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THE WORLD & INDIA

SPECIALLY ADAPTED FOR USE OF SCHOOLS IN INDIA

BY

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LATE ASSISTANT DIRECTOR OF PUBLIC INSTRUCTION IN THE BOMBAY PRESIDENCY

FROM *THE JUNIOR GEOGRAPHY* AND OTHER GEOGRAPHIES BY

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CONTENTS

PART I

PHYSIOGRAPHICAL INTRODUCTION TO WORLD GEOGRAPHY

CHAP.		PAGE
I.	The Earth	1
II.	The Land	8
III.	Climatic Regions	35
IV.	The Ocean	52
V.	Plant and Animal Regions	62
VI.	Man	75
VII.	The Natural Regions of the World	87

PART II

INDIA AND CEYLON

VIII.	A General Survey of India	105
IX.	Climate and Productions of India	119
X.	The Coast-line, Communication, and Trade of India	130
XI.	Political Divisions of India	134

PART III

ASIA

XII.	Physical Features and Climate of Asia	159
XIII.	The Climate, Natural Regions of Asia and their Products	169

PART IV

THE BRITISH ISLES

XIV.	General Geography of Britain	189
XV.	England and Wales	209
XVI.	Scotland	236
XVII.	Ireland and the Islands in British Waters	246

PART V

EUROPE

XVIII.	The General Character of Europe	257
XIX.	Western and Central Europe	283
XX.	Alpine, Southern, and Eastern Europe	304

PART VI

AFRICA, AUSTRALASIA, AND AMERICA

XXI.	The General Geography of Africa	327
XXII.	The Regional Geography of Africa	337
XXIII.	Australasia and the Pacific Islands	352
XXIV.	The General Geography of North America	365
XXV.	Regional Geography of North America	377
XXVI.	South America	390

LIST OF ILLUSTRATIONS

PART I

PHYSIOGRAPHICAL INTRODUCTION TO WORLD GEOGRAPHY

FIG.		PAGE
1-6.	Different Hemispheres—showing Land and Water	3
7.	Pole Star, Latitude and Longitude	5
8.	The Seasons	7
9.	Hypsographic Curve (after Penck, Wagner, and Krümmel)	9
10.	World—Lowlands and Continental Shelf (Bisiker)	11
11.	World—Land over 6,000 feet high. Water over 6,000 feet deep (Bisiker)	13
12.	Distribution of Volcanoes (after Wägler)	14
13.	Distribution of Earthquakes (after Montessus de Ballore)	14
14.	Vesuvius (Italian Survey)	15
15.	Alpine Type of Mountains: Hohe Tauern, &c. (Debes' Hand-Atlas)	16
16.	World—Contours of 0, 1,500, 3,000, and 6,000 feet (Bisiker)	18
17.	Tableland and Rift Valley. West and East of Dead Sea (Debes' Hand-Atlas)	19
18.	Highland and Fiords. Western Scandinavia (Debes' Hand-Atlas)	20
19.	World—Structural Divisions (Herbertson, based on Suess)	22
20.	Drainage Areas	24
21.	Mississippi Delta (after U.S. Survey)	26
22.	Sections of an Alpine Valley with and without a Glacier	28
23.	Map of Glaciers and Glaciated Valleys (Aletsch, Rhone, &c.) (Dufour's Atlas)	29
24.	A Ria of South-western Ireland	32
25.	Superficial Deposits of Land and Ocean (Berghaus, Murray, Renard, Schott, &c.)	34
26-27.	Mean Temperature and Mean Pressure at Sea-level. April (after Buchan)	38
28-29.	Mean Temperature. January and July (after Buchan, Hann, and others)	40
30-31.	Winds in January and July (after the Deutsche Seewarte)	42
32-33.	Mean Pressure at Sea-level. January and July (after Buchan, Hann, and others)	43
34.	Mean Annual Rainfall (Herbertson)	46
35-36.	Mean Rainfall in January and July (Herbertson)	47
37.	Climatic Regions (Herbertson)	49
38-39.	Ocean Currents in January and July	53
40-41.	Ocean—Mean Temperature of Surface Waters, February and August (after Murray, Schott, &c.)	54, 55
42.	Ocean—Salinity (after Murray, Krümmel, Schott, &c.)	57
43-44.	Diagrams to illustrate the Theory of the Tides	59, 60
45.	Tides round the British Isles (after Berghaus)	61
46.	World-Vegetation (Hardy)	65
47.	Vertical Distribution of Vegetation	67
48.	World—Animal Realms (Sclater)	74
49.	World—Distribution of Population (Bisiker)	76

FIG. PAGE
50. World—Distribution of Occupations (after Hahn, Friederich, &c.) . . 77
51. World—Distribution of Wheat, Rice, and Maize (Bisiker) 79
52. World—Distribution of Coal and Iron (Bisiker) 81
53. World—Distribution of Wool, Cotton, Silk, and Flax (Bisiker) . . 83
54. The British Empire 86
55. Natural Regions of the World 88

PART II

INDIA AND CEYLON

56. Physical Features of India, Burma, and Ceylon 106
57. Main Physical Divisions of India 107
58. Physical Features of Northern India and Tibet 108
59. The Rivers of the Punjāb 110
60. Rivers and Canals of India 112
61. Soils of India 114
62. Malabar Coast; Western Ghāts 115
63. Physical Features of Ceylon 116
64. Lower Basin of the Irawadi 118
65-68. India—Mean Temperature at Different Seasons . . . 120
69-72. India—Mean Pressure and Winds at Different Seasons . . . 122
73-76. India—Seasonal Rainfall 123
77. India—Mean Annual Rainfall 124
78. India—Vegetation Map 125
79. Distribution of Rice in India 126
80. Distribution of Wheat in India 126
81. Distribution of Cotton in India 127
82. India—Coal Distribution 128
83. India—Salt (Main Areas) 128
84. Density of Population in India and Ceylon 129
85. Railways of India 131
86. Political Divisions of India and Surrounding Lands 135
87. The Ganges Delta and the lands that border it 137
88. South India 139
89. The Port of Madras 141
90. The Port of Bombay 143
91. NE. India 145
92. NW. India 149
93. Parts of India governed by Native Rulers 155

PART III

ASIA

94. Map of Asia showing Distances from the Coast 159
95. Relief of Asia 160
96. Key to Relief of Asia 161
97. The Northern Lowlands of Asia 162
98. Comparative Height and Breadth of Himālayas, Alps, and Scottish Highlands 165
99. Caravan Routes from Oasis to Oasis in Arabia 167
100-1. Asia—Mean Temperature in January and July, reduced to Sea-level . 168
102. Mean Annual Rainfall of Asia 170

FIG. PAGE
103. Seasonal Distribution of Rainfall in Asia 171
104. Political Divisions of Asia 17-
105-6. Asia—Rainfall in January and July 173
107. Some of the more important Foods of SW. Asia 174
108. Some Products of SW. Asia 175
109. Towns, Routes, and Political Divisions of SW. Asia 177
110. Towns and Routes of Russian Asia 179
111. The Far East 183
112. Coal and Iron in China 184
113. Population of Eastern Asia 185
114. Chief Railways of China 186
115. Physical Features of Japan 187

PART IV

THE BRITISH ISLES

116. Contour Lines of Britain 190
117. Physical Features of Britain 191
118. The Rocks of Britain 193
119. The Chief Rivers, River Basins, and Divides of Britain . . . 196
120. Poor Pastures of Britain 197
121. Distribution of Sheep in Britain 197
122. Distribution of Rich Pasture in Britain 199
123. Distribution of Cattle in Britain 199
124. Distribution of Cultivated Land in Britain 199
125. Distribution of Wheat in Britain 199
126. Mean Annual Rainfall of Britain 200
127. Actual Mean Annual Temperature of the British Isles, unreduced . 203
128. Mean Annual Temperature of the British Isles, reduced to Sea-level . 203
129. Mean Temperature of the British Isles in July, reduced to Sea-level . 203
130. Mean Temperature of the British Isles in January, reduced to Sea-level 203
131-2. Winds of the Atlantic in Winter and in Summer 204
133. Density of Population in Britain 205
134. Distribution of Agricultural, Pastoral, and Fishing Population in the British Isles 206
135. Distribution of Industrial and Commercial Population in the British Isles 206
136. Distribution of Coal in Britain 207
137. Distribution of Cotton and Linen Manufactures in the British Isles . 208
138. Distribution of Woollen and Silk Manufactures in the British Isles . 208
139. Distribution of Iron Ore, Ironworks, and Ship-building in the British Isles 208
140. Towns in the British Isles with over 50,000 Inhabitants . . . 208
141. Natural Regions of England and Wales 211
142. Routes and Towns of Northern England 212
143. Towns and Routes of Industrial England 215
144. Routes and Towns of Wales and the Severn Basin 218
145. Routes and Towns of SW. England 222
146. The Thames Basin 226
147. The Site of London 231
148. London Docks and the Commodities brought to them 231
149. The Towns and Routes of SE. England 232
150-1. Physical Features and Rocks of England between the Lower Thames and the Channel 235
152. Section from the Channel to the Thames across the Wealden Region . 235
153. Scottish Railways 238

FIG. PAGE
154. The Central Lowlands of Scotland 239
155. Heights, Railways, and Towns of Ireland 247
156. Irish Canals 250
157. Ireland—Mean Annual Temperature not reduced to Sea-level; January and July reduced to Sea-level 252
158. Ireland—Mean Annual Rainfall and driest and wettest Months . . 252
159. Ireland—Bogs 252
160. Ireland—Emigrants 252

PART V

EUROPE

161. Europe—its Peninsulas, Islands, and Seas 258
162. Distance from the Sea in Europe 259
163. Physical Features of Europe 261
164. Chief Drainage Areas and Divides of Europe 265
165. Temperature Map of Europe, showing the Duration of Frosty and Hot Weather 266
166. Mean Annual Rainfall of Europe 268
167-8. Regions of Europe receiving more or less than 6 inches of rainfall during the summer three months and the winter three months . 269
169. Vegetation Map of Europe 271
170. Europe—Northern Limit of some Cultivated Plants 274
171. Europe—Distribution of Sheep and Cattle 275
172. Europe—Density of Population 280
173. Europe—Political Map 282
174. Scandinavia and the Baltic Sea 284
175. Highlands, Routes, and Towns of Central Europe 286
176. Distribution of Minerals in Central Europe 288
177. Routes from Berlin 291
178. The Navigable Waterways of Central Europe 292
179. Physical Features of France and the Bordering Lands 298
180. Key to Physical Features of France and the Bordering Lands . . 299
181. Routes and Towns of France 302
182. Physical Divisions of Iberia 305
183. Physical Features of Alpine and Karpathian Lands 308
184. The Western and Central Alps and the Routes across them . . . 311
185. Austria-Hungary—Routes and Towns 312
186. Mountain Area, Rivers, and Towns of Italy 315
187. Physical Features, Routes, and Towns of Balkan Peninsula . . . 318
188. The Situation of Constantinople 321
189. Rivers, Towns, and Routes of Russia in Europe 323

PART VI

AFRICA, AUSTRALASIA, AND AMERICA

190. Relief Map of Africa 328
191. Rivers, Lakes, and Inland Drainage Areas of Africa 329
192. Distances from the Sea in Africa 330
193-5. Africa—Mean Temperature in October, January, and July, reduced to Sea-level 330
196. Mean Annual Rainfall of Africa 332

FIG.		PAGE
197.	Rainy Seasons in Africa	332
198.	Vegetation of Africa	334
199.	Distribution of some of the more important Plant and Animal Products of Africa	335
200.	The Nile below Khartum	340
201.	West Africa	344
202.	Central Africa	344
203.	South Africa	348
204.	Towns and Routes of South Africa	349
205–6.	Distance from the Sea and Area of Inland Drainage in Australia	353
207.	Physical Features of Australia	354
208–9.	January and July Isotherms of Australia	356
210.	Mean Annual Rainfall of Australia	356
211.	Dry and Rainy Seasons of Australia	356
212.	Natural Vegetation of Australia	357
213.	Towns, Railways, and Telegraph Routes of Australia	359
214.	The States of the Australian Commonwealth	360
215.	Relief of New Zealand	362
216.	Mean Annual Rainfall of New Zealand	362
217.	Distance from the Sea in North America	366
218.	Distance from the Sea in South America	366
219.	The Physical Features of North America	368
220.	Key to the Physical Features of North America	369
221–2.	The Mean Temperature of North America in January and July, reduced to Sea-level	371
223.	Mean Annual Rainfall of North America	371
224.	Seasonal Distribution of Rainfall in North America	371
225.	Distribution of Forests in North America	373
226.	Distribution of Sheep and Cattle in North America	374
227.	Routes from the Great Lakes to the Atlantic	375
228.	Physical Features of Western Canada	378
229.	Routes and Towns of Western Canada	378
230.	Main Railway Routes of Canada and the United States of America	380
231.	Chief Crops of the United States	383
232.	Distribution of Coal in the United States	384
233.	The Appalachian Mountains	385
234.	Plant Products of Mexico, Central America, the West Indies, and Venezuela	387
235.	The Physical Features of South America	392
236.	Key to Relief Map of South America	393
237–8.	Mean Temperature of South America in January and July, reduced to Sea-level	395
239.	Mean Annual Rainfall of South America	395
240.	Seasonal Distribution of Rainfall in South America	395
241.	Economic Products of South America	396
242.	Railways of South America	396

PART I

PHYSIOGRAPHICAL INTRODUCTION TO WORLD GEOGRAPHY

Note. Paragraphs printed in square brackets and in small print are intended for the use of the teacher and advanced private students.

Note. *The teacher must have a large physical wall-map of the World, such as the Oxford World Map, showing Physical Features, and use it constantly (as well as the globe) in addition to making full use of the maps printed in this Section.*

Note. The teacher must see that the meaning of the term *distributed* is clearly understood when used in the geographical sense—*scattered, placed, arranged, spread about.* Such phrases as 'the distribution of land and water', 'the distribution of population', &c., must be quite clear. Also terms 'development' of a country, and 'relief' (map).

CHAPTER I

THE EARTH

1. **The Earth Ball.** When we look around on a clear moonlight night we see the land stretching away towards the horizon and above us the blue heavens with stars, planets, and Moon. Looking through a telescope more stars appear, but all remain sparkling points of light. The planets and the Moon on the other hand seem larger and look like golden balls. As we climb a high mountain on the Earth the horizon grows wider and wider. If we could be raised high enough the Earth would also look like a great ball. The surface of the ball would differ in appearance according as it was water or land, and even as the land was covered with plants, or sand, or snow.

2. **The Science of Geography** deals with such things as land, water, plants, animals, and man on the Earth's surface. The surface of the Earth is so large that no man can expect

to see it all for himself. We have to observe carefully the nature and placing of land, water, winds, clouds, rain, vegetation, animals, and man in that part of the World which we know, and turn to books of travel and pictures for descriptions or pictures of other parts of the globe. In addition to these we use globes, models, and maps, which show all parts of the Earth's surface on a smaller scale than in reality.

3. **The Globe.** Globes are the best models of the Earth as a whole, because the Earth is almost a ball. We know this from the increasing of the horizon with height, from the shadow of the Earth which can sometimes be seen on the sky before sunrise or after sunset, and from its shadow on the Moon when the Earth comes between Moon and Sun. As a ship leaves the shore, the hull, then the mast, and lastly the smoke vanishes. New stars are known to come into view and old ones disappear in travelling north or south. If we could get telegrams from places on a north-south line between the north and south poles at noon it would be found that the Sun on March 21 or September 23 would be on the horizon at both poles, overhead halfway between them, and at a smaller angle above the horizon at other places. This angle would grow smaller from a right angle at the equator to zero at the pole. In the same way, if we had telegrams from all places on an east-west line we should find that the local times differed; and that, if we take the Earth to be a ball, there was an hour's difference in time for every 15°—which is just what we get on a globe turning completely round an axis or through 360° in twenty-four hours.

4. **The Size of the Earth.** Actual measurements show that the Earth is very nearly a ball, but slightly flattened at the poles, so slightly that for most purposes this may be left out of account. The flattened end would not be visible on the largest globe made, for one diameter is only $\frac{1}{300}$ shorter than the other; so that on a globe 300 inches or 25 feet in diameter the distance between the poles would be 1 inch less than between two opposite points on the



FIG. 1. The Western Hemisphere.



FIG. 2. The Eastern Hemisphere.



FIG. 3. The Southern Hemisphere.



FIG. 4. The Northern Hemisphere.



FIG. 5. The Water Hemisphere.



FIG. 6. The Land Hemisphere.

equator, and on a one-foot globe it would be $\frac{1}{25}$ of an inch. Any ball therefore makes a good model of the Earth.

The Earth itself is about 7,900 miles, or, roughly, 500,000,000 inches in diameter. It is so large that the curvature[1] at the surface is only 8 inches at one mile from the point and 100 feet at 13·2 miles, and one mile at about 100 miles.

5. Movements of the Earth. The Earth has two motions which have very important results: (1) its daily rotation or turning on its axis, and (2) its annual revolution or revolving round the Sun.

6. Rotation. The daily rotation, or turning, produces Day and Night, and permits us to find out not merely Time, but also Position on the Earth's surface.

The line round which the Earth spins is called the Axis, and the ends of this axis are the Poles, the North Pole being on the left and the South Pole on the right when looking in the direction of rotation. There are no *actual* Axis and Poles of course. If we stand facing the direction towards which the Earth is moving we are facing East and our backs are to the West, the North is on our left hand and the South on our right hand.

The circumference of the circle cutting the Earth in two halfway between the Poles at right angles to the axis is called the Equator, and is about 25,000 miles long.

7. Parallels of Latitude. We might *imagine* the Earth marked with circles parallel to the equator. These are called circles of Latitude, and they grow smaller and smaller from the equator, which is the largest, to the pole, which is merely a point. The equator is called latitude 0°, the North and South poles latitude 90° N. or S., because the angle between the equator and the pole is a right angle. The latitude of any place between the pole and the equator, supposing the Earth to be a ball, is the angle that the line drawn from it to the Earth's centre makes with the plane of the equator. (See Fig. 7, 4 and 5.)

[1] Curve or bending.

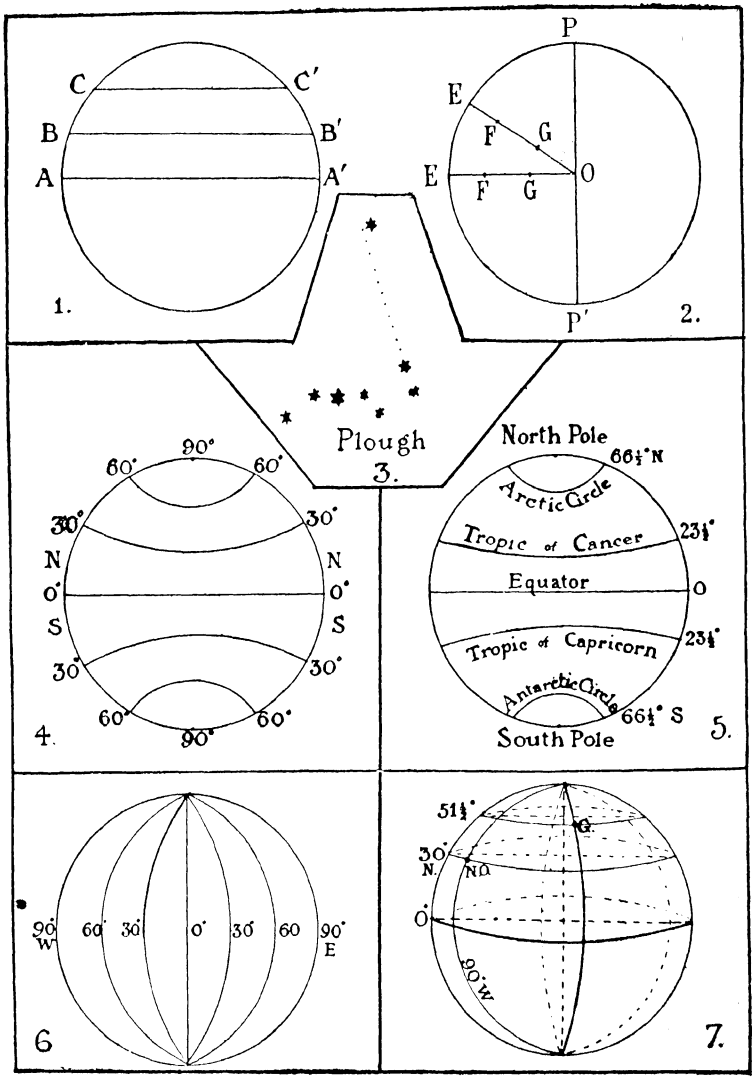


FIG. 7. 1, 2. Angular Measurements. 3. The Plough and Pole Star. 4. Parallels of latitude drawn for every 30°. 5. The Polar Circles, Tropics, Equator, and Poles. 6. Meridians of longitude drawn for every 30°. 7. The position of Greenwich and New Orleans determined by latitude and longitude.

8. The Meridians of Longitude. The Earth's rotation helps us to draw another set of lines, at right angles to the parallels of latitude. These pass through both poles and cut the equator at right angles. Along one half of any great circle drawn through both poles, noon is always found at the same time. Such a great circle is called a Meridian. There is no natural meridian from which we can reckon longitude as we reckon latitude from the equator. Most people have agreed to use the meridian of Greenwich as the starting-point.

We can divide the World by means of 360 meridians, passing through both poles, cutting the equator at right angles, and each making with its neighbour an angle of 1° at the poles. We could reckon the meridian of Greenwich 0, and reckoning from E. to W. number the others from 1 to 359, the 360th being the meridian of Greenwich again. This is sometimes done. It is more usual to measure from 0° to 180° E. of Greenwich, and from 0° to 180° W. of Greenwich, 180° W. and E. being the same line.

9. Position. We can now see how the position of any point on the Earth's surface can be fixed. If we know that it lies at a certain latitude N. of the equator, it must be somewhere on a particular circle parallel to the equator. If we know its longitude, then we know exactly how far along that circle from where the meridian of Greenwich cuts it, the place must be. Hence, all we should need to know in order to fix the position of a point on the surface of the Earth would be its latitude and longitude. In order to fix its position on the solid Earth, we must know its height above or below sea level. (See Fig. 7, 7.)

10. Revolution and the Seasons. The path of the Earth round the Sun is not in the same plane as the equator of the Earth, but at an angle of $23\frac{1}{2}°$. Twice a year, at the spring and autumn equinoxes[1], March 21 and September 23, day and night are equal all over the Earth. At other

[1] Latin: *aequus* equal, *nox* night.

times they are equal only on the equator. At the poles the Sun is on or above the horizon for six months and beneath it for six months. At the arctic and antarctic circles, $23\frac{1}{2}°$ from the poles, the Sun never sinks below the horizon on at least one night at midsummer, and never rises

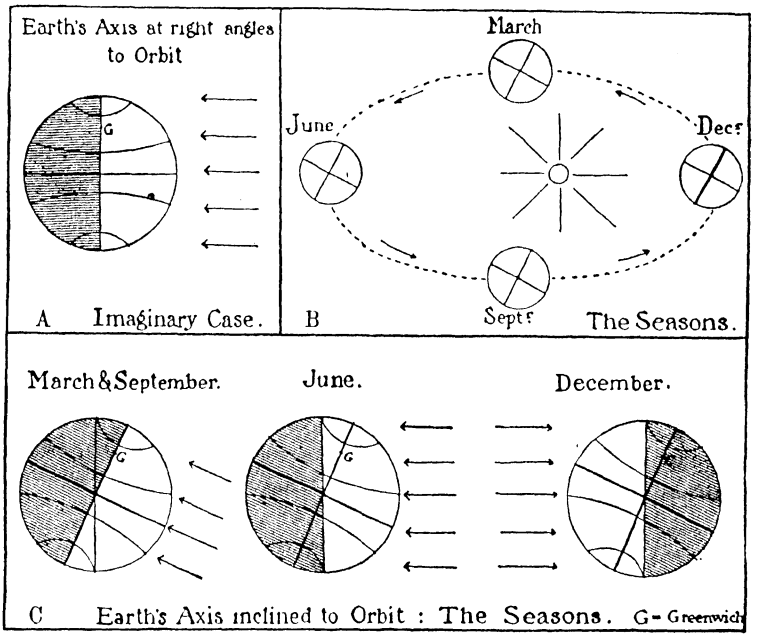


FIG. 8. *A*. The Seasons as they would be if the Earth's axis were at right angles to its orbit. *B*, *C*. The position of the Earth at the different seasons with axis inclined. The best way to study the diagram is to put a lamp on the table to represent the Sun, to take a globe, holding it so that its axis is inclined as shown in the diagram, and to put the globe in the four positions shown in the diagram. In each position make the globe turn on its axis and notice which parts are lighted and which parts are shaded. Cf. Fig. 7.

above it on one day at midwinter. At the tropics of Cancer and Capricorn, $23\frac{1}{2}°$ from the equator, the Sun is overhead at noon once a year. Between the tropics it is overhead twice a year.

At the equator day and night are always equal, and the

Sun is never less than $66\frac{1}{2}°$ above the horizon at noon and is overhead twice a year, at the equinoxes.

At the tropics the shortest days and nights are each $10\frac{1}{2}$ hours and the longest days and nights $13\frac{1}{2}$ hours; the Sun is overhead at noon in summer and is 43° above the horizon in midwinter.

Halfway between the tropics and the polar circles the shortest day and night are $8\frac{1}{2}$ hours and the longest $15\frac{1}{2}$ hours. The Sun is $68\frac{1}{2}°$ above the horizon at noon at midsummer and $21\frac{1}{2}°$ at midwinter.

At the polar circles the longest day and night are 24 hours and the shortest 0 hours. The sun is 47° above the horizon at midsummer and below it at midwinter.

At the poles there is a period of six months day and six months night, and the Sun gradually rises from the horizon at the equinox to $23\frac{1}{2}°$ above the horizon at midsummer, and sinks to the horizon again by the following equinox.

Notice that the total amount of possible sunshine is the same at equator and poles—and indeed everywhere on a smooth globe. It is, however, very differently *distributed* throughout the year.

CHAPTER II*

THE LAND

11. The Surface of the Earth is two-sevenths land and five-sevenths water (29 per cent. land, 71 per cent. water), as can be measured on Figs. 5 and 6. This shows a hemisphere whose *centre* lies near the mouth of the Loire in France, which is almost half land and half water, while the other hemisphere is almost all water. This unequal distribution is due to the heights and depths of the surface of the globe. These are

* Before commencing this chapter the teacher should recapitulate earlier lessons on land-forms, and revise knowledge of water-shed, plateau, volcano, delta, alluvial soil, glacier, moraine, sand-dune, and harbour-bar.

not very great in proportion to its size. The highest mountain —Mount Everest, in the Himālayas—is 29,000 feet; the greatest depth of the sea, east of Mindanao in the Philippines, is 32,100 feet below sea-level. The mean[1] depth of the sea (11,500 feet) is, however, five times as great as the mean height of the land (2,300 feet).

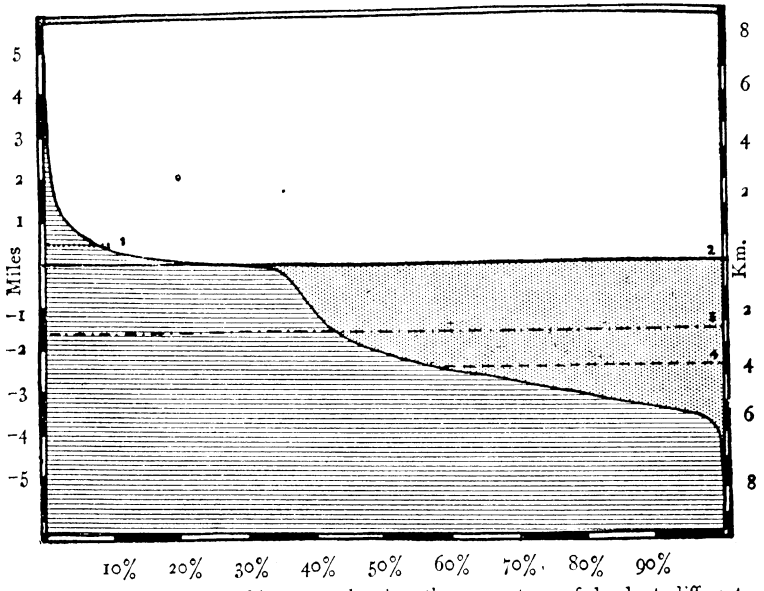


FIG. 9. A hypsographic curve showing the percentage of land at different elevations. The area shaded with lines represents land, the dotted area the ocean, and the area left white the atmosphere. Line 1 the mean height of the land above sea-level, and 2 the sea-level. 3 represents surface of the globe which would be formed if ocean and atmosphere were removed and the outside of the solid crust made smooth by filling up all the hollows with materials obtained from the higher parts. 4 shows the mean depth of the ocean.

The curve (Fig. 9) shows the percentage of land at different heights. It is made by measuring the areas of the solid surface at different heights and finding what percentage they are of the whole surface of the Earth. On it notice (1) the small area of very great *abysses* or *deeps*, (2) the vast area of the *main ocean floor*, (3) the steep *submarine*[2] *slope* above it

[1] Average

[2] Under-water.

leading to (4) the shallow waters of the *continental shelf*, (5) the *lowlands*, (6) the steep *land slope* which ends in (7) the *crest* of the lands, even more abrupt and marked than the deep areas of the ocean.

We can find what would be the mean level of the solid crust if it were quite smooth. It would be a little over 7,500 feet below the present sea-level. Fig. 9 shows this mean level line, the land above sea-level, the land above the mean height, and the sea below the mean depth.

12. The Continental Shelf and the Lowlands. The most important submarine line is that of 600 feet below sea-level, where a sudden break in the slope of the solid surface takes place, which we may call the continental edge. The area not submerged[1] by more than about 600 feet is the continental shelf. On it most of the valuable fisheries of the world are found. The 600-foot line above sea-level is commonly taken to mark the upper limit of the lowlands. Here a very large proportion of the peoples of the world live. The map (Fig. 10) shows the distribution of continental shelf and of lowland. The rough outlines of these divisions should be carefully examined.

13. The Floors of the Oceans. The heights and depths of the sea-bottoms are not so great as those of the land. Deep narrow troughs are often found near lofty mountains or steep-sided ridges, e.g. off the Aleutian Islands and Japan, the Marianne Islands (Guam), the Kermadec and Tonga Islands, and North Chile in the Pacific; south of Java in the Indian Ocean and north of the West Indies in the Atlantic. The Atlantic Ocean has a submarine ridge running throughout its length, dividing two great troughs; from its southern end two ridges run, one south-west and one south-east. Another ridge, between Scotland, Iceland, and Greenland, cuts off the Atlantic from the Arctic basin. An island-studded ridge curves round between North and South America. In the Pacific, ridges occur above which the islands of Asia rise

[1] Drowned, under water.

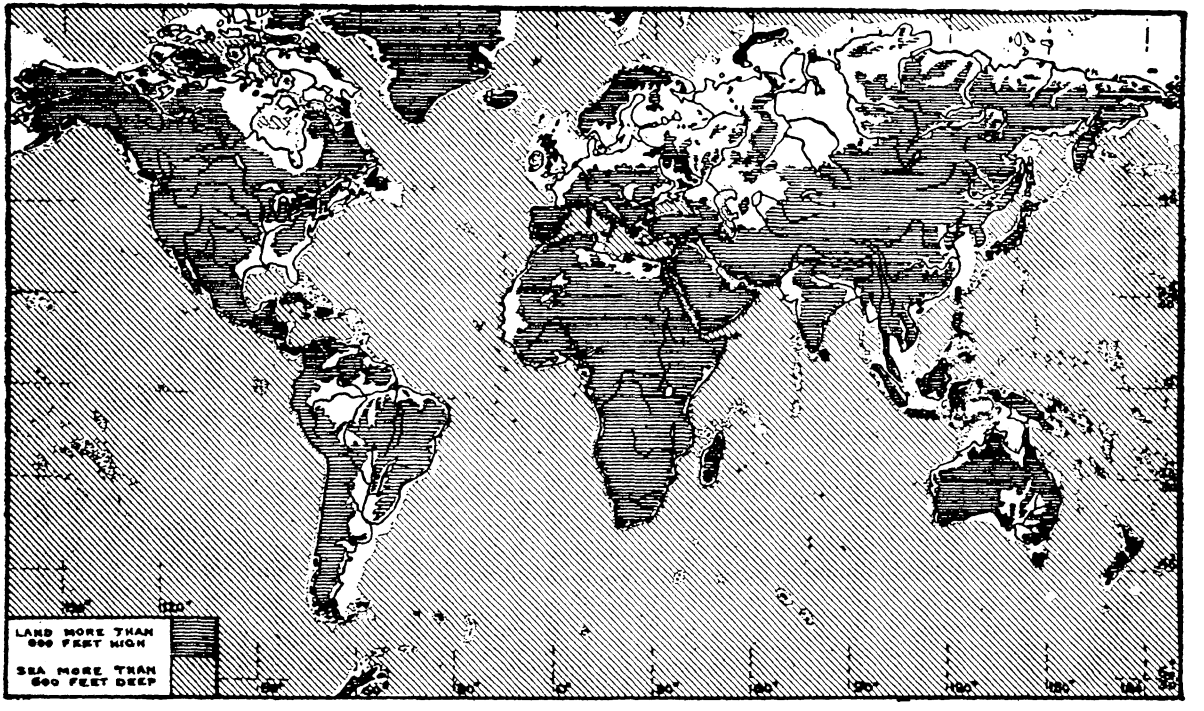


FIG. 10. The World, showing the lowlands and the continental shelf.

above the waves, and from Central America a wide rising passes to the south-east. In the Indian Ocean a series of parallel heights run north and south in the west with islands above them, (*a*) Madagascar, (*b*) Mauritius, and (3) the Maldive Islands. (See Fig. 10.)

14. The Highest Land and the Steepest Slopes. Above sea-level the highest land is distributed in well-marked bands. That over 6,000 feet is shown on Fig. 11, which also shows the areas of great mountain ranges. These ranges can be traced in two bands, one bordering the Pacific—the Pacific Mountain System—and one across the middle of the Old World—the Mid-World Mountain System. On the same figure the seas below 6,000 feet are shown. The highest mountain ranges are near the deepest seas. Here are the steepest slopes of the outer crust of the Earth.

15. The Distribution of Volcanoes and Earthquakes. Figs. 12 and 13 should be compared with Fig. 11, when it will be seen that a great many of the volcanoes of the world are in the Pacific and Mid-World mountains and troughs.

The other volcanoes occur in the middle of the Pacific in more or less parallel lines, running SE. to NW.; they are found along the ridge of the Atlantic and in a long line in East Africa.

16. Volcanoes are connected with the Earth's interior by a long opening or pipe, up which molten matter is forced. This sometimes overflows at the surface in a stream of glowing lava, at other times hot ashes and gases are thrown out high into the air and the land around is covered. As a rule a volcanic mountain is shaped like a cone. (See Fig. 14.)

17. Mountain Nodes and Plateaus. The general plan of the great mountain systems is not that of a band of the same width all along. Here and there the band, or chain, narrows and then expands again, forming nodes[1] and internodes. At the nodes the lowlands on either side approach each other most closely, and the ranges are usually crowded

[1] Knot, knob, joint.

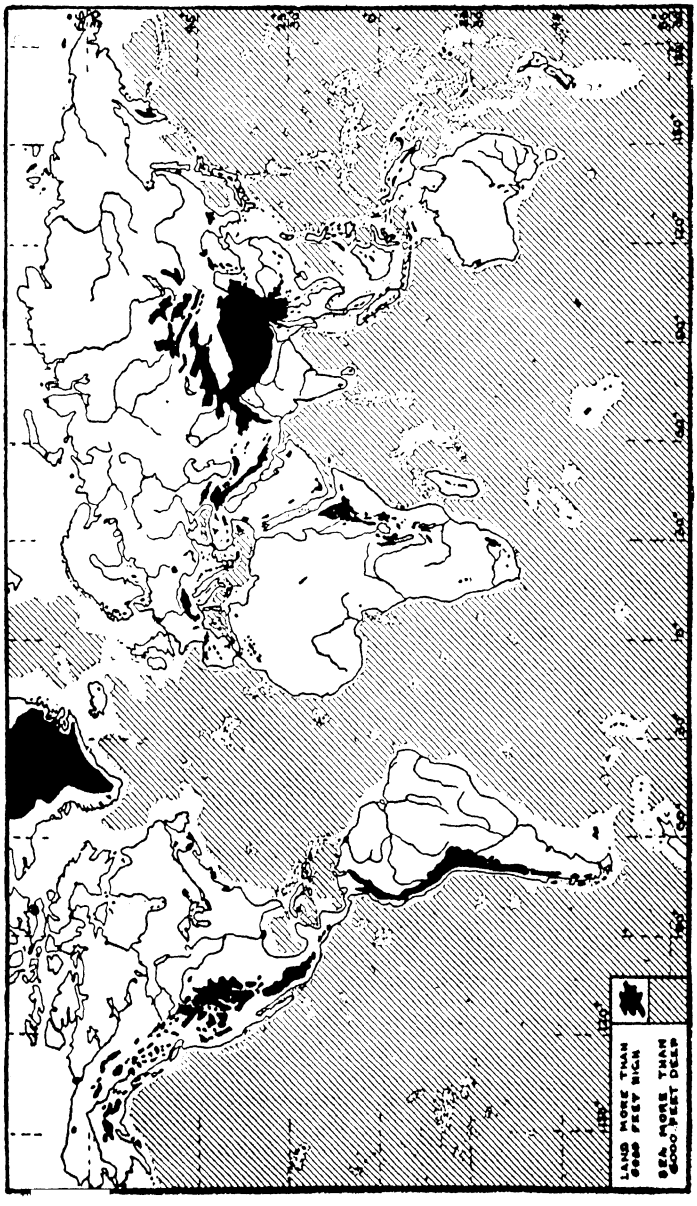


FIG. 11. The World, showing land higher than 6,000 feet above sea-level and the part of the crust which is covered with water deeper than 6,000 feet.

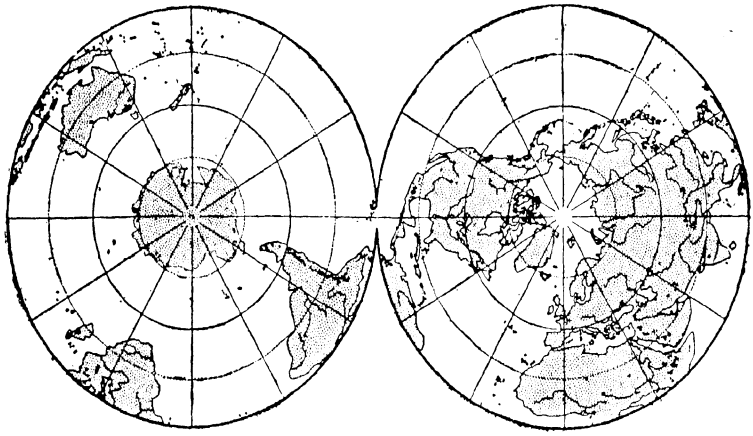


FIG. 12. The Distribution of Volcanoes. Compare this with Figures 13, 16, and 19.

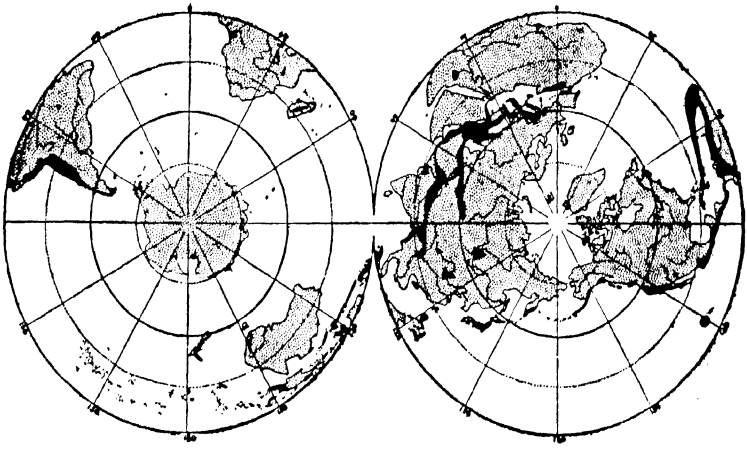


FIG. 13. The Distribution of Earthquakes. Compare this with Figures 12, 16, and 19.

together, as in Armenia or the Pamirs. At the internodes the ranges may be farther apart and even more numerous than at the nodes. With the exception of those on the margin, the ranges are here less lofty, and a vast plateau is

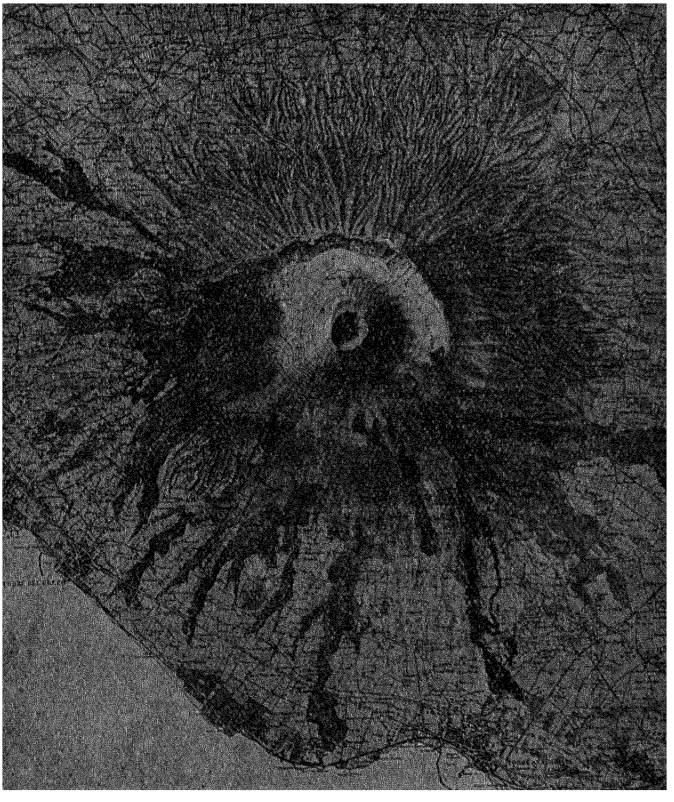


FIG. 14. Map of Vesuvius. The radiating streams of darker colour indicate lava flows. Notice the radiating valleys. The names are not meant to be read.

formed. (Look at a physical map of South America or Asia.)

18. The Topography of a Mountain System — The Ranges. Look now more closely at a small part of one of

these mountain systems. The plan is everywhere somewhat similar, although the appearance presented to a traveller differs greatly in different parts of the world, mainly owing to differences of climate and vegetation. This general plan is well shown in Fig. 15. Notice the parallel ridges separated by parallel valleys. Neither ridges nor valleys are continuous; two ridges may run into one, as may two valleys. The

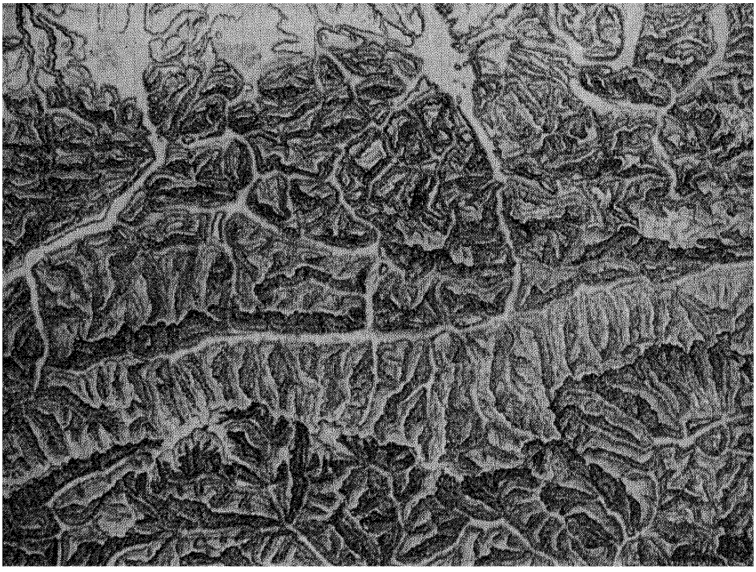


FIG. 15. Map of Part of a Mountain System: Hohe Tauern and Northern Limestone Alps, Valley of Salzach. Cf. Fig. 23.

valleys tend to be boat-shaped, the ridges are like boats turned keel upwards.

19. The Valleys. The main rivers flow in long stretches between parallel ridges, until they turn at right angles and pass, usually through some gorge, into a valley, where they turn sharply again and flow parallel to their former course, e.g. the Columbia in North America, the Doubs in the Jura. The tributaries come down the sides of the ridges nearly at

right angles. When in flood they bring down much mud, which is deposited when the speed of the torrent is checked in the main valley, e.g. Upper Rhine or Rhone. The waste dropped may cause the main stream to hug the opposite side of the valley. On such waste many of the villages are built. The basin or area drained by each river is nearly rectangular. The line between two basins, the water parting or divide[1], runs along the main ridges, and divides between tributaries run along each spur, forming a sort of fish-bone plan, very like that of the main stream and tributaries. The valleys parallel to the ridges are called longitudinal, those across the ridges transverse. The main routes follow the longitudinal valleys, since cross-mountain paths are difficult (except where a sufficiently wide transverse valley offers an easy passage from one longitudinal valley to another).

[**20. Divisions of Mountain Systems.** The great mountain systems can thus be divided into chains of many ranges, compressed at the mountain nodes and expanded into plateaus between marginal ranges at the internodes. Each range may be made up of a number of ridges which, with a more or less irregular crest, rise here and there into peaks and sink to saddles or 'cols'.]

21. Distribution of Tablelands and Highlands. The figure (16) shows the distribution of land between 1,500 and 3,000 feet and between 3,000 and 6,000 feet. It also shows two other forms of land—tablelands and highlands. (Cf. Fig. 19.)

Notice the distribution of these. The tablelands cover Western Australia and the east and north-east of South America, Africa, Arabia, the Deccan. The highlands are found in the east of North America, the east of the Old World, and the east of Australia. They do not occur in marked bands, but rather in widely-spread masses, and so differ greatly from the high mountains. Like these, their appearance varies with climate and vegetation. The differences between these two kinds of higher ground will be seen in the following figures.

22. The Tablelands have great expanses of flat land

[1] Here a noun, meaning 'that which divides'.

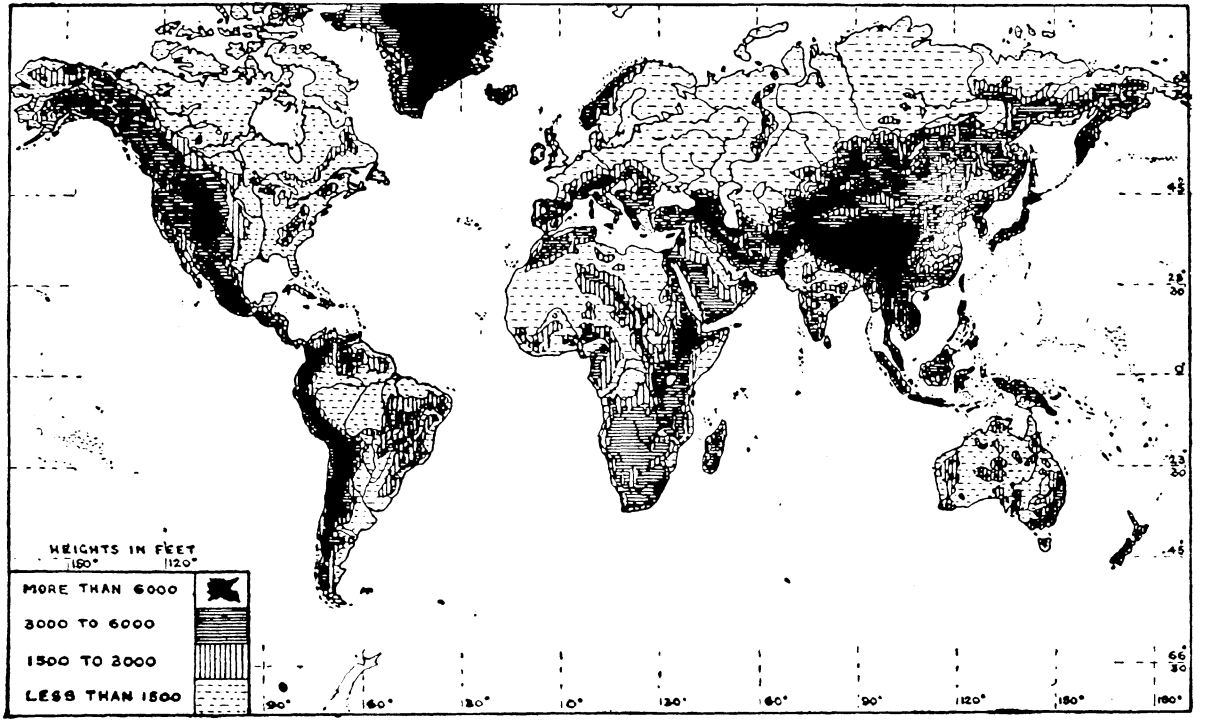


FIG. 16. The land between 1,500 and 3,000 feet and between 3,000 and 6,000 feet.

approached by very steep slopes, e. g. the High Veld of South Africa. When the plain forms the *highest* land the steep slope which bounds it leads down to lower terraces, e. g. in Natal.

[The rivers flow in deep steep-sided valleys, often difficult to penetrate and with their tributaries make a more or less rectangular network, most of the bends and junctions forming right angles. Except in the bordering terraces there is none of the parallel arrangement of ridge and valley found in mountain systems. The river gorges deepen towards the edge



FIG. 17. Part of a Tableland.—The land round the Dead Sea. Note how much more cut up the land is on the west where the rainfall is fairly abundant than on the east where the rainfall is slight. This also shows the rift valley in which the Jordan flows to the Dead Sea.

of the tableland, and the rivers leave it by a series of rapids or waterfalls e.g. the Congo and Zambezi. In such lands the valleys are barriers to communication, and the main routes traverse the higher flat lands, which have to be reached from the lower terraces and plains by zigzag routes cut in some valley side where it opens at the edge of the slope.]

When the great expanse of flat land is at a lower level steep-sided hills rise above it. These are usually flat topped due to a cap of hard rock, but here and there the area of the flat top is so small that the hill becomes pointed, and may even become rounded when the hard rock is quite worn away

The rivers and divides in the lower land have a similar plan to those of the higher land, but the valleys are not usually so deeply cut. Communication is much easier in this form of low tableland or platform, but the valleys still form barriers rather than highways. (See Fig. 17.)

23. **The Highlands** have quite a different appearance. The valleys and divides run out like the spokes of a wheel, each

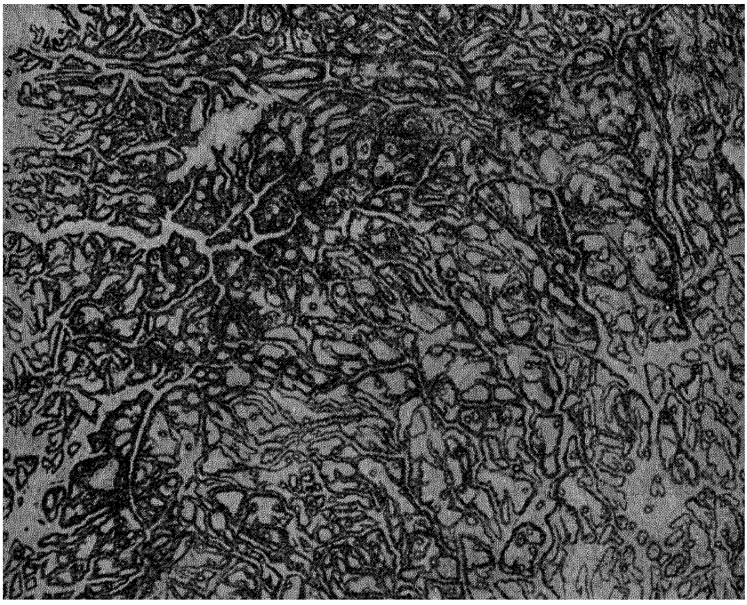


FIG. 18. Part of a Highland.—Western Scandinavia, showing the rounded forms of the well-eroded highland and the Hardanger and other fiords in the west.

river system is distinct and separate, the branching network of streams resembling a great tree in winter, e. g. rivers of Scottish Highlands and Southern Uplands.

[As a rule neither the parallel ridge and valley of the mountainous area nor the rectangular steep-sided valley system of the tablelands is common in the highlands. The main valleys gradually narrow and shallow as they are traced farther into the highlands and are joined by the numerous

branches from which the tributaries come. The divides also radiate and run along the highest lines of the rounded hills. The main routes follow the wider valleys, and where the hills become lower and more rounded cross from one valley to another over easy passes. (See Fig. 18.)]

24. The Distribution of Types of Land. The map in Fig. 19 shows the distribution of three types of land. It should be compared with Figs. 10, 11, and 16.

25. Varieties of these Types. These are the most important divisions of the higher land, but many different forms of the types can be found. In volcanic areas, such as Auvergne or Iceland, conical mountains, highlands, and even tablelands are found together. In some highlands, such as those of Southern Ireland and the Appalachians, the valleys and ridges are parallel. Tablelands may be discovered in the plateaus of the mountainous areas, such as that through which the Colorado has cut its famous canyon or great nullah.[1]

The land forms can be found in all degrees of sharpness, usually becoming rounded as they grow older. The shaping depends in part on the structure of the rock.

[It will vary according as the rock is homogeneous or not, according as the strata are horizontal or inclined, and according to the resistance offered by successive layers to the agents which wear away or denude them. The amount of rainfall also plays an important part in determining the profile of the hills and valleys.]

26. The Denudation[2] Agents. The weathering[3] of rocks is due to temperature changes, moisture, and frost; the resulting waste is carried away by moving water, ice, and wind, and may gather in various forms, e.g. alluvial[4] flats, moraines,[5] or dunes.

The lowlands are mainly undulating[6] forms of the types

[1] Gorge, or cutting.

[2] The term *denude* must be clearly explained—*laying bare, uncovering, wearing away.* Denudation agents are the forces, like wind and rain, that wear away rocks.

[3] Wearing away by action of the weather.

[4] Alluvial soil is earth brought down and dropped by rivers.

[5] Line of rocks and stones found at the base and edges of glaciers.

[6] Carefully explain *undulating* and draw an *undulating* line on blackboard. Refer to motion of a shaken rope lying loose on the ground, and to the surface of the sea.

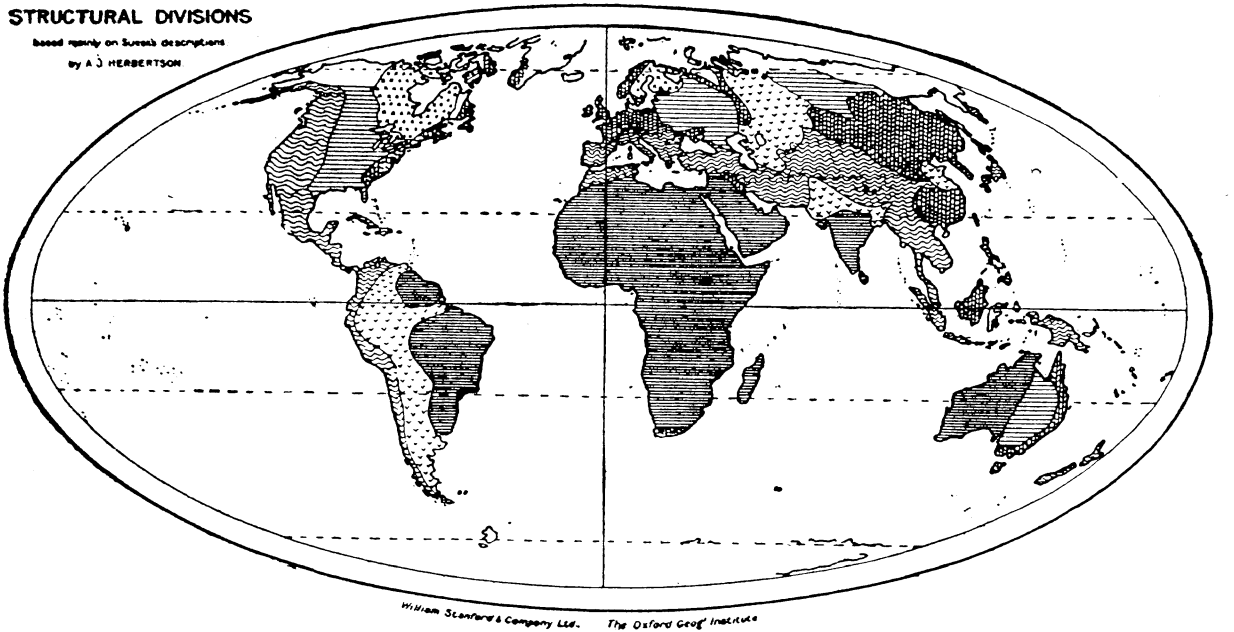


FIG. 19. The Archaean regions are shown by crosses, the old unfolded sedimentary areas with parallel straight lines, which are closer when these form tablelands and are wider apart when they form lowlands. The more recent mountain systems are indicated by a wavy line and the older mountain systems which have been worn down at least once and at present form blocks which stand up as highlands above basins have wavy lines with straight lines crossing them. Recent and tertiary rocks which are not folded are shown by v v.

already described. They will be best considered after a study of the agents at work changing the surface of the land.

27. Cycles of Forms. Each type of land surface when acted on continuously by one of the denuding agents is slowly worn down to a plain. It goes through a cycle of forms. We can speak of young or early, mature, and old or late phases of a cycle of any type.

28. Distribution of Erosion[1] Agents. From Fig. 25 the areas where rain, ice, and wind respectively are the most important agents acting on the surface can be found. Each of these agents has a different effect in wearing away exposed parts of the land and in arranging waste matter. In order to get some idea of the landscape of the globe we may consider Fig. 19, which shows the distribution of lowlands, mountains, tablelands, and highlands, along with Fig. 34, which shows the mean annual rainfall, and so shows where water is and is not an important agent of erosion.

29. Rivers, Basins, and Waterpartings. We all know the rain-river shaped land. The rain falls all over the surface, and, owing to the action of gravity, that which does not soak into the ground or dry up seeks the lowest level, carrying with it particles of soil. It gathers on the valley floor, and flows in a channel from the divide downwards to the ocean or lake in which the river ends. This channel deepens as time goes on, and a well-marked valley, V-shaped in section, is formed.

The area from which a river collects its waters and rock waste is called its basin, and the line between two river basins the waterparting, or watershed, or divide. Looking down stream we call the bank on the right hand the right bank and that on the left hand the left bank.

30. The greatest area of land is drained to the Atlantic Ocean and its various seas and gulfs, especially to the Arctic

[1] Explain clearly and *erode* a piece of chalk with a knife. Refer to ancient buildings whose walls show plain signs of erosion and are crumbling and wearing owing to the action of the weather.

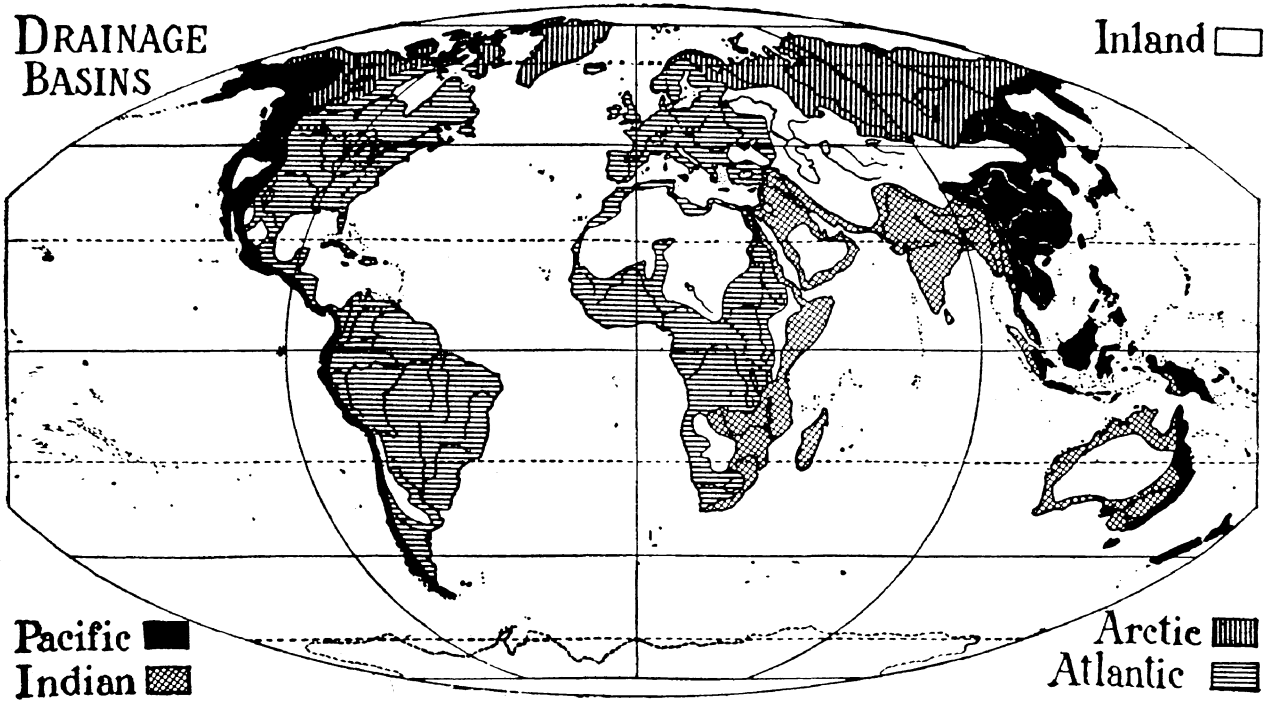


FIG. 20. Drainage Areas. Atlantic, Pacific, Indian, and Inland.

Ocean. The map of Fig. 20 shows this very clearly. The Atlantic rivers are usually longer, flow more slowly, and are of much greater use to man than those of the Pacific. They have long courses, slight and steady gradients, and many of them are navigable for long distances.

All rivers do not reach the sea. Some gradually disappear in reaching a dry warm country, e. g. the Zerafshan in Russian Turkestan, or their waters accumulate in a lake, e.g. the Volga in Europe and the Shari in Africa. The area drained by such rivers is called an inland drainage area or inland basin, in contrast with the marginal drainage areas or basins where waters are carried to the ocean.

The percentage area of land drained to the Oceans and to the interior of the continents is

Atlantic Ocean, including Mediterranean and Arctic .	50·8 %
Pacific „	14·4 %
Indian „	12·8 %
Inland Drainage (including deserts)	22·0 %

31. **The Action of Flowing Water.** The waters of all the many streams which make up a river system dissolve the soluble parts of the rocks and carry away grains,[1] thus gradually wearing down the land across which they flow. The steeper slopes and the softer rocks are most rapidly worn away. River water can carry only a certain quantity of rock waste, depending mainly on the speed and, to a less extent, on the volume of the river. The growing volume of a river towards its mouth is more than counteracted by the smaller speed, so that it cannot carry across the plain the same load which it could transfer down the valley in the mountains or highlands. The waste is therefore dropped in the plain. As the bed of the river rises, the water may, in times of flood, rise above the banks and spread over the plain, leaving behind a coating of mud. In this flat land every small obstacle serves to turn the river. It tends to swing first to one side and then to another of its bed, so that it follows a winding course. The

[1] Small particles of rock waste.

current is strongest against the concave bank, which is therefore eaten back until two turns may meet. The river takes the new short cut thus opened, abandoning a crescent-shaped portion of its channel.[1] The waters remaining in the old channel form crescent or 'cut-off' lakes, e. g. the Forth, Rhine, Mississippi. As more waste is deposited the bed and banks

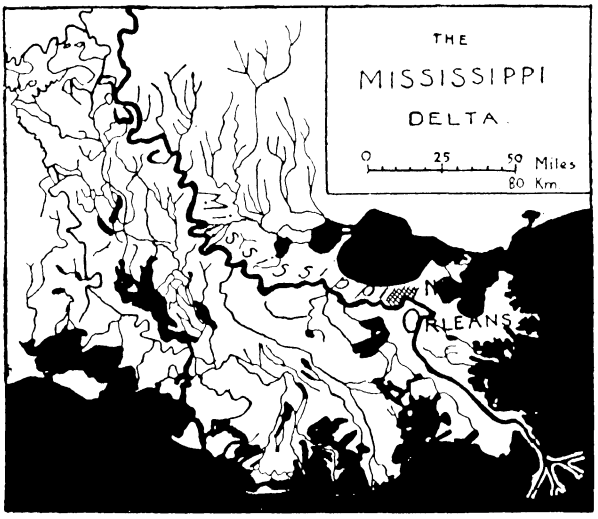


FIG. 21. Notice the main stream and the branches or distributaries which leave the main stream. Some of the rivers rise at the foot of the banks of the main stream, gathering the waters which filter through these banks. Notice the numerous lakes and islands. There are some crescent lakes filling old bends of the river near the present main stream.

of a river may even be raised above the general level of the plain, as the lower Po or Mississippi.

32. **Deltas and Estuaries.** Near the mouth a stream may enter the sea or lake by a different channel. Such distributaries are common where tidal or other currents do not carry away the waste which is dropped in a fan-shaped area round each mouth. This part of the river flood-plain carried out to sea by a number of distributaries forms a delta. (Fig. 21.)

[1] Draw *crescent* shape on blackboard—like young moon.

Most rivers gather water and waste from the higher ground, grow larger as they approach their mouths, and drop the waste which they carry in their lower course. The area from which waste is collected is usually much greater than that on which it is deposited. If the tides and currents are strong this waste is carried away and the mouth of the river is scoured and widened. An estuary is such a widened mouth of a river up which the tide passes.

[33. **Form Cycles in River Basins.** We must remember that though changes of the land surface are slow, they are of great importance if we consider a long time. During the earlier phases of a land surface a river tends to make irregularities, but after maturity is passed the surface becomes more and more smooth. The area and flatness of the lower land both grow, and at last there is a flat or slightly undulating plain. The river basin is then said to be base-levelled or made into a peneplain (almost a plain). A region which has had its smooth surface carved and cut by water, &c., and has later been changed once more into an almost unbroken plain is said to have passed through a complete 'cycle of erosion'. If the region is again uplifted, or if the surface of the lake or sea which forms its base-level is lowered, the streams and rivers which drain it will renew their youth, and a fresh cycle will be begun.]

34. **The River Profiles and Gradients.** The section along the bed of a river is called the river profile, and it shows different slopes or gradients at different parts of the course. These differ in different kinds of lands and at different stages of the erosion cycle.

The simplest form of profile is that found in a well-matured highland region which is bordered by a plain. Here there is a gradually flattening curve from source to mouth. Such a river is said to be well graded. The typical curve for a tableland has irregularities in the profile, for there are rapids or waterfalls where the river rushes from one level to a lower one. In mountains such as the Alps the profile is generally flat where the river is flowing parallel to the ranges, but it becomes steeper where it turns and crosses, usually in a gorge, from one longitudinal valley to another. Many rivers are complex, and different parts of them have had different histories, e.g. the Rhine.

35. **The Action of Ice** is like that of water in many ways, but it is not shut within such narrow channels. The snow collecting in the higher mountain valleys is pressed into ice. The weight of this causes a downward pressure and forces the

ice to move down the valleys. In cold regions the glacier[1] reaches the sea and breaks off in icebergs which float with eight-ninths of their volume below the water. In warmer regions the ice melts before reaching the sea. Like a river, the ice carries rock waste which has fallen or been carried on to it from the valley sides. It also grinds down and drags with it the rocks over which it moves; thus it has rock waste below as well as above. It gradually widens and deepens the valley through which it flows, giving it a U shape, though to what extent the deepening is actually due to the ice is not known (see Figs. 22 and 23). Where the ice begins to melt

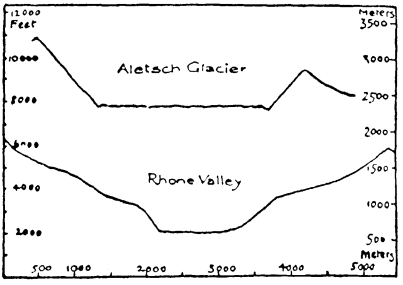


FIG. 22. Sections of an Alpine valley with and without ice. Cf. Fig. 23.

freely the glacier gets clogged with waste. These heaps and collections round the foot and flanks of a shrinking glacier are called moraines. As in the case of a river, the erosive action of the glaciers is greatest where the slope and volume of the ice are greatest, and dies off towards its lower limit, where the greatest collection of morainic matter is found.

At one time ice sheets and glaciers covered a much wider area than they do at present. Evidence that glacial action has modelled the surface is afforded by the ice-polished rocks, U-shaped valleys, and side and end moraines.

When a great glacier receives a tributary the surfaces of the two usually join at about the same level, but the valley floor of the main glacier may be far below that of the tributary.

[1] Ice 'river' moving down a valley.

When the ice is melted, the waters, running off rapidly, do not fill the valley to the same depths as the ice did, so that the tributary streams often plunge in fine waterfalls from side into main valleys. The ridges in a glaciated area tend to be very angular and irregular in outline, where they rise above the ice and are subjected to changes of temperature on either side of the freezing-point, though not to the smoothing action of

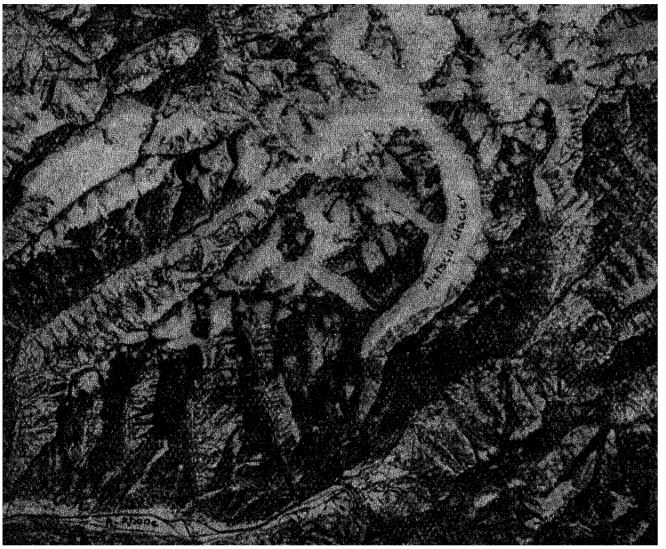


FIG. 23. The Aletsch Glacier and part of the Rhone Valley. Cf. Fig. 22. The names are not meant to be read.

moving ice. Here and there sharp-pointed peaks, 'needles,' and 'teeth' are found. This gives great beauty to the scenery of a region which has been glaciated. Some of the main valley floors are surrounded at their upper end by steep sides.

36. Wind Action. Where there is little or no rain, changes of temperature and wind are the chief agents shaping the surface. Wind, the movement of the air, is not confined to

a well-defined line, as that of a river or glacier. It passes in every direction and at all heights, carrying with it loose particles of rock, which, rubbing against exposed surfaces, help to wear or scratch them still more, and themselves become somewhat rounded grains of sand. Outstanding rocks are rounded and polished by the sand blast; with a lull in the wind the particles begin to fall and collect. The general effect, as in rain and river erosion, is to lower the heights and to fill up the hollows. Valleys found in desert areas are due to the torrents which scoop them out after one of the rare thunderstorms.

In certain districts the sand gathers in ridges either spindle- or crescent-shaped, known as dunes. These ridges present a gentle slope to windward up which the grains are driven, the lighter ones to be carried into the air, the heavier to roll down over the steeper leeward [1] slope.

37. **Sea Action.** The great storm waves which beat on the coast may cause great erosion, especially where the coast is soft. The cliffs of chalk near Dover and those of boulder clay in Norfolk are cut back in this way. The currents due to the rising and falling tides and to prevailing winds may aid erosion. They carry away and redistribute the waste material of the land. Spurn Head has been formed by such current-carried waste. The coasts of India, owing to the hard rocky ghāts, are not much eroded.

38. **Types of Coast-line.** The margin of the land is acted on by waves and currents, but these only put the finishing touches on forms which are otherwise caused. Where the land has sunk relatively to the sea, the old forms of surface fix the main features of the coastal belt. These can be grouped as under.

39. **Mountain Coasts.** Where a series of parallel ranges and valleys run out under the sea, a series of long parallel peninsulas and elongated gulfs are formed. These inlets,

[1] Explain *leeward* and *windward*—the side protected from the wind and the side towards the wind.

which narrow and shallow[1] as they run inland, are called *rias*. If the coast is parallel to the ranges, then the coast will have few openings, except where some transverse valley permits the sea to penetrate beyond the outer range into the first longitudinal valley, forming a T- or L-shaped gulf. Such coasts are seen in Southern and South-western Ireland (see Fig. 24). If such a land is still farther submerged, a series of islands is formed bounding a long narrow sound,[2] as is the case in the North-east of the Adriatic. The Pacific Ocean is bounded by mountain coasts, especially on the east. Mountain coasts are also called the Pacific type of coasts.[3]

40. Coasts of Tablelands and Highlands. The tablelands usually have a coast-line with but few inlets, these taking the form of square-headed bays, e.g. the West coast of Arabia. The highlands, on the other hand, yield some of the most deeply engulfed coasts, e.g. part of the East coast of Australia. The main lines of promontory and bay depend on the undulations of land. The drowned valleys form long estuaries. Highland coasts are common in the North Atlantic, and may be called the North Atlantic type of coast.[3] Tableland coasts are common in the Indian Ocean, and may be termed the Indian type of coast.[3]

41. Glaciated Coasts. The most remarkable of the greatly indented coasts is that of a glaciated area. Drowned glaciated valleys, no matter in which kind of land they have been cut, all form long, narrow, deep, steep-sided gulfs or bays called fiords. It must be noticed that, owing to sea ice not floating until it is more than five-sixths under water, a fiord coast is not always one where the land and sea level has altered. The sea lochs of West Scotland are typical fiords.

42. Dune Coasts. Where a desert or low sandy land is under water the dunes may form a line of bordering heights between and behind which the sea may come, forming T-

[1] Here a verb—*become shallow*.

[2] Long narrow tract of water between islands and the shore.

[3] It is better to use the terms mountain, highland, and tableland as types of coast, as each ocean has examples of more than one type of coast.



FIG. 24. A Ria of South-western Ireland—Kenmare 'River'. Note the gradual shallowing and narrowing of the inlet. Make sections along the northern and southern margins of the map and along the axis of the ria, and across the western and eastern ends of the map.

gulfs, e.g. the West coast of the Sahara, the Landes in France.

43. **Smooth Coasts.** A regular coast-line is typical of a region which has risen above the waves. The smooth sea-bottom thus bared presents few irregularities, and as the slope is usually very gentle, the coast is regular and shallow. The eastern coast of the United States south of Chesapeake Bay is an example. A mature coast-line presents a broken outline, owing to the unequal erosion of rocks of different hardness. In old age the exposed promontories are worn away, and sand-spits and banks close the mouths of inlets, which are slowly filled with soil, either brought directly by rains, or indirectly by waves and currents. A smooth, regular coast-line is produced by this combined collection and erosion, but such coasts are rare.

44. **Harbours.** The regular coasts do not have good harbours. Mountain and highland coasts, more particularly such as have been glaciated, have the inlets and island-protected roadsteads which shelter ships. A mountain area, however, may have few harbours if unbroken ranges run parallel to the coast. Such is the case with the Deccan coasts of India. It must be remembered that a good harbour does not necessarily give rise to a great port. There are innumerable good harbours in Western Scotland, but few great ports. The land access is just as important as the approach by sea. Harbours on an estuary are therefore the best for great ports.

45. **Lowlands.** The chief types of lowlands may now be reviewed. The most important is the peneplain.[1] [This is the final product of long-continued rain-river erosion, e.g. Mississippi basin. It is the last phase in the cycle of erosion of all kinds of structure.] In desert areas are found level stretches of bare wind-swept rock, or of undulating sand-dunes. These are old lowlands.

Young lowlands may be formed by the draining of a lake

[1] 'Almost a plain.'

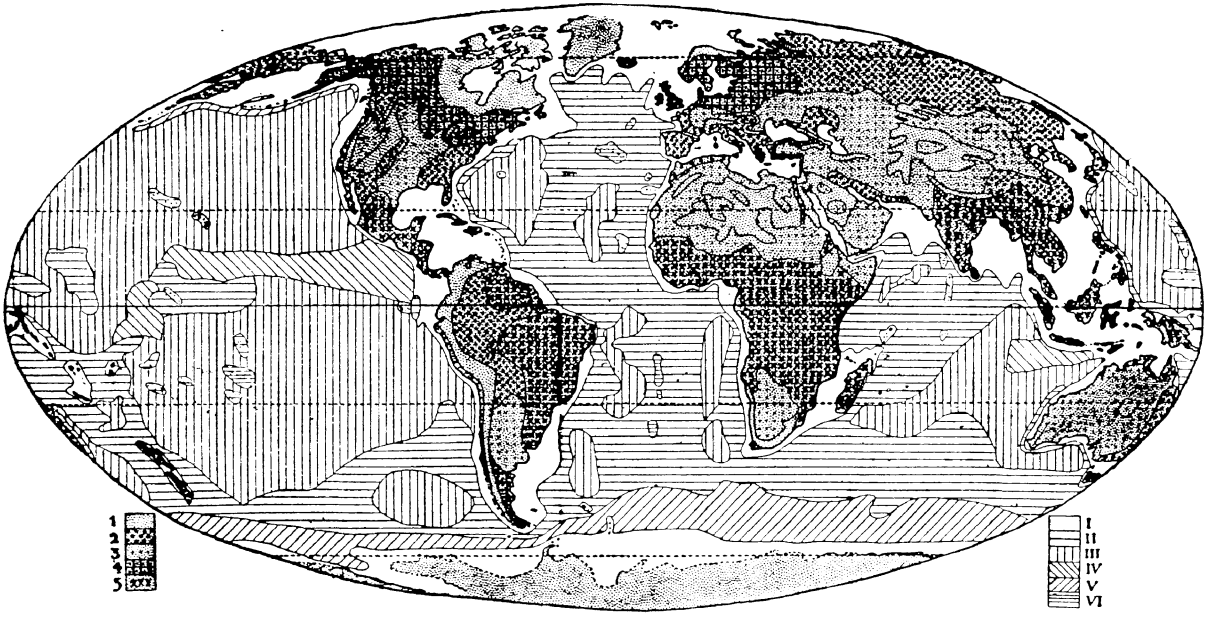


FIG. 25. Superficial Covering of Land and Ocean Floor.

Land Surface. 1. Areas of bare rock or covered with permanent snow and ice. 2. Water-borne soils. 3. Wind-borne soils. 4. Ice-borne soils. 5. Laterite. *Sea Bottom.* I. Muds of land origin. II. Globigerina Ooze. III. Red Clay. IV. Radiolarian Ooze. V. Diatom Ooze. VI. Pteropod Ooze.

(e.g. the Red River basin), or by the arising of a region from beneath the sea (e.g. the East coast plain of North America).

46. Soils. The surface of the land is not commonly formed of solid rock but covered with a loose material, the soil. Fig. 25 shows the distribution of different kinds of surface coverings. The bare rock appears in the areas with the shading 1. These have been swept bare by winds in the desert areas or scoured [1] by great ice sheets, or they are still covered with ice and snow. The soils that are formed by the action of weathering in wet regions and by running water are shown by shading 2. Their distribution should be compared with that of rainfall in Fig. 34. So should the area of wind formed soils of the deserts and desert margins. The ice-formed soils show the former extension of ice sheets.

[47. Laterite, shown by shading 5, is a soil found mainly in hot, wet regions. It is red and contains iron. Probably bacterial and chemical action under the hot, moist conditions cause it to be formed from rocks of different composition.]

CHAPTER III*

CLIMATIC REGIONS

48. Importance of Climate. The state of the lower layers of the atmosphere has a very important effect on the state of the surface of land and sea. We have already seen that different types of landscape are found in different climatic regions; later we shall learn that different climatic regions fix the chief vegetational regions. The study of the climatic regions into which the Earth's surface can be divided is thus one of the most important parts of geography.

The atmosphere which surrounds the Earth consists of nearly 21 per cent. of its volume in oxygen and 79 per cent.

[1] Rubbed

* Revise knowledge of radiation, conduction, and convection of heat.

of nitrogen, while carbon dioxide and other gases are present in very small quantities. There is also a small amount of water vapour, which is of very great importance.

The gases, which are fixed in quantity, vary in temperature and pressure owing to changes in the quantity of heat supplied to the atmosphere. This heat comes from the Sun.

49. The quantity of heat supplied at different places depends upon three factors: (1) The obliquity [1] of the Sun's rays; (2) the distribution of land and water; and (3) the height above sea-level.

When the Sun is overhead at the equator, it is on the horizon at the poles. The greater the mass of air through which the Sun's rays have to pass, the less is the quantity of heat which reaches the surface. Also, a pencil of rays falling obliquely on a surface has to heat a larger area than the same pencil falling vertically, and therefore supplies a less quantity of heat. Owing to both these facts, the temperature drops steadily from the equator to the poles. The former fact is the more important.

The atmosphere is only partly heated by direct solar [2] rays. These reach the surface of the land and water, which in turn heat or cool the lower layers of the atmosphere by conduction and radiation. Land is both heated and cooled more rapidly than water. The Sun's rays can pierce beneath the surface of water, and the heat received directly is spread widely in the water itself. Thus more heat is stored up by water than by land, and the distribution of land and water affects that of the temperature.

Temperature falls with height about 1° F. for 300 ft. for five or six miles, and then it remains almost the same for the next five or six miles.

Hence, distance from the equator, from the sea, and above sea-level have all to be considered before we can understand the distribution of temperature.

[1] Slant, or angle.

[2] Of the sun (Latin *sol*, the sun).

50. Temperature Maps. Thermometers are read two or more times a day, and if the hours are properly selected the sum of the readings divided by their number gives the mean average temperature for that day. Sometimes this average temperature is got by adding together the maximum and minimum readings for that day, and dividing by two. When the average temperatures for every day of a month are known and these temperatures are added together and divided by the number of days in the month, the mean temperature for that month is obtained. Similarly by adding the mean temperature of the twelve months and dividing by 12, the mean temperature for that year is got. As the temperature varies a little from year to year, the temperatures for a large number of Januaries are added together and divided by the number. This gives the mean temperature which may be expected in January. The mean temperatures for February, &c., are obtained in the same way, and so is the mean annual temperature. The mean temperature for a month is now entered on a map for each station. The map is covered with numbers, and lines are drawn for selected temperatures, such as 32°, 50°, 68° F. (0°, 10°, 20° C.), just as contour lines are drawn. These are called isotherms (*isos*, equal, and *thermē*, heat). (See Figs. 26, 28, 29, 37.)

Temperature varies greatly with height, and meteorologists usually make maps which are 'corrected' for height, i. e. an addition of 1° F. is made for every 300 feet the station lies above sea-level, and this amended value is entered on the map. The map of such isotherms, 'reduced to sea-level', as they are called, is much less complicated than that showing the real temperatures.

51. Pressure Maps. The isobars (*isos*, equal, *baros*, weight) are drawn in a similar way, but here the correction to 'reduce' the mean pressures to sea-level is more complicated, for it depends on temperature as well as on elevation. All isobaric maps are so 'reduced'. (See Figs. 27, 32, 33.)

52. Rainfall Maps. The lines of equal rainfall, or isohyets (*isos*, equal, *hyetos*, rain), are drawn in a similar way.

53. Temperature Maps when the greatest heat is near the Equator. Let us now look at the temperature map for April (Fig. 26) or October, and see how far it is to be explained by such facts. The Sun is then overhead at noon not far from the equator, and the line of greatest temperature at sea-level is not very far from the equator. The hottest areas are near the equator in the interior of the continents where the land is low (cf. Fig. 10). The hot belt, where the

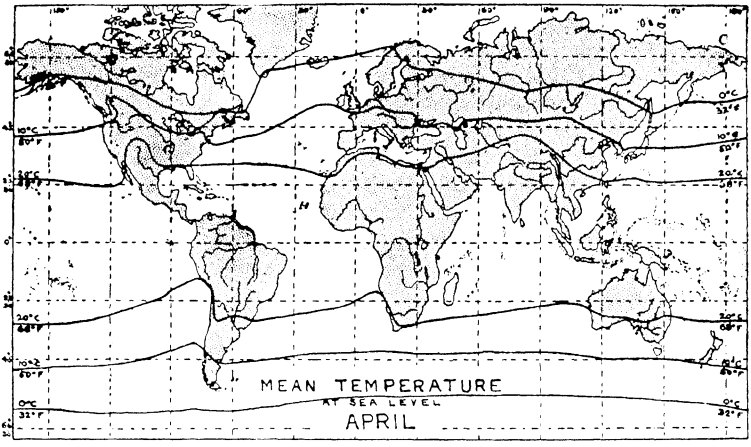

MEAN TEMPERATURE
AT SEA LEVEL
APRIL

FIG. 26.

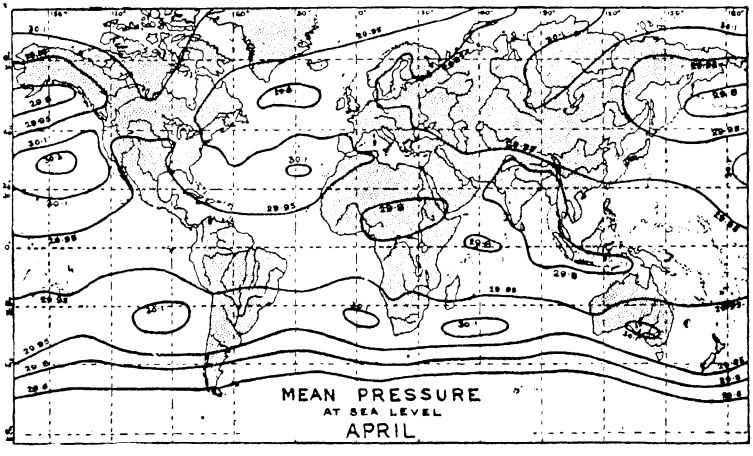

MEAN PRESSURE
AT SEA LEVEL
APRIL

FIG. 27.

mean temperature is over 70° F., lies roughly, between the tropics; the line of 50° F., separating the cool from the warm temperature belt, is a little over 40° from the equator; and the land with a temperature under the freezing-point lies beyond latitude 60°. Notice how the hot belt (over 70° F.) widens and the cool belt (between 30° and 50°) narrows in the east of the continents and west of the oceans. This will be explained when we study wind and current maps.

54. Temperature Maps at other Seasons. A new fact is brought in when we remember that the Sun's height in the heavens changes with the seasons—that at midsummer it is overhead at noon $23\frac{1}{2}°$ from the equator. This makes the January and July temperature maps represent the extremes of heat and cold for the North and South Hemispheres. We must study these maps (see Figs. 28 and 29), and compare them with that for April (Fig. 26).

The hot zone in January, when it is summer in the Southern Hemisphere, lies between 25° N. and 30°–35° S. over the ocean, but over the land it bulges southward to 35°, and in South America to 40° S. The cold zone (under 32° F.) in the Southern Hemisphere lies south of the Antarctic circle; but in the Northern Hemisphere it is as far south as 55° N. over the oceans, except in the North-east Atlantic, and over the lowlands it reaches to 40° and even 35° N. In the west of the northern continents north of 30° N. the isotherms run SSE. or SE., and in Europe even due south in places; while on the east of the continent they run north-east. This must be carefully studied with wind and current charts.

In July, during the northern summer, the hot zone is north of 20° S., and extends over 35° N. in the Pacific, 40° N. in the Atlantic, and 55° N. over the lowlands. The cold zone does not appear in the Northern Hemisphere, but lies south of 55° S. in the Southern one.

55. Importance of Certain Isotherms. Certain temperatures are of much greater importance than others in determining the distribution of plants, e. g. the summer isotherm of 50° F. roughly determines the poleward limit of trees. A useful temperature map may be made by drawing the isotherms of 30°, 50°, and 70° for the hottest and coldest months. This shows very clearly where the difference between winter and summer is great and where it is small. Notice how the range of temperature is greatest over the most extensive land areas, and least over the oceans.

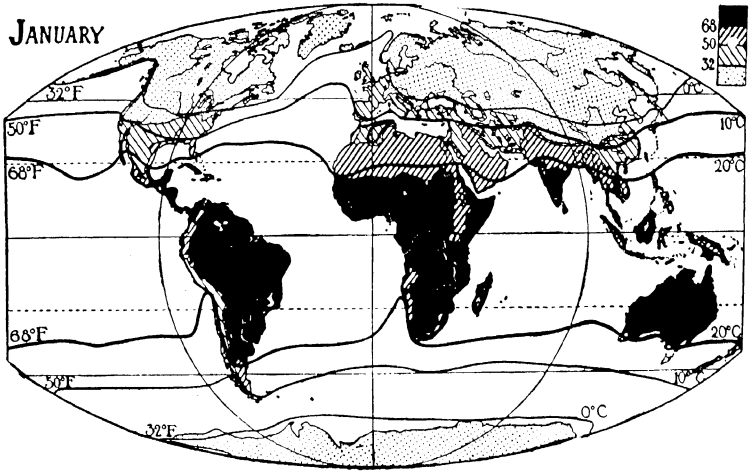


FIG. 28. Isotherms for January.

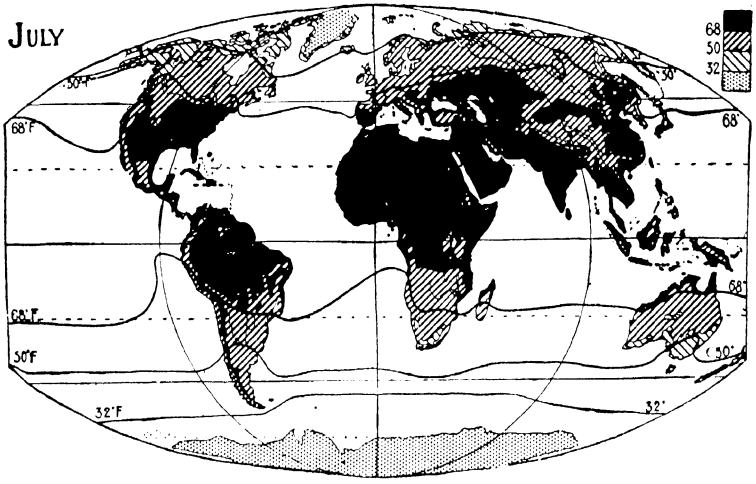


FIG. 29. Isotherms for July.

In these two figures compare the different positions of the isotherms in January and July, especially near the west and east coasts of the continents.

56. Density and Pressure. The air over a heated surface is warmed by conduction, convection, and radiation. Free air when heated expands, and becomes thinner and lighter, thus reducing its pressure. In the same way when air is cooled it contracts, and the pressure increases. If the pressure over neighbouring areas is unequal, the air tends to move from the region of high pressure to the region of low pressure. A constant cause of pressure difference between two regions will produce a constant air current or wind between them. The air over a region of low pressure moves upwards, that over a high-pressure region moves downwards. Compensating or 'return' or 'counter' currents are produced in the upper atmosphere.

[57. At low elevations the pressure of the mercurial barometer diminishes 1 inch for every 900 feet of ascent. The distribution of pressure, corrected to the sea-level, is shown for April in Fig. 27. Notice the belt where the barometer readings are low. The minimum line runs a little north of the equator. North and south this low-pressure belt is bordered by one of high pressure with maximum lines between 30° and 40°. This zone of high pressure, or baric ridge, is succeeded by another zone of low pressure, or baric trough, with the lowest part between 55° and 70°, rising to a slight high-pressure cap over the polar area.

58. Pressure and Temperature. On comparing this with Fig. 26 the baric minimum near the equator is found to be roughly similar to the maximum of temperature. The higher pressures round the poles correspond with the lower temperature found there. There is nothing, however, in the temperature map to correspond with the zones of high pressure in low latitudes, except that these are least marked over the continents when the temperature is relatively high. Nor does the temperature map explain the existence of the low-pressure zone between 55° and 70°.

59. Pressure and Winds. The wind arrows on Figs. 30, 31 show that the air at the surface does not move from higher to lower pressure areas at right angles to the isobars, but almost parallel to them, forming a swirl about the high-pressure system, clockwise in the Northern Hemisphere, and counter-clockwise in the Southern Hemisphere. A similar swirl is set up about each low-pressure area, counter-clockwise in the Northern, and clockwise in the Southern Hemisphere. This may be expressed more generally by saying that moving air tends to turn in the Northern Hemisphere to the right, in the Southern Hemisphere to the left of its normal path. This is termed the law of deviation due to

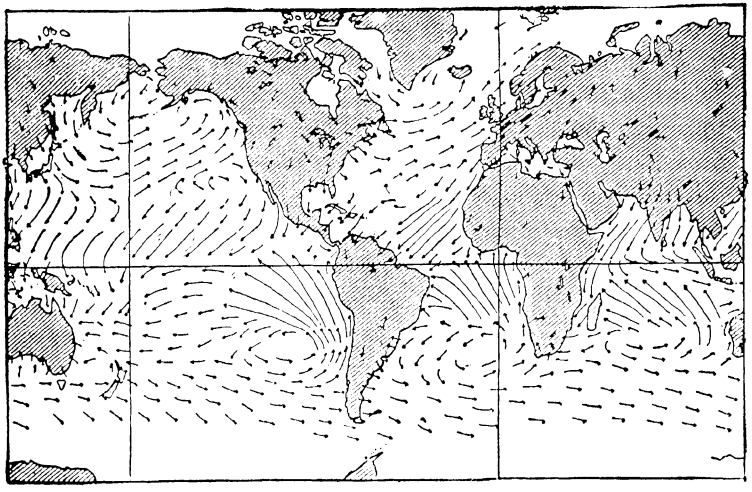


FIG. 30. Winds in January.

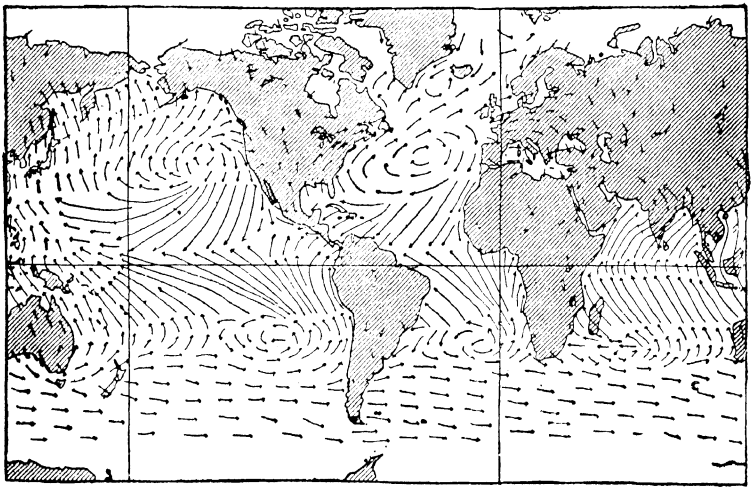


FIG. 31. Winds in July.

N.B. Compare these with Figs. 32 and 33, and notice that the winds blow (i) clockwise round highs in the N. Hemisphere and lows in the S. Hemisphere, but (ii) counter-clockwise round lows in the N. Hemisphere and highs in the S. Hemisphere. Cf. also Figs. 28 and 29, and note how the winds blow from colder land to warmer sea in winter and from cooler sea to hotter land in summer.

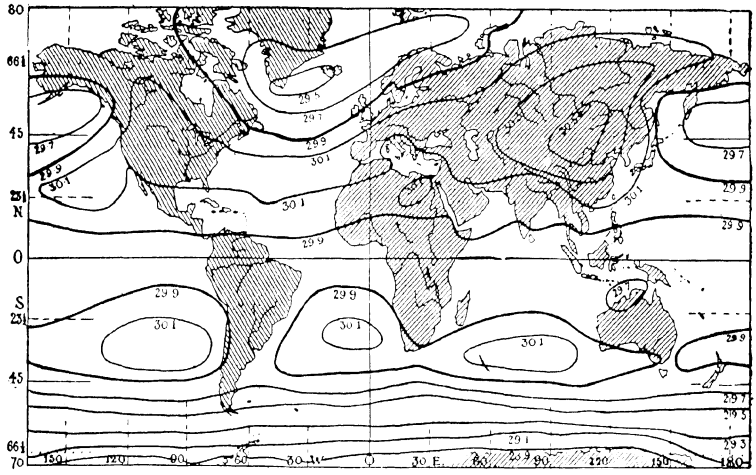


FIG. 32. Mean Pressure for January reduced to sea-level.

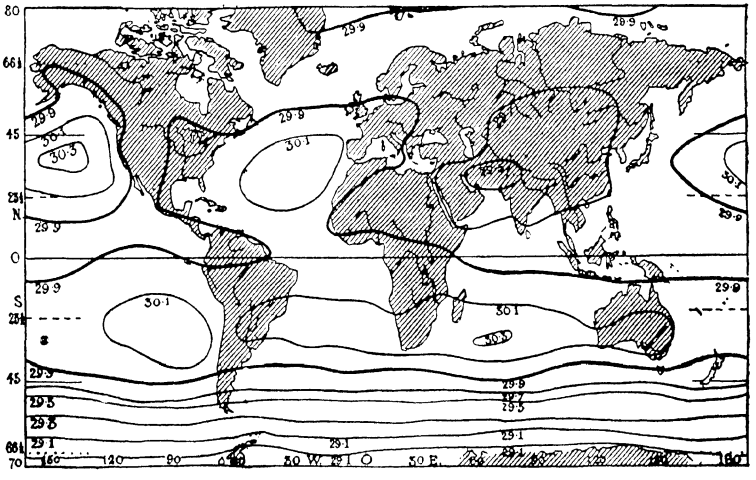


FIG. 33. Mean Pressure for July reduced to sea-level. Compare Figs. 32, 33 with the Mean Temperature for January and July (Figs. 28, 29), and the winds for January and July (Figs. 30, 31). Notice particularly (i) the difference of temperature and pressure in Asia in January and July and the effect on the pressure and winds; (ii) the northward and southward movements of the temperature, pressure, and wind belts.

the Earth's rotation. This deviation may be illustrated by trying to draw rapidly a straight line in any direction on a globe which is rotating.

On the whole the winds blow from the axis of high pressure towards that of low pressure, so that between 30° and 0° there are NE. and SE. winds[1], known as the trade or steady winds of the Northern and Southern Hemispheres, and between 30° and 60° SW. and NW. winds. The storm winds, or westerlies, of these temperate belts are not so constant as the trades. The weather here is determined by the eastward movements of a series of low-pressure systems, huge wind-swirls or cyclones which may be 1,000 miles in diameter.

60. January and July Isobars. Turn now to the January and July pressure and wind maps (Figs. 32, 33, 30, 31). In both the low temperatures over the continents where it is winter go with high pressure, sinking air, and outflowing winds; and the high temperatures over the continents where it is summer go with low pressures, rising air, and inflowing winds. Over the seas in the winter the temperature is higher and the pressure lower, while the opposite is true in summer, except in the high-pressure belts of the Southern Hemisphere. The distribution of land and water has much to do with the distribution of high and low pressure; and the belts noticed in October are considerably changed with the changes of temperature over land and sea in summer and winter. This is seen when the land and water hemispheres are compared. Notice the effect of the land mass of Asia.

61. Monsoons. As a result of the heat equator lying far to the north of the sun equator in July on the Northern Hemisphere, the SE. winds cross the equator and become SW. winds. The change in direction is due to the change in the rotational deviation in crossing the equator. This SW. wind is most marked in India, where it forms the summer monsoon. Similarly the NE. trade wind drawn across the equator in January forms the NW. monsoon, e.g. in N. Australia.

62. Movements of Pressure and Wind Belts. The pressure and wind belts move N. and S. with the Sun. This should be examined on Figs. 32, 33, 30, and 31. The northern and southern limits of the trade winds and strong westerly wind zones should be noted for January and July. The belt of prevailing SW. winds outside the tropics, blowing from a warmer to a cooler region, partly explains the difference in direction of the isotherms on the E. and W. coasts of the northern continents noticed in the temperature maps. Notice more particularly the Mediterranean and other regions in similar latitudes in the west of the continents, which have stormy westerly winds in winter and light or trade winds in summer.

[1] Winds are named according to the direction *from* which they blow, ocean currents according to the direction *towards* which they flow.

In similar latitudes in the east of the continents this is not the case, where a monsoon wind prevails in summer.

63. Pressure and Winds of the Upper Atmosphere. Atmospheric pressure diminishes with altitude according to fairly well-known laws. The pressure over the globe at a height of 13,000 feet has been calculated, and is found to be a maximum within the tropics and a minimum at the poles. The tendency of the winds would therefore be to move spirally from W. to E. around the poles. This is true everywhere except for a belt immediately over the equator, where the upper winds and clouds move from E. to W., turn to SE. and NE. in low latitudes and gradually become S. and N., and then SW. and NW., and finally westerly winds in higher latitudes. This causes an accumulation of air about latitude 30° N. and S., which explains the tropical high pressure. It explains why the isobars at the surface are not exactly what we should expect from a study of the isotherms.]

64. Rainfall for January and July. Turn now to Figs. 35 and 36, which show the rainfall for January and July. Compare carefully the areas of greatest rainfall in the two months, and notice how they are related to the prevailing[1] winds. Rain falls when the air is so cooled that part of the water in a state of vapour becomes condensed. This happens when the air is forced upwards into colder regions, as in the belt of a rising air round the equator, or over the lands in summer, or in the moving swirls or cyclones of the stormy wind belts. It also happens where the prevailing winds from the sea strike a high land which forces the air upwards. The permanent[2] rainy areas are those found in both maps. The larger areas of seasonal rains can be seen; those having summer rains are far greater than those having winter rains. There is also a large area having little or no rain at any season. This will be shown on Fig. 34.

The winter rainy regions are those which lie in the stormy wind area in winter but in the calm area of descending winds in summer, or else they are in the trade-wind area, where a high land runs at right angles to the prevailing wind and turns it upwards.

[1] See that class clearly understands the meaning of *prevailing* in this sense—steady and continuous for a considerable part of the year.

[2] Fixed, regular, *pukka*.

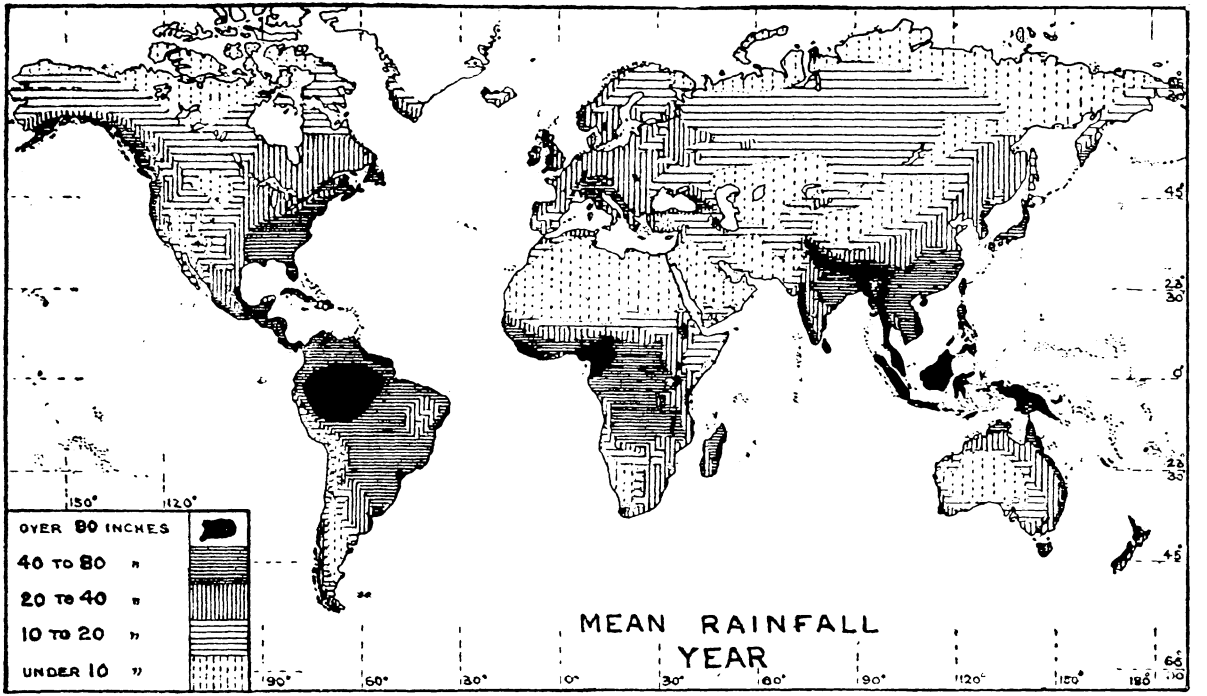
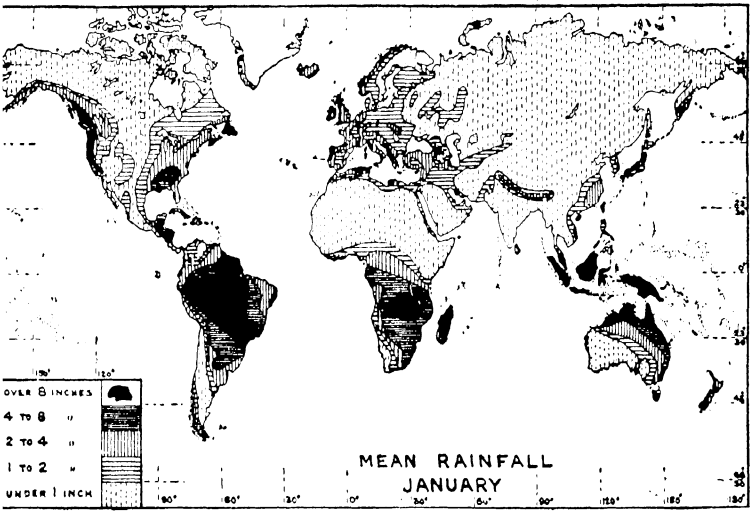
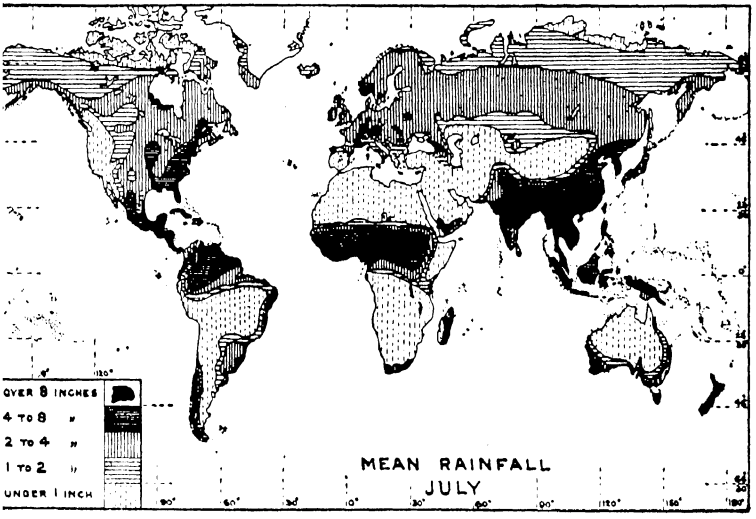


FIG. 34. Mean Annual Rainfall. Compare with Figs. 35 and 36 and note what regions have marked summer rains and what have marked winter rains.





FIGS. 35, 36. Mean Rainfall for January and for July. Compare (i) with winds of Figs. 30 and 31. Notice influence of land and sea winds, and of the north and south positions of the wind belts.

65. Distribution of Mean Annual Rainfall. Fig. 34 shows the mean annual rainfall and brings out the areas which get enough rain and those that do not. Notice the almost continuous belt of equatorial rain which joins a belt running northwards and southwards along the east coasts. In the middle temperate latitudes there is a new belt right across the continents, but of very much smaller fall. Along the west coast of temperate lands this extends farther north and south. Between the equatorial and mid-temperate rain-belts in the centre, and even in the west of the continents, there are desert areas. In the cold north the rainfall also lessens rapidly.

66. Climatic Regions of the Lands. Taking the temperature and rainfall maps together, we can make a map of different climatic regions. The older geographers divided the globe into the hot zone, the two temperate, and the two cold zones. There was good reason for this. In the intertropical[1] belt the day and night are never longer than $13\frac{1}{2}$ hours or shorter than $10\frac{1}{2}$ hours. The seasonal temperature changes are small, and the daily ones are more important. It is a belt of steady weather, broken only now and then by local thunder or great storms. The seasons are marked by changes of rainfall rather than of temperature. Beginning at the equator in Fig. 37 we see the belt where it is never cold at sea-level divided into an equatorial part which receives rain at all seasons, and two bounding belts where summer rains are by far the most important. Both bend poleward in the east of the continents, but are succeeded in the centre and west by desert lands.

67. In the temperate belt the seasonal changes are all-important. Changes in the length of day and night are more marked. Spring and autumn, with almost equal day and night as in the intertropical belt, are divided by winter and summer. Daily as well as seasonal changes of weather vary greatly. The weather changes from day to day.

There are marked divisions in this temperate belt due partly to temperature and partly to changes.

[1] Between the tropics.

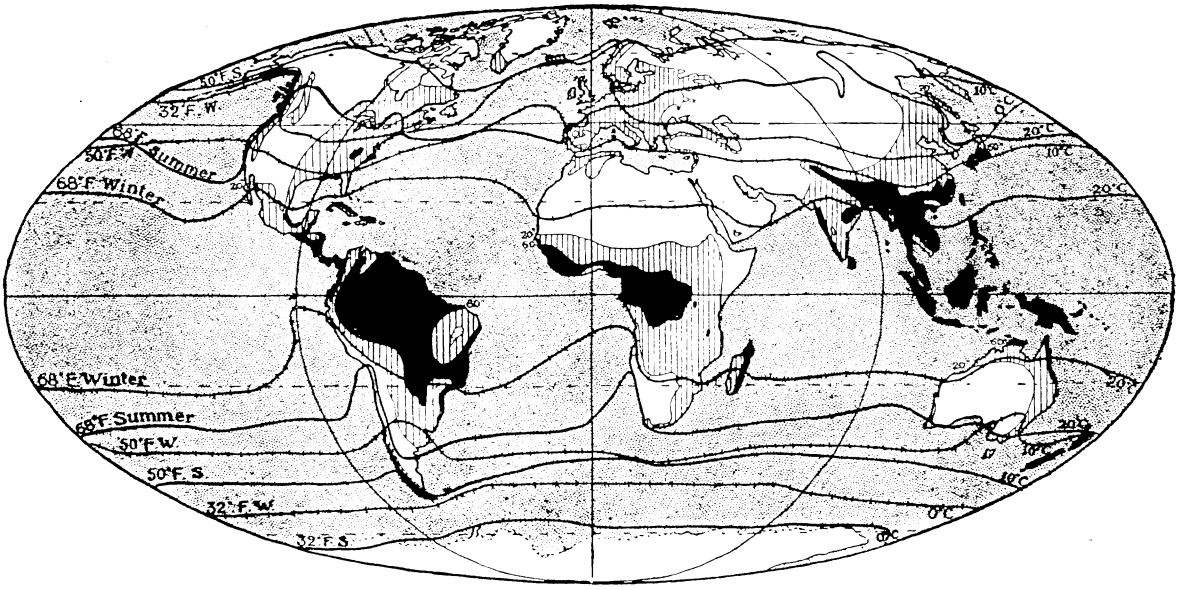


FIG. 37. The isothermal lines of 0°, 10°, and 20° C. (32, 50, and 68° F.) are drawn for Summer (July in N. Hemisphere and January in Southern) and Winter (January in N. Hemisphere and July in Southern).

The rainfall lines of 20 and 60 inches are shown. The arid or rather dry regions are left white, those with a moderate rainfall have a ruling of parallel lines, those with a very heavy rainfall are black.

68. Beyond the desert lie the western regions of winter rains—with mild winters and warm summers (Mediterranean type of climate). In the east, in the same latitudes, there are lands of cold winters and hot wet summers. In the temperate rain-belt the coast is mild and rainy, with heavy autumn and winter rains. The centre is much drier, much colder in winter, much warmer in summer. The east has also extreme cold and heat, but less than the centre and with a much better rainfall.

69. In the frigid belt the winters lengthen, the short days are divided by long nights, and near the pole the night is continuous for many weeks. In summer the light is equally continuous, but the lowness of the Sun, the thick layer of air its rays have to pierce, and the covering of ice and snow which has to be melted before the land can be heated, keep the temperature low. Daily changes of weather, so important near the equator, scarcely count. There is a long, cold, dry, dark winter, a slightly shorter summer, light, but not warm, with some fall of snow or rain.

70. Climatic Girdles around Mountains. The mountain areas in each of these regions rise through increasingly colder and, at lower levels, wetter bands to a cap of eternal[1] snow.

A comparison may be made between the girdle of a mountain within the tropics and the climatic regions on the eastern sides of the continents. There are, however, several important differences. Day and night remain almost equal most of the year and daily changes are more important than seasonal ones, except rainfall. A cloud girdle is found at varying elevations, and this moves up and down daily.

71. Climate and Rivers. Compare the map of drainage areas (Fig. 20) with those of climate, especially with those of temperature and rainfall. From this it will be seen that rivers flowing to the Arctic, such as the Mackenzie and the Ob, are frozen part of the year. As the southern parts thaw in spring before those farther north, ice blocks are formed and the water floods the plains. Rivers whose sources are in hills with a heavy snowfall in winter are also flooded in spring, but here the melting begins lower down and spreads up the river, and the water runs off as the

[1] Everlasting, never-melting.

ice melts. Rivers like the Upper Rhine and Rhone may remain full most of the summer owing to the melting of glacier ice, which is greatest then.

Most rivers have floods when rain falls most heavily; and this is for most parts of the World in summer, e.g. the rivers of India. Some rivers, such as the Nile and the Indus, rise in wet regions and turn into the desert where they lose much water by evaporation. Evaporation has to be taken into account as well as rainfall. This makes the heavier summer rains of many regions produce little or no flood, as the evaporation is too great.

72. The Climatic Regions of the Ocean are best considered with reference to prevailing winds. North and south of the equator lies a belt of calms, the Doldrums, with temperatures never much below or above the average, with moist air, much cloud, occasional squalls, and many thunderstorms. North and south come the trade-wind belts with slightly greater differences of temperature. In the Indian Ocean the winds are alternately north-east and south-west monsoons, there is much less cloud, steady winds with dry air and little rain. Then come the sub-tropical calms of the 'Horse' latitudes. Here the air is dry and descending, clouds are few, and rain is rare. These calms are succeeded by the stormy westerly winds, known in the Southern Hemisphere as the 'stormy westerlies' or the 'Roaring Forties'. Here the atmospheric conditions vary greatly from day to day. In front of each cyclone or low-pressure system the winds blow spirally inwards, on the whole from warmer regions, and bring much water, which appears as cloud from which rain falls as the air is swirled upwards. Behind each cyclone the air is drawn in from colder regions, bringing cold dry weather. Now and again a high-pressure system develops and bright calm weather rules. Beyond the westerly wind belts ships rarely penetrate. In the south there is land, in the north the ice-bound Arctic Ocean. The prevailing winds are probably easterly, blowing out from the high-pressure caps at the poles.

73. Winds and Sailing-Ships. These winds have to be considered by captains of sailing-ships, who have to plan their course so that favouring winds and currents are made use of as much as possible, and belts of adverse winds crossed quickly. For instance, the sailing-ships of Bombay that trade with the coast-towns of the Persian Gulf and the east coast of Africa cannot make their voyages between June and September while the south-west monsoon is blowing.

As an exercise consider the way the ship would go from Aden to Calcutta during the south-west monsoon. Also find out which would be the easiest way for a ship to go (*a*) from Cape Town to New Zealand, (*b*) from New Zealand to Cape Town.

CHAPTER IV

THE OCEAN

74. Wind-caused Currents. The wind affects the surface waters of the Ocean, raising ripples, then waves, and finally causing a current. Where the wind is permanent there is a permanent ocean current. In the trade-wind area the winds blow the surface water westward, while in the westerly storm-wind zones they tend to move it eastward. These two currents, following the example and impulse of the winds, tend to form a great swirl[1] in each ocean, moving in the Northern Hemisphere in the same direction as the hands of a clock, and in the Southern Hemisphere in the opposite direction. Round the equator, between these swirls a counter current turns eastward along the calm belt. This is probably due to the piling up of water in the west causing a movement eastwards in the calmer belt, but the eastward movement may be helped by monsoonal winds. The monsoonal influence is clearly marked in the North Indian Ocean, where the general direction of the currents is on the whole westward in summer and eastward in winter. In the Pacific the shape of the coast causes a bending north-westward in the North Pacific westerly Wind Drift. In the Southern Hemisphere the eastward current in front of the west winds encircles the globe.

75. Gulf Stream and Westerly Storm Wind Drift. The North Atlantic has a very peculiar form, or shape. Part of the westerly current north of the equator is driven into the Caribbean Sea and Gulf of Mexico. The collection of water is prevented by the action of gravity and a current passes out into the Atlantic through the Strait of Florida as a well-marked warm stream which joins the warm current outside the Antilles. This warm and relatively salt current is now

[1] Explain *swirl*, and illustrate by means of a bowl of water.

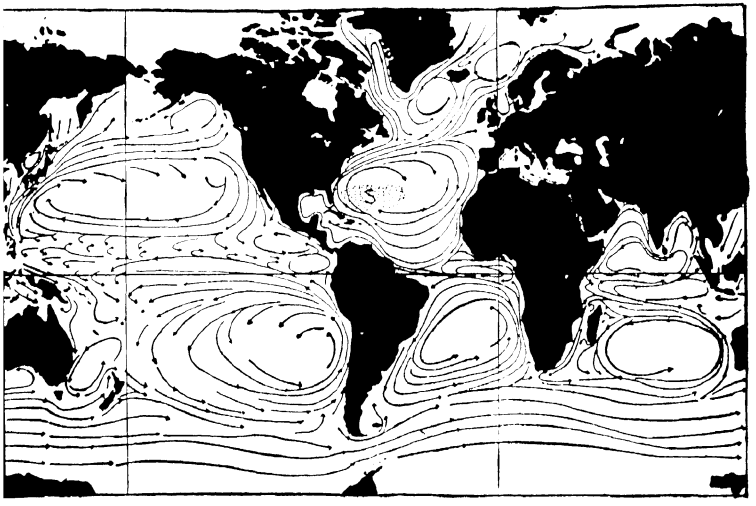


FIG. 38. Ocean Currents in January. Cf. Figs. 30 and 32.

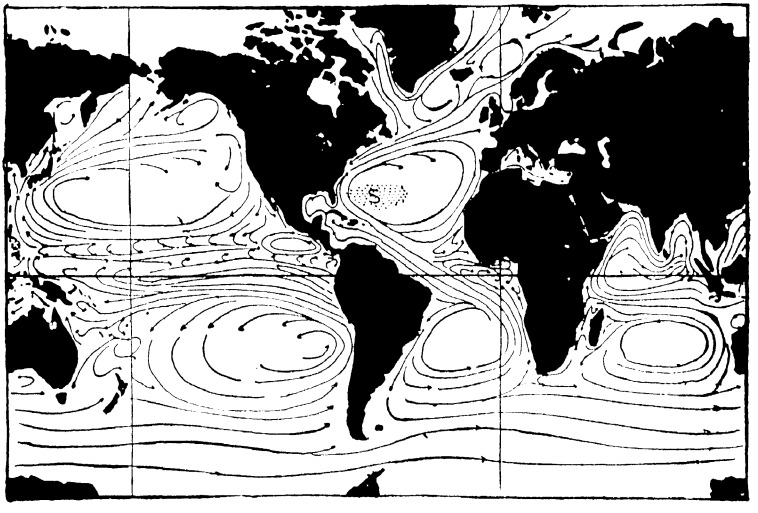


FIG. 39. Ocean Currents in July. Cf. Figs. 31 and 33.

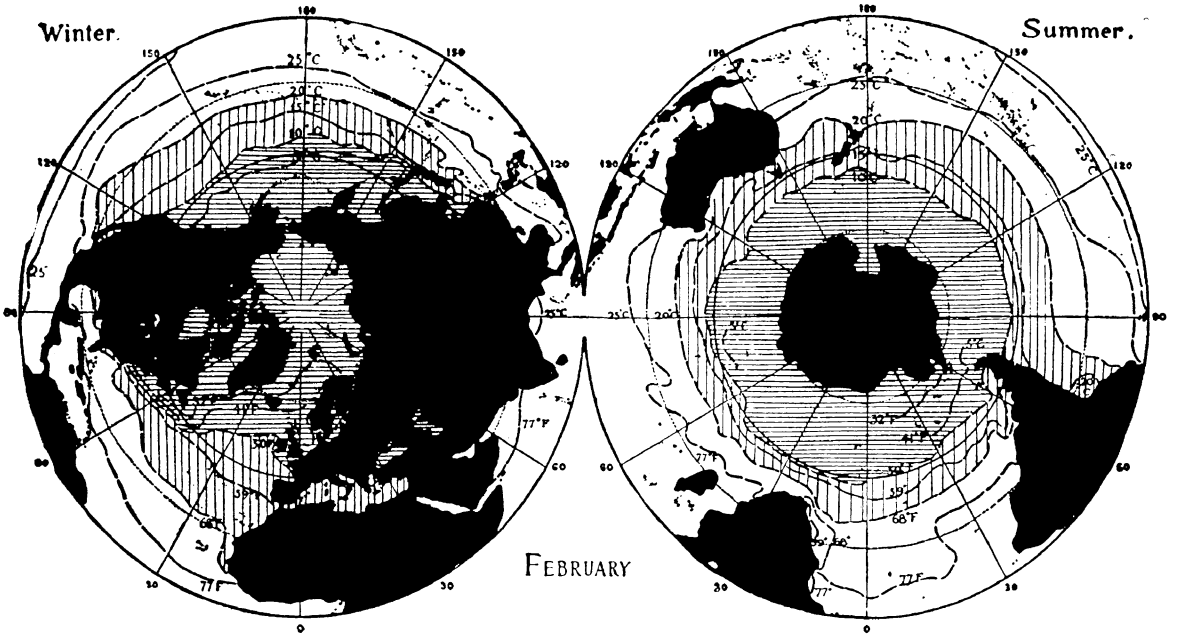


FIG. 40. Mean Temperature of Surface Waters in February. This is the month of minimum temperature north of the tropic of Cancer and of maximum temperature south of the tropic of Capricorn. Cf. Figs. 28 and 26.

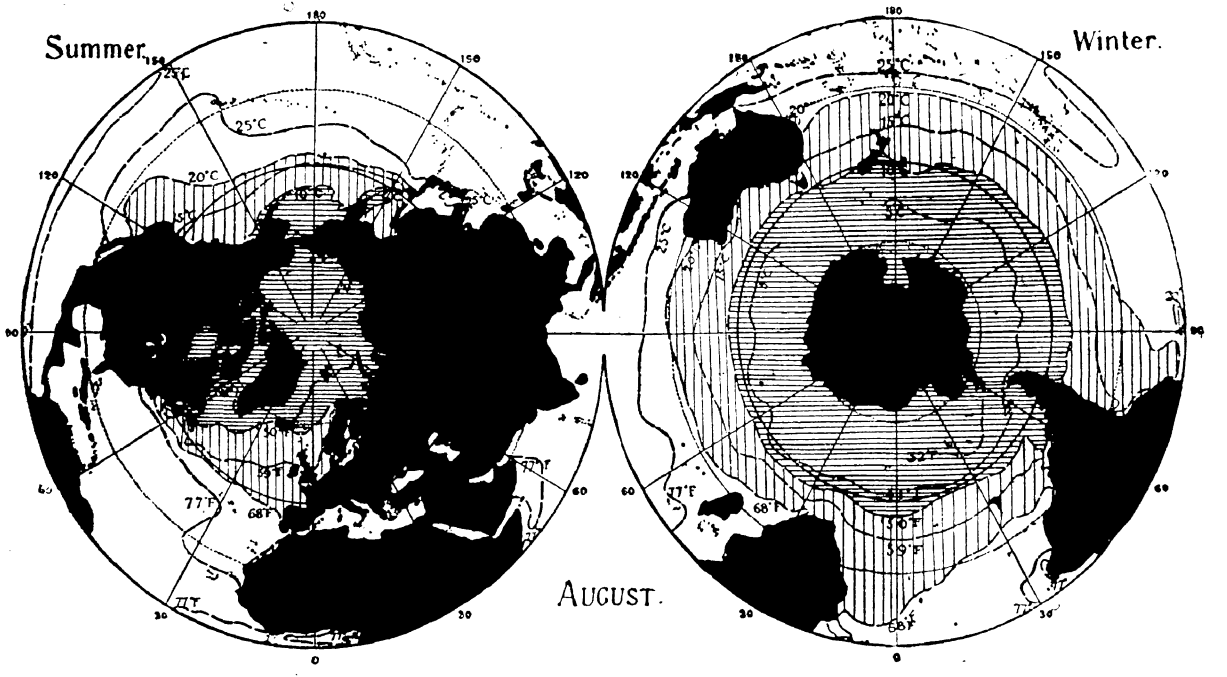


FIG. 41. Mean Temperature of Surface Waters in August. Compare with Fig. 40 opposite and explain the differences. Notice in both maps the differences between the water isotherms and those for the air shown in Fig. 29.

called the Gulf Stream. It is well marked off the coast of Florida and the Carolinas, but it becomes less so beyond Cape Hatteras, where it begins to become a general surface drift. The prevailing westerly winds carry this eastwards across the Atlantic. In the east it divides. Part is carried southwards parallel to the European and African coasts, and forms a cooler current as it moves into warmer latitudes. The other part, forming warmer surface water, is driven beyond the Arctic circle, and keeps the seas north of Norway free from ice even in winter.

76. Through the openings between the land in the north, cold currents move southwards, partly to take the place of the warmer water, partly brought by northerly winds. Owing to the influence of rotation these cold currents hug the east shore of Greenland and of North America.

Cold water, known as the 'cold wall', is also found south of Newfoundland, close to the American coast. This is mainly owing to the fact that where the winds blow off-shore the surface waters are driven onward and cooler waters from below replace them, causing cooler surface conditions. This is especially marked off the west coast of South Africa and of South America. An on-shore wind tends to bank up warm surface waters against the land; thus the currents increase the temperature differences noticed in middle latitudes between east and west coasts.

77. **Surface Temperatures.** While the temperatures of the surface waters of the ocean on the whole diminish from equator to pole, there are many changes due to these currents. Where the currents move from higher to lower latitudes the seas are cooler, when from lower to higher they are warmer. Where upwelling water occurs low surface temperatures result.

Fig. 40 should be carefully studied for details and the belts of temperature examined in connexion with the statements of the last three sections.

[78. **Vertical Distribution of Temperature.** The temperature diminishes from surface to bottom. Most bottom water is under 40° F.,

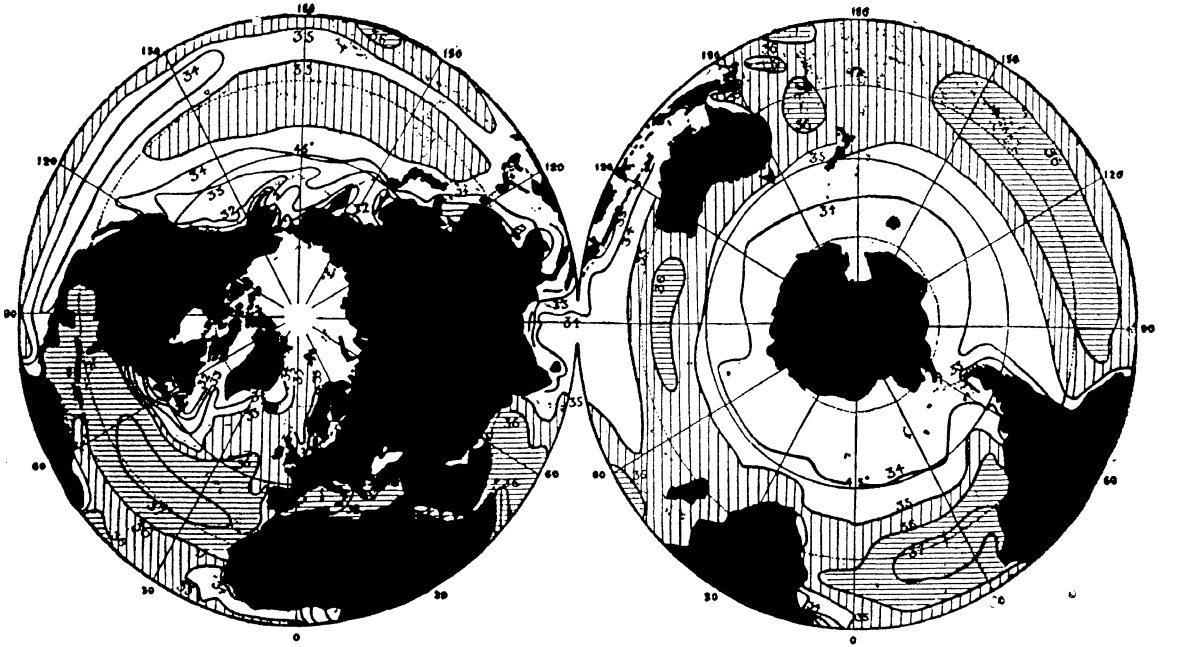


FIG. 42. Average Salinity of the Surface Waters of the Oceans. Compare with mean April temperature (Fig. 26) and April pressure (Fig. 27). Explain the areas of high salinity and judge from the Rainfall map in Fig. 34, which shows only that over the land, whether the rainfall is likely to be great or little in these regions over the sea.

and over forty per cent. of it is between 30° and 35° F. Just as the air is rising in low and sinking in high-pressure regions, so the ocean waters rise in low-pressure areas and sink in high-pressure areas. Hence near the equator, at depths of 1,000 feet, where the cold bottom water is rising, the temperature is lower than farther north and south under the high-pressure regions, where the surface water is descending.

79. **Salinity.**[1] The normal salinity of ocean water is 35 per thousand or per mille, which may be written $^{o}/_{oo}$. The saltness of the sea varies as well as the temperature. Where evaporation is great and rainfall slight the surface water becomes salter; where rainfall is heavy and evaporation slight the surface water is fresher. In inland seas such as the Mediterranean and Red Seas, where there is a narrow and not very deep passage to the great ocean, where the temperature is high, where few rivers run in and little rain falls, the salinity becomes very great. The level of such seas tends to become lower than the ocean outside, and a surface current flows in from the ocean. An undercurrent flows out below, which is warm and salt; for in such seas, where the cold under-waters of the ocean cannot enter, the lower waters remain at the temperature of the ocean at the level of the bottom of the strait by which they are joined to it. The temperature of all Mediterranean waters is 75 F. at depths below the sill[2] of the Strait of Gibraltar. (See Fig. 42.)

Some inland seas, however, receive much rain and river water and are relatively fresh. This large supply of water adds to their volume, and the surface current flows out as a fresher one than a salter undercurrent which passes inwards below. This takes place in the cases both of the Baltic and Black Seas.]

80. **Tides.** Currents are also caused by tides. The tides are risings and fallings of the level of the ocean twice every twenty-four hours fifty minutes. They are due to the attraction exercised by the Sun and Moon on the mobile[3] waters of the surface. The waters in the line between the centres of the Earth and Moon are more attracted than the centre of the Earth, and the centre of the Earth more than the waters on the side remote from the Moon. Hence a shape like that in Fig. 43 and the formation of two wave-crests which move round the World as the Earth turns round on its axis. Similar waves are caused by the Sun.

[1] Saltness.
[2] Ledge, raised ocean-bottom coming near the surface.
[3] Moving, unfixed, movable.

[**81.** Gravitational attraction is directly proportional to the mass of the attracting body, but inversely proportional to the square of its distance.[1] The attraction of the smaller Moon on the Earth as a whole is much less than that of the larger Sun, for while the Moon is only 390 times nearer the Earth than is the Sun, the mass of the Sun is 26,650,000 times that of the Moon. Yet the tide caused by the Moon is greater than that caused by the Sun.

Why? The tides are due to the difference in the value of the gravitational attraction at the centre of the Earth and at the surface along the line between the centre of the Earth and the attracting body. Let us call the Earth's radius 1, the Moon's distance from the Earth's centre is 60

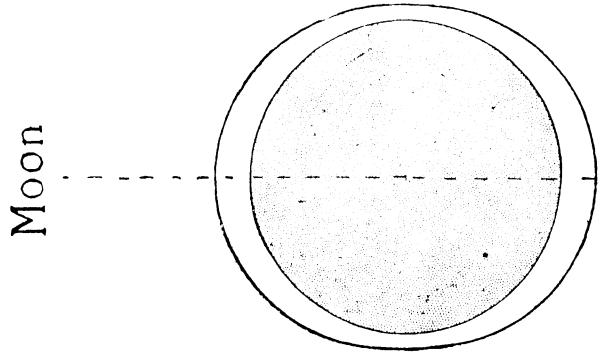


FIG. 43. Diagram to show the tide caused by the Moon in an ocean of uniform depth covering the Earth.

times this, the Sun's distance from the Earth's centre is 23,250 times this. If we call the Moon's mass 1, the sun is 26,650,000. Hence the difference in the attraction at the Earth's centre and surface due to the Moon is to the difference at the centre and surface due to the Sun as

$$\frac{1}{59^2} - \frac{1}{60^2} : \frac{26{,}650{,}000}{23{,}249^2} - \frac{26{,}650{,}000}{23{,}250^2} = 2\tfrac{1}{4} : 1 = 9 : 4.]$$

82. Spring and Neap Tides. There are two solar tides every twenty-four hours. Owing to the Moon revolving round the Earth any point on the Earth's surface returns to a similar position under the Moon, not in twenty-four hours but in twenty-four hours fifty minutes. Hence the two tides do not always coincide.

[1] The bigger the body, the more it attracts: the farther away, the less it attracts.

[83. When the Earth, Moon, and Sun are in the same straight line, which happens twice a month, the height or amplitude from crest to trough of the tidal wave is the sum of the amplitudes of the lunar and solar waves; but when the line of centres of the Moon and Earth is at right angles to that of the Sun and Earth (see Fig. 44), the crest of one

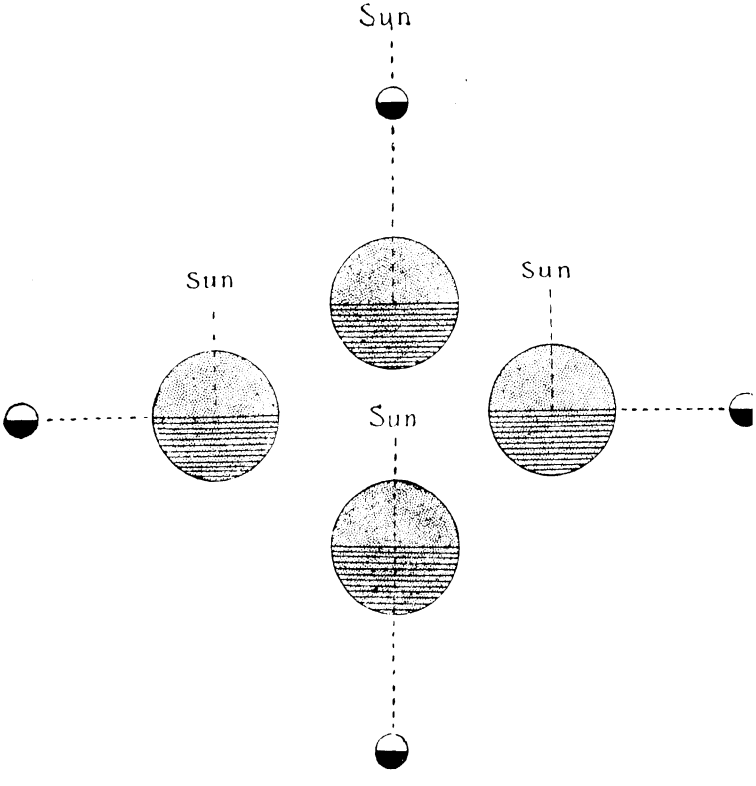


FIG. 44. The four positions of Earth, Sun, and Moon. Spring tides occur when the Moon and Sun are in opposition or conjunction; neap tides when the positions are in quadrature or at right angles to each other.

wave coincides with the trough of the other, and the resultant amplitude is the difference between the two. The amplitude of the former or spring tides is to that of the latter or neap tides as 13 : 5.]

84. Value of Tides. The tides are of greatest use on the shallow seas, and especially in the bays and estuaries which

border these, where the tidal wave becomes higher owing to the heaping of the water. In estuaries the outlet of the river water is stopped, and this leads to further accumulations[1]. Sometimes the wave is suddenly formed in such an estuary and rushes up as a wall of water, known as a *bore* in the Severn and the *eagre* in the Trent.

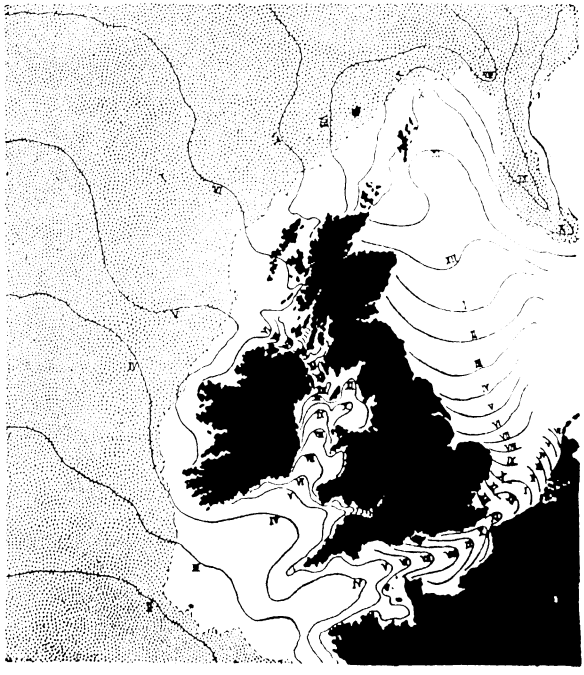


FIG. 45. The hours of high water in the British Seas, when noon is the hour of high water at Liverpool

The rise of tides allows ships requiring a great depth of water to enter ports and proceed farther inland than could otherwise be possible. On the other hand, where there is no tide wharves can be built and used at all times. In narrow straits the tidal wave may form a current or 'race', as in the Pentland Firth.

[1] Collection, heaping up, gathering together.

85. The Ocean Floor. The covering of the sea-bottom is due to the falling of matter from the surface. Near the land, rock waste brought by rivers, or made by the waves, is distributed and sinks. This may be found 100 to 200 miles from the shore, and sometimes to 300 miles. Beyond this, in addition to volcanic ash the chief source of deposits is the constant rain of the remains of the tiny creatures which live near the surface.

[At the greatest depths these organic remains are chemically decomposed, and are replaced by Red Clay, which is regarded as the final transformation product of all marine sediments.

Similar deposits laid down in past ages have been consolidated and elevated to the surface, forming chalk, limestone, &c.]

CHAPTER V

PLANT AND ANIMAL REGIONS

86. Land and Water Organisms. Just as the first division of the Earth's surface is into land and water, so the first division of the web of life is into (1) plant and animal life on the land, and (2) aquatic[1] plant and animal life.

87. Vegetation Types and Plant Formations. Except in the icy and dry districts, most of the surface of the land is covered with a continuous covering of vegetation. It is best to distinguish the regions which are forested from those covered with grass, and the grasslands from the deserts. These are the chief types of vegetation, and we speak of forest vegetation, grass vegetation, and desert vegetation.

In the true forest the trees are continuous. Towards its margin grassy glades are more and more common. Then grass becomes more important than trees. Finally, we find grasslands with no trees or with only a narrow belt of trees

[1] Connected with water (Latin *aqua*, water).

along some watercourse. The vegetation between forest and grassland we may call open woodland or parkland.

Similarly there is a scrub vegetation between grassland and desert, where grass and low bushes grow in patches, and become drier and often spiny [1].

[88. As in the case of land forms, the vegetations may be subdivided. These subdivisions are called plant formations. For instance, the forest vegetation may be subdivided into various formations—evergreen forests, deciduous [2] forests, coniferous [3] forests, &c. The grassland is not uniform [4], and may even contain a tree formation, e. g. river woods. The character of the vegetation differs in different exposures and on different soils. Heather moor, cotton grass moor, peat moss, bracken, hill pasture, meadow pasture are among the grassland formations in Britain, each composed of several associations of plants.]

89. Distribution of Vegetations. Three great belts of forest vegetation are found, one in the equatorial and one in each of the temperate belts. Trace them on the map, and notice the limiting latitudes. The equatorial forests are bounded by parklands, passing into grasslands (savanas), then to scrublands, which border the desert. The temperate forests are also bordered on the equatorial side by open woodlands which pass into grasslands (steppes), scrub, and finally desert. On the polar side, the forest passes into dwarf forest, and this into tundra with mosses, lichens, and a few flowering plants, which bloom when the ground thaws in summer, and finally into the land of perpetual [5] snow.

Notice the limits of these different vegetations. Compare carefully the east coast conditions with those of the west coast, and observe the continuity of forest or grassland along or parallel to the east coast, in latitudes in which there is desert on the west coast and in the centres of the continents.

90. Vegetation and Climate. Compare carefully the vegetation map with the annual and seasonal rainfall maps and the map of temperature zones.

[1] Having spines, spikes, or thorns.
[2] Falling off—shedding leaves.
[3] Bearing cones.
[4] Always the same.
[5] Everlasting.

Examine Fig. 46. Compare it with Fig. 37 and also with Fig. 25. Notice in the first place that the forests are found in an equatorial belt (15, 16, 17), and in middle latitudes 30° to 60° (3, 4, 5, 6, 7). They are bordered by grasslands, with hot or warm summers (12, 13, and 14) or cold summers (8 and 9). In the west of the continents, about 15° to 30°, and in the hearts of the northern continents are deserts and scrub (10 and 11), while icy wastes or tundra (2) fringe the polar lands. The high mountains with girdles of vegetation are shown by 1.

91. The *equatorial forest* is in the hot lands, with constant rain, and is sometimes called the hot rain forest or selva (No. 17 in Fig. 46). Here the vegetation is very dense; a thick undergrowth and a wilderness of creepers interlacing tree and tree make this forest an almost solid mass of vegetation from 100 to 200 feet high.

The *monsoon forest* (16) is less dense, for there is a dry season. In higher districts where the temperature is a little lower and the rainy season shorter and the rain less heavy, a smaller, drier, *hot thorn forest* grows (15).

92. Where the forest passes into the more open *parkland* or wooded savana (14) the rainfall is less heavy and continuous. In the hot grasslands, or *savanas* (13), there is a very marked hot rainy season and a long dry period with a cool and a hot season. Here, except along watercourses, the slow-growing trees requiring a good water supply do not flourish. The surface is covered with long grasses which grow in the wet season, wither in the dry season, and are dried and sometimes take fire and are burned in the hot season. Outside the tropics in the southern hemisphere the character slightly alters owing to the cooler winters. It may be called *sub-tropical savana* (13).

93. The grass becomes poorer as the summer rains become scantier. In the *scrublands* (10) the plants are long-rooted or bulbous, the growing points seem to die off in the dry air into sharp pointed spines. In this scrubland gummy juices protect some plants from excessive loss of water, but when

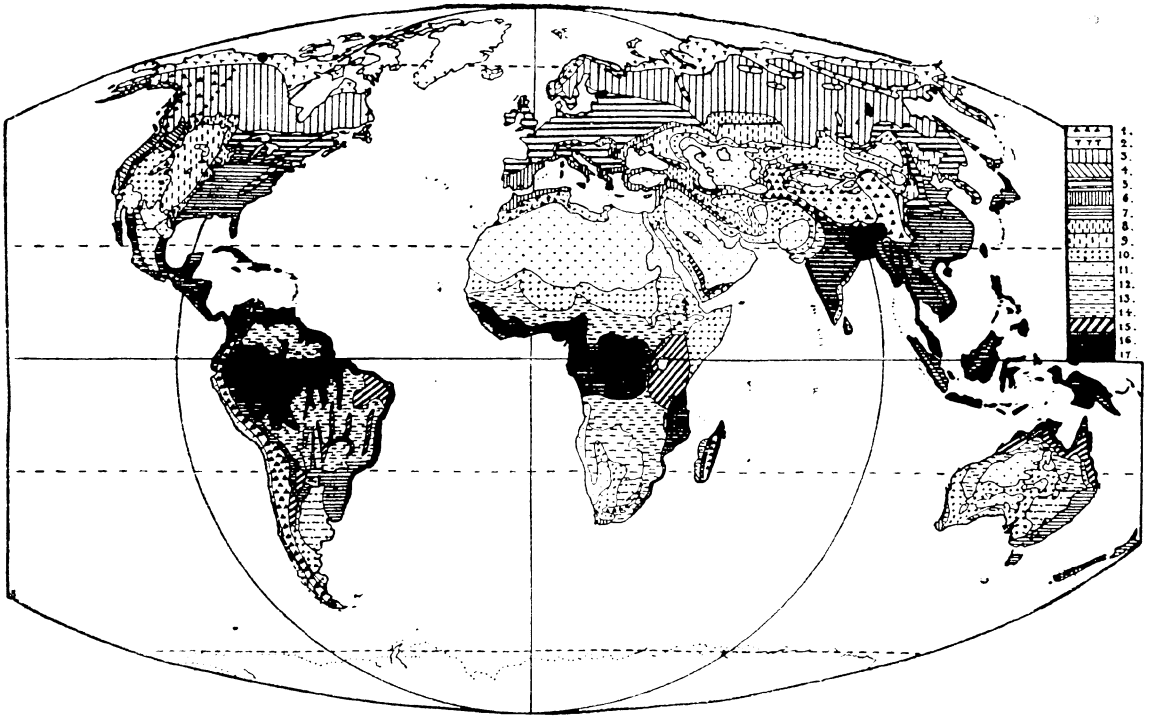


FIG. 46. Distribution of Vegetation. Compare Figs. 25 and 37. The numbers are explained in the text.

the dry season comes and the bark cracks these gums come through: e. g. the acacia.

94. The *desert* (11) has few plants save where there is underground water supplying wells or springs, or where a river from rainier regions, such as the Nile, yields water to form a fertile spot or belt—an oasis. Notice particularly the position of the great deserts of the Sahara, Arabia, and Thar, Australia, Kalahari, and Atacama, and compare them with the rainfall and wind maps. Compare the areas of desert vegetation of the Great Basin of North America, Iran, Turan, Shamo or Gobi, with the conditions shown for these regions on rainfall and mountain maps.

95. The temperate grasslands or *steppes* (9) are mainly found in the interior; and occur in the regions with wide range of temperature where some snow falls in winter but where most of the rather scanty rain falls in summer. Compare the rainfall, temperature, and mountain maps in working out their limits. They gradually merge[1] through a wooded steppe or *park steppe* (8) into the temperate forests.

The southern hemisphere *steppes* (12) have a milder winter and pass gradually into savana.

96. The *temperate forests* have not the vertical tangle of creepers found in the hot rain forest, but some of them have dense undergrowth. We must distinguish between (1) forests of the warm temperate belt (latitude 30° to 45°) and (2) forests of the temperate belt (latitude 45° to 60°).

97. The *warm temperate forests* are divided into western and eastern areas by the steppes or poleward extensions of the deserts. The western warm forest region (6) is one of dry warm summers and cool moist winters, commonly called the Mediterranean type of climate. The eastern warm forest region (7) is one of wet warm summers and cold and drier winters. Both have evergreen trees, but in the former these have small dry leaves, such as the maritime[2] pine or the olive, and the latter larger thicker leaves.

[1] Pass into and mingle.

[2] Near the sea.

98. The *cool temperate forests* consist mainly of coniferous[1] woods, the taiga (3) and the Western American pine forests (4). Between 45° and 60° in the west in Europe and between 45° and 50° on the east of the continents, where the winters are not so severe, and the summers are warm and wet, deciduous forests are found (5). Note that in South America the cool forests are absent to the east of the Andes. The Andes form a barrier which prevents the west wind rains from reaching these lands.

99. The equatorward limit of the *tundra* (2) or half-frozen desert may be compared with the isotherm of 50° F. for the

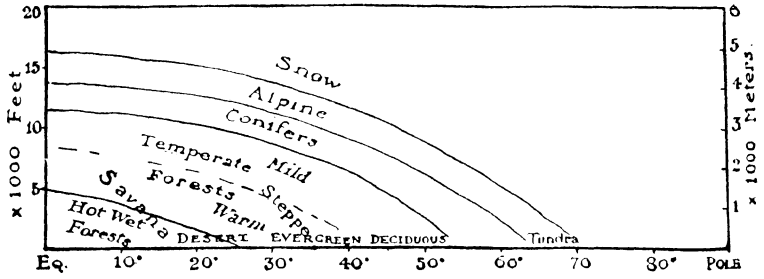


FIG. 47. Vertical Zones or Girdles of Vegetation. This is a generalized diagram. The conditions along the western coasts are shown in capital letters.

warmest month and the limit of 10 inches of annual rainfall. The surface thaws for a short time and to a small depth in summer, when large numbers of small brightly-coloured flowers appear. A few stunted bushes are found in sheltered spots.

[100. **Vertical Girdles of Vegetation.** The snow-capped mountains of equatorial regions may have dense hot wet jungles at their base. The belts or girdles follow each other as do those of the vegetation from equator to pole on the eastern sides of the continents. Rain forest gives place to more open forest, and this gradually becomes dwarfed. Grassy meadows appear and give way to a girdle of sparse scrubby plants, with many mosses and lichens, and finally pass into the cap of snow and ice.

[1] Bearing cones.

The cloud girdle marks a special region of the mountain. The upper part, which is moistened at night, is in the sunshine all day, while the lower part is moistened and shaded during the heat of the day. This well-watered girdle has long slender trees, of which the bamboo is a type.

In higher latitudes the lowest girdle is that of the surrounding country, and except in very dry areas the higher girdles of the mountains are somewhat like the belts of the lowland between the mountains and the poles (1).

101. Vegetation and Soil. While climate controls the most important vegetation types and plant-formations (see §§ 90–9, above), other factors may determine many of the subdivisions of these plant associations.

The plants of the dry sand dunes differ from those of the wet marshes, although the climate is the same. The rock plants on a mountain differ from those on the meadow soils in the same climatic belt. The elm is common on the clays of the English lowlands, oak woods with a dense undergrowth are found in deep moist loamy soil with no stagnant water, while beech woods with little undergrowth occur on light soils, which need have no great depth.]

102. Aquatic Plants may be divided into two great groups: (*a*) those which are rooted to the soil, and (*b*) those which have their whole substance in water.

The land-rooted water-plants occur in lakes and rivers and along the margins of the oceans. Free floating and swimming plants move among these rooted plants. Only rootless plants are usually found at the surface of deep waters (pelagic plants). In the Sargasso Sea parts of rooted plants have been pulled from their roots and floated to this calm region where they collect.

Both in fresh and salt water there are great changes in the character of the vegetation with depth, due to diminished light. In the bright or light belts, 15 to 100 feet below the surface, the larger rooted plants can live, but in the sombre or dim belt these become very scarce.

It will be well to consider more fully (1) fresh-water vegetation, (2) marine vegetation.

103. Fresh-water Vegetation. In rivers the water is flowing and there are few plants which are not rooted in the soil or

fixed to stones. In streams which rise in flood the vegetation of the banks is often uprooted and may form floating islands of vegetation. The *sudd* of the Nile is of this character.

In lakes the floating and swimming plants are found to depths of 100 feet or so, while rooted plants are found in the shallower waters and in the marshes which border them.

[104. **Marine Littoral**[1] **Vegetation.** We may distinguish two belts of littoral vegetation: (*a*) the tidal belt where plants are covered and then left out of water twice a day; (*b*) the submerged belt. In both seaweeds fixed to rocks form the characteristic plants. These seaweeds vary in colour; green seaweeds predominate in the upper half of the tidal belt; olive-brown seaweeds are commonest in the lower half; and red seaweeds are most abundant in the submerged areas. Few rooted plants are known to exist below 600 feet. Considerable differences exist in the littoral vegetation of hot, warm, cool, and cold seas: e.g. the mangrove swamps of the hot belt differ from our seaweed vegetation. Many kinds of plankton[2] are found in these shallow seas.

105. **Pelagic Plants** are either free swimming or floating plants. The pelagic forms are of great importance, for they make the food on which a large part of the animal life of the ocean depends directly or indirectly. Diatoms are the commonest of these plants, but the character of the vegetation varies with the temperature and salinity of the waters. Pelagic regions are best divided into two great types—warm and cold.

The dark regions contain few, if any, plants, and these must be parasitic, e.g. bacteria. Bacteria are by far the most widely distributed of plants, being found practically everywhere on land and in the waters.

106. **Marine Animals** may also be divided into swimming and floating animals, and animals fixed or creeping on the ocean floor. As all animals ultimately depend on green vegetable food, and as this is found only at or near the surface, animal forms are also most abundant at or near the surface, and especially over the continental shelf. Many free swimming larvae are found. Below this depth, in the vast spaces filled with water of almost uniform temperature and salinity, but increasing in pressure with depth, animals are scarcer. At great depths in a very cold, dark, changeless world a more abundant fauna is found. Sponges, sea-urchins, crustaceans, molluscs, and blind or almost blind fishes are the commonest forms. In the intermediate belt there is a rain of dead matter from the surface which yields some food, but is not concentrated as it is in the lower layers, where it accumulates on the bottom.

[1] Belonging to the sea-shore.

[2] Floating plants.

The skeletons of other organisms are so abundant on part of the ocean floor that their names have been given to the oozes in which they predominate. The uniformity of the bottom and of the waters above it produces great uniformity of deposit and of life over great areas.]

107. The Littoral[1] Region is the most varied in animal as in plant life, owing to the varied conditions of the bottom, of the waters above it, and of the food supply, plant and animal. Along the bottom all manner of animals with shells or limy skeletons are fixed or creep about, while many fishes swim in the shallow water above. The great fisheries of the world lie above the continental shelf, more particularly where waters of different character mingle, e.g. the Newfoundland Banks, the shallow seas round the British Isles, the Agulhas Banks south of Africa, the margin of the Pacific Ocean. In all these cases ocean currents bringing a constant and abundant supply of organic food are important. Man visits the arctic and antarctic seas to hunt the great marine mammals, rich in oil warm skins, or precious bone, e.g. seal, whale, walrus.

108. Dispersion of Animals. Most animals are mobile and are found spread over great areas. For those confined to salt water, land and rivers form barriers to movement, and differences of temperature, salinity[2], and pressure of the ocean waters control their distribution. Most fresh water or salt and fresh water forms find the land a barrier that cannot be crossed.

Among land animals those which fly have the greatest range, but wide seas or deserts or lofty mountain systems are barriers. For other land animals these are even greater obstacles. Differences in climatic conditions and in the character of the vegetation are very important factors in the distribution of animals. The most satisfactory way of studying the geography of animals is to consider it with that of plants. Each plant region has an animal life fitted to it.

109. Animals of the Polar Regions. There is little life in the great ice- and snow-covered areas. Elsewhere the chief

[1] Sea-shore. [2] Saltness.

sources of food supply are the fish and other marine animals, lichens, shoots of mosses, and dwarf shrubs of the tundra. Most of the animals are either white all the year or change to a white covering in the winter. The polar bear, the arctic fox and hare, the lemming, the musk ox, are typical of the polar regions, and towards the south of this zone many fur-bearing animals are found. In Eurasia the reindeer has been tamed, but in North America the caribou has not. Most of the birds are migratory[1], coming north to breed in summer. At that season eider and other ducks, snow geese, divers, ptarmigan, auks, guillemots, and many other birds can be found. The insect life there is very vigorous, and mosquitoes abound.

110. **Northern Temperate Forests and Grasslands.** Great areas of the primaeval forest are but thinly inhabited, mainly by birds and insects. On the northern margins fur-bearing animals abound, and on the southern edge species common to forest and grasslands. On the grasslands the animals are mainly herbivorous[2]. Many animals are common to America and Eurasia, but a number are found only in one of these two continents. Among the forms common to both are the elk or moose, glutton, wolf, fox, cat, lynx, marmot, beaver, ermine, of the forest; the bison (now almost extinct), lemming, field-mouse, of the grasslands; and the wild sheep of the mountains. Insectivora[3], bats, song birds, hawks, reptiles, and other forms unknown in Polar lands appear.

The skunk, the prairie dog, pouched rats (gophers), jumping mouse, are peculiar to America, as are the Rocky Mountain goat, the grizzly bear, the Californian condor, found in the west. In the south of North America the racoon, opossum, humming bird, and other Southern American forms appear. The European tamed animals have been introduced. The turkey is of American origin.

In Eurasia the badger, wild pig, civet, hedgehog, mole, hyena, unknown in America, are found. Horses, saiga

[1] Coming and going with the seasons.
[2] Grass-eating.
[3] Insect eaters.

antelopes, musk and roe deer, roam over the grasslands; and the camel on the poor steppes. On the mountains are found the goat, the chamois of the Alps, and the yak of Central Asian mountains.

111. Animals of the Desert and Scrub Lands. In much of the desert there is no food for larger animals, but round the margin and in the scrub lands they appear. In the Sahara and Arabia the gazelle and other antelopes, a few lions, panthers, and jackals, the striped hyena, desert fox, and jumping mouse exist, as well as ostriches, many lizards and scorpions, some snakes, beetles, and locusts. The camel is found wild on the borders of the Asiatic desert. Most of the desert animals have tawny[1] coats (cf. the white coats of polar animals).

112. Animals of the Hot Forest and Grasslands. The equatorial forests, so rich in plant life, support great numbers of birds and insects, which can move in the dense vegetation, many snakes, mammals[2] such as monkeys which live in trees, but few of the larger mammals, whose movements would be hindered by the dense undergrowth. The crocodile, hippopotamus, and rhinoceros live in the great rivers of the forest park zone.

As the forest grows opener and the undergrowth less dense, the large mammals increase in number. In Africa man-like apes, e.g. gorillas, are found. The lion, leopard, and other carnivorous[3] animals prey on the plant-eating beasts. Elephants, giraffes, antelopes, zebras, and buffaloes wander over the grasslands and in the forest glades. The termites (so-called white ants) destroy all dead trees, and mosquitoes and tsetse flies carry germs producing fever and other diseases. In the scrub lands, and even in the desert, baboons live in the rocky fastnesses; antelopes may still be seen. Here panthers, hyenas, wolves, and foxes, and even in some parts the lion, exist. Ostriches are found.

113. In America there are both carnivorous and herbivorous

[1] Khaki coloured, brown and yellow.
[2] Animals that suckle their young.
[3] Meat-eating.

animals in the lands between the dense forest and desert, but the species are different. The jaguar or ounce and puma replace the leopard and lion. The tapir and peccary, the armadillo and sloth, and the opossum are among the common mammals. Numberless birds (among them parrots, toucans, humming birds), snakes, bats and vampires, and insects, are found in the forest and campos. In the grasslands the rhea or American ostrich wanders. The condor is found in the Andes and even at sea-level in the south. Dragon-flies replace the locusts of Africa, and the viscacha burrows in the pampas. The alpaca and llama are the tamed kinds of the camel-like guanaco and vicuña of the Andes.

114. The hot forests and grassland of Asia and the Malay archipelago are not so continuous as those of Africa and America. India is not very rich in species—the Indian elephant, tiger, hyena, buffalo, the peacock, the pheasant, crocodile, and great pythons are among the commonest. On the other hand, the Malay region has many species. On the whole they are more nearly related to African than to South American types, though the tapir is found. Man-like apes, e.g. the orang-utan, with lemurs, sun-bears, elephants, tigers, rhinoceroses are common, and there are many brightly-coloured birds.

115. Animals of the South Temperate Regions. The south temperate regions are cut off from each other by wide seas, so that there is little in common between the three divisions. The chief African and South American animals are those of the savanas. They were formerly abundant, but are being replaced by sheep, cattle, and horses where the climate is suitable. The ostrich has been tamed and is reared for its feathers, but not the South American rhea.

116. Australian Animals are very strange. With the exception of some rats and mice and of the native dog, or dingo, probably taken there, there are no mammals save of a very early type. Some are pouched, e.g. kangaroos, pouched cats (such as the Tasmanian tiger or hyena), bandicoots, flying

opossums, wombats. The duckmole and the Australian hedgehog are somewhat like birds and reptiles as well as mammals. Many Australian birds are related to Old World kinds; such are the warblers, thrushes, crows, pigeons (which are very abundant): others are found nowhere else, such as the lyre bird, the emu or Australian ostrich, the bush turkey, and

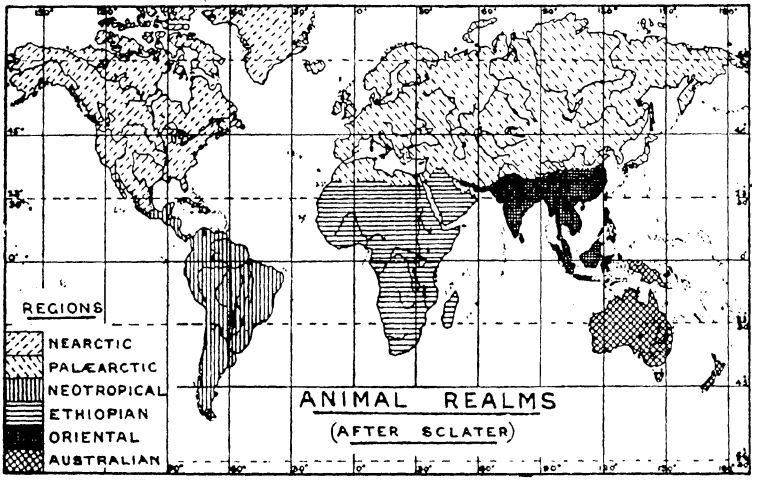


FIG. 48. Animal Realms.

many forms of parrot, and in New Zealand the wingless apteryx.

[117. **Insular**[1] **Floras**[2] **and Faunas.**[3] Islands lying near a continent have plants and animals like those of the continent, though the number of species is generally smaller. Islands lying far from continents have usually a very poor fauna. Animals which can fly, such as birds and insects, and also reptiles which can swim, are commonest. Mammals are commonly absent except when taken there by man. The geographical conditions do not vary much in most islands, and the plants and animals are not so varied as in the larger islands which we know as the Old and New World and Australia. Yet peculiar species exist in many islands. In the cases of New Zealand, Madagascar, and Australia it seems as if at

[1] Island. [2] Plants. [3] Animals.

an earlier geological age they were part of a more extensive land mass, for the animals are similar to fossil forms found in the adjacent continents. It is concluded that these islands were cut off from the rest of the lands before many modern forms had developed under the very varied conditions of these larger land areas, and that the more primitive forms have survived in these islands, while in the Old and New World more vigorous creatures have been evolved which have ousted the simpler older ones.]

118. **Animal 'Realms'.** It will be seen that while the general character of animal life is similar in similar plant regions the animals are not of the same species. The world may be divided into animal realms or provinces in which certain animals are found and nowhere else.

[119. The chief realms or provinces are shown in Fig. 48. Notice the continuity of the Palaearctic Realm in the northern hemisphere, pointing to the possibility of animals passing from one part to another in recent times. The figure suggests that barriers exist between it and the other realms—the great mountain system which crosses Asia separating it from the Indian or Oriental Realm, the Sahara Desert from the African or Ethiopian Realm, while the islands of the West Indies and the narrow lands of Central America seem to have been longer in close contact with the South American and Neotropical Realm than with that to the north. Australia has a remarkable fauna of its own, which points to long separation from Asia. It is difficult to draw a line between Oriental and Australian Realms, through the Malay Archipelago.]

CHAPTER VI

MAN

120. **Distribution of Man.** Look at Fig. 49, which shows where men are most numerous and where they are fewest. Three large areas stand out as much the most densely inhabited. Notice the bounding latitudes in Western Europe, Eastern Asia, and in India. The areas next in importance are Eastern North America, the rest of Europe south of 60° N., the western and central Sudan and Guinea Coast, parts of the

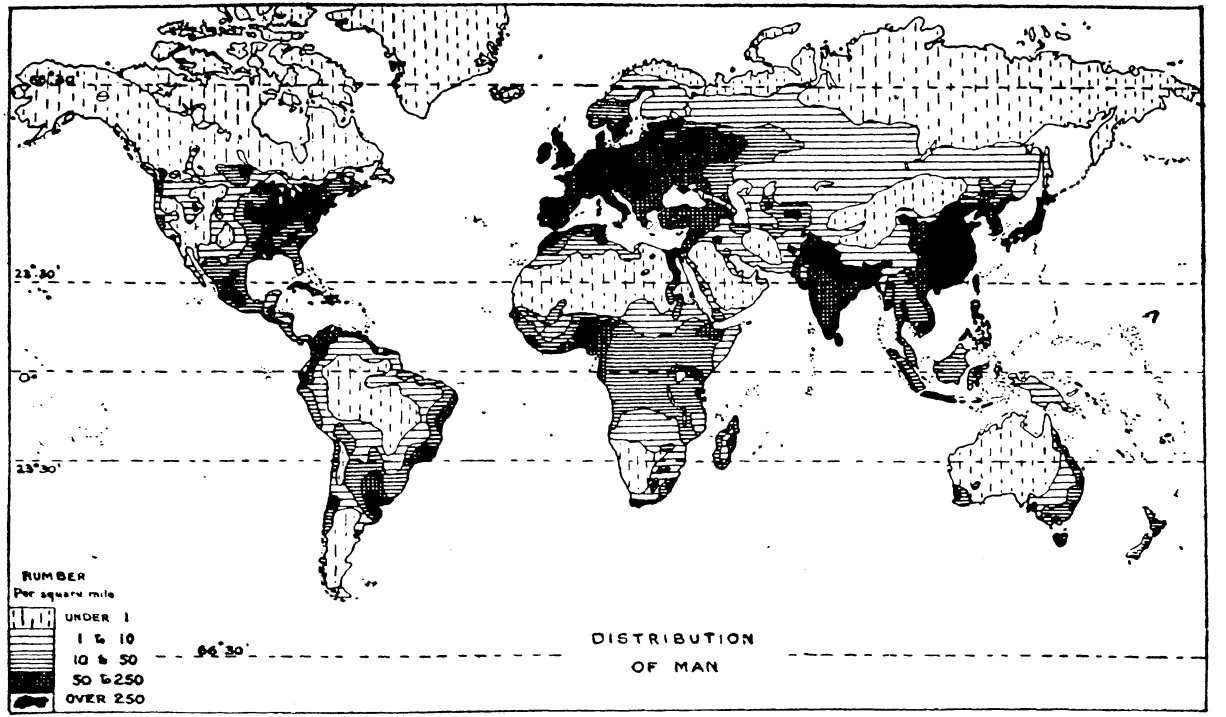


FIG. 49. Distribution of Density of Population. Cf. Figs. 34 and 46.

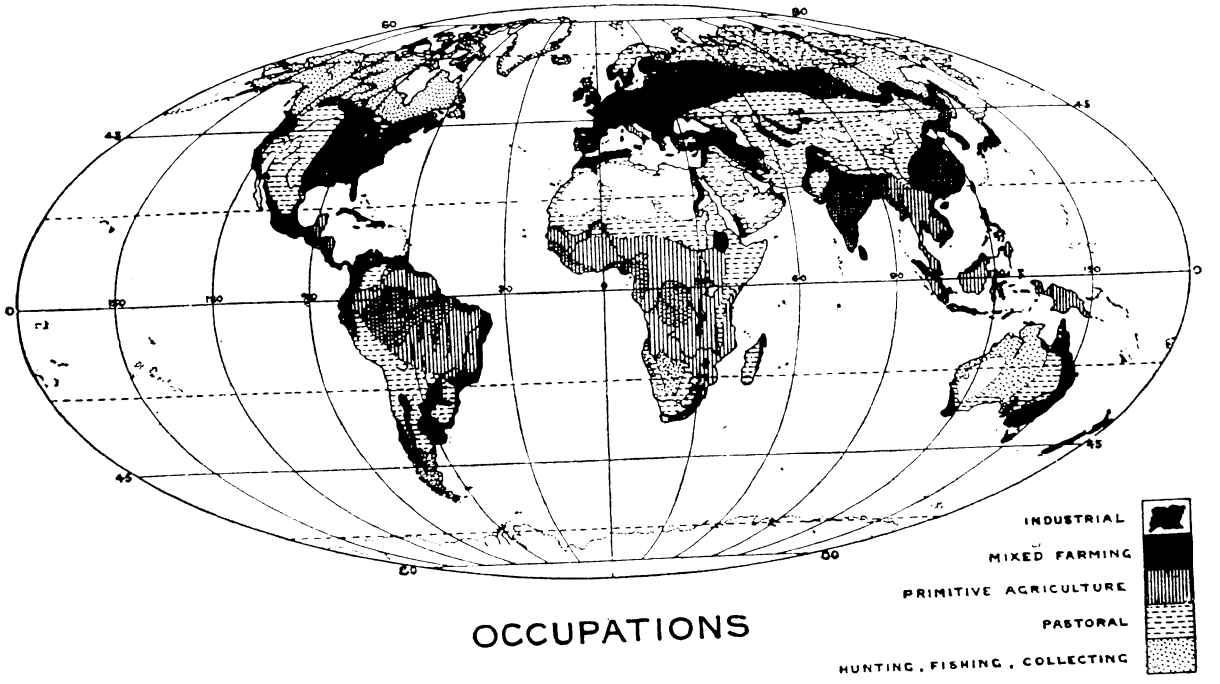


FIG. 50. Distribution of Occupations. For explanation see text and cf. Figs. 49, 46, and 34.

peninsula and islands of south-east Asia and a number of smaller areas. The least densely peopled parts are the tundra, deserts, and lofty mountain plateaus, except such of the latter as lie under 10,000 feet or so within 30° of the equator.

Compare these divisions with those of the vegetation, rainfall, temperature, and mountains. This comparison will suggest that certain climatic and vegetation conditions are necessary for a dense population, and that very extreme conditions of too much drought or moisture, too much heat or cold, too rugged a country, are all unfavourable. A country must be fertile enough to feed its people or so situated that food can easily be obtained elsewhere. This leads to the study of occupations.

121. The Distribution of Occupations can be studied in Fig. 50. Note carefully the limits of each. Compare with the vegetation and density of population maps. The most sparsely peopled lands (less than one person per square mile) are those where there is practically no vegetation, where some fishing and hunting peoples just manage to exist. Next come the pastoral lands supporting flocks and herds. The inhabitants move about and require a great stretch of land to yield enough food for a family. The dense forests, inhabited by hunting peoples whose women folk cultivate a little patch of ground, are also thinly peopled. In the agricultural lands, the density of population increases, the people are settled, every thousand acres yields far more food when sown with cereals[1] or planted with other crops than when used merely for pasture, so that from 50 to 250 people live on each square mile. The Chinese and Indian areas are very fertile. On account of rich soil and favourable climate, in many parts more than one crop can be raised in a year, so that there is more food to be had. In the richer parts 500 to 1,000 people can live on a square mile.

122. The Distribution of Manufacturing Peoples. Though towns and cities with manufactures and trade have grown up

[1] Grain.

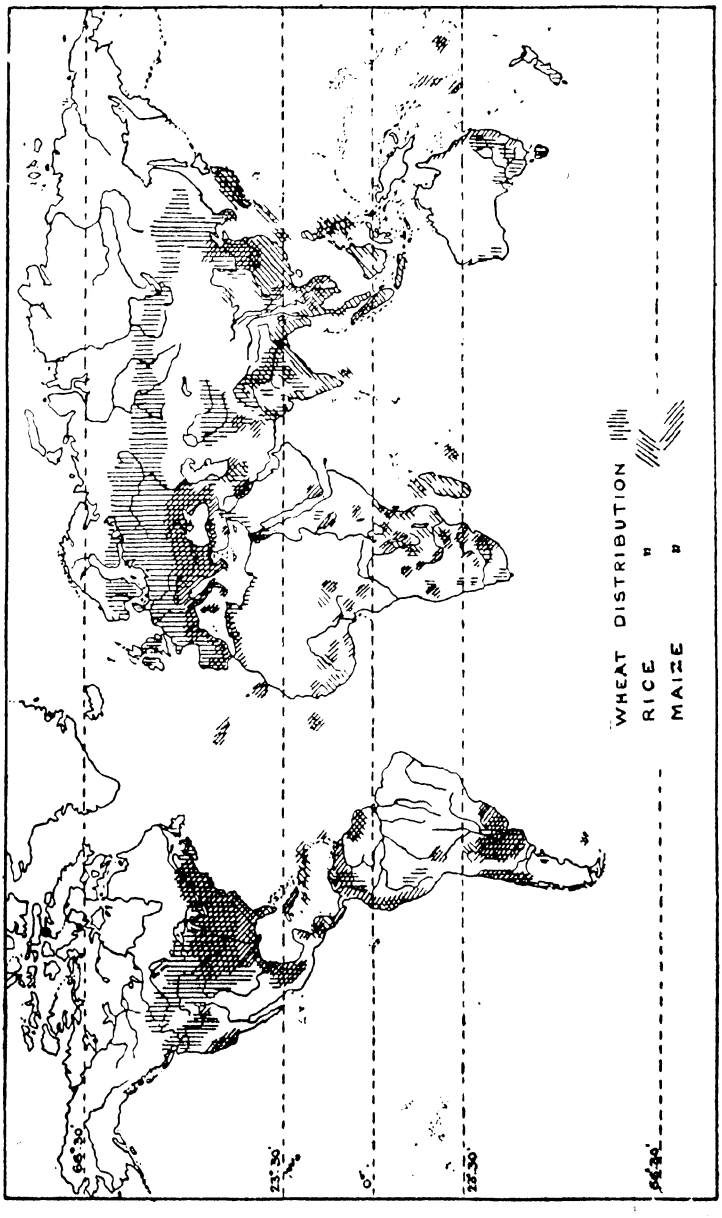


FIG. 51. Distribution of Important Cereal Foods—Wheat, Maize, and Rice.

in all rich agricultural lands, the most important of these are found in countries where modern industrial methods are adopted. For this modern industry machinery is required. The coalfields tend to become industrial centres. This explains the great density of population in parts of Europe, over 500 per 1,000 acres (see Fig. 49). Round the North American coalfields the population is rapidly growing. These manufacturing and mining peoples do not produce their own food, but it is carried by rail or by water in return for their manufactures. They also import much raw material for the manufactures. Many people are occupied in transporting goods.

123. Distribution of Cereals. The regions producing cereals in large quantities are shown on Fig. 51. Wheat is the most important of these. It is a plant of the temperate belt, but it is grown in winter in some parts of the hot belt where the winters are cool enough, e. g. in India. In India the farmers live mainly on millets, in Russia on rye, so that most of the wheat can be exported. This was not possible until means of transport became good and cheap.

We shall now study the distribution of some minerals and raw materials and the routes by which they and the chief food and manufactured articles are carried from place to place.

124. Distribution of Coal, Iron, and Precious Metals. Fig. 52 shows the distribution of coal and iron. Notice that where coal is worked in Europe and North America the population is very dense. This is because it is the source of the power which turns the machinery in the factories or of the heat which reduces the ores to the metals and permits the making of the machinery and the engines which drive it. Iron for machinery is of great importance. Study the distribution of iron ore.

Gold, silver, copper, and nickel are important because they are used as money and in the arts. Platinum and other precious metals which are costly to purchase, are more and more used in industry. Gold and silver mining especially lead

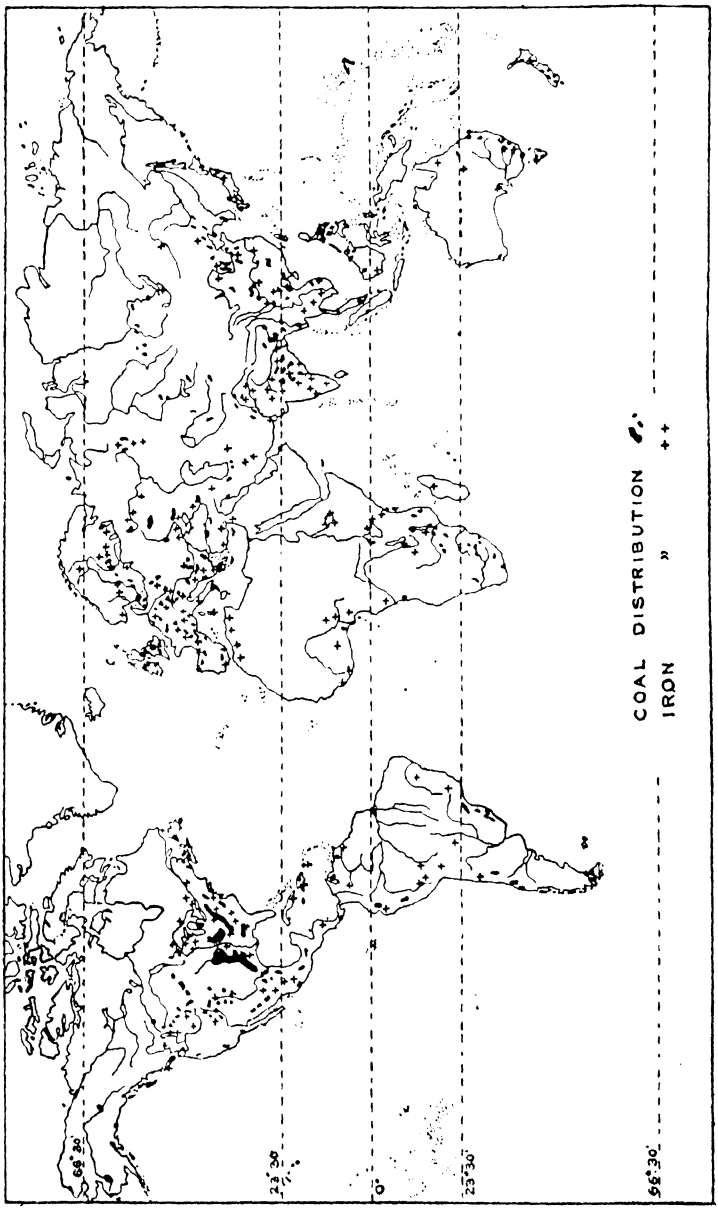


FIG. 52. Distribution of Coal and Iron.

to local density of population, e. g. in parts of California, East Australia, the Transvaal, and even in the dry desert of West Australia and the intensely cold regions of the Yukon basin, because these metals are very valuable in proportion to their bulk.

125. Distribution of Raw Materials. The raw materials chiefly used in the textile manufactures are silk, cotton, wool, and flax (for linen); while for coarse fabrics jute and hemp are employed. The distribution of these is shown on Fig. 53. Wool, flax, and hemp are chiefly found in the cool or warm belts, silk in the warm belt, and cotton and jute in the hot belt where summer rains prevail.

Indiarubber, a product of the wet lands of the hot belt, is more and more used in industry. Oils for lubricating[1], soap making, &c., come from many sources, e. g. oil palm of Africa, the coco-nut (copra), and other trees of the hot belt, and from lint (linseed) from hot and warm belts, the fibre of the warm belt lints (flax) being used for linen.

126. Distribution of Means of Transport. Railways, canals, and roads are found in the countries which have the great manufacturing industries. Railways are being introduced into all parts of the world and bring the raw material and foods to the port from which they are carried to other lands.

127. Chief Railway Routes. Accounts will be found elsewhere of important railways in different parts of the world. Only one or two of the more important through routes can be mentioned here.

In the Old World Paris, Berlin, Vienna, and Moscow are the most important continental railway centres with lines running to all the great ports. The Atlantic is joined to the Pacific Ocean by the Great Siberian Railway. Another line runs south-westwards to Turan, and some day will join the Indian system. The Indian Ocean will also be reached by a continuation of the Orient Express through Asia Minor to the Persian Gulf.

[1] Oiling machinery.

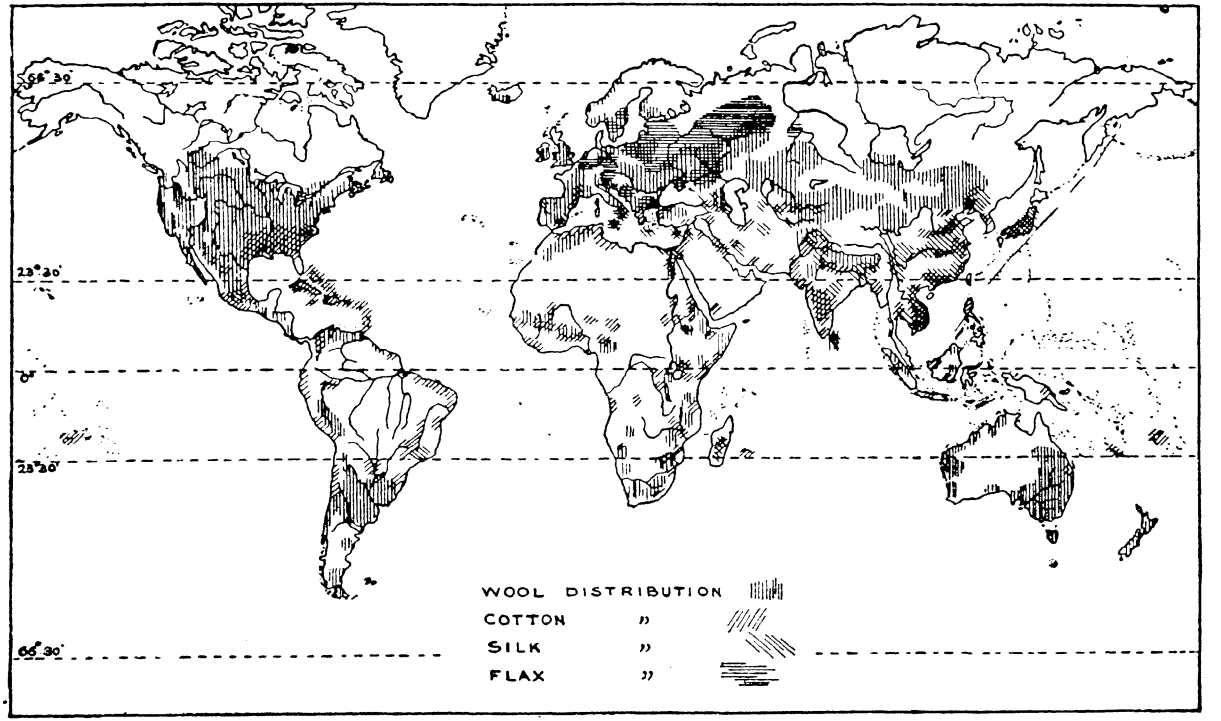


FIG. 53. Distribution of Important Textile Fibres—Cotton and Flax, Silk and Wool.

In Africa various uncompleted links of a transcontinental[1] system have been made: (1) the south to north or Cape to Cairo route using the Great Lakes, (2) an east to west route from Mombasa by the Victoria Nyanza and the Congo river and railways.

In North America there are many east to west transcontinental lines, two in Canada, six in the United States, and two in Mexico. The number of north and south lines is growing, and soon Hudson Bay will be joined to the Gulf of Mexico. In South America the line from Buenos Aires to Valparaiso is not yet completed. A network of lines extends from the Plate estuary. Many smaller railways run inland from the coast and parallel to it all round the continent. It has been proposed to join up the north-south lines in the west to form a great north and south through route.

128. Chief Ocean Routes. The chief routes connect the populous countries with a seaboard. The most important meeting-place of routes is the narrow seas round Britain. Steamers travel between continental and British ports of these seas and all ports of the world. The North Atlantic routes to ports between the St. Lawrence and Chesapeake Bay are the most important. From these American ports trade is growing with the Mediterranean, South America, and the West Indies. The Atlantic and West Mediterranean ports of Europe also trade with North and South American ports. Now that the Panama Canal is cut the Eastern United States trade with Western America and Eastern Asia will grow, and also that between Europe and Western America. South and West African trade is mainly with Britain, France, and Germany.

The cutting of the Suez Canal opened a route to India, East Africa, Australasia, and Eastern Asia from ports of Western and Southern Europe. Some Australian and New Zealand trade is carried on via the Cape of Good Hope. Sailing vessels still go out by that route and return by Cape Horn, using the stormy west winds. The way in which

[1] Across the continent.

the wind system affects the course of sailing ships should be studied in a good atlas.

The Pacific routes are mainly along the coasts, but steamers connect the Western North American ports from Vancouver to San Francisco with Japan, China, the Philippines, New Zealand, and Australia. Japan has now several important steamship lines.

129. Distribution of Telegraphs, &c. Modern business requires quick means of transporting not merely goods and people but also ideas. The telegraph and telephone are constantly used. Cables have been laid on the floor of the ocean and telegraph wires carried across desert areas. These link together the more thickly peopled parts of the world and join them to the regions where they obtain raw materials and food. Study the distribution of telegraphs bearing this in mind. The telegraph is also used by governments and is one of the most important links binding the different parts of the British Empire together. In recent years wireless telegraph stations have been erected on land, lighthouses, and on great liners and warships.[1]

130. Distribution of States. While the commerce of the world depends on the distribution of products and of people who make use of them, it is helped or hindered by political divisions. The division of the world into states is necessitated by the need to secure law and order. With the exception of the Chinese, Japanese, and Ottoman Empires the great states of the world are European or those of the descendants of Europeans. The whole of America and Australasia, practically all Africa, Northern and South-Eastern Asia, and most of Southern Asia are governed by men of European stock. In Africa Abyssinia, in Asia Persia, Afghanistan, and Siam are more or less independent, in addition to Turkish, Chinese, and Japanese possessions.

131. Distribution of Races, Languages, and Religions. Mankind may be classified according to his physical structure

[1] Refer to the *Titanic* disaster.

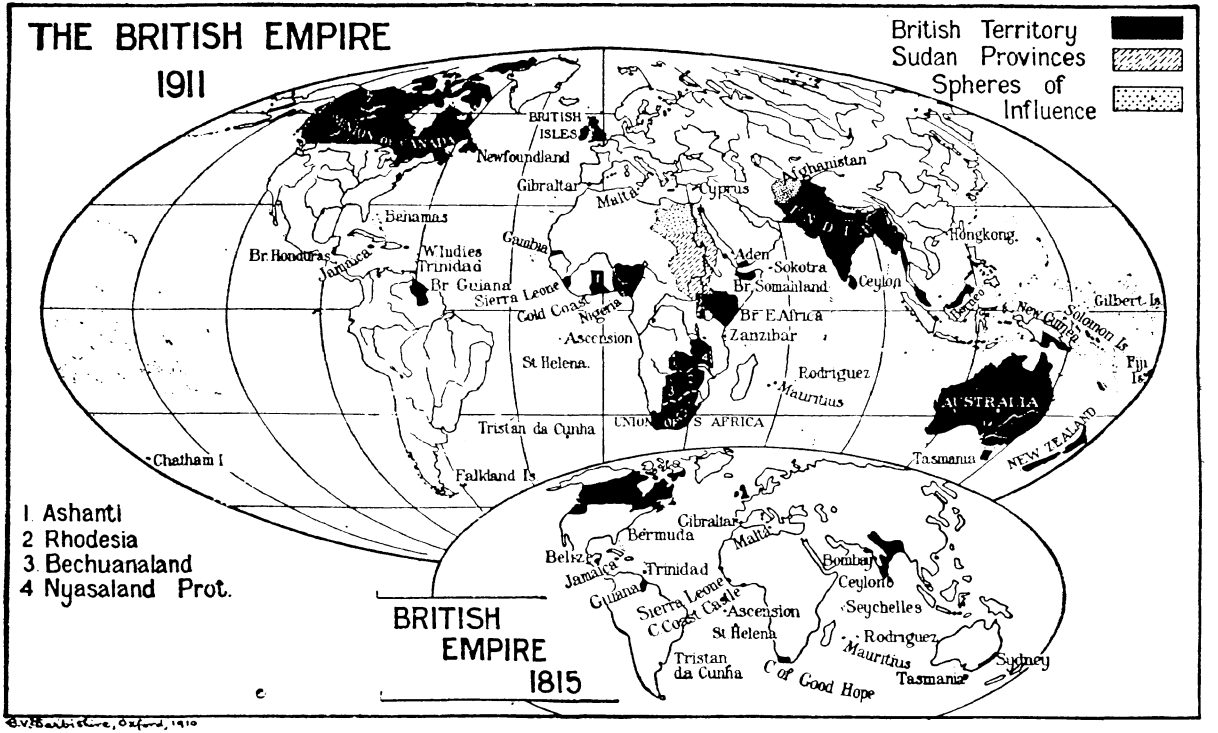


FIG. 54. The British Empire.

(race) or according to his customs, language, and religion (culture). The latter is the more important for the geographer. A common language forms a most important bond between peoples. It permits easy intercourse and gives to all who speak it a common literature. Religion also unites peoples, even of different languages. Common language, religion, and economic interests form the most important ties binding men together.

With the spread of European trade European languages and religions have become important in most countries controlled by Europeans.

It is important to remember the land which forms the home of these peoples. A country is not made up of people alone, but of hills and valleys and plains, rivers, lakes and seas, plants and animals all bathed by the atmosphere.

CHAPTER VII

THE NATURAL REGIONS OF THE WORLD

132. We have now studied the way in which mountains and plains, hot lands and cold lands, wet lands and dry lands, forests, grasslands, and deserts, man and some of his works are spread over the surface of the Earth. In comparing different maps, for instance those of rainfall and vegetation, we have found many similarities. These suggest that the World may be divided into different natural divisions or regions, each of which has its own kind of land, climate, vegetation, and animal life. The chief natural regions are shown on Fig. 55, and they may be arranged in the following types:

(1) Polar types: which may be divided into lowlands (1*c*) and highlands (1*a*, *b*, and *d*), and the ice-covered regions (1*e*).

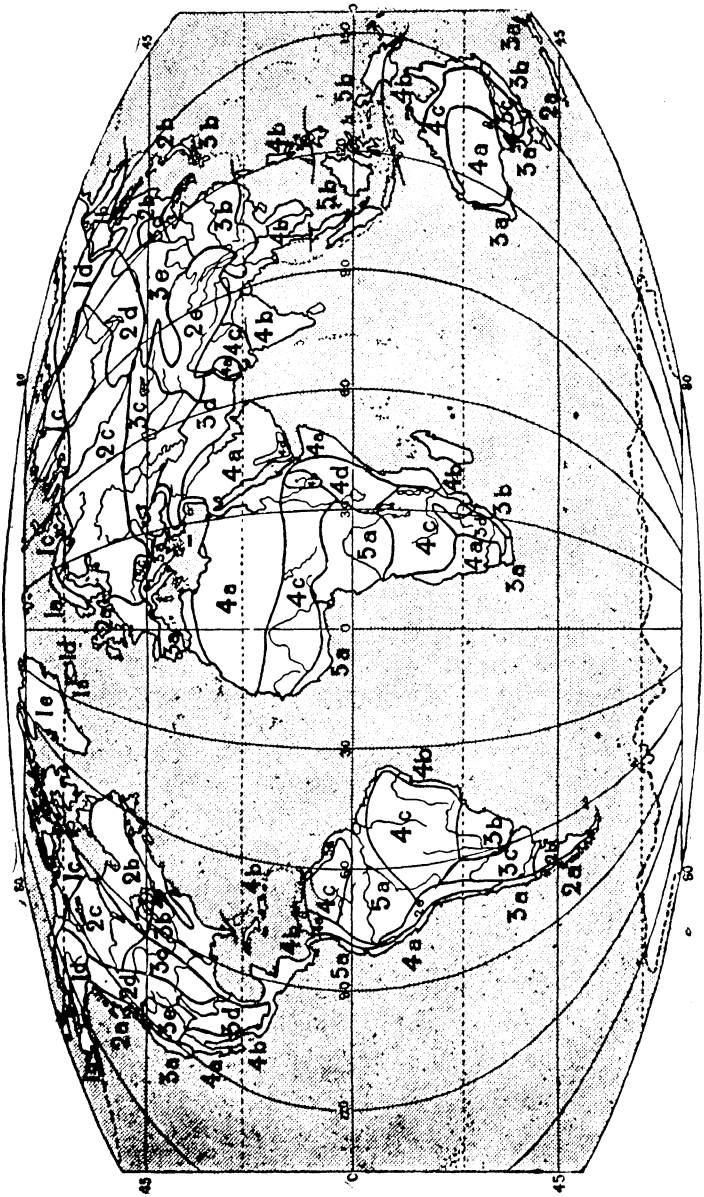


FIG. 55. Natural Regions of the World (as described in the text).

(2) Cool Temperate types—
- (*a*) western margin, or West European type;
- (*b*) eastern margin type;
- (*c*) interior lowlands, or Siberian type;
- (*d*) interior highlands, or Altai type;
- (*e*) lofty plateaus, or Tibet type.

(3) Warm Temperate types—
- (*a*) western margin, or Mediterranean type;
- (*b*) eastern margin, or China type;
- (*c*) interior lowlands, or Turan type;
- (*d*) plateau, or Iran type;
- (*e*) plateau with cold winters, or Mongolian type.

(4) and (5) Types of Tropical Hot Lands—
- 4 (*a*) western desert, or Sahara type;
- 4 (*b*) Monsoon summer rain type of eastern or southern margin;
- 4 (*c*) summer rain type of interior, or Sudan type;
- 4 (*d*) moderate plateau type of East Africa;
- 4 (*e*) lofty plateau type of Ecuador;
- 5 (*a*) wet equatorial lowland, or Amazon type;
- 5 (*b*) wet equatorial mountainous islands, or Malay type.

133. Polar Lowlands or Tundra Type. The polar lowlands, or *tundra*, are found in Europe, Asia, and North America. They show the effect of continued cold. The year consists of two seasons—a long severe winter, with little or no daylight, and a short summer, during which the daylight is almost continuous. For two-thirds of the year the tundra is buried in snow. In summer the snow melts and the surface soil thaws for a few inches, affording food for plants whose roots do not go deep. Below this marshy, wet layer the ground is always frozen. Few plants can endure these hard conditions. The vegetation of the tundra consists chiefly of moss and lichens, mixed with low, berry-bearing bushes. In sheltered spots along the watercourses may be found dwarf

trees, a foot or two high. In the extreme north even this poor vegetation disappears. To the south the tundra passes into woodland, in which the trees become larger, more numerous, and of more varied species.

The tundra is thus ill-fitted to sustain animal life, yet it produces one animal of great importance. This is the reindeer. It lives on reindeer moss, and is able to reach it in winter by digging away the snow with its hoof. In the Old World it has been tamed, and supplies many tribes with food, clothing, and a means of transport. In the tundra of the New World it is not tamed, but the caribou, an animal of the same family, is hunted.

134. Polar Highlands or Ice-cap Type. In the polar highlands elevation and high latitude produce a still more severe climate. Greenland is a good example. It is a lofty highland, with peaks from 5,000 to 11,000 feet high along the coast. Except for a narrow coastal strip the whole island is buried beneath a sheet of ice of unknown thickness. Only the western coastal strip is habitable. The surrounding seas are the home of seals, walruses, polar bears, whales, &c., which supply food, clothing, oil for lighting and heating, and bones and fibres for many useful purposes.

Antarctica, the lofty continent supposed to exist round the South Pole, appears to be an uninhabited Greenland, with an even thicker ice-cap.

As a rise in elevation means a fall in temperature, the conditions of the tundra and of the ice-cap are found on the higher slopes of lofty mountains. The mountains of the British Isles are not high enough to show the latter (like those of the Himalayas are), but on the highest the dwarfing and gradual disappearance of trees and the growth of mosses and lichens, can be seen on a small scale.

135. The Cool Temperate Lands. The cool temperate lands are almost all in the northern hemisphere, where they stretch across the Old and the New World as a continuous

they include the extreme south of South America, New Zealand, and Tasmania.

The temperate lands have cool summers, and cold or mild winters. The winter cold increases with distance from the equator, and still more with distance from the sea. The heaviest rainfall is brought by the westerly winds to the western slopes of the coastal mountains where these occur. The lowest rainfall is in the lee of the mountains, and in the interior of the continents. Wheat ripens everywhere within this area, except in the higher latitudes, and at high elevations.

Within the vast extent of the northern cool temperate lands many differences occur, depending mainly on elevation and on distance from the ocean.

136. **The Western Margin or West European Type.** Both in the Old and the New World there is a well marked difference between the eastern and western margins. British Columbia in North America and the western part of Scandinavia in Europe may be compared. Both are mountain lands lying in the track of the westerly winds. The mountain slopes of both stop the rainy winds and receive a heavy rainfall at all seasons, but especially in autumn and winter. In both, fishing and forest industries are more important than agriculture.

Somewhat similar conditions are seen in the British Isles, in Northern France, and over much of the German Empire. The summers become hotter and the winters colder towards the east, but the climate is nowhere very extreme.

The vegetation of Western Europe has been so changed by man that little remains in a virgin state. The whole region was once covered with forest. The hardiest forest tree is the birch, which is found higher and farther north than the conifers. Next come the conifers, the needle-like leaves of which can bear the severe winters of high latitudes or elevations. They compose the forests of Scandinavia and of the higher highlands of Central Europe. The lowland

forests of Central Europe consist of broad-leaved trees, which resist the winter cold by shedding their leaves. The highlands of Western and Central Europe are still forested.

137. Over the lowlands of Central Europe the forest has largely disappeared, and agriculture is the chief occupation, except on the coalfields where manufactures are carried on. Cereals are the chief crop. Root crops include the potato, introduced from the New World, and now a universal food, the sugar-beet, largely grown on the poorer soils of France and Germany for making sugar, and various roots for fodder. Of fibre plants, hemp and flax are important, especially in the east. Sheep are kept on hill pastures, supplying wool, and cattle on the richer grasslands, where dairy-farming is important. The manufactures are chiefly of iron and textiles.

138. In the southern hemisphere are the densely-wooded south-west of Chile, which may be compared with British Columbia; the Falkland Islands, which may be compared with the Hebrides; Tasmania, a sheep-shearing, fruit-growing land; and New Zealand, which is partly cattle-farming and partly agricultural.

139. **The Eastern Margin Type.** The chief difference between the eastern and western margins of the cool temperate lands is that in the former the winters are much colder, and the rainfall not so great. Eastern Canada in the New World may be compared with Amuria and Manchuria in the Old World. The rivers and harbours are ice-bound in winter, except on the southern margin. Eastern Canada is the most developed of these lands. Much of it is still covered with forest. In the cleared areas agriculture, dairy-farming and fruit-growing are carried on. The forest industries are very important. Lumber, or rough wood, is floated down the rivers, to be sawn at such lumber centres as Ottawa. Manufactures are growing. Many of them work up timber, either into wood-pulp and paper or into furniture. The coastal fisheries are important.

Amuria is in an earlier stage of development. Its forests are the home of tribes who live by hunting. Manchuria has fertile plains and valleys, in which agriculture is carried on by Chinese farmers.

In the southern hemisphere the southern part of Argentina belongs to this kind of region. It has a smaller rainfall, and is as yet little developed.

140. The Interior Lowlands, or Siberian Type. Both in the Old and New World the interior consists of a vast lowland crossed by great rivers. The climate is extreme, the winters being long and severe, and the summers hot. The rainfall diminishes rapidly, becoming very small towards the west in the New World, and to the east in the Old World. The rain falls chiefly in summer.

The zones of vegetation are well marked. Just south of the tundra is a poor woodland, passing into fine forests of conifers. These thin out in the south and pass into grasslands, in which trees are rare. These grasslands, or *steppes*, stretch across Eastern Europe, and across Asia to the highlands of Eastern Siberia. They have long been the homes of pastoral peoples owning tame animals, who follow their wandering herds hither and thither, and obtain from their produce all the necessaries of life. In North America the steppes are called prairies. At the time of the European discovery they were the home of countless herds of bison, which were hunted by Indian tribes. White settlement destroyed both hunter and game. Agriculture, which had been practised to some extent by the former inhabitants, has been pushed westward as far as the increasing dryness of the climate allows. Much of the west is too dry for cereals, and is better suited for cattle-raising.

The Siberian lands of the Old World are going through these stages of development. Wheat has replaced natural grasses over vast areas, but, as in the New World, its extension is checked by the dryness of the interior.

Lands of the Siberian type occur only in the centre of large

continents. There are, therefore, none in the southern hemisphere.

141. The Interior Highlands, or Altai Type. Both in the Old and New Worlds lofty mountain areas occur in the interior of the continents. In the Old World they consist of the Altai and other highlands of Siberia. In the New World they lie much nearer to the sea, and form part of a great mountain system which runs the whole length of America. The rainfall is heaviest on the northern slopes in Asia and on the western slopes in America, and these are forested. The leeward side is drier and barer. Above the forest line come grasslands, succeeded by vegetation of the tundra type, which ceases entirely at the snow-line. These highlands are rich in minerals, which are much worked in the New World, and to a slight extent in Siberia. They present great difficulties to communication, though railways have been carried across the mountain barriers in the New World. Agriculture is possible only in the valleys. Hunting is still the chief resource in the Siberian area, as it used to be in the American. The population is small.

142. The Warm Temperate Lands. The warm temperate lands of the northern hemisphere form a belt across the New World. A similar belt across the Old World is broken by a wedge of the highest land in the World. In South America they form a broad belt across the narrowing continent, and they are well marked in South Africa and Australia.

The warm temperate lands have warmer summers than the cool temperate lands, and warmer winters, except in regions of high elevation or in the interior of continents, where the climate is of the most extreme type, the summers being very hot, the winters very cold. The rainfall varies in amount and season. In the west the rains fall in winter, in the east in summer, while the interior is almost rainless

The warm temperate lands have a very wide range of products. Maize, millet, and rice tend to replace wheat,

except on the high ground. Cotton, the most important of fibre plants, does well in the hotter parts, and silk, the product of silkworms which are fed on mulberry-trees, is also a common product. The higher pastures supply wool and fine kinds of hair. The number of sweet and useful fruits is very great. Oil-producing plants, of which the olive is the most valuable, are also common in the region.

143. **The Western Margin, or Mediterranean Type.** The Mediterranean lands have warm summers, mild winters, and winter rains, that is, rains in the winter half-year. The chestnut and the walnut are common trees of the higher, wetter parts, and evergreen oaks, of various kinds, of the drier parts. A thorny evergreen scrub is common in the Mediterranean basin. For summer crops irrigation is generally necessary. Many of the common Mediterranean plants—the olive, fig, mulberry, orange, and apricot among fruits, rice, cotton, and the deep-rooted lucerne—are of Asiatic origin. The date was introduced from Africa, maize and tobacco from the New World. The olive was grown in Sicily many centuries before the birth of Christ. The vine is of equal or greater age. Grapes are made into wine except in the Mohammedan countries, where religious scruples forbid it. Traces of this feeling remain in Spain, where grapes are dried into raisins, and perhaps in Greece, where a smaller kind is dried into currants. The orange is a later comer, and was not cultivated in Italy till about a century before the Christian era. The fig is important in the Levant.

144. In North America a broad belt of mountains borders the west coast, and the Mediterranean type is found only in the Californian valley, which will produce whatever can be grown in the Mediterranean. Wine is becoming an important product. Irrigation is generally necessary.

The central part of the valley of Chile in South America, the western part of Cape Colony in South Africa, and the south-west of West Australia, the south of South Australia and Victoria, belong to the same type. In all, attention is

being paid to the cultivation of Mediterranean products, especially of the vine.

145. The Eastern Marginal Lands, or China Type. The eastern marginal lands of the warm temperature belt receive summer rains. The climate is extreme, the summers being hot and the winters very cold. In the north of China, in the latitude of Italy, the rivers are frozen in winter. In the forests walnut and other trees flourish, and there is an undergrowth of evergreens recalling the evergreen scrub of the Mediterranean region.

In the north, cereals and pulses are grown as an early crop, while the summer crops include sugar, indigo, rice, and cotton. Tea, on well-drained hill slopes, is important farther south. In the extreme south tropical plants, such as the banana, appear. The opium poppy and the mulberry for silkworms are widely grown.

Japan belongs to this type, though winter rains also occur in the south and west, which have a fairly uniform rainfall all the year round.

146. In North America, a similar region, of about the same extent, with hot summers, cool winters, and summer rains, extends from the Atlantic coast to the Mississippi; maize, tobacco, cotton, and rice are the chief products. In South Africa, Natal and the eastern part of Cape Colony, and Eastern New South Wales and Southern Queensland in Australia belong to this type. Rainfall in all becomes small towards the interior. The crops of China and the eastern United States will be grown in these regions as their development advances.

147. The Interior Lowlands, or Turan Type. This type is represented in Central Asia by a vast area stretching from the Black Sea far into the heart of the continent, in North America by a smaller area extending from about 100° W. to the western mountains, and in South America by much of Argentina. Through their position in the interior of the continent, all have a very extreme climate and a small rainfall.

In the New World these dry lowlands are chiefly used for cattle raising. In the Old World, where the dryness is more intense, they are little better than desert, except in the irrigated areas, where fruits and cereals of the Mediterranean type are grown. In Russian Central Asia much attention is being paid to the cultivation of cotton.

148. The Plateau, or Iran Type. A broad belt of plateaus stretches across temperate Asia from the Mediterranean to the frontiers of China, broken by still higher mountains. The rainfall is very scanty, and the climate is very extreme. The only fertile parts are the valleys leading into the mountains, and such districts as can be irrigated from the mountain streams. Even here vegetation is never rich, and travellers have remarked that plants grow quite separate, no one touching another. Wherever water can be brought cereals are grown, and such fruits as the apricot, peach, almond, &c.

149. The Cold Plateau, or Mongolian Type. Mongolia is an even drier region of a somewhat similar type, with cooler summers and much colder winters. It is desert or scrub land with a fringe of oases round the foot of the mountains which border it.

The Great Basin Region of North America west of the Rocky Mountains is somewhat similar.

The plateau of Mexico lies partly within the tropics, but its elevation gives it a temperate climate, except on the coasts, where the climate is moist and very hot, and the vegetation is tropical. On the plateau, at various elevations, rice, sugar, cotton, coffee, and cacao are grown under irrigation, with maize, wheat, tobacco, and fruits still higher. The unirrigated parts of the plateau are covered with dry, thorny plants, forming a poor pasturage, best suited for goats. Henequen, a fibre plant, and cacti of different varieties are common plants of the drier parts.

150. The Hot Lands. The fall of seasonal rains, which we have already seen in the Mediterranean lands (winter) and China (summer), becomes extremely well marked in the hot

lands. Rain falls only in the summer months, and the year is divided into a wet and a dry season. The rain belt follows the Sun north and south, crossing the equator twice, and near the equator, though rain falls at all seasons, the year has two wet and two dry seasons. In the trade wind area rainless regions occur, as these winds are moving from colder to warmer latitudes, and are therefore dry.

In the tropical lowlands the temperature is high at all seasons, but on the higher parts the climate may be extreme. The range of products is therefore large, as the products of each belt can be grown at a suitable elevation.

151. The West Tropical Deserts, or Sahara Type. A band of rainless desert, varying in size with that of the land mass, is found round the tropics on the western side of all the continents in both hemispheres. It is best marked in Northern Africa and Arabia, where the Old World is very broad. A smaller desert is found in the north-west corner of India. In the corresponding latitudes of North America the continent narrows, and the desert area is smaller. In the southern hemisphere are the Chile-Peru desert of South America, the Kalahari in South Africa, and the great western desert of Australia. All these lie in the track of the trade winds.

The Sahara, or North African desert, has a very varied surface. It rises to the south, and is crossed from north-west to south-east by a belt of higher tableland. Much of the surface consists of sand. Elsewhere there may be a thin covering of thorny scrub. The absence of vegetation allows the exposed surface to become intensely heated during the day, and rapidly cooled during the night. Hence the range of temperature between day and night and between summer and winter is very great.

Water is often stored in the lower layers of the soil, and can be reached by sinking wells. Irrigation then becomes possible, and an oasis, or fertile area, is formed. The oases are thickly planted with palms. Beneath their shade, cereals, pulses, and fruits are grown. The common animal of the

desert is the camel, which lives on the thorny scrub. In the better parts, sheep and goats are kept by wandering herdsmen. The oases are inhabited by a settled population, who carry on some manufactures. Trade is carried on by caravans of camels, which cross the desert by well-known routes from well to well and from oasis to oasis.

The Arabian desert is a continuation of the Sahara, from which it is separated only by the narrow Red Sea. The valleys are cultivated under irrigation, but the interior consists of salt or sand deserts, crossed with difficulty by camel caravans. The Indian desert is similar.

152. The North American desert consists of alkaline plains, with a scanty vegetation of cactus, yucca, and other thorny plants. Some varieties of yucca store water; others bear a fruit resembling the date in flavour. Wandering Indian tribes feed on the various desert plants and animals.

The desert of Chile and Peru resembles that of North America. Large deposits of nitrates are of great value.

The Kalahari desert is a stony, sandy desert. Large areas are covered with poor grass and thorny desert vegetation.

The Australian desert covers much of the interior. In the barer parts it is sandy or stony and without vegetation. Thousands of square miles are covered with spinifex, a prickly plant useless for pasture. The summer heat is very intense, and the range between day and night and between winter and summer is very great. Certain plants store water in their roots, a fact well known to the wandering native tribes.

153. **The Monsoon Type.** These lands have outflowing winds in winter, the dry season, and inflowing winds in summer, the wet season. These seasonal winds are called monsoons. *India is the typical monsoon land.* The north-east or dry monsoon blows from October to April, and the south-west or wet monsoon from the Indian Ocean from April to September. Violent storms occur at the change of monsoon. In some years the monsoon brings little rain, and famine results. Heavy rains fall on the seaward slopes of the

Western Ghāts. In the east the wet monsoon is drawn north over the Bay of Bengal and north-west along the Ganges valley, but brings little rain to the rest of the peninsula. In south-east India the north-east trades bring winter rains after crossing the Bay of Bengal. The wetter mountain slopes are densely forested. Rice is grown in the swamps round the river deltas. Wheat is grown under irrigation as a winter crop chiefly in the Punjāb. Millet is the cereal on the drier plains. Cotton, tea on well-drained hill slopes with a sufficient rainfall, tobacco, the opium poppy, indigo, sugar, jute, and many other industrial plants are cultivated. There is thus great likeness between the products of India and of Southern China, which is on the edge of the monsoon. In Ceylon the vegetation is tropical. The coco-nut palm grows by the sea. The dense forests produce cinnamon and other spices and the bamboo, a valuable grass (bamboo is really a giant grass!). On the highlands tea and coffee are grown.

154. The Indo-China peninsula has forested highlands and swampy lowlands, which grow rice. Teak, a valuable hard timber, grows in the forests of Burma. The bamboo supplies wood for furniture. Many Indian crops are being introduced into those parts of the peninsula which are under British and French control.

155. Central America and the Guiana lowlands are in the region of summer rains. The eastern coasts of Central America have rain all the year round, but especially in summer. The western have a well marked dry season in winter. The products vary with the elevation. The hot zone, up to 3,000 feet, produces rich forests, containing mahogany, logwood, palm, and bamboos. The many tropical fruits include the banana and the pineapple. Cacao, which requires a high temperature, abundant moisture, a rich, deep soil, and shade from the scorching rays of the Sun, is cultivated under the shade of bananas. Sugar is an important cultivated crop in the hot lowlands, both of Central America and of the Guianas. Coffee, which requires somewhat similar conditions, can be cultivated

to higher elevations, and is also found in the lower part of the next zone. In the warm temperate zone, from 3,000–6,500 feet, are grown the fruits and cereals of the temperate lands at suitable elevations. Maize is the chief cereal. Still higher and cooler is the cool zone, suitable for the fruits and cereals of northern lands. The products of the West Indies are similar, but vary somewhat from island to island.

156. The Sudan Type. In Africa most of the inter-tropical region consists of lofty plateaus, rising above the tree-line only in the higher mountain areas, but too high for the growth of the dense forests which cover the lowlands. There is a very heavy summer rainfall. The temperature varies with the elevation. In the low plateaus there is little difference between winter and summer, but on the higher plateaus the winters are cold. The vegetation is of the *savana* type, well seen in the Southern Sudan. This is a grass land, with clumps of trees, which give a park-like appearance. The gigantic baobab is very common. Except where the tsetse fly is found, the savanas are suitable for cattle keeping, and are the home of pastoral tribes. Wheat and millet are grown at varying elevations. The cultivation of coffee and cotton is increasing.

In South America savanas are found in Northern Colombia, Western Ecuador, the Orinoco basin, and the highlands of Guiana. On the lowlands of Colombia and Ecuador rice, bananas and tropical fruits, cacao and sugar are grown. Coffee, cereals, and fruits are grown in the temperate zone. In the savanas east of the Andes cattle-rearing is important, as well as in the *llanos* of the Orinoco and in the savanas of the western lowlands.

Much of Brazil outside the Amazon basin is a savana land. The *campos* and *pampas* of the Plate basin are great cattle-rearing regions. On the highlands coffee, sugar, and cotton are grown. The coastal lowlands are densely forested.

The northern part of Australia is a savana region. In the lower lands the banana, pineapple and other fruits, sugar, coffee, cotton, &c., are grown.

157. **The East African Plateau Type** is cooler and drier than the Sudan Type, and in the higher parts temperate crops can be raised.

158. **Equatorial Lofty Plateau Type.** On the plateau of Quito, at a height of 9,000 feet, cereals are grown for local use, but this is near the upper limit of cultivation.

159. **The Equatorial Lowlands, or Amazon Type.** The equatorial lowlands occupy vast areas in the Amazon basin of South America, and on the Guinea coast and in the Congo basin of Africa. The temperature is high at all seasons, and rain falls throughout the year, with two wetter seasons at the equinoxes. These lowlands are covered with dense forests, remarkable for the numerous species of trees, and for the eager struggle for light and air which goes on. Tree grows upon tree, their roots and foliage mixing. Creeping plants climb foot by foot up the trunks of forest giants to flower amidst their topmost branches. Below, in the warm hot mud, fungi and other humbler plants breed in darkness. The dense roof of branches shuts out the Sun above, while below, the undergrowth itself attains the size of a forest. The whole is cut up by creeks and waterways, feeders of the great rivers which in the rainy seasons form inland seas. Of the resources of these tropical forests little is yet known. The trees of trade value are rubber in the Amazon and West Africa, gutta-percha in the East Indies, the oil palm of the Guinea coast, and cabinet woods such as ebony, mahogany, and satinwood. The native tribes live by hunting and fishing, and practise rough agriculture.

160. **Equatorial Island and Mountain Types.** Tropical forests of a similar kind cover the Malay peninsula and the islands of the Malay archipelago. Their inhabitants are extremely backward. In the Dutch islands agriculture has been developed, especially in Java, where coffee, sugar, and other tropical products are cultivated. Spices are obtained in great quantities from the forests. The sago palm is the chief food-plant of the native tribes.

161. High Plateaus, or Tibetan Type. The northern part of the plateau of Tibet is an uninhabited region of lofty mountains rising above the snow-line and enclosing barren valleys. The population is gathered in the valleys of Southern Tibet, the highest inhabited region in the world. The winters are long and very severe; the summers are hot. Much of the country consists of glaciers and snow-fields. The remainder supplies poor grazing for yaks. In the sheltered valleys, barley and pulses are grown under irrigation. The summers are hot enough to ripen the peach and apricot, which, with the mulberry, are found high up in many of the mountain valleys of Central Asia.

The west coast of South America, from the equator to south of the tropic of Capricorn, is bordered by the Andes, which rise in the plateaus of Peru and Bolivia to a height of 10,000 or 12,000 feet, with peaks in the surrounding ranges of 20,000 feet. Though lying close to the equator these lofty regions are tropical only on the lower slopes. The valleys are fertile, but irrigation is necessary. Sugar and wheat grow side by side. Cotton, maize, melons, wheat, barley, and potatoes are grown according to the elevation. On the *puna*, or highest part of the plateau, the climate is very extreme, the nights being cold at all seasons. Large herds of cattle, llamas, vicuñas, and sheep are kept. In the forests of the eastern slopes of the Andes, which do not belong to the plateau proper, the cinchona tree grows, supplying quinine.

162. Summary. Hard and fast lines cannot be drawn between these regions. We compare Ecuador with the Sudan, but the comparison is only broadly true for the savana regions. The highest parts are to be compared with Bolivia or Tibet, and the forests of the lowlands, or of the eastern slopes of the Andes, with those of the Amazon. Even in equatorial lands the conditions of the tundra and of the polar ice deserts may be found, *if the land is high enough.*

At the present time, with cheap and easy transport, the peopling of the Earth is proceeding rapidly. The science of

tropical medicine is changing the belief that certain regions are necessarily graves. By the close of this century many tropical and equatorial lands which are at present too thinly peopled for the development of their immense resources, will have been settled. A scientific study of the natural regions of the World would greatly simplify the task, and would save many failures. Unconsciously we already think of the World in regions, and try to apply to one part the experience gained in another. The extension of cotton-growing in the Niger basin, or of tea in Natal, are examples of this process.

INDIA AND CEYLON

CHAPTER VIII

A GENERAL SURVEY OF INDIA

163. ALTHOUGH Man has divided India into a very large number of changeable political divisions (some of which have been changed, in our own time, e.g. Bengal) Nature has only divided India into four great and well marked regions or natural divisions. These are:—

1. The Himālayan Region.
2. The Indo-Gangetic Plain.
3. The Southern Tableland.
4. Burma.

1. *The Himālayan Region.*

164. This great natural division of India is like a huge wall that cuts India off from the rest of Asia. Not only does it protect India—it also causes the rainfall and snow that provide the waters for the Indus and the Ganges. North of the Himālayas is a vast desert. South of the Himālayas is one of the most thickly populated regions of the World. Wind and mountains are the causes. The south-east monsoon, laden with moisture after its journey across the Bay of Bengal, comes in contact with the hundreds of miles of ice and snow and cold stone of the Himālayan Wall. The air contracts and the moisture condenses and falls as rain—squeezed out of the wind, like water squeezed out of a sponge, by the grip of the cold.

If one could look down upon this region from a balloon one would see that, save in the north-west, the mountain ranges form a barrier that is unbroken and insurmountable

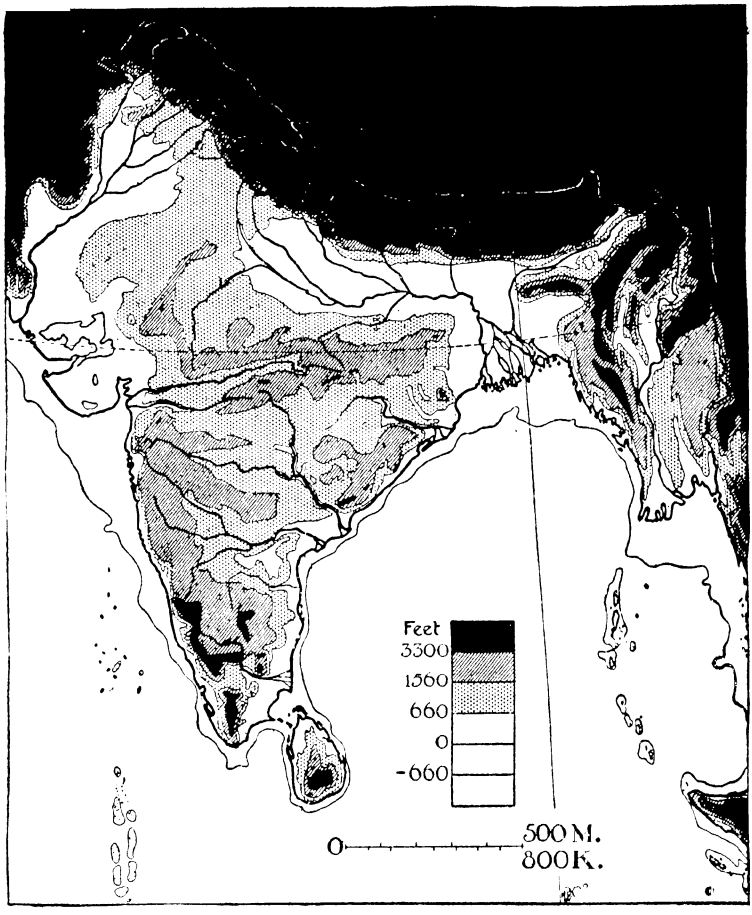


FIG. 56. Physical Features of India, Burma, and Ceylon.

and that prevents both commerce and invasion. One would also see that where there is no mountain barrier there is a desert barrier—and the wonderful privacy and loneliness of Tibet would be fully understood. From Lhasa to the plains of India is a journey of many weeks across high passes of the Himālayas. All are very steep and difficult, and some are always covered with snow.

165. The scenery of the Himālayas is the grandest in the World. All that is magnificent in the Alps is found on a greater scale. The snow peaks are twice as high. The glaciers are far larger. The rivers are wilder, and they rush with even more irresistible force. The highest peak is Mount

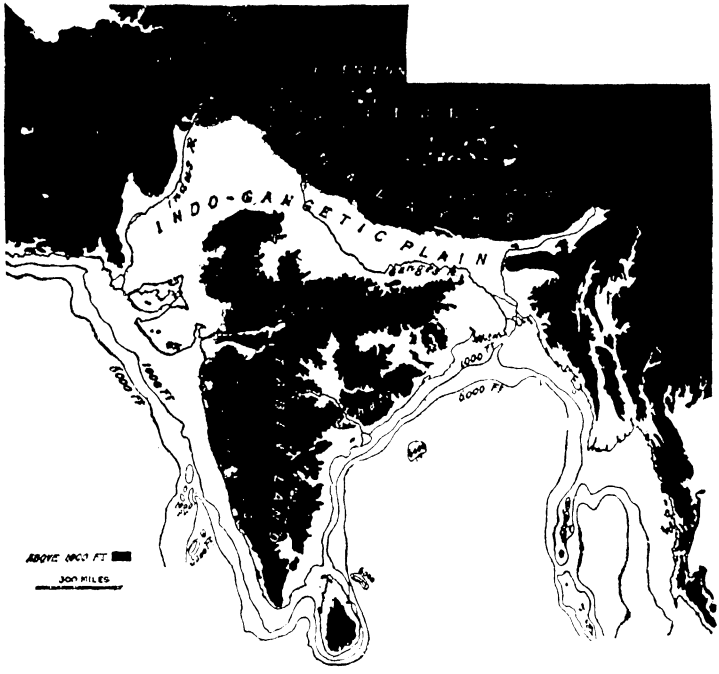


FIG. 57. Main Physical Divisions of India.

Everest, on the Tibetan side of the main range. It is the highest known point in the World, and is five and a half miles high. It is finely seen from the Brahmaputra valley as a huge glittering mass of snow.

One of the best routes from Lhasa leads down to India through the Sikkim Himālayas. Among these lies Darjiling, which can be reached by railway from the plains of Northern India. In about thirty-five miles the line rises to a height of

a mile and a half above the sea. The line climbs first through the tea-fields of the lower hills, then enters magnificent forests, which clothe the slopes of the higher valleys. In some parts of the Himālayas the slopes are forested to a height of over two miles. The view becomes grander. Far below are the valleys the train has left, while far above are the great peaks towards which it is climbing. Steep precipices fall away from the edge of the line, dropping to raging torrents far below. The line curves round hill-sides and plunges in and out of

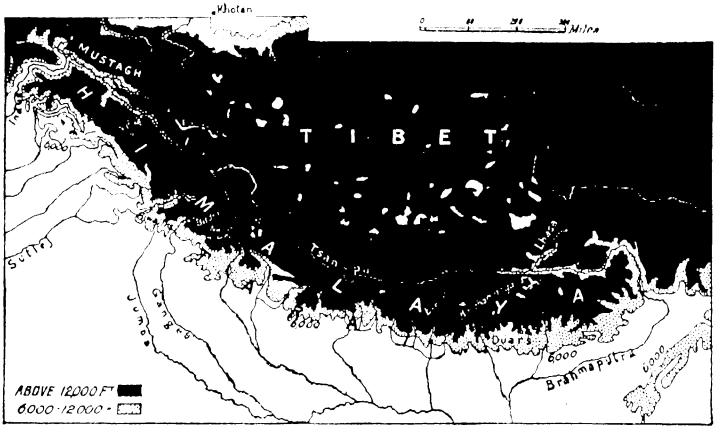


FIG. 58. Physical Features of Northern India and Tibet.

tunnels, and is carried on bridges across gorges which seem to have no bottom. Little Tibetan villages are passed. At last the distant plains of India are seen no more. The train is descending the northern slopes to Darjiling, a mile and a half above the sea.

From Darjiling range after range of the Himālayas is seen, one snowy peak rising behind another. Kanchenjunga, almost the highest mountain in the World, towers into the air fifty miles away. Its great precipices fall steeply to the river gorges at its base, and its snows glitter in the sunshine. On either side of the giant are other magnificent snowy peaks, rising out of a sea of forest.

166. A few miles from Darjiling a glimpse is caught of Everest, nearly a hundred miles away, rising behind the nows of the nearer ranges.

Beyond, as the map shows, the mountains of Eastern Tibet spread out into ranges which run east and south. We know very little of them. Great rivers rise in their snows and pour down through their gorges. The forests which cover their lower slopes and fill their lower valleys are the home of wild tribes. Vast regions have never yet been trodden by a civilized man.

2. *The Indo-Gangetic Plain.*

167. The snows of the Himālayas feed the Indus, the Ganges, and their tributaries. All these rivers are loaded with rock waste from the mountains, for as they rush down they tear away soil and rocks from the mountain sides, and carry this along with them. They carry most when they are swollen by the melting snows. In the course of ages they have built up vast plains at the base of the Himālayas. Every year the Indus is pushing its delta farther into the Arabian Sea, and the Ganges delta is creeping farther into the Bay of Bengal.

168. **The Punjab.** The Punjāb, the Land of the Five Rivers, is part of the vast plain which lies at the southern base of the Himālayas. It is crossed by great tributaries of the Indus. For many months their broad beds are filled with a network of streams which carry very little water. In early summer, when the snows melt in the Himālayas, they swell into broad, deep, swift rivers which rage across miles of river bed. The wild current sweeps along great trees uprooted in the mountains, and if these should dam the river, miles of country would be flooded. If they should dash against the piers of a bridge its foundations might give way under the shock. In the Punjāb the river banks are low. If the course of a river is checked it makes a new channel. Many villages are destroyed in this way. The Government spends enormous sums in making embankments to hold the rivers in.

The main stream of the Indus leaves the mountains near Peshawar. Here Britain keeps strong garrisons to guard the Khaibar Pass route. The river spreads out in the Peshawar valley, but soon it narrows again to a gorge. In this part of its course it receives the Kabul river from Afghanistan. When

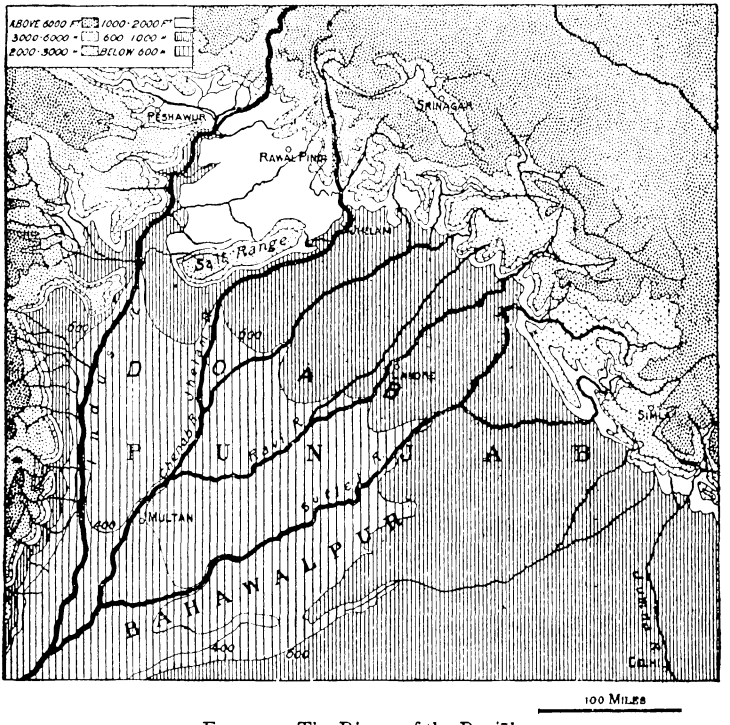


FIG. 59. The Rivers of the Punjāb.

it reaches the open plains, the Indus breaks up and often shifts its course. It unites with its Punjāb tributaries. Here irrigation canals are being made to irrigate the deserts round the lower Indus. It passes on the south into the dry region of Rajputana, the home of one of the finest Indian races. Rajput chiefs have built magnificent cities in the irrigated oases along the southern margin of the desert.

169. Sind, across which the Indus flows to the sea, has a very dry extreme climate. There are few plants to protect the soil, which becomes intensely heated in summer. For the same reason it cools quickly in winter. Here the Indus is higher than the surrounding country, because the river is always dropping sediment on to the bottom of its bed.

South of Hyderabad the Indus forms a great delta. The port of Karachi is built at its western end. It is the outlet for the Indus basin.

170. The Irrigation System of the Indus. The Indian Government is spending enormous sums to irrigate the Punjāb. Great dams are built across the rivers, which deepen the water behind and force it into the canals on either side. Some of these canals are over two hundred miles long and carry more water than the Thames at London Bridge. Smaller canals distribute the waters of the larger ones. Wherever the canals go fertility follows. The dry soil becomes soft rich mud. Within the last ten years immense uninhabited wastes have been turned into a land of flourishing villages. Many of these grow wheat as a winter crop, which is exported from Karachi. Similar work is being begun in the desert of Sind. These dry plains have now 2,000,000 inhabitants.

171. The Plains of the Ganges. These are not so dry as the Punjāb and Sind. They receive heavy rains from the rainy monsoons which blow up the Ganges valley from the south-east.

The plains of the Lower Ganges form Bengal. The Ganges, like the Indus, is used for irrigation. A great canal taps the river where it leaves the Himālayas. This canal irrigates the region between the Ganges and its tributary the Jumna. Twenty miles lower tributaries from the mountains have again made the Ganges a great river. Another great canal carries away its waters.

Along the Ganges and its tributaries are old and splendid cities containing magnificent buildings. Delhi, Lucknow, Agra, and Benares are the most famous. Delhi has always been

important because it stands on the route from the Indus desert to the fertile plains of the Ganges. Its emperors adorned it with costly marbles and priceless gems. It has been sacked many times but it has always risen anew from its ashes, and now it is once again the capital of India. Agra has magnifi-

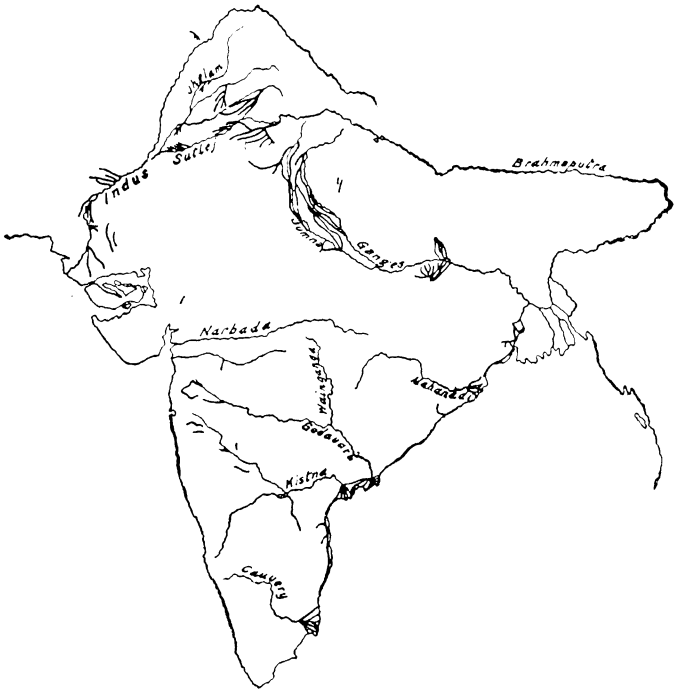


FIG. 60. Rivers and Canals of India.

cent palaces and tombs. Benares is the holy city of the Hindus, to which pilgrims come in thousands to wash away their sins in the sacred river. In these and many other cities famous old trades are carried on, and their jewellers, goldsmiths, weavers, and embroiderers produce exquisite and costly work.

172. Bengal. The Ganges enters the sea by a great swampy

delta, full of forested islands called Sunderbunds. To the same delta flows the Brahmaputra. It crosses Tibet and rushes down through the forests and tea gardens of Assam to the plains of Bengal.

Calcutta, the capital of that province, is built on the Hughli, one of the streams by which the Ganges enters the sea. It is a hot and unhealthy place in summer. During the hot season the Government goes up to Darjiling in the Himālayas.

The many splendid cities of the Ganges are really less important than the thousands of villages which cover the plains. Here millions of hard-working peasants cultivate the village lands. For most of the year the plains of the Ganges are a vast brown expanse. The mud villages are the same colour. Round the villages deep wells have been sunk to the stores of underground water. Buffaloes and oxen slowly wind the buckets up and down. Patient men pour out the water they bring up over the thirsty fields. The very poor have no animals and wind up the buckets by hand. With sufficient water Bengal will grow anything.

3. *The Southern Tableland.*

173. South of the northern plains India consists of a vast tableland called the Deccan. In the west this is about half a mile high. It sinks gradually to the east. On the north it falls by forested hills to the plains. The northern region is ruled by many native princes. Descendants of the oldest races of India live in its forests, where they were driven by the conquerors who seized the northern plains.

On the west the Deccan falls steeply to the Malabar coast, which fringes the Arabian sea. From the sea it is seen as a high forested mountain range, called the Western Ghāts. At the base lies Bombay, the busiest port of India, which does an enormous trade by sea. It manufactures the cotton grown on the plateau above. In places its forest of mill chimneys is like that of a Lancashire cotton town.

The lower broken eastern edge of the Deccan tableland rises as the Eastern Ghāts above the plains of the Coromandel coast. All along this coast the surf makes it difficult to land. The chief town and port is Madras.

Railways climb from the Malabar and Coromandel coasts to the plateau, which is a region very unlike the vast level

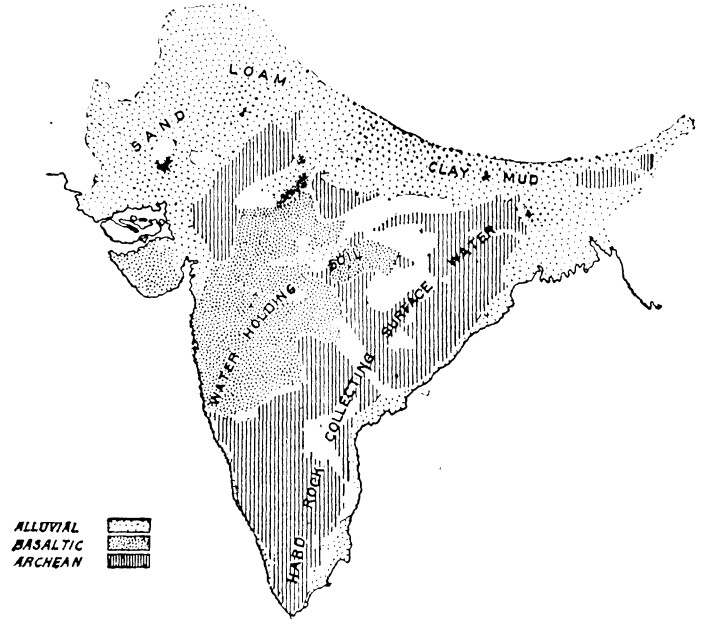


FIG. 61. Soils of India.

plains of Northern India. Hills rise for 1,500 or 2,000 feet above the general level of the plateau. They are often densely forested. Many of these hills end in steep craggy precipices which are difficult to climb. All over Central India the chiefs have turned them into castles and strongholds. The country is crossed by deep gorges and ravines. Their forested depths are the home of many wild animals.

Much of the surface of the Deccan is wild and rocky, but there are fertile stretches of cultivated lands between the hills. Much of the soil is the rich black cotton earth in which cotton is grown to perfection. Wheat pulses, opium, and millet are important crops.

Only two great rivers flow east, the Narbada and Tapti. The Mahanadi, the Godaveri, the Kristna, and the Kauveri rise in the higher west and flow east. They form falls in their descent to the sea. The Kauveri Falls supply electricity to the goldfields of Mysore.

Politically the Deccan is under divided control. In the north are the Central Provinces. The margins form part of the Bombay and Madras Presidencies. The southern part of the Deccan forms the native states of Hyderabad and Mysore.

174. In the south the Deccan rises to the Nilghiri Hills. South of these is the Palgat Gap, a depression between them and the hills of the native state of Travancore. It is an important railway route between east and west.

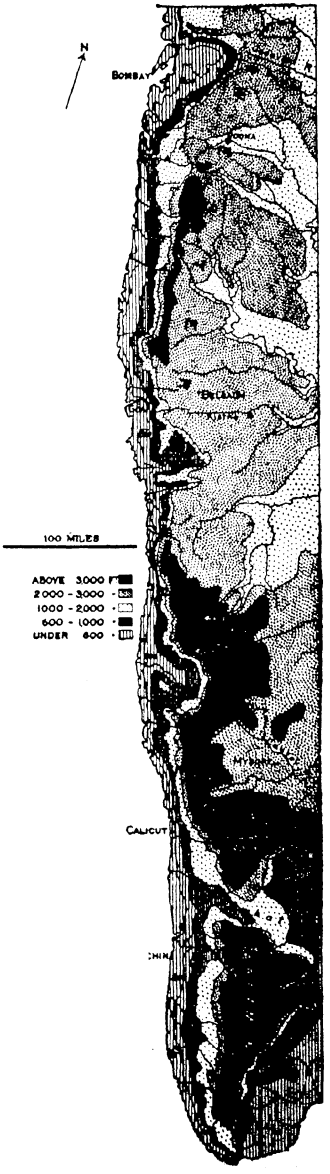


FIG. 62. Malabar Coast; Western Ghāts.

Southern India contains many different kinds of country and of people. It includes sea-coast, plain, and mountains. Madras itself is a great modern port. Inland are famous old cities with temples as magnificent as those of Northern India.

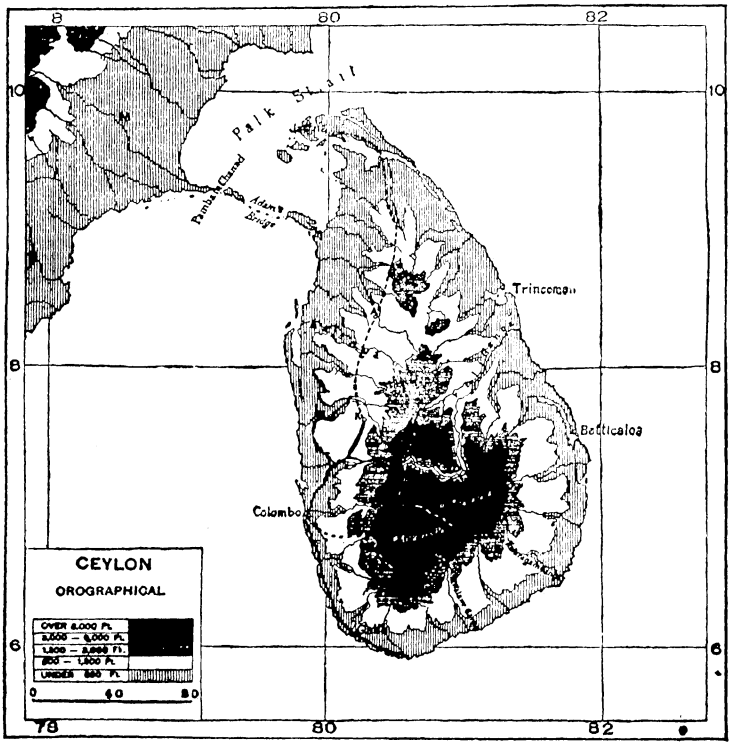


FIG. 63. Physical Features of Ceylon.

Some of the people are learned scholars, clever merchants, and industrious peasants. Others are primitive people, living in forests, practising strange religions, and with only the simplest wants.

175. Ceylon is a mountainous island lying at the south of India. Much of it is covered with dense tropical forest, and

its hills have been terraced and planted with tea, and coffee is also grown. The rubber and coco-nut plantations are important.

Ceylon has a long and famous history. Once it was covered with splendid cities and palaces. Its great artificial lakes made it one of the most fertile lands in the world, but its conquerors allowed the irrigation works to fall into decay, and the forest quickly covered what had been fertile clearings.

The chief city is Colombo, a busy port. Among other things it exports the jewels found in the mountains and the pearls brought up from the surrounding seas.

4. *Burma.*

176. Burma consists of parallel ranges of lofty mountains separated by deep valleys. At the lower end of the valleys the rivers form deltas where they enter the sea. These delta lands are always muddy and swampy, and are flooded for many weeks. The hot moist climate suits rice, the chief food in the deltas, which is eaten with fish caught in the rivers and seas. Sometimes fish is made into highly flavoured sauces, which give a relish to the tasteless rice.

Behind the deltas lie vast forests, in which the valuable teak trees grow. It is a very hard wood which is cut in the forests and then dragged by tame elephants to a river. The strong current floats it down to the delta ports, where elephants drag the huge logs up the mud banks.

177. Rangoon, the capital of Burma, is built a few miles from the sea, on a river connected with the Irawadi. Round the city are palms, banana groves, bamboo thickets, and rice fields. Rangoon is a busy port, exporting teak and rice. There are many splendid temples. The people are picturesquely dressed in richly coloured silks.

From Rangoon we might sail nearly eight hundred miles up the Irawadi. We should see much of Burmese life, for all the villages are built by rivers. Every hill has its temple or pagoda, with gilded and coloured roofs.

Four hundred miles up the river we should reach an old capital. It contains a thousand temples. The finest was built about 800 years ago.

A hundred miles higher we reach Mandalay, the capital of Upper Burma, which like all important Burmese cities has splendid temples.

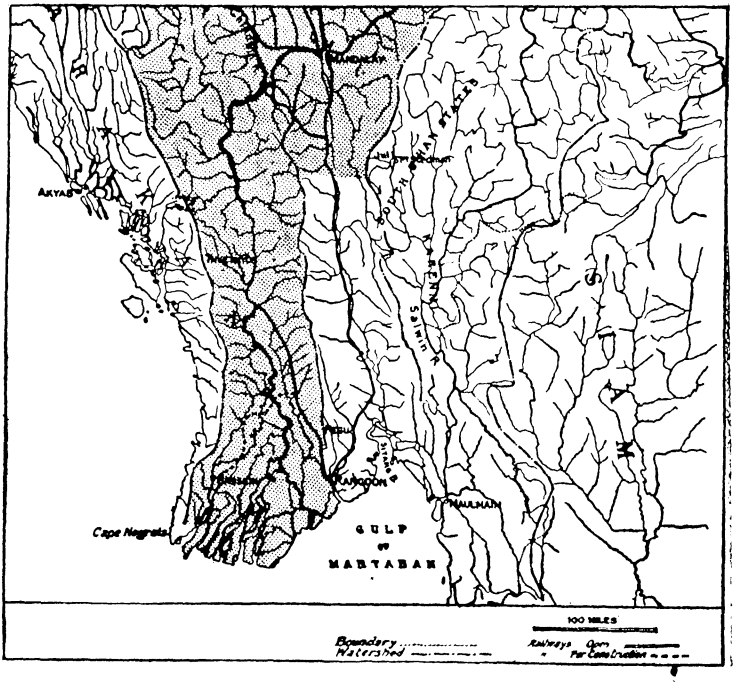


FIG. 64. Lower Basin of the Irawadi.

Above Mandalay the river flows between mountains, the gorges become narrow and winding, the forest spreads on either side. We see the distant mountains of China rising on the sky-line. At last the river is broken with rocks and rapids and our boat must stop.

178. The Salwin, which flows parallel to the Irawadi, is

navigable for less than a hundred miles, for above the delta its course is broken with rapids. Its swift current brings down vast quantities of teak from the mountains, which is exported from Moulmein, the chief city of the delta.

179. Agriculture is the chief occupation of Lower Burma, and rice the most important product. Fishing is also very important. Some fish is eaten fresh but more is dried and salted. In Upper Burma there are high plains among the mountains, where wheat, cotton, and other crops are grown. The ruby mines are very important. The mountains of Burma produce the finest rubies in the world. Petroleum is also got.

CHAPTER IX

CLIMATE AND PRODUCTIONS OF INDIA

180. Since India extends from 34° north of the equator to 8° south, and since it consists of low plains, lofty tablelands, and very high mountains, it is evident that the country must have a very wide range of climate. As a matter of fact the great differences resulting from the great extent of the country are somewhat lessened by the differences of elevation. Most of the tropical region of India is elevated tableland and is thus less hot than it otherwise would be, while much of the northern part is lowland and therefore less cold than it would be if more elevated.

The great barrier of the north, cutting India off from Asia politically and geographically, also cuts it off climatically and causes it to differ in this respect from the rest of the continent surrounding it.

181. When the sun is farthest south, in winter, the climate is hottest in the south and becomes cooler and cooler from south to north. But when the sun is straight over the tropic of Cancer, in summer, the plains south of the Himālayas become exceedingly hot. (Cf. Figs. 65–8.)

Fig. 65. Fig. 66.

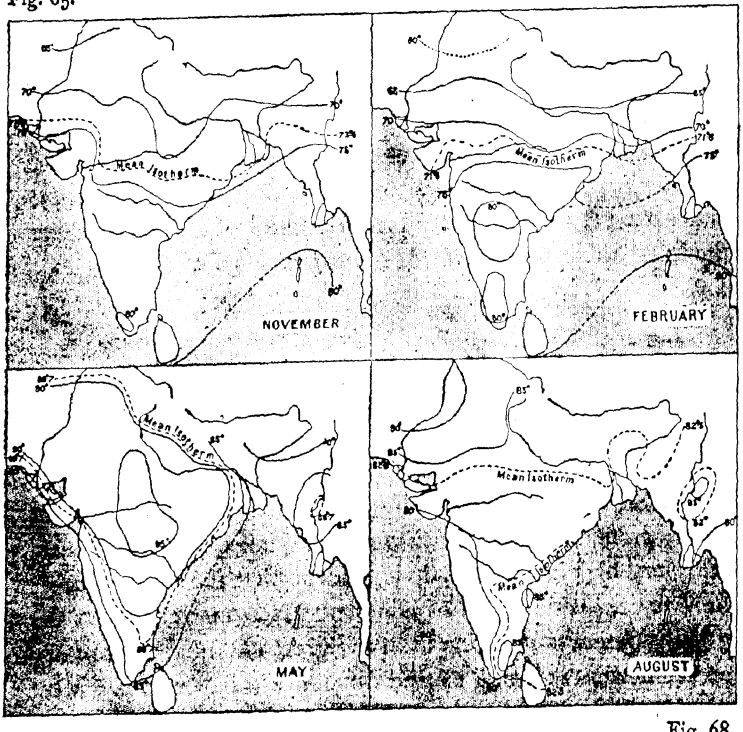


Fig. 67. Fig. 68.

FIGS. 65, 66, 67, 68. Mean Temperature at Different Seasons.

The dotted line shows the average temperature for India in each of the four months. Notice that the north is under the mean in winter and above it in summer; also that there are areas above this average in south-east India and in Burma in August, while the highest temperatures are in Central India in May.

182. The Summer Monsoon. From these thousands of square miles of very hot plains the air rises upward, as it expands, forming an area of low pressure. When, in air or sea, any portion moves, surrounding portions must flow in to take its place. To the south of this low-pressure area is a high-pressure area of less-expanded moisture-laden air which has come over the warm ocean (and turned somewhat to the right by the Earth's rotation). This south-west wind is the summer monsoon which brings the moisture without which India would be a desert. (Cf. Figs. 69–72.)

183. Summer Monsoon Rains. As this monsoon is, in many parts of India, the bringer of the only rain that falls throughout the year, it is one of the most important factors of the climate. In an ordinary year the heating of the northern plains causes the inflow of the air from over the cooler seas and the current of air, coming as a south-west wind, meets the Western Ghāts of the Malabar Coast, is turned upwards, expands, is cooled and loses great quantities of moisture which fall in the form of steady heavy rain—some places, such as Mahableshwar, receiving as much as 300 inches in a season of three months, and the whole coastland from one to two hundred inches.

As a result of this condensation of the moisture, the wind passes on as a dry wind and brings no moisture to the land on the lee (or farther) side of the mountains. Hence tracts of desert are found in the path of what reached the country as a very wet wind, and the Great Indian Desert succeeds the very fertile lands to the south.

184. From the Bay of Bengal the air rushes in towards the low-pressure area over the plains, across Bengal to the Himālayas, and in front of them it is forced upwards, expands, cools, and pours down the heaviest rainfall in the world—one place (Cherrapungi in the Khasi Hills) receiving nearly 40 feet annually. Similarly the mountains of Burma wring moisture from the sea-wind.

185. Thus the Sun, heating the Earth, causes movement

Fig. 69. Fig. 70.

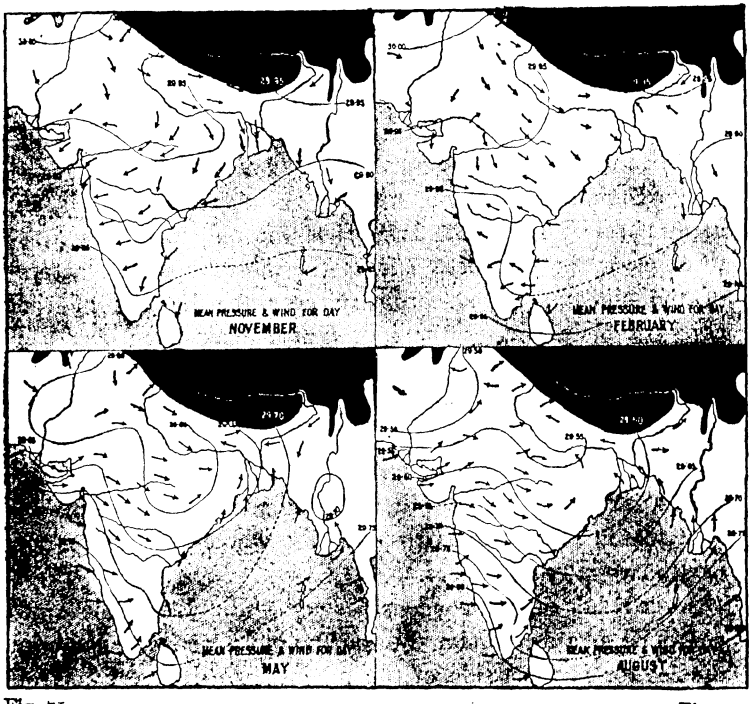


Fig. 71. Fig. 72.

FIGS. 69, 70, 71, 72. Mean Pressure and Winds at Different Seasons.

The black shows the lofty land north of India not influenced by the movements of the lower atmosphere. Compare carefully the pressure and wind maps with the temperature maps. Notice that the pressure is high in Northern India in winter and low in summer, and that the areas of lowest pressure are very nearly the same as the areas of highest temperature.

Fig. 73. Fig. 74.

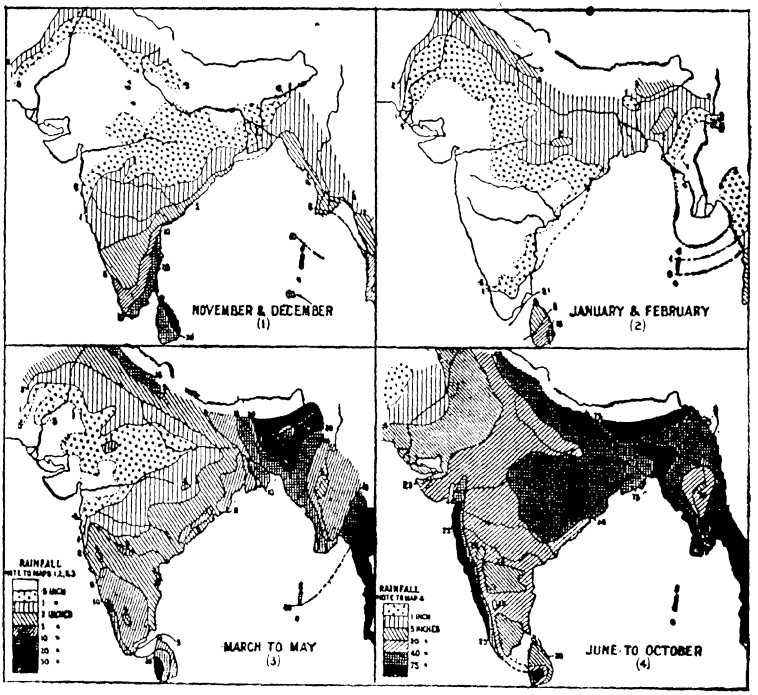


Fig. 75. Fig. 76.

FIGS. 73, 74, 75, 76. Seasonal Rainfall.

Notice that so much rain falls from June to October that it is necessary to use a different scale of shading for the map of that season. Compare these maps with the four maps of pressure and winds (Figs. 69–72). Contrast the rainfall in the south-east of India in November and December, when the south-east monsoon is retreating and storms occur in the Bay of Bengal, with that for January and February, when the north-east monsoon is in full force.

of the air from cooler to hotter places; and, the cooler places being frequently over the sea (which heats and cools more slowly than the land), the incoming wind often brings rain if it is forced to ascend, expand, and cool. The wet wind which meets the mountains deposits large quantities of water and

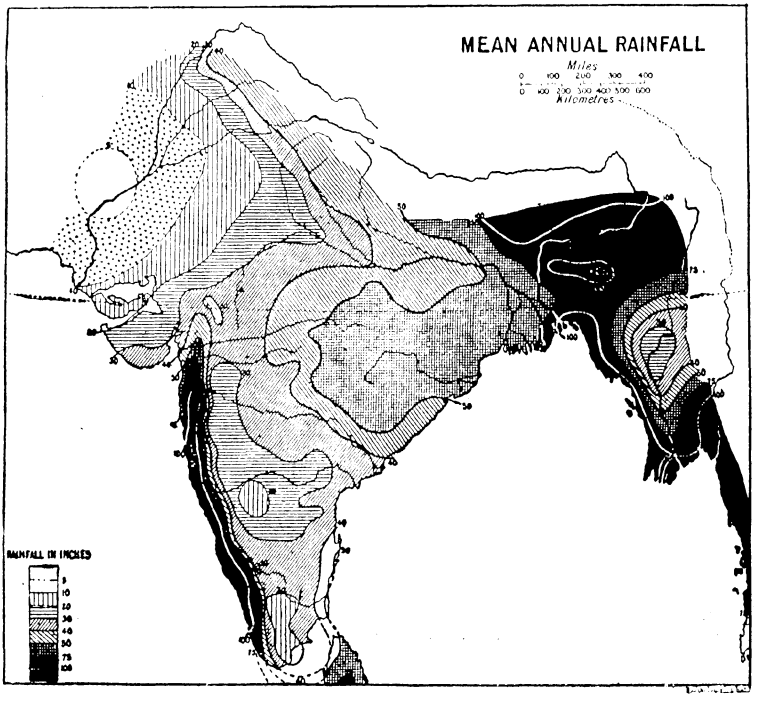


FIG. 77. Mean Annual Rainfall.

passes over them to the other side as a dry wind, causing deserts on the lee sides of the mountains.

186. Differences of rainfall cause differences of vegetation, climate, occupation, and distribution of population. Although the southern part of the Great Indian Desert is in the same

latitude as parts of Bengal, is of the same flat and level character, and is similarly exposed to sea winds, the one, owing to its being on the 'wrong' side of the rain-seizing mountains, is a vast dry sandy desert, while the other is a most fertile, productive, and well-watered tract. Where

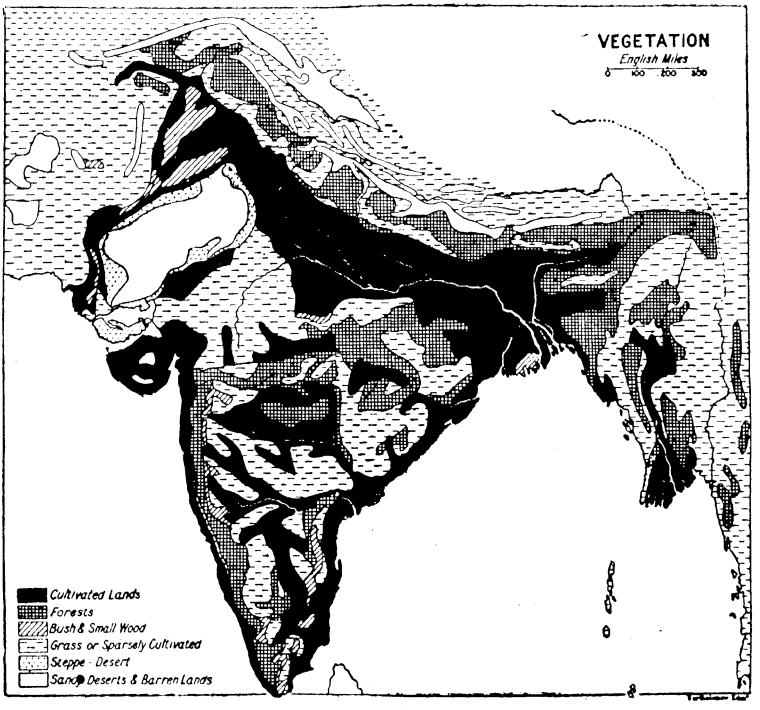


FIG. 78. Vegetation Map.

water can be brought to the parched soil by irrigation it often becomes very productive, as in the case of parts of the Punjāb; and in some parts (e. g. the Western Deccan) the soil is the black volcanic kind that retains moisture and remains fertile in spite of insufficient rain.

187. Crops. Both temperature and rainfall are factors in deciding the nature of the crops that can be grown in any particular soil. Wheat requires a low temperature and not much moisture, can only be grown in the Punjāb, the United Provinces, the Central Provinces, and a part of Bihar and Orissa, and not in equally fertile but warmer parts, like Bengal.

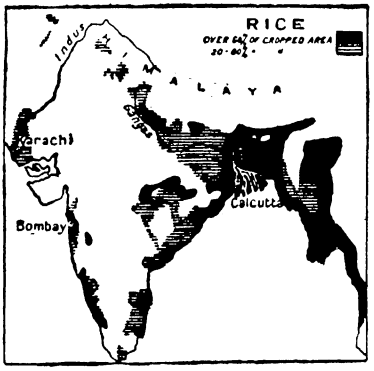


FIG. 79. Distribution of Rice in India.

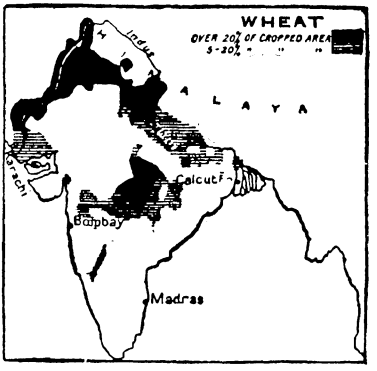


FIG. 80. Distribution of Wheat in India.

188. Animals. Since India is so densely populated, there is little pasture-land where the soil will produce any food crop for man, or any crop of commercial value. Wherever there is no irrigation, and rainfall is scanty, the land is used for pasturage. Milk being one of the chief articles of diet of a vegetarian people, cows are kept in all parts, but in the poor lands of the almost desert region north of the Aravalli mountains the country is wholly pastoral and supplies the demand for draught-oxen throughout much of India.

Sheep and goats thrive in the dry hilly country of the north, and are reared for the sake of the wool and hair rather than for milk or flesh. The famous Kashmir shawls are made from the 'mohair' of the goat.

Elephants are found in the forests and jungles of the Malabar Coast and Assam, the camel is used in the north-west and Sind, and the wild ass is found in Rajputana.

189. **Timber.** The tree products of India are very valuable, the most important being teak, sissoom, deodar, sal, bamboo, palm, and mango. Teak requires damp jungle country, and flourishes in Assam, Burma, and Bombay. Sal needs drier soil and is found in Central India, while the deodar prefers mountain slopes and is the common tree of the Himālayas.

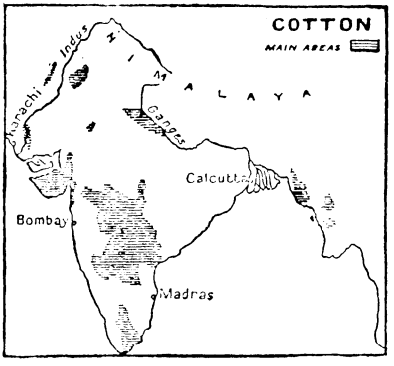


FIG. 81. Distribution of Cotton in India.

The palms are exceedingly useful, especially the coco-nut palm, which grows by the sea. The date-palm flourishes in the Deccan plains and is the common tree of Mysore. From bamboo the cultivator makes his home and almost every kind of utensil he requires, and the mango provides him with food.

190. **Minerals.** India is mainly an agricultural country, but her minerals are becoming more and more important. Coal, iron and manganese ore, gold and precious stones, salt, tin, mica, and oil are found.

Compared with Europe and America there is not a great deal of coal mined in India, though many new mines have lately been opened. Coal is mostly found in Chota Nagpur

and Bengal, also in the basins of the Narbada and Damodar and in Assam. It is of great importance to India's growing industries. Gold is mined in Mysore; precious stones in Burma, Ceylon, and the Deccan. India has always been famous for its jewels. Oil is found in Burma and Assam, tin in Burma, iron in Bihar and Bengal, manganese in the Central Provinces, Madras, and Mysore, mica in Bihar, salt from the evaporation of the sea or from the Punjāb 'Salt Range', and from the Rajputana salt lakes.

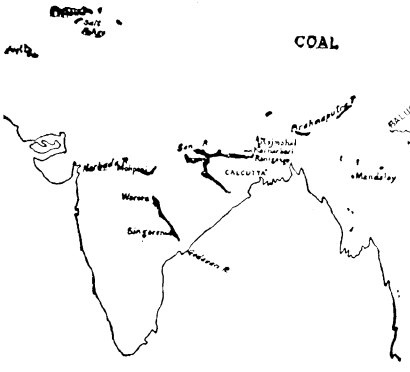


FIG. 82. Coal distribution.

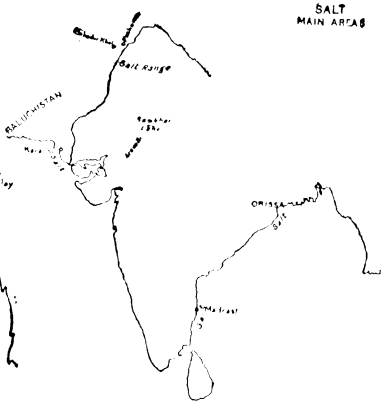


FIG. 83. Main Salt Areas.

The minerals of India have given rise to several large new centres of population, such as Asansol in the Bengal coal district and Tatanagar (Jamshedpur) in the iron district.

191. Population. The climate of India is thus the chief factor in fixing the settlement of the population in various areas—placing hundreds to the square mile in some parts and dozens in others. The population (of between three and four hundred millions) of India is densest in the low, rich, fertile lands of Bengal, Bihar, and Oudh, where there are over 400 to the square mile. It is thinnest in the Great Indian Desert, where there are only four to the square mile.

Of the total population four-fifths is in British territory (which is three-fifths of India).

192. Climate affects character, and character affects history; and for this and other reasons History and Geography should

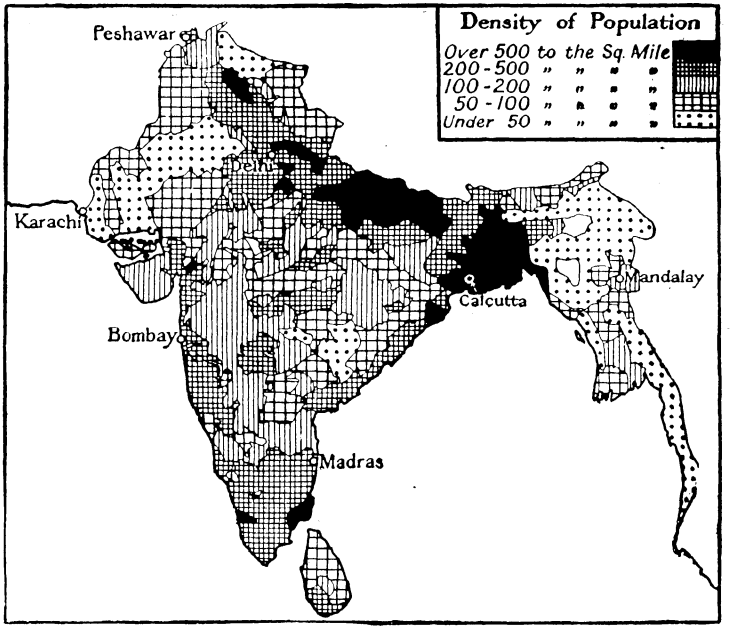


FIG. 84. Density of Population in India and Ceylon.

be studied together. The general physical conditions and economic state of a region greatly influence its inhabitants, and the people of two neighbouring regions may be widely different in physique and character. Differences of geographical conditions cause great differences of interest, necessity, policy, and ambition.

Physical geography makes political geography to a very

great extent, as seen in the case of (*a*) the mountain regions, (*b*) the tableland regions, and (*c*) the lowland regions of India.

(*a*) The wild and mountainous region of Afghanistan has been left independent. Mountainous Kashmir is a native state under its own rajah. The Himālayan states of Nepal and Bhutan are independent.

(*b*) In the tableland region of the Deccan the wild and rugged region of Central India is under a native ruler. The less difficult and inaccessible part to the south penetrated by the Narbada, Tapti, and Mahanadi rivers, is British. The higher and wilder regions to the south are the dominions of the Nizam, and Mysore.

(*c*) The lowlands, in order of fertility, are: the desert of Rajputana—under native rulers; the irrigated parts of the Punjāb, British; the upper basin of the Ganges, Agra, and Oudh, British; the lower basin of the Ganges, British; Eastern Bengal and Assam, British.

The physical geography of all these areas has decided their political geography.

CHAPTER X

THE COAST-LINE, COMMUNICATION AND TRADE OF INDIA

193. If you look at the map, you will see that the coast-line of India is not irregular like that of Europe but regular and uniform. It is mostly sandy and rocky coasts with few natural harbours for large ships. That is why India was never a great maritime country. Bombay has a fine harbour. Karachi has been made so by human labour. Madras is quite artificial. Calcutta is up a difficult river. Rangoon is also up a river though more easily navigable. Vizagapatam is the only other natural harbour. Other small harbours are Mangalore, Cochin, Tuticorin, Goa, and Chittagong.

194. Roads and Railways. Both the roads and railways are good in India. There are over 36,000 miles of railways and 200,000 miles of good roads. It took great engineering skill to take them up high mountains and over enormous rivers. Over 500 millions of passengers are carried every year and 90 million tons of goods.



FIG. 85. Railways of India.

In all countries roads and railways are important, but nowhere as important as in India. They are very necessary for the defence of the frontier and in time of famine make it possible to take food quickly from one province to another. They have had an enormous civilizing effect on India. The main railway lines run from the capital cities to each other; Calcutta to Madras; Calcutta to the United Provinces, Delhi,

and the North-West; Calcutta to Bombay by two routes; Calcutta to Assam; then from Bombay to Agra, to Lucknow, Delhi, Karachi, and Madras; Madras to Malabar and to Tuticorin and Rameswaram. Many more lines are still being constructed and many crores spent on railway material. It has been found that Indian industries are much handicapped still by there not being enough railways.

195. The roads are still greatly used both by pilgrims and for traffic. One of the largest roads in the world is the Grand Trunk Road joining Bengal with the Punjāb. And the great rivers and canals are in many places the chief thoroughfares still. Tea is brought from Assam and jute from Eastern Bengal in river steamers. The Brahmaputra, Ganges, Indus, and Irawadi are crowded with boats. Seventy years ago there were no railways in India and few canals or good roads.

196. The postal system of India is one of the best in the world. Until recently it was the cheapest, but the rise in the cost of living has made it necessary to charge more. The money order and V.P.P. systems are excellent. Telegraph lines run to Europe under the sea and overland.

197. **Trade.** India's trade by land with neighbouring states is not important. India's good roads end at the frontier as well as any security for traders. Look at the mountains encircling India and you will understand why this is. There is some trade with Afghanistan and Persia along the old North-West trade routes where caravans have travelled from the earliest ages. There is a little with Tibet and China over the Himālayan passes and through Burma. But nearly the whole bulk of trade is done through the ports, Calcutta, Bombay, Madras, Rangoon, Karachi, and Chittagong. To these ports run the big railways from every province.

India exports the surplus of the products which her soil and climate favour—cotton, rice, tea, coffee, wheat, oil-seeds, hides, jute, silk, spices, and indigo. India imports things she needs and cannot yet produce enough of them in the country—piece goods, machinery, hardware, cutlery, refined sugar, silk and

woollen goods, drugs, and a host of miscellaneous articles such as motor-cars and paper..

198. **Manufactures.** India is mainly an agricultural country, but her manufactures grow more important every year. Some of the old hand industries have died out, because machine production on a large scale was cheaper. There are now about 260 cotton mills in India, employing three lakhs of people. Most of the mills are at Bombay or Ahmedabad. You will see that most of the cotton is grown in the West of India. The jute industry centres round Calcutta, where over 70 mills employ a quarter of a million hands. There are also cotton mills at Madras, and in the big cities many other industries such as paper manufactures, and leather and engineering works. A great new industry is the iron and steel industry at Tatangar in Bihar and at Barakar, Bengal, new cities having grown up in a few years. Industries are located wherever power is easy to obtain, e.g. coal, raw material near at hand, and transport easy. Calcutta has coal near at hand. Bombay has electricity which is derived from artificial waterfalls in the Ghāts.

199. The building of factories has unfortunately caused a decrease in the hand-weaving industries, though much is still done and Indian silk and shawls are still famous. Also the concentration of many people in the big cities has caused congestion and unhealthy conditions of life. The workmen do not care so much as they should, because they all intend to return to their village one day, but the municipalities and employers are now endeavouring to improve things as far as they can.

CHAPTER XI

POLITICAL DIVISIONS OF INDIA

200. The Provinces of British India are—

(*a*) *Under Governors.* 1. Bengal; 2. Madras; 3. Bombay (these three are known as Presidencies); 4. United Provinces of Agra and Oudh; 5. Bihar and Orissa; 6. Central Provinces and Berar; 7. Assam; 8. Punjāb.

(*b*) *Under a Lieutenant-Governor.* Burma.

(*c*) *Under Chief Commissioners.* 1. North-West Frontier Province; 2. British Baluchistan; 3. Ajmer-Merwara; 4. Coorg; 5. Andaman and Nicobar Islands.

These provinces extend over a million square miles and contain 247,138,396 people.

201. Indian Native States. The chief are Hyderabad, Baroda, Mysore, Kashmir, and Nepal.

Other groups of Native States are the Rajputana Agency, the Central India Agency which includes Gwalior, Indore, and Bhopal, the Madras States including Travancore and Cochin, and other small states in nearly all the British provinces. The states extend over 750,000 square miles and contain 71,936,736 people.

202. Recent changes. Assam, Bihar and Orissa, the United Provinces, Central Provinces, and Punjāb were recently put under Governors instead of Lieutenant-Governors or Chief Commissioners.

A. British India.

1. *Bengal.*

203. This important province is moist and hot, except for a few months in the cold weather when it is dry and cool. The land is mostly alluvial (i.e. brought down by the rivers)

and is therefore very fertile, and is densely populated. More than half the province produces two crops a year, and it is as a garden compared to other parts of India. The great crop is rice, Bengal producing more than all the rest

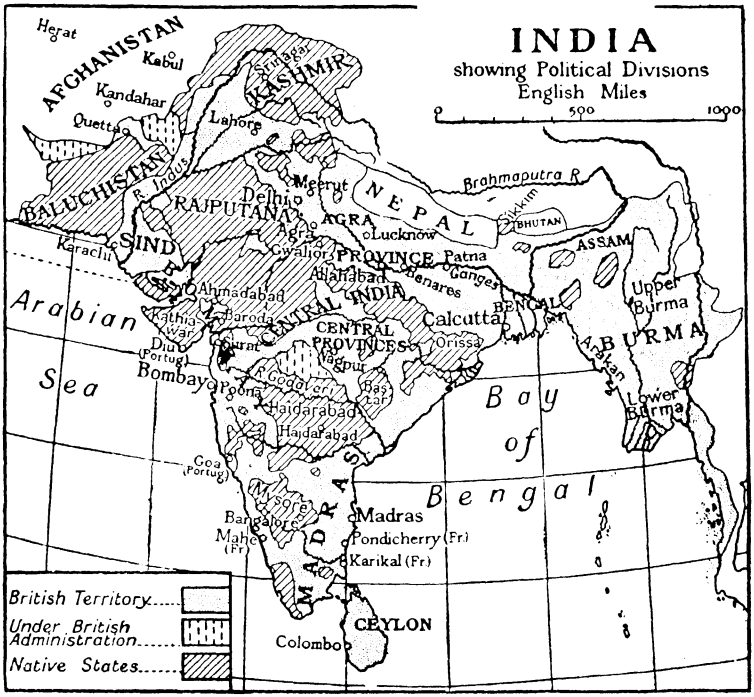


FIG. 86. Political Divisions of India and Surrounding Lands.

of India and Burma. The other staple crop is jute, especially in Eastern Bengal. No other land in the world can grow jute like the Bengal product. Wheat, barley, maize, and millet are grown in some parts where the rain is not so heavy. In the mountain districts of Darjiling tea is grown which is considered the best in the world. Sugar-cane, tobacco, opium, and oil-seeds are also cultivated.

Coal is mined at Ranigang and all round Asansol, and iron ore is also found. The cheap and near supply of coal is the secret of Calcutta's prosperity. All up and down the banks of the Hugli are jute mills, paper, sugar, rope, and soap factories, and large engineering works.

Bengal exports rice, jute (raw and manufactured), tea, opium, silk, oil-seeds, &c., and imports cotton and woollen goods, oil, machinery, iron, and steel and stores of all kinds. There are excellent communications, as you will see from the map, Bengal being a network of navigable rivers.

204. The Eastern Bengal Railway runs to the Himālayas and Brahmaputra basin; the Bengal North Western to Upper India north of the Ganges. The Bengal Nagpur Railway runs through Chota Nagpur to the Central Provinces and also to Madras. The Assam-Bengal Railway serves Assam and parts of Bengal east of the Brahmaputra. The great East Indian Railway has three lines running up to the Ganges Valley and the cities of northern India.

205. The capital of Bengal and former capital of the Indian Empire is Calcutta, founded only 250 years ago. With its suburbs it has a population of 1,263,292. It owes its importance to its position, as a convenient place for collecting the products of India's most fertile provinces as well as for receiving products and distributing them by rail, river, or canal. And, as we have said, there is a good supply of coal near at hand. The mill workers and coolies come from all round the United Provinces, Bihar and Orissa especially.

Even before the days of railways and canals the position of Calcutta made it a natural outlet for the fertile provinces of the Ganges and Brahmaputra valleys. Now the river banks are crowded with great liners, cargo boats, river boats and barges. There are huge docks at Kidderpore. But much dredging is necessary to prevent the Hugli silting up, and skilled pilots must take each ship down the ninety miles of river to the open sea. From Calcutta two or three times

a week run mail steamers to Rangoon, as there is no railway between India and Burma.

Calcutta is also important for its University, many colleges, its School of Art, Science institutes, and its intellectual life in



FIG. 87. The Ganges Delta and the lands that border it.

general. On the opposite bank is *Howrah*, a busy industrial centre and the terminus of the Bengal Nagpur and East Indian railways. It is joined to Calcutta by a floating bridge.

206. *Dacca*, on the Burhiganga, a tributary of the Brahmaputra, was once capital of Eastern Bengal and Assam when that province existed. But it was once far more famous as

a great Mahommedan capital and the centre of a fine muslin industry which now no longer flourishes. A new university has recently been instituted at Dacca.

Chittagong in Eastern Bengal, 12 miles from the mouth of the Kamaphuli river, is a fairly busy port. Its imports are mostly piece goods, salt, and oil, and its exports tea and jute. Lascar crews for steamers are largely recruited from Chittagong.

Asansol is the great railway and colliery centre of Western Bengal. *Darjiling* in the Himālayas is the hot-weather seat of the Bengal Government and a famous tea-growing district. Its scenery is amongst the most beautiful in the world.

207. The people of Bengal are of Mongolo-Dravidian race, and number nearly 46 million. The Bengalis are clever and intelligent, and the peasants patient and hard-working. Owing to the damp climate they have not great physical strength and the province suffers much from malaria, hook-worm, and kala-azar. One-sixth of the population (mostly in E. Bengal) is Mahommedan.

2. *Madras.*

208. The climate of Madras is warm and moist, there being greater differences in the hilly interior, of course, than along the coast. In October and November, as the monsoon retreats, heavy rain falls on the east coast. When the south-west winds blow in June, July, August, and September, the west coast receives a heavy rainfall and the east coast is dry. As the Western Ghāts are steep and high, the rainfall on the west is greater than on the east—generally about 130 inches as against only 50 inches. In the centre of the province, where a very moist wind from neither side can penetrate, the rainfall varies from 16 to 30 inches.

209. The soil of Madras is not as rich and fertile as that of Bengal, there being more stony and sandy ground than water-holding ground (known as black cotton-soil) and so a much greater dryness of soil generally. There are, however, over 7,000 miles of irrigation canals and 70,000 great storage tanks. These tanks are specially needed in a province of

porous soil that allows the water to drain quickly away, and not in a province of black cotton-soil that holds the water.

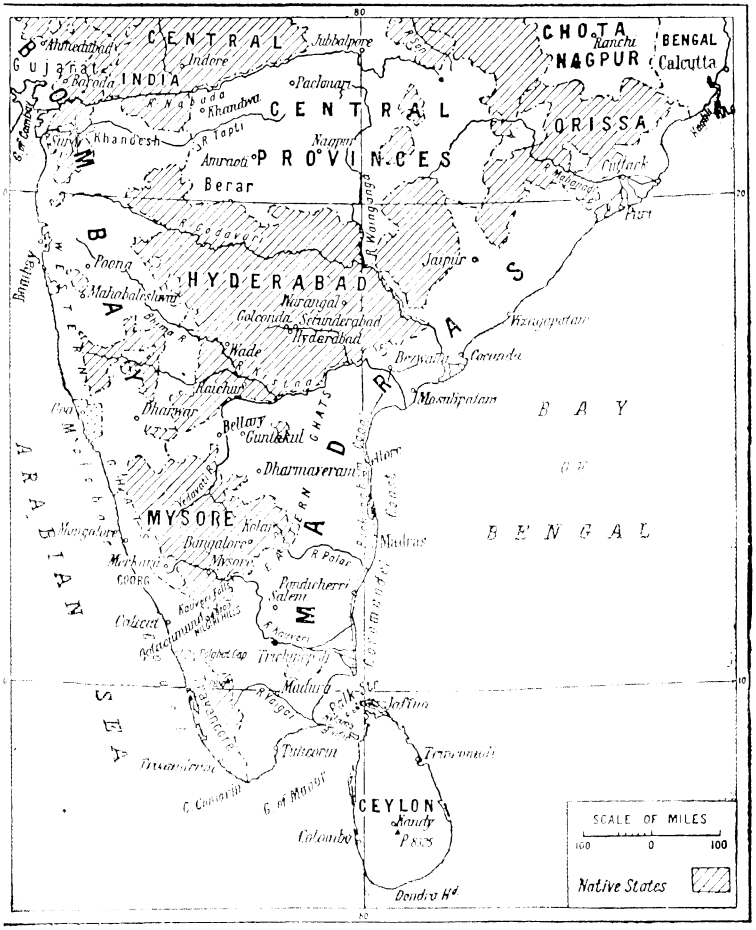


FIG. 88. South India.

210. Madras is an agricultural province and produces rice in the wet districts and millets and pulses in the dry. Cotton, sugar-cane, oil-seeds, tobacco, spices, tea, coffee, cinchona (quinine), and indigo are also grown.

Good iron ore is found but not much worked owing to lack of fuel and lime. Gold, mica, and salt are also obtained.

Madras exports cotton, rice, sugar, hides, oil-seeds, and indigo, and imports manufactured cotton-goods, hardware, machinery, metals, and provisions; but the foreign trade of the province is small, owing to the absence of really good harbours and ports.

211. Communications are good in Madras, particularly the roads (owing to the plentifulness of stone). The water-communication is far behind that of Bengal, however, owing to the fact that the rivers are in flood during the monsoons and too shallow for use in the dry weather. One important highway is the Buckingham canal, which joins the Godavari with the Palar and connects the capital with the northern and southern parts of the Presidency.

From Madras railway lines run in all directions. The Madras and Southern Maratha runs to Calcutta, Bombay, Hyderabad, and Bangalore. The South Indian railway runs to Tuticorin and Rameswaram (for Ceylon) and to the Nilgiris and Malabar coast.

212. *Madras*, the capital of the Presidency, has a population of over half a million and is the third largest city in India. It was founded by John Day in 1639. Having an artificial harbour, difficult to approach, Madras has little trade compared to Bombay or Calcutta. There are a few cotton mills, but lack of coal prevents the growth of more industries. Madras is the seat of government in the cold weather and has fine public buildings and a large university. Education is more advanced than in other parts of India.

Trichinopoly, on the Cauvery, with over a lakh of inhabitants, is the second city in the Presidency. It is famous for its Rock Temple, for cheroots and jewellery. The great Vishnu Temple of Srirangam is close by. It is also a railway centre. Near by is the native state of Pudakottah. *Madura*, once the capital of the old Pandyan kingdom, is also famous for its temple and is a place of pilgrimage. *Tanjore* was the old

capital of the Chola kingdom. *Rameswaram* and *Conjeveram* are also great places of pilgrimage. Ootacamund in the Nilgiris is the hot-weather seat of Government and has a very pleasant climate.

213. The people of Madras are Dravidian. In the south-east and south-west they speak Tamil and Malayalam respectively, and in the north-west and north-east Kanarese and Telugu. The population is over forty millions, of which nearly three million are Mahommedan and over two million Christians. Although education is advanced in the province as a whole, many of the people are very backward especially on the Malabar coast, notably the Moplahs.

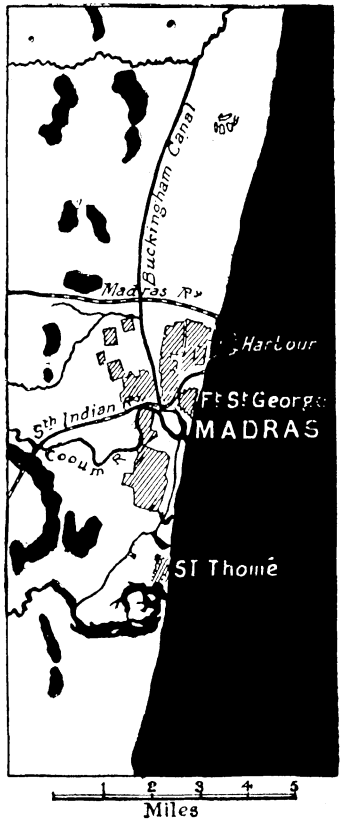


FIG. 89. The Port of Madras.

3. *Bombay.*

214. The climate of Bombay varies widely on account of its being a long narrow strip of country extending through nearly 15° of latitude and including some of the driest and wettest tracts in India. Although over a thousand miles long, it is nowhere more than 300 miles wide. In the south, owing to the south-west sea-winds and the Western Ghāts, the rainfall is abundant. On the coast the climate is moist and oppressive in the summer but agreeable in the cold weather. On the Deccan tableland the summer is hot and dry, but

pleasant and wholesome in the winter. In Sind very great heat is experienced during the summer day and great cold during the winter night. The winds which brought enormous quantities of rain to Bengal and the Himālayan tracts reach Rajputana, Sind, and Baluchistan hot and dry. Much of Sind does not receive 5 inches of rain, while places on the Western Ghāts are receiving 300 inches.

215. As elsewhere, the wet districts of the Presidency produce rice and the dry tracts millets and pulses. Wheat is also grown in Sind. Cotton is cultivated in Khandesh, Dharwar, and Gujerat.

The Bombay Presidency has scarcely any coal or other minerals, and coal has to come by rail across India or by sea. Nowadays the huge hydro-electric constructions in the Ghāts give Bombay the power needed to drive all the cotton mills and other factories.

216. Communications are good, especially by rail, though the Indus (in Sind) is the only waterway. From Bombay the G. I. P. railway runs in two branches to Jubbulpore and Nagpur (for Calcutta), to Poona and Raichur (for Madras), and also to Lucknow, Agra, and Delhi. The B. B. & C. I. runs to Ahmedabad and Delhi, thus linking on to the North Western Railway.

217. The capital of the Presidency is *Bombay*, with over a million inhabitants, situated on an island. Though a large island, it is nearly entirely built over, and the city is extending on to Salsette, the larger island to the north. Bombay, which is now generally considered as large and important as Calcutta, owes its wealth, size, and importance to its magnificent harbour and its position as the nearest port to Europe (except Karachi, which has not so safe a harbour, and which stands at the edge of a desert, while Bombay has behind it a great area of fertile country). It owes much of its wealth to the cotton industry, a bountiful supply being near at hand and its damp climate suitable for its manufacture. There are also many engineering workshops and other industries.

Though damp it is tolerably cool throughout the year, and is the cold-weather seat of Government and the centre of the university. The population (1,172,953) is very mixed, Europeans, Parsis, Gujerathis, Mahrattas, and others from all parts of India. It is 1,400 miles from Calcutta and 800 from Madras. The mail steamers come and go from England every week.

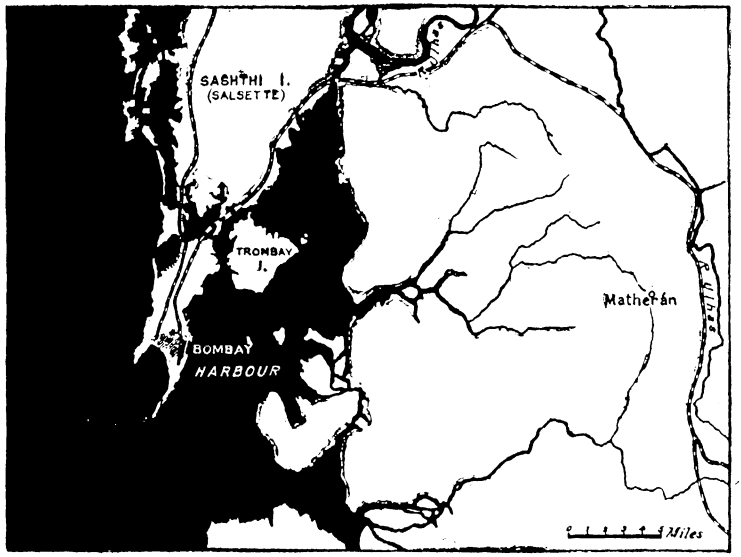


FIG. 90. The Port of Bombay.

218. *Ahmedabad*, in Gujerat, once a famous Mahommedan capital, has a large cotton industry and over 2½ lakhs of inhabitants. *Karachi* is the capital of Sind and a flourishing port. It serves the great wheat districts of the Punjāb, and is of great military importance from its proximity to the NW. Frontier. *Poona*, the old Mahratta capital, is the seat of Government in the monsoon, and is a large military station. It is also important as an educational centre and railway junction. *Surat*, at the mouth of the Tapti, was originally the principal English port in the west of India, but the

harbour has silted up. *Nasik* is a famous religious centre on the Nerbudda river.

219. The people of Bombay are of mixed origin, and are mostly Hindus. In Sind they are mostly Mahommedans and speak Sindhi. In Gujerat they are mostly Hindus and speak Gujerati. On the Deccan are the Marathas, good cultivators and workmanlike. They speak Marathi. In the south of the Presidency Kanarese is spoken. The population is about thirty millions. The traders and merchants of Western India are very keen and capable.

4. *Bihar, Chota Nagpur, and Orissa.*

220. These parts of India were formerly known as the Lower Provinces of Bengal, and were created into a separate province at the Durbar of 1911. They are now ruled by a Governor. Most of the province is higher and drier than Bengal, and so produces pulse, millet, wheat, and maize, though rice is also largely grown in the Ganges valley and Orissa. Indigo is also cultivated in Bihar though the industry has suffered because of the synthetic dyes which can be made cheaper by chemicals. Lac is also largely gathered in Bihar. Chota Nagpur is rich in coal and iron ore. The Biharis are half Aryan and somewhat resemble the Bengalis. The inhabitants of Chota Nagpur and Orissa are Dravidian, some tribes like the Santhals being very wild and uncivilized. The East Indian, Bengal North-Western, and Bengal Nagpur Railways all run through the provinces.

221. *Patna*, the capital of Bihar, with 1½ lakhs of inhabitants, is on the Ganges and has always been an important place. It now has a University. The military cantonment is at Dinapur. *Ranchi* is the capital of Chota Nagpur and the cold-weather seat of Government. *Gaya* in Bihar is a famous place of pilgrimage from its connexion with Gautama Buddha. *Paresnath Hill*, the highest mountain in Bihar, is 4,500 feet high and is a place of pilgrimage to the Jains. *Cuttack* on the Mahanadi is the chief town in Orissa and is famous for its silver work. *Puri* in Orissa is known throughout the world

for its temple and Jagannath car, and is a popular seaside resort for Calcutta. The languages are Hindi, Urdu, Santhali, and Oriya.

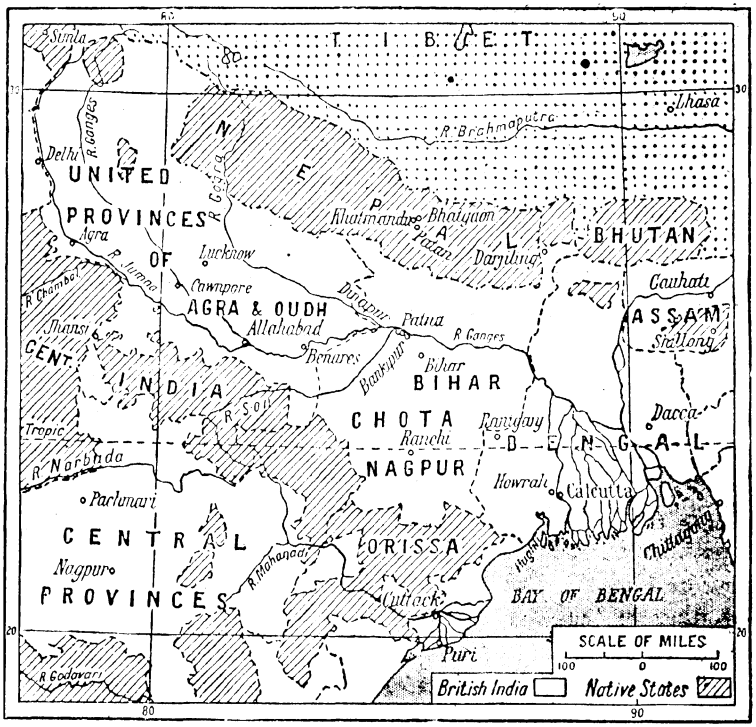


FIG. 91. NE. India.

5. *The United Provinces of Agra and Oudh.*

222. The climate of the United Provinces is 'continental' and extreme, as is to be expected in a country so far from the sea. In summer the average annual maximum is 113° F., and in winter the average annual minimum is 41° F.

Rain-bearing winds from the Bay of Bengal bring much moisture to the eastern part of the mountains, and less to the western part as they become drier and drier. In the northern part of the country—near the hills—rainfall is copious, but in the south it is neither regular nor plentiful,

the winds that have passed over the mountains of the Deccan being already dry.

223. Thus over-watered, swampy tracts of fever-haunted jungle are found in the north (and known as the Terai), and under-watered, sandy tracts are found in the south, where famine and scarcity from drought are common. Between the two extremes the country is very fertile, the soil being good and rain and irrigation-water plentiful. The country between the Ganges and the Jumna called the Doāb (two waters) and that north of these rivers is very productive, and in many parts yields two crops each year.

Wheat and rice are the chief crops, and pulses and millets, barley and maize come next. Sugar, opium, and cotton are very important products also.

224. Communications are excellent by water, rail, and road. There is much water traffic along the Ganges, Jumna, Ramganga, Gumti, Sarda, Gogra, Rapti, Chambal, Betwa, Ken, Tons, and Son rivers, their tributaries and canals—all these rivers flowing all the year round (fed by the melting Tibetan snows), except the Gumti. The railways are very numerous.

The Great Indian Peninsula Railway runs from Cawnpore to Jhansi; the Bombay, Baroda and Central India Railway runs to Agra and Cawnpore; the East Indian Railway follows the Ganges and crosses the Doāb on its way from Calcutta to Delhi; the North Western Railway runs through the north; the Bengal and North Western Railway runs from Bengal into Oudh; and the Oudh and Rohilkhand Railway joins the north and west with the east.

225. The capital of the United Provinces is *Allahabad*, with about 2 lakhs of inhabitants, at the junction of the Jumna with the Ganges. Before the Mutiny Agra was the capital. Allahabad is only the fourth largest city in the United Provinces (Lucknow, Cawnpore, and Benares being bigger). It is an important trade and railway centre, but has few manufactures of its own. It was fortified by Akbar. Allahabad is 560 miles by rail from Calcutta.

The junction of the rivers is a great place of pilgrimage.

Lucknow, with about 2½ lakhs of inhabitants, on the Gumti, is capital of Oudh, famous for its historical associations, and now partially the seat of Government for the Provinces. It has a new University and beautiful parks and gardens. Gold and silver filigree work is carried on here.

Agra, with about 1 lakh eighty thousand inhabitants, on the Jumna, founded by Akbar, was the first capital of the Mogul Empire. Its palaces and the Taj Mahal render it one of the most famous cities in the world. It is now a large educational centre.

Cawnpore, with about 2 lakhs of inhabitants, on the Ganges, has been called the *Manchester of India*. It has large industries of various sorts, cotton mills, woollen mills, leather works, &c., and its blankets, tents, and saddlery are the best in India. It is also a large railway junction and centre of the grain trade. Industrially it is the most important place in northern India.

Benares, with 2 lakhs of inhabitants, on the Ganges, is the most holy city of Hinduism. It is built along the river and there are hundreds of temples and palaces. It is famous for its silk and brass work. It now has a flourishing Hindu University.

Other important places are *Meerut* and *Bareilly*, military centres, and *Aligbar* where the Moslem University is situated.

226. The people of the United Provinces are of mixed Aryan and Dravidian origin and number about 50 millions, about one-seventh being Mahommedans. In Oudh there are nearly 550 to the square mile. The density of the population is due to the fertile soil watered by many rivers, and the healthy climate. Hindi and Urdu are the two chief languages.

6. *The Punjāb.*

227. The climate of the Punjāb is more extreme than that of the United Provinces—being farther inland—and, in summer, 120° F. in the shade is not unknown, 118° F. is frequent,

and 112° is quite common. The winter temperature averages 80° F. less than the summer, and the difference between day and night (at the same time of year) is remarkable, the thermometer often falling 50° F. after sunset. The monsoon winds not reaching the Punjāb until most of their moisture has been condensed out of them, the province has a scanty rainfall. It is greatest, of course, near the mountains in the north, but is only 30 inches there. In the south and west begins the great Indian Desert.

228. The Punjāb, however, has a greater area of irrigated land than any other Indian province, and the skill and ingenuity of the British engineers have turned many thousands of square miles of deserted into highly productive land—at a cost of 120,000,000 rupees. Over 12,000 miles of canals irrigate over 12,000 square miles of land.

229. Wheat is by far the largest and most important crop, the climate and soil of the Punjāb being as suitable as any in the World for this grain. Millets and pulses, gram and barley, oil-seeds, cotton and sugar, are important crops, while rice, tobacco, and indigo are also grown. Tea is produced in the Kangra valley, and silk near Multan. Salt is obtained from the Salt Range by mining, as well as alum and antimony. Coal is found near the Jhelam, and saltpetre in many parts of the lowlands.

230. Communications are good, and many thousands of trading barges use the canals and rivers. The North Western Railway runs down the Indus Valley from Multan to Karachi, and carries the export wheat and cotton to that port. It also joins Delhi, Umballa, and Lahore, and runs on to Rawalpindi and Peshawar. A line now runs from Umballa to Simla, the 'summer capital' of India.

231. *Delhi* with about 3 lakhs of people, now a separate province and the capital of India since the King-Emperor's Delhi Durbar Proclamation of December 12, 1911, was the largest city of the Punjāb, and was the capital of the Mogul Empire. It is the most famous of the ancient historical cities

of India, and contains the palace, the fort, and the Jumma Masjid of Shah Jehan, who founded the present city. Delhi is the most important railway centre in northern India, and

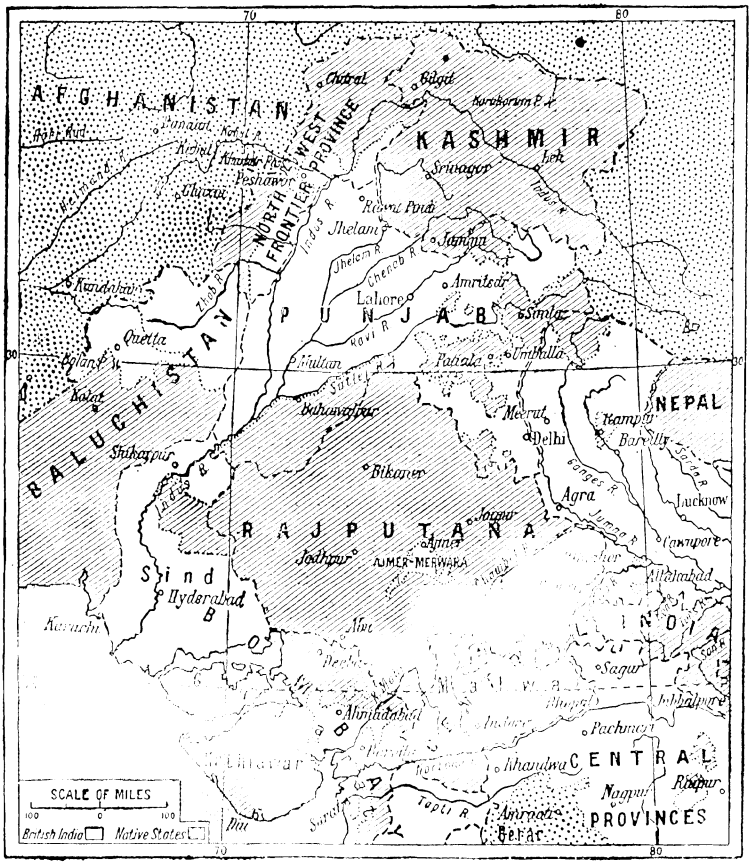


FIG. 92. NW. India.

has growing carpet and pottery industries. It was formerly noted for its gold and silver work and muslins, and has always been a large trade centre.

232. *Lahore*, with two and a quarter lakhs of inhabitants, is the cold-weather seat of the Punjāb Government, and was

once the capital of Akbar as well as of the Sikhs, the tomb of whose king, Ranjit Singh, it contains. It is an important railway centre, and has a university and fine public buildings.

Amritsar, with about one and three-quarters lakhs of people, is the Sikhs' sacred city, and is named after the Pool of Immortality made there by one of the great Sikh *gurus*. It has important silk, cotton, carpet, and shawl industries, and is the chief market for the Kashmir and Tibetan trade.

Simla, in the Himālayas, is the famous hot-weather seat of the Government of India and of the Punjāb Government.

233. The people of the Punjāb are pure Aryans, and speak Punjābi, Urdu, and Rajasthani (in the south-west). There are more than twenty million people, of whom two million are Sikhs. Mohammedans outnumber Hindus slightly. The population is thickest where the soil is most fertile—rising to 400 to the square mile in the north—but the province is not thickly populated compared with much of India.

7. *Burma.*

234. The climate of Burma is hot and moist, and nearly every part of the province receives a copious rainfall, that of the coast districts being heavy. The country round Mandalay, being sheltered from the monsoon winds, has a lower rainfall and receives only 30 inches.

Water being very plentiful, rice is the chief crop, and is grown greatly in excess of the needs of the province—providing the chief export. Cotton and tobacco, and in the drier areas, millets and pulses, are also produced. The Burmese forests are famous for their teak. Rubber is also grown.

Kerosene oil is obtained in large quantities, and iron, tin, marble, jade, and rubies are mined.

235. The coast-line of Burma, unlike that of India, is rocky and broken and is fringed with islands. Communications are not as good in Burma as in India. There are a few good roads and about 1,500 miles of railway. The most important line runs from Rangoon to Mandalay, and thence

to the northern border. Other lines run from Rangoon to Prome and Bassein to Prome, and from Rangoon to Martaban and Moulmein.

236. Most of the traffic of Burma is by water. The Irawadi is the great highway, running as it does through the centre of the country for nearly 1,000 miles and being navigable for steamers almost all the way for most of the year. Naturally, most of Burma's important towns are upon its banks and it is the great outlet to the coast. The famous fleet of river steamers goes to and fro between Bhamo and Rangoon, carrying goods and passengers.

Though a longer river than the Irawadi, the Salwin is far less valuable for communication, as it is shut in by steep mountains, and has cataracts and rapids which hinder navigation.

237. Burma is an agricultural country, but there are silk and cheroot industries, timber and rice-husking mills, petroleum and candle works, and wood-carving industries.

Burma exports large quantities of rice and teak, as well as petroleum, cheroots, silk, and rubies.

238. The people of Burma are chiefly Mongolian, and there are many different tribes and races known as Tibeto-Burmans. There are only about twelve million people to about 240,000 square miles, or roughly fifty to the square mile. Hence, as the soil is fertile, the people are better off than those of India, getting plenty of food with little labour. Burmese and Karen are the chief languages, and Buddhism the chief religion. The Burmese are, on the whole, better educated than the people of India, but they are not particularly hard-working and enterprising.

239. The capital of Burma is *Rangoon*, on the eastern branch of the Irawadi delta, with three lakhs of inhabitants. It is the third port of the Indian Empire, and has large rice mills and rice and teak export trade. It contains the famous Golden Pagoda, over 300 feet in height. Most of its trade is done by Parsis, Hindus, Mohammedans, and

Sikhs, who form half the population of this city. *Moulmein*, at the mouth of the Salwin, has a large teak trade, and exports much rice. *Bassein* has also a large rice trade. *Prome* is an important trading town. *Bhamo*, in the north, is the market of the overland China trade.

Since 1885, when Burma became a British province, it has flourished prospered, and progressed very greatly.

8. *Assam.*

240. Assam was made a Chief-Commissionership in 1911 when separated again from E. Bengal. In 1920 it became a province under a Governor.

The climate of Assam is very damp, the rainfall abundant, and the heat never excessive. In consequence it is very fertile. Tea, rice, and jute are principally cultivated and exported, also oranges, silk, and rubber. It contains enormous forests full of wild game. Cotton weaving and silk manufacture are still carried on as home industries. Many coolies go from Chota Nagpur, Central Provinces, and Madras to work in the tea gardens.

241. The chief towns are Gauhati, Dibrugarh, and Sibsagar on the Brahmaputra and Shillong in the Khasi hills, the seat of Government. Baniyachang, a village township, has the largest population. Transport in Assam is mostly by water though there is the Assam Bengal railway. Good quality coal is mined at *Ledo* and there are oil wells at *Makum*.

9. *The Central Provinces and Berar.*

242. The climate of the Central Provinces, now administered by a Governor, is good and the soil fertile. In the east both monsoons bring moisture. Berar has black soil and produces much cotton. Elsewhere rice, pulses, grain, and oil-seeds are grown.

The Bengal-Nagpur railway from Calcutta meets the Great Indian Peninsular at Nagpur, another line of which meets the East Indian at Jubbulpore. Other lines from north to south

are being constructed. Roads are fairly good but the rivers not navigable. Some coal is found and manganese ore is also mined.

243. The capital is Nagpur, an important trading centre, and where there are several large cotton mills. Jubbulpore is an important town and military station. Pachmarhi in the hills is the hot-weather seat of Government. The population is about 12 million, mainly Dravidian, of whom 10 millions are Hindus. Hindi and Marathi are the principal languages.

10. *The North-West Frontier Province.*

244. The climate of this province is continental and extreme, there being great variation between the temperatures of summer and winter and between those of night and day. It is similar to that of the Punjāb, but (the province being farther from the sea and farther north) is more severe.

The rainfall is scanty, and the cultivated lands are mainly along the river valleys. Wheat is the chief crop. Pulses, barley, and maize are grown and a certain amount of cotton. Irrigation does something to make up for scanty rainfall and about 1,500 square miles of land are watered by canals.

245. *Peshawar*, by the Khaibar Pass, is the chief town, and has about a lakh of inhabitants. It is strongly garrisoned and is the great gateway between India and Afghanistan. The North Western Railway connects it with Karachi and Lahore.

There are not $2\frac{1}{2}$ million people in this province (of which the area is nearly 17,000 square miles) and hill tribes form a large proportion of the population.

Urdu and Punjābi are spoken in the plains and Pushtu in western mountains.

11. *Baluchistan.*

246. *Baluchistan* also, for the same reason, has a very extreme climate and is partly a desert through lack of rain. Cultivation being difficult, the population averages only 5 to the square mile.

247. *Quetta,* the capital, has a better rainfall and the country round produces fruit, wheat, and millets. It is a very important military post, 3 miles from the Bolan Pass, and on a great overland trade route. The Staff College of the Army is there. The people of Baluchistan, partly Dravidian, partly Turko-Iranian, are pastoral and nomadic. British Baluchistan, over 8,000 square miles, forms the north-western portion of Baluchistan, and includes Quetta. The Sind-Pishin railway joins Quetta to India.

B. Native States.

12. *Hyderabad (or the Nizam's Dominions).*

248. This is the largest and most important of the Protected States. It has an area of some 83,000 square miles and nearly twelve million people.

Being plateau country, Hyderabad[1] has a cool and dry climate for the greater part of the year. The rainfall varies from 30 to 40 inches—both monsoons having lost much of their moisture before their arrival.

In the north-west the black cotton-soil prevails and a large quantity of cotton is produced. Millets, rice, indigo, and oil-seeds are cultivated, and some wheat in dry districts. There is much jungle but few useful trees.

The Great Indian Peninsular Railway runs through this state to Raichur and there joins the Madras and Southern Mahratta Railway, while the Nizam's State Railway runs from Wade to Golconda, Hyderabad, Warangal, and Bezwada, where it joins the Madras and Southern Maratha Railway and the East Coast Railway.

249. The capital is *Hyderabad* on the Musi, with some half a million inhabitants, many of whom are Arabs and Pathans. It is the next largest city to Madras in southern India. Close to it is Secunderabad, the British cantonment, and one of the largest military stations in India.

[1] Also spelt Haidarabad.

The people are Dravidian, and though chiefly Hindu are ruled by a Mussulman prince, a descendant of the viceroy of the Moguls. Telugu is spoken in the east, Kanarese in the south, and Marathi in the west.

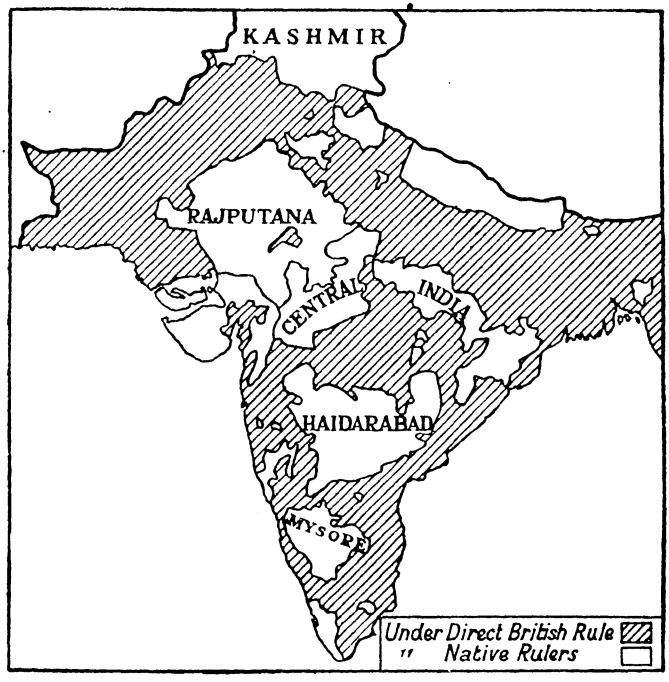


FIG. 93. Parts of India governed by Native Rulers.

13. *Baroda.*

250. *Baroda* is the most important of the Gujerat states which lie round the Gulf of Cambay. It has a population of about two millions, and an area of some 8,000 square miles.

The most important towns in the territory of the Gaikwad of Baroda are *Baroda*, the capital, with about a lakh of inhabitants; and Deesa, which is a military station. The climate and productions of Baroda are those of Gujerat.

14. *Mysore and Coorg.*

251. The climate of Mysore is cool owing to its elevation, and the rainfall is only heavy along the mountains of the west and south. The soil is rocky and sandy, and the average rainfall of from 25 to 35 inches is insufficient. Rivers and irrigation are widely used for cultivation, and as in Madras under similar conditions, large tanks are very numerous.

Ragi (a small millet) is the chief crop, rice and sugar-cane along the river valleys, and cotton in the north.

Teak and sandalwood are obtained from the forests, and in the hills of the south-west are cinchona (quinine) and coffee plantations. Gold is mined at Kolar, and recently many industrial enterprises have been started in the State, iron works, mills, &c.

The Madras and Southern Maratha Railway connects Bangalore with Madras and Bombay, and Mysore State Railway with Mysore city. Roads are numerous and good.

252. *Bangalore* is the seat of the Government and a British military station. Mysore is the Maharajah's residence. The people are Dravidian and mostly Hindu. Kanarese is the principal language.

253. *Coorg*, a small British province, lies to the south-west and is administered by the Resident at Mysore. Mercara is the chief town.

Travancore (capital, Trivandrum) has a population of $3\frac{1}{2}$ millions. Rice is the chief product and coffee is grown in the hills. The State lies on the Malabar coast, and is well served by waterways and railways. Cochin is a smaller state adjoining and has valuable forests. Ernaculum is the capital. Both these states are well governed and progressive, especially as regards education.

15. *Kashmir.*

254. The climate of Kashmir is one of the most pleasant and wholesome in the world. In winter it is sufficiently cold

to be bracing and in summer not hot enough to be enervating. (On the mountains the cold is, of course, very great.) The rainfall is scanty. On the hills of the south are fine forests of deodar and other trees. Fruits, millets, wheat, and barley are grown in the valleys. Flowers grow everywhere in the Vale of Kashmir.

The Indus, Gilgit, Jhelam, and Chenab all water Kashmir and help to make it one of the most beautiful countries in the world. The people are Aryans and are fair, handsome, and strong.

255. *Srinagar* the capital, on the Jhelam, with about 130,000 inhabitants, is a flourishing town in a beautiful spot. It was the summer residence of the Mogul Emperors. Kashmir shawls are made here from the hair of the Kashmir goat. It is an important trade-route junction, and has silk and carpet industries. *Leh*, the chief town in Ladakh, is one of the highest towns in the world (11,000 feet). *Jammu* is the chief town of the lower southern region of Kashmir. The State has no railways and travellers go by road from Rawalpindi.

16. *Nepal.*

256. Lying, as it does, along the Himālayas, the rainfall of Nepal is heavy. At the foot of the hills is the belt of malarial tropical swampy country called the *terai*. Thick forests clothe the lower slopes of the mountains and produce *sal* and *sissoo* wood. Rice grows in the valleys, and in drier districts wheat, barley, millets, and oil-seeds.

The people are Gurkhas (of Aryan origin) and Tibeto-Burmans (of Mongolian origin). The Gurkhas are fine soldiers and enlist in the Indian army.

257. *Khatmandu* is the Gurkha capital, and *Patan* the former capital.

Bhatgaon is the chief trading centre, dealing in cattle, hides, wheat, tobacco, oil-seeds, and timber, which are exchanged for cotton and woollen goods, hardware, leather, sugar, petroleum, and salt, from India.

17. *The Rajputana Agency.*

258. Rajputana consists of twenty Native States supervised by the Agent to the Governor-General in Rajputana.

The chief of these are the Rajput states of Jodhpur, Jeypur, Udaipur, Bikanir, Alwar, and Kotah. There are two Jat states, Dholpur and Bharatpur; one Mohammedan, Tonk; one British, Ajmer-Merwara.

The climate of Rajputana is hot and dry, but less so in the east than in the west. This is due to the fact that the Aravalli mountains cross the Agency and bring a fair rainfall to the eastern portion. Here the soil is fertile and well-watered, producing millets and pulses, oil-seeds, cotton, wheat, barley, and sugar. The western part of the country is mostly sand and desert, and has barely 5 inches of rain a year.

Salt is obtained in large quantities from the Sambhur Lake near Ajmer and from Luni.

Railways run from Ajmer to the North Western line and Baroda, and from Sambhur to Delhi and Agra.

The largest town in the Agency is *Jeypur*, with one and three-quarter lakhs of inhabitants.

259. *Ajmer* is the capital of Ajmer-Merwara and contains a famous Chiefs' College.

Udaipur[1] is the capital of the principal Rajput kingdom.

Abu is a sanatorium and summer seat of the Agent.

The Rajputs are of pure Aryan descent and are brave men and fine soldiers. The population of the Agency is about ten million, eight million of which is Hindu and one million Mohammedan. Jains are numerous. The chief languages are Hindi and Rajasthani.

[1] Old spelling Oodeypore.

PART III

ASIA

CHAPTER XII

PHYSICAL FEATURES AND CLIMATE OF ASIA

260. **Position.** The mainland stretches from the equator to within 12° of the Pole, or including the islands on the con-

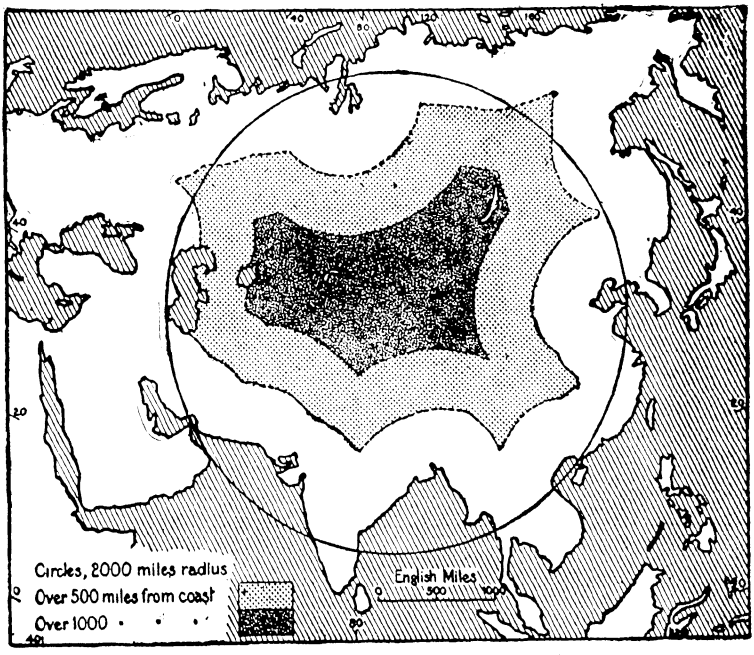


FIG. 94. Map of Asia showing Distances from the Coast.

tinental shelf from 10° S. To the west it is bounded by Europe, the Black Sea, the Mediterranean, and the Red Sea, the latter separating it from the continent of Africa. It stretches east through 154°, to 170° W., where it is less than

40 miles from the American coast. Its area is about 17,000,000 square miles, or between four and five times that of Europe.

261. Seas, Gulfs, Peninsulas, Islands. The greater part of the continent is a compact mass lying between the tropic of Cancer and 77° N. (see Figs. 94 and 95). Three great peninsulas,

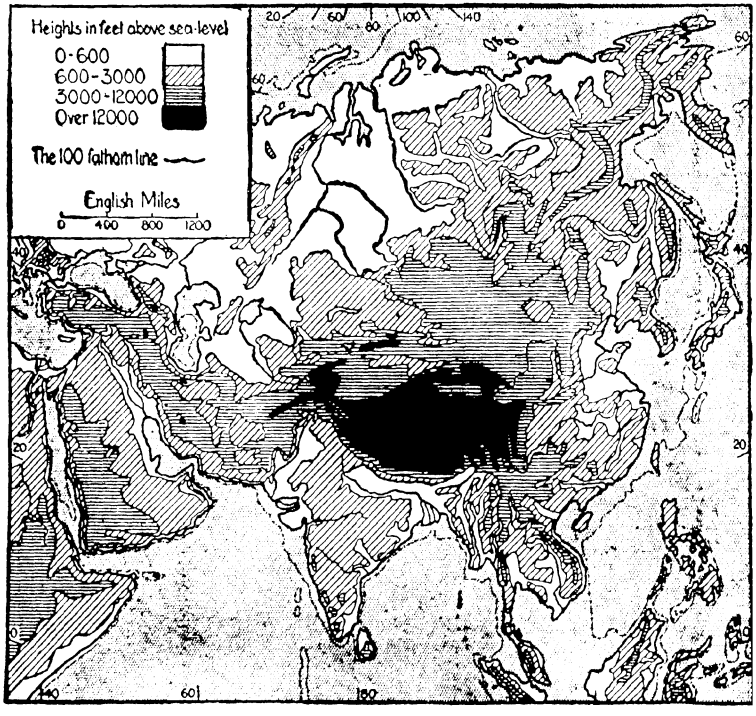


FIG. 95. Relief of Asia.

Arabia, the Deccan or India, and Indo-China, project on the south into the Indian Ocean, and are separated by its gulfs, the Arabian Sea between Arabia and India, and the Bay of Bengal between India and Indo-China. Notice the almost landlocked Persian Gulf, between the eastern coast of Arabia and the mainland. On the east coast a fringe of islands and

peninsulas enclose four seas. These are the South China Sea, enclosed by the East Indian Islands, Sumatra, Java, Borneo and Celebes, and the Sunda, Molucca, and Philippine Islands; the East China Sea, enclosed by Formosa, and the Lu Chu Islands; the Sea of Japan, by the Japanese Islands; and the

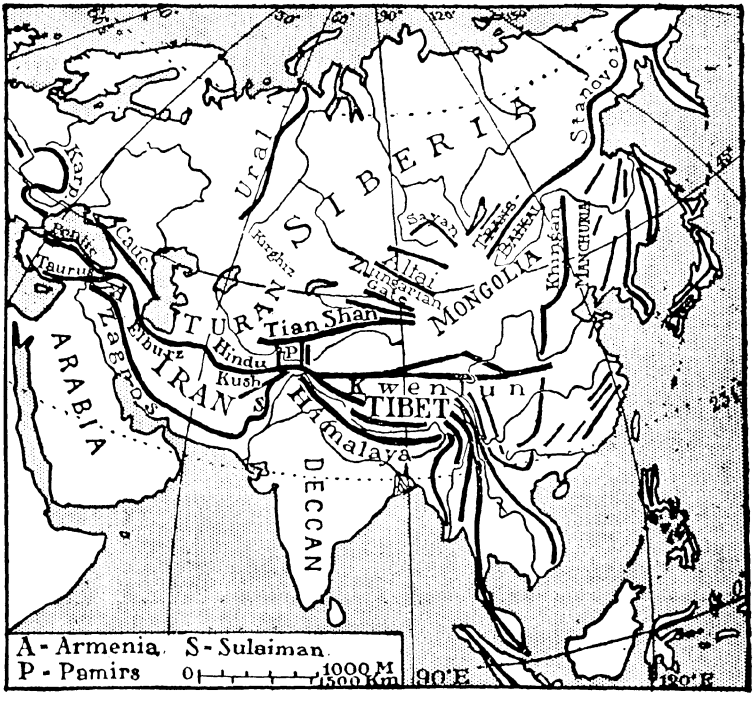


FIG. 96. Key to Relief of Asia.

Sea of Okhotsk, by the Kurile Islands and the Kamchatka peninsula.

262. Physical Features. Look at the map in Fig. 95 showing the relief. Lines are drawn at 600 feet below sea-level, and at 600 feet, 3,000 feet, and 6,000 feet above sea-level. Notice that about a quarter of Asia is less than 600 feet above sea-level, and that by far the greater part of these lowlands

are in the north and west. The highlands form the remainder of the continent, with smaller lowlands round the lower courses of the rivers. About one-twelfth of the continent is over 10,000 feet above sea-level.

We may divide Asia into five belts:

(1) The Northern Lowland.
(2) The Central Mountains, with their marginal lowlands.
(3) The Southern Tablelands.
(4) The Eastern Highlands.
(5) The Eastern Volcanic Chain.

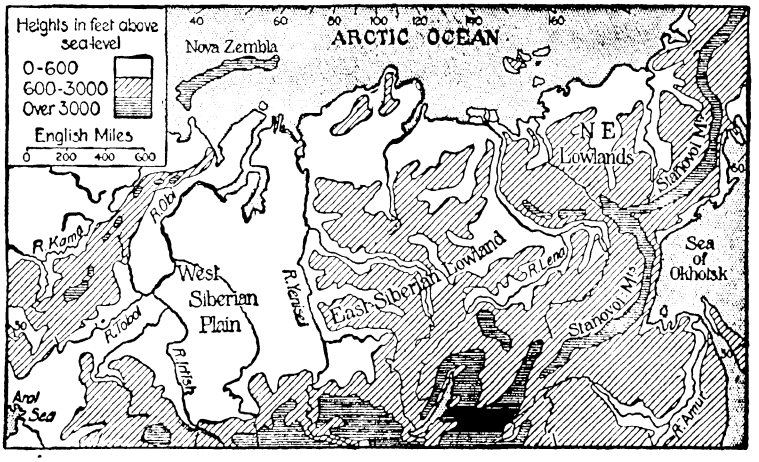


FIG. 97. The Northern Lowlands of Asia.

263. The Northern Lowland is continuous with the Great Plain of Europe. The two continents form one vast continent, which is often called *Eurasia*. The Northern Lowland of Asia and the Plain of Europe form the Eurasian Lowland.

The Northern Lowland is broadest in the west, and narrows towards the east. In the south and east it rises to the Central Mountains and the Eastern Highlands. It consists of the plain of Turan in the south-west, and of the Siberian Lowland in the north.

264. Turan, the south-west corner of the Northern Lowland, is drained not to any ocean but to a hollow in the centre, the Sea of Aral, a basin of inland drainage like the Caspian. Its rivers are the Amu Daria, or Oxus, and the Syr Daria. To the south and east it is bounded by the lofty walls of the Hindu Kush, the Pamirs, and the Tian-shan, or Celestial Mountains. In the north-east it is separated by low heights from the Siberian Lowland. Turan consists partly of steppe, and partly of sandy desert, with fertile valleys.

265. The Siberian Lowland consists of three parts. In the west it is a low, flat, swampy plain, drained by the Ob and its tributaries to the Arctic Ocean. The eastern and higher part forms a low platform drained by the Yenisei and the Lena to the same ocean. East of the Lena are the North-eastern Lowlands, enclosed by the Verkhoyansk and Stanovoi Mountains, which form part of the Eastern Highlands (see Fig. 97).

This Northern Lowland resembles Russia in its general character. Along the Arctic Ocean extends the tundra, where in spring the rivers melt, and flood the surrounding country. South of the tundra are the forests, coniferous in the north, and mixed with deciduous woods in the south. South of the forest zone, or taiga, as it is called in Siberia, are steppe lands, passing into desert in Turan.

266. The Central Mountains are the largest and loftiest mass of highlands in the world. They are a continuation of the highlands of Europe. They widen out from west to east, where they occupy the entire centre of the continent. Three chains or groups, running from west to east, can be seen. The northern chain is the Caucasus and the Tian-shan. The central chain, which is the best marked, includes the Pontic Mountains, the Elburz range, the Hindu Kush, the Pamirs, and the Kwenlun Mountains. Between the northern and central chains lie a series of hollows, the Black and Caspian Seas in the west, and the Tarim basin, enclosed between the

Tian-shan and the Kwenlun, in the east. The southern chain is represented by the Taurus, the Zagros and Sulaiman Mountains, and the mighty Himālayas. Between the central and southern chains lie the plateaus of Asia Minor, Iran, and Tibet. In the Armenian Highlands and the Pamirs these three chains are brought close together, by the narrowing of the mountain belt (Figs. 95 and 96).

267. Most of these mountain systems consist of many ranges, with plateaus and valleys between. The Caucasus is like parts of the Alps, but with some cones of extinct volcanoes, the highest of which, Elbruz, rises to over 18,000 feet. Its lowest slopes are covered with beech forest, with grassy pastures above. The Tian-shan, by no means the longest range in the Central Mountains, extends for a distance as great as that from London to Petrograd. Its northern slopes fall steeply to the lowlands of Turan and Western Siberia, its southern slopes equally steeply to the Tarim basin. Many of its peaks are above the snow-line, and its glaciers and snow-fields are very large. They feed the Amu and Syr Daria, the former rising in the Pamirs. Their upper courses flow first in great gorges and then through fertile mountain valleys, sinking at last to the plain of Turan, over which they flow, growing smaller, to the Aral Sea. The scenery of the Central Chain is very varied. Its many ranges differ in height, steepness, breadth, and in the rocks of which they are made. In the Armenian Highlands rise the Euphrates and Tigris, flowing through wild gorges to the lowland of Mesopotamia. The Hindu Kush is a broad and lofty system, which forms the southern wall of the gorge of the upper Amu. The finest of all the mountains of Asia are the Himālayas, which rise steeply above the lowlands at their southern base. From the plains they look like a wall of forest, crowned with peaks of eternal snow.

268. Everything we know of mountain scenery is here seen on a huge scale. The forests are more dense, the snow peaks more dazzlingly beautiful, the glaciers vaster, the precipices higher, the gorges steeper and more profound, the roaring rivers which rush through them, between walls thousands of feet in height, more terrific in strength and volume than anywhere else in the world. By forest, gorge and precipice, piled like a giant staircase from three to four miles high, they climb to the passes leading to the plateau of Tibet, above which their snowy peaks rise a mile or two higher still (Fig. 95). Mount Everest, the highest mountain in the world, is 29,000 feet, or

nearly six miles in height (Fig. 98). No foot has yet reached it, and the way is barred by peaks almost equally big.

269. Rivers from the Central Mountains. Three great rivers rise in the glaciers of the Himālayas, all of which break through the mountains in great gorges and defiles, which in places cannot be climbed. The Indus gathers up the waters of the western Himālayas, and flows south to the Arabian Sea. The Ganges with its many tributaries collects the waters of the Central Himālayas, entering the Bay of Bengal

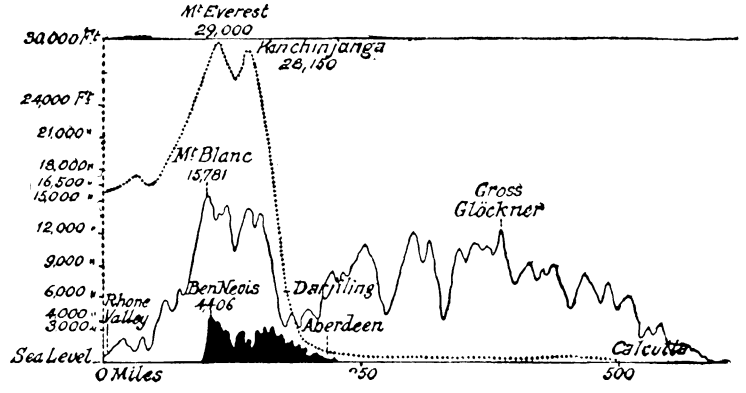


FIG. 98. Comparative Height and Breadth of Himālayas, Alps, and Scottish Highlands.

by a vast swampy delta, where it is joined by the third river, the Brahmaputra, which has found its way over the plateau of Tibet, and round the eastern margin. At the eastern edge of the plateau of Tibet the mountains turn south, and break up into the parallel ranges of Indo-China, separated by densely forested gorges, in which the rivers Irawadi, Salwin, Mekong, and others flow south to the sea. The glaciers of Eastern Tibet give birth to the Hwang-ho and the Yang-tse-kiang. Their upper courses are in wild and little-known gorges, their middle courses cross the Eastern Highlands, and their lower courses form the fertile lowlands of China.

270. The Lofty Plateaus. Asia Minor, Iran, and Tibet are all rugged plateaus, above whose surface rise many mountains. The valleys, though often steep, are fertile, especially in Asia Minor and Iran. Even in Tibet, which lies nearly three miles above the level of the sea, there are a few valleys where agriculture is possible. Much of the area of all these plateaus, however, is fit only for poor pasture.

271. Southern Lowlands. South of the Central Mountains are the marginal lowlands, varying from a mere strip along the coast, as in Asia Minor and Iran, to broad and fertile plains round the lower courses of the rivers. Look at Fig. 96 and find the plain of Mesopotamia, consisting of the lower basins of the Euphrates and Tigris, flowing to the Persian Gulf; the plain of Hindustan, formed by the lower basins of the Indus and the Ganges, walled in by the Sulaiman, Hindu Kush and Himālaya Mountains; the plain of Burma round the lower Irawadi; the plain of Siam round the lower Menam; and the plain of Cambodia round the lower Mekong. These lowlands are very fertile. In the plains of Mesopotamia and Hindustan irrigation is necessary, but the rivers supply abundant water for this purpose.

272. The Southern Tablelands, Arabia and the Deccan, lie south of these lowlands.

Arabia is separated from Africa by the Red Sea, at the head of which is the narrow isthmus of Suez, joining the two continents. It is a tableland, highest in the west and sloping eastwards to the Persian Gulf. The western part is covered with poor pasture, broken up by deep, steep, fertile valleys. Farther east are sandy deserts, with fertile spots known as oases (Fig. 99). A narrow strip of sandy infertile lowland borders the tableland, widening in the east to the Mesopotamian plain.

The tableland of the Deccan lies south of the plain of Hindustan. It also is highest in the west, where its margin, rising steeply above the narrow coastal lowland, is known as the Western Ghāts, which means steps. Its southern end forms the Nilgiri Hills. It slopes to the east, and most of its rivers

such as the Godavari and Kistna or Krishna, flow in that direction to the Bay of Bengal, except the Narbada and Tâpti, in the north-west, which flow west. To the south, separated by the shallow Palk Strait, is the island of Ceylon, low in the north, but mountainous in the south.

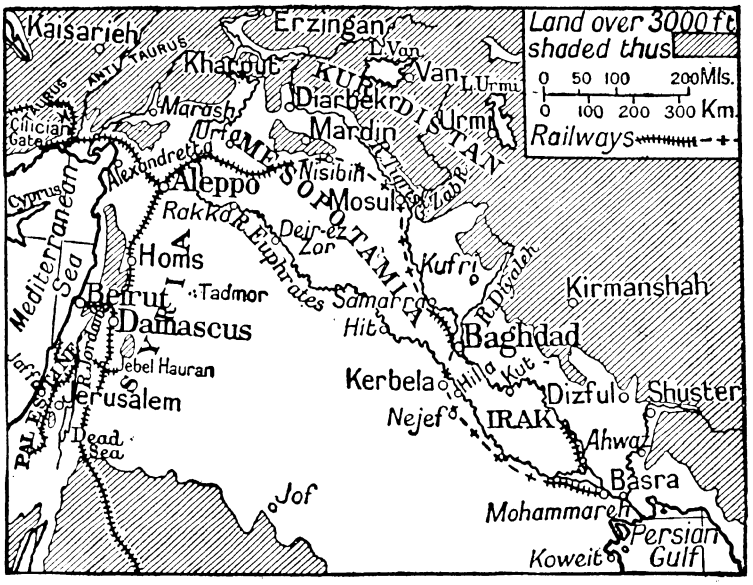


FIG. 99. Syria, Mesopotamia, and Northern Arabia.

273. **The Eastern Highlands** are much older and less lofty than the Central Mountains, to which they bear the same relation as the Central European Highlands bear to the Alps. The long narrow Lake Baikal separates the Sayan and Altai mountains to the west, from the Yablonoi, or Trans-Baikal Highlands to the east. To the south is the Mongolian plateau, composed of deserts and poor steppes, stretching to the base of the Central Mountains. The eastern edge of this plateau forms the Khingan Mountains, overlooking the lowland of Manchuria drained by the Amur, and the North China Highlands, overlooking the plain of North China. To the

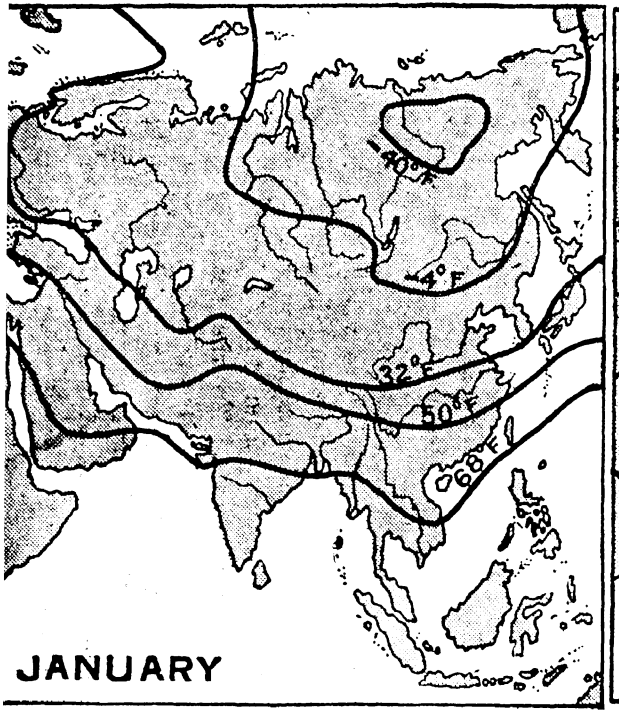


FIG. 100. Mean Temperature in January reduced to sea-level.

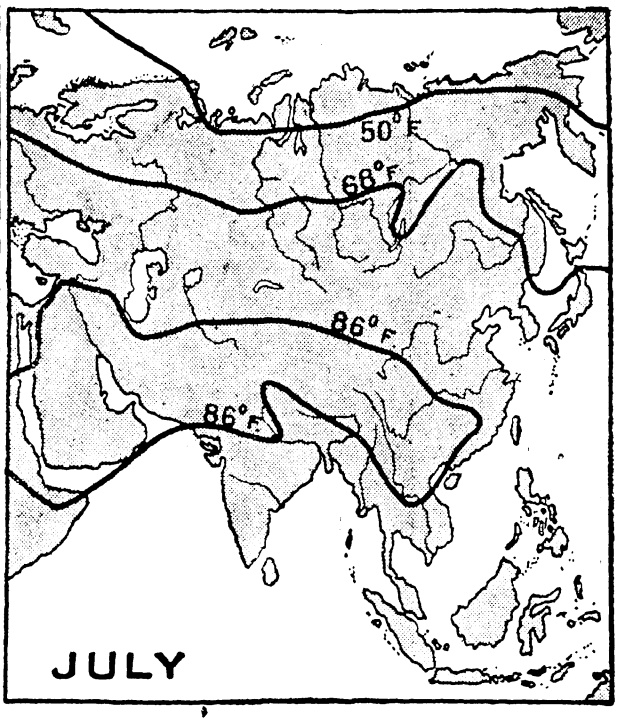


FIG. 101. Mean Temperature in July reduced to sea-level.

south of this plain are the extensive South China Highlands, between Tibet and the sea.

274. **The Eastern Volcanic Chain** runs through Kamchatka, the Kurile Islands, Japan, the Lu-chu Islands, and the Philippines. It has fertile soil, deep valleys, and steep conical mountains, of which Fujiyama, the sacred mountain of Japan, is the most perfect.

CHAPTER XIII

THE CLIMATE, NATURAL REGIONS OF ASIA AND THEIR PRODUCTS.

275. **Climate.** Two facts join to make the climate of Asia very varied. The first is its great extension from north to south, the extreme north being within the Arctic Circle, the extreme south quite near the equator. The second is its great difference of height, which varies from sea-level to the summit of Mount Everest, nearly six miles higher.

Over most of Asia the climate is marked by great extremes. We saw in Europe the influence of the ocean in making climate equable[1]. In Asia the land mass is much more compact. Look at the diagram in Fig. 94. It shows a circle whose centre is the west of the Mongolian plateau, and whose radius is 2,000 miles in length. Notice that this circle includes almost no sea. The same diagram shows how great a proportion of the continent is over 500 miles from the sea, while the interior is over 1,500 miles from it. A very small proportion of the continent, therefore, is made equable by the neighbourhood of the sea.

276. Look at the map in Fig. 100 and notice how large an area of the land is under the freezing point in January, and how only the south and south-east are free from frost. Notice

[1] Steady, level, equal, having no great changes.

on the other hand in the map in Fig.101 that in July the greater part of the lowlands in the interior are at least as warm as the Mediterranean, and that only the extreme north and the high mountain areas have low temperatures.

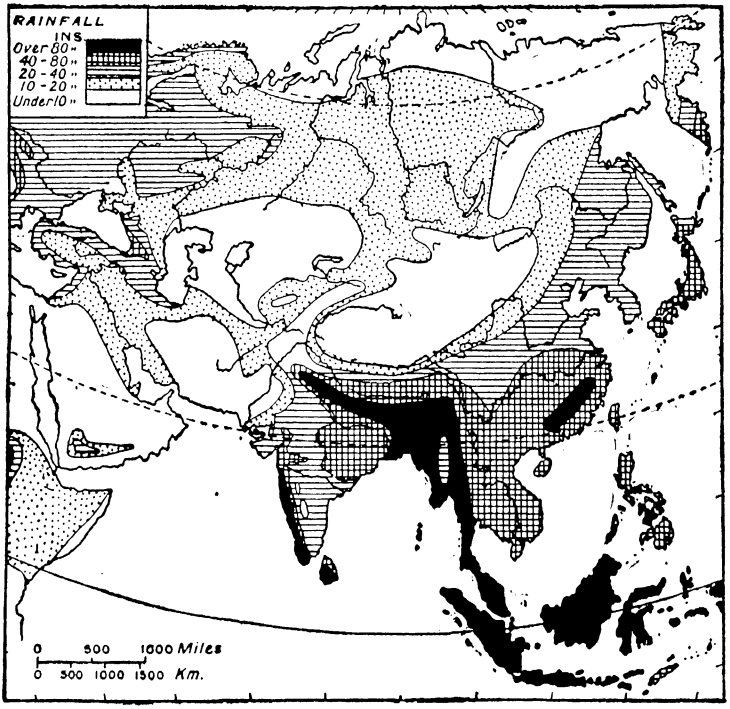


FIG. 102. Mean Annual Rainfall of Asia.

Now look at the rainfall map in Fig. 102. Notice that only the margin of the continent from Kamchatka to the Deccan and a narrow strip round the Mediterranean has over 20 inches rainfall. Two-thirds of the continent receives very little rain.

In winter the winds blow out from the land to the ocean, so that little rain falls at that season except round the Mediterranean, and on the north-east coast, north of Korea, where

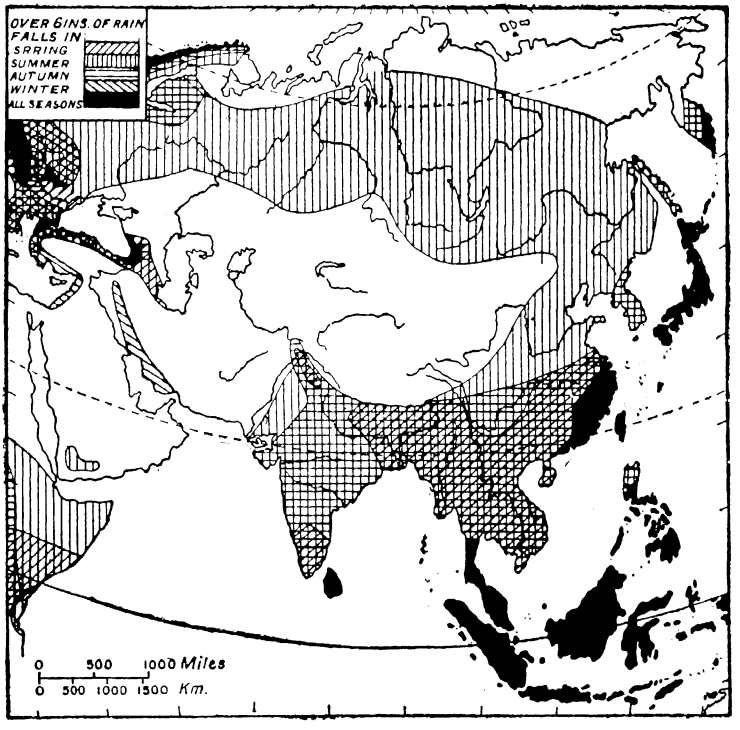


FIG. 103. Seasonal Distribution of Rainfall in Asia.

winter storms occur. In summer, except in the Mediterranean, the winds blow in from the sea, bringing rain from the ocean, so that summer is the wetter season. As the seas lie to the south and east most of their moisture is stopped by the

lofty mountains of these regions and very little reaches the interior. Only in the northern lowlands, where there are no high mountains, is there a belt of rainfall across the interior of the continent.

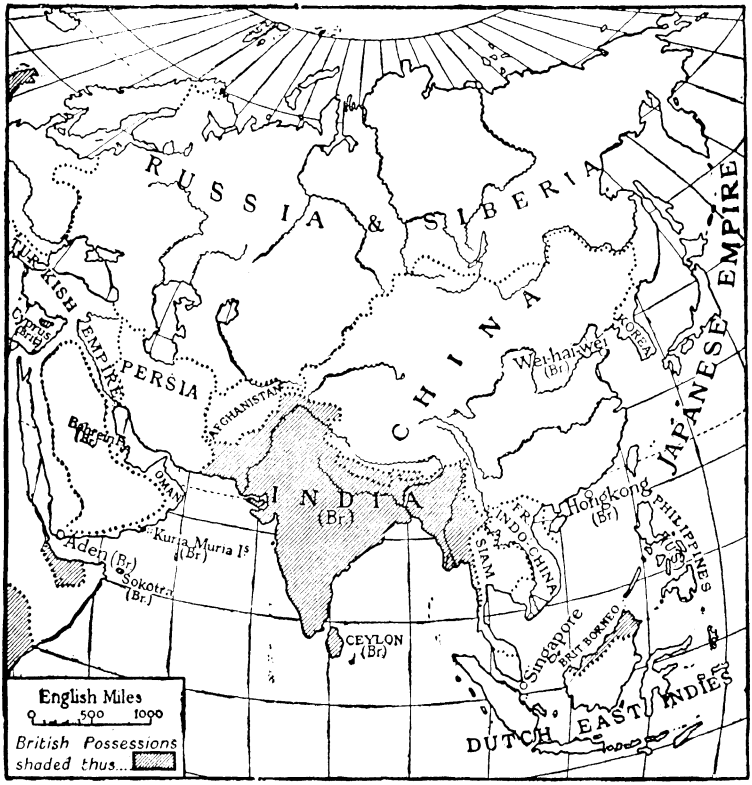


FIG. 104. Political Divisions of Asia. The British possessions are shaded.

The winds of the Indian Ocean are called Monsoons. They blow outward from the north-east in winter, which is the dry season, and inwards, from the south-west, in summer, which is the wet season. The same name is often given to the out-flowing and inflowing winds of eastern Asia.

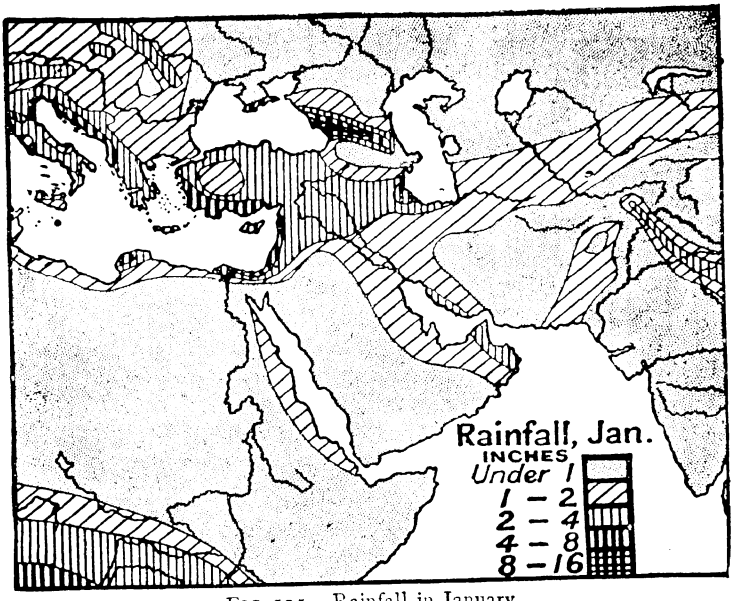


FIG. 105. Rainfall in January.

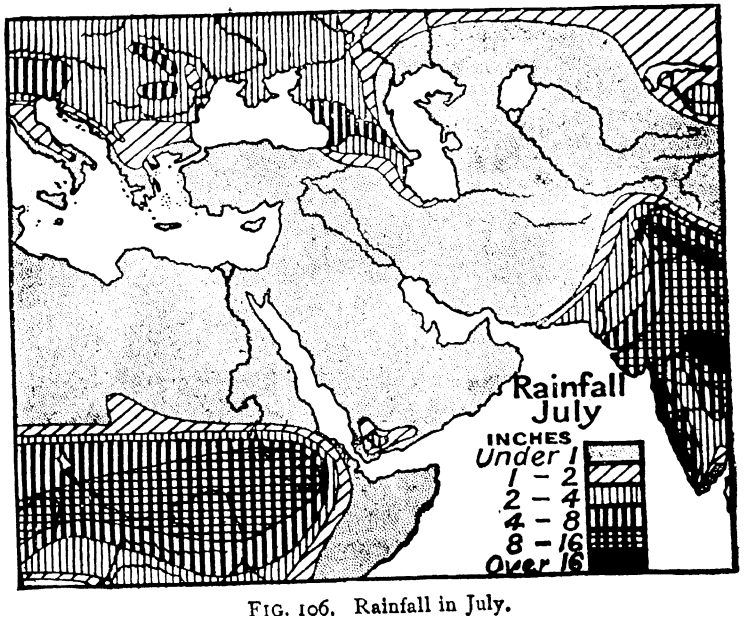


FIG. 106. Rainfall in July.

277. Natural Regions of Asia. We may group the lands of Asia, according to their climate, vegetation, and products, as the Mediterranean lands, the Siberian lands, the Desert lands, and the Monsoon lands. The political divisions are shown in Fig. 104.

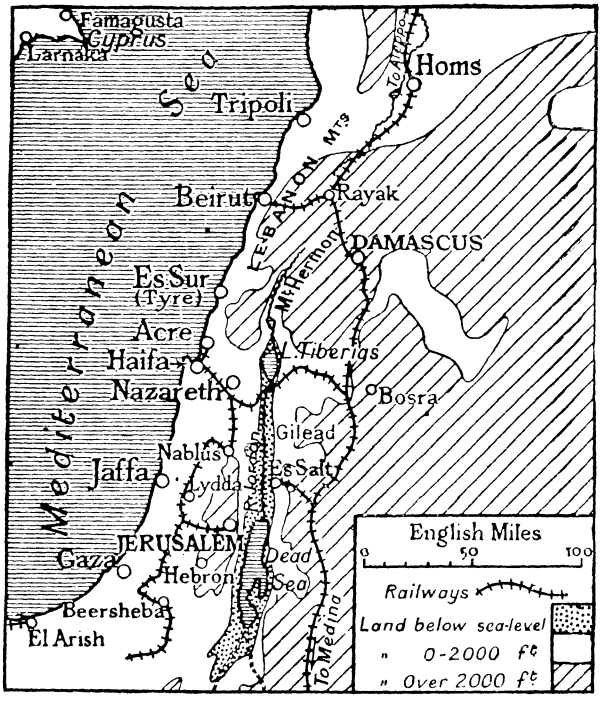


FIG. 107. Palestine.

278. The Mediterranean Lands. These stretch from the Mediterranean to the plateau of Iran. They include Asia Minor, Syria, Palestine, Armenia, and Mesopotamia, which all belonged to the Turkish Empire down to the great war, the Russian territory of Transcaucasia, and the kingdom of Persia. All have the Mediterranean climate with warm, dry summers, mild winters and winter rains, but the heat increases

rapidly to the south and away from the sea, and the rainfall diminishes (see Figs. 105–6). It is therefore difficult to draw the line between the Mediterranean and the desert lands. The products belong to the Mediterranean type. The cereals include barley, wheat, maize, and millets. The vine is largely

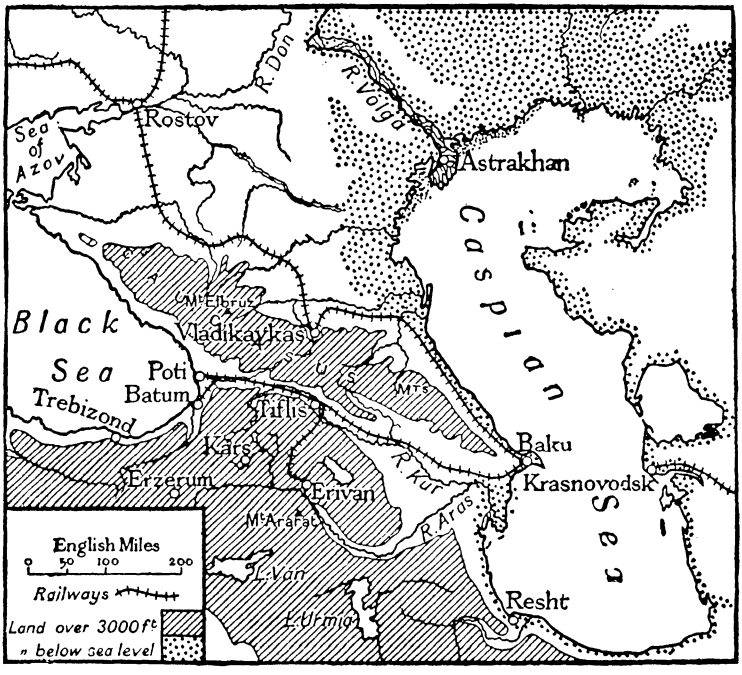


FIG. 108. Caucasia.

grown round the Mediterranean for raisins, but inland becomes less important than the fig, pomegranate, peach, and apricot. The mulberry is widely grown as a shade tree and for silk-worms, and cotton, tobacco, and the opium poppy are largely grown. The date-palm becomes important towards the desert edge. Irrigation[1] is necessary everywhere. Camels, goats,

[1] Watering by means of canals, wells, water-wheels, and pumps.

and sheep are kept on the plateaus and in the highlands, and the manufacture of rugs and carpets is carried on (see Figs. 107–8).

279. Caucasia. The Russian territory of Caucasia (area about 181,000 square miles) is the best developed of these lands. It includes the fine forested slopes of the Caucasus, the valleys with their vineyards, orchards, and fields of maize, cotton and tobacco, the minerals of the Caucasus, and the vast deposits of petroleum around the Caspian. The centre of the petroleum region is Baku, on the Caspian. The chief inland town is Tiflis, on the cliffs of the Kur river. A railway connects Baku with Batum on the Black Sea, through the fine forested gorge of the Rion, with the lowlands cleared for maize. At every station are long sidings for railway oil tanks. Armenians, Georgians, and wild mountain tribes inhabit the territory.

280. Asia Minor, Syria, and **Mesopotamia** (area about 650,000 square miles) present a great contrast with Caucasia in the neglect of their natural riches. Irrigation is backward, and tracts which might produce rich crops are allowed to serve for poor pasture. Railways are little developed, and much of the trade is done by camel caravan. On the Black Sea the chief port is Trebizond. To the south are the highlands of Armenia and Kurdistan, with Erzerum as the largest town. Smyrna, on the Aegean, exports fruits, cotton, opium, figs, carpets, sponges, &c. Syria, to the south, with Palestine, and its capital Jerusalem, are poorly cultivated and thinly peopled. The oranges of Jaffa are famous, and tobacco and silk are important. The capital is Damascus, an important centre of caravan trade, connected by rail, across the Lebanon range, with Beirut, on the Mediterranean. Aleppo, farther north, is a great meeting-place of routes, on the shortest route from the Mediterranean to Mesopotamia, once the granary of Asia, which has fallen into decay through the ruin of its irrigation system. Wandering tribes of herdsmen and robbers form the scanty population of what should be a garden. The dates of the lower

Tigris and the Persian Gulf are exported from Basra. The chief towns are Mosul and Baghdad, both on the Tigris, which is navigable for river steamers to the latter town (see Fig. 101). It is thought that Mesopotamia might be made as fertile as it was in early history. The Turks did some irrigation and

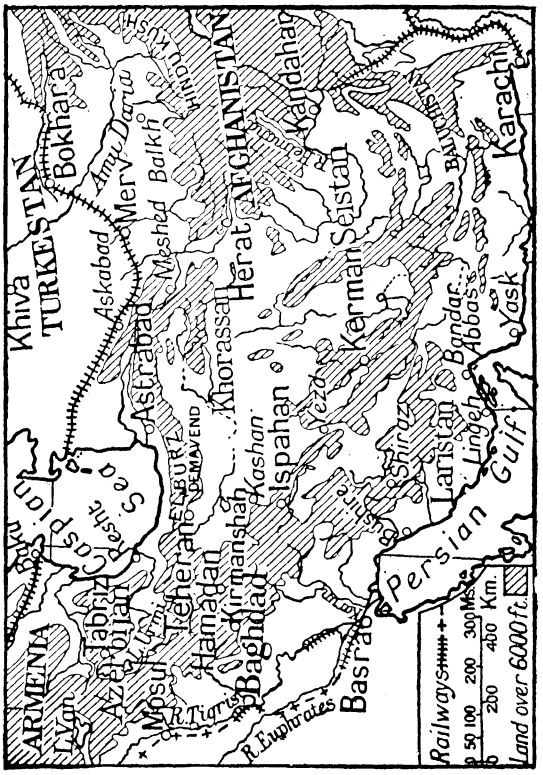


FIG. 109. Persia.

drainage work under British guidance before the war, and more may be done in future.

281. Persia. Persia (area about 630,000 sq. miles) is like the lands west of it, but a greater proportion of the surface is salt or sand desert. The villages are chiefly in the mountain valleys, and the dry plains are thinly peopled. Water is

brought for many miles in underground channels and wherever it comes it brings fertility. Communication is by mule or camel caravan, while Persian horses are famous. Roads are bad, and railways few. The capital is Teheran, at the foot of the Elburz mountains. The other towns are Tabriz and Resht, in the north-west, Ispahan and Shiraz, in the centre, and Bushire on the Persian Gulf (see Fig. 109).

282. **Cyprus,** in the Mediterranean, resembling Asia Minor in climate and products, is ruled by Britain.

283. **The Siberian Lands.** The Siberian lands (area nearly 5,000,000 sq. miles), the great northern lowland of Asia, have all the varieties of climate of Eastern Europe, but in a more extreme form, and with less rainfall, owing to its greater distance from the sea. Siberia is in fact an extension of Eastern Europe, the Urals forming no true boundary. Its tundra, forests, steppes, and deserts are a continuation of the same zones in Russia.

284. **The resources**[1] of Siberia, though far from fully developed, are very great. Its forests supply all kinds of forest produce, and form the greatest fur district in the world. In the Urals and the Eastern Highlands the mineral wealth is great. In the lands south of the forest great harvests of wheat are grown in the rich black earth. In the steppes flocks and herds support a wandering population, and supply sheepskin and felt from the sheep, leather and saddlery from oxen and horses, camels' hair cloth, rugs, carpets, tallow, &c. The margin of the desert of Turan (area about 1,500,000 sq. miles) is being brought under cultivation, and in the oases of Khiva, Merv, Bokhara, Samarkand, Tashkent, Khojent, and Khokand, cotton and the fruits and cereals of hot countries ripen.

285. **The chief towns of Siberia** are Omsk and Tomsk on tributaries of the Ob, and Irkutsk near Lake Baikal. These are towns which combine streets impassable from mud with the fine buildings and the wealth and comforts of European cities. A railway, the Trans-Siberian line, runs from Europe

[1] Productions of all kinds, mineral, vegetable, and animal.

and Russia across the steppes to Omsk, the 'capital of the steppes', and thence through the forest past Krasnoyarsk, on the Yenisei, to Irkutsk, the chief town of Siberia. The line runs south of the lake, and one branch crosses the highlands to the east, and continues across Manchuria to the Pacific, which is reached at Vladivostok, on the sea of Japan, while a southern line passes by Mukden to Port Arthur, and to Peking, &c. Another branch runs north of the river Amur and east of its tributary the Ussuri, also ending at Vladivostok. The Amur is navigable; its chief ports are Blagovestchensk and Khabarovsk.

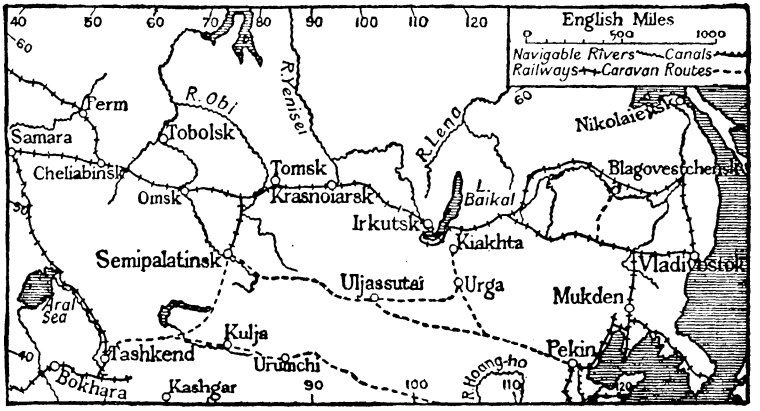


FIG. 110. Towns and Routes of Russian Asia.

286. **The towns of Turan,** on the oases of the same name already mentioned, are connected by the Trans-Caspian line, which runs to Khokand, at the foot of the Tian-shan. From Khojent it connects through Tashkent with Orenburg and the European lines (see Fig. 110).

287. **The Desert Lands.** The desert lands are of two kinds, the cold and the hot. The cold deserts lie either in the far north, in the Siberian tundra, or at great elevations, as in **Tibet** (area about 738,000 sq. miles), which forms part of the Chinese territories (Fig. 104). The greater part of this plateau

consists of snow-fields and tundra-like wastes, but in a few sheltered valleys barley and fruits ripen in the hot summer. The chief occupation outside these valleys is the keeping of yaks, a kind of ox, which can cross passes too high for any other animals. The capital is Lhasa, in a fertile valley.

The hot deserts stretch from Arabia, through Persia (including Turan to the north, and Afghanistan to the east), the Tarim hollow, and Mongolia, almost to the Pacific. In the deserts of the interior the climate is very extreme, winters being very cold. Where irrigation is possible fertile oases can be created, where cotton, cereals and fruit can be grown.

288. Arabia (area about 1,400,000 sq. miles; Independent[1] Arabia, 1,230,000 sq. miles) is fertile only in the west and south, where mountain streams make irrigation possible. This richer part belongs to Turkey. Coffee and dates are the most valuable agricultural products, and the horse and camel the most valuable animals. Mecca, Medina, and the port of Mocha at the south of the Red Sea are almost the only towns. Aden, a barren volcanic peninsula at the southern entrance to the Red Sea, is a British coaling station, and a key to the route to India. The remainder of Arabia is divided among petty sovereigns. In the south-east is the port of Muscat.

289. Afghanistan. Afghanistan (area about 250,000 sq. miles) is a land of bleak mountains and deep valleys, with a very extreme climate. The valleys when irrigated permit a scanty agriculture. Elsewhere a poor pasture affords grazing for animals. The camel is the principal transport animal. The chief towns are Herat, in a fertile valley, and Kabul, which commands the route into India by the Khaibar Pass.

290. Chinese Turkestan. The deserts of the Tarim, or Chinese Turkestan, and Mongolia, form part of the Chinese territories. They are walled in by mountains, at the base of

[1] Self-governing.

which are oases. The rest is poor steppe or sandy desert. In the west Kashgar and Yarkand are important towns. In the east the oases are small and the towns unimportant.

291. **The Monsoon Lands.** These have dry winters (very cold in the north, warm in the south) and hot summers, with a well-marked rainy season. Irrigation is carried to great perfection in India and China, enabling arid regions to be cultivated and both winter and summer crops to be raised. Rice, grown in flooded fields, is a very important crop, forming along with millet the chief food of the people. Maize, wheat, and other cereals, pulses, oil-seeds, sugar, and the opium poppy are largely cultivated. Tea, which needs hot summers, abundant showers, and good drainage, is grown on the hill slopes of Japan, China, India and Ceylon, and Java. Of fibre-yielding plants the most important are cotton, which is grown throughout the monsoon lands, and jute, cultivated in the Ganges delta. The forests, which cover large areas, especially in Indo-China, provide hard timbers, teak being the most valuable, 'fancy' woods such as ebony, lacquer, and wax trees, and other valuable products. In the lowlands of the Ganges delta, and of Indo-China, in parts of which the rainfall is very great, the forests become dense and rank, forming wet jungles, which supply rubber, cacao, and other tropical plants. In these forests live the tiger, elephant, huge apes, and other animals never seen in the forests of the north. The buffalo becomes an important draught animal, especially in India.

Division of the Monsoon Lands. In the south are (1) the Indian Empire and Ceylon, including the plain of Hindustan, the Deccan peninsula, and the western part of the Indo-Chinese peninsula, (2) the independent kingdom of Siam, (3) French Indo-China, occupying most of the peninsula east of Siam, (4) the Malay archipelago. In the east are the Chinese lands, excluding Tibet and Mongolia, the Japanese mainland province of Cho-sen, occupying the peninsula of Korea, and the island empire of Japan (see Fig. 104).

India and Ceylon. These have been described on pp. 105–158.

293. Indo-China. Indo-China is a land of forested mountains and swampy lowlands. Rice is the chief crop. Indigo is becoming important in French Indo-China. The products of the luxuriant tropical forests include gutta-percha, rubber, cacao, pepper, &c. Bangkok is the capital of the kingdom of Siam (area about 200,000 sq. miles) (see Fig. 111). The chief towns of French Indo-China (area about 257,000 sq. miles) are Saigon in the south, Hue in the centre, and Hanoi in the north. The long, narrow, mountainous, densely-forested south-western peninsula forms the Malay peninsula, the southern part of which is British. Its tin mines are the richest in the world. To the south is the island of Singapore, also British, one of the great shipping and trading centres of the east.

294. The Malay Archipelago. In the Malay archipelago Sumatra, Java, and the smaller Sunda Islands continue the line of the Malay peninsula. To the north lie Borneo and Celebes, and the Moluccas, or Spice Islands, with the Philippine archipelago, east of the South China Sea. The latter belongs to the United States. The rest of the islands form the Dutch East Indies, except northern Borneo, which is British, and a scrap of Portuguese territory in Timor. Java is by far the most important island. A chain of volcanoes runs through it, and the lower slopes and plains are wonderfully fertile. Sugar, coffee, tea, rice, indigo, cinchona,[1] rubber, and teak are principal products: other islands yield also spices (Moluccas), copra, petroleum, coal (Sumatra, &c.), and tin. The capital is Batavia in Java. Luzon, the largest of the Philippines, produces sugar, copra, tobacco, and a fibre called Manila hemp, from Manila, the capital and chief port.

295. China. The monsoon lands of China are the lowland of Manchuria, the central plain, and the southern highlands. The winters are cold, even in the south; the summer rainfall

[1] For quinine.

generally plentiful. Manchuria is fertile but thinly peopled, though towns have risen along the railway. Beans, millets, cereals, fruits, and medicinal plants, such as ginseng, are grown. The capital is Mukden, in the south, with the port of Niuchwang. Port Arthur, with the port of Tairen, is a terminus of the Siberian line.

296. **The Northern Plain of China** is covered with a rich but thirsty yellow soil called loess, which makes irrigation

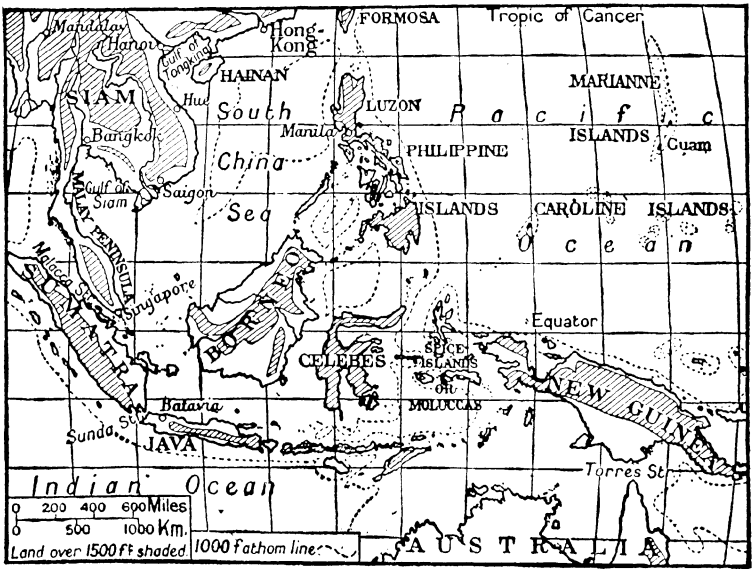


FIG. 111. The Malay Archipelago.

necessary even where the rainfall would be ample for less porous soils. Millets and cereals are the chief crops. The mineral wealth, particularly coal, is enormous, in the bordering hills, and as it occurs near densely populated parts of the country, manufactures may develop in the future. The Hwang-ho, the chief river of Northern China, is not navigable, and has an uncertain course through the loose soil. Its banks are higher than the surrounding plain, and it frequently breaks through the embankments which restrain it.

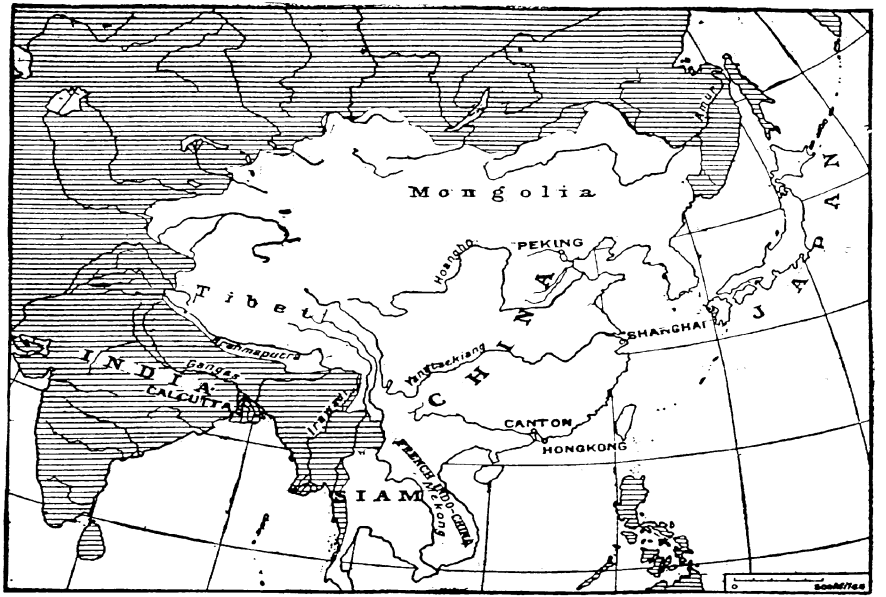


FIG. 112. The Far East (left white in map).

flooding vast areas, and destroying thousands of lives. The capital is Peking, in the north, with Tientsin as its port.

297. **Southern China** is more varied in surface than North China. Much of it consists of a fertile red soil, which can be cultivated to a great height in the mountain valleys. The

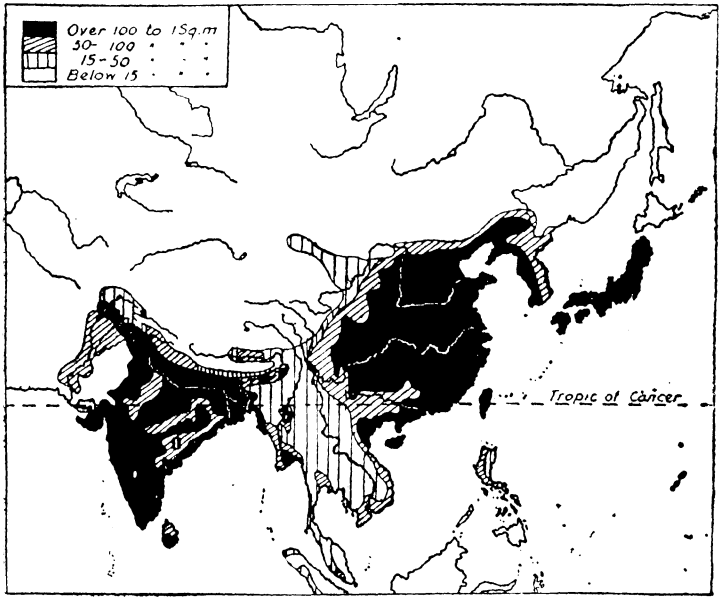


FIG. 113. Population of Eastern Asia.

largest river is the Yangtse-kiang, which flows through one of the richest regions of China. Tea is grown on the hill slopes, and opium, cereals, silk, tobacco, coal, salt, and iron are the other chief products. Many populous towns, such as Hankow, lie on the Yangtse, which is navigable for ocean steamers to the Ichang gorge, 1,000 miles from the sea. Shanghai, near its mouth, is one of the busiest ports in the East. The basin of the Si-kiang, to the south, is hotter and wetter, and rice is largely grown in the lowlands. The mulberry is important

in the highlands, and silk is a valuable product. Minerals are abundant in the basins of both the Si and the Yangtse. Canton, at the mouth of the Si, is the chief among the many ports which export the produce of this rich region. Hongkong, an island at the mouth of the Si, is British.

The chief railways of China are shown in Fig. 114.

298. Tibet and Mongolia, which are included in the Chinese

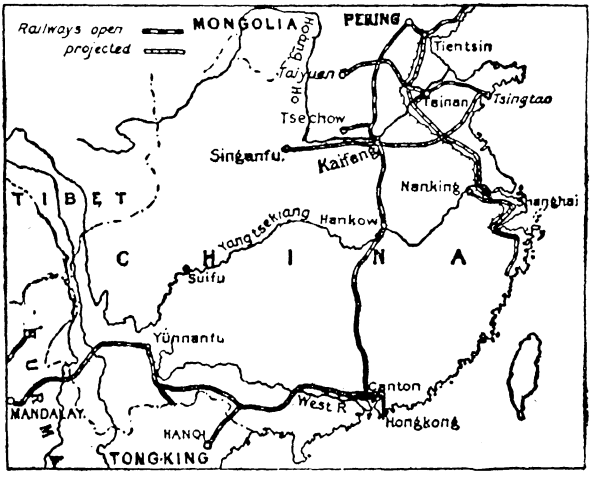


FIG. 114. Chief Railways of China.

Empire (area about 4,278,000 sq. miles), have already been described (pp. 166, 180, 181).

299. **Korea.** Korea (area about 82,000 sq. miles) is a mountainous peninsula, sloping steeply to the ocean, and covered with forest. Its wealth is very undeveloped, but is known to be great. The valleys and plains of the longer western slope are planted with rice and maize in the south, and with cereals and pulses in the north. The capital is Seoul, some distance from the sea, with Chemulpho as its port.

300. **Japan.** Japan (area about 148,000 sq. miles) consists

of four large volcanic islands and several small ones (see Fig. 115). The northern island of Yezo is a hilly forested land, with coal and other minerals, and rich fisheries. The capital is Hakodate. Honshiu, the most important island, contains several active[1] and some extinct[2] volcanoes, including the beautiful Fuji-yama, shown in almost every Japanese picture. The forests produce valuable timber, including the lacquer tree. On the lower slopes are cultivated tea and mulberries. The valleys and flooded plains are planted with rice and other cereals, pulses, and fruit trees. The capital is Tokyo, on the bay of the same name, with Yokohama as its port, the centre of a great foreign trade. The old capital is Kyoto, to the west, on Lake Biwa. Not far away, on the shores of the beautiful island-studded[3] Inland Sea, is Ozaka, a city of canals and factory chimneys, engaged in ship-building and cotton manufacturing. Kobe is the chief port of this important industrial region. To the south of the Inland Sea are the islands of Shikoku and Kiushiu, the latter with a rich coalfield near Nagasaki, its chief town and port, on a fine harbour. Formosa (area about 14,000 sq. miles), off the coast of China, nearly a thousand miles to the south, is a forested mountain land, producing camphor in the highlands, and tea on the lower hills.

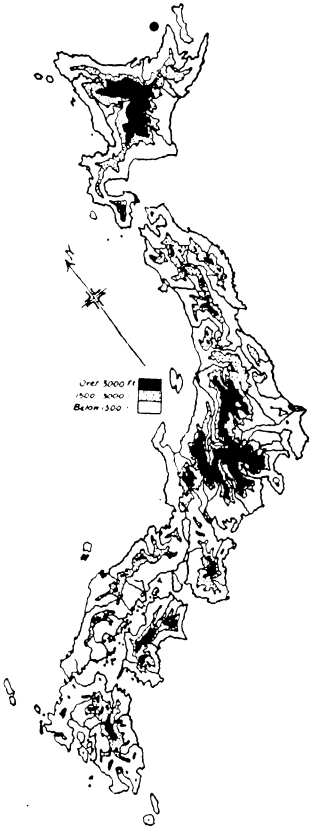


FIG. 115.
Physical Features of Japan.

[1] Burning. [2] Not burning, cold. [3] Covered with islands.

301. Peoples of Asia. The population of Asia is supposed to be about 850 millions, or more than half of the human race. Nearly nine-tenths of the people live in the monsoon lands where the highest civilizations have developed. The steppes contain most of the remaining tenth. The hot and cold deserts are the most thinly populated part of the continent.

302. Races and Religions. The races of Asia are very varied. They were formerly classed as (1) the Caucasian or White Race of Aryans and Semites, inhabiting Asia Minor, Arabia, Persia, Afghanistan, and the northern part of India, (2) the Malay, or Brown Race, occupying much of Indo-China, and the Malay archipelago, (3) the Mongolian, or Yellow Race, occupying the remaining and far greater part of the continent. If this classification is limited to the languages spoken, it is no doubt nearly correct. The peoples are at every stage of culture, from the highly civilized races of India, China and Japan, to the wild tribes inhabiting the forests of the south-eastern peninsulas and islands. Many religions are professed, the most important being Mohammedanism, which extends eastward from the Mediterranean into India, China, and the Malay peninsula and archipelago, and Buddhism, which extends north and east from India into Tibet, Siberia, China, and Japan. Hinduism is only found in India, Confucianism in China, and Shintoism in Japan, existing side by side with the other religions named. Various forms of heathenism are practised by the uncivilized tribes of the forest and tundra.

PART IV

THE BRITISH ISLES

CHAPTER XIV

GENERAL GEOGRAPHY OF BRITAIN

The Physical Features of Britain.

303. THE maps in Figs. 116 and 117 show the British Isles or Britain and the neighbouring parts of Europe. The largest island is Great Britain, which lies to the east of Ireland, the next largest. To the west is the Atlantic Ocean, which is covered with ice in the Arctic regions. To the east of Britain is the Old World. We shall see later that Britain is affected in many ways by the neighbourhood (i) of this vast ocean to the west, and (ii) of this immense mass of land to the east.

The English Channel and the Strait of Dover separate Britain from the Continent. These are the 'Narrow Seas', leading from the Atlantic to the North Sea. Great Britain and Ireland are separated by the square Irish Sea, which is entered from the Atlantic by St. George's Channel and the North Channel.

304. **Relief and Coast-line.** Fig. 116 shows the high and low land of Britain, and the shallow and the deep seas. If the seas sank, or the land rose 600 feet, Britain would be joined to Europe, and the North Sea would become a plain, with the Goodwin Sands, the Dogger Bank, and other shallows rising above it as low hills. The part of the earth's crust covered by shallow seas is called the 'continental shelf', and the islands on it are called 'continental islands'.

The lands between sea-level and 600 feet above it are called

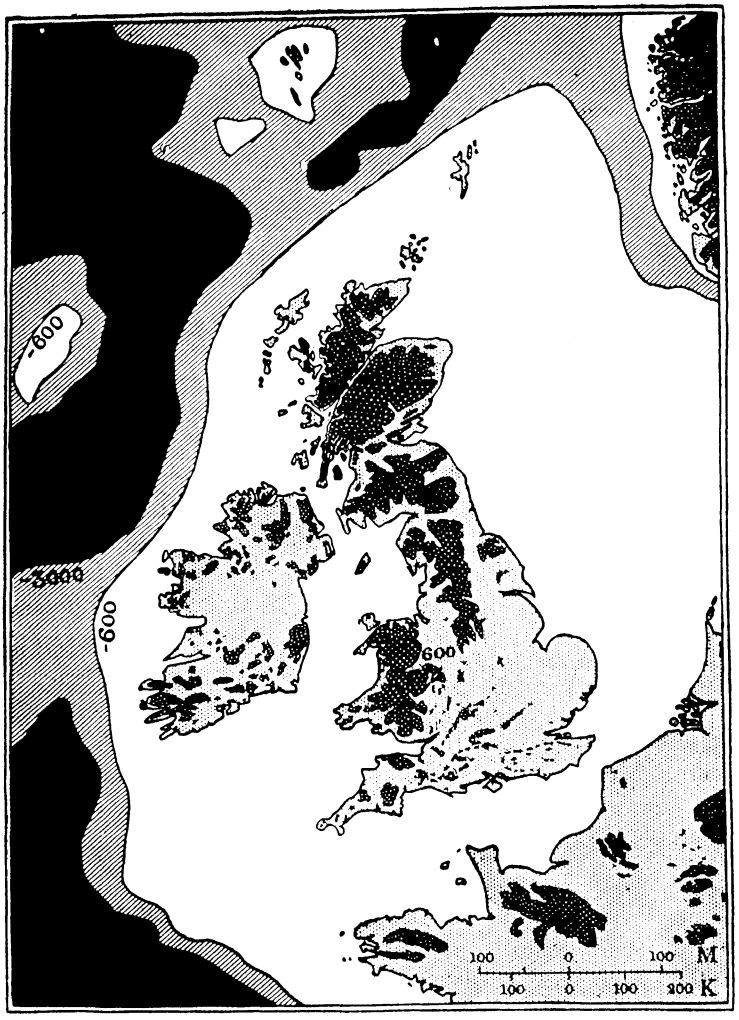


FIG. 116. Contour lines of Britain. The line round the blackened seas, marked —3,000, shows where the coast-line would be if the sea sank or the land rose 3,000 feet. The line between the shaded seas and the white or shallow seas, marked —600, shows where the coast-line would be if the sea sank or the land rose 600 feet. The line round the black land, marked 600, shows where the coast-line would be if the sea rose or the land sank 600 feet. Such lines are called contour lines, and all the points they join are the same height above or below sea-level.

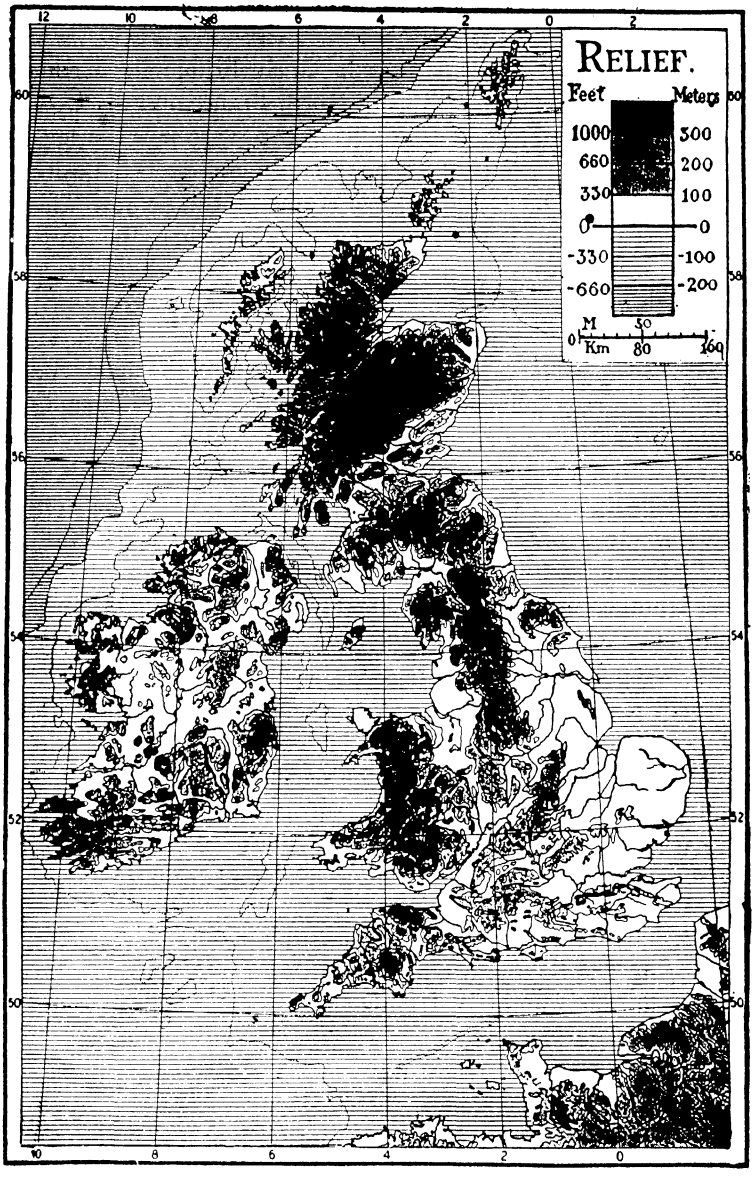


FIG. 117. Physical Features of Britain. The thin line in the deep sea is the contour of −660 feet, that in the shallow sea of −330 feet, and that in the shaded land of +660 feet. They are not meant to be studied in detail in this book.

lowlands. The widest lowlands in Great Britain lie in the south and east, facing the plains of North France and the Low Countries. The fens and sand hills of the Wash face the fens and sand hills of Holland. The Thames estuary is opposite to the Scheldt, and Southampton Water to the Seine. The narrowest crossing is from Dover to Calais, where the sea is under 120 feet deep. The highlands of Great Britain lie in the north and west. Ireland has level plains in the centre, and highlands in the north and south.

305. **Seas.** The sea penetrates deeply into the land, and this has a great influence on our climate. It also enables vessels to carry goods cheaply far inland. A set of circles drawn with a 50-mile radius, and their centres at the heads of the chief estuaries, show how few of our large towns lie far from the sea. It is only 25 miles between the heads of the Firth of Clyde and the Firth of Forth; 80 miles between the Mersey and Humber estuaries, and 100 miles between the Thames and Severn estuaries. Shipping is helped by the strong tides that sweep in from the Atlantic (twenty-seven high tides a fortnight). Vessels are carried up the estuaries by the rising tide and brought down again by the falling tide. Both in the Irish and North Seas the tidal waves enter from the north as well as from the south, and at some places both tides join: e.g. Dublin and London, which have unusually high tides.

306. **Highlands and Uplands.** These are:

I. The Scottish Highlands.

II. The Central Highlands, consisting of—
  i. The Southern Uplands.
  ii. The Cumbrian Highlands.
  iii. The Pennines.

III. The Southern Highlands.
  i. Welsh Highlands.
  ii. The Heights of Devon, Cornwall, or South-western Peninsula.

IV. The Scarp Lands of SE. England, which are ridges of much lower heights.

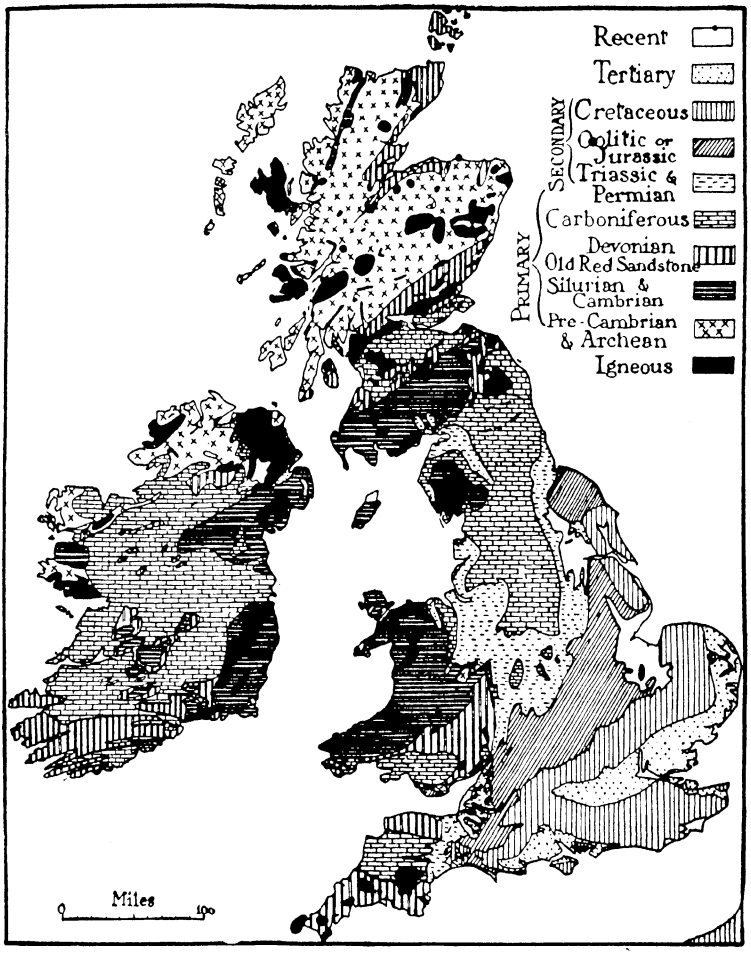


FIG. 118. The Rocks of Britain. The surface rock greatly affects the life of a region, through (i) the kind and quantity of soil, (ii) the abundance and scarcity of water, (iii) the character of the occupations, and (iv) the position of towns and villages. The table in this map arranges the rocks in order of their age: (i) primary, (ii) secondary, (iii) tertiary, and (iv) recent or quaternary.

307. The broad Central Lowlands or Midland Valley of Scotland separates the Northern and Central Highlands, and a number of smaller lowlands are found round these highlands. The most extensive lowlands are in the Midlands of England, between the Scarp Lands and the Central and Southern Highlands. These run between the Pennines and the Welsh Highlands to the Irish Sea (Plains of Cheshire and Lancashire) and east of the Pennines form the Vale of York.

Notice that the general direction of the highlands and lowlands of Great Britain is from south-west to north-east, except in the Pennine region, where it is north and south, and in the south of Wales and of England, where it is east and west.

308. South and east of a line from the Tees to the Exe are plains out of which rise long ridges, mostly under 1,000 feet high. Across these plains or vales the longest rivers of England flow. The ridges all rise steeply on one side, forming what is called an escarpment or scarp, and slope much more gradually on the other side.

309. In the south of Ireland the general direction of ridge and valley is east and west, but elsewhere it is from south-west to north-east, as in Great Britain. The highlands are round the coast, and may be arranged in two groups, (1) the Northern and (2) the Southern Highlands, separated by (3) a very broad Central Plain. This plain reaches the sea in the east opposite the Lancashire and Cheshire Plain of England.

310. The Structure of Britain. Compare the maps of Figs. 117 and 118, and after colouring red all of the rocks older than, i.e. below, the Permian. The highest lands rise where the older rocks, which are harder than the younger rocks, appear at the surface. In the scarp lands, which consist of younger rocks, the rocks are tilted and there are alternate layers of harder rocks, which form the ridges, and of softer rocks, which form the flat clay valleys between them.

Notice next that the Central Lowlands of Scotland and of Ireland are mainly of carboniferous rocks, which in Northern England have been raised to form the Pennines. This shows that it is important to know how the different layers or beds of rock are arranged. In some places they lie flat, in others they are tilted, as in the scarp lands, and in others they have been thrown into folds, as in south-west Ireland, forming a set

of arches or valleys, and troughs or downfolds. In the course of ages the tops of the arches may be so worn away by weather, running water, and moving ice, that it is not possible to trace the upfolds and downfolds as ridges and valleys. This is the case in the Welsh and Scottish Highlands. In the course of these changes the older rocks, which once were far below the surface, are brought to light. As some of these contain valuable minerals this may bring wealth to a whole district. This has happened in the Pennine coalfields. (See pp. 212–16.)

In other parts of Britain the layers of strata have split and cracked. Sometimes hot melted rock has pushed its way upwards and formed volcanoes, the remains of which can be seen in the Scottish Lowlands, or vast lava flows, as in the north-east of Ireland (Antrim plateau, see p. 249). This cracking may cause whole blocks of rock to sink, leaving other blocks standing up among the sunken mass. When the mass that has sunk is between two parallel sets of cracks, it forms a long valley. Such is Glen More, which cuts the Scottish Highlands into two, and such is the Central Lowland of Scotland.

The surface of Britain, except in the south of England, has been changed by the ice which formerly covered it. The steep-sided valleys, with long narrow lakes, and the fiord coasts of the Highlands are the result of this. Boulder clay, which was formed of the different rocks over which the ice passed, covers much of the lower heights and plains, and in some cases makes a district fertile which would not otherwise be so (e.g. the chalk in Norfolk).

311. **Rivers.** In Fig. 119 look carefully at the highlands and uplands of Britain. Notice that the streams flow straight down the highland slopes, but on entering the lowlands some turn at right angles, and flow parallel to the base of the highlands until they reach the sea, e.g. Dee, Trent, Yorkshire Ouse. In the west, where the highlands fall steeply to the sea, the rivers are short, swift, and unnavigable, and flow in narrow, steep-sided valleys. These mountain valleys are often very beautiful, but not, as a rule, profitable to man, though the force of the stream is sometimes used to drive mills or make electricity. The long lowland streams are slow, and form navigable waterways. They become less swift as they near the sea, and begin to drop their soil and build up fertile plains of river soils (alluvium). Much of the richest farm-land lies in these wide valleys.

Compare the basins of the largest rivers, noting how far they lie in the highlands, and how far in the lowlands. Trace the main water-parting or divide between the basins of the streams flowing east and the basins of the streams flowing west and compare it with the map of physical features (Figs. 117, 119).



FIG. 119. The chief Rivers, River Basins, and Divides. The main divides between rivers flowing N., S., E., or W. are shown by dashes, the minor divides by dots.

Plant and Animal Life and Products.

312. Vegetation. Britain lies in a belt of cold temperate forests, i.e. pine forests in the north, forests of oak, elm, &c., in the south. Formerly most of the country was covered with forests, which have been cut down for fuel, timber, to clear

space for cultivation, and to make roads. Their place is taken by cities, towns, and agricultural land, except where such places as Sherwood, Epping Forest, and the New Forest have been preserved. Trees will not grow above a certain height, and on the higher ground moors (the grouse moors and deer forests of Scotland) are common. In the flatter parts of the highlands, especially in Ireland, stagnant water collects, in which only marsh plants grow. Such bogs or fen lands, and the salt marshes and sand hills that border our coasts are the chief lowland wastes. Each has its own peculiar plants.

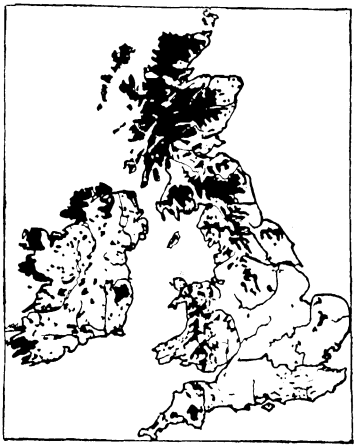


FIG. 120. Poor Pastures of Britain, chiefly hill pastures.

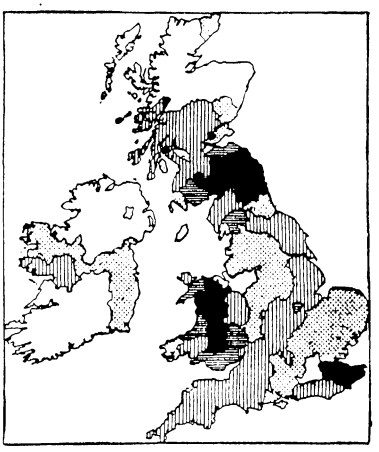


FIG. 121. Distribution of Sheep. Black over 800 sheep per 1,000 acres; horizontal lines 600–800; vertical lines 400–600; dots 200–400; white under 200.

313. **Animals.** The wild animals of Great Britain are like those of the mainland of Europe, but there are fewer kinds. No large mammals are peculiar to the British Isles. Some of those found in Great Britain are absent in Ireland, e.g. the mole, weasel, and all kinds of snakes. The bears, wolves, and beavers of Roman times are now extinct.

314. **Plants and Animal Products of Britain.** Fig. 120 shows the poor pastures, moors, and waste lands in black. These are sheep lands. It is easy to get materials for a map

showing the distribution of sheep in Great Britain and Ireland. Every year a farmer must fill up forms stating how many sheep and cattle he has, how much land he has sown with wheat, barley, oats, &c., and how much is in grass. These forms are sent to the Boards of Agriculture in London or Dublin, and from them reports are written which give the number of sheep, cattle, &c., and the number of acres under grass, or crops for each county. In a large county there are usually more cattle, sheep, &c., than in a small one.

Why are sheep more numerous than cattle in the east of Great Britain, and why are cattle more numerous than sheep in Ireland? The answer must be sought in the relief maps, vegetation maps, climate maps. The relief map, for example, gives one explanation. Cattle are more important on the lowlands (Cheshire or Pembroke), and sheep in hill districts (e.g. Central Wales), but this is not all.

Fig. 124 shows the number of acres of land in crops per 1,000 acres, and Fig. 122 the number of acres in pasture per 1,000 acres in each county. On the arable lands are grown cereals (food grains), mainly wheat, barley, and oats; root crops, such as potatoes and turnips, beans, peas, and grass for hay and fodder. These crops are not grown all over the arable land. Wheat (Fig. 125) is chiefly grown between the Humber and the Thames. Elsewhere, oats are the chief cereal. Barley is widely grown, but most in the wheat counties.

Some parts of the country produce special crops, such as hops[1] (Medway and Lower Severn valleys), flax (Ulster), cider apples (Kent, Devon, Hereford, and Worcester). Potatoes are important in Ireland, and market-gardens near towns.

Comparing the sheep, cattle, arable, and pasture maps, we find that the eastern lowlands are arable, that sheep are commoner on the eastern hills, and cattle on the western lowlands. But highland and lowland, and even soil will not account for all the differences, and we must seek other reasons in the air above and the soil beneath.

[1] For making beer.

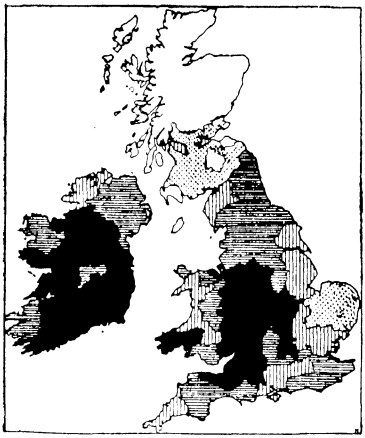


FIG. 122. Distribution of rich Pasture in Britain. Black counties with over 500 acres per 1,000 acres; horizontal lines 375–500 acres; vertical lines 250–375 acres; dots 125–250 acres; white under 125 acres.

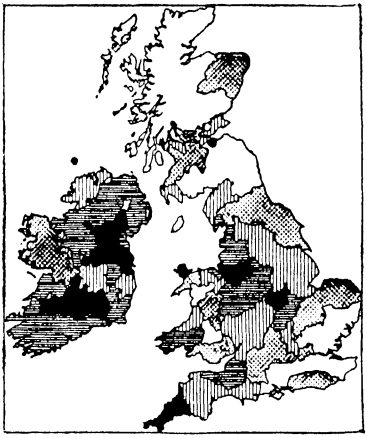


FIG. 123. Distribution of Cattle. Black over 250 cattle per 1,000 acres; horizontal lines 200–250; vertical lines 150–200; dots 100–150; white under 100.

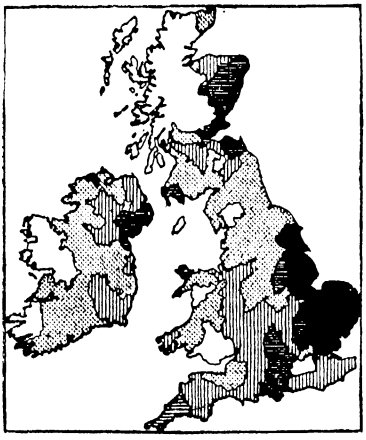


FIG. 124. Distribution of cultivated land. Black counties with over 500 acres per 1,000 cultivated; horizontal 375–500; vertical 250–375; dots 125–250; white under 125.

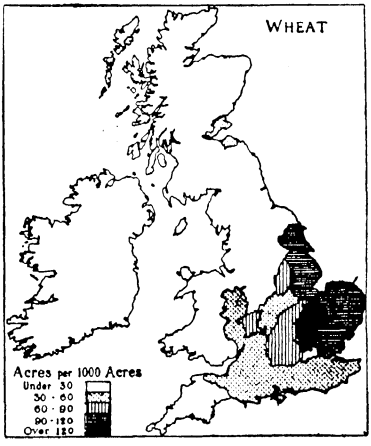


FIG. 125. Distribution of wheat in Britain, showing the number of acres out of every thousand in which wheat is grown.

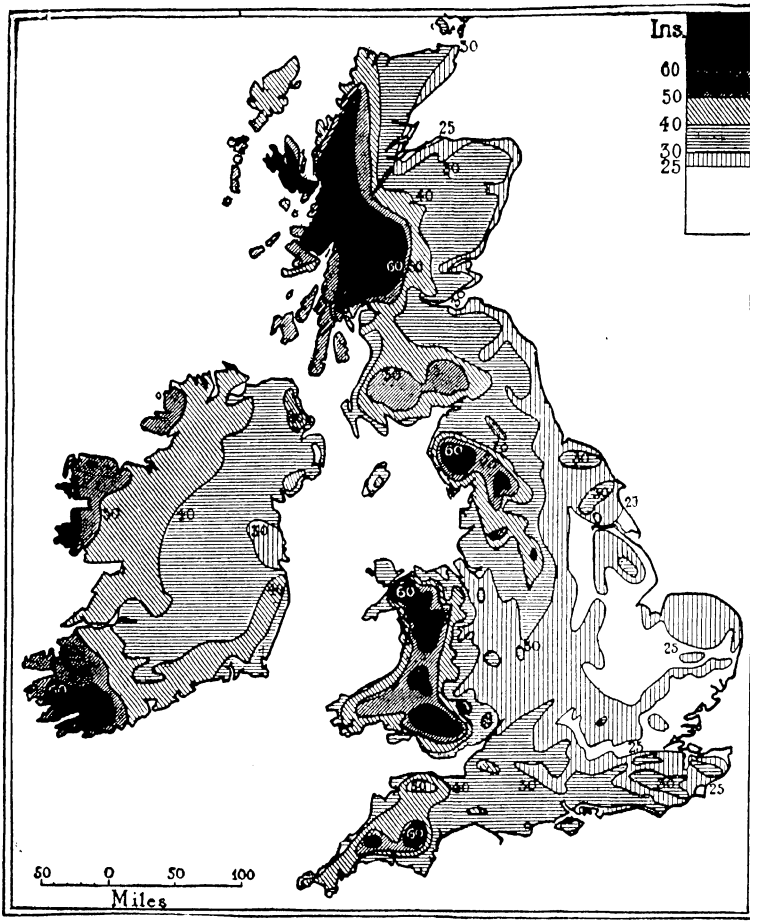


FIG. 126. Mean Annual Rainfall of Britain. The map is compiled from observations taken all over the country. The darkest parts are the wettest and also the highest. The white parts are low and have a scanty rainfall.

Climate.

315. **Rainfall.** Fig. 126 shows the mean annual rainfall of the British Isles. It shows that the areas of lowest rainfalls (under 30 inches a year) lie in the eastern lowlands, and that

the areas of heaviest rainfall are the Highlands of West Scotland, the Lake District, Wales, and two patches in Western Ireland.

Compare this map with the maps for sheep, cattle, arable, and wheat land. They are like each other in many ways. The eastern arable land is dry, but the western pasture land is wet. Sheep are found in the drier parts, cattle in the wetter parts outside the mountain area, and wheat only in the very driest parts of the east. Wheat is grown in the southern counties only, and little is raised on the equally dry plains of eastern Scotland. Why? The answer is given in the temperature maps (Figs. 127–30).

316. Temperature. Fig. 127 shows the mean annual temperatures of the air touching the land. To make the map clearer, the land between the isotherms has been shaded. The darker shading shows where the air near the surface is colder, the lighter shading where it is warmer. A comparison with Fig. 117 shows that the colder areas are highlands. If we climb a high hill, we soon find that the air grows colder as we ascend. In winter the hill-tops are white with snow long after it has disappeared from the valleys and plains below. We have seen that trees will not grow above a certain height, another proof of the greater cold at that height.

317. In most temperature maps the temperatures show not the exact temperature of a place, but what it would be at sea-level. This is found by adding 1° F. for every 300 feet above sea-level. The isotherms thus drawn do not show the effect of the height of the land.

Fig. 129 shows the mean July temperatures. As we should expect, the greater height of the Sun in the south makes the southern days warmer. Compare the maps for July and January (Figs. 129, 130), and notice that

(1) the July isotherms on the whole run west-east, the January isotherms north-south;

(2) in July, London (64° F.) is warmer than the Orkneys (55° F.), but in January, London (39° F.) is *colder* than the Shetlands (40° F.).

This last fact is very remarkable. It does not depend either on the Sun, which is as much higher at noon in the south as in other months, or on the length of day, for January days are shorter in the Orkneys than in London. The reasons are these. The greatest area and depth of water

lies west of the British Isles, the largest land surface lies east. Land heats quickly, and cools quickly. Water heats slowly, and cools slowly. On a hot summer's day a bare rock will burn your hand, and you bathe it in the cool water beside it. On a clear summer's night the same rock is stone cold, but the water feels warm. In fact it is slowly cooling, and giving out the heat it has absorbed during the day. Again, a cupful of tea cools more slowly than a saucerful. If you apply these familiar facts, you can easily explain the July and January isotherms.

In July the hottest area lies over south-eastern England.[1] The coolest lands are those washed by the north-western seas. There the deep Atlantic is still slowly absorbing heat.[2] The North Channel and Irish Sea carry this cooling oceanic influence south, and so the isotherms of 58° F. and 68° F. curve south. In the east the shallow North Sea is soon warmed, and has little influence in cooling the land. The English Channel cools the south coast slightly. In January these conditions are reversed. The land has long lost its summer heat, and is chilled. It is coldest in the east where it faces the ice-bound plains of Central Europe. On the other hand, the sea has still some store of summer heat. Hence the warmer areas face the deep waters of the Atlantic coast. The straits and channels bear this influence inland. The curves of the isotherm of 42° F. show this, slightly in the north, but more clearly in the south. By January the shallow North Sea has cooled entirely.

318. **Winds.** Winds are named from the direction from which the wind comes. If this direction is noticed, it will be found that on two days out of three, the winds in Britain come from the west or south-west, i.e. from the Atlantic. The arrows on the map in Fig. 131 show the direction of the winds for January. These bring air which has been close to the Atlantic water. They therefore bring warmth, especially the south-westerlies (see the curve of isotherm 42° F. in Fig. 130), but become cold as they pass over the land, and are colder on the east than on the west coast. The east winds, which come from colder lands and colder seas, are dry and biting. In

[1] The days are longer in the north, but this is not enough to counterbalance the effect of the Sun rising higher in the southern heavens, and shining more directly down on the Earth.

[2] The surface-layers of the land are warmest in July, not long after the Sun has reached its highest summer position in the heavens, but it is not till August that the surface-waters of the sea reach their highest temperature. The reverse happens in winter, and the surface-layers of the land are coldest in January, the month that follows the shortest day while those of the sea are not at their coldest until a month later, in February.

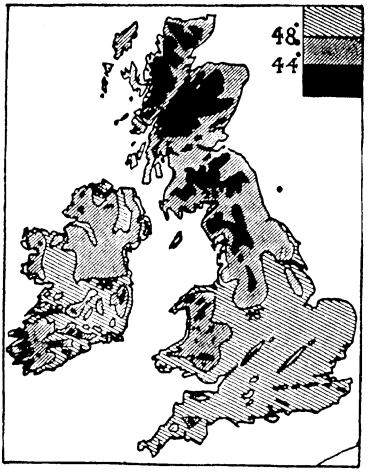


FIG. 127. Actual Mean Annual Temperature, unreduced. The darkest parts are the highest and coldest.

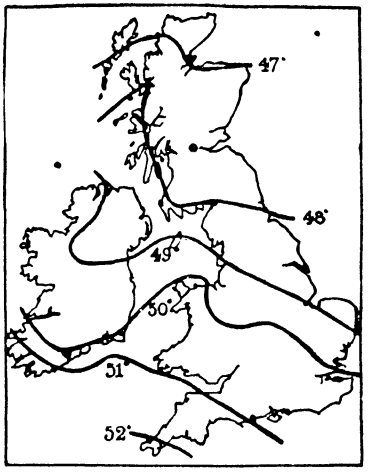


FIG. 128. Mean Annual Temperature of the British Isles, reduced to sea-level.

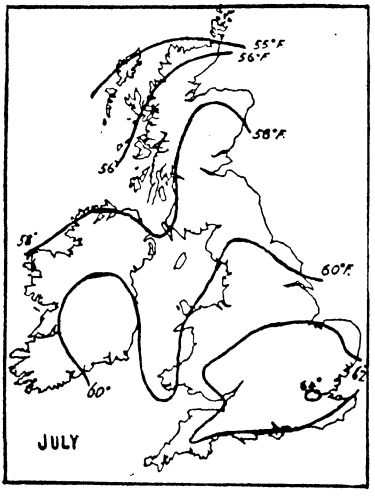


FIG. 129. Mean Temperature of the British Isles in July, reduced to sea-level.

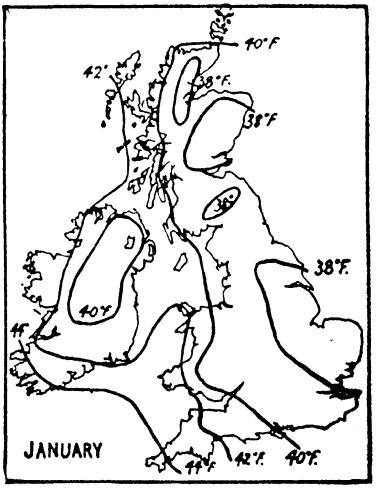
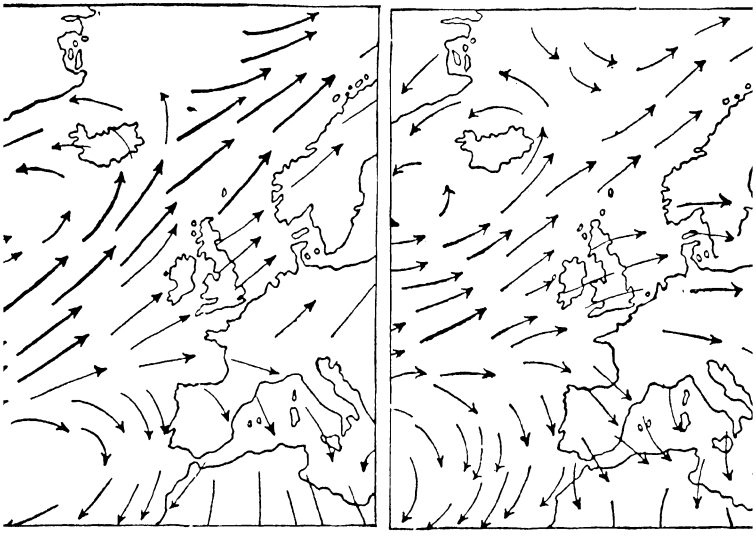


FIG. 130. Mean Temperature of the British Isles in January, reduced to sea-level.

spring and autumn the south-west winds are not nearly so strong, and in spring they are not so frequent, while the easterly winds are not so cold. In summer (Fig. 132) the south-west winds are still weaker, and though the sea is cooler than the land in the same latitudes, these winds come from warmer latitudes, and cool the land less than they heat it in winter.



FIGS. 131 and 132. Winds of the Atlantic: (131) in Winter, (132) in Summer.

319. Climate, Livestock, and Crops. We are now better able to explain the distribution of pastoral and agricultural land, sheep, cattle, and wheat. Cattle are commonest on the lowlands of the north and west, because the wetter and milder climate (i. e. a longer season of growth) favours tall juicy grasses. Sheep, which do best on the short stiff grass of well-drained soils, are commonest on the drier eastern slopes of the highlands, and the limestone and chalk hills of south-eastern England. Cereals are grown in the east and south-east, and wheat is important only in the drier parts of the east, which have the warmest summers. Scotland was formerly the 'land of (oat) cakes' and porridge, for oats grow in the cool wet autumns better than any other cereal.

Human Geography.

320. **The Divisions of Britain.** Politically, Britain consists of the United Kingdom of Great Britain and Ireland. The Isle of Man and the Channel Islands, off the French coast, are

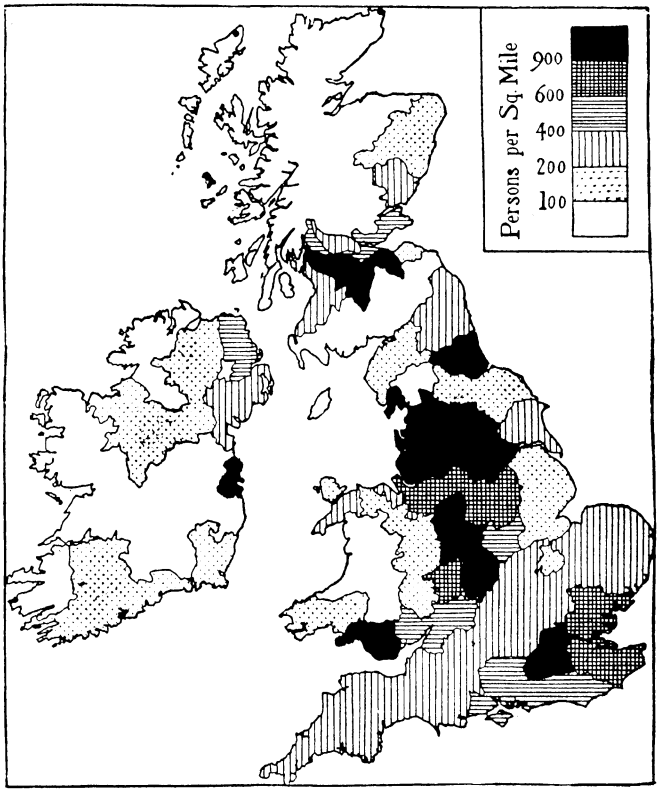


FIG. 133. Density of Population in Britain.

British, but have parliaments of their own. London is the capital of the kingdom of England, which includes the principality of Wales, of the United Kingdom, and of the British Empire. Edinburgh and Dublin are the capitals of the kingdoms of Scotland and Ireland. England, Scotland, Ireland, and Wales are subdivided into administrative counties,

boroughs, and urban and rural districts. These again fall into parishes. The administrative divisions of the army, navy, and churches differ from those of the civil administration.

321. Distribution of Population. Every ten years a Census of the people of Britain is taken, and gives not only their numbers, but also their occupations. Over 45 million people live in Britain, and 34 million of these live in England.

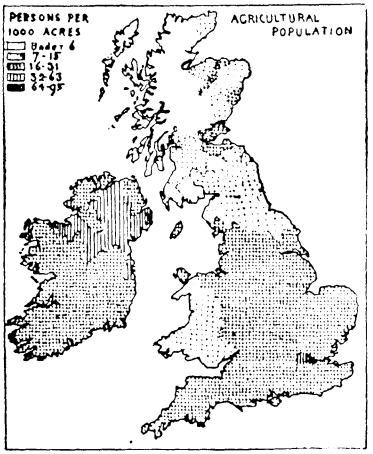


FIG. 134. Distribution of Agricultural, Pastoral, and Fishing Population in the British Isles.

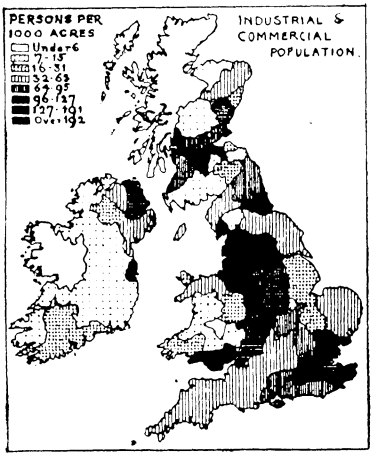


FIG. 135. Distribution of Industrial and Commercial Population in the British Isles.

Scotland has $4\frac{3}{4}$ million people; Ireland more than $4\frac{1}{4}$ million; and Wales over 2 million. Fig. 133 shows the density, and Figs. 134 and 135 the chief occupations. Here again the numbers have been mapped per 1,000 acres. Fig. 134 gives some idea how people would be scattered if there were no manufactures or commerce in Great Britain, and shows roughly which parts were most thickly peopled before the rise of manufactures. The flat lowlands of south-east England are most densely peopled, and the rain-swept north-west of Scotland most thinly. A comparison with Figs. 124, 122, shows that the agricultural countries are more thickly peopled than the pastoral.

322. Population on the Coalfields. Fig. 135 shows that the industrial population is crowded round a few centres. Neither shape nor climate explains the position of these centres, but Fig. 136 does. The densest population is on the coalfields. Coal is used to make steam for driving machinery, and it pays best to build factories near the coal-mines.

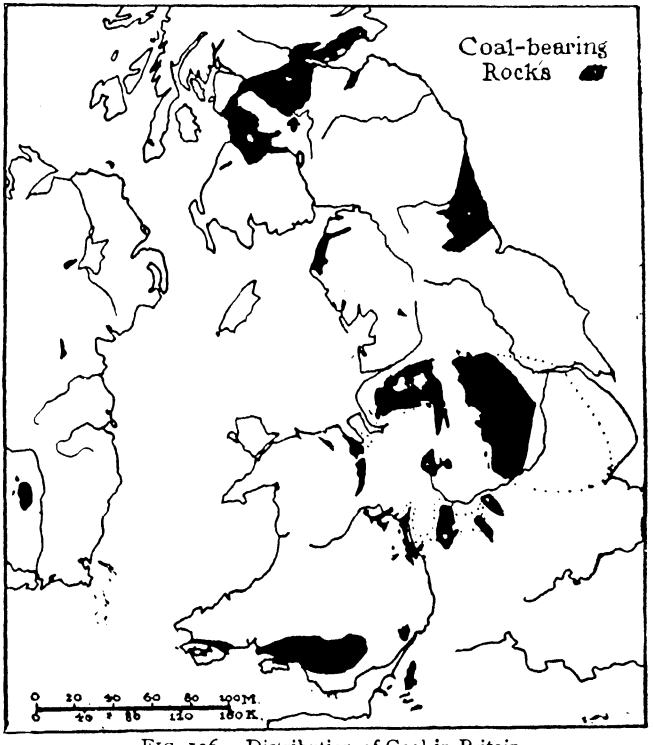


FIG. 136. Distribution of Coal in Britain.

The dotted lines enclose areas in which coal exists at some depth, but probably not too deep for profitable working. Cf. this with the next four figures.

In Britain, the chief coalfields occur in three belts:

1. In Central Scotland.

2. On the sides of the Pennines, and south of the Pennines in the midlands of England.

3. On the east and south borders of the Welsh Highlands.

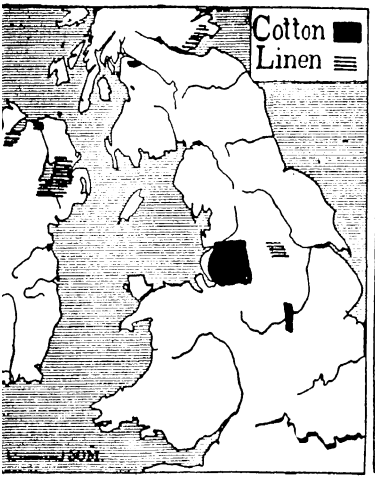


FIG. 137. Distribution of Cotton and Linen Manufactures.

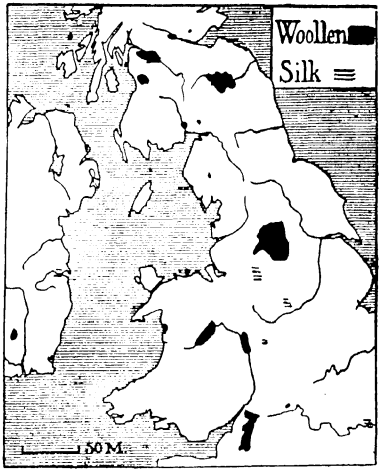


FIG. 138. Distribution of Woollen and Silk Manufactures.



FIG. 139. Distribution of Iron ore, Iron-works, and Ship-building.

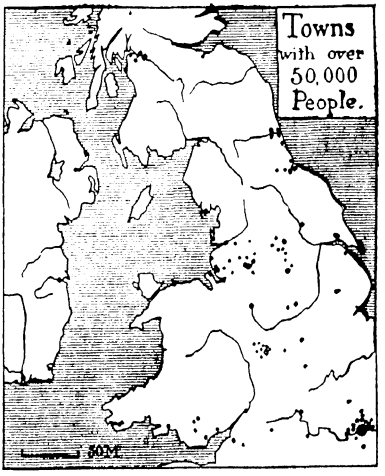


FIG. 140. Towns with over 50,000 Inhabitants.

Only two great industrial centres lie away from the coalfields. Belfast imports cheap coal from Scotland, and London imports its coal from north-east England by sea and land.

CHAPTER XV

ENGLAND AND WALES

323. **Natural Regions.** Fig. 141 shows a division of England and Wales into natural regions. These depend largely on the different kinds of rock of which our islands are built. Rocks change into different kinds of soil, some poor, some rich and fertile, some letting water sink to great depths, some holding it up at the surface, some forming hard highlands, some soft and easily worn away into lowland river basins. To the farmer, soil is almost as important as weather; and to the manufacturer the rocks are all important, as a comparison of the coalfields (shown in black) with Fig. 136 will show you.

In the west there are three mountainous areas, all of ancient rocks, hard limestones, slates, and sandstones, with such volcanic rocks as granite and basalt:

(i) *The Lake District.*

(ii) *The Welsh Highlands.*

(iii) *The West Country* (Cornwall, Devon, and Somerset).

(iv) *The Pennine Chain*, a fold of limestone, with coal on either side.

(v) *The Midlands*, a lowland of softer clays and sandstones, which touch the coast at the Dee, Humber, and Severn estuaries.

Then come the alternate clay valleys and ridges of south-east England, formed by

(vi) *The Limestone* (or *Oolitic* or *Jurassic*) *Belt*, a long ridge of rather hard limestone stretching across England from the

Cleveland Hills to Lyme Regis. All the coal and most of the ores of England lie west of this belt.

(vii) *The Clay Vales* of the Upper Thames and Great Ouse, and *the Fens.*

(viii) *The Chalk Belt*, chalk hills (downs) stretching from Flamborough Head to the Isle of Wight. Chalk once covered all south-east England, but has been worn away in some parts, and buried under loose clays and sands in others, forming

(ix) *The London Basin*;

(x) *The Hampshire Basin.*

Northern England.

324. The Lake District. This is a highland mass of very hard rocks. Being very ancient it has been worn down, century after century, by rain and rivers, and in long past ages by glaciers. In the centre high masses stand up, Helvellyn, Skiddaw, and Scafell (3,206 feet), the highest summit in England, which overlooks the deepest lake, Wastwater (258 feet deep). From these central points swift rivers flow out. Their upper valleys contain long and beautiful lakes which lie in rock basins hollowed out by glaciers.

The rainfall is the heaviest in England. Heather and poor pasture support sheep (Fig. 121), and the country is thinly peopled (Fig. 133). Lead has been mined from Roman times. Pencils are made of Ceylon graphite at Keswick, one of many tourist centres. Coal is obtained and exported from Maryport, Workington, and Whitehaven.

The largest population is on the plains by the coast. Barrow-in-Furness, in the south, is a great industrial town. With a good harbour under the shelter of Walney Island, and very pure iron ore, it makes ships and great guns.

325. Lune and Eden Valleys. The Lake District is divided from the Pennine Chain by the Lune and Eden valleys.

Carlisle has always been of great importance. See how the mountain routes meet there; south from the Eden Valley and

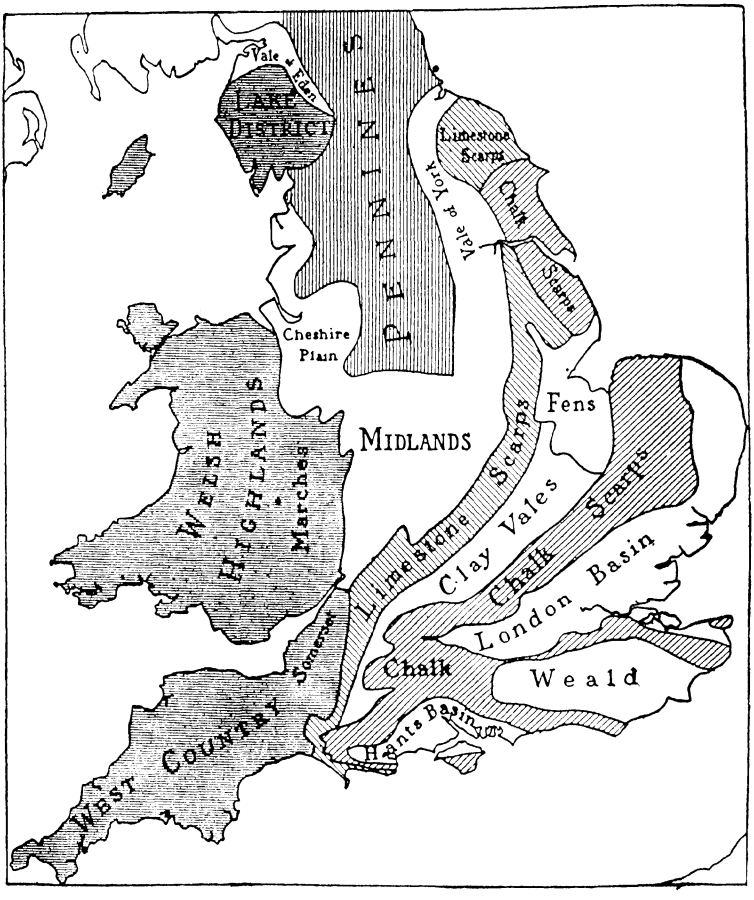


FIG. 141. Natural Regions of England and Wales.

the plain by the coast, east from Newcastle, north from Edinburgh and Glasgow, through the valleys of the Liddel, Annan, and Nith. Carlisle was a Roman camp and port, and the terminus of a Roman wall, and of the route from Lancaster.

326. The Pennine Chain is the backbone of Northern England. It is a long north-south fold of old hard rocks, joined to the Cheviot Hills in the north by volcanic rocks,

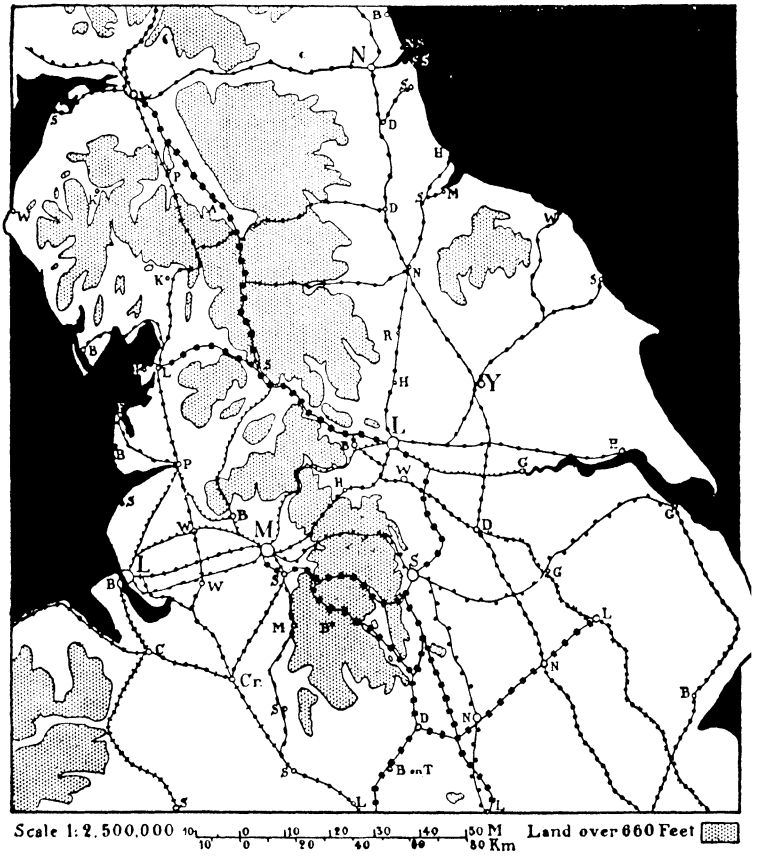


FIG. 142. Routes and Towns of Northern England.

which disappear in the south under the clays of the Central Plain. On either side are great coalfields. The Pennine fold is built of limestone rocks, which were once covered with hard sandstones. Limestone, though hard, is porous, and water

often sinks through it to a great depth, and flows in underground streams, hollowing out large caverns, which are common in the centre and in the Peak District. At lower levels these waters gush out in springs, some containing medicinal salts, e.g. Harrogate, Buxton.

Owing to the dryness of the soil, and the height, the hills are high moors with stretches of short grass for sheep. In early days wool was spun in the small villages on the Pennine slopes, and the looms were driven by the swift mountain streams. This manufacture is still the chief industry in Yorkshire.

327. Northumberland and Durham Industrial Region. The Northumberland and Durham coalfield has a great advantage in being on the sea, for it is cheaper to carry heavy goods by water than by land. Three rivers cross the coalfield, on which three great groups of towns have arisen. In the north are the Tyne ports, Newcastle, North and South Shields, Gateshead, and Wallsend, from which a fleet of colliers[1] carries coal to the North Sea and Baltic ports, and to London. Many industries have grown up round these coalfields. Newcastle makes great modern guns, ships, machinery, and chemicals from salt, which is found in Durham. On the Wear is Sunderland, also a coal port and iron-smelting town. Then come the Tees towns, Darlington, Stockton, Middlesbrough, and Hartlepool. The first three are the great iron-working towns of Britain. Over £10,000,000 worth of iron ore is raised yearly from the Cleveland Hills to the south, but even this is not sufficient, and Swedish ore is imported. Locomotives, machinery of all kinds, and steel ships are made at Middlesbrough and Hartlepool.

328. The West Yorkshire and Nottingham Industrial Region. Farther south is the West Riding or Yorkshire coalfield. We have seen that in early days skilled weavers wove wool in the mountain valleys. This was before the time of the steam engine, which brought about the 'industrial revolution'.

[1] Ships carrying coal.

When that came in the late eighteenth and early nineteenth century, the woollen industry left the hills for the coalfields and the huge factories and cities of the plain were built. Thus grew up the woollen towns round Leeds. The woollen manufacture long ago outgrew the local supply, and wool is brought from Australia, New Zealand, and South Africa, through the ports on the Humber (Hull and Grimsby) and Liverpool. Leeds, which commands the routes to Liverpool through the Aire, and shorter routes by tunnels through the Pennines, has become the great market both for wool and for the finished products. It makes ready-made clothing, and, together with Bradford and Keighley, makes machinery for the woollen mills. Bradford, besides wool, has also great mohair factories. Huddersfield makes cloth. Halifax has the greatest carpet looms in the world. Barnsley has linen factories. The largest glass works in the world are at Castleford, where the Calder joins the Aire. In the Don Valley, Sheffield and Rotherham make armour plates and fine steel, axles, springs, screws, &c. The local rock makes excellent grindstones, which have long been used for putting a fine edge on cutting tools. Doncaster makes locomotives for the Great Northern Railway (G.N.R.). Nottingham, at the southern end of the field, makes lace, cycles, tobacco, and hosiery. Coal-mining is carried on, especially round Chesterfield.

329. Lancashire and Cheshire Industrial Region. West of the Pennines is the Lancashire coalfield, which is even more populous than the West Riding. Mark on a map the ring of cotton towns round Manchester. Rochdale is the only large town west of the Pennines with large manufactures of wool. Why is the cotton manufacture so much more important than the woollen? The chief reason is that cotton is more brittle than wool, and except in a damp climate the fibre breaks. Here, on the wetter western side of the Pennines, the climate, though unsuited for cereals, is an advantage for cotton spinning. The ports are well situated for importing American cotton, and coal is abundant and cheap. The double town of

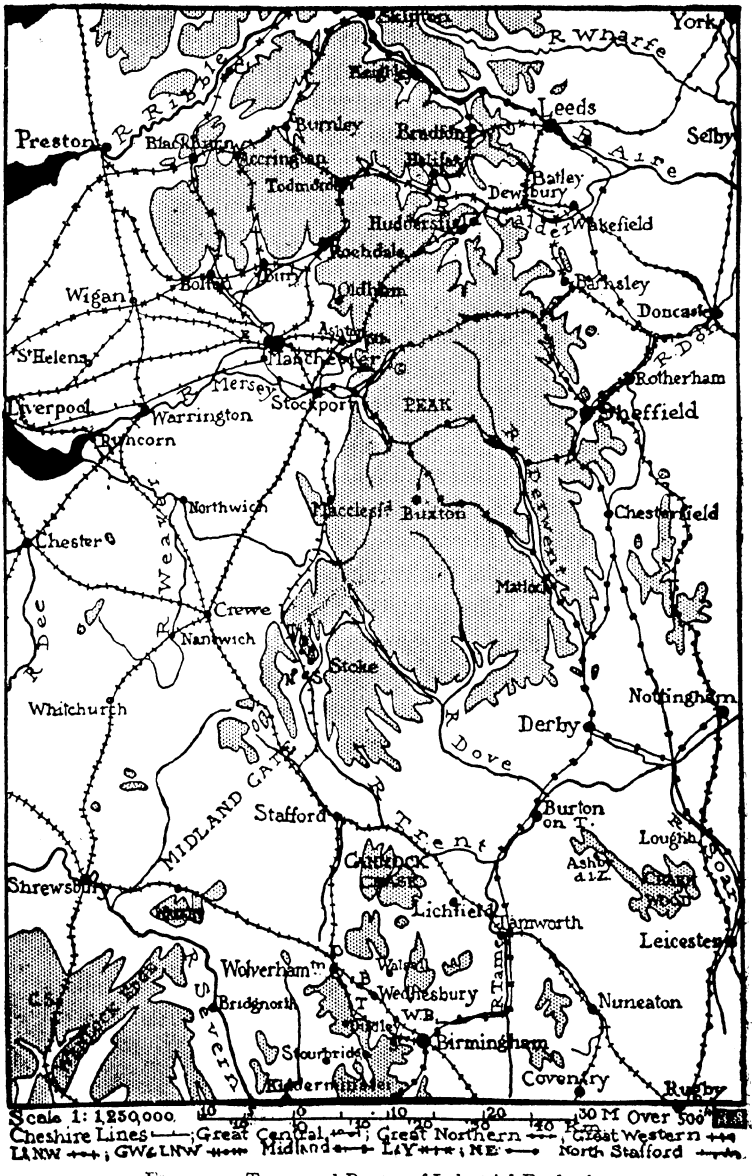


FIG. 143. Towns and Routes of Industrial England.

Manchester and Salford on the Irwell is the great cotton market (cp. Leeds), and has profited greatly by the cutting of a ship canal to Liverpool. Liverpool, with Birkenhead on the west bank of the Mersey, imports raw cotton (mainly from the United States, Egypt, and India), wool, and food for a dense population. With miles of docks and a deepened estuary, it has replaced the older port of Chester on the Dee. Cotton is also imported through Preston and Hull. Macclesfield weaves silk.

One advantage of the factory system is that a piece of work can be divided into different processes, each done by a different machine. This division of labour saves both time and money. The same principle is developing in different towns of this great group. A bale of cotton bought in Liverpool may be spun at Bolton, woven at Blackburn, and dyed at St. Helens or Widnes, where dyes are made. The machinery is chiefly made at Rochdale, Bury, and Manchester.

330. **The Potteries.** At the southern end of the Pennine Chain is the triangular coalfield of North Staffordshire. On this, local clay, salt from the Weaver Valley, and gypsum from Derby, have helped the growth of the 'Potteries', i. e. the earthenware and china factories of the 'five towns' now united and called Stoke. Pottery travels best by water, and canals have been cut from the Upper Trent and the Weaver Valley. By the Weaver and the Trent and Mersey canal come barges of china clay which has been shipped to the Mersey from Cornwall and Devon.

331. **Yorkshire and Lancashire outside the Industrial Areas.** If you look at Figs. 117, 141, 142, you will see that two arms run north from the Central Plain. The western arm forms the plains of Cheshire and Lancashire, crossed by the rivers Ribble, Mersey, and Weaver. On the east the Pennine slope is longer. To the wide vale of York, the Swale, Ure, Nidd, Wharfe, and Aire flow east from the longer slope of the Pennines. Below the junction of the Swale and Ure the wide stream is known as the Yorkshire Ouse. The Vale of York is cut off from the sea by the limestone scarp (the steep face) of the Yorkshire Moors and the chalk scarp of the Yorkshire

Wolds. The Derwent, which drains the Vale of Pickering between them, and the Don from the south-west, are other important tributaries of the Ouse. The Ouse is joined by the Trent from the south and the estuary of the two rivers forms the Humber. These plains are the great routes to Scotland. Outside the mining districts they are rich agricultural regions.

East of the Vale, the Moors end in cliffs on the seaward side. The openings of river valleys to the sea form small harbours, fishing villages, and watering-places (e. g. Scarborough and Whitby). On the deep estuary of the Humber are the ports of Goole, Hull, and Grimsby. The last, being next the sea, and having good railway communication, is the chief fishing port, from which fish from the Dogger Bank are rapidly sent to London.

332. **Lincolnshire.** The chalk belt continues southwards by the Lincolnshire Wolds, which are broken first by the Witham and then by the Wash. Notice the remarkable course of the Witham, north along Lincoln Edge, through Lincoln Gap, and then south-east between Lincoln Edge and the Wolds to the Wash. Lincoln means the colony (*colonia*) of the lyn or pool (cp. Dublin, Lynn, &c.). The pool is the bend of the Witham which cuts the gap. The old Roman road ran along the high ground of the Lincoln Edge to avoid the marshes. Lincoln is a typical gap town. On the high northern edge of the gap stand the ancient castle and cathedral; the town lies below in the valley. A railway map shows the importance of the routes through the gap. Lincoln is a market town, and, like other towns near the rich fen land manufactures farm tools and agricultural machinery.

333. **York** is the natural capital and market centre of the Vale of York. Its old walls and many Roman ruins still remain, and it possesses a fine cathedral.

334. **Durham,** with castle, cathedral, and university, is an old town picturesquely [1] built on a high mound, surrounded on three sides by the Wear.

[1] Prettily, like a picture.

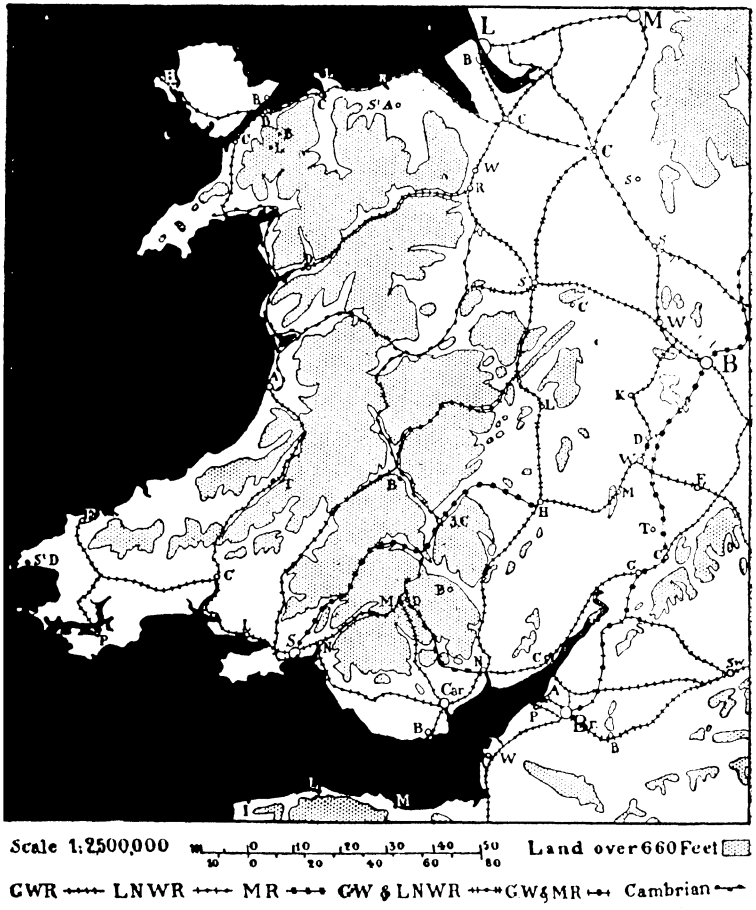


FIG. 144. Routes and Towns of Wales and the Severn Basin.

Wales and its Border.

335. **Wales and the Welsh Marches.** Fig. 144 shows that the Welsh peninsula, which lies between the Dee and the Bristol Channel, is a highland area, broken by long river valleys, and bordered by lowlands. Wales is built of hard

ancient rocks, slates, and limestones, some of which contain coal (see Fig. 136). Its surface has been worn down by glaciers, which covered the northern part of Great Britain in the Ice Age.

336. In **North Wales** the mass of the land is occupied by the Snowdon Ranges, which run in a north-easterly and south-westerly direction, as is shown by the outstretched finger of Lleyn peninsula. Snowdon, 3,570 feet high, is an extinct volcano, and is the centre of the highest mountain mass south of the Grampians. It is a picturesque rugged land, with a small population of shepherds and quarrymen. The latter work in the slate quarries, the produce of which is shipped from Bangor and Carnarvon, at the ends of the Menai Strait. A denser population lives on the North Wales coalfields, round the mining towns of Wrexham and Ruabon and the chemical works of Flint (salt from the Weaver Valley). A little smelting and pottery is also done, but the importance of these coalfields sinks before that of Lancashire. The Lancashire towns, however, provide a market for agricultural, especially dairy, produce. Anglesey has more cattle for its size than any other county in England and Wales. Rhyl, Llandudno, and other coast towns have developed into watering-places.

337. **Central Wales** chiefly consists of the high wide moorland of Montgomery and Radnor, between the upper valleys of the Dee and Usk. The highlands pasture sheep, and Welsh mutton is famous. As in the Pennines, local wool gave rise to woollen manufactures in the mountain valleys. Fishing villages have become seaside resorts where there is good communication, either inland by rail, or outland by estuary, e.g. Barmouth and Aberystwyth (*aber* = mouth of). The lower warmer plains of Cardigan are, like Anglesey, dairy pasture.

338. In **South Wales** are the lower highlands of the Black Mountains and Brecknock Beacons bordered on the west by the wide plains of the Towy and Milford Haven, and on the

south by the plains of Glamorgan and Monmouth. These mountains run from west to east.

In early days the most important towns lay, as they still do, at points where the roads near the coast cross a river. Such sites were marked by Roman camps and Norman castles, under the protection of which towns arose. The bridges prevented river traffic, and ships were forced to unload below them. Small trading towns and churches grew up at these points. Cornish tin and copper were brought to the Glamorgan estuaries, and smelted with timber from the Brecknock valleys. After coal was used, the deep river valleys enabled miners to run horizontal shafts into the rich seams, and small towns at the mouths of the valleys have grown into the great smelting cities of Swansea, which manufactures tin-plate from the ores of the Malay Peninsula; Llanelly, which works Spanish copper; and Cardiff and Newport, with engineering and ship-building works. Inland, a network of railways opens up the great iron-smelting area that lies round Merthyr Tydfil. The valleys are either cultivated, or blackened by many furnaces. The hills above, high, rounded, elongated [1], and thinly covered with grass, have hardly an inhabitant (Fig. 133). Where routes meet there are valley towns (Brecon) and tourist centres, especially where there are mineral springs (Llandrindod Wells, near Builth). As in Northumberland, the coalfield adjoins the sea. The ports of Cardiff, Swansea, Barry, and Newport export coal, especially the finest quality of smokeless coal (anthracite) used by the British and German navies. This coalfield extends into Pembrokeshire, and Pembroke on the fine fiord of Milford Haven is a Government dockyard.

339. **The Plain of Hereford** is drained by the Wye, on which, near the junction of the main tributaries, lie the market town of Hereford ('the ford of the army') and Monmouth. This is a specially favoured region. The old red sandstone soil is fertile, and the protecting hills give it a dry and comparatively warm and sunny summer climate. Hereford cider

[1] Of a long shape.

orchards, hop-gardens, and cattle are famous. The Forest of Dean, east of the Wye, has local iron which was smelted first by local timber, then by local coal.

The Plain of Hereford is separated from the Vale of the Lower Severn by the Malvern Hills, with Malvern (mineral springs) at their eastern base. This long range of high hills, rising steeply from the plains, commands a wide view.

340. **History and Routes.** The east to west direction of the southern mountains of Wales, and the south-west to north-east direction of those of the centre and north, and the similar direction of the valleys, made communication from north to south very difficult, as a railway map shows.

The Romans built four great camps to guard the border, Chester commanding the north coast route, Wroxeter that of the Severn Valley, Worcester the Teme Valley, and Gloucester the south coast route. Roman roads north and south led to outposts at Carnarvon and Caerleon-on-Usk (*Caer* or *Car* = fort). When the Anglo-Saxons seized England, the highlands served as a refuge for the Welsh, and preserved their language. Offa, King of Mercia, built his famous dyke at the foot of the hills to check their raids. Later, the Norman barons were allowed to hold whatever land they conquered on the border, and they built their castles higher up the valleys at Montgomery, Ludlow, and Monmouth. The easiest advance was by the wider plain of the south coast, past the castles of Chepstow, Newport, Cardiff, and Swansea, to Pembroke. The Welsh made their last stand in the northern highlands. Llewellyn defied Edward I in the Snowdon Range. Edward and his army followed the coast, and built the castles of Conway and Carnarvon. The railways follow these historic routes. In the north, the L.N.W.R. line from Crewe and Chester follows the coast to Bangor, and is carried by a tubular bridge across the strait to Holyhead. In the south, New Milford and Fishguard are ports in connexion with Waterford and Rosslare in Ireland. The Great Western (G.W.R.) main line follows the coast and connects with Bristol or Swindon by the Severn Tunnel, or with Gloucester by Chepstow.

The West Country.

341. **The Coasts.** This has a sunken coast-line, where volcanic hills have been changed into peninsulas (Lizard and Land's End), and river mouths into long estuaries. The estuaries form easily protected harbours, commanding the Atlantic routes. Plymouth, to-day, near the extreme west of

the English Channel, is a port of call where many ocean steamers land mails and passengers. Devonport, close by, and Falmouth are our western naval stations. Brixham, Penzance, and St. Ives are used by fishing fleets. The mild waters make the coast well suited for invalids. Torquay, on Tor Bay, is a popular winter resort. Ilfracombe and Lynton are watering-places on the high north coast of Exmoor.

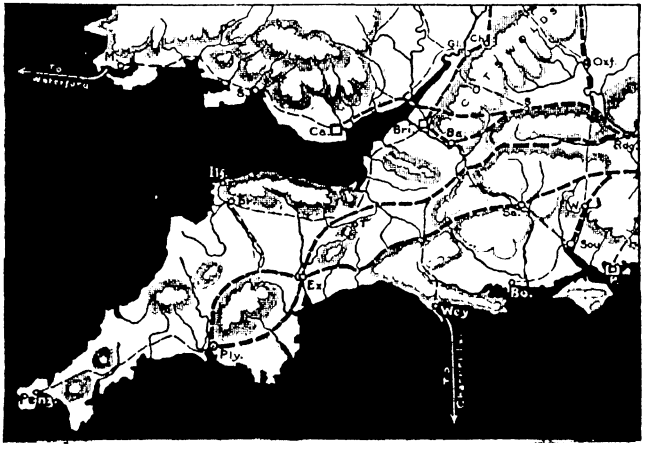


FIG. 145. Routes and Towns of SW. England.

342. **The Hills.** Inland is a chain of wide vales, the Vale of Somerset, drained by the Tone and Parret, the Vale of Devon, drained by the Exe and Taw, and the Vale of Tamar. These are separated in the south by the Blackdown Hills, Dartmoor, and Bodmin Moor. These are masses of hard granite. These granites coming up hot from the depths of the earth long ago, baked and cracked the surrounding layers of rock, sweating out the ores that lay therein, so that the metal ran and set in the cracks round the edges, forming veins of tin and copper. These have been mined from time immemorial. Many are exhausted, but Bodmin still raises ores, which are sent to Wales. Granite, when weathered, forms a

tough white clay. This is the best china-clay, and is shipped from Fowey to the Potteries. There are sheep on the upland pastures, especially the heights of Exmoor and the Quantocks and Mendips.

343. **The Vales.** The vales raise cattle. Devon (cp. Hereford) has a mild climate and a fertile soil. It is a peaceful land of red cattle and red cider apples. Taunton in the Vale of Somerset is the chief of many small market towns. North of Taunton much of the land is drained marsh. The Isle of Athelney, where the Tone joins the Parret, was the fen refuge of Alfred the Great, near the ancient abbey of Glastonbury. The lead of the Mendip Hills to the north-east has been worked since the earliest days. Your atlas will show you the railways which converge upon Exeter at the head of the Exe estuary. Exeter was the camp by which the Romans held the Cornishmen or West Welsh in check. It has a fine cathedral. (For railways, see Fig. 145.)

344. **The Scilly Islands,** off Land's End, have an even warmer climate than Cornwall. They grow spring flowers and early vegetables for the London and country markets.

The Midlands.

345. **The Central Lowlands.** Compare Figs. 141 and 143. You will see that the plain of the midland counties is a wide lowland, shaped like a triangle, widest in the north, where it is bounded by the end of the Pennine Chain, and narrowing in the south between the Welsh Highlands and the Cotswolds and Northampton Heights. Birmingham lies in the centre of this region. The Midlands are drained by three streams, which flow slowly along the soft clays, parallel to the highland boundaries, and receive their longest tributaries from them. In the north, the middle valley of the Trent receives the Upper Trent, Sow, Dove, and Derwent from the Pennines, and the Tame and Soar from the south. In the west, the main stream of the Severn runs southwards parallel to the Welsh Highlands. It rises in Plynlymmon, near the

west coast of Wales, and after flowing north-east across Wales, enters England above Shrewsbury. Lastly, the Warwickshire Avon joins the Severn at Tewkesbury. The soft clays and sandstones form a low damp country, with no great heights except near the coalfields. Apart from the industrial areas, the central lowlands are agricultural, and the heavy soils suit cattle. Dairy-farming and market-gardening are important near the industrial markets. Orchards and hop-gardens are important in the lower valley of the Severn and Avon.

346. The Heights. The lines of hills and coalfields (see Fig. 136) all lie in the north, and are continuations of the Pennines. If we may compare the Pennine Range to an arm, we may say that though the wrist is buried, the four fingers and a thumb of limestone, volcanic rock, and coal are bent up above the level clays of the Midland Plain. The thumb lies to the east and sticks up in the Leicestershire coalfield, with Ashby-de-la-Zouch in the middle of it, and the granite heights of Charnwood Forest (moorland). The first finger is the long narrow Warwickshire coalfield between Tamworth and Nuneaton. The second and fattest finger is the Black Country, with the narrow north-south line of the Clent-Lickey Hills and Birmingham on its southern margin. The third finger is the South Staffordshire coalfield, which lies along the Severn between Wellington and Kidderminster, with a similar north-south line visible in the Clee Hills. Lastly, the little finger curves westwards, from the granite mass of the Wrekin to the Shropshire coalfield immediately south of Shrewsbury.

347. The Black Country. Great manufactures are carried on in the Black Country. Coal is found with iron ores, limestones, and clays (used in casting). North-west of Birmingham are the great ironworking towns, Wolverhampton with huge foundries[1], Walsall, Wednesbury, Dudley, and Stourbridge, which make earthenware and ugly blue Staffordshire bricks. This area is linked by rail, tramways, and canals.

[1] Iron-smelting (or copper-smelting) works.

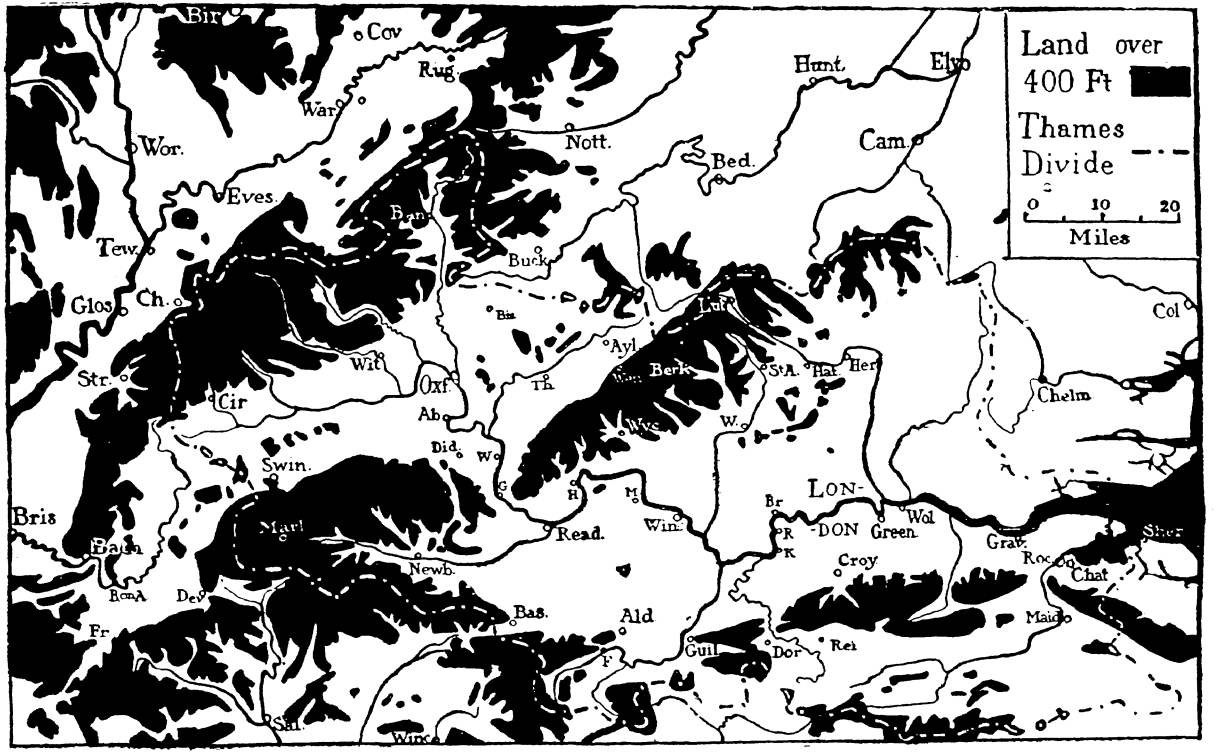
Birmingham itself is engaged in finer metalwork, small arms, cycles, bedsteads, screws, and cutting tools. It is the great market, served by the ports of Liverpool, Hull, Bristol, and London. Some of the older towns to the south prosper through special industries. Coventry makes cycles; Bromsgrove, west of the Lickeys, makes chains; and Redditch, east of them, has the largest needle and fish-hook factories in the world.

348. **Other Industrial Areas.** The red clay itself is used for earthenware, bricks, &c., and often contains salt. The Leicestershire and Warwickshire coalfields are mining districts, but road metal, important in clay countries, is quarried in Charnwood Forest and at Nuneaton. Leicester (*Legionum castra* = Camp of the Legions) manufactures boots and shoes (leather from the lowlands) and hosiery (wool from the nearest uplands). Burton-on-Trent has vast breweries, for which the local water is specially suited. The other two coalfields are comparatively unimportant. Wellington has iron-foundries. Kidderminster makes carpets. Shrewsbury, on a height nearly surrounded by the Severn, is an old market town.

349. **Salt** is pumped up at Northwich, Middlewich, and Nantwich. Droitwich is a salt town with medicinal salt baths, and provides the material for glazing the china made at Worcester, a cathedral city near the junction of the Severn and the Teme. There are salt springs at Malvern and Leamington.

350. **Towns of the Lower Severn and Warwick Avon.** The river soils of the Lower Severn have large hop-gardens and orchards (Evesham), and many ancient market towns, e.g. Worcester, Tewkesbury, Gloucester. On the Avon is Stratford-on-Avon, the birthplace of Shakespeare, our greatest poet. Close by is Warwick, an ancient Roman town, with a fine castle. Rugby, farther east, has electrical works, and is a great railway centre.

The main routes are given in Fig. 143. There are railway works at Crewe and at Derby.


Land over 400 Ft
Thames
Divide
0 10 20
Miles
Bir.
Cov.
Rug.
War.
Wor.
Eves.
Tew.
Glos.
Ch.
Str.
Cir.
Wil.
Oxf.
Ab.
Did.
Swin.
Bris.
Bath
Marl.
Newb.
Read.
Bas.
Ald.
Sal.
Win.
Buck.
Bed.
Nott.
Hunt.
Elyo.
Cam.
Luf.
Ayl.
Berk.
Th.
Wye.
W.
St.A.
Hat.
Her.
Col.
Chelm.
LON-
DON
Br.
R.
K.
Wol.
Green.
Croy.
Grav.
Roch.
Chat.
Maid.
Guil.
Dor.
Rei.
Bas.
Fr.
Dev.
Bom.A.
Wine.

The Scarp Lands and Clay Vales.

351. The Limestone Belt. We have seen the northern end of this in the Cleveland Hills and Lincoln Edge. This ridge turns south-westwards across England in the Northampton Heights, Edge Hill, and the Cotswolds, and ends in the Dorset coast and Portland Bill. The well-drained heights are sheep pasture. Here arose the well-known breeds of 'Cotswolds' and 'Oxford Downs' sheep. The lower lands are agricultural, with many market towns, some of which, like Lincoln, lie on gaps that have fixed the main routes. Some have farming industries, e. g. Grantham and Kettering (agricultural tools from local ores); Northampton (boots and shoes, ironwork). Buckingham and Banbury are other ancient gap towns. The villages on the Cotswold slopes were great centres of the woollen industry. Witney, near Oxford, gave its name to Witney blankets. Stroud makes red army cloth, the water being particularly good for dyeing. Bath, in the gorge cut by the Bristol Avon, has been a famous spa[1] since Roman times. Bristol, at the head of the Avon estuary, has been a great port for centuries. Besides regular services to the Irish seaports, Bristol trades with the West Indies, and has tobacco, cacao, sugar, and boot industries. Building-stone is quarried at Bath and Portland. Throughout the region the houses are of limestone, and rough stone walls take the place of hedges.

352. The Clay Vales. The limestone belt is drained to the south-east. Between it and the chalk ridges lies a valley of soft clays found in the Vale of Blackmoor (Dorset), the Vale of the White Horse (under the Berkshire Downs, on which a figure of the white horse is cut), the spreading waters of the Upper Thames, the Vale of Aylesbury, and the Fenland drained to the Wash. Much is drained flood-land forming the richest dairy pasture in the kingdom, and producing Dorset butter, Cheddar cheese, and Stilton cheese. Oxford, at the junction of the Thames and Cherwell, is the centre of the Oxford Clay

[1] Place for drinking medicinal waters.

Vale, where routes from all directions join. Surrounded on three sides by rivers and marshes, it had an ancient camp and a Norman castle, and became the seat of the first university of England.

353. **The Fenland.** Till within historic times this was a region of reed beds and mud flats, flooded at high-water, and supporting only a small population of fishermen and wild fowlers. The towns were on the low hills, then islands, of Peterborough and Ely (Eel Island), where rich monasteries arose. Cambridge, the second university in England, resembles Oxford in its fen-bound isolation. Other ancient towns were built just beyond the flood area, e.g. St. Ives and Huntingdon on the Ouse, Stamford on the Welland. All are important market centres. The Fens have been drained, and form rich black agricultural land. The flat green plains are planted with cereals, and root crops, with brilliant patches of yellow mustard, and, round Wisbech, acres of strawberries and orchards.

The fields are divided by long straight dykes, which carry the water off into deeper drains, banked up on either side. This water is held back by strong gates, and can only enter the rivers when the water is low. The Fen rivers are also between banks, and at high tide their waters rise 15 to 20 feet above the level of the surrounding land. Sea tides bar out the tides of the Wash, the salt marshes of which are still being drained.

354. **The Chalk Belt.** This forms a continuous belt of ridges in the East Anglian Heights, the Chiltern Hills, and the Berkshire Downs. These have their steep slopes and short rivers to the north-west and their long slopes and rivers to the south-east. The upper Thames flows through what is known as the Goring Gap, between the Chilterns and the Berkshire Downs. South of the Berkshire Downs the chalk area widens to the broad plateau of the Hampshire Downs and Salisbury Plain. This is the centre of the chalk, and from it one arm, the West or Dorset Downs, runs south-west to the Isle of Purbeck, and two other ridges run east, the North and South Downs, which end, one in the Isle of Thanet, the other in Beachy Head.

355. These chalk lands stand up as hills, not because of their hardness, but because chalk is an extremely porous soil. Water sinks deep down into it, and there are few surface streams or rivers to wear the land down. The dry soil with short turf makes excellent sheep pasture. Owing to absence of water the villages generally lie at the foot of the ridge where there are springs. The bare unfenced downs are used for military camps and manœuvres (Salisbury Plain), for aeroplanists, and for racing stables (Epsom, Newmarket, Newbury). The chalk is thinly peopled, and the chief towns command gaps in the chalk, through which routes run from one basin to another.

356. **The Vale of London and East Anglia.** The chalk of the Chilterns passes beneath the Thames and reappears in the North Downs. The chalk has in fact been bent down, forming a basin now filled with clays and sands, across which run the Kennet and lower Thames. Some of the sand is poor soil, but the mixed clays and sands make excellent farming country.

In East Anglia, Norwich on the Wensum is the most important place. It still has great sheep fairs, but the woollen industry is now given up, and its place has been taken by the manufacture of agricultural tools, boots and shoes, and the preparation of mustard grown in the neighbourhood, starch, &c.

357. The coast is smoothed by strong currents, which are rapidly wearing it away. Part of this material is banked up along the coast. Wherever there are hard cliffs or river mouths, small fishing villages have grown into seaside resorts; e.g. Cromer, Yarmouth, and Lowestoft, on the Yare and Waveney estuaries. At the heads of the deeper Essex estuaries ancient bridge-towns grew up. Ipswich, on the Orwell, makes agricultural machinery and railway plant. Colchester, on the Colne, was a Roman fort, and famous then as now for oysters. Harwich, on the Stour inlet, is a passenger port, with daily sailings for the nearer continental ports.

Last comes the deepest and most important historic estuary of all, that of the Thames. Its bridge-town is London, the capital of England and the British Empire.

358. London. In ancient times the shores of the Thames estuary were marsh. London is built where these marshes become narrow and where high ground first appears on both sides of the river, making the construction of a bridge possible. Below this bridge, vessels landed and sold their cargoes. Their crews, and also such travellers as crossed the Thames by the bridge, required food, inns, &c. The City of London, with St. Paul's Cathedral, miles of docks, warehouses, markets, factories, shipping and insurance offices, banks, and exchanges, has grown up round London Bridge. The docks, easily dug in drained marsh, with their chief imports are shown in Fig. 148. Special manufactures depend on each dock, e.g. West Ham soap on West African palm-oil (East India Docks); Deptford leather-tanning and glue industries on cattle landed at Deptford. Here the Tower of London was built to command the bridge. The industrial area has now spread down the estuary. Greenwich and Blackwall have docks, and Woolwich and Chatham, at the mouth of the Medway, are great arsenals and naval dockyards. The forts protecting the estuary are at Tilbury, Gravesend, and Sheerness (on Sheppey Island). Queenborough, on Sheppey, is a passenger traffic station.

359. London was more than a bridge-town. Above the bridge the river in old days was wider and shallower. There were many islands, now drained (e.g. Bermonds-ey, Chels-ea, Putn-ey). On one of these, at the lowest ford, the kings built Westminster Palace. In Westminster are St. James's and Buckingham Palaces, Westminster Abbey, the Houses of Parliament, the War Office, and other Government buildings. Here too are the royal parks, and round them the richer quarters.

360. To see why London became the capital we must look at the routes it commands. The Thames estuary faces the Scheldt, Rhine, and other waterways of the Low Countries. These were all important as markets for English wool. More important still are the great routes meeting on the Strait of Dover, from the Baltic, the Mediterranean, and the New World.

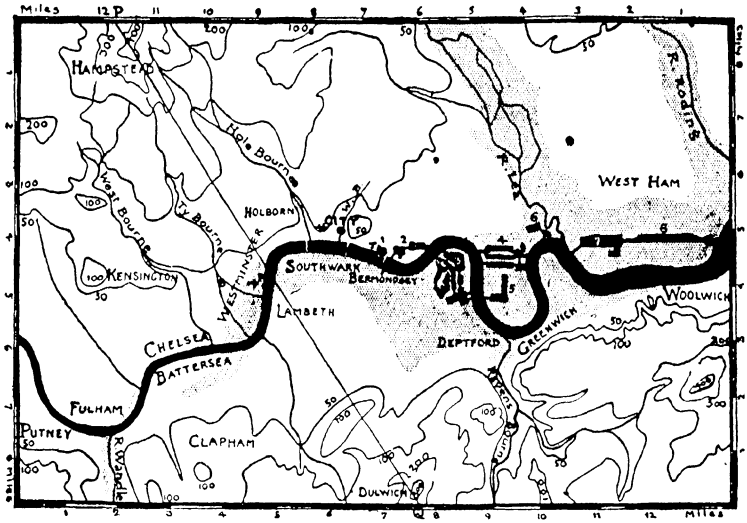


FIG. 147. The Site of London.

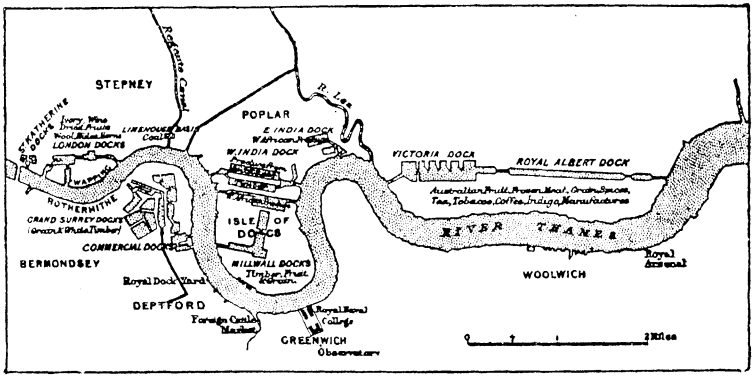


FIG. 148. London Docks and the Commodities brought to them.

Again, London lies in the centre of the ridges, and from it the routes run out in all directions, up the gentler slopes, and through the gaps of the chalk and limestone hills. This is shown by the railways of Fig. 149.

361. On these lines are the next important towns in the Thames basin. Hertford Castle guarded the Lea valley.

St Albans and Luton manufacture straw-hats and lie at the ends of the gap leading to Bedford. High Wycombe, in a less important gap, makes chairs from the Chiltern beech forests. Up the Thames are Kingston, Richmond, the royal residences



FIG. 149. The Towns and Routes of SE. England.

of Hampton Court and Windsor, Henley, and the industrial town of Reading (biscuits and carpets) at the lower end of the Goring Gap.

362. Railways. Nearly a dozen great lines of railways, and others of less importance, meet at London (see Fig. 140).

Those from the north follow the river valleys wherever possible, and cross the Chiltern Hills in gaps.

Important lines bring the whole district between North Wales and South Devon and Cornwall into communication with the capital, by the Thames valley, connecting it with the great ports and naval stations on the west and south coast, as well as with the busy industrial districts of the Midlands.

London is connected with the south coast by many lines which run through the gaps in the Chalk Downs or in tunnels through them. The line to Brighton tunnels through the North and South Downs. Only the North Downs need be crossed to reach Folkestone and Dover. A line runs along the northern border of the chalk by Chatham and Canterbury, and enters Dover by a tunnel through the chalk.

363. **The North and South Downs and the Weald.** The Weald is a lowland lying between the North and South Downs. Its clays and sands are older and softer than the chalk. Wind and rain have worn away the chalk, exposing the softer rocks beneath. The rough edges of the chalk stand out as the North and South Downs. This all happened before the days of man. The ridge of the Weald was then continued into France, but the sea has eaten through the land forming the shallow Dover Straits, and is still wearing away the white chalk cliffs of Dover and Calais. Notice where the chalk runs out into the sea, the North Downs in the Isle of Thanet, and the South Downs in Beechy Head.

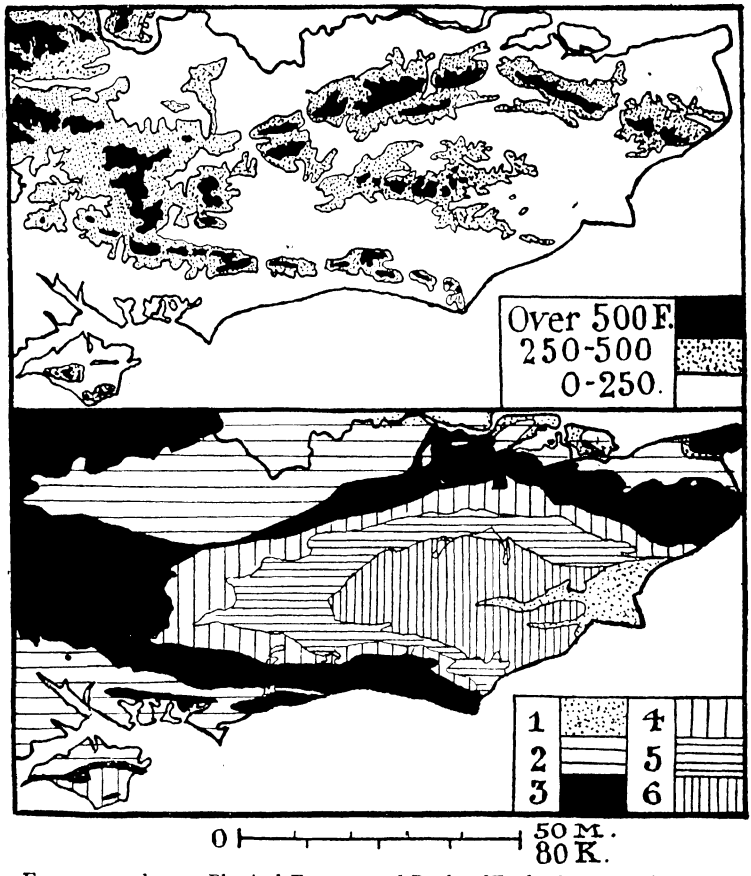
This south-eastern corner is the link between England and the Continent. Hence its great importance in history. Dover and Lympne were Roman ports, then came the 'Cinque Port' union of Sandwich, Dover, Hythe, Romney, and Hastings. Communication is now through the ports of Dover (to Calais), Folkestone (to Boulogne), and Newhaven (to Dieppe). Other coast towns are fishing and seaside resorts, e. g. Margate, Ramsgate, Deal, Hastings, Eastbourne, and Brighton.

364. The interior of the Weald was formerly covered with a dense forest. This supplied fuel for ironworks (local iron)

and oak for ships. The ancient woodland (except a small patch) and the ironworks have vanished, and the Weald is now agricultural, raising cattle and sheep on Romney Marsh and on the Downs. The rich Medway soils have orchards, hops, and market-gardens. The Vale of Kent deserves its name of the Garden of England, and its prosperity is shown by the many towns and villages. These may be looked out in a large map

365. Defence against the Continent is important as well as traffic with it. Dover is strongly fortified, and ancient castle and market towns are placed in the chalk gaps, by which routes pass inland. In the south the castles of Arundel and Lewes held the gaps of the Arun and Ouse. In the north, notice Guildford on the Wey, Dorking on the Mole, and Maidstone (with breweries and paper-mills on chalk streams) on the Medway. Canterbury is the religious capital of England. Ashford at the other end of the Stour Gap has great sheep and cattle fairs. The military centre is Aldershot, built upon open sandy moors where its troops can rapidly reach London, Portsmouth, and the south coast.

366. **The Hampshire Basin** is a downfold, i.e. a valley of chalk filled with sands and clays washed from the surrounding chalk heights (cf. the London Basin). The south has a sunken and much-worn coast, as is shown by the sunken river valleys of the Solent and Spithead, which separate the Isle of Wight from the mainland, and by the harbours of Portsmouth, Southampton Water, and Poole. Southampton Water, the estuary of the Test and Itchen, has four tides a day. One comes up the Solent, and another two hours later, by Spithead. This makes Southampton peculiarly accessible to shipping. Behind Portsmouth harbour there is a long ridge of chalk, now strongly fortified, and commanding the harbour with heavy guns. Portsmouth is our largest naval dépôt, with huge docks, slips at which Dreadnoughts can be built, armouries, and the Royal Naval College. Spithead and the Solent are protected by forts. Southampton, in the heart of the basin, is a



FIGS. 150 and 151. Physical Features and Rocks of England between the Lower Thames and the Channel. In Fig. 151, 1 = alluvium, 2 = tertiary clays, sands, &c., 3 = chalk, 4 = upper and lower greensand with gault clay between, 5 = weald clay, 6 = Hastings beds of sandstone, &c. Cf. Fig. 152.

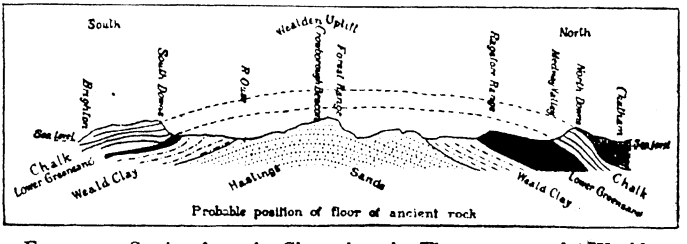


FIG. 152. Section from the Channel to the Thames across the Wealden region. Cf. Figs. 150 and 151.

busy port, a ferry town for the Channel Islands and France (Havre), and a passenger station for the East and West Indies and other colonies. Bournemouth fifty years ago was a small fishing village on bare moorlands, but the firm sands, warm climate, and sweet-smelling pine woods have made it a popular winter resort. Inland, belts of clay support mixed farming and forest, but the lighter sands are moorland. These form the beautiful woods and moorlands of the New Forest between the Avon and Southampton Water. Small winter stations are found on the mild coast of the Undercliff of the Isle of Wight. Newport is the capital of the island.

367. Two roads lead north by gaps in the chalk, one by Salisbury, the other by Winchester, both cathedral cities. Near the former is the stone circle of Stonehenge, a prehistoric monument about which we know little. Another route runs west by the Frome Valley and Dorchester. South of the Frome is the so-called Isle of Purbeck, a beautiful country with ridges of chalk and limestone running parallel to the sea. Swanage is a watering-place, Weymouth a small port and passenger station for the Channel Isles. The chief export is Portland stone.

CHAPTER XVI

SCOTLAND

368. Physical Features. The Border, the boundary between England and Scotland, is formed by the Solway Moss, the Cheviot Hills, and the Lower Tweed. It is a natural boundary, difficult to cross, and still thinly peopled.

Look at Fig. 117. Scotland is the most mountainous of the three kingdoms. The Highlands are highest in the west, while the Lowlands are most continuous in the east. The short steep slope of land is to the west, the long and gentle slope to the east. Scotland turns its back on the Atlantic,

and its largest river valleys and most navigable estuaries open to the North Sea and Europe. The Firth of Clyde is the only great river opening to the west.

369. Three physical divisions and natural regions are well marked—the Southern Uplands, the Central Lowlands, and the Highlands. The Southern Uplands are built of ancient granites, slates, and other hard rocks. In the Central Lowlands the rocks are quite different from those of the Southern Uplands or the Highlands. Part of this district is submerged and forms the Firth of Clyde on the west coast, and the Firths of Forth and Tay on the east, all valuable waterways. It contains the only coal in Scotland, and is the most densely populated and richest part of the country. Elsewhere, both in the uplands and highlands, the coal has been worn away by wind, water, and ice. The Highlands contain the oldest rocks, and form the most compact mountain area in our land.

The Southern Uplands.

370. The Southern Uplands. These are like North Wales, not only in the nature of the rocks, but also in the direction of the rocks from south-west to north-east. They form a continuous belt of highland, divided by river-valleys, and bordered by narrow plains near the coast. A railway map shows that on these valleys and plains depend the routes between England and Scotland, and that on them lie the chief towns. As in Wales, the uplands consist of moorlands and sheep pastures. Sheep-rearing 'Cheviots' is the chief occupation. Roxburgh, Berwick, and Selkirk have more sheep per 1,000 acres than any other counties in Britain.

371. Routes between England and Scotland. The easiest route between England and Scotland follows the east coast from the old Border fortress of Berwick-on-Tweed, past Dunbar, where the Lammermuir Hills reach the sea, to Edinburgh. The Tweed rises near Hart Fell, and drops 1,000 feet in the first thirty miles. Its valley has long been a centre of great wealth and a large population, as is shown by the number of



FIG. 153. Scottish Railways.

fine ruined monasteries, Melrose, Kelso, Jedburgh, &c., destroyed by the border wars. The water-power has given rise to many small manufacturing towns, e.g. Peebles on the Tweed, Galashiels on the Gala, Selkirk on the Ettrick, Hawick on the Teviot, making cloth and hosiery.

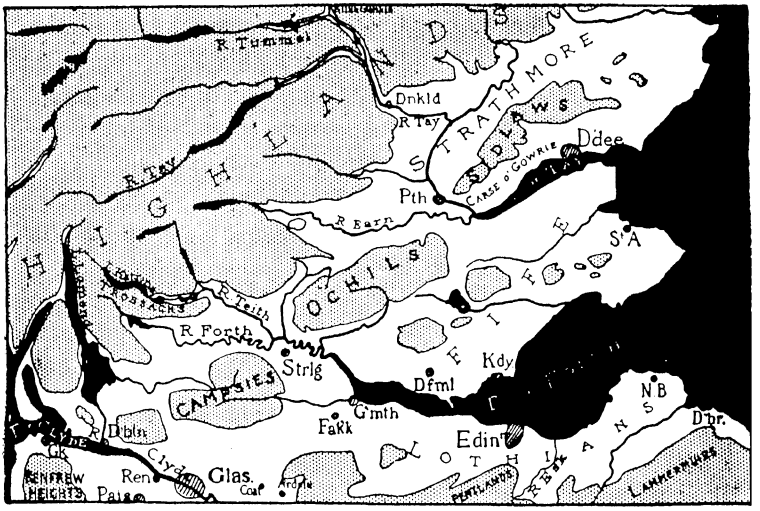


FIG. 154. The Central Lowlands of Scotland.

The Central Lowlands.

372. **The Central Lowlands.** Look at Fig. 154. When the sinking took place, masses of melted rock reached the surface, forming volcanoes. When these volcanoes ceased to be active, the lavas cooled and hardened. This happened so long ago that the rocks below have been worn away, and the hard streams of lava remain as high crags on which many ancient castles are built (e.g. Edinburgh and Stirling). The lava-streams also stand out as rounded hills (compare Cornwall). A belt of such heights runs across the lowland as the Renfrew Hills, the Campsie Fells, Ochil Hills, and the Sidlaw Hills. These hills are separated by the waterways of the Clyde, Forth, Tay, which have cut deep gaps through the volcanic

barrier. On these gaps all the routes from north to south meet, and in them lie Glasgow, Stirling, and Perth, the three keys to the Highlands. Edinburgh, the fourth great lowland town, lies near the Pentland Hills on the east-coast route to England.

The modern history of these four historic towns, and the rise of newer industrial centres, depends on the distribution of the coalfields. There are three areas of coal: (1) the West or Ayr coalfield; (2) the Central or Lanarkshire coalfield, stretching from the Clyde across the upper part of the Forth estuary, through Lanark, Stirling, and Clackmannan; (3) the Eastern coalfields on both sides of the Forth estuary, in Fife and Midlothian. All lie close to the sea, and contain the iron and limestone used in iron-smelting.

373. **The Ayr Coalfield.** On the Ayr coalfield the chief industrial centre is Kilmarnock, with foundries, engineering shops, and woollen factories. The coast towns, Ayr, Troon, &c., export coal and iron, especially to the ship-yards of Belfast.

374. **The Central Coalfield, the Clyde Valley, and Glasgow.** The Central coalfield has (1) great quantities of coal and iron, (2) the splendid estuary of the Clyde, almost the only waterway on the west coast, and (3) easy communication by rail and by canal with the Forth. The Clyde rises in the heart of the Southern Uplands, near Leadhills, a lead-mining centre and the highest village in Great Britain (1,400 feet). Flowing swiftly north-west through narrow mountain alleys ('glens'), it drops over the falls of Clyde to the wider lowland valley ('strath'), at the head of which stands Lanark. Lanark thus commands the routes by the Clyde and Nith. The glens are sheep pasture. In the straths grow richer grass for cattle and the hardier cereals. Hence Lanark has weaving, distilling, and leather industries. Below Lanark the Clyde enters the coalfield. Many towns blacken the valley, Hamilton the mining centre, Motherwell, Coatbridge, and Airdrie with iron-furnaces, and Glasgow. Glasgow is by far

the largest and wealthiest city in Scotland. A gap town, it has an ancient cathedral and university. Note the many routes, one of which goes down the Clyde to Greenock, another through the Beith Gap by Paisley and Dalry to Ardrossan, while the third goes to Grangemouth on the Forth and connects Glasgow with the North Sea and Baltic ports. As a bridge-town at the head of a tidal river, and with the river deepened for ocean-going vessels, it has become a great port. Local coal, iron, and timber are brought to the wharves at a low cost. The Clyde is now one of the greatest ship-building areas in the world, Glasgow, Port Glasgow, Dumbarton, and Greenock being the chief towns thus engaged. Glasgow also works chemicals. Dumbarton uses the pure waters of Loch Lomond for bleaching. Other industries depend on the American trade. Paisley, with a suitable climate, has the largest cotton and linen thread factories in the kingdom ('Paisley shawls'). As the centre of a densely populated district, Glasgow equals Liverpool and Manchester, and is surpassed only by London. A canal connects the Clyde and the Forth. Measure its length. In the east of the field, the historic town of Falkirk lies in the middle of a coal and iron district. Grangemouth and Alloa are coal ports.

375. **Edinburgh and the Midlothian Coalfield.** Edinburgh, the second town in Scotland in point of wealth and size, ranks first as the administrative capital of Scotland. It was first a hill fort on the volcanic crag of the Castle Rock, commanding the narrow passages east and west between the Pentland Hills and the sea. Like most university towns it is a great printing centre, and has also famous breweries and distilleries. Both these industries depend upon a large supply of water, which is brought by the mountain streams of the Leith and the Midlothian Esk, along which lie the paper-mills. Edinburgh has also great cattle-markets, for the Lothian plains, with their drier climate, make good grazing and agricultural land.

The Midlothian coalfield supports iron and mining towns,

and also contains valuable oil shale, from which oil and ammonia are extracted. Leith, which is continuous with Edinburgh, exports these products, and imports food-stuffs. The narrowest part of the estuary (Queensferry) has been spanned by the Forth Bridge, which is over a mile long. Here the docks of Rosyth serve as a naval base for the North Sea.

376. **Fife and the Forth Valley.** The Fife Peninsula is cut off by the Ochil Hills, and Firths of Forth and Tay. Hilly in the centre, but with a rich plain near the coast, it was called by a Scottish king 'a beggar's mantle with a fringe of gold'. Cupar, an inland town, is the capital. St. Andrews, an old religious centre and university, is now a great golf and holiday resort. The Fife coalfield, of which the chief centres are Lochgelly and Cowdenbeath, supports such industrial towns as Dunfermline, an ancient Scottish capital, now engaged in linen manufacture, and Kirkcaldy, which makes oil-cloth. The flax for these Scottish linen factories is mostly grown in Russia. Methil and Burntisland export coal.

Stirling, between the Campsie Fells and Ochil Hills, owes its importance to the fact that its castle commands both the gap and the lowest bridge on the Forth. Stirling has cloth and leather factories, and is a great railway junction.

377. **The Tay Valley and the Coast.** Perth is a similar bridge-town. It controls many routes, south to Edinburgh either by the Forth Bridge or by Stirling, west to Oban by Crieff, north to Inverness, either by the Tay valley or by the east coast. It has great sheep markets, many industries, and large dye works. It was a favourite seat of Scottish kings, and not far away is Scone, the crowning-place of the kings of Scotland.

North of Perth, the Tay and Isla drain Strathmore, the 'Great Vale', a rich belt of grazing-land lying between the Sidlaws and the Highland edge. Dundee and the fishing towns of Arbroath and Montrose manufacture hemp and flax into rope, sailcloth, and linen. Sixty years ago, when the

Crimean War cut off the Russian supply of hemp, Dundee manufacturers began to import jute fibre from India. Dundee is the centre of the jute manufactures, and produces bags, carpets, and fabrics of fine appearance but poor quality. Dundee manufactures marmalade and jam. It is also the head-quarters of the North Sea whaling and sealing fleets. The Tay Bridge enables the east-coast railway to cross the estuary. Stonehaven is a fishing town with brewing and woollen industries.

The Highlands and Islands.

378. The Highlands. Fig. 153 shows the great highland masses of northern Scotland, which are continuous except for the remarkable long, narrow valley of Glenmore, or the Great Glen, which runs from the Moray Firth south-west to the Firth of Lorne. This is a very narrow valley, a crack in the Earth's crust. Two long, deep lakes, Loch Ness and Loch Lochy, occupy about three-fifths of it. From Loch Ness the Ness River flows to the north-east, and from Loch Lochy the Lochy flows to the south-west.

Little agriculture is possible in the mountain glens. Heavy rains carry away any loose soil, except where it is held back by woods of fir and birch. Above the narrow glens are moorlands of purple heather and yellow bracken, broken by soft green patches of moss, blackened where the heather has been burnt for sheep pasture. It has been found that the highlands pay their owners better as deer forest and grouse moor than as sheep pasture. These preserves and the salmon streams fetch very high prices. The salmon-net fisheries of the Tay alone bring in £17,000 a year. These bare desolate moors are very thinly peopled. Few houses can be seen except an occasional shepherd's or keeper's hut. In old days the Highlanders seldom married or settled outside their own valleys. Hence the devotion of the clansmen to their chief (the head of the family), their hostility to other clans, and their raids. Raids are now replaced by peaceable emigration. The

young people depart to Canada or New Zealand, where they succeed by their thrift and industry.

379. The South-Eastern Highlands. In the Eastern Highlands, south-east of Glenmore, the higher western edge is marked by such heights as Ben More and Ben Nevis. Ben Nevis (4,400 feet high) is the highest mountain in the British Isles. Snow remains in the corners of the north-eastern precipices all the year round. East from Ben Nevis in the line of the Grampian plateaus are the heights of Cairngorm (4,300 feet high) and Ben Macdhui.

South of Loch Linnhe the long Mull of Kintyre stretches out towards Ireland with Arran to the east, and to the west Jura, with two conical[1] hills and the low-lying boggy Islay. Kintyre has many small lowland farms, raising cattle and the hardier cereals, oats and barley. Campbeltown, in the south, and Islay have distilleries. Fisheries are important, especially the herring and haddock fisheries of Loch Fyne. The magnificent scenery attracts thousands of tourists to Inverary, at the head of Loch Fyne, and Oban. One of the finest tours is by coach from Callander through the Trossachs to Loch Katrine, which is crossed by steamer, and by coach again to Loch Lomond.

380. The drier east coast is good farming land. The chief town, Aberdeen, between the estuaries of the Dee and the Don, is one of the four Scottish universities. It exports, and is built of, grey granite. It has many industries, imports Irish cattle to be fattened on the neighbouring farms, and together with Peterhead and Fraserburgh is an important fishing town. The royal residence of Balmoral, and the historic seat of Braemar, lie in the highland valley of the Dee. Banff, Elgin, and Nairn are market towns on the rivers flowing to the northern coast, where there are many fishing villages. This plain is also crossed by the Spey, the long valley has separated Monadhliath Mountains from the Grampians.

Inverness is the natural capital of the Highlands, command-

[1] Shaped like a cone.

ing the East Coast, Highland, and Glenmore routes. Glenmore is now used by the Caledonian Canal, which allows vessels of considerable size to pass from east to west without facing the dangerous passage of the Pentland Firth. Fort George in the north, Fort Augustus in the centre, and Fort William at the foot of Ben Nevis were built by our Hanoverian kings against the Jacobite clans of the north. Fort William is the most important.

381. **The Northern Highlands,** like the Grampians, are wide desolate grouse moors and deer forests, with deep lochs and salmon rivers. The only lowlands and towns lie round the Cromarty and Dornoch Firths, and in the eastern corner of Caithness. Dingwall, Cromarty, and Dornoch are small market towns. Invergordon is becoming important now the Cromarty Firth is a naval base. Wick is very important for its herring fisheries. The lowland on which these towns are built consists of flat layers of red sandstone. Wick exports great slabs of this for paving purposes. The Pentland Firth, between the Orkneys and the mainland, is extremely stormy and dangerous. The tides race through this narrow channel between the Atlantic Ocean and the North Sea at a rate of six to ten miles an hour, forming dangerous whirlpools.

382. **The Orkneys and Shetlands** have herring and whale fisheries. The fleets sail from their two capitals, Kirkwall and Lerwick. The small, hardy, rough-coated Shetland ponies and sheep feed on the wind-swept pastures.

383. **The West Coast and the Hebrides.** The west coast has a very wet climate. Everywhere the mainland is penetrated by long winding valleys shut in between mountain walls on either side. These valleys contain long glacial lakes, such as Loch Morar and Loch Maree. These are often of great beauty. There are a few small villages built on the ledges and narrow deltas of the fiords. Their inhabitants are half farmers and half fishermen. Communication inland is very difficult, and only three railways reach the west coast. Portree is a tourist centre. Iona, south of Staffa, still has remains of

the first Christian missionaries, St. Columba and his followers, who came from Ireland.

384. The Outer Hebrides are separated from the Inner Hebrides by the wide Minch. On the map they look rather like a kite, the head of which is Lewis or Harris, and the tail a string of islands of which the North and South Uist are the largest. The bare rounded hills of these islands are covered with clay, and in the hollows are many little lakes. The soil is infertile and often boggy. A few cattle and sheep are kept. Only the hardier cereals, oats and barley, will grow. Fishing is the chief occupation and centres at Stornoway, the only town. Still wilder and lonelier is the tiny island of St. Kilda, fifty miles west of Harris. The inhabitants live chiefly on the fisheries and the sea-fowl that breed on the steep cliffs.

385. Population. The map in Fig. 133 shows how little of Scotland is well peopled. Most of that small population is gathered into the central belt of the central lowlands and the eastern coast plains. Edinburgh, with its easy communications by land and sea, is a very well placed capital. Hardly any important town except Aberdeen, Inverness, Oban, Greenock, Ayr, and Dumfries, is more than 50 miles distant, and the last three are only just over 60 miles away. This concentration of the population does much to give Scotland its well-marked national unity.

CHAPTER XVII

IRELAND AND THE ISLANDS IN BRITISH WATERS

386. Position. Ireland lies west of Great Britain near the edge of the continental shelf. It is 13 miles from the nearest point of Scotland, and 140 miles from England where the Irish Sea is widest. Dublin is a little more than 6° west of Greenwich, and as time is reckoned by longitude (four minutes fast

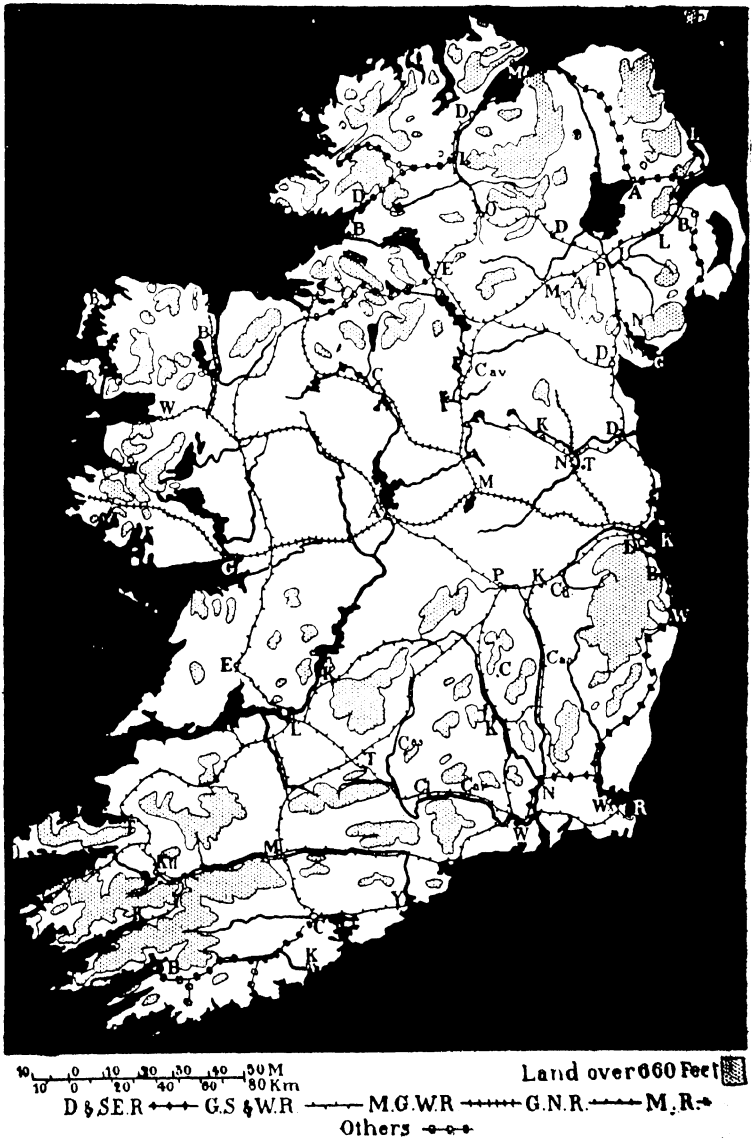


FIG. 155. Heights, Railways, and Towns of Ireland.

or slow for each degree east or west of Greenwich) Irish time is 25 minutes later than English time.

387. General Physical Features. The physical map in Fig. 155 shows that the centre of Ireland is a lowland with hardly a height over 660 feet. North and south are upland areas broken into many small mountain groups by wide river valleys. Lines drawn from Dundalk to Sligo and from Dublin to Limerick roughly bound the Central plain and divide Ireland into three natural regions: (1) Northern Ireland, (2) Central Ireland, and (3) Southern Ireland.

Northern Ireland.

388. The Donegal Highlands. There are three mountain groups, the Donegal Highlands, the Sperrin Mountains, and the Antrim Highlands. East and west of the Sperrin Mountains the Foyle and Bann have cut deep valleys to the Central Lowlands. The Donegal Highlands are among the wildest in Ireland, with long south-west to north-easterly valleys. The coast is rugged, forming great cliffs, and is cut by inlets, of which Lough Swilly is the largest. This is a very poor district, and owing to the steep cliffs, the inhabitants are unable to add to their resources by fishing. Agriculture is very difficult.

Two fertile lowlands lie at the base of the Donegal Highlands. One of these opens west to the Atlantic and forms the valley of the river Erne. This river widens out for half its course into lakes, of which Upper and Lower Lough Erne are the chief. Enniskillen is built at the head of Lower Lough Erne, and Ballyshannon at the mouth of the river, where it flows into Donegal Bay.

The second lowland opens north to Lough Foyle, between the Donegal Highlands and the Sperrin Mountains. Londonderry, at the head of Lough Foyle, bleaches linen and makes shirts. Moville, at the mouth of the bay, is a port of call for Atlantic steamers. A railway runs through the lowland gap by Strabane and Omagh, to Dundalk and Dublin.

389. The Antrim and Mourne Mountains. East of the Foyle a circle of highlands surrounds the flat basin of Lough Neagh, the largest lake in the British Isles. In the north the wide valley of the Bann, with Coleraine at its mouth, separates the Sperrin Mountains to the west from the Antrim Mountains to the east. The south-western gap of the Blackwater separates the Sperrin Mountains from the highlands of Armagh. A southward gap runs from Newry to the valley of the Upper Bann, between the Armagh Heights and the Mourne Mountains. The last and most important gap is that of the Lagan, which flows out at Belfast, and separates the Mourne Mountains from the high volcanic plateaus of Antrim. Most of the lowland between the Mourne Mountains and the sea is occupied by the fiord of Strangford Lough.

390. Routes. All the gaps are used for railways and canals. The canals centre in Lough Neagh. The Newry Gap is used by the railway which runs from Dublin, through Newry to Portadown, and then turns east by the Lagan valley to Belfast.

391. The North-Eastern Industrial Area. The north-eastern corner is the only industrial part of Ireland. It owes its wealth chiefly to its convenient position opposite the coal-fields of Scotland and Northern England. Belfast is the most important industrial and commercial centre in Ireland. Situated on a navigable estuary, it is in direct communication with Glasgow, Barrow, and Liverpool. Hence, with supplies of cheap coal and iron, it is, like the Clyde, a great ship-building centre, and makes heavy machinery. There are also great whisky distilleries and tobacco factories. Most important of all is the linen industry. For this, Belfast has the advantages of extremely pure water for steeping and bleaching flax, and a damp climate. Some of the flax is grown in the country, but much is imported from Belgium and the Baltic lands. Linen (like rope and sailcloth) is also manufactured in the neighbouring towns, Lisburn, Lurgan, Armagh, and Newry. Shirt-making is also widely carried on. This area

was colonized from Scotland. There are many differences between this industrial community and the rest of Ireland, which is mainly pastoral. Very few minerals are worked.

The Central Lowland and the Western Highlands.

392. On the west coast the Central Lowland reaches the sea at Sligo on Sligo Bay, Westport on Clew Bay, Galway on Galway Bay, and Limerick on the Shannon Estuary. These are the most important coast towns in the western part of the lowland. It reaches the sea in the east between the Mourne and Wicklow Mountains. Dundalk, Drogheda, and Dublin are the most important coast towns in the east.

393. Dublin is the natural capital of Ireland, and the centre of the main routes both by land and sea. Trace the railways that spread out from Dublin across the plains: (1) to Belfast by Drogheda, Dundalk, and Newry; (2) to Sligo by Mullingar, Longford, and Carrick-on-Shannon; (3) to Galway by Mullingar, Athlone, and Ballinasloe; (4) to Wexford by Wicklow; and (5) the less direct route to Cork. Two canals also cross this flat land. The Royal Canal follows the railway to Mullingar and turns west to join the Shannon above Lough Ree. The Grand Canal runs west through Tullamore, and afterwards follows the Brosna tributary of the Shannon.

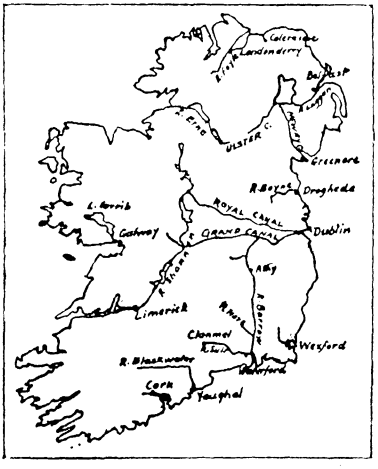


FIG. 156. Irish Canals.

The oversea communications of Dublin are still more important. It is the best of the east coast harbours, and lies opposite Lancashire and the western ends of the routes that lead to industrial England and London. For the fastest

services, Kingstown, at the south-east end of Dublin Bay, is used by mail steamers for Holyhead, off the Welsh island of Anglesey. Owing to its easy communication with the main routes of England across the Cheshire Plain, Dublin has always been the centre of English rule in Ireland. It is the capital, the residence of the Lord Lieutenant, the seat of the High Courts and chief Government offices, and of the most important university. As an industrial centre it is noted for a kind of beer[1] and whisky, and, together with the neighbouring town of Balbriggan, for the manufacture of poplins.

394. The **Boyne** valley is one of the most fertile parts of the Central Lowland. Among the towns are Tara and Kells, both famous in Irish history and legend. Drogheda, its port, manufactures cotton and linen. Farther north, Dundalk, on Dundalk Bay, also a port, has similar industries. It commands the best route from Dublin and the eastern and most fertile part of the Central Lowland to Belfast and the lowlands round Lough Neagh.

395. **Bogs and Loughs.** The Central Lowland is a flat limestone area, covered in many parts with thick clay. On this clay shallow water gathers, and mosses and other marsh plants grow. They form bogs, which are soft, green, unproductive areas. When a bog is drained, the deep layers of dead moss are cut and dried into peat for burning. This is practically the only fuel used inland, for Ireland has little coal. The largest bog in the east is the Bog of Allen, between the Liffey and the Barrow.

The drained bogs and the drier parts of the Central Lowland make good pasture, and the chief occupations are cattle- and horse-rearing. The wet climate does not suit cereals, and potatoes are the chief crop. Notice the fewness of inland towns, which are small market centres, situated on the belts of drier ground, by which the roads and railways of the plain avoid the bogs.

[1] Called Dublin *porter*.

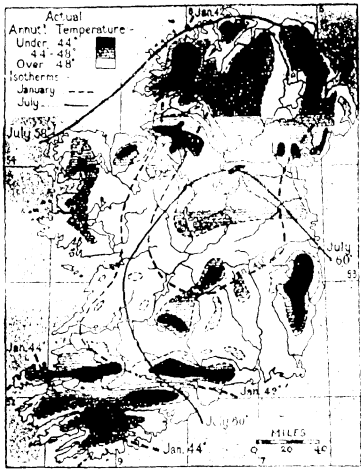


FIG. 157. Mean Annual Temperature not reduced to sea-level. January and July reduced to sea-level.

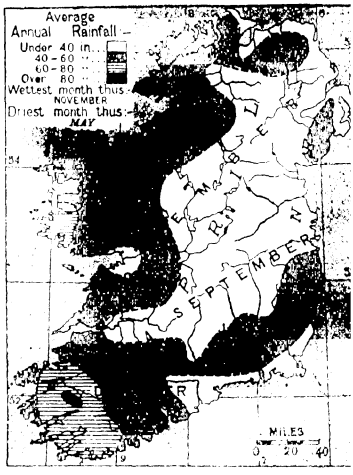


FIG. 158. Mean Annual Rainfall and driest and wettest months.

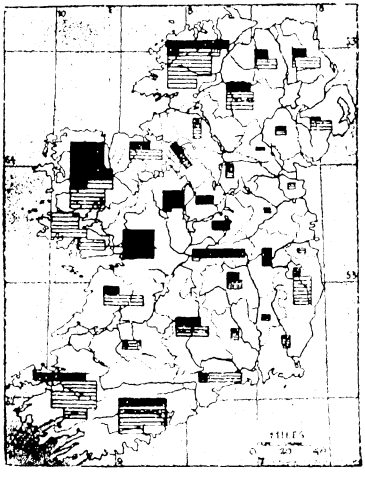


FIG. 159. Bogs. The black areas are drawn to show proportionately the extent of bog in each county; the shaded areas show the amount of mountainous waste land.

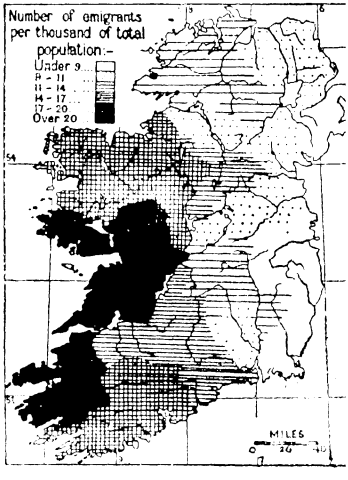


FIG. 160. Emigrants. The black areas show which districts supply most emigrants. The cross-shaded districts come next.

The western half of the Central Lowland is wetter, and has many lakes. The limestone is very easily dissolved, and the rivers spread out their channels. Upper and Lower Loughs Erne are examples of such 'lakes'. Loughs Mask and Corrib are formed in the same way, and the stream that connects them flows underground.

396. The Shannon. The western part of the Central Lowland is drained by the Shannon, which rises in the hilly north and flows through Lough Allen, a lake almost entirely surrounded by hills. Farther south it flows through Loughs Ree (with Athlone at the southern end) and Derg (with Killaloe at the southern end), below which it flows through a gorge.

The Suck and the Brosna enter the main stream between Loughs Ree and Derg. Ballinasloe, on the Suck, has one of the largest cattle markets in Ireland. The estuary of the Shannon is long and narrow. Limerick, at its head, has a good harbour and a fine floating dock, and exports the cattle and dairy produce of the rich Clare and Limerick plains. There is one opening from the Shannon estuary to the north, the estuary of the Fergus, the river on which Ennis is built.

397. The Western Highlands. On the west the Central Lowland is almost completely cut off from the Atlantic by highlands, which stretch from Sligo Bay to Galway Bay. They are not continuous, but are separated by arms of the Central Lowland, which reaches the sea at several points. Here ports have grown up, but they are less important than they would be if the inland region were more fertile. Cattle are bred in the lowland areas, but the highlands are rugged, poor, and thinly peopled.

Sligo Bay, with Sligo as its port, opens between the Ox Mountains or Sligo Highlands and the heights of Leitrim. The Moy Lowland opens to Killala Bay, with the small port of Killala, between the Sligo Highlands on the east and the Mayo or Nephin Beg Highlands on the west. Part of this lowland

is formed by Lake Conn, and Killala Bay is its submerged northern end. A narrow strait separates the Mayo Mountains from the Achill Islands, the largest and most picturesque of Irish islands, in which Achill Head rises 2,200 feet out of the sea. A third arm of the Central Lowlands opens to Westport, on Clew Bay, between the Mayo Highlands and the Connemara Mountains. These lie west of Loughs Mask and Corrib, and form part of the broad peninsula between Clew and Galway Bays. Connemara is a picturesque but infertile region of mountains, moors, bogs, and lakes.

Sligo and Galway are by far the most important of these western ports, for they are the outlets for the least poor regions and are much nearer to Dublin and the more fertile east. Galway formerly carried on a large trade with Spain.

Southern Ireland.

398. **South-west Highlands.** In the south-west the heights and valleys run east and west. This is very clearly shown by the shape of the peninsulas and bays of the south-west coast. The rocks of the Earth's crust have been bent into folds which run from west to east. The upfolds or arches form mountain ranges and peninsulas; the downfolds or valleys form long bays and river valleys. Dingle Bay, the lakes of Killarney, and the valley of the long eastward-flowing Blackwater form the northern downfold. The second fold is shown by the inlet called Kenmare River and by the Lee valley; a third by Bantry Bay and the valley of the Bandon. The bays are sunken lowlands, which become narrower and shallower towards their heads.

399. Three islands may be noticed. Valentia Island, at the end of Dingle Bay, is the most westerly weather station in the British Isles, and gives the first warning to the rest of the country of storms coming from the Atlantic. Bear Island, lying to the north of Bantry Bay, shelters Bear Haven, an important naval station. Clear Island, the southern point of Ireland, is the western end of the most southern upfold,

where ships coming from America are sighted. The Killarney River drains the beautiful Killarney Lakes, which lie at the foot of the lofty heights of the Macgillicuddy Reeks (Carrantual, 3,400 feet). Like other Irish waters, the rivers and lakes contain good salmon and trout.

400. The Southern Harbours and Wicklow Hills. The eastward-flowing rivers are much longer than those flowing west. Notice that when they reach the sea each turns sharply south, breaking through a gap in the highland to an estuary on which a port is situated. Find on any map Kinsale on the Bandon, Cork on the Lee, Youghal on the Blackwater, and Waterford on the Suir. Kinsale, formerly of great importance, is now little more than a fishing town. Cork has the advantage of a magnificent harbour. It is the outlet for the produce of the fine grazing lands of Munster, and exports cattle, butter (more than any other town in Britain), eggs, bacon, &c. The local industries include woollen goods, agricultural tools, together with tanning, brewing, distilling, and bacon-curing. American mails landed at Queenstown, on one of the numerous islands in the harbour, save time by going overland to Kingstown (Dublin) and then to Holyhead, or to Rosslare and thence to Fishguard. Waterford resembles Cork in its exports. The Nore and Barrow, which flow into the north of Waterford harbour, like the Suir and other slow Irish streams, are navigable for some distance. Clonmel, on the Suir, has condensed milk factories. Castlecomer, north of Kilkenny, lies on the edge of a small coalfield. Wexford, on the Slaney estuary, exports livestock, whisky, fish, &c., but the harbour is obstructed by a bar of sand which can only be passed by small vessels.

401. The Wicklow Hills contain lovely glens and small lonely lakes from which flow the streams of the Liffey, the Slaney, and the short but beautiful Avoca. Wicklow and Bray are two of the many tourist centres which lie at the foot of these hills.

The inland towns are market towns and are somewhat

larger than those in the centre and north-west. Most of the barley grown in Ireland is raised in the basins of the Nore and Barrow. The flat bare Curragh, east of Kildare, is used for a military camp.

402. Summary. Ireland was once divided into four provinces, each of which had its sea-board and harbours, its infertile highlands, and its share of the rich central plain. These were Ulster, in the north; Leinster, in the south-east; Munster, in the south-west; and Connaught in the west. The fertile valley of the Boyne, one of the best parts of Ireland, once formed the kingdom of Meath. Most of western Ireland, whether mountain or plain, is infertile, partly because of the nature of the surface rock, which makes a poor thin soil, and partly because of the wet climate. The most fertile parts are river valleys, which are sheltered from the heaviest rains by mountains, and are covered by deep fertile soil. Other points to notice are the absence of woods and of coal. In spite of the extent of lowland, communication is not easy owing to the number of lakes and bogs. Except round Belfast, stock raising, horse breeding, and dairy farming pay best, and none of these is an occupation that supports a dense population. These facts explain why the inland towns are all small market centres, and why all the large towns are on the coast and connected with the export trade.

Islands in British Waters.

403. Man (230 square miles), in the Irish Sea, almost equidistant from England, Scotland, and Ireland, is a mountainous island, rich in minerals, especially lead. It possesses its own Parliament, the House of Keys, which sits in Douglas, on the east coast, the largest town. The picturesqueness of the island attracts thousands of tourists, chiefly from Lancashire.

404. The Channel Islands in the English Channel, 80 miles from England and 10 from France, are the remnants of England's French possessions, and still use a French dialect. The islands have self-government. Orchards are numerous, and fruit and early vegetables, especially potatoes, are grown for the English market. Cattle are bred in large numbers. The largest islands are Jersey (45 square miles), capital St. Peter's Fort; and Alderney (4 square miles).

PART V

EUROPE

CHAPTER XVIII

THE GENERAL CHARACTER OF EUROPE

405. Position. The most northerly point, North Cape, is distant nearly 20° from the pole; the southerly point, Cape Tarifa, is over 35° from the equator. From north to south, therefore, Europe covers little more than one-third of the distance between pole and equator, and lies almost wholly in temperate latitudes. The most westerly part of the mainland reaches nearly to 10° W., while the eastern boundary reaches 60° E.

406. Seas, Gulfs, Peninsulas, and Islands. Look at Fig. 161. Notice how the mainland is cut up into peninsulas by the sea, which penetrates deeply into the northern half of the continent as the North Sea, and the Baltic Sea, with its gulfs. These we may call the Northland Seas. Still more deeply cut is the Mediterranean Sea in the south, connected through the Strait of Gibraltar with the Atlantic Ocean. It widens out into northward-running gulfs, which cut the southern half of Europe into three great peninsulas. Connected with the Mediterranean on the east by the Dardanelles is the small Sea of Marmora, leading by the Bosporus into the vast Black Sea, which opens by the Strait of Kerch into the small Sea of Azov. All these may be regarded as together forming a Midland Sea. The land-locked Caspian Sea, still farther east, is not connected with the Midland Sea.

407. The result of this penetration of land by sea is to bring all parts of Europe within a short distance of the sea (see

Fig. 162), and to give Europe, and particularly the peninsular countries, a very great extent of coast-line, and many excellent harbours. The inhabitants readily become skilful fishers, sailors, and traders by sea. They are thus keen explorers and good colonists, and they, and their descendants in other continents, lead the world in all seafaring occupations.

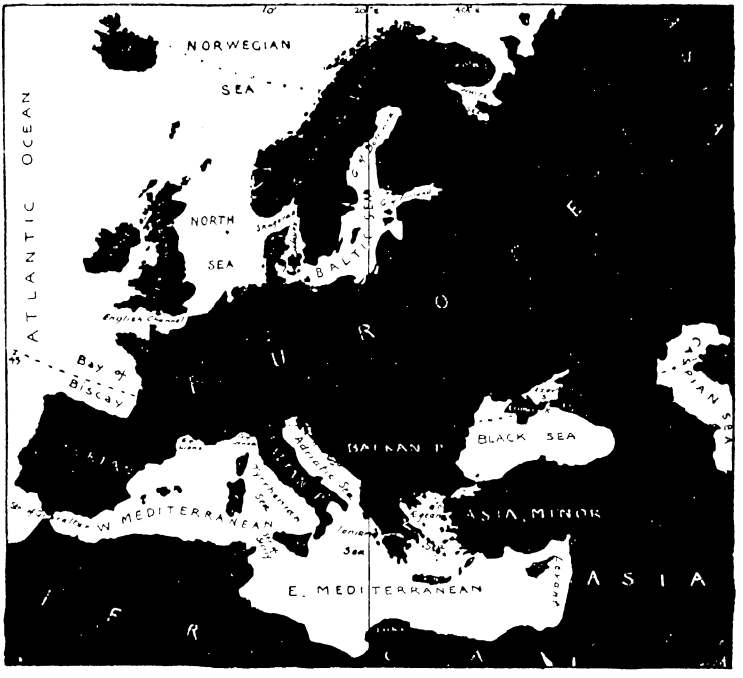


FIG. 161. Europe—its Peninsulas, Islands, and Seas.

Physical Features.

408. Physical Features. Look at the relief map, Fig. 163, which shows several different levels of land:

1. The shallow seas under 660 feet deep, covering the continental shelf, and the deep seas over this depth;

2. The lowlands, between sea-level and 660 feet elevation;

3. The uplands between 660 and 2,000 feet;

4. The mountainous lands over 2,000 feet.

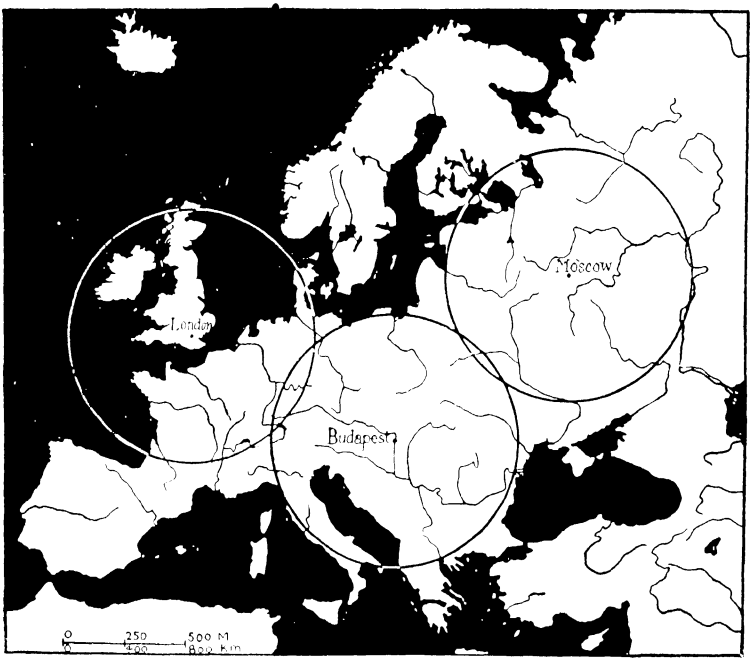


FIG. 162. Distance from the Sea in Europe.
The circles are drawn with Moscow, Budapest, and London as centres, and have a radius of 500 miles long.

409. The Seas. Observe that the deep seas form three basins (Figs. 161, 163):

1. The Arctic Ocean with its southern gulf, the Norwegian Sea, separated by a submarine ridge stretching from the British Isles through Faeroe Islands and Iceland to Greenland from

2. The main basin of the Atlantic;

3. The basins of the Mediterranean, divided from each other by submarine ridges.

Notice that the inner seas of Europe fall into two groups—the shallow Northland and the deep Midland Seas. The shallow seas make very rich fishing grounds, visited by fishing fleets from the many excellent harbours of the surrounding shores. The tides of the Atlantic are strongly felt in the shallow seas of the west, causing a great rise and fall in the estuaries which open to them, and carrying the shipping up and down with the tide. The Baltic is almost landlocked, and the tides are scarcely felt. The rivers consequently form deltas instead of estuaries, and numerous lagoons border the sea. The deep Midland Seas are also tideless. Deltas and lagoons are formed as in the Baltic. The deep seas are less rich in fish than the shallow seas.

410. Lowlands. The shallow seas border the lowlands, of which they are the drowned portions. Lowlands and shallow seas together form a continuous band stretching across Europe from east to west; broad, but for the most part drowned, in Western Europe; narrowed to a little more than a quarter of the breadth in Central Europe; and widening out in the east to form the compact mass of Eastern Europe, stretching from the White Sea in the north, to the Black and Caspian Seas in the south.

The lowlands may be grouped as:

1. The Plain of the Low countries.
2. The German Lowland.
3. The Plain of Russia.

411. Highlands and Mountains. The lowlands are bordered by the uplands, highlands, and mountains of Europe.

Look at the map, which shows that these form three groups (Fig. 163):

1. The Ural Mountains on the east.
2. The Highlands of Britain and Scandinavia, or the North-west Highlands, on the north-west.

FIG. 163. Physical Features of Europe.

3. The Central and Southern Mountains and Highlands which form the bulk of Central Europe and of the Mediterranean peninsulas and islands on the south. These may be grouped into:

(*a*) The Central Highlands.

(*b*) The Alps and Karpathians, each curving round to enclose a lowland, the former that of Lombardy, the latter that of Hungary.

(*c*) The mountains of the southern peninsulas and islands.

412. The Plain of the Low Countries consists of deltas and marshes. It lies so low that it is continually in danger of flood from sea and river, to prevent which dykes or walls have been built to keep out the sea, and to confine the streams of the deltas to their channels. Where the coast is sandy the sand hills, or dunes, are planted with coarse grasses, whose long creeping roots mat the light sands together, and enable them to resist wind and water.

413. The North German Lowland consists of two belts, a low hilly land bordering the sea, known as the Baltic Heights, and a plain to the south. This hilly land, which is separated from the sea by a narrow belt of low sandy shore and lagoons, consists of low wooded hills, containing thousands of lakes. It slopes gently southward to the flat plain of Central Germany. In the plain the landscape consists of moors and pine forests, varied by rich green meadows and cultivated fields. The rivers creep slowly across the plain, often flooding the low surrounding country, and on approaching the sea form deltas.

414. The Russian Plain lies mainly between 300–600 feet above sea-level, rising gradually from west to east. It rarely exceeds 1,000 feet in height. The differences which it shows in different parts are due to the influence of climate and soil on its vegetation, the forest giving place in the south to broad grass and wheat lands. As this plain contains nearly half the area of Europe the rivers which crawl across it are the longest in the continent.

The Russian plain rises in the east to the wooded Ural Mountains, which form the eastern limit of Europe.

415. **The Plateau of the North-west Highlands** forms the bulk of the Scandinavian peninsula, and is continued in the highlands of Britain. In Scotland it rises, as we have seen, to the height of over 4,000 feet, and it reaches twice this elevation in Scandinavia. In Scandinavia the plateau rises steeply from the sea on the west, and descends first abruptly and then gradually to the sea on the east, so that Norway in the west is almost wholly a mountainous country, while Sweden in the east is undulating. The west coast is a fiord coast, like the west coast of Scotland, but in Scandinavia the fiords penetrate far more deeply into the land, and their mountain walls are far higher and steeper. The lower parts of the plateau are covered with pine forests, but the high plateau consists of heaths and bogs, with mountains sometimes rising above the general level.

416. **The Central Highlands** consist of a number of separate masses of hills, rising to from 3,000 to 5,000 feet above the sea, usually with rounded summits and thickly wooded almost from top to bottom. The lower slopes are cleared for cultivation, or for pasture lands. The plains between are richly cultivated.

417. **The Alps** are from two to three times as high as the Central Highlands. They consist of parallel ranges, separated by deep steep-sided valleys, some of which contain long narrow lakes where they open to the plain. Many of the peaks rise above the line of continual snow, which gathers to so great a depth in the valleys between, that it is changed into solid ice by its own pressure. These masses of ice creep in long tongues, or glaciers, down the valleys, melting at last into rushing torrents. Below the snow-line, but still too high for trees, are the alps, or mountain pastures. Lower still, the sides of the valleys are clothed with forests, first of dark evergreens, and lower of deciduous[1] trees. The valleys widen out,

[1] Leaf-shedding.

and at lower levels, their floors and sides are cultivated. In the eastern Alps are limestone ranges, too steep for snow to lie on, with bare rock peaks, which are often of strange shape.

A few great valleys lead far into the heart of the Alps. At certain points it is possible to pass from the head of one valley directly to the head of another, over a mountain pass, a sort of depression between the peaks which enclose the valleys. Without these valleys, and the passes to which they lead, the Alps would be impassable.

418. **The Karpathians** continue the curve of the Alps, but reach to little more than half the height of the highest Alpine peaks. They are rounded ridges except on the north, where rocky peaks rise to 8,700 feet. Except on the highest slopes, which are grass-covered, they are thickly forested.

419. **The Southern Peninsulas.** The Iberian peninsula in the west, and the Balkan peninsula in the east, are both broad, with a high plateau in the centre. The central, or Italian peninsula, is long and narrow, with a backbone of mountains. Active volcanoes are found in the south-west. The highlands of these peninsulas are all forested in the north, but bare in the centre and south.

420. **Rivers.** The rivers of the North-west Highlands are short and unimportant on the steep north-western slope; longer, but still rapid, on the longer eastern slope, over which they flow to the Baltic.

The short slope of the Russian plain is also to the north-west, but as it is very gentle the rivers flowing to the Baltic and White Seas are long and very sluggish. They are divided from the rivers flowing down the long slope to the Black and Caspian Seas by a line of higher ground, which runs from the Karpathians north-east to the centre of the Urals. The Volga, the longest river in Europe, flowing to the Caspian, and the Dnieper, flowing to the Black Sea, are the most important. All the rivers are slow, and navigable almost to their source. They are frozen in winter, as are those flowing to the Baltic and White Seas.

421. The rivers flowing from the Central Highlands are swift in their upper courses, but become slow enough for navigation as they cross the plain. The Vistula, the Elbe, the Rhine, the Seine, and the Loire are the most important. The Rhine is exceptional as being the only river which crosses the entire breadth of the highlands of Central Europe, connecting them with the Alpine region in the heart of which

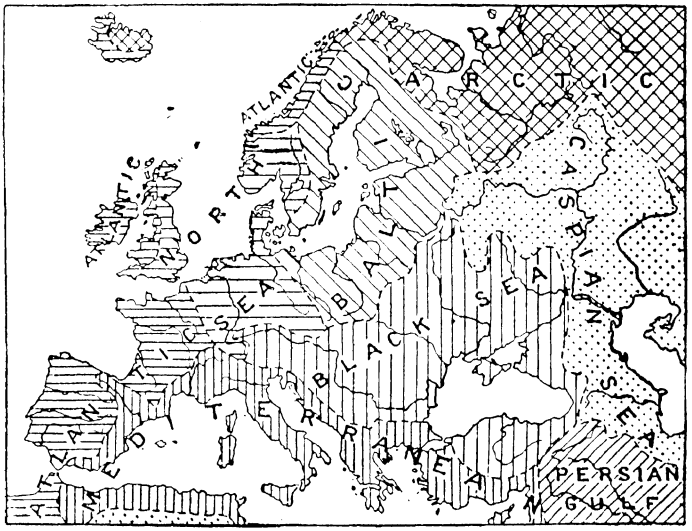


FIG. 164. Chief Drainage Areas and Divides.

it rises. Two rivers drain the outer, or convex, margin of the Alps, the Saone-Rhone on the west, flowing to the Mediterranean, and the Danube on the north, flowing to the Black Sea. The inner, or concave, margin is drained by the Po, which has formed a low-lying plain between the Alps and the mountains of the Italian peninsula. Most of the rivers of the southern peninsulas have their courses mainly in the highlands, and are navigable only near their mouths, where they enter the lowlands.

422. The valleys of some of these rivers form important routes, followed from ancient times by roads, and at the present day by railways. The Seine, with the Saone-Rhone valley, and the Rhine with the tributaries of the Po, form through routes from north to south. The Danube is the great natural route from west to east, connecting Central

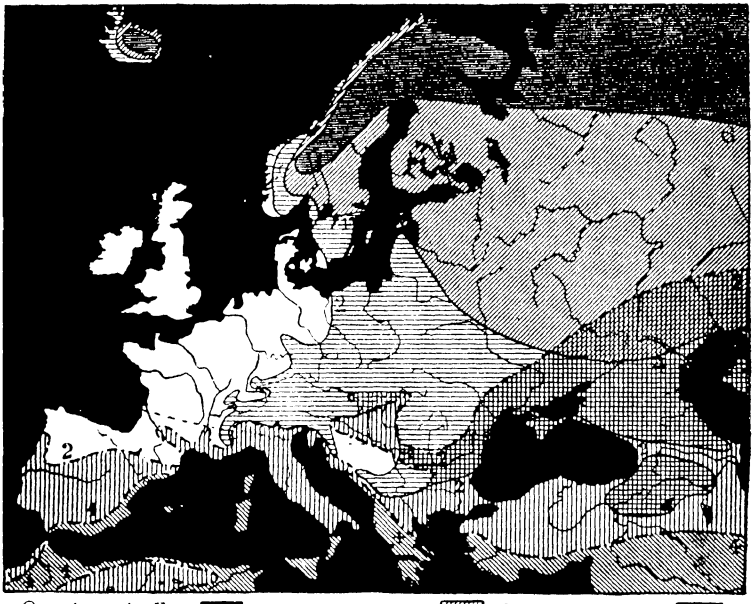


FIG. 165. Temperature Map of Europe, showing the Duration of Frosty and Hot Weather. The cross-rulings show the regions with greatest ranges of temperature.

Europe with the Balkan peninsula and the countries round the Black Sea.

The areas drained to the different seas are shown on Fig. 164.

Climate.

423. **Temperature.** Look at the map in Fig. 165. It shows the regions of Europe where frost occurs in winter. Notice that nearly all Scandinavia and Central Europe have more

than two months' continuous frost in winter. The greater part of the Russian plain has over four months' frost. Notice too that all the western coasts and the Mediterranean have no long-continued frosts, though frosts sometimes occur. The period of frost in the Baltic is shorter than on the surrounding lands. The warmest winter regions of Europe, as in the British Isles, are those near the sea, and for the same reason. The sea is warmer than the land in winter, or, rather, it cools less quickly, and it warms the air which passes over it towards the land. The severity of the winter in Europe increases, not exactly from south to north, though the winters of Northern Europe are much colder than the winters of Southern Europe, but much more from west to east, where the land widens out and the interior is farthest distant from the sea. Over a great part of Europe the winter is much milder than it would have been if the continent had been more compact.

424. The same map shows where the summers are longest and hottest. In the Thames valley, the warmest part of the British Isles, the temperature in the heat of summer does not average over 64° F., and when for a few days it averages over 70° F. we feel the heat very oppressive. The map shows that the Midland Seas and their surrounding lands have an average temperature of over 70° F. every day for over two months of the year, while in the extreme south this average is maintained for four months. Notice particularly that in the south-east of Russia it becomes hotter in summer as we go in a north-easterly direction, that is to say, away from the sea. The influence of the sea is to make the climate of the neighbouring lands uniform, or equable, by keeping down the heat in summer, and, in a still more marked degree, by keeping down the cold in winter. The lands of the west, no part of which is very far from the sea, have no extremes of heat or cold, while in the Russian plain, farthest from the sea, places in the latitude of the English Channel have four months' steady frost, and over two months' intense heat. But for the cutting up of Europe by the Northland and Midland Seas

a great part of the continent would have a much hotter summer and a much colder winter, that is a much more 'extreme' climate. That this is not the case is, perhaps, the greatest of all the advantages which result from the arrangement of land and sea already described.

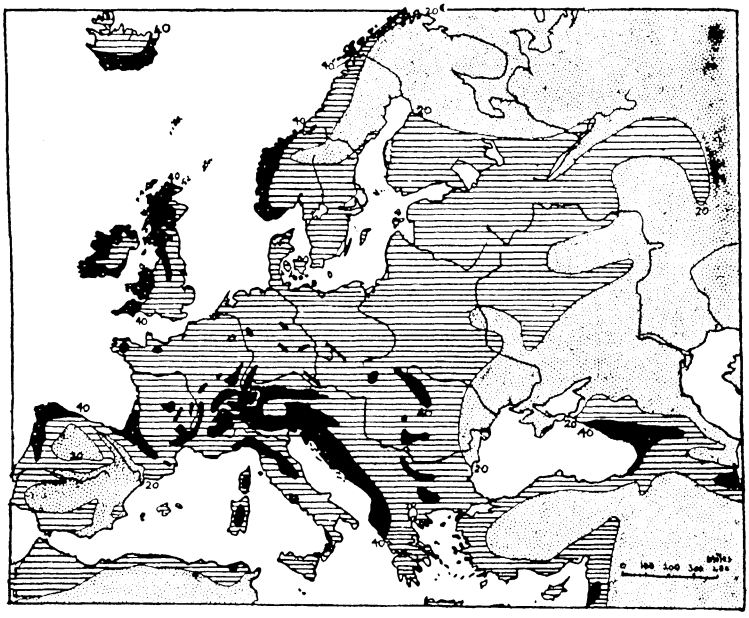
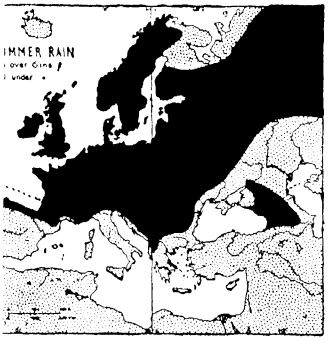


FIG. 166. Mean Annual Rainfall of Europe. The dotted parts have under 20 inches, the ruled parts from 20 to 40 inches, and the black parts over 40 inches of rain.

425. Rainfall. Climate, as we know, is affected not by temperature only but by moisture. Look at Fig. 167, where the map shows the rainfall in any year in different parts of Europe. If we compare it with the relief map in Fig. 163 it will be seen that the rainiest regions are highlands, and that the plains are, on the whole, much drier. Now compare the rainfall of east and west, either in the lowlands or in the Scandinavian or the Iberian peninsula. As in Britain there is a great contrast between the wet west and the dry east. To explain it we look at the prevailing winds, which are

west or south-westerly. That is to say, they come over the sea, bringing rain to the west coasts.

426. Fig. 166 shows only the total quantity of rain which falls in the year, but in different parts of Europe, owing to the great extent of the continent, rain falls at very different times. Look at Fig. 167, which shows the rainfall in the summer three months, June, July, and August. The rainfall is fairly equal all over Northern Europe, but greatest in the highlands, and very small round the Mediterranean, where hardly any rain falls. The air over the land becomes heated in summer and



3. 167. Regions of Europe receiving more or less than 6 inches of rainfall during the summer three months.

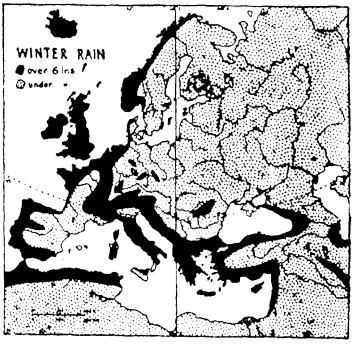


FIG. 168. Regions of Europe receiving more or less than 6 inches of rainfall during the winter three months.

rises to the colder regions of the upper air, where it is chilled and the moisture it contains condensed into rain. The prevailing winds are still from the Atlantic. Over the Mediterranean the wind is blowing from the north-east, i.e. from cooler to warmer regions, so that the air is not cooled, and there is little or no rainfall.

Now look at Fig. 168, which shows the rainfall in the three winter months, December to February. Notice that all the east of Europe is very dry, and that it is only along the very margin of the western Mediterranean coasts and in the Alpine region that rain falls abundantly. The prevailing winds come from the south-west, that is, from warmer latitudes and over

the sea, which we have already seen is warmer in winter than the land. On reaching the land, therefore, the air is cooled, and parts with its moisture as rain or snow, so that it is comparatively dry before it reaches the interior of Central and Eastern Europe.

427. Climatic Regions. We can now divide Europe into the following three climatic regions: 1, The West, with equable temperature and rain at all seasons; 2, the East, with extremes of temperature and summer rains; 3, the Mediterranean, with hot dry summers and mild winters, and receiving the greater part of its rainfall during the winter six months.

Plants, Animals, and Minerals.

428. Vegetation. Look at Fig. 169, which shows the natural vegetation of Europe. It shows six different vegetation regions:

1. The tundra, or lands of the extreme north, which are too cold for the growth of trees, indicated by cross rulings.

2. The wooded or forest regions.

(*a*) The 'coniferous', or cone-bearing, needle-leaved, evergreen pine and fir woods of the north, represented by vertical ruling;

(*b*) The 'deciduous' trees, which shed their leaves every autumn, covering the lower part of Central Europe, represented by slanting ruling;

(*c*) The evergreen forests of the Mediterranean basin, represented by horizontal rulings.

3. The steppe, or the grasslands of the south-east, indicated by dots.

4. The mountain regions, too high for trees, shown in solid black.

429. The Tundra, in the extreme north, is always frozen except for a month or two in the short summer, when it thaws to the depth of a foot or two. Water cannot penetrate this frozen soil, and the whole tundra tends to be marshy or water-logged in summer. Towards the pole, vegetation dis-

appears, but over the greater part there is a poor growth of moss, lichens, &c. Low berry-bearing bushes appear farther south, and dwarf trees, a few inches or a foot or two in height, grow in sheltered spots, becoming larger and more numerous towards the forest edge.

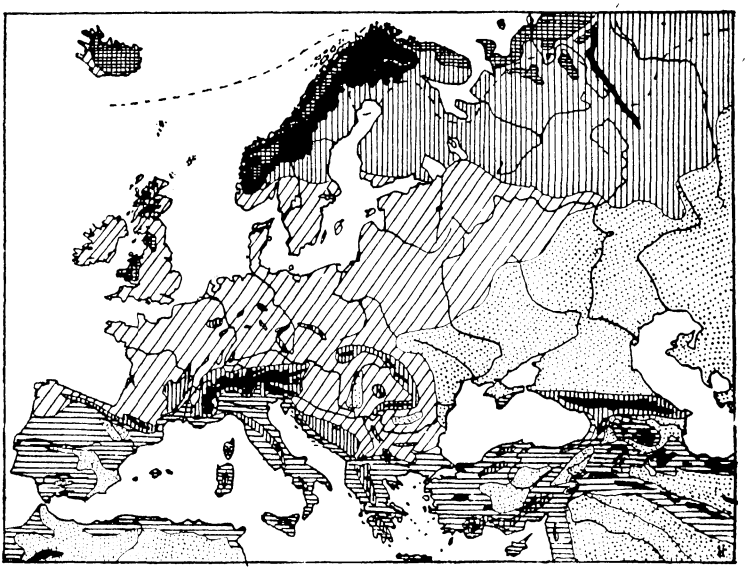


FIG. 169. Vegetation Map of Europe.

The tundra offers nothing to its few inhabitants except the reindeer moss on which the reindeer feeds, and the berries which ripen in autumn. The reindeer alone makes human life possible. It provides a means of moving over the tundra, and supplies milk for food, and skins for clothing and other uses. The life led on the tundra is poor even in summer, and in winter a move is made south to the forest edge.

430. The Coniferous Forests of the Scandinavian peninsula and the north of Eastern Europe consist of tall, straight firs and pines, beneath whose shade we find none of that undergrowth of flowers and grass which makes English woods so

lovely. Their tall straight stems make masts for ships, or are sawn into planks to build their keels and decks. The houses in the forest area are generally of wood, often beautifully carved and painted. Wood is used instead of coal for fuel, and is even burned in furnaces to smelt metals or, in some parts of the forest country, to drive the trains and steamboats. The trees are felled in winter and dragged over the frozen ground to the rivers, down which they float when the frost breaks up in the spring. On these forest rivers, sawmills are often built where rapids or waterfalls make the current strong enough to turn water-wheels, and there much timber is sawn. In recent years the growth of trade has led to many new uses for wood. The best timber is made up into such articles as door-frames and window-sashes, which are sent to other countries in a finished state. Wooden matches are made in large quantities, while timber of short length or inferior quality is made into pulp, out of which paper is made.

Coniferous forests are also found on the highlands of Central Europe, whose timber is put to much the same use. On the Rhine, the Elbe, and particularly the Vistula, great rafts of timber are floated down, steered by a small crew who live in wooden cabins built on the raft.

431. **The Deciduous Forests** of the Central European Lowlands are chiefly made up of oak, elm, beech, and (farther south) chestnut. The girth of the trees is much greater, and their branching more irregular, so that they are unsuitable for masts. Their harder timber is used where hardness is required.

432. **The Evergreen Forests** of the south are unlike either of the preceding. Pines occur, but of a bushier shape, unlike the tall spires of the northern forests. The silver-grey olive groves, the forests of cork and other evergreen oaks, are the principal remains of the evergreen forests which once covered Southern Europe. These have been cut down throughout the Mediterranean lands to the great injury of the country. The roots of trees protect and bind together the soil and

prevent rains and streams from carrying it away. Much of Southern Europe has been changed from a fertile, if rather dry, land to barren rocky hill-sides, in whose scanty soil only dry thorny plants can live.

433. **The Steppe,** or treeless grassland, occupies the drier regions of the south of Eastern Europe, where the winter is severe, the summer hot, and the rainfall light. These conditions are not favourable for slow-growing plants, and as the soil is extremely light and loose, trees do not root firmly. The plants which do best are those which come to perfection in a single year. As we see in our hay-meadows, grasses of various kinds grow very rapidly, and flower and seed in a few weeks. In the steppe, grasses find exactly the conditions which suit them. The soil which has been frozen in winter thaws in spring, supplying moisture to their roots, while the sun grows stronger and hotter daily. In the spring the steppe is beautiful with expanses of many-coloured flowers.

434. The steppe, in its natural condition, is fitted only for the rearing of grass-eating animals, particularly horses and sheep. It offers no stone or timber for building or fuel, and the people of the steppe were, and in some cases still are, dwellers in tents, made either of the skins of animals or of their wool pressed into felt. Such trades as carpet-making, leather-working, and saddlery, use up the wool and skins in other ways. Towards the south-east, where the steppe is drier and hotter, the grass becomes poorer, and the country passes into a semi-desert condition.

435. Such are the natural vegetation zones of Europe, but many changes have been made by man. Only the tundra now remains in its natural condition. The evergreen forests of the Mediterranean, and the forests of Central Europe, which covered the regions best suited for agriculture, have almost disappeared. Much more remains of the coniferous forest, for this is found either in colder parts of Europe or on the higher mountain slopes, neither of which are well suited for agriculture. Even the steppe has, within the last century,

been brought under the plough, and large areas have been turned into agricultural land.

436. **Cultivated Plants.** Look at the map of the cultivated plants in Fig. 170. The most important are the cereals—wheat, barley, rye, and oats. Wheat, which, as we saw, needs warm and rather dry summers, is grown throughout the Mediterranean lands and the 'deciduous' belt, except where it is too high

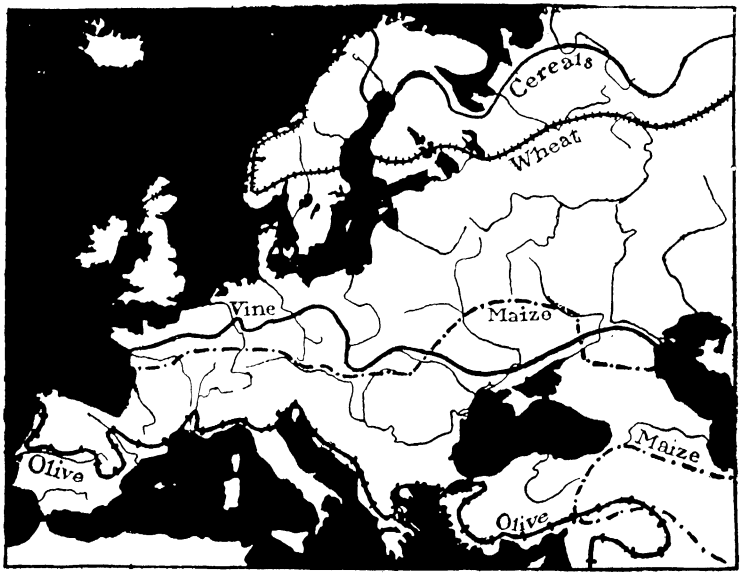


FIG. 170. Northern limit of some cultivated Plants.

and cold or very wet or dry. It ripens excellently in the hot summers of the steppe, which is becoming a great wheat-growing land. Rye and oats are grown throughout Central and Eastern Europe on the poorer lands and in the higher districts. Barley is grown wherever agriculture is possible. Root crops are most important in the 'deciduous belt'. The potato is grown everywhere except in the coldest and driest parts of the continent. The turnip is also widely distributed. The sugar-beet is largely cultivated in the central lowlands.

The pulses, especially peas and beans, are largely grown in the Mediterranean and the deciduous belt. Lucerne is grown for fodder in the south, and clover farther north. The fibre plants, flax and hemp, are chiefly cultivated in the lowlands of Central Europe and in the west of the Russian plain.

437. Of fruits, the grape vine and the olive, both Mediterranean plants, are the most important. Other Mediterranean

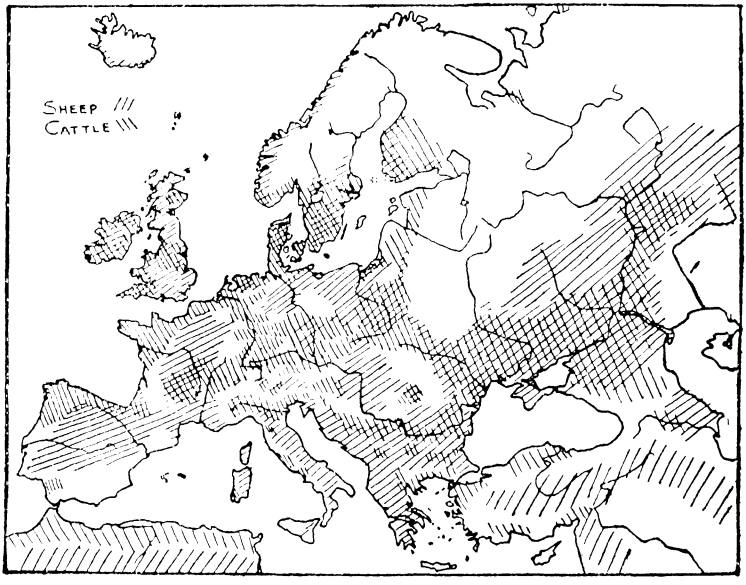


FIG. 171. Distribution of Sheep and Cattle.

fruits are the orange, lemon, fig, mulberry, pomegranate, and peach. The vine extends northwards, along the southern slopes of the hills, far into Central Europe. As we go north the walnut, pear, plum, cherry, and particularly the apple, become more important.

438. Animals. As man has dealt with the vegetation of Europe, so has he with its animal world. The wild animals, like the forests, have disappeared before his advancing plough, though a few still remain in the forests and on the higher

mountain slopes. Some small fur-bearing animals, in the northern coniferous forests, are almost all that now remain of the once numerous wild animals of Europe.

Man has introduced his own domesticated animals, as he has introduced his own cultivated plants.

The horse is found all over Europe, but in greatest numbers in the grasslands. It is less numerous in the mountain lands of the Mediterranean, where the mule becomes more important. The donkey is important all over Central and Southern Europe. Cattle are found throughout Europe, except in the north of the Scandinavian peninsula and of the Russian plain, but they are most numerous in the wetter grasslands. Sheep become more important than cattle in the drier grasslands, on limestone pastures, on the steeper mountain slopes, and in the drier regions generally (see Fig. 171). The goat replaces the sheep on still drier pastures, as, for instance, in much of the Iberian peninsula. The pig is an important domestic animal everywhere except in the northern forests. It is bred in immense numbers in the oak forests of Southern Europe. The reindeer is confined to the extreme north of Europe, where it lives on young sprouts and shoots in summer, and procures its winter food, the reindeer moss, by digging with its hoof in the snow. This hoof is broad and well suited for travelling over snow or over boggy yielding ground. The dog has followed man all over Europe. Another important group of domestic animals are the fowl, duck, goose, turkey, &c., which are bred both for their eggs and for their flesh. The common fowl is the most widely distributed, being found all over the continent except in the north of Eastern Europe. The others are most important in Central and Southern Europe, with the exception of the Iberian peninsula. Two other creatures of importance to man may be noted: the bee, which is found all over Central and Southern Europe, where honey is an important article of diet; and the silk-worm, which is reared in the Mediterranean lands where the mulberry on which it feeds can be grown.

439. Fisheries. Fishing is important in the shallow northern seas, where herring, cod, and flat fish are abundant. Off the coast of the Scandinavian peninsula the summer fishing season is the busiest time of the year. Vast quantities of fish are salted, smoked, or dried in the sun, for export to the countries of Southern and Eastern Europe, where fasting is practised as a religious duty. The deep seas of the Mediterranean are less rich in fish, but the sardine fisheries are important. The chief river fisheries are salmon in the rivers of Northern Europe, and sturgeon in the rivers flowing to the Caspian.

440. Minerals. The mineral wealth of Europe is varied and widely distributed. Gold is found in small quantities in the Urals and the Karpathians; silver, though very common, especially along with lead, is nowhere found in very large quantities. Copper occurs in many parts of Central and Western Europe, in the Urals, and especially in the south of the Iberian peninsula, where lead is also found, as well as in the British Isles. Mercury is mined in the south of the Iberian peninsula, and platinum in the Urals. Coal and iron, the most useful, are also the most abundant and are constantly found together. Iron occurs in varying quantities in most parts of Europe, though it is least abundant in the Italian and the south of the Balkan peninsulas, and in the north and south-east of the Russian plain. Coal is found on the northern margin of the Central Highlands, in Britain, in the heart and south of the Russian plain, and in the Urals. Sulphur is obtained in the volcanic regions. Petroleum (kerosene oil) is found on the outer margin of the Karpathians, and especially at the eastern end of the Caucasus, where towns have grown up which depend entirely for their prosperity on oil. Salt is mined in Central Europe, and in the British Isles, and evaporated from the sea round the coast, especially in the Mediterranean.

Building stone and clay are almost everywhere found, except in the steppe lands.

People.

441. Distribution of Occupations. Look at Fig. 169, which shows the distribution of vegetation. If this were the only circumstance to consider, the occupations of Europe would be few and simple. Along the coasts we should have a fishing population, who would procure the timber for their boats from the nearest forests. In the tundra, where the reindeer is the only domesticated animal, and agriculture is impossible, we should have a very poor life, without settled home, as the reindeer must continually move on to find new feeding grounds. In the forests we should have small scattered villages, and these would be along the rivers, which take the place of roads in the forest. Hunting would be important, and such industries would be carried on as timber-cutting, boat-building, saw-milling, and the various other occupations suited to the forest, including the fur trade. On the steppe we should have great herds of cattle, horses, and other stock, with their owners dwelling in tents, following their flocks and herds hither and thither, and engaged in working up the hair, wool, skins, tallow-fat, &c., yielded by their flocks.

442. Examples of these simple occupations are found all over Europe, but they are no longer the only ones. Agriculture has been practised for thousands of years, bringing with it the settled home, which has changed the shifting village into the town or city. The process of clearing the forest, and, recently, of ploughing the steppe, has transformed Europe into an agricultural country, in which mixed farming, which combines agriculture with the rearing of stock, is the most important occupation. According to special circumstances, one or other of these branches becomes more important, as, for example, the cultivation of wheat in the rich soils of the Hungarian lowland, and the steppe; dairy-farming where rich moist pastures are found, as in Ireland, or the Low Countries; or sheep-farming where there are large tracts of hill pasture, as in Wales, or the drier highlands of the Iberian peninsula.

443. As a country becomes agricultural, with a larger, richer population settled in cities and towns, new kinds of raw material are produced, new wants arise, and new occupations grow up. Thus the clearing of the forest and the growth of settlement both makes houses necessary and provides the timber for them. The trades of the builder, joiner, carver, and painter arise, throwing off new branches as time goes on. The demand for better ploughs improves the smith's trade. The increase in the quantity of wool produced on sheep-farms improves the weaver's trade, which in its turn requires machinery, and so on. Within our own times a new trade, the making of motor-cars, has come into being, and all the well-paid trades connected with the use of electricity are quite young. All of these trades are carried on in all the principal towns of Europe, and many of the more important in the villages also.

444. Rather more than a hundred years ago it was discovered that steam could be used to drive machinery, giving a greater output at less cost. On the coalfields, where cheap fuel could be had, it became more profitable to use land for manufacture than for agriculture. All over the coalfields of Europe the population is largely engaged in smelting metals, making machinery, and carrying on weaving, or textile industries of many kinds.

445. Another group of occupations is connected with the selling of goods made by others, whether in small shops, or in large warehouses, which trade with all parts of the world, employing clerks, travellers, railway servants, seamen, and others.

446. Still another group is concerned with the care of the sick, the education of the young, the teaching of religion, the practice and administration of law, and the defence and government of the country. These occupations are known as professions, and are carried on chiefly in the capitals, but in a greater or less degree in all the towns and villages of Europe.

447. Density of Population. The density of population depends on the occupation. Where that is destructive, as in the case of hunting, the supply of food gradually ceases, and population never increases to any great extent. Where men are engaged in increasing the food supply, either by breeding animals or by cultivating plants, a much larger population can be supported on the same area. Animals rapidly eat

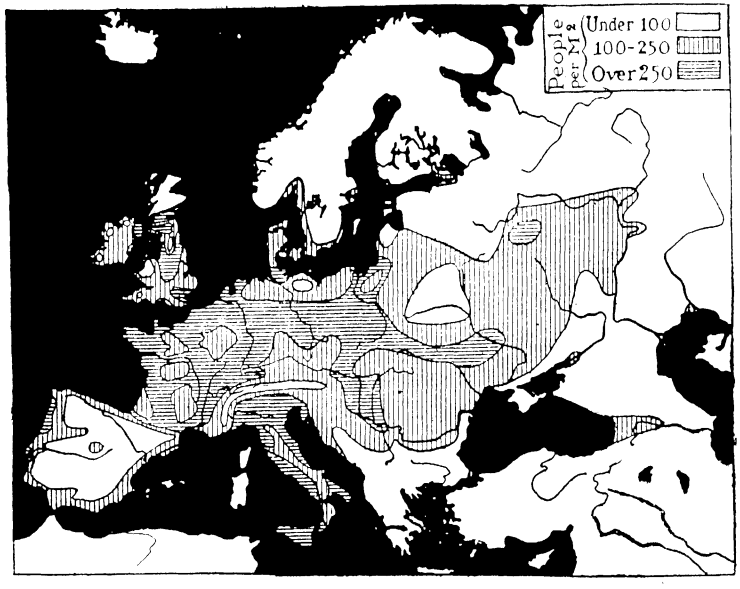


FIG. 172. Density of Population.

a given area bare, and must move to another, and thus more ground is required for keeping animals than for growing crops. We have already seen that in the British Isles the agricultural counties support a denser population than the pastoral ones. Population is densest in the manufacturing districts, which do not grow their own food, but import it from other parts of the world. (See Fig. 172.)

448. Races. The people of different parts of Europe differ considerably from each other in height, build, colour, and shape of the head, though not so strikingly as Europeans differ from

the inhabitants of Eastern Asia or of Central Africa. Except in the tundra, where man, like vegetation, does not attain full development, the peoples of Northern Europe are tall, slender, and fair-complexioned, with blue eyes and light hair. This type is commonest in the Scandinavian peninsula, and extends into our own country and across the Central Lowlands. It is called the Northern race. In the mountain regions of Central Europe and in the centre of the Eastern Lowlands the people are shorter and stouter, with broader heads, and darker hair, eyes, and skins. This is called the Alpine race. A third group, found in the Mediterranean lands, is slighter, but still shorter and darker than the preceding, and their heads are longer and narrower. This is the Mediterranean race. These races extend across Europe from east to west, but they speak different languages, and belong politically to different states.

449. **Languages.** A large number of languages are spoken, but those used by nine-tenths of the people of Europe belong to the Teutonic languages, spoken for the most part by the Northern race; the Romance languages, spoken chiefly in the Western Mediterranean and derived from Latin; and the Sclavonic languages, spoken in Eastern and South-eastern Europe. Turkish, spoken in parts of the Balkan peninsula, Magyar, spoken in Hungary, with others less important, are of Asiatic origin.

450. **European States.** Look at Fig. 173, observe the names of the states into which Europe was divided, and compare their position with the map in which the configuration is shown. The group of states lying round the Northland Seas are the British Isles, forming the United Kingdom of Great Britain and Ireland, or Britain; the Scandinavian peninsula, forming the kingdoms of Norway and Sweden; and the islands of the Sound, with the peninsula of Jutland, forming the kingdom of Denmark. On the southern shores are France, Holland, and Belgium lying round the Rhine delta, and the German Empire, stretching across Central Europe, almost to the Alps.

Along the western Mediterranean lie Spain, which, with

Portugal, occupies the Iberian peninsula, France, which has therefore a double advantage as regards sea, and Italy in the Italian peninsula, with Switzerland crowning the Alps above. The empire of Austria-Hungary, until it collapsed in 1918, had a short coast-line on the Adriatic. It then lost this coast, and broke up into (1) Austria (German), in the Eastern Alps, with the Austrian Danube and Vienna, (2) Czecho-Slovakia in Bohemia and Moravia, (3) Hungary in the middle Danube



FIG. 173.

plain, (4) Yugo-Slavia, including the mountain-lands south of the middle Danube, with Serbia to the south-east in the Balkan peninsula. The Balkan peninsula is divided into several states. North of the Lower Danube lies Rumania, south of it Bulgaria, with a coast-line on the Black Sea. Albania lies south of Yugo-Slavia, bordering the Adriatic Sea, and Greece occupies the extreme south of the peninsula, and extends around the northern shore of the Aegean Sea. Turkey has a strip of land bordering the Bosporus, on which its capital, Constantinople, is situated. The republic of Andorra in the

Pyrenees, the principality of Monaco on the Mediterranean, surrounded by French territory, the republic of San Marino in Eastern Italy, and the principality of Liechtenstein, in the Upper Rhine valley, all very small, are of no political importance.

The Baltic Sea is bounded on the east by lands which used to be included in the Russian Empire before the revolution in 1917 broke it up. These are Finland, Esthonia, Latvia, and Lithuania. Poland extends from the Baltic to the Karpathians, over lands formerly Russian and German. The Ukraine, an area bordering the Black Sea east of Rumania, is another part of the former empire where it has been attempted to form an independent republic. The Russian lands cover the whole of Eastern Europe.

CHAPTER XIX

WESTERN AND CENTRAL EUROPE

Norway and Sweden.

451. Physical Features. Look at the map of the Scandinavian peninsula, which consists of Norway (124,000 square miles) on the west, and Sweden (172,000 square miles) on the east (see Fig. 174). Notice that the west coast is protected for most of its length by a fringe of islands. This breaks the waves of the Atlantic, and makes calm channels between itself and the mainland. Notice also the long fiords penetrating scores of miles inland. Many waterfalls descend from their mountain-walls, which in some fiords rise to 4,000 or 5,000 feet. Norway is a mountain land, with a little flat land in the south.

Sweden consists of the longer, gentler slope of the Highlands, and the lower parts are hilly with many lakes.

452. Climate and Products. The coast of Norway has a mild though cool climate. Elsewhere the climate is severe. The winters are long and dark. At midsummer, in the northern half of the peninsula, the sun never sets, and for some weeks night is reduced to an hour or two of twilight. Norway receives much rain, but Sweden is far drier.

Agriculture is possible only in the flatter south of Sweden.

The long summer daylight shortens the time between sowing and harvesting. The forests supply great quantities of timber,

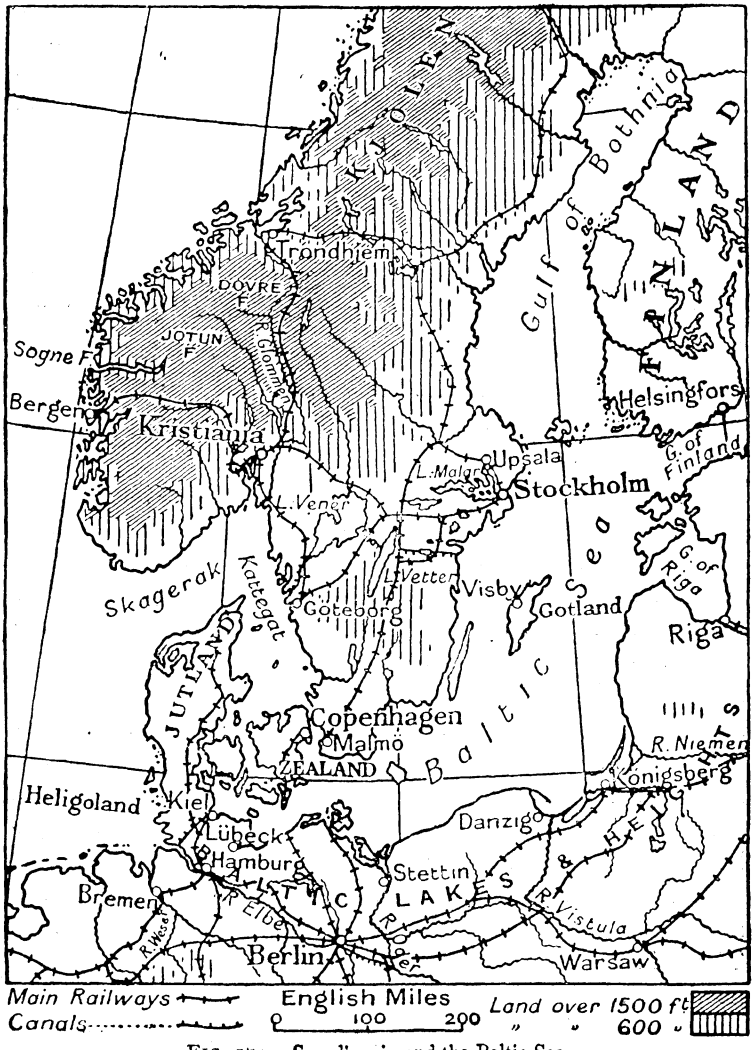


FIG. 174. Scandinavia and the Baltic Sea.

joinery, wood pulp, matches, &c., for export. The mountain streams supply the power necessary for mills and electro-

chemical works. There are fisheries in Norway and iron mines in Sweden. The Norwegians are a nation of seamen. Fishing-fleets sail to catch whales and seals in the Arctic seas, cod, herring, and other fish off the Lofoden Islands, and in the North Sea and the Atlantic.

The iron mines at Kiruna and Gellivara, in northern Sweden, are so important that a railway has been built across the highlands to Narvik, a port always free from ice. The iron mines of the south are also famous.

453. Towns. In both countries most towns are on or near the coast. Hammerfest and other northern towns are engaged in the whale and seal fishery. Trondhjem, on Trondhjem Fiord, is a famous old city. Bergen, in the south, is a fishing and fish-curing centre. Christiania, the capital, is on the Christiania Fiord. Stockholm, the capital of Sweden, on Lake Mälar, is a city of islands, bridges, lakes, and pine woods. Upsala, the old capital, is a university town. Göteborg is a busy port, trading in lumber and forest produce. It is connected with the capital by the Göta Canal, which crosses the forested lowland, and passes through several lakes, including Vener and Vetter, the largest in Sweden.

Central Europe.

454. Divisions. Look at the map of Europe in Fig. 173, and observe the political divisions. The kingdom of Denmark consists of the peninsula of Jutland on the mainland, with the neighbouring islands, and the Faeroe Islands in the Atlantic Ocean. The kingdom of the Netherlands, or Holland, consists of the delta of the Rhine. Most of the remainder is occupied by the independent kingdoms, duchies, principalities, and cities which make up the German Empire, or Germany. The diamond-shaped, mountain-bound kingdom of Bohemia was included in the Austrian Empire. The north is flat, and often marshy, especially round the Rhine delta. East of the Jutland peninsula the coast is bounded by the semicircle of the Baltic Heights, a forested, rather infertile,

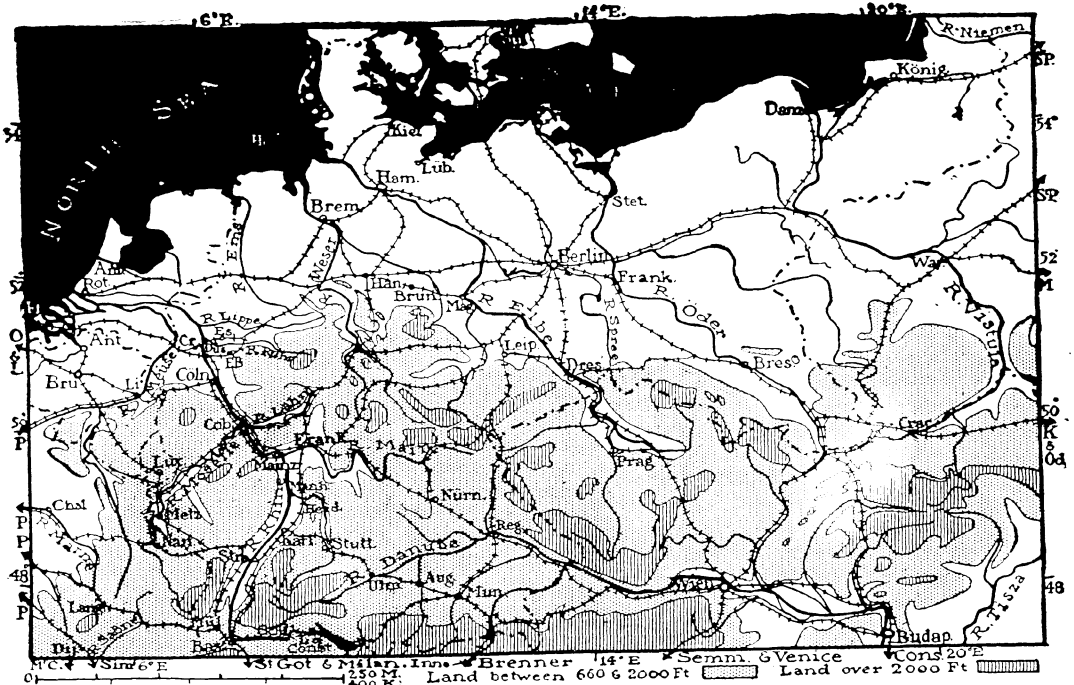


FIG. 175. Highlands, Routes, and Towns of Central Europe.

The lines to Ostend, Lille, and Paris, on the west; Mont Cenis, Simplon, St. Gotthard, Brenner, Semmering (for Venice), and Constantinople, on the south; and for Odessa, Kiev, Moscow, and Petrograd, on the east, are shown.

lakeland. To the south the country forms part of the great plain of Europe. This plain is crossed by numerous rivers, which rise either in the Central Highlands or in the Alps.

455. **Climate and Products.** The natural divisions of Central Europe run from east to west, and not from north to south. The north is on the whole flat, the south is on the whole high, thus there is less difference in the temperature of north and south than would otherwise be the case. The climate is more equable in the west than in the east, for reasons already explained, and in the east is drier than the west.

The soil is generally fertile, though in many parts of the east it is too sandy to suit all crops. About one-half is cultivated, about a quarter is forest, and about one-fifth is pasture land. Pasture land is at least as important as agricultural land in Holland and Denmark. In Holland there is hardly any forest, and a greater proportion of waste land, chiefly marshes, than in the other countries of Central Europe. In the German Empire, which occupies the bulk of Central Europe, the richest agricultural land is in the west, where wheat is grown. On the poorer soils of the north and east rye and oats are the chief grains cultivated, and large areas are planted with potatoes and the sugar-beet, both of which give rise to important industries, spirits being widely manufactured from potatoes, while sugar is made in great quantities from the sugar-beet. The manufacture of wine is important wherever the vine will ripen, and beer is made wherever hops can be grown or cheaply obtained.

456. The numerous navigable waterways, rivers, and canals, with excellent ports at their mouths, allow raw materials to be cheaply carried to the coalfields, on which the manufacturing towns are situated. These coalfields are found on the northern margin of the Central Highlands where the Rhine, Elbe, and Oder, and their tributaries leave them, and are known as the Westphalian, Saxon, and Silesian coalfields. In the sheep-rearing districts wool is manufactured locally. Many parts of the highlands are rich in minerals and mining, and the various

Denmark.

457. Denmark (15,000 sq. miles) consists of a peninsula and numerous islands. It has a long coast-line, but few good harbours; for the shores, except on the east, are sandy with many lagoons. The shallow winding Little Belt, the broader and deeper Great Belt and the Sound, between Zealand and

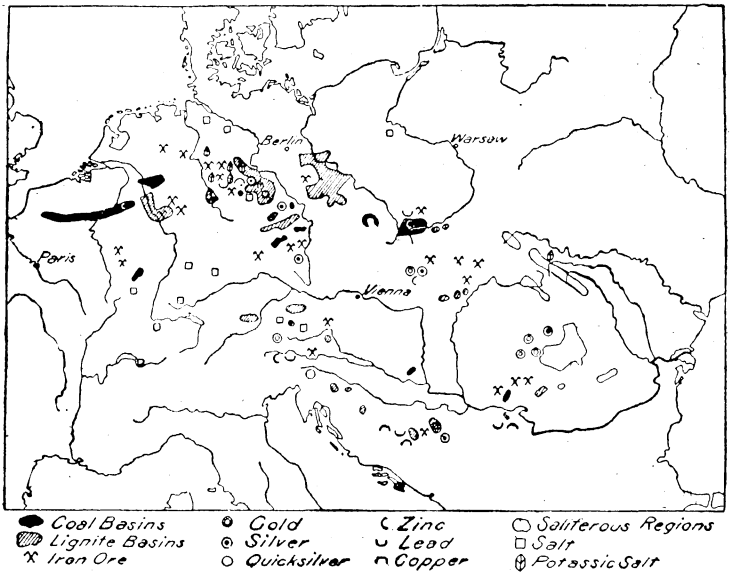


FIG. 176. Distribution of Minerals in Central Europe.

Scandinavia, lead from the Baltic to the North Sea, and much trade passes through them.

The Baltic Heights extend into Jutland and the islands, but are not over 600 feet high. Jutland, though about two-thirds of Denmark, contains less than half the population. Four-fifths of the country is productive, rather less than half is arable land, and about the same pasture. Forests occupy one-

twentieth of the productive area. Dairy-farming is the chief occupation, and butter the chief export. Glove-making is important.

Copenhagen, the capital and the only town of any size, looks beautiful from the Sound. The other towns are ports, or ferry towns. There are no long railways, but the trains are carried on large ferry boats from shore to shore.

458. **The Faeroes,** or Sheep Islands, several of which are uninhabited, are engaged in sheep-farming and fishing.

459. **Iceland** (40,000 sq. miles) is a large mountainous island in the Arctic Ocean with small lowlands in the south and south-west. The island is volcanic, Hekla being the best known of over a hundred volcanoes, active or extinct; and geysers, or hot springs, throw up fountains of hot water at intervals. The greater part of the island, which rises to a height of 6,400 feet, is covered with snow, and the valleys are filled by glaciers, from which issue short rapid rivers forming waterfalls. The climate is too cold for agriculture, but the pastures are rich in the short summer, and feed excellent sheep, cattle, and ponies. Fishing is important. Only the coast and the lower valleys are inhabited. The capital is Reykjavik, in the south-west. Iceland is a State with the same king as Denmark, but no longer belongs to Denmark.

The German Empire.

(*With the whole Rhine Valley*)

460. The German Empire stretches from the Alps to the Northland seas. Except in the north it is bounded by land, so the fact that most of its rivers flow to German waters, and are navigable for a great part of their course, is of the greatest importance.

Germany is divided into North Germany, occupying the plain, broken by the Baltic heights in the north, and South Germany occupying the highlands.

461. **The Eastern Rivers.** Beginning from the east, the lower courses of the Niemen (or Memel) and the Vistula open to great lagoons, the former with Memel, the latter with Danzig at its mouth. The timber trade of the Vistula is very important. It is a Polish rather than a German river.

462. **The Oder,** though it rises in Moravia, is German for most of its course. Short left-bank tributaries drain the pine-forested slopes of the Riesen Gebirge, or Giant Mountains, which separate Silesia from Bohemia. The main stream flows across the plains of Silesia, through an agricultural land decreasing in fertility to the north and east, where some wheat, but much more rye, potatoes, sugar-beet, and flax are grown. Sheep are fed in the mountain districts, and their wool is manufactured in a number of small towns. The Silesian coalfield is in the south-east. Breslau, on the Oder, the capital of Silesia, manufactures cotton, woollen, and linen fabrics. Frankfurt-on-the-Oder is a sugar-manufacturing town, in the centre of the sugar-beet district. Stettin is a shipbuilding centre and an important port.

463. **The Elbe** is the most important river of North Germany. Its tributaries make it the outlet of a large and wealthy district. It rises in Bohemia.

Many tributaries drain the mountains which enclose Bohemia, the Erz Gebirge, or Ore Mountains, on the north-west; the Böhmer Wald, or Bohemian Forest, on the south-west; the Riesen Gebirge, or Giant Mountains, and the other ranges which make up the Sudetes Mountains on the north-east; and the Moravian Highlands on the south-east. Look out the position of all these in Fig. 175, and notice how they enclose the diamond of Bohemia between them. The line of the Bohemian Forest is continued through the Fichtel Gebirge, or Fir Mountains, the Thüringer Wald, or Thuringian Forest; the line of the Sudetes is carried in a more broken manner through the detached Harz Mountains towards the Weser Highlands in the north-east, while the line of the Erz Gebirge is continued through the Fichtel Gebirge and the Franconian and Swabian Jura to the Rhine, and beyond the Rhine as the Swiss Jura.

464. **Saxony.** The Elbe enters Saxony through a fine gorge, between the Sudetes and the Erz Gebirge in the picturesque Saxon Switzerland, and leaves the mountains as a broad, shallow stream, not always navigable in dry seasons. It passes Dresden, the capital of Saxony, a handsome town, with fine art galleries, public gardens, and beautiful pine-forested surroundings. Below Dresden it flows across the

plain, with marshy or forest land on its right bank, and on its left, agricultural districts cultivated with potato and sugar-beet. The Mulde, Saale, and other tributaries on the left bank drain the German slopes of the Erz Gebirge, the Thuringian Forest, and the eastern slopes of the Harz. The former crosses the Saxon coalfield, with the manufacturing and mining towns of Chemnitz and Freiberg. All the mountains supply timber and feed sheep which yield the famous Saxony

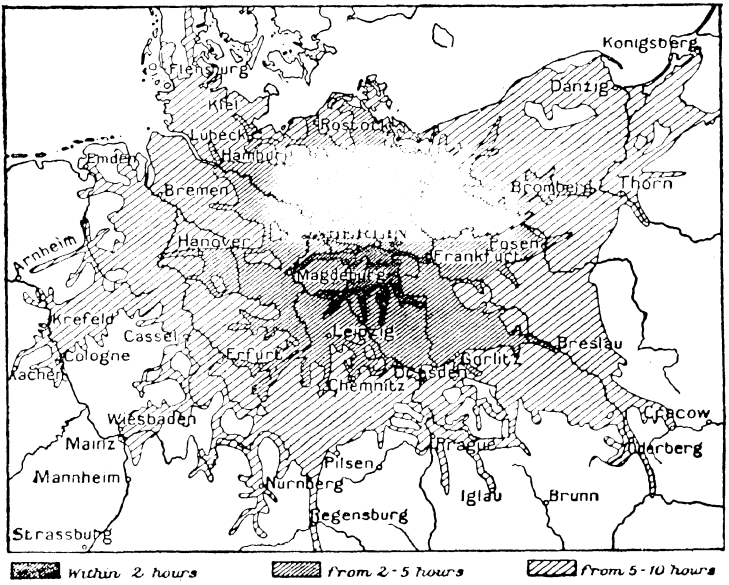


FIG. 177. Routes from Berlin, indicated by lines showing time required in travelling by express train. All places in the darkest area are within two hours' journey of Berlin, all in the white area are over ten hours' journey from Berlin.

wool, from which Saxony flannel is manufactured. The Erz Gebirge, or Ore Mountains, are rich in minerals. The chief towns of the Saale basin are Leipzig, on a tributary, the centre of the German publishing trade, and Halle. Not far below the confluence of the Saale is Magdeburg, a fortress of great strength, a centre of the sugar manufacture.

465. Berlin. On the right bank the Elbe receives the Havel, on a tributary of which, the Spree, stands Berlin, the

capital, a town whose magnificent buildings, streets, promenades and gardens are mostly modern. Like all modern capitals it is the centre of many industries, especially of those which supply luxuries. It is one of the great railway centres of the empire, and of Europe (see Fig. 177). It is connected by canal with both the Elbe and the Oder, whose ports Stettin

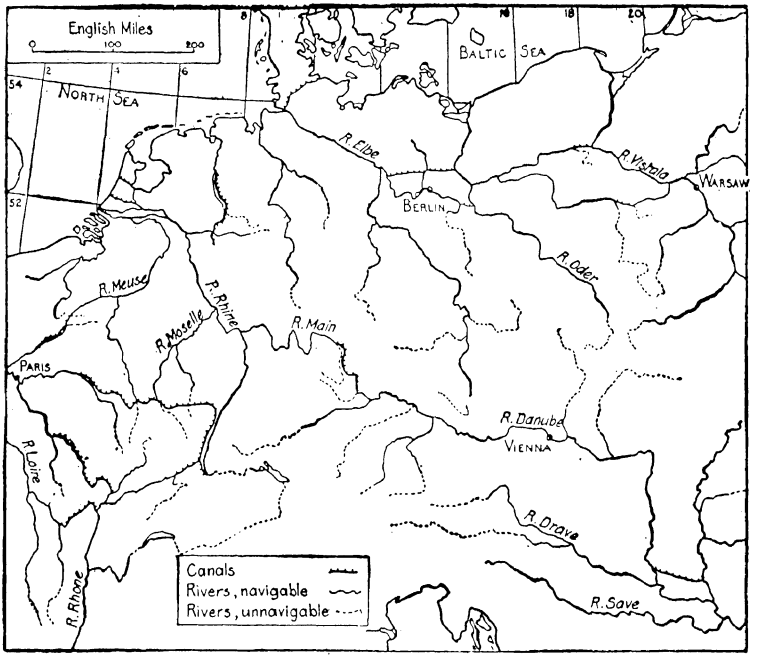


FIG. 178. The Navigable Waterways of Central Europe.

and Hamburg are therefore both ports of the capital (see Fig. 178).

466. **Hamburg**, at the head of the estuary of the Elbe, has greatly developed with the growth of trade with the United States, and is one of the greatest ports of Europe. The traffic down stream consists of the mineral wealth

of Saxony and Bohemia and the manufactured articles of the Saxon coalfield. Hamburg is connected by canal with the Baltic port of Lübeck, on the Trave, the boundary between Schleswig-Holstein and Mecklenburg; Kiel, to the north of Lübeck, is connected with the Elbe estuary below Hamburg by the Kiel Canal, and the Elbe is thus in direct communication with the Baltic as well as with the North Sea.

467. **The Weser** has only half its course in the plain, which here narrows. It is formed by the Werra from the Thuringian Forest, and the Fulda, from the highlands of Hesse, both beautifully wooded. On the east rise the Harz Mountains, rounded, forest-clad hills, rich in minerals. The Weser leaves the highlands in a narrow gorge, known as the Westphalian Gate, and flowing across the cultivated plain receives the Aller, with its tributary, the Leine, on which stands Hanover. This town, and Brunswick, are the two principal towns of the agricultural district between the Elbe and the Weser. The port of the Weser is Bremen, at the head of the estuary, the rival of Hamburg for the trade of Central and Southern Germany.

468. **The Danube** is the only German river which does not flow north. Trace its upper course between the German Jura and the Bohemian Forest on the north, and the Bavarian Foreland on the south. Its source is in the Black Forest, a few miles only from the Rhine. On the right are the Iller, with the cathedral town of **Ulm** at its confluence, and the Lech, flowing past Augsburg; both have long been important, as was also Ratisbon, or Regensburg, on the Danube. The last important tributary in Germany is the Isar, on which is Munich, the capital of the kingdom of Bavaria, one of the finest modern cities in Europe. The Bavarian Foreland is covered with pine forests, with pastures on their lower slopes, where cattle are reared in large numbers. The flatter land along the lower courses of the rivers and along the Danube is cultivated.

469. **The Rhine** is the only river which flows from the Alps to the North Sea. between which it is an important link.

Trace the course of the Rhine; note its many changes of direction, and the vast area drained by it and its tributaries. It rises in the Alps by two main streams, and flows north to Lake Constance. It turns west, and passes in a narrow valley between the Swiss and German Jura, forming the Falls of Schaffhausen.

470. The Middle Rhine Plain. The Rhine now turns north, and separates France from Germany, since France, by the peace of 1919, acquired the lands west of the middle Rhine, in Alsace and Lorraine, which had belonged to Germany. Here the river flows across a fertile plain, bounded to the east (Germany) by the forested rounded slopes of the Black Forest, and west (France) by the similar Vosges mountains. Though the winters are cold the summers are hot, and the autumns are dry and warm. The sunny slopes of the hills are terraced for vineyards. The plains are planted with every kind of grain, as well as with hops and tobacco. Fruits come to perfection, and many of the highroads are lined with fruit-trees. The valleys running up into the hills are hardly less rich. Their bottoms and lower slopes are cultivated in the same manner as the plain, while higher are beautiful meadows, above which rise dark pine woods which give the Black Forest its name. The streams turn saws which cut the timber. The peasants are skilful wood-carvers, and wear picturesque costumes and live in quaint wooden houses.

Chief towns are Strasbourg (fortress; university) and Mulhouse (Mühlhausen; cotton works) in Alsace (France), and Freiburg (university) and Karlsruhe (engineering works) in Baden (Germany), with a ship canal to the Rhine.

The first important tributary is the Neckar from the Swabian Jura. It flows past Stuttgart, the capital of Württemberg, and passes between the Odenwald and the Black Forest in a narrow forested gorge, at the mouth of which stands the university town of Heidelberg, with its romantic ruined castle. The busy river port of Mannheim, to which large barges of 2,000 tons come, is at the mouth of the Neckar.

The Main, the most important tributary, enters some sixty miles below the Neckar. Notice how its head-streams collect the waters of the Fichtel Gebirge and the Franconian Jura, as it flows across the kingdom of Bavaria. The chief town is Nürnberg (Nuremberg) on a tributary, a famous commercial and artistic town in the Middle Ages, and now a busy manufacturing town. Its walls and towers still stand, and its magnificent churches and old houses make it one of the most interesting cities of Germany. Hops are largely grown all over Bavaria, which is famous for its beer. On the Lower Main the chief city is Frankfurt-on-the-Main, an old historical city, now largely rebuilt. It is a trading and banking centre, and has become an important river port. Mainz, at the junction of the Main and Rhine, is also a manufacturing city and river port.

471. **The Rhine Gorge.** The Rhine now enters a beautiful gorge, between hills forested or covered with terraced vineyards with picturesque castles on the crags, and small towns at the water's edge. The river is broad, crowded with passenger and cargo traffic, with an occasional timber raft floating to the woodless delta.

About half-way through the gorge the Rhine receives two tributaries entering almost opposite each other, the Lahn on the right bank, and the Moselle on the left. Coblenz, a busy port and manufacturing town, is built at the confluence of the Moselle, just opposite to the fortified rock of Ehrenbreitstein. Trace the course of the Moselle, which, with its tributary the Saar, drains the French slopes of the Vosges, flows past the fortress of Metz, the capital of Lorraine, and enters the Rhine through a long forested gorge. To the west of its junction with the Saar is Luxemburg, the capital of a small independent Grand-duchy. The Saar basin has a coalfield, the output of which belongs to France.

472. **The Lower Rhine.** The Rhine flows across the North German plain in a north-westerly direction. Here wheat and

rye are grown, as well as oats, potatoes, and hemp. The Rhine flows past Cologne (Köln), a city famous for nearly two thousand years, with the largest Gothic cathedral in Europe, a strong fortress, a port for ocean steamers, and one of the busiest towns of Germany. Düsseldorf is a great port and manufacturing town, as is Duisberg at the junction of the Ruhr, which flows through the busiest coalfield of Germany. At Barmen-Elberfeld all kinds of textiles are manufactured, and at Essen great guns are made. Krefeld, west of the Rhine, is the chief silk-manufacturing town of Germany. The Rhine now turns west, and forms the delta which is occupied by Holland.

473. The Rhine is navigable from Strasbourg, in Alsace, to the sea, and forms the greatest waterway of Europe, carrying goods in both directions, binding together north and south and enabling them to exchange their products, agricultural, mineral, and manufactured. Ocean steamers reach Cologne, where their cargo is transferred to river steamers. The commerce of these river ports, which have already been named, is in some cases more valuable than that of first-class ocean ports.

The Netherlands, or Holland.

474. The Netherlands, or the Low Countries (area about 12,600 sq. miles), occupies the delta of the Rhine, and is crossed by its mouths. There are no hills, and the sea has eaten into the land, leaving remains of the old coast-line in the numerous islands. The Zuyder Zee is so enclosed by islands as almost to form an inland lake.

475. The Drained Land and its Produce. The coast is everywhere low, and except for a border of low sand dunes, is often below the sea-level. To keep the sea from flooding it, strong dykes have been built, and the low-lying meadows are pumped dry by means of windmills. A quarter of Holland is agricultural land, and half as much more pasture land. The chief crops are rye, potatoes, hops, sugar-beet, tobacco, and

some wheat. Dairy farming is very important. The Dutch are famous cultivators of flowers, especially of bulbs in the loose soil. Manufactures are important.

476. **Towns.** The position of Holland makes it the outlet of Western Central Europe, and a great volume of trade passes along the Waal (which receives the Maas, or Meuse, from the plateau of Lorraine), the Lek, and the Rhine, the principal distributaries of the Rhine. Rotterdam, on the Lek, is one of the greatest ports of Europe. Amsterdam, on the Zuyder Zee, is a shipping, banking, and commercial town, and the great diamond-cutting centre of Europe. The capital is The Hague, near the east coast. Utrecht, at the limit of the area liable to flood, is the most important town in the centre.

Belgium and France.

477. **Physical Features.** As in Germany, there are highlands in the south and lowlands in the north. The lowland is narrowest in the east, where the highlands approach nearest to the North Sea, forming the kingdom of Belgium (area about 11,500 sq. miles). France (area about 204,000 sq. miles) occupies the remainder, extending from the English Channel, in the north, to the Mediterranean, in the south, and from the Atlantic, in the west, to the Rhine[1], in the east. The lofty Pyrenees, from the Bay of Biscay to the Golfe du Lion, separate it from the Iberian peninsula in the south-west. In the east the Jura cut it off from Switzerland, and the Alps from Italy.

478. **The Central Plateau** is the poorest and most thinly populated part of France, with the exception of the upper slopes of the Alps and Pyrenees. It consists of (i) high plateaus, covered with poor pastures, and (ii) of bare limestone tablelands, in which the rivers have cut narrow gorges, some steep, some of them 1,500 feet deep. Elsewhere the valleys are wide, with sloping sides, which are cultivated. Towards the centre is a region of extinct volcanoes (Mont Dore, 6,000 feet) and lava sheets. The deep valleys of the Loire and Allier are fertile. The Plateaus of Langres and of Lorraine join it to the forested Vosges. The wooded Ardennes, to the north, are the western continuation of the Lower Rhine Highlands.

479. **Rivers.** There are five river basins: (1) that of the Meuse and Scheldt, which flow to the Rhine delta, the northern part of the basin forming Belgium; (2) the Seine basin, drained to the Channel; (3) the Loire basin in the west, drained to the Bay of Biscay; (4) the basin of the Dordogne-

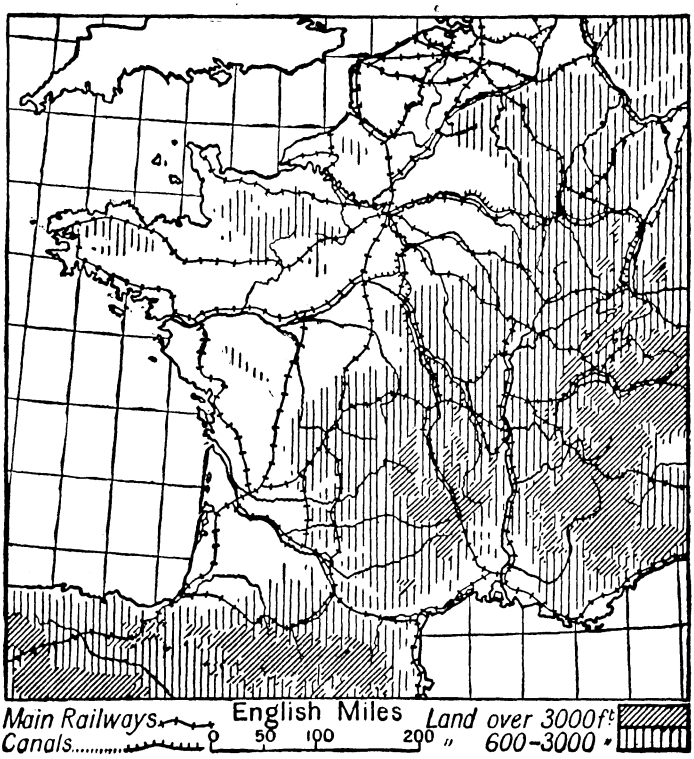


FIG. 179. Physical Features of France and the Bordering Lands.

Garonne, in the south-west, drained to the Bay of Biscay. All these rivers, except the Garonne, which comes from the Pyrenees, rise in the Plateau of Langres or the Vosges. (5) To the east of the Central Plateau, and separating it from the Jura and the Alps, is the smaller lowland of the Saône-Rhone, which passes in the south-west into the lowland of Languedoc.

It will be seen from the rivers that the Central Plateau is lowest in the north-west, and rises gradually to the east and south margins, where it is known as the Cevennes, which look like mountains from the deep Rhone valley.

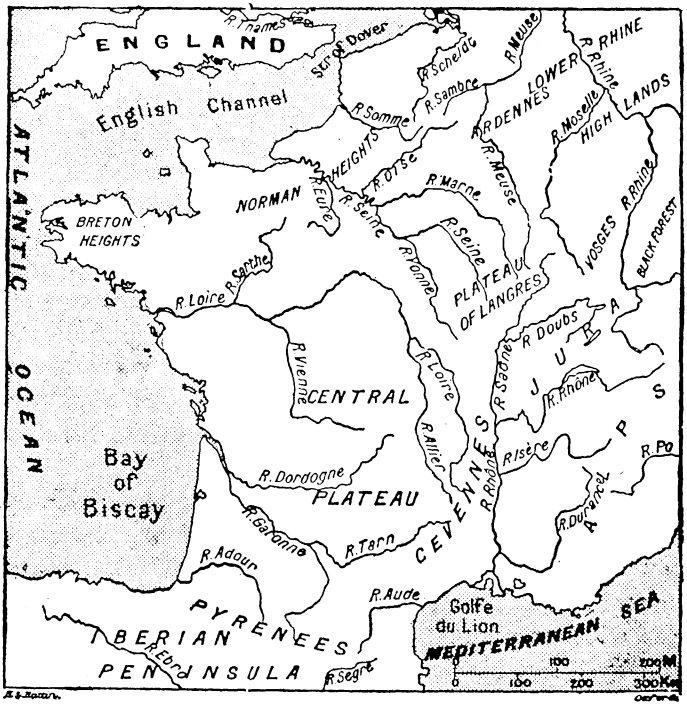


FIG. 180. Key to Physical Features of France and the Bordering Lands.

480. Climate and Products. The climate of the north differs little from that of Southern England. The orchards of Normandy, from which large quantities of cider are made, are famous. Much wheat is grown as well as other cereals, root crops, especially sugar-beet, and flax in the east. The summer heat increases to the centre and south. The vine ripens south of a line drawn from the mouth of the Loire to

the Ardennes, except on the higher parts of the plateau. The south of France has the Mediterranean climate of winter rains and hot dry summers, and the olive, orange, lemon, mulberry, and other Mediterranean fruits ripen.

481. **Minerals and Manufactures.** The mineral wealth is not great. The largest coal-field is in the Sambre-Meuse basin, and on it are situated the industrial towns of Belgium and North-east France. Mines here were destroyed in the great war, but by the peace France got the coal in the Saar field (German Lorraine). A smaller coal-field is found round St. Etienne in the Central Plateau between the upper Loire and the Rhone on which iron industries are carried on. Many manufacturing towns are served by good waterways, both rivers and canals. These traverse most parts of the lowlands, especially in the north, and help to carry imported materials like coal, cotton, wool, and ores. Flax for the linen manufacture is largely grown in the country. Silk is manufactured in the south, especially in the Rhone valley, where silkworms are reared and coal is easily obtained from the St. Etienne coal-field.

482. **The Kingdom of Belgium** is a political division which does not correspond with any natural division. It consists of a lowland and a highland portion. The narrow lowland of Flanders and Brabant, drained by the Scheldt and its tributaries, widens west and east into the lowlands of France and Germany. The highland of the Ardennes, through which the Meuse flows in a gorge like that of the lower Rhine, has forests and pastures which supply timber and wool. Though Belgium has been desolated by years of war, it must be remembered that she had, and will have, great industries. Agriculture is important in the lowlands, except in the marshy north. The cultivation of flax, and the waters of the Scheldt and its tributary the Lys, good for bleaching, helped to develop the manufacture of linen. The Franco-Belgian coal-field runs along the Meuse and Sambre, on both sides of the frontier. At the east end iron and zinc occur. Liége, noted as an engineering centre; the many towns on the coal-field famous

for iron, textile, and other manufactures; Ghent, at the confluence of the Lys and Scheldt, a centre for cotton and linen; Antwerp on the Scheldt estuary, a great port for both Belgium and western Germany—all these illustrate the importance of Belgian industries. Ostend and Zeebrugge are other ports, and Brussels, the capital, in the centre, has been a great market for lace, gloves, and many other goods.

France.

483. The North-east. Although, during the great war, little more than a twelfth of the whole area of France was invaded, the parts which suffered, in the north-east, include some of the principal manufacturing centres, with the Franco-Belgian coal-field, the iron mines about Longwy and Briey, &c. In these parts are Lille, the adjoining towns of Tourcoing and Roubaix, Douai, Amiens, St. Quentin, Reims, and Nancy, all noted for various textile manufactures, and most of them for machinery; Reims and Châlons-sur-Marne, also, as centres of the wine (champagne) trade; together with many smaller towns, Dunkirk, Calais, and Boulogne are the chief ports in the north-east.

484. The Seine Basin. The Seine basin, with the upper courses of the Meuse and Moselle, is a land of limestone scarps and clay plains, resembling the Thames basin. Sheep are kept on the hill pastures, and the steep slopes facing the sun are terraced for vines. Numerous cotton-manufacturing towns lie round the base of the Vosges, of which Nancy, on a tributary of the Moselle is the chief.

The Seine flows north-west from the Langres plateau to the Channel. Its chief tributary, the Marne, on the right bank, comes from the plains and heights of Champagne, whose hill vineyards yield the famous wine. Reims, an old cathedral city with woollen manufactures, is the centre of Champagne.

485. Paris, the capital of France, at the junction of the Marne, is a magnificent city, with broad tree-lined streets, great squares, and fine ancient and modern buildings. It manufactures many articles of luxury and beauty, and is an important port. Up to Paris the Seine is navigable for smaller sea-going vessels,

while ocean liners reach Rouen, the Manchester of France, the centre of the cotton manufacture of the Lower Seine, with a fine old cathedral. Le Havre, at the mouth of the estuary, is the chief port of Northern France, and 'the haven' of Paris, with a great American and English trade.

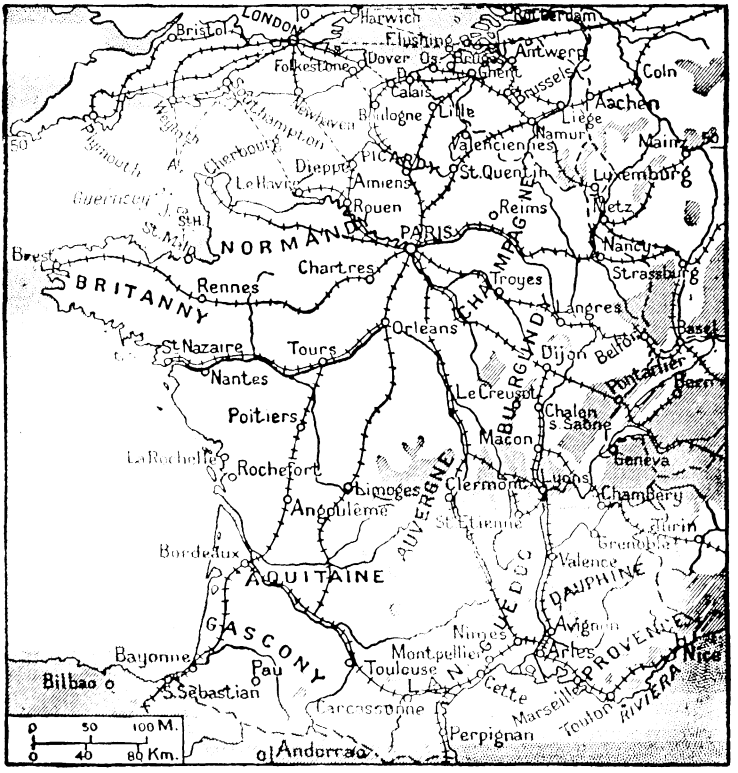


FIG. 181. Routes and Towns of France.

The Norman *Heights* consist of chalk pastures, with fertile valleys rich in orchards and corn lands.

486. The Loire Basin. The Loire is the longest river of France. The main stream, and its chief tributary, the Allier, rise less than 100 miles from the Mediterranean, in the Cevennes, and flow north across the plateau. St. Etienne, on the coalfield between the Loire and the Rhone, is the chief

industrial town, and Clermont, on the edge of the fertile Allier valley overlooked by the Puy de Dome and other volcanic cones of Auvergne, the capital. Orléans is built where the Loire turns west, to flow through Touraine, 'the Garden of France'. Nantes, at the head of the estuary, and St. Nazaire, at the mouth, are the ports of the Loire.

The highlands of Britanny to the north resemble Cornwall and Devon in scenery, climate, and products. Brest, in the extreme west, is the Atlantic naval station.

487. The Garonne-Dordogne Basin. The Garonne rises in the Pyrenees, and flows past the ancient city of Toulouse, across the fertile plain of Aquitaine, receiving on its right bank the Tarn, and, a little below the estuary of the Gironde, the Dordogne from Auvergne. Bordeaux, at the head of the estuary, a great port, is the outlet for the wine districts of the lower Garonne. South of the Gironde the coast is bordered by sand dunes, whose progress inland has been checked in recent years by planting pinewoods.

488. The Saône-Rhone Basin. The Saône-Rhone valley is the great natural route from the Mediterranean to the north (see Fig. 181). Notice what an important break it makes between the highlands on either side. The Saône valley flows near the head-waters of the rivers of the Moselle, Meuse, and Seine basins, and by the valley of the Doubs it is connected through the Gate of Burgundy between the Vosges and the Jura with the Middle Rhine Plain. The steep slopes of the mountains on the right bank produce the wines of Burgundy. Dijon, on a tributary, is the centre of this district. Lyon, at the junction of the Saône and Rhone, is the centre of the silk manufacture. Below Lyon the united river, known as the Rhone, receives on its left bank two tributaries, the Isère and the Durance, from the lofty Alps of Dauphiné. The valley widens out to the rich plain of Languedoc, famous for wine, and on the east is the hill land of Provence, famous for olive oil. The Rhone forms a delta and the port of the valley, Marseille, is to the east of the delta. It is a magnificent city,

one of the greatest ports of the Mediterranean, and the centre of many industries. Cette, on the Golfe du Lion, exports the wines of Languedoc. Toulon, east of Marseille, is a naval station. The coast farther east, called the Riviera, is famous for its beauty and its mild winter climate. Nice is the most famous of its many health resorts. Monaco is a small independent principality[1].

CHAPTER XX

ALPINE, SOUTHERN AND EASTERN EUROPE

Spain and Portugal.

489. Physical Features. The greater part of the peninsula is occupied by a lofty plateau, called the Meseta, with only three large lowlands. The lofty wall of the Pyrenees (11,000 feet) cuts it off from France. The scenery is extremely grand, with forests of oak and beech on the lower slopes. The Pyrenees are continued along the Bay of Biscay by the Cantabrian Mountains, rising steeply on their northern side, and sloping more gently on the south to the high plain of Old Castile which lies 3,000 feet above the sea. The Ebro, flowing from these mountains south-east to the sea, crosses the lowland of Aragon. The Meseta slopes west to the Atlantic and is crossed by three long parallel rivers, which flow in gorges deeply sunk below the level of the plateau. They are useless for communication or navigation till they reach the lowlands near the sea. They are the Douro, draining Old Castile, the Tagus, separated from it by the Castilian Mountains, which with the Guadiana, drains New Castile. The southern margin of the Meseta, Sierra Morena, rises above the lowland plain of Andalusia, crossed by the Guadalquivir, with the Sierra Nevada towering above it on the south. The third lowland is in the south of Portugal, which consists of the lower basins of the

[1] Ruled by its own prince.

Douro, Tagus, and Guadiana. (Area about 34,500 sq. miles.) The remainder of the Iberian peninsula is occupied by Spain. (Area about 191,000 sq. miles.)

490. Climate and Products. The climate of northern Spain differs greatly from that of the south. The north

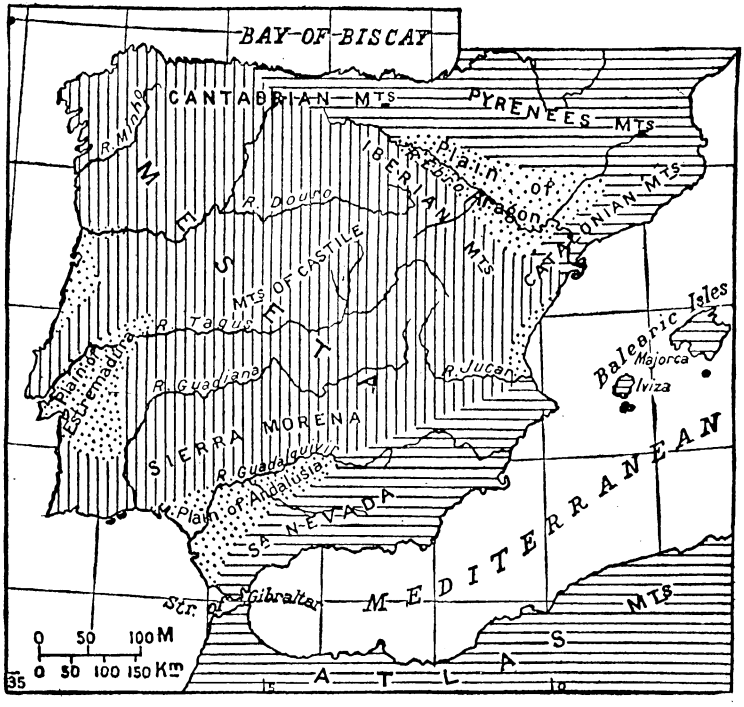


FIG. 182. Physical Divisions of Iberia.

receives rain all the year round, the south has the Mediterranean climate with winter rains. The lofty mountains to the north prevent the moist Atlantic winds from reaching the interior, which is one of the driest parts of Europe. The northern slopes of the northern mountains are forested, but the Meseta is bare. Sheep and goats are kept on its poor pastures and are driven to lower levels in autumn, as the winter on the high plateau is very severe. Agriculture is carried on in the

lowlands, but irrigation is generally necessary, except in the north. This is difficult on the plateau, as the deep gorges of the rivers make their waters inaccessible, and the smaller rivers run dry in summer. Careful irrigation has made of Murcia and Valencia, the Mediterranean provinces of the east coast, real gardens, in which are grown olives and oranges, rice and sugar cane, while in one district the date palm ripens. Andalusia is less fertile, but is famous for horses. In parts of southern Spain and Portugal there are forests of evergreen oaks, in which large herds of swine are fed.

491. The mineral wealth is great. The Cantabrian Mountains are rich in iron, which is exported to South Wales from Bilbao and Santander, and in coal. Copper and quicksilver are mined in the southern mountains, but mining, like agriculture, is less forward than it might be. The only manufacturing town of importance is Barcelona, on the north-east coast, which makes textiles, chiefly cotton. The vines produce wine, or their grapes are dried into raisins, which, with oranges and other Mediterranean fruits, are exported from Valencia and Malaga. The chief wine ports are Cadiz, exporting sherry, and Oporto, in Portugal, exporting port.

492. Towns. Lisbon, on the estuary of the Tagus, finely placed on hills above the river, is the capital of Portugal and an important port. The capital of Spain is Madrid, on a tributary of the Tagus, on a high plain, nearly 2,500 feet above the sea. The other towns of importance, in addition to the ports already mentioned, are Saragossa, in the Ebro valley, Seville, the capital of Andalusia, on the Guadalquivir, and Granada, on a tributary, at the foot of the Sierra Nevada, with the famous palace of the Moorish kings called the Alhambra.

493. Gibraltar, in the extreme south, a lofty rock nearly 1,400 feet high, connected with the mainland by a low isthmus, commands the strait of the same name where the Mediterranean is narrowed down to 9 miles, between the Spanish coast southwards and the African coast northwards. It is held by Britain, and is strongly fortified.

The Alpine and Karpathian Lands.

494. **Physical Divisions.** The Alps, in the west, begin at the Mediterranean, run north to the east of the lower Rhone valley, and then curve eastwards. They are separated from the Central Highlands of Europe by the upper Danube valley, and broaden to the east, where the Danube valley narrows between them and the southern mountains of Bohemia. From their broad eastern margin spring the Dinaric Alps at the southern end, extending along the Dalmatian coast of the Adriatic. From the northern end the great semicircle of the Karpathians curves round, enclosing Hungary, the broad plain of the middle Danube. The river breaks through, between the Alps and the Karpathians, in what is called the Karpathian Gate, where Pressburg is built.

495. **The Alps.** The Alps are politically in five countries—Italy, France, Switzerland, Austria, and a little strip in Germany. They are broadest in Austria; the highest summits, Mont Blanc and Monte Rosa, both over 15,000 feet, are in France and Italy respectively, but close to the Swiss frontier. The easiest approaches to them are in Switzerland, which contains the largest glaciers of the Alps, the upper courses of three out of the four great rivers which drain them, and much of the most magnificent scenery.

496. **Western Rivers of the Alps.** From the St. Gotthard group, which flow—(1) the Rhone, to the Golfe du Lion; (2) the Rhine and its tributaries the Reuss and the Aar, to the North Sea; and (3) the Ticino, one of the head-streams of the Po, to the Adriatic. Their valleys go like the spokes of a wheel from this centre, which commands the routes along all of them.

The Rhone rises in a great glacier and flows west in a deep valley, which separates the Bernese Alps on the north from the Pennine Alps on the south. It turns north near the foot of Mt. Blanc, and breaks through the mountains to the blue lake of Geneva through which it flows. On leaving the lake

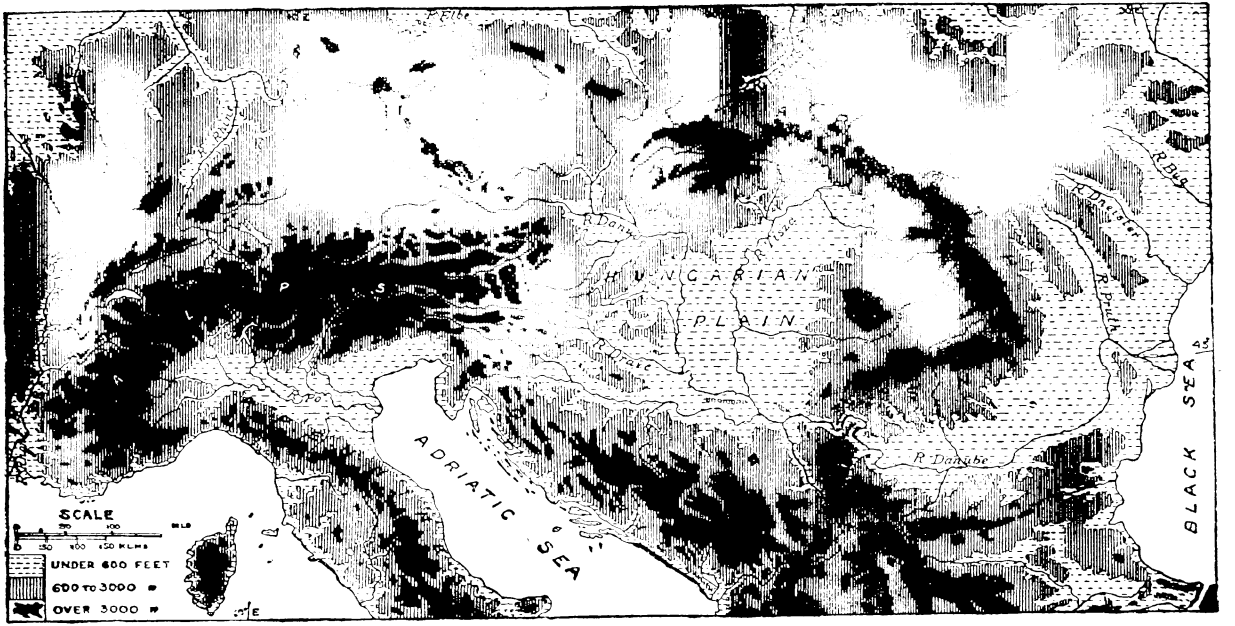


FIG. 183. Physical Features of Alpine and Karpathian Lands.

it flows round the southern end of the Swiss Jura, and west to the valley of the Saône, which it enters at Lyon. Its tributaries, the Isère and Durance, drain the outer margin of the Western Alps, between Mt. Blanc and the Mediterranean.

The Rhine flows in a direction exactly opposite to the infant Rhone, and after receiving a second head-stream turns north, cutting its way through the mountains to Lake Constance, through which it flows. On leaving the lake it turns west, receiving the Aar, which collects the waters of the valleys opening to the north, many of which are filled by long, narrow, mountain-girt lakes of great beauty, and of Lake Neuchâtel, at the base of the Swiss Jura. The Rhine flows west between the Black Forest and the Jura, and then turns north where Basel is built and enters Germany.

The Ticino flows south in a direction exactly opposite to that of the Reuss, through Lake Maggiore.

497. The Eastern Rivers of the Alps. The Danube, the fourth of the great Alpine rivers, rises in the Black Forest, and receives only one tributary from the Swiss portion of the Alps, the Inn. East of the Inn the valleys run from west to east and their waters are carried to the Danube by the Drave and Save, both of which, after leaving the mountains, have long courses across the middle Danube plain (Fig. 185). The main stream of the Danube, after receiving the Inn, flows in a magnificent gorge through the Austrian Gate, between the outliers of the Alps and of the Bohemian Forest. Its valley then widens to the plain on which Vienna is situated. After passing Vienna it flows past Poszony, where, at the Karpathian Gate, the highlands again approach the river for a short distance. It now flows first east and then due south across the Hungarian plain as a broad and noble stream. It turns east again below the confluence of the Drave, and breaks through the Karpathians again in a gorge of great beauty, the sides of which in places reach 2,000 ft. At the Iron Gate rapids, now made navigable, it enters the plain of Valakhia (Wallachia), which it crosses to the Black Sea, forming a large and swampy delta.

498. Alpine Scenery and Products. The general character of the Alps is the same throughout their whole extent. Along the line of greatest height many peaks rise above the snow-line, and are separated from each other by vast snow-fields and valleys filled by glaciers. Below the snow-line are the alps, or summer pastures, where flocks are fed in summer, yielding the famous Swiss milk, cheese, and skins for glove-making and other uses. Lower down the valley the forests begin, the uses of which have already been described. Fixed dwellings are few in the forest zone, but increase as the valleys descend to the level where agriculture can be carried on. In summer the Alps become 'the playground of Europe', and are crowded by thousands of visitors, for whom there are a great number of large hotels.

499. Passes. There are many passes across the Alps, of varying height and difficulty. The chief railway routes are: (1) the Mont Cenis route, which uses tributaries of the Isère and the Po; (2) the Simplon Route, using the upper Rhone and a tributary of the Ticino; (3) the St. Gotthard, using the Reuss and the Ticino (all with long tunnels through the core of the Alps); (4) the low Brenner route, using the valleys of the Inn and the Adige. (See Fig. 184.)

500. The Jura are part of the Alpine system, but much lower. They consist of broad ridges and hollows, with picturesque valleys, ravines, lakes, and pine-forests. Cattle-keeping is important, and many busy manufactures are carried on in the numerous small towns.

501. The Karpathians are highest in the east, where they rise to near 9,000 feet. The greater part of the range, however, does not rise above the tree-line, and is thickly forested.

Switzerland.

502. The federal republic of Switzerland (area about 16,000 sq. miles) occupies the plateau between Lakes Geneva and Constance, with the bordering Jura to the north, and the Alps to the south-east. The climate is in general that of Central

Europe, except in the mountains, where the temperature is lower. The Alpine area is engaged in pasturage, supplying condensed milk and cheese, agriculture, and in providing for tourists in summer. The industrial towns are on the plateau. There is no coal in Switzerland, and industries are carried on either by imported coal or by water-power, which is very

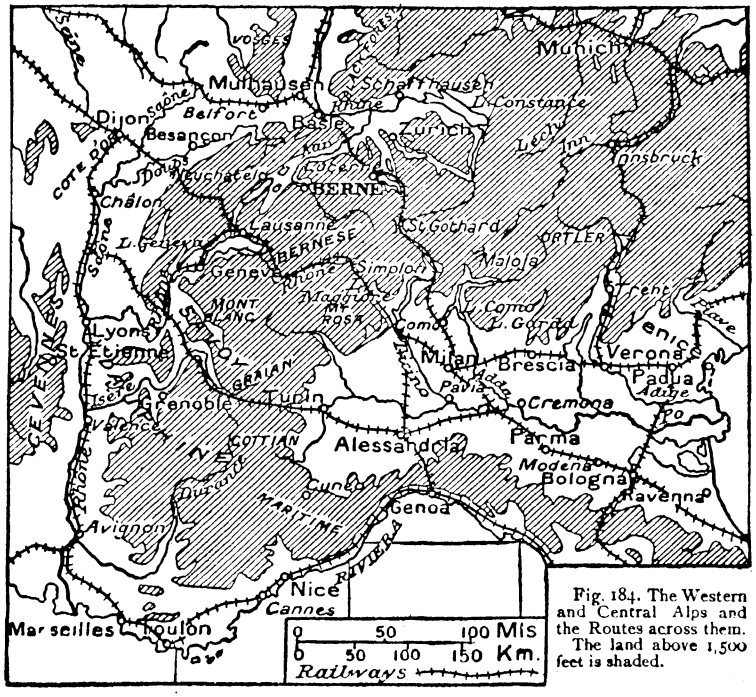


Fig. 184. The Western and Central Alps and the Routes across them. The land above 1,500 feet is shaded.

abundant. This is used in the various electrical industries, which are important all over Switzerland. Villages and hotels almost at the snow-line are lighted by electricity, and most of the mountain railways are driven by electricity. The chief industries are the silk manufacture, materials for which are obtained from Italy by the St. Gotthard route, carried on chiefly at Zürich and Basel; cotton, manufactured round

Zürich and St. Gall, and the manufacture of textile and electrical machinery with Zürich as the centre. There are numerous small industrial towns in the Jura, where watch-making is carried on. Geneva is the commercial centre of this manufacture. The capital is Bern, on the Aar, in the centre of the plateau.

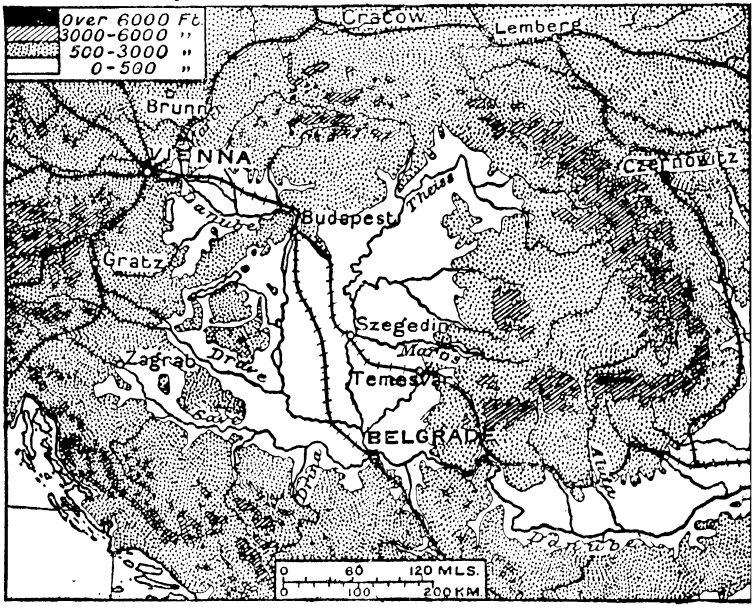


FIG. 185. The Hungarian Plain and its borders.

The Middle Danube and Neighbouring Lands.

503. The Danube Lands. The lands of the Danube basin above the Iron Gate, with the east coastal slope of the Adriatic, belonged mainly to Austria-Hungary until that Empire broke up in 1918. In Bohemia and Moravia, which belonged to Austria, and the territory of Slovakia to the east, which formed the north-west of Hungary, the Czechs and Slovaks live, and this land became the independent republic of Czecho-Slovakia (pronounced approximately Chekho-Slovakia), with Prag as its capital. To the south-west is Austria (German Austria), including Vienna, and extending from north of the Danube to the eastern frontier of Switzerland. It thus covers

the Eastern Alpine lands described below, except the southernmost. Here begins Yugo-Slavia or the land of the southern Slavs—the Slovenes, Croats, and Serbs,—of which Carniola, Croatia-Slavonia, Bosnia, Herzegovina, and Dalmatia, with part of the Banat east of the lower Tisza and north of the Danube, were included in the empire. Hungary, the land of the Magyars, falls almost wholly within the middle plain of the Danube, north of the Drave (which makes a dividing line between Magyars and Southern Slavs). The east of the plain belongs to Rumania, excepting a small part in the south which is Yugo-Slav.

504. The Eastern Alps and Dalmatia. The Eastern Alps have already been described (pp. 333-4). The climate of the southern valleys is more genial than that of the northern, and the vine for wine and the mulberry for silkworms are largely grown in the Adige valley. The climate of the narrow strip of lowland between the Dalmatian coast and the bare rugged Dinaric Alps is that of the Mediterranean, with hot summers and very heavy winter rains. The vine, olive, and mulberry are cultivated, and goats are largely kept on the high limestone pastures. The port is Triest. Here and elsewhere along the coast is a strong Italian population. The other important towns of the Alpine region are Innsbruck on the Inn, at the northern end of the Brenner route, the capital of Tirol, and Salzburg on a tributary of the Inn. Graz, on a tributary of the Drave, near a small coalfield, is the only industrial town of the Alpine provinces. All are surrounded by magnificent scenery.

505. Bohemia. Bohemia, enclosed between mountain walls, is chiefly drained north to the Elbe, on the most important tributary of which stands the capital Prag, a busy industrial town with engine works and other manufactures. Bohemia is rich in coal, and many manufactures are carried on. Paper is made in the forest districts. The manufacture of fine glass, cottons, woollens, beer, and sugar are all important, and support a dense population. Coal is also found in Moravia, which is a great woollen manufacturing region, and in Silesia.

506. Galicia. The lands north of the Karpathians have a more extreme climate than that of Central Europe. The highlands are wooded, the lowlands are cultivated with wheat and other cereals and potatoes. Galicia, part of Poland, is rich in petroleum and in salt. Salt is mined near Cracow, the old capital of Poland, on the Vistula. Poles and Ruthenians or Little Russians are among the inhabitants of Galicia.

507. Vienna, the capital of Austria, is picturesquely situated on the Danube, where the eastern spurs of the Alps reach the river. It commands the routes by the upper Danube to Central Europe, as well as those of its lower basin. Routes from all parts of Europe pass through Vienna. The Danube is navigable both up and down stream.

508. Hungary. Hungary lies in the western part of the middle Danube plain. The climate resembles that of Eastern rather than that of Central Europe. Hungary is very fertile, and is one of the great wheat lands of the world. The mountains are rich in minerals, and the forests supply timber for export. The lower lands near the Danube make rich pasture lands. Hungarian horses are fed on the grasslands. The capital is Budapest, on the broad Danube. Flour-milling is the most important industry.

509. Kroatia, in Yugo-Slavia, is the south-western part of the plain, of which Agram near the Save is the capital. The port of Fiume, on the Adriatic, exports flour, timber, wine, and the other produce of the country.

510. The part of Yugo-Slavia which was formerly Bosnia and Herzegovina consists of a mountainous limestone country, rising to over 7,000 feet. The eastern mountains are densely forested. The country is very rugged, the rivers flowing in wild gorges. Coal and salt are abundant. Dried plums and timber are exported.

Italy.

511. Italy (area about 110,500 sq. miles) is long and narrow (Fig. 186), and everywhere washed by the sea, except in the north, where it is cut off from Central Europe by the Alps. The only lowlands on the east are (i) the plain of the Po, or

Lombardy, which slopes from the west, opening in the east to the shallow head of the Adriatic Sea, and (ii) Apulia in the south. The Apennines run through the middle of the peninsula from north to south. To the west of the Apennines lie the highlands of Tuscany, drained to the west by the Arno, the plains round Rome drained by the Tiber, and the volcanic plains round Naples.



FIG. 186. Mountain Area, Rivers, and Towns of Italy.

512. The Northern Plain. The climate of the lower slopes of the Alps is warmer than that of the northern Swiss valleys. The lower slopes have chestnut woods. The vine is largely grown, and mulberry-trees feed the silkworm, the raw silk being manufactured in the plain below. The winters are severe. Numerous streams from the Alps are used to irrigate excellent pasture and agricultural land, on which maize and even rice are cultivated. The chief towns are Turin, in the west, at the end of the Mont Cenis route across the Alps; Milan, at the end of the St. Gotthard route, a busy industrial town, and the centre of the silk manufacture of Northern Italy; Verona, at the end of the Brenner route, and Venice, a city of lagoons and islands, with canals for streets. Bologna in the south of the plain, at the foot of the Apennines, commands the chief routes across the mountains into Tuscany.

513. Western Italy. The Ligurian coast, or Italian Riviera, is extremely beautiful, with richly wooded rocky shores overhanging the blue waters of the Mediterranean. The largest town is Genoa, the chief port of Italy, on a wide bay backed by hills. The direct railway routes across the Alps make it a great centre for trade between northern and southern Europe.

The chief town of the Tuscan highlands is Florence, famous for its art treasures, situated on the Arno a little below where it leaves the Apennines. Tuscany is the land of the vine and olive, both of which are largely grown all over the Italian peninsula, though the olive does not ripen in Lombardy, where the winters are too cold. The trees of Tuscany and southern Italy are evergreen, the tall cypress and the bushy stone pine being the commonest.

South of Tuscany is the highland of Umbria drained by the upper Tiber, with many famous towns, built for the most part on the crests of the hills, the lower slopes of which are terraced for vines and olives.

514. Rome, the capital of Italy, lies in the plain of the lower Tiber, a few miles from the sea. It is situated on low

hills, with beautiful views over the surrounding plain, or Campagna, to the wooded hills which enclose it. It contains the largest church in Europe, the cathedral of St. Peter, and many smaller ones. These, like the numerous palaces, and particularly the Vatican, the residence of the Pope, contain priceless art treasures. Many ruins of the ancient city remain in the midst of modern streets.

515. **Southern Italy.** Naples stands on a fertile plain with a fine bay. Above it towers the smoking cone of Vesuvius, an active volcano, whose eruptions do frequent damage. The lowland of Apulia grows a particularly hard wheat, which is made into a food called 'macaroni', chiefly at Naples. Brindisi and Taranto are ports for steamers for the East and Australia. Here they take up or set down mails which are sent by the quicker route across Europe to and from London, while the boats go round Spain and France to and from the English Channel.

Calabria, the long western projection of Italy, is a thinly peopled mountain region, separated by the Strait of Messina from the island of Sicily.

516. **Italian Islands.** Sicily has an even warmer climate than the rest of Italy. Wheat and the vine are grown, and fruits, of which the orange and lemon are the most important. On irrigated lands many crops can be reaped in a year. The volcano of Etna rises to the height of 10,000 feet in the east, above the town of Catania. The capital is Palermo on the northern coast.

To the north of Sicily are the volcanic Lipari Islands. Off the Tuscan coast is the small island of Elba. Farther west lie the large mountainous islands of Corsica and Sardinia, the former belonging to France. Iron mining is important in Sardinia and Elba, and sulphur in Sicily. The other minerals are unimportant.

517. **Malta,** an island south of Sicily, cultivates vegetables, which supply the early markets of Europe. It is a British naval station guarding the route to India.

The Balkan Peninsula and Rumania.

518. **Rumania,** as we have seen, possesses the eastern part of the middle Danube plain. It also extends over the lower Danube plain, which lies between the Danube and the lofty



FIG. 187. Physical Features, Routes, and Towns of Balkan Peninsula.

Karpathians, which descend to it in steep forested slopes, cut by the valleys of the Danube tributaries. The plain is a great wheat land, the grain being carried down the Danube, and shipped from Galatz, at the head of the swampy delta. Forest products are important in the Karpathian area. Cattle are kept in the hill pastures. The sunny slopes of the valleys

are terraced for vines. The capital of Rumania is Bukarest, in the centre of the plain. Rumania has important oil-fields about Ploeshti.

519. The Balkan peninsula lies south of the Danube. It is a mountain land, occupied in the west by the Dinaric and Albanian Mountains. This western mountain region is occupied by Yugo-Slavia as described on p. 338. The valleys of the Morava and the Vardar connect the Aegean with Central Europe.

To the east of this furrow are five belts—(i) the plains of Bulgaria, (ii) the Balkan mountains, (iii) the Maritsa valley, (iv) the Rhodope Mountains, and (v) the Aegean coast, all running from west to east.

To the south the peninsula narrows greatly in Greece, but it is still mountainous. The extreme south is a peninsula of very irregular shape called the Morea, joined by the narrow isthmus of Corinth, now crossed by a ship canal. The western coast of Albania and Greece is fringed by the Ionian Islands. The Aegean Sea, to the east of Greece, is thickly dotted with islands, forming an archipelago. The Balkan peninsula, in the east, brings Europe within a mile of Asia. Between the two is the Sea of Marmora, which narrows in the south to the Dardanelles, leading to the Aegean gulf of the Mediterranean, and in the north to the equally narrow Bosporus, leading to the Black Sea. Here is built Constantinople, holding the passage from Europe to Asia.

520. Climate and Products. The climate of the Balkan peninsula resembles that of eastern Europe in the north and east, with cold winters and hot summers. The mountains of the west coast are extremely wet, but the rainfall diminishes to the east. On the western coast and in the narrower south the Mediterranean climate with cool winters prevails. In the north and centre the mountains are covered with forests of oak and beech. In the west and south these are replaced by the evergreen trees of the Mediterranean, and olives, oranges, lemons, and figs come to perfection. Maize is the chief cereal

in the Morava basin, and wheat in Bulgaria. The vine, tobacco, and mulberry for silkworms are widely grown. Orchards of plum trees cover large areas in the north. Roses are grown for making perfumes, especially in the Maritsa valley. In Greece figs are grown, and small grapes which are dried into currants. Pigs are kept in the beech forests, sheep, cattle, and goats everywhere on the higher pastures. The mineral wealth, though considerable, is little used, and manufactures do not exist, except in the form of peasant industries.

521. Montenegro and Albania. Montenegro is a barren lofty limestone region, in which cattle-rearing is the chief occupation. The capital is Cettinye, on a plain not far from the sea but high above it. Albania is a similar land farther south, of which Scutari, on a plain bordering the Adriatic, is the chief town.

522. Serbia, part of Yugo-Slavia, is a highland country between the Dinaric Alps and the Balkans, sloping to the lowland of the Morava and upper Vardar valley. Swine are fed in immense numbers in the oak and beech forests of the highlands. The valleys are cultivated with cereals and fruits, especially plums. The capital of Yugo-Slavia is Belgrad, on hills opposite the confluence of the Save and the Danube. Üsküb or Skoplye is the chief town in the upper Vardar valley.

523. Bulgaria in the north slopes from the Balkans to the Danube, of which it forms the high right bank. Unlike the low Rumanian bank, it has good approaches to the river, and many river ports such as Rustchuk. Varna is the Black Sea port. Wheat is grown in the north. Cattle, sheep, and goats are kept in the higher south. The capital is Sofia, on the Isker plain, south of the Balkans, a city of modern type. The Maritsa lowland belongs mainly to Bulgaria. Roses, cereals (including rice), plums, and vines are grown. Raw silk is an important product. The chief towns are Philippopolis and Adrianople on the Maritsa.

524. Turkey in Europe consists of a narrow strip of land stretching from the Black Sea to Marmora. The capital is Constantinople, magnificently situated on the Golden Horn. It is a triple city, consisting of Stambul and Pera on the European, and Scutari on the Asiatic side of the strait.

525. Greece is a mountain-land of islands and peninsulas, with deeply-cut valleys, and isolated plains. The summers are hot and dry, and vegetation becomes parched and withered. The west is wetter and more fertile than the east, producing large quantities of currants. The vine, fig, and olive are

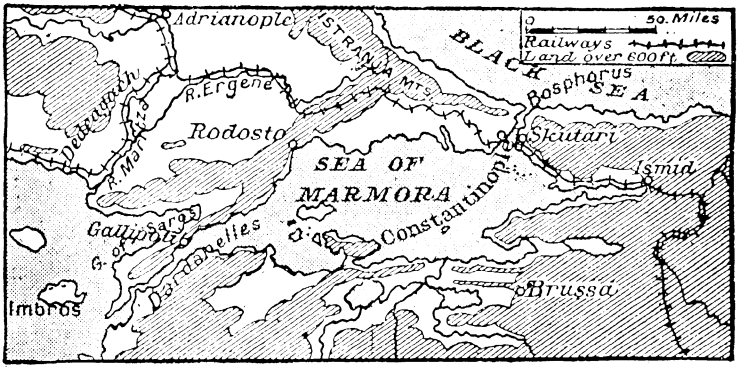


FIG. 188. The situation of Constantinople.

grown. The capital is Athens, in a situation like that of Edinburgh. It is built round the base of a lofty rock, the summit of which is still crowned by the ruins of ancient temples, commanding the route between the lofty mountains behind and the sea in front. The climate and products of the Ionian and Aegean islands are similar to those of the mainland. The mountainous island of Crete is the most important of Greek islands.

Greece extends into Macedonia, north of the Aegean, where Salonica, built to the east of the delta, is the chief city and a great port.

526. The Routes across the Balkans are controlled by the

physical features. The Orient Express route from Paris, Vienna and Budapest enters Serbia at Belgrád and goes up the Morava valley. It divides at Nish. One branch goes up the Morava and down the Vardar to Salonica and Athens. The other runs upwards over the hills to Sofia, and again over hills to the upper Maritsa valley, which it follows to Adrianople and then goes on to Constantinople. The railway is continued on the other side of the Bosporus across Asia Minor to Mesopotamia and one day it may be carried as far as India.

The European Russian Lands and Poland.

527. Russia occupies the eastern plain of Europe. Almost none of the surface is over 1,000 feet high, except in the Urals and Caucasus. Trace the line dividing the waters flowing to the Arctic Ocean and the Baltic Sea from those flowing to the Black and Caspian Seas. It runs from the Karpathians to the middle of the Urals. The rivers draining the shorter northern slope flow across the pine-wooded lowlands of Northern Russia, which pass in the extreme north into tundra.

527 a. The Division of European Russia. Since the Russian empire collapsed in 1917 some of its component peoples have set up, or tried to set up, new States. In Finland there was always much opposition to Russian rule. In the Baltic lands, south of the Gulf of Finland, there are the Esthonians in Esthonia and northern Livonia, the Letts occupying most of Livonia and Courland, and the Lithuanians of Kovno, extending westward to the port of Memel. South of these, and east of the Poles, are the White Russians, most backward of the inhabitants of this part of Russia, in an inhospitable territory. Southward again, extending from eastern Galicia and the Bukovina (where they are called Ruthenians) through Volhynia, Podolia, and Kiev into New Russia and so to the Black Sea and Sea of Azov, are the Little Russians or Ukrainians, originally the inhabitants of the Ukraine or 'border' between the Russians and the Poles, Turks, and Tatars. The population of the Crimea is predominantly Tatar. Throughout most of the rest of European Russia the principal people is that called Great Russian.

528. Northern Russia. The Northern Dvina flows to the White Sea, with the port of Archangel on a low flat, on the right bank of the estuary. This port, icebound in winter, is the oldest Russian port.

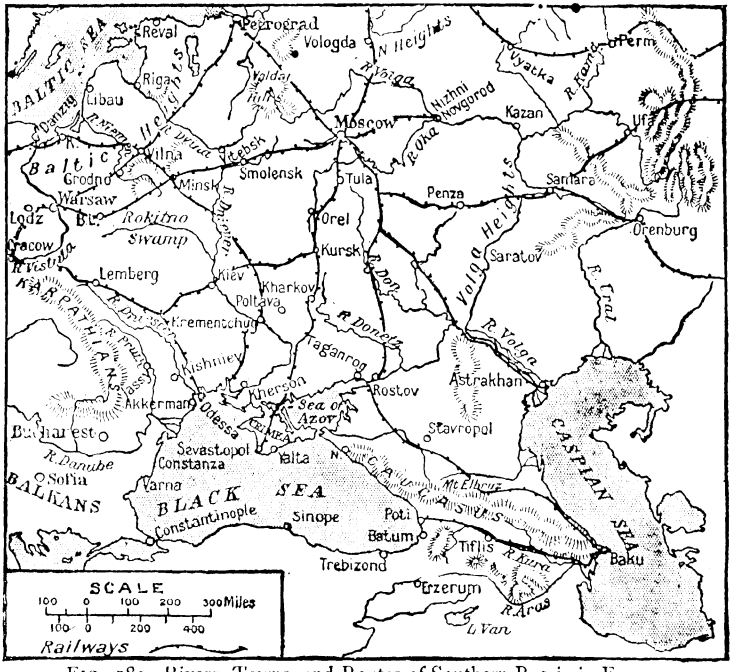


FIG. 189. Rivers, Towns, and Routes of Southern Russia in Europe.

The inhabitants of the lower basin of the Dvina, and of the Pechora, to the east, are mainly engaged in preparing train oil from the Arctic fisheries, pitch, tar, and deals from the forests, and in trading in tallow, skins and furs. The peninsula of Russian Lapland, to the north of the White Sea, is thinly populated by fishermen, hunters, and reindeer breeders.

529. Finland, or Fenland, has one-third of its surface covered with water. The rest of the country is forested. The capital is Helsingfors, on the Gulf of Finland, the handsome capital of a highly intelligent and progressive country.

530. Western Russia. Lakes Ladoga and Onega, the largest in the Baltic Lake-district, are in Russia, and are

drained by the Neva, at the mouth of which stands the city of Petrograd, protected by the island fortress of Kronstadt. Though built on piles in the Neva swamps, Petrograd is a handsome city, with broad quays, fine public buildings and private houses, and the immense cathedral of St. Isaac, with burnished domes and cupolas, brightly coloured as in all Russian churches.

The Western Dvina flows across the Baltic Heights to the Gulf of Riga through a land of lakes and pine forests, in the clearings of which rye, flax, and hemp are grown, while the forests supply timber, masts, pitch, and tar for export. The port of Riga, at the mouth of the Dvina, is a picturesque old town, the many spires of which are visible miles out at sea.

531. **Poland** consists, in great part, of the basin of the Vistula. Timber, flax, rye, and sugar-beet are grown in the forest clearings. The Vistula coalfield supplies the cotton town of Lodz, in a busy industrial region, and Warsaw, the capital, on the Vistula, placed on a fertile plain, where routes from all parts meet. The port of the Vistula is Danzig on the Baltic.

532. **Central Russia.** The northern part of the basins of the rivers draining the longer southern slope of the great Russian plain is still in the woodland. Towns are few, and chiefly at the meeting-point of routes. (See Fig. 189.) The chief river is the Volga, the longest river in Europe. Its basin forms more than half of Central Russia. It rises in the low Valdai Hills, about 600 feet above the sea, and its course is everywhere very slow. It flows south-east across the woodland. Its tributary, the Oka, flows first north, and then east, draining the coalfield round Tula, the Sheffield of Russia. On a tributary is Moscow, the old capital, in the centre of Russia, on a height in the forest clearing, where many routes meet. On this height is built the fortress of the Kremlin, a collection of barracks, palaces, and churches, with their glittering, many-coloured domes, forming one of the most picturesque groups of buildings in the world. Nizhni Novgorod, at the confluence of the Oka and Volga, is built partly on the

Kremlin Hill, and partly on the plain below, on which a great fair is annually held.

533. **Eastern Russia.** The Volga now flows east and near it is Kazan, rising above the plain, which is under water when the river is full. A little lower is the confluence of the Kama, flowing from the base of the Urals, which are rich in minerals, past Perm, in the centre of a great mining region. Below the confluence, the river flows south and flows between a high right bank (1,000 feet in places) and a low left bank. Samara is a busy port, on a sharp bend of the river. It is where the railway for Siberia crosses the river. Numerous granaries and windmills show that the river has entered one of the great wheat districts of Russia. Saratov, with numerous bright domes and many windmills, is finely situated on the high right bank of the river, which is here three miles wide. Immense steppes extend on both sides of the river in its lower course, stretching on the east far across Asia. The Volga enters the Caspian by a great delta. Astrakhan, at the mouth, is built on one of the numerous islands formed by its mouths. It is the chief port of the Caspian which has no outlet to the ocean, and a centre of the important sturgeon fisheries of the Lower Volga.

534. **Southern Russia.** The Don, to the west of the Volga, flows across steppe lands to the Sea of Azov, opening by the Strait of Kerch into the Black Sea, whose waters wash the shores of the Crimean peninsula. To the east of the river is the Don and Donets coalfield, the busiest town of which is Kharkov, with brewing, engineering and other industries. The longer Dnieper, west of the Don, runs in the forest area, and has a very similar course. It flows past the ancient city of Kiev, built on wooded hills on the right bank. Kherson, at the mouth, is an important port. Odessa, the principal city of Southern Russia, and the chief centre of the Black Sea trade, is built on a cliff rising above the stormy Black Sea. It trades in all the produce of the steppes.

535. **Climate and Products.** The climate of Russia is one of extremes, with very severe winters, especially in the

north and east. Little rain falls, and that chiefly in summer. The differences of climate in this vast plain are expressed by well-marked zones. In the north is the bleak tundra, passing to the south into stunted woodlands. These become fine forests of evergreens farther south, varied by oak and beech towards the centre. About one-third of Russia is forest. On the southern edge of the forest the trees appear in clumps, forming an open wooded country. The soil consists of rich black earth, forming some of the finest agricultural land in the world. Farther south are the steppes, or treeless grasslands, in the better parts of which are grown immense quantities of wheat for export, and of rye for home consumption. To the south the steppes become drier and sandier, with scanty vegetation, where stock can be kept only in the better parts. Along the Caspian and Aral Seas they form sandy wastes, once covered by the waters of these seas. In the Crimea, which is sheltered by hills in the north from the cold winds of the steppe, the climate and products are those of the Mediterranean.

536. Industries. Agriculture, forest industries, and the keeping of animals in the steppes are more important than manufactures. Many factory hands work only in winter, returning to the country in summer. Moscow is the largest manufacturing town, with cotton as its staple industry. Cotton is also manufactured at Lodz. Rifles, swords, and other weapons, and steel and iron goods of every kind are manufactured on the Tula coalfield. Petrograd, like most capitals, has many manufactures. A number of peasant industries are carried on throughout Russia, the best known of which is coloured embroidery.

PART VI

AFRICA, AUSTRALASIA, AND AMERICA

CHAPTER XXI

THE GENERAL GEOGRAPHY OF AFRICA

537. Position. The mainland of Africa forms a vast peninsula between 35° N. and 35° S. The continent is divided by the equator and crossed by both tropics. By far the greater part of the land lies north of the equator. The area is 11,500,000 sq. miles, about six and a half times that of India.

538. Seas, Gulfs, Islands. Africa is united to Eurasia by the narrow isthmus of Suez. On the north it is bounded by the Mediterranean, on the west and south by the Atlantic, on the east by the Indian Ocean and the narrow rift of the Red Sea, separating it from Asia.

Notice the extreme compactness of Africa, and the absence of peninsulas and islands, except Madagascar, off the east coast, separated by the Mozambique Channel. In the north there is a single great gulf, the Gulf of Tripoli. On the west, about 4° N., the continent narrows to half its width, forming the Gulf of Guinea. Africa is the most compact of the three continents which form the Old World (see Fig. 192).

539. Physical Features. The surface of Africa is also much more uniform than that of Eurasia. It is a series of tablelands, lower in the north and west, higher in the south and east. Except in the north-west, where the Atlas Mountains rise to the height of over 6,000 feet, there is little land over 3,000 feet in north and west. In the south and east, except for the narrow coastal plain and along the courses of the rivers, there is little land lower than 3,000 feet. The highlands everywhere

come close to the sea, and leave only a narrow coastal plain at the base. The rivers, therefore, all form falls or rapids, where they descend from the plateau to the plain below (Fig. 190).

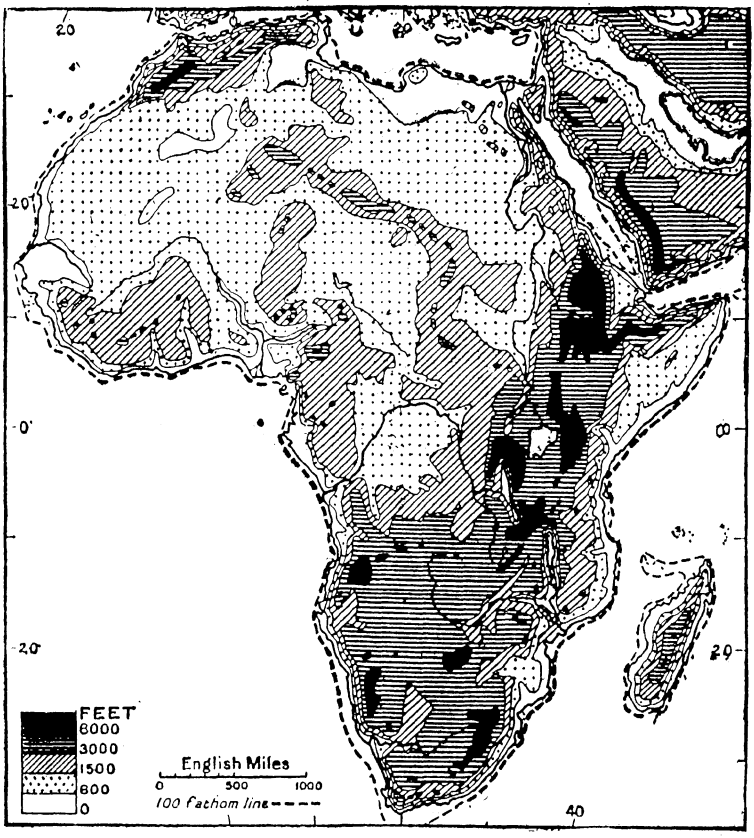


FIG. 190. Relief Map of Africa.

540. Natural Regions. Africa consists of several well-marked regions:—(1) The high north-west margin, forming the Atlas Mountains. (2) The Sahara, or rainless desert, mostly below 1,500 feet in height but with isolated masses of

higher ground rising to over 3,000 feet. (3) The Niger basin and upper Guinea. (4) The Nile basin. (5) The Congo basin. (6) The Abyssinian Highlands in the north-east. (7) The Plateau of the Great Lakes. (8) The Southern Plateau, drained by the Zambezi and other rivers.

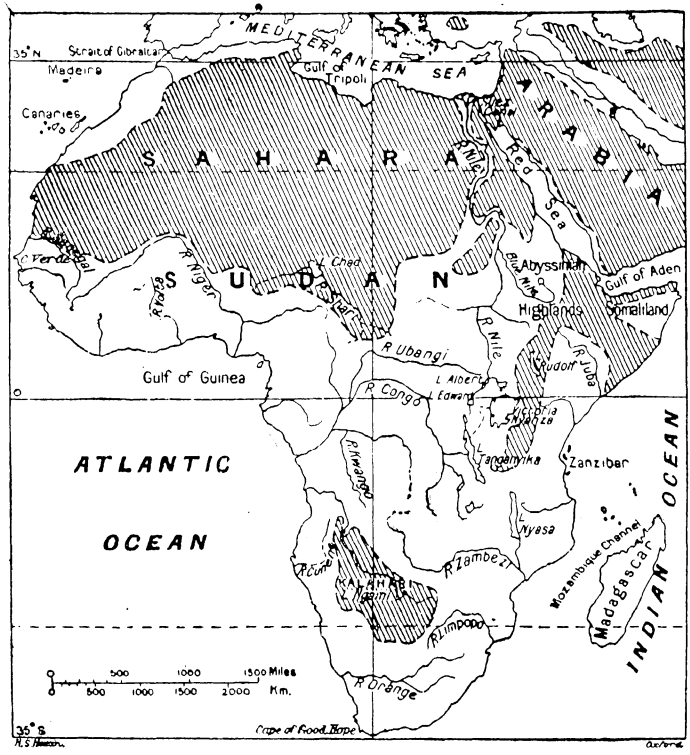


FIG. 191. Rivers, Lakes, and Inland Drainage Areas of Africa. The areas which are not drained to the sea are shaded.

541. **Climate**:—*Temperature* (Figs. 193, 194, 195). Three-quarters of the continent lies between the tropics, and so the temperature is everywhere high. Only in the extreme north and south and in the highest parts is the average temperature under 60° in the coldest month. It is hotter at the equator in October (Fig. 193) than in January and July. This is because

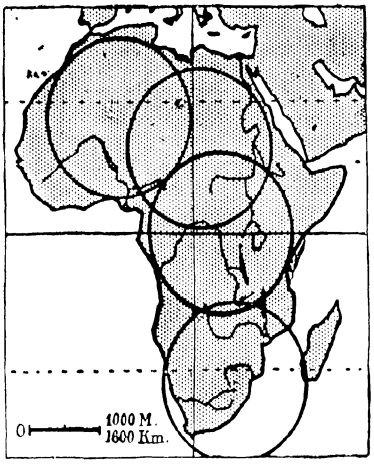


FIG. 192. Distances from the Sea in Africa.

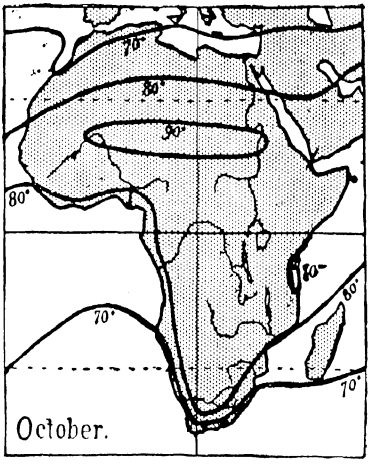


FIG. 193. Mean Temperature in October reduced to sea-level.

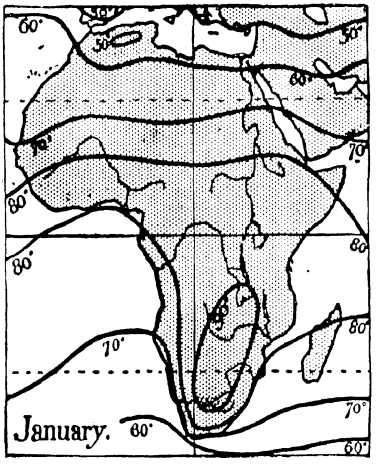


FIG. 194. Mean Temperature in January reduced to sea-level.

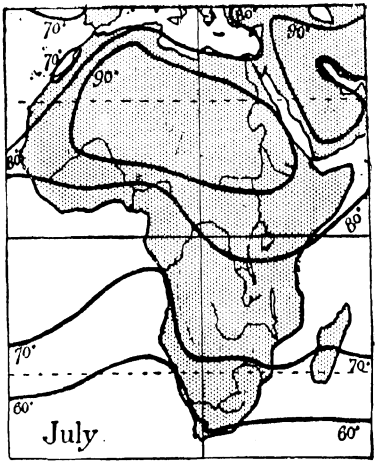


FIG. 195. Mean Temperature in July reduced to sea-level.

the Sun is overhead at noon at the equinox, but it is overhead at the tropic of Cancer in July and at the tropic of Capricorn in January, and Figs. 194, 195, show that in July it is hottest in the north and in January it is hottest in the south. The rainfall maps show a belt of heavy rainfall at the equator at all seasons. Consequently there is a belt of cloud which screens the surface of the Earth from the direct rays of the Sun, and it is never so hot at the equator as it is farther north or farther south.

The length of day and night is always equal at the equator, but the day is $10\frac{1}{2}$ hours in winter and $13\frac{1}{2}$ hours in summer at the tropic. The seasonal ranges of temperature are consequently much greater at the tropic than at the equator. They are greater in the interior than near the coast. Round the tropics the rays of the Sun beat down upon the soil which has no covering of vegetation to protect it. In the desert the difference of temperature between day and night and between winter and summer is very marked. The extreme north and south of Africa have winter and summer temperatures corresponding to those of the Mediterranean at the same elevation.

542. Rainfall. The equator bisects the continent, so that there is great similarity in the zones of climate and vegetation north and south of the equator. On either side of the equatorial belt, where heavy rains fall at all seasons, is a belt in which fairly abundant rains fall in summer (see Fig. 197). Do not forget that north of the equator summer occurs during the southern winter. North and south of these belts of summer rains are the rainless deserts, covering the whole of the continent in the north, where it is broadest, but much narrower in the south, where it tapers. On the north-western margin of the northern, or Saharan desert, the Atlas region has winter rains, that is, the Mediterranean climate, already explained. A similar climate is found in the extreme south-west corner of South Africa, for similar reasons. The south-east of South Africa and Madagascar are included in the region of summer rains (Fig. 197). The mean annual rainfall is shown in Fig. 196

The cause of these differences in the season at which rain falls depends largely on the heating and cooling of the air over sea and land. Where the sun is highest, and the air most heated, a belt of air is always rising, and passing into higher and colder layers of the atmosphere, where it parts with some of its moisture as rain. This belt moves north and south of the equator with the Sun, but the equator is always within it. This explains why there is rain at the equator at all seasons of the year, and why the regions to the north and south have rain in summer when the sun is highest.

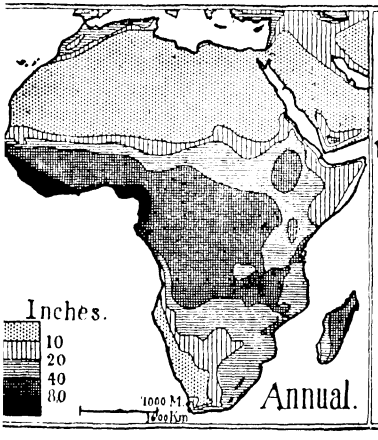


FIG. 196. Mean Annual Rainfall of Africa.

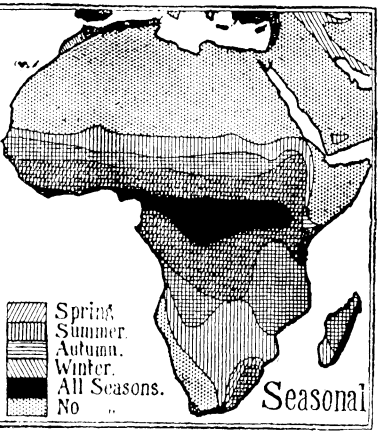


FIG. 197. Rainy Seasons in Africa.

543. **Trade Winds.** This rising of air in the equatorial belt explains the permanent winds known as trade winds. They are caused by the indraught of air due to the rising of heated air in the equatorial belt. They would blow from north to south but for the rotation of the Earth, which deflects them into north-east winds in the northern, and south-east winds in the southern hemisphere. As they are passing to warmer layers of atmosphere, where they can hold more moisture, they do not bring rain except when they encounter a barrier, whether of high coast or of mountains, by which

they are forced upwards, chilled, condensed, and obliged to part with their moisture as rain. This happens most readily in summer, when the air over the land is also rising. The summer rains of the south-east of South Africa, and of Madagascar are due to this cause.

The trade winds which blow over North Africa have not passed over any considerable area of sea in their course from the north-east. They bring little moisture, so that North Africa is almost rainless except in the Atlas region, which is climatically part of the Mediterranean. In South Africa they have come over sea, but they part with their moisture on the highlands of the east, and blow over the west as dry winds.

Examine the following figures and show how they bear out these statements:—

Algiers	78·1° July, 54·0° Jan.
Biskra	90·0° July, 52·0° Jan.
Cape Verde Islands	77·9° July, 72·0° Jan.
Zanzibar	82·7° Mar., 77·0° July and Aug.
Capetown	69·9° Jan., 55·1° July.
Durban	74·8° Jan., 63·1° July.
Johannesburg (5,700 feet)	65° Jan., 50° July.

544. Vegetation. Well-marked vegetation zones correspond to these climatic zones. In the extreme north, where the Mediterranean climate prevails, the Mediterranean cereals, fruits, and evergreen woods are found (see Fig. 198). Towards the edge of the desert these give place to poor grassland, with scrubby mimosas, and other gum-yielding trees. In the desert itself plants grow in scattered tufts, and consist of thorny or fleshy plants, adapted in different ways for resisting drought. To the south the desert passes into poor scrub land, south of which lie the savanas, with summer rains. These savanas are often called park lands, a name which well describes them. The trees grow in clumps and glades, giving a beautiful and park-like appearance. They are often massive, like the baobab. New palms make their appearance, as well

as tropical fruits, of which the banana is one of the most valuable. Still farther south is the hot, moist, equatorial forest with innumerable species of trees, creepers, parasites,

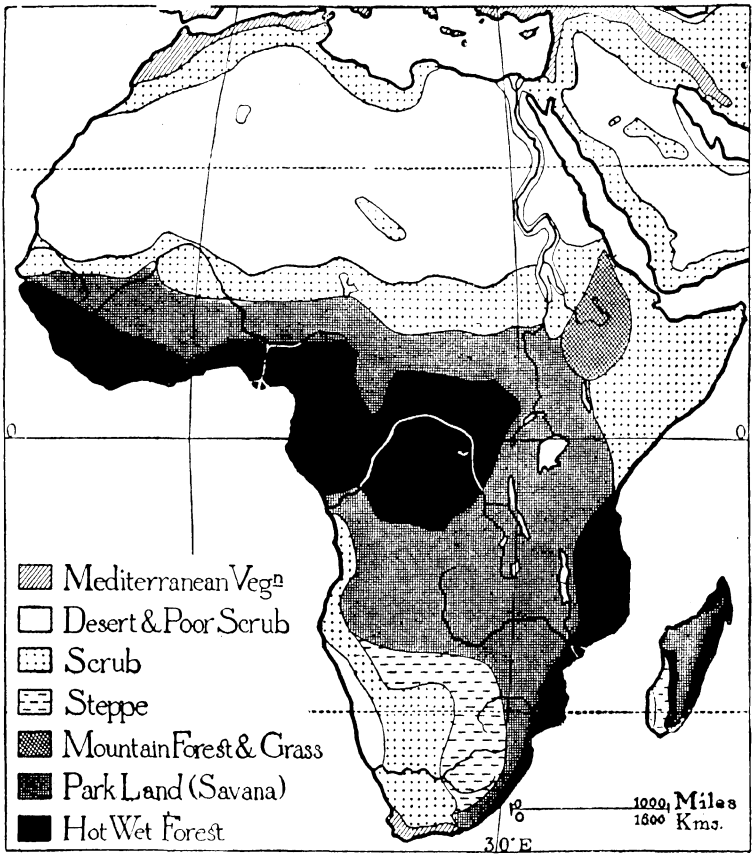


FIG. 198. Africa: Vegetation.

fungi, and every form of vegetable life. Many descriptions have been written of the tropical forest, but every traveller ends by saying that it is impossible to give any idea of it. It contains many plants useful to man, such as rubber, but it is

so impenetrable except along its rivers that little more than its fringe is known (see Fig. 199).

South of the equator these zones are repeated in inverted order. The dense forest is succeeded by savanas, and these again by poor scrub lands, passing into desert, with scrub

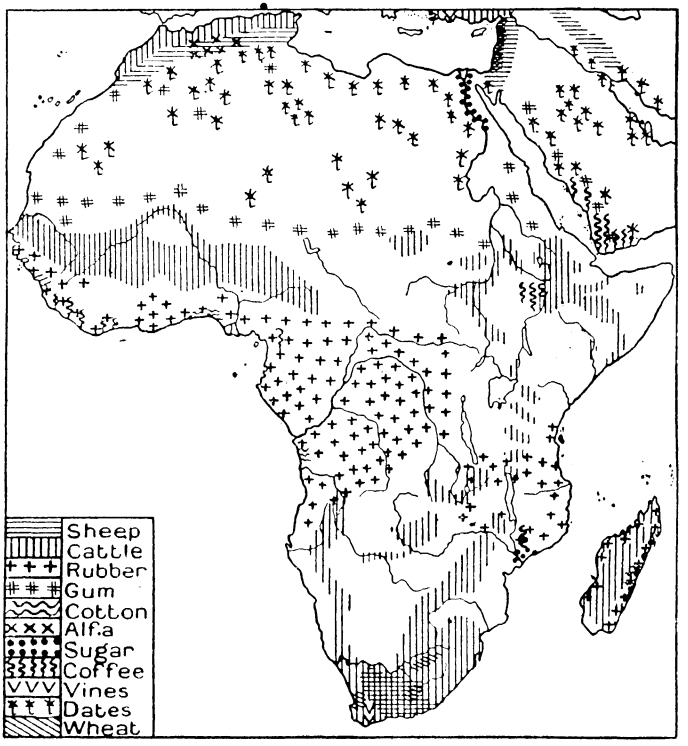


FIG. 199. Map showing the Distribution of some of the more important Plant and Animal Products of Africa.

lands and temperate woods beyond their southern margin. In temperate South Africa forests are rare. The fruits and cereals of Central Europe and the Mediterranean can be grown (see Fig. 199).

545. Animals. Different animals are found in these different zones. North of the Sahara the animals are those of

Southern Europe. On the margin of the deserts goats and camels are important, the camel being the only animal able to cross the desert. In the savana lands appear the antelope, zebra, giraffe, elephant, rhinoceros, lion, panther, hyena, leopard, and others. The hippopotamus makes his home in the swamps of the river banks. The river waters are infested by crocodiles. Of birds the wingless ostrich is the most notable. Insects are numerous, sometimes gigantic, and often dangerous. The termite, or white ant, destroys everything but stone, metals, and the hardest of woods. The tsetse and other flies convey the germs of diseases to men, cattle, and horses. In the equatorial forests animals are crowded out by trees. The commonest are those which make their home in trees, including monkeys of all sizes. In the extreme south the animals of Europe have been introduced, including the merino sheep from Spain and the Angora goat from Asia Minor. Ostrich farms are numerous in the south and east.

546. Peoples of Africa. In the north the Arabs and Berbers, belonging to the white race, form the bulk of the population, with Europeans in the settled parts near the Mediterranean coast. Peoples of white stocks are found as far south as Abyssinia, and even in the Great Lake Plateau. In the Sudan they are much mixed with negro blood. The bulk of the population of the Sudan and West Africa is negro. Of these the Hausas are the most civilized, and their language is the great commercial tongue of West Africa. South of the equator the Bantu negroes are in the majority. Their languages are all related to each other, and one of them, Swahili, is the commercial language of East Africa. In the forests are remnants of a dwarf race, the Pygmies. In the south-west the Hottentots and Bushmen are gradually dying out, but the Kaffirs, of Bantu stock, are increasing, and form the large majority of the population of South Africa. Of Europeans in South Africa the majority are of Dutch origin. The others are English, French, and German. Of the African races the Arabs, who profess Mohammedanism, and the tribes in contact

with them, are the most civilized. The inhabitants of the savanas are superior to the forest tribes, who have many degraded customs and superstitions. The peoples of Africa are settled or wandering, according to the nature of their occupation. The Arabs of the desert, for instance, are wandering herdsmen, while in agricultural regions the same race builds and inhabits walled cities.

The population is supposed to be about 135,000,000. It is nowhere very dense, except in Egypt. The Sudan, the Barbary Coast, and the fertile parts of South Africa come next in density.

CHAPTER XXII

THE REGIONAL GEOGRAPHY OF AFRICA

Northern Africa.

547. The Atlas, or Barbary Region. This is a high mountain region, consisting of a fertile, well-watered strip of coastal plain, rising in the south to the Atlas Mountains. In the west the Atlas consists of two ranges, the Great Atlas and the Anti-Atlas, farther east of three chains. It is highest in the west, where it rises to nearly 14,000 feet. The long slope to the Atlantic, which receives winter rains, is forested below the snow-line, and the lower slopes are fertile. Beyond this lofty range the land is dry, but the valley between the Great and the Anti-Atlas contains enough water to irrigate several oases.

548. Morocco. The western part of this region forms Morocco, mostly a French protectorate. The chief inland towns are Morocco City, or Marakesh, in a plain encircled by the snow peaks of the Atlas, Mekinez, and Fez. Tangiers, on the Strait of Gibraltar, is the chief port. The coastal plain, the lower hill-slopes, and the oases, are cultivated with barley and other cereals. The olive, fig, orange, evergreen oak, and

other Mediterranean trees grow north of the Atlas. In the oases, of which Tafilet is the largest and most fertile, the date is the most important tree, though cereals and fruits are also grown. In the drier parts cattle, sheep, and goats are kept. Many wandering tribes combine cattle-grazing with raids for plunder.

549. **Algeria and Tunisia.** The Mediterranean coast is bordered by a low range, separated from the northern range of the Atlas by a fertile valley called the Tell. The Tell is cultivated with vineyards, olive gardens, and cereals. Between the two main ranges to the south lies a high arid plateau, producing esparto, or alfa grass, which is exported for paper-making. Here and on the borders of the desert are many salt lakes. Iron ore is important. The country is French; and is divided into Algeria in the west and Tunisia in the east, or called after their capitals Algiers and Tunis. Oran to the west, with a fine harbour, and Constantine to the east, on a rock commanding the Tell, are important towns.

550. **Tripoli.** Farther east the coast is almost desert, but enough rain falls round Tripoli and in the peninsula of Barka for some cultivation where the land can be irrigated. This land belongs to Italy.

551. **The Sahara.** The Sahara extends from the Atlas to the Red Sea, and from the Mediterranean to about 25° S. It is the largest desert area in the world, and is twice the size of India. Its surface is covered in parts with a scanty vegetation, but the greater part consists of bare stones and sand-hills, sometimes rising as high as 600 feet. Travellers have compared its surface to that of an ocean of sand, broken into hills and valleys, and have described the hard toil of climbing hill after hill, only to see before them an unbroken series of similar hills and valleys, glaring in the blinding sunshine. The sand of the desert is produced by the wearing away of the rocks, and is not the bed of an old sea. In some parts the surface consists of rough stony tablelands, scoured bare of sand by the violence of the desert storms. Here and

there in the lower parts water can be found at no great depth by sinking wells. Round such wells, or round natural springs, are oases of date palms, varying in size with the amount of water available for irrigation.

552. Egypt. The most important part of the Sahara is Egypt, a British possession, which before the great war was in name Turkish, but under British direction because it controls the route to India. It consists of the valley of the Nile, which varies from five or six miles in breadth in Nubia, to thirty miles in Lower Egypt. On either side of this ribbon of green stretches the desert.

553. The Nile. The Nile rises south of the equator on the Great Lake Plateau. Look at the map and trace its course (Fig. 191). Its head-stream, the Kagera, flows into the great Victoria Nyanza, or lake, which is larger than Ceylon. The river then descends from the higher to the lower plateau, forming falls, and flows into Lake Albert, which itself receives a large tributary from Lake Edward. After leaving Lake Albert the river descends again, and flows through the fertile savana land of the Sudan, forming swamps many miles wide, which become a great lake when the river is in flood. In this part of its course it is often blocked by masses of floating vegetation called the sudd, which it has torn from its banks and swept along with its current. On the northern edge of the Sudan, which is gradually passing into poor scrub, it receives two important tributaries, the Blue Nile and the Atbara, from the Abyssinian Highlands. At the confluence of the Blue Nile, a rapid mountain river, is Khartum, the capital of the Sudan. Below the confluence of the Atbara the river makes a great S-shaped bend, and flows for 1,800 miles in a steep-walled valley of varying breadth. The desert extends on either side, and the river receives no other tributary. Below the mouth of the Blue Nile it forms six cataracts in its descent to the Mediterranean, which it enters by a great delta (Fig. 200).

554. The Nile Floods. The Nile rises in the equatorial

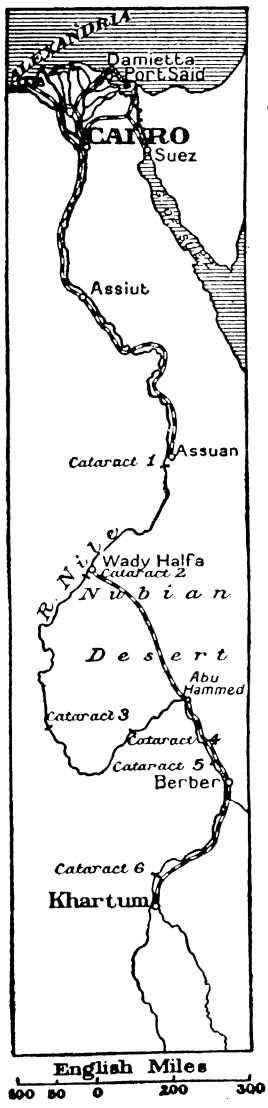


FIG. 200. The Nile below Khartum.

region of constant rains, and its Abyssinian tributaries are in the region of monsoon rains. To the first is due its steady flow, to the second its regular floods in summer and autumn. On these floods depends the very existence of Egypt. Since the British occupation great engineering works have been undertaken to regularize the supply of water to the land. The river has been dammed at Aswan at the first or most northerly cataract, at Asyut, and at the head of the delta, to hold back a proportion of the flood waters for distribution by irrigation canals during the season of low Nile. This slightly extends the area of fertile Egypt, and enables several crops to be grown in the year.

555. **Products of Egypt.** Where water can be had the land is exceedingly fertile. Wheat is largely cultivated, as well as maize, millet, barley, and pulses, especially lentils. These are mainly winter crops. The most valuable summer crop is cotton, which is becoming the most important of Egyptian products. Rice and sugar-cane are grown in the marshy delta. Date groves line the river far into the Sudan. The fruits of the Mediterranean ripen in the Nile valley as far south as the Sudan, where the banana becomes the most important fruit.

556. Routes and Towns. The Nile forms the only route across the desert from the Mediterranean to the interior. The narrow isthmus of Suez, separating the Mediterranean from the Red Sea, is pierced by the Suez Canal, which saves the long sea route between India and Europe round the south of Africa.

Egypt commands the canal, and controls the routes leading from it. This gives it its great political importance. Alexandria, west of the delta, is one of the oldest cities in the Mediterranean. Cairo, at the apex, is the capital. Not far off are the famous Pyramids of Egypt. A railway runs from Alexandria and Port Said to Cairo and Aswan, whence the traveller proceeds by steamer to the Second Cataract. From there a railway crosses the desert, avoiding the great Nile bend, to the Nile opposite Khartum (Fig. 200).

The canal is nearly 100 miles long. It has to be dredged constantly to keep it from being filled up with desert sand. The town of Suez is built at the southern or Red Sea end, and that of Port Said at the northern or Mediterranean end.

557. Abyssinia. The Abyssinian Highlands are a volcanic plateau, rising to 14,000 or 15,000 feet. In many parts they are split by deep chasms or valleys, with sides a mile in depth, whose upright walls are formed of many-sided columns. Such a country is extremely inaccessible. The climate and products of Abyssinia (area about 300,000 sq. miles) vary with the elevation. In the lowest, hottest parts, its climate and vegetation are tropical. Higher, in the region of summer rain and lower temperatures, coffee, vines, and cereals are grown in the savanas. Higher still are grown the hardier cereals, and animals graze. Abyssinia is an independent kingdom, the capital being Addis Abbeba. Towards this town a railway is being built from Jibuti, on the Red Sea in French territory, to the north of which is the Italian colony of Eritrea (area about 88,000 sq. miles). East of this is Somaliland, occupying the horn of Africa, and divided into British Somaliland (68,000 sq. miles) in the north, and Italian (136,000 sq. miles) in the south. It forms the eastern end of the Sahara.

Central Africa.

558. The Eastern Plateau. This plateau rises in a series of terraces from the east coast to the interior. It is crossed by two great rifts, each partly filled by a chain of lakes. In the western of these rifts lie Lakes Albert and Edward, drained to the Nile, Tanganyika to the Congo, and Nyasa to the Zambezi. The lakes of the eastern rift are much smaller (see Figs. 190, 191).

The northern part of this Lake plateau falls within Uganda and Kenya, British territories. To the south is Tanganyika Territory, formerly German East Africa, now under British control. The whole of this region is less than 1,000 miles from the equator. The eastern coastal plain is narrow, fertile, and malarial. Above it rise two or more terraces, relatively dry and unfertile, though forming savana lands in some of the higher parts. Along the eastern rift are a series of extinct volcanoes, such as Kenya (17,000 feet) and Kilima-Njaro (19,000 feet), so high that on their summits the snow never melts. Beyond the rift the land rises to 8,000 or 10,000 feet, and will probably prove suitable for permanent European settlement. It sinks again to the swampy shores of Victoria Nyanza, which lies about 4,000 feet above the sea. To the west extends the rainy equatorial belt, with dense tropical forest. Above the western rift towers the magnificent snow-crowned group of Ruwenzori, overlooking Lakes Albert and Edward. Between Lake Edward and Tanganyika is a group of active volcanoes. From Mombasa, on the east coast, a railway has been built to Port Florence, on Victoria Nyanza, whence a steamer carries the traveller to the north-western shores, which form part of Uganda. Cotton is the chief product, and the banana the staple food.

Zanzibar and Pemba, two small islands belonging to Britain off the east coast, are noted for their cloves. Zanzibar is the most important port in East Africa.

559. Uganda, Kenya, and Zanzibar. The coastal plain is fringed with mangrove swamp, behind which, but never

out of sight of the sea, grows the coco-nut palm. This palm supplies the negro with most things: food from the nut and leaf-bud, drink from the milk, huts built from the timber and thatched with the leaves; fibre, cloth, and rope from the bark, vessels and ladles from the shell, and for his other wants he trades with copra or dried kernels. Above the coastal plain the foothills are very fertile and planted with various fruits, bananas, pomegranates, mangoes from India, breadfruit from the Pacific. Then comes a steep rise to the high plateau, which has a soil that fails to hold the rain, and so there are patches of scrub, bare and brown for most of the year, but in the wet season clothed with a sudden growth of rich tall grass. Beyond the eastern rift the plateau rises to 8,000 and 10,000 feet, with open prairies and moorlands which may prove suitable for permanent European settlement. This is a 'big game' country, with elephant, rhinoceros, hippopotamus, giraffe, and many antelopes. On the grass-lands of Uganda tall fine negroes raise cattle and bananas, and under British influence, cotton. The dark silent forests are only inhabited by wandering tribes of pygmies, a very primitive hunting people. From Mombasa, the chief port, a line runs past Nairobi, the chief centre of Kenya, to Port Florence on Victoria Nyanza, whence a steamer runs to Entebbe, the chief town of Uganda.

560. The Niger Basin and Sudan. Immediately south of the Sahara comes the belt of lands with summer rains, extending across the continent to the highlands of Abyssinia. This belt forms the Sudan. It is a rich park land, with a fertile soil, in which are grown maize, millet, and other cereals, as well as many tropical fruits. It is drained by three great rivers, the Nile in the east, the Shari in the centre, flowing to Lake Chad, a lake of very varying dimensions, with no outlet to the ocean, and the Niger in the west (see Figs. 190, 191).

The Niger rises near the west coast and flows inland, forming a broad marshy flat valley like the middle course of the Nile. It turns to the south-east, breaking through the

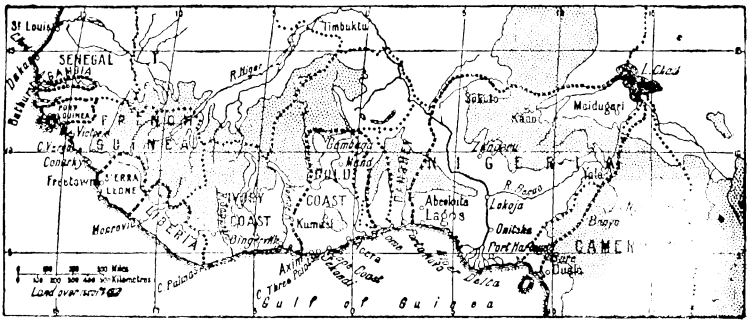


FIG. 201. West Africa,

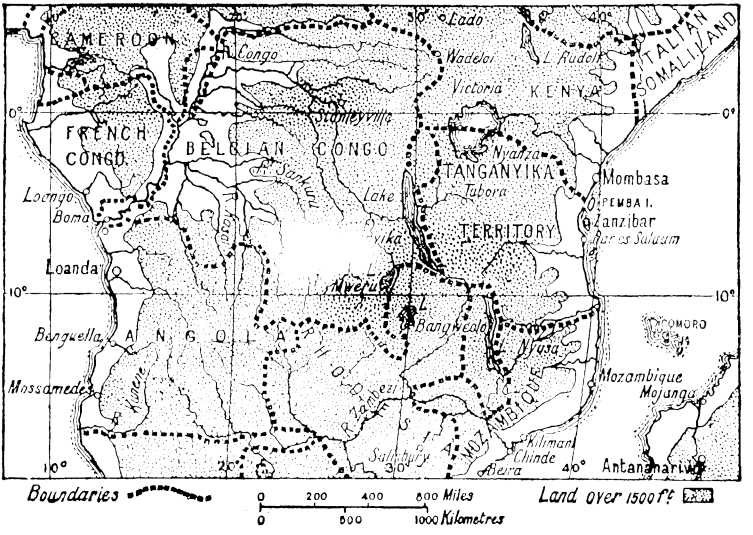


FIG. 202. Central Africa.

In these two figs. the German colonies are shown as they existed before the war.

Niger Highlands in a densely forested gorge, from which it emerges first into open wooded lands and then into the dense forests of the Guinea coast. The oil palm is the chief tree of the delta and the lower Niger. Its largest tributary is the Benue, from the east.

561. **The Guinea coast** is a low, unhealthy, densely forested land, rising to the north to the Guinea plateau, which is of no great height. It is cut up by innumerable creeks and rivers, which are important means of communication in the impenetrable forests. At the mouth of the rivers, in the region uncovered by the tides, are mangrove swamps, with twisted roots, covered with slimy and stinking mud. The coast is without harbours and is always beaten by surf. The tribes of these forested areas are extremely savage, practising horrible forms of religion, with human sacrifices.

The chief products of the Guinea coast are ground-nuts in the west and the oil palm in the east. In the tropical forests of the delta and lower Niger rubber and other tropical products are obtained.

562. **Political Divisions.** The greater part of Central and Western Africa north of the Congo, about 1½ million sq. miles, is French. The capital of the French Sudan is Timbuktu, near the Niger bend. The British possess the Lower Gambia, Sierra Leone, with Freetown, the one good harbour of the Western Guinea coast, the Gold Coast, Lagos, and Nigeria, consisting of the lower basin and delta of the Niger, the total area being about 165,000 sq. miles. The independent state of Liberia lies east of Sierra Leone. Togoland, east of the Gold Coast, and Kamerun, south-east of the Niger, are colonies taken from Germany in the great war. All these grow in importance as good administration is established and roads and railways are made. Lines have been made inland from the chief ports, Dakar, Freetown, Lagos, &c.

563. **Nigeria.** The western part of the Sudan has long been inhabited by races of Arab and negro blood, who have attained a fairly high degree of civilization. They are clever tillers of

the soil, growing millet, maize, cotton, &c. They make woollen cloth and leather, and are accomplished traders. Their towns, instead of being mere collections of huts, like those of most negroes, are strong walled cities, some with a population of 100,000.

From Lagos, the chief port, a railway is built to Kano through Zungeru, the capital, and Zaria, and a branch runs southwards through Bida to the navigable Niger. Lokoja, opposite the mouth of the Benue, is another important centre.

564. The Congo Region. The Congo basin is surrounded by high ground, down which the tributaries flow either north or west. The main stream rises south of Lake Tanganyika, and flows north through Lakes Bangweolo and Mweru, receiving the surplus waters of Tanganyika. Many of its tributaries rise quite near to those of the Nile. The most important is the Welle, which, like the main stream, flows through a country which is densely forested in the valleys, but rises to opener woods and savanas at higher elevations. The middle Congo is navigable for 1,000 miles above Stanley Pool, where it forms a lake-like expansion. Below Stanley Pool it breaks through the Lower Guinea Plateau in a densely forested gorge, forming falls and rapids, and enters the Atlantic by a deep estuary. A railway has been built from Leopoldville, on Stanley Pool, to Boma, to avoid the rapids, and carry rubber, ivory, and other forest produce to the coast. The natives of the Congo basin, like those of other densely forested parts of Central Africa, practise many horrible customs. Politically the Congo basin is divided into Belgian Congo (area about 900,000 sq. miles), French Congo to the north of the estuary, and the Portuguese territory of Angola (area about 457,000 sq. miles) to the south. The highlands of Angola are planted with coffee, which is carried by rail to the port of San Paul de Loanda.

565. The Zambezi. The Zambezi rises in wooded highlands, but in its lower course enters a region of dense forest. Like all the African rivers, its course is broken by falls where it passes over the terraces of the plateau. The highest of these

are the wonderful Victoria Falls. Above the falls the river is over a mile wide, and the gorge into which it plunges is only some 400 or 500 feet wide but 400 feet deep. The lower course of the Zambezi lies in Portuguese East Africa. It enters the sea by a great delta, with mangrove swamps in its tidal area.

566. Nyasaland. On the left the Zambezi receives a very large tributary, the Shiré, which has come down from the Nyasa Highlands, forming rapids in its descent from terrace to terrace. These highlands are planted with coffee, cotton, cereals, and fruits, according to the elevation. A railway from Blantyre to the Zambezi avoids rapids on the Shiré.

567. Rhodesia. The middle portion of the Zambezi basin forms Rhodesia (area about 312,000 sq. miles), a forest and savana land, probably rich in minerals. The railway from Cape Town is rapidly being pushed north and has nearly reached Lake Tanganyika. Very little of Southern Rhodesia is less than 3,000 feet above the sea. The greater part is above the fever-line, which is here about 4,000 feet. All kinds of cereals and fruits are or will be grown. The country is rich in minerals, especially gold, which has long been worked here by the natives. The capital is Salisbury, joined by a line through Portuguese territory to Beira. From Salisbury a line runs to the Victoria Falls line, which goes south through Bulawayo across Bechuanaland into Cape Province.

South Africa.

568. Natural Divisions. South of the Limpopo the South African plateau is under 4,000 feet only in the river valleys. Like the rest of South Africa it rises from the sea in a series of terraces, forming hilly lands, grassy in the east and desert in the west (see Fig. 191). The high grassy tablelands form the High Veld. The land is highest in the south-east, where it reaches 10,000 or 12,000 feet in the Drakensberg Mountains. These mountains, in which are the sources of the Orange and

its tributary the Vaal, contain the finest scenery in South Africa. Many of the peaks are above the snow-line. These mountains are steep to the east, with deep ravines and magnificent falls, the Tugela Falls, the most famous, having a drop of 1,800 feet. To the south are two terraces, the Great and Little Karroo, the former walled in by the Lange Berge, the

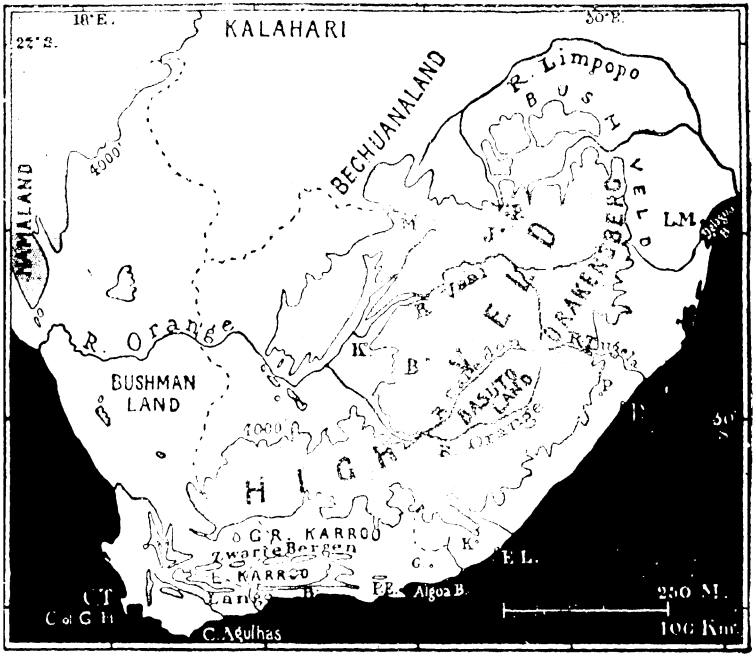


FIG. 203. Map of South Africa.

latter by the Zwarte Berge. Looking from the Great Karroo northward to the High Veld, the faces of the terraces appear as mountains and are known by various names. The Karroos are dry high plains with scanty rainfall and vegetation. The east and south terraces and the eastern margin of the High Veld are fertile, and contain most of the population. The rest is poor grazing ground, passing in the west into the Kalahari

desert. South Africa is British, except German S.W. Africa, which lies north of the Orange river in a semi-desert region.

569. **The Union of South Africa** was created in 1910. Politically it falls into four provinces: the Transvaal, between the Limpopo and the Vaal; the Orange Free State, between the Vaal and the Orange; Natal and Zululand, on the eastern margin south of Portuguese East Africa; and the Cape of

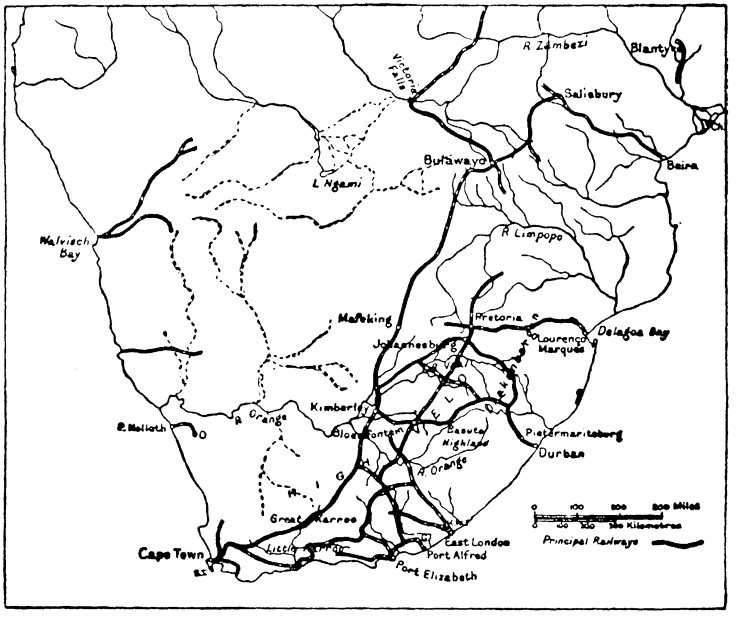


FIG. 204. Towns and Routes of South Africa.

Good Hope, south of the Orange River and Natal. There are also the native territory of Basutoland in the Basuto Highlands, and the Bechuanaland Protectorate.

570. **The Transvaal** is divided between the healthy grasslands of the High Veld and the lower and less healthy valleys. The High Veld is pastoral, and the older towns, such as the capital, Pretoria, were farming centres. South of Pretoria, from east to west, runs the high bare ridge of the Witwatersrand, the water-parting between the Limpopo and the Vaal,

famous for the Rand goldfields. On the ridge is Johannesburg, situated near the eastern end of fifty miles of gold-bearing reef, and within easy reach of the coal-mines of the eastern Rand. It has grown to be the largest and wealthiest town in South Africa. The railway connexions to the Portuguese port Lourenço Marquez, on the magnificent harbour of Delagoa Bay, and to Durban, the port of Natal, are shown on Fig. 204. In the south, mainly where irrigation is possible, maize ('mealies'), tobacco, oranges, and lemons are grown.

571. **The Orange Free State** lies between the Vaal and the Orange. Its level plains are broken by flat-topped hills, where grasses and other plants grow quickly after the early summer (November) rains.

There are diamond mines in the west. The population is pastoral, driving cattle and sheep from pasture to pasture. Agriculture is chiefly in the wheat lands of the Caledon Valley. Bloemfontein, the capital, is on the lines from Port Elizabeth to Pretoria, and from Kimberley to Durban.

572. **Basutoland** has hardly any white inhabitants. It is sometimes called the Switzerland of South Africa. Mont aux Sources (i. e. sources of the Tugela, Orange, Wilge, and Caledon rivers) in the north is 11,000 feet high.

573. **Natal** consists of three zones: (1) the hot coastal belt where sugar, bananas, and sub-tropical fruits are grown, as well as tea in the north; (2) the middle agricultural zone, producing maize and other cereals; and (3) the upper pastoral zone, where large flocks of sheep are raised. The whites are far outnumbered by the Kafirs or Zulus. The sugar and tea plantations are worked by imported Indian coolies, who are as numerous as the whites. Durban on Port Natal is the chief port, and from it lines run north and south along the coastal plain, and another line climbs to the capital Pietermaritzburg in the central zone, and on to Ladysmith. From Ladysmith two lines cross the Drakensberg, one to the Orange Free State, and the other, via the coalfields of Dundee and Newcastle, to the Transvaal.

574. Cape of Good Hope. The greater part of the Cape Colony is a poor pastoral region, but the southern and eastern margins are more fertile. The extreme south-east resembles Natal, and nearly all the land is divided into Kafir small-holdings, except between the Kei River and Algoa Bay, where Europeans grow maize, tobacco, and sub-tropical fruits. The chief inland town is Grahamstown. The ports are East London and Port Elizabeth (on Algoa Bay). These serve the hard dry lands of the Karroo, with their sheep (merino wool), goats (mohair), and ostriches. The south-west, with dry summers and winter rains, i. e. a Mediterranean climate, has Mediterranean products. Excellent vines are grown, and fruit cultivation is increasing under irrigation. Wheat is grown in the Malmesbury Plains. Cape Town, the capital and seat of the Union Parliament, is the nearest port to Europe, and lies on a magnificent bay. The main line from Cape Town runs north-west across the Great Karroo, roughly dividing the land into the dry steppes of the west and north and the relatively fertile region of the south. It then turns north to the diamond fields of Kimberley, and on to Rhodesia. There is copper at Ookiep.

Bechuanaland, north of the Orange, is semi-desert, except in the east, where lie the capital, Vryberg, and the chief town of Mafeking, on millet and wheat-producing lands irrigated from the Vaal tributaries.

575. African Islands. Madagascar is about twice the size of the British Isles. The west coast is low and swampy. Above, the land rises in terraces to a savana-covered plateau, which descends much more steeply to the narrow east coastal plain, fringed with lagoons. The lowlands are densely forested, yielding rubber. A railway connects Tamatave, the port, on the east coast with Antinanarivo, the capital, in the centre of the plateau. Madagascar is a French possession and is being rapidly opened up.

Réunion (950 sq. miles), a French, and Mauritius (720 sq. miles), a British island. are both volcanic. They yield

sugar, coffee, vanilla, and other tropical products. Port Louis, the capital of Mauritius, has a good harbour. Nearly three-quarters of the 380,000 inhabitants of Mauritius are Indians. The negro inhabitants of Rodriguez, a dependency of Mauritius, grow tropical fruits. The Seychelles are coral-islands producing coco-nuts.

St. Helena and Ascension are volcanic islands in the Atlantic. Both are British. The Cape Verde Islands and Madeira, also volcanic, belong to Portugal. They produce sugar, and Madeira wine. The Canary Islands are Spanish. They produce sugar, wine, and bananas. The most beautiful is the volcanic peak of Teneriffe.

CHAPTER XXIII

AUSTRALASIA AND THE PACIFIC ISLANDS

Australia.

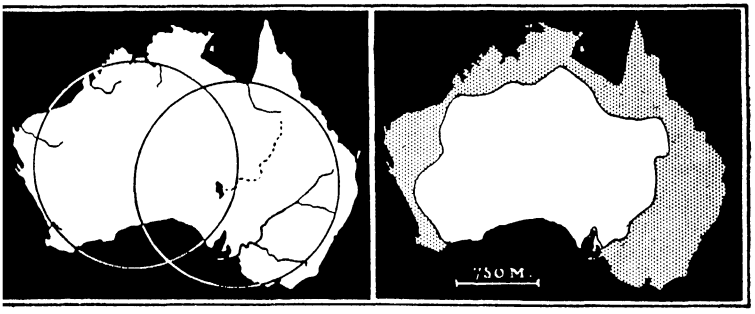
576. Position. The continent of Australasia consists of three large and several small islands. It stretches from the equator half-way to the South Pole. Australia, the largest island, is nearly 3,000,000 sq. miles or over $\frac{3}{4}$ the size of Europe. New Guinea, to the north, the second in area, is about $\frac{1}{10}$ the size of Australia. Tasmania, to the south, separated from Australia by Bass Strait, is about $\frac{1}{10}$ the size of New Guinea.

577. Seas, Gulfs, Peninsulas, and Islands. Australia is compact like Africa (Fig. 205). The Gulf of Carpentaria, on the north coast, is the only very large gulf. In the south is the great incurve called the Great Australian Bight. Notice also the Spencer and St. Vincent Gulfs on the south coast.

578. Physical Features. The only considerable area of land over 3,000 feet above sea-level is in New Guinea, where the backbone of the island is formed by a lofty mountain range, probably higher than Mont Blanc. The southern part of New Guinea is a lowland. There are no mountains like the

Himalayas in Australia. The Eastern Highlands is a denudation highland (see p. 20). It rises steeply from the east coast, and slopes west to the Central Lowland which stretches almost from north to south of the continent. Farther west the land is a low tableland, with a few higher masses rising above it. Tasmania resembles the Eastern Highlands, of which it is a continuation.

The Eastern Highlands, sometimes erroneously called a Great Dividing Range, are known in different parts under different names. In the south, where they rise highest, the Blue Mountains and the Kosciusko Plateau may be noticed.



FIGS. 205, 206. The circles are 1,500 miles in diameter.

The Blue Mountains rise steeply from the lowlands, and are extremely difficult to climb. Deep sunken valleys, with lofty walls, end in impassable nullahs. It took early settlers many years to find a route through this mountain barrier to the interior. In the south-east the Australian Alps rise in Mt. Kosciusko to over 7,300 feet, the last few hundred feet being above the snow-line.

579. Rivers and Lakes. The short eastern slope of the Eastern Highlands is drained to the Pacific by rivers of no great length. The long western slope is drained to the interior, except in the extreme north and in the south, where there is the only great river-system in Australia, the Murray-Darling. The Murray rises in the south-east, and is joined by the

Lachlan and Murrumbidgee from the Highlands farther north. All pass through deep gorges in the highland part of their course. The Murray unites with the Darling, whose headstream has risen in the Eastern Highlands near the tropic of Capricorn, and which has received numerous tributaries from the central parts of the Highlands. The united river is turned south

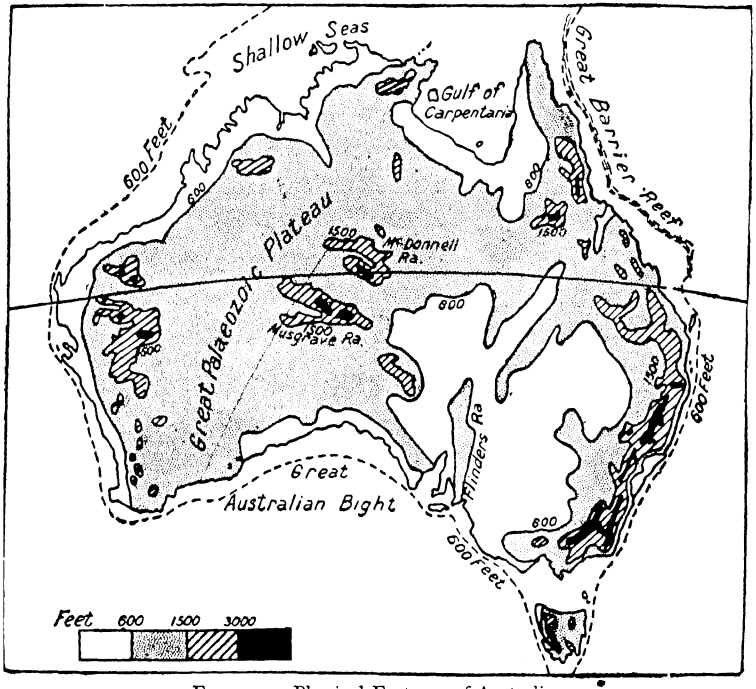


FIG. 207. Physical Features of Australia.

by the South Australian Highlands, and enters the sea through a large lagoon, Lake Alexandrina. Most of these rivers are navigable during the wet season, but in the dry season many run dry, though the Murray, which is fed by the snows of the Australian Alps, is a permanent river. The northern half of the Eastern Highlands is lower but broader. Consequently the rivers which drain the seaward slope are longer. The Fitzroy and Burdekin may be noted. The western slopes are

cored by many long river-beds, but these are filled only in he wet season. When full they flow to Lake Eyre, in the entre of the continent, a basin of inland drainage similar to he Caspian and Aral Seas in Eurasia, and Lake Chad in Africa. Round the north and west coast short rivers from he tableland flow to the sea. The south and centre are practically rainless, and have no permanent rivers. (Cf. Fig. 209.)

580. Climate. Only the extreme south and the higher ground has a winter temperature under 60° F. The summer emperature is extremely hot, for the land is broadest where he tropic crosses it. The difference between the summer and winter temperature is great, but rather because the summer is extremely hot than because the winter is cold. The differences are greatest in the interior, and more on the east than on the west coast. Find the following places and compare their emperatures at different seasons: Palmerston, 87·3° Nov., 78·0° July; Alice Springs, 87·6° Jan., 51·8° July; Perth, 76·3° Feb., 55·0° July; Sydney, 71·5° Jan., 52·5° July; Hobart, 60·9° Feb., 45·7° July.

Look at the rainfall map in Figs. 210, 211 and notice that only n New Guinea, East and North Australia, and Tasmania is he rainfall at all heavy. Over the greater part of Australia he rainfall is less than 20 inches, and within this large areas eceive only 10 inches or less. Much of the interior is an lmost rainless desert. Compare the much larger Sahara and he much smaller Kalahari. Like these deserts it lies in he trade winds area. These winds have parted with their noisture on the seaward slopes of the Eastern Highlands, and become hotter and drier as they pass inland. New Guinea lies near enough to the equator to receive abundant and frequent ains. In North Australia the winds blow in summer from he sea to the land, from NW. in the west, NE. in the east, bringing summer rains (cf. India and China). Tasmania always ies in the track of the stormy west winds, which bring rain at ll seasons. When the belts move northwards in winter the outhern part of the Eastern Highlands is in this belt.

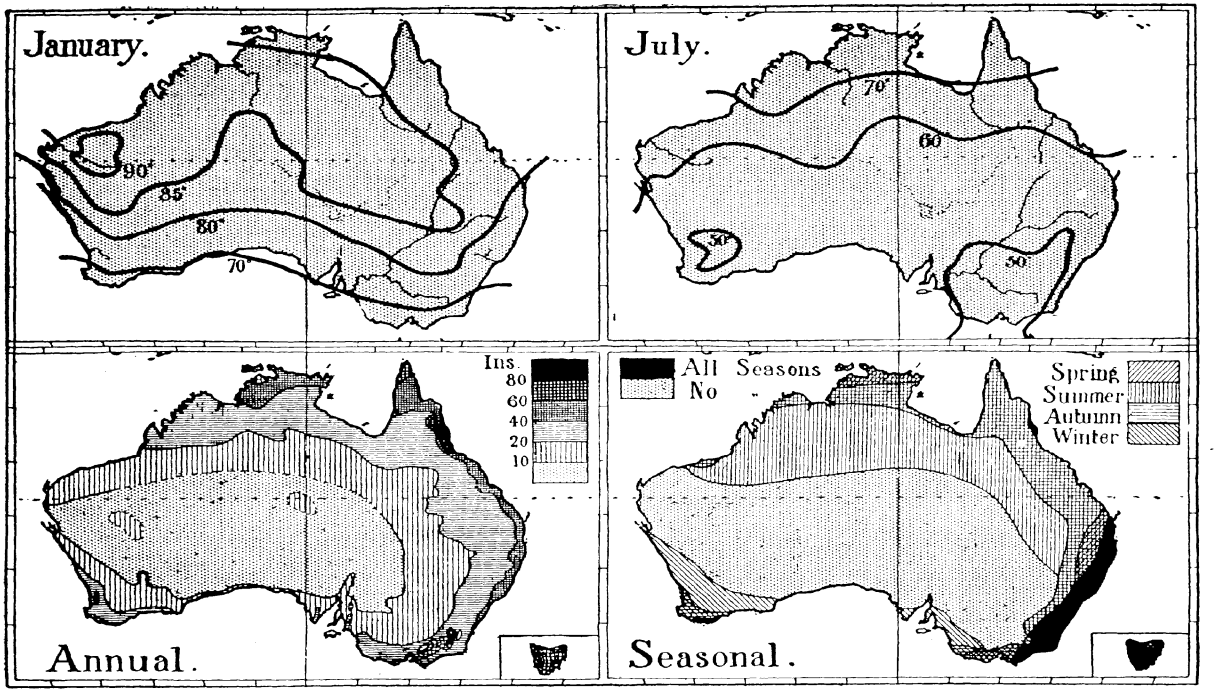


FIG. 208. January Isotherms of Australia. FIG. 209. July Isotherms of Australia. FIG. 210. Mean Annual Rainfall of Australia. The 10-inch line near the desert in the north-west should probably be nearer the tropic. FIG. 211. Dry and Rainy Seasons. All black means rain at all seasons.

In climate Tasmania may be compared with Northern France, the extreme south of the Eastern Highlands with the Mediterranean, the centre of the continent with Northern Africa and Arabia, and the northern coast with India. Hence, allowing for differences in the arrangement of land and water, and of

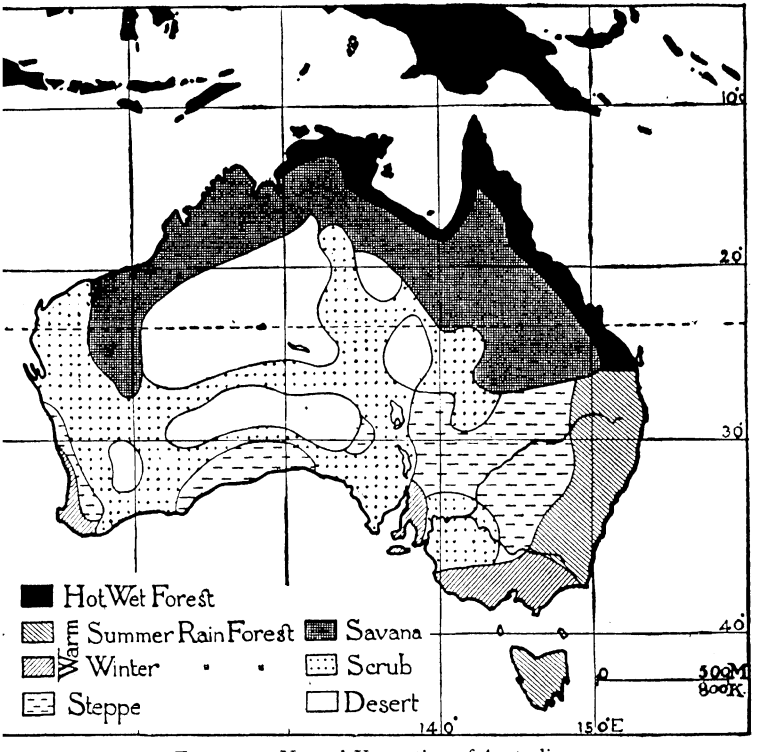


FIG. 212. Natural Vegetation of Australia.

highland and lowland, we find the same types of climatic region south of the equator as we find in the north.

581. **Vegetation.** Australia was early separated from the rest of the Old World by deep seas, and many plants and animals are found nowhere else. Most native trees are suited to a hot dry climate, and a very strong sun. The chief are

eucalypts or gum-trees, and acacias or wattles. The eucalypts shed their bark and hang their leaves edgeways to the sunshine. The forests exist round the wetter margins. Much of the interior, where it is not mere sandy or stony desert, is covered with a scrub of thorny plants, very difficult to penetrate. Between forest and scrub or desert are grazing lands, which make the keeping of sheep and cattle one of the most important industries (see Fig. 212).

582. **Animals.** At the time of its discovery by Europeans the animals of Australia included the kangaroo and opossum, the young of which are carried by the mother in a sort of pouch. The mammals and many birds and reptiles were very different from those of the Old World. European colonists have introduced domesticated animals, and some wild ones. The rabbit has so multiplied as to be a national danger.

583. **Products.** Roughly, over one-quarter of Australia is good agricultural land, over a quarter good pastoral land, less than a quarter is very poor pastoral land, and a quarter useless desert. The hard wheat is excellent in quality. Maize is grown where there is enough rain. Wheat requires at least 15 inches of rainfall a year, maize 30 inches, and sugar 40 inches.

The cultivated plants of the Old World have also been generally introduced in areas with suitable climates. Thus the cultivated products of Tasmania resemble those of Northern France, Tasmanian apples being excellent. In the south-west and south-east the fruits and cereals of the Mediterranean, including the vine, are grown. In the wetter eastern and southern lowlands there are dairy farms with rich pastures. In the north-east the products of the hotter monsoon lands are grown, more particularly sugar. The cultivation of tea and cotton is beginning. In northern Australia and in New Guinea are tropical forests, producing rubber, &c.

The very great mineral wealth of Australia includes gold, silver, copper, lead, tin, coal, petroleum, and precious stones.

584. **Political Geography.** The native population is dying

out, and the country is peopled by colonists of British descent. In the tropical north the climate is trying for Europeans, and the labour problem is difficult to solve. Manufactures are steadily growing, but the market is still small. Australia needs a much larger population. Railways have been built in many parts from the coast to the interior. They are best developed in the east, where the lines connect the chief towns

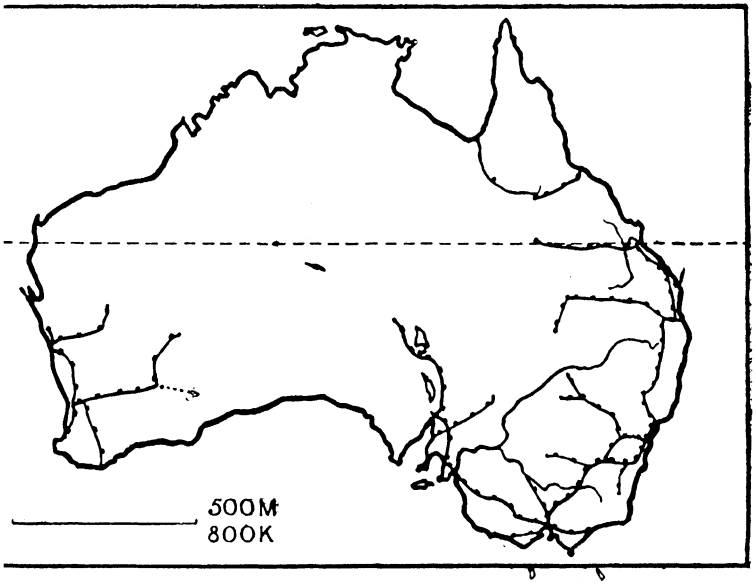


FIG. 213. Towns, Railways, and Telegraph Routes of Australia.

of Queensland, New South Wales, Victoria, and South Australia with each other and with the interior (see Fig. 213).

Politically the whole continent is British, except parts of New Guinea, which are Dutch and German. British New Guinea is a dependency of the Commonwealth called Papua.

The Commonwealth of Australia consists of six States: Queensland, New South Wales, and Victoria in the east, South Australia, West Australia, and Tasmania (Fig. 214). Northern Territory and Papua are administered by the Commonwealth. The capital is Canberra.

585. Queensland (670,500 sq. miles, 650,000 people) is crossed by the tropic of Capricorn, and its products are tropical and sub-tropical. It is the rainiest and best watered of the colonies, and has the largest forest areas, producing valuable timber. Only 1,000 square miles are cultivated, and 370,000 are used for grazing. The chief crops are sugar-cane (coast), maize, and wheat on eastern part of highlands. Cattle are commoner in the hotter, wetter north, sheep in the drier

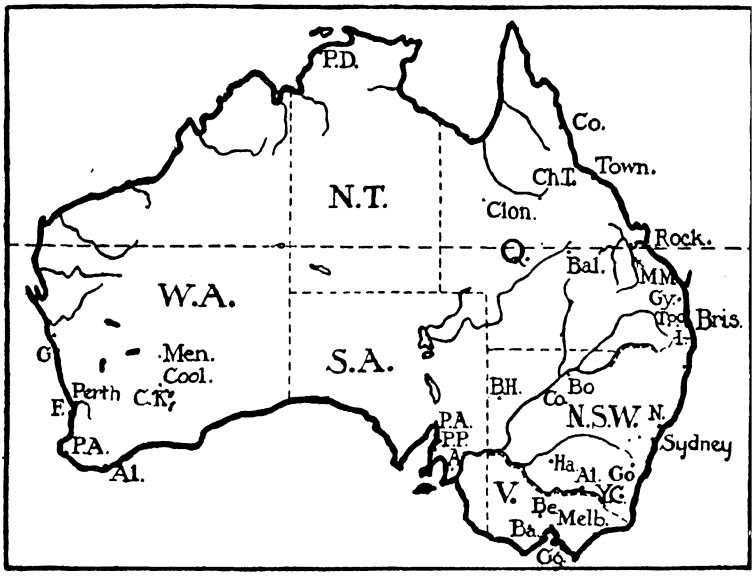


FIG. 214. The States of the Australian Commonwealth. YC = Camberra.

parts, where there are many deep wells for watering stock. The mineral wealth is great. Gold, copper, and tin are the most valuable metals. Most of the towns are on the coast. The capital and chief port is Brisbane. Rockhampton and Townsville are starting-points of long railway lines into the interior. Ipswich is a coal and manufacturing centre.

586. New South Wales (310,400 sq. miles, 1,700,000 people) lies outside the tropics. The coast is well watered and fertile, and dairying is important. Cereals (wheat and maize) and

fruits, including grapes, are grown on the 4,000 square miles which are cultivated. It has more sheep than any other colony. Coal is found from Newcastle, Lithgow, Bulli, and in very deep mines at Sydney. Gold is abundant in the eastern highlands, especially near Bathurst and Goulburn. Silver is mined at Broken Hill, copper at Cobar. The capital is Sydney, on Port Jackson, one of the most magnificent bays in the world. Camberra, the Federal capital, is in the south-east.

587. **Victoria** (88,000 sq. miles, 1,400,000 people) is the smallest and most rugged of the colonies. It is also the most extensively cultivated (7,000 sq. miles) and densely peopled. Sheep-farming is the most important occupation. Water from the Murray irrigates the Mildura fruit farms. Fruits and cereals (wheat and oats) are grown. The vine does well on the sunny hill slopes. Wool and dairy produce are the most valuable; next agricultural products, especially wheat; wine and fruit come next, and then minerals, mainly gold. Gold-fields are important round Bendigo and Ballarat. The capital is Melbourne, on Port Phillip. Geelong manufactures wool.

588. **South Australia** (380,000 sq. miles, 400,000 people). It is fertile in the south, where over 3,000 square miles are cultivated, mainly with wheat, hay, and vines. Owing to the dryness the wheat is extremely fine but poor in yield. Sheep-farming is important, but drought causes great losses. Copper is the chief mineral. The capital is Adelaide.

589. **Northern Territory** (525,000 sq. miles, under 4,000 white people) was formerly part of S. Australia. There are hot, wet forests round the north coast, and rich pastoral lands suitable for cattle farther inland. Elsewhere it is desert or very poor pastoral land. Darwin may become an important port if a transcontinental line is built.

590. **West Australia** (976,000 sq. miles, 300,000 people). The south-west is forested, containing the valuable hard timbers, karri and jarrah. There are about 1,000 square miles of land cultivated, mainly in the south-west. Wheat, hay, oats, fruit, and vines are the chief products. Sheep and

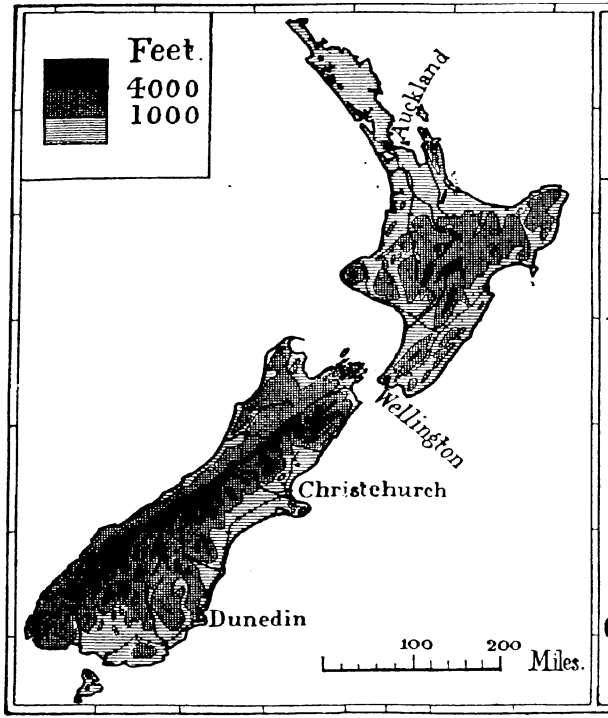


FIG. 215. Relief of New Zealand.

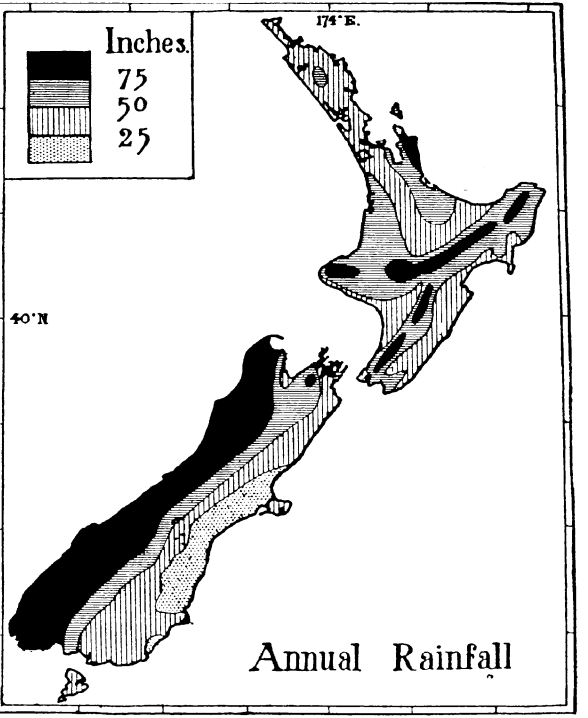


FIG. 216. Mean Annual Rainfall of New Zealand.

cattle are kept in the river valleys. Western Australia produces as much gold as all the rest of the continent. There are two good belts, the eastern one from Kalgoorli and Coolgardie to Pilbura, and the western from Southern Cross to Cue. Water is pumped up over 1,300 feet in great pipes which run for nearly 400 miles from a reservoir near Perth to Coolgardie. The capital is Perth, near the mouth of the Swan. Albany is the southern port. Coal is found near Collie.

591. **Tasmania** (26,200 sq. miles, 200,000 people) is about the size of Scotland. It is rich in minerals, especially copper and silver, tin, and gold. Over 1,000 square miles are cultivated, two-thirds being in grass. The island is well wooded. Wheat, oats, potatoes, hay, fruit, and hops are grown. Sheep-farming is important. The capital is Hobart. Launceston lies opposite Australia.

New Zealand.

592. **Position.** **New Zealand** (105,000 sq. miles, 1,000,000 people) consists of two large islands, the North Island, and the South (or Middle) Island, separated by Cook Strait, and the small Stewart Island, in the extreme south. The islands lie between 34° and 48° S., extending from the latitude of Sydney to 250 miles south of Tasmania. They are over 1,000 miles from Australia, from which they are parted by deep seas.

593. **Physical Features.** The North Island is much lower than the South Island, where Aorangi, or Mt. Cook, rises in the Southern Alps to over 12,000 feet. The glaciers of the Southern Alps are very extensive and descend into the forest zone. The valleys with their long narrow lakes, and the fiords of the coast, resemble those of Scotland. North Island contains the active volcanoes of Ruapehu, over 9,000 feet, and Tongariro, over 7,500 feet. The extinct cone of Mt. Egmont, over 8,000 feet, is often compared with Fujiyama, in Japan. Geysers, hot springs, and other signs of volcanic activity occur.

594. **Climate.** The latitudes correspond with those from Gibraltar to northern France. The climate is cooler and more equable, owing to the influence of the sea on the narrow islands.

The climate of Auckland, 67° Feb., 52° July, rainfall 42 in.; Hokitika, 60° Jan., 45° July, rainfall 114 in.; and Christchurch, 61·7° Jan., 42·5° July, rainfall 26 in., may be compared with Lisbon, 71° July, 41° Jan., rainfall 29 in.; Valentia (Ireland), 59° July, 45° Jan., rainfall 56 in.; and Greenwich, 64° July, 38° Jan., rainfall 25 in. Compare the latitudes of these places.

595. **Products.** The forests of the North Island contain valuable timber, including the kauri pine, which furnishes a most useful gum. Large deposits of this gum, the produce of forests long dead, are dug out of the ground. Owing to the westerly storms the west coast is the wetter, as in Britain, and the east coast drier. The west is covered with forests, the total forested area being 30,000 square miles. Two-thirds of New Zealand is suitable for agriculture. At present over 20,000 square miles are sown with grass, and nearly 3,000 square miles are cultivated, mainly with oats and wheat. The drier east is pasture land, on which millions of sheep are fed, the finest being kept on the famous Canterbury Downs, in the lee of the Southern Alps. Gold, coal, and silver are the chief minerals. The gold occurs in the rocks of Westland and the Thames basin, and is washed out of the river sands in the south-east. The chief exports are wool, frozen meat, dairy produce, gold, tallow, hides, and kauri gum.

596. **Towns.** The largest town is Auckland, on the narrow isthmus separating the north-west peninsula from the rest of the North Island. It has harbours on both sides of the isthmus. The capital is Wellington on Cook Strait, in North Island near the centre of the islands. In South Island Christchurch and Dunedin, on the east, export the produce of the pastoral districts. Hokitika and other western ports export gold and coal.

The Pacific Islands.

597. The Central and Western Pacific are studded with small islands between 30° N. and S. The most important are

New Caledonia (French), Hawaii (American), Fiji, Solomon (British), and Samoa (German and American). The majority are either mountainous, forested volcanic islands, or low coral islands. New Caledonia has sedimentary as well as igneous rocks.

598. The climate everywhere is hot but equable. The wet and dry seasons are well marked. The volcanic islands are the more fertile, growing sugar, bananas, and other tropical produce. The coco-nut palm is important along all the coast, and the dried flesh of its nut supplies copra, which is used in soap and other manufactures. The inhabitants of the islands of the south-west are short, dark, and frizzy haired, belonging to the Papuan, or Melanesian race. In the eastern islands they belong to the tall, fairer, and much more intelligent Polynesian race. The majority are clever sailors and fishers, and practise many arts. Many Chinese and Japanese have emigrated to the plantations, especially in Hawaii, and Indians are numerous in Fiji.

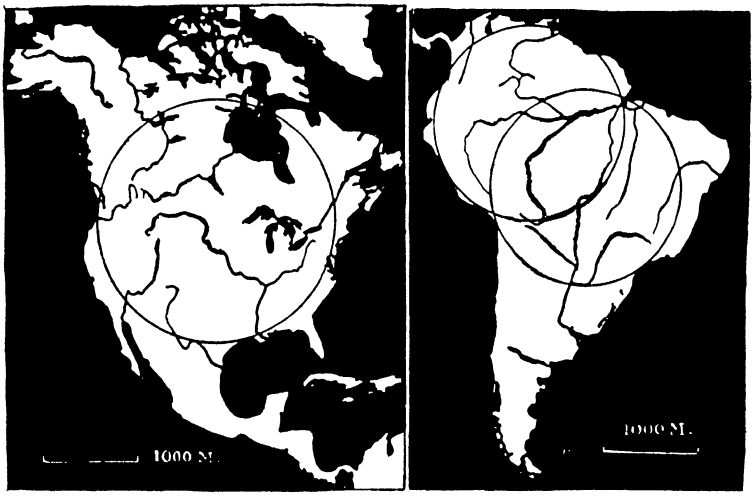
CHAPTER XXIV

THE GENERAL GEOGRAPHY OF NORTH AMERICA

599. **Position.** North America almost touches Asia in the north-west, where the two continents are separated by Bering Strait, and comes nearest to Europe in the north-east. It is broadest to the north and narrows to the south, where it is joined to South America by the narrow isthmus of Central America. On the west it is bounded by the Pacific Ocean, on the east by the Atlantic, and on the north by the Arctic Ocean. The mainland begins about 500 miles from the equator, and extends to within 1,500 miles of the North Pole.

600. **Seas, Gulfs, Peninsulas, Islands.** Notice the three

great gulfs, the Gulf of Mexico, in the south, between the peninsulas of Florida and Yucatan, Hudson Bay, in the north-west, almost shut in by the Labrador peninsula, and the long, narrow gulf of California, in the south-west, separating the peninsula of Lower California from the mainland. Notice also the four island groups, (1) the chain of the West Indies stretching from Yucatan to the South American end of the Caribbean Sea, (2) Newfoundland across the Gulf of the



FIGS. 217, 218. The circle is 2,500 miles in diameter in North America. The circles in South America are 2,000 miles in diameter.

St. Lawrence, (3) the Northern Archipelago, of which Greenland and Baffin Land are the largest islands, and (4) the islands off the fiords of the northern part of the Pacific coast. The area of North America is nearly 8,000,000 sq. miles, and with all its islands nearly 9,000,000 sq. miles. Few parts are more than 1,000 miles from the coast (see Fig. 217).

601. Physical Divisions. The highlands lie near the Atlantic and Pacific coasts, while the lowlands occupy the centre of the continent, or form narrow coastal plains. The continent

may be divided into (1) the Western Mountains, (2) the Eastern Highlands and Greenland, and (3) the Central Lowlands.

602. **The Western Mountains.** The centre of this system consists of a belt of plateaus of varying breadth, bordered east and west by long and lofty mountain chains. The eastern chain is called the Rocky Mountains. The western chains are known as the Alaskan, Cascade, and Sierra Nevada Mountains. In the north the plateau is low and broad, forming the basin of the Yukon, to the south of which the Alaskan ranges rise to peaks of 18,000 or 19,000 feet, with great glaciers and snow-fields. To the south the plateau is higher and narrower, forming the basins of the Fraser and Columbia rivers, which rise in the Rockies to the east, and break through the Cascades in magnificent gorges to the Pacific coast. South of the Columbia, the plateau attains its greatest height between the Sierra Nevada on the west and the Rockies on the east. It is known as the Great Basin. Much of it is a basin of inland drainage, with Great Salt Lake in the east. The southern part of the Great Basin is drained by the Colorado river, flowing in gorges sometimes a mile deep, and so narrow as to seem rather cracks in the earth than valleys.[1] Still farther south is the Mexican plateau, ending in a great chain of volcanoes, of which the highest is the nearly extinct Popocatapetl (Figs. 219, 220).

Through the greater part of the western mountain system a third range can be traced to the west, sometimes as a Pacific coastal range on the mainland, sometimes in the islands, such as Vancouver, fringing the coast. It is separated from the western chain of the Alaskan, Cascade, and Sierra Nevada Mountains by valleys, or by narrow straits or sounds.

603. **The Central Lowlands.** At the eastern base of the Rockies the land is over 6,000 feet above sea-level. It slopes gently to the lowest line between Hudson Bay and

[1] Deep narrow nullahs of this kind are called 'canyons' in America.



FIG. 219. The Physical Features of North America.

the Gulf of Mexico, where it is rarely more than 600 feet high. To the east it rises slowly to the Eastern Highlands. Broadly speaking, it forms a great plain extending from the Arctic Ocean to the Gulf of Mexico between the Eastern and Western Highlands, narrowing in the south where the



FIG. 220. Key to Physical Features of North America.

continent tapers. It contains four great river basins, the Mackenzie, flowing to the Arctic Ocean, the Nelson flowing to Hudson Bay, the St. Lawrence flowing to the Atlantic, and the Missouri-Mississippi, flowing to the Gulf of Mexico. Notice the ring of lakes round Hudson Bay, most of which

are drained by the Mackenzie, Nelson, and St. Lawrence. This part of the Central Lowland is a lakeland like that round the Baltic. The St. Lawrence drains the Great Lakes, Superior, Michigan, Huron, Erie, and Ontario, the largest body of fresh water in the world. Notice that there are no lakes in the Mississippi basin.

604. The Eastern Highlands are divided by the St. Lawrence into the Labrador Highlands in the north, and the Appalachian Highlands in the south, with few points over 5,000 feet high. Both are densely forested. The Appalachians are bordered in the east by a coastal plain, which widens out to the south. It is crossed by a number of short but important rivers, the lower valleys of which are drowned by the sea, forming excellent harbours. Of these most important are the Hudson, Delaware, Susquehanna and Potomac, the last two forming the deep inlet, or drowned valley, of Chesapeake Bay.

605. Greenland is a vast island, about $\frac{1}{4}$ the size of Australia, lying almost entirely within the Arctic Circle. It is buried beneath a sheet of ice of unknown depth, except for a small strip on the south of the west, to which it owes its name. In the interior it rises to a height of about 8,000 feet above sea-level.

606. Climate. North America, with its extension from north to south, and its great variety of elevation, has, like Asia, and for the same reasons, every variety of climate. In the extreme north and in Greenland the snow lies all the year round, and over a great part of the north the winter lasts from three to eight months. Look at Fig. 221 and notice how large a part of the continent has a temperature below the freezing-point in the month of January. In Fig. 222, which shows the summer temperature, notice how far north the line of 50° extends. Thus a great part of the continent has an extreme climate with cold winters, and warm or hot summers. Notice that, in summer, as we should expect, the heat increases from the coast to the interior, and the highest summer temperature is found in the south-west of the central lowlands.

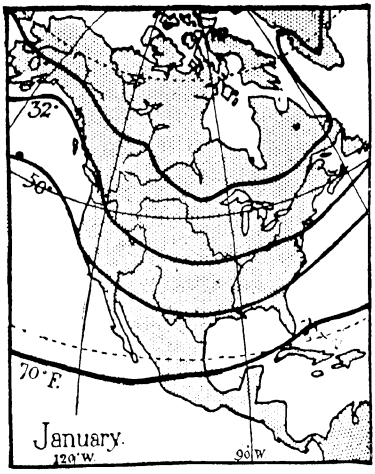


FIG. 221. The Mean Temperature of North America in January reduced to sea-level.

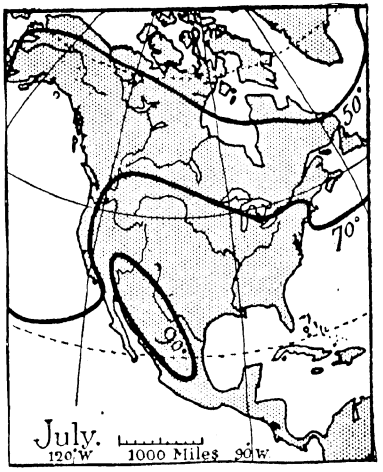


FIG. 222. The Mean Temperature of North America in July, reduced to sea-level.

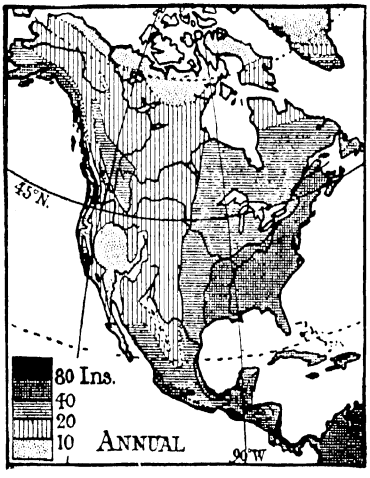


FIG. 223. Mean Annual Rainfall.

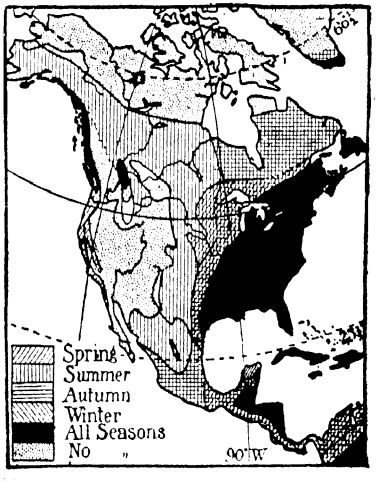


FIG. 224. Seasonal Distribution of Rainfall in North America.

Look at the rainfall map in Fig. 223, and notice that the east coast is wet from Newfoundland southwards. The rainfall lessens slowly, but steadily, from the coast to the interior. West of the Mississippi the rain falls chiefly in summer, and is scanty. In the extreme west the lowlands become very dry. On the west coast the north has rain at all seasons, but most in winter (Fig. 224). This is succeeded to the south by a belt 500 to 600 miles long with only winter rains, that is, a Mediterranean climate. The lofty western ranges of the Sierra Nevada prevent the winds from reaching the Great Basin, which is a rainless desert. Still farther south is the dry calm area, where deserts of great extent would occur, as in North Africa, if the continent were broad instead of very narrow. Southern Mexico and Central America lie in the region of summer rains immediately north of the equator.

607. Vegetation. The vegetation zones, like the climatic zones, correspond with those of the Old World. In the north are the unbroken ice and snow of Greenland and the islands of the Northern Archipelago, with the tundra to the south. Next come the forests, scanty and dwarf on the tundra edge, but passing into magnificent forests of conifers farther south. These again pass into mixed woods, which extend farther south along the wetter coasts than in the drier interior. In the southern part, and along the east coast, they have been partly cleared for agriculture (see Fig. 225).

Next come the steppe or grasslands, the richer eastern parts of which are called prairies in America. These become drier in the east, passing into desert in the south-west. Southern Mexico and Central America are rugged lofty lands, in which all zones occur, from the tropical forests on the coastal plains to the tundra-like areas of the highest mountains, lying below the snow-line, where all vegetation ceases.

608. Animals. The animals of North America resemble those of the Old World. Large herds of caribou or reindeer, and moose or elk, roam over the tundra. Beavers and other

fur-bearing animals are found in the northern forests, and bears in the Rockies. Wild animals are not numerous outside the forest and western mountain areas. The important

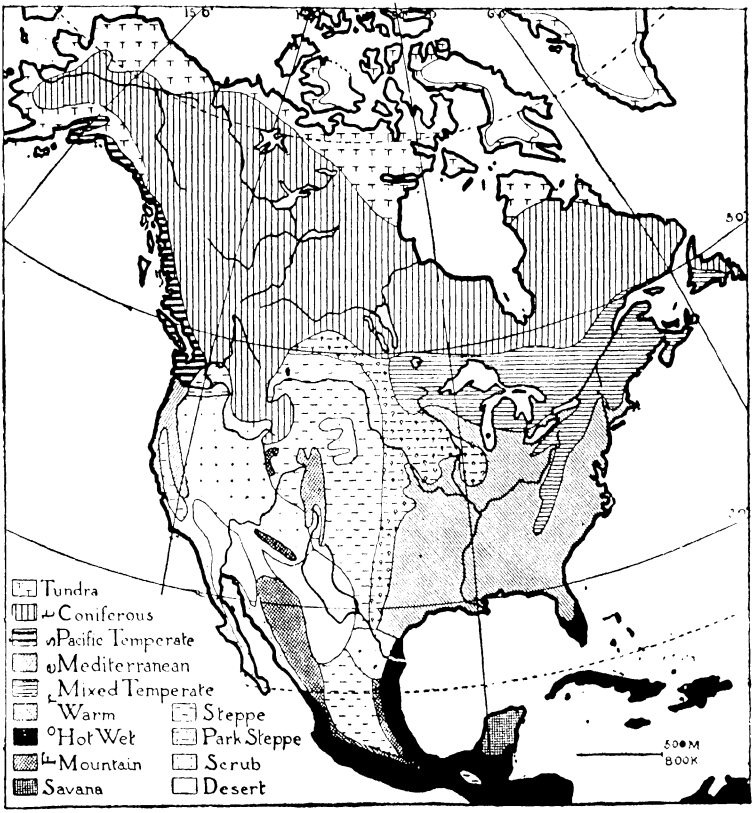


FIG. 225. Map showing the Distribution of Forests in North America.

animals are the domestic animals of the Old World, sheep, cattle, pigs, and horses, which are kept in great numbers (Fig. 226).

609. Minerals. Minerals are abundant in the western mountains and the Eastern Highlands. Coal and petroleum (or kerosene oil) are found in the lowlands (see Fig. 227).

610. Occupations. The occupations carried on in North America resemble those of Europe. Lumbering is extremely important in Canada, where the lumbermen go to the forests in winter to cut trees, which are dragged over the frozen ground to the rivers, to be floated down in spring. Fisheries

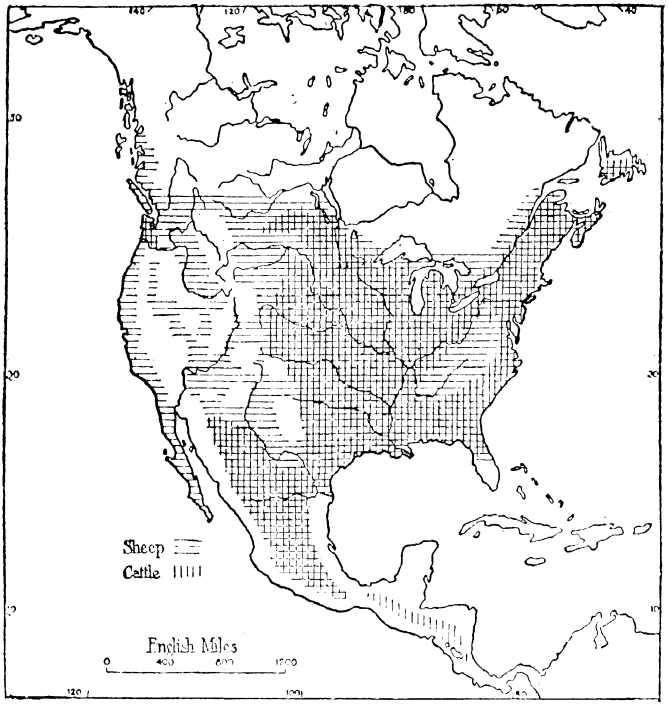


FIG. 226. Distribution of Sheep and Cattle in North America.

are important on both the Atlantic and Pacific coasts, as well as in the Arctic waters. The Central Lowland is agricultural in the east and south, and pastoral in the drier west. The Atlantic seaboard is densely peopled, with large and busy manufacturing cities, wherever coal and water-power are available, and numerous ports along the coast. The Pacific

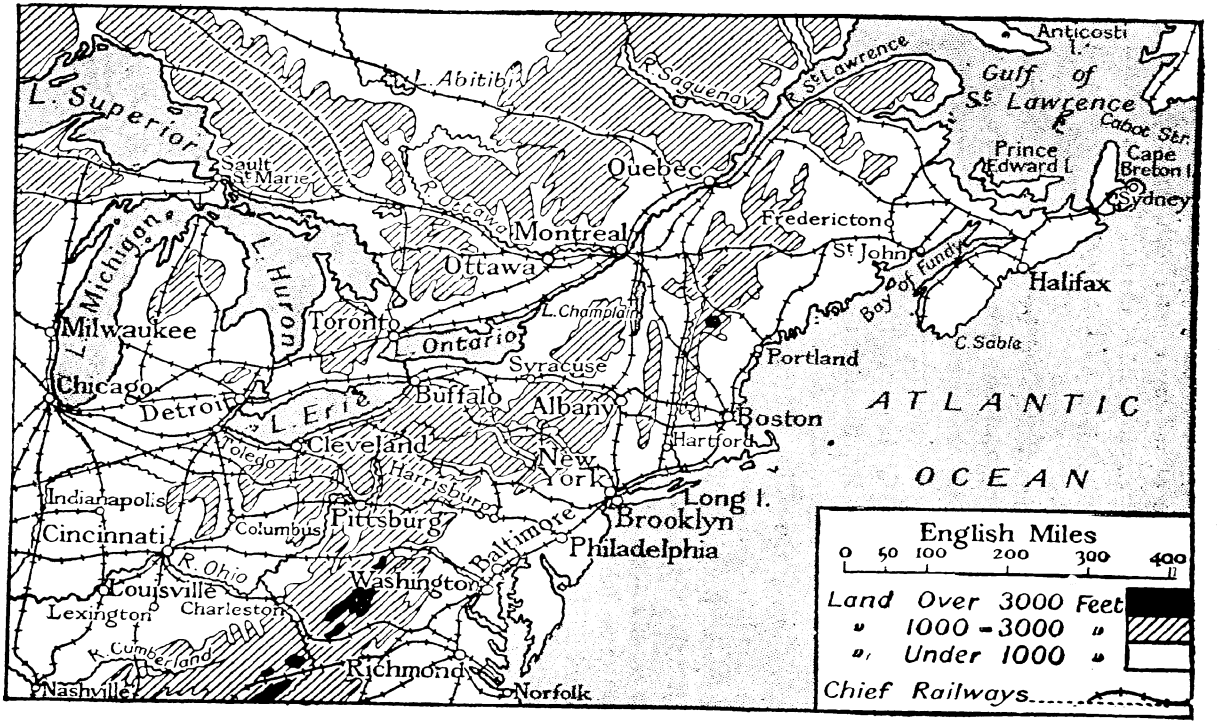


FIG. 227. Routes from the Great Lakes to the Atlantic.

seaboard is less developed, but there are several important ports. Several lines of railway cross North America from ocean to ocean. The eastern part of the continent is covered by a network of lines, joining all the important towns with each other (Fig. 227).

611. Peoples. When discovered by Europeans, America was inhabited by a reddish-brown, straight-haired race, called by the settlers Redskins or Red Indians. They depended for their living partly on agriculture, but chiefly on hunting the bison, which roamed in immense herds across the steppes. The bison have wholly, the red men largely, disappeared before the white man, and are now found only in special reservations in the plains, and in the mountains of the north and south. The Europeans who have replaced them are chiefly of Spanish descent in the south, and of British descent, with a large mixture from the continent of Europe, in the centre and north. There is a large population of French descent round the St. Lawrence. In the southern States are several millions of negroes, the descendants of slaves imported from Africa, chiefly in the seventeenth and eighteenth centuries, to work at agriculture in the hot south.

612. Political Divisions. The British lands of Canada and Newfoundland occupy the whole of the north, except Alaska in the north-west, which belongs to the United States. The Federal Republic of the United States stretches across the centre of the continent, from the Atlantic to the Pacific, and from British America to the frontiers of Mexico. The Republic of Mexico occupies the tapering southern portion of the continent between the Atlantic and the Pacific. Central America is divided between a number of small republics. The West Indies are divided among several powers. Cuba, the largest island, is a republic protected by the United States.

CHAPTER XXV

REGIONAL GEOGRAPHY OF NORTH AMERICA

613. British North America (area about 3,800,000 square miles) consists of the Dominion of Canada on the mainland, and the island colony of Newfoundland, which includes the east coast of Labrador on the mainland.

Canada and Newfoundland.

614. Boundaries. Canada is bounded north by the United States territory of Alaska, and the Arctic Ocean; and by the Pacific and Arctic Oceans on the west and east. The southern or United States boundary corresponds with no natural feature, except the Great Lakes, the northern shores of which are Canadian.

615. Yukon and British Columbia. The surface of Canada consists of a western mountain area, a central plain partly drowned by Hudson Bay, and highlands in the east. The northern part of the mountainous west forms the Yukon basin, a frozen land, with thin scrub on the hill-sides. The discovery of the rich gold-fields of the Klondike created Dawson City, which is reached by rail from Dyea through United States territory. The Klondike gold-fields can only be reached from Canada over difficult passes which are inaccessible for much of the year. South of the Yukon the land is a sea of mountains, with deep forested valleys very difficult to penetrate. On the Pacific coast these descend to deep fiords, bordered by islands, of which the most important is Vancouver, with Victoria, the capital of British Columbia, the mountain state of Canada. Vancouver City, on the mainland, on an inlet near the mouth of the Fraser, and Prince Rupert near the mouth of the Skeena, are the ends of railways which cross the continent. The Canadian Pacific Line from Vancouver is carried up the western slopes of the mountains by the gorge of the Fraser,

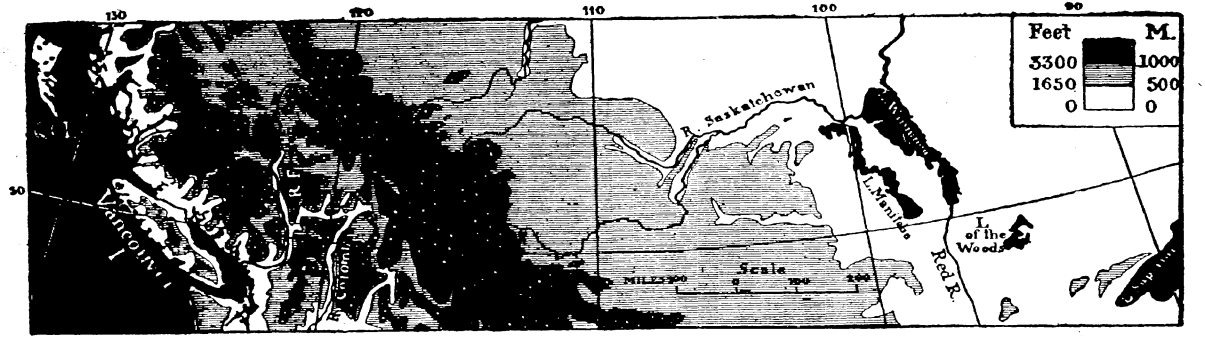


FIG. 228. Physical Features of Western Canada.

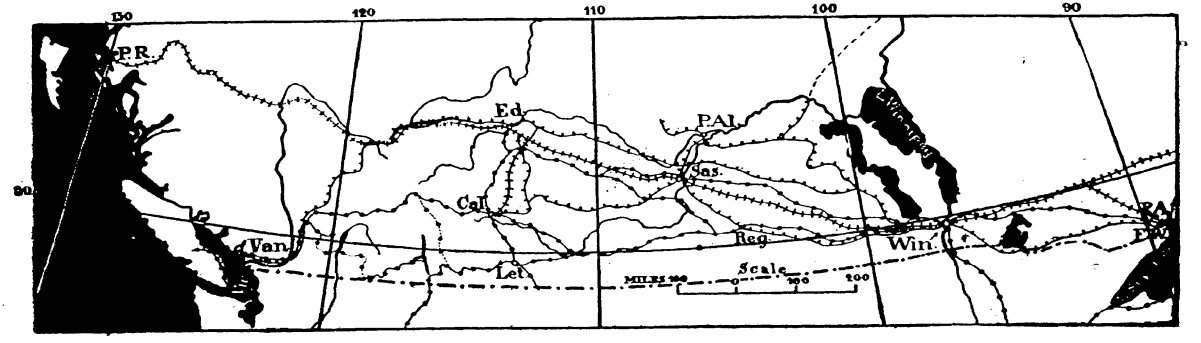


FIG. 229. Routes and Towns of Western Canada.

and then crosses the parallel Gold, Selkirk, and Rocky Mountains, through magnificent scenery of snow peak, glacier, pine forests, deep gorges, and roaring torrents. The floors of the valleys are fertile but thinly settled. In the eastern ranges gold, silver, and coal are abundant, and branch lines run to the mining districts.

616. **Alberta, Saskatchewan, and Manitoba.** The main line descends the eastern slopes of the Rockies to the plains, which in the west of Alberta are too dry for agriculture, and form great cattle ranches, or ranges. The winds which blow over them are dry, having parted with their moisture on the western slopes, and as they descend they become warm. Where these winds blow in spring the temperature rises rapidly, and snow disappears as if by magic. The line follows the valley of the Saskatchewan, the main stream of the Nelson, to the agricultural eastern plains. Here the cold is great in winter and the soil frozen, but when the spring thaws come wheat roots quickly in the moist soil. Light rains fall in early summer, when the ear is filling, and abundant sun ripens it. Southern Saskatchewan and Manitoba, and particularly the lake plain crossed by the Red River valley, are covered in summer with ripening wheat as far as the eye can reach. At the stations great go-downs are built, to which the grain is brought, to be carried eastward. Towns are growing rapidly as railways are built. The largest is Winnipeg, the capital of Manitoba, on the Red River, near Lake Winnipeg. Regina, Prince Albert, and Battleford in Saskatchewan; and Calgary and Edmonton in Alberta, should be looked out on the map. Fig. 230 shows the main lines (i) to Vancouver, (ii) to Prince Rupert, through fertile districts which are being rapidly settled. With its fertile soil, and numerous navigable rivers and lakes, it will become a prosperous agricultural region.

617. **Ontario and Quebec.** East of Manitoba the lines enter the forest area. At Fort William and Port Arthur, on Lake Superior, steamers are loaded with grain for the ports of East Canada and Europe. Ottawa, on the Ottawa River, the

Dominion capital, has a great lumber trade and many saw-mills driven by water-power from the Chaudière Falls. Montreal, on an island, where the Ottawa enters the St. Lawrence (see Fig. 230), is the chief commercial and manufacturing centre of Canada, and the busiest port, shipping the produce of its forests, ranches, and wheat lands, and the fruit and dairy produce of the Lake Peninsula. This, the richest part of

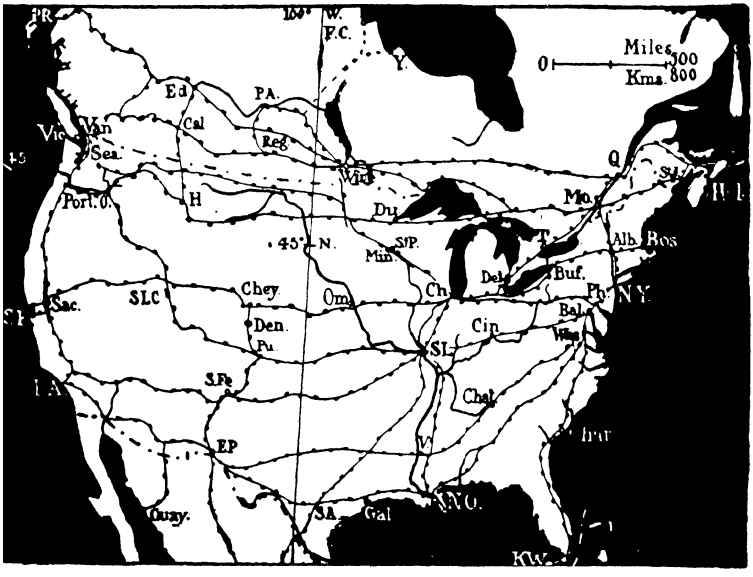


FIG. 230. Main Railway Routes of Canada and the United States of America.

Canada, lies between Lakes Huron, Erie, and Ontario, in the latitude of Southern France. It is covered with vineyards, orchards, market gardens, and dairy farms. Special fruit trains carry its fruits and vegetables to the market centres. Toronto, on Lake Ontario, is the chief town and manufacturing centre. Many busy towns lie on or near the northern shores of Ontario. Between Erie and Ontario are the famous Niagara Falls. To avoid them the Welland Canal has been cut. Another canal, the Soo, or Sault Sainte Marie, avoids rapids between Superior and Huron. With the aid of these canals there is through

connexion by the Great Lakes and St. Lawrence between Fort William and the ports on both sides of the Atlantic. Large ocean steamers come up the St. Lawrence as far as Montreal. At the head of the estuary is Quebec, finely built on heights commanding the river. In the fertile district south of the St. Lawrence, between Montreal and Quebec, a number of small manufacturing towns have grown up.

North of the St. Lawrence and the Great Lakes lumbering is the chief occupation. The Labrador peninsula, and the country round Hudson Bay, a land of lakes and forests, is visited only by hunters and fur-traders.

618. Maritime Provinces. New Brunswick, south of the St. Lawrence, is a forested hilly land, with fertile valleys. St. John, the capital, is a lumber and fishing port. The peninsula of Nova Scotia and Cape Breton Island are also forested, with rich pastures and orchards round Fundy Bay, which is remarkable for its high tides. The capital is Halifax, with a magnificent harbour. As the St. Lawrence is frozen in winter, Halifax and St. John, which are ice-free, are of great importance to Canadian trade. The mineral wealth of these eastern provinces is great. Nova Scotia has large coalfields, especially round Sydney, in Cape Breton Island, with great iron works. Prince Edward Island is covered with orchards and market gardens.

619. Newfoundland. Newfoundland is an undulating land of lake and forest. Its mineral wealth is great but undeveloped. Its cod and other fisheries are among the most important in the world. Fishing fleets sail from St. John's to the seal and whale fisheries of Labrador, Greenland, and the Arctic Seas.

The United States.

620. The Pacific States. The United States (area about 3,000,000 sq. miles), like Canada, consists of mountains in the west, plains in the centre, and highlands in the east. The western mountain area is much broader than in Canada, and drier. The Pacific is bordered by a coastal range, behind

where wheat is grown in the north, and maize in the centre. In the hotter south these cereals are replaced by cotton, tobacco, rice, &c. Most of the wheat is sent to Duluth, on Lake Superior, or Chicago, on Lake Michigan, to be shipped to the East, and Europe. Much, however, is converted into flour. Minneapolis, at St. Anthony's Falls, on the upper Mississippi, is the great milling centre. Of the many busy

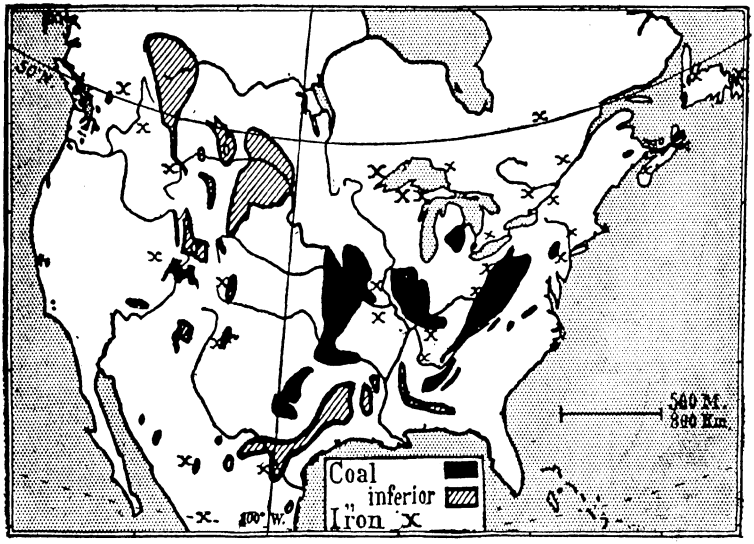


FIG. 232. Distribution of Coal in the United States.

towns of the Mississippi notice St. Louis, at the junction of the Missouri, in the centre of the maize zone (Fig. 230). St. Louis, Chicago, and other towns of the Mississippi, such as Omaha, are centres to which the live stock of the western ranches, and the hogs fattened on the maize lands are sent for slaughter and distribution. New Orleans on the delta, 100 miles from the sea, is the great cotton market and port. Many other gulf ports, of which Mobile may be noted are engaged in the same trade.

624. The Industrial Region of the Plains. South of the

Great Lakes is one of the greatest coalfields in the world, covered with manufacturing towns, of which Chicago (over 2,000,000 inhabitants), and Cincinnati and Pittsburg, on the upper Ohio, are the most important. Iron is brought from

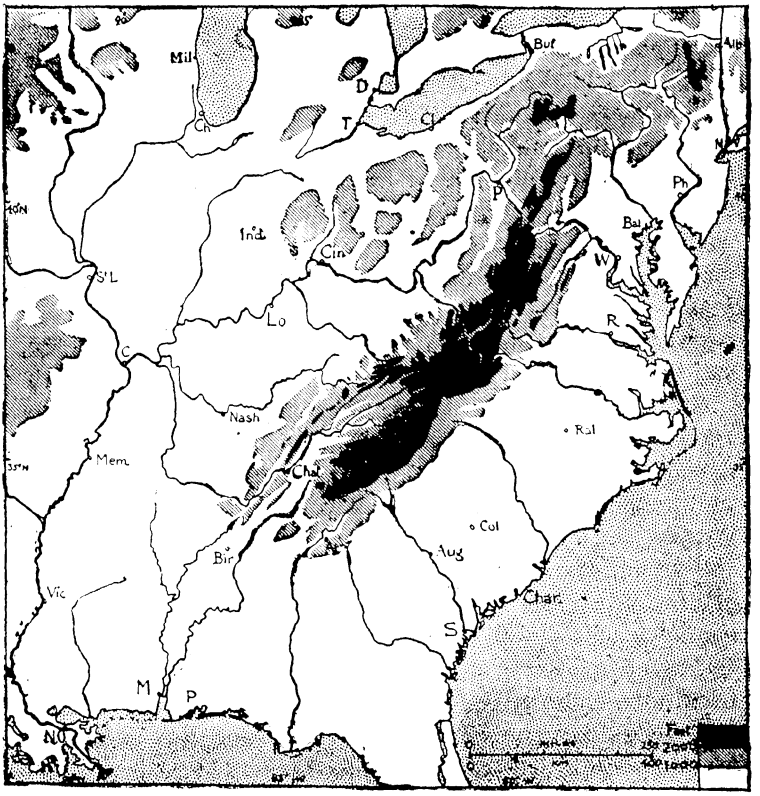


FIG. 233. The Appalachian Mountains.

Lake Superior to Cleveland and other lake ports, and manufactured in Pittsburg and the district. The wooded Appalachians, with fertile valleys, are still thinly peopled, except between the upper Ohio and the Atlantic, where coal is abundant (Fig. 232).

625. New England and New York. In New England the rivers from the highlands supply water-power to many busy manufacturing towns, such as Manchester and Fall River. The most important city is Boston, in Massachusetts, a great port. Look at Figs. 220, 233, and notice to the east of New England, the valley of the Hudson, continued by Lake Champlain, running due north to the St. Lawrence near Montreal. In the middle of the Hudson valley the Mohawk valley enters from the west, forming a natural route through the mountains to Lake Ontario and the west. The position of New York at the end of this Hudson-Mohawk route has been one of the chief causes of its importance. By this route are brought the agricultural and manufactured products of the interior, to be shipped from New York, on an island at the mouth of the Hudson, and now extending over the neighbouring islands and coasts. New York has a population of 5,000,000, and is the largest city in the world after London.

626. Other Atlantic States. Other important Atlantic ports are Philadelphia, an engineering and manufacturing centre, at the mouth of the Delaware, with over 1,500,000 inhabitants, and Baltimore on Chesapeake Bay. South of Baltimore is Washington, the Federal capital and the seat of the legislature and administration. South of Chesapeake Bay the coastal plain widens into a large lowland, which is continuous south of the Appalachians with the Central Plain. In the north tobacco and maize, and in the south cotton and rice, are the chief crops. Charleston exports cotton. The Atlantic coast is bordered by swamps and lagoons south of Chesapeake Bay, and in Florida, where orange groves and fruit gardens cover large areas.

627. Alaska, a territory of the United States, is a mountainous land, highest in the south. It is valuable chiefly for its gold, which is found in the sands of sea and river as well as in the rocks. The Yukon is navigable for a few months in summer, and is the chief means of communication. The capital is Sitka, on an island in the south. Off the Alaskan coast and in the Bering Sea are important seal fisheries.

Mexico.

628. Position and Divisions. The republic of Mexico (area about 767,000 sq. miles) occupies a plateau, rising east and west to lofty mountains continuous with the Rocky Mountains, and to a volcanic chain which borders it in the south (Fig. 220). Beyond the isthmus of Techuantepec and the Yucatan peninsula are lowlands. The coast is sandy and good harbours are few. Vera Cruz, in the south-east, is the best.



FIG. 234. Plant Products of Mexico, Central America, the West Indies, and Venezuela.

The tropic of Cancer crosses southern Mexico, which receives little rain in the interior. Its varied elevation gives it several zones of climate. Along the coast and up to 3,000 feet is the hot belt, producing tropical products. The coco-nut flourishes near the sea, mahogany and other fancy woods, logwood and other dye woods, are found in the forests. Rice, sugar, cotton, cacao, and tobacco are largely cultivated. In the warm zone, between 3,000 and 7,000 feet above sea-level, coffee, bananas, rice, sugar, cinchona, oranges and other southern fruits, maize and other cereals are grown where there is enough moisture for irrigation. Aloes and cactuses are common plants

in the drier parts. Above 7,000 feet, in the cool zone, cereals are grown (Fig. 234).

629. **Minerals, Towns and Routes.** The mineral wealth of Mexico is very great, especially in silver. The railways climb from the coast to the plateau, and run from the volcanic range north to the United States. An important line crosses the isthmus of Techuantepec. The capital is Mexico, on a high plain, near the base of Popocatapetl. Guadaljara, Pueblo, and other large towns have grown up in the silver districts. Vera Cruz and Tampico are the chief ports in the Atlantic, and Mazatlan on the Pacific coast.

Central America.

630. The small republics of Guatemala, Honduras, Salvador, Nicaragua, Panama, and Costa Rica, with British Honduras, occupy the narrow neck of Central America (area over 200,000 sq. miles). They lie within the tropics, and receive abundant rains, mainly in summer, and heaviest in the east except in the extreme south, where the west is also very wet. The wet slopes are the most densely forested (Fig. 224). As in Mexico, three vertical zones—hot, warm, and cool—can be seen. The lower hot belt is covered with dense forests, producing cocoanuts, rubber, mahogany, bananas, pineapples, and other fruits. Cotton is grown in the lower grounds, and cacao on the hill slopes. The temperate lands are also forested, but the drier parts are grasslands where cattle are kept. Coffee and tobacco are grown in the warm zone. In the cool lands, wheat and potatoes are grown. The west is the cultivated and most populous side (Fig. 234). The Panama isthmus is more than 40 miles wide, and across it a great ship canal joins the Atlantic to the Pacific.

The West Indies.

631. The West Indies consist of the large islands of Cuba, Jamaica, Hispaniola, and Porto Rico, forming the Great Antilles, and the smaller islands forming the Lesser Antilles.

All of them are mountainous, many of them volcanic, and most of them densely forested, especially on their eastern slopes. The climate is tropical, with rains in summer and autumn. Sugar is the most important product, but tobacco, coffee, bananas, and other products are increasing in importance.

Cuba, a republic under the protection of the United States, is nearly as large as England. It is densely forested. Among the forest trees are many kinds of palms, mahogany, and many tropical fruit trees. Sugar and tobacco are the chief cultivated crops. The capital is Havana.

Hispaniola is divided into the republics of Haïti and San Domingo, producing sugar, cotton, &c.

Porto Rico is a mountainous possession of the United States. It has grasslands on the upper slopes, where the forests have been cleared, and plantations of sugar and coffee at lower levels.

632. British Islands. Jamaica is a mountainous island, with numerous rivers. It produces excellent coffee, especially on the Blue Mountains in the east, sugar, cacao, ginger, allspice, tobacco, and many varieties of fruit. The export of bananas is becoming very important. Kingston is the chief town and port.

The other British islands are grouped into the (*a*) low Bahama coral islands, producing pineapples and sisal hemp; (*b*) the Leeward Islands, of which Antigua, the seat of government, with fields of sugar-cane and pineapples, and the mountainous island of Dominica yielding coffee, are the chief; (*c*) the forested volcanic Windward Islands, St. Lucia, St. Vincent and Grenada, producing sugar and cacao; (*d*) Barbados, dotted with the sugar plantations of its negro inhabitants; and (*e*) Trinidad, close to the South American coast, important for cacao, and for a great pitch lake.

CHAPTER XXVI

SOUTH AMERICA

633. Position. The continent of South America is broadest in the north and narrows to the south. It stretches between 12° N. and 55° S., if we include the islands forming the southern extremity, of which the largest is Tierra del Fuego, separated from the mainland by Magellan Strait. It is surrounded on all sides by the sea, except in the north, where it joins the narrow neck of Central America. The Pacific washes its western and the Atlantic its southern shores. Its area is about 7,000,000 sq. miles. Notice in Fig. 218 that no part is 1,000 miles from the sea.

634. Physical Features. The general arrangement of highlands and lowlands is the same as in North America. There is a high mountain area in the west, lowlands in the centre, and highlands in the east.

The proportion of lowland is greater in South America than in any other continent except Europe, and the proportion of land over 10,000 feet is also greater than in any other continent except Asia.

635. The Andes. The western mountain area, or Andes, is narrower and higher than that of North America. In the north, three ranges from the Caribbean Sea converge to the high narrow plateau of Ecuador, which lies about 8,000 feet above the sea. This is bordered by lofty ranges, about 12,000 feet in height, but rising in Chimborazo to over 20,000 feet, and almost as high as the volcanic cone of Cotopaxi. Other magnificent snow peaks rise from 17,000 to over 19,000 feet, including several volcanoes. Both the Atlantic and Pacific slopes are densely forested. South of Ecuador the Andes of Peru are still threefold, with a high cold plateau between the western and central chains, and a broader and more fertile region between the central and eastern ranges. The height of the chains is about 13,000 feet, with peaks rising to 19,000

feet. In this section rise the Amazon and its tributaries. Bolivia, to the south, is a high plateau, about 12,000 feet above the sea, and enclosed by lofty ranges which contain some of the highest peaks in South America. Sorata and other peaks rise to nearly 22,000 feet. Lake Titicaca, in the north-eastern part of the plateau, is a basin of inland drainage. South of the Bolivian plateau the ranges converge to one main chain, where Aconcagua, the loftiest mountain of the New World, rises to over 23,000 feet. South of it is the Uspallata, or Cumbre Pass, from Argentina, on the east, to Chile on the west, one of the most important passes in the Andes, and the route taken by a railway. The range continues to the south with snow peaks, volcanic cones and glaciers, the eastern valleys containing numerous lakes, and the western slopes forming fiords and islands.

The coastal range is not always so well marked as in North America. Notice the valley of Chile, between the Andes and the coast range. It may be compared with the valley of California, while the sounds and islands of Southern Chile recall British Columbia.

636. **The Eastern Highlands** consist of the Guiana Highlands in the north-east, separated by the Amazon basin from the Highlands of Brazil. Both are forested tablelands, cut by deep gorges, to which the rivers descend in magnificent falls. The Brazilian Highlands rise steeply from the Atlantic and slope to the west.

637. **The Rivers.** The plain between the Andes and the Eastern Highlands is drained by three great rivers, the Orinoco, between the Andes and the Guiana Highlands, the Amazon, between the Guiana and Brazilian Highlands, and the Paraguay-Parana, south of the Brazilian Highlands (Figs. 235, 236).

638. **The Orinoco** rises in the tropical forests of the Guiana Highlands and divides into two branches. Notice that one of these, the Cassiquiare, flows to the Negro, a tributary of the Amazon, connecting the two river systems. The main stream of the Orinoco flows round the western base of the Guiana

Highlands, receiving many long, parallel tributaries from the west, navigable to the base of the Andes, which descend very steeply to the lowlands. The river crosses the llanos, or savana

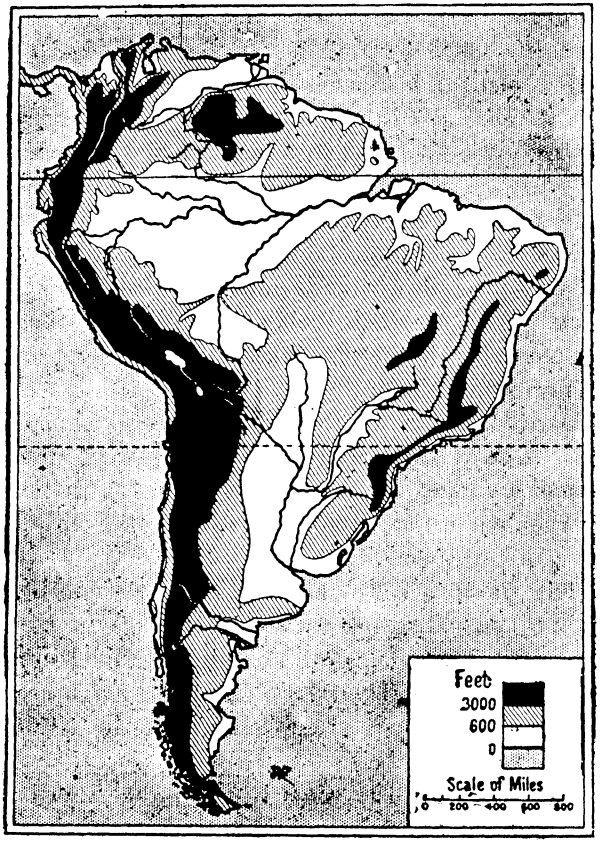


FIG. 235. The Physical Features of South America.

lands of Venezuela, and enters the sea by a great delta, through densely forested swamps.

639. **The Amazon** rises in the Andes of Peru, by two main streams, the Marañon, between the western and central Andes of Peru, and the Ucayali, which rises farther south in the eastern chain. The Marañon cuts its way through the two

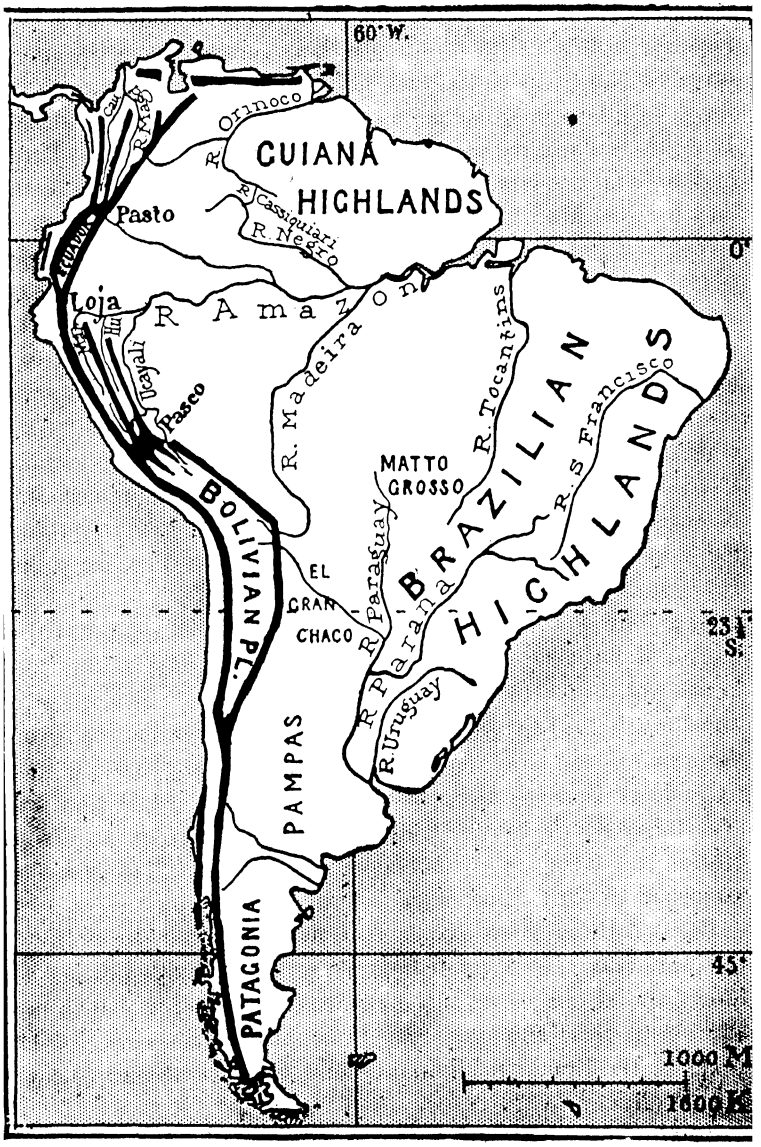


FIG. 236. Key to Relief Map of South America.

outer ranges of the Andes, and joins the Ucayali, both rivers forming numerous falls and rapids, as they descend the steep forested slopes to the plains. The united river is navigable for the remainder of its course, a distance of over 3,000 miles. It receives many tributaries from the Andes of Ecuador, Peru, and Bolivia, the largest being the Rio Negro on the left bank, and the Rio Madeira on the right bank. Both are immense rivers, and the Amazon itself is as broad as an inland sea. In places its depth is as much as 120 feet, and the volume of water it carries to the ocean is very great. For the whole of its course it flows through dense tropical forests, often breaking up into parallel streams, and having very many forested islands on its broad waters. It enters the sea by a great estuary, up which the tides rush with great force. The estuary is nearly filled by the island of Marajo, not much smaller than Scotland. Notice on the map the Para river, the channel generally used for ships entering the Amazon, and the Tocantins, from the Brazilian Highlands, which enters it.

640. The Plate Rivers, &c. The land which separates the basins of the Amazon and the Parana-Paraguay is low, and in the wet season the two systems are joined. The Paraguay flows south through open forests, receiving the Parana from the open forests of the Brazilian Highlands. The united river flows through the grassland or pampas of Argentina, and turns south to the Plate estuary, or Rio de la Plata. Notice the Uruguay, which also flows to the Plate estuary almost in the same line as the middle Parana.

Besides these great rivers two others should be noticed, the Magdalena, with its tributary the Cauca, both flowing in long parallel gorges from the Andes of Ecuador, north to the Caribbean Sea, and the São Francisco, which rises in the south of the Brazilian Highlands and flows north and east to the Atlantic.

South of the Plate estuary a number of short rivers drain the eastern slopes of the Andes, not all of which reach the ocean.

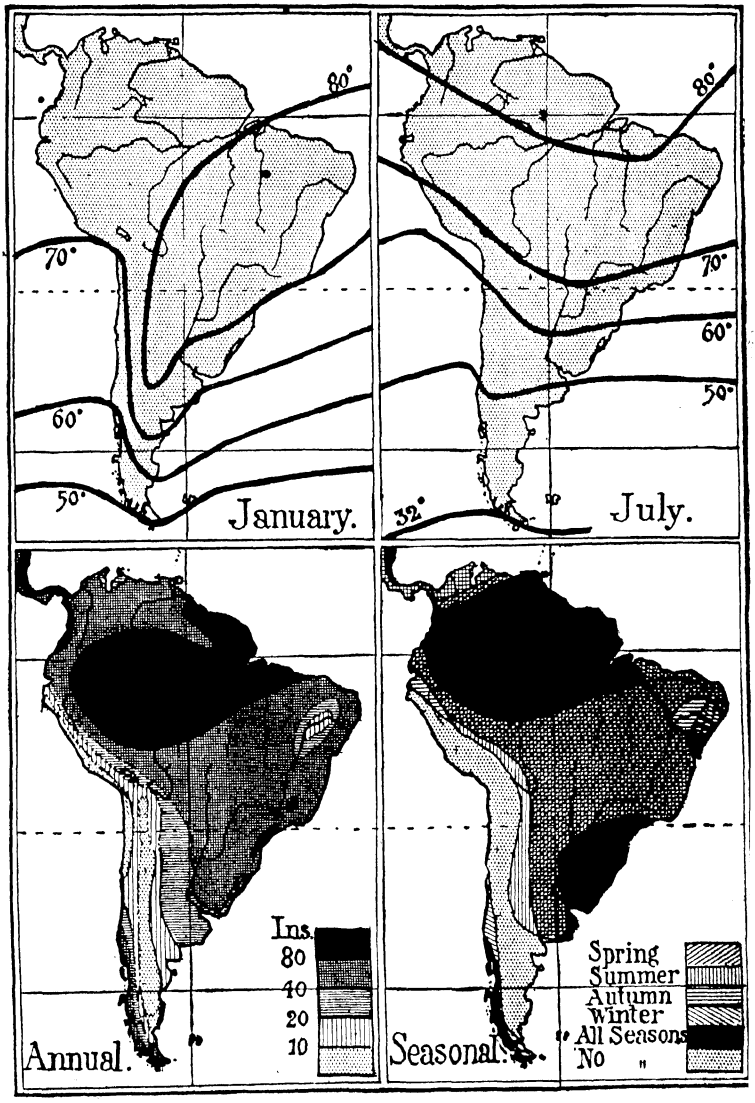


FIG. 237. Mean Temperature of South America in January reduced to sea-level.
FIG. 238. Mean Temperature of South America in July reduced to sea-level.
FIG. 239. Mean Annual Rainfall.
FIG. 240. Seasonal Distribution of Rainfall in South America.



FIG. 241. Economic Products of South America.



FIG. 242. Railways of South America.

641. Climate and Products. Notice that South America is broadest just south of the equator, where South Africa contracts in width. Also that the greater part of the land lies within the tropics, but that south of the tropic of Capricorn it narrows rapidly. Over the greater part of the continent, therefore, the temperature is high at all seasons, and except in the mountain area, where the hot, warm and cool belts are found, there is no great range of temperature. Notice that in the lowlands the greatest range of temperature is found in the upper Paraguay basin (Figs. 237, 238). South of the tropic of Capricorn the temperature falls, and in the extreme south, in the latitude of Ireland, the temperature is like that of Ireland.

Look at the rainfall map in Fig. 239 and notice in the lands east of the Andes the great breadth of the equatorial rain belt, which is the largest area of heaviest rains in the world, and also that the Andes form a barrier to the trade winds.

642. Vegetation. The great volume of the Amazon and the density of the tropical forests are both due to the immense rainfall of this region. It would be impossible to give any idea of the richness of this forest, the extent of which is little less than that of Europe. Rubber is an important product. Palms, figs, mimosa, and bamboo are common trees, and these are covered with creepers and parasites of many kinds. This great forest area—the selvas—is still little known, except round the rivers, and the density of its vegetation makes it very difficult to penetrate. North and south of this belt of equatorial rains and dense forests are regions with summer rains, forming opener woods, as in the campos of Brazil, and savanas, as in the llanos of the Orinoco or the pampas of the Plate basin. These belts may be compared with the corresponding belts in Africa. In the extreme south the country is drier, with slight winter rains on the coast. West of the Andes, from the Gulf of Guayaquil northwards rain is abundant, but southward the western coast, lying in the lee of the trade winds, is a rainless desert, corresponding in position with the Kalahari and Australian deserts, but very narrow, owing to the near approach

of the Andes to the sea. The Chilean valley has the Mediterranean climate of dry summers and winter rains. South of 42°, where the coastal range breaks up into islands, rain falls at all seasons of the year, as in British Columbia, or northern Europe. Evergreen pine woods clothe the slopes of the mountains. On the eastern slopes, where little rain falls, are the thorny scrub lands of Patagonia.

643. Animals. Many of the animals of South America are found only in that continent. Neither the elephant nor the hippopotamus of the Old World is found. The lion is represented by the puma, and the tiger by the jaguar. The llama, or South American camel, is used on the high passes of the Andes, as the yak is used in Tibet. The alpaca, belonging to the same family, domesticated for its wool, is also found in the Andes, in which the common bird is the great condor. Many beautiful small birds flit through the tropical forest, including the humming-bird and the bird of paradise.

The domesticated animals of Europe have been introduced outside the forest and mountain area, and sheep, cattle, and horses are kept in large numbers on the pampas (Fig. 241).

644. Occupations. South America contains but a small part of the population which its great natural wealth could support. The inhabitants number about 50,000,000 and are at all stages of civilization. In the tropical forests are wandering tribes, ignorant of agriculture and the arts of life, who live by fishing and gathering forest produce. At the other extreme are the great cities of Buenos Aires (1,400,000 people) or Rio Janeiro (1,130,000 people), with enormous populations, flourishing industries, and all the comforts of the modern world. The forest is yet little used, except for the collection of rubber. The grasslands are among the great cattle-rearing regions of the world. Agriculture is carried on all round the margin of the continent, as well as on the mountain slopes and plateaus, and in the lowlands of the Magdalena and Plate basin. For the chief plants cultivated see Fig. 241. Manufactures are little developed, but are growing in the large cities.

645. Races. The bulk of the white population is of Spanish descent on the eastern, and of Portuguese descent on the western side of the continent, with a large proportion of Germans in Brazil, and of British in British Guiana, Chile, and Argentina. Both Spanish and Portuguese have intermarried with the native Indians, forming a mixed race. The Indian tribes are more numerous than in North America, especially in the mountains and forests.

646. Political Divisions. The Andes form the states of Colombia, Ecuador, Peru, Bolivia, and Chile. East of Chile extends the great lowland country of Argentina, with the smaller states of Uruguay and Paraguay, round the rivers of the same name. Brazil occupies in the north-east an area equal to that of Europe. On the north lie Venezuela, and British, Dutch, and French Guiana. Except the three last, all are republics. The chief towns and routes are shown in Fig. 242.

647. Colombia. Colombia (440,000 sq. miles) consists of a coastal strip, a high Andean region, the lowlands of the Magdalena and Cauca, and the llanos in the east. The coast and Andean region have four climate and vegetation zones: (1) the hot belt with sugar, cacao, and tropical fruits up to 3,000 feet; (2) the warm belt with temperate products, well suited to coffee and maize, up to 6,500 feet; (3) the cool belt, up to 10,000 feet, suited for northern fruits and cereals; (4) the treeless paramos, over 10,000 feet. Cattle are kept on the llanos, round the Cauca, and on the lofty plateau of Bogota. Railways hardly exist, roads are bad, and the Magdalena is the chief means of communication between the interior and the coast. The capital is Bogota, nearly two miles above sea-level.

648. Ecuador. Ecuador (116,000 sq. miles) consists of the coast and Andean area, the eastern slopes of which descend to the tropical forests of the Amazon basin. In climate and productions it resembles Colombia. Both east and west are densely forested, except in the higher parts. The cinchona

tree is of great importance for the manufacture of quinine. A railway climbs from Guayaquil on the coast to Quito, over 9,000 feet above the sea.

649. Peru. Peru (680,000 sq. miles) consists of the coast, the Andean area, rich in minerals, and tropical forests in the Amazon basin. The coast is a desert, crossed by fertile valleys, in which are grown cotton, sugar, tobacco, rice, &c. Alpacas and vicunas are numerous in the mountains, producing excellent wool. The eastern forests supply cinchona and rubber, and cacao is largely cultivated. Mining, especially silver and copper, is important in many parts of the mountain area. Railways climb from the coast to Pasco, the centre of the silver district, and to Lake Titicaca on the Bolivian plateau. The capital is Lima, with Callao as its port.

650. Bolivia. Bolivia (70,000 sq. miles) has no coastal area, but consists of the Andean region in the west, and of the forested Amazon lowlands in the east. Mining is important in many parts. Alpacas and vicunas yield large quantities of wool. The eastern valleys produce cinchona and the finest qualities of cacao and coffee. In the forests rubber is an important product. The chief town is La Paz, near Lake Titicaca, the centre of the cinchona trade. From Southern Bolivia a line runs over the southern Andes to Antofagasta in Northern Chile.

651. Chile. Chile (290,000 sq. miles) is a long narrow country, larger than any European country but Russia. The northern part of it consists of the Atacama desert, from which are obtained large quantities of nitrates, one of the best known means of enriching soil. The valley of Chile is very fertile, producing Mediterranean fruits and cereals, of which the vine, grown for wine and raisins, is the most important. In the centre is the capital, Santiago, a handsome modern city, connected by a railway over the coastal range with its port, Valparaiso. Concepcion is the chief town in the south, near a coalfield. Punta Arenas, in the south, is in a gold-mining, sheep-rearing district. The southern fisheries are important.

Much of Chile, especially in the forested areas, is undeveloped, but the country is advancing rapidly. A railway crosses the Andes by a tunnel under the Uspallata Pass to Buenos Aires.

652. Argentina (1,150,000 sq. miles), **Paraguay** (170,000 sq. miles), and **Uruguay** (71,000 sq. miles), the countries of the Plate basin, together occupy an area half the size of Europe. At the western foot of the Andes the climate is dry. In the south, warm winds clear the ground of snow and allow of cattle-raising, as in Alberta. The north is too hot and dry for cultivation, except under irrigation, when sugar, tobacco, the vine and other southern fruits can be grown, round Tucuman and other centres. On the pampas vast quantities of cattle are kept, and the making of meat extract is an important industry. The eastern part, round the Parana and Uruguay, is a great wheat and maize growing region. Large quantities of cereals are exported, from Rosario on the Plate estuary, Buenos Aires, the capital of Argentina, La Plata, and Montevideo, the capital of Uruguay. The capital of Paraguay is Asuncion.

The railways of Argentina are well developed, connecting all the important centres. The trans-continental line is carried by Mendoza to Las Cuevas, which will be the Argentine end of the tunnel under the Andes.

653. The Falkland Islands (6,500 sq. miles), off the extreme south-east of Argentina, are British. The climate is cold and rainy. Sheep-rearing is the chief work. Port Stanley, on the eastern of the two islands, is the chief town.

654. Brazil. Brazil (3,200,000 sq. miles) lies between the tropics, except in the extreme south. It is almost as large as Canada or the United States. The greater part of it is occupied by the vast Amazon forest, the rest by the savanas and campos of the Brazilian Highlands. The vast forested interior is little developed, and large areas are not even explored. Cattle are kept in the southern savanas. The highland margin, round São Paulo, is a coffee-growing district

the port of which is Santos. The towns are almost all on the coast, though Manaos, at the confluence of the Amazon and Negro, is an important port. Para, or Belem, at the mouth of the Para river, is the great port for rubber and forest produce. Pernambuco, and Bahia or San Salvador, are the ports for the agricultural districts, in which sugar, cacao, and tobacco are grown. The capital is Rio de Janeiro, one of the largest cities of the New World, on a magnificent bay, backed by mountains. Railways are developing in the east.

655. The Guianas. The Guianas consist of unhealthy lowlands, densely forested, rising to the Guiana Highlands in the south. Sugar, cacao, coffee, and cotton are grown on the irrigated coastal plains. In the south of British Guiana are rich but inaccessible gold-fields. The capital of British Guiana (190,000 sq. miles), or Demerara, is Georgetown. Paramaribo is the capital of Dutch Guiana (46,000 sq. miles), and Cayenne of French Guiana (30,000 sq. miles).

656. Venezuela. Venezuela (400,000 sq. miles) consists of three very different regions. The first is the eastern end of the Andes, where the valleys and slopes are cultivated with sugar, cotton, cacao, and other tropical products. This is the only settled part of the country. The capital is Caracas, lying in a fertile valley behind the coastal range, which is crossed by a railway to the port, La Guaira. The second region is the lowlands of the Orinoco, a cattle country, as yet little developed. The third is the forested western slopes of the Guiana Highlands, little known, except round the gold-fields in the north.

INDEX.

[*The reference is to pages.*]

Aar R., 309.
Aberdeen, 244.
Aberystwyth, 219.
Abu, 158.
Achill Is., 254.
Aconcagua, 391.
Adaipur, 158.
Addis Abbeba, 341.
Adelaide, 361.
Adrianople, 320.
Aegean Sea, 310.
Afghanistan, 130, 132, 180.
Agra, 111, 130, 147.
Agulhas Banks, 70.
Ahmedabad, 142, 144.
Airdrie, 240.
Aire R., 216.
Ajmer, 158.
Alaska, 386.
Alaskan Mts., 367.
Albania, 320.
Albans, St., 232.
Albany, 363.
Albert, Prince, 379.
Aldershot, 234.
Aleppo, 176.
Aleutian Is., 10.
Alexandria, 341.
Alexandrina, L., 354.
Algiers, 338.
Allahabad, 147.
Allier R., 297.
Alloa, 241.
Alps, 307.
Alps, Southern, 363.
Alwar, 158.
Amazon R., 102, 391, 392.
Amiens, 301.
Amritsar, 150.
Amu Daria, 163, 164.
Amuria, 92.
Andalusia, 306.
Andes, 73, 390.
Andorra, 282.
Andrews, St., 242.
Angeles, Los, 382.
Angola, 346.
Antarctica, 90.
Antigua, 389.
Antinanarivo, 351.
Antwerp, 301.
Aorangi, 363.
Appalachians, 21, 385.
Apulia, 317.
Arabia, 160, 180.
Arabian Desert, 66, 99.
Arabian Sea, 160.
Aral, Sea of, 163.
Aravalli Mts., 127.
Arbroath, 242.
Ardennes, 297.
Argentina, 401.
Armagh, 249.
Armenia, 151.
Arthur, Port, 179, 184.
Arthur, Port (Am.), 379.
Arundel, 234.
Ascension, 352.
Ashby-de-la-Zouch, 224.
Assam, 113, 126, 127, 128, 130, 152.
Astrakhan, 325.
Atacama Desert, 66.
Atbara R., 339.
Athelney, I. of, 223.
Athens, 321.
Atlas Mts., 327, 337.
Auckland, 364.
Augsburg, 293.
Australia, South, 361.
Australia, West, 361.
Australian Alps, 353.
Australian Desert, 66, 99.
Auvergne, 21.
Avoca, 255.
Ayr, 240.

Baghdad, 177.
Bahamas, 389.
Bahia, 402.
Baikal, L., 167.
Baku, 176.
Balbriggan, 251.
Ballarat, 361.
Ballinasloe, 253.
Ballyshannon, 248.
Balmoral, 244.
Baltimore, 386.
Baluchistan, 154.
Banbury, 227.
Banff, 244.
Bangalore, 156.
Bangkok, 182.
Bangor, 221.
Bangweolo, L., 346.
Bankipur, 145.
Barbados, 389.
Barcelona, 306.
Barka, 338.
Barmen-Elberfeld, 296.
Barmouth, 219.
Barnsley, 214.
Baroda, 156.
Barry, 220.
Basel, 311.
Basin, Great, 367.
Basra, 177.
Bassein, 152.
Batavia, 182.
Bath, 227.
Bathurst, 361.
Battleford, 379.
Bear I., 254.
Bechuanaland, 351.
Bedford, 232.
Belfast, 249.
Belgrad, 320.
Belt, Great, 288.
Belt, Little, 288.
Benares, 111, 148.
Bendigo, 361.
Bengal, 136.
Bengal, Bay of, 160.
Benue, 346.
Bergen, 285.
Berlin, 82, 291.
Bern, 312.
Betwa R., 146.
Bhamo, 152.
Bharatpur, 158.
Bhatgaon, 158.
Bhutan, 130.
Bida, 346.
Bihar, 129, 145.
Bikanir, 158.
Bilbao, 306.
Birkenhead, 216.
Birmingham, 223.
Biwa, L., 187.
Blackburn, 216.
Blagovestschenk, 179.
Blanc, Mt., 307.
Blantyre, 347.
Bloemfontein, 350.
Blue Mts. (Aust.), 353.
Blue Mts. (W. I.), 389.
Bodmin, 222.
Bogota, 399.
Bohemia, 285, 313.
Böhmer Wald, 290.
Bokhara, 133, 178.
Bolivia, 400.
Bologna, 316.
Bolton, 216.
Boma, 346.
Bombay, 113, 130, 133, 142.
Bordeaux, 303.
Borneo, 182.
Boston (Mas.), 386.
Boulogne, 301.
Bournemouth, 236.
Bradford, 214.
Braemar, 244.
Brahmaputra R., 113, 131, 165.
Brazil, 401.
Brecon, 220.
Bremen, 293.
Brenner, 310.
Brest, 302.
Breton, Cape, I., 381.
Brighton, 233.
Brindisi, 317.
Brisbane, 360.
Bristol, 221, 227.
Brixham, 222.
Broken Hill, 361.
Bromsgrove, 225.
Brunswick, 293.
Brunswick, New, 381.
Buckingham, 227.
Buckingham Canal, 140.
Budapest, 314.
Buenos Aires, 84, 401.
Burma, 128, 151.
Burma, Plain of, 166.
Burton-on-Trent, 225.
Bury, 216.
Bushire, 178.
Buxton, 213.

Cadiz, 306.
Caerleon-on-Usk, 221.
Cairngorm, 244.
Cairo, 341.
Calabria, 317.
Calais, 301.
Calcutta, 113, 133, 137.
Caledonia, New, 365.
Calgary, 379.
California, 82.
Callao, 400.
Cambodia, Plain of, 166.
Cambridge, 228.
Campbeltown, 244.
Campos, 101.
Campsie Fells, 239.
Canary Is., 352.
Canberra, 359.
Cantabrian Mts., 304.
Canterbury, 234.
Canterbury Downs, 364.
Cape Town, 351.
Caracas, 402.
Cardiff, 220, 221.
Carlisle, 211.
Carnarvon, 221.
Cascade Mts., 367.
Cassiquiare R., 391.
Castlecomer, 255.
Castleford, 214.
Catania, 317.
Caucasia, 176.
Caucasus, 163, 164.
Cawnpore, 147.
Cayenne, 402.
Celebes, 182.

Cenis, Mt., 310.
Cette, 304.
Cettinye, 320.
Cevennes, 299.
Ceylon, 100, 116, 126.
Chad, L., 343.
Channel Is., 256.
Charnwood Forest, 224.
Chaudière Falls, 380.
Chemnitz, 291.
Chemulpho, 186.
Chenab R., 157.
Chepstow, 221.
Cherrapungi, 121.
Chesapeake Bay, 33, 370.
Chester, 216, 221.
Chesterfield, 214.
Chicago, 384.
Chile, 400.
Chimborazo, 390.
China, East, Sea, 161.
China, South, Sea, 161.
Chittagong, 136.
Chota Nagpur, 128.
Christchurch, 364.
Christiania, 285.
Cincinatti, 385.
Clear I., 254.
Cleveland, 385.
Cleveland Hills, 213.
Clonmel, 255.
Clyde, Firth of, 192.
Coatbridge, 240.
Cobar, 361.
Coblenz, 295.
Colchester, 229.
Coleraine, 249.
Collie, 363.
Cöln, 296.
Colombia, 399.
Colombo, 117.
Colorado R., 21, 367.
Columbia R., 16, 367.
Concepcion, 400.
Congo R., 19, 102, 346.
Connaught, 256.
Constance, L., 294.
Constantinople, 319, 321.
Conway, 221.
Coolgardie, 363.
Coorg, 126.
Copenhagen, 289.
Cork, 255.
Coromandel Coast, 114.
Corrib, L., 253.
Corsica, 317.
Costa Rica, 388.
Cotopaxi, 390.
Coventry, 225.
Cowdenbeath, 242.
Cracow, 313.
Crete, 321.
Crewe, 221, 225.
Cromarty, 245.
Cromer, 229.
Cuba, 389.
Curragh, 256.
Cuttack, 146.

Dacca, 138.
Dakar, 345.
Dalmatia, 313.
Dalnyi, 184.
Damascus, 170.
Damodar, 128.
Danube R., 266, 309.
Darjiling, 107, 113, 126, 136.
Darlington, 213.
Dartmoor, 222.
Darwin, Port, 361.
Dawson City, 377.
Deal, 233.
Dean, Forest of, 221.
Deccan, 33, 113, 160, 166.
Dee R., 195.
Delagoa Bay, 350.
Delaware R., 370.
Delhi, 111, 150.
Denver, 382.
Derby, 225.
Derwent R., 217.
Devonport, 222.
Dharwar, 142.
Dholpur, 158.
Dibrugarh, 153.
Dijon, 303.
Dinapur, 145.
Dinaric Alps, 313.
Dingwall, 245.
Dividing, Great, Range, 353.
Dnieper R., 264.
Doab, 146.
Dogger Bank, 189.
Doldrums, 51.
Domingo, San, 389.
Dominica, 389.
Don R. (Yorks.), 217.
Don R., 325.
Doncaster, 214.
Donets R., 325.
Dorking, 234.
Dornoch, 245.
Doubs R., 16.
Douro R., 304.
Dover, 233, 234.
Downs, North, 233.
Downs, South, 233.
Drakensberg Mts., 347.
Drave R., 309.
Dresden, 290.
Droitwich, 225.
Dublin, 250.
Dudley, 224.
Duisberg, 296.
Duluth, 384.
Dumbarton, 241.
Dundee, 243.
Dunedin, 364.
Dunfermline, 242.
Dunkirk, 301.
Durban, 350.
Durham, 217.
Dvina R., 322.

Eastbourne, 233.
Ebro R., 304.
Ecuador, 399.
Edinburgh, 240.
Edward, Prince, I., 381.
Egmont, Mt., 363.
Egypt, 339.
Elba, 317.
Elbe R., 265, 290.
Elburz Mts., 163.
Elgin, 244.
Elizabeth, Port, 351.
Ely, 228.
Ennis, 253.
Enniskillen, 248.
Epping Forest, 197.
Epsom, 229.
Erie, L., 370.
Eritrea, 341.
Erzerum, 176.
Erz Gebirge, 290.
Essen, 296.
Etienne, St., 300, 302.
Etna, 317.
Euphrates R., 164.
Eurasia, 162.
Everest, Mt., 9, 107.
Evesham, 225.
Exe R., 222.
Eyre, L., 355.

Faeroes, 289.
Falkirk, 241.
Falkland Is., 92, 401.
Falmouth, 222.
Fez, 337.
Fichtel Gebirge, 290.
Fiji, 365.
Finland, 322.
Fishguard, 221.
Fitzroy, 354.
Flint, 219.
Florence, 316.
Florence, Port, 342.
Folkestone, 233.
Forth R., 26.
Forth, Firth of, 192.
Francisco, San, 382.
Francisco, São, 394.
Frankfurt-on-Main, 295.
Frankfurt-on-Oder, 290.
Fraser R., 367.
Fraserburgh, 244.
Freetown, 345.
Freiberg, 291.
Freiburg, 294.
Fujiyama, 169.
Fundy, Bay of, 381.

Galashiels, 239.
Galatz, 318.
Galicia, 313.
Gall, St., 312.
Galway, 254.
Gandak R., 145.
Ganges R., 109, 111, 131, 146, 165.
Garonne R., 303.
Gateshead, 213.
Gauhati, 153.
Geelong, 361.
Gellivara, 285.
Geneva, 312.
Georgetown, 402.
Ghâts, Eastern, 114.
Ghâts, Western, 113.
Gibraltar, 306.
Gilgit, 157.
Gironde R., 303.
Glasgow, 240.
Glasgow, Port, 241.
Glenmore, 195, 243.
Gloucester, 221.
Godaveri R., 115.
Gogra R., 145, 146.
Goodwin Sands, 189.
Goole, 217.
Goring Gap, 228.
Göteborg, 285.
Gotthard, St., 310.
Goulburn, 361.
Grahamstown, 351.
Granada, 306.
Grangemouth, 241.
Grantham, 227.
Graz, 313.
Greenland, 90, 370.
Greenock, 241.
Greenwich, Meridian 6.
Grenada, 389.
Grimsby, 214, 217.
Guadaljara, 388.
Guadalquivir R., 304.
Guadiana R., 304.
Guam, 10.
Guatemala, 388.
Guayaquil, 400.
Guiana, 402.
Guildford, 234.
Guinea, 345.
Gumti R., 146.

Hague, The, 297.
Haiti, 389.
Hakodate, 187.
Halifax (Yorks.), 214.
Halifax (N.S.), 381.
Halle, 291.
Hamburg, 292.
Hamilton, 240.
Hammerfest, 285.
Hankow, 185.
Hanoi, 182.
Hanover, 293.
Harrogate, 213.
Hartlepool, 213.
Harz Mts., 290.
Hastings, 233.
Havana, 389.
Havre, Le, 301.
Hawaii, 365.
Hawick, 239.
Hebrides, 245.
Heidelberg, 294.
Hekla, 289.
Helena, St., 352.
Helens, St., 216.
Helsingfors, 322.
Helvellyn, 210.
Henley, 232.
Herat, 180.
Hereford, 220.
Hertford, 231.
Himâlayas, 105, 164.
Hindu Kush, 163, 164
Hindustan, Plain of, 1
Hispaniola, 389.
Hokitika, 364.
Holyhead, 221.
Honduras, 388.
Honshiu, 187.
Howrah, 138.
Huddersfield, 214.
Hudson R., 370.
Hué, 182.

Hughli R., 113, 138.
Hull, 214, 217.
Humber R., 192.
Huntingdon, 228.
Huron, L., 370.
Hwhang-ho, 165, 184.
Hyderabad, 115, 155.
Hythe, 233.

Iceland, 21, 289.
Ichang Gorge, 185.
Ilfracombe, 222.
Indo-China, 160, 182.
Indus R., 51, 109, 131, 157, 165.
Innsbruck, 313.
Inverary, 244.
Invergordon, 245.
Ipswich, 229.
Ipswich (Q.), 360.
Iran, 66.
Irawadi R., 117, 131, 165.
Irkutsk, 179.
Iron Gate (Danube), 309.
Islay, 244.
Ispahan, 178.
Ives, St., 222.
Ives, St. (Hunts.), 228.

Jackson, Port, 361.
Jaffa, 176.
Jammu, 157.
Japan, 186.
Japan, Sea of, 161.
Jedburgh, 230.
Jerusalem, 176.
Jeypur, 158.
Jhelam, 149, 157.
Jodhpur, 158.
Johannesburg, 350.
John, St., 381.
John's, St., 381.
Jubbalpore, 142.
Jumna R., 111, 146.
Jura, 244.
Jura Mts., 290, 310.
Jutland, 285.

Kabul, 110, 180.
Kalahari, 66, 99.
Kalgoorli, 363.
Kama R., 325.
Kamerun, 345.
Kanchenjunga, 108.
Kangra, 149.
Kano, 346.
Karachi, 111, 130, 133, 144.
Karlsruhe, 294.
Karpathians, 310.
Karroo, 348.
Kashgar, 181.
Kashmir, 130, 157.
Kauveri R., 115.
Keighley, 214.
Kelso, 239.
Ken R., 146.
Kenmure R., 254.
Kenya, 342.
Kermadoc Is., 10.
Keswick, 210.
Kettering, 227.
Khabarovsk, 179.
Khaibar Pass, 110, 180.
Khandesh, 142.
Kharkov, 325.
Khartum, 339.
Khasi Hills, 121.
Khatmandu, 158.
Kherson, 325.
Khiva, 178.
Khojent, 178, 179.
Khokand, 178, 179.
Kidderminster, 225.
Kidderpore, 138.
Kiel, 293.
Kiev, 325.
Kilda, St., 246.
Kilima-Njaro, 342.
Killala, 253.
Killarney Lakes, 254.
Kilmarnock, 240.
Kingston, 232.
Kinsale, 255.
Kirkcaldy, 242.
Kirkwall, 245.
Kiushiu, 187.
Klondike, 377.
Korea, 186.
Kosciusko, Mt., 353.
Kotah, 158.
Krasnoyarsk, 179.
Kristna R., 115.
Kroatia, 314.
Kronstadt, 324.
Kuenlun Mts., 163.
Kyoto, 187.

Labrador, 381.
Lachlan R., 354.
Ladoga, L., 322.
Lagos, 345.
Lahn R., 295.
Lahore, 150.
Lammermuir Hills, 237.
Lanark, 240.
Land's End, 221.
Langres, Plateau of, 297.
Launceston, 363.
Laurenço Marquez, 350.
Lawrence, St., R., 370.
Leamington, 225.
Lech R., 293.
Ledo, 153.
Leeds, 214.
Leeward Is., 389.
Leh, 157.
Leicester, 225.
Leinster, 256.
Leipzig, 291.
Leith, 242.
Lek R., 297.
Lena, 163.
Leopoldville, 346.
Lerwick, 245.
Lewes, 234.
Lhasa, 106, 180.
Liberia, 345.
Liechtenstein, 282.
Liège, 300.
Liffey R., 255.
Lille, 310.
Lima, 400.
Limerick, 253.
Lincoln, 217.
Lincoln Edge, 217.
Lincoln Gap, 217.
Lisbon, 306.
Lisburn, 249.
Liverpool, 216.
Lizard, The, 221.
Llandrindod Wells, 220.
Llandudno, 219.
Llanelly, 220.
Llanos, 101.
Lochgelly, 242.
Lodz, 324.
Lofoden Is., 283.
Loire R., 265, 297, 302.
Lombardy, 316.
London, 229.
London, East, 351.
Londonderry, 248.
Louis, Port, 352.
Louis, St., 384.
Lowestoft, 229.
Lübeck, 293.
Lucia, St., 389.
Lucknow, 111, 147.
Ludlow, 221.
Lurgan, 249.
Luton, 232.
Luxemburg, 295.
Luzon, 182.
Lynton, 222.
Lyon, 303.
Lys R., 300.

Macclesfield, 216.
Macdhui, Ben, 244.
Mackenzie R., 50, 369.
Madagascar, 12, 351.
Madeira, 352.
Madeira Rio, 394.
Madras, 130, 139.
Madrid, 306.
Madura, 141.
Magdalena, 394.
Magdeburg, 291.
Mahableshwar, 121, 144.
Mahanadi R., 115, 130.
Maidstone, 234.
Main R., 295.
Mainz, 295.
Makum, 153.
Malabar Coast, 113, 127.
Malaga, 306.
Mälar, L., 285.
Malay Arch., 102, 182.
Maldive Is., 12.
Malta, 317.
Malvern, 221, 225.
Man, I. of, 256.
Manaos, 402.
Manchester, 216.
Manchuria, 92, 183.
Mandalay, 118, 151.
Manilla, 183.
Manitoba, 379.
Maranon, 392.
Margate, 233.
Marino San, 282.
Maritsa R., 319.
Marseille, 303.
Maryport, 210.
Mask, L., 253.
Mauritius, 12, 351.
Mecca, 180.
Medina, 180.
Meghna R., 137.
Mekinez, 337.
Mekong, 165.
Melbourne, 361.
Melrose, 239.
Memel, 289.
Mendips, 223.
Merkara, 156.
Mersey R., 192, 216.
Merthyr Tydfil, 220.
Merv, 178.
Meseta, 304.
Mesopotamia, Plain of, 166.
Methil, 242.
Metz, 295.
Mexico, 388.
Michigan, L., 370.
Middlesbrough, 213.
Middlewich, 225.
Milan, 316.
Mildura, 361.
Minch, 246.
Mindanao, 9.
Minneapolis, 384.
Mississippi R., 26, 33, 382.
Missouri R., 383.
Mobile, 384.
Mocha, 180.
Moluccas, 182.
Mombasa, 84, 342.
Monaco, 282, 304.
Mongolia, 181.
Monmouth, 220, 221.
Montenegro, 320.
Montgomery, 221.
Montreal, 380.
Montrose, 242.
More, Ben, 244.
Morea, 319.
Morena, Sierra, 304.
Morocco, 337.
Moscow, 82, 324.
Moselle R., 295.
Mostar, 314.
Mosul, 177.
Motherwell, 240.
Moulmein, 119, 152.
Moville, 248.
Mühlhausen, 294.
Mukden, 179, 184.
Multan, 149.
Munich, 293.
Munster, 256.
Murcia, 306.
Murray R., 353.
Muscat, 180.
Mweru, 346.
Mysore, 115, 126, 127, 128, 130, 156.

Nagasaki, 187.
Nagpur, 153.
Nairn, 244.
Nancy, 301.
Nantes, 303.
Nantwich, 225.
Narbada R., 115, 128, 130.
Narenta R., 314.
Narvik, 285.
Natal, 350.

Nazaire, St., 303.
Neckar R., 295.
Negro, Rio, 394.
Nelson R., 369.
Nepal, 130, 132, 157.
Netherlands, 285, 296.
Neva R., 324.
Nevada Sierra, 304.
Nevada Sierra (N. Am.), 367, 372.
Nevis, Ben, 245.
Newbury, 229.
Newcastle, 213.
Newcastle (N.S.W.), 361.
New Forest, 197.
Newfoundland, 381.
Newfoundland Banks, 70.
Newhaven, 233.
Newmarket, 229.
Newport, 220, 221.
Newport (I. of W.), 236.
Newry, 249.
Niagara Falls, 380.
Nicaragua, 388.
Nice, 304.
Nidd R., 216.
Niemen R., 289.
Niger R., 343.
Nigeria, 345.
Nile R., 51, 66, 339.
Nilghiri Hills, 115.
Nish, 322.
Niuchwang, 184.
Nizam's Dominions, 130, 155.
Nizhni Novgorod, 324.
Normandy, 299.
Northampton, 227.
Northern Territory, 361.
Northwich, 225.
Nottingham, 214.
Nova Scotia, 381.
Nubia, 339.
Nürnberg, 295.
Nyanza, Albert, 339.
Nyanza, Edward, 339.
Nyanza, Victoria, 339.
Nyasa, L., 342.
Nyasaland, 347.

Ob R., 50, 163.
Ochil Hills, 239.
Oder R., 290.
Odessa, 325.
Ohambal R., 146.
Ohio R., 383.
Oka R., 324.
Okhotsk, Sea of, 161.
Omsk, 179.
Onega, L., 322.
Ontario, L., 370.
Orange R., 347.
Orinoco R., 391.
Orleans, 303.
Orleans, New, 384.
Ostend, 301.
Ottawa, 92, 379.
Oudh, 129, 130.
Ouse R., 217.
Ouse (Yorks.), 195.
Oxford, 227.
Ozaka, 187.

Pachmari, 153.
Paisley, 241.
Palermo, 317.
Palgat Gap, 115.
Palk Strait, 167.
Pamirs, 15, 163.
Pampas, 101.
Panama, 388.
Panama Canal, 84.
Para, 402.
Para R., 394.
Paraguay, 394.
Paramaribo, 402.
Parana, 394, 401.
Paris, 82, 301.
Pasco, 400.
Paulo São, 401.
Paz, La, 400.
Peebles, 239.
Pemba, 342.
Pennines, 194, 212.
Pentland Firth, 61, 245.
Perm, 325.
Pernambuco, 402.
Persian Gulf, 160.
Perth, 242.
Perth (W.A.), 363.
Peru, 400.
Peshawar, 110, 154.
Peterborough, 228.
Peterhead, 244.
Petersburg, St., 324.
Philadelphia, 386.
Philippopolis, 320.
Phillip, Port, 361.
Pickering, Vale of, 217.
Pittsburg, 385.
Plata, La, 401.
Plate R., 394.
Plymouth, 221.
Po R., 26, 265.
Pontic Mts., 163.
Poona, 144.
Popocatapetl, 367, 388.
Portland, 382.
Porto Rico, 389.
Portsmouth, 234.
Potomac R., 370.
Potteries, 216.
Prag, 313.
Pressburg, 309.
Pretoria, 349.
Prome, 152.
Pueblo, 388.
Punjab, 100, 109, 130, 148.
Punta Arenas, 400.
Puri, 146.
Pyrenees, 304.

Quantocks, 223.
Quebec, 381.
Queensland, 360.
Quentin, St., 301.
Quetta, 154.

Rajputana, 110, 127, 128, 130, 158.
Ramganga R., 146.
Ramsgate, 233.
Ranchi, 146.
Rangoon, 117, 133, 152.
Rapti R., 146.
Ratisbon (Regensburg), 293.
Reading, 232.
Red R., 379.
Redditch, 225.
Regina, 379.
Resht, 178.
Réunion, 351.
Reykjavik, 289.
Rheims, 301.
Rhine R., 17, 26, 51, 265, 309.
Rhodope, 319.
Rhone R., 17, 51, 303, 307.
Rhyl, 219.
Ribble R., 216.
Richmond, 232.
Riesen Gebirge, 290.
Rio de Janeiro, 402.
Rion, 176.
Riviera, 304, 316.
Rochdale, 216.
Rockhampton, 360.
Rocky Mts., 367.
Rodriguez, 352.
Romania, 318.
Rome, 316.
Romney, 233.
Rosa, Mt., 307.
Rosslare, 221.
Rosyth, 242.
Rotherham, 214.
Ruabon, 219.
Ruapehu, 363.
Rugby, 225.
Rustchuk, 320.
Ruwenzori, 342.

Sacramento R., 382.
Sadiya, 136.
Sahara, 66, 72, 75, 98, 328, 338.
Saigon, 182.
Salisbury, 347.
Salisbury Plain, 229.
Salonika, 321.
Salt Range, 128, 149.
Salt Lake City, 382.
Salvador, 388.
Salwin R., 151, 165.
Salzburg, 313.
Samara, 325.
Samarkand, 178.
Sambhur, L., 158.
Samoa, 365.
Sandwich, 233.
Santander, 306.
Santiago, 400.
Santos, 402.
Saône R., 303.
Saragossa, 306.
Saratov, 325.
Sarda R., 146.
Sardinia, 317.
Saskatchewan R., 379.
Sault Ste. Marie Canal, 380.
Savanas, 101.
Save R., 309.
Scafell, 210.
Scarborough, 217.
Schaffhausen, 294.
Scheldt R., 300.
Scilly Is., 223.
Scone, 242.
Seattle, 382.
Seine R., 265.
Selkirk, 239.
Seoul, 186.
Servia, 320.
Severn R., 61, 192.
Seville, 306.
Shamo, 66.
Shanghai, 185.
Shannon R., 253.
Shari R., 25, 343.
Sheffield, 214.
Sherwood Forest, 197.
Shields, N. and S., 213.
Shikarpur, 133.
Shikoku, 187.
Shillong, 153.
Shiraz, 178.
Shrewsbury, 225.
Siam, Plain of, 166.
Siberian lowland, 163.
Sibsagar, 153.
Sicily, 95, 317.
Sidlaw Hills, 239.
Sierra Leone, 345.
Si-kiang, 185.
Simla, 150.
Simplon, 310.
Sind, 111, 127.
Singapore, 182.
Skiddaw, 210.
Skutari, 320.
Slaney R., 255.
Sligo, 253.
Smyrna, 176.
Snowdon, 219.
Sofia, 320.
Solomon Is., 365.
Somaliland, 341.
Son R., 145, 147.
Sorata, 391.
Sound, The, 288.
Sources, Mont aux, 350
Southampton, 234.
Srinagar, 157.
Stamford, 228.
Stanley, Port, 401.
Stanovoi Mts., 163.
Steppe, 273.
Stettin, 291.
Stirling, 242.
Stockholm, 285.
Stockton, 213.
Stoke, 216.
Stornoway, 246.
Stourbridge, 224.
Strasburg, 294, 296.
Stratford-on-Avon, 225
Strathmore, 242.
Stretensk, 179.
Stroud, 227.
Stuttgart, 294.
Sudan, 337.
Sudetes, 290.
Sulaiman Mts., 164.
Sumatra, 182.
Sunda Is., 182.
Sunderbunds, 113.
Sunderland, 213.
Superior, L., 370.

Surat, 144.
Susquehanna R., 370.
Swale, 216.
Swanage, 236.
Swansea, 220, 221.
Swindon, 221.
Switzerland, 310.
Sydney, 361.
Syr Daria, 163, 164.

Tabriz, 178.
Tagus R., 304.
Tamar R., 222.
Tamatave, 351.
Tampico, 388.
Tanganyika, 342.
Tapti R., 115, 130.
Tarim, 181.
Tarim basin, 163, 180.
Tashkent, 178.
Tasmania, 363.
Taunton, 223.
Taurus Mts., 164.
Taw R., 222.
Techuantepec, 387.
Teheran, 178.
Tell, 338.
Tenasserim, 128.
Teneriffe, 352.
Tewkesbury, 224.
Thames R., 192.
Thar, 66.
Thian Shan, 163, 164.
Thüringer Wald, 290.
Tibet, 103, 133, 166, 180.
Ticino R., 309.
Tigris R., 164.
Timbuktu, 345.
Titicaca, 391.
Tocantins, 394.
Tokay, 314.
Tokyo, 187.
Tomsk, 178.
Tone R., 222.
Tonga Is., 10.
Tongariro, 363.
Tonk, 158.
Tons R., 147.
Torquay, 222.
Toulouse, 303.
Townsville, 360.
Transvaal, 82.
Travancore, 115.
Trebizond, 176.
Trent R., 61, 195.
Trichinopoli, 141.
Triest, 313.
Trondhjem, 285.
Troon, 240.
Tundra, 270.
Turan, 66, 82, 163, 178.
Tuscany, 316.
Tweed, 237.

Udaipur, 158.
Uganda, 343.
Ulm, 293.
Ulster, 256.
Umbria, 316.
Upsala, 285.
Ure R., 216.
Uruguay, 401.
Usküb, 320.
Uspallata Pass, 391.

Vaal R., 348.
Vaigai, 141.
Valakhia, 309.
Valdai Hills, 324.
Valencia, 306.
Valenciennes, 301.
Valentia I., 254.
Valparaiso, 84, 400.
Vancouver City, 377.
Vancouver I., 377.
Vardar R., 319.
Varna, 320.
Veldt, 19.
Vener, L., 285.
Venezuela, 402.
Venice, 316.
Vera Cruz, 387.
Verde, Cape, Is., 352.
Verona, 316.
Vesuvius, 317.
Vetter, L., 285.
Victoria, 361.
Victoria (Van.), 377.
Victoria Falls, 347.
Vienna, 82, 313.
Vincent, St., 389.
Vistula R., 265, 289.
Vladivostok, 170.
Volga R., 25, 264, 324.
Vosges, 294.

Waal, 297.
Wallsend, 213.
Walney I., 210.
Walsall, 224.
Warwick, 225.
Washington, 386.
Wastwater, 210.
Waterford, 221, 255.
Weald, The, 233.
Weaver R., 216.
Wednesbury, 224.
Welland Canal, 380.
Wellington, 225.
Wellington (N.Z.), 364.
Weser R., 293.
Westport, 254.
Wexford, 255.
Weymouth, 236.
Wharfe R., 216.
Whitby, 217.
Whitehaven, 210.
Wick, 245.
Widnes, 216.
William, Fort, 245.
Windsor, 232.
Windward Is., 389.
Winnipeg, 379.
Wisbech, 228.
Witney, 227.
Witwatersrand, 349.
Wolverhampton, 224.
Worcester, 221, 225.
Workington, 210.
Wrekin, 224.
Wrexham, 219.
Wroxeter, 221.
Wycombe, High, 232.

Yablonoi R., 167.
Yangtse-kiang, 165, 185.
Yarmouth, 229.
Yellowstone Basin, 382.
Yenisei R., 163.
Yezo, 187.
Yokohama, 187.
York, 217.
York, New, 386.
York, Vale of, 216.
Yosemite Valley, 382.
Yucatan, 387.
Yukon, 82, 367.

Zagros Mts., 164.
Zambezi R., 19, 346.
Zanzibar, 342.
Zaria, 346.
Zealand, New, 363.
Zerafshan, 25.
Zungeru, 346.
Zürich, 311.
Zuyder Zee, 296.

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