARD HEAD is a high craggy projecting point, with some sunken rocks close to, and a group of islets and rocks south-eastward of it.

Chatfield and Stephens islets.—The former are five in number, some of which are high and peaked, with sunken rocks about them, lying within one mile to the south-east of Hilliard head; there are also some sunken rocks between Chatfield islets, and Stephens islet, which lies E.S.E. $1\frac{1}{3}$ miles from the head, and close to the shore. From 3 to 4 miles from Hilliard head, between the bearings of S.S.E. and S. $\frac{1}{2}$ W. are several islets and rocks of which the most remarkable is Sugarloaf rock.

South-east shore of port Davey.—From Hilliard head to Forbes point, N.E. by N. one mile from it, the shore forms a bay, between which and Pyramidal rock is Swainson islet, with some sunken rocks close round it and a dry rock near its north-west extreme. There are 7 to 10 fathoms water between Hilliard head and Swainson islet, and 5 to 15 fathoms between the head and Pyramidal rock.

On the east side of Forbes point is Norman cove, about one-third of a mile in extent, having 4 and 5 fathoms water in it, from the east side of which the shore sweeps round a quarter of a mile to Knapp point, close off which is Hay islet, lying N.E. $\frac{1}{2}$ N. two-thirds of a mile from Forbes point.

Hannant point, which lies in line with Hay islet near Knapp point and Forbes point, is a narrow projection separating Spain bay on the south-west side, from Hannant inlet on the north-east side of the point. Spain bay has 8 to 11 fathoms across its entrance, close within which there is a sunken rock. This bay, which runs in about three-quarters of a mile from its entrance, has not been sounded inside the sunken rock.

Hannant inlet.—The entrance of this inlet is barely a quarter of a mile wide, between Hannant point and O'Brien point to the northward of it, and is nearly barred across by a narrow islet extending above a quarter of a mile N.E. and S.W. close within the entrance. Thence the inlet runs nearly 3 miles to the southward, but it has not been surveyed.

Nares rock, lying N.E. by N. $1\frac{1}{4}$ miles from Pyramidal rock, is a sunken patch, with 2 to 5 fathoms water round it. There are more than 17 fathoms water between Swainson isle and Nares rock, and 18 to 7 fathoms between the rock and Norman cove.

Shanks islets, eight in number, lie in line with Pyramidal and Nares rocks, and W. by N. one mile from Hannant point. These islets, which extend 4 cables, north and south, have sunken rocks close about them, but there is a clear channel, with 6 to 18 fathoms water between the shore about Knapp point and a line from Nares rock to Shanks islets, and 12 to 7 fathoms from Spain bay to 2 cables east of Shanks islets.

The East shore of port Davey, from O'Brien point, trends nearly N.N.W. $\frac{1}{2}$ W. $1\frac{1}{2}$ miles to Turnbull head, which forms the south-east side of the entrance of Bramble cove. There are 8 to 10 fathoms water a cable off shore, except at a third of a mile southward of Turnbull head, where a rocky ledge projects nearly a cable from the shore.

BREAKSEA ISLES extend from half a mile N.N.W. of the north Shanks islet to three-quarters of a mile W. $\frac{1}{4}$ N. of Turnbull head. They are two in number, the southern and longer island being three-quarters of a mile long; but neither of them exceeds 300 yards in width. There is a dry rock near the south end of the southern island, and the coasts of both have sunken rocks close along them; but there are 13 to 9 fathoms water within a cable of their west sides, and 4 to 6 fathoms at the same distance from their east sides, between which and the mainland there are regular depths of 6 to 8 fathoms.

South passage, the channel between Shanks and Breaksea islets is nearly half a mile wide, with 16 to 10 fathoms water; and there are 14 to 6 fathoms from the middle of the passage to within a cable of the ledge of rocks south of Turnbull head.

North passage, between Breaksea isles and a rocky patch N.N.W. of it, which shows itself a few feet above water, is one-third of a mile wide, with 10 fathoms water, and 7 to 8 fathoms between the passage and the entrance of Bramble cove.

BRAMBLE COVE is a safe and commodious harbour, having an entrance 3 cables wide, with 4 to 14 fathoms water, between Turnbull head and Milner head, one-third of a mile north-west of it.

There is a dry rock close to Turnbull head, and a sunken rock lies close to Milner head. Within the entrance, Bramble cove forms a basin extending one mile east and west and three-quarters of a mile north and south, with regular soundings, decreasing from 14 fathoms in the entrance to about 4 fathoms off the shores, except to the eastward of Turnbull head, where there are 10 to 15 fathoms.

There is a rock above water with some sunken rocks, close to the eastern shore ; and on the south side is Sarah isle, which, though little more than 2 cables in extent, greatly contracts the entrance from Bramble cove into Bathurst harbour, through an opening between 3 and 6 cables eastward of Turnbull head, the east side of the opening being Hixson point.

Bathurst harbour.—The entrance into Bathurst harbour from Bramble cove is one cable wide, with 9 to 16 fathoms, between a projection a quarter of a mile eastward of Turnbull head and the south-west extreme of Sarah isle. There is also a very narrow passage with $2\frac{1}{2}$ fathoms water, between the south-east point of Sarah isle and Hixson point.

From its entrance, Bathurst harbour trends eastward nearly one mile to Mundy isle, and for the first half mile it is a quarter of a mile wide, with 7 to 14 fathoms water in mid-channel ; but thence to Mundy isle the harbour is nearly half a mile wide, with 14 to 7 fathoms in mid-channel and at a cable from the south shore.

Mundy isle, which is about a quarter of a mile long, lies midway between projections of the north and south shores leaving a channel one cable wide, with 9 to 15 fathoms, between the south-west end of Mundy isle and the projection of the south shore, and a 3-fathoms channel between the north-east end of the isle and the point which projects from the north shore.

From Mundy isle Bathurst harbour trends one mile eastward, with an average width of two-thirds of a mile, and regular soundings, decreasing from 11 fathoms in the centre to 5 and 4 fathoms a cable from either shore. The only objects worth notice on either side are Deep point, N.E. by E. one-third of a mile from the north-east end of Mundy isle, and Noon point, S.S.E. $\frac{1}{2}$ E. nearly two-thirds of a mile from Deep point ; a small islet near the shore, lies a quarter of a mile westward of Noon point.

At a mile above Mundy isle, Bathurst harbour is only a quarter of a mile wide, it increases to two-thirds of a mile in width at three-quarters of a mile farther to the eastward, with 3 and 4 fathoms water a cable from the south shore, and 4 to 6 fathoms within 2 cables of the north shore ; but the harbour has only been partially sounded.

Spring river.—At N.E. by E. $1\frac{1}{3}$ miles from Noon point is an islet which lies close off the mouth of Spring river, a stream flowing into Bathurst harbour from the northward ; between this islet and an opening in the south shore, half a mile to the southward of it, there are 5 to 11 fathoms.

From the mouth of Spring river Bathurst harbour becomes a narrow channel, winding about 4 miles in an easterly direction, when it opens into an extensive sheet of water, forming the head of the harbour. It has a cluster of small islets in its south-west corner, and a narrow branch extends above 4 miles to the southward.

Kathleen isle.—From Milner head to Ashley head, N.W. by W. $\frac{1}{4}$ W. 2 miles from it, the north-east shore of port Davey forms a bay, fronted by Kathleen isle, which lies equidistant from the two heads and about half a mile from the shore. There is a cluster of islets and sunken rocks between the north extreme of the island and the shore ; and between Kathleen isle and the rocky patch to the southward of it, is a channel 2 cables wide, with 5 to 10 fathoms water.

Ashley head, and Bluff head two-thirds of a mile north-west of Ashley head, are each bordered by a rocky ledge ; but may be approached within a cable in 6 and 5 fathoms water.

Pym point.—From Bluff head the shore curves northward nearly $1\frac{1}{4}$ miles to Pym point ; it is intersected nearly midway by an inlet, close off which are three small islets, with some sunken rocks.

The West shore of port Davey from Pollard head curves in a N.N.E. $\frac{3}{4}$ E. direction $1\frac{1}{2}$ miles to Garden point, and thence forms another curve extending N.N.W. $\frac{3}{4}$ W. 2 miles to Earle point. Between Garden and Earle points the shore is lined with rocks, and a shoal with sunken rocks extends a quarter of a mile northward and eastward from Earle point.

Whaler cove is a slight indentation of the coast between Garden point and a small islet near the shore one mile north-west of it. From this islet a rocky reef extends about half way to Garden point, and nearly 2 cables from the shore. There are 4 to 7 fathoms water within 2 cables of the shore in the south-east part of the cove, where there is tolerably sheltered anchorage in north-west or westerly gales; but it is exposed to the wind and sea, if blowing hard from the S.W.

Bond bay extends from Earle point N.N.W. $\frac{1}{2}$ W. $1\frac{2}{3}$ miles to Curtis point, and is $1\frac{1}{4}$ miles deep; but nearly the whole bay is occupied by a flat having rarely more than 8 feet water on it, except in the entrance, where there are 2 to $2\frac{3}{4}$ fathoms, between half a mile N.N.W. of Earle point and a quarter of a mile south-east of Curtis point.

Kelly basin.—In the bight of Bond bay, at $1\frac{1}{4}$ miles westward of Earle point, is an opening about 300 yards wide, having 9 to 12 feet water, which leads into Kelly basin, a circular sheet of water $1\frac{1}{4}$ miles in diameter; it is filled by a shoal flat, except for about three-quarters of a mile to the south-westward from its entrance, where there are 12 to 6 feet water.

Payne bay, the northern part of port Davey is little more than 2 miles wide, east and west, at its entrance between Pym and Curtis points, whence the bay extends $1\frac{2}{3}$ miles to the northward. The east shore of Payne bay from Pym point trends N.N.W. $\frac{1}{2}$ W. one mile to Woody point. Two small islets, with sunken rocks about them, lie N.W. one-third of a mile from Pym point, nearly 2 cables from the shore; and from Woody point three similar islets, with sunken rocks, extend nearly 2 cables.

Between Woody point and Fitzroy point, W. by N. $\frac{3}{4}$ N. $1\frac{3}{4}$ miles from it, the north shore of Payne bay forms a bight, having two small islets near the shore, half a mile north-west of Woody point, and another islet three-quarters of a mile eastward of Fitzroy point, the shore being mostly lined with sunken rocks. Fitzroy islets, which are four in number, with sunken rocks about them, extend one-third of a mile southward and a quarter of a mile south-westward from Fitzroy point.

Stephen river.—Above Payne bay the north part of port Davey, from the width of nearly $1\frac{1}{2}$ miles between Curtis and Fitzroy

points, contracts to a quarter of a mile across, at the mouth of Stephen river, which flows from the northward into the head of the port, W. $\frac{3}{4}$ N. $1\frac{3}{4}$ miles from Fitzroy point. Sunken rocks lie close along the north shore, and others extend about a quarter of a mile from the bights on either side of Observatory point, which lies $1\frac{1}{2}$ miles north-west of Curtis point.

The north part of port Davey is filled by a shoal flat, having generally 6 to 8 feet water on it, the 12-foot edge of which from a quarter of a mile off Curtis point, trends N.W. by N. to about half a mile west of Fitzroy point. At half a mile northward of Observatory point a ridge, with 3 to 4 feet water on it, stretches east and west nearly across from shore to shore.

Soundings.—From 25 fathoms midway between Pyramidal rock and Garden point, the soundings gradually decrease to 12 fathoms within a cable of the rock, and to 9 fathoms a quarter of a mile from Garden point. From 5 fathoms close to Nares rock, the soundings increase to 23 fathoms $1\frac{1}{2}$ miles in a N.W. by N. direction, and thence decrease to 10 fathoms at one mile E.N.E. of Garden point. From a line between this point and Kathleen isle, where the depths increase regularly from 4 to 10 fathoms, the soundings up the harbour to Payne bay, decrease regularly to 4 fathoms. The shores on either side of the harbour, as far up as Earle point and Bluff head, may be generally approached within half a mile in 5 and 6 fathoms; but off Earle point, on the west side, and between Bluff head and Woody points, on the eastern side, there are only 3 and 4 fathoms at that distance from the shore.

DIRECTIONS.—With the assistance of the chart, there is no difficulty in entering port Davey, by passing between Pollard head and the Pyramidal rock, taking care to avoid the sunken rock reported by Captain Stokes to lie nearly in mid-channel. In entering from the southward a good offing must be kept until Pyramidal rock bears N.E., to clear the high peaked Chatfield islets.

Whaler cove.—In the event of being obliged to run into port Davey through stress of weather, when blowing from N.W. or West, having cleared Pollard head and the reported sunken rock to the south-eastward of it, haul round Garden point and anchor in

5 to 7 fathoms, in Whaler cove ; but should the wind be from, or shift to the S.W., this anchorage is unsafe, being exposed with the wind and sea from that quarter.

Working into port Davey, the west shore between Pollard head and Garden point may be safely approached until the water shoals to 8 fathoms ; but in standing towards the south-east shore, care must be taken to tack in time to avoid Nares rock.

Bramble cove.—To shift from Whaler cove to Bramble cove or Bathurst harbour, with the wind not to the southward of S.W., run across for the North passage, by steering for the north extreme of Breaksea isles ; pass between them and the rocky patch to the northward and then into Bramble cove, which is easy of access either from the North or South passage ; both sides of the cove are bold, and may be approached within a cable in 4 fathoms, and the entrance is well protected by Breaksea isles from the heavy sea which rolls into port Davey. Bramble cove, and Bathurst harbour within it, are perfectly secure in the most boisterous weather, and afford convenient and safe anchorage when compelled to leave Whaler cove.

Bathurst harbour.—As the chart is a sufficient guide for entering Bathurst harbour from Bramble cove, it is only necessary to state that the proper channel is between Turnbull head and Sarah isle.

Bond bay.—If compelled by southerly gales to leave Whaler cove, and unable to fetch Bramble cove, run to the northward for Bond bay, taking care not to shoal the water to less than $3\frac{1}{2}$ fathoms, and to give Earle point a good berth, to avoid the sunken rocks which project east and north from it. Having passed Earle point, and brought Bluff head to bear E. by S., haul into Bond bay till the peak of Pyramidal rock is just shut in with, and visible over Garden point, bearing S.S.E. $\frac{1}{2}$ E. (S. 28° E.), and anchor in $3\frac{1}{2}$ to 3 fathoms, half a mile off the north extreme of Earle point. Small vessels might run further up the bay, and anchor in 3 to $2\frac{1}{2}$ fathoms, and be more sheltered from the sea that runs up the port.

Bramble cove from the southward.—For Bramble cove from the southward, after rounding Pyramidal rock, steer N.E. by N.

(N. 34° E.) for the South passage, and having passed between Shanks and Breaksea isles, enter Bramble cove as directed when proceeding from Whaler cove.

Working out from Bramble cove.—If the wind be from the North or North-west, the South passage between Breaksea and Shanks isles is the most practicable; but if from the West or South-west, the North passage is the more safe and convenient one for going out, leaving the rocky patch on the north side of that passage, on the starboard hand, and giving it a good berth. If necessary to tack when in this passage, do not stand within 2 cables of the rocky patch, or of the Breaksea isles, as the heavy swell which sets in may cause the vessel to miss stays; then, if not nearer than that distance, there is sufficient space to bear up and go to leeward of either the rocky patch or the islands, where there are from 8 to 10 fathoms water within 50 to 100 yards of either, and ample room to get the vessel again under command.

TIDES.—From what was observed during 10 days in port Davey, there appears to be no uniform motion in the tides, neither in their ebbing nor flowing, nor in their rise. It seems, however, that they are greatly influenced by the force and direction of the winds, for previously to a strong westerly breeze, the water rose from 4 to 5 feet, and fell but 2 feet. When the fine weather returned, 2 feet appeared to be the extent of the rise, and this was about the time the moon changed.

The COAST from $1\frac{1}{2}$ miles eastward of Hilliard head trends S.S.E. $\frac{1}{4}$ E. 11 miles to the South-west cape of Tasmania; the land is mountainous and presents a barren and desolate appearance.

See chart, No. 2,130.

CHAPTER IX.

TASMANIA.—SOUTH AND EAST COASTS.

VARIATION in 1897.

South cape - - 9° 32' E. | Eddystone point - 9° 50' E.

Nearly stationary.

SOUTH-WEST CAPE is bold and remarkable, with a sharp and rugged outline. Approaching it from the westward, no danger is to be apprehended; but from the eastward and bound round it, as the prevailing winds are from the westward, it is necessary to keep a good offing, for the long westerly swell, which rolls in with great force, in conjunction with the current, which generally sets down the coast and towards the cape, throws a vessel very fast to leeward.

The **SOUTH COAST** of Tasmania extends from South-west cape, nearly East, 36 miles to South cape, and, as might be expected from its exposed situation, is rugged, abrupt, and barren, with some small islands lying from 3 to 12 miles off it. The projecting heads of land are supported by basaltic columns, like the Giant's Causeway in Ireland, and it is without any known places of shelter from onshore winds, although it contains two or three sandy bays.

Between two steep rocky heads bearing E.N.E., distant $3\frac{1}{2}$ and 7 miles from South-west cape, is a sandy bay, divided into two bights by a rocky point, with two clumps of rocks in the entrance.

Cox bight.—From the east point of the sandy bay just described, to the north-west point of Louisa bay, E. by N. $\frac{1}{2}$ N. $6\frac{1}{2}$ miles from it, is an indentation, of which the western corner forms Cox bight, a deep sandy, but exposed bay. From Cox bight to Louisa bay the coast rises to Bathurst range, which attains an elevation of 2,626 feet.

Louisa bay and High bluff.—Louisa bay extends about one mile from north-west to south-east, and has an islet in its entrance.

From the south-east point of the bay the coast trends E.S.E. 3 miles to High bluff, the appearance of which may be inferred from its name.

MAATSUYKER ISLES.*—Needle rock.—Maatsuyker isles consist of two large and several smaller isles lying between 3 and 9 miles off High bluff; the south-west of the two principal isles, which lies E. by S. $\frac{1}{2}$ S. 13 miles from South-west cape, is 920 feet high, and has a reef projecting to the south-west, on which is Needle rock. There are several islets and rocks on a reef which extends northward from the island. The north-east Maatsuyker isle is 1,160 feet high, and lies midway between the south-west isle and High bluff. There is a sunken rock midway between Louisa bay and the inner isle, and S.S.E. $2\frac{1}{2}$ miles from the latter is a cluster of rocks, the highest being 540 feet above the sea.

LIGHT.—The lighthouse 42 feet high and painted white, on the south end of the south-west Maatsuyker isle, exhibits at 348 feet above high water a *double flashing* white light, showing *two flashes* in quick succession *every 30 seconds*, which should be seen from a distance of 25 miles in clear weather. The light is visible round the horizon, except between the bearings of S. 5° E., through south, and S. 73° W., where it is obscured by the south-west Maatsuyker isle; and when within a distance of 6 miles, between the bearings of N. 62° E. and N. 68° E., where it is obscured by Needle rock.

MEWSTONE,† S.E. $6\frac{1}{2}$ miles from the south-west Maatsuyker isle, is a clifly islet 440 feet high; there are rocks close to the eastward and westward of it.

Soundings.—There are 61 to 45 fathoms between Maatsuyker isles and Mewstone; but vessels are recommended to pass south of Mewstone, S.W., 6 miles from which there are 85 fathoms, coral and fine brown sand.

The **COAST** from High bluff trends N.E. 7 miles to an inlet, and thence extends S.E. $\frac{1}{2}$ E. 12 miles to the west entrance point of South cape bay, 2 miles north-west of which is Fluted point. Two rocks above water lie close off a clifly point 3 miles to the south-east of the inlet just noticed, and S.S.W. $2\frac{1}{2}$ miles from the outer of these two rocks is isle du Golfe; there is also a small islet or rock near the shore 2 miles to the north-west of Fluted point.

* Named by Tasman.

† Named by Furneaux.

See chart, No. 1,079.

LA PEROUSE.—From 3 miles south-eastward of the inlet just noticed to South cape bay, the coast consists mostly of high cliffs, from which the land rises to the lofty La Perouse range. La Perouse, 3,925 feet high, is a remarkable table-topped summit, with precipitous cliffs along its south and south-east sides; it bears North, distant 8 miles from the west entrance point of South cape bay. The summit of this range of mountains is a conspicuous thumb-shaped peak, 4,200 feet high, bearing S. 66° W., $2\frac{1}{2}$ miles from La Perouse. A sharp remarkable conical apex, 2,630 feet high, rises from a spur trending from La Perouse towards Recherche bay; this apex usually shows out clearly when the higher mountains to the westward are obscured. Another spur runs E.S.E. from the summit of the above range, and joins the hills above Three Hillock point and Whale head; on this spur the most remarkable part is a dome-shaped wooded summit, 1,060 feet high, which rises abruptly from the flat country surrounding it. The Catamaran river flows through the valley between these two spurs into Recherche bay. The higher portions of the mountain ranges above 3,000 feet elevation are usually rocky and precipitous, but below that altitude the mountain sides and valleys are very thickly wooded. From La Perouse a ridge trends to the north-west, and the main range runs 25 miles to the north, the most elevated part of it being Adamson peak, 4,085 feet high, and bearing N. by E., 10 miles from La Perouse. From mount Alexander, a not very remarkable peak, 3,380 feet high, and situated North, $1\frac{2}{3}$ miles from La Perouse, a ridge trends E.N.E. and terminates in Wooded hill, 1,835 feet high, a peak which shows as a perfect cone from all directions, and is quite unmistakable; this ridge separates the valley of d'Entrecasteaux river to the southward from that of the river Lune to the northward, the former flowing into the Pigsties at the head of Recherche bay, and the latter into the Left Hand narrows, north-west of South port.

South cape bay extends East 5 miles across from its west entrance point to Three Hillock point, and is 3 miles deep; but it is too open and exposed to deserve further notice. There are some ponds of fresh water behind the eastern bight of the bay, $1\frac{1}{2}$ miles to the northward of Three Hillock point.

SOUTH CAPE.—Three Hillock point, about 500 feet high, forms the south-west extremity of South cape, which is a broad

See charts, No. 1,079 and No. 960, approaches to Hobart, including d'Entrecasteaux channel and Derwent river, scale $m = 0.68$ inches.

projection terminating eastward at Whale head, E.N.E. 2 miles from Three Hillock point. Two miles northward of South cape the land rises to Bare hill, which is 905 feet high.

Soundings.—From a depth of 80 fathoms, rocky bottom, at about 2 miles southward of the Mewstone, to 2 miles south-west of South cape, there are 74 to 48 fathoms. A bank with depths of less than 20 fathoms extends three-quarters of a mile south-east of Three Hillock point; and there are 30 fathoms, sand, half a mile south of that point.

PIEDRA BLANCA (White rock) and EDDYSTONE, S.E. $\frac{3}{4}$ S. and S.E., nearly 15 miles from Three Hillock point, are two cliffy islets connected by a rocky reef, and lying N.E. by E. $\frac{1}{2}$ E. and S.W. by W. $\frac{1}{2}$ W., $1\frac{1}{4}$ miles from each other; the former is about 150 feet high; the Eddystone resembles an ill-shaped tower, and is about 200 feet high.

SIDMOUTH ROCK, N.E. $\frac{1}{2}$ N., 5 miles from Eddystone, is about 100 yards in diameter, and is awash, with a reef projecting about half a mile to the north-east of it. There is no bottom at 20 fathoms close round this rock and reef, and the passage between it and Eddystone seems to be free from danger.

Rurick rock was said to have been seen in 1822; and to lie E. $\frac{1}{2}$ S. 33 miles from Piedra Blanca. Unsuccessful searches were made for this rock by H.M. surveying vessel *Dart* in 1887 and 1888. Soundings obtained over the whole area, in which reports of the rock had been made, showed deep water and a regular slope of the bottom. Consequently, Rurick rock is considered not to exist, and it has been expunged from the Admiralty charts.

D'ENTRECASTEAUX CHANNEL* is a smooth water passage between the south-east coast of Tasmania and Bruny island, leading from the south-westward to the Derwent river. The south entrance of this channel extends from South cape nearly N.E. by E. 20 miles to Tasman head, the south point of Bruny island, with soundings in 40 to 60 fathoms, for the greater part of the distance across. The channel, about 35 miles long, is slightly winding, the general direction being S. by W. $\frac{1}{2}$ W. and N. by E. $\frac{1}{2}$ E.; but its width is

* In April, 1792, Admiral D'Entrecasteaux, with the ships *Recherche* and *Esperance*, sighted the Mewstone and bore up for the mainland, intending to make Cook's anchorage in Adventure bay. Through an error of his pilot,* instead of rounding Bruny island, he stood to the west of it, and found himself in the channel which now bears his name.

irregular, varying from 5 miles within the south entrance to little more than half a mile in the north entrance, the depths ranging from 40 to 6 fathoms in the fairway.

The coast from Whale head trends about N.N.E. $\frac{3}{4}$ E. $3\frac{1}{4}$ miles to Second Look-out point, a rocky projection, on the north side of which is a landing place; this coast has 19 to 4 fathoms one quarter of a mile off. From Second Look-out point, a rocky indentation, with deep water in it, trends northward three-quarters of a mile to First Look-out point, and thence a bold rocky coast extends the same distance to the south entrance point of Recherche bay, which is low and grassy.

RECHERCHE BAY.—The north entrance point of this bay is cliffy and 20 feet high. Mutton rocks extend half a mile to the eastward of it, the largest of them E. by N. $\frac{1}{2}$ N. $3\frac{1}{2}$ cables from the point. This rock is about one cable in length north and south, and 20 feet high; the outer Mutton rock is small, 5 feet high, and situated one cable south-east of the largest rock. Shoal water, marked by kelp, extends nearly one cable southward of the outer rock.

A small and dangerous patch, marked by kelp, is situated E. by S. $\frac{1}{4}$ S. $3\frac{1}{2}$ cables from the largest Mutton rock. In ordinary weather this patch has sometimes no breaker on it for hours, when suddenly a tremendous roller sweeps over it. A depth of $4\frac{1}{2}$ fathoms was obtained on it, but there may be less water.

Blind reef, with a least depth of 7 feet on it at low water, lies E. by S. nearly one mile from the outer Mutton rock. In moderate weather the sea breaks very little on this reef. Except to the northward the soundings decrease suddenly from deep water to the 3 fathoms edge of the reef, and there are patches of kelp north-west of it.

Denmark reef is a small patch, marked by kelp, with a depth of $2\frac{1}{4}$ fathoms on it, situated north-west of the south entrance point of Recherche bay. Between this rock and the point West of it are Kelly rocks, some of which are always dry.

ROCKY BAY, the south arm of Recherche bay, has secure anchorage except with N.E. and East winds. The eastern part of the

bay is shallow. Two rocks above water are situated in the south-western part of the bay. The hills bordering the shores are densely wooded, and elevated from 600 to 900 feet.

Anchorage.—N.E. and East winds throw a heavy swell into Rocky bay, rendering it an unsafe anchorage; several vessels have been lost in this bay, and whaling vessels do not frequent it very much.

The deep water area, north-east of the eastern rock above water in the south-western part of the bay, is fully exposed to the heavy squalls which sweep with great violence down Blowhole valley, and therefore it cannot be recommended as an anchorage. With southerly winds the best berth is in the north-western bight of Rocky bay, off the township of Ramsgate, about 3 cables off shore, in $4\frac{1}{2}$ fathoms, sand.

Directions.—Give the south entrance point of Recherche bay a berth of 2 cables, and avoid the kelp off that point. Pass to the southward of Denmark reef; the south point of the projection westward of Kelly rocks bearing W. $\frac{1}{8}$ S. (S. 80° W.), or in line with a remarkable dome-shaped wooded summit, 1,060 feet high, leads between Denmark reef and the shoal water to the southward. Round the south point of the projection westward of Kelly rocks, at a distance of a cable, and then steer for the anchorage.

Catamaran river mouth is three-quarters of a cable wide, with a depth of 6 feet in it; a rock awash is situated half a cable North of the south entrance point of the river.

Recherche bay anchorage.—The anchorage in Recherche bay is so much exposed to easterly and south-easterly gales, which, although not of frequent occurrence, send in a heavy sea, that vessels of sufficiently light draught usually anchor well to the eastward, and on the approach of gales from those quarters, slip their cables and run into the Pigsties for shelter. The best anchorage is about 3 cables North of the north point of the projection westward of Kelly rocks, in 9 fathoms, sand.

THE PIGSTIES, the north arm of Recherche bay, has a rock above water (Shag rock) in the middle of the entrance, with another rock awash about 30 yards E.S.E. of it. The edge of the kelp affords a good guide for navigating the channel eastward of these rocks, as it marks approximately the 3-fathoms line, and it may be skirted

closely; the depth in mid-channel eastward of the rocks is from 5 to 6 fathoms. Foul ground on which the sea breaks in bad weather, and marked by kelp, extends $1\frac{1}{2}$ cables S.S.W. from the south part of the east entrance point to the Pigsties. This harbour was formerly much frequented by whaling vessels during south-easterly gales. The land around is densely wooded.

Directions.—To enter the Pigsties, when north of Kelly rocks, bring Shag rock in line with Wooded hill (a cone-shaped mountain), bearing N.N.W. $\frac{1}{4}$ W. (N. 25° W.), and keep that mark on until abreast the south part of the east entrance point; pass about one-third of a cable east of Shag rock, and then keep the north part of the east entrance point open on the starboard bow, taking care not to stand so far to the westward as to bring Shag rock outside the southernmost point of land seen. After passing the north part of the east entrance point, keep westward of the north and south parts of the east entrance point in line, until a red cliff on the eastern shore of the Pigsties bears E.N.E. (N. 67° E.), when alter course towards the cliff for the anchorage.

Anchorage.—The best anchorage in the Pigsties is in a depth of $3\frac{1}{2}$ fathoms, mud, with the summit of the trees on the point westward of Kelly rocks in line with the north part of the east entrance point. This is an excellent harbour for small vessels, with very smooth water, and the bottom is such soft mud that a vessel is not injured by it if aground.

Supplies.—Water may be obtained on the western side of the Pigsties; milk and butter may be procured from the inhabitants, and fishing boats frequent the bay. There are only a few scattered inhabitants, and the surrounding country is so thickly timbered that cultivation has been carried no further than the planting of a few orchards near the houses. Two saw-mills have been established, one at the mouth of Catamaran river in Recherche bay, and the other at the mouth of D'Entrecasteaux river, at the north end of the Pigsties; tramways run a short distance into the bush from these mills.

Telegraph and mail communication.—The telegraph office is on the western shore of the Pigsties, whence there is communication by telephone with Hastings, and thence by telegraph to Hobart. The telephone wire has been carried to Bare hill above South cape,

where it has been proposed to establish a signal station. The post office is on the west entrance point to the Pigsties; there is mail communication twice a week with Hobart, but the road is a mere track as far as the Narrows at South port. The local steam-vessels did not call at Recherche bay in 1887.

ACTÆON ISLES and SHOALS, which lie about 3 miles north-eastward of Recherche bay, are two isles with numerous rocks and reefs extending from them.

Sterile isle, the south Actæon isle, is 25 feet high, and covered with grass and bushes; it lies N.E. by E. $\frac{3}{4}$ E., $3\frac{1}{2}$ miles from the south entrance point of Recherche bay, and has dry and covered rocks close to the eastward and westward. Depths of 2 to $4\frac{1}{2}$ fathoms, on the inner part of which the sea breaks, extend 4 cables N.W. by W. from the north-west point; and breakers roll over the foul ground which stretches half a mile to the south-eastward, and one mile to the southward from the island. Upon some of these patches the sea does not always break.

South-east break is a small detached patch with a depth of 9 fathoms on it, lying S.E. by E. upwards of one mile from Sterile isle. The sea breaks on this patch only in bad weather.

South break, S. $\frac{1}{2}$ W. $1\frac{1}{4}$ miles from Sterile isle, has a least depth of 6 feet on it. Vessels should not attempt to pass between South break and Sterile isle. The sea breaks in bad weather in a depth of 8 fathoms on the bank to the southward of Sterile isle.

Actæon isle, the north Actæon isle, is 53 feet high, and covered with scrub and grass; it is nearly divided into three parts, the northern narrow neck being dry at low water, and the southern neck always dry. A rock lies close to the north point of Actæon isle, with a reef and foul ground extending 2 cables northward from it. Rocks above water, on the eastern part of which the *Actæon* was wrecked, stretch 2 cables from the south point. The sea breaks on the shoal extending nearly a mile southward of the south point of Actæon isle. The reef and spit extending 2 cables from the west point of the isle has kelp beyond the danger.

Deep Water bank or Ring of kelp patch, the eastern of the Actæon shoals, is a small rocky patch, lying N.E. nearly one mile

from Sterile isle. A depth of 5 fathoms was obtained on this patch but there may be less water ; the sea only breaks on it occasionally.

Black reef, $1\frac{1}{4}$ miles north-westward of Sterile isle, is a cluster of rocks awash at high water. A bank with depths of $3\frac{1}{2}$ to 5 fathoms extends half a mile in a northerly direction from Black reef, and then, with a slight break, curves round to the coast northward of Sullivan point, its whole length being thickly grown with kelp, which also grows in a south-easterly direction from Black reef for a quarter of a mile.

The coast, which is low, with Black Swan lagoon behind, trends from the north entrance point of Recherche bay N.E. by E. $1\frac{1}{4}$ miles ; it then becomes more elevated, and turns E. by S., half a mile to Sullivan point, 2 cables south-east of which is Bowden's mistake, a reef which in moderate weather breaks occasionally.

South port lagoon.—From Sullivan point a rocky coast sweeps round in a N.N.W. direction $1\frac{1}{4}$ miles to a narrow tongue of land, running N.N.E. $\frac{1}{2}$ E., nearly 2 miles to the entrance of South port lagoon, which entrance is upwards of a cable wide, and has generally a heavy surf across it.

George III. rock, upon which a vessel of that name was wrecked, is a small patch with a depth of 8 feet on it, lying N.E. by N. 2 miles from Sullivan point. This rock seldom breaks except in heavy weather, and there is a little kelp round it.

South port bluff, one mile north-east of the entrance to South port lagoon, is 65 feet high, and on it stands a tomb to the memory of those who perished in the wreck of the ship *George III.*, 12th April 1835.

Blanche rock, nearly half a mile south-eastward of South port bluff, and 40 feet high, is bare, with a few dry and covered rocks extending nearly a cable to the south-east from it.

South port isle, nearly half a mile north-eastward of South port bluff, is flat-topped with a clifly coast ; it is 83 feet high, and covered with grass. A few rocks, with shoal water half a cable beyond them, extend one cable south-east from the east point. A small islet lies about one cable West of South port isle.

SOUTH PORT.—From South port bluff the coast trends N.N.W. half a mile to a rocky point, three-quarters of a mile N.N.W. $\frac{1}{2}$ W. of which is a projection, with 3 fathoms water close to it. The west shore of the port is fronted by a shoal, stretching nearly three-quarters of a mile eastward of the entrance to the Narrows at the head of South port; on the eastern part of this shoal is Pelican islet, a low rock covered with grass and with several high trees on it. There are 4 to 8 fathoms, on fine gray sand, in the bight to the south of Pelican islet; and a depth of 4 fathoms can be carried to the head of the pier in the south-west part of that bight. The east extreme of the shoal eastward of Pelican islet is marked by a mass of thick kelp. Shallow water, the edge of which is steep, but not marked by kelp, extends more than one cable north of the low rocky point south of Pelican islet. The water shoals rapidly from 5 to 2 fathoms on the north-west side of this bight, the edge of the bank being on the line joining the pier and the west end of the rocks westward of Pelican islet.

The Narrows is a shallow muddy inlet forming three branches, with the river Lune discharging itself into the middle branch or Left-hand narrows.

Hastings township is situated on the eastern side of the north branch or Right-hand narrows. There is a large saw-mill here, with a tramway running into the bush from it, and a good road to Hythe.

Hythe.—The north shore of South port consists of two bays, separated by a rocky promontory. The township of Hythe is at the head of the western bay, and has a large saw-mill and tramways.

Stack of Bricks, a rock 30 feet high, is situated off the eastern point on the north shore of South port, and is steep-to to the southward.

Anchorage.—The eastern bay on the north side of South port is very much exposed to easterly and south-easterly gales, and with those winds it would be imprudent to anchor there; but it is well sheltered against north-westerly gales, with good holding ground, the best berth being in 7 fathoms, sand, with the extreme of the rocky promontory bearing W.S.W. (S. 67° W.), distant 3 cables.

The bay south of Hythe has a thick growth of kelp, in which the depth is 4 fathoms, west of the rocky promontory; kelp also grows for one cable south of that promontory, with deep water immediately outside it. This bay affords anchorage in $3\frac{1}{2}$ fathoms, sand and mud, but is exposed to easterly and south-east gales, although by anchoring westward of the kelp that weed might break the sea. The best berth is in $3\frac{1}{2}$ fathoms, with Hythe pier bearing N. $\frac{1}{2}$ W. (N. 6° W.) and Stack of Bricks just open south of the rocky promontory east of the bay.

The bight to the southward of Pelican islet is more protected with winds from the eastward, but the deep water space is too narrow to admit of anchoring near the pier. The best berth is with the east extreme of Pelican islet in line with the schoolhouse at Hythe (on a point eastward of the township), bearing N. $\frac{1}{2}$ E. (N. 6° E.), and about $1\frac{1}{4}$ cables from Pelican islet, in $7\frac{1}{2}$ fathoms, sand.

Directions.—To enter the anchorage off Hythe, South port island, just hidden by the south entrance point of South port, leads to the southward of the kelp in the middle of the bight; and when the east extreme of Pelican islet is in line with the east extreme of the sandy beach in the south part of South port, keep that mark on astern, and anchor as directed above.

Communication.—Hythe and Hastings are both in telegraphic communication, and there is a mail from Hythe to Hobart twice a week overland. Steam-vessels from Hobart call at Hythe twice a week.

Timber.—The hills at the back of Hythe rise to a height of 1,000 to 1,550 feet, and are thickly timbered with blue gum and stringy bark.* The land on the south side of South port is thickly wooded, and from 200 to 360 feet high.

Burnett point.—From Stack of Bricks the coast trends N.E. by N. three-quarters of a mile to Burnett point, the cliffs being about 100 feet high, and thence N.N.W. for half a mile to the south point of Sisters bay, off which a reef extends 2 cables from the shore, having, on the outer part, a small rocky islet 5 feet above high water.

See chart, No. 960.

* The blue gum tree reaches a height of 100 to 120 feet with a diameter of 3 to 5 feet; the wood is strong, durable, and easy to work. The *eucalyptus microrrhyncha*, or stringy bark, grows to a height of 50 to 100 feet and a diameter of 2 to $4\frac{1}{2}$ feet; the wood is light, strong, hard, and polishes well.

Sisters and Lady bays are two indentations of the coast, a half and one-third of a mile deep respectively, with from 3 to 10 fathoms water, sandy bottom, and separated by a rocky promontory, $1\frac{1}{2}$ miles N. $\frac{3}{4}$ W. from Burnett point. In the north part of Lady bay there is a saw mill and pier.

There is another smaller bight half a mile to the northward of Lady bay, from whence a rocky, cliffy coast line extends N.E. $\frac{1}{2}$ E. for 2 miles to Scott point. This coast is fringed with kelp its whole length.

Scott point is on the south side of port Esperance; from the projection north of it a rocky bank, with from 4 to 5 fathoms, and marked by kelp, extends in a northerly direction nearly 4 cables, having a small patch of 3 fathoms on its outer extremity, from which the projection north of Scott point bears S. $\frac{3}{4}$ E., distant one-third of a mile.

PORT ESPERANCE.—From Scott point the coast trends northward one-third of a mile to a projection between which and Esperance point, a little more than one mile northward from it, is the entrance of port Esperance, which extends thence $2\frac{3}{4}$ miles in a W. by N. direction, and is $1\frac{3}{4}$ miles wide. Hope isle, which is about 100 feet high, nearly half a mile in extent, and with a few trees near the summit, lies one mile within the entrance, dividing it into two channels, that on the south side of the island being one-third of a mile wide, with 15 to 25 fathoms, over mud and sand, where a vessel may be sheltered from all winds.

About a mile West of Hope isle, a point of the south shore projects to the northward, on the west side of which is the entrance of an inlet one-third of a mile wide, with 8 fathoms in mid-channel, and from 8 to 20 fathoms between it and Hope isle. From its entrance the inlet winds about $1\frac{3}{4}$ miles in a W.N.W. direction to a point which divides it into two branches, one trending half a mile to the southward, and the other about the same distance westward to Esperance river. One-third of a mile within the entrance of this inlet is Rabbit islet, between which and the west entrance point there is a narrow passage, with 4 to $2\frac{1}{2}$ fathoms, and $3\frac{1}{2}$ fathoms water within the islet, above which the channel appears to be obstructed by small islets or rocks. A vessel may lie in this inlet perfectly landlocked.

A bank of from $3\frac{1}{2}$ to 4 fathoms extends from Hope island to the northward, across the bay, on which, and at a quarter of a mile north of Hope island, is situated a small islet with a few trees on it, named Dead islet.

Between the islet and Esperance point there are 6 to 8 fathoms water, sand and rock, affording a convenient anchorage, with Esperance point in line with Ventenat point bearing East, and Scott point S.S.E. (S. 22° E.), the west extreme of South Bruny being open to the eastward of it.

Snachall islets are two small rocky islets situated half-a-mile N.W. $\frac{3}{4}$ W. from Dead islet, having a reef extending $1\frac{1}{2}$ cables from them in a S.E. by E. direction.

Between this reef and the bank on which Dead islet stands is a narrow channel of 8 and 9 fathoms. Shoal water extends from Snachall islets in a N.W. by N. direction to the shore.

There is a rivulet half-a-mile to the north-westward, but the water is brackish and difficult to obtain.

Dover township in the north-western part of the port is in telegraphic communication. There is much fine timber in the neighbourhood, which gives employment for several saw mills.

Water.—There is a narrow bight in a sort of ravine formed between the heights of Folkestone on the south shore, south-west of Hope isle, having 7 fathoms in the entrance and $4\frac{1}{2}$ to $2\frac{3}{4}$ fathoms farther in, and affording shelter for heaving down a vessel. At the bottom of the bight is a rivulet of excellent water.

Roaring bay.—From Esperance point the coast trends N.N.E. $\frac{1}{4}$ E. for half-a-mile to a point having a small bight on its west side; the northern portion of this bight is marked by a conspicuous red cliff, 150 feet high. Between the last mentioned point and another projection, N.E. $\frac{1}{2}$ E. about $2\frac{1}{3}$ miles from it, there is an indentation, of which the north bight is Roaring bay.

Coast.—From the N.E. point of this bay the coast trends N. $\frac{1}{2}$ W. half-a-mile to Huon point, the west entrance point of Huon river.

Mount Esperance, 1,515 feet in height, and situated 3 miles W. $\frac{3}{4}$ N. from Huon point, is the summit of the mountain range,

with spurs both to Huon river and port Esperance, and is everywhere densely wooded.

TASMAN HEAD.—Tasman head, the south extreme of South Bruny island, forming the north-eastern point of the south entrance of D'Entrecasteaux channel, is high, abrupt, and composed of basaltic pillars, with a shoal, which should be avoided, and with depths of 12 to 19 fathoms, extending from it S. by W. $1\frac{1}{2}$ miles and S.E. by S. $2\frac{1}{4}$ miles, on which are several small islets and numerous rocks, some of the former producing vegetation. Arched rock, 170 feet high is situated one cable offshore, south-east of Tasman head.

Friar rocks.—The largest and most conspicuous islet of Friar rocks is 325 feet high, and half a mile southward of Tasman head, the passage between being apparently free from danger. It is possible to land on the north side of this islet when the sea is smooth. A chain of islets and rocks extends 6 cables south-eastward of the largest islet, terminating in a rock nearly awash, on which the sea usually breaks. The two south-eastern islets of the group are 90 and 95 feet in height, pyramidal in shape, and, except where whitened by gannets, have a bleak, weather-beaten appearance. The south-western islet is 250 feet high, and appears to be split in two when seen from the south-east or north-west. Vessels should not attempt to pass between the rocks and islets of this group.

Shoal.—A small rocky shoal, with 17 to 20 fathoms water on it, and 30 to 45 fathoms all round, is situated S. $\frac{1}{2}$ W. $4\frac{3}{4}$ miles from the south-western Friar islet.

The coast between Tasman head and East head is bold, rocky and precipitous. The land at the back rises in smooth grass and scrub-covered summits, 800 to 1,000 feet high, culminating in mount Bruny, a saddle-shaped summit, 1,700 feet high, and covered with thick scrub.

CLOUDY BAY, a bight in the southern end of South Bruny island, exposed to all the fury of south-west gales, is 3 miles wide, E. $\frac{3}{4}$ N. and W. $\frac{3}{4}$ S., at its entrance between East and West heads, whence it extends $3\frac{1}{4}$ miles North to a long narrow tongue of land stretching westward from the east side, and separating this bay from Cloudy lagoon. The east shore of Cloudy bay for the first $1\frac{3}{4}$ miles is rocky and irregular, the most projecting danger being a reef with

dry rocks upon it, extending from a point about midway between East head and the head of the bay; there is a rock 5 feet high at its extremity, $1\frac{1}{2}$ cables westward of the point. Another reef, with thick kelp on it, extends one-third of a mile northward from the north extreme of this point, on the east side of which is a small bight, with depths of 2 to $1\frac{1}{2}$ fathoms water, affording complete protection in all weathers to fishing and other small vessels. The east side of Cloudy bay between this bight and a projection of the north shore appears to consist of a sandy beach. The head of the bay is exposed to a great surf.

Cloudy lagoon is a shallow sheet of water $1\frac{3}{4}$ miles long, E.N.E. and W.S.W., $1\frac{1}{4}$ miles wide, and communicates with the north-west corner of Cloudy bay by a narrow channel trending north and south two-thirds of a mile. The land for about $1\frac{1}{2}$ miles northward of the lagoon is low and swampy.

Half Moon bay.—The western shores of Cloudy bay fall in steep cliffs from grassy downs, 300 to 680 feet high, with several small open bights, the southern of which, Half Moon bay, is the most important. It has depths of 7 to 12 fathoms, white sand, with thick kelp a quarter of a mile from the shore along the head of the bay.

Anchorage.—Except the small vessels mentioned above, no vessel should anchor in Cloudy bay, unless it is absolutely necessary to do so. In such a case the best position is in Half Moon bay, as there a vessel is well to windward should southerly winds come on.

The coast between West head and another point lying S.W. by W. $\frac{3}{4}$ W. from it, and S.E. half a mile from cape Bruny, forms an exposed bay $1\frac{1}{2}$ miles wide and three-quarters of a mile deep, its bight being a sandy beach, with a rocky point, half a mile westward of West head. Chains of high rocks extend to the southward for upwards of a cable from each point. A bank with 16 to 20 fathoms runs $1\frac{1}{4}$ miles southward from West head.

CAPE BRUNY, the south-west point of South Bruny island, is 291 feet high.

LIGHT.—The lighthouse on cape Bruny, 44 feet high, and painted white, exhibits at 335 feet above high water a *revolving* white light, which revolves *every minute and forty seconds*, and should be seen from a distance of 22 miles in clear weather.

From a distance of 10 miles the light shows for *fifty* seconds, and is *eclipsed* for *fifty* seconds.

Courts isle extends from a few yards to half a mile southward of cape Bruny, and is nearly a quarter of a mile wide. It is flat-topped, grassy and precipitous, with a small islet, 60 feet high, one cable south-west of it; there are 10 to 14 fathoms close to the southward of the isle and islet.

Soundings.—Between Actæon isle and cape Bruny, the depths range between 30 and 40 fathoms. A rocky bank extends $1\frac{3}{4}$ miles S.W. by S. from cape Bruny, with depths of 12 to 17 fathoms on it. The light-keeper has reported a very heavy break on this bank in bad weather, but nothing less than 12 fathoms was obtained during a careful search by H.M. surveying vessel *Dart*; the bottom is very irregular.

Mount Barren, three-quarters of a mile North of cape Bruny, is about 500 feet high, with a cairn on it. The land near cape Bruny is covered with grass and scanty scrub.

STANDAWAY BAY extends from cape Bruny N.W. $\frac{3}{4}$ N 4 miles to a point one mile southward of Hopwood point. The detached rocks in the bay are from 10 to 30 feet high, and lie from one to $2\frac{1}{2}$ cables offshore. Mount Bleak is 510 feet high, and its south-western slopes are covered with scanty scrub. The depth of 20 fathoms is about half a mile offshore throughout Standaway bay.

Hopwood point is the north-west point of the promontory from 300 to 500 feet high, extending $4\frac{1}{2}$ miles in a N.W. direction from mount Barren. It is the north end of the cliffy coast line, extending from cape Bruny, and when seen from the vicinity of the Zuidpool rock, appears as the north extreme of the promontory.

About N. by E. half a mile from Hopwood point is a projection having some rocks above water close to its west side, E.N.E. three-quarters of a mile from which is a third point forming the west entrance point of Great Taylor bay. These points are low and rocky.

Partridge isle, which extends from about one cable to $1\frac{1}{2}$ miles northward from the north-west point of this promontory, is one-third of a mile broad, with 18 to 7 fathoms water close to its west shore. It is wooded and 230 feet high.

There is a landing place on its east side, off which there is anchorage in 10 fathoms, mud and sand, with Hopwood point in line with the south extreme of Partridge isle, bearing S.S.W. $\frac{1}{4}$ W. (S. 25° W.), and the north extreme of the island N.W. $\frac{3}{4}$ W. (N. 53° W.)

GREAT TAYLOR BAY.—The entrance of this bay is $2\frac{1}{2}$ miles wide from W.S.W. to E.N.E., and runs in about $3\frac{1}{4}$ miles in a S.E. $\frac{1}{2}$ S. direction. The western shore for the first $2\frac{1}{2}$ miles is nearly straight, and thence irregular to the bottom of the bay. A patch, which is awash at high water, lies a quarter of a mile from the shore $2\frac{1}{2}$ miles from the west entrance point. The eastern shore of Great Taylor bay consists of projecting points and bights, the most extensive of the latter being the bay of Islands, which lies midway between the north-eastern entrance point and the south extreme of Great Taylor bay. The bay of Islands is over half a mile wide at its entrance, whence it runs in nearly a mile to the north-eastward.

Curlew islet is 23 feet high, covered with grass, and situated 2 cables S.S.W. from the north entrance point of the bay of Islands, and there is a smaller islet, 30 feet high, nearly the same distance from the southern shore of this bay, over half a mile within the entrance.

Oak point.—At $1\frac{1}{2}$ miles, S. $\frac{1}{4}$ E. from Curlew islet, is Oak point, the southern projection of the eastern shore; the bight to the south-west of the point being surrounded by a sandy beach.

The store houses for the lighthouse on cape Bruny, with a pier for landing, are built on the western shore, S.W. $\frac{1}{2}$ W. from Oak point.

The depths in Great Taylor bay range from 17 fathoms at the entrance to 8 and 9 fathoms one mile from the head of the bay, thence gradually shoaling.

Anchorage.—Great Taylor bay is too large to afford shelter from gales at all times; although the bottom generally is hard

black mud, vessels have dragged their anchors, even with a long scope of cable.

VENTENAT POINT.—From the east entrance point of Great Taylor bay the general trend of the western coast of South Bruny island, which is slightly embayed, is nearly North $3\frac{1}{2}$ miles to Ventenat point. This point, which forms the west side of the entrance of Little Taylor bay, is the north extremity of a tongue of land projecting N. by W. $\frac{1}{2}$ W. $2\frac{1}{4}$ miles, and separating Little Taylor bay from D'Entrecasteaux channel. There are 24 to 12 fathoms between Partridge isle and Ventenat point, but a reef projects a short distance north from the point.

Shoal water.—A small patch of 12 fathoms lies about N.E. $\frac{1}{4}$ N. $2\frac{1}{4}$ miles from the north end of Partridge isle and another of 10 fathoms N. $\frac{1}{4}$ W. nearly 2 miles from the same point.

Little Taylor bay is $1\frac{1}{2}$ miles wide, N.E. by E. and S.W. by W., at the entrance, whence it extends about S. by E. $2\frac{1}{2}$ miles. There is a small bight in the western shore of the bay, half a mile within Ventenat point, where anchorage may be obtained in from 4 to 5 fathoms, sand and mud, sheltered from South and West winds; and there is a larger, but more shallow one, in the eastern shore, between three-quarters of a mile and $1\frac{1}{2}$ miles from the north-east entrance point of the bay, but it is not recommended, being exposed to the north-west, from which direction the strongest gales are experienced, and the sea soon gets up. Little, like Great Taylor bay, is capable of receiving large vessels, although the anchorage in neither of them can be considered good.

The west coast of South Bruny island from Little Taylor bay takes a general N. by E. $\frac{1}{2}$ E. direction $6\frac{3}{4}$ miles to Simpson point, the north extremity of a part of the island, projecting $3\frac{1}{4}$ miles to the northward, and separating Isthmus bay on its east from D'Entrecasteaux channel on its west side.

Satellite island, $2\frac{1}{4}$ miles N.N.E. $\frac{1}{2}$ E. from Ventenat point, and half a mile from the shore, is 170 feet high, cultivated, and has a thick grove of trees on its west side.

The coast is cliffy almost throughout, from 70 to 40 feet in height and accessible. There is a pier on the north-east side of the island.

Between Satellite island and Bruny island there is foul ground ; a reef of rocks extends 2 cables from Bruny island, and the depth between is from 2 to 3 fathoms.

Zuidpool rock, about 50 yards in extent with 2 fathoms water on it, lies nearly midway between Ventenat point and Huon island, with the north-east extreme of Huon and Garden islands in line, bearing N.N.W. $\frac{1}{2}$ W., and the north end of Satellite island, N.E. by E. $\frac{3}{4}$ E., Huon and Satellite islands each being distant $2\frac{1}{4}$ miles.

Within the 5-fathoms line the shoal is about $1\frac{1}{2}$ cables long, north and south, by three-quarters of a cable wide, with from 7 to 10 fathoms around.

Buoy.—A black and white chequered nun buoy, which is, however, liable to drift, is moored close to this danger.

Clearing marks.—Hopwood point, seen just open east of the south extreme of Partridge island, bearing S.S.W. $\frac{1}{4}$ W. (S. 25° W.), leads a quarter of a mile eastward of Zuidpool rock.

The north-east extreme of Hope island, in line with Esperance point bearing W. by S. $\frac{1}{2}$ S. (S. 73° W.), leads one cable to the northward.

Mount Windsor, a conspicuous summit above Brabazon, on the Huon river, 1,460 feet in height, in line with Cygnet point N.W. $\frac{1}{4}$ N. (N. 42° W.), leads close to the south-west, and Cygnet point in line with the south extremity of Huon island, clears the Zuidpool rock to the north-east.

Huon island, which lies close off the entrance of Huon river, $1\frac{2}{3}$ miles East of Huon point, is wooded in the centre, the tops of the trees being 254 feet above high water. There are some houses on its north end, and a small pier.

HUON RIVER.—Huon river is $2\frac{3}{4}$ miles wide at its entrance from Huon point to Ninepin point bearing E. by N. from it ; a cluster of rocks lies off Ninepin point, between which and Huon island there is a channel two-thirds of a mile wide. The south-west shore of Huon river from Huon point, extends N.W. by W. $6\frac{3}{4}$ miles to a projecting part of Adelaide, which is a small settlement, between Surge bay on its south-east side and Flight bay to the north-west

of it. The objects along this shore which appear most worthy of notice, seem to be Surveyor bay, two-thirds of a mile within Huon point; Police point, N.W. 2 miles from Surveyor bay; Desolation bay W. by N. $\frac{1}{2}$ N. $1\frac{1}{2}$ miles from Police point; and White bluff, N.W. $\frac{1}{2}$ W. $1\frac{1}{4}$ miles from Desolation bay; close to the westward of the bluff is Flower-pot rock, above water.

The Butts.—The north-east shore of Huon river from Ninepin point trends W.N.W. $1\frac{1}{4}$ miles to a small peninsula point S.W. by W. $\frac{3}{4}$ W. nearly 8 cables from which is a rocky patch, covered at high water, named the Butts, having an iron beacon, a staff and ball on it.

Mount Windsor, a conspicuous summit, in line with Cygnet point, bearing N.W. $\frac{1}{4}$ N. (N. 42° W.) leads 2 cables westward of the Butts.

Garden island.—Between the small peninsula just noticed and a point W. by N. $\frac{3}{4}$ N. $2\frac{1}{2}$ miles from it, and half a mile south-eastward of Cygnet point, is a bight 2 miles wide and $1\frac{1}{3}$ miles deep, having in its centre Garden island, which is three-quarters of a mile long north and south, and one-third of a mile broad. This island gives the name to a creek flowing into the bight half a mile to the north-east of the north point of the island; there is a small cove one mile to the westward of the rivulet.

Cygnet point is a broad projection between a small cove on its south-east side and Abel bay on its north-west side, and forms the south-east point of the entrance of port Cygnet. Abel bay is little more than a quarter of a mile in extent.

PORT CYGNET.—Port Cygnet is $1\frac{1}{2}$ miles wide at its entrance from Cygnet point to Beaupré point, in a N.W. by W. $\frac{1}{2}$ W. direction and extends 4 miles to the northward. The east shore of the port is broken and irregular, consisting of points and bights. Deep bay, the southern and largest of these bights, lies between one and 2 miles northward of Cygnet point, and extends nearly three-quarters of a mile in a north-east direction. On the north side of a projecting point of Welsh, one mile northward of the north point of Deep bay, is an inlet a quarter of a mile wide, extending about half a mile to the eastward. This inlet is separated from a similar one at the head of the port by two projecting points.

Lovett is a small township with post and telegraph stations on the shores of port Cygnet. Population in 1891, 247, and in the district about 1,690. The country round is agricultural and timber producing. Fruit is grown in the neighbourhood, and alluvial gold has been found. Coal seams in the district are systematically worked.

The West shore of port Cygnet from Beaupré point, trends N.N.E. $\frac{3}{4}$ E. $1\frac{1}{2}$ miles to a point projecting from Lymington, between which and another point N. $\frac{3}{4}$ W. three-quarters of a mile from it, is a bay two-thirds of a mile deep, with $3\frac{1}{2}$ fathoms water in its centre. The western bight of this bay has a sandy beach, to the northward of which is a small inlet. From the north point of Lymington bay the west shore of port Cygnet extends N. by W. $\frac{1}{4}$ W. $1\frac{3}{4}$ miles to Lovett, at the north extreme of the port, where it forms a narrow shallow inlet.

Each of the five bights just described receives a small stream flowing from the neighbouring hills, of which hills mount Cygnet, N.E. $\frac{1}{2}$ N. $4\frac{3}{4}$ miles, and mount Morrison, N. $\frac{1}{2}$ E. $5\frac{1}{2}$ miles from Cygnet point, appear most worthy of notice; but mount Grey, N.N.W. $3\frac{1}{2}$ miles from mount Morrison, seems the most elevated, being 2,713 feet high.

The shores of port Cygnet are a little elevated, and generally steep; their declivity is gentle, and the remarkable fertility of the soil offers everywhere the most enchanting and varied appearance. In several places natural quays are formed, easy of access for large vessels, or even for the purpose of careening. The middle of the harbour has from $3\frac{1}{2}$ to 7 fathoms water, upon a mud and sandy bottom; and with the exception of the interior of some of the bays, a depth of less than 3 to 4 fathoms is seldom found at a distance of over about 100 yards from the shore.

The North-east shore of Huon river.—Between Beaupré point and Poverty point, one-third of a mile to the north-west of it, is a cove, whence the shore trends N.W. by W. $\frac{3}{4}$ W. 2 miles to a small stream, with a rock close off it, and thence W. by N. $1\frac{3}{4}$ miles to One Tree point, at Brabazon; midway between the

stream just noticed, and One Tree point is Petchey bay, which is barely a quarter of a mile in extent.

From One Tree point, Huon river takes a N. $\frac{3}{4}$ E. direction for nearly 10 miles, with an average width of half a mile. Its east shore from One Tree point to California bay, 5 miles to the northward of the point, is irregular, and intersected by several small streams; but for the next 5 miles it is nearly straight.

The West shore of Huon river from Flight bay to abreast of California bay, consists of points and bights, the largest two of the latter being Hospital and Castle Forbes bays. Hospital bay, which lies N. by W. $\frac{1}{2}$ W. $1\frac{1}{2}$ miles from One Tree point, is two-thirds of a mile wide, N. by E. and S. by W., at the entrance, whence it trends nearly one mile to the westward, the mouth of the Kermadic river being in its north-west corner. The bight of the bay is mostly occupied by an islet and shoal water. From the north point of Hospital bay the shore trends N.N.W. $\frac{1}{2}$ W. $1\frac{1}{4}$ miles, and N.E. $\frac{1}{2}$ N. the same distance, to Bullock point, the intermediate bight being Castle Forbes bay, between which and Bullock point is a smaller bay.

Franklin.—For about 6 miles above Bullock point the west shore which is nearly straight, forms the water frontage of Franklin. There are 10 to $4\frac{1}{4}$ fathoms water between One Tree and Bullock points, but from nearly abreast of, to 5 miles above the latter point, the river is mostly filled by the Egg islands.

The township of Franklin is 30 miles S.W. of Hobart; in 1891, the population was 506, and of the district 3,704. It has a telegraph station and daily communication with Hobart by mail coaches, also by steamer. The country around is thickly timbered, giving employment to several saw mills; much fruit is also grown.

Victoria.—At 6 miles above Bullock point Huon river turns N.W. $\frac{1}{2}$ N. 2 miles to Victoria, whence, after being joined by a small stream from the north-eastward, it becomes a mere rivulet, flowing from the westward.

Victoria, now officially named Huonville, is situated on the banks of Huon river, at its junction with Mountain river, and is connected

with Hobart by a good road. The principal industry is the timber trade. Coal has been found. It is a telegraph station; and mail coaches run daily to Hobart.

NINEPIN POINT is the south point of the peninsula formed by the Huon river on one side, and the D'Entrecasteaux channel on the other, and is situated $8\frac{1}{2}$ cables E. by N. $\frac{1}{2}$ N. from the north point of Huon island.

Arch islet is a perforated rock, 50 feet high, lying $1\frac{1}{2}$ miles E. by N. $\frac{1}{2}$ N. from Huon island and half a mile from the shore, with depths of 2 to 6 fathoms between.

Three Hut point.—Gordon.—The west shore of D'Entrecasteaux channel from Ninepin point after turning three-quarters of a mile to the north-east, trends nearly East for 2 miles, and then again turns north-eastward, $1\frac{1}{2}$ miles to Three Hut point, behind which is the township of Gordon, with about 100 inhabitants.

There are 3 to 4 fathoms water close along the shore for the greater part of the distance, but at one mile south-west of Three Hut point, the 3-fathoms line is nearly a quarter of a mile from the beach, therefore this point must not be rounded too closely.

Telegraph.—Gordon is a port of clearance, and has a telegraph office.

Anchorage.—During west and north-westerly winds the anchorage off Three Hut point is sheltered. A good berth is in $4\frac{1}{2}$ fathoms, mud, with the pier bearing West, and the southern beacon on Long bay bank, N. by W. (N. 11° W.), with a conspicuous white house on the shore, $1\frac{3}{4}$ miles to the northward, open to the eastward.

Mount Royal, three-quarters of a mile W.S.W. from Three Hut point, is an elevated part of Gordon, rising to the height of 1,190 feet, and forms the south end of the mountain range extending 17 miles in a N. by W. direction.

This range attains a height of about 2,000 feet; 2 miles to the westward of Peppermint bay, and further northward, it rises to between 2,400 and 2,500 feet, with long spurs extending to the coast, the mountains and valleys being everywhere densely wooded.

Communication.—There is a good road from Hobart, which passing through Margate at the head of North-west bay, and striking

across the different valleys, approaches the coast near Oyster and Little coves, whence it follows the coast pretty closely to Gordon. The telegraph follows the line of road.

Steamers run daily from Hobart, calling at all the principal townships and landing places on the way to Huon river, and twice a week on to port Esperance and South port.

Long bay bank.—From Three Hut point the coast trends N. $\frac{3}{4}$ E. $2\frac{3}{4}$ miles to Whale-boat rock, above water, and thence N. by W. $\frac{1}{2}$ W. $1\frac{1}{2}$ miles to Flower-pot rock, 10 feet high, close to the shore, half a mile to the northward of which is Fleurty's point. On the north side of Three Hut point is a shoal bight about a quarter of a mile wide. A bank borders the coast between Three Hut and Fleurty's points, and extends two-thirds of a mile to a quarter of a mile from the shore, projecting farthest from the land one mile northward of Three Hut point. Four large beacons erected in from 9 to 12 feet water indicate the general bend of the bank which sweeps uniformly round from Three Hut point to Fleurty's point, the 3-fathoms line passing about one cable outside the two northern beacons.

From Simpson point a narrow rocky bank with from 4 to 5 fathoms water extends to the southward for a distance of $1\frac{1}{4}$ miles parallel to and with its western edge, about 4 cables from the coast.

The channel between this bank and Long bay bank is two-thirds of a mile wide, with 6 to 7 fathoms in the fairway.

There is a small 5-fathoms patch detached from Long bay bank, 9 cables W. by S. $\frac{1}{4}$ S. from Simpson point, and another the same distance N. $\frac{1}{2}$ W. from that point.

Middleton is the name of the township at Long bay, it is merely a few scattered houses. There is a good pier, off which anchorage may be obtained in $4\frac{1}{2}$ fathoms, with the pier bearing W. by S. (S. 79° W.), and the nearest beacon on Long bay bank S. by W. (S. 11° W.), one-third of a mile from the shore. There is a buoy on the edge of the bank off Middleton.

CURRENT.—The prevailing current in D'Entrecasteaux channel sets in a northerly direction, one to 2 knots according to the wind.

Tidal streams.—During spring tides, after a continuation of light winds, the flood stream sets to the northward and the ebb to

the southward ; these streams are felt most strongly near Three Hut point and Long bay, where the rate is from $\frac{3}{4}$ to one knot an hour.

Birch, Peppermint, Trial, and Flight bays.—From Fleurty's point to the north-east point of Oyster cove, N. $\frac{1}{2}$ E. $4\frac{3}{4}$ miles from it, the western coast of D'Entrecasteaux channel is embayed to the depth of a mile, and consists of alternate bays and points, nearly all the bays having a small stream flowing into them.

Birch bay, the southern and widest of these bays, extends from Fleurty's point N.N.W. $\frac{1}{2}$ W. $1\frac{1}{4}$ miles, and is one-third of a mile deep. Peppermint bay forms a double bight, extending N. by W. one mile from the northern point of Birch bay. The name of the township is Woodbridge, which had 166 inhabitants in 1891. There is a postal and telegraph office.

The pier is built on the point dividing the bay into the two bights above mentioned, off which the anchorage is in 6 fathoms, mud, with the pier bearing W. by S. $\frac{1}{2}$ S. (S. 73° W.) distant $3\frac{1}{2}$ cables, and the north point of the bay N. by W. $\frac{1}{2}$ W. (N. 17° W.).

The northern portion of the bay is shoal, the 3-fathoms line extending $1\frac{1}{2}$ cables to the southward of the north point.

Between the north point of Peppermint bay and another projection N. by E. $\frac{1}{2}$ E. nearly $1\frac{1}{2}$ miles from it there are three bights, named Peach, Trial, and Flight bays.

Little and Oyster coves lie between the north-east point of Flight bay and Simmonds point $1\frac{1}{2}$ miles N.E. by N. from it, and are separated from each other by a broad projection of the coast, which rises to a height of 500 feet.

Little cove is one-third of a mile across at the entrance, and three-quarters of a mile deep, with 5 to 8 fathoms in the outer portion. There is a beacon in 10 feet water, near the middle of the cove.

Oyster cove is two-thirds of a mile in width and the same in depth, with 7 to 8 fathoms in the middle. The north-east point of the cove is named Simmonds point.

Channel rock is a small rocky patch three-quarters of a cable in extent, and having 11 feet least water over it, with 5 to 7 fathoms around. It is situated $2\frac{1}{2}$ cables S.S.E. $\frac{1}{2}$ E. from Simmonds point.

NORTH-WEST BAY.—From Simmonds point the coast extends N. $\frac{3}{4}$ E. $1\frac{3}{4}$ miles to Snug point, the south side of the entrance

of North-west bay, which is nearly $1\frac{1}{2}$ miles wide S. by W. $\frac{1}{2}$ W. and N. by E. $\frac{1}{2}$ E.; there are $3\frac{1}{2}$ fathoms close to Snug point, and 10 to 15 fathoms thence across the entrance to the opposite point. The two entrance points are high and rocky; but the shores of the bay are much lower, and easy of access. Within its entrance North-west bay extends 4 miles north and south, and 2 miles from its entrance to its west shore. The south shore from Snug point, trends W. $\frac{1}{2}$ N. 2 miles to Snug bay, three-quarters of a mile to the northward of which is Snug river, whence the west shore extends N. $\frac{1}{2}$ E. $2\frac{1}{4}$ miles to the east point of Margate, between which and the north corner of the bay one mile to the northward, is a shoal bight, with North-west bay river flowing into it. From the north corner of North-west bay, its north-east shore trends nearly S.E. by S. $3\frac{1}{4}$ miles to the north entrance point. The east shore of the bay is clear of dangers, but on the west shore a reef extends for nearly 2 cables to the eastward of the north point of Snug bay, and there is another reef extending 4 cables from the shore midway between Snug bay and the east point of Margate.

The soundings in North-west bay gradually decrease from 10 to 15 fathoms across the entrance to 6 and 7 fathoms eastward of the Chimneys (the landing place for Margate), thence shoaling rapidly to 3 and 2 fathoms off the mouth of North-west bay river.

Margate is a little place with a population of 158 in 1891. The district is agricultural, and great quantities of fruit are grown here.

Pierson point.—From the north entrance point of North-west bay the coast trends N.E. by E. one mile to Pierson point, which is high and cliffy, and forms the north-west side of the north entrance of D'Entrecasteaux channel.

Midway between the above points there is anchorage in 8 fathoms, mud, in a small indentation of the coast at 2 cables from the shore, sheltered from N.W. winds.

At one-third of a mile north-west of Pierson point, mount Louis rises to the height of 694 feet.

There is a telegraph signal station on mount Louis communicating with mount Nelson at $7\frac{1}{2}$ miles farther to the northward, and $2\frac{1}{2}$ miles southward of Hobart, which transmits all necessary information from the entrance of Derwent river. Another line of

telegraph extends easterly from mount Nelson to port Arthur and Fortescue bay, by which the approach of vessels between Maria island and cape Pillar is made known.

Pilot station.—There is a pilot station on Pierson point, and the pilots are provided with a whale boat, in which they board inward bound vessels in Storm bay, at a distance depending upon the weather. From the station there is telephonic communication with Hobart.

ISTHMUS BAY is separated from D'Entrecasteaux channel by a promontory, the summit of which is 1,130 feet high, gradually sloping down to Simpson point, which is low and rocky.

The bay is 3 miles deep; its west shore from Simpson point trends S. by E. $\frac{3}{4}$ E., for $3\frac{1}{2}$ miles to a small inlet having an islet inwhence the south-east shore, which is bordered by shoal flats, curves nearly 4 miles in a N.N.E. direction, to a small projecting point with reddish coloured cliffs, named the Bluff, with a low rocky point a quarter of a mile north of it.

The south-east shore of this bay is only separated from Adventure bay, on the east side of Bruny island by an isthmus, which for a distance of .2 miles, is 200 to 400 yards broad, nearly dividing the island midway between its north and south ends. On the north side of the northern of the two small projecting points just noticed, is a cove half a mile wide, whence the east shore of Isthmus bay trends N.W. by W., three-quarters of a mile to a cliffy point which separates Isthmus from Great bay.

Between Simpson point and the Bluff there are from $5\frac{1}{2}$ to 6 fathoms near the former, decreasing gradually towards the head of Isthmus bay and the Bluff, off which the 3-fathoms line projects over half a mile.

Great bay is 2 miles wide, N. by W. $\frac{3}{4}$ W. and S. by E. $\frac{3}{4}$ E. at its entrance, and nearly $2\frac{1}{4}$ miles deep; one mile within its entrance the bay is contracted to $1\frac{1}{4}$ miles in width by projections of the north and south shores, within which it again expands to nearly $2\frac{1}{2}$ miles, north and south. There is a small cove on either side of a broad projecting part of the south shore; that to the westward being named Fancy bay, and that to the eastward Ford bay; and there is an inlet in the north-east extreme of the bay with a stream running

into it, and apparently a narrow channel to it through the flats which border the east shore. The north-east portion of Great bay is called Adams bay.

Missionary bay.—From Stockyard point—a double projection which separates Great bay from Missionary bay, to the north-west of it—the entrance of Missionary bay extends W. $\frac{1}{2}$ S. $1\frac{1}{2}$ miles to Soldiers point, whence the bay runs in about one mile to the north-eastward. There is generally a less depth than 3 fathoms in this bay.

Snake islet.—One mile W. by N. $\frac{1}{2}$ N. from Soldiers point is a bay half a mile deep, in the inner part of which is Snake islet, 30 feet high, and covered with grass; one cable S.W. of the islet is a rock that dries 3 feet at low water.

Shoal.—A rocky shoal, $1\frac{1}{4}$ cables in length W.N.W. and E.S.E., and half a cable in breadth, with depths of 6 to 10 feet on it, lies with the south end of Snake islet bearing from the centre of the shoal N.E. $\frac{3}{4}$ E. distant $2\frac{1}{2}$ cables nearly. A red and white vertically striped nun buoy lies in 6 feet water, near the centre of the shoal, with the south end of Snake islet bearing N.N.E. (N. 22° E.) distant $2\frac{1}{4}$ cables.

There are depths of 5 fathoms half a cable south-west of the shoal, and a channel, which is used by small vessels, with about 20 feet water between it and the rock one cable south-westward of Snake islet.

Also several shoal heads with depths of 6 to 10 feet lie about 2 cables south-eastward of Snake islet and on the 5-fathoms line.

From the west point of Snake islet bay, the coast turns N.N.W. half a mile to Kinghorne point, thence N.N.E. $\frac{1}{4}$ E. half a mile to the south-east point of Apollo bay, which is half a mile deep; from the south-east corner of Apollo bay the coast trends N.N.W. three-quarters of a mile to Roberts point. The channel between Apollo and Peppermint bays is $1\frac{1}{4}$ miles wide, with $5\frac{1}{2}$ to 10 fathoms water close to the eastern shore, and 10 to 11 fathoms in the fairway.

Green island, situated $2\frac{1}{2}$ miles N. by W. from Simpson point, and E. $\frac{3}{4}$ S. one and a half miles from Fleurty's point, is a small grass covered islet, 20 feet high, with a few bushes on it. The 5-fathoms line extends $1\frac{3}{4}$ cables from it, N.E. and S.W., narrowing the passage to half a mile between it and the 5-fathoms line on the west side of the channel, which here projects nearly one mile from the shore.

Barnes bay.—From Roberts point the coast trends N.E. $\frac{1}{4}$ E. $1\frac{1}{2}$ miles to the south-west entrance point of Barnes bay, which is half a mile wide, N.E. and S.W., at the entrance, whence it runs in 2 miles to the eastward. Immediately inside the south-west entrance point of this bay is a small cove, one-third of a mile in width by the same in depth, in which small vessels may anchor in 7 fathoms, sand and mud. At half a mile S.E. of the south-west entrance point of the bay is Sykes cove, which is half a mile wide at the entrance, whence it trends S.E. three-quarters of a mile. From the east point of the cove the south-east shore of Barnes bay extends N.E. nearly $1\frac{1}{4}$ miles, to a point, between which and a projection of the northern shore the bay is contracted to a channel 2 cables wide, leading into Simmond bay, the inner part of Barnes bay, which extends one mile north and south, forming two narrow bights, one trending to the north and the other to the southward.

Shelter cove, which lies between the north-east entrance point of Barnes bay and another point N.W. by W. from it, is half a mile wide at the entrance, whence it extends half a mile N.N.E., and near the head of which and on the eastern side is the quarantine station.

There is anchorage in 10 fathoms, mud, at the entrance of this cove, partially sheltered from N.W. winds, with Woodcutters point bearing N.W. (N. 45° W.), and the quarantine station, N.E. $\frac{1}{2}$ E. (N. 51° E.).

Mount Roberts is a double-topped hill, thickly wooded, the south-east and highest peak being 774 feet in height, and it is the summit of the peninsula formed by Barnes bay on the north, and Great bay on the south.

NORTH ENTRANCE of D'ENTRECASTEAUX CHANNEL.—From Woodcutters point, which lies N.W. half a mile from the north-west point of Shelter cove, the coast, after turning half a mile to the eastward, trends nearly North $1\frac{1}{2}$ miles to Bligh point, whence it curves $1\frac{3}{4}$ miles in a N.N.E. $\frac{1}{2}$ E. direction to Kelly point, which forms the south-east side of the north entrance of D'Entrecasteaux channel. This entrance, which is two-thirds of a mile wide, has 3 fathoms water close to Pierson point, and 7 to 10 fathoms in the fairway. In the bights on both sides of Bligh point there is shoal water, and the 3-fathoms line extends about $1\frac{1}{2}$ cables to the

north-westward of that point. There is a considerable quantity of kelp off Kelly point, and the shoal water extends for $1\frac{1}{2}$ cables to the northward, and one cable to the westward of that point.

Note.—The navigation of D'Entrecasteaux channel is not difficult either by day or night, if provided with the Admiralty chart, the principal dangers being the Actæon shoals, Zuidpool rock, the bank which borders the west shore between Three Hut and Fleurty's points, and the Channel rock. In passing the valleys and mountains, strong gusts and contrary winds are met with, and a moment afterwards it falls quite calm, an inconvenience common to lands of this description. At the various anchorages much trouble is found in weighing the anchor, in consequence of the tenacity of the muddy bottom which everywhere exists.

This channel, which affords safe shelter for shipping, is not recommended as a passage for sailing vessels bound to Hobart, except in the summer season, when dependence may be placed on the sea breeze.

Ships from the westward have frequently taken this passage, as affording immediate anchorage, secure from all winds; but they were often several days before they reached Hobart. The detention is caused by the direction given to the wind, even when it blows strong at sea from the S.W., by the high hills and deep openings that form the west side of the channel, such as South port, port Esperance, and Huon river, each of which gives a respective or distinct course to the wind. The passage to Hobart by Storm bay is preferable for sailing vessels.

DIRECTIONS.—In proceeding through D'Entrecasteaux channel for Hobart, from the westward, and not having a pilot, on no account pass between Actæon shoals and the west shore; but having arrived abreast of Whale head, bring it to bear S.W. by W. (S. 56° W.), and not to the southward of that bearing until Burnett point bears N. by W. $\frac{1}{2}$ W. (N. 17° W.), at which time S.E. Break (Actæon shoals) will bear W. by N. $\frac{1}{4}$ N. (N. 76° W.) distant 2 miles; from that position steer N. $\frac{1}{2}$ W. (N. 6° W.) 11 miles, when the north end of Partridge isle should bear N.E. by E. $\frac{3}{4}$ E. (N. 65° E.) distant $1\frac{1}{4}$ miles nearly: this course leads clear of all dangers.

In baffling or contrary winds, keep on the east shore, which may be approached boldly. It is necessary to approach the west shore with great caution, until abreast Blanche rock.

When working in the channel be careful to keep the lead going and not approach Actæon shoals to less than a depth of 20 fathoms. Having passed Blanche rock, the shore on either side may be approached to half a mile.

From $1\frac{1}{4}$ miles S.W. by W. $\frac{3}{4}$ W. of the north end of Partridge island steer N.E. (N. 45° E.) till Partridge island is just seen clear westward of Hopwood point bearing S.S.W. $\frac{1}{4}$ W. (S. 25° W.), which mark leads a quarter of a mile to the eastward of Zuidpool rock. Then steer N.E. by N. (N. 34° E.) to abreast of Three Hut point.

After passing Three Hut point, borrow towards Simpson point, to avoid Long bay bank, which borders the shore between Three Hut point and Fleurty's point, and take care not to close the east shore within half a mile, to keep clear of the 4-fathoms bank on that side.

The west summit of mount Roberts, 660 feet in height, just open east of Green island N. $\frac{1}{2}$ E. (N. 6° E.), leads in mid-channel between these dangers.

Pass Green island at a distance of about one-third of a mile, and proceed to the northward through the fairway, slightly borrowing towards Woodcutters point to avoid Channel rock.

BRUNY ISLAND, the west coast of which has already been described as forming the east shore of d'Entrecasteaux channel is 27 miles long from Tasman head to Kelly point, in a N. $\frac{1}{2}$ W. direction, and 9 miles across at its southern and broadest part. A ridge of mountains 1,700 feet high near its south end, extends to the northward along the east side of the island from Tasman head to Simpson point; it rises to a height of 2,010 feet near its centre, and thence gradually falls. These mountains are for the most part densely wooded.

Between Little Taylor bay and Cloudy lagoon the land is quite low, and to the westward of this neck a coast ridge runs north and south; the summit, 550 feet high, is situated 3 miles S. by E. $\frac{1}{2}$ E. from Ventenat point, and is easily distinguished by its position, height, and small saddle-shaped top.

The hills to the south-east and south-west of Cloudy bay are grass covered downs, falling steeply in cliffs to the sea, and sloping gradually inshore.

The south portion of North Bruny island, between Adventure and Trumpeter bays, is composed of flat-topped wooded hills, 500 to 660 feet high on the east side.

Between Trumpeter and Adams bays the land falls considerably, rising again 600 to 700 feet in undulating wooded heights to the northward to cape Delasorte.

The East coast of Bruny island from Tasman head trends N.E. $1\frac{1}{2}$ miles to a projecting point which forms a bold headland; the coast then runs N. $\frac{1}{4}$ W. $3\frac{3}{4}$ miles, and thence N.E. by E. half a mile to a double point, half a mile broad; close southward of which is Arched islet, flat-topped, and 80 feet high. A narrow reef borders the coast between one and $1\frac{3}{4}$ miles south-west of Arched islet, and kelp extends from it there a quarter of a mile. From the double point to cape Connella, N. by E. $\frac{3}{4}$ E. $2\frac{3}{4}$ miles, the coast is embayed to the extent of three-quarters of a mile. There is a sunken rock in the south-western part of this bight, and two small islets lie near the shore, at three-quarters of a mile, and $1\frac{1}{4}$ miles to the south-westward of cape Connella.

FLUTED CAPE.—From cape Connella the coast, precipitous and bold, trends North $1\frac{1}{4}$ miles to Fluted cape, and thence north-westward $1\frac{1}{4}$ miles to the south point of Adventure bay, close to the north-eastward of which is Penguin island. The cliffs of Fluted cape are composed of basaltic columns, and are from 700 to 800 feet in height. The summit of Fluted cape, which is well marked, is 1,000 feet high, and thickly wooded, as is all the neighbouring country.

Penguin island is 200 feet high and wooded, with a cliffy coast. The island is steep to on its north and west sides.

Soundings.—Between Tasman head and cape Connella, the depth is 20 fathoms about three-quarters of a mile, and upwards of 40 fathoms, 4 to 5 miles from the land.

ADVENTURE BAY.*—From Penguin island the coast, with some slight windings, first trends S.W. by S. $1\frac{1}{2}$ miles to a long

* This bay was named by Furneaux, who anchored in it in the *Adventure* in 1773.
See chart, No. 960.

sandy beach forming the head of the bay, and thence curves for 2 miles in a north-west direction to Cooktown, having a rocky projection about midway, off which there is kelp and foul ground stretching a distance of 2 cables. The southern bight of Adventure bay has 13 fathoms, sand and shells, in the centre, shoaling gradually to the southward, where the 10-fathoms line is two-thirds of a mile from the beach. Several fresh water streams flow into this bight.

From Cooktown, a steep and cliffy coast, bordered by kelp, runs 2 miles N. by W., whence a sandy beach extends N.N.E. $\frac{3}{4}$ E. $5\frac{1}{2}$ miles, forming the south-east coast of the isthmus between Adventure and Isthmus bays. The southern part of this isthmus is flat, with scattered trees on it; the northern part consists of sand-hills, the southern of which is the highest, 140 feet, and is covered with scrub; there are two lagoons at the back of the north end of the long beach. West of cape Frederick Henry is an exposed bight, with 10 fathoms three-quarters of a mile from its head. On the east side of this bight there is foul ground with some kelp growing on it. The soundings in Adventure bay are regular, over a sandy bottom, with 10 fathoms about half a mile offshore.

Cooktown, on the west side of Adventure bay, consists of a few houses near the beach; landing there is very bad, being usually through surf, and the bottom of the bay off the township is rocky and uneven with a growth of kelp, rendering the position a bad one for anchoring. There is a disused coal mine, with a tramway leading to it from the coast, about half a mile northward of Cooktown.

Anchorage.—The best berth is in the south part of the bay, off a small sandy bight, three-quarters of a mile to the south-west of Penguin island, in 10 fathoms, sand and mud. This anchorage has good holding ground, and is protected from all but northerly and north-easterly winds. Although north-easterly gales are not frequent, they occasionally blow with great strength and send a very heavy sea into Adventure bay.

Wood and water are plentiful in Adventure bay, but are difficult to obtain, owing to the surf on the beach, except in the sandy bight off which anchorage is recommended above.

CAPE FREDERICK HENRY is a precipitous grassy bluff, 350 feet high, with a bare rock of conical shape and 250 feet high, close to it. From the cape a high cliffy coast which is steep-to, extends N. by W. nearly 3 miles to the south point of Variety bay. The coast ridge, 660 to 450 feet high, runs immediately above the top of these cliffs, in some places falling down sheer from the summit. A thickly wooded ridge, of nearly equal height with the coast ridge, extends parallel to that ridge at a distance of three-quarters of a mile to the westward, the stream in the valley between discharging into Adventure bay; the above ridges unite in a lower saddle at Variety bay, whence the coast hills closely follow the coast cliffs as far as Trumpeter bay, where the land near the coast and across to Great bay is low.

Variety bay is an indentation 3 miles northward of Cape Frederick Henry; its shores are thickly bordered with kelp to a distance of 2 cables off, and there are some rocks near the shore in its northern part, but in the southern part of the bay there is room to obtain a certain amount of protection from south-easterly winds, at a distance of one cable outside the kelp in a depth of 10 fathoms, sand.

Trumpeter bay.—From Variety bay the coast trends N.N.W. one mile to the south-east point of Trumpeter bay. This bay does not afford much protection from south-easterly winds. There are a few houses near the shore, and the best landing place is on the sandy beach nearly in the centre of the bay, off which also is the best anchoring place, in 8 to 10 fathoms.

Yellow bluff.—One Tree point.—From the north point of Trumpeter bay an irregular, rocky, cliffy coast trends North one mile to Yellow bluff, distinguishable by its cliffs of that colour; thence the coast runs N.N.W. $\frac{1}{2}$ W., $1\frac{1}{2}$ miles to One Tree point, which projects one-third of a mile from the general line of coast, and is low and rocky. North of Trumpeter bay the land rises to a well-defined summit, elevated 730 feet, and situated half a mile to the westward of Yellow bluff; thence there is a gradual slope to the northward, forming a thick wooded coast range which rises again to a height of 790 feet, three-quarters of a mile south-west of Bull bay.

Kelly and Bull bays.—Between One Tree point, and cape Delasorte, N.W. $\frac{3}{4}$ N. $2\frac{1}{2}$ miles from it, are Kelly and Bull bays, separated from each other by a broad rocky point; there are 7 to 2 fathoms within a quarter of a mile of the shores of these bays, but they are mostly bordered with rocks. From cape Delasorte the coast trends W.N.W. nearly one mile to Kelly point, and is bordered with rocks, outside which, at about one-third of a mile north-east of Kelly point, there are 7 fathoms water.

DERWENT RIVER.—This river, which is 130 miles long, has conspicuous marks at its entrance:—mount Louis, a conical hill 694 feet high with the signal station, on the west side; and on the east side, Iron Pot islet with the lighthouse, bearing E. by N. $\frac{1}{2}$ N. distant 3 miles from Kelly point, and Betsy isle 3 miles to the eastward of Iron Pot islet.

The entrance of Derwent river between cape Delasorte and Derwent lighthouse, is $2\frac{1}{4}$ miles wide, with depths of 10 to 8 fathoms, sand and broken shells. Thence the river retains an average width of about $2\frac{1}{2}$ miles for the distance of 12 miles to Hobart, the soundings in mid-channel increasing to 20 fathoms at 6 miles above the entrance, and from this depth decreasing to 12 fathoms close to the town. There are generally 10 to 12 fathoms within half a mile of, and at least 3 fathoms a quarter of a mile from either shore.

LIGHT.—Derwent lighthouse, on Iron Pot islet half a mile southward of cape Direction, is a square tower 40 feet high, painted white, and exhibits, at 65 feet above high water, a *fixed* white light, which should be seen from a distance of 10 miles in clear weather.

The channel between the lighthouse and cape Direction is rocky, only leaving a narrow passage for small vessels.

Blackman bay.—The west shore of Derwent river from Pierson point trends N.N.W. 3 miles to the south point of Blackman bay, close off which are some dry and covered rocks. This bay extends half a mile north and south, and is a quarter of a mile deep, with 6 fathoms close off its entrance, and 6 feet near the shore.

Kingston.—**Brown's river.**—From Blackman bay the shore trends North two-thirds of a mile to the south point of Kingston

bay, which thence extends North one mile, and is half a mile-deep, with 12 to 9 fathoms water in the entrance, and 9 to 6 feet near the shore. Browns river flows into this bay, at half a mile within its north point.

Kingston is on Browns river in a grazing and fruit district, and in 1891 had a population of 249 inhabitants. It is 10 miles southward of Hobart, connected with it by telegraph, and a mail coach runs daily. There is a jetty for landing goods and passengers.

Alum cliffs.—Crayfish point.—From the north point of Kingston bay the rocky shore trends irregularly N. by E. $\frac{1}{2}$ E. half a mile to the south-west point of Alum cliffs bay, which extends thence N.N.E. about one mile to Crayfish point. It forms a double-bight, a quarter of a mile to one-third of a mile deep, with 7 to 4 fathoms across its entrance, and 3 to $3\frac{1}{4}$ fathoms one cable from the shore, which is partly bordered by rocks. Alum cliffs are precipitous and conspicuous, when seen from the distance of a mile.

From Crayfish point the rocky shore extends North, $1\frac{3}{4}$ miles, when a succession of rocky points and small beaches trends N. by W. $\frac{1}{2}$ W. about half a mile to One Tree point, a rocky projection between which and Sandy bay point, N.W. by N. one-third of a mile from it, is a smooth beach.

Near Sharp hill there is a conspicuous white tower about 60 feet high and 250 feet above the sea.

The shore from Pierson point to Sandy bay point, although rocky, is bold, there being generally 5 fathoms water a quarter of a mile from it, except off One Tree point, where there are 5 fathoms nearly one-third of a mile from the point.

MOUNT NELSON.—SIGNAL STATION.—From Sharp hill three-quarters of a mile northward of Brown's river, a range of forest hills extends in a N. $\frac{1}{2}$ E. direction $2\frac{1}{2}$ miles to mount Nelson, which is 1,116 feet high, having a telegraph station on it, communicating with mount Louis and Hobart, the commercial code, as well as local signals being used. Gentle slopes and spurs descend from this range to the coast from Alum cliffs to Sandy bay point.

Sandy bay point is the north-east extreme of low flat land projecting about a quarter of a mile from the more elevated, well-wooded, and partly cultivated land which descends from mount Nelson.

Sandy bay extends from Sandy bay point N.W. $\frac{1}{4}$ W. $1\frac{1}{3}$ miles to Battery point; a smooth beach trends 4 cables westward from Sandy bay point to a rocky head, whence the shore, consisting of rocky points and sandy beaches, extends nearly W.N.W. half a mile to Dunkley point, which projects $1\frac{1}{2}$ cables from the line of coast, its outer part being closely fringed with dry and covered rocks, with 6 to 15 feet water close to them. From the inner part of Dunkley point the shore trends N.W. by W. 3 cables to a small stream, and thence turns N. by E. one-third of a mile to Wellington rivulet, one cable to the southward of which are some bath-houses. From Wellington rivulet the south-east frontage of Hobart, with its patent slips and jetties, trends N.E. $\frac{1}{2}$ N. 3 cables to a point, and thence nearly N.N.W. a quarter of a mile to Battery point, the south point of the entrance of Sullivan's cove, the principal anchorage of Hobart.

Ridges of well-wooded and partly cultivated land descend from mount Nelson to the coast between One Tree point and Hobart, with several small streams flowing into the bay. A road from the southward to Hobart passes by the villages and houses which are situated near the shore of Sandy bay. The suburb of Queenborough, westward of Sandy bay point, has a population of 1,900. An electric tram connects with Hobart.

From 100 yards to 4 cables north-west of Sandy bay point there are 5 to 10 fathoms water, with uniform soundings in 12 fathoms thence to one cable off Battery point. The shore of Sandy bay may be approached to $1\frac{1}{2}$ cables in 5 fathoms, and to one cable in 3 fathoms, except at one-third of a mile south-east of Dunkley point and at 4 cables nearly northward of Dunkley point, where the 3-fathoms edge of the bank which borders the bay projects $1\frac{1}{2}$ cables and the 5-fathoms edge nearly a quarter of a mile from the shore. The 5-fathoms line extends from Dunkley point 150 yards to the eastward, and 100 yards to the northward. A detached bank, about one cable across, with $3\frac{1}{2}$ to 5 fathoms water on it, lies N.W. by W. 4 cables from Sandy bay point; with this exception the depth of water gradually decreases towards the shore.

SOUTH ARM is a peninsula from one mile to a quarter of a

mile broad, extending from cape Direction N. by W. $\frac{1}{2}$ W. $5\frac{1}{2}$ miles to Gellibrand point, which forms the south side of the entrance of Ralph bay. This peninsula is mostly covered with open forest; the land for about $1\frac{1}{2}$ miles northward of cape Deliverance, and between $1\frac{1}{2}$ and $2\frac{1}{2}$ miles southward of Gellibrand point, being elevated; there are two hills near cape Deliverance, and one 400 feet high, S. by E. $\frac{1}{2}$ E. 2 miles from Gellibrand point; the remaining portion of the arm is undulating with low narrow flats between the higher land.

The **East shore** of Derwent river is partly formed by South arm, which extends from cape Direction N.W. one mile to the south point of Half Moon bay, and forms three bights, the north-western and largest of which has 3 fathoms water; but the south point of Half Moon bay and cape Deliverance have only 12 feet water 2 cables from them.

Half Moon bay extends $1\frac{3}{4}$ miles, N. by W. $\frac{1}{2}$ W. and S. by E. $\frac{1}{2}$ E., and is three-quarters of a mile deep, with depths of 5 and 6 fathoms in the middle, and one to 4 fathoms close along shore.

From the north point of Half Moon bay the shore trends N. $\frac{1}{2}$ W. one mile to the south point of Opossum bay, close to the southward of which is a small cove with 2 fathoms water in it. At half a mile north-west of the north point of Half Moon bay is a 4-fathoms bank a quarter of a mile off shore, with 5 fathoms inside it.

Opossum bay is three-quarters of a mile wide, from S.S.E. to N.N.W., and half a mile deep, with depths from 6 to 2 fathoms. This bay is separated from a bight to the northward of it by a broad hilly point, partly fringed with dry and covered rocks, whence the rocky shore of the bight extends N.N.E. $\frac{1}{2}$ E. three-quarters of a mile to Gellibrand point.

TRYWORK POINT is situated $1\frac{1}{2}$ miles North of Gellibrand point. Trywork point and the rocky shore, extending half a mile to the eastward from it, form the north side of the entrance of Ralph bay, and the south end of the North arm. This arm, which separates the northern part of Ralph bay from Derwent river, is 2 miles long, north and south, three-quarters of a mile to half a mile broad, and consists of a series of undulating grassy hills, with patches of cultivation.

From Trywork point, the east shore of Derwent river curves North, $1\frac{1}{4}$ miles, and thence N. by W. $\frac{1}{2}$ W. $1\frac{2}{3}$ miles to a projection of the shore, between which and Kangaroo bluff, $1\frac{2}{3}$ miles to the westward of it, are two small bays, of equal size, separated from each other by a broad rocky point, at the foot of a hill close to the northward of it. The shore from Trywork point to Kangaroo bluff, although rocky, has depths from 2 to 6 fathoms about a cable from it, and may be approached to one-third of a mile in 10 fathoms.

KANGAROO BLUFF is the cliffy south point of an elevated peninsula, extending N.N.W. half a mile to Bellerive pier, one cable to the eastward of which is Dawson's wharf: from the bluff the shore sweeps round in a N.W. and North direction to the pier, and although rocky, it may be approached to 100 yards in 3 fathoms water.

Kangaroo bay lies between Kangaroo bluff and Montagu point, W.N.W. three-quarters of a mile from it; from $1\frac{1}{2}$ cables W.N.W. of the bluff to the same distance E.S.E. from the point, there are 7 to 10 fathoms water in the entrance, whence the bay trends three-quarters of a mile in a N.E. direction, gradually decreasing to one cable in width between Bellerive pier and a low point projecting a cable from the opposite shore. From Montagu point the north-west shore of Kangaroo bay, for about half a mile, may be approached to 50 yards in 3 fathoms, thence the edge of the northern bank trends eastward to 100 yards north of Bellerive pier. Above the pier the bay expands to 2 cables in width, but it is filled by a flat, on which the greatest depth of water is only 15 feet. From 7 fathoms in the entrance the depth of water decreases to 4 fathoms about 100 yards N.W. of the pier.

Bellerive is a rapidly extending suburb of Hobart, on the opposite side of the Derwent, with a population of 625 in 1891. Steam ferry boats ply across to Hobart. It is the terminus of the Bellerive and Sorell railway.

Montagu point, which has a depth of 8 fathoms within 150 yards of it, is the south-west extreme of a hilly wooded promontory projecting three-quarters of a mile from the north-eastward, its most elevated part being a hill 316 feet high, situated N.N.E. $\frac{1}{2}$ E. half a mile from the point.

Montagu bay.—From Montagu point the shore trends N. by W. $\frac{1}{2}$ W. one-third of a mile to the south point of Montagu bay, which extends thence N. by W. $\frac{1}{2}$ W. one-third of a mile. Between the south point of the bay and a rocky spit, 2 cables to the north-eastward of it, is a shoal bight with only 12 feet water a cable from the shore; but the north shore may be approached to about 50 yards in 3 fathoms water. The bay runs in nearly one-third of a mile in a N.E. direction, terminating in a small shallow cove, on the north-west shore of which are some smelting works. From 7 fathoms in the entrance the depths decrease to $3\frac{1}{2}$ fathoms at 100 yards south of the smelting works.

Soundings.—About a quarter of a mile to the northward of Montagu point there are 11 and 12 fathoms 150 yards from the shore; but there are only $4\frac{1}{2}$ fathoms at that distance off the south point of Montagu bay. Between a quarter of a mile north-west of Montagu point and $1\frac{1}{2}$ cables south-west of the north point of Montagu bay there is a pool about 4 cables long and one wide, having depths of 22 to 26 fathoms.

ANCHORAGE will be found in any part of Derwent river, but the safest on all occasions is on the west side, the east being unsafe, especially for small vessels, several having been lost by anchoring near it.

Pilots.—The only pilot station for Derwent river is at Pierson point. See page 692.

Pilotage.—Pilotage payable by any vessel liable to pay pilotage, whether upon entering or leaving the port of Hobart, shall be paid by every such vessel, which shall enter or depart from the waters comprised within an imaginary line drawn from the Derwent lighthouse to Pierson's point.

All navigable waters within the said line and extending northwards therefrom shall for pilotage purposes be deemed to be the port of Hobart.

Lights.—A *fixed* red light is exhibited from the outer end of the New wharf, on the south side of Sullivan's cove, it is 18 feet above high water and should be seen from a distance of 3 miles in clear weather.

Two *fixed* red and green lights, placed horizontally, are shown from the end of Brooke street pier.

A *fixed* white light is shown from the end of Elizabeth street pier.

A *fixed* green light is shown from the end of Argyle street pier.

Two *fixed* lights, green and red, placed vertically, are shown from the end of Dunn street pier.

DIRECTIONS.—There are two approaches to Derwent river, through D'Entrecasteaux channel, and through Storm bay, between the north part of Bruny island and Tasman peninsula, at about 12 miles to the eastward of it; but the latter approach is much to be preferred by sailing vessels, experience having taught that though apparently time and smooth water would be gained by going through D'Entrecasteaux channel, still, in consequence of violent squalls, which suddenly rush down the hills, preventing vessels from carrying sail, much time is actually lost, so that in all cases the better passage to Derwent river is through Storm bay.

From the westward bound into Derwent river through Storm bay give Tasman head, the south point of Bruny island, a good berth, to avoid Friar rocks. To the northward of Fluted cape the most remarkable object is mount Wellington, a table mountain, 4,166 feet high, 4 miles W. by S. $\frac{1}{2}$ S. from Hobart, and when Betsy isle, which is high and wooded, is seen, steer to pass on the west side of Derwent lighthouse on Iron Pot islet. In approaching Derwent river the generally strong prevailing westerly winds make it desirable to keep within a mile of Bruny island.

Enter Derwent river between cape Delasorte and Derwent lighthouse, and keep the west shore aboard to half a mile off One Tree point. From half a mile off One Tree point steer to the north-west for Sullivan's cove, the usual anchorage off Hobart, where vessels may come to as most convenient; but one anchor should be laid out well to the south-east for the convenience of getting under way. There is no danger all the way up, so that the vessels may work in or out without a pilot, tacking at about a quarter of a mile off shore, and may anchor anywhere, on muddy bottom. *See* pages 705, 709.

HOBART, the capital of Tasmania, has several public buildings and Ordnance and Commissariat stores; it is situated on a gently sloping plain at the foot of the hills that descend from mount

Wellington, which bears W. by N., distant $5\frac{1}{4}$ miles from mount Nelson, and is 4,166 feet high, with Collins Bonnet, another mountain, 4,131 feet high, nearly 4 miles to the westward of mount Wellington. Between the mouth of Wellington rivulet and Battery point there are patent slips, wharves and jetties, with a hulk and several buoys moored off them, on the bank before noticed, the 3-fathoms edge of which extends 100 to 300 yards from the shore. The population in 1894 was 35,910.

About 100 yards to the southward of Battery point the shore recedes into two small bights, in the southern of which is a patent slip, with a depth of 6 fathoms 30 yards from it. For about 2 cables to the southward of Battery point, the bank, on which several buoys are moored, projects in places 120 yards from the shore to the depth of 5 fathoms.

Trade.—The principal imports are,—manufactured goods, tools, tea, sugar, stores, etc.; and the exports,—wool, grain, hops, sperm oil, timber, vegetables, and fruits. In 1894 vessels of a tonnage of 576,303 entered and cleared at Hobart.

Fort Mulgrave.—Signal station.—Fort Mulgrave, on which a signal station, is situated about one cable to the south-west of Battery point, at an elevation of 85 feet above the sea.

Time signal.—A time signal has been established at the flagstaff on the site of Fort Mulgrave 85 feet above high water. The signal is a ball, which is hoisted to half mast about 10 minutes before signal, as preparatory, close up at 5 minutes before signal, and is dropped at 1 h. 0 m. 0 s. p.m. standard time of Tasmania, equivalent to 15 h. 0 m. 0 s. Greenwich mean time. A gun is fired from the Queen's battery simultaneously with the drop of the ball. The ball at the flag-staff is dropped by hand and is not to be implicitly relied on; when it fails, a red pendant is hoisted at the masthead for one hour. *See page 30.*

Geographical position.—The flag-staff at Fort Mulgrave is in lat. $42^{\circ} 53' 22.3''$ S., long. $147^{\circ} 20' 28''$ E.

SULLIVAN'S COVE, the principal anchorage of Hobart, extends from Battery point N. by W. $\frac{3}{4}$ W. nearly 3 cables to its north point. From a depth of 4 fathoms 100 yards north-east of Battery point, the depths increase to 10 and 9 fathoms in the middle of the

cove and thence decrease to 6 and 5 fathoms $1\frac{1}{4}$ cables to the eastward of the north point of the cove. The cove is a little more than 2 cables deep. From 9 and 10 fathoms in the middle of the entrance the depths decrease to 5 and 6 fathoms within 50 yards of the shore and wharves, over a bottom of mud.

The new wharf, about 450 yards long, forms the south side of Sullivan's cove; a portion of this wharf is available for large vessels at all times of the tide.

From the south-west corner of Sullivan's cove to its north point there is a continuation of wharves from which project six piers. (For lights, *see* pages 705-6.)

Brooke street pier, the south-western one, is 75 yards long. This pier is used by the local steam-vessels running to D'Entrecasteaux channel and New Norfolk.

Franklin pier, 50 yards to the north-eastward of Brooke street pier, is 70 yards long.

Elizabeth street pier, 100 yards north-eastward of Brooke street pier, is 73 yards long, and projects into a depth of 7 fathoms. This pier is used by the Tasmanian Steam Navigation Company.

Argyle street pier, 60 yards further north-eastward, is 91 yards long in a S.E. by E. $\frac{1}{2}$ E. direction. This pier is used by the New Zealand Shipping Company's steam vessels.

Dunn street pier, 120 yards north-eastward of Argyle street pier, is 160 yards long in a S.E. $\frac{1}{2}$ E. direction, with 7 fathoms at its outer end.

Kangaroo steam pier, 50 yards further north-eastward, is 35 yards long, extends into 26 feet water, and is used by the steam-ferry boat to Kangaroo point.

Bank.—A bank with only 15 to 18 feet water on its outer edge, extends about half a cable southward and one cable eastward of the north point of Sullivan's cove.

Close to the northward of the north point of the cove is the mouth of Hobart rivulet, between which and Macquarie point, N. by E., a

little more than 2 cables from it, there are only 12 feet water one cable from the shore, with irregular depths of $2\frac{1}{2}$ to 5 fathoms extending $1\frac{3}{4}$ cables to the eastward of the mouth of the rivulet.

A part of this shoal to the southward of Macquarie point is being reclaimed.

Prohibited anchorage.—Vessels are prohibited from anchoring, for a longer period than 12 hours, above Sandy Bay point in the area between lines drawn from Battery point to Sandy Bay point, and S.E. (S. 45° E.) from Macquarie point.

The port authorities are very particular regarding the observance of this rule, on account of the hindrance of vessels in the prohibited area to long steamers going alongside wharves.

Buoys.—The bank off Hobart rivulet is marked by two black can buoys, the south-east buoy lies in 3 fathoms, S.E. $\frac{1}{4}$ E. three-quarters of a cable from the south-east point of the retaining wall; the north buoy, in 2 fathoms, the same distance N.N.E. $\frac{1}{2}$ E. from the point of the wall. There is less than 5 fathoms water for one cable eastward of the line joining these buoys, and for about half a cable to the south-east of the south-east buoy.

Macquarie point, over which is Queen's battery, may be approached to 100 yards in 5 and 6 fathoms water; the ebb tidal stream sets strongly around and towards the point.

The Domain.—From Macquarie point the river frontage of the Domain curves north-west and northward nine-tenths of a mile to Pavilion point, and has a landing-place one cable, and a patent slip 3 cables from the former point. There are 3 fathoms water close to the landing-place; but a flat, with depths of $3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms, extends above one cable from it.

For about one-third of a mile southward of Pavilion point, a bank, having 4 to 5 fathoms water on it, extends one-third of a mile from the shore. Between this bank and that which projects from the landing-place, to the northward of Macquarie point, there are regular depths of 6 to 9 fathoms. On the northern part of the Domain are Government house, and the Botanical gardens.

Docks and patent slips.—There are three wet docks, or basins, the largest two being Constitution dock, which has an entrance at about 30 yards to the north-east of Argyle street pier; and the Victoria dock, a more shallow, but much larger basin to the north-eastward of it, having an entrance at about 50 yards to the northward of Kangaroo steam pier. Wet dock in Sullivan's cove belongs to the Colonial Government, and is adapted for vessels of 12 feet draught. Hobart has four patent slips. The largest slip, No. 1, under Fort Mulgrave, is capable of taking a ship of 1,000 tons, except those with bilge keels; the length of the cradle is 217 feet, it has a depth of 26 feet at the outer end and 14 feet at the inner end.

The patent slip near Macquarie point, which is adapted for a vessel of 500 tons, projects 100 yards northward into 3 fathoms water, towards two buoys moored in 4 fathoms, on a bank with $3\frac{1}{2}$ to 4 fathoms on it, extending $1\frac{1}{2}$ cables from the shore; but to the eastward of the patent slip, and 2 cables to the northward of it, there are 5 fathoms water within 100 yards of the shore. The remaining two slips are also capable of hauling up vessels of about 500 tons.

Repairs to small engines and boilers can be made by the Derwent Engineering and Shipwright Works; where cylinders of 36 inches diameter can be cast and bored, boilers can be repaired or made to 30 tons in weight, shafts of 8 inches in diameter and 20 feet in length can be forged and turned, and a piston of 56 inches diameter has been made. There are temporary sheers at the works capable of lifting 30 tons.

Supplies.—Stores of all kinds, provisions, fruit, water, and fire-wood, are easily procured.* The country in the immediate neighbourhood is rich in natural productions, such as coal, iron, black-lead, alum, mica, precious stones, and gums.

Water has to be procured in ship's boats, as there is no local water tank. For coal, *see* page 12.

In the vicinity of D'Entrecasteaux channel and Huon river the trees are lofty, straight, and hard, and are used for the keels of the largest ships built in the colony; they are the largest species of

* It is necessary to send to Melbourne or Sydney for many of the stores necessary for a ship's refit.—Remark book, *Rambler*, 1890.

See chart, No. 105.

the *Eucalypti* in Australasia; other woods are used for ornamental purposes, particularly the Huon pine, which somewhat resembles satin wood.

Risdon ferry.—From Pavilion point Derwent river trends north-westward 3 miles to Risdon ferry, and varies in width from one to one-third of a mile, with depths of 12 to 6 fathoms. The shores are bold, with several inlets, those most worthy of notice on the south-western side being Newton and Prince of Wales bays; the former, which has $2\frac{1}{2}$ fathoms water in its entrance, is distant $1\frac{1}{3}$ miles, and the latter $2\frac{2}{3}$ miles from Pavilion point. On the north-east side, three-quarters of a mile N.E. of Pavilion point, Lindisfern bay trends half a mile to the northward; and N.W. $2\frac{1}{2}$ miles from this bay is Risdon cove, half a mile southward of which is the ferry.

From Risdon cove Derwent river extends north-westward $2\frac{1}{2}$ miles to a narrow point projecting one mile from the west shore, the intermediate portion of the river being nearly 2 miles wide, and forming an extensive bay on the south-west side. There are $5\frac{1}{2}$ to $3\frac{1}{2}$ fathoms water in mid-channel.

Bridgewater.—Between the east shore, and the point which projects from the opposite side, the river is contracted to a quarter of a mile in width, and turning thence about one mile to the westward, it trends N.W. by N. $1\frac{3}{4}$ miles to Jordan river, which flows into Derwent river from the northward. Between the mouth of Jordan river, and Bridgewater $1\frac{3}{4}$ miles to the north-west of it, and for about 2 miles to the westward of the bridge, Derwent river is nearly half a mile wide, above which it is much smaller, with branches flowing into it, mostly from the northward and north-westward.

Bridgewater is 12 miles from Hobart on the north side of the Derwent, which is here crossed by a causeway and bridge. The main line railway also crosses here, a drawbridge being maintained for the convenience of navigation. There is a telegraph station.

Mount Dromedary.—The land on either side of the Derwent river consists of hills and fertile valleys, with numerous small streams flowing into the river. The principal summits of these ridges above Hobart are mounts Direction, Faulkner, and Dromedary, which bear respectively N. by E. $\frac{3}{4}$ E. 7 miles, N.W. by N. 5 miles, and N.W. $\frac{3}{4}$ N. 13 to 16 miles from mount Wellington. Mount

Direction is 1,468 feet, and mount Dromedary 3,245 feet high. Mount Direction has a shoulder and sharp fall on the west side.

TIDES.—It is high water, full and change, at Hobart, at 8h. 15m.; springs rise $4\frac{1}{2}$ feet, and neaps $3\frac{1}{2}$ feet. The tides here are irregular, and frequently almost stationary for days.

Tidal streams.—The flood stream is barely perceptible between Iron Pot islet and Kelly point, but it runs stronger under mount Louis, and thence parallel to the shore, following the course of the river at the rate of half a knot. Between Macquarie and Montagu points the ebb stream runs South $1\frac{1}{2}$ knots at half tide; off Battery point it runs S. by E., sweeping round Sandy bay to the south-eastward, at the rate of three-quarters of a knot, and after passing Sandy point, its strength gradually decreases to half a knot at the entrance of the river.

Winds.—During summer, or from December to March, the winds are generally land and sea breezes, which blow from N.N.W. and S.S.E., but with no degree of certainty, for frequently a sudden change takes place in the middle of a fine sea breeze, a violent gale coming on from the westward, which usually lasts three or four days. In January and February the weather is generally fine with light N.W. to S.W. winds, a sea breeze blowing up the harbour in the afternoons; the barometer stands at about 30·00 inches, and the temperature is between 75° and 50° Fahr. Now and then the sea breeze is interrupted by fresh North to West winds, with squalls off the high land, when the barometer is usually below 30·00 inches. In March, the sea breeze is not so regular, and the temperature is between 65° and 50° Fahr. Winter may be said to commence in April, which month and May are regarded as the finest in the year, the weather being cold, bright, with light winds and occasional spells of heavy gales, generally from the westward, which last 3 to 4 days at a time. During winter gales are frequent. In June the temperature is between 61° and 40° Fahr. There is much rain and sometimes fog. A N.W. to West wind at Hobart is often a S.W. wind outside.

Rainfall.—The average rainfall at Hobart is 23·5 inches, falling on 144 days annually.

RALPH BAY, which is separated from the east side of Derwent river by North and South arms, extends $7\frac{1}{2}$ miles in nearly a parallel



direction with the river, and $1\frac{1}{2}$ to $3\frac{1}{2}$ miles east and west. The entrance of the bay between Gellibrand and Trywork points is $1\frac{1}{4}$ miles wide with 7 to 14 fathoms water, but within the entrance the water is mostly shallow. Mortimer bay is an indentation of the east shore of Ralph bay, between 2 and 3 miles E.S.E. of Gellibrand point. From Maria point, the north-west extreme of Mortimer bay, the east shore of Ralph bay trends northward $3\frac{1}{2}$ miles to the foot of mount Mather, which is 575 feet high. Between mount Mather and the north shore of Ralph bay, a creek half a mile wide at its entrance, trends about $1\frac{1}{2}$ miles to the eastward and southward; this creek and Mortimer bay are both very shallow.

Hope beach forms a slight curve extending from cape Direction nearly N.E. by E. 3 miles to Goat bluff, a small cliffy point, on which there is a hillock 85 feet high. This beach, which is low and narrow, is the only barrier between Ralph bay and the sea.

There are regular soundings in 11 to 14 fathoms water, between the entrance of Derwent river and Betsy island, with 6 and 7 fathoms close to the sides of the island, and within half a mile of Hope beach.

The coast, a sandy beach, from Goat bluff curves N.E. by E. $1\frac{3}{4}$ miles to cape Contrariety. *See* page 717.

BETSY ISLAND is about one mile long north and south, half a mile wide, and 470 feet high. A dark red sandy soil shows itself in numerous landslips on its eastern side. The island is bold and precipitous, and landing can only be effected on the north side on a cobble stone beach, near a ruined hut. In Lady Franklin's time (1837 to 1843) it was reserved for acclimatization purposes, and the greater portion of the summit has been cleared of trees and stones. Nothing now remains except a breed of dark silver grey rabbits.

Little Betsy is a small rocky islet, 60 feet high, about 2 cables South of the island; $2\frac{1}{2}$ cables south-eastward of Little Betsy are two small rocks just above water, which nearly always break heavily, and about one cable further to the southward is a rock under water, which only breaks in heavy weather.

Passage.—Between the north end of Betsy island and Goat bluff is a passage three-quarters of a mile wide, with a general depth

in the centre of $5\frac{1}{2}$ fathoms, but half way over to Goat bluff from the north-east end of Betsy island are two flat rocks about 3 feet high, called Black Jack rocks ; these are usually covered with cormorants. Thick kelp extends to the southward of these rocks, but there is a good passage on the north side, carrying not less than 5 fathoms and about a cable wide. The leading mark through is the northern summit of mount Forestier in line with the extreme of cape Contrariety bearing N.E. by E. (N. 56° E.). This forms a convenient short cut for small vessels proceeding between Hobart and Frederick Henry bay.

Anchorage.—There is good anchorage for a small vessel in ordinary weather, out of the swell, off the beach on the north side of Betsy island, in from 5 to $5\frac{1}{2}$ fathoms. A heavy surf runs on all the beaches facing to the southward on this part of the coast.

STORM BAY,* the west shore of which is formed by the coast of Bruny island, from cape Frederick Henry to cape Delasorte, and the north shore by the coast from cape Direction to cape Deslacs, is 16 miles wide E. by N. from cape Frederick Henry to cape Raoul and extends from its entrance 15 miles northward to cape Deslacs.

Soundings.—From 50 fathoms $1\frac{1}{2}$ miles south-west of cape Raoul, the depth of water across Storm bay gradually decreases towards Bruny island, over a bottom of fine red sand, with black specks and small broken shells. The 20-fathoms line crosses Storm bay at a distance of about 3 miles south-east of Betsy isle, and thence runs to within one mile of the coast at the south-east point of Trumpeter bay, and within a quarter of a mile off cape Frederick Henry. The bottom in the north-west part of Storm bay is brown sand.

Towards the entrance of Derwent river the bottom becomes muddy, which is generally the case where there is any considerable run of fresh water.

DIRECTIONS.—From the eastward, after rounding cape Pillar and cape Raoul, stand over towards cape Frederick Henry, and steer thence along the north-east coast of Bruny island for the entrance of Derwent river. In working against a north-west wind, work up along the same coast, to avoid the strong outset from Frederick Henry bay.

If, when off Betsy island, the wind should blow from N.W., so as to prevent a vessel from working into Derwent river, good

* So named from Tasman experiencing a heavy storm in it, in 1642.

See charts, No. 969, No. 809, and No. 1,079.

anchorage may be obtained either in Adventure bay or Frederick Henry bay. In calms or light winds vessels may, if necessary, anchor with a stream or kedge in Storm bay until they get a breeze.

Vessels bound to sea from Derwent river, and meeting a south-east gale in Storm bay, may find safe anchorage in North-west bay, just within the north entrance of D'Entrecasteaux channel.

Winds.—During great part of the summer season, from November to April, when the weather is fine and settled, sea and land breezes generally prevail, the land breeze coming off between 8 and 10 o'clock; both these breezes are preceded by an interval of calms or light airs for two or three hours. From January to March the north-west winds come in very hard squalls.

CAPE RAOUL, the south point of Tasman peninsula, is situated in lat. $43^{\circ} 14' 25''$ S., long. $147^{\circ} 48' 27''$ E. It is formed of high basaltic columns, presenting a very remarkable appearance, and falling in perpendicular cliffs from a plateau three-quarters of a mile wide and about 800 feet high, which projects in a S.S.E. direction for nearly 2 miles from a saddle-shaped wooded mountain 1,625 feet high. The south-east point of the cape terminates in a single basaltic pillar which has deep water close to it. One mile W. by N. from the cape, and $1\frac{3}{4}$ cables off shore, there is a long and narrow bare rock, about 25 feet high at the north end, gradually sloping to the south-west, in which direction it extends $1\frac{3}{4}$ cables. The sea breaks heavily on this rock, which is steep-to. Three-quarters of a mile north of the above rock, and close to the coast are two islets, the northern and larger of which is about 120 feet high. There are 20 to 30 fathoms everywhere within a quarter of a mile of the cliffs of cape Raoul.

From cape Raoul the hilly east shore of Storm bay consists of a succession of small bays and points extending 7 miles in a north-west direction to Low point, the south point of Wedge or Quoin bay. A shoal patch, about 2 cables in extent, with 13 fathoms least water over it, coral bottom, and 17 to 19 fathoms around, lies with the south-west extreme of cape Raoul bearing E. $\frac{5}{8}$ S. (S. 83° E.) distant $4\frac{3}{4}$ miles. Quoin isle, which lies half a mile off Low point, is three-quarters of a mile long, north and south, and one-third of a mile broad, with some rocks close off its two ends, the Witch rock (sunken) lying E.N.E. $1\frac{1}{2}$ cables from the north point. The isle is of a dull reddish brown colour, and at the north end or shoulder of the quoin about 260 feet high.

Wedge bay.—The entrance of Wedge or Quoin bay extends from Low point N. $\frac{3}{4}$ W. 2 miles to Inner North head, with depths of 7 to 11 fathoms; from its entrance the bay trends 2 miles eastward, where it terminates in a shallow bight about one mile wide, with the small Brother and Sister islets lying between one and 2 cables from its north shore; close behind the low sandy east shore of this bight are two lagoons. Wedge bay is shallow, and exposed to westerly winds.

Burnett harbour or Parsons bay is a considerable inlet on the north side of Wedge bay, having an entrance a quarter of a mile wide situated N.E. $\frac{1}{2}$ N. 2 miles from the north point of Quoin isle, each point of the entrance being bordered by a narrow shoal. From its entrance Burnett harbour extends N.E. $1\frac{1}{4}$ miles, and thence S.E. about the same distance. The former trend of the harbour is a quarter of a mile to 3 cables wide, with 12 to 9 and 6 fathoms water, and with long kelp about the entrance points and near the shore on either side. There is a small inlet, Mary cove, on the north-west side of the harbour at two-thirds of a mile within the entrance.

The south-east, or inner trend of Burnett harbour, although wider, is more shallow than the outer one, the depths decreasing from 9 to $1\frac{1}{2}$ fathoms at one-third of a mile from the south extreme of the harbour over a bottom of stiff mud. The south-west shore of the inner part of the harbour is divided into two shallow bights by a point projecting to within one-third of a mile of the opposite shore, and there is a small islet, named Flax islet, close off the point; there are also two shoal bights in the north part of the harbour, fronted by a sand and mud-flat, having one to 3 feet water on it.

The township of Nubeena, with telephonic communication, is situated on the shores of this harbour. Population 150.

Although Wedge bay and Burnett harbour are small, yet from their position opposite Derwent river, they may be often found convenient for small vessels when adverse winds prevent their entering that river. Fresh water may be procured, but with some difficulty.

From North Passage point, on the north side of the entrance to Burnett harbour, the coast trends W. by S. one mile to Inner North head, then W. by N. $\frac{1}{2}$ N. $1\frac{3}{4}$ miles to Outer North head.

Rock.—A rock with 21 feet water over it at low water and 7 to 9 fathoms close around, and which breaks heavily with a south-westerly swell lies with mount Communication bearing N. 5° W. $2\frac{1}{10}$ miles.

FREDERICK HENRY BAY was discovered in 1792 by D'Entrecasteaux, who named it North bay (Baie du Nord). Since then, by a series of extraordinary typographical errors, the name North bay has changed places with the original Frederik Hendrik bay of Tasman, on the north-east side of Forestiers peninsula, where he first landed in 1642. D'Entrecasteaux does not appear to have penetrated further than Renard point, and it remained for Flinders and Bass, in the sloop *Norfolk* of 25 tons, in 1798, to sail into the magnificent landlocked harbour, which Flinders called Norfolk bay after his vessel.

Norfolk bay was much used by government vessels and boats, when port Arthur was a convict establishment, and extensive remains of convict settlements are scattered about round the bay. Frederick Henry or North bay is 3 miles wide at its entrance between cape Deslacs and North-west point, whence it extends to the northward for 9 miles to Seven mile beach and the entrance of Pitt water. The bay is from 5 to 6 miles wide, and everywhere clear of dangers, with a bottom of sand and shells and depths of 10 to 11 fathoms abreast of cape Deslacs, shallowing gradually to Seven mile beach.

Cape Contrariety is a bold clifty point, perfectly steep-to. From cape Contrariety the coast is clifty, the cliffs being from 200 to 300 feet high, rising to 615 feet a quarter of a mile inland, for $1\frac{3}{4}$ miles to the northward to the west end of Clifton beach, which extends in a N.E. by E. direction about one mile to cape Deslacs.

Cape Deslacs is a long grass covered flat clifty point nearly 200 feet high. The cliffs are composed of a whitish yellow mudstone and show conspicuously in all directions.

There is a very good blow hole under cape Deslacs close to the water's edge. The coast northward of cape Deslacs is clifty to the entrance of Pipe Clay lagoon.

Pipe Clay lagoon.—One and three-quarter miles to the northward of cape Deslacs is the entrance to this lagoon, shown by a white sandy beach, with a depth of from 6 to 8 feet of water at the mouth; a narrow shifting channel with 3 to 4 feet of water leads in for about half a mile to where a pier has been run out for the convenience of ketches, which call here for fruit, &c. It then opens out into a shallow lagoon some 2 miles long by three-quarters of a

mile wide, mostly dry at low water; the bottom is composed of a stiff white clay, hence the name.

Calvert's hill is a prominent object, 455 feet high, on the north side of Pipe Clay lagoon, with several large trees on its summit. Behind it are the Muddy plains, an extensive marsh, where occasionally wild duck may be found.

There are numerous farms about, and an extensive trade in fruit is carried on from this part of the country.

Richardson's beach is about 2 miles northward of Pipe Clay lagoon, there is a large fruit growing establishment here and a small pier for shipping it from.

May point is just to the north of Richardson's beach, it has a very conspicuous white patch of mudstone cliff similar to cape Deslacs.

Ralph bay neck.—A stretch of sand northward of May point called the Two mile beach forms the eastern side of Ralph bay neck, which in one place is a little over a quarter of a mile wide.

In the time of the convicts there was a tramway across this neck to carry boats between Ralph and Frederick Henry bays.

Single hill is $2\frac{1}{2}$ miles northward of May point, it is a flat-topped summit 670 feet high. Abreast it to the eastward and about half a mile off shore is a small sandy patch of $2\frac{1}{2}$ fathoms, but all the north-west corner of the bay is shallow and the 5 fathoms line extends nearly 2 miles from the shore.

Clarence plains are at the back of Single hill and extend down to Ralph bay neck. The original base line for the Ordnance survey of Tasmania was measured here by the Royal Engineers in 185—. On the west side of Clarence plains is a range of hills, averaging 800 to 900 feet in height, the northern summit being mount Rumney, 1,220 feet high, on which is a large cairn.

Mount Rumney is in latitude $42^{\circ} 51' 43''$ S., longitude $147^{\circ} 27' 31''$ E.

Seven mile beach forms the head of Frederick Henry bay and is a curved sandy beach, at the eastern end of which is a narrow opening into the Pitt water; a sand bank extends out for 5 cables on the western side of the entrance leaving a passage about one cable wide with from 3 to 4 fathoms in it.

Pitt water.—This lagoon extends nearly 9 miles in a westerly direction from the entrance.

Within the entrance a narrow channel trends westward between two rocks, above which it passes close to a projecting head on the north side and a point extending from the south shore. There are 3 fathoms water between the two rocks and 6 to 5 fathoms in the channel to the east and west of them.

Spectacle island.—One and a quarter miles to the southward of the entrance to the Pitt water is a projecting cliffy point, close off which are 3 small islets. Spectacle island is the southern and largest of these islets, and is 40 feet high.

On the northern islet are two holes right through the rock, which probably gave the name.

Whale rock.—Seven cables South of Spectacle island is Whale rock, 2 feet high, on which the swell generally breaks heavily. About one cable southward of it is a rock under water.

Rocky patch.—Four cables West of Whale rock is a rocky patch of 4 fathoms, with 5 to 6 fathoms around.

Carlton bluff, 2 miles E.S.E. from Spectacle island, is 370 feet high and looks like an island from the bay. On its north side is the entrance to Carlton river, into which ketches go at high water; it almost dries at low water.

Renard point is one mile further to the south-east with Roaring beach between. It forms the north point of the entrance to Norfolk bay.

Isle of Caves, 9 cables S.W. by W. from Renard point is a small islet, 35 feet high, bare of trees. At the south-east corner of the islet are two caves in the cliff, which gave the name.

Bass spit is a spit or bank of sand extending, inside the 5 fathoms line, $1\frac{1}{3}$ miles to the southward of the isle of Caves, it has a breadth of about 6 cables and its north point is N.W. by W. nearly one mile from the isle. The least water on it is $3\frac{1}{2}$ fathoms at the south-east corner, which is steep-to.

The eastern side of the entrance to Frederick Henry bay, extending from Outer North head N. by W. $\frac{1}{4}$ W. $4\frac{1}{2}$ miles to North-west point, is a bold, rugged, broken up shore, on which the sea always breaks heavily, rendering landing practically impossible. It is steep to all along and in places lined with kelp.

Outer North head, a bold bluff point about 740 feet high, is the turning point into Wedge bay; 2 cables S. by W. of it is a flat rock, one foot high, on which the sea always breaks. A rock with 21 feet (and probably less) water on it, lies with the rock one foot high bearing S.E. by E. $\frac{3}{4}$ E. (S. 65° E.) distant a quarter of a mile.

Mount Communication, $1\frac{1}{2}$ miles North-East of this head, is a flat-topped summit 1,120 feet high. The summit is partially cleared and was one of the convict signal stations. A few hundred yards below the summit on the north side is a well of good water, 40 feet deep; this is somewhat remarkable as all the water in the district is brackish. On one of the western spurs about three-quarters of a mile from the summit are the remains of a quarry, from which the aborigines obtained green stone for axes, &c.

Storm cove is a small cove $2\frac{3}{4}$ miles northward of Outer North head; there is a patch of sunken rocks here surrounded with kelp, behind which fishing boats obtain shelter in westerly weather.

North-west point, which is surmounted by a summit 690 feet high called Black Jack, forms the eastern point of the entrance to Frederick Henry bay. The coast here turns to the eastward for over a mile to form a bay $1\frac{3}{4}$ miles across, with a white sand beach called Sloping Main at its head, behind which is a stretch of marsh land extending back nearly to Coal Mines summit.

Between North-west point and Sloping island, 2 miles to the northward, the bay is mostly under 5 fathoms; there is a sandy patch in the centre of it, with 4 fathoms water and 5 to 6 fathoms around, lying one mile S.S.E. from Sloping island.

Sloping island, one mile in length north and south and half a mile wide, is a long low island with a few scattered trees on it. The highest part (220 feet) is near the south end of the island and it slopes down to its north end, a low point on the north-east side of which is a small white hut.

Close off the south-west point of the island is a narrow rocky ledge, 20 feet high, a favourite resort for cormorants. A bank of one to 3 fathoms connects Sloping island with the main, its north edge being steep-to.

Hog islet is two-thirds of the way from Sloping island towards Green head, it is 15 feet high and just at the north edge of the bank. In the time of the convicts a boat was always kept here and the remains of the hut where the boat's crew lived still exist.

On the land eastward of Sloping island is a sandy beach three-quarters of a mile long, inshore of which is a shallow lagoon extending nearly to Lime bay and generally covered with water fowl.

Green head, a yellowish cliffy point, forms the north extremity of Tasman peninsula. The land here is 300 to 400 feet high and is rather thickly wooded. A sandy spit runs out under water from Green head for $2\frac{1}{4}$ cables to the 3 fathoms line; it is usually plainly visible when the light is good.

Flinders channel.—Between Green head and Renard point, a distance of 2 miles, is the entrance to Norfolk bay, but the navigable channel called Flinders channel is only about 6 cables wide southward of Bass spit. Off the north point of Sloping island, which can be safely passed at a distance of $1\frac{1}{2}$ cables, the soundings are over 20 fathoms, the deepest spot in Frederick Henry bay.

Leading mark.—A white-washed beacon on a long low grassy point, about three-quarters of a mile West of Low island, in line with Tasman hill, a well-defined summit on the far side of Blackman's bay, bearing N.E. by E. $\frac{1}{2}$ E. (N. 62° E.) leads through Flinders channel in not less than 7 fathoms and clears the spit off Green head.

Lime bay, $1\frac{1}{2}$ miles to the eastward of Green head, is very shallow, and at low water dries out for some distance, but it is a convenient place to anchor off in southerly winds.

Whitehouse point is a cliffy point on the eastern side of Lime bay and forms the turning point into Norfolk bay.

North shore.—From Renard point on the north shore, the coast extends to the eastward in a succession of small bays and low grassy points for 5 miles to Dunally bay. A range of well-wooded hills extends along the coast with occasional cleared patches and farm houses. There is a pier with 5 feet of water alongside it, $2\frac{1}{2}$ miles eastward of Renard point. The road from Dunally passes by here and over the hills to a bridge across the Carlton river and thence to Sorell.

Low island is about a quarter of a mile in extent, 60 feet high, and there are a few clumps of trees on it. A reef of rocks runs out for a short distance from its north point, and midway between the island and the shore the passage is blocked by a rocky patch which dries one foot.

Dunally bay, which is $1\frac{1}{2}$ miles wide, is very shallow, there being less than 3 fathoms right across.

A pier, nearly a third of a mile long, runs out to the edge of the dry line and has 5 feet of water at its end. On a small rise over the bay is a very comfortable little hotel, a favourite resort in summer months for visitors from Hobart. The township of Dunally is about half a mile further inland, where there is a post and telegraph office.

East bay neck is a low neck of land nearly half a mile wide between Dunally bay and Blackman bay, a shallow inlet opening out of Marion bay on the east coast of Tasmania. It connects Forestiers peninsula with the mainland. North of Dunally bay is a high range of hills, with a conspicuous tree on the highest summit, which is 1,435 feet high.

Mount Forestier lies south-east of Dunally, about $1\frac{1}{2}$ miles inland: it has a conspicuous double summit, the northern being 875 feet and the southern 1,050 feet high, on the latter are the remains of a stone hut, one of the old signal stations.

Garden island or Smooth island, 2 miles southward of Low island is about three-quarters of a mile long N.N.W. and S.S.E. and a quarter of a mile wide. It is 140 feet high and clear of trees except a clump on the south end, it contains a few acres of very good pasture land; near the north point are some farm buildings.

On the east side of Garden island and northward of it to Dunally bay, the water is shallow; but good anchorage in from 4 to 5 fathoms may be had in north-west winds under the south-east corner of the island.

Norfolk bay, from a line adjoining Whitehouse point and Garden island, extends from 6 or 7 miles to the southward, with a width of about 5 miles. It is perfectly land-locked, clear of dangers and with everywhere anchorage with good holding ground.

The Western side of Norfolk bay has no distinctive feature except the Coal Mines, where there are a cluster of ruined prison buildings with a summit behind, 275 feet high, partially cleared and on which was a signal station, and the curious underground cells for convicts still to be seen. The mines were worked by convict labour, an inferior kind of coal only fit for household purposes being obtained. It is stated that the slag at one of the pit mouths has been on fire for the last 30 years and that it is still smouldering.

Close to the water with the remains of a pier in front of it is a large store house forming a conspicuous object in the bay.

The soundings are comparatively shallow abreast the Coal Mines, the 5 fathoms line being about three-quarters of a mile from the shore.

Ironstone point is a low point covered with trees midway between Whitehouse point and the Coal Mines.

Saltwater river, 2 miles southward of the Coal Mines at the south-west corner of Norfolk bay, has a bare grassy hill, 175-foot high, with a few houses, some in ruins on its eastern side; this was a Government farm worked by convicts. There is a pier here with a depth of 7 feet alongside it.

The south side of Norfolk bay is a succession of jutting yellow sandstone points with small bays between.

Deer point is the point on the east side of Salt water river, then comes Price's bay and Primadina point, $1\frac{1}{2}$ miles to the south-eastward.

Impression bay is the bay on the east side of Primadina point, here is a small township with post and telegraph office. Overlooking the south-west side of the bay are some remains of a small Model prison, this was a sanatorium in the time of the convicts.

There is a small pier with 10 feet water at its end running out from a small point in this bay.

The Cascades.—In the south-west corner of the next deep bay, $1\frac{1}{2}$ miles to the eastward of Impression bay, is The Cascades, formerly a convict station; two small waterfalls originate the name. It is now known as Kunya; there is a post and telegraph office and a pier with 5 feet of water alongside it.

Single tree point, at the south-east corner of Norfolk bay, is $3\frac{1}{2}$ miles E. by N. from Primadina point; it is a jutting rocky ledge with a large solitary gum tree at its end.

Woody island is about 2 cables northward of Single tree point, it is 75 feet high, 2 to 3 cables in extent and covered with clumps of shea-oak. At its eastern point is a ruined signal hut, which formed the connecting link between Signal hill and Eagle Hawk neck. A few rabbits may be got on the island. There is very good shelter under Woody island in from 4 to 5 fathoms for one vessel during heavy north-westerly weather.

Little Norfolk bay, an inlet about one third of a mile broad, runs $1\frac{1}{2}$ miles S.S.E. from Woody island to Taranna, where there is a pier with 9 feet water alongside and to which there is a narrow channel with from 3 to 4 fathoms in it.

Taranna consists of a few houses and a hotel with post and telegraph offices. The road from Carnarvon (distant 7 miles) passes here and then goes by Eagle Hawk and East bay necks to Sorell.

Signal hill is about 2 miles S.E. by S. from Taranna; on its shoulder under the summit is a cleared space, where the signal station was that connected with port Arthur. Signal hill is in latitude $43^{\circ} 4' 50''$ S., longitude $147^{\circ} 53' 5''$ E.

Dart bay is between Woody island and Heather point, three-quarters of a mile to the northward, There are 7 to 5 fathoms in

this bay to nearly one mile eastward of Heather point. From it Eagle Hawk bay, a long narrow inlet, extends $2\frac{1}{2}$ miles eastward to Eagle Hawk neck; this bay is very narrow for the last $1\frac{1}{2}$ miles, averaging $1\frac{1}{2}$ cables in width, with a depth of from one to 2 fathoms.

Eagle Hawk neck is a narrow neck connecting Forestier and Tasman peninsulas, on it are some sand hills about 60 feet high. On the east side of the neck is Monge bay, on the east coast of Tasmania. The neck averages about 100 yards broad, but in one place at times there is scarcely a distance of 20 yards between the two high water levels. In the time of the convicts a subaltern's guard was stationed here, and bull dogs were chained at short intervals apart across the neck to prevent escape.

Mount Macgregor, $2\frac{1}{2}$ miles northward of Eagle Hawk neck, is 1,925 feet high, the highest summit in this part of the country; it is a well defined double summit densely wooded.

Three-quarters of a mile to the north-west of Heather point is a point, close off which is a small islet 10 feet high, one cable outside this islet is a rocky patch about a cable in extent with a few boulders just above water on it.

Flinders bay, one mile further to the northward, is three-quarters of a mile deep; there are 7 fathoms in the entrance and the depth gradually decreases to the head of the bay.

Wattle point, $1\frac{1}{4}$ miles to the south-east of Garden island and about $3\frac{1}{2}$ miles N.W. by N. from Heather point, forms the south point of King George's sound.

King George's sound, a deep, shallow inlet, is half a mile wide at its entrance between Wattle point and Gull island to the north-east, a small wooded island 160 feet high and about 4 cables in extent. The sound then extends $1\frac{1}{2}$ miles to the north-east and has a depth of from 2 to 3 fathoms to a small pier at its head; there are .5 feet alongside the pier.

Anchorage in Frederick Henry and Norfolk bays may be had almost anywhere according to the chart. But a swell is nearly always setting in from Storm bay on the east side of Frederick Henry bay, and it must be remembered that the heaviest and most

sudden blows begin from N.W. to S.W. The holding ground is everywhere good, generally sand and shells in Frederick Henry bay, mud and clay north of Norfolk bay, and soft mud in Norfolk bay. In Norfolk bay, although completely land-locked, a very nasty short sea for boats very quickly gets up in strong winds.

Communication.—A small steamer runs twice a week from Hobart to Norfolk bay, calling at Saltwater river, Impression bay, The Cascades, Taranna and Dunally. Small ketches constantly run from Hobart all round the bays, trading principally in firewood and fruit during the season.

A good road runs from Carnarvon by Taranna, Eagle Hawk and East bay necks to Sorell, where there is a railway to Bellerive opposite Hobart. Another road branches off from Taranna, along the south side of the bay to Saltwater river and from Impression bay to Wedge bay.

Supplies.—Fish may be caught in abundance with hook and line, and on many of the sand beaches a good haul of flounders may be had with the seine at night.

The fishing industry is carried on in a somewhat desultory manner by whaler-built fishing boats in Storm and Frederick Henry bays; the boats usually work in couples, either line fishing, or along the edge of the kelp with "grab all" nets.

Fresh meat and vegetables, dairy produce, &c., may be obtained at Saltwater river and Impression bay in any quantity on due notice being given. The farmers here are prepared to enter into a contract, if necessary, for a large daily supply.

Tides.—A tide poll was set up in Impression bay and day and night observations were taken during the progress of the survey in 1894.

The tides appear to closely follow the tides at Hobart, both as to the times of high and low water and as to irregularity.

There is a large diurnal inequality; with the moon's declination North, the higher high water follows the superior transit of the moon; with the moon's declination South, the higher high water follows the inferior transit.

The greatest range of the tide appears to occur when the moon is at its greatest North or South declination, the least range when the moon is on the equator. There is therefore no proper establishment.

The height of the tide is usually much affected by the barometer, a low barometer causing an abnormal high tide.

At Impression bay the approximate time of high water, full and change, is 8h. 15m.; springs rise 6 feet 4 inches, neaps rise 4 feet 0 inches, neaps range 2 feet 4 inches.

A bench mark is cut on the second pile out on the west side of the pier in Impression bay, 6 feet 3 inches above the datum of low water springs and 3 feet 2 inches above mean sea level.

Tidal streams.—The tidal streams are weak and practically imperceptible, but after a heavy gale from the south-west a distinct set was felt into Frederick Henry bay, and in Flinders channel towards Norfolk bay.

TASMAN PENINSULA, of which the west and north coasts have been described with the shores of Storm, Frederick Henry, and Norfolk bays, extends N.W. $\frac{1}{2}$ W. and S.E. $\frac{1}{2}$ E. 23 miles, and 13 miles across; it consists of wooded hills and fertile valleys, with numerous streams of pure fresh water.

CAPE PILLAR, the south-east extreme of Tasman peninsula, lies E. by N. $\frac{1}{2}$ N. 9 miles from cape Raoul, and is the most remarkable headland on the coast, being formed of perpendicular columns of basalt rising to a height of 913 feet, and there forming a flat surface, the high land near the cape being mostly without wood.

Tasman island, 811 feet in height, is rocky, sterile, rugged, and flat-topped; it is close southward of cape Pillar. Off the south-west end of Tasman island is a remarkable semi-detached rock with two peaks, the gap between the rock and island is perfectly straight and square. On one of the peaks of the rock is a large stone, which has exactly the appearance of a lighthouse when on an easterly or westerly bearing. There is a narrow passage between cape Pillar and the island, sometimes available for small vessels.

PORT ARTHUR.—The coast between capes Raoul and Pillar forms a bay, in which, midway between the two capes, is the entrance

of port Arthur, one of the most secure harbours in Tasmania; it runs in a north and south direction about 5 miles and is clear of all dangers.

Westward of cape Pillar the coast continues high and precipitous for about 5 miles to Arthur's peak, a conspicuous summit, 1050 feet high, which forms the east head of the entrance to the port.

The point under Arthur's peak is named the Budget; on it is a remarkable pillar rock which stands out alone, when viewed from a north or south direction, and close off it is a small rock 5 feet high.

The entrance is easily made out from seaward by the dip in the high land, and by mount Brown, a long flat precipitous summit 570 feet high, which forms the west head of the entrance and appears as an island against the land behind.

Kelp extends off nearly all the points in this harbour to a depth of from 5 to 10 fathoms. It always grows from a rocky bottom and should be avoided.

The East shore of port Arthur is steep-to and runs in a N. by W. direction for 4 miles to the head of Stinking bay, one mile southward of which is Denman's cove, an excellent place for hauling the seine.

The coast westward of mount Brown runs back to the neck of the peninsula on which the mount stands, forming a bay, at the head of which is a remarkable cave, and half a mile nearer mount Brown is the "blow hole," which is described as being a most magnificent sight in heavy southerly gales.

Black rock.—South-west of mount Brown, at 3 cables from the shore, is Black rock, 30 feet high, with deep water close round it; between Black rock and a small point to the northward of it is an isolated rock, which always breaks.

Half Moon bay.—Just to the northward of mount Brown is a small cove, Half Moon bay, 4 cables wide by $3\frac{1}{2}$ deep, in which there is always too much swell to afford any anchorage.

Black point, on the north side of Half Moon bay is 80 feet high, flat and clifty. The entrance to the harbour is 8 cables wide, with deep water right across between this point and the Budget.

Safety cove is about one mile to the northward of Black point and is 7 cables long, north and south, and 4 cables deep, east and west; it has anchorage in from 5 to 12 fathoms, sand, but there is always a certain amount of swell here.

Puer point.—From Safety cove the coast is about 100 feet high and clifty to Puer point, about one mile to the northward, one cable off which is Dead island, a small islet 40 feet high, with the tops of the trees 120 feet high. This islet was the burying place of the old convict establishment, and about 1,700 bodies are supposed to have been buried here.

On the north-west side of Dead island a rocky spit extends for $1\frac{1}{2}$ cables towards Frying-pan point, with from 4 to 5 fathoms water on it; it is distinctly shown by the kelp.

Opossum bay, the best anchorage in port Arthur, is half a mile wide at its entrance between Puer point and Frying-pan point. From its entrance the bay extends about one mile to the southward; its south shore is fronted by a sand and mud flat.

Mason cove, on the north-west side of Opossum bay, is one cable deep, and forms the water frontage of the settlement of Carnarvon. There are remains of jetties on the south side, and there is a wooden pier on the north side with 18 feet water at its outer end and 12 feet at its inner end. There are only $3\frac{1}{2}$ fathoms at the entrance of the cove and it soon shallows.

Anchorage.—There is excellent anchorage off Mason cove in from 7 to 12 fathoms, sand.

Carnarvon, as the once famous convict settlement of port Arthur is now called, has a population of about 100; most of the old prison buildings are still standing.*

From its sheltered position a mild climate is experienced all the year round, fruit and flowers grow in abundance, and it is a very pretty little spot.

Communication.—There is communication by coach twice a week with Taranna in Norfolk bay and thence by steamer to Hobart. A road is being made across the peninsula to Wedge bay (about 7 miles), which will bring Carnarvon within 3 hours of Hobart. There is a post and telegraph station here.

* A fire has since (in the summer of 1895) destroyed the model prison, hospital and other structures.

Frying-pan point is a narrow, low point, with tall gum trees on it; from its north end a rocky ledge runs about one-third of a cable into Stewarts bay.

Stewarts bay, 4 cables deep by 3 cables wide, is between Frying-pan and Garden points; a small vessel could find anchorage in it, in from 6 to 8 fathoms, but shoal water extends round it for about $1\frac{1}{2}$ cables from the shore.

Garden point is covered with trees, and forms the extremity of a peninsula with a long flat cleared top, 115 feet high, and some buildings upon it.

Long bay extends from Garden point to the northward for nearly 2 miles; it is 2 to 3 cables wide, with not less than 5 fathoms water for the first three-quarters of a mile, after which it shallows and the head of the bay dries. Small craft by keeping on its eastern side can get within half a mile of the head of the bay.

Stingaree bay, three-quarters of a mile above Garden point, and on the western side of Long bay, from which it is separated by a small peninsula extending to the south-east, is shallow and there are many rocks in it.

Oakwood, a small settlement at the head of Long bay, consists of about half a dozen houses.

Supplies.—Port Arthur is situated within an amphitheatre of lofty wooded hills (the trees being mostly stringy bark gum), well watered and of a most pleasing aspect. Fish abound and can be caught in any quantity with line or seine. Fresh meat can be obtained at Carnarvon. Nearly all the bays have small streams of fresh water flowing into them. There is excellent timber about the port.

Tides.—From day observations made for a limited period, it would appear that spring tides occur at the time of the moon's greatest North or South declination instead of at full and change, so that there is no "age of the tide" and probably no fixed establishment.

The time of high water, full and change, has been given as about 8h. 20m., springs rise about $4\frac{1}{2}$ feet.

EAST COAST OF TASMANIA.

The **EAST COAST** of **TASMANIA** from cape Pillar (*see* page 727) curves 5 miles in a N. by W. $\frac{1}{4}$ W. direction to cape Hauy, which has a cluster of detached conspicuous rocks close off it, and forms the south point of Dolomieu, or Fortescue bay.

Hippolite rocks are situated immediately in front of Dolomieu bay, between E.N.E. and N.E. by N. one to $2\frac{1}{2}$ miles from cape Hauy; they consist of two rocks above water and covered patches, the east and most elevated rock being 216 feet high, of a reddish brown colour, and quoin shaped, high at the west end. There are 50 fathoms water between the Hippolite rocks. The west rock is 28 feet high.

Dolomieu bay is $1\frac{1}{4}$ miles wide, north-west and south-east, and $1\frac{1}{2}$ miles deep, with a white sandy beach; the bay is sheltered only with land winds, the Hippolite rocks not being sufficient to protect it from seaward.

MONGE or PIRATE BAY.—From Dolomieu bay the coast trends nearly N.N.W. $\frac{1}{2}$ W. 6 miles to the south-east point of Monge bay, between one and 3 cables north-west of which is the isle of Fossils, connected with the point by a reef of dry and sunken rocks. From its south-east point Monge bay extends N.N.W. $\frac{1}{2}$ W. $1\frac{1}{2}$ miles to its north-west point, close off which lie the two Clyde islets. This bay is three-quarters of a mile deep, with a small sandy beach in its southern bight, and a more extensive one along its western shore; the latter forms Eagle Hawk neck, the narrow isthmus which connects Tasman peninsula with Forestiers peninsula, to the northward of it. From the neck the water in the bay appears very shallow for over half a mile out and a heavy surf always rolls in. On the north-west shore of Monge bay is a curious geological formation called the Pavement, an extensive level of basaltic rock, much resembling a pavement of large flat stones, laid with remarkable regularity between straight parallel lines, which may be seen at low water, and 2 or 3 miles to the south-eastward are the Blow hole and Tasman's arch.

Signal station.—There is a signal station at Eagle Hawk neck and communication can be made by the commercial code; it is connected by telegraph.

The coast from Monge bay extends 2 miles in a N.N.E. $\frac{1}{2}$ E. direction to cape Surville; a small islet lies close to a point three-quarters of a mile north-east of the north-east point of Monge bay; and half a mile to the south-east of cape Surville, the Sisters islets lie within half a mile of a projection of the coast. Immediately behind a bay, midway between Eagle Hawk neck and cape Surville, mount Macgregor rises to the height of 1,925 feet.

Between cape Surville, and a projection N. by W. $1\frac{1}{4}$ miles from it, is a bay half a mile deep, having two small islets or rocks, one close within the cape, and the other near the shore midway between the two points of the bay. From the north point of this bay the coast extends N. by W. 2 miles to Yellow bluff, and thence N.W. by N. the same distance to Humper bluff. The coast is high and bordered with rocks above and under water, and affords neither anchorage nor shelter, as the sea breaks upon every part of it with violence.

Wilmot cove, locally known as Lagoon bay, is the west end of an inlet trending W.S.W. $1\frac{1}{4}$ miles from its entrance, between Humper bluff, and cape Frederik Hendrik N. by W. two-thirds of a mile from it. The south shore of this inlet is fronted by several rocks and small islets, the largest and most distant from the shore being the Kelly islets, which lie midway between Humper bluff and Wilmot cove; some rocks also extend from the extremity of cape Frederik Hendrik to the south-eastward. In this cove is the one solitary dwelling on this part of the peninsula.

Cape Frederik Hendrik,* formed of basaltic columns, is a narrow point stretching $1\frac{1}{2}$ miles in a N.E. by E. $\frac{1}{2}$ E. direction from the line of coast, and forms the south-eastern point of Marion bay.

MARION BAY is an exposed indentation of the coast, extending from cape Frederik Hendrik N.N.W. $8\frac{1}{2}$ miles to cape Bernier, and is 4 miles deep, but the only part at all available for vessels is in the southern portion of the bay.

* Named after Prince Frederik Hendrik of Orange, Stadtholder of Holland from 1625 to 1647, and the grandfather of William of Orange, afterwards William III. of England; Marion bay is named after the French Captain, Marion du Fresne, who anchored here in the *Mascarin* in 1772.

North bay, the original Frederik Hendrik bay of Tasman, which forms the southern portion of Marion bay, extends from cape Frederik Hendrik N.W. by W. 3 miles to cape Paul Lamanon, and is $1\frac{1}{4}$ miles deep, with a small inlet W.S.W. 2 miles from the extremity of the former cape. Green islet*, which lies in front of the bay, N. by W., $1\frac{1}{4}$ miles from cape Frederik Hendrik, is too small to afford any protection from seaward.

Cape Paul Lamanon is a small projecting point, low, stony, arid, covered with small timber and rough scrub, with the High rocks, and others above and under water, close to it. From this cape the coast trends westward one mile to the north-east entrance-point of port Frederik Hendrik, and is bordered by a reef of rocks.

Port Frederik Hendrik is an extensive but shoal inlet on the south-west side of Marion bay, the west side of its confined entrance being formed by a narrow point which projects S.E. by S. 2 miles from the west to within one-third of a mile of the opposite shore. This port is nearly of a triangular form, extending from its entrance S.W. by S. $4\frac{1}{2}$ miles to about a quarter of a mile of East Bay neck on the north-east shore of Norfolk bay, and is 3 miles wide from south-east to north-west. The shores are high, and form a projecting double point on the east side, and two long narrow projections on the west side.

M. Freycinet, the French navigator, says :—"The breakers at the entrance of port Frederik Hendrik, appear to render the channel difficult; it has, however, not less than 3 fathoms water, and by ranging tolerably close to the reef off the outer point, and then closing the eastern shore, deeper and smoother water will be found. This port can be useful to small vessels only, the soundings being irregular and everywhere shallow. In the south part, where they appear to be deepest, we had only 3 fathoms, and the port is otherwise obstructed by extensive banks, which dry at low water. A single rivulet of fresh water was found in the south-east part of the port; but a boat cannot approach within a mile of it. The many dry torrent beds, however, show that there is no want of water in the rainy season. The country is of the same description as that about D'Entrecasteaux channel."

* It was to the north-west of this islet that Tasman anchored in the *Heemskerck* in 1642, and on the shore of the bay that he planted the Dutch flag.

Supplies.—Wood can be had here, and plenty of fish may be taken on the large bank at the entrance.

Tides and tidal streams.—No correct observations of the tides have been made, but the rise is about 4 feet, and the tidal stream at the entrance runs about 2 knots.

The COAST.—From the entrance of port Frederik Hendrik a flat sandy beach curves N. $\frac{3}{4}$ W. 5 miles to Du Ressac point: landing is at all times dangerous on this beach, and is impossible with winds from the sea, as an enormous surf breaks more than 2 cables from it. A mountain torrent pours through this beach in the rainy season.

Between Du Ressac point and cape Bernier the coast, which is of moderate height, forms two sandy bights that may be approached with off-shore winds, when that nearest the cape will be found the most convenient.

Cape Bernier is high and remarkable on account of its conical shape; there are 6 and 7 fathoms water close to the southward and eastward of it.

MARIA ISLAND is separated from the east coast of Tasmania by a navigable channel $2\frac{1}{2}$ to $4\frac{1}{2}$ miles wide; cape Peron, its south point, lying East $3\frac{1}{2}$ miles from cape Bernier. Cape Peron is a bold headland with three rocks situated off it. The one nearest the cape, from which it is separated by only 20 yards, is called Pyramid rock, and is 118 feet high; the outer rock, which is known to the fishermen as the Boy in the Boat, is a small dangerous pinnacle, steep-to, only 2 feet above high water, and lies S.S.W. $\frac{1}{2}$ W. 4 cables from cape Peron, while the middle of the three is 6 feet high, and situated about midway between the other two. Maria island is 11 miles long, north and south, and at 5 miles N. by E. $\frac{1}{2}$ E. from cape Peron, is nearly divided by Riedlé bay on the east, and Oyster bay on the west side, there being only a low sandy isthmus between them. The southern part of the island is $3\frac{1}{2}$ miles, and the northern $6\frac{1}{2}$ miles broad.

The South coast of Maria island from cape Peron trends N.E. by E. 3 miles to cape Maurouard, on the south-west side of which is a small inlet. From this cape the coast trends irregularly, one mile north-eastward to cape Bald, and thence N.N.W. $\frac{1}{2}$ W. $2\frac{1}{2}$ miles to the south-west point of Riedlé bay. There are 10 fathoms water close to cape Bald ; but some rocks lie near the shore $1\frac{1}{2}$ miles to the northward of that cape.

The south and east coasts of Maria island are all of granite, and rise abruptly, like a wall, to the height of 200 feet, but gradually descend from cape Maurouard toward Riedlé bay. There are some caves in which the water breaks with a great noise.

Riedlé bay extends nearly 2 miles across from south-west to north-east, and is one mile deep, with some rocks projecting from its west and north shores. There are 15 to 9 fathoms, fine sand, in the south-western part of the bay, but in the north-eastern part there are only 5 or 6 fathoms. Riedlé bay affords but indifferent anchorage for vessels remaining any length of time, being entirely exposed to the wind and sea from South to N.E. Landing may be effected at the south-western part of the bay, with the wind off the land, but farther to the northward, the approach to the shore is prevented by a dangerous bar.

From cape Mistaken, which lies E. by N. $1\frac{1}{4}$ miles from the north-east point of Riedlé bay, the east coast of Maria island trends N.N.E. $\frac{1}{2}$ E. $1\frac{1}{2}$ miles to Ragged head, with a small islet or rock close to the east side of the cape. The coast from Ragged head extends N.W. $\frac{1}{2}$ N. 5 miles to cape Boullanger, with a small inlet midway, and some rocks near the shore 2 miles to the north-west of the head. The land rises from this high steep coast to a lofty ridge ; mount Maria, W.N.W. 3 miles from Ragged head, being 2,329 feet, and Bishop and Clerk mount, $1\frac{1}{4}$ miles south-west of cape Boullanger, being 3,000 feet high.

There are 19 fathoms water about one mile from the shore between capes Mistaken and Boullanger.

From cape Boullanger the north end of Maria island forms a bay extending W. $\frac{1}{2}$ N. 2 miles to the north point of the island, half a mile off which is North islet, with Black, and other rocks between it and the shore to the south-east of the islet.

The West coast of Maria island from cape Peron, trends N.N.W. $1\frac{1}{2}$ miles, and thence N. by E. $\frac{1}{2}$ E. 3 miles to the south-east point of Oyster bay. There are $3\frac{1}{2}$ to 4 fathoms water along this coast, but the point is enclosed by a shoal.

Oyster bay is $1\frac{1}{4}$ miles wide from south-east to north-west at its entrance, within which the bay expands to $2\frac{1}{4}$ miles, and is $1\frac{1}{4}$ miles deep, but its shores are bordered by a shallow flat; the greatest depth of water in the bay is not more than $3\frac{1}{2}$ fathoms, and it generally does not exceed 2 or 3 fathoms, with a white sandy bottom.

The north side of the entrance of Oyster bay is formed by a low narrow point, projecting nearly $1\frac{1}{2}$ miles to the south-west from the coast-line, from the extremity of which the west coast of Maria island extends N. by E. $\frac{1}{2}$ E. 6 miles to its north point, and forms a succession of small bights and points, bordered by a shoal, on which are some sunken rocks. Shoal water extends to about $2\frac{1}{4}$ miles N. by W. from the north entrance point of Oyster bay.

The north-west part of Maria island from Oyster bay to its north point, is low and wooded.

Settlement.—Immediately on the south-west side of the north point of Maria island there is a small cove, close to which is the settlement. There is communication by steamer to Triabunna.

Productions.—The soil of Maria island is excellent, and deep in the valleys. Oysters, lobsters, and mussels are abundant, the former of an extraordinary size; but other kinds of fish are scarce, particularly in the beginning of winter.

The COAST from cape Bernier, trends North $3\frac{1}{2}$ miles to Galets point, and is steep, with 6 or 7 fathoms water close to. Cockle bay is merely a slight indentation of the coast, terminating to the southward in a small inlet, on the west side of Pebbly point, which lies 2 miles north of cape Bernier.

From Galets point the coast trends north-westward nearly $2\frac{1}{2}$ miles to the head of a small inlet formed on its north-east side, by a low narrow point stretching out about one mile south-eastward from the coast-line. This point is fronted by a sandy beach, and a small stream flows into the inlet.

Lachlan islet, which lies E.N.E. one mile from this point, is of triangular form, $1\frac{1}{2}$ cables broad, 43 feet high and covered with grass. The only conspicuous object on it is a solitary bush which is nearly in the centre. There is a small reef of rocks $1\frac{1}{2}$ cables to the north-west of Lachlan islet, the highest point of which is one foot above high water.

The channel west of Lachlan islet has not more than 12 feet water in it, and only small vessels should attempt it.

Between the low narrow point, abreast of this islet, and a steep cape N. by W. $2\frac{1}{2}$ miles from the point, the coast is slightly embayed, with $5\frac{1}{2}$ fathoms water about a mile from it. From this cape a high rocky coast extends 3 miles N.W. $\frac{1}{2}$ W. to Luther point, the south point of Prosser bay. A range of mountains extends from S. by W. to N. by E. behind the coast from port Frederik Hendrik to Prosser bay, its principal summits being Gordon Sugar-loaf, 1,350 feet high, and Prosser Sugar-loaf, 2,195 feet high, the former bearing S.W. by W. $\frac{1}{2}$ W., distant $8\frac{1}{2}$ miles, and the latter W.N.W. 6 miles from cape Bernier. Thumbs, 1,805 feet high, the north summit of this range, is situated about $3\frac{1}{2}$ miles to the south-west of Prosser bay.

Between the steep cape just noticed, and a projecting point $2\frac{1}{2}$ miles northward of it, is a deep bay extending 2 miles north-west to Meredith point, a broad point, which separates Prosser bay from Spring bay.

Orford roads is a fair anchorage during the westerly gales which are so prevalent, but cannot be recommended in easterly gales, as the bottom is of hard sand, and a swell rolls in round the north end of Maria island.

Prosser bay is about one mile across, but it is shallow, and useless for any but small vessels. A vessel may anchor off its entrance, but would not be sheltered from southerly winds, which are violent in this locality. In easterly gales there is a dangerous sea in this bay.

Prosser river discharges into Prosser bay. On its right bank is situated the hamlet of Orford, which contains 100 people. The river is reported to be deep, but the bar has only 2 feet on it at low water.

See charts, No. 1.079: and No. 869, Spring bay and adjacent anchorages. scale m = 4.7 inches.

There is a post office and a telegraph station at Orford.

Spring bay, so called from a chalybeate spring on its east side, is $2\frac{1}{4}$ miles long N.N.W. and S.S.E., from 4 to 8 cables broad, and has a navigable area of one square mile, the northern portion of the bay being much choked with sand and mud. It is completely sheltered from wind and sea, and the holding ground of mud is good. The township of Triabunna is on the shore at the head of the bay, three-quarters of a mile from the nearest anchorage. Two spits jutting out from the east shore narrow the bay, viz., Sappho spit and Horseshoe bank. The latter is covered with weed.

Anchorage is very good at the mouth of Spring bay, between Freestone point and Meredith point, but this is a long way from the town. To proceed up the harbour as near to Triabunna as possible keep well over on the west shore until past Observatory point, to avoid Sappho spit, taking care to give a wide berth to the Horseshoe bank, which shoals very suddenly to 4 feet with Patten point in line with the court-house; anchor (between Horseshoe bank and Patten point), in 20 feet of water, the point being distant 3 cables, and in line with the court-house.

Geographical position.—Observatory point is in lat. $42^{\circ} 32' 19''$ S. long. $147^{\circ} 55' 48''$ E.

Tides.—It is high-water full and change at the entrance of Spring bay at 7h. 30m. Springs rise from 4 to 5 feet, according to the wind; neaps 3 to $3\frac{1}{2}$ feet. Neaps range 2 feet.

Triabunna had 165 inhabitants in 1891. The exports are wool, mimoso bark, grain, and fruit. There is a magistrate, who is also warden; and a superintendent of police, who combines this duty with that of collector of customs, valuator, and registrar. The principal building is a court-house, which also covers a prison and municipal council-room. There are two small churches, Protestant and Roman Catholic, and a telegraph office. Indications of anthracite coal have been found in the neighbourhood. There is postal communication between Spring bay and Hobart four times a week, the journey by coach and rail, occupying from 18 to 20 hours. Steamers ply regularly to and from Hobart and Launceston.

The climate of Spring bay is salubrious. During the stay of H.M.S. *Dart*, from 24th February to 24th March, the thermometer on board ranged from 39° to 74° in the shade. On the night of the 15th March a frost occurred which destroyed all the grapes in the neighbourhood of Triabunna.

A tidal wave occurred in Spring bay on the morning of the 28th August, 1883, a few hours after the volcanic eruption in the strait of Sunda. The water rose 3 feet higher than high-water spring tides, and washed backwards and forwards many times. Oysters, before plentiful in the harbour, have since disappeared.

Oakhampton bay is the name given by the settlers to the deep bight between Home Look-out point and Lower Look-out point (cape Bougainville).

CAPE BOUGAINVILLE is a double point about a mile broad, projecting one mile to the south-east from the line of coast; some sunken rocks extend a short distance from the cape, close outside which there are 17 fathoms.

The channel between the east coast of Tasmania and Maria island is $3\frac{1}{2}$ miles wide at its south entrance, between capes Bernier and Peron, and there is the same width at its north entrance (reported by the fishermen to be clear of dangers), between cape Bougainville and the north point of Maria island, but midway, it is contracted to two narrow channels by Lachlan islet and the rocks above it. There are 8 and 9 fathoms water in mid-channel off Oyster bay, 7 fathoms 2 miles northward of the islet, and 19 fathoms in the north entrance of the channel.

Directions.—Proceeding to Spring bay by the south entrance pass the Boy in the Boat at a moderate distance and steer over to three-quarters of a mile from Galets point, until Lachlan islet bears N. by W. (N. 11° W.), distant $2\frac{1}{2}$ miles, when haul up N. $\frac{1}{4}$ E. (N. 3° E.) and pass the islet on its eastern side at a distance of half a mile. A straight course for Lachlan islet from the Boy in the Boat cannot be steered on account of a shallow spit off Oyster bay, which stretches out into the channel, a depth of 23 feet being found at low water, E. $\frac{1}{2}$ N. $1\frac{2}{10}$ miles from Galets point, and S. by E. $\frac{3}{4}$ E. $2\frac{3}{4}$ miles from Lachlan islet. After passing Lachlan islet, continue to steer

northward for 2 miles, taking care to avoid the shallow ground north of it and the shoal water extending off Maria island; and then make a straight course for Spring bay, which appears as a gap in the land. On this track through the East Lachlan channel to Spring bay there are not less than $4\frac{1}{2}$ fathoms water at low water spring tides.

West, distant 8 cables from Soldier point and north-eastward of Lachlan islet, is the end of a shallow spit, extending from Maria island, upon which there are 6 to 18 feet at low water springs.

Vessels drawing over 21 feet are recommended not to approach Spring bay by the south entrance, as the sand-spits around Lachlan islet and off the shores of the channel have been known to silt up and alter their position. No stranger in a vessel drawing over 6 feet should enter the West Lachlan channel.

Tidal streams.—In the Lachlan channels the flood stream runs to the north, the ebb to the south.

The COAST from cape Bougainville curves in a N. by W. direction $5\frac{1}{2}$ miles to the south-east point of Grindstone bay. Between one and $2\frac{1}{2}$ miles northward of the cape there are two small inlets, close off which are some sunken rocks; but there are 17 to 24 fathoms one to 2 miles from the coast between the cape and the bay.

Cape Bailly.—From Grindstone bay, which is a small inlet trending to the westward, the coast trends N.W. 2 miles, and thence N.N.E. 4 miles to cape Bailly, on the south side of which are some rocks above water, with 10 fathoms close outside them, and 16 to 14 fathoms between Grindstone bay and the cape. The land from cape Bougainville to cape Bailly is less elevated, but still steep and wooded.

Ile des Phoques, E. by N. 7 miles from Grindstone bay, is a sterile rock from 400 to 600 yards in extent; there are 12 fathoms water close to the southward of it, and 26 to 24 fathoms between it and the shore.

SCHOUTEN ISLAND, which forms the east side of the entrance of Fleurieu or Oyster bay, is $4\frac{1}{2}$ miles long, east and west, and one to 2 miles broad, with cape Faure, its south-west extreme, bearing E.N.E., distant $9\frac{1}{2}$ miles from cape Bailly. Cape Sonnerat,

the south extreme of the island, which lies E. by S. 3 miles from cape Faure, has groups of islets and rocks extending 2 miles to the southward, the southern being the Taillefer islets; an islet also lies one mile off the north-west extreme of Schouten island.

Water.—There is a small stream of excellent water on the south part of Schouten island, where a boat may easily land; and the inlet at the east end of the island may possibly afford a landing-place.

Géographe strait, which separates Schouten island from the south point of Freycinet peninsula to the northward of it, is about half a mile across at its narrowest part, with apparently no other detached danger than a small rock above water, close off the south point of the peninsula.

FREYCINET PENINSULA is 6 miles long north and south, and $3\frac{1}{2}$ miles across its broadest part, whence it gradually narrows to its south point. The east side of the peninsula from its south point trends nearly N. by E. $\frac{1}{4}$ E. 6 miles to its north-east point, whence the northern end turns West and S.W. $2\frac{1}{2}$ miles to the isthmus which connects this with another peninsula to the northward of it. The east side is partly bordered with rocks, and the south-west and north-west sides are slightly indented. There is some tin mining on the peninsula.

The isthmus which connects Freycinet peninsula with a smaller one to the northward of it, is $1\frac{1}{2}$ miles long, N.W. and S.E. and half a mile broad, the greater portion of it being occupied by a pond of fresh water supplied by the rains; it is separated from the bay on its west side by a barrier of sand about 50 yards broad; the other part of the isthmus is tolerably well wooded.

The peninsula to the northward of this isthmus extends 4 miles east and west, the isthmus which connects it with the land farther north, being one mile broad.

Thouin and Sleepy bays.—Thouin bay, on the east side of the southern isthmus, is one mile broad north and south, half a mile deep; but exposed to the eastward. From the north point of this bay the east side of the northern peninsula trends N. by W. $2\frac{1}{2}$ miles to the head of Sleepy bay, a small bight on the south side of cape Tourville.

CAPE TOURVILLE.—This cape projects about half a mile to the south-east, with a cluster of small islets or rocks extending from it about one mile to the north-east; these, together with the cape, probably protect Sleepy bay from the northward, although it must be fully exposed to the southward and eastward.

Aspect.—Freycinet peninsula, 2,014 feet high, and Schouten island, also high, are steep, and sterile towards the sea, but low and wooded on the west side; cape Tourville being also high, these alternate mountains and isthmuses give this part of the coast from seaward, the appearance of a chain of islands.

FLEURIEU or OYSTER BAY is formed on the east side by Schouten island and the peninsulas to the northward of it; and on the west side by the coast extending northward from cape Bailly. This bay is $9\frac{1}{2}$ miles wide at its entrance, whence it extends northward 14 miles to its low north shore.

The West shore of Fleurieu bay from cape Bailly, extends N.N.W. 2 miles, and then turns West one mile to the entrance of Little Swan port. A rock above water, with 11 fathoms close to the northward of it, lies near the shore one mile N. by W. $\frac{1}{4}$ W. from cape Bailly.

Little Swan port does not appear to be more than one cable wide at its entrance, but the port extends thence 3 miles in a S.W. direction, with the width of a mile; it is, however, only fit for boats. There are two small islets in the western part of Little Swan port, between which and its north shore is the mouth of Little Swan port river, an inconsiderable stream winding from the westward. Little Swan port mountain, 1,757 feet high, is situated S.W. by W. $\frac{1}{4}$ W. 9 miles from cape Bailly.

From Little Swan port the west shore of Fleurieu bay extends N. by E. $3\frac{1}{2}$ miles to Buxton point, and is intersected by two small streams, one at $1\frac{1}{4}$ miles, and the other at $2\frac{3}{4}$ miles north of the entrance of the port. The coast from Buxton point, after turning about one mile to the north-west, trends N.N.E. $\frac{1}{4}$ E. $5\frac{1}{2}$ miles to Webber point, between which, and Waterloo point N. by W. $2\frac{1}{2}$ miles from it, the coast forms a slight indentation, with a small stream flowing into it one mile northward of Webber point, and an inlet close to the southward of Waterloo point.

Swansea.—On the left bank of the small stream is the settlement of Swansea, where there is a telegraph station. A wharf extends 1,000 feet into deep water. There is communication by coaches to Campania and Campbell town on the Main line of railway, and to Hobart by steamer every week. Population 282 in 1891.

About one mile north-west of Waterloo point is the mouth of a small stream flowing from the south-westward, whence the north shore of Fleurieu bay curves E. by N. $\frac{3}{4}$ N. 7 miles to the entrance of Great Swan port. For about 5 miles westward from this opening the shore forms the south side of a low tongue of land, which separates Fleurieu bay from Great Swan port.

The East shore.—Refuge islet.—The east shore of Fleurieu bay has already been described as far north as the isthmus between Freycinet peninsula and that to the northward of it, on the west side of which the bay affords good anchorage, sheltered by Refuge islet, which, with some rocks close to the southward, lies near the shore one mile from the north-west part of the isthmus.

Wood and water may be procured from this anchorage with facility, the latter from the pond on the isthmus.

Hepburn point.—The bay on the west side of the northern isthmus, abreast of Sleepy bay, is $1\frac{1}{4}$ miles wide at its entrance between the west point of the northern peninsula, and Hepburn point to the northward of it, and is about 2 miles deep. Although there are several rocks in this bay, it is said to afford good anchorage. From Hepburn point the east shore of Fleurieu bay trends N.W. by N. $1\frac{1}{2}$ miles to the entrance of Great Swan port.

Soundings.—The middle of Fleurieu bay has not been sounded; but there are 12 to 6 fathoms from one mile off Buxton point to close off Webber point, whence, to within half a mile of the north shore, there are 7 to $5\frac{1}{2}$ fathoms, with $4\frac{1}{2}$ fathoms between the latter depth and the entrance of Great Swan port. From half a mile off the west point of the northern peninsula to the same distance off Hepburn point there are 7 to $4\frac{1}{2}$ fathoms.

GREAT SWAN PORT.—From its entrance, which appears to be not more than one cable wide, Great Swan port trends westward

5 miles along the north side of the tongue of land before noticed to the mouth of Swan river, which flows into the port from the northward and westward. The port from its entrance increases to one mile in width.

Moulting lagoon.—About $1\frac{1}{2}$ miles north-east of the mouth of Swan river is a narrow opening communicating with Moulting lagoon, which extends thence 5 miles in a N.N.E. direction, forming, by a projection of the north-west shore, two basins, the south-western being $2\frac{1}{2}$ miles, and the north-eastern $1\frac{1}{2}$ miles in extent. There are several islets, or rocks, in this lagoon, and a small stream flows into the north-eastern basin from the northward.

The East coast of Tasmania from cape Tourville extends 2 miles in a N. $\frac{1}{4}$ E. direction to the south-east point of Bluestone bay, and receding thence half a mile to the westward, it trends N.N.W. $\frac{1}{2}$ W. 3 miles to a double headland, having on its west side a small inlet; N.W. by N. $1\frac{1}{4}$ miles from this is a larger opening. Between the latter and Moulting lagoon, 2 miles to the westward of it, the land rises to mount Peter.

CAPE LODI.—From the north-west of these two inlets the coast trends northward 7 miles to cape Lodi, 3 miles south of which a point projects half a mile to the south-east from the line of coast. There are 14 fathoms water within a mile of the south-east point of Bluestone bay and 9 fathoms close off cape Lodi, with 8 to 5 fathoms near the coast between these points, but very few soundings have been taken.

Peggy point.—From cape Lodi the coast curves N. by W. $2\frac{3}{4}$ miles to Peggy point, close off which is a small islet. The coast from Peggy point forms a bay 2 miles deep, extending N. by W. $\frac{1}{4}$ W. $7\frac{1}{2}$ miles to the south extreme of Long point. The shores of this bay are intersected by several inlets and small streams, the largest of the former being an opening with a small islet in it, N.W. 3 miles from Peggy point. About one mile from Peggy point towards the opening is Diamond islet close to the shore. The small township Bicheno is situated on this coast.

LONG POINT is of a peninsular form, with its east face extending above a mile north and south, and forms a small bight on either

side of the isthmus which connects it with the mainland to the westward of it. These little bays have jetties, with coal shoots for the convenience of coasting vessels. The township is named Seymour.

Coal.—There are exports of coal, fire-clay, &c., from Long point, a seam of good coal having been opened, about half a mile from Long point, and worked by a company.

St. Patrick head.—About one mile West of the north part of Long point is an inlet with a narrow entrance, trending north and south parallel with the shore. From this inlet the coast extends $9\frac{3}{4}$ miles in a North direction to St. Patrick head, which, together with the coast for about 2 miles south of it, is bordered by a reef. There are 10 fathoms water close to the northward of the reef, which projects but a short distance from the head in that direction.

Soundings.—From about 10 miles East of cape Tourville to 7 miles N.E. of Long point there are 66 to 40 fathoms, with similar depths about 5 miles from the shore, but immediately outside those soundings there is no bottom at 89 fathoms.

The COAST from St. Patrick head trends W. by N. $\frac{1}{2}$ N. $1\frac{1}{2}$ miles and thence N. by W. $\frac{3}{4}$ W. 3 miles to the entrance of a creek trending irregularly nearly 2 miles in a N.N.W. direction. About 2 miles farther to the northward is the mouth of a small stream flowing from the northward and westward. From the mouth of this stream the coast extends N. $\frac{1}{2}$ E. 5 miles to the entrance of a creek, having a small arm trending to the westward and a larger one to the southward; S.S.E. 2 miles from this creek lies Paddy islet, about half a mile off the coast. The coast, consisting of a slightly curved sandy beach, next trends nearly N. by E. 6 miles to St. Helen's point.

The township of Falmouth is situated at the north-west end of the creek, $5\frac{1}{2}$ miles from St. Patrick head. Population about 100.

Signal station.—There is a signal station at Falmouth, and communication can be made by the commercial code; it is connected by telegraph.

Maurouard or St. Helen's isle, which lies South 5 miles from St. Helen's point, and a little more than a mile from the shore, is

nearly three-quarters of a mile long, east and west, with a rocky reef extending from it to the southward. Some fresh water has been found on the isle, and in case of absolute necessity a vessel might anchor in 18 fathoms between it and the shore. Between Maurouard isle and St. Helen's point there are 16, 11, and 5 fathoms water within half a mile of the shore.

Aspect.—From cape Tourville to cape Lodi the coast is rocky and barren, but towards St. Patrick head it appears to be well wooded, and, rising higher near St. Helen's point, presents several remarkable points of a pyramidal shape in the interior, the three most worthy of notice within 10 miles of the coast being Lyne Sugar-loaf, 1,777 feet high, W. $\frac{1}{2}$ S. 8 miles from cape Lodi; mount St. John, 2,550 feet high, S.W. by W. $\frac{3}{4}$ W. 10 miles from Long point; and mount Nicholas, 2,812 feet high, about 10 miles to the westward of St. Patrick head. There are more lofty mountains in the interior, St. Paul Dome, W. $\frac{1}{2}$ S. 11 miles from mount St. John, being 3,368 feet, and Ben Lomond, about N.W. $\frac{1}{2}$ W. 11 miles from the Dome, being 5,010 feet high.

ST. HELEN'S POINT is the north end of a long, and comparatively narrow tongue of land, with a continuous ridge of hills on it, extending in a N. by E. and N.N.E. direction to Bare top hill, which at two-thirds of a mile within the north-east extreme of the point, rises to the height of 250 feet. The point from Bare top hill to its north-east extreme is about three-quarters of a mile broad, and thickly fringed with rocks, none of which appear to extend beyond a cable from the shore, except from the south-east extreme of the point, whence a reef of rocks extends about 2 miles to the south-east: there are 60 fathoms a mile off the end of this reef, and 66 fathoms 4 miles farther to the eastward.

GEORGE BAY is an extensive harbour on the west side of the long tongue of land just noticed, with a wide deep approach from the sea, between St. Helen's point and Grant point to the north-west of it.

GRANT POINT, the outer north-west point of the entrance of George bay, is a rocky projection bearing N.N.W. $\frac{3}{4}$ W., distant

See charts, No. 1,079, and No. 1,081, George bay, scale $m = 3.0$ inches, entrance plan, scale $m = 8.4$ inches.

2 miles from Bare top hill. The land rises from Grant point to the height of 1,203 feet at mount Pearson, which bears W. $\frac{1}{2}$ N. distant $4\frac{1}{2}$ miles from the point. Elephant rock, which lies N.E. by N. a quarter of a mile from Grant point, is the south-eastern of a cluster of small islets and rocks, altogether not exceeding 2 cables in extent.

Entrance to George bay.—From Grant point the shore trends S.S.E. nearly half a mile to the inner north-west point of the entrance, which is $1\frac{1}{4}$ miles wide, N.W. by W. and S.E. by E. between this point and the north-west extreme of St. Helen's point. There are 14 fathoms in mid-channel, with soundings decreasing to 7 and 9 fathoms a cable off the south-east side of the entrance, and 7 to 5 fathoms within 2 cables of the north-west side. From this line of soundings the depths decrease to 4 and 3 fathoms when Bare top hill bears S.E. The shoalest water outside the bar, is within a quarter of a mile of the shore to the north-west of Bare top hill; but the depths quickly decrease to 9 and 8 feet upon the bar, which extends across the channel leading into George bay.

From the north extreme of St. Helen's point a very broken rocky shore extends nearly S.W. one mile, whence a low smooth shore trends West one-third of a mile to Blanche point, which lies W. $\frac{1}{2}$ S. nearly one mile from Bare top hill.

South shoal, which has irregular depths of one to 5 feet water on it, extends nearly half way across from the south-east to the opposite shore. From half a mile north-eastward of Blanche point the north-west edge of South shoal curves to $1\frac{3}{4}$ cables north-west of the point. A bight, one cable wide, with 10 to 6 feet water, runs in south-westward between the north-east end of the shoal and the shore, and a spit, with two knolls to the northward, projects 150 yards from Blanche point.

Middle shoal is a bank 200 to 150 yards broad, with 2 to 5 feet water, lying N.E. and S.W., nearly parallel with the north-west edge of South shoal, of which it may be considered to form the outer part, as it is only in the south-west end of the space between the two shoals that the water is one foot deeper than it is

on Middle shoal itself. The north-east end of this shoal lies N.E. by N. 6 cables, and the south-west, N.N.W. 2 cables from Blanche point.

Granite rock, Dora, and Clerk points.—From the inner north-west point of the entrance the irregular rocky west shore extends S. $\frac{3}{4}$ W. a little over one mile to Granite rock point, whence a more uniform shore trends S.W. $\frac{3}{4}$ S. nearly a quarter of a mile to Dora point, and then a quarter of a mile farther in the same direction to Clerk point, which lies West, one-third of a mile from Blanche point.

Beacons placed on Granite rock point in line lead over the bar.

North shoal.—The shore for about one-third of a mile northward from Granite rock point is fronted by North shoal, which has 2 to 4 feet water, and extends a quarter of a mile from the shore, terminating in a narrow irregular spit, with 4 and 5 feet water N.E. 4 cables from Granite rock point.

Outer bar.—The channel between North and Middle shoals, which is the principal passage into George bay, is about 120 to 270 yards wide, with only 8 and 9 feet water on the bar across its entrance. This bar appears to be permanent, as its state, when surveyed in 1862, by Lieutenant Brooker, agreed with Major Cotton's report of 1853, and with earlier records. From the bar the depth of water increases to $4\frac{3}{4}$ fathoms in the channel one cable southward of Granite rock point.

The East shore is low between Blanche point and Atkins point S. by W. $\frac{1}{2}$ W. $1\frac{1}{2}$ miles from it, and forms two bights, separated by Pelican point, a low sandy spit projecting 2 cables to the south-west and south. The northern bight is filled by shoals and sand-banks, with one to 8 feet water between them; and the southern bight is occupied by a sand and mud-flat. The outer edge of the former extends about 100 yards beyond the line between Blanche and Pelican points; and the outer edge of the sand and mud-flat recedes about 150 yards from the line between Pelican and Atkins points.

Horse-shoe bank, with one to 5 feet water, is a continuation of the South shoal, extending to one-third of a mile S.W. $\frac{1}{2}$ S. from

Blanche point, and appears to be the great obstacle to the navigation of George bay. From the sand-spit which projects from Blanche point, the east edge of Horse-shoe bank trends South and S.W. 4 cables to its south point, leaving an inlet with $1\frac{1}{2}$ to $2\frac{1}{4}$ fathoms between the bank and the shoal fronting the east shore, which inlet extends to within 100 yards of Blanche point. From its south point the west edge of Horse-shoe bank sweeps round north-westward and northward 4 cables to its north-west spit, which has a beacon on it, and 6 feet water.

Inner bar.—The channel from Dora point is uncertain; sometimes it takes a former direction, known as Glover channel, at others by the west shore, and when surveyed in 1862, it passed between the north-west spit of Horse-shoe bank and some small patches close off Dora point, which are marked by a white buoy, the channel being there about 70 yards wide, with a bar, on which there were 7 feet water. Thence the channel gradually increased to 150 yards in width off Clerk point, with depths of $1\frac{1}{2}$ to $2\frac{1}{2}$ fathoms; but 100 yards northward of this point a spit, with 4 feet water projects from the west shore to within 60 yards of Horse-shoe bank. About mid-way between Dora and Clerk points a black buoy is placed on the edge of the shoal at one cable off shore.

On the east side of the north-west spit of Horse-shoe bank there was in 1862, a blind channel 150 yards wide, with $4\frac{1}{4}$ to $1\frac{1}{4}$ fathoms water, running 2 cables southward into the bank, beyond which distance there were only 2 to 4 feet water for more than a cable in that direction. This, however, in 1863, appears to have become the channel, as it then crossed the Horse-shoe bank.

The West shore of George bay from Clerk point, forms a bight extending S. by W. $\frac{1}{4}$ W. $1\frac{2}{3}$ miles to a projection a quarter of a mile westward of Atkins point. This bight, which is 4 cables deep, with several ledges of rocks along its north-west shore, is filled with mud-flats covered at half-flood, the east edge of which, from Clerk point, trends South, S. $\frac{1}{2}$ W. and S.S.W. $1\frac{1}{3}$ miles to one cable off the south point of the bight, whence the outer edge of the west mud-flats sweeps round to the shore, about one-third of a mile to the south-west of the point.

The outer edge of these flats is steep and regular, except $1\frac{1}{2}$ cables north-west of Pelican point, where a 5-foot spit projects about

100 yards. There are several long narrow ditches running nearly north and south through these flats the most remarkable of which, from its entrance a quarter of a mile northward of Atkins point, runs up North to within 2 cables south-westward of the spit just mentioned; from 6 feet water in the entrance of this narrow inlet the depths increase to 12 feet near its northern end.

The Main channel into George bay from Clerk point, is bounded on the west side by the edge of the mud-flats just described, and on the east side by the Horse-shoe bank, the edge of the shoals northward of Pelican point, and the sand and mud-flats thence to Atkins point. From Clerk point the channel increases to $1\frac{1}{4}$ cables in width, abreast of the south point of Horse-shoe bank, with 13 to 7 and 9 feet water; between Pelican point and the 5-feet spit to the north-west of it, the channel is nearly one cable wide, with 2 to 4 fathoms water. From Pelican point to Atkins point the channel is generally about $1\frac{1}{4}$ cables wide, with an average depth of 3 fathoms in the fairway; there are 3 fathoms water within 80 yards of Pelican point, and 4 fathoms close to Atkins point.

The shores.—From a steep point, on which stands the Constable's house, S.S.W. $\frac{1}{2}$ W. $1\frac{1}{2}$ cables from Atkins point, the east shore trends S. by W. $\frac{1}{4}$ W. nearly half a mile to the north extreme of the south-east bight of George bay, which extends thence S.S.W. $\frac{3}{4}$ W. $1\frac{1}{2}$ miles to a small islet, close to a projecting bend of the shore, nearly half a mile south-east of which is a small lagoon. This bight is bordered by flats, which from its north-east point, extend W. by S. four-fifths of a mile; the western portion of these flats, for a distance of half a mile, being about 2 cables broad and divided by two narrow channels, with 13 to 8 feet water. The north edge of these flats is separated by a narrow channel, from a bank 200 to 100 yards broad, which, from 2 cables north-west of the north-east point of the bight, extends W.S.W. 4 cables. Although the narrow channel between this bank, and the flats to the southward of it, has 12 to 17 and 11 feet water, it appears too narrow at its western end to have any outlet in that direction. From $1\frac{1}{2}$ cables southward of the north-east point of the bight the flat, which borders the bight, extends 100 yards to 400 yards from the shore, projecting farthest from the middle of the bight.

From the projection a quarter of a mile westward of Atkins point, the west shore sweeps round about one mile in a S.W. by W. direction

to the east point of the entrance of Moulting bay, between 3 cables and half a mile eastward of which some rocks lie close to the shore. This forms the south shore of a hilly promontory, half a mile to one mile broad, projecting $1\frac{1}{2}$ miles from the northward, between Moulting bay and the bay from Horse-shoe bank to Atkins point.

The main channel from Atkins point trends in a S.W. and W.S.W. direction $1\frac{1}{4}$ miles to its opening into George bay, and is bounded on the north-west side by the south edge of the western mud-flats and the shore thence to the east point of the entrance of Moulting bay and on the opposite side by the bank and flats before noticed. The channel is 150 yards wide abreast of the Constable's house, with 4 fathoms close to the point on which the house stands; thence it increases to a quarter of a mile in width one-third of a mile farther to the south-westward, between which and its opening into George bay it varies from nearly one cable to a quarter of a mile in width; with irregular depths of 10 feet to 5 fathoms, the bottom being sand throughout the channel, from the entrance into the bay.

The east and central portion of this extensive land-locked harbour of George bay, contains, independently of its south-west and north arms, an area of nearly one square mile, with regular depths of 5 to 12 fathoms, over a bottom of mud.

South-west arm.—From the small islet at the south-west extreme of the south-east bight of George bay, the south-east shore curves in a S.W. $\frac{1}{2}$ S. direction nearly one mile to the south bight of the arm, which extends nine-tenths of a mile E. $\frac{3}{4}$ N. and W. $\frac{3}{4}$ S., and is one-third of a mile deep. About half a mile S.W. from the east point of the bight is a cliffy projection, on which are some farm buildings. From the west point of this bight the shore curves N.W. by N. a quarter of a mile to a projecting point, and thence nearly half a mile in a W. $\frac{1}{2}$ N. direction to Jason's Gates bridge. Some rocks above water extend about 100 yards from the projecting point. From the islet to the bridge there are 3 fathoms water within a cable of the shore.

The land behind this shore is hilly, and one-third of a mile S.E. of the east end of the south bight, rises to the height of 180 feet; there are several small streams in the valleys between these hills, and some springs close to the beach, about half a mile to the south-west of the small islet before mentioned.

McDonald point, the north-west entrance point of the south-west arm of George bay, is a sandy projection lying S.W. by S. one mile from the east entrance point of Moulting bay, and forms the south-east side of the mouth of George river.

The north-west shore of the south-west arm of George bay, from McDonald point, extends irregularly, half a mile in a S.W. by S. direction to a small islet in the mouth of a narrow creek, trending about N.W. by W. 4 cables to the foot of a little ridge of hills, which extends thence nearly one mile in a N.W. by W. $\frac{1}{2}$ W. direction. About one and $1\frac{3}{4}$ cables to the south-westward of McDonald point the low land between the south-west arm and George river is intersected by two narrow creeks trending nearly east and west.

St. Helen's, on the north side of the south-west arm, is a post town and telegraph station. Coaches run to St. Mary's and Scottsdale railway stations; and a steamer trades every alternate week to Hobart or Launceston. A large amount of tin ore from Blue tier and Thomas plain is shipped here. Population 400.

From the islet in the mouth of the creek, before noticed, the north-west shore of the south-west arm of George bay trends in and out, for a distance of three-fifths of a mile in a S.W. by W. $\frac{1}{4}$ W. direction to a low projecting point, on the west side of which, and a quarter of a mile within its extremity, is the mouth of a small stream flowing from the north-westward, and winding along the south-west side of the ridge. From the mouth of this stream the shore winds south-westward about three-quarters of a mile to Jason's Gates bridge.

From McDonald point to Jason's Gates bridge the shore appears to be everywhere inaccessible on account of mud-flats covered at half flood, which extend a quarter of a mile to half a mile from the shore. The edge of these flats, from about a quarter of a mile N.N.E. of McDonald point, trends E.S.E. 2 cables, and S.E. by S. 4 cables to an elbow projecting E. by S. half a mile from McDonald point, and forming between it and the small islet to the south-east, the entrance into the south-west arm. From this elbow the edge of the mud-flats curves three-fifths of a mile south-westward, and then sweeps round in a S.S.W. and W. $\frac{1}{2}$ S. direction three-quarters of a mile to the east side of the mouth of an inlet, nearly one cable wide, trending N.N.W. $\frac{1}{2}$ W. about a quarter of a mile, and reaching within 150 yards of the shore. From 5 fathoms in the entrance of this inlet the

depths in it gradually decrease to 5 feet, at little more than one cable from the low point to the northward of it. From the west side of the entrance of this inlet the edge of the mud-flats trends W.S.W. a quarter of a mile, whence it turns in and out, half a mile in a W. by N. $\frac{1}{2}$ N. direction to within a cable of the shore, and terminates at Jason's Gates bridge.

Oyster patch is about 100 yards in extent, with 6 feet water, from which the clifty point in the south bight bears S. $\frac{1}{4}$ E., and Jason's Gates bridge W. $\frac{1}{4}$ S. : there are 2 to 5 fathoms water close round the patch, and 3 and 4 fathoms between it and the east side of the entrance of the creek $1\frac{1}{2}$ cables to the north-westward. There are some stones on the mud-flat one-third of a mile to the north-east of the patch.

The navigable water in the south-west arm of George bay is half a mile wide at its entrance, whence it varies from 4 cables to three-quarters of a mile in width to within two-thirds of a mile of the bridge. There are 11 and 12 fathoms across the entrance, with similar depths up to Oyster patch, and 9 to 3 fathoms within a cable of the south shore and of the mud-flats, the bottom throughout being mud. The navigable water in the western corner of the arm, for about two-thirds of a mile outside the bridge, is a quarter of a mile broad, with 7 and 8 fathoms close off the rocks which project from the south shore, whence the depths gradually decrease towards the bridge, with 3 fathoms within 100 yards of the south shore, and of the mud-flats on the north side.

George river is one cable wide at its entrance, between McDonald point and the low point to the north-west of it, and fronted by small banks, extending a quarter of a mile to the northward. The river flows from the north-westward to about a cable northward of the ridge before-mentioned, and thence trends eastward to the entrance. From the entrance to three-quarters of a mile above it, where the river is only 50 yards wide, the depth of water does not exceed one to 3 feet.

From the north-west point of the entrance of George river the shore trends W.N.W. a quarter of a mile to a narrow creek, which communicates with the river one-third of a mile above the entrance and separates the low point from the more elevated land behind it. From this creek the west shore of George bay extends above half a mile northward to the west entrance point of Moulting bay, and is

bordered by a mud-flat which from one cable north-east of the creek to the same distance south of the point, does not extend beyond 150 yards from the shore ; the edge of the flat being steep-to, with 2 and 3 fathoms close to it. At a quarter of a mile northward of the creek last noticed, there is a farm close to the shore, from whence a jetty projects nearly to the edge of the flat.

Between the west shore of George bay and the opposite promontory there is a clear space extending upwards of three-quarters of a mile N.E. and S.W., and half a mile from N.W. to S.E., having 9 and 10 fathoms water in the centre, and 5 fathoms within 100 yards of the mud-flats, in which the western portion of this space is embayed.

Moulting bay, which is the north arm of George bay, is three-quarters of a mile across east and west at its entrance, whence it extends North $1\frac{1}{2}$ miles. From the east entrance point, to another projection half a mile north of it, the shore is steep with $2\frac{1}{2}$ to 4 and 5 fathoms about 50 yards from it. But with this exception the shores of the bay appear to be inaccessible, especially to the northward and westward, on account of a continuous mud-flat, the edge of which from the north point of the steep east shore just mentioned, extends 2 cables from the shore three-quarters of a mile farther to the northward. From the north and west shores the mud-flat extends one to $2\frac{1}{2}$ cables, and from the west entrance point it projects half way across towards the east shore, leaving an entrance two-fifths of a mile wide, with $2\frac{1}{4}$ to 9 fathoms water. Within the entrance there is a space one mile long, north and south, and three-quarters of a mile to a quarter of a mile wide, with 5 to 2 fathoms water on a bottom of mud. The north and north-west shores of Moulting bay are low, and intersected by several small streams. On the west side of the entrance the land is hilly and rises to a summit 700 feet high, W. by N. $1\frac{1}{2}$ miles from the west point of the entrance of the bay.

DIRECTIONS.—Although there is a sufficient space in George bay for a fleet of the largest ships, it is only available for vessels of light draught on account of the narrow intricate channel leading into the bay from its outer entrance, and the bars which obstruct the channel ; there are only 9 feet water on the outer bar to the north-west of Bare top hill, and uncertain depths in the shifting channels between Dora and Blanche points.

As the outer entrance of George bay is exposed to the northward and eastward, gales from between these points may naturally be

expected to cause heavy breakers upon the outer bar, when it would appear unsafe for any vessel to attempt to enter ; and even under the most favourable circumstances, there is only a sufficient depth of water in the entrance for vessels of light draught, there being as little as 8 feet on the bar at low water.

In a vessel, however, adapted to the depth of water on the bar, having, with smooth water and a commanding breeze, approached near enough to the entrance to clearly distinguish Granite rock point, bring the beacons on the point in line, which lead over the bar between Middle and North shoals, then steer to pass about half a cable southward of the point : thence, keep at the distance of about half a cable, along the west shore, between Granite rock and Dora points, passing between the white buoy off Dora point and the beacon on the spit of Horse-shoe bank. Having cleared the small patches close off the latter point, take the channel that may be the most practicable one, either along the west shore, leaving the black buoy on the edge of the flat on the starboard hand ; or through Horse-shoe bank, which a stranger should ascertain before passing Dora point.

From the south extreme of Horse-shoe bank steer a mid-channel course for Atkins point, keeping midway between Pelican point and the spit to the westward of it ; and after passing close to Atkins point, and that under the Constable's house to the south-west of it, steer in mid channel between the north shore, and the shoals immediately to the southward of it, $1\frac{1}{4}$ miles, which will clear the channel into George bay.

TIDES.—It is high water, full and change, in George bay, at 9 h. 42 m. ; springs rise 3 feet, neaps 2 feet.

The East coast of Tasmania from Grant point, curves to the north-westward and northward about $3\frac{1}{2}$ miles to a point, close off which lies Sloop rock. At three-quarters of a mile to the westward of Grant point is the entrance of a lagoon which branches to the south-westward and westward.

Between the point abreast of Sloop rock, and another projection N. by W. $\frac{1}{4}$ W. $2\frac{1}{2}$ miles from it, the coast forms an indentation half a mile deep, with a small double inlet in its south-west corner, and a sunken rock close off its north point. From the north point of this

bay the coast sweeps round N.N.W. 2 miles to a small inlet, and thence extends N. $\frac{1}{4}$ W. 5 miles to the entrance of Anson lake in the southern part of the bay of Fires. *See* pages 583-5.

The Gardens are some sunken patches which lie near the coast between the north point of the indentation just noticed and the small inlet 2 miles to the northward of it, but the outermost of these dangers does not appear to extend beyond a mile from the shore.

Soundings.—From 60 fathoms at 5 miles off St. Helen's point the soundings gradually decrease to 36 fathoms at 3 miles off Eddystone point. Between this line of soundings and the shore, for about 5 miles southward from Eddystone point, the soundings decrease to 15 fathoms at about one mile from the shore.

See chart, No. 1,079.

CHAPTER X.

AUSTRALIA.—EAST COAST, CAPE HOWE TO PORT JACKSON.

VARIATION IN 1897.

Cape Howe - - 9° 50' E. | Port Jackson - - 9° 35' E.

Nearly stationary.

NEW SOUTH WALES.

The COAST.—From Telegraph point, two-thirds of a mile N. by W. of the north point of Gabo island, the coast, which consists of bare white sand-hillocks, the highest being 143 feet, trends N.E. $\frac{1}{4}$ E. 3 miles to a sandy point, with a ledge of dry and sunken rocks extending half a mile in a S.S.E. direction from it, on which the sea breaks heavily; this point may be taken for cape Howe, as its bare sand-hills make it much more conspicuous than that cape, and thence the coast trends N.E. by N. $1\frac{1}{4}$ miles to cape Howe.

A reef.—At from three-quarters to one mile S. by W. of the above-mentioned sandy point is a reef of rocks with 19 feet water on its shoalest part. This reef is a quarter of a mile outside a line drawn from cape Howe to Gabo island lighthouse, and 2 miles from the former; it breaks heavily during a swell.

CAPE HOWE is a low point, composed of stones and sand, covered with ti trees; the land to the westward is almost level for 4 miles to the foot of Howe hill and the Howe range of mountains which extends nearly N.N.W. 5 miles from that hill.

At 3 miles to the N.N.W. of Howe range is another range, called Table hills, attaining an elevation of 1,786 feet, so that the whole aspect of the country about cape Howe is that of a mountainous district.

See charts, No. 1,211, Rame head to port Jackson, scale $m = 0.14$ inch; and No. 1,017, Gabo island to Montagu island, scale $m = 0.5$ inch.

A geodetic station, erected on nearly the highest part of the point one cable inland, to mark the boundary between Victoria and New South Wales, is 148 feet above the level of the sea.

Howe Hill, 1,300 feet high, is conspicuous, rising abruptly from the adjacent low land, its southern aspect exhibiting a steep fall, and its summit being shaped like a haystack. From Howe hill a range of round and flat-top hills extends in a northerly direction to Wonboyn river. On the south-west side of Howe hill is a lake of brackish water.

About $2\frac{1}{2}$ miles to the northward of Howe hill there is a deep cutting through the thick timber, open from the eastward; this is the boundary line cut by the Government of Victoria, dividing that colony from New South Wales.

The COAST.—From cape Howe a rocky coast trends N. by W. $\frac{1}{2}$ W. $3\frac{3}{4}$ miles to Black head, thence N.N.W. 5 miles to some cliffs of granite and porphyry, which sweep round in a N. by E. and N.W. direction 5 miles to the southern extreme of a long sandy beach in Disaster bay. A barren heath extends from cape Howe to the cliffs, but these are surmounted by steep grassy hills, bearing gum, oak, and other trees.

The coast from cape Howe to the south bluff of Disaster bay consists of steep rocky points, with a few sandy indentations.

DISASTER BAY, situated about 12 miles N. by W. from cape Howe, is 5 miles broad at its entrance, and 3 or 4 miles deep, terminating in a curved sandy beach $3\frac{1}{2}$ miles in length. In the north-west part of Disaster bay, and about $3\frac{1}{2}$ miles from the rocky bluff forming the south point of the bay, is Bay cliff, the south head of Wonboyn river, which is only accessible to boats in fine weather; the narrow mouth of this river is sometimes fordable for cattle, but the sand is continually shifting.

Anchorage with north-east winds may be had in 13 to 17 fathoms water near the northern shore, with no dangers and a cliffy coast.

GREEN CAPE (*Bundooro*), lying 15 miles N. $\frac{1}{4}$ E. from cape Howe, is a smooth, low point, covered with grass, dotted with patches of small bushes, and sloping gradually to the eastward, from an-

elevation of 501 feet $2\frac{1}{2}$ miles inland ; its coast to the northward is low and rocky ; there are 16 fathoms within a quarter of a mile from the cape, and no outlying dangers.

LIGHT.—A lighthouse, 68 feet in height, on the extremity of Green cape, exhibits at 144 feet above the sea a *flashing* white light, showing a flash *every fifty seconds* ; the light is visible between the bearings of N. 5° E. and S. 25° E., and should be seen from a distance of 19 miles in clear weather.

Signal station.—There is a signal station at Green cape, and communication can be made by the commercial code. It is connected by telegraph.

The COAST.—From Green cape the coast trends N.W. by N. 3 miles to Bitangabee creek (with 9 feet of water), which is a good harbour for small vessels or boats ; thence N.N.W. $4\frac{1}{2}$ miles to Mowwarry point ; and then N.W. by W. $3\frac{1}{2}$ miles to Red point. The coast from Green cape to Red point is bold, with rocky points and small sandy beaches, having 15 to 20 fathoms within half a mile of the shore, the land along it being generally barren heath, with good grass on the points ; the back country is hilly, and thickly wooded. Haycock hill, 922 feet above the sea, and W.S.W. $2\frac{1}{2}$ miles from Mowwarry point, is the highest of these hills ; but the most elevated land in this locality is mount Imlay, a remarkable and densely wooded peak, 2,910 feet in height, bearing W. $\frac{3}{4}$ N., distant nearly 16 miles from Green cape.

Soundings.—There are 50 fathoms about 6 miles off Green cape, 48 fathoms 7 miles off Mowwarry point, and 42 fathoms 8 miles north-eastward of Red point, with gradually decreasing depths towards the coast, along which there are 31 to 22 fathoms one mile from it.

Mowwarry rock, 80 feet high, and shaped like a haystack, is conspicuous from the southward ; it lies $7\frac{3}{4}$ miles N.N.W. $\frac{1}{2}$ W. from Green cape.

Red point, the south head of Twofold bay, lies $3\frac{1}{2}$ miles N.W. by W. from Mowwarry rock, and may be known by a white stone tower on it 66 feet above the sea.

TWOFOLD BAY is $2\frac{3}{4}$ miles wide between Red point and Worang point, the north point of the bay, and from a depth of 20 fathoms midway between the points the bay extends 4 miles westward to the head of Nullica bay. The entrance is free from dangers, with the exception of a rock with 5 fathoms water, on which the sea breaks only in bad weather from the eastward, lying N. $\frac{1}{2}$ E. 4 cables from the white stone tower on Red point; $1\frac{1}{2}$ cables in the same direction from the tower is a rock covered at high water, on which sea always breaks. Between this rock and the point there are 4 fathoms water, and between the two rocks 7 fathoms. The west end of the long sandy beach at the entrance to Walker river, kept in sight clear of Jews head, bearing W.S.W. (S. 67° W.), leads north of the 5-fathoms rock, in 14 fathoms.

Aspect.—The land about Twofold bay appears more mountainous than the coast immediately north or south of it; the hills, which are either round or sharp-topped, lying in clusters, and gradually increasing in elevation to the westward. Mount Imlay is sometimes obscured, but when seen is an excellent mark for entering the bay. *See* pages 759, 765.

The South shore of Twofold bay, between Red point and Honeysuckle point, three-quarters of a mile to the westward of it, forms an exposed bay, having 4 fathoms water close to its points, and 8 to 11 fathoms between them. A small rock above water lies close to the shore, a quarter of a mile to the south-east of Honeysuckle point.

From Honeysuckle point a bold cliffy shore extends W.S.W. nearly one-third of a mile to Jews head, off the north-west extreme of which, and in a direction towards Lookout point, is a rock with 3 fathoms water, $1\frac{1}{2}$ cables from the shore; the white tower on Red point, kept in sight north of the north-east extreme of Jews head, leads clear of the rock in 7 fathoms. From Jews head the coast trends S.W. 3 cables to Munganoo point, the north-east point of East Boyd bay.

EAST BOYD BAY, which appears to afford the most sheltered anchorage for large vessels on the south side of Twofold bay, extends from Munganoo point S.W. nearly one mile to Brierly point, and is half a mile deep. A bank with 12 to 9 feet water on it extends about

one cable from the shore round the bay to within a quarter of a mile of Brierly point, from which the bank projects one-third of a mile to the northward. East Boyd, on the east side of this bay, about one-third of a mile southward of Munganoo point, was a whaling station, and contains a few houses, probably uninhabited.

Anchorage.—Small vessels anchor in East Boyd bay, in from $3\frac{1}{2}$ to $2\frac{1}{2}$ fathoms, sandy bottom, by bringing Worang point and Munganoo point in line about N. $\frac{1}{2}$ E.; large vessels find shelter from south and south-east winds further out in 5 or 6 fathoms, and smoother water with easterly winds than on the opposite shore in Snug cove.

Water may be obtained from a well, sunk on a flat at the back of one of the little sandy beaches, on the east shore of this bay, but in times of drought it is low and not good.

Kiyerr inlet, at $1\frac{1}{2}$ cables to the southward of Brierly point, is a shallow opening only a few yards wide, forming the mouth of a lagoon, separated from the south shore of Twofold bay by a low narrow barrier, extending from Kiyerr inlet W.N.W. one mile, or to about one-third of a mile south-eastward of Torarago point, on which are the ruins of a tower, bearing W. $\frac{1}{2}$ S., distant $1\frac{3}{4}$ miles from Munganoo point. The lagoon, which is full of low islets and shoals, forms the estuary of the Towamba or Walker river, an inconsiderable stream winding into Twofold bay from the southward, having 6 feet at low water on the bar. This river is sometimes frequented by small craft to ship potatoes; and whale oil used to be shipped here, the boiling-down establishment being situated in a little bight south of Brierly point, named Kiyerr, beyond which the river is only navigable for boats. Between Brierly point and Whale spit, which dries at low water and projects about $2\frac{3}{4}$ cables north-eastward from Torarago point, a bank having 6 to 12 feet water on it, extends 4 to 2 cables from the low narrow barrier just noticed, and about three-quarters of a cable from Whale spit.

Red point open north of Jews head leads clear of Whale spit.

Nullica bay, which forms the western bight of Twofold bay, is $1\frac{1}{4}$ miles wide between Torarago and Oman points, with 4 to 5 fathoms water between them; the bay shoals gradually to 12 feet for a mile to the westward, $1\frac{1}{2}$ cables from the beach.

Between Whale spit and the mouth of Myruial creek, situated W. by N. $\frac{1}{2}$ N. about one mile from the ruins of the tower on Torarago point, is a sandy bay, half a mile deep, close behind which are the remains of the township of West Boyd, consisting of a few deserted houses.

A flat, with 6 to 18 feet water on it, extends 2 to 4 cables from the shore between Whale spit and Myruial creek.

From Myruial creek the north-west shore curves round northward and north-eastward about $1\frac{1}{4}$ miles to Oman point. A ledge of rocks extends $1\frac{1}{2}$ cables from the north point of the mouth of the creek; thence to Oman point, shoals with 6 to 13 feet water on them extend one to 2 cables from the shore, except at half a mile northward of the creek, where there are 3 fathoms close to the land.

The shore from Oman point trends N.E. $\frac{1}{2}$ E. nearly half a mile to Cocora point, which forms the west extreme of Snug cove. On the east side of Oman point a shoal, with 12 feet water on it, projects about $1\frac{1}{2}$ cables from the shore; but there are 4 fathoms between the shoal and Cocora point.

Lookout point is a rocky peninsula one-third of a mile broad, with a few stunted trees on its summit, and presenting a steep cliffy aspect to the southward and eastward; the point is situated about midway on the north shore of the bay, from which it projects towards the south-east about two-thirds of a mile, and is connected with the mainland by a low narrow spit of sand, half a cable wide, forming two small bights or coves, the southern of which is Snug cove.

LIGHT.—The lighthouse on the south extremity of Lookout point is a wooden structure 45 feet high, painted white, and exhibits at 125 feet above high water a *fixed* red light, visible seaward between the bearings of N. 62° W. and S. 39° W.; the light should be seen from a distance of 7 miles in clear weather, and is intended only as a guide for coasters frequenting the place.

Rocks.—About $1\frac{1}{2}$ cables East from the lighthouse is a rock awash at low water, and E. by S. $\frac{3}{4}$ S. $2\frac{1}{3}$ cables from the lighthouse is a sunken pinnacle rock, with $3\frac{1}{2}$ fathoms water over it; on the former the sea nearly always breaks, but on the latter only in bad weather.

EDEN is a small settlement situated at the back of Lookout point. The town is built on the slopes and valley between two hills which jut out into the bay, dividing it into two parts. Eden since 1880 has recovered some of its former trade owing to the calling of steam-vessels. A road from Eden gives access to the Monaro district and passes through Cooma, the present terminus of the southern railway. The principal trade consists in the shipment of live stock to Hobart, pigs and bacon to Melbourne, and wool and hides to Sydney. The population of Eden in 1891 was 359 persons. There is a telegraph station here. In 1894 the value of the imports was £618, and of the exports £15,819.

Rainfall.—The average rainfall at Eden is 37·2 inches, falling on 123 days annually.

Snug cove, the anchorage off the township of Eden, extends nearly two-thirds of a mile east and west between Cocora point and the lighthouse on Lookout point, but is not more than a quarter of a mile deep, and is bordered by a shoal, which extends 100 to 200 yards from the shore. There are 5 to 3 fathoms water in the cove, bottom soft clay and sand, where two or three small craft can lie land-locked off the jetty, by shutting in Red point with the south extreme of Look-out point. Larger vessels anchor in 6 fathoms, about half a mile westward of the lighthouse, or in 4 fathoms about $1\frac{1}{2}$ cables further to the north-westward, with the lighthouse bearing East, and Eden jetty, on the east side of the cove, N.E. This anchorage is, however, exposed to the heavy swell of an east or south-east gale, only partially broken by the heads, but during north-east winds it is snug.

Soundings.—There are 10 fathoms water midway between the lighthouse and Brierly point, whence the depths gradually decrease to 3 fathoms at the edge of the banks which border the shores of Nullica bay.

Yallungo cove is a small inlet on the north-east side of the isthmus which connects Lookout point with the mainland; some dry and sunken rocks extend across the entrance of the cove, and a reef borders the shore immediately to the northward of it.

All the points which project into Twofold bay are the terminations of thickly timbered ranges of hills, with numerous creeks and lagoons between them, most of which have salt, or brackish water.

Calle-Calle bay, the exposed northern bight of Twofold bay,

is $1\frac{1}{2}$ miles wide, N.E. and S.W., between Lookout and Worang points, and is nearly $1\frac{1}{4}$ miles deep, with 13 to 12 fathoms across its entrance, from the middle of which the depths gradually decrease to 3 fathoms at the head of the bay, close off the mouth of Curalo lagoon, a narrow shallow opening, at times apparently blocked up, and bearing N.W. by W. $\frac{1}{2}$ W., distant $1\frac{1}{4}$ miles from Worang point.

Calle-Calle bay affords shelter from the north-east winds, but it is not a desirable anchorage, being open to south-east and southerly winds, and almost always disturbed by a swell.

Curalo lagoon is an extensive sheet of salt water, which, from its entrance trends, with gradually increasing width, about one mile to the south-westward, where it is half a mile wide, with a branch extending into the thickly timbered land to the north-westward. This lagoon, abounding with excellent fish, is only separated from the north-western shore of Calle-Calle bay by a low narrow tongue of land.

Pilots.—On a vessel off Twofold bay making the usual signal, she will be boarded by the pilot as soon as practicable.

The pilot, who is also harbour-master, and a boat's crew are stationed in the bay.

Signal station.—There is a signal station at Twofold bay light-house and communication can be made by the commercial code. It is connected by telegraph.

Storm signals.—A storm signal mast is placed near the light-house. Notice of gales blowing on any part of the coast of New South Wales is communicated to vessels passing Twofold bay. *See* pages 24, 840.

Custom house.—A custom house officer is stationed here, and the usual regulations must be observed, and the rates paid as at other ports of entry and discharge in the colony, should a vessel break bulk or land passengers.

Supplies.—Wood in abundance can be procured in all parts of Twofold bay; water may be obtained at Eden, and also on the south side of the bay at East Boyd; other supplies are scarce, difficult to get, and prices high. The ponds and lagoons, which are at the back of most of the beaches are frequented by ducks, teal, herons, red-bills, and some small flights of curlew and plover; and the bay appears to be well stocked with fish.

DIRECTIONS.—Twofold bay is so open to seaward and is so free from detached dangers, that there is very little difficulty in entering it; mount Imlay, bearing S.W. $\frac{1}{4}$ W. (S. 48° W.) leads midway between the entrance points. On approaching the bay, take care to avoid the sunken rocks which lie to the northward of Red point (*see* page 760), and having distinctly made out the lighthouse and other objects, the ruins of the tower on the east side of West Boyd kept on a S.W. by W. (S. 56° W.) bearing leads in through the middle of the bay, when anchor either in Snug cove off the township of Eden, or in either of the anchorages off East or West Boyd, according to the prevailing wind, or as most convenient.

When running for Twofold bay in bad or thick weather, after dark, the light must not be depended on for making the place, as it is difficult to distinguish in such weather, and the lighthouse should not be approached within one-third of a mile.

In entering Snug cove with a southerly wind care must be taken to shorten sail in good time and to drop the anchor in 6 or 5 fathoms, before Red point comes on with the south extreme of Lookout point, and in veering cable the lead should be hove over the stern of the vessel.

In rounding Lookout point and entering Snug cove with much sea on, the Red tower amongst the trees at the back of the West Boyd town, kept open north of Torarago point, S.W. $\frac{1}{4}$ W. (S. 48° W.), leads in 11 fathoms a quarter of a mile south of the rocks.

For shelter in Twofold bay from a south-easterly gale the anchorage off East or West Boyd, on the south side of the bay, is far preferable to Snug cove; and it is by no means certain that it is not so even with an easterly gale. The southern part of Nullica bay, off West Boyd, is a very convenient anchorage, and was the constant resort of coasters.

TIDES.—It is high water, full and change, in Twofold bay at 8 h. 15 m.; rise 5 to 7 feet.

The COAST.—Mewstone is a small rock, 20 feet high, lying one cable south-east of Worang point; it is steep-to, but there is no passage inside. From this rock the coast trends N. by W. $\frac{1}{2}$ W. 2 miles to a point having close in front of it Bullara or Lennard

island, which is flat, with a reef projecting a short distance from its north extreme. From this island the coast curves N.W. by N. 2 miles to the red Quoraburagun cliffs, and thence North $2\frac{1}{4}$ miles to Ioala point, which is connected by a reef of rocks with Haystack rock, a remarkable round-shaped boulder, 50 feet high, lying close off the point. A succession of rocky points from Haystack rock sweeps round north-westward and westward one mile to the entrance of Panbula river. The most elevated land between Twofold bay and this river is mount Robinson, a long hill, 1,127 feet high, at 4 miles N.W. by W. of Worang point, and 3 miles W. $\frac{1}{4}$ S. of Bullära island. The land is everywhere thickly wooded, and rises gradually to mount Robinson.

MERIMBULA BAY.—Is a sandy indent, lying between Ioala and Merimbula points, bearing from each other N. by W. $\frac{3}{4}$ W. and S. by E. $\frac{3}{4}$ E. distant $2\frac{3}{4}$ miles; it is about $1\frac{3}{4}$ miles deep, with 16 to 17 fathoms water, shoaling gradually to 8 fathoms within $2\frac{1}{2}$ cables of the beach.

Hunter rock, with $3\frac{1}{2}$ fathoms, on which the sea seldom breaks, lies N. by W. 5 cables from Haystack rock. The small sandy beach between two conspicuous bluffs on the west side of the entrance to Panbula river, kept open of the north extreme of Ioala point, leads to the northward of Hunter rock; the extremes of Ioala point and Bullära island in line lead to the westward; and Haystack rock on with Quondolo red cliff in the sandy bight south, leads to the eastward of it. There is a channel between Hunter rock and Ioala point, and the northern of the two bluffs well shut in by Ioala point leads through it.

Panbula river discharges itself into the south-west corner of Merimbula bay; and is accessible only for boats or small craft immediately after floods, which sweep the bar away. The river is about one or 2 cables wide, and trends south-westward nearly 2 miles into Panbula lake, which is about $1\frac{1}{2}$ miles in extent, with several small streams flowing into it. The village of Panbula, at about $2\frac{1}{2}$ miles to the westward of the entrance of the river, is situated near the Walker branch, which flows into the lake from the westward, between Melton hill to the northward, and Mowbray range to the southward of it. The population of Panbula was 422 in 1891. There is a telegraph station here, and there are six mails a week from Sydney.

Anchorage.—Good anchorage sheltered from south-west and southerly winds may be obtained off the entrance of Panbula river in 6 fathoms, with the north part of Ioala point bearing East, and Merimbula point N. by E. (N. 11° E.).

Merimbula creek and lake.—From the bluff forming the west head of Panbula river the coast is a long sandy beach, curving in a northerly direction for 3 miles to Merimbula creek, which runs out from the lake in the north-west corner of the bay. There are at times 7 feet at high water on the bar of this creek; it is visited weekly by a small steam-vessel from Sydney, which has to warp in through the winding, narrow, shoal channel to the small settlement some 2 miles from the entrance. Merimbula lake is somewhat of a triangular form, and about $1\frac{1}{2}$ miles in extent, its east side being separated from the sea by a narrow sandy flat covered with scrub.

Merimbula is a township situated on Merimbula lake, with a population in 1891 of 184 persons; there are several storehouses and a pier situated nearly at the mouth of the lake; good roads extend back into the country, along which wool, and other produce, is carted down for export to Sydney. There is a telegraph station here, there are six mails a week from Sydney, and there is weekly communication with Sydney by steamer.

No directions can be given for entering Merimbula creek, it can only be recommended for boats; buoys have to be placed by the trading steam-vessel almost every trip; the rocks on one side of the entrance, and the sand-spit on the other, cause great risk whenever she enters; and the vessel is also frequently bar bound for several days at a time during neaps.

TIDES.—It is high-water, full and change, at Panbula river at 9h. 0m.; springs rise, 4 to 6 feet.

MERIMBULA POINT projecting about a mile in a south-east direction from the north side of the entrance of Panbula river, is a steep, cliffy headland, affording at a quarter of a mile off shore shelter from north-east winds, in about 6 fathoms, sand; but on the appearance of a southerly wind it must be left, as a heavy sea rolls in.

The COAST.—About one mile N.N.W. from Merimbula point is Panbula inlet, whence the coast extends N. by E. $1\frac{2}{3}$ miles to Tura head, between which and Turingal point, N. $\frac{1}{4}$ W. 4 miles from the head, is a bay $1\frac{1}{2}$ miles deep, divided midway by Bournda island, close behind which is a salt-water pool. Wallagoot lagoon, which lies nearly one mile to the westward of Turingal point, is also salt, and is only separated from the shore of the bay by a narrow ridge, without any apparent opening.

Wolumla or Massey peak.—From Panbula inlet to Bournda island the coast consists of sandstone and pipeclay cliffs, with grassy headlands and low scrubby ranges behind. The most remarkable hill behind this part of the coast appears to be Massey peak, a thickly wooded mountain 2,660 feet high, bearing W. by S. $\frac{1}{4}$ S., distant 11 miles from Tura head.

TATHRA HEAD.—From Turingal point, an uneven line of granite and pipeclay cliffs, with grassy land over them, extends 4 miles N. $\frac{1}{2}$ E. to Tathra head, between which and Wajurda point, 2 miles N. $\frac{1}{4}$ W. from the head, is an exposed bay about three-quarters of a mile deep.

Tathra.—A small pier extends from the south shore of this bay, with moorings off it, laid down by the government; it is visited by the steam-vessel on her way to Merimbula, and when the wind is off the land, or the weather fine, by small schooners; most of the Bega district market commodities are exported from this place. Communication with the town of Bega, 10 miles inland, is by coach.

Mogareka inlet and Bega river.—About $1\frac{1}{2}$ miles to the south-westward of Wajurda point is Mogareka inlet, the mouth of Bega river, which is sometimes open, with 6 feet water on the bar. Close within its mouth, where there is a small islet, this inlet forms three branches, two of which trend to the southward whilst the main branch winds S.W. and S.E. about $2\frac{1}{2}$ miles to two small islets, above which the river flows between the ranges of hills, from the westward. Between Tathra head and Mogareka inlet the shore is low and sandy; but between the inlet and Wajurda point the land is more elevated, with some rocks near the shore.

Baronda head and inlet.—Baronda head is a rocky projection nearly half a mile to the northward of Wajurda point, and forms the north side of the mouth of Baronda inlet, which is dangerous even for boats, being very narrow, with sunken rocks on either side of it. From Baronda head a beach extends N. by E. $2\frac{1}{4}$ miles to Tanya lagoon, and at N. by E. $1\frac{1}{2}$ miles from this lagoon is Bithry inlet, which is not fordable.

BUNGA HEAD.—From Bithry inlet the coast consists of a series of small projecting rocky points trending irregularly, N.N.E. $3\frac{1}{4}$ miles to Bunga head, which is a steep, cliffy headland, forming the most prominent projection from the coast when seen from the northward or southward; the cliff is 200 feet high, having a peaked summit 400 feet high; several detached dry and sunken rocks fringe its base from a half to one cable distant. About one quarter of a mile S. by E. from the head lies Mimosa rock. Hence the coast trends N. $\frac{1}{2}$ E. $1\frac{1}{2}$ miles to Goalen head, a green, smooth, sloping point with dark rocky shores; about one mile to the north-westward of which, is Erungona creek. The coast from Bithry inlet to Erungona creek is closely bordered with dry and sunken rocks, except at about $1\frac{1}{2}$ miles to the south-westward of Bunga head, where there appears to be a sandy beach nearly half a mile long.

Thubbul inlet and river.—From Erungona creek a low sandy beach curves to the northward one mile to Thubbul inlet, the estuary of the river of the same name. This inlet is narrow and fordable at its mouth, within which it is 2 or 3 cables wide, and trends about W.S.W. two-thirds of a mile to where the river winds into it from the north-westward. At about $2\frac{1}{2}$ miles above the mouth of the inlet the water is said to be fresh.

ASPECT.—The land between Mogareka inlet and Thubbul river is generally poor, with high scrubby hills, destitute of grass. Mount Townsend or Mumbulla, 2,630 feet high, lies West $9\frac{1}{2}$ miles from Bunga head, and is the summit of a high, thickly-timbered range of mountains, rising in gradations towards it from north and south; it appears round topped from some views, whilst from others it appears sharp with a nipple top; there are several peaks 1,500 to 2,100 feet high around it within a radius of 2 miles. From about 2 miles southward of this mountain, one ridge trends in a W. by N. direction,

whilst others branch off to the south-eastward and eastward, terminating at Wajurda point and at other points of the coast between Tanya lagoon and Erungona creek.

SOUNDINGS.—There are 65 fathoms, sand, at about 15 miles off Twofold bay, and no bottom at 100 fathoms at the same distance off Bunga head, from which depths the soundings decrease with some regularity towards the land. From 10 miles eastward of Twofold bay to about the same distance to the eastward of Thubbul river, there are 50 to 70 fathoms at an average distance of 10 miles from the shore.

Baragga point.—Burratat rocks.—Baragga point is the central of a series of small rocky points, bordered with sunken rocks, which, from Thubbul inlet, sweep round in a N.N.E. and N.W. by N. direction $2\frac{1}{2}$ miles to a salt lagoon close to the shore, whence a sandy beach trends N. $\frac{1}{2}$ E. nearly 2 miles to Jerimbut point, which has a reef of sunken rocks projecting from it, and is fronted by the three Burratat rocks, above water.

Bermagüe inlet.—The coast from Jerimbut point extends N. $\frac{1}{2}$ E. nearly $2\frac{1}{4}$ miles to a rocky projection, at three-quarters of a mile to the westward of which is Bermagüe inlet, across the narrow entrance of which is a 6-foot bar, with apparently some sunken rocks close off the east point of the entrance. This inlet appears to be much encumbered by two islets or banks, lying in it, one being close within the entrance, and the other at about half a mile farther to the westward. Several small craft trade to the inlet for wattle bark and timber. The township of Bermagüe has postal and telegraphic communication; population 210.

Anchorage.—Small vessels can obtain anchorage, protected from southerly winds, under the head to the eastward of Bermagüe inlet.

Tides.—It is high water, full and change, on Bermagüe bar at 9h. 20m.; rise 5 feet.

The COAST.—For the first 2 miles northward of Thubbul inlet the country is good for cattle, but thence to Bermagüe inlet there are thick scrub and forest. From Bermagüe inlet a low sandy beach,

backed by a swamp, curves to the northward $2\frac{1}{2}$ miles to the south part of Murunna point. Close behind the beach, at a quarter of a mile to the westward of the north part of Murunna point, is Walluga lake, the water of which is salt. Thence a sandy beach, backed by good pasture, with plenty of fresh water, extends N.N.E. $\frac{1}{2}$ E. nearly 3 miles to a double point, at N.N.E. $\frac{3}{4}$ E., 2 miles from which is cape Dromedary. Shoal water extends over half a mile off shore at $1\frac{1}{4}$ miles northward of Murunna point.

MOUNT DROMEDARY, the most remarkable object on this part of the coast, and visible in clear weather from a distance of 60 miles, is a double mountain 2,706 feet high, which, from its figure, was named by Captain Cook mount Dromedary; it stands 4 miles back from the coast, with Ajungagua hill, 702 feet high, between the mount and the cape of that name.

CAPE DROMEDARY, which lies E. $\frac{3}{4}$ N. $5\frac{1}{4}$ miles from the mountain of the same name, is the eastern of a series of granite and ironstone points, extending from $1\frac{1}{2}$ miles S.S.W. $\frac{1}{2}$ W. of the cape to Barbunga lagoon, at N.N.W. $\frac{1}{2}$ W. $1\frac{1}{4}$ miles from it. Several rocks lie along these points, and between cape Dromedary and Barbunga lagoon, reefs of dry and sunken rocks project some distance from the shore.

Nugget point.—From Barbunga lagoon a sandy shore, with some sunken rocks close to it, trends nearly N.N.E. $1\frac{3}{4}$ miles to Nugget point, from which a succession of granite and ironstone points and small sandy bays extends nearly N.N.W. $3\frac{1}{2}$ miles to Wagonga inlet. Nugget point and the other projections between it and Wagonga inlet, are bordered with reefs. Between Barbunga lagoon and Wagonga inlet there is good grazing country along the headlands, but it is intersected by salt and brackish lagoons, and some parts are thickly wooded.

MONTAGU ISLAND (BARUNGUBA), E. by N. $\frac{1}{2}$ N. $3\frac{3}{4}$ miles from Nugget point, may be called two islets, being divided near the centre by a deep rocky chasm, through which the sea breaks with heavy easterly winds; it is about one mile long, N. by W. and S. by E., and one-third of a mile broad. The south part of the island, 210 feet high near its centre, is of granite formation, with long rank grass and scrub growing on

See charts, No. 1,017; and No. 1,018, Montagu island to Beecroft head, scale $m = 0.5$ inch.

it, abounding with rabbits; the soil appears to be of a rich quality; its coast is rocky, and from 300 to 500 yards from the south extreme of the island, which is low and bare, there are a number of large granite boulders. The north part of this island, some 20 or 30 feet lower than the south, is of volcanic formation, masses of conglomerate lying about it; it is also covered with long grass.

A ridge of rocks with from 5 to 9 fathoms water on it extends from the south-west extreme of Montagu island in a S. by W. $\frac{3}{4}$ W. direction little more than a mile; on its south end are 6 fathoms, on which the sea frequently breaks in bad weather. The ledge is steep on both sides, dropping suddenly into 13 and 15 fathoms to the westward, and 15 and 20 to the eastward. It should be avoided by vessels, particularly small coasters, in heavy weather, as there is a confused sea on the ridge.

LIGHT.—A lighthouse on the summit of the island, exhibits at 250 feet above the sea, a *fixed and flashing* white light, showing a *fixed light for 33 seconds, eclipsed for 16 seconds, flash for 5 seconds, and eclipsed for 16 seconds.* The light should be seen from a distance of 20 miles in clear weather.

Signal station.—There is a signal station at Montagu island lighthouse and communication can be made by the commercial code. It is not connected by telegraph.

Tides.—It is high water, full and change, at Montagu island, at 8h. 30m., springs rise 5 to 7 feet.

Anchorage.—Small vessels sometimes anchor with easterly and south-easterly winds, in a small bight on the west coast formed by the two parts of the island, but it cannot be recommended for large ships. Small craft unable to get off the land or fetch a safer anchorage would find tolerable shelter in this little cove by getting as close in as possible with the gap open E. $\frac{1}{2}$ N., one cable off shore. The bottom is irregular and rocky.

DIRECTIONS.—In navigating this part of the coast, steam vessels, and sailing vessels having a fair wind, bound northward, are recommended to keep inside Montagu island, and about 2 miles off

the mainland all the way to the northward, to avoid the southerly current usually found outside; at this distance from the coast an eddy sometimes runs to the northward.

SOUNDINGS.—From 5 miles off Thubbul river to about one mile westward of Montagu island, the soundings range from 51 to 17 fathoms, on a sandy bottom; but at 7 miles south-eastward of the island there is no bottom at 100 fathoms.

Wagonga inlet has a narrow entrance, sometimes accessible to small vessels, but there is generally a heavy break across it. Within the entrance this inlet extends about $1\frac{1}{2}$ miles to the south-westward, with several creeks branching to the northward and southward, and an islet, or bank in the middle of it, between which and the south-eastern bight of the inlet is the anchorage for such small vessels as may enter.

Wagonga is a small postal town, the population in the district in 1891 being 300. There are four saw mills. In the vicinity of mount Dromedary are extensive gold reefs.

YELLOW HEAD.—MARKA POINT.—From Wagonga inlet the coast, consisting of sandy beaches and rocky points mostly bordered by reefs, extends nearly N. $\frac{3}{4}$ W. 3 miles to Yellow head, on the north side of which is Minmuga lake, a salt lagoon, about a quarter of a mile wide, trending to the westward. A low sandy beach from Minmuga lake extends N. by W. $\frac{1}{2}$ W. $1\frac{3}{4}$ miles to Burra lake, which is about three-quarters of a mile in extent, and thence N. $\frac{1}{2}$ E. $1\frac{1}{4}$ miles to a smaller lagoon, at N. by E. $\frac{1}{2}$ E. half a mile from which is Marka point: the coast from this lagoon to Marka point and for about a mile to the north-westward of it, is bordered with sunken rocks. Although the country from Wagonga inlet to Marka point is partly covered with scrub and is intersected by salt lagoons it affords good pasture along the headlands.

Turos inlet (Boogon) and Turos river.—At about three-quarters of a mile to the north-west of Marka point is a small hilly projection, whence a low narrow tongue of land extends North, three-quarters of a mile to the mouth of Turos inlet, which does not appear more than one cable wide, and is sometimes closed; but after heavy rains it is open, and only fordable at low water.

There is a sunken rock about 2 cables off the mouth of the inlet. Within its entrance Tuross inlet forms a labyrinth of points, creeks, and islets, extending about 3 miles north and south, and east and west. At about 3 miles westward of its entrance, Tuross inlet receives the waters of Tuross river, a considerable stream winding from the south-westward, through a good cattle country, over which there are several stations.

BINGE-BINGE POINT.—From the opening into Kialy lagoon at one mile to the northward of Tuross inlet, a sandy beach, with scrubby land behind it, trends N. by E. 2 miles to a rocky projection, about half a mile to the northward of which is Binge-Binge point; both points have reefs of rocks projecting from them. From Binge-Binge point a succession of small bays and rocky points curve round N. by W. $1\frac{1}{4}$ miles to Mullinburra point and thence northward $2\frac{1}{4}$ miles to Congar creek, a narrow inlet, with sunken rocks close to its mouth.

Petro head and Black rock.—From Mullinburra point the coast trends to the north-westward three-quarters of a mile to Petro head, with Black rock lying about 2 cables off it, from which a rocky ledge extends northward to abreast of Congar point, which lies $1\frac{3}{4}$ miles N. $\frac{1}{4}$ W. from Petro head: there are only $3\frac{1}{2}$ fathoms water on some parts of this ledge. The sea always breaks on the rock, and with strong south-easterly gales it breaks heavily on some patches of the ledge, which would be dangerous to a small deeply-laden vessel, or might cause a large one to strike the ground in the hollow of the sea, which runs here in a heavy south-east gale. From Congar point the beach continues in a N. by W. direction one mile to Yowaga point, thence in the same direction for $1\frac{1}{2}$ miles to the south base of Toragy point, the headland forming the south side of the entrance of Moruya river.

Between Binge-Binge and Toragy points there are good grassy headlands, with salt lagoons and scrub between them; near the latter point there are some forest gum and swamp oak trees, besides scrub.

TORAGY POINT and MORUYA RIVER.—Toragy point is the north-east extreme of a rocky peninsula, with some grassy slopes on its north side, extending nearly half a mile from E.N.E. to

W.S.W. ; there are some rocks above water close off the north-east extreme, within 100 yards of which there are 5 and 6 fathoms water. On the west point or inner south head of this peninsula there is a pilot station, with a signal staff.

Two rocky patches, on which the sea breaks in bad weather, lie off the entrance of Moruya river, with 5 fathoms water over them. The southern patch lies E. by N. $\frac{1}{2}$ N. one mile from the signal-staff, and the other 3 or 4 cables to the northward of the southern patch. Nearly half a mile from these patches to the eastward the bottom is broken and rocky, with 6 to 9 fathoms. There are 8 and 9 fathoms, sandy bottom, between the patches and the south head. From one cable off Toragy point to half a mile off Congar point the bottom is rocky and irregular, varying in depth from $2\frac{1}{2}$ to 7 and 8 fathoms, and the sea breaks from one-half to three-quarters of a mile off shore in detached patches for the whole distance.

Moruya river forms a bar harbour, of which the narrowest part of the entrance lies between the inner south head of Toragy point and a low point about 2 cables to the north-westward of it ; but the channel is contracted to barely 100 yards in width by the North spit, which projects to the southward and eastward from the low north-western point to within 130 yards of the rocks at the inner south head. From 6 fathoms at one cable off the north-east point of the peninsula, the water decreases to 8 feet at about one cable from the shore midway between the north-east and west points. Thence to the narrow part of the entrance, between the signal-staff and the North spit, there are irregular depths of 7 to 14 feet at about a cable to 100 yards from the shore. At N. by W. $\frac{1}{4}$ W. 100 yards from the signal-staff is a small rock above water, close outside which there are only 3 feet water. The government breakwater at the entrance to the river is nearly 2,000 feet in length.*

From the inner south head of Toragy point its rocky and sandy west coast trends nearly S.S.E. 2 cables to its south-west point ; whence the coast of the isthmus, which connects the peninsula with the land to the southward of it, curves one-third of a mile southward to a small creek ; from the entrance to which the south shore of Moruya river, consisting of a low sandy beach, with rocky points projecting from it, extends West nearly a mile to a creek, bearing S.W. by W. $\frac{1}{2}$ W., distant a little less than a mile from the signal-

See chart, No. 1,018.

* Two breakwaters have been constructed at the river entrance, and a silt dredge has been at work for several years with small success. *Australian handbook*, 1896.

staff. There is a garden, with some buildings, along the west side of the isthmus, and at the back of the south shore of the river, the land from a swampy sand-flat, rises westward to sandy ranges of no great height, covered with gum trees, oak, and scrub.

Southern flats.—The bight formed between the west extreme of Toragy peninsula and the creek, at about a mile south-westward of the signal-staff, is nearly occupied by two shoal flats, separated from each other by a narrow opening, too shallow even for boats, trending S.S.W. $\frac{1}{2}$ W. from the direction of the signal-staff: but there is a boat channel, 50 to 20 yards wide, between the east flat and the west side of the isthmus.

From the north-east spit of the western flat, at 150 yards south-westward of the signal-station, the outer edge of the flat curves W. by N. $1\frac{1}{4}$ cables; whence it trends south-westward nearly half a mile, forming the southern and south-eastern side of the river channel, from the entrance. There is an islet on the south-eastern part of each of these two flats; that on the east flat being merely a small patch of low scrub, lying S. by E. one-third of a mile from the signal-staff. Quandolo islet, on the west flat, S.W. $4\frac{1}{2}$ cables from the signal-staff, is considerably larger and more elevated than the other islet. The east flat is surrounded with water; but the south-west end of the west flat is connected with the mud which borders the southern shore.

The North shore of Moruya river, from the north-west entrance point, curves about S.W. by W. $\frac{1}{2}$ W. 4 cables to a small sand-spit projecting to the south-eastward, and thence trends W. $\frac{1}{2}$ S. half a mile to a building near the shore. The land behind this shore is somewhat flat, and covered with open bush of swamp-oak and gum. Close to the eastward of the building is a stratum of fine red clay; and to the westward the land rises to ridges of soft sandstone, covered with gum, oak, and scrub.

From its south-eastern extremity the inner edge of the North spit, opposite the signal-staff, after trending West 150 yards, extends N. by W. $\frac{1}{2}$ W. $1\frac{1}{2}$ cables, and thence turns westward towards the north shore. The shore westward of the small sandy spit just mentioned, is bordered by a mud-flat, the outer edge of which, from this spit, sweeps round in a south-westerly and westerly direction to within a cable of the rocky south shore, at W.S.W. one mile from the signal-staff.

The channel of Moruya river, from its entrance between the signal-staff and the North spit, is bounded to the southward by the edge of the western of the two flats before described, and thence, by the rocky south shore. And the channel is bounded to the northward by the inner edge of the North spit, by the north shore thence to the small sand-spit, and then by the edge of the mud-flat which trends to the westward from the sand-spit.

The channel between the southern edge of the North spit and the flat to the southward of it, is about 100 yards wide, with 7 to 10 feet water in the fairway; thence the channel gradually increases north-westward to the width of $1\frac{1}{2}$ cables, with 6 to 7 feet water in the deepest part, close along the western side of the North spit. Thence the river channel trends south-westward, with an average width of $1\frac{1}{2}$ cables, and 6 and 7 feet water in mid-channel, up to abreast of the small sand-spit, before mentioned, which projects from the north shore. Thence the depth of water gradually decreases to 4 feet, the greatest depth being along the edge of the mud-flat on the north-west side, until the north extreme of Quandolo islet bears East, when the deepest water trends south-west, towards the rocky south shore; abreast of which there are 7 to 9 feet water. The Moruya river trends westward past Moruya, to which it takes a winding course from the south-westward.

Although Moruya river is only adapted to steam and other small vessels of light draught, it promises to become a place of considerable importance, being the only outlet by water for the produce of the Araluen and Braidwood districts, with their gold-fields.

Moruya on the south shore of Moruya river, and 5 miles from its entrance, had a population of 1,236 persons in 1891. There is a telegraph station; and regular communication by coach and steam-vessels is maintained, there being six mails a week from Sydney. The district is agricultural and mining.

PILOT.—Vessels bound into the river must make the usual signal for a pilot; a look-out is always kept; the pilot either communicates in return from the signal-staff on the south bluff, or goes off to the vessel. It must be remembered that the tidal streams are strong and that the pilot may not be able to get off until slack water.

Signal station.—There is a signal station at Moruya pilot station, and communication can be made by the commercial code. It is connected by telegraph.

DIRECTIONS.—Vessels must always enter with the flood, more especially when there are freshets in the river; for then the ebb stream runs out through the narrow mouth at the rate of 7 knots, forming eddies that would prevent any vessel from steering, and place her in great danger of being set on the rocks to the southward, or on the sand-spit to the northward. The channel across the bar is continually shifting, the average depth being about 7 feet at high water springs.

The bar is seldom smooth, and during southerly gales breaks for a considerable distance to the eastward of the heads.

When over the bar, a mariner must be guided by circumstances, as the sand-banks near the entrance of the river change every tide. At times, if there are no freshets in the river to colour the water, the greatest depth will be apparent, as the bottom consists of white sand or black rocks. Where the water appears most blue it is the deepest. The best winds for entering Moruya river are those from between North and S.E.; southerly or south-westerly winds get baffling under Toragy point. After crossing the bar, and on approaching the entrance of the river, pass close to a sunken rock, on which a beacon is placed, and which is left on the port hand. Here the tidal stream runs very strongly, and vessels are apt to be horsed on to the North spit. The bottom is rocky, and anchors are almost useless, therefore it is advisable when entering or leaving to wait until the stream slackens, either at high or low water, according to the state of the bar.

Broulee, 4 miles to the northward, affords good anchorage for vessels awaiting tide or otherwise. *See* page 780.

An anchor should be ready to let go after rounding the inner south head.

The tides have not been recorded on the colonial plan of Toragy point and Moruya river, but they probably differ very little from those in Bateman bay, 10 miles farther to the northward. It may therefore be assumed that it is high water, full and change, on Moruya bar, at 8h. 0m.; rise, 4 to 6 feet.

The usual tidal signals are shown on the flag-staff on the outer south head.

ASPECT.—Peak Alone, 3,130 feet above the sea, bearing W. $\frac{3}{4}$ S., distant $11\frac{1}{2}$ miles from mount Dromedary, although a solitary mountain, may be considered as the north easternmost of Maneroo range. The land adjacent to the coast between mount Dromedary and the entrance to Moruya river is low, level, and thickly timbered; receding to the westward it maintains the same characteristic features, broken only by a few undulating ranges of 300 to 400 feet in height, till it meets the base of the high coast range of mountains (some 10 or 12 miles inland), extending from the south extremity of Challenger range in a N. by W. direction for 20 miles to a cluster of high conspicuous peaks named Horns, the highest of which, Evening peak, lies W. $\frac{1}{2}$ N. 14 miles from Toragy point.

This range, however, is not altogether uniform and uninterrupted, being broken about its centre, or at mount Lambert, which rises to an elevation of 3,200 feet; it here loses its general direction, and forms deep gorges, gullies, and isolated hills, but from seaward these features are not perceptible, and a high unbroken range of mountains with sharp peaks will be seen for a distance of 20 miles north and south.

Moruya river, running through the Honoria valley, divides this range of mountains from Duke of Edinburgh range, which, commencing at mount Haig, 3,381 feet above the sea, extends in a N. by E. direction for 24 miles to mount Fane, near the head of Clyde river, where it becomes broken into detached steep table-topped mountains. Some of the higher mountains in this range are conspicuous from seaward, Collaribbee, Budawang, and Curroebilly, being respectively 3,424, 3,630, and 3,619 feet high. A road through a pass over 2,000 feet high has been cut near Budawang, connecting the Braidwood district to the westward of the range with the coast.

The COAST, from the north-west point of the entrance of Moruya river, consists of a sandy beach extending N. $\frac{1}{2}$ E. $2\frac{1}{4}$ miles to a small stream, between which and Broulee island, at N.E. by E. one mile from it, are two points, with reefs projecting from them.

Broulee island, about a quarter of a mile eastward from the coast, is enclosed by a reef of dry and covered rocks, close outside

which there are 4 fathoms water. This island forms the south-west point of a bay, which thence extends N.E. $2\frac{1}{2}$ miles to Burrewarra point, and is nearly $1\frac{1}{2}$ miles deep; the irregular west and north shores of the bay are bordered by dry and covered reefs.

Anchorage.—In the north-west part of the bay between Burrewarra point and Broulee island there is good anchorage, sheltered from north and north-east winds. Northward and westward of Broulee island, small vessels find shelter from southerly winds in about 3 fathoms, with the north point of the island bearing E.S.E., and Toragy point in line with the point of the mainland immediately west of Broulee island.

Soundings.—The 100-fathoms edge of the bank of soundings, from $5\frac{1}{2}$ miles to the eastward of Montagu island, extends about N. by E. to 15 miles East of Burrewarra point, and between Montagu island and Burrewarra point there are 50 fathoms between 4 and 5 miles, 30 fathoms at $2\frac{1}{2}$ miles from the coast, and thence regularly decreasing soundings towards the land, the bottom being everywhere sand.

BURREWARRA POINT is a rocky headland 182 feet high, projecting about half a mile from the coast line; it is closely fringed by a reef of dry and covered rocks, and there is a sunken patch close to the north-westward of it. Between this headland and a double rocky point at N. $\frac{3}{4}$ W., $1\frac{3}{4}$ miles from it, are two little bights, separated by a small prominent point, connected by a ledge of dry rocks with a rocky islet lying a quarter of a mile to the eastward of the point. There is a rock above water close to the south-west shore of the southern bight. From the double point a bay, partly bordered by a reef, extends N. $\frac{1}{2}$ W. three-quarters of a mile to South head, which has a rocky reef projecting from it, and forms the south point of Bateman bay.

BATEMAN BAY extends from South head N. by E. $\frac{1}{4}$ E. $4\frac{1}{2}$ miles to North head, and runs in W.N.W. $3\frac{1}{4}$ miles from Tollgate islets in the middle of the entrance to the bar of Clyde river.

The swamps and lakes on the north shore of Bateman bay abound with swan, duck, teal, &c.; schnapper fishing will be found off the rocky points.

Bateman bay is a village on the Clyde, near its entrance into the bay, 130 miles southward of Sydney. The district is noted for its fine timber, and there are several saw mills. There is a telegraph station at the village; there are six mails a week, and also weekly steam communication with Sydney. Population in 1891, 253.

Black rock, 32 feet high, lies N. by E. $\frac{1}{2}$ E. one mile from South head, and is about 200 yards in extent, with 6 to 10 fathoms water close round it. Between this rock and Tollgate islets there is a channel $1\frac{1}{4}$ miles wide, having 10 to 15 fathoms water, on a sandy bottom.

The south-west shore of Bateman bay, from the South head, extends N.N.W. $1\frac{1}{4}$ miles, and thence N.W. by N. $2\frac{3}{4}$ miles, to Observation head, and consists of a series of rocky points and small sandy bays. From a point at two-thirds of a mile northward of South head, a reef of dry and covered rocks projects one-third of a mile towards Black rock. All the other projections of the south-west shore of the bay are also bordered by reefs of a similar kind, but none of them extend beyond $1\frac{1}{2}$ cables from the points.

Trennant rock, a small pinnacle rock with $3\frac{1}{2}$ fathoms water on it and 12' to 13 fathoms close to, lies S. by E. one-third of a mile from the south extreme of Tollgate islets. There is a passage between Trennant rock and Tollgate islets with 8 to 10 fathoms by keeping within a cable of the south-west islet.

North head, in line with the east end of Tollgate islets, leads directly to it, and, seen open either side, leads clear. Entering Bateman bay to the southward of this rock, pass half a mile northward of Black rock, and steer for Square head.

TOLLGATE ISLETS, which are two in number, are connected by a ledge of rocks and reefs, and extend together nearly half a mile N.E. by N. and S.W. by S.; the south-western islet is 157 feet high, and both are closely fringed with rocks, having 9 to 6 fathoms water at about $1\frac{1}{3}$ cables outside them; from a conical rock between the Tollgate islets a ledge of rocks with 12 to 15 feet water extends N.W. $\frac{1}{2}$ W. one-third of a mile; on the west end of the ledge there are 15 feet, with 7 fathoms close to; $1\frac{1}{2}$ cables North and N.E. of the ledge the bottom is rocky, with 3 to $6\frac{1}{2}$ fathoms, deepening suddenly to 9 and 10 fathoms, sand.

South-west Tollgate islet swarms with snakes.

A small vessel may take shelter under the lee of these islets ; but it would be imprudent for a stranger to do so, except in a case of absolute necessity.

There is a channel one mile wide, with 7 to 10 fathoms water, between Tollgate islets and Three Islet reef, which lies S.W. $\frac{1}{2}$ S. three-quarters of a mile from North head.

Observation head, 50 feet high, is enclosed by a reef of dry and covered rocks. Snapper islet, at N.N.E. $\frac{1}{2}$ E. one-third of a mile from the head, is 75 feet high, about 100 yards in extent, and is the north-western and larger of two islets lying N.W. by W. $\frac{1}{2}$ W. and S.E. by E. $\frac{1}{2}$ E. nearly 2 cables from each other. Both islets have reefs about them ; the eastern islet having a reef which extends $1\frac{1}{2}$ cables to the southward. There are two shoal patches between this islet and Observation head, with 2 fathoms water between them and the head. From $1\frac{1}{4}$ miles north-westward of South head to within one mile of Observation head, there are 12 to 8 fathoms at about two-thirds of a mile from the shore ; but from one mile southward of the head to Snapper islet the shore is fronted by a shoal, with 3 to one fathom water on it.

North shore.—North head, and Three Islet point at W. by S. $\frac{1}{2}$ S. two-thirds of a mile from it, are both fringed with dry and covered rocks ; but at the head of the little bay between these points there appears to be a sandy beach. Three Islet point derives its name from three islets lying close together, and extending S.E. by S. a quarter of a mile from the point. Three Islet reef, before noticed, which extends $1\frac{1}{2}$ cables southward from the outermost islet, has a dry rock on it, with 7 fathoms water, 2 cables to the westward of it.

Reef point is a small projecting headland at W. by N. three-quarters of a mile from Three Islet point, with a reef of dry and covered rocks extending about $1\frac{1}{2}$ cables from it. The bay between Three Islet and Reef points is divided into two small coves by a point, having a ledge of dry and covered rocks projecting S.S.W. a quarter of a mile from it.

Acheron ledge, which lies S.W. a quarter of a mile from Reef point, is about $1\frac{1}{2}$ cables long, N.W. and S.E., with a rock above water

on either end, and a bank, having $1\frac{1}{2}$ to 4 fathoms water on it, extending S.W. 3 cables from it. There are 6 and 7 fathoms water between Three Islet point and this bank; and there is the same depth of water on the west side of the bank, with 5 fathoms at 2 cables westward of the north-western rock on Acheron ledge.

Chain bay extends from Reef point N.W. $\frac{1}{2}$ W. two-thirds of a mile to a point, from which ledges of dry and covered rocks project S.S.W. 2 cables and $1\frac{1}{2}$ cables to the south-eastward; the east shore is also bordered by a reef; but between this and the ledges which project from the north-west point of the bay there is a sandy beach, one-third of a mile long, with $1\frac{1}{2}$ to 2 fathoms within a cable of the shore. Immediately behind Chain bay there is some cultivated land, with buildings near it.

White cliffs.—Square head.—From the north-western point of Chain bay the north shore trends N.W. by W. one-third of a mile to the White cliffs, and is bordered with dry and covered rocks, which project one cable from the cliffs, and extend along shore double that distance to the westward. From the White cliffs a smooth shore curves a little more than a mile in a W. by S. direction to the inner fall of Square head, which is 400 yards broad, and projects S. by W. half a mile from the low land behind it, to one mile northward of Observation head.

Soundings.—From the entrance of Bateman bay to a line between Acheron ledge and Snapper islet there are regular depths, decreasing inwards from 15 fathoms between Black rock and Tollgate islets, and from 10 fathoms between these islets and Three Islet reef, to 6 and 5 fathoms between Acheron ledge and Snapper islet. But the head of the bay is fronted by a shoal, the 3 fathoms edge of which, from 2 cables north-westward of Acheron ledge, curves in a W. by S. $\frac{1}{2}$ S. direction to about one cable south of Square head, and, after passing a cable outside Snapper islet and the small islet to the south eastward of it, closes the rocky point at one mile to the southward of these islets.

DIRECTIONS from the Southward.—Approaching Bateman bay from the southward, give Burrewarra point a good berth, and do not haul into the bay until Black rock bears W.S.W. (S. 67° W.), as

there are dangerous rollers along the coast from the point to the rock. From about half a mile North of Black rock steer N.W. $\frac{3}{4}$ N. (N. 37° W.) for Square head, this passes about 3 cables to the eastward of the Snapper islet reefs.

From the Northward.—Entering Bateman bay from the northward, steer about S.W. by S. (S. 34° W.) for Tollgate islets, passing the North head at the distance of about half a mile; and when Square head bears W. by N. $\frac{3}{4}$ N. (N. 70° W.) steer for it on this bearing, which leads one-third of a mile south of Three Islet reef, and $2\frac{1}{2}$ cables south of Acheron ledge.

Between Tollgate islets and Three Islet reef there are 7 to 10 fathoms rocky bottom, and with easterly gales, during the ebb stream out of Clyde river, there is a heavy confused sea all the way to the mouth of the river, with occasionally a heavy break in the bay.

Anchorage.—Tollgate islets afford shelter in case of necessity, with winds from E.S.E. to S.W. The best anchorage is in 8 fathoms sandy bottom, with the centre of the south-west islet bearing S.E. by S. (S. 34° E.) distant half a mile, when, if the wind should shift to the northward, vessels can get under way and pass between the islets and Black rock. In weighing from this anchorage and taking the southern passage, to pass westward of the 16-foot ledge, keep the North head summit (which is the highest hill over North head) in line over the first little sandy beach immediately within, and West of Three Islet point, bearing about N. by E. (N. 11° E.). This leads in 7 fathoms water half a cable west of the danger. Small craft can anchor much closer in, with the south-west islet on the same bearing in 5 or 6 fathoms. *See* pages 781–2.

The anchorage recommended in Bateman bay for large vessels is in 5 or 6 fathoms, sand, at about half a mile westward of Acheron ledge; and for vessels of about 10 feet draught, is $1\frac{1}{2}$ cables to the westward of the large Snapper islet, (which can be passed on the north side close to in 21 feet), in from 12 to 15 feet, with the centre part of Tollgate islets in line with the edge of the north cliff of Snapper islet. A vessel will ride easy at anchor, though a heavy ground swell is experienced; on the ebb stream setting out of Clyde river a kedge should be run out to the westward from the stern, to prevent being brought broadside on to the swell.

Although the anchorages in Bateman bay appear much exposed to seaward, a vessel with good ground-tackle, may lie here with comparative safety, almost at any time, if her berth be well chosen.

TIDES.—It is high water, full and change, at Observation head, Bateman bay, at 8h. 0m. ; springs rise, 4 to 6 feet.

CLYDE or BUNDOO RIVER.—The entrance of this river may be considered to lie between Observation and Square heads, where the greatest depth of water in mid-channel is $3\frac{1}{2}$ fathoms, the depth decreasing towards the heads and towards the bar, at a quarter of a mile within the line of the heads.

The south-west shore of Clyde river from Observation head curves in a W. by N. $\frac{1}{2}$ N. direction two-thirds of a mile to a projection, whence a low shore extends nearly N.W. $1\frac{1}{2}$ miles to Smoke point. From the bay between Observation head and the projection next to the westward of it, the southern portion of the bar extends two-thirds of a mile towards Square head.

From the south-western corner of Square head, the north shore of Clyde river trends North half a mile to a small creek, and thence W.S.W. $1\frac{1}{4}$ miles to a low point, between which and the south-west shore are the first narrows above the bar, the river being here only $1\frac{1}{2}$ cables wide. At half a mile and three-quarters of a mile westward of the small creek are two points, from each of which a small reef projects to the southward. From these points the northern portion of the bar extends in a S.E. $\frac{1}{2}$ S. direction to within a short distance of the southern portion of the bar.

The bar.—The channel over the bar which extends across the entrance of Clyde river had, in 1870, 6 feet at low water, enabling steam, and other vessels of light draught, to carry on a considerable trade with Clyde river.

Within the bar there are 9 feet water, whence the river channel trends along the south-west shore, the depth of water gradually increasing to the first narrows above the bar, where there are 4 fathoms between Smoke point and the low point to the eastward of it.

Between a small creek on the west side of Smoke point, and an inlet in the opposite shore to the northward, the river is half a mile

wide, with an islet near the shore at 2 cables north-west of Smoke point. From this part of the river it gradually contracts to the second narrows above the bar at one mile westward of the islet, where the river is only 2 cables in width. At about three-quarters of a mile westward of Smoke point the south shore of the river is intersected by two creeks.

From the second narrows above the bar the river again increases in width, and trends W. by S. one mile to its junction with Macleay river, where the channel is about 2 cables wide. The south shore between the second narrows and the mouth of Macleay river is intersected by numerous creeks. Macleay river takes its rise from the hills to the south-westward and westward, whilst Clyde river flows southward from the back of Cook's Pigeon house, a remarkable isolated, conical mountain, 2,398 feet high, and distant 22 miles from the junction of the two rivers.

Nelligen, a small township, is situated 7 or 8 miles up, on the right bank of Clyde river, and in 1891 had a population of 188 persons. The district is principally agricultural and pastoral. About 15 miles further up the Clyde is the settlement of Brooman, from which a large amount of produce is carried. There is a telegraph station at Nelligen, and the steam-vessel calls once a week from Sydney.

DIRECTIONS.—Having arrived between Snapper islet and Square head, in crossing the bar, keep the fairway buoy on the port and the other buoys on the south edge of the North bank on the starboard hand until the mouth of the river be opened. The buoys are painted black on their sides and white on their ends. The buoys get frequently shifted by the action of freshets out of the river, or bad weather from seaward, and the entrance has to be re-sounded and the buoys re-placed before entering over the bar. After crossing the bar, by hugging the south shore, deep water is carried up to the wharf.

Outward-bound sailing vessels should only attempt to go to sea at slack water.

Pilot.—There is no pilot at this river, and only local steam-vessels and small coasters well acquainted with the place frequent it.

ASPECT.—The land about Bateman bay is low and thickly wooded, receding from each shore to an elevation of 400 to 600 feet. Further inland the country is mountainous; mount Oldrey, a conspicuous round summit, 2,212 feet above the sea, is the highest of Clyde range, and lies W. $\frac{3}{4}$ N. 12 miles from the North head of Bateman bay. This range extends in a south-east direction from Duke of Edinburgh range, and is separated from Belmore range, which lies parallel to it further south, by Macleay river. Mount Collaribbee, 3,385 feet high, lies W.N.W. $5\frac{1}{2}$ miles from mount Oldrey.

Belmore range is separated from mount Haig by a deep gorge, and extends from Duke of Edinburgh range, in a south-east direction along the north bank of Moruya river for 7 or 8 miles, terminating in a remarkable semi-detached mountain, mount Wandera, 1,945 feet high, also named, from its shape, Camel's hump. This range is made up of five distinct and peculiar summits, mostly anvil shaped, with valleys or gorges between each.

From seaward, Honoria valley is remarkable when seen on a north-west bearing, apparently dividing the barrier of high mountains, and separating the coast from the inland ranges.

Flat rock.—**Wasp islet.**—The coast from North head of Bateman bay extends N. by E. $\frac{1}{4}$ E., $5\frac{1}{2}$ miles to point Upright, and consists of a series of small points and sandy beaches. At $2\frac{1}{2}$ miles northward of North head lies Flat rock, a mile to the northward of which lies Wasp islet, 40 feet high, thence to point Upright the land recedes nearly a mile, forming a bay about 2 miles long, terminating in a sandy beach. At one mile to the south-west of point Upright is the mouth of a narrow inlet, winding $1\frac{1}{2}$ miles south-westward into a lagoon 2 miles long, N. by W. and S. by E., and half a mile wide.

POINT UPRIGHT is the termination of a ridge of hills extending from the westward, and was so named by Captain Cook, from its perpendicular cliffs.

Grasshopper islet is situated on a reef which projects above half a mile to the north-eastward from point Upright, and N.E. by N. about a quarter of a mile from Grasshopper islet, lies a ledge of sunken rocks, on which the sea breaks heavily.

Dawson islets.—Between point Upright and a rocky projection N. $\frac{1}{2}$ E. 2 miles from it, the coast forms a bay, of which the southern half is a sandy beach, with some sunken rocks along it. From the north point of this bay the coast continues N.N.E., $1\frac{1}{2}$ miles to a point at the base of mount O'Hara, which rises close behind, to the height 1,110 feet. A reef, on which are the two Dawson islets, extends about half a mile eastward from this point.

O'Hara islet and head.—O'Hara head is N.E. $\frac{1}{2}$ N. $2\frac{1}{4}$ miles from Dawson islets, and O'Hara islet, 15 feet high, lies near the shore at half a mile northward of Dawson islets. Between O'Hara head and First Sandy point, at N. by E. $\frac{3}{4}$ E. $2\frac{1}{4}$ miles from it, the coast consists of a sandy beach, with rocky points extending one-third of a mile north-westward of the head, and a rocky point, with a sunken rock about $1\frac{1}{2}$ cables off it, nearly in the middle of the beach. Near a small islet close to the northward of O'Hara head there is anchorage for coasters, but it is not recommended.

BRUSH ISLAND, which lies one cable off First Sandy point, is about half a mile across, and 140 feet high, the sand-hills being covered with scrub, and abounding with rabbits. About 4 cables N.E. from the east extremity of Brush island, which lies nearly a mile from First Sandy point, is a dangerous sunken rock on which the sea only breaks with a heavy swell.

Vessels bound North and keeping in-shore to avoid the current, should be careful when passing this island to haul out a mile to seaward.

In the channel between Brush island and the land there is a rock above water.

Anchorage.—On the north-west side of Brush island, anchorage may be obtained in 6 fathoms, sandy bottom, with O'Hara head in line with First Sandy point, and the north extreme of the island bearing East.

Stokes islet.—From First Sandy point a beach, having a building, Murramarang house, on it at one-third of a mile from the point, curves N.N.W. $1\frac{1}{4}$ miles to a projection, W. by N. rather over half a mile from which is the entrance to a lagoon; from the projection the coast extends N.W. by N. $1\frac{1}{2}$ miles, in and out, to the narrow

mouth of the creek trending to the westward. The north side of the mouth of this inlet is formed by a small peninsular headland, between which and a point at N. by E. $1\frac{1}{2}$ miles from it, is a bay having a small opening at one mile north-west of the head, forming the mouth of a lagoon about half a mile in extent. Stokes islet, which lies half a mile north-east of this opening, is surrounded by reefs apparently connected with the shore to the northward of the islet.

Crampton islet, N.N.E. one mile from Stokes islet, is situated on a reef which extends across the mouth of a narrow inlet trending North $1\frac{3}{4}$ miles, and separated from the sea by a low narrow tongue of land.

Between Crampton islet and Lagoon head, at N.N.E. $\frac{1}{2}$ E. $2\frac{1}{2}$ miles from it, is a sandy bay nearly half a mile deep. From Lagoon head a rocky coast, bordered by a reef, trends in a N.E. and North direction one mile to a narrow opening, trending north-westward $1\frac{1}{4}$ miles into a lagoon about 2 miles long, north and south, and half a mile across its widest part, with a small stream flowing into its northern end from the westward. This lagoon is separated from the coast to the southward and eastward of it by ranges of hills. From the mouth of the lagoon a sandy beach extends N.E. three-quarters of a mile to a prominent rocky point off which a narrow ledge of rocks projects S.E. three-quarters of a mile. The outer rock of this ledge is 6 feet above high water, and there is a depth of 21 fathoms a quarter of a mile eastward of it. The sea breaks all the way between the outer rock and the shore. From this ledge rocky points extend N.E. $2\frac{3}{4}$ miles to Warden head, with a reef projecting nearly half a mile from the south-east extreme of it, at N.N.W., about half a mile from which is the entrance of Ulladulla harbour.

LIGHT.—A lighthouse on Warden head exhibits a *fixed* white light, which should be seen from a distance of 12 miles in clear weather.

SULLIVAN REEF, lying N.E. a quarter of a mile from the north-east part of Warden head, is a rocky patch (on which the sea nearly always breaks), extending N. by W. and S. by E. little more than a cable, and about 50 yards wide; its centre is dry at low water

springs, with 10 feet on its north end, 12 on the south, and 4 to 6 fathoms close to all round. This reef, lying nearly across the fairway of the entrance to Ulladulla harbour, forms a natural breakwater, and tends considerably to break the heavy seas rolling in towards the artificial breakwater at the head of the harbour during easterly winds.

There is a passage both north and south of this reef, the northern one is to be preferred, and is about half a mile wide between the reef and North head, with 7 and 8 fathoms near the middle.

ULLADULLA HARBOUR is 4 cables wide, N.W. and S.E., between the rocky shelf which projects half a cable from Warden head, the south-east point, and the detached rocks which extend nearly the same distance from North head, the north-west point of entrance. From the middle of the entrance, Ulladulla harbour trends West half a mile, and is one-third of a mile wide, except at its western end, where a sandy bay forms the inner harbour, which extends N. by W. $\frac{1}{2}$ W. 2 cables, and is one cable deep. The north and south shores of all but the inner harbour are bordered by shelves of rock extending farthest from the south shore, from which, at half a mile westward of Warden head, the rocky shelf projects $1\frac{1}{2}$ cables to the northward. In mid-channel, between the entrance heads, there are 5 to $6\frac{1}{2}$ fathoms, sand, which shoals gradually towards the pier end, between which and the rocky ledge extending from the point northward of it, a distance of nearly a cable across, there are 19 and 20 feet water.

Inner harbour.—The little bay which forms Ulladulla inner harbour is sheltered from the eastward by a pier, which extends from the south point of the bay over the western end of the shelf, N. by E. $\frac{1}{2}$ E., 160 yards, and thence N.W. $\frac{1}{2}$ N., 80 yards, to the pier head, in 17 feet water.

Between the pier head and the rocky shelf which projects E.S.E. nearly half a cable from the north point of the inner harbour, the entrance is nearly one cable wide, with 3 to $3\frac{1}{2}$ fathoms water in the fairway, whence the depths gradually decrease to 5 feet, close to the northern shelf; but there is deeper water on the south side, there being 11 feet close along the back of the outer part of the pier. From 17 feet at the pier-head the depth gradually decreases to 3 feet

within 30 yards of the shore, except on the ballast in the south corner of the harbour, towards which a jetty projects from the south end of the pier into 2 feet water. On the south-west side of the inner harbour there is a slip, between which and the jetty, two streams run through the beach; a small stream also flows into the north-western part of the harbour.

Leading lights.—Two lights, one *fixed* red, the other *fixed* white, are exhibited from the beach at the head of the bay; these lights kept in line bearing W. $\frac{3}{4}$ S. (S. 82° W.) lead into Ulladulla harbour, clear of danger, until abreast the pier head.

Ulladulla in 1891 had a population of 1,582 persons. Dairy farming is the principal industry, and there is plenty of good timber giving employment for saw-mills. There is a telegraph station here, there are six mails a week and also weekly steam communication with Sydney, carrying marketable commodities.

DIRECTIONS.—When approaching Ulladulla from the north-east and east the heads are difficult to distinguish, being low, and the points adjacent resembling them. From the southward, when abreast of Brush island, the northernmost low point seen projecting from the shore is Warden head; on a nearer approach it may be identified by a deep gap cut through the trees, a short distance inland, and there is also the lighthouse on it. Cook's Pigeon house (*see* page 786), bearing W. $\frac{3}{4}$ S. (S. 82° W.), leads to the entrance of the harbour, and when within 5 or 6 miles the white houses at the head of the harbour and the sandy beach under them will be distinguished.

Cook's Pigeon house kept over the centre of this sandy beach, on a W. $\frac{3}{4}$ S. (S. 82° W.) bearing, leads in mid-channel, north of Sullivan reef; when within the reef, the Pigeon house will be lost sight of. Sullivan reef generally breaks, and should be passed on its north side at the distance of about 2 cables. North head should not be approached too close, as there is a depth of 14 feet, one-third of a cable southward, from the low-water rocks extending south-east from it. When nearing the pier, keep more towards the north shore to avoid the ledge extending a cable E.N.E. from the pier end, with 8 and 12 feet on its north extreme; then haul in as the wind will allow, passing

the pier at a convenient distance. Small vessels anchor inside the pier in from 13 to 15 feet water, three-quarters of a cable from the beach.

The bottom is sand over rock, and if likely to blow hard from the westward it is necessary to run out a warp to a tree on shore, or bury a kedge in the sand, to prevent the possibility of dragging and tailing on to the pier. Steam vessels discharge alongside the pier.

During summer, sailing vessels are recommended in the early morning to tow or warp out towards North head, during the calm preceding the north-east wind, when a long board can be made towards Sullivan reef, and the next tack will clear the North head, or almost a fair wind may be made by taking the south channel; but this should not be attempted unless in fine weather, as it is narrow with a rocky irregular bottom, and in bad weather the sea breaks across the channel. When Lagoon head is seen clear to the eastward of Warden head, bearing S.W. by S. (S. 34° W.), a vessel is outside Sullivan reef, and in about 16 fathoms.

At night.—To enter the harbour steer in with the leading lights in line, bearing W. $\frac{3}{4}$ S. (S. 82° W.), taking care to be nothing to the southward whilst in the vicinity of Sullivan reef. These lights lead in clear of danger until abreast the pier head.

Current.—Vessels bound northward find little or no current by keeping inshore between Brush island and cape St. George.

The current from the northward striking the bluff headlands about Jervis bay appears to be diverted from its general direction, and strikes the coast again about Brush island, leaving in the space inshore of this limit comparatively slack water.

TIDES.—It is high water, full and change, in Ulladulla harbour at 8h. 30m.; springs rise 6 feet.

Aspect.—From the North head of Bateman bay to the back of Ulladulla harbour a range of hills from 600 to 1,370 feet high follows the trend of the coast a little distance inland from it. The most conspicuous and first from the southward is mount O'Hara, which is flat, 1,100 feet high, one mile from the coast, and $3\frac{1}{2}$ miles N. $\frac{1}{2}$ E. from point Upright. From mount O'Hara the range is somewhat

lower for 5 miles to Wason heights, consisting of three distinct round-topped hills, lying about 3 or 4 miles from the coast; thence the range continues in a N. by E. $\frac{1}{2}$ E. direction gradually decreasing in height, till lost in the flat rich agricultural lands between Ulladulla and Cook's Pigeon house, which bears W. $\frac{3}{4}$ S., distant 11 miles from the entrance of Ulladulla harbour. Cook's Pigeon house, 2,398 feet high; Table hill, which lies between 4 and 7 miles N.N.E. of it; and mount Sidney, 2,496 feet high, at 4 miles N. $\frac{1}{2}$ W. of the Pigeon house, form a conspicuous group from seaward off this part of the coast. From the north extreme of Table hill a ridge descends in an E. by N. direction towards the coast, whilst a lofty range extends W.S.W. 15 miles from the hill to mount Curroebilly, and then turns South 11 miles to mount Budawang, which is 3,630 feet high; hence the range trends S.S.W. to within 2 miles of mount Collaribbee, before mentioned.

Nurrawherre inlet.—Between the North head of Ulladulla harbour and a projecting point at North $1\frac{1}{2}$ miles from it, the coast forms a sandy bay, with reefs projecting from both its points and also from the southern part of the beach. From the north point of this bay the coast curves N.N.W. $1\frac{1}{2}$ miles to Nurrawherre inlet, the northern half being a sandy beach, and thence N.E. by N. $2\frac{1}{2}$ miles to a low point forming the south-east side of the opening of Cuhudjuhrong lake, close in front of which is Green islet. Reefs extend from the south head of Nurrawherre inlet to Preservation rock at 2 cables off it, and also from the foot of a hill at half a mile to the northward of it.

Green islet and Cuhudjuhrong lake.—Green islet is fringed by a reef apparently connected with the bar across the mouth of Cuhudjuhrong lake behind it, which trends westward 4 miles, and is one-third of a mile wide. At about a mile within the mouth of this lake a cluster of islets begins, immediately to the northward of which an arm of the lake branches to the northward; the islets extend $1\frac{1}{4}$ miles to the westward.

Rocky patch.—There is a small rocky patch, with 4 fathoms water on it, about E. by N. $\frac{3}{4}$ N. $1\frac{1}{4}$ miles from the centre of Green islet.

Red point.—From the north-east point of the mouth of Cuhudjuhlong lake the coast trends N.E. 2 miles to Red point, which projects two-thirds of a mile eastward from the coast-line; there are two small beaches between the inlet and the point, with hilly land behind. Between Red point and the narrow mouth of Swan lake, at N. $\frac{1}{2}$ E. 3 miles from it, is a bay one mile deep, the irregular shore of which is intersected by two small streams. Cadmurray beach lies between three-quarters of a mile to the southward and $1\frac{1}{2}$ miles north-eastward of the mouth of Swan lake, and reefs project from the points at each end of it.

Swan lake.—From its mouth, Swan lake continues very narrow for about two-thirds of a mile in a N.W. by N. direction, within which it forms a lagoon extending $1\frac{1}{2}$ miles N.W. and S.E., and one mile to half a mile across. From the entrance to Swan lake a sandy beach trends N.E. $1\frac{1}{2}$ miles to the west point of Wreck bay, which point forms the south side of the narrow mouth of Sussex inlet.

WRECK BAY.—ST. GEORGE'S HEAD.—Wreck bay is a dangerous bight, which, from its west point, extends E. $\frac{1}{2}$ N. 5 miles to St. George's head, and is $2\frac{1}{4}$ miles deep in the eastern part. The north shore of the bay, from the mouth of Sussex inlet, consists of a sandy beach fronted by rocks, extending nearly N.E. by E. $\frac{1}{2}$ E. as far as a rocky point $2\frac{1}{2}$ miles north-westward of St. George's head; but between this point and the head the eastern end of the bay forms a rocky bight bordered with reefs.

Caution.—When navigating near this part of the coast during bad weather with easterly and south-easterly winds guard against being set into Wreck bay.

Anchorage.—During the summer, anchorage may be obtained in Wreck bay, one mile off shore, in 7 fathoms, sandy bottom, with St. George's head bearing S.E.

Sussex inlet and St. George's basin.—Sussex inlet is a narrow channel trending in a N.W. and North direction $1\frac{1}{2}$ miles into St. George's basin, which extends thence 3 miles to the northward, and is 5 miles long from W.S.W. to E.N.E.; it is separated from Wreck bay by a low tongue of land, one mile broad, extending 5 miles

from the eastward to Sussex inlet. The west shore of the basin forms several large creeks trending to the westward, into the northern of which flows a small stream.

Aspect.—The land from Ulladulla harbour to St. George's head is mostly low and thickly wooded, with ridges of hills extending inland from the coast between Red point and Wreck bay. From Table hill the main range takes an irregular semicircular direction to the northward and north-eastward, and, after rounding St. George's basin, terminates at St. George's head.

Soundings.—From 2 miles S.E. of South head, to the same distance East of North head of Bateman bay, the soundings range from 25 to 30 fathoms; they increase to 50 fathoms at 4 miles East of point Upright, between which and 4 miles South of St. George's head the depths range between 50 and 60 fathoms, decreasing to 30 fathoms at 3 miles E.N.E. of the head.

CAPE ST. GEORGE.—From St. George's head the coast trends N.E. by E. 3 miles to cape St. George; there is a small exposed bay midway between these two headlands, and the cape has some sunken rocks close about it.

From cape St. George a cliffy coast, with 27 to 29 fathoms water at one mile off it, winds northward $2\frac{3}{4}$ miles to Governor head.

LIGHT.—Midway between cape St. George and Governor head is a steep cliffy projection, on which stands a lighthouse, a white tower, 61 feet high, which exhibits, at 224 feet above the sea, a white, red, and green light *alternating every half-minute*. The white light should be seen from the distance of 18 miles, and the red and green 14 miles in clear weather. From the southward, the light opens of cape St. George on about a N. by W. (N. 11° W.) bearing: from the northward the light opens of Crocodile head on a S.S.W. $\frac{1}{2}$ W. (S. 28° W.) bearing.

Caution.—Mariners should observe the limits through which this light is visible, as it is obscured to a vessel inshore either to the northward or southward.

Signal station.—There is a signal station at cape St. George lighthouse, and communication can be made by the commercial code. It is connected by telegraph.

Storm signals.—Notice of existing storms, on any part of the coast, are signalled to passing vessels. *See* pages 24, 840.

JERVIS BAY.—**Bowen isle**, which forms the south-west point of the entrance of Jervis Bay, lies close off Governor head, from which it is only separated by a breach $1\frac{1}{2}$ cables across, appearing as if the cliff had been torn to pieces, and leaving here and there a straggling rock above water, and where there is a passage for small craft, in very calm weather, which requires local knowledge to use. The isle is 6 cables long, north and south, 4 cables broad, and 133 feet high. Shoal water extends one cable north of the isle and about 3 cables west of it, where it nearly meets the shoal water extending north-westward from Governor head.

Bowen isle, which for situation, soil, scenery, and fresh water, seems the most desirable spot in Jervis bay, is moderately wooded, and has much clear ground, covered only with long grass. Its sea front is formed of high vertical cliffs, in many places deeply rent. From these cliffs the isle slopes gradually but irregularly towards the bay, and that side is low and formed of sand intermixed with rocks.

Water.—The largest and most convenient stream of fresh water lies directly at the back of a little sandy bight on the west side of Bowen isle, where boats can easily load in fine weather. The average annual rainfall at cape St. George is 55 inches.

Middle ground, a rocky patch about half a cable across, with 8 fathoms water on it, lies about N. $\frac{1}{4}$ W. 7 cables from the north point of Bowen isle.

PERPENDICULAR POINT, N.E. $\frac{1}{2}$ E. 2 miles from the north point of Bowen isle, is a bold cliffy headland, 263 feet high, and forms the north-east point of the entrance of Jervis bay. This point from its rising perpendicularly to a flat surface, without tree or shrub, is a most conspicuous feature of the coast. But there is an inner north head to the entrance, formed by Longnose and Dart points, which lie W. by N. $\frac{1}{2}$ N. $1\frac{1}{2}$ and $1\frac{3}{4}$ miles from Perpendicular point. The intermediate shore forms an irregular bight, with a reef projecting nearly a quarter of a mile from Longnose point, and Bumbora rock, a sunken rock about half a cable across with 12 feet water over it, on which the sea breaks in bad weather, lying $3\frac{1}{2}$ cables S. $\frac{1}{2}$ W. from the point. Between the reef off

Longnose point and Bumbora rock there is a depth of 6 fathoms, and 11 fathoms close to the rock. With the exception of this reef and rock, the entrance into Jervis bay is free from all dangers, with 25 to 12 fathoms water (and the Middle ground 8 fathoms rocky patch), on a bottom of sand, and deep water on both sides of the entrance.

Within its entrance Jervis bay extends 8 miles north and south, and nearly 3 to $5\frac{1}{2}$ miles east and west, with regular soundings, gradually decreasing inwards from 18 and 17 fathoms in the entrance, to 9 and 6 fathoms within half a mile of the greater portion of the shores of the bay; there is anchorage either in Darling road, to the westward of Bowen isle, or in Montagu road, to the northward of Dart point, but Darling road is the preferable of the two.

Darling road is the southern part of a bay 2 miles deep, which from the north extreme of Bowen isle, extends N.W. by W. $\frac{1}{2}$ W. $4\frac{1}{4}$ miles to Plantation point; some sunken rocks lie close to the extremity of that point, one which breaks being 2 cables eastward of the point, and a 3 fathoms rocky patch at half a mile E.N.E. from it. Vessels should not pass between this patch and the point; inside the 2-fathoms line the ground is foul. A sand-spit, with $1\frac{1}{2}$ to 2 fathoms water on it, projects half a mile northward from the eastern part of the bay, and adds to the security of the anchorage by breaking the swell which sets in; with this exception, the shores of the bay may be approached within a quarter of a mile in $5\frac{1}{2}$ to 7 fathoms. The shore from one to 2 miles southward of Plantation point is only separated from the eastern end of St. George's basin by an isthmus 2 miles broad.

The western bight of Jervis bay, from Plantation point to Flora point, nearly 4 miles to the northward of it, is $1\frac{1}{2}$ miles deep. Dent rock, a pinnacle rock, with 2 feet on it at low water, lies $1\frac{1}{2}$ cables off shore, and with the east extreme of Plantation point bearing E. $\frac{1}{2}$ S. distant 8 cables. At N.W. $1\frac{1}{2}$ miles from Plantation point is the mouth of Moona Moona creek, from which a ledge of sunken rocks extends one cable into 2 fathoms water. At about 8 cables northward of Moona Moona creek is Carrambeen creek, with a ship-building village of the same name just inside it, where there is a post-office. Shoal water extends about half a mile off these creeks, and a patch of rocks nearly covered at high water lies about 3 cables off Carrambeen. Flora point, with the shore for half a mile to the

westward, and a quarter of a mile northward of it, is bordered by rocks, with 3 fathoms water about $1\frac{1}{2}$ cables outside them.

The whole of the west side of the bay is exposed to the heavy swell thrown in by south-east gales, and is consequently unsafe for anchorage; the sea breaking on it may be heard at a considerable distance.

Anchorage.—Darling road affords good anchorage in 6 to 8 fathoms, with the south end of Bowen isle in line with the east point of Darling road, and Hole-in-the-wall (a white cliffy projection with a hole through it) bearing E. by S. ($S. 79^\circ E.$), or as convenient.

Fish.—Good seine, also hook and line fishing, is to be had off the points and beaches.

Montagu road, which affords secure anchorage, extends from the south point of the road N. by W. $1\frac{1}{2}$ miles to Montagu point, and is about half a mile deep, with depths of 5 and 6 fathoms at a quarter of a mile off shore.

Anchorage.—The anchorage in Montagu road is in 6 to 7 fathoms, stiff ground; the soundings are regular. Although large ships may here lie landlocked, they are exposed to a heavy fetch of the sea from the southward, to which also every other part of the bay is subjected; it is therefore indispensable that the ground tackle be good.

Buoys.—Three buoys, with flags, are moored in Jarvis bay, in depths of 10 and 12 fathoms, on about the following bearings and distances from Dart point,—W.N.W. $8\frac{1}{2}$ cables, N.W. by W. $\frac{3}{4}$ W. $1\frac{8}{10}$ miles, and N.W. $\frac{1}{2}$ N. $1\frac{4}{10}$ miles. These buoys are not for purposes of navigation.

Green point is nearly a mile north-west of Montagu point, the shore between being rocky, with a depth of 5 fathoms at 2 cables off it, except at $1\frac{1}{2}$ cables south of Green point, where a reef extends westward 2 cables, with a small islet, Green islet, on it.

Hare bay extends West $1\frac{3}{4}$ miles from Green point to Flora point; it is $1\frac{1}{4}$ miles deep, and is divided into two bights by Red point, nearly equidistant from Green and Flora points. Between the rocks off Green point, and 3 fathoms at nearly half a mile off Flora point, there are 4 to 6 fathoms water across the bay. The eastern and larger of the two bights into which Hare bay is divided is mostly occupied by a shoal, with only one to 7 feet water on it, extending farthest off Cararma creek, at half a mile N.N.E. of Green point. The western bight has 3 fathoms at about 4 cables from the shore, and there is a 3 fathoms rocky patch at three-quarters of a mile E. by N. from Flora point, while the depths inside the 3 fathoms line are irregular.

DIRECTIONS.—Outside Jervis bay, and along the coast to the northward as far as Beecroft head, a heavy confused sea is experienced during even moderately bad weather; and perhaps along the coast of New South Wales there is no place where greater care is required in managing small vessels in bad weather than in the vicinity of this steep peninsula. This is in consequence of the agitated state of the sea, which may be attributed to the current out of Shoalhaven bight meeting at Beecroft head another branch of the stream in a disturbed state from crossing Young banks, and the currents being much stronger near projecting headlands than elsewhere.

If bound into, or passing Jervis bay, carefully avoid being drawn into Wreck bay, where the land is very deceptive. When bound into Darling road, steer for the north point of Bowen isle and round it not nearer than 2 cables, keeping Perpendicular point well open north-westward of the low north-west point of Bowen isle, bearing N.E. by E. (N. 56° E.) until Governor head bears E. by S. (S. 79° E.), which clears the sand-spit, when stand in for the anchorage. Although the isle may be closely approached on its east and north sides, in light winds keep without the influence of the swell.

From the northward and eastward give Perpendicular point a good berth, for, although it is bold and clear close to, a fresh south-east wind does not blow home, but becomes light and baffling, while the swell sets heavily upon it; and as there is no anchorage near

the point, except at a great depth, it should be carefully avoided in light winds. After passing Perpendicular point the chief danger in the approach to Montagu road is the reef and Bumbora rock off Longnose point, to clear which steer in rather north of mid-channel between Bowen isle and Longnose point, till Green point is seen well open of the bluff northward of Dart point, before steering for the anchorage. The vicinity of the Middle ground should be avoided; the Bumbora rock breaks in heavy weather.

TIDES.—It is high water, full and change, in Jervis bay, at 8h. 30m.; springs rise 5 feet.

Supplies.—Fresh water can be obtained at the head of Darling road, and a quarter of a mile along the beach, to the southward from Hole-in-the-Wall, is a small stream always running. With the exception of a few fishermen, who are migratory, and the village of Carrambeen in the north-west corner, the shores of Jervis bay are uninhabited; no supplies can be obtained, but the ridges abound in kangaroo. The nearest town is Nowra, 9 miles N.W. by N. from Carrambeen.

CROCODILE HEAD.—From Perpendicular point a line of cliffs trends N.E. $\frac{1}{2}$ N. $1\frac{3}{4}$ miles to Crocodile head, 356 feet high, and thence N. $\frac{1}{2}$ E. $1\frac{1}{2}$ miles to a bight half a mile wide, with three small islands, named Drum and Drumsticks, in the middle of it. From the north point of this bight a continuation of the line of cliffs extends N. by E. 2 miles to Beecroft head, the east extreme of Crookhaven. There are 30 and 32 fathoms water within a mile of the shore between Perpendicular point and Beecroft head. Between Perpendicular point and Drum and Drumsticks there is a depth of 30 fathoms from a quarter to half-a-mile off shore.

YOUNG BANKS are two shoal rocky patches lying N.N.E. $\frac{3}{4}$ E. 3 miles, and N.E. $\frac{3}{4}$ N. $5\frac{1}{2}$ miles from Beecroft head. The south-western patch is half a mile long N.E. and S.W., and $2\frac{1}{2}$ cables wide, with 7 to 10 fathoms water over it, 16 and 17 on its north side, a small patch of 10 fathoms lying about 7 cables W.N.W. of it, and 15 fathoms close to on the south side; the sea has been seen to break on it in heavy gales; between it and Beecroft head there is a deep channel, though the soundings are irregular, ranging from 11 to 20 and

25 fathoms ; between this patch and the north-eastern one the soundings are from 14 to 21 fathoms, rocky bottom ; 12 fathoms is the least water on the north-eastern patch, deepening suddenly to 43 on its east side, and 14 to 20 fathoms half a mile to the westward of it.

The vicinity of these banks should be avoided, as the current when strong causes heavy overfalls even during smooth water. Cape St. George lighthouse kept in sight clear of Crocodile head, S.S.W. $\frac{1}{2}$ W. (S. 28° W.), leads to the eastward ; and Cambewarra, the southern and highest mountain of Shoalhaven range, just seen to the southward of mount Berry, a remarkable isolated conical hill, on the lowland about Shoalhaven river, bearing W. by N. $\frac{1}{4}$ N. (N. 76° W.), leads about one mile to the northward.

CROOKHAVEN BIGHT.—From Beecroft head, the coast trends N.W. for half a mile, thence round low rocky points, and two small bights to Crookhaven, where good anchorage may be obtained in Abraham's bosom, in about 6 or 7 fathoms water, with the north point of Beecroft head bearing E.N.E. distant half a mile. In rounding this north point, which is low and projecting, care must be taken to avoid a sunken rock with 2 feet water on it and on which the sea breaks occasionally, lying $1\frac{1}{2}$ cables to the northward of its extreme, with 9 fathoms close to, and 6 between it and the shore. At the north extreme of Crookhaven bight, on the west shore, near some out-lying rocks off the beach, there is an isthmus, about 200 yards across to a fordable creek running into the head of Jervis bay.

Shipwrecked mariners in this vicinity can reach Carrambeen by walking across this neck and skirting the north-west beaches of Jervis bay to the settlement.

SHOALHAVEN BIGHT.—Vessels should during a prevalence of bad weather keep outside this bight, which extends from Beecroft head to Black point, a distance of 13 miles, as heavy tide rips exist, caused probably by the strong ebb streams from the Crookhaven and Shoalhaven rivers (which are much accelerated by rains) discharging into the bight, directly across the course of the ocean current running to the southward.

See chart, No. 1,020, Beecroft head to port Jackson, scale $m = 0\cdot5$ inch.

From the west end of Crookhaven a smooth shore curves in a N.N.W. direction $3\frac{1}{2}$ miles to Kinghorn head (a low projecting point), between half a mile and 2 miles to the southward of which is a lagoon 2 miles long, north and south, and one mile wide, only separated from the sea by a very narrow ridge. From Kinghorn head a sandy beach curves N.N.W. $\frac{1}{2}$ W. 2 miles to a narrow rocky point, forming the east head of the entrance of the Crookhaven river.

SHOALHAVEN RIVERS, between which and Sydney there is communication by steam vessel six times a week, are separated from each other by Comerong island.

Caution.—No one should attempt to enter these rivers unless thoroughly acquainted with them, more particularly that of Shoalhaven, without having first procured a pilot, who will board vessels upon the usual signal being made.

Bar.—The approach to Crookhaven river—the southern Shoalhaven river,—is over a bar, with seldom less than 10 feet at low water, close to the western side of the east head, whence the channel, between the rocky shore on the eastern, and the sandy shoal on the western side, trends S.S.W. $\frac{1}{2}$ W. about half a mile to the entrance of the river, between a rocky point projecting from the south shore and the sand head at 150 yards to the westward of it, the channel being here 100 yards wide, with 19 to 21 feet water. From the north edge of this sand head a narrow ledge of rocks, above water, extends nearly 2 cables to the northward, outside of which there are breakers over the sandy shoal on the west side of the channel from the bar to the entrance of the river. A white beacon is placed on the north-east extremity of the reef, extending about 350 yards from the east head. There are three other white beacons on the south side of the channel.

During south or south-west winds sailing vessels should not attempt to enter if there is much sea on, but go into Jervis bay, or to the anchorage known as Abraham's bosom, in Crookhaven bight.

Comerong island.—The coast forming the east side of Comerong island, after trending in a N.N.W. $\frac{1}{4}$ W. direction $2\frac{1}{2}$ miles

from the entrance to Crookhaven river, terminates at the north point of the island, which forms the south side of the mouth of the northern Shoalhaven river, and may be distinguished by a small hillock on it. On the west side, at a quarter of a mile southward from the point, is the narrow mouth of a lagoon in the northern end of Comerong island, whence the north and north-west coasts of the island trend West half a mile, and S.W. by S. nearly a mile to the north-western entrance of the navigable channel, which communicates between the two Shoalhaven rivers. With the exception of the hillock on its north point, Comerong island appears to be low and flat, with its south coast mostly lined with mangroves, covered at high tides. There is some forest and bush land on the south-east part of the island.

NORTHERN SHOALHAVEN RIVER.—The mouth of this river lies between the north point of Comerong island and the sand head at a quarter of a mile to the northward of it, and is crossed by a bar, on which the sea breaks.* The bar is of a shifting nature and the channel liable to change. The breakers on the south spit of the entrance extend about $1\frac{1}{2}$ miles off shore. Within its entrance the river expands to more than half a mile in width, but again narrows to 2 cables across, between the north-west extreme of Comerong island and a point of the opposite shore. Close to the north-westward of the entrance of the navigable channel is an islet, whence the northern Shoalhaven river extends nearly West 5 miles to Pig islet, with a width of nearly a quarter of a mile. Above Pig islet the river winds in a W. by S. direction along the south side of Cambewarra range.

Nowra, a township on the right bank of the river about $1\frac{1}{2}$ miles above Pig islet, had a population of 1,706 in 1891. There are railway and telegraph stations here.

LIGHT.—A lighthouse at the north entrance point of Shoalhaven river exhibits a *fixed* red light which should be seen from a distance of 10 miles in clear weather.

Signal and pilot station.—At North Shoalhaven lighthouse is a signal station, and communication can be made by the commercial code. It is connected by telegraph.

See chart, No. 1,020.

* The depth on the bar at high water was between 15 and 12 feet during 1895.

It is also the pilot station (one pilot with a boat and crew).

TIDES.—It is high water, full and change, in Shoalhaven rivers, at 8h. 30m. ; springs rise 9 feet, neaps 6 feet.

Aspect.—Mount Cambewarra, which bears W. by N., distant 9 miles from the entrance of the Northern Shoalhaven river, is the most remarkable summit of a range of mountains extending from the mount S.W. by W. about 8 miles, and N.E. 4 miles to some table land. But the highest land near this part of the coast is mount Berry, which, at 2 miles W.N.W. of the entrance of the river, rises from its north shore to the height of 1,000 feet, and serves as a good guide.

BLACK POINT.—The coast from the entrance of the northern Shoalhaven river forms a sandy beach, extending, with a slight curve, N. by E. $\frac{3}{4}$ E. $5\frac{1}{2}$ miles to a small double creek, whence the coast trends S.E. by E. $\frac{1}{2}$ E. half a mile to Black point and Black rock, with a reef extending S.S.W. half a mile from them. Between Black point, and the south point of Geering bay at N. $\frac{1}{2}$ E., $2\frac{1}{4}$ miles from it, are two small bights, separated from each other by a point with a reef projecting from it.

Gerringong is a village, 7 miles southward of Kiama on the south coast road, in the southern part of Geering bay. There are railway and telegraph stations and a steam-vessel to and from Sydney calls here. The population was 1,534 in 1891.

Geering bay extends one mile north and south, and is one-third of a mile deep, with a sandy beach, at the north end of which is a small double inlet. The south point of the bay and the beach for some distance to the northward of it have reefs extending along them.

Caution.—Immediately on the appearance of bad weather from S.S.E., veering easterly, vessels at anchor off Gerringong should proceed to sea, as, during bad weather from seaward, a heavy sea sets in.

From Geering bay a succession of rocky points and small bights extends N. by E. and North 4 miles to the south head of Kiama

harbour. The points which project from the northern and greater portion of this coast have ledges of sunken rocks projecting from them.

KIAMA HARBOUR is a little cove, available for vessels of light draught, sheltered from the southward and eastward by a peninsula, which, together with the rocky shelf about it, extends 4 cables in an E. by N. direction from the mainland. It is 400 yards broad, and rises at the centre to a hill about 41 feet high, with a flag-staff on it, close to which is Blow-hole rock. There is a beacon, 46 feet above the sea, on the eastern rock off Kiama peninsula. There are two detached rocks above water near the south side, and one close to the north point of the peninsula, the latter lying N. by W. $\frac{3}{4}$ W. 250 yards from the flag-staff. From this rock the entrance of the harbour is 3 cables across in a N.W. by W. direction, and is a quarter of a mile deep.

From 150 yards north, to about the same distance north-westward of the rock which forms the east point of the entrance, there are 6 to 4 fathoms water, with irregular depths between these soundings and the shore; from this the depths decrease somewhat irregularly, up the harbour, in a south-westerly direction, to 6 feet water at about 150 yards from the shore. The channel leading to the basin is about 60 yards wide, with depths of from 15 to 23 feet.

The basin, formed by jetties or breakwaters, extending to the westward from the east side, and to the north-north-west from the south side of the harbour, is 150 yards long, N.E. by E. $\frac{1}{2}$ E. and S.W. by W. $\frac{1}{2}$ W., about 80 yards deep, and there are depths of 15 to 17 feet all over it. There is a red buoy moored in 14 feet water off this basin on the south side of a 12 feet patch.

KIAMA, with a population in 1895 of about 2,380 is immediately behind a small open bay extending W. by N. $\frac{1}{2}$ N. 300 yards from the jetty; but the shore being mostly rock, with shoal water off it, there is no convenient landing-place in front of the town. Although small, Kiama harbour is of considerable importance in the beautiful Illawarra district. Steam vessels call daily in to land and embark passengers and cargo. There are railway and telegraph stations here.

The west side of Kiama harbour from this little bay trends northward a quarter of a mile to the north-west point of the entrance, and consists of perpendicular rock, 40 to 60 feet high, bordered by rocky shelves extending 50 to 150 yards from the shore, and projecting farthest towards the entrance of the basin on the opposite side, the intermediate space being about 120 yards wide, with 10 to 17 feet water.

LIGHTS.—A *fixed* green light is exhibited, at 119 feet above high water, on the hill above Blow-hole rock, and it should be seen from a distance of 9 miles in clear weather.

A *fixed* green harbour light is exhibited from near the end of the breakwater on the north side of the basin.

DIRECTIONS.—Strangers are recommended to hoist the pilot signal, approach the harbour with the end of the breakwater on a south-west bearing, and to wait for the pilot at a safe distance off the shore.

Tides.—It is high water, full and change, in Kiama harbour at 9h. 0m. ; springs rise $4\frac{1}{2}$ feet.

Aspect.—The most elevated summit of Flinders ridge, to the south-westward of Kiama, appears to be mount Nipple, which bears S.W. $\frac{3}{4}$ W., distant 7 miles from Kiama head, and is 2,240 feet high, with one ridge extending W.S.W. from it, and another, the Crown mountains, 10 miles north-westward to the south-western termination of Reliance range. Mount Fall, 2,106 feet high, and mount Broughton head, 1,800 feet high, are two other heights between Flinders ridge and the coast, the former at N.E. $\frac{1}{2}$ N. $2\frac{1}{4}$ miles, and the latter N.E. by E. $\frac{1}{2}$ E. 3 miles, from mount Nipple. From the north-western trend of Flinders ridge, ridges descend north-eastward towards the coast.

BASS POINT.—The coast from Kiama harbour trends irregularly, N. by E. one mile to a projecting head, and thence N.N.W. 2 miles to Minumurra river, close off which is Stack islet surrounded by a reef, having 16 fathoms water at half a mile to the south-eastward of it. Reefs also extend from the projecting head into the bay to the north-westward. From Minumurra river two small sandy bays extend $1\frac{1}{4}$ miles in a N.E. by N. direction, whence a line of cliffs trends north-eastward $1\frac{1}{2}$ miles, to Bass point.

Windang islet.—Between Bass point and Red point, which bears North, distant 6 miles from it, the low coast forms an exposed bay nearly 2 miles deep, the sandy beaches, of which its shore consists, being separated by three rocky points, between N.N.W. and N.W., and at $1\frac{1}{2}$, 2, and $2\frac{1}{2}$ miles from Bass point. At North one mile from the northern of these points lies Windang islet, close to the beach.

Shell harbour, between the first two points just mentioned, has a narrow entrance, only fit for small craft. The district is principally pastoral. The population in 1895 was 1,600 persons. There are railway and telegraph stations here, and also communication with Sydney by steam-vessel.

ILLAWARRA LAKE.—The beach immediately behind Windang islet forms the only barrier between the sea and the south-east corner of Illawarra lake, which, from $5\frac{1}{2}$ miles W. by N. of Bass point, extends N.N.E. about 5 miles to nearly 2 miles westward of Red point, and is 3 miles wide. Macquarie river flows into the south-west corner of the lake, and Mullet river into its north-western part. The lake is shallow.

About 2,600 bushels of fish are caught annually in this lake and sent to Sydney market.

RED POINT, so named by Captain Cook from the dull red colour of the cliffs and rocks of which it is composed, according to Captain Flinders, has four hillocks on it, which present the form of a saddle. Red point may also be readily known by mount Kembla, a remarkable hill, 1,786 feet high, at about W. by N. 6 miles from it, which, from its form, was named Hat hill by Captain Cook. From the back of this hill Reliance range trends S.W. $\frac{1}{2}$ S. 12 miles, and N.N.E. 10 miles, descending in the latter direction from mount Keira, 1,573 feet high, to the coast.

Red point islets and Tom Thumb islands.—The former are three low rocky islets extending, nearly in line, one mile eastward from Red point, the western and largest being 70 feet high; and Tom Thumb islands, which are two in number, the south-eastern being 20 feet high, and the north-western 15 feet, are also rocky, and lie respectively N. by E. $\frac{3}{4}$ E. 2 miles, and N. $\frac{1}{4}$ W. $2\frac{1}{2}$ miles from Red point.

Port Kembla.—There is a jetty at port Kembla (northward of Red point) with a depth of about 27 feet alongside it at low water, and colliers up to 2,000 tons coal here, except in north-east and easterly gales, which are of rare occurrence. Coal is shipped at the rate of 120 tons an hour. About 600 tons of coal were raised daily in 1889 by the Mount Kembla Coal Company.

Tom Thumb lagoon.—From Red point, cliffs trend N.W. by N. one mile to the south point of a sandy bay, which thence extends N. by W. $\frac{1}{4}$ W. $3\frac{1}{4}$ miles to Wollongong head, its southern part being three-quarters of a mile deep. At W. $\frac{1}{2}$ S. $1\frac{1}{2}$ miles from the north-western Tom Thumb islet the beach which forms this bay is intersected by the narrow shallow mouth of Tom Thumb lagoon, which is $1\frac{3}{4}$ miles long, north and south, one mile wide, and is separated from the sea-shore by a narrow tongue of land, extending one mile from the northward to the mouth of the lagoon.

Soundings.—From 30 fathoms at $1\frac{1}{4}$ miles off Beecroft head the depth of water decreases to 10 fathoms at 3 miles N.N.E. of the head, whence the soundings increase with some regularity to 42 fathoms at 5 miles off Black point, between which and $2\frac{1}{2}$ miles off Bass point the soundings range from 30 to 44 fathoms, and then again decrease to 33 fathoms at $2\frac{1}{2}$ miles south-east of Red point. The 100-fathoms edge of the bank of soundings, from 15 miles eastward of Black point, extends northward to about 17 miles off Wollongong head; at about 20 miles eastward of Kiama head there are 280 fathoms, fine dark sand.

WOLLONGONG HEAD is a rocky peninsula projecting eastward 2 cables from the lower land to the westward of it; it is $1\frac{3}{4}$ cables across from its south side to its north point, and rises to a hill 59 feet high, on which is a signal station, at S.E. $\frac{1}{2}$ E. $1\frac{1}{2}$ cables from the north point. Some rocks project one cable from the south-east point of the head.

WOLLONGONG HARBOUR, between which and Sydney there is daily communication by steam vessels, is the southern bight of a bay extending N.W. $\frac{1}{4}$ N. nearly two-thirds of a mile to a ledge of rock which borders the sandy shore for about 2 cables farther to the northward, and has detached rocks projecting from it about 120 yards to the south-eastward. From 5 fathoms at $1\frac{1}{2}$ cables

to the northward of the north point of Wollongong peninsula the depth of water decreases regularly to about 3 fathoms within 150 yards of the detached rocks which project from the north-west point of the bay.

Wollongong harbour is protected by a breakwater 450 feet long, extending W.N.W. from the north-west point of Wollongong head.

LIGHTS.—On the end of the breakwater a circular iron lighthouse, 56 feet above high water, exhibits a *fixed* red light, visible between the bearings of S. 22° W., and N. 73° W., which should be seen from a distance of 10 miles in clear weather. The light is also visible inside the breakwater to guide vessels into the basin.

A *fixed* red light is shown in the lower part of the north-east side of the lighthouse when it is dangerous for vessels to enter the harbour.

Two *fixed* red leading lights are shown on the south shore of the harbour; when southward of Para reef in line they lead in, to off the end of the breakwater, in not less than 15 feet at low water.

Buoy.—A black buoy is placed abreast the breakwater lighthouse, 45 feet eastward of the line of the leading marks, to indicate the end of the rubble mound extending from the breakwater.

Signal station.—There is a signal station at Wollongong lighthouse, and communication can be made by the commercial code. It is connected by telegraph.

Para reef.—The only detached danger in Wollongong bay is said to be Para reef, lying nearly E.S.E. 2 cables from the north-west point of the bay; there are 9 feet water on it, but when there is any easterly swell the sea breaks on this reef.

Basin.—On the north-east side of Wollongong harbour extensive artificial works have been constructed, forming a basin 600 feet in length, in a N.E. and S.W. direction and 150 feet broad, having an area of 2 acres, with depths of 11 to 15 feet, and wharfage accommodation of 1,700 feet.*

Pilot.—A pilot with boat and crew is stationed at Wollongong, who will render service and assistance to vessels when required, but cannot be depended on for going outside to bring vessels in. A tug is stationed here to tow vessels in and out of the harbour.

See chart, No. 1,020, plan of Wollongong harbour, scale m = 12.0 inches.

* The largest vessel that has coaled here drew about 15½ feet of water (1896).

WOLLONGONG, situated at the base of one of the highest peaks of the Illawarra range, ranks in tonnage and numbers of shipping the third sea port of the colony. It is gradually increasing in importance, and contained in 1895, 3,400 inhabitants. The coal mines, about 3 miles distant from the port, are connected with the basin by locomotive and horse traction railways. In 1894, 314,542 tons of coal were raised.

Passenger steam-vessels ply daily to and from Sydney. It is connected with Sydney by rail.

Exports of produce and imports of merchandise amount to about 60,000 tons annually; besides coal, the exports consist of pigs, calves, poultry, cheese, bacon, and butter. In 1895 vessels of a tonnage of 162,830 entered and cleared at Wollongong.

DIRECTIONS.—If from the southward with a strong southerly wind, sail should be shortened and the vessel hove to, 2 miles southward of Flagstaff hill, to enable the pilot to get off; if from the northward sail should be shortened in time and the vessel hove to off the port, for the same purpose. From the southward, after passing outside Tom Thumb islets, steer about N.W. by N. (N. 34° W.), then round Wollongong head; when northward of the flag staff, haul up to a cable of the rocks, and work up for the end of the breakwater, taking care to avoid Para reef, which lies nearly half a mile to the northward of it.

From the Northward.—When running along the shore from the northward for Wollongong, do not, when within 4 miles of it, bring Wollongong head to bear to the southward of S.S.W. (S. 22° W.) until Mark hill, a long double summit hill, barren at each end and thickly wooded in the centre, is in line with the centre of the bluff forming the eastern side of Wollongong harbour, bearing S.S.W. $\frac{1}{4}$ W. (S. 25° W.), which leads to the eastward of Bellambi reef in 11 fathoms water, then steer for the harbour, keeping a good look-out for Para reef.

At night Wollongong light is eclipsed over Bellambi reef, and also when bearing north of W. by N. $\frac{1}{2}$ N. (N. 73° W.). The entrance can therefore be approached if the light is in sight. When entering the port, and rounding the breakwater, it is obscured, and afterwards becomes visible as a guide for proceeding into the basin. The red lights on the south shore of the harbour in line lead in from southward of Para reef.

TIDES.—It is high water, full and change, in Wollongong harbour at 8 h. 45 m. ; springs rise $4\frac{3}{4}$ feet.

Towradgi point.—From 2 cables northward of the north-west point of Wollongong bay a sandy beach extends, with a slight curve, N. by E. $\frac{1}{2}$ E. $1\frac{1}{2}$ miles to Towradgi point, which is formed of blue-stone boulders ; a covered reef extends from it. From Para creek, behind the ledge of rock at the south end of this beach, a coast range of low sand-hills extends close behind the beach to Towradgi point ; these hills are covered with coarse grass and scrub, with dense bush behind them.

Sandspit point.—Between Towradgi point and Sandspit point, at N.N.E. $\frac{1}{4}$ E. three-quarters of a mile from it, is a sandy bay, with ranges of low sand-hills close along the beach, separated by two creeks, the mouths of which are barred across by the beach. Sandspit point, which has some rocks close to its extremity is enclosed by a reef, which is always covered.

BELLAMBI POINT and REEF.—From Sandspit point a sandy beach, apparently bordered by a shoal, winds in and out, half a mile in a N.N.E. direction to Bellambi point, which consists of rock with a surface of sand. Bellambi reef, which partially dries at low water and always breaks, extends nearly E. by S. half a mile from the east side of Bellambi point, and a rock about one cable in extent, lies S.E. by E., 4 cables from the point. There are 3 fathoms at one cable to the south-eastward, and 11 feet water at 50 yards to the north-westward of the rock with a boat channel nearly midway between it and the shore.

Bellambi bay extends from Bellambi point N.N.W. $\frac{1}{2}$ W. $1\frac{1}{4}$ miles to a point with a ledge of rock projecting about one cable from it, and is one-third of a mile deep. The south shore consists, like Bellambi point, of rock with a sandy surface, extending from the point half a mile in a W. by N. direction to a small creek close behind it. Hence to the north-west point of the bay, its west shore consists of a smooth sandy beach.

Half a mile southward of Waniora point a reef extends about 4 cables to the eastward.

Bellambi village.—From 150 yards northward to one-third of a mile north-westward of Bellambi point there are 3 to 6 fathoms water, from which soundings, the depths decrease somewhat irregularly, to 2 fathoms within 100 yards of the shore, in a little bight extending a quarter of a mile westward from Bellambi point, and forming the sea frontage of Bellambi village, the population of which was 204 in 1891, and where there is a railway station. In the eastern corner of this bight is a jetty 500 feet long, with a depth of 22 feet at its end at low water.

DIRECTIONS.—For Bellambi bay from the southward; there is to the northward of the northernmost Hat peak a broken point in the mountain range, named Coorimal or Broken Nose, which bearing W.S.W. (S. 67° W.) leads into the bay clear of the reefs.

From the Northward.—From 4 miles off Hacking point steer S.W. by S. (S. 34° W.) until a white sandy point forming the east extreme of the bay, is seen ahead. While steering for this point an iron-roofed store will come in sight, which bearing S.S.W. (S. 22° W.) leads to the jetty.

Embarking coal.—Vessels drawing up to 19 feet (according to the tide), take in their cargoes under the coal staith from the railway trucks at the end of the jetty. A tramway, 3 miles long, leads to the mines, where a superior steam coal is worked in a seam 9 feet thick.

WANIORA POINT.—From the north-west point of Bellambi bay the coast extends North one mile to Waniora point, which has a reef projecting from it, and separates a small bight to the southward, from a sandy bay extending N.N.W. $\frac{1}{2}$ W. one mile from the point.

Bulli.—Bulli is a postal township with a railway and telegraph station, and a population in 1891 of 2,570 persons. It is the headquarters of the Bulli Mining Company; the mine is about $1\frac{1}{2}$ miles distant, and in 1894 the output was 61,900 tons of coal, valued at £16,770. There are several farms in the neighbourhood. Communication with Sydney is either by rail or by the Wollongong steam vessel. Within the bight to the north-west of Waniora point is Bulli coal station, where a wooden pier 700 feet in length projects N.E. by E. over the rocks into 22 feet of water. This position is slightly protected from the southward by a reef of rocks, dry at

low water, extending E.S.E. $1\frac{1}{2}$ cables from Waniora point; and steam vessels lie as close as prudent to the pier, and load in ordinary weather, as they are able to get away on the appearance of a shift of wind to seaward. But it is a dangerous place for sailing vessels to load at, even under favourable circumstances.

Coal cliff.—Stanfield bay.—From Waniora point the coast extends N. by E. $\frac{1}{2}$ E. $5\frac{3}{4}$ miles in a direct line to Coal cliff: for the first 2 miles the coast appears to be low and bordered by reefs, but the remaining portion consists of a line of cliffs. Stanfield bay is merely the northern of two small bights lying between Coal cliff and a little stream at N. by E. $\frac{1}{2}$ E. $1\frac{1}{2}$ miles from it.

Clifton, a mining village, with post, telegraph, and railway stations, is situated about 300 feet above the sea on Coal cliff. A jetty extends 500 feet from the mouth of the coal mine into 20 feet water, whence steam colliers ship the coal. In 1894 the output was 23,699 tons.

Wata Mooli.—The coast from Stanfield bay extends, with a little indentation, N.E. $\frac{1}{2}$ N. 8 miles to Wata Mooli, a boat harbour, where water may be procured, with shelter for large boats, from all winds except those from the southward and eastward. This coast consists of a line of cliffs, except where it is broken for about three-quarters of a mile by a beach nearly midway between Stanfield bay and Wata Mooli.

HACKING POINT.—From Wata Mooli the coast trends irregularly, in and out, $4\frac{1}{4}$ miles in a N. by E. $\frac{1}{2}$ E. direction to Hacking point, and is mostly fringed with dry and covered rocks, not extending far from the shore. Hacking point protects port Hacking from southerly or south-easterly gales.

Jibbon Bumbora, about half a mile to the south-eastward of Hacking point, is a detached patch of rocks 2 or 3 cables in extent, with 15 fathoms water at half a mile to the eastward, and 7 fathoms close to the northward of them. The sea nearly always breaks on these rocks.

Aspect.—Ranges of hills extend close along the coast from Bellambi bay to Hacking point; Bulli hill rises to 1,048 feet, but these hills are not very remarkable; that most worthy of notice being Table hillock, 484 feet high, at S.S.W. $1\frac{1}{2}$ miles from Hacking point.

Soundings.—From about 15 miles off Red point the 100-fathoms edge of the bank of soundings extends nearly N. by E. $\frac{1}{2}$ E. to about the same distance off Hacking point, with 75 to 40 fathoms between 11 and 5 miles from the shore. But there are 56 fathoms, mud, at 3 miles off Wata Mooli, and 24 to 16 fathoms at one mile from the shore from Wata Mooli to Hacking point, the bottom being mostly sand.

PORT HACKING is a small anchorage, suitable for coasters, on the west side of Hacking point. The entrance, which lies between Hacking point, and Glaisher point at two-thirds of a mile to the westward of it, is half a mile wide, with 4 to 5 fathoms water between the ledges of rocks which project from both points of the entrance. From Hacking point the port extends nearly one mile in a W. by S. $\frac{1}{2}$ S. direction to a bar with 3 to 6 feet water on it, stretching across an opening between two rocky points, lying N. by E. and S. by W. one-third of a mile from each other, and forming an inner entrance, leading from port Hacking into the shallow, but extensive inlet to the westward.

Port Hacking is nearly half a mile wide, with two small sandy bights on the south side, divided by a rocky projection, close to which there are $2\frac{1}{2}$ fathoms water. The north shore, which extends W. by S. $\frac{1}{2}$ S. barely half a mile from Glaisher point to the north point of the inner entrance, forms the south end of a hilly promontory, a quarter of a mile to half a mile broad, extending $1\frac{1}{4}$ miles from the northward. There are 11 to 6 fathoms from one mile north-eastward, to the entrance of port Hacking; but from 5 fathoms in the entrance, the depth of water inwards decreases rapidly to 3 and 2 fathoms.

Port Hacking inlet.—From the inner entrance of port Hacking the south shore of the inlet trends in and out, 2 miles to the westward, and is bordered by a bank extending 2 to 4 cables from the shore. At three-quarters of a mile to the westward of the south point of the inner entrance is a rocky head, from which a shoal ridge projects N.N.W. one-third of a mile, with an islet on its outer end, and a smaller one on the west side of the ridge, close to the head.

A boat channel winds westward along the northern edge of the bank just noticed, but is only defined on the north side by the south

end of a hilly tongue of land extending, between two creeks, above one mile from the northward ; and by the shore from a quarter of a mile northward to one mile westward of the northern islet. The channel is barely one cable wide between the east end of the southern bank and the rocky south-east point of the hilly tongue of land to the north-westward of it, and 120 yards wide between the south-west point of the tongue of land and the northern islet, to the south-westward of it. For about one mile to the westward of the islet the channel is $1\frac{1}{2}$ to 2 cables wide, when the inlet forms two arms, one trending between the hills to the south-westward, and the other branching between other hills to the north-westward, in which direction a small river winds into the inlet from the south-westward.

Tides.—It is high water, full and change, in port Hacking, at 8h. 45m. ; springs rise 7 to 8 feet.

Bate bay, an exposed bight, $1\frac{1}{4}$ miles deep, between port Hacking and Botany bay, extends from Glaisher point N.E. $3\frac{1}{4}$ miles to Potter point, close to the north-westward of which is Botany cone, 180 feet high, with some dry and covered rocks extending from its base to the southward. At three-quarters of a mile westward from Potter point is another rocky projection, from which a reef extends three-quarters of a mile to the south-westward. The west shore of Bate bay trends in and out, nearly one mile northward from Glaisher point, to a point fringed by a reef, on the north-west side of which is a small sandy bight ; this reef, which has 6 and 7 fathoms water close outside it (except in a W.S.W. direction where there are 22 to 27 feet for a distance of 3 cables from the reef), continues along shore for about one-third of a mile southward from the point. From this little bight Cronulla beach curves along the foot of bare sandy ridges to the rocky projection at three quarters of a mile westward of Potter point. There are 10 fathoms in the middle of the entrance of the bay, between which and 9 fathoms water at a quarter of a mile off shore abreast of it, there are irregular depths of 7 to 11 fathoms. About three-quarters of a mile westward of Potter point, there is a boat harbour having a depth of 6 feet in the centre.

Cape Solander.—From Potter point a cliffy coast, closely fringed with rocks, trends N.E. $\frac{1}{2}$ E. nearly half a mile to cape Baily,

whence a more elevated line of cliffs extends about $1\frac{3}{4}$ miles northward to cape Solander, the south-west point of the entrance of Botany bay. A sand-hill rising from a bluff at half a mile northward of cape Baily, is the only hill worthy of notice over the cliffs between capes Baily and Solander.

BOTANY BAY.—The outer heads of Botany bay are cape Solander, and cape Banks at N.E. $1\frac{1}{4}$ miles from it, the latter being a small peninsula projecting a little more than one cable from the cliffy land to the northward of it. There are 4 fathoms water close to cape Solander, and 7 fathoms at one cable from cape Banks, with 10 to 17 fathoms between them. From cape Solander the south-western side of the entrance is a continuation of cliff trending N.N.W. and W.N.W. three-quarters of a mile to Inscription point, and is bordered by a rocky ledge, not extending beyond half a cable from the shore; this point and the shore for about one-third of a mile to the south-westward of it are fringed by a narrow reef.

The north-eastern side of the entrance of Botany bay trends in and out, three-quarters of a mile westward to a point, between which and the north-east inner head of the entrance there is a shallow bight. The north-east inner head, which lies N.N.E. three-quarters of a mile from Inscription point, has a tower on it, close to the west side of which is a monument to the memory of the unfortunate French navigator, M. La Perouse. Bear islet extends $1\frac{1}{2}$ cables from the south point of this head, with which it is connected by narrow fringing reefs. At $1\frac{1}{2}$ cables to the southward of the islet is Bumbora, a rocky patch with 4 feet water on it, which breaks, and between which and the south-western side of the entrance there is a channel nearly half a mile wide, with regular soundings in 8 to 10 fathoms, and a clear approach from seaward.

Within its entrance, Botany bay forms nearly an equilateral triangle, of which each side is about 4 miles long; the shores are low and wooded, with very shoal water extending a considerable distance from them, except for about one mile within the north-east inner head, where some low hilly ranges terminate in two points, one at 4 cables, and the other nearly one mile N.W. by N. from the monument, each point being closely fringed by a reef, with $3\frac{1}{4}$ fathoms close outside the former, and $2\frac{1}{2}$ fathoms at one cable off the latter point. Between the monument and the north-western point there are two shallow sandy coves.

The south shore of Botany bay from Inscription point, sweeps round half a mile in a S.W. direction, whence a sandy beach extends W. by S. $1\frac{1}{2}$ miles to Bonna point, between half a mile and $1\frac{1}{4}$ miles to the westward of which, the south shore of the bay is formed by the northern end of a low flat peninsula, named Towra point, extending from the southward, and separating a shallow lagoon, named Weeney bay, on its east side, from the estuary of George river on its west side. The lagoon, within its entrance includes Weeney and Quibray bays, extending nearly 2 miles east and west, and one mile south from its entrance.

Shoal patch.—This shoal, a rock with 9 feet water on it at low water spring tides, lies with Inscription point, E. by S. $\frac{1}{4}$ S. distant about $2\frac{3}{4}$ cables. East of it the soundings increase quickly to 28 feet, and there are depths of 12 to 20 feet at about 2 cables westward and south-westward of the rock.

Botany village is situated on the north side of the bay, and had a population of 2,400 in 1894. It is much frequented by pleasure parties from Sydney, with which place it is connected by a tramway. There is a telegraph office here.

George river.—The estuary of this river is nearly one mile wide, between Towra point and Doll's point, a low broad point to the westward of it, whence a bight, one mile wide, extends 2 miles to the southward: Killigalere and Shell points give the southern part of this bight the form of a lagoon, which is called Woolooware bay, and is about the same size as that to the eastward of it. Between Sans Souci and Commons point the estuary of George river is about a quarter of a mile wide, whence its main course, between the numerous creeks on either side of it, trends W. by N., 3 miles to the junction of George river, with a narrow creek, or rivulet from the southward: to this junction the river flows from the northward and westward.

Cook river.—From the west side of the estuary of George river the low sandy shore, Lady Robinson's beach, which forms the west side of Botany bay, curves N. by E. $\frac{3}{4}$ E. 4 miles to Cook river, a considerable stream flowing from the north-westward, and which until recently supplied the city of Sydney with fresh water.

Light.—A *fixed* white light is exhibited from the end of the pier at the entrance to Cook river, as a guide to vessels navigating that river.

From the mouth of Cook river, which is about 4 cables wide, the north-east shore of Botany bay trends S.E. by E. $\frac{3}{4}$ E. $1\frac{1}{2}$ miles to the foot of a hillock, between which and the first point to the south-eastward of it is a shoal sandy bay, one mile across N.W. and S.E. and nearly half a mile deep. At half a mile westward of the hillock is a small jetty, close behind which is a hotel.

Botany bay is generally so shallow, that the only part having more than $3\frac{3}{4}$ fathoms water, is on the eastern side of the bay, between the entrance and three-quarters of a mile S.S.E. of the jetty, and is therefore quite open to the south-eastward. This space of comparatively deep water, is one mile wide, close within the entrance, whence it gradually narrows to the north-westward. There are 6 to 9 fathoms across the entrance, between Inscription point and La Perouse monument, whence the depth of water decreases gradually to 4 fathoms at three-quarters of a mile from the jetty.

At one cable to the north-westward of Inscription point there are $5\frac{1}{2}$ fathoms, whence the 3-fathoms edge of the shoal water which occupies the greater portion of the bay, trends half a mile to the westward, and, after winding $2\frac{1}{2}$ miles in a N.W. direction, turns south-eastward to about 6 cables off the jetty. From this 3-fathoms edge the water gradually shoals towards the south and west shores and Cook river; the most shallow part being apparently off the low peninsula and the lagoon to the eastward of it, on the south side of the bay, where there are only 6 feet water at about three-quarters of a mile from the shore. From 6 cables off the jetty the 3-fathoms edge of the shoal water which projects from the north-east shore of the bay, trends in a S.E. by E. $\frac{1}{2}$ E. direction to the first point to the northward of La Perouse monument, with very shallow water towards the shore.

Directions.—To enter Botany bay, keep in about mid-channel between the outer heads; cape Banks just open of the next point to the westward of it leads southward of the rocky patch Bumbora. Having passed this danger, haul in towards the north-east shore, and anchor in 6 or 5 fathoms, with La Perouse monument bearing about E.S.E. A vessel seeking shelter in Botany

bay from a southerly gale, will probably find as good, if not better anchorage in 5 or 4 fathoms, at 3 or 4 cables to the north-westward of Inscription point, but care must be taken to avoid Shoal patch. Although the anchorage in the eastern part of Botany bay is of considerable extent where vessels may lie in 7 to 4 fathoms water, there is no shelter from south-easterly winds, and when they blow from that quarter, a heavy sea rolls into the bay.

Caution—Masters of vessels, fishing parties, and others, are cautioned against anchoring, creeping, dredging, or fishing near the position of the telegraph cables connecting Botany bay with New Zealand.

TIDES.—It is high water, full and change, in Botany bay, at 8h. 10m.; springs rise 7 to 8 feet.

Long bay.—From cape Banks a line of cliffs extends in a N. $\frac{1}{2}$ E. direction $1\frac{1}{2}$ miles to the south-west point of Long bay, which is half a mile wide at its entrance, whence it runs in two-thirds of a mile, and terminates to the northward in a narrow cove. Some sunken rocks project from the north-east head of the bay.

Coogee bay.—From the projecting north-east head of Long bay, cliffs trend N.N.W. two-thirds of a mile to the south point of Marubra bay, which is two-thirds of a mile wide, from S. $\frac{3}{4}$ E. to N. $\frac{3}{4}$ W., and nearly half a mile deep. Between the cliffy headland which forms the north point of this bay, and a projecting point at $1\frac{1}{2}$ miles to the northward of it, is Coogee bay, half a mile deep in its northern part, where there are two very small inlets, the south-western of which has some sunken rocks close off it.

BONDI BAY.—From the north point of Coogee bay—which projects nearly two-thirds of a mile south-eastward from the coast-line, and has some rocks close to the shore at half a mile northward of it—a double bight extends N. by E. $\frac{1}{4}$ E. $1\frac{3}{4}$ miles to Eclipse bluff. A point at half a mile south-westward of the bluff, separates Grama Grama bay, on its south-west side, from Bondi bay north-east of it. From Eclipse bluff a line of coarse sandstone cliffs extends, with a slight curve, N. $\frac{3}{4}$ W. $2\frac{1}{4}$ miles to the Outer South head of port Jackson.

Soundings.—At nearly E. by S. 14 miles from Hacking point there are soundings in 90 fathoms, dark sand, from close outside of which the 100-fathoms edge of the bank of soundings extends north and north-eastward to a position at E. by N. 19 miles from the Outer South head of port Jackson. From this 100-fathoms edge of the bank the soundings decrease with regularity towards the shore, which, from 4 miles southward of Hacking point to the entrance of port Jackson, may be generally approached to the distance of about a mile, in 20 to 30 fathoms, the bottom being everywhere sand. There are no detached dangers off this part of the coast, except Jibbon Bumbora; and the ledges of rocks which project from most of the points, rarely extend beyond a quarter of a mile from them.

PORT JACKSON,* independently of being the port of the metropolis of New South Wales, is justly extolled as the most commodious and secure harbour on the East coast of Australia; and although vessels have sometimes been wrecked in attempting to enter, these disasters, in most cases, may be attributed rather to want of judgment and common prudence than to any real difficulty in making or entering the port.

In approaching port Jackson from the eastward, the summit of the northern of the two Sydney heads will, in clear weather, be first seen, from its being considerably higher than the adjacent coast. As the port is neared, it will be easily identified by the lighthouse and signal station on Outer South head and the bold, perpendicular profile of North head. *See* view of port Jackson entrance on chart No. 1,069.

The characteristic features of the coast to the northward and southward of port Jackson, assume somewhat different aspects: for, although North head, with its immediate vicinity, presents a high, table-topped precipitous appearance, yet the high, undulating hills, thickly covered with trees, which rise from the coast farther to the northward, are strikingly in contrast with the sterile table-

* The entrance to port Jackson was passed at noon on the 6th May, 1770, by Captain Cook, who notes in his journal,—“Abreast of a bay or harbour wherein appears to be good anchorage, which I called port Jackson.” Doubtless this was in compliment to Mr. George Jackson, one of the joint secretaries to the Admiralty, as the next port passed was called, after the other secretary, port Stephens. The fact is mentioned on a monumental tablet to Sir George Duckett (formerly Mr. George Jackson), in Bishops Stortford church, Hertfordshire.

See chart, No. 1,020, and No. 1,069, port Jackson, scale $m = 6.0$ inches.

topped cliffs which extend to the southward of the port ; and would, even if the lighthouses did not present a conspicuous feature, point out whether the land seen, is to the northward or southward of the entrance of port Jackson.

Outer South head.—Outer South head is a precipitous projection of the coast, which here consists of coarse sandstone cliffs, of a light reddish colour ; the summit of the head is 300 feet above the sea.

LIGHT.—Macquarie or Outer South head lighthouse is a white circular stone building, 76 feet high, standing near the edge of the cliff, a quarter of a mile to the southward of Outer South head. It exhibits, at 344 feet above high water, an electric *revolving* white light, which attains its greatest brilliancy *every minute* ; it is visible seaward between the bearings of N. 11° W. and S. 14° W., and should be seen from a distance of 21 miles in clear weather.

Signal station.—Near the edge of the cliff, about a quarter of a mile to the northward of Macquarie lighthouse, are a signal station and telegraph office ; communication can be made by the commercial code. Storm signals are shown. *See* pages 24, 840.

The Gap.—From Outer South head the cliffy coast-line trends N.N.W. $\frac{1}{2}$ W. one mile to Inner South head which forms the rounding point on the south side of the entrance of port Jackson.

Midway between Outer and Inner South head lighthouses the profile of the cliffs breaks down to a deep hollow and indentation of the coast, known as the Gap, which is so remarkable, that it has on a dark night even been mistaken for the entrance of port Jackson.

Gap bluff, immediately to the northward of the Gap, rises to the height of 300 feet.

The water is deep along the coast between Outer and Inner South heads ; there are 14 fathoms a quarter of a mile, and from 4 to 9 fathoms one cable from the shore ; the cliffs are so precipitous as to afford no refuge in case of shipwreck.

Inner South head.—From Gap bluff the ridge gradually descends to Inner South head, which is 60 feet above high water, and has a lighthouse upon its extremity.

LIGHT.—Hornby or Inner South head lighthouse on Inner South head is a tower 30 feet high, painted red and white in vertical stripes ; it exhibits, at 90 feet above high water, a *fixed* white light, visible seaward between the bearings of N. 34° W. and S. 51° W., which should be seen from a distance of 14 miles in clear weather.

South reef is a ledge of rocks extending nearly a cable to the northward from Inner South head : it is easily seen in the daytime by the sea constantly breaking upon it. On the west shore to the southward of Middle head and above Obelisk bay are two white obelisks, each 30 feet high : the eastern and lower obelisk is at the edge of an elbow of the coast, the western and upper obelisk is upon a wooded slope and bears W. $\frac{1}{2}$ S. (S. 84° W.) from the former. These obelisks in line lead to the northward of the South reef and the north edge of the Bar.

Outer North head, on the north side of the entrance of port Jackson, is a flat-topped perpendicular cliff, 242 feet high. The east coast of North head promontory is a high precipitous cliff, first trending from Outer head N. $\frac{3}{4}$ E. one mile to North point, and then nearly N.W. three-quarters of a mile, to Cabbage Tree bay ; this coast is also bold, there being from 4 to 13 fathoms water at a cable from the shore.

Inner North head, W. $\frac{1}{2}$ N. nearly three-quarters of a mile from Outer North head, is a projection of the cliffy coast extending from Outer North head, and the coast between the heads forms the north side of the entrance of port Jackson.

The entrance of port Jackson is $1\frac{3}{4}$ miles wide, between Outer North and South heads ; the narrowest part, between Inner North and South heads, is a little more than three-quarters of a mile across from cliff to cliff ; but this breadth is reduced by a rocky spit on each side, to barely three-quarters of a mile. The entrance is clear of dangers, and the soundings are regular ; the depth in mid-channel being 17 fathoms, sand. Although there is a depth of

9 to 12 fathoms within a cable of the north shore, the sea generally rolls in and breaks heavily upon the cliff.

The Sound is that part of port Jackson immediately within the entrance, and which branches off into Spring cove, North, and Middle harbours. Although the Sound occupies an area of nearly $1\frac{1}{2}$ square miles, with regular soundings in 8 and 9 fathoms, it is too exposed to the ocean swell to afford safe anchorage, except with off-shore winds.

Spring cove and quarantine establishment.*—From Inner North head the cliffs recede to the north-westward for about half a mile, terminating at a hummocky point, upon which is the quarantine signal station : this forms the sheltering point of Spring cove, where 4 or 5 vessels, in moderate weather, may obtain safe anchorage, to ride out quarantine. The quarantine establishment and burial ground are situated at about a quarter of a mile from the cliff, between Spring cove and Inner North head.

North harbour is a deep bight to the north-westward of Spring cove, with regular soundings of 6 to 8 fathoms, and, although not apparently open to the fury of south-east gales, it is a treacherous anchorage ; but after running for Spring cove, and finding its limited space so filled by vessels as to prevent taking up a berth, anchorage may be had in 6 fathoms, about a quarter of a mile to the northward of the north point of Spring cove, at a cable from the east shore, and in some measure sheltered from the sea, which south-east gales send into the middle and western portions of North harbour.

A spit of 2 to $2\frac{1}{2}$ fathoms extends about $1\frac{1}{2}$ cables to the southward from Dobroyd point, the west point of the entrance to North harbour ; it is marked by a red buoy at its extreme.

Hunter's bay is one mile within the heads and four-tenths of a mile broad, between Middle head and Grotto point. No vessel should enter Hunter's bay when blowing hard from the eastward, as it is then a sheet of broken water, although with depths of $3\frac{1}{4}$ to $4\frac{1}{2}$ fathoms ; this would defy any ground tackle, and swamp a laden craft, the draught of which might prevent her crossing the 9 foot bar, between Hunter's bay and Middle harbour.

See chart, No. 1,069.

* This is the only quarantine station in New South Wales, and is very completely equipped.

Middle harbour, which trends to the north-westward from Hunter's bay, carries from 14 to 5 fathoms water for about three-quarters of a mile above the bar ; when, after narrowing to a cable in width abreast of Hillery spit, it turns to the westward, into a 16-fathoms estuary, which branches into deep creeks, leading to no settlement or object for traffic, except the firewood upon its banks, which some Sydney lighters find profitable.

Middle head, W.N.W. two-thirds of a mile from Inner South head, is a lofty, precipitous, bold bluff of whitish freestone, immediately facing the entrance of port Jackson. As it is exposed to the ocean swell, the sea breaks upon it with great violence during easterly gales.

George head, S. by W. $\frac{3}{4}$ W. three-quarters of a mile from Middle head, is 209 feet high ; a shoal of less than 3 fathoms extends from George head a quarter of a mile towards Middle head.

Bradley head, the southernmost projection of the north shore of port Jackson, is S.S.W. $\frac{1}{2}$ W. nearly $1\frac{1}{4}$ miles from George head, and shoals extend about half a cable southward and one cable eastward from it. There is a pillar about 25 yards off the south-west extremity of the head. Between George and Bradley heads are Chowder and Taylor bays, separated from each other by Chowder head. Storm signals are shown from Bradley head. *See* pages 24, 840.

The Bar, with Sow and Pigs shoals, extend across port Jackson between Inner South and George heads. At times a heavy swell sets into the harbour, which requires an allowance of a fathom for scend ; this must be duly considered by vessels of great draught.

A portion of the Sow and Pigs shoals is a group of rocks, showing at half tide, and marked by an iron beacon rod, surmounted by an open hooped ball. This beacon is fixed nearly midway between the shores on either side, and the outer and inner edges of the Bar, which spreads over two-thirds of a mile north and south, and extends from shore to shore, across the entrance, which is here three-quarters of a mile wide.

Spits of rough ground extend S.S.W. a quarter of a mile, and S. by E. one-third of a mile, from the beacon, with from 11 to 18 feet

water upon them ; these, with a 16 to 17 feet ridge to the westward of them, form Sow and Pigs shoals, which separate the East from the West channel. But there are two patches of 18 feet water lying respectively N. by E. $\frac{1}{4}$ E. $1\frac{3}{4}$ cables, and North $2\frac{1}{3}$ cables from the beacon, and which are the most dangerous shoals upon the Bar, as they lie in the fairway between the Sound and the light-vessel, and are open to the full scend of the ocean swell. These patches, which are the most shallow parts of the northern edge of the Bar, separate East from West channel, as the shoals just described to the southward, do in that direction.

LIGHTS.—The Sow and Pigs light-vessel, painted red, is moored in 21 feet water, to the north-westward of the shoals, and nearly one cable from the beacon. The light-vessel shows a red flag by day ; and two *fixed* white lights, placed vertically 6 feet apart upon one mast, by night. The upper light is 28 feet above the water, and the lights are visible from a distance of 6 miles in clear weather. At sea the lights are obscured by Outer North head and Inner South head except when bearing between S.W. by W. $\frac{1}{2}$ W. (S. 62° W.) and S.W. by W. (S. 56° W.).

Storm signals are shown from the light-vessel. *See* pages 24, 840.

An orange-coloured *fixed* light is shown from a pile light beacon, which is in 28 feet water off the south-east part of the Sow and Pigs. From the light beacon the obelisk on Green point bears E.N.E., distant $2\frac{1}{2}$ cables.

PILOTS.—The pilot station at Watson bay is within half a mile of the signal station on the Outer South head, and the look-out is kept at the signal tower, from which the night signals of vessels requiring pilots are answered. A Government steam vessel is stationed in Camp cove to take pilots off to vessels making the port. If the state of the sea will not admit of a pilot being put on board from the steam vessel, she will lead the way into smoother water between the heads, where tugs will be in attendance. *See* also pages 15, 16.

Caution.—The speed of steam vessels, when westward of fort Denison, must not exceed 6 knots an hour ; a heavy penalty is imposed for an infringement of this regulation.

Pratique.—A vessel requiring pratique shall not proceed further up the harbour than a line between Bradley head and Shark point until permission shall have been received from the health officer.

WEST CHANNEL crosses the Bar on the western side of Sow and Pigs shoals; the narrowest part of the channel is between George head and the shoals, where it is $1\frac{1}{2}$ cables wide with depths of over 3 fathoms. The light-vessel is situated so as to render this an available night channel, which may be taken without a pilot, in moderate and clear weather, by any one who has studied the chart and directions.

The depth in West channel at low water, ordinary springs, is from 20 to 21 feet.

Leading mark through the channel:—St. John's church, at Darlinghurst, just open of Bradley head, bearing S.W. by S. (S. 34° W.), clears the 18-foot patches on the northern edge of the Bar, and the Sow and Pigs shoals, on their western sides, and the shoal extending from George head on its eastern side.

Watson bay.—From Inner South head, the east shore of port Jackson trends S. $\frac{3}{4}$ W. half a mile to Green point, the north extreme of Watson bay, and upon which, at high-water mark, is a white obelisk, about 12 feet high. Parsley and Vacluse bays, which are separated by Vacluse point, are two small bights forming a continuation of Watson bay; the three bays having a common entrance, which is 4 cables across, S.S.W. $\frac{3}{4}$ W. from Green point to Bottle and Glass spit. Both points of the entrance are closely begirt with sunken rocks; and from Bottle and Glass spit, foul ground borders the shore for nearly half a mile to the south-westward, terminating at Shark point.

There is a white obelisk, about 25 feet high, on the south-west shore of Parsley bay.

Watson bay is the life-boat and pilot station; and as there is smooth anchorage, in 6 to 7 fathoms water, outward-bound vessels frequently anchor here to wait for a fair wind.

EAST CHANNEL.—This channel across the Bar is defined by leading marks, with deeper and much smoother water than West channel; but the necessity for suddenly hauling up at right angles when entering from seaward, with a south-east breeze,

is occasionally a disadvantage to this channel. The outer narrows of East channel, where the soundings quickly decrease from 8 to $4\frac{1}{2}$ fathoms, lie between South reef and the northern 18-foot patches of Sow and Pigs shoals, at the north entrance of the channel, which is there nearly a quarter of a mile wide.

The depth in East channel at low water, ordinary springs, is 26 feet.

Buoy.—A buoy is moored off Camp cove in 5 fathoms, and bears N. $\frac{1}{2}$ W. distant $1\frac{1}{4}$ cables from the obelisk on Green point.

Lights and leading marks for East channel, and cross mark for the southern edge of Sow and Pigs shoals :—

The two lighthouses in the vicinity of Vacluse bay, bearing S. $\frac{3}{8}$ E. (S. 4° E.) and N. $\frac{3}{8}$ W. (N. 4° W.) from each other, when in line lead through the East channel in not less than 26 feet at low water springs. Each lighthouse exhibits a *fixed* red light.

St. James' church spire, which is surmounted with a ball and cross, open of Bradley head, bearing S.W. $\frac{3}{4}$ W. (S. 53° W.), leads clear of the south-eastern elbow of Sow and Pigs shoals.

Macquarie, or Outer South head lighthouse, its breadth open to the southward of the red and white chequered obelisk upon the wooded slope of Parsley bay, bearing S.E. by E. $\frac{1}{2}$ E. (S. 62° E.), clears the south-western, or inner edge of the Bar.

Twenty-eight feet patch, with a least depth of 28 feet, hitherto known as the Four-fathom bank, lies $2\frac{1}{2}$ cables N. by W. from Shark point; the leading mark, St. James's spire, open of Bradley head, bearing S.W. $\frac{3}{4}$ W. (S. 53° W.), leads two-thirds of a cable north-westward of the shoal; and Post Office tower in line with Bradley head pillar, bearing S.W. by W. (S. 56° W.), leads close to the northern edge of the shoal; also the south-east extreme of Outer North head cliff (seen over Inner South head), open north of Pile light beacon, bearing N.E. $\frac{1}{8}$ N. (N. 44° E.), leads one-third of a cable north-westward of the shoal.

Port Jackson above the Bar is so free from dangers, and is so clearly represented on the chart, that a few of the islands and most prominent points, bordering the fairway, need now be only briefly noticed.

Anchorage.—The Sound only affords temporary anchorage with off-shore winds, where vessels may wait for a tug or a favourable opportunity for entering port Jackson. There is good anchorage in Watson bay.

Shark island is small and thickly wooded, 30 feet in height, and lies E. by S. $\frac{1}{2}$ S. two-thirds of a mile from Bradley head; a spit of foul ground extends nearly a cable from its north-west end and is marked by a small black buoy at its north-east extreme.

The shoal ground extending about two-thirds of a cable to the south-east of the island is marked by a red buoy at the 3-fathoms extreme.

Light.—A harbour light is exhibited from a platform erected in 22 feet water on the north edge of the shoal ground extending from Shark island. The light is a *fixed* white light, visible from the fairway of the harbour, between Shark point and point Piper, and is so bright as to be easily distinguished from ordinary lights. It is one cable N.W. $\frac{1}{2}$ N. from the north-east extreme of Shark island.

Clarke island, S. by W. $\frac{1}{4}$ W., two-thirds of a mile from Bradley head, is similar in aspect to Shark island, but much smaller; and the water is deeper round it, although there are less than 5 fathoms at half a cable north-east and south-westward of it.

Garden island, which lies nearly one mile to the south-westward of Bradley head, is considerably larger and higher than the others; a shallow spit runs out from its south point. Garden island is a Naval depôt, and there is a wharf on the west side. On the island are stores, engineers' shops, a saw mill, boat house, boat slip, and barracks.

The observation spot is on a granite rock in the north part of the island, and in latitude $33^{\circ} 51' 37''$ S., longitude $151^{\circ} 13' 51''$ E.

Buoy.—A shoal extending half a cable to the eastward off the north-east end of the island is marked at its extreme by a black buoy with staff and ball.

Fort Denison.—**Light.**—Fort Denison, formerly called Pinchgut islet, lies about a quarter of a mile to the north-westward of the north end of Garden island. This islet is a mass of bare rock and masonry, with a martello tower on its north-east extreme, from

which is shown a *fixed* red light, which may be seen from a distance of 5 miles in clear weather, except through a small sector southward of it. The islet should not be passed within half a cable, on account of two small spits extending a short distance from it.

Fort Macquarie.—The fort is situated near the north extreme of the point which separates Farm cove from Sydney cove. Shoal water runs out about half a cable from the point, the spit being marked by a black buoy.

Fort Macquarie is in latitude $33^{\circ} 51' 33''$ S., longitude $151^{\circ} 13' 0''$ E.

Woolloomooloo bay and Farm cove.—Farm cove and the northern portion of Woolloomooloo bay are reserved for the anchorage of ships of war, and moorings are laid for the use of H.M. ships. Man-of-war anchorage is included in the space bounded by a line drawn from fort Macquarie, passing about half a cable southward of fort Denison, to the north extreme of Garden island, and a line from the south extreme of Garden island W. $\frac{3}{4}$ S. to the Domain.

Water.—There is a small camber for boats, inside a jetty on the west side of Farm cove, at about half a cable from fort Macquarie, with a pipe supplying excellent water at the end of the jetty, at which Government boats can, without charge, water at all times of tide.

Kirribilli point, the most prominent projection on the north shore of port Jackson, to the westward of Bradley head, lies N.N.E. one-third of a mile from fort Macquarie. A rocky spit extends half a cable from Kirribilli point, which, with fort Macquarie spit, reduces this part of the harbour to a quarter of a mile in breadth.

The Fairway of port Jackson, within which vessels are not allowed to remain at anchor, is bounded on the north side by an imaginary line extending from the distance of $1\frac{1}{2}$ cables eastward of Middle head to one-third of a cable southward of Bradley head, Kirribilli and Blues points; and on the south side by a line passing at the distance of one-third of a cable, westward of Inner South head and Green point, northward of Shark island light, Clark and Garden islands, and Dawes point.

It is not here deemed necessary to enter into a detailed description of port Jackson above fort Macquarie, as a vessel having arrived thus far, will be berthed by the Portmaster's directions, according

to her destination ; and the various commercial localities, and other details of the kind, will be best understood by reference to the chart.

Submarine cable.—Persons are cautioned against anchoring, creeping, dredging, or fishing near the submarine cable and fresh water pipes which are laid between Dawes point and Milson's point.

SYDNEY, the capital and seat of government of New South Wales, is situated at a distance of 4 miles from the mouth of the harbour. The harbour is not an uniform expanse of water, but is broken up in all directions by steep points jutting out into it, forming bays which are harbours in themselves, and allow the heart of the city to be easily reached from the water.

Vessels drawing 27 feet water can in many parts lie close in shore. This last natural advantage has been greatly utilised, and the water is skirted with wharves, stores, and warehouses. Sydney cove has wharves round it, and there are also wharves in Woolloomooloo bay available for the longest vessels. The eastern side of Darling harbour, which skirts the western side of the city, has its frontage entirely occupied with wharves and quays as well as extensive stores. Between Miller and Dawes points the space is almost completely taken up by commercial premises.

The approaches to berths, and the process of berthing, are equally simple, and these being entirely the business of the pilot and port-master, no directions are necessary on that head.

Water for the city flows through conduits from the united Nepean, Cataract, and Cordeaux rivers, which rise in the mountainous country westward of Wollongong.

Within the city there are numerous and extensive factories and foundries. Steam ferry boats ply between the city and its transmarine suburbs. The trade of Sydney is considerable : during the year 1894 the total tonnage entering and leaving port Jackson was 3,571,614. The principal imports are,—wines, spirits, manufactured goods, wearing apparel, hardware, earthenware, saddlery, books, stationery, carriages, tea, sugar ; and the exports,—wool, tallow, hides, felts, horns, hoofs, bones, leather, gold, copper, copper ore, tin, tin ore, shale and pearl shell. The population of the city, including suburbs, was 423,600 at the end of 1894.

DIRECTIONS.—The most unfavourable times for sailing

vessels to enter port Jackson are in easterly gales, southerly gales, and light variable winds with a ground swell rolling in upon the heads.

Easterly gales sometimes blow very hard, causing a heavy sea upon this coast, which not only breaks with great violence upon Sydney heads, but occasionally right across the entrance, and directly home to Middle head; a vessel, however, scudding in, must approach within 3 cables of Middle head, at the risk of being swept upon it by the hurling sea whilst hauling up, almost at right angles, to cross the Bar, and weather George head, upon which also the sea breaks.

Easterly gales are frequently attended by haze-banks, which might prevent the lights being seen at night until too late for a vessel to claw off the land; sailing vessels should therefore, day or night, keep the sea rather than bear up for port Jackson in a gale from the eastward, and should not approach the coast within 10 miles.

It must be borne in mind, when getting an offing, that the weather gauge will be to the north-eastward as the gale expands itself, and that in standing to the northward the vessel is safe as long as Outer South head light is not shut in by Outer North head, which it is, upon the bearing of S. by W. $\frac{1}{4}$ W. (S. 14° W.), and then the soundings begin to shoal to about 20 fathoms, within which line no vessel should approach the coast.

The southerly gales are strong squally winds, which rush down the harbour, and frequently embarrass sailing vessels when working up between the heads, sometimes taking them aback, and exposing them to destruction against the North head cliffs; vessels should therefore wait outside until the wind becomes more steady, unless in very good working order and the flood stream is running.

Sailing vessels should not attempt to enter between the heads with light variable winds, as, under such circumstances, they frequently become unmanageable, and, being left to the mercy of the ground swell, may be set upon either of the heads; therefore it is advisable to anchor and wait for a steady breeze, or summon a steam tug, before getting too near the heads.

If bound to port Jackson and, from want of observations, uncertain of the latitude, and the land is fallen in with either to the

See charts, No. 1,020; No. 1,021, port Jackson to port Stephens, scale $m = 0.5$ inch; No. 2,166, Broken bay, scale $m = 2.0$ inches; No. 2,179, Botany bay; No. 1,069.

southward or the northward of it, in heavy weather, shelter may be found in Botany bay, to the southward, or Broken bay, to the northward, according to circumstances.

Botany bay, as already described at page 816, lies about 10 miles to the southward, and Broken bay, described in Australia Directory, Vol. II., lies 16 miles to the northward of port Jackson; and it is of the utmost consequence that those in such vessels as may happen to be in bad condition, and unable to keep off shore, should be aware of these useful places of refuge.

Sailing vessels approaching port Jackson in the night with southerly or westerly winds, should keep the sea until daylight (unless intending to employ a tug); but with winds from the northward or eastward, and favourable weather, they may safely enter.

Soundings have been accurately ascertained within the range of Macquarie or Outer South head light; and are a valuable assistance in nearing the land in thick weather. East of the entrance of port Jackson, at 18 miles off shore, the depth is 100 fathoms, olive sand, from which it shoals regularly to 20 fathoms, close in with the land and with the entrance. To the northward of the port, 100 fathoms is farther off shore; and, on the contrary, to the southward, this depth does not extend off more than 14 miles.

From the Southward.—If the weather be dark or thick, preserve a good offing until the Sydney heads, or Macquarie or Outer South head lighthouse be seen, in order to clear the projection of the coast about Botany bay, where it is comparatively low, and where the current sometimes sets S.W., towards the shore.

Having clearly made out the Sydney heads, and being abreast of Outer South head, if the wind be fair, steer to the north-westward, taking care not to bring Outer South head lighthouse west of Gap bluff, in order to clear South reef, which as the sea generally breaks upon it, may easily be seen, and with a commanding breeze, may be passed in 10 fathoms at the distance of a cable. Soon after opening Middle head north of Inner South head, the two white obelisks on the western shore will be visible, these in line, bearing W. $\frac{1}{2}$ S. (S. 84° W.), clear the South reef and the 18 feet patches on the northern edge of the Bar.

By the West channel.—Steer in with the western obelisks in line, or to the north of that line, giving a good berth to the North

head, until St. John's church at Darlinghurst is nearly in line with Bradley head, bearing S.W. by S. (S. 34° W.); then keep this mark on which leads through West channel, in from 20 to 21 feet at low water springs; and when Outer South head lighthouse opens south of the red and white chequered obelisk upon the eastern slope of Parsley bay, bearing S.E. by E. $\frac{1}{2}$ E. (S. 62° E.), the Bar is passed. The soundings, when passing the 18-foot patch on the northern edge of the Bar, decrease from 7 to $5\frac{1}{2}$, and then to $3\frac{1}{2}$ or $3\frac{1}{4}$ fathoms, which is the depth until through West channel, when the water quickly deepens to 10 fathoms, as Outer South head lighthouse opens its breadth southward of the red and white chequered obelisk.

The Bar being cleared, steer S.S.W. (S. 22° W.), passing between Bradley head and Shark island; round the head at the distance of about 2 cables, to clear the shoal extending from it, and then proceed westward for Sydney.

By the East channel.—Steer in with the western obelisks in line or to the north of that line for Middle head, giving a good berth to the North head, until the leading light towers in the vicinity of Vaucluse are in line, bearing S. $\frac{3}{8}$ E. (S. 4° E.), keep this mark carefully on (which leads through East channel in 26 feet at low water) until St. James' church spire at Sydney is its breadth open south of Bradley head bearing S.W. $\frac{3}{4}$ W. (S. 53° W.), which leads clear of the south-east extreme of the Sow and Pigs shoal, then round the pile light beacon, and steer for Bradley head, passing it at the distance of about 2 cables.

At night from the Southward.—Being abreast of, or at about three-quarters of a mile to the eastward of Outer South head light, with Inner South head fixed light well open of Gap bluff, bearing N.W. (N. 45° W.), steer N.W. by N. (N. 34° W.) until Inner South head light bears S.W. (S. 45° W.), when the Sow and Pigs light should be well open bearing S.W. by W. $\frac{1}{4}$ W. (S. 59° W.); then steer West, which will clear South reef and the 18-foot patches on the northern edge of the Bar, rounding the breakers on the former, at the distance of over a cable in 10 to 14 fathoms. Then proceed by East or West channel as directed at pages 834, 835.

From the Eastward.—The latitude (33° 50' S.) is the best guide for making port Jackson from the eastward. When the heads are clearly distinguished, enter as directed at pages 832, 833.

West channel at night.—As in the daytime, the latitude must be depended upon for making port Jackson from the eastward, until Outer South head revolving light, and afterwards Inner South head fixed light are distinguished.*

When Inner South head light is distinctly visible, steer for it upon a West bearing, until Outer South head light bears about S.S.W. (S. 22° W.); then alter course to W. by N. $\frac{1}{2}$ N. (N. 73° W.), so as to make sure of clearing the dangerous South reef; and when Inner South head light bears S.W. (S. 45° W.), distant about a quarter of a mile, and the Sow and Pigs light is well open, bearing S.W. by W. $\frac{1}{4}$ W. (S. 59° W.), steer West again, round the breakers on South reef at the distance of a cable, in not less than 10 fathoms water, and when the Sow and Pigs light bears S.S.W. (S. 22° W.) steer S.W. by S. (S. 34° W.), through West channel, passing at about a cable on the west side of the light-vessel. When Outer South head light bears S.E. by E. $\frac{1}{2}$ E. (S. 62° E.) the Bar is passed, when steer S.S.W. (S. 22° W.) until Shark island light is in line with Outer South head light bearing E. by N. $\frac{1}{4}$ N. (N. 76° E.); then steer westward for the red light on fort Denison, which pass on either side, at the distance of a cable, bring it astern in line with Outer

* If, when running in upon a westerly bearing of Inner South head light, the land be too indistinct for cross bearings, the vessel's approximate position may be readily ascertained by a sextant angle, between Inner and Outer South head lights, the corresponding distance being found in the following table:—

Bearing of Inner South head light.	Angle between Inner and Outer South head lights.	Distance from Inner South head light.	Distance from Outer South head light.
W. by S.	0		
	14 15	5 miles.	5 miles.
	17 45	4 "	4 "
	23 15	3 "	3 "
	33 35	2 "	2 $\frac{1}{4}$ "
	56 0	1 "	1 $\frac{1}{2}$ "
West.	14 10	5 "	4 $\frac{1}{2}$ "
	17 50	4 "	3 $\frac{3}{4}$ "
	23 50	3 "	2 $\frac{3}{4}$ "
	35 40	2 "	2 "
	62 40	1 "	1 $\frac{1}{4}$ "
W. by N.	13 30	5 "	4 $\frac{1}{2}$ "
	17 25	4 "	3 $\frac{1}{2}$ "
	23 55	3 "	2 $\frac{1}{2}$ "
	37 20	2 "	1 $\frac{3}{4}$ "
	70 10	1 "	1 "

South head light, bearing E. by N. (N. 79° E.), which clears fort Macquarie spit, and anchor in Sydney cove, in 7 fathoms, mud.

East channel at night.—Having cleared South reef as directed in the foregoing paragraph on the West channel, do not bring the Sow and Pigs light west of S.W. (S. 45° W.) until the two *fixed* red leading lights in the vicinity of Vacluse are in line, bearing S. $\frac{3}{8}$ E. (S. 4° E.); steer through the East channel with this mark on, and round the orange-coloured light on the pile beacon marking the south-east elbow of the Sow and Pigs shoals at the distance of a cable. Then steer about S.W. $\frac{1}{4}$ W. (S. 48° W.), avoiding the foul ground extending about a cable off shore between Bottle and Glass rocks and Shark point.

When Outer South head light is in line with Shark island light bearing E. by N. $\frac{1}{4}$ N. (N. 76° E.), or about 2 cables south-eastward of Bradley head, steer westward for the red light on fort Denison, which pass at the distance of a cable on either side and bring (astern) in line with Outer South head light, which will clear fort Macquarie spit. Anchor in Sydney cove in 7 fathoms mud.

From the Northward.—No special directions are required in the day time, as those already given at pages 832–4 answer every purpose, taking care to give Outer North head a good berth, especially with a light wind and a ground swell.

At night from the Northward.—Keep Outer South head light to the westward of S.S.W. $\frac{1}{2}$ W. (S. 28° W.) to give half a mile clearance to Outer North head, and look out for the entrance, the quickly successive opening of Inner South head light, bearing S.W. $\frac{1}{2}$ W. (S. 51° W.) and the Sow and Pigs light S.W. by W. (S. 56° W.); it is rarely so dark but that the black towering North head will show the entrance; when the Sow and Pigs light is shut in by Inner South head, bearing S.W. by W. $\frac{1}{2}$ W. (S. 62° W.), steer for Inner South head light, remembering that North head is cleared as long as the Sow and Pigs light is not opened north of Inner South head. When Outer North head is abeam distant about 2 cables, keep a W. by S. $\frac{1}{2}$ S. (S. 73° W.) course, in not less than 10 fathoms, until South reef is passed, when proceed by East or West channel as before directed. If desirable, give Outer North head a greater berth, when a more westerly course will lead past South reef.

Working into port Jackson.—A westerly wind blows right out of the entrance; but there is ample working room for a well-handled vessel between the heads, the shortest board being half a mile, between South reef and Inner North head; and, should the ebb stream be running, it may be much evaded by always tacking to the southward directly the light-vessel opens to the northward of Inner South head, until having worked up as close to South reef as to bring the signal tower on Outer South head to touch Gap bluff, bearing S. by E. $\frac{3}{4}$ E. (S. 20° E.), upon which line the vessel may stretch to the northward, clearing South reef at a cable distant, and then haul close up on the port tack, directly the light-vessel opens to the south-westward. Here the ebb stream will catch the vessel on the weather bow; but towards the North harbour its strength, of $1\frac{1}{2}$ knots, will be avoided.

It should be here stated that immediately outside the Bar, the ebb stream sets to the north-eastward, towards Inner North head, and then E.S.E. along shore, towards Outer North head, leaving the space from the line of the Outer heads to Inner South head, in slack water during the ebb.

There is deep water at the distance of rather more than a cable from Middle head, whence a S.S.W. (S. 22° W.) course leads across the Bar into the port.

Vessels drawing more than 14 feet, with a fresh wind, ought not to attempt to work through either of the narrow channels across the Bar; but vessels drawing less than 14 feet can stretch across from shore to shore, north of the Sow and Pigs light-vessel, passing over the 18-foot patches on the northern edge of the Bar.

When abreast of George head, West channel is contracted to little more than $1\frac{1}{2}$ cables in width by the 17-foot ridge forming the south-west extreme of Sow and Pigs shoals; to clear this, the obelisk on the south slope of the North head promontory must be kept a little open to the westward of the light-vessel, until Outer South head lighthouse is open at least its own breadth south of the chequered obelisk below it, when the Bar is passed.

Caution.—To ensure success in working in, and to avoid mishap, smart working, and readiness with both anchors is absolutely

necessary to cope with flaws and gusts of wind, as well as the ground swell, which perplex even those who frequent port Jackson.

To Cockatoo island.—Keep in mid-channel, until about a mile above Sydney cove, where there is a patch extending about a cable east and west, with a least depth of $3\frac{3}{4}$ fathoms on its north-east part, lying nearly midway between Balls head and Longnose point; to clear which to the southward keep Blues point just open of Balls head. Then, after clearing Longnose point, steer for Cockatoo island, at the south-east elbow of which is the Fitzroy dry dock, denoted by the steam-engine chimney, and at the west end the Sutherland dock.

TIDES.—It is high water, full and change, at North head, at 8h. 15m., springs rise 6 feet; and at Sydney at 8h. 38m., the rise at ordinary springs being $5\frac{1}{4}$ feet, and at neaps 4 feet.

Between April and October the night tides are higher than the day tides at Sydney, and between October and April the day tides are the higher. The usual sequence of the tides is from the lower low water to the higher high water.

Tidal streams.—In the offing, within the line of the current, the ebb stream sets to the southward and the flood to the northward. Outside the Bar, as just stated, the ebb sets across the Sound, towards Inner North head, and then about E.S.E. close along shore in the direction of Outer North head, leaving all the space between the line of the Outer heads, and Inner South head, in slack water, as regards the ebb stream. The ebb and flood streams set fairly across the Bar, N.E. and S.W.; up the harbour, they partake of the mid-channel course, the ebb from Shark island to the Bar setting N.E. and the flood S.W.; and above Bradley head the ebb stream East, and the flood West; the maximum rate of the ebb being 2, and of the flood $1\frac{1}{2}$ knots.

Time ball.—A ball is dropped from the top of the Astronomical observatory at Sydney electrically from the standard clock, at 1h. 0m. 0s. p.m. New South Wales standard time, equivalent to 15h. 0m. 0s. Greenwich mean time. The ball is hoisted half way up, as preparatory, at five minutes before the signal. When the signal fails in accuracy, the ball is at once hoisted half way up, and kept up for one hour. The amount of error is published in the local daily papers. *See page 30.*

The observatory is in latitude $33^{\circ} 51' 41''$ S., longitude $151^{\circ} 12' 23''$ E., or 10h. 4m. 49.53s.

Rainfall.—The average rainfall at Sydney is 50.9 inches, falling on 156 days annually.

Coaling facilities.—Coal for steaming purposes can be obtained at Sydney in any quantity. Steam vessels are supplied from hulks and lighters, or direct from steam colliers. *See* page 15.

DOCKS and SLIPS.—Every facility is to be obtained at Sydney for repairing vessels of any size or description, with abundant supplies and stores of every kind.

Fitzroy dock is a government dock at Cockatoo island, at about 2 miles above Sydney cove. The dock is 507 feet long, and 59 feet wide at the entrance, with a depth of $21\frac{1}{2}$ feet over the sill, at high water ordinary springs.

Sutherland (Biloela) dock, also a government dock, at Cockatoo island, is 638 feet long, 84 feet wide at the entrance, and has 32 feet over the sill at high water ordinary springs. Two red warping buoys are placed off the entrance of this dock.

These establishments are provided with the largest, most powerful and recently improved machinery, but all warps and necessary labour for docking must be provided by the ship about to be docked.

Mort's dock is a private dry dock in the bight of Waterview bay, on the south side of the harbour, at about $1\frac{1}{2}$ miles above Sydney cove. This dock is 472 feet long and 60 feet wide at the entrance, with a depth of $19\frac{1}{2}$ feet over the sill at high water ordinary springs. The Jubilee floating dock, 317 feet long and 44 feet wide at the entrance, is owned by the same company.

Rountree's floating dock in Waterview bay is 164 feet long, 42 feet wide, and has 12 feet on the sill; it is capable of taking a vessel of 600 tons.

Anderson's floating dock in Johnstone bay is 318 feet long, 56 feet wide, and has 18 feet on the sill.

The Atlas pontoon at Woolwich is 242 feet long, 56 feet wide, and capable of lifting vessels of 1,200 tons with a draught of 14 feet.

Patent Slips.—Davy and Sand's patent slip, Pyrmont, is 180 feet long, and capable of taking vessels of 600 tons.

The A.U.S.N. Company's slip in Darling harbour is 430 feet long, 37 feet wide, and can take vessels of 1,500 tons.

Town's patent slip can take vessels of 1,500 tons, 260 feet long, and drawing 9 feet 10 inches forward.

Mort's slips in Waterview bay; No. 1 has 270 feet length of cradle and a lifting power of 2,000 tons, No. 2 of 200 feet and 1,000 tons, and No. 3 is for small craft.

Building and repairs.—A screw steamer of 500 tons has been built; engines of 750 indicated horse power have been made, and 2,500 horse power repaired; castings are made to 40 tons; cylinders bored to 120 inches; boilers are made to 50 tons weight; shafting 24 inches diameter and 38 feet long has been forged and turned, and pipes of 30 inches diameter brazed; masts can be made, and boats built.

Mort's Dock and Engineering Company have sheers capable of lifting 60 tons, with a depth alongside of 23½ feet at low water.

Wharves.—**DARLING HARBOUR.**—Length of wharf, 4,000 feet; depth alongside at low water 18 feet; one steam crane to lift 10 tons; lit with electric light.

PYRMONT WHARF.—Length of wharf, 3,500 feet; depth alongside at low water, 25 feet; four steam cranes, each lifting 10 tons; railways on wharf; lit with electric light.

SYDNEY COVE.—**CIRCULAR QUAY.**—Length of wharf frontage, east 2,005 feet; west, 2,760 feet; depth of water, 28 to 30 feet.

From the east wharves there is a projection 320 feet long, with 28 feet of water at low water. The total wharf frontage in Sydney cove is to be extended to 4,622 feet, exclusive of the space occupied by ferry steamers. These wharves are used by the large sea-going vessels and mail steamers.

WOOLLOOMOOLOO BAY.—COWPER WHARF.—Length, 3,000 feet ; depth of water, 25 feet ; cranes to lift 10 and 15 tons ; lit with electric light.

BLACKWATTLE BAY WHARF.—Length, 1,400 feet ; for vessels drawing 10 feet ; depth is to be increased to 20 feet at low water.

There is also a great number of private wharves in port Jackson.

Steam tugs.—There are steam tugs at Sydney, which may be summoned by signal when required ; usually one or more are in waiting for vessels outside the heads.

Steamship Companies.—The Peninsular and Oriental Company, the Orient Company, the Union Steamship Company of New Zealand, the Compagnie Messageries, and the Australasian United Steam Navigation Company have establishments at Sydney.

Gunpowder.—A vessel arriving with any explosive on board, besides the ship's stores, is to hoist a pilot-jack at the main, and keep the same flying until all the explosives are landed according to law.

All vessels are required (with penalty for non-compliance) to land at the Government magazine whatever gunpowder they have on board, whether as cargo or stores, before passing westward of Garden island. The Master of any vessel westward of this place, on board which more than 12 pounds of gunpowder may be found, is liable to a fine of one pound sterling for every additional pound weight so found. Cartridges and chemical explosives must be treated in the same way as gunpowder.

Port regulation.*—No ballast, rubbish, gravel, earth, stone, wreck, or filth is to be thrown from any boat or vessel in the harbour of port Jackson, or into any creek or river within the limits thereof, excepting only on land where the tide or water never flows.

Numerical flags.—The following flags or pendants are used at the Signal Stations of New South Wales to indicate the place from which a vessel arrives, and in storm signals where a gale is blowing :—

1. Red.
2. Yellow and blue, horizontal, 2 divisions.
3. Blue, yellow, red, vertical.
4. Red and white, 4 divisions.

* Laws and regulations to be observed in port Jackson may be found in a hand-book issued by the Marine Board.

See chart, No. 1,069.

5. White, with 5 blue crosses.
6. Blue and yellow, 6 horizontal stripes
7. Blue, with 7 white crosses.
8. Blue and white, 8 triangles.
9. Red and white, 9 vertical stripes.
0. Blue, white ball in centre.

Substitute, White.

Numeral pendant, Yellow and red, vertical

Ports represented by numerical flags :—

- | | | |
|------------------------|----------------------------------|---|
| 1. London. | 36. Singapore. | 69. United States. |
| 2. Portsmouth. | 37. Wilson promontory. | 70. Macleay river. |
| 3. Plymouth. | 38. Java. | 71. Canada. |
| 4. Bristol. | 39. Japan. | 72. Gabo island. |
| 5. Liverpool. | 40. Sydney. | 73. Coasting voyage. |
| 6. Hull. | 41. Moreton bay. | 74. Whaling voyage. |
| 7. Lynn. | 42. Clarence river. | 75. Manning river. |
| 8. Other English port. | 43. Port Macquarie. | 76. Circular head. |
| 9. Leith. | 44. Port Stephens. | 77. Clyde. |
| 10. Torres strait. | 45. Newcastle. | 78. South sea island. |
| 11. Cleveland bay. | 46. Jervis bay. | 79. California. |
| 12. Greenock. | 47. Twofold bay. | 80. Keppel bay. |
| 13. Other Scotch port. | 48. Corner inlet. | 81. Port Denison. |
| 14. Dublin. | 49. Port Phillip. | 82. Wollongong. |
| 15. Belfast. | 50. Portland bay. | 83. Wide bay. |
| 16. Londonderry. | 51. South Australia. | 84. Port Curtis. |
| 17. Cork. | 52. King George sound. | 85. New Caledonia. |
| 18. Other Irish port. | 53. Western Australia. | 86. Paget sound. |
| 19. France. | 54. Launceston. | 87. Fiji. |
| 20. Belgium. | 55. Hobart. | 88. Port Fairy or
Warrnambool. |
| 21. Holland. | 56. Gulf of Carpentaria. | 89. Hokianga. |
| 22. Germany. | 57. New Zealand. | 90. Kaipara. |
| 23. Russia. | 58. Auckland. | 91. Manukau. |
| 24. Sweden. | 59. Bay of Islands. | 92. Taranaki. |
| 25. Spain. | 60. Port Nicholson. | 93. Nelson. |
| 26. Portugal. | 61. Shoalhaven. | 94. Port Cooper. |
| 27. Cape of Good Hope. | 62. Society islands. | 95. Otago. |
| 28. Mauritius. | 63. Friendly islands. | 96. Bluff harbour. |
| 29. Bourbon. | 64. Navigator's islands. | 97. Hawke's bay. |
| 30. Bombay. | 65. Sandwich islands. | 98. Kiamo. |
| 31. Ceylon. | 66. East coast of S.
America. | 99. Wallaroo. |
| 32. Madras. | 67. West coast of S.
America. | 101. Port Mackay. |
| 33. Calcutta. | 68. Richmond river. | 102. Queensland (not
above-mentioned). |

Life saving appliances.—There are only two lifeboats proper on the coast of New South Wales, one being at port Jackson and the other at Newcastle; the whale boats at the pilot stations are fitted with cork linings, &c., and have rendered excellent service in saving life. Life saving appliances are also kept at Sydney, Wollongong, Kiama, Shoalhaven, and Twofold bay (not including ports northward of Sydney).

APPENDIX.

PROVISION DEPÔTS.—Particulars of all the provision depôts, established in the islands of the South Indian and South Pacific oceans, for the benefit of shipwrecked mariners:—

1. CROZET ISLANDS—HOG ISLAND.—The provision depôt is a hut near the landing place on the eastern side of the island, $2\frac{1}{4}$ miles southward of the Five Giants, which lie off the north-east point of Hog island. In December 1887, the French vessel *Meurthe* left at this depôt, one ton of preserved beef, half a ton of biscuits, 84 lbs. of sardines in oil, 20 blankets, 15 pairs of shoes, and 15 pairs of cloth trousers, all packed in boxes; also 2 spears, 2 hatchets, and cooking utensils.

The depôt is approximately in lat. $46^{\circ} 6\frac{1}{2}'$ S., long. $50^{\circ} 14\frac{1}{2}'$ E.

1a. CROZET ISLANDS—POSSESSION ISLAND.—The provision depôt consists of huts, situated about 100 yards from the coast in the south-east corner of American bay, which is on the east side of the island, and about 7 miles from Dark head, the north-east point. H.M.S. *Comus*, in 1880, left here sufficient provisions for 50 people for 50 days, also jerseys, trousers, stockings, and shoes. The provisions were intact when Possession island was visited by the French vessel *Meurthe* in December 1887.

The depôt is approximately in lat. $46^{\circ} 23'$ S., long. $51^{\circ} 46\frac{1}{2}'$ E.

2. KERGUELEN ISLAND.—The depôt established by the French Government is situated in the south-east part of Jachmann peninsula, Hillsborough bay, near the south-western shore of the eastern lake, and about half a mile northward of the coast opposite Gazelle basin. It is in a cave at the foot of the west cliff of a rocky chasm running north and south, and its position is indicated by a stone cairn, $11\frac{1}{2}$ feet in height, and about 14 feet broad at the base, erected on the summit of the west cliff of the chasm. This cairn, painted black, is visible from Gazelle basin, and shows clearly against

the grey rocks which form the background. The entrance to the cave was closed by large stones, and the inscription—*Vivres et Vêtements, Eure, Janvier 1893*—was placed on the cliff a few yards above it.

The depôt is approximately in lat. $49^{\circ} 16' 45''$ S., long. $69^{\circ} 40' 30''$ E., and it contains one ton of preserved beef, half a ton of biscuits, 20 swan-skin shirts, 20 pairs woollen drawers, 20 blankets, 4 packets of matches. The boxes of preserved beef are stowed in a pile, coated with coal tar; the biscuits are in four iron-hooped barrels, covered with coal tar; the clothes are in two similar barrels, and the matches are in a box, similar to the beef boxes, painted with red lead and labelled with the contents.

In the event of the cairn being destroyed, follow these directions to find the depôt:—Land on the north side of the inlet opposite Gazelle basin, in a small creek, sheltered by a rocky point, where boats can land under any circumstances of wind or tide; proceed about half a mile directly inland to the shore of the lake, then turn westward and follow the lake to its western end, where the chasm in which the depôt is situated will be seen on the left hand.

3. **ST. PAUL ISLAND.**—*See* page 52.

4. **AMSTERDAM ISLAND.**—*See* page 56.

The following depôts are maintained by the Government of New Zealand. Those on Auckland, Campbell, Antipodes, Bounty and Snares islands are visited by a steamer twice a year, and those on Kermadec islands once a year. Finger posts to indicate the positions of the depôts are to be erected on all these islands.

5. **SNARES ISLANDS.**—A provision depôt is established on North-east island, and is situated in Boat harbour at the eastern end of the island, or approximately in lat. $48^{\circ} 4' 35''$ S., long. $166^{\circ} 34'$ E.

6. **AUCKLAND ISLANDS.**—There are three depôts; one, a square wooden house on the south side of Erebus cove, port Ross, on the east side and at the northern end of the principal island; the second is at the head of Norman inlet (wrongly named Musgrave inlet on charts), and not at the inlet named Norman inlet, $2\frac{1}{2}$ miles northward; the third is in the western arm of Camp cove, Carnley harbour, at the south end of the principal island.

The approximate positions are,—of the Erebus cove depôt lat. $50^{\circ} 33\frac{1}{4}'$ S, long. $166^{\circ} 12'$ E.; of the Norman inlet depôt, lat. $50^{\circ} 44' 25''$ S., long. $166^{\circ} 8'$ E and of the Camp cove depôt, lat. $50^{\circ} 52\frac{1}{4}'$ S., long. $166^{\circ} 3'$ E.

A life-boat has been placed on Enderby island, the north-eastern of the group; another at the north-west end of Adams island the southern of the group; and a third on Rose island, immediately south-west of Enderby island.

7. **CAMPBELL ISLAND.**—The depôt is in Tucker cove, at the head of South or Perseverance harbour, on the east side of the island; its position is indicated by a white staff.

It is approximately in lat. $52^{\circ} 33\frac{1}{2}'$ S., long. $169^{\circ} 6\frac{1}{2}'$ E.

8. **ANTIPODES ISLANDS.**—The depôt is a hut at an elevation of 100 feet above the sea, visible from some distance north-eastward; it is 300 feet from the landing place, which is on the north-east side of the large island, and half a mile westward of its east point, or approximately in lat. $49^{\circ} 41\frac{1}{4}'$ S., long. $178^{\circ} 43'$ E.

9. **BOUNTY ISLANDS.**—The depôt is a hut at an elevation of 120 feet above the sea, and is visible from the northward; it is situated southward of the western inlet of the principal island—the north-eastern—of the western group of the Bounty islands, or in approximately lat. $47^{\circ} 43\frac{1}{4}'$ S., long. $179^{\circ} 0\frac{1}{2}'$ E.

10. **KERMADEC ISLANDS.**—There are two depôts, each a small galvanised iron shed, fitted with spouting and a tank to catch water, and containing a supply of biscuits, medicines, tools, &c. One is situated on the southern side of Macdonald cove (crater), on the north-west side of Curtis island, or approximately in lat. $30^{\circ} 35'$ S., long. $178^{\circ} 36'$ W.; the other at Lava cascade, about $1\frac{1}{2}$ cables south-eastward of the northern point of Macauley island, or approximately in lat. $30^{\circ} 15'$ S., long. $178^{\circ} 31'$ W.

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