GEOGRAPHY OF FRANCE

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By

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and

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ECONOMIC GEOGRAPHY

A LIST OF THE MAPS

"The features which have produced French unity and have made France a world-center of civilization have a geographic foundation. Physically France is made up of basins fringing plateaus of old rocks. A happy distribution of lowlands has provided avenues through which far-spread influences have penetrated the country. Up the sunny corridor of Provence and Burgundy and through the narrow gate of Carcassonne came the visions of Mediterranean civilization to brighten the cloudier northern basins. The gates of Metz-Verdun, the Meuse-Sambre, and that of Ypres gather up roads from Central Europe and from Asia beyond. Then there are the ways of the sea. The channel, that passed on Gallic civilization to Britain, gave the northerners an entry to France. The way of the open sea, Brittany, is one of those Celtic lands whose contributions to the life of Western Europe have been little appreciated as yet.

"The meeting point of these roads is the Paris Basin, and there have met and blended the ideas and ideals that have traveled along them. And from the rich interweaving has been created the national spirit, of which the high expression is the Frenchman's ability to keep in sympathetic touch with the ideals and thoughts of other nations."

THE PREFACE

It is difficult to pique the curiosity of the public with the word "geography," when for so long it has meant arid lists of countries, rivers, mountains, plains, and cities, forced as so many isolated facts into a child's reluctant mind. Such it is no longer. But the modern geographer finds himself confronted with a problem: how is it possible to convey an idea of the changed character of geography while using the same old label? It has become a university study, with wide knowledge as a prerequisite. It is a live, alluring, suggestive subject, yet still we continue to call it "geography" for lack of a better term.

Like other sciences, geography has gradually been taking shape during the last thirty or forty years, encountering many obstacles by the way. Specialists in other branches have objected that it tends to overestimate the importance of environment; or that it is too diffuse, concerned with too many vague generalities difficult if not impossible to define. It is asked what the field of geography really is, what its subject-matter, what its aim. In France much has already been done to answer such questions. The science has been developed, yet at the same time made more exact; elaborated, yet clarified. The outcome is the French School of Regional Geography.

The French geographer begins with a *tabula, rasa*. His mind is as unprejudiced as a photographic plate. He understands the laws of physiography, of course, and climatology; he is awake to life responses, both past and present. But, *confining himself to a given region*, he is

content to accumulate knowledge. He studies natural factors influencing man, human factors touched by nature. His is a science of relationships and explanations. Without theories as to what he should expect to find, without attempting to establish laws, he studies facts as they present themselves. With what facts, then, is he concerned? What is meant by the term "regional geography"?

As the name would indicate, it is the study of "natural regions." When a botanist uses that term he refers to characteristic types of vegetation within a given region, a geologist to rock formations, a physiographer to drainage systems and other surface features. But each is occupied with only a single aspect of the region. The geographer, on the other hand, takes a locality distinguished from its neighbors by relief, soil, climate, vegetation, or a combination of several of these features, studies each in turn, then describes the place as a complete and living whole. Nothing is important except in so far as it contributes to this end. Next, natural conditions influencing human activities are taken up, and lastly, man's adaptation to such conditions. What use has he made of the means at his disposal? How far can his various activities be accounted for by the conditions? Other branches of study may deal with many of the same facts in the same region —geology with structure, agriculture with soils, economics with raw materials and manufactures —but geography makes the synthesis, connecting divergent sorts of information, and explaining human occupations in the light of all these conditions.

Thus geography is seen to be primarily not descriptive —though it needs the art of such a master as Vidal de la

Blache, the founder of the modern school of French geography, to show it as its best — but largely explanatory. It does not hold that natural endowments can always create a local activity. It cannot always even explain. But *for a given region* it shows to what degree man and his environment affect each other — for natural conditions unquestionably form the frame within which he is obliged to act. With such ideas in mind, we find the old word "geography" vitalized with new meaning.

A distinctive feature of the French school is that in every case the region chosen is sufficiently restricted to make a thorough, complete study possible. There are few countries so small or so uniform as to be composed of but a single natural region. Such a country as France, for instance, must be divided into a dozen or more parts, to each of which the method of study is applied afresh from beginning to end, the emphasis on different stages varying according to necessity. At least ten books of over 500 pages each have already been written about regions of France. One of the best known is "La Flandre" by Professor Raoul Blanchard of the University of Grenoble. To Professor Blanchard also is due the credit of being a pioneer in a specialized branch of regional geography known as urban geography. The development of so artificial and so localized a growth as a great city is shown to be preëminently dependent on physical factors, its situation, site, natural resources, transportation facilities, and so on explaining in large part its pursuits. One of the first works on urban geography to appear was a study of Grenoble published by Professor Blanchard in 1910.

"Geography" may be considered a blanket term. "Physical geography," "human geography," "economic

geography" are all included in the study of a given region, each contributing to an understanding of the whole. No country is without interest; the most repellent, the most monotonous holds the attention merely by challenging an explanation of why it should be repellent or monotonous. The battle *within a given region* between man and nature —in which man's success depends on his understanding his adversary, submitting to her requirements in order gradually to transform her and make her obey him in the end—this is the subject-matter of regional geography. It may be classed with the humanities; in fact, in French universities it is taught in the Faculty of Arts and Letters.

This book, a brief summary of the geography of France, is intended to show the methods of regional geography, using by way of illustration the country where not only detailed studies of many regions have been made, but where the subject itself has been most extensively developed. There is no French edition. The book was written after the armistice for the American Expeditionary Force and is for the first time appearing in the United States.

It is hoped that it may prove to be another link in the chain binding France and America together by deeper understanding, and that it may help toward a realization of that *entente intellectuelle* which at the present time is occupying the attention of both French and American educators.

MILLICENT TODD

Medomak, Maine
September, 1919

A FOREWORD

France is an extremely varied country. Within an area of only 207,054 square miles there is almost every kind of soil, a most diversified structure, and a topography including all forms and all elevations up to 16,000 feet, thereby exceeding in altitude the height of the Rocky Mountains of the United States.

In passing from the Alps to the Atlantic Ocean, and from north to south, one encounters all varieties of climates ranging from the Arctic to the subtropical, each with its characteristic types of vegetation. This of course implies widely differing agricultural possibilities.

Moreover, bordering as it does on two seas, and having easy access to the continent in all directions, France is the connecting link between the principal races and civilizations of Europe. It has assimilated racial elements as dissimilar as Greek, Phoenician, Gallic, Latin, Germanic, all of which long since have melted into the mass of its prehistoric peoples, thus forming the most uniform and at the same time the most composite nation in the world.

We now propose to study this variety and this unity of France. In order to do so, after a glance at the essential physical characteristics of the country, we shall take up its natural regions, giving

especial attention to those which have been the scene of the Great War. We shall then study the principal forms of the economic life of the country, and conclude with a brief chapter on the colonial empire of France.

RAOUL BLANCHARD

University of Grenoble
August, 1919

INTRODUCTION

GEOGRAPHY OF FRANCE

CHAPTER I

STRUCTURE AND RELIEF

Structure and relief. The territory of France is composed of rocks belonging to all the great geological ages. It has high mountains of recent origin, low worn-down *massifs*,[1] more or less lifted and transformed by the upheaval which formed the recent chains, and deep, wide basins spreading out between these *massifs* and these mountains.

Hence the chief factor in the topography of France is this great upheaval which took place in a past geological age. The chains of mountains in the east and southeast, Alps and Pyrenees, recently uplifted, geologically speaking, during that uplift crowded and jostled and transformed the whole of the preëxisting surface of France, both old mountain masses and intervening basins. Obviously the regions nearest the center of action must have been more uplifted and more transformed than those at a distance. So it appears that this movement of Alps and Pyrenees is the key to a complete understanding of the surface relief of France.

[1] For lack of an English equivalent, *massif* will be used to indicate a mass of ancient mountains which were leveled by erosion and subsequently lifted by a movement of the ground.

The high mountains. In the east and southeast are found the high mountains of recent origin. They are a part of great foldings which occurred in the Tertiary Age around the Mediterranean and even across southern Asia as far as the Pacific. In France they include the Pyrenees, the Alps, and the Jura.

The Pyrenees. A little older than the Alps, the Pyrenees were lifted across the middle of a vast basin which extended from the center of France to the center of Spain. They consist of great recumbent folds inclining toward the north, the margin of which, confronting France, forms a high wall whose mean elevation ranges from 6,000 to 10,000 feet.

The French Alps. Sweeping from Nice to Vienna is a great arc of mountains whose western extremity composes the French Alps. In France they have a north-south direction. They comprise various types, including continuous outer chains, from 3,000 to 7,000 feet in height, called Pre-Alps, and back of these, the high mountains 10,000 to 14,000 feet in height—an ancient rock-wall which somewhat obstructed the westward thrust of the big folds welling up from the inner boundaries of the chain. On an average, the French Alps consist of a series of mountain chains from 60 to 90 miles in width.

The Jura. The Jura is the outermost division of the Alps, to which it is joined at the south. This division describes an arc about 30 miles in width, higher on the east whence the folding-stress came, and attaining an elevation of about 5,000 feet.

The upheaval of these mountains profoundly shook France throughout its length and breadth, molding the surface anew to its farthest limits.

A Structural Map

The ancient massifs. These so-called *massifs* are but the remains of high mountain ranges which used to cover most of French territory. Worn

away by erosion, they were reduced to mere stumps, between which deep basins were hollowed out. The thrusts of the Tertiary Age affected these fragments, shoving them up again and distorting them considerably. They are more lifted and more difformed toward the southeast, in proportion as they are near to the Alps and the Pyrenees.

The Massif Central. Nearest of all to the recent chains is the Massif Central; consequently it is the *massif* that underwent the most complete resurrection. Its southeastern front, facing the Alps, was lifted to form a kind of wall whose altitude is more than 5,000 feet above the Rhône, falling off by degrees toward the north and the southwest. Back of this precipice, the plateau, through which the Alpine movements advanced with difficulty, was broken into blocks, some of which sank, while others were raised. Prolonged eruptions also took place, piling up volcanic mountains here and there. So this central part of the *massif*, with its deep depressed basins overtopped by fragments of the original rock-mass, which in turn are surmounted by volcanoes and lava-flows, is a region of unlike parts where elevations vary from 1,000 to 6,000 feet. On a small scale it recalls the highlands of Idaho and Utah. Toward the west and the southwest, on the other hand, the Massif Central, less disturbed by the Alpine thrust, is only a plateau sloping gently and evenly down to the surrounding plains.

The Vosges. Near the Jura are the Vosges, an

older group of mountains, also extensively modified. They were formerly a part of the German Black Forest. The entire *massif*, very much uplifted, was cut in two by a falling-in like those in the Massif Central. In this depressed area the plain of the Rhine was gradually filled in. Hence the Vosges look abruptly down upon the plain of Alsace from a height of more than 3,500 feet, while they slope gently toward the northwest, merging at last with the plateau of Lorraine.

The Ardenne. Situated much farther north, the ancient area of the Ardenne felt the effect of the Alpine movements much less. The original mass, however, was somewhat lifted at the south, where its height ranges from 1,600 to 2,300 feet, thence descending gradually toward the Belgian plain.

The Massif Armoricain. Lastly, the vast Massif Armoricain, which occupies all the western part of France, was hardly lifted at all. Yet in comparison to near-by basins, it is a region of high land, where the elevation toward the east is more than 1,300 feet, reaching a height almost as great in the interior of Brittany. But it is not so much the topography as the nature of the soil, rugged and infertile as it is, which distinguishes Brittany from the surrounding basins.

The basins. Between the mountains and the ancient *massifs* extend the basins which already existed in previous ages, but whose characteristics were intensified by the last movements of the earth's

surface. As would be expected, they are larger and more open the farther they are from the mountains.

The Depression of the Saône and Rhône rivers. Between the Alpine chains (Alps and Jura) and the Massif Central is a deep north-south depression crowded in between the mountains, more a passage-way than a valley—the Depression of the Saône and Rhône rivers. Midway in its length, at the place where the Alps reach nearest to the Massif Central, the valley becomes a narrows; at the south and at the north it widens into the plains of Provence and the plain of the Saône. The whole forms between the Mediterranean and the Vosges an excellent thoroughfare whose elevation is hardly 600 feet at a distance of 300 miles from the sea.

The Basin of Aquitaine. Spreading out between the Pyrenees, the Massif Central, and the Massif Armoricain is the Basin of Aquitaine, much larger and with a wide expanse on the Atlantic Ocean. Its lowest part, between the platforms sloping from the Massif Central and the plateaus adjacent to the Pyrenees, is a wide groove—less than 300 feet above sea-level, reaching from the Atlantic to the Mediterranean—in which all streams unite to form the Garonne River.

The Paris Basin. Lastly, the vast Paris Basin occupies all the northern part of France, from the Massif Armoricain to the Massif Central, the Vosges, and the Ardenne. It even extends across the Channel, being continuous with the lowlands

of the south of England. Without obstruction it connects with the broad Anglo-Flemish basin on the north whose center is still occupied by the North Sea. In contrast to the Basin of Aquitaine, it has the form of a saucer with its lowest level at Paris, rising from that point in all directions.

This entire region is composed of plains or plateaus of slight elevation, peculiarly adapted to human needs, with easy access to the sea as well as to the other basins. The latter is an especially significant fact, for the most characteristic feature of the relief and structure of France is that the different basins fitting in around the mountainous regions easily communicate with one another. Between the Vosges and the Ardenne the Paris Basin meets the plain of the Rhine; between the Vosges and the Massif Central it joins the Saône-Rhône valley by the wide so-called "saddle" of Burgundy; between the Central and Armorican Massifs the saddle of Poitou connects it with the Basin of Aquitaine, and the latter, by the saddle of Lauraguais, communicates with the lower valley of the Rhône. None of these saddles has an elevation of more than 1,300 feet; several are not over 650 feet high, and thus, traveling from north to south and from east to west, it is very easy to pass between the highlands or to avoid them altogether. It appears, therefore, that its diversity of structure and relief does not stand in the way of the complete physical unity of France.

CHAPTER II

CLIMATE AND VEGETATION

Bordering both the Mediterranean and the Atlantic, France shares the climates of both. Yet its irregularities of relief are such that if the climate of France is, on the whole, mild and damp, there are nevertheless various modifications, as one goes from north to south, and especially from east to west.

Mediterranean climate. In its most decided form the Mediterranean climate is found along the shores of the Mediterranean, partly owing to the fact that the Mediterranean region is the most isolated of any in France, shut in by the mountainous areas of the Massif Central, the Pyrenees, and the Alps, and communicating with other regions only by the saddle of Lauraguais and the narrows of the Rhône. The distinguishing features of the Mediterranean climate are very different from those of the Atlantic climate.

Dryness is its principal characteristic. The Mediterranean climate has an absolutely dry season, summer. From the beginning of June to the end of September rain is extremely rare, and often there is none at all. Even during other seasons rains are violent but short. There are 55 rainy days at Marseille (English, *Marseilles*), one-fourth

as many as at Brest (200). The atmosphere is almost always clear, the sky cloudless, and fogs are unusual. Moreover, the temperature is high; summer is warm, winter is mild. Yet the cold can be quite severe, except in certain favored places — Nice, for example. In winter a dry, cold north wind, the *mistral*, frequently blows in Provence and accentuates the dryness.

Vegetation has adapted itself to this climate, equipping most of its plants to resist drought. The trees have thick evergreen leaves, the live oak, olive, cypress, Aleppo pines, and woody shrubs being armed against evaporation with leaves that are small, hard, and varnished. Beautiful forests are rare; they give place to thickets of brushwood (*garrigue*) and scrubby growth (*maquis*). Agriculturists have to resort to irrigation, which gives magnificent results.

This Mediterranean climate of France is the same as that of southern Italy, of Greece, and of southern California.

Atlantic climate. Except the Mediterranean region, the entire area of France is under the influence of the Atlantic Ocean, which supplies it with abundant rainfall and moderates the cold. Nevertheless the altitude of the mountainous regions and especially the distance from the sea give rise to many varieties of climate, forming bands almost parallel to the ocean; that is to say, extending from north to south rather than from east to west.

Breton climate. Most under the influence of the Atlantic is the Breton climate, covering nearly all of the Massif Armoricain, surrounded as it is on three sides by the ocean. Within the confines of this climate everything is equable, temperature as well as humidity being almost uniform. There is no winter and almost no summer. Under the softening influence of the sea the temperature never descends below the freezing point. At the western extremity of Brittany, Roscoff and Brest have a December temperature as mild as that of Nice. On the other hand, summer lacks heat. The temperature of Brittany in July is much lower than that of Geneva and Strasbourg. Humidity is very high; rain falls at least every other day in fine, gentle, interminable showers. The atmosphere is mild and always misty. In this country of green meadows and apple orchards, the vine cannot prosper for lack of the sun's light and heat.

Parisian climate. Back of Brittany, throughout almost the entire Paris Basin there is a transition climate which may be called Parisian. From the saddle of Poitou to the plains of Flanders, from Normandy to Lorraine, the climate is homogeneous and temperate. There is a winter and a summer, but the cold never lasts long and the heat is always moderated by rain. The region being so low, the rainfall is slight, although rainy days are frequent (150 at Paris and Lille). The least elevation, giving shelter from the cold winds and concentrating the

sun's warmth on a slope with a good exposure, is enough to change the climate completely, for here everything is finely adjusted. Hence the Parisian climate, favorable to the cultivation of cereals on a large scale, also permits the raising of grapes on the well-sheltered slopes of Touraine, on the cliffs of the Ile-de-France, and even on the hillsides about Paris.

As one passes inland, the seasons become more and more marked—the summers hotter, the winters colder. But the rainfall, contrary to what might be expected, becomes more and more abundant, the increased elevation forcing the ocean clouds which have slipped across the plains to condense their humidity.

Aquitainian climate. Throughout the climatic zone which extends diagonally from the Pyrenees to the Vosges, there are great differences. Toward the southwest, within the area covered by the Aquitainian climate, the Basin of Aquitaine has mild winters and hot summers like those of the Mediterranean region. In contrast to the latter, however, it is very humid, especially in summer. Consequently there is a vigorous, lush vegetation, born of heat and dampness. Beautiful trees with delicate foliage grow here, walnut, almond, chestnut, and fruit trees. There are luxuriant vineyards, and corn or maize is the characteristic crop. The same climate is found again farther east, in the deep valleys of the Massif Central, the Northern Alps, and in the Plain of the

Saône. In the midst of harsh mountain climates these depressions with their mulberry and fruit trees recall Lombardy and certain of our Gulf states.

Lorraine climate. Finally, as one approaches the Rhine, the summers are still hot but the winters are severe, as in South Germany. In this region of Lorraine, though the cold season is dry the summer is damp. Nevertheless southern touches enter even into these localities. Chestnut trees penetrate into Alsace; the vine, thanks to the heat of summer, grows on the hillsides of Lorraine and adorns the foothills of the Alsatian Vosges.

Thus the climate of France shows a happy combination of continental and oceanic influences as well as of northern and southern elements. Consequently the soil of France lends itself to a great variety of products. Also on this account as much as because of the varied topography, an extraordinary variety of natural regions results, each region distinct from the other, yet all closely connected by a thousand geographical and human points of resemblance.

NATURAL REGIONS

CHAPTER III

THE MEDITERRANEAN REGION

Sister of Greece, southern Italy, and Algeria, the Mediterranean region of France is a country of sunshine and merriment, picturesque, varied, and rich. Its remarkable individuality is due to several causes; first, to its well-marked boundaries, almost everywhere mountains and sea; next, to its calm blue waters — the means of approach of many succeeding civilizations — contrasting with the rugged shore; but especially to the influence of a hot, dry climate engendering a rather special vegetation. With its ancient Greek cities, its Roman ruins, and its buildings of the Middle Ages, it undoubtedly is the most historic part of France, yet at the same time the gayest and the youngest.

On the whole, the Mediterranean region is much diversified; at the west there are the low plains of Languedoc, at the east the hills of Provence, at the south the island of Corsica.

The Plains of Languedoc. The material which torrential streams, swelled to formidable proportions by Mediterranean storms, have torn from nearby mountains (Eastern Pyrenees, Massif Central) has accumulated along the shore in many deltas. These alluvial deposits, joined together little by little, compose the plains of Languedoc. This accumulating

THE MEDITERRANEAN REGION

process is still going on; the sea never ceases to pile up along the shores the masses of sand and gravel which are brought down by the strong current of the Rhône. So the coast is straight and low, formed of bars and sand reefs like those of North Carolina, shutting in behind them salt-water lagoons. Ports are few on account of lack of shelter, the only one of any importance, Cette, being artificial. But the alluvial plains stretching out beyond are very fertile. Thanks to the hot, dry climate they are wonderfully well adapted to cultivation of the vine. This activity has developed enormously during the nineteenth century, since railways have facilitated transportation of the produce throughout the whole of France. Vineyards cover the plains, even along the lagoons down to the very edge of the sea, crowding out all other crops. In this restricted region more than one-third of all the wine of France is produced. This grape cultivation, carried on scientifically, requires many laborers, so the country is densely populated. The large cities, Nîmes, Montpellier, Narbonne, Perpignan, enthroned as they are in the midst of vineyards, still retain some of the majesty of Rome as well as much of the picturesque aspect of the Middle Ages. Their present rôle is to centralize the wine trade of the region.

Provence. Farther toward the east the plains merge with the vast delta of the Rhône, including the wide, half-submerged expanses of Camargue—

not unlike the lowlands of Louisiana—and the dry platform of Crau, composed of pebbles rolled down from the Alps. Soon gray or whitish hills, clothed with sparse vegetation, begin to rise above the lowlands, their bold forms brought into relief by the limpid atmosphere. Towns or ruins of towns perch proudly upon them. This is Provence. From the Rhône to the Italian frontier the region has numerous chains of hills running in an east-west direction, their height varying from 1,600 to 3,000 feet. At the west they are formed of light-colored limestones or sandstones. Farther toward the east, the Maures are darker and adorned with pines, while still beyond rise the bold red-porphyry summits of the Estérel, their deep red tints making a marked contrast with the blue sea. Spread out between these chains are little plains composed of reddish soil, where the mildness of the climate makes possible the growing of olives, also of grapes and various other fruits. These products are the first of the season sold in Paris. Irrigation gives magificent results. Here also bauxite, from which aluminum is manufactured, is extracted from the soil.

Yet the most richly endowed part of Provence is the coast, thanks to the indentations and bays made by contact of mountains and sea, thanks also to the charm of the climate, softened by the sea; in addition it is shut off from the north by the wall of the Alps. At the west, the port of Marseille, near the valley of the Rhône, is the gateway of France

toward the Mediterranean as well as the point of departure for travelers going to North Africa, the Orient, and the Far East. It is also a great industrial city, handling the oil-yielding products of the colonies besides the cereals of Africa and Russia, sugar cane, and chemical and building materials. The noisy, active city has more than 600,000 inhabitants. A little farther east, the great military port of Toulon is developing its docks and shipyards around an admirably protected harbor. Lastly, beyond the Estérel is the beginning of the Côte d'Azur (English, *Riviera*), land of enchantment, where the splendor of the mountains meets that of the blue sea, and the delicious climate attracts, as at Los Angeles, hundreds of thousands of winter visitors. Cannes, Nice, Monaco, Menton (English, *Mentone*), are the centers of this region of winter resorts. An important industry, year-round production of flowers and the transformation of those flowers into perfumes, has grown up along these shores where orange and lemon trees and certain tropical plants yield plentiful harvests.

Corsica. Corsica is even more rugged than the Côte d'Azur. This large island, with an area of 3,367 square miles, is almost wholly mountainous. It has only one narrow lowland plain along its eastern shore. Two-thirds of the island, including all the west and south, is only a great granite mass, the remains of an ancient continent which formerly occupied the site of the western Mediterranean. This

massif lifted by the Alpine thrust is now a wilderness of great jagged mountains, some of which attain 9,000 feet in height. It is the poorest and least populous part of the island. The inhabitants, who cultivate olive and orange trees as well as cereals and early vegetables, live on the valley floors. They are beginning little by little to come down closer to the sea, from which they used to keep away because it was the means of approach of pirates and invaders. On the northeast are mountains of schist, of softer rock, therefore less elevated. They are related to the Alps and inhabited by a dense population living largely on the products of the chestnut tree. Here is the most active port, that of Bastia. For a long time threatened with invasion, Corsica lived in its shell, so to speak. It is only just beginning to make use of its resources. A sense of security is at last leading it to adapt its mode of life to raising the Mediterranean crops for which its climate is so well fitted, as well as to put itself at the disposal of tourists who may come to taste the charm of its soft airs and enjoy the beauty of its landscapes, its rugged red mountains, and its blue gulfs.

CHAPTER IV

THE FRENCH ALPS

North of the Mediterranean region, and sheltering it from the cold, rises the great arc of the Alps, reaching from Nice to the Lake of Geneva and beyond into Austria. Throughout the two hundred miles of their extent these mountains are composed of two distinct parts, in which structure, relief, climate, vegetation, and human life are totally unlike. In the north, from the Lake of Geneva to the Massif of Pelvoux, the chain is more regular, narrower, the altitude higher, and the climate, under the influence of the Atlantic, colder and damper; glaciers are plentiful, streams abundant and regular in flow, vegetation luxuriant, and the population dense. In the south, where the chain of the Alps is wider and less elevated, the dryness of the Mediterranean climate prevails. Watercourses tumbling down the arid slopes turn into fantastic, raging torrents at short notice. This is the land of sheep as the north is the land of cattle. Of all the features distinguishing the two regions, those dependent on climate are the most important; that is to say, the humidity of the northern Alps, the dryness of the southern.

The northern Alps. Arranged in belts extending, roughly, from north to south, the northern

French Alps, Jura, Saône-Rhône Depression

Alps are high mountains, well watered, verdant, and thickly settled.

Pre-Alps. Toward the west above the valley of the Rhône the Pre-Alps form the outer belt. They are composed of long lines of mountains separated from each other by deep valleys through which Alpine rivers flow toward the Rhône. Beautiful white cliffs tower above smiling valleys where clear mountain streams ripple through meadows and forests. There are few cultivated fields, for man is occupied with forests and herds of cattle; he is both cowherd and woodcutter. Beautiful lakes, like the Lake of Annecy and the Lake of Bourget, occupy deep clefts between the mountains. In fact, these Pre-Alps are charming and idyllic.

Subalpine depression. Back of them, from the Swiss frontier to the Pelvoux, extends a long low zone called the "subalpine depression," hollowed out by streams and ancient glaciers between the Pre-Alps and the inner *massifs.* At a slight elevation, rising from 650 to 3,500 feet, the climate is that of a low plain with hot, damp summers. On these alluvial lands accumulated by the mountain streams, vegetation is luxuriant and varied; mulberry trees, the vine, tobacco, corn, and fruit trees are cultivated. The subalpine depression is an admirable thoroughfare, a sort of long street from which roads branch off toward the outside world between the blocks of the Pre-Alps, while others lead toward the heart of the Alps and toward Italy.

Industries grew up here centuries ago, making use of the rocks for cement or lime and the skins of the animals for glove manufacture (Grenoble gloves). During the last twenty years the utilization of the torrents ("white coal") for power and the production of electric light as well as for electro-chemical and electro-metallurgical products has had a remarkable development. This has attracted to the subalpine depression a dense population. At a confluence of wide valleys, overshadowed by massive mountain silhouettes, is situated the capital of the French Alps, the city of Grenoble, with 100,000 inhabitants.

Inner massifs. Just beyond the subalpine depression on the east rises a mighty wall, unbroken save here and there by great rifts of which tempestuous streams have taken possession. This is the chain of the inner *massifs* of granite, reaching in the summits of Mont-Blanc and the Pelvoux the greatest altitude in the Alps (Mont-Blanc, 15,780 feet). Pointed summits and vast domes rise above glaciers (Mer de Glace, the Bossons) which descend into the valleys among fields and forests down to 3,600 feet. Here nature is stronger than man, who struggles to grow little patches of rye or potatoes on the steep slopes or leads his flocks into the high pasture lands. Nevertheless even in the very deepest valleys hydro-electric plants have been established, their thick fumes obscuring the rugged, blackish landscape.

Inter-alpine world. Following the gorges that pierce this shining snow-covered wall, one penetrates

into the midst of a true Alpine world, molded out of the great recumbent mountain folds which are piled up behind the rampart of the central *massifs*. High mountains of dark schist or light-colored limestone frequently carrying glaciers frame deep-set valleys, sometimes contracted into narrows, sometimes widening into true basins. The altitude still admits of vine cultivation and orchards, but the principal resource is cattle raising, which necessitates on the part of the inhabitants a continual rhythmic passing up and down between the valley floor and the pasture lands among the summits. Hydro-electric plants are more and more capturing the high waterfalls. But there are further possibilities of development here. These valleys penetrating the heart of the mountains lead up to famous passes, Mont Cenis and Little Saint-Bernard, over which climb the great routes from Lyon (English, *Lyons*) to Italy. The railway from Paris to Turin also passes through here. All these advantages have attracted a large population to the interior valleys, forming a little inter-alpine world like the Four Cantons of Switzerland and the Austrian Tyrol.

The southern Alps. In proportion as the northern Alps are regular and harmonious, the southern Alps are chaotic and difficult of access. Nature here is harsh and violent, and the contrast is great between the luminous, sunlit sky and the mountain slopes crumbling into decay, the streams in their rocky

beds and the poor, sparse vegetation. The difference is almost as striking as that between the mountains of Oregon and those of New Mexico.

Pre-Alps. The Pre-Alps are extremely wide here. But they are no longer the pleasant, verdant mountains of the north set in parallel lines, covered with thick forests. The topography is rough and irregular. Beneath the naked cliffs stretch slopes of blackish earth torn apart by chasms, much resembling the Bad Lands of Dakota. The torrents now tumbling through gorges, now spreading out over wide spaces, are constantly enlarging their stony beds. On the valley floors Mediterranean plants can be found, almond and olive trees, but above them is only a miserable scrubby growth. These mountains take on a little charm only as they approach the sea, back of Nice, where pine forests adorn the slopes. In place of cattle there is only sheep raising. Hence these southern Pre-Alps are thinly settled, and more resemble the mountains of Algeria or Syria than their northern neighbors.

Inter-alpine world. Back of them we do not find the subalpine depression at all, and the central *massifs* are entirely eclipsed, not reappearing until we reach the Mercantour in the far south. In their place are rugged sandstone or schistose mountains whose soil is poor and stony. The regularity of the northern Alps appears only in the high interior valleys of Briançonnais and Queyras, whose elevation is considerable, and where in forests and high pasture

lands a vigorous pastoral life goes on. Human habitations are found at great heights. The city of Briançon, guarding the road to Italy, has an altitude of 4,300 feet, and the highest villages of the Queyras, with their black wooden houses, reach an elevation of 6,700 feet, very unusual in Europe. But intercourse is difficult, and the whole interior of the southern Alps would be condemned to complete isolation were it not for the great transverse valley of the Durance. This makes a wide gap from Briançon all the way to Provence, through which passed the armies of Caesar, and into which to-day commerce and civilization are able to penetrate. In this valley the vine can grow up to a height of 4,000 feet. Almond and olive trees make their way right into the heart of the Alps. Commercial cities have sprung up all along this fine highway, and industries utilize the furious torrent of the Durance to transmit light and power to the shores of the Mediterranean.

Thus the French Alps are a real world in themselves, a world which is wonderfully varied, too. The north is regular, elevated, damp, verdant as the beautiful Swiss mountains themselves; the south, confused, chaotic, rudely picturesque, is the near relative of other Mediterranean mountains. But the entire region, thanks to white coal, is waking to industrial possibilities, and is fast becoming one of the busiest regions in France.

CHAPTER V

THE JURA

Not far from Grenoble the Pre-Alps divide, some of their folds following the Alpine chain, others sweeping out toward the north and forming an independent chain known as the Jura. These mountains are a detached branch distinct from the Alps, to which they serve as a kind of advance guard. Held fast at both ends by ancient *massifs*—Vosges and Massif Central—the stress which lifted the folds of the Jura was able to spread out more in the center, making a kind of arc swollen in the middle and tapering at both ends. The chain is therefore divided into three distinct parts, Northern, Central, and Southern Jura.

Northern Jura. The compact folds of the northern Jura are on Swiss territory, narrowing more and more toward the confluence of the Aar and the Rhine, at which point they disappear. Across these low, forest-covered mountains pass the important railways joining the Rhine country and northwestern Europe to Switzerland and Italy.

Central Jura. Much larger and also much more varied is the central part of the Jura. On the west it overlooks the plain of the Saône from a rather steep front, a cliff deeply indented by valley lobes. With an admirable exposure above the damp plain, these

hillsides can produce the sensitive crops which have given the locality the name of *Vignoble* (vineyard). Rock salt is found here, and as it is mined at the point of contact between highlands and lowlands, it adds to the trade of both regions. It is in the Vignoble that the cities of the Jura are located, the principal one being Besançon. Back of this the Jura consists of plateaus in tiers from 2,000 to 3,000 feet in height, rising toward the east. The soil is poor, dry, and usually very permeable, so that the plateaus are covered with forests. The waters, filtering through the soil, reappear as magnificent springs in the hollows, full-grown streams from the start. They reach the plain through wide gorges alive with industries. Finally, at the east, where the effect of the Alpine movements was stronger, the compact folds were lifted still higher, forming the *Montagne* (mountain), with a height of nearly 6,000 feet. These folds are similar in their parallel arrangement to the Appalachians. An abundant rainfall produces dense forests, and especially pasture lands, whose cattle are exploited by societies of peasants called *fruitières*. These are ancient coöperative dairy associations which make butter and Gruyère cheese. Nor is this all. A very special industry has developed here, dependent somewhat on the severity of the climate. In order to make use of the leisure of the long winter hours when they are more or less snowbound, the highlanders of the Jura have taken up occupations requiring

little raw material but much time and careful attention. Industries demanding fine workmanship have grown up in this way, using wood for making pipes and rulers, metals for watches and clocks, glass and crystal for optical work. The people also make articles of celluloid and horn, and even undertake the cutting of precious stones. These industries have expanded from the domestic workshop into big factories, and now there are quite a number of busy little cities in the Montagne—Morez, Saint-Claude, Oyonnax. It has become the most prosperous as well as the most populous part of the Jura.

Southern Jura. Toward the south the mountain folds are again closely pressed together, the plateaus disappear, and the Jura is composed as at the north of a succession of low chains separated by depressions. These valleys recall the beautiful Shenandoah of Virginia. As the mountains are lower they are more easily cultivated. The vine is found almost everywhere. The villages with their flat red-tiled roofs already begin to look like the south. Industries exist here also, but there is nothing to compare with the patient, painstaking work of the highlanders of the Haut-Jura. This is the country of silk manufacture, controlled by the great houses in Lyon. Railways cross the chain through transverse valleys widened by ancient Alpine glaciers. The Paris-Turin line passes through on its way to the Alps. Finally, at the extreme south, the Rhône crosses the Jura through imposing gorges whose

steep grades are being made use of by hydro-electric plants. Magnificent projects already give promise of gigantic factories to be erected in the near future.

Thus the Jura mountains play an important economic rôle. Rich in forests and in cattle, with varied and thriving industries, they are also, in spite of the difficult terrain, a kind of thoroughfare traversed by all the trunk lines, putting western Europe in touch with Italy via Switzerland and the tunnels of Cenis, Simplon, and Gothard.

CHAPTER VI

THE DEPRESSION OF THE SAÔNE AND THE RHÔNE

Between the recent mountains (Alps, Jura) and the ancient but rejuvenated Massif Central, there is a deep depression where the sinking movements were going on until a very recent date. At the end of the Tertiary Age the northern part was filled by lakes and the southern part by a long, narrow marine gulf. Both have been replaced by the Rhône and its great tributary, the Saône. Broad and spacious in the north opposite the Jura, the valley tapers toward the south where it comes nearest to the Alps, and thus has two different aspects — the plain of the Saône, and the basins and narrows of the Rhône.

Plain of the Saône. From the Vosges to Lyon the plain of the Saône forms an elongated depression 160 miles long and 40 miles wide, with a moderate elevation varying from 500 to 1,300 feet. It was occupied during the Tertiary Age by a great lake. This lake was formed once again in the Quaternary Age when the opening of the plain toward the south was obstructed by Alpine glaciers overflowing from the Jura. The clays and sands deposited in these lakes form the rich, damp, impermeable soil of the existing plain. The climate is that of a depression.

Rains are not abundant, being intercepted in their westward journey from the Atlantic by the barrier of the Massif Central. The temperature, cold in winter, is warm in summer, and generates in the moist earth a prolific vegetation. Nevertheless important differences should be noted between north and south.

Haute-Saône. Toward the northeast, the basin is slightly more elevated—hence the name Haute-Saône (English, *Upper-Saône*)—and the lakes occupied only the lowest portions of the region. The fertile deposits are therefore limited in extent. The greater part of the soil is formed of dry limestones which produce meager crops and scrubby forests. As the country is hardly fit even for farming, it is thinly settled. But on the border of the plain of Alsace, in the open region between the Jura and the Vosges which is called the Gap of Belfort or the Door of Burgundy, accessibility and the presence of a small coal basin at the foot of the Vosges have stimulated an industrial activity like that of Lorraine and Alsace. There are mills for the spinning and weaving of cotton, machine shops in Belfort, besides hardware, bicycle, and automobile factories. This shows the influence of accessibility on the economic development of the plain of the Saône.

The Bresse. In the middle, a region called the Bresse occupies the lowest part of the ancient lake bottom. The soil of bluish clay is damp and fertile except where the streams that emptied into the lake

deposited gravels, forming a soil both dryer and poorer in quality. Meadowlands and ponds are plentiful, and in this rich earth orchards thrive, also cereals, among which corn is the principal crop. Groups of houses with their gay red-tiled roofs are scattered here and there among the meadows under rows of luxuriant trees. Cattle and poultry form the wealth of the Bresse, certainly one of the best instances of rural opulence in France. Cities are infrequent, although the population is dense. They are really only agricultural markets scattered along the outskirts of the country to facilitate its commercial relations with the exterior.

The Dombes. The southern extremity, called the Dombes, that part of the plain which was invaded by the great Alpine glaciers, rises gently toward the south. The glaciers deposited throughout this region a thick layer of moraines, making an impermeable soil, by nature infertile. The country was wooded for a long time. In order to exploit it, the monks in the Middle Ages cleared it and made a great number of artificial fishponds. When these were emptied, their sites, fertilized by the alluvial deposits, were planted with cereals. This procedure had but one defect, its unwholesomeness. In this marshy region the heat of summer developed fevers which made the Dombes one of the most unhealthful places in France. In the nineteenth century most of the ponds were drained. Roads and railways have been opened up and fertilizers imported for

the improvement of the arable land. The Dombes is to-day as well cultivated as the Bresse, and the state of public health has so much improved that it has been possible to reconstruct several of the ponds, thus supplying the fish market of Lyon. The proximity of that city has had a great influence on the agricultural prosperity of the Dombes, which has gradually become its chief source of supply for cattle and products of the soil.

Côtes of Burgundy. Along the western border of the plain rise the limestone slopes of Burgundy, which border the Massif Central as well. Above the low, flat spaces little grayish cliffs appear, at the foot of which, inclined at a moderate angle, is a talus-slope (composed of fragments of the cliffs which have broken off and fallen down). Having an excellent southeasterly exposure and a light gravelly limestone soil, these slopes are famous for the vineyards which are the pride of the Côte d'Or, Côte de Chalon, Côte de Mâcon. On the plateaus above there are only moors or woods; on the slopes the well-cared-for vineyards; below, scattered along at intervals of less than a mile, the large villages of the wine growers, a strong, sturdy population. The whole forms a narrow but singularly favored belt, more especially as the railways from Paris to the Mediterranean pass through here, having reached the saddle without obstruction from the Paris Basin. Necessarily, at the point where this thoroughfare descends to meet the plain of the Saône,

an important city grew up, Dijon, the ancient capital of the Dukes of Burgundy, to-day the capital of the wine trade and a central market for the entire region.

There is a bond connecting all these different parts of the plain — the Saône itself. The beautiful river flows from north to south, so wide that its peaceful surface is almost as quiet as a lake. It has always been an admirable waterway, well adapted to navigation, made all the more useful by engrafting upon it numerous canals which lead toward the Rhine, the Moselle, the Marne, the Seine, and the Loire. The Saône is like the trunk of a tree with many branches, rooted at the south where it joins the Rhône in the great city of Lyon.

The basins and narrows of the Rhône. Here the landscape has an entirely different appearance. Instead of being a wide plain, the valley is transformed into a series of narrow defiles linking together a chain of basins which expand in proportion as they approach the south.

From Lyon to Tournon the valley of the Rhône recalls that of the Rhine between Mainz and Bonn, but it has more light and color. The mighty river, held in between high walls of hard rocks on which perch fortresses or little towns adorned with Roman or mediaeval remains, gnaws away at the Massif Central. At every bend of the river the slopes facing south are covered with sensitive crops, peaches, cherries, and grapes, which require much care as

well as a benign climate. Making use of the rapid waters of the tributaries, the silk industry, as well as the woolen, enlivens the little cities snuggling in the narrow valley. On each side of the river, railways and roads carve out a passageway, bearing testimony to the enormous economic importance of this valley, the highway to the south of France and to the Orient, through which Roman civilization first penetrated into Gaul.

South of Tournon the narrows are found only at intervals. Plains expand between them, wider and wider toward the sea, framed harmoniously by the Pre-Alps and the Massif Central. Little by little the southern aspect becomes more marked. The heat of summer is intense, and the wind blows about little flurries of white dust. Irrigation becomes more and more necessary for agriculture, and is quite easily practiced, thanks to the water of the Rhône and its Alpine tributaries. South of the plain of Valence, where cereals are the principal crop, the cultivation of strawberries, melons, and vegetables on a large scale begins in the plain of Comtat, whose products are shipped to Paris, England, and Germany. Each field is limited in extent but admirably well cared for, protected from the cold *mistral* (north wind) by hedges of cypress or by wind shields made of reeds. Mulberry and almond trees adorn the plain, olive trees furtively seek out the sunny slopes. All along the river white cities have grown up, either commercial centers

or "halting places" along the Rhône, cities which have remained to this day half Roman, the noble outlines of their towers and amphitheaters rising above the impetuous rush of the stream—Valence, Orange and its Roman theater, Avignon and its palace of the popes, Arles and its Roman arenas.

The mighty Rhône, crowded with islands, is the life of this valley, filled with the sound of its surging waters. Thanks to the varied character of its tributaries, the great river always has enough water. Rising in the Swiss Alps, it reaches Lyon as an Alpine stream, swelled in late spring and summer by melting snows and glaciers. Its larger tributaries from the Alps, such as the Isère, accentuate this characteristic. On the contrary, the Saône, river of the plains, has winter floods, while the southern tributaries are fullest in the autumn. Hence the Rhône, fed by streams differing in origin, is never low, and it is without question the most powerful river of France. But its grade is so steep just below Valence that upstream navigation is difficult. It needs to be reconstructed, as it were, and this will be one of the great undertakings of the near future. There is a project to make use of the Rhône at the same time for navigation, irrigation, and the production of power, 700,000 horse power being an average estimate of its yield. When this is realized the Rhône will be more than ever the life of the country it traverses.

Situated at the confluence of the Saône and the

Rhône and at the point of contact between the plain and the narrows, Lyon has the most remarkable location of any city in France. For it not only unites the valley of the Saône to that of the Rhône, but it is close to the Massif Central, easily approached at this place, besides being near the Jura and the Alps. Here the highway from Paris to the Mediterranean crosses that from the ocean to Switzerland. The Alpine thoroughfares start here. Lyon is thus admirably situated from a commercial point of view. And trade has led to industry, for example, silk manufacture, which Lyon directs rather than carries on, for silk is made mostly in the vicinity round about the city. Lyon has always been prosperous; under the Roman Empire it was the capital of Gaul, to-day it is the second city of France. With more than 600,000 inhabitants, it is the metropolis of a vast region reaching all the way from the Vosges to Provence.

CHAPTER VII

THE MASSIF CENTRAL

In the very heart of France, facing the Jura and the Alps across the valley of the Saône and the Rhône, sloping gently toward the Basin of Paris and the Basin of Aquitaine with which it finally blends, partaking at the south of the Mediterranean climate and elsewhere of the Atlantic, the Massif Central from a geographical point of view is the epitome of France. As a whole, though much diversified, it can be divided into three parts, an eastern front ending in a precipice above the Saône-Rhône depression, a central area of volcanic mountains and basins, and plateaus at the west and south.

The eastern front. The violence of the Alpine thrust was so terrific that the entire eastern edge of the *massif* was forced up, forming a mountainous ridge which rises very slowly when approached from the west, but on the east falls off abruptly from a height of 4,500 or 5,000 feet to the Rhône valley below. It is really more the edge of a plateau than a chain of mountains. This series of cliffs has two different aspects. Toward the south, from the saddle of Lauraguais almost as far as Lyon, the precipice is very high, slashed with great gorges, the effect of the Mediterranean storms, as

The Massif Central

will be explained. It is a true mountain country. Toward the north, on the other hand, from Lyon to the Morvan, the edge of the plateau flattens out into low hills which are easy of access.

Southern part. The southern part of the eastern front of the Massif Central, a border zone approximately two hundred miles long, is one of the most rugged localities in France. The varied rocks — limestone, schist, granite — bulging here and there with extinct volcanoes, have been fashioned into pointed crests by innumerable torrential streams. The Mediterranean autumn storms cause sudden downpours of tremendous violence (36 inches in 24 hours), bringing on such floods that one of the rivers, the Ardèche, which is only about seventy miles long, can, at any rate for a few hours, compete as to volume with the Mississippi. The flanks of these mountains are so steep that in order to cultivate them the inhabitants have had to build a succession of little horizontal stone walls upon the hillsides to hold up the tiny fields, sometimes hardly bigger than a pocket-handkerchief. Even so, because of the infertility of the soil, crops are poor, except on certain valley floors where fine orchards can develop, owing to the heat of the Mediterranean climate. On the heights, flocks of sheep find pasturage, seeking refuge during the summer from the burning plains of Languedoc.

But industries can flourish even in these rugged mountains. The streams, thanks to their steep

grade, and in spite of their irregularity, supply motive power for factories. A few coal deposits are worked along the border of the mountains, furnishing the necessary fuel for the foundries of Alais. The southern part of the eastern front, especially in the Cévennes and in Vivarais, is a silk country. That is to say, silkworms are raised in the deep, hot valleys where the mulberry tree grows. The fiber of the cocoons is removed and spun in many little factories scattered here and there along the rivers. It is here and in the near-by valley of the Rhône that raw silk for weaving is prepared. Here also the skins of animals raised in the mountains are worked in large leather factories, while the wood and rags of the region are manipulated by famous paper mills. This picturesque mountain region is thickly populated by a sturdy, prolific race with an intense religious faith. A row of industrial towns, Alais, Aubenas, Annonay, guards the openings of the principal valleys.

Northern part. Toward Lyon the relief is less pronounced. As the distance between the Massif Central and the Alps increases, the highlands, having been less lifted, gradually flatten out. The altitude rarely exceeds 3,000 feet. More recent and more fertile soils, limestone and marl, overlie the masses of hard rock. This entire front is broken at intervals by passes connecting the valley of the Saône with that of the Loire. The mountains, being less elevated, are more easily accessible. The

vine is cultivated on the outer, eastern slopes. Above are fine pastures where the herds of *Charolais* are fattened. Unproductive land is thus reduced to a few rugged places, almost entirely wooded. The most famous of these rough countries is the *Morvan*, 2,000 to 2,500 feet high, which forms the northern boundary of the Massif Central, and from which logs are floated downstream toward Paris. The depressions dividing the mountains into sections contain deposits of coal which are the richest in central France. A busy industrial life has grown up in these low regions where transportation is easy. Toward the south, Saint-Etienne and its suburbs, situated between the Rhône and the Loire, use the coal for the development of metal industries (machine-shop products, war material, firearms), and especially for silk manufacture (ribbons and trimmings). It is one of the most thickly settled and enterprising places in France. Back of Lyon, the entire hilly region of *Lyonnais* and *Beaujolais*—at Tarare, for example—makes muslins both of cotton and of silk. Farther north the coal basin of Montceau-les-Mines supplies the enormous metal works of Le Creusot, which call to mind those of Pittsburgh.

Thus, from one end of it to the other, this border of the Massif Central, varied as it is, has great economic importance. If it forms a barrier which can be easily penetrated only at its northern extremity, the development of its streams and its coal,

not to mention the enterprise of its inhabitants, makes it, notwithstanding, one of the most active, up-to-date regions in France.

Mountains and basins of the interior. Back of the eastern front, the larger part of the Massif Central, which had already felt the effect of the uplift of the Pyrenees to such an extent that its surface was undulated from one end to the other, was still more affected by the counter-stress of the Alpine movements. As it was unable to give way under pressure, this great resistant mass was broken into fragments, some of which were dropped down, others forced up. All along the lines of fracture eruptions took place, piling up lavas upon the base rock. Hence this region has three different types of topography: fragments of the ancient *massif* which remained intact, the volcanic mountains, and the depressed areas.

The ancient mountains. The lifted portions of the original plateau which have not been covered by subsequent eruptions appear as round-topped mountains (Monts de Margeride, du Livradois, du Forez), with heights of about 5,500 feet. Their granite soil is not fertile; meager forests, interspersed with fields of rye, pastures of little value, and waste lands cover the slopes. It is the poorest and most desolate part of the Massif Central.

The volcanic mountains. There are two groups of volcanic peaks, each of which follows the western border of the two principal depressions. Along the

more eastern of the two the volcanic region is limited in extent, and is confined to the mountains of Velay — a row of eruptive mounds and peaks. Along the western valley, on the other hand, the volcanic trail is much more extensive. The southern volcanoes (Aubrac) are much older than those of the center (Cantal, Monts-Dore) and of the north (les Puys). Aubrac is only an incoherent mass, while Cantal and the Monts-Dore have high crests, peaks, and deep valleys, and the Puys (Puy-de-Dôme) have kept the form of cones or craters and still seem ready to belch forth flames or streams of lava. The presence of many hot springs (Royat, la Bourboule) and of certain grottoes of the chain of Puys still containing carbonic acid gas is evidence of former volcanic activity. Rising above the ancient surface, these steep extinct volcanoes, from which blackish lava-flows like long snakes with crackly skins creep slowly down almost into the green valleys below, are one of the most picturesque spectacles in France.

The volcanic highlands are fertile. The rocks, when decomposed, make a soil rich in phosphoric acid, lime, and potassium. Moreover, they are well watered, because they condense the humidity in the clouds drifting over from the Atlantic. It follows that the pasture lands are exceptionally fine, especially on the western slopes, where a famous breed of cattle called Salers is raised. The population is small, owing to the high altitude. The people are known as Auvergnats, are strong and hard-working,

and are occupied mostly with cattle breeding. The ungainly mountain cities with their houses of black basalt rock are famous for great fairs at certain fixed seasons.

The basins. At the foot of the volcanic mountains the basins extend in two irregular lines, forming two chains of depressions, those toward the east strung together by the Loire, those of the west by the Allier. Very restricted at the south, these valleys grow wider toward the north, expanding to meet the Paris Basin. In the intervals between the basins the rivers have carved deep, narrow gorges out of the base rock. The series through which the Loire flows, Velay, Forez, and the Roanne plain, is the least continuous; the basins of the Allier—which flows through the plain of Brioude, of Issoire, and of the Limagne —are less separated by narrows. The Loire group is less fertile, because the volcanoes, fewer in number, have not enriched the soil with their lavas. Exception must be made of the charming basin of Velay, a rich country bristling with volcanic needles. Here Lafayette was born. On the contrary, the Allier group, where eruptive material has collected repeatedly, is extremely fertile. The climate, very hot in summer and not too damp, thanks to the screen which the mountains spread out toward the west, protects the sensitive crops. Limagne is a real garden, where fields of grain and of sugar beets are intermingled, and orchards and vineyards cover the lower slopes. An increasing farm population

furnishes the labor necessary for manufactures, such as rubber (employing 20,000 persons at Clermont-Ferrand), cutlery, and foodstuffs of various kinds. Cities have grown up at the foot of the mountains in the basins, those along the Loire (Roanne) being less important than those along the Allier (Vichy, Clermont-Ferrand).

Lastly, the basins are commercially important. They make it possible, as you come from the Paris Basin or from the plain of the Saône, to penetrate into the heart of the Massif Central. In this way the political influence of Paris has spread toward the south. The valley of the Allier has especially profited by this, its basins being more numerous and closer together. Here the railway from Lyon to Bordeaux crosses that from Paris to Saint-Etienne, and from Clermont another line threads its way among the Cévennes toward the Mediterranean plains of Languedoc.

Plateaus of the west and south. Those parts of the Massif Central farthest from the Alps were much less disturbed and altered than the center and the east. The south and west of the *massif* retained the form of plateaus sloping gently toward the outer edges. Here there are no real mountains, although the altitude is sometimes more than 3,000 feet. There are only table-lands and rounded hillocks. A picturesque touch is given by the valleys, carved into gorges by the rivers tumbling down toward the basins of Paris and Aquitaine.

The plateaus of the west. The *Limousin* is another name for the plateaus of the west. These are composed of wide stretches of rolling country whose gently rounded hillocks grow less and less pronounced toward the west. But although the altitude diminishes, the granite soil is so infertile that it contrasts strikingly with that of the limestone plains in near-by basins—one means of distinguishing the Limousin from the surrounding country. The topsoil is a "cold" layer, as the inhabitants call it; that is, it is poor in fertile elements. Crops, mostly rye, oats, and potatoes, are meager. The most nutritious food is supplied by the chestnut tree, which climbs the hillsides to a height of 2,300 feet. The Limousin is also a region of grasslands well watered by the clouds from the Atlantic, which condense as they rise above the hills. Multitudes of little rivulets ripple across the impermeable soil, watering the pastures where graze herds of cattle, a long-lived breed which forms the real wealth of the Limousin. But manufactures are not altogether lacking. In the north a few small coal beds supply the foundries of Montluçon. The waters of the clear streams in the deep valleys are used by the tanneries of Saint-Junien and the munition works of Tulle. Finally, the exploitation of kaolin, the clayey residue from the decomposition of granite, accounts for the famous porcelain factories of Limoges. Although deep gorges make communication difficult and necessitate high viaducts for the railways, the Limousin

is nevertheless a thoroughfare where at Limoges the Lyon-Bordeaux line crosses that from Paris to Toulouse. Industry and trade have therefore made of Limoges the economic metropolis of central France, a city of almost 100,000 inhabitants. The people of the Limousin are strong and energetic; large numbers emigrate every year to find employment in Lyon, and especially in Paris. For more than a century the masons of the Limousin have built both private houses and public buildings in the capital.

The plateaus of the south. More picturesque but poorer still than the western plateaus are those of the south. Toward the east is the region of the *Causses*, a great limestone table-land whose soil is dry, whose vegetation is like that of the steppes. It is almost uninhabited, being slashed by deep gorges, one of which, the canyon of the Tarn, with a depth of 2,000 feet below its precipitous limestone walls, recalls the Grand Canyon of the Rio Colorado. Toward the west, the rough plateaus of the *Ségalas*, or "rye lands," composed of hard, impermeable rocks strewn with piles of loose granite boulders, are not unlike the Limousin. Life has had to find shelter on the valley floors, which are sometimes very narrow and sometimes are spread out among the red sandstones into wide, well-cultivated depressions where a Mediterranean flora has also sought refuge. All intercourse is extremely difficult, although there is considerable industrial activity. The sheep and goats of the region

furnish milk for the famous Roquefort cheese, also the raw materials for the leather factories of Millau and the woolen factories of Mazamet. On the borders of the Basin of Aquitaine the coal deposits of Decazeville and Carmaux account for the metal and glass works. In the autumn large numbers of the inhabitants go down to the plains of Languedoc to sell the products.

Thus, in spite of its altitude, the Massif Central is a busy region. Accessible through the valleys of the Loire and the Allier and by the plateaus of the west, it does not constitute an obstruction between northern and western France and the great regions of the southeast. If its agricultural resources are important only within the fertile depressions of the volcanic area, its manufactures are nevertheless prosperous, thanks to the coal deposits around its edges, thanks also to its water power, which is being constantly developed. The vigorous inhabitants have by their labor benefited all the surrounding regions. The picturesque beauty of the country, as well as the efficacy of the waters of its hot springs, attracts many tourists. So the Massif Central may be said to constitute one of the greatest reserves of power in France.

CHAPTER VIII

THE PYRENEES

Unlike the Massif Central and the Alps, the French Pyrenees do not form a great region. They are but the narrow boundary of a chain of mountains which attains its greatest development in Spain, its width on French soil rarely exceeding twenty miles. But the chain is high and steep and forms a real barrier. From many points of view the appearance of the French Pyrenees is different from that of the Alps. Lifted bodily, their folds sloping toward the north, the high mountains descend abruptly toward the Basin of Aquitaine. There are almost no "advance guards"—secondary chains, that is—comparable to the Pre-Alps. The mountain valleys do not unite in great arteries as in the Alps, making the high regions accessible. Each valley of the Pyrenees is of very simple construction, merely a north-south line straight from the heights to the plain below. These valleys, necessarily very short, contain streams which never become large enough to excavate wide beds nor to cut back very far the inclosing walls. Instead of the broad Alpine valleys, like the subalpine depression, the Maurienne, the Tarentaise, and the valley of the Durance, here there is a multitude of little transverse valleys, exactly alike, difficult of access and communicating

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with each other only by means of high passes. The summits have many different forms—finely chiseled peaks, heavy rock masses, table-lands ending in precipices, and high plains shut in by mountains—showing that the chain was eroded, then lifted again, and once more attacked by the forces of wind and water.

Since the Pyrenees are lower than the Alps, their highest peaks rarely exceeding 10,000 feet, there are only small glaciers of little or no importance. But the mountains are damper, having a rainfall heavier than that of the Alps. They receive the abundant moisture brought by the northwest winds from the near-by Atlantic. Over the cliffs tumble cascades of pure water much clearer than Alpine streams, which are clouded with the waste of the schistose rocks. These mountains are dotted with little lakes, held by barriers of hard rock which the water and ice have not had time to saw through. Vegetation is more luxuriant than in the Alps. Forests abound, and wherever man has destroyed them to make pasture lands for his flocks and herds, grass and bushes persistently cling to the soil. If they are less imposing than the Alps, the Pyrenees have notwithstanding much picturesque charm. Toward the east the influence of the Mediterranean climate is felt. The mountains are more rugged, often with huge, yawning fissures, and though farming can be carried on at greater heights than at the west, the pasture lands are very inferior and the

forests are often replaced by mere scrubby growth (*maquis*).

The French Pyrenees are therefore to be divided into two parts, the Eastern Pyrenees, or those near the Mediterranean, and those near the Atlantic. The latter, greater in extent, include both the Western and the Central Pyrenees.

Atlantic Pyrenees. *The Western Pyrenees.* Extending from the ocean to the pass of Somport, the Western Pyrenees are lovely, verdant mountains of moderate elevation. Corn fields reach far up into the valleys, and cattle raising is the chief occupation. The passage into Spain is so easy that the two sides of the chain were for a long time under the same government, the Kingdom of Navarre. A unique people, the Basques, inhabit both slopes. Besides the route along the shore, there are two famous passes, that of Roncevaux, celebrated by the crossing of Charlemagne, and that of Somport.

The Central Pyrenees. On the other hand, the Central Pyrenees, much more difficult to cross than the Alps, form a real barrier, separating France from Spain. The valley heads of the gorges descending toward the plain are surrounded by high walls of rock, as in the amphitheater of Gavarnie, where the foliage of the ash groves below forms a striking contrast with the high, white walls, over which fall ice-bordered cascades. Each of these valleys is a little world in itself, filled with crops below, while above are pasture lands where flocks from the

valleys and droves of sheep from Spain graze during the summer. The methods of agriculture and cattle raising in these isolated regions are often antiquated. The Pyrenees are not so much exploited as the Alps, but they have great charm. The green slopes and clear streams are full of quiet beauty. Many hot springs, their waters among the most efficacious in Europe, are scattered here and there in the valleys, at Eaux-Bonnes, Cauterets, Barèges, Luchon, etc. Industry is waking up, making use of the minerals and the marbles. Utilization of the water power is getting under way, and large hydro-electric power plants are under construction. The people are vigorous and fine-looking, but few in number, and cities are scarce, being located only where the valleys open into the Basin of Aquitaine. Lourdes and Foix form a sort of bond between mountains and plains.

Mediterranean Pyrenees. About fifty miles from the Mediterranean another landscape makes its appearance. The *Eastern Pyrenees* are dryer, sometimes almost arid. Their outlines in the clearer air are well defined; one can see farther across the bare, rugged summits. Gray takes the place of green as the predominant tone. In the west the houses are scattered; here they are united in villages built on prominent points like fortresses. Contrasts are violent; sometimes there are high depressions more elevated than those of the Vosges, broad, gray plains, in a setting of yellow rock-walls, recalling the high

plains of Algeria or Utah, sometimes deep, narrow gorges whose bare cliffs half conceal the sensitive Mediterranean crops far below. Near the sea the hills disappearing beneath the blue waves are bordered by little coves which recall the shores of Attica. This rough country has the advantage of possessing two transverse routes, the great passes of the Perche and the Perthus, over which one may travel without difficulty into Spain. Here, as at the west, the two slopes for a long time were under the same government. The people also spoke the same language — Catalan. Since these mountain regions are more accessible than the rest of the chain, their inhabitants are more enterprising, exploiting their iron and utilizing the power of their streams.

Nevertheless, except at the extremities, the economic value of the Pyrenees is inferior to that of other French mountains. Their valleys are too restricted and too isolated. The great barrier is not sufficiently indented to admit of trade of any importance. The people are just beginning to combat these unfavorable conditions by building roads wide enough to handle a large traffic between France and Spain. Already they have driven two tunnels, that of Somport and that of Puymorens, through which are to pass the direct routes from Pau to Aragon and from Toulouse to Barcelona. With the development of hydro-electric power the mountains will be transformed altogether.

CHAPTER IX

THE BASIN OF AQUITAINE

Surrounded by the Pyrenees, the Massif Central and the Massif Armoricain, the vast Basin of Aquitaine might appear to be identical in structure with the Paris Basin. But nothing could be further from the truth. The history of its formation is entirely different, and it follows naturally that its geographical features do not resemble those of the Paris Basin in the least. The Basin of Aquitaine was originally part of a depression which extended from the Massif Central well into Spain. The chain of the Pyrenees was thrust up from the middle of this enormous basin. The result was not only that it was cut in two, the Basin of Aquitaine representing only the northern half, but also that the upheaval modified the topography of the basin considerably. Streams rushing down from the recently uplifted mountains piled up at their base an immense deposit of alluvial material which a subsequent movement of the ground seems to have elevated still farther. As a result the basin is dissymmetrical. On the north it is merely an inclined plane sloping gradually away from the Massif Central, while at the south it consists of a great alluvial fan spreading from the middle of the chain of the Pyrenees toward the east, north, and west. Between these two slopes, a long

groove conducts the waters of the basin toward the Atlantic; it is called the valley of the Garonne. Instead of a flat, saucer-shaped depression like the Paris Basin, here there is a furrow. Instead of one center this basin has two, one at each end of the groove. This arrangement has had a great influence on the history of the country as well as on its economic development. Two rival cities, Toulouse and Bordeaux, have divided the region between them. From an economic point of view one half turns toward the east, the other half toward the west.

The Basin of Aquitaine is thus composed of three parts, the plateaus of the north, the slopes of the south, and the valley of the Garonne separating the plateaus from the slopes.

The plateaus of the north. The plateaus of the north, a sort of platform, backed on the north by the Central and Armoricain Massifs, slope gradually toward the southwest. They are of limestone formation which yields a dry, loose soil, but they are frequently covered by more recent rocks, sands, and clays, more compact and thus yielding a less fertile soil. They are dissected by wide, deep valleys, the richness of whose soil added to their advantageous exposure makes them the pride of the country. The altitude of the plateaus, the number of valleys, and the extent of the patches of sand make it possible to distinguish several different types of country.

Charente. At the northwest is Charente, bordering on the ocean, the lowest of all the plateaus and the most dissected. Under the favoring influence of the mild and damp marine climate there are many luxuriant meadowlands. Coöperative agricultural societies manufacture a grade of butter so superior that it has monopolized the Paris market. Toward the south the vine grows luxuriantly, and a celebrated liquor known as Cognac is manufactured. In addition to agricultural industries, there are paper manufactures, the pure water percolating through the limestone rocks supplying the well-known paper mills of Angoulême. A wide, open country, it is easily accessible, and across it passes the highroad from Paris to Bordeaux and Spain. The coast used to be indented with numerous bays, now mostly silted up. The gulfs have been transformed into low plains which are wonderfully fertile, along whose edges are located famous oyster beds (*Marennes*). From the ends of the promontories a series of beautiful islands, such as Oléron and Ré, reaches out into the sea and forms a protection for harbors where the ports are located — Rochefort, and especially La Rochelle, which hopes to become the Atlantic port of Switzerland. This agreeable, well-located region may look forward to a bright future.

Périgord. Next in line toward the southeast is Périgord, less favored by nature. The plateaus, being less dissected, are often covered with sand, and are therefore wooded more often than cultivated.

Toward the southwest, in the Double, the soil is very poor. Here, as in the Dombes (plain of the Saône), ponds were formerly constructed which became fever-traps and had to be cleaned up — a long-delayed procedure which was not accomplished until the nineteenth century. The vineyards of the limestone plateau were all destroyed by the phylloxera during the eighties, but they have been replaced by truffle-bearing oaks which have a good yield. Fortunately the valleys are admirably suited to agriculture. Well sheltered beneath the limestone cliffs, in whose caves prehistoric man used to live, they enjoy a soft, sunny climate and yield excellent vegetables, grapes, and other fruits. In particular, the region near Brive, protected on the north by the Massif Central, is a real garden, shipping its early fruits to Paris by the direct Paris-Toulouse railway.

Quercy. Farther toward the southeast, Quercy is a region of still higher and even dryer plateaus, real table-lands where fields of grain in the hollows are surrounded by poor sheep pastures. All the more marked is the contrast with the luxuriant valleys of the Dordogne, Lot, and Aveyron, where sensitive crops can grow and where the population is very dense.

The northern plateaus of the Basin of Aquitaine thus show a notable contrast between their moderately elevated plateaus and their opulent valleys. The same is true of the south.

The southern slopes. The southern slopes of the Basin of Aquitaine can be divided into three parts. In the center is the great alluvial fan of Armagnac, flanked on the west by the plain of the Landes and on the east by the lowlands of Haut-Languedoc.

Haut-Languedoc. The low area which joins the Eastern Pyrenees to the southern plateaus of the Massif Central is called Haut-Languedoc. This area also connects with Bas-Languedoc, adjoining the Mediterranean, over the saddle of Lauraguais. It is one of the most affluent regions in France, where life is easiest. Originally Haut-Languedoc was a sort of plateau, but the clayey sandstone composing its soil was so soft and the valleys were widened by the streams so quickly, that the plateau disintegrated and is now represented by only a few high wooded strips. All along the slopes and in the valleys there is a multitude of little hamlets whose occupants cultivate corn and wheat, harvest grapes and other fruit, and raise poultry and cattle. Their agricultural wealth satisfies. Factories do not exist, except a few tanneries and woolen mills near the mountains. This region with its roads, railways, and the Canal des Deux-Mers (Two Seas) connecting the Atlantic and the Mediterranean forms a wonderful thoroughfare which has not by any means been made the most of. So well endowed by nature, abounding in picturesque old cities like Albi and Carcassonne, Haut-Languedoc is not as much exploited as it should be — a state of affairs only too common in Aquitaine.

Armagnac. The heart of ancient Gascony, known by the name of Armagnac, is not so well off. The great, flat, alluvial fan on which it is situated rises to a height of 2,300 feet in the middle, nearest the Pyrenees. From that point a great number of valleys radiate in every direction. Toward the east they are so crowded together that the streams are small and unimportant, while the western valleys are wide enough to accommodate some of the largest rivers of the Pyrenees. These valleys are well adapted to irrigation. Between them the plateau is covered with trees, or more often with a scrubby growth, *touya*, upon which the flocks that come down from the Pyrenees graze in winter. From the grapes which grow on the slopes and valley floors is manufactured a famous liquor, Armagnac brandy. Cereals are cultivated, and a breed of horses, called Tarbes, is raised. In the rich western valleys are located many winter resorts—Pau, for instance—thanks to the mildness of the marine climate and the fine views of the imposing chain of mountains. Along the shore, where the outermost bulwarks of the Pyrenees meet the sea, there are smooth beaches, the most famous of which is Biarritz, with its multitudes of tourists. The only industrial city in the Basin of Aquitaine is located near here, the port of Bayonne, which produces pig iron from Spanish ore with English coal.

The Landes. Very different from Armagnac is the Landes. It consists of a vast triangular plain,

whose base is the coast, rising gradually toward the east, where it attains a height of about 300 feet. The soil is mostly sea sand which the western winds have spread like a great cloak over the ground, leveling all the ups and downs of the surface. This sand is consolidated into impermeable sandstone a foot or two below the surface, so that water collects on top, and the desolate region until recently consisted of moors and marshes in which the inhabitants struggled about on stilts. But this state of affairs has been completely changed, thanks to the efforts of modern engineering. The invading sand dunes along the shore, behind which water has collected in large ponds that are entirely shut off from the sea, have been anchored by planting trees upon them. In the interior, ditches have been dug to dry out the marshes, and the waste lands have been planted with pine and cork trees. To-day the Landes is one vast forest with cultivated open spaces here and there, equipped with a dense network of railways and exporting in great quantities wood, cork, and resin. The region is growing rich and the population is increasing, conditions very unusual in the Basin of Aquitaine.

The valley of the Garonne. Between the northern plateaus and the southern slopes stretches a narrow groove, followed throughout its entire length by the great river which collects all the waters of the basin. This is the valley of the Garonne. Fed by streams from mountains almost entirely devoid

of glaciers, whose winter snows melt rapidly in the spring, the Garonne is necessarily an irregular stream, subject to dangerous floods at the same time that heavy Atlantic downpours descend upon the entire basin. The Garonne is clogged with alluvial material brought by torrents from the Pyrenees, which have worn away the soft sandstones of Haut-Languedoc, as well as by the streams which have traversed the red sandstones of the Massif Central. This undependable river with its constantly shifting channel is not suitable for navigation, except in its lower reaches, where the tide raises its level. It was necessary to build a lateral canal beside it all the way to Toulouse, a waterway which unfortunately is not well suited to heavy traffic. This fact is the more to be regretted since the valley is as varied as it is rich.

The plain of Toulouse. Upstream, between Haut-Languedoc and Armagnac, stretches the plain of Toulouse, that part of the valley which spreads out between the Pyrenees and Quercy. Upon its fertile alluvial land are grown the biggest crops of grain in southern France. It follows that Toulouse is a center of the flour trade. This vast plain, over which great clouds of dust are blown about by the wind, is densely populated. Except in the regions where the river is liable to overflow, villages of mud houses with roofs of tile, similar to the adobe houses of Mexico, cluster. Wherever the streams can be crossed, there are found cities of brick whose streets are

paved with round cobbles from the stream bed. The largest of these cities is Toulouse (150,000 inhabitants), situated at the place where the route from the Mediterranean over the saddle of Lauraguais joins the valley of the Garonne. It is an ancient capital whose commerce, as well as its intellectual activity, is considerable, but because of insufficient means of transportation it has not attained the industrial development of which it is capable.

Agenais. Below Toulouse the valley turns westward, narrowing as it slips between Armagnac and the cliffs of Quercy. Facing south as it does, and protected on the north, it resembles a hothouse. Its cultivable land, composed of terraces of alluvial material brought by the Garonne, is very fertile, but is not of great extent. Agenais is just one vast garden. The little cultivated spaces only a few yards square, surrounded by plum trees and vineyards, produce wheat, vegetables, and tobacco. These products form the basis for a not inconsiderable trade, the vegetables being shipped to Paris and the plums of Agen, rivaling those of California, to the entire world. The narrow strip of Agenais is densely populated and dotted with little cities. It is a contented, happy country — too happy, perhaps — where the temptation not to work is great, and where the birth rate is decreasing with alarming speed.

Bordelais. The valley broadens toward the northwest, and the tides of the ocean mingle with the yellowish, even chocolate-colored, waters of the

river, which widens into a magnificent estuary, the Gironde. This region, called Bordelais, is given over to cultivation of the vine, owing as much to qualities of the soil as to ease of exportation. There are only vineyards as far as the eye can reach; the heavy soils of the valley floor produce the rich, dark wines of Palus, the limestone slopes near by produce Sauternes, or wines of the côtes, and the gravels along the edge of the plateau the famous vintages of the Graves (Médoc). In addition, the beautiful estuary is well suited to commerce. The port of Bordeaux exports, besides wine, stone and lumber from the Landes, and imports English coal. Great smelting and chemical plants have been built up along the quays. The imposing city of 300,000 inhabitants is not only the center of the western part of the Basin of Aquitaine, but the influence of its trade and industries will shortly be felt throughout the entire southwest of France.

The Basin of Aquitaine thus appears to include regions of differing importance, but life is easy and pleasant throughout. Unfortunately, the basin suffers on account of the defective state of its transportation facilities, which are not favorable to the establishment of industries. It suffers still more from an excess of good things, a condition which seems to inspire the inhabitants to the least possible effort. Nowhere in France is the birth rate lower, nowhere is rural depopulation more marked. Herein lies a real danger for this richly endowed land.

CHAPTER X

THE MASSIF ARMORICAIN

At the western extremity of France the Massif Armoricain projects into the sea. Here the rugged peninsula of Brittany seems reaching out to meet the ocean storms. Surrounded by the sea on three sides, Brittany has a long and deeply indented coastline. The marine climate is found here in its most extreme form. Continuous rains and an even temperature explain why the vegetation is mostly grass and trees. But this ancient *massif* is inhospitable to man, ill adapted to agriculture, and really livable only along the coasts and at its junction with the Basin of Paris on the east. Ruggedness and a mild, equable climate are its two chief characteristics.

The Massif Armoricain can be divided into two parts. Its western extremity is a peninsula almost separated from the continent, while at the east, from Cherbourg to La Rochelle, its rocky landscape blends with the surrounding plains. The bleak character is less pronounced here, and the region shares the more agreeable mode of life of the adjoining basins.

Brittany. Brittany is a peninsula about one hundred and sixty miles long by seventy miles wide, consisting of hard rocks — sandstone, granite, and schist. Its soil is thin, its population is hardy and

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prolific and partly made up of Celts who came over from England. Being so cut off from France, it remained for a long time aloof, the people even speaking a different language, Bas-Breton. The tide which rises and falls far up in the innumerable sounds and bays along its shores seems to endow it with special characteristics. Not, however, that Brittany is entirely maritime. Two chains of round-topped hills, parallel to the axis of the peninsula, extend in an east-west direction a short distance from both northern and southern coasts, separating the narrow maritime zone called *Armor* from the more extensive interior known as *Arcoat*.

Maritime Brittany. The coastal zone known as Armor or Maritime Brittany is richly endowed by nature. Its wealth is due to three causes, the configuration of its shore line, its excellent soil, and the peculiar mildness of its climate.

Its coast line is very irregular and is thus comparable to that of the state of Maine. On the north, sea and land interpenetrate; that is to say, there are long, pointed promontories, deep, narrow sounds, and innumerable little islands. At the west, broad, well-protected bays face the ocean, one of which, the harbor of Brest, communicating with the sea by a very narrow strait, makes a wonderful refuge for warships as well as merchant vessels. It recalls the harbor of San Francisco. The southern shore is no less irregular. It has in addition an inland sea, known as the Morbihan, sprinkled with islands,

of which, so the saying goes, there are as many as days in the year. The ocean has a tendency to fill up the shallows and build barrier-reefs across the inlets and from one island to another. The harbor of Lorient is not comparable to that of Brest, but the entire coast of Brittany is well suited to various kinds of seafaring life. Each bay, each inlet has its little port, very active at high tide, serving as a point of departure for some local fishing fleet. Sometimes these fleets consist of small boats which do not venture far from land, sometimes of big schooners and trawlers which follow the schools of sardines along the south shore, sometimes of still larger vessels which set out from Saint-Malo or Paimpol to fish for cod near Iceland or off the Banks of Newfoundland. The fishermen are a magnificent race, as numerous as they are hardy and resolute, and most of the sailors on French men-of-war are recruited among them. The presence of the navy yards and the arsenals of Brest, a city of 100,000 inhabitants, and of Lorient, can be explained both by the nature of the coast and by the peninsular form of the country. A project is under consideration for making Brest a great transatlantic port to shorten the voyage to the United States, toward which Brittany seems to be reaching out. Although its eccentric location would apparently unfit it for trade, a number of its northern ports, Brest, Morlaix, Saint-Brieuc, Saint-Malo, are in constant communication with England, which

affords the chief market for the farm produce of the peninsula.

For it must be noted that this coastal region is not only a maritime country, but is also rich agriculturally, a fact due primarily to seaweeds and marine deposits which are brought by the tide, and which are excellent fertilizers. Along the northern shore farming is made easier because a layer of rich loam[1] covers the bare skeleton of rocks. As already noted, the climate of the entire coast is so mild that there is almost no winter, and southern plants such as fuchsias and azaleas can grow outdoors the year round. So agriculture flourishes, especially in the fertile lands of the north. Spring comes so early that vegetables raised here, especially in Roscoff, reach Paris as soon as those from the Mediterranean region.

This band of coast is therefore very rich. Every summer it attracts hordes of tourists who seek out its picturesque resorts, the most famous of which is Dinard, near Saint-Malo. Manufacturing industries have taken root in Brittany on account of the abundant labor supply. Soda is extracted from sea weeds, and canning factories put up sea foods of various kinds, especially sardines. Thus Armor, with its maritime, agricultural, and industrial resources, really deserves the name of "Golden Belt" which has been bestowed upon it. It is one

[1] *Limon* is a word for which there is no exact English equivalent. It is a superficial soil of different origins, always rich, varying in depth from a few inches to a few feet. The word "loam" is a free translation.

of the most thickly settled regions in France and one where the population is increasing most rapidly.

Inland Brittany. The contrast with the rugged interior is great. This is real Brittany, Arcoat, where ancient customs and Celtic legends have been best preserved. Here the soil is thin and infertile. Farming is confined to raising potatoes and certain cereals which can be grown on poor land; that is, rye and buckwheat. Apple orchards, protected here from the ocean winds, are a great asset, especially as they furnish cider, the favorite drink of the country. But the chief product is cattle, which graze in the rocky pastures and on the gorse and heather of the moors. The peasants used to work on great estates as serfs. They are not so tall nor so fine looking as the people near the coasts. They live far from each other, in little low stone houses, and hygiene is to them entirely unknown. Formerly inland Brittany was the poorest part of France, and many inhabitants emigrated to Paris or to the basins of Paris and Aquitaine.

But the country is gradually being transformed, thanks to the improvement of transportation facilities. The canal from Nantes to Brest has made it possible to obtain lime, a necessary fertilizer. During the last twenty-five years a network of railways has been built all over Brittany, importing fertilizers and exporting the products of the country. Cattle breeding has taken a great start. The Breton language is fast disappearing, a fact to be welcomed,

as it erected a barrier between the peasant and the outside world. The younger generation all speak French. Progress is shown everywhere.

At the two extremities of Brittany natural conditions are more favorable. Toward the west, among the soft schists, the basin of Châteaulin almost joins the Golden Belt, while at the east the vicinity of Rennes has a fertile soil, thanks to the marine sediments deposited in an arm of the sea at the end of the Tertiary Age. This basin of Rennes has the further advantage of communicating easily with both northern and southern coasts, and at the same time of not being far from the Paris Basin. Rennes serves as a center for this elongated country, which really has none at all, and also as its open door to France. Its traditional rôle as capital is thus explained, also its commercial development, for Rennes is both the intellectual and the economic metropolis of the entire peninsula.

Eastern part of the Massif. East of Brittany the Massif Armoricain is less isolated and more accessible. While preserving the characteristics peculiar to its soil and climate, it partakes at the same time of those of adjoining regions with which it has always been connected for political reasons. It is much richer than the interior, being more open and more developed as to natural resources. From the Paris Basin, near at hand, it is differentiated by its rugged topography, its dark-colored rocks, and the abundance of trees planted in thick rows around

its fields and meadows. It is distinctly the type of landscape known in France as the "west." But it is a west which is domesticated and easy of access. From north to south the following divisions may be made: Lower Normandy, Lower Maine, the Vendée, and the Valley of the Lower Loire.

Lower Normandy. With its great peninsula of Cotentin protruding into the English Channel, Lower Normandy is nevertheless not a maritime region. Its coasts are much less indented than those of Brittany, its harbors are few and far between. The most important of all is that of Cherbourg, a military post and port of call, which was artificially constructed by means of an enormous breakwater. But if it lacks harbors—for it is much like the shallow, sandy coast of New Jersey—it has a luxuriant vegetation in the interior, where cattle graze knee-deep in the tall meadow grass. Toward the south, among the hills of the Bocage Normand, the soil is not so good. But this is more an industrial locality, anyway, with cotton mills and foundries—the seat of an ancient industry which since the revival of iron-mining has taken on a new lease of life. The economic center of the region is the city of Caen at the northeast, well within the limits of the Paris Basin. Agricultural produce and minerals are shipped in that direction, for Normandy turns its back, as it were, on Brittany.

Lower Maine. The same may be said of Lower Maine. This desolate country used to be covered

with thick woods, but the timber was all cut and the land was made use of in two ways, first, as pasture for flocks, and second, as arable land where cereals, flax, and hemp were cultivated. A brisk manufacture of textiles was carried on by hand at home, adding considerably to the resources of this poorly endowed country. But this condition of affairs was completely changed in the nineteenth century. As in Brittany, the soil was enriched by artificial fertilizers imported by rail. The moors were put under cultivation, and methods of cattle breeding were greatly improved. Agricultural prosperity became so great that home industries were completely driven out. The manufacture of textiles is now carried on only in Laval, other existing industries being stone-quarrying and mining on a small scale — gold, for instance. The chief occupation in Lower Maine to-day is selling cattle to the farmers in the rich plains of the Paris Basin.

The Vendée. South of the Loire, the Vendée is even more accessible, surrounded by the basins of Paris and Aquitaine. In the center is a group of rugged hills, a more or less impoverished region. But the flat lands in the northeast and southwest have a fertile soil — schists enriched by the addition of lime — well suited to wheat growing and cattle raising. As in Charente, butter made by the agricultural coöperative societies called "*beurreries*" is a very valuable commodity. These are associations of peasants who have come together and set up

little factories, each with a sales depot. Every member brings his milk, for which the company pays him the highest possible price. It is then made into butter and sold by expert dairymen in the employ of the association. The by-products, buttermilk and so forth, serve as food for swine, which are fattened and disposed of at fabulous prices. The richest parts of the Vendée are the low plains and marshes along the coast, ancient bays now silted up. The shore line is for the most part even, and there are few harbors.

The Valley of the Lower Loire. But north of the Vendée a great thoroughfare pierces the rugged heights of the Massif Armoricain. It is both a waterway and a highway. This is the Valley of the Lower Loire, which widens as it nears the ocean into a broad estuary. This valley is both the high-road to Brittany and the southern outlet of the Paris Basin. Therefore it has considerable economic importance. The river unfortunately is entirely inadequate as a means of transportation, though improvement of it has begun. Above Nantes the stream has been artificially restrained to a single channel, and below the city the estuary has been dredged so as to accommodate ships drawing as much as twenty-six feet. The port of Nantes has regained its former prosperity. Trade has stimulated industrial activity such as metallurgy, ship building, and the manufacture of food products. Below this city of 200,000 inhabitants, at the entrance of the estuary,

is Saint-Nazaire, the port for ocean liners. This is where the enormous docks for landing most of the American troops in France were constructed.

To sum up, the Massif Armoricain, which was formerly a poor country, is now progressing rapidly. This progress is felt even in the interior of Brittany, though it is greatest in the more accessible regions at the east, where improvement of the soil has been more easily accomplished. This eastern part can furnish to the Paris Basin on a large scale those products to which the region is especially adapted by nature, that is, cattle and their by-products.

CHAPTER X

THE PARIS BASIN: PLAINS OF THE SOUTH AND THE NORTHWEST

Taking its outside dimensions from the Massif Armoricain to the Vosges, and from the Ardenne to the Massif Central, the Paris Basin is the largest of the natural regions of France. No locality of similar extent and configuration can be found in the United States to serve as a basis for comparison. The plain of the Nord may also be included, the transition between the two being almost impossible to determine. In this vast expanse of lowlands it goes without saying that there must be differences of relief. Even here the Alpine thrust, although weaker, warped the surface of the ground sufficiently so that many kinds of land forms were fashioned which can be easily distinguished. We shall run through successively the plains of the south and the rolling country of the northwest, then linger for some time among those plains and plateaus of the north and east which have been the scene of the Great War.

Plains of the south. A relief more simple than that of the broad plains reaching from the gates of Paris to the Massif Central and the Massif Armoricain would be hard to find. The surface of the ground has not stirred since the ocean waters last occupying the basin slowly retreated, and finally disappeared

behind the rugged coast of Brittany. The uplift of the entire region was so slight that the rivers, lengthening their courses little by little as they followed the retreating sea, had sufficient time to

THE PARIS BASIN: PLAINS OF NORTH, CENTER, AND SOUTH

cut down their valleys wherever they encountered resistant rocks. Vast, flat plains dissected by broad, beautiful valleys—such is the simple topography

of the region. And yet it is here, in districts without distinguishing characteristics of any kind, that all the grace and harmony of the true French landscape is to be found.

Even if the relief is simple, the nature of the soil and, consequently, the vegetation and agricultural possibilities are very varied.

Berry. At the southeast the region consists of a limestone plateau, Berry — wide, dry stretches of country which are rather dreary. Upon the slightly rolling surface, field follows field with no avenues of trees or even hedgerows to relieve the monotony. It is a land of cereals and of sheep, whose wool provided the raw materials for the old-time cloth factories that are still operating in Châteauroux and Romorantin. In the limestone soil is found a little iron, which in ancient Gaul supplied the foundries of the old fortress of Bourges, taken by Caesar after a famous siege. Although the mines of Berry are no longer exploited, the iron industry has persisted to this day, and is represented by the iron works of Vierzon and the great government factories in the arsenal of Bourges.

Poitou and Touraine. West of Berry in Poitou and Touraine the dry plains give place to wetter plains. From the border of the Basin of Aquitaine almost to the Seine, the limestone is covered here and there with thick patches of sandy clay, more or less infertile, but suitable for forest lands. Brooks and rivers again make their appearance, giving a

quiet, pleasing aspect to the countryside. In Poitou these regions called *brandes*, consisting of heaths, forests, and groves of chestnut trees, form a sort of bridge between the two rugged districts of the Massif Central and the Massif Armoricain, rising east and west of the saddle. Still farther inland, in Touraine, these plains form *gâtines*, that is to say, sterile regions, seldom even wooded, where farming hardly pays.

Sologne. To the south of Orléans is situated the melancholy region called Sologne, which used to be one of the most neglected spots in France. Wide moors covered the gravelly, clayey soil, and the hollows were filled with artificial ponds like those in the Dombes, real pest holes of malaria. Toward the middle of the nineteenth century a colonizing venture, organized and carried on by the Emperor Napoleon III, began to transform the country. Ponds were drained, moors were forested, waste lands were reclaimed. The population is not numerous, but prosperous and healthy. Sologne, with its forests full of game, has become the greatest hunting ground in France. Previous to the war special trains for hunters left Paris every day during the open season for the game preserves of Sologne.

Beauce. North of Orléans the plains again become dry throughout the whole expanse of a vast region called Beauce. Its monotonous fields extend to the very gates of Paris. Although dry, it is fertile enough — the limestone covered with loam —

a true wheat country which has been since time immemorial the granary of Paris. It entirely lacks the element of the picturesque, except perhaps in spring when the wind sweeps across the green fields of grain stretching between the gray-walled villages clustered here and there.

Between these plains of the south, some of which are dry, others moist, some fertile, others bare, there exists one bond — the circulatory system of this incongruous organism. This is the broad valley through which flows the Loire with its tributaries, the Cher, Indre, Vienne, Loir, and Sarthe. These rivers have excavated deep valleys in the soft substratum of limestone. The limestone walls are often precipitous and riddled with caves which serve even now as the abode of human beings. On the valley floors the alluvial material brought by the rivers makes an excellent soil, sufficiently moist, and neither too light nor too heavy. Thanks to the shelter of the slopes and to the east-west direction of the streams, the influence of the marine climate can penetrate far up the valleys, where crops are luxuriant. Vineyards and orchards (plums of Touraine) are interspersed with fields of wheat, gardens, and nurseries. Very slight touches suffice to make a landscape full of grace and charm — just the bend of a stream, or the rows of trees which border it, the outline of a hillside covered with well-groomed gardens, or clean little white peasant houses. But what a proud contrast is made by a glimpse of one

of those regal *châteaux* which sprang into being all up and down the valley of the Loire during the Renaissance! Truly here we are in the heart of France, where everything is well ordered, harmonious, and finely adjusted.

These rich valleys inhabited by a hard-working and unusually refined type of peasant have yet another rôle; they are great thoroughfares. Their importance is attested by the presence of numerous cities, Angers and Le Mans on the edge of the Massif Armoricain, Poitiers on the road to Aquitaine, Tours at the crossroads from west and southwest, and Orléans where all the roads converge before reaching Paris. Unfortunately, this commercial rôle is disappearing since the rivers are no longer navigable. The Loire and its tributaries from the Massif Central are certainly very inadequate from the viewpoint of navigability. In their upper courses they have a steep grade, and all the water which the impermeable soil could not absorb rushes down with great rapidity. These floods sweep into the valleys of the Paris Basin, from which they cannot escape quickly for lack of sufficient slope; so they tear away embankments and dikes and inundate the lowlands. Yet in summer the watercourses are reduced to little rivulets, lost among banks of sand. Formerly, for lack of better means of transportation, the inhabitants tried to adapt themselves to the vagaries of the rivers, and there was a brisk boat trade between Orléans and Nantes, but since the building of railways this

has almost entirely disappeared. Only recently has it been recognized that water transportation is absolutely necessary for the economic development of these regions, and in particular that industries which used to prosper can be revived only by improving the waterways. At the suggestion of the people of Nantes, who wish the sphere of influence of their port to be felt in the interior, a plan for improving the Loire has been drawn up. It has already been put into practice between Angers and Nantes. Its completion will increase the trade of this well-located region, reduced at present to the exploitation of agricultural resources, which are by no means equally important throughout the area.

Plains and plateaus of the northwest. The part of the Paris Basin bordering on the English Channel and backed by the Massif Armoricain on the west is better endowed by nature. Everything seems expressly arranged for the convenience of agriculture, commerce, and industry.

Agricultural prosperity is due in part to the mild marine climate, moderated still further by a high humidity, but even more to qualities of the soil. Where this is not composed of marl, the soil best suited to rich meadow grass, it consists of a chalky limestone covered with fine loam, in which cereals flourish abundantly. These two kinds of soil occur in broad, alternating bands at right angles to the shore line. Marls appear wherever erosion has washed away the chalk which usually overlies them in this vicinity.

Plains. Near the boundary of the Massif Armoricain marl soils are found in the fertile hollow known as the lowlands or basin of *Auge*. According to a local proverb, grass grows so fast here that it pushes up the cattle, and a stick lost in the grass in the evening cannot be found next day! Thus the basin is primarily a cattle-raising country, where animals for the Paris market are fattened, and where famous butter and cheese — Camembert, for instance — are made. Throughout the southern extension of this moist zone, in the region of *Perche*, the well-known Percheron draught horses, much sought after in America, are bred. Conditions are the same in the verdant lowlands of *Bray* toward the northeast, a country of rich meadows and apple orchards, and also toward the north in *Boulonnais*, a celebrated horse market.

Plateaus. Alternating with these lowlands at an elevation of about three hundred feet, stretch broad plateaus which fall off into the sea in a series of steep, picturesque cliffs. The permeable chalky soil is covered with a thick layer of loam, excellent for wheat, beets, and, formerly, textile plants such as flax and hemp. This is the edge of the wide, open plain of the Nord, which is both the most fertile and the best cultivated part of France. It also profits by its nearness to the sea and the high humidity. The fields are interspersed with meadows, and the villages are surrounded with screens of trees or closely planted orchards. These towns are composed of huge groups of farm buildings

placed side by side. Through the deep, wide, verdant valleys pass the transportation routes along which industries of various kinds have grown up.

Coast. Its long line of coast explains why this region has always been one of trade. Not that the coast is everywhere well adapted to the construction of harbors. In *Boulonnais*, for instance, there are a few small bays, with fairly good shelter, from which Napoleon had planned to descend upon England. But with these exceptions the coast is inhospitable. Toward the north, in *Picardy*, it is low and even, its only openings small estuaries mostly silted up, its harbors insignificant. In *Normandy*, as far as the mouth of the Seine, the chalk cliffs, more than three hundred feet high, overlook the ocean. It is a picturesque region, but hardly suited to the give and take of trade between land and sea. Harbors are found only at valley mouths. There is not room enough for their necessary buildings, and, moreover, they are inaccessible from the interior. Beyond the estuary of the Seine there are cliffs and beaches, but with the exception of the mouth of the Orne, there is not one natural harbor.

To sum up, the coast is beautiful and admirably adapted to vacation resorts, and is crowded every summer with Parisians, who have built such imposing watering places as Trouville and Etretat. But it is less well suited to commerce.

Yet nearness to the Channel, which is the busiest stretch of water on the globe, and to England, ought

to tempt the inhabitants to sea-callings. The little harbors can serve as points of departure for fishing fleets. Boulogne, for example, is the largest fishing port in France; its trawlers ceaselessly patrol the waters of western Europe, and the city supplies two-thirds of France with fish, even shipping as far as the shores of the Mediterranean. On the other hand, several ports have specialized in rapid transit to England. Dieppe, for example, is in constant communication with Newhaven and Brighton, while Boulogne is only twenty-five miles from Folkstone, with which it has daily connection. The coast of Normandy, however, is not smooth throughout its entire length. It is deeply cut into by the broad estuary of the Seine, which is the chief trade route of France. This bay is all the more important because it is the outlet of a river which is the best adapted to navigation of any in the country. Two important ports have grown up at the mouth of this superb waterway. The outer of the two, Le Havre, is the chief port of entry for travelers from North America; it is also a huge depot where tropical products such as coffee are stored previous to being manipulated by trade. Rouen, situated on the Seine where it is still under tidal influence, has an entirely different rôle; it is primarily the port of Paris. To Rouen English coal, American oil, Scandinavian timber, Algerian wines, and foreign wheat are brought by ocean-going vessels and reshipped by train or river steamer to the capital. Rouen is thus the

gateway for the center of the Paris Basin, which gives it an importance increased during the war, for the city has recently become, after Paris, the chief port of France.

In conclusion, agriculture and commerce have brought about the establishment of industries, agriculture providing a labor supply, commerce facilitating the import of raw materials and the export of manufactured products. At the south, the iron ore of the Massif Armoricain is treated in the big foundries of Caen. At the north, in Boulonnais, cement is manufactured from the clayey limestones, and metal works already established have been transformed into specialized factories for making steel pens.

The region round about Rouen is destined to remain a center of textile industries, as it long has been. In the Middle Ages native flax, and wool brought from across the sea, were made into cloth here. In the eighteenth century cotton manufacture advanced to first place among the industries. Woven at first in the country, cotton is now both spun and woven in and about the city of Rouen.

Such an abundance of natural resources makes of the northwest part of the Paris Basin a rich and populous country. The rural districts are inhabited by a thriving, prolific people, in whom the Scandinavian blood of the Northmen, mixed with the prehistoric and Celtic elements, has formed a powerful race which is both shrewd and level-headed.

The cities with their superb medieval buildings are real capitals, especially the metropolis of Rouen (150,000 inhabitants). During the Roman period it was already flourishing, and under the Normans who conquered Great Britain it was the most important place of all. One glance at its great monuments testifies to the prosperity of the past. It is a source of satisfaction that the industries of the present time still maintain its reputation as one of the most prosperous cities of France.

CHAPTER XII

THE PARIS BASIN: THE NORD; FLANDERS, ARTOIS, PICARDY

Northern France, from the Belgian frontier to the plateaus round about Paris, is one vast plain, admirably cultivated—before the Great War—intersected by a remarkable network of railways and canals, and animated by a vigorous industrial life. Here the horrors of war raged most brutally and most continuously. Here the devastation wrought by the Germans was most widespread. And here is a part of the battle-front that witnessed the most desperate fighting. But the warfare was not of the same kind in Flanders as in Artois and Picardy, because the three regions are geographically very different. They must be distinguished from each other—the plains of Flanders from the hills and ridges of Artois and from the plain of Picardy.

Flanders. Flanders is a low, flat, wet country. It is a concave region, a basin, as opposed to the convexity of the hills of Artois, south of Flanders. It is really but a part of the North Sea basin, and is barely above the level of its waters. The underlying rocks are so soft that the relief is, as it were, all melted and smoothed into almost perfectly horizontal plains upon which appear only the merest vestiges of hills.

Along the North Sea stretches a plain so low and so flat that it scarcely rises above the mean tide level. The only elevated portion is the line of ridges called the Monts de Flandre, between Saint, Omer and Ypres. Most of these hills do not exceed 200 feet in height, and only a giant or two attains 300 feet, so that nowhere does the relief offer an obstruction to traffic.

But on the other hand, the nature of the soil and the presence of water almost everywhere can be as much of an obstacle to armies on the march as real mountains would be. Clay is the characteristic soil of French Flanders, and is the fundamental fact to be reckoned with. Throughout the region the clay soil presents the same difficulties, both to agriculture and to traffic. After a rain the water, unable either to run off the level ground or to percolate through the impermeable clay, remains stagnant on the surface, turning the country into one vast mud-flat. But in the dry season this heavy soil cracks, breaks open, and becomes as hard as rock. The laborer must then pour water on his plough in order to advance, whereas after a rain he must work barefooted, as it is impossible to extricate any footgear from the mire. It is not hard, therefore, to imagine the effect of the passage of hordes of armed men, followed by their great convoys, across such a country. The dirt roads are always impassable during the wet season. Even the paving of the highways sinks under the weight of heavy cartage, and the

enormous ruts are gradually effaced by sloughs of mud.

But the clay soil of Flanders has still greater surprises in store. In the interior it is responsible for that luxuriant vegetation which has given the name of Houtland (wooded country) to one entire section. Thick hedges, rows of trees in imposing avenues, clusters of elms about the houses, groves on the less fertile portions, adorn the countryside, half concealing it beneath a veil of green. This vegetation makes an excellent ambush. The maritime plain is intersected by a network of canals and ditches which at low tide drain into the sea the waters that fall from a sullen sky. As its level is below high tide, the region is easily flooded by opening the gates through which the inland waters escape. This was done by the Belgians in 1914 when they turned the battle field of the Yser into an arm of the sea by opening the locks at Nieuport.

Thus it appears that the Flemish plain, taken all in all, is not practicable for armies. Yet the Germans hurled themselves furiously upon it because occupation of the rich lands seemed to them a condition of their success.

In the first place, the possession of the coast seemed particularly necessary. In itself this line of gray dunes bordered by red-roofed fishermen's houses would appear to have little value. But it is close to England, and commands the entrance to the strait of Calais. Two large ports are located upon

it: Dunkerque (English, Dunkirk), at the north, the receiving port for the raw materials necessary for Flemish industries, and Calais, the favorite landing place and point of departure when coming from or going to England. The maritime plain behind is, when sufficiently dry, extremely fertile.

But the interior of Flanders is still more fertile. Before the war it was the busiest and most populous part of France. The soil, for centuries worked intensively by an intelligent people, produced excellent crops of wheat and barley, hops, sugar beets, and flax. Its fields of grass, clover, and alfalfa fed the plentiful herds of cattle, which in turn supplied milk, butter, cheese, and meat to the dense population of the region. This population was concentrated around Lille. The industrial activity of that city dates from the Middle Ages, when it spun and wove English wool while peasants near by spun and wove the flax raised in the neighborhood. During the last century machine labor has almost entirely supplanted hand labor, and great factories have been established in Lille and its vicinity. Cotton manufacture has been added to that of wool and linen. In the group of cities of which Lille is the center, Lille itself specialized in cotton and linen thread; Roubaix and Tourcoing monopolized the woolen industry, and Armentières and the cities along the Lys made linen fabrics. Moreover, the presence on the spot of an abundant laboring class, constantly increased by the immigration of Belgians,

determined the rise of other industrial establishments such as the machine shops, breweries, oil works, and chemical factories of Lille, more especially those of the suburbs south of the city. The manufacture of ready-made clothing was also important, supplying the big department stores of Paris and employing 30,000 women.

This great industrial center was densely populated —a million inhabitants in a space of 340 square miles. Tall factory chimneys towered above the tree tops. Three large cities, Lille, Roubaix, and Tourcoing, joined by an almost uninterrupted line of suburbs which all together tended to form a single urban mass, alone had a total of 650,000 inhabitants. The whole region was devastated by the war. Armentières was destroyed, two sections of Lille were ruined. The Germans carefully removed or rendered worthless the entire equipment of the factories. French Flanders is now only a great inert body waiting to be brought back to life.

Artois. Destruction is even greater farther south in Artois and in the coal fields extending toward the east.

Artois is a succession of hills beginning near the coast in Boulonnais and decreasing in height little by little toward the east. At the foot of their slopes were driven the first "artesian" wells, which took their name from that of the region. The northern boundary of the ridge, whose elevation is brought into relief by a fault, just south of Lille, overlooks

the Flemish plain at a height of over 500 feet. Its crests became celebrated during the Great War—the heights known as Notre-Dame de Lorette and Vimy Ridge, for instance, which were desperately fought over because they commanded an enormous expanse of territory. Beyond the Scarpe the higher

THE PARIS BASIN: NORTHERN BATTLE FIELDS, ILE-DE-FRANCE, CHAMPAGNE

land is represented by a few scattered knolls, like the hills of Monchy-le-Preux and the sandy mounds south of Douai which finally merge with the plain.

North of this convex region and stretching along its base, are located the most important coal deposits of France. These are the westward extension of the coal fields of Belgium which reach across the Rhine as far as Westphalia. A curious industrial landscape is superposed, as it were, on the original rural aspect of the plain. First, there is the necessary equipment for mining the coal, brick chimneys, and metal openwork shaft houses for pulleys and chains which drive the frame into the shafts. Near by are mine-dumps, solid black cones as much as a hundred feet high, formed of waste from the mines, the "cursed mountains" of the sinister country. Waves of little one-story houses whose red bricks are blackened by the heavy smoke trailing along the ground beneath the low-hanging clouds sweep across the plain. These groups of houses, all identical, are called *corons* (mining-towns). They sometimes smother the native villages altogether, sometimes form an adjoining quarter geometrical in pattern, or even constitute, all by themselves in the midst of the open country, a perfectly new town with streets and houses all exactly alike. Here and there a city looms above the monotonous landscape — Lens, Douai, Valenciennes — old fortresses whose bulwarks have long since disappeared, their sites having become modern industrial centers. For

previous to the war, activity was as great here above the ground as beneath it. In order to profit by the presence of fuel without being burdened by the cost of transportation, a long trail of industrial establishments grew up all along the coal belt — coke furnaces, iron works, oil refineries, chemical factories, glass works, mirror factories. After the Lille group, this region with its centers of Béthune, Lens, Douai, Aniche, Denain, Anzin, Valenciennes, was the most densely populated of any in France. To-day it is lifeless. The factories are destroyed or robbed of their machinery. The mines are ruined, except those at the west which were not occupied by the Germans, and which were worked even during bombardments. The most productive part of the coal basin, near Lens, was systematically rendered useless. The shafts were filled with rubbish — remains of the mining apparatus — and then flooded by destroying the casing which prevented the subterranean waters from filling the galleries. Four or five years of persistent labor will be necessary to restore the coal fields to a workable condition. In these rich countries, so hard hit, the war is by no means over.

Picardy. Toward the south desolation spreads still farther, but in a somewhat different form, for in Picardy throughout a wide district even the soil itself is destroyed.

Picardy is from most points of view the exact opposite of Flanders. It is a chalk plateau with a

mean height of about 300 feet, extending from the Sambre to the Channel. It is the most monotonous and depressing place imaginable, in spite of the valleys of the Somme and its tributaries which are sunk below its surface to a depth of about 200 feet. Except for these valleys there is nothing but a uniform expanse of rolling country traversed by a network of dry gullies. It is even possible to find an absolutely horizontal surface. The fertile region between Péronne and Amiens, *Santerre*, for a distance of fifteen miles or more has neither hill nor valley. Certainly the nature of the ground does not obstruct progress, which indeed is the easier, as the soil is dry, thanks to the permeability of the chalk. Neither does vegetation interfere. Trees are rare throughout the entire plain, and are found only on the principal valley floors. Groves have entirely disappeared under the greedy axe of the peasants, who are eager to increase the amount of soil fit for cultivation.

The land has the mournful appearance of a region completely and scientifically exploited. It is the great highway by which to invade France from the north. Here were fought the battles of 1914, 1916, and 1918.

This plain was extremely fertile. Upon the chalk was a layer of loam several feet thick, admirably suited to agriculture. In the nineteenth century it was used for a somewhat sensitive crop, sugar beets, and Picardy became the chief source of sugar

supply for France. Wheat, which followed beets in the rotation of crops, profited by the cultivation of the latter and gave a fine yield. On the waste from the sugar factories cattle were fattened for the market. A dense rural population collected in large villages whose houses were packed close together to be as near as possible to the wells, which are very costly on this permeable plain. These villages became fortresses of the battle fields. Moreover, an abundance of labor, added to the presence of raw materials and good transportation facilities, created industries such as the manufacture of sugar and of alcohol, milling, brewing, and the making of linens and woolens, whose raw materials were formerly produced in the vicinity. This manufacture is still carried on to a certain extent in the country, where the workmen weave in winter and turn farmer in summer. But more and more it is concentrated around the towns which have sprung up in the valleys along the rivers or canals, as at Amiens, with its velvet and cloth factories, Saint-Quentin, a cotton center, and Cambrai, a great agricultural mart.

This prosperity is only a memory. Saint-Quentin is in ruins, Amiens has been partially destroyed. Rural industries have entirely disappeared.

Even the land is spoiled, because throughout the length and breadth of the battle fields the soil was so deeply ploughed up by trenches, shell-holes, and mine-craters that the covering of loam was either destroyed, reduced to powder, or buried beneath the

chalk of the subsoil. Throughout a zone ten, twenty, or even thirty miles in width, it is feared lest the fertility of the soil may not have been completely ruined, so that the only means of restoring it would be to forest it with pines. A cloak of thin forests is thus to take the place of the fine crops of the past, and large tracts of prosperous Picardy will be transformed into solitudes poorer than Sologne or the Landes of Gascony.

Cities destroyed, inhabitants scattered to the four winds, industries annihilated, lands laid waste to a depth unknown — such is the heritage bequeathed the scourge of war as it disappeared from Northern France.

CHAPTER XIII

THE PARIS BASIN: THE PLATEAUS OF THE ILE-DE-FRANCE

South of Péronne and Saint-Quentin the surface of the monotonous plain takes on a different appearance. At first there are rounded hillocks scattered helter-skelter, each hill with a perfectly even cap of rock, betraying the presence of hard strata.

South of Noyon these hills, united in groups, expand into one continuous plateau occupying the center of the Paris Basin and sloping gradually toward that city.

The foundation of these plateaus is a firm, resistant limestone which underlies all the superstructure. This rock crops out in all the cliffs bordering the region. But at the north as well as at the south this architecture is considerably modified. At the north, soft rocks underneath the limestone are worn into great valleys, carving the plateau into bits; such is Soissonnais. At the south, the plateau remains intact, but the limestone almost disappears beneath a layer of clay and sand which entirely changes its appearance; such is Brie.

Soissonnais. To repeat, Soissonnais is composed of an underlying horizontal layer of limestone dissected by valleys into fragments differing greatly in size. The plateau is very dry, even more so than

the plain of Picardy. Trees are even scarcer than in Picardy. There they at least surround the villages. Here there are no villages. Not, however, that the plateau is poor. On the contrary, the layer of loam covering the surface produces as good crops as does the great plain of the Nord. Beets and wheat thrive here. But the villages nestle in the valleys in order to get out of the wind, and also to be near the water seeping out from beneath the thick limestone. Only a few straggling roofs show above the cliffs, or a slender church spire peers over the top as if to watch for an approaching enemy. A few large, isolated trees, held in great veneration, and a few big farms cannot suffice to occupy the wide, bare spaces traversed by modern highways as well as by the direct lines of the ancient Roman roads.

The surface of the lonely plateau is diversified, however, by a network of valleys which bring life and action into Soissonnais. The size of these depressions is astonishing when seen from the edge of the cliffs. The least among them would seem to have been excavated by a large river. And yet they are occupied only by unpretentious, peaceful little streams, the Oise, Aisne, Vesle—which has sculptured a valley two miles in width—and the Ailette, a mere rivulet, whose valley, nevertheless, is more than a mile wide. Sands and clays beneath the limestone explain this extensive erosion. The surface water, as soon as it reaches these soft layers,

begins to sink in at once and to wear away stream beds, while the upper layers of limestone, thus undermined, break off and fall down; and so is the valley widened. Accordingly the high, flat surface is dissected into a multitude of little plateaus, or torn into long narrow strips, the most famous of which is the Chemin-des-Dames.

The variety of the strata cut through by the valleys produces diversified land forms and consequently differing resources. The valley floor rests upon a layer of clay, which makes it damp, sometimes even marshy, and it is covered with trees and grasslands. The slopes above are gradual, consisting of fine sand or rich, mellow soil. The bits of limestone which crumble off and fall down from above mix with what is already there and produce an almost perfect topsoil. Here are raised vegetables, the pride of Soissonnais — string beans, artichokes, asparagus. There are orchards, too, and on the best exposures, vineyards. Most of the villages, clustered about springs, lie hidden in the recesses within reach of the meadows below as well as the wide fields above, and close to the valuable lands on the slopes. Far above rises the limestone cornice whose clear-cut outlines make a striking contrast with the humble landscape below. Here is where openings to quarries played such an important part in the Great War, serving as shelters and strongholds.

This lovely region was in fact the scene of many of the bloodiest battles. In this countryside so full

of charm—all scented as it were with memories of the ancient history of France, adorned with *châteaux* and churches whose architecture is world-famous, as well as picturesque old cities—the most infernal struggles of the war took place: the battle of the Aisne in 1914 and 1915, the battle of Chemin-des-Dames in April and October, 1917, the German offensive of Chemin-des-Dames in 1918, and finally, the glorious second battle of the Marne, which extended even farther south into Brie.

Brie. The landscape changes little by little toward the south. The valleys are deep as before, but not so wide and not so numerous. The principal ones are those of the Marne and of the Ourcq. The plateau is more continuous; its appearance is different because the surface is covered with sands and clays upon the limestone. A sandy zone bounds Soissonnais on the south, indicated by lines of low, wooded hills, the names of which (Forests of Villers-Cotterets and Fère-en-Tardenois) have been made famous by the Franco-American offensive. Beyond the valley of the Marne, commanded by Château-Thierry, the beautiful region of Brie extends all the way to the Seine. The soil, composed of clay and loam, is damper than that of the plateaus of Soissonnais. Here and there, even, there are ponds. Vegetation is more luxuriant, trees shut in the farms and form little groves now and then. Agricultural products are varied and abundant. Brie is queen of wheat. Together with her neighbor, Beauce, she

supplies Paris. Sugar beets grow here, too, and cattle are numerous, furnishing Paris with meat and cheese (Brie). On the slopes of the deep valleys are orchards whose fruits are sent to the capital. A few industries thrive in the rural countryside — stone quarrying and plaster manufacturing; there are flour mills, sugar manufactories, and distilleries. But agriculture gives the country its peculiar stamp, with its scientific processes and its almost industrial aspect, combining farm and factory in one. So many farm hands are needed in the rush seasons that in summer and fall Belgian Flemings have had to be imported; they poured by thousands into the great farms. Brie really forms an extension of the fertile plains reaching from the center of Belgium all the way to Paris.

CHAPTER XIV

THE PARIS BASIN: CHAMPAGNE

Toward the east, extending as far as the Vosges, the Paris Basin shows a simple configuration formed of two component parts, plateaus and cliffs. All the layers deposited by the seas of the Tertiary and Secondary Ages appear one after the other, from the most recent to the most ancient, brought to light by the uplift of the whole mass as a result of the Alpine thrust and by subsequent erosion. As the entire region was bent up like the edge of a saucer, the layers all slope toward Paris, each one forming a plateau inclined slightly in that direction and ending in an abrupt escarpment or *côte* at the east. This type of relief is found as far west as Champagne. It is even more manifest in Lorraine. (See map, p. 130).

The first of these escarpments facing east is that which, overlooking the plain of Champagne, forms the edge of the plateau of the Ile-de-France. Rising 500 to 650 feet above the plain, this cliff twists and turns, forming bays and promontories like the famous "mountain" of Reims (English, Rheims), sometimes even "islands," remnants of the cliff left standing alone upon the plain, like the Monts de Champagne, upon which the fierce battles of 1917 and 1918 took place. On the frontal margins are

found the same kinds of soil which appeared in the valleys of Soissonnais. These slopes, which have an advantageous exposure to the south and east, are covered with the famous vineyards of Champagne. The vine is cultivated here only by persistent effort, the results of which are often destroyed by early frosts. The vineyards are very small, sometimes hardly more than an acre or two, and the land is enormously expensive, ranging from 30,000 to 45,000 francs a hectare (2.47 acres). The wine harvested is manipulated in immense cellars hollowed out of the chalk to such a depth that they were bomb-proof. The population collects on the slopes in gay little villages hardly more than 500 yards apart. Even so, it is necessary at harvest time to hire helpers from all the surrounding country.

At the foot of the abrupt incline are prosperous cities, centers of the wine trade, such as Epernay, Ay, and Reims. The last-named city was also a great producer of woolen goods, as well as a trade center, situated as it is at the gateway of the Ile-de-France and on the through line from Calais to Bâle. Its buildings, especially its cathedral, bore witness to its former greatness and to its important place in history. For it was in the cathedral of Reims that for ten centuries the kings of France were consecrated. It was to the people of France not only a marvel of architecture but the symbol of their greatness. It is ruined now.

During four years the Germans ceaselessly bombarded Reims from the Monts de Champagne without the slightest military excuse. The site where this city of 110,000 inhabitants once stood is now only a desert waste.

Champagne pouilleuse. Beyond, the country is open toward the east. There is only a plain, wide as the sea. That part of Champagne known as *pouilleuse* (a figurative expression meaning useless) extends as far as the Argonne, and is flatter than Picardy, although it rises almost imperceptibly toward the east. While the chalky soil resembles the soil of Picardy, the valleys are not as deep. No gorges, no craggy surfaces break the monotony of these undulating plains. In Picardy, at least man bestirred himself to adorn the landscape with many big villages, church spires, and rounded haystacks. But here all is empty space, where land forms and even human beings seem to be wanting. This is because the soil is almost sterile. There is no loam on the surface. Chalk crops out everywhere, yielding a soil of limestone gravel or white powder made spongy by the slightest rain, which turns it into a sticky white paste. There are no fertile elements whatever. It can be characterized as arid. Yet attempts have been made to utilize it, and most of the worthless and unproductive lands have been reforested. All the higher portions have been planted with pines, so abundant now that they often fill one-third or one-quarter of the entire space. Confining most

of their efforts to the regions nearest the valleys, the peasants have succeeded, by means of fertilizers, in increasing the quantity and especially the quality of their crops. All the villages as well as the cities are found in valleys, as, for instance, Châlons and Troyes, the first a transportation center, the second an industrial city manufacturing woolen goods from raw materials provided by the sheep of the solitudes.

These great plains which seem incapable of producing anything whatever, with a vegetation so sparse that "the chalky soil appears here and there like skin under the pelt of a scabby sheep," are the regions best adapted by far to movements of armies. Attila and the Huns were once conquered here, like William II in 1914. Furious attacks were launched here in 1915, 1917, and 1918. Modern strategy had succeeded in making use of the slightest irregularities of the surface, turning to account the pine woods and scattered villages; in a word, making the region, open and defenseless as it is, into a veritable fortress. For this is where trench warfare was most successful.

Champagne humide. Less ingenuity was required to make the most of the neighboring locality, "moist" Champagne, with its hilly area of the Argonne.

A new rock, in turn lifted toward the east, comes to light beneath the chalk. Its mere appearance is enough to transform the landscape. Instead of permeable chalk, here are sands and clays; that is to say, a moist soil, where water is as plentiful as

it is uncommon in Champagne *pouilleuse*. Ponds, especially toward the south, are numerous. There are forests everywhere — great, dense woods wreathed in mist. Cultivated fields are scarce except in one or two broad valleys; they make way for cattle raising.

On the whole, the land forms resulting from these soft rocks are not much differentiated. But there is one notable exception to the rule in the Argonne. In a line with Reims and Verdun, its soil is composed of a hard, whitish sandstone, constituting a little upland area with an elevation of about a thousand feet. The height above the surrounding country is thus inconsiderable, but the land forms are very complicated. The sandstone slopes are steep, and the hills are dissected by ravines whose walls are precipices. Thus the Argonne is a labyrinth of crests and hollows. Over this wilderness of deep gorges and steep ridges is spread an immense forest-cloak of oaks, birches, mountain ash, and pines, with an impenetrable underbrush of heather, ferns, and broom. In these thickets war resembles a trappers' fight. Nowhere else during the Great War were the opposing forces so entangled with each other. For years the conflict raged here without result. A prodigious effort on the part of the French and especially of the Americans in the autumn of 1918 chased the Germans from thicket to thicket and from gorge to gorge, until with the great offensive of November first, the Argonne forest was entirely cleared of the

enemy, who was forced back beyond the Meuse. The Argonne has been called, with good reason, the Thermopylae of France. But it is a Thermopylae from which the Allies succeeded in driving back the barbarians.

CHAPTER XV

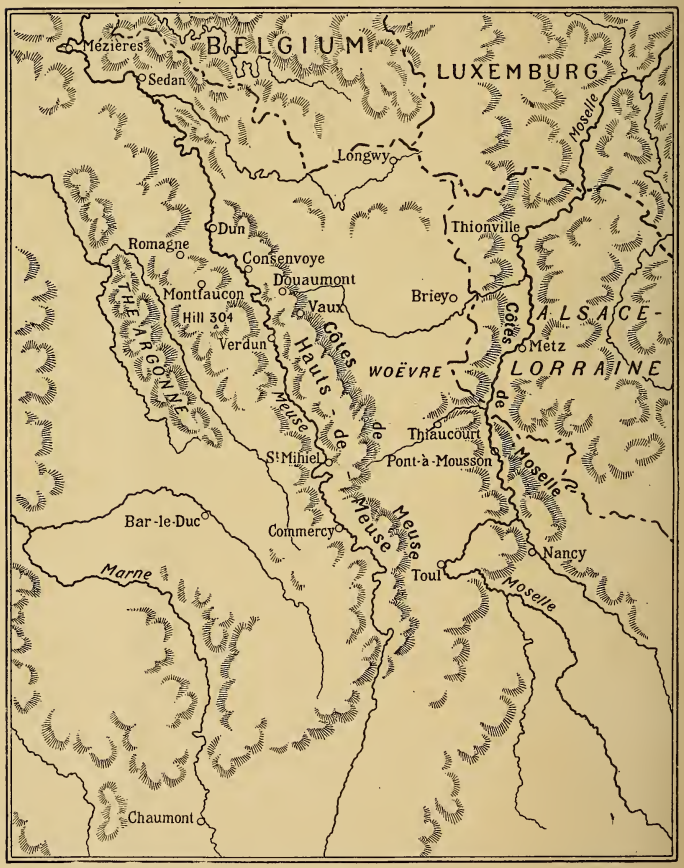
THE PARIS BASIN: LORRAINE

The landscape of plateaus and cliffs already noted in the Ile-de-France and Champagne is still more marked in Lorraine. From beneath the sands and sandstones of "moist" Champagne protrudes a limestone layer rising toward the east and ending in a more or less regular *côte*. From the foot of this first *côte* another plateau extends toward the east, almost identical with the first, and after this another and yet another until one arrives at the higher and more scattered hills upon the plain of Lorraine.

Thus a distinction must be made between the region of plateaus and *côtes* at the west and the plain at the east. In this chapter we are concerned only with that part of Lorraine which remained French after the partition of 1871.

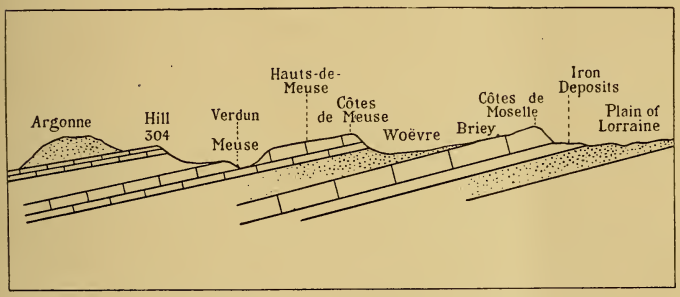
The plateaus of the west. Rolling uplands crossed here and there by deep ravines between steep limestone cliffs, like those dissecting the plateaus of the Hauts-de-Meuse near Douaumont and Vaux — such are the plateaus of the west. Both appearance and natural resources differ, according as the soil is composed of clay or limestone. The limestone plateaus, which are the more extensive, are infertile. The rock, which is scarcely decomposed

at all on the surface, yields only a sort of gravel. It is hard to cultivate except here and there in hollows. Besides, the climate is severe, the elevation being close to 1,300 feet. The vocation of these



THE PARIS BASIN: LORRAINE, PLATEAUS AND CÔTES

limestone soils is to produce forests. Each plateau figures on a forest map as a festooned veil. There are many forests on the crests of the first limestone belt, that of Bar-le-Duc, and those of Avocourt, Cheppy, Romagne, which have become sadly famous. But these are nothing in comparison to the great woods appearing on the plateau next farther east.



Cross-Section of Côtes of Lorraine

This wide, elevated expanse, called in military terms the Heights of the Meuse, which traverses Lorraine all the way from Chaumont to Sedan, is entirely forested. Do we need to recall such names as the Forests of Consenvoye, Ormont, and Grande-Montagne, where the American army fought so heroically? The only passageway through the region is the wide valley of the Meuse, which follows the central line of the plateau from Commercy past Saint-Mihiel and Verdun to Dun. Upon its fields and meadows and bordering villages the dark wall of forests looks down from above. Another wooded

region, less dense, and with more open spaces, is that which commands Nancy, Pont-à-Mousson, and Metz.

When a more impermeable clayey soil takes the place of the limestone still farther east along the *côtes*, the appearance of the plateau is not necessarily much altered. To be sure, deep ravines in the limestone are more or less blotted out when crossing the clay soil; that is to say, the relief is less pronounced, but less regular. The plateau is more rolling, but is not as much dissected. Forests still cover a large part of the soil where it is too clayey for crops to succeed without too great expense. This is why the zone of soft, impermeable rocks following the Côtes of the Meuse from Toul north — the region to which is given the name of Woëvre, whether at the south near Thiaucourt or at the north in the Forest of Woëvre — is covered with great forests. Here and there among the woods many ponds testify to the impermeability of the soil. The southern part of the Woëvre is dotted over with them. Nevertheless there are open districts as well. In spots where the soil is less compact and more suited to agriculture, especially wherever a layer of loam covers the clay, the trees have been cut off and villages cluster around the fallow lands. But these populous regions are not common. The really favored parts of the country are the *côtes*.

Each of the plateaus invariably rises slowly toward the east, where it terminates in an escarp-

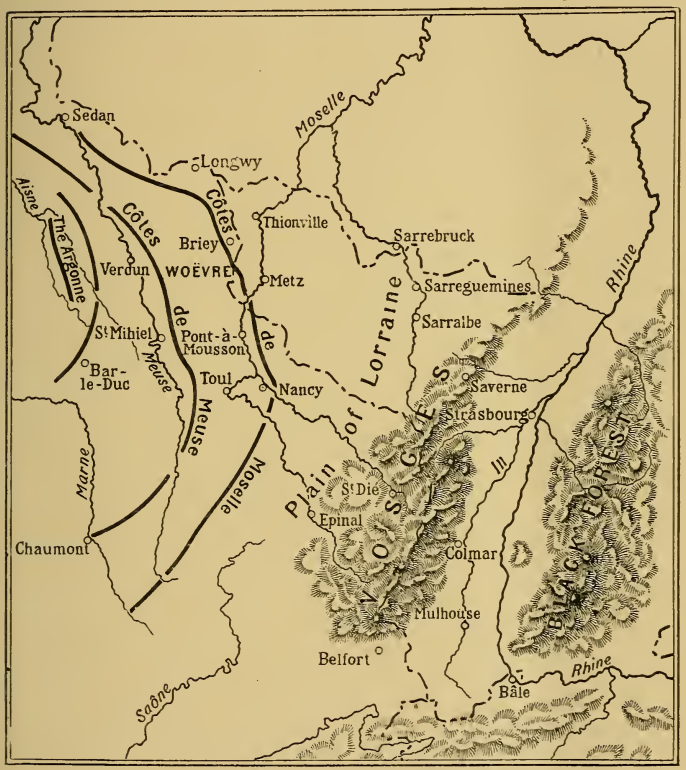
ment overlooking the next plateau. These *côtes* are the pride of Lorraine.

The *côte* is due to the contact of two different component parts, as has been said: the base, a soft, impermeable layer in which erosion has progressed rapidly; the cornice, a thick limestone mass forming the edge of the plateau. Thus the lower slopes of the *côte* are gradual but the upper part is steep, sometimes even forming a precipice. The slopes have a more equable climate, are less exposed to frost than the valley floor, and are protected from the northwest winds as well. They are sunny, especially when facing southeast. An admirable topsoil consisting of decomposed bits of limestone mixed with clay covers the slopes, and is well suited to any crops. Orchards and vineyards thrive here. All conditions are favorable to man. The settlements are among the orchards below, where the inhabitants can exploit the forests above them as well as the rich lands in the valley. Quarries in the limestone cliffs furnish building materials for the villages nestling at the foot of the *côtes*. These escarpments have played a great part in the history of the country from a military point of view, for since time immemorial they have been the rampart of France against Germanic invasions. The Great War witnessed some terrible struggles on these gentle slopes: the battle of the cliffs of Nancy in 1914, on the Côtes of the Moselle; the battles of Verdun in 1916 and 1918 on the Côtes of the Meuse; battles of 1916, 1917, and

1918 on the Côte de l'Ouest, Hill 304, Montfaucon, Romagne, and Bantheville. This region, although of little agricultural value, has nevertheless great industrial wealth. All along the Côtes of the Moselle a thick vein of iron ore comes to the surface. It is the richest vein yet exploited in the world, with the exception of the deposits near Lake Superior. Iron is mined along the Moselle on the edge of the *côte* and for the last twenty years has been mined in the plateau as well, of which the *côte* is only the edge. This is the famous basin of Briey, extending from Nancy into Luxembourg (English, Luxemburg). The mineral is treated on the spot, both in what was German Lorraine and in that part which remained French. From here France obtained nine-tenths of her iron. This explains the enormous difficulties she had to overcome in order to reorganize her industries in the midst of war, robbed at the same time of the iron of Lorraine and of the coal of the Nord. A supply of French and German coal determined the location of factories near the mines. The entire seam bristles with smelters where the ore is treated. In order to colonize this thinly populated region, immigration of Italians, Poles, and Belgians was encouraged; these immigrants mingled with the French. More than ever is Lorraine a border land.

The plain of the east. At the foot of the easternmost *côte* the simple structure of the landscape of western Lorraine disappears. Plateaus and cliffs

give place to the plain. Along the line of contact between the two regions, the strip of territory at the foot of the *côtes* is not unlike a hyphen between



LORRAINE AND ALSACE

the two parts of Lorraine, containing the large towns of the region — Nancy, for instance, which has become a commercial and industrial city of

120,000 inhabitants since the immigration of the people of Alsace-Lorraine who did not wish to remain in that country under German tyranny. This has made Nancy the capital of the east. The metallurgy of western Lorraine and the chemical and textile industries of the east alike find a market in Nancy. Its commercial rôle is hardly less important than its intellectual influence.

Toward the east stretches a rolling plain, dotted with low hills and sometimes ridges, but distinctly a plain in comparison to the *côtes* and the Vosges surrounding it. There are only gentle slopes, but slopes everywhere — rounded hillocks and wide, undulating valleys. Here and there on a hilltop a rugged cap may be seen, a remnant of overlying limestone or sandstone. The hollows in the clay soil are often filled with water, and ponds are scattered everywhere. The melancholy landscape is intersected by long wooded streaks, forests which grow upon the infertile pebbly soils washed down from the Vosges. The valleys are broad, always damp, and sometimes marshy. These heavy soils are difficult to cultivate, and the crops do not give good yields. But industries can get a foothold here, owing to various conditions. Below the surface are layers of rock salt, whose exploitation has led to the establishment of chemical plants round about Nancy. Along the upper reaches of the valleys, spinning and weaving factories, seeking out localities with better transportation facilities, have made of Lorraine

the chief cotton center of France. The clay of the soil also furnishes raw materials for the manufacture of porcelain (Lunéville), and near the Vosges the sands resulting from the decomposition of the sandstone supply glass, crystal, and mirror factories. Hence Lorraine tends more and more to become an industrial region. It was for a long time a poor agricultural country, often trampled under the heel of armies. For the last fifty years, however, its people, enlivened and their energy and initiative aroused by Alsatian immigration, have been making the most of the soil and the transportation facilities. In this way Lorraine has become one of the most active parts of France, one of those which she holds most valuable and most dear.

CHAPTER XVI

THE VOSGES

In its turn the plain of Lorraine rises toward the east, and along its margin is a wide, mountainous highland of sandstone more than 2,600 feet in height. These hard rocks take bulky forms, their steep sides falling off perpendicularly into deep valleys. Except in the valleys, with their fields and meadows, the sandstone belt is one immense spruce forest. It would be studied as a part of the Vosges if it were not separated from them by a depressed zone where at the contact between plain and mountains there are many cities, Saint-Dié and Epinal, for instance, markets for mountain industries.

Beyond the plain rise the Vosges proper. They are peculiar mountains. Their elevation is not great, the highest summit reaching an altitude of only 4,677 feet, but the climate is severe. They are well watered, because the rain-bearing winds from the Atlantic reach them without obstruction, sweeping across the flat expanses of the Paris Basin. A heavy blanket of snow remains upon them well into May. The moisture gives rise to superb forests on the mountain sides, mostly of spruce and fir. These cover the slopes up to 4,000 feet, above which the severity of the climate discourages all vegetation except bushy thickets and wet, grassy fields where

flocks from below graze in summer. Thus in spite of their low altitude, the Vosges have one characteristic of high mountains — a well-marked timber-line.

The landscape is more or less fantastic. The summits are rounded, not especially prominent. There are neither peaks nor points, but the valleys are deep and dangerous. Moreover, the two slopes are very unlike. The Vosges rise gradually from west to east by great dome-like summits, whereas on the east they fall away abruptly to the plain of Alsace, cut off sharp by the fault which let down the plain of the Rhine. Seen from that side, the contrast is marked between the high crests resembling huge cupolas, and the steep slopes below. Nor is this all. Glaciers occupied the valleys during the Quaternary Age; on the west, which was wetter and cooler, they were larger and descended almost to the plain; everywhere they polished the slopes and hollowed out deep depressions filled by lakes to the present day. The mountains which they fashioned still have cascades and streams with steep gradients. This arrangement is well suited to human occupation. Penetration even to the very interior of the chain is made easy by the wide, deep valleys, though agriculture is encouraged neither by the severe climate nor by the infertility of the granite soil. But other industries find here most favorable conditions, with wood enough for fuel or raw material, and water for motive power. The working of wood is a custom of long standing in the mountains.

To it has been added the paper industry. In addition, the manufacturers of Mulhouse (German, Mülhausen) established in the high valleys branches of the cotton factories of their city. These factories greatly increased in number after 1871 owing to emigration from Alsace-Lorraine; the valleys are filled with them. A strange spectacle was seen, that of lowland peoples moving up into the hills seeking industrial employment; and the high regions to-day are much more thickly settled than the plain of Lorraine. The valleys sloping toward Alsace, being sunnier and warmer, with streams at a still steeper grade, are filled with successions of factories.

To sum up, these rugged heights are like a busy hive in comparison to the plains of Lorraine and of the Saône which lie below. The ravages of war, being more localized, will be repaired more easily here than elsewhere.

CHAPTER XVII

ALSACE–LORRAINE

The provinces torn from France by Germany in 1871 in spite of the unanimous protest of the inhabitants have formed since that time a single political unit which Germany has used not only as a bulwark for self-protection, but also for a stronghold from which to attack France. This *Reichsland* developed in the interests of Germany is, however, composed of two very different parts, a Lorraine territory, extending over the northern part of the plain of Lorraine, and the long valley of Alsace.

Lorraine. The Lorraine territory extends from the Côtes of the Moselle to the northern Vosges. From Pont-à-Mousson to Thionville the scalloped line of cliffs shelters a multitude of villages surrounded with orchards. In every indentation of the plateau made by a river valley the exploitation of iron has given rise to huge metal works of all sorts whose prosperity recalls that of the industrial establishments of western Pennsylvania. These new centers of industry somewhat overshadow the old fortresses near the crossings of the Moselle — Thionville, and particularly Metz, whose population was reduced by an enormous emigration into France.

Toward the east the well-known characteristics of the Lorraine plain reappear — a heavy clay soil

dotted over with large ponds, limestone ridges whose slopes are shared by vineyards and hop fields, and poor sandstone soils over which forests are gradually spreading. On the whole it is a country of scanty crops, where the inhabitants have a hard time to get along. But industries are perhaps even more flourishing than in French Lorraine. This is because of a coal basin, that of Sarrebruck (German, Saarbrücken), extending south into Lorraine. Thanks to this fuel supply near at hand, the industries of the region have been extensively developed. From rock salt, chemical products are manufactured at Sarralbe (German, Saaralben). Large porcelain factories are located at Sarregueminès (German, Saargemünd), and glass and crystal works in the valleys of the sandstone plateau. It is to be hoped that at greater depths the coal basin may extend even beyond the 1871 frontier, for the discovery of such an important resource would be for the whole of Lorraine a fact of greatest consequence. In conclusion, Lorraine which was German, with its intensive development of metallurgy and its factories turning out such varied products, is becoming more and more an industrial country.

At the east the granite mass of the Vosges no longer intervenes, as at the south, between Lorraine and Alsace. A sandstone plateau called the Lower Vosges rises 1,000 to 1,300 feet above the deep Alsatian depression. This belt is really an obstruction, and was formerly a boundary line, not so much

on account of the topography as because of impenetrable forests. Intercourse between the two regions can take place only through breaks in the forest, which has been cleared at points where the elevation is least. The lowest and most convenient of these defiles is the pass of Saverne, through which runs the Paris-Strasbourg railway and the Marne-Rhine Canal — the gateway of Alsace toward the west.

Alsace. A low plain situated in the deep, sunken belt which cut the ancient *massif* of the Vosges-Black Forest in two, Alsace has one of the most marked individualities in western Europe. The Vosges, rising abruptly above it on the west, protect it from ocean influences, making its climate twice as dry as that of Lorraine, with an added southern quality shown by the appearance of sensitive crops, and by an intensive cultivation of the vine. The sunny climate is the first evidence of that hospitable character of Alsace which is noticeable even in the nature of its soil.

Formed of alluvial deposits which have gradually filled the valley, brought chiefly by the Rhine and its tributaries, Alsace is divided into a series of bands of different kinds of soil paralleling that river and the Vosges and filling the space between the two.

First, along the river itself there is a half-watery zone. Although the Rhine has been confined to a single channel by the construction of embankments, the waters continue to percolate through and fill

up old stream beds, where there is an aquatic vegetation, reeds, rushes, and osiers, with thickets of poplars and willows. This is a favorite hunting ground, completely wild except here and there where the river can be crossed.

Next comes the zone of terraces between Bâle and Strasbourg, a few feet above the level of the Rhine. These are composed of a gravelly soil, very dry on the surface but with ground water at a slight depth. This indifferent soil is mostly covered with thin and scattered forests. But on the other hand, the zone makes an excellent thoroughfare. It forms a kind of bridge from Belfort to Strasbourg between the marshy belts of the Rhine and the Ill. Here was located the Roman road, and here is the Rhône-Rhine Canal. This region is thinly populated.

Behind this belt appears a second moist zone, that of the Ill, merging near Strasbourg with that of the Rhine. The soil is composed of clay deposits brought from the Vosges by the Ill and its tributaries, whose confluence with the Rhine has been forced back far toward the north by the principal stream. Water stands everywhere on the impermeable soil, either overflowing from the level streams or seeping through from the Rhine itself. This, then, is a zone of marshy meadowlands which are capable of producing, when drained, magnificent harvests of cereals, tobacco, and vegetables. The population is dense throughout. Here along the

quiet Ill rather than the fickle Rhine is where the large cities of Alsace are located — Mulhouse, Colmar, Strasbourg.

The fourth zone, along the foot of the Vosges, is again dry. Wherever it is not obstructed by masses of pebbles, as at the valley mouths, it is wonderfully fertile, because its soil is a kind of loam known as loess, with unlimited agricultural possibilities. It is the richest part of Alsace, with its great crops of cereals, tobacco, and hops raised by a multitude of small landowners who are prosperous and of a democratic turn of mind. This was the home of prehistoric man, who subdued this advantageous region before beginning on the wet lands which formerly were completely covered with forests. It is the most thickly settled part of Alsace.

And lastly, still parallel to the Rhine and along the limestone slopes at the foot of the Vosges, prolonged toward the north by ridges in front of the sandstone plateau of Lorraine, stretches the zone which has the best exposure of all and is the most protected. This is the habitat of the vine, cultivated with an attention and a resulting success which recall the *côtes* of Burgundy. Here, as in Burgundy, numberless small towns with a hale and hearty people have grown up at the foot of the slopes. If north of the pass of Saverne the vine is less cultivated than toward the south, orchards and hop fields are even more successful, covering all the hills at the foot of the Lower Vosges.

So in spite of similarity of origin, Alsace has extremely varied agricultural resources. This is its peculiar characteristic. Possibly less favored from a manufacturing than from an agricultural point of view, it nevertheless has such good transportation facilities, both waterways and railways, that raw materials can easily be brought here. Strasbourg is a flourishing metallurgical center. The water power of the Vosges, skillfully manipulated, has given new life to the ancient textile industries of Mulhouse, of which that city is still the center. All along the Vosges there are cotton and woolen factories. Recently the development of certain resources in the lower layers of the soil has begun; for instance, the great deposits of potassium near Mulhouse and of petroleum in the Lower Vosges.

But Alsace is especially well suited to trade. It is the route from northwestern Europe to Switzerland, and connects the basins of Paris and the Saône with Central Europe. The Rhine, regulated for traffic, is already serviceable as far as the port of Strasbourg and soon will be so even to Bâle. All these commercial qualifications are summed up in the great Alsatian city itself, for Strasbourg is situated at the point of contact of various parts of Alsace; the zones of the Rhine and the Ill join here, the fertile terraces extend almost to its precincts, and behind it opens the pass of Saverne. Thus at the same time it is both a center and a halfway station. Because of its commercial rather than its industrial

advantages it has become a metropolis of 160,000 inhabitants where Latin and Germanic civilizations have blended.

Such are the provinces which now return to France after forty-eight years of captivity. The feelings of their inhabitants were well known. Since the time of the Revolution they have been entirely and intensely French. No part of France has given to the army more illustrious generals, and even in the recent war 30,000 Alsatians voluntarily enlisted with the French forces.

CHAPTER XVIII

PARIS

On account of its economic importance and its four million inhabitants, but especially because of the intellectual and artistic power radiating from it, Paris may be considered the magnetic pole of France. It deserves special study apart from the great natural regions.

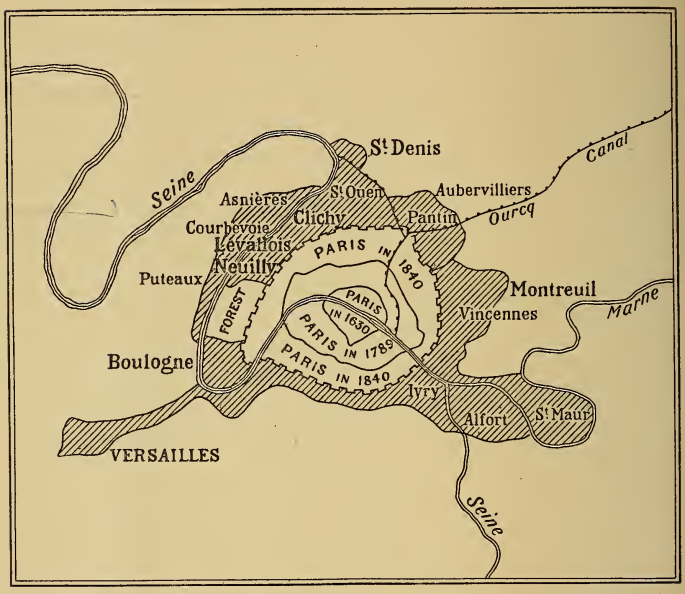
Situation. The city of Paris is the true center of the Paris Basin. It is the geological center because it is situated at the lowest point in the vast depression, the strata sloping in this direction from every side. The principal rivers of the basin —Seine, Marne, Oise—converge toward Paris. Only the Loire, which flowed toward the site of Paris during the Tertiary Age, was subsequently diverted toward the west; but there is no barrier between its banks and those of the Seine. Hence Paris is an excellent center of transportation routes, both of roads—south via the plain of Beauce, north via Picardy—and of waterways—the lower Seine toward the ocean, the upper Seine via the Yonne into Burgundy, via the Marne into Lorraine, and via the Oise, which opens the plains of the north, into Belgium. Water transportation is the more important since all these rivers are models of navigability. One of the water routes, that of the Seine

and the Yonne, even has an international importance because it leads from the Channel to the Saône and the Mediterranean. By this route prehistoric trade was carried on between ancient Mediterranean civilizations and northern Europe. Thus it is obvious that Paris has an admirable commercial situation, owing primarily to facility of water transportation, as the ship on its coat-of-arms would indicate.

Site. An important city had to grow up somewhere along the navigable waterway of the Seine. The determining factor in locating the exact site of Paris is the confluence of the Marne with the Seine. Together these two rivers have hollowed out of the Ile-de-France a very wide valley. Swinging back and forth, detaching spurs or carving out great bays from the surface of the plateau, the rivers have sculptured a broad basin, irregular and much frayed around the margins, but in every direction having as its horizon the well-defined edge of the plateau.

This Parisian hollow, at an altitude of only 100 to 150 feet, is rich in resources. Protected by the sheltering walls, both the vine and the fig tree can grow here. The varied nature of the hills, which remain in high relief here and there, gives a great range of exposure as well as of soil. Along the slopes the valuable soils of the valleys of Soissonnais and of the escarpments of Champagne reappear. They furnish building materials, limestone, gypsum—of which plaster of Paris is made—and clay for tiles. Thus Paris became a city of monuments and

beautiful buildings, more naturally so than London, which has in its vicinity no building materials



PARIS

but clay, and Berlin, with little but sand. To all these contrasting conditions is due the wide range of agricultural resources — cereals both in the valley and on the plateaus of Beauce and Brie, vineyards on the slopes, orchards on the hillsides. It is a site full of possibilities and charm, and it might be said that even without its excellent transportation facilities this little corner of France would have been chosen as advantageous for human occupation.

Development of the city. It remains to be seen how the city has developed within its frame.

Its origin was the Ile de la Cité, an island in the Seine equally well located for self-defense and for trade. The island used to be much lower than at present, and has risen only little by little during the centuries upon its own ruins. It also was originally much smaller, and was enlarged during the Middle Ages by the annexation of several islets. The river was also more complex than in our day, with many shallow branches. This network of islands and branches explains the choice of the site, because here, where the river was so "braided," crossing was easiest.

The first enlargement of the city, which took place during the Roman period, was made on the left bank (facing downstream). There, just across from the Cité, a fragment of the plateau advances to the very banks of the river. This is the hill of Sainte-Geneviève. The road to Orléans reaches the river crossing almost without leaving the plateau. The place was easily defended on account of its height. The Roman city, of which an arena or two still remain, was accordingly built here. Hollowed out of the limestone are baths and catacombs in which the early Christians sought refuge. The right bank, on the other hand, was not at all hospitable. It was low, its soil a coarse alluvium covered with forests, and it was hemmed in between the Seine and an old channel of the stream whose location is still

indicated by the existing line of great boulevards. River floods were constantly filling it up, and even to the present day the ancient channel has a tendency to form again when the river is high, and to overflow. At such times water appears welling up from beneath, in parts of the city quite remote from the Seine. This right bank region, to-day the most thickly settled part of Paris, was at that time uninhabitable.

During the reign of the Carolingians the right bank was transformed, thanks to the Church. Under Charles the Bald a hermitage was established near the present *rue de Rivoli*. Abbeys were built in the woods, and the monks cleared and cultivated the marshes. The city followed, and little by little occupied the newly discovered territory. In the fourteenth century it had crept as far as the old stream bed, along which the fortifications of Charles V were built. It did not progress farther in that direction for a very long time. A few paved highways (*chaussées*), still called by the same names (*chaussée d'Antin*, for example), crossed the marshes, but the people hesitated to build upon the unstable soil, so easily flooded. It was not until the eighteenth century that the low, moist region was drained and made healthful. After that the city at once took advantage of the space, and joined to itself the suburbs among the hills, that of Flanders at the northeast and Batignolles at the northwest. Finally, in the nineteenth century, the human tide

climbed the steeps on both sides and overwhelmed the old villages on the hilltops, Montmartre and Auteuil, for instance. The city walls built in 1840 included such towns within Paris. This inclosure still marks the administrative boundaries of the city.

But no wall could restrain the vitality of Paris. A vast suburban area is now welded to the capital and reaches out tentacles in every direction. The growth is especially marked along the waterways, the Seine, Marne, and especially the Saint-Denis Canal, which obviates the necessity of traffic following the great bend of the stream. Vincennes, Ivry, Alfort, Saint-Maur, and other suburbs on the Marne are upstream, and Boulogne, Sèvres, Puteaux, Neuilly, Levallois, Courbevoie, Asnières, Saint-Ouen, and others on the Seine are downstream, while Pantin, Aubervilliers, and Saint-Denis are located along the canal. These are all manufacturing towns. Where the plateaus crowd closest to Paris the suburbs have spread least; that is, toward the south and east. But the outskirts reach much farther, even beyond Versailles, which Louis XIV built in the midst of the woods. It may be said that within a radius of twenty to thirty miles about Paris the people either have their business in the city or help to supply its needs while working at home.

Rôle and aspect of Paris. Created in the beginning by transportation facilities, Paris has remained a commercial city. It is truly the center of the trade of France. Its wharves along the Seine, but

especially along the Saint-Denis Canal, which removes unsightly factories from the beautiful banks of the river, constitute much the most important port in France. All the great French railways have a terminus here. Besides its wholesale commerce, Paris has an important retail trade, especially in luxuries, which makes it a city unlike any other in the world.

Because of this rôle of commercial city and of luxurious capital, various industries have sprung up. Paris has on the spot neither fuel nor raw materials, but in addition to its excellent transportation facilities it has an altogether remarkable working population, numerous, intelligent, and energetic, already long established in the city for commercial or political reasons. Therefore most of the industries of Paris are those dependent on the characteristic traits of the population; that is to say, industries requiring especial taste, care, and originality. Articles distinguished by a certain nicety are turned out—clothing, finery, jewelry, cabinet work, leather work, and so on. Cruder manufactures, such as metallurgy and chemical products, are relegated to the suburbs.

Paris is also a city of pleasure and amusements. A great many French and almost as many foreigners come here regularly to enjoy the gay, brilliant life it offers. It is also an administrative center, thanks to the remarkable centralization of France. But its chief distinction is perhaps in being the

capital of art and literature. The University is the largest in the world (about 20,000 students), and this city far more than any other in the world attracts, in order to perfect them, writers and artists. For Paris is like a vast Museum of Fine Arts where each succeeding century has left its trace—a cross section, as it were, of the history of France. The Roman period, for example, is represented by the Julian baths; different epochs of the Middle Ages by Saint-Germain-des-Prés, Notre-Dame, the Law Courts, and many other buildings; the Renaissance by the Louvre; the seventeenth century by the Luxembourg and the Invalides; the eighteenth by the Panthéon; the nineteenth by the Arc de Triomphe and the Opéra—to mention but a few conspicuous monuments.

In its outward appearance and in its arrangement the city reflects all these different characteristics. The central quarter on the right bank is especially given over to wholesale and retail trade. Most of the office buildings are emptied at night, their occupants living in the suburbs or outskirts, much as in great American cities. The east is principally the industrial quarter, where the people work both in the shop and at home. The left bank includes the intellectual center, with the University and the Ecole des Beaux-Arts, the Administration Buildings as well as the industrial quarters along the river both up- and down-stream, and the aristocratic residential district. The west is the rich quarter

inhabited by persons who, if not wealthy, at least are in comfortable circumstances.

Paris is much differentiated; it is made up of a mass of little provincial cities, as it were, composed of immigrants from the whole of France, often grouping themselves around the stations where they arrive: the Flemings and people of Picardy around the Gare du Nord, those of Alsace-Lorraine around the Gare de l'Est, Normans around the Gare Saint-Lazare, Bretons around the Gare Mont-Parnasse, Gascons and Limousins near the Gare d'Orléans, people from the Alps, Auvergne, and Provence near the Gare de Lyon. Even foreigners form separate colonies: Belgians in the north, Italians in the east, English and Americans mostly in the rich quarters of the west, although many Americans are found near the University and the Ecole des Beaux-Arts in the well-known Latin Quarter.

And over this composite whole is spread an atmosphere of indefinable charm and harmony, blending all incongruities and making Paris, *par excellence*, the city of beauty, culture, and elegance.

ECONOMIC GEOGRAPHY

CHAPTER XIX

COAL

Coal is formed of vegetable débris which accumulated along the shores of ancient continents, where it underwent a prolonged pressure owing either to a process of folding or to the weight of material piled above it. In Europe the best coal is the oldest, that which was formed during the so-called Carboniferous Period.

Obviously coal should be found on the site of the continents of that period, more especially around the margins of those earliest land masses. In France several such places have been identified. They are the ancient *massifs* which the Alpine folding has more or less uplifted. And it is either on the site or around the underground prolongation of these land masses that there should be found coal deposits worth exploitation. Such *massifs* are numerous and extensive in France: the Ardenne, an eastern extension of the Massif Rhénan; the Vosges, the Armorican, and the Central Massifs. There are even some *massifs* of the same age inclosed within the Alps. These facts would seem to indicate a large coal supply for France. Such, however, is not the case. Unfortunately, most of these *massifs* have no coal at all around their edges. The vast Armorican Massif has none whatever. The Vosges have but

one small deposit, Ronchamp on their southern boundary, yielding about 200,000 tons yearly. The

Coal Deposits

Alps are a little better off, for although mining is made difficult by the sinuosities of the deposits, the need of fuel is so great that the owners succeeded in 1917 in extracting 507,000 tons of anthracite, about 37 per cent more than previous to the war.

But the only localities where coal can be mined in large quantities are those encircling the margins of the Massif Central and in the northern fields (the Nord).

Massif Central. Coal is mined both in the interior and around the edges of the Massif Central. In the interior the deposits are very limited in extent, being scattered here and there about the depressed areas. They produce about 600,000 tons a year. The margins are much better supplied. Toward the north, along the Morvan and on the northern boundary of Limousin, little basins, already partially exhausted, yield more than a million tons, which supply the manufactures of Montluçon. At the southwest, the two fields of Aubin and Carmaux in 1917 yielded 2,600,000 tons. Close at hand are the iron works of Aubin-Decazeville and the glass works of Carmaux. But the most richly endowed border is the eastern, with its basin of Alais, Saint-Etienne, and Montceau-les-Mines, which, together with a few other small deposits, in 1917 yielded 11,200,000 tons. These beds supply the metallurgical industries of Alais, the textile, metal, and glass works of the Saint-Etienne region, and the manufactures of Lyon and Le Creusot. Furthermore, an extension of the Saint-Etienne coal basin southeast of Lyon and even as far as the plain of the Saône has recently been discovered, and the exploitation of that deposit will be of the greatest importance to Lyon and its vicinity.

Plain of the Nord. But the Plain of the Nord is far richer. The coal deposits which follow the northern margin of the ancient *massif* of the Ardenne in Belgium are found at a greater depth along the subterranean continuation of that *massif* in France. In the eighteenth century mining began between the Belgian frontier and Douai, but the extension of the deposits toward Artois was not discovered nor utilized until about 1860. This coal basin therefore consists of two parts: the one located in the department of the Nord is the poorer of the two, yielding in 1913 but 8,000,000 tons, mined in Anzin, Aniche, and the Escarpelle. The other, situated in the department of Pas-de-Calais, richer and more scientifically exploited, in 1913 yielded 22,000,000 tons, the principal centers being Courrières, Lens, Liévin, Noeux, Béthune, Marles, Bruay. Thus the total production of the basin was 30,000,000 tons, more than twice that of all the other mines of France. This coal supplied the great industries of the Nord, was shipped to Paris, and by barge even to Lyon. During the Great War three-quarters of this coal basin was in the hands of the Germans, and that part which remained under French control, although its output was pushed to the limit, was able to yield, in 1917, only 11,500,000 tons.

With a total production in 1913 of 40,000,000 tons of coal, three-quarters of which came from the Plain of the Nord, France produced in 1915, following the invasion, only 16,000,000 tons. In 1917

by superhuman effort the total was raised to 29,000,000 tons. Let us not forget that with this reduced output the country created and carried on an immense war industry, manufacturing heavy artillery and supplying its Allies as well as itself with ammunition and other war material. Let us also not forget that the Germans have destroyed the best mines in the Nord, so that for four or five years France will be unable to equal its pre-war figure of 40,000,000 tons.

Moreover, even this total was absolutely inadequate for the country's needs. In 1913 France imported for industrial purposes 20,000,000 tons of English, Belgian, and German coal. Attempts have been made to supply the deficit by sinking numerous shafts in the deeper underlying rocks of Lorraine and along the southern margin of the Ardenne. Small yields can be looked for in those localities. But they will by no means supply the demand. In order to carry on her revived industries France more than ever will be obliged to import fuel from abroad.

CHAPTER XX

WHITE COAL

As if to make up in part for an insufficient supply of coal, France fortunately possesses in her mountain streams reserves of power which she is beginning to make use of on a large scale. The falling water is confined in turbines, and its force is thus transformed into an electric current which can be used either on the spot or, by transmission, at a distance.

In order to convert the water into power, a steep grade is necessary, so the white-coal, or hydro-electric, power plants are established either in the mountains or along their margins. Such regions in France are the Vosges, the Jura, the Massif Central, the Pyrenees, and the Alps.

Vosges and Jura. The Vosges and the Jura have few white-coal plants because the streams of these localities have long been utilized as motive power for mere mill wheels of innumerable small factories in the valleys. The only use of water under pressure—white coal—is for the lighting of the local towns and villages.

Massif Central. The Massif Central has the advantage of steep gradients, especially on its eastern front and in its volcanic area. But on the other hand, the watercourses of these localities are very irregular in flow. Whereas in summer they

are almost dry, in the autumn they turn into formidable torrents. Their power has long been used by a multitude of small factories, and not without difficulty could it be made to supply more. Only the great streams, the Loire and the Allier, contain enough water for operation at all seasons, and even these will be utilizable only after an outlay of much capital for necessary machinery. On the other hand, the watercourses on the western borders of the *massif*, fed by rains from the Atlantic, are much more regular. So, in spite of a gentler gradient, the chief power plants have been established on this slope, along the Cher, the Vienne, the Dordogne, the Lot, and their tributaries. The power generated has a minimum estimated value of 900,000 horse power with 1,800,000 horse power as the mean force which the watercourses of this region are capable of yielding.

Pyrenees. The Pyrenees are better supplied with watercourses. They are much higher than the Massif Central, with an abundant rainfall (except at the east), and as the snow remains well into the summer, and there are even a few small glaciers, the streams have plenty of water and are steady in flow. The gradients of these streams are steep and irregular, because the abruptness with which the mountains end causes the valleys to fall off suddenly to the plain below. Countless high lakes serve as reservoirs. If no large trunk streams are available, as in the Alps, at least there are countless rivers of

more or less importance, the lowest estimate of whose minimum possible yield is 1,000,000 horse power. Very little had been done previous to the war. But during the last three years important power plants have been established, especially at the west and in the center. The electrification of all the railways in the vicinity of the Pyrenees may be looked for in the near future.

Alps. But the region of the Alps is by far the most favored, as much on account of the initiative of the inhabitants as on account of the natural advantages. For this is where the white-coal industry was brought to life. It was utilized for the first time near Grenoble by three enterprising men, one from the Alps, one from the Pyrenees, and one from the Massif Central — affording a curious example of geographical influence on industry. This is also where long-distance transmission of power was tried for the first time. Here are utilized either the high waterfalls whose small volume of water is conducted through turbines from a height of 1,000 to 3,000 feet, or low falls, where an entire river may be confined in enormous conduits and allowed to fall only 50 to 150 feet. Fortunately the Alpine streams are very constant in flow. Their high-water mark is reached in summer when the snow and ice are melting in the mountains, and they do not dry up in winter, thanks to an abundant rainfall. The conditions controlling the flow of high-mountain streams not being the same as those governing the rivers of low

mountains, the factories making use of one source of supply can supplement it with the other if necessary at different seasons. This is made possible by the fact that most of the white-coal factories of the northern Alps are electrically connected. This solidarity is one of the most remarkable instances of the industrial progressiveness of France. Lastly, the width of the great Alpine valleys enables the manufacturers making use of white coal to locate in the very heart of the mountains, preventing loss of power inevitable with transmission.

Thus we see that the French Alps are very rich in electric power. Estimates of the minimum force available show 4,000,000 horse power, while a mean estimate gives 8,000,000 horse power. Previous to the war the power in use by already established factories amounted to 700,000 horse power only. In the midst of war this total has been raised by 300,000 horse power, and the construction of power plants has progressed with amazing rapidity, all available labor being made use of, especially German prisoners of war. Important industries have sprung up in the heart of the Alps — electro-metallurgy, electro-chemistry, and paper manufacture. Besides the force supplying these industries, much power is transmitted outside the mountain area, from the southern Alps to Marseille and Nice, from the northern Alps to Lyon and even to Saint-Etienne, where it competes with coal. Projected plans will raise the potentiality to 1,500,000 horse power in

1920. Besides this, there remains to be developed the Rhône, whose abundant, swift-moving waters will give a mean total of 700,000 horse power. So in southeastern France the scanty coal supply will be in part compensated for.

As far as the development of white coal is concerned, France ranks high. In fact, thanks to the exploitation of Alpine streams, she is second in Europe only to Norway, whose natural advantages are much superior. The rapid spread of this youthful industry (even in the midst of war) is, as it were, the symbol of the surprising elasticity of France, who, as her enemies wished to have the world believe, was degenerating and exhausted.

CHAPTER XXI

METALS AND METALLURGY

The lack of coal in France is almost equaled by the scarcity of metals. In general, ancient mountain areas produce abundant seams of metals; such is the case with the *massifs* of Germany, Bohemia, Spain, and the primary rocks of the Rockies. But in France the ancient *massifs* are widely extensive to no purpose at all. They are no richer in minerals than in coal. A little silver-bearing lead is found in Brittany, gold in the Armorican Massif, and zinc in the Massif Central, but these deposits are all unimportant and without a future. In addition to the deposits in the primary *massifs*, the Mediterranean region of France has somewhat extensive deposits of bauxite, a red clay from which aluminum is extracted. But except for these deposits and for iron, France is obliged to import all her metal supply from abroad. Hence the industries treating these metals are all located near the frontiers, or the ports, in the north and on the lower Loire.

Fortunately iron is very abundant in France, so much so that she can export it, and to a certain extent this compensates for her lack of other minerals.

History of metallurgy. Iron is found all over the surface of the earth, in all sorts of soils, and in

rocks of all ages. So it is found in all parts of France. It has been worked almost everywhere and used

METALLURGY CENTERS

for various purposes. The iron industry, under the kings, was carried on in the plains as well as in the mountains. Nevertheless there were certain regions where it was more actively carried on than elsewhere; for instance, those where the ore was

found in abundance, principally limestone regions, or where fuel was easily obtainable, such as the wooded plateaus of upper Burgundy and the Jura.

But in the nineteenth century the use of coal, industrial concentration, and the development of mines on a large scale, necessitating good transportation facilities, put the little forges out of commission. Ore and fuel being heavy and bulky, it was desirable, at least as far as first processes are concerned, to avoid transportation. Metallurgy was therefore so organized that smelting took place at the mines; that is, what may be called primary metallurgy, which exists in regions producing the mineral. Cast iron, wrought iron, and steel when once reduced can better stand the cost of transportation. They can then be reworked in places which, although possessing no raw materials, can furnish more favorable conditions. Four such conditions — fuel, motive power, an abundant or skilled labor supply, an old tradition of manufacture — control what is known as secondary metallurgy.

Primary metallurgy. By primary metallurgy is meant the reduction of ore to metal. Establishments for this purpose are located close to the mines, except one which is near a coal supply.

Lorraine. The most important iron deposits are in Lorraine, where, in the limestone plateau terminating in the Côtes de Moselle, a thick layer of phosphorous ore is found. The development began only after 1880, but real progress has been still more

recent, 3,000,000 tons of ore being produced in 1895, 6,000,000 in 1905, 14,000,000 in 1911, 19,000,000 in 1913 — altogether some nine-tenths of the total iron production of France. Some of this supply was shipped to other parts of France or sent abroad, but 10,000,000 tons were worked on the spot. The region supplied more than half of the steel used in France, three-quarters of the cast iron, two-thirds of the rails and I-beams. New cities sprang up and grew with American rapidity. The population of Joeuf jumped from 1,000 to 30,000 in fifteen years. The difficulties which France faced during the war can be imagined when one remembers that this region which was indispensable for her production of metals was in the hands of the Germans from August, 1914, to November, 1918.

Massif Armoricain. Other mineral deposits were discovered and exploited northeast of the Massif Armoricain not far from Caen. In 1910 the output was 500,000 tons, in 1913 it was 1,000,000 tons, and since then it has been greater still. Part of it was exported previous to the war, but during the war the entire output was worked on the spot in newly constructed blast furnaces which are said to be the biggest in the world. Thus there has grown up in Normandy a center of metallurgy served by the port of Caen.

Plain of the Nord. Lastly, thanks to water transportation of the minerals of Lorraine or Algeria by way of Dunkerque, the Plain of the Nord also

manufactured iron and steel in the vicinity of the coal fields. But progress in this region was less marked than in Lorraine.

Secondary metallurgy. Not ore but metal is treated by secondary metallurgy, which turns the metal into finished products. These products, more valuable because they have gone through the expensive process of reduction as well as because they are less bulky, can better bear the cost of transportation. Therefore conditions governing the location of these industries are more complex. The three chief conditions are the following:

First, an ancient industry which existed because of mineral deposits now exhausted may still survive. But such a survival is possible only if the region has good transportation facilities, as throughout the upper Marne valley, all along the canal from the Marne to the Saône (Saint-Dizier), also in the Ardenne, along the valley of the Meuse between Mézières and Givet. Possessing neither fuel nor ore, these centers are the least prosperous.

Secondly, mills may be established near a fuel supply. These are the most important of all. Such mills, when not taken over by the enemy, supplied France with munitions and war materials. The most prosperous group was that of the Nord, along the coal basin and at its margins (Lille, Maubeuge), where machinery and rolling stock were manufactured. The largest center was that of Denain. Around the margins of the Massif Central,

Montluçon and Guérigny at the north and Decazeville and Alais at the south are situated near small coal deposits. Lastly, Le Creusot and the whole group of Saint-Etienne, with their fuel close at hand, manufactured most of the war material. The industries of the ports where foreign coal is imported might also be included under this heading—the foundries of the lower Loire, of the Gironde, and of the Adour.

Thirdly, motive power of the streams has determined the location of factories in the heart of the mountains, in spite of poor transportation facilities. Such is the case in the Pyrenees, but this fact is even more strikingly illustrated in the Alps. Electrometallurgy is established in the deep valleys, producing synthetic iron from the rebuilding of scraps —a process which was invented here—aluminum, ammunition, and special steels made with the aid of such minerals as vanadium, manganese, and tungsten. The most important center of these industries is Grenoble.

CHAPTER XXII

THE TEXTILE INDUSTRY

The textile industry is traditional and widespread in France, owing largely to the fact that the country, thanks to its climate and its soil, once produced the principal raw materials, silk, wool, flax, and hemp, though the production of all of them has greatly decreased during the last hundred years.

Silk is produced in the southeast under Mediterranean influences, for this is the only climate in France sufficiently hot and dry to develop and hatch the silkworm. The principal areas of cultivation are the valleys of the Cévennes and Vivarais, and the basins in the valley of the lower Rhône. Silkworm culture is constantly decreasing, however, because of the invasion of Italian and oriental raw silk, which is produced by a cheaper labor supply and is consequently not so expensive as native silk.

Wool was very abundant as long as the practice of rotation of crops required, every so often, fallow years, during which time the land furnished pasturage for sheep. The complete abandonment of this agricultural practice has banished the sheep, except in the very poorest regions, such as Champagne, the southern Alps, the eastern Pyrenees, and the interior of the Mediterranean region. Therefore

the production of wool has decreased, especially as the number of animals slain very young has greatly increased.

Flax and *hemp* are diminishing even more rapidly. Their cultivation requires a rich soil and constant care. The depopulation of the rural districts is therefore bad for these crops. They are raised only in small quantities in the north and in the valleys of Maine.

Consequently French textile industries must import almost all their raw materials — cotton from the United States, silk from Italy, the Orient, and the Far East, wool from Argentina and Australia, flax and hemp from Russia, and jute from India. This state of affairs implies one important condition for the industries using these materials; that is, that they be located as near as possible to the ports of arrival — in other words, either near the sea or near large trade centers. Yet at the same time many of these industries, for the most part of long standing, bound by many links to the past, have a tendency to remain in the old centers of production of raw materials. Moreover, as they require an enormous labor supply, some of them have taken root just because of the presence of such a supply. From this complex condition of affairs three principal types of industries can be singled out.

Industrial centers near a former base of supplies. The location of many small groups which are only the relics of ancient textile industries as they existed

before the introduction of modern conditions is explained by the nearness of some former base of

Textile Centers

supplies. The blanket factories of Orléans were established because of wool grown in Beauce, the woolen industry of Romorantin and Châteauroux because of the wool of Berry, the hosiery manufacture of Troyes as well as the woolen industry

of Reims and Sedan because of the wool of Champagne; while the linen factories of Maine depended on an earlier cultivation of flax and hemp.

An up-to-date illustration of the survival of an earlier manufacture is the *group of Lyon*, situated near the center of silkworm culture. But here there were other advantages as well — proximity to the Italian and oriental silk markets, and the existence of an abundant labor supply near the Rhône and along the border of the Massif Central. These conditions attracted other textile factories, cotton and woolen, for instance. Hence it appears that the group of Lyon is very complex, more so perhaps than others because of the many processes through which the valuable and delicate textile, silk, is obliged to pass. Several of these processes may be noted: reeling off the cocoons, spinning, and milling — operations in which machinery is of little help and which require female hand labor. These specialties are carried on mostly along the margins of the Alps and the Massif Central. Then there is weaving, which used to be concentrated in Lyon, but which has almost entirely left the city because of a cheaper and very abundant labor supply in the country; next, there is finishing-off (dyeing and dressing), confined to Lyon itself; and finally, allied industries, such as the making of ribbons at Saint-Etienne, of chiffons at Tarare, of cotton goods at Roanne, and of woolen goods at Vienne. In this way the existence of a former center of silk

production has created an enormous industrial region in which the contribution of French raw silk is no longer more than a detail.

Industrial center near the unloading ports. The best example of an industrial center near the unloading ports is *Normandy*. Here also the industry is traditional and has long been favored by the cultivation of flax and hemp in the vicinity, as well as by the presence of labor supplied by the rich farming communities near at hand. But textile manufacture has always been encouraged by the ease with which raw materials could be imported by sea — formerly wool from England and Spain, and since the eighteenth century, cotton from America. Woolen manufacture has almost entirely disappeared, but spinning and weaving of cotton continue to prosper at Rouen, both in its suburbs and along the valley of the Seine, and near Dieppe.

Centers well supplied with labor. The largest groups of textile manufactories in France, those of Lorraine and the north, owe their importance chiefly to their abundant labor supply.

Lorraine. Until the manufacturers of Mulhouse decided not many years ago to make use of the poor peasant populations of the upper valley of the Moselle, Lorraine had no textile industry. After 1871 the enterprise grew on account of the arrival of great numbers of Alsatians, who went to the Vosges to establish new factories. Little by little Lorraine has become the most important center of

cotton manufacture, with almost half of the spindles in France and more than half of the looms. The industry shows a tendency to move down toward the plain, where better transportation facilities are to be found.

The group of the north. Previous to the war the group of the north was the most important as well as the most complex of all. Its prosperity was due to several causes. Like the group of Lyon, it was connected with a very ancient use of local raw materials, flax of Flanders, wool of Artois. By way of Dunkerque it was also within easy reach of imports. But the chief factor in its development was undoubtedly the presence of abundant labor furnished by the overpopulated adjoining regions, including Belgian Flanders. This fact explains the great industrial centers so near to the frontier — Lille with linen and cotton, Armentières and the cities of the Lys with linen, Roubaix and Tourcoing with woolen goods as their chief products.

CHAPTER XXIII

THE INDUSTRIAL REGIONS

Several conditions are required for the establishment and the development of industries in a given region: first, the presence either of coal or of a cheap motive power; second, the presence of raw materials; third, an abundant labor supply; fourth, transportation facilities for the importation of fuel or raw materials as well as for the ready exportation of the finished products. Four regions in France possess in whole or in part these advantages, and have therefore become important industrial centers.

The region of the north. So far as industries are concerned the region of the north, including Picardy, possesses most of the conditions favorable to great economic activity. It has the fuel, thanks to its coal basin, which in 1913 yielded 30,000,000 tons. Raw materials are less abundant, and are confined to agricultural products. But good transportation facilities and the proximity of excellent ports like Dunkerque and Antwerp made the importation of the necessary raw materials comparatively easy. The region also had an abundant native supply of labor. These favorable conditions brought about the development of an industrial center comparable to the most important in Western Europe, furnishing employment to about a million persons.

Of this number, textile manufactures employed about 300,000 — 60,000 for linen, 70,000 for woolen, 30,000 for cotton, the others for trimmings, laces and nets, blankets and carpets, hosiery, machine embroidery, velvet and plush, and lastly, dyeing, bleaching, and dressing. Metallurgy came next as far as numbers were concerned, employing 140,000 persons, 118,000 in primary metallurgy alone. Clothing manufacture employed 136,000 persons, a great percentage of whom turned out ready-made garments. Mines had 110,000 workmen, 76,000 of whom were in the Pas-de-Calais. Such were the chief industries of the region. But its advantages are such that many other branches of manufacture were attracted, woodworking employing 59,000 persons; tanneries and shoe factories, 34,000; glass works and porcelain factories, 30,000; chemical works, 15,000; breweries, 15,000; sugar factories, 12,000; rubber factories, 7,000. Finally, the number of persons employed in transportation, as many as 58,000, completes the economic inventory of the region.

The region of the east. Having developed large industries only during the last forty years, the east is much less advanced than the north. Fuel must be imported, and transportation is not so easy as in the north. The region being thinly settled, it was necessary to import labor. On the other hand, raw materials — iron, rock salt, and wood — are found here in abundance.

The most important industry was textile manufacturing, employing 100,000 persons. The cotton mills of the Vosges and the plain of Lorraine employed 55,000 workmen, embroidery and lace factories, 25,000. Lorraine heads the list in France as far as cotton manufacturing is concerned. Iron mining and reduction come next, with 64,000 employees. If the number seems small it is because primary metallurgy, which predominates here, requires relatively few laborers. Other groups are much less important: there are 39,000 mill hands for cloth, 23,000 for wood, 14,000 for food supplies, 11,500 for glass and porcelain, 11,400 for hides and skins, 5,600 for chemical products, 5,000 for paper. Comparisons with the north are enlightening: 15,000 employees of transportation lines, both railways and waterways, as against 58,000 in the north, with a total of 300,000 workmen in comparison to 1,000,000 in the north.

These two industrial groups hardly exist to-day. That of the north is confined to the western part of the Pas-de-Calais. The iron industry of Lorraine is destroyed. The reconstruction of these industries may be considered among the gravest problems facing France at the present time.

The region of Lyon. Remote from the battle-front, the region of Lyon really profited by the war. It is less compact than the northern and eastern regions on account of the nature of the country. It collects all sorts of industries about

the great city as a center. The coal basins around the Massif Central furnish fuel, and the hydro-electric plants of the Alps transmit to the region a part of their power. The labor supplied by the poor inhabitants of the neighboring mountains is sufficient. On the other hand, the local raw materials are no longer adequate, and neither is the means of transportation, because navigation on the Rhône is not to be depended upon. Thus, conditions are less favorable than in the north.

Here also textile industries take the lead, with 240,000 persons, 166,000 of whom are employed for silk-manufacture (spinning, 43,000, weaving, 67,000, trimming and ribbons, 32,000, etc.). Lace making employs 32,000, cotton, 20,000, wool, 6,000. Metallurgy is very important, with a much larger force than in Lorraine—90,000 before the war. Here there is chiefly secondary metallurgy, especially in Le Creusot and Saint-Etienne. There are 65,000 in the lumber business, 50,000 in mining, 25,000 in tanneries, 25,000 in glass and porcelain works. Before the war the region of Lyon had a total of 700,000 workmen, about 40,000 of whom were employees of transportation lines. Thus it was a worthy second to the north. Since the war this number may have risen as high as 1,000,000.

The region of Paris. By far the smallest in area, since it is confined to the city and its suburbs, the region of Paris nevertheless employed, previous to the war, 1,200,000 persons in industries of various

kinds. It may be considered, therefore, the leading industrial region of France, notwithstanding the fact that it has neither fuel nor raw materials. But transportation facilities—railways and waterways—are splendidly developed. The point of chief importance, however, is that there is an unusual labor supply from the viewpoint both of quantity—for there are 4,000,000 inhabitants—and of quality—for the people are both intelligent and artistic, workmen of an intellectual metropolis. It follows that most of the Parisian industries, requiring little or no machinery or fuel, are dependent on this original character of the labor supply; that is to say, they are minute and fastidious, entirely different from the massive industries of the north, the east, and Lyon.

Hence textile manufacture, which takes the lead in the three other regions, is entirely lacking here. In its place, at the head of the list, is the manufacture of clothing—tailoring, dressmaking, millinery, employing 230,000 persons, 124,000 of whom are dressmakers within the city itself! It is true that metallurgy takes second place, with 184,000 employees, a greater number than in the north. But it is very specialized metallurgy, extremely varied, requiring skilled labor—automobile manufacture, wrought-iron work, bronze work, engraving, the making of surgical and optical instruments, etc. The same is true of the wood-working industry, which employs 104,000 persons, most of whom are furniture or cabinet makers. The manufacture of

foodstuffs, with 72,000 employees, specializes in preserving and canning, sugar refining, and the making of confectionery. Leather workers (60,000) make mostly pocketbooks and other fine leather articles. The publishing business employs 48,500 workmen, of whom 30,000 are printers. Pasteboard and cardboard manufacture, with 16,000 workmen, must be added. There are 22,000 jewelers and 10,000 feather workers. The suburbs contain almost all the rubber factories, employing 6,000 hands, also chemical factories with 35,000 and porcelain and glass works with as many as 25,000 employees.

The nature of these Parisian industries, dependent as they are upon the importation of raw materials and the exportation of the finished products, brings out the importance of transportation facilities, the business of which in Paris alone employs 124,000 persons, twice as many as in the north. All these facts serve to characterize Parisian industries as unique in the world — that is to say, they represent industrial activity based upon intellectual and artistic qualifications.

CHAPTER XXIV

WHEAT

Before the war France was more an agricultural than an industrial country. Over half of her population was occupied with cultivating the land. Hence agricultural products form a large part of her wealth. The most important of these products are wheat, cattle, and the vine, which will be discussed in this and the two following chapters.

The development of wheat growing. The raising of cereals has been from time immemorial very important in France, chiefly because bread is the principal food of the French. In order that this valuable commodity might be easily obtained without too much dependence upon transportation, wheat was planted wherever it could mature. The great increase of population toward the end of the eighteenth century resulted in an additional amount of land being devoted to cereals, which were planted even on poor soils where the yield was small. The improvement of means of transportation in the nineteenth century brought about two results. First, railways could ship to less favored agricultural regions grain grown in more favored regions, the former thus tending to diminish their supply and the latter to increase theirs. Specialization began. Second, Western Europe was flooded with foreign

wheat grown on the steppes of Russia, the plains of America, the Pampa of Argentina — countries

Principal Wheat Regions

favored by fertility of soil and suitability of climate, as well as by economic conditions. Specialization was carried still further in Europe as a consequence of this invasion. The growing of wheat on poor soils had to be given up altogether. It was confined

to the most productive regions. In certain countries like Great Britain wheat cultivation, previous to the war, had almost entirely disappeared. France had withstood foreign competition only by resorting to artificial measures; that is, a protective tariff which has enabled French wheat to keep the national market for itself almost entirely.

Wheat regions. Under the influence of these various factors wheat growing has been abondoned in regions whose soil is poor and climate severe, such as the Armorican and Central Massifs, the Vosges, the Alps, or the interior of the Mediterranean area. It is now confined to localities where the evenness of the surface lightens agricultural labor, and where the soil is composed of deep, mellow, fertile loam. It is true that in these rich lands wheat has had to compete with industrial plants, formerly flax and hemp, and now tobacco, chicory, and, above all, sugar beets. But wheat has adapted itself to this rivalry in a most satisfactory manner. If these crops in rotation have limited it to certain years only, wheat culture has profited by following a crop which requires intensive methods of cultivation. The result is that although the acreage of wheat is reduced, the yield has increased to such an extent that any shortage is counterbalanced.

The chief wheat-growing regions are the great loam-covered plains of the north of France; in order of importance, Flanders, Picardy, Brie, Beauce, Soissonnais. Not only do they have a greater

acreage of wheat than others, but their yield per acre is largest. While the average yield in France is 18 hectoliters (about 50 bushels) a hectare (about 2½ acres), the Nord gives 27, Brie 26, Beauce 25. In these regions cultivation is practiced on a large scale, taking on an almost industrial character, with the help of improved agricultural machinery and chemical fertilizers. Many farm hands are required; these wheat lands, therefore, have always attracted agricultural immigration. Every year gangs of Belgian Flemings came to work in the Plain of the Nord, as well as in Brie and Beauce. Bretons also came to Beauce, while the weavers who worked in their homes left their industrial occupations in summer to farm themselves out in the wide fields of Picardy. Before the Great War these regions furnished about half of the wheat grown in France.

The other wheat districts are more scattered. They are found where there is fine alluvial soil, in the valleys of the Garonne and the Loire, including Anjou, and also in the west of France — Charente, Vendée — where patches of loam upon the surface of limestone or crystalline rocks have made possible an intensive cultivation greatly aided by modern fertilizing methods.

Previous to the war France was the third producer of wheat in the world, following the United States, with an average of 19 million tons a year, and Russia, with 17 millions. The French yield fluctuated between 9 million tons (1910) and 13 million

(1907). Yet this enormous quantity barely supplied the home demand. Hence the difficulties that France faced during the war are obvious, and due to lack of labor, lack of fertilizers, and especially to the destruction and ravages of war in the great productive regions — the Nord, Picardy, Soissonnais, and even Brie.

CHAPTER XXV

CATTLE

Cattle are one of the greatest resources in France, and one which previous to the war was rapidly increasing. This advance was due primarily to a decrease in the growing of cereals, which has turned many good wheat lands over to grass. It was due secondly to rural depopulation, which by reducing the number of farm hands makes grasslands more desirable than cultivated crops, that require much more attention. Thirdly, the betterment of social conditions has made meat a much more important food product than it used to be in France. For these reasons cattle raising has become a very remunerative undertaking. The increase of forage crops has made it possible to carry on this enterprise almost everywhere.

Nevertheless the increase in the number of cattle does not imply an increase in all domestic animals. The number of hogs remains stationary, although hogs are universally raised—one might say that almost every peasant house has its pig. Sheep are diminishing steadily; it is cattle and horses alone that show an increase. At the beginning of 1914 the number of cattle was nearly 15,000,000 head, an increase of more than 100,000 since 1913; horses numbered 3,230,000; sheep, 16,200,000—250,000 less than in

1913. This decrease in the number of sheep is explained by the lack of grazing lands, due to the

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discontinuance of fallow years and the improvement of pastures, which makes it possible to raise cattle instead of sheep; hence the latter disappear in favor of the former. Little by little sheep have been driven back into the dry and arid regions where

cattle cannot live: Champagne, Berry, the hills and plains of the Mediterranean region, and especially the southern mountains—plateaus of the Massif Central, southern Alps, and eastern Pyrenees—where they furnish good returns.

Horses and cattle therefore divide the more favored localities where humidity and the impermeability of the soil make grass grow luxuriantly. A distinction must be made between the places where the animals are bred and raised, those where they are fattened, and those where their by-products are treated.

Regions of production. In the regions of production young animals are bred and raised to maturity, thus supplying raw material for other localities. To do this the regions must have enough forage at their disposal. The producing countries are those where humidity of climate insures a moist soil requisite for the development of grasslands, though it must be said that such regions, if fertile, are concerned more with the fattening process, which needs very rich pasture. So it is the poorer soils especially which are given over to cattle raising. This is the condition for instance, in almost the whole of the Armorican Massif, where the cattle are small but have many good points. These animals are sold in the Paris Basin. This condition also exists in the Massif Central, where a famous breed (Salers) is raised among the volcanic mountains; and in the Pyrenees, the Jura, and the Alps, where the best

animals come from the Pre-Alps and the wide valley of the Tarentaise.

While the countries producing cattle are mostly poor regions, this fact is not true of localities which are given over to the raising of horses. The horse, being more valuable and of a higher grade, is a product of rich lands. It is raised in Boulonnais and on the adjoining highlands of Artois, in Perche, and in the plain of Tarbes.

Regions for fattening. More is required of the countries where cattle are fattened, in order to develop them, get the most work out of them, and at the same time make them fit for market. They should be fattened in rich pastures where the work demanded of them is not too hard; that is, in flatlands. On the other hand, in order that the animals may be shipped without too much expense, the region must be easily accessible; that is to say, not far from the market. Thus the best regions are those which in addition to their natural advantages of soil, climate, and relief, have the further advantage of being near to centers of population where much meat is consumed.

The French centers of population are especially the industrial regions of the Nord, of Paris, and of Lyon, and the regions specializing in cattle fattening are close at hand. Near to the centers of the Nord are the plains of Flanders, where fattening is scientifically organized. Near Lyon are the fine pastures of Charolais, Bourbonnais, Velay, and

Bresse. But around Paris are the best pasture lands of all; in Normandy there is Bray and the valley of Auge, besides the grasslands of Maine, and a little farther away from the city the grasslands near the Morvan.

Lastly, countries possessing no natural pasture lands, but having a rich soil and located near large markets, have taken up the fattening in barns of animals for slaughter, feeding them with artificial fodder such as waste from agricultural industries and the pulp from sugar refineries and breweries. This was the practice in Flanders, also in Picardy, which provided Paris and the Nord with fat steers known as *sucriers* (sugar-fattened).

Regions utilizing the by-products. Cattle have other values besides the meat they yield. While alive, they furnish milk from which butter and cheese are manufactured, and when killed, their skins, bones, and fats can also be utilized. All the regions where cattle are raised deal in these by-products. This is one of the busiest retail trades in France. Several places have specialized in it — some because a very luxuriant grass crop gives a special value to the butter and cheese, as Normandy, for instance, with its Isigny butter and Camembert cheese; others because their special breed of cattle produces unusually good milch cows, as Brittany, whose butter is famous; while still other regions have attained first rank by organizing coöperative societies of producers and manufacturing butter by special processes — like

Charente, Vendée, and Poitou, where to-day the best butter in France is made.

The war has unfortunately reduced cattle in France by one-fifth because of the devastation in the northeast and because of the enormous amount of meat required by the Allied armies. The losses in this important source of the wealth of France must also be made good.

CHAPTER XXVI

THE VINE

Wine, which is the national drink of France, is considered by most Frenchmen an article of diet that is as necessary as bread. This fact explains the importance of the cultivation of the vine. It is the characteristic crop of France, which through its cultivation has given to the French peasant his most marked traits.

Although it can bear the winter cold, the vine requires early and protracted heat in summer. On this account it is excluded from the northwest of France, where the summer is cool, and can grow on mountain slopes only up to 2,300 feet in the northern and 3,600 feet in the southern Alps. The present limit of its cultivation is a line joining the Morbihan to Mézières, passing through Paris.

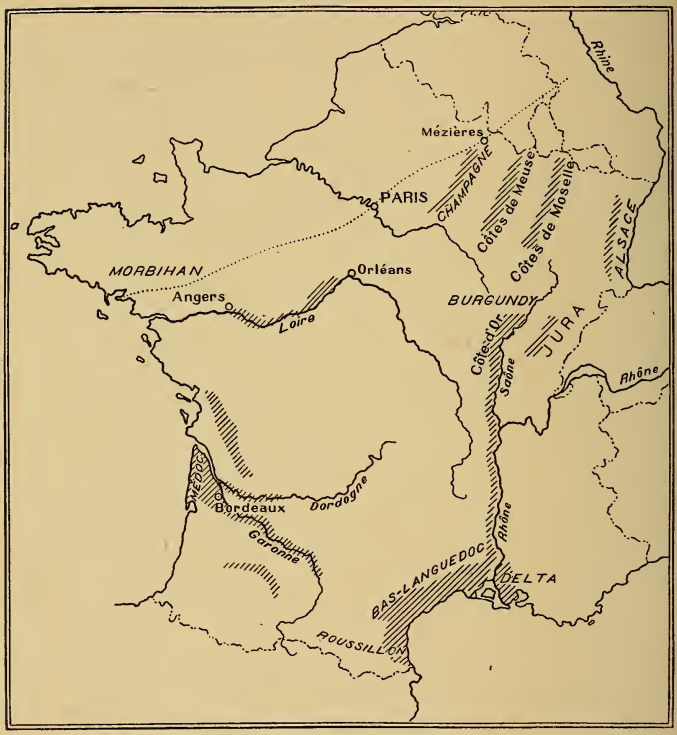
South of this line the culture of the vine has been much affected by the improvement of transportation facilities. The railways and the steamboats, making possible the importation into central and northern France of wines produced cheaply and abundantly in the Mediterranean region and in Algeria, have set up a rivalry formidable to all vineyards not endowed by nature with actual advantages of soil and exposure. The acreage under cultivation is therefore much reduced. The vine has

been relegated to the localities best suited to its demands, where, in consequence, the harvest is surest.

Furthermore, the vine toward the end of the nineteenth century went through a severe ordeal, the ravages of the phylloxera pest, which appeared in the south about 1870. At first the pest made little progress, and the harvest of 1875 was the most abundant ever known, with more than 80,000,000 hectoliters of wine, or about 1,760,000,000 gallons (a hectoliter equals about 22 gallons). But beginning in 1880, the outlook became more and more ominous. Between 1880 and 1890 production fell to 20,000,000 and even as low as 15,000,000 hectoliters. The consequences were very serious: loss of wealth, increased depopulation of rural districts, immigration toward Algeria and Tunisia. The misery felt throughout the country put even the republican form of government to a severe test.

The struggle against the pest was admirably carried on by the rooting up of some of the diseased vineyards, the flooding of others, and finally the replanting with American slips which could withstand the disease. But since that time these new vineyards have been subject to different pests. The vines, which seem to have been exhausted by the grafting process, now require much more care. This is expensive and has raised the cost of production. The acreage of vineyards is therefore much smaller than before the crisis, and although the production

has somewhat increased, the former figures have never been equaled. In 1895 there were 26,000,000



Principal Wine Regions

hectoliters, in 1898, 32,000,000, in 1900, 67,000,000. Since 1900 the harvest has usually fluctuated between 40,000,000 and 50,000,000 hectoliters, exceeding 60,000,000 in the best years. It was poor during the war because of lack of cultivation, and numberless

vineyards which have been left to themselves for four years will probably have to be abandoned. Hence, although the wine-growing regions were almost all beyond the reach of battle, the influence of the war has been cruelly felt even there.

The localities where the vine is grown are of two kinds. The one, very small in extent, is an area where all conditions favor production — the western part of the Mediterranean region. The other includes all the rest of France up to the Morbihan-Mézières line, where grapes are an exceptional crop, cultivated only here and there where soil and exposure are advantageous.

The vine in the Mediterranean region. The plains of Roussillon, Bas-Languedoc, and the delta of the Rhône are admirably suited to the vine from the viewpoint both of climate and of soil. The summer is long and hot; late spring frosts are not to be feared. The region is formed of alluvial terraces, light soils which warm up quickly and are best suited to the vine. Even the heavy clay soils of the lowlands can be utilized, since the summer drought is a guarantee against failure. Full advantage could be taken of these favorable conditions only after cheaper transportation made possible the sale throughout France of the highly colored, somewhat ordinary wines produced upon these plains. The extensive cultivation of the vine in this locality dates only from the middle of the nineteenth century. At the present time the vineyards include almost all available land.

The industry may be called a monoculture. In order to produce wine in great quantities and at a moderate price, cultivation is scientific and on a large scale, a very different condition of affairs from that existing in other French vineyards. The care given the vines, the fight against pests, the harvesting, are all organized like an industry. What makes this cultivation all the more ticklish and difficult is that the countless processes of smoking with sulphur or sulphate, scalding, etc., must be done at exactly the right time, without the least delay, and according to weather indications. So certain regions have established weather bureaus for predicting and notifying the vine growers of the exact moment at which to begin necessary treatments. In spite of a population ordinarily sufficient, at certain seasons it is necessary to call in outside labor — Spaniards or mountaineers from the Pyrenees and the Massif Central.

The results are remarkable. The region normally furnishes half of the entire wine production of France, sometimes three-fifths. In 1912 the harvest was 27,000,000 hectoliters — 39,000,000 for all of France, — 14,000,000 of which came from the department of Hérault alone. When a hectoliter of wine cost 10 to 12 francs to produce and could be sold for 80 francs, the enormous profits earned by growers here are plain to be seen.

Other wine-growing regions. Outside the Mediterranean region the vine is a more exceptional crop, occupying only certain favored localities here

and there, more and more scattered as one goes north. To escape the late frosts and to profit by all the heat of summer, the plant should be grown only on favorable exposures, sunny slopes, and easily heated soils. On these fortunate sites vines of great value are cultivated, whose harvests are able to compensate for high costs and inevitable risks. Their culture is undertaken almost entirely by small farmers capable of intensive and protracted work, who take care of their vineyards with the utmost devotion, treating them a little like a spoiled but dearly loved child. During the spring the buds must be doused with boiling water from time to time to keep off certain parasites, an example of the painstaking care involved.

In a word, the vine is found nearly everywhere, but always on favorable exposures, mountain slopes, and limestone hillsides. Four principal centers of production may be noted, which in extent are more and more limited toward the north.

Bordeaux. The largest region is the Bordeaux center, most favored by the somewhat southern climate, the nature of the soil — gravels of Médoc and limestone slopes of the valleys of the Garonne and Dordogne — and the ease of exportation from the great port of Bordeaux. This region has from time immemorial supplied foreign trade, and until the middle of the nineteenth century it was the largest center of the wine industry in France. Its production, however, is very small in quantity

compared to that of the Mediterranean region, fluctuating between 2,000,000 and 5,000,000 hectoliters. But the largest part of this production consists of *grands vins*, expensive wines which are exported all over the world.

Saône-Rhône. The Saône-Rhône center extends along the southeastern slopes overlooking the valley of the Rhône and the plain of the Saône. The climate is less favorable than that near Bordeaux. Frosts are more to be feared. On the other hand, this productive region has admirable transportation facilities, because it is traversed from one end to the other by the most important railway in France. In the arrangement of the vineyards the already exceptional physical conditions are made the most of; that is, the vineyards are located in a narrow strip between plain and upland. This is shown most strikingly in Burgundy, where the vineyards occupy a strip not more than a few hundred yards in width. The famous wines of the Côte d'Or are made here — Beaune, Nuits, Chambertin, etc. The quality is more important than the quantity. The Côte d'Or produces on an average 1,000,000 hectoliters.

Valley of the Loire. From Angers to Orléans, the valley of the Loire, as well as the tributary valleys, has good exposures on the hillsides, and the wine growers profit by the fact that they are near or surrounded by regions which cannot grow the vine at all. The yield varies from 3,000,000 to 6,000,000 hectoliters.

Champagne. Beyond, toward the northeast, the vine can be grown profitably in only a very limited area, and its harvest is most uncertain. Such is the case on the Côtes de Moselle and the Côtes de Meuse. The most important center is that of the escarpments of Champagne, where the culture of the vine has been carefully maintained, thanks to the value of the plants and the unique processes of fermentation. The yield is small, between 100,000 and 300,000 hectoliters, but wines raised in distant regions are sent to be reworked and transformed in the cellars of Champagne.

Thus it appears that the production of wine has gone through an extensive evolution in France. It tends to concentrate, to leave regions where cultivation of the vine is difficult and the yield small, for those which can produce expensive or abundant wines. This change is very important, because the vine is perhaps the largest single crop in France, or at any rate the one to which the peasant is most partial. Vineyards give employment to more than 1,500,000 growers, for the most part small landholders who are active and enterprising, democratically inclined, and much attached to the soil and to the cause of freedom.

CHAPTER XXVII

TRANSPORTATION ROUTES

France has a remarkable system of roads, the finest in the world, to which the present widespread use of automobiles gives added importance. The most inaccessible regions are provided with them, and there is not a remote village, no matter how small, which cannot communicate with the outside world by means of a well-kept road.

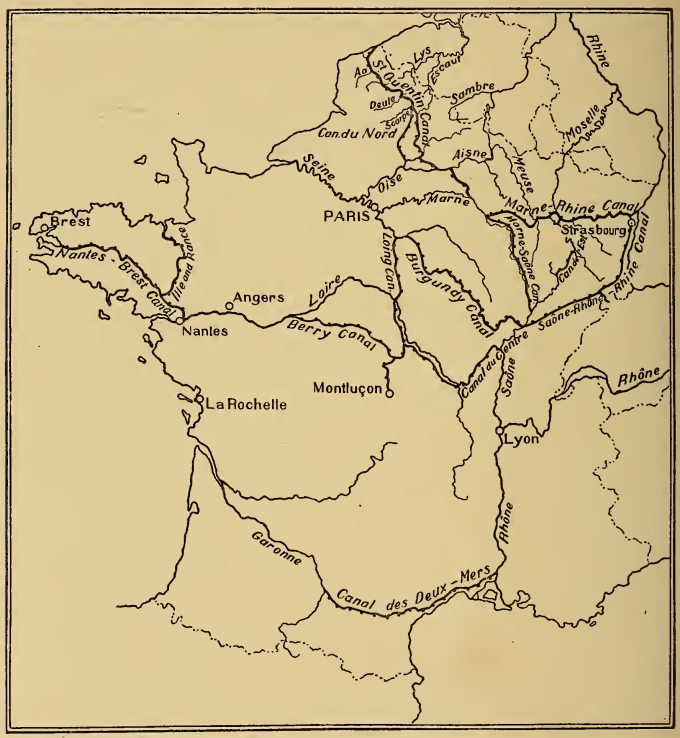
The railway system is longer than that of any other country in western Europe except Germany. But it has its faults. Planned especially to connect the provinces with the capital, it is too much centered at Paris, the point of departure for almost all through lines. During the last twenty-five years a few transverse trunk lines have been built—Calais-Bâle, Lille-Nancy, and one from the Atlantic to Geneva via Lyon. It will be necessary to add to these still further, and the important east-west American line will help considerably in this respect.

But the high cost of transportation by railway has shown the importance of waterways. The development of the latter has preference in the program of proposed public works to-day. The waterways can of course be only peripheral; that is to say, they must go around the Massif Central. Even the low regions surrounding this *massif* are not all

equally well adapted to water transportation. From a physical and economic point of view the north and the east have the advantage. For the most regular and peaceful streams with the gentlest grades are found there—the Seine and its tributaries, the rivers of the north, also the Meuse and the Saône, whose valleys are separated only by insignificant highlands. The great industrial regions are located there, centers of the north, of the east, of Paris, of Lyon, which necessarily require good transportation facilities. The streams of the south and west are more unmanageable, the Rhône on account of its steep grade, the Loire and the Garonne on account of their irregular, changeable flow. But as the industrial resources of these regions are fewer, the demand for transportation is less imperative. Thus it follows that only in the north and in the east has a satisfactory system of navigable waterways been achieved. Elsewhere nearly everything still remains to be done.

Systems of the north and east. Navigable waterways are very numerous in the north and east, and very well planned. Usually they can accommodate boats drawing a little more than nine feet carrying a load of three hundred tons. This network of waterways is made up of several parts: First, the system of the north, composed of rivers (the Aa, Lys, Deule, Scarpe, Escaut, Sambre) flowing toward Belgium, and of the canals joining them, extending from the North Sea to the Oise. The traffic on some of

these waterways, those in the coal districts, for instance, before the war exceeded 6,000,000 tons a



WATERWAYS

year. This system, by far the most crowded of all, was connected with Paris by the Canal of Saint-Quentin and the Oise. That was the busiest waterway in France, and the pre-war tonnage amounted to almost 8,000,000 tons yearly. The canal was so

congested in spite of electric traction that it became necessary to dig another canal, the Canal du Nord, connecting Douai with Paris direct, by way of Péronne and Noyon. The fighting along its banks was so intense that the canal, barely finished in 1914, was destroyed before it could be used.

The system of the north is connected with that of the east by a line of navigable waterways joining the Oise to the Aisne and the Aisne to the Marne where it connects with the Marne-Rhine Canal, thus serving also as a link between the east and Paris. This is the route by which coal and coke are shipped to the east from the north, and, in the opposite direction, the one by which the ores and metals of Lorraine are shipped west. Lorraine has an excellent system of waterwaps, the Meuse and the Moselle with their canals, as well as the Marne-Rhine Canal and Canal de l'Est.

Lastly, all the industrial centers of the north and east connect by water with the region of Lyon. From Alsace and from Lorraine the Rhône-Rhine Canal and the Canal de l'Est connect with the Saône. From the north the direct route to Lyon is via the Marne-Saône Canal, which sends coal from the Pas-de-Calais to the market of Lyon. Between Paris and Lyon there is, on the one hand, the Burgundy Canal; on the other, a canal consisting of three parts, that of the Loing, the lateral canal of the Loire, and the Canal du Centre, which serves a very busy region—Roanne and Le Creusot.

This entire system of waterways is therefore intricate and crowded. To it Paris owes its rôle as a great port, with a tonnage in 1913 of almost 14,000,000 tons. The only improvements necessary are the deepening of certain canals which are at present too shallow, and the construction of a canal from the northern industrial centers to those of the east, directly connecting the coal fields of the Nord with the iron mines of Lorraine.

Systems of the south and west. The remainder of France unfortunately is not as well supplied with waterways. The natural waterways are insufficient, needing many improvements. There is less freight, and the railway companies have prevented the development of waterways as much as possible. At present there is only one large canal, which, from a commercial point of view, is very inadequate — the Canal des Deux-Mers, parallel to the Garonne and joining that river to the Rhône. Its tonnage does not amount to 500,000 tons yearly. In the southern part of the Paris Basin the canals of Berry, which are too narrow and too shallow, supply the industrial center of Montluçon. The canals of Brittany have a merely nominal traffic.

Much remains to be done in developing the waterways. This is another of the great undertakings for the next few years. A project is under way for regulating the Loire between Orléans and Nantes. It has already been put into operation between Nantes and Angers. La Rochelle is thinking about

a connection with the Loire, and of one from there to the Saône. And lastly, the enterprising region of the southeast is intending to make the Rhône navigable all the way from the Mediterranean to Geneva, in order to secure the trade of Switzerland and to develop the already active industries of the region. The spirit of initiative which characterizes this part of France leads one to hope for the realization of this great undertaking and that it may be accomplished in a not too distant future.

CHAPTER XXVIII

THE COLONIAL EMPIRE

The colonial empire of France is second only to that of Great Britain. It was a great help during the Great War, giving freely both of men and of supplies. This empire is very composite, because it has been built up haphazard, not according to any particular plan. Of the vast possessions of the seventeenth and eighteenth centuries—eastern Canada as far as the Great Lakes, Louisiana, West Indies, the Deccan—there remain only fragments: the islands of Saint-Pierre and Miquelon, two islands of the West Indies, Guiana, five cities in India, and a few islands in the Indian Ocean. In the nineteenth century the monarchy of 1830 and especially the Second Empire had a somewhat incoherent colonial policy, but a profitable one nevertheless, for this policy brought to France Algeria, Cochin-China, Senegal, and various oceanic islands. Credit should be given to the Third Republic for conceiving and creating a real empire, adding Morocco and Tunisia to Algeria, and exploring and occupying the Sahara, the Sudân, the banks of the Congo, and Madagascar, as well as conquering nine-tenths of French Indo-China and organizing it throughout.

This empire, which is eighteen times as large as France, with a population of 50,000,000, is extremely

varied. It includes the original colonies — relics of the past — besides countries in North Africa suited to colonization and vast regions suited only for exploitation.

The old colonies. *Saint-Pierre* and *Miquelon*, *Guadeloupe* and *Martinique*, *French Guiana*, the *Island of Réunion* in the Indian Ocean, and *five cities of India* are all integral parts of France; that is to say, their inhabitants are represented in the French parliament somewhat after the manner of Algeria. With the exception of the colony of Saint-Pierre and Miquelon, which is only a fishing station near Newfoundland, they are all tropical regions raising coffee and sugar cane. Their economic activity is of little consequence.

Countries suited to colonization. *North Africa*, on the other hand, is the keystone of the colonial empire of France. This region is really a part of Mediterranean Europe into which the mountains of Italy and Spain extend. From every point of view it is very different from the great African tableland of the interior. The climate and vegetation are identical with those of southern Spain and Sicily. It is true that the presence of two long chains of mountains surrounding the high plateaus makes it rather rugged. But the rich coast plains and the inland basins are capable of yielding plentiful harvests, especially with the help of irrigation, which is very successfully practiced. European agriculture has spread over the coast ranges of Algeria, where cereals,

the vine, olives, and early vegetables are raised. The plateaus are beginning to experiment with dry-farming, but their principal dependence is sheep. The southern oases produce dates. Agriculture is much more developed at the two extremities, however, in Morocco and Tunisia, thanks to wide expanses of territory where the climate is subject to the softening influence of the sea. Western Morocco is a wonderful country where cereals flourish and where cotton will probably be raised on a large scale. Southern Tunisia produces olives, as during the Roman occupation.

Furthermore, North Africa has mineral resources. Prospecting has already revealed their presence in Morocco. Eastern Algeria and Tunisia produce in abundance phosphates and iron, for whose exploitation many railways have been built. If lack of coal cripples industry, commerce at least flourishes in both countries. Before the war it amounted to 1,500,000,000 francs, more than a billion for Algeria alone.

Europeans can live in North Africa, and about a million have located there, half of whom are French. The others, Spaniards and Italians, mostly poor immigrants, quickly become French citizens. Thus a young Latin race is growing up in the region, French both in language and in spirit, which may become for France what Australia and Canada are for Great Britain. In addition there are at least 10,000,000 natives, 4,700,000 of whom

are in Algeria, 1,700,000 in Tunisia, and the remainder in Morocco. Some of these are sedentary, others nomad. These races are assimilated with difficulty on account of their religion, for they are Mohammedans. Nevertheless great progress is being made, as was shown by their remarkable loyalty during the war. To reward them, France has just increased their share in the local administration of Algeria. In Tunisia the native government continues to function under French control. Morocco, where the power of the sultan has been maintained, will soon be pacified. Credit should be given to General Lyautey for continuing the work during the Great War, in spite of German propaganda. Only among the high Atlas mountains and in the far north, which is under the control of Spain, is the country still dangerous.

What France has been able to accomplish in North Africa is thus considerable, and the importance of this part of the French colonial empire seems greater every day. A real African France has sprung up, valuable in the development both of the trade and of the industry of the mother country. During the war it furnished more than 500,000 soldiers and workmen.

Colonies for exploitation. The other French colonies situated in tropical latitudes are not suited to European colonization. But they serve as outlets for French trade, and also supply raw material of various kinds. They include a number of islands of

Oceania, which are mostly ports of call, like Tahiti, and coaling stations, like Jibuti, which is also the outlet of Abyssinia. The large southern island of New Caledonia, rich in nickel, and the great colonies of French West Africa, French Equatorial Africa, Madagascar, and Indo-China complete the list.

French West Africa consists of the vast plain of western Sudân from Lake Chad to Senegal, which has access to the coast by way of several colonies of secondary importance—Senegal, French Guinea, the Ivory Coast, Dahomey. Several zones of vegetation can be distinguished as we pass from south to north: equatorial virgin forests, followed by steppes growing dryer and dryer toward the north till a completely desert type of vegetation is reached. The agricultural products are therefore very varied. At the south, palm oil, rubber, kola, and copra are exploited. Farther north the principal export is cattle, but in the valleys where flooding is possible, cereals are raised—millet, for instance—and also cotton. The northeast, being very much dryer, produces peanuts. From each coast region railways extend inland, tending to converge in the interior. There are already more than 3,000 kilometers (1,875 miles) of track laid.

The black population of the interior received the French with joy, for the government is mild and has brought peace to countries which were sadly in need of it. This region supplied 200,000 good

soldiers, who played an honorable part on the battle fronts of France and Morocco. French West Africa will be united to Algeria by rail across the Sahara, which is now entirely under control. When this plan is carried out, the great port of Senegal, Dakar, will be the terminus of a through line from Europe as well as the point of departure for South America.

French Equatorial Africa. Extending from the mouth of the Congo River to Lake Chad, French Equatorial Africa is less developed because its outlet to the sea, among mountains and virgin forests, is extremely difficult. It has the same products as French West Africa, but cannot export them with any ease until its system of railways has been more extended.

Madagascar. The island of Madagascar, which is a little larger than France, consists mostly of a vast plateau, difficult of access, whose soil is not very fertile. Nevertheless the forests along the coast produce rubber and vanilla, and rice is cultivated in the inland valleys. The crystalline rocks contain some gold. Large flocks are raised in the interior. A railway built with much difficulty connects the capital, Antanànarivo, situated on the plateau, with the port of Tamatave, providing an outlet for trade, which is concerned chiefly with the export of agricultural products to British South Africa.

French Indo-China. French Indo-China, which is more than half as large again as France, is a

varied country. It consists mostly of a large plateau in the interior which slopes toward Cambodia in the south and is framed on the north and east by the mountains of Tonking and Annam. Two large plains are formed by the deltas of the two great rivers of the country, the Mekong and the Songkoi. These two plains, Cochin-China and Lower Tonking, are very rich and very thickly settled. The chief crop is rice. Tonking, which has coal, minerals, and building materials, is already venturing in a small way to begin manufacturing. The interior is difficult to exploit because of the lack of transportation facilities, the river being full of rapids. The construction of railways is proceeding rather rapidly, and already a line from Tonkin has given an outlet to southwestern China. The foreign trade of Indo-China already exceeds 500,000,000 francs yearly. If the colony were properly organized this trade could be considerably increased, supplying France with tea, rubber, silk, and jute.

The Great War has shown France the importance of her colonial empire and the urgent necessity of developing its economic possibilities. The development of these possibilities is in the front rank of the undertakings of the near future. The war has also shown the importance of colonial fighting expeditions in the making of soldiers, for it is in these battles that some of the most illustrious generals of France have been trained—Joffre, Galliéni, Gouraud, Mangin, and many others.

A KEY TO PRONUNCIATION

For French words presenting any difficulty.

Symbols for French vowels and certain consonants. Note that the same sound is often spelled in different ways.

If the student will bear constantly in mind that the vowels in the examples given in this "key" have French and not English values, he will have no difficulty. It may not be easy at first to pronounce *i* like *an* in *sang*, or *ŏ* like *o* in *nor*, but a little practice will make it simple.

A	*a* as *a* in f*a*t.	Examples, m*a*l, *A*lpes
	â as *a* in f*a*r.	" m*â*le, Le H*â*vre
E	*é* as *a* in f*a*te.	" f*é*e, *E*pinal
	è as *e* in th*e*re.	" f*è*ve, *A*isne
	ê as *e* in th*e*re (prolonged).	" f*ê*te, S*e*ine
	ĕ as *u* in b*u*rn (rounding the lips and leaving out the r).	" j*e*, Gr*e*noble
I	*ĩ* as *e* in m*e*.	" *ĩ*le, *I*sère, *Y*pres
O	*ŏ* as *o* in n*o*r.	" m*o*rt, *O*rléans
	ô as *o* in n*o*.	" m*ô*le, Rh*ô*ne
U	*u* has no English equivalent. Place lips in position for pronouncing *oo*, and say *ee*.	Examples, d*u*c, L*u*néville
EU	*eu* as *e* in f*e*rn (rounding the lips and leaving out the r).	" p*eu*, M*eu*se
OU	*ou* as *oo* in b*oo*t.	" j*ou*r, T*ou*rs
OI	*oi* as *wa* in *wa*rrant.	" l*oi*, *Oi*se

Nasal vowels have no equivalent sound in English. Let the breath pass through the nose and mouth at the same time, *leaving off the sound of m or n which follows:*

AN, AM } *ā* as *en* in *en*core — Examples, p*an*, Fr*ance*

(A prolongation of the first syllable of *en*core produces the effect, stopping before sounding the *n*.)

EN EM	$\bar{e}$ as *en* in *en*core.	Examples, *en*, L*en*s
IN IM	$\bar{\imath}$ as *an* in s*an*g.	" p*in*, Re*ims*
ON OM	$\bar{o}$ as *on* in s*on*g.	" b*on*, Ly*on*
UN UM	$\bar{u}$ as *un* in s*un*g.	" br*un*, Verd*un*

CH	*ch* as *sh* in *sh*ed.	Examples, *ch*âteau, *Ch*aumont
J	*j* as *s* in vi*s*ion.	" *j*our, *J*offre
GN	*gn* (liquid) as *gn* in mi*gn*onette.	" campa*gn*e, Dordo*gn*e
LL	*y* (liquid) as *li* in bril*li*ant.	" fi*ll*e, Marsei*ll*e

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Aar, L' (lâr)
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