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R. S. Tarr^a

^a Cornell University, Ithaca, N. Y.

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MAN AND HIS ENVIRONMENT IN GERMANY.

By R. S. Tarr

Cornell University, Ithaca, N. Y.

I.

THE CLIMATE.

THE northernmost part of Germany lies in about the same latitude as the southern tip of Alaska, and the entire country is north of the latitude of the northernmost point of Maine. Yet it has not a cold climate. In the north the winter climate is raw and damp, but the snowfall is not heavy and extremes of cold are not common. For instance, during the winter of 1910 which was, however, milder than usual, there were only four or five days of sleighing in Berlin, in the latitude of southern Labrador, and about an equal period of skating on the shallow ponds of the city parks. There was much cloudiness and much rain, and for days, and even weeks, the sun was not seen; and when the weather was clear, the sun was so low that one scarcely realized the fact in the city. A little after four o'clock it is dark in midwinter; but in midsummer the days are very long. While in summer there are some periods of exceptional heat, whose effect is intensified by the humidity, the summer weather is usually cool, and there is an abundance of rain.

The cloudiness, rainfall and equable temperatures are the result of the damp west winds which prevail from the Atlantic whose temperature is raised by the inflow of warm waters from the southwest supplying abundant vapor and tempering the heat of summer and the cold of winter. Naturally the influence of the ocean winds diminishes with distance from the sea, that is, toward the east and the south; but in the latter direction the change is masked by the fact that the land surface rises in that direction. Thus at Munich (1703 feet) though further south than Berlin, the winters are colder, and because of the elevation the summers are cooler; but in spite of the distance from the sea the rainfall is heavy both summer and winter.

Besides the general variations in climate there are numerous local differences, as between valley and mountain, between lee and windward

slopes, and between shady and sunny exposures, all of which give rise to important local responses to climatic influence. For example the sunny slopes of the Rhine and Moselle valleys are terraced and transformed to one of the leading vine producing regions of the world, while the shady slopes are usually either bare rock or at best support only forest growth.

Even in the most favorable state, the inhabitant of Germany has been forced to a life of industry, for he must win for himself not merely subsistence from day to day, but he must provide adequate food, clothing and shelter for the long period of winter. Certain favorable conditions, wisely taken advantage of for many centuries, and careful modification and utilization of less favorable conditions have bred a race of people whose profound influence on Europe and the rest of the world has spread far beyond the limits of Germanic speech, even extending that term to English. No nation of the world today shows a more thorough, intelligent and scientific utilization of its resources than Germany. To her we of the United States must look for those lessons in conservation of soil, water, mineral and forest which we so sorely need. Her resources are husbanded; waste is reduced to a minimum; natural conditions are made use of when possible; they are improved upon where necessary; and this little country, smaller than our single state of Texas, not only supports a population of 63,000,000, but is increasing in industry, wealth and prestige as no other country in the world is doing save perhaps the United States. No country of Europe, excepting Russia, has so increased in population in the last half century.

THE SOIL AND ITS CULTIVATION

Except for the rainfall, which is ample, the climate of Germany is not especially favorable except in spots. Only here and there for instance, is the climate warm enough for grape culture. It is the hardy grains, fruits and vegetables upon which the agriculturist must chiefly depend. Nor is the soil good, on the whole. On the northern plain there are extensive stretches of soil so sandy that it has been found more suitable to forest growth than to crops. In the plateau and low mountain region of central and southern Germany there are broad tracts of forest and there are extensive pasture lands where the slopes are too steep, or the soil too thin or sterile for successful agriculture. Yet the soil is everywhere made to yield its utmost, and Germany is an important agricultural nation. Ninety-five per cent of the land is productive, including forests and pasture. Where farming is carried on it is done intensively; the soil is given crops to which it is best adapted; the ground is worked carefully foot by foot; fertilizing materials are carefully saved and utilized; the soil is not exhausted and allowed to run down; and no spaces are left for weeds or brush by fence-side and roadside. As one passes through them in a train

the farm lands look like a succession of carefully cultivated gardens with narrow strips of hay, clover, grain, potatoes, etc., all thriving as only properly cared-for crops can. It is a crime to pick an apple, or even a cherry, from a tree whose limbs overhang a highway, for every tree has an owner who expects a profit from his fruit.

When the methods of German agriculture prevail in the United States our yield per acre will be greatly increased, our acreage will be multiplied, and the population that can be supported will be increased many fold. Those who fancy that they see danger of over population in the United States in the no distant future, or fear that we may not continue to supply ourselves with food, need only study the possibilities of application of German methods to reassure themselves. It may be long before the American farmers' wives and girls work day after day in the fields, or before milch cows are put to the plow, as in Germany; but care to keep up the soil, a study of adaptation of crops to soil, elimination of weed patches between fields, and proper tillage and fertilization of the soil are all easily within reach. Doubtless these improvements will become widespread when land becomes of sufficient value to demand greater care.

MAIN SURFACE FEATURES

The surface of Germany is exceedingly complex in detail, but it is not my purpose to discuss the detailed topography and its influences, interesting and important though this is. Omitting the Alpine section, for the southern boundary extends a short distance into the Alps, Germany may be said to consist of two quite different parts, the northern half a broad plain, the southern half a plateau which rises gradually, with somewhat irregular boundary, above the southern edge of the plain.

On the whole, the northern plain is remarkably level, though with low hills and hilly areas here and there. It was covered by the continental glacier and therefore has local minor irregularities of topography and soil due directly or indirectly to glacial deposit—moraines, drumlins, sand dunes, lake clays, lake basins, and swamps. There are extensive pasture lands, tracts of forest, and much land in crops. It is essentially a farming country, like the rest of Germany utilized to the utmost, and producing the crops of a raw, damp climate. There has been a great addition to the extent of the farm land by the drainage of swamps, as at Spree-wald, near Berlin, where a folk has lived and preserved peculiar customs and costumes in the midst of a broad swamp which they have drained. The houses front upon the narrow drainage ditches and the people travel to their work, or to church, or to visit one another, in boats pushed with spiked poles, along the shallow canals. Protected by their swampy environment, these people have been so little influenced that we have here a bit of the middle ages almost at the door of the fifth greatest city of the world.

The plateau section of Germany is far more complex than the northern, or Prussian, plain. It is composed of many parts, of different geological history, and of different topography, a consideration of which could not be undertaken in an article of this scope. Speaking very generally, it is a plateau, varying in elevation from place to place, whose origin has been, first, complex mountain uplift, then reduction by denudation to the rolling condition of advanced maturity of topography, to which the name peneplain may properly be applied, then uplift of variable amount, with faulting, with local areas of down sinking and with volcanic eruption, and finally dissection by stream erosion. As a result of this complex history, only the outline of the main features of which were stated in the preceding sentence, the southern half of Germany has a very varied, though subdued, topography.

The main element is the peneplain plateau, and when upon its surface, one sees mainly levelness or hilly topography; but in the different sections there are different elevations, and notable differences of topography in detail. A second noteworthy element of the topography is the presence of small areas of low mountains like the Vosges, the Black Forest, the Hartz and the Erz Gebirge, which are mainly either the upturned edges of fault blocks, or parts of the plateau where the rocks are so resistant that they were not worn down to the general peneplain level. A third noteworthy interruption of the plateau surface is where blocks of the earth's crust have settled below the plateau level, so-called *graben*, like the broad middle Rhine valley between Bingen and Basel. A fourth feature of the plateau is the abundance of deep, narrow river valleys, veritable gorges, which cross it in various directions, notably the gorges of the Rhine and its tributaries, such as the Moselle from the west and the Lahn from the east. Some of these valleys, like the Moselle, still preserve the meanders with which they formerly swung in broad, sweeping curves over their floodplains on the ancient peneplain, but now etched into the mountain rock in which the rivers are entrenched. These gorges have precipitous sides, and from their bottoms one seems to be in a mountainous country; but from their tops one looks out over a rolling farming country; and a few miles, or at times even a few hundred yards, from the edge of the gorge one would not suspect that he was on the verge of a valley several hundred feet deep. The larger of these gorge valleys have been cut down so near to grade that the river current is nowhere so rapid as to check navigation; but the smaller side streams are still actively gnawing their way down into the plateau, and their headwaters are on the plateau top.

GERMAN FORESTRY

Much of the plateau country is unsuited to agriculture because of unfavorable climatic or soil conditions, or because of the steep slopes. Most

of such country is planted with forest, treated as crops, so that Germany is an important lumber producing country. Forest farming, or forestry, is practiced in a most intelligent and scientific manner. Upon German methods is based the scientific forestry of the world. There is no slashing and ruthless destruction of the forest and there are no extensive forest fires. Individual trees are selected for cutting, or small tracts are cleared, and even the twigs are utilized. Cutting is carefully planned and executed in order to yield the greatest return and the least waste. A cut-over area is replanted and a large forest yields a continuous revenue, as a farm does. The forest is kept free from useless undergrowth; weak trees or trees that crowd other better ones are removed; roads and paths are maintained through the forest; the spread of fire is prevented by plowed trenches, and the forest is patrolled by trained foresters. Under Fernow and Pinchot, chiefs of the United States Forestry Service, these German methods were introduced into the United States, and it is one of the objects of the conservation movement, for which Pinchot stands, to continue and extend these methods. It is the duty of all patriotic American citizens to stand in support of this movement in order that our great forest resources may not continue to be wasted, as they have been, for the enrichment of a few and the impoverishment of the future.

These forest areas of Germany line the gorge sides and cover the mountains where soil or slope are unfavorable for crops, and smaller patches dot the surface whenever the conditions favor forest rather than crops. Besides yielding a return in wood crop, and in other products of forest trees, the German forests exert an important influence in regulating the run-off of the rainwater and thus in regulating the streams and in diminishing the danger from floods, as well as in checking the removal of soil from highland to lowland, with the accompanying stripping of the thin soil from the mountain slopes and its deposit in destructive sheets of waste on the more fertile lowlands.

The German forests are further utilized as a home for edible wild animals, notably the rabbit, the deer and certain birds, carefully protected and killed for food only at certain seasons, and in reasonable numbers. Thus we have the peculiar anomaly of finding in the densely settled country of Germany a far greater use of game as an article of diet than in our country with its great tracts of wilderness. At the proper season, game is one of the conspicuous objects exposed for sale in the meat markets of the cities.

FARMING AREAS IN THE PLATEAU

In the plateau the most extensive farming areas are on the plateau uplands between the more elevated mountain portions and between the gorges of the deeply entrenched rivers. Here one finds numerous villages and small towns, for, in general, the German farmer dwells in a village

walking to his farm lands which radiate out from the village center. There are certain areas where isolated farms and farm houses, like those in America, are dominant, but, in general, this is not the case. Most of the gorge valleys are too narrow and too steep sided for extensive farming, but where conditions are favorable, as in narrow strips of floodplain, or on less steeply sloping valley sides, the soil is cultivated. The chief exception to the rule of absence of cultivation in the gorge valleys is in the Rhine valley and some of its tributaries, notably the Moselle. Here, for centuries, those slopes having sunny exposures have been terraced in the Italian style, at great expense of labor, to become the seat of remarkably productive vineyards. Probably this method of utilization of slopes normally too steep and rocky for crops was introduced by the Romans when they used the Rhine as a highway to northern Europe. It is used also to some extent for other fruits and vegetables, but in the narrower slopes, the crops that will grow are not of sufficient value to repay the vast work of removing stones, building retaining walls, and carrying soil to fill the space between the walls. In the Rhine and Moselle valleys, the southern position, the distance from the sea, the protection furnished by the gorge enclosure, the presence of water to moderate the climate, and, above all, the steep slopes facing the mid-day sun so as to receive its rays at approximately right angles to the slope, give rise to a local climate in which the growing season is prolonged, the early and late frosts are diminished, and the necessary summer heat is provided for highly successful grape culture.

Some of the best farming sections are in the broader valleys of which the most important example is the graben valley of the Rhine above Bingen. This valley has a fertile soil, a gently rolling topography, and a warm climate, for it lies in the southern part of Germany, is bordered by mountains, and lies only about 300 feet above sea level. It is therefore a densely populated, fertile garden, and it has the great advantage of situation on the Rhine highway. From these fertile lowlands to the pasture lands of the mountains there is every gradation; and consequently a great variety of products of a cool temperate climate. Barring only a very small area in the Alps in the extreme south, and smaller areas in lower mountains, no part of Germany is too high for crops or forest; and in no part is there too little rainfall for agriculture. There are, however, such great tracts of land with steep slopes, thin soil, and sterile soil, and so much swamp land and upland with cool summer climate that only about 50 per cent of the land is adapted to crops. Only by the most careful and intelligent methods is the farm land made to yield a living to the dense agricultural population. Owing to the careful utilization of pasture lands, and to the skillful practice of forestry, the percentage of waste land is reduced to a minimum,—but 9 percent of the total land

area. Thus Germany ranks high among European nations in both its farm and its forest products. By carefully husbanding these fundamentally important resources abundant material is furnished for the maintenance of a wide variety of manufactures. Thus soil and climate, though not especially favorable on the whole, are so utilized by these people as to yield large returns in crops, domestic animals, and forest products.

MINERAL RESOURCES

Far more favorable than soil and climate are the resources from the rocks beneath the soil, and these have been utilized with equal intelligence and scientific skill to the great profit of the nation. The geological structure of Germany is extraordinarily complex.

The mineral products include a large proportion of the materials most useful to man:—an abundance of building stone of many kinds; clays, sands and cement materials, widely scattered; salt and brines; a great variety of metalliferous minerals, including ores of gold, silver, copper, lead and zinc, and rich deposits of iron; fuels, notably bituminous coal, brown coal and peat; and other products of value and importance. These are all made to contribute to the wealth of the nation and the same careful attention to conservation of resources and elimination of waste is seen here as in agriculture and forestry.

INLAND WATERWAYS

In its development of industries, as in other ways, Germany has been greatly influenced by its natural facilities for transportation. The mountains and dissected plateau, with their broad tracts of forest, interpose obstacles to travel, but the major rivers, flowing in gorges whose beds are reduced nearly to grade, make excellent highways whose usefulness is rendered greater by the abundant and well distributed rainfall, by the supplies of water contributed by headwaters in the mountains and upland plateau, and by the regulation of run-off brought about by the forests in the headwater region. The usefulness of the navigable rivers is also increased by the mildness of the winter climate by reason of which, even though so far north, navigation upon them is interrupted little if at all.

THE RHINE

Among the river highways none equals the Rhine in importance; in fact it is without rival among any similar highways in the world. Fed by the melting snows of the Alps and by numerous tributaries from the plateau and its mountainous portions, and with its volume regulated by passage through Lake Constance, the Rhine flows in Germany, first through the fertile graben valley, then through its gorge, and finally over the northern plain and its delta to the sea in the Netherlands. From Basel to the sea there is no rapid that very seriously interferes with navigation, and the river has been carefully improved by dredging, by

retaining walls and by other devices for straightening the course, shortening the distance and maintaining sufficient depth of water for safe navigation in the channel. Ocean boats of moderate size pass up the river, and Cologne is essentially a seaport, although far inland. Other boats load and unload on the river banks, and at the busiest points artificial harbors are made for the fleet of river boats taking on or putting off their loads. The entire valley from well out on the northern plain as far up as Basel is densely settled and the seat of great and varied industry, and near Cologne are the most extensive coal fields of Germany whose fuel is needed in the industries of the upper valley. There are navigable tributaries like the Moselle and the Main which extend the area served by this artery of commerce; and the area is still further increased by a wisely planned system of canals which connect the Rhine with the Rhone, with the Marne, with the Danube, and, across the northern plain, with the Eros and Weser.

Looking down upon the Rhine from an elevated point on the walls of its gorge one sees a constant procession of river steamers large and small, and single boats and chains of boats laden with lumber, coal and merchandise. Scores of boats may be seen in a single view, and on each side of the river is a railway line adding to the volume of traffic along this great highway. Perched upon a rock pinnacle in the range of our view is the ruin of a castle, the relic of by-gone days when river craft of different kind, but laden with valuable goods, were made to pay tribute to the robber baron for the privilege of following this highway for purposes of trade. All the centuries of the Christian era, at least, have witnessed busy traffic along the Rhine, but at no earlier period has the river attained the importance in commerce that it possesses today. It has even profoundly influenced the history and development of the German people; today it is one of the vital resources of a great empire. From its use by the German, and from its improvement at his hands, we can learn an important lesson in the utilization of our own as yet wasted resources of navigable waterways.

OTHER WATERWAYS

Next to the Rhine in importance is the Elbe, similarly improved so that it is navigable into Bohemia and connected by canal across the northern plain with the other navigable rivers to the east. Though highly important as a means of transportation, the Elbe is far less significant than the Rhine in the present and past life of the nation. The very moderate slope, the abundant rainfall and the moderate evaporation in the Prussian plain are all favorable factors inviting utilization of the water highways, and the invitation has been amply accepted so that a large proportion of the transportation of heavy freight is done by boat.

(Concluded in October.)